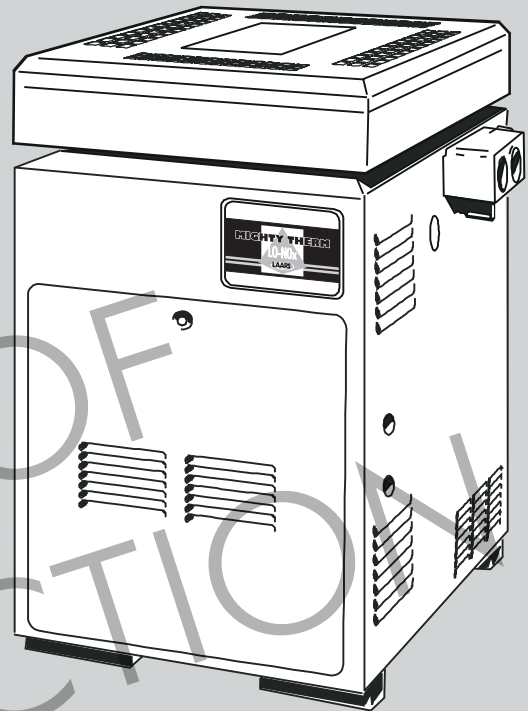


Installation, Operation
and Maintenance
Instructions for

Mighty Therm™ LO-NOx

Hydronic Boiler
Models HH-PH
Sizes 250/400
For Natural Gas Only

U.S. Reg. 1,483,289
Canada Reg. 333,796



FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water boiler installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ 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 and 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 nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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

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SECTION 1.

General Information

1.1 Introduction

This manual provides installation, operating, and maintenance instructions for Model HH, PH Hydronic Boilers, Sizes 250 and 400. Review all application and installation procedures completely before proceeding with the installation. Experience has shown that most operating problems are caused by improper installation.

The boilers are offered in a basic configuration (see Figure 1). On PH boilers the pump is factory installed.

WARNING

Mighty Therm hydronic boilers **must** be installed in accordance with the procedures detailed in this manual, or the Laars Heating Systems warranty will be voided. The installation **must** conform to the requirements of the local jurisdiction having authority, and, in the United States, to the latest edition of the National Fuel Gas Code, ANSI Z223. In Canada, the installation must conform to the latest edition of CSA B149.1 Natural Gas Installation Code and/or local codes. Any modifications to the boiler, its gas controls, or wiring may void the warranty. If field conditions require modifications consult the factory representative before initiating such modifications. Improper installation could result in property damage, injury, or even death.

MISE EN GARDE

Les appareils de chauffage à eau chaude Mighty Therm **doivent** être installés dans le respect des directives détaillées contenues dans ce manuel, à défaut de quoi la garantie fournie par Laars Heating Systems sera annulée. L'installation doit être conforme à la réglementation locale ou, en l'absence de réglementation locale, avec le National Fuel Gas Code, ANSI Z223. Au Canada, l'installation doit respecter les exigences de la plus récente édition du Code d'installation du gaz naturel CSA B149.1, et/ou des codes de la construction locaux. Toute modification apportée à la chaudière, aux régulateurs de gaz ou au câblage peut compromettre la garantie. Si certaines conditions particulières rendent des adaptations nécessaires, consulter un représentant du fabricant avant d'entreprendre ces modifications. Une mauvaise installation peut entraîner des dommages matériels, des blessures ou même la mort.

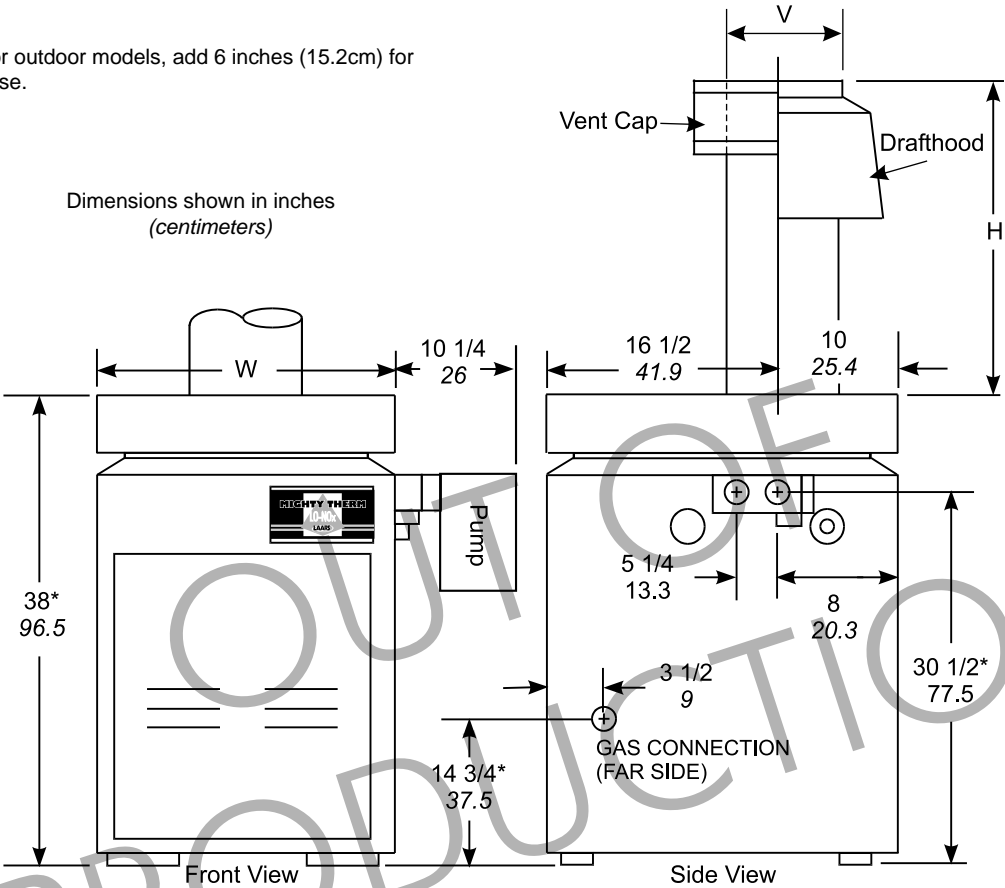
1.2 Warranty

Laars Heating Systems Mighty Therm boilers are covered by a limited warranty. The owner should fill out the warranty registration card and return it to Laars Heating Systems.

All warranty claims must be made to an authorized Laars Heating Systems representative or directly to the factory. Claims must include the serial number and model (this information can be found on the rating plate), installation date, and name of the installer. For specific warranty conditions refer to your Limited Warranty.

Some accessory items are shipped in separate packages. Verify receipt of all packages listed on the packing slip. Inspect everything for damage immediately upon delivery, and advise the carrier of any shortages or damage. Any such claims should be filed with the carrier. The carrier, not the shipper, is responsible for shortages and damage to the shipment whether visible or concealed.

NOTE:* For outdoor models, add 6 inches (15.2cm) for outdoor base.



Model Size	Firing Rate		Heater Width "W"		Venting Dimensions					
					Drafthood Vent Vent Cap Diameter "V"		Outdoor Dim "H"		Indoor Dim "H"	
	MBtu/h	kW	in	cm	in	cm	in	cm	in	cm
250	250	73.3	22 1/2	57.2	7	17.8	18 1/4	46.4	25 1/4	64.1
400	399	117.0	31 3/4	80.6	9	22.9	21 1/2	54.6	27 1/2	69.9

All dimensions are nominal.

Figure 1. General Configuration.

SECTION 2. Installation Instructions

2.1 General Information

WARNING

Improper installation or maintenance can cause nausea or asphyxiation from carbon monoxide in flue gases which could result in severe injury, property damage or death. Follow the manufacturer's maintenance schedule for the appliance. Follow local regulations with respect to installation of carbon monoxide (CO) detectors.

MISE EN GARDE

Une mauvaise installation ou un entretien inadéquat peut être la cause de nausées ou d'asphyxie en raison de la présence de niveaux dangereux de monoxyde de carbone dans les résidus de combustion et peut entraîner des dommages matériels, des blessures ou même la mort. Suivre les directives du fabricant au sujet du programme d'entretien de l'appareil. Suivre les règlements locaux touchant l'installation de détecteurs de monoxyde de carbone (CO).

All gas-fired products require correct installation to assure safe operation. The requirements for boilers include the following:

1. Field assembly of draft hood or vent cap (see Section 2.2).
2. Appropriate site location clearances and flooring.
3. Sufficient combustion and ventilation air.
4. Adequate venting of combustion products.
5. Adequate water flow.
6. Properly sized gas meter and piping.
7. Proper electrical wiring.

This manual provides the information needed to meet these requirements. Review all application and installation procedures completely before continuing the installation.

2.2 Field Assembly

The HH, PH boilers are shipped from the factory with the top assembly in the low-profile configuration for outdoor installations.

The HH, PH boilers are design certified for indoor installation when equipped with a special draft hood, which must be installed without modification. The part number for the draft hood is on the boiler rating plate. Follow this procedure to make the conversion:

1. Remove the top plate, stamped "HOT", by slipping a fine-blade screwdriver into the slot and prying it up (see Figure 2).
2. Remove the top by removing all eight screws connecting it to the jacket (see Figure 3).
3. Remove the rainguard assembly (see Figure 4).
4. Remove the two screws securing the left vestibule cover (see Figure 5). The cover can be discarded.
5. Remove the vent cap or draft hood and accessories from the carton.
NOTE: Vent cap is for outdoor installation, when required.
6. Place transition plate (with 14" long side) securely on top of flue collector so flue gases will not leak (see Figure 6).
7. Remove back portion of rainguard (see Figure 7).
8. Re-install the rainguard (see Figure 8).
9. Replace boiler top and all eight screws (see Figure 9).
10. Slide the adapter plate up over the bottom of the stack extension. Fit the stack extension, of the draft hood or the vent cap, on top of the collar of the flue transition plate (see Figures 10 and 11).
11. Seat the adapter plate on the top assembly, and secure it with screws supplied in the kit (see Figure 12).
12. Attach the clips to the adapter plate by securing the slotted side of the clips with the screws in the kit (see Figure 13).
13. Use the holes in the clips as guides to drill three 1/8" dia. holes in the stack.
14. Secure the stack to the clips with the screws supplied in the kit (see Figure 13).
15. Figure 14 shows a cross-section of the finished installation.
16. Find the vent damper box which is located in the boiler package (boiler model 250 only).
17. Install the vent damper directly to the top of the draft hood outlet. The damper operator should face to the front of the boiler, and the flow direction arrow should point **upward**. Use the vent damper wire harness to connect the vent damper to the boiler. The bracket end of the harness should be connected to the vent damper actuator (see Figure 16).
18. Plug the wiring for the draft hood switch into the receptacle on the left side of the vent damper box (see Figure 15).
19. Do not modify the automatic vent damper device. The venting system must be arranged so that only the boiler is served by the vent damper device supplied with the boiler. Provide at least six

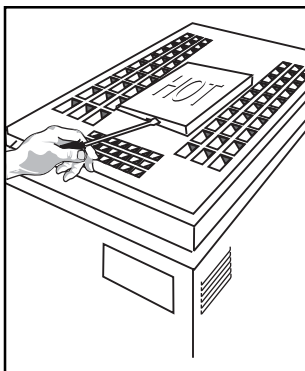


Figure 2.

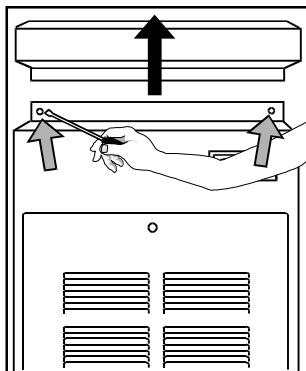


Figure 3.

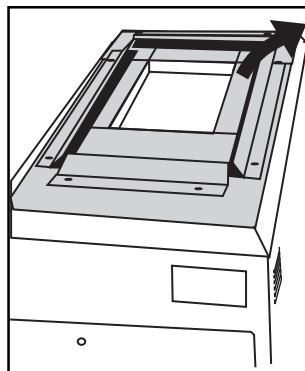


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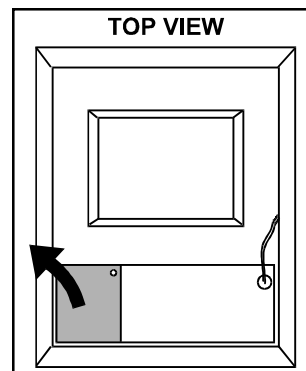


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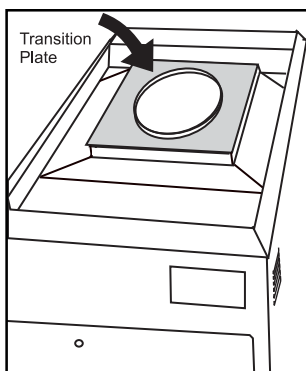


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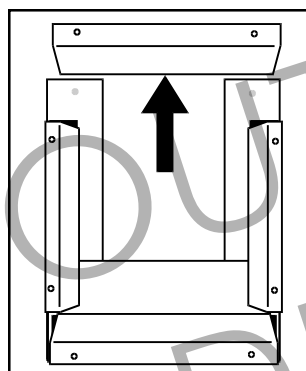


Figure 7.

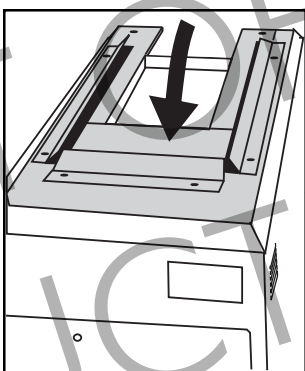


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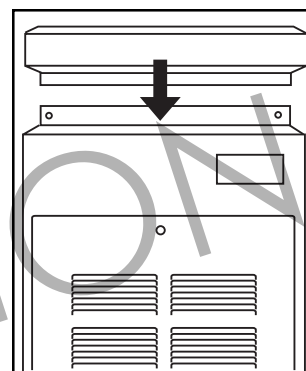


Figure 9.

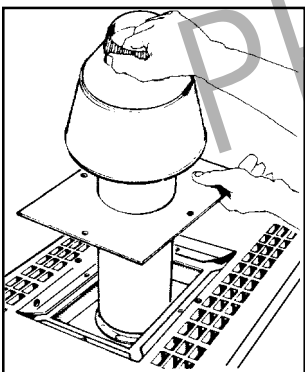


Figure 10.

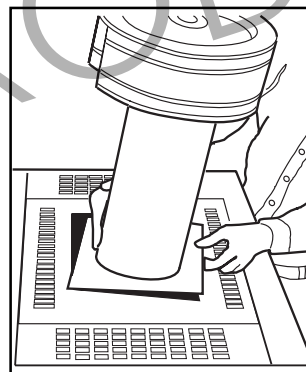


Figure 11.

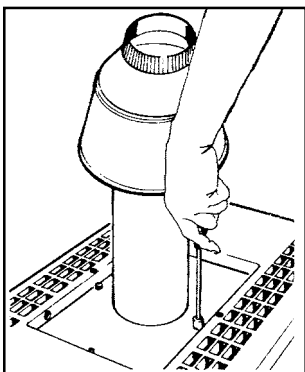


Figure 12.

