Sta-Rite Pool/Spa Heater Training and Service Manual

Models

SR200NA / SRC200NA

SR200LP / SRC200LP

SR333NA / SRC333NA

SR333LP / SRC333LP

SR400NA / SRC400NA

SR400LP / SRC400LP

SR400HD

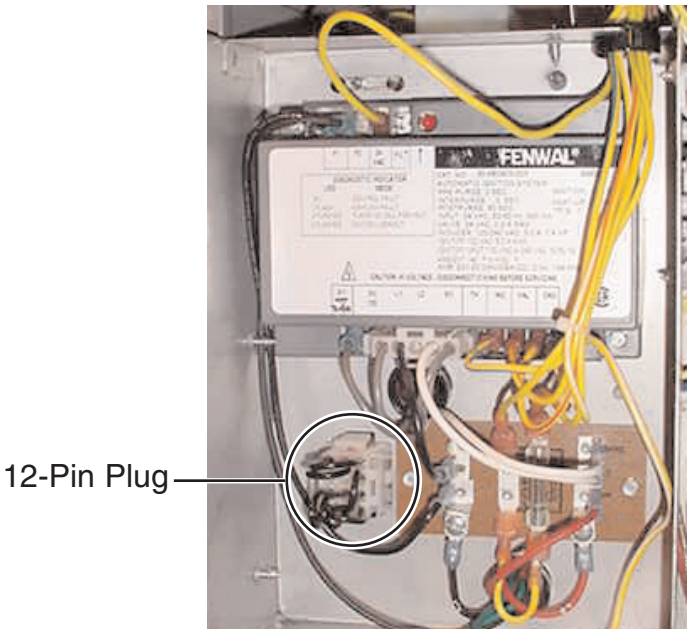
NOTICE:

See the inside of the front cover to determine if a heater is single voltage (115VAC – built prior to 4/27/04) or dual voltage (120/240 VAC – built 4/27/04 or after.)

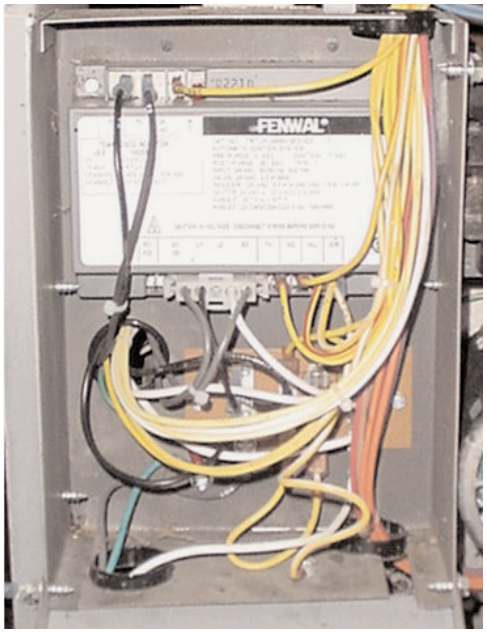
S5066 (Rev. 8/20/04)

IMPORTANT

To determine if a heater is single voltage (115VAC – manufactured before 4/27/04) or dual voltage (120/240VAC – manufactured on or after 4/27/04), shut off power to the heater, remove the heater covers and open the control box.



Dual Voltage Control Box. Note 12-Pin Plug at left rear of box. Dual voltage units (120/ 240VAC) have been manufactured since April 27, 2004.



Single Voltage Control Box. Single voltage units (120VAC only) were manufactured prior to April 27, 2004.

See Pages 4-32 and 4-33 for Wiring Connection Diagrams.
See Page 7-1 for more information.

Heater Design and Function

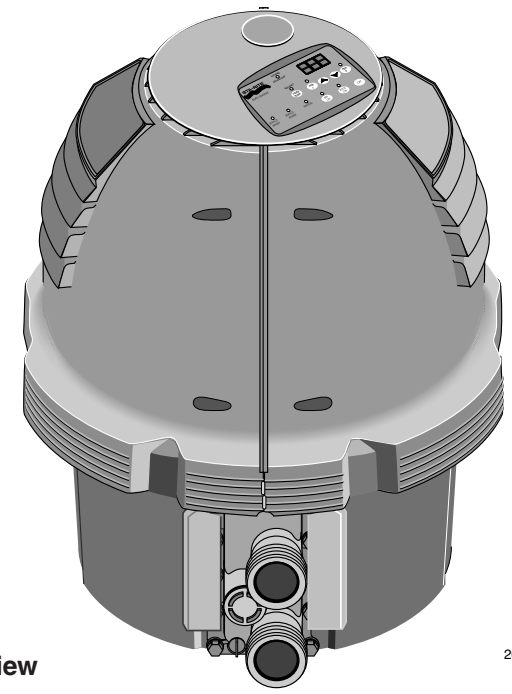


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Figure 1-1: Heater Exterior View

The Sta-Rite Pool/Spa Heater provides clean, efficient and economical water heating for fresh water pools and spas in a compact unit.

Safety Precautions:

⚠ WARNING **Hazardous fuel.** This appliance is gas fired. Models with NA or HD suffix use natural gas only. Models with LP suffix use propane (LPG) gas only. Do not try to operate heater on any fuel except the fuel for which it was designed. Improper installation, operation, or servicing can cause gas leaks, fire, and explosion.

Read and understand this training manual before attempting to install or service this Sta-Rite Pool/Spa Heater.

Use the section review questions to check your knowledge of the heater and its operation.

⚠ WARNING **Hazardous voltage.** This heater requires 120VAC or 240VAC (see inside front cover of this book) for the control electricity. Take all normal precautions for the voltage involved, including precautions needed when working with electricity around a spark-ignitible fuel.

- Installation must comply with all local building codes that apply.
- Installation must comply with National Electrical Code (NEC) (ANSI/NFPA 70) or Canadian Electrical Code (CEC, Standard CSA 22.1) requirements (as applicable), and all local electrical code requirements that apply.
- United States heater installations (including venting) must meet National Fuel Gas Code (ANSI Z223.1) requirements and any local Fuel Gas Code requirements or restrictions that apply.
- Canadian heater installations (including venting) must comply with Standards CSA-B149.1 - INSTALLATION CODES FOR GAS-BURNING APPLIANCES AND EQUIPMENT.

⚠ DANGER warns about hazards that **will** cause death, serious personal injury, or major property damage if ignored.

⚠ WARNING warns about hazards that **can** cause death, serious personal injury, or major property damage if ignored.

⚠ CAUTION warns about hazards that **will** or **can** cause minor personal injury, or property damage if ignored.

For further information or assistance, call Sta-Rite customer service at 1-800-752-0183

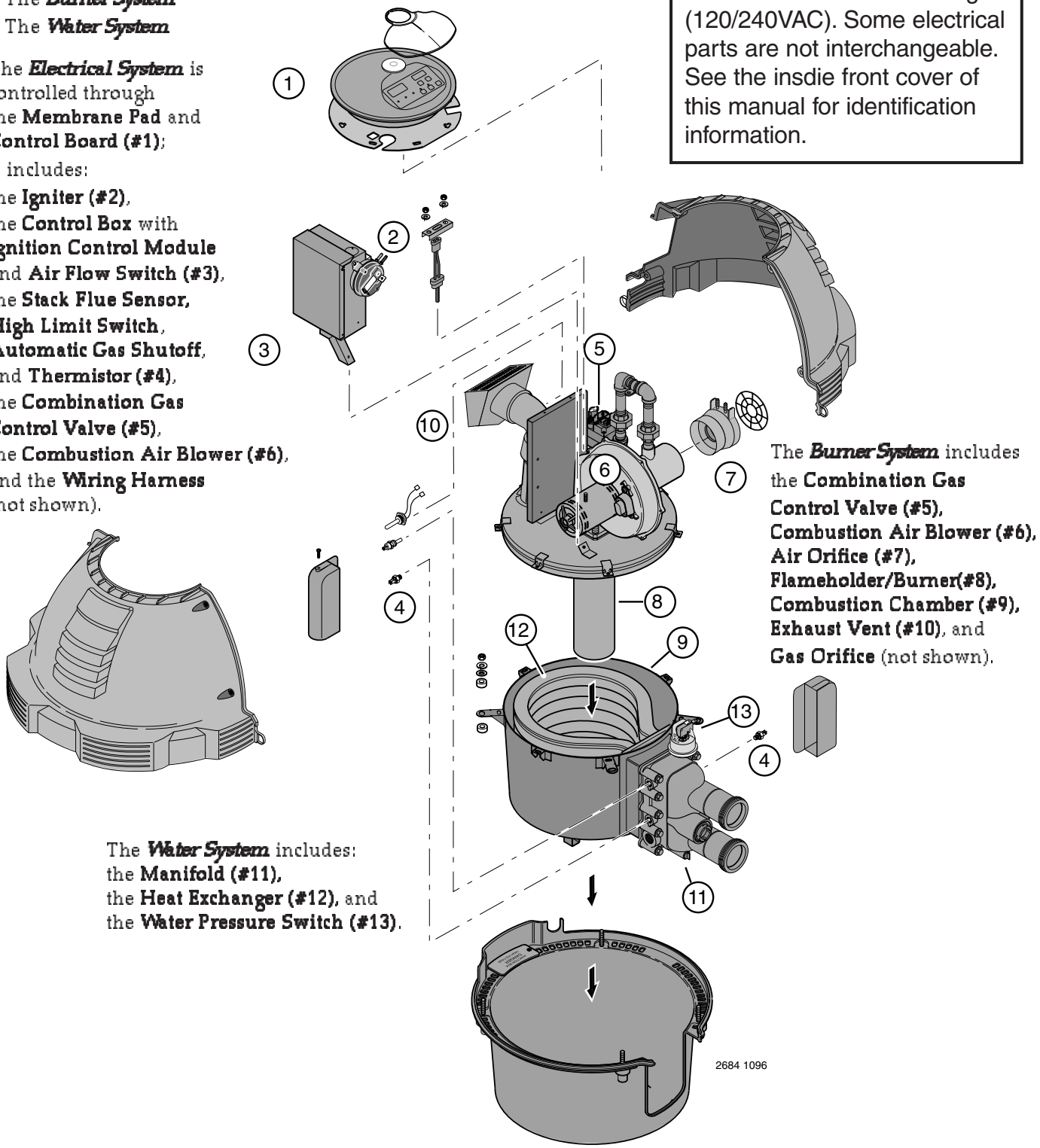
Heater Main Systems

The Heater Has Three Main Systems:

- The ***Electrical System***
- The ***Burner System***
- The ***Water System***

The ***Electrical System*** is controlled through the **Membrane Pad** and **Control Board (#1)**; It includes: the **Igniter (#2)**, the **Control Box** with **Ignition Control Module** and **Air Flow Switch (#3)**, the **Stack Flue Sensor, High Limit Switch**, **Automatic Gas Shutoff**, and **Thermistor (#4)**, the **Combination Gas Control Valve (#5)**, the **Combustion Air Blower (#6)**, and the **Wiring Harness** (not shown).

NOTE: All heaters built prior to 4/27/04 are single voltage (115VAC). Heaters built on or after 4/27/04 are dual voltage (120/240VAC). Some electrical parts are not interchangeable. See the insdie front cover of this manual for identification information.



The ***Burner System*** includes the **Combination Gas Control Valve (#5)**, **Combustion Air Blower (#6)**, **Air Orifice (#7)**, **Flameholder/Burner(#8)**, **Combustion Chamber (#9)**, **Exhaust Vent (#10)**, and **Gas Orifice** (not shown).

The ***Water System*** includes: the **Manifold (#11)**, the **Heat Exchanger (#12)**, and the **Water Pressure Switch (#13)**.

Figure 1-2: Heater Systems

Operating Control

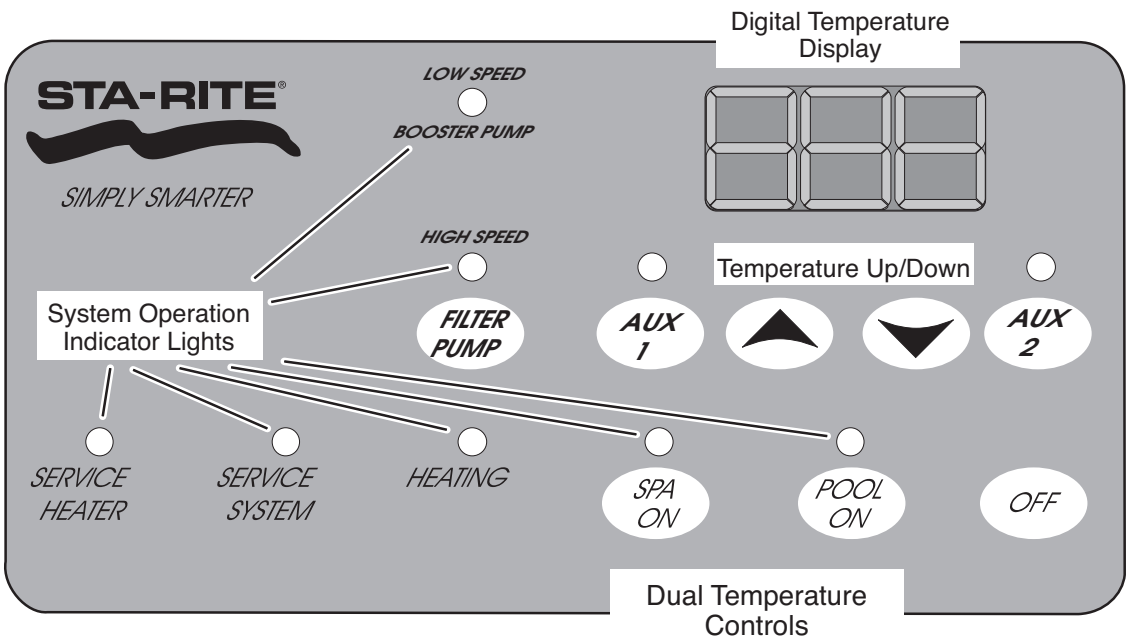


Figure 1-3: Control Board / Membrane Pad

The heater is operated through an externally mounted Operating Control Center. Pool and spa settings, a digital temperature display, and system operation indicator LEDs are located on the touch-sensitive Membrane Pad (see Figure 1-3). The indicator LEDs monitor a series of electronically controlled safety interlocks.

The function of each Operating Control is listed below. Each indicator light function is listed at right.

NOTE: When either the TEMP▲ or TEMP▼ touch pads are pressed, the digital display will indicate the temperature setting. After five seconds the display returns to the actual current pool or spa temperature (depending on "Pool On" or "Spa On" setting).

To toggle the display between degrees Centigrade (°C) and degrees Farenheit (°F): press the OFF button; then press TEMP▲ or TEMP▼ for 5 seconds. The display will flash once and change modes (°C to °F or vice versa).

OPERATING CONTROL	*ACTION*: RESULT
POOL ON	*Press*: Pool water temperature setting now drives the heater control system.
SPA ON	*Press*: Spa water temperature setting now drives the heater control system.
OFF	*Press*: Switches off the heater
TEMP▲	*Press*: Raises the pool or spa temperature setting.
TEMP▼	*Press*: Lowers the pool or spa temperature setting.

INDICATOR LIGHT	Light ON indicates
POOL ON	Heater is on. The *pool water* temperature is controlling heater operation.
SPA ON	Heater is on. The *spa water* temperature is controlling heater operation.
HEATING (Steady)	The thermostat is calling for heat; burner is firing.
HEATING (Blinking)	The thermostat is calling for heat; burner is NOT firing.
SERVICE SYSTEM	There is insufficient water flow to the heater.
SERVICE HEATER	There is a fault in the heater, its controls, or the gas supply.

Safety Precautions:

⚠WARNING **Fire hazard.** Do not attempt to operate the heater or override any safety controls when the "service heater" light is on. Doing so can damage the heater and may cause fire or explosion.

See "Troubleshooting", Page 7-1, for more detailed information.

Electrical Flow Through the Heater

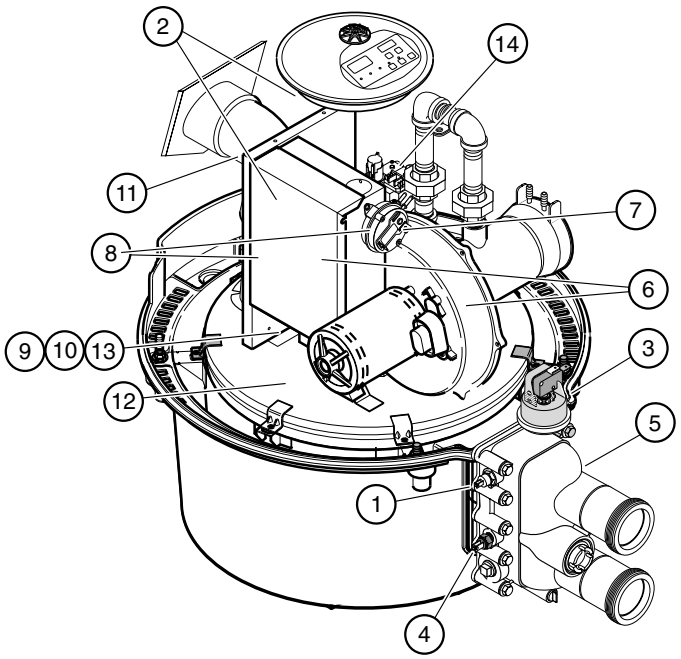


Figure 1-4: Electrical Flow

1. The **Thermistor** senses the inlet water temperature.
2. If the temperature sensed is lower than that set on the **Operating Control**, power is supplied to the **Ignition Control Module** through a series of safety interlocks (see below).
3. The **Water Pressure Switch** senses whether or not there is adequate water flow through the heater.
4. The **High Limit Switch** monitors the outlet water temperature and will open if a malfunction causes the outlet temperature to exceed 135˚ F (57° C).
5. The **Automatic Gas Shutoff Switch (AGS)** monitors the outlet temperature from the Heat Exchanger and will open if a malfunction causes the water outlet temperature to exceed 140˚ F (60° C).
6. If the High Limit Switch and the Water Pressure Switch are OK, the **Ignition Control Module** starts the **Combustion Air Blower**.
7. When the Blower comes up to speed the **Air Flow Switch (AFS)** senses air flow across the Air Metering Orifice.
8. If the airflow is sufficient, the AFS closes, completes the ignition circuit, and supplies power to the **Ignition Control Module**.
9. In 20 seconds the **Hot Surface Igniter (HSI)** element heats to ignition temperature. The **Combination Gas Control Valve** then opens and the burner flame ignites.
10. The HSI element automatically switches from ignition mode to a flame sensing mode to monitor the flame.
11. The **Stack Flue Sensor** monitors the flue collar temperature and will shut down the heater if the temperature exceeds 500° F (260° C).
12. The Burner in the **Combustion Chamber** fires until the desired water temperature is reached. Once reached, the Burner shuts off and the Blower continues to run for about 45 seconds (known as "post purge").
13. If the burner does not ignite in seven seconds, the system shuts down and will not restart. The heater must be turned off and turned back on again at the Membrane Pad (wait about 5 seconds) before it will start.
14. If the flame is extinguished during operation, the **Combination Gas Control Valve** closes and the ignition cycle reactivates.
15. If any safety interlocks open during Burner operation, the Burner immediately shuts off, but the Blower continues to run for about 45 seconds.

Safety Precautions:

⚠WARNING Risk of electric shock, fire or explosion. Do not attempt to override any electrical safety interlocks which have opened. Find and fix the fault before operating the heater.

Gas and Air Flow Through the Heater

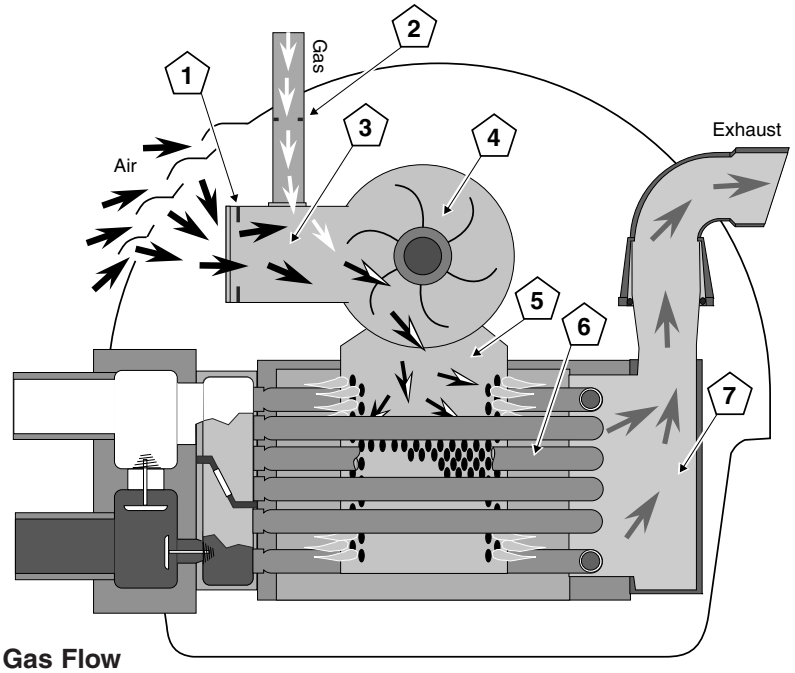


Figure 1-5: Air and Gas Flow

1. The Blower draws ambient air into the Burner System by negative pressure through the **Air Orifice**.
2. The Blower at the same time is drawing Natural or Propane Gas into the Burner System by negative pressure through the **Gas Orifice**.
3. The air and gas are thoroughly mixed in the **Mixing Tube**.
4. The **Blower** then forces the air/gas mixture into the **Flame Holder** in the **Combustion Chamber** under a slight positive pressure.
5. The mixture is ignited in the **Combustion Chamber**, around the circumference of the **Flameholder**. Combustion continues until the pre-set water temperature is reached.
6. The **Heat Exchanger** tubes surrounding the Burner/Flameholder extract heat from the hot flue gases and heat the water flowing through the tubes.
7. The cooled exhaust is collected in a sealed **Exhaust Plenum**, then is discharged out the **Vent Body**.

Safety Precautions:

⚠WARNING Risk of fire or explosion.
If Combination Gas Control Valve does not open or if fuel does not ignite properly, DO NOT attempt to override safety interlocks to force combustion. **Find and fix fault before operating heater.**

Water Flow Through the Heater

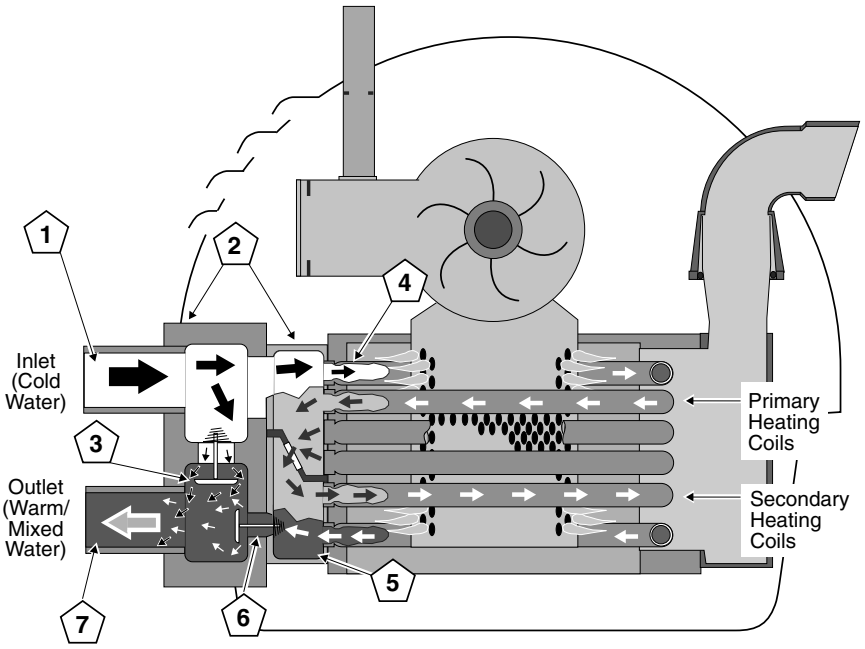


Figure 1-6: Water Flow

1. The pool or spa circulating pump supplies water to the heater through the **Inlet**.
2. Water passes to and from the heater through 2" PVC piping to the **Manifold** and the **Manifold Adapter**.
3. A **Spring-loaded Automatic Bypass Valve** in the Manifold bypasses water in excess of that required by the Heat Exchanger.
4. The **Manifold Adapter** distributes water to the individual tubes of the **Heat Exchanger**.
5. Water is heated in the coils of the Heat Exchanger and returned to the Manifold Adapter.
6. The **Thermal Regulator** controls the flow of water out of the Heat Exchanger to maintain a water outlet temperature above 120° F (49° C).
7. The water flows from the **Outlet** to the pool or spa.

Safety Precautions:

⚠ CAUTION **Risk of heater damage and flooding.**
Do not attempt to operate heater unless water flow through heater is within prescribed limits. See Table 1, "Maximum and Minimum Flow Rates in GPM" below.

Heater installed above pool/spa water level should have no flow restricting or shutoff valves in system. Heaters installed below pool/spa water level should have isolation valves to allow servicing.

Table 1

Maximum and Minimum Flow Rate in GPM (LPM)		
Model	**Minimum Flow**	**Maximum Flow**
200	20 (76 LPM)	120 (454 LPM)
333	33 (114 LPM)	120 (454 LPM)
400	40 (151 LPM)	120 (454 LPM)

Section Review

In this section you learned the basic components and operation of the Sta-Rite Pool/Spa Heater. Use this Section Preview to review the main points covered in Section One.

Name the three main systems of the heater.

1. _____
2. _____
3. _____

What is the function of the Membrane Pad?

_____

_____

Respond to the following statements:

This heater has a pilot light that must be lit by hand.

Yes_____ No_____

The Service System light indicates a fault in the heater or its controls.

Yes_____ No_____

If any safety locks open during operation, the Burner and Blower immediately shut off.

Yes_____ No_____

The Thermal Regulator controls the flow of water out of the heat exchanger.

Yes_____ No_____

The Service Heater light indicates a fault in the heater or its controls.

Yes_____ No_____

All Sta-Rite heaters operate on 230VAC.

Yes_____ No_____

Heater Installation

General Requirements for Installation

Intended Use

This heater is designed for use in heating fresh-water swimming pools or spas. Do not use this heater as a heating boiler or water heater, or for heating saltwater pools.

Code Accordance

Installation in the U.S. must be in accordance with all local codes, or, in the absence of local codes, with the latest edition of the National Fuel Gas Code, ANSI Z223.1, and the National Electrical Code, ANSI/NFPA 70.

Installation in Canada must be in accordance with all local codes, and with Standards CSA-B149.1 - INSTALLATION CODES FOR GAS-BURNING APPLIANCES AND EQUIPMENT.

Heater Location

Do not install the heater within five feet of the inside surface of a pool or spa unless the heater is separated from the pool or spa by a solid fence, wall or other permanent barrier.

Orient the heater for convenient access to gas, electrical and water connections.

Venting Requirements

The heater is supplied with an integral venting system for outdoor installation. In the U.S., vent conversion kits are available for indoor installations. Do not use a draft hood with this heater. See Pages 2-3 through 2-11 for venting information.

Gas Connections

Heater Models SR200NA, SRC200NA, SR333NA, SRC333NA, SR400NA, SR400HD, and SRC400NA, leave the factory equipped to use natural gas. Heater Models SR200LP, SRC200LP, SR333LP, SRC333LP, SR400LP, and SRC400LP leave the factory equipped to use liquid propane (LP) gas. In the field, refer to the nameplate on the heater for the type of gas the heater is equipped to use.

See Pages 4-17 and 4-18 of this Training Manual for general instructions on replacing the orifice. Use only factory authorized replacement parts for fuel conversions. See Repair Parts, Page 5-3, for information on Gas Orifice Kits. Follow instructions included with Conversion Kits when converting the heater from natural gas to Propane or vice versa.

Safety Precautions:

⚠WARNING **Explosion hazard. Improper installation, service or maintenance can cause an explosion or fire resulting in death, serious injury or property damage.**

Warranty is void if heater has been improperly installed, serviced, or maintained.

⚠WARNING **Explosion hazard with Propane gas heaters. Propane gas is heavier than air and will settle to the ground or floor. Do not install a heater using Propane gas in pits or other locations where gas might collect.** Follow the requirements for heater location as specified by the Standard for Storage and Handling of Liquifed Petroleum Gases, ANSI/NFPA 58 (latest edition) so that the heater is installed a safe distance from Propane gas storage and filling equipment.

Typical Installation

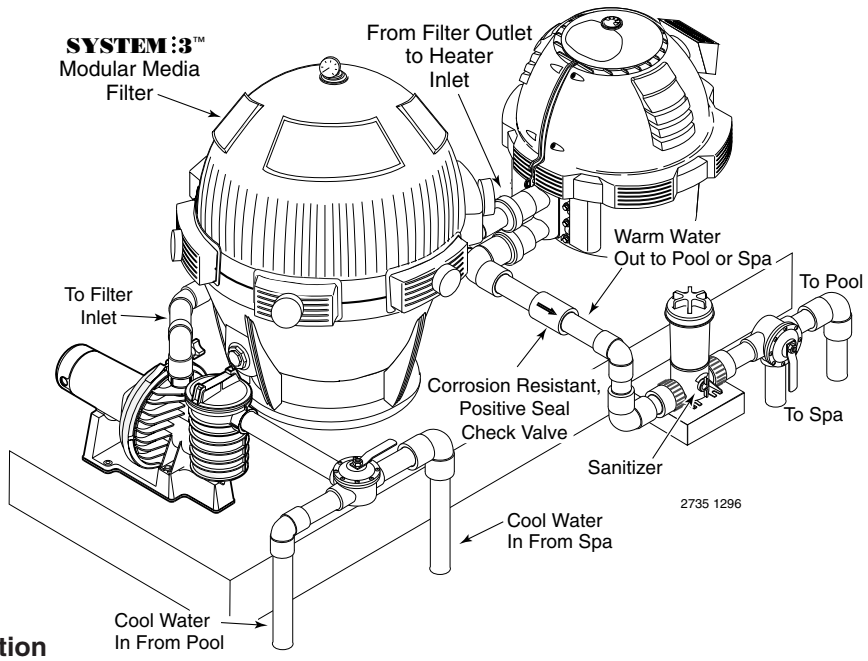


Figure 2-1: Typical Installation

The heater can be used to heat either pools or spas. A typical installation is shown above.

NOTE that the heater is downstream from the filter.

Also, the Chemical Feeder (Sanitizer) should be installed as far downstream from the heater as possible.

Keep the number of elbows and fittings in the plumbing to a minimum.

Install a chemical resistant, positive stop check valve between the heater and the chemical feeder.

Pool/Spa Sizing

The Sta-Rite heater is available in three input ratings:

Model	Rating
• SR/SRC200NA, SR/SRC200LP	200,000 BTUs/Hr
• SR/SRC333NA, SR/SRC333LP	333,000 BTUs/Hr
• SR/SRC400NA, SR/SRC400LP	400,000 BTUs/Hr
• SR400HD	400,000 BTUs/Hr

Use the tables below to determine the correct model size for a particular pool or spa.

Table 2-A: Maximum Pool Size in Sq. Ft. for a Given Model Heater and a Given Temperature Rise/24 Hr.

Temp. Diff. °F (C°)	MODEL NUMBER		
	SR200NA SR200LP	SR333NA SR333LP	SR400NA SR400LP SR400HD
15 (8.3)	400	700	900
20 (11.1)	350	550	700
25 (13.9)	250	450	550
30 (16.7)	200	350	450
35 (19.4)	200	300	400

Recommended models for pools.

Table 2-B: Minutes For 30° F (11.4° C) Temperature Rise

Spa Size Gal.(L)	MODEL NUMBER		
	SR200NA SR200LP	SR333NA SR333LP	SR400NA SR400LP SR400HD
200 (757)	18	11	9
300 (1,136)	27	16	13
400 (1,514)	35	21	18
500 (1,893)	44	27	22
600 (2,271)	53	32	27
700 (2,650)	62	37	31
800 (3,028)	71	43	35
900 (3,407)	80	48	40
1,000 (3,785)	89	53	44

Recommended models for spas.

Installation Procedures

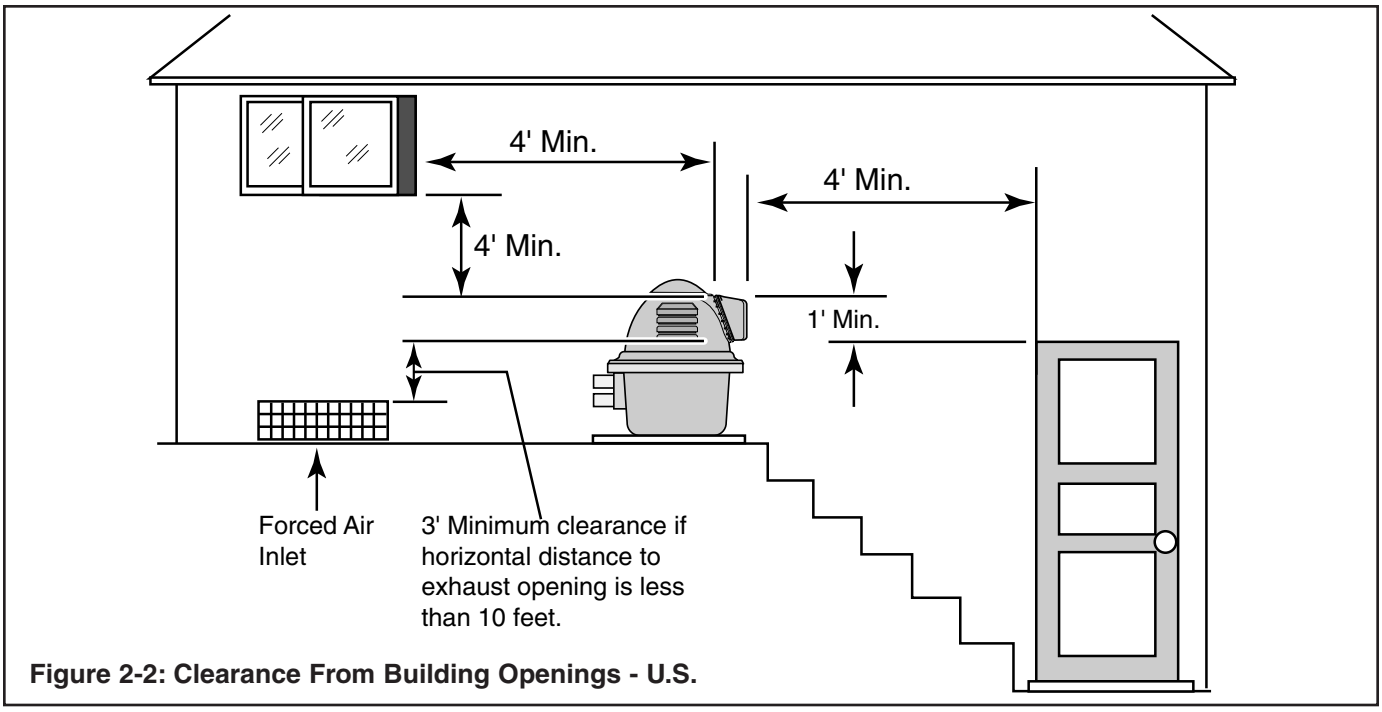


Figure 2-2: Clearance From Building Openings - U.S.

Heater Placement and Clearances

The heater must be at least five feet from the pool or spa unless there is a solid barrier between the heater and the pool or spa. In Canada, the heater must be at least 18″ from any property line.

Outdoor Installation

For heaters located outdoors, using the built-in stackless venting system.

Heater Clearances

There are two reasons for the clearances given here. They are:

1. Adequate clearance from combustibles to avoid a fire hazard.
2. Adequate air circulation around the heater to avoid overheating.

Adequate working room for ease of maintenace will depend on the installation.

Locate the heater on a level surface in an open, unroofed area that is protected from drainage or runoff. Install the heater in an area where leaves or other debris will not collect on or around the heater. Do not install the heater where water (including rain, sprinklers, or runoff) will fall directly onto the heater jacket.

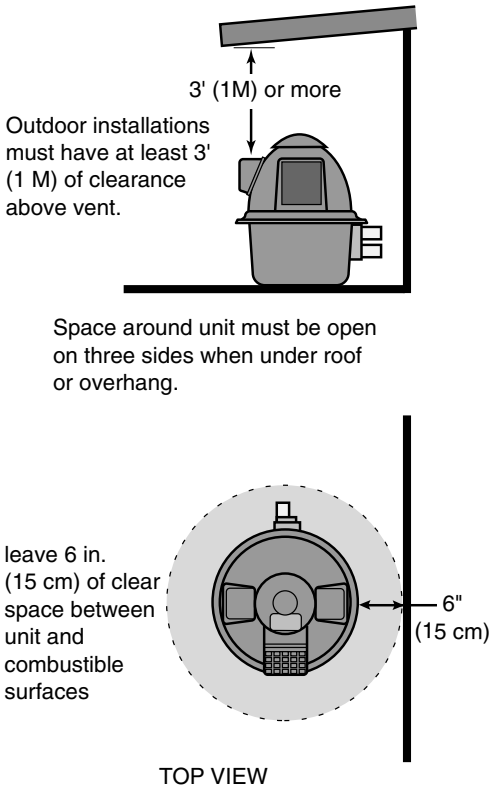


Figure 2-3: Combustion Clearances

Safety Precautions:

⚠WARNING **Fire hazard.** The minimum clearance to combustible surfaces is 6 inches.

Heater Placement, Clearances, and Venting

Outdoor Installation

If the heater is located under a roof or deck overhang, there must be at least three feet (3') clear space (U.S.) or four feet (4') clear space (Canada) between the bottom of the overhang and the top of the heater exhaust vent, and the space around the heater must be open on three sides.

U.S.: The vent terminal opening must be located further than four (4) feet below, four (4) feet horizontally, and one (1) foot above any door, window, or gravity inlet to a building. The vent terminal opening must be further than three (3) feet above any forced air inlet located within ten (10) feet horizontally. The exhaust from the heater may cause discoloration of painted surfaces in close proximity (see Figure 2-2).

Canada: The heater must not be installed with the top of the vent assembly within ten (10') feet below, or to either side of, any opening into a building.

The heater is certified for installation on combustible flooring.

The following clearances must be maintained from combustible surfaces:

U.S.:

TOP	OPEN
ALL SIDES	6 INCHES

OR:

TOP	3 FEET
1 SIDE	6 INCHES
OTHER 3 SIDES	OPEN

Canada:

TOP	4 FEET (1.2 M)
ALL SIDES	6 INCHES (15 cm)

If the heater is under a roof or deck overhang, the space around the heater must be open on three sides.

Orient the heater for convenient access to the water connections and to the gas and electrical connections (below the vent terminal).

The exhaust discharges vertically from the vent. Make sure that the control panel is not over the exhaust (see next paragraph).

The heater control panel assembly on top of the jacket can be turned to any of six positions for convenient access to the Operating Control panel as follows:

1. Unbolt and separate the jacket halves.
2. Pull the hairpin clips (see Figure 2-4).
3. Depress plastic clips on the control panel assembly and lift panel off of support plate. (see Figure 2-4).
4. Turn the control panel to the desired position and snap it in place.
5. Make sure that the operating controls can be adjusted without having to lean over the exhaust vent. If necessary, reorient heater to separate operating controls and exhaust.
6. Replace the hairpin clips.
7. Replace jacket halves and bolts and tighten.

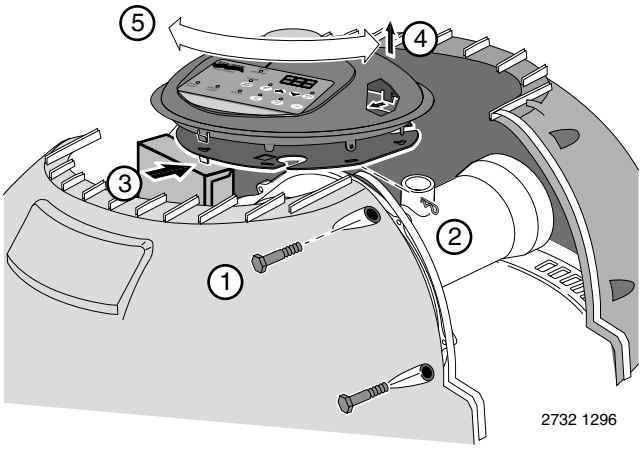


Figure 2-4: Indexing Control Panel

Safety Precautions:

⚠WARNING Risk of explosion if a Propane gas unit is installed in a pit or other low spot. Propane gas is heavier than air. Do not install the heater using Propane gas in pits or other locations where gas might collect. Consult your local building code officials to determine installation requirements of heater relative to Propane gas storage tanks and filling equipment. Installation must meet National Fuel Gas Code requirements. Consult local codes and fire protection authorities about specific installation restrictions.

⚠WARNING Risk of fire and explosion if installed at floor level in an automotive garage or near gasoline or flammable liquid storage. In a utility room or residential garage, install the heater with the base at least 18" above the floor so that the bottom of the combustion chamber and igniter will be at least 20" off the floor.

⚠WARNING Risk of asphyxiation if exhaust is not correctly vented. Follow venting instructions exactly when installing heater. Do not use a draft hood with this heater.

⚠WARNING Risk of carbon monoxide poisoning. DO NOT operate heater if vent faults are detected. Correct any vent faults before operating heater.

Heater Placement, Clearances, and Venting

Indoor (U.S.) and Outdoor Shelter (Canada) Installation Instructions

The heater is design certified by CSA for installation on combustible flooring; in alcoves; in basements; in closets or utility rooms (in the U.S.).

In Canada, this pool heater can only be installed outdoors or in an enclosure ("outdoor shelter") that is not normally occupied and does not directly communicate with occupied areas.

For installation on carpeting, the heater must be mounted on a metal or wood panel that extends at least three inches (10 cm) beyond the base of the heater. If the heater is installed in a closet or alcove, the entire floor must be covered by the panel.

⚠WARNING Explosion hazard with Propane gas heaters. Propane gas is heavier than air and will settle to the ground or floor. Do not install a heater using Propane gas in pits or other locations where gas might collect. Follow the requirements for heater location as specified by the Standard for Storage and Handling of Liquifed Petroleum Gases, ANSI/NFPA 58 (latest edition) so that the heater is installed a safe distance from Propane gas storage and filling equipment.

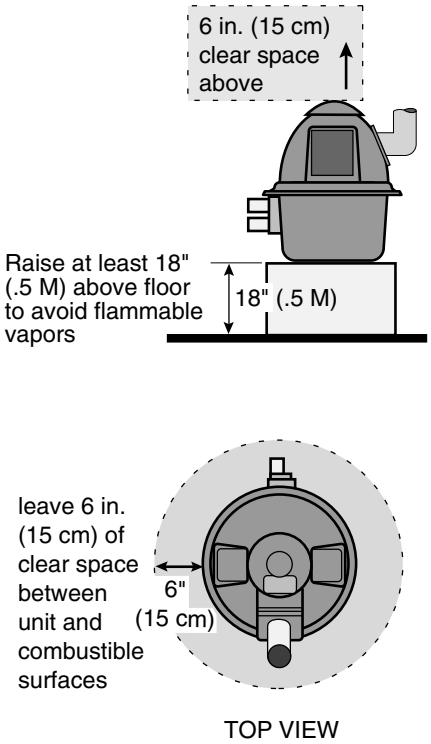


Figure 2-5: Minimum Indoor Clearances

Installation in a Garage or Utility Room

⚠WARNING Risk of fire and explosion if installed at floor level in an automotive garage or near gasoline or flammable liquid storage. Gasoline fumes are heavier than air and will settle to floor level in closed spaces. Gasoline fumes and spilled gasoline or other volatile liquids (such as some paints and varnishes) will travel across the floor and can be ignited by a gas appliance. In a utility room or residential garage installation, install the heater with the base at least 18 inches above the floor, so that the burner and ignition device will be at least 20 inches above the floor (see Figure 2-5). In a garage, install a rail or wall to protect the heater from physical damage by a moving vehicle.

