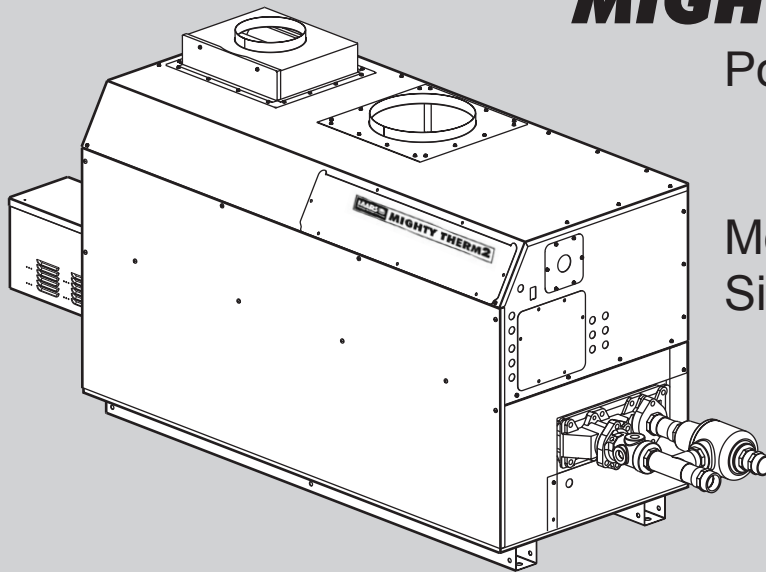


Installation and Operation Instructions for

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 boiler installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ WARNING

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

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

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a nearby phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

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

⚠ AVERTISSEMENT

Assurez-vous de bien suivre 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 dans le bâtiment où vous vous trouvez.
- 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 service 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.

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SECTION 1.

General Information

In the Commonwealth of Massachusetts, this appliance must be installed by a licensed plumber or gas fitter.

WARNING

The MT2P pool heater **must** be installed in accordance with the procedures detailed in this manual, or the Laars Heating Systems warranty may 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 CAN/CGA-B149.1, Natural Gas Installation Code or CAN/CGA-B149.2, Propane Gas Installation Code, and/or local codes. Where required by the authority having jurisdiction, the installation of MT2P appliances 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.

1.1 Introduction

This manual provides information necessary for the installation, operation, and maintenance of Laars Heating Systems MT2P copper tube pool heaters. Read it carefully before installation.

All application and installation procedures should be reviewed completely before proceeding with the installation. Consult the Laars Heating Systems 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 MT2P appliance is protected against over pressurization. A pressure relief valve is fitted to all appliances. It is installed on the outlet header, at the water outlet of the appliance.

IMPORTANT: The inlet gas pressure to the appliance

must not exceed 13" W.C. (3.2kPa).

All installations must be made in accordance with the 1). American National Standard Z223.1/NFPA54-Latest Edition "National Fuel Gas Code" or 2). CAN/CGA 1-B149 "Installation Codes for Gas Burning Appliances and Equipment" 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.

1.2 Model Identification

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

Model Character Designation

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

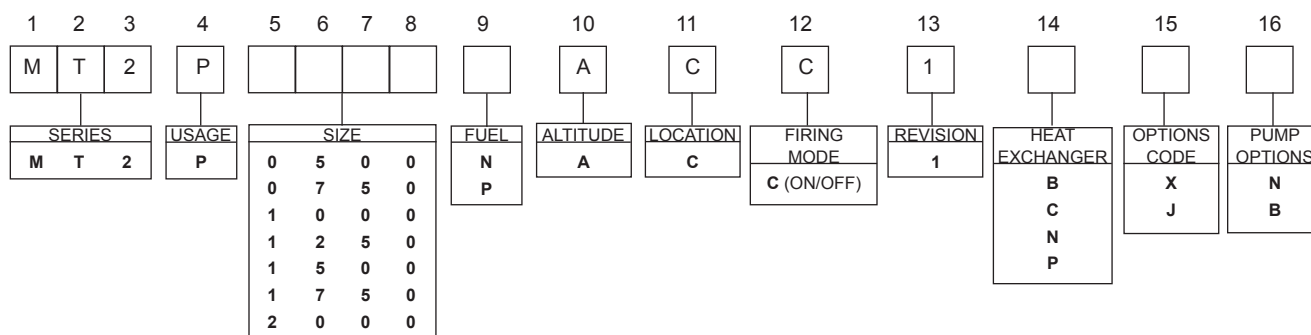
C = Indoor and Outdoor

12 Firing Mode

C = On-off

13 Revision

1 = First version



14 Heat Exchanger

B = Glass-lined cast iron / copper / bronze trim
(std. on water heaters)

C = Glass-lined cast iron / copper
(std. on boilers, n/a on water heaters)

N = Glass-lined cast iron / cupro-nickel
(n/a on water heaters)

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, TACO, normal water pump

B = Pump mounted, B&G, optional normal water pump

1.3 Warranty

Laars Heating Systems appliances are covered by a limited warranty. Owners 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 (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.

1.4 Dimensions

See Figure 1.

1.5 Locating the Appliance

The appliance 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 appliance is design certified by CSA-International for installation on combustible flooring; in basements; in closets, utility rooms or alcoves. The location for the appliance 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 MT2P 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 **Table 2** should be met when choosing the locations for the appliance.

1.6 Locating Heater with Respect to Pool System Loop

For the best results, the MT2P 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 appliance must be installed with longer piping runs, then larger diameter piping shall be used. Consult the factory for assistance.

1.7 Locating Appliance for Correct Horizontal Vent/Ducted Air Distance From Outside Wall

The forced draft combustion air blower/blowers

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	CA001401	20260701
750	10	25	8	20	8	20	50	15	3	CA001402	20260703
1000	10	25	8	20	8	20	50	15	3	CA001405	20260705
1250	12	30	10	25	10	25	50	15	3	CA001405	20260705
1500	12	30	10	25	10	25	50	15	3	CA001404	20260706
1750	14	36	12	30	12	30	50	15	3	CA001404	20260706
2000	14	36	12	30	12	30	50	15	3	CA001404	20260706

*Horizontal venting requires stainless vent pipe. See Table 5

Table 1. Horizontal Vent / Combustion Air Parameters.

in the appliance has/have sufficient power to pull air and vent properly when the following guidelines for horizontal air and vent are followed (see Table 1).

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 in Table 1. The larger vent collar size is to accommodate Category I (vertical) vent

systems.

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.

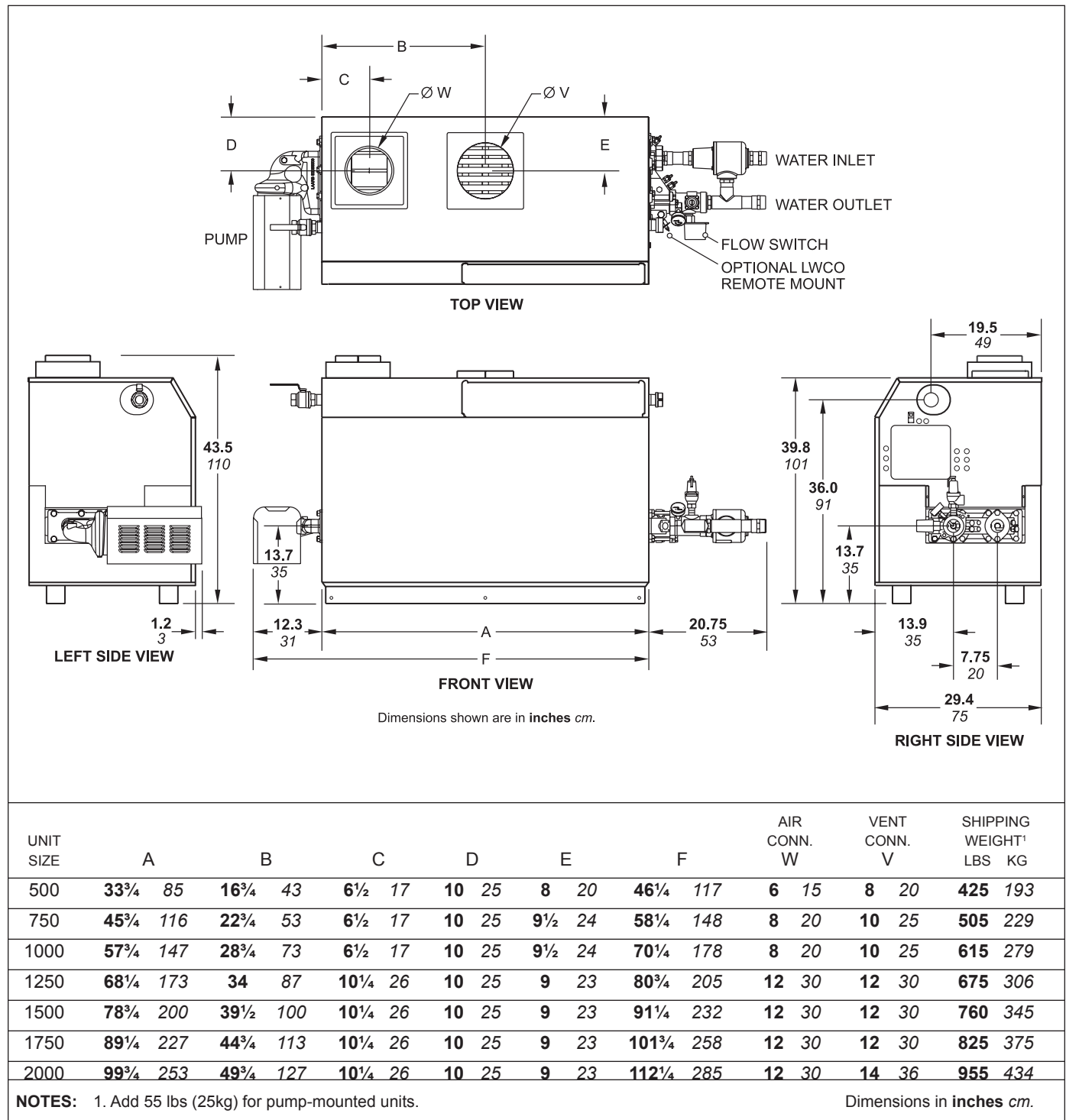


Figure 1. Dimensional Data.

