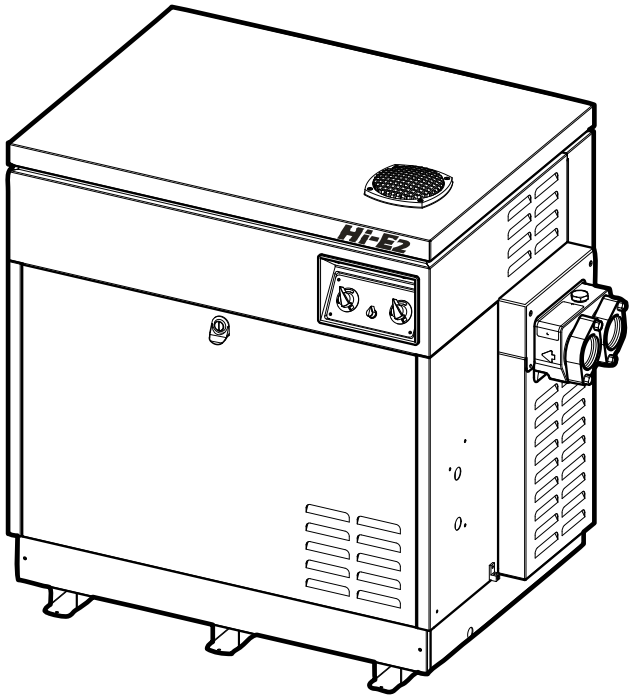
Jandy® Pro Series

# INSTALLATION AND OPERATION MANUAL




# Jandy Pro Series Hi-E2® and Hi-E2®R
## Gas-Fired Pool and Spa Heater
## EHE

**⚠ WARNING** **IF THESE INSTRUCTIONS ARE NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT, CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.**

**FOR YOUR SAFETY:** This product must be installed and serviced by a contractor who is licensed and qualified in pool equipment by the jurisdiction in which the product will be installed where such state or local requirements exists. In the event no such state or local requirement exists, the installer or maintainer must be a professional with sufficient experience in pool equipment installation and maintenance so that all of the instructions in this manual can be followed exactly. Before installing this product, read and follow all warning notices and instructions that accompany this product. Failure to follow warning notices and instructions may result in property damage, personal injury, or death. Improper installation and/or operation can create carbon monoxide gas and flue gases which can cause serious injury, property damage, or death. For indoor installations, as an additional measure of safety, Zodiac Pool Systems, Inc. strongly recommends installation of suitable carbon monoxide detectors in the vicinity of this appliance and in any adjacent occupied spaces. Improper installation and/or operation will void the warranty.

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

**WHAT TO DO IF YOU SMELL GAS**

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

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

H0205000_REVM

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# Section 1. General Information

## 1.1 Introduction

This manual contains information for the proper installation and operation of the Hi-E2 and Hi-E2R Model EHE pool/spa heater. Certain sections are specific to United States or Canadian installations, and are labeled United States or Canada. Procedures in this manual must be followed exactly. To obtain a copy of this manual contact Zodiac Pool Systems, Inc. ("Zodiac®"). For address information. See back cover.

## 1.2 Description

The Hi-E2 Low NOx heater is a very efficient gas-fired pool and spa heater. Its combustion system includes a heat exchanger which extracts 95% of the energy in the gas fuel. It has no standing pilot burner. It exceeds the requirements of energy conservation regulations such as those in California, Hawaii, New York, Oregon and other states which require that a pool heater have intermittent ignition.

The heater is designed to operate in conventional swimming pool and spa equipment arrangements. It requires 115V 60 Hz electrical power. It has the versatile dual-thermostat control system for pool/spa combinations.

The Hi-E2 is certified by CSA International to comply with latest editions of applicable standards. In the United States, the applicable standard is ANSI Standard Z21.56 for gas-fired pool heaters. In Canada, it is Standard CSA 4.7.

The Hi-E2 Low NOx heater has been designed specifically to heat fresh water swimming pools and spas, and with proper installation and care, it will provide years of reliable service. Do not use it to maintain pool or spa water temperature below 70°F. Do not use it as a heating boiler or general service water heater or to heat true salt water systems where salinity is in the 35,000 ppm range. For special applications, consult your Jandy Pro Series dealer.

## 1.3 Warranty

The Hi-E2 is sold with a limited factory warranty. A copy of the warranty is included in a plastic bag inside the heater. The warranty does not cover damage caused by improper installation, operation, or field modification; or damage to the heat exchanger caused by corrosive water. See Section 3.4 for guidelines on pool water chemistry.

**⚠ WARNING**

Improper installation or maintenance can cause nausea or asphyxiation from carbon monoxide in flue gases which could result in severe injury, or death. For indoor installations, as an additional measure of safety, Zodiac Pool Systems, Inc. strongly recommends installation of suitable Carbon Monoxide detectors in the vicinity of this appliance and in any adjacent occupied spaces.

# Section 2. Installation Instructions

## 2.1 General Requirements

All gas-fired products require correct installation to assure safe and satisfactory operation. The requirements for pool heaters include the following:

1. Appropriate site location and clearances.
2. Sufficient supply of clean air for combustion and ventilation.
3. Proper venting of products of combustion.
4. Properly sized gas pipe.
5. Properly sized gas meter.
6. Adequate water flow.
7. Provision for disposal of combustion condensate water.

In the United States, installation must be in accordance with local codes and the most recent edition of the National Fuel Gas Code, ANSI Z223.1/NFPA-54. The Code can be obtained from:

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169
www.nfpa.org

In Canada, install the heater in accordance with local codes and the most recent edition of the Natural Gas and Propane Installation Code, CAN/CSA B149.1.

### Special Precautions

Liquefied petroleum (LP) gas is heavier than air. Therefore, a pool heater using LP gas is subject to special installation rules. Consult local codes and fire protection authorities about specific installation restrictions.

Fuel gas and its combustion products are known to cause cancer or harm the reproductive process. Follow these installation instructions and applicable codes exactly to avoid this.

**⚠ WARNING**

To Reduce the Risk of Fire, install pool equipment in an area where leaves or other debris will not collect on or around the equipment. Keep surrounding area clear of all debris such as paper, leaves, pine-needles and other combustible materials.

## 2.2 Heater Assembly and Preparation

The Hi-E2 can be installed in a variety of ways, some of them requiring preparation or assembly in the field. In all cases, condensate tubing and fittings, which are provided with the heater, must be connected and routed. Water connections are provided on the right side of the heater but can be changed to the left side by reversal of the water headers.

It is best to handle these preparations before the heater is in its final location. Instructions are provided in subsequent sections of this document.

### Installation at High Elevation

The Hi-E2 has a venturi-type combustion system which does not require modification for operation at high elevation. In this type of system, air and fuel gas density changes are automatically compensated for, assuring proper air/fuel mixture. Heating capacity is reduced about 3 percent per 1000 feet (305 meters) above sea level. In general, efficiency at high elevation is equal to or better than at sea level.

## 2.3 Heater Location

The Hi-E2 may be installed indoors or outdoors as outlined in later sections. When installed indoors, combustion air will often be piped to the heater and this requirement may affect the choice of location, see later section on air for combustion and ventilation. Both indoor and outdoor installations require provision of means for disposal of combustion condensate per section 2.8.

Install the heater at least 5 feet (1.52 meters) from the inside wall of the pool or spa unless the heater is separated from the pool or spa by a five-foot (1.52 meter) high solid fence, wall or other permanent barrier.

Equipment must be installed on a firm, solid, non-absorbent level surface; and per the requirements of local codes and Authority Having Jurisdiction (AHJ). Equipment can weigh up to 300 lbs. Use suitably rated mounting surface materials to avoid risk of settlement, and never use sand to level the equipment as the sand will wash away. Check local building codes for additional requirements.

**CAUTION**

When pool equipment is located below the pool surface, a leak from any component can cause large scale water loss or flooding. Zodiac Pool Systems, Inc. cannot be responsible for such water loss or flooding or resulting damage.

When pool equipment is located below the pool surface, a leak from any component can cause large scale water loss or flooding. Zodiac Pool Systems, Inc. cannot be responsible for such water loss or flooding or resulting damage. Location of the heater below *or above* the pool deck affects operation of its water pressure switch. See sections on water piping and heater start-up for more information about this.

Locate the heater in an area where water leakage will not result in damage to the area around the appliance or to a structure. If forced to locate the heater where water leakage may cause damage, provide a suitable pan with drain under the heater. This pan must not restrict air flow or heater functions.

In selection of a location, disposal of combustion condensate must also be considered. The heater can produce three gallons of condensate water per hour under some operating conditions. Means to drain this condensate must be available or special provisions, such as a condensate pump must be provided. See later section on condensate disposal.

## 2.4 Installation Clearances

Clearances between the heater and combustible material must be per Table 1.

**Table 1. Installation Clearance Requirements.**

| Surface/Component | Minimum Clearance Inches (mm) |
|---|---|
| Rear & Blank Side | 2 (55) |
| Piping Side | 12 (305) |
| Front | 18 (455)* |
| Top - Indoors | 6 (150) |
| Top - Outdoors | Open (See Note) |
| Flooring | Combustible |
| Vent | 0 |
| * For Canada 24 inches (610 mm) clearance | |

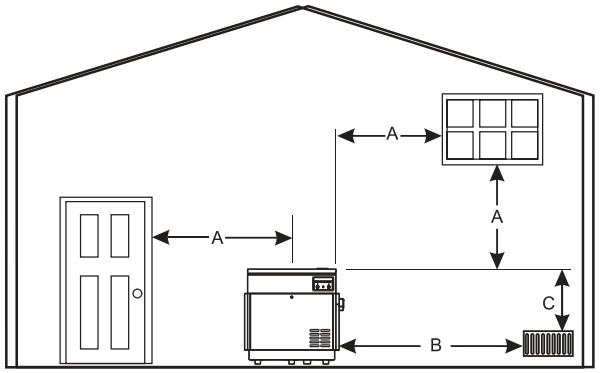
**NOTE** See Section 2.5 for outdoor installation requirements.

These clearances are the minimum acceptable. Whenever possible, larger clearances should be provided to assure adequate room for service operations. Note that gas piping must be provided through the left side of the unit and that the combustion air duct, when provided, also enters through the left side. See later section on combustion air, and also the section on water piping.

Do not install the heater on carpeting or similar material.

## 2.5 Outdoor Installation

Locate the heater in an open, unroofed area and maintain the clearances shown in Table 1. Do not locate the heater below or adjacent to any doors, windows, louvers or grates, etc., which connect in any way with an inhabited area of a building, even through another building such as




**Distance from heater to door, window or other opening to living structure**

Dimension '**A**'**-** USA - 4 ft (1.2m) Minimum,
CANADA - 10 ft (3.05 m) Minimum.

**Distance from heater to forced air inlet or other vented opening**

Dimension "**B**" - USA and CANADA - May be any distance if dimension "C" is 3 ft. (0.9 m) or more.

Dimension "**B**" - USA and CANADA - Must be at least 10 ft. (3.05 m) if dimension "C" is less than 3 ft. (0.9 m).

**Figure 1. Outdoor heater location.**

a garage or utility room, see Figure 1. Do not locate the heater below an outdoor deck, unless treated as an indoor installation with adequate clearances and proper venting to a location away from the deck.

If the heater is installed close to a structure, protect it from rain water runoff by means of gutters, roof water diverters or similar measures. Do not locate the heater close to irrigation sprinklers. Water from sprinklers may damage controls and electronic components.

Because the Hi-E2 is very efficient, combustion system exhaust gases are moist. Do not locate the heater such that this exhaust will impinge on structures or vegetation which may be damaged by combustion condensate.

**⚠ WARNING**

**United States**

Do not install the heater with the top of the vent assembly within 4 feet (1.22 m) horizontally, 4 feet (1.22 m) below or less than 1 ft (300 mm) above of any opening into a building.

**Canada**

Do not install the heater with the top of the vent assembly within 10 feet (3.05 m) of any opening into a building.

In Florida it is required that the heater be securely fastened to the equipment pad. Use a size 1/4" x 2-1/4" long galvanized or plated concrete screws and washers at each of the four (4) tabs located at the base of the heater. Mounting the appliance in this manner meets the applicable requirements of the Florida Building Code.

Mounting screws are not provided with this heater. After placing the heater on the equipment pad, drill a hole in the concrete at each of the four (4) tabs on the feet of the heater. (The correct size drill bit is usually provided with the concrete screws when purchased). Place a screw in each of the holes and fasten the heater to the equipment pad, see Figure 2. **Do not over torque the screws**.

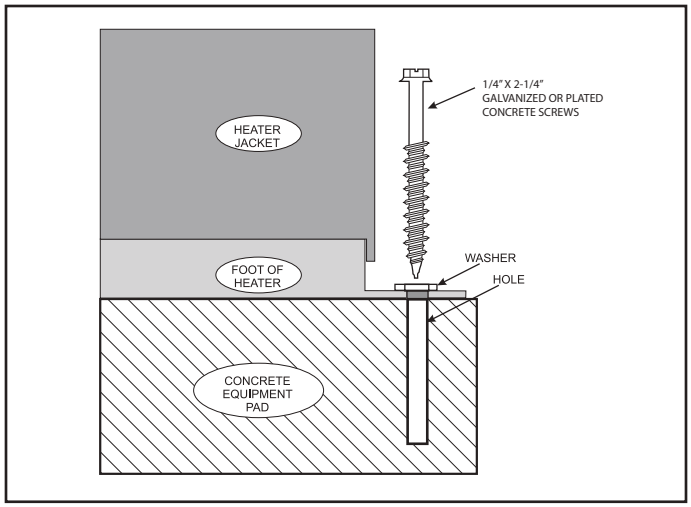



**Figure 2. Anchor heater to equipment pad.**

## 2.6 Outdoor Shelter Installation (Canada)

An outdoor shelter is an unoccupied enclosure which does not communicate directly with occupied areas. The Hi-E2 may be installed in such a shelter only when the installation is in accordance with local codes and the most recent edition of the Natural Gas and Propane Installation Code (CAN/CSA B-149.1). These codes and standards and Zodiac® require that the heater be properly vented as outlined in this manual. Other requirements also apply, such as provision of ample uncontaminated air for combustion and ventilation.

## 2.7 Indoor Installation

The Hi-E2 can be located indoors when provided with "one-pipe" or "two-pipe" systems for combustion air and combustion product venting. A one-pipe installation has only a vent pipe, and air for combustion must be provided to the room the heater is located in. A two-pipe system (sometimes referred to as "direct vent" or "sealed combustion") has a vent pipe *plus* a pipe bringing air directly to the heater's combustion system.

Section 2.7.2 specifies requirements for provision of combustion and ventilation air for one-pipe installations. Section 2.7.3 covers two-pipe installation.

An important consideration in selecting one (1) or two (2) pipe installation is the quality of the combustion air. Indoor air is sometimes contaminated with various household or pool sanitation chemicals which can cause corrosion in the heater combustion system. Unless the indoor air is known to be free of these materials, two (2) pipe installation is strongly recommended.

### 2.7.1 Preparation of Heater For Indoor Installation

If the Hi-E2 is to be installed indoors, its exhaust discharge grille must be converted to an exhaust pipe configuration.

The necessary vent collar, gasket and screws are shipped packaged within the heater. The conversion can be done quite simply as follows. See Figures 3 and 4:

1. Remove the vent exhaust grille by removing the four (4) screws which retain it. The grille, its gasket, and the screws may be discarded.
2. Place the vent collar gasket on the top of the heater aligning its center hole and screw holes with those in the top of the heater.
3. Place the vent collar over the gasket and fasten it in place with the screws and lockwashers provided. Be sure that all components are properly aligned. Screws must be tightened enough to assure a sealed joint without deforming the vent collar.

### 2.7.2 Combustion Air Requirements for One-Pipe Installation

One-pipe indoor installations must have specific provisions for supply of combustion and ventilation air to the room in which the heater is located. Two (2) air openings must be provided — one (1) near the ceiling and one (1) near the floor. When air is provided directly through an outside wall, each opening must have at least 1 square inch (6.5 square cm) of area per 4000 BTU/h of heater input. When air is provided indirectly through ducts from the outside, the openings and passages must have at least 1 square inch of area per 2000 BTU/h of heater input. These requirements are interpreted in Table 2.

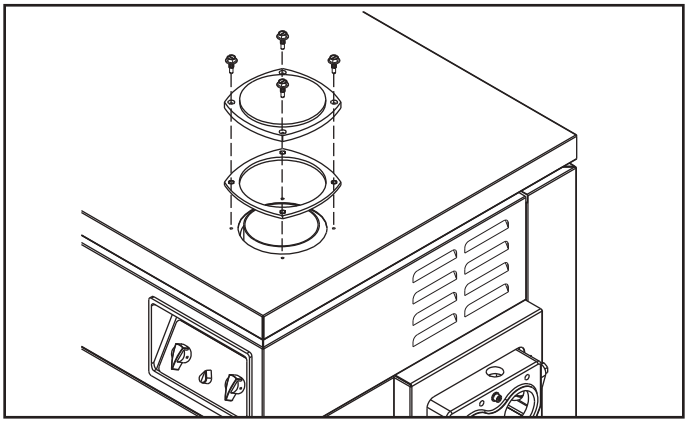


**Figure 3. Removal of outdoor exhaust grille.**

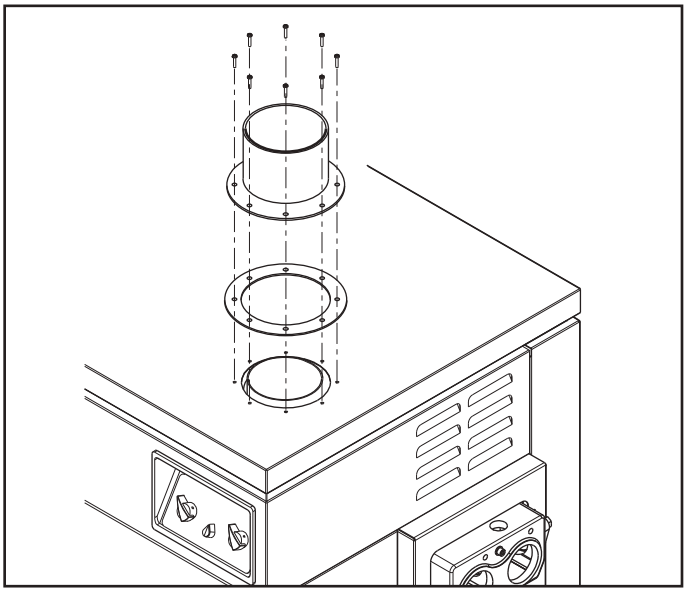


**Figure 4. Vent collar assembly for indoor installation.**

**Table 2. Required Net Free Area of Openings for Combustion and Ventilation Air.**

| Model | Required net free area in square inches (sq. cm) for each of 2 openings - one (1) near ceiling and one (1) near floor | |
|---|---|---|
| | Directly Through an Exterior Wall | Through Horizontal Ducts |
| 350 | 88 (570) | 175 (1130) |

Note that the numbers indicate the *net free area* — after allowing for the blockage of grille bars, etc. See applicable local codes and the previously-cited national codes for details. Even though codes may permit it, Zodiac® does not recommend installations with only "infiltration" as the means for provision of combustion air.

See Section 2.7.3.3 for vent pipe sizing.

**⚠ WARNING**

Do not store any chemicals, cleaners, or other corrosive material near combustion air openings or in the room. Avoid locating appliance vents in the vicinity of combustion air openings. Failure to prevent corrosive materials from mixing with combustion air can result in reduced heater life and unsafe heater operation.

### 2.7.3 Two-Pipe Installation (Direct Vent)

This section specifies installation requirements for combustion air and vent piping for "two pipe" installations. A two-pipe system provides isolation of the Hi-E2 combustion system from the space in which the heater is installed. It has not only a vent pipe, but also a combustion air pipe to provide air directly from the outdoors. Research studies have shown that contaminants which may corrode internal heater parts are typically at much lower levels in outdoor air than in air from indoors.

#### 2.7.3.1 Connection of Combustion Air Pipe

A collar for combustion air pipe connection is provided in the heater at the inlet of the filter box. As shown in Figure 5, the combustion air pipe is routed through the side of the heater to the filter box connection. Remove the cover plate from the left side panel to provide access for the air pipe.