Heater Clearances
Indoor (U.S.) or Outdoor Shelter (Canada)

The following clearances must be maintained from combustible surfaces:

TOP	6 INCHES
ALL SIDES	6 INCHES
VENT	6 INCHES

Venting Indoor and Outdoor Shelter Installations

⚠WARNING Risk of asphyxiation if exhaust is not correctly vented. Follow venting instructions exactly when installing heater. Do not use a draft hood with this heater, as the exhaust is under pressure from the burner blower and a draft hood will allow exhaust fumes to blow into the room housing the heater. Exhaust venting to the outdoors is required for all indoor and outdoor shelter ("enclosed") installations.

DO NOT common vent this heater with another appliance.

DO NOT substitute or modify parts in the venting system.

Enclosed installation requires venting to the outside. On an enclosed installation, the exhaust discharges from the Vent Body into a vent pipe. Locate the heater so the vent run is as short and straight as possible. Orient the heater so that the vent pipe does not interfere with adjustment of the operating controls. The operating control panel located on top of the jacket can be rotated for easy access.

Safety Precautions:

⚠WARNING Risk of carbon monoxide poisoning. DO NOT operate heater if vent faults are detected. Correct any vent faults before operating heater.

Heater Venting

Venting Indoor and Outdoor Shelter Installations – Continued

The heater requires sufficient air for combustion and ventilation. Choose a location that will avoid contamination by chemical fumes.

NOTE: Combustion air contaminated by corrosive chemical fumes can damage the heater and will void the warranty.

Table 2-C: Corrosive Vapors and Possible Sources

Area	Likely Contaminants
Chlorinated swimming pools and spas	Pool or spa cleaning chemicals. Acids, such as hydrochloric or muriatic acid
New construction and remodeling areas	Glues and cements, construction adhesives, paints, varnishes, and paint and varnish strippers. Waxes and cleaners containing calcium or sodium chloride
Beauty parlors	Permanent wave solutions, bleaches, aerosol cans containing chlorocarbons or fluorocarbons
Refrigeration plants or various industrial finishing and processing plants	Refrigerants, acids, glues and cements, construction adhesives
Dry cleaning and laundry areas	Bleaches, detergents, or laundry soaps containing chlorine. Waxes and cleaners containing chlorine, calcium or sodium chloride

Combustion and Ventilation Air Supply

For indoor installation, the heater requires air supply openings for ventilation and combustion. The minimum requirements are for two (2) openings: one 12 inches from the ceiling for ventilation air and one 12 inches from the floor for combustion air, in accordance with the latest edition of the National Fuel Gas Code, ANSI Z223.1., and any local codes that may apply.

The minimum net free area in square inches shall be as follows:

Table 2-D: Combustion and Ventilation Air Requirements

Model	All Air From Inside Building		All Air From Outside Building	
	Combustion	Vent	Combustion	Vent
200	200 in² 1,291 cm²	200 in² 1,291 cm²	50 in² 323 cm²	50 in² 323 cm²
333	333 in² 2,149 cm²	333 in² 2,149 cm²	84 in² 542 cm²	84 in² 542 cm²
400	400 in² 2,581 cm²	400 in² 2,581 cm²	100 in² 645 cm²	100 in² 645 cm²

Indoor Vent Installation

Always vent the heater to the outdoors.

- Vent it horizontally or vertically using Special Gas Vent, (see Table 2-G, Page 2-10), or
- Vent it vertically using Type "B" double wall vent connector pipe.

Locate the heater so as to minimize the length of horizontal vent pipe and the number of vent elbows required. Horizontal vent runs must slope up 1/4" per foot from the heater to allow exhaust condensate to drain and must have a condensate drain as described in the venting installation instructions.

Outdoor Vent Cover Removal

The heater is supplied from the factory with a built-in stackless outdoor vent for outdoor installation. Remove the outdoor Vent Cover for enclosed installation. To reinstall the outdoor Vent Cover, hold it in place against the Vent Body,push together, and fasten with two screws.

Heater Venting – Negative Pressure

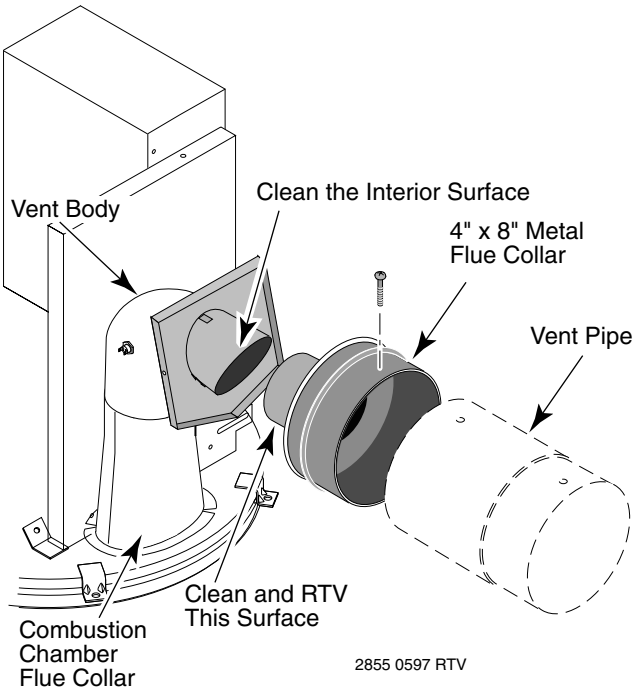


Figure 2-6: Flue collar

⚠WARNING Risk of asphyxiation. Do not use a draft hood with this heater.

To connect a negative pressure metal gas vent to the heater, order the appropriate Metal Flue Collar from thechart below:

Metal Flue Collar Kit	Sta-Rite Part No.
4x6”	77707-0076
4x8”	77707-0077

1. See Table 2-E, below, to determine allowable vent sizes for your heater.

NOTE: Table 2-E is for installations in which the total lateral vent length (that is, the horizontal distance from the Metal Flue Collar to the main vertical portion of the vent) is less than 1/2 the total vent height (the vertical distance from the flue collar to the vent termination) and which have three or less elbows in the system. For venting systems which do not meet these conditions, consult the National Fuel Gas Code, ANSI Z223.1 (U.S.) and CSA-B149.1 (Canada).

Vertical Venting - Negative Pressure (See Figure 2-7)

Vent the heater vertically in a negative pressure (positive draft) system in accordance with the National Fuel Gas Code, ANSI Z223.1, and local codes. Class “B” Double-wall vent connector is recommended; however single-wall pipe is allowed by the National Fuel Gas Code in some circumstances. Consult your local code official for detailed information.

Table 2-E: Permitted Minimum and Maximum Vent Heights By Size and Heater Model
Read “VERTICAL VENTING – NEGATIVE PRESSURE” (above) before using this table.

Type B Double Wall Vent With Type B Double Wall Connector In Feet (Meters)						
	Model 200		Model 333		Model 400	
Vent Size	Min. Height	Max. Height	Min. Height	Max. Height	Min. Height	Max. Height
6 in.	6 Ft. (1.8)	100 Ft. (30.5)	30 Ft. (9.0)	100 Ft. (30.5)	Not Rec.	Not Rec.
7 in.	6 Ft. (1.8)	100 Ft. (30.5)	10 Ft. (3.0)	100 Ft. (30.5)	15 Ft. (4.6)	100 Ft. (30.5)
8 in.	6 Ft. (1.8)	100 Ft. (30.5)	6 Ft. (1.8)	100 Ft. (30.5)	8 Ft. (2.4)	100 Ft. (30.5)
9 and 10 in.	6 Ft. (1.8)	50 Ft. (15.3)	6 Ft. (1.8)	100 Ft. (30.5)	6 Ft. (1.8)	100 Ft. (30.5)

Type B Double Wall Vent With Single Wall Connector In Feet (Meters)s						
	Model 200		Model 333		Model 400	
Vent Size	Min. Height	Max. Height	Min. Height	Max. Height	Min. Height	Max. Height
6 in.	6 Ft. (1.8)	15 Ft. (4.6)	Not Rec.	Not Rec.	Not Rec.	Not Rec.
7 in.	6 Ft. (1.8)	8 Ft. (2.4)	10 Ft. (3.0)	20 Ft. (6.0)	15 Ft. (4.6)	50 Ft. (15.3)
8 in.	Not Rec.	Not Rec.	6 Ft. (1.8)	20 Ft. (6.0)	8 Ft. (2.4)	20 Ft. (6.0)
9 in.	Not Rec.	Not Rec.	Not Rec.	Not Rec.	6 Ft. (1.8)	6 Ft. (1.8)
10 in.	Not Rec.	Not Rec.	Not Rec.	Not Rec.	Not Rec.	Not Rec.

Heater Venting – Negative Pressure

2. Install the metal Flue Collar in the Vent Body of the heater (located under the outside vent cover). Fasten the metal Flue Collar to the Vent Body with two #10 sheet metal screws. Use UltraCopper® silicone RTV to seal the metal Flue Collar to the Vent Body. Follow instructions supplied with the metal Flue Collar. Before connecting the metal Flue Collar to the Vent Body, wet a clean cloth or paper towel with isopropyl alcohol (rubbing alcohol) and vigorously wipe the socket of the Vent Body. Immediately wipe the cleaned surfaces dry with a clean cloth or paper towel. Repeat for the exterior of the 4" end of the metal Flue Collar. Attach the metal Flue Collar to the Vent Body using the RTV supplied with the kit, following the instructions included with kit. **Do not** use a draft hood with this heater.
3. Attach the vent pipe to the Metal Flue Collar with sheet-metal screws.

⚠WARNING Risk of fire or asphyxiation if vent is not assembled according to manufacturer's instructions or if vent parts from different manufacturers are mixed. Vent parts from different manufacturers ARE NOT interchangeable. Mixing parts from more than one manufacturer may cause leaks or damage to vent. When assembling a vent, pick one manufacturer and be sure that all vent parts come from that manufacturer and are specified by the manufacturer for your system. Follow manufacturer's instructions and local and National Fuel Gas Code requirements carefully during assembly and installation.

4. Install vent pipe so that it can expand and contract freely as the temperature changes. Support the vent pipe according to applicable codes and the vent manufacturer's instructions. Pipe support must allow the vent pipe free movement out and back, from side to side, or up and down as necessary, without putting a strain on the heater or vent body. Slope horizontal pipe runs up from the heater at least 1/4" per foot (2 cm/meter). Install Listed condensate drains at low points where condensate might collect. Plumb condensate drains to a drain through hard piping or high-temperature tubing such as silicone rubber or EPDM rubber – do not use vinyl or other low temperature tubing. Follow drain manufacturer's installation instructions.
5. Use Listed firestops for floor and ceiling penetrations. Use Listed thimble for wall penetrations. Use a Listed roof flashing, roof jack, or roof thimble for all roof penetrations. Do not fill the space around the vent (that is, the clear air space in the thimble or firestop) with insulation. The roof opening must be located so that the vent is vertical.
6. See Table 2-F (Page 2-7) for height of vent termination above the roof (U.S.) and Figure 2-7 (Page 2-7) for U.S. venting requirements. See Figure 2-8 (Page 2-7) and Standard CSA-B149.1 for Canadian venting requirements.
7. Do not run the heater vent into a common vent with any other appliance.

⚠WARNING Fire Hazard. Do not vent the heater directly into a masonry chimney. Installation into a masonry chimney must use a chimney liner and must meet National Fuel Gas Code requirements and all local code requirements.

Heater Venting – Negative Pressure

Table 2-F: Vent Termination Height vs. Roof Pitch - U.S.

Roof Pitch	Minimum Height Above Roof*
Flat to 6/12	1 Ft.
6/12 to 7/12	1 Ft. 3 in.
>7/12 to 8/12	1 Ft. 6 in.
>8/12 to 9/12	2 Ft.
>9/12 to 10/12	2 Ft. 6 in.
>10/12 to 11/12	3 Ft. 4 in.
>11/12 to 12/12	4 Ft.
>12/12 to 14/12	5 Ft.
>14/12 to 16/12	6 Ft.
>16/12 to 18/12	7 Ft.
>18/12 to 20/12	7 Ft. 6 in.
>20/12 to 21/12	8 Ft.

* Vent must be at least eight (8) feet away from nearest vertical surface. Vents extending five (5) feet or more above the roof must be braced or guyed. Consult your local code officials for detailed information.

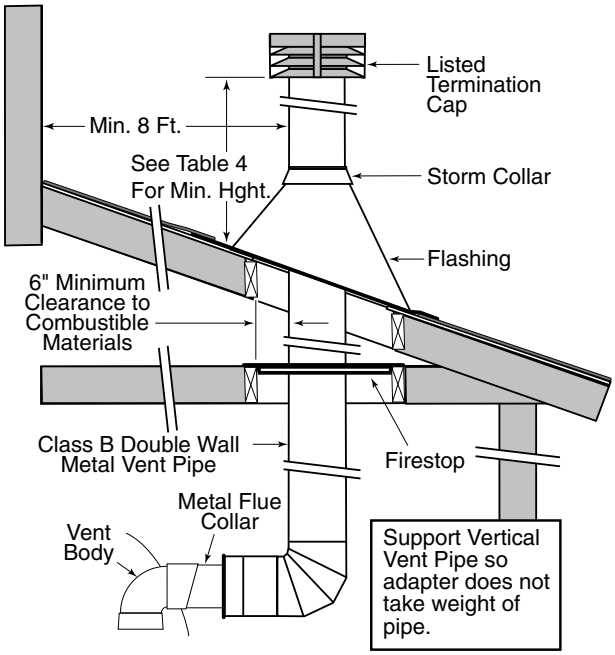


FIGURE 2-7: Typical Metal Vent Pipe Installation (Vertical – Negative Pressure) - U.S. Standards

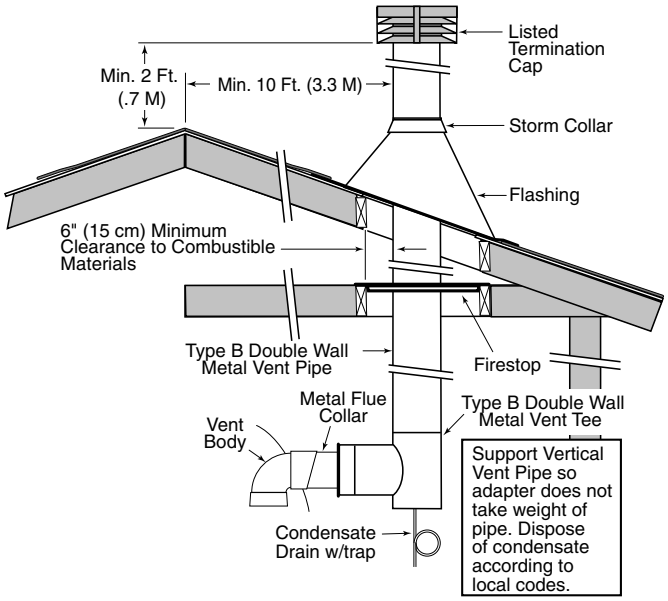


FIGURE 2-8: Typical Metal Vent Pipe Installation (Vertical – Negative Pressure) - Canadian Standards

If corrosion is a problem in your area, consider installing a condensate drain with a trap.

Heater Venting – Positive Pressure

Horizontal or Vertical Venting - Positive Pressure (See Figures 2-9, 2-10 and 2-11)

Vent the heater either horizontally or vertically using one of the 4-inch Special Gas Vent Pipes listed on Page 2-10 (Table 2-G). Install the vent pipe in accordance with local codes and the provisions of the National Fuel Gas Code, ANSI Z223.1 (U.S.) or Standard CSA-B149.1 (Canada), and the vent manufacturer's instructions. **Do not** use a draft hood with this heater. Use one of the special gas vents specified in Table 2-G (Page 2-11) for positive-pressure venting of this heater – do not use any other vent with it. Install the vent according to the vent manufacturer's detailed instructions.

Maintain clearance between the vent pipe and combustible surfaces according to the vent manufacturer's instructions and code requirements. Do not place any insulating materials around the vent or inside the required clear air space surrounding the vent. See Table 2-H (Page 2-12) for maximum permissable vent lengths. See Table 2-J (Page 2-12) for vent thimbles and terminals listed in U.S.

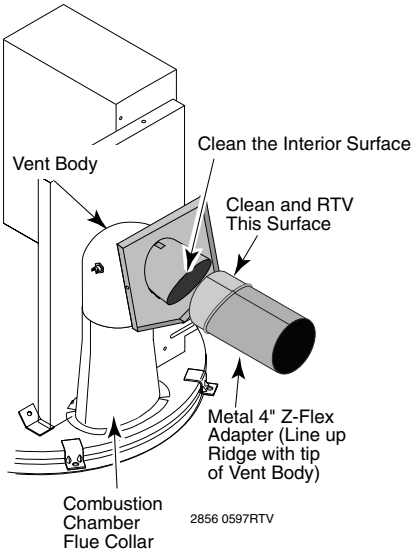


Figure 2-9: Metal Appliance Adapter for Metallic Special Gas Vent (4")

Connecting Special Gas Vent to the Heater

Metallic:

1. Order an Appliance Adapter Kit:
   Sta-Rite Part No. 77707-0086 for Saf-T Vent® or Saf-T Vent®CI.
   Sta-Rite Part No. 77707-0087 for Z-Vent.
2. Remove the outside Vent Cover.

Surface Preparation:

3. Install the Appliance Adapter in the Vent Body of the heater (located under the outside Vent Cover). Before connecting the Appliance Adapter to the Vent Body, wet a clean cloth or paper towel with isopropyl alcohol (rubbing alcohol) and vigorously wipe the socket of the Vent Body. Immediately

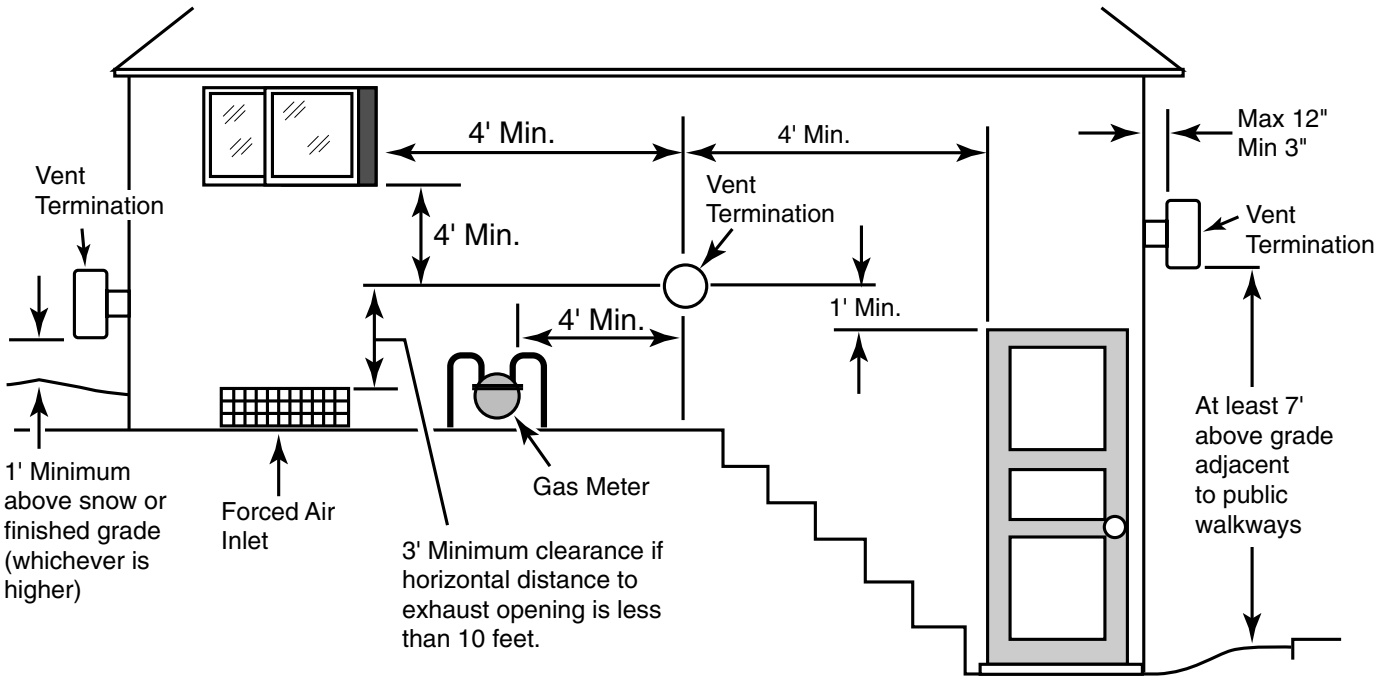


FIGURE 2-10: Minimum Clearances for Vent Termination - U.S.

Heater Venting – Positive Pressure

wipe the cleaned surfaces dry with a clean cloth or paper towel. Repeat for the exterior of the heater end of the Appliance Adapter. Attach the appliance adapter to the vent body using the adhesive specified by the vent manufacturer, following the vent manufacturer's instructions.

⚠WARNING Risk of carbon monoxide poisoning if Appliance Adapter is improperly attached. Mechanical connections (such as screws) can cause cracking and leaks in the Adapter or Vent Body. Do not drill holes or use screws to connect the Appliance Adapter to the heater Vent Body. Attach with the adhesive that is supplied with the Appliance Adapter Kit.

⚠WARNING Risk of fire or asphyxiation if vent is not assembled according to manufacturer's instructions or if vent parts from different manufacturers are mixed. Vent parts from different manufacturers ARE NOT interchangeable. Mixing parts from more than one manufacturer may cause leaks or damage to vent. When assembling a vent, pick one manufacturer and be sure that all vent parts come from that manufacturer and are specified by the manufacturer for your system. Follow manufacturer's instructions and local and National Fuel Gas Code requirements carefully during assembly and installation.

4. Install vent pipe so that it can expand and contract freely as the temperature changes. Support the vent pipe according to applicable codes and vent manufacturer's instructions. Pipe support must allow the vent pipe free movement out and back, from side to side, or up and down as necessary, without putting a strain on the heater or Vent Body. Slope horizontal pipe runs up from the heater at least 1/4" per foot. Install Listed condensate drains at low points where condensate might collect. Plumb condensate drains to a drain through hard piping or high-temperature tubing such as silicone rubber or EPDM rubber – do not use vinyl or other low temperature tubing. Follow drain manufacturer's installation instructions.
5. Use Listed firestops for floor and ceiling penetrations. Use Listed thimble for wall penetrations. Use a Listed roof flashing, roof jack, or roof thimble for all roof penetrations. Do not fill the space around the vent (that is, the clear air space in the thimble or firestop) with insulation. The roof opening must be located so that the vent is vertical.
6. Vent Termination – Vertical (See Table 2-F, Page 2-9, for height of vent termination above the roof in the U.S. See Table 2-J, Page 2-12, for Listed terminations.) Use a Listed vent terminal specified by local and national codes and your manufacturer's instructions. A roof termination must be vertical. In Canada, the Vent Cap location must have a minimum clearance of 4 feet (1.2 M) horizontally from electric meters, gas meters, regulators, and relief openings.
7. United States Vent Termination – Horizontal (See Table 2-J). Use a listed wall thimble and vent terminal from Table 2-J.

In the U.S. the terminal must be located (see Figure 2-10, Page 2-10):

- at least 3" and at most 12" out from the wall (see Figure 2-10), following the vent manufacturer's instructions.
- at least 12" above finished grade or the normally expected snow accumulation level, whichever is higher.

Table 2-G: Recommended Special Gas Vents (Positive Pressure)

Brand	Manufacturer	Material Type	Sealant
Saf-T Vent® 4" Special Gas Vent (Single Wall)	Heat-Fab, Inc. 38 Hayward Street Greenfield, MA 01301 (800) 772-0739	Metal	Consult Manufacturer
Saf-T CI Vent® Special Gas Vent (Double Wall)	Heat-Fab, Inc. 38 Hayward Street Greenfield, MA 01301 (800) 772-0739	Metal	Consult Manufacturer
Z-Vent 4" Special Gas Vent (Type BH), Model SVE	Z-Flex U.S., Inc. 20 Commerce Park North Bedrford, NH 03110-6911 (800) 654-5600	Metal	G.E. RTV 106

Heater Venting – Positive Pressure

- at least 4 feet below or horizontally from, or 1 foot above, any doors or windows or gravity air inlet to a building.
- At least 3 feet above any forced air inlet located within 10 feet.
- At least 4 feet horizontally from electric meters, gas meters, regulators and relief equipment.
- At least 7 feet above grade adjacent to walkways or similar traffic areas.

Allow at least 3 feet vertical clearance over vent termination when terminating under an overhang or deck.

Avoid corners or alcoves where snow or wind could have an effect. Exhaust may affect shrubbery and some building materials. Keep shrubbery away from termination. To prevent staining or deterioration, sealing or shielding exposed surfaces may be required.

Canada: Vent Termination – Horizontal (See Table 2-J). Use a listed wall thimble and vent terminal from Table 2-J.

The terminal must be located

- at least 10 feet (3.3 M) from any opening into a building.
- at least 12" (.3 M) above finished grade or the normally expected snow accumulation level, whichever is higher
- At least 4 feet (1.2 M) horizontally from electric meters, gas meters, regulators and relief equipment
- At least 7 feet (2.1 M) above grade adjacent to walkways or similar traffic areas.

Allow at least 4 feet (1.2 M) vertical clearance over vent termination when terminating under an overhang or deck.

Avoid corners or alcoves where snow or wind could have an effect. Exhaust may affect shrubbery and some building materials. Keep shrubbery away from termination. To prevent staining or deterioration, sealing or shielding exposed surfaces may be required.

⚠WARNING Fire Hazard. Do not run the heater vent into a common vent with any other appliance. Do not run the Special Gas Vent into, through, or within any active vent such as a factory built or masonry chimney.

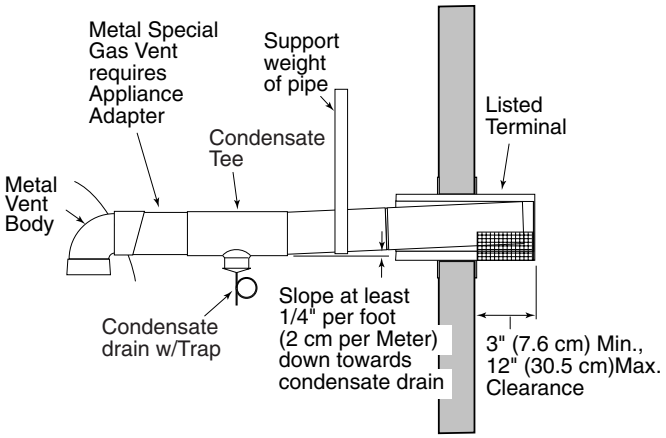


Figure 2-11: Typical Special Gas Vent Pipe Installation (Horizontal-Positive Pressure)

Table 2-H: Maximum Vent Length

4" Special Gas Vent (Vertical or Horizontal)*	
No. of 90° Elbows	**Maximum Length**
0	25 Ft. (7.6 M)
1	20 Ft. (6.1 M)
2	15 Ft. (4.6 M)
3	10 Ft. (3.0 M)

* Minimum vent length is one foot (.3 M) or in accordance with vent manufacturer's instructions and local and national codes.

Horizontal vents 3' or less in length do not require a condensate tee, but must slope down toward the outlet at 1/4" to the foot (.8cm/M) to allow condensate to drain.

Final Installation Check:

Check that horizontal vent pipe runs slope uniformly at least 1/4" per foot (2 cm/meter) to condensate drain(s). No sags, no dips, no high or low spots.

Check that vent is supported at elbows, tees, and horizontal and vertical runs according to manufacturer's instructions and code requirements.

Check that vent supports and wall and ceiling penetrations allow free movements up, down, and sideways without putting any strains on the heater or vent body.

Check for at least six inch (15 cm) free air clearance between the heater vent pipe and combustible materials.

Check that all joints are completely together and sealed.

Table 2-J: Listed Thimbles and Vent Terminals (for Special Gas Vents)

Vent Brand	Wall Thimble	Horizontal Terminal	Vertical Terminal
Saf-T Vent®	(Part of Vent term.)	5490CI Horizontal Term.	5400 Cap
Saf-T CI Vent®	(Part of Vent term.)	5490CI Horizontal Term.	5400 Cap
Z-Vent	2SVSWTF04	2SVSTTF04 Tee	2SVSRCF04 Cap

Installation Procedures

Heater Gas Connections

NOTE: See Page 4-14 through 4-18 in "Routine Maintenance and Professional Servicing" for detailed information about:

- Combustion, CO_2 levels, etc.
- Conversion from natural gas to LP gas and vice versa.
- Burner servicing.

Gas Piping (See Figure 2-12)

The heater requires a gas supply of not less than 4" wc and not more than 14" wc. Gas supply pressures outside of this range may result in improper burner operation. A minimum inlet pressure of 4" wc is required to maintain the input rating.

The gas supply must be installed in accordance with the National Fuel Gas Code, ANSI Z223.1, and all applicable local codes.

Install a manual shutoff valve and a sediment trap and union located outside the heater jacket. Do not use a restrictive gas cock. Shutoff valve must be a full ported, listed valve for gas service.

The following gas pipe sizes are recommended for gas supply piping:

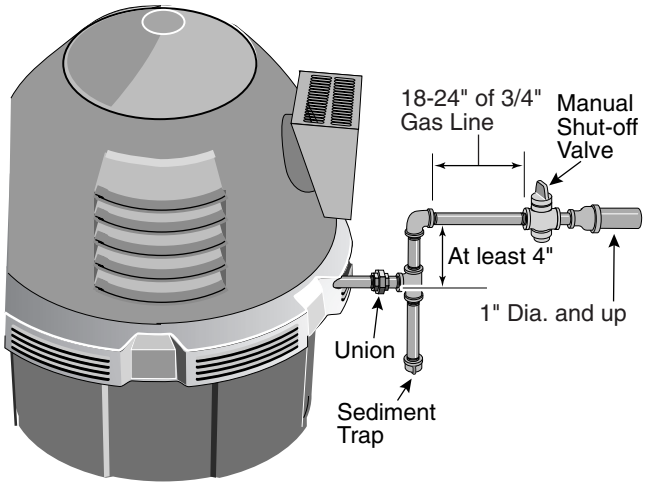


Figure 2-12: Raise gas line above Air Orifice (at least 4") centerline to reduce risk of water in the gas line in case of a heat exchanger leak.

Pressure Testing

Before operating the heater, test all gas connections for leaks with soapy water. DO NOT use an open flame to test for leaks.

Isolation for Pressure Testing

Disconnect the heater and its shutoff valve from the gas supply when pressure testing the gas supply system at test pressures *above* 1/2 psig (3.5 kPa).

Close the manual shutoff valve to isolate the heater from the gas supply line when pressure testing the gas supply system at test pressures *at or below* 1/2 psig (3.5 kPa).

NOTE: DO NOT use a corrugated flexible gas line to supply heater. It will not deliver enough gas (at nominal diameter) to supply heater.

Table 2-K: Recommended Pipe Sizes - Natural Gas

Recommended Pipe Sizes for Natural Gas @ 1,000 Btu/ft³, 0.6 Sp Gr, 0.5" wc Pressure Drop					
Model	**0-25'**	**26-50'**	**51-100'**	**101-200'**	**201-300'**
SR200	3/4"	1"	1"	1-1/4"	1-1/4"
SR333	1"	1-1/4"	1-1/4"	1-1/2"	1-1/2"
SR400	1"	1-1/4"	1-1/4"	1-1/2"	2"

Table 2-L: Recommended Pipe Sizes - Propane

Recommended Pipe Sizes for Propane					
Model	**0-25'**	**26-50'**	**51-100'**	**101-200'**	**201-300'**
200	3/4"	3/4"	1"	1"	1-1/4"
333	3/4"	1"	1"	1-1/4"	1-1/4"
400	1"	1"	1-1/4"	1-1/4"	1-1/2"

Safety Precautions:

⚠WARNING Risk of fire or explosion.

For safe installation:

1. **Do not** install a Propane heater in a pit or other low spot. Propane gas is heavier than air and may collect in low spots, causing a fire or explosion.
2. In utility rooms or garages, raise heater 18" off the floor. Heavier-than-air fumes from gasoline or other flammable liquids can travel across the floor and could be ignited by the heater if they reach the combustion chamber.
3. NEVER use a Propane heater in a natural gas installation or vice versa unless you have converted the gas orifice to the correct specification with a Sta-Rite conversion kit.
4. Do not use any orifices other than Sta-Rite replacement orifices.
5. Do not attempt to alter the heater's rating by changing the orifice.
6. If combustion is not correct at first start-up, use Sta-Rite orifice kit (not conversion kit) to correct it. See Pages 4-17 and 4-18 in "Routine Maintenance and Professional Servicing" for more information.

Heater Electrical Connections

Power Supply Requirements

Heaters built before 4/27/04 require a line voltage supply of 115-120 VAC, single-phase, 60 Hz. Heaters built on or after 4/27/04 can use either 115-120 VAC or 240 VAC. You must install the correct 12-pin plug in the control box before operating the heater (See Page 7-1 for instructions). The line voltage power supply to the heater must be enclosed in an approved flexible conduit connected directly to the junction box located inside the heater jacket.

Wiring the Junction Box (See Figure 2-13)

Line voltage field wiring should be 14 gauge, with a circuit capacity of 15 amps. Connect the hot lead of the power supply to the black wire, the neutral lead to the white wire, and the ground wire to the green wire.

1. All wiring must meet applicable code requirements.
2. Electrically ground and bond the heater in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70, or Standard CSA C22.1 - Canadian Electrical Code, Part 1. A bonding lug is provided on the outside of the jacket under the junction box for this purpose.
3. Electrical power circuits to the pool heater must follow local codes and National Electrical Code or Canadian Electrical Code (as applicable).
4. Use Type T (35°C rise) wire for all wiring between the heater and devices not attached to it.
5. Enclose all line voltage wiring in approved flexible conduit, and securely attach it to the field wiring junction box molded into the lower jacket. To reduce abrasion where the flexible conduit enters the junction box, install an insulating bushing or its equivalent on the conduit.
6. **The filter pump must run continuously when the heater is on, and for at least 15 minutes after the heater is off** (see "Fireman's Switch" below). Any switches installed in the pump circuit (including the circuit breaker) that can disconnect the pump must also disconnect the heater.
7. Do not install single pole switches, including protective devices, into a grounded line. Observe hot/neutral polarity when connecting power to the heater.

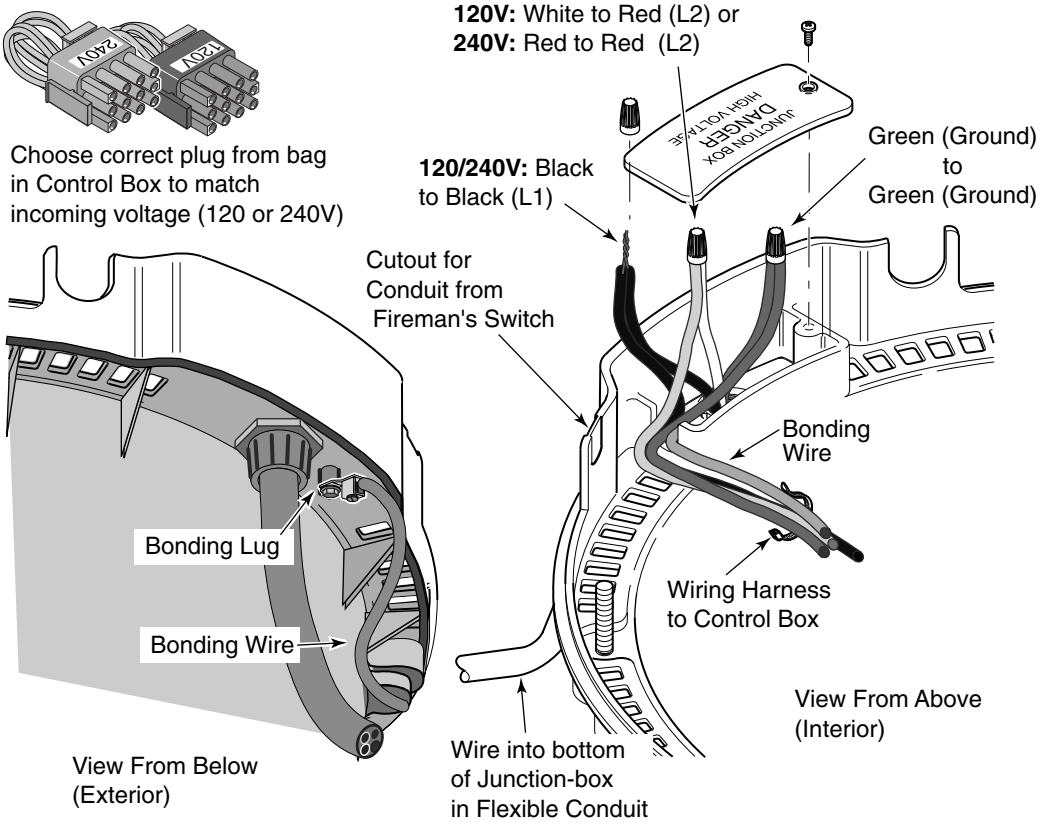


Figure 2-13: Junction Box Connections. New dual voltage heaters will have a tag on the junction box identifying them as dual-voltage equipment. See Page 7-1 for more information about the 12-pin plug.

Heater Electrical Connections

Fireman's Switch/Remote (See Figure 2-14)

NOTE: If, while there is line voltage connected to the heater, you touch either line voltage terminal with any 24VAC wire that is connected to the control board (including the Fireman's Switch jumper), you will immediately destroy the control board and void the warranty.

If the filter pump is controlled by a time clock, a low-voltage Fireman's Switch that switches off the heater at least 15 minutes before shutting off the pump should be installed. The Fireman's Switch completes the circuit for the low voltage safety switches; it DOES NOT get any power from the 115 volt power supply.

NOTE: When using a timer and Fireman's Switch, the heater's power supply should come from the load side of the timer.

Connect the Fireman's switch to the heater as follows:

1. Turn off power to heater at main circuit breaker panel.
2. Unbolt and separate the upper jacket halves.
3. Remove the Control Box Cover.

Safety Precautions:

⚠WARNING **Hazardous voltage.** Can shock, burn, or kill. Use all normal precautions for working with 120 or 240 VAC electrical power.

4. Remove the factory-installed jumper between the Fireman's Switch terminals. See Figure 2-14.
5. Connect the wires between the Fireman's Switch terminals on the heater and the Fireman's Switch terminals on the time clock using 18 gauge (1 mm^2) wire with a minimum 3/64" (1.2 mm) thick insulation rated for a temperature rise of at least 221° F (105° C). Route the wires through the heater's junction box (See Figure 2-14). The fuse is a 1.25 amp AGC 1-1/4" fast blow fuse, available locally.
6. Reinstall and bolt up the jacket halves.

Maximum Temperature Set Point

To set the Maximum Temperature Set Point, proceed as follows:

1. Turn heater off.
2. Unbolt and remove upper jacket halves.
3. Depress clips and remove control board assembly dome.
4. Push the Maximum Temperature Set Point button on the back of the control board (See Figure 2-15). The following sequence should happen:
   A. The unit will come on and the POOL ON light will come on.
   B. Press the appropriate TEMP▲ or TEMP▼ pad (on TOP of the panel) to set maximum pool temperature.

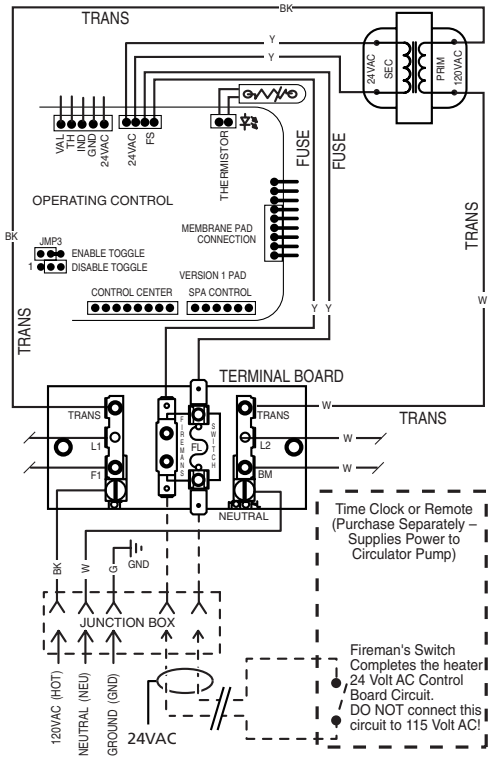


Figure 2-14A: Fireman's Switch/Remote Connections – Single Voltage Heater

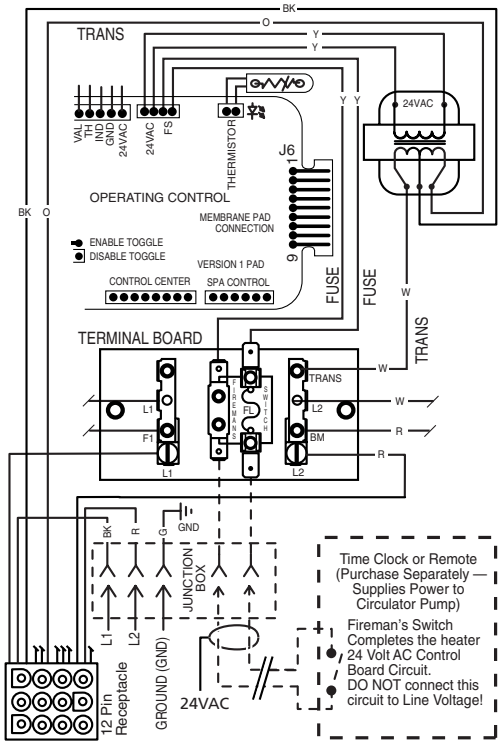


Figure 2-14B: Fireman's Switch/Remote Connections – Dual-Voltage Heater

Heater Water Connections

C. Wait 30 seconds; the POOL ON light will go off and the SPA ON light will come on.

D. Press the appropriate temperature control to set maximum spa temperature (set temperature to 104° F [40° C] or less).

E. Wait 30 seconds; the SPA ON light will go off and the unit will shut down.

5. Reinstall and bolt up the jacket halves.

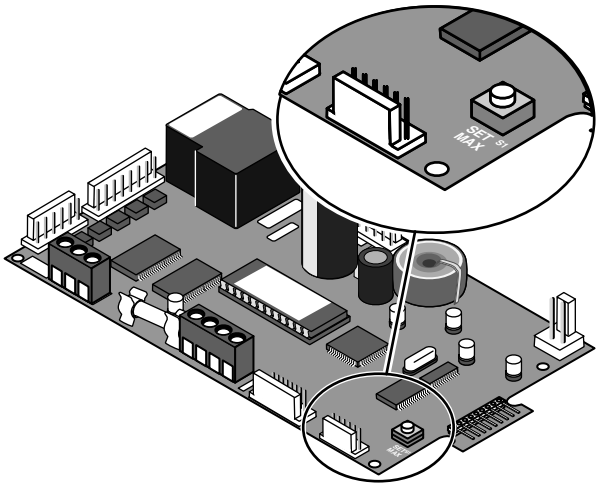


Figure 2-15: Maximum Temperature Set Point

The heater requires adequate water flow and pressure to operate.