SECTION 2.

Venting and Combustion Air

2.1 Combustion Air

MT2P pool heaters 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 CAN/CGA B149, Installation Codes, or applicable provisions of the local building codes.

A MT2P appliance 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. Never obtain combustion air from the pool area. Corrosion of and/or damage to the pool heater may result.

2.1.1 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 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 (see Table 3). When communicating to the outdoors through horizontal

APPLIANCE 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 2. Clearances.

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, for each MT2P 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 CAN/CGA B149.

2.1.2 Intake Combustion Air

Never obtain combustion air from the pool area. Corrosion of and/or damage to the pool heater may result. 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 Laars horizontal wall terminal (see Table 1). 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).

Use single-wall galvanized pipe (per Table

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.

4) for the combustion air intake (see Table 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 1). 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. MT2P appliances have venting and combustion air ducting on 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. The MT2P loses less than 1 percent of its input rating to the room, but other heat sources may be present.

2.2 Venting

2.2.1 Vent Categories

Depending upon desired MT2P venting, it may be considered a Category I or a Category III appliance. In general, a vertical vent system will be a Category I system. However, in rare instances, a MT2P's vertical vent system may be considered Category III. In the U.S., the National Fuel Gas Code (American National Standard 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 the MT2P's vertical vent system does not satisfy the criteria for Category I venting, it must be vented as a Category III system.

All MT2P vent systems which discharge horizontally (without the use of a power venter) are considered Category III vent systems.

2.2.2 Category I Vent

When vented as a category I appliance, the vent system must conform to the National Fuel Gas Code (American National Standard 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 appliance, such that the flue draft does not exceed (negative) 0.1"

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.

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.

2.2.3 Common Venting Systems

MT2P units are Category I fan-assisted when vented vertically and adhering to all applicable codes. MT2P units are not allowed to be vented into a common horizontal vent system, 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. When common venting MT2P fan-assisted heaters with 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.**

⚠WARNING

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

It is for this reason that, in addition to following proper vent sizing, construction and safety requirements from the National Fuel Gas Code, ANSI Z223.1 or in

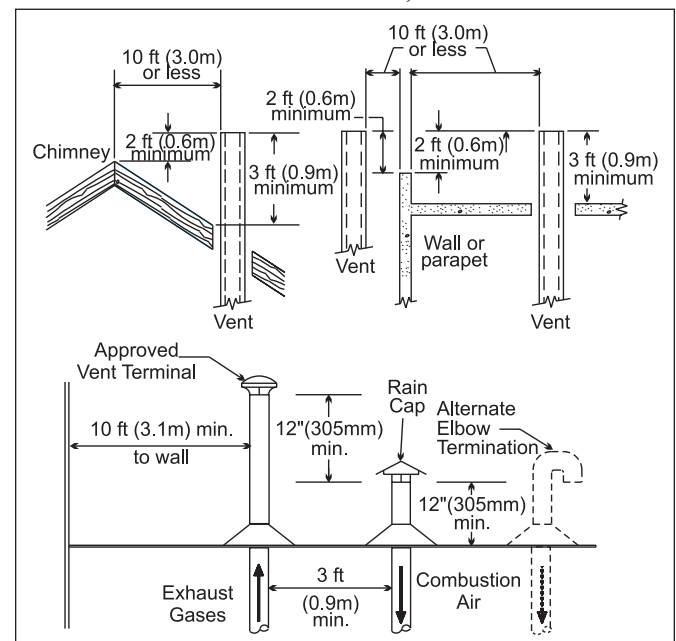
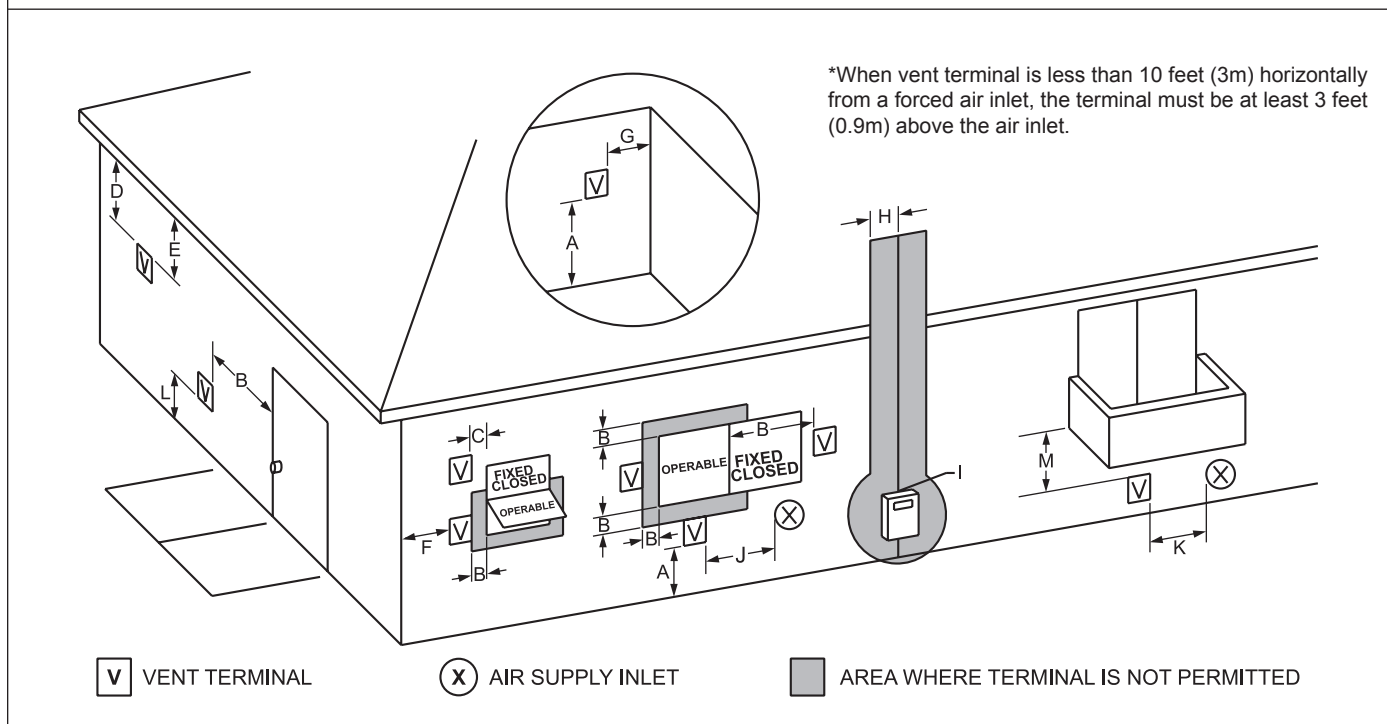


Figure 2. Combustion Air and Vent Through Roof.

	U.S. Installations (see note 1)	Canadian Installations (see note 2)
A= Clearance above grade, veranda, porch, deck, or balcony	12 inches (30 cm) See note 6	12 inches (30 cm) See note 6
B= Clearance to window or door that may be opened	4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening	36 inches (91 cm)
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 feet (61cm) 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 center line extended above meter/regulator assembly	See note 4	3 feet (91 cm) within a height 15 feet above the meter/regulator assembly
I= Clearance to service regulator vent outlet	See note 4	3 feet (91 cm)
J= Clearance to nonmechanical air supply inlet to building or the combustion air inlet to any other appliance	4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening	36 inches (91 cm)
K= Clearance to a mechanical air supply inlet	3 feet (91 cm) above if within 10 feet (3 m) horizontally	6 feet (1.83 m)
L= Clearance above paved sidewalk or paved driveway located on public property	Vent termination not allowed in this location for category IV appliances.	Vent termination not allowed in this location for category IV appliances.
M= Clearance under veranda, porch, deck, or balcony	See note 4	12 inches (30 cm) (see note 3)

Notes:

1. In accordance with the current ANSI Z223.1 / NFPA 54 National Fuel Gas Code.
2. In accordance with the current CAN/CGA-B149 Installation Codes.
3. Permitted only if veranda, porch, deck, or balcony is fully open on a minimum of two sides beneath the floor.
4. 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.
5. For clearances not specified in CAN/CGA-B149, 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 12" above expected snow line. Local codes may have more specific requirements, and must be consulted.

**Figure 3. Combustion Air and Vent Through Side Wall.**

Canada, from CSA B149.1 as well as all applicable local codes, it is required that installers provide some means to prevent operation with a blocked common vent. It is suggested that a blocked vent safety system be employed such that if the switch from one appliance trips due to excessive stack spill or backpressure indicating a blocked vent condition, that all appliances attached to the vent be locked out and prevented from operating. (Note that the MT2P Pool Heater is equipped with a blocked vent safety (pressure) switch, as shipped.) As an additional precaution, it is recommended that a Carbon Monoxide (CO) alarm be installed in all enclosed spaces containing combustion appliances. If assistance is required in determining how a blocked vent safety system should be connected to a LAARS product, please call Laars' Applications Engineering Dept.

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.

2.2.4 Category III Vent

When the MT2P 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, per [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 1](#) 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.

2.3 Locating Vent & Combustion Air Terminals

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.

