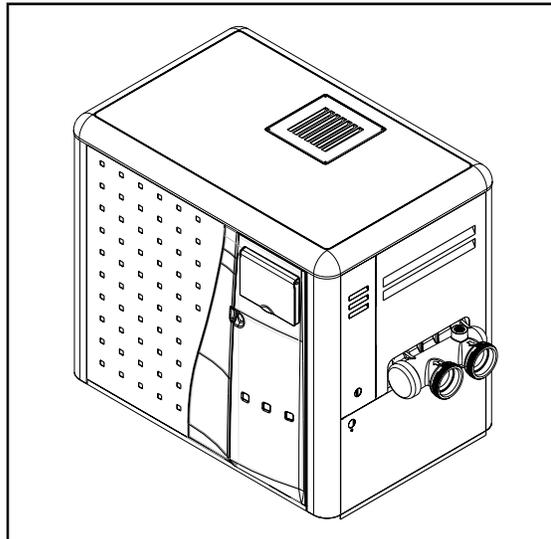


MiniMax[®] NT Series Pool & Spa Heaters

OPERATION & INSTALLATION MANUAL



U.S. Patent Numbers
6,295,980
5,318,007 - 5,228,618
5,201,307 - 4,595,825



To
Consumer
Retain For
Future
Reference

WARNING

FOR YOUR SAFETY - READ BEFORE OPERATING

- If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.
- Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Installation and service must be performed by a qualified installer, service agency or the gas supplier.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this heater or other appliances.

WHAT TO DO IF YOU SMELL GAS

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

For additional free copies of this manual; call (800) 831-7133.

Pentair Water Pool and Spa, Inc.

1620 Hawkins Ave., Sanford, NC 27330 • (919) 566-8000
10951 W. Los Angeles Ave., Moorpark, CA 93021 • (805) 523-2400

Customer Service

If you have questions about ordering Pentair Pool Products replacement parts, and pool products, please use the following contact information.

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Phone: (800) 831-7133 (press 3 in voice mail)

Fax: (800) 284-4151

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Web site

visit www.pentairpool.com to find information about Pentair Water Pool and Spa, Inc.

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Heater Identification Information

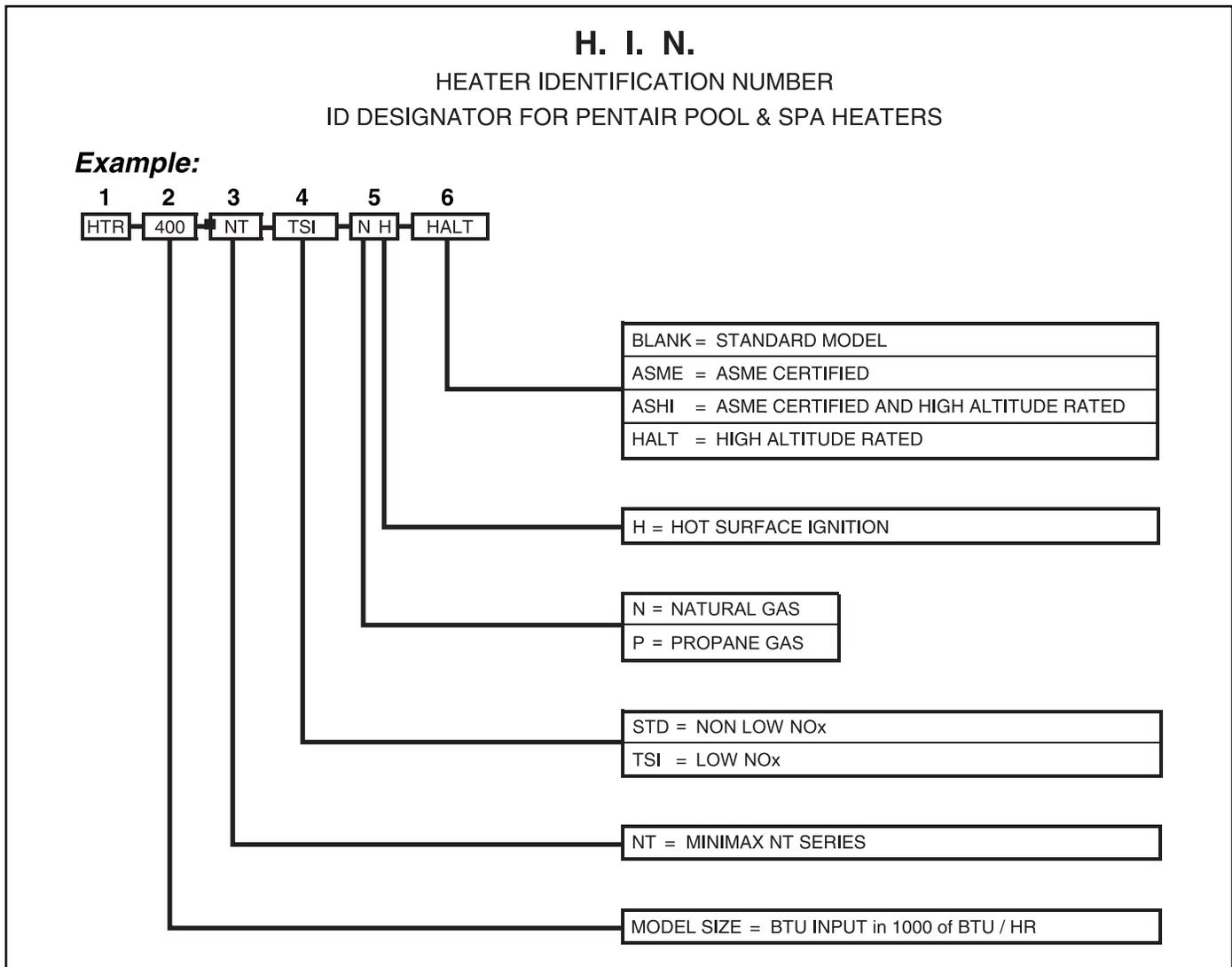
To identify the heater, see rating plate on the inner front panel of the heater. There are two designators for each heater, one is the Model Number and the other is the Heater Identification Number (HIN).

a. Heater Identification Number (HIN)

The following *example* simplifies the identification system:

- 1) **HTR** : Heater
- 2) **(200, 250, 300 or 400)** : Input rating (Btu/hr) X 1000
- 3) **NT** : MiniMax NT Series
- 4) **STD or TSI** : Series Character
- 5) **NH or PH**: Gas type (Natural gas or Propane gas) and ignition system (Hot Surface Ignition)
- 6) Options :
 - Blank**: Standard Model
 - ASME**: ASME Certified (Bronze Headers)
 - ASHI**: ASME Certified Bronze Header and High Altitude Rating
 - HALT**: High Altitude Rating

HEATER IDENTIFICATION INFORMATION — (HIN)



Introduction

MiniMax[®] NT Series

Pool and Spa Heaters

Congratulations on your purchase of a MiniMax NT high performance heating system. Proper installation and service of your new heating system and correct chemical maintenance of the water will ensure years of enjoyment. The MiniMax NT is a compact, lightweight, efficient, induced-draft, gas fired high performance pool and spa heater that can be directly connected to schedule 40 PVC pipe. The MiniMax NT also comes equipped with the Pentair multifunction temperature controller which shows, at a glance, the proper functioning of the heater. All MiniMax NT heaters are designed with a direct ignition device, HSI (hot-surface ignition), which eliminates the need for a standing pilot. The MiniMax NT requires an external power source (120/240 VAC 60 Hz) to operate.

This instruction manual provides operating instructions, installation and service information for the MiniMax NT high performance heater. The information in this manual applies to all MiniMax NT models. It is very important that the owner/installer read and understand the section covering installation instructions, and recognize the local and state codes before installing the MiniMax NT. History and experience has shown that most heater damage is caused by improper installation practices.

IMPORTANT NOTICES

...For the installer and operator of the MiniMax NT pool and spa heater. The manufacturer's warranty may be void if, for any reason, the heater is improperly installed and/or operated. Be sure to follow the instructions set forth in this manual. If you need any more information, or if you have any questions regarding to this pool heater, please contact Pentair Water Pool and Spa, Inc. at (800) 831-7133.

WARRANTY INFORMATION

The MiniMax NT pool heater is sold with a limited factory warranty. *Specific details are described on the warranty registration card which is included with the product.* Return the warranty registration card after filling in the serial number from the rating plate inside the heater.

Pentair Pool Products' high standards of excellence include a policy of continuous product improvement resulting in your state-of-the-art heater. We reserve the right to make improvements which change the specifications of the heater without incurring an obligation to update the current heater equipment.

These heaters are designed for the heating of swimming pools and spas, and should never be used as space heating boilers, general purpose water heaters, in non-stationary installations, or for the heating of salt water. The manufacturer's warranty may be void if, for any reason, the heater is improperly installed and/or operated. Be sure to follow the instructions set forth in this manual.

⚠ CAUTION

OPERATING THIS HEATER CONTINUOUSLY AT WATER TEMPERATURE BELOW 68° F. WILL CAUSE HARMFUL CONDENSATION AND WILL DAMAGE THE HEATER AND VOID THE WARRANTY. Do not use the heater to protect pools or spas from freezing if the final maintenance temperature desired is below 68° F., as this will cause condensation related problems.

CODE REQUIREMENTS

The installation must conform with local codes or, in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* and/or *CSA B149.1, Natural Gas and Propane Installation Codes*. The heater, when installed, must be electrically grounded and bonded in accordance with local codes or, in the absence of local codes, in the USA, with the *National Electrical Code, ANSI/NFPA 7*; in Canada, with *Canadian Electric Code, CSA C22.1*.



CONSUMER INFORMATION AND SAFETY

⚠️ WARNING

The U.S. Consumer Product Safety Commission warns that elevated water temperature can be hazardous. See below for water temperature guidelines before setting temperature.

1. Spa or hot tub water temperatures should never exceed 104° F. A temperature of 100° F. is considered safe for a healthy adult. Special caution is suggested for young children. Prolonged immersion in hot water can induce hyperthermia.
2. Drinking of alcoholic beverages before or during spa or hot tub use can cause drowsiness which could lead to unconsciousness and subsequently result in drowning.
3. Pregnant women beware! Soaking in water above 100° F. 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. maximum rule.
4. Before entering the spa or hot tub, the user 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.
5. 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.
6. Persons taking medication which induce drowsiness, such as tranquilizers, antihistamines or anticoagulants should not use spas or hot tubs.

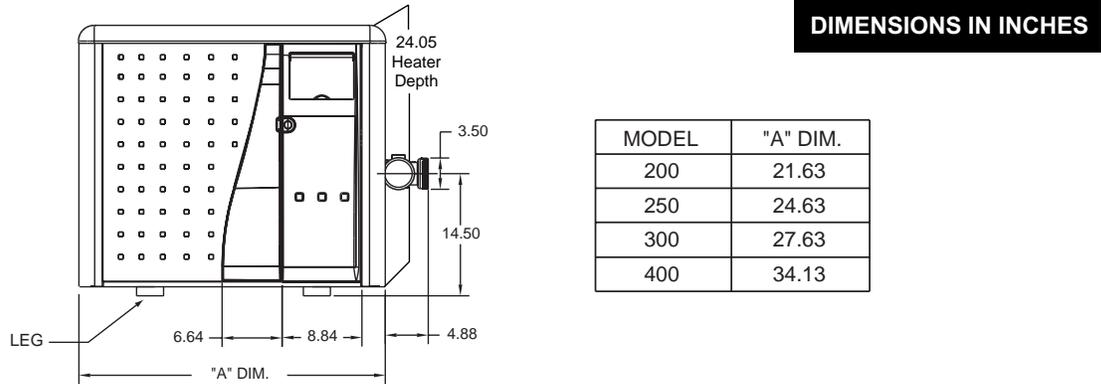
⚠️ WARNING

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the heater. Do not use this heater if any part has been under water. Immediately call a qualified service technician to inspect the heater and to replace any part of control system and gas control which has been under water.

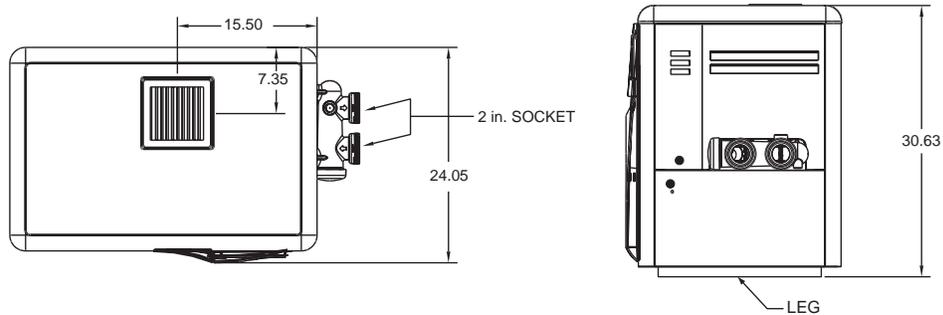
Installation Instructions

SPECIFICATIONS

These installation instructions are designed for use by qualified personnel only, trained especially for installation of this type of heating equipment and related components. Some states require installation and repair by licensed personnel. If this applies in your state, be sure your contractor bears the appropriate license. See **Figure 1** for Outdoor and Indoor Installations.



OUTDOOR INSTALLATION



INDOOR INSTALLATION

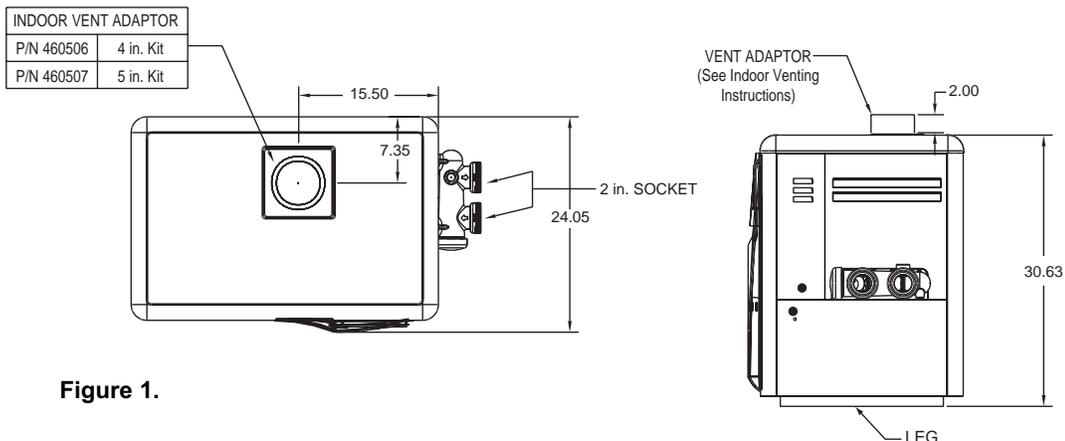


Figure 1.