There should be no shut-off valves or other flow restrictions in the outlet plumbing from the heater that could prevent flow through the heater. Use a diverter valve to switch flow between the pool and spa. Do not use any type of valve that can shut off flow. A shut-off valve should only be placed in the heater outlet plumbing to isolate the heater if it is below the level of the pool or spa.

A check valve should be installed if there is a possibility of back-siphoning through the heater when the pump is off.

Pressure Relief Valve (See Figure 2-16)

Heaters are not supplied with a pressure relief valve, although Canadian code and some local U.S. codes may require them. If required, install a 3/4" Pressure Relief Valve complying with the ANSI/ASME Boiler and Pressure Vessel Code. The relief pressure of the valve MUST NOT EXCEED 50 PSI.

A 3/4-inch NPT connection is provided in the manifold for installation of a pressure relief valve. The relief valve must be installed vertically, using a 3/4-inch brass nipple and elbow. Do not place a valve between the manifold and the relief valve.

To avoid water damage or scalding from operation of the relief valve, install a drain pipe in the outlet of the pressure relief valve that will direct water discharging from the valve to a safe place for disposal. Do not install any reducing couplings or valves in the drain pipe. The drain pipe must be installed so as to allow complete drainage from the valve and drain line. The relief valve should be tested at least once a year by lifting the valve lever.

⚠WARNING **Explosion hazard.** Any heater installed with restrictive devices in the piping system downstream from the heater (including check valves, isolation valves, flow nozzles, or therapeutic pool valving) must have a relief valve installed as described on this page.

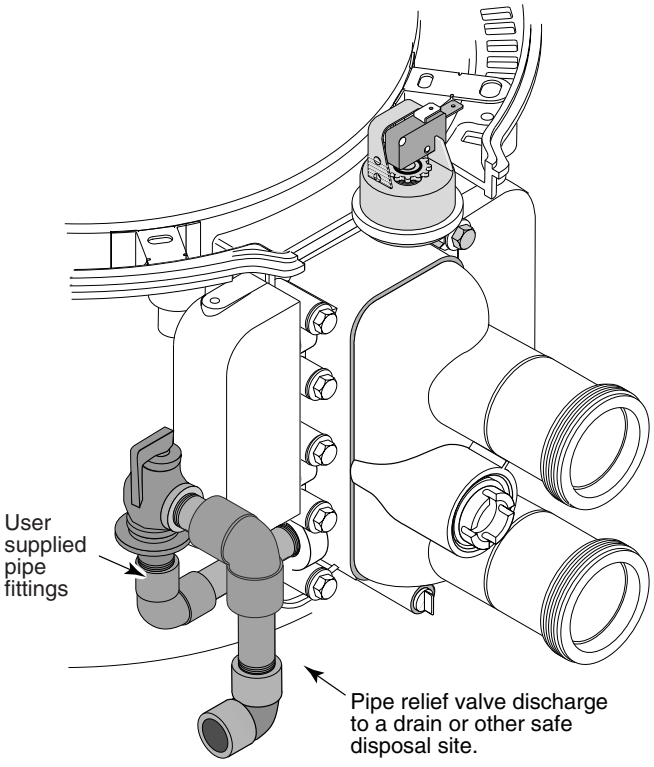


Figure 2-16: Relief Valve Installation

Heater Water Connections

Pressure Switch Settings:

The water Pressure Switch turns off the burner if the water flow is interrupted. If the water flow is restricted, the water Pressure Switch may prevent the burner from firing and cause the "Service System" light to come on. For deck-level heater installations, the Pressure Switch is factory-set at 3 psi.

If the Pressure Switch is 2 to 4 feet *below* the pool water level, turn the star-wheel on the switch clockwise (↷) to raise the pressure setting. See Figure 2-17, below.

If the Pressure Switch is 2 to 5 feet *above* the pool water level, turn the star-wheel on the switch *counter*-clockwise (↶) to lower the pressure setting. See Figure 2-17, below.

NOTE: When the Pressure Switch is more than 4 feet below the pool water level, or more than 5 feet above the pool water level, a Flow Switch is required. The Pressure Switch is no longer adequate for the installation.

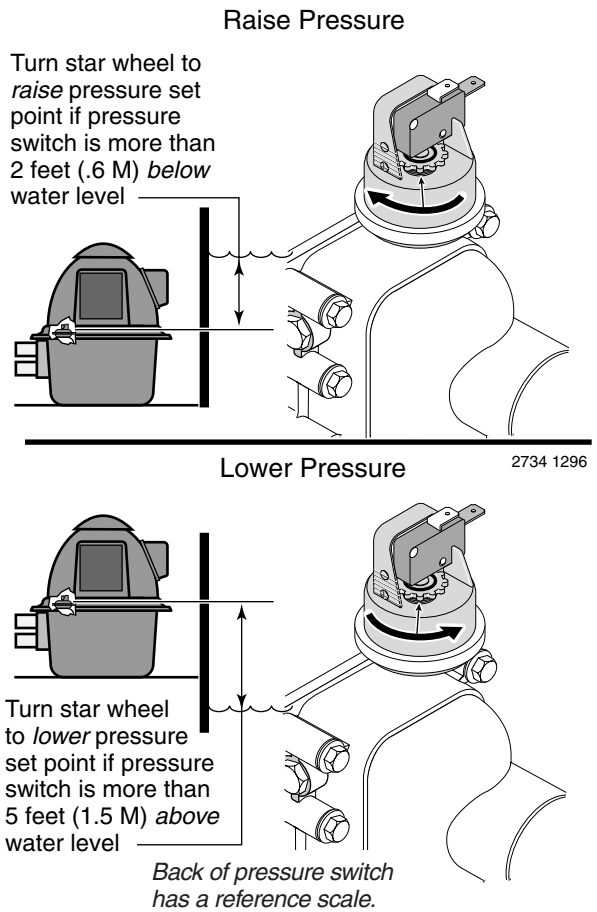


Figure 2-17: Pressure Switch Adjustment

Water Piping Specifications

The heater is designed to be connected directly to 2-inch PVC pipe, using the integral unions provided. The low thermal mass of the heater prevents overheating of the piping if the pump stops. There is no need for a heat sink.

⚠ CAUTION **Improper operation of chemical feeders can cause severe damage to the heater**, which is not covered by the warranty. Install the chemical feeder downstream of the heater. Equip the chemical feeder with an anti-syphon device to prevent chemicals from siphoning into the heater if the pump stops.

Water Flow Rate Requirements

Maximum and minimum water flow rates required by the heater are listed below:

Table 2-M: Maximum/Minimum Flow Rate

Maximum and Minimum Flow Rate in GPM (LPM)		
Model	**Minimum Flow**	**Maximum Flow**
200	20 (76 LPM)	120 (454 LPM)
333	33 (114 LPM)	120 (454 LPM)
400	40 (151 LPM)	120 (454 LPM)

Heater Water Connections

If the temperature difference is above the maximum, there is not enough water flow to the heater. Check for obstructions in the filter, skimmers, and plumbing. If the water flow is still inadequate, a larger pump is required.

Safety Precautions:

⚠ CAUTION **Live steam hazard.** If the burner and the pump are stopped at the same time, wait at least 15 minutes before starting filter pump to avoid severe damage to heater.

If the temperature difference is less than the minimum, the water flow rate to the heater is above 120 GPM, and must be reduced by installing a manual bypass valve (Figure 2-18). After installing the valve, adjust the valve to bring the temperature difference within the acceptable range, then remove the valve handle or lock it in place to prevent tampering.

High Altitude Installation

Above 2,000 feet elevation, derate the heater 4% per 1,000 feet of elevation **above sea level**. That is, at 3,000 feet elevation, derate the heater 12%; at 5,000 feet elevation, derate the heater 20%. If local authorities allow it, the Sta-Rite heater only requires to be derated 1.7% per 1,000 feet above sea level.

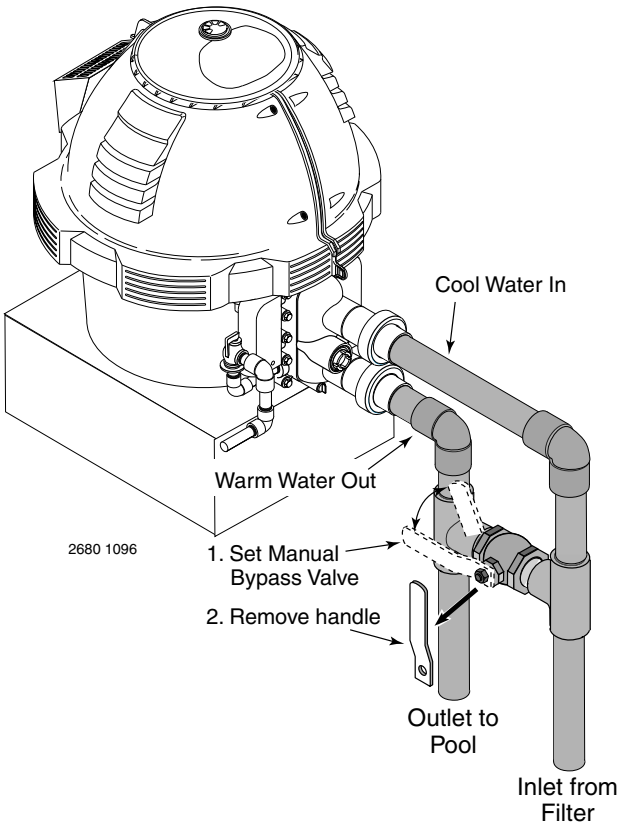


Figure 2-18: Manual Bypass Valve

Winterizing

Winterizing (See Figure 2-19)

For outdoor heaters in freezing climates, shut the heater down and drain it for winter as follows:

1. Turn off electrical supply to the heater.
2. Close main gas control valve and manual gas valve (located outside the heater).
3. Open drain plug located on the bottom of the manifold, and drain the heat exchanger and manifold adapter completely. If heater is below pool water level, be sure to close isolation valves to prevent draining the pool (isolation valves are not required and should not be used on heaters installed above pool water level). Assist the draining by blowing out the heat exchanger through the pressure switch fitting with low pressure compressed air (less than 5 PSI or 35 kPa).
4. Disconnect the compression fittings at both ends of the copper tube connecting the pressure switch to the manifold adapter and drain the tube and switch.
5. Drain the plastic inlet/outlet manifold through the outlet pipe. If the pipe does not drain naturally to the pool, install a drain cock in the outlet pipe to drain the manifold.

NOTE: Water trapped in the heater can cause freeze damage. Allowing the heater to freeze voids the warranty.

To return the heater to service after winterizing:

1. Close drain cock and fittings.
2. Before starting the heater, circulate water through the heater for several minutes until all air noises stop. See also "PRE-OPERATION CHECKLIST" (Page 3-1) and "ROUTINE MAINTENANCE AND PROFESSIONAL SERVICING" (Page 4-1).

Safety Precautions:

⚠WARNING Explosion hazard. Purging the system with compressed air can cause components to explode, with risk of severe injury or death to anyone nearby. Use only a low pressure (below 5 PSI), high volume blower when air purging the heater, pump, filter, or piping.

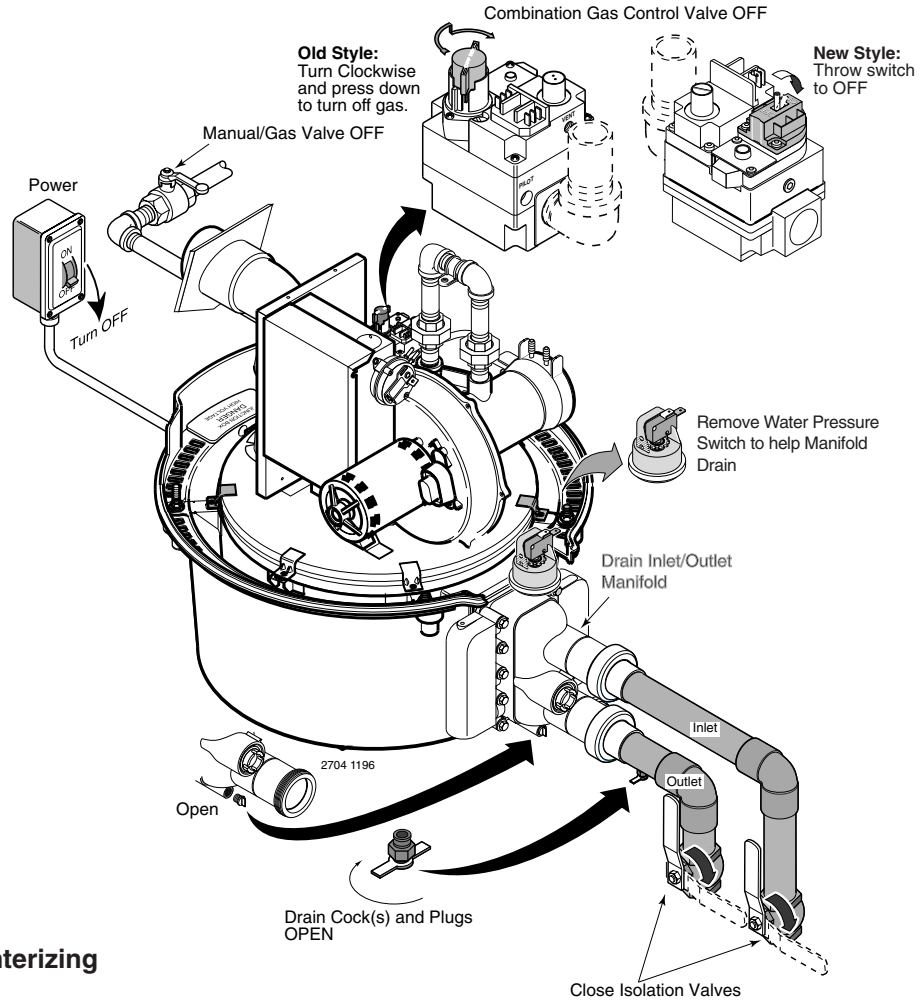


Figure 2-19: Winterizing

Post Installation Checklist / Section Review

Post Installation Checklist

___1. Is the heater correctly grounded and bonded?
___2. Is the heater rated for the correct fuel (natural or LP gas) for the installation?
___3. Is a relief valve installed (if required)?
___4. Is a manual bypass valve installed (if needed?)
___5. Is an external manual gas shutoff valve installed?
___6. Is the heater connected to the correct power supply (115VAC for single voltage heaters; 120/240VAC for dual voltage heaters)?
___7. Is the heater downstream of all other components in the system except the chemical feeder?
___8. Are isolation valves installed in the system (if pool/spa water level is higher than the heater)?
___9. Does the system circulation pump deliver at least the minimum required gallons per minute for the model heater installed?
___10. Is the area above the integral exhaust vent open (outdoor installation only)?
___11. Has the exhaust vent pipe been checked for leaks, cracks, or other faults (indoor installations only)?
___12. Has the gas line been checked for leaks?
___13. Is the heater elevated at least 18" off the floor?
___14. Is the heater physically protected from damage by a moving vehicle (garage installations)?
___15. Have combustion and ventilation air requirements been met (indoor installations only)?
___16. Does the installation meet all code requirements?

Section Review

LP gas is heavier than air.

Yes_____ No_____

The heater is supplied with an integral venting system for: (select one of the following)

____ Indoor heater installation.
____ Outdoor heater installation.
____ Both, indoor and outdoor installation.

Respond to the following statements:

A draft hood is required for indoor heater installation.

Yes_____ No_____

Before operating the heater, the heater and its gas connections must be leak tested. Use soapy water to test all gas connections.

Yes_____ No_____

A bonding lug is used to:

____ Electrically bond the heater.
____ Join pipe and fittings.
____ Install a manual shut-off valve.
____ Connect the Fireman's Switch to the heater control.

All wiring between the heater and devices not attached to it shall conform to the specifications of:

____ Type B wire (35°C rise).
____ Type T wire (35°C rise).
____ Type B wire (50°C rise).
____ Type T wire (50°C rise).

A flow switch is required when a heater is mounted more than _____ above deck level.

____ 2 feet
____ 3 feet
____ 4 feet
____ 5 feet

A flow switch is required when a heater is mounted more than _____ below deck level.

____ 2 feet
____ 3 feet
____ 4 feet
____ 5 feet

The pressure switch must be adjusted when a heater is mounted more than _____ above deck level.

____ 2 feet
____ 3 feet
____ 4 feet
____ 5 feet

Section Review

The pressure switch must be adjusted when a heater is mounted more than _____ below deck level.

____ 2 feet (.67 M)
____ 3 feet (1 M)
____ 4 feet (1.3 M)
____ 5 feet (1.67 M)

It is OK to operate the heater when the Service Heater indicator light is on.

Yes_____ No_____

When clearing gas from the line, you should wait _____. If you still smell gas, stop and turn off gas to heater.

____ 1 minute
____ 5 minutes
____ 10 minutes
____ 30 minutes

When turning off the gas supply to the heater, the _____ must be removed.

____ operating control panel
____ jacket cover
____ flue collar
____ vent cover

Respond to the following statements:

For indoor installation, locate the heater so as to minimize the length of the horizontal vent and the number of elbows required.

Yes_____ No_____

Maintain a 6 inch clearance from the top and sides of a heater installed indoors.

Yes_____ No_____

The heater is design certified by CSA for installation on combustible flooring in the U.S.

Yes_____ No_____

The recommended minimum clearance for indoor heater servicing requirements is 12 inches or 1 foot (.34 M).

Yes_____ No_____

Which of the following outdoor heater installation guidelines is incorrect?

____ Allow a 6-inch (15 cm)clearance above the heater.
____ Locate the heater on a level surface.
____ Do not install the heater under a deck or overhang.
____ Locate the heater in an area where leaves or other debris will not collect on or around it.

The heater is designed to be connected to _____ PVC pipe, using integral unions provided.

____ 1 inch (2.54 cm)
____ 1-1/2 inch (3.81 cm)
____ 2 inch (5.08 cm)
____ 2-1/2 inch (6.35 cm)

The minimum/maximum water flow rate required for the 333 Model Heater is:

____ 20/120 GPM (76/454 LPM)
____ 33/120 GPM (114/454 LPM)
____ 40/120 GPM (151/454 LPM)
____ 33/140 GPM (114/530 LPM)

A pressure relief valve is supplied with the heater.

Yes_____ No_____

If a heater's temperature rise exceeds the maximum temperature rise:

(select all that apply)

____ check for obstructions in the filter, skimmers, and plumbing.
____ there is not enough water flow to the heater.
____ replace the manual bypass valve.
____ a larger pump may be required.
____ Thermal Regulator stuck.

Important Safety Precautions

Important Safety Precautions

Follow the instructions below before operating or servicing the heater.

⚠WARNING Failure to follow these instructions can cause a fire or explosion resulting in death, personal injury or property.

- DO NOT try to light the burner by hand. This heater has an ignition device that automatically lights the burner.
- Before operating or repairing the heater, check the area around the unit for any gas odor. Be sure to check near the floor, because some gas (such as propane) is heavier than air and will settle on the floor.
- Before operating the heater, make sure that heater and surrounding area are free from combustibles, flammable liquids, and chemicals.

⚠WARNING Explosion hazard with Propane gas. Propane gas is heavier than air; check the floor area surrounding the heater as it will settle on the floor.

- Turn the gas control knob by hand only. do not try to force or use tools to turn the knob.
- DO NOT operate the heater if any part of it has been under water. If any part of the heater has been under water, check the part and replace it if necessary.

Operation Procedures

Pre-Operation Checklist

Before operating the heater, perform the following pre-operation checks:

- Check around the heater for any gas odor (see the "Important Safety Precautions" section).
- Check that the pool or spa is properly filled with water and that water flow is unobstructed.
- Check that openings for combustion and ventilation are unobstructed. Remove any debris in or around heater.
- Check that all water connections are tight.
- Make sure that heater and surrounding area are free from combustibles, flammable liquids, and chemicals.
- Run the pool/spa circulating pump for several minutes to clear all air from the system.

Cold Weather Operation

The heater may be operated in the wintertime, provided air temperatures remain above freezing and the water temperature is not permitted to drop below 65°F. Extended heater operation with water temperatures below 65°F can result in serious damage to the heater and is not covered by warranty.

NOTE: When starting the heater for the swimming season with a water temperature below 50°F, the heater may be used to heat the water; however, make sure that the heater operates continuously until the water temperature reaches the heater's minimum setting of 65°F.

During cold weather, if there is no danger of freezing, operate the filter pump continuously even if the heater is not operating. If air temperatures are expected to drop below freezing (32°F), shut down the heater and winterize it (See "WINTERIZING", Page 2-19). Allowing the heater to freeze will void the warranty.

Operation Instructions

Use the following procedures to operate the heater:

1. **STOP!** Read the "Important Safety Precautions" section before proceeding.
2. Set both pool and spa thermostats to the lowest settings.
3. Turn off all electric power to the appliance.
4. **DO NOT** try to light the burner by hand. This heater does not have a pilot. It is equipped with an ignition device that automatically lights the burner.
5. Remove the Jacket Cover by unfastening the bolts connecting the halves of the jacket.
6. Turn the Gas Control Knob clockwise to the red line, press slightly, then turn to the OFF position. On newer models, throw the ON-OFF toggle to OFF. (See Figure 3-1).
7. Wait five minutes to allow gas to clear, then continue to Step 8. (If, after five minutes, a gas odor is still detected, STOP!)

   If a gas odor is detected:
   - Do not light the heater or any other appliances in the area.
   - Do not touch any electrical switches.
   - Do not use a telephone in the immediate area.
   - Call the gas supplier from a telephone in another location.
   - If you cannot reach the gas supplier, call the fire department.

Operating Instructions

8. Turn the Gas Control Knob counterclockwise to the ON position. On newer models, throw the ON-OFF toggle to ON.
9. Replace and bolt together both halves of the Jacket Cover. The Jacket Cover must be in place when operating the heater.
10. Set 3-way valves on inlet and outlet to pool or spa, as appropriate.
11. Turn on all electric power to the heater.
12. Press either the POOL ON or SPA ON touch pads on the Membrane Pad.
13. Press the TEMP▲ or TEMP▼ touch pads to set the desired temperature.
14. The Blower will come on immediately and, after about 20 seconds, the Burner will fire. If the Burner does not fire, push the OFF switch, wait five minutes, and push either the POOL ON or SPA ON switch. Repeat if needed.
15. The Burner should fire until the pre-set pool/spa water temperature reaches the temperature set on the thermostat. The Blower will continue to run for about 45 seconds after the burner shuts off.
16. If the heater will not operate, follow the instructions in "Turning Off Gas to the Heater" below.

Turning Off Gas to the Heater

If the heater will not operate, use the following procedure to turn off the gas supply to the heater:

1. Press the OFF button on the Membrane Pad.
2. Turn off all electric power to the heater.
3. Remove Jacket Cover.

CAUTION: Heater parts may be hot after operation.

4. Turn the Gas Control Knob clockwise to the red line, press slightly, then turn the knob to the OFF position (or throw ON-OFF toggle to OFF).
5. Replace the Jacket Cover.

Note: Newer models are equipped with an ON-OFF toggle switch which replaces the Gas Control Knob.

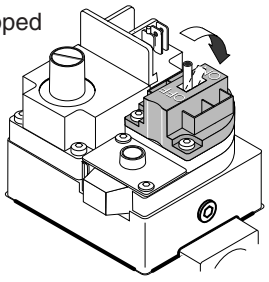


Figure 3-1:

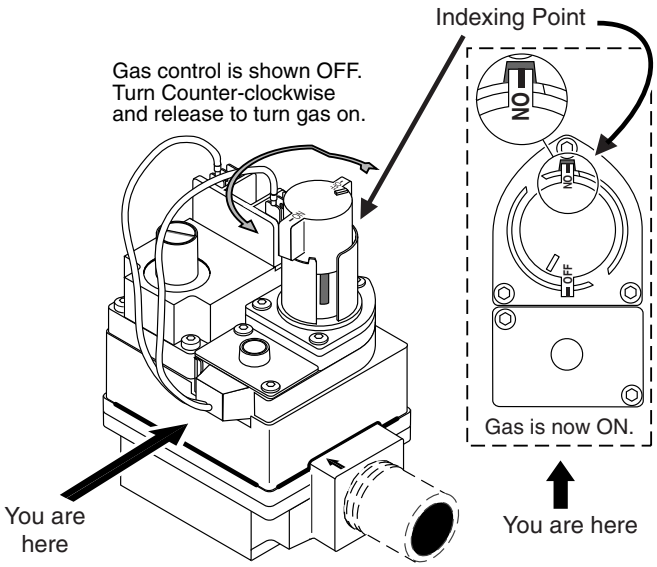


Figure 3-2: Combination Gas Valve, Turning Gas ON

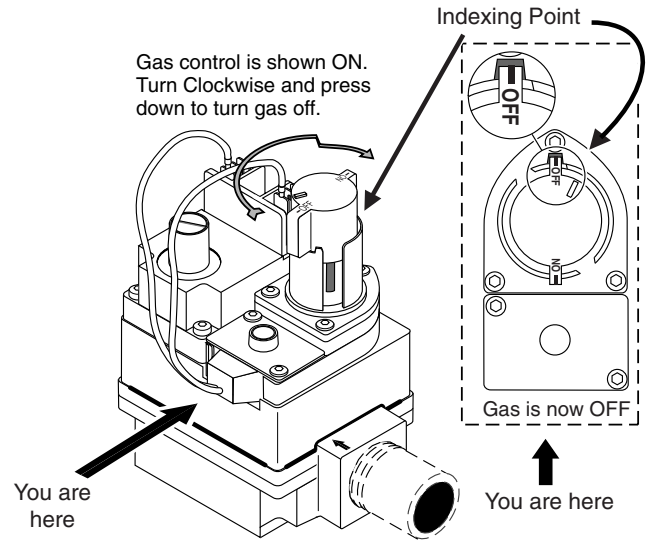


Figure 3-3: Combination Gas Valve, Turning Gas OFF

Safety Precautions:

See Page 3-1.

Routine Maintenance and Professional Servicing

Preliminary Checklist

Complete the following checklist before servicing the heater.

1. Remove debris from inside the heater and the area around it.
2. Make sure the ventilation openings on the Jacket Cover are unobstructed and that nothing is blocking the Vent Cover. On indoor heaters, make sure air intakes are open and free of obstructions.
3. Make sure the area around the Heater is free of chemicals, combustible materials, flammable vapors, and corrosive liquids.
4. Make sure all water connections are tight and that water flow is unobstructed.
5. Make sure the pool or spa is properly filled with water.
6. If the Heater has not been used for an extended time, run the Pump for several minutes to clear air from the system.

Routine Maintenance

The following maintenance should be performed every 6 months and at the start of each swimming season.:

1. Air Flow. Make sure the ventilation openings on the Jacket Cover are unobstructed and that nothing is blocking the Vent Cover. On indoor (or "outdoor shelter") heaters, make sure air intakes are open and free of obstructions.
2. Combustibles, Flammables, and Corrosives. Make sure the area around the Heater is free of chemicals, combustible materials, flammable vapors, and corrosive liquids.
3. Water Pressure Relief Valve. Test the Water Pressure Relief Valve by lifting the valve lever.
4. Water Pressure Switch. Test the Water Pressure Switch, which turns off the Heater if the water flow is interrupted.
   a. Lower the temperature setting on the Operating Control Panel to turn off the Heater.
   b. Wait 15 minutes after the Burner is off and then turn off the Pump.
   c. Raise the temperature on the Operating Control Panel to turn on the Burner.
   d. Wait 1 minute. The Burner should not come on. If the Burner or Blower does come on at this point, the Water Pressure Switch is malfunctioning. Immediately press the "Off" button on the Operating Control Panel to turn the Burner off. See TROUBLESHOOTING, Page 7-1.

NOTE: The Water Pressure Switch may prevent the Burner from coming on, if water flow to the Heater is reduced due to a clogged filter.

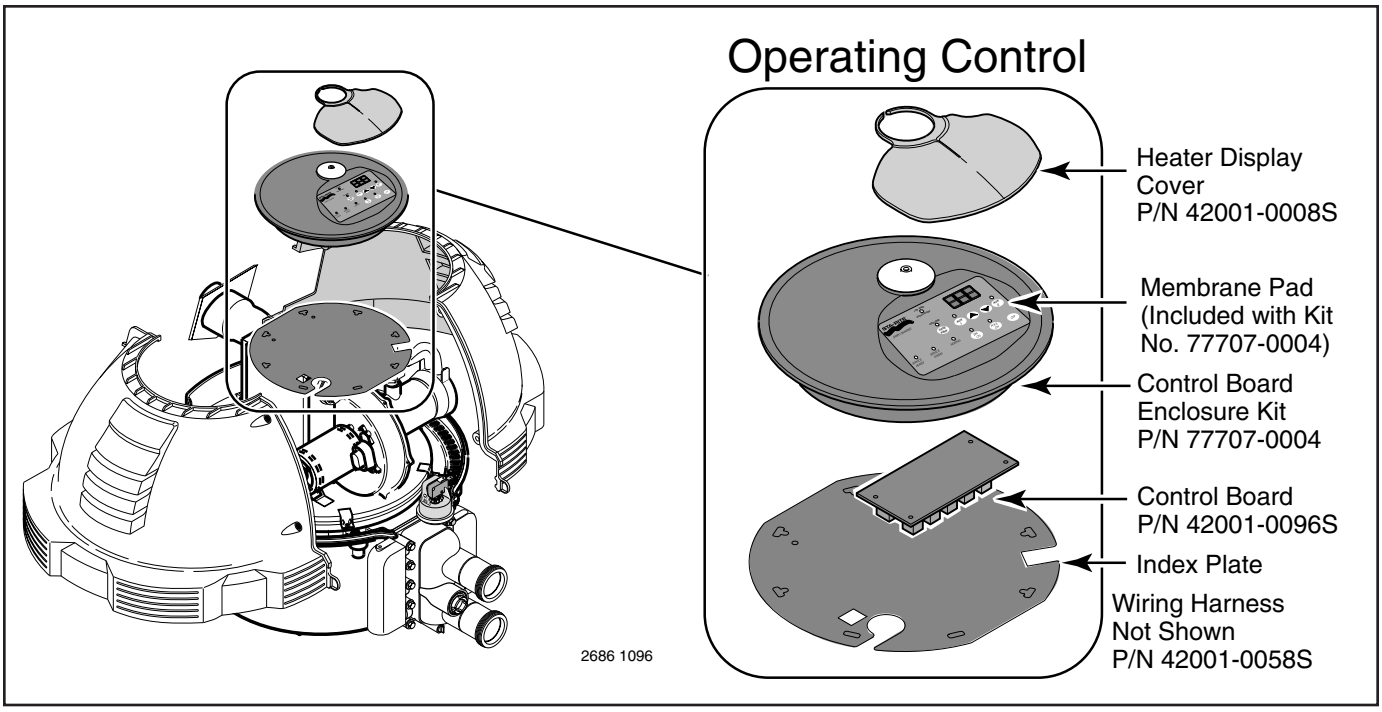
NOTE: Operating the Heater without sufficient water flow can cause severe damage to the Heater.

NOTE: If the Pump is off, make sure that the burner has been off at least 15 minutes before restarting the pump. Starting the pump too soon after shutting off the burner can severely damage the Heater from water hammer caused by cold water shocking the hot heating coils.

5. Special Gas Vent Systems. On Heaters installed indoors (or in "outdoor shelters") with Special Gas Vent systems, repeat the Final Installation Check. Make sure pipes, joints, and fittings do not have cracks, leaks, or breaks.

Safety Precautions:

Servicing the Heater Control Board - Operating Control



Location

The Operating Control assembly is located in the top portion of the heater. The Operating Control contains a Protective Cover, Membrane Pad, Control Board and Wiring Harness.

The Control Board is connected to the heater via a wiring harness. The heater may be serviced with Operating Control in place or dismounted but connected via its wiring harness.

The Operating Control can be mounted to face in any of six directions.

The Operating Control and the Jacket Cover must be in place for normal operation.

Function

The Membrane Pad contains the keypad for inputting the pool and spa temperatures, the pool/spa/off buttons, and displaying the digital temperature. Indicator lights on the Membrane Pad show the status of heating demand and of the system and safety interlocks.

The Membrane Pad is connected to the Control Board via a quick-disconnect terminal. The Control Board contains diagnostic lights to show which of the safety interlocks is open. See Page 4-29 for detailed Control Board information.

Servicing Procedure

NOTE: Do not allow any of the Circuit Board Component leads to the circuit board to touch the index plate. Do not force any plugs; they are polarized. If they are right, they will assemble easily. Be sure all plugs are connected to the correct sockets.

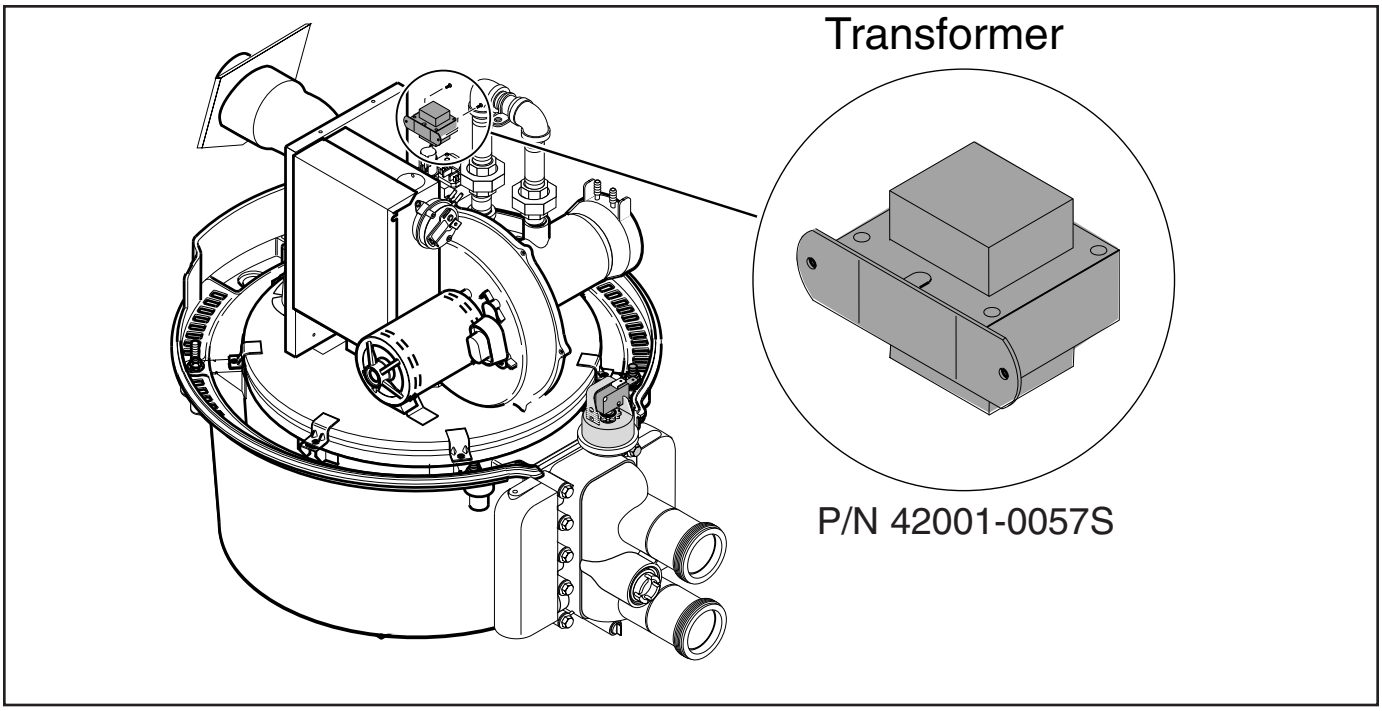
To gain access to the Control Board:

1. Turn off the filter pump and all electrical power to the heater.
2. Unbolt and remove the heater Upper Left and Upper Right Jacket Covers.
3. Remove the Protective cover.
4. The Operating Control Assembly is mounted to the top of the heater assembly on four tabs. To release the Assembly, remove the hairpin clips, gently press each of the tabs inward, and lift the Assembly.
5. Replace the Operating Control Board by disconnecting it from the wiring harness, removing the mounting screws, and replacing it with a new Board. The Board is not serviceable.
6. To complete installation, reverse Steps 1 through 4 above.

Safety Precautions:

⚠WARNING **Hazardous Voltage.** Can shock, burn, or kill. Disconnect all power to the heater before attempting to service or remove the Operating Control Assembly.

Transformer



Location

The Transformer is located on the back of the Control Box.

Function

The Transformer provides low-voltage (24VAC) power to the Heater Control Board, Ignition Module, and Gas Valve.

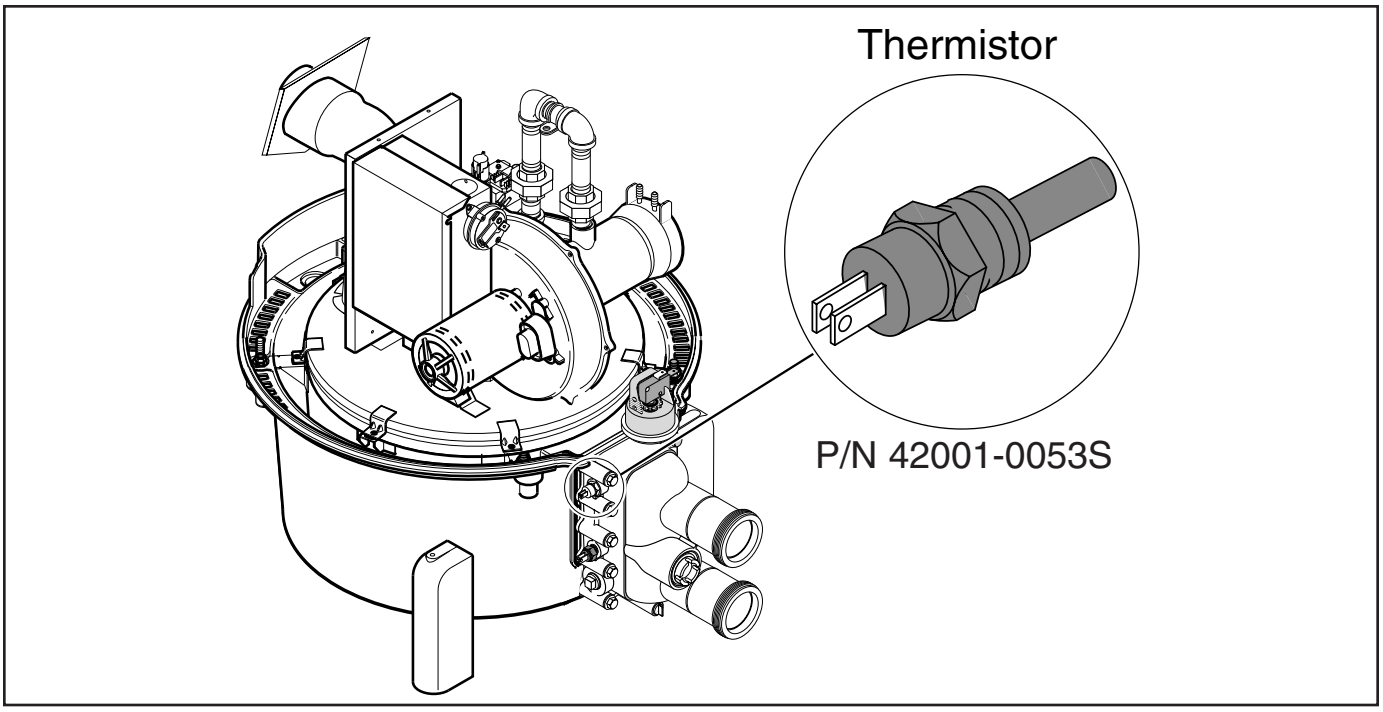
Servicing Procedure

1. Turn off all power to the heater.
2. Unbolt and remove the Upper Left and Upper Right Jackets.
3. Disconnect the electrical connection to the Transformer.
4. Remove Transformer and replace with a new one.
5. Reverse steps 1 through 4 above to complete installation.

Safety Precautions:

⚠WARNING **Hazardous Voltage.** Can shock, burn, or kill. Disconnect all power to the heater before attempting to service or remove the Operating Control Assembly.

Thermistor



Location

The Thermistor is located in the uppermost well of the Manifold under the left-hand Switch Cover.

Function

The Thermistor monitors the inlet water temperature.

Servicing Procedure

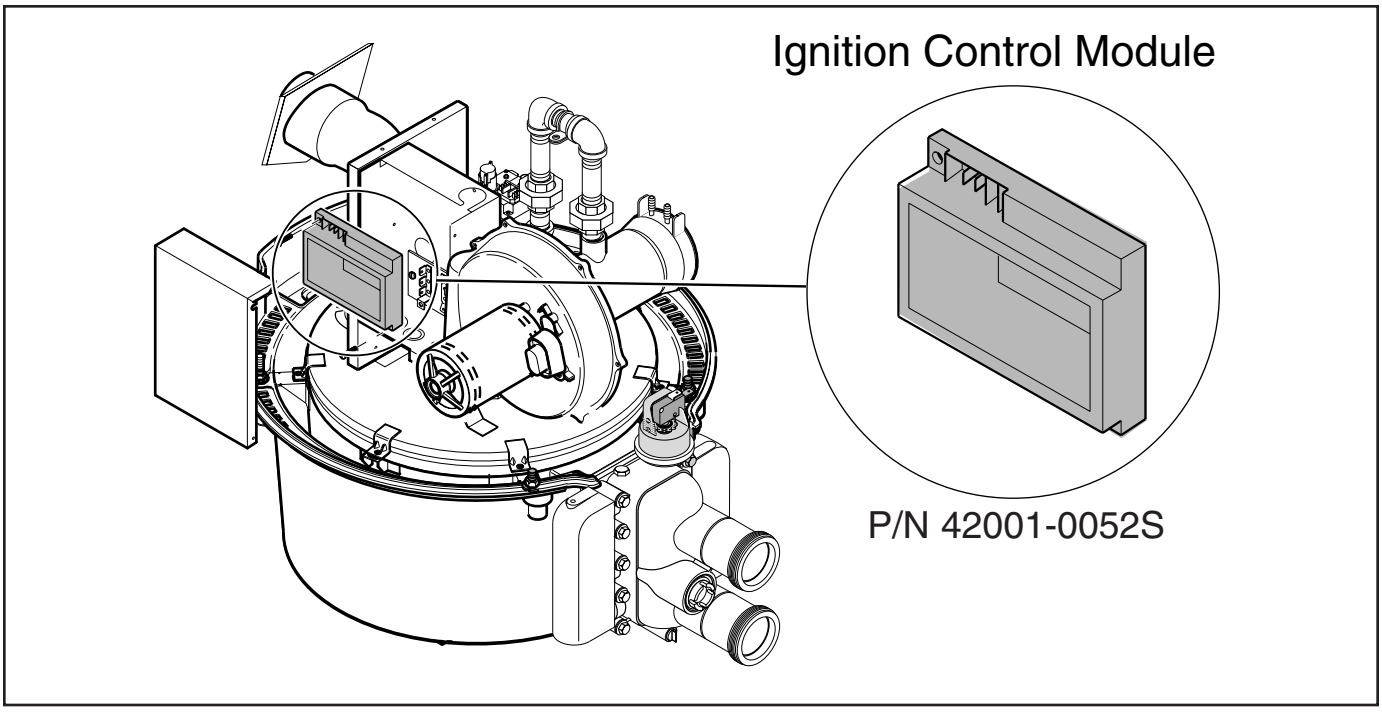
To check the Thermistor:

An open Thermistor displays E01 on the control board. A shorted Thermistor displays E02.