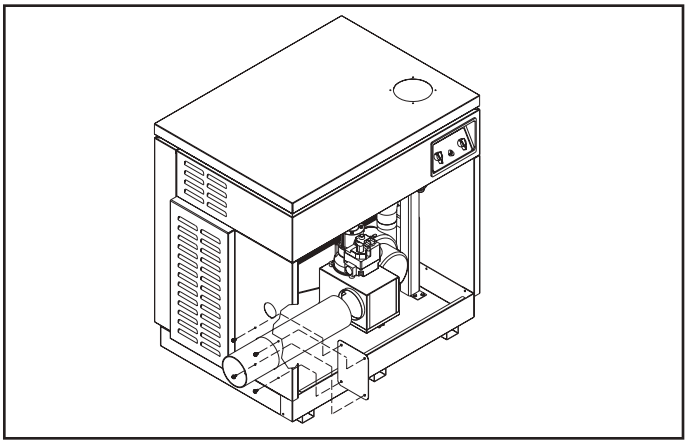


**Figure 5. Connection of combustion air pipe to heater.**

### 2.7.3.2 Piping Materials

**⚠ WARNING**

To avoid risk of property damage, serious injury, or death, use ONLY piping materials from the list below which are certified or listed for the application per the requirements of UL 1738 and/or ULC S636, by a Nationally Recognized Testing Laboratory (NRTL).

Vent piping must be corrosion resistant because combustion condensate is usually present on its internal surfaces. The materials listed in Table 3. are acceptable for vent piping:

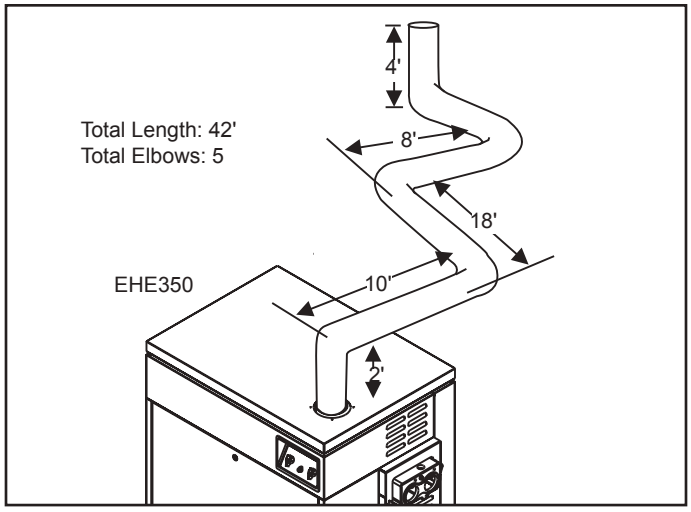



**Figure 6. "One-pipe" installation.**

### 2.7.3.3 Size and Length of Combustion Air and Vent Piping

Piping for combustion air and venting must be large enough to avoid restriction of the heater combustion system. Pipe diameter, number of elbows and length of pipe determine how much it restricts flow to or from the heater. Table 3 specifies the allowable length of piping for various situations.

The following example illustrates use of table 3:

**EXAMPLE:** A model 350 heater is to be installed in a one-pipe system with schedule 40 PVC or CPVC, see Figure 6. The vent pipe run is 42 feet long and has

**Table 3. Maximum Combined Length of Combustion Air and Vent Piping in Feet.**

| APPROVED VENTING MATERIALS* | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PVC** | | Class 100, Class 125, Schedule 40 or Schedule 80 | | | | | | | | **CPVC** | | | Schedule 40, Schedule 80 | | | | |
| **29-4C®** | | Stainless steel venting materials listed for venting of condensing gas-fired appliances. | | | | | | | | | | | | | | | |
| **Model** | Pipe Size Inches (cm) | **Number of Elbows** | | | | | | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | | **Total Length of Pipe Schedule 40 PVC, Schedule 40 CPVC & 29-4C®- Feet (m)** | | | | | | | | | | | | | | | |
| 350 | 4 (10.2) | 61 (18.6) | 50 (15.2) | 39 (11.9) | 27 (8.2) | 16 (4.8) | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | 5 (12.7) | 225 (68.6) | 211 (64.3) | 197 (60) | 184 (56) | 170 (51.8) | 157 (47.8) | 143 (43.5) | 130 (39.6) | 116 (35.4) | 116 (35.4) | NA | NA | NA | NA | NA | NA |
| | 6 (15.2) | 573 (174.7) | 556 (169.5) | 538 (164) | 521 (158.9) | 503 (153.3) | 484 (147.5) | 465 (141.7) | 446 (135.9) | 426 (130) | 426 (130) | 383 (116.7) | 360 (110) | 336 (102.4) | 310 (94.5) | 283 (86.3) | 255 (77.7) |
| | | **Total Length of Pipe Schedule 80 PVC & Schedule 80 CPVC - Feet (m)** | | | | | | | | | | | | | | | |
| 350 | 4 (10.2) | 48 (14.6) | 36 (11.0) | 24 (7.3) | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | 5 (12.7) | 173 (52.7) | 161 (49.1) | 149 (45.4) | 137 (41.8) | 125 (38.1) | 113 (34.4) | 101 (30.8) | 89 (27.1) | NA | NA | NA | NA | NA | NA | NA | NA |
| | 6 (15.2) | 438 (134) | 426 (130) | 414 (126) | 402 (123) | 390 (119) | 378 (115) | 366 (112) | 354 (108) | 342 (104) | 330 (101) | 318 (96.9) | 306 (93.3) | 294 (89.6) | 282 (86.0) | 270 (82.3) | 258 (78.6) |

**NOTES**
1. Vent must be Class 100, 125 or Schedule 40 PVC or CPVC, Schedule 80 PVC or CPVC. Combustion air pipe may be PVC, CPVC or suitable metal pipe.
2. Heavy condensation occurs in long vent pipes. Provide a separate entrapped condensate drain from vent piping near heater when 5" vent pipe exceeds 100 feet or 6" vent pipe exceeds 50 feet.

*
- For saltwater version heaters (EHE350NS and EHE350PS) a 180°F vent limit switch is required and PVC venting is not allowed.
- All metal sections of the venting system used must be stainless steel and listed/certified/classified by a Nationally Recognized Testing Laboratory (NRTL) as being compliant with the applicable requirements of the Underwriters Laboratories (UL) standard for safety for "Venting Systems for Gas-Burning Appliances, Categories II, III, and IV" (ANSI/UL 1738), and properly installed in accordance with any manufacturers' instructions and in compliance with applicable local and national installation codes.
- The non-metallic sections of the venting system installed must also be listed/certified/classified by a Nationally Recognized Testing Laboratory (NRTL) as being compliant with the applicable requirements of the applicable requirements of the Underwriters Laboratories (UL) standard for safety for "Venting Systems for Gas-Burning Appliances, Categories II, III, and IV" (ANSI/UL 1738) In addition, non-metallic venting systems may also be listed/classified by a NRTL as being in compliance with the requirements of the UL standard for "Type BH Gas Venting Systems" (ULC S-636). When installed properly in accordance with any manufacturers' instructions and in compliance with applicable local and national installation codes.

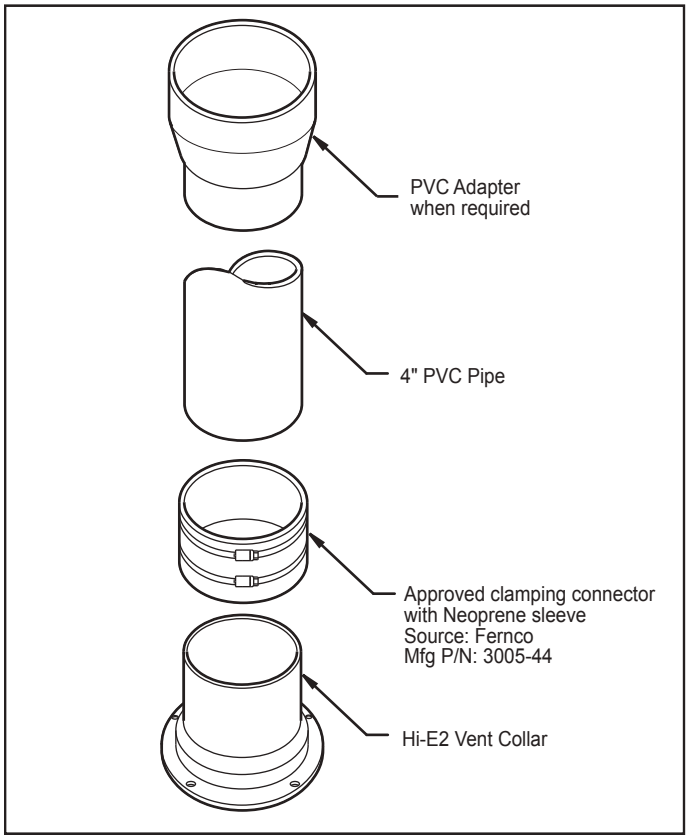



**Figure 7. Indoor vent connection, Hi-E2 pool heater.**

five (5) elbows. Per Table 3, Only 16 feet of 4" vent pipe would be allowable which would not allow for completion of the run. Therefore the pipe size needs to be increased. 140 feet of 5" piping would be sufficient to complete the run.

#### 2.7.3.4 Combustion Air and Vent Pipe Installation

The Hi-E2 must be vented to the outdoors. Refer to Figure 7. It must not be vented in common with any other appliance, even if that appliance is of the condensing type. Common venting can result in severe corrosion of the Hi-E2 or of the other appliances or their venting, or escape of combustion product gases through such appliances or vents. Do not vent the Hi-E2 to a fireplace chimney or building chase.

Combustion air ducting, when provided, must not be shared with any other appliance or with another Hi-E2. Doing so may result in flow of air through the other appliances instead of directly from the outdoors.

The combustion air intake and vent outlet must be located exterior to the building and in the same pressure zone - i.e. both through the roof or both through a side wall. The vent terminal must be located in accordance with local codes, as applicable, and in accordance with the following:

1. Locate the vent terminal so that it will not be damaged by pedestrians and other traffic, and so that the discharge is not offensive. The National Fuel Gas Code requires a through-wall vent terminal be at least 7 feet (2.13 m) above grade if located at a public walkway.
2. Locate the vent terminal so the vent exhaust does not settle on building surfaces and other nearby objects. Vent products may corrode such surfaces or objects.
3. Locate the vent terminal at a sufficient horizontal distance from any gas or electric metering, regulating or relief equipment. In the United States, this distance must be at least 4 feet (1.22 m). In Canada, it must be at least 10 feet (3.05 m).
4. Locate the vent terminal at a sufficient horizontal distance from any building opening. Take special care to assure that combustion products do not enter a building through windows, doors, ventilation inlets, etc. In the United States, this distance must be at least 4 feet (1.21 m). In Canada, it must be at least 10 feet (3.04 m).

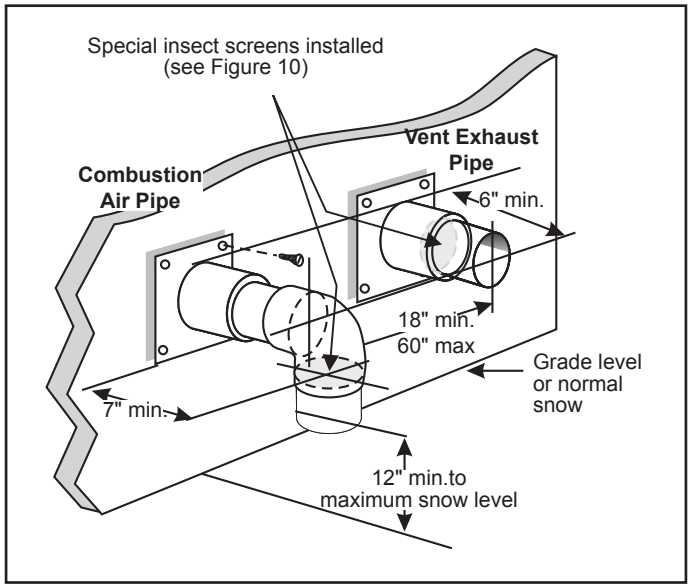



**Figure 8. Vent and combustion air terminals at exterior wall.**

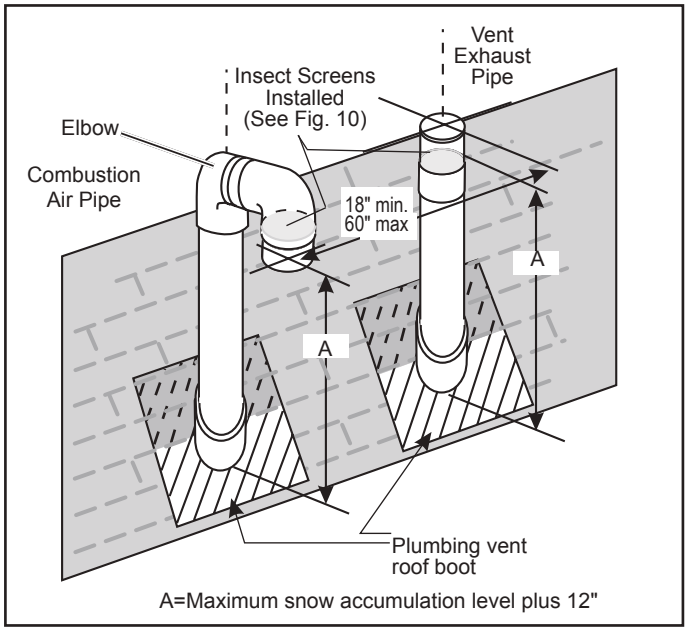



**Figure 9. Vent and combustion air terminals at roof.**

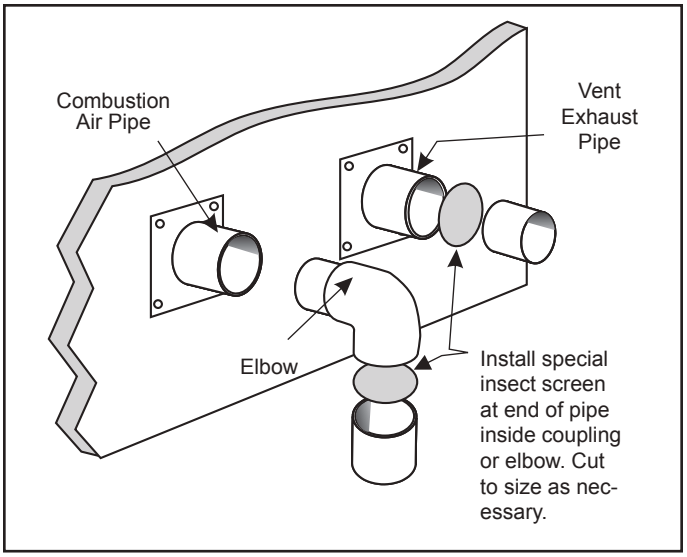



**Figure 10. Installation of insect screens.**

As shown in Figures 8 and 9, the combustion air intake and the vent outlet must be installed no closer together than 18" (45.7cm) and no farther apart than 60" (1.5m). The combustion air inlet opening must face downward to prevent entry of rain or snow. The vent outlet must discharge away from the combustion air inlet - normally in a horizontal direction when on a wall and vertically upward when on a roof. Both should terminate at least 12" (30.5cm) above the snow accumulation level. In locations with freezing climate, extension of the vent pipe outside of the building should be minimized. The insect screens provided with the heater must be installed at the combustion air and vent pipe openings as shown in Figure 10. Insect screens are sized to fit the inside of a 5" PVC pipe fitting. Trim them as necessary for smaller pipe sizes.

Connect the vent pipe to the heater vent collar with an air-tight corrosion-resistant clamp. The connection must not allow leakage of combustion products into the space but should be removable for service. See Figure 7.

Connect the combustion air pipe to collar of the air filter box. For this *combustion air pipe only*, sheet metal pipe is most convenient and can be screwed directly to the collar. Seal the joint with silicone sealer or similar mastic material.

Install vent piping with a continuous rise of at least 1/4" per foot (20 mm per meter) away from the heater. This will assure that any condensate forming in the vent pipe will flow back to the heater where it can be disposed of properly.

Support vent piping with suitable hangers so its weight does not bear on the heater or building penetration and so that piping joints are not strained. Support horizontal runs at intervals no greater than 6 feet (1.82 meters), and closer if necessary to avoid sagging. Sagging can trap condensate water and block the vent.

Both combustion air and vent piping joints must be sealed. Metal combustion air pipe joints should be fastened with screws and sealed with permanent sealer or tape. Plastic vent pipe joints must be made with solvent cement listed for such use. Joints in 29-4C® stainless steel pipe must be sealed in accordance with its listing. Connection of combustion air and vent piping to the heater should be serviceable — i.e. removable for heater service.

#### 2.7.3.5 Room Ventilation

The room a Hi-E2 is installed in must be provided with adequate ventilation. Like other gas-fired appliances, the Hi-E2 releases heat to its environment, and a room with no ventilation may become too warm.

In one-pipe installations, the normal (code-required) provisions for combustion air also assure reasonable ventilation of the room. If a two-pipe system is installed, ventilation must be provided by other means, such as through grilles or openings or with a small fan.

#### 2.7.3.6 Inspection and Replacement of Existing Vent System with New Components

If the Hi-E2 is being installed to replace an existing pool heater, it is recommended that a new appropriate venting system be installed with the new heater. However, if an existing venting system must be used, be sure to carefully inspect the venting system to ensure that it is in good condition and continues to be appropriate for the Hi-E2 heater. Replace any parts that are not in good and serviceable condition with new parts before completing the pool heater installation.

## 2.8 Condensate Disposal

In a high-efficiency combustion process, combustion product gases are cooled so much that liquid water is condensed. Flow of this "condensate" can be quite high. When pool water is very cold, as much as 2 or 3 gallons

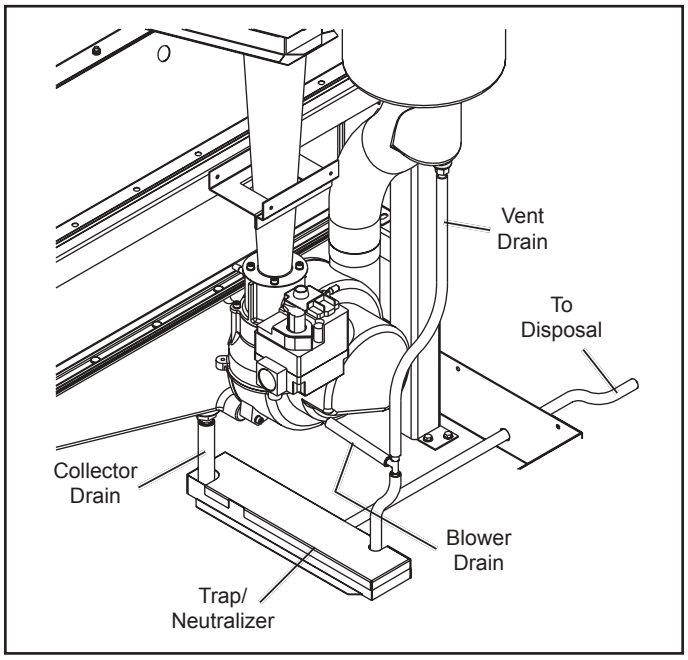



**Figure 11. Condensate drainage components.**

of condensate can be produced in an hour. Condensate is mildly acidic. Before treatment, its "pH" is typically in the 3.5 to 6.0 range.

Handling and disposal of condensate is not complicated, but it must be done correctly to prevent problems or complaints. A trap/neutralizer assembly is provided with the heater to simplify installation. This assembly is easily installed in the base of the heater. Figure 11 illustrates its installation and the routing of drain tubes.

**To install the condensate assembly, first install the short length of 5/8" I.D. tubing (Collector Drain) on the barbed fitting on the bottom of the condensate collector.** Then drop the condensate tray into the opening in the base pan of the heater, bending the 5/8" tubing as necessary to get the tube into the tray. Readjust the 5/8" tubing so that its lower end is 1/4" - 3/8" above the bottom of the tray. The tray can be positioned with the outlet fitting to the right, as shown in Figure 11, or with the fitting to the left, depending on the direction required for condensate disposal. Connect the piece of 1/2" I.D. tubing to this outlet fitting and route it out of the heater through the hole in the side of the base panel. This tube carries condensate to the drain. If this disposal tube is routed to the left, remove the plug button from the hole on the left side of the base panel and push it into the hole on the right side.