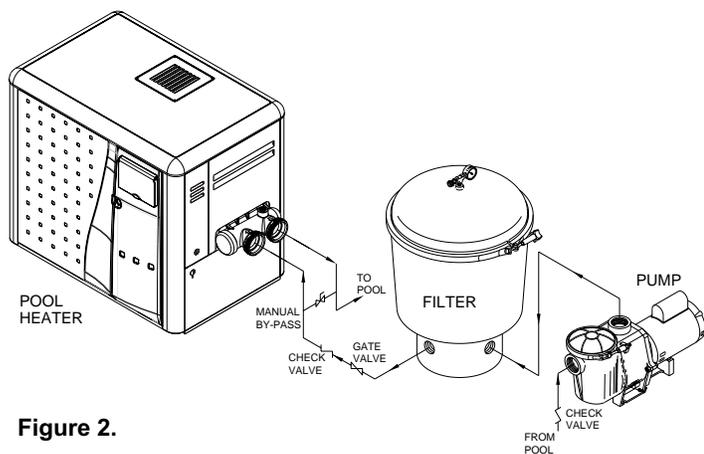


Figure 2.

PLUMBING CONNECTIONS

The MiniMax NT heater has the unique capability of direct schedule 40 PVC plumbing connections. A set of bulkhead fittings is included with the MiniMax NT to insure conformity with Pentair’s recommended PVC plumbing procedure. Other plumbing connections can be used. See Figure 2 for plumbing connections.

MANUAL BY-PASS

Where the flow rate exceeds the maximum 120 GPM, a manual bypass should be installed and adjusted. After adjustments are made, the valve handle should be removed to avoid tampering. See Figure 2.

Model	Min. (GPM)	Max. (GPM) *
200	20	120
250	30	120
300	30	120
400	40	120
* Do not exceed the maximum recommended flow rate for the connecting piping.		

Table 1.

⚠ CAUTION

Before operating the heater on a new installation, turn on the circulation pump and bleed all the air from the filter using the air relief valve on top of the filter. Water should flow freely through the heater. Do not operate the heater unless water in the pool/spa is at the proper level. If a manual by-pass is installed, temporarily close it to insure that all air is purged from the heater.

See page 30 for Pressure Relief Valve Installations.

BELOW POOL INSTALLATION

If the heater is below water level, the pressure switch must be adjusted. This adjustment must be done by a qualified service technician. See following CAUTION before installation.

VALVES

When any equipment is located below the surface of the pool or spa, valves should be placed in the circulation piping system to isolate the equipment from the pool or spa. Check valves are recommended to prevent back siphoning.

⚠ CAUTION

BELOW OR ABOVE POOL INSTALLATION

The water pressure switch is set in the factory at 1½ PSI. This setting is for a heater installed at pool level or within 3’ above or 3’ below. If the heater is to be installed more that 3’ above or 3’ below, the water pressure switch must be adjusted by a qualified service technician. See page 22, Figure 22.

FLOW SWITCH

If the heater is installed more the 6’ above the pool or more than 10’ below the pool level, you will be beyond the limits of the pressure switch and a flow switch must be installed. Locate and install the flow switch externally on the outlet piping from the heater, as close as possible to the heater. Connect the flow switch wires in place of the water pressure switch wires.

⚠ CAUTION

Exercise care when installing chemical feeders so as to not allow back siphoning of chemical into the heater, filters or pump. When chemical feeders are installed in the circulation of the piping system, make sure the feeder outlet line is down stream of the heater, and is equipped with a positive seal noncorrosive “Check Valve”, (P/N R172288), between the feeder and heater.

WATER CONNECTIONS

Reversing Headers —

Reversible Inlet/Outlet Connection

The MiniMax NT Series heater is factory assembled with right side inlet/outlet water connections. The inlet/outlet header can be reversed for left side water connections **without removing the heat exchanger**.

Reversing Water Connections

Tools required:

Phillips Screw Driver
9/16 in. Socket and Wrench
1/2 in. & 9/16 in. Open Wrench

1. Remove the right and left large access doors. *It is not necessary to remove the top of the heater to gain access to the headers.*



2. Disconnect all wires from the high-limit switches except the short jumper wire.



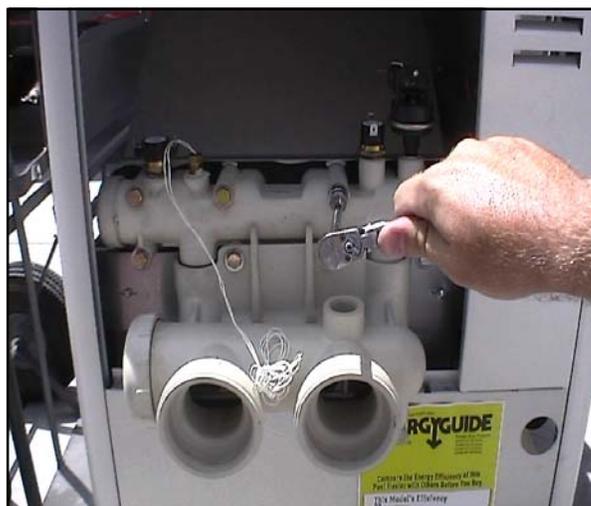
NOTE

Do **NOT** remove the high-limit and pressure switches or the thermistor from the front header during the reversing procedure, as they will be in the proper location when installed on the left side.

3. Disconnect the water pressure switch wiring.
4. Disconnect the temperature sensor wires from the circuit board and feed them back to the header.



5. Remove the 8 bolts holding the main inlet/outlet head.



Reversible Inlet/Outlet Connection, cont'd.

On the MiniMax NT Series heater there is insulation installed by the factory on the return head side of the heaters. This insulation is there so that if the heads are reversed in the field, during initial installation of the heater, the high limits will be insulated from the heat radiating from the flue collector.

- Return head in position before removal. This view shows the insulation installed by the factory. Remove the 8 bolts holding the return head in place.



- When heads are removed, replace the heat exchanger tube seal gaskets.



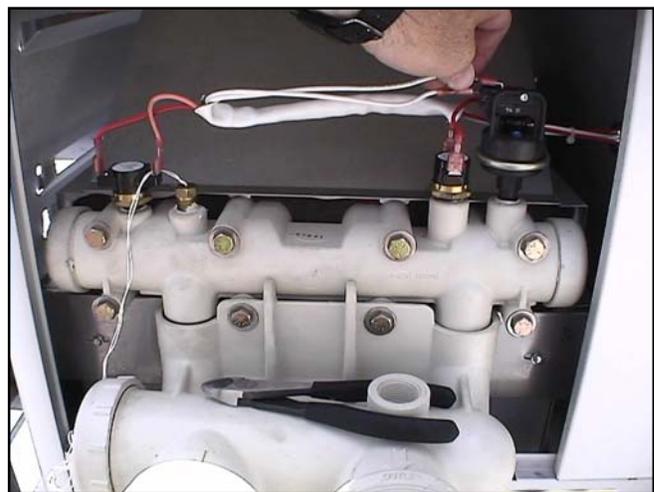
- Exchange the inlet/outlet header with the return header. Lift the insulation to allow the main head to be installed. Align header with the heat exchanger. When head is placed into position, release the insulation; it will now shield the high limits from the heat produced by the flue collector. Install header bolts, and tighten snugly by hand. (This will help avoid cross threading.) When tightening, use a cross pattern starting from the center of the header. **DO NOT over tighten.**



- Install the temperature sensing probe by passing the wires through the hole provided on the left side of the brace panel. Route wires through the support bracket.



- Reconnect all the high limit wires and the pressure switch wiring, routing the wires through the same hole as the thermostat sensor wires.



- Pump and bleed system to check the head for leaks.
- Reinstall the two large inspection plates on the appropriate side.

Remember: The inlet and outlet markings on the header are still correct.
Do not plumb the heater backwards.

GAS CONNECTIONS

GAS LINE INSTALLATIONS

Before installing the gas line, be sure to check which gas the heater has been designed to burn. This is important because different types of gas require different gas pipe sizes. The rating plate on the heater will indicate which gas the heater is designed to burn. The tables, shown on page 12, show which size pipe is required for the distance from the gas meter to the heater. The table is for natural gas at a specific gravity of .65 and propane at a specific gravity of 1.55.

When sizing gas lines, calculate three (3) additional feet of straight pipe for every elbow used. When installing the gas line, avoid getting dirt, grease or other foreign material in the pipe as this may cause damage to the gas valve, which may result in heater failure.

The gas meter should be checked to make sure that it will supply enough gas to the heater and any other appliances that may be used on the same meter. The gas line from the meter will usually be of a larger size than the gas valve supplied with the heater. Therefore a reduction of the connecting gas pipe will be necessary. Make this reduction as close to the heater as possible.

The heater and any other gas appliances must be disconnected from the gas supply piping system during any pressure testing on that system, (greater than ½ PSI). The heater and its gas connection must be leak tested before placing the heater in operation. **Do not use flame to test the gas line.** Use soapy water or another nonflammable method.

NOTE

A manual main shut-off valve must be installed externally to the heater.

⚠ WARNING

DO NOT INSTALL THE GAS LINE UNION INSIDE THE HEATER CABINET. THIS WILL VOID YOUR WARRANTY.

SEDIMENT TRAPS

Install a sediment in front of the gas controls. The sediment trap shall be either a tee fitting with a capped nipple in the bottom outlet which can be removed for cleaning, as illustrated in Figure 3, or a other device recognized as an effective sediment trap. All gas piping should be tested after installation in accordance with local codes.

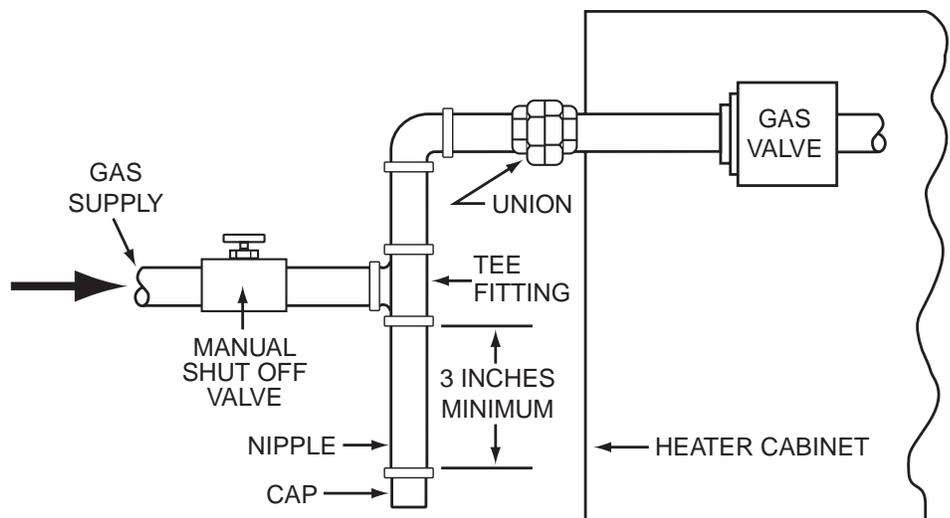


Figure 3.

GAS PIPE SIZING

Table 2.

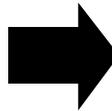
PIPE SIZING FOR GAS LINE CONNECTIONS														
MAXIMUM EQUIVALENT PIPE LENGTH (Ft.)														
Natural Gas at 1000 B.T.U. per Cubic Foot														
Propane Gas at 2500 B.T.U. per Cubic Foot														
MODEL	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"		2-1/2"	
	NAT	PRO	NAT	PRO	NAT	PRO	NAT	PRO	NAT	PRO	NAT	PRO	NAT	PRO
200	-	20'	30'	80'	125'	250'	450'	600'	-	-	-	-	-	-
250	-	10'	20'	50'	70'	150'	250'	500'	600'	-	-	-	-	-
300	-	-	10'	30'	50'	100'	200'	350'	400'	600'	-	-	-	-
400	-	-	-	10'	20'	60'	100'	150'	200'	450'	400'	-	-	-

“RESIDENTIAL” PROPANE GAS 2 STAGE REGULATION

In many Propane gas line installations, the gas supplier and/or installer will utilize a two stage regulation process where by at the supply tank they will install the first stage gas regulator, which would be at a higher pressure, usually 10 psi. This higher pressure allows for a much longer distance and in a much smaller pipe size. Then within a short distance of the pool heater, usually around 24 inches, they will install a second regulator, which is the second stage, and this would be set at the required inlet pressure of the heater.

See “Gas Pressure Requirement Charts”

Stage One "High Pressure" Gas Pipe Sizing			
10 PSI @ 2500 B.T.U. Per CU. FT.			
MAXIMUM EQUIVALENT PIPE LENGTH			
Model	0 to 50 Ft.	50 to 100 Ft.	100 to 150 Ft.
200 through 400	1/2 in.	1/2 in.	1/2 in.



Stage Two "Low Pressure" Gas Pipe Sizing		
Stage 2 set at 14 in. W.C.		
MAXIMUM EQUIVALENT PIPE LENGTH		
Model	0 to 10 Ft.	10 to 20 Ft.
200 through 400	3/4 in.	3/4 in.

Table 3.

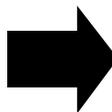
Table 4.

“RESIDENTIAL” NATURAL GAS 2 STAGE REGULATION

In many Natural gas line installations, the gas supplier and/or installer may utilize a two stage regulation process where by at the streets main gas supply they will install the first stage gas regulator, which would be at a higher pressure. This higher pressure is usually set at 2 psi or 5 psi and can be for long distances and in a much smaller pipe size. Then within a short distance of the pool heater, generally around 24 inches, they will install a second regulator, which is the second stage. This second stage regulator would be set at the minimum operating pressure for the heater. For “Natural Gas Pentair Pool Heaters” the minimum is 7 inches W.C.

See “Gas Pressure Requirement Charts”

Stage One "High Pressure" Gas Pipe Sizing			
2 PSI @ 1000 B.T.U. Per CU. FT.			
MAXIMUM EQUIVALENT PIPE LENGTH			
Model	0 to 50 Ft.	50 to 100 Ft.	100 to 150 Ft.
200 through 300	1/2 in.	1/2 in.	1/2 in.
400	3/4 in.	3/4 in.	3/4 in.
5 PSI @ 1000 B.T.U. Per CU. FT.			
200 through 400	1/2 in.	1/2 in.	1/2 in.



