SECTION 1.
General Information

This manual provides maintenance instructions for the Teledyne Laars Hi-E Model EPH 300 pool and spa heater.

SECTION 2.
Overall Operation and Service

2A. Heater Control Components

Some of the heater control components are the same as those used in conventional heaters, but others are designed specifically for the Hi-E EPH 300 heater (see Fig. 1).

The following paragraphs describe the special controls and their operation.

2A-1. Pressure Switch

The pressure switch is a safety device that senses water pressure or back pressure between the heater and the pool or spa when the filter pump is operating. The switch is factory set at 2 pounds per square inch (psi) (14 kilopascals [kPa]).

When the switch senses adequate water pressure, it closes, allowing the heater to fire. The switch opens any time water pressure is below 2 psi (14 kPa) and remains opens, preventing the heater from firing, regardless of the temperature control setting. If the water pressure is too high, the switch remains closed, allowing the heater to fire even if the filter pump is off. Therefore, the height difference between the heater and the pool or spa water surface level must fall within the correct range.

2A-2. High Limit Switches

The Hi-E heater has two disk-type high limit switches to meet ANSI safety requirements. The high limit switches open if the temperature of the water exceeds the respective limits, shutting down the heater. The high limit switches close and automatically reset when exposed to cool water flow for a short time.

The 150 degrees Fahrenheit (°F) (66 degrees Celsius [°C]) high limit switch senses the temperature of the hottest water as it leaves the heat exchanger. The 135°F (57°C) high limit switch senses the temperature of the mixed water after it leaves the heater and mixes with water that bypasses the heater inlet to the outlet.

Water can overheat if the water flow rate drops, usually due to a flow restriction in the heat exchanger, pool piping system, or a dirty filter. A broken disc or spring in the automatic flow control valve can cause the 150°F (66°C) high limit switch to open, allowing too much water to bypass the heat exchanger, correspondingly lowering the water flow rate through the heat exchanger.

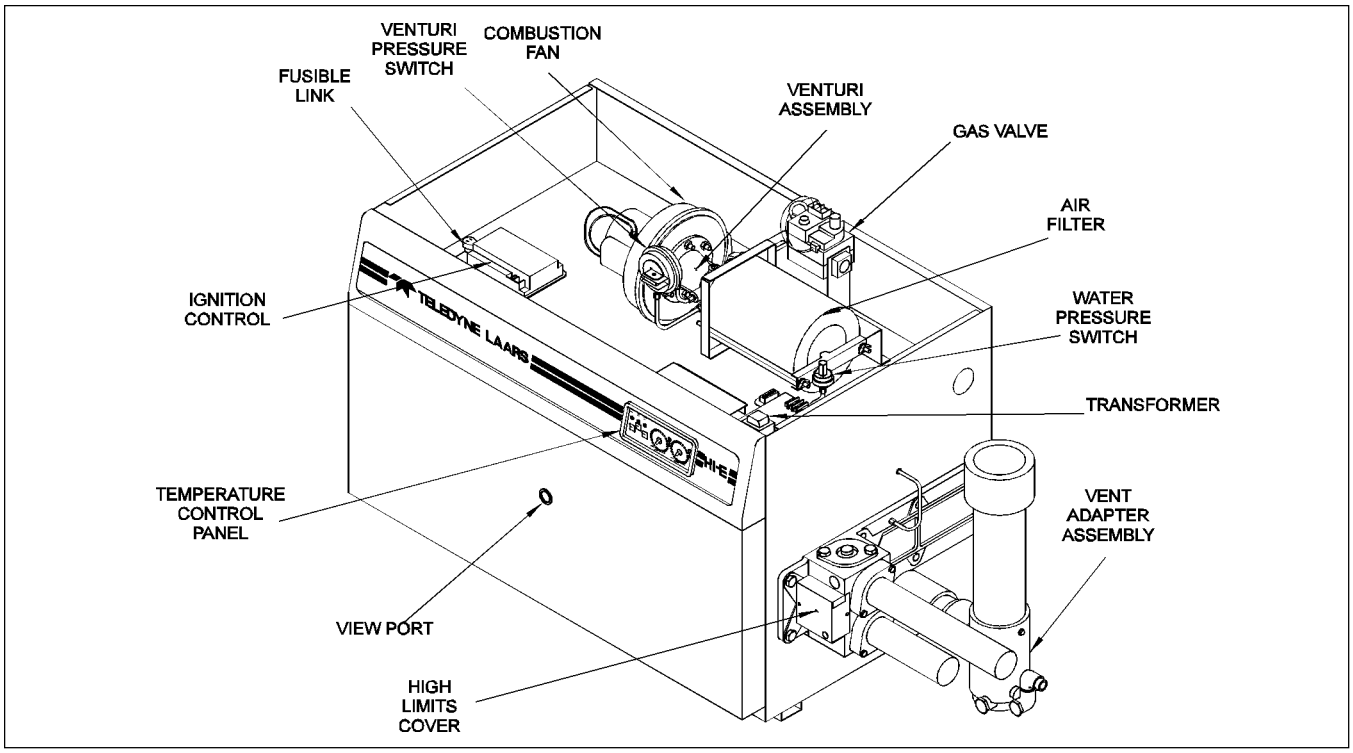


Figure 1. Component Location

2A-3. Fusible Link

This is a one-time, thermally fusible element which shuts down the heater if it detects temperatures higher than 305°F (152°C) inside the heater control compartment.

2A-4. Temperature Control Panel

The temperature control panel includes two temperature controls (regulates pool/spa water temperatures) and a touch pad (OFF, SPA, and POOL) that turns the heater on and off and selects which temperature control will be active. An indicator light above the controls tells you which is active. The control panel also has lights labeled, WATER BELOW TEMP, HEAT ON, and FAN ON. These lights indicate the operating status of the heater.

2A-5. Venturi Pressure Switch

The venturi pressure switch senses pressure through the venturi. Blockage in venting or the heat exchanger will cause the venturi pressure switch not to close. The venturi pressure switch is pre-set at the factory for normal installations. Do not adjust the venturi pressure switch.

2A-6. Ignition Control

The ignition control provides power to the igniter and fan, opens the gas valve when there is a call for heat, and senses when a flame is established. The ignition control is programmed to make three attempts at ignition. Each attempt consists of the following cycle:

1. A 15-second purge period during which the combustion fan purges the combustion chamber.

2. A 20 to 35-second igniter heat-up period. The glow of the igniter can be seen through the heater view port near the end of this period.

3. A 7-second trial for ignition. The gas valve opens and gas ignites. The gas valve stays open as long as the igniter senses flame.

If ignition is not successful, the control shuts down and locks out. It remains in the lockout condition until the heater is turned off then back on by the touch panel pads or when the 120 volt alternating current (VAC) power to the heater is interrupted.

2A-7. Gas Valve

The Hi-E heater has a negative pressure gas valve that regulates the gas to the heater based on the amount of air flow through the venturi. The gas valve is the ON/OFF device that permits gas to flow from the supply line into the heater. It is energized by the ignition control.

2A-8. Transformer

The transformer converts 120VAC into 24VAC used by the heater circuit.

2B. Venturi/Negative Pressure Regulator System

The fuel/air mixing system in the Hi-E EPH 300 heater makes sure the fuel/air ratio remains the same under a wide range of flow conditions (see Fig. 2).

An important feature of the pressure system is that blockage of the combustion air supply or the vent will only reduce the firing rate; it will not cause poor quality combustion.

2C. Pressurized Combustion System

The Hi-E EPH 300 heater has a positive pressure combustion system; the pressure in parts of the system is slightly higher than atmospheric pressure. This has an important effect on service procedures. There can be NO gas leaks in the system from whatever cause. If a leak exists in the section between the combustion fan and the burner, a flammable mixture of fuel gas and air can escape. A leak in the combustion chamber will release very hot gases. These gases may enlarge the leak due to their high temperature. Leakage from the system at points after the heat exchanger will release combustion products or condensate water. The service technician must be alert to these possibilities when servicing the heater.

⚠WARNING

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

2D. Periodic Inspection

Before starting troubleshooting procedures, inspect the pool or spa system for obvious problems. All of the pool system components, including pump,

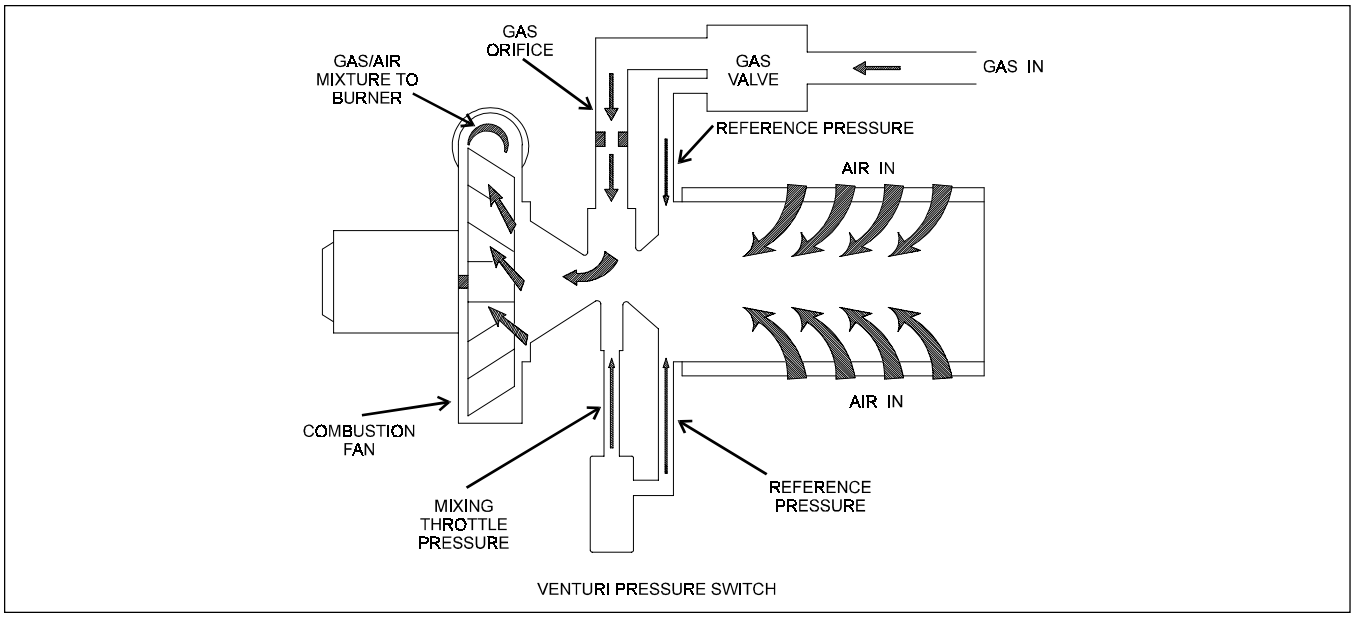


Figure 2. Venturi/Negative Pressure Regulator System

filters, and strainers, water valves, gas supply, electrical power and time clocks, have an effect on heater operation. The following basic checks should be performed:

1. Is electrical power to the heater turned on?

2. Is there a time clock or other control in the system, and is that control on?

3. Is the heater turned on at the touch panel? If it is, the light over the active temperature control will be lit.

4. Is the temperature control knob set high enough to call for heat?

5. Is the gas supply turned on at all locations?

6. Is the heater's combustion air filter clean?

7. Are all wiring connections solid?

8. Is the ignition control in lockout mode? Turn the heater off and then back on at the touch panel to restart the ignition sequence.

If all of these items have been checked, look for less obvious problems (see Section 3, Troubleshooting).

2E. Temperature Rise Test Procedure

A temperature rise test confirms proper water flow through the heater. Perform a temperature rise test as follows:

1. Verify the heater is OFF. If it is necessary to turn the heater off, push the OFF button at the touch pad (see Fig. 3) and wait at least 3 minutes.

2. Turn the filter pump OFF.

3. Remove the 1/4 inch (6.35 millimeters [mm]) National Taper Pipe (NPT) plug located on the inlet/outlet header (see Fig. 4) and replace it with a Pete's plug.

4. Insert a pocket thermometer through the Pete's plug into the header to a depth of about 5 inches (127 mm).

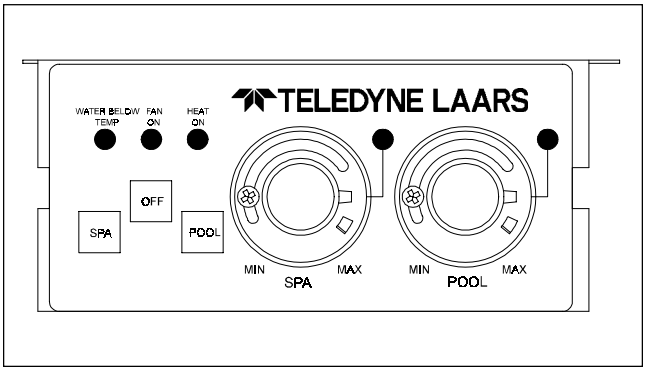


Figure 3. Temperature Control

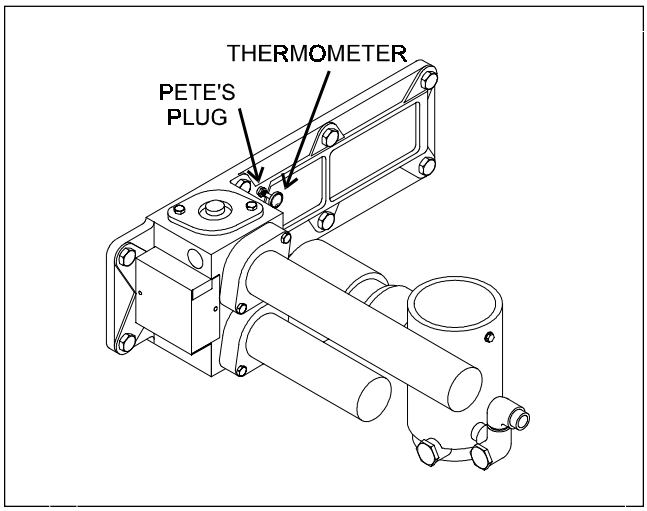


Figure 4. Thermometer Location

5. Make sure the pool filter is clean.

6. Close manual bypass valve, if installed.

7. Turn the filter pump ON and wait 5 minutes.

8. Record the temperature indicated by the thermometer (cold water).

9. Turn the heater on following the lighting instructions found under the top panel of the heater.

10. Allow the heater to run for 5 minutes. Record the new temperature reading (hot water).

11. Subtract the first temperature reading (cold water) from the second temperature reading (hot water). The difference between the two readings is called the ***temperature rise***. Proper water flow rate is obtained when the temperature rise falls between 18 and 22°F (10 and 12.2°C).

12. If the temperature rise is within the correct range (see step 11), complete the procedure as follows:

    a. Turn the heater off.

    b. Wait 5 minutes, then turn the filter pump off.

    c. Remove the thermometer and the Pete's plug.

    d. Replace the 1/4 inch (6.35 mm) NPT plug at the header.

If the temperature rise is outside the range indicated, two possibilities arise:

1. Case 1: The temperature rise value is less than 18°F (10°C).

2. Case 2: The temperature rise value is greater than 22°F (12.2°C).

2E-1. Temperature Rise Test Case 1

There are two conditions that can produce a temperature rise value less than 18°F (10°C): The supply gas pressure is too low or the system's water flow is too high.

Use table 1 to verify the heater's gas supply while the unit is firing and as close as possible to the unit under test.

Low supply gas pressures can be the result of using the wrong pipe size, meter, valves, or regulators. Correct the problem, then repeat the temperature rise test.

If the temperature rise is still below 18°F (10°C) after a retest, then the system's water flow may be too high.

If the system filter-flow rate is higher than approximately 125 gallons per minute (GPM) (474 liters per minute [LPM]), install a manual bypass valve with an adjustable valve (see Fig. 5). Then repeat the temperature rise test, gradually adjusting the flow with the bypass valve (see Section 2D-3) until the proper temperature rise is obtained. Once the adjustment is complete, wire the handle of the manual by-pass to the pipe to prevent any accidental change in the water flow.

2E-2. Temperature Rise Test Case 2

The main reason for a temperature rise value greater than 22°F (12.2°C) is a low water flow through the heater. Check the installation for the following:

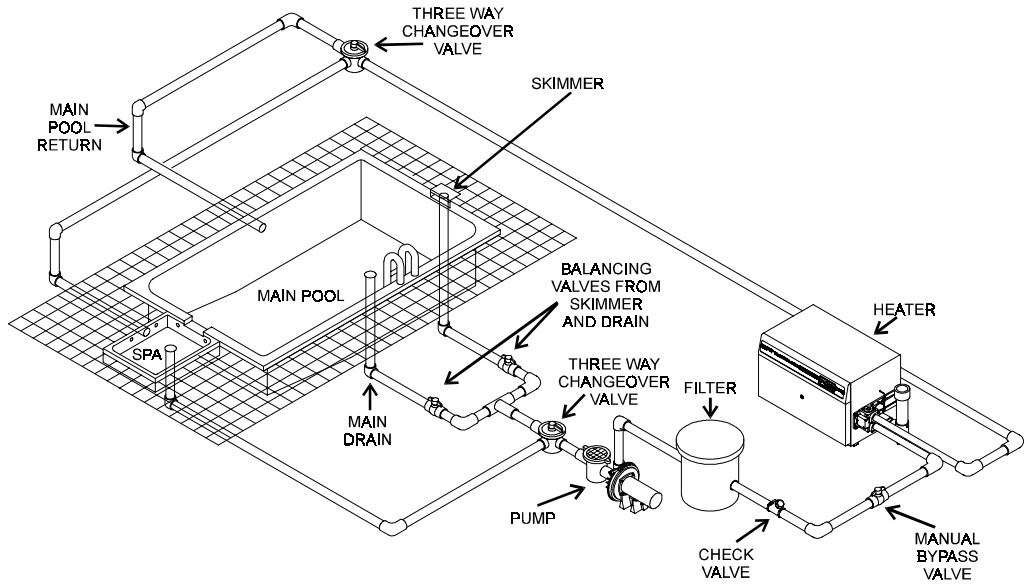
1. Incorrect water pipe size or a combination of different pipe sizes.

2. Excessive pipe length for the size pump installed.

3. Pump too small for application.

Table 1. Gas Supply Pressure Requirements

Supply Pressure Water Column	Natural Gas		Propane Gas	
	in.	mm	in.	mm
Minimum	5	127	11	279
Maximum	10	254	14	356



Notes:
1. When using metal pipe as heat sink, join metal and PVC/CPVC, using metal male and PVC/CPVC female connection.
2. A manual bypass valve is used only when filtration rate normally exceeds 125 GPM (474 LPM).

Figure 5. Typical Manual Bypass Valve Installation

4. Too many restrictions in the water path which may include small pumps or 2 speed pumps (low), dirty filters, clogged pipes, or partially closed water valves to the heater.

Verify and correct the condition and then repeat the temperature rise test.

> **⚠Caution**
> Operation with the temperature rise above maximum or below the minimum can damage the heater and will void the warranty.

2E-3. Adjusting the Manual Bypass Valve

After the manual bypass valve is installed, use the following procedures to set the bypass valve:

1. Close the manual bypass valve completely.

2. Repeat steps 7 through 12 of the temperature rise test (see Section 2E), slowly opening the manual bypass until the temperature falls between 18 and 22°F (10 and 12.2°C).

3. Once the temperature is within the correct range, wire the handle of the manual bypass valve to the pipe to prevent change in the water flow.

SECTION 3. Troubleshooting

3A. Supply Gas and Metering System

If the heater does not supply its rated output (heating too slow), or if a blue lazy flame (too little gas), or a bright flame (too much gas) is noticed, check the supply gas pressure. Proper operation of the fuel/air balancing system depends on the following:

1. Proper supply gas pressure to heater.

2. Correct gas pressure difference across the metering orifice.

3. Correct orifice for the fuel being used. Figure 3 shows how the system works.

4. Vent pipe length.

3A-1. Checking the Manifold Regulated Gas Pressure

The Hi-E heater's negative pressure gas valve regulates the gas to the heater based on the amount of air flow through the venturi. Proper operation of the heater depends on the proper settings of the gas flow. Symptoms of improper operation are either a blue lazy flame (too little gas) or a bright yellow flame (too much gas).

NOTE: Gas supply test, stack test, and air flow filter test should be completed before attempting this test or making any adjustments.

1. Check supply gas pressure (see Section 3B-2).

2. Check that all ports and tubes are clear that connect the gas valve and venturi.

3. Check for proper orifice (see Table 2).

4. Attach a manometer or a 1/2 inch (13 mm) negative pressure gauge between the outlet pressure tap on the gas valve and the venturi (lower) inlet pressure tap (see Fig. 6).

Table 2. Gas Metering Orifice Size

	Natural Gas	LP Gas
Orifice Diameter	0.354 in. (8.99 mm)	0.295 in. (7.49 mm)
Color Code	Brass	Silver

5. The pressure at the gas valve outlet will be 0.2 inch (5.08 mm) water column (W.C.) less than the pressure at the venturi (lower) inlet.

6. Take a reading. The ideal range should be between -0.1 and -0.3 inches (-2.5 and -7.6 mm) W.C. when the gas valve is energized.

IMPORTANT: Before the gas valve is energized, the pressure reading will be approximately 2.8 inches (71 mm) W.C. on outdoor units fitted with the standard vent stack. On indoor installations with vent piping as long as 60 feet (18 meters [m]), the pressure can be as low as 2.0 inches (51 mm) W.C.

3A-2. Checking the Supply Gas Pressure

To check the gas supply pressure:

1. Attach one end of a manometer hose to the fitting on the gas valve (see Fig. 6).

2. Remove threaded cap from T-fitting and replace with fitting from manometer.

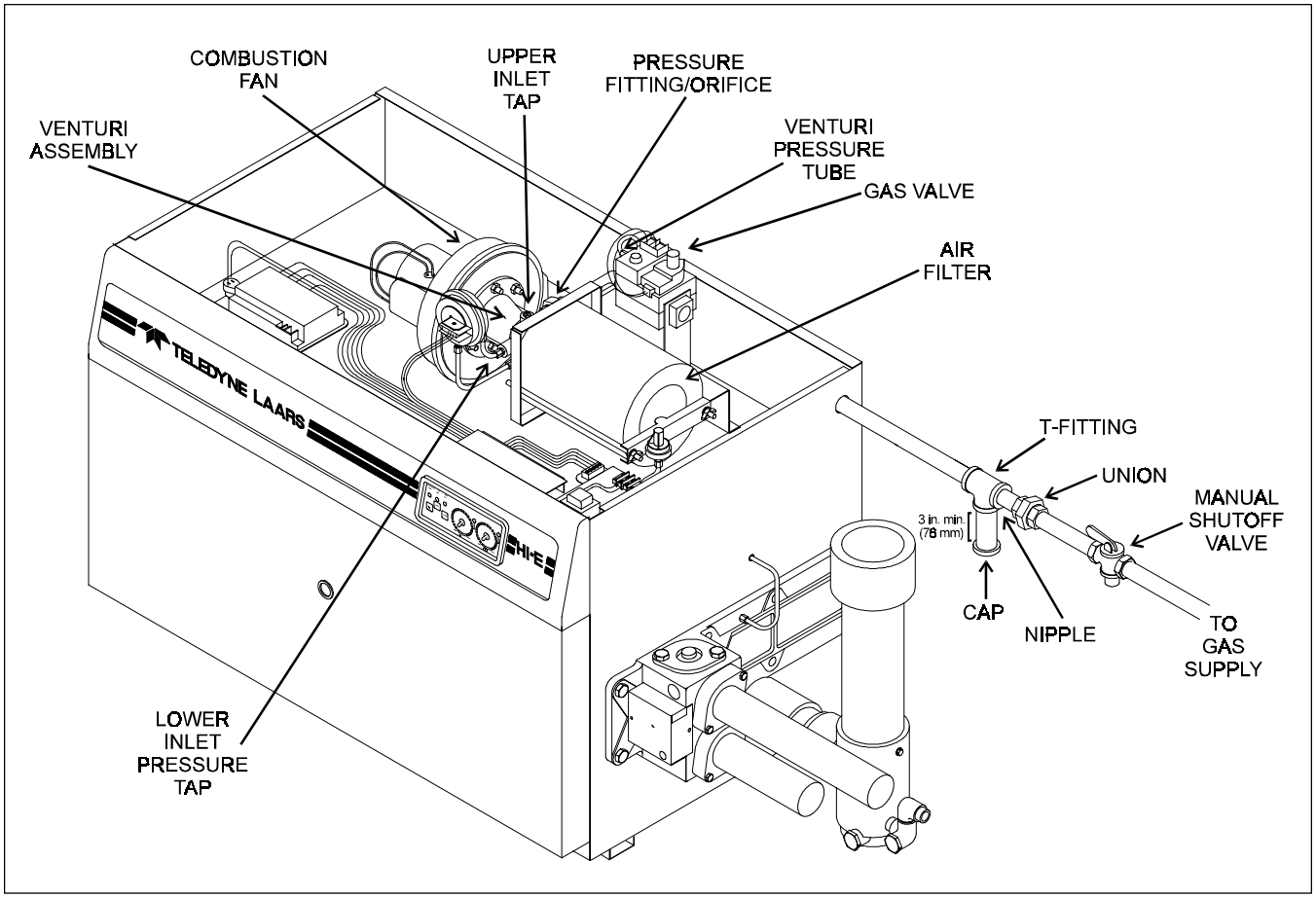


Figure 6. Checking the Gas Pressure

3. A minimum of 5 inches (127 mm) W.C. for natural gas and 11 inches (279 mm) W.C. for propane gas, when the burner is firing, is required.

4. If the supply gas pressure is less than the minimum, check for under-sized pipe between the meter and the heater, a restrictive fitting, an under-sized gas meter.

IMPORTANT: Any gas supply problem must be corrected. The source of the incorrect supply pressure must be found and corrected. If you cannot clear up the supply pressure problem, contact a qualified service technician or your local gas company.

3A-3. Checking the Metering Orifice

Gas flow is controlled by the orifice in the fitting between the gas valve and the venturi throat. The orifice must be the correct size for the fuel being used (see Table 2).

To inspect the gas orifice:

1. Disconnect the venturi pressure tube (see Fig. 6).
2. Carefully remove the fitting between the gas valve and the venturi throat.

3. Remove the orifice and inspect it.

4. Reassemble all parts properly after making sure the orifice size is correct.

3A-4. Checking the Venturi Pressure Switch

The venturi pressure switch is calibrated to open when the pressure falls below the minimum values, shutting off the heater. If a dull blue lazy flame is detected or it takes a long time for the heater to heat up, the cause may be:

1. A restriction in the combustion system flow by a partially blocked combustion air inlet or vent terminal.

2. Excessive vent pipe length or too many 90 degree elbows (see Document 3090B, Installation and Operation Manual).

3. Worn or dirty combustion air filter.

4. Internal blockage in the condensate trap or drain system.

To check the venturi pressure difference perform the following stack test:

1. Remove upper inlet pressure tap from the top of the venturi (see Fig. 6).

2. Attach the hose from the manometer to the upper tap on the venturi.

NOTE: The manometer must be able to read a negative pressure.