2.3.1 Side Wall Vent Terminal

The Laars side wall vent hood ([listed in Table 1](#)) must be used when the heater is vented through a side wall. It provides a means of installing 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 CAN/CGA B149.1 or .2 and local applicable codes ([see Figure 3](#)). Consider the following when installing the terminal:

1. Through-the-wall vent terminals must terminate at least 7-feet above a public walkway.
2. Locate the vent terminal so that vent gases cannot be drawn into air conditioning system inlets. The National Fuel Gas Code requires that it be at least 3 feet (0.9m) above any such inlet that is within a horizontal distance of 10 feet (3m).
3. Locate the vent terminal so that vent gases cannot enter the building through doors, windows, gravity inlets or other openings. The National Fuel Gas Code requires that it be located at least 4 feet (1.2m) below, 4 feet (1.2m) horizontally from, or 1 foot (0.3m) above such openings. Whenever possible, locations under windows or near doors should be avoided.
4. Locate the vent terminal so that it cannot be blocked by snow. The National Fuel Gas Code requires that it be at least 12 inches (30 cm) above grade, but the installer may determine it should be higher, depending upon local conditions.
5. Locate the terminal so the vent exhaust does not settle on building surfaces and other nearby objects. Vent products may damage such surfaces or objects.
6. Locate the terminal at least 6 feet (1.8m) horizontally from any gas or electric metering, regulating, or relief equipment.
7. If the MT2P 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.
8. Note that side wall vent terminals for all models are shipped with reducers for the vent collars,

SIZE	OUTDOOR VENT TERMINAL	OUTDOOR COMBUSTION AIR TERMINAL
500	20254703	D2007900
750	20254705	D2007900
1000	20254705	D2008000
1250	D2007700	D2008000
1500	D2007700	D2008000
1750	D2007800	D2008000
2000	D2007800	D2008200

Table 6. Vent Terminals for Outdoor Units.

to accommodate horizontal vent sizes, shown in [Table 1](#).

⚠WARNING

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

2.3.2 Side Wall Combustion Air Terminal

Never obtain combustion air from the pool area.

Corrosion of and/or damage to the pool heater may result. The Laars side wall combustion air terminal ([listed in Table 1](#)) 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 least 12 inches (30 cm) above grade, but the installer may determine it should be higher, depending upon local conditions.
4. If the MT2P 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 3](#)).

2.3.3 Vertical Vent Terminal

MODEL AND GAS TYPE	DISTANCE FROM GAS METER OR LAST STAGE REGULATOR					
	0-100'	0-31m	100-200'	31-61m	200-300'	61-91m
500 natural	1-1/2"	3.8cm	2"	5.1cm	2"	5.1cm
500 propane	1"	2.5cm	1-1/2"	3.8cm	1-1/2"	3.8cm
750 natural	2"	5.1cm	2"	5.1cm	2-1/2"	6.4cm
750 propane	1-1/2"	3.8cm	1-1/2"	3.8cm	2"	5.1cm
1000 natural	2"	5.1cm	2-1/2"	6.4cm	3"	7.6cm
1000 propane	1-1/2"	3.8cm	2"	5.1cm	2-1/2"	6.4cm
1250 natural	2-1/2"	6.4cm	2-1/2"	6.4cm	3"	7.6cm
1250 propane	2"	5.1cm	2"	5.1cm	2-1/2"	6.4cm
1500 natural	2-1/2"	6.4cm	3"	7.6cm	3"	7.6cm
1500 propane	2"	5.1cm	2-1/2"	6.4cm	2-1/2"	6.4cm
1750 natural	2-1/2"	6.4cm	3"	7.6cm	3"	7.6cm
1750 propane	2"	5.1cm	2-1/2"	6.4cm	2-1/2"	6.4cm
2000 natural	3"	7.6cm	3"	7.6cm	3-1/2"	8.9cm
2000 propane	2-1/2"	6.4cm	2-1/2"	6.4cm	3"	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 Size.

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](#)).

2.3.4 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](#)). 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.

2.4 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 Mighty Therm2.

If local codes allow, outdoor installations may use 1' of appropriately sized galvanized single wall or BVent 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 boiler. This is available as a

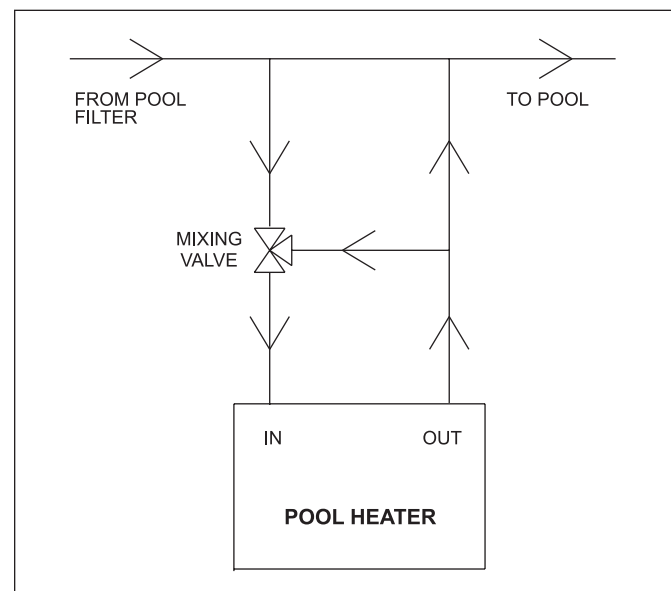


Figure 4. Mixing System.

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](#).

SECTION 3. Gas Supply and Piping

3.1 Gas Supply and Piping

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

The MT2P's gas train allows the user to pipe the gas from either the right side or the left side of the unit. As shipped, the left side of the gas train is capped off, and there is a manual valve on the right side. If desired, the manual valve may be switched with the cap on the opposite side to accommodate alternate installations.

Review the following instructions before proceeding with the installation.

1. Verify that the appliance is fitted for the proper type of gas by checking the rating plate. Laars Heating Systems appliances are normally equipped to operate at elevations up to 2000 feet (610m). MT2P appliances may be adjusted to operate properly at higher elevations; however, input will be reduced if the heating value of the gas supply is below sea level values.
2. The maximum inlet gas pressure must not exceed 13" W.C. (3.2kPa). The minimum inlet gas pressure is 5" W.C. (1.2kPa).
3. Refer to [Table 7](#), 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 appliance 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 appliance and its gas connection must be leak tested before placing it in operation.
11. Purge all air from gas lines.

⚠ Caution

Do not use open flame to check for leaks.

NOTE: The MT2P appliance 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,

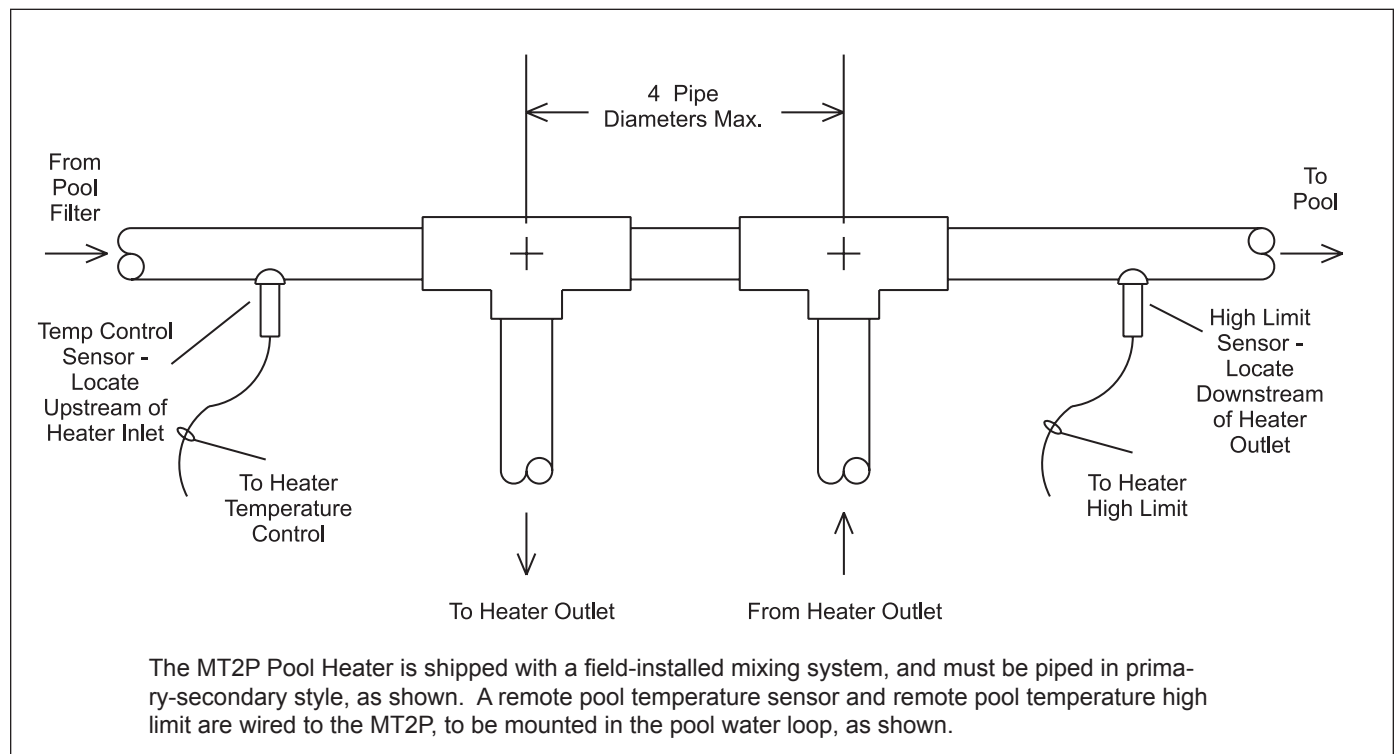


Figure 5. Pool Heater Piping.

undersized gas supply lines and/or an obstructed gas supply line. The MT2P may not fire if the gas pressure lower than 5" w.c.

SECTION 4. Water Connections

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.

MT2P 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 4). This keeps cold return water from causing condensing on the outside of the MT2P 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 5 for proper connection of the MT2P heater to the pool loop.

4.2 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 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.

4.3 Sensor Locations

Two sensors must be installed in the pool loop, as shown in Figure 5. 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.

SECTION 5. Electrical Connections

WARNING

The appliance 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 boiler. Plastic pipe or dielectric unions may isolate the boiler electrically. Service and maintenance personnel, who work on or around the boiler, may be standing on wet floors and could be electrocuted by an ungrounded boiler.

Single pole switches, including those of safety controls and protective devices must not be wired in a grounded line.