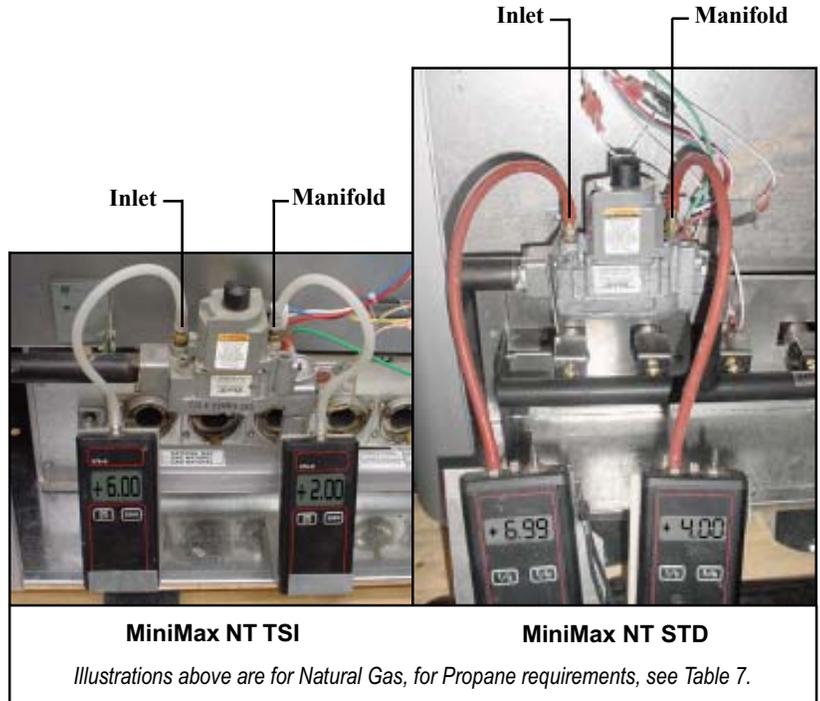
Stage Two "Low Pressure" Gas Pipe Sizing		
Stage 2 set at 7 in. W.C.		
MAXIMUM EQUIVALENT PIPE LENGTH		
Model	0 to 10 Ft.	10 to 20 Ft.
200 through 300	3/4 in.	3/4 in.
400	3/4 in.	1 in.
Stage 2 set at 7 in. W.C.		
200 through 400	3/4 in.	1 in.

Table 5.

Table 6.

TESTING GAS PRESSURE

1. Push the power switch to “OFF”.
2. Turn the gas valve knob to “OFF”.
3. Remove 1/8 in. NPT plug on the outlet side of the valve and screw in the fitting from the Manometer kit.
4. Connect the Manometer hose to the fitting.
5. Turn the gas valve knob to “ON”.
6. Turn on the heater and read the Manometer.
7. The Manometer must read per the values of the Gas Pressure Requirement Table, on manifold side of the gas valve, while operating.
8. If reading is below specified; check the inlet pressure while the heater is running to make sure of proper supply before attempting adjustments.
9. For adjustment, remove the Regulator Adjustment Cap and using a screwdriver turn the screw clockwise to increase - counterclockwise to decrease gas pressure.



⚠ CAUTION

The use of Flexible Connectors (FLEX) is NOT recommended as they cause excessive high gas pressure drops.

GAS PRESSURE REQUIREMENTS

Gas Pressure	Model	Natural	Propane
		Inches W.C.	
Maximum Inlet	STD	10	14
	TSI	10	N/A
Minimum Inlet	STD	5*	12
	TSI	4	N/A
Manifold	STD	4	11
	TSI	2	N/A

NOTE: All readings must be taken while heater is operating. Any adjustments or readings made while heater is off will result in performance problems.

All Values are +/- 0.2 inch W.C.
 * 6 inch. W.C. for STD 400 Model.

Table 7.

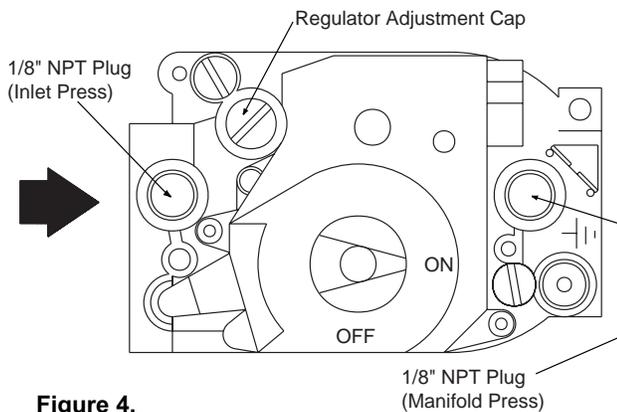


Figure 4.

INDOOR VENTING — General Requirements

The vent pipe must be the same size or larger. The MiniMax NT heaters are capable of a 360-degree discharge rotation and operate with a positive vent static pressure and with a vent gas temperature less than 400° F. The total length of the horizontal run must not exceed the length that is listed below in the tables.

NOTE

The allowable vent runs for each vent pipe diameter are different and can not be exceeded.

Each 90-degree elbow reduces the maximum horizontal vent run by 8 feet and each 45-degree elbow in the vent run reduces the maximum vent run by 4 feet. See the tables below for the maximum vent lengths using 90-degree and 45-degree elbows.

The MiniMax NT is a “Category III” appliance and is an induced-draft pool and spa heater which uses positive pressure to push flue gases through the vent pipe to the outside. This requires a completely sealed vent system—single wall vent pipe with sealed-seams and joints. **Flue gases under positive pressure may escape into the dwelling with any cracks or loose joints in the vent pipe, or improper vent installation.** The vent pipe must be of a sealed-seam construction, such as those listed for use with “Category III Appliances”, and for operating temperatures less than 400° F. The use of listed thimbles, roof jacks and/or side vent terminals are required; and the proper clearances to combustible materials must be maintained in accordance with type of vent pipe employed—in the absence of a clearance recommendation by the vent pipe manufacturer, the requirements of the Uniform Mechanical Code should be met. **The ventilation air requirements for the MiniMax NT heater can be found on page 16.** It is recommended that vent runs over 18 feet be insulated to reduce condensation related problems and/or the use of a condensate trap in the vent run close to the heater may be necessary in certain installations such as cold climates. The MiniMax NT heater is suitable for through-the-wall venting, see table and dimensions below.

Recommended sources for Side-wall vent hood terminals include: The Field Controls Co. (2308 Airport Road, Kingston, NC 28501, (800)742-8368) and Tjernlund Products Inc. (1601 Ninth Street, White Bear Lake, MN 55110, (800) 255-4208)—consult manufacturer for model information and availability.

4 inch Vent Pipe		
Number of Elbows		Maximum Vent Run (Feet)
90°	45°	
1	—	22
1	1	18
1	2	14
2	—	14

Table 8.

5 inch Vent Pipe			5 inch Vent Pipe		
Number of Elbows		Maximum Vent Run (Feet)	Number of Elbows		Maximum Vent Run (Feet)
90°	45°		90°	45°	
0	2	45	2	2	29
1	—	45	2	3	25
1	1	41	2	4	21
1	2	37	3	—	29
1	3	33	3	1	25
2	—	37	3	2	21
2	1	33	4	—	21

Table 9.

CAUTION

Do NOT combine exhaust vent pipes to a common exhaust vent in multiple unit installations. Run separate vent pipes.

THROUGH WALL VENT KITS FOR HEATERS						
Part Number	Dim. A	Dim. B	Dim. C	Dim. D	Dim. E	Dim. F
471532	4 in. Dia.	6 in. Dia.	8½ in.	6 5/16 in.	12 5/8 in.	10 5/8 in.
471543	5 in. Dia.	8 in. Dia.	8½ in.	8 in.	12 5/8 in.	10 5/8 in.

Table 10.

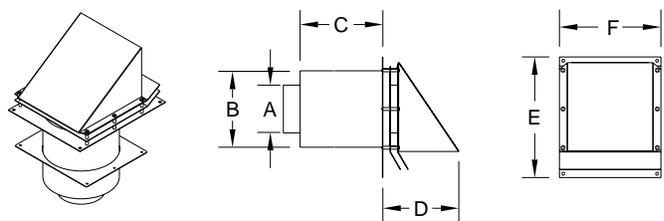


Figure 5.

INDOOR INSTALLATION (USA ONLY)

OUTDOOR SHELTER INSTALLATION (CANADA)

See page 16 for Vent Adaptors

All products of combustion and vent gases must be completely removed to the outside atmosphere through a vent pipe which is connected to the stack adaptor. A vent pipe extension of the same size must be connected to the vent adaptor and extended at least 2 feet higher than highest point of the roof within a 10 foot horizontal radius, and at least 3 ft. higher than the point at which it passes through the roof, or as permitted by local code; see Figures 6, 7 and 12. The vent should terminate with an approved vent cap (weather cap) for protection against rain or blockage by snow. Insulated vent pipe and an approved roof jack shall be employed through the roof penetration.

The heater must be located as close as practical to a chimney or gas vent.

CAUTION
The heater should be installed at least 5 feet away from the pool or spa.

The heater must be placed in a suitable room with adequate ventilation and on a leveled floor, where leakage from heat exchanger or water connections will not result in damage to the area adjacent to the heater or the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan with adequate drainage, be installed under the heater. The pan must not restrict air flow.

It is recommended to install the heater on fire-resistance slabs. Do not install the heater directly on a combustible wood floor without placing a non-combustible material between the floor and the heater. **Heaters must NEVER be installed directly on carpeting.**

Installations in basements, garages, or underground structures where flammable liquids may be stored must have the heater elevated 18 inches from the floor. The following minimum clearances from combustible materials must be provided.

SIDE OF HEATER	INSTALLATION	
	INDOOR (Outdoor Shelter)	OUTDOOR
	INCHES	INCHES
WATER PIPING	18	18
BLANK	6	6
REAR	6	6
TOP *	18	Open Un-roofed Area
FRONT	24	24

* To ceiling or roof.

Table 11.

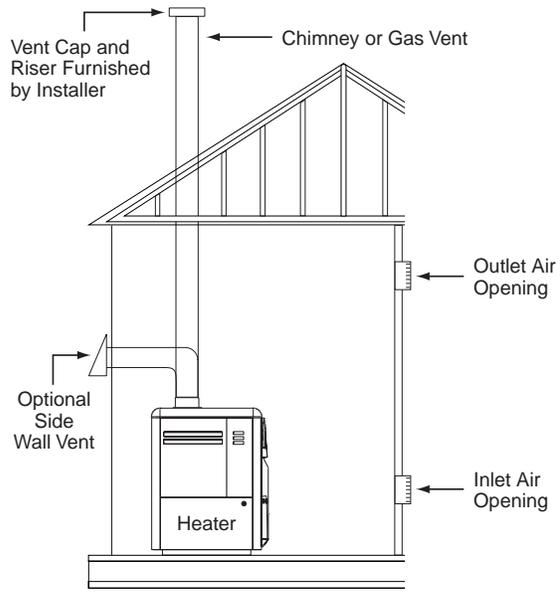


Figure 6.

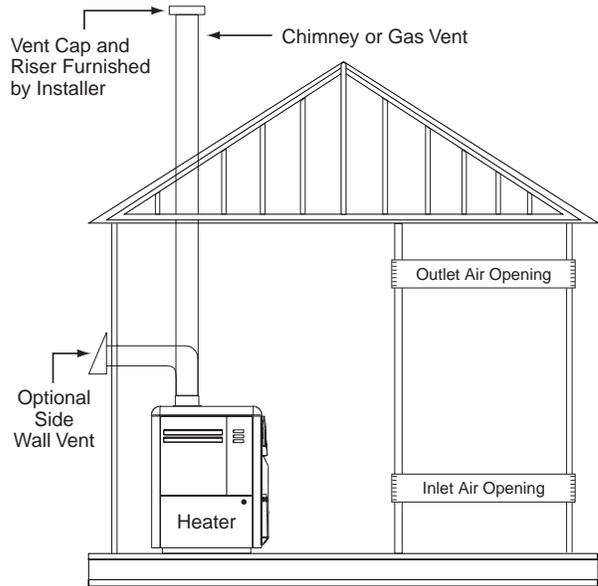


Figure 7.

The heater should not be installed closer than 6 inches to any fences, walls or shrubs at any side or back, nor closer than 18 inches at the plumbing side. A minimum clearance of 24 inches must be maintained at the front of the heater.

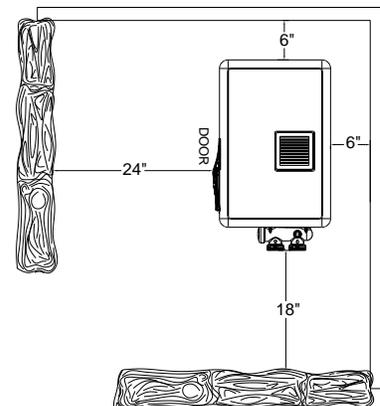


Figure 8.

COMBUSTION AIR SUPPLY

For indoor installation, the heater location must provide sufficient air supply for proper combustion and ventilation of the surrounding area.

The requirements for the air supply specify that the room in which a heater is installed should be provided with two permanent air supply openings; one within 12 inches of the ceiling, the other within 12 inches of the floor. These openings shall directly, or through duct, connect to outdoor air.

Pentair Water Pool and Spa, Inc. does not recommend indoor installations that do not provide combustion air from outside the building.

Air Supply Requirements Guide for MiniMax NT Heaters

Net Free open Area for Each Opening * (Square Inches)		
Heater Size	Ducted from Outside	Direct from Outside
200	100	50
250	125	63
300	150	75
400	200	100

* Area indicated is for one of two openings; one at floor level and one at the ceiling.
NOTE: If using louvered type or screen type openings, check with Louver/Screen Manufacturers to correct for the Louver/Screen resistance.

Table 12.

CAUTION

Chemicals should not be stored near the heater installation. Combustion air can be contaminated by corrosive chemical fumes which can void the warranty.

VENT ADAPTORS

(FITS ALL MODELS)

The proper vent adaptor must be installed on the heater as shown below in [Figure 9](#).

Product No.	Vent Dia.
460506	4 in.
460507	5 in.

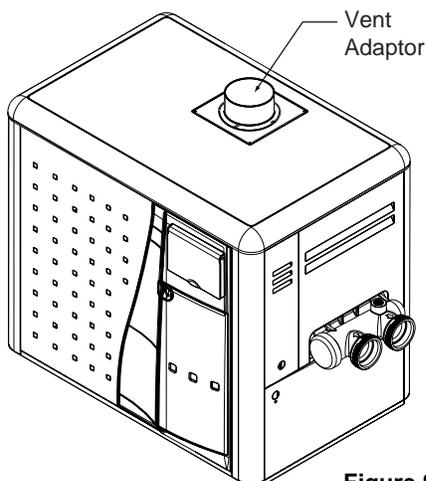


Figure 9.

