Water Connections & Piping

REVERSIBLE WATER CONNECTIONS: This heater is designed so that it can be installed with the water connections located on either the right or left side. Heaters are factory-shipped with right-side water connections. To move the connections to the left side follow the instructions below. A trained service technician must perform these steps before the heater is installed.

> ⚠ **ATTENTION** - The heater is for use with pool and spa/hot tub water furnished by municipal water distribution systems only. Do not use with mineral water, seawater (PPM>5000), or other non-potable waters which invalidate the warranty. Do not install any restriction in the water pipe between the heater outlet and the pool/spa with the exception of; three-way switching valve, in-line chlorinator and/or chlorinator check valve.

1. Before beginning, be aware that it is not necessary to remove the water header from the heat exchanger to perform this manipulation. When this procedure is complete, the water connections are reversed; water inlet will be located at the BACK of the heater and water outlet will be located at the FRONT.
2. Remove the front access panel and disconnect water temperature sensor plug from the ignition control board located inside the heater.
3. Remove screws and remove both of the upper plastic heater side panels (see Figure 7a). Note the wires that pass through a hole in the heater side panel go through a split-bushing, which will allow separation of the wires from the panel without disconnecting them.
4. Disconnect the 2 wires connecting the heater wire harness to the heat exchanger header. One is located on the water pressure switch and one is located on the temperature limit switch, both on the top of the header. Pull these wires into the heater cabinet from the hole in the right- hand metal side panel in the heater, and re-route them out through the corresponding left-hand metal side panel in the heater.
5. Remove Top Flue Cover (see Figure 7b).
6. Remove Rain Shield Assembly (see Figure 7b). Note that there are screws which hold the rain shield assembly to the heat exchanger tube sheets, which also must be removed for proper disassembly.
7. Pull the water temperature sensor wires out of the heater cabinet through the hole in the right-hand metal side panel.
8. Lift and rotate the heat exchanger 180 degrees. Do not flip. Use care when setting the heat exchanger in place do not damage the white sealing gaskets or combustion chamber refractory. If damaged, these sealing surfaces must be repaired or replaced.
9. Route the water temperature sensor wires into the heater cabinet through the hole in the left-metal side panel, and re-connect to the ignition control board.
10. Reconnect the 2 wires connecting the heater wire harness to the water pressure switch and the temperature limit switch.
11. Reverse the above panel disassembly steps to reassemble the heater.

Figure 7a: Screw Locations on Side of Unit

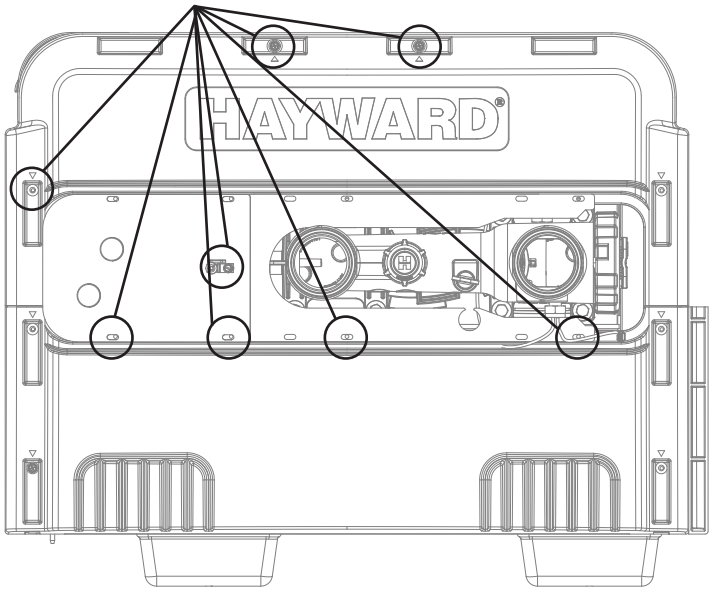


Figure 7b: Top and Heat Exchanger Removal

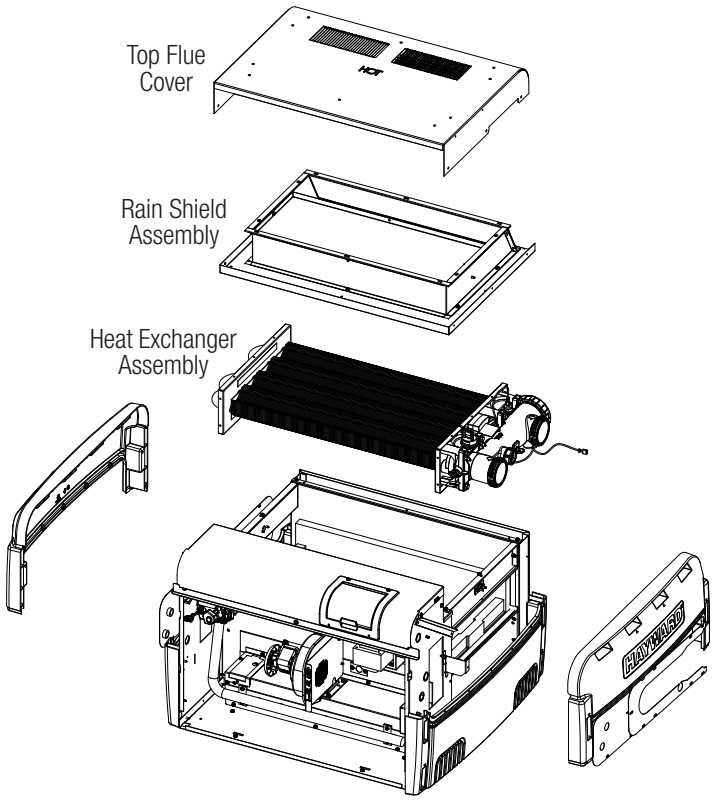


Figure 8: Water Connections

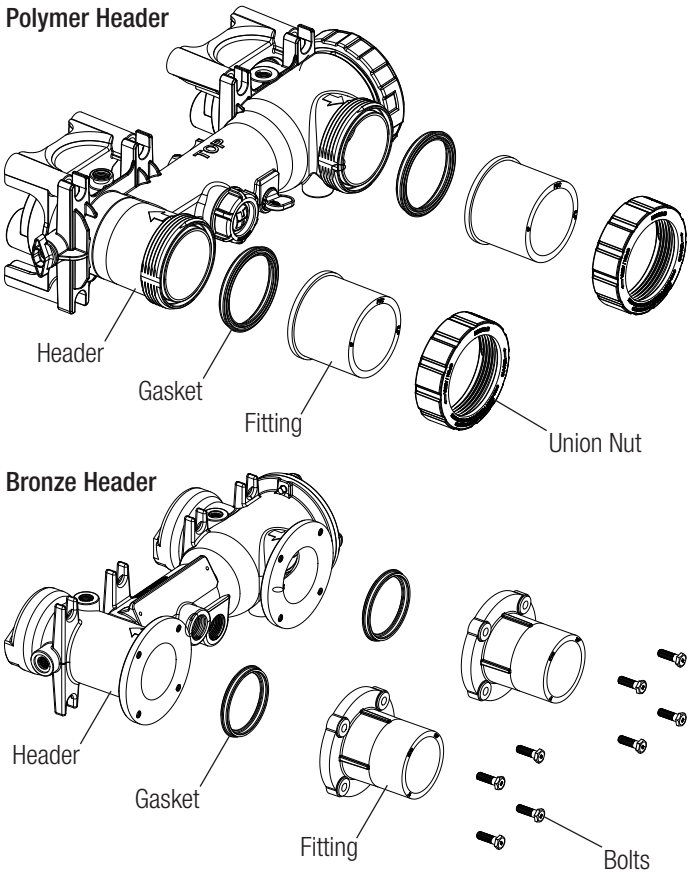
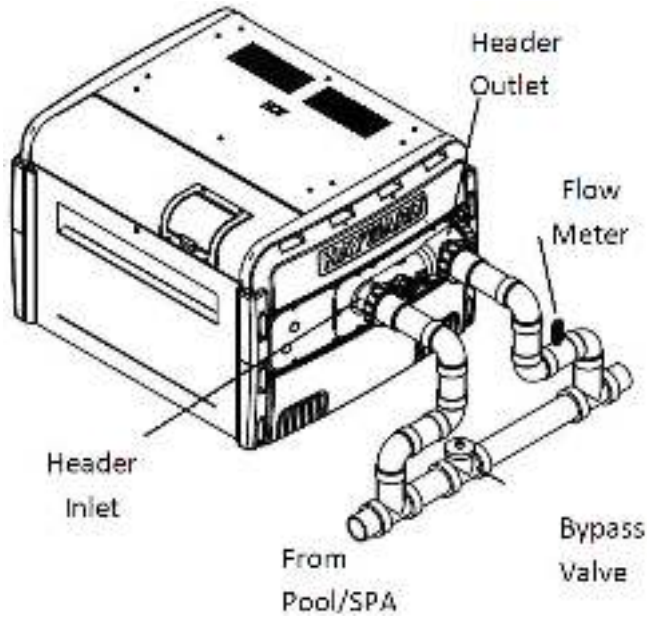


Figure 9: Bypass Valve(s)



⚠ WARNING - **Explosion Hazard.** Blockage of water flow from heater return to pool may result in fire or explosion causing property damage, personal injury, or loss of life.

The heater is equipped with CPVC flanged pipe nipples to accommodate water piping to and from the pool or spa. These pipe nipples will accept piping by solvent welding (PVC glue). The fittings will accept either a 2"pipe, or a 2 1/2" pipe fitting, and seal to the heater header with rubber gaskets. On plastic headers, the fittings are secured in place with supplied plastic union nuts, and on bronze headers (ASME models), the fittings are secured in place with bolts. Assemble these parts to the heater prior to plumbing. Tighten union nuts (or bolts) securely before gluing fittings to the ends of the pipe nipples. See Figure 8. The CPVC flanged pipe nipples must be installed on the heater inlet and outlet without modification. Pipe, fittings, valves, and any other element of the filter system may be made of plastic materials, if acceptable to the authority having jurisdiction. Heat sinks, heat tapes, firemen switches, and check valves are not required on the heater. However, if there is any chance of "back-siphoning" of hot water when the pump stops running, it is suggested that a check valve be used on the heater outlet pipe down stream of bypass system. The built-in bypass inside the header will maintain proper flow through the heat exchanger if the flow rate is within the range specified in the specification in the Getting Started section. The minimum flow rate is to be calculated or measured with the in-floor cleaning system in use, if the pool is so equipped, as well as any other jets or other demands on the water flow. If the normal pump and filter system flow rate exceeds 125 gpm then a manual bypass valve must be installed as shown in Figure 9. Damage caused by flow rates outside this range will void the manufacturer's warranty. Bypass valve setting may be accomplished by temporarily installing a flow meter on the outlet line of the heater. Then adjust the manual bypass valve until the flow rate through the heater is within the flow rate range specified. Once the manual bypass valve is set, note the position and remove the valve handle to prevent accidental adjustment.

⚠ CAUTION - Improperly adjusted manual bypass valves will result in damage to the heater if the flow rates are not maintained under all operating conditions as specified in the Specifications section. The heat exchanger will fail and this damage will not be covered under the manufacturer warranty.

Typical Pool Piping Arrangements

Figure 10 illustrates a typical pool piping diagram and layout for the pool equipment. Figure 11 illustrates a multiple heater installation for very large pools with and without a manual bypass valve.

Figure 10: Typical Plumbing to Pool or Spa

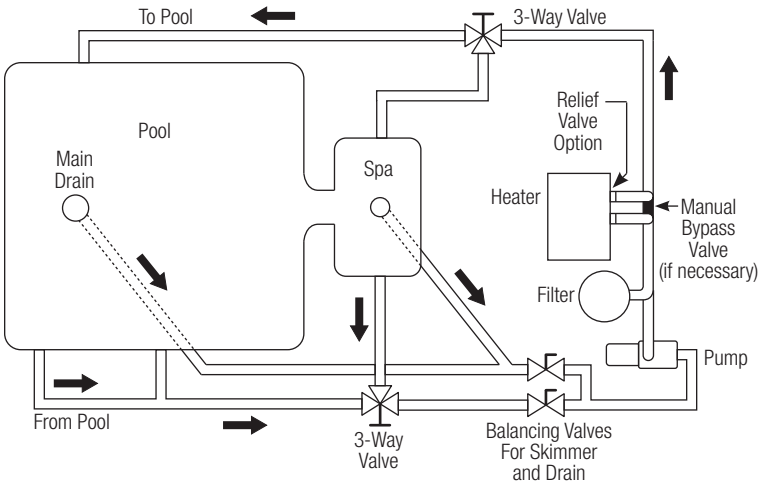


Figure 11: Multiple Heater System

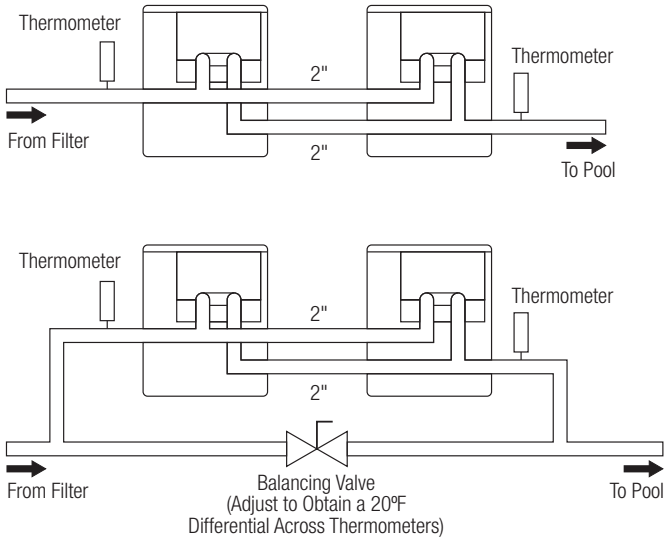


Figure 17: Installation Above Pool or Spa

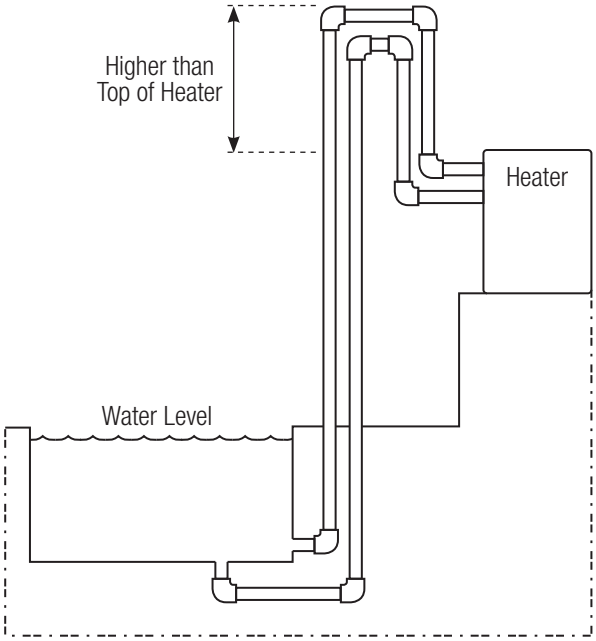
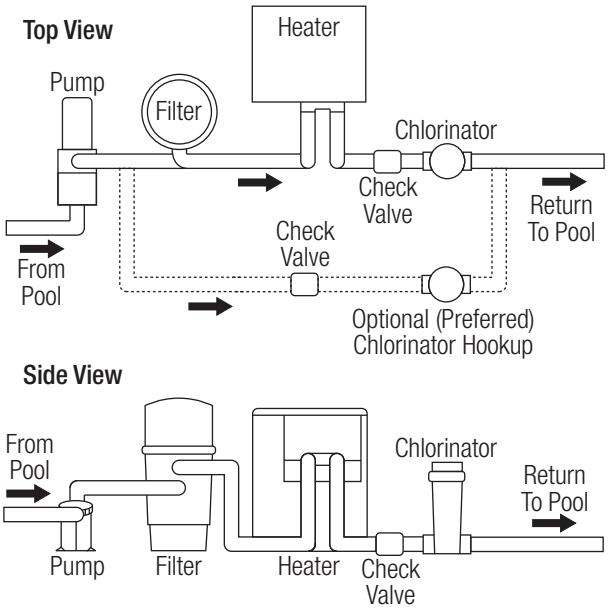


Figure 18: Automatic Chlorinator



If the heater is installed less than three (3) feet above the surface of the pool/spa water, install eyeball fittings or directional flow fittings on the end of the return water line to the pool/spa to create adequate back pressure at the heater to operate the pressure safety switch when the pump is running. If the heater is installed more than three (3) feet above the surface of the pool/spa water, install a loop as shown in Figure 12 to prevent drainage of water in the heater during a filter change. For installation above or below the pool/spa surface, refer to System Start-Up section for proper pressure switch setup.

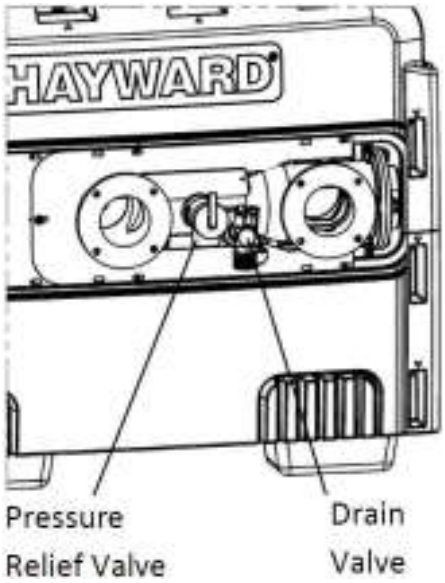
If used, a chlorinator must be installed downstream from the heater in the pool return line and at a lower elevation than the heater as shown in Figure 13. Install a separate positive seal corrosion resistant check valve between the heater outlet and the chlorinator to prevent highly concentrated sanitizer from back siphoning into the heater. Back siphoning may occur when the pump is shut off and a pressure differential is created.

DRAIN VALVE INSTALLATION (ASME MODELS ONLY): If installing an ASME model heater, a 3/4" brass drain valve must be installed. A drain valve is included separately with all ASME heaters. Apply a suitable amount of pipe thread sealant or Teflon tape to the threads and install as shown in Figure 14.

PRESSURE RELIEF VALVE (ASME MODELS ONLY): If installing an ASME model heater, a 3/4" pressure-relief valve having a discharge capacity greater than or equal to the Btu/hr input of the heater, and a pressure rating equal to or less than the working pressure must be installed. See the rating plate located inside the front access panel on the heater for the input rating and working pressure. An appropriate pressure relief valve is included separately with all ASME heaters. Apply appropriate pipe thread sealant or Teflon tape to the threads and assemble as shown in Figure 14. Please note that the drain valve must be installed before the pressure relief valve. Install the pressure relief valve with the discharge connection facing the ground. If necessary, connect a pipe (of the same size as the valve outlet) to the outlet and run it to a code appropriate place of discharge. Do not install any shut-off or restriction in this pressure relief discharge line.

PRESSURE RELIEF VALVE (NON-ASME MODELS ONLY): Some local building codes require a pressure relief valve for non-ASME pool/spa heaters. The plastic header has a 3/4" port which can be used for this purpose (see Figure 14 for location of port). A 3/4" pressure relief valve having a discharge capacity greater than or equal to the Btu/hr input of the heater, and a pressure rating equal to or less than the working pressure is recommended. See the rating plate located inside the front access panel on the heater for the input rating and working pressure. If desired, you may order the pressure relief valve; order p/n CHXRLV1930. Remove the factory-installed pipe plug, and install the pressure relief valve using an appropriate amount of pipe thread sealant or Teflon tape on the threads. Install the pressure relief valve with the discharge connection facing the ground. If necessary, connect a pipe (of the same size as the valve out- let) to the outlet and run it to a code appropriate place of discharge. Do not install any shutoff or restriction in this pressure relief discharge line.

Figure 14: Drain and Pressure Relief Valve Locations



Electrical Connections

GENERAL INFORMATION: An external supply of power is required to operate the control system of the heater. The electrical specifications for this heater are 120 or 240VAC, 60Hz, 1-phase, 5.5A maximum current. It is recommended that circuit protection for the heater circuit be rated at 15 Amperes. The heater is shipped from the factory wired for use with 240VAC, 60 Hz field power supply. To convert the heater to 120VAC, 60 Hz operation remove the 240VAC voltage selector jumper from the ignition control board and replace it with the 120VAC jumper. These jumpers are tie-wrapped together and are located on the fuse board. See Figure 16 for location of the fuse board. All wiring connections to the heater must be made in accordance with the latest edition of the National Electrical Code ANSI/NFPA 70, unless local code requirements specify otherwise. In Canada, follow CSA C22.1 Canadian Electrical Code, Part 1. The heater must be electrically grounded and bonded in accordance with local codes or, in the absence of local codes, with National Electrical Code, ANSI/NFPA 70. Wiring connections must be made as shown in the wiring diagram found inside the heater cabinet, and a copy is provided for convenience in the Getting Started section at the beginning of the manual. The heater must also have an independent ground and bond connection. There is a ground lug inside the control box adjacent to the power connections per Figure 15 and a bonding lug on the side of the heater per Figure 6. Use a solid copper conductor, size No. 8 AWG (8.4 mm2) solid copper bonding wire or larger for bonding conductor. Run a continuous wire from external bonding lug to reinforcing rod or mesh. Connect to the grounding lug provided and to all metal parts of swimming pool or spa, and to all electrical equipment, metal piping (except gas piping), and conduit within 5 ft. (1.5 m) of inside walls of swimming pool or spa. **IMPORTANT** - Reference NEC codes for all wiring standards including, but not limited to, grounding, bonding and other general wiring procedures.

Hayward recommends the use of a sacrificial anode(s). Sacrificial anodes provide protection to the heat exchanger against galvanic corrosion when properly installed. Sacrificial anodes should be regularly inspected and replaced before the end of their useful life.

⚠ **WARNING** - **Risk of Electric Shock.** Review all safety information provided in the Getting Started section of this manual prior to servicing. Always disconnect power circuit before servicing. This heater contains wiring that carries high voltage. Contact with these wires could result in death or personal injury.

The heater may be installed with the electrical service and optional remote control wiring entering the heater cabinet on either the left side junction box or right side using the floating junction box. There are (4) openings for electrical entry. The junction box must be used for field power wiring. Plug any unused openings with the supplied caps. The power connections are to be made to the supplied wires inside the junction box (see Figure 15a) using field supplied wire nuts. All connections are to be stored within junction box attached to side panel.

REMOTE CONTROL CONNECTION: Remote control can be accomplished via a 2-wire or 3-wire connection (see Figure 15b). The 2-wire connection allows thermostat control where the remote temperature is sensed and calls for heat when needed. The 3- wire remote switches function between "POOL" and "SPA". The set point temperatures for "POOL" and "SPA" operation are still controlled locally. The 3-wire remote simply provides a convenient way to manage the "POOL" or "SPA" mode selection. Remote wiring is accomplished using the factory supplied remote wire harness. Remote wiring must be run in a separate conduit from power supply. Use 22 AWG wire for runs less than 30 feet. Use 20 AWG wire for runs over 30 feet. The maximum allowable run is 200 feet.

2-WIRE REMOTE CONTROL CONNECTION: Connect the appropriate wires from the remote control to the factory harness ORANGE wire ("POOL") and WHITE wire ("COM"). To configure the heater for 2-wire remote thermostat control, use the "MODE" key on the heater keypad to put the control into"STANDBY" mode. Then simultaneously press and hold the "(-)" and "MODE" keys for 3 seconds until the display shows the code "bo" (bypass operation). Once in bypass operation, press the 'MODE' button until 'POOL' or 'SPA' LED is illuminated. The control is now ready to operate in 2-wire remote thermostat control. The heater's thermostat will only function to limit the return water temperature to a maximum of 104°F.

3-WIRE REMOTE CONTROL CONNECTION: Connect the appropriate wires from the remote control to the factory harness ORANGE wire ("POOL"), WHITE wire ("COM"), and RED wire ("SPA"). No control 'MODE' configuration setting is needed, only connection of all three remote control wires. To operate the heater with a remote 3-wire switch, the heater's control must be in "STANDBY" mode.

The "STANDBY" LED will be illuminated. When the remote switch is set to "Pool" the "POOL" LED will be illuminated and the water temperature will be displayed. When the remote switch is set to "Spa" the "SPA" LED will be illuminated and the water temperature will be displayed. The heater will use its internal thermostat to regulate the water temperature to the set point of the mode selected.

Figure 15a: Junction Box Connections

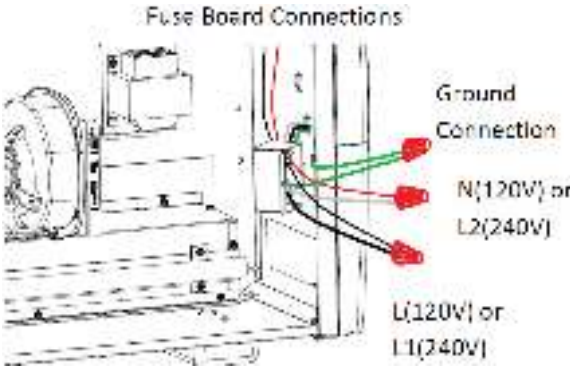
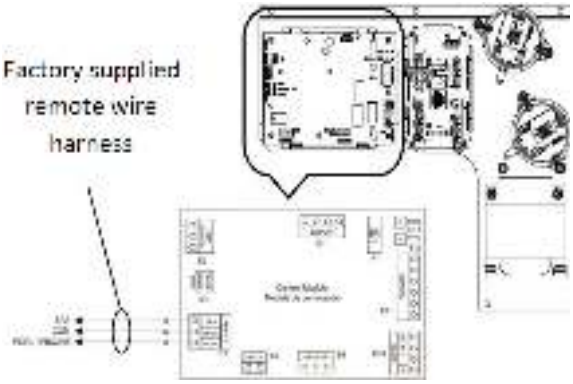


Figure 15b: Remote Control Connections

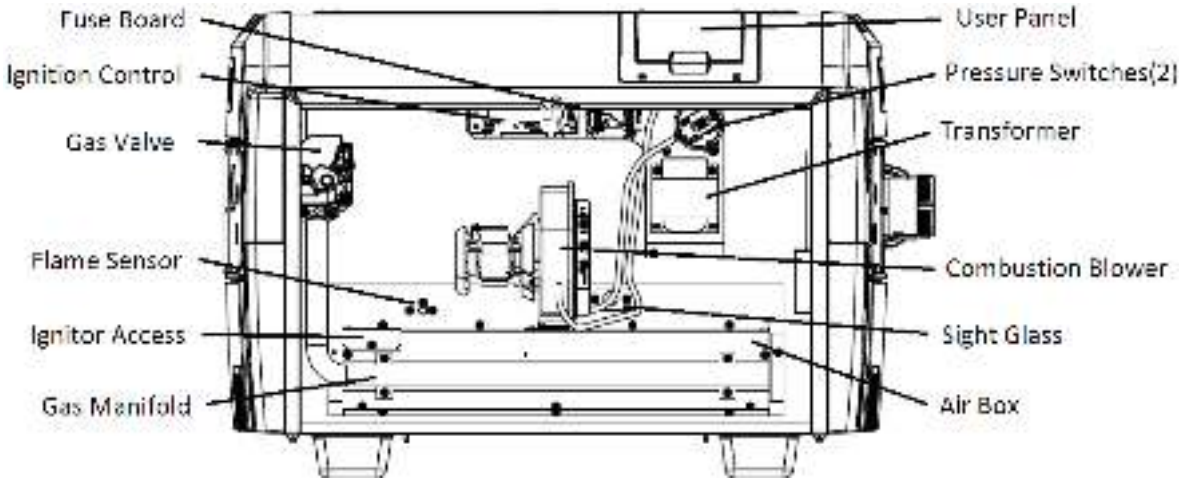


System Start-Up

General Information

The heater is equipped with a control system that automatically monitors the "Pool" and "Spa" temperature set points and control devices. Then when heat is needed, turns on the combustion air blower, hot surface igniter and gas valve to light the burners and monitor the flames. Figure 16 provides a summary of heater components and their locations. Some of the following procedures will require the heater to be operating. The full lighting and shutdown instructions are included in this manual as well as on the lighting and operating label affixed to the inside of the front access panel of the heater. Water must be flowing through the heater during any operation. Check that the pump is operating and the system is filled with water and purged of all air prior to starting the heater.

Figure 16: Location of Components



Control Setup

This pool heater is equipped with a digital thermostat which allows the user to select the desired water temperature (see Figure 17). The heater will then function automatically to maintain the desired temperature. The heater has 4 modes of operation:

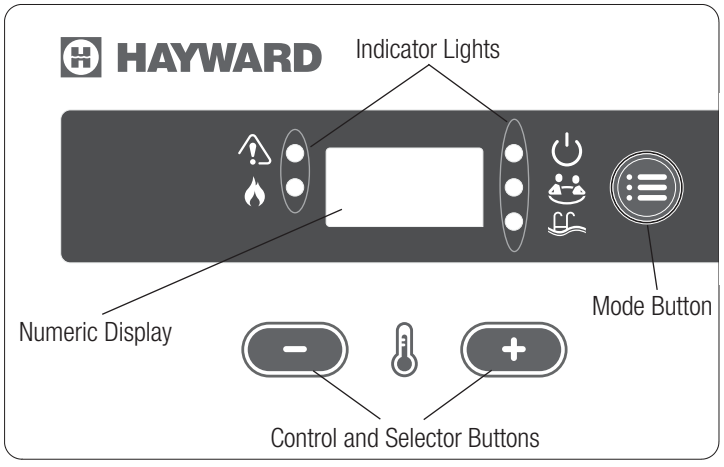
1. **STANDBY:** in this mode, the heater will not function to heat the water.
2. **SPA:** in this mode, the heater will automatically function to maintain the water temperature setting for SPA mode.
3. **POOL:** in this mode, the heater will automatically function to maintain the water temperature setting for POOL mode.
4. **BYPASS OPERATION** "bo" is displayed. In this mode the heater will respond to a remote call for heat for set point control and monitor the local thermostat for high return water temperature (maximum of 104°F).

Use the MODE button to change STANDBY/POOL/SPA modes. The indicator lights will illuminate to show which mode is currently active.

USER PANEL AND KEYPAD INPUTS: The control accepts user inputs via user panel (Figure 17).

1. When changing the mode from "STANDBY" to either "SPA" or "POOL" (see Figure 17) there may be up to a 10- second delay before the heater starts operating. The control performs an internal self-test and then verifies that the blower vacuum switch contacts are open before energizing the blower.
2. It is normal for the heater to encounter a 1 to 2-second delay in responding to any user panel input.
3. It is normal for the heater to encounter up to a 5-second delay when the user panel is used to reset the control to clear an error code.
4. The control will accept a mode change during lockout after 5 seconds. The control will continue to display the error code and remain in lockout until it is reset. At reset the control will go to the last saved mode.

Figure 23: User Panel



NORMAL OPERATION FOR POOL & SPA MODES: The control continually compares the water temperature with the set point and the high limit temperature. When the water temperature is more than 1°F below the set point a call for heat is generated and a heating cycle is initiated.

1. The control checks for open contacts at the blower vacuum switch.
2. The control energizes the blower and the igniter. The igniter heat-up time is approximately 20 seconds. The blower is running a pre-purge cycle during this time.
3. The control checks for closed contacts at the blower vacuum switch.
4. When the igniter reaches the proper temperature a 4-second trial for ignition begins. The control opens the gas valve and monitors flame current. The igniter is turned off when flame is sensed or after 4 seconds.
5. The blower vacuum switch, temperature limit switches, vent pressure switch, water pressure switch, the water temperature sensor, and the flame sensor are constantly monitored during a call for heat to assure the heater is operating properly.
6. When the thermostat is satisfied and the call for heat ends the control immediately de-energizes the gas valve and flame extinguishes.
7. The control operates the blower during a 30-second post-purge period.

FAHRENHEIT OR CELSIUS: The temperature can be displayed in Fahrenheit or Celsius. To change the display, use the "MODE" button to place the heater in "STANDBY". Then press and hold the "(+)" and "MODE" buttons until the display shows the °F/°C selection. Press the "(-)" button to toggle between selections. To accept the selection, press the "MODE" button. If the user does not act, the selection will be automatically accepted after 60 seconds.

TEMPERATURE ADJUSTMENT: This control allows the user to have 2 individual pre-set temperature settings, "SPA" and "Pool". To adjust the temperature while in "SPA" or "POOL" mode, use the (+) and (-) buttons. The numeric display will flash while the temperature is being adjusted. When the numeric display is not flashing, the actual measured water temperature is being displayed. The temperature settings for both "SPA" and "POOL" modes are initially set at the factory to 65°F. The minimum allowed settings for "SPA" and "POOL" modes are both 65°F. The maximum allowed settings for "SPA" and "POOL" modes are adjustable up to 104°F using the TEMPERATURE MAXIMUM SET POINT feature (see below).

TEMPERATURE MAXIMUM SET POINT: The digital thermostat in this pool heater allows the user to lock the maximum temperature setting allowed. This feature is useful for preventing unauthorized users from manually adjusting the temperature settings higher than desired. On a new heater, the maximum allowed temperature lock settings are initially set at the factory to 90°F for "POOL" mode, and 104°F for "SPA" mode. To adjust these settings, use the following procedure:

1. Use the MODE button to put the heater in "STANDBY" mode.
2. Press and hold both the (+) and (-) buttons at the same time.
3. After 3 seconds, the thermostat enters maximum temperature lock adjustment mode.
4. The "SPA" indicator light illuminates and the numeric display shows the current "SPA" mode maximum temperature lock setting. Both the "SPA" indicator light and the numeric display flashes rapidly when in adjustment mode.
5. Use the (+) and (-) buttons to set the desired maximum temperature lock setting. When finished, press the MODE button.
6. The "POOL" indicator light illuminates and the numeric display shows the current "POOL" mode maximum temperature lock setting. Both the "POOL" indicator light and the numeric display flashes rapidly when in adjustment mode.
7. Use the (+) and (-) buttons to set the desired maximum temperature lock. When finished, press the MODE button.
8. The heater will return to "STANDBY" mode

FAILURE TO LIGHT – RETRY: If the first ignition attempt fails during a normal heating cycle the control will make two (2) additional ignition attempts:

1. The control de-energizes the gas valve after the 4-second ignition trial ends.
2. The control operates the blower during a 30-second post-purge period.
3. The control monitors for open contacts at the blower vacuum switch.
4. The control performs a gas valve relay check.
5. A normal ignition sequence resumes with Item #2 in NORMAL OPERATION FOR POOL & SPA MODES (see above). If the third ignition trial fails the control enters a safety lockout (or "hard" lockout) after the post purge period of the third failed trial.
6. The error code "IF" is displayed and the "SERVICE" indicator is illuminated.
    a. The control automatically resets and clears the "IF" error code without any user intervention after 60 minutes. If there is a call for heat after reset, the control will make three (3) trials for ignition. If ignition is not established the control will again enter safety lockout for 60 minutes. This cycle will continue until ignition is established or the call for heat is removed.
    b. The user can reset the control and clear the "IF" error code by pressing the "MODE" button to move through "STANDBY"and return to the previous mode ("POOL" or "SPA").

LOSS OF FLAME – RECYCLE: If flame is established and then lost, the control will make ten (10) attempts at ignition. If flame is lost within ten (10) seconds of ignition, the control will respond within 2 seconds. If flame is lost more than ten (10) seconds after ignition the control will respond within 0.8 seconds.

1. The control de-energizes the gas valve and the blower.
2. The control monitors for open contacts at the blower vacuum switch.
3. The control performs a gas valve relay check.
4. A normal ignition sequence resumes with Item #2 in NORMAL OPERATION FOR POOL & SPA MODES (see above).
5. If the tenth ignition trial fails the control enters a safety lockout (or "hard" lockout) after the post- purge period of the tenth failed trial.
6. The error code "IF" is displayed and the "SERVICE" indicator is illuminated.
    a. The control automatically resets after 60 minutes. If there is a call for heat after reset the control will make three (3) trials for ignition. If ignition is not established the control will again enter safety lockout for 60 minutes. If flame is established but is lost the control will make ten (10) attempts at ignition. This cycle will continue until ignition is established or the call for heat is removed.
    b. The user can reset the control and clear the "IF" error code by pressing the "MODE" button to move through "STANDBY"and return to the previous mode ("POOL" or "SPA").

AUTOMATIC RESET TIME: The heater will automatically reset when an error condition is corrected and resume operation as detailed in NORMAL OPERATION FOR POOL & SPA MODES (see above). The heater can be manually reset using the keypad by cycling the mode button through "STANDBY" and back to the original operating mode ("SPA" or "POOL").

Gas Testing

GAS LINE TESTING: The appliance and its gas connection must be leak tested before placing the appliance in operation. The heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressure equal to or less than ½ psig (3.45 kPa). Gas supply line must be capped when not connected. After pressure testing, reconnect the gas piping to the gas valve. Turn gas supply "ON" and test all pipe and tubing joints for leaks. Use a soap and water solution.

