

MiniMax 100 (C€ Marked)

ABOVE GROUND POOL & SPA HEATER

USERS & INSTALLATION MANUAL

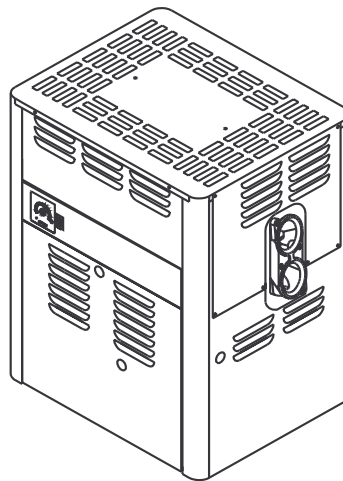
IMPORTANT SAFETY INSTRUCTIONS
READ AND FOLLOW ALL INSTRUCTIONS
SAVE THESE INSTRUCTIONS

⚠ WARNING

FOR YOUR SAFETY - READ BEFORE OPERATING

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

PacFab
I N C O R P O R A T E D



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

To
Consumer
Retain For
Future
Reference

⚠ WARNING

Warning: 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.

For Your Safety

WHAT TO DO IF YOU SMELL GAS

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

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

PacFab, Inc.

Corporate Headquarters: 1620 Hawkins Ave., Sanford, NC 27330 • (919) 774-4151

Western Operations: 10951 West Los Angeles Ave., Moorpark, CA 93021 • (805) 523-2400

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Introduction

MiniMax 100 (C€ Marked) ABOVE GROUND POOL AND SPA HEATERS

Congratulations on your purchase of a MiniMax 100 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 100 is a compact, lightweight and efficient gas fired high performance above ground pool and spa heater that can be connected to schedule 40 PVC pipe and has a built-in top. The heater includes the following features:

- Reliable direct-spark ignition (DSI) system available in propane or natural gas versions.
- Millivolt standing pilot versions in propane and natural gas, when no convenient line power is present.
- Fuel gas input of 100,000 btu/hr.
- Quiet and dependable operation from packaged burner system proven reliable in worldwide usage.
- Heat exchanger constructed of premium non-corroding materials including bronze headers standard.
- The controls have been designed to be very easy to troubleshoot and very easy to access and replace in the rare event of a malfunction-making the MiniMax 100 user friendly.

IMPORTANCE NOTICES FOR THE INSTALLER AND OPERATOR

Gas Safety (Installation and Use) Regulations, 1994 (as amended)

It is the law that all gas appliances are installed by competent persons in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your own interest, and that of safety, to ensure that the law is complied with.

General Requirements

This appliance must be installed by a competent person, i.e. CORGI registered in accordance with the relevant requirements of the Gas Safety Regulations, current I.E.E. Regulations, Model Water Byelaws, Local Water Authority Byelaws and any relevant requirements of the local gas supplier, local authority and the relevant British Standard Codes of practice and Building Regulations. Manufacturers notes must not be taken in any way as overriding statutory obligations. Typical documents include:

- BS. 6891; Installation of low pressure pipework.
- BS. 6644; Installation of Gas Fired Hot Water Boilers 60kW to 2MW.
- CP341; Water Supply.
- British Gas Publications:
 - IM2; Purging Procedures of Non-domestic Gas Installations.
 - IM5; Soundness Testing Procedures for Industrial and Commercial Gas Installations.
 - IM11; Flues for Commercial and Industrial Gas Fired Boilers and Air Heaters.
 - Model Water Byelaws.

SPECIFICATIONS - TECHNICAL DATA

(NATURAL GAS MODELS ONLY)

CATEGORY		I _{2H}	I _{2E}	I _{2E+}
GAS AND SUPPLY PRESSURE		G20 @ 20mb.	G20 @ 20mb.	G20 @ 20mb. G25 @ 25mb.
BURNER PRESSURE				
	mbar	9.3	9.3	9.3 (3.7)
	(in.wg)	(3.7)	(3.7)	13.8 (5.5)
HEAT INPUT	GROSS			
	kW	29.3	29.3	29.3
	(Btu/h)	(100,000)	(100,000)	(100,000)
	NET			
	kW	26.4	26.4	26.4
	(Btu/h)	(90,077)	(90,007)	(90,007)
HEAT OUTPUT				
	kW	23.4	23.4	23.4
	(Btu/h)	(79,841)	(79,841)	(79,841)
GAS RATE				
	m ³ /h	2.8	2.8	G20 - 2.8 G25 - 3.2
FLUE GAS VOLUME (4.5% CO ₂ , 100°C)				
	m ³ /h	88	88	88
INJECTOR DIAMETER & (MARKING)				
	mm	1.25		
		(125)		
NUMBER OF INJECTORS (BURNERS)		14	14	14
MAXIMUM WATER PRESSURE		8		
	bar (psi)	(125)		
MAXIMUM WATER FLOW		45		
TEMP		°C		
ELECTRICAL SUPPLY		230V - 50Hz		
		FUSED AT 5A. POWER 35W		
WEIGHT (EMPTY)				
	kg	38	38	38.25
	(lbs)			
NOMINAL FLUE DIAMETER				
	mm	125	125	125
(INDOOR INSTALLATION)	(in.)	(5)	(5)	(5)

SPECIFICATIONS - TECHNICAL DATA

(LPG MODELS ONLY)

CATEGORY		I _{3P}	I _{3P}	I _{3B/P}
GAS AND SUPPLY PRESSURE		G31 @ 37mb.	G31 @ 50mb.	G30 @ 29mb.
BURNER PRESSURE mbar (in.wg)		21.0 (8.4)	21.0 (8.4)	21.0 (8.4)
HEAT INPUT	GROSS kW (Btu/h)	29.3 (100,000)	29.3 (100,000)	34.3 (117,000)
	NET kW (Btu/h)	26.96 (91,988)	26.96 (91,988)	31.6 (107,819)
HEAT OUTPUT kW (Btu/h)		23.4 (79,841)	23.4 (79,841)	27.4 (93,625)
GAS RATE m³/h		1.1	1.1	0.98
FLUE GAS VOLUME (4.5% CO ₂ , 100°C) m³/h		101	101	119
INJECTOR DIAMETER & (MARKING) mm		0.85 (085)		
NUMBER OF INJECTORS (BURNERS)		14	14	14
MAXIMUM WATER PRESSURE bar (psi)		8 (125)		
MAXIMUM WATER FLOW TEMP °C		45		
ELECTRICAL SUPPLY		230V - 50Hz FUSED AT 5A. POWER 35W		
WEIGHT (EMPTY) kg (lbs)		38	38	38
NOMINAL FLUE DIAMETER (INDOOR INSTALLATION) mm (in.)		125 (5)	125 (5)	125 (5)

This instruction manual provides operating instructions, installation, and service information for the MiniMax 100 high performance heater. The information in this manual applies to the MiniMax 100 natural gas and L.P.G., DBI and millivolt standing pilot heater models.

This heater is designed for the heating of fresh water swimming pools and spas, and should not be used for any other purpose.

The heater must only be installed in the open air or in a room separated from living rooms and provided with appropriate ventilation directly to the outside.

The heater must be used only in accordance with these instructions. Incorrect use is dangerous and invalidates all warranties and certification.

WARRANTY INFORMATION

The MiniMax 100 pool heater is sold with a limited factory warranty. *Specific details are described on the back cover of this manual and a copy of the warranty and warranty registration card are included with the product.* Return the warranty registration card after filling in the serial number from the rating plate inside the heater. For ordering parts, you should indicate model and serial numbers of the heater. If the parts are requested for warranty, you must also indicate the date of installation.

PacFab's 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 current heater equipment.

Operation



SAFETY RULES

1. Spa or hot tub water temperatures should never exceed 40° C (104° F). A temperature of 38° C (100° F) is considered safe for a healthy adult. Special caution is suggested for young children.
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 39° C. (102° 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 38° C. (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 2.2° C. (4° F.).
5. Persons with 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 appliance. 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.

MINIMAX 100 DIRECT-SPARK IGNITION LIGHTING/OPERATION- NATURAL GAS & PROPANE

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.

- A. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner 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.
- C. 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.
- D. Never store any materials within the vicinity of the appliance or ventilation openings.

SAFETY INFORMATION - IF YOU SMELL GAS, FOLLOW THESE RULES

- 1. Shut off gas line or propane tank.
- 2. Immediately call your gas supplier from a neighbour's phone.
- 3. Follow the gas supplier's instructions.
- 4. If you cannot reach your gas supplier, call the fire brigade.
- 5. Do not light matches or lighter.
- 6. Do not try to light any appliance.
- 7. Do not touch any electric switch; do not use any phone in your building.
- 8. Open all doors and windows. (Indoor)

STOP! HAVE YOU READ THE SAFETY INFORMATION?

OPERATING INSTRUCTIONS

TO LIGHT THE APPLIANCE

- 1. Make sure pump is running and primed.
- 2. Push power switch on.
- 3. Set thermostat to desired setting.
- 4. The unit should spark and the burner should ignite.
- 5. In new installations where the gas line hasn't been bled, the ignition sequence may require resetting by interrupting the electrical supply following each failed ignition.
- 6. If the heater does not operate as it should, in a reasonable amount of time, read the Troubleshooting Guide portion of this manual or isolate gas supply and call a service technician at your gas supplier.

TO TURN THE APPLIANCE OFF

- 1. Set the thermostat to lowest setting and turn off power switch.
- 2. Turn off all electric power to the appliance if service is to be performed, (if applicable).
- 3. If the appliance is to be turned off during a period when frost is likely, consult your service engineer/gas supplier to take the appropriate action. (Drain the system.)

MILLIVOLT LIGHTING/OPERATION- NATURAL GAS & PROPANE

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.

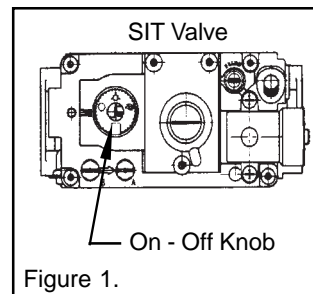
BEFORE OPERATING: Smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Do not 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.

NEVER store any materials within the vicinity of the appliance or ventilation openings.

SAFETY INFORMATION - IF YOU SMELL GAS, FOLLOW THESE RULES

1. Shut off gas line or propane tank.
2. Immediately call your gas supplier from a neighbour's phone.
3. Follow the gas supplier's instructions.
4. If you cannot reach your gas supplier, call the fire brigade.
5. Do not light matches or lighter.
6. Do not try to light any appliance.
7. Do not touch any electric switch; do not use any phone in your building.
8. Open all doors and windows. (Indoor)



STOP! HAVE YOU READ THE SAFETY INFORMATION?

TO LIGHT THE APPLIANCE

1. Push power switch off. Remove the front casing door. Twist the black knob on the gas valve anti-clockwise to the pilot position and release it.
2. Make sure pump is running and primed.
3. Push in and retain fully depressed the black knob on the gas control. At the same time, repeatedly operate the piezo spark generator to produce a spark at the pilot burner. When the pilot has been lit, keep the black knob depressed for a further 20 seconds. If the pilot does not remain alight when the black knob is released, twist the knob clockwise then release it. Wait at least three minutes then repeat the procedure from step 5.
4. In new installations where the gas line hasn't been bled, the pilot may be slow to light.
5. When this pilot flame is established, turn knob anti-clockwise and turn the power on. Set the thermostat to the desired setting and the main burner should light. Refit casing door.
6. If the heater does not operate satisfactorily, consult the Troubleshooting Guide portion of this manual.

TO TURN THE APPLIANCE OFF

FOR SHORT PERIODS

Set the thermostat to its lowest setting, wait two minutes, then turn the power off. (Turn off all electric power to the appliance if a service is to be performed.)

NOTE: The appliance is fitted with a thermo-electric flame failure device therefore the pilot and gas cock must not be turned off except for long term shut-down, emergencies, or servicing.

If the appliance is to be turned off during a period when frost is likely, consult your service engineer/gas supplier to take the appropriate action. (Drain the system.)

FOR LONG PERIODS

Set the thermostat to its lowest setting, wait two minutes, then turn the power off. Twist the black button on the gas valve clockwise then release it. Turn off the gas cock.

NOTE: If severe weather (frost) conditions are anticipated during a period, shutdown the heater and system must be completely drained. Consult your service engineer/gas supplier to take the appropriate action. (Drain the system.)

OPERATING (CONTROLS)

DIRECT SPARK ELECTRONIC AND MILLIVOLT MODELS

For convenience and economy all MiniMax 100 heaters are equipped with a thermostat on the front of the heater control panel; see Figure 2.

The Pool/Off/Spa switch allows the heater to be turned off when heating is not desired.

1. "ON" position - Maintains selected pool temperature.
2. "OFF" position - Heater will not come on regardless of drop in pool temperature.

SELECTOR DIALS

The selector dial (knob) eliminates constant thermostat adjustments. Set the spa dial at the desired spa temperature.

NOTE

To eliminate error due to piping heat losses, measure pool temperature with an accurate thermometer directly at the pool or spa.

If further adjustment is needed rotate the knob until the desired temperature is obtained. This knob position corresponding to your desired maximum pool or spa temperature may now be preset (locked) by the knob stopper which prevents the knob from being turned beyond the maximum temperature you set.

THERMOSTAT KNOB STOPPER

Each thermostat is equipped with a mechanical stop that can be locked or unlocked with use of a screwdriver to prevent temperatures in excess of that desired by the user; see Figure 2.

The maximum setting can be adjusted by loosening the screw "A" and turning the stopper dial to desired maximum setting. Lock the setting by tightening the screw. The Mechanical stop is under the knob. Ensure that the knob is stopping at the correct position when the knob is rotated clockwise from a lower temperature position.

OVERHEAT THERMOSTAT

A manual reset overhear thermostat is fitted on the RHS of the unit adjacent to the flow header.

If the appliance will not light, press the overhear reset button before contacting a service engineer.

If the overhear condition persists, contact a service engineer or your gas supplier.

HEATER OPERATION

GENERAL

The MiniMax 100 DBI employs a microprocessor based Direct Spark Ignition (DSI) system to light the main burner and therefore has no pilot. The ignition circuit operates at 24 VAC and requires that a 230 VAC (50Hz) line voltage be supplied to the heater.

The MiniMax 100 MV (Millivolt) requires no external power source and the control circuit derives all its power from the energy generated from the standing pilot/thermopile generator combination.

The MiniMax 100 DSI Control utilizes a microprocessor to continually and safely monitor, analyze, and control the proper operation of the gas burner. The DSI Control features LED diagnostics, automatic one hour reset, and flame current test pins. The LED is located on the DSI.

CONTROLS OPERATION (DBI SYSTEM) Heat Mode

1. When a call for heat is received from the thermostat supplying 24 volts to TH/W, the control will reset, perform a self check routine, and flash the diagnostic LED for up to four seconds. After a brief delay the gas valve is energized and the ignition electrode begins to spark for the four (4) second trial for ignition period.
2. When flame is detected during the trial for ignition, sparking is shut-off immediately and the gas valve remains energized. The thermostat and main burner flame are constantly monitored to assure the system continues to operate properly.
 - a. When the thermostat is satisfied and the demand for heat ends, the main valve is de-energized immediately.

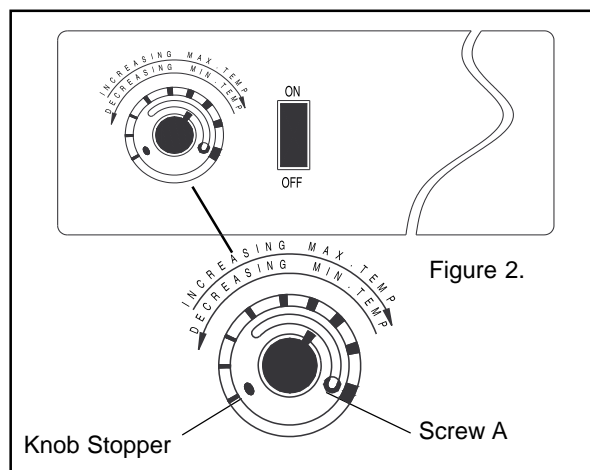


Figure 2.

Failure to Light- Lockout (DBI Models Only)

1. Should the main burner fail to light, or flame is not detected during the trial for ignition period the control will go into lockout and the valve will be turned off immediately.
2. Recovery from lockout requires a manual reset by resetting the thermostat or turning off the ON/OFF switch for a minimum period of 5 seconds.

IMPORTANT!

IT IS RECOMMENDED THAT NO MORE THAN TWO IGNITION ATTEMPTS IN SUCCESSION BE PERFORMED FOR NATURAL GAS SYSTEMS . BEFORE FURTHER IGNITION ATTEMPTS, WAIT AT LEAST FIVE MINUTES FOR GAS TO CLEAR.

