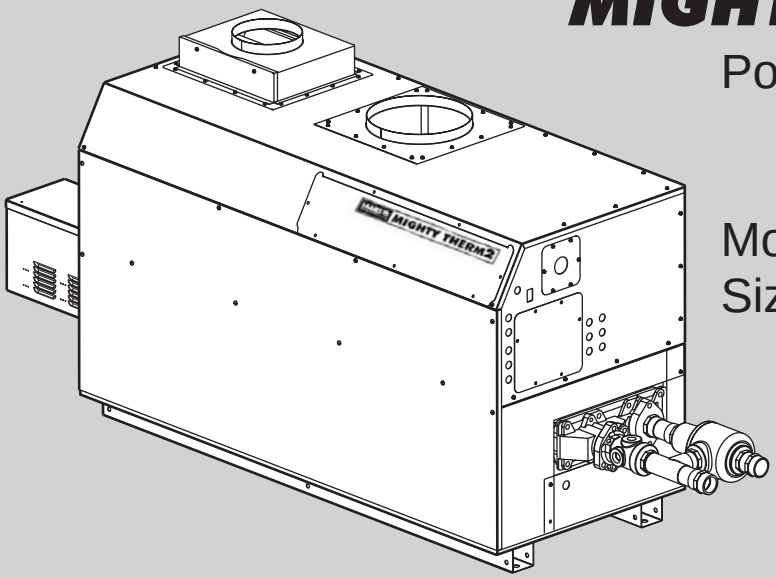
Installation and Operation Instructions for

MIGHTY THERM2®

Pool Heater



Model MT2P
Sizes 500–2000 MBTU/h

FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water pool heater 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. For indoor installations, as an additional measure of safety, Laars strongly recommends installation of suitable Carbon Monoxide detectors in the vicinity of this appliance and in any adjacent occupied spaces.

⚠ 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.

⚠ AVERTISSEMENT

Assurez-vous de bien suivres les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort.

Ne pas entreposer ni utiliser d'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareils.
- Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dansle bâtiment où vous êtes.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le sservice des incendies.

L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.

H2331400L

LAARS® Heating Systems Company

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Heating Systems Company

SECTION 1 General Information

1.A Introduction

This manual provides information necessary for the installation, operation, and maintenance of the Laars Heating Systems Mighty Therm2 commercial pool heater. Read this manual carefully before installation.

All application and installation procedures should be reviewed completely before proceeding with the installation. Consult the factory, or local factory representative, with any issues or questions regarding this equipment. Experience has shown that most operating issues are caused by improper installation.

The Mighty Therm2 is protected against over pressurization. A pressure relief valve is fitted to all units. It is installed on the outlet header, at the water outlet of the unit

NOTE: Throughout the content of this manual, the Mighty Therm2 will be referred to as a 'unit'. unit = MightyTherm2

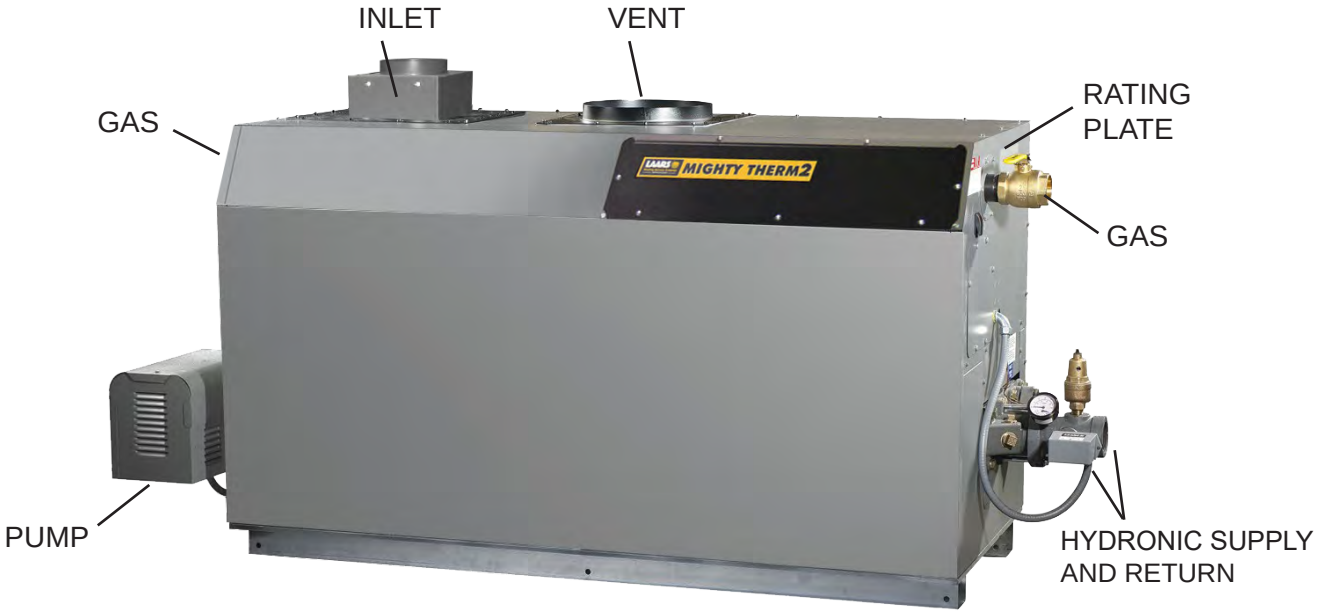
1.B Warranty

Laars Heating Systems Mighty Therm2s are covered by a limited warranty. Owner should submit online warranty registration at ***www.Laars.com***.

All warranty claims must be made to an authorized Laars Heating Systems representative, directly to Customer Service, or online at ***www.Laars.com***.

Claims must include the serial number and model number (this information can be found on the rating plate), installation date, and name of the installer. Shipping costs are not included in the warranty coverage.

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.



The Pump and the Hydronic Supply/Return are reversible.

The Mixing Valve is not shown in this photo.

1.C Model Identification

Consult the rating plate on the unit. The following information describes the model number structure.

1-3 Model Series Designation
M T 2 = Mighty Therm2

4 Usage
P = Pool Heater

5-8 Size
0 5 0 0 = 500,000 BTU/h input
0 7 5 0 = 750,000 BTU/h input
1 0 0 0 = 999,000 BTU/h input
1 2 5 0 = 1,250,000 BTU/h input
1 5 0 0 = 1,500,000 BTU/h input
1 7 5 0 = 1,750,000 BTU/h input
2 0 0 0 = 1,999,000 BTU/h input

9 Fuel
N = Natural Gas
P = Liquid Propane

10 Altitude
A = 0-10,000 feet

11 Location
C = Indoor and Outdoor *

12 Firing Mode
C = On-off

13 Revision
1 = First version

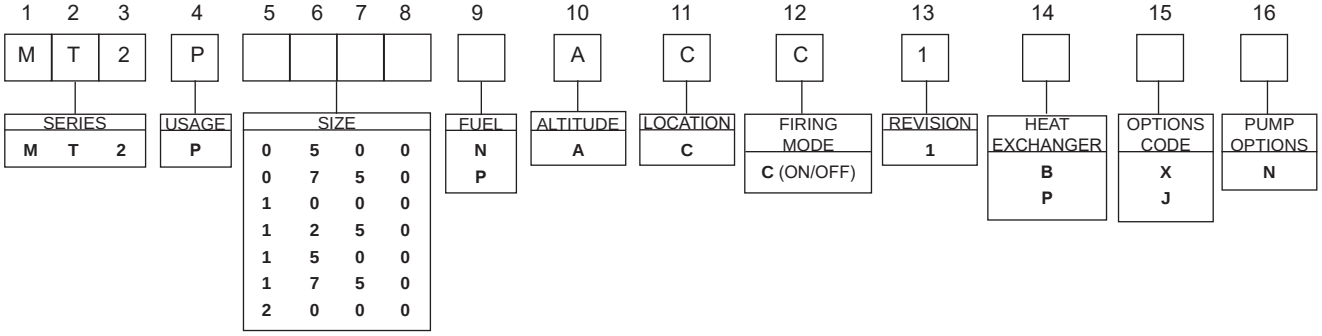
14 Heat Exchanger
B = Glass-lined cast iron / copper / bronze trim (std)
P = Glass-lined cast iron / cu-nickel / bronze trim

15 Option Code
X = Standard unit
J = CSD-1, FM, IRI, IL

16 Pump Options
N = Pump mounted, normal water pump

* Outdoor installation of this unit is not permitted in Canada.

Model Nomenclature as seen on the Rating Plate.



1.D Safety Notes

Safety notes are used throughout this manual to bring attention to the presence of hazards with various risk levels and to offer important information concerning the life of this product. There are 3 basic types.

1	⚠ WARNING	Indicates an imminently hazardous situation which, if not avoided, can or will result in death or serious injury and can or will result in catastrophic property damage.
2	⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in moderate injury and/or property damage.
3	NOTE:	Indicates instructions that are important to that topic but not related to personal injury or property damage.

⚠ WARNING

- Water temperature over 125°F (52°C) can cause severe burns instantly or death from scalds.
- Children, disabled and elderly are at highest risk of being scalded.
- See instruction manual before setting temperature at the unit.
- Feel water before bathing or showering.
- If this unit is used to produce water that could scald if too hot, such as domestic hot water use, adjust the outlet control (limit) or use temperature limiting valves to obtain a maximum water temperature of 125°F (52°C).

⚠ WARNING

Fire or Explosion Hazard

Improper configuration can cause fuel buildup and explosion. Improper user operation may result in property loss, severe physical injury, or death.

Any change to safety-related configuration parameters must only be done by experienced and/or licensed burner/boiler operators and mechanics.

If overheating occurs or if the gas supply fails to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the appliance.

If any odor of gas is detected, or if the gas burner does not appear to be functioning in a normal manner, close the main gas shutoff valve. Do not shut off the power switch. Contact your heating contractor, gas company, or factory representative.

⚠ AVERTISSEMENT

En cas de surchauffe ou si l'alimentation en gaz ne s'arrête pas, fermez.

⚠ WARNING

This unit must be installed in accordance with the procedures detailed in this manual, or the manufacturers 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 Z223.1/NFPA54. In Canada, the installation must conform to the latest edition of CSA B149.1 Natural Gas and Propane Gas Installation Code, and/or local codes. Where required by the authority having jurisdiction, the installation of these units must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1. 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.

⚠ WARNING

Carbon Monoxide Hazard

This product burns gas to produce heat. The appliance must be properly installed, operated, and maintained to avoid exposure to appreciable levels of carbon monoxide.

The installer must verify that at least one carbon monoxide alarm has been installed within a residential living space or home following the alarm manufacturer's instructions and applicable local codes before putting the appliance into operation. It is important for carbon monoxide alarms to be installed, maintained, and replaced following the alarm manufacturer's instructions and applicable local codes.

⚠ AVERTISSEMENT

L'installateur est tenu de vérifier qu'au moins une alarme de détection de monoxyde de carbone soit installée dans un espace résidentiel ou dans un domicile conformément aux directives du fabricant de l'alarme et aux codes locaux applicables avant de mettre l'appareil en service.

⚠ WARNING

Electrical Shock Hazard

Electrical shock can cause severe injury, death or property damage. Disconnect the power supply before beginning installation or changing the wiring to prevent electrical shock or damage to the equipment. It may be necessary to turn off more than one power supply to disconnect.

All electrical wiring is to be done in accordance with local codes, or in the absence of local codes, with: 1) The National Electrical Code ANSI/NFPA No. 70 - latest Edition, or 2) CSA STD. C22.1 "Canadian Electrical Code - Part 1." This appliance must be electrically grounded in accordance with these codes.

⚠ WARNING

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures above 180ºF, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator.
2. Long sleeved, loose fitting clothing.
3. Gloves.
4. Eye Protection.

⚠ WARNING

CANCER AND REPRODUCTIVE HARM.
WWW.P65WARNINGS.CA.GOV.

AS REQUIRED BY THE STATE OF CALIFORNIA PROPOSITION 65.

⚠ CAUTION

The supply voltage to this unit must not be disengaged, except for service or isolation, or unless otherwise instructed by procedures outlined in this manual. To signal a call for heat, use the correct terminals as instructed in SECTION 5 of this manual.

⚠ CAUTION

CO needs to be less than 150 ppm.

⚠ ATTENTION

Le CO doit être inférieur à 150 ppm.

NOTE: All installations must be made in accordance with 1) American National Standard Z223.1/NFPA54-Latest Edition "National Fuel Gas Code" or 2) CSA B149.1 "Natural Gas and Propane Installation Code" or in Canada reference the B149.1 latest edition and with the requirement of the local utility or other authorities having jurisdiction. Such applicable requirements take precedence over the general instructions contained herein. All electrical wiring is to be done in accordance with the local codes, or in the absence of local codes, with: 1) The National Electrical Code ANSI/NFPA No. 70-latest Edition, or 2) CSA STD. C22.1 "Canadian Electrical Code - Part 1". This appliance must be electrically grounded in accordance with these codes.

NOTE: A pressure relief valve is included with each unit and must be installed prior to filling the system.

1.E Locating the Unit

This unit should be located to provide clearances on all sides for maintenance and inspection. It should not be located in an area where leakage of any connections will result in damage to the area adjacent to the appliance or to lower floors of the structure.

When such a location is not available, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance.

The unit is design certified by CSA-International for installation on combustible flooring; in basements; in closets, utility rooms or alcoves**.** The location for the unit should be chosen with regard to the vent pipe lengths and external plumbing. The unit shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during operation and service (circulator replacement, control replacement, etc.). When vented vertically, the unit must be located as close as practical to a chimney or outside wall. If the vent terminal and/or combustion air terminal terminate through a wall, and there is potential for snow accumulation in the local area, both terminals should be installed at an appropriate level above grade.

The dimensions and requirements that are shown in Figure 1 should be met when choosing the locations for this unit.

1.F Locating Heater with Respect to Pool System Loop

For the best results, this unit should be located within 15 feet (4.6m) of the pool system loop. The pump is sized for 30 feet (9.1m) of piping.

If the unit must be installed with longer piping runs, then larger diameter piping shall be used. Consult the factory for assistance.

SURFACE	REQUIRED CLEARANCE FROM COMBUSTIBLE MATERIAL		RECOMMENDED SERVICE ACCESS CLEARANCE	
	inches	*cm*	inches	*cm*
Left Side	1	*2.5*	24	*61*
Right Side	1	*2.5*	24	*61*
Top	1	*2.5*	12	30
Back	1	*2.5*	12**	*30***
Front	1	*2.5*	36	*91*
Vertical (Category 1) Vent	6*	*15.2**		
Horizontal (Category 3) Vent	per UL1738 venting system supplier's instructions			

*1" (2.5cm) when b-vent is used.
**When vent and/or combustion air connects to the back, recommended clearance is 36" (91cm).

Table 1. Clearances

1.G Locating Appliance for Correct Horizontal Vent/Ducted Air Distance From Outside Wall

The forced draft combustion air blower/blowers in the unit has/have sufficient power to pull air and vent properly when the following guidelines for horizontal air and vent are followed (see Table 2).

NOTE: On all MT2P models, the vent collar size is larger than the size of the vent pipe that can be used.

Side wall vent terminals for these sizes are shipped with replacement vent collars, to accommodate horizontal vent sizes. Vent collar size and horizontal pipe diameters can be found Table 2 and Figure 1. The larger vent collar size is to accommodate Category I (vertical) vent systems.

SECTION 2 Venting and Combustion Air

2.A Combustion Air

This Pool Heater must have provisions for combustion and ventilation air in accordance with 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 CSA B149.1, Installation Codes, or applicable provisions of the local building codes.

This unit may receive combustion air from the space in which it is installed, or it can be ducted directly to the unit from the outside. Ventilation air must be provided in either case.

2.A.1 Combustion Air From Room

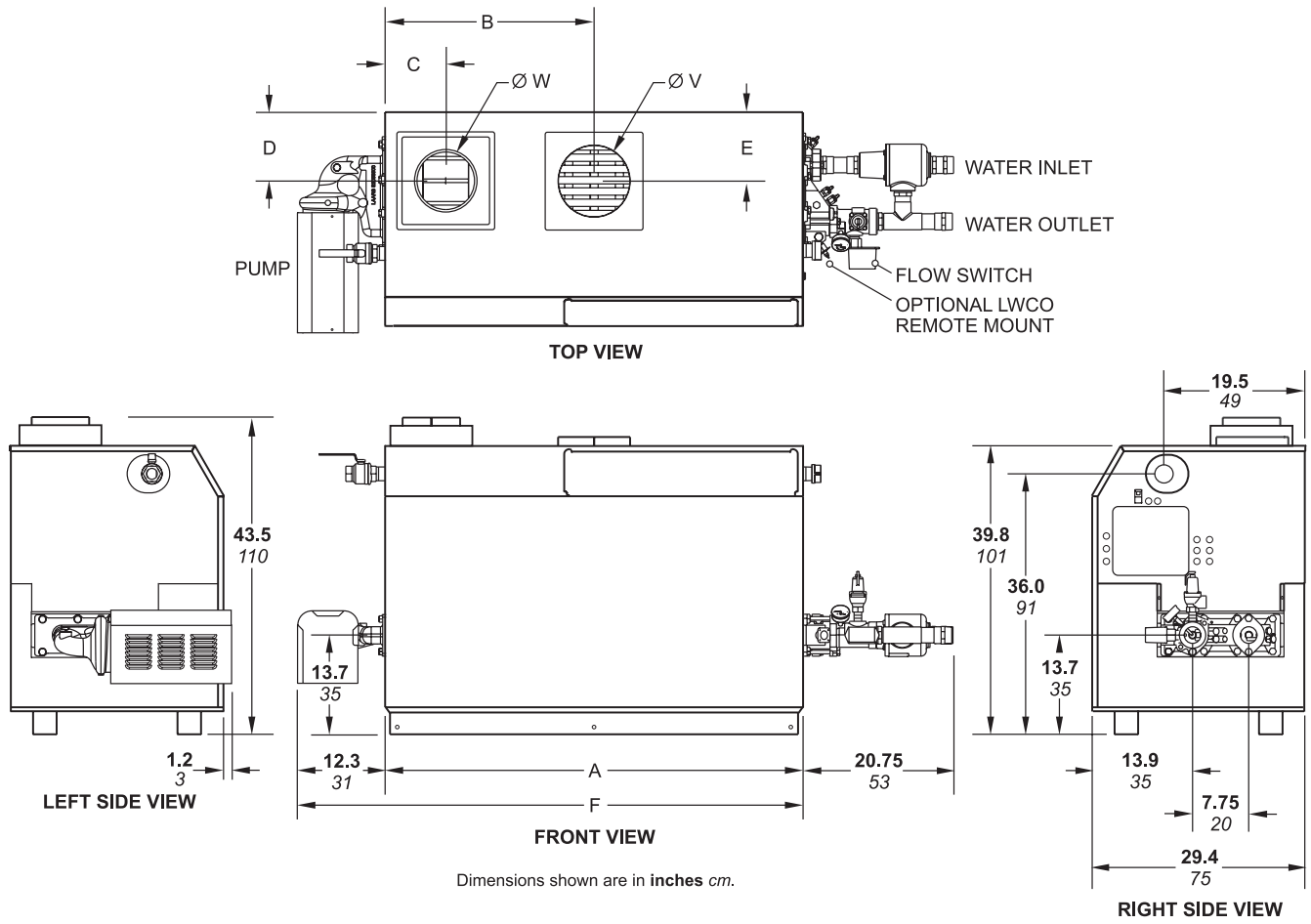
In the United States, the most common requirements specify that the space shall communicate with the outdoors in accordance with method 1 or 2, which follow. Where ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect.

Method 1: Two permanent openings, one commencing within 12 inches (30 cm) of the top and one commencing within 12 inches (30 cm) of the bottom, of the enclosure shall be provided. The openings shall

NOTE: When located on the same wall, the MT2P combustion air intake terminal must be installed a minimum of 12" (30cm) below the exhaust vent terminal and separated by a minimum of 36 inches (91cm) horizontally.

The air intake terminal must be installed high enough to avoid blockage from snow, leaves and other debris. Never obtain combustion air from the pool area. Corrosion of and/or damage to the pool heater may result.

1.H Dimensions



UNIT SIZE	A	B	C	D	E	F	AIR CONN. W	VENT CONN. V	SHIPPING WEIGHT[1] LBS	KG
500	**33¾** *85*	**16¾** *43*	**6½** *17*	**10** *25*	**8** *20*	**46¼** *117*	**6** *15*	**8** *20*	**425**	*193*
750	**45¾** *116*	**22¾** *53*	**6½** *17*	**10** *25*	**9½** *24*	**58¼** *148*	**8** *20*	**10** *25*	**505**	*229*
1000	**57¾** *147*	**28¾** *73*	**6½** *17*	**10** *25*	**9½** *24*	**70¼** *178*	**8** *20*	**10** *25*	**615**	*279*
1250	**68¼** *173*	**34** *87*	**10¼** *26*	**10** *25*	**9** *23*	**80¾** *205*	**12** *30*	**12** *30*	**675**	*306*
1500	**78¾** *200*	**39½** *100*	**10¼** *26*	**10** *25*	**9** *23*	**91¼** *232*	**12** *30*	**12** *30*	**760**	*345*
1750	**89¼** *227*	**44¾** *113*	**10¼** *26*	**10** *25*	**9** *23*	**101¾** *258*	**12** *30*	**14** *36*	**825**	*375*
2000	**99¾** *253*	**49¾** *127*	**10¼** *26*	**10** *25*	**9** *23*	**112¼** *285*	**12** *30*	**14** *36*	**955**	*434*

NOTES: 1. Add 55 lbs (25kg) for pump-mounted units. Dimensions in **inches** *cm.*

Figure 1. Dimensional Data (pump-mounted models).

NOTE: The vent collar size is larger than the size of the vent pipe that can be used. Vent collar size and horizontal pipe diameters can be found in Table 2. The larger vent collar size is to accommodate Category I (vertical) vent systems.

NOTE: When located on the same wall, the combustion air intake terminal must be installed a minimum of 12" (30cm) below the exhaust vent terminal and separated by a minimum of 36 inches (91cm) horizontally.

The air intake terminal must be installed high enough to avoid blockage from snow, leaves and other debris.

SIZE	VENT COLLAR SIZE		HORIZONTAL VENT PIPE DIAMETER		INTAKE AIR PIPE DIAMETER		MAX. PIPE LENGTH		MAX. NO. OF ELBOWS	SIDE WALL VENT TERMINAL PART NUMBER	SIDE WALL COMBUSTION AIR TERMINAL PART NUMBER
	in.	*cm*	**in.**	*cm*	**in.**	*cm*	**ft.**	*m*			
500	**8**	*20*	**6**	*15*	**6**	*15*	**50**	*15*	3	CA001406	CA20260701
750	**10**	*25*	**8**	*20*	**8**	*20*	**50**	*15*	3	CA001407	CA20260703
1000	**10**	*25*	**8**	*20*	**8**	*20*	**50**	*15*	3	CA001407	CA20260703
1250	**12**	*30*	**10**	*25*	**12**	*30*	**50**	*15*	3	CA001408	CA20260706
1500	**12**	*30*	**10**	*25*	**12**	*30*	**50**	*15*	3	CA001408	CA20260706
1750	**14**	*36*	**12**	*30*	**12**	*30*	**50**	*15*	3	CA001409	CA20260706
2000	**14**	*36*	**12**	*30*	**12**	*30*	**50**	*15*	3	CA001409	CA20260706

Table 2. Horizontal Vent / Combustion Air Parameters.

communicate directly, or by ducts, with the outdoors or spaces that freely communicate with the outdoors. When directly communicating with the outdoors, or when communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4000 BTU/hr (5.5 square cm/kW) of total input rating of all equipment in the enclosure. When communicating to the outdoors through horizontal ducts, each opening shall have a minimum free area of not less than 1 square inch per 2000 BTU/hr (11 square cm/kW) of total input rating of all equipment in the enclosure. Table 3 shows data for this sizing method, and for each model.

Method 2: One permanent opening, commencing within 12 inches (30 cm) of the top of the enclosure, shall be permitted. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces that directly communicate with the outdoors and shall have a minimum free area of 1 square inch per 3000 BTU/hr (7 square cm/kW) of the total input rating of all equipment located in the enclosure. This opening must not be less than the sum of the areas of all vent connectors in the confined space.

Other methods of introducing combustion and ventilation air are acceptable, providing they conform to the requirements in the applicable codes listed above.

In Canada, consult local building and safety codes or, in absence of such requirements, follow CSA B149.1.

2.A.2 Intake Combustion Air

The combustion air can be taken through the wall, or through the roof. When taken from the wall, it must be taken from out-of-doors by means of the Manufacturers horizontal wall terminal (see Table 2 on page 10). When taken from the roof, a field-supplied rain cap or an elbow arrangement must be used to prevent entry of rain water (see Figure 2 on page 11).

Use single-wall galvanized pipe, per Table 4 on page 11 for the combustion air intake (see Table 2 and Figure 1 for appropriate size). Route the intake to the heater as directly as possible. Seal all joints with tape. Provide adequate hangers. The unit must not support the weight of the combustion air intake pipe. Maximum linear pipe length allowed is 50 feet (15.2m). Three elbows have been calculated into the 50-foot (15.2m) linear run. Subtract 10 allowable linear feet (3.0m) for every additional elbow used (see Table 2 on page 10). When fewer than 3 elbows are used, the maximum linear pipe length allowed is still 50 feet (15.2m).

The connection for the intake air pipe is on the filter box. This unit has venting and combustion air ducting attached to the top.

In addition to air needed for combustion, air shall also be supplied for ventilation, including all air required for comfort and proper working conditions for personnel. This unit loses less than 1 percent of its input rating to the room, but other heat sources may be present.

2.B Venting

2.B.1 Vent Categories

Depending upon desired venting for this unit, it may be considered a Category I or a Category III appliance.

Unit Size	Each Opening*	
	Square inches	Square cm
500	125	807
750	188	1213
1000	250	1613
1250	313	2020
1500	375	2420
1750	438	2826
2000	500	3226

*Net Free Area in Square Inches / Square cm
Area indicated is for one of two openings; one at floor level and one at the ceiling, so the total net free area could be double the figures indicated.

This chart is for use when communicating directly with the outdoors. For special conditions and alternate methods, refer to the latest edition of ANSI Z223.1.

Note: Check with louver manufacturers for net free area of louvers. Correct for screen resistance to the net free area if a screen is installed. Check all local codes applicable to combustion air.

Table 3. Combustion Air Openings.

In general, a vertical vent system will be a Category I system. However, in rare instances, a vertical vent system may be considered Category III. In the U.S., the National Fuel Gas Code (ANSI Z223.1-Latest Edition), or in Canada the CSA B149.1 (latest edition), defines a Category I vent system, and includes rules and tables to size these vent systems. If this units vertical vent system does not satisfy the criteria for Category I venting, it must be vented as a Category III system.

All vent systems which discharge horizontally (without the use of a power venter) are considered Category III vent systems.

2.B.2 Category I Vent

When vented as a category I appliance, the vent system must conform to the National Fuel Gas Code (ANSI Z223.1-Latest Edition) in the U.S., or in Canada, to CSA B149.1 (latest edition). The vent system must be sized and installed for a Category I Fan-Assisted Appliance.

If chimney height is greater than 25 feet, or if multiple units are vented into the same vertical vent, a barometric damper must be installed on each unit, such that the flue draft does not exceed (negative) 0.1" w.c.

If using a power venter for any type of Category I venting, the draft should be set between (negative) 0.01 and 0.10" w.c.

2.B.3 Common Venting Systems

These units are Category I fan-assisted when vented vertically and adhering to all applicable codes.

When common venting a fan-assisted unit with other other appliances through one shared vertical 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.**

TERM	DESCRIPTION
Pipe	Single-wall galvanized steel pipe, 24 gauge minimum (either insulated or non-insulated)
Joint Sealing	Permanent duct tape or aluminum tape

Table 4. Required Combustion Air Piping Material

⚠ WARNING

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

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 must be followed.

As an additional precaution, it is recommended that a Carbon Monoxide (CO) alarm be installed in all enclosed spaces containing combustion appliances.

This unit is not allowed to be vented into a common horizontal Cat III vent system (horizontal discharge or other configuration for Cat III), unless a properly sized vent fan is used, and the common vent system is properly designed by the vent fan manufacturer or a qualified engineer.

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 gasses into living spaces, common venting should not be applied, and appliances should each be vented separately.

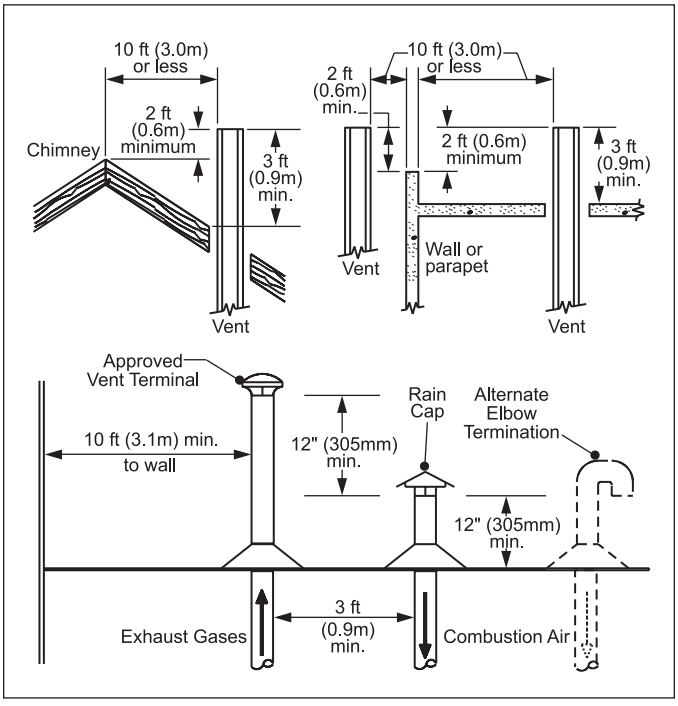


Figure 2. Combustion Air and Vent Through Roof.

		Canadian Installations[1]	U.S. Installations[2]
A =	Clearance above grade, veranda, porch, deck, or balcony	12 in (30 cm)	12 in (30 cm)
B =	Clearance to window or door that may be opened	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 12 in (30 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW) • 36 in (91 cm) for appliances >100,000 Btuh (30 kW)	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 9 in (23 cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW) • 12 in (30 cm) for appliances >50,000 Btuh (15 kW)
C =	Clearance to permanently closed window	See Note 4	See Note 5
D =	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 ft (61 cm) from the center line of the terminal	See Note 4	See Note 5
E =	Clearance to unventilated soffit	See Note 4	See Note 5
F =	Clearance to outside corner	See Note 4	See Note 5
G =	Clearance to inside corner	See Note 4	See Note 5
H =	Clearance to each side of centerline extended above meter / regulator assy	3 ft (91 cm) within a height of 15 ft (4.6 m)	See Note 5
I =	Clearance to service regulator vent outlet	3 ft (91 cm)	See Note 5
J =	Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 12 in (30cm) for appliances > 10,000 Btuh (3 kW) and ≤ 100,000 Btuh (30 kW) • 36 in (91 cm) for appliances > 100,000 Btuh (30 kW)	• 6 in (15 cm) for appliances ≤ 10,000 Btuh (3 kW) • 9 in (23cm) for appliances > 10,000 Btuh (3 kW) and ≤ 50,000 Btuh (15 kW) • 12 in (30 cm) for appliances > 50,000 Btuh (15 kW)
K =	Clearance to a mechanical air supply inlet	6 ft (1.83 m)	3 ft (91 cm) above if within 10 ft (3 m) horizontally
L =	Clearance above paved sidewalk or paved driveway located on public property	7 ft (2.13 m)†	7 ft (2.13 m) for mechanical draft systems (Category I appliances). Vents for Category II and IV appliances cannot be located above public walkways or other areas where condensate or vapor can cause a nuisance or hazard*
M =	Clearance under veranda, porch, deck, or balcony	12 in (30 cm)‡	See Note 5

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.
‡ Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.

Notes:
1) In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code.
2) In accordance with the current ANSI Z223.1/NFPA 54, Natural Fuel Gas Code.
3) If locally adopted installation codes specify clearances different than those illustrated, then the most stringent clearance shall prevail.
4) For clearances not specified in CAN/CSA-B149, clearance is in accordance with local installation codes and the requirements of the gas supplier.
5) For clearances not specified in ANSI Z223.1/ NFPA 54, clearance is in accordance with local installation codes and the requirements of the gas supplier.
6) IMPORTANT: Terminal must be placed such that it remains a minimum of 12” above maximum expected snow line. Local codes may have more specific requirements, and must be consulted.

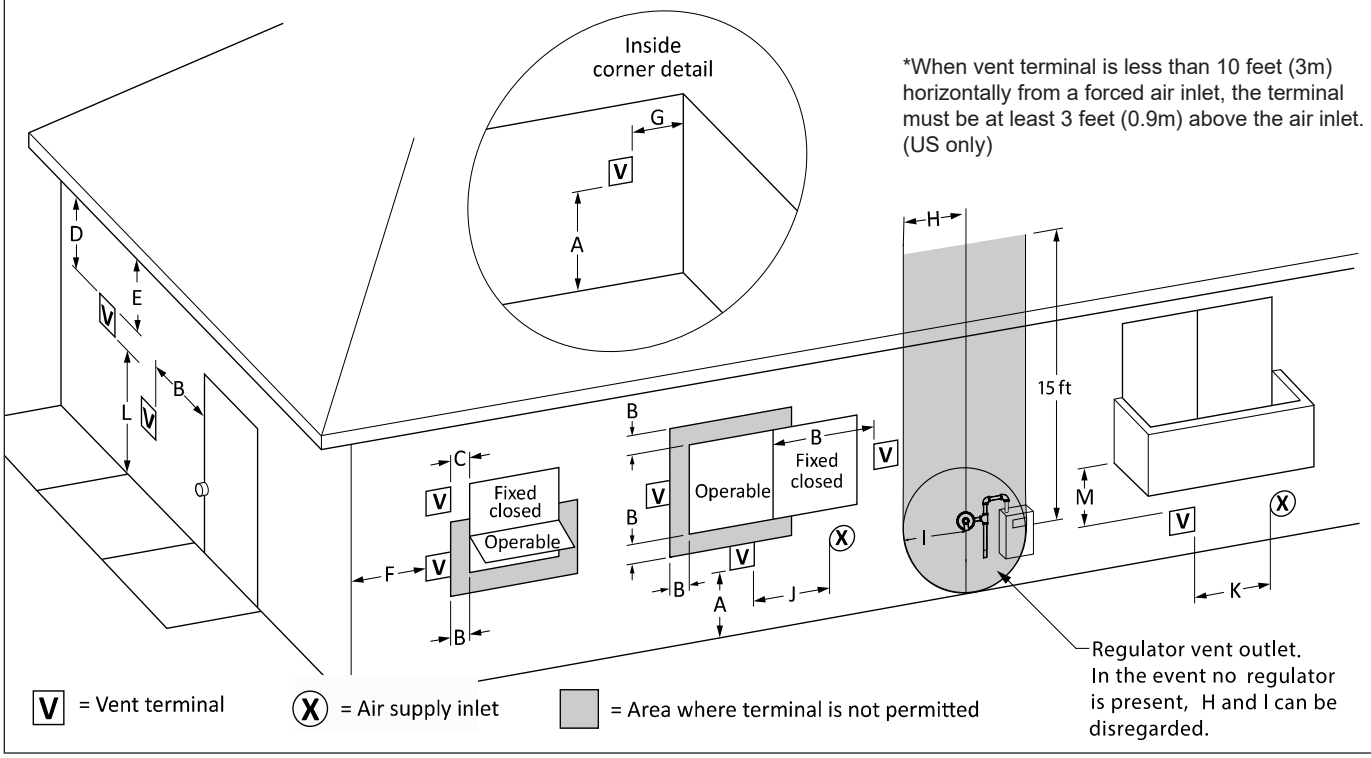


Figure 3. Combustion Air and Vent Through Side Wall.