To replace the Thermistor:

1. Turn off the filter pump and all electrical power to the heater.
2. If the heater is below the pool water level, close isolation valves to avoid draining the pool.
3. Remove the Drain Plug under the Manifold to drain the heater.
4. Unbolt and remove upper left and upper right jackets to expose the Operating Control Assembly and the Manifold Switch Cover.
5. Remove the Operating Control Assembly (See Page 4-2).
6. Disconnect the Thermistor wires on the Control Board (Connector J5).
7. Remove the Manifold Switch Cover.
8. Unscrew the Thermistor from the Manifold.
9. To replace the Thermistor, reverse Steps 1 through 8. Be sure to teflon tape the threads when reinstalling Thermistor.

Ignition Control Module



Location

The Ignition Control Module is located in the Control Box.

Function

The Ignition Control Module receives line voltage for powering the Blower and Ignitor, and is sequenced by low voltage supplied from the Operating Control Board through the safety interlocks. It also supplies low-voltage power to the Combination Gas Valve.

Servicing Procedure

To access the Ignition Control Module:

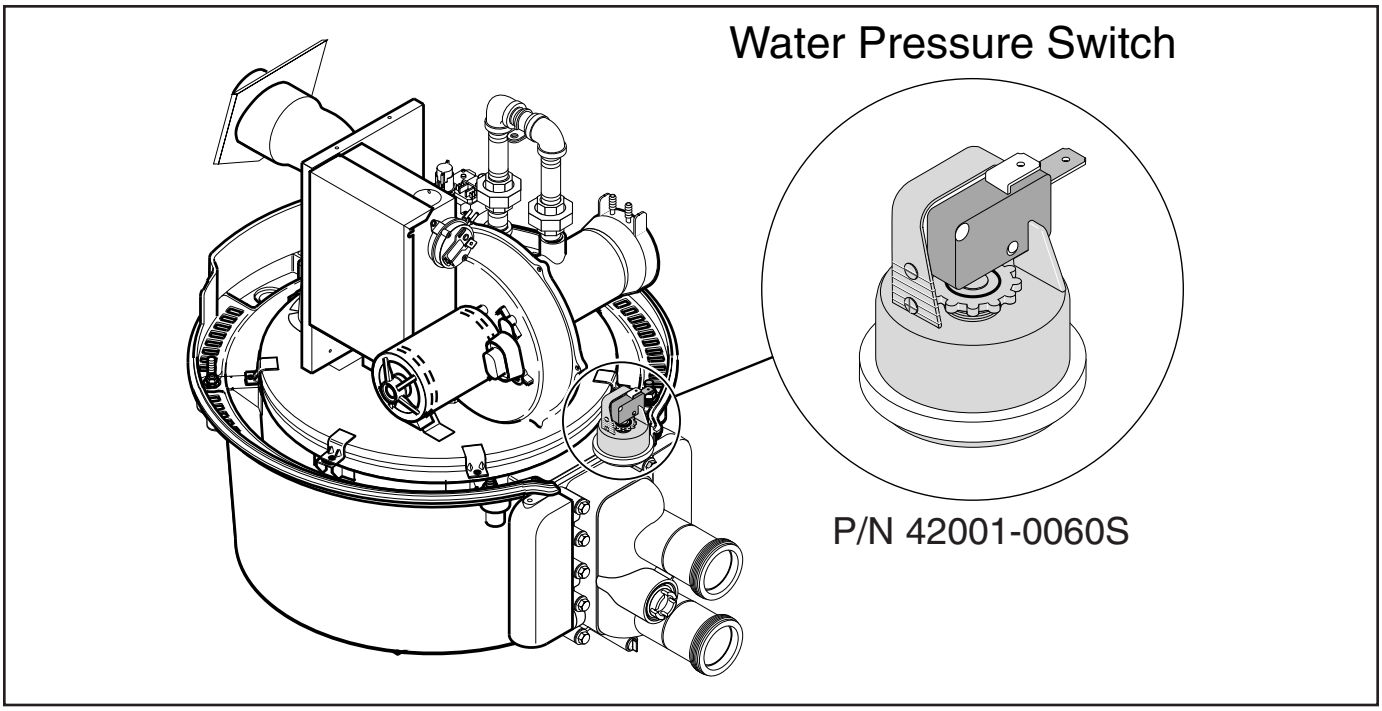
1. Turn off the pump and all electrical power to the heater.
2. Unbolt and remove Upper Left and Upper Right Jackets from the heater.
3. Open the Control Box cover by loosening the screw on the top right side of the cover.
4. Disconnect all wires to the Ignition Control Module.
5. Remove the Ignition Control Module and replace it with a new one.
6. Reconnect all wires to the Ignition Control Module according to the connection diagram, Page 4-31.
7. Replace all covers and restart heater.

Safety Precautions:

⚠WARNING **Hazardous voltage.** Both the Control Box and the Ignition Control Module contain line voltage. Disconnect the heater from the main power source when servicing or replacing these parts.

⚠WARNING **Risk of control malfunction, overheating, possible fire or explosion.** Use *only* Sta-Rite parts when replacing the Ignition Control Module.

Water Pressure Switch



Location

The Water Pressure Switch is located on top of the Manifold.

Function

The Water Pressure Switch permits the Burner to fire only when there is enough water flow through the heater to allow normal operation. It opens when water flow to the heater is insufficient.

Servicing Procedure

To replace the Water Pressure Switch:

1. Turn off the pump and all electrical power to the heater.
2. Unbolt and remove Upper Left and Upper Right Jackets from the heater.
3. If the heater is below the pool water level, close isolation valves to avoid draining the pool.
4. Remove the Drain Plug under the Manifold to drain the heater.
5. Disconnect the wires attached to the Water Pressure Switch.
6. Unscrew the Water Pressure Switch and replace it with a new one.
7. Make sure the newly installed Water Pressure Switch is properly adjusted. Refer to the Pressure Switch settings below.

Pressure Switch Settings:

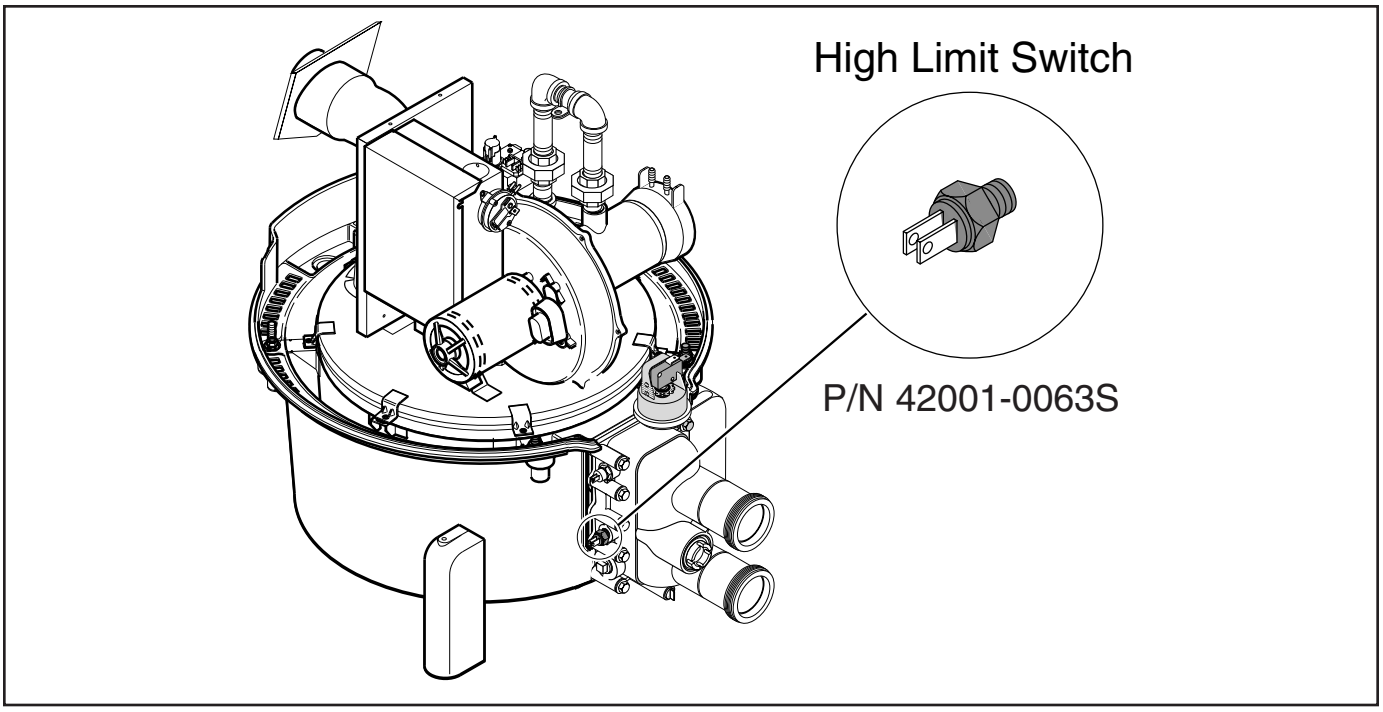
For deck-level heater installations, the Pressure Switch is factory-set at 3 psi (20.6 kPa). If the pool water level is 1-2 feet (.3-.6 M) below or 1-5 feet (.3-1.6 M) above the Pressure Switch level, reset the switch so that it is open when the pump is off and closed when the pump is running. Turn the star-wheel on the switch clockwise to raise setting (heater below the pool) and counter-clockwise to lower the setting (heater above the pool). Test the switch after resetting (see the Heater Installation section and Figure 2-17, Page 2-17).

NOTE: When the pool water level is more than 2 feet (.6 M) below or 5 feet (1.6 M) above Pressure Switch level, a Pressure Switch is no longer adequate. A Flow Switch must be installed instead. Minimum rating of Flow Switch must match minimum flow rate of heater (see Page 1-6).

Safety Precautions:

⚠WARNING **Hazardous pressure.** Do not bypass Water Pressure Switch. If heater elevation is too far above or below pool/spa water level for Pressure Switch, replace it with a Flow Switch.

High Limit Switch



Location

The High Limit Switch is located in the lowermost well of the Manifold under the left-hand Manifold Switch Cover. It is black to differentiate it from the AGS Switch, which is marked with a yellow dot.

Function

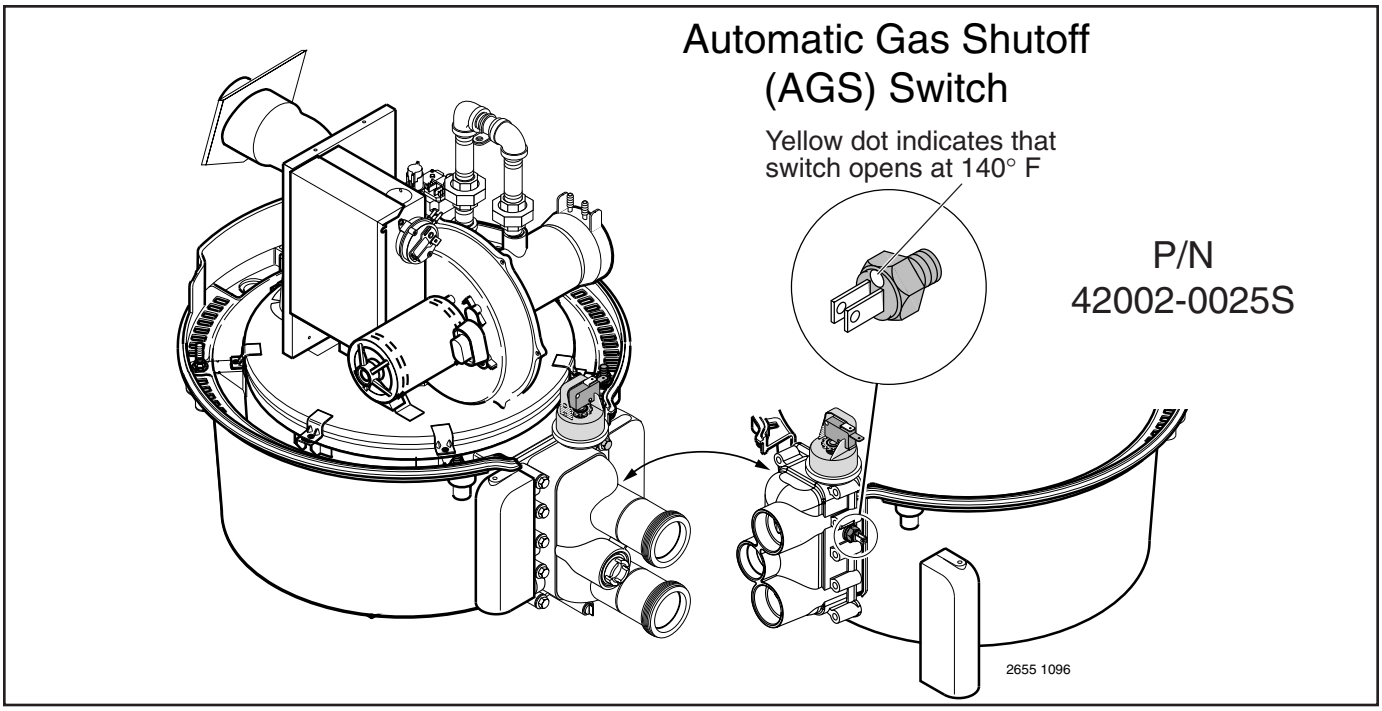
The High Limit Switch prevents the Heat Exchanger outlet temperature from exceeding 135° F, ±8° F (57° C, ±3° C).

Servicing Procedure

To replace the High Limit Switch:

1. Turn off the filter pump and all electrical power to the heater.
2. Unbolt and remove Upper Left and Upper Right Jackets from the heater to reach switch cover bolt.
3. If the heater is below the pool water level, close isolation valves to avoid draining the pool.
4. Remove the Drain Plug under the Manifold to drain the heater.
5. Remove the Switch Cover.
6. Disconnect the High Limit wires from the Switch.
7. Unscrew the High Limit Switch from the Manifold.
8. Replace the High Limit Switch by reversing Steps 1 through 7 above. Be sure to teflon tape the threads when reinstalling the High Limit Switch.

Automatic Gas Shutoff (AGS) Switch



Location

The Automatic Gas Shutoff (AGS) Switch is located in the middle well of the Manifold on the right-hand side under the right-hand Switch Cover. The AGS Switch is marked with a yellow dot to differentiate it from the High Limit Switch, which is black.

Function

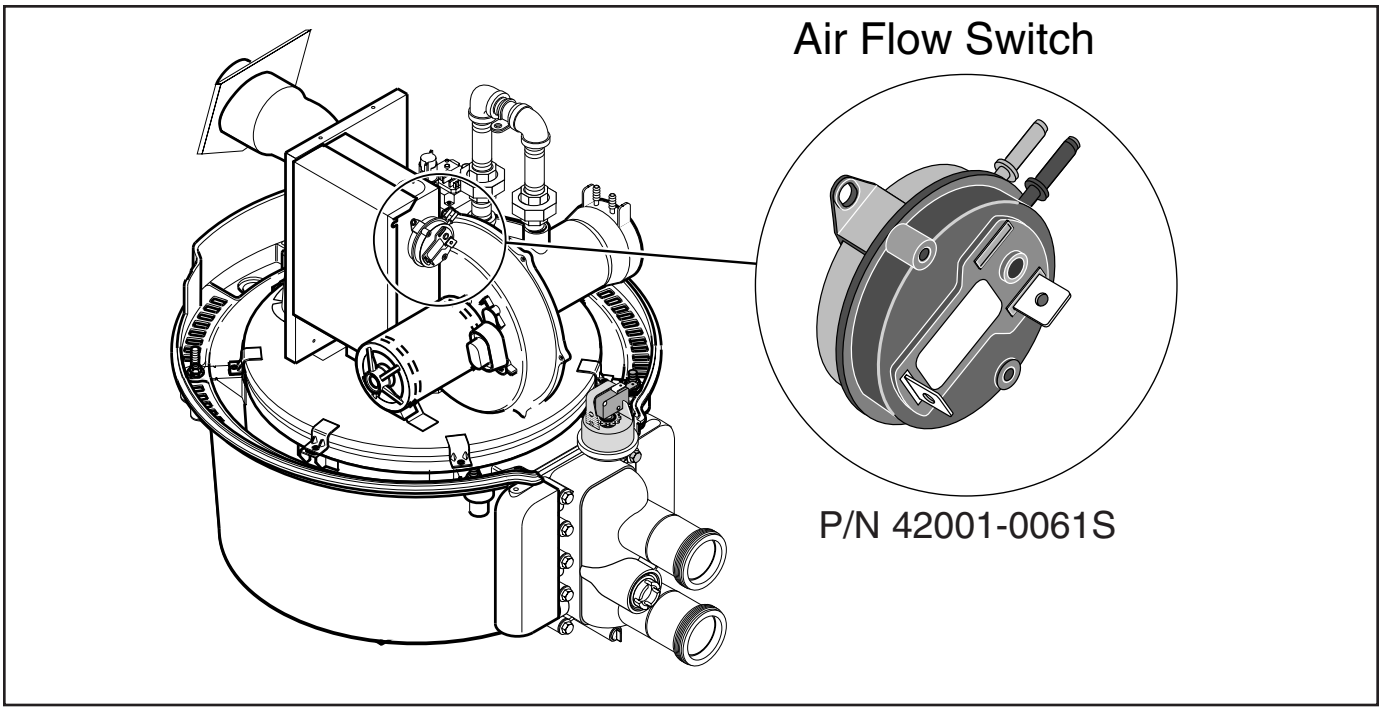
The AGS Switch prevents the Heat Exchanger output from exceeding 140° F, ±8° F (60° C, ±3° C).

Servicing Procedure

To replace the AGS Switch:

1. Turn off the filter pump and all electrical power to the heater.
2. Unbolt and remove Upper Left and Upper Right Jackets from heater to reach switch cover bolt.
3. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
4. Remove the Drain Plug under the Manifold to drain the heater.
5. Remove the Switch Cover.
6. Disconnect the AGS wires from the Switch.
7. Unscrew the AGS Switch from the Manifold.
8. To replace the AGS Switch, reverse Steps 1 through 7. Be sure to teflon tape the threads when reinstalling the AGS Switch.

Air Flow Switch (AFS)



Location

The Air Flow Switch (AFS) is fastened to the Control Box.

Function

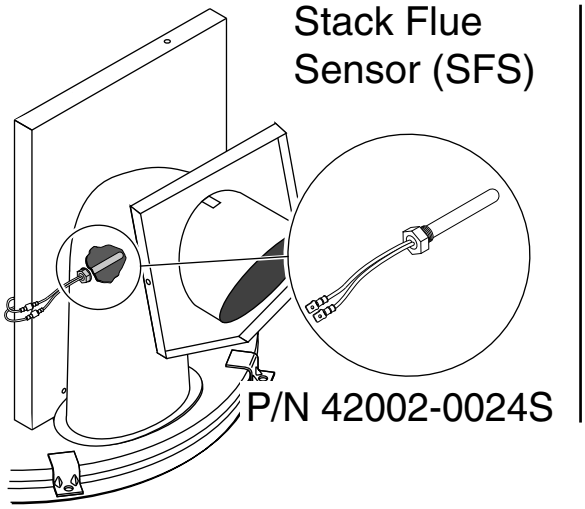
The Air Flow Switch senses the pressure differential across the air orifice to prevent the burner from firing if there is insufficient air flow. The AFS is factory-set and is nonadjustable.

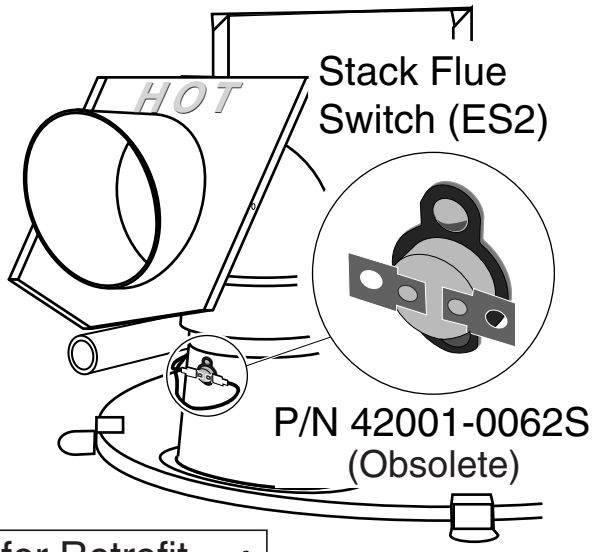
Servicing Procedure

To replace the AFS:

1. Turn off the pump and all electrical power to the heater.
2. Disconnect the plastic tubing from the AFS fittings.
3. Disconnect the wires from the AFS.
4. Remove the screws fastening the AFS to the Control Box.
5. To Replace the AFS, reverse Steps 1 through 4 above.

Stack Flue Sensor / Stack Flue Switch





See Page 4-41 for Retrofit Probe Information

Location

The Stack Flue Switch (ES2 - Heaters built before 3/1/2000) is located on the Combustion Chamber Flue Collar below the Vent Body.

The retrofitted Flue Temperature Probe Switch (ES2 - it replaces the Stack Flue Switch on heaters built before 3/1/2000) is located on the Exhaust Elbow.

The Stack Flue Sensor (SFS - Heaters built after 3/1/2000) is located on the Exhaust Elbow.

NOTE: The Stack Flue Sensor, the Probe, and the Stack Flue Switch must all be sealed with RTV at installation.

Function

The Stack Flue Switch and the Probe open if the flue gas output temperature exceeds 500° F (260° C). The Stack Flue Sensor monitors the exhaust temperature and shuts down the heater if it exceeds 500° F (260° C).

Servicing Procedure

To replace the Flue Temperature Probe Switch, See Page 4-41.

To replace the Stack Flue Switch or Sensor:

1. Turn off the filter pump and all electrical power to the heater.
2. Allow the heater to cool for at least half an hour before proceeding.
3. Unbolt and remove the Upper Left and Upper Right Jackets from the heater.
4. Disconnect the wires from the Stack Flue Switch/Sensor.
5. **Stack Flue Switch:** This switch is sealed in place. Do not remove or disturb it. If you are replacing this switch with a probe or sensor, remove the wires from the switch and run them to the probe/sensor.
   Stack Flue Sensor: Reach into the Exhaust Elbow; unscrew the locknut on the Sensor and remove it. Unscrew the Sensor from the Exhaust Elbow. Clean the RTV off of the joint.
   NOTE: The Stack Flue Sensor requires the new smart control board (Model #0300-100001).
6. To replace, reverse Steps 1 through 5 above.
   NOTE: Be sure to seal the Switch/Sensor with RTV in the joint.

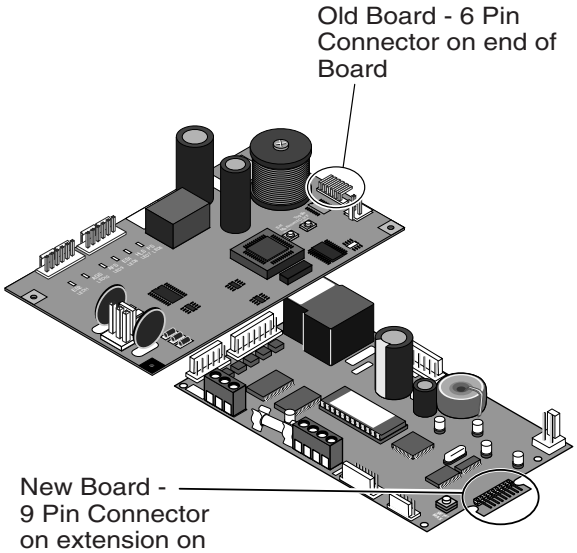
See Page 4-11 for Control Board setup and Complete Stack Flue Identification. See Page 4-29 for more information on the new Control Board. See Page 4-41 for more information on the Flue Temperature Probe Switch.

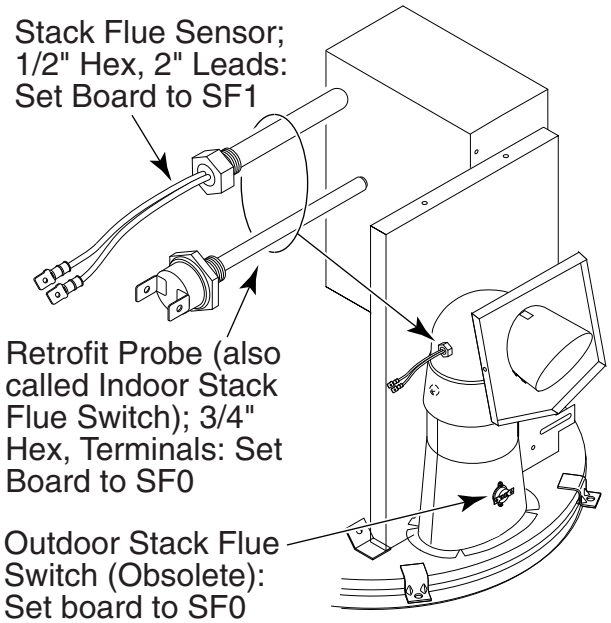
Safety Precautions:

⚠WARNING **Burn hazard. If heater has been operating, allow it to cool for at least half an hour before touching the Stack Flue Switch, Stack Flue Sensor, the Combustion Chamber Collar, or the Exhaust Elbow.**

⚠WARNING **Fire hazard.** For enclosed installations, Stack Flue Switch must be replaced with a Flue Temperature Probe Switch, Page 4-37.

Stack Flue Sensor / Stack Flue Switch





Old and new control Board Identification. Old board is not field programmable.

Control Board Setup and Stack Flue Protection Identification

The new Control Board is designed to work with the Stack Flue Switch and Flue Temperature Control Probe (older heaters) or with the Stack Flue Sensor (newer heaters). The old Control Board works with the Stack Flue Switch and the Probe only.

Please see illustration (above) to identify Stack Flue Protection and Control Board. Follow the procedure below to program a new control board to match the Stack Flue Protection (the old Control Board is not field programmable).

1. Turn the power to the heater ON.
2. Press and hold the OFF button on the membrane pad until the 3-digit display shows "Ad0" or "Ad1" (about 10 seconds).
3. Release the button and then press it momentarily. The 3-digit display will now show either "SF0" or "SF1".
4. Use the arrow buttons on the membrane pad to set the 3-digit display to read as follows:
   For units with a Stack Flue Switch (indoor or outdoor): SF0
   For units with a Stack Flue Sensor:.....SF1
5. Momentarily press the "OFF" button to exit the program. See the heater owner's manual for normal heater operation instructions.

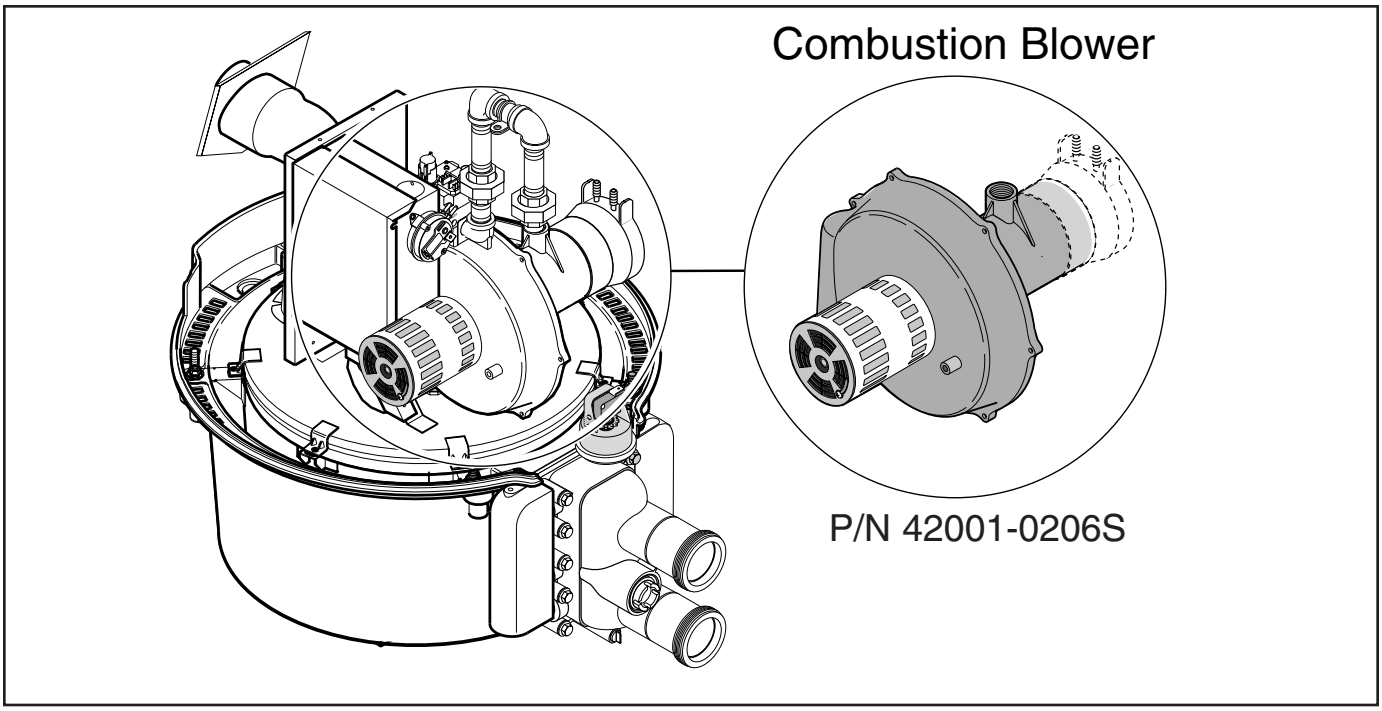
Checking Stack Flue Temperature

To check the Stack Flue temperature, press and hold for five seconds either the Pool On key (if in pool mode) or Spa On key (if in spa mode). The new Control Board will then show the current Stack Flue temperature. Release the key to allow the display to return to water temperature. The old Control Board will not display the Stack Flue temperature.

NOTE: Allow the heater to fire for five minutes before making this check, to allow the Stack Flue time to get to operating temperature.

Temperature Displayed	Action Required
<250° F (121° C)	Very Low – Check thermal Regulator; Pull one bottom manifold bolt to check for water in the heat exchanger tub; if so, drain tub and recheck to be sure that there are no leaks in coil or plumbing. If no leaks are found, recheck at intervals; condition may correct itself. If not, call Sta-Rite Pool Customer Service.
250-290° F (121-143° C)	Low – Check thermal regulator; if OK, check heating value of gas (may be low); if OK, condition will probably correct itself over time. Recheck in one month.
290-350° F (143-177° C)	Acceptable range – all models, all fuels; no action required.
>350° F (177° C)	High – Check Thermal Regulator; Check for Low Flow, Limed up or Sooted Up Heat Exchanger; Wrong Orifice; Orifice not changed for altitude; Inadequate ventilation or vent too long (indoor only).

Combustion Air Blower



The Burner System includes the Combustion Air Blower, the Mixer and Air Orifice, the Combination Gas Control Valve, the Gas Orifice, the HSI Igniter, and the Flameholder.

Location

The Combustion Air Blower is located in the front top portion of the heater.

Function

The Combustion Air Blower draws combustion air in, mixes the air and gas, and forces the air/gas mixture into the burner. The Air Orifice, attached to the Air/Gas Mixer inlet, meters the flow of combustion air to the Burner. The Blower inlet is under a negative pressure, and the Blower outlet is at a positive pressure.

To check Combustion Air Blower operation, disconnect flexible plastic tubes at the Pressure Switch and connect them to a differential pressure gauge. Turn gas off and press POOL ON. When Blower starts, check differential pressure. Differential should be as follows:

Model	Pressure Differential Minimum (in W.C.)
SR200	3.3
SR333	2.8
SR400	2.2

Servicing Procedure

NOTE: The air and gas mixtures are precisely matched for the specific model and should not be altered except as described under "Gas Orifice", Page 4-17.

Replacing the Combustion Air Blower:

1. Close the external manual gas valve.
2. Turn off the pump and all electrical power to the heater.
3. Disconnect the Gas Valve from the Blower inlet at the union.
4. Remove the Pipe Clamp connecting the gas pipe to the Index Plate.
5. Disconnect the wires to the Blower at the connector.

(Continued on the next page)

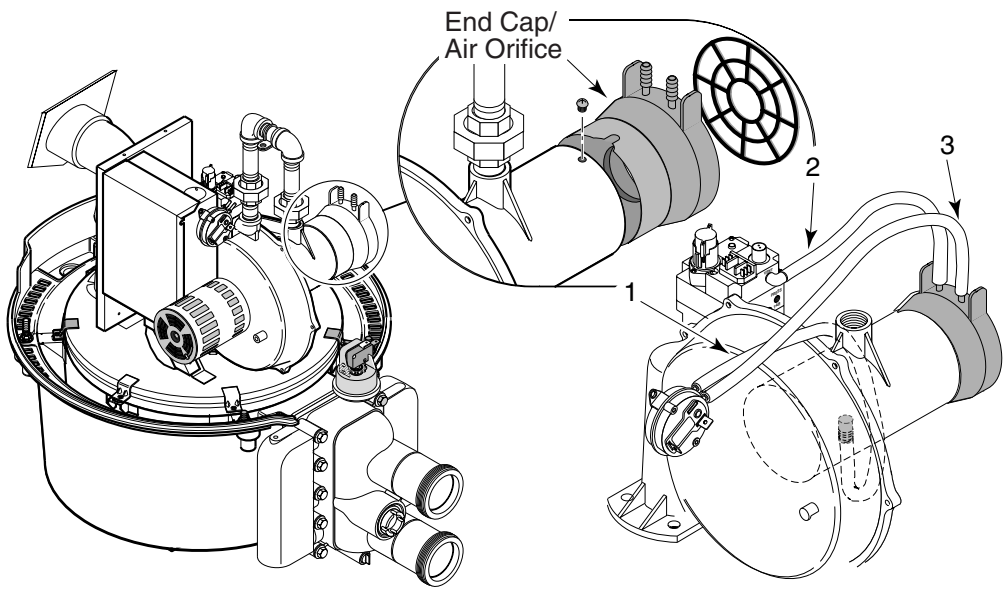
Safety Precautions:

⚠WARNING **Fire and explosion hazard.** The Air Orifice is sized specifically for the air/gas mixture required by the burner. **Do not modify the Air Orifice or replace it with an orifice of a different size.**

⚠WARNING **Fire and explosion hazard.** The Combustion Air Blower handles a combustible air/gas mixture. When servicing this part, check all seals for tightness to ensure the Blower is not leaking.

Combustion Air Blower

(Continued from the preceding page)



Run tubing as shown:

1. From Air Flow Switch to bottom of Air Orifice.
2. From Combination Gas Valve Vent to Air Orifice Port.
3. From Air Flow Switch to Air Orifice Port.

6. Disconnect the plastic tubes at the blower and remove the Air Orifice and Grille (See picture above).

NOTE: Slit the tubing before removing it to avoid breaking the hose barbs. Trim the tubing when reinstalling it.

7. Remove the four nuts connecting the Blower outlet flange to the Blower/Adapter Plate.
8. Lift the blower off the four mounting studs.
9. Replace the Combustion Air Blower by reversing Steps 1 through 7 above. See the following NOTE.

NOTE: When replacing or reassembling the Combustion Air Blower:

1. Install a new Adapter Plate/Blower Gasket. Tighten the Blower outlet flange nuts onto the studs in a criss-cross alternating sequence to a torque of 125-150 in-lb. Do not overtighten.
2. Use a soapy-water solution to leak test the Blower's outlet flange. Note the following:
   a. When checking for leaks, raise the Blower's outlet pressure by blocking the flue or Vent Body with your hand.
   b. Operate the blower with the gas turned off by increasing the temperature setting on the Membrane Pad.
3. Reconnect tubing to Air Orifice and Grille as shown above.

Air Orifice and Grille

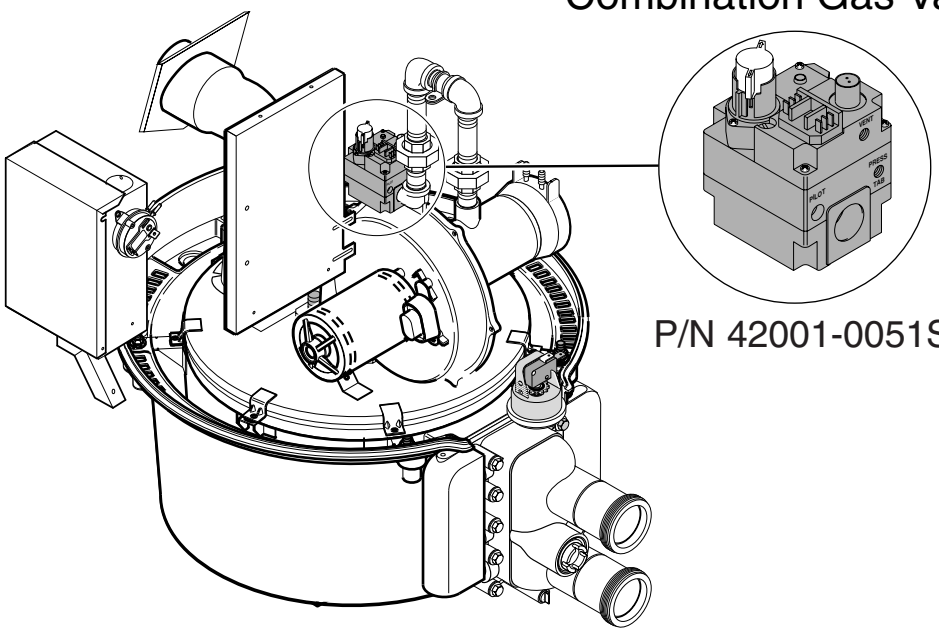
The Air Orifice attaches to the Mixing Tube inlet. It precisely meters the combustion air going into the Combustion Air Blower. If the Air Orifice becomes plugged or damaged, replace it with a genuine Sta-Rite part. Do not modify it or try to use a different orifice/grille. See Page 5-3 for part numbers.

Safety Precautions:

⚠WARNING **Fire and explosion hazard.** The Air Orifice is sized specifically for the air/gas mixture required by the burner. **Do not modify the Air Orifice or replace it with an orifice of a different size.**

⚠WARNING **Fire and explosion hazard.** The Combustion Air Blower handles a combustible air/gas mixture. When servicing this part, check all seals for tightness to ensure the Blower is not leaking.

Combination Gas Control Valve



Location

The Combination Gas Control Valve is located on the right side of the heater on top of the combustion chamber.

Function

The Combination Gas Control Valve incorporates dual gas shut-off valves and a negative-pressure regulator. The negative-pressure regulator controls the outlet pressure to slightly below the reference pressure supplied to the regulator diaphragm by the vent line. For proper operation, the regulated pressure at the outlet manifold of the valve must be 0.2" wc below the reference pressure, and the gas "vent" tap must be connected to the Mixer inlet.

Servicing Procedure

See next page for instructions on checking the gas pressure through the Combination Gas Control Valve.

Replacing the Combination Gas Control Valve:

1. Close the external manual gas valve.
2. Turn off the pump and all electrical power to the heater.
3. Disconnect the gas supply piping at the external union.
4. Disconnect the Combination Gas Control Valve from the Air/Gas Mixer at the closest union.
5. Disconnect the plastic tube from the Combination Gas Control Valve "VENT" port.
6. With piping on both sides of the Combination Gas Control Valve disconnected, slide the Combination Gas Control Valve out of its support bracket.
7. Replace the Combination Gas Control Valve by reversing Steps 1-5 above.
8. Test for gas leaks with a soapy water solution.

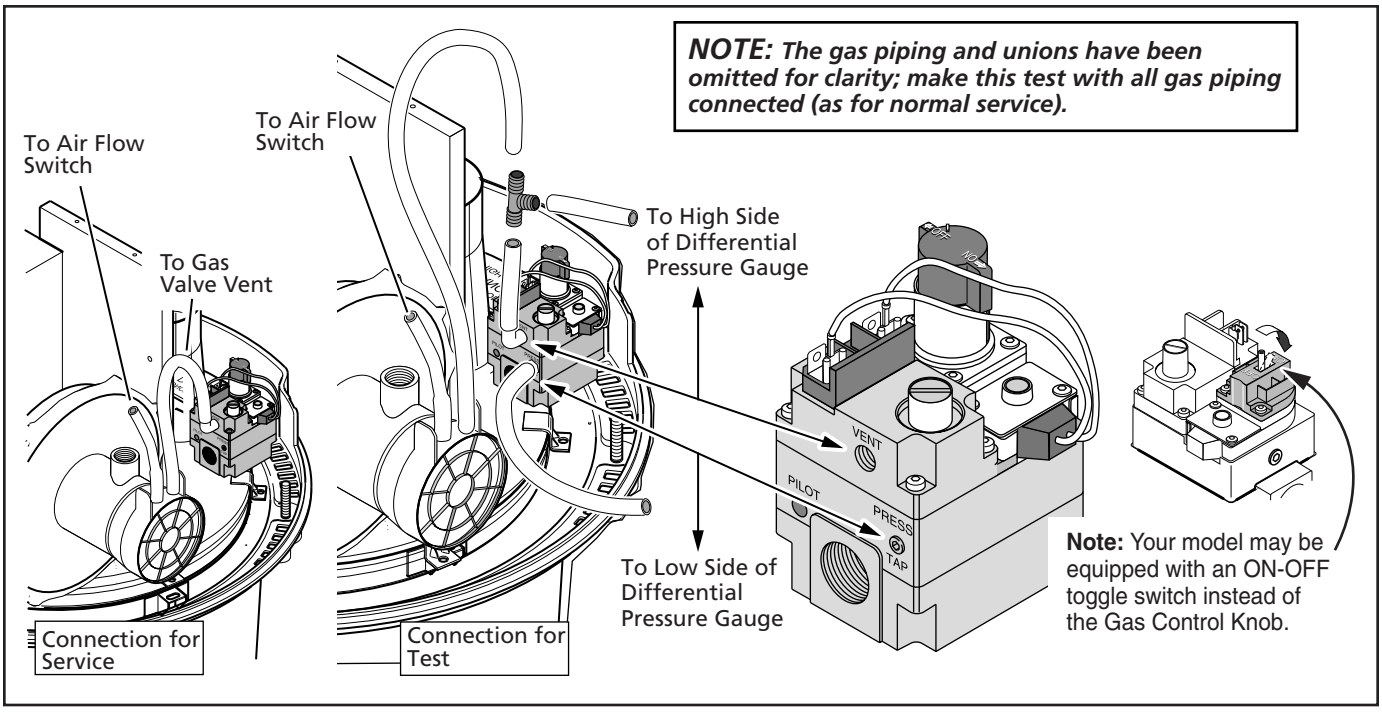
NOTE: When reconnecting the Combination Gas Valve to the gas supply-piping, use a thread sealant approved for use with natural gas and LP gas (such as RECTORSEAL).

Safety Precautions:

⚠WARNING **Fire and explosion hazard.** Do not adjust the gas flow by changing the regulator setting. To adust the gas flow, the Gas Orifice must be replaced with an orifice from a gas orifice replacement kit (see "Gas Orifice", Page 4-17, for more information).