NOTE: All internal electrical components have been prewired. No attempt should be made to connect electrical wires to any other location except the field wiring strip.

5.1 Main Power

Mighty Therm 2 Pool Heater sizes 500 to 1500 use a single 120-volt fused supply (see Figure 6 for over-current protection ratings). The installer can change these units to use a separate circuit for the pump, if desired. Instructions to make this change are found in Section 5.1.1.

Sizes 1750 and 2000 require two 120-volt fused supplies (see Figure 6 for over-current protection ratings).

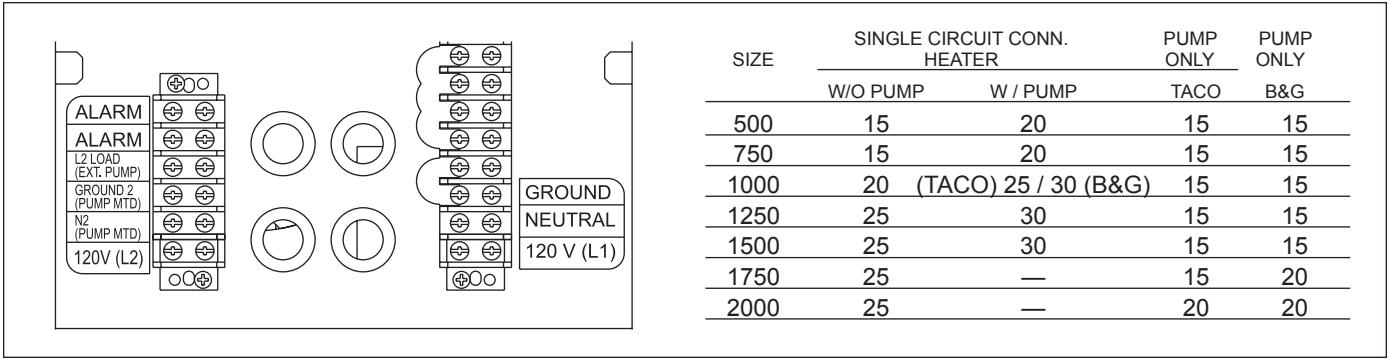


Figure 6. Field Wiring.

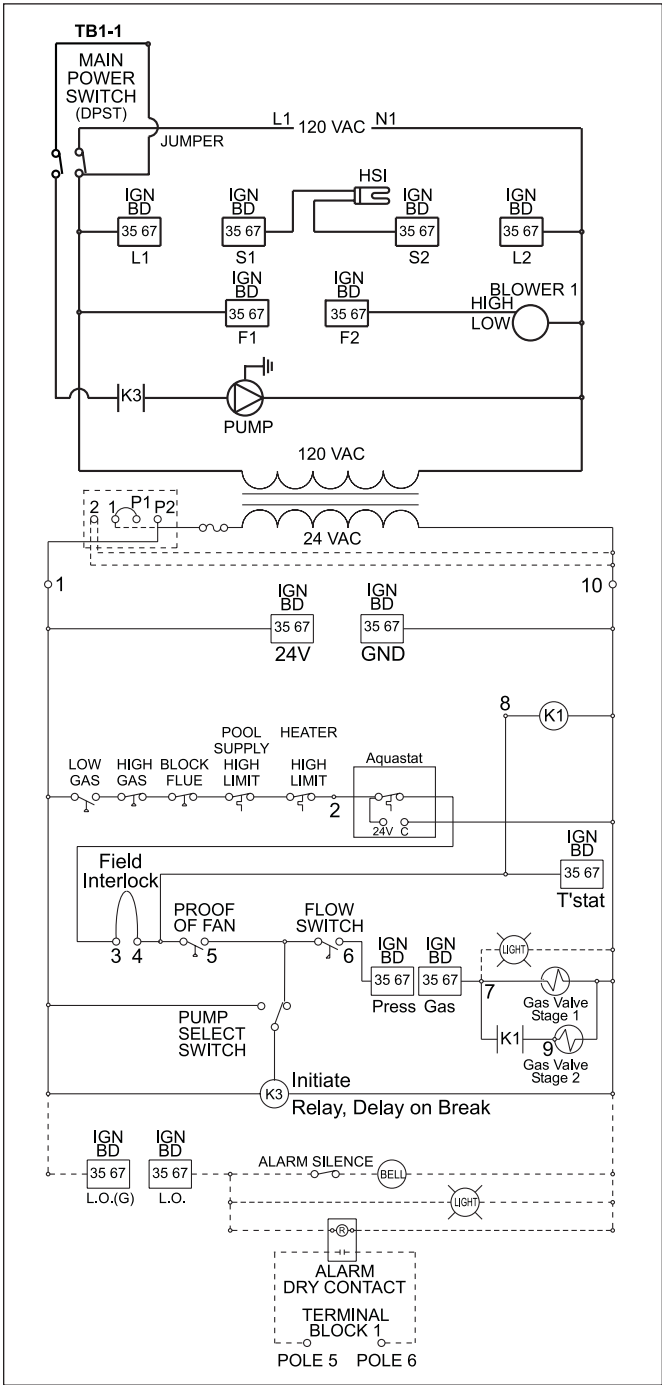


Figure 7. Wiring Schematic, sizes 500-750.

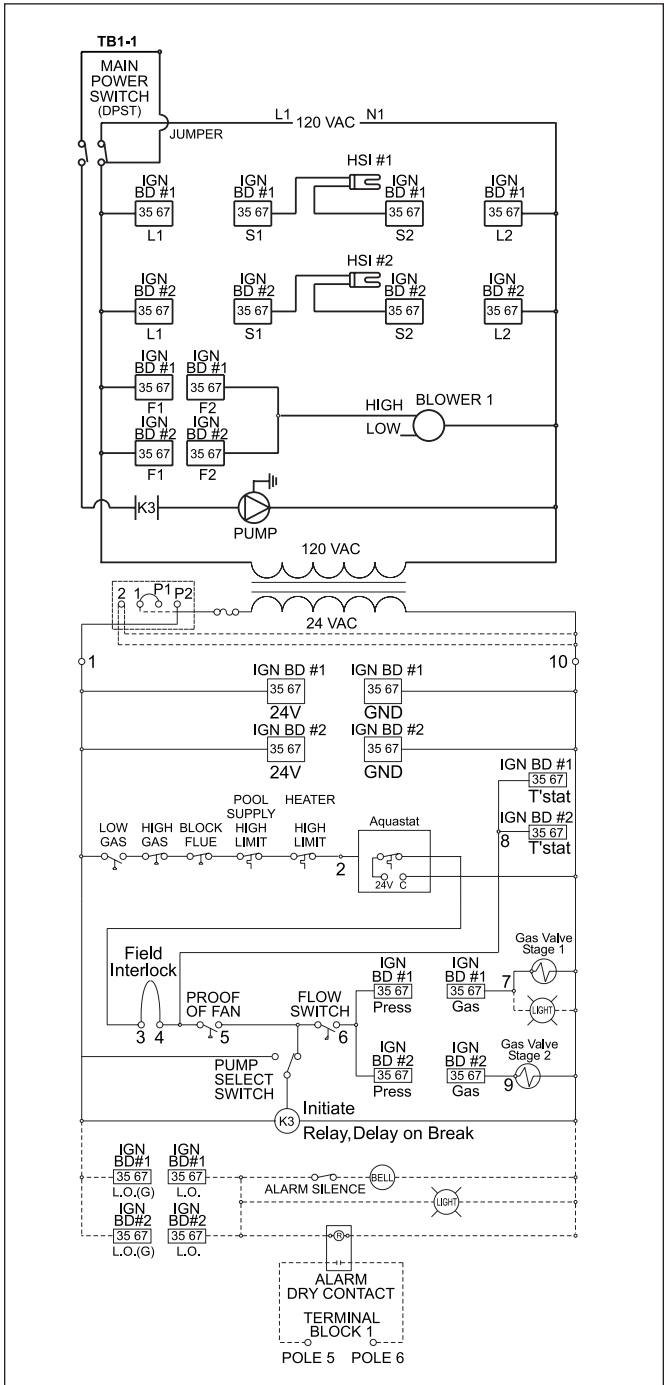


Figure 8. Wiring Schematic, size 1000.

5.1.1 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.

5.1.2 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 6](#) 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 6](#) for over-current protection ratings).

5.2 Temperature (Operating) Control

The MT2P temperature control operates by measuring the pool loop return temperature, before the heater inlet piping. 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 4](#). During operation, the automatic mixing system diverts water from the outlet to the inlet to "pre warm" the water to a minimum inlet temperature 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.

5.3 Limit Controls

In addition to the pool heater temperature control, MT2P appliances are 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 5](#)). 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 to, 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.