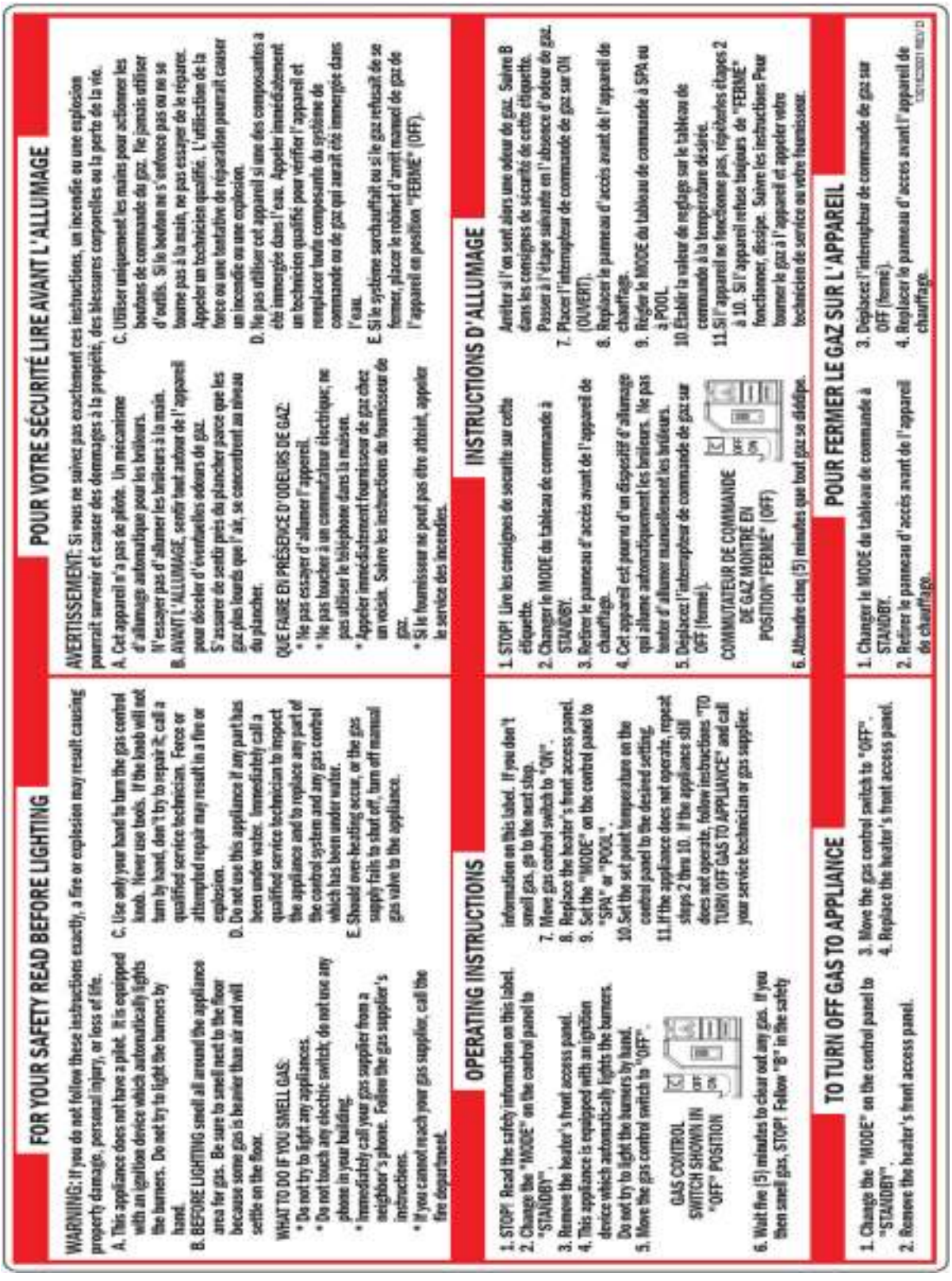
> ⚠ **WARNING** - **Explosive Hazard.** The use of an open flame to check for gas leaks could cause an explosion resulting in severe injury and/ or death. Shut off gas and fix even the smallest leak right away. Be sure to leak test the heater gas manifold fittings using the above procedure once the heater is in operation.

GAS PRESSURE TESTING: The following gas pressure requirements are important for the operation of the burners in gas heaters. Improper gas pressure or gas volume may create the following conditions:

1. Flame burns totally yellow.
2. Flame lift off burner.
3. Heat exchanger soot's up. The gas pressure regulator on all heaters is preset at the factory, but the setting should be verified by the installer to ensure proper operation.

> ⚠ **ATTENTION** - If inlet gas pressure is inadequate, check for undersize piping between the gas meter and the heater or for a low-capacity gas meter (see Gas Supply section of this manual).

Figure 18: Lighting & Operating Instructions Label



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

WHAT TO DO IF YOU SMELL GAS:

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

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

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

E. Should over-heating occur, or the gas supply fails to shut off, turn off manual gas valve to the appliance.

POUR VOTRE SÉCURITÉ LIRE AVANT L'ALLUMAGE

AVERTISSEMENT: Si vous ne suivez pas exactement ces instructions, un incendie ou une explosion pourrait survenir et causer des dommages à la propriété, des blessures corporelles ou la perte de la vie.

A. Cet appareil n'a pas de pilote. Un mécanisme d'allumage automatique pour les brûleurs. N'essayer pas d'allumer les brûleurs à la main.

B. AVANT L'ALLUMAGE, sentir tout autour de l'appareil pour déceler d'éventuelles odeurs de gaz. S'assurer de sentir près du plancher parce que les gaz plus lourds que l'air, se concentrent au niveau du plancher.

QUE FAIRE EN PRÉSENCE D'ODEURS DE GAZ:

- Ne pas essayer d'allumer l'appareil.
- Ne pas toucher à un commutateur électrique; ne pas utiliser le téléphone dans la maison.
- Appeler immédiatement fournisseur de gaz chez un voisin. Suivre les instructions du fournisseur de gaz.
- Si le fournisseur ne peut pas être atteint, appeler le service des incendies.

C. Utiliser uniquement les mains pour actionner les boutons de commande du gaz. Ne jamais utiliser d'outils. Si le bouton ne s'enfonce pas ou ne se tourne pas à la main, ne pas essayer de le réparer. Appeler un technicien qualifié. L'utilisation de la force ou une tentative de réparation pourrait causer un incendie ou une explosion.

D. Ne pas utiliser cet appareil si une des composantes a été immergée dans l'eau. Appeler immédiatement un technicien qualifié pour vérifier l'appareil et remplacer toute composante du système de commande ou de gaz qui aurait été immergée dans l'eau.

E. Si le système sarchauffait ou si le gaz refusait de se fermer, placer le robinet d'arrêt manuel de gaz de l'appareil en position "FERMÉ" (OFF).

OPERATING INSTRUCTIONS

1. STOP! Read the safety information on this label.
2. Change the "MODE" on the control panel to "STANDBY".
3. Remove the heater's front access panel.
4. This appliance is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Move the gas control switch to "OFF".

GAS CONTROL SWITCH SHOWN IN "OFF" POSITION

6. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information on this label. If you don't smell gas, go to the next step.
7. Move gas control switch to "ON".
8. Replace the heater's front access panel.
9. Set the "MODE" on the control panel to "SPA" or "POOL".
10. Set the set point temperature on the control panel to the desired setting.
11. If the appliance does not operate, repeat steps 2 thru 10. If the appliance still does not operate, follow instructions "TO TURN OFF GAS TO APPLIANCE" and call your service technician or gas supplier.

INSTRUCTIONS D'ALLUMAGE

1. STOP! Lire les consignes de sécurité sur cette étiquette.
2. Changer le MODE du tableau de commande à STANDBY.
3. Retirer le panneau d'accès avant de l'appareil de chauffage.
4. Cet appareil est pourvu d'un dispositif d'allumage qui allume automatiquement les brûleurs. Ne pas tenter d'allumer manuellement les brûleurs.
5. Déplacer l'interrupteur de commande de gaz sur OFF (fermé).

COMMUTATEUR DE COMMANDE DE GAZ MONTRE EN POSITION "FERMÉ" (OFF)

6. Attendre cinq (5) minutes que tout gaz se dissipe. Arrêter si l'on sent alors une odeur de gaz. Suivre B dans les consignes de sécurité de cette étiquette. Passer à l'étape suivante en l'absence d'odeur de gaz.
7. Placer l'interrupteur de commande de gaz sur ON (OUVERT).
8. Replacer le panneau d'accès avant de l'appareil de chauffage.
9. Régler le MODE du tableau de commande à SPA ou à POOL.
10. Établir la valeur de réglage sur le tableau de commande à la température désirée.
11. Si l'appareil ne fonctionne pas, répéter les étapes 2 à 10. Si l'appareil refuse toujours de "FERMÉ" fonctionner, décisive. Suivre les instructions Pour fermer le gaz à l'appareil et appeler votre technicien de service ou votre fournisseur.

TO TURN OFF GAS TO APPLIANCE

1. Change the "MODE" on the control panel to "STANDBY".
2. Remove the heater's front access panel.
3. Move the gas control switch to "OFF".
4. Replace the heater's front access panel.

POUR FERMER LE GAZ SUR L'APPAREIL

1. Changer le MODE du tableau de commande à STANDBY.
2. Retirer le panneau d'accès avant de l'appareil de chauffage.
3. Déplacer l'interrupteur de commande de gaz sur OFF (fermé).
4. Replacer le panneau d'acces avant l'appareil de chauffage.

GAS PRESSURE TEST PROCEDURE: Follow the lighting instructions on the unit (or from Figure 18). Refer to Figure 16: Location of Components for the location of the gas valve. See Figure 19 for pressure regulation adjustment for use in this procedure. Note that even though the valves look different, the required pressure taps and regulation adjustment screws are present on every gas valve.

1. Obtain the necessary equipment; Qty (2) manometers to read pressure in inches of water column, Qty (2) 1/8"NPT pipe barbed fitting, silicon or EPDM hose to fit on barb fittings, 3/16" hex wrench, 7/16 open end wrench, and medium flat screw driver.
2. Turn off gas supply to heater. Access the gas valve and remove the 1/8" plugs from the gas valve inlet pressure and manifold pressure taps and install the barb fittings into the tap openings.
3. Securely connect the hoses and manometers to the barb fittings. Make sure the manometers have ample range and accuracy to properly read the gas inlet pressure and manifold pressure per Table 5.
4. Turn on gas and water to heater and start the heater following the lighting & operating instructions on the label affixed inside the front access panel. If there is more than one pool/spa heater connected to the gas supply line, turn each of those appliances "ON" while testing the heater.
5. Take pressure readings with the heater(s) running, the pressure values should agree with those in Table 5. If the pressures are within the stated ranges, then no further adjustment is needed. If the manifold gas pressure does not meet the values in Table 5, the gas valve regulator must be adjusted.
6. To adjust the gas valve regulator perform the following:
   a. Remove the screw cap over the regulator adjustment screw (see Figure 19).
   b. Turn the inner regulator adjustment screw clockwise to increase pressure and counterclockwise to decrease pressure as required.
   c. Replace the screw cap over the regulator adjustment screw.
   d. Cycle the heater on/off multiple times and repeat measurements to ensure regulation springs are set.

Table 5: Required Gas & Air Pressures (inwc)

Measurement	Natural	Propane
Manifold Pressure	+1.80 to 2.20	+6.80 to 7.00
Inlet Pressure, Minimum	+4.50	+10.00
Inlet Pressure, Maximum	+10.50	+13.00
Blower Vacuum, Minimum	-0.50	-0.50
Vent Pressure, (Models 150-400) Maximum	+0.45	+0.45
Vent Pressure, (Model 500) Maximum	+0.30	+0.30

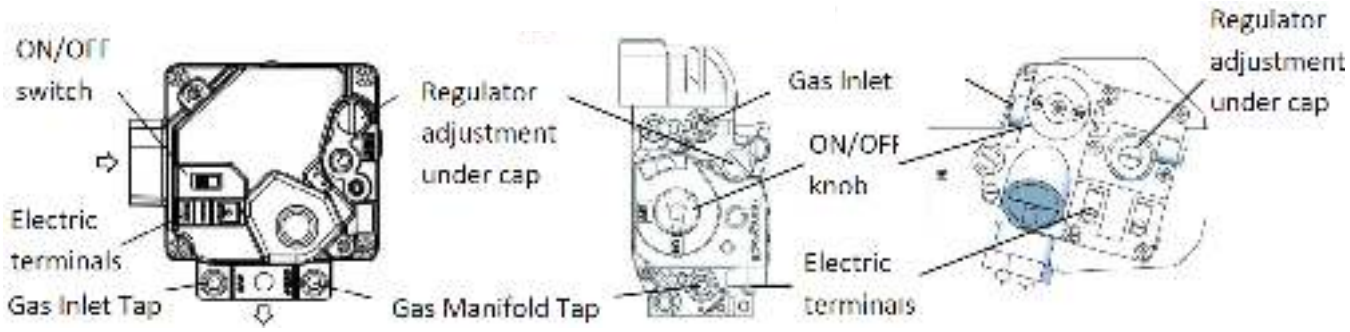
⚠ ATTENTION - If proper pressures cannot be achieved by adjusting the gas valve regulator, the installer must contact the gas supplier and request that the inlet pressure to the heater(s) be provided to within the gas pressure range listed.

7. Remove the barb fittings and replace the original 1/8" pipe plugs. Turn on gas and water to heater and start the heater to check for gas leaks.

⚠ WARNING - **Explosion Hazard.** Do not remove the measurement tap screws with the valve in the "ON" position and gas supplied to heater. No gas pressure must be present when the taps are open to atmosphere. Removal of the taps screws or barb fittings with gas present could cause an explosion resulting in severe injury and/or death.

⚠ WARNING - **Explosion Hazard.** Gas pressures in excess of those listed in Table 5 could cause a gas leak or diaphragm rupture. Gas leakage could cause an explosion resulting in severe injury or death.