⚠WARNING **Fire and explosion hazard.** This appliance is equipped with an unconventional gas control that is factory-set with a manifold pressure of -.2 inches wc. Improper installation, adjustment, alteration, service, or maintenance of the Combination Gas Control Valve can cause fire, explosion, death, personal injury, or property damage. Installation or service must be performed by a qualified installer, service agency, or the gas supplier. If this control is replaced, it must be replaced with an identical gas control.

Combination Gas Control Valve



Instructions For Checking the Gas Pressure Through the Combination Gas Control Valve

These instructions are for the use of qualified service technicians only!

Do not attempt this procedure unless you have been trained and certified in the care and repair of gas-fired appliances!

Do not attempt this procedure if the following instructions are confusing!

This appliance is equipped with an unconventional gas control valve that is factory set with a manifold pressure of –.2" wc. Installation or service must be performed by a qualified installer, service agency, or the gas supplier. If this control valve is replaced, it must be replaced with an identical control.

The Combination Gas Valve incorporates dual shut-off valves and a negative-pressure regulator. For proper operation, the regulated pressure at the outlet manifold of the valve must be 0.2" wc below the reference pressure at the blower mixer inlet, and the gas valve 'VENT' tap must be connected to the Endcap/Air Orifice as shown.

Do not attempt to adjust the gas input by adjusting the regulator setting. The correct gas regulator setting is required to maintain proper combustion and must not be altered.

Verify the maximum and minimum regulated gas pressures from the gas supply. These pressures must be within the range listed on the conversion plate.

To check that the gas pressure setting is correct, use the following procedure:

1. Turn off the electrical supply to the heater; turn off the pump; turn off the manual gas supply valve to the heater.
2. Unbolt and separate the top jacket halves.
3. Use a 3/16" hex key to remove the plug from the 'PRESSURE TAP' port on the outlet side of the Combination Gas Control Valve.

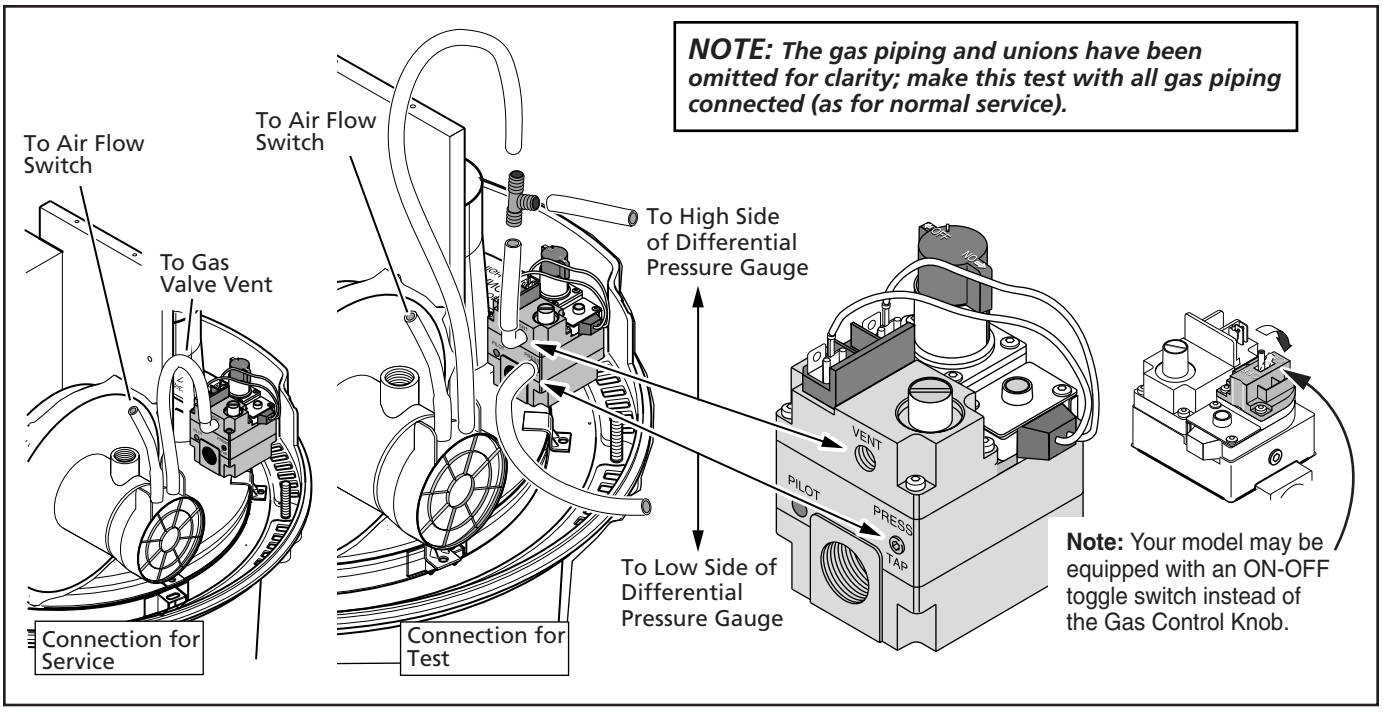
(Continued on the next page)

Safety Precautions:

⚠WARNING Risk of fire or explosion. Improper installation, adjustment, alteration, service, or maintenance of the Combination Gas Control Valve can lead to fire or explosion, causing loss of life, personal injury, or property damage.

Combination Gas Control Valve

(Continued from the preceding page)



4. Install a 1/8" NPT barbed fitting into the 'PRESSURE TAP' port. Use a flexible tube to connect it to the **low** side of a differential pressure gauge or a slope gauge. This gauge will measure low (outlet) pressure.

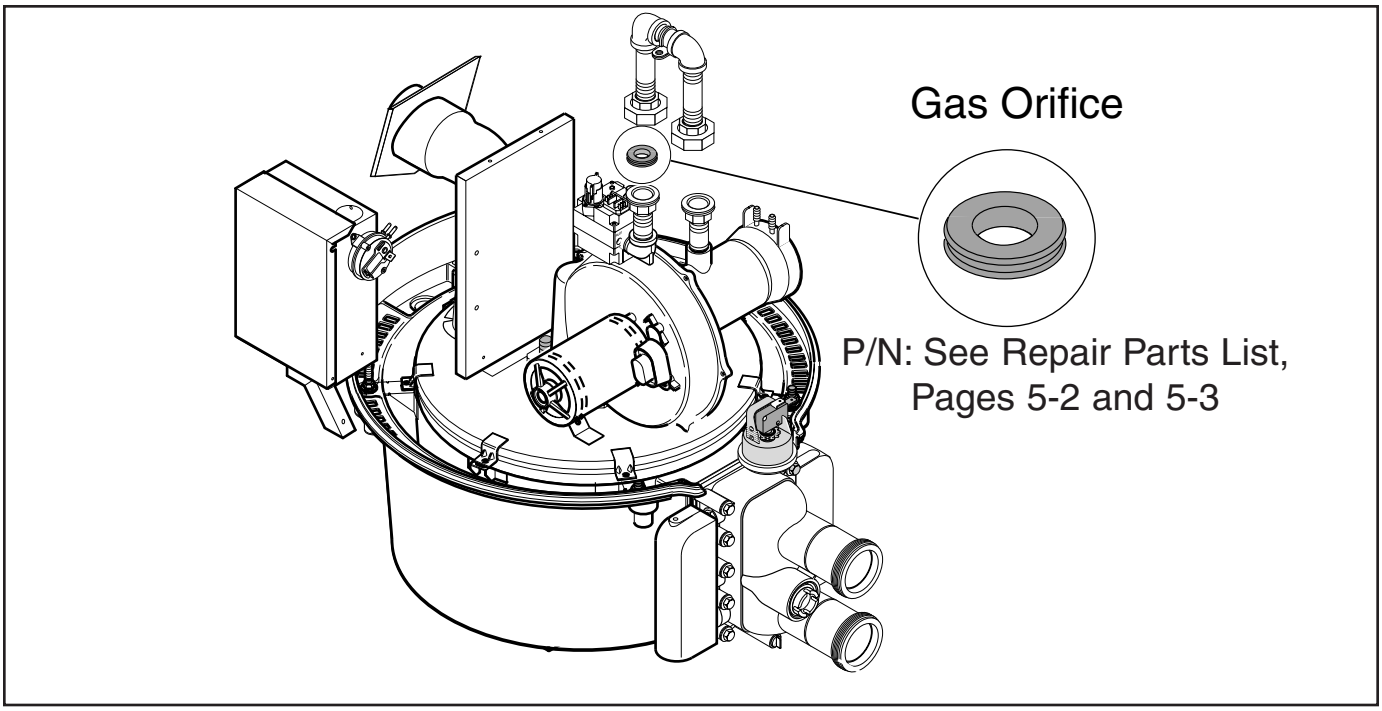
   NOTE: If you are using a slope gauge or a differential pressure gauge of less than 3" capacity, close the shutoff valve of the gauge to avoid pulling the liquid out of the gauge when the blower starts.
5. Disconnect the tube from the Gas Valve 'VENT' port. Connect it to a tube with a tee running to the high side of a differential pressure gauge and to the blower's air orifice grille (See Picture, above).
6. Turn on the Manual Gas Shutoff Valve.
7. Before operating the heater, leak-test the heater and all its gas connections with soapy water.

   ⚠WARNING Risk of fire or explosion. Never test for gas leaks with an open flame.
8. Turn on electricity to heater and start the pump.
9. Turn on the heater.
10. After the burner lights, verify that the supply pressure is within the range 4" to 14" wc. If the supply pressure drops below this range when the burner ignites, the gas line capacity may be inadequate, and should be increased. See Page 2-13.
11. With the burner still on, open the shut-off on the gauge. The pressure gauge should then read .2" ±.1" wc. (Since the pressure tap is connected to the low side of the gauge, the pressure is actually negative.) If the pressure is outside the range listed, call the factory at 1-800-752-0183. Do not try to adjust the pressure yourself.
12. If the pressures are within the limits given above, shutoff the heater, replace the tube to the Blower Inlet, replace the heater covers and cycle the heater to check for proper operation.

Safety Precautions:

⚠WARNING Risk of fire or explosion if Combination Gas Control Valve is incorrectly adjusted. If it is necessary to adjust the gas valve, this must be done only by a qualified service agency.

Gas Orifice



Location

The Gas Orifice is located in the first union downstream from the Combination Gas Control Valve.

Function

The Gas Orifice meters the flow of gas to the Burner. The Gas Orifice is precisely matched to the Air Orifice for proper air/gas ratio. The Gas Orifice is also sized at the factory and labeled for Propane or Natural Gas operation and for rated heat output. If the orifice must be replaced, use an orifice of the same size and rating or one from a gas orifice replacement kit properly marked for the fuel (Natural Gas or Propane) used by the heater you are servicing. If the union must be replaced, replace it only with a Sta-Rite Union, P/N 38404-4097. The orifice is designed to fit this union and might not properly seat in other unions.

Do not attempt to adjust the air/fuel mixture by altering gas or air orifice sizes or by adjusting the gas input to achieve a particular gas input rate ("clocking the meter"), as the rate may vary depending on elevation and local gas heating value.

Do not attempt to adjust the gas input outside of the specified range.

Servicing Procedure

Indications that too much gas is being burned (mixture is too rich) are CO_2 too high, O_2 too low, or hearing a high-pitched whistle.

Indications that too little gas is being burned (mixture is too lean) are as follows:

1. Delayed or noisy ignition.
2. Pronounced exhaust odor. (However, for a short time after initial installation, there may be an odor from the insulation binder, which is normal.)
3. Rough, rumbly Burner noise.

Check the air/fuel ratio for proper combustion by measuring the carbon dioxide (CO_2) or oxygen (O_2) level in the exhaust. See the table below for acceptable levels of CO_2 and O_2 when burning natural and LP gas.

	Flue Gas CO_2 and O_2 Ranges	
Type of Gas	**CO_2 (dry basis)**	**O_2 (dry basis)**
Natural Gas	8.0% - 9.0%	5.3% - 7.0%
Propane	9.2% - 10.5%	4.9% - 6.9%

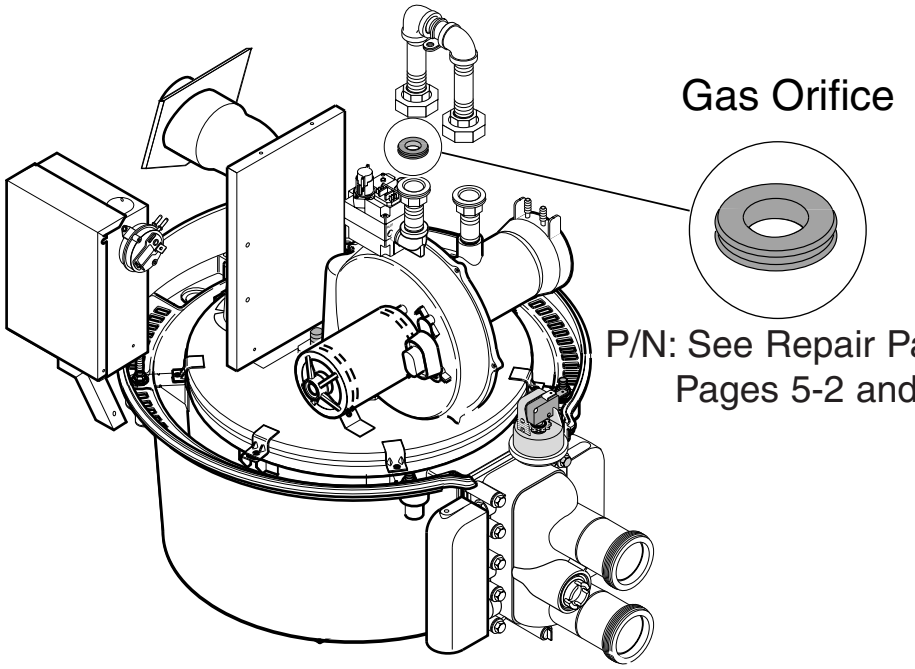
(Continued on the next page)

Safety Precautions:

⚠WARNING **Risk of fire or explosion.** Turn off gas at external manual gas valve and turn off electrical power to the heater before replacing the Gas Orifice. If you are installing a heater labeled for natural gas, but the supply is Propane (or vice versa), use a Sta-Rite conversion kit to convert the heater to the available fuel supply. DO NOT attempt to alter the orifice.

Gas Orifice

(Continued from the preceding page)



If the air/gas ratio is not correct, or if you are getting any of the indications of poor combustion, call Sta-Rite Customer Service at 1-800-752-0183 for information about the Gas Orifice Adjustment Kit. Use the kit that is designed for the model of heater being serviced. The kit should 1) be properly marked for Propane or natural gas operation, and 2) have a properly rated input.

Orifice Replacement Procedure:

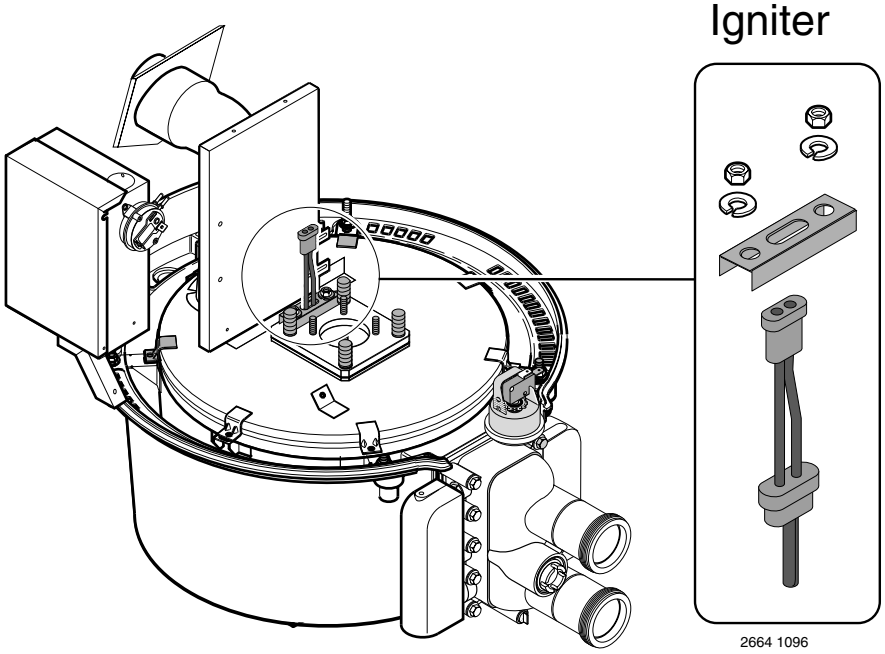
1. Turn off the electrical supply to the heater; turn off the pump; turn off the manual gas supply valve to the heater.
2. Unbolt and separate the top jacket halves.
3. Unscrew completely the 3/4" gas line union closest to the combination gas control valve.
4. Loosen the 3/4" gas line union directly above the air inlet tube.
5. Loosen the pipe clamp holding the gas line to the upper control support and swing the gas line loop out of the way.
6. Remove the gas orifice and O-Ring contained in the union nearest the combination gas control valve (correct union is next to sticker on gas pipe).
7. Install the O-Ring on the adjustment orifice. Verify the correct size of the orifices included in your kit (see instructions included with kit).
8. Insert the adjustment orifice squarely in the gas line union next to the combination gas valve.
9. Swing the gas loop and union half back into place and tighten both unions securely.
10. Tighten the pipe clamp holding the gas line to the top control support.
11. Replace the top jacket; tighten bolts.
12. Turn on heater. Observe it for smooth ignition and regular combustion without undue noise or pulsation.
13. Run heater for at least 10 minutes. After at least 10 minutes of continuous operation, insert a combustion analyzer probe into the exhaust and measure CO_2 or O_2. The recommended CO_2 and O_2 ranges are listed on Page 4-17. Preferably, the readings should be in the midrange.

NOTE: See instructions included with kit for plus and minus orifices to correct combustion problems. For more information, call Sta-Rite Customer Service at 1-800-752-0183.

Safety Precautions:

⚠WARNING **Risk of fire or explosion.** Turn off gas at external manual gas valve and turn off electrical power to the heater before replacing the Gas Orifice.

Hot Surface Igniter



Kit
P/N 77707-0054
includes Igniter and Gasket

Igniter Bracket
P/N 42001-0030S

Igniter
P/N 42001-0054

Igniter Gasket
P/N 42001-0066S
(Not shown)

Location

The Igniter is located in the top center of the Combustion Chamber.

Function

The Hot Surface Igniter (HSI) is heated electrically to ignite the Burner. The HSI requires 120 VAC power which is supplied by the Ignition Control Module. The HSI requires about 20 seconds to reach operating temperature.

Servicing Procedure

1. Turn off the pump and all electrical power to the heater.
2. Disconnect the HSI wires at the Molex connector.
3. Loosen the nuts holding the Igniter Bracket.
4. Carefully remove the HSI from the unit.
5. Check resistance across HSI to test. Resistance should be 40-75 Ω at room temperature. Cracks in HSI which affect performance will alter resistance level but may be too small to see.
6. Replace the HSI by reversing Steps 1 through 4 above.

NOTE: Replace the Igniter Gasket whenever you replace the HSI. Tighten the igniter hold-down nuts to 20 inch-lbs. torque. Overtightening can crack the HSI base.

7. Start the Combustion Air Blower and check for leaks with a soapy water solution.

Safety Precautions:

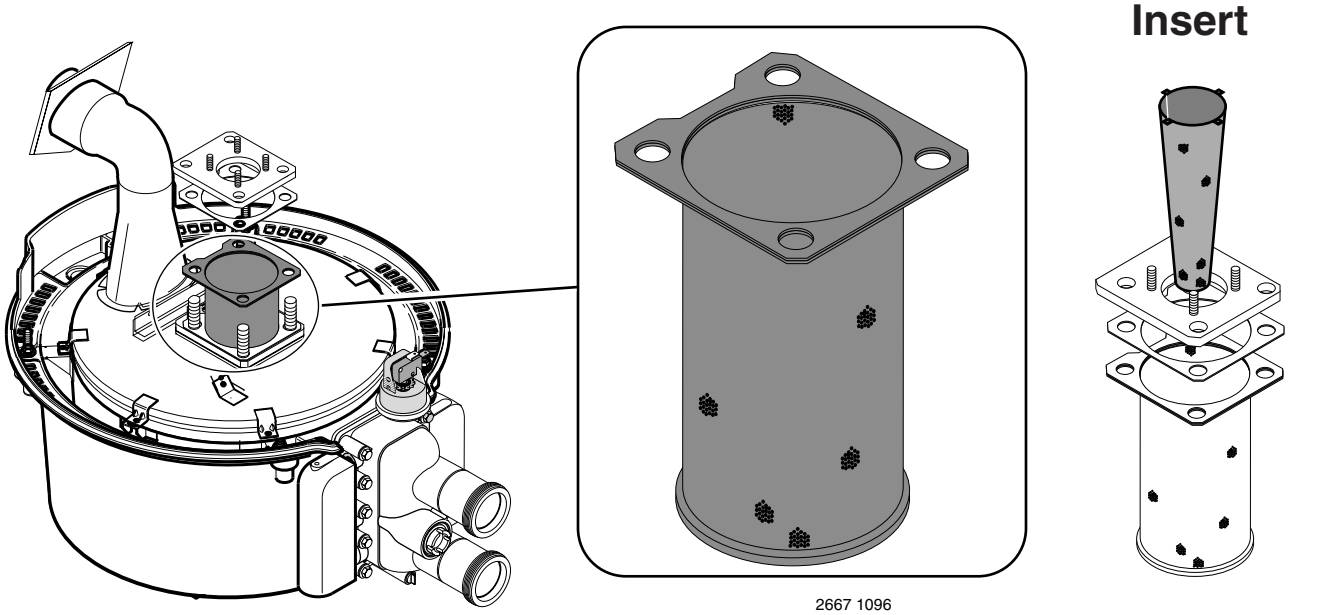
⚠ CAUTION The HSI Igniter is fragile and easily broken if jarred. Use caution when removing it.

⚠ CAUTION Use only the specified replacement igniter. Other ignitors can fail to reach the required operating temperature in the required time.

Flameholder/Burner

Flameholder Kit

SR200 Series: P/N 77707-0202
SR333 Series: P/N 77707-0203
SR400 Series: P/N 77707-0204



Location

The Flameholder/Burner is located in the center of the Combustion Chamber.

Function

The Flameholder/Burner supports the flame in the Combustion Chamber and is a perforated sheet-metal screen containing many small holes for efficient combustion and even heat distribution. The Flameholder Insert helps stabilize the flame over the length of the Flameholder (Series SR/SRC333 and SR/SRC400 only).

Servicing Procedure

The Flameholder should be inspected periodically to make sure there is no plugging or deterioration. Note the following:

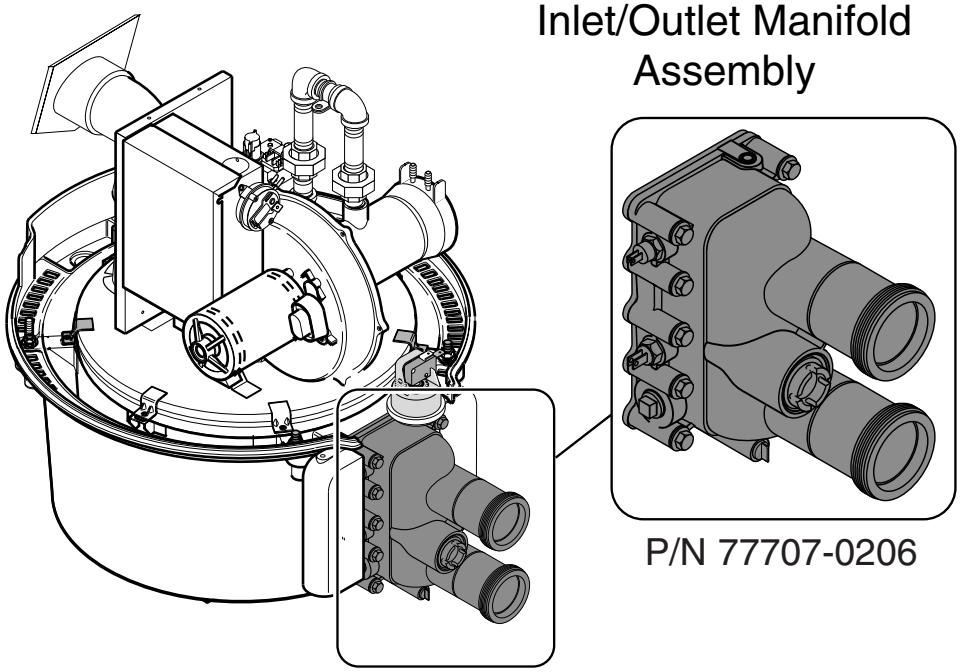
1. Improper burner operation, such as an incorrect air/gas ratio, can cause the flame to lift, to be noisy, or to overheat the Flameholder.
2. The Flameholder will not plug up in normal operation; however, extremely dusty or lint-laden air should be avoided.
3. The Flameholder has a slightly oxidized appearance in normal operation. However, extensive flaking or distortion of the Flameholder caused by overheating is not normal.

Replacing the Flameholder

1. Turn off the filter pump and all electrical power to the heater.
2. Remove the Combustion Air Blower. (See Replacing the Combustion Air Blower.) It is not necessary, however, to remove the blower at its outlet flange. The Blower can be removed at the Blower Adapter Plate. See the exploded view of the Burner System, Page 5-2.
3. Carefully lift the Flameholder with a gentle twisting motion. Be careful not to rub it against the Combustion Chamber insulation.
4. Replace the Flameholder by reversing Steps 1 through 4 above. See NOTE below.

NOTE: When you replace the Flameholder, also replace the Flameholder/Combustion Chamber Gasket and the Adapter Plate/Flameholder Gasket. Tighten the nuts onto the studs in a criss-cross alternating sequence to a torque of 70-80 in-lb. Do not overtighten.

Inlet/Outlet Manifold *(Heaters built after 3/15/01)*



Location

The inlet and outlet piping is connected to the Inlet/Outlet Manifold by 2-inch union connections. The Manifold must be removed to gain access to the Internal Bypass Valve or to remove the Heat Exchanger.

Function

The Inlet/Outlet Manifold provides the connections for inlet and outlet water. The Manifold houses the Thermal Regulator and the Internal Bypass Valve.

Servicing Procedure

To access the Inlet/Outlet Manifold:

1. Turn off the filter pump and all electrical power to the heater. Close the external Manual Gas Valve.
2. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
3. Disconnect the gas pipe back to the external Manual Gas Valve so that the heater can move enough to provide working clearance.
4. Remove the Drain Plug under the Manifold to drain the heater.
5. Loosen the inlet/outlet piping unions.
6. Unscrew the Thermal Regulator Plug.

⚠ CAUTION **The Thermal Regulator Spring is behind the plug and will cause the plug to fly if not restrained.**

7. Remove the Thermal Regulator along with the spring attached to it.
8. Remove the Switch Covers on both sides of the Manifold.
9. Disconnect all wires to the High Limit Thermostat, AGS Switch and Thermistor.
10. Remove the Water Pressure Switch.
11. Remove the 10 bolts holding the Manifold to the Heat Exchanger Coil; then remove the Manifold from the Heat Exchanger Coil.

Manifold Disassembly

1. With a screwdriver, carefully pry out the Bottom Plate (See Figure 4-1, Page 4-22). The Insert will come out with it.
2. Remove the Insert from the Bottom Plate.
3. Remove the Baffle Plate and Internal Bypass Valve from the Manifold.
4. Unscrew the AGS, Thermistor, and HLS from the Manifold shell.

Safety Precautions:

⚠ WARNING **Fire or explosion hazard.** Disconnect all power to the heater and close the External Manual Gas Valve before starting this procedure.

⚠ CAUTION **The Thermal Governor plug has a spring behind it.** Restrain it when removing it from the Manifold to prevent it from flying and possibly injuring persons nearby.

Inlet/Outlet Manifold *(Heaters built after 3/15/01)*

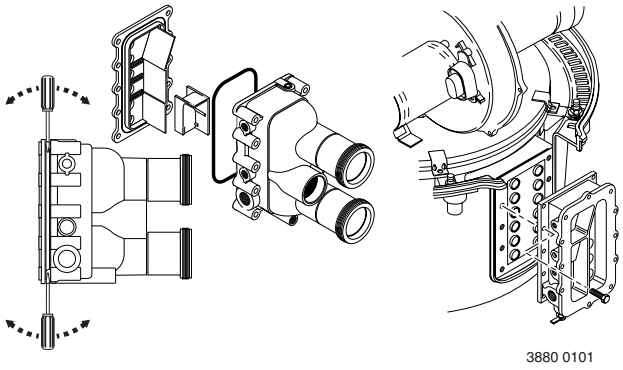


Figure 4-1: Gently pry Bottom Plate off of Manifold.

NOTE:

- Take care to keep the Manifold O-ring sealing surfaces clean, replace the O-ring, and position it properly when reassembling.
- Lubricate the O-rings with Parker O-Ring Lube for easy installation.
- If you are replacing a cast iron manifold/adapter with a one-piece Inlet/Outlet Manifold, purchase Part No. 77707-0014 (model SR/SRC200), 77707-0015 (SR/SRC333), or 77707-0016 (SR/SRC400) complete with safety switches. Do not reuse the safety switches from the cast-iron adapter; the new manifold uses some different switches. See Figure 4-5 for switch locations in the new manifold.
- If you are replacing a one-piece manifold, you can purchase a manifold complete with safeties or you can purchase the shell and necessary components and transfer the safety switches to the new manifold. See Figure 4-5 for switch locations. If you transfer the old switches, BE SURE that they are all in good working condition before putting them in the new manifold.
- See Figure 4-6 for switch cover installation instructions.
- Have a No. 77707-0008 Insulation Kit on hand in case the heating coil shifts during manifold installation and requires opening the combustion chamber cover to realign it.

Manifold Reassembly

NOTE: Make sure that the Baffle Plate, Insert, and Bottom Plate are correct for your heater. The part number is molded on. Check the Water System Repair Parts List and Exploded View, Page 5-4, to verify part numbers. The number is not molded on some inserts for 200K heaters.

1. Install the Internal Bypass Valve in the Manifold.
2. Install the Baffle Plate in the Manifold.
3. Install the Insert and Bottom Plate (with the Manifold O-ring) in the Manifold. You will have to tap them together with a rawhide or plastic mallet.
4. Clean the tube-sheet and O-Ring sealing surfaces as shown in Figure 4-2.

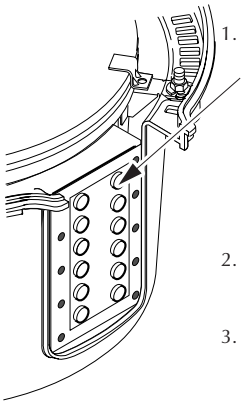


Figure 4-2: Clean the tube sheet and O-Ring sealing surfaces thoroughly as described above.

Manifold Installation (See Figures 4-3 and 4-4):

NOTE: On some heaters, the long manifold bolts used on the one-piece Inlet/Outlet Manifold will push the Evaporator Plate out of position. Operating the heater with the Evaporator Plate out of place can severely damage the heater. Since the Evaporator Plate can't be seen from the outside of the heater, install the short bolts as directed below to avoid moving it.

SR/SRC200 and SR/SRC400 (Figure 4-3):

1. Hand-tighten all long bolts; then tighten indicated bolts (*) enough to allow short bolts to engage.
2. Follow "Manifold Torque Procedure" below.

SR/SRC333:

1. These models use long bolts only. Tighten all bolts hand tight.
2. Follow "Manifold Torque Procedure" below.

Manifold Torque Procedure (All Models):

1. Make sure that all bolts are engaged and hand tight.
2. Torque the bolts **in sequence** as shown (Figure 4-4). Some noise (popping, etc.) is normal as you tighten.
3. Go around the manifold and retighten the bolts as needed to the specified torque (you may have to do this several times).
4. Reverse Steps 1 through 10 to finish reinstalling the manifold.

⚠WARNING Explosion and fire hazard. Be sure that all gas connections are tight and do not leak before attempting to start the heater.

- Check gas union(s) for leaks with soapy water before firing the heater.
- Start and run the filter pump for several minutes before starting the heater in order to purge all air from the system. Open all air vents in the system (on Filter, Strainer, etc.) while purging the air.

Inlet/Outlet Manifold *(Heaters built after 3/15/01)*

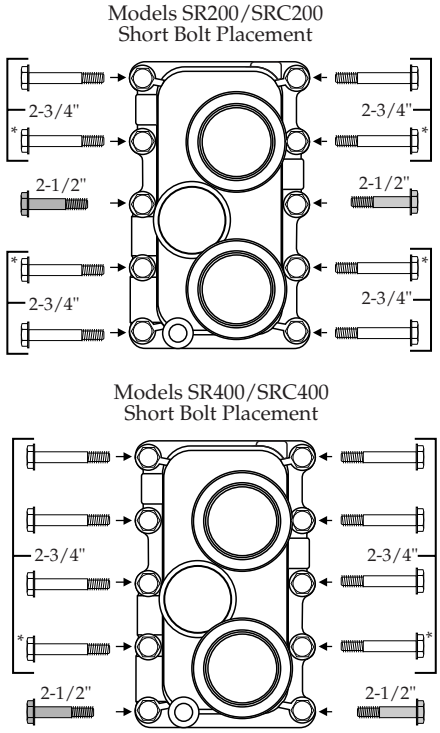


Figure 4-3: Short bolt placement. Models SR333/SRC333 use all long bolts.

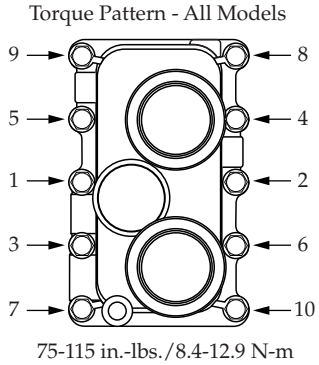


Figure 4-4: Manifold Installation: Torque sequence. You may have to retighten the bolts several times to achieve the necessary torque.

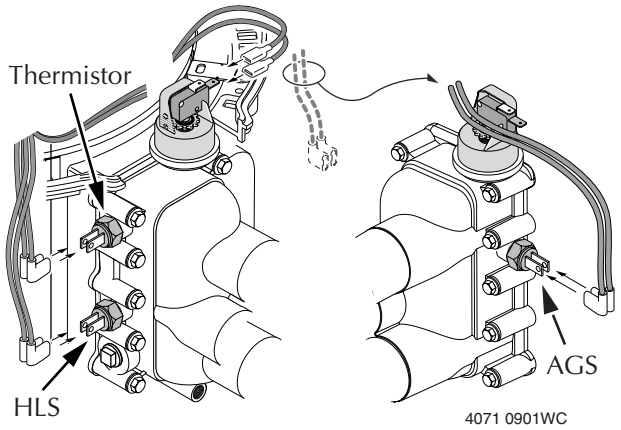


Figure 4-5 Safety switch locations on the one-piece manifold. When replacing a cast-iron adapter, move the AGS from the opposite side. Be sure to route wires around pressure switch as shown (to keep them away from the combustion chamber top).

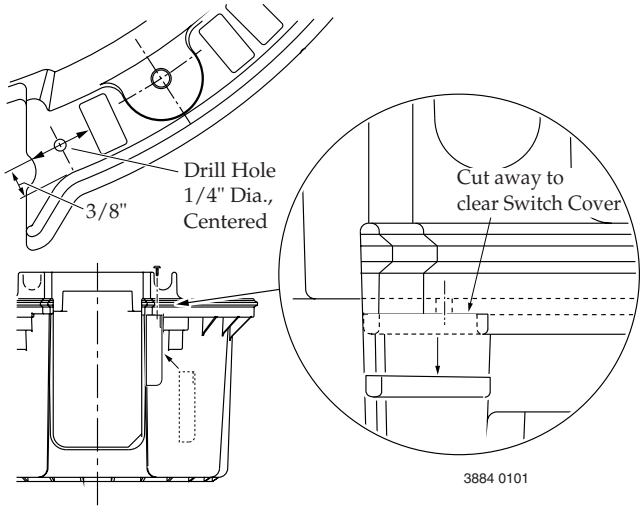


Figure 4-6: Install the second switch cover as shown when retrofitting a new manifold.

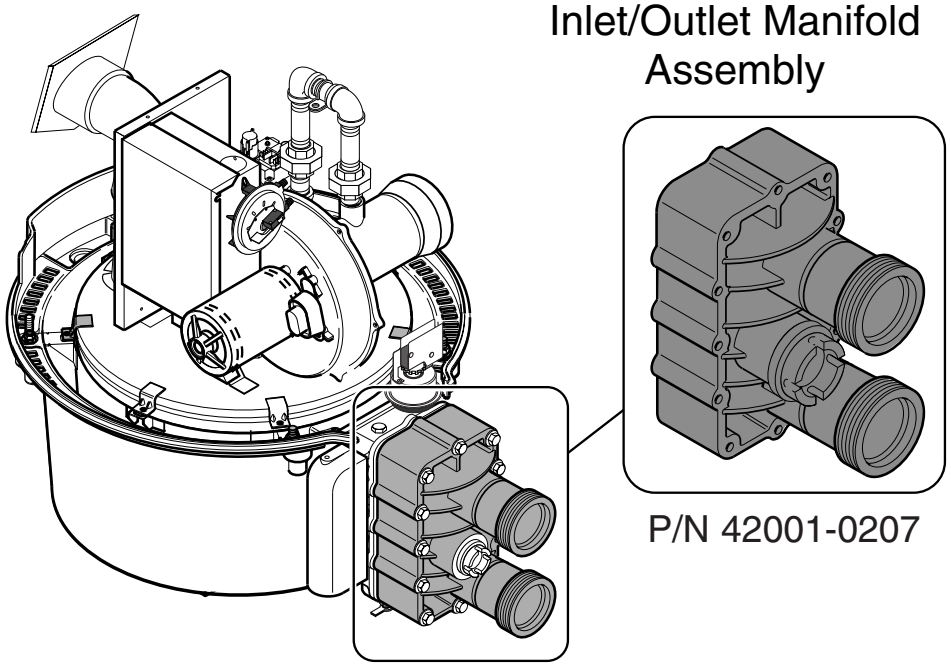
Safety Precautions:

- Start and run the filter pump for several minutes before starting the heater in order to purge all air from the system. Open all air vents in the system (on Filter, Strainer, etc.) while purging the air. Run the pump with the vents open until all vents run a solid stream of water.
- Check gas union(s) for leaks with soapy water before firing the heater.

⚠WARNING Explosion and fire hazard. Be sure that all gass connections are tight and do not leak before attempting to start the heater.

- See Figure 4-5 for switch cover installation instructions.
- Have a No. 77707-0008 Insulation Kit on hand in case the heating coil shifts during manifold installation and requires opening the combustion chamber cover to realign it.

Inlet/Outlet Manifold *(Heaters built before 3/15/01)*



Location

The inlet and outlet piping is connected to the Inlet/Outlet Manifold by 2-inch union connections. The Manifold must be removed to gain access to the Internal Bypass Valve or to remove the Manifold Adapter.

Function

The Inlet/Outlet Manifold provides the connections for inlet and outlet water. The Manifold houses the Thermal Regulator and the Internal Bypass Valve.

See Pages 4-21 and 4-22 for heaters built after 3/15/01.

Servicing Procedure

To access the Inlet/Outlet Manifold:

1. Turn off the filter pump and all electrical power to the heater. Close the external Manual Gas Valve.
2. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
3. Disconnect the gas pipe back to the external Manual Gas Valve so that the heater can move enough to provide working clearance.
4. Open the Drain Cock under the Manifold Adapter to drain the heater.
5. Loosen the inlet/outlet piping unions.
6. Unscrew the Thermal Regulator Plug.

⚠ CAUTION The Thermal Regulator Spring is behind the plug and will cause the plug to fly if not restrained.

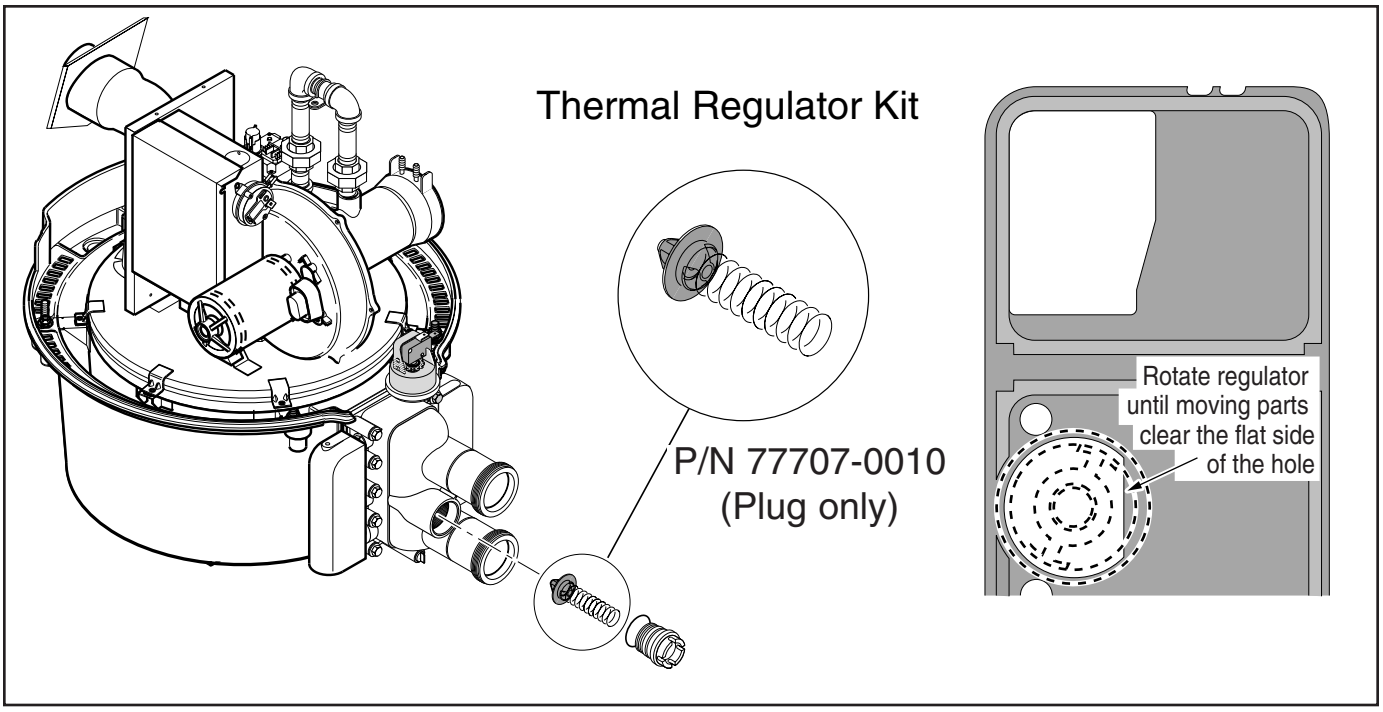
7. Remove the Thermal Regulator along with the spring attached to it.
8. Remove the 12 bolts holding the Manifold to the Manifold Adapter; then remove the Manifold from the Manifold Adapter.
9. Reassemble the Manifold and Manifold Adapter by reversing Steps 1 through 8 above. Take care to keep the O-ring sealing surfaces clean, replace the O-ring and position it properly when reassembling.
10. Tighten bolts only enough to mate the surface of the Manifold with the surface of the Manifold Adapter. Tighten bolts in a criss-cross alternating sequence. Torque bolts to 125-150 in-lbs.