TERM	DESCRIPTION
Pipe	Must comply with UL Standard 1738 such as Type 29-4C Stainless Steel (either insulated or non-insulated).
Joint Sealing	Follow vent manufacturer's instructions

Table 5. Required Horizontal Venting Material

2.B.4 Category III Vent

When this unit is vented with horizontal discharge, it must be installed per this installation manual and the venting system manufacturer's installation instructions. The vent system must be sealed stainless steel (see Table 5).

Route the vent pipe to the heater as directly as possible. Seal all joints and provide adequate hangers as required in the venting system manufacturer's Installation Instructions. Horizontal portions of the venting system must be supported to prevent sagging and may not have any low sections that could trap condensate. The unit must not support the weight of the vent pipe. Horizontal runs must slope downwards not less than ¼ inch per foot (2 cm/m) from the unit to the vent terminal. Reference Table 2 on page 10 for the size of the Category III vent system. Up to three elbows can be used with 50 linear feet (15.2m) of pipe. Subtract 10 allowable linear feet (3.0m) for every additional elbow used.

⚠ WARNING

The outdoor vent terminal gets hot. This unit must be installed in such a way as to reduce the risk of burns from contact with the vent terminal.

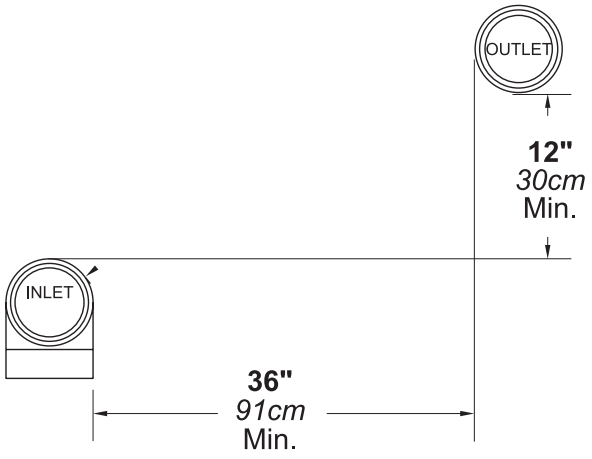


Figure 4. Minimun Venting Distance.

2.C Locating Vent & Combustion Air Terminals

2.C.1 Side Wall Vent Terminal

The appropriate manufacturers side wall vent hood must be used, and is listed in the installation and operation manual. The terminal provides a means of installing the vent piping through the building wall, and must be located in accordance with ANSI Z223.1/ NFPA 54 and applicable local codes. In Canada, the installation must be in accordance with CSA B149.1 or .2 and local applicable codes. Consider the following when installing the terminal:

1. Figure 3 on page 12 shows the requirements for mechanical vent terminal clearances for the U.S. and Canada.
2. Vent terminals for condensing appliances or appliances with condensing vents are **not** permitted to terminate above a public walkway, or over an area where condensate or vapor could create a nuisance or hazard.
3. Locate the vent terminal so that vent gases cannot be drawn into air conditioning system inlets.
4. Locate the vent terminal so that vent gases cannot enter the building through doors, windows, gravity inlets or other openings. When possible, locations under windows or near doors should be avoided.
5. Locate the vent terminal so that it cannot be blocked by snow. The National Fuel gas code requires that it be at a minimum of 12" above grade. In a location that has the possibility of snow accumulation, it is critical the installer places the vent at least 12" higher than the maximum potential snow line. Seek local municipalities and their codes for appropriate installation techniques.
6. Locate the terminal so the vent exhaust does not settle on building surfaces or other nearby objects. Vent products may damage such surfaces or objects.
7. If the pool heater uses ducted combustion air from an intake terminal located on the same wall, locate the vent terminal at least 3 feet (0.9m) horizontally from the combustion air terminal, and locate the vent terminal at least 1 foot (0.3m) above the combustion air terminal.

2.C.2 Side Wall Combustion Air Terminal

The manufacturers side wall combustion air terminal (see Table 1 on page 8) must be used when the unit takes its combustion air through a duct from a side wall. Consider the following when installing the terminal:

1. Do not locate the air inlet terminal near a source of corrosive chemical fumes (e.g., cleaning fluid, chlorinated compounds, etc.)
2. Locate the terminal so that it will not be subject to damage by accident or vandalism.
3. Locate the combustion air terminal so that it cannot be blocked by snow. The National Fuel gas code requires that it be at a minimum of 12"

above grade. Depending on local conditions, the installer should ensure that it remains at least 12" above the maximum potential snow line. Seek local municipalities and their codes for appropriate installation techniques.

⚠ WARNING

It is critical that the combustion air intake and the vent terminals remain at least 12" above the maximum potential snow line. If either the vent terminal or the air terminal is blocked by snow, there may be potential for the unit to produce excess carbon monoxide and or recirculate flue gasses into the building/dwelling. Personal injury or DEATH may occur. Natural snowfall, drifting, and banking should all be taken into account when locating the terminals in a potential snow environment.

4. If this unit is side-wall vented to the same wall, locate the vent terminal at least 3 feet (0.9m) horizontally from the combustion air terminal, and locate the vent terminal at least 1 foot (0.3m) above the combustion air terminal (see Figure 4).

2.C.3 Vertical Vent Terminal

When the unit is vented through the roof, the vent must extend at least 3 feet (0.9m) above the point at which it penetrates the roof. It must extend at least 2 feet (0.6m) higher than any portion of a building within a horizontal distance of 10 feet (3.0m), and high enough above the roof line to prevent blockage from snow. When the combustion air is taken from the roof, the combustion air must terminate at least 12" (30cm) below the vent terminal (see Figure 2 on page 11). Seek local municipalities and their codes for appropriate installation techniques.

From Massachusetts Rules and Regulations 248 CMR 5.08:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or inpart 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 cannot 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 (½) 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.

(b) EXEMPTIONS: The following equipment is exempt from 248 CMR 5.08(2)(a) 1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontal vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEMNOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the fuel gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The identification of each "special venting system" shall include either the listing of the website, phone number or manufacturer's address where the venting system installation instructions can be obtained; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions provided with that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for the Product Approved side wall horizontally vented gas fueled equipment, and all the venting instructions, parts lists, and/or design instructions for the venting system shall remain with the appliance or equipment at the completion of the installation.
Manufacturers' websites where venting system installation instructions may be obtained is located on the manufacturers website (see back cover).

2.C.4 Vertical Combustion Air Terminal

When combustion air is taken from the roof, a field-supplied rain cap or an elbow arrangement must be used to prevent entry of rain water (see Figure 2 on page 11). The opening on the end of the terminal must be at least 12" (30cm) above the point at which it penetrates the roof, and high enough above the roof line to prevent blockage from snow. When the vent terminates on the roof, the combustion air must terminate at least 12" (30cm) below the vent terminal.

2.D Common Vent Test — Pool heaters

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

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

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as 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.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so that the heating unit will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
7. Any improper operation of the common venting system should be corrected so that the installation conforms to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Installation Codes. 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 Part II of the National Fuel Gas Code, ANSI Z223.1/ NFPA 54 and/or CSA B149.1, Installation Codes.

2.E Vent Terminals for Outdoor Units

For outdoor applications, the vent and combustion air openings must be covered with proper terminals to prevent rain, snow and other objects from falling into the unit.

If local codes allow, outdoor installations may use 1' of appropriately sized galvanized single wall or B-Vent and a rain cap for exhaust vent termination in the default configuration (venting out of the top). Note that some local codes may require a higher vertical vent height, extending above any perimeter fencing, etc. In installations where the appearance of the vent is objectionable, the low profile vent terminals in Table 6 may be used.

Combustion air inlets consist of appropriately sized galvanized pipe and elbows to allow the open end to face down aside the pool heater. This is available as a Commercial Kit from the manufacturer.

Part numbers for the low profile terminals to cover the vent and combustion air openings are shown in Table 6

SIZE	OUTDOOR VENT TERMINAL	OUTDOOR COMBUSTION AIR TERMINAL
500	20254703	CA014701
750	20254705	CA014702
1000	20254705	CA014702
1250	D2007700	CA014704
1500	D2007700	CA014704
1750	D2007800	CA014704
2000	D2007800	CA014704

Table 6. Vent Terminals for Outdoor Units.

SECTION 3 Gas Supply and Piping

3.A Gas Supply and Piping

Gas piping should be supported by suitable hangers or floor stands, not by the pool heater.

This units gas train allows the user to pipe the gas from either the right side or the left side of the unit. As shipped, the right side of the gas train is capped off, and there is a manual valve on the left side. If desired, the manual valve on the left side of the gas train may be moved to the right side, and the cap on the right side may be moved to the left.

Review the following instructions before proceeding with the installation.

1. Verify that the unit is fitted for the proper type of gas by checking the rating plate. These units are equipped to operate at elevations up to 10,000 feet (3050m) and may be adjusted to operate properly at altitudes above 2500 feet (see 6.C.2 on page 27) and the input will be reduced if the heating value of the gas supply is below sea level values.
2. Verify the inlet gas supply pressure.

	Min	Max
Natural Gas	4” W.C.	10.5” W.C.
Propane	8” W.C.	13” W.C.

3. Refer to Table 7 on page 17, to size supply.
4. Run gas supply line in accordance with all applicable codes.
5. Locate and install manual shutoff valves in accordance with state and local requirements.
6. A sediment trap must be provided upstream of the gas controls.
7. All threaded joints should be coated with piping compound resistant to action of liquefied petroleum gas.
8. The unit and its individual shutoff valve must be disconnected from the gas supply piping during any pressure testing of that system at test pressures in excess of 1/2 PSIG (3.45kpa).
9. The unit must be isolated from the gas supply system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG (3.45kpa).
10. The unit and its gas connection must be leak tested before placing it in operation.
11. Purge all air from gas lines.

⚠ WARNING

If an inline high gas pressure regulator is used, it must be of the lockup type and located a minimum of 10 feet from the unit. Failure to do so may result in insufficient gas volume supplied to the unit.

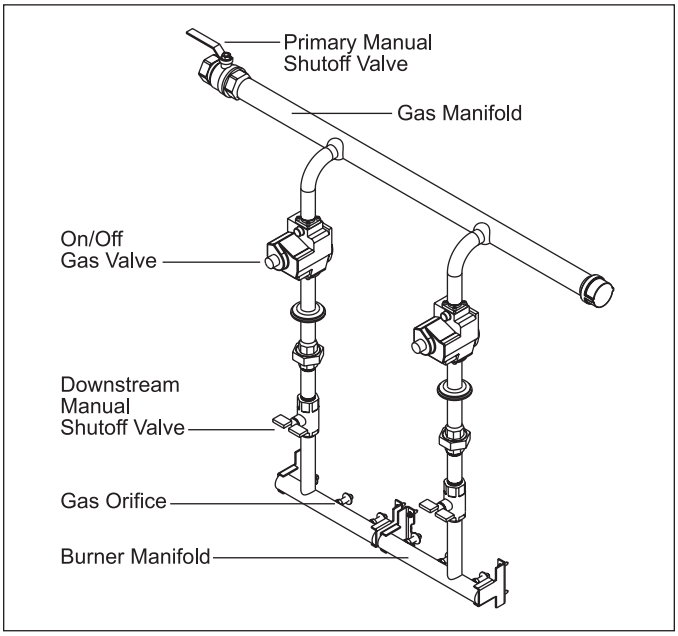


Figure 5. Typical Gas Train Configuration.

NOTE: This unit and all other gas appliances sharing the gas supply line must be firing at maximum capacity to properly measure the inlet supply pressure. The pressure can be measured at the supply pressure port on the gas valve. Low gas pressure could be an indication of an undersized gas meter, undersized gas supply lines and/or an obstructed gas supply line.

⚠ WARNING

Do not use open flame to check for leaks. An open flame could lead to explosion, which could result in property damage, serious injury or death.

SIZE AND GAS TYPE	DISTANCE FROM GAS METER OR LAST STAGE REGULATOR 0-100'	100-200'	200-300'
500 natural	1½"	2"	2"
500 propane	1"	1½"	1½"
750 natural	2"	2"	2½"
750 propane	1½"	1½"	2"
1000 natural	2"	2½"	3"
1000 propane	1½"	2"	2½"
1250 natural	2½"	2½"	3"
1250 propane	2"	2"	2½"
1500 natural	2½"	3"	3"
1500 propane	2"	2½"	2½"
1750 natural	2½"	3"	3"
1750 propane	2"	2½"	2½"
2000 natural	3"	3"	3½"
2000 propane	2½"	2½"	3"

Metric Equivalent

SIZE AND GAS TYPE	DISTANCE FROM GAS METER OR LAST STAGE REGULATOR *0-31m*	*31-61m*	*61-91m*
500 natural	*3.8cm*	*5.1cm*	*5.1cm*
500 propane	*2.5cm*	*3.8cm*	*3.8cm*
750 natural	*5.1cm*	*5.1cm*	*6.4cm*
750 propane	*3.8cm*	*3.8cm*	*5.1cm*
1000 natural	*5.1cm*	*6.4cm*	*7.6cm*
1000 propane	*3.8cm*	*5.1cm*	*6.4cm*
1250 natural	*6.4cm*	*6.4cm*	*7.6cm*
1250 propane	*5.1cm*	*5.1cm*	*6.4cm*
1500 natural	*6.4cm*	*7.6cm*	*7.6cm*
1500 propane	*5.1cm*	*6.4cm*	*6.4cm*
1750 natural	*6.4cm*	*7.6cm*	*7.6cm*
1750 propane	*5.1cm*	*6.4cm*	*6.4cm*
2000 natural	*7.6cm*	*7.6cm*	*8.9cm*
2000 propane	*6.4cm*	*6.4cm*	*7.6cm*

NOTES: 1. These figures are based on 1/2" (0.12kPa) water column pressure drop.
2. Check supply pressure and local code requirements before proceeding with work.
3. Pipe fittings must be considered when determining gas pipe sizing.

Table 7. Gas Piping Sizes.

SECTION 4 Water Connections

4.A Piping

Hot water piping should be supported by suitable hangers or floor stands. Do not support piping with this appliance. Due to expansion and contraction of copper pipe, consideration should be given to the type of hangers used. Rigid hangers may transmit noise through the system resulting from the piping sliding in the hangers. It is recommended that padding be used when rigid hangers are installed. Maintain 1" clearance to combustibles for hot water pipes.

Pipe the discharge of the relief valve (full size) to a drain or in a manner to prevent injury in the event of pressure relief. Install shutoff valves where required by code.

Pool Heaters are equipped with mounted pumps, which serve the heater plus 30 feet of full-sized piping with a normal number of fittings. If the pool's loop is more than 15 feet away from the heater, please contact the factory.

A mixing system is shipped with the heater. The system consists of a three-way valve, and piping. When the control detects water temperature that is below 130°F (54°C), it will direct the three-way valve to actuate, which sends water from the outlet of the heater back to the inlet. The outlet water that is diverted to the inlet mixes with the return water from the pool, and keeps the inlet temperature at or above 120°F (49°C) (see Figure 7). This keeps cold return water from condensing on the outside of the heat exchanger.

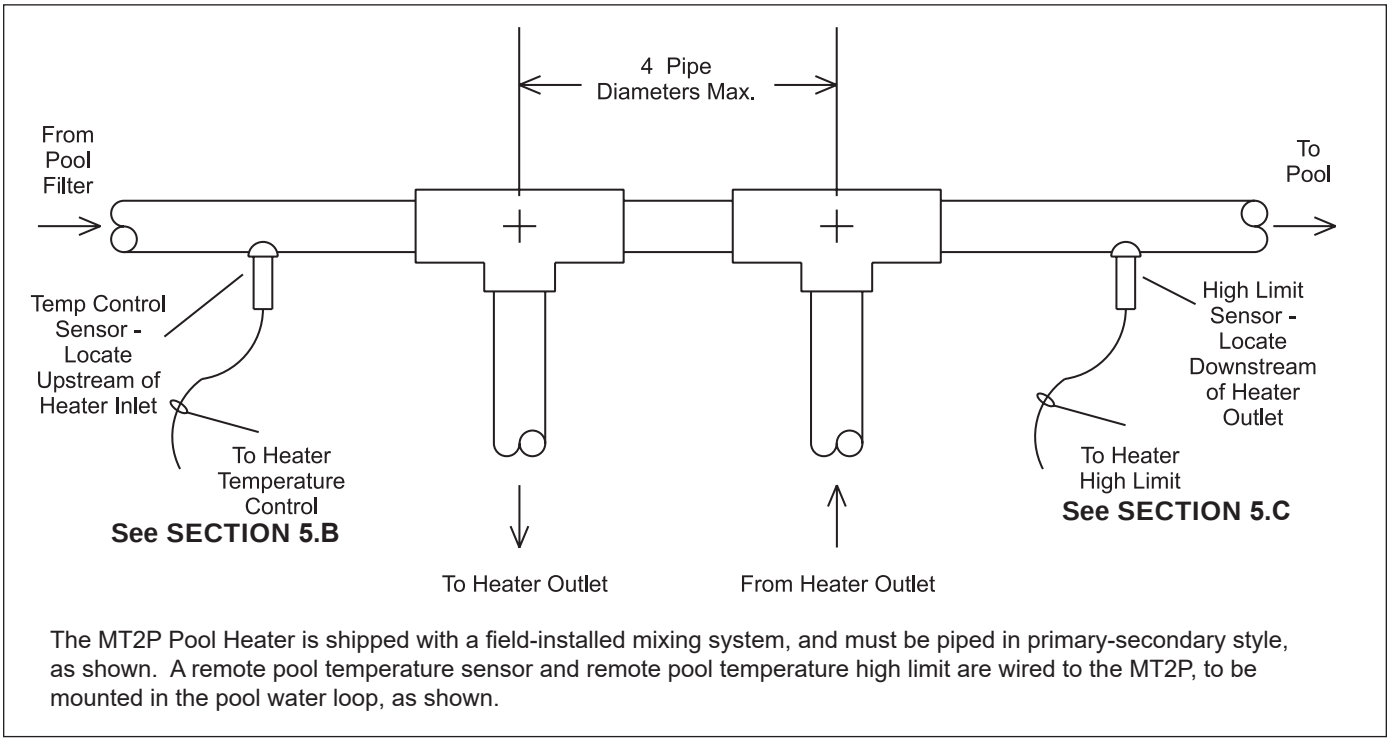
Heater return water piping may be PVC, CPVC or copper. Because of the high temperature of heater outlet water, it is critical that the heater outlet piping be made of CPVC or copper.