Figure 19: Gas Valves



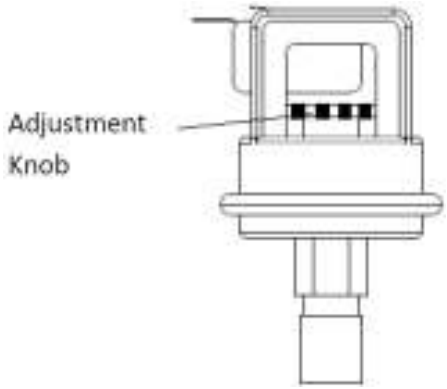
For all valves, adjust regulator pressure by removing the screw cap and turning the adjustment screw clock wise for increase in pressure and counter clock wise for decrease in pressure

Water Testing

WATER PRESSURE SWITCH TEST / ADJUSTMENT PROCEDURE: The pressure switch is preset at the factory for most typical deck level installations. When the heater is located above or below the level of the pool or spa, the pressure switch will require adjustment to compensate for the change in static pressure. The following procedure is recommended when the switch needs adjustment and/or is replaced;

1. Be sure the filter is clean before making any adjustment.
2. Turn "ON" the filter pump and ensure all air is out of the water lines,and ensure water flow rate is at least the rated minimum (see Specifications Section).
3. Turn "ON" the heater and adjust the temperature control to create a call for heat.
4. For Installations with Heater above water level: If the heater does not light, adjust the pressure switch by turning the adjustment knob on the pressure switch counter-clockwise until the heater lights. Turning the adjustment knob counterclockwise decreases the pressure needed to close the switch (Figure 20).
4. For Installations with Heater below water level: Turn the adjustment knob on the pressure switch clockwise, until the heater turns off,then turn the knob ¼ turn counter-clockwise, so that the heater turns back on. Turning the adjustment knob clockwise increases the pressure needed to close the switch
5. Check the function of the pressure switch by turning the filter pump on and off several times and confirming that the heater turns off immediately when the pump is turned off. Never allow the heater to operate with less than the minimum rated water flow rate.

Figure 20: Water Pressure Switch



TWO-SPEED PUMP: In a few cases the pressure from a two-speed pump is below the 1-pound minimum required to operate the water pressure switch on the heater. This is apparent when the pressure switch cannot be further adjusted. In these cases the pump must be run at high speed to operate the heater. If the pump and piping arrangement are such that the required 1-pound minimum pressure cannot be obtained, do not attempt to operate the heater. Correct the installation.

⚠ **ATTENTION** - Heater installation, checkout, and start-up should now be completed. BE SURE to leave this manual with the pool owner.

Maintenance & Service

Periodic Inspection

The heater is designed and built for long performance life when installed and operated according to the manufacturer's directions. Regular inspection by qualified service personnel is recommended to keep the heater working properly. The following inspection points are suggested to help maximize heater life.

1. Periodically check the venting on outdoor heaters. The heater's venting areas (the louvered top panel) must never be obstructed in any way and minimum clearances must be observed to prevent restriction of combustion and ventilation air. Remember that shrubs grow and in time may obstruct a heater's venting areas.
2. Check the venting of indoor heaters for looseness and possible leaks. Keep all openings for combustion and ventilation air clear and unobstructed.
3. Keep the entire pool heater area clean and free of all debris, combustible materials, gasoline, and other flammable vapors and liquids. Remove any leaves or paper from around the heater.
4. Do not store chlorine, other pool chemicals, or other corrosives in the vicinity of the heater.
5. If the heater is operating on propane gas, the tank must not fall below 30% full or damage to the heater may occur. Manufacturer will not be responsible for heaters that soot up due to improper gas level in the tank resulting in inadequate gas volume.
6. If another appliance is added to the gas line at a later date, consult the local gas company to be sure the gas line will have the capacity to supply both units at full input rating at the same time.
7. Do not use the heater if any part has been under water. Contact a qualified service technician to inspect the entire heater and replace any part of the control system or gas valve that was under water. If heater has been totally submerged in water it must be removed and the entire heater must be replaced.
8. An inspection program is a good preventative maintenance measure. Keep this manual in a safe place for future reference for yourself as well as for a service technician to consult when inspecting or servicing the heater. Any additional inspection procedures are to be performed by a qualified service technician.

Water Chemistry

⚠ WARNING - **Water Chemistry.** Failure to maintain proper water chemistry may cause premature heat exchanger damage or failure

The heat exchanger in your pool heater is made from the highest quality of copper and nickel (Cupronickel) materials. This premium material and the exacting processes used to manufacture the heat exchanger is state of the art in pool heater design and manufacture. However, it remains vital that the heat exchanger be protected from damaging or corrosive chemicals, insufficient water flow or improperly balanced water chemistry. Heat exchanger damage or failure resulting from improper flow, improperly balanced pool water or the improper addition of sanitizer into the water is NOT covered under the terms of the warranty. The following factors are critical to heat exchanger protection. Follow the guidelines in Table 6 to help prevent pre-mature damage to or failure of your heater and heat exchanger.

1. **WATER FLOW THROUGH HEATER:** Water must be flowing through the heater at the minimum rated flow rate during operation. Check that the pump is operating and the system is filled with water and purged of all air prior to starting the heater. The minimum flow rates are listed in the Specifications section. Some installations may require an adjustment to the water pressure switch for proper low-flow protection. Test your system and if necessary, adjust the water pressure switch as described in Water Testing section.

2. **WATER CHEMISTRY:** The chemistry balance and mineral content of swimming pool and spa water changes rapidly due to the addition of sanitizing chemicals, user loads, exposed rain, runoff, and the amount of sun - to name a few. Improper chemistry (see Table 6) balance and mineral content can cause scaling and deposits to form on pool walls, in the filtration system, in the heat exchanger tubes, and additionally can promote corrosive action to all metals in the water path. Changing spa water regularly and maintaining the correct chemical balance in your pool/spa will keep the pool/spa safe and sanitary and will help heat exchanger longevity. Use a 4-way pool/spa water test kit to check your water frequently (at least weekly). Use the following guidelines to help maintain proper water chemistry:

Table 6: Water Chemistry

Chemical	Recommended Level	Effect of Low Levels	Effect of High Levels
Chlorine	1 to 3 ppm	hazy water, algae growth, bacteria causing infections	swimmer irritation, bleaching of clothes/hair, corrosive to heat exchanger
Bromine	2 to 4 ppm		
pH	7.4 to 7.6 ppm	corrosive to heat exchanger, swimmer irritation	cloudy water, scaling of heat exchanger, reduced sanitizer effectiveness
Total Alkalinity	80 to 120 ppm	corrosive to heat exchanger, large fluctuations in pH	scaling of heat exchanger
Calcium Hardness	200 to 400 ppm	corrosive to heat exchanger	scaling of heat exchanger
Salt	2700 to 5000 ppm	poor salt chlorinator performance	corrosive to heat exchanger

3. **SKIMMER CHLORINATION:** Placing chlorine or bromine tablets directly into the skimmer may result in high chemical concentrations flowing through the heater. DO NOT place chlorine or bromine tablets in the skimmer.

4. **CHLORINATOR INSTALLATION:** Chlorinators must be installed downstream of the heater, and a check valve must be installed between the heater and chlorinator to prevent high chemical concentrations from back flowing into the heater. Make sure your piping arrangement meets the chlorinator installation requirements.

5. **BYPASS VALVE:** Bypass heater until water chemistry is properly balanced, so that corrosive and potentially damaging water will not flow through the heater and therefore the heat exchanger. Close the bypass valve once the water is properly balanced.

   ⚠ WARNING - **Bypass.** Failure to close the bypass valve when attempting to operate the heater will result in extensive damage to the heat exchanger

Ensure water flow through the heater is restored before operating the heater. A bypass feature is also advantageous for service needs and for the ability to remove the heater from the water path when not heating.

Winterization

In moderate climates, the heater can continue to operate during short-term cold spells. Do not use the heater to maintain the water temperature just above freezing or for freeze protection. Care must be taken to avoid freeze-up in the heater. When it is used during freezing weather, the pump must run continuously. The heater is not warranted against freeze-ups. In regions where freezing temperatures are encountered, all water must be drained from the heater when it is out of service to prevent damage to the heater and piping. Draining the heat exchanger is recommended as part of the season's shutdown procedures.

⚠ ATTENTION - A heater damaged by freezing is not covered under the manufacturer warranty.

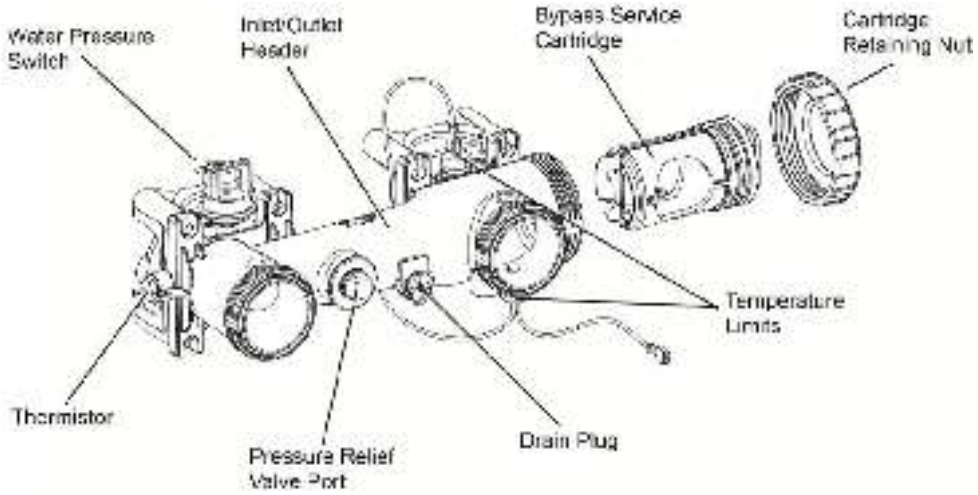
DRAINING THE HEAT EXCHANGER: This procedure applies to installations where the heater is located higher than the pool water level. If it is necessary to drain a pool heater located below the pool water level, you must either partially drain the pool, or isolate the pool heater from the pool using valves, then follow these steps.

1. Set the heater to STANDBY mode using the keypad.
2. Turn the electricity to the heater OFF at the circuit breaker panel.
3. Turn the heater gas valve OFF using the knob or switch on the valve (see Figure 19).
4. Turn the heater's gas supply OFF at the main shut-off valve outside the heater cabinet.
5. Be sure the circulating pump is OFF.
6. On models with plastic headers, remove the plastic drain plug (see Figure 21). On models with bronze headers (ASME models),open the brass drain valve located on the header (see Figure 14).
7. Allow all water to drain from the heater.
8. On models with plastic headers, re-install the plastic drain plug. On models with bronze headers (ASME models), close thebrass drain valve located on the header.

SPRING START-UP: This procedure should be performed annually to ready your heater for the upcoming season. In addition to the steps outlined below, it is recommended that a Periodic Inspection (page 26) also be performed.

1. Inspect and clean the heater, being sure the heater is free of leaves and debris prior to startup.
2. Be sure inlet and outlet piping are properly attached to the heater and the drain valve is closed.
3. Turn the filtration system pump "ON" and allow the system to run long enough to purge all the air from the lines.
4. Turn the gas supply to the heater "ON".
5. Set the temperature control using the keypad to "POOL" or "SPA" and adjust the set point to the desired temperature setting.
6. If operating difficulties are encountered, contact a qualified service company for assistance.

Figure 21: Heat Exchanger Header



Component Service

⚠ WARNING - Only qualified service technicians, with appropriate test equipment, should be allowed to service the heater. All of the components that comprise the system have an effect on heater operation. Before proceeding with heater related troubleshooting tips, be certain that the pump is operating correctly, the filters and strainers are not blocked, the valves in the piping are properly positioned, and the time clocks are properly set.

⚠ WARNING - Failure to comply with the service instructions may result in equipment damage, fire, asphyxiation, or carbon monoxide poisoning. Exposure to products of incomplete combustion (carbon monoxide) can cause cancer and birth defects or other reproductive harm.

⚠ WARNING - **Explosion Hazard.** Do not attempt to repair broken or faulty components of this heater. Do not modify the heater or its components in any manner. To do so may result in a malfunction that could result in death, personal injury, or property damage. Check with the pool owner to see if any part of the heater has been under water. Replace any electrically operated component that has been under water.

The following service procedures: **HEAT EXCHANGER INSPECTION AND CLEANING** and **BURNER INSPECTION AND CLEANING** are recommended to be performed as part of annual heater maintenance to ensure proper heater operation and long life.

HEAT EXCHANGER INSPECTION AND CLEANING: Remove the louvered exhaust cover panel and inspect the external surfaces of the heat exchanger for debris or soot accumulation. If heat exchanger needs cleaning perform the following procedure:

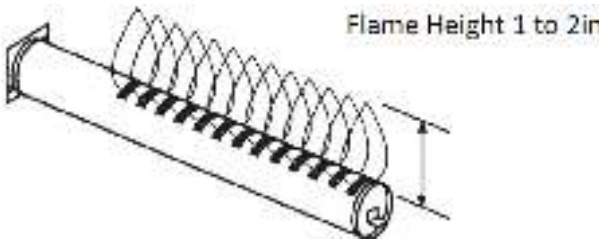
⚠ WARNING - **Burn Hazard.** Let heater cool before performing any disassembly or servicing of the heater.Wear proper PPE when servicing heater.

1. Turn pump, main gas valve and heater power "OFF". Perform only DRY cleaning with heat exchanger in heater. WET cleaning requires that the heat exchanger be removed from heater.
2. For DRY cleaning remove debris by hand, soft-tipped brush or shop VAC.
3. For WET cleaning remove heat exchanger by following the "Reversible Water Connections" procedure found in the Water Piping section of this manual. Use a soft-tipped brush (such as a paint brush), to apply a degreaser to the entire heat exchanger surface (top and bottom). Allow the heat exchanger to sit for a period of time to allow the degreaser to loosen the debris. Wash the heat exchanger using a garden hose at a medium to low pressure setting. Ensure both the top and bottom surfaces are cleaned.
4. Check combustion chamber refractory is still in a single-piece casting with no cracks or holes. This evaluation can be performed with heat exchanger in place with additional lighting or with heat exchanger removed from unit. If combustion chamber refractory is damaged, the entire chamber must be replaced.
5. Re-assemble the heater by reversing the disassembly steps. Turn pump, main gas valve and heater power "ON". Test fire heater.

⚠ ATTENTION - Although the heat exchanger should be cleaned of soot and reinstalled, the fact that soot occurred should be investigated. It may indicate other problems such as: Insufficient air supply; Inadequate venting; High or low gas pressure; Blockage of burner tubes or orifices; Blockage of blower inlet; Low voltage supply causing blower to "spin" slower; Improper heater location / installation; Incorrect gas supply pipe size; Excessive water flow through heat exchanger; Or an LP tank below 30% full level.

BURNER INSPECTION AND CLEANING: With the heater "ON", remove the front access panel and make a visual inspection of the main burners through the sight glass (see Figure 16) The main burner flames should be about 1" to 2" in height and should not "lift" off the burner ports (see Figure 22). A normal flame is blue, without yellow tips. Yellow tips or a totally yellow or "lazy" flame may be an indication of an incorrect fuel / air mixture. Check the heater for restrictions to the air supply, heat exchanger, vent system, burner body and/or gas orifices.

Figure 22: Burner Flame Characteristics



BURNER REMOVAL AND REPLACEMENT: Refer to Page 6, Figure 5, and Figure 16 as needed.

1. Turn pump, gas supply, and heater power “OFF”. Turn gas valve knob “OFF”.
2. Remove the front access panel.
3. Disconnect the union joint in the gas supply piping outside the heater cabinet.
4. Disconnect the wiring terminals from the gas valve and blower
5. Remove the gas manifold assembly. It is attached to the air box using (4) screws.
6. Remove the screws from the igniter access panel and pull it out of the way. Do not disconnect the wires.
7. Remove the air box cover. Do not remove the blower from the air box cover.
8. Remove the (2) screws securing each burner to the combustion chamber front.
9. Pull the burners straight out of the heater.
10. Reverse the above procedure to re-install the burners.
11. Turn the gas supply “ON”. Use a soapy water solution to check for leaks. Bubbles forming indicate a leak.

    ⚠ **WARNING** - **Explosion Hazard.** The use of an open flame to check for gas leaks could cause an explosion resulting in severe injury and/or death.

12. Turn pump, gas valve knob and heater power “ON”. Test fire heater by following the **GAS PRESSURE TEST PROCEDURE.**

GAS VALVE REPLACEMENT: Refer to Page 6, Figure 16 and Figure 19 as needed.

1. Turn pump, gas supply, and heater power “OFF”.
2. Disconnect the union joint in the gas supply piping outside the heater cabinet.
3. Remove the front access panel.
4. Disconnect the wiring terminals from the gas valve.
5. Remove the gas manifold assembly. It is attached to the air box using (4) screws.
6. Unscrew the gas valve from the gas manifold pipe.
7. Reassemble the gas manifold assembly using the new gas valve. Only use liquid pipe thread sealant on the male threads of thegas manifold pipe. Do not place pipe dope on the first two threads of any joint.
8. Reverse the above procedure to re-install the gas manifold. Turn pump, main gas, gas valve and heater power “ON”. Test fireheater by following the GAS PRESSURE TEST PROCEDURE. Check for leaks using soap and water

IGNITER REPLACEMENT: Refer to Page 6 and Figure 16 as needed.

1. Turn pump, gas supply, and heater power “OFF”.
2. Remove the front access panel.
3. Disconnect the igniter wires from the ignition control board.
4. Remove the screws from the igniter access panel. Working from the underside of the panel, press the bushing out of the hole inthe sheet metal panel.
5. Slide the igniter wires through the slot on the panel and pull the panel free.
6. Remove the (2) screws that secure the igniter.
7. Pull the igniter straight back until it is free of the combustion chamber refractory and out of the air box.
8. Replace the igniter and reverse the above procedure to reassemble unit.

FLAME SENSOR REPLACEMENT: Refer to Page 6 and Figure 16 as needed.

1. Turn pump, gas supply, and heater power “OFF”.
2. Remove the front access panel (4 screws).
3. Disconnect the flame sensor wire from the ignition control board.
4. Remove the screws that secure the flame sensor to remove the sensor.
5. Replace the flame sensor and reverse the above procedure to reassemble unit.

BURNER ORIFICE REPLACEMENT: Refer to Page 6 and Figure 16 as needed.

1. Turn pump, gas supply, and heater power "OFF".
2. Disconnect the union joint in the gas supply piping outside the heater cabinet.
3. Remove the front access panel.
4. Disconnect the wires from the terminals on the gas valve.
5. Remove the gas manifold assembly. It is attached to the air box using (4) screws.
6. Remove the orifices using a 7/16" wrench.
7. After cleaning or replacing orifices re-install into the gas manifold pipe being careful not to cross-thread or over tighten as a leakmay result.

⚠ **ATTENTION** - Do not enlarge orifice holes.

⚠ **ATTENTION** - All replacement wiring must be replaced with manufacturer supplied replacement parts.

IGNITION CONTROL SYSTEM: The control system in this heater consists of 4 components (ignition control board, display board, fuse board and membrane key-pad). The locations of these components are shown in Figure 16. The ignition control board functions as the heater's thermostat control, safety control system, and gas ignition and combustion monitoring system.

To remove/replace the ignition control board or the fuse board:

1. Turn pump, gas supply, and heater power OFF.
2. Remove the front access panel.
3. Disconnect all wires from the printed circuit board.
4. Detach the board from the sheet metal panel by compressing the plastic standoffs.
5. Replace the board and reverse the above procedure to reassemble unit.

BLOWER VACUUM SWITCH: The blower vacuum switch is a safety device that prevents the ignition sequence from continuing unless the blower is developing sufficient airflow for combustion. Figure 16 shows the location of the blower vacuum switch in the heater cabinet. When the blower achieves sufficient airflow, the negative pressure created in the blower housing closes the contacts on the blower vacuum switch, indicating to the ignition control board that it is safe to continue the ignition sequence. A silicone tube connects the blower vacuum switch with the blower as shown in Figure 16.

To remove the blower vacuum switch:

1. Turn pump, gas supply, and heater power "OFF".
2. Remove the front access panel.
3. Remove the wires from the vacuum switch.
4. Pull the tubing from the hose barb on the switch.
5. Remove the (2) screws that secure the pressure switch to the control panel.
6. Replace the pressure switch and reverse the above procedure to reassemble unit.

HIGH LIMIT SWITCHES: The heater is equipped with two automatic high limits, located on the water header. These high limits are automatically resetting safety devices wired in series with the thermostat and gas valve. See Figure 21. If the water temperature exceeds the limit set point, the gas valve will be closed, shutting off gas supply to the burners. Erratic high limit operation is an indication of water flow issues. Reduced flow may be caused by a clogged filter or strainer, excessive flow through the external bypass (if one is used), or lime scale accumulation in the heat exchanger.

To replace a high limit switch:

1. Turn pump, gas supply, and heater power "OFF".
2. Drain the heat exchanger of all water.
3. Unplug the high limit wires from the wiring harness.
4. Unscrew the high limit switch from the header.
5. Replace the high limit switch. Use new sealant on the high limit switch threads before reinstalling.
6. Reverse the above procedure to reassemble unit.

VENT PRESSURE SWITCH: The vent pressure switch is a safety device that disables the unit when the flue opening is blocked, which prevents sufficient combustion gas flow through the unit. Figure 16 shows the location of the vent pressure switch in the heater cabinet. When the flue is blocked, pressure is created and opens the contacts on the vent pressure switch, directing the ignition control board to deactivate the unit. A silicone tube connects the vent pressure switch to the blower as shown in Figure 16.

To remove the vent pressure switch:

1. Turn pump, gas supply, and heater power "OFF".
2. Remove the front access panel.
3. Remove the wires from the pressure switch.
4. Pull the tubing from the hose barb on the switch.
5. Remove the (2) screws that secure the pressure switch to the heater.
6. Replace the pressure switch and reverse the above procedure to reassemble unit.

EXHAUST GAS TEMPERATURE LIMIT: The exhaust gas temperature limit monitors the flue gas temperature above the heat exchanger and opens when the temperature rises high enough to indicate that the heat exchanger is no longer transferring heat to the pool water effectively. If the temperature limit opens, effort must be made to assess and rectify the condition that activated the temperature limit and potentially damaged the heat exchanger. The condition is generally low water flow and/or scaling of the heat exchanger cupronickel tubes from poor water chemistry. Replace the limit as well as the heat exchanger, if needed, before operating the unit again.

To replace the exhaust gas temperature limit:

1. Turn pump, gas supply, and heater power "OFF".
2. Remove the upper end cap on the header side of the unit (see Page 6).
3. Unplug the two wires from the exhaust gas temperature limit located in the flue collector panel above the middle of the header.
4. Unscrew the (2) screws securing the limit to the panel and remove the limit and gasket.
5. Place the new limit and gasket in place and reverse the above procedure to reassemble unit.

THERMISTOR: The thermistor monitors the return water temperature to thermostatically control pool and spa water to the selected temperature and to shut the heater off as the return water reaches 104 F. See Figure 21.

To replace the thermistor:

1. Turn pump, gas supply, and heater power "OFF".
2. Drain the heat exchanger of all water.
3. Remove the front access panel.
4. Unplug the thermistor connector from the ignition control board.
5. From outside the heater, pull the thermistor leads out of the control box and through the hole in the heater chassis.
6. Unscrew the thermistor from the inlet side of the header.
7. Replace the thermistor. Use new sealant on the thermistor threads before re-installing.
8. Reverse procedure above to reassemble unit.

WATER PRESSURE SWITCH: The water pressure switch (see Figure 21) is preset at the factory for most typical, deck level installations. When the heater is located above or below the level of the pool or spa, the pressure switch may require adjustment to compensate for the change in static head pressure. If adjustment is needed, the procedure is detailed in **WATER PRESSURE SWITCH TEST / ADJUSTMENT PROCEDURE**.

⚠ ATTENTION - Do not operate the pool heater without the function of a properly adjusted pressure switch or flow switch.

To replace the pressure switch:

1. Turn pump, gas supply, and heater power "OFF".
2. Remove the (4) screws securing the upper end panel and remove the panel.
3. Remove the (2) screws securing metal trim panel to the upper trim panel.
4. Remove the wires from the pressure switch.
5. Unscrew switch from header.
6. Replace the pressure switch. Use new sealant on the pressure switch threads before re-installing.
7. Reverse procedure above to reassemble unit.

TRANSFORMER: The transformer converts the field supply voltage (either 240 VAC or 120 VAC) to a 120 VAC output for blower and igniter power, and a 24 VAC output for powering the ignition control board, control circuits, and gas valve. See Figure 16 for its location.

To replace the transformer:

1. Turn pump, gas supply, and heater power "OFF".
2. Remove the front access panel.
3. Unplug transformer from the fuse board
4. Remove the (2) screws that secure the transformer to the control box.
5. Replace the transformer.
6. Reverse procedure above to reassemble unit.

BYPASS SERVICE CARTRIDGE: The following procedure details how to remove and replace the internal pressure bypass valve in the header. This procedure applies only to plastic (non-ASME) headers. On bronze (ASME) headers, the bypass service cartridge is not field-replaceable. Please contact technical support for more information.

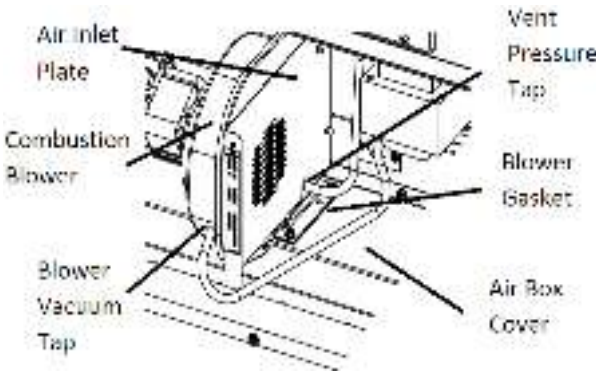
1. Turn pump, main gas valve, and heater power off.
2. Drain heat exchanger according to instructions in this manual.
3. Remove 6 screws and remove the upper plastic heater side panel, to allow access to the header.
4. Remove the cartridge retaining nut from end of header (see Figure 21).
5. Slide out the bypass cartridge from the end of the header (see Figure 21).
6. Check the function of the bypass valve to ensure the valve flaps rotate smoothly on the shaft, and the spring fully closes the valve.
7. Apply silicone O-ring grease (Jack's 327 Multilube p/n SP032712, or equivalent) on O-ring seals on the bypass cartridge before inserting into the header.
8. Insert bypass cartridge into header with the arrow on the end of the cartridge pointing up.
9. Re-install cartridge retaining nut. Nut should be tightened hand-tight only. DO NOT OVER-TIGHTEN.
10. Re-install the upper plastic heater side panel.
11. Reverse procedure above to reassemble unit.

COMBUSTION BLOWER: The blower provides the air that mixes with the gas in the burners for the combustion process. The blower operates during the pre-purge time (approximately 30 seconds) at the beginning of each ignition cycle, during the entire time the gas valve is open and the burners are firing, and for 30 seconds after the gas valve closes. See Figure 16 and Figure 23.

To replace the blower:

1. Turn pump, gas supply, and heater power "OFF".
2. Remove the front access panel.
3. Disconnect the blower wire harness from the ignition control board.
4. Disconnect the tubing from the hose barb on the blower housing.
5. Remove the blower from the air box cover (4 screws).
6. Remove the blower air inlet plate from the blower (4 screws).
7. Be sure the blower outlet gasket is in place before proceeding. Reverse the above procedure to reassemble the blower.

Figure 23: Combustion Blower



Troubleshooting

Error and Display Codes: See Table 7: Display Code Index.

Troubleshooting the Unit: See Table 8: Troubleshooting Lookup Chart.

AUTOMATIC RESET TIME: The heater will automatically reset when an error condition is corrected and resume operation. The heater can be manually reset using the keypad by cycling the MODE button through "STANDBY" and back to the original operating mode ("POOL" or "SPA").

⚠ **WARNING** - These instructions are intended for the use of qualified personnel trained and experienced in the installation and servicing of this type of heating equipment and its related system components. Some states may require installation and service personnel to be licensed. Persons not qualified should not attempt to repair this equipment according to these instructions. These instructions and procedures are not for the use of "do-it-yourself" consumers.

⚠ **WARNING** - **Burn Hazard.** The operation of the heater with the pump shut off could cause heater overheating and fire. Never operate heater with the pump shut off.

⚠ **ATTENTION** - As a preliminary check, make sure that all wire connections are clean and tight and that all wiring conforms to the wiring diagram.

FUSE SPECIFICATIONS: The fuse designations are printed on the power board and the ignition control board. See Figure 16 for board locations. Fuses are available as common hardware items or may be purchased from manufacturer in a service parts kit. The fuse specifications are:

- F1 fuse (low voltage): 3A blade style fast-acting automotive fuse, type 257
- FC1 & FC2 (transformer primary) and FC4 (transformer secondary): 3A slo-blo fuse, 5 x 20 mm

INTERNAL WIRING: If the heater display is blank after the electrical has been installed, refer to Troubleshooting Lookup Chart to determine the cause. Note, the ribbon cable between the display board and the ignition control board is keyed to ensure correct connection.

SUPPLY WIRING: If the heater is connected to the line side of the circuit it will be powered at all times. In this situation, when the pump shuts down the heater will display a fault code of "LO". If there is a call for heat and the pump then restarts there will be a 2-minute delay for the heater to fire. After the pump has been running for at least 2 minutes there is no delay for heater operation. Wiring the heater to the load side of the timer or controller will not result in a 2-minute delay if the pump primes quickly enough to activate the heater's water pressure switch. If the pump is slow to prime the heater may display an "LO" fault code and will take 2 minutes to automatically restart. If the pump has primed, this wait can be avoided by manually clearing the error code via the keypad by changing the mode through the "STANDBY" setting and returning to the initial setting ("SPA" or "POOL").When a heater is wired to the line side of the power circuit (continuous power) the blower will not operate when the pump is cycled via a time clock or other switch method.

Table 7: Display Code Index		
NOTE: Continuation of control sequence is immediate after error is corrected. Automatic reset may take up to 2min for control self-diagnostics to complete. Lockout recover may take up to 60 min.		
Code	**Description**	**Information**
AC	Air switch circuit closed error	Blower vacuum switch closed when expected open. If the blower vacuum switch is closed before blower has started, the ignition control board will not start the blower until circuit is opened.
AO	Air switch circuit open error	Blower vacuum switch open when expected closed. If the blower vacuum switch does not close after the blower starts for ignition or opens unexpectedly during operation / post purge the ignition control board will shut off gas and air flow and attempt a new ignition. If the blower vacuum switch does not close after the blower starts for ignition the ignition control board will suspend the ignition trial and go into lockout. The blower will continue to run.
bd	Ignition control board data error	If the ignition control board does not satisfy self-diagnostic or input data values are corrupted on power up or initial trial for ignition, the ignition control board will lockout until error condition is corrected.
bd	Gas valve sensed as “ON” error	If gas valve is powered when it should be off the heater will shut down and go into lockout. Blower will operate until error condition is corrected.
bd	Gas valve sensed as “OFF” error	If gas valve is unpowered but flame is sensed the blower will run for 5 s then start a new ignition sequence. If error occurs 10 times during a call for heat the ignition control board will go into lockout.
bo	Bypass operation mode	This is normal display when heater is being controlled by a remote thermostat. No service is required. If heater is not being controlled by remote thermostat, change setting by using the MODE key to put the heater into STANDBY. Press and hold the DOWN key and then press and hold the MODE key. Hold down both keys for 3 seconds until the indication “bO” is removed from the display.
CE	Communication error	If communication between the ignition control board and the display board is not established within 3 s of power-up or is lost for 30s during operation unit will shut down and error will be displayed. The error code will be cleared upon a valid data exchange between boards.
EE	EEPROM error	An error was detected in the ignition control board.
HF	High flame sensor signal error	If flame is sensed with the gas valve off the ignition control board will go into lockout. The blower will run until error condition is corrected. When corrected, the ignition control board will run blower for 5 s then automatically restart after 2 minutes.

Table 8: Display Code Index		
NOTE: Continuation of control sequence is immediate after error is corrected. Automatic reset may take up to 2 min for control self-diagnostics to complete. Lockout recover may take up to 60 min.		
HS	High temperature sensing error	A) Inlet water temperature sensor is reporting a temperature in excess of 104°F. Normal operation resumes 2 minutes after inlet water temperature sensor reports temperatures of 104°F or less. This error functions for both normal and remote thermostat modes. B) Inlet water temperature sensor is reporting a temperature change at a rate faster than 6°F in 60 seconds or less while the heater is firing, indicating a potentially damaging low water flow condition. Normal operation resumes when temperatures stabilize. If this condition is detected 3 times in a one hour period, the heater will lockout.
IF	Ignition failure error	If the maximum number of ignition retries is exceeded, the heater will shut down and go into lockout. Automatic reset is 60 minutes.
IO	Igniter open error	If the ignition control board is not in lockout and senses that the igniter circuit is open when the blower is running the ignition control board will turn off the blower and go into lockout. Automatic restart 2 min after error is corrected.
LO	Limit string open error	If the limit string opens the heater shuts down and goes into lockout. Automatic restart is 2 minutes after the error condition is corrected and the limit string closes.
PF	Electrical power supply wiring error	This code will display if supply power polarity is reversed, low voltage is detected, or if the ground path is not sufficient. Reset is immediate after error is corrected.
Sb	Keypad stuck button error	If one of the keypad buttons is closed (or pressed) for more than 30 s the unit will shut down. The error code will be cleared when the condition is corrected.
SF	Temperature sensor failure error	If an excessive temperature difference between the redundant thermistors (5 °F or more) or a sensor “out of bounds” condition with either thermistor (less than 10°F or greater than 180°F) will result in unit shut down and the error code displayed. Automatic restart is 2 minutes after the error is corrected.

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Table 9: Troubleshooting Lookup Chart		
Code/Fault	**Diagnostic Step**	**Suggested Troubleshooting Action**
No code displayed **Heater will not power up**	1. Check for Low & High voltage output from fuse board	Disconnect plug from P5 connector from Fuse Board. Measure for 24VAC between pins of receptacle on Fuse Board. Reconnect plug. Disconnect plug from P6 of Fuse Board. Measure for 120VAC between pin 3 and 5 of receptacle on Fuse Board. Reconnect plug. If OK, proceed to section titled "Low voltage circuit fault". Otherwise, proceed to step 2.
	2. Ensure power supply to heater is turned on.	Measure for field supply voltage across terminals of TB1 terminal block on Fuse Board. If OK, proceed to step 3.
	3. Check for faulty fuse board wiring.	Inspect Fuse Board wiring. Ensure all plugs are securely fastened to Fuse Board. If OK, proceed to step 4.
	4. Verify that FC1 and FC2 fuses on fuse board are working	Remove FC1 and FC2 fuses from fuse holder. Measure continuity across fuse. If fuses are open, proceed to section titled "Open FC1 and/or FC2 Fuses". If fuses are OK, reinstall them and proceed to step 5.
	5. Verify that voltage selector plug is installed	Check that proper Voltage Selector Plug 120 or 240 VAC is installed in Fuse Board. If OK, proceed to step 6.
	6. Check for defective transformer.	Disconnect plug from P4 connector from Fuse Board. Measure for 24VAC between pins 1 & 2 of plug of Transformer and 120VAC between pins 4 & 6. If 24VAC or 120VAC is not present, replace Transformer. Otherwise,proceed to step 7.
	7. Fuse Board is defective	Replace Fuse Board.
No code displayed **Low voltage circuit fault.**	1. Check for Low Voltage Output from Fuse Board	Disconnect plug from P5 connector from Fuse Board. Measure for 24VAC across pins. Reconnect plug. If OK, proceed to step 2. Otherwise, proceed to step 5.
	2. Check for faulty ignition control board wiring.	Inspect ignition control board wiring. Ensure all plugs are securely fastened. If OK, proceed to step 3.
	3. Verify low voltage input to ignition control board	Verify 24VAC across R and C terminals on ignition control board. If not OK, replace harness. If OK, proceed to step 4.
	4. Verify that F1 Fuse on ignition control Board is not open.	Remove F1 fuse from fuse holder. Measure continuity across fuse. If OK, replace ignition control board. If fuse is open, proceed to section titled "Open FC3 or FC1 Fuses".
	5. Verify that FC3 on Fuse Board is not open	Remove FC3 fuse from fuse holder. Measure continuity across fuse. If fuse is open, proceed to section titled "Open FC3 or FC1 Fuses". If OK, reinstall fuse and proceed to step 6.
	6. Check for defective Transformer.	Disconnect plug from P4 connector from Fuse Board. Measure for 24VAC between pins 1 & 2 of plug from transformer. If 24VAC is not present, replace Transformer. Otherwise, proceed to step 7.
	7. Fuse Board is defective	Replace Fuse Board
No code displayed **Open FC1 and/or FC2 Fuses.**	1. Verify that 120VAC Voltage Selector Plug is not installed with a 240VAC field power supply.	Check that proper Voltage Selector Plug is installed. If OK, proceed to step 2. If 120VAC plug is installed and field supply voltage is 240VAC, FC1 and FC2 fuses may be blown. Install the correct Voltage Selector Plug and new FC1 and FC2 fuses.
	2. Check for faulty Transformer wiring.	Inspect Transformer wiring. Ensure insulation on wiring is not worn. If OK, proceed to step 3.
	3. Defective Transformer	Replace Transformer.
No code displayed **Open FC3 and/or F1 Fuses**	1. Check for faulty Gas Valve wiring.	Inspect Gas Valve wiring. Ensure insulation on wiring is not worn. If OK, proceed to step 2.
	2. Verify that Gas Valve is not defective.	Measure for resistance across Gas Valve terminals and between each terminal and ground. If short exists, replace Gas Valve. If OK, proceed to step 3.
	3. Check for faulty ignition control board wiring.	Inspect ignition control board wiring is to supplied wiring diagram. Ensure insulation on wiring is not worn and no bare wire is exposed. If OK proceed to step 4.
	4. Ignition control board is defective.	Replace ignition control board.