3. Start the heater and let the unit fire.

4. Take a reading. Readings should be:

   a. -2.2 to -3.2 inches (-56 to -81 mm) W.C. for outdoor units with standard stack extensions.

   b. - 1.4 to -3.2 inches (-36 to -81 mm) W.C. for indoor units with proper venting.

3A-5. Checking the Air Flow (Filter)

The amount of gas that flows to the burner is regulated by the amount of air through the venturi. Testing pressure readings at the gas valve pressure tap can determine if there is an air flow problem.

If the heater is heating slowly or cycling on and off, perform the following filter test:

1. Attach a manometer or a negative pressure gauge to the press tap opening on the gas valve.

2. Turn on the heater.

NOTE: The fan will come on and the heater will fire about 20 to 30 seconds later.

3. Take a reading. Reading should be -0.3 to -0.5 inches (-7.6 to -12.7 mm) W.C.

4. If the reading is less than -0.3 inches (-7.6 mm) W.C., check the tubing between the gas valve regulator and the venturi port for blockage.

5. If the reading is greater than -0.5 inches (-12.7 mm) W.C., there is a restriction of air through the heater. This will not harm the heater, only reduce its output British Thermal Unit (BTU) rating.

To correct the reduced air flow check the following:

1. Check and clean the air filter. It may be necessary to replace, if very dirty.

2. Check for excessive pipe length on vent.

3. Check for a dirty or worn fan unit.

4. Check to see if the "P" trap is clear.

> **⚠WARNING**
> Do not attempt to adjust the gas pressure at the gas valve. Serious damage could occur.

3B. Electrical Troubleshooting

This section describes procedures for checking the electrical power and control components of the heater (see Fig. 7 for a typical example of a wiring diagram). Use the flowchart (see Fig. 8) and the following sections to troubleshoot the heater. Read all of these procedures before starting repairs.

The following tools are required for proper service and problem diagnosis of the heater and heater system:

1. Gas pressure test kit with range from 0 to 14 inches (0 to 356 mm) W.C.

2. Electric meter(s) with the following ranges:

   a. 0 to 150 volts alternating current (VAC)
   b. 0 to 25V direct current (DC)
   c. 0 to 2,000 ohms resistance

3. A pressure gauge and a thermometer with proper ranges for heater operation.

3B-1. Testing the Electrical Supply Power

The electrical components of the Hi-E heater operate with supply voltage ranging from 103 to 126VAC at 60 Hertz (Hz). To test the electrical power supply:

1. Measure the voltage at the hot and neutral wirenut connections in the heater electrical junction box.

2. Voltage outside of the required range may be due to poor wiring connections, to other loads (e.g., air conditioning compressors), or to an electrical utility company problem.

3B-2. Testing the Pressure Switch

All new heaters are provided with pressure switches preset to work at an optimum elevation of 3 feet (0.91 m) above or below the water surface level of the pool/spa to be heated (see Fig. 9). However, the switch can be adjusted to operate correctly in heaters installed a maximum of 10 feet (3.05 m) below the water surface of the pool/spa and to a maximum of 6 feet (1.83 m) above the water surface.

> **NOTE:**
> **Pressure switches are only adjusted to turn heater off, not on.**

- *DO NOT* adjust the pressure switch if the heater is installed at elevations of more than 6 feet (1.83 m) above the water surface or more than 10 feet (3.05 m) below the water surface. Instead, contact your Teledyne Laars representative for instructions.

If it is known positively that too much water pressure is preventing the switch from opening and turning the heater off, adjust the pressure switch (see Sections 3B-5). If the heater is installed within the recommended range, but does not fire, perform the following back pressure test to check the water pressure switch:

1. Use a volt-ohmmeter and check the voltage at the water pressure switch.

2. If voltage is found at one terminal and not the other, the pressure switch is keeping the heater from firing.

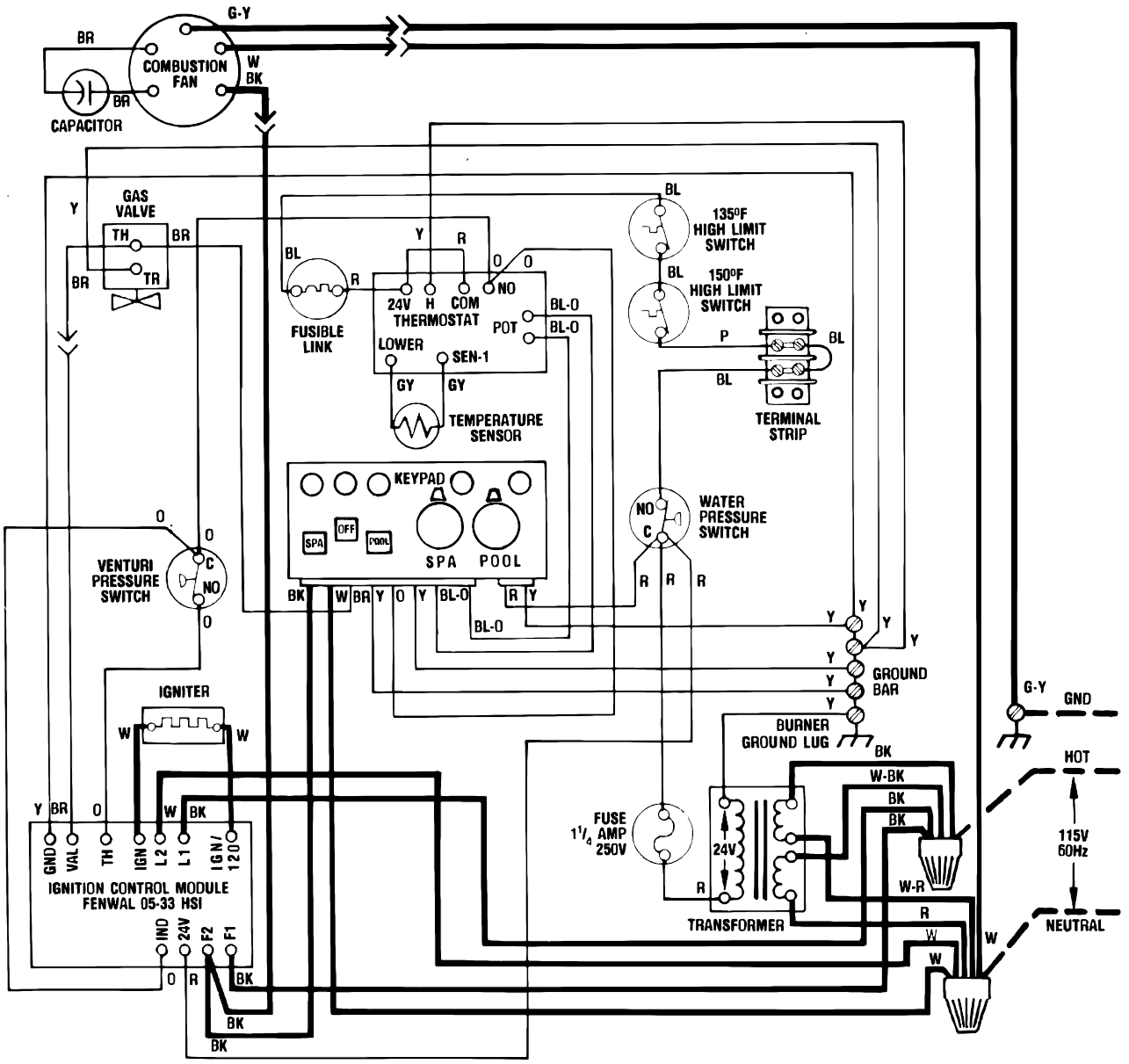
3. To further isolate the problem, remove the copper tube from the pressure switch.

4. Attach a pressure gauge to the tube and turn on the pump.

5. If the pressure gauge reads less than 2 psi (14 kPa), there is a pressure related problem. The problem may be caused by low water pressure.

A drop in the water pressure may be caused by:

1. A very short pipe run from the heater to the pool or spa may prevent sufficient back pressure from developing and prevent the pressure switch from closing. If this occurs, lengthen the piping between the heater and the pool where the return line enters, or install directional fittings or elbows.