1. Remove the six (6) retaining screws from the old exhaust grill and discard the screws, gasket, and exhaust grill as shown in [Figure 10](#).

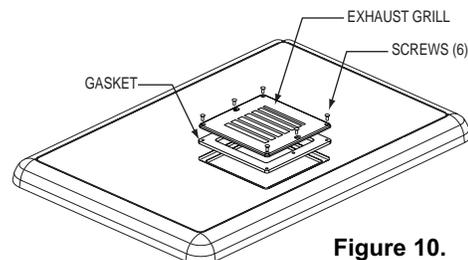


Figure 10.

2. Install the Vent Adaptor as shown in [Figure 11](#). Make sure the holes in the gasket, metal flange of the main vent assembly, and heater cover are aligned before securing into place using the six (6) screws provided in the Vent Adaptor Kit.

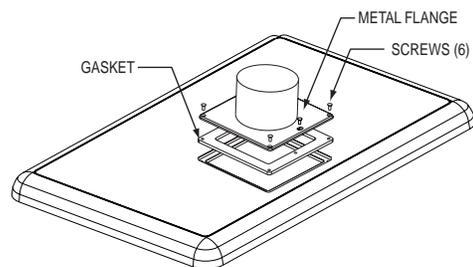
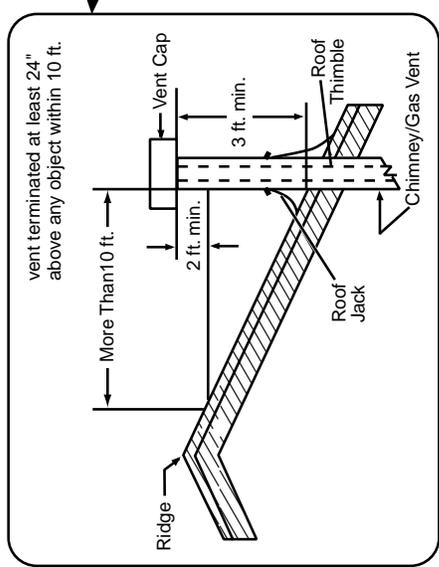
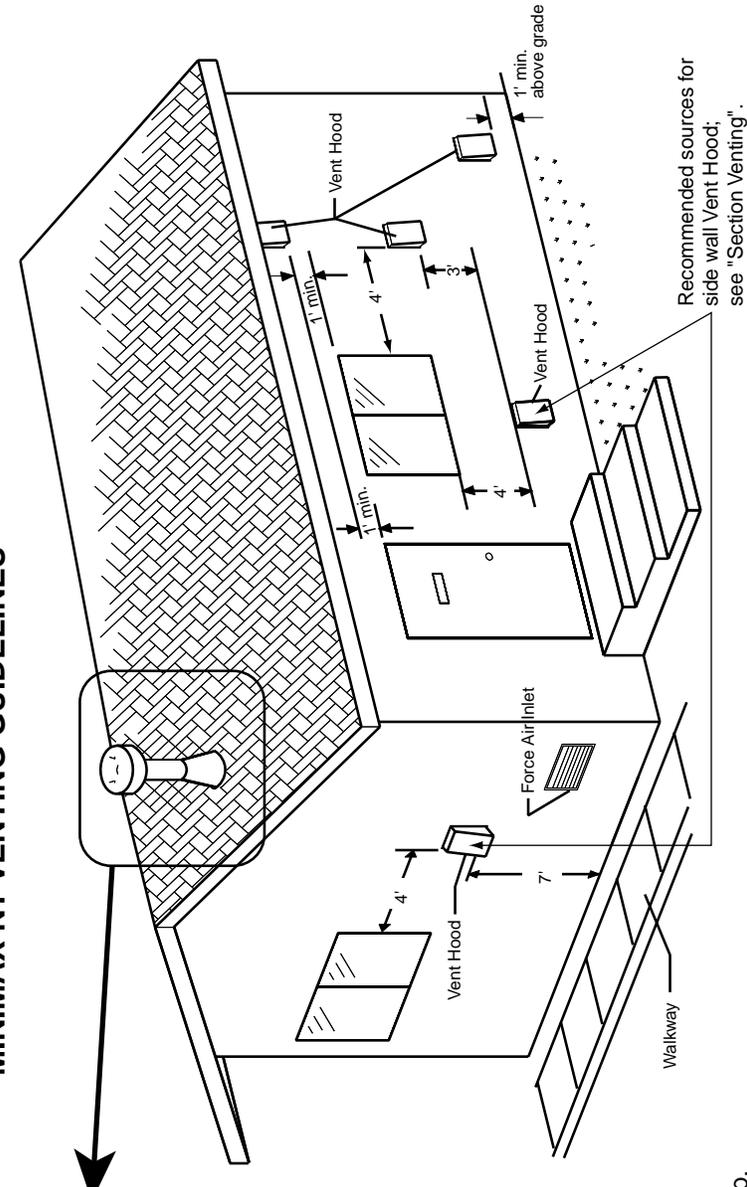


Figure 11.

**INDOOR INSTALLATIONS
MINIMUM VENTING GUIDELINES**



Vent for roof penetration installations:

- must extend at least 3 ft. higher than the point at which it passes through the roof, or as permitted by local code.
- must use a roof thimble through the roof penetration.
- must terminate with an approved (listed) roof jack, storm collar, and vent/weather cap.

Vent pipe extension:

- must be the same diameter as the vent connector.
- must be suitable for use with category III appliances with flue gas temperature ratings less than 400 deg. F.
- may use a single wall vent pipe with permanently sealed seams, joints and proper insulating materials.

Vent termination for side wall installations:

- must be not less than 7 ft. above public walkways.
- must be at least 3 ft. above any outside air intake located within a 10 ft. radius.
- **must NOT** be within 3 ft. of an inside corner of the structure.
- must be at least 1 ft. above grade.
- must be located the following distances away from any door, window, or gravity air inlet:
 - 4 ft. below
 - 4 ft. horizontally
 - 1 ft. above

Air Supply

- Clearances indicated are for non-mechanical air supply inlet to the building. For mechanical air supply inlet, a minimum horizontal clearance of 10 feet should be maintained away from the vent termination.

Figure 12.

OUTDOOR INSTALLATION (Outdoor Shelter Installation in Canada, see page 15)

For outdoor installation with an exhaust grill, the heater must be placed in a suitable area on a level, noncombustible surface. Do not install the heater under an overhang with clearances less than 3 feet from the top of the heater. The area under an overhang must be open on three sides.

IMPORTANT!

- In an outdoor installation it is important to ensure water is diverted from overhanging eaves with a proper gutter/drainage system. The heater must be set on a level foundation for proper drainage.
- Under certain conditions, “heavy rains or unusually high winds”, it may be necessary to install an outdoors vent. In this situation, use Outdoor Vent Kit, P/N 460424, (see below).
- This unit shall not be operated outdoors at temperatures below -20° F.

OUTDOOR INSTALLATION VENTING GUIDELINES

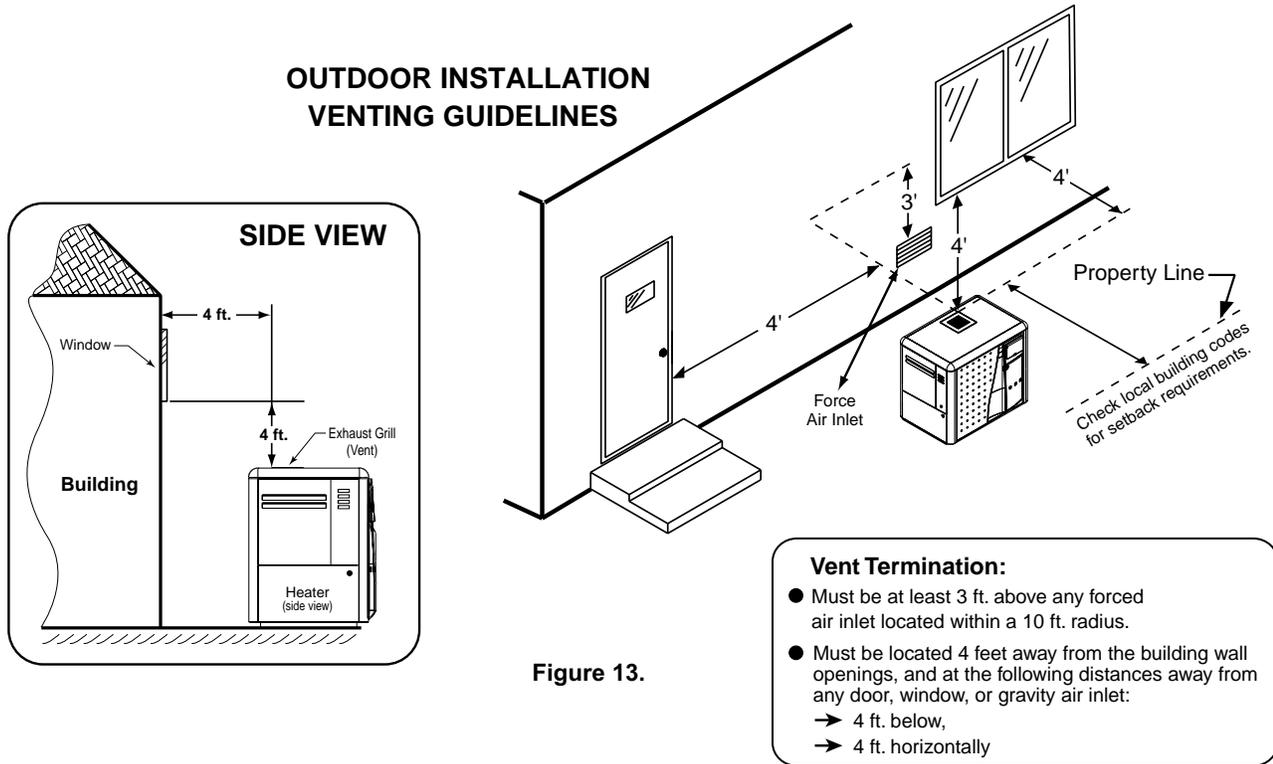


Figure 13.

OUTDOOR VENT KIT

1. Remove the six (6) retaining screws from the old exhaust grill and discard the screws, gasket, and exhaust grill as shown in Figure 14.
2. Install the Outdoor Vent Kit, (P/N 460424), as shown in Figure 15. Make sure the holes in the gasket, metal flange of the main vent assembly, and heater cover are aligned before securing into place using the six (6) screws provided in the Outdoor Vent Kit.

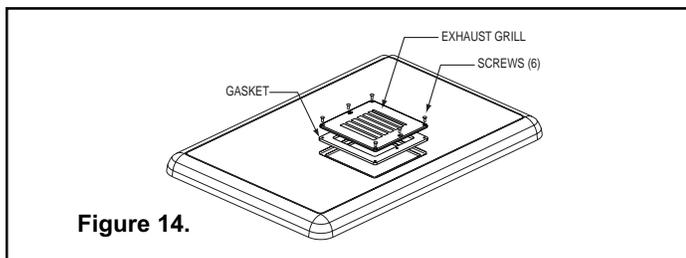


Figure 14.

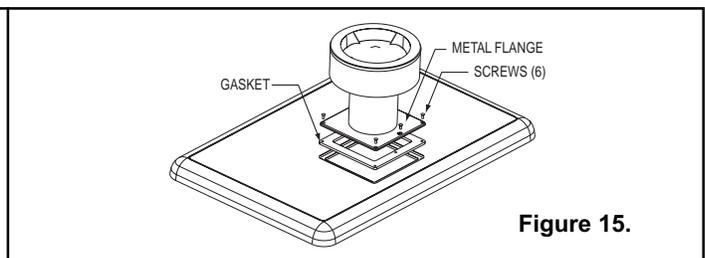


Figure 15.

CAUTION

If installing the heater next to or near an air conditioning unit or a heat pump, allow a minimum of 36 in. between the air conditioning unit and the heater.

ELECTRICAL CONNECTIONS

Electrical Rating 60 Hz 120 / 240 Volts AC, single phase

⚠ CAUTION

This heater is designed to operate at 120 or 240 VAC. It is not recommended to be connected to OR operate on a 208 VAC.

NOTE

- The MiniMax NT heater is prewired for 240-volt AC connection using the “RED” connector and the “BEIGE” common connector; see **Figure 16** below. For 120-volt AC supply, remove the “BEIGE” common connector and plug it into the “BLUE” common connector.
- When connecting the power supply to the “Line Terminal Block” inside the junction box, follow the polarity as shown below. Connecting to 120 VAC, make sure that you connect the wire to the terminal (L), the neutral wire is connected to the neutral terminal (N) and the ground is connected to the ground terminal (GND); see below, **Figure 17**.
- If any of the original wiring supplied with this heater must be replaced, installer must supply (No. 18 AWG, 600V, 105° C. U.L. approved AWM low energy stranded) copper wire or it’s equivalent. Thermal fuse wiring must be replaced with 18 AWG, 600V, 150° C. temp. rating.

⚠ CAUTION

The installation must conform with local codes or, in the absence of local codes, with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* and/or *CSA B149.1, Natural Gas and Propane Installation Codes*. If an external electrical source is utilized, the heater, when installed, must be electrically grounded and bonded in accordance with local codes or, in the absence of local codes, in the USA, with the *National Electrical Code, ANSI/NFPA 7*; in Canada, with *Canadian Electric Code, CSA C22.1*.

Always use crimp type connectors when connecting two wires.

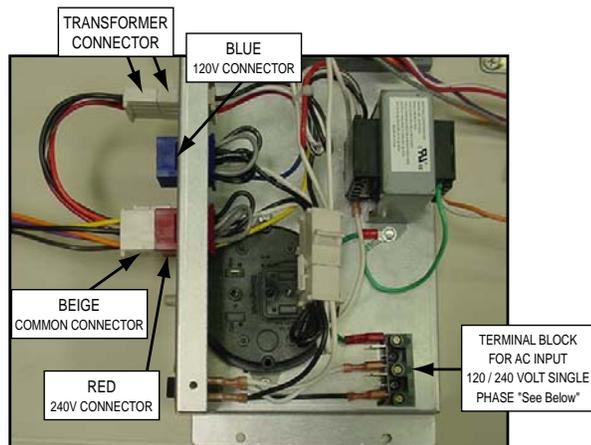


Figure 16.

You need to open the right door then remove the control panel cover for servicing the Line Terminal Block as shown in Figures 16 & 17, (see item 40 in the exploded view on [page 33](#)).