Safety Precautions:

⚠ WARNING Fire or explosion hazard. Disconnect all power to the heater and close the External Manual Gas Valve before starting this procedure.

⚠ CAUTION The Thermal Governor plug has a spring behind it. Restrain it when removing it from the Manifold to prevent it from flying and possibly injuring persons nearby.

Thermal Regulator *(All Heaters)*



Location

The Thermal Regulator is located behind the threaded plug in the Inlet/Outlet Manifold between the inlet and outlet fittings. It is held in place by a spring.

Function

The Thermal Regulator is a thermostatically activated valve that throttles water flow to maintain the Heat Exchanger Outlet temperature above 120°F.

Servicing Procedure

The Thermal Regulator is nonserviceable; it must be replaced if it is defective.

To replace the Thermal Regulator:

1. Turn off the filter pump and all electrical power to the heater.
2. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
3. Open the Drain Cock under the Manifold Adapter or remove the Drain Plug under the Manifold to drain the heater.
4. Unscrew the Thermal Regulator Plug.

⚠ CAUTION **The Thermal Regulator Spring is behind the plug and will cause the plug to fly if not restrained.**

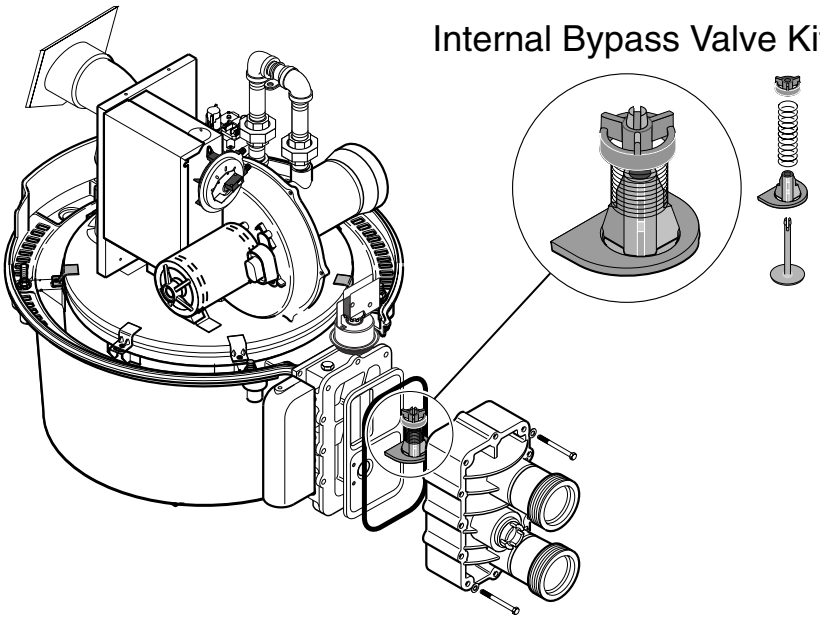
5. Remove the Thermal Regulator along with the spring attached to it.
6. Install a new Thermal Regulator by reversing Steps 1 through 5 above.

NOTE: When installing a new Thermal Regulator, attach it to the spring with C-clip (supplied) to help with installation and removal. Make sure that the Thermal Regulator seats in the Baffle Plate port. If the port has a flat side, the frame on the Regulator must be turned to clear the flat (See illustration above).

Safety Precautions:

⚠ CAUTION **The Thermal Regulator plug has a spring behind it.** Restrain it when removing it from the Manifold to prevent it from flying and possibly injuring persons nearby.

Internal Bypass Valve *(Heaters built before 3/15/01)*



Internal Bypass Valve Kit P/N 77707-0001

Spring Retainer
P/N 42001-0015

Spring
P/N 37607-0010

Separator Plate
P/N 42001-0011

Bypass Valve Poppet
P/N 42001-0014

Location

The Internal Bypass Valve is located inside the Inlet/Outlet Manifold.

NOTE: The Inlet/Outlet Manifold must be removed to service or replace the Internal Bypass Valve.

For heaters built after 3/15/01, see Pages 4-21 and 4-22 for replacement instructions.

Function

The Internal Bypass Valve maintains a constant flow to the Heat Exchanger by opening to allow excess flow to bypass the Heat Exchanger.

Servicing Procedure

1. Turn off the filter pump and all electrical power to the heater. Close the external Manual Gas Valve.
2. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
3. Disconnect the gas pipe back to the external Manual Gas Valve to allow the heater to move enough to provide working clearance.
4. Open the Drain Cock under the Inlet/Outlet Manifold to drain the heater.
5. Loosen the inlet/outlet piping unions.
6. Unscrew the Thermal Regulator Plug.

⚠ CAUTION **The Thermal Regulator Spring is behind the plug and will cause the plug to fly if not restrained.**

7. Remove the Thermal Regulator along with the spring attached to it.
8. Remove the Inlet/Outlet Manifold by removing the 12 bolts holding the Manifold to the Manifold Adapter.
9. Remove the baffle plate and O-ring to gain access to the Internal Bypass Valve chamber.
10. Remove the Bypass Valve Assembly and replace it with a new one.
11. To Replace the valve, reverse Steps 1 through 10 above.

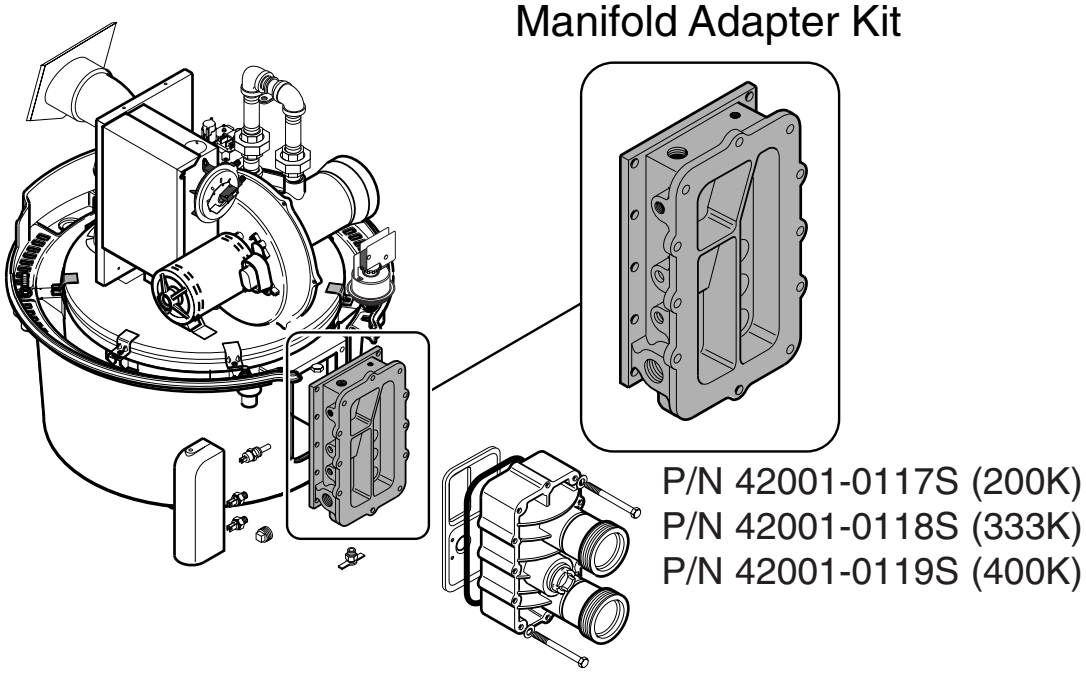
NOTE: When tightening the Inlet/Outlet Manifold bolts, tighten to 125-150 in-lb. Make sure that O-Ring and sealing surfaces are clean and that the O-Ring is correctly positioned.

Safety Precautions:

⚠ WARNING **Fire or explosion hazard.** Disconnect all power to the heater and close the External Manual Gas Valve before starting this procedure.

⚠ CAUTION **The Thermal Regulator plug has a spring behind it.** Restrain it when removing it from the Manifold to prevent it from flying and possibly injuring persons nearby.

Manifold Adapter (Obsolete)



Location

The Manifold Adapter is located between the Inlet/Outlet Manifold and the Combustion Chamber.

Function

The Manifold Adapter distributes inlet/outlet water to the tubes of the Heat Exchanger.

Servicing Procedure

Removing the Manifold Adapter should only be necessary if 1) the Manifold Adapter is damaged, or 2) the Heat Exchanger has to be repaired or replaced.

If the Manifold Adapter is damaged, replace both the Adapter and the Inlet/Outlet Manifold with a new one-piece Plastic Manifold. See Pages 4-21 and 4-22 for Plastic Manifold information. The Manifold Adapter is no longer available as a repair part.

To access the Manifold Adapter:

1. Turn off the filter pump and all electrical power to the heater. Close the external Manual Gas Valve.
2. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
3. Open drain cock under the Manifold Adapter and drain the heater.
4. Disconnect the gas pipe back to the external Manual Gas Valve to allow the heater to move enough to provide working clearance.
5. Remove the Inlet/Outlet Manifold. (See Inlet/Outlet Manifold, Page 4-23).
6. Remove the Switch Cover on the side of the Manifold Adapter.
7. Disconnect all wires to the High Limit Thermostat, AGS Switch and Thermistor.
8. Loosen the compression fitting to the Pressure Switch and remove the tube.
9. Unscrew the bolts that attach the Manifold Adapter to the tube sheet; remove the Manifold Adapter.
10. To replace the Manifold Adapter, reverse Steps 1 through 5 above.

NOTE: When reinstalling the Manifold Adapter:

1. Replace the O-rings on the Heat Exchanger tubes whenever reinstalling the Manifold Adapter.
2. Reposition the O-rings properly; keep the O-rings and their sealing surfaces clean. Lubricate O-rings with Parker O-Ring Lube for easy installation.
3. Tighten the bolts in a criss-cross alternating sequence to a torque of 125-150 in-lb. Do not over-tighten.

Safety Precautions:

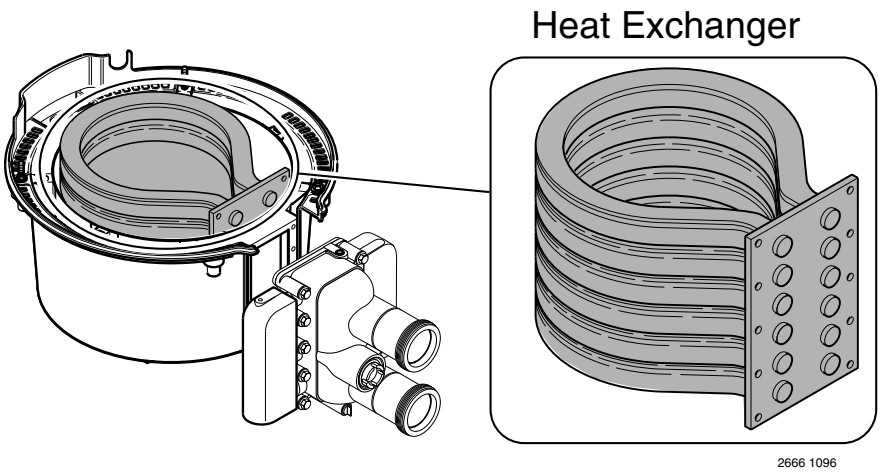
⚠ WARNING **Fire or explosion hazard.** Disconnect all power to the heater and close the External Manual Gas Valve before starting this procedure.

⚠ CAUTION **The Thermal Regulator plug has a spring behind it.** Restrain it when removing it from the Manifold to prevent it from flying and possibly injuring persons nearby.

Heat Exchanger

Tube Sheet Coil Assembly Kit

SR/SRC200 Series: P/N 77707-0232
SR/SRC333 Series: P/N 77707-0233
SR/SRC400 Series: P/N 77707-0234
SR400HD Series: P/N 77707-0244



Location

The Heat Exchanger includes several copper-finned tubes bent in a circular shape surrounding the Flameholder/Burner. The number of tubes depends on the model of heater. The ends of the tubes are expanded into a steel tube sheet, which is bolted to the Manifold Adapter (heaters built prior to 3/15/01) or the Inlet/Outlet Manifold (heaters built after 3/15/01). The ends of the tubes are sealed to the Manifold Adapter with individual O-rings.

Function

Water flows through the Heat Exchanger Tubes, which extract heat from the flue gases.

NOTE: The Heat Exchanger can be damaged by operating conditions like freeze-ups, improper water chemistry, or corrosives in the vicinity of the heater. Avoid these to keep the Heat Exchanger in good working order.

Servicing Procedure

Inspect the Heat Exchanger periodically or when operating problems occur. By removing the Flameholder, a partial inspection of the inward-facing surfaces of the Heat Exchanger can be done with a flashlight and mirror.

For a complete inspection of the Heat Exchanger, remove it from the unit. If any one of the Heat Exchanger tubes is damaged, replace the entire Heat Exchanger. Repairing individual Heat Exchanger Tubes requires special tools and procedures and should not be attempted.

To Access the Heat Exchanger:

1. Turn off the filter pump and all electrical power to the heater. Close the external Manual Gas Valve.
2. Remove the Upper Left and Upper Right Jackets and disconnect the gas pipe back to the external Manual Gas Valve.
3. Disconnect the electrical supply wires at the junction box and from the Thermistor, High Limit, AGS, and Pressure Switch. Pull the Wiring Harness clear of the Junction Box to allow removal of the Combustion Chamber Cover Assembly.
4. Unscrew the seven screws holding the cover tabs to the chamber brackets.

(Continued on the next page)

Safety Precautions:

⚠WARNING **Fire or explosion hazard.** Disconnect all power to the heater and close the External Manual Gas Valve before starting this procedure.

Heat Exchanger

(Continued from the preceding page)

5. Lift the Chamber Cover from the Combustion Chamber.
6. Carefully remove the two top insulation pieces from the Heat Exchanger.
7. Inspect the inward-facing surfaces of the Heat Exchanger.
8. Reassemble by reversing steps 1 through 7 above.

To Remove the Heat Exchanger:

1. Turn off the filter pump and all electrical power to the heater. Close the external Manual Gas Valve.
2. If the heater is below the water level of the pool, close isolation valves to avoid draining the pool.
3. Remove the Upper Left and Upper Right Jackets and disconnect the gas pipe back to the external Manual Gas Valve.
4 Remove the Inlet/Outlet Manifold (all heaters) and Manifold Adapter Assemblies (heaters built before 3/15/01). See Pages 4-21, 4-22, 4-23 and 4-26.
6. For indoor installations, remove the Vent Connector.
7. Disconnect the electrical supply wires at the junction box. Pull the Wiring Harness back clear of the Junction Box to allow removal of the Combustion Chamber Cover Assembly.
8. Unscrew the seven screws holding the cover tabs to the chamber brackets.
9. Lift the chamber cover from the Combustion Chamber.
10. Carefully remove the top insulation from the Heat Exchanger.
11. The Heat Exchanger is held in position by bolts to the Inlet/Outlet Manifold (heaters built after 3/15/01) or to the Manifold Adapter (heaters built prior to 3/15/01). With these parts removed, the Heat Exchanger can be lifted from the chamber.
12. Replace the Heat Exchanger by reversing steps 1 through 11 above.

    NOTE: When re-installing the Combustion Chamber Cover, apply a bead of RTV 106 around the cover flange before re-assembly. Torque the nuts to 20-30 in-lbs. Allow 24 hours for the RTV to cure before firing the heater for an extended length of time.

NOTE: When replacing the Heat Exchanger:

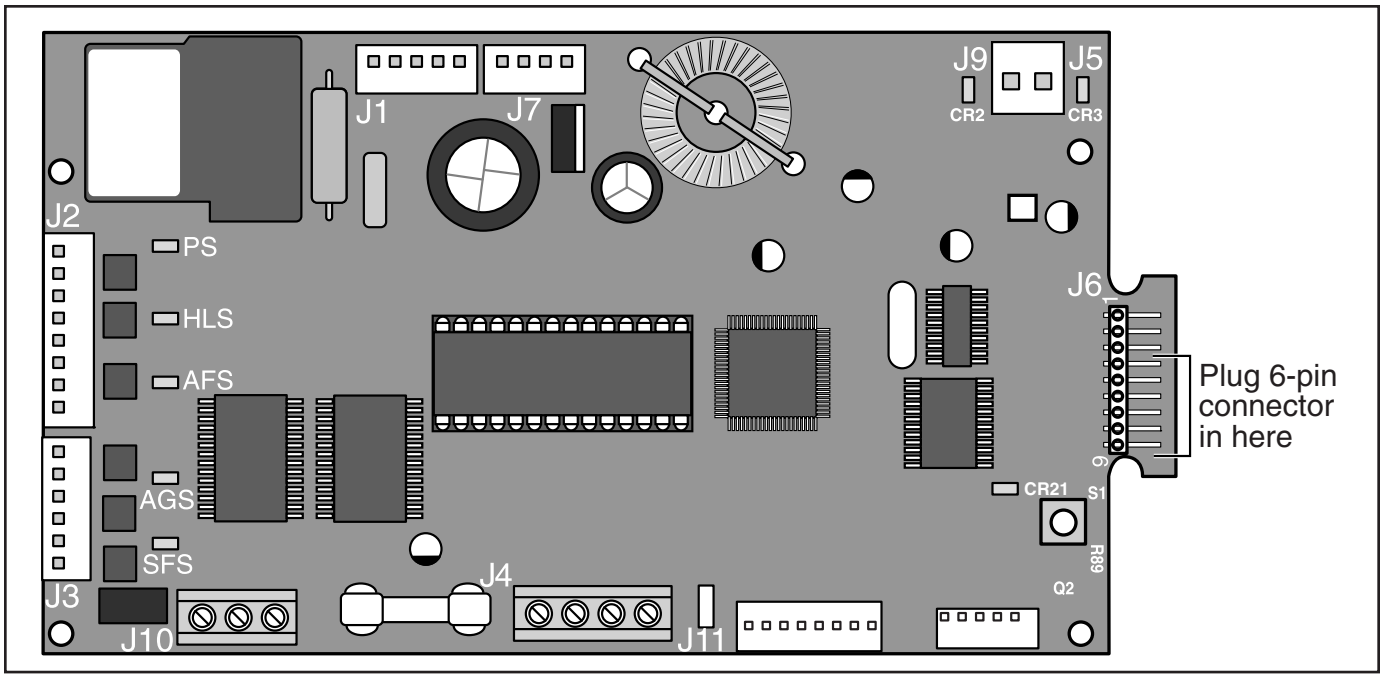
1. Replace any damaged insulation. No gaps should exist between the insulation and the Heat Exchanger.
2. Use a soapy-water solution to leak test the gas piping, blower and burner flanges, and Combustion Chamber sealing surfaces. Note the following:
   a. When checking for leaks, raise the blower's outlet pressure by blocking the flue outlet or vent terminal with your hand.
   b. The blower can be operated with the gas turned off if the temperature setting on the Operating Control Panel is lowered.
3. If leaks appear between the combustion chamber and the cover, seal them with GE RTV 106.

Safety Precautions:

⚠ WARNING **Fire or explosion hazard.** Disconnect all power to the heater and close the External Manual Gas Valve before starting this procedure.

⚠ CAUTION **The Thermal Regulator plug has a spring behind it.** Restrain it when removing it from the Manifold to prevent it from flying and possibly injuring persons nearby.

Control Board



Function

1. When the pool or spa heater keypad control is "ON", the LED readout displays the current pool/spa water temperature as determined by the Thermistor mounted in the water inlet header. This water temperature is compared to the user-preset desired temperature, and when the sensed water temperature drops below the pre-set temperature, the digital processor calls for heat.
2. Upon a call for heat, the K1 relay on the operating control closes, supplying 24VAC to pin 1 to J2. Current then flows sequentially through the Water Pressure switch (PS), back through pin 2 of J2 and out through pin 3 of J2 through the high limit switch (HLS), back through pin 4 of J2 and out through pin 5 of J2 through the spare switch jumper, back through pin 6 of J2, and on to pin 7 of J2 and pin 3 of J1.
3. Pin 3 of J1 supplies power to the IND terminal of the burner control, which switches the internal F1/F2 relay to supply 120 VAC power to the combustion air blower. Pin 7 of J2 supplies power to the air flow switch (AFS), which, after it senses the pressure differential created by the combustion air flow, closes and supplies power to pin 8 of J2.
4. 24VAC current flows from pin 8 of J2 to pin 4 of J1, to the TH terminal of the burner controller. This initiates a 20-second heating cycle of the hot surface igniter (HSI). After approximately 20 seconds, when the HSI has reached operating temperature, the VAL terminal of the burner controller is energized, and 24VAC is supplied to pin 5 of J1, and out through pin 1 of J3, through the AGS switch to pin 2 of J3, out through pin 3 of J3, through the Stack Flue Switch (ES2) safety switch jumper to pin 4 of J3, and out through pin 5 of J3 to the gas control, thereby opening the Combustion Gas Control Valve.
5. If any of the PS, HLS, AFS, or ES2 open during the call for heat, the 24VAC is interrupted from the IND and TH terminals, which interrupt power to the blower and gas control. The ignition sequence will resume from the start when the open switch recloses.
6. If the AGS opens during a call for heat, the 24VAC to the gas valve is interrupted, closing the gas valve (or preventing it from opening). The operating control also goes into a lockout state, which requires power to the heater to be turned off and then turned on for the control to resume functioning.

   NOTE: If, while there is line voltage connected to the heater, you touch either line voltage terminal with any 24VAC wire that is connected to the control board (including the Fireman's Switch jumper), you will immediately destroy the control board and void the warranty.

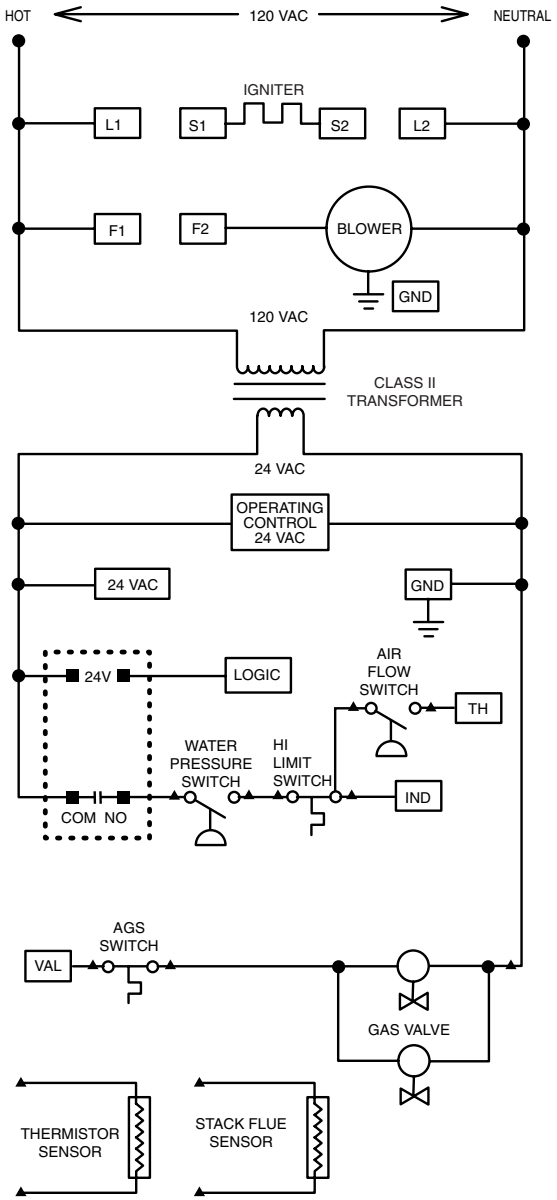
Safety Precautions:

⚠ CAUTION **Chance of electrical shock or fire.** The control board uses 24VAC electricity. Be sure you take all normal precautions for the voltage involved.

Schematic Ladder Wiring Diagram

Heaters built before 4/27/04 (Single Voltage)

LADDER DIAGRAM



NOTES:

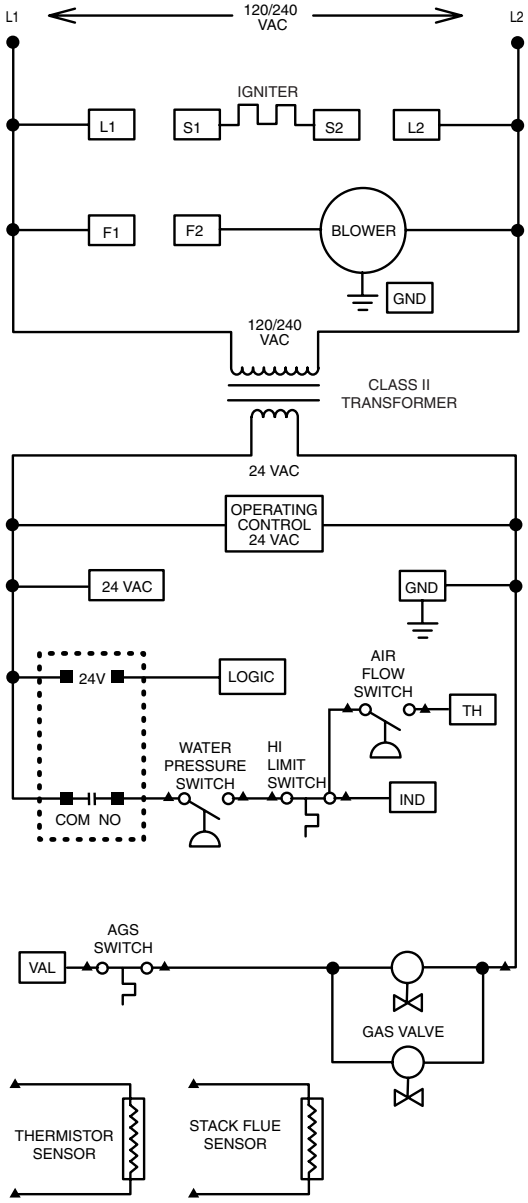
1.) L1 L2 F1 F2 S1 24 VAC S2 GND IND VAL AND TH ARE CONNECTED ON THE IGNITION MODULE.

2.) ▲ PIN AND SOCKET CONNECTOR.

3.) IF ANY OF THE ORIGINAL WIRES AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, THEY MUST BE REPLACED WITH TYPE 105°C OR ITS EQUIVALENT.

Heaters built after 4/27/04 (Dual Voltage)

LADDER DIAGRAM



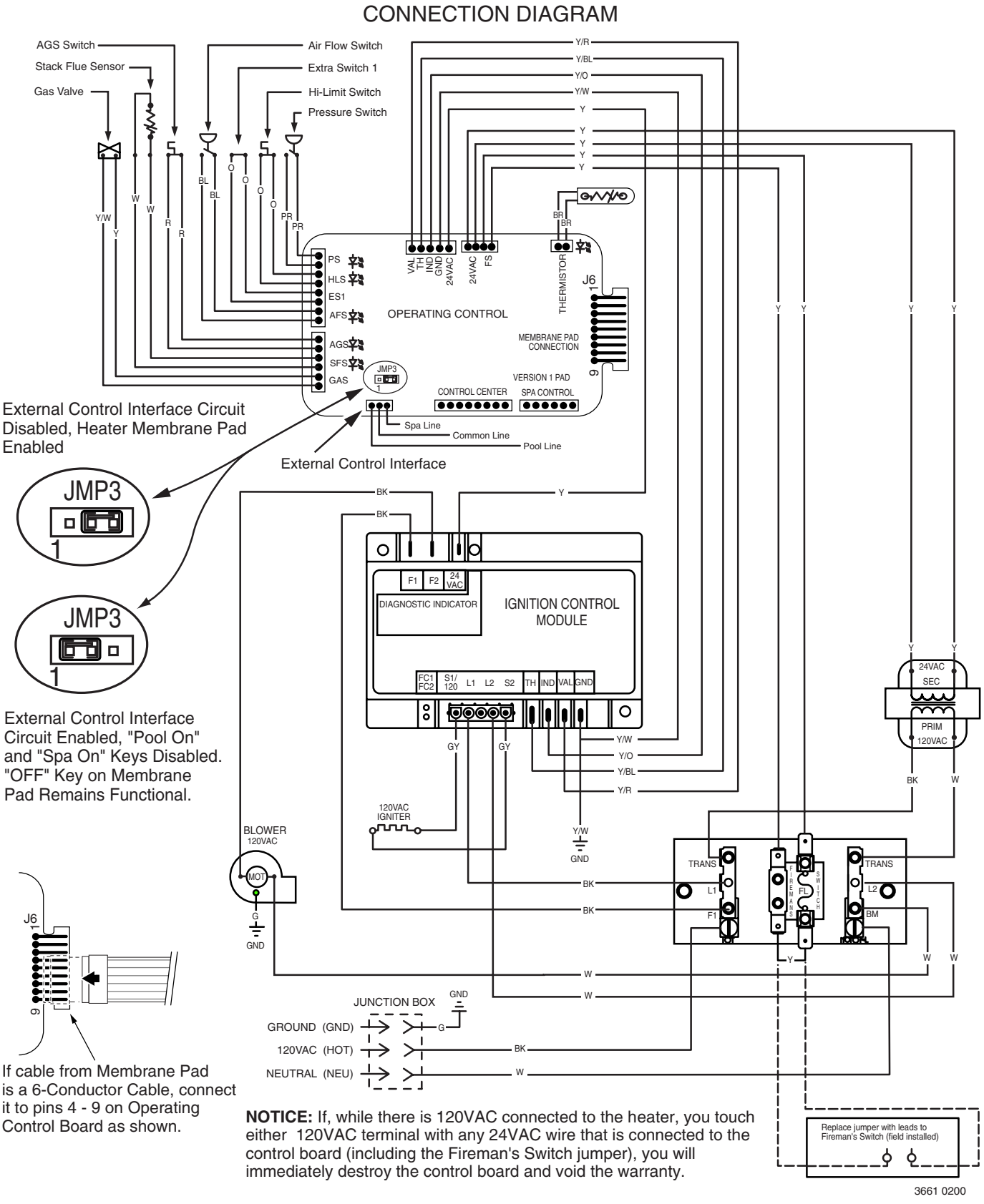
NOTES:

1.) L1 L2 F1 F2 S1 24 VAC S2 GND IND VAL AND TH ARE CONNECTED ON THE IGNITION MODULE.

2.) ▲ PIN AND SOCKET CONNECTOR.

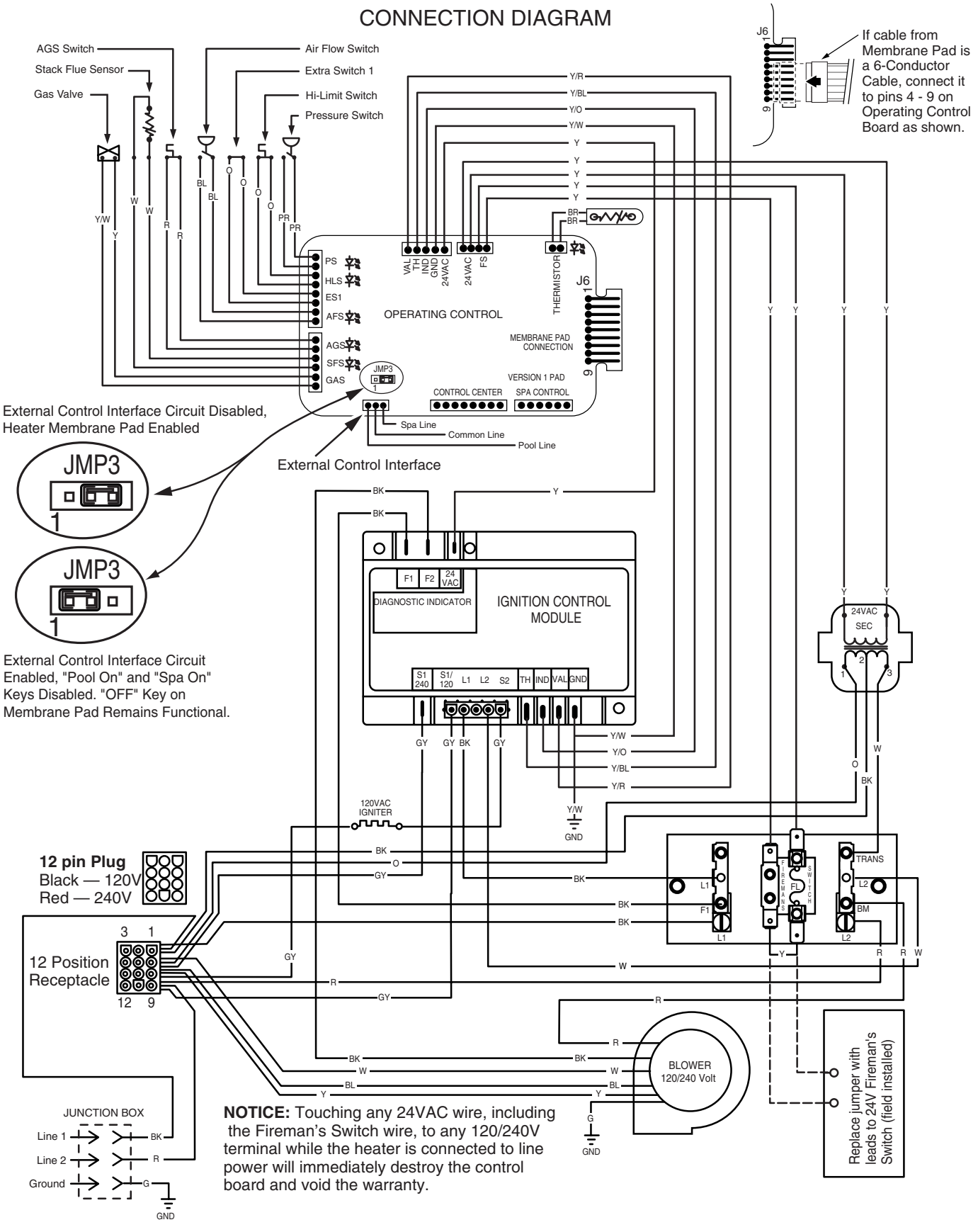
3.) IF ANY OF THE ORIGINAL WIRES AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, THEY MUST BE REPLACED WITH TYPE 105°C OR ITS EQUIVALENT.

Single Voltage Pool Heater Wiring Connection Diagram (115VAC)



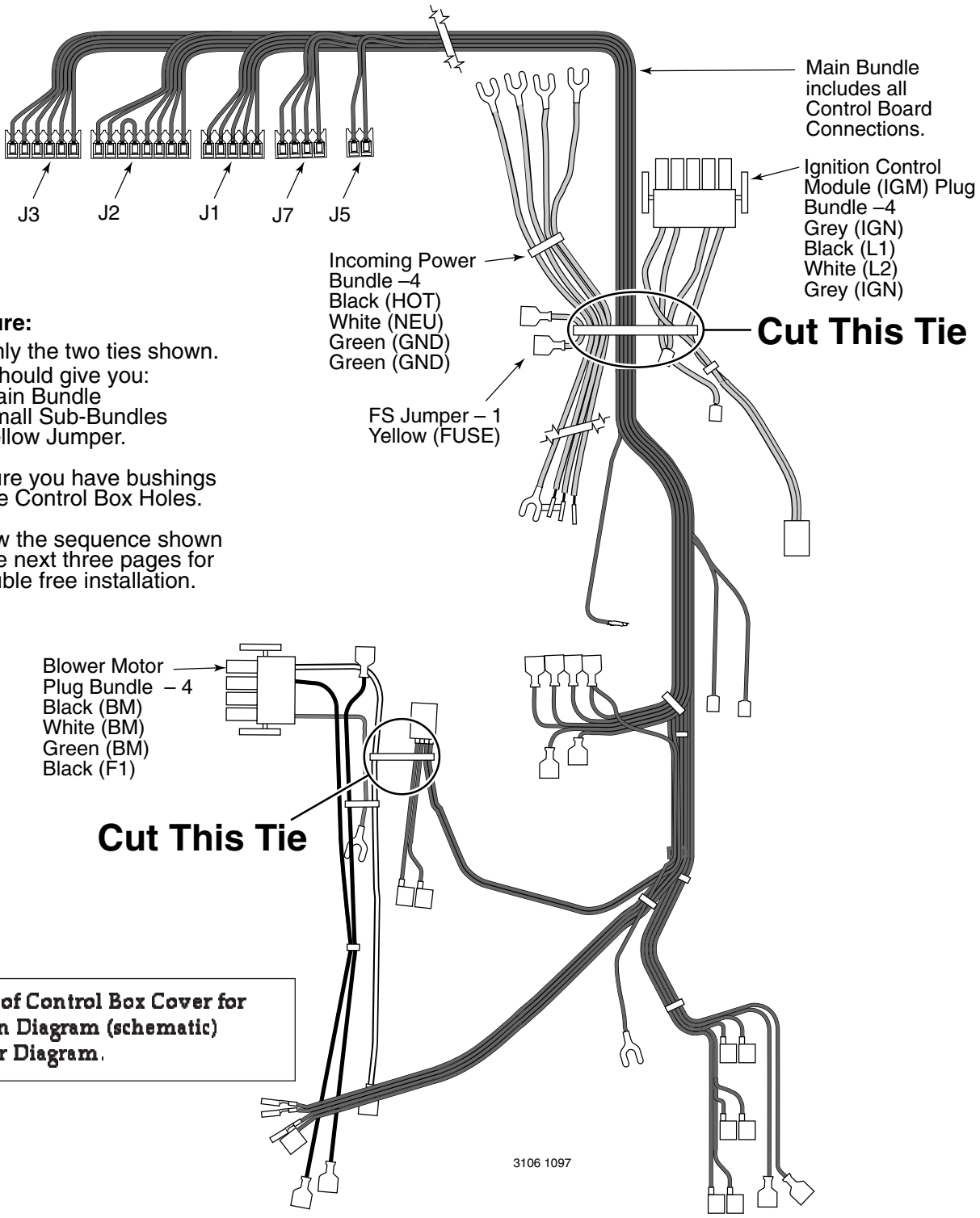
NOTICE: If, while there is 120VAC connected to the heater, you touch either 120VAC terminal with any 24VAC wire that is connected to the control board (including the Fireman's Switch jumper), you will immediately destroy the control board and void the warranty.

Dual Voltage Pool Heater Wiring Connection Diagram (120-240-VAC)



Single Voltage Wiring Harness Connection Instructions

READ ME FIRST!



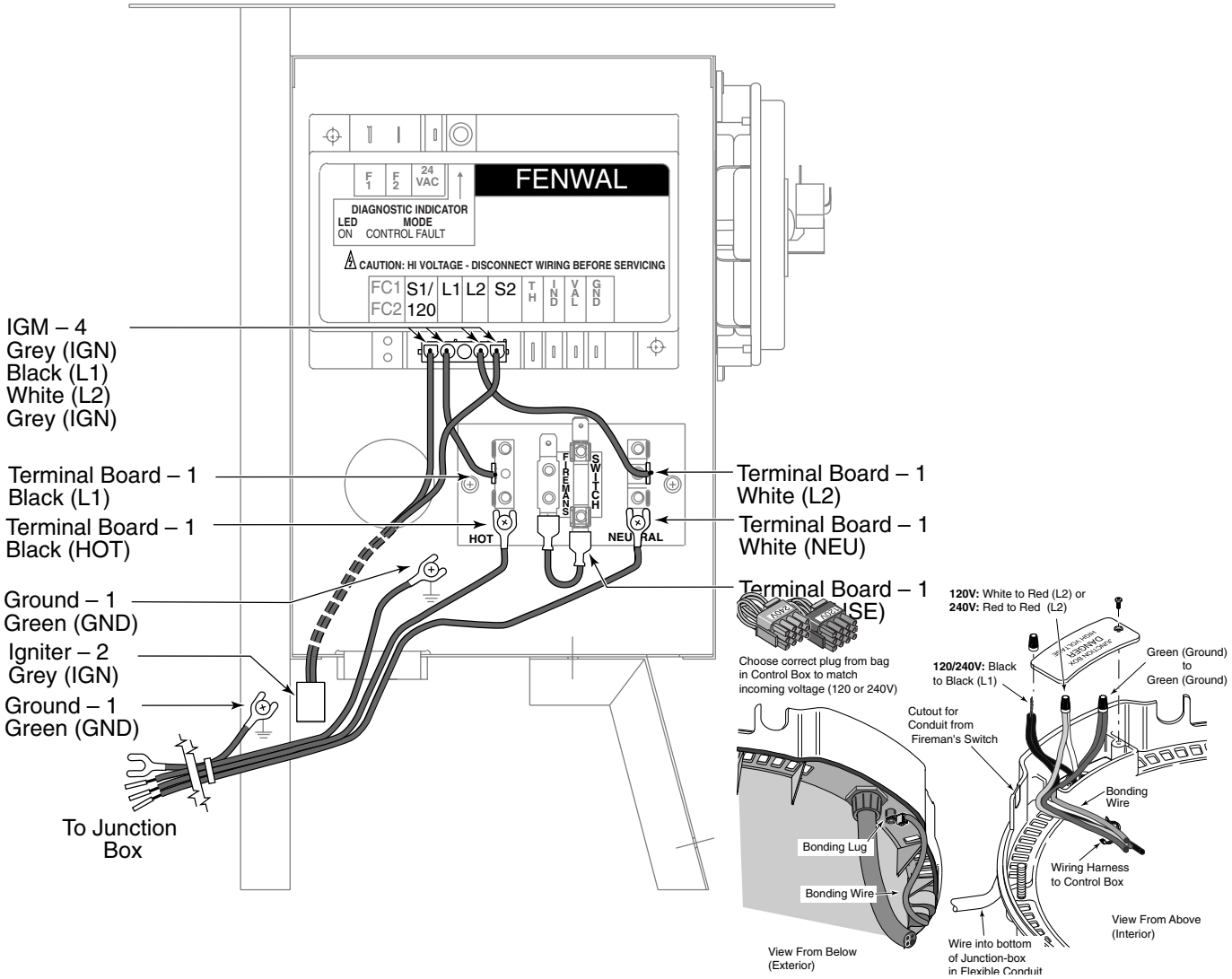
Procedure:

1. Cut only the two ties shown.
   This should give you:
   1 Main Bundle
   3 Small Sub-Bundles
   1 Yellow Jumper.
2. Be sure you have bushings for the Control Box Holes.
3. Follow the sequence shown on the next three pages for a trouble free installation.

See inside of Control Box Cover for Connection Diagram (schematic) and Ladder Diagram.

Single Voltage Wiring Harness Connection Instructions

Step 1



Wiring Procedure

All Wire Ends and Terminals are marked. Match the marks.

1A. Ignition Control Module (IGM) Plug Bundle:

Plug into IGM Board connector. Run L1 and L2 to Terminal Board and 2 Grey IGN's out back of Control Box to Igniter as shown.

1B. Incoming Power Bundle:

A. Connect Ground outside Control Box under screwhead.

B. Run HOT, NEU, and GND up to Terminal Board as shown; fasten under screwheads. Use a bushing in hole in bottom of Control Box.