See Figure 6 for proper connection of the MT2P heater to the pool loop.

4.B Automatic Chlorinators

A concentration of chlorine in the heater can be very destructive; therefore the following rules about the installation and operation of such devices must be followed:

1. The chlorinator should be installed so it introduces the gas or solution downstream of the heater.
2. The chlorinator should be wired so it cannot operate unless the filter pump is operating.
3. The chlorinator should be provided with an anti-siphon device so that the draining of the piping after the pump shuts off will not siphon chlorine solution into the heater.
4. When the operation of a chlorinator is such that it must be installed in the pump suction, or some other place where the chlorine solution flows through the heater, corrosion of the heater



The MT2P Pool Heater is shipped with a field-installed mixing system, and must be piped in primary-secondary style, as shown. A remote pool temperature sensor and remote pool temperature high limit are wired to the MT2P, to be mounted in the pool water loop, as shown.

Figure 6. Pool Heater Piping.

can occur. Excessive concentrations of chlorine resulting from improper adjustment or chlorinator equipment failure are responsible for this corrosion. The heater warranty does not cover the resulting damage to the heat exchanger.

4.C Sensor Locations

Two sensors must be installed in the pool loop, as shown in Figure 6. The inlet sensor for the temperature control must be installed in the pool loop within 12" (30 cm) of the inlet to the heater. The second sensor, the high limit sensor, must be installed in the pool loop within 12" (30 cm) downstream of the heater outlet. This sensor is a capillary and bulb. It shall be used with the immersion well that is provided.

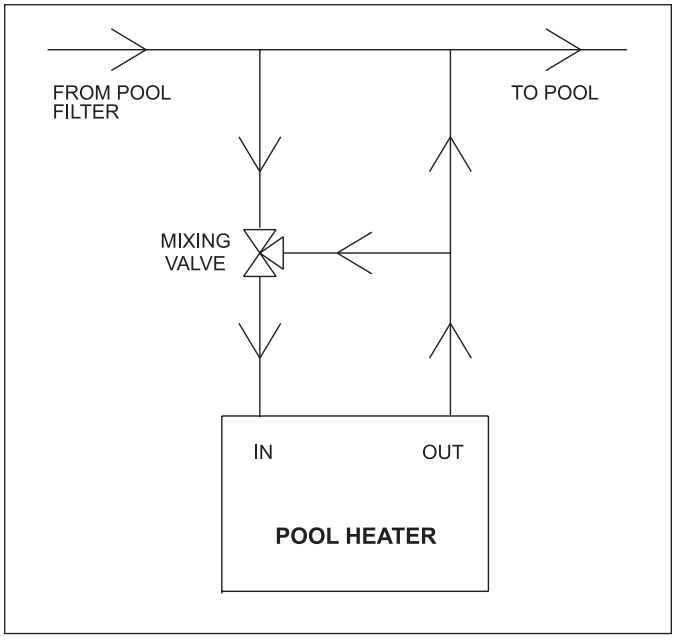


Figure 7. Mixing System.

SECTION 5
Electrical Connections

⚠ WARNING

This unit must be electrically grounded in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code, ANSI/NFPA 70, in the U.S. and with latest edition of CSA C22.1 Canadian Electrical Code, Part 1, in Canada. Do not rely on the gas or water piping to ground the metal parts of the pool heater. Plastic pipe or dielectric unions may isolate the pool heater electrically. Service and maintenance personnel, who work on or around the pool heater, may be standing on wet floors and could be electrocuted by an ungrounded pool heater.

NOTE: All internal electrical components have been pre-wired. No attempt should be made to connect electrical wires to any other location except the wiring box

5.A Main Power

Pool Heater sizes 500 to 1500 use a single 120-volt fused supply (see Figure 8 for over-current protection ratings). The installer can change these units to use a separate circuit for the pump, if desired.

Sizes 1750 and 2000 require two 120-volt fused supplies

5.A.1 Changing Single Circuit to Two Circuits

Sizes 500 to 1500 will be shipped from the factory for a single 120-volt power supply. To use a separate circuit for the pump:

1. Ensure power is disabled to the unit
2. Remove the three jumper wires that connect the L2, N2 and GROUND wires on terminal block 1 to the main distribution terminal block. These wires will be black/white, white and green respectively.

5.A.2 Field Wiring

Field wiring connection points are located inside the line voltage connection/field wire area. Single 120-volt units will be field connected at the main terminal block labeled "120V (L1)", "NEUTRAL" and "GROUND" (see Figure 8 for over-current protection ratings).

Sizes 1750-2000, and those which have been field retrofitted to electrically separate the pump and heater, require two 120-volt circuits. The heater circuit is found on the main terminal block and denoted as "120V (L1)", "NEUTRAL" and "GROUND". The pump circuit is located on terminal block 1 and is denoted as "120V (L2)", "N2 (PUMP MTD)", "GROUND 2 (PUMP MTD)" (see Figure 8 for over-current protection ratings).

5.B Temperature (Operating) Control

This units temperature control operates by measuring the pool loop return temperature, before the heater inlet piping (see Figure 6). It is adjustable to a maximum of 105° F and will prevent heater operation at return temperatures above 105° F. It also contributes to the temperature of the water entering the heat exchanger. The automatic mixing system is already installed, shown in Figure 7. During operation, the automatic mixing system diverts water from the outlet to the inlet to “pre warm” the water to a minimum inlet temp-erature of about 120°F. This prevents condensation from forming, which can damage the heater.

⚠ CAUTION

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.

5.C High Limit Controls

In addition to the pool heater temperature control, this unit is fitted with a pool loop high limit set at 135°F and an automatic reset heater high limit with a maximum setting of 200°F.

The pool loop high-limit sensing bulb is to be installed in the sensor well (supplied), downstream of the heater (see Figure 6). If sufficient capillary length exists to reach the sensor location, the control may remain in its location near the rear of the cabinet on the right side, behind the slide out drawer. If the sensor location is farther from the heater than the capillary will reach, then the control should be moved to the remote location and the wires extended to the new location of the control. If the controller needs to be moved, and it is being moved to an outdoor location, the control will need to be put in a weather-tight enclosure to protect it from rain, snow, etc.

The other limit control limits the temperature of the discharge from the heat exchanger to a maximum of 190°F. This limit should be set to a minimum of 175°F. To set the limit controls, remove the control panel cover and pull the control panel out to gain access. Appliances with reversed heat exchangers have the limit controls relocated to the left side of the appliance. The left access door must be removed to gain access to the limit controls on these appliances.

⚠ WARNING

Improper field wiring may result in fire or explosion which can cause property damage, severe injury, or death. Make only wiring connections which are in accordance with the Installation and Operation manual.

⚠ AVERTISSEMENT

Un câblage incorrect lors de l'installation peut causer un incendie ou une explosion pouvant entraîner des dommages matériels, de graves blessures ou la mort. Ne faire seulement que les connexions conformes au Manuel d'installation et d'exploitation.

SIZE	SINGLE CIRCUIT CONN. HEATER		PUMP ONLY
	W/O PUMP	W / TACO PUMP	TACO
500	15	20	15
750	15	20	15
1000	20	25	15
1250	25	30	15
1500	25	30	15
1750	25	—	15
2000	25	—	20

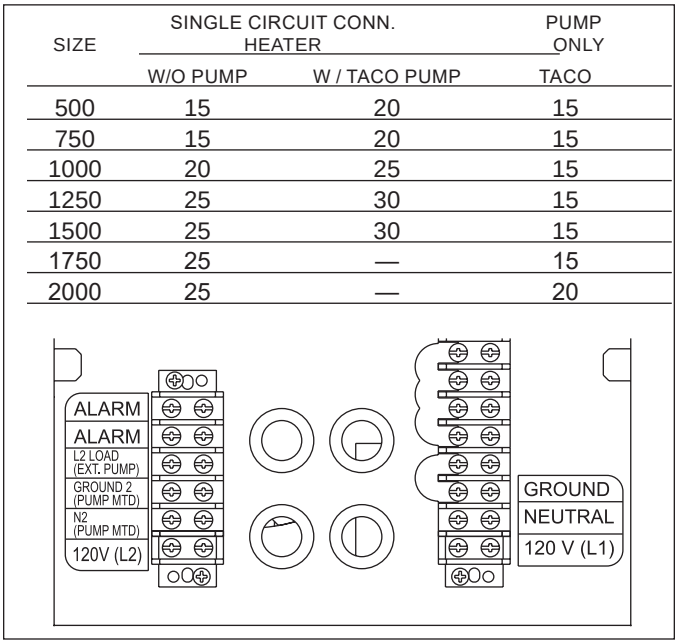


Figure 8. Field Wiring.

5.D Wiring Diagrams

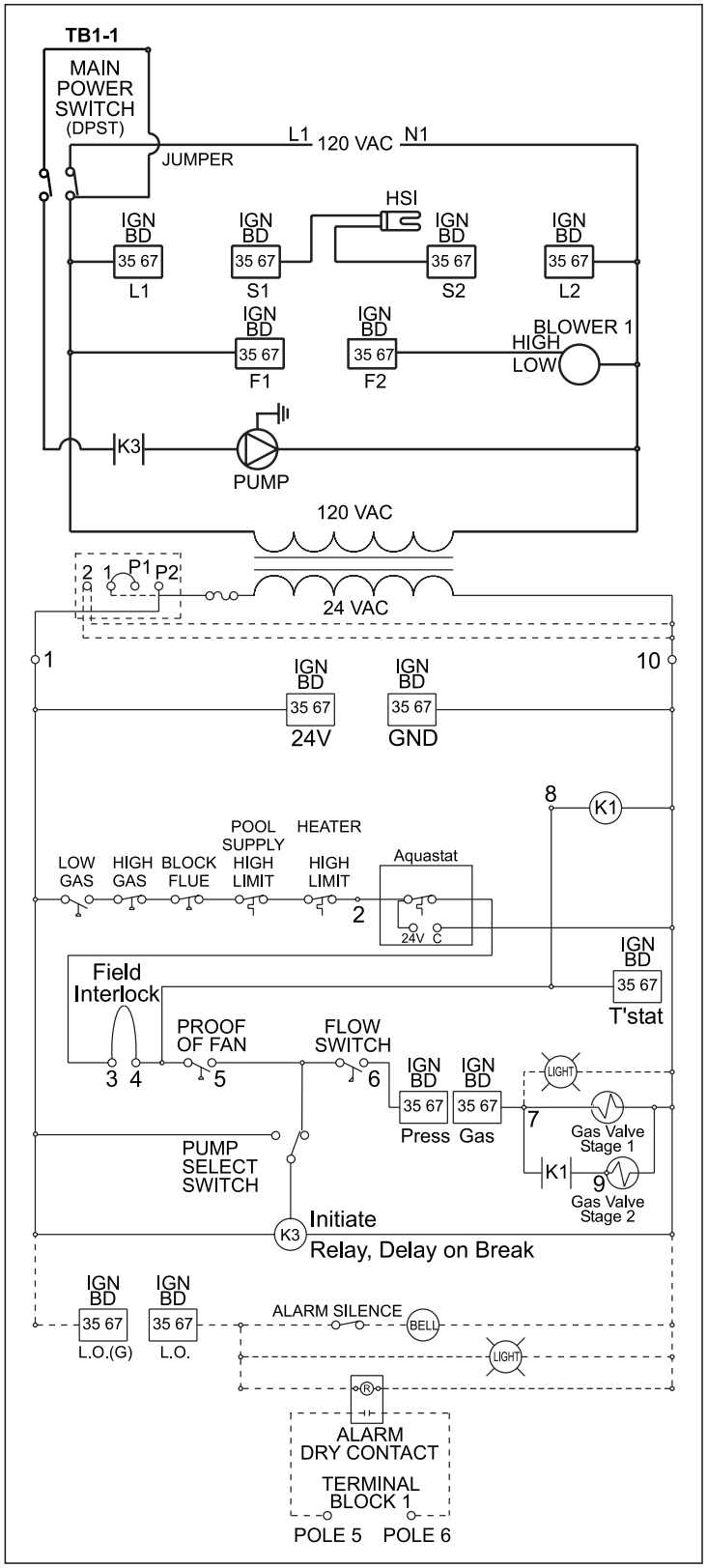


Figure 9. Models 500 - 750 Wiring Diagram.

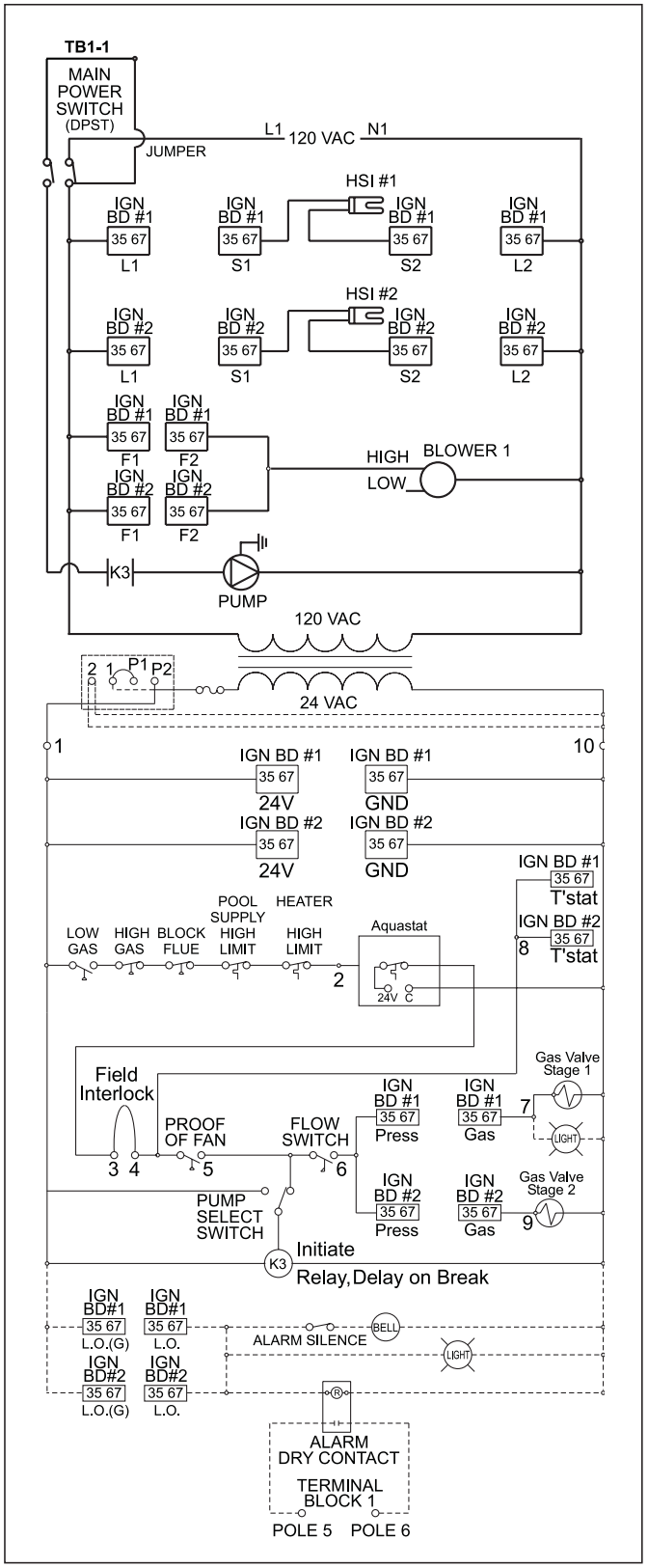


Figure 10. Model 1000 Wiring Diagram.

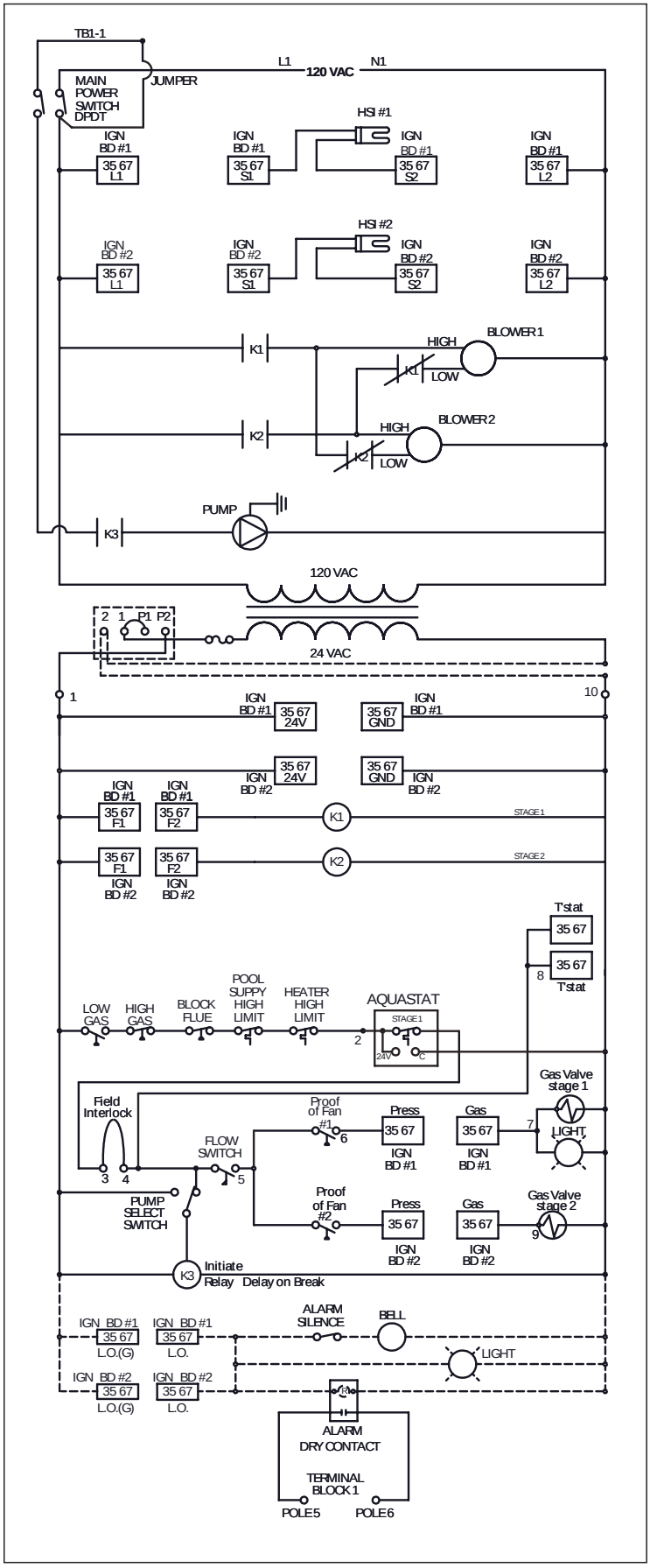


Figure 11. Models 1250–2000 Wiring Diagram.