LEGEND

P - PURPLE	BL - BLUE
BK - BLACK	O - ORANGE
W - WHITE	G-Y - GREEN W/ YELLOW TRACER
BR - BROWN	W-BK - WHITE W/ BLACK TRACER
Y - YELLOW	W-R - WHITE W/ RED TRACER
R - RED	BL-O - BLUE W/ ORANGE TRACER
GY - GRAY	

FACTORY WIRED 115V
FIELD WIRED 115V
FACTORY WIRED 24V

Figure 7. Wiring Diagram

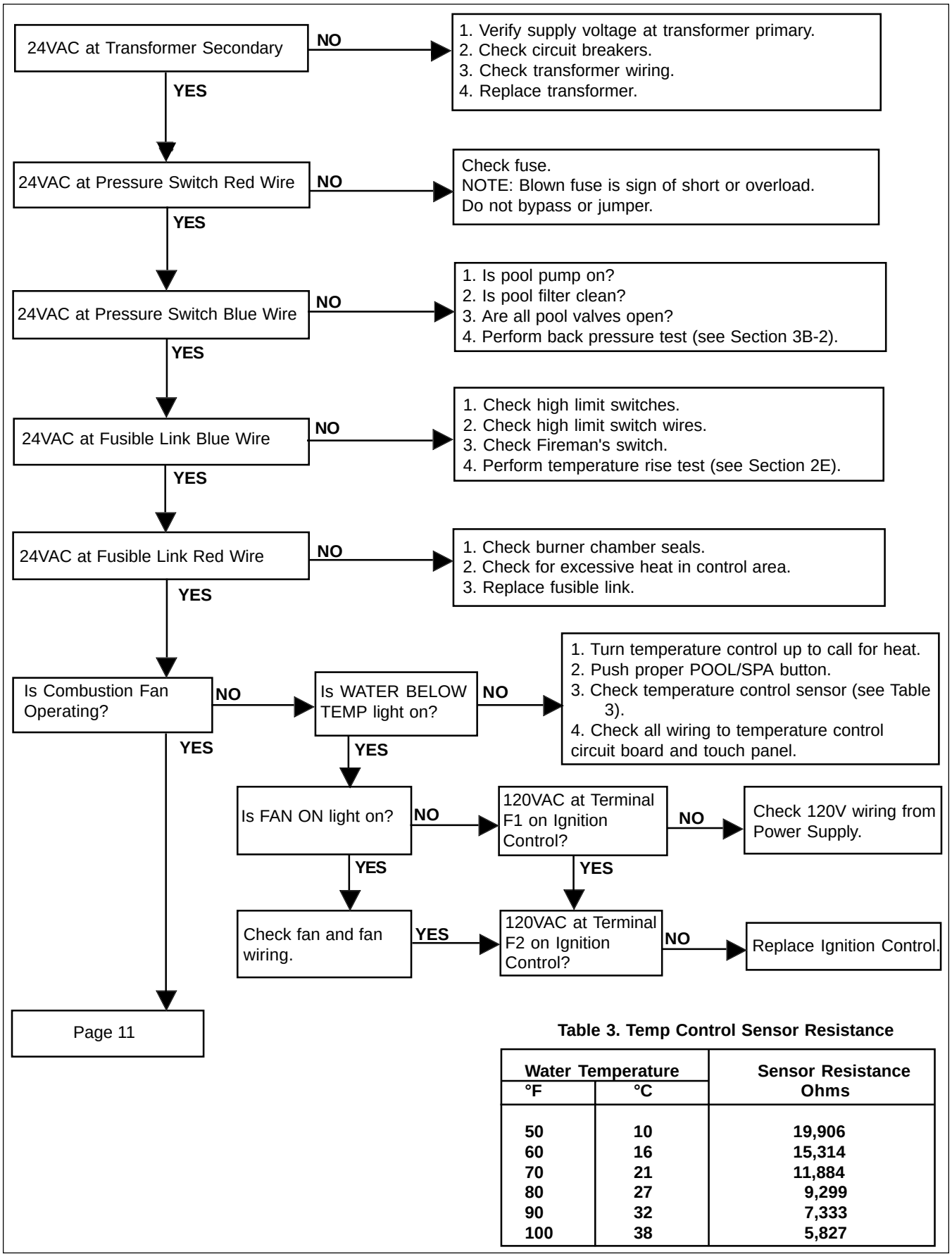


Table 3. Temp Control Sensor Resistance

Water Temperature		Sensor Resistance
°F	°C	Ohms
50	10	19,906
60	16	15,314
70	21	11,884
80	27	9,299
90	32	7,333
100	38	5,827

Figure 8. Troubleshooting Flowchart

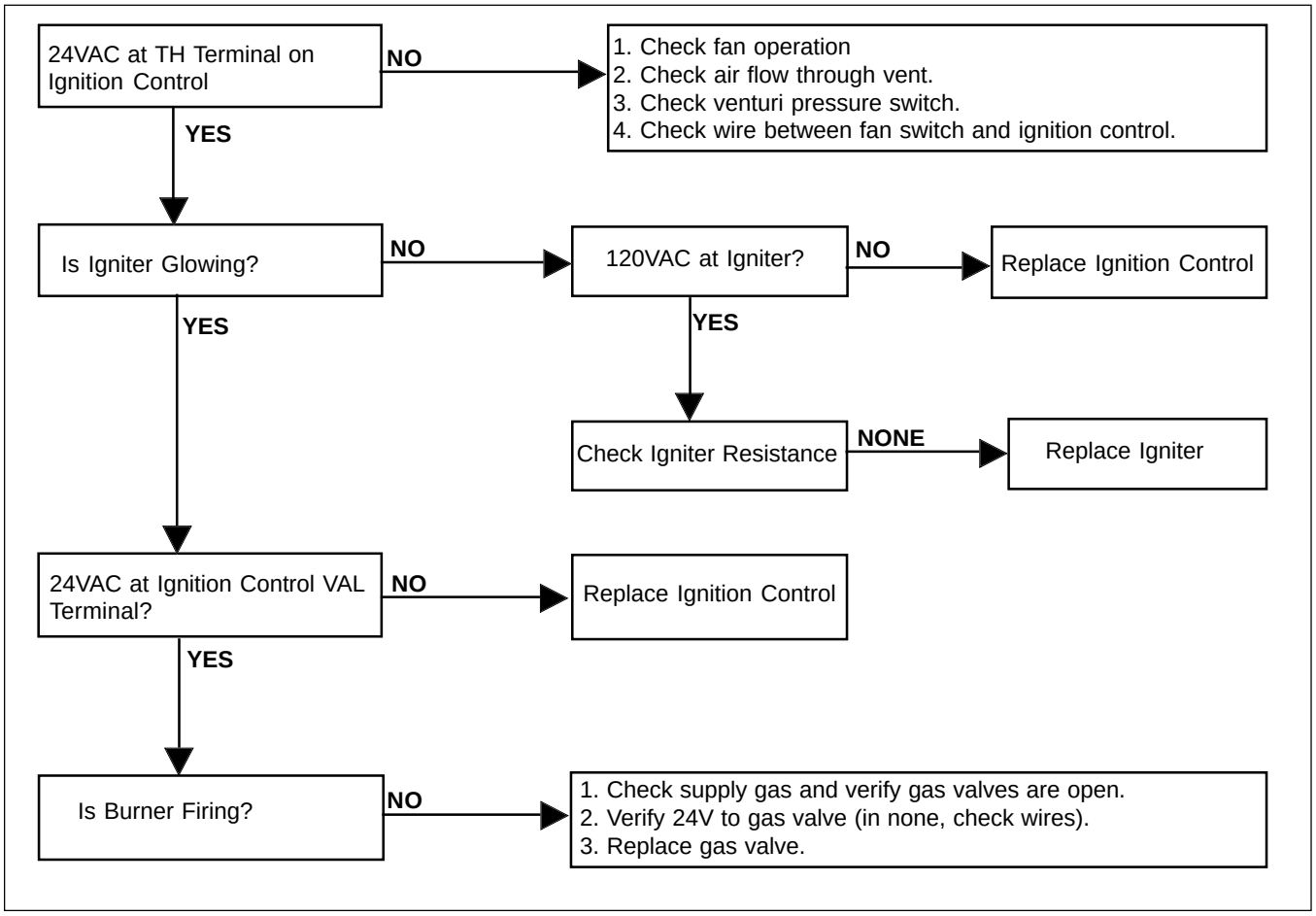


Figure 8. Troubleshooting Flowchart (Continued)

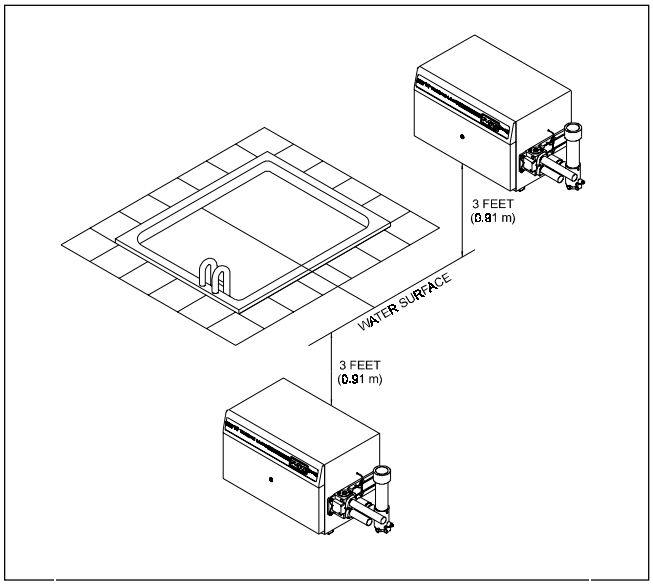


Figure 9. Optimum Elevation Between the Heater and the Pool/SPA

2. A dirty or clogged pool filter or leaf trap may restrict the water flow and cause pressure loss. The dirtier the filter or trap, the greater the loss.
3. A filter pump with a bad motor or impeller develops less pressure.