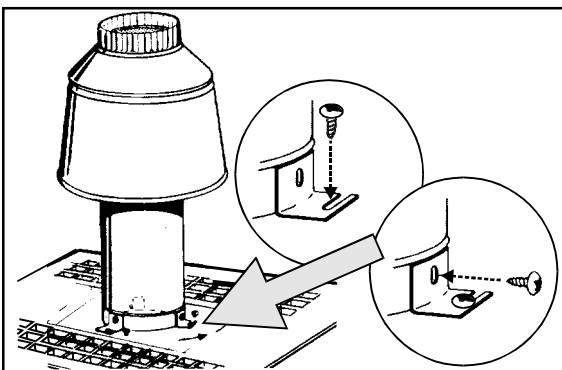


Figure 13.

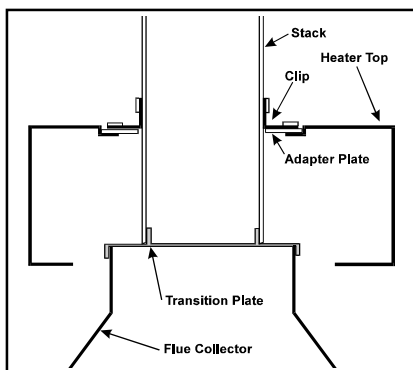
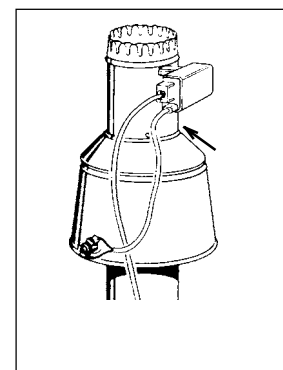


Figure 14.

Figure 15. Drafthood
Switch Receptacle.

inches clearance between the automatic vent damper and combustible construction, and be sure to allow access for servicing the damper.

⚠ WARNING

Do not force the damper to open or close by moving the damper blade, turning the shaft, or turning the position indicator. Doing so can cause an unsafe condition, leading to property damage, injury or death.

⚠ MISE EN GARDE

Ne pas forcer l'ouverture ou la fermeture du registre en faisant bouger le volet du registre, en tournant la tige ou en tournant l'indicateur de pression. Cela peut engendrer une situation non sécuritaire susceptible de provoquer des dégâts matériels, des blessures ou la mort.

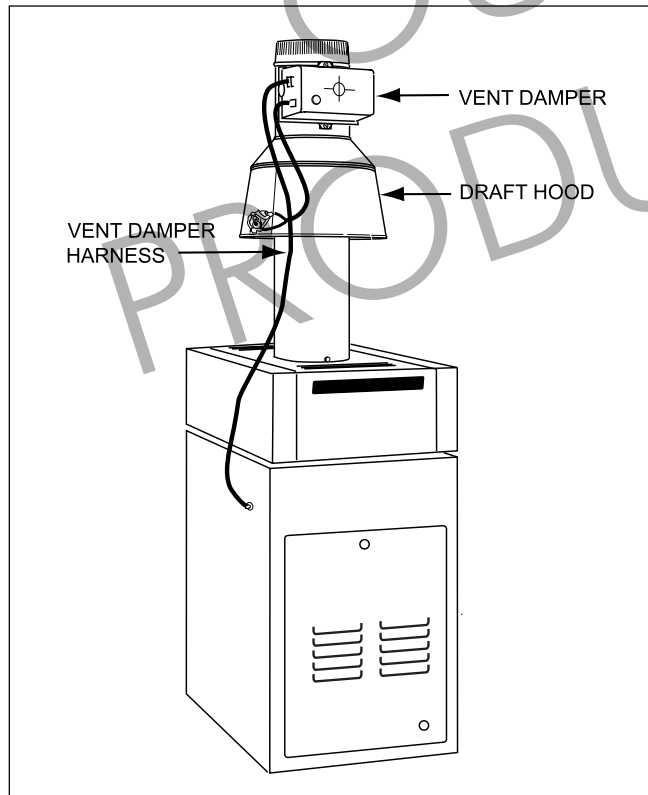


Figure 16. Vent Damper Installation (Model 250 only).

2.3 Site Location

2.3.1 Installation Information

⚠ WARNING

Improper installation or maintenance can cause nausea or asphyxiation from carbon monoxide in flue gases which could result in property damage, severe injury, or death.

⚠ MISE EN GARDE

Une mauvaise installation ou un entretien inadéquat peut provoquer la nausée ou l'asphyxie en raison de la présence de niveaux dangereux de monoxyde de carbone dans les résidus de combustion et peut entraîner des dommages matériels, des blessures ou même la mort.

Avoid placing the boiler in locations where it can cause damage by water or condensate leakage. If this is not possible, provide a suitable drain pan under the boiler to catch and divert any leakage. The pan must not restrict air flow around the boiler.

Locate the boiler to provide adequate clearance on all sides for inspection, service and to provide adequate air circulation for proper operation.

Locate the boiler so the clearances from combustible surfaces shown in Table 1 and Figure 17 are met.

Locate the boiler on a waterproof floor with a floor drain and a 6 inch (15.2 cm) minimum curb on all four sides to protect the building if boiler repairs are needed.

Clearance from:	Indoors		Outdoors	
	inch	cm	inch	cm
Top	37	94	Unobstructed	
Water conn. side	12	30.5	Unobstructed	
Opposite side	6	15.2	6	15.2
Front	Alcove		Unobstructed	
Rear	6	15.2	6	15.2
Vent*	6	15.2	—	

Flooring: Combustible

Service clearance = 36 inches (91.4cm) at front of boiler, and 18 inches (46cm) at water connection side.

*1" (2.5cm) if double wall vent is used.

6" base for outdoor boiler is required.

Table 1. Minimum Boiler Clearances from Combustible Surfaces.

2.3.2 Outdoor Installation

⚠ Caution

Outdoor installations are not recommended in areas where the danger of snow blockage exists.

⚠ Avertissement

L'installation à l'extérieur n'est pas recommandée dans les zones où il y a des risques d'obstruction par la neige.

1. Locate the boiler in an open, unroofed area. Do not locate the boiler below or adjacent to any doors, windows, louvers, grills, etc., which connect in any way with an inhabited area of a building, even though the access might be through another structure such as a garage or utility room (see Figure 18 and Table 1).
2. There must be a minimum of 4 feet (1.22 m) horizontally and vertically between the boiler and any door, window, or gravity inlet to a building (see Figure 19).
3. Minimum clearance of 4 feet (1.22m) [6 feet (1.83m) in Canada] horizontally from, and in no case above or below, unless the minimum horizontal distance is maintained, from electric meters, gas meters, regulators and relief equipment.
4. If the boiler is installed close to a structure, protect it from rain water runoff with rain gutters on the roof or other measures. Do not locate the boiler near sprinkler systems that could spray water on it.
5. Avoid locations where wind deflection off nearby structures might cause wind loading and downdraft conditions. Where downdraft conditions exist, locate the boiler at least 3 feet (0.91 m) from the structure.

2.3.3 Flooring - Typical Installation

All outdoor boilers must be installed with the special base, as a standard part of the boiler. The base, part number R0368900, is provided in a separate package. The boiler is designed and certified for installation on combustible flooring. **NEVER** install the boiler on carpeting. **NEVER** store objects on or around the base of the boiler. For outdoor base installation, see Figure 20.

2.4 Combustion and Ventilation

Air Supply

All indoor installations must have openings to outside air for combustion, ventilation and dilution of flue gases from inside the building (see Figure 21 and

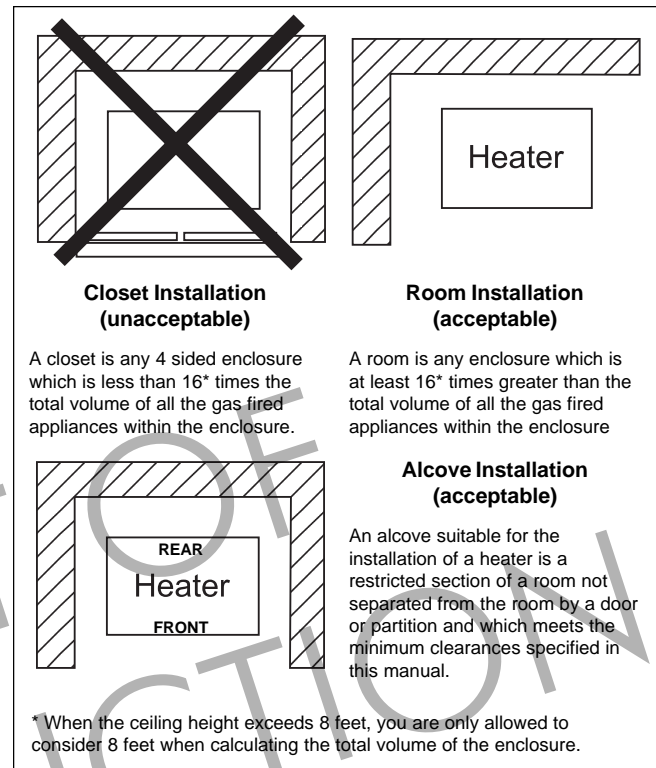


Figure 17. Alcove Installation.

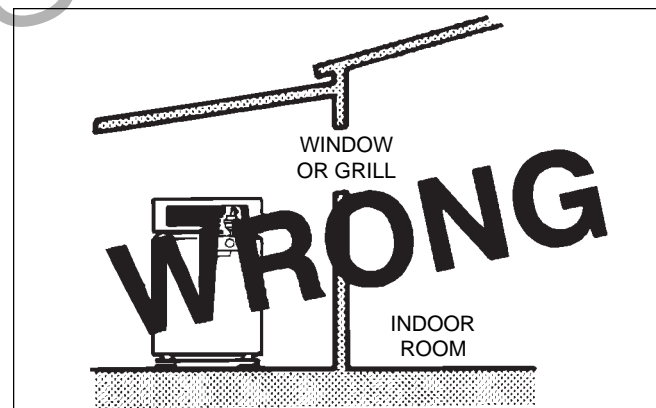


Figure 18. Incorrect Outdoor Installation.

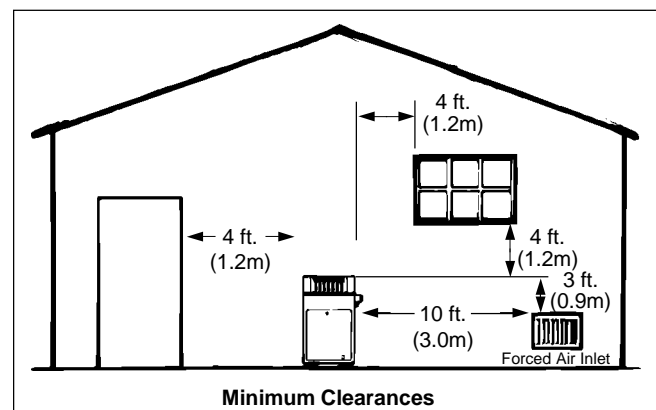


Figure 19. Outdoor Location Installation.

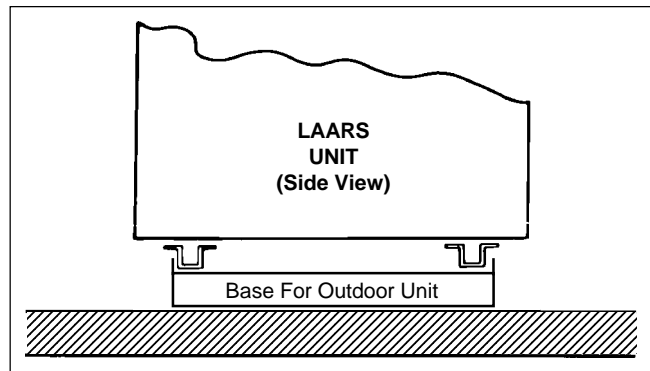
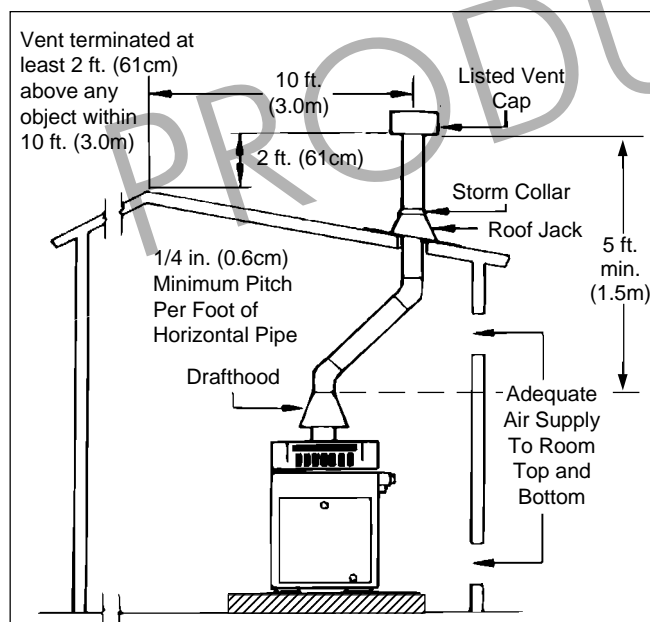


Figure 20. Base for Outdoor Installation.

Model	Required Net Free Opening Area Directly from Outside			
	At Top		At Bottom	
	in. ²	cm ²	in. ²	cm ²
250	63	406	63	406
400	100	645	100	645

Note: For screens or louvers, add 50%.

Table 2. Air Openings to Outside.

**Notes:**

1. The drafthood must sit directly on top of the heater as shown and must not be altered in any manner.
2. An Underwriters' Laboratories listed vent cap is required to eliminate downdraft and allow the heater to function properly.
3. Use approved roof fitting.

Figure 21. Indoor Installation and Venting.

Table 2). Laars does not recommend indoor installations that do not provide combustion air from outside the building.

Boiler rooms which are confined spaces require two permanent air supply openings: one within 12 inches (30.5 cm) of the ceiling, the other within 12 inches (30.5 cm) of the floor.

NOTE: Check with louver manufacturers for net free area of louvers. If screens or louvers are installed, add 50 percent for each screen/louver to the net free area. Check the latest edition of ANSI Z223.1 or in Canada CSA B149 and all local codes applicable to combustion air.

2.4.1 Outdoor Air Supply

When combustion air comes directly through an outside wall, each opening must have a minimum free area of at least one square inch for each 4,000 BTU/h input of the total input rating of all appliances in the enclosed area. (In Canada, refer to CSA B149.1)

2.4.2 Indoor Air Supply

Confined and non-confined areas have different requirements for installation. Check the latest edition of ANSI Z223.1 or in Canada CSA B149 and all local codes applicable to combustion air.

2.4.3 Exhaust Fans or Vents

Any equipment which uses air or removes air from the boiler room can use up the combustion air supply or reverse the natural draft action of the venting system. This could cause flue products to build up in the boiler room. More air must be supplied to make up for the decrease.

2.5 Venting (Category I)

2.5.1 General Information

When installed indoors, the drafthood must be connected to a venting system. The venting system must be installed by a qualified installer and in accordance with the latest edition of ANSI Z223.1. In Canada, the installation must be in accordance with CSA B149.1, and any local codes that apply.

The vent pipe must have a listed vent cap, and extend at least 2 feet (0.6 m) above any object within a 10 foot (3.0 m) radius.

NOTE: Do not use sheet metal screws at the snap lock joints of Type B double-wall gas vents.

Do not weld or bolt the vent pipe to the boiler drafthood. The weight of the stack must not rest on the boiler. The drafthood and boiler top must be easily removable for normal boiler service and inspection.

⚠ WARNING

Avoid ending boiler vents near air conditioning or air supply fans. The fans can pick up exhaust flue products from the boiler and return them inside the building, creating a possible health hazard, resulting in serious injury or death.