FOR PROPANE (LPG) SYSTEMS ALLOW AT LEAST FIVE (5) MINUTES BETWEEN IGNITION ATTEMPTS FOR THIS HEAVIER-THAN-AIR GAS TO SAFELY DISSIPATE. AFTER TWO UNSUCCESSFUL IGNITION ATTEMPTS WITH PROPANE, OPEN THE BURNER ACCESS DOOR AND WAIT AT LEAST THIRTY (30) MINUTES BEFORE REPLACING DOOR TO ATTEMPT FURTHER IGNITION ATTEMPTS.

NOTE

Normally the heater will light in the first or second attempt. And with the exception of a new installation or one that has been shut down for an extended period, where there is considerable air trapped in the gas supply line, unsuccessful ignition indicates other problems with the ignition system - such as an unclean ignition electrode impeding flame sensing.

3. If the thermostat is still calling for heat one hour after a lockout the control will automatically reset and attempt to ignite the burner again.

Flame Failure-Re-Ignition

1. If the established flame signal is lost while the burner is operating, the control will respond within 0.8 seconds. The H.V. spark will be energized for a trial for ignition period in an attempt to relight the burner.
 - a. If the burner does not light, the control will de-energize the gas valve, shutting off the gas flow, and the control will go into lockout as described above in "Failure to Light-Lockout." If flame is re-established, normal operation resumes.

Control Fault -Diagnostic LED Conditions

Error Mode	LED Indication
Internal Control Failure	Steady on
Flame Sense Fault	2 flashes
Ignition Lockout	3 flashes

The DBI Ignition Control can be accessed after removing the heater's front control panel. The diagnostic LED located on the top of the DBI control will flash on for 1/4 second, then off for 1/4 second during a fault condition. The pause between fault codes is 3 seconds.

Maintenance

MAINTENANCE INSTRUCTIONS

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 flueing system. Make sure there are no obstructions in the flow of combustion and ventilation air.
2. Visually inspect the main burner and the pilot burner flame (on millivolt models). The normal color of the flame is blue, see Figure 3. When flame appears yellow, burners should be inspected and cleaned.
3. Keep the burner area clear and free from combustibles and flammable liquids.

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 25° C 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.
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 25° C. Lower the temperature to a range that can be achieved easily in one day. Generally, this would be 5.5° C to 8.4° C lower providing the pool heater is sized properly.
7. During the winter or while on vacation, turn 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 AUTUMN OPERATION

If the pool is being used occasionally, do not turn the heater completely off. Set the thermostat down to 18° C. 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

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. 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, 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.

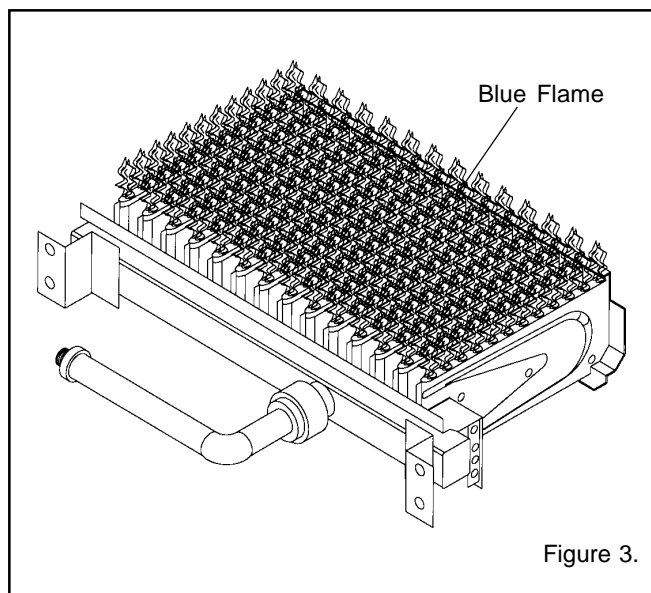


Figure 3.

CHEMICAL BALANCE

POOL AND SPA WATER

Your MiniMax 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.

⚠ WARNING

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 1. Muriatic Acid has a pH of about 0. Pure water is 7 (neutral). Weak Lye solution has 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 2.

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.
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 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.

ALKALINITY High - 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.

Table 1. **pH Chart**

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

Table 2. **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			

Installation Instructions

SPECIFICATIONS

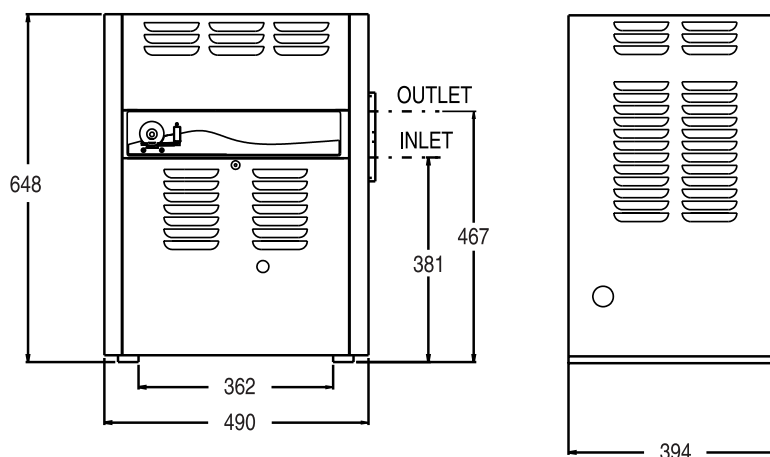
IMPORTANT NOTICE: These installation instructions are designed for use by qualified personnel only, trained especially for installation of this type of heating equipment and related components.

The heater must be installed on a level surface consisting entirely of, or a combination of, noncombustible materials such as steel, iron, brick, tile, concrete, slate, or plaster. Do not install on carpeting. The heater must be installed to keep specific clearances on all sides for service and inspection.

This appliance is so designed that no special precautions are necessary to reduce operational noise levels.

OUTDOOR INSTALLATION

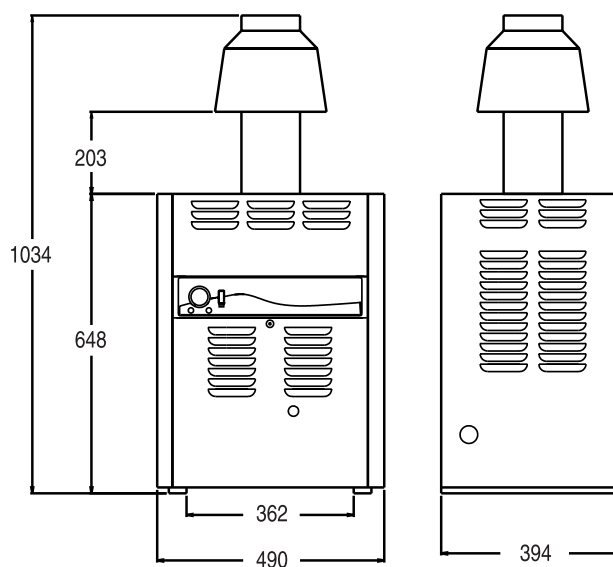
Stackless, applies to all
MiniMax 100 outdoor models



Outdoor Installation

INDOOR INSTALLATION

Applies to all MiniMax 100
indoor models,
Draft hood stack diameter = 125 mm



Indoor Installation

OUTDOOR INSTALLATION

This heater is certified for outdoor installation. If the heater is installed in very cold areas proper precautions are needed for freeze protection. The heater must be placed in a suitable area on a level, noncombustible surface. Do not install heater under an overhang with clearances less than 3 feet from top of the heater. The area under an overhang must be open on three sides.

NOTE

Water drainage must be diverted from heater installed below overhangs with use of gutters. To assure proper rain drainage in outdoor installation, heater must be set on a level foundation.

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 front of heater; see Figure 4.

IMPORTANT!

When locating the heater, consider that high winds can roll over or deflect off adjacent buildings and walls. Normally, placing the heater at least three feet from any wall will minimize downdraft.

Unusually high prevailing wind conditions and downdrafts may require the use of a stack type outdoor vent kit (available at additional cost).

NOTE

This unit shall not be operated outdoors at temperatures below 18° C for propane and -29° C for natural gas.

NOTE

Overhangs must be such that flue products are not diverted into living spaces. Heaters installed under overhangs must be protected from direct roof water drainage by gutters and the like. From the point where the flue products leave the heater, that point **MUST** be a minimum of four (4) feet below, four (4) horizontally from or one (1) foot above any door, window or gravity inlet into the building; see Figure 5.

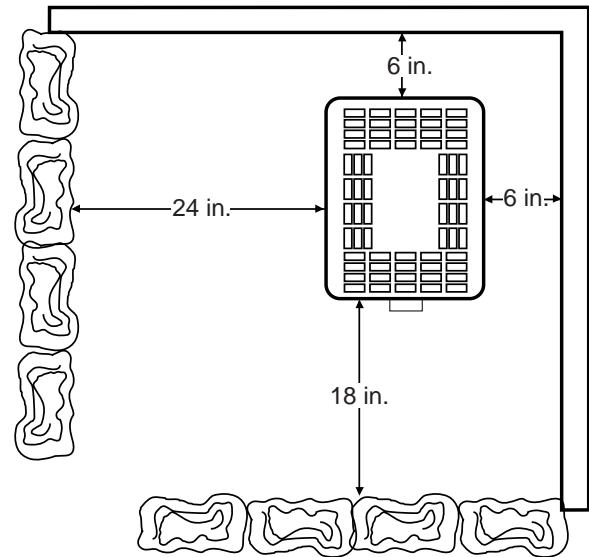


Figure 4.

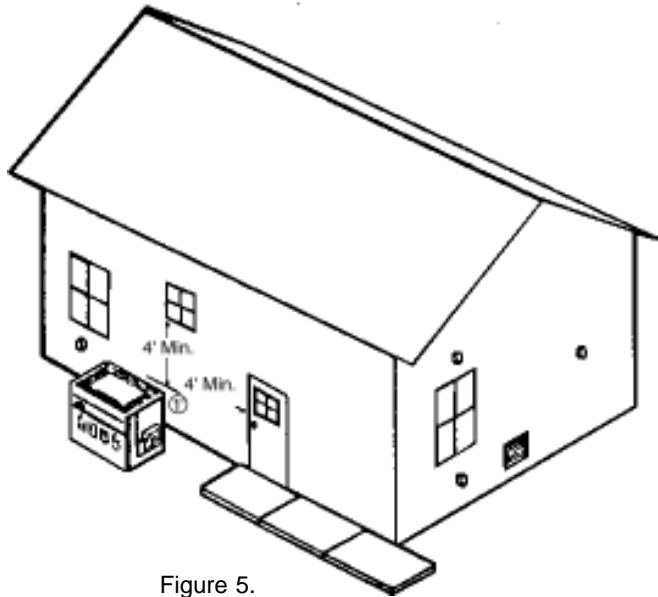


Figure 5.

INDOOR INSTALLATION

The installation of flueing systems should conform with the latest edition of BS 5440:1.

All products of combustion and flue gases must be completely removed to the outside atmosphere through a flue pipe which is connected to the draft diverter. A flue pipe extension of the same size must be connected to the draft diverter and extended at least 600 mm higher than the highest point of the roof within a 3 m horizontal radius, and at least 1 m higher than the point at which it passes through the roof; see Figure 6. The flue should terminate with an approved terminal (weather cap) for protection against rain or blockage by snow. Double-wall flue pipe and an approved weathering shall be employed through the roof penetration.

The draft diverter must be installed so as to be in the same atmospheric pressure zone as the combustion air inlet to the pool heater. The certified (factory) draft diverter **must not** be modified in any way and must be employed in every indoor installation.

The heater must be located as close as practical to a chimney or gas vent. The heater should be installed at least 2 m away from the pool or spa.

The heater must be placed in a suitable room on a non-combustible floor and in an area 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.

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

	Side	Front	Top
Water Connection	18 in.	24 in.	
Remaining	6 in.	6 in.	
Ceiling Clearance			36 in.*

*To ceiling or roof.

NOTE

The heater requires **two** uninterrupted air supply openings; one for ventilation and one to supply oxygen for proper gas combustion; see Figure 7.

When a heater is installed indoors, two air openings must be provided. One opening should be placed at the bottom and one at the top of the room to allow for a free flow of air. If other gas appliances are installed in the same room, you must check to see that they have been provided with the proper size openings, otherwise they may use the air intended for your pool heater.

The air supply openings should be sized according to Table 3.

CAUTION

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

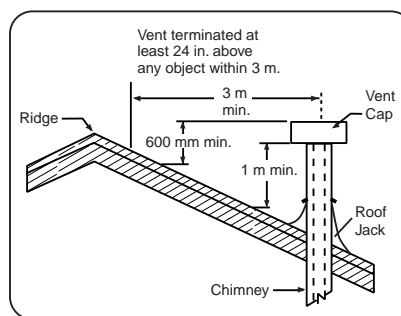


Figure 6.

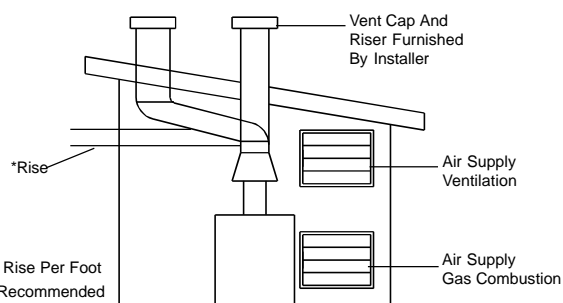


Figure 7.

Table 3.

Air Opening Requirements		
Model	High Level cm ² (sq. in.)	Low Level cm ² (sq. in.)
100 DBI	100 (16)	200 (31)
100 MV	100 (16)	200 (31)

It is essential that the ventilation is direct from outside. The appliance must not be installed in a room directly or indirectly connected to a living space.

FLUE TEST

Use the following steps to perform a quick check of your flueing installation. Allow the heater to operate for 15 minutes. Close the doors in the room, then strike a wooden match and blow out the flame. Hold the smoking match next to the draft diverter; see Figure 8. If the smoke is pulled up into the flue and out of the room, the flueing is correct. If it does not, you must make flueing corrections.

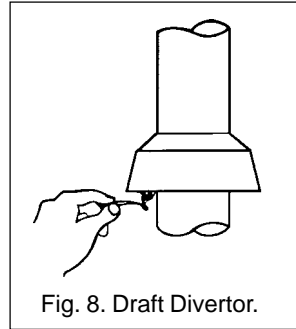


Fig. 8. Draft Diverter.

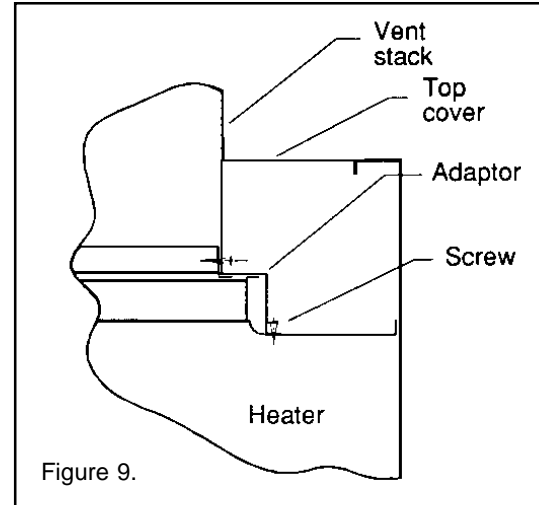


Figure 9.

Stack Type Indoor Draft Diverter Kit

Model	Draft Diverter	Product No.	Flue Dia.
100 DBI	DH 10	471187	125 mm
100 MV	DH 10	471187	125 mm

Indoor Draft Diverter Installation

1. Take out slotted outer top piece after first removing sheet metal screws, attaching it to the cabinet.
2. Install adapter (vent kit).
3. Install top cover (vent kit).
4. Install draft diverter (vent kit).

Use provided screws to secure the vent assembly; see Figure 9.

NOTE

If any of the original wiring supplied with this heater must be replaced, installer must supply (No. 18 awg 105° C approved AWM low energy stranded) copper wire or it's equivalent.

CAUTION

The heater must be electrically earthed and bonded in accordance with local codes or, in the absence of local codes, with the latest national electrical codes.

ELECTRICAL INSTALLATION

The main supply required is 230V 50Hz fused at 5A, via a fused double pole isolation separation of at least 3 mm in both poles.

This should be a permanent connection to the fixed wiring of the system.

There must be only one common isolator for the boiler and its control system and it must provide complete electrical isolation.

The power supply cable to the appliance should be at least 0.75 mm² (24 x 0.2 mm²) PVC heat resistant, as specified in Table 16 of BS 6500.