3B-3. Adjusting the Pressure Switch

When the heater is installed between 3 and 10 feet (0.91 and 3.05 m) ***below*** the water surface of the pool or spa, the pressure switch senses the increased weight of the water, remains closed, and allows the heater to fire when insufficient water is present. Adjust the pressure switch as follows:

1. Turn heater to OFF position.
2. Disconnect wires to the pressure switch.
3. Clip leads of a voltmeter across the pressure switch.
4. Set voltmeter to lowest resistance scale.
5. Use a 7/32 inch (5.55 mm) Allen wrench to adjust the switch. Slowly turn the adjustment clockwise (raising the setting) until the pump turns OFF (see Fig. 10).

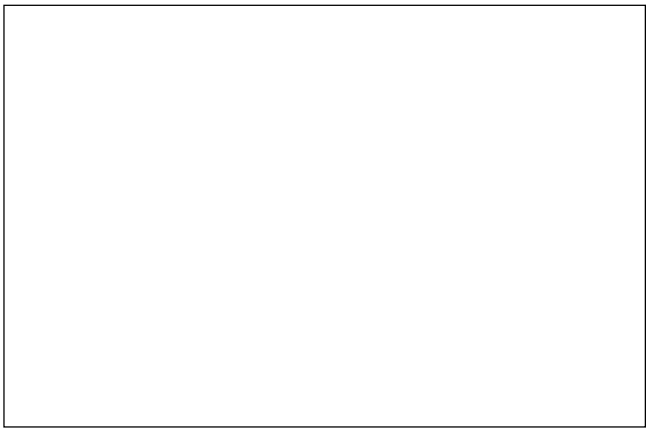


Figure 10. Adjusting the Pressure Switch

6. Turn pump ON. If pressure switch does not open, turn pump OFF and repeat step 5. When pressure switch opens, go to step 7.

7. Slowly turn the adjustment **clockwise** until the pressure switch closes.

8. Then slowly turn the adjustment **counterclockwise** until the pressure switch opens again.

9. Turn the pump OFF and ON to check the adjustment. Pause after each attempt. The pressure switch should open immediately after the pump stops.

10. Reconnect wires to the pressure switch.

11. After pressure switch is adjusted, the rise should be taken to verify water flow.

12. Turn the heater ON following the instructions found on the inside of the heater.

13. Set the temperature control to the desired temperature.

14. If a satisfactory adjustment cannot be made, contact a Teledyne Laars representative for assistance.

3B-4. Testing the Ignition Control

⚠Caution
The ignition control and igniter operate on 120V power. Keep this in mind while servicing the heater, and take care to avoid electrical shock.

To test the ignition control:

1. Turn the heater on and observe the ignition sequence.

2. If the igniter doesn't glow, turn the power off and disconnect the igniter from the ignition control.

3. Connect the leads of the voltmeter to the igniter and igniter/120 terminals of the ignition control.

4. Set the voltmeter on the AC scale with a range of at least 150V.

5. Turn the heater on.

6. Turn the temperature control knob all the way to the right. After about 15 seconds, the voltmeter should read about 120V.

7. If the voltmeter does not read voltage, replace the ignition control.

3B-5. Testing the Igniter

If there is proper voltage, but the igniter does not glow, the igniter may be open. To test the igniter:

1. Switch the volt-ohmmeter to read resistance or ohms, on a range which can read from zero to about 500 ohms.

2. With the igniter unplugged from the ignition control, connect the leads of the ohmmeter to the ends of the igniter wiring (see Fig. 11). A cold igniter should have resistance in the range of 50 to 400 ohms.

3. If the reading is above or below the range of 50 to 400 ohms, replace the igniter.

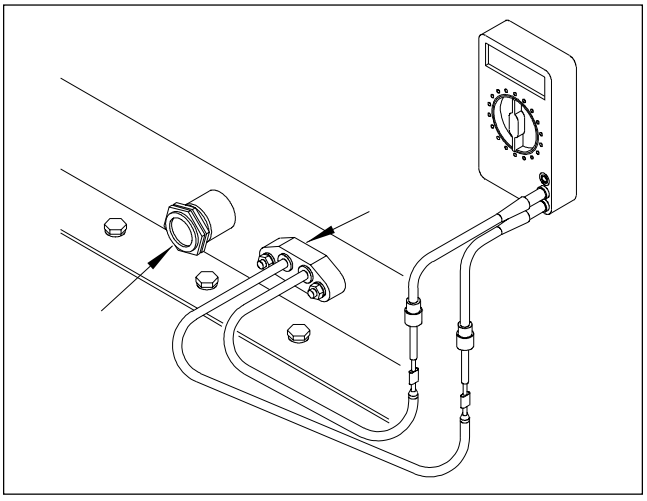


Figure 11. Igniter Resistance Test

3B-6. Testing the Combustion Fan Motor

If the combustion fan will not run, the motor or ignition control may be at fault. To test the combustion fan:

1. If the FAN ON indicator light is on, and the fan is not on, check for 120VAC at the motor.

2. If there is voltage, replace the combustion fan.

3. If there is no voltage, replace the ignition control.

3B-7. Testing the Gas Valve

If the igniter glows, but no flame appears at the burner surface, test the gas valve as follows:

1. Clip one lead of the voltmeter to the gas valve terminal having two brown wires attached to it.

2. If the voltmeter does not read voltage, replace the ignition control.

> **⚠WARNING**
> Never attempt to repair the gas valve. Such attempts will void the warranty, and could lead to dangerous results.

3. If the voltmeter shows voltage, verify that the gas is on and the gas locks are open. If the gas is on and the gas locks are open, then replace the gas valve.

SECTION 4. Maintenance

4A. Replacing the Combustion Air Filter

The Hi-E EPH 300 heater uses a high efficiency paper, fiber matrix filter covered with a foam sleeve. The sleeve stops large particles and extends the life of the paper element. A dirty air filter can reduce the combustion air so that the venturi pressure switch does not sense enough air flow. If this occurs, replace the combustion air filter as follows:

1. Remove the top of the heater.
2. Loosen the thumbnuts at the right end of the filter assembly.

3. Remove the retainer and combustion air filter cap, then remove the filter assembly (see Fig. 12).

4. Remove the foam sleeve and clean it with warm water and detergent, if necessary.

5. Take out the paper element and shake or gently brush the element to remove any dust that may have collected. Compressed air may be used for this process. If the paper element cannot be cleaned satisfactorily, replace it.

> **⚠Caution**
> When using compressed air, be careful not to damage component or direct compressed air at anyone. Failure to comply could result in damage to component or injury from flying dust.

6. Reinstall the paper element, the foam sleeve, and the retaining hardware. Make sure the air filter is seated tightly at the venturi inlet, and the cap is in place so that air cannot bypass the filter element.

4B. Inspecting the Flow Control Valve

The flow control valve maintains the correct volume of water through the heater over varying conditions (e.g., water pressure and pool filter cleanliness) up to a maximum flow rate of 125 GPM (474 LPM). If the system's filter flow rate exceeds 125 GPM (474 LPM), a bypass valve is required.

The flow control valve normally does not require service, but chemical imbalances can damage the flow control valve, shaft, or spring which, over time, can slow or eventually shut down the valve. Either condition can cause erratic heater operation and shorten heater life.

Perform a temperature rise test (see Section 2E) to confirm proper operation of the flow control valve.

To inspect the flow control valve:

1. Turn OFF the filter pump.

2. Remove the cap from the flow control valve (see Fig 13).

3. Inspect the disk to make sure it is properly seated.

4. If the disc is not properly seated, disassemble the valve and overhaul it. Replace any corroded parts.

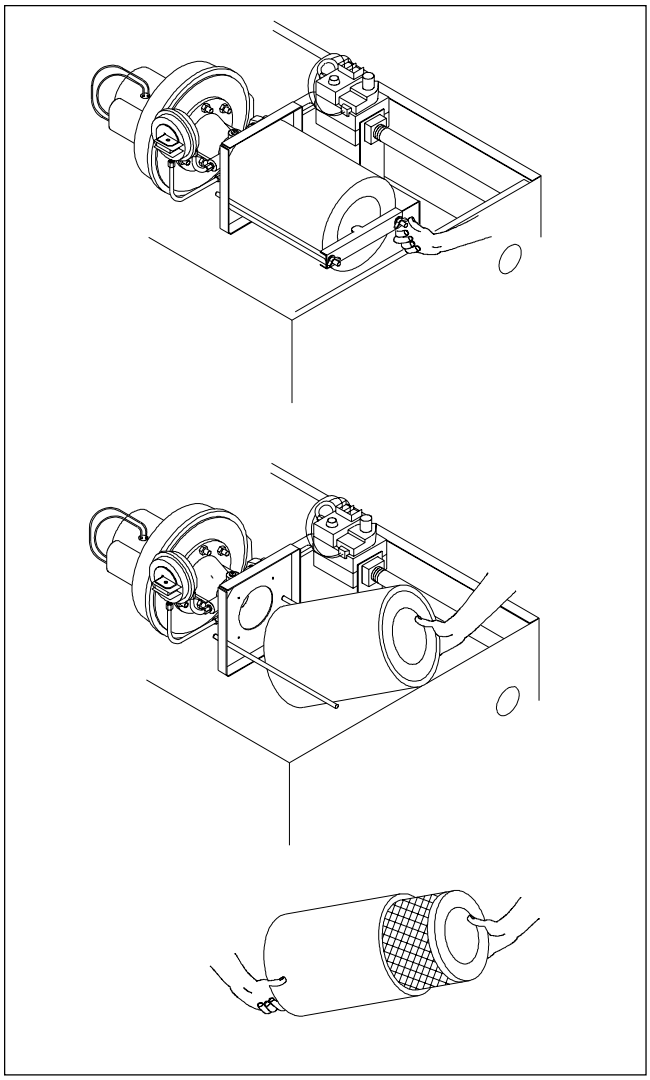


Figure 12. Filter Removal

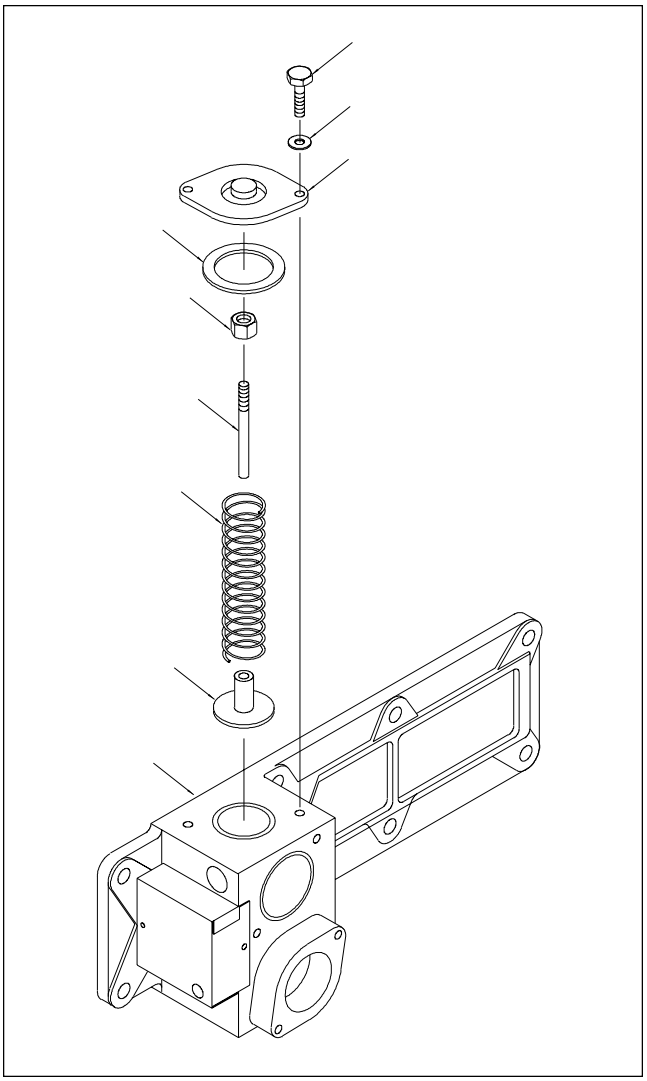


Figure 13. Flow Control Valve

4C. Removing the Venturi Assembly and Combustion Air Fan

1. Turn off the electrical power and gas supply outside the heater.

2. Remove the top panel.

3. Disconnect the supply gas pipe from the gas valve.

> **⚠Caution**
> Label all wires prior to disconnection. Wiring errors can cause improper and dangerous operation.

4. Disconnect all wires from the venturi pressure switch.

5. Disconnect the brown and yellow wires from the gas valve.

6. Separate the four-wire connector located near the combustion air fan (see Fig. 14).

7. Remove the four nuts and washers attaching the combustion air fan to the top of the burner shroud.

8. Lift the entire venturi assembly off the burner shroud and place it on a suitable work bench.

9. Remove the six nuts and washers attaching the combustion air fan to the venturi.

10. Hold the combustion air fan with one hand, and separate from the venturi.

11. Reverse the previous steps to install a new fan.

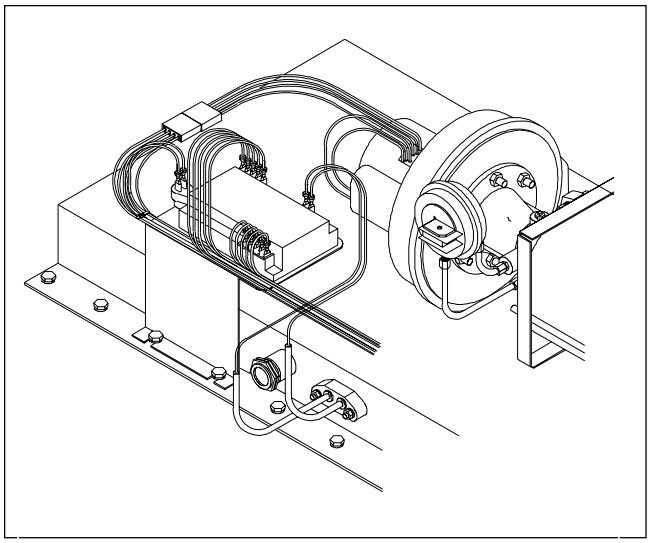


Figure 14. Removing the 4-Wire Fan Connector

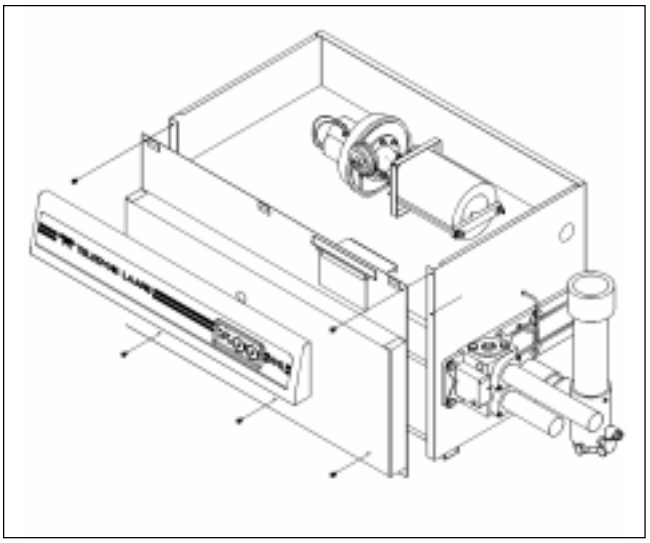


Figure 15. Upper and Lower Front Panel Removal

4D. Replacing the Burner, Heat Exchanger, and Condensate Pan

Due to the complexity of the procedures required to replace these components, the instructions are included in the replacement kits. The appropriate kit numbers can be found in the parts list (see Section 5).

4E. Removing the Igniter

NOTE: One of the screws also attaches the ground lug to the outside right panel.

1. Remove two retaining screws from the temperature control circuit board.

2. Carefully slide the temperature control circuit board into the heater compartment.

3. On the right side of the heater, remove the three screws that fastens the electrical junction box to the right side panel.

4. Remove the upper front panel by removing the screw located on the left side, inside the heater compartment (see Fig. 15).

5. Lift the upper front panel out of the three slots and set it aside (see Fig. 15).

6. Remove the lower front panel assembly by removing the three screws along the base of the heater, and the four screws on the sides (see Fig. 15). Two of these screws are inside the heater compartment.

7. Remove the hex bolts that fastens the igniter and pull the igniter out of the heater. Make sure you do not damage the refractory material around the opening.

8. Install the new igniter so that the black igniter surface doesn't touch the chassis or refractory material when it is in place. The igniter should be 1/2 inch $\pm$1/16 inch (13 mm $\pm$1.58 mm) from the burner surface and parallel to it (see Fig. 16). Make sure there is no leakage from the combustion chamber. A small leak of hot gas will erode the leak area, make it larger, and cause a problem.

9. Install new gaskets.

10. If the igniter glows, but flame appears only briefly, there may be a problem with the fuel supply, igniter or ignition control, or the piping to the venting system.

11. If a new installation or the fuel gas piping has been serviced, remove any air in the gas supply line, so the heater will operate normally. Using an incorrect fuel will result in the fuel/air mixture being wrong and a flame that is not normal. The fuel gas must be the same as specified on the heater rating plate.

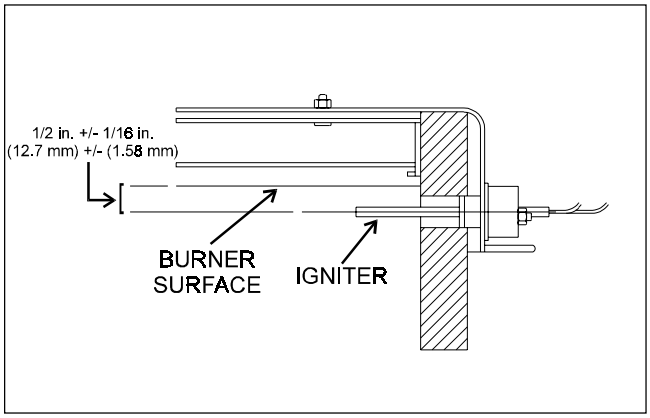


Figure 16. Igniter Installation

After eliminating all possible problems with the fuel supply and igniter, replace the ignition control.