Connect the remaining short piece of 3/8" I.D. tubing to the barbed tee fitting in the tubing immediately in front of the blower. Position this tubing so that its bottom end is 1/4"-3/8" above the bottom of the condensate tray. This tube provides drainage for the vent duct and blower.

A package of limestone gravel neutralizer is provided with the condensate assembly. Remove the neutralizer from the packing and spread evenly throughout the tray and around the properly placed tubes. Be sure that a limestone pebble does not plug any of the tubes.

IMPORTANT After placing the limestone neutralizer in the tray add water until the water level is at the same height as the overflow, see figure 12. Place the cover on the tray when this is done.

It is important that there be no sagging sections of tubing to trap water. Drainage to the trap and out of the trap to the drain must be assured by continuous downward routing of these tubes. It may be necessary to elevate the heater to provide downward routing. The outlet of the disposal tube must be open to the air. PVC pipe is recommended for long drain tubes.

If a gravity drain is not available, a condensate pump must be provided in the field. Suitable condensate pumps are available commercially at air conditioning equipment distributors.

Incorrect installation of the condensate assembly or tubing can result in overflow or waterlogging of the vent. In normal operation, water accumulates in the tray at the level of the outlet fitting, and this provides a "water seal" which accommodates combustion system pressures. Figure 12 illustrates the water seal. Note that water is "pulled" up toward the condensate collector pan and is pushed down slightly by the vent/blower drain. If there is no water seal, air rushes into the collector drain, preventing normal drainage of condensate water, until vent drainage provides the seal. See Section 2.12, Start-Up and Adjustment.

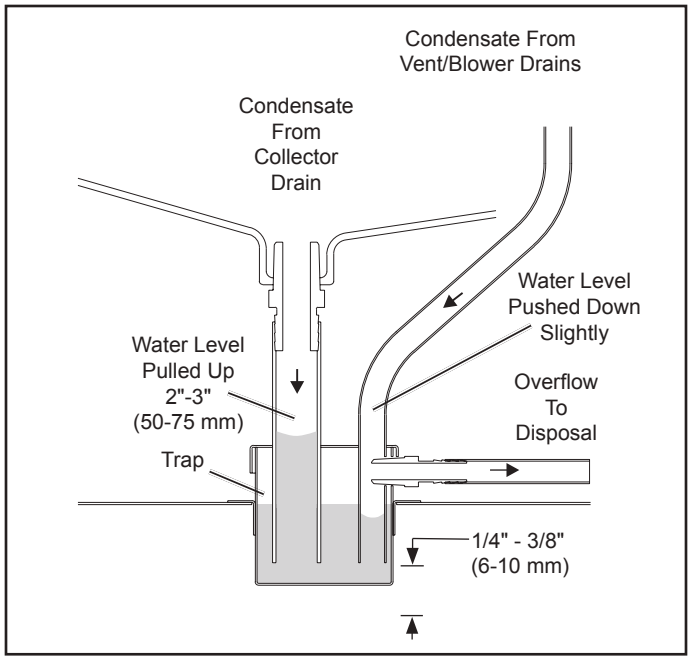



**Figure 12. Condensate drain and trap.**

The installer must be sure to take whatever measures are necessary to prevent property damage by condensate overflow. If the heater location is such that this water can directly or indirectly damage a building, furnishings or other property, an overflow pan or other appropriate preventative measure should be provided.

## 2.9 Gas Supply and Piping

Before installing gas piping, check the rating plate on the heater to be sure that the heater is for use with the correct (available) gas. Make sure that gas supply pressure is adequate per the requirements in Table 4.

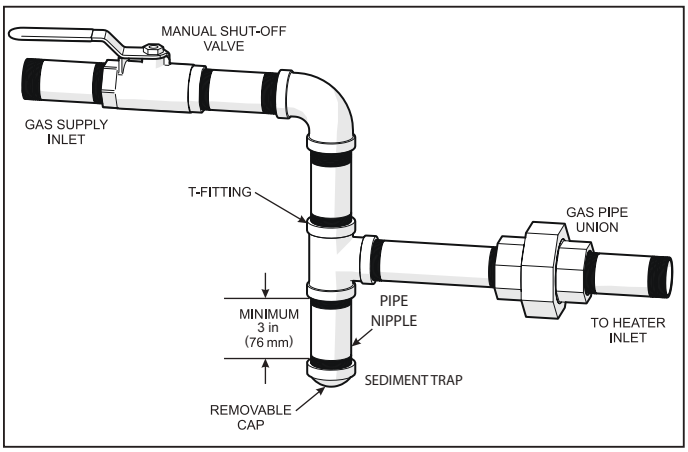



**Figure 13. Manual Shut-off Valve and Sediment Trap.**

**Table 4. Gas Supply Pressure Requirements.**

| Supply Pressure | Minimum | Maximum |
|---|---|---|
| Natural Gas | 5 inches WC (125 mm WC) | 10.5 inches WC (265 mm WC) |
| LP Gas | 11 inches WC (280 mm WC) | 14 inches WC (350 mm WC) |

Gas piping must be large enough to provide the required gas flow rate without excessive pressure drop. Table 5 specifies pipe sizes which will limit pressure drop to 0.5 inches WC (125 Pa), based on the National Fuel Gas Code, ANSI Z223.1/NFPA-54.

Do not use flexible appliance connectors on any gas connections unless the connector is CSA approved for outdoor installation and is marked with the BTUH capacity (which must be equal to or greater than the heater rated input) and the type of gas (Natural or LP). Also, any flexible connectors, such as CSST buried underground must be certified for underground installation and meet all applicable codes. Please note, use of flexible connector still requires the installation of a sediment trap per NFPA 54.

**Table 5. Required Gas Pipe Size.**

| Model | Natural Gas | | | LP Gas | | |
|---|---|---|---|---|---|---|
| | 0-50' (0-15 m) | 50-100' (15-30 m) | 100-200' (30-60 m) | 0-80' (0-15 m) | 50-100' (15-30 m) | 100-200' (30-60 m) |
| 350 | 1-1/4" | 1-1/4" | 1-1/2" | 1" | 1-1/4" | 1-1/4" |

Support gas piping properly so its weight does not bear on the heater. Install a drip leg, a non-restrictive shutoff valve and a union on the gas supply line outside of the heater. See Figure 13.

Before operating the heater, test the gas supply system, including all connections, for leaks using a soap solution. Do not use a flame or any ignition source for leak detection. Disconnect the heater and its individual gas shutoff valve during pressure testing if the test pressure is higher than 1/2 psig (3.34 kPa). If the pressure is 1/2 psig (3.45 kPa) or lower, close the manual valve on the heater gas control during testing.

When the heater is started, check the supply pressure to verify that it is adequate during heater operation. Undersize piping, a restrictive fitting or an undersize gas meter can cause low operating pressure.

### High Elevation

To assure good combustion and general operation, gas appliances may require manual de-rating when installed at high elevation. This is *not necessary* with the Hi-E2 because it has a special venturi-type combustion system which self-compensates for changes in barometric pressure. Air flow through the venturi pulls the correct flow of gas into the burner regardless of air density. Good quality combustion and high efficiency are assured without special adjustment or changes to the heater.

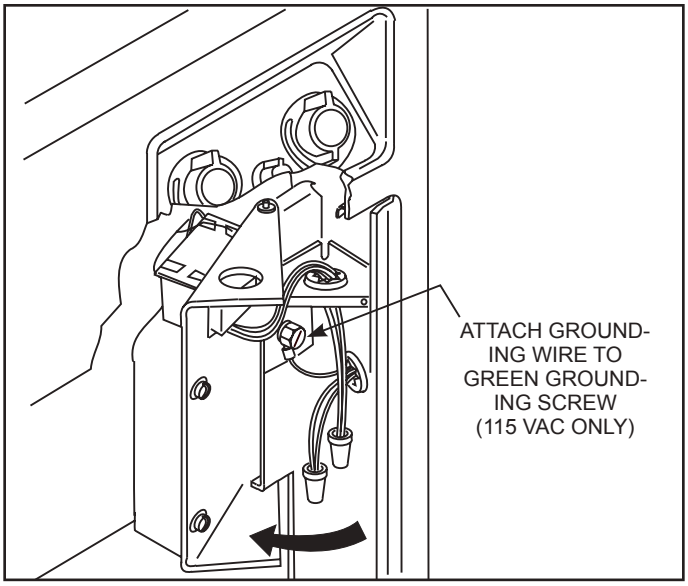



**Figure 14. Field wiring connections.**

#### 2.9.1 Special Precautions for LP Gas

LP Gas is heavier than air and can therefore more readily collect or "pool" in enclosed areas if provision for proper ventilation is not made. Installation of pool heaters in enclosed areas such as pits is not recommended. However, if such an installation is required be sure to pay special attention to proper ventilation requirements for LP gas. Locate heaters a safe distance from LP gas cylinders and filling equipment. Consult the National Fuel Gas Code (NFPA 54 / ANSI Z223.1, latest edition), the Natural Gas and Propane Installation Code in Canada (CAN/CSA B149.1, latest edition), and any other local codes and fire protection authorities about specific installation restrictions in your area.

## 2.10 Electric Wiring

**⚠ WARNING**

**ELECTRICAL SHOCK HAZARD.** This heater contains wiring that carries high voltage. Contact with these wires may result in severe injury or death.

**CAUTION**

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

#### 2.10.1. Electrical Power

Electrical wiring must be in accordance with the latest edition of the National Electrical Code® (NEC®), ANSI/National Fire Protection Association® (NFPA) 70, unless local code requirements indicate otherwise; and in Canada with latest edition of CSA C22.1 Canadian Electrical Code.

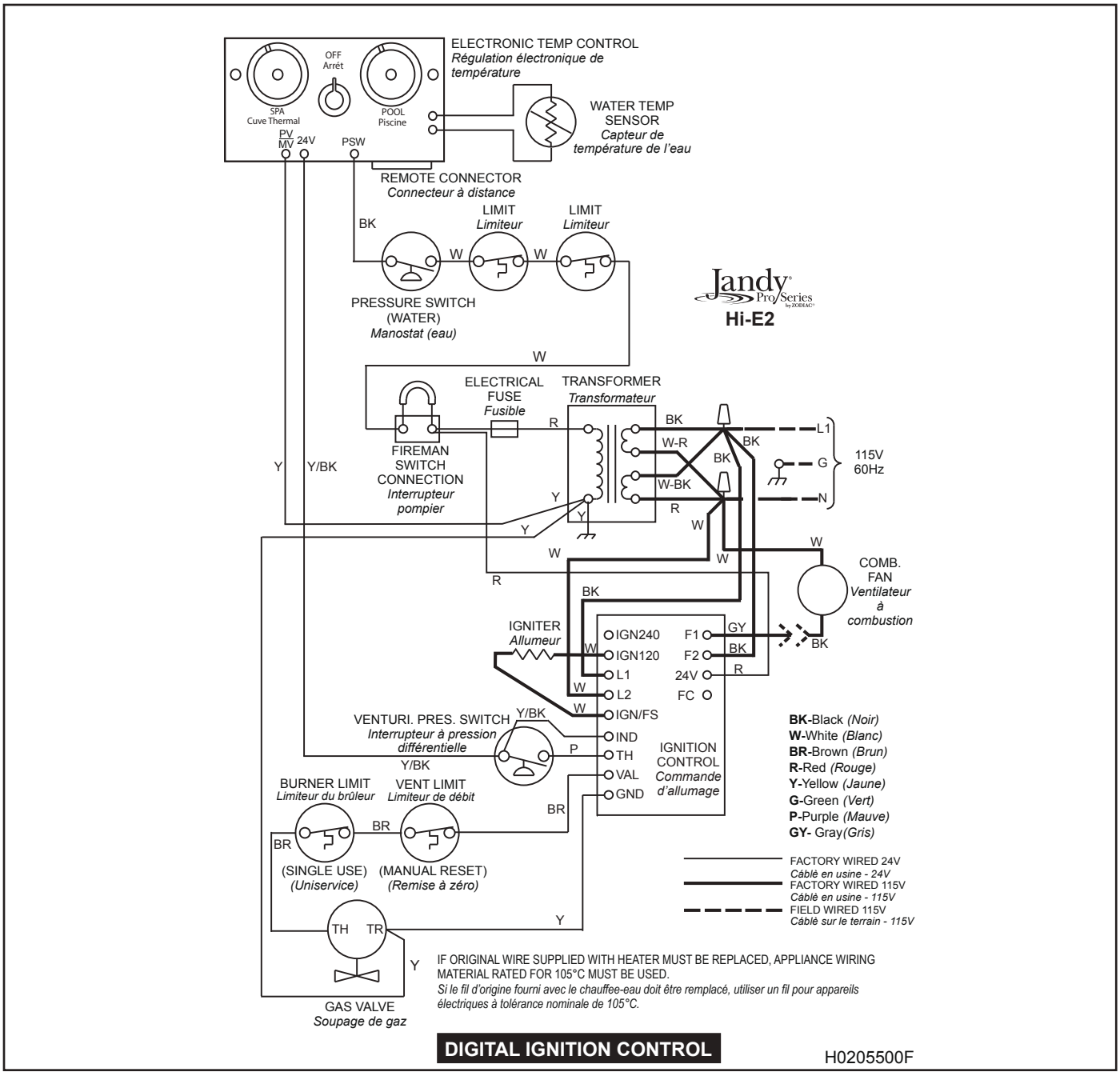



**Figure 15. Wiring diagram, Hi-E2 pool heater.**

The Hi-E2 requires electrical power from a 115V, 60 Hz source. Do not connect this heater to a 230VAC power source. Wiring connections must be made exactly as shown in the wiring diagram, see Figure 15. Grounding must be provided as required by the prevailing electrical code.

Connect wiring inside the junction box, which is on the right side of the heater and is accessible through the door opening. Line voltage connections must be made within this box. A labeled green grounding screw is provided in the junction box for a grounding wire. See Figure 14.

Wiring should include a means to prevent operation of the heater when there is no water flow. This is typically done with a time clock "Fireman's Switch" as discussed in Section 2.10.3.

### 2.10.2 Bonding

**CAUTION**

To prevent premature failure of the appliance resulting from stray voltages and voltage differentials, the heater must be bonded to other equipment which is part of the pool plumbing system with a solid copper wire not smaller in diameter than 8 AWG, 6 AWG in Canada.

Zodiac® requires that the appliance be connected to a "bonding loop" that includes all electrical equipment in the system and on the equipment pad. Bonding lugs must be connected with a solid copper wire not smaller than 8 AWG (6 AWG in Canada). Failure to do so will void warranty.

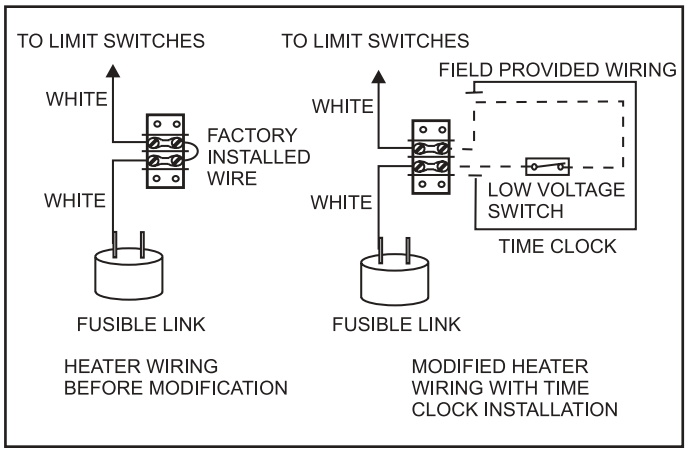



**Figure 16. Typical time clock wiring.**

Additionally, in the United States the National Electrical Code® and in Canada the Canadian Electrical Code, require that all metallic components of a pool structure, including reinforcing steel, metal fittings and above ground components be bonded together (forming a "bonding grid") with a solid copper conductor not smaller than a 8 AWG (6 AWG in Canada).

The NEC and the CEC also require that the equipment and/or appliances associated with the pool water circulating system, including, but not limited to, pump motors and heaters be bonded together as part of the equipotential bonding grid. Zodiac® provides a special labeled bonding lug on the right side of the heater to accommodate this requirement.

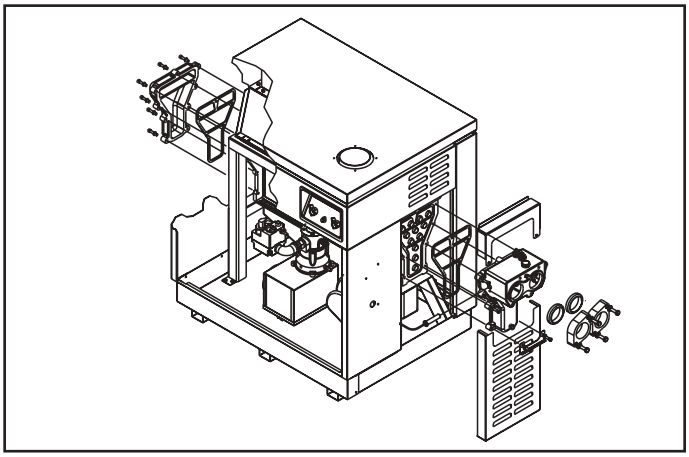


**Figure 18. Water connection as shipped.**

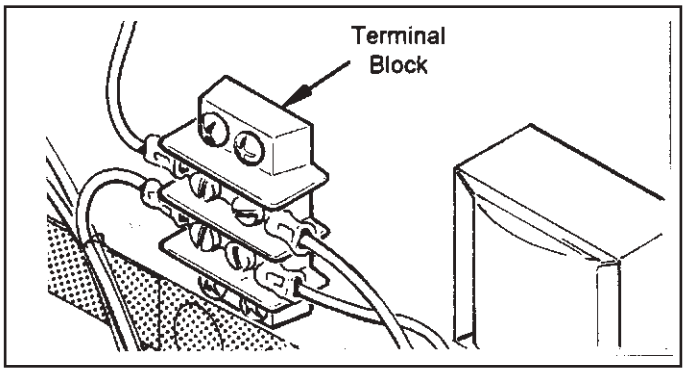



**Figure 17. Terminal block for fireman's switch or remote control wiring.**

### 2.10.3 Auxiliary Time Clock Wiring

If a time clock is provided to control the pool filter pump, it should have a separate low-voltage (Fireman's) switch for the heater. Route the heater's 24 VAC control circuit through this switch as shown in Figures 16 and 17. To do this, remove the "jumper" from the terminal block in the heater control compartment. Connect two (2) wires to this terminal block and route them to the Fireman's switch at the time clock. Provide wiring of at least 18 gauge with insulation at least 3/64" thick and having a temperature rating of at least 90°C.

### 2.10.4 Remote Operation

The Hi-E2 pool/spa heater controls can be wired for remote operation. The Jandy Pro Series AquaLink® RS remote control permits switching from pool to spa, with temperature set points for each, and turning the heater on and off from a remote location. Contact your local Jandy Pro Series distributor for information on the AquaLink® RS control system to fit your back yard recreational needs.

An interrupt (on/off) type remote can be connected by removing the jumper wire on the terminal block located in the control compartment, see Figure 17 and connecting the two (2) wires from the remote to the two (2) terminals on the terminal block. This type of remote control will turn the heater on or off, but will not switch between the two (2) temperature controllers on the temperature control panel or allow for temperature adjustments.

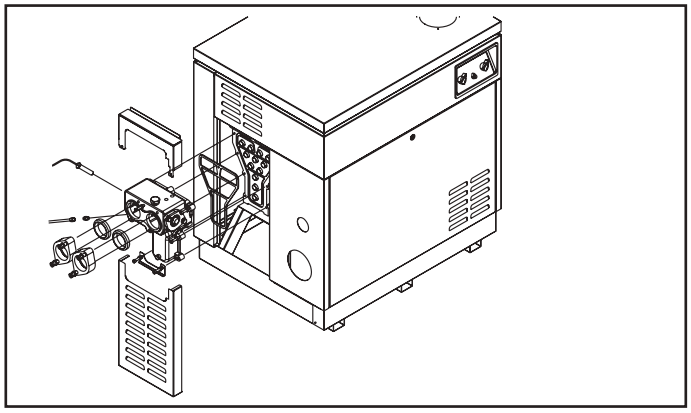


**Figure 19. Water connection reversal.**

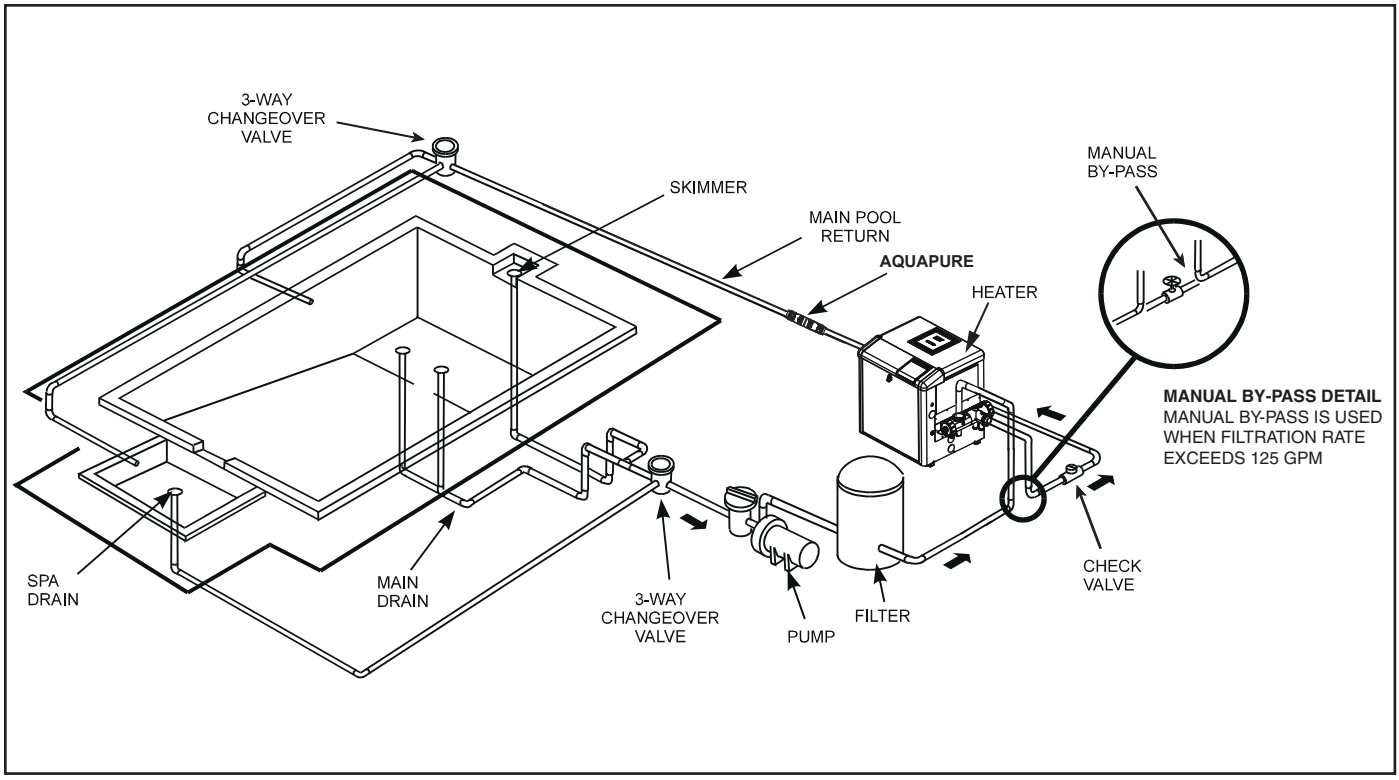



**Figure 20. Typical water piping.**

## 2.11 Water Piping

### 2.11.1 Reversal of Water Connections

The Hi-E2 is shipped with water connections on the right side, but it can be modified in the field to provide left-side water connections. This is done by removing the water headers and re-installing them opposite to their original location. Some of the heater wiring and control components must be relocated, so this change must be done only by a trained service technician.

Water connection reversal is illustrated in Figures 18 and 19. Proceed as follows:

1. Remove the vent exhaust grille by removing the four (4) screws which retain it. Retain these and all other parts for later reassembly.
2. Remove the top cover by removing the screws around the edges, under the overhang.
3. Remove the header covers. Note that the return header cover is retained by wing nut fasteners *inside the heater*.
4. Disconnect the pressure switch wires and remove the pressure switch tube from the inlet/outlet header by unscrewing the brass fitting.
5. Remove the temperature control sensor by removing the retainer bracket and its cap screws.
6. Disconnect the limit switch wires from the limit switches. The limit switches and the short wire between them may be left in place.
7. Remove both headers by unscrewing eight (8) cap screws retaining each header.
8. Install the inlet/outlet header on the left side of the heater and the return header on the right. Position gaskets carefully to avoid water leaks.
9. Re-route the limit switch wires in front of the venturi tailpipe and attach them to the limit switches.
10. Re-route the temperature sensor wires in front of the venturi tailpipe and insert the sensor into the header. When the inlet/outlet header is on the left side, the sensor opening is at the rear. Re-install the retainer bracket and screw.
11. Re-install the pressure switch tube and fitting. Relocate fitting.
12. Adjust wiring and pressure switch tube routing so that they don't rest on sharp edges or on the hot surfaces of the combustion chamber. The combustion chamber is the portion of the assembly just above the heat headers.
13. Re-assemble all other components and fasteners.

### 2.11.2 Pool/Spa Piping Systems

Figure 20 illustrates typical piping for pool equipment in pool/spa combination pools. With its Flex-Temp temperature control, the Hi-E2 is particularly suitable for this type of pool installation.

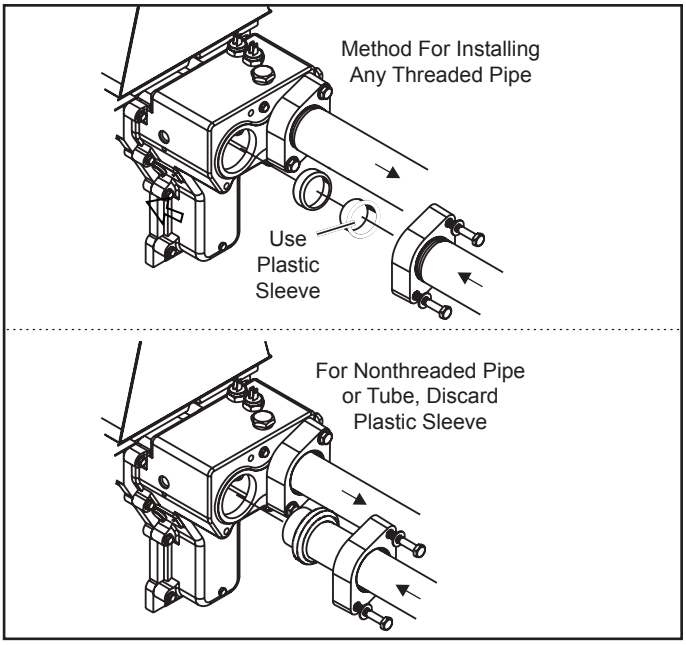



**Figure 21. Piping to heater.**

The heater must be protected from back-siphoning of water, which can result in dry starts. If there is any chance of back-siphoning, provide a check valve between the pool and the filter pump inlet.

Arrangement of pool system components other than as illustrated in these diagrams can affect the operation of the heater's water pressure switch. Location of the heater above or below the pool water surface can also affect operation of the switch. In general, the pressure switch can be adjusted to accommodate this effect if the heater water connections are no more than six feet below the pool water surface and no more than 15 feet above it. See instructions for pressure switch adjustment in the heater start-up section of this manual for more information about this. Note that when pool equipment is located below the pool surface a leak can result in large scale water loss or flooding. Zodiac cannot be responsible for such water loss or flooding or the damage caused by it.

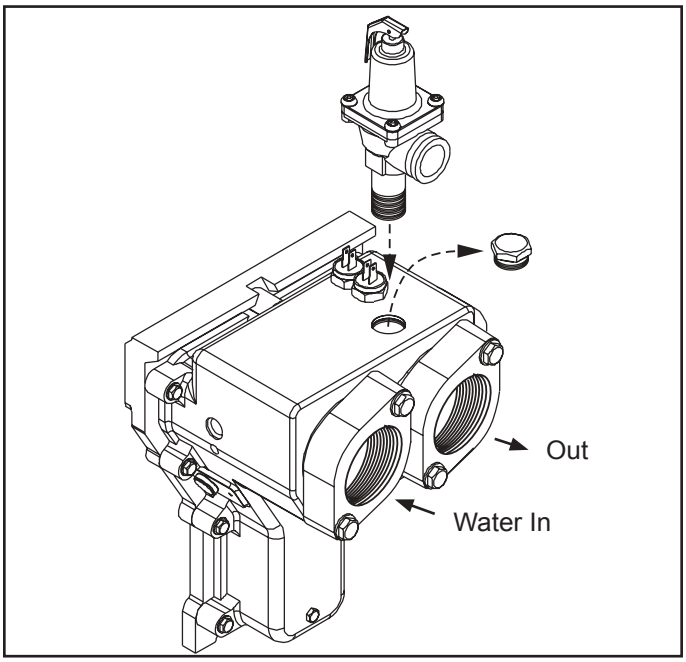



**Figure 22. Pressure relief valve installation.**

Do not install a shutoff valve or any kind of variable restriction in the water piping between the heater outlet and the pool/spa.

Pool systems with water flow rates higher than 100 GPM require an adjustable external bypass at the heater. See the section on start-up and adjustment for this information.

### 2.11.3 Connections at Heater

The Hi-E2 has a universal water header and flange design. With this feature, a variety of piping materials and sizes can be used at the heater. 1-1/2" PVC or 2" copper pipe can be connected directly to the heater using the rubber "donut" gaskets provided with the heater. 2" PVC or metal pipe can be threaded directly to the flanges and 1-1/2" schedule 40 metal pipe can be used with the rubber donut gaskets. See Figure 21.

### 2.11.4 Pressure Relief Valve and Temperature Relief Valve

A pressure relief valve (PRV) is recommended in all installations, and is mandatory in any installation in which the water flow can be restricted between the heater outlet and the pool/spa. A pressure relief valve may also be required by local codes and a pressure relief valve must be provided in Canada. Be sure to check any applicable installation codes in your area to determine whether a pressure relief valve is required.

A pressure relief valve is not supplied with the Hi-E2. All equipment installations need to be in accordance with the manufacturers instructions.

To install a pressure relief valve:

1. Remove the 3/4" brass plug from the top of the inlet/outlet header, see Figure 22.
2. Install the pressure relief valve in the opening. Make sure to get a sung fit. Do not overtighten.
3. Provide a short length of brass or stainless steel pipe as necessary to position the valve above the sheet metal cover.
5. The final orientation of the pressure relief valve should be vertically aligned with the discharge opening facing away from the heater.
6. Install a discharge pipe from the pressure relief valve discharge opening to a safe area. This is a precaution to prevent the possibility of personal injury or property damage in the event scalding water is discharged from the pressure relief valve.
7. Install the discharge pipe so that there is no trapped or standing water in the piping. Discharge piping must be facing down, terminating with a threadless nipple, no less than 6" from floor.

The maximum working pressure of this heater is 75 psig. Be sure to take into consideration the maximum allowable pressure of the other components in the system when installing a PRV. Any pressure relief valve installed must comply with provisions of the standard described in ANSI® Z21.22 for the United Sates or CSA 4.4 in Canada.

Some local codes may also require installation of a temperature relief valve. Check with your local codes for requirements in your area. The valve setting should be in accordance with local codes. Zodiac® recommends that the water delivered to the pool not exceed 104°F. All temperature and/or pressure relief valves must be listed by a Nationally Recognized Testing Lab (NRTL) such as CSA, UL, or ETL.

#### 2.11.5 Automatic Chlorinators (Chemical Feeders)

A high concentration of chlorine (and many similar chemicals) in the pool heater can be very destructive. Heater damage caused by chemical concentration is not covered by the Warranty. See Table 7 for guidelines on pool water chemistry.

**IMPORTANT** Always install a corrosion resistant check valve when any sanitation equipment, including erosion feeders and salt chlorination systems are installed.

Wire an electric chlorinator so that it cannot operate unless the filter pump is running. If the chlorinator has an independent clock control, synchronize it with the filter clock.

If the chlorinator is equipped with its own pump, install it so that it introduces the chlorine downstream from the heater, and, if possible, below the level of the heater outlet fitting.

## 2.12 Start-up and Adjustment

#### 2.12.1 Normal Operation

The Hi-E2 pool heater operates automatically. It provides heat in response to the selector switch and temperature settings on the control panel on the front of the heater. The heater has internal controls to sense adequate water flow and to handle any abnormal condition.

Normal operation is as follows:

1. The pool/spa system filter pump provides water flow. A pressure-flow switch in the heater detects water flow and enables the control to operate the heater. (If the recommended fireman switch has been provided, it must also enable operation.)
2. If the selector switch is set to "Pool" or "Spa", and if the water temperature is not warm enough, the control signals the combustion system to start.
3. The ignition control starts the combustion blower.
4. When the venturi pressure switch detects combustion air flow and when a suitable “pre-purge” time has been allowed, the ignition control energizes a “hot surface” igniter.
5. The igniter is allowed to reach ignition temperature, at which it glows bright red-orange. This is visible through the combustion chamber view port.
6. The gas valve is opened and gas flows into the combustion air. The gas/air mixture flows through the burner into the combustion chamber. It is ignited by the igniter.
7. The ignition control electronically senses successful ignition by “flame rectification”, and the gas valve is allowed to stay on. The igniter is de-energized.
8. The heater operates for as long as the control demands heat, subject to continued water flow and satisfactory operation of the system.
9. When the control stops calling for heat, the ignition control shuts off the gas valve and the flame goes out.
10. The ignition control continues to operate the combustion blower for a “post-purge” period, after which it is turned off.

The process is repeated upon the next call for heat. If ignition is unsuccessful, or if the flame fails during normal operation, the ignition shuts off the gas valve. It imposes a post purge and two (2) more ignition cycles, and it shuts down the system if ignition is not achieved in three (3) cycles.

#### 2.12.2 Start-up

Before operating the heater, pour water into the condensate tray and verify that it drains properly. Confirm that pool water is flowing normally through the pool system and equipment. Start the heater in accordance with the Operating Instructions section of this manual, with particular attention to the lighting and shutdown instructions and temperature control operation.

The heater may not start on the first try. Air in the gas line or other start-up situations may cause it to recycle. It will lock out if ignition is not achieved in three attempts. To provide three (3) additional attempts, turn the pool/spa selector switch off and then back on.

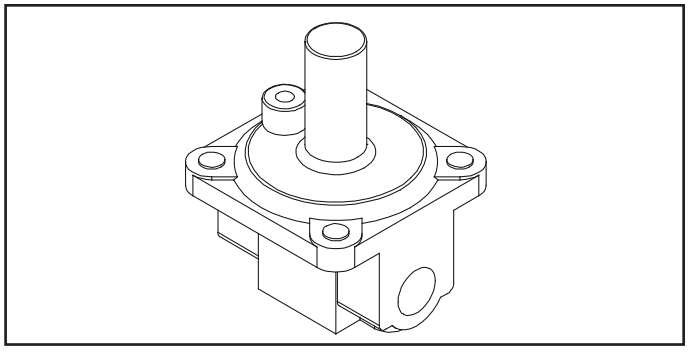


**Figure 23. Step-down gas pressure regulator.**

When the heater starts, immediately feel the outlet header of the heater to confirm that there is adequate water flow. The header should not be hot. Normally, water temperature will rise only a few degrees as it passes through the heater, and a “hot” header or pipe indicates low water flow.

**⚠ WARNING**

When the heater is fired for the first time, the combustion chamber refractory binder material is driven out by the heat of the flame. White smoke and/or sharp odors may be emitted from the vent during this period. Do not inhale combustion product fumes at any time, and especially when these fumes are being emitted. This “burn-in” period will last only a few minutes.

### 2.12.3 Condensate

If there is no water in the condensate trap, the heater’s combustion blower will pull air into the lower drain hose and normal drainage of combustion condensate will not occur. This water will accumulate to blower inlet level and will (temporarily) be blown out of the vent. Eventually it will drain back to the tray and will "prime" the trap. To avoid this "wet" start-up, simply pour water into the tray before starting the heater.

### 2.12.4 Gas Pressure

Model Hi-E2 pool heaters include a step-down regulator to reduce the pressure of gas entering the combination gas valve. *This regulator is factory set between 1.25” and 3.0” WC regardless of whether natural or LP gas is used by the heater.*

Confirm that gas supply is of adequate size per Section 2.9 of this manual. Confirm that the step-down regulator is properly set by verifying that the pressure at the port on the inlet side of the gas valve is 1.25 - 3.0 inches WC with the heater operating (fired).

Checking of gas pressure at the outlet of the gas valve requires knowledge of the venturi system of the Hi-E2 pool heater. Do not attempt to adjust this pressure without thorough understanding of its operation and settings, as outlined in the maintenance section of this manual.

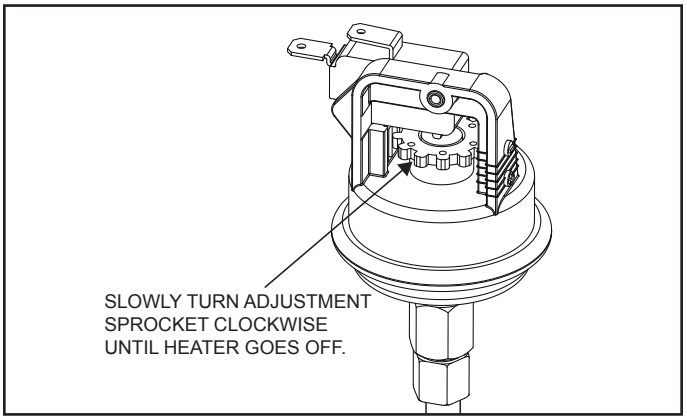



**Figure 24. Adjustment of pressure switch.**

#### 2.12.4.1 Step-down Gas Pressure Regulator

The step-down regulator does not change requirements for gas supply piping or pressure as stated in Table 4 and measurements must be taken before the step-down gas pressure regulator. In addition, it will not change any of the servicing procedures for the venturi/combination flow system. Gas supply must be as stated in the installation and operation manual and on the heater rating plate. Servicing procedures for the venturi/combustion flow system must be as specified in the installation and operation manual. Incorrect adjustment of the combination gas control can cause improper heater operation and hazardous combustion emissions.

To order this regulator as a separate part, please order kit number R0337300, shown in Figure 23.

### 2.12.5 Adjustment of Water Pressure Switch

The pressure switch is pre-set at the factory for normal pool installations. Do not adjust it unless the heater water connections are more than three feet above or below the pool surface. If they are not in this range, the pressure switch must be adjusted. This can be done in the field if the water connections are no more than six feet above the pool surface and no more than ten feet below it. For other situations, contact a Jandy Pro Series representative.

**CAUTION**

The water pressure switch should be adjusted to turn the heater off when the pump is off. Setting the switch to close at too low of a flow can damage the appliance. Adjust the switch to turn the heater off, not on.

To adjust the pressure switch, proceed as follows. See Figure 24.

The pool filter must be clean before making this adjustment. The heater does not have to be firing.

1. Turn the switch to OFF, and make sure the pressure switch is at its lowest setting. This is done by rotating the adjuster counterclockwise as far as it will go.
2. Start the filter pump and confirm by means of an ohmmeter that the pressure switch closes (if the switch fails to close, replace it with a switch which has a lower minimum setting).
3. Turn switch to ON. Heater should start.
4. With your fingers, turn the adjustment sprocket very slowly clockwise until the heater goes off.

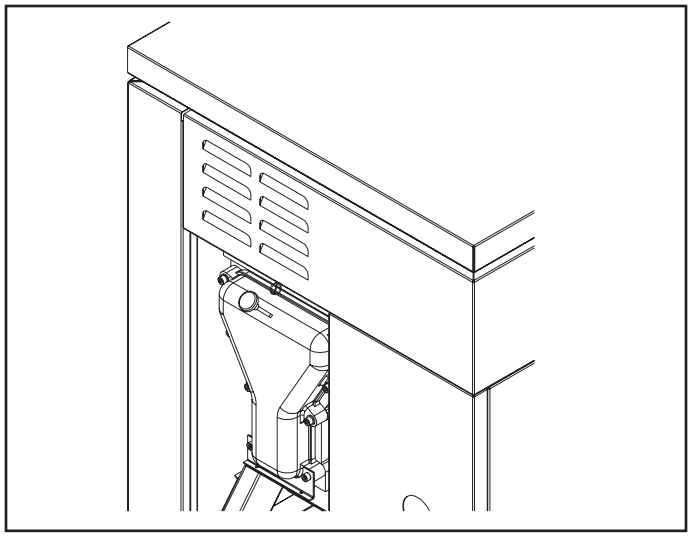


**Figure 25. Temperature rise measurement at return header.**

5. Slowly turn the pressure switch adjustment sprocket counterclockwise one-quarter turn. The heater should come back on.
6. Check the adjustment by turning the filter pump OFF. The burners should shut off immediately. If they do not, restart the filter pump and repeat Steps 6 and 7. Check the adjustment again.
7. Return the pool temperature control to the desired temperature.

It may be necessary to repeat these steps to get a proper setting. The switch must be set so that the heater will not fire unless the pump is running. If a proper setting cannot be reached, contact the factory service department.

8. Reinstall the door.

### 2.12.6 Water Temperature Rise

The Hi-E2 pool heater has an internal bypass device which accommodates a wide range of water flow. Its purpose is to ensure that flow through the heat exchanger is adequate to provide high efficiency operation and prevent overheating even though flow through the filter system may vary.

Correct water flow should be confirmed upon start-up of the heater and in most servicing situations. If flow is not normal, corrections must be made to the pool system. If the system has an external flow bypass (because of very high filter system flow), it should be adjusted to provide proper flow through the heater. Flow is evaluated by determining the water temperature rise through the heat exchanger.

Before checking temperature rise, be sure the pool filter is clean. If necessary, clean the filter. Temperature rise is measured at the return header, which is on the side opposite to the inlet/outlet header. For access, remove the side cover, which is held in place by wing nut fasteners *inside the heater*. Remove the brass plug on the top surface of the header and install a Pete's Plug and pocket thermometer. See Figure 25.

Proceed as follows:

1. If the piping system has a manual bypass valve, close it.
2. Turn off the heater by moving the switch on the temperature control panel to “Off”.
3. After three minutes, note and record the thermometer reading. This is the pool temperature.
4. Start the heater and let it operate for at least five minutes. Note and record the thermometer reading. The difference between this reading and the first one is the temperature rise.
5. If the piping system has a manual bypass valve, gradually adjust it until the temperature rise is in the range required by Table 6.
6. Scribe a line on the bypass valve shaft and case to mark the correct adjustment position. Wire the handle to the pipe to prevent tampering.

Note that temperature rise is somewhat less when the water is hot (spa application) and when heater is installed at elevations significantly above sea level. For high elevation installations, reduce the numbers in Table 6 by 3% per 1000 feet above sea level.

**Table 6. Water Temperature Rise and Flow Rates (measured at return header).**

| Model | Minimum Temp Rise, °F (C) | Maximum Temp Rise, °F (C) | Minimum System Flow GPM |
|---|---|---|---|
| 350 | 20 (11) | 29 (16) | 30 |

In a system without external bypass, it may be necessary to make changes. If temperature rise is too low, a manual bypass must be installed. If temperature rise is too high, there is inadequate flow, possibly requiring a change to the piping system or a larger pump. Before proceeding with either remedy, verify proper heater operation. Low gas input results in low temperature rise and vice-versa. A problem with the heater internal bypass assembly also affects measured temperature rise.

# Section 3. Operating Instructions

Lighting and shutdown instructions are posted inside the heater.

**⚠ WARNING**

LP GAS: To avoid possible injury, fire and explosion, read and follow these precautions and all instructions on this appliance before starting the heater. LP (propane) gas is heavier than air and will remain at ground level if there is a leak. Before lighting, sniff at ground level. If you smell gas, follow these rules:

1. DO NOT light matches. DO NOT turn electric lights or switches on or off in area. DO NOT use an electric fan to remove the gas from area.
2. Shut off gas at LP tank.
3. Telephone gas company and fire department for instructions. Give your name, address and phone number.

If your LP tank runs out of fuel, turn off gas at the appliance. After the tank is refilled, the appliance must be re-started according to the instructions located on the inside of the door.

## 3.1 Start-Up Procedure

**⚠ WARNING**

For your safety, when starting the heater, keep your head and face well away from the burner area to prevent any risk of personal injury.

**⚠ WARNING**

Vent pipes and heater tops get hot! These surfaces can cause serious burns. Do not touch these surfaces while the heater is in operation.

**CAUTION**

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

**CAUTION**

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

**CAUTION**

Do not attempt repairs on the gas controls or appliance. Tampering is dangerous and voids all warranties.

**CAUTION**

Keep all objects off the top of the heater. Blocking air flow could damage the heater and might void the warranty.

With any new pool or spa installation, run the filter pump with the heater off long enough to completely clean the water. This removes any installation residue from the water. Clean the filter at the end of this operation before starting the heater. Do not operate the heater unless the pool is properly filled with water.

When raising the temperature of water in a cold pool, remove all time clock settings. This lets the filter system and heater operate continuously until the water reaches the temperature setting on the thermostat. When that happens, the heater will shut off automatically, but the filter pump will keep running.

## 3.2 Temperature Controls

The Hi-E2 heater has a dual temperature control which allows either of two (2) different temperature settings to be selected with the rotary switch on the control panel. The owner can set one control for normal use and the other for standby, or one might be set for a pool and the other for a spa. Setting the rotary switch to the middle position turns the heater off. See Figure 26.

The temperature controls on the Hi-E2 cover a range from approximately 70°F (21°C) to approximately 104°F (40°C). Always use an accurate pool thermometer to test the pool water temperature. To prevent users from setting the water temperature higher than desired, use the TEMP-LOK feature by positioning the tab next to the knob and then tightening the screw. Note that the heater should not be used to maintain pool or spa temperature below 70°F (21°C).

**IMPORTANT** The temperature controls cannot be calibrated in the field. If the temperature control does not work, shut down the heater and replace the temperature control. DO NOT use the temperature control to shut the heater off. Remove the access door and turn the main gas valve to OFF.

## 3.3 Lighting and Shutdown

### 3.3.1 Lighting the Heater

Lighting and shutdown instructions are listed on the label attached to the inside of the service door and also on the inside of the control compartment door.

Lighting instructions are as follows:

1. Turn off all electrical power to the heater at the main junction box.
2. Open the control compartment door and switch the gas valve to OFF.
3. Turn the rotary switch on the temperature control panel to OFF.
4. Wait 5 minutes before trying to start the heater.
5. Switch the gas valve toggle switch to ON. See Figure 27.

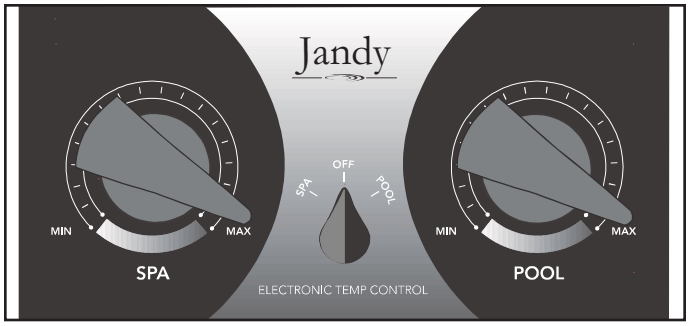



**Figure 26. Temperature control panel.**

6. Replace the control compartment door.
7. Turn on electrical power to the heater.
8. Turn on the filter pump.
9. Turn the rotary switch to either SPA or POOL. Set the temperature control to the desired setting. The ignition control automatically lights the burner when the thermostat calls for heat.
10. Set the time clock, if one is installed.

### 3.3.2 Shutdown

Complete shutdown instructions are as follows:

1. Set both temperature controls to the lowest setting.
2. Turn the rotary switch on the control panel to OFF.
3. Turn off all electrical power to the heater at the main junction box.
4. Open the control compartment door and switch the gas valve to OFF.
5. Turn external gas valve off.

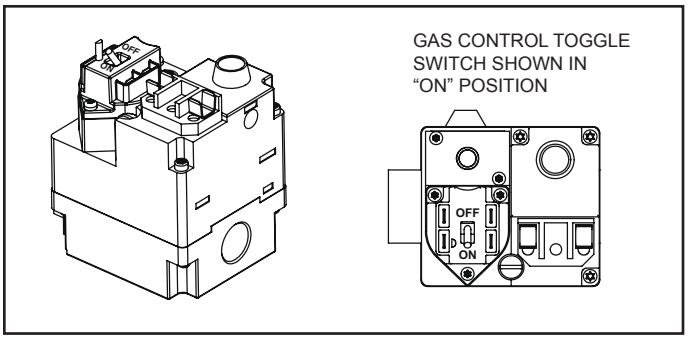



**Figure 27. Gas valve.**

## 3.4 Water Chemistry

### 3.4.1 Pools

The mineral content of swimming pool water increases daily, due to natural evaporation and the addition of sanitizing chemicals. If the mineral concentration in the pool gets too high, the excess minerals will deposit on the walls of the pool, in the filter system, and in the heater tubes. It is important to keep the pH factor of the pool water between 7.4 and 7.6. See Table 7 for guidelines on other chemical measurements.

### 3.4.2 Spas

The proper chemical balance in spa water is more critical than in a swimming pool heater operation. Due to the spa's size, high water temperature, and heavy usage, chemical values in a spa can vary greatly. This chemical imbalance can result in unsanitary water conditions, and affect the life of the heater.

#### 3.4.2.1 Spa Water Chemistry

Maintaining safe water conditions in a spa can only be done by regular water changes and the proper addition of sanitizing chemicals. Kits are available from your local pool supply dealer for making the various tests for mineral content. One of these kits will detect copper in the system. This is usually a warning that corrosion is taking place, possibly due to a low pH value combined with other chemistry problems. The condition can be corrected by changing the spa water and closely monitoring the pH factor and chemical properties of the water. See Table 7.

**Table 7. Chemical Concentration Levels.**

| Test | Recommended Level* |
|---|---|
| Free Chlorine or | 1.0 to 3.0 ppm (3.0 to 5.0 spa) |
| Bromine | 2.0 to 4.0 ppm (3.0 to 5.0 spa) |
| pH | 7.4 to 7.6 |
| Total Alkalinity (TA) | 80 to 120 ppm |
| Calcium Hardness (CH) | 200 to 400 ppm |
| Cyanuric Acid | 30 to 50 ppm |
| Total Dissolved Solids (TDS) | Less than 2000 ppm |
| Copper | 0 ppm |

*Concentration levels taken from "Basic Pool and Spa Technology" published by APSP (Association of Pool and Spa Professionals).

#### 3.4.2.2 Saturation Index

PH, Total Alkalinity (TA), temperature, Calcium Hardness and Total Dissolved Solids (TDS) play a role in whether the water is either corrosive or scale forming. These factors are combined in the Langelier Saturation Index, which is a method for determining whether or not water is properly balanced.

| Saturation Index = pH + AF + CF + TF -12.1* | | | | | |
|---|---|---|---|---|---|
| A-Factor=(AF), C-Factor=(CF), T-Factor=(TF) | | | | | |
| Total Alkalinity | | Calcium Hardness | | Temperature | |
| A-Factor | | C-Factor | | T-Factor | |
| PPM | Factor Value | PPM | Factor Value | °F | Factor Value |
| 5 = | 0.7 | 5 = | 0.9 | 32 = | 0.0 |
| 25 = | 1.4 | 25 = | 1.0 | 37 = | 0.1 |
| 50 = | 1.7 | 50 = | 1.3 | 46 = | 0.2 |
| 75 = | 1.9 | 75 = | 1.5 | 53 = | 0.3 |
| 100 = | 2.0 | 100 = | 1.6 | 60 = | 0.4 |
| 150 = | 2.2 | 150 = | 1.8 | 66 = | 0.5 |
| 200 = | 2.3 | 200 = | 1.9 | 76 = | 0.6 |
| 300 = | 2.5 | 300 = | 2.1 | 84 = | 0.7 |
| 400 = | 2.6 | 400 = | 2.2 | 94 = | 0.8 |
| 800 = | 2.9 | 800 = | 2.5 | 105 = | 0.9 |
| A saturation index of 0 is perfectly balanced | | | | | |
| A negative saturation index has corrosive tendencies | | | | | |
| A positive saturation index has scaling tendencies | | | | | |
| A saturation index of +0.3 or -0.3 is ideal | | | | | |
| *-12.1 should be changed to -12.2 if Total Dissolved Solids (TDS) measure at 1,000 ppm or greater | | | | | |

**Table 8. Water Saturation Index**

The practice of putting tablet-based sanitizer in the skimmer basket can produce heavily chlorinated water with very low pH. If this comes in contact with metal parts of the heater it can cause serious damage. Practices like this should be discontinued.

If acidic conditions are present, there could be signs of metal in the pool water that could cause staining on the floor of your pool. This might manifest itself in the form of brown stains on the finish of your pool bottom or pool water discoloration. Your local pool dealer can test for metals in your water or can provide you with a test kit.

Every effort should be made to maintain the water balance of your pool or spa in the proper range. Ignoring this very important component of your pool's water chemistry can make the water less enjoyable to bathe in and result in permanent damage to your heater and/or complete failure of individual components.

Zodiac Pool Systems does not warrant heat exchangers damaged by corrosive water issues or from the build-up of calcium in the heater's heat exchanger. Any questions regarding proper water balance can be directed to our product support line at Zodiac® or to your local pool dealer.

#### 3.4.2.3 Water Changing

Zodiac Pool Systems, Inc. recommends changing of spa water every 60 days if usage is light and every 30 days during heavy usage. Be sure to stabilize the water chemistry after every water change.

#### 3.4.2.4 Corrosion

The corrosive action of pool/spa water is increased by the following:

- Low pH - acidity
- Low Total Alkalinity - bicarbonates
- Low Calcium hardness - soft water

#### 3.4.2.5 Testing

Zodiac recommends that spa owners purchase a test kit and use it regularly. A minimum kit is one which will measure chlorine and pH levels.

The pool/spa owner will find it helpful to have a qualified professional technician perform more extensive chemical testing and water changing on a regular basis.

### 3.5 Spa/Hot Tub Safety Rules

The following "Safety Rules for Hot Tubs," recommended by the U.S. Consumer Product Safety Commission should be observed when using the spa:

1. Spa or hot tub water temperature 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 (3) months of pregnancy (resulting in the birth of a brain-damaged or deformed child). Pregnant women should stick to 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°F (2°C).
5. Persons with medical history of heart disease, circulatory problems, diabetes or blood pressure problems should obtain their physician's advice before using a spas or hot tubs.
6. Persons taking medications which induce drowsiness, such as tranquilizers, antihistamines, or anticoagulants should not use spas or hot tubs.

Prolonged immersion in hot water can induce hyperthermia. Hyperthermia occurs when the internal body temperature reaches a level several degrees above the normal body temperature of 98.6°F (37°C). Symptoms include dizziness, fainting, drowsiness, lethargy, and an increase in the internal body temperature.

The effects of hyperthermia include:

- Unawareness of impending hazard
- Failure to perceive heat
- Failure to recognize need to leave spa
- Physical inability to leave spa
- Fetal damage in pregnant women
- Unconsciousness resulting in a danger of drowning

## 3.6 Swimming Pool Energy Savings Tips

Zodiac® suggests the following to help conserve fuel and minimize the cost of operating your pool heater without sacrificing comfort.

1. Set the heater temperature control no higher than 78°F (26°C). The American Red Cross maintains that the healthiest water temperature for swimming is 78°F (26°C). Be certain you are using an accurate pool thermometer because a variance of 4°, from 78 to 82°F (26 to 28°C), will use as much as 40% more gas.
2. Carefully monitor the water temperature of your pool in the summer time, because heater usage can be reduced due to warmer air temperatures.
3. Find the proper setting on the pool heater temperature control and use the TEMP-LOK to discourage further adjustments.
4. Set the filter time clock to start the pump no earlier than 6:00 AM during the pool heating season. This is the time when nightly heat loss stabilizes.
5. If the pool is only going to be used on weekends, reduce the heater temperature control setting by 8 or 10 degrees during the week. It should be reset to the 78°F (26°C) level before expected usage, keeping in mind to allow enough lead time for the water to reach the desired temperature.
6. During the winter shut down the heater by following the lighting and shutdown instructions in Section 3.1. When on vacation for longer than a week, make sure the heater is shut off at the temperature control panel.
7. Where possible, shelter the pool from prevailing winds with well-trimmed hedges or other landscaping, cabanas, or fencing.
8. Always use a pool cover when practical. Besides providing a valuable safety feature, a pool cover will reduce heat loss, conserve chemicals, and reduce the load on filter systems.

## 3.7 Seasonal Care

### 3.7.1 Spring and Fall Operation

During periods when the pool is only going to be used once in a while, turn the temperature control to the "MIN" setting. This prevents the pool from becoming "chilled," yet still requires the least amount of time to raise the water back up to swimming temperature.

If the heater is not going to be used for a long period of time, shut it down completely, following the instructions in Section 3.3.2, Shutdown, or the lighting and shutdown instructions posted inside the heater.

### 3.7.2 Winterizing

If you don't plan to use the pool or spa over the winter and your area is subject to freezing temperatures, have a qualified professional technician perform the following steps to protect the heater:

1. Shut off the heater's gas valve according to the lighting and shutdown instructions.
2. Shut off the main supply gas cock outside the heater jacket.
3. Completely drain the heater before the first frost. To drain the heater, remove the side panel, and remove the drain plug. See Figure 28.
4. Grease the threads of the drain plug and return it to the manifold, but do not tighten.
5. Disconnect the copper tubing from the pressure switch fitting. See Figure 28.
6. Cover the vent grille so that snow will not accumulate in the combustion blower, where it may freeze.

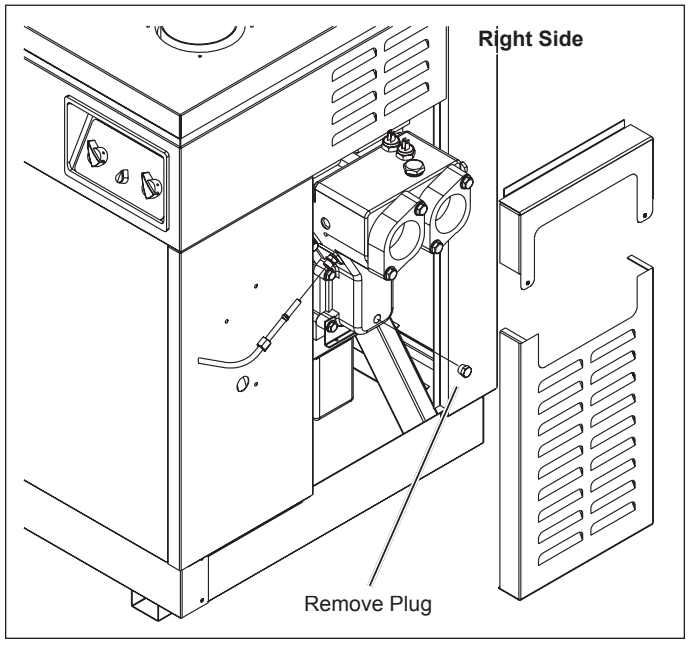



**Figure 28. Water header draining.**

To reactivate the heater in the spring, have a qualified professional technician reassemble the heater as follows:

1. Attach the pressure switch fitting to the copper tubing. See Figure 28.
2. Tighten the drain plugs in the headers.
3. Clean the condensate drainage system and condensate trap.
4. Replace the combustion air filter.
5. Uncover the vent grille.
6. Turn on the main supply gas cock outside the heater jacket.
7. Turn on the heater according to the lighting and shutdown instructions inside the top cover.

## 3.8 Periodic Inspection

**⚠ WARNING**

Improper installation or maintenance can cause nausea or asphyxiation from carbon monoxide in flue gases which could result in severe injury, or death.

### 3.8.1 Owner Inspection

The Hi-E2 heater has been designed and constructed to provide long performance life when installed and operated properly under normal conditions. The following basic guidelines should be maintained:

1. Keep the top of the heater clear of all debris, and make sure there is no collecting of flammable materials, leaves, paper, etc., around or beneath the heater.
2. Keep the pool heater area clean and free of all combustible materials, gasoline and other liquids, and vapors.
3. Do not use the heater if any part has been under water. Immediately call a qualified professional technician to inspect the heater and replace any part of the control system and any gas control which has been under water.
4. Check for spider webs and other debris at the combustion air inlet and vent outlet — especially at spring start up.

### 3.8.2 Professional Inspection

Inspection by a qualified professional technician, performed at least once a year by a qualified professional technician, are required to keep the heater operating efficiently through the years. The following basic checks should be performed.

1. Inspect the condensate disposal system to be sure that condensate flows freely and verify that the condensate tray has sufficient limestone neutralizer and enough water to create a water trap in the condensate drain assembly.
2. Replace combustion air filter. Refer to Section 4.4.
3. For heaters installed with combustion air or vent piping, inspect screens at the inlet or outlet of these pipes. Clean screens as necessary to assure free flow. See illustrations in combustion air and vent pipe installation section.
4. Make sure that the pressure switch operates properly by shutting the filter pump off and on a few times. The burner should go off immediately after the pump stops. An ignition sequence should start shortly after the pump is turned back on.
5. Make a visual check of the main burner flame. The flame can be seen in a mirror/viewport arrangement in the upper part of the heater. The flame should be light blue and the burner surface should be dark, with only a few glowing fibers. See Figure 29.
6. Inspect the gas and electronic controls, including the following:
   - High temperature limit switch
   - Water pressure switch
   - Venturi differential pressure switch
   - Automatic gas valve
   - Burner temperature limit switch
   - Vent limit switch
   - Temperature control
   - Control circuit fuse
7. Perform a temperature rise test in accordance with Section 2.12.
8. If the heater is equipped with a pressure relief valve, clean any accumulated corrosion and make sure that water runs freely through it.
9. Inspect the outside of the combustion chamber and burner for corrosion and indication of improper operation.
10. Regularly inspect electrical controls for deterioration. Repair and replace as necessary.

**NOTE** Keep this manual in a safe place for future reference by you and your professional technician when inspecting and servicing the heater.

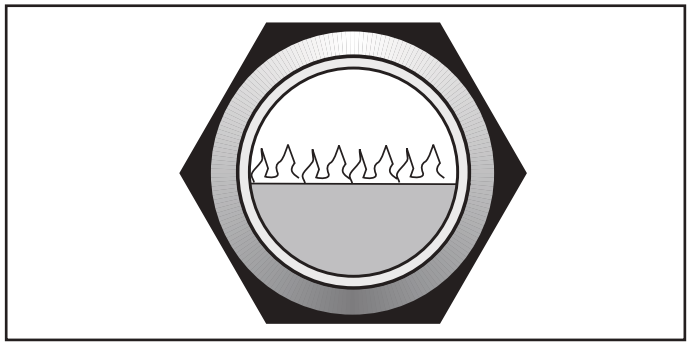


**Figure 29. Burner flame (visible near top of heater in mirror).**

# Section 4. Maintenance and Service

**⚠ WARNING**

Improper installation or maintenance can cause nausea or asphyxiation from carbon monoxide in flue gases which could result in severe injury, or death. For indoor installations, as an additional measure of safety, Zodiac Pool Systems, Inc. strongly recommends installation of suitable Carbon Monoxide detectors in the vicinity of this appliance and in any adjacent occupied spaces.

**⚠ WARNING**

To avoid the risk of exposure to unsafe levels of Carbon Monoxide, which can result in serious personal injury or death, always ensure that the combustion air filter is properly installed and secured in the tracks provided in the air filter box.

**⚠ WARNING**

**SERVICING SAFETY**

Some of the servicing procedures for the HI-E2 heater are hazardous because they involve fuel gas, electricity, moving parts and procedures which require testing or temporary bypass of safety controls. For this reason, the heater must be serviced only by a qualified professional service technician.

**IMPROPER SERVICE HAZARD**

The HI-E2 heater incorporates unique design features. Incorrect service of this heater can result in personal injury or damage to property. To avoid such hazards, the heater must be serviced only by a qualified professional service technician.

## 4.1 General

A qualified professional technician must service the Hi-E2 pool heater using Zodiac® service procedures. Before calling for service, however, the owner should check for obvious problems. The other components in the pool system, including pump, filters and strainers, water valves, gas supply, electrical power and time clocks, have an effect on heater operation.

Confirm that the heater control is set to “pool” or “spa” and that the corresponding temperature knob is set high enough to make the heater operate. Make sure the pump is operating, that the filter and strainers aren’t clogged, that there are no mis-positioned water valves, that the gas or electric power supplies aren’t shut off and that time clocks are properly adjusted. Also be sure that the combustion air filter is clean and that there is no blockage of the vent or combustion air inlet. See later section on combustion air filter service.

## 4.2 Induced-Draft Combustion System

The Hi-E2 pool heater has an advanced combustion system which makes it highly efficient and reliable. This system is illustrated in Figure 30.

A special corrosion resistant high-speed blower pulls flow through the system and exhausts it to the outdoors. Air is pulled into the system through a combustion air supply duct, when provided, and through an air filter into a venturi. The venturi functions much like an automobile carburetor venturi - i.e. when air is forced through it, a “negative” pressure is created at the venturi throat. This negative pressure pulls gas through a metering orifice, resulting in an optimal mixture of air and fuel gas. The air and gas are thoroughly mixed in the venturi tailpipe, pulled through a special burner and ignited in the combustion chamber. Hot combustion products are then pulled through a highly efficient downward-flow heat exchanger. Combustion products are cooled below their dew point and condensate water is formed and drained away. Flow then enters the blower, where it is forced out of the heater at the vent terminal or through a vent pipe to the outdoors.

## 4.3 Heater Components and Their Operation

1. Gas valve / Regulator - The gas valve controls gas flow into the venturi. It provides flow only when the temperature control require heat and only if all safety controls enable operation. It is also a *negative pressure regulator.* It regulates the gas pressure to 0.2” WC less than the air pressure at the venturi inlet. This is necessary for proper operation of the venturi system and cannot be done with common (positive pressure) gas valves.
2. Combustion blower - The combustion blower is a specially designed to handle moist combustion products, having special plastic housing and impeller. It is powered by a brushless DC motor.

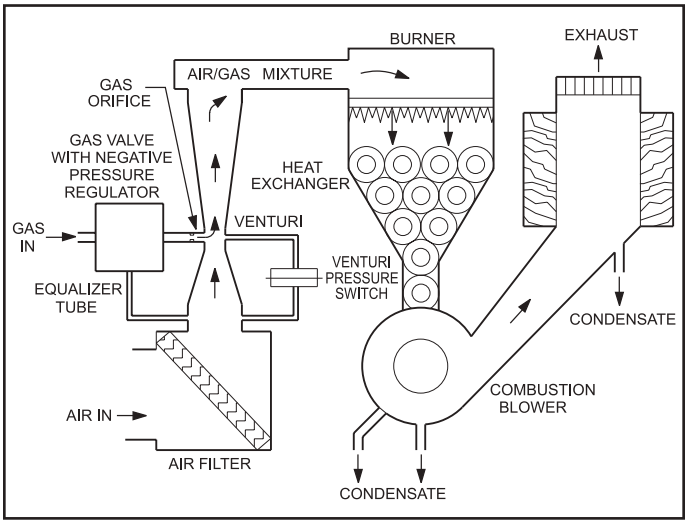



**Figure 30. Combustion system diagram.**

3. Temperature Control - The control is an electronic control which senses water temperature by means of a thermistor and controls heater operation to bring the water to that selected. It has two (2) temperature setting knobs which are typically used to set pool and spa temperatures. A selector switch determines which setting is chosen.

4. **Ignition Control** - The ignition control provides energy for ignition of the air/gas mixture, monitors the flame and controls the combustion blower and gas valve. When the temperature control requires heat, the ignition control starts the blower, providing a pre-purge of the combustion chamber. Then it applies electrical power to a "hot surface" igniter. When the igniter is hot enough, it opens the gas valve. It has sophisticated means to sense ignition and flame condition so that unburned gas will not escape. After the burner is shut off, it continues blower operation to provide a post-purge period.

5. **Igniter** - The hot surface igniter is a ceramic element which becomes very hot when electrical power is applied to it. It functions both as an igniter and as flame sensor. As a sensor, it is the electrode through which the ignition control detects "rectification" of current passed through the flame. Inadequate rectification indicates an unsatisfactory flame condition. The ignition control responds to the flame signal provided by the ignitor.

6. **Venturi Pressure Switch** - This switch verifies that air is flowing through the combustion system by sensing pressure reduction at the venturi throat (relative to pressure at the venturi inlet). It shuts off the heater if air flow is inadequate.

7. **Limit Switches** - Two (2) limit switches prevent excessive water temperature - both are just outside of the heat exchanger outlet (slightly before the mixed water stream). If either senses excessive temperature, burner operation is interrupted.

8. **Water Pressure Switch** - This control senses whether or not water is available to the heater by measuring back pressure inside of the heat exchanger. If the pool water pump fails or the water filter is blocked, the pressure switch prevents operation of the burner. It can be affected by the installation conditions as discussed earlier in this manual.

9. **Burner Temperature Limit Switch** - This is a single-use switch which detects abnormal burner temperature. It is a disc-type switch which is held against the burner plenum by a sheet metal bracket. It is not able to be reset. The burner limit switch prevents or interrupts burner operation if the burner plenum becomes too hot.

10. **Vent Limit Switch** - The vent limit switch protects the vent system from excessive exhaust temperature. It is located on the vent diffuser above the combustion blower. It interrupts burner operation if temperature becomes too hot for the plastic materials used to vent the heater.

See the earlier section entitled Start-up and Adjustment for the normal sequence of operation.

## 4.4 Combustion Air Filter

**⚠ WARNING**

To avoid the risk of exposure to unsafe levels of Carbon Monoxide, which can result in serious personal injury or death, always ensure that the combustion air filter is properly installed and secured in the tracks provided in the air filter box.

The combustion air filter is a rectangular foam filter located in a box near the bottom of the control compartment. The filter removes lint and large scale dust particles to prevent blockage of the burner media.

The filter should be replaced annually in normal service. Heavy use of the heater or operation in adverse environments may dictate more frequent replacement, however. It can be removed through the front of the filter box as illustrated in Figure 31.

Remove the wing nuts retaining the front panel and slide the panel out. Replace it only with the specified part available from a Jandy Pro Series representative. Push the replacement filter into the tracks and slide the panel back in.

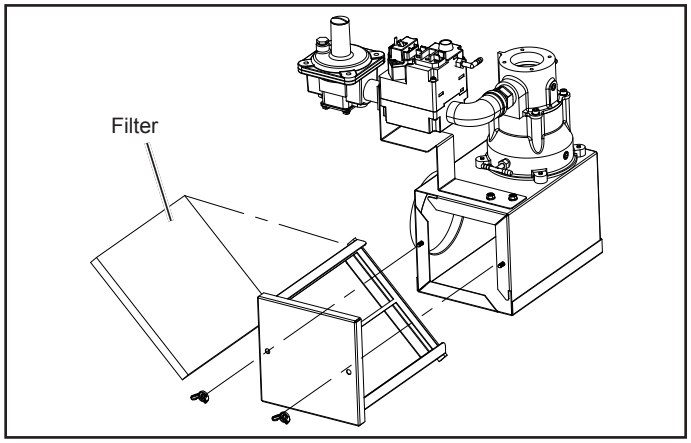



**Figure 31. Air filter replacement.**

## 4.5 Electrical Trouble Shooting

**⚠ WARNING**

**ELECTRICAL SHOCK HAZARD.** This heater contains wiring that carries high voltage. Contact with these wires may result in severe injury or death.

**CAUTION**

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

This section describes procedures for checking the electrical power and control components of the heater one at a time and in the order they appear in the control circuit. These procedures require a Volt-Ohm meter with 0-150 VAC range, and 0-1000 Ohm resistance range. Figure 32 shows the power and control circuits, and where to take measurements. Location numbers in circles have been added, and will be referenced in the following sections.

As stated at the beginning of this manual, some of these procedures are hazardous. Only a qualified service technician should service the heater.

### 4.5.1 115V Electrical Power Supply

The electrical components of the Hi-E2 pool heater are designed to operate with supply voltage ranging from 103V to 126V at 60 Hz. Measure supply voltage at the "hot" and "neutral" wirenut connections in the heater electrical junction box (identified as points A and B on the wiring diagram). If no voltage is present, correct this external to the heater. Circuit breakers, time clock settings or similar devices may be the problem. Voltage outside of the above range may be due to poor wiring, poor connections, other loads such as air conditioning compressors or to an electric utility company problem. Arrange for correction of the voltage as appropriate.

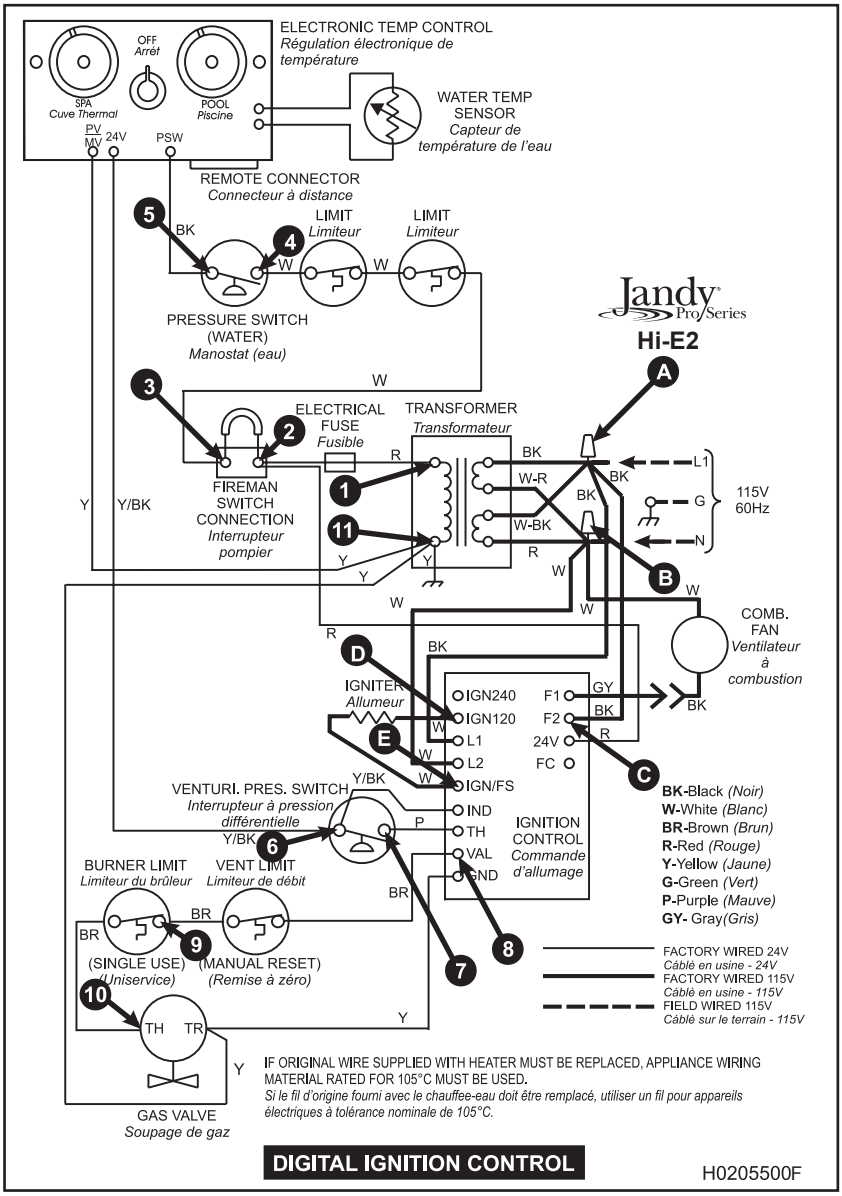



**Figure 32. Wiring diagram with test points.**

### 4.5.2 Control Circuit Trouble Shooting

The heater controls are in a 24V 60 Hz circuit with operating and safety controls basically arranged in a series circuit. Trouble shooting is done by probing for voltage at various points in the circuit to determine which component is preventing operation. Check points are indicated on Figure 32. The recommended procedure steps through the circuit in a sequential way, but verifying voltage at any of the numbered points confirms that all prior components are OK. Experienced technicians may be able to shorten the process by going directly to one of the intermediate test points.

#### 4.5.2.1 Transformer

Attach one lead of the voltmeter to the transformer terminal with a yellow wire attached to it, which is point 11 on Figure 32. (This lead can be left in place for most of the testing.) Touch the free lead of the meter to the transformer terminal with a red wire, point 1. The meter should show 20-28 volts. If there is no voltage, replace the transformer.

#### 4.5.2.2 Fuse

Leaving the "common" voltmeter lead in place at point 11, touch the free probe to point 2. This is the terminal block screw attached to the red wire from the in-line fuse, and absence of voltage indicates a defective fuse. If there is no voltage, inspect the rest of the wiring to be sure that there is no "short" such as contact of a terminal with the heater chassis or another terminal. Correct any such condition and replace the fuse.

#### 4.5.2.3 Fireman Switch and External Interlocks

Probe for voltage at point 3, the other connection of the terminal block, which has a white wire connected to it. If there is no voltage, the time clock switch or other external interlock may be mis-adjusted, mis-connected or defective. Correct this external problem.

#### 4.5.2.4 Limit Switches

Probe for voltage at point 4, which is the water pressure switch terminal with the white wire connected to it. This switch is mounted on the end of a copper tube and is about 2" in diameter. Absence of voltage at this point indicates that one of the limit switches is open. This is normally due to excessive water temperature, which should be thoroughly investigated before replacement of limit switches. Water flow deficiency may be due to obvious problems such as a defective pump or blocked water filter. Alternatively, it may be due to overfiring, or to a problem with the water piping or the heater's internal bypass control. Overfiring might be a result of an incorrect gas orifice or supply of propane gas to a heater intended for natural gas. If there are no such fundamental problems, identify which of the switches is open by temporarily connecting a jumper wire across its terminals. Replace a defective limit switch. Limit switch access is through the side cover panel on the side of the heater to which water pipes are connected.

**NOTE** The limit switches have different trip points, and it is important that replacements are correct. The 150°F switch has a red dot on the side of the brass fitting, and must be installed closest to the combustion chamber. The 135°F switch has no dot and must be installed in the tapping closest to the water piping connections.

#### 4.5.2.5 Water Pressure Switch

Touch the voltage probe to point 5, which is the other terminal of the water pressure switch having a black wire is connected to it.

If there is no voltage, the pressure switch contacts are open. This is almost always due to a water flow deficiency, the most common one being a blocked water filter. It may be due to causes cited in the previous paragraph, however, and sometimes is due to blockage of the copper tube or mis-adjustment of the switch. Investigate thoroughly, referring to the earlier section on "Adjustment of Pressure Switch". If there is no problem with the pool system or pressure switch adjustment, replace the pressure switch.

#### 4.5.2.6 Temperature Control

Probe for voltage at point 6, which is the terminal of the venturi pressure switch having a yellow & black wire connected to it. This is the switch mounted on the frame above the blower between the vent diffuser and the venturi tailpipe. It is about 4" in diameter.

Absence of voltage at point 6 indicates that the control is not calling for heat. Be sure that knobs are set to call for heat as indicated earlier and as described in the Operating Instructions section of this manual. Verify that the thermistor sensor wires are not severed or shorted. Check wiring connections by removing the temperature control through the front of the bezel. If the control is properly set and all wiring and connections are correct, replace the control.

#### 4.5.2.7 Venturi Pressure Switch

Touch the voltmeter probe to point 7, which is the terminal of the venturi pressure switch having a purple wire connected to it. If there is no voltage at point 7, the venturi pressure switch is open, indicating inadequate flow through the combustion system. The venturi pressure switch is a differential type switch which is activated by the pressure difference created when air flows through the venturi. When the combustion blower is not operating, the venturi pressure switch must be open and voltage will not be present. See following sections on ignition control "lockout" and combustion blower operation for possible remedies.

Check for blockage at the combustion air inlet, a dirty air filter or blockage at the vent exhaust or in the vent. In improperly installed vent may trap condensate water, for example, restricting flow. If there is no obvious problem, analyze venturi operation as outlined in a later section of this manual. If flow is normal, replace the venturi pressure switch.

#### 4.5.2.8 Ignition Control

There will be voltage at point 8, which is the "MVP" terminal of the ignition control, only when there is an attempt to ignite the burner or when the ignition control's flame sensing system has determined that it is OK to allow burner operation. Even if voltage has been confirmed at point 7, the "trial for ignition" sequence is imposed by the ignition control. This sequence consists of a 15 second period of pre-purge blower operation, a 40 second period for heatup of the igniter and a 7 second trial for ignition, during which there is voltage at point 8. If satisfactory ignition is not achieved, the igniter is turned off and the blower is operated for a 45 second post-purge. The system may go through this cycle as many as three (3) times, but thereafter it is "locked out" by the ignition control. Additional attempts will be made only if the call for heat is interrupted by turning off electrical power or setting the control to "Off".

To trouble shoot the ignition control, connect the voltmeter probe at point 8 and set the control to call for heat. Observe that the normal sequence takes place by noting blower operation, the glow of the igniter through the combustion chamber sight glass and then voltage at point 8. If the blower does not operate or the igniter doesn't glow, investigate as outlined in a later sections. If both of these components operate normally but voltage doesn't appear at point 8 during the trial for ignition, replace the ignition control. If voltage appears at point 8 but there is no ignition, proceed to analysis of other components.

#### 4.5.2.9 Burner Limit Switch

The burner limit switch is located on the front surface of the burner plenum near the top of the heater. Servicing this switch normally requires removal of the top of the heater, but it can be checked by probing for voltage at point 9 on the vent limit switch. Point 9 is the terminal of the vent limit switch to which is connected a brown wire coming down from above. The vent limit switch is mounted on the vent outlet diffuser above the combustion blower.

Voltage will be present at point 9 only during normal operation or during a trial for ignition. If necessary restart the heater using the control to obtain one of these conditions. If voltage does not appear at point 9, the burner limit switch is open. This may be due to burner mis-adjustment, incorrect gas orifice size or similar problems which should be investigated as outlined in later sections. If there are no such problems and there is no evidence of excessive burner temperature, replace the burner limit switch.

#### 4.5.2.10 Vent Limit Switch

Probe for voltage at point 10, which is the gas valve terminal having a brown wire connected to it. As in the preceding case, this terminal will have voltage present only during a trial for ignition or during normal operation. If voltage is not found, the vent limit switch is open, indicating that the exhaust temperature has been too high.

Normal vent temperature is between 100oF and 140oF. Excessive temperature might be due to excessive water temperature or overfiring of the system. Investigate water temperature and possible water flow deficiency. Confirm that the heater is equipped for the correct fuel gas - especially that propane gas is not being provided to a heater configured for natural gas. To confirm correction of the problem, re-set the switch by pushing the red button. If vent temperature is normal and the switch will not allow operation, replace it.

**⚠ WARNING**

The combustion blower, the igniter and some terminals of the ignition control utilize 115V power and require appropriate servicing precautions. Note that wires and terminals of these components may be "hot" even when the component is not operating.

#### 4.5.2.11 Combustion Blower

The combustion blower operates when it is provided with 115V, 60 Hz power. Confirm this by connecting the voltmeter between the "neutral" wirenut and point C, which is the terminal marked F2 on the ignition control. Unless the system is in lockout, 115V should be present at point C whenever a call for heat reaches the venturi pressure switch (i.e. 24V at point 6). To be sure that a lockout condition is not in effect, turn the heater off and then back on at the control.

If 24V is present at point 6 but 115V does not appear at point C (and there is no lockout) the ignition control is defective. If 115V power is available at point C and the combustion blower does not run, the blower is defective and should be replaced. Note, however, that the blower has an internal overtemperature limit and before replacing it confirm that the environment of the heater is not excessively hot. If so, ventilation of the heater room may be necessary.

#### 4.5.2.12 Igniter

The igniter should glow during ignition attempts as outlined in the earlier section on ignition control. If it does not, connect the voltmeter between terminals marked D and E on the ignition control. If 115V is present during the igniter-on portion of the ignition sequence but there is no glow, the igniter is probably defective. If voltage is not found, the ignition control is defective and should be replaced.

An igniter which will not glow should be checked by disconnecting the wires from the ignition control and measuring the igniter resistance. A cold igniter should have resistance in the range of 40 to 75 ohms. Replace the igniter if resistance is outside of this range.

### 4.6 Venturi Combustion Flow System

Verifying proper operation of the comustion flow system has two (2) aspects - air flow and gas flow. Air flow is checked by measuring pressures at service ports on the venturi. Gas flow is checked by evaluating venturi pressures plus the regulator offset pressure and the gas orifice size.

In a venturi flow system the difference between various pressures is far more important than their "gauge" value relative to the room. The *gas pressure offset and the gas orifice pressure differential* are especially important concepts. The following sections illustrate these and related information.

### 4.6.1 Pressure Measurement Ports

Figure 33 shows venturi and gas control components and service port locations. Air flow enters the venturi from below through the filter box. It is pulled through a converging section to the throat, where pressure is reduced substantially. Gas flow is pulled into the throat through an orifice inside the pipe between the throat and the elbow. Air and gas are combined in the throat and mix thoroughly as they proceed through the venturi tailpipe to the burner.

Service ports are provided at three (3) places. On the right side of the venturi an inlet service port is provided just above the air filter box. Also on the right side, a throat service port is provided - at the narrowest section of the venturi casting. A gas valve service port is provided on the outlet face (right side) of the gas valve.

To evaluate system operation requires accurate measurement at these ports. A digital manometer, known to be accurately calibrated, is ideal. Other instruments may be used, but the "positive/negative" nature of the readings must be very clear. Also, gas pressure offset measurements are at very low levels (0.2" WC) and the instrumentation must be capable of determining it accurately.

### 4.6.2 Venturi System Checkout

**⚠ WARNING**

When servicing is complete be sure to replace pressure service port plugs and assure that pressure switch and equalizer tube connections are unaltered and firmly in place.

#### 4.6.2.1 Gas Orifice Differential

This measurement indicates how much "pull" is available to move gas through the orifice. Turn off the heater and connect the manometer tubes with the *positive* side connected to the gas valve service port and the *negative* side to the venturi throat service port as shown in Figure 34. Turn on heater. The manometer will read zero until the gas valve opens, and then it will indicate the gas orifice differential. The *gas orifice differential* should be 4.0" ± 0.3" WC for a unit at sea level. See section on High Elevation Operation for other elevations.

Note the reading and turn off the heater at the control. Then go on to the next measurement - gas pressure offset.

#### 4.6.2.2 Gas Pressure Offset

Note that an equalizer tube is connected from a port on the front of the venturi inlet to the vent of the gas valve regulator. This is a very important component which allows the regulator to track air pressure even when abnormal things occur, such as blockage of the combustion air. Before firing, confirm that this tube and the venturi pressure switch tubes are in place and firmly connected.

Connect the positive side of the manometer to the venturi inlet service port, which is at the bottom on the right side. Connect the negative side of the manometer to the gas valve service port, see Figure 35. Turn the heater on. Until the heater fires, the manometer will indicate several inches of water pressure, but after the gas valve opens, it will indicate the gas *pressure offset*, which should be 0.2" ± 0.1" WC - i.e. the gas pressure should be 0.2" WC less than the pressure at the venturi inlet service port.

If the offset is incorrect, adjust the gas pressure regulator to the correct pressure. This can usually be done while the heater is firing, but the burner may go off when the regulator seal cap is removed. In any case, the offset pressure measurement must be read *when the heater is operating and the seal cap is firmly in place*. Note that a special tool is required to remove the regulator cap.

Figure 36 shows the gas pressure offset reading when a U-Tube manometer is used.

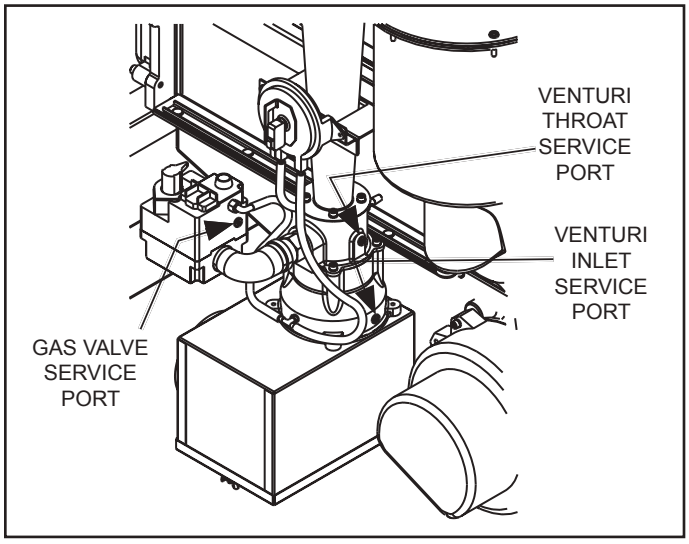



**Figure 33. Venturi flow system components.**

**⚠ WARNING**

In order to discourage incorrect adjustment by unqualified persons, the gas valve regulator cap requires a special tool for removal. Contact your representative about a special tool for this cap.

**⚠ WARNING**

When servicing is complete be sure to replace pressure service port plugs and assure that pressure switch and equalizer tube connections are unaltered and firmly in place.

### 4.6.3 Air Flow Investigation

If gas pressure offset is correctly set but gas orifice differential is abnormal, check air flow through the system per the following sections.

#### 4.6.3.1. Unfired Venturi Differential Pressure.

Determine if air flow through the system is in a normal range by operating the system with the gas valve turned off. Connect the positive side of the manometer to the venturi inlet service port, which is at the bottom on the right side. Connect the negative side of the manometer to the gas valve service port of the gas valve, see Figure 37. Turn the gas valve knob to "Off". Turn the heater on by selecting "Pool" or "Spa" at the control and adjusting the temperature setting high. The blower will start immediately and the manometer will indicate the "unfired venturi differential" pressure. This is the pressure difference created by airflow through the venturi. It should be approximately 4.7" ± 0.3" at sea level. See Section 4.6.5 for other elevations.

Note that when the heater is operated with the gas valve off, it will eventually “lock out” because the ignition control does not sense flame. Normally there will be enough time to obtain the measurement, but if necessary, additional blower operation can be induced by turning the Flex-Temp control off and then back on again.

If the reading is not normal, attempt to correct it by blower speed adjustment. Blower speed is adjusted by turning a special screw on the right side of the motor - at about 4 o’clock, see Figure 38. A small countersunk hole is provided there for access to the screw, but is covered by a thin silver-colored label. Remove or puncture the label.

A small flat-blade screw driver is required. It must have a 3/32” or 2.5 mm (.098”) blade and must be about 4-1/2” long. A jeweler’s screw driver or an electronics pot adjustment screw driver (with handle cut short if necessary) can be used. Insert the screw driver through the hole on the motor housing. Turn it clockwise to increase the flow and counter-clockwise to decrease.

If blower speed adjustment results in acceptable venturi differential, shut off the system at the Flex-Temp control and return to “Gas orifice differential” measurement per Section 4.6.2.2. Make a final speed adjustment *as necessary to obtain correct gas orifice differential.*

If the system cannot be made to operate normally by blower speed adjustment, investigate possible flow problems per the following sections.

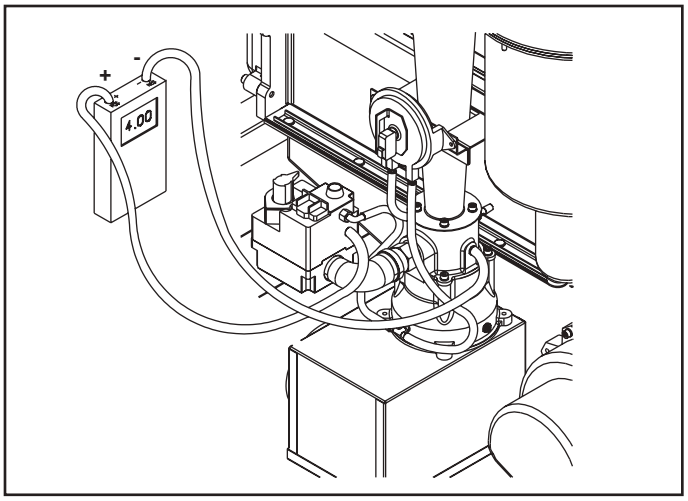



**Figure 34. Gas orifice differential measurement.**

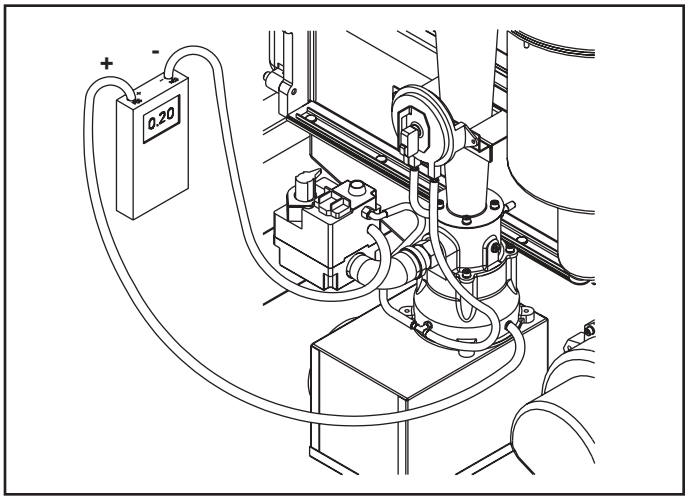



**Figure 35. Gas pressure offset measurement.**

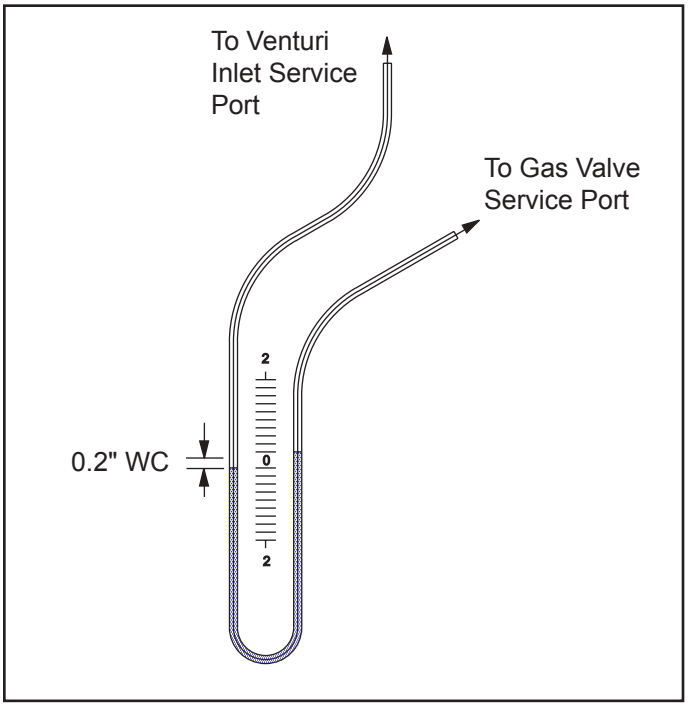



**Figure 36. Gas pressure offset measurement with U-tube manometer.**

#### 4.6.3.2 Combustion Air Flow

Begin by connecting the *negative* side of the manometer to the venturi inlet and leaving the *positive* side open to ambient, as shown in Figure 39. In a normally operating heater, the pressure will be 0.2 to 0.6" WC *less* than the ambient pressure. For a model 350 with clean filter and no combustion air duct, the reading will be near the middle. If combustion air is ducted to the heater, the reading will be near the high end. If an excessive reading is observed (i.e. *more negative*), flow is probably restricted by a dirty filter or blockage in the combustion air supply system. Correct any such problems and verify normal operation by returning to the venturi system checkout procedures.

Pressure readings will be less if the heater is located at an elevation significantly above sea level.

#### 4.6.3.3 Flow in Heater and Vent

If the venturi inlet pressure reading is normal (or less than normal), flow may be blocked within the heater or in the exhaust venting, or the combustion blower may be operating below standard. To evaluate this, connect the *negative* side of the manometer to the collector pressure tap, as shown in Figure 40, leaving the *positive* side open to ambient (this requires a pressure tap with a 1/4" NPT thread). When the heater is operating, the pressure at this location should be about 2.8 ± 0.5" WC less than ambient for a model 350. If a greater reading is observed (i.e. *more negative*), flow is restricted within the heater, most likely at the burner or the heat exchanger. If the reading is substantially less (i.e. *less negative*), the combustion blower is not operating properly or flow is blocked after the blower, possibly in the vent. Correct any such problems and verify normal operation by returning to the venturi system checkout procedures.

Pressure readings will be less if the heater is located at an elevation significantly above sea level.

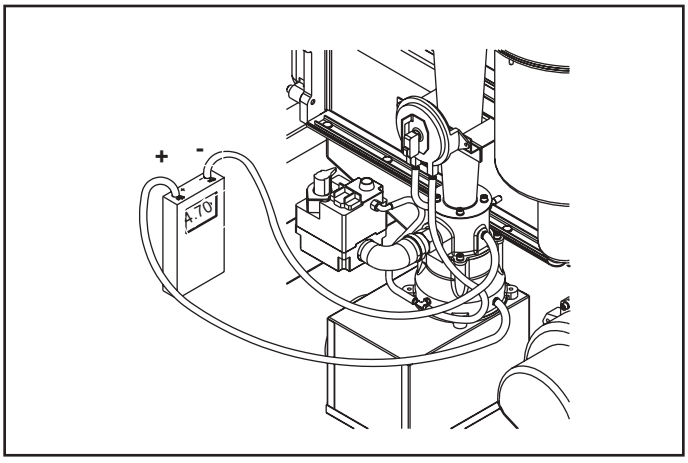



**Figure 37. Unfired venturi differential measurement.**

#### 4.6.4 Fuel Gas Type and Gas Orifice Size

Zodiac® configures its heaters for natural gas with 0.60 specific gravity and 1035 BTU/Ft3 or for propane gas with 1.52 specific gravity and 2500 BTU/Ft3. Required gas orifices are listed in the replacement parts list. Consult your Jandy Pro Series representative if the available gas is substantially different.

#### 4.6.5 High Elevation Operation

The venturi combustion flow system completely compensates for installation at elevations other than sea level. Gas orifice changes are not necessary. Unlike conventional systems with open type burners and positive pressure regulators, the gas orifice differential pressure is *created* by the air flow, and it is automatically reduced when air density decreased. A Hi-E2 heater commissioned at sea level will operate at nearly the same air/gas mixture when operated at higher elevation. Its firing rate will decrease about 3% per 1000 feet due to the barometric pressure change.

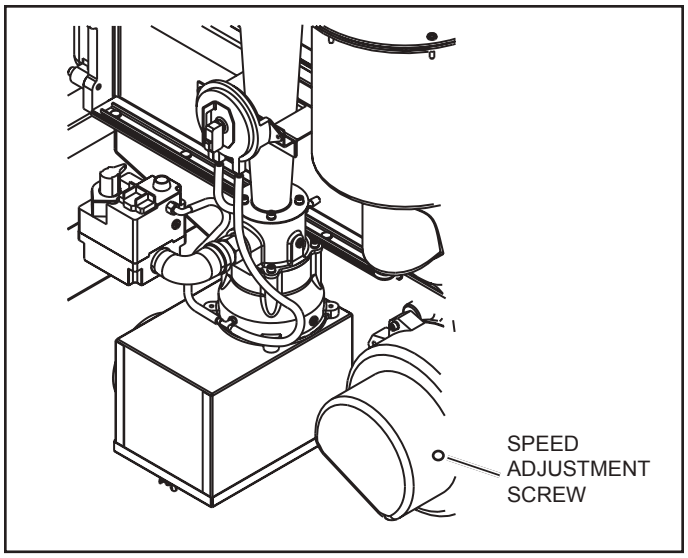



**Figure 38. Blower Speed Adjustment.**

In servicing a Hi-E2 heater at high elevation be aware that the input will be naturally reduced by this amount and that the differential pressures, as discussed in prior sections, will also be reduced. Pressure readings at various elevations will be approximately as follows:

| Elevation Ft (m) Sea Level | Gas Orifice Differential 4.0" (102 mm) WC | Unfired Venturi Differential 4.7" (119 mm) WC |
|---|---|---|
| 4000 (1220) | 3.4 (86) | 4.0 (102) |
| 6000 (1830 | 3.2 (81) | 3.7 (94) |
| 8000 (2440) | 2.9 (74) | 3.5 (89) |
| 10000 (3050) | 2.7 (69) | 3.2 (81) |

The gas pressure offset is determined by the regulator spring adjustment, not air density. It is not affected by elevation change.

## 4.7 Combustion Condensate

The condensate disposal system of the Hi-E2 pool heater is quite simple, but must be properly installed and maintained. See the installation instructions for information on correct tubing installation. Condensate drainage should be observed routinely and if necessary, the flow-ways should be cleaned.

In normal operation, condensate drains from the condensate collector behind the combustion fan. A 5/8" I.D. drain tube conducts this water into the condensate trap/neutralizer, where a “water seal” prevents room air from being pulled into the system. The water seal of the trap prevents vent gases from being discharged into the room. A smaller amount of condensate may drain from the vent duct and blower. See Figures 12 and 13 in the Condensate Disposal section of the installation instructions.

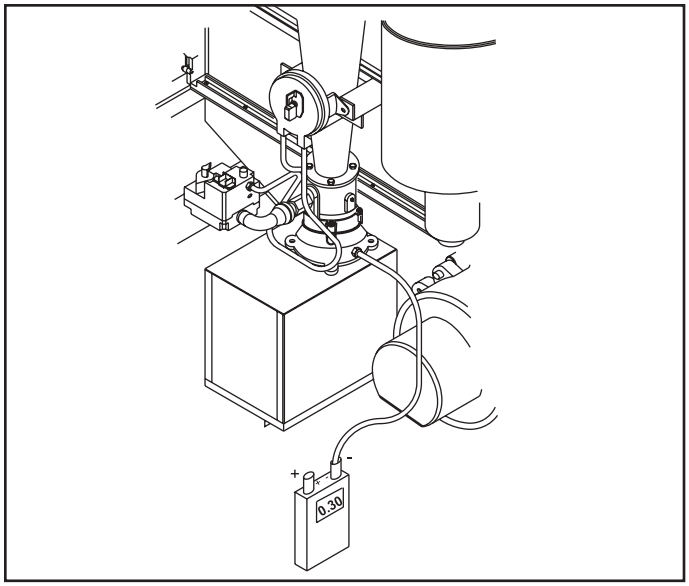



**Figure 39. Venturi inlet pressure measurement.**

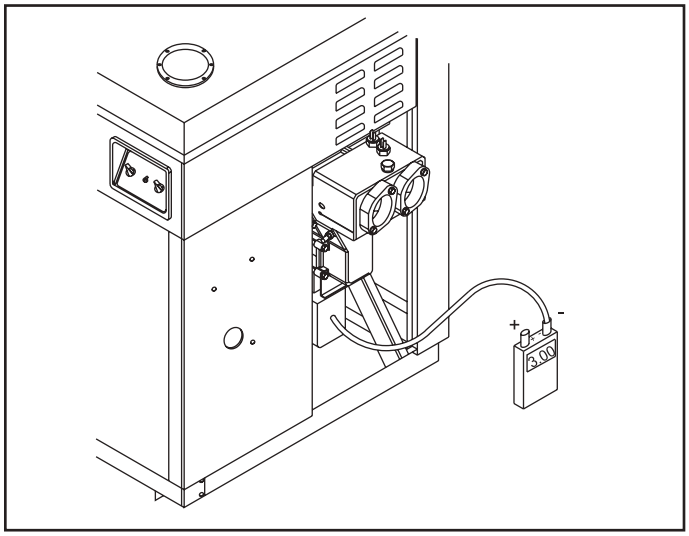



**Figure 40. Collector pressure measurement.**

During start-up, condensate from the collector cannot reach the trap unless the water seal is established. This can be done by pouring water into the trap. The heater will self-prime by driving water into the vent outlet, from which it will eventually drain into the trap. However, it is better to avoid this by manually priming the trap.

If condensate is not draining from the system, check for improper routing of the drainage tubes or blockage in the drainage system. Tubing must be installed with a continuous fall in the direction of condensate flow. Sags may trap water, defeating the intended operation. Check for blockage by disconnecting drainage tubes at the collector and the vent diffuser. Probe these openings with a tool or wire hook to dislodge any debris.

Limestone gravel neutralizer is required in the condensate tray to prevent corrosion. This material should be replaced once a year to assure its continuous benefit. Replacement packages are available from Zodiac® or its representatives.

It is normal that a blue/green deposit forms in the neutralizer. This is caused by very small concentrations of copper ions present in the condensate. By increasing the pH of the condensate, the limestone causes this material to precipitate and be retained in the gravel.

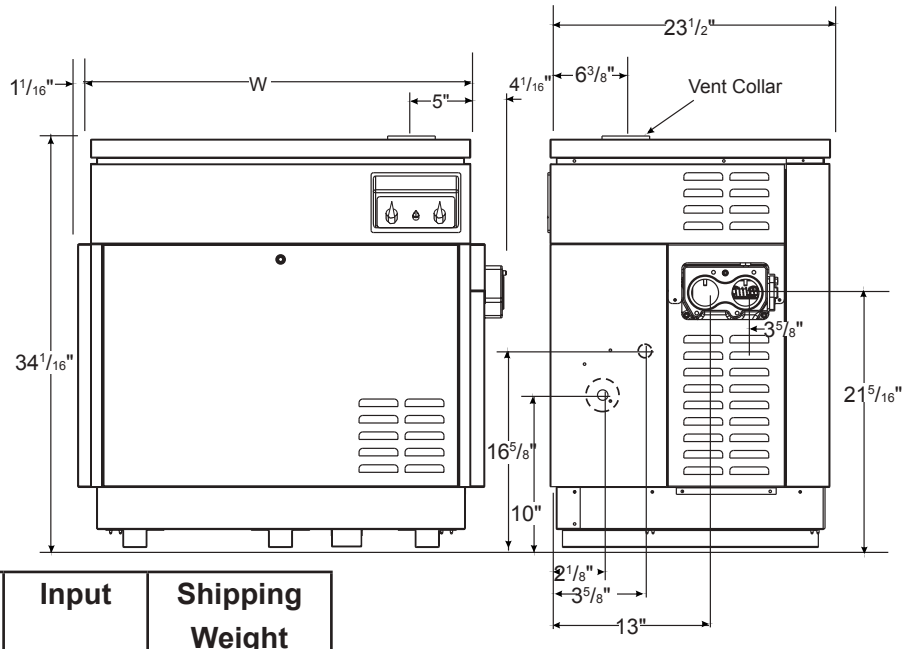
## 4.8 Major Component Service

The venturi assembly, the burner assembly and the heat exchanger tube assembly can be replaced if necessary, but correct procedures and use of only factory-provided parts are essential to assure satisfactory service and safe operation. Sealing the system with the specified sealers and gaskets is especially important. Contact Zodiac® Technical Support for information.

# Section 5. Capacities and Dimensions

## 5.1 General Information

- The Hi-E2 is design certified by CSA International as a swimming pool heater under ANSI Standard Z21.56 for use in the United States and Standard CSA-4.7 for use in Canada.
- The Hi-E2 pool heater is certified for use indoors or outdoors in the United States.
- The Hi-E2 pool heater is for use with natural or liquefied petroleum gas. Ratings apply to either fuel.
- De-rating for elevation is not necessary because of the Hi-E2 heater's special combustion system. Reduced barometric pressure at high elevations naturally decreases input and output by approximately 3 percent per 1000 feet above sea level.
- Heaters require 115V, 60Hz electrical power.
- Working pressure 75 psig.




| Model No | With W | Input | Shipping Weight |
|---|---|---|---|
| 350 | 31 7/8 | 350,000 | 252 lbs. |

**Figure 41. Capacities and Dimensions.**

# Section 6. Replacement Parts

## 6.1 Ordering Information

To order or purchase parts for the Jandy Pro Series Hi-E2 pool and spa heater, contact your nearest Zodiac dealer or distributor. Access the Zodiac web site at www.zodiacpoolsystems.com for the nearest service center. If it cannot supply you with what you need, contact Zodiac Pool Systems, Inc. Technical Support Department at 800.822.7933.

**NOTE** To order the correct part, it is important that you state the model number, serial number and type of gas when applicable. This information is on the rating plate inside the heater.

## 6.2 Parts List

| Key No. | Description | Model No. | ORDER PART NO: |
|---|---|---|---|
| | **MAINTENANCE AND SERVICE COMPONENTS** | | |
| | Limestone Gravel (condensate neutralizer) | 350 | R0306200 |
| | Combustion Air Filter | 350 | R0308000 |
| | **JACKET ASSEMBLY** | | |
| 1 | Base Panel | 350 | R0347105 |
| 2 | Frame Support Assembly | 350 | R0301505 |
| 3 | Back Panel | 350 | R0347205 |
| 4 | Left Side Panel | 350 | R0347300 |
| 5 | Right Side Panel | 350 | R0347400 |
| 6 | Temperature Control Panel Assy | 350 | R0347505 |
| 7 | Door | 350 | R0347605 |
| 8 | Inlet/Outlet Header Panel | 350 | R0347700 |
| 9 | Right Top Side Panel | 350 | R0347800 |
| 10 | Return Header Panel | 350 | R0347900 |
| 11 | Front Kick Panel | 350 | R0348005 |
| 12 | Top Panel | 350 | R0348105 |
| | Jacket Hardware Kit *(Note 1)* | 350 | R0302100 |
| | Internal Hardware Kit *(Note 1)* | 350 | R0302500 |

| Key No. | Description | Model No. | ORDER PART NO: |
|---|---|---|---|
| | **WATER SYSTEM** | | |
| 13 | Heat Exchanger Assy, Complete, Cu | 350 | R0303805 |
| 13 | Heat Exchanger Assy, Complete, CuNi | 350 | R0523705 |
| 14 | Heat Exchanger Tube Assy, Cu | 350 | 10839405 |
| 15 | Inlet/Outlet Header | 350 | R0303900 |
| 16 | Return Header | 350 | R0304000 |
| 17 | Gasket, Header | 350 | R0304300 |
| 18 | By-Pass Valve Assembly | 350 | R0304400 |
| 19 | Flow Control Cap | 350 | S0076700 |
| 20 | By-Pass Valve Gasket | 350 | R0011400 |
| 21 | By-Pass Valve Spring | 350 | R0304500 |
| 22 | By-Pass Valve Rod | 350 | R0304900 |
| 23 | By-Pass Valve Disk | 350 | R0011500 |
| 24 | Flange & Gasket Assy, 2" (2) | 350 | R0055000 |
| 25 | Flange, 2" | 350 | 10573500+ |
| 26 | Flange Gasket, 2" | 350 | S0078000+ |
| 27 | Flange Sleeve, 2" | 350 | S0078200+ |
| 28 | Flange Gasket 1 1/2 - 2" | 350 | S0078100+ |

| Key No. | Description | Model No. | ORDER PART NO: |
|---|---|---|---|
| 29 | Pressure Relief Valve, 75 PSI (requires field supplied 3/4 NPT x 3" brass nipple) | 350 | R0040400 |
| | Heat Exch. Hardware Kit *(Note 1)* | 350 | R0319105 |
| | Inlet/Outlet Header Hardware Kit *(Note 1)* | | R0319300 |
| | Return Header Hardware Kit *(Note 1)* | | R0319200 |
| | **COMBUSTION SYSTEM ASSEMBLY** | | |
| 30 | Gas Valve | 350 | R0200100 |
| 30A | Step Down Regulator | 350 | R0337300 |
| 31 | Anti-Rotation Bracket (not shown) | 350 | R0348500 |
| 32 | Orifice Holder | 350 | R0320000 |
| 33 | Gas Orifice, NAT | 350 | R0309305 |
| 33 | Gas Orifice, LPG | 350 | R0309405 |
| 34 | Combustion Air Filter Assembly | 350 | R0348200 |
| 35 | Combustion Air Filter | 350 | R0308000 |
| 36 | Venturi Inlet | 350 | R0320305 |
| 37 | Venturi O-Ring | 350 | R0320400 |
| 38 | Venturi Plenum | 350 | R0320500 |
| 39 | Venturi/Tailpipe Gasket | 350 | R0348300 |
| 40 | Mixing Chamber/Tail Pipe Assy | 350 | R0320600 |
| 41 | Mixing Chamber/Burner Gasket | 350 | R0348300 |
| 42 | Burner Assembly | 350 | R0305905 |
| 43 | Burner/Comb. Chamber Gasket | 350 | R0305805 |
| 44 | Combustion Chamber Assembly | 350 | R0305105 |
| 45 | Refractory Tile Set | 350 | R0305305 |
| 46 | Sight Glass Assembly | 350 | R0305400 |
| 47 | Combustion Chamber Strip Set (not shown) | 350 | R0213105 |
| 48 | Combustion Chamber/Coll. Gasket | 350 | R0305705 |
| | Venturi Hardware Kit *(Note 1)* | 350 | R0322200 |
| | Mixing Chamber Hardware Kit *(Note 1)* | | R0322100 |
| | Burner Hardware Kit *(Note 1)* | 350 | R0319405 |
| | **EXHAUST ASSEMBLY** | | |
| 49 | Blower/Collector Gasket | 350 | R0308700 |
| 50 | Combustion Blower | 350 | R0308200 |
| 51 | Blower/Vent Duct Sleeve | 350 | R0308600 |
| 52 | Blower/ Vent Duct Clamp | 350 | R0308800 |
| 53 | Vent Duct Assembly | 350 | R0303100 |
| 54 | Vent Duct/Heater Top Gasket or Heater Top/Indoor Vent Collar Gasket | 350 | R0309100 |
| 55 | Heater Top/Outdoor Exhaust Grill Gasket | 350 | R0309500 |
| 56 | Outdoor Exhaust Grill | 350 | R0348400 |
| 57 | Indoor Vent Collar (not shown) | 350 | R0307900 |
| 58 | Condensate Trap Assembly | 350 | R0303300 |
| 59 | Limestone Gravel | 350 | R0306200 |
| 60 | Condensate Trap Cover | 350 | R0213300 |
| | Venturi Hardware Kit *(Note 1)* | 350 | R0322200 |
| | Mixing Chamber Hardware Kit *(Note 1)* | | R0322100 |

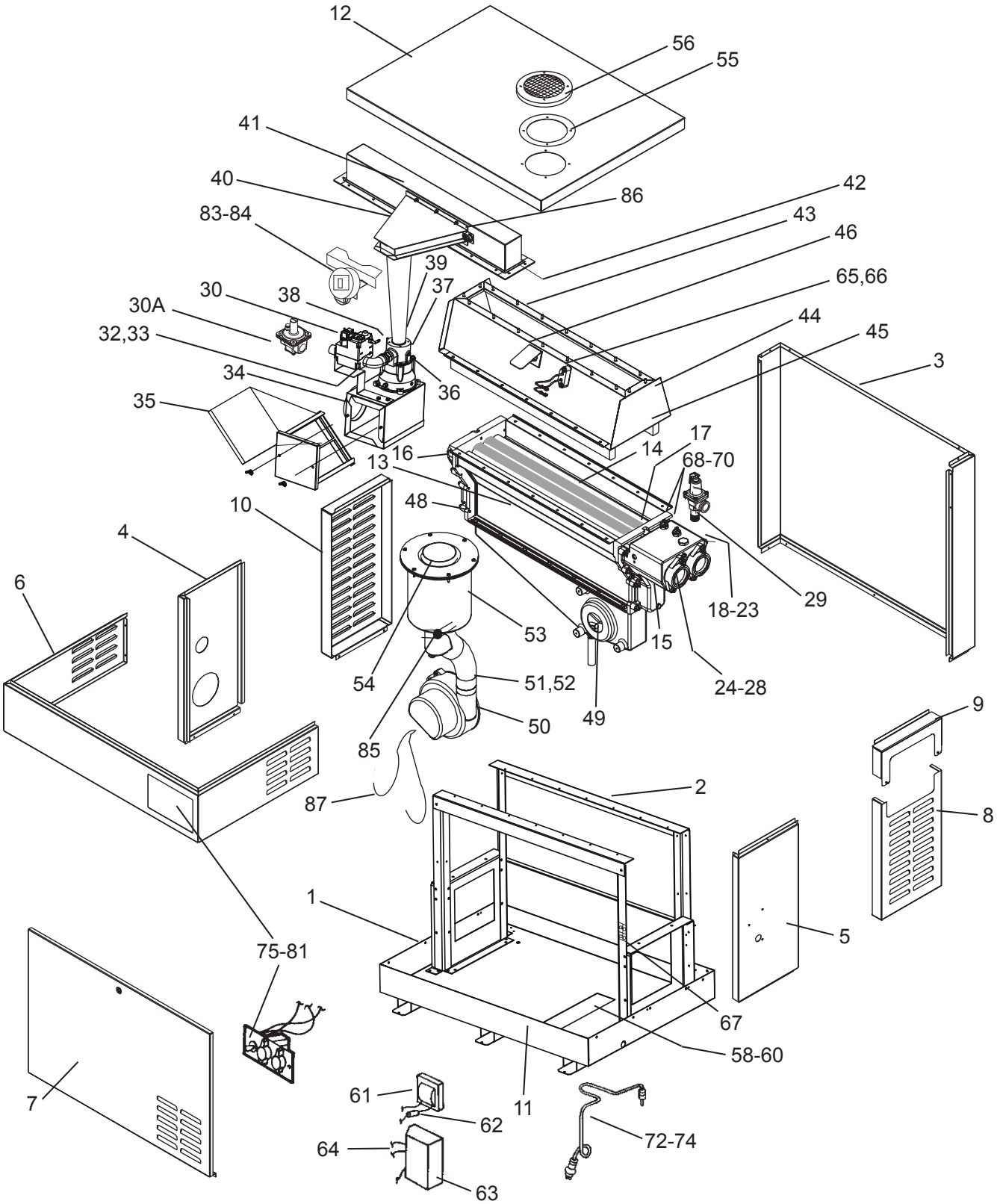
| Key No. | Description | Model No. | ORDER PART NO: |
|---|---|---|---|
| | **ELECTRICAL COMPONENTS AND CONTROLS** | | |
| 61 | Transformer | 350 | R0061100 |
| 62 | In-Line Fuse Holder Assembly | 350 | R0325600 |
| 63 | Ignition Control | 350 | R0202900 |
| 64 | Wire Harness, Ignition Control | 350 | R0302700 |
| 65 | Igniter Assembly | 350 | R0016400 |
| 66 | Igniter Gasket | 350 | R0205300 |
| 67 | Terminal Block | 350 | R0301900 |
| 68 | High-Limit Switch Set | 350 | R0322700 |
| 69 | High-Limit Switch, 135°F | 350 | R0302400 |
| 70 | High-Limit Switch, 150°F | 350 | R0302300 |
| 71 | High-Limit Switch Wire Harness (not shown) | 350 | R0322600 |
| 72 | Pres. Switch & Siphon Loop Assy | 350 | R0322900 |
| 73 | Pressure Switch, 2 PSI | 350 | R0013200 |
| 74 | Pressure Switch Siphon Loop | 350 | R0307800 |
| 75 | Temp. Control Assy, Electronic | 350 | R0011700 |
| 76 | Temp. Sensor (not shown) | 350 | R0011800 |
| 77 | Temp. Sensor Gasket | 350 | E0116400 |
| 78 | Temp. Sensor Plastic Sleeve | 350 | 10444900+ |
| 79 | Temp. Control Knob | 350 | R0010700 |
| 80 | Pool/Spa Selector Knob | 350 | R0099900 |
| 81 | “Temp-Lok” Disc | 350 | 10583100+ |
| 82 | Temp. Sensor Retainer Clip (not shown) | 350 | 10716701 |
| 83 | Differential Pressure Switch | 350 | R0302000 |
| 84 | Differential Pres. Switch Bracket | 350 | R0302200 |
| 85 | Exhaust Vent Limit Switch | 350 | R0309000 |
| 86 | Burner High Limit Switch | 350 | R0319700 |
| 87 | Combustion Blower Wire Harness | 350 | R0308100 |
| | **OPTIONAL COMPONENTS** | | |
| | High Temp. Silicone Sealant | 350 | R0322800 |
| | Heat Exchange Baffles | 350 | R0410100 |
| | 4" Venting Connector, Hi-E2 | 350 | R0444900 |

**NOTES:**

1. **All hardware sets contain all pieces necessary for assembly, including gaskets. Not shown.**

2. **Gaskets and hardware are included in all kits that involve the removal of a gasket as part of the procedure to replace a part.**

## 6.3 Exploded View



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