⚠ MISE EN GARDE

Éviter de placer les sorties d'évent près des appareils de climatisation ou les ventilateurs des prises d'air. Ces prises d'air peuvent aspirer les résidus de combustion et les faire pénétrer à l'intérieur de l'immeuble, ce qui peut représenter une menace pour la santé et occasionner des blessures corporelles sérieuses ou même la mort.

Locate unit as close as practical to a chimney or vent termination. Have horizontal runs sloping upwards not less than 1/4 inch per foot (21mm/m) from the boiler to the vent terminal. Support a vent connector for the design and weight of the material used to maintain clearances and prevent physical damage and separate of joints.

Doivent présenter des tronçons horizontaux dont la pente montante est d'au moins 1/4 po par pied (21mm/m) entre la chaudière et l'évent. Doivent préciser que les sections horizontales doivent être supportées pour prévenir le fléchissement.

Always use double-wall or insulated vent pipe (Type B or equivalent).

⚠ WARNING

In cold weather, uninsulated outside vents can chill the rising flue products, blocking the natural draft action of the venting system. This can create a serious health hazard which can ultimately cause death by spilling flue products into the boiler room.

⚠ MISE EN GARDE

Dans les régions froides, les événements non isolés peuvent occasionner la condensation des résidus de combustion qui y circulent, ce qui a pour effet de réduire le tirage naturel du système d'évacuation des résidus. Cela peut représenter une sérieuse menace pour la santé, pouvant même provoquer la mort en causant le refoulement des résidus de combustion dans la chaufferie.

Avoid oversize vent piping or extremely long runs of the pipe which may cause too much cooling and condensation of flue gases.

When the installation of a power vent or draft fan in the venting system is necessary, qualified personnel should design the installation following good

engineering practices and all applicable codes. A suitable draft switch must be wired into the boiler control circuit at the terminal designated Field Interlock to keep the boiler from firing unless there is a positive draft.

2.5.2 Common Venting Systems

Venting Multiple Appliances

When installing venting for a Mighty Therm Lo-NOx boiler or water heater installed as a Category I fan-assisted appliance with other Category I appliances through one shared duct called a "common vent", special care must be taken by the installer to ensure safe operation. In the event that the common vent is blocked, it is possible, especially for fan-assisted devices, to vent backwards through non-operating appliances sharing the vent, allowing combustion products to infiltrate occupied spaces. **If the appliances are allowed to operate in this condition, serious injury or death may occur.**

⚠ WARNING

Operation of appliances with a blocked common vent may lead to serious injury or death. Safety devices must be implemented to prevent blocked common vent operation. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of spillage of flue gases into living spaces, common venting should not be applied, and appliances should each be vented separately.

⚠ AVERTISSEMENT

Le fonctionnement des appareils avec un système d'évacuation bloqué peut provoquer des blessures graves, voire la mort. Des dispositifs de sécurité doivent être installés pour éviter le blocage des systèmes d'évacuation. Si le fonctionnement de tous les appareils connectés à un système d'évacuation commun ne peut pas être assuré, y compris la prévention de la dispersion des gaz toxiques dans les espaces habités, on ne devrait pas installer un système d'évacuation commun et chaque appareil devrait être ventilé séparément.

It is for this reason that, in addition to following proper vent sizing, construction and safety requirements from the National Fuel Gas Code, ANSI Z223.1 or in Canada, from CSA B149.1 as well as all applicable local codes, it is required that installers provide some means to prevent operation with a blocked common vent. It is suggested that a blocked vent safety system be employed such that if the switch from one appliance trips due to excessive stack spill or backpressure indicating a blocked vent condition, that all appliances attached to the vent be locked out and prevented from operating. As an additional precaution, it is recommended that a Carbon Monoxide (CO)

alarm be installed in all enclosed spaces containing combustion appliances. If assistance is required in determining how a blocked vent safety system should be connected to a LAARS product, please call Applications Engineering at (603) 335-6300.

Refer to the installation and operating instructions on all appliances to be common vented for instructions, warnings, restrictions and safety requirements. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of spillage of flue gases into living spaces, common venting should not be applied, and appliances should each be vented separately.

2.5.3 Inspection of Commonly Vented Appliances

If the instrumentation of this boiler replaces an older boiler in a common vent system with other appliances, or if you remove additional appliances from the common vent, all the appliances must be checked for proper venting.

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

1. Seal any unused openings in the common venting system.
Sceller toutes les ouvertures non utilisées du système d'évacuation.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
Inspecter de façon visuelle le système d'évacuation pour déterminer la grosseur et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étranglement, de fuite, de corrosion et autres défaillances qui pourraient présenter des risques.
3. Insofar as it is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
Dans la mesure du possible, fermer toutes les portes et les fenêtres du bâtiment et toutes les portes entre l'espace où les appareils toujours

raccordés au système d'évacuation sont installés et les autres espaces du bâtiment. Mettre en marche les sècheuses, tous les appareils non raccordés au système d'évacuation commun et tous les ventilateurs d'extraction comme les hottes de cuisinière et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale. Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.

4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
Mettre l'appareil inspecté en marche. Suivre les instructions d'allumage. Régler le thermostat de façon que l'appareil fonctionne de façon continue.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
Faire fonctionner le brûleur principal pendant 5 min ensuite, déterminer si le coupe-tirage déborde à l'ouverture de décharge. Utiliser la flamme d'une allumette ou d'une chandelle ou la fumée d'une cigarette, d'une cigare ou d'une pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
Une fois qu'il a été déterminé, selon la méthode indiquée ci-dessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de façon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1.
Tout mauvais fonctionnement du système d'évacuation commun devrait être corrigé de façon que l'installation soit conforme au *national Fuel Gas Code, ANSI Z223.1* et (ou) aux codes d'installation *CSA-B149.1*. Si la grosseur d'une

section du système d'évacuation doit être modifiée, le système devrait être modifié pour respecter les valeurs minimales des tableaux pertinents de l'appendice F du *National Fuel Gas Code, ANSI Z223.1* et (ou) des codes d'installation *CSA-B149.1*.

2.6 Water Flow System

2.6.1 Freeze Protection

Proper precautions for freeze protection are recommended for boiler installations in areas where the danger of freezing exists.

Power outage, interruption of gas supply, failure of system components, activation of safety devices, etc., may prevent a boiler from firing. **Any time a boiler is subjected to freezing conditions, and the boiler is not able to fire, and/or the water is not able to circulate, there is a risk of freezing in the boiler or in the pipes in the system.** When water freezes, it expands. This can result in bursting of pipes in the system, or damage to the boiler, which could result in leaking or flooding conditions.

Do not use automotive anti-freeze. Maintaining a mixture of minimum 50% water and maximum 50% properly inhibited HVAC glycol, which contains an antifoamant, is the preferred method of freeze protection for Mighty Therm boilers. **Percentage of glycol used in the Mighty Therm boiler must not exceed 50%.** Typically, this mixture will serve as burst protection for temperatures down to approximately -35°F (-30°C). To get the desired temperature rise

across the boiler when the is mixture is used, increase the water flow by 15% above the original recommendation. Increase the head loss requirement by 20%.

IMPORTANT NOTES: Different glycol products may provide varying degrees of protection. Glycol products must be maintained properly in a heating system, or they may become ineffective. Consult the glycol specifications, or the glycol manufacturer, for information about specific products, maintenance of solutions, and set up according to your particular conditions.

2.6.2 Pump Requirements

High recovery, low volume water boilers need enough water flow for efficient operation. The system pump must develop enough pressure to overcome the pressure drop of the boiler plus the pressure drop of the entire circulation system at the flow rates selected from Table 3.

The correct flow rate can be verified by checking the temperature rise of water as it passes through the boiler. To check the temperature rise, measure the difference in water temperature between the boiler inlet and outlet to determine flow. For example: If a Size 250 boiler is installed; the inlet water temperature is 160°F (71°C); and the outlet water temperature is 185°F (85°C); then there is a 25°F (14°C) temperature rise. Per Table 3 this equals a flow rate of 16 GPM (1.0L/s) and a head loss (pressure drop) of 1.2 feet of water. If a higher temperature rise is measured, flow

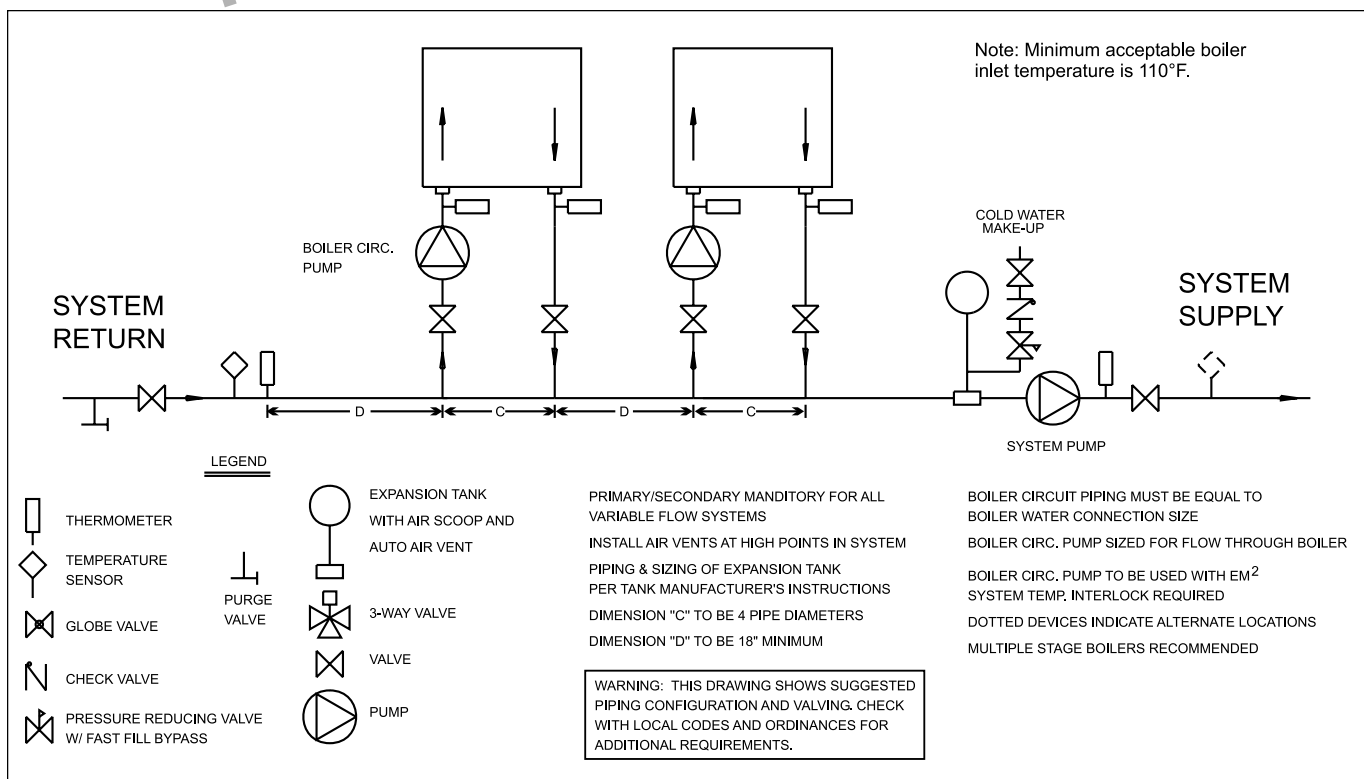


Figure 22. Multiple Boilers, Primary Secondary System.

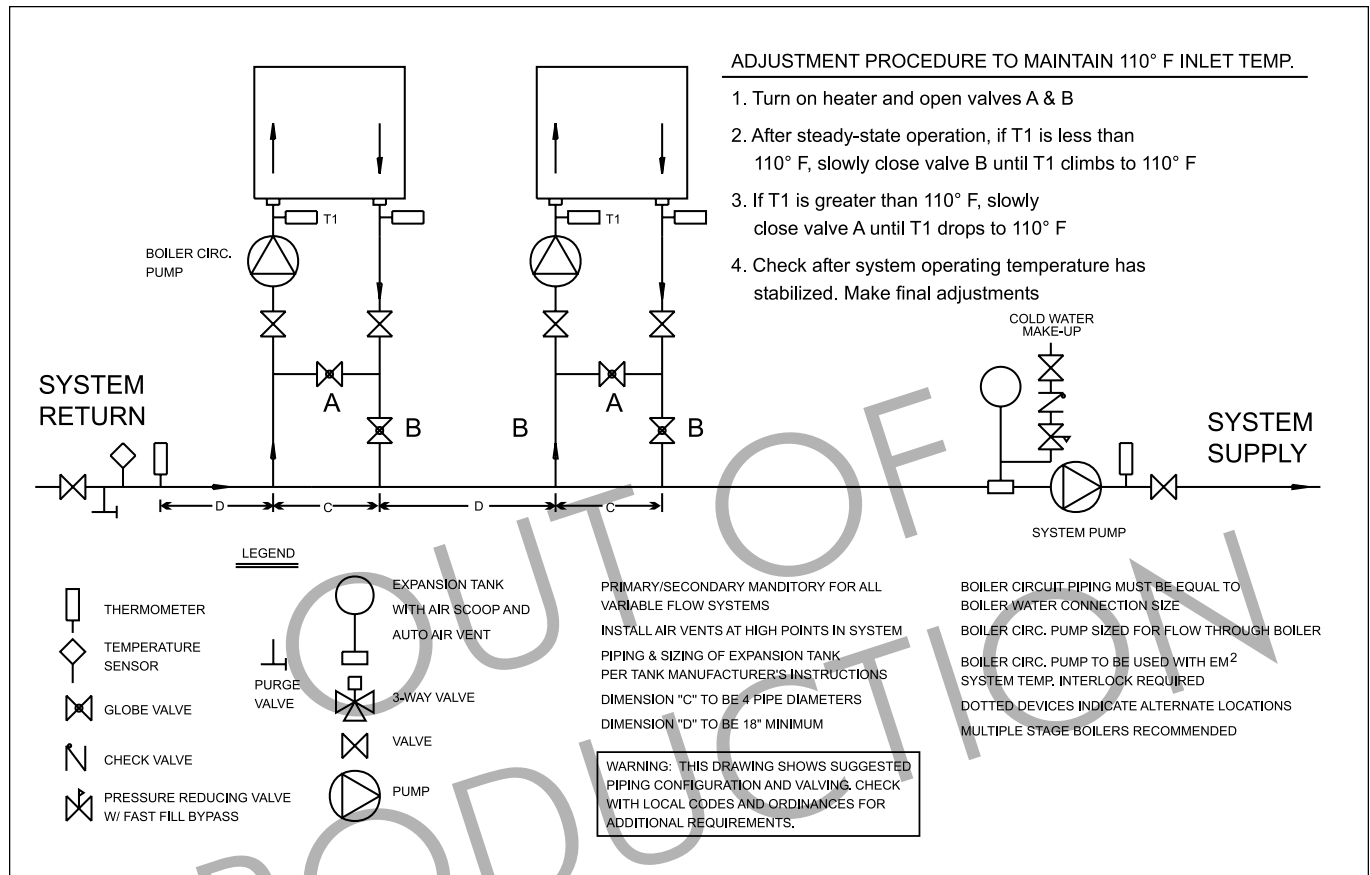


Figure 23. Multiple Boilers, Low Temperature System.