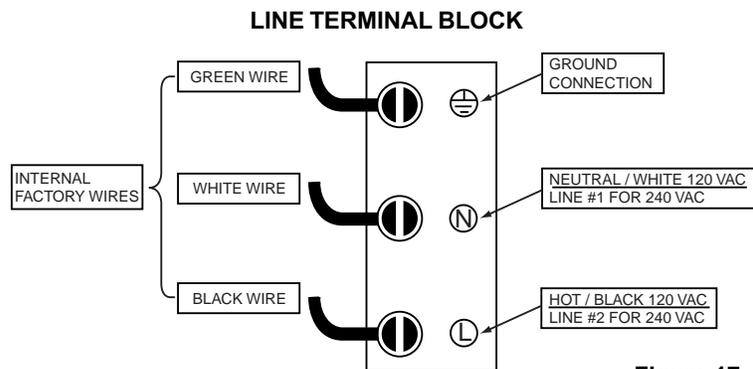


Figure 17.

WIRING DIAGRAM—NT STD & TSI WITH DDTc

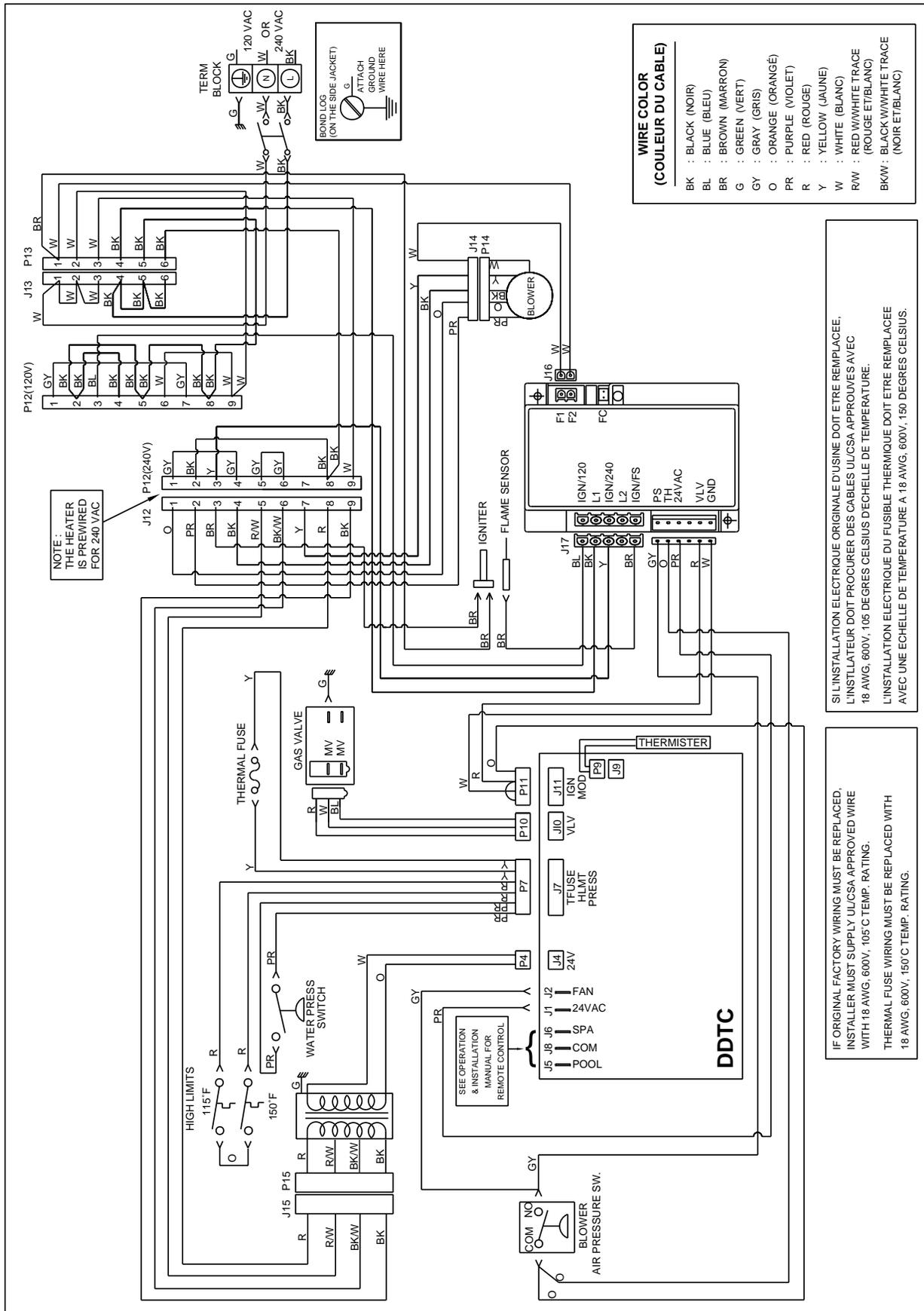


Figure 19.

Operation Instruction

BASIC SYSTEM OPERATION

1. **Start pump, make sure the pump is running and is primed, to close the water pressure switch and supply power to heater.** Be sure the pool and/or spa is properly filled with water. Follow the Lighting/Operating instructions below.

MINIMAX NT HSI ELECTRONIC IGNITION LIGHTING/OPERATION

FOR YOUR SAFETY: READ BEFORE LIGHTING

⚠ WARNING



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

Do not attempt to light the heater if you suspect a gas leak. Lighting the heater can result in a fire or explosion which can cause personal injury, death, and property damage.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
- B. **BEFORE OPERATING**, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
 - Do not try to light any appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the Fire Department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Forced or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

WHAT TO DO IF YOU SMELL GAS

1. **STOP!** Read the safety information above, (A through D).
2. Open the access doors. Set power switch to "OFF", (see [Figure 25](#)).
3. Set the thermostat to "OFF", (see [page 27](#)).
4. This appliance is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Push in gas control knob slightly and turn clockwise  to "OFF".
NOTE: Knob cannot be turned to "OFF" unless knob is pushed in slightly. Do not force.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Follow "B" in the safety information above. If you don't smell gas, go to the next step.
7. Turn gas control knob counterclockwise  to "ON". See [Figure 20](#).
8. Close the access doors and set the thermostat to desired Mode: "POOL, SPA or REMOTE".
9. Set the thermostat to the desired temperature setting.
 - a. Ignition module is energized and the pre-purge cycle is started, approximately 15 seconds.
 - b. Fan motor starts, which closes Vacuum Air Pressure (fan) switch.
 - c. Check for powering-up the (glow coil) hot-surface ignitor by viewing through the glass window or opening on the burner face plate.
10. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

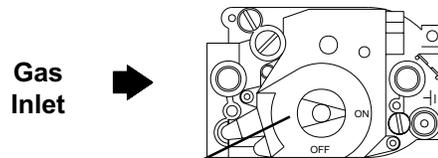


Figure 20. Gas control knob shown in "ON" position.

TO TURN OFF GAS TO APPLIANCE

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

SAFETY CONTROLS

VACUUM AIR PRESSURE (FAN) SWITCH

The air pressure switch, (see **Figure 21**), is a safety device used to insure that the combustion air blower (fan) is operating and has been designed to monitor the vacuum (negative) pressure within the blower housing. The air pressure switch is factory set and is connected upstream of the ignition module. The ignition module does not operate unless the air pressure switch and all safety switches are closed.

WATER PRESSURE SWITCH

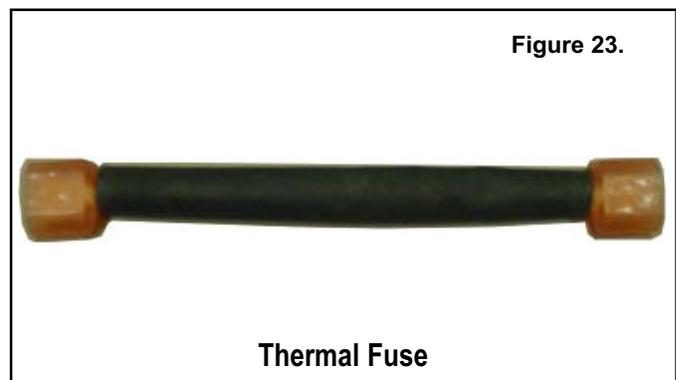
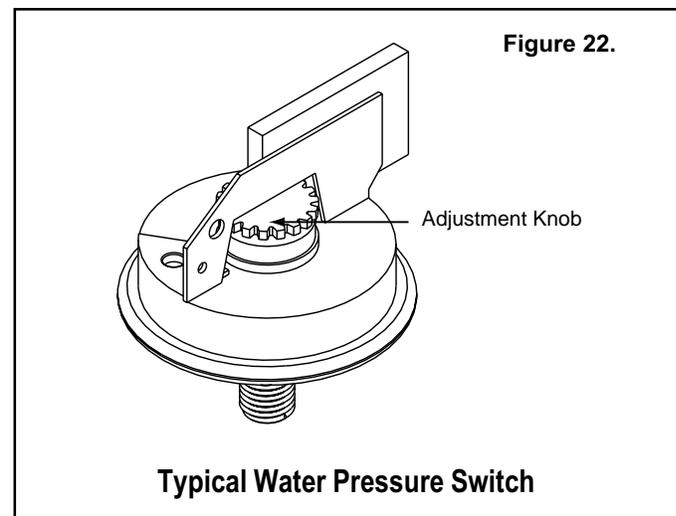
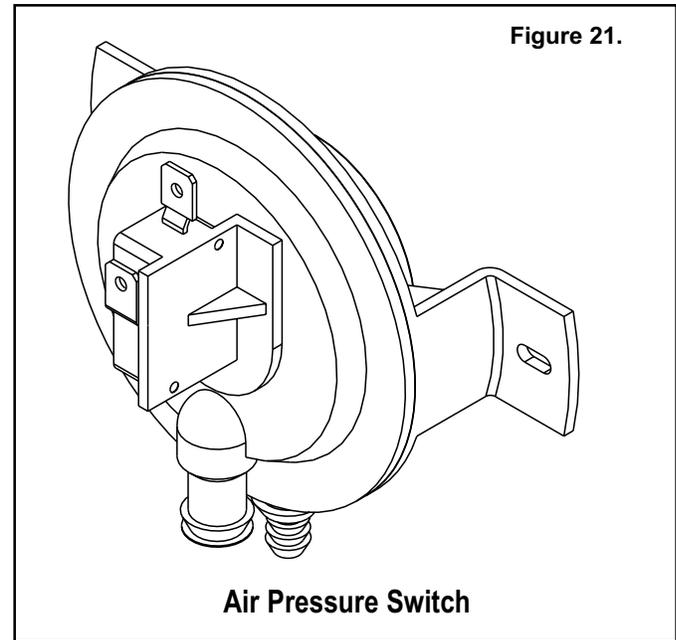
The water pressure switch, (see **Figure 22**), closes when there is a sufficient flow of water to the heat exchanger to safely operate the heater. The switch has been preset by the Factory at 1½ PSI for operation. **NOTE:** See, *Below Pool Level Installation instructions on page 8*. The switch may remain closed with no water flow if there is more than a 3 ft. elevation difference between the heater (heat exchanger) and the pool water line—if this is the case, the water pressure switch must be reset by a qualified service technician to maintain open switch contacts with no water flow.

NOTE

If the pool is more than one floor above or one floor below the heater, the water pressure switch may have to be replaced with a flow switch.

THERMAL FUSE

This is a single-use switch, mounted on combustion chamber jacket divider (inner front panel). The fuse, (see **Figure 23**), is activated by excessive temperature due to abnormal operating conditions. Upon detection of excessive heat within the inner front panel, the fuse will open the safety circuit causing shutdown of the heater.



SAFETY CONTROLS, (cont'd.)

HIGH LIMITS

A “High Limit”, is a safety device that opens the electrical circuit and shuts off the heater based on a water temperature set point within the “High Limit Device”. The MiniMax NT series of heaters contains two (2) high limit devices which are located on the main inlet / outlet header, one sensing the inlet water temperature and one sensing the outlet water temperature.

OPERATION OF IGNITION MODULE

The Ignition Module, (see [Figure 24](#)), is microprocessor based and operates on 24 VAC supplied by the transformer. The control utilizes a microprocessor to continually and safely monitor, analyze, and control the proper operation of the gas burners. The module with the presence of the flame sensor, using flame rectification, allows the heater to operate.

1. HEAT MODE

- When a call for heat is received from the thermostat supplying 24 volts to the (TH) terminal, the module will check the pressure switch for normally open contact. The combustion blower is then energized and, once the air pressure switch contacts close, the 15-second "pre-purge" period begins. After pre-purge, the hot surface igniter is energized for approximately 40-second heat-up period, followed by the gas valve for the "trial for ignition" (TFI) period, for maximum of 7 seconds for the STD model and 6 seconds for the TSI model.
- When the flame is detected during the TFI period, through the flame sensor, the igniter is deactivated and the gas valve remains energized.

Note: For all TSI heaters: After the pre-purge period the combustion blower slows down to half normal speed during the heat-up and TFI periods and continues thereafter for another 30 seconds at low speed, then return to full speed for the remainder of the heating cycle.

- The thermostat, air pressure switch and burner flame are constantly monitored to assure that the system operates properly. When the thermostat is satisfied and the demand for heat ends, the gas valve is immediately de-energized, the module senses the loss of flame signal and initiates the 45-second "post-purge" period before de-energizing the combustion blower.

2. FAILURE TO LIGHT THE BURNER—LOCK OUT

Should the main burner fail to light, or the flame is not detected during the first TFI (try for ignition) cycle, the gas valve is de-energized and the ignition module performs an "inter-purge" delay (approximately 15 seconds) before attempting another TFI cycle. The module will attempt 2 additional TFI's cycles before locking out. The gas valve will be turned off immediately. The combustion blower will be turned off following 45 seconds "post-purge" period.

The module will automatically reset after one hour, if the thermostat is still calling for heat, and attempt a new TFI cycle.

3. FLAME FAILURE—RE-IGNITION

If the established flame signal is lost while the burner is operating, the control will respond within .08 second. The gas valve is de-energized and the control starts a new ignition sequence in an attempt to relight the burner. The ignition attempt will be repeated (3) times. If the burner does not relight, the control will go into lockout as previously described in the “Failure to Light the Burner—Lock Out”. If flame is reestablished, normal operation resumes.

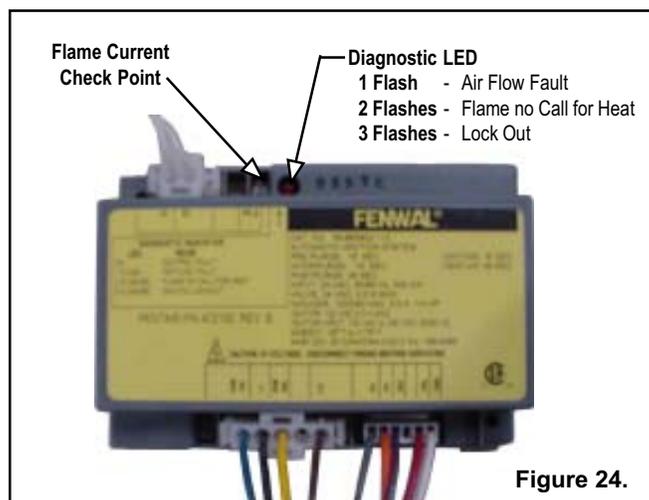


Figure 24.

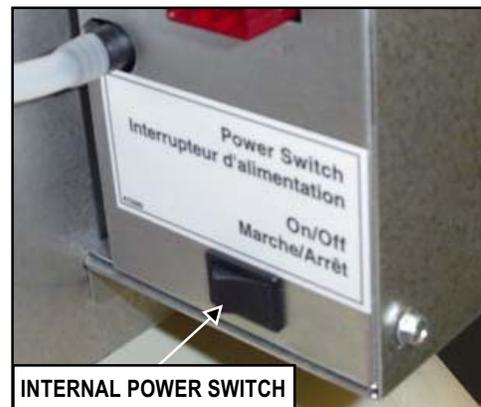


Figure 25.

DIGITAL DISPLAY TEMPERATURE CONTROLLER (DDTC)

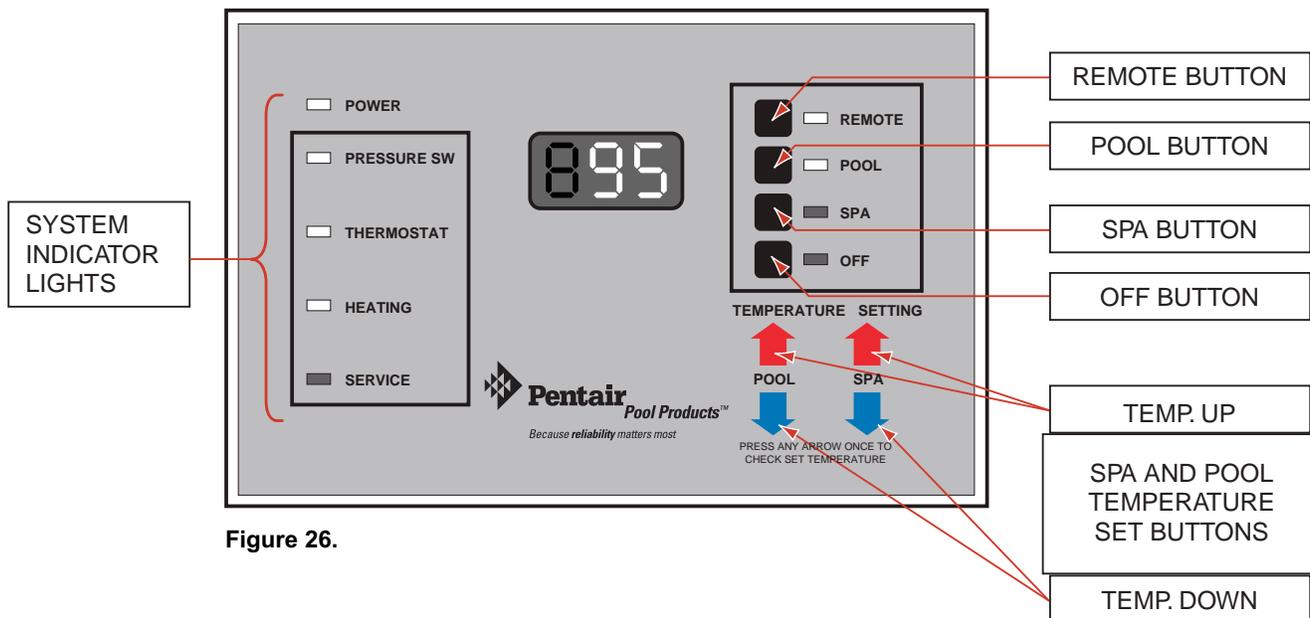


Figure 26.

The DDTC board, shown in Figure 26, is a digital temperature controller capable of controlling the pool, spa or both to a minimum temperature of 65° F. (below 65° F. display reads "Off") and a maximum of 104° F. The DDTC board also functions as a system status indicator, using LED lights and programmed error codes.

During normal operation, the DDTC will display the current temperature of the water returning to the heater, depending on which mode has been selected, "Pool" or "Spa". This is accomplished by a thermister (sensor) on the inlet port of the water header of the heater and working in conjunction with the internal microprocessor controlling the operation of the heater.

Changing the desired pool or spa temperature is easily done by simply depressing the appropriate up or down arrow until the display reads the desired set-point temperature. For example, set pool to 78° F. and the spa to 104° F., when releasing the up or down arrow the display will flash once then return to the current temperature.

At any time, you wish to know the temperature setting of the pool or spa, simply press the appropriate up or down arrow, the display will flash once and display the set-point temperature for three (3) seconds, then flash once again and return to the current temperature.

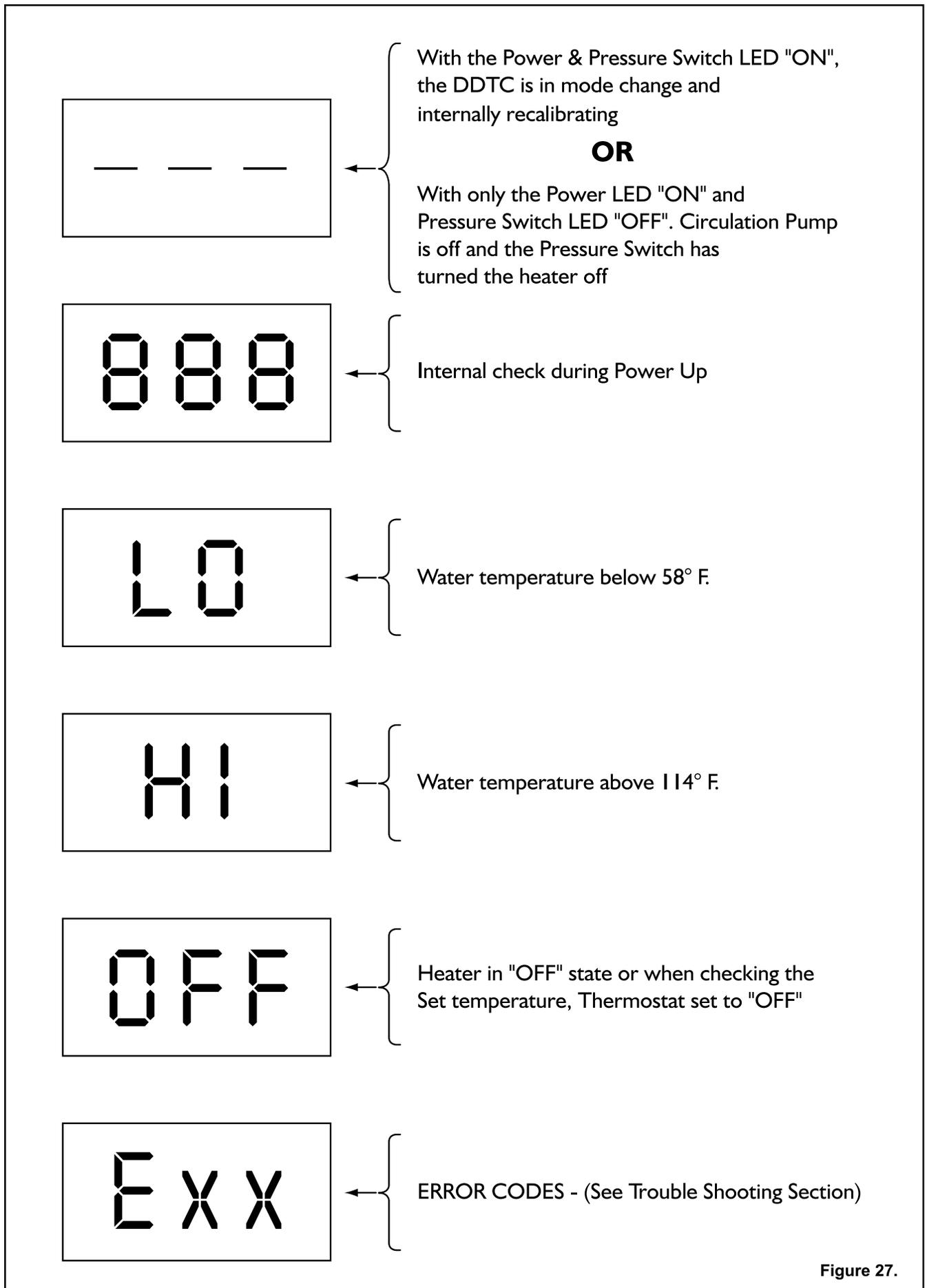


Figure 27.

SET UP

The MiniMax NT Heater comes from the factory preset with a pool temperature setting of 78° F. and a preset spa temperature of 100° F., and in the off mode setting. Once the power is turned on, the DDTC board will do a self diagnostic internal check, during this time the display will first read “888”, then the display will switch to three dashes “- - -”, this process takes approximately ten (10) seconds. The DDTC will then illuminate the “Power” LED and “Off” LED, see Figure 27.

1. Turn on the power to the heater; the switch is on the bottom of the electrical junction box located internally on the right side of the cabinet. The DDTC will now go through the self-diagnostic’s test as stated above.
2. Turn on the circulating system pump and make sure that adequate water is being delivered to the heater, The “PRESSURE SW” LED will now illuminate.
3. If you are using the heater with a remote control system, open the right door of the heater to access the rear portion of the DDTC. Locate the three terminals marked “Pool” (J5), “Spa” (J6) and “Com” (J8). If the remote system is a three-wire remote unit, connect the pool lead to the “pool” terminal J5, connect the spa lead to the “spa” J6 terminal and connect the common wire to the “com” terminal J8. If the remote system is a two-wire remote, the remote system will be used to turn the heater on for a selected body of water, Pool or Spa, select which application you are working with and connect one wire to the common terminal J8 and the other wire to either “Pool J5” or “Spa J6”. Close and latch the door.

LED INDICATORS

There are nine lights that can be seen from the front of the control panel, (five are system indicators and four are mode indicators), which helps you understand the operation of the heater, see Figure 26. If something should go wrong, the lights will aid in troubleshooting the problem. An additional four lights can be seen after opening the control panel. These four lights are diagnostic indicators for the service technician to troubleshoot the system.

On the right front of the DDTC board there are four Buttons and corresponding LED lights, see Figure 26. Using the buttons allows you to select one of the four modes and the lights indicate which operational mode that the heater is in, **Off**, **Spa** mode, **Pool** mode or **Remote** mode. If the heater is not connected to a remote system then the remote mode will not be used.

The following are descriptions of the five system indicators:

• POWER

The light is on at all times, in any switch position, indicating 24 VAC power is being supplied to the control circuit. If it fails to light, no other light will be on. Possible causes are:

1. External power to the heater is disconnected; check service panel circuit breaker or fuses;
2. Transformer has failed.

• PRESSURE SW (WATER PRESSURE SWITCH)

This light is on when Spa/Pool Selector switch is on, indicates the circulating pump is running properly. If pressure light fails to light, the pump may have lost its prime or water flow may be restricted by an inadvertently closed valve or clogged filter or pump basket. If you have determined that there is no water flow restriction to the heater, you should call a qualified technician.

• THERMOSTAT

This light is on when the thermostat contacts close, signaled by the water temperature falling below the set-point, calling for the heater to fire to maintain the desired water temperature.

• HEATING

The heating light is on any time the thermostat has signaled a call for heat which initializes the ignition safety circuit — the light comes on indicating successful firing of the main burners and stays on until the pool/spa reach the water temperature setting.

• SERVICE

The service light is off during normal operation of heater. The light only comes on if a problem with a control has occurred or when the heater is first firing. The problem must be investigated by the technician prior to attempts to fire the heater again.

TEMPERATURE SETTING

The heater comes factory set at 78° F. for the pool mode and 100° F. for the spa mode, using the up and down arrows, you can set the thermostats to a minimum temperature of 65° F., or a maximum of 104° F. If you desire to heat only one body of water, the thermostat is capable of an off mode. As an example, if you only wish to heat the spa and not the pool, simply depress and hold the pool down arrow, and the thermostat will lower its setting to 65° F. then go to an off mode. If there is a remote system connected to the heater, please see the special thermostat setting features under Heating Mode Selection & Remote mode.

HEATING MODE SELECTION

1. **Off Mode:** The heater will not come on. **NOTE:** The "Off" display on the Digital Display Temperature Controller does not mean that the heater is off. It only states that the pool or spa thermostat has been turned off.
2. **Spa Mode:** The heater will operate and heat the spa to the desired temperature.
3. **Pool Mode:** The heater will operate and heat the pool to the desired temperature.
4. **Remote Mode:** The DDTC is compatible with two and three wire remote control systems. In order to operate by a remote control system, the REMOTE mode must be selected on the front panel. When the REMOTE mode is selected, the REMOTE LED will light up.

REMOTE CONTROL

THE TWO-WIRE REMOTE CONTROL SYSTEM is typically installed and connected to the heater for spa heating. The two-wire remote system is usually provided with a water temperature sensor that monitors the system temperature and turns the heater on or off in response to the temperature of the spa. To heat a spa, it should be connected to terminals J6 and J8. Pool heating remote control would require connecting to terminals J5 and J8. If the REMOTE mode is set at the front panel LED light, the DDTC will respond to a contact closure by remote system and heater will operate until the remote system temperature setting is satisfied.

NOTE: With this type of two-wire remote, with its own temperature sensors and system control, using the up arrows on the front of the DDTC, hold down the up arrow until you reach the maximum setting of 104° F., this allows the remote system thermostat to operate the heater at any set-point below 104° F., the heater thermostats then act as a secondary controller if water temperature reaches 104° F.

THE THREE-WIRE REMOTE CONTROL SYSTEM will be connected to terminals J5, J6 & J8. J8 is the common terminal. If the heater is in the REMOTE mode, the DDTC will monitor the terminals and respond to a contact closure between J5 & J8 or J6 & J8. A contact closure between J5 & J8 will cause the DDTC to switch to the POOL setting and control the heater to the DDTC pool set-point temperature. A contact closure between J6 & J8 will cause the DDTC to switch to the SPA setting and control the heater to the DDTC spa set-point temperature. If only heating the spa, then depress the pool down arrow until the display goes to "Off".