SECTION 5.
Parts List for Hi-E EPH 300

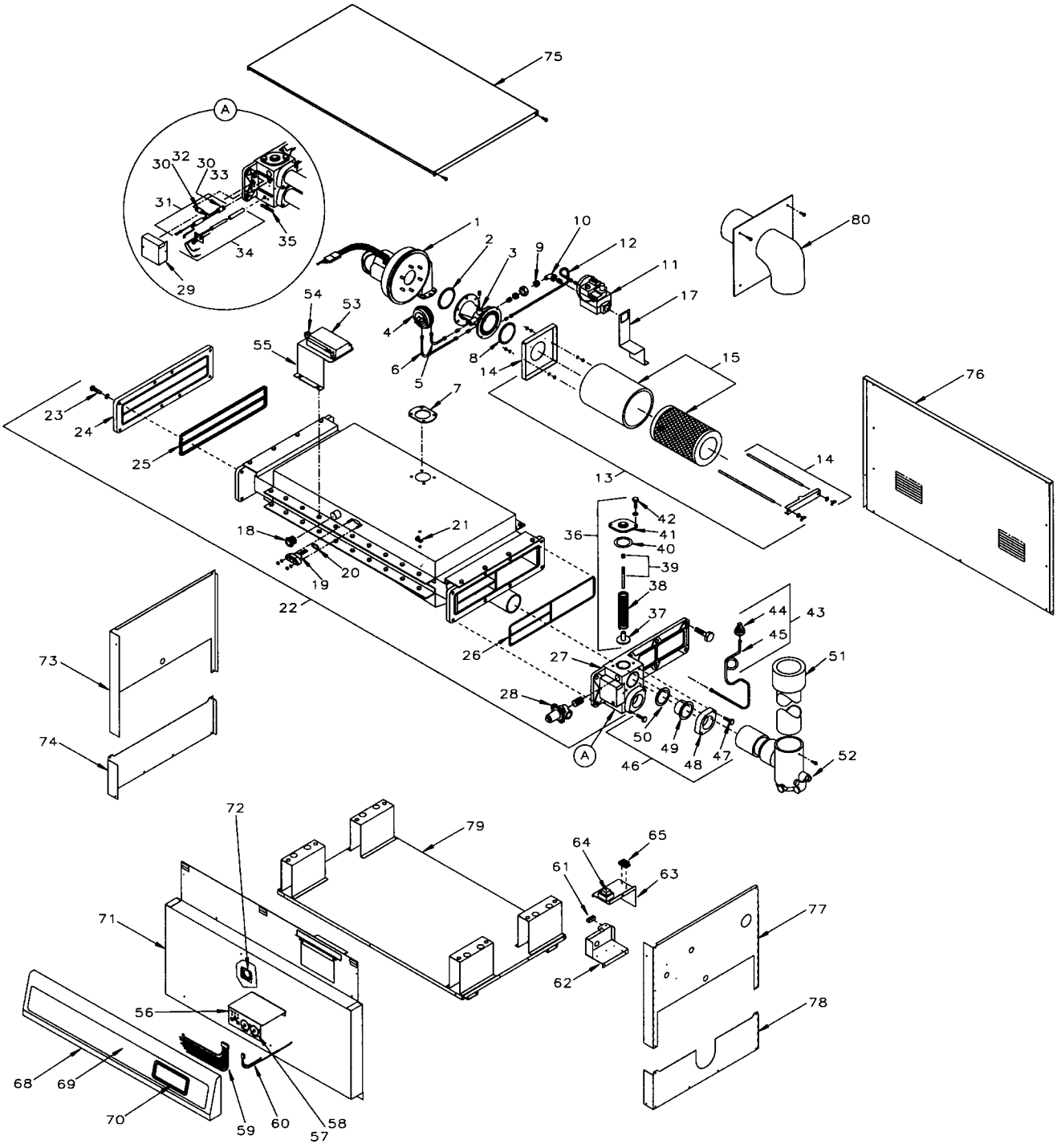
5A. General Information

To order or purchase parts for the Teledyne Laars Hi-E EPH 300 pool and spa heater, contact your nearest Teledyne Laars dealer or distributor. If they cannot supply you with what you need, contact Customer Service, Teledyne Laars, 6000 Condor Drive, Moorpark, CA 93021, telephone (805) 529-2000.

5B. Parts List

Item	Description	Part Number
1.	Fan, Combustion	R0204700
2.	O-Ring, Venturi	R0205400
3.	Venturi	R0015700
4.	Venturi Pressure Switch	R0203300
5.	Tube, Venturi Press. Sw., Throat	R0202300
6.	Tube, Venturi Press. Sw., Filter	R0202500
7.	Gasket, Combustion Fan	R0205500
8.	Plug, Pressure Test Point	R0204800
9.	Nipple, Gas Orifice	R0205600
10.	Orifice	
	Natural Gas	R0205700
	LP Gas	R0205800
11.	Valve, Gas	R0200100
12.	Tube, Venturi Press. Sw., Valve	R0202500
13.	Filter Assembly	R0204500
14.	Filter Support, Kit	R0206200
15.	Filter, Air	R0201800
16.	Harness, Combustion Fan	R0206700
17.	Bracket, Gas Valve	R0210900
18.	View Port Nipple	R0201500
19.	Igniter Assembly	R0016400
20.	Gasket, Igniter	R0205300
21.	Connector, Wire	E0092000
22.	Burner/Heat Exchanger Assy.	R0204200
23.	Bolt/Washer Set, Header	R0205900
24.	Header, Return	R0202200
25.	Gasket, Return Header	R0201200
26.	Gasket, In/Out Header	R0201100
27.	Header, In/Out	R0202600
28.	Pressure Relief Pressure	R0200000
29.	Cover, High Limits	R0201700
30.	Retainer, High Limits	R0207800
31.	Harness Assembly, High Limits	R0208000
32.	High Limit, 150°F	R0023000
33.	High Limit, 135°F	R0022700
34.	Sensor Assy., Temperature	R0208100
35.	Drain Cock/Plug Kit	R0010500
36.	Flow Control Assembly	R0208200
37.	Disc, Flow Control	R0011500
38.	Spring, Compression, Green	R0202000
39.	Rod/Nut Set, Flow control	R0206100
40.	Gasket, Flow Control	R0011400
41.	Cap, Flow Control	10557400
42.	Bolt/Washer Set, Flow Cntrl Cap	R0206000
43.	Water Pressure Switch Assy.	R0200300
44.	Water Pressure Switch	R0095100
45.	Siphon Loop, Water Press. Sw.	R0208300
46.	Flange Assembly	R0055000
47.	Bolt/Washer Set, Flange	R0211200
48.	Flange, 2 Inches	10573500
49.	Sleeve, Flange , 2 Inches	S0078200
50.	Gasket, 1-1/2 Inches Pipe Adapter	S0078100
51.	Vent Stack Assembly	R0203100
52.	Vent Adapter Assembly	R0202800
53.	Ignition Control	R0202900
54.	Fusible Link	R0012200
55.	Bracket, Ignition Control	R0209100
56.	Temperature Control Assembly	R0211300
57.	Knob/Temp-Lok Set	R0211400
58.	Label, Temperature Control	R0211600
59.	8-Pin Harness Assembly	R0212300
60.	3-Pin Harness Assembly	R0212400
61.	Lug, Neutral	E0106800
62.	Junction Box, Bottom	R0209500
63.	Junction Box, Top	R0209600
64.	Transformer, 120/24 VAC	R0200800
65.	Terminal Strip Assembly	R0209700
66.	Fuse Assembly	R0212600
67.	Fuse, 1 1/4 Amp.	R0021300
68.	Panel, Upper Front	R0205100
69.	Label, Upper Front Panel	R0209800
70.	Bezel, Temperature Control	R0209900
71.	Panel, Lower Front	R0210000
72.	Glass, Sight	F0038700
73.	Panel, Upper Left Side	R0210100
74.	Panel, Lower Left Side	R0210200
75.	Panel, Top	R0210300
76.	Panel, Rear	R0210400
77.	Panel, Upper Right Side	R0210500
78.	Panel, Lower Right Side	R0210700
79.	Base Assembly	R0210800
80.	Vent Termination*	10685600

*Required for Indoor Installations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TELEDYNE LAARS HI-E
LIMITED WARRANTY

Your Teledyne Laars Hi-E Model EPH 300 pool and spa heater is backed by this double warranty to assure your complete satisfaction.

1. Controls, copper heat exchanger tubes, combustion fan, burner, and firebox panels are warranted against defects in materials and workmanship for two (2) years from date of purchase.

2. All other parts are warranted against defects in materials and workmanship for five (5) years from date of purchase.

The above warranty applies only if the installation and operating instructions applicable to the model purchased are expressly and completely followed. These instructions are furnished with the unit and are also available by writing to the Teledyne Laars factory. The liability of Teledyne Laars shall not exceed the repair or replacement of defective parts, and shall not include transportation to or from factory, field labor, and consequential or incidental damages. Ship inoperative parts or complete heater with Serial number, Model number and purchase date, transportation prepaid, directly to address below, attention Customer Service.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

TELEDYNE LAARS

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20 Industrial Way, Rochester, N.H. 03867 (603) 335-6300
480 S. Service Road West, Oakville, Ontario, Canada L6K 2H4 (905) 844-8233

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