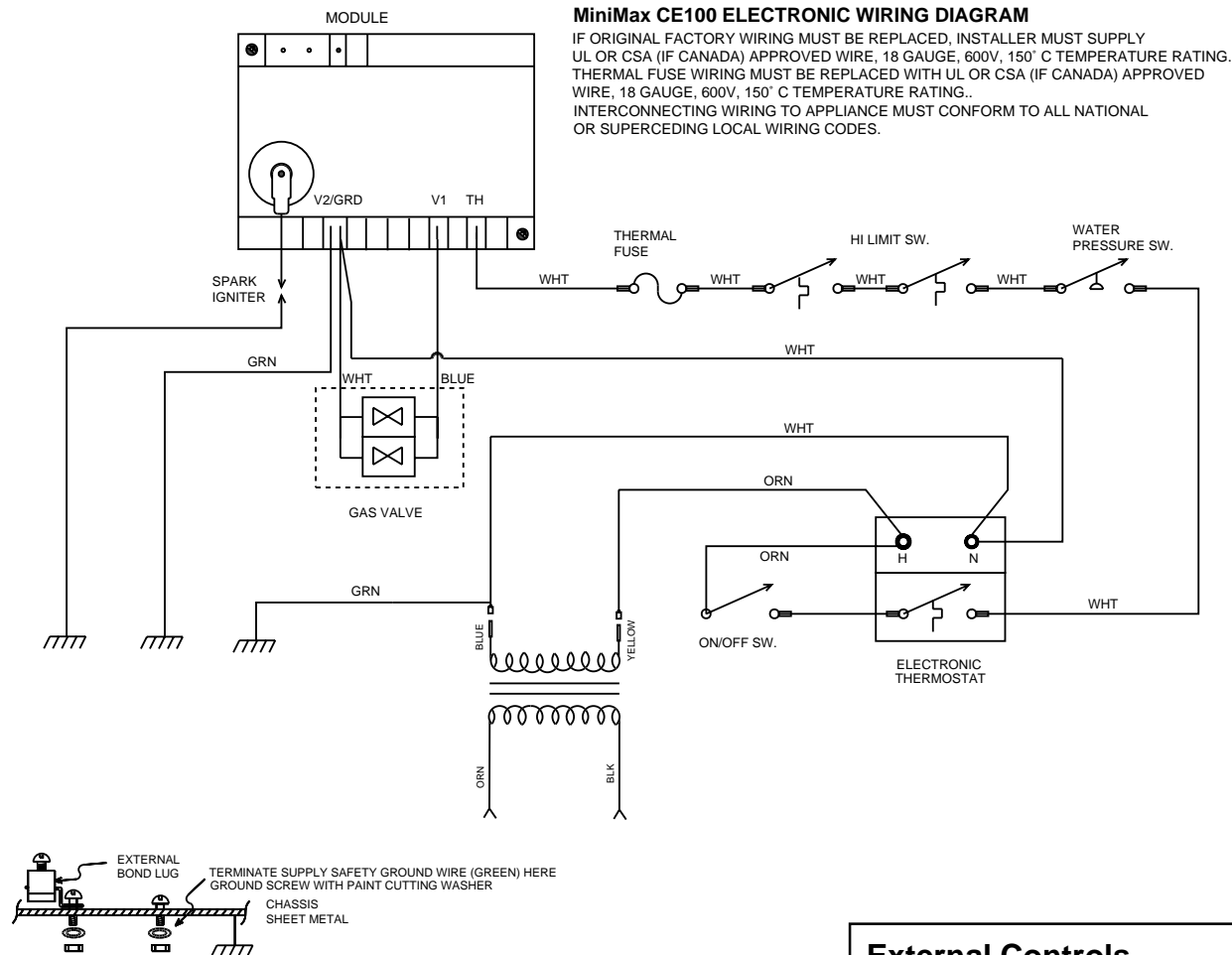
All external wiring to the boiler must be in accordance with the latest I.E.E. Wiring Regulations and any local regulations which apply.

The appliance must be earthed.

In the event of an electrical fault after installation of the appliance, preliminary electrical systems checks must be carried out i.e. Earth Continuity, Short Circuit, Polarity and Resistance to Earth.

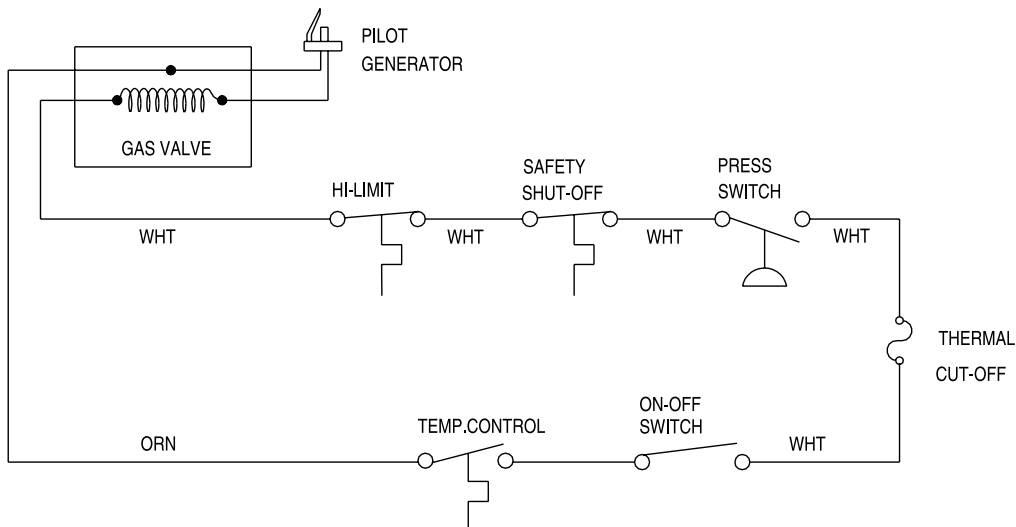
All fuses must be ASTA approved to BS 1362.

MiniMax 100 Electronic Direct Spark Ignition Wiring Diagram



MiniMax 100 Millivolt Wiring Diagram

IF ANY OR THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, INSTALLER MUST SUPPLY (NO. 18 AWG 105°C) COPPER WIRE.



External Controls

Any external control (such as a time clock) should be connected to the electrical supply to the appliance and must not interrupt or disturb the internal wiring of the appliance.

PLUMBING CONNECTIONS

The MiniMax 100 heater has the unique capability of direct schedule 40 or 80 CPVC/ABS/PVC plumbing connections. Either a Quick-Flange or Quick-Flange II (depending on model ordered) has been included with the MiniMax 100 to insure conformity with PacFab's recommended CPVC/ABS plumbing procedure; see Figure 10. Other plumbing connections can be used. The instructions on the following pages show the methods for successfully connecting plumbing to the inlet/outlet header with either the Quick-Flange or Quick-Flange II.

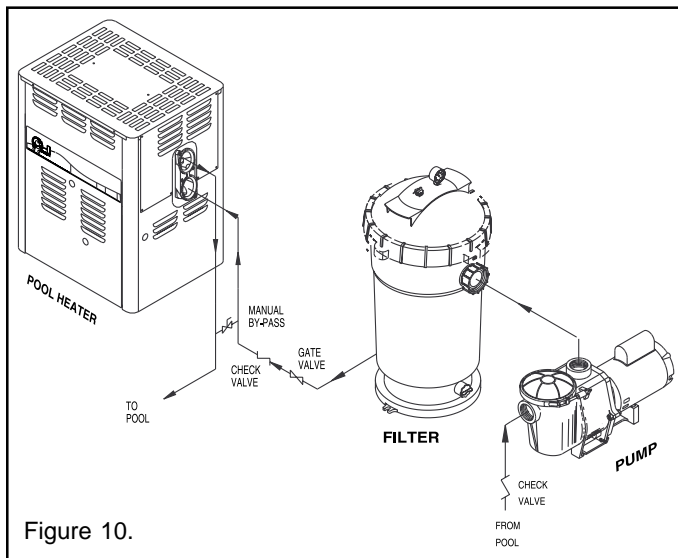


Figure 10.

MANUAL BY-PASS

Where the flow rate exceeds the maximum 80 GPM, a manual by-pass should be installed and adjusted. After adjustments are made, the valve handle should be removed to avoid tampering.

Model	Min.	Max.*
100	20	80

* Do not exceed the maximum recommended flow rate for the connecting piping.

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 siphon; see Figure 11.

Caution: Exercise care when installing chemical feeders so as to not allow back siphoning of chemicals into the heater, filters or pump.

PRESSURE SWITCH

The pressure switch will keep the circuit open when the pump is not on and operating. When the filter pump turns on, the pressure switch closes the circuit and the heater will operate. When the heater is installed below water level of a spa or pool, adjustment of the pressure switch may be required. For adjustment of pressure switch, we recommend the following procedures.