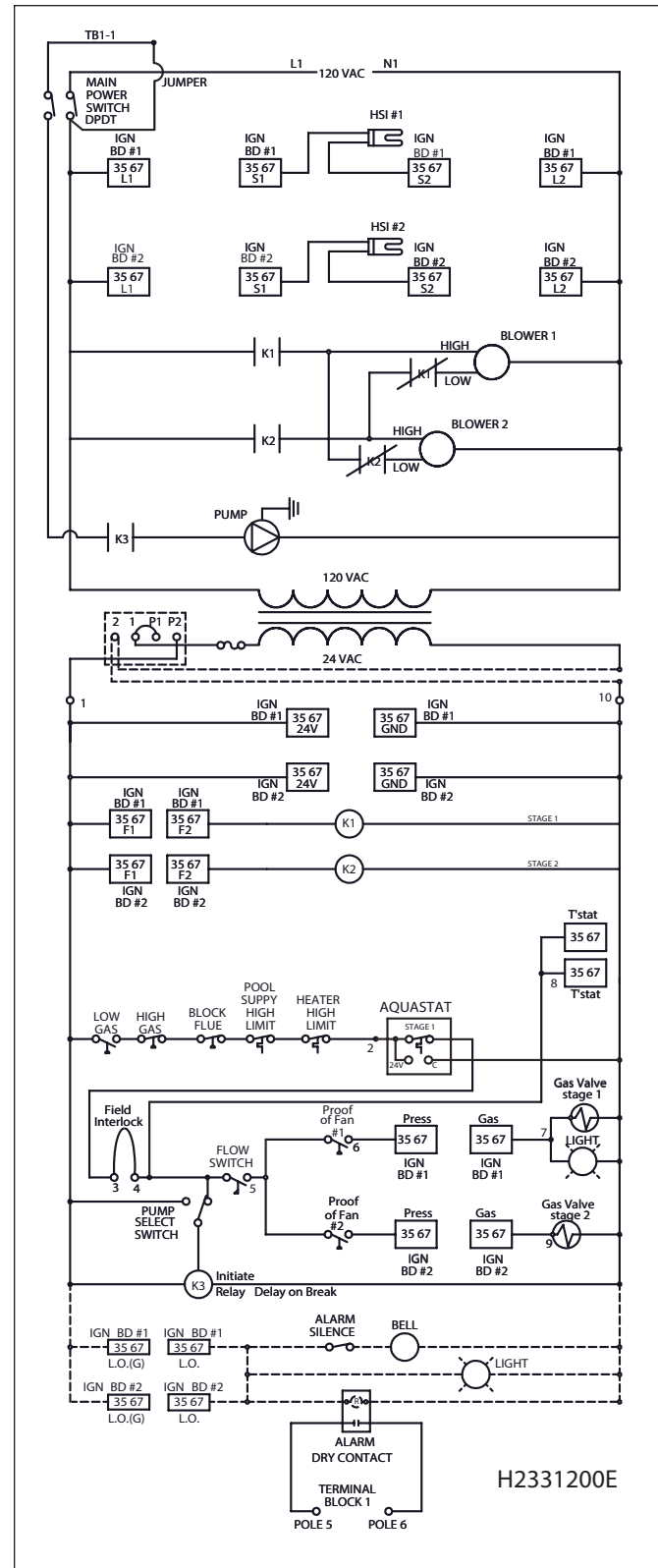


Figure 9. Wiring Schematic, sizes 1250-2000.

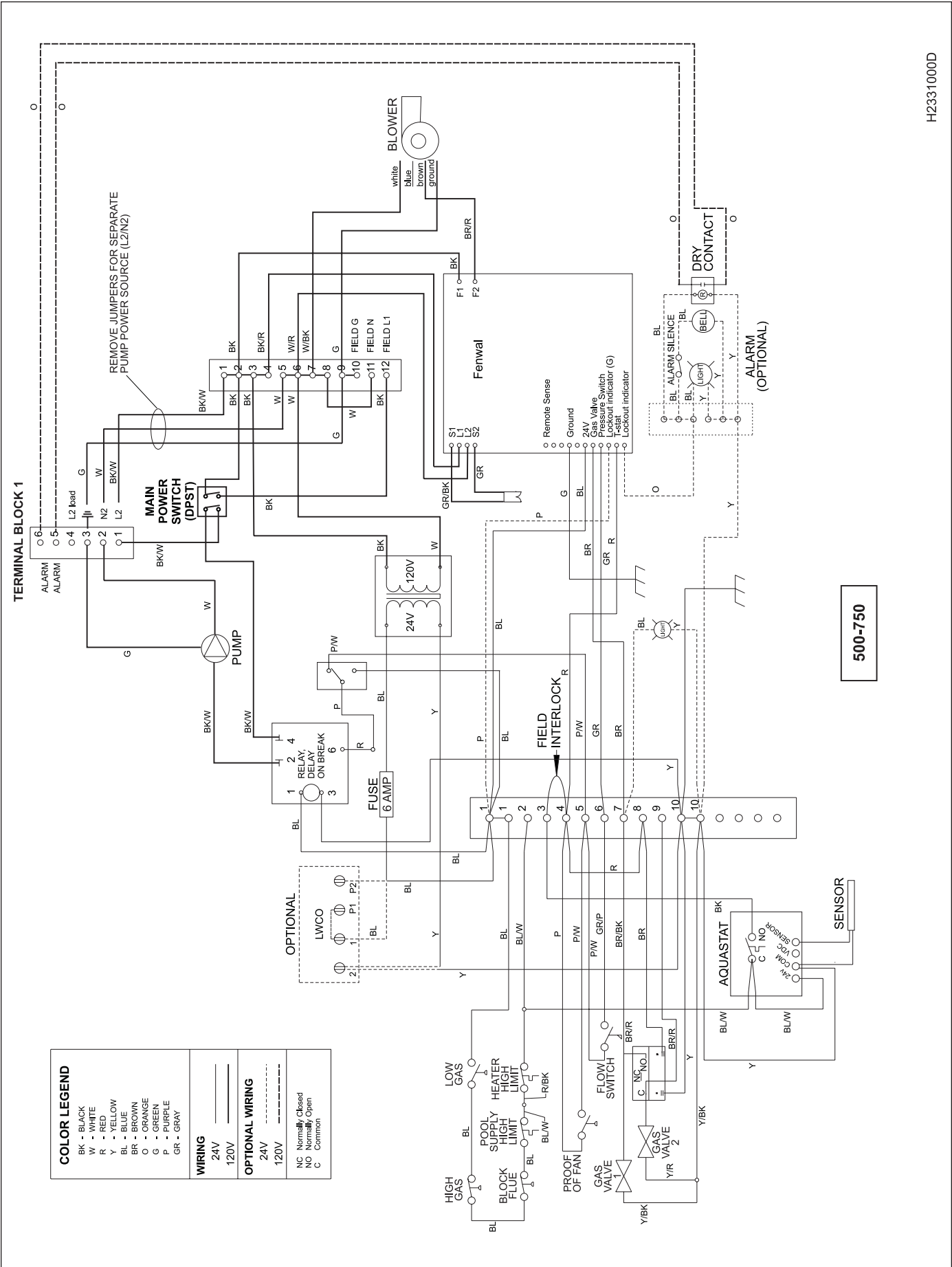


Figure 10. Connection Diagram, sizes 500-750.



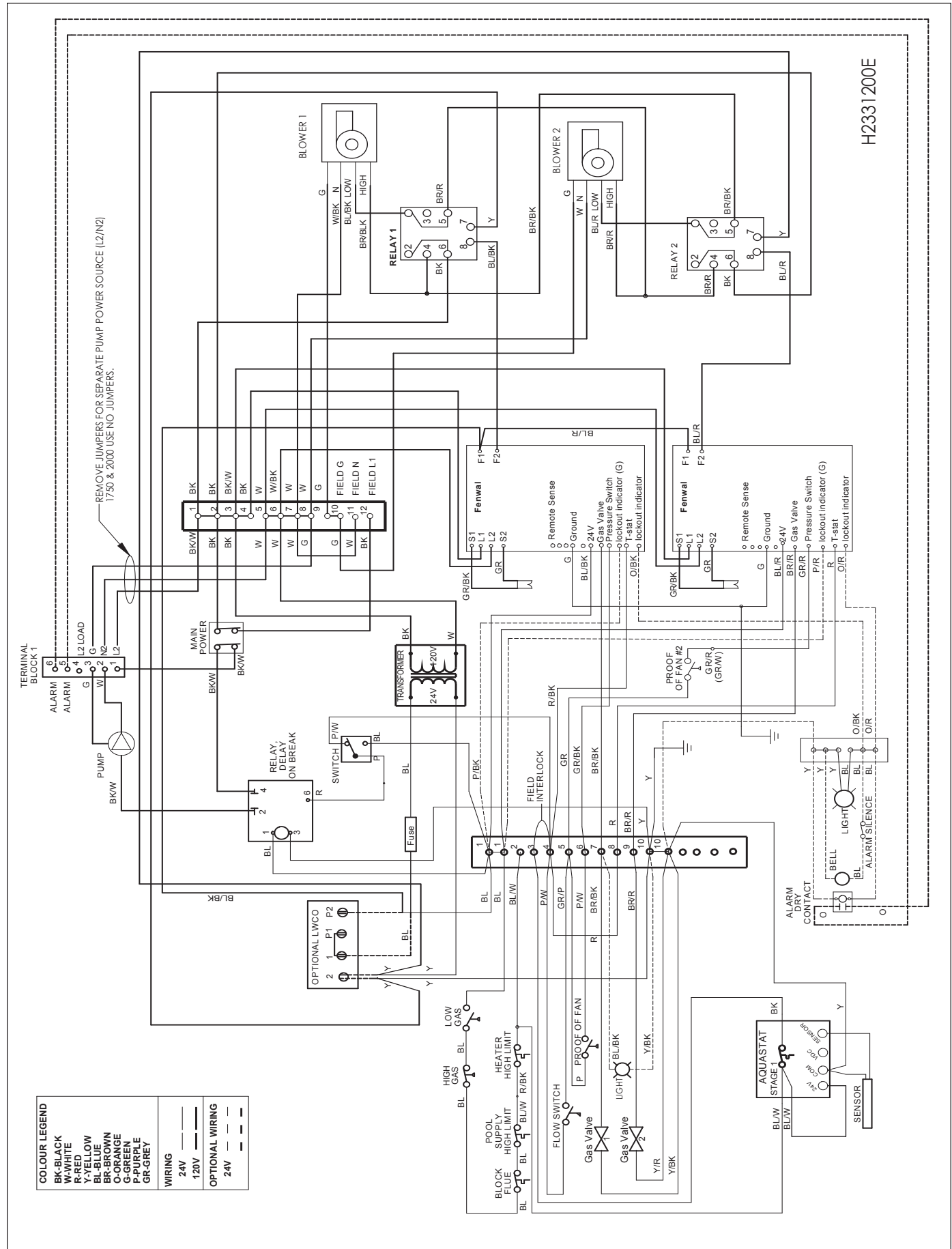


Figure 12. Connection Diagram, sizes 1250-2000.

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.