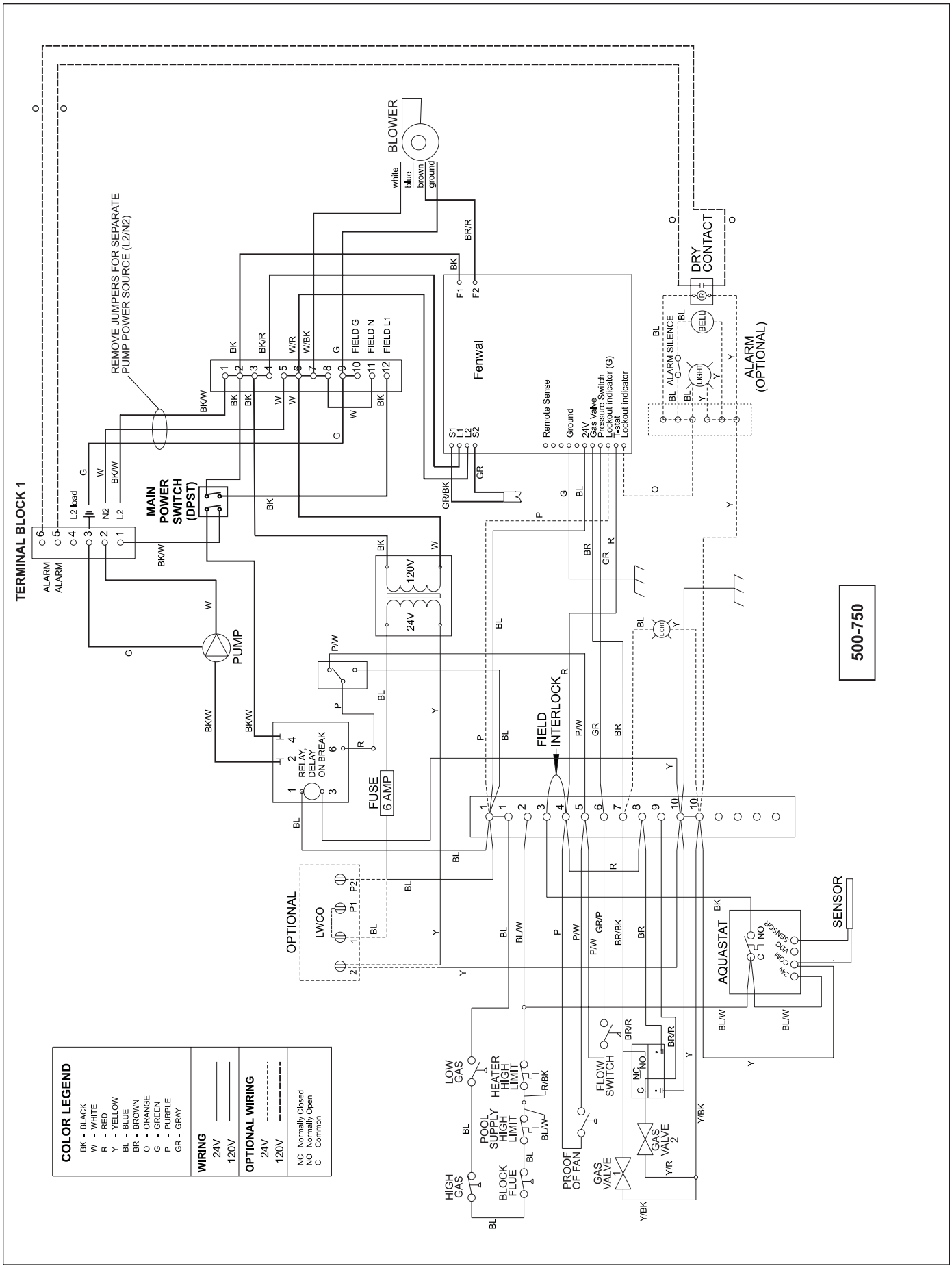


Figure 12. Models 500–750 Connection Diagram.

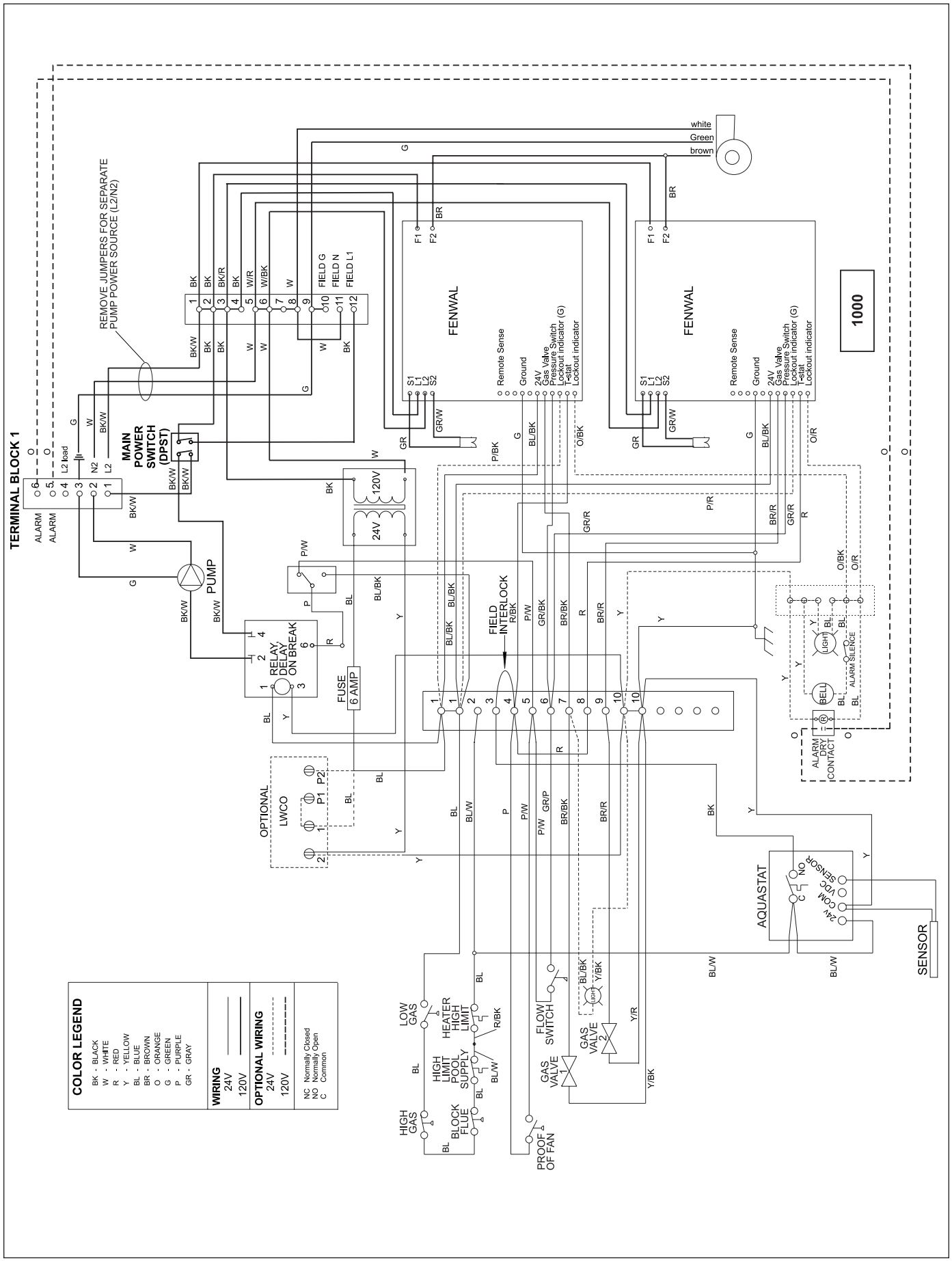


Figure 13. Sizes 1000 Connection Diagram.

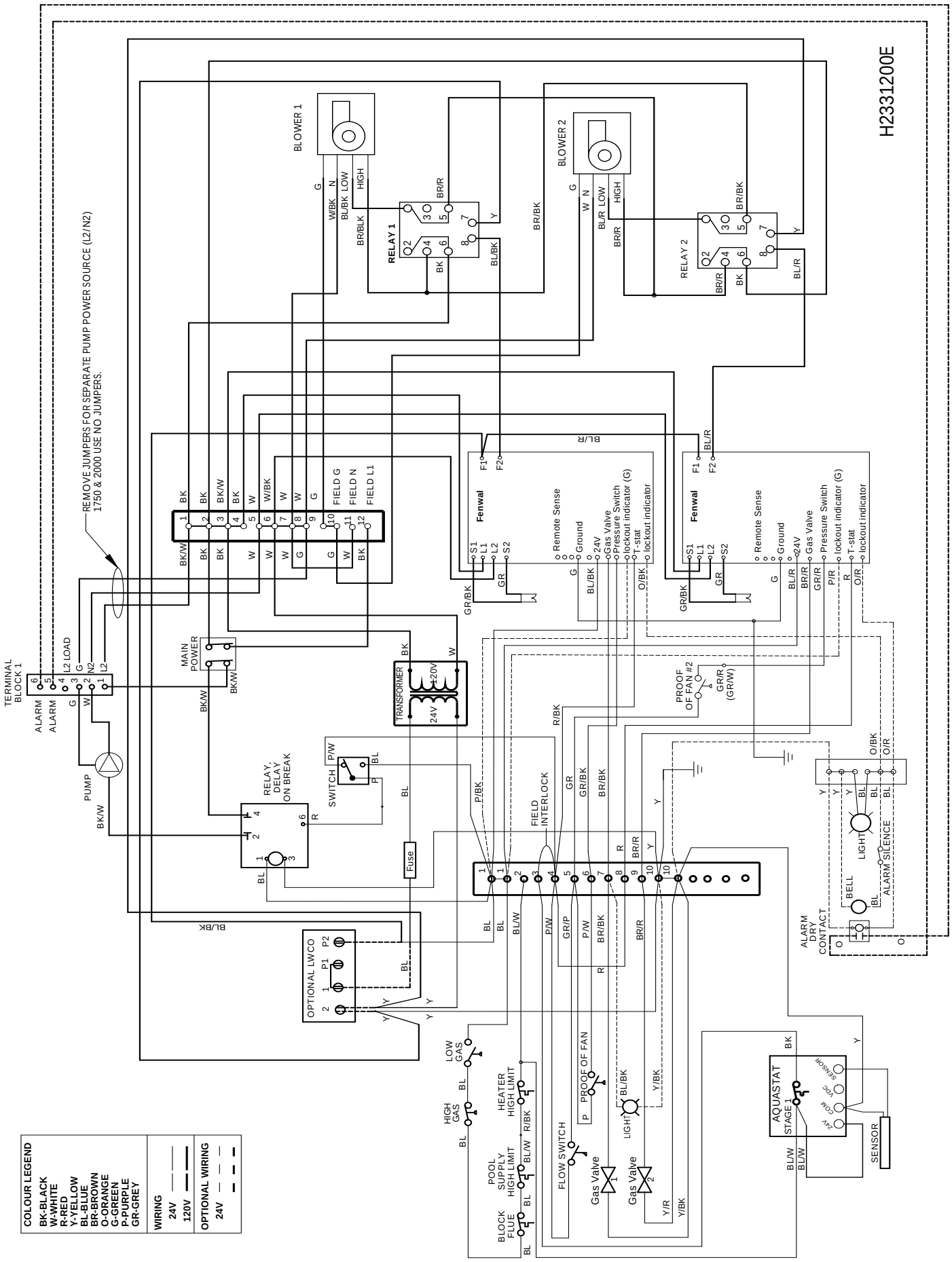


Figure 14. Sizes 1250–2000 Connection Diagram.

SECTION 6 Operating Instructions

6.A Sequence of Operation

Upon initiation of the main power switch, 120V will be sent to multiple items. Among these are the open contact fan relays, open contact ignitor relay, open contact pump relay, ignition control module(s) and open contact lock out indicators (the optional alarm package uses this). In addition to these, 24V will travel through the optional gas pressure switches and optional auto reset high limit and pool heater control relays. The 24V will then travel through the block flue switch and the manual reset high limit to the temperature controller.

Upon a call for heat from the MT2's internal control or an external staging control, 24V travels through the field interlock (if closed) and then to the ignition control(s) "T-stat" terminal (500-750 models are equipped with one ignition control and models 1000-2000 are equipped with two ignition controls).

When "T-stat" on an ignition control is energized, its fan will energize and the ignition control will seek signal from the "pressure circuit". The pressure circuits consist of the flow switch and proof of fan.

Models 500-1,000 calls for fan, fan prove, initiate pump then prove flow, after which "pressure circuit" has been satisfied.

Models 1250-2000 calls for pump, proof of flow, initiate fan then prove fan, after which "pressure circuit" has been satisfied. The fan prove will only occur for the active stage that has been called.

When pressure circuit has been satisfied, proving combustion air and adequate water flow, the hot surface igniter will initiate. The ignition control checks that the igniter current reached a predetermined level then will dwell momentarily. When dwell time is complete the gas valve will open.

After a 4-second trial for ignition, the igniter switches off. Unless a flame is detected by the flame sensor (a minimum value of 0.4µA), the gas valve will close and The ignition module will either attempt ignition again (up to three times) or will lock out if the optional lockout ignition module is used.

If flame is sensed, the burner will continue to fire as long as there is a call for heat and adequate flame signal. If there is a subsequent loss of flame signal, the burner will attempt re-ignition up to three times (only once if optional lockout ignition is used.) When the call for heat is satisfied, the gas valves(s) close and the blowers continues to run for 30 seconds.

The pump will continue to run for 0.1 to 10 minutes, depending on what the pump time delay has been set to. Model sizes 1,000-2,000 have two ignition controls that control the individual stages. If one ignition control should fail for any reason, the remaining module can operate its burners independently. *(Note that if a single blower is disabled on units 1250-2000, the other fan will continue to operate and safely allow the pool heater to run with a single stage.)*

6.B Filling the System

1. Ensure the system is fully connected. Close all bleeding devices and open make-up water valve. Allow system to fill slowly.
2. If make-up water pump is employed, adjust pressure switch on pumping system to provide a minimum of 12 psi (81.8 kPa) at the highest point in the heating loop.
3. If a water pressure regulator is provided on the make-up water line, adjust the pressure regulator to provide at least 12 psi (81.8 kPa) at the highest point in the heating loop.
4. Open bleeding devices on all radiation units at the high points in the piping throughout the system, unless automatic air bleeders are provided at such points.
5. Run system circulating pump for a minimum of 30 minutes with the pool heater shut off.
6. Open all strainers in the circulating system, check flow switch operation, and check for debris. If debris is present, clean out to ensure proper circulation.
7. Recheck all air bleeders as described in Step 4.
8. Check liquid level in expansion tank. With the system full of water and under normal operating pressure, the level of water in the expansion tank should not exceed ¼ of the total, with the balance filled with air.
9. Start up system according to the procedure in this manual. Operate the entire system, including the pump, pool heater, and radiation units for one (1) hour.
10. Recheck the water level in the expansion tank. If the water level exceeds ¼ of the volume of the expansion tank, open the tank drain, and drain to that level.
11. Shut down the entire system and vent all radiation units and high points in the system piping, as described in Step 4.
12. Close make-up water valve and check strainer in pressure reducing valve for sediment or debris from the make-up water line. Reopen make-up water valve.
13. Check gauge for correct water pressure and also check water level in the system. If the height indicated above the pool heater insures that water is at the highest point in the circulating loop, then the system is ready for operation.
14. Refer to local codes and the make-up water valve manufacturer's instructions as to whether the make-up water valve should be left open or closed.
15. After placing the unit in operation, the ignition system safety shutoff device must be tested. First, shut off the manual gas valve, and call the unit for heat. After the pre-purge and ignitor heat-up time, the main gas terminals will be energized, attempting to light, for four (4) seconds, and then will de-energize. The unit will go into lockout mode. Second, turn the power off and then on again, open

the manual gas valve and allow the unit to light. While the unit is operating, close the manual gas valve and ensure that power to the main gas valve has been cut.

16. Within three (3) days of start-up, recheck all air bleeders and the expansion tank as described in Steps 4 and 8 previously.

Important: The installer is responsible for identifying to the owner/operator the location of all emergency shutoff devices.

⚠ WARNING

Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control that may have been under water.

6.C Operating the Burner and Set Up

6.C.1 Set Up for 0 to 2500 Feet Altitude

The setup must be checked before the unit is put in operation. Problems such as failure to start, rough ignition, strong exhaust odors, etc. can be due to improper setup. Damage to the heater resulting from improper setup is not covered by the limited warranty.

1. Using this manual, make sure the installation is complete and fully in compliance with the instructions.
2. Determine that the appliance and system are filled with water and all air has been bled from both. Open all valves.
3. Observe all warnings on the Operating Instructions label and turn on gas and electrical power to appliance.
4. Switch on the appliance power switch located on the right side of the unit.
5. The MT2P will enter the start sequence, as long as the unit is being called for heat. The blower and pump come on for pre-purge, then the ignitor warm-up sequence starts and after the ignitor warm-up is complete and all safety devices are verified, the gas valves open. If ignition doesn't occur, check that there is proper gas supply. Wait 5 minutes and start the unit again. During initial start up, air in the gas line may cause the MT2P to "lock out" during the first few trials for ignition. Depending on the ignition modules installed, the manual reset button on the ignition module(s) may need to be depressed to restart the heater.
6. When the unit is running, the supply gas pressure must be checked. Inlet gas pressure must not exceed 13" W.C. (3.2kPa). The minimum inlet gas pressure is 5" W.C. (1.2kPa).
7. Once the inlet gas pressure is verified, the outlet gas pressure from each valve (manifold gas pressure) must be checked, and adjusted, if necessary. The manifold gas pressure must be 2.5" W.C. (0.62kPa).
8. Complete the setup by checking the CO_2 at the outlet of the unit. The CO_2 should be 8% for natural gas, or 9.2% for propane.
9. **After placing the appliance in operation, the Burner Safety Shutoff Device must be tested**. To test:
   (a) Close gas shutoff valve with burner operating.
   (b) The flame will go out and blower will continue to run for the post purge cycle. Three (3) additional attempts to light will follow (only one (1) attempt for optional module). Ignition will not occur as the gas is off. The ignition control will lockout, and will have to be reset before the unit will operate. The ignition control reset button is located on each ignition control, in the lower right corner, and can be reset by depressing. It is not marked on the ignition control label.
   (c) Open gas shutoff valve. Restart the appliance. The ignition sequence will start again and the burner will start. The appliance will return to its previous mode of operation.

NOTE: Models 1250, 1500, 1750 and 2000 have two ignition controls and two ignitors.

6.C.2 High Altitude Adjustment and Set Up

These units may be operated at high altitude (7700 ft., 2347 m) with a reduction in output of approximately 10%. At altitudes of less than or more than 7700 ft. (2347 m) the unit will perform equally as well, but with differing reductions in output. At elevations higher than 7700 ft. (2347 m) the reduction in output will exceed 10% and at elevations below 7700 ft. (2347 m) it will be less than 10%. High altitude adjustment must not be made on units operating at elevations below 2500 ft. (762 m).

No orifice changes are required to adjust this unit for high altitude. High altitude adjustment is accomplished by adjustment of the gas valve manifold pressure and the air shutter(s). The required instruments used to assist in these adjustments are a CO_2 or O_2 Analyzer and a U-Tube Manometer or other device capable of reading a pressure of 2.5-3.0 inches W.C. (0.62-0.75 kPa).

Start the adjustment process by checking the CO_2 in the "as installed" condition. Adjust the air shutter(s) so that the CO_2 is about 8% or the O_2 is about 6.8% for units operating on Natural Gas. For units operating on LP Gas adjust the air shutter(s) so that the CO_2 is about 9.2% or the O_2 is about 6.8%. Units with two blowers should be adjusted so that the air shutters below each blower are open the same amount.

Once the CO_2 or O_2 has been set, the manifold pressure may be adjusted. Remove the 1/8 NPT plug from the lower side of the gas valve that is to be set and

install a fitting, hose and manometer. Start the unit and observe the manifold pressure. Manifold pressure must be adjusted to 3.0 in. W.C. (0.75 kPa) (for high altitude only, standard operating pressure is 2.5 in. W.C. (0.62 kPa)). It is adjusted by removing the slotted cap on the gas valve and turning the adjustment screw (beneath the cap) clockwise to increase pressure and replaced after the adjustments have been completed and the fitting, hose and manometer have been removed and the 1/8" plug has been replaced. Repeat this process until all gas valves have been set. **Note:** The pressure can be set only when the unit is operating and only when the particular gas valve being adjusted is energized by a call for heat from the staging control.

After all of the gas valve manifold pressures have been set, the CO_2 or O_2 must be reset. CO_2 or O_2 will have changed when the manifold pressure was adjusted. Open the air shutter(s) to reduce the CO_2 or O_2 to the values achieved previously.

The procedure is complete when all gas valves are adjusted to a manifold pressure of 3.0 in. W.C. (0.75 kPa) and the CO_2 is adjusted to 8.0% for Natural Gas units or 9.2% for LP units (to be checked only at full fire). When using an O_2 analyzer, the correct O_2 is 6.8% for both Natural Gas and LP units.

⚠ CAUTION

Should any odor of gas be detected, or if the gas burner does not appear to be functioning in a normal manner, close main shutoff valve, do not shut off switch, and contact your heating contractor, gas company, or factory representative.

6.D Shutting Down the Unit

1. Switch off the main electrical disconnect switch.
2. Close all manual gas valves.
3. If freezing is anticipated, drain this unit and be sure to also protect building piping from freezing. **This step to be performed by a qualified service person.**

6.E To Restart the Unit

If drained, follow 6.B in this manual for proper filling and purging.

1. Switch off the main electrical disconnect switch.
2. Close all manual gas valves.
3. **WAIT FIVE (5) MINUTES.**
4. Set the aquastat or thermostat to its lowest setting.
5. Open all manual gas valves.
6. Reset all safety switches (pressure switch, manual reset high limit, etc.).
7. Set the temperature controller to the desired temperature setting and switch on electrical power.
8. Burner will go through a prepurge period and ignitor warm-up period, followed by ignition.

6.F Therapeutic Pools (Spas)

Therapeutic pools or “spa” pools are usually piped and controlled so that very warm or hot water, often with air injection, is forced at high velocity into a confined area of a swimming pool or into a small separate pool. For the purposes of this manual, any application in which the water temperature is maintained above 85°F (30°C) is considered a *spa.*

SPECIAL SET-UP AND OPERATING PROCEDURES APPLY TO SPAS.

1. MT2P 1000 and larger should **not** be used for spas due to their higher temperature rises.
2. To ensure that the spa inlet does not exceed 104°F (40°C), the spa filter pump must circulate water at the minimum flow rates shown in Table 8.

NOTE: Maximum Spa Temperature Is Assumed To Be 100°F (38°C).

3. Spas are excellent for relaxation, body-conditioning and for arthritic and rheumatic problems, but can be hazardous.

⚠WARNING

The U.S. Consumer Product Safety Commission has warned that elevated temperatures in spas and hot tubs can be hazardous. Follow these “Safety Rules for Hot Tubs:”

- Spa or hot tub water temperatures should never exceed 104°F (40°C). A temperature of 100°F (38°C) is considered safe for a healthy adult. Special caution is suggested for young children.
- Drinking of alcoholic beverages before or during hot tub use can cause drowsiness, which could lead to unconsciousness and subsequently lead to drowning.
- Pregnant women beware! Soaking in water above 102°F (39°C) can cause fetal damage during the first three months of pregnancy (resulting in the birth of a brain-damaged or deformed child). Pregnant women should stick to the 100°F (38°C) maximum rule.
- Before entering the spa or hot tub, users should check the water temperature with an accurate thermometer; spa or hot tub thermostats may err in regulating water temperatures by as much as 4°F (2°C).
- Persons with a medical history of heart disease, circulatory problems, diabetes or blood pressure problems should obtain their physician’s advice before using spas or hot tubs.
- Persons taking medications which induce drowsiness, such as tranquilizers, antihistamines or anticoagulants, should not use spas or hot tubs.

HEATER MODEL	MINIMUM FILTER PUMP FLOW RATE
MT2P 500	240 GPM
MT2P 750	360 GPM

Table 8. Table 8. Minimum Filter Pump Flow Rates For Spas.

SECTION 7
Maintenance

7.A System Maintenance

1. Lubricate the system water-circulating pump, if required, per the instructions on the pump.
2. If a strainer is employed in a pressure reducing valve or the piping, clean it every six months.
3. Inspect the venting system for obstruction or leakage at least once a year. Periodically clean the screens in the vent terminal and combustion air terminal (when used).
4. Keep the unit area clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
5. If the unit is not going to be used for extended periods in locations where freezing normally occurs, it should be isolated from the system and completely drained of all water. All systems connected to it should also be drained or protected from freezing.
6. Low water cutoffs, if installed, should be checked every 6 months. Float type low water cutoff should be flushed periodically.
7. Inspect flue passages, and clean with brushes/ vacuums, if necessary. Sooting in flue passages indicates improper combustion. Determine the cause and correct.
8. Inspect the vent system and air intake system, and if the vent system is Category III, ensure that all joints are sealed properly. If joints need to be resealed, completely remove existing sealing material, and clean with alcohol. Apply new sealing material, and re-assemble.

7.B Maintenance and Component Description

Only genuine OEM replacement parts should be used.

⚠ CAUTION

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

See Figure 15 for location of gas train components.

The gas and electric controls on the unit are engineered for long life and dependable operation, but the safety of the equipment depends on their proper functioning. It is strongly recommended that a qualified service technician inspect the basic items listed below every year.

a. Ignition controls
b. Ignitors
c. Water temperature control
d. Automatic gas valve
e. Pressure switches
f. Blowers

7.B.1 Burners

Close main manual gas valve before proceeding. Checking the burners for debris - Remove the ignitor inspection panels(s) and ignitor(s) and inspect the burners through the ignitor hole(s) using a flashlight to illuminate. If there is any indication of debris on the burners that are visible, all the burners will need to be inspected more thoroughly. Remove the screws from around the front of the air box (large panel from which the ignitor inspection panel(s) were removed), and remove the large panel. Remove the gas manifold assemblies and the burner panels. Inspect the burners. Clean burners, if necessary, by blowing compressed air from the outside of the burners into the center of the burner. A dirty burner may be an indication of improper combustion or dirty combustion air. Determine the cause, and correct. Replace the burners in the reverse order

7.B.2 Filter

The filter used in the this unit is washable with an 83% arrestance. Since the filter is washable, it will only need replacement when unwashable, deteriorated or damaged. If filter replacement is needed, it should only be replaced with a factory part. Inspect the air filter. If there is debris on the air filter, remove it from the filter box, and wash it with mild soap and water. Ensure that the filter is completely dry before re-installing, in reverse order.

7.B.3 Gas Valves

The gas valves are designed to operate with supply pressures of 4-13 inches w.c. (1.0 to 3.2 kPa).

To remove a valve, shut off 120-volt power and the manual gas shutoff valve. Remove the top front panel from the unit. Disconnect the wires to the valve. Disengage the flanged fitting before and after the valve, and remove the valve. Re-install in reverse order. Ensure o-rings are properly installed for both inlet and outlet. Turn on manual gas shutoff valve and 120 volt power and check operation and tightness of gas valve connections.

7.B.4 Pool Loop High Limit Control

The high limit switch is an automatic reset switch with an adjustable set point, up to 135°F (57°C). To replace the switch, shut off the 120-volt power to the appliance. Remove the cover from the switch to access the mounting screws. Remove the screws, and pull the switch off the control panel. Remove the capillary and bulb from the thermal well located in the pool loop adjacent to the heater outlet. Replace in reverse order.

7.B.5 Automatic Reset High Limit Control

An automatic reset high limit is used to limit heater water from exceeding 210°F (99°C) (CSD-1 models will be equipped with a manual reset high limit rather than the automatic reset version). The high limit switch

has an adjustable set point, up to 200°F (93°C). To replace the switch, shut off the 120-volt power to the appliance. Remove the cover from the switch to access the mounting screws. Remove the screws, and pull the switch off the control panel. Remove the capillary and bulb from the thermal well located in the header. Replace in reverse order.

7.B.6 Temperature Control

The temperature control is a Honeywell L6008. To replace the control, shut off the 120-volt power to the unit. Remove the cover from the control panel, and remove the mounting screws to remove the controller. Replace in reverse order.

7.B.7 Ignition Controls

The ignition controls ensure the proved interrupted-type ignition system. They control the hot surface ignitors and prove that the flame signal is appropriate for powering the gas valves. It also controls the blower's pre-purge and post-purge. Model sizes 500 and 750 have one ignition control. Sizes 1000 to 2000 have two ignition controls. On sizes up to 750, one ignition control controls stages 1 and 2. On unit sizes 1000–2000, one ignition control is for stage 1, and the other is for stage 2.

To replace a control, shut off the 120-volt power to the unit. Remove the cover from the control panel. Remove the electrical connectors from the ignition control. Take out the controller's mounting screws, and pull the controller out. Replace in reverse order.

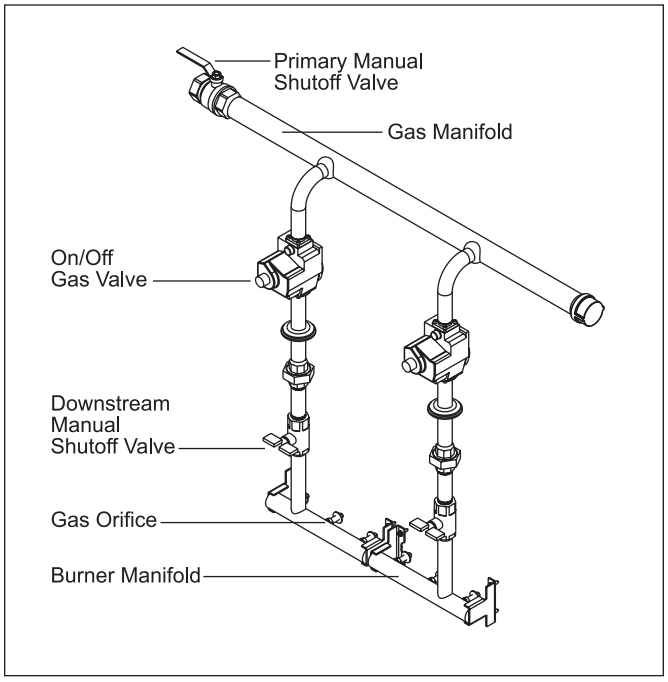


Figure 15. Typical Gas Train Configuration.

7.B.8 Ignitors/Sensor

The ignitor/sensor used are 120v "hot surface" type. They are energized whenever there is a call for heat and switched off when ignition is established and flame has been sensed. Model sizes 500 and 750 have one ignitor/sensor. Sizes 1000 to 2000 have two ignitor/sensors. To replace the ignitor/sensor, shut off the 120-volt power to the unit, remove the ignitor access panel, disconnect the Molex connector, remove the two mounting screws on the ignitor/sensor flange and pull the ignitor out. ((Hot Surface) Ignitor and the Flame Sensor are the same items). Install in reverse order, always using a new ignitor gasket with the replacement ignitor.

⚠ CAUTION
Ignitor gets hot.

7.B.9 Transformer

The transformer is not capable of supplying control voltage for external devices such as zone valves, which must have their own separate power supply. Should a transformer need replacing, shut off the 120-volt power. Unplug the transformer wires, remove the mounting screws and remove the transformer. Replace transformer in the reverse order.

7.B.10 Blowers

The combustion air blowers bring the combustion air for the this unit from the upper chamber to the lower chamber. Mixing of the gas and air occurs in the burners. Sizes 500, 750 and 1000 each have one blower, and sizes 1250 to 2000 each have two blowers. If a blower change is required, turn off the 120-volt power and gas supply to the unit. Remove the front panel. Disconnect the blower's wire harness. Remove the screws at the blower flange, and pull the blower out. Replace blower in reverse order, ensuring that all joints are made correctly. After replacement, ensure that the unit operates properly, by following the set-up procedure in this manual.

7.B.11 Flow Switch

This unit uses a paddle-type flow switch to ensure that the unit has water flow before ignition is allowed.

7.B.12 Heat Exchanger Coil

⚠ WARNING

Black carbon soot buildup on a dirty heat exchanger can be ignited by a random spark or flame, thereby creating a risk of fire or explosion.. To prevent this from happening, dampen the soot deposits with a wet brush or fine water spray before servicing the heat exchanger.

This unit has a pre-mixed burner system. These systems provide the burners with sufficient air for complete combustion, and black carbon sooting is seldom experienced. If sooting is suspected, view ports for inspection of the heat exchanger are provided on the right side of the pool heater. They are located below the headers, and are accessed by opening the small round cover that is attached by one screw. In the unlikely event that there is a buildup of black carbon soot or other debris on the heat exchanger, clean per the following:

1. Disconnect the electrical supply to the unit.
2. Turn off the gas supply by closing the manual gas valve on the heater.
3. Disconnect and remove the wires, conduit and sensors from all components that are attached to the inlet/outlet header.
4. Isolate the heat exchanger from the water supply.
5. Disconnect the header flanges from the inlet and outlet.
6. Allow the heat exchanger to drain. Remove the front cover(s) by removing the rubber access strip(s) and the retaining screws. Remove the venting and remove the top, by removing the screws that attach the top to the side panels. Remove the side panels. Remove the front lower panels sealing the combustion area. To remove the gas train, disconnect the unions located below the intermediate pan and the field installed union located outside the cabinet, and pull up, bringing the union end connectors through the grommets in the intermediate pan. To remove the intermediate pan, remove the slide out control assembly and blower(s) to reveal the screws. Remove the screws holding the intermediate pan, and lift up to remove it. The heat exchanger has integral metal sections attached, which connect to the frame of the pool heater. Locate and remove the screws along the front, rear and bottom of the integral metal sections, and remove the heat exchanger and metal sections by lifting up. On the larger units, a center heat exchanger support must be unbolted before it can be removed.
7. Remove the heat exchanger from the unit. **Note:** The heat exchangers are heavy and may require two people to remove to avoid personal injury.
8. Clean the heat exchanger: A light accumulation of soot or corrosion on the outside of the heat exchanger can be easily removed. Use a wire brush to remove loose soot and scale from the heat exchanger. Do not use water or compressed air for cleaning.

Note: While the heat exchanger is out of the unit, inspect the firewall refractory insulation. Replace if necessary.

11. Inspect the inside of the copper tubes for scale buildup. Scale can build up on the inner surface of the heat exchanger tubes, which can restrict water flow. If the tubes show signs of scaling, clean the internal surface. The manufacturer offers a tube cleaning kit, part number R0010000.
12. Reassemble in the reverse order, and check the units operation after start-up.

NOTE: The Warranty does not cover damage caused by lack of required maintenance, lack of water flow, or improper operating practices.