1. Backwash the filter and clean the pump hair and lint basket before making any adjustment to the pressure switch.
2. Switch the circulation pump on and make sure it is primed.
3. Push the heater power switch on and set the thermostats to their highest temperature settings.
4. Clean the locktight off of the pressure switch adjustment knob threads.
5. Turn the adjustment knob clockwise or away from the micro-switch, until the heater shuts down; see Figure 12.
6. Turn the adjustment knob counter-clockwise 1/2 turn and the heater should re-fire.
7. Turn the pump off and the heater should shut down. If the heater does not shut down, repeat the procedure.
8. Switch the pump off and on several times to assure proper adjustment.

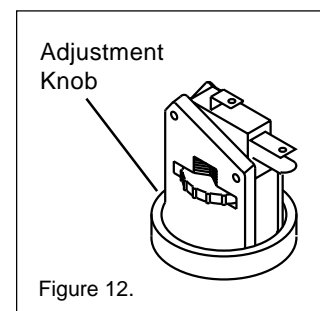


Figure 12.

NOTE

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

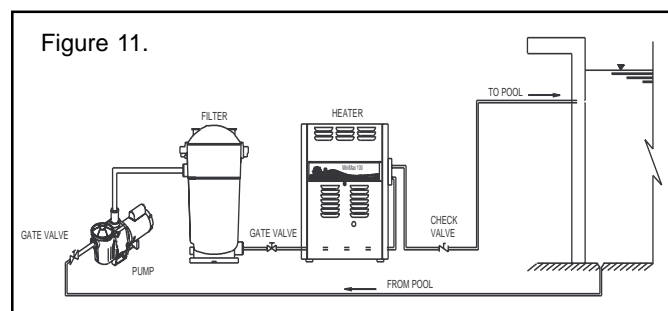
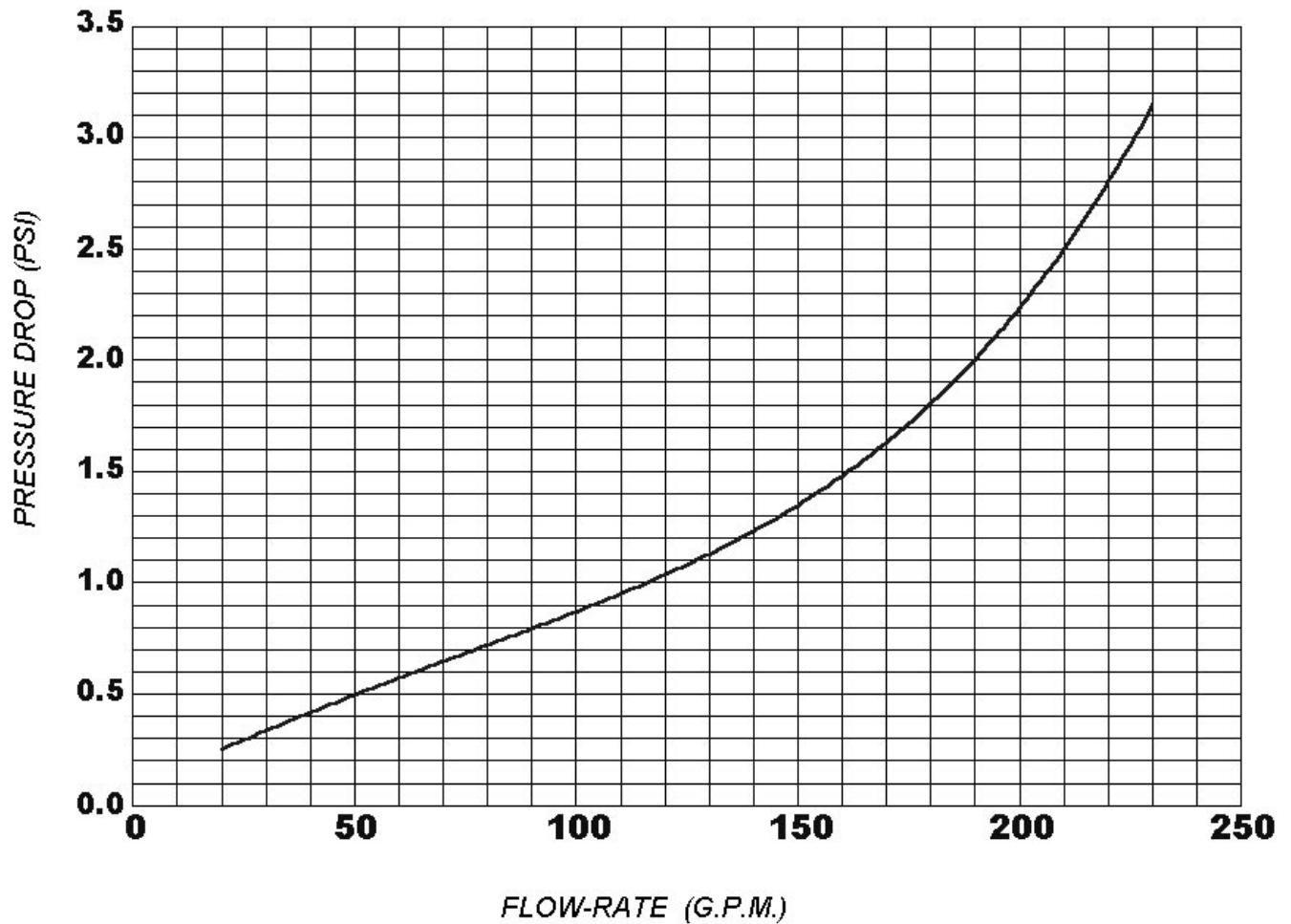


Figure 11.

PLUMBING CONNECTIONS

THE GRAPHIC BELOW INDICATES THE PRESSURE DROP EXPECTED ACROSS THE APPLIANCE FOR ANY GIVEN FLOWRATE

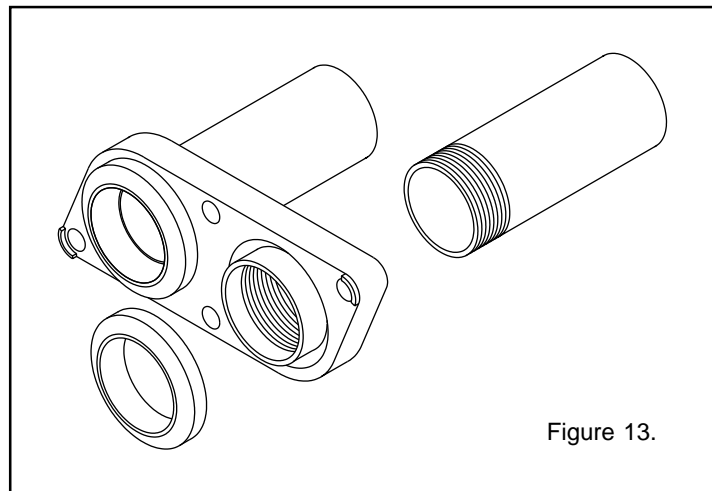
PRESSURE DROP CURVE



WATER CONNECTIONS

QUICK-FLANGE II INSTALLATION INSTRUCTIONS

FOR 1½ SCHEDULE 40 CPVC or ABS PIPE or SCHEDULE 80 PVC
(you may adapt to SCH 40 PVC 12 inches beyond the Quick Flange II)
(1½ in. npt x 1½ in. CPVC/ABS slip Male Adaptor may be required)



1. Insert 2 in. rubber gaskets over 2 in. gasket retainer rings molded to bottom of Quick-Flange II; see Figure 13.
2. Bolt Quick-Flange II to header using supplied 3/8 in. bolts and 3/8 in. washers.
3. Using pipe dope, thread pipe directly to Quick-Flange II.
 - a. Or, first thread a 1½ in. npt x 1½ in. slip CPVC/ABS male adaptor (not supplied) to the Quick-Flange II, and after preparing the joint by sanding with a medium grit sandpaper, glue the pipe to the adaptor with a quality solvent glue.

NOTE

All versions of the Minimax 100 include a Quick-Flange II Adaptor.

Each MiniMax 100 Quick-Flange II Accessory Kit, p/n 471083, contains the following items:

- One (1) Quick-Flange II unit
 - Two (2) 2 in. Rubber Gaskets
 - Four (4) 3/8 in. Bolts
 - Four (4) 3/8 in. Washers
-

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. Table 4 shows which size pipe is required for the distance from gas meter to the heater. The table is for natural gas at a specific gravity of .65 and propane at specific gravity of 1.5.

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 heaters 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 PSIG).

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.

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

⚠ WARNING

Do not install the gas line union inside the heater cabinet. This will void your warranty.