SECTION 6. Operating Instructions

6.1 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 boiler 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 500-1000 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. Mighty Therm2 sizes 1000-2000 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 boiler to run with a single stage.)*

6.2 Filling the Heater System

1. Ensure the system is fully connected, filled with water and all valves are open.
2. Start up heater according to the procedure in this manual. Operate the entire system for one (1) hour.
3. 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, push the reset button (optional Ignition Module only), 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 no longer exists.
4. Check the entire system for leaks.

Caution

Protect the heater from low pH water if an "acid start up" or similar technique is used. Corrosion of the heater and heat exchanger due to low pH water is not covered under the limited warranty. The water must be neutralized to normal pH levels before filling the heater and starting up the system.

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

WARNING

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

6.3 Operating the Burner and Set Up

6.3.1 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 CO₂ at the outlet of the unit. The CO₂ 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.

6.3.2 High Altitude Adjustment and Set Up

MT2P appliances may be operated at high altitude (7700 ft., 2347 m) with a reduction in output of approximately 10%. 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%. When adjusted properly, the appliance will perform properly at any altitude. High altitude adjustment must not be made on appliances operating at elevations below 2500 ft. (762 m).

No orifice changes are required to adjust the MT2P appliances 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 CO₂ or O₂ 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 CO₂ in the "as installed" condition. Adjust the air shutter(s) so that the CO₂ is about 8% or the O₂ is about 6.8% for appliances operating on Natural Gas. For appliances operating on LP Gas adjust the air shutter(s) so that the CO₂ is about 9.2% or the O₂ is about 6.8%. Appliances with two blowers should be adjusted so that the air shutters below each blower are open the same amount.

Once the CO₂ or O₂ 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 appliance 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. After the adjustments have been completed, the fitting, hose and manometer have been removed and the 1/8" plug has been replaced, replace the cap. Repeat this process until all gas valves have been set. **Note:** The pressure can be set only when the appliance is operating and only when the particular gas valve being adjusted is energized by a call for heat.

After all of the gas valve manifold pressures have been set, the CO₂ or O₂ must be reset. CO₂ or O₂ will have changed when the manifold pressure was adjusted. Open the air shutter(s) to reduce the CO₂ or O₂ 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 CO₂ is adjusted to 8.0% for Natural Gas appliances or 9.2% for LP appliances. When using an O₂ analyzer, the correct O₂ is 6.8% for both Natural Gas and LP appliances.

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.

6.4 Shutting Down the MT2P

1. Switch off the main electrical disconnect switch.
2. Close all manual gas valves.
3. If freezing is anticipated, drain the MT2P and be sure to also protect building piping from freezing. **This step to be performed by a qualified service person.**

6.5 Spring and Fall Operation Stand-by Service

Turn the thermostat down to approximately 70°F (21°C). This will prevent the pool and surrounding ground from becoming chilled and permit the pool to be raised to swimming temperature in a shorter length of time. **Do Not Operate** below 60°F (16°C).

6.6 Winter Operation Complete Shutdown

1. See Section 6.4
2. If the heater is not protected from freezing temperatures, it should be **completely drained before the first frost**. Drain the heater by removing the plug at the end of the inlet/outlet header casting. Also, remove the small plug at the bottom of the pump housing. Do not replace either plug until the time that refilling is desired. The heater must be level for complete draining. When compressed air is used to blow out lines, it is still necessary to follow these directions. Because of the potential for electrical power failure or pump failure, freeze protection should never be accomplished by operating the pool heater and the filter pump. Either of those failures will potentially allow a freeze up and cause damage to the heater and the attached system.
3. **Improper use of the heater:** The Laars PNCP pool heater is not designed for continuous use as a “anti-freezing” device for pools. Operating the heater at low water temperatures will damage the heat exchanger.

6.7 To Restart the MT2P

If drained, follow [Section 6.2](#) 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 pool aquastat to its lowest setting.
5. Open all manual gas valves.
6. Reset all safety switches.
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.

6.8 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

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

Table 8. Minimum Filter Pump Flow Rates For Spas.

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.

SECTION 7. Maintenance

7.1 System Maintenance

1. Lubricate the system water-circulating pump, if required, per the instructions on the pump.
2. Inspect the venting system for obstruction or leakage at least once a year. Periodically clean the inlet air filter and the screens in the vent terminal and combustion air terminal (when used).
3. Keep the appliance area clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
4. If the appliance 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.
5. Low water cutoffs, if installed, should be checked every 6 months. Float type low water cutoff should be flushed periodically.
6. Inspect flue passages, and clean with brushes/vacuums, if necessary. Sooting in flue passages indicates improper combustion. Determine the cause and correct.
7. Inspect the vent system and air intake system, and 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.

7.2 Appliance Maintenance and Component Description

Only genuine Laars 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 **Figure13** for location of gas train and control components.

The gas and electric controls on the appliance 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

7.2.1 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.

7.2.2 Filter

The filter used in the MT2P is washable with an 83% arrestance. Since the filter is washable, it will only need replacement in very rare cases. 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.

7.2.3 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 unions before and after the valve, and remove the valve. Pull the pipe nipples from the inlet and outlet of the valve, and clean the threads on the pipe nipples for re-use. Apply pipe dope to the pipe nipples (threaded joints should be coated with piping compound resistant to action of liquefied petroleum gas), and re-install in reverse order. Turn on manual gas shutoff valve and 120 volt power and check appliance operation and tightness of gas valve connections.

7.2.4 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.

7.2.5 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.

7.2.6 Temperature Control

The temperature control is a single stage electronic device. To replace control, shut-off the 120-volt power to the appliance. Remove the cover, then the low voltage wires and sensor wires (assuming the sensor is functional). Remove the mounting screws and pull the switch off of the control panel. Replace in reverse order.

7.2.7 Ignition Controls

The ignition controls ensure the proved interrupted-type ignition system. They control the hot

surface ignitor(s) and prove that the flame signal is appropriate for powering the gas valves. It also controls the blower's pre-purge and post-purge. MT2P sizes 500 and 750 have one ignition control. Sizes 1000, 1250, 1500, 1750 and 2000 have two ignition controls. On these models, one ignition control provides for part-load start-up and the second control brings the heater to full rate, after the first control has started the part-load burners.

To replace a control, shut off the 120-volt power to the appliance. 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.

7.2.8 Ignitors

The ignitors used are 120v "Hot Surface" type. They are energized whenever there is a call for heat and switched off when ignition is established and the flame has been sensed. MT2P sizess 500 and 750 have one ignitor. Sizes 1000, 1250, 1500, 1750 and 2000 have two ignitors. To replace the ignitor, shut off the 120-volt power to the appliance, remove the ignitor access panel, disconnect the Molex connector, remove the two mounting screws on the ignitor flange, and pull the ignitor out. Install in reverse order, always using a new ignitor gasket with the replacement ignitor.

Caution

Ignitor gets hot.

7.2.9 Ignition Sensors

The ignition sensors ensure that the main flame is ignited, so that raw gas is not allowed to fill the combustion chamber. The ignitors are the ignition sensors on MT2P appliances. There are no separate ignition sensors.

7.2.10 Transformer

The MT2P's transformer is not capable of supplying control voltage for external devices. 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.

7.2.11 Blowers

The combustion air blowers bring the combustion air for the MT2P from the upper chamber to the lower chamber. Mixing of the gas and air occurs in the burners. 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

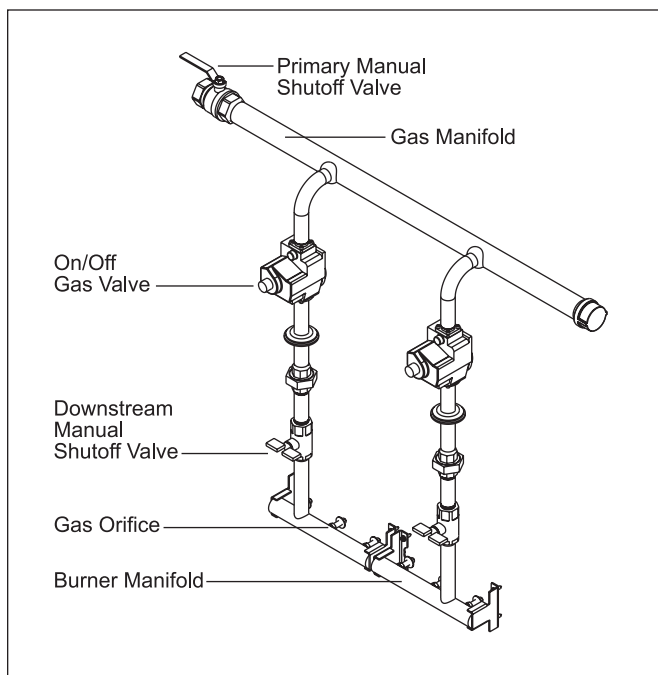


Figure 13. Typical Gas Train Configuration.

unit operates properly, by following the set-up procedure in this manual. Use caution in handling the blower, ensuring you do not put pressure on the blower wheel.

7.2.12 Flow Switch

The MT2P uses a paddle-type flow switch to ensure that the unit has water flow before ignition is allowed.

7.2.13 Heat Exchanger Coil

Caution

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

The MT2P 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 both sides of the 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). 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 above 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 boiler. 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 appliances, 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 will 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.
9. NOTE: While the heat exchanger is out of the unit, inspect the firewall refractory insulation. Replace if necessary.
10. 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. Laars offers a tube cleaning kit (p/n R0010000).
11. Reassemble in the reverse order, and check appliance 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

8.1 Resolving Lockouts

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

1. **Inadequate gas supply:** Before proceeding, ensure that the gas supply has not been shutoff or the LP tank (LP boilers) is not empty. Then, restart the boiler 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 appliance, after resetting the appliance and attempting another start-up. The gas pressure to the appliance 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 O₂ or CO₂). MT2P appliances operate best with 45% excess air (8% CO₂ on natural gas, 9.2% CO₂ on LP). Check the CO₂ of the appliance and adjust if necessary.
3. **Ignitor failure:** If the boiler goes through a normal start cycle but combustion does not occur, and the gas pressure is at least 5" w.c., ignitor failure may be the cause. Check the ignitor by unplugging it, allowing it to cool to room temperature, and measuring the ignitor resistance. It should be 50-80 ohms. If the resistance is not 50-80 ohms, replace the ignitor. If the resistance is correct, reset the boiler 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.

8.2 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.

8.3 Short Cycling

Because of the large mass of pool systems, short cycling should not exist. If it does, it will be caused by insufficient flow in the pool loop. Check that there is no blockage in the pool loop such as a plugged or partially plugged pool filter.

8.4 High Gas Consumption

Appliances operating with an improper air/fuel ratio are very inefficient and consequently, have very high gas consumption. Because efficiency is high when the CO₂ is high (or O₂ is low), appliances operating with low CO₂

or high O₂ (especially LP appliances) consume more gas. Adjust the CO₂ or O₂ for optimum efficiency. If no combustion analyzing equipment (CO₂ or O₂) is available then a proper adjustment of the air/fuel ratio (CO₂ or O₂) cannot be accomplished. However, by briefly sniffing the flue gases it is possible to determine if the CO₂ or O₂ 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 CO₂ or high O₂. The CO₂ should be 8% natural gas (9.2% LP) at high fire. To check the CO₂, first verify that the supply gas pressure is within 5" to 13" w.c. (1.2 to 3.2 kPa) With the MT2P running with both 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 CO₂, and adjust the air shutters if further adjustment to the CO₂ is needed. Models 1250, 1500, 1750 and 2000 have two blowers and two air chambers (boxes). The pressure of each air box must be equal when the final adjustment is made.

8.5 Troubleshooting the Pool Heater Temperature Control

With a Voltmeter, test for 24 VAC between terminals 1 & 2 on the 10 pin connector. Check that the sensor temperature is lower than the setpoint temperature by at least the differential setting. If this is true, check that there is 24 VAC at the yellow wire on the 4 pin connector. If there is not 24 VAC, check that the high limit is not open. If there is 24 VAC at the yellow wire on the 4 pin connector and not at the light blue wire on that connector, replace the control.

8.6 Troubleshooting MT2P Controls

The MT2 series consists of two models with one ignition module (500 & 750) and five models with two ignition control modules (1000-2000).

A diagnostic/power distribution terminal strip is located in the upper control panel. To access this remove the high limit/ignition control panel cover. Troubleshooting can be accomplished by using a voltmeter to verify 24-volts has energized individual components.

Ladder diagrams for models 500-750 are shown in [Figure 7](#). These models have one ignition control and one inducer. This inducer is powered directly from the Fenwal ignition control's "Fan Connections". The wire diagrams for these models are located in [Figure 10](#).

The ladder diagram for model 1000 is shown in [Figure 8](#). This model has two ignition controls and one inducer. This inducer is powered directly from the Fenwal ignition control's "Fan Connections". The wire diagrams for these models are located in [Figure 11](#).

Ladder diagrams for sizes 1250-2000 are shown in [Figure 9](#). These models have two ignition controls and two inducers. This inducer is powered indirectly from the Fenwal ignition control's "Fan Connections" via two 120-volt switching relays. When either ignition module receives a call for heat, it switches its blower to high speed and the blower of the idle ignition module to low speed. The wiring diagram is shown in [Figure 12](#).

SECTION 9.

Replacement Parts

Only genuine Laars replacement parts should be used.

9.1 General Information

To order or purchase parts for the Laars MT2P, contact your nearest Laars dealer or distributor. If they cannot supply you with what you need, contact Customer Service (see back cover for address, telephone and fax numbers).

9.2 Parts List

[illegible]

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 15								
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)	
	Manifold, 3 Burner/Orifice, Right	L2012900 (1)	L2012900 (1)		L2012900 (2)	L2012900 (1)	L2012900 (1)	

Item	Description	Size 500	Size 750	Size 1000	Size 1250	Size 1500	Size 1750	Size 2000
	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 (3)	L2012200 (2)
	Assembly, 4 Burner			L2012500 (3)		L2012500 (3)	L2012500 (3)	L2012500 (4)
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 (3)	
	Gasket, 4 Burner			S2012500 (3)		S2012500 (3)	S2012500 (3)	
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 16							
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	A0063300	A0063300	A0063600	A0063600	A0063600	A0063600	A0002700
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 17							
75	DPDT Switch	E0109200	E0109200	E0109200	E0109200	E0109200	E0109200	E0109200
75A	DPDT Switch	E2056300	E2056300	E2056300	E2056300	E2056300	E2056300	E2056300
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)

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

Quantity 1 unless otherwise indicated: (2)

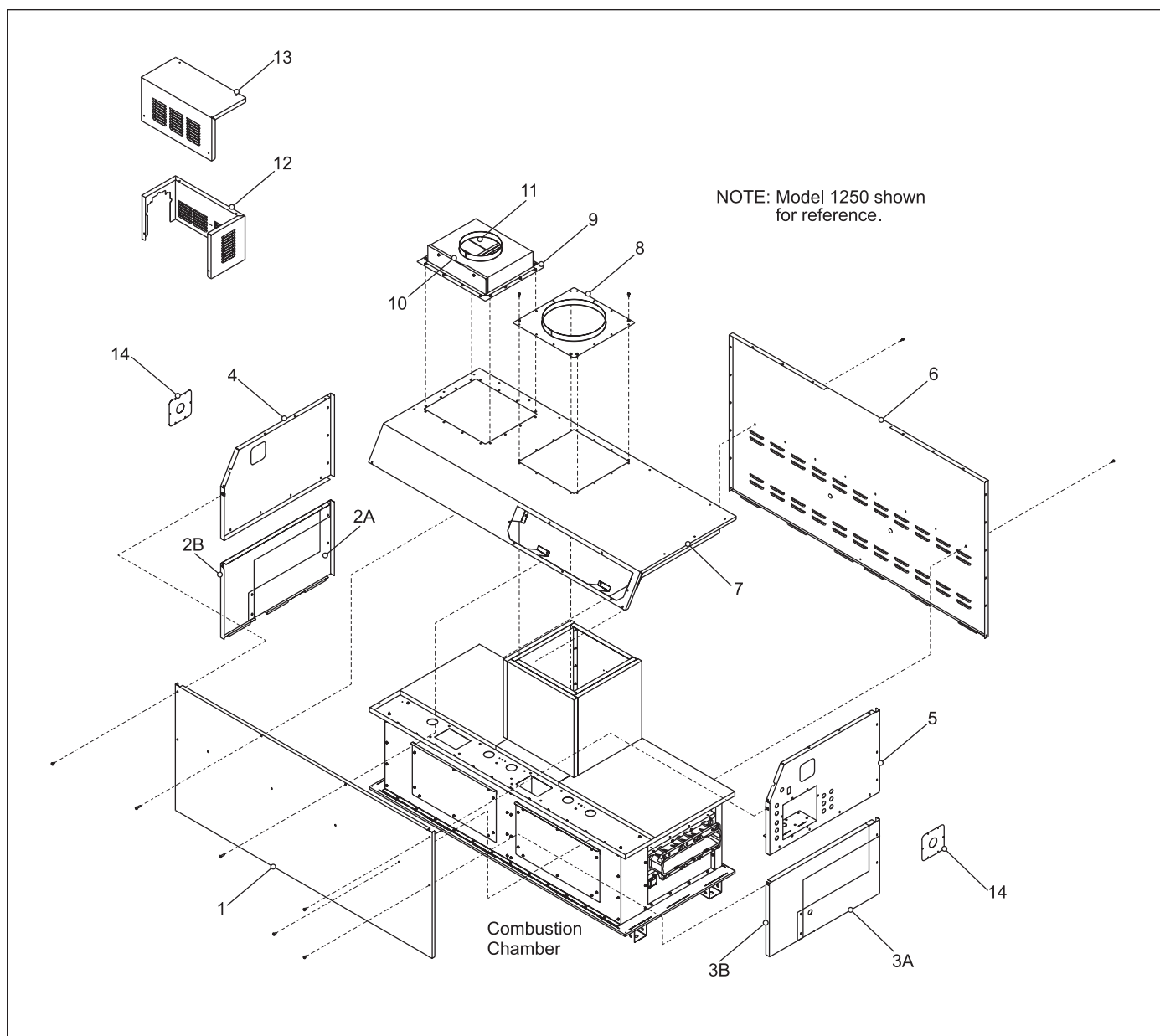


Figure 14. Sheet Metal Components.