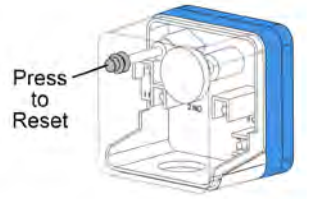
SECTION 8 Trouble Shooting

8.A Resolving Lockouts

There are many causes of lockouts. The three most common causes are: (1) inadequate gas supply, (2) poor combustion, (3) ignitor failure.

1. **Inadequate gas supply:** Before proceeding, ensure that the gas supply has not been shutoff or the LP tank (LP pool heaters) is not empty.

   If your pool heater is equipped with the optional gas pressure switches, then the Low Pressure switch might have tripped and will need to be reset.



   Then, restart the pool heater and observe the operational cycle. After a 15-second fan pre-purge, the ignitor will heat up for 20 seconds, and then the unit will light. If it does not, check the gas supply pressure to the unit, after resetting the unit and attempting another start-up. The gas pressure to the unit must be above 5" W.C. (1.2kPa) throughout the entire start-up cycle. If it is not, correct the supply problem (check gas valves or supply piping). If the supply pressure is adequate, consult the factory for assistance.
2. **Poor combustion:** Poor combustion should be suspected if there is a strong flue gas odor. The odor may result from an improper gas/air ratio (high or low O_2 or CO_2). These units operate best with 45% excess air (8% CO_2 on natural gas, 9.2% CO_2 on LP). Check the CO_2 of the unit and adjust if necessary.
3. **Ignitor failure:** If the pool heater goes through a normal start cycle but combustion does not occur, ignitor failure should be suspected. Check the ignitor by unplugging the ignitor plug and measuring the ignitor resistance. It should be 50-80 ohms at room temperature. If the resistance is not 50-80 ohms, replace the ignitor. If the resistance is correct, reset the pool heater and check for 120 VAC at the ignitor plug during the start cycle. If there is no voltage, replace the faulty ignitor wire harness or the ignition control.

8.B Delayed Ignition — Possible Causes

A defective burner can cause a delayed ignition. If the gas supply pressure is proper and the gas valves are functioning properly, then burners should be inspected. There should be no distortion or perforations in the burners outside of the active burner port area. Replace if indicated.

8.C High Gas Consumption

Units operating with an improper air/fuel ratio are very inefficient and consequently, have very high gas consumption. Because efficiency is high when the CO_2 is high (or O_2 is low), units operating with low CO_2 or high O_2 (especially LP units) consume more gas. Adjust the CO_2 or O_2 for optimum efficiency. If no combustion analyzing equipment (CO_2 or O_2) is available then a proper adjustment of the air/fuel ratio (CO_2 or O_2) cannot be accomplished. However, by briefly sniffing the flue gases it is possible to determine if the CO_2 or O_2 is within the proper range. No significant flue gas odor should be detected when combustion is proper. A strong piercing smell indicates poor combustion and generally a lean mixture - low CO_2 or high O_2. The CO_2 should be 8% at high fire. To check the CO_2, first verify that the supply gas pressure is within 5" to 13" w.c. (1.2 to 3.2 kPa) With the unit running with all stages firing, set the air box pressure to 1.5" w.c. (0.37 kPa) (as a starting point), by adjusting the air shutter(s) at the bottom of the fan(s). Check the CO_2, and adjust the air shutters if further adjustment to the CO_2 is needed. Sizes 1250 to 2000 have two blowers and two air chambers (boxes). The pressure of each air box must be equal when the final adjustment is made.

SECTION 9 Replacement Parts

Only genuine OEM replacement parts should be used.

9.A General Information

To order or purchase parts for this unit, contact your nearest Manufacturers Representative or Distributor. See back cover for website.

9.B Parts List -

Item	Description	Size 500	Size 750	Size 1000	Size 1250	Size 1500	Size 1750	Size 2000
	Sheet Metal Components - *See Figure 16*							
1	Panel, Jacket, Front	5F3320	7F3320	10F3320	12F3320	15F3320	17F3320	20F3320
2A	Panel, Jacket, Side, Lower Left	5F3420	5F3420	5F3420	5F3420	5F3420	5F3420	5F3420
2B	Panel, Jacket, Side, Lower Right	5F3421	5F3421	5F3421	5F3421	5F3421	5F3421	5F3421
3A	Panel, Jacket Side, Lower Left	5F3520	5F3520	5F3520	5F3520	5F3520	5F3520	5F3520
3B	Panel, Jacket, Side, Lower Right	5F3521	5F3521	5F3521	5F3521	5F3521	5F3521	5F3521
4	Panel, Side, Top Left, Jacket	5F3400	5F3400	5F3400	5F3400	5F3400	5F3400	5F3400
5	Panel, Side, Top Right, Jacket	5F3501	5F3501	5F3501	5F3501	5F3501	5F3501	5F3501
6	Panel, Rear, Jacket	5F3220	7F3220	10F3220	12F3220	15F3220	17F3220	20F3220
7	Panel, Top, Jacket	5F3021	7F3021	10F3021	12F3021	15F3021	17F3021	20F3021
8	Weldment, Vent Plate	5F3100	7F3100	7F3100	12F3100	12F3100	12F3100	20F3100
9	Weldment, Housing, Air Inlet/Filter	5F3800	5F3800	10F3800	12F3800	12F3800	12F3800	20F3800
10	Panel, Access, Filter	5F3701	5F3701	5F3701	12F3701	12F3701	12F3701	12F3701
11	Filter, Combustion Air	A2088700 (1)	A2088700 (1)	A2088700 (1)	A2088700 (2)	A2088700 (2)	A2088700 (2)	A2088700 (2)
12A	Pump Housing Right Side	5C3018	5C3018	5C3018	5C3018	5C3018	5C3018	5C3018
12B	Pump Housing Left Side	5C3019	5C3019	5C3019	5C3019	5C3019	5C3019	5C3019
12C	Pump Housing Cover	5C3020	5C3020	5C3020	5C3020	5C3020	5C3020	5C3020
14	Cover, Pipe, Gas Manifold	5F3304 (2)	5F3304 (2)	10F3304 (2)	20F3304 (2)	20F3304 (2)	20F3304 (2)	20F3304 (2)
15	Plate, Cover, Sight	10338600	10338600	10338600	10338600	10338600	10338600	10338600
	Internal Components - *See Figure 15*							
16	Assembly, Base	5F1020	7F1020	10F1020	12F1020	15F1020	17F1020	20F1020
17	Panel, Front, Combustion Chamber	5F2003	7F2003	10F2003	12F2003	15F2003	17F2003	20F2003
18	Panel, Rear, Combustion Chamber	5F2006	7F2006	10F2006	12F2006	15F2006	17F2006	20F2006
19	Panel, Top, Combustion Chamber	5F2001	7F2001	10F2001	12F2001	15F2001	17F2001	20F2001
20	Weldment, Chamber, Left Side, Bottom	5C2602	5C2602	5C2602	5C2602	5C2602	5C2602	5C2602
21	Weldment, Chamber, Right Side, Bottom	5C2202	5C2202	5C2202	5C2202	5C2202	5C2202	5C2202
22	Panel, Chamber, Left/Right Side, Top	5C2002 (2)	5C2002 (2)	5C2002 (2)	5C2002 (2)	5C2002 (2)	5C2002 (2)	5C2002 (2)

Item	Description	Size 500	Size 750	Size 1000	Size 1250	Size 1500	Size 1750	Size 2000
23	Assembly, Sight Glass	10956000	10956000	10956000	10956000	10956000	10956000	10956000
24	Panel, Side, Air Box	5F2015 (2)	5F2015 (2)	5F2015 (2)	5F2015 (2)	5F2015 (2)	5F2015 (2)	5F2015 (2)
26	Panel, Access, Air Box	5F2004	7F2004	10F2004	12F2004	15F2004	17F2004	20F2004
27	Cover, Access Panel, Air Box	5F2005 (1)	5F2005 (1)	5F2005 (1)	5F2005 (2)	5F2005 (2)	5F2005 (2)	5F2005 (2)
28	Divider, Chamber, Upper, Air Box				15F2005	15F2005		
29	Divider, Chamber, Lower, Air Box				15F2002	15F2002		
30	Divider, Front Chamber, Combustion Chamber						20F2002	20F2002
31	Assembly, Exhaust Stack	5F2027	7F2027	7F2027	12F2027	12F2027	12F2027	12F2027
32	Assembly, Copper Tube, Heat Exchanger	5C4000	7C4000	10C4000	12C4000	15C4000	17C4000	20C4000
	Assembly, Cupro-Nickel, Heat Exchanger	5C4020	7C4020	10C4020	12C4020	15C4020	17C4020	20C4020
33	Tile, Side (Left and Right)	T2015600 (2)	T2015600 (2)	T2015600 (2)	T2015600 (2)	T2015600 (2)	T2015600 (2)	T2015600 (2)
34	Tile, Front	T2017300 (1)						
35	Tile, Front, Left Side	T2016200 (1)	T2016800(1)	T2016800(1)	T2016800(1)	T2016800(1)	T2016800(1)	T2016800(1)
36	Tile, Front, Right Side		T2016300 (1)	T2017100 (1)	T2017900 (1)	T2017100 (1)	T2017900 (1)	T2017100 (1)
37	Tile, Front, Center				T2016900 (1)	T2016900 (1)	T2016900 (2)	T2016900 (2)
38	Tile, Rear	T2015700 (1)						
39	Tile, Rear, Left Side		T2017500 (1)	T2016600 (1)	T2016600 (1)	T2016600 (1)	T2016600 (1)	T2016600 (1)
40	Tile, Rear, Right Side		T2016600 (1)	T2016600 (1)	T2018100 (1)	T2016600 (1)	T2018100 (1)	T2016600 (1)
41	Tile, Rear, Center				T2017200 (1)	T2017200 (1)	T2017200 (2)	T2017200 (2)
42	Tile, Bottom	T2015500 (1)						
43	Tile, Bottom, Left Side		T2017400 (1)	T2017400 (1)	T2017400 (1)	T2017400 (1)	T2017400 (1)	T2017400 (1)
44	Tile, Bottom, Right Side		T2016500 (1)	T2017400 (1)	T2018000 (1)	T2017400 (1)	T2018000 (1)	T2017400 (1)
45	Tile, Bottom, Center				T2015900 (1)	T2015900 (1)	T2015900 (2)	T2015900 (2)
	Gas Train Components - *See Figure 17*							
46	Blower	A2111900 (1)	A2111900 (1)	A2111900 (1)	A2111900 (2)	A2111900 (2)	A2111900 (2)	A2111900 (2)
47	Weldment, Blower Mount	5C5300 (1)	5C5300 (1)	5C5300 (1)	5C5300 (2)	5C5300 (2)	5C5300 (2)	5C5300 (2)
47A	Assembly, Blower Damper				15C5400 (2)	15C5400 (2)	15C5400 (2)	15C5400 (2)
48	Manifold, Gas Supply	5C6100	7C6100	10C6100	12C6100	15C6100	17C6100	20C6100
49	Valve, Ball, Manual Shutoff	V2003100	V2003100	V2003200	V2003300	V2003300	V2003300	V2003300
50	Valve, Gas, Combination	V2016000 (2)	V2016000 (3)	V2016000 (3)	V2016000 (5)	V2016000 (5)	V2016000 (6)	V2016000 (6)
51A	Weldment, Pipe, Gas Valve/Ball Valve	P2073600 (2)	P2073600 (3)	P2073600 (3)	P2073600 (5)	P2073600 (5)	P2073600 (6)	P2073600 (6)
51B	4" Nipple, black	P0014700 (2)	P0014700 (3)	P0014700 (3)	P0014700 (5)	P0014700 (5)	P0014700 (6)	P0014700 (6)
51C	Union	P0030400 (2)	P0030400 (3)	P0030400 (3)	P0030400 (5)	P0030400 (5)	P0030400 (6)	P0030400 (6)
52	Valve, Ball, Manual Shutoff, Secondary	V2000200 (2)	V2000200 (3)	V2000200 (3)	V2000200 (5)	V2000200 (5)	V2000200 (6)	V2000200 (6)
53	Manifold, 3 Burner/Orifice, Left	L2012800 (1)	L2012800 (2)		L2012800 (3)	L2012800 (1)	L2012800 (2)	

Quantity 1 unless otherwise indicated: (2)

Item	Description	Size 500	Size 750	Size 1000	Size 1250	Size 1500	Size 1750	Size 2000
	Manifold, 3 Burner/Orifice, Right	L2012900 (1)	L2012900 (1)		L2012900 (2)	L2012900 (1)	L2012900 (1)	
	Manifold, 4 Burner/Orifice, Left			L2012600 (2)		L2012600 (2)	L2012600 (2)	L2012600 (4)
	Manifold, 4 Burner/Orifice, Right			L2012700 (1)		L2012700 (1)	L2012700 (1)	L2012700 (2)
54	Assembly, 3 Burner	L2012200 (2)	L2012200 (3)		L2012200 (5)	L2012200 (2)	L2012200 (3)	
	Assembly, 4 Burner			L2012500 (3)		L2012500 (3)	L2012500 (3)	L2012500 (6)
55	Orifice, Gas, Natural	L2013000 (6)	L2013000 (9)	L2013000 (12)	L2013000 (15)	L2013000 (18)	L2013000 (21)	L2013000 (24)
	Orifice, Gas, Propane	L2012400 (6)	L2012400 (9)	L2012400 (12)	L2012400 (15)	L2012400 (18)	L2012400 (21)	L2012400 (24)
56	Gasket, 3 Burner	S2012700 (2)	S2012700 (3)		S2012700 (5)	S2012700 (2)	S2012700 (3)	
	Gasket, 4 Burner			S2012500 (3)		S2012500 (3)	S2012500 (3)	S2012500 (6)
57	Ignitor, Hot Surface w/Gasket	2400-286 (1)	2400-286 (1)	2400-286 (2)	2400-286 (2)	2400-286 (2)	2400-286 (2)	2400-286 (2)
	Heat Exchanger Components - *See Figure 18*							
58	Flow Switch	E0013000	E0013000	E0013000	E0013000	E0013000	E0013000	E0013000
59	Low Water Cutoff (optional)	E2076500	E2076500	E2076500	E2076500	E2076500	E2076500	E2076500
60	Gauge, Temperature/Pressure	A0079000	A0079000	A0079000	A0079000	A0079000	A0079000	A0079000
61	Tee, Adapter, Outlet, Cast Iron	20130001	20130001	20130001	20130001	20130001	20130001	20130010
	Tee, Adapter, Outlet, Bronze	20150302	20150302	20150302	20150302	20150302	20150302	20150313
62	Relief Valve, 75 PSI	RA2138800	RA2138800	RA2138801	RA2138801	RA2138802	RA2138802	RA2138802
63	Flange, Connection, Cast Iron	10391302	10391302	10391302	10391302	10391302	10391302	10391302
	Flange, Connection, Bronze	20255401	20255401	20255401	20255401	20255401	20255401	20255401
64	Gasket, Connection Flange	S0063700 (2)	S0063700 (2)	S0063700 (2)	S0063700 (2)	S0063700 (2)	S0063700 (2)	S0063700 (2)
65	Cover, In/Out, Glass-Lined Cast Iron	10364504	10364504	10364504	10364504	10364504	10364504	10364504
	Cover, In/Out, Bronze	10364501	10364501	10364501	10364501	10364501	10364501	10364501
66	Gasket, Header/Cover	S0095100 (2)	S0095100 (2)	S0095100 (2)	S0095100 (2)	S0095100 (2)	S0095100 (2)	S0095100 (2)
66A	Gasket (Bronze Headers)	S0024600	S0024600	S0024600	S0024600	S0024600	S0024600	S0024600
67	Water Barrier, Inlet/Outlet	20230101	20230101	20230101	20230101	20230101	20230101	20230101
68	Baffle, Water Deflector, Inlet	10338300	10338300	10338300	10338300	10338300	10338300	10338300
69	Well, Immersion, Temperature Control	E2058300	E2058300	E2058300	E2058300	E2058300	E2058300	E2058300
70	Cover, Return, Glass-Lined Cast Iron	10364300	10364300	10364300	10364300	10364300	10364300	10364300
	Cover, Return, Bronze	10364301	10364301	10364301	10364301	10364301	10364301	10364301
71	Pump Housing, Glass-Lined Cast Iron	S2056900	S2056900	S2056900	S2056900	S2056900	S2056900	S2056900
	Pump Housing, Bronze	S0024600	S0024600	S0024600	S0024600	S0024600	S0024600	S0024600
72	Baffle, Diffuser, Pump Housing Inlet	10338400	10338400	10338400	10338400	10338400	10338400	10338400
73	Mixing Valve	A2114601	A2114602	A2114602	A2114602	A2114603	A2114604	A2114605
	Electrical Components - *See Figure 19*							
75	DPDT Switch	E0109200	E0109200	E0109200	E0109200	E0109200	E0109200	E0109200
75A	DPDT Switch	E2056300	E2056300	E2056300	E2056300	E2056300	E2056300	E2056300

Item	Description	Size 500	Size 750	Size 1000	Size 1250	Size 1500	Size 1750	Size 2000
78	Control, Gas Ignition, Three Try (standard)	E2313900 (1)	E2313900 (1)	E2313900 (2)	E2313900 (2)	E2313900 (2)	E2313900 (2)	E2313900 (2)
	Control, Gas Ignition, Single Try (CSD-1 option)	E2107300 (1)	E2107300 (1)	E2107300 (2)	E2107300 (2)	E2107300 (2)	E2107300 (2)	E2107300 (2)
79	Terminal Block, 16 Position, Dual Row	E2327500	E2327500	E2327500	E2327500	E2327500	E2327500	E2327500
80	Switch, Hi-Limit Auto Reset (standard)	E2217700	E2217700	E2217700	E2217700	E2217700	E2217700	E2217700
	Switch, Hi-Limit, Manual Reset (CSD-1 option)	E2217800	E2217800	E2217800	E2217800	E2217800	E2217800	E2217800
81	Thermostat, On/Off Electronic, 60° to 105° F	E2103800	E2103800	E2103800	E2103800	E2103800	E2103800	E2103800
82	Sensor, Temperature	E2103700	E2103700	E2103700	E2103700	E2103700	E2103700	E2103700
82A	Well, Immersion, 1/2 NPT (not shown)	E2074000	E2074000	E2074000	E2074000	E2074000	E2074000	E2074000
83	Panel, Mounting, Limits/Ign Control	5F7001	5F7001	5F7001	5F7001	5F7001	5F7001	5F7001
84	Panel, Cover, High Limit/Ign Control	5F7003	5F7003	5F7003	5F7003	5F7003	5F7003	5F7003
85	Panel, Access, Terminal	5F7006	5F7006	5F7006	5F7006	5F7006	5F7006	5F7006
86	Switch, Rocker 30A, 120V	E2343300	E2343300	E2343300	E2343300	E23433700	E2343300	E2343300
87	Terminal Block, 6 Position, Dual Row (optional)	E2327700	E2327700	E2327700	E2327700	E2327700	E2327700	E2327700
88	Terminal Block, 12 Position, Dual Row	E2342500	E2342500	E2342500	E2342500	E2342500	E2342500	E2342500
89	Switch, Pressure, Diaphragm, Spdt	E0240900 (2)	E0240900 (2)	E0240900 (2)	E0240900 (3)	E0240900 (3)	E0240900 (3)	E0240900 (3)
90	Bracket, Pressure Switch	5F7007	5F7007	5F7007	5F7007	5F7007	5F7007	5F7007
91	Transformer, 150 Va, 120/24V	E2310400	E2310400	E2310400	E2310400	E2310400	E2310400	E2310400
92	Relay, Time Delay (24 Vac) Delay On Break, Adj.	E2077700	E2077700	E2077700	E2077700	E2077700	E2077700	E2077700
93	Relay, 24vac, DPDT	E2327800	E2327800		E2327800 (2)	E2327800 (2)	E2327800 (2)	E2327800 (2)
94	Panel, Mounting, LWCO Switch (optional)	5F7005	5F7005	5F7005	5F7005	5F7005	5F7005	5F7005
95	Wire Harness #1, Fenwal (not shown)	E2328800	E2328800	E2328400	E2328400	E2328400	E2328400	E2328400
96	Wire Harness #2, Control Panel (not shown)	E2328900	E2328900	E2328500	E2330100	E2330100	E2330100	E2330100
97	Wire Harness #3, Main (not shown)	E2329000	E2329000	E2329100	E2328600	E2328600	E2328600	E2328600
98	Wire Harness, Pool Control (not shown)	E2330501	E2330501	E2330501	E2330501	E2330501	E2330501	E2330501
99	Switch, Hi-Limit, Auto Reset 135°F	E2104800	E2104800	E2104800	E2104800	E2104800	E2104800	E2104800
100	Panel, Mounting, High Limit Switch	5F7009	5F7009	5F7009	5F7009	5F7009	5F7009	5F7009

Quantity 1 unless otherwise indicated: (2)

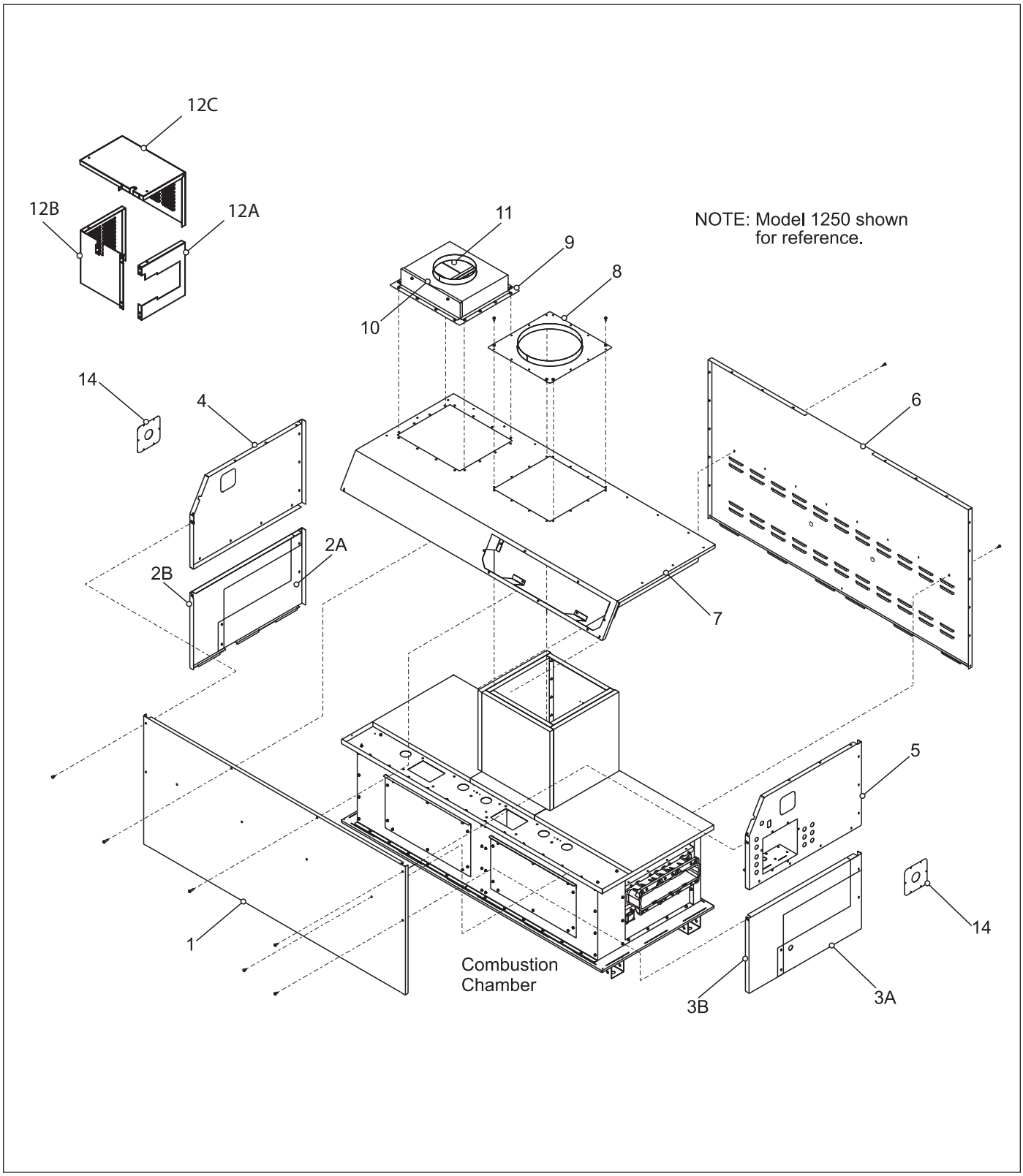


Figure 16. Sheet Metal Components.

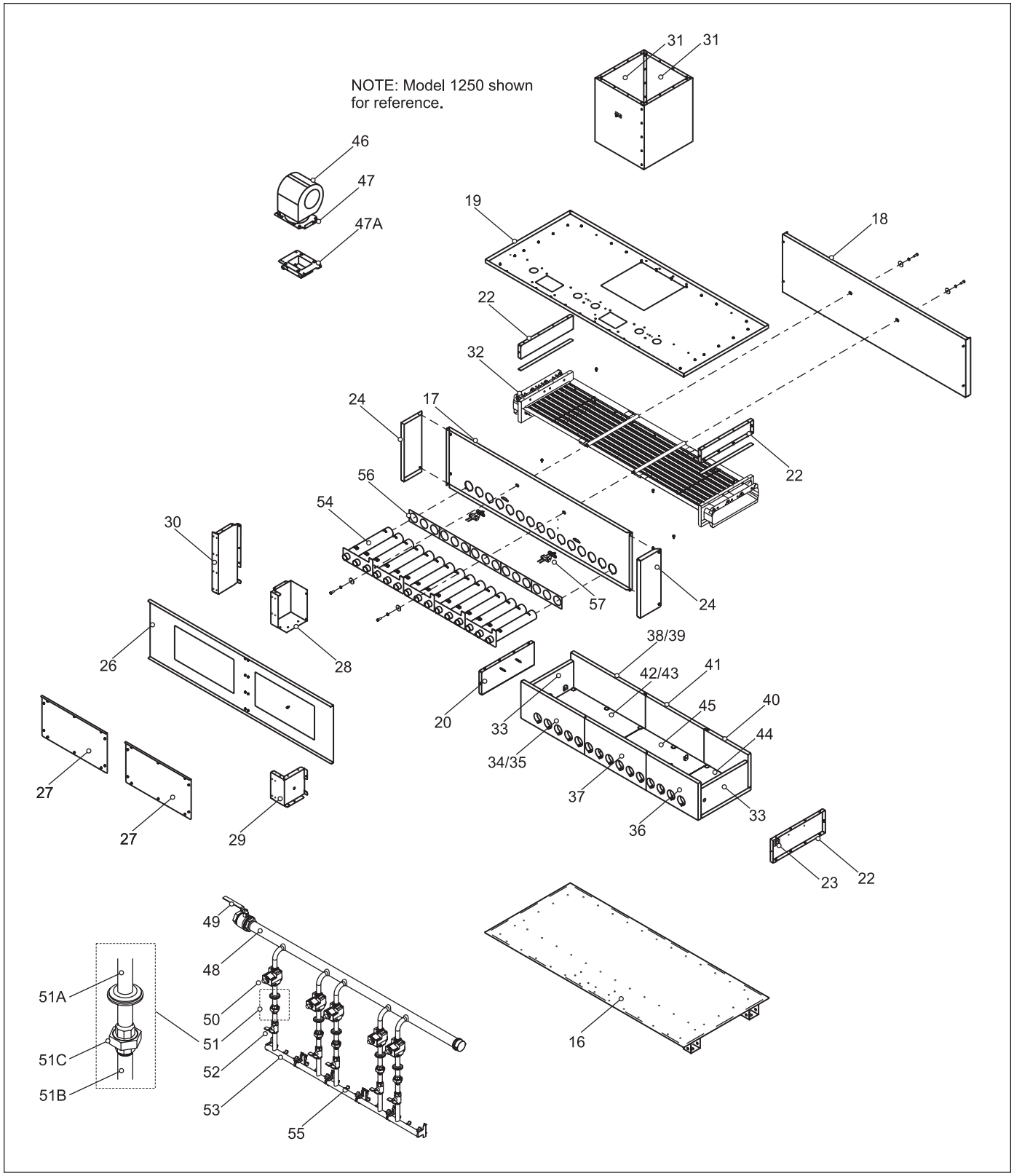


Figure 17. Internal Components.

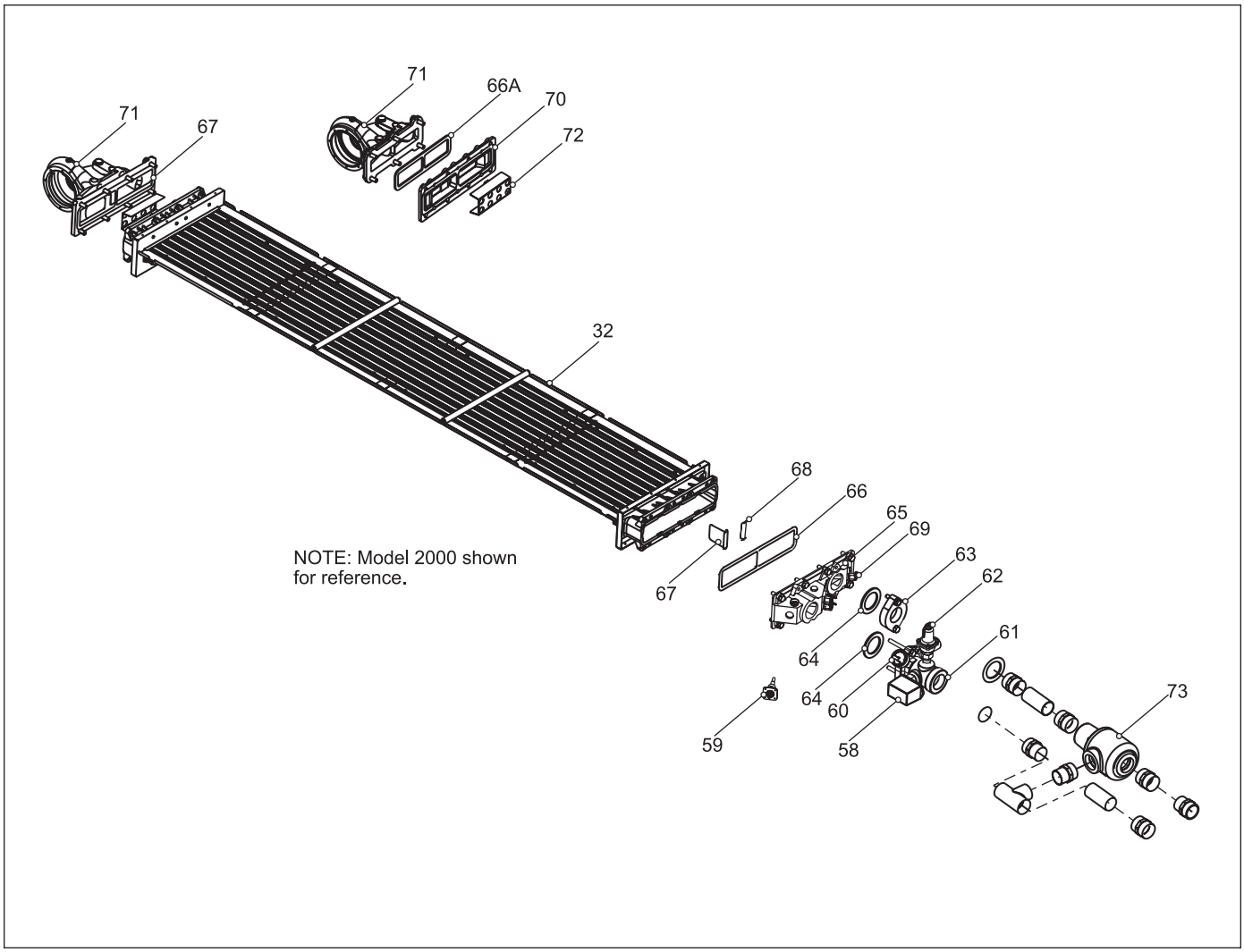


Figure 18. Heat Exchanger Components.

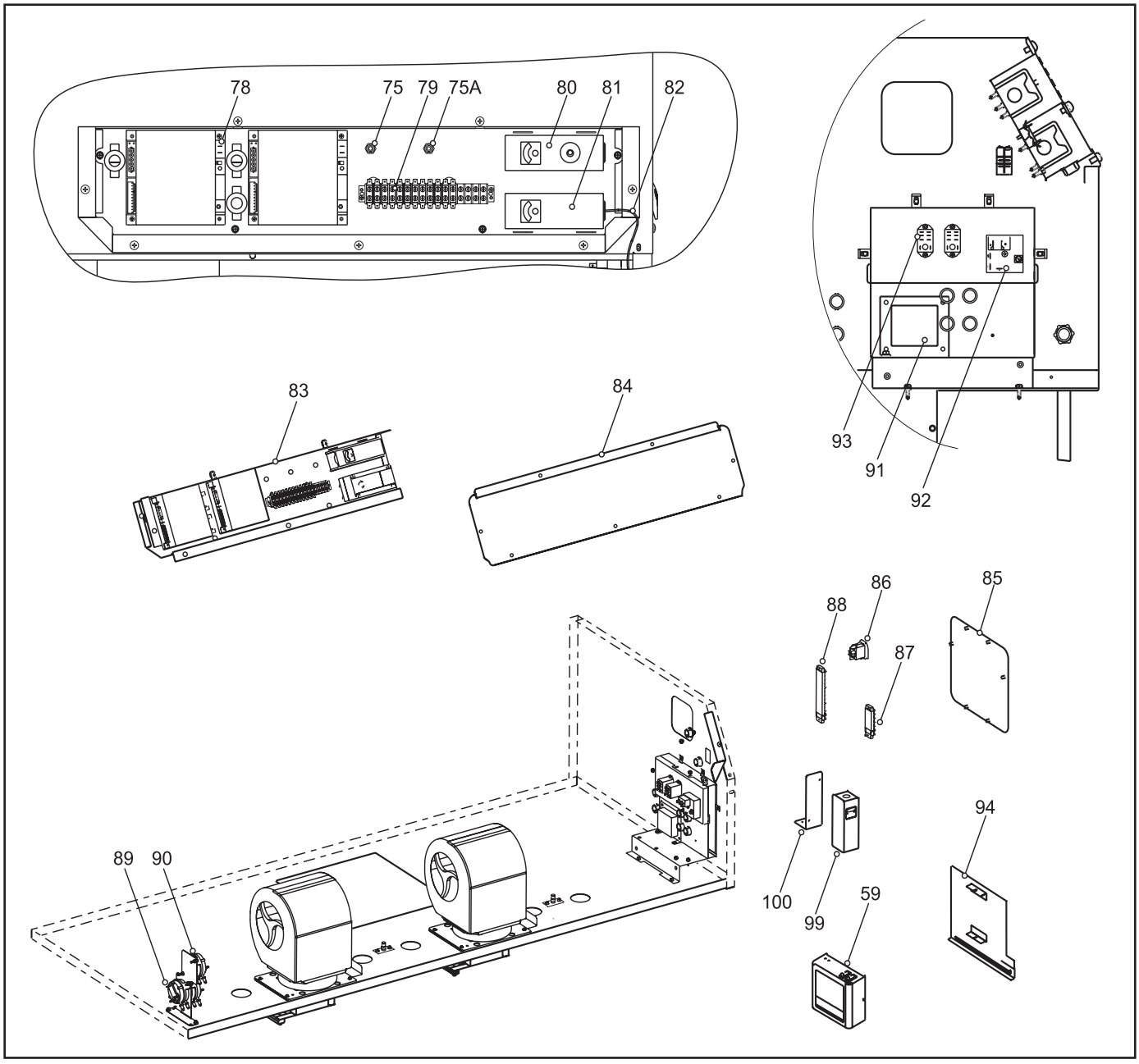


Figure 19. Electrical Components.

H2331400L

Laars Heating Systems Company reserves the right to change specifications, components, features, or to discontinue products without notice.

LAARS Heating Systems Company

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