⚠ CAUTION

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

Pipe Sized For Length Of Run In Equivalent Feet

	1/2"		3/4"		1"	
Model	Nat	LP	Nat	LP	Nat	LP
100 DSI	20'	50'	50'	150'	150'	600'
100 MV	20'	50'	50'	150'	150'	600'

Table 4.

COMMISSIONING

FILLING THE SYSTEM

1. Ensure all power is off and all external controls are off.
2. Open all supply and return valves.
3. Fill heating system to minimum operating pressure.
4. Purge air from all system pipe work recharging the system to the minimum operating pressure.

INITIAL FIRING

Before commissioning the appliance, the whole gas installation, including the meter, **MUST** be pre-purged and tested for gas soundness in accordance with BS 6891:1988.

Important: Open all doors and windows, extinguish naked flames and **DO NOT SMOKE** whilst purging the gas line.

Before commencing the commissioning procedure, ensure that the gas service cock is turned on, electricity supply is isolated.

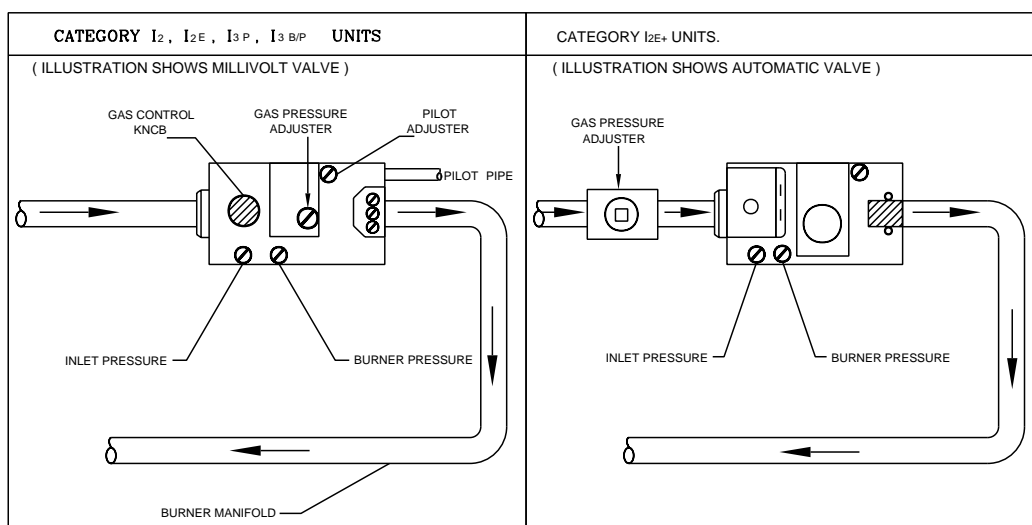
1. Be sure that the system has been adequately vented of air and is water - tight.
2. Connect an accurate manometer to the Gas Valve outlet connection.
3. Open gas shut-off valve.
4. Following appropriate lighting instructions in the **users section** of this manual, checking that the burner setting pressure is as detailed on the appliance database and specification sheets of this manual.

If burner pressure requires adjustment, the adjuster location is shown for the specific appliance category, below.

IMPORTANT NOTE

Adjustment of the setting pressure for category I_{2E+} must only be done with the **main burners off** following removal of the sealing cap. Always replace the sealing cap before refiring, checking for gas soundness with leak detection fluid.

GAS CONTROL ASSEMBLY



Upon completion of commissioning and testing the system, the installer should draw the user's attention to the following:

1. Give the "Users Instructions" to the householder and emphasise their responsibilities under the "Gas Safety (Installation and Use) Regulations 1994" (as amended).
2. Explain and demonstrate the lighting and shutdown procedures.
3. Advise the householder on the efficient use of the system, including the use and adjustment of all system controls.
4. Advise the user of the precautions necessary to prevent damage to the system and to the building, in the event of the system remaining inoperative during frost conditions.
5. Explain the function of the boiler overheat thermostat and how to reset it. Emphasise that if cut-off persists, the boiler should be turned off and the installer or service engineer consulted.
6. Stress the importance of an annual service by a registered heating engineer.
7. The electrical mains supply to the appliance must remain on for the frost protection circuit to operate.

SERVICE SECTION

GENERAL

To ensure safe and efficient operation of the appliance, it is recommended that the servicing is carried out at regular intervals, the frequency of which will vary depending on the condition of installation and usage: once every year will be adequate.

Servicing must be undertaken by a competent person, such as a service engineer.

NOTE

Refer to Short Parts List when ordering spares.

Before undertaking any work on the appliance - switch off the electrical supply at the external isolator.

BURNER TRAY REMOVAL & DISASSEMBLY

You may need to inspect and repair the parts of the heater that allows the gas to flow from the gas supply line into the burners.

1. Turn off gas supply.
2. Isolate the electrical supply.
3. Remove the gas line, flanged onto the gas valve.
4. Remove gas valve holding bracket.
5. Remove gas valve wires.
6. Disconnect the ignition wiring.
7. Remove burner manifold fixing screws and draw out the burner tray.
8. Check the main burner orifices and check for any blockage.
9. Check thermocouple (Millivolt only) for deterioration and replace if necessary.
10. Remove the pilot orifice and clean it. (Do not use any sharp object! It will destroy the designed orifice size!)
11. After all control devices have been removed, clean manifold.
12. Reassemble in reverse. Reestablish gas, water and electrical supplies.
13. Check water tightness, gas soundness and electrical continuity.

NOTE

If the heater has been off for the winter or has been installed, but not fired for an extended period of time, insects will crawl into these orifices and the pilot orifice and prevent the heater from firing.

Installation of the high tension ignition wire is very important when reassembling the burner tray into the heater. The ignition wire must be placed onto the assembly tightly and completely to assure proper spark at the electrode during heater start-up.

If the ignition wire is not on to the assembly all the way, with a tight connection, the spark will be erratic and the sequence and subsequent gas valve will be interrupted.

SOOT FORMATION ON THE HEAT EXCHANGER

Usual Causes of Sooting:

1. Low gas pressure in the gas supply line.
2. Excessive water flow can create condensation which can cause a soot formation.
3. Foreign material in burners and orifices. (Remove foreign material such as dirt, spider webs, etc.)
4. Inadequate air supply for the heater, when installed indoors, can cause a soot formation.

NOTE

After de-sooting a heater, the flame should be blue in color, NOT YELLOW. Dust in the air can turn the flame yellow. A slight yellow tip on a blue flame is OK.

To remove a light soot formation, with the heat exchanger still in the heater, use the following procedures:
--

- | |
|---|
| <ol style="list-style-type: none">1. Remove the burners and cover the orifices to protect against dirt or other material.2. Remove flue collector and baffles.3. Using a brush with a long handle, you may brush off the bottom of the tubes, which will generally remove any soot present. You may choose to use a vacuum cleaner. |
|---|

NOTE

Do not use a Wire Brush or compressed air to remove soot.

-
4. Brush off and clean all burner heads using caution not to damage burner ports.
 5. Replace burners and test fire heater.

~~OR~~

1. Powdered detergent and scrub brush accompanied by high water pressure to spray the heat exchanger thoroughly.
2. A very mild acid and water solution and high water pressure. When using acid, exercise extreme caution so as not to etch or damage the copper tubing.

To protect eyes from soot or cleaning solution use safety eye wear.
--

Inspecting the Heat Exchanger Tubes (*Heat Exchanger in Place*)

Under normal operating conditions, the MiniMax heater will operate for years without scale deposits forming in the tubes. In some pools, however, the mineral content of the water is such that completely scale-free operation is next to impossible. For this reason, the MiniMax pool heater has been designed so that the heat exchanger can be easily inspected without disassembling the entire unit. Inspection of the tubes at regular intervals is good assurance of longer life and less maintenance. To inspect the tubes for scale deposits, use the following procedure; having isolated and drained the appliance of water:

1. Remove inspection plate on the left of the unit.
2. Remove the four (4) bolts holding the quick-flange in place.
3. Remove the return head and visually inspect the tubes.
4. Replace tube gaskets and reassemble in reverse order.

REMOVING THE HEAT EXCHANGER

For heavy soot accumulation which cannot be successfully removed by merely brushing or use of a vacuum cleaner, the heat exchanger must be removed for the heater.

1. Isolate both gas and electrical supply to the heater.
2. Isolate water supply and drain down the heater.
3. Remove the top from the heater.
4. Remove inner lid, flue collector and inspection panels.
5. Disconnect the plumbing at the break away flanges and the pressure switch line. Remove the thermostat bulb and hi-limit wires from the inlet/outlet header.
6. Remove the heat exchanger mount screws on the side of the heater.
7. Lift heat exchanger out of heater.