Troubleshooting Instruction

TROUBLESHOOTING (DDTC)

The DDTC temperature display contains three LED's with a decimal point between the first and second, this display is also used to display an error code if for some reason there is a failure within the heater control system or a DDTC internal fault. The DDTC will display the actual temperature or set-point temperature or OFF, as selected by the user. When DDTC detects an error, the display will show Exx, see Figure 27, where Exx is the error code of DDTC fault, see Table 13. Codes 1 through 9 indicate a “soft lockout” error that means after these errors are fixed, the heater will resume normal operation and restart immediately. Code ERR indicates a “hard lockout” error that means after these errors are fixed, you need to reset the power of the heater through the switch on the bottom of the electrical junction box on the right side of the cabinet.

NOTE: If Code ERR is shown on the LED display at any time, turn the heater off, (from power switch), then turn on the heater again. If the error code is still displayed, call a certified Pentair Service Technician for repair.

Error Code	Error Description
E01	System Low Voltage
E02	High Temperature Limit
E03	Thermal Fuse Open
E04	Fan Failure
E05	Ignition / Flame Failure
E06	Gas Valve / Module Failure
E07, E08, E09	Not Used
ERR	Call Pentair's Technical Service Department at: (800) 831-7133

Table 13.

TROUBLESHOOTING (GENERAL)

<i>Possible Cause</i>	<i>Remedy</i>
Heater will not come on	
Automatic ignition system fails	Check if electrical connections are correct and securely fastened – If YES, call serviceperson.
Pump not running	Place pump in operation
Pump air locked	Check for leaks
Filter dirty	Clean filter
Pump strainer clogged	Clean strainer
Defective wiring or connection	Repair or replace wires
Defective pressure switch	Replace switch
Defective gas controls	Call serviceperson
On-Off switch in "OFF" position	Turn switch to "ON"
Heater Short Cycling (Rapid On and Off Operation)	
Insufficient water flow	Clean filter and pump strainer
Defective wiring	Repair or replace wiring
Defective flow valve or out of adjustment	Call serviceperson
Defective hi-limit and/or thermostat	Call serviceperson
Heater Makes Knocking Noises, make sure all valves on system are open.	
Heater operating after pump has shut off	Shut off gas supply and call serviceperson
Heater exchanger scaled	Shut off gas supply and call serviceperson

SERVICE CHECKS—IGNITION MODULE

Symptom	Cause/Cure
1. Dead	A. Miswired B. Transformer bad C. Fuse/Circuit breaker bad D. Bad control
2. Thermostat on—no ignition	A. Miswired B. Bad thermostat no voltage at terminal
3. Valve on, no ignition	A. Defective ignitor B. Miswired C. Bad control (check voltage at ignitor)
4. Ignitor on, no valve action	A. Valve coil open B. Open valve wire C. Bad control (check voltage)
5. Flame okay during Try For Ignition (TFI), no flame sense (after TFI)	A. Bad flame sensor B. Bad wires C. Poor ground at burner D. Poor flame (check flame current)

Maintenance Instruction

It is recommended that you check the following items at least every six months and at the beginning of every swimming season.

1. Examine the venting system. Make sure there are no obstructions in the flow of combustion and ventilation air.
2. Visually inspect the main burner and the hot surface ignitor. The normal color of the flame is blue. When flame appears yellow, burners should be inspected and cleaned. Check ignitor for damage.
3. Inspect the heat exchanger for soot. Clean as necessary.
4. Remove burner tray and clean burners and main burner orifices.
5. Keep the heater area clean and free from combustibles and flammable liquids.
6. Check wire ends and wire connections. They should be clean and tight.
7. Check the gas pressure (supply and manifold) as described in this manual.

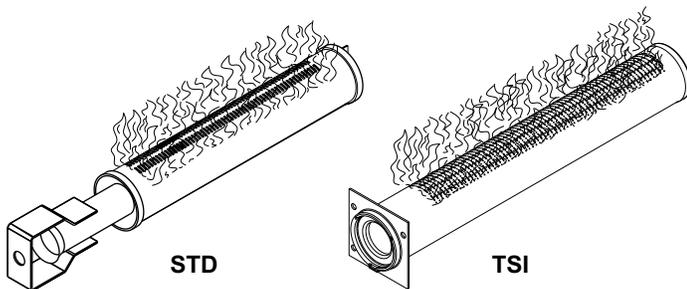


Figure 28.

ENERGY SAVING TIPS

1. If possible, keep pool or spa covered when not in use. This will not only cut heating costs, but also keep dirt and debris from settling in the pool and conserve chemicals.
2. Reduce the pool thermostat setting to 78° F. or lower. This is accepted as being the most healthy temperature for swimming by the American Red Cross.
3. Use an accurate thermometer.
4. When the proper maximum thermostat settings have been determined, tighten the thermostat knob stopper.

CAUTION

REMOVE THE FLOW VALVE ASSEMBLY WHEN DRILLING THE HOLE TO INSTALL A PRV, OTHERWISE, YOU WILL DRILL INTO THE VALVE ASSEMBLY.

PRESSURE RELIEF VALVE

In some installations, a pressure relief valve (PRV) is required on the MiniMax NT Series. To install a PRV, remove the access

doors, remove Flow Valve assembly, then carefully drill a 3/8 in. hole in center of 3/4 in. NPT port (on main header) being careful to drill *only* through wall at bottom of 3/4 in. NPT port and no deeper—now thread in the 3/4 in. NPT PRV.

NOTE: (A.S.M.E. version varies slightly. It is of bronze construction, and is supplied with the A.S.M.E. Section IV, pressure relief valve pre-installed at factory.)

Test the relief valve at least once a year by lifting up lever.

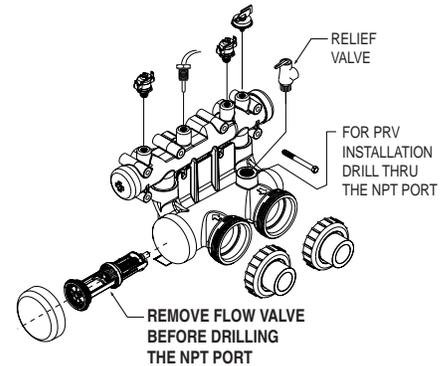
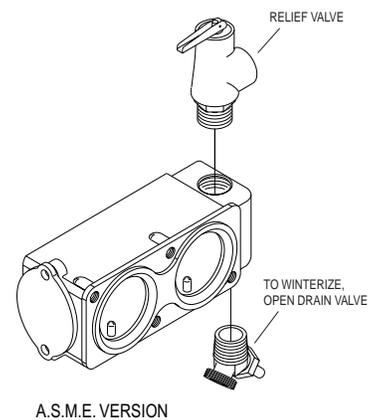


Figure 29.



5. Set time clock to start circulation system no earlier than daybreak. The swimming pool loses less heat at this time.
6. For pools that are only used on the weekends, it is not necessary to leave the thermostat set at 78° F. Lower the temperature to a range that can be achieved easily in one day. Generally, this would be 10° F. to 15° F., if pool heater is sized properly.
7. During the winter or while on vacation, turn the heater off.
8. Set up a regular program of preventative maintenance for the heater each new swimming season. Check heat exchanger, controls, burners, operation, etc.

SPRING AND FALL OPERATION

If the pool is being used occasionally, do not turn the heater completely off. Set the thermostat down to 65° F. This will keep the pool and the surrounding ground warm enough to bring the pool up to a comfortable swimming temperature in a shorter period of time.

WINTER OPERATION

⚠ CAUTION

- Operating this heater continuously at water temperatures below 68° F. will cause harmful condensation and will damage the heater and void the warranty.
- If the heater has been drained for freezing condition, do NOT turn "ON" until the system is circulating water.
- Water trapped in the heat exchanger can result in freeze damage to the exchanger or headers. Freeze damage is specifically not covered by the warranty.

If the pool won't be used for a month or more, turn the heater off at the main gas valve. For areas where there is no danger of water freezing, water should circulate through the heater all year long, even though you are not heating your swimming pool. **The MiniMax NT should not be operated outdoors at temperatures below 0° F. for propane and -20° F. for natural gas.** Where freezing is possible, it is necessary to drain the water from the heater. This may be done by opening the drain valve, located at the inlet/outlet header, (see [Figure 29.](#)), allowing all water to drain out of the heater. It would be a good practice to use compressed air to blow the water out of the heat exchanger. *(See additional notes under Important Notices in Introduction.)*

CHEMICAL BALANCE

POOL AND SPA WATER

Your Pentair Pool Products pool heater was designed specifically for your spa or pool and will give you many years of trouble-free service, provided you keep your water chemistry in proper condition.

Three major items that can cause problems with your pool heater are: improper pH, disinfectant residual, and total alkalinity. These items, if not kept properly balanced, can shorten the life of the heater and cause permanent damage.

CAUTION

Heat exchanger damage resulting from chemical imbalance is not covered by the warranty.

WHAT A DISINFECTANT DOES

Two pool guests you do not want are algae and bacteria. To get rid of them and make pool water sanitary for swimming - as well as to improve the water's taste, odor and clarity - some sort of disinfectant must be used.

Chlorine and bromine are universally approved by health authorities and are accepted disinfecting agents for bacteria control.

WHAT IS A DISINFECTANT RESIDUAL?

When you add chlorine or bromine to the pool water, a portion of the disinfectant will be consumed in the process of destroying bacteria, algae and other oxidizable materials. The disinfectant remaining is called chlorine residual or bromine residual. You can determine the disinfectant residual of your pool water with a reliable test kit, available from your local pool supply store.

You must maintain a disinfectant residual level adequate enough to assure a continuous kill of bacteria or virus introduced into pool water by swimmers, through the air, from dust, rain or other sources.

It is wise to test pool water regularly. Never allow chlorine residual to drop below 0.6 ppm (parts per million). The minimum level for effective chlorine or bromine residual is 1.4 ppm.

pH - The term pH refers to the acid/alkaline balance of water expressed on a numerical scale from 0 to 14. A test kit for measuring pH balance of your pool water is available from your local pool supply store; see Table 14.

Table 14. pH Chart

Strongly Acid			Neutral					Strongly Alkaline						
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Muriatic Acid has a pH of about 0. Pure water is 7 (neutral). Weak Lye solution have a pH of 13-14.

RULE: 7.4 to 7.6 is a desirable pH range. It is essential to maintain correct pH, see Table 15.

If pH becomes too high (over alkaline), it has these effects:

1. Greatly lowers the ability of chlorine to destroy bacteria and algae.
2. Water becomes cloudy.
3. There is more danger of scale formation on the plaster or in the heat exchanger tubing.
4. Filter elements may become blocked.

If pH is too low (over acid) the following conditions may occur:

1. Excessive eye burn or skin irritation.
2. Etching of the plaster.
3. Corrosion of metal fixtures in the filtration and recirculation system, which may create brown, blue, green, or sometimes almost black stains on the plaster.
4. Corrosion of copper tubes in the heater, which may cause leaks.
5. If you have a sand and gravel filter, the alum used as a filter aid may dissolve and pass through the filter.

CAUTION: Do not test for pH when the chlorine residual is 3.0 ppm or higher, or bromine residual is 6.0 ppm or higher. See your local pool supply store for help in properly balancing your water chemistry.

RULE: Chemicals that are acid lower pH. Chemicals that are alkaline raise pH.

Table 15. pH Control Chart

6.8	7.0	7.2	7.4	7.6	7.8	8.0	8.2	8.4
Add Soda, Ash or Sodium Bicarbonate		Marginal	Ideal	Marginal	Add Acid			

ALKALINITY High or Low:

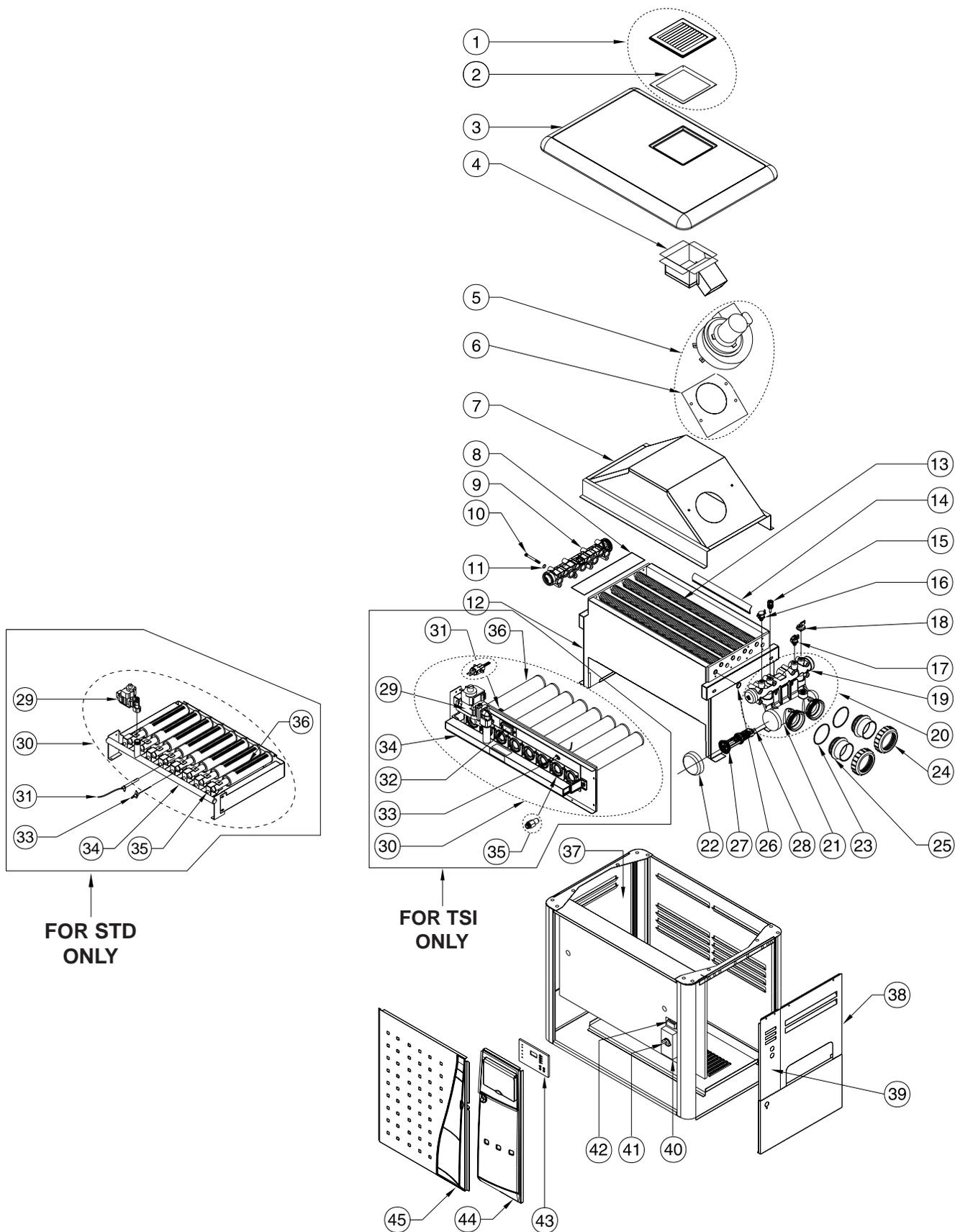
"Total alkalinity" is a measurement of the total amount of alkaline chemicals in the water, and control pH to a great degree. (It is not the same as pH which refers merely to the relative alkalinity/acidity balance.) Your pool water's total alkalinity should be 100 - 140 ppm to permit easier pH control.

A total alkalinity test is simple to perform with a reliable test kit. You will need to test about once a week and make proper adjustments until alkalinity is in the proper range. Then, test only once every month or so to be sure it is being maintained. See your local pool dealer for help in properly balancing the water chemistry.

REPLACEMENT PARTS

NT STD w/DDTC — (all Models)

NT TSI w/DDTC — (200, 250, and 300 Models)



Replacement Parts—NT STD						
Item	Description	Quantity	200	250	300	400
1	Exhaust Grill w/Gasket	1	472352			
2	Gasket, Exhaust Grill	1	471701			
3	Top Cover w/Posts	1	472353	472354	472355	472356
4	Exhaust Assembly	1	472373	472376	472373	
5	Blower w/Gasket	1	472361	472362		472374
6	Gasket, Blower	1	471610			
7	Flue Collector	1	472008	472007	472006	472005
8	Insulation, Header/Hi-Limit	1	472270			
9	Return Header Assembly	1	471991			
10	Bolt, Heat Exchanger	16	471622			
11	Washer, Heat Exchanger	16	072184			
12	Fire Box Assembly	1	471904	471835	471922	472332
13	Heat Exchanger w/Headers	1	471910	471785	471928	471838
	Heat Exchanger w/o Headers	1	471933	471934	471935	471936
14	Baffle, Heat Exchanger	8 / 16 (200, 250, 300 / 400)	471642	471641	471896	471640
15	Thermistor Probe	1	471566			
16	Hi-Limit Thermostat - 115° F.	1	471587			
17	Hi-Limit Thermostat - 150° F.	1	471694			
18	Water Pressure Switch	1	472125			
19	In/Out Top Sub-Header Assembly	1	472363			
20	In/Out Main Header Assembly	1	471992			
21	In/Out Bottom Sub-Header	1	472364			
22	Cap, In/Out Bottom Sub-Header	1	471420			
23	O-Ring, Adapter	2	274494			
24	Adapter, Bulkhead Ring	2	274440			
25	Adapter, Bulkhead, 2"	2	471441			
26	Gasket, Fin Tube, Seal	18	070951			
27	Flow Valve Assembly	1	471750			
28	Power Element, Flow Valve	1	472330			
29	Gas Valve - Natural Gas	1	471601			
	Gas Valve - Propane		471671			
30	Burner Tray Assembly, Natural Gas	1	472042	472037	472033	472028
	Burner Tray Assembly, Propane		471907	471913	471925	471931
31	Igniter	1	471602			
32						
33	Flame Sensor	1	471603			
34	Gas Manifold w/Orifices, Natural, 0-2000'	1	472023	472022	472021	472020
	Gas Manifold w/Orifices, Propane, 0-2000'		472027	472026	472025	472024
35	Orifices, Natural, 0-2000'	4 / 5 / 6 / 8	073727			
	Orifices, Propane, 0-2000'	(200 / 250 / 300 / 400)	073728			
36	Burner	2 / 3 / 4 / 6 (200 / 250 / 300 / 400)	070230			
	Burner w/Bracket	2	471970			
37	Jacket, Upper Panel, Left	1	471575			
38	Jacket, Upper Panel, Right	1	471576			
39	Jacket, Upper Sub-Plate	2	471767			
40	Junction Box Assembly	1	472505			
41	Air Pressure Switch, 0-2000'	1	472178	472180	472181	472183
42	Module, Ignition Control	1	472447			
43	Temperature Controller Assembly	1	472100			
44	Right Door Assembly with Controller	1	471727			
	Right Door Assembly w/o Controller	1	472372			
45	Left Door Assembly	1	471900	472318	471918	471726
NA	Thermal Cut-off (Not Shown)	1	075173			
NA	Transformer, 40 VA (Not Shown)	1	471571			
NA	Wire Harness Assembly (Not Shown)	1	472506			
NA	Indoor Vent Adaptor (See pg.16)	1	460506 (4") / 460507 (5")			

Note: Parts for ASME and high altitude (above 2000') are not listed above, please contact our Customer Service Department for details.

Replacement Parts—NT TSI

Item	Description	Quantity	200	250	300	400 ★
1	Exhaust Grill w/Gasket	1	472352			
2	Gasket, Exhaust Grill	1	471701			
3	Top Cover w/Posts	1	472353	472354	472355	472356
4	Exhaust Assembly	1	472357	472358	472359	472358
5	Blower w/Gasket	1	472361		472362	
6	Gasket, Blower	1	471610			
7	Flue Collector	1	472008	472007	472006	472005
8	Insulation, Header/Hi-Limit	1	472270			
9	Return Header Assembly	1	471991			
10	Bolt, Heat Exchanger	16	471622			
11	Washer, Heat Exchanger	16	072184			
12	Fire Box Assembly	1	471904	471835	471922	472332
13	Heat Exchanger w/Headers	1	471910	471785	471928	471838
	Heat Exchanger w/o Headers	1	471933	471934	471935	471936
14	Baffle, Heat Exchanger	8 / 16 (200, 250, 300 / 400)	471642	471641	471896	471640
15	Thermistor Probe	1	471566			
16	Hi-Limit Thermostat - 115° F.	1	471587			
17	Hi-Limit Thermostat - 150° F.	1	471694			
18	Water Pressure Switch	1	472125			
19	In/Out Top Sub-Header Assembly	1	472363			
20	In/Out Main Header Assembly	1	471992			
21	In/Out Bottom Sub-Header	1	472364			
22	Cap, In/Out Bottom Sub-Header	1	471420			
23	O-Ring, Adapter	2	274494			
24	Adapter, Bulkhead Ring	2	274440			
25	Adapter, Bulkhead, 2"	2	471441			
26	Gasket, Fin Tube, Seal	18	070951			
27	Flow Valve Assembly	1	471750			
28	Power Element, Flow Valve	1	472330			
29	Gas Valve - Natural Gas	1	472430			
30	Burner Tray Assembly	1	472366	472367	472368	472369
31	Igniter	1	472216			
32	Window Glass w/Holder		472370			
33	Flame Sensor	1	471603			
34	Gas Manifold w/Orifices, 0-4000'	1	472285	472286	472287	472288
35	Gas Orifices, 0-4000'	4 / 5 / 6 / 8 (200 / 250 / 300 / 400)	472263			
36	Burner	4 / 5 / 6 / 8 (200 / 250 / 300 / 400)	472211			
37	Jacket, Upper Panel, Left	1	471575			
38	Jacket, Upper Panel, Right	1	471576			
39	Jacket, Upper Sub-Plate	2	471767			
40	Junction Box Assembly	1	472505			
41	Air Pressure Switch, 0-4000'	1	472178	472179	472182	
42	Module, Ignition Control	1	472150			
43	Temperature Controller Assembly	1	472100			
44	Right Door Assembly with Controller	1	472087			
	Right Door Assembly w/o Controller	1	472097			
45	Left Door Assembly	1	471900	472318	471918	471726
NA	Thermal Cut-off (Not Shown)	1	075173			
NA	Transformer, 40 VA (Not Shown)	1	471571			
NA	Wire Harness Assembly (Not Shown)	1	472506			
NA	Indoor Vent Adaptor (See pg.16)	1	460506 (4") / 460507 (5")			

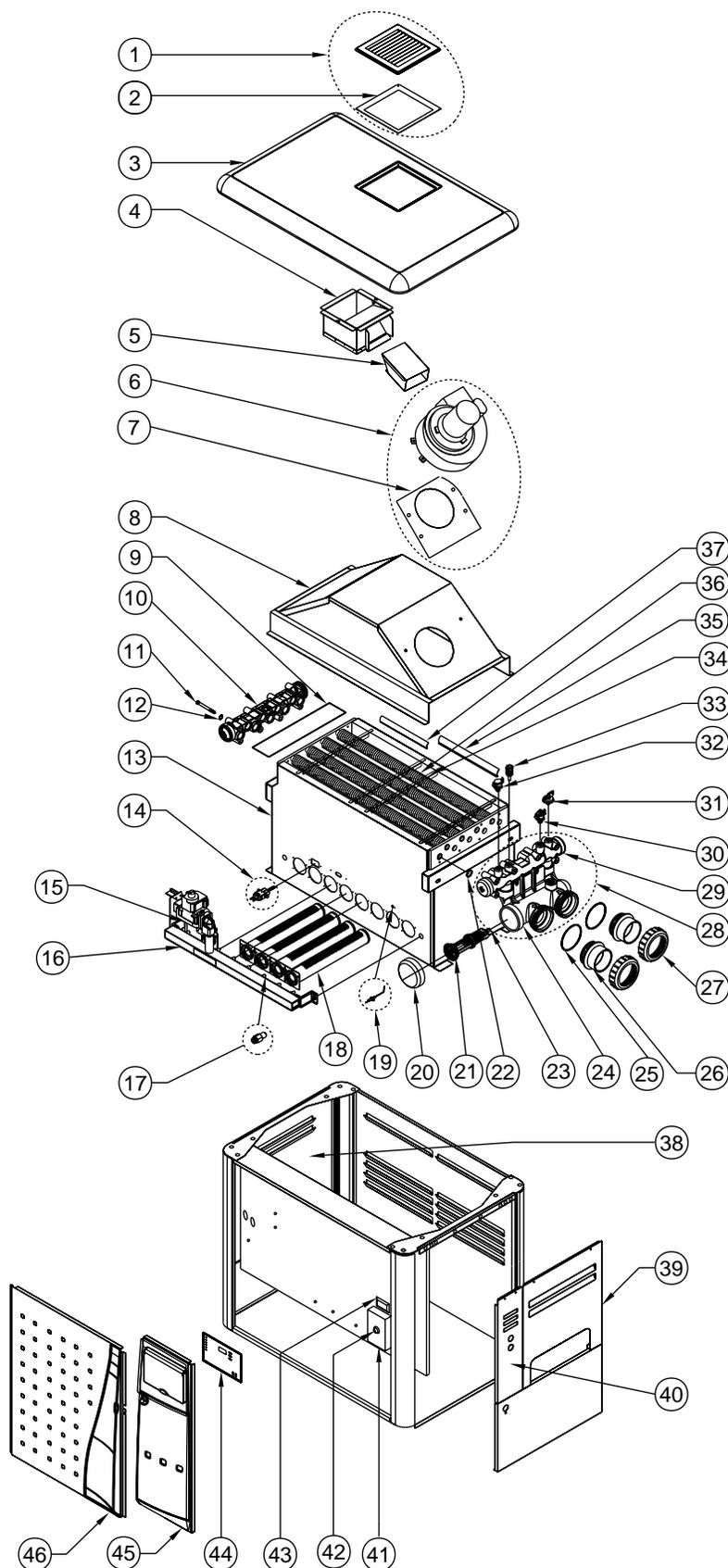
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Replacement Parts for the 400 Model Series are for models manufactured prior to product Serial No. 12040039

Note: Parts for ASME and high altitude (above 4000') are not listed above, please contact our Customer Service Department for details.

REPLACEMENT PARTS

NT TSI w/DDTC — (400 Model — Starting w/Serial No. 12040039)



Replacement Parts — NT TSI — (400 Models)			
Starting with Serial Number 12040039			
Item	Description	Qty	Part No.
1	Exhaust Grill w/Gasket	1	472352
2	Gasket, Exhaust Grill	1	471701
3	Top Cover w/Posts	1	472356
4	Exhaust Assembly	1	472144
5	Exhaust Duct	1	472259
6	Blower w/Gasket	1	472480
7	Gasket, Blower	1	471610
8	Flue Collector	1	472005
9	Insulation, Header/Hi-Limit	1	472270
10	Return Header Assembly	1	471991
11	Bolt, Heat Exchanger	16	471622
12	Washer, Heat Exchanger	16	072184
13	Fire Box Assembly	1	472476
14	Igniter	1	472477
15	Gas Valve – Natural Gas	1	472430
16	Gas Manifold w/Orifices, 0-4000'	1	472262
17	Gas Orifice, 0-4000'	8	472434
18	Burner	8	472211
19	Flame Sensor	1	472251
20	Cap, In/Out Bottom Sub-Header	1	471420
21	Flow Valve Assembly	1	471750
22	Gasket, Fin Tube, Seal	18	070951
23	Power Element, Flow Valve	1	472330
24	In/Out Bottom Sub-Header	1	472364
25	O-Ring, Adapter	2	274494
26	Adapter, Bulkhead, 2"	2	471441
27	Adapter, Bulkhead Ring	2	274440
28	In/Out Main Header Assy	1	471992
29	In/Out Top Sub-Header Assembly	1	472363
30	Hi-Limit Switch, Water Temperature, 150° F.	1	471694
31	Water Pressure Switch	1	472125
32	Hi-Limit Switch, Water Temperature, 115° F.	1	471587
33	Thermister Probe	1	471566
34	Bracket, Baffle Hold-down	4	472329
35	Baffle, Heat Exchanger	16	472301
36	Heat Exchanger w/Headers	1	471838
	Heat Exchanger w/o Headers	1	471936
37	Side Baffle, Heat Exchanger	4	472303
38	Jacket, Upper, Left	1	471575
39	Jacket, Upper Panel, Right	1	471576
40	Jacket, Upper Sub-Plate	2	471767
41	Junction Box Assembly	1	472505
42	Air Pressure Switch, 0-4000' (Not Shown)	1	472481
43	Module, Ignition Control (Not Shown)	1	472150
44	DDTC, Temperature Control Assembly	1	472100
45	Right Door Assembly, with Controller	1	472087
	Right Door Assembly, w/o Controller	1	472372
46	Left Door Assembly	1	471726
N/A	Thermal Cut-off (Not Shown)	1	075173
N/A	Transformer, 40 VA (Not Shown)	1	471571
N/A	Wire Harness Assembly (Not Shown)	1	472506
N/A	Indoor Vent Adaptor, 5" (See pg. 16)	1	460507

Note: Parts for ASME and high altitude (above 4000') are not listed above, please contact our Customer Service Department for details.

SAVE THESE INSTRUCTIONS

Pentair Water Pool and Spa, Inc.

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*Because **reliability** matters most*