C. Run other ends of bundle out bottom of Control Box to Junction-Box; hook behind uprights in Bottom Enclosure.

D. Fasten Wire Bundle with a wire tie.

E. Trim excess from wire ends in Junction-Box.

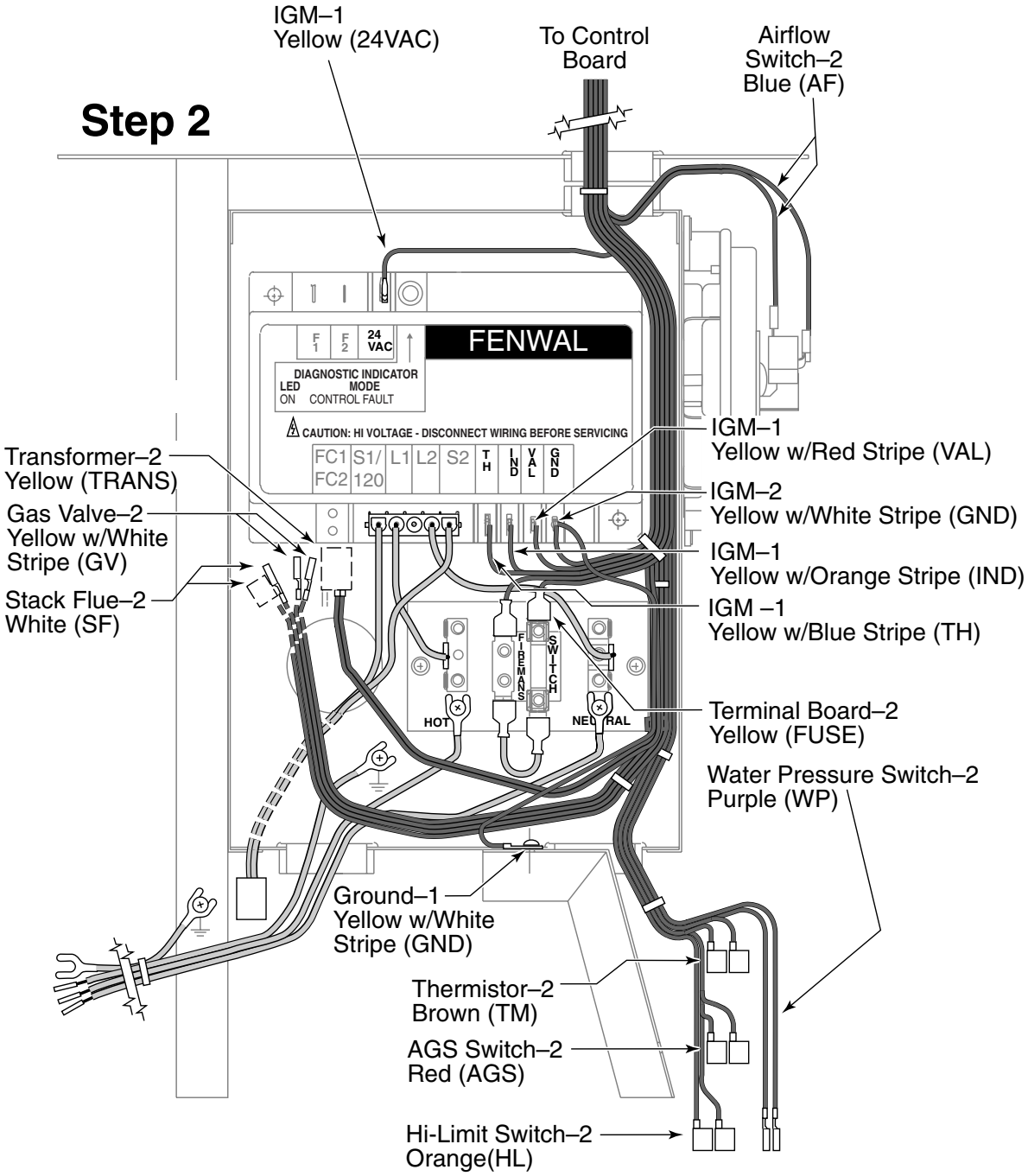
Safety Precautions:

⚠WARNING **Hazardous voltage. Can kill, burn, or shock.** This heater control system uses both 110 volt AC and 24 volt AC. Take all normal precautions for the voltages involved.

Disconnect power from heater before attempting to service, repair, or rewire the electrical system.

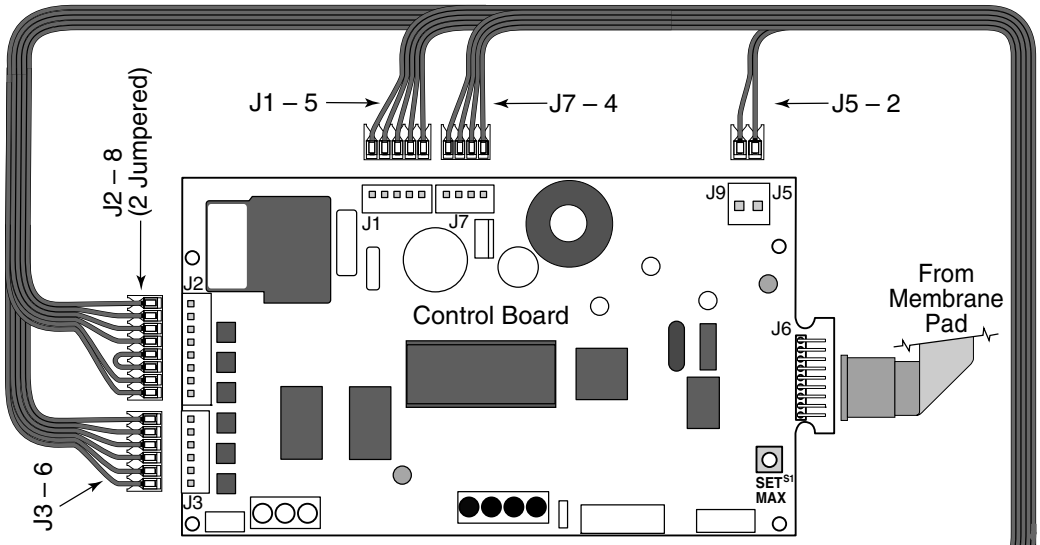
Only trained, qualified service technicians should attempt to service, repair, or rewire the electrical system of this heater.

Single Voltage Wiring Harness Connection Instructions

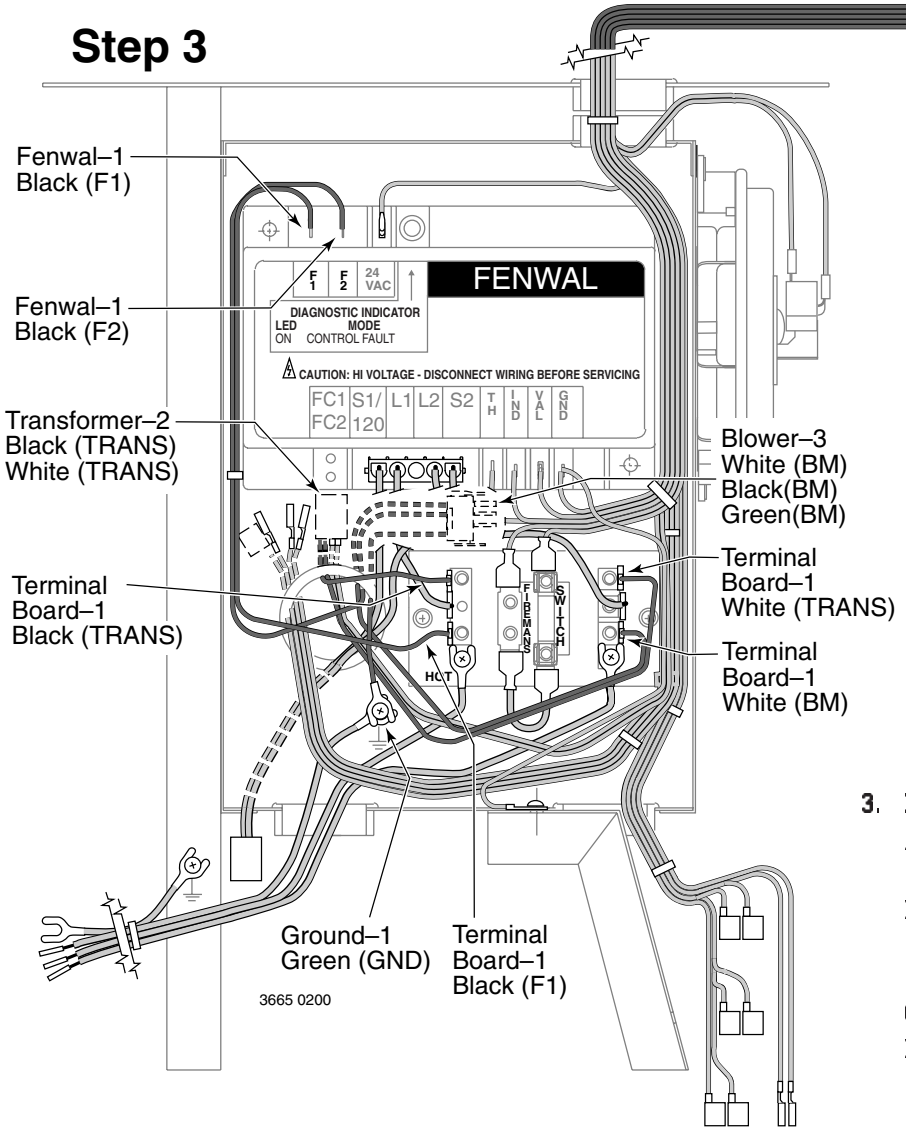


2. **Main Bundle:**
   A. Stuff into slot in top plate and down into Control Box, Control Board ends up.
   B. Add bushing to Control Box and Top Plate.
   C. Make connections as shown above. Don't do Control Board connections yet.
   D. Thread Sub-harness (TM, AGS, HL, WP,) down through bottom of Control Box and out to AGS, Thermistor, Water Pressure Switch, etc.
   E. Thread Yellow TRANS, Yellow GV, and White SF out through the hole on the back of the control box and connect as shown.

Single Voltage Wiring Harness Connection Instructions



Step 3



3. **Blower Motor Bundle:**
   - A. Connect Blower Motor Bundle as shown above.
   - B. Attach plugs to control board as shown. Be sure to observe keying and do not force any connections.
   - C. Check all connections.
   - D. Connect power and run heater through one full cycle to verify correct connections.

Vent Body Retrofit For Enclosed Installations

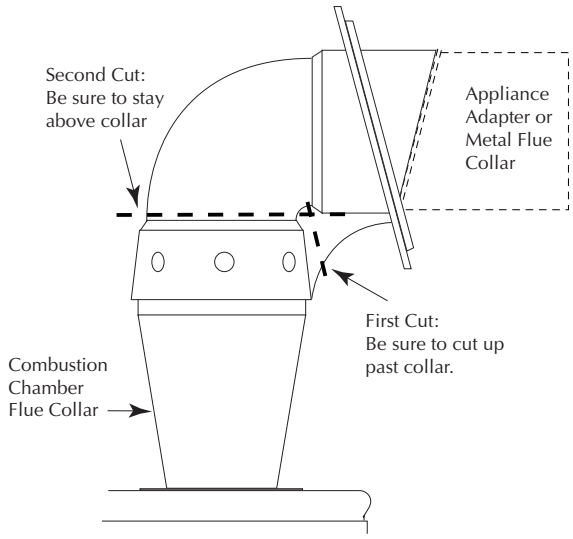
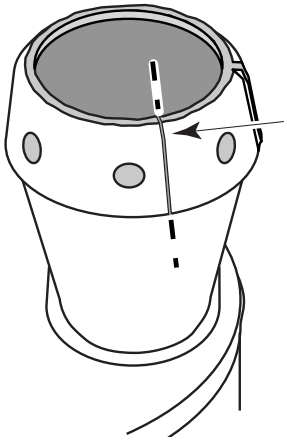
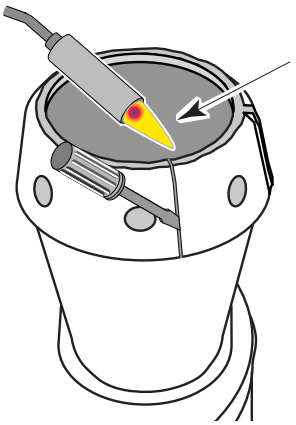


Figure 4-3



Third cut into socket allows you to separate socket from Combustion Chamber Flue Collar. Make cut carefully through socket and part way through epoxy. ***Do not*** cut into Combustion Chamber Flue Collar.

Figure 4-4



Heat metal Flue Collar from inside, starting at the last saw cut. Move torch around inside Flue Collar to soften epoxy.

Figure 4-5: After third cut, heat flue collar and pry plastic collar off. Clean up metal flue collar with torch and screwdriver or putty knife.

Safety Precautions:

⚠WARNING Risk of fire, explosion, and electrical shock. Heater service and repair must be performed by a qualified installer, service agency, or the gas supplier.

⚠WARNING Burn hazard. If heater has been operating, allow it to cool for at least half and hour before touching the Flue Collar or the plastic Vent Body.

⚠WARNING Carbon monoxide hazard. Check all flue and vent pipe joints for leaks.

Probe Installation

⚠WARNING Risk of fire, explosion, and electrical shock. Heater service and repair must be performed by a qualified installer, service agency, or the gas supplier.

Tools Required:

You will need the following tools to make this installation:

1 Reciprocating saw with a 6"x24t Bi-metal blade
1 Propane torch
1 Putty knife
1 Phillips screwdriver
1 Straight-blade screwdriver
1 Electric drill with 5/32" and 3/8" bits
1 Wire brush
1 5" capacity C-clamp
180 grit (or finer) sandpaper
Isopropyl alcohol

NOTE: You must purchase the appropriate Appliance Adapter Kit for your venting installation. Do not try to save and reuse the Appliance Adapter you are removing from the heater.

Retrofit Procedure

1. Turn off the filter pump and all electrical power to the heater.
2. Allow the heater to cool for at least half an hour before proceeding.
3. Unbolt and remove the Upper Left and Upper Right Jackets from the heater.
4. Disconnect the wires from the Stack Flue Switch.
5. Disconnect the vent pipe from the Metal Flue Collar or the Appliance Adapter (see Figure 4-3).
6. Remove the plastic Vent Body and the flue collar or Appliance Adapter with three cuts from a reciprocating saw (see Figures 4-3 and 4-4). Use a 6"x24t bi-metal blade.

(Continued on the next page)

Vent Body Retrofit For Enclosed Installations

(Continued from the preceding page)

7. Heat around the inside of the Combustion chamber Flue Collar with a propane torch to soften the epoxy; peel the plastic collar off the Combustion Chamber Flue Collar and scrape the Flue Collar clean with a putty knife.
8. Remove 3/8-24 plug from the side of the Elbow.
9. Apply UltraCopper®* RTV Silicone (supplied) to the sealing faces of the Probe and its nut and install the Probe in the 3/8" hole in the Elbow (Figure 4-6).
10. Apply UltraCopper®* RTV Silicone to the sealing face of the nut and tighten it onto the Probe from inside the Elbow.

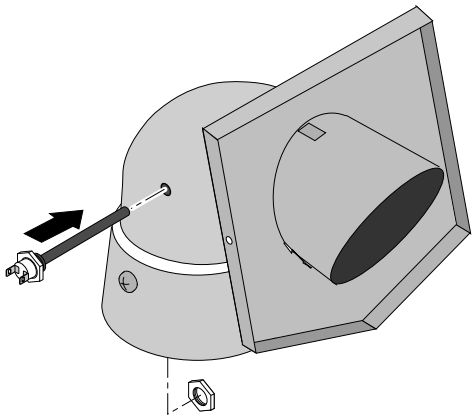


Figure 4-6: Apply 600°F RTV to sealing faces of probe and nut and install probe.

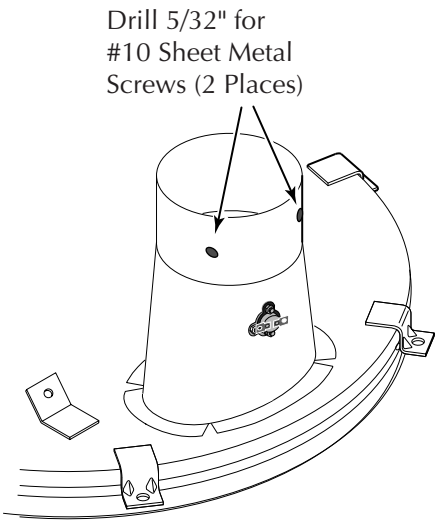


Figure 4-7: Drill Combustion Chamber Flue Collar as shown for Probe and for sheet metal screws for Welded Vent Elbow Assembly.

11. Check the fit between the Elbow and the Combustion Chamber Flue Collar. It should be a close, uniform fit all the way around – not more than 3/16" clearance at any point. If not, the Combustion Chamber Flue Collar is out of round. Use a C-clamp to gently round it up. The Elbow must fit and seat (bottom lip should be 4-3/8" above the Flue Collar flange) before applying any adhesive.
12. Before applying any adhesive to the Metal Elbow or the Combustion Chamber Flue Collar, set the Elbow on the Flue Collar with the Elbow's detent mark aligned with the centerline of the Stack Flue Switch. Drill two 5/32" holes into the Combustion Chamber Flue Collar through the pre-drilled holes on opposite sides of the Elbow (Figure 4-7). These holes will take #10 sheet metal screws to mechanically lock the Elbow to the Combustion Chamber Flue Collar. Don't install the screws yet.
13. The Welded Metal Elbow Assembly is pre-drilled (Figure 4-8) to take #10 sheet metal screws to lock the Appliance Adapter to the Elbow Assembly after it has been RTV glued in place.

(Continued on the next page.)

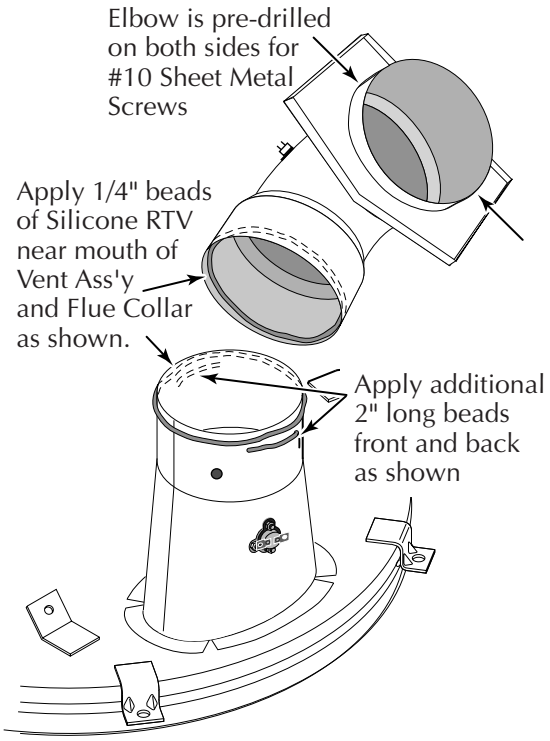


Figure 4-8: Apply Silicone RTV beads as shown. Spread out RTV with a tongue depressor or a rubber gloved finger.

Vent Body Retrofit For Enclosed Installations

(Continued from the preceding page)

14. Remove the Metal Elbow and degrease the gluing surfaces of the Combustion Chamber Flue Collar and the Elbow with isopropyl alcohol. Do not touch these surfaces after they have been degreased.
15. Use the RTV supplied to apply two continuous 1/4" beads of RTV, one all the way around inside the Elbow, and the other all the way around outside the Combustion Chamber Flue Collar. Apply two additional 1/4" beads about 2" long to the Flue Collar, front and back (see Figure 4-8).
16. Use a tongue depressor or a rubber-gloved finger to spread the RTV out uniformly over the gluing surfaces.
17. Install the Elbow; align the Elbow and push straight down on it; Compress the Combustion Chamber Flue Collar until the Elbow is completely bottomed out. The bottom of the Elbow should be 4-3/8" above the Flue Collar flange. The detent mark on the Elbow must align with the centerline of the Stack Flue Switch and the holes must align with the 5/32" holes drilled in the Flue Collar in Step 12 (see Figure 4-7).
18. Apply RTV to two of the #10 sheet metal screws supplied; secure the Elbow to the Flue Collar with them.
19. Some Silicone RTV may squeeze out from under the lip of the Elbow Assembly. If so, pack it back around the bottom edge of the elbow to ensure a good seal, especially at the front and back of the joint. If no Silicone RTV has been squeezed out, apply additional RTV around the outside of the joint and pack it in to make a good seal.
20. Connect the Stack Flue Switch wires to the new Probe. Do not remove the stack flue switch; it is sealed to the Combustion Chamber Flue Collar to prevent carbon monoxide/flue gas leaks.
21. Reinstall the gas vent pipe to the heater, sealing all joints according to local code requirements and the vent manufacturer's instructions. Fasten the Appliance Adapter to the Elbow Assembly with UltraCopper® Silicone RTV and the last two #10 screws provided.

    NOTE: You have about 1/2 hour of working time after making the RTV joint. After the joint starts to cure, wait one hour before testing.
22. After one hour, fire heater for not more than one minute to test for exhaust leaks. Reseal any leaks that are found.
23. Reinstall the Upper Left and Upper Right Jackets on the heater.

    NOTE: Wait 24 hours before firing heater continuously. This will allow the RTV to cure completely before exposing it to heat.

* Loctite Corp, Rocky Hill, CT 06067

Heater Exhaust Temperature Probe Installation

(42001-0405 Kit)

To verify whether Control Board is New or Old

1. Start heater in either pool or spa mode.
2. Allow heater to fire for two or three minutes (if necessary, raise thermostat setting to cause heater to fire).
3. Press and hold for 5 seconds: "Pool On" (in Pool mode) or "Spa On" (in Spa mode).
4. A new Control Board will show the stack flue temperature. An old Control board will continue to show the water temperature.
5. Refer to the chart below for the correct Sensor/Probe to use with your heater's control board. Purchase sensor or probe separately.

	New Board	Old Board
Sensor	OK (Best)	Replace with Probe
Probe	OK (Sensor Preferred)	OK
Stack Flue Switch	Replace with Sensor	Replace with Probe

Replacement Procedure:

1. Turn off the filter pump and all electrical power to the heater.
2. Allow the heater to cool for at least half an hour before proceeding.
3. Unbolt and remove the Upper Left and Upper Right Jackets from the heater.
4. Remove the 3/8-24 plug from the side of the Metal Elbow Assembly.
5. Apply UltraCopper®* RTV Silicone (supplied) to the sealing faces of the Probe and its nut and install the Probe in the 3/8" hole in the Metal Elbow (Figure 4-9).

NOTE: If the heater has a plastic Exhaust Elbow, DO NOT PROCEED FARTHER with this installation. Instead, call Customer Service at 1-800-752-0183 and order a Vent Body Retrofit Kit (See Page 4-38) and replace the plastic elbow with a metal one.

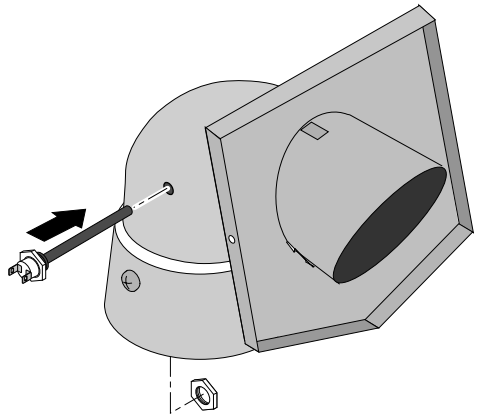


Figure 4-9: Apply 600°F RTV to sealing faces of probe and nut and install probe.

6. Apply UltraCopper®* RTV Silicone to the sealing face of the nut and tighten it onto the Probe from inside the Metal Elbow.

   NOTE: You have about 1/2 hour of working time after spreading the RTV. After the joint starts to cure, wait one hour before testing.
7. Connect the Stack Flue Switch wires to the new Probe. Do not remove the stack flue switch; it is sealed to the Combustion Chamber Flue Collar to prevent carbon monoxide/flue gas leaks.
8. After one hour, fire heater for not more than one minute to test for exhaust leaks. Reseal any leaks that are found.
9. Reinstall the Upper Left and Upper Right Jackets on the heater.

   NOTE: Wait 24 hours before firing heater continuously. This will allow the RTV to cure completely before exposing it to heat.

* Loctite Corp, Rocky Hill, CT 06067

Safety Precautions:

⚠WARNING **Risk of fire, explosion, and electrical shock.** Heater service and repair must be performed by a qualified installer, service agency, or the gas supplier.

⚠WARNING **Burn hazard. If heater has been operating, allow it to cool for at least half and hour before touching the Flue Collar or the Vent Body.**

⚠WARNING **Carbon monoxide hazard. Check all flue and vent pipe joints for leaks.**

Service

Routine maintenance (such as, testing the water pressure relief valve and the water pressure switch) shall be performed:

A. Every 6 months.
B. Every 12 months.
C. At the start of each swimming season.
D. Both A and C above.

Servicing the Controls System

Match each of the control system components with its appropriate function:

____ Air Flow Switch (AFS)
____ Automatic Gas Shutoff (AGS) Switch
____ Ignition Control Module
____ High Limit Switch
____ Control Board
____ Thermistor
____ Transformer
____ Water Pressure Switch

a) This component has a set of diagnostic lights which warn if a safety interlock is open.
b) This switch permits the burner to start only when the water pressure reaches 3 psi.
c) This component provides low-voltage power to the heater.
d) This component will prevent the burner from starting if air flow through the Air Orifice is insufficient.
e) This switch is marked black.
f) This component monitors the inlet water temperature.
g) This component receives line voltage for powering the Blower.
h) This switch is marked red.

Servicing the Burner System

The gas orifice meters the flow of gas to the burner. Indications that too little gas being burned include: (select all that apply)

____ Rough, rumbly burner noise.
____ The indicator light is on.
____ A high-pitched whistle.
____ Pronounced exhaust odor.
____ Delayed or noisy ignition.

The Combustion Air Blower includes the:

A. Air Orifice
B. Air/Gas Mixing Tube
C. Negative-Pressure Regulator
D. both A and B above.

Respond to the following statements "Yes" or "No".

When replacing or reassembling the Combustion Air Blower, use isopropyl alcohol (rubbing alcohol) to check that the blower's outlet flange is tight and not leaking.

Yes____ No____

When burning natural gas, the acceptable level of CO_2 is between 9.2 and 10.5 percent.

Yes____ No____

Match each of the burner system components with its appropriate function:

____ Combustion Air Blower
____ Combination Gas Valve
____ Flameholder
____ Gas Orifice
____ HSI Igniter

a) This component incorporates dual gas shut-off valves and a negative-pressure regulator.
b) This component supports the flame in the combustion chamber.
c) This component supplies air and gas to the combustion chamber.
d) This component is heated electrically to ignite the burner.
e) This component meters the flow of gas to the burner.

Service

Servicing the Water System

Match each of the water system components with its appropriate function:

____ Heat Exchanger
____ Manifold Adapter
____ Inlet/Outlet Manifold
____ Internal Bypass Valve
____ Thermal Governor

a) The inlet and outlet piping is connected to this component by 2-inch union connections.
b) This component is a valve that throttles water flow to maintain the Heat Exchanger outlet temperature above 120° F (49° C).
c) This component compensates for variations in pump flow by opening to allow excess flow to bypass the Heat Exchanger.
d) This component surrounds the flameholder to extract heat from the combustion gases.
e) This component provides plumbing connections and houses the Thermal Governor and the Internal Bypass Valve.

Respond to the following statements "Yes" or "No".

The Manifold Adapter should be removed for routine cleaning.

Yes____ No____

When reinstalling the Manifold Adapter, the O-rings on the Heat Exchanger tubes should be replaced.

Yes____ No____

If any one of the Heat Exchanger tubes is damaged, the entire Heat Exchanger must be replaced.

Yes____ No____

The Thermal Governor is non-serviceable. It must be replaced if defective.

Yes____ No____

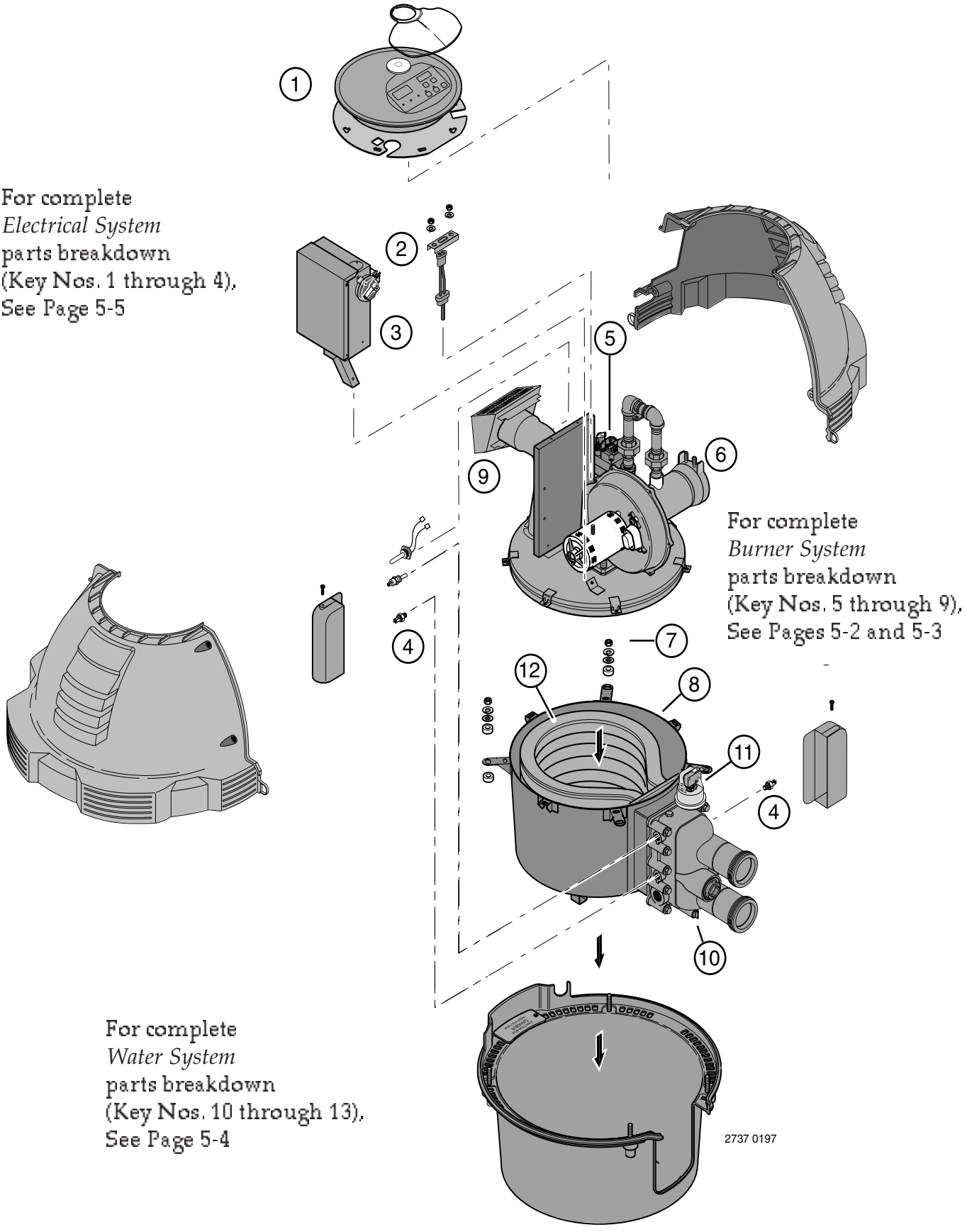
Before servicing or replacing the Internal Bypass Valve, the Manifold Adapter must be removed.

Yes____ No____

A plastic exhaust elbow should be replaced with a metal elbow as soon as possible.

Yes____ No____

Repair Parts



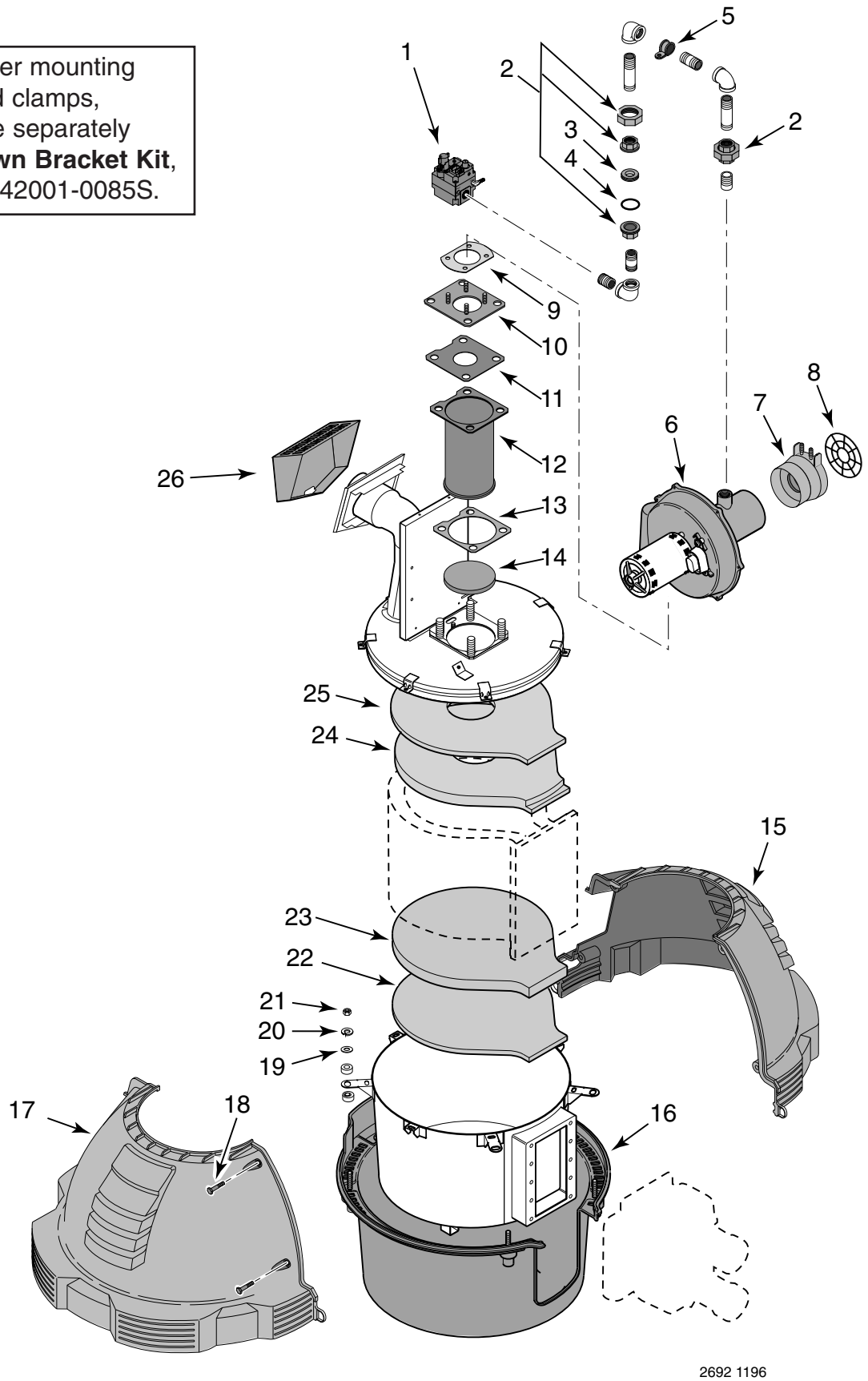
For complete
Electrical System
parts breakdown
(Key Nos. 1 through 4),
See Page 5-5

For complete
Burner System
parts breakdown
(Key Nos. 5 through 9),
See Pages 5-2 and 5-3

For complete
Water System
parts breakdown
(Key Nos. 10 through 13),
See Page 5-4

Repair Parts – Burner System

For Heater mounting bolts and clamps, purchase separately **Bolt Down Bracket Kit**, Part No. 42001-0085S.

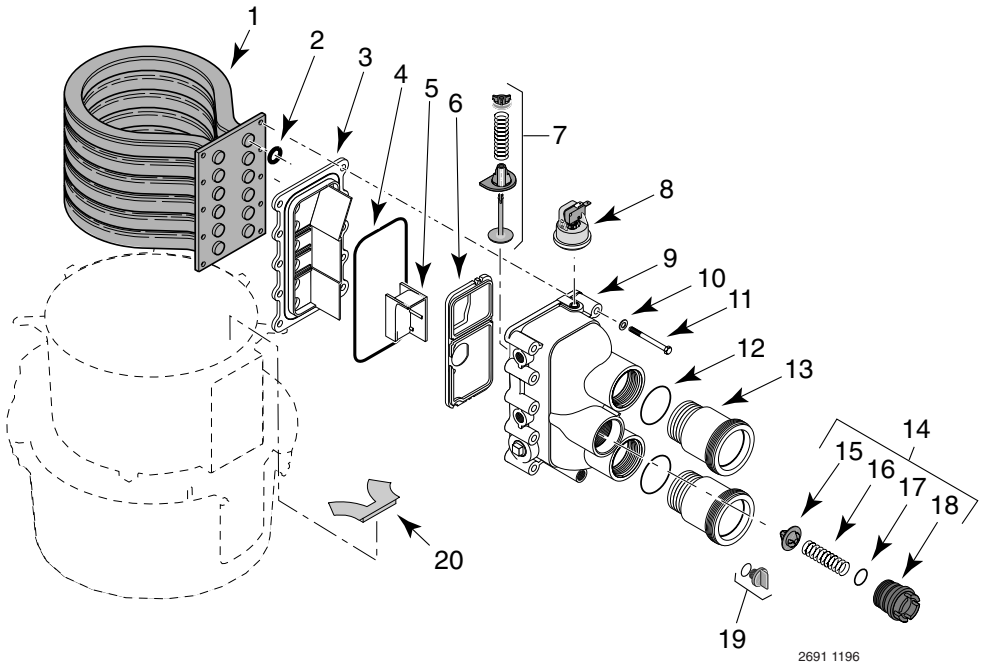


Repair Parts – Burner System

Key No.	Part Description	Qty.	Model		
			SR200NA SR200LP SRC200NA SRC200LP	SR333NA SR333LP SRC333NA SRC333LP	SR400NA SR400LP SRC400NA SRC400LP SR400HD
1	Combination Gas Control Valve Kit	1	42001-0051S	42001-0051S	42001-0051S
2	3/4" Union	2	38404-4097S	38404-4097S	38404-4097S
•	Gas Orifice Kit – NG (Incl. Key Nos. 3 and 4)†		77707-0331	77707-0321	77707-0311
3	Gas Orifice – NG*	1	42001-0331	42001-0321	42001-0311
4	Gas Orifice O-Ring	1	U9-370	U9-370	U9-370
•	Gas Orifice Kit – LPG (Incl. Key Nos. 3 and 4)†		77707-0361	7707-0351	77707-0341
3	Gas Orifice – LPG*	1	42001-0361	42001-0351	42001-0341
4	Gas Orifice O-Ring	1	U9-370	U9-370	U9-370
•	NG to LPG Conversion Kit (Incl. Key Nos. 3 and 4)†		77707-1361	77707-1351	77707-1341
3	Gas Orifice – NG*	1	42001-0361	42001-0351	42001-0341
4	Gas Orifice O-Ring	1	U9-370	U9-370	U9-370
•	Conversion Instructions, NG to LPG*	1	S402	S402	S402
•	NP to LPG Conversion Decal*	1	32165-4082	32165-4082	32165-4082
•	LPG to NG Conversion Kit (Incl. Key Nos. 3 and 4)†		77707-1331	77707-1321	77707-1311
3	Gas Orifice – LPG*	1	42001-0331	42001-0321	42001-0311
4	Gas Orifice O-Ring	1	U9-370	U9-370	U9-370
•	Conversion Instructions, LPG to NG*	1	S403	S403	S403
•	LPG to NG Conversion Decal*	1	32165-4083	32165-4083	32165-4083
5	Gas Piping Clamp Kit	1	31786-4019S	31786-4019S	31786-4019S
6	Air Blower Kit	1	42001-0206S	42001-0206S	42001-0206S
7	Endcap/Air Orifice – Inlet Mixing Tube	1	77707-0091	77707-0092	77707-0093
8	Endcap Mixing Tube Grill	1	42001-0094S	42001-0094S	42001-0094S
•	Blower/Adapter Plate Gasket Kit (Includes Key Nos. 9, 11, 13)	1	77707-0011	77707-0011	77707-0011
9	Blower/Adapter Plate Gasket*	1	42001-0067	42001-0067	42001-0067
10	Blower Adapter Plate	1	42001-0090	42001-0090	42001-0090
•	Flameholder Kit (Includes Key Nos. 11, 12, 13, 14)		77707-0202	77707-0203	77707-0204
11	Flameholder/Adapter Plate Gasket*	1	42001-0084	42001-0084	42001-0084
12	Flameholder Assembly*	1	42001-0202	42001-0203	42001-0204
13	Flameholder/Combustion Chamber Gasket	1	42001-0065	42001-0065	42001-0065
14	Flameholder Insulation Cap	1	42001-0075	42001-0075	42001-0075
•	Flameholder Insert (Included with Flameholder Kit)*	1	–	42001-0027	42001-0027
•	Condensate Evaporator	1	42001-0031	42001-0031	42001-0031
15	Upper RH Heater Enclosure Kit**		77707-0002	77707-0002	77707-0002
16	Lower Enclosure	1	42001-0001S	42001-0001S	42001-0001S
•	Upper Enclosure Gasket	1	33457-1051S	33457-1051S	33457-1051S
17	Upper LH Heater Enclosure Kit-NG	1	77707-3200N	77707-3333N	77707-3400N
17	Upper LH Heater Enclosure Kit-LPG	1	77707-3200L	77707-3333L	77707-3400L
18	Upper Enclosure Fastener Kit	1	77707-0007	77707-0007	77707-0007
19	3/8" Flat Washer	4	U43-62SS	U43-62SS	U43-62SS
20	3/8" Lock Washer	4	U43-12SS	U43-12SS	U43-12SS
21	3/8" Hex Nut	4	U36-38SSW	U36-38SSW	U36-38SSW
•	Insulation Kit (Includes Key Nos. 22, 23, 24, 25, and Condensate Evaporator, Page 5-4)	1	77707-0008	77707-0008	77707-0008
22	1/2" Insulation Blanket*††	1	42001-0073	42001-0073	42001-0073
23	1" "M" Insulation*	1	42001-0072	42001-0072	42001-0072
24	1" Top Insulation*	1	42001-0070	42001-0070	42001-0070
25	1/2" Insulation Blanket*	1	42001-0071	42001-0071	42001-0071
•	Lower Enclosure Insulation	1	42001-0074S	42001-0074S	42001-0074S
26	Metal Vent Cover	1	42001-0021S	42001-0021S	42001-0021S
•	3/8-24x1/2" Hex Head Capscrew	1	37006-4277	37006-4277	37006-4277
•	Metal Exhaust Elbow Kit	1	42001-0209S	42001-0209S	42001-0209S
•	One-Piece Metal Elbow/Cover Assembly	1	42001-0214S	42001-0214S	42001-0214S

* Not available separately.
** Kit parts not available separately.
• Not illustrated.
† Not included with heater. Order separately.
†† SR/SRC200 uses 2.