⚠ CAUTION

When lifting heat exchanger out of the fire brick, use caution so as not to damage the fire brick.

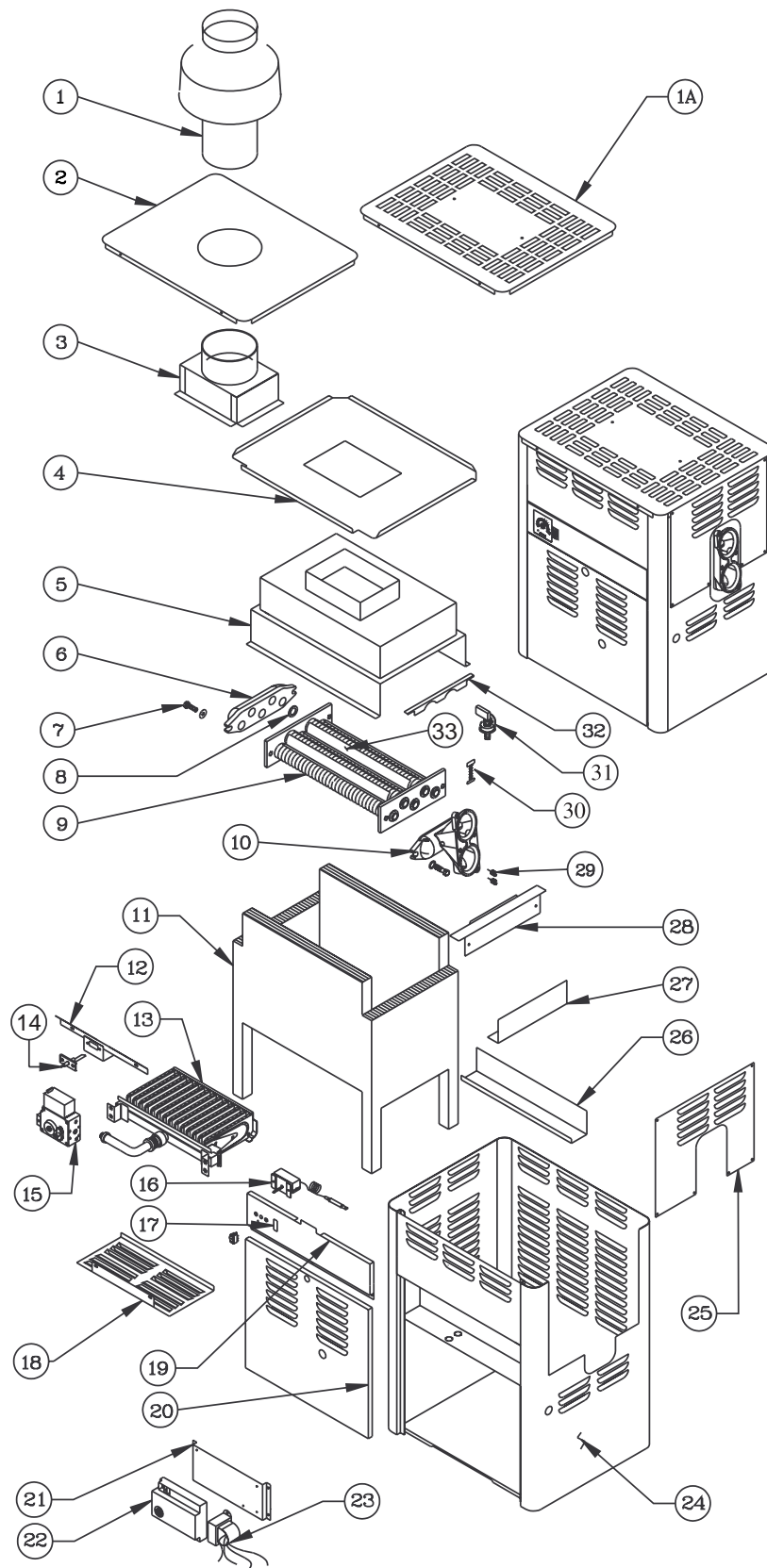
REINSTALLING HEAT EXCHANGER

1. Inspect fire box for damage or cracks that would allow heat to leak out into the outer cabinet and controls.
2. Remove any old sealant from fire box.
3. Apply new sealant to the fire box (Silicon Rubber Industrial Grade R.T.V.) or equivalent. The sealant must completely seal the space between the heat exchanger and the fire box, so that when the heater is firing, heat does not escape to the outer cabinet.
4. Place heat exchanger into the box and push down firmly, until the heat exchanger sets solidly on the fire box.
5. Reconnect the inlet and outlet flange to the headers (use new flange gaskets) careful not to move the heat exchanger and break the seal.
6. Reinstall flue collector, inner panel and top.
7. Re-establish gas, water and electrical supplies; checking water tightness, gas soundness and electrical continuity.

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 serviceman.
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 serviceman
On-Off switch in "OFF" position	Turn switch to "POOL" or "SPA"
Heater Short Cycling (Rapid On and Off Operation)	
Insufficient water flow	Clean filter and pump strainer
Defective wiring	Repair or replace wiring
Defective or stuck by-pass valve	Call serviceman
Defective hi-limit and/or thermostat	Call serviceman
Heater Makes Knocking Noises, Make sure all valves on systems are open	
Heater operating after pump has shut off	Shut off gas supply and call serviceman
Heater exchanger scaled	Shut off gas supply and call serviceman

EXPLODED VIEW



PARTS LIST

ITEM	DESCRIPTION	QUANT.	PART NUMBER
1*	Indoor Draft Hood	1	471198
1A	Outdoor Top	1	471213
2*	Indoor Top (Cover)	1	471075
3*	Indoor Stack Adaptor	1	471214
3A	Metric Pipe Adaptor (not shown)	2	471490
*	Indoor Draft Hood Kit consisting of items 1, 2, 3 & 3A	1	471439
4	Middle Top	1	471069
5	Flue Collector	1	471059
6	Return Header	1	471096
7	Bolt 3/8 x 16 UNC x 3/4	4	471200
8	Rubber Seal tube	10	470742
9	Heat Exchanger Less Heads	1	471093
10	Main Header (Inlet/Outlet)	1	471094
11	Combustion Chamber	1	N.A.
12	Ignitor Electrode Bracket	1	471058
13	Burner Natural Gas	1	471453
	Burner LPG	1	471452
14	Ignitor Electrode	1	471090
15	Gas Valve-Nat. Gas DSI	1	471457
	Gas Valve-LPG DSI	1	471456
	Gas Valve-Nat. Gas Millivolt	1	471489
	Gas Valve-LPG Millivolt	1	471488
16	Thermostat Millivolt	1	072022
16A	Thermostat Electronic	1	471431
17	On/Off Switch spst	1	471128
18	Heat Shield Burner Tray	1	471070
19	Control Panel Assy	1	471078
20	Door Assembly	1	471067
21	Control Bracket	1	471159
22	Ignition Control DSI	1	471454
23	Transformer	1	074617
24	Jacket Assembly	1	N.A.
25	Inspection Panel	1	471071
26	Burner Tray Back Support	1	471169
27	Burner Tray Side Support	2	471166
28	Heat Exchanger Support Brackets	2	471164
29	Hi-Limit Safety Switch	2	071017
30	Flow Valve, assy.	1	471095
31	Pressure Switch	1	471097
32	Baffle Hold Down Bracket	1	471064
33	Flue Baffle	4	471065
**	Items Below Not Shown		
**	Washer 3/8 I.D.	4	072169
**	Thermal Cutoff Switch	1	075173
**	Pilot Natural Gas Millivolt	1	471487
**	Pilot LPG Millivolt	1	471486
**	Thermopile Generator	1	071515
**	Quick-Flange Kit for 2" slip connection	1	471215
**	Quick-Flange II Kit for 1½" thd. connection	1	471083
**	Kit Wiring MMX 100 Millivolt	1	471201
**	Kit Wiring MMX 100 DSI	1	471485
**	Knob	1	470184
**	Knob Stopper	1	470414
**	Presslite Piezo Ignitor Assy-Millivolt	1	075459
**	Valve Drain 1/4 npt	1	072136
**	Hi-Tension Ignition Cable	1	471092
**	Rubber bushing, 2" i.d.	2	070544

NOTES

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NOTES

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PacFab, Inc.

Corporate Headquarters: 1620 Hawkins Ave., Sanford, NC 27330 • (919) 774-4151

Western Operations: 10951 West Los Angeles Ave., Moorpark, CA 93021 • (805) 523-2400

PacFab
I N C O R P O R A T E D