

INSTALLATION AND SERVICE MANUAL



Swimming Pool Heaters 150,000 - 399,999 Btu/hr Models



IMPORTANT:

This is a gas appliance and should be installed by a licensed electrician and/or certified gas supplier. Service must be performed by a qualified service installer, service agency or the gas supplier.

⚠ WARNING

If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

This pool heater **MUST NOT** be installed in any location where gasoline or flammable vapors are likely to be present, unless the installation is such to eliminate the probable ignition of gasoline or flammable vapors.

WHAT TO DO IF YOU SMELL GAS

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

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

WARRANTY

Factory warranty (shipped with unit) does not apply to units improperly installed or improperly operated.

Experience has shown that improper installation or system design, rather than faulty equipment, is the cause of most operating problems.

1. Improper maintenance of pool water chemistry resulting high water hardness and high alkalinity that results in a lime scale build up in the copper tube is not the fault of the

equipment and is not covered under the manufacturer's warranty (See Facts About Water Chemistry).

2. Excessive pitting and erosion on the inside of the copper tube may be caused by too much water velocity through the tubes and is not covered by the manufacturer's warranty (See Water Connections, Maximum Flow Rates for flow requirements).

SPECIAL INSTRUCTIONS TO OWNER

NOTE:

Retain this manual for future reference.

This manual supplies information for the installation, operation and servicing of the appliance. It is strongly recommended that this manual be reviewed completely before proceeding with an installation.

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or additional information, consult a qualified installer, service agency or the gas supplier.

CHECKING EQUIPMENT

Upon receiving equipment, check for signs of shipping damage. Pay particular attention to parts accompanying the pool heater which may show signs of being hit or otherwise being mishandled. Verify total number of pieces shown on packing slip with those actually received. In case there is damage or a shortage, immediately notify the carrier.

Do not use this pool heater if any part has been under water. The possible damage to a flooded pool heater can be extensive and present numerous safety hazards. Any pool heater that has been under water must be replaced.

⚠ OWNER WARNING

The information contained in this manual is intended for use by qualified professional installers, service technicians or gas suppliers. **Consult your local expert for proper installation or service procedures.**

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IMPORTANT:

Consult and follow all local Building and Fire Regulations and other Safety Codes that apply to this installation. Consult local gas utility company to authorize and inspect all gas and flue connections.

Your conventionally vented gas unit must have a supply of fresh air circulating around it during burner operation for proper gas combustion and proper venting.

⚠ WARNING

Should overheating occur or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, turn off the manual gas control valve to the appliance at a location external to the appliance.

PREVENTION OF FREEZING

Heat exchangers and headers damaged by freezing are not covered by warranty.

Refer to the **WINTERIZING** section.

SPA AND HOT TUB SAFETY

The following safety rules must be observed while operating a spa or hot tub.

1. Spa or hot tub water temperatures should never exceed 104°F (40°C). A temperature of 100°F (38°C) is considered safe for a healthy adult. Special caution is suggested for young children.
2. Drinking of alcoholic beverages before or during spa or hot tub use can cause drowsiness which could lead to unconsciousness and subsequently result in drowning.
3. Pregnant women beware! Soaking in water above 102°F (39°C) can cause fetal damage during the first three months of pregnancy (resulting in birth of brain-damaged or a deformed child). Pregnant women should observe the 100°F (38°C) maximum rule.
4. Before entering the spa or hot tub, users should check the water temperature with an accurate thermometer; spa or hot tub thermostats may err in regulating water temperatures by as much as 4° Fahrenheit (2°C).
5. Persons with a medical history of heart disease, circulatory problems, diabetes or blood pressure problems should obtain their physician's advice before using spas or hot tubs.

- Persons taking medications which induce drowsiness, such as tranquilizers, antihistamines or anticoagulants, should not use spas or hot tubs.

⚠ WARNING

To minimize the possibility of serious personal injury, fire, or damage to your pool heater, never violate the following safety rules.

- Pool heaters are heat producing appliances. To avoid damage or injury, do not store materials against the pool heater or the vent-air intake system. Use proper care to avoid unnecessary contact (especially children) with the pool heater and vent-air intake components.
- Never cover your pool heater, lean anything against it, store trash or debris near it, stand on it or in any way block the flow of fresh air to your pool heater.
- UNDER NO CIRCUMSTANCES** must flammable materials such as gasoline or paint thinner be used or stored in the vicinity of this pool heater, vent-air intake system or any location from which fumes could reach the pool heater or vent-air intake system.

CODES

The pool heater shall be installed in accordance with those installation regulations in force in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made. In the absence of such requirements, the installation shall conform to the latest edition of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA-B149 Installation Code.

As an option, all pool heaters may be ordered with heat exchanger construction that conforms to the latest edition of the ASME Boiler and Pressure Vessel Code, Section IV, Part HLW. See *Note* on page 31 for additional information.

INSTALLATION PROCEDURE

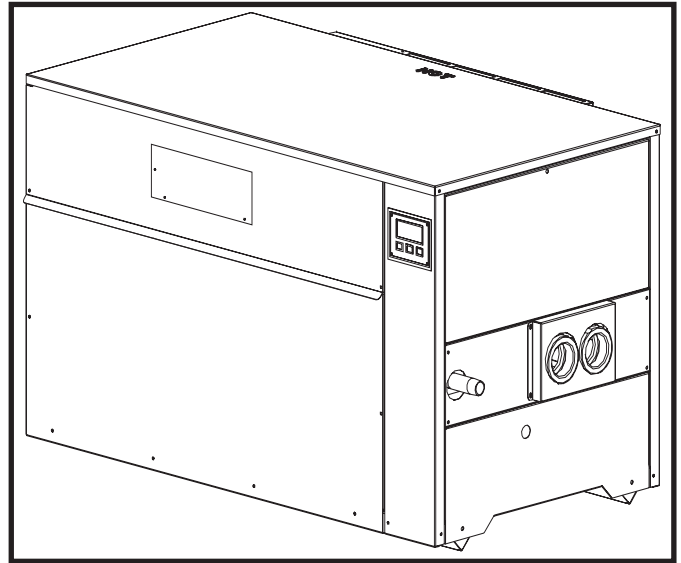


FIG. 1 Front View 150,000 - 399,999 Btu/hr Models

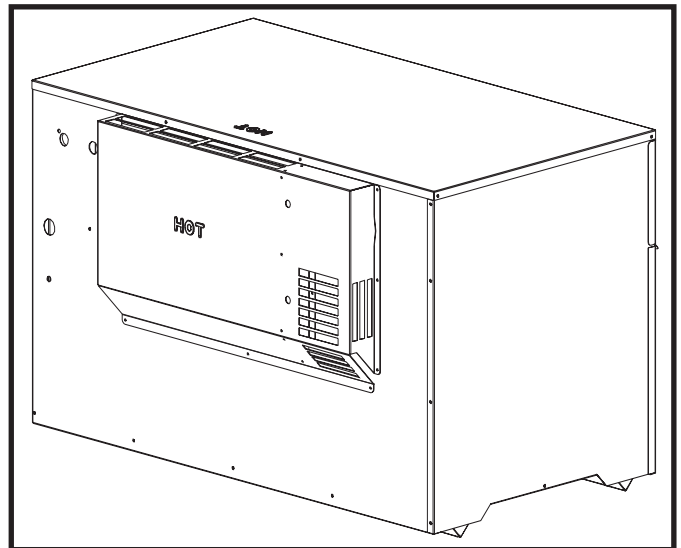


FIG. 2 Rear View 150,000 - 399,999 Btu/hr Models

LOCATION OF UNIT

- Locate the pool heater so that if water connections should leak, water damage will not result in damage to the area adjacent to the pool heater or to the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the pool heater. The pan must not restrict combustion air flow. Under no circumstances is the manufacturer to be held responsible for water damage in connection with this pool heater, or any of its components.
- The indoor pool heaters must be installed so that the ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (fan adjustment, control replacement, etc.).

3. Pool heaters located in a residential garage and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit must be installed so that all burners and burner ignition devices have a minimum clearance of not less than 18" (46cm) above the floor. The pool heater must be located or protected so that it is not subject to physical damage by a moving vehicle.

4. **DO NOT** install this pool heater in any location where gasoline or flammable vapors are likely to be present.

5. The pool heater must be installed on a level, non-combustible floor. Concrete over wood is not considered a non-combustible floor. Maintain required clearances from combustible surfaces.

6. The pool heater must not be installed on carpet or other combustible material.

7. For installation on a combustible floor only when installed on a special base:

Pool heaters installed over a combustible floor **MUST** use the Special Combustible Floor Base. The heater must be centered on the base as shown in Figure 3. The correct part number for the required base is noted on the rating plate of each unit and listed in Table A.

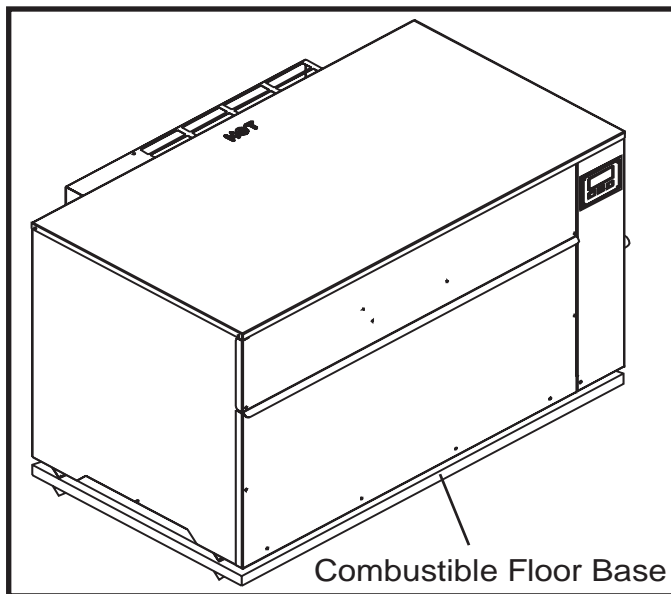


FIG. 3 Special Combustible Floor Base

**TABLE - A
COMBUSTIBLE FLOOR KITS**

Input Btu/hr	Kit Number
150,000	CFK3300
199,999	CFK3300
250,000	CFK3301
300,000	CFK3301
399,999	CFK3302

8. Outdoor models require the use of the factory supplied outdoor vent cap assembly. The outdoor vent cap is mounted on the flue outlet of the pool heater as shipped. Outdoor models must not be installed directly on the ground. The outdoor unit must be installed on a concrete, brick, block or other non-combustible pad. Outdoor models have additional special location and clearance requirements. These are specifically addressed in the Venting Section under Outdoor Installation. Do not install in locations where rain from building runoff drains or sprinkler systems will spill onto the pool heater. A windproof cabinet protects the unit from weather.

9. Indoor installations require that the factory installed outdoor vent cap be removed from the pool heater to allow the installation of a flue pipe. Specific instructions for the removal of the outdoor cap are addressed in the venting section. Indoor installations require adequate supplies of clean combustion air for proper operation. Optional venting arrangements may allow direct pipe connection from the unit to the outside for combustion air. See the "Venting Options" section of this manual.

10. This pool heater must be installed at least five feet from the inside wall of a pool unless separated from the pool by a solid fence, wall or permanent barrier.

11. When a pool heater is installed within the pool structure, the structure shall be designed such that in the event of a fuel gas leak, the leaking gas is vented to the exterior of the pool structure.

CLEARANCES FROM COMBUSTIBLE CONSTRUCTION

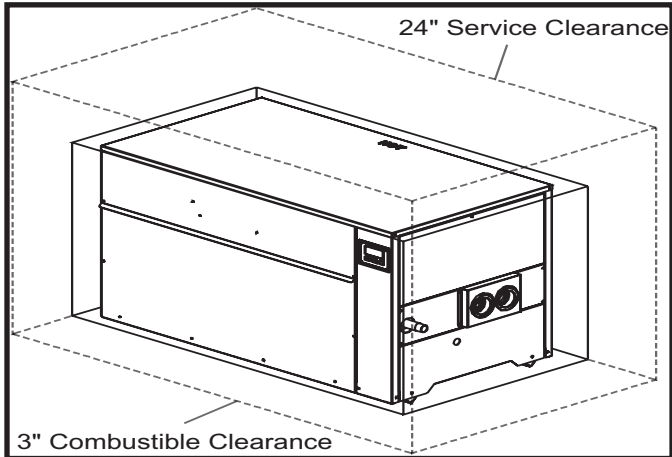


FIG. 4 Clearances from Combustible Construction (Front)

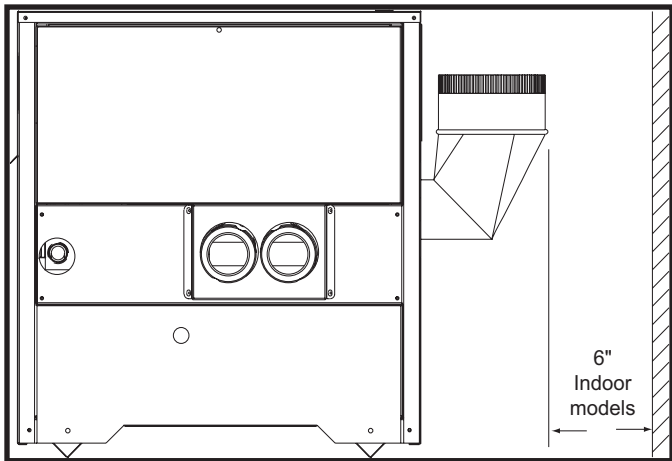


FIG. 4a Clearances from Combustible Construction (Back)

Clearances from Combustible Construction:

- Right Side - 3" (7.6 cm)(24" (0.61m) suggested for service)
- Rear (Outdoor) - 3" (7.6 cm) (3" minimum from any surface)
- Rear (Indoor) - 6" (15.2 cm) (6" minimum from any surface)
- Left Side - 3" (7.6 cm)
- Front - ALCOVE* (24" (0.61m) suggested for service)
- Top - 3" (7.6 cm) (24" (0.61m) suggested for service)
- Flue - 6" (15.2 cm)
- Hot Water Pipes - 1" (25.4mm)

*An ALCOVE is a closet without a door.

Maintain minimum specified clearances for adequate operation. Allow sufficient space for servicing pipe connections, pump and other auxiliary equipment, as well as the pool heater. See rating plate for specific service clearance requirements.

COMBUSTION AND VENTILATION AIR REQUIREMENTS FOR CONVENTIONALLY VENTED APPLIANCES AND SIDEWALL VENTED APPLIANCES

Provisions for combustion and ventilation air must be in accordance with Section 5.3, Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada CAN/CGA-B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes.

The equipment room **MUST** be provided with properly sized openings to assure adequate combustion air and proper ventilation when the unit is installed with conventional venting or sidewall venting and drawing combustion air from the room.

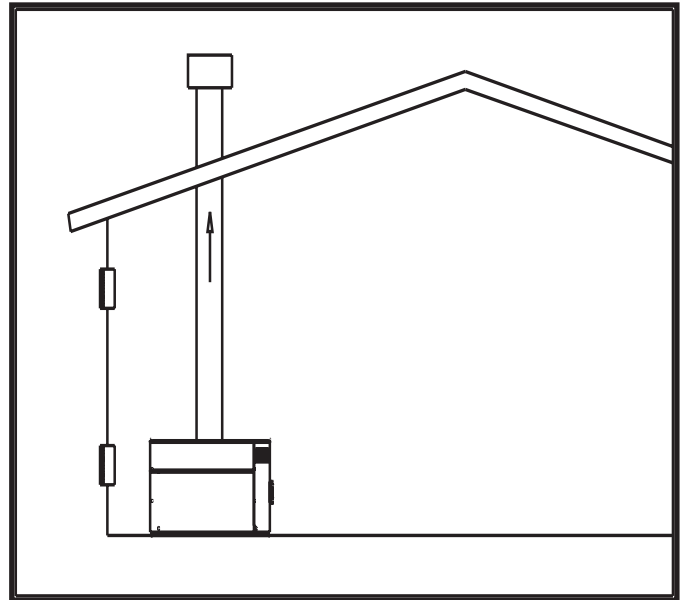


FIG. 5 Combustion Air Direct from Outside

1. If air is taken directly from outside the building with no duct, provide two permanent openings to the equipment room:
 - (a) Combustion air opening, with a minimum free area of one square inch per 4000 Btu/hr input (5.5 cm² per kW). This opening must be located within 12" (30 cm) of the bottom of the enclosure.
 - (b) Ventilation air opening, with a minimum free area of one square inch per 4000 Btu/hr input (5.5cm² per kW). This opening must be located within 12" (30cm) of the top of the enclosure.

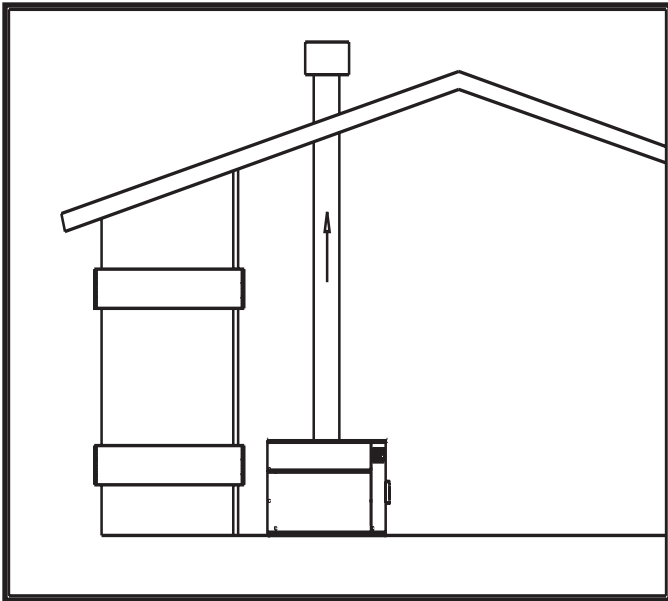


FIG. 6 Combustion Air Through Ducts

2. If combustion and ventilation air is taken from the outdoors using a duct to deliver the air to the equipment room, each of the two openings should be sized based on a minimum free area of one square inch per 2000 Btu/hr (11cm² per kW).

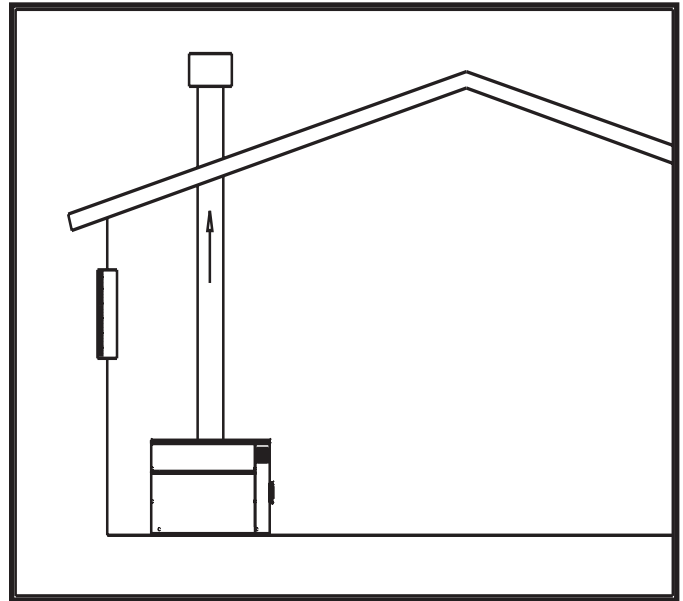


FIG. 8 Combustion Air from Outside - Single Opening

4. If a single combustion air opening is provided to bring combustion air in directly from the outdoors, the opening must be sized based on a minimum free area of one square inch per 3000 Btu/hr (7cm² per kW). This opening must be located within 12" (30cm) of the top of the enclosure.

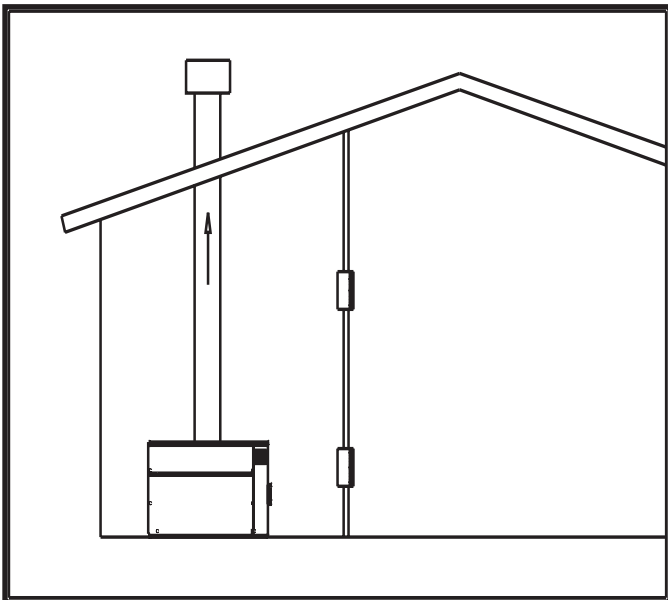


FIG. 7 Combustion Air from Interior Space

3. If air is taken from another interior space, each of the two openings specified above should have a net free area of one square inch for each 1000 Btu/hr (22cm² per kW) of input, but not less than 100 square inches (645cm²).

**TABLE - B
MINIMUM RECOMMENDED COMBUSTION AIR SUPPLY TO EQUIPMENT ROOM**

Combustion Air Source			
Boiler Input	Outside Air* 2 Openings	Outside Air* 1 Opening	Inside Air 2 Openings
150,000	37.5 in ² (242 cm ²)	50.0 in ² (323 cm ²)	150 in ² (968 cm ²)
199,999	50.0 in ² (323 cm ²)	66.7 in ² (430 cm ²)	200 in ² (1290 cm ²)
250,000	62.5 in ² (403 cm ²)	83.3 in ² (537 cm ²)	250 in ² (1613 cm ²)
300,000	75.0 in ² (484 cm ²)	100 in ² (645 cm ²)	300 in ² (1935 cm ²)
399,999	100 in ² (645 cm ²)	133 in ² (858 cm ²)	400 in ² (2581 cm ²)

*Outside air openings shall directly communicate with the outdoors. When combustion air is drawn from the outside through a duct, the net free area of each of the two openings must have twice (2 times) the free area required for Outside Air/2 Openings. The above requirements are for the pool heater only, additional gas fired appliances in the equipment room will require an increase in the net free area to supply adequate combustion air for all appliances. Combustion air requirements

are based on the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada CAN/CGA-B149 Installation Code for Gas Burning Appliances and Equipment. Check all local code requirements for combustion air.

All dimensions are based on net free area in square inches. Metal louvers or screens reduce the free area of a combustion air opening a minimum of approximately 25%. Check with louver manufacturers for exact net free area of louvers. Where two openings are provided, one must be within 12" (30 cm) of the ceiling and one must be within 12" (30 cm) of the floor of the mechanical room. Each opening must have net free area as specified in Table B. Single openings shall be installed within 12" (30 cm) of the ceiling.

⚠ CAUTION

Under no circumstances should the mechanical room ever be under a negative pressure. Particular care should be taken where exhaust fans, attic fans, clothes dryers, compressors, air handling units, etc., may take away air from the unit.

The combustion air supply must be completely free of any flammable vapors that may ignite or chemical fumes which may be corrosive to the pool heater. Common corrosive chemical fumes which must be avoided are fluorocarbons and other halogenated compounds, most commonly present as refrigerants or solvents, such as Freon, trichlorethylene, perchlorethylene, chlorine, etc. These chemicals, when burned, form acids which attack the heat exchanger finned tubes, headers, flue collectors, and the vent system. The result is improper combustion and a non-warrantable, premature pool heater failure.

EXHAUST FANS: Any fan or equipment which exhausts air from the equipment room may deplete the combustion air supply and/or cause a downdraft in the venting system. Spillage of flue products from the venting system into an occupied living space can cause a very hazardous condition that must be immediately corrected. If a fan is used to supply combustion air to the equipment room, the installer must make sure that it does not cause drafts which could lead to nuisance operational problems with the pool heater.

DirectAire Vertical, DirectAire Horizontal and E-Rite Venting systems have specific requirements for combustion air ducts from the outside which are directly connected to the pool heater. See the requirements for this combustion air duct in the venting section for each specialized vent system.

VENTING

General

Vent installations for connection to gas vents or chimneys must be in accordance with Part 7, "Venting of Equipment," of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA - B149 Installation Codes for Gas Burning Appliances and Equipment or applicable provisions of the local building codes.

Conventional negative draft venting and sidewall venting applications, where outside air is used, must have adequate combustion and ventilation air supplied to the equipment room in accordance with the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA - B149 Installation Codes for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes.

The distance of the vent terminal from adjacent buildings, windows that open and building openings **MUST** comply with the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA - B149 Installation Codes for Gas Burning Appliances and Equipment.

Vent connection is made directly to the flue outlet connection on the unit. No additional draft diverter or barometric damper is required on single unit installations when a negative draft is maintained within the specified range. The connection from the pool heater's vent to the stack must be made as direct as possible.

Barometric Damper Location

The preferred location for the barometric damper (if required) is in a tee or collar installed in the vertical pipe, rising from the unit's flue outlet. The barometric damper **MUST NOT** be installed in a bull head tee installed on the unit's flue outlet. The tee or collar containing the barometric damper should be approximately three feet vertically above the connection to the unit's flue outlet. This location ensures that any positive velocity pressure from the unit's internal combustion fan is dissipated and the flue products are rising due to buoyancy generated from the temperature of the flue products. Adjust the weights on the damper to ensure that draft is maintained within the specified range.

IMPORTANT:

Examine the venting system at least once a year. Check all joints and vent pipe connections for tightness. Also check for corrosion or deterioration. Immediately correct any problems observed in the venting system.

VENT SYSTEM OPTIONS

This pool heater has six venting options. They are: (1) **Conventional Negative Draft Venting** with vertical rooftop flue termination and combustion air supplied from the equipment room, (2) **Vertical DirectAire Venting** with a vertical conventional vent for flue products and a combustion air pipe from either the sidewall or roof top, (3) **Powered Sidewall Venting** to exhaust flue products out a sidewall with a powered vent assembly and combustion air supplied from the equipment room (4) **Horizontal DirectAire Venting** with a powered vent assembly to exhaust the flue products out a sidewall and a combustion air pipe from the sidewall, (5) **E-Rite Sidewall Venting** which uses the internal combustion air fan to exhaust the flue products out a sidewall vent termination with a limited vent length. Combustion air for an E-Rite Sidewall vent must be supplied with a combustion air pipe from the sidewall, (6) **Outdoor Venting** using the factory supplied air inlet/vent cap installed on the unit. All pool heaters are shipped from the factory equipped for Outdoor Installation. All other optional vent systems require the removal of the outdoor vent cap and installation of specific vent kits and venting materials. The following is a detailed explanation of the installation requirements for each venting system, components used and part numbers of vent kits for each model.

The Outdoor Vent System

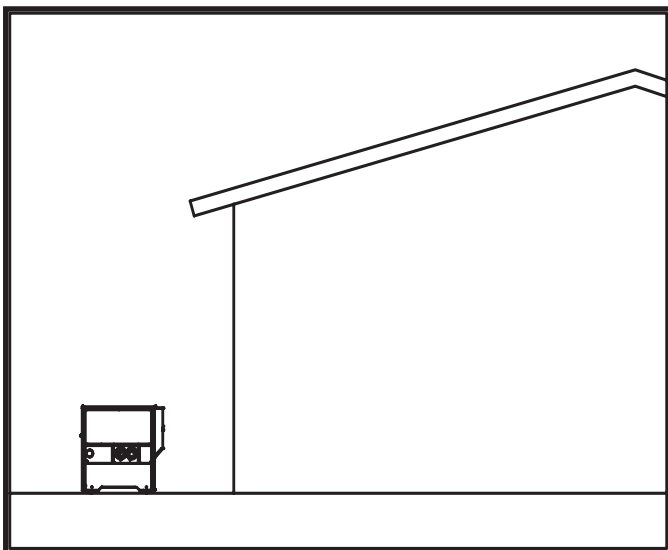


FIG. 9 Outdoor Installation Illustration

OUTDOOR INSTALLATION

Units are self venting and can be used outdoors when installed with the factory supplied Outdoor Vent Cap. The outdoor vent cap is mounted directly to the rear of the pool heater as shipped from the manufacturer and covers the flue outlet and combustion air inlet openings on the jacket. No additional vent piping is required.

⚠ WARNING

The flue products discharged from the flue outlet on the outdoor vent cap may be very hot. Avoid touching or other direct contact with the flue gases or the vent cap assembly. These components are **HOT** and direct contact can result in burns.

⚠ WARNING

Outdoor models **MUST** be installed outdoors and **MUST** use the outdoor vent cap assembly supplied by the manufacturer. Personal injury or product damage may result if any other cap is used or if an outdoor model is used indoors. All covers, doors and jacket panels must be properly installed to insure proper operation and prevent a hazardous condition.

⚠ CAUTION

Pool heaters which are shut down or will not operate may experience freezing due to convective air flow in the outdoor vent cap installed on the unit. If operated in cold climates, continuous pump operation is recommended to help prevent freezing of pool water in an outdoor installation. Proper freeze protection must be provided. A pool heater that is not in use in the winter season must be properly drained and winterized. See Freeze Protection.

Combustion air supply must be free of contaminants (See Combustion and Ventilation Air). To prevent recirculation of the flue products into the combustion air inlet, follow all instructions in this section.

Outdoor Vent/Air Inlet Location

The venting areas must never be obstructed. Keep area clean and free of combustible and flammable materials. Maintain a minimum clearance of 3" (76 mm) to combustible surfaces and a minimum of 3" (76 mm) clearance to the air inlet. To avoid a blocked air inlet or blocked flue condition, keep the outdoor cap air inlet, flue outlet and drain slot clear of, leaves, debris, snow, ice, etc.

A unit should not be located so that high winds can deflect off of adjacent walls, buildings or shrubbery causing recirculation. Recirculation of flue products may cause operational problems, bad combustion or damage to controls. The unit should be located at least 3 feet (0.91m) from any wall or vertical surface to prevent adverse wind conditions from affecting performance.

The outdoor pool heater must not be installed in an area that is enclosed by walls or a fence that will block free wind movements around the unit. Free movement of wind around the outdoor unit is required to carry away the flue products and provide combustion air. The flue outlet/combustion air inlet cap of an outdoor pool heater must not be installed closer than 10 feet (3.05m) from an inside corner of an L-shaped structure. Walls or enclosed fencing may cause eddy currents which can re-circulate the flue products into the combustion air inlet. Recirculation of flue products may cause operational problems, bad combustion or non-warrantable damage to controls.

Do not install the pool heater with outdoor venting under a deck.

Do not install an outdoor pool heater in a well, stairwell, alcove, courtyard or other recessed area.

The outdoor cap must be located 4 feet (1.22m) below and 4 feet (1.22m) horizontally from any window, door, walkway or gravity air intake.

The combustion air inlet of the outdoor cap must be located at least one foot (0.30m) above grade and above normal snow levels. The pool heater must be at least 10 feet (3.05m) away from any forced air inlet.

The pool heater must be at least 3 feet (0.91m) outside any overhang.

Clearances around outdoor installations can change with time. Do not allow the growth of trees, shrubs or other plants to obstruct the proper operation of the outdoor vent system.

Do not install in locations where rain from building runoff drains will spill onto the pool heater.

Do not locate the pool heater so that water from sprinklers may spray directly on the unit. Water may damage controls or other electrical components.

Multiple unit outdoor pool heater installations require a minimum of 4 feet (1.22 m) clearance between the vent cap and air inlet of adjacent heater to prevent recirculation of flue products.

Flue gas condensate can freeze on exterior walls or on the vent cap of a pool heater operated in the winter months. Frozen condensate on the vent cap can result in a blocked flue condition. Some discoloration to exterior building or unit surfaces can be expected. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.

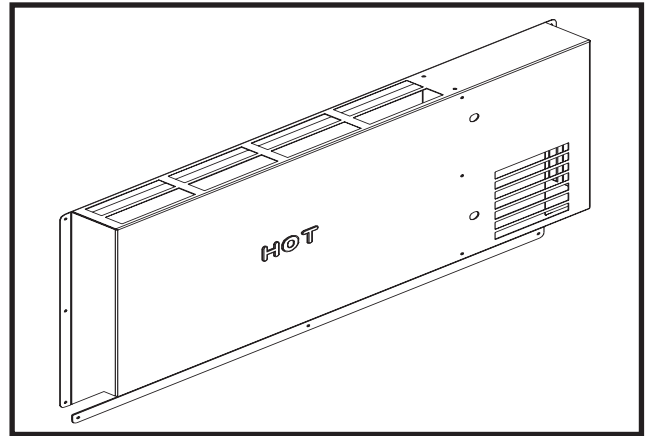


FIG. 10 Outdoor Vent Cap (Outside View)

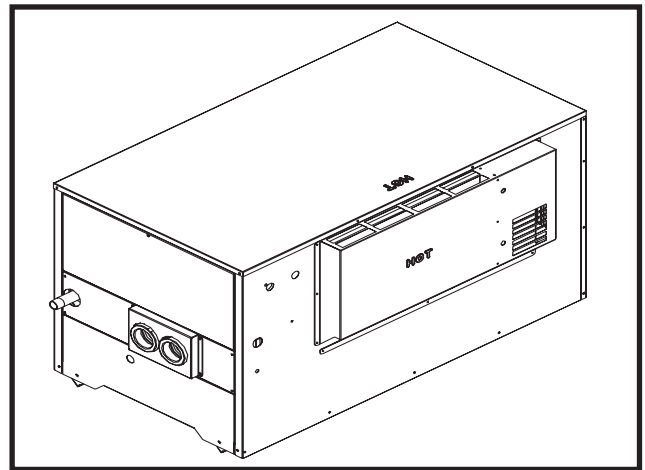


FIG. 11 Outdoor Vent Cap Installed on Unit

The Outdoor Vent Cap Kit

The required outdoor cap part numbers are listed by unit size. The venting kit must be furnished by the manufacturer in accordance with CSA International requirements. An outdoor vent cap kit is mounted on the pool heater as shipped from the factory. The kit includes the flue outlet/combustion air inlet assembly and gasket. Since the outdoor vent cap assembly is supplied with each pool heater, the following part numbers are provided for service part information.

**TABLE - C
OUTDOOR VENT CAP KITS**

Input Btu/hr	Outdoor Cap Kit Number
150,000	ODK3040
199,999	ODK3040
250,000	ODK3041
300,000	ODK3042
399,999	ODK3042

⚠ CAUTION

Pool heaters which are shut down or will not operate may experience freezing due to convective air flow through the vent cap installed on the unit. Proper freeze protection must be provided, see Freeze Protection. A pool heater that is not in use in the winter season must be properly drained and winterized.

⚠ CAUTION

An Outdoor Installation, DirectAire Vent or an E-Rite Vent into dead air spaces such as alleys, atriums and inside corners can cause recirculation of flue gases. Recirculation of flue gases will cause incomplete combustion, sooting, premature failure of the jacket, vent and heat exchanger as well as icing of the combustion air intake during operation in severe cold weather. Minimum clearances between the combustion air intake and exhaust vent terminal are specified in the installation instructions. To prevent recirculation of the flue gases, maintain as much distance as possible between the combustion air intake and the exhaust vent terminal.

INSTALLATION OF OPTIONAL VENT KITS

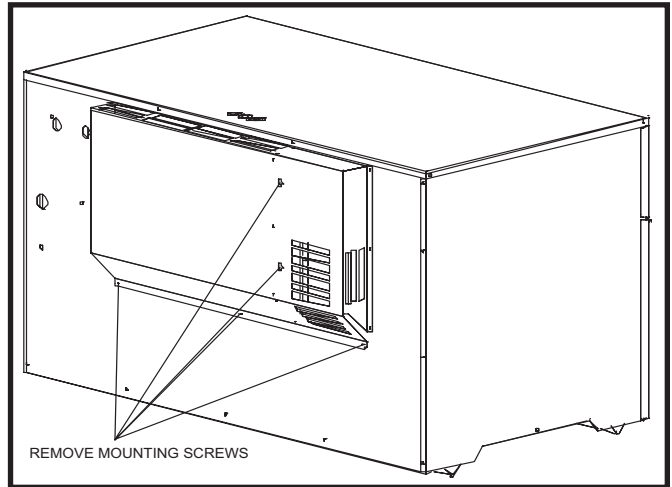


FIG. 12 Removal of Outdoor Vent Cap

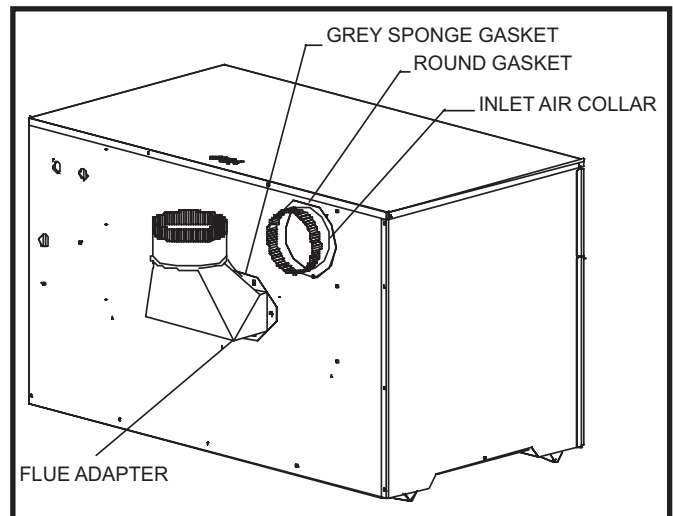


FIG. 13 Installation of Flue Adapter and Air Inlet Collar

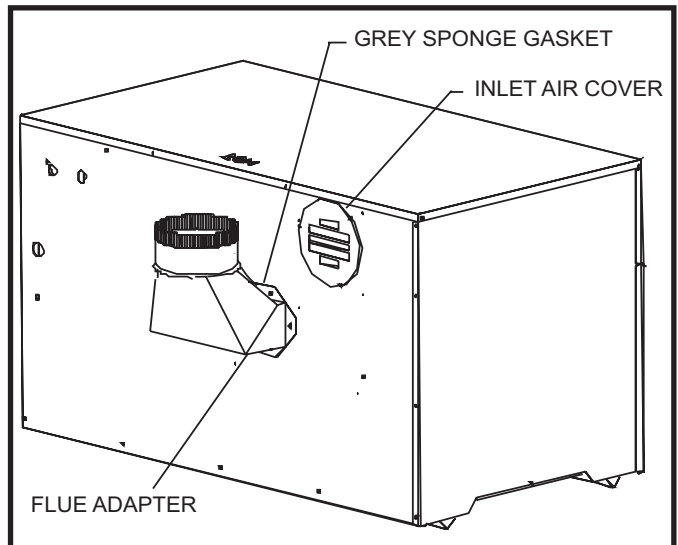


FIG. 14 Installation of Flue Adapter and Inlet Air Cover

Whenever a vent option other than outdoor installation is desired, the outdoor vent cap assembly **MUST** be removed and an optional vent kit must be installed on the pool heater. The vent kit allows connection of the flue and/or a combustion air pipe. The vent kit includes the flue adapter and an air inlet collar to allow connection of an air inlet pipe or an air inlet cover when combustion air is drawn from the equipment room. Remove the screws surrounding the outdoor vent cap and the two screws in the divider between the flue outlet and air inlet chambers on the vent cap. Use the screws removed from the outdoor vent cap to secure the components in the vent kit. Mount the flue adapter on the back of the pool heater over the flue outlet. Mount the air inlet collar or air inlet cover over the combustion air inlet opening on the rear of the jacket. Seal the flue adapter and air inlet collar with the gaskets provided in the kit. The flue adapter transitions the rectangular flue outlet to a round flue pipe connection and turns the flue outlet vertical for ease of installation. Vent pipe connection is made directly to the outlet of the flue adapter. The air inlet collar allows connection of a round pipe to the pool heater to supply combustion air. The inlet air cover provides a grill to limit the entrance of foreign matter into the pool heater's air inlet.

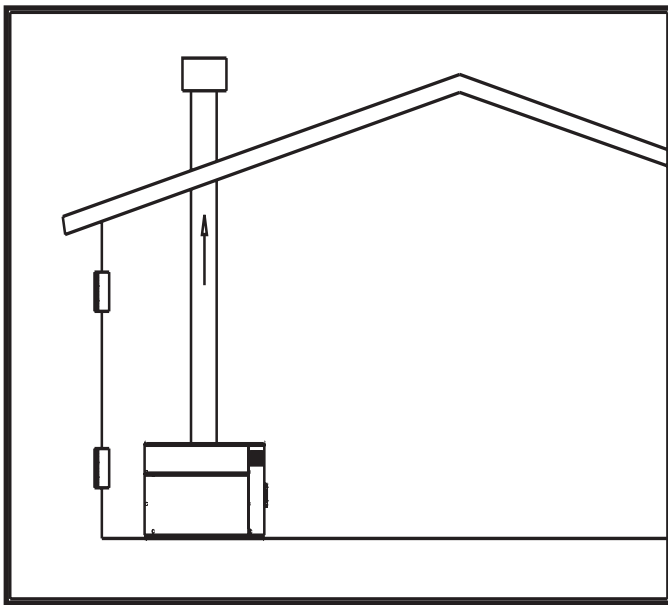


FIG. 15 Conventional Negative Draft Vertical Venting with Combustion Air Louvers

Conventional Venting

A CONVENTIONAL NEGATIVE DRAFT VENTING SYSTEM

The outdoor vent cap assembly **MUST** be removed before any connection to a conventional negative draft vent system can be made. A conventional vent adapter kit **MUST** be installed on the pool heater's flue outlet. The conventional vent kit includes the flue adapter and an air inlet cover. Mount the air inlet cover over the combustion air inlet opening on the rear of the jacket.

No additional draft diverter or barometric damper is required on single unit installations with a dedicated stack and a negative draft within the specified range of a negative 0.02 to 0.08 inches water. If the draft in a dedicated stack for a single unit installation exceeds the maximum specified draft, a barometric damper must be installed to control draft. Multiple unit installations with combined venting or common venting of this pool heater with other Category I negative draft appliances requires that each pool heater must have a barometric damper installed to regulate draft within the proper range.

**TABLE - D
CONVENTIONAL VENT DATA**

Input Btu/hr	Conventional Vent Flue Size	Conventional Vent Kit Number
150,000	5"	CVK3000
199,999	5"	CVK3000
250,000	5"	CVK3000
300,000	5"	CVK3001
399,000	6"	CVK3002

The negative draft in a conventional vent installation must be within the range of a negative 0.02 to 0.08 inches water to insure proper operation. All draft readings are made while unit is in stable operation (approximately 2 to 5 minutes). Remember that the draft in a conventional negative draft vent may vary seasonally. A pool heater with a high draft when operating in the winter months may have a much lower draft in the summer. Initial set-up of a vent system with a draft of not more than a negative 0.05 inches water will generally insure that increased draft in the winter months will not exceed the specified maximum. Maximum draft can not exceed a negative 0.08 inches of water.

On a conventionally vented, negative draft pool heater, the connection from the vent to the stack or vent termination outside the building **MUST** be made with listed Type "B" double wall (or equivalent) vent connectors and must be direct as possible with no reduction in diameter. Use the National Fuel Gas Code venting tables for double wall vent to properly size all vent connectors and stacks. The Type "B" vent and accessories, such as firestop spacers, thimbles, caps, etc., **MUST** be installed in accordance with the manufacturers instructions. The vent connector and firestop must provide correct spacing to combustible surfaces and seal to the vent connector on the upper and lower sides of each floor or ceiling through which the vent connector passes.

Any vent materials specified must be listed by a nationally recognized test agency for use as vent material.

Locate the pool heater as close as practicable to chimney or gas vent.

Avoid long horizontal runs of the vent pipe, 90° elbows, reductions and restrictions. Horizontal portions of the venting system shall be supported to prevent sagging. Horizontal runs must slope upwards not less than 1/4 inch per foot (21 mm/m) from the appliance to the vent terminal. Follow manufacturers instructions.

Do not use an existing chimney as a raceway for a flue pipe if another appliance or fireplace is vented through the chimney.

The weight of the venting system must not rest on the unit. Adequate support of the venting system must be provided in compliance with local codes and other applicable codes. All connections should be secured with rustproof sheet metal screws.

Vent connectors serving appliances vented by natural draft **MUST NOT** be connected to any portion of a mechanical draft system operating under positive pressure. Connection to a positive pressure stack may cause flue products to be discharged into the living space causing serious health injury.

Common venting systems may be too large when an existing unit is removed. At the time of removal of an existing appliance, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while other appliances remaining connected to the common venting system are not in operation.

- (a) Seal any unused opening in the common venting system.
- (b) Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other unsafe condition.
- (c) Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any other appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- (d) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
- (e) Test for spillage at the draft hood/relief opening after five minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
- (f) After it has been determined that each appliance remaining connected to the common venting system

properly vents when tested as above, return doors, windows, exhaust fans, fireplace dampers and other gas burning appliances to their previous conditions of use.

(g) Any improper operation of the common venting system should be corrected so that the installation conforms to the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA - B149 Installation Codes for Gas Burning Appliances and Equipment. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CAN/CGA - B149 Installation Codes for Gas Burning Appliances and Equipment.

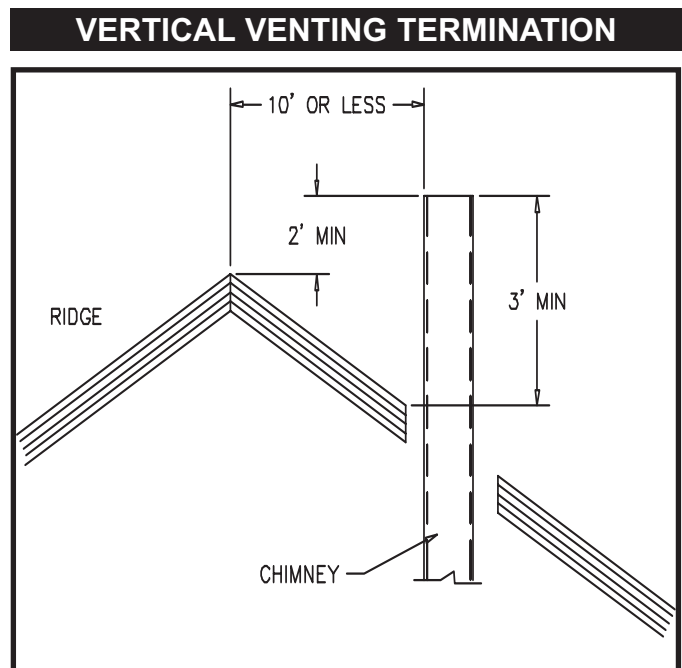


FIG. 16 Vent Termination from Peaked Roof - 10' or Less From Ridge

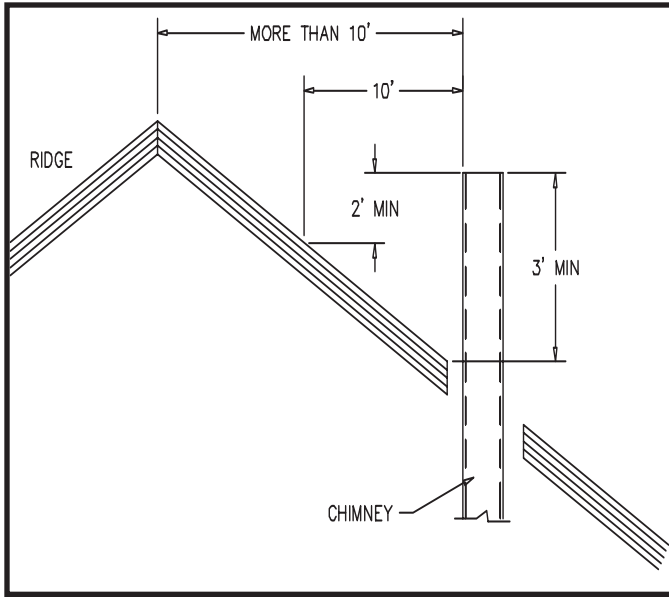


FIG. 17 Vent Termination from Peaked Roof More Than 10' From Ridge

The vent terminal should be vertical and exhaust outside the building at least 2 feet (0.61m) above the highest point of the roof within a 10 foot (3.05m) radius of the termination.

The vertical termination must be a minimum of 3 feet (0.91m) above the point of exit.

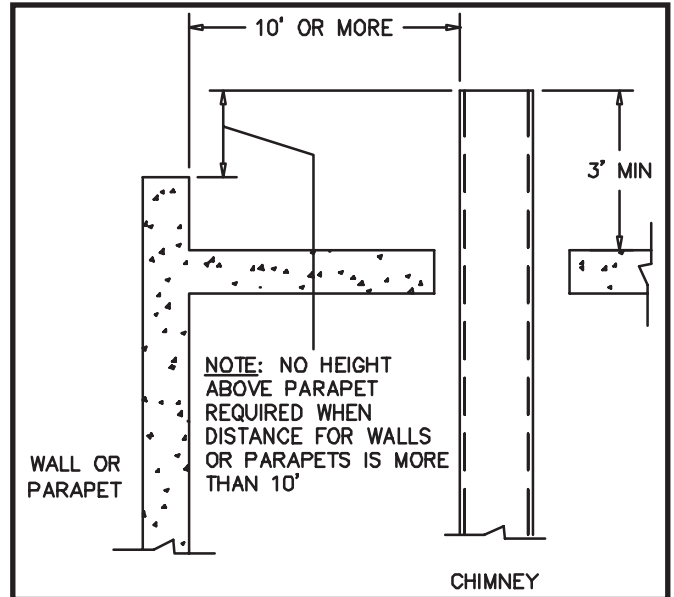


FIG. 19 Vent Termination from Flat Roof More Than 10' from Parapet Wall

A vertical termination less than 10 feet (3.05m) from a parapet wall must be a minimum of 2 feet (0.61m) higher than the parapet wall.

The vent cap should have a minimum clearance of 4 feet (1.22m) horizontally from and in no case above or below, unless a 4 foot (1.22m) horizontal distance is maintained from electric meters, gas meters, regulators and relief equipment.

The venting system shall terminate at least 3 feet (0.9m) above any forced air inlet within 10 feet (3.05m).

The venting system shall terminate at least 4 feet (1.2m) below, 4 feet (1.2m) horizontally from, or 1 foot (30cm) above any door, window or gravity air inlet into any building.

Do not terminate the vent in a window well, stairwell, alcove, courtyard or other recessed area. **The vent cannot terminate below grade.** The bottom of the vent terminal shall be located at least 12 inches (30cm) above grade.

To avoid a blocked flue condition, keep the vent cap clear of snow, ice, leaves, debris, etc. Flue gases will form a white plume in winter. Plume could obstruct window view.

Flue gas condensate can freeze on exterior surfaces or on the vent cap when a pool heater is operated in the winter months. Frozen condensate on the vent cap can result in a blocked flue condition. Flue gas condensate can cause discoloration of exterior building surfaces. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.

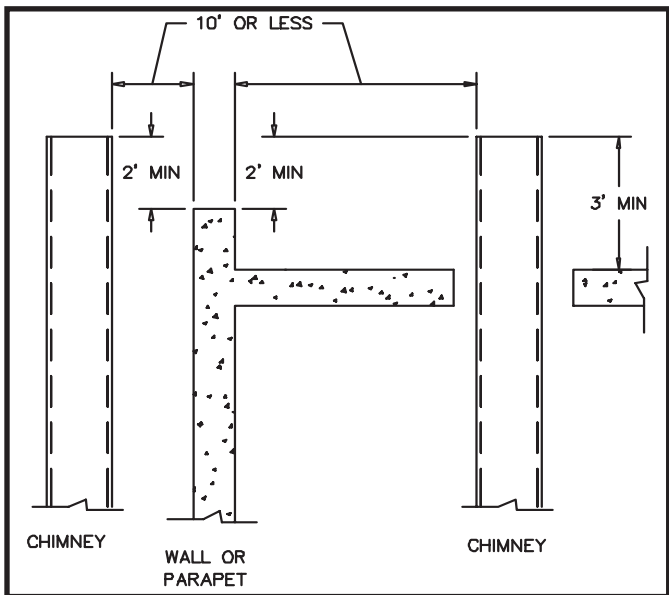


FIG. 18 Vent Termination from Flat Roof 10' or Less from Parapet Wall

MASONRY CHIMNEY INSTALLATION

A masonry chimney must be properly sized for the installation of a high efficiency gas fired appliance. Venting of a high efficiency appliance into a cold or oversized masonry chimney can result in operational and safety problems. Exterior masonry chimneys, with one or more sides exposed to cold outdoor temperatures, are more likely to have venting problems. The temperature of the flue products from a high efficiency appliance may not be able to sufficiently heat the masonry structure of the chimney to generate proper draft. This will result in condensing of flue products, damage the masonry flue/tile, insufficient draft and possible spillage of flue products into an occupied living space. Carefully inspect all chimney systems before installation. If there is any doubt about the sizing or condition of a masonry chimney, it must be relined with a properly sized and approved chimney liner system.

Inspection of a Masonry Chimney

A masonry chimney must be carefully inspected to determine its suitability for the venting of flue products. A clay tile lined chimney must be structurally sound, straight and free of misaligned tile, gaps between liner sections, missing sections of liner or any signs of condensate drainage at the breaching or clean out. If there is any doubt about the condition of a masonry chimney, it must be relined. **An unlined masonry chimney must not be used** to vent flue products from this high efficiency appliance. An unlined chimney must be relined with an approved chimney liner system when a new appliance is being attached to it. Metallic liner systems (Type "B" double-wall or flexible or rigid metallic liners) are recommended. Consult with local code officials to determine code requirements or the advisability of using or relining a masonry chimney.

The Vertical DirectAire Vent System

A CONVENTIONAL VERTICAL NEGATIVE DRAFT VENTING SYSTEM WITH A COMBUSTION AIR PIPE FROM A SIDEWALL OR ROOFTOP INLET CAP

Follow all requirements in the General Venting section and Conventional Negative Draft Venting for venting flue products to the outdoors and general installation instructions.

The *Vertical DirectAire* vent system requires the installation of two vent pipes directly to the unit, one vertical pipe with a roof top termination for the flue products and one pipe for combustion air. The combustion air pipe may terminate horizontally with a sidewall air inlet or vertically with a rooftop air inlet. Vent connection is made directly to the unit after the outdoor vent cap assembly is removed and the conventional flue

outlet and direct air inlet adapters are installed. No additional draft diverter or barometric damper is required on single unit installations with a dedicated stack and a negative draft maintained between 0.02 to 0.08 inches water. The flue may be combined with the vent from any other negative draft, Category I appliances. Multiple unit installations common vented with other negative draft appliances require that each pool heater **MUST** have a barometric damper installed to regulate draft within the proper range. The common vent and connectors from multiple pool heaters must be sized per the requirements of the venting tables for Type "B" double wall vents in the latest edition of the National Fuel Gas Code, ANSI Z223.1 or in Canada, CAN/CGA - B149 Installation Codes.

The sidewall or vertical rooftop **DirectAire** combustion air supply system has specific vent material and installation requirements. The air inlet pipe connects directly to the pool heater to supply combustion air. In most installations, the combustion air inlet pipe will be a dedicated system with one air inlet pipe per pool heater. Multiple air inlets for **DirectAire** systems may be combined if the guidelines in "Combined Air Inlet Points" are followed. The air inlet pipe will be connected to a combustion air inlet cap as specified in this section.

Combustion air supplied from outdoors must be free of contaminants (See Combustion and Ventilation Air).

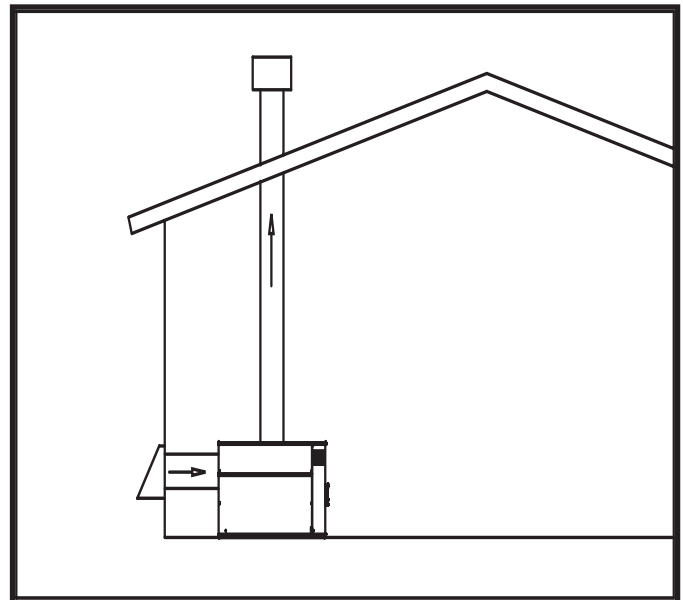


FIG. 20 Vertical / Horizontal Installation Illustration

Sidewall Air Inlet

The Sidewall Air Inlet Cap Kit is supplied as one of the **DirectAire** Vent Kits which must be ordered from the manufacturer. This sidewall cap will supply combustion air for a single pool heater only.

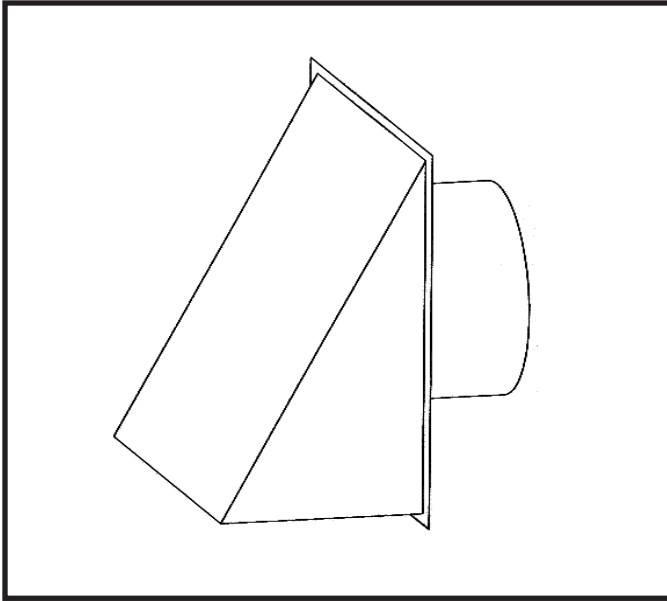


FIG. 21 Air Inlet Cap for Sidewall Termination

Locate units as close as possible to sidewall where the combustion air supply system will be installed.

To prevent recirculation of flue products from an adjacent vent cap into the combustion air inlet, follow all applicable clearance requirements in the latest edition of the National Fuel Gas Code and instructions in this manual.

The combustion air inlet cap must be installed at least one foot (0.30m) above ground level and above normal snow levels.

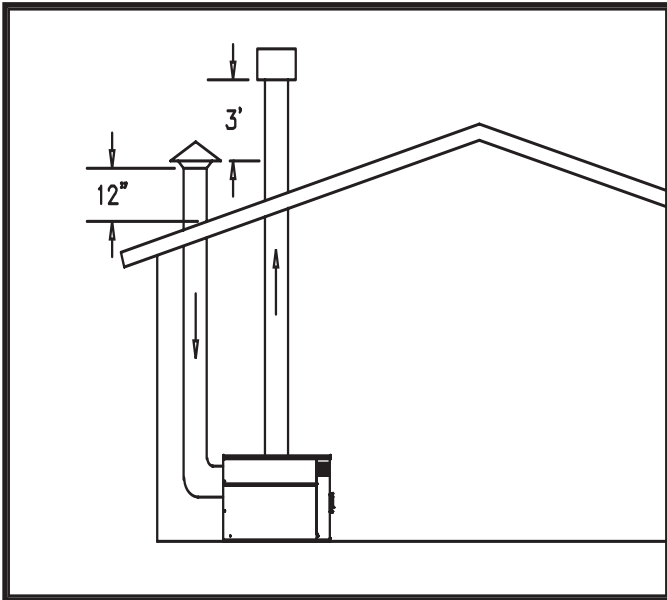


FIG. 22 Vertical DirectAire Installation with Rooftop Combustion Air

Vertical Rooftop Air Inlet

The air inlet cap for the vertical roof top air inlet is supplied in the **Vertical DirectAire** Roof Top Air Kit which must be ordered from the manufacturer. **This roof top cap will supply combustion air for a single unit only.**

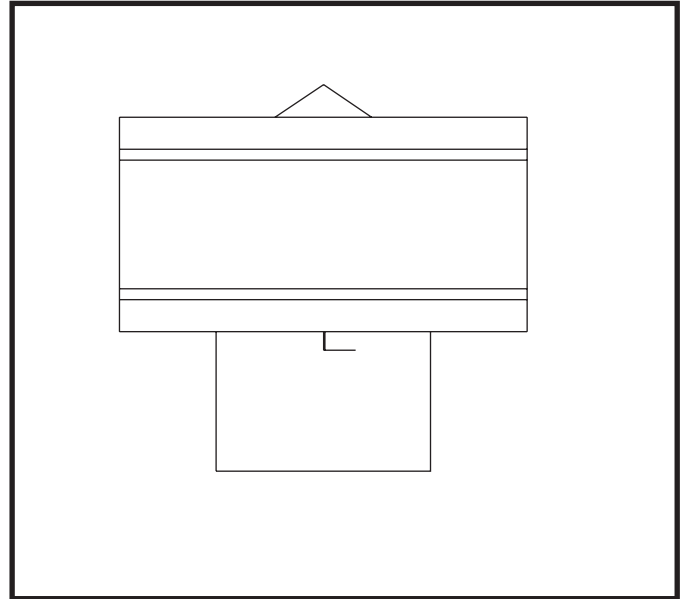


FIG. 23 Air Inlet Cap for Rooftop Termination

The point of termination for the combustion air inlet cap **MUST** be at least 3 feet (0.91m) below the point of flue gas termination (vent cap) if it is located within 10 feet (3.05m) of the flue outlet.

The combustion air inlet cap must not be installed closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

The air inlet point for the combustion air inlet cap must be installed at least one foot (0.30m) above the roof top and above normal snow levels.

Incorrect installation and/or location of the air inlet cap can allow the discharge of flue products to be drawn into the combustion process on the pool heater. This can result in incomplete combustion and potentially hazardous levels of carbon monoxide in the flue products. This will cause operational problems with the pool heater and possible spillage of flue products which can cause personal injury, death or property damage.

Combined Air Inlet Points

The air inlet pipes from multiple pool heaters installed with the DirectAire venting system can be combined to a single common connection. The common air inlet pipe must have a cross sectional area equal to or larger than the total area of all air inlet pipes connected to the common air inlet pipe. [Example: two 5" air inlet pipes (19.6 in² area each) have a total area of 39.2 in²

and will require a single 8"(50.3 in² area) common air inlet pipe.] The air inlet point for multiple pool heater air inlets must be provided with an exterior opening which has a free area equal to or greater than the total area of all air inlet pipes connected to the common air inlet. This exterior opening for combustion air must connect directly to the outdoors. The total length of the combined air inlet pipe must not exceed a maximum of 50 (15.3m) equivalent feet. Subtract 5 feet (1.52m) for each elbow in the air inlet pipe. You must deduct the restriction in area provided by any screens, grills or louvers installed in the common air inlet point. These are common on the sidewall air inlet openings. Screens, grills or louvers installed in the common air inlet can reduce the free area of the opening from 25% (metal louvers) to 75% (wood louvers) based on the materials used.

Air Inlet Pipe Materials

The *Vertical DirectAire* system requires installation of a separate pipe to supply combustion air from outdoors directly to the unit. **The following air inlet pipe materials and sealing recommendations apply whenever an optional venting system is used to duct combustion air directly to the pool heater.**

Air Inlet Pipe Materials

The air inlet pipe(s) must be sealed. Choose acceptable combustion air inlet pipe materials from the following specified materials in this section.

PVC, CPVC or ABS (4" or 5" I.D.)*

Dryer Vent (not recommended for rooftop air inlet)

Galvanized steel vent pipe with joints and seams sealed as specified below.

Type "B" double wall vent with joints and seams sealed as specified below.

* Plastic pipe requires an adapter (not provided) to transition between the air inlet and cap.

Sealing of single wall galvanized or Type "B" double wall vent material used for combustion air supply in a DirectAire Vent System

(a) Seal all joints and seams of the air inlet pipe using either Aluminum Foil Duct Tape meeting UL Standard 723 or 181A-P or a high quality UL Listed silicon sealant such as those manufactured by Dow Corning or General Electric.

(b) Do not install seams of air inlet pipe on the bottom of horizontal runs.

(c) Secure all joints with a minimum of three sheet metal screws or pop rivets. Apply aluminum foil duct tape or silicone sealant to all screws or rivets installed in the air inlet pipe.

(d) Ensure that the air inlet pipe is properly supported.

⚠ CAUTION

Using other vent or air intake materials, failure to properly seal all seams and joints or failure to follow vent pipe manufacturer's instructions can result in personal injury, death or property damage. Mixing of venting materials will void the warranty and certification of the pool heater.

NOTE:

The use of double wall vent material for the combustion air inlet pipe is recommended when the pool heater is operated in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

Length of Air Inlet Pipe

The total equivalent length of the sidewall or vertical rooftop **DirectAire** combustion air inlet pipe must not exceed a maximum of 50 equivalent feet (15.3m) in length. Subtract 5 feet (1.52m) for each elbow in the air intake system. Do not exceed limits for the combustion air inlet piping lengths.

Vent Kits

The **Vertical DirectAire Vent Kit** for sidewall or rooftop air inlet **MUST** be ordered from the pool heater manufacturer for single unit installations. The part number for each kit is listed by unit size. Each kit includes the flue outlet adapter air inlet collar and in sidewall air kits, a sidewall combustion air inlet cap to supply air to a single pool heater. Each kit includes instructions for proper installation. The flue pipe, rooftop vent cap for the flue, vertical air inlet cap and air inlet pipe are purchased locally. You must specify if the air inlet cap is for a vertical rooftop termination or a sidewall termination. The air inlet cap for the combined air supply from multiple boilers must be purchased locally.

**TABLE - E
DIRECTAIRE VENT KITS**

Input Btu/hr	Conventional Vent Flue Size	Air Inlet Pipe*	Vert./Hor. Air Inlet Kit	Vertical Air Inlet Kit
150,000	5"	4"	VDK3020	VDK3017
199,999	5"	4"	VDK3020	VDK3017
250,000	5"	4"	VDK3020	VDK3017
300,000	5"	5"	VDK3021	VDK3018
399,999	6"	5"	VDK3022	VDK3019

*Minimum diameter, installer may increase diameter one pipe size for ease of installation if needed.

⚠ CAUTION

The air inlet cap supplied in the *Vertical DirectAire Vent Kit* is used to supply combustion air to a single pool heater. The rooftop vent cap for flue products should be a standard commercial cap purchased locally. The use of a sidewall or rooftop air inlet cap other than the manufacturers recommended cap for single pool heater installations or use of a common air inlet cap for multiple pool heaters with insufficient free area and/or protection from wind and weather may result in operational problems with the pool heater or potentially hazardous spillage of flue products which can cause personal injury, death or property damage.

Venting of Flue Products

For venting flue products vertically to the outdoors, follow all requirements in the installation instructions for conventional venting.

Termination point for the flue products must follow the clearance requirements in the Vertical Vent Termination section of Conventional Venting.

A barometric damper is **NOT** required in the flue on *Vertical DirectAire* installations if the draft is within the 0.02 to 0.08 inches water negative required for proper operation. **If the draft exceeds this range, a barometric damper MUST be installed.**

⚠ CAUTION

Pool heaters which are shut down or will not operate may experience freezing due to convective air flow in the air inlet pipe connected to the unit. If operated in cold climates, continuous pump operation is recommended to help prevent freezing of pool water on DirectAire systems. Proper freeze protection must be provided. A pool heater that is not in use in the winter season must be properly drained and winterized. See Freeze Protection.

The Powered Sidewall Venting System

POWERED SIDEWALL VENTING WITH COMBUSTION AIR FROM THE EQUIPMENT ROOM

This venting system uses a powered vent assembly which pulls the flue products from the pool heater and exhausts out a sidewall. The fan in the powered vent cap generates a negative draft at the unit. Combustion air is drawn from the equipment room (see Combustion and Ventilation Air Requirements). The outdoor vent cap must be removed and the optional Sidewall Vent Kit must be installed. See Installation of Optional Vent Kits.

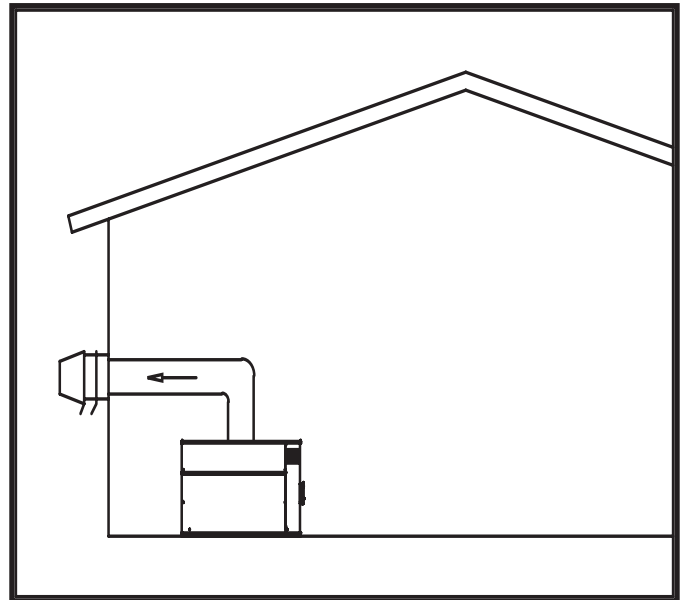


FIG. 24 Sidewall Venting Installation with Powered Vent Cap

The sidewall fan is mounted in a vent cap which is installed on an exterior wall. The sidewall fan and accessories are included in a venting kit which must be furnished by the manufacturer in accordance with CSA International requirements. This venting kit includes a flue adapter, an air inlet cover, the sidewall

fan/cap, barometric damper, proving switch and all necessary relays to interlock with the pool heater's control system. A barometric damper is required in the flue on Powered Sidewall Venting installations. A barometric damper is supplied with each Powered Sidewall Vent Kit and **MUST** be installed in the flue of each unit. The barometric damper must be adjusted to maintain a negative draft between 0.02 to 0.05 inches water when the powered sidewall vent cap is operating. The barometric damper controls draft and provides dilution air to the vent system to prevent condensate formation. When a barometric damper is installed, the equipment room must have adequate air to supply dilution air to the barometric damper.

Length of Flue Pipe

The maximum total equivalent length of flue pipe connected to the powered sidewall cap cannot exceed 75 equivalent feet (22.9m). Subtract 5 feet (1.52m) for each elbow in the vent. Do not exceed the limit for total equivalent vent pipe length.

Sidewall Vent Termination

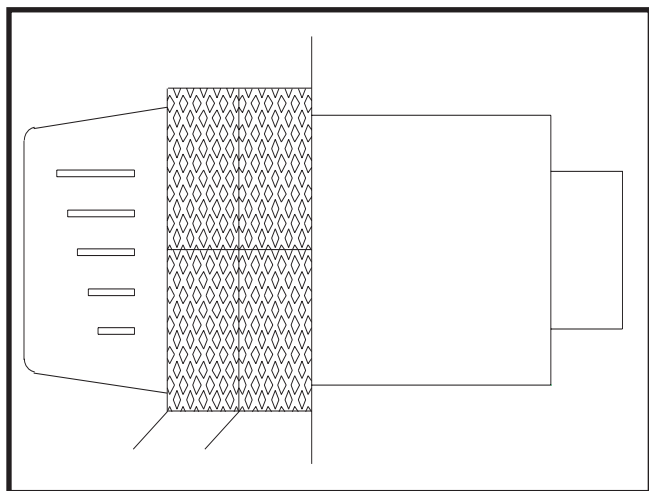


FIG. 25 Powered Sidewall Vent Cap

The powered sidewall vent cap must be installed on an exterior sidewall. The powered sidewall vent cap and accessories are included in a venting kit which must be furnished by the manufacturer in accordance with CSA International requirements. This venting kit includes a flue adapter, an air inlet cover, the powered sidewall cap, barometric damper, proving switch and all necessary relays to interlock with the heaters control system.

The powered sidewall vent cap **MUST** be interlocked with the pool heater's control system to start the fan on a call for heat and prove fan operation before the pool heater fires. Terminal strip connections are provided on the unit for easy connection of the factory supplied vent kit and control package for the sidewall vent fan. See the installation instructions provided with the vent kit.

Sidewall Vent Pipe Requirements

The connection from the vent to the powered sidewall fan/cap **MUST** be made with listed type "B" double wall (or equivalent) vent and accessories. There shall be no reduction in vent size from the units flue outlet to the inlet of the sidewall vent fan. Vent pipe material must be supplied by the installer.

Follow all requirements in the General Venting and Sidewall Vent Termination sections for venting flue products to the outdoors. See the Combustion and Ventilation Air Requirements section to insure that adequate combustion and ventilation air is supplied to the mechanical room. All other general installation requirements must be followed.

Venting of Flue Products

The sidewall vent cap shall terminate at least 3 feet (0.91m) above any forced air inlet within 10 feet (3.05m).

The sidewall vent shall terminate at least 4 feet (1.22m) below, 4 feet (1.22m) horizontally from or 1 foot (0.30m) above any door, window or gravity air inlet to the building.

Do not terminate the sidewall vent in a window well, stairwell, alcove courtyard or other recessed area. The sidewall vent cannot terminate below grade.

The sidewall vent system shall terminate at least 1 foot (0.30m) above grade, above normal snow levels and at least 7 feet (2.13m) above grade when located adjacent to public walkways. The sidewall vent shall not terminate directly above a public walkway.

The sidewall vent terminal shall not be installed closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

The sidewall vent cap should have a minimum clearance of 4 feet (1.22m) horizontally from and in no case above or below, unless a 4 foot (1.22m) horizontal distance is maintained from electric meters, gas meters, regulators and relief equipment.

Flue gas condensate can freeze on exterior walls or on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition. Some discoloration to exterior building surfaces can be expected. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.

Powered Sidewall Vent Kits

The Powered Sidewall Vent Kit **MUST** be ordered from the pool heater manufacturer. The part number for each kit is listed by unit size. Each kit includes a flue adapter, an air inlet cover, a powered sidewall fan/cap assembly, barometric damper, control relay, proving switch and instructions for proper installation. The outdoor vent kit, installed on the pool heater as shipped from the factory, must be removed to install the Powered Sidewall Vent Kit.

**TABLE - F
POWERED SIDEWALL
VENT KITS**

Input Btu/hr	Flue Size	Powered Sidewall Kit
150,000	4"	SVK3031
199,999	4"	SVK3031
250,000	5"	SVK3032
300,000	5"	SVK3033
399,999	5"	SVK3033

⚠ CAUTION

Pool heaters which are shut down or will not operate may experience freezing due to convective air flow into the equipment room. If operated in cold climates, continuous pump operation is recommended to help prevent freezing of pool water. Proper freeze protection must be provided. A pool heater that is not in use in the winter season must be properly drained and winterized. See Freeze Protection.

The Powered Horizontal DirectAire Vent System

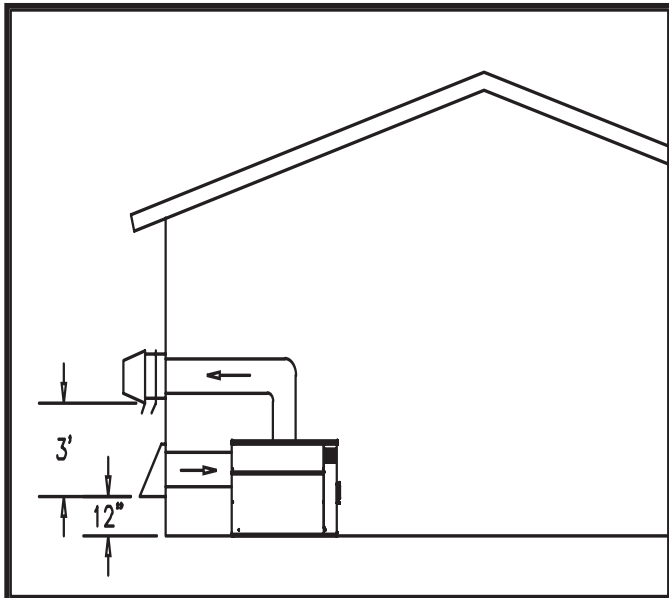


FIG. 26 Power Horizontal DirectAire Installation Illustration

**POWER HORIZONTAL DIRECTAIRE WITH
A SIDEWALL FLUE AND
SIDEWALL AIR INLET**

Follow all requirements in the General Venting section and Sidewall Venting for venting flue products to the outdoors and general installation instructions.

The *Power Horizontal DirectAire* vent system requires the installation of two vent pipes directly to the pool heater, one pipe for flue products and one for combustion air. Both vent pipes are installed horizontally with a sidewall termination point. Vent connection is made directly to the pool heater. Flue products are carried to the sidewall by a powered sidewall cap/fan assembly. A barometric damper is supplied with each Horizontal DirectAire Vent Kit and **MUST** be installed in the flue of each unit. The barometric damper must be adjusted to maintain a negative draft between 0.02 to 0.05 inches water when the powered sidewall vent cap is operating.

The *Power Horizontal DirectAire* combustion air supply system has specific vent material and installation requirements. The air inlet pipe uses an adapter to connect directly to the pool heater to supply combustion air. The combustion air inlet pipe will be a dedicated system with one air inlet pipe per pool heater. The air inlet pipe must be connected to a combustion air inlet cap as specified in this section. Combustion air supply pipes for multiple pool heater installations can **NOT** be combined into a single pipe and inlet termination point.

Combustion air supplied from outdoors must be free of contaminants (See Combustion and Ventilation Air).

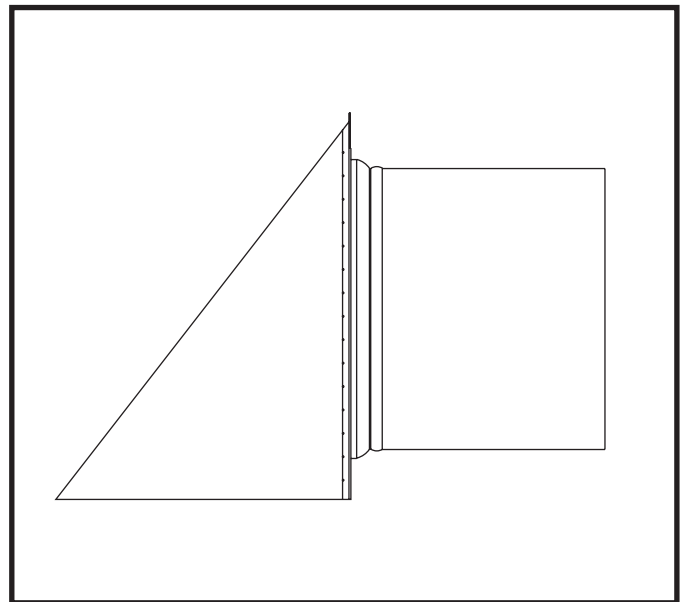


FIG. 27 Air Inlet Cap for Sidewall Termination

Sidewall Air Inlet

The sidewall air inlet cap is supplied in the *Power Horizontal DirectAire Vent Kit* which must be ordered from the manufacturer. This sidewall cap will supply combustion air for a single unit only.

Locate units as close as possible to sidewall where the combustion air supply system will be installed.

To prevent recirculation of flue products from an adjacent vent cap into the combustion air inlet, follow all applicable clearance requirements in the latest edition of the National Fuel Gas Code and instructions in this manual.

The combustion air inlet cap must be installed at least one foot (0.30m) above ground level and above normal snow levels.

The point of termination for the combustion air inlet cap **MUST** be at least 3 feet (0.91m) below the point of flue gas termination (powered vent cap) if it is located within 10 feet (3.05m) of the flue outlet from the powered vent cap. Use care to insure that the air inlet cap assembly is properly installed on the air inlet pipe. The combustion air inlet cap and the powered vent cap **MUST** be installed on the same wall and in the same pressure zone.

The combustion air inlet cap must not be installed closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

Incorrect installation and/or location of the air inlet cap can allow the discharge of flue products to be drawn into the combustion process on the pool heater. This can result in incomplete combustion and potentially hazardous levels of carbon monoxide in the flue products. This will cause operational problems with the pool heater and possible spillage of flue products which can cause personal injury, death or property damage.

Air Inlet Pipe Materials

The Power Horizontal *DirectAire* system requires installation of a separate pipe to supply combustion air from outdoors directly to the pool heater. See the air inlet pipe materials specified in the *DirectAire* venting section for material requirements and sealing recommendations for the air inlet pipe in a Horizontal *DirectAire* system.

⚠ WARNING

Using other vent or air intake materials, failure to properly seal all seams and joints or failure to follow vent pipe manufacturer's instructions can result in personal injury, death or property damage. Mixing of venting materials will void the warranty and certification of the pool heater.

NOTE:

The use of double wall vent material for the combustion air inlet pipe is recommended when the pool heater is operated in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

Length of Air Inlet Pipe

The total equivalent length of the *Power Horizontal DirectAire* combustion air inlet pipe must not exceed a maximum of 75 (22.9m) equivalent feet in length. Subtract 5 feet (1.52m) for each elbow in the air intake system. Do not exceed limits for the combustion air inlet piping lengths.

Vent Kits

The *Power Horizontal DirectAire Vent Kit* for sidewall installation **MUST** be ordered from the pool heater manufacturer. The part number for each kit is listed by unit size. Each kit has a flue adapter, inlet air collar, sidewall powered vent cap, barometric damper, proving switch, controls, and combustion air inlet cap to supply air to a single pool heater and instructions for proper installation. The flue pipe and air inlet pipes are purchased locally.

**TABLE - G
POWERED HORIZONTAL DIRECTAIRE
VENT KITS**

Input Btu/hr	Flue Size	DirectAire Inlet Pipe*	Power Horizontal DirectAire Kit
150,000	4"	4"	SVK3034
199,999	4"	4"	SVK3034
250,000	5"	4"	SVK3035
300,000	5"	5"	SVK3036
399,999	5"	5"	SVK3036

*Minimum diameter, installer may increase diameter one pipe size for ease of installation if needed.

The sidewall air inlet cap supplied in the *Power Horizontal DirectAire Vent Kit* is used to supply combustion air to a single pool heater. Combustion air supply pipes from multiple units can **NOT** be combined into a single air inlet pipe and inlet point. The use of a sidewall air inlet cap other than the manufacturers recommended cap may result in operational problems with the boiler or potentially hazardous spillage of flue products which can cause personal injury, death or property damage.

Venting of Flue Products

For venting flue products horizontally to the outdoors, follow all requirements in the installation instructions for sidewall venting.

Termination point for the flue products must follow the clearance requirements in the Sidewall Vent Termination section of Sidewall Venting.

A barometric damper is required in the flue on *Power Horizontal DirectAire* installations. The barometric damper must be adjusted to maintain the draft within the 0.02 to 0.05 inches water negative required for proper operation. The barometric damper provides dilution air to the vent system to prevent condensate formation.

⚠ CAUTION

Pool heaters which are shut down or will not operate may experience freezing due to convective air flow in the air inlet pipe connected to the unit. If operated in cold climates, continuous pump operation is recommended to help prevent freezing of pool water on DirectAire systems. Proper freeze protection must be provided. A pool heater that is not in use in the winter season must be properly drained and winterized. See Freeze Protection.

E-RITE SIDEWALL VENTING SYSTEM

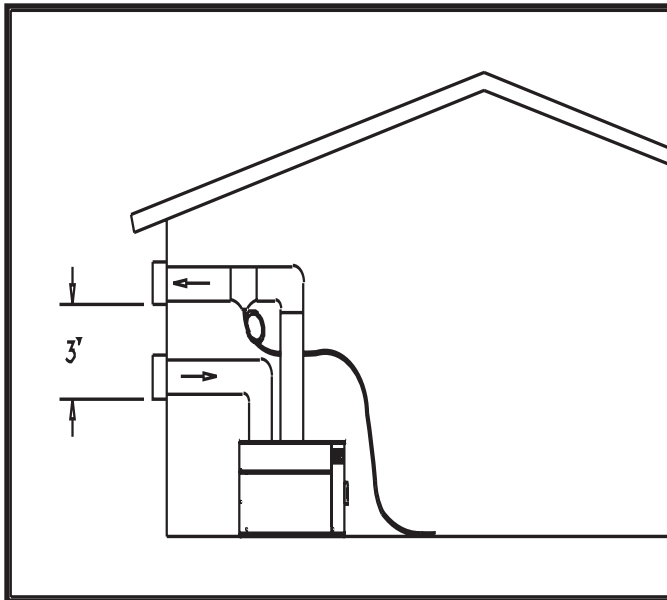


FIG. 28 E-Rite Sidewall Vent Installation

This venting system uses the internal combustion air fan to force the flue products out of a sealed vent pipe to a sidewall vent cap assembly. The fan generates a positive pressure in the

flue to the vent cap and requires the use of a Category IV stainless steel vent pipe with joints and seams fully sealed. Combustion air must be drawn from the outside with a separate combustion air pipe connected to the pool heater. The outdoor vent cap must be removed and the optional E-Rite Sidewall Vent Kit must be installed. See Installation of Optional Vent Kits.

The air shutter on the combustion air fan **MUST** be adjusted when the E-Rite Sidewall Vent Kit is installed. Use a rule to measure the distance from the base of the fan to the end of the air shutter. Follow the steps below to adjust the fan air shutter. Compare this distance to the specified "A" dimension for the unit.

1. Turn the power switch to the "OFF" position.
2. Turn the gas valve switch to the "OFF" position
3. Remove upper front access door.
4. Use a ruler or the spacer supplied in the vent kit to measure the distance from the base of the fan to the end of the air shutter. Compare this distance to the specified "A" dimension for the E-Rite Sidewall Vent System.

TABLE - H
AIR SHUTTER ADJUSTMENT OPENING
FOR E-Rite VENT SYSTEMS

Input Btu/hr	"A" Dimension Opening	Chamber Pressure
150,000	1 1/4"	1.4"
199,999	1 1/4"	1.3"
250,000	1 3/8"	1.3"
300,000	1 9/16"	1.3"
399,999	1 3/4"	1.3"

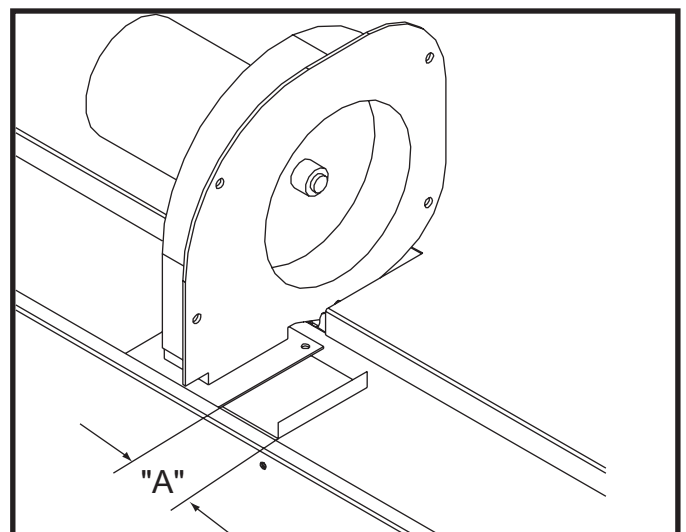


FIG. 29 Combustion Air Fan with Air Shutter "A" Dimension

The E-Rite Sidewall combustion air supply system has specific vent material and installation requirements. The air inlet pipe connects directly to the pool heater to supply combustion air. The combustion air inlet pipe will be a dedicated system with one air inlet pipe per pool heater. The air inlet pipe, its connection and location of the combustion air inlet cap will be the same as specified in the Horizontal DirectAire Vent Systems.

Combustion air supplied from outdoors must be free of contaminants (See Combustion and Ventilation Air).

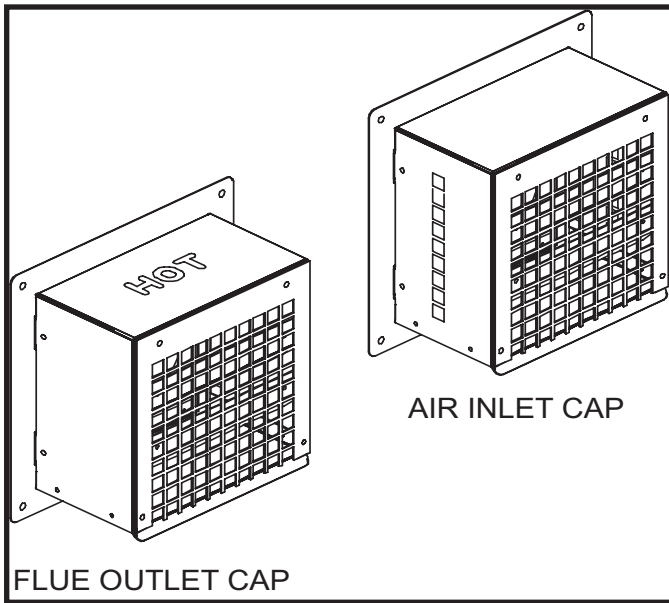


FIG. 30 E-Rite Sidewall Vent Caps Illustration

E-Rite Sidewall Vent Cap for 150,000 through 399,999 Btu/hr Models

The E-Rite Sidewall vent caps must be installed on an exterior sidewall. The E-Rite Sidewall vent cap and accessories are included in a venting kit which must be furnished by the manufacturer in accordance with CSA International requirements. This venting kit includes a flue adapter, air inlet collar, sidewall vent cap, air inlet cap and necessary adapters to install a separate combustion air pipe from the pool heater to the outdoors.

The factory supplied sidewall vent kit **MUST** be used for sidewall venting installation.

E-Rite Sidewall Vent Kits

The *E-Rite Sidewall Vent Kit* **MUST** be ordered from the pool heater manufacturer. The part number for each kit is listed by unit size. Each venting kit includes the sidewall caps, necessary adapters to install a separate combustion air pipe from the pool heater to the outdoors and instructions for proper installation.

**TABLE - I
E-RITE SIDEWALL VENT KITS**

Input Btu/hr	Inlet & Outlet Vent Diameter	E-Rite Sidewall Vent Kit
150,000	4"	HDK3024
199,999	4"	HDK3024
250,000	4"	HDK3024
300,000	5"	HDK3025
399,999	5"	HDK3025

The flue pipe from the flue outlet on the side of the pool heater to the sidewall vent cap is under a positive pressure and must use a totally sealed Category IV vent pipe.

E-Rite Sidewall Vent Pipe Requirements

The connection from the vent to the sidewall cap **MUST** be made with listed Category IV vent material and accessories. There shall be no reduction in vent size from the pool heater's flue outlet to the inlet of the sidewall vent cap. Vent pipe material may be purchased locally by the installer.

Flue Pipe Materials

Select venting material from the following specified vent materials:

Protech Systems Inc. Fas N Seal Vent with AL29-4C stainless steel
(Call 1-800-766-3473 for nearest distributor)

Z-Flex Z-Vent with AL29-4C stainless steel
(Call 1-800-654-5600 for nearest distributor)

Heat-Fab Inc. Saf-T CI Vent with AL29-4C stainless steel (Call 1-800-772-0739 for nearest distributor)

Flex-L International Inc. StaR 34 Vent with AL29-4C stainless steel
(Call 1-800-561-1980 for nearest distributor)

Metal-Fab Inc. Corr/Guard Vent with AL29-4C stainless steel
(Call 1-800-835-2830 for nearest distributor)

Or other listed **Category IV** vent systems suitable for a positive pressure gas fired appliance.

Air Inlet Pipe Materials

The E-Rite Sidewall Vent system requires installation of a separate pipe to supply combustion air from outdoors directly to the pool heater. See the air inlet pipe materials specified in the DirectAire venting section for material requirements and sealing recommendations for the air inlet pipe on an E-Rite Sidewall Vent system.

NOTE

The use of double wall vent material for the combustion air inlet pipe is recommended when the pool heater is operated in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

⚠ WARNING

Using other vent or air intake materials, failure to properly seal all seams and joints or failure to follow vent pipe installation instructions can result in personal injury, death or property damage. Improper sealing of venting materials will void the warranty and certification of the pool heater.

Length of Flue Pipe and Air Inlet Pipe for an E-Rite Sidewall Vent System

The maximum total equivalent length of the sidewall flue or the sidewall combustion air inlet pipe must not exceed a maximum of 20 equivalent feet (6.1m) in length. Subtract 5 feet (1.52m) for each elbow in the flue pipe or the air intake system. The transition adapter mounted to the flue outlet on the pool heater does not count as one of the elbows in the venting system. **Do not exceed limits for the combustion air inlet and flue outlet piping lengths.**

Sealing of Type "B" double wall vent material or galvanized vent pipe material used for air inlet pipe on a E-Rite Sidewall Vent System:

- Seal all joints and seams of the air inlet pipe using either Aluminum Foil Duct Tape meeting UL Standard 723 or 181A-P or a high quality UL Listed silicon sealant such as those manufactured by Dow Corning or General Electric.
- Do not install seams of vent pipe on the bottom of horizontal runs.
- Secure all joints with a minimum of three sheet metal screws or pop rivets. Apply aluminum foil duct tape or silicone sealant to all screws or rivets installed in the vent pipe.

- Ensure that the air inlet pipes are properly supported.

The PVC, CPVC or ABS air inlet pipe should be cleaned and sealed with the pipe manufacturers recommended solvents and standard commercial pipe cement for the material used. The PVC, CPVC, ABS or Dryer Vent air inlet pipe should use a silicone sealant to insure a proper seal at the pool heater connection and the air inlet cap connection. Dryer vent should use a screw type clamp to seal the vent to the boiler and air inlet cap. Proper sealing of the air inlet pipe insures that combustion air will be free of contaminants and supplied in proper volume.

Sealing of vent material for use with the E-Rite Sidewall Vent System

The vent materials, Heat-Fab Saf-T CI Vent, Z-Flex Z-Vent, Protech Systems Fas N Seal Vent, Flex-L Star-34 Vent, Metal-Fab Corr/Guard Vent or listed AL29-4C vent systems suitable for positive pressure, must be installed and sealed per the vent manufacturers installation instructions.

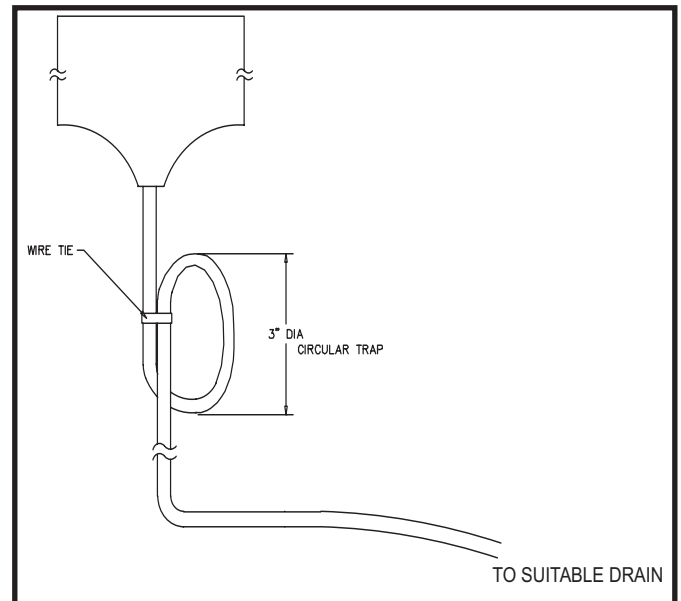


FIG. 31 Drain Tee Installation

Drain Tee Installation

A drain tee must be installed in the vent pipe to collect and dispose of any condensate that may occur in the vent system. The drain tee must be installed as the first fitting after the horizontal ell on the top of the unit. See the typical vent installation drawings. Plastic drain tubing, sized per the vent manufacturers instructions, shall be provided as a drain line from the tee. The drain tubing must have a trap provided by a 3" (7.6cm) diameter circular trap loop in the drain tubing. Prime the trap loop by pouring a small quantity of water into the drain hose before assembly to the vent. Secure the trap loop in position with nylon wire ties. Use caution not to collapse or restrict the condensate drain line with the nylon wire ties. The

condensate drain must be routed to a suitable drain for disposal of condensate that may occur in the direct vent system. Refer to the condensate drain installation instructions as supplied by the manufacturer of the vent material.