No code displayed **Open FC4 Fuse.**	1. Check for faulty Igniter wiring.	Inspect Igniter wiring. Ensure insulation on wiring is not worn. If OK, proceed to step 2.
	2. Check for faulty Blower wiring.	Inspect Blower wiring. Ensure insulation on wiring is not worn. If OK, proceed to step 3.
	3. Check for defective Igniter.	Disconnect Igniter plug from ignition control board. Measure resistance across Igniter. Resistance should be 10.9-19.7 ohms at 77°F. If out of this range, replace igniter. If OK, proceed to step 4.
	4. Check for defective Blower.	Disconnect Blower plug from ignition control board. Measure resistance across Blower windings. Winding resistance across lead should be in the following range: Red-to-White: 4 to 5 ohms. If measured values vary substantially from these values, blower is defective. Replace. Otherwise proceed to step 5.
	5. Ignition control board is defective.	Replace ignition control board.
AC displayed **Air switch circuit closed error**	1. Check for defective blower on relay or ignition control board.	Disconnect Blower plug from ignition control board. With heater off, measure continuity across pins 1 and 2 of receptacle on ignition control board. If closed, ignition control board relay is defective. Replace ignition control board. If OK, proceed to step 2.
	2. Vacuum switch is defective.	Replace blower vacuum switch.
AO displayed **Air switch circuit open error**	1. Check for faulty vacuum switch tubing	Check tubing and replace if necessary. If OK, proceed to step 2.
	2. Check for faulty vacuum switch wiring or connection.	Inspect vacuum switch wiring. Ensure wire harness terminals are securely fastened to spade terminals on vacuum switch. If OK, proceed to step 3.
	3. Check for faulty blower wiring or connection	Inspect blower wiring. Ensure plug on blower is securely fastened to ignition control board. If OK, proceed to step 4.
	4. Check for defective vacuum switch	Disconnect Blower plug from ignition control board. Measure resistance across Blower windings. Winding resistance across lead should be in the following range; Red-to-White: 4 to 5 ohms. If measured values vary substantially from these values, Blower is defective. Replace. If OK, proceed to step 5.
	5. Check for defective blower relay.	Disconnect Blower plug from ignition control board. Place heater in Pool or Spa Mode. Lower set point temperature to generate call for heat. During pre-purge period, measure for 120VAC across pins 1 and 2. If 120VAC is not present, ignition control board relay is defective. Replace ignition control board. If OK, proceed to step 6.
	6. Vacuum switch is defective	Replace blower vacuum switch.
bd displayed **Ignition control board data error**	1. Verify that FC4 Fuse on Fuse Board is not open.	Remove FC from fuse holder. Measure continuity across fuse. If OK, reinstall fuse and proceed to step 2. If Fuse is open, proceed to section titled “Open FC4 Fuse”.
	2. Verify high voltage output from Fuse Board.	Disconnect plug from P6 connector of Fuse Board. Measure for 120VAC across pins 3 and 5 of P6 receptacle on Fuse Board. If OK, reconnect plug and proceed to step 3. If not OK, go to step 4.
	3. Check for defective Harness.	Disconnect plug from E10 connector of ignition control board. Measure for 120VAC across pins 1 and 3 of Plug on Harness. If OK, replace ignition control board. If not OK, replace Harness.
	4. Check for defective Transformer.	Disconnect plug from P4 connector of Fuse Board. Measure for 120VAC between pins 4 and 6 of plug from Transformer. If OK, proceed to step 5. If not OK, replace Transformer.
	5. Fuse Board is defective	Replace Fuse Board.
bo displayed **Bypass Operation**	1. Check to see if Ignition control board is in Bypass Operation	This is normal display when heater is being controlled by a remote thermostat. No service is required. If heater is not being controlled by remote thermostat, change setting by using the MODE key to put the heater into STANDBY. Press and hold the DOWN key and then press and hold the MODE key. Hold down both keys for 3 seconds until the indication “bO” is removed from the display.

CE displayed **Control to display communica-tion error**	1. Disconnect and then re-connect power to heater.	Reset communication between Display Interface and Ignition control board.
	2. Check for faulty wiring or connection.	Inspect Display Interface Wiring. Ensure Display Interface Plug is securely attached to ignition control board. If OK, proceed to step 3.
	3. Display Interface and/or Ignition control board are defective.	Replace Display Interface and/or ignition control board.
EE displayed	1. EEPROM error Defective igni-tion control board	Replace ignition control board.
HF displayed **High flame sensor signal error**	1. Ignition control board is defective	Using the sight glass, check to see if the flame is present in the unit. If not, replace ignition control board. If flame is present, use a voltmeter to determine if 24 VAC is present at the gas valve connections. If so, replace ignition control board. If not, move to Step 2.
	2. Gas Valve is defective	Replace Gas Valve
HS displayed **High temp. sens-ing Error**	1. Check remote thermostat setting	Verify set point setting of remote thermostat is at or below 104°F. If set point of remote thermo-stat is OK, or if heater is not configured for remote thermostat, proceed to step 2.
	2. Verify that the water flow is adequate	Verify that water flow to heater is above minimum required (see SPECIFICATION in Getting Started Section). Note that intermittent periods of low water flow will cause this error. If OK, proceed to step 3.
	3. Check inlet water tempera-ture sensor	Compare the heater's temperature reading to the pool water temperature with an accurate thermometer. If significantly different, replace inlet water temperature sensor.
IF displayed **Ignition failure error**	1. Ensure gas supply shut off valves are open.	Ensure that main gas shutoff installed adjacent to heater is open. Ensure that knob on gas valve inside unit is in “on” position. If OK, proceed to step 2.
	2. Check for low gas supply press.	Ensure inlet gas supply pressure is between the minimum and maximum values indicated on rating plate. If OK, proceed to step 3.
	3. Check for faulty flame sense connection.	Inspect flame sense wiring. Ensure wire harness terminals are securely fastened to flame sense and to ignition control board. If OK, proceed to step 4.
	4. Check for faulty gas valve connection	Inspect gas valve wiring. Ensure wire harness terminals are securely fastened to spade termi-nals on gas valve. If OK, proceed to step 5.
	5. Check for gas valve failure or gas valve relay failure.	1. Measure voltage across gas valve during trial for ignition. If 24VAC is present and gas valve does not open, gas valve is defective. Replace gas valve.
		2. If 24VAC is not present, gas valve relay on ignition control board is defective. Replace igni-tion control board.
	6. Check for blockage	Inspect gas orifices for blockages which could prevent gas flow. Remove and inspect burners for blockages.
IO displayed **Igniter open error**	1. Check for faulty connection.	Inspect Igniter wiring. Ensure Igniter Plug is securely attached to ignition control board. If OK, proceed to step 2.
	2. Igniter is defective	Replace Igniter.
LO displayed **Water Pressure Switch Fault**	1. Verify that the pump is run-ning.	This is a normal display when the pump is off. Turn pump on. LO code should clear. If LO does not clear, proceed to step 2.
	2. Verify that water flow is adequate	Verify that water flow rate to heater is above minimum required (see SPECIFICATION in Getting Started Section). If OK, proceed to step 3.
	3. Check for faulty wiring or connection.	Inspect water pressure switch wiring. Ensure wire harness terminals are securely fastened to spade terminals on water pressure switch. If OK, procced to step 4.
	4. Check for correct water pres-sure switch setting.	Adjust water pressure switch setting as presented in Manual (only if heater is above or below water level). If LO does not clear, proceed to step 7.
	5. Water pressure switch is defective	Replace water pressure switch.

LO displayed Vent Pressure Switch Fault Cont...	1. Check for faulty wiring or connection.	Inspect vent pressure switch wiring. Ensure wire harness terminals are securely fastened to spade terminals on vent pressure switch. If OK, proceed to step 2.
	2. Verify state of vent pressure contacts.	Remove wire leads from vent pressure switch and jumper leads. Operate heater. Measure continuity across vent pressure switch. If closed, LO code is not caused by vent pressure switch fault. If open, proceed to step 3. Remove jumper from wire leads and reconnect wire leads to vent pressure switch.
	3. Check for restricted or blocked flue.	Ensure that flue is not blocked or restricted. See indoor vent sizing requirements in installation manual. Verify heat exchanger is not blocked. Verify burners are not blocked. If OK, proceed to step 4.
	4. Vent pressure switch is defective.	Replace vent pressure switch.
LO displayed Temp. Limit Switch Fault cont…	1. Check for faulty wiring or connection.	Inspect temperature limit switch wiring. Ensure wire harness terminals are securely fastened to spade terminals on temperature limit switches. If OK, proceed to step 2.
	2. Verify state of temperature limits' contacts	Remove wire leads from limit switch and jumper leads. Operate heater. Measure continuity across limit switches. If closed, LO code is not caused by temperature limit switch fault. If open, proceed to step 3. Remove jumper from leads and reconnect leads to temperature limits.
	3. Verify that water flow is adequate	Verify that water flow rate to heater is above the minimum required (see Specifications section). If OK, proceed to step 4.
	4. Temperature limit switch is defective.	Replace temperature limit switch.
LO displayed Exhaust Gas Temp. Limit Fault cont…	1. Check for faulty wiring or connection	Inspect temperature limit switch wiring. Ensure wire harness terminals are securely fastened to spade terminals on temperature limit switch located in the flue collector panel above the center of the header. If OK, proceed to step 2.
	2. Verify state of temperature limit's contacts	Remove wire leads from limit switch and measure continuity across limit switch contacts. If closed, LO code is not caused by exhaust gas temperature limit switch fault. If open, proceed to step 3.
	3. Heat exchanger has been damaged	This is generally due to low water flow, poor water chemistry, or other factors. Correct issues with water flow through the heater and water chemistry and then replace the heat exchanger and exhaust gas temperature limit. Continuing to run the heater after this limit has tripped will cause damage to the entire unit and will not be covered by the warranty.
PF displayed	1. Polarity reversed	Reverse L and N (120vac) or L1 and L2 (240VAC).
	2. Insufficient ground continuity	Check for proper ground to unit and at service disconnect box.
	3. Low voltage detected	Check that proper Voltage Selector Plug is installed.
	4. Ignition control board damaged	--
Sb displayed	1. Keypad stuck button error, keypad is defective	Replace Display Interface Assembly.
SF displayed Temp. sensor failure error	1. Check for faulty wiring or connection.	Inspect sensor wiring. Ensure sensor is plugged into back of ignition control board. If OK, proceed to step 2.
	2. Sensor is defective	Replace temperature sensor.

⚠ **WARNING** - Pool heaters are heat producing appliances. To avoid possible over heating of the outer jacket and damage or injury with such an event: (1) no materials should be stored against the jacket and (2) care should be taken to avoid unnecessary contact (especially by children) with the jacket.

⚠ **WARNING** - When lighting a gas heater, the lighting instructions must be followed exactly to prevent "flashback" of excess gas in the heater. Electronic ignition heaters and electric heaters must have the power shut off when making adjustments for servicing, or coming into contact with the heater.

⚠ WARNING - UNDER NO CIRCUMSTANCES SHOULD FLAMMABLE MATERIALS, SUCH AS GASOLINE OR PAINT THINNERS, BE USED OR STORED IN THE VICINITY OF THE HEATER OR IN ANY LOCATION FROM WHICH FUMES COULD REACH THE HEATER.

Service Parts

The following service parts and kits are available from Hayward and through your local distributor. When ordering parts, include the complete heater model number listed on the unit's rating plate. (Example: H400FDN) All service must be performed by a qualified technician.

Cabinet Parts
- Control Access Panel
- Cabinet Top
- Header Controls Cover
- Water Side Trim Panels
- Cabinet Base

Electronic Controls
- Ignition Control Board
- Display Board and Ribbon Cable
- Field Wiring Panel (Fuse Board)
- Inlet Water Thermistor
- Water Pressure Switch
- High Temperature Limits
- Exhaust Temperature Limit
- Blower Pressure Switch
- Vent Pressure Switch
- Transformer
- Ignitor
- Flame Sensor
- Voltage Selector Jumper
- Fuses
- Wiring Harnesses

Heating Components
- Combustion Blower
- Burner
- Combustion Chamber
- Heat Exchanger Assy

Water Manifold Components
- Header Assembly
- Union Flange
- Pressure Relief Port Plug
- Drain Plug

Miscellaneous Kits
- Gasket Kit
- Header O-Ring Kit
- Gas Conversion Kits (Natural or LP)
- Electrical Accessory Kit

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HAYWARD® Pool Products Limited Warranty

Hayward Pool Products, Inc., warrants the components of this product to be free from defects in materials and workmanship during the warranty period. Please visit https://hayward.com/support/resources/warranty for product warranty details.

The limited warranty excludes damage from freezing, negligence, improper installation, improper use or care, Acts of God or as specified in installation and operations manual. Parts that fail or become defective during the warranty period shall be repaired or replaced, at our option.

Proof of purchase is required for warranty service. In the event proof of purchase is not available, the manufacturing date of the product will be the sole determination of the purchase date.

To obtain warranty service, please contact the place of purchase or the nearest Hayward Authorized Service Center. For assistance on your nearest Hayward Authorized Service Center, please visit us at https://hayward.com/dealerlocator.

Hayward shall not be responsible for cartage, removal, repair or installation labor or any other such costs incurred in obtaining warranty replacements or repair.

The Hayward Pool products warranty does not apply to components manufactured by others. For such products, the warranty established by the respective manufacturer will apply.

The express limited warranty above constitutes the entire warranty of Hayward Pool Products with respect to its pool products and is in lieu of all other warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose. In no event shall Hayward Pool products be responsible for any consequential, special or incidental damages of any nature.

Some states do not allow a limitation on how long an implied warranty lasts, or the exclusion of incidental or consequential damages, so the above limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state.

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