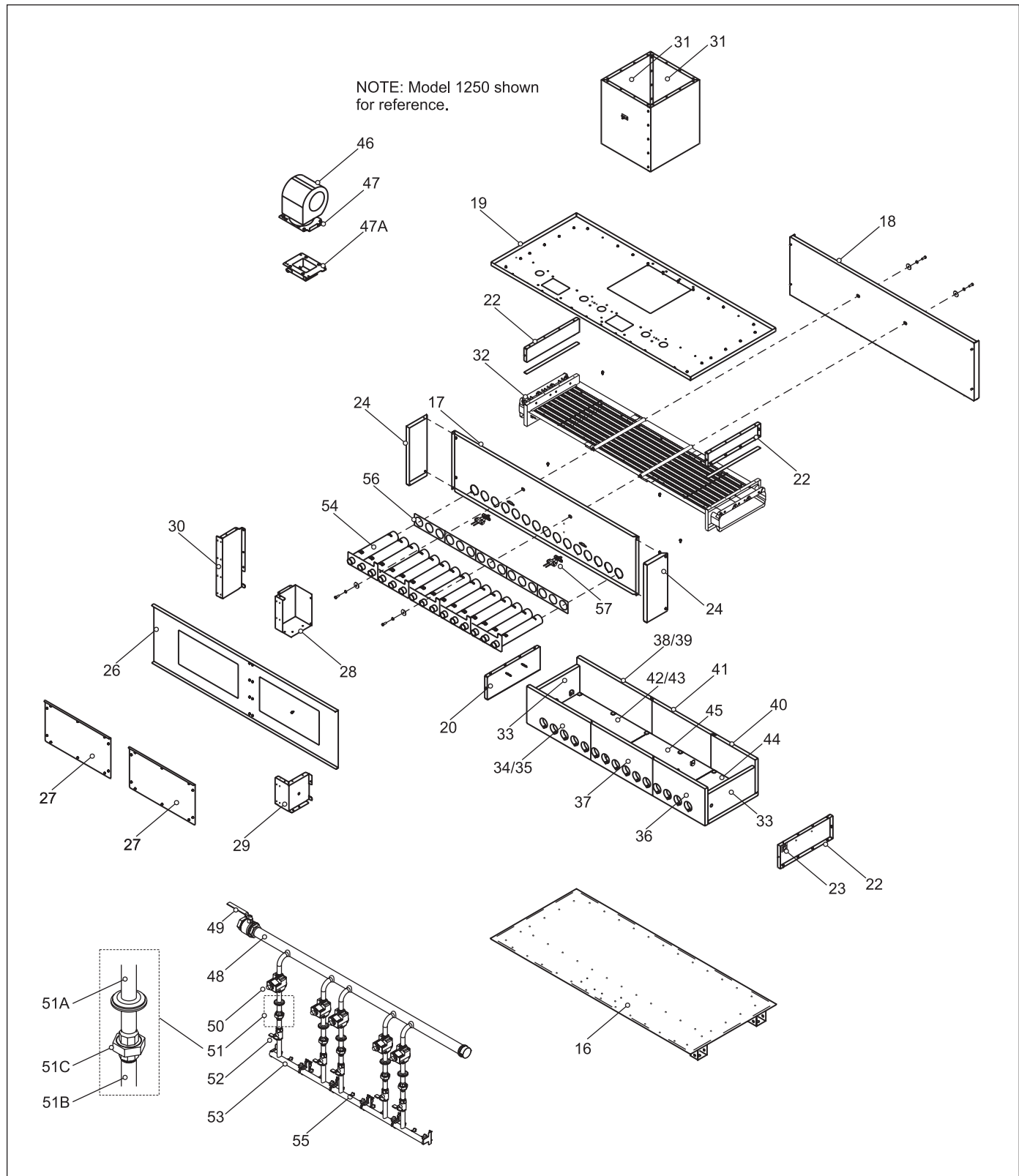


Figure 15. Internal Components.

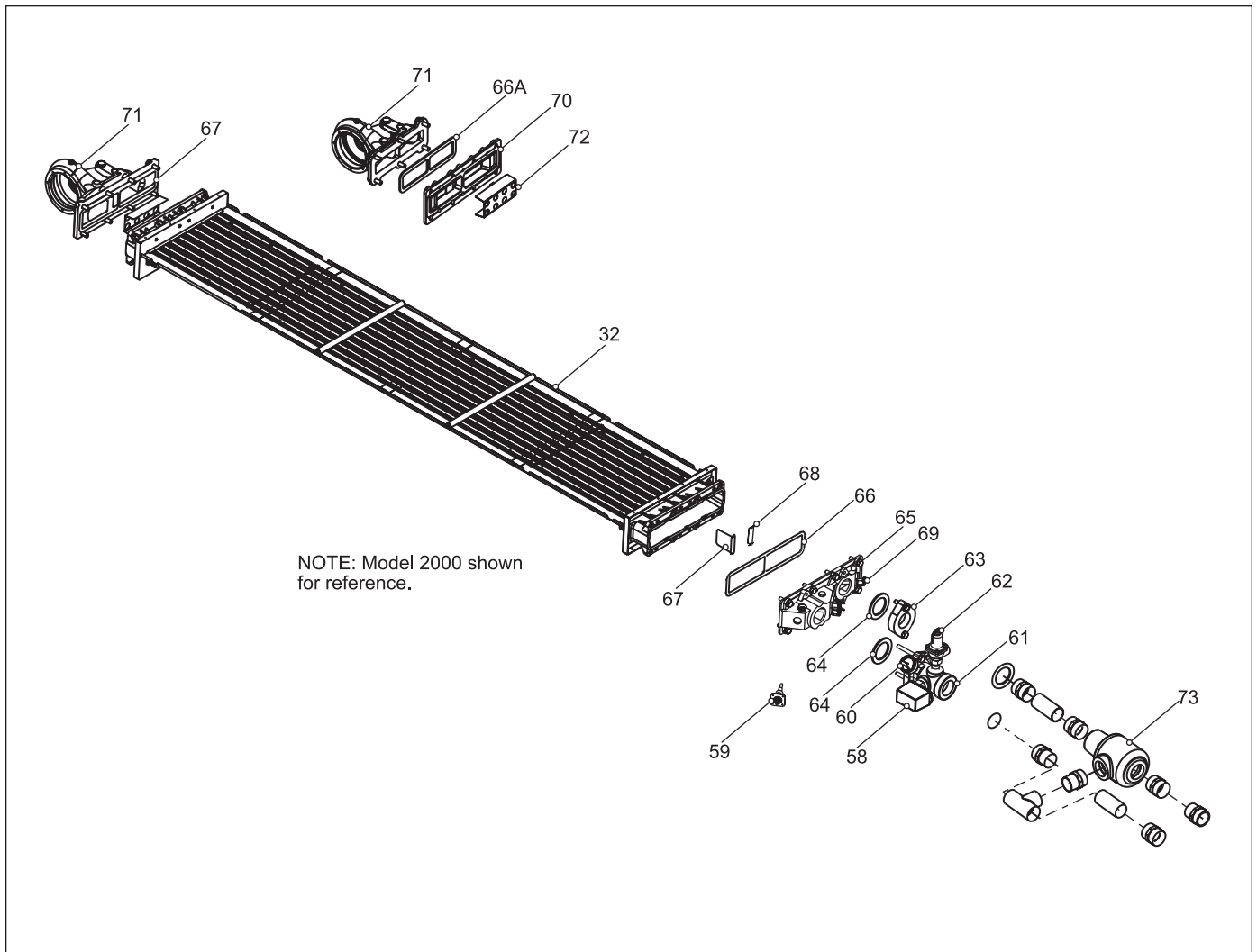


Figure 16. Heat Exchanger Components.

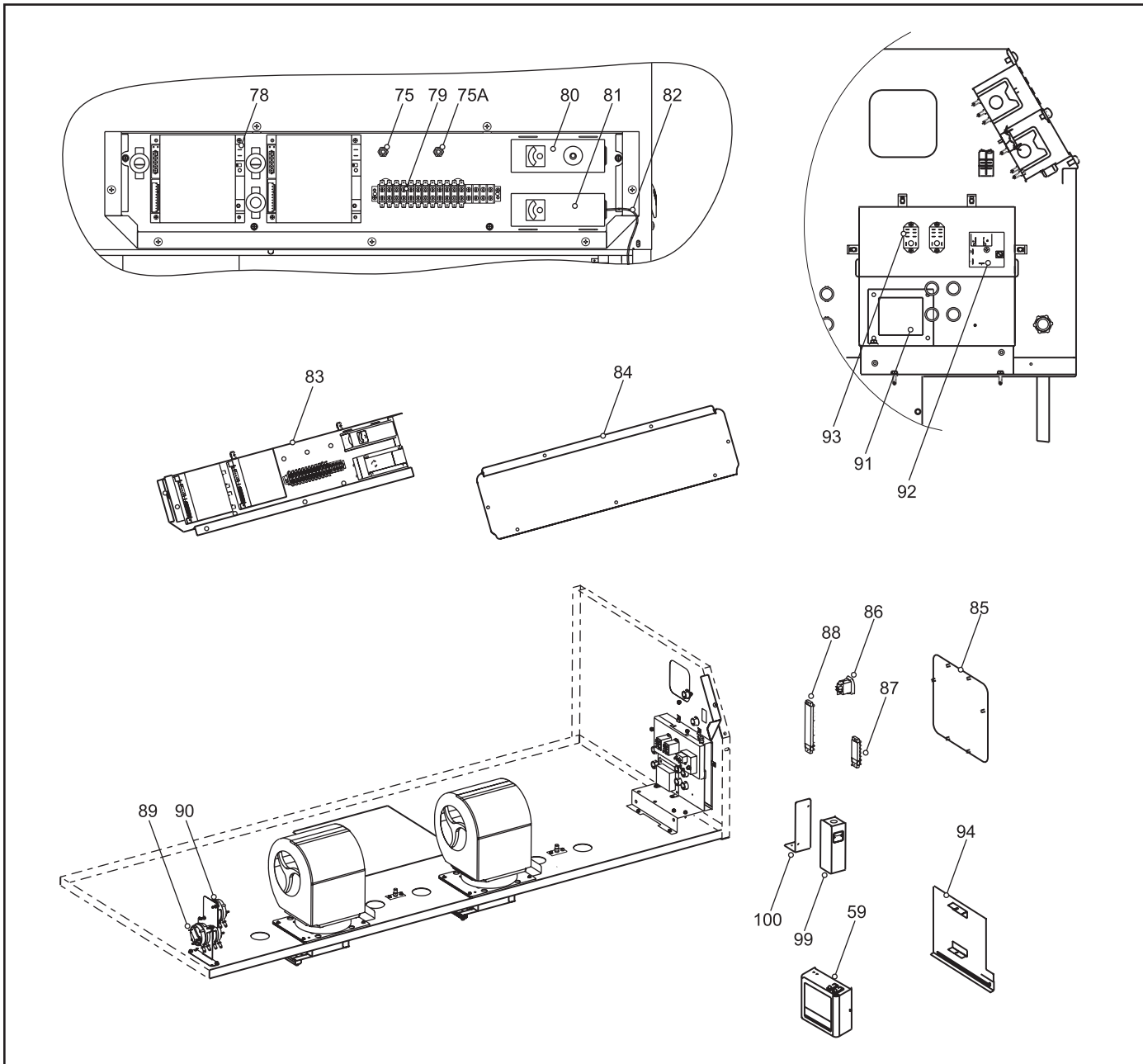


Figure 17. Electrical components.



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Dimensions and specifications subject to change without notice in accordance with our policy of continuous product improvement.