When an *E-Rite Sidewall* vent system is disconnected for any reason, the flue must be reassembled and resealed according to the vent manufacturers instructions to insure that flue products will not be discharged into the equipment room or other occupied spaces in the building. The air inlet pipe must also be resealed to insure that combustion air will be free of contaminants and supplied in proper volume.

The connection from the vent to the vent termination outside the building **MUST** be made with one of the specified vent materials and must be direct as possible with no reduction in diameter. The vent accessories not otherwise provided, such as firestop spacers, thimbles, caps, etc., **MUST** be from the same vent material manufacturer and installed in accordance with the manufacturers listing. The vent connection through the sidewall must provide correct spacing to combustible surfaces. The vent pipe connection to the sidewall vent cap **MUST** have a gas-tight seal to prevent the leakage of flue products.

Installation of an *E-Rite Sidewall Vent System* requires that each pool heater in a multiple unit installation have a dedicated flue pipe and sidewall vent cap. The flue discharge or air inlet from multiple pool heaters installed with the *E-Rite Sidewall Vent System* may **NOT** be combined to a single common vent.

⚠ DANGER

Failure to properly seal all joints and seams as required in the flue piping may result in flue gas recirculation, spillage of flue products and carbon monoxide emissions causing severe personal injury or death.

Follow all requirements in the General Venting and Sidewall Vent Terminations sections for venting flue products to the outdoors. See the Combustion and Ventilation Air Requirements section to insure that adequate combustion and ventilation air is supplied to the mechanical room. All other general installation requirements must be followed.

E-Rite Sidewall Vent Termination

The sidewall vent cap shall terminate at least 3 feet (0.91m) above any forced air inlet within 10 feet (3.05m).

The sidewall vent shall terminate at least 4 feet (1.22m) below, 4 feet (1.22m) horizontally from or 1 foot (0.30m) above any door, window or gravity air inlet to the building.

Do not terminate the sidewall vent in a window well, stairwell, alcove courtyard or other recessed area, The sidewall vent can not terminate below grade.

The sidewall vent system shall terminate at least 1 foot (0.30m) above grade, above normal snow levels and at least 7 feet (2.13m) above grade when located adjacent to public walkways. The sidewall vent shall not terminate directly above a public walkway.

The sidewall vent terminal shall not be installed closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

The sidewall vent cap should have a minimum clearance of 4 feet (1.22m) horizontally from and in no case above or below, unless a 4 foot (1.22m) horizontal distance is maintained from electric meters, gas meters, regulators and relief equipment.

Flue gas condensate can freeze on exterior walls or on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition. Some discoloration to exterior building surfaces can be expected. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.

Combustion Air Inlet

Combustion air supply pipes can **NOT** be combined into a single pipe for multiple unit installations.

Combustion air supplied from outdoors must be free of contaminants (See Combustion and Ventilation Air). To prevent recirculation of flue products into the combustion air inlet, follow all instructions in this section.

To help prevent recirculation of flue products:

The combustion air inlet cap **MUST NOT** be installed above the flue outlet cap.

The combustion air inlet cap must be installed horizontally or below the flue outlet and **MUST** maintain a minimum 3 foot (0.91m) radius clearance from the flue outlet cap.

The combustion air inlet cap and vent cap for flue outlet **MUST** be located on the same sidewall and in the same pressure zone.

The combustion air inlet cap must not be installed closer than 10 feet (3.05m) from an inside corner of an L-shaped structure.

The combustion air inlet cap must be installed at least one foot (0.30m) above ground level and above normal snow levels.

Multiple E-Rite Sidewall Vent Installations

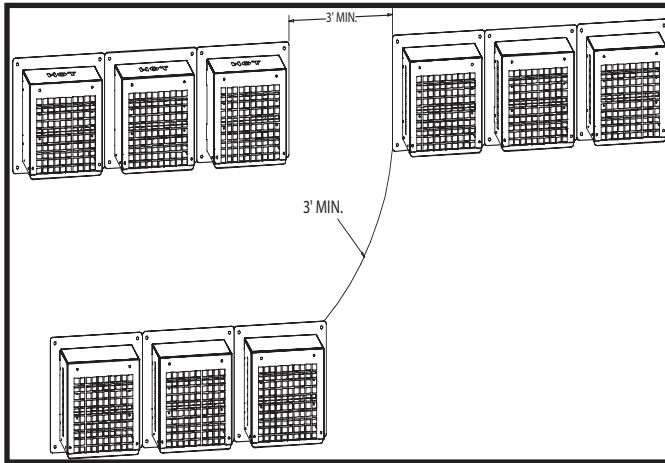


FIG. 32 Installation of Multiple E-Rite Sidewall Vent Caps

The combustion air inlet caps for multiple unit installations must maintain the minimum 3 foot (0.91m) radius clearance below or horizontally from the closest flue outlet. Multiple flue outlet caps may be installed side by side and multiple air inlet caps may be installed side by side but the 3 foot (0.91m) radius minimum clearance between air inlet and flue outlet must be maintained. All clearance and installation requirements in this section and the applicable portions of the general venting section must be maintained on multiple unit installations.

⚠ CAUTION

Pool heaters which are shut down or will not operate may experience freezing due to convective air flow in the flue pipe or from negative pressure in the equipment room. If operated in cold climates, continuous pump operation is recommended to help prevent freezing of pool water. Proper freeze protection must be provided. A pool heater that is not in use in the winter season must be properly drained and winterized. See Freeze Protection.

GAS SUPPLY

Verify unit is supplied with the type gas specified on the rating plate. This unit is orificed for operation up to 2000 feet altitude. Consult factory for installations above 2000 feet elevation.

TABLE - J INLET GAS PRESSURE

Measured at the inlet pressure tap located upstream of the combination gas valve.

Btu/hr Input	Nat. Gas	LPG
150,000 - 399,999 Btu/hr Max. (Inches-Water Column)	10.5" w.c.	13" w.c.
150,000 - 300,000 Btu/hr Min. (Inches-Water Column)	4.5" w.c.	4.5" w.c.
399,999 Btu/hr Min. (Inches-Water Column)	5.0" w.c.	5.0" w.c.

Maximum inlet gas pressure must not exceed the value specified. Minimum value listed is for the purposes of input adjustment.

MANIFOLD PRESSURE: Measured at the pressure tap on the downstream side of the combination gas valve. If adjustment of regulator pressure is required, see Manifold Adjustment Procedure. **Do not increase regulator pressure beyond specified pressure setting.**

TABLE - K NET MANIFOLD PRESSURE

Btu/hr Input	Natural and LP Gas Regulator Setting
150,000 - 399,999	1.8" w.c. Net for the Referenced gas valve

GAS PRESSURE TEST

1. The pool heater and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at a test pressure in excess of **1/2 PSIG (3.5kPa)**.
2. The pool heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than **1/2 PSIG (3.5kPa)**.
3. The pool heater and its gas connection must be leak-tested before placing the heater in operation.

GAS CONNECTION

Safe operation of the unit requires properly sized gas supply piping. See the following data:

- Gas pipe size may be larger than heater connection.
- Installation of a union is highly recommended for ease of service. Install union as close as possible to gas valve inlet.
- Install a manual main gas shutoff valve, outside of the appliance gas connection and before the gas valve, when local codes require.
- A trap (drip leg) **MUST** be provided in the inlet of the gas connection to the unit.
- The combination gas valve has an integral vent limiting device and does not require venting to atmosphere, outside the building.
- Optional gas controls may require routing of bleeds and vents to the atmosphere, outside the building when required by local codes.

**TABLE - M
FITTINGS TO EQUIVALENT STRAIGHT
PIPE**

Diameter Pipe (inches)	3/4"	1"	1 1/4"	1 1/2"	2"	3"	4"	5"
Equivalent length of Straight Pipe (feet)	2'	2'	3'	4'	5'	10'	14'	20'

**TABLE - L
LOW PRESSURE NATURAL GAS
SINGLE UNIT INSTALLATIONS
SUGGESTED GAS PIPE SIZE**

Input Btu/hr	DISTANCE FROM METER				
	0-50'	51'-100'	101'-200'	201'-300'	301'-500'
150,000	3/4"	1"	1 1/4"	1 1/4"	1 1/2"
199,999	1"	1"	1 1/4"	1 1/2"	2"
250,000	1"	1 1/4"	1 1/2"	1 1/2"	2"
300,000	1 1/4"	1 1/4"	1 1/2"	1 1/2"	2"
399,999	1 1/4"	1 1/4"	1 1/2"	2"	2"

LP GAS INSTALLATIONS

⚠ WARNING

LP (propane) gas is heavier than air and will remain at floor level if there is a leak. Basements, crawl spaces, alcoves, and areas below ground level will serve as pockets for accumulation of leaking gas. Before lighting, sniff at floor level. **IF YOU SMELL GAS, follow instructions on PAGE ONE of INSTALLATION & SERVICE MANUAL. Shut off gas at LP tank outside of building. DO NOT OPERATE APPLIANCE UNTIL LEAKAGE IS CORRECTED.**

LP gas cylinders shall be located outdoors and away from the pool structure in accordance with the latest edition of the Standard for the Storage and Handling of Liquefied Petroleum Gases, ANSI/NFPA 58, or CAN/CSA B149.2, and applicable local codes.

For each elbow or tee, add equivalent straight pipe to total length from Table N.

**TABLE - N
MULTIPLE UNIT INSTALLATIONS GAS PIPING SIZE CHART**

Nominal Iron Pipe Size, Inches	Length of Pipe in Straight Feet														Maximum Capacity of Pipe in Thousands of Btu/hr per hour for gas pressures of 14 Inches Water Column (0.5 PSIG) or less and a pressure drop of 0.5 Inch Water Column (Based on NAT GAS, 1025 Btu/hr per Cubic Foot of Gas and 0.60 Specific Gravity)
	10	20	30	40	50	60	70	80	90	100	125	150	175	200	
3/4	369	256	205	174	155	141	128	121	113	106	95	86	79	74	
1	697	477	384	328	292	267	246	226	210	200	179	164	149	138	
1 1/4	1,400	974	789	677	595	543	502	472	441	410	369	333	308	287	
1 1/2	2,150	1,500	1,210	1,020	923	830	769	707	666	636	564	513	472	441	
2	4,100	2,820	2,260	1,950	1,720	1,560	1,440	1,330	1,250	1,180	1,100	974	871	820	
2 1/2	6,460	4,460	3,610	3,100	2,720	2,460	2,310	2,100	2,000	1,900	1,700	1,540	1,400	1,300	
3	11,200	7,900	6,400	5,400	4,870	4,410	4,000	3,800	3,540	3,300	3,000	2,720	2,500	2,340	
4	23,500	16,100	13,100	11,100	10,000	9,000	8,300	7,690	7,380	6,870	6,150	5,640	5,130	4,720	

**TABLE - O
SINGLE OR SECOND STAGE
LOW PRESSURE
PROPANE GAS PIPING
SINGLE UNIT INSTALLATIONS
SUGGESTED GAS PIPE SIZE**

DISTANCE FROM METER				
Input Btu/hr	0-50'	51'-100'	101'-200'	201'-300'
150,000	3/4"	1"	1"	1"
199,999	3/4"	1"	1"	1 1/4"
250,000	1"	1"	1 1/4"	1 1/4"
300,000	1"	1 1/4"	1 1/4"	1 1/2"
399,999	1"	1 1/4"	1 1/4"	1 1/2"

For each elbow or tee, add equivalent straight pipe to total length from Table N.

**TABLE - P
FIRST STAGE
HIGH PRESSURE PROPANE
GAS PIPING
SINGLE UNIT INSTALLATIONS
SUGGESTED GAS PIPE SIZE**

Length	Tubing Size
0 - 70 Feet	1/2" Copper Tubing
71 - 250 Feet	5/8" Copper Tubing

Capacity based on 5 PSIG inlet with 1 PSIG pressure drop.

GAS PIPING

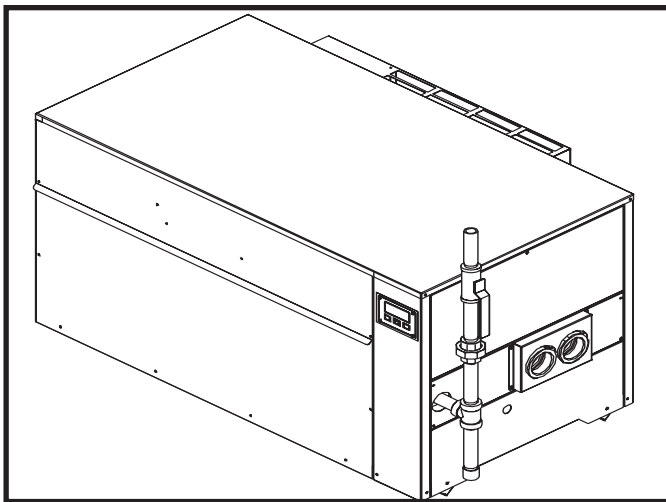


FIG. 33 Gas Line Connection to unit w/sediment trap and manual main gas shut-off valve

All gas connections must be made with pipe joint compound resistant to the action of liquefied petroleum and natural gasses. All piping must comply with local codes and ordinances. Tubing installations must comply with approved standards and practices.

Install Piping to Control

1. The gas line should be a separate line direct from the meter unless the existing gas line is of sufficient capacity. Verify pipe size with your gas supplier.
2. Use new, properly threaded black iron pipe free from chips. If tubing is used, make sure the ends are square, deburred and clean. All tubing bends must be smooth and without deformation. Avoid flexible gas connections. Internal diameter of flexible lines may not provide unit with proper volume of gas.
3. Install a manual main gas shutoff valve at the pool heater's gas inlet, outside of the pool heater and before the gas valve. When the pool heater is installed in, under or directly attached to the pool or spa structure, the manual main gas shutoff valve must be located outside the pool structure.
4. Run pipe or tubing to the pool heater's gas inlet. If tubing is used, obtain a tube to pipe coupling in order to connect the tubing to the pool heater's gas inlet.
5. Install a sediment trap in the supply line to the pool heater's gas inlet (see Figure 33).
6. Apply a moderate amount of good quality pipe compound (DO NOT use Teflon tape) to pipe only, leaving two end threads bare.
7. Remove seal over gas inlet to pool heater.

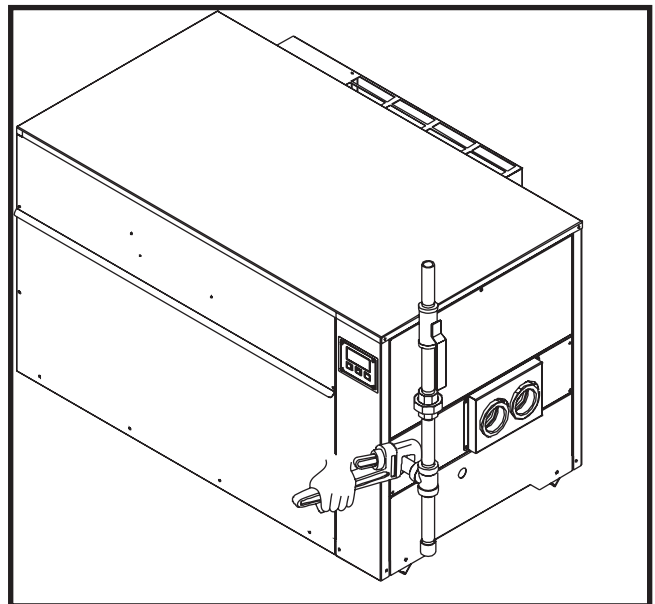


FIG. 34 Wrench to Support Gas Valve for Piping Connection

8. Connect gas pipe to inlet of unit. Use a wrench to support the gas manifold on the unit.

9. For LP gas, consult your LP gas supplier for expert installation.
10. Ensure that all air is properly bled from the gas line before starting the ignition sequence. Start up without properly bleeding air from the gas line may require multiple reset functions of the ignition control module to achieve proper ignition.

GAS MANIFOLD PRESSURE ADJUSTMENT PROCEDURE

IMPORTANT:

The gas valve is referenced to the fan pressurized chamber by a hose connected from the vent of the gas valve regulator to the chamber pressure tap located on the front inside portion of the jacket. Reference the drawings in this section for component location and connection points for pressure measurement. The referenced chamber pressure must be subtracted from the manifold pressure to obtain actual net manifold pressure for normal operation. A manometer or magnahelic gauge legible in 0.1" increments up to 10" water column is required to check and adjust the manifold pressure. The regulator cover screw on the gas valve must be in place and tight for the appliance to operate properly.

1. Turn the power switch to the "OFF" position.
 - (a) Remove the top front jacket panels.

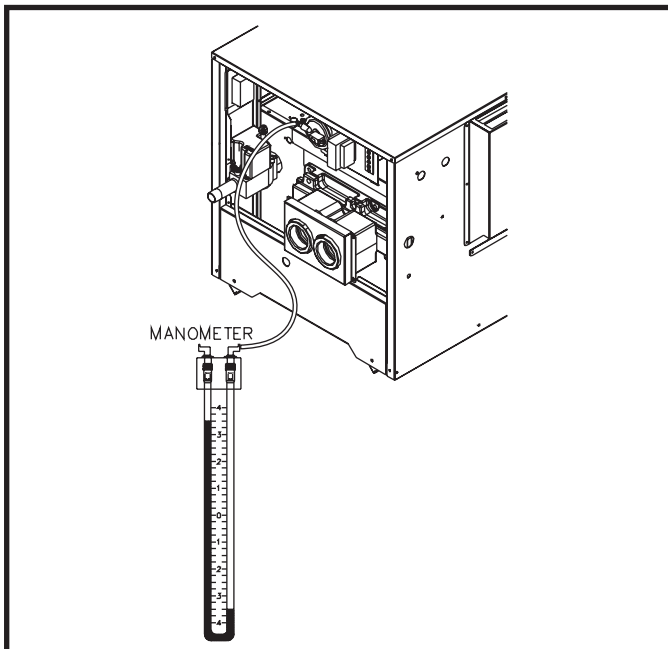


FIG. 35 Front Chamber Pressure Measurement

- (b) Locate the air pressure switch located to the right of the combustion air fan. Trace the hose from the air pressure switch to the barb located in the top right front corner of the upper chamber. Remove the hose from this barb and connect the hose from the manometer or magnahelic to this barb to measure the air pressure in the front chamber.
- (c) Turn the power switch to the "ON" position.
- (d) Ensure that the "ON/OFF" switch on the smart valve is in the "ON" position.
- (e) Set the electronic temperature control to call for heat. The fan should start.
- (f) While the combustion air fan is running for the pre-purge cycle and the pressure in the front chamber stabilizes, record the pressure in the front chamber. This pressure will be used to calculate the net manifold pressure.
- (g) Turn the power switch to the "OFF" position.
- (h) Remove the manometer or magnahelic hose from the front chamber barb and reinstall the hose from the air pressure switch to the barb.
- (i) Turn the manual gas cock to the "OFF" position.

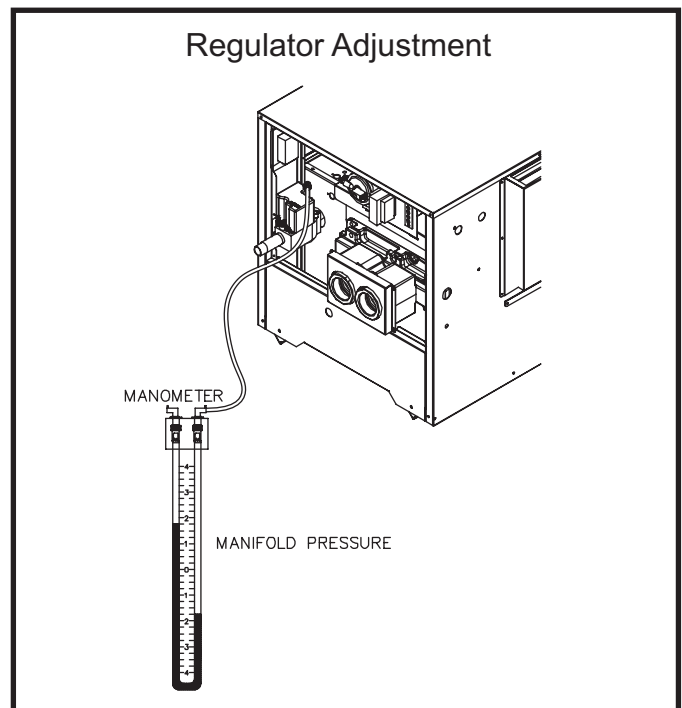


FIG. 36 Manifold Gas Pressure Measurement

- (j) Remove the 1/8" hex plug, located on "outlet" side of the gas valve and install a fitting suitable to connect to a manometer or magnahelic gauge. Minimum range of scale should be up to 5" w.c. for natural gas and LP gas.

(k) A reference pressure hose is factory installed from the barbed connection on the gas valve regulator to the fan pressurized front chamber. All manifold pressure measurements made with the reference hose in place will be the sum of the net manifold pressure and the air pressure in the front chamber.

- (l) Turn the power switch to the "ON" position.
- (m) Ensure that the "ON/OFF" switch on the smart valve is in the "ON" position.
- (n) Turn the manual gas cock to the "ON" position.
- (o) Set the electronic temperature control to call for heat.
- (p) Before the valve opens, the manometer or magnahelic gauge will read a positive air pressure of 1.3" w.c. to 1.5" w.c. in the jacket as supplied by the combustion air fan on high speed in the pre-purge cycle. There is no gas flow at this point. This air pressure reading is normal.
- (q) The gas valve will open at the end of the trial for ignition stage and remain open as the burners fire. Observe the gas manifold pressure when the valves open. If insufficient gas pressure is supplied to the burners, the burners will not fire. Record the gas pressure indicated on the manometer or magnahelic. Subtract the air pressure in the front chamber (as recorded in step 7) from the gross manifold pressure observed at the end of trial for ignition and when the burners are firing. The gross manifold pressure will typically be within the range of 3.1" w.c to 3.5" w.c. for Natural Gas and LP Gas. The difference in the gross manifold pressure and the front chamber pressure is the net manifold pressure setting of the gas valve's regulator. Compare the net setting to the setting specified for the type of gas used. Adjust the regulator as required. Set the electronic temperature control or thermostat to a setting lower than the unit's water temperature to turn the burners off. Allow unit to run through the post purge sequence. Turn the power switch to the "OFF" position.

Net Manifold Pressure = Regulator Pressure Less Front Chamber Pressure:

Type of Gas	Net Manifold Pressure Setting
Natural Gas or LP Gas	1.8" w.c.

NOTE:

The front chamber pressure must be subtracted from the gross regulator pressure to obtain actual net manifold pressure for normal operation. The front chamber pressure may vary based on elevation, vent length and model. For information on chamber pressure, see Combustion Air Adjustment.

Do not increase net manifold pressure beyond the specified pressure setting.

If adjustment is necessary, remove the regulator cover screw on the gas valve.

- (r) Turn regulator adjustment screw clockwise to raise regulator gas pressure, counter clockwise to lower the regulator gas pressure. Turn regulator adjustment screw ¼ turn in the desired rotation and cycle the burners on in the sequence listed below and record the observed chamber and regulator settings. Subtract to determine the net manifold pressure setting. Repeat as necessary to achieve the specified net manifold pressure setting.
- (s) Replace cover screw on the regulator and turn the power switch to the "ON" position. Set the electronic temperature control or thermostat to call for heat. Observe gas regulator pressure again at the burner "ON" stages. Repeat this sequence until the proper regulator setting has been obtained.

NOTE:

If the regulator cover screw is not in place and tight, the unit will not function properly.

- (t) Turn the power switch to the "OFF" position.
- (u) Turn manual gas cock knob to the "OFF" position.
- (v) Remove the gas pressure fitting from the gas valve and replace with the 1/8" hex plug (that was previously removed) and tighten.
- (w) Ensure that the chamber pressure reference hose is properly connected to the gas valve.
- (x) Turn the manual gas cock to the "ON" position.
- (y) Turn the power switch to the "ON" position and replace the jacket panels. The appliance is now ready to operate.

If manifold pressure can not be properly maintained, check gas supply pressure with a manometer connected to the inlet pressure tap on the gas control.

CHECKING GAS SUPPLY PRESSURE

1. Turn the main power switch to the "OFF" position.
2. Shut off gas supply at the field installed manual gas cock in the gas piping to the appliance. If fuel supply is LP gas, shut off gas supply at the tank.

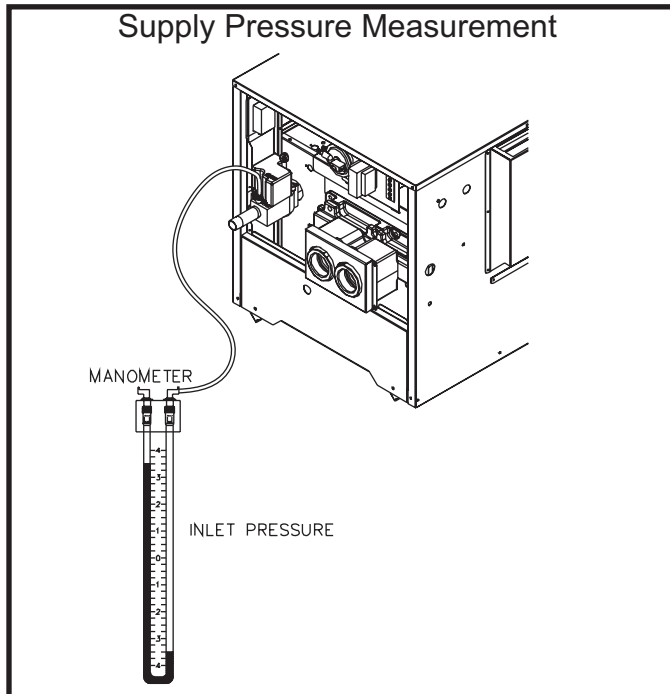


FIG. 37 Gas Supply Pressure Measurement at Combination Gas Valve

3. Remove the 1/8" hex plug, located on "inlet" side of the gas valve. An inlet pressure tapping is located on the top side of the valve body. A tapping on the field installed main manual gas cock may also be used. Install a fitting in the inlet pressure tapping suitable to connect to a manometer or magnahelic gauge. Range of scale should be 14" w.c. or greater to check inlet pressure.
4. Turn on gas supply at the manual gas cock, turn on LP gas at tank if required.
5. Turn the power switch to the "ON" position.
6. Ensure that the "ON/OFF" switch on the smart valve is in the "ON" position.
7. Set the electronic temperature control to call for heat.
8. Observe the gas supply pressure as all burners are firing. Ensure that inlet pressure is within the specified range. Minimum and Maximum gas supply pressures are specified in the Gas Supply Section.
9. If gas pressure is out of range, contact gas utility, gas

supplier, qualified installer or service agency to determine necessary steps to provide proper gas pressure to the control.

10. If gas supply pressure is within normal range, proceed to remove gas manometer and replace pressure tap fittings in the gas control.
11. Turn the power switch to the "OFF" position.
12. Shut off gas supply at the manual gas cock in the gas piping to the appliance. If fuel supply is LP gas, shut off gas supply at the tank.
13. Remove the manometer and related fittings from "inlet" side of the gas valve, replace 1/8" hex plug in gas valve and tighten.
14. Turn on gas supply at the manual valve, turn on LP gas at tank if required.
15. Turn the power switch to the "ON" position.
16. Ensure that the "ON/OFF" switch on the smart valve is in the "ON" position..
17. Set the electronic temperature control or thermostat to call for heat.

If proper ignition and burner operation is not achieved after checking gas supply pressure and setting the correct net manifold pressure, see the Maintenance section for Combustion Air Adjustment. Follow the procedure to adjust the combustion air fan.

IMPORTANT:

Upon completion of any testing on the gas system, leak test all gas connections with a soap and water solution while main burners are operating. Do not spray soap and water solution on the SmartValve housing. The use of an excessive amount of soap and water solution can damage the control. Immediately repair any leak found in the gas train or related components. Do Not operate an appliance with a leak in the gas train, valves or related piping.

Check burner performance by cycling the system while you observe burner response. Burners should ignite promptly. Flame pattern should be stable, see "Maintenance-Normal Flame Pattern." Turn system off and allow burners to cool, then cycle burners again to insure proper ignition and flame characteristics.

WATER CONNECTIONS

This pool heater is equipped with an automatic, built-in bypass located in the front header. This bypass is flow actuated to

maintain proper flow through the pool heater at flow rates of less than 100 GPM. If the water flow rate to the pool heater exceeds 100 GPM, an auxiliary bypass **MUST** be installed in the piping to the pool heater. See auxiliary bypass section for piping and adjustment.

**TABLE - Q
MINIMUM WATER FLOW REQUIREMENTS**

Minimum water flow rates to insure proper operation are as follows:	
Input Btu/hr	Minimum Flow
150,000	15 GPM
199,999	20 GPM
250,000	25 GPM
300,000	30 GPM
399,999	40 GPM

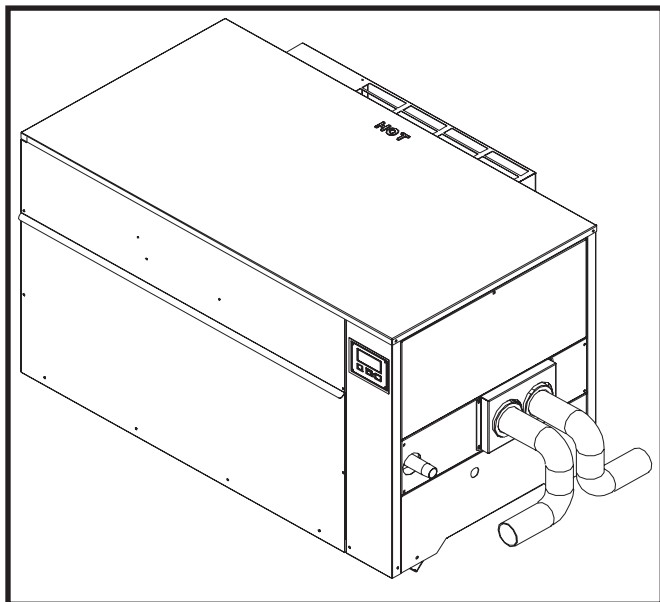


FIG. 38 Typical Piping for Water Connections

Inlet and Outlet Connections

Connection to the pool heater can be made with either 2" threaded pipe or a slip connection with 1 1/2" or 2" pipe. Two inch threaded pipe may be directly screwed into the flanged header connections for both inlet and outlet piping. Each pool heater is supplied with two sets of gaskets to allow a flanged compression attachment of either 2" or 1 1/2" copper pipe directly to the front header. Ensure that the correct gasket is used to match the pipe diameter used. Minimum pipe size for installation of the pool heater is 1 1/2" diameter.

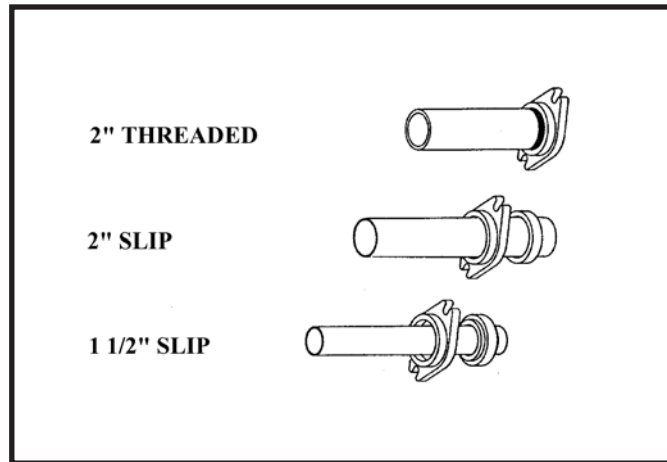


FIG. 39 Alternate Piping Connections

NOTE:

The pool heater installation may require a 3/4" drain pipe. Check with your local code authorities. In these applications, install a 3/4" threaded connection in the piping, located immediately downstream of the inlet/outlet connection on the front header for system drainage.

A metallic pipe heat sink is not required on pool heater installation. PVC, CPVC or other high temperature plastic piping may be used to pipe directly to the pool heater if permitted by local codes. When the pool heater is used with a spa or therapy pool, CPVC or metallic pipe is recommended. **A silicon type sealant with a high elasticity must be used at flanged connections to prevent leakage.** This helps to compensate for the large differences in expansion and contraction of the materials used in piping and the flanged connections. The filtration pump must operate simultaneously when the heater is in service to ensure that there is no damage to PVC piping connected directly to the pool heater. A check valve should be installed in the piping to the heater if there is the possibility of "back siphoning" when the pump stops.

AUXILIARY BYPASS

When water flow rates to the pool heater exceed 100 GPM, a portion of this high water flow **MUST** be diverted with an external bypass. High performance pumps can provide flows in excess of 100 GPM. An auxiliary bypass as shown in the attached drawing **MUST** be installed when the maximum flow is exceeded. The bypass must have a valve installed between the connections to the pool heater to allow a portion of the excess flow to be diverted to the pool. The bypass allows the proper volume of water to be supplied to the pool heater to prevent sweating and condensate. The bypassed water prevents needless pressure drop and reduction in flow rates.

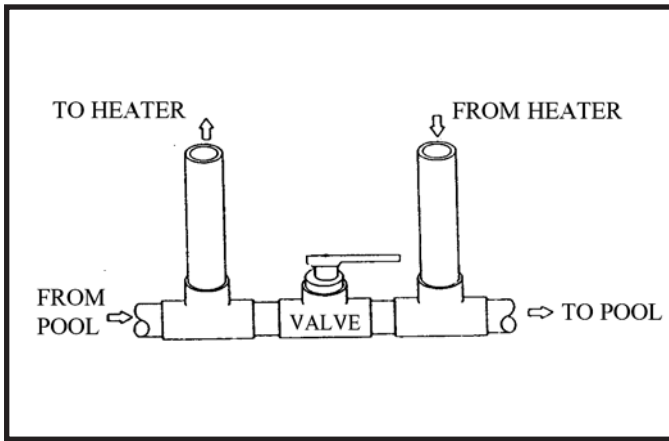


FIG. 40 Auxiliary Bypass Piping

ADJUSTMENT OF AUXILIARY BYPASS

1. Backwash and clean pool filters.
2. Start with bypass valve in half open position.
3. Start the pool heater.
4. Check the temperature of the outlet piping from the pool heater. It should be slightly warm to the touch.
5. If the pipe is hot, close the bypass to increase flow to the pool heater. If the pipe is cold, open the valve to decrease flow to the pool heater and increase temperature rise.
6. High water flow can cause condensate and operational problems which are non-warrantable.

AUTOMATIC CHLORINATORS AND CHEMICAL FEEDERS

All chemicals must be diluted into the pool or spa water before they are circulated through the pool heater. Any concentration of chlorine in the pool heater can cause damage to the unit. Do not place chlorine tablets or bromine sticks in the skimmer. High chemical concentrations will result when the pump is not running.

Chlorinators must feed downstream of the pool heater and have an anti-siphoning device to prevent chemical back-up in the heater when the pump is shut off.

IMPORTANT:

High chemical concentrations from improperly adjusted feeders and chlorinators can cause rapid corrosion to the heat exchanger. This damage is non-warrantable.

RELIEF VALVE

An optional temperature and pressure relief valve may be field installed in the front header if required by local codes. Open the upper side jacket panel above the water connections to access the mounting point. Remove the 3/4" NPT plug in the outlet side of the front header to install the relief valve. The relief valve should be properly sized based on local code requirements. In the absence of local code requirements, the relief valve should be sized in accordance with ASME Boiler and Pressure Vessel Code, Section IV ("Heating Boilers"). The relief valve is installed in the vertical position and mounted in the front header on the hot water outlet of the pool heater. Remove the plug from the rear jacket panel to route the discharge pipe to the outside of the jacket. Water damage to the controls may occur if discharge piping is not properly installed to route relief valve discharge water to the exterior of the jacket. No valve is to be placed between the relief valve, and the unit. To prevent water damage, the discharge from the relief valve shall be piped to a suitable floor drain for disposal when relief occurs. No reducing couplings or other restrictions shall be installed in the discharge line. The discharge line shall allow complete drainage of the valve and line. Relief valves should be manually operated at least once a year.

⚠ CAUTION

Avoid contact with hot discharge water.

SmartValve COMBINATION GAS VALVE

The SmartValve combination gas valve will regulate gas pressure, cycle the gas supply on and off to the burners in addition to containing the electronics for burner ignition and operation of the combustion air fan. Each combination SmartValve consists of two valve seats to meet the requirements for redundant gas valves. The SmartValve has an ON/OFF switch that must remain in the "ON" position at all times when the unit is in service. The gas control valve has pressure taps located on the inlet and discharge sides of the valve. Manifold pressure is adjusted using the regulator adjustment screw located under the cover screw.

The manifold pressure is preset at the factory and adjustment is not usually required. If the manifold pressure is to be adjusted, follow the "Gas Manifold Pressure Adjustment Procedure" for proper adjustment.

Venting of the Combination Gas Valve

The combination gas valve/regulator used on all models is equipped with an integral vent limiting orifice per ANSI Z21.78. This vent limiter insures that the volume of gas emitted from the valve is minimal should a rupture of the diaphragm occur. Combination gas valve/regulators equipped with integral vent limiters are not required to have vent or relief lines piped to the outdoors. A barbed connection is provided at the vent termination point on the valve to connect the bias pressure hose from the fan pressurized chamber to the regulator. The bias hose connection prevents stoppage of the vent limiter by foreign material. The termination of the vent limited opening on the combination gas valve/regulator complies with the safety code requirements of CSD-1, CF-190(a) as shipped from the manufacturer without the installation of additional vent lines.

ELECTRICAL CONNECTIONS

This appliance is wired for 120 VAC service. The unit, when installed, must be electrically grounded and bonded in accordance with the requirements of the local codes or, in the absence of local codes, with the latest edition of the National Electrical Code ANSI/NFPA No. 70. When the unit is installed in Canada, it must conform to the CSA-C22.2, No.3, Electric Features of Fuel Burning Equipment and/or local Electrical Codes.

1. The electrical power circuit to this pool heater shall be installed with a ground fault circuit interrupter. Local codes shall govern the installation of this device.
2. All wiring between the unit and field installed devices shall be made with type T wire [63°F (35°C) rise].
3. Line voltage wire exterior to the appliance must be enclosed in approved conduit or approved metal clad cable.
4. The filter pump must run continuously when the pool heater is being fired.
5. To avoid serious damage, DO NOT energize or operate the pool heater until the pool, filter system and related piping is properly filled with water. Serious damage may result.
6. Provide the pool heater with proper overload protection.

**TABLE - R
AMP DRAW DATA**

Input Btu/hr	Fan	Controls	Approximate Total Amps @ 120 VAC
150,000	1.2	0.5	1.7
199,999	1.4	0.5	1.9
250,000	1.5	0.5	2.0
300,000	1.6	0.5	2.1
399,999	1.8	0.5	2.3

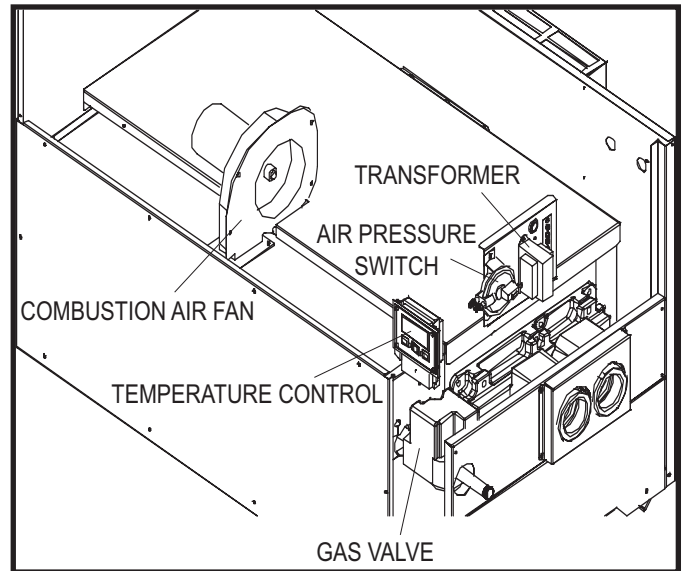


FIG. 41 Component Location Drawing

ELECTRONIC OPERATING TEMPERATURE CONTROL

The pool heater is equipped with a microprocessor based adjustable digital electronic temperature control to provide ON/OFF operation. Operation is based on temperature input from an immersion sensor. The immersion temperature sensor senses inlet water temperature to the pool heater and is located in the inlet side of the front header. The digital electronic control allows two temperature set points to be programmed into the control, one for pool operation and one for spa operation. The sensor is a negative coefficient platinum thermistor. A liquid crystal display is provided to indicate sensed temperature and operating parameters.

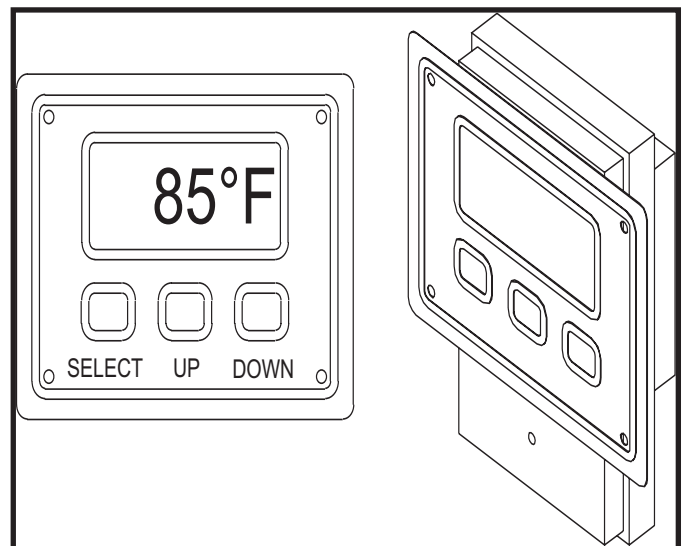


FIG. 42 Electronic Temperature Control Display and Programming Keys

SPECIFICATIONS

Set Point Adjustment Range: 55°F up to 105°F (13°C up to 41°C).

Differential Adjustment Range: 1°F up to 20°F (1°C - 11°C)

Temperature Accuracy: +/- 1°F.

Display Resolution: 1°F via Liquid Crystal Display (LCD).

Sensor: NTC Thermistor, 10k ohms @ 77°F (25°C).

Operating Humidity: < 90% RH Non-condensing.

Operating Ambient Temperature: -20° to 140°F (-30° to 60°C).

The electronic temperature control is located on the right front side of the pool heater. Three programming keys are provided to adjust the temperature set point and differential values and to control the display. The three keys are: the **Select** key, **Up** arrow key and **Down** arrow key (Figure 42A).

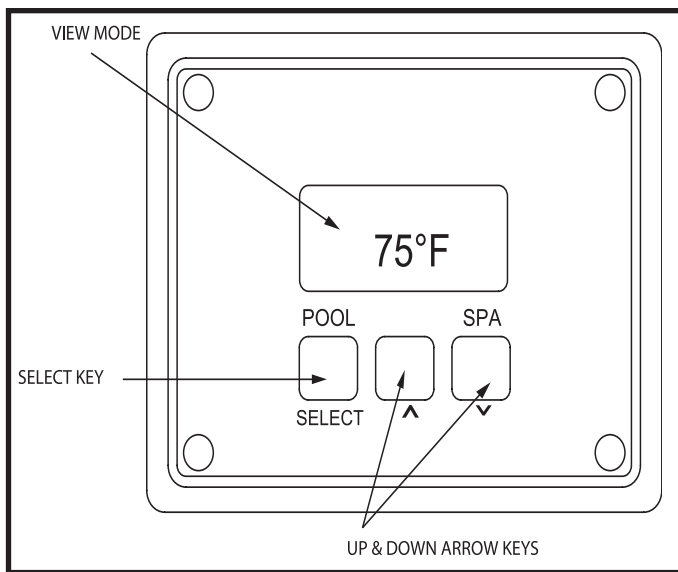


FIG. 42A Select Key, Up Arrow and Down Arrow Keys

Select Key - Allows the user to select the currently displayed temperature set point used for operation of the heater. Pool temperature setting, Spa temperature setting or Off may be selected by depressing the Select key in normal operation. A pointer will move in the display window to indicate the temperature mode selected for operation. When the "OFF" position is selected, this will disable the call for heat operation of the pool heater. When in the view mode for normal operation, the display shows the current inlet water temperature.

Up and Down Arrow Keys - Allows the displayed parameter to be increased or decreased. After pressing the Select key, a control value can be changed by using the **Arrow** keys. Control values will be increased or decreased by 1° F for each time the **Arrow**

keys are depressed. The temperature set point for the Pool temperature setting or the Spa temperature setting may be adjusted at any time by pushing the Up or Down arrow keys. Ten seconds after any activity to adjust the set point has stopped, the display will revert to showing the current inlet water temperature.

Set Point - The value selected to be maintained by your temperature controller.

Differential - The difference between levels for "Turn-On" and "Turn-Off" operation in your control system.

For Example: If your pool temperature is set at 85°F and you were to set your differential at 5°F; the pool heater would shut down when it reached 85°F and would fire back up when the temperature drops to 80°F, due to the 5°F differential. Your differential is adjustable between 1° - 20°F.

NOTE:

Be careful not to set your differential too low, this could lead to short cycling which in turn could cause non-warrantable conditions.

Control values and operation selection will remain in the device memory even after power is removed.

TEMPERATURE ADJUSTMENT PROCEDURE

Follow the steps below to program your electronic temperature control.

1. If the temperature control is in the Off Mode, press the **Select** key. This will take it out of Off Mode and into Operation Mode.
2. Press and hold the **Select** and the **Up** and **Down** arrow keys simultaneously for approximately three seconds.
3. You are now in Programming Mode.
4. The first parameter displayed is the pool temperature setting (Figure 42B).

NOTE:

Pressing the Select key takes you to the next parameter setting. If for example you are not using the spa function, simply press the Select key to move on to the next parameter.

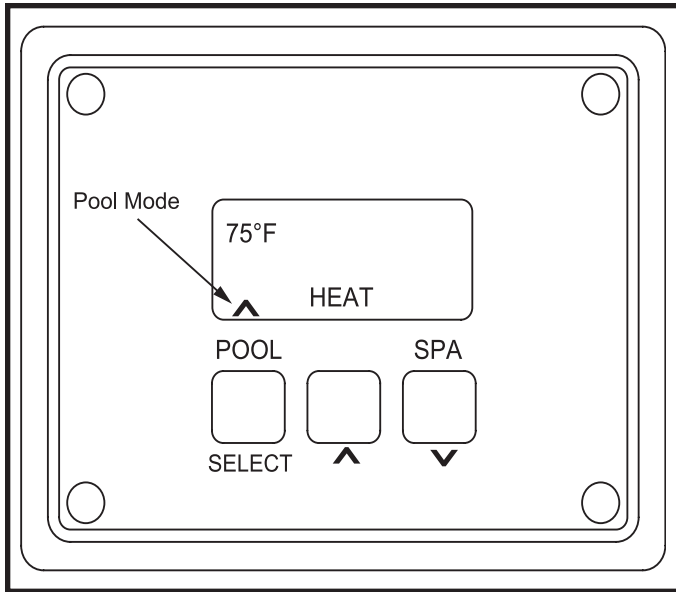


FIG. 42B Pool Temperature Setting

5. Using the **Up** and **Down** arrow keys, adjust the pool temperature. When at the desired temperature, press the **Select** key (Figure 42B).

6. The pool differential is displayed.

7. Using the **Up** and **Down** arrow keys, adjust the pool differential. When at the desired differential (between 1° - 20°F), press the **Select** key.

8. The spa temperature is displayed (Figure 42C).

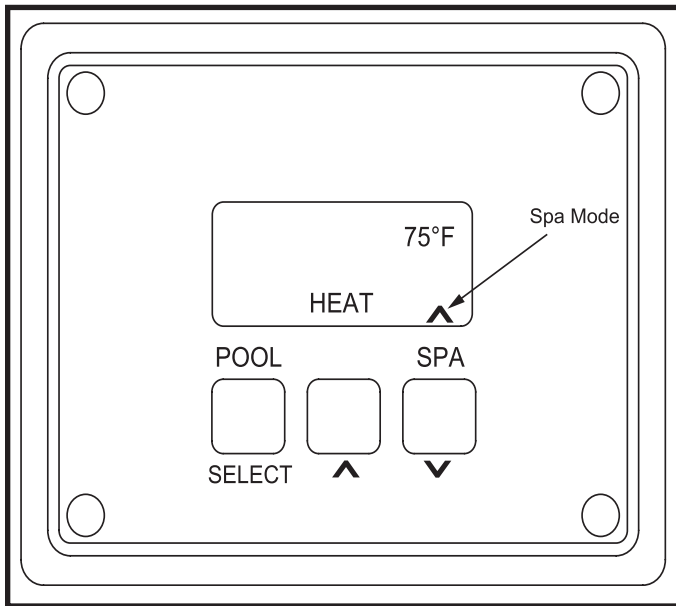


FIG. 42C Spa Temperature Setting

9. Using the **Up** and **Down** arrow keys, adjust the spa temperature (Figure 42C). When at the desired temperature, press the **Select** key.

10. The next parameter displayed is the spa differential.

11. Press the **Up** and **Down** arrow keys until the desired differential is reached (between 1° - 20°F) for the spa. When at the desired differential, press the **Select** key.

12. A choice of °F or °C is displayed. Using the arrow keys, select °F or °C. Press the **Select** key.

13. After a period of 10 seconds with no activity to adjust control settings, the display will revert back to normal display of water temperature (Figure 42A).

NOTE:

When power is initially applied to a new pool heater the control points will be pre-programmed. The factory final quality test sets the unit for test firing. The preset values are as follows:

Selection	Set Point	Differential
Pool	80°F	4°F
Spa	100°F	5°F

NOTE:

The control values programmed into memory will not be lost because of a power failure.

ERROR MESSAGES DISPLAYED BY THE ELECTRONIC TEMPERATURE CONTROL

There are three error messages that can be displayed in response to software or hardware problems with the pool heater's internal electronic temperature control. The error codes that may be seen on the display are:

ERR - The internal EEPROM of the microprocessor in the electronic temperature control has a read error at power up. This error cannot be field repaired. Replace the pool heater's electronic temperature control if error persists.

SHr - There is a short in the temperature sensor. Make sure sensors are properly installed, wired and connected to the control. Correct sensor installation or replace sensor.

OPn - There is a break in the wiring to the temperature sensor. Make sure sensors are properly installed, wired and connected to the control. Correct sensor installation or replace sensor.

HIGH WATER TEMPERATURE LIMIT CONTROLS

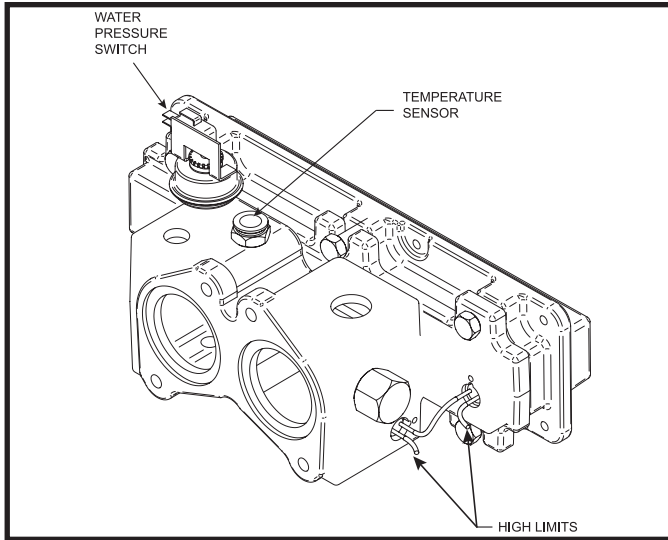


FIG. 43 Front Header with Limits, Pressure Switch and Temperature Sensor

High Water Temperature Limit Control

The pool heater is equipped with two fixed settings, auto-reset high water temperature limit controls. If water temperature exceeds the set point, the limit will break the control circuit and shut down the unit. The limit control will only be reset after the water temperature has cooled below the set point of the limit. The high water temperature limit controls are mounted in the outlet side of the front header.

NOTE:

The limit control will not reset until the water temperature has dropped below the set point of the high limit.

WATER PRESSURE SWITCH

The pressure switch is factory preset for normal installations at deck level. The switch will stop operation of the pool heater on low water flow. The water pressure switch is factory pre-set at 5 PSI. Do not adjust the pressure switch unless the pool heater is located more than four feet above or below the deck level.

PRESSURE SWITCH ADJUSTMENT

The pressure switch is located in the front header, behind the upper side jacket panel, above the water connections. When required, the pressure switch can be reset with the following procedure:

1. Clean filter and skimmer.
2. Start filter pump.

3. Set digital thermostat to highest setting.
4. Turn the adjustment knob on the pressure switch clockwise until the combustion air fan in the front control panel turns off. Fan will not turn off if system pressure exceeds 5 PSI.
5. Slowly turn the adjustment knob counter-clockwise until the combustion air fan turns on. Turn knob an additional ¼ turn counter-clockwise.
6. Turn filter pump off and on several times. The heater should shut down immediately when the pump stops.
7. If the heater does not shut down immediately as the filter pump stops, repeat steps 4, 5 and 6 until proper operation is achieved.
8. Reset thermostat to desired temperature setting.

⚠ WARNING

Operation of the pool heater without proper flow will cause immediate non-warrantable damage to the heat exchanger.

LIGHTING INSTRUCTIONS

FOR YOUR SAFETY, READ BEFORE OPERATING

⚠ WARNING

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

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. **BEFORE OPERATING**, smell around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle to the floor.

WHAT TO DO IF YOU SMELL GAS

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

- C. Use only your hand to push the gas control switch. Never use tools. If the switch will not move by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this pool heater if any part has been under water. Immediately call a qualified service technician to inspect the appliance. The possible damage to a flooded appliance can be extensive and present numerous safety hazards. Any appliance that has been under water must be replaced.

LIGHTING INSTRUCTIONS

1. **STOP!** Read the safety information above.
2. Set the digital thermostat to the lowest setting.
3. Turn Off all electrical power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burners. **DO NOT** try to light the burners by hand.

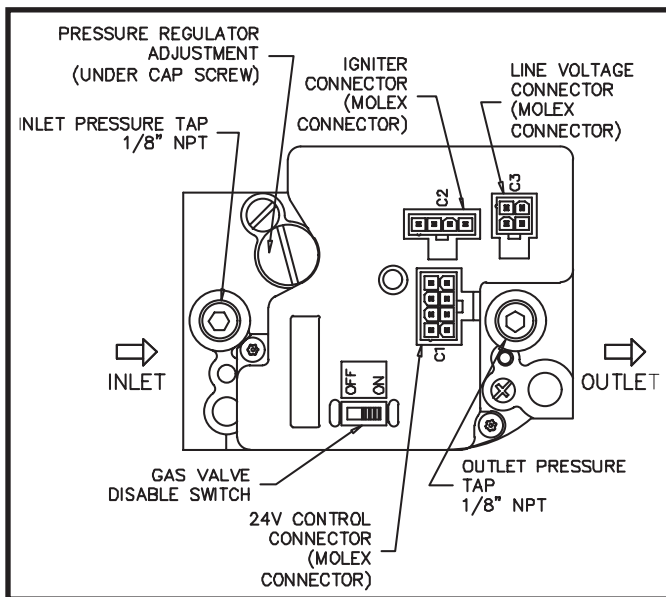


FIG. 44 SmartValve Combination Gas Valve

5. Remove the control access panel.
6. Push the gas control switch to the "OFF" position.
7. Wait five (5) minutes to clear out any gas. If you smell gas, **STOP!** Follow "B" in the safety information. If you don't smell gas, go on to the next step.
8. Turn the gas control switch to the "ON" position.
9. Replace the control access panel.
10. Turn on all electric power to the appliance.

11. Set the digital thermostat to the desired settings.
12. If the appliance will not operate, follow the instructions below "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the digital thermostat to the lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove the control access panel.
4. Push the gas control switch to the "OFF" position.
5. Replace the control access panel.

⚠ WARNING

Should overheating occur or the gas fail to shut off, turn off the manual gas control valve to the appliance.

IGNITION SYSTEM CHECKOUT

1. Turn off gas supply to unit.
2. Turn electric power on.
3. Program the temperature control to a setting above pool water temperature or to highest safe setting.
4. The igniter will cycle on trial for ignition.
5. The ignition module will make a total of four tries for ignition and then lock out for one hour before retrying for ignition or until main power is turned off and back on to reset the control.
6. Program the temperature control to desired temperature set point.
7. Turn on gas supply.
8. Turn main power switch "OFF" and then "ON".
9. If ignition system fails to operate properly, repair work must be performed by a qualified serviceman or installer.

HOT SURFACE IGNITION SYSTEM

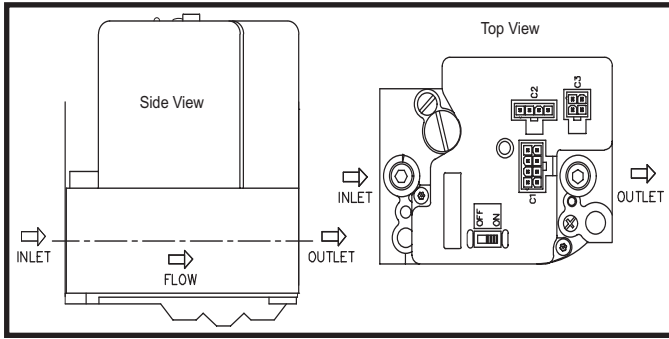


FIG. 45 SmartValve with Hot Surface Ignition Control Module

Service Parts

This unit uses a SmartValve electronic ignition control module and a hot surface igniter. The electronic ignition module/SmartValve is not repairable. Any modification or repairs will invalidate the warranty and may create hazardous conditions that result in property damage, personal injury, fire, explosion and/or toxic gases. A faulty hot surface igniter, flame rod or ignition module **MUST** be replaced with a new OEM unit only. An OEM specification igniter, flame rod and ignition control module/SmartValve for this specific unit are available from your local distributor. **DO NOT** use general purpose field replacement ignition modules/SmartValves or igniters. Each pool heater has one ignition module, one hot surface igniter and a flame rod.

Flame Sensing

The SmartValve uses a separate flame rod to sense the presence of main burner flame. The flame rod is mounted just above the burner adjacent to the hot surface igniter. The flame rod is connected to the SmartValve with a pink wire. The minimum flame current required to sustain burner operation is 0.5 microamps. In normal burner operation the flame current should be steady and in the range of 4 to 6 microamps. An unsteady or constantly changing microamp signal usually indicates a gas/air mixture problem that must be corrected. Flame current can be measured using a DC microamp meter that can be installed in series with the pink wire from the flame rod to the ignition module on the SmartValve.

OPERATION AND DIAGNOSTIC LED INDICATOR

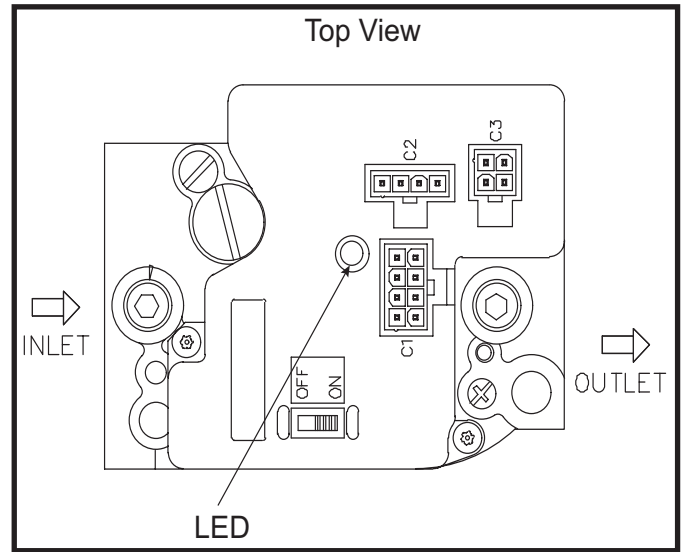


FIG. 46 Top View of SmartValve and LED Indicator

The SmartValve has a single LED located in the top center of the control. Illumination of the LED indicates operation and troubleshooting assistance.

**TABLE - S
LED INDICATOR ASSISTANCE**

LED Status	Indicates
Off	No power to system controls.
Bright-Dim	Normal operation shows whenever the system is powered on a call for heat unless an abnormal event has occurred.
2 Flashes	Airflow proving switch remains closed more than 30 seconds after a call for heat sequence begins. Combustion air blower is not energized until airflow proving switch opens.
3 Flashes	Airflow proving switch remains open longer than 30 seconds after combustion air blower is energized. System goes into a 5 minute delay period with combustion air blower off. At the end of the 5 minute delay, another ignition cycle will begin.
4 Flashes	Temperature limit controls open. Low or no water pressure. Combustion air blower is energized.
5 Flashes	Flame signal sensed out of proper sequence.
6 Flashes	System lockout-flame signal not present. After 1 hour lockout reset delay, control will reset and initiate a new ignition sequence if the call for heat is still present.

IGNITION AND CONTROL TIMINGS

F-9 Hot Surface Ignition System with SmartValve

Prepurge: 15 Seconds

Hot Surface Igniter Heat-up Time: 7 seconds (first try); 10 seconds (subsequent tries)

Trial for Ignition: 7 Seconds

Flame Recognition Period: 1 Second

Automatic Restart Delay: Minimum 60 Minutes

Ignition Retries: 3 Retries after initial trial (4 total ignition cycles)

Failure Response Time: 2 Seconds at less than 0.5 μ A flame current

ENERGY SAVING RECOMMENDATIONS

1. Keep the pool/spa covered when not in use. This will cut heating cost, reduce water evaporation, conserve chemicals and reduce load on the filtering system.
2. Reduce pool thermostat to 78°F (25°C) or lower, reduce spa temperature to 100° F (38°C).
3. Use an accurate pool/spa thermometer to monitor water temperature.
4. Record the proper temperature settings for your pool and spa set points and discourage further adjustments of the digital control.
5. Use a time clock to start filter pump no earlier than 6 a.m. during pool/spa season. This is the time when nightly heat loss stabilizes.
6. Turn the pool/spa heater off and drain during long periods when the pool will not be used (winter, vacations, etc).
7. Follow a regular program of preventative maintenance for your heater each new swimming season. Check heat exchanger, controls, burners and operation of the unit.
8. For pools used only on weekends, the thermostat may be set lower than 78°F (25°C) during the week. Lower setting to a range that can be easily achieved in one day's operation of the pool heater.

MAINTENANCE

Listed in this section are items that must be checked to insure safe reliable operations. Verify proper operation after servicing.

1. Examine the venting system at least once a year. Check more often in first year to determine inspection interval.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Outdoor Installations - Check vent cap for proper mounting, corrosion or any obstruction of the flue outlet or combustion air inlet.

Indoor Installations - Check all joints and pipe connections for tightness, corrosion or deterioration. Flush condensate drain hose with water to clean when required. Clean screens in the venting air intake system as required. Have the entire system, including the venting system, periodically inspected by a qualified service agency.

2. Visually check main burner flames at each start up after long shutdown periods or at least every six months. A burner viewport is located on the left side of the unit, below the water connections on the front header. Remove cap to view flame.

⚠ WARNING

The area around the burner viewport is hot and direct contact could result in burns.

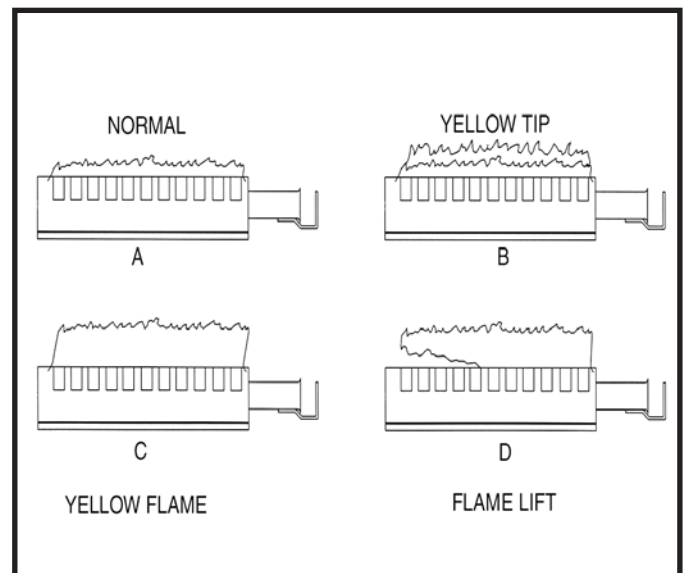


FIG. 47 Flame Pattern Illustration

(a) **Normal Flame:** A normal flame is blue, with slight yellow tips, with a well defined inner cone and no flame lifting.

(b) **Yellow Tip:** Yellow tip can be caused by blockage or partial obstruction of air flow to the burner(s).

(c) **Yellow Flames:** Yellow flames can be caused by blockage of primary air flow to the burner(s) or excessive gas input. This condition **MUST** be corrected immediately.

(d) **Lifting Flames:** Lifting flames can be caused by over firing the burner(s), excessive primary air or high draft.

If improper flame is observed, examine the venting system, insure proper gas supply and adequate supply of combustion and ventilation air.

3. **Flue Gas Passageways Cleaning Procedures:** Any sign of soot around the outer jacket, at the burners or in the areas between the fins on the copper heat exchanger indicates a need for cleaning. The following cleaning procedure must only be performed by a qualified serviceman or installer. Proper service is required to maintain safe operation. Properly installed and adjusted units seldom need flue cleaning.

All gaskets on disassembled components **MUST** be replaced with new gaskets on reassembly. Gasket kits are available from your distributor.

BURNER REMOVAL AND CLEANING

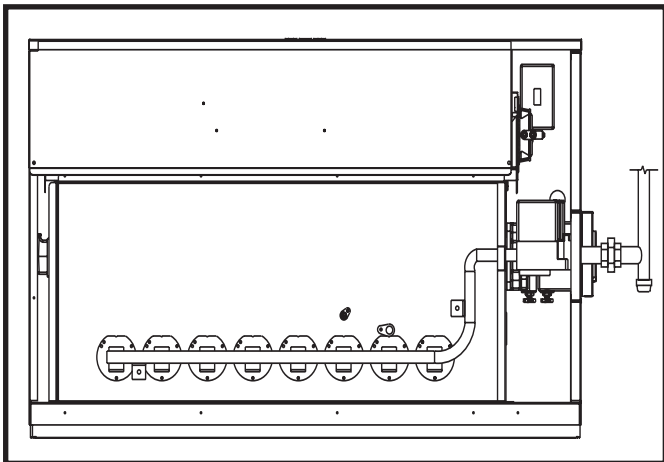


FIG. 48 Gas Train and Burners

- (a) Turn off main power to unit.
- (b) Turn off main manual gas shutoff to unit.
- (c) Remove the front outer jacket panels.
- (d) Disconnect the gas supply from the gas valve manifold assembly with a field supplied union before the gas valve.

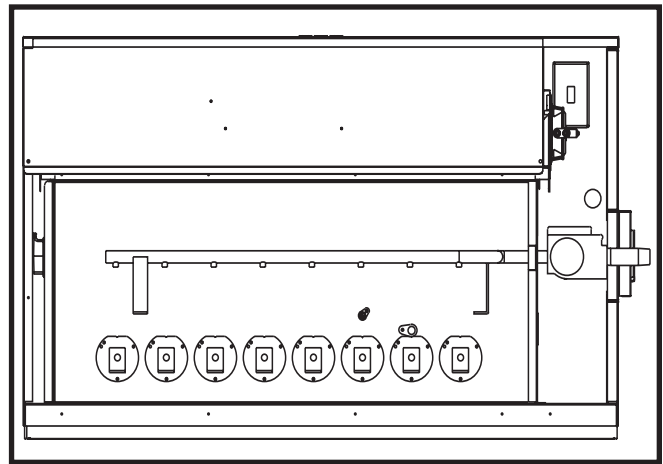


FIG. 49 Gas Train Rotated Up for Burner Removal

- (e) Remove mounting screws from manifold mounting brackets. Rotate the manifold/orifice assembly up and away from burners (Figure 50).
- (f) Remove the mounting screws from each burner and slide the burner out toward front of unit. Use caution to prevent damage to burners, burner gaskets, refractory, hot surface igniter or wiring.
- (g) Remove soot from burners with a stiff bristle brush. Dirt may be removed from burner ports by rinsing the burner thoroughly with water. Drain and dry burners before re-installing. Damaged burners must be replaced.

A pool heater installed in a dust or dirt contaminated atmosphere will require cleaning of the burners on a 3 to 6 month schedule or more often, based on severity of contamination. Contaminants can be drawn in with the combustion air. Non-combustible particulate matter such as dust, dirt, concrete dust or dry wall dust can block burner ports and cause non-warrantable failure. Use extreme care when operating a unit during new construction. The burners will probably require a thorough cleaning before the pool heater is placed in service.

⚠ WARNING

The combustion chamber lining in this appliance contains ceramic fiber materials. Ceramic fibers can transform into cristobalite (crystalline silica) when exposed to temperatures above 2192°F (1200°C) dependent upon the length of exposure time.*

The International Agency for Research on Cancer (I.A.R.C.) has concluded, "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans."**

Testing has confirmed that the ceramic fibers in this application do not reach 2192°F (1200°C).

*Reference Dyson, D., Butler, M., Hughes, R., Fisher, R., and Hicks, G. The Devitrification of Alumino-silicate Ceramic Fiber Materials - The Kinetics of the Formation of Different Crystalline Phases, Ann. Occup. Hyg. Vol. 41, No. 55, 1997.

**Reference I.A.R.C. Monograph 68, June 1997.

Note: The ceramic fiber material used in this appliance is an irritant; when handling or replacing the ceramic materials it is advisable that the installer follow these safety guides.

REMOVAL OF COMBUSTION CHAMBER LINING OR BASE PANELS:

- Avoid breathing dust and contact with skin and eyes.
- Use NIOSH certified dust respirator (N95) (<http://www.cdc.gov/niosh/hompage.html>).
- Lightly mist with water (only those areas being handled) the combustion chamber lining or base insulation to prevent airborne fibers.
- Remove combustion chamber lining or base insulation from the boiler and place it in a plastic bag for disposal.
- Wash potentially contaminated clothes separately from other clothing. Rinse clothes thoroughly.
- NIOSH stated First Aid:
 - Eye:** Irrigate immediately.
 - Breathing:** Fresh air.

HEAT EXCHANGER CLEANING

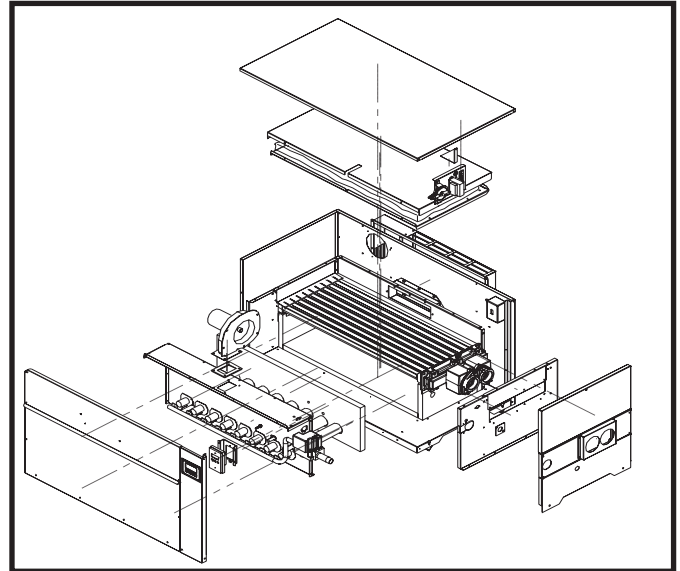


FIG. 50 Exploded View of Heater

- (h) While burners are removed, check the heat exchanger surface for sooting. If soot is present, heat exchanger must be cleaned and problem corrected. Proceed as follows.
 - (i) Remove the top jacket panel.
 - (j) Disconnect the two pin connector to the combustion fan.
 - (k) Remove the four nuts that hold the fan to the inner cabinet.
 - (l) Remove two screws from the front and lift off the inner top heat shield.
 - (m) Remove the fiberglass insulation on top of the combustion chamber.
 - (n) Remove the screws that hold down the combustion chamber top.
 - (o) Remove the six screws that hold the heat exchanger front head in place.
 - (p) Remove the front and rear heat exchanger retaining brackets.
 - (q) Remove the V-baffles and frame-end runners and clean as necessary.
 - (r) Remove soot from heat exchanger with a stiff bristle brush. Use a vacuum to remove loose soot from surfaces and inner chamber.
 - (s) Remove the one screw on both sides of the rear header of the heat exchanger and bend the bracket out a little bit.

- (t) The heat exchanger can be removed by disconnecting all water piping and sliding the heat exchanger towards the front of the unit. Once the heat exchanger is removed from the unit, a garden hose can be used to wash the tubes to ensure that all soot is removed from the heat exchanger surfaces.

NOTE:

Do not wet the pool heater's refractory.

- (u) Ensure that all burner ports are cleaned to remove any soot. See Burner Cleaning Procedure.
 - (v) Carefully reinstall the heat exchanger and "V" baffles if removed from the unit.
 - (w) Reinstallation is the reverse of the installation procedure. Use new gasket material to insure a proper air seal.
 - (x) Reassemble all gas and water piping. Test for gas leaks.
 - (y) Reassemble outer jacket panels.
 - (z) Cycle unit and check for proper operation.
4. **Combustion Air Fan:** The combustion air fan should be checked every 6 months or each season of operation. Clean fan as required when installed in a dust or dirt contaminated location.
 5. **Water Circulating Pump:** Ensure that the filter system pump is providing adequate flow to the pool heater. Backwash and clean filter as required to maintain proper flow.
 6. Keep the pool heater area clear and free from combustible materials, gasoline and other flammable vapors and liquids.
 7. Check frequently to be sure the flow of combustion and ventilation air to the pool heater is not obstructed.
 8. This pool heater uses a transformer to supply a low voltage control circuit. The voltage on the secondary side should be 24 to 28 VAC when measured with a voltmeter.
 9. **Hot Surface Igniter Replacement:** The hot surface igniter can be replaced with an OEM igniter available from your dealer.

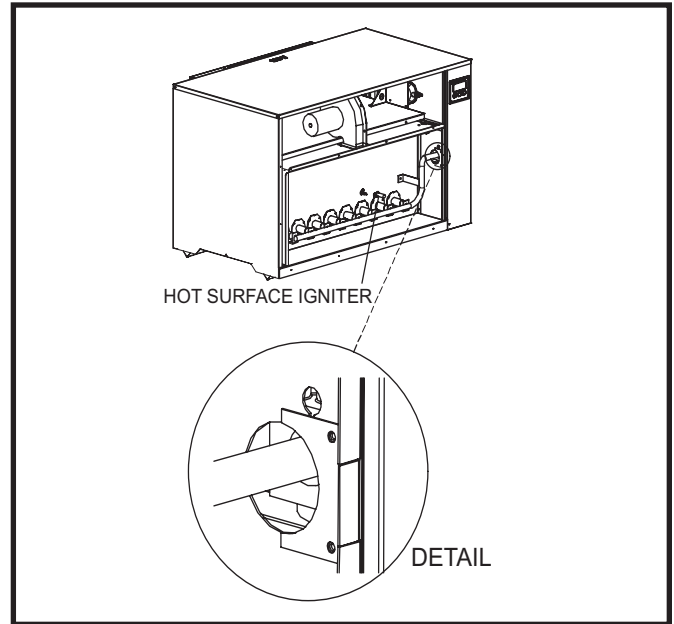


FIG. 51 Access to Hot Surface Igniter and Wiring Grommet

- (a) Turn off main power to unit.
- (b) Turn off main manual gas shutoff to unit.
- (c) Remove the front outer jacket panels to access the front chamber.
- (d) Disconnect the 1x4 Molex connector from the SmartValve ignition module.
- (e) Remove the igniter retaining screw and slide the igniter out of the combustion chamber.
- (f) Remove the two screws that secure the gas manifold support bracket as shown in the illustration.

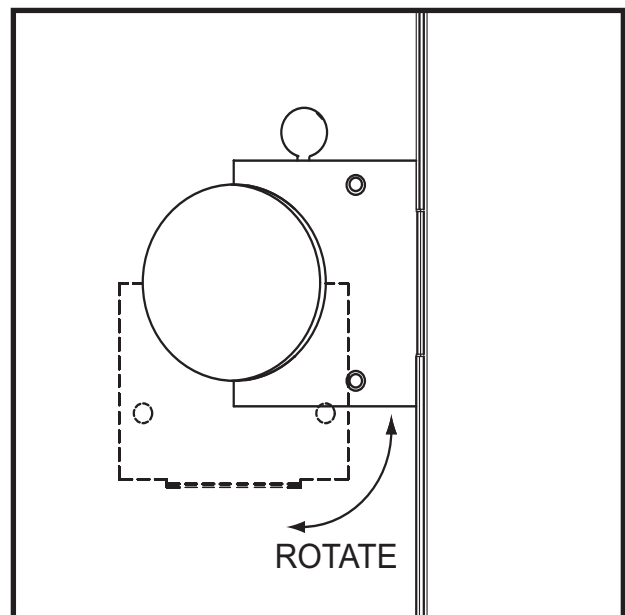


FIG. 52 Access and Positioning of Wiring Grommet

- (g) Push the strain relief bushing through the panel and slip the igniter and flame sensor wires down and around the manifold grommet.
- (h) Install the new igniter and route the wires through the bushing.
- (i) Locate the bracket as shown in the illustration and rotate 90° to position.
- (j) Ensure that the manifold support bracket and vinyl grommet are properly positioned to seal the pressurized front chamber. Incorrect installation of the grommet may result in reduced combustion air supply and operational problems.
- (k) Reassemble in reverse order.

10. Combustion Air Shutter Adjustment: This unit uses a fan assisted combustion process. The fan air shutter is factory pre-set and should not need adjustment in most cases. If adjustment is required, the fan air shutter may be manually adjusted to a dimension specified for each model.

Follow the steps below to adjust the fan air shutter if the unit does not function properly or a continuous low air condition is observed:

- (a) Check for proper installation and draft in venting system. Correct as required.
- (b) Turn the power switch to the "OFF" position.
- (c) Turn the gas valve switch to the "OFF" position.
- (d) Remove upper front access door.
- (e) Use a ruler to measure the distance from the base of the fan to the end of the air shutter. Compare this distance to the specified "A" dimension for the unit.

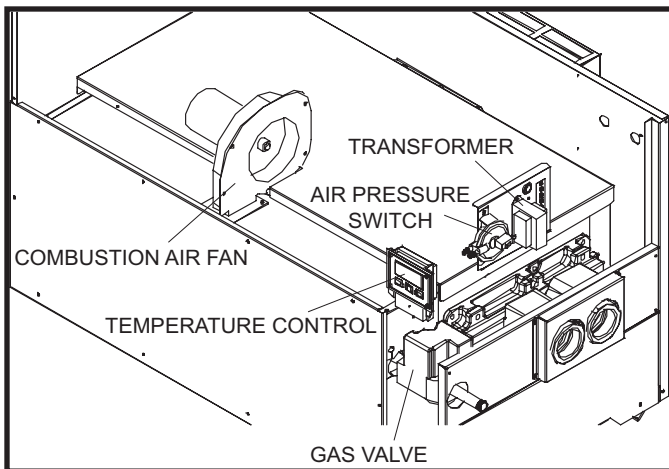


FIG. 53 Combustion Air Fan Location

**TABLE - T
AIR SHUTTER
ADJUSTMENT OPENING**

Input Btu/hr	"A" Dimension Opening	Chamber Pressure
150,000	1 1/4"	1.4"
199,999	1 1/4"	1.3"
250,000	1 3/8"	1.3"
300,000	1 9/16"	1.3"
399,999	1 3/4"	1.3"

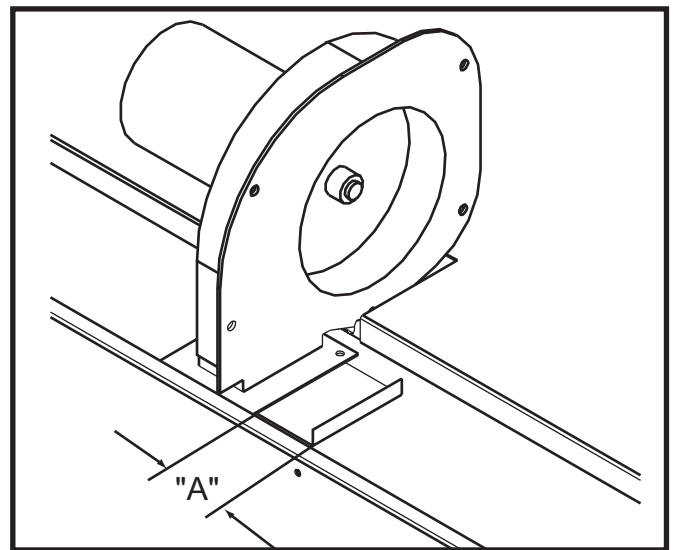


FIG. 54 Combustion Air Fan with Air Shutter "A" Dimension

Differential Air Pressure Measurement

The position of the air shutter on the combustion air fan can be checked with a slack tube manometer (Figure 55). Disconnect the two tubes from the air pressure switch and connect one to each side of a manometer. Turn on the pool heater and allow the combustion air fan to operate. The observed pressure reading on the manometer should correspond to the range shown in the "Differential Air Chart" on page 44 if the air shutter is properly adjusted. The differential pressure varies based on air density at elevation.

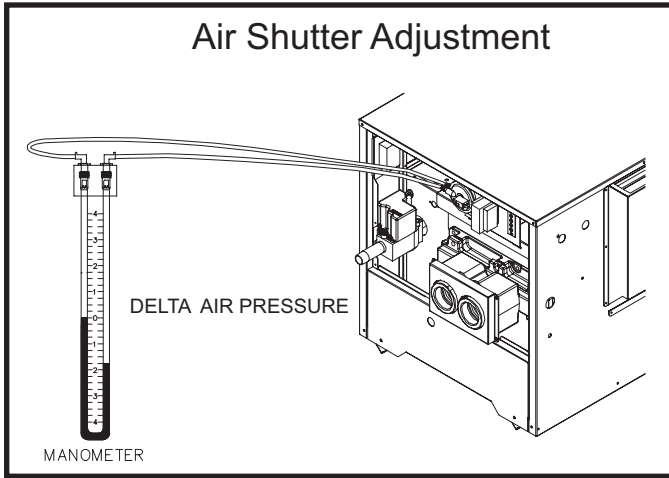


FIG. 55 Air Shutter Pressure Measurement

DIFFERENTIAL AIR CHART

Differential Air	Elevation
1.55" - 1.75" W.C.	0 - 4000'
1.4" - 1.6" W.C.	4000' - 8000'
1.2" - 1.4" W.C.	8000' - 12,000'

GAS TRAIN AND CONTROLS

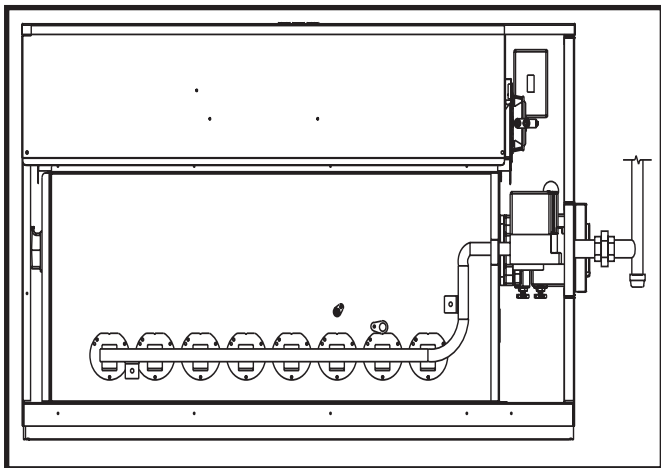


FIG. 56 Gas Train Drawing

NOTE:

The gas train and controls assembly provided on this unit have been tested under the applicable American National Standard to meet minimum safety and performance criteria such as safe lighting, combustion and safety shutdown operation.

TERMINAL STRIP FOR REMOTE THERMOSTAT OR CONTROLS CONNECTION

A remote thermostat or other remote safety control may be connected to the pool heater. Follow the manufacturers instructions supplied with the remote control or thermostat for proper installation and adjustment. The pool heater is equipped with a terminal strip to allow easy connection of a remote switching devices or additional field installed safety controls. The terminal strip is located inside the jacket. Connection of a set of dry switching contacts or a remote thermostat to cycle the unit ON and OFF from a remote source should be made to the **R** and **W** terminals. The **X** and **B** terminals may also be used to connect any field installed safety control such as a flow switch that will not routinely cycle. Remove the jumper between the selected terminals before making a connection to these terminals. A control connected to the **R** and **W** terminals will interrupt the 24 VAC control circuit to shut off the pool heater.

Additional safety controls are added to the boiler's 24 VAC control circuit by connecting them to terminals **X** and **B** on the boiler terminal strip. Remove the jumper between the **X** and **B** terminals before making a connection to these terminals. A control with contacts that routinely cycle on normal operation should not be connected to these terminals. A control connected to the **X** and **B** terminals will interrupt the 24 VAC control circuit to shut off the pool heater.

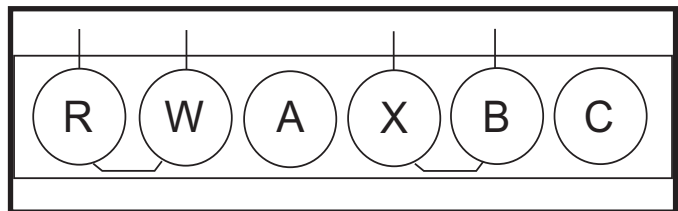


FIG. 57 Terminal Strip

Remove the brass jumper between the terminals to be used. Refer to the chart in this section to determine maximum allowable wire length and gauge recommended to connect the switching contacts of the remote thermostat or control to the appropriate terminals on the terminal strip.

**TABLE - U
WIRE GAUGE FOR REMOTE CONNECTION**

Wire Gauge	Maximum Allowable Length
12 GA	100 ft
14 GA	75 ft
16 GA	50 ft
18 GA	30 ft

When connecting a remote temperature controller to **R** and **W** on the terminal strip to cycle pool heater operation, the pool heater's internal electronic temperature control should be set as an additional high limit control. This will prevent problems between the set point of the remote temperature control and the pool heater's internal controller.

FACTS ABOUT WATER CHEMISTRY

Factors which affect pool and spa water and, more importantly, the efficiency of your new pool/spa heater are:

1. PROPER FILTRATION
2. PROPER CIRCULATION
3. DISINFECTION AND OXIDATION
4. pH CONTROL AND TOTAL ALKALINITY
5. ALGAE CONTROL

The water chemistry of your pool or spa changes daily due to natural evaporation of the water and the addition of chemicals. Chemicals are used to sanitize and control algae growth in the pool. Their addition must be carefully monitored. If there is an imbalance in the pool water chemistry, the minerals in the pool water will precipitate out and collect in the pool, filter system and the pool heater. The accumulation of minerals or scale in the pool heater due to a chemical imbalance will cause a non-warrantable failure of the heat exchanger and its components.

pH is the most important factor in maintaining proper balance in your pool/spa water. pH is the measurement of the acidity or alkalinity of water. The chart below shows the ideal pH range and what can happen when the pH increases or decreases from the ideal of 7.2 to 7.8.

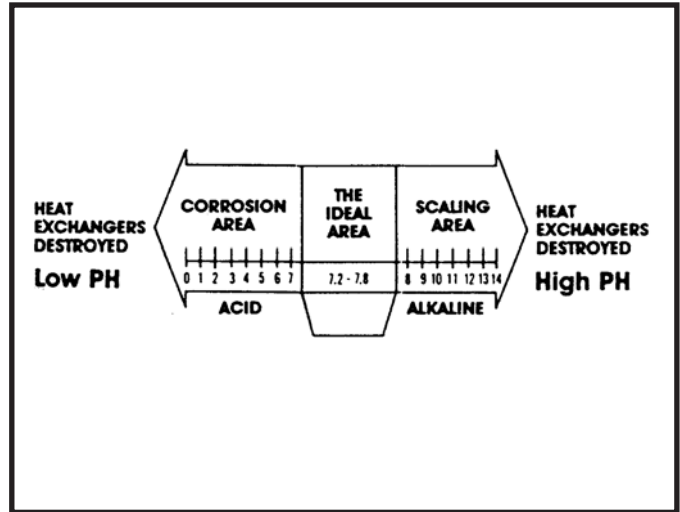


FIG. 58 pH Scale

If the pH becomes too high, it lowers the ability of chlorine to destroy bacteria and algae, water can become cloudy, filter elements may become blocked, and scale formation will occur in the pool and heat exchanger. If the pH becomes too low the water becomes acid. You can have eye burn and skin irritation, etching of the plaster, corrosion of metal fixtures and the resulting stains on the plaster, degradation of sand and gravel filters and corrosion of the copper tubes in the heat exchanger. **Damage to the pool heater due to improper pH is non-warrantable.**

We recommend using a four-way test kit to monitor the following levels to insure proper operation of your pool heater:

**TABLE - V
RECOMMENDED POOL
CHEMISTRY LEVELS**

Test	Recommended Level
Correct pH	7.2 - 7.8
Chlorine Residual	1.0 - 5.0 ppm
Total Alkalinity	80 - 120 ppm
Calcium Hardness	175 - 350 ppm

Chlorine residual is the chlorine remaining in the pool water after it is consumed in the process of destroying bacteria, algae and other oxidizable materials.

Total alkalinity is the measurement of the total amount of alkaline chemicals in the water. Alkalinity controls pH. Sodium bicarbonate is used to raise total alkalinity.

Calcium hardness can be raised by the addition of calcium chloride, and lowered by the addition of Tri-sodium Phosphate or its equivalent.

The corrosive level of pool water can also be measured by the Langlier Saturation Index. This index is calculated by a formula which uses operating temperatures, total alkalinity, pH, calcium hardness and total dissolved solids. The optimum Saturation Index value is zero. A negative value indicates a corrosive condition. Your pool/spa dealer can provide additional data and equipment to make this measurement if a problem exists.

HEAT EXCHANGER INSPECTION

Tubes

This pool heater is especially designed to operate without accumulation of scale in the heat exchanger, even in very hard water. Periodic inspections of the tubes should be made to be sure that no scale is accumulating. Water piping should be disconnected at the flanges. The front header can be removed to inspect the tubes. A scale deposit of paper thickness is normal. Heavier deposits should be cleaned out. If scale is found in the tubes, **THE CAUSE SHOULD BE FOUND AND CORRECTED.** Removal and cleaning of the heat exchanger must be performed by a qualified serviceman or installer.

The probable cause is improper water chemistry. Check the following possible causes:

1. High pH.
2. Improper adjustment of an external bypass.
3. Inadequate pump flow.

Always be sure that the filter pump is in good operating condition and runs continuously when the pool heater is in operation.

PREVENTION OF FREEZING

Heat exchangers and headers damaged by freezing are not covered by warranty. If equipment is subject to freezing temperature, the following precautions must be observed.

FREEZE PROTECTION

Although this pool heater is CSA design certified for outdoor installations - such installations are not recommended in areas where pool heater will be operated in the winter months and the danger of freezing exists. Proper freeze protection must be provided for outdoor installations, pool heaters installed in unheated mechanical rooms or where temperatures may drop to the freezing point or lower. If freeze protection is not provided for the system, a low ambient temperature alarm is recommended for the mechanical room. Damage to the pool heater by freezing is non-warrantable.

1. Pump Operation - **MOST IMPORTANT** - This pool heater is designed for continuous operation of the filter system pump when the burners are firing. If the system pump does not run continuously an additional pump must be installed to provide constant circulation through the unit. The constant flow of warm pool water can help prevent freezing.
2. Location - Indoor pool heaters must be located in a room having a temperature safely above freezing [32°F(0°C)].
3. Caution - A mechanical room operating under a negative pressure may experience a downdraft in the flue of a pool heater which is not firing. The cold outside air pulled down the flue may freeze a heat exchanger. This condition must be corrected to provide adequate freeze protection.
4. Outdoor Pool Heater Installation - Use extreme caution to prevent freezing. A snow screen should be installed to prevent snow and ice accumulation around the pool heater or its venting system.
5. Shut-down and Draining - If for any reason the pool heater is to be shut off when temperatures may be below 35°F (2°C), you must winterize the unit:
 - (a) Shut off gas supply.
 - (b) Shut off water supply.
 - (c) Shut off electrical supply.
 - (d) Remove the lower side jacket panel below the water connections (Figure 59).
 - (e) Locate the three (3) drains on the bottom of the front header (Figure 60).
 - (f) Open all three (3) drains and allow the heat exchanger to drain completely. Leave drains open until Spring. Drain the pump and related piping.

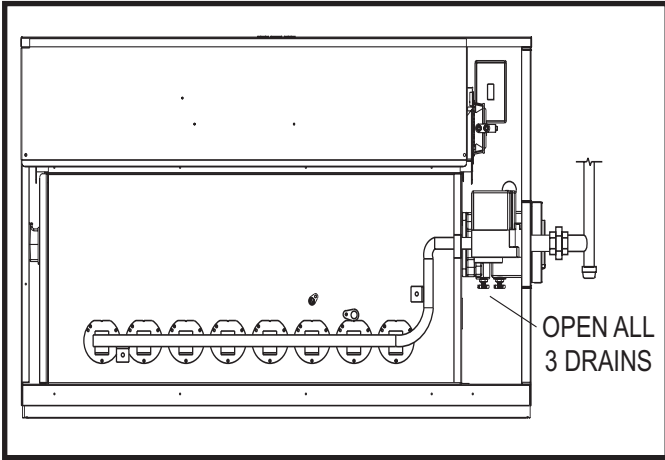


FIG. 59 Drain Locations

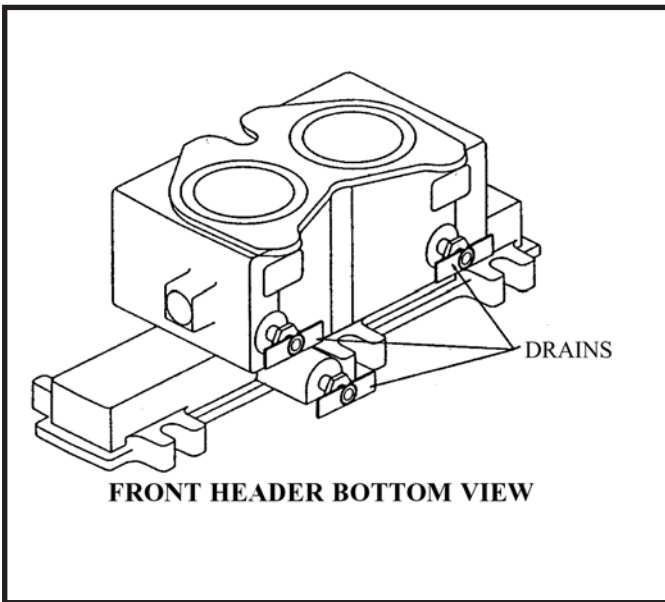


FIG. 60 Front Header - Bottom View