Size	Temperature Rise in °F °C															
	20°F 11°C				25°F 14°C				30°F 17°C				35°F 19°C			
	GPM	H/L*	L/s		GPM	H/L*	L/s		GPM	H/L*	L/s		GPM	H/L*	L/s	
		ft		m		ft		m		ft		m		ft		m
250	20	2.1	1.26	0.6	16	1.00	1.2	0.4	13	0.82	0.8	0.2	11	0.69	0.6	0.2
400	31	1.96	5.2	1.6	25	1.58	3.4	1.0	21	1.32	2.3	0.7	18	1.13	1.7	0.5

Water Flow - GPM or L/s: Gallons per minute or Liters per second.

*Pressure drop (head loss) through the boiler, expressed in feet or meters of water (H₂O).

Table 3. Temperature Rise.

must be increased by changing the piping or pump size.

2.6.3 Variable Water Flow Systems

There can be reduced water flow through the boiler in heating systems using zone valves, zone pumps or 3-way valves. This can result in a high temperature rise across the boiler. Laars recommends primary-secondary pumping for all variable flow systems. The boiler pump in a primary-secondary system maintains constant flow through the boiler even though the system flow is variable. In a primary-secondary system the pressure drop of the boiler is not added to the system (see Figures 22, 23 and 24).

2.6.4 System Pressure Requirements

The HH, PH boilers are designed to operate on closed, pressurized systems. A minimum of 12 psi (82.7kPa) should be maintained on the system where boiler supply water temperatures are 200°F (93°C) or less. If higher temperatures are required, the minimum system pressure should be at least 15 psi (103.4 kPa) above the water vapor pressure corresponding to the elevated water temperature.

Do not use the HH, PH boilers to operate on open, pressurized systems unless the supply water temperatures are kept below 180°F (82°C), and a minimum of 5 psi (34.5 kPa) static head is maintained at the boiler.

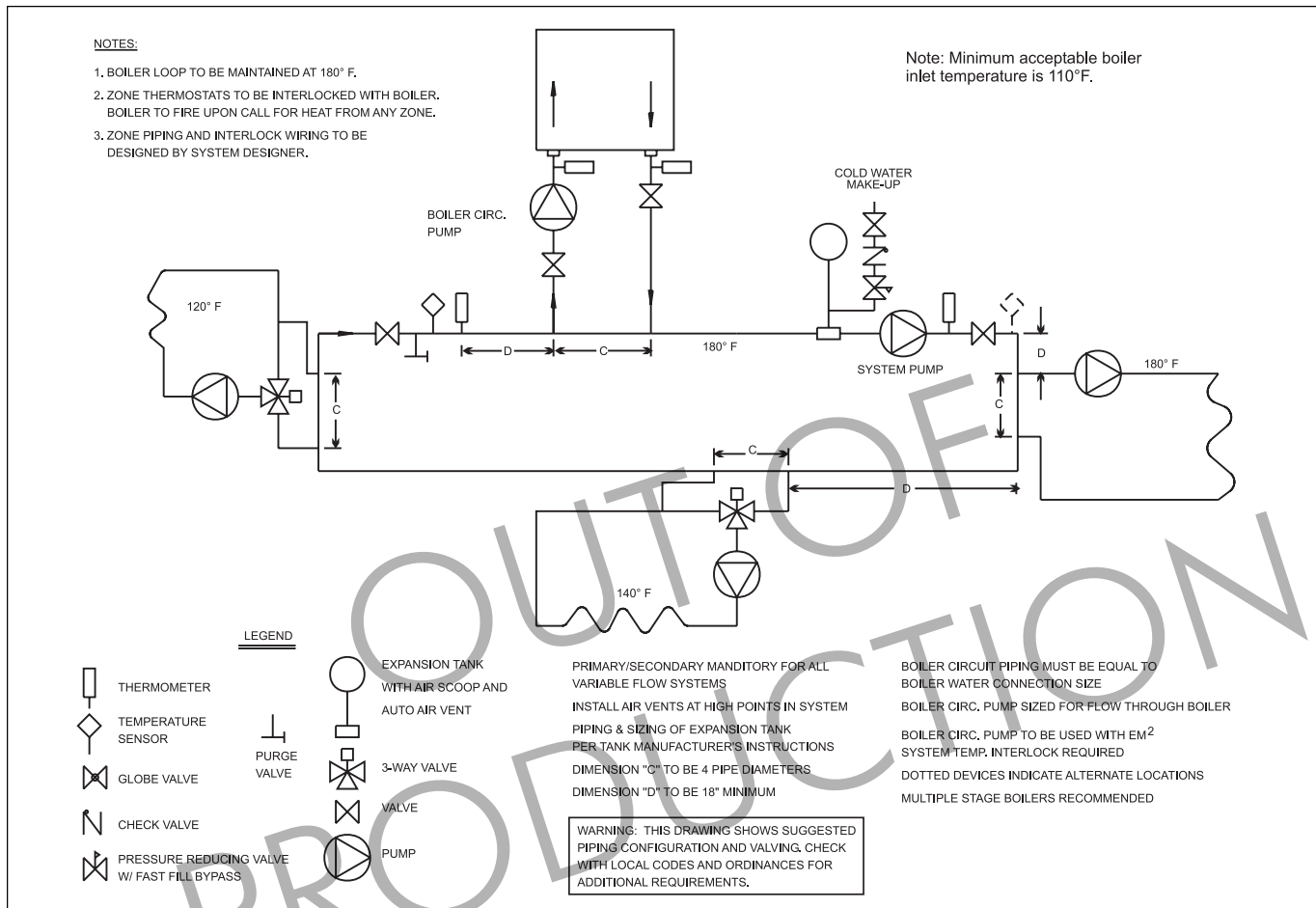


Figure 24. One Boiler, Multi-Temperature System.

2.6.5 Chilled Water Systems

If the boiler is part of a refrigeration system, include the proper valves to isolate the boiler from the refrigeration system during times when the boiler is not operating.

When the boiler piping is connected to heating coils, which are close to refrigerated air circulation, install flow control valves or other automatic methods to prevent gravity circulation of the boiler water during the cooling cycle.

2.6.6 System to Boiler Piping

1. Install gate valves at the inlet and outlet to the boiler so it can be isolated for service.
2. Make sure the pressure relief valve (see Figure 25) has its outlet piped to a drain or floor sink. Pay special attention to relief valve settings in installations where the boiler is located on the ground floor of a tall building, or where the operating temperature of the boiler is above 210°F (99°C). In both cases, the static pressure of the system is raised. This would bring raw water into the system. The factory will furnish a 75 psi (516.8 kPa) setting unless a special setting is ordered.

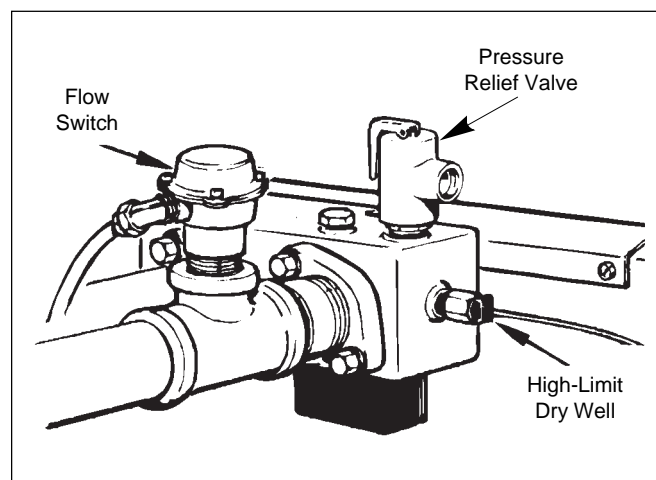


Figure 25. Pressure Relief Valve.

3. Install a low water cutoff device if the boiler is installed above radiation level.
4. Install manual and/or automatic air venting devices at high points in the system to get rid of air.
5. Install a correctly sized expansion or compression tank in accordance with the manufacturer's instructions.

- Support the weight of all water and gas piping with suitable hangers or floor stands.
- Check piping diagrams with local applicable plumbing, heating and building safety codes.

2.6.7 Filling the System

- Close all air vents and open the makeup water valve. Let the system fill slowly.
- If a makeup water pump is used, adjust the pressure switch on the pumping system to maintain at least 12 psi (82.7 kPa) at the highest point in the heating loop.
- If a water pressure regulator is installed on the makeup water line, adjust the pressure regulator to provide at least 12 psi (82.7 kPa) at the highest point in the heating loop.
- Open air vents on all radiation units at the high points in the piping throughout the system, unless automatic air vents are installed at those points.
- Run the system circulating pump for at least 30 minutes with the boiler shut off.
- Recheck all air vents as described in Step 4 above.
- With the system full of water and under normal operating pressure, the air pressure in the expansion tank should be at least 12 psi (82.7 kPa).
- Start up the boiler following the instructions found on the inside of the boiler.
- Operate the whole system, including the pump, boiler, and radiation units for 1 hour.
- Shut down the entire system and vent all radiation units and high points in the system piping as described in Step 4 above.
- Close the makeup water valve and check the strainer in the pressure reducing valve for sediment or debris. Reopen the makeup water valve.
- Check the gauge to make sure the water pressure is right, and check water level in the system. If the water level indicated above the boiler shows that water is at the highest point in the circulating loop, then the system is ready for operation.
- Within 3 days of start-up, recheck all air vents and expansion tank as described in Steps 4 and 8 above.

2.6.8 Minimum Boiler Temperature

The boiler inlet water temperature must be minimum 110°F (43°C) when the system has come up to normal operating conditions. Lower temperature inlet water may allow the production of condensation on the outside of the copper finned tubes, which can block the flue gases and/or cause improper combustion, leading to heat exchanger sooting.

For systems with lower than 110°F (43°C) temperature, boiler must be protected from low temperature return water. There are many methods of achieving low temperature protection. Figure 23 shows an example of such a system. Damage caused by condensation is not covered under the terms of the limited warranty.

2.7 Gas Supply and Piping (Natural Gas Only)

2.7.1 General Instructions

Review the following instructions before continuing the installation.

- Gas piping installation must be in accordance with the latest edition of ANSI Z223.1. In Canada, the installation must be in accordance with CSA-B149.1 and all local codes that apply.
- Check the rating plate to make sure the boiler is fitted for the type of gas being used. Laars LO-NOx boilers are normally equipped to operate with natural gas below a 2000 foot (609 m) altitude.
- If a gas pressure regulator is required, the installation must be in accordance with the latest edition of ANSI Z223.1. In Canada, the installation must be in accordance with CSA-B149.1 and all local codes that apply.
- The figures in Table 5 should be used to size the gas piping from the gas meter to the boiler.
- Install a sediment trap (drip leg) ahead of the gas controls (see Figure 26). Fit the trap with a threaded cap which can be removed for cleaning.
- Install a non-restrictive manual gas shutoff valve for service and safety. Check the local codes.
- Disconnect the boiler and its individual shutoff valve from the supply gas system during pressure

Distance from Gas Meter or Last Stage Regulator			
Boiler Size	0-100 feet 0-30 m Nat.	100-200 feet 30-60 m Nat.	200-300 feet 60-90 m Nat.
	in. (NPT)	in. (NPT)	in. (NPT)
250	1¼	1¼	1½
400	1¼	1½	2

Notes:

- These numbers are for natural gas (0.65 Sp. Gr.) and are based on ½ inch (13mm) water column pressure drop. Check supply pressure with a manometer, and local code requirements for variations.
- Check supply pressure and local code requirements before preceding with work.
- Pipe fittings must be considered when determining gas pipe sizing.

Table 5. Pipe Size Requirements (natural gas).

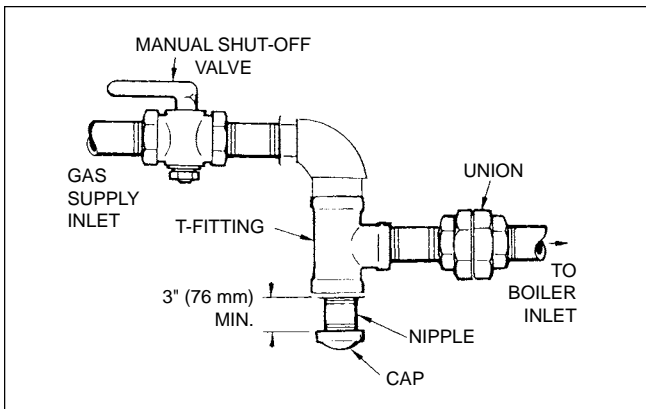


Figure 26. T-Fitting and Sediment Trap.

testing of the system at pressures higher than 1/2 pounds per square inch (psi) (3.4 kilopascals [kPa]). If the test pressure is equal to or less than 1/2 psi (3.45 kPa), close the manual shutoff valve on the boiler during the piping pressure test.

8. Gas supply pressures to the boiler are listed in Table 6.

Supply Pressure Water Column	Natural Gas	
	in.	mm
Minimum	6	152
	See Rating Plate	
Maximum	10.5	267

Table 6. Gas Supply Pressure Requirements.

NOTE: The boiler and all other gas appliances sharing the boiler gas supply line must be firing at maximum capacity to properly measure the inlet supply pressure. Low gas pressure could indicate an under-sized gas meter and/or obstructed gas supply line.

9. Do not exceed the maximum inlet gas pressures specified. Excessive pressure will result in damage to the boiler's gas controls. The minimum pressure specified is for gas input adjustment.
10. The correct burner manifold gas pressure is stamped on the rating plate. The regulator on the gas valve is preset at the factory, and does not normally need adjustment.
11. Before operating the boiler, test the complete gas supply system and all connections for leaks using a soap solution.

⚠ Caution

Since some leak test solutions (including soap and water) may cause corrosion or stress cracking, rinse the piping with water after testing.

⚠ Avertissement

Étant donné que certaines solutions utilisées pour vérifier les fuites (dont le savon et l'eau) peuvent causer la corrosion ou la fissuration, rincer les canalisations avec de l'eau après avoir effectué les essais.

2.8 Electrical Wiring

⚠ WARNING

Electrically ground the boiler in accordance with the latest edition of the National Electrical Code, ANSI/NFPA 70. In Canada, use C22.1. Do not rely on the gas or water piping to ground the metal parts of the boiler. Often, plastic pipe or dielectric unions isolate the boiler electrically. Service and maintenance personnel who work on or around the boiler may be standing on wet floors and could be electrocuted by an ungrounded boiler. Electrocution can cause serious injury or death. The electric circuit to which the unit will be connected should be "OFF" during installation and wiring of the unit.

⚠ MISE EN GARDE

La chaudière doit être reliée à la terre en respectant les exigences de la plus récente édition du National Electrical Code ANSI/NFPA 70. Au Canada, utiliser le C22.1. Ne pas avoir recours aux canalisations de gaz ou d'eau pour relier à la terre les pièces métalliques de la chaudière. Les tuyaux de plastique ou raccords diélectriques servent souvent à isoler la chaudière au point de vue électrique. Les employés qui sont appelés à travailler sur la chaudière ou autour pour effectuer l'entretien et les réparations peuvent se retrouver sur un plancher mouillé et risquer l'électrocution si l'appareil n'est pas adéquatement mis à la terre. L'électrocution peut occasionner des blessures graves ou la mort. Le circuit électrique auquel l'appareil est branché doit être en position d'arrêt « OFF » durant l'installation et le câblage de l'appareil.

1. Check boiler wiring and pump for correct voltage, frequency, and phase. Check to make sure boiler is wired for 120 volts alternating current (VAC). If 240 VAC, contact local factory representative or Laars.
2. Wire the boiler and pump exactly as shown in the wiring diagram supplied with the boiler. See Figures 30 through 33 for a typical example of a wiring diagram.

- Electrically interlock the pump and boiler so the boiler cannot come on unless the pump is running.
- Connect all field-installed devices (draft switches, relays, timers, outdoor temperature reset devices, etc.) to the boiler wiring at points labeled Field Interlock.

SECTION 3.

Operating Instructions

NOTE: Safe lighting and other performance criteria were met with the gas manifold and control assembly installed on the boiler during tests specified in ANSI Z21.13.

⚠ WARNING

For your safety, when starting the boiler, keep your head and face well away from the lower firebox opening to prevent any risk of personal injury. Vent pipes, drafthoods, and boiler tops get hot! These surfaces can cause serious burns. Do not touch these surfaces while the boiler is in operation.

⚠ MISE EN GARDE

Pour assurer sa sécurité, la personne qui allume la chaudière devrait garder la tête le plus éloignée possible de l'ouverture inférieure de la chambre de combustion afin de prévenir tout risque de blessure au moment de l'allumage. Les tuyaux d'évent, les coupe-tirage et la surface supérieure des chaudières deviennent très chauds ! Toucher à ces surfaces peut occasionner des blessures sérieuses. Ne pas toucher à ces surfaces alors que la chaudière fonctionne.

3.1 Start-Up Procedure

- Make sure the system pump is running and there is water flow.
- Follow the lighting and shutdown procedure in Figure 28 or 29.

3.2 Setting the Temperature Controls

⚠ Caution

On a boiler equipped with the vent damper device, the damper must be in the open position when the main burners are operating.

⚠ Avertissement

Le registre des chaudières munies d'un dispositif de volet motorisé doit être en position ouverte lors que les brûleurs principaux fonctionnent.

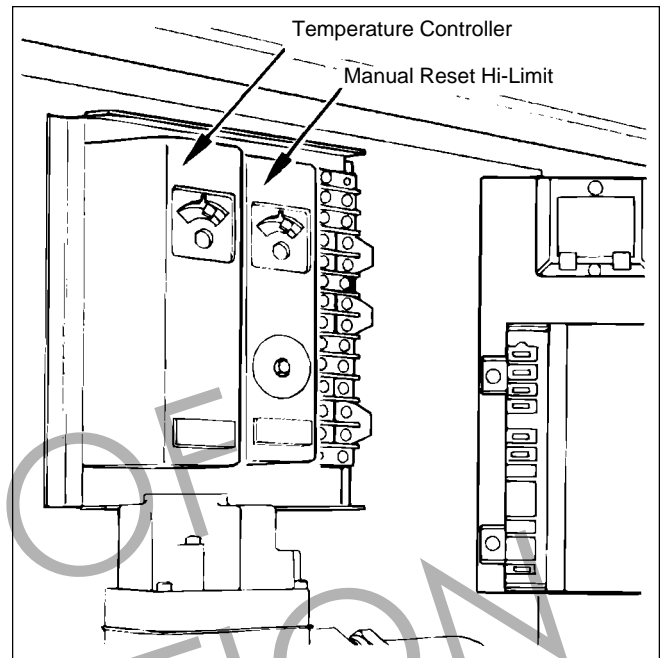


Figure 27. Temperature Controls.

To set the temperature and high-limit controls:

- Set the temperature controller at the system design temperature.
- For boilers with the temperature controller bulb at the boiler inlet, set the high-limit 40°F to 50°F above temperature controller setting.
- For boilers with the temperature controller bulb at the boiler outlet, set the high-limit 15°F to 25°F above temperature controller setting.

3.3 Hi-Limit Switch Checkout

After running the boiler for a long enough period, bring the water temperature within the range of the hi-limit switch and slowly back off the high limit setting until the boiler shuts off. The main burners should reignite (following the normal ignition cycle) when the hi-limit switch is reset and turned back up to its original setting. The boiler should now run until it shuts off automatically on operating control.

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the boiler (refer to troubleshooting section).

3.4 Shut-Down Procedure

Shut down the boiler following the instructions in Figures 28 and 29.

Where there is a danger of freezing, shut off the water supply and remove the drain plugs on both sides of the boiler jacket. Drain every part of the system subject to damage from freezing temperatures.

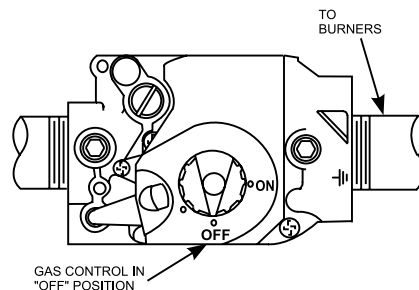
FOR YOUR SAFETY READ BEFORE OPERATING

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

- A. This appliance does not have a pilot light. It is equipped with an ignition device which automatically lights the heater. Do NOT try to light the burners 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 appliance switch to "OFF" and remove the heater door.
3. Turn off all electric power to the appliance.
4. Set the thermostat to lowest setting.
5. This appliance is equipped with an ignition device which automatically lights the heater. Do not try to light the burners by hand.
6. Turn gas control knob clockwise ➡ to "OFF".
7. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
8. Turn gas control knob counterclockwise ↶ to "ON".
9. Set thermostat to desired setting. Replace heater door.
10. Turn on all electric power to appliance.
11. Turn appliance switch from "OFF" to "ON".
12. If the appliance will not operate, check that the pump is on, and all of the safety switches are reset. Otherwise, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Turn appliance switch to "OFF".
2. Remove the heater door.
3. Set the thermostat to lowest setting.
4. Turn off all electric power to the appliance if service is to be performed.
5. Turn gas control knob clockwise ➡ to "OFF".
6. Replace heater door.

Figure 28. Lighting and Shutdown Instructions.

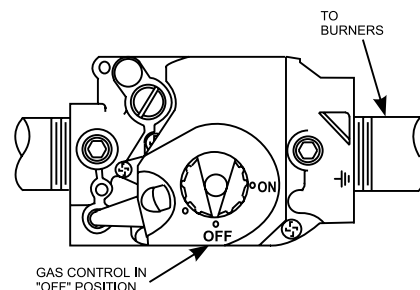
POUR VOTRE SÉCURITÉ LISEZ AVANT DE METTRE EN MARCHÉ

⚠ AVERTISSEMENT: Quiconque ne respecte pas à la lettre les instructions dans la présente notice risque de déclencher un incendie ou une explosion entraînant des dommages, des blessures ou la mort.

- A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. ne tentez pas d'allumer le brûleur manuellement.
- B. **AVANT DE FAIRE FOCTIONNER**, reniflez tout autour de l'appareil pour déceler une odeur de gaz. Reniflez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.
QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:
 - Ne pas tenter d'allumer d'appareil
 - Ne touchez à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.
- C. Ne poussez ou tournez la manette d'admission du gaz qu'à la main; ne jamais utiliser d'outil. si la manette reste coincée, ne pas tenter de la réparer; appelez un technicien qualifié. Le fait de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.
- D. N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été blondés dans l'eau

INSTRUCTIONS DE MISE EN MARCHÉ

1. **ARRÊTEZ!** Lisez les instructions de sécurité sur la portion supérieure de cette étiquette.
2. Mettre le bouton de commande à "OFF". Enlevez la portière du chauffe-eau.
3. Coupez l'alimentation électrique de l'appareil.
4. Réglez le thermostat à la température la plus basse.
5. Cet appareil est muni d'un dispositif d'allumage qui met le chauffe-eau en marche automatiquement. Ne pas essayer d'allumer les brûleurs à main.
6. Tournez le bouton de la commande de gaz dans le sens des aiguilles d'une montre ➡ jusqu'à la position "OFF".
7. Attendre cinq (5) minutes pour laisser échapper tout le gaz. Reniflez tout autour de l'appareil, y compris près du plancher, pour déceler une odeur de gaz. Si vous sentez une odeur de gaz, **ARRÊTEZ!** Passez à l'étape B des instructions de sécurité sur la portion supérieure de cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
8. Tournez le bouton de commande de gaz dans le sens contraire des aiguilles d'une montre ↶ jusqu'à la position "ON".
9. Remplacez le panneau d'accès aux commandes.
10. Mettez l'appareil sous tension.
11. Réglez le thermostat comme désiré et tournez le bouton de commande de la position "OFF" à la position "ON".
12. Si l'appareil ne se met pas en marche, suivez les instructions intitulées "Comment couper l'admission de gaz de l'appareil" et appelez un technicien qualifié ou le fournisseur de gaz.



COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

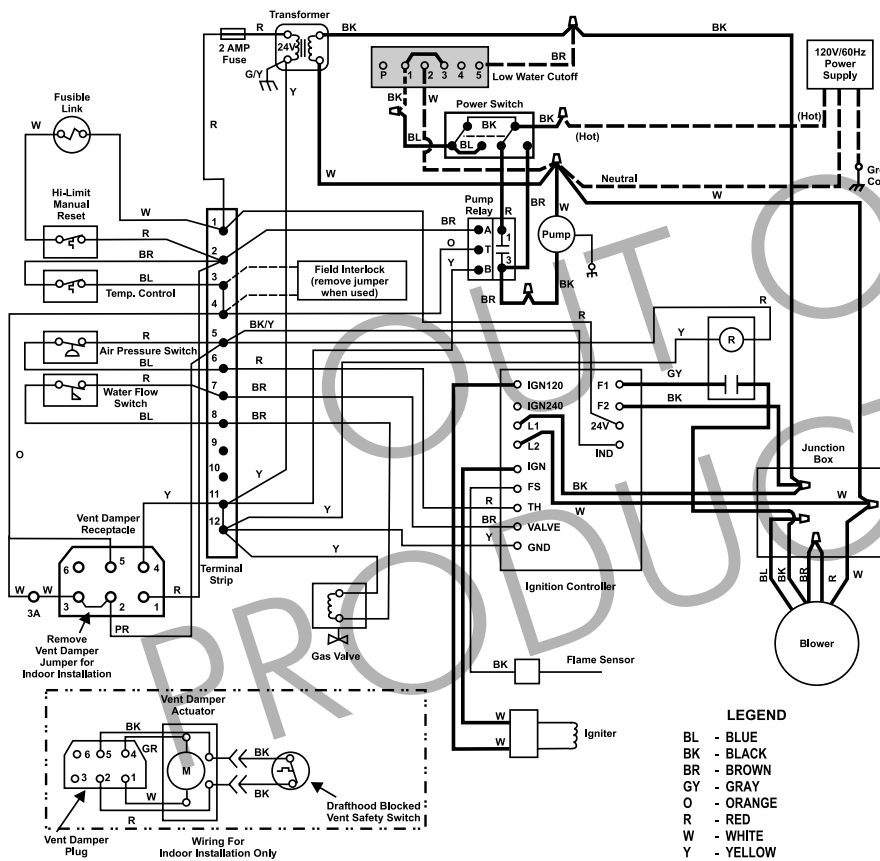
1. Mettre le bouton de commande à "OFF". Enlevez la portière du chauffe-eau.
2. Réglez le thermostat à la température la plus basse.
3. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
4. Tournez le bouton de contrôle de gaz dans le sens des aiguilles d'une montre ➡ jusqu'à la position "OFF".
5. Remplacez le panneau d'accès aux commandes.

Figure 29. Instructions D'allumage et de Fermeture.

SYSTEM NUMBER 22 - HOT SURFACE IGNITION

On/Off with EM2
Hydronic Boiler PH (Size 250)

Wiring Diagram

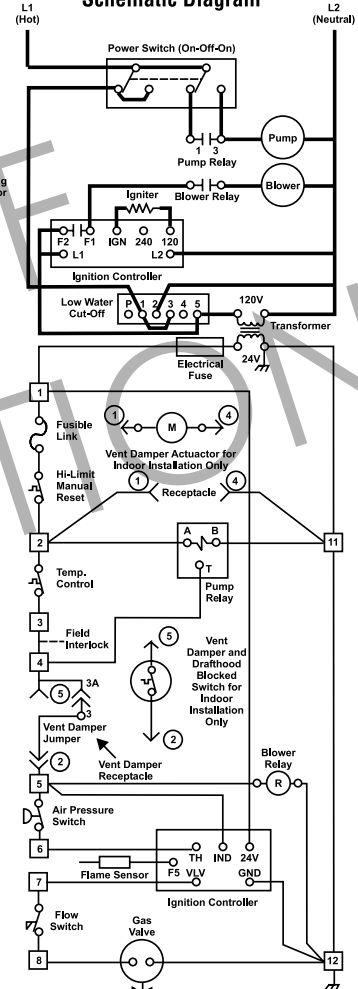


IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE HEATER MUST BE REPLACED IT MUST BE REPLACED WITH APPLIANCE WIRING MATERIAL (105°C) OR ITS EQUIVALENT. WHITE WIRES TO FUSIBLE LINK MUST BE REPLACED WITH WIRE HAVING INSULATION RATED AT 200°C (AVAILABLE FROM FACTORY).

LEGEND

- BL - BLUE
- BK - BLACK
- BR - BROWN
- GY - GRAY
- O - ORANGE
- W - WHITE
- Y - YELLOW
- G/Y - GREEN w/YELLOW TRACER
- BK/Y - BLACK w/YELLOW TRACER
- FACTORY WIRING 24V
- - - FIELD WIRING 24V
- FACTORY WIRING 120V
- - - FIELD WIRING 120V
- OPTIONAL COMPONENT
- 2 TERMINAL STRIP
- BVSS BLOCKED VENT SAFETY SWITCH

Schematic Diagram



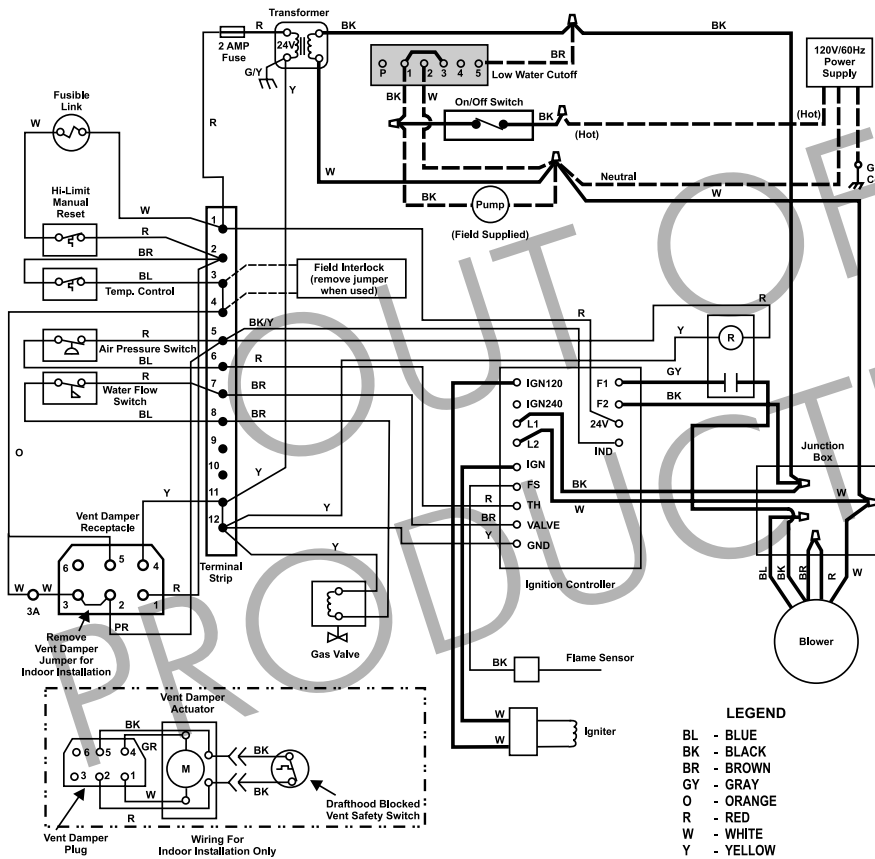
H0248300-

Figure 30. Mighty Therm LO-NOx, PH250.

SYSTEM NUMBER 22 - HOT SURFACE IGNITION

On/Off Hydronic Boiler HH (Size 250)

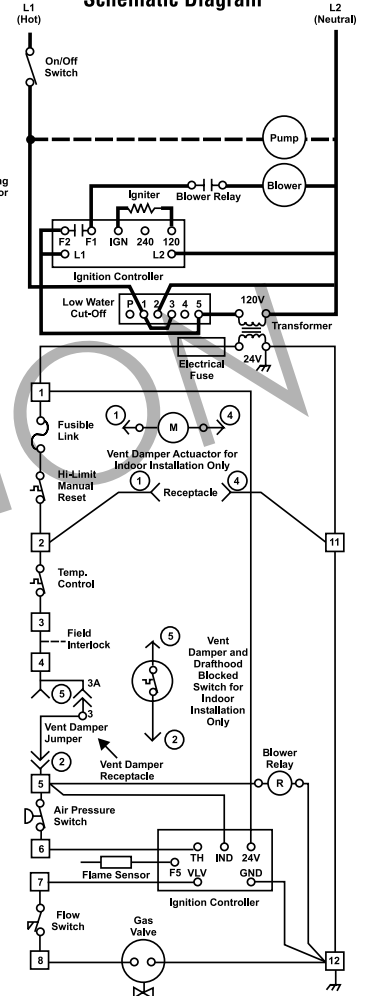
Wiring Diagram



LEGEND

- BL - BLUE
- BK - BLACK
- BR - BROWN
- GY - GRAY
- O - ORANGE
- R - RED
- W - WHITE
- Y - YELLOW
- G/Y - GREEN w/YELLOW TRACER
- BK/Y - BLACK w/YELLOW TRACER
- FACTORY WIRING 24V
- - - FIELD WIRING 24V
- FACTORY WIRING 120V
- - - FIELD WIRING 120V
- OPTIONAL COMPONENT
- 2 TERMINAL STRIP
- BVSS BLOCKED VENT SAFETY SWITCH

Schematic Diagram



H0248400-

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE HEATER MUST BE REPLACED IT MUST BE REPLACED WITH APPLIANCE WIRING MATERIAL (105°C) OR ITS EQUIVALENT. WHITE WIRES TO FUSIBLE LINK MUST BE REPLACED WITH WIRE HAVING INSULATION RATED AT 200°C (AVAILABLE FROM FACTORY).

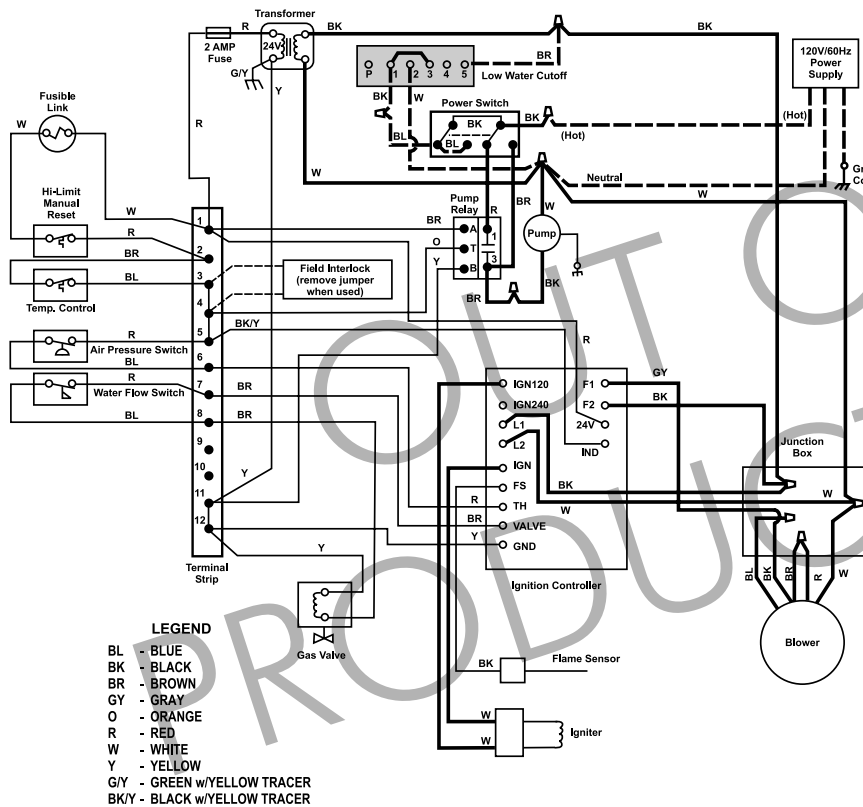
Figure 31. Mighty Therm LO-NOx, HH250.

SYSTEM NUMBER 22 - HOT SURFACE IGNITION

On/Off with EM2

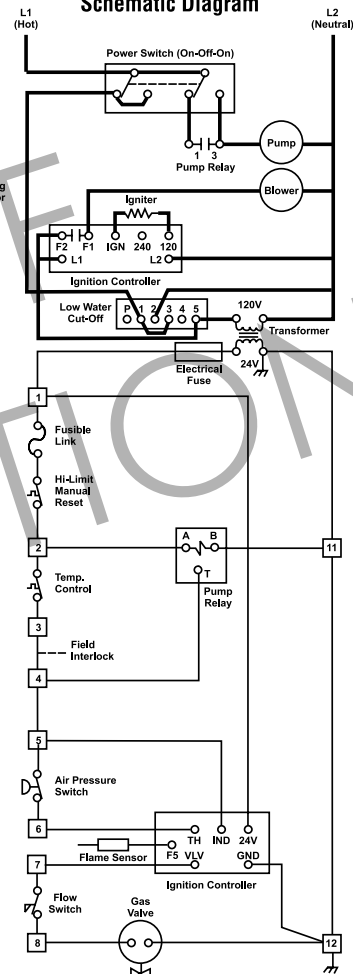
Hydronic Boiler / Volume Water Heater (PH/PW) 400

Wiring Diagram



IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE HEATER MUST BE REPLACED IT MUST BE REPLACED WITH APPLIANCE WIRING MATERIAL (105°C) OR ITS EQUIVALENT. WHITE WIRES TO FUSIBLE LINK MUST BE REPLACED WITH WIRE HAVING INSULATION RATED AT 200°C (AVAILABLE FROM FACTORY).

Schematic Diagram



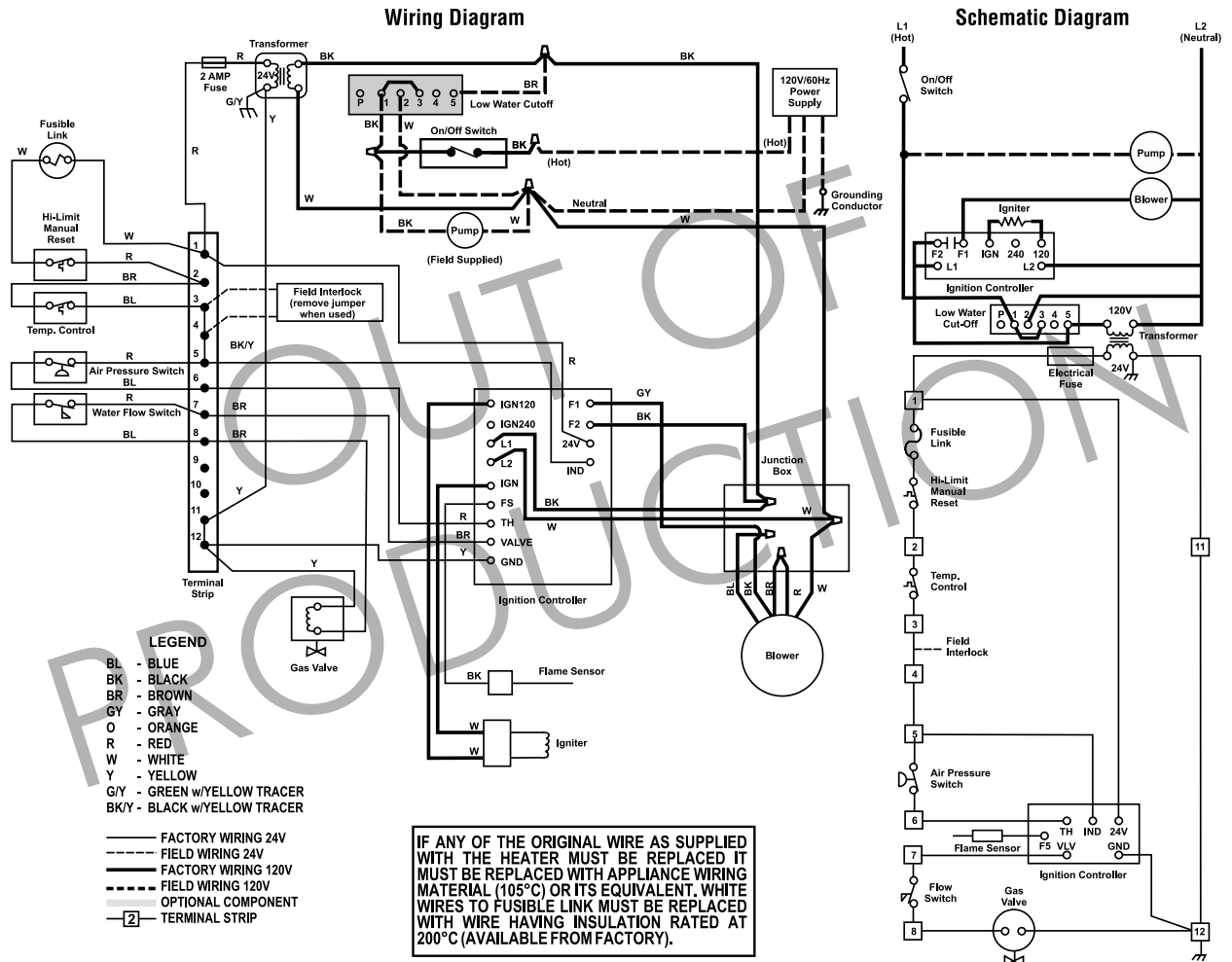
H0247900-

Figure 32. Mighty Therm LO-NOx, PH 400.

SYSTEM NUMBER 22 - HOT SURFACE IGNITION

On/Off

Hydronic Boiler / Volume Water Heater (HH/VW) 400



H0248600-

Figure 33. Mighty Therm LO-NOx, HH 400.

SECTION 4. Maintenance

4.1 General Instructions

1. Oil the water circulating pump in accordance with the manufacturer's instructions.
2. If a strainer is used in a pressure reducing valve or in the piping, clean it every 6 months in accordance with the manufacturer's instructions.
3. At startup and every 6 months after, check the main burner flame. If the flame has the appearance of sooting tips, check for debris near orifices. Call service technician.

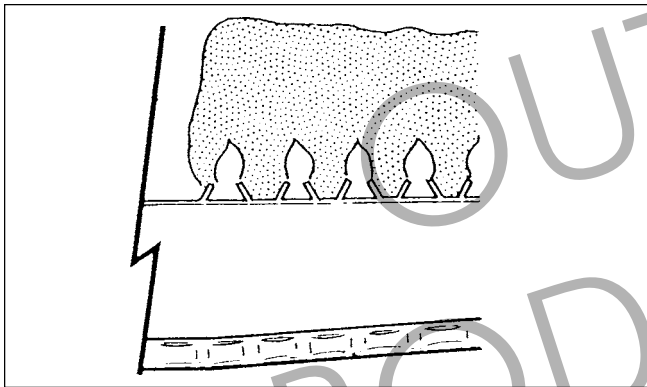


Figure 34. Flame Patterns.

4. Inspect the venting system for blockage, leakage, and corrosion at least once a year.
5. Keep the boiler area clear of combustible material, gasoline, and other flammable liquids and vapors.
6. Be sure all combustion air and ventilation openings are not blocked.
7. Check for black carbon soot buildup on the external surfaces of the heat exchanger every 6 months.
8. Do not use the boiler if any part has been under water. Replace any part of the control system and any gas control which has been under water.

NOTE: After installation and first startup, check the heat exchanger for black carbon soot buildup after the following periods of operation: 24 hours, 7 days, 30 days, 90 days, and once every 6 months thereafter.

4.2 HEAT EXCHANGER

4.2.1 Inspecting the Heat Exchanger

To check the scale buildup, periodically inspect the tube having the highest temperature as follows:

1. Remove the ¼ inch, NPT plug located on the left side of the boiler.
2. Remove the large, hex-head plug located on the right side of the boiler under the in/out header

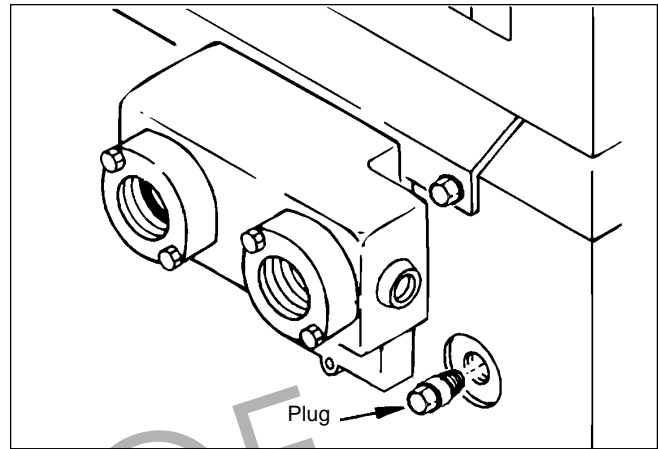


Figure 35. Scale Inspection.

(see Figure 35). Perform this inspection after 60 days of and after 120 days of operation. This will establish a regular inspection routine.

3. Reinstall both plugs after inspection.

4.2.2 Cleaning the Heat Exchanger

An inspection and cleaning of the complete heat exchanger can only be done by removing it from the boiler.

1. Remove the heat exchanger.

⚠ WARNING

Black carbon soot buildup on a dirty heat exchanger can be ignited by a random spark or flame. To prevent this happening, dampen the soot deposits with a wet brush or fine water spray before servicing the heat exchanger. Ignition of soot can possibly cause serious injury or burns, and in extreme cases, death.

⚠ MISE EN GARDE

L'accumulation de suie noire ou de saleté sur l'échangeur thermique peut s'enflammer par le contact d'une étincelle ou d'une flamme. Humidifier les dépôts de suie à l'aide d'une brosse mouillée ou d'une vaporisation d'eau avant d'effectuer l'entretien de l'échangeur thermique afin d'empêcher que cela se produise. L'embrasement de la suie peut occasionner des blessures graves, de brûlures et même, dans les cas extrêmes, la mort.

2. Remove the heat baffles and check for a light accumulation of soot or corrosion on the outside of the heat exchanger tubes.

NOTE: While the heat exchanger is out of the boiler, inspect the firewall insulation blankets for wear and tear. Replace if necessary.

3. Use a wire brush to remove soot and loose scale from the heat exchanger. Do not use water or compressed air for cleaning.

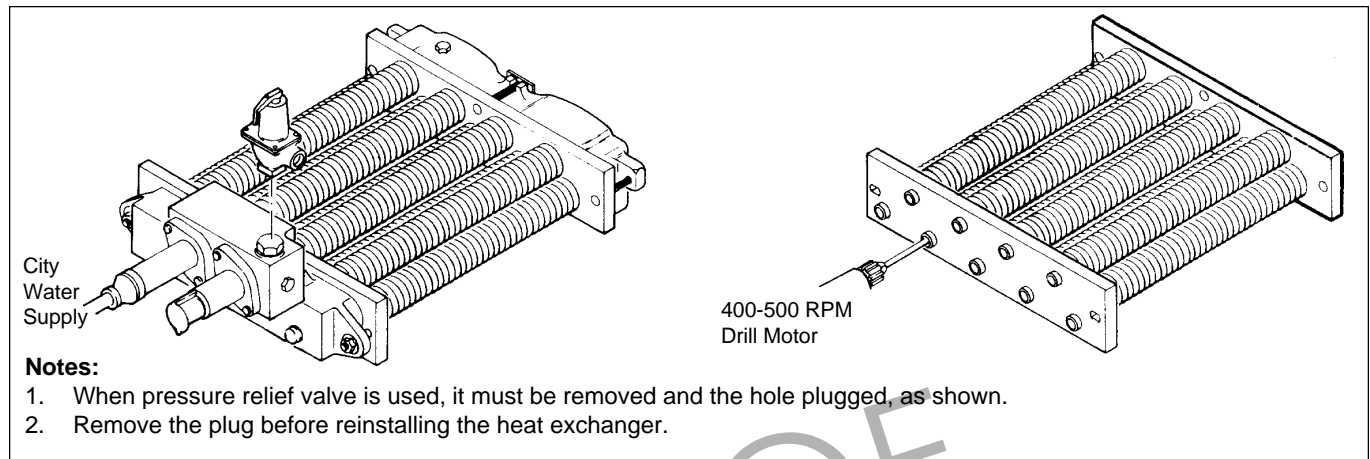


Figure 36. Heat Exchanger Tube Cleaning.

NOTE: Use only the correct carbide tipped reamers which are available from Laars.

4. Ream the insides of the tubes (see Figure 36).
5. Pull the reamer out frequently to remove lime powder and prevent the drill from binding in the tube.
6. Install new gaskets. Do not reuse the old ones.
7. Tighten the header bolts progressively, starting with the two center bolts. Maximum torque is 20 inch pounds (27 Nm). Do not over-torque.
8. Pressure test the heat exchanger for leaks with city water supply before re-installing.
9. When placing the heat exchanger back in the boiler, carefully hold the refractory insulation blocks apart and lower the heat exchanger into place. Be sure the sheet metal covers, which protect the insulation blocks, are replaced carefully.
10. If a header bolt is stripped, drive it out of the header plate and replace it (see Section 6, Parts List).
11. Reinstall the heat exchanger.

SECTION 5.

Troubleshooting and Service

5.1 Gas Pressure Tests

Use the following procedures to check the main gas supply and manifold gas pressures. A manometer kit is available from Laars and instructions for its use are included in the kit. A dry gas pressure gauge may also be used for either test.

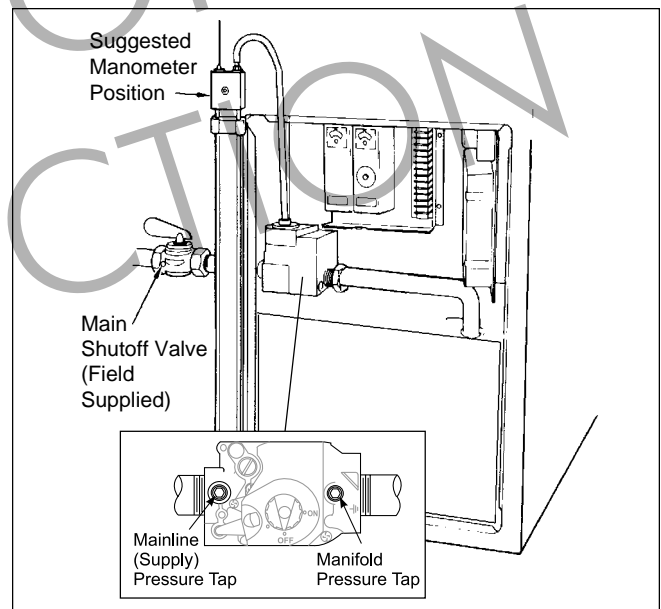


Figure 37. Gas Manifold Pressure Test.

5.1.1 Checking the Main Line Gas Pressure

1. Attach a manometer (or a dry gas pressure gauge) to boiler jacket (see Figure 37).
2. Open both columns on the manometer.
3. Use shutoff valve outside the boiler jacket to shut off all gas supply to the boiler.
4. Remove the 1/8 inch NPT test plug in the inlet side of the gas valve and replace it with the 1/8 inch NPT fitting from the manometer kit.
5. Attach one end of the manometer hose to the fitting on the gas valve and the other end to the manometer.
6. Open gas supply shutoff valve outside the boiler and follow the lighting instructions in Figures 28 and 29 to turn on the boiler.
7. With the main burners firing, the manometer reading should be between 6 and 10.5 inches (15.2 and 26.7 cm) W.C.

5.1.2 Checking the Manifold Regulated Gas Pressure

1. Attach a manometer (or a dry gas pressure gauge) to boiler jacket (see Figure 37).
2. Open both columns on the manometer.
3. Use shutoff valve, on outside of boiler jacket, to shut off all gas supply to the boiler.
4. Remove the 1/8 inch NPT test plug on the outlet side of the gas valve, and replace it with the 1/8 inch NPT fitting from the manometer kit.
5. Attach one end of the manometer hose to the fitting on the gas valve and the other end to the manometer.
6. Turn on gas supply to the boiler, and follow the lighting instructions in Figures 28 or 29 to turn on the boiler.
7. With the main burner firing, the manometer reading should be 4 inches (10cm) W.C. for natural gas.
8. Turn the toggle switch to OFF.
9. Shut the system down following the shutdown instructions in Figures 28 or 29.
11. Disconnect the manometer tubing from the gas valve and replace the 1/8 inch NPT fitting with the original plug.

5.2 Electrical Troubleshooting

This section describes procedures for checking the electrical power and control components of the boiler. Read all of these procedures before starting repairs.

Problems with boilers not firing are usually caused by something reducing water flow through the boiler, causing the protective switches in the boiler system to shut down the boiler.

The following tools are required for proper service and problem diagnosis of the boiler and heating system.

1. Gas pressure test kit with range from 0 to 14 inches (0 to 35.6 cm) W.C.
2. Electric meter(s) with the following ranges:
 - a. 0 to 500 volts VAC
 - b. 0 to 2000 ohms (Ω)
 - c. 0 to 20 microamps (μA)
3. Tube cleaning kit with a reamer, stainless steel brush, speed handle, and handle extensions.
4. A pressure gauge and a thermometer with proper ranges for boiler operation.

5.2.1 Boiler Does Not Come On

Important: Disconnect power to the boiler before removing or replacing any component or wire connection.

WARNING

If power is not disconnected, jumpering gas valve or accidental grounding of the wire harness, or component terminals to the boiler frame or jacket could cause the ignition control fuse to blow or may cause the boiler to fire, resulting in injury or property damage.

MISE EN GARDE

Si l'alimentation électrique n'est pas coupée, un contact avec la soupape de gaz, la mise à la terre accidentelle du faisceau de câbles ou des bornes des composants au cadre ou à la paroi de la chaudière peut faire sauter les fusibles ou provoquer l'allumage de la chaudière, occasionnant des blessures des dégâts matériels.

1. Make sure the boiler has been properly installed.
2. Make sure the pump is not airlocked, clogged or otherwise inoperative.
3. Make sure the gas valve is on and there is gas pressure in the line.
4. Check all electrical connections and wiring. Finding a loose connection or a charred wire can save a lot of time and money.
5. Check the fuse inside the twist-lock fuse holder. If it is burned, replace it with a 2-amp fuse (Part No. E0084400). If there is a short, the cause of the short must be found and repaired. Do not jumper or bypass the fuse.
6. Make sure the electrical circuit to the boiler is on.
7. Make sure the toggle switch on the right side of the boiler is on.
8. Make sure the temperature control is set high enough to call for heat.
9. Make sure the manual reset on the safety controls (e.g., low water cutoff, hi-limit switch, etc.) has not tripped. If it has, reset it.

If the pump is circulating water, and the rest of these items check out all right, the trouble could be in the boiler control system.

Caution

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

Attention

Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Les erreurs de câblage peuvent nuire au bon fonctionnement et être dangereuses. S'assurer que l'appareil fonctionne adéquatement une fois l'entretien terminé.

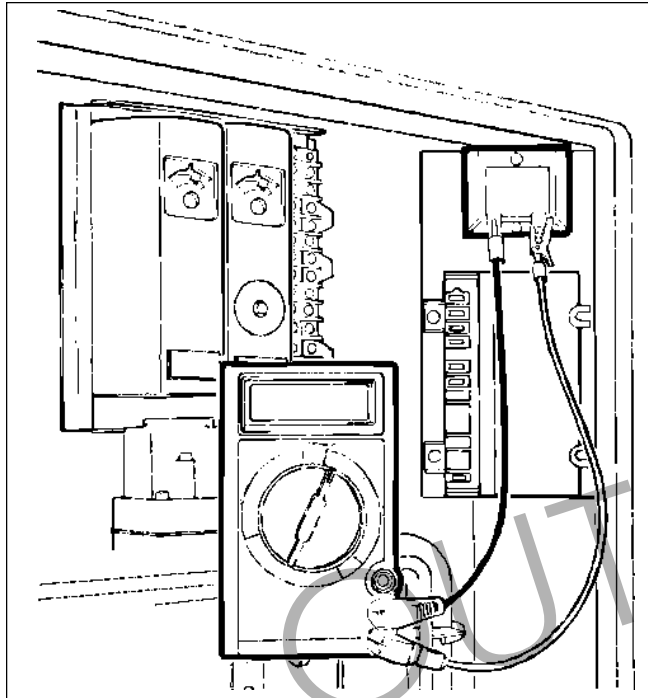


Figure 38. Testing the Transformer.

5.2.2 Testing the Transformer

NOTE: Keep the pump running.

Testing the transformer requires an AC voltmeter with a 50 volt (V) range. Test the transformer using the following procedures:

1. Clip a lead from the voltmeter to the yellow wire terminal on the transformer (this lead stays connected to this terminal for all tests).
2. Touch the other lead to the red wire terminal (see Figure 37). The voltmeter should read 20 to 28VAC.
3. If the voltmeter does not show voltage, check the electrical power supply.
4. If the voltage is less than 20VAC, the electrical circuit to the boiler may be supplying less than 103VAC. This could be due to high pump load or air conditioners or other appliances on the circuit.

5.2.3 Testing the Electrical Power Supply

The electrical components of the HH and PH boilers operate with supply voltage ranging from 103 to 126VAC at 60 Hertz (Hz). To test the electrical power supply:

1. Measure the voltage at the hot and neutral connections inside the boiler electrical junction box.
2. Voltage outside of the required range may be due to poor wiring connections, to other loads (e.g., air conditioners, compressors) on the circuit, to high pump load, or to an electrical utility company problem.

5.2.4 Testing the Manual Reset Hi-Limit Switch

To test the manual reset hi-limit switch (see Figure 39):

1. Touch the other lead of the voltmeter to both terminals of the manual reset hi-limit switch. The voltmeter should read 20 to 28VAC at both terminals.
2. If no voltage is detected at one terminal, reset the manual reset hi-limit switch by pressing the reset button. Check the temperature setting.
3. If after pressing the reset button there is still no voltage indicated at one terminal, replace the manual reset hi-limit switch. An open switch may indicate excessive water temperatures or improper setting.

5.2.5 Testing the Flow Switch

The flow switch is a safety device that senses water flow through the boiler. When the switch senses adequate water flow, it closes, allowing the boiler to fire. If the water flow is too low, the switch remains open and prevents the boiler from firing regardless of the temperature control setting.

The flow switch is factory mounted and wired. Never attempt to repair the flow switch. If the flow switch is found to be defective, replace the flow switch. To test the flow switch:

1. Remove cap from flow switch (see Figure 25).
2. Touch a voltmeter lead to each terminal of the flow switch.
3. If the voltmeter reads voltage at each of the terminals, the switch is good.

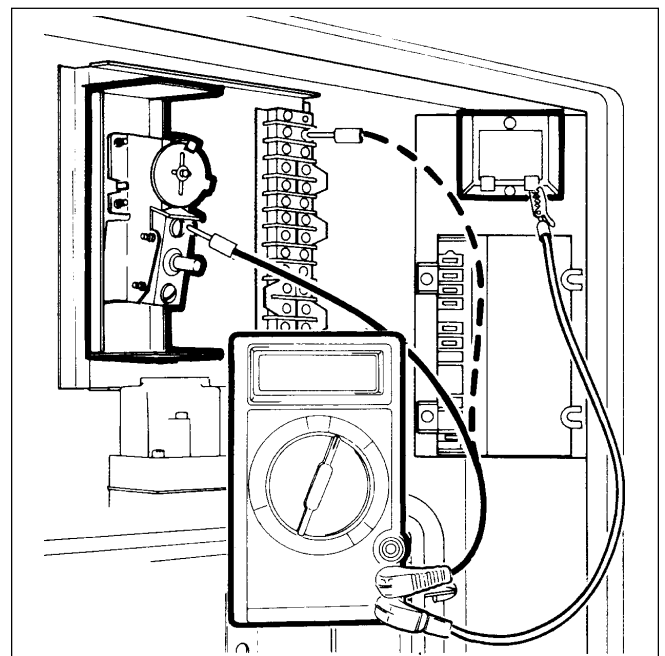


Figure 39. Testing the Manual Reset Hi-limit Switch.

4. If there is no voltage at one terminal, it indicates an open switch. Replace the flow switch.

5.2.6 Testing the Fusible Link (flame roll-out switch)

The fusible link is a thermally fusible element which shuts down the boiler if it detects excessive temperatures inside the heat exchanger compartment. To test the fusible link (flame roll-out switch):

1. Remove the electrical wiring from the fuses and check across each fuse's terminals with a continuity or ohm meter.
2. Touch the voltmeter lead to the lower terminal on the terminal block.
3. If the voltmeter reads voltage, the safety fuse and the fusible link are good.
4. Replace the fuse when an open circuit is detected. An open fuse indicates overheating in the heat exchanger compartment.
5. Check for blockage of the heat exchanger.

5.2.7 Testing the Fuse

To test the fuse:

1. Clip a lead of the voltmeter to the grounding terminal.
2. Touch the other voltmeter lead to terminal number (1) one on the terminal strip.
3. If there is no voltage, replace the fuse. A blown fuse is usually an indication of a short in the 24VAC circuit. It is important that the cause of the short be found and repaired. Do not jumper or bypass the fuse.

5.2.8 Testing the Ignition Control

⚠ Caution

The ignition control and igniter operate on 120V power. Keep this in mind while servicing the boiler, and take care to avoid electrical shock.

⚠ Avertissement

La commande d'allumage et l'allumeur sont alimentés de courant de 120V. Ne pas oublier cela au moment de faire l'entretien de la chaudière, et faire preuve de prudence pour éviter l'électrocution.

The ignition control provides power to the igniter, energizes the gas valve when there is a call for heat, and senses when a flame is established. To test the ignition control for spark ignition:

1. Clip one lead from the voltmeter to the yellow wire terminal on the transformer (or to terminal number (12) twelve on the terminal strip).

2. Touch the other voltmeter lead to terminal number (6) six on the terminal strip.
3. If the voltmeter reads voltage, the temperature control and the manual reset hi-limit switch are not keeping the boiler from firing.
4. Make sure the flame sensor is clean and positioned in place, the terminal connection is tight, and the lead is at least 3/8 inch (9.5 mm) from the boiler chassis and other metal parts.

NOTE: The ignition control cannot be repaired in the field. If it does not operate properly, replace it.

5.2.9 Combustion Air Blower

This boiler uses a fan-assisted combustion process. For proper operation of the burners, inspect the air blower for contamination one week after start-up and every six (6) months thereafter.

1. To inspect and service the blower, shut off all electrical and gas supply to the boiler.
2. Disconnect the air hose from the air blower (see Figure 40) and from the air inlet elbow.
3. Remove the screws holding the blower bracket (see Figure 40) off the inner front panel.
4. Inspect the blower wheel. Clean the blower housing and its wheel from any contamination or debris.
5. Check the air hose for any blockage or rupture. Clean any blockage, if ruptured or holes exist, replace the hose.
6. Reassemble all parts securely in place.

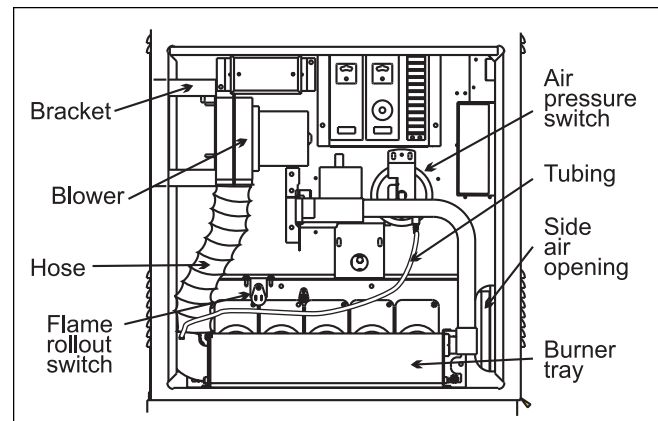


Figure 40. Controls Location.

5.2.10 Boiler Will Not Shut Off

1. If the boiler stays on with the brown wire on the gas valve disconnected, replace the gas valve.

⚠ WARNING

Never attempt to repair the gas valve. Such attempts will void the warranty, and could lead to property damage, serious injury or loss of life.

⚠ MISE EN GARDE

Ne jamais tenter de réparer la soupape de gaz. Toute tentative en ce sens annulera la garantie et peut occasionner des dégâts matériels, des blessures graves ou même la mort.

2. Check electrical components for loose wires.
3. Check all wiring connections for correct order of the components wiring, follow the wiring diagram provided with the boiler.

SECTION 6. Replacement Parts

6.1 Ordering Information

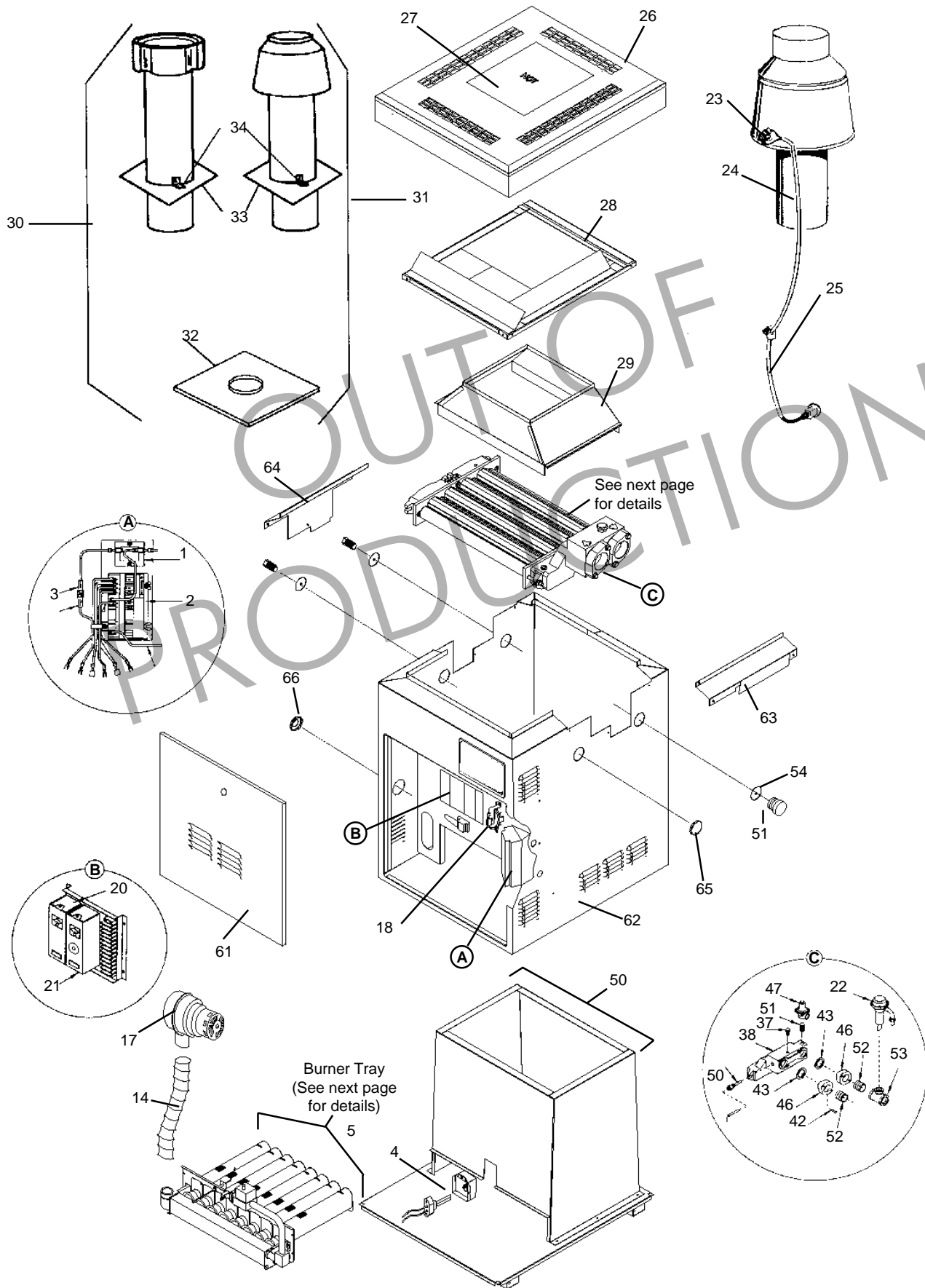
To order or purchase parts for the Laars HH and PH boilers, contact your nearest Laars dealer or distributor. If they cannot supply you with what you need, contact Laars Customer Service at the address shown on back cover of this manual.

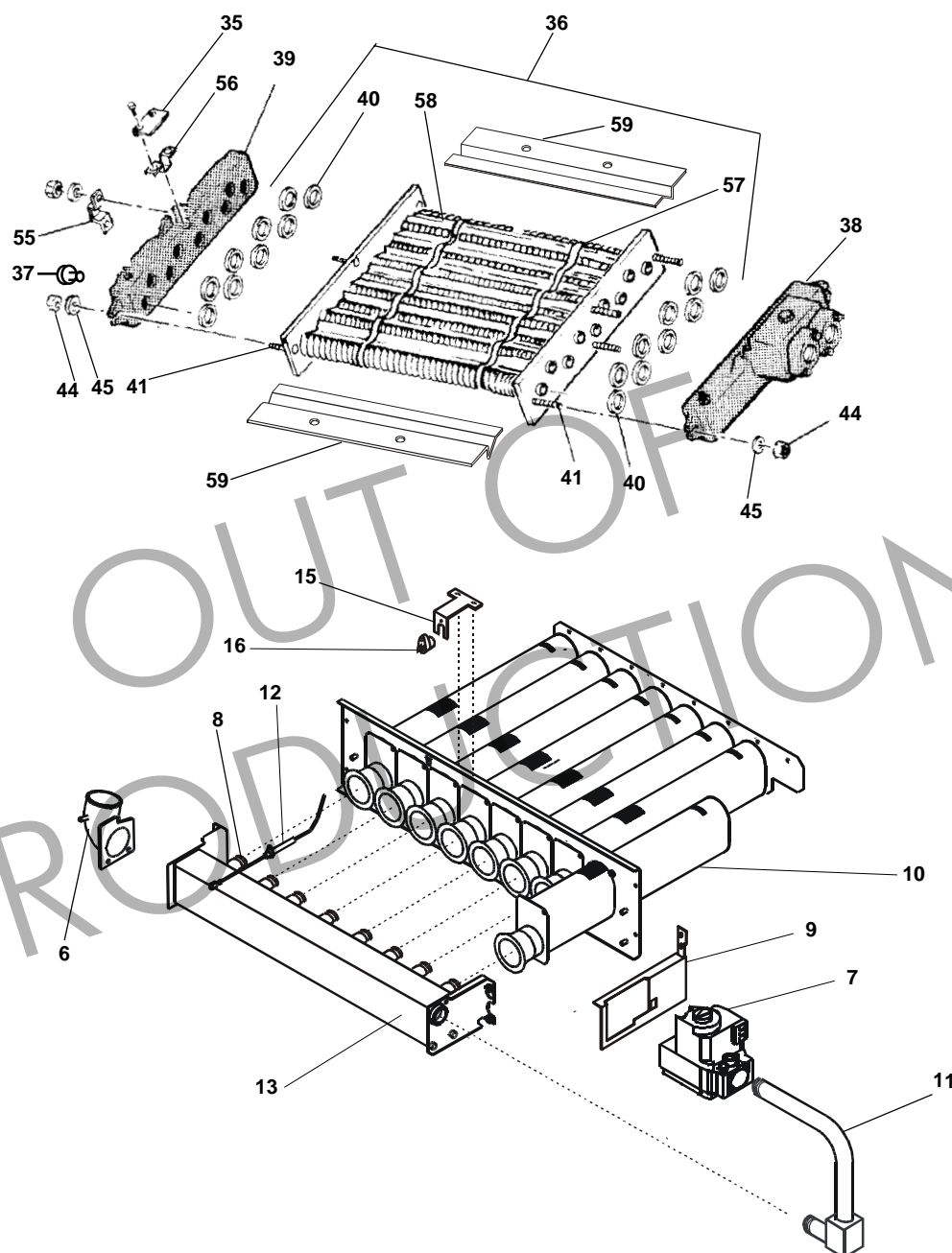
Visit our website at www.laars.com for Service Center listings.

6.2 Parts List

Key No.	Description	Model No.	Order Part No.
IGNITER SYSTEM			
1	Transformer, 115V/24V 40VA Ignition	All	E0086100
2	Ignition Control	All	R0328800
3	In-Line Fuse Assembly	All	E0228900
4	Hot Surface Ignitor	All	R0317200
MAIN GAS ASSEMBLY			
5	Burner Tray Assembly	250	R0360003
		400	R0360005
6	Air Inlet Elbow	All	R0360300
7	Gas Valve	All	R0336800
8	Gas Orifice (set of 8) (Note 1)	All	R0360100
9	Anti-Rotation Bracket	All	R0331800
10	Burner, Main	All	R0360400
11	Gas Pipe with Attachment	All	R0360200
12	Flame Sensor	All	R0360900
13	Manifold	250	R0365803
		400	R0365805
14	Air Inlet Hose	All	R0360600

Key No.	Description	Model No.	Order Part No.
ELECTRICAL SYSTEM			
15	Fusible Link Assembly	All	R0361800
16	Fusible Link	All	R0361900
17	Blower	All	R0360500
18	Air Pressure Switch with Tubing	All	R0360700
19	Toggle Switch (on/off) (not shown)	All	E0077000
	Toggle switch (EM2) (not shown)	All	E0109200
20	Hi-Limit, Manual Reset	All	E0015900
21	Temp Controller, On/Off	All	E0014400
22	Flow Switch	All	E0013000
23	Switch BVSS, Draffhood	250	E0121000
24	Switch BVSS, Harness	250	10697802
25	BVSS Adaptor Cable	250	10887300
26	Top Enclosure	250	R0343403
		400	R0343405
27	Top Filler Plate	250	R0343703
		400	R0343705
28	Rainshield Kit	250	R0318303
		400	R0318305
29	Flue Collector Assembly	250	R0316403
		400	R0316405
30	Outdoor Vent Cap	250	10561503
		400	10561505
31	Indoor Draffhood	250	R0369303
		400	10561405
32	Flue Transition Plate	250	10861903
		400	10861905
33	Adapter Plate	250	10535303
		400	10535305
34	Clip	All	10211000
35	Flue Collector Hold Down Bracket	All	10726200
WATER SYSTEM			
36	Heat Exch, Tube Assy, Copper	250	R0095503
		400	R0095505
	Heat Exch, Tube Assy, Cupronickel	250	R0095603
		400	R0095605
37	Plug, 1/4 inch NPT	All	P0026800
38	In/Out Header		
	Cast Iron (S0079200), 2-Pass	All	10593800
39	Return Header		
	Cast Iron (S0079200), 2-Pass	All	10593800
40	Header Gasket (18)	All	R0050800
41	Bolt, Dome Head (8)	All	F0046100
42	Screw, Hex Cap (4)	All	F0051400
43	Gasket		
	Cast Iron Flange	All	S0076500
44	Nut	All	F0040800
45	Washer	All	F0011100
46	Flange, 1-1/2 inch		
	Cast Iron (S0076400)	All	10573600
47	Pressure Relief Valve (75 psi)	All	A0063300
48	Pump and Rainshield Assembly (not shown)		
		250	10999802
		400	10999803
49	Valve, Drain	All	P0058700
50	Well, Temp Control, 1/2 inch NPT	All	E0025900
51	Nipple, Brass, 3/4 inch	All	P0025300
52	Nipple, Cast Iron (1-1/2 inch)	All	P0024400
53	Tee, Cast Iron	All	P0071700
54	Bushing, Brass	All	P0018500
55	Heat Exchanger Support Bracket	All	10457000
56	Flue Collector Hold Down Clamp	All	10726300
57	Clip, Baffle Retainer	All	S0083900





Key No.	Description	Model No.	Order Part No.
58	Baffle, Heat Exchanger (8)	250	10697403
	.....	400	10697405
59	End Baffle, Heat Exchanger	250	R0365903
	.....	400	R0365905

FIREBOX COMPONENTS

60	Complete Combustion Chamber Assy	250	R0316703
	.....	400	R0316705

JACKET COMPONENTS

61	Door with Latch	250	R0360803
	.....	400	R0360805
62	Jacket Assy, Less Top Assy	250	R0343503
	.....	400	R0343505

Key No.	Description	Model No.	Order Part No.
63	Gap Closure, Inlet/Outlet	All	R0344300
64	Gap Closure, Return	All	R0344400
65	Button Plug, 1-3/4"	All	F0035300
66	Button Plug, 2" (w/ hole for gas line)	All	F0056600
67	Outdoor Base (not shown)	All	R0368900

OPTIONAL COMPONENTS

67	Touch-up Spray Paint, Pewter + Black	All	R0335800
68	Touch-up Spray Paint, Pewter Only	All	X0022700
69	Touch-up Spray Paint, Black Only	All	X0022900

NOTE 1: The Laars LO-NOx boiler is designed for operation only with natural gas up to an altitude of 2000 feet. The orifice set listed in the above parts list reflects these conditions. For other applications contact your authorized Laars dealer or our Customer Service department.

OUT OF
PRODUCTION



H0251300A



Waterpik Technologies

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