Repair Parts – Water System

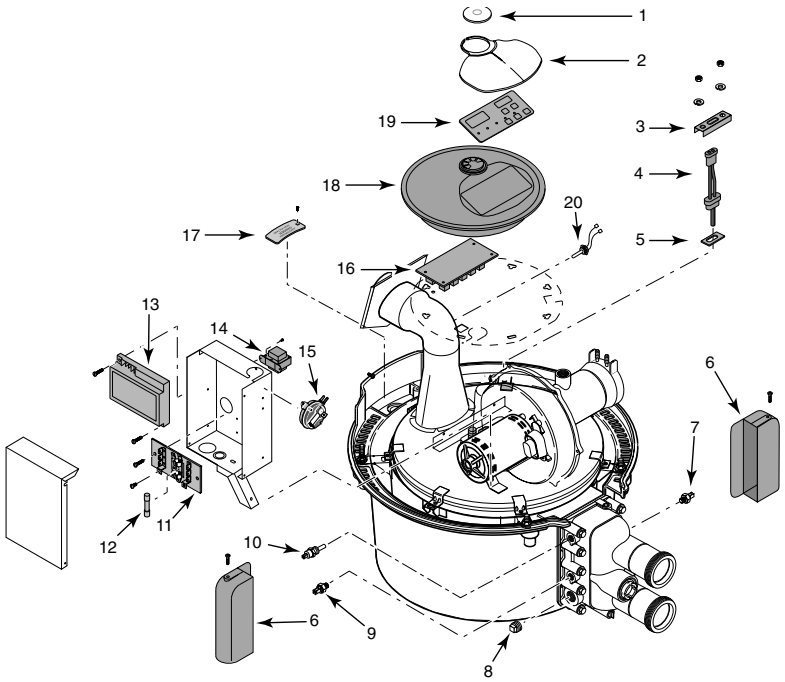


Key No.	Part Description	Qty.	Model		
			SR200NA SR200LP SRC200NA SRC200LP	SR333NA SR333LP SRC333NA SRC333LP	SR400NA SR400LP SRC400NA SRC400LP SR400HD
1	Tube Sheet Coil Assembly Kit – NA and LP Series (Includes Key No. 2)	1	77707-0232	77707-0233	77707-0234
1	Tube Sheet Coil Assembly Kit – HD Series (Includes Key No. 2)	1	–	–	77707-0244
2	Coil/Tubesheet Sealing O-Ring Kit	( )	77707-0117(6)	77707-0118(10)	77707-0119(12)
3	Manifold Bottom Plate	1	42002-0015	42002-0016	42002-0017
4	Manifold O-Ring*	1	35505-7437	35505-7437	35505-7437
•	O-Ring Kit (Incl. Key Nos. 2, 4)	1	77707-0120	77707-0120	77707-0120
5	Manifold Insert*	1	42002-0018	42002-0019	42002-0020
6	Manifold Baffle Plate*	1	42002-0013	42002-0014	42002-0022
7	Manifold Bypass Valve Kit	1	77707-0001	77707-0001	77707-0001
8	Water Pressure Switch	1	42001-0060S	42001-0060S	42001-0060S
9	Manifold Body with Safeties** (Incl. Key Nos. 10, 11)	1	77707-0205	77707-0205	77707-0205
9	Manifold Body Only (Incl. O-Ring Kit)	1	77707-0206	77707-0206	77707-0206
10	5/16 Flat Washer	10	U43-41SS	U43-41SS	U43-41SS
11	5/16-18x2-3/4" Hex Capscrew	10	37007-0214	37007-0214	37007-0214
12	Connector Tube O-Ring	1	U9-226	U9-226	U9-226
13	Connector Tube Kit (Includes O-Ring)	1	77707-0017	77707-0017	77707-0017
14	Thermal Regulator Kit (Incl. Key Nos. 15, 16, 17, 18 and Spring Clip)	1	77707-0010	77707-0010	77707-0010
15	Thermal Regulator (Includes Spring Clip)	1	38000-0007S	38000-0007S	38000-0007S
16	Thermal Regulator Spring*	1	37607-0011	37607-0011	37607-0011
17	Thermal Regulator Cap O-Ring	1	35505-1313	35505-1313	35505-1313
•	Thermal Regulator Spring Clip*	1	42001-0097	42001-0097	42001-0097
18	Thermal Regulator Cap*	1	42001-0016	42001-0016	42001-0016
19	Drain Plug	1	U178-920P	U178-920P	U178-920P
20	Condensate Evaporator*	1	42001-0031	42001-0031	42001-0031

* Not available separately. • Not illustrated.

** See Page 5-5 Key Nos. 7, 8, 9 and 10 for Safeties and Relief Valve Plug.

Repair Parts – Electrical System



Key No.	Part Description	Qty.	Model		
			SR200NA SR200LP SRC200NA SRC200LP	SR333NA SR333LP SRC333NA SRC333LP	SR400NA SR400LP SRC400NA SRC400LP SR400HD
•	Display Cover Retainer Cap Kit (Incl. Key No. 1)*		77707-0009	77707-0009	77707-0009
1	Display Cover Retainer Cap	1	42001-0009	42001-0009	42001-0009
•	CPSC Warning Label	1	32165-4084	32165-4084	32165-4084
2	Heater Display Cover	1	42001-0008S	42001-0008S	42001-0008S
3	Igniter Bracket	1	42001-0030S	42001-0030S	42001-0030S
•	Igniter/Igniter Gasket Kit (Incl. Key Nos. 4 and 5)		77707-0054	77707-0054	77707-0054
4	Igniter**	1	42001-0054	42001-0054	42001-0054
5	Igniter Gasket	1	42001-0066S	42001-0066S	42001-0066S
6	Manifold Switch Cover	2	42001-0007S	42001-0007S	42001-0007S
7	Automatic Gas Shutoff Switch (AGS)	1	42002-0025S	42002-0025S	42002-0025S
8	3/4" Hex Head Pipe Plug	1	WC78-38AT	WC78-38AT	WC78-38AT
9	High Limit Switch	1	42001-0063S	42001-0063S	42001-0063S
10	Thermistor	1	42001-0053S	42001-0053S	42001-0053S
11	Terminal Board	1	42001-0056S	42001-0056S	42001-0056S
12	Fireman's Switch Fuse (1.25A, 1-1/4")	1	32850-0099	32850-0099	32850-0099
13	Ignition Control Module	1	42001-0052S	42001-0052S	42001-0052S
14	Transformer	1	42001-0057S	42001-0057S	42001-0057S
15	Air Flow Switch	1	42001-0059S	42001-0059S	42001-0059S
16	Control Board Kit	1	42001-0096S	42001-0096S	42001-0096S
•	#6-19x5/16" Phil Pan	4	37337-0092	37337-0092	37337-0092
•	Heater Wiring Harness	1	42001-0058S	42001-0058S	42001-0058S
•	Junction Box Cover Kit (Incl. Key No. 17)*		77707-0022	77707-0022	77707-0022
17	Junction Box Cover	1	42001-0022	42001-0022	42001-0022
•	Junction Box Wiring Decal	1	32165-4081	32165-4081	32165-4081
•	Control Bd Encl/Membrane Panel Kit (Incl. Key Nos. 18 and 19)*		77707-0004	77707-0004	77707-0004
18	Control Board Enclosure	1	42001-0004	42001-0004	42001-0004
19	Membrane Pad**	1	42001-0055	42001-0055	42001-0055
20	Stack Flue Sensor	1	42002-0024S	42002-0024S	42002-0024S

* Kit parts not available separately.

** Not available separately.

*** Available separately.

• Not illustrated.

Glossary

AGA - American Gas Association. The certifying body for gas-fired appliances.

Air Flow Switch - The switch that senses the pressure drop across the air orifice. It will prevent or stop combustion by causing the gas valve to stay closed or close if air flow is insufficient for combustion.

Air Gas Mixing Tube (Air Gas Mixer) - The tube on the inlet side of the combustion blower where the air and gas are mixed together.

Air Orifice - The metering hole in the plate inside the blower inlet endcap. It meters the correct amount of air for combustion.

ANSI - American National Standards Institute. Develops industry wide voluntary standards for safety, signage, measurements, etc.

Automatic Gas Shutoff Switch (AGS) - The switch that senses the outlet water temperature and causes the gas valve to close if the water temperature exceeds 150° F (65.5° C).

British Thermal Unit (BTU) - The amount of heat required to raise the temperature of 1 pound of water 1° Fahrenheit.

Bonding Lug - An electrical connector mounted on the exterior of the heater to which the bonding conductor for the pool system is connected.

Burner Control Module - See Ignition Control.

Check Valve - A valve that allows for the flow of water in only one direction.

Combustion Chamber - The entire sealed portion of the appliance within which combustion occurs. It contains the heat exchanger.

Condensate - The liquid which separates from a gas (including flue gases) due to a reduction in temperature.

Control Board - The electronic circuit board that works in conjunction with the thermistor as the heater thermostat. It also contains the remote communications circuitry.

Combination Gas Control Valve - The regulator to a) maintain gas outlet pressure and b) turn the gas off and on to the heater. It has dual shutoff valves.

Combustion Air Blower (Mixing Blower) - The motor-driven blower that supplies the correct air/gas mixture to the gas burner/flameholder.

Draft - The flow of gases or air through chimney, flue, or equipment caused by pressure differences.

Draft Hood - A device built into the heater or made a part of the vent connector to: a) provide for the ready escape of flue gases in the event of no draft, backdraft or stoppage beyond the draft hood; b) prevent a back draft from entering the heater; and c) neutralize the effect of stack action of the chimney or gas vent upon the operation of the appliance. The Sta-Rite pool heater has a pressurized burner and does not use a draft hood.

Excess Air - Air supplied for combustion beyond that which is required for perfect combustion.

Fireman's Switch - A switch external to the heater that keeps the pool pump running for 15 minutes after the heater shuts off.

Flameholder - A cylindrical perforated can that supports the combustion of the air/gas mixture. Combustion takes place just off the flameholder's surface.

Flue Gases - The products of combustion (including the excess air) which flow out the heater exhaust.

Gas Orifice - A disk with a hole in it located in a gas line union. It meters the correct flow of gas for combustion. Kits are available to convert heaters from Propane to Natural Gas and vice versa, and also to correct combustion problems.

Heat Exchanger - The series of finned copper tubes that carry water internally. It is contained in the combustion chamber and allows for the transfer of heat from the combustion gases to the water.

Heating Value (High or Total) - The number of British thermal units produced by the combustion, at constant pressure, of 1 cubic foot ($0.03m^3$) of gas when the products of combustion are cooled to the initial temperature of the gas and air, when the water vapor formed during the combustion is condensed, and all corrections to standard conditions have been made. This value for natural gas is approximately 1,000 BTU per cubic foot. For Liquefied Petroleum Gas (Propane) it is about 2,500 BTU per cubic foot.

Heating Value (Low) - The same as the High or Total Heating Value when the water vapor is not condensed, resulting in a lower value. This value is approximately 900 BTU per cubic foot for natural gas and 2,300 BTU per cubic foot for Liquefied Petroleum Gas (Propane).

High Limit Switch - The switch that senses the outlet water temperature and causes the gas valve to close if water temperature exceeds 135° F (57.2° C). The setting of this switch is lower than that of the AGS.

Hot Surface Igniter - Ignition of the gas/air mixture caused by an electrically heated element whose surface gets hot enough to ignite the air/gas mixture, without any sparks or pilot lights.

Igniter - A device which uses electrical energy to ignite gas.

Inlet/Outlet Manifold - The manifold to which the inlet and outlet water lines are connected. It contains an internal water bypass valve to maintain correct water flow to the heater. It routes the water into and out of the heat exchanger tubes and houses the High Limit Switch, Automatic Gas Shutoff, and Thermistor. It also contains the thermal governor, which minimizes condensation on the heat exchanger.

Input Rating - The gas burning capacity of an appliance in BTUs per hour.

Internal Bypass Valve - The valve in the inlet/outlet manifold that automatically controls the water flow through the heat exchanger. It causes the excess flow to bypass the heat exchanger, so that it mixes with the heater water as the water leaves the heater.

Limit Switches or Limit Controls - Devices responsive to changes in pressure, temperature, or liquid level for turning on, shutting off, or throttling the gas supply to an appliance.

Manifold Adapter (obsolete) - A transition piece located between the inlet/outlet manifold and the heat exchanger tubes. See inlet/outlet manifold.

Membrane Pad - The control panel at the top of the heater where the operating temperature and heating function selections are made.

NFPA - National Fire Protection Association. Publishers of National Electrical Code (NEC) and National Fuel Gas Code (NFGC). For more information, call 1-800-344-3555.

Orifice - The opening in a cap, spud, disk, or other device whereby the flow of a gas is limited.

Pressure Relief Valve - A valve mounted on the manifold adapter that will automatically open at a preset pressure. For the Sta-Rite heater the rating is 50 psi (345 kPa). This must be an ASME valve with a minimum BTU rating equal to that of the heater.

Pressure Switch - A switch that senses the inlet water pressure. It causes the gas valve to close or prevents it from opening if the water pressure is less than the switch set point.

Primary Air - The air introduced into a burner that mixes with the gas before it reaches the port.

Safety Shutoff Device - A device that will shut off the gas supply to the burner(s) in the event the source of ignition fails.

Secondary Air - Air externally supplied to the flame at the point of combustion, generally only in a natural draft unit.

Thimble - A device used for the penetration of a wall through which the vent piping is run.

Transformer - An electrical device that converts line voltage (120 VAC) to low voltage (24 VAC). It provides low voltage for the safety switch circuits and for the control board.

Vent Body - The plastic elbow designed for the attachment of a vent connector or the venting system.

Read Me First!!

NOTE: Connecting a **single-voltage** (115VAC) heater to a 240VAC line, or installing the **black 120** volt plug in the control box of a dual-voltage heater and then connecting the heater to a **240 volt** line, **will destroy the transformer, control board, and ignition control module, and will void the warranty.** If you install the red 240 volt plug in a dual-voltage heater and then connect the heater to a 120 volt line, the heater will not operate.

READ THE FOLLOWING CAREFULLY:

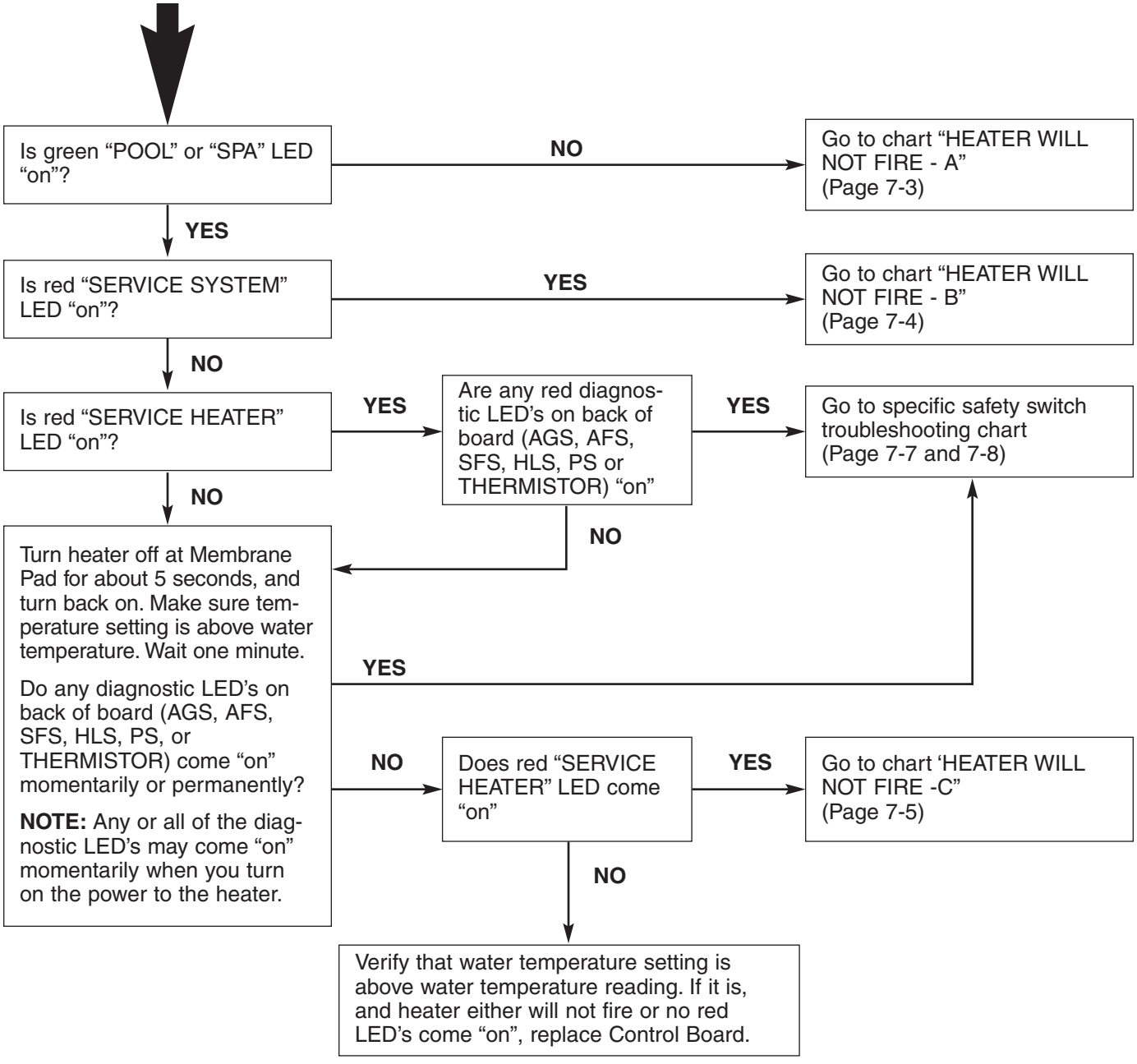
1. Check the line voltage to your heater. Single-voltage heaters operate on 120VAC ONLY. Dual-voltage heaters will operate on either 120 Volts AC or 240 Volts AC.
2. Remove the covers and check for a 12-pin plug in the back of the control box.

   A. If the control box does *not* take a plug, the heater is a single-voltage heater and will operate on 120VAC ONLY.

   B. If the control box *does* take a plug, the heater is dual-voltage. The plug must match the incoming line voltage. The **BLACK** plug is for **120 volts**, the **RED** plug is for **240 volts**.
3. If the 12-pin plug is not plugged into the back of the control box, select the correct plug from the bag in the control box and plug it in. The **BLACK** plug is for **120 volts**, the **RED** plug is for **240 volts**.

Initial Troubleshooting

Start here for directions to specific Troubleshooting Chart



STACK FLUE TEMPERATURE

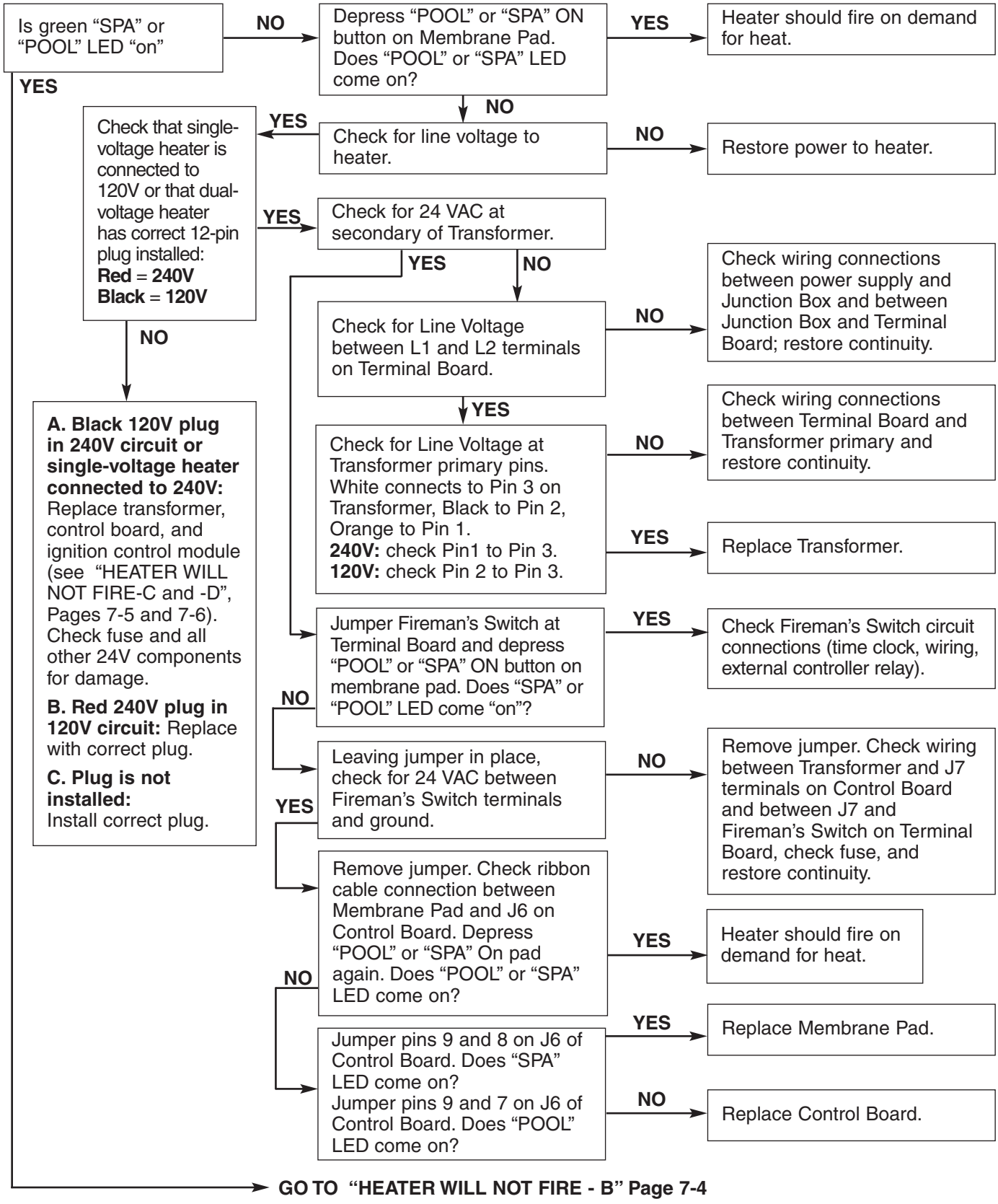
Can indicate good operation or can show problems. See Page 4-11 for more information.

⚠WARNING **Hazardous voltage. Can shock, burn or kill.** Disconnect power before servicing any components.

⚠WARNING **Fire and Explosion hazard.** Do not jumper switch terminals to remedy a failed safety switch.

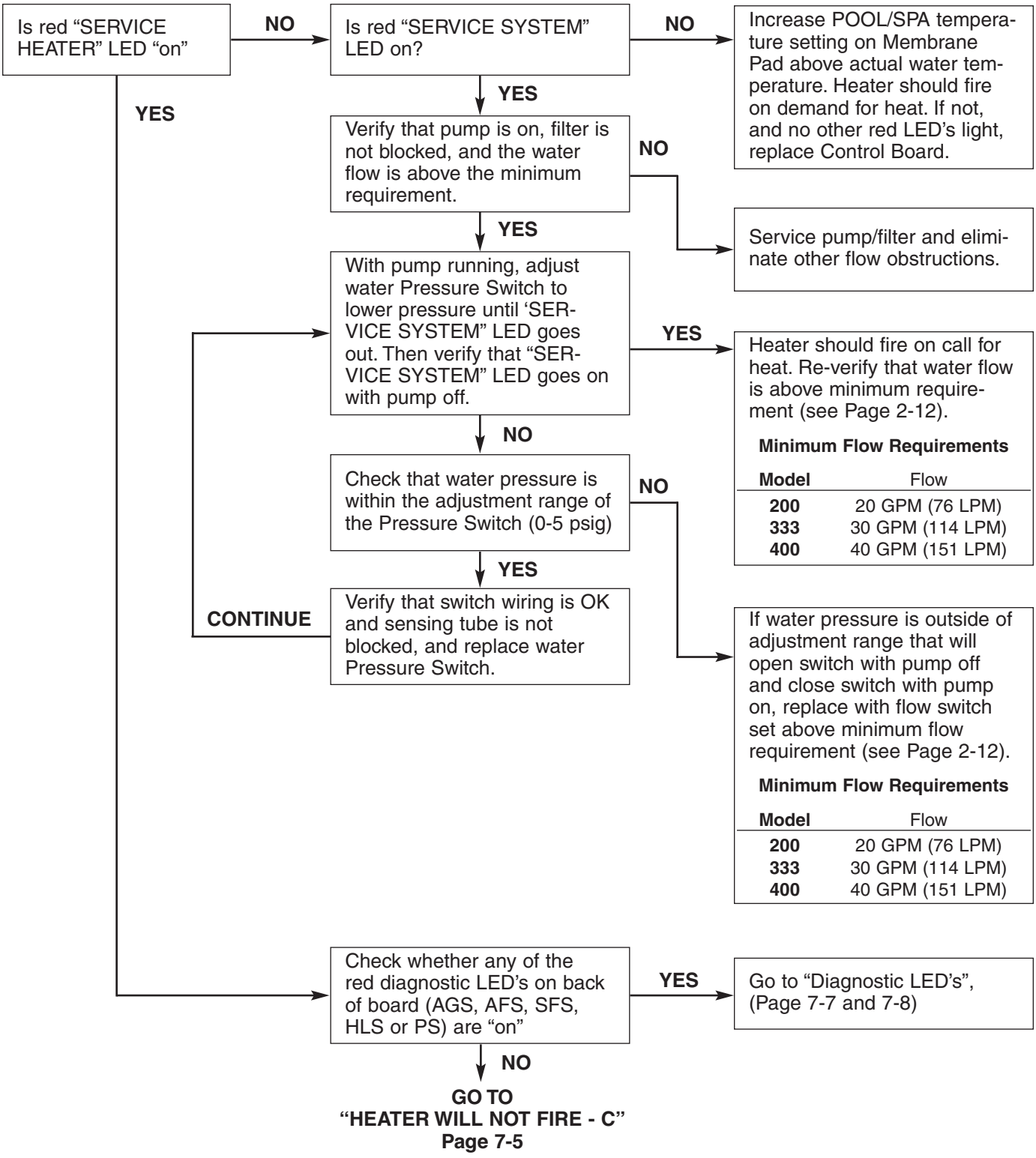
Heater Will Not Fire - A

Start



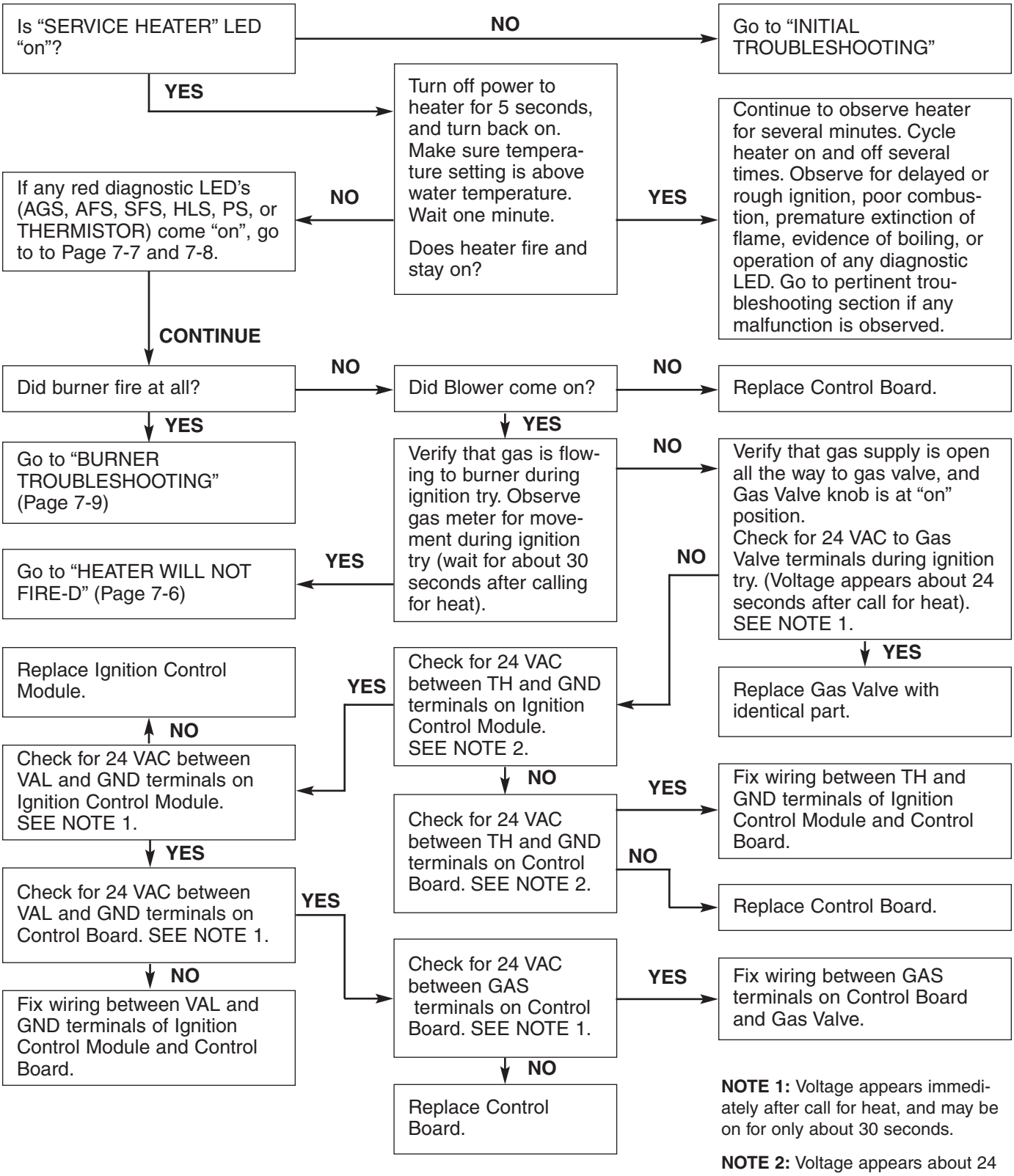
Heater Will Not Fire - B

Start



Heater Will Not Fire - C

Start



NOTE 1: Voltage appears immediately after call for heat, and may be on for only about 30 seconds.

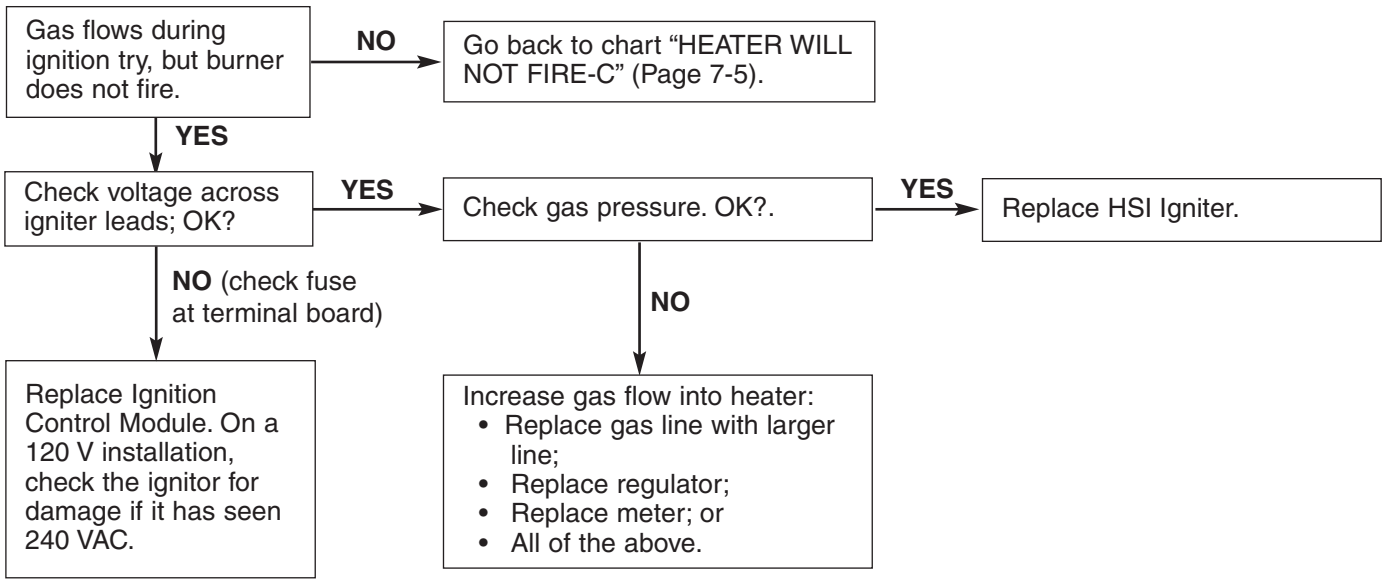
NOTE 2: Voltage appears about 24 seconds after call for heat, and may be on for only about 7 seconds.

Heater Will Not Fire - D

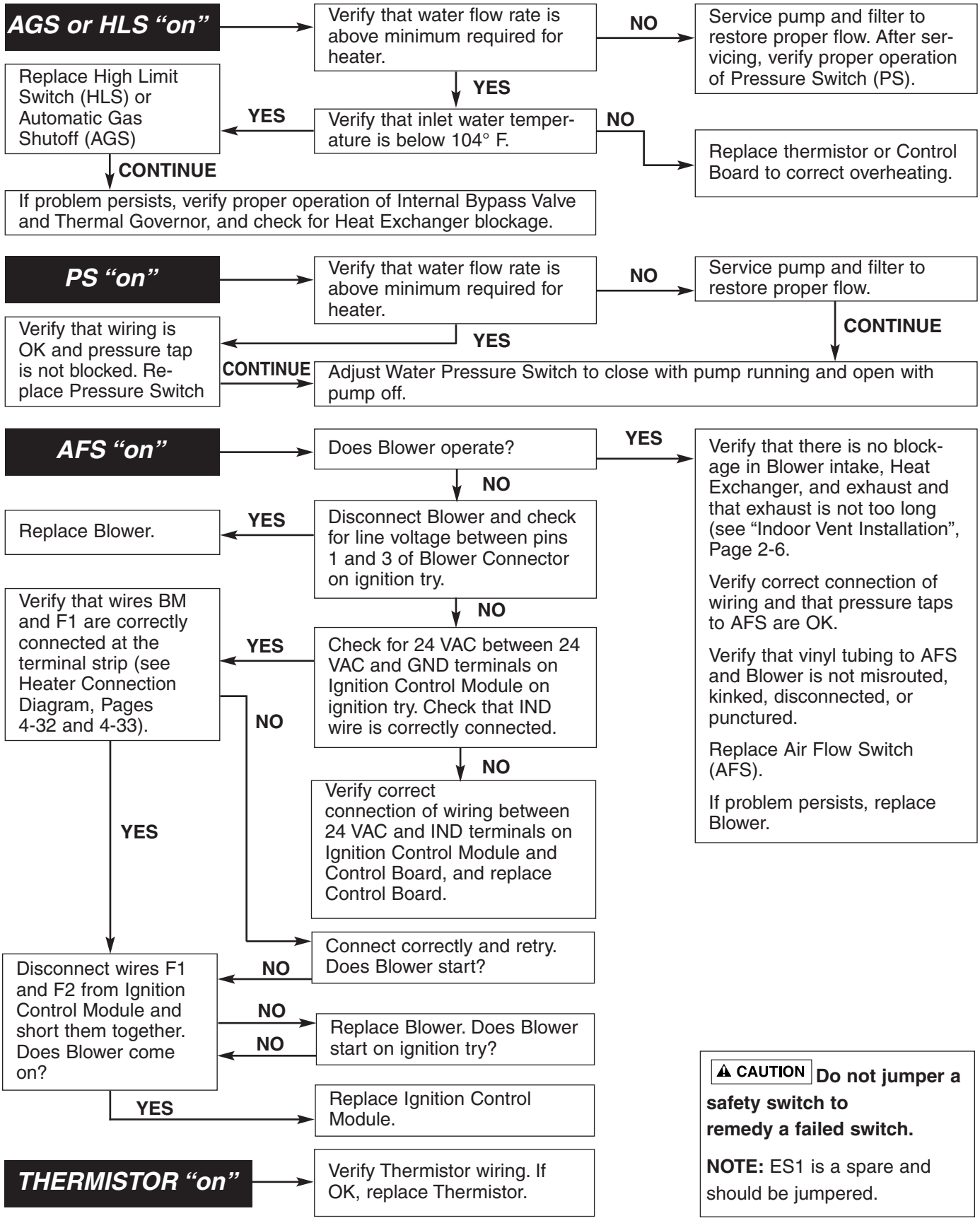
IMPORTANT! READ ME FIRST!!

IMPORTANT! READ ME FIRST!!
If your heater is correctly connected to **240 Volts AC**, The Ignition Control Module (ICM) will convert the 240VAC to an intermittent pulse to the ignitor. Digital meters don't read this type of signal well. (An analog meter will give a better reading than a digital meter). If the ICM is bad, your voltmeter will read either 0 VAC or 240 VAC. If your ICM is good, your meter will read some voltage between 0 and 240 VAC. Exactly what reading you get will depend on the meter, but with a good ICM, the reading won't be 0 VAC or 240 VAC, but somewhere in between.

Start



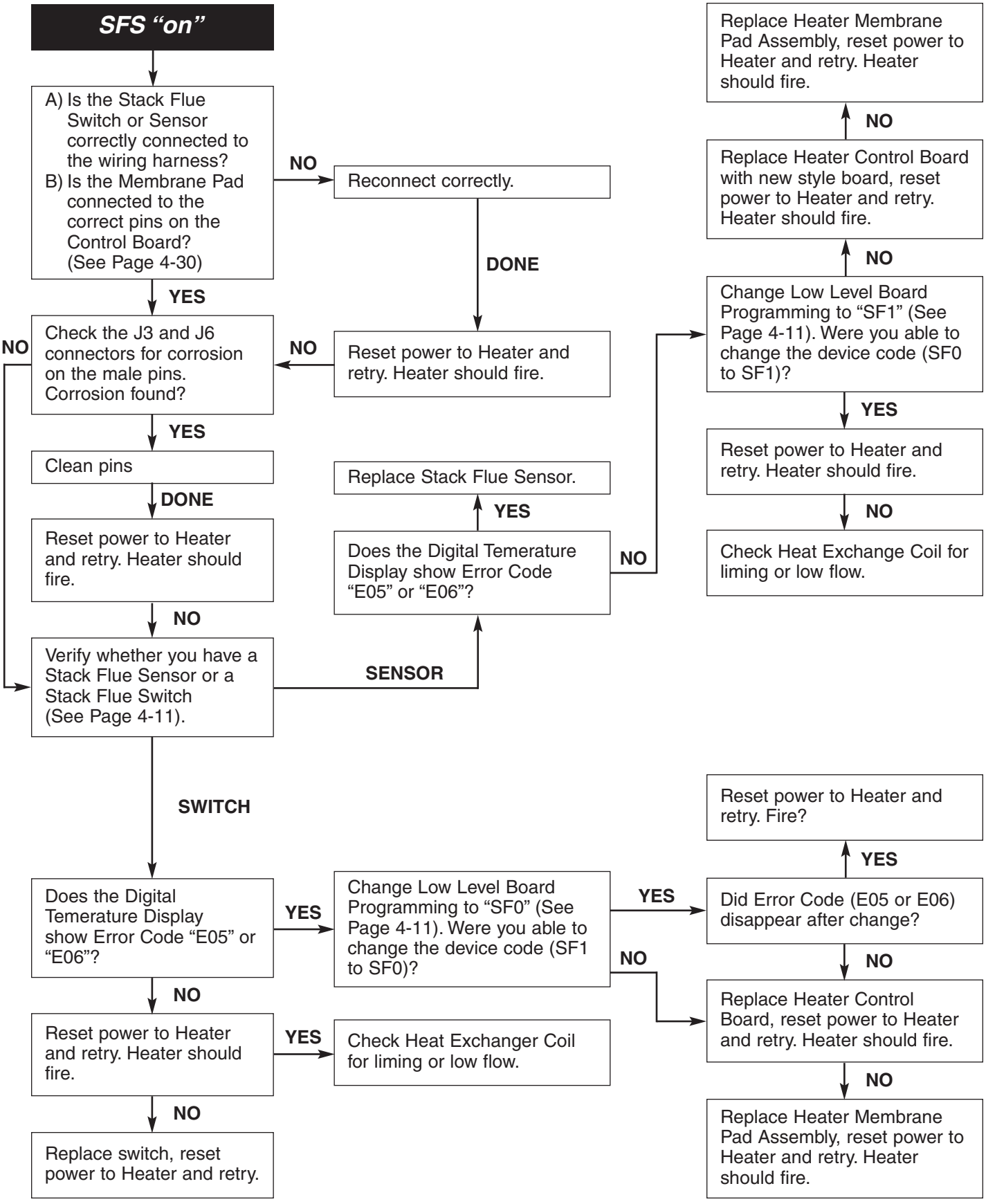
Diagnostic LED's: AGS, AFS, HLS, PS, THERMISTOR



⚠ CAUTION **Do not jumper a safety switch to remedy a failed switch.**

NOTE: ES1 is a spare and should be jumpered.

Diagnostic LED's: SFS



Burner Troubleshooting

SYMPTOM	CAUSE	REMEDY
Loud, high-pitched whine	Flame is too rich.	Verify pressure tap between gas valve and blower inlet. Verify gas regulator setting 0.2" wc below blower inlet pressure. Replace gas orifice with **smaller** size. Adjust CO_2 to 8%-9% for natural gas. 9.2%-10.5% for propane.
Flame is "fluttery." Exhaust may have acrid smell or burner may fail to stay lit.	Flame is too lean.	Verify gas regulator setting 0.2" wc below blower inlet pressure. Replace gas orifice with **larger** size. Adjust CO_2 to 8%-9% for natural gas. 9.2%-10.5% for propane.
Burner pulsates on surges, especially on ignition.	Exhaust vent is too long.	Reduce length of exhaust vent and/or number of elbows.
Combustion appears normal, but flame does not stay lit.	Flame current is not being sensed.	Check for wet or damaged igniter with low resistance to ground. Replace with new igniter. Verify burner flameholder is properly grounded. Replace Ignition Control Module.

Heat Exchanger Troubleshooting

SYMPTOM	CAUSE	REMEDY
Boiling in heat exchanger. May be accompanied by "bumping" sounds.	Low water flow to heater. Heat exchanger plugged. Bypass valve stuck open. Thermal governor stuck closed.	Service pump and or filter. Service heat exchanger. Correct water chemistry. Service bypass valve. Replace thermal governor.
Sweating.	Thermal governor failed.	Replace thermal governor.

Troubleshooting Questions

The following condition exists when you arrive at the customers installation:

- Green "POOL" or "SPA" LED is on
- Red "SERVICE HEATER" LED is on
- None of the red diagnostic LED's on the back of the Control Board are on
- After turning off the 120VAC and turning back on, the heater does not fire and stay on
- No diagnostic LED's came on
- The Burner did not fire at all
- Blower operates
- Gas is flowing to the burner
- 120VAC is being supplied to the Igniter

a. Defective Gas Valve
b. Defective Control Board
c. Defective Igniter
d. Defective Thermistor

The following condition exists when you arrive at the customers installation:

- Green "POOL" or "SPA" LED is not on
- Green "POOL" or "SPA" LED does not come on after depressing "POOL" or "SPA" button on membrane pad
- 120VAC is being supplied to the Heater
- A check of the Transformer secondary shows no 24V
- A check of the "HOT" and "NEUTRAL" terminals of the Terminal Board shows 120VAC is present
- A check of the primary of the Transformer shows 120VAC is present

a. Blown Fuse
b. Defective Membrane Pad
c. Defective Transformer
d. Defective Control Board

The following condition exists when you arrive at the customers installation:

- Green "POOL" or "SPA" LED is on
- Red "SERVICE SYSTEM" LED is off
- Red "SERVICE HEATER" LED is off
- After turning off the 120VAC and turning back on, making sure temperature setting is higher that water temperature, no diagnostic LED's come on momentarily or stay lit.
- Red "SERVICE HEATER" LED does not come on

a. Defective Thermistor
b. Pump Basket clogged
c. Defective Control Board
d. Defective Membrane Pad