

# TROUBLESHOOTING

## IMPORTANT NOTICE

These instructions are primarily intended for the use of qualified personnel specifically trained and experienced in the installation of this type of heating equipment and related system components. Installation and service personnel may be required by some states to be licensed. Persons not qualified shall not attempt to install this equipment nor attempt repairs according to these instructions.

## **MECHANICAL (FOR QUALIFIED SERVICE PERSONNEL ONLY)**

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
Harmonics, or whining noise	U.G. Inoperative.....	Check movement by putting in hot water (110°F or higher). If no movement, replace.
	*Debris or restriction in system.....	Locate the restriction and remove. Flush system and clean.
	*Debris in gas line.....	Remove debris or blow out gas line.
	Low flow.....	Scale forming in heat exchanger - clean heat exchanger and check pool pH and total alkalinity.
Heater going on and off continuously	Dirty filter.....	Backwash filter.
	Low water level in pool.....	Raise water level.
	External bypass setting out of adjustment.....	Adjust bypass
	*Pressure switch out of adjustment.....	Adjust pressure switch
Liming or scale forming on heat exchanger	Poolwater.....	Recommended pH should be between 7.3 and 7.8 total alkalinity 100-150 PPM maximum. Hardness-150-400 PPM maximum. (see page 2)
Sooting	High flow rates.....	Reduce by adding manual bypass valve and adjust by putting thermometer in header (1/4" NPT) drain opening. Set bypass so thermometer reads between 105° and 110°F.
	U.G. Inoperative.....	Check movement by putting in hot water (110°F or higher). If no movement, replace.
	*Air starvation.....	Refer to installation instructions.
	*Improper venting.....	Follow recommended installation instructions.
	*Insects or debris clogging burner intake ports.....	Clean burners
Pilot outage	Low gas pressure.....	Adjust gas pressure.
	Restricted pilot.....	Clean pilot.
	Weak pilot generator.....	Replace pilot.
Yellow lazy flame	Low gas pressure.....	Adjust gas pressure.
	*Insects or debris clogging burner intake ports.....	Clean burners.

\*Usually occurs on initial start-up

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Outer jacket very hot (paint blistered)	*Broken refractory caused by shipping damage or improper combustion..... Excessive sooting of heat exchanger.....	Replace refractory panels.  Determine cause of sooting & correct.
Takes long time to heat pool or spa	Calculate temperature in °F/hr.....  Filter not running long enough..... Dirty filter..... Gas line or meter under-sized.....	Heat rise (°F/hr.) = $\frac{\text{Htr. output}}{\text{Pool gallonage} \times 8.33}$ or refer to heater sizing chart. This does not take into account heat loss due to weather. Reset time clock. Clean filter.  Refer to installation instructions.
Liming	Bypassing too much water.....  U/G not functioning.....	Inspect bypass for movement, if no movement, replace. Replace if no movement when heated.
Leaking at well.	Overacid.....	Replace well and maintain water chemistry properly.
Leaking at heat exchanger.	Overacid.....	Replace heat exchanger and maintain chemistry properly.
Gasket brittle and leaking- (overheated).	Heater running after pump shuts off..... Refractory damage..... Sooted heater.....	See pressure switch adjustment. Replace refractory. Determine cause of sooting and correct.

\*Usually occurs on initial start-up

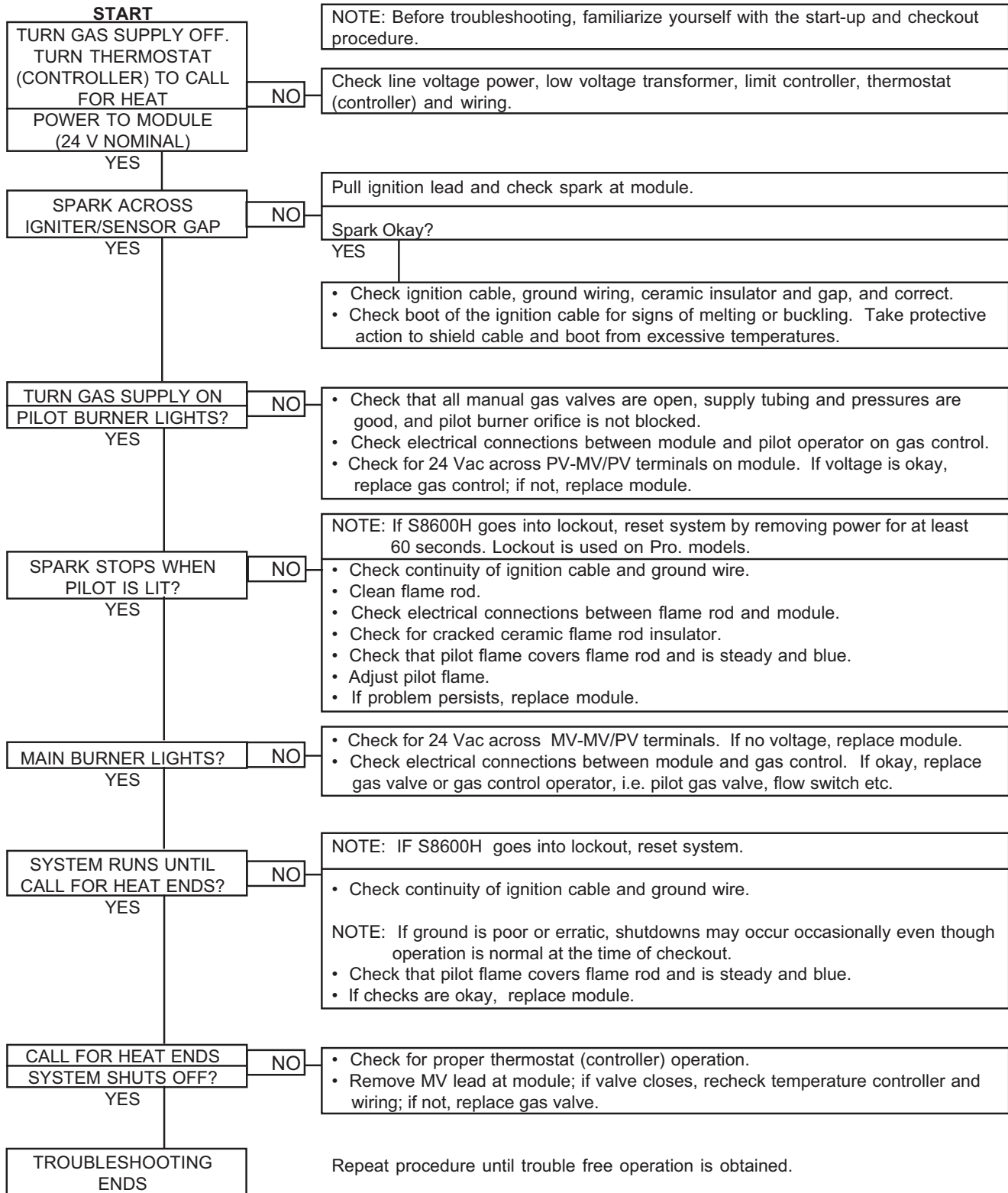
**ELECTRICAL (ELECTRONIC IGNITION IID) IID**

Intermittent Pilot System

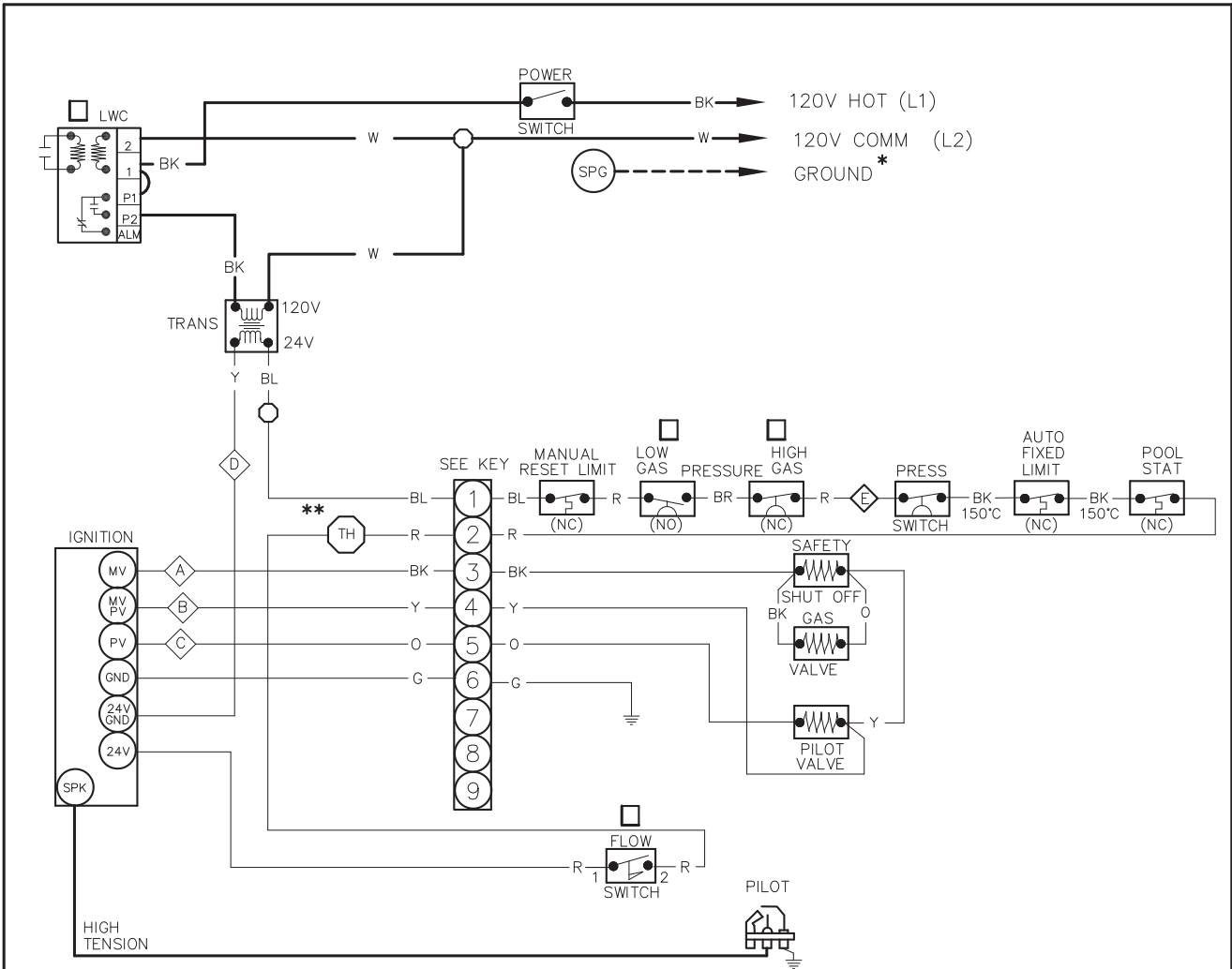
**TROUBLESHOOTING HONEYWELL S8600**

**WARNING: HIGH VOLTAGE.** For qualified technicians **ONLY**.

**NOTE:** Some heaters may be equipped with an ignition module that shuts off pilot gas if the pilot fails to light. To reset, interrupt power to the heater.



# Wiring Diagram—Models 926–1223



**NOTES:** \* USE GROUND CONNECTION PROVIDED. FAILURE TO PROVIDE PROPER GROUND MAY RESULT IN LOCK-OUT ALL GROUND  $\perp$  TERMINATE AT (SPG).

\*\* USE (TH) CONNECTION FOR FIREMAN SWITCH HOOKUP

(A) - (E) CONNECTIONS FOR OPTIONAL E-4 ALARM PANEL.

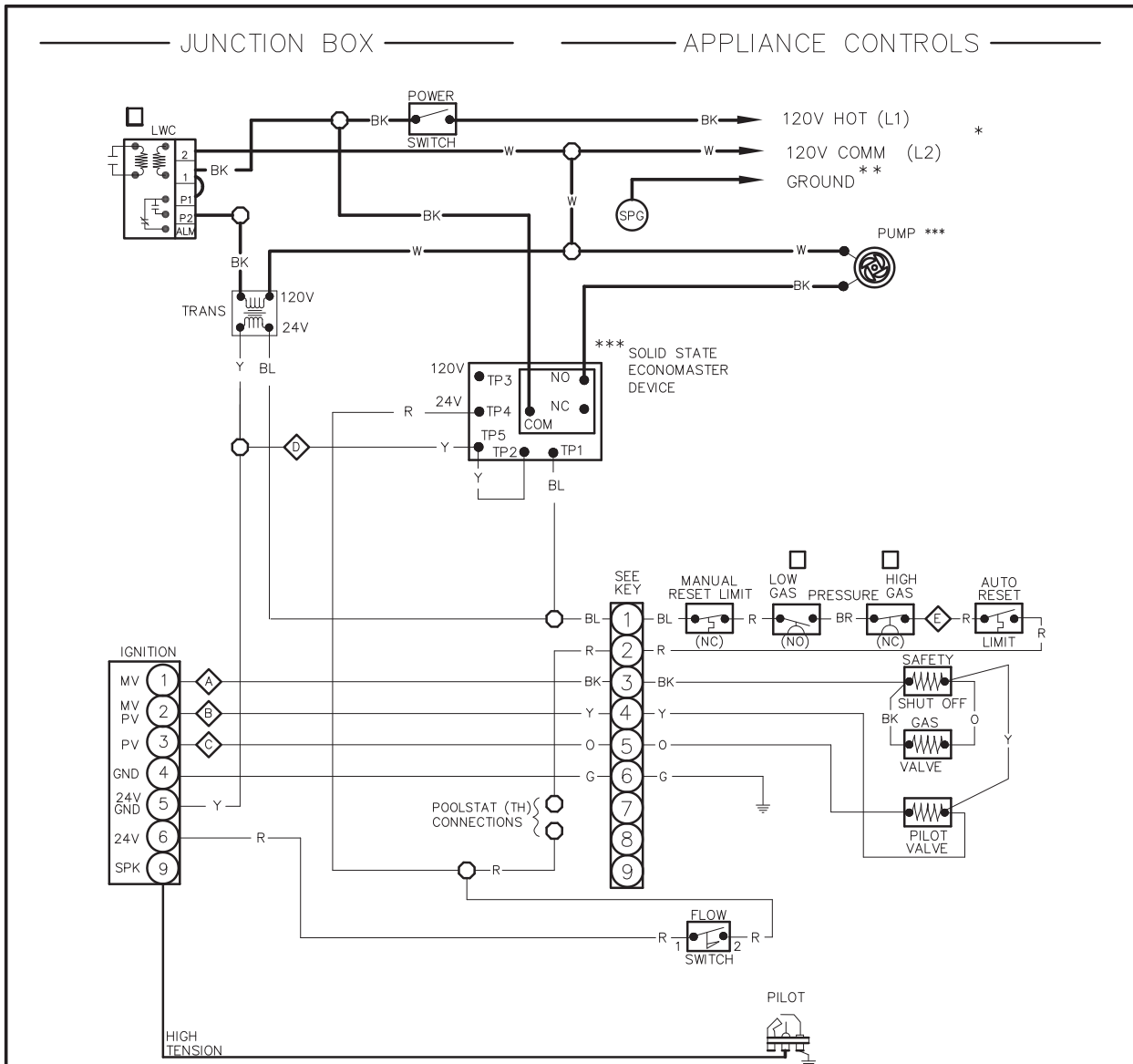
CHECK CONTROLS PROVIDED (WIRED AS SHOWN)  
REPLACE WIRING WITH 105°C WIRE OR 150°C WIRE AS NOTED

APPROVED BY:	
CHECKED BY:	
ORIG E.O. 2101	
05/15/86	
CHG E.O. 4304	
08/06/08	
<b>Raupak</b>	

<b>WIRING DIAGRAM IID</b>	
<b>FIRING MODE - ON/OFF</b>	
INPUTS:	926,000 THRU 1,223,000 BTUH
SIZE:	<b>926-1223</b>
TYPE:	<b>P</b>

KEY										
—	LOW VOLTAGE									
- - -	FIELD INSTALL									
—	LINE VOLTAGE									
- - -	FIELD INSTALL									
○	WIRE NUT									
(SPG)	GROUND									
BK	BLACK									
BR	BROWN									
R	RED									
O	ORANGE									
Y	YELLOW									
G	GREEN									
BL	BLUE									
V	VIOLET									
W	WHITE									
●	CONNECTION									
(TH)	THERMOSTAT PLUG (ACTUAL)									
<table border="1" style="margin: auto;"> <tr> <td>3</td> <td>2</td> <td>1</td> </tr> <tr> <td>6</td> <td>5</td> <td>4</td> </tr> <tr> <td>9</td> <td>8</td> <td>7</td> </tr> </table> FRONT VIEW		3	2	1	6	5	4	9	8	7
3	2	1								
6	5	4								
9	8	7								
<b>152103</b>	<b>10</b>									

# Wiring Diagram—Models 1287-1826



**NOTES:**

- \* POWER TO APPLIANCE MUST BE INTERLOCKED WITH MAIN SYSTEM FILTER PUMP.
- \*\* **USE GROUND CONNECTION PROVIDED. FAILURE TO PROVIDE PROPER GROUND MAY RESULT IN LOCK-OUT ALL GROUND ≡ TERMINATE AT (SPG).**
- \*\*\* PUMP USED MUST BE RATED AT 10 AMPS MAX OR 3/4 HP MAX. PUMP DELAY ADJUSTABLE BETWEEN 3-10 MINUTES.

**⬠-⬠** CONNECTIONS FOR OPTIONAL E-4 ALARM PANEL.

CHECK CONTROLS PROVIDED (WIRED AS SHOWN)  
 IF ANY OF THE ORIGINAL WIRE AS SUPPLIED MUST BE REPLACED, IT MUST BE REPLACED WITH ITS EQUIVALENT, 105°C OR 150°C AS NOTED.

CHECKED BY:	
APPROVED BY:	
ORIG E.O.	3171
	3/23/98
CHG E.O.	4249
	7/18/08
<b>Raupak</b>	

**WIRING DIAGRAM IID/ECONOMASTER FIRING MODE - ON/OFF**

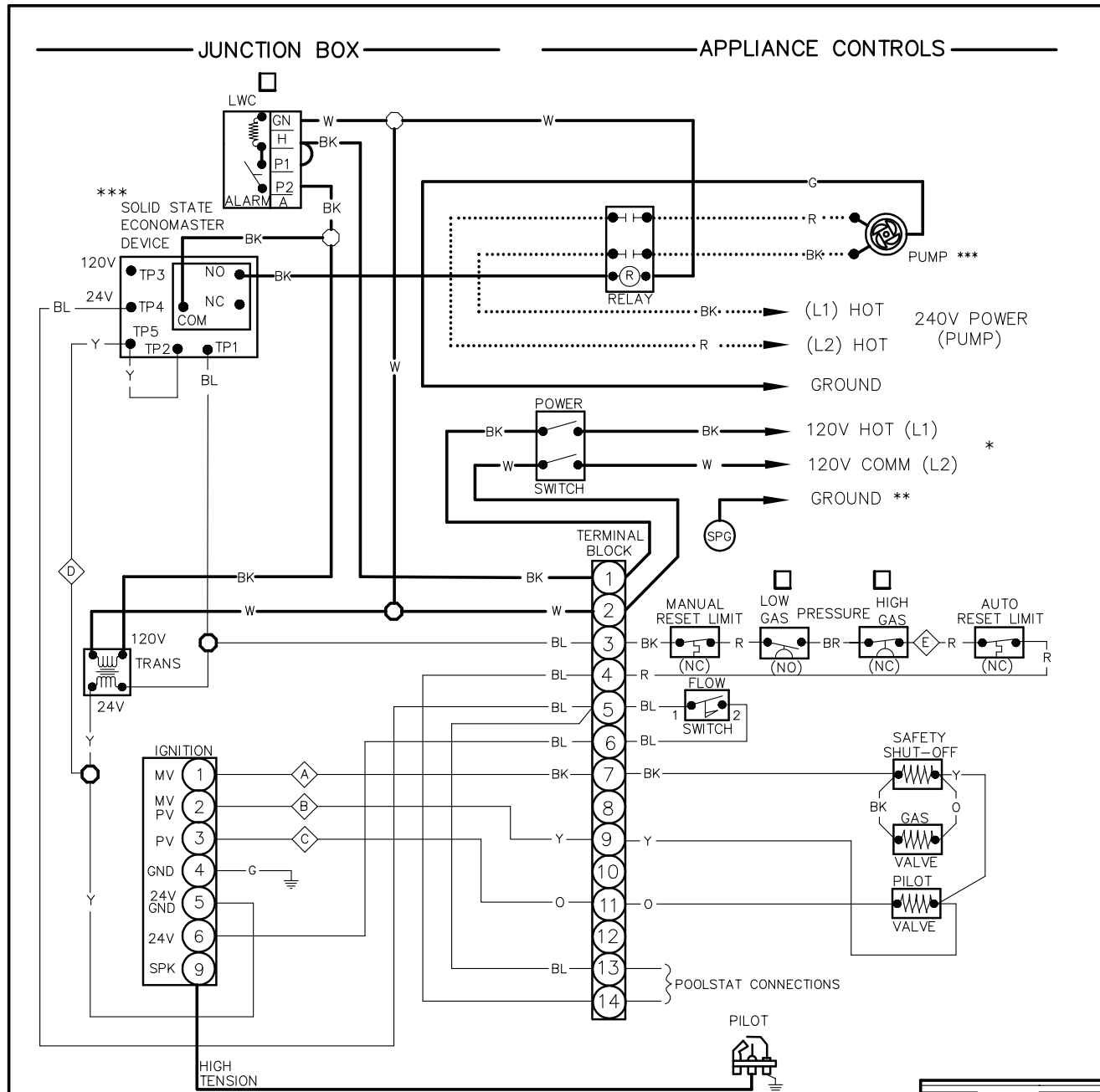
INPUTS: 926,000 THRU 1,826,000 BTUH

SIZE: **926-1826**

TYPE: **P**

KEY	
—	LOW VOLTAGE
----	FIELD INSTALL
—	LINE VOLTAGE
----	FIELD INSTALL
○	WIRE NUT
⊙	GROUND
BK	BLACK
BR	BROWN
R	RED
O	ORANGE
Y	YELLOW
G	GREEN
BL	BLUE
V	VIOLET
W	WHITE
PLUG (ACTUAL)	
FRONT VIEW	
<b>152403</b>	<b>4</b>

# Wiring Diagram—Models 2100-2500



**NOTES:**

- \* POWER TO APPLIANCE MUST BE INTERLOCKED WITH MAIN SYSTEM FILTER PUMP.
  - \*\* **USE GROUND CONNECTION PROVIDED. FAILURE TO PROVIDE PROPER GROUND GROUND MAY RESULT IN LOCK-OUT. ALL GROUND  $\neq$  TERMINATE AT (SPG).**
  - \*\*\* PUMP USED MUST BE RATED AT 10 AMPS MAX OR 3/4 HP MAX. PUMP DELAY ADJUSTABLE BETWEEN 3-10 MINUTES.
  - ⬡-⬢ CONNECTIONS FOR OPTIONAL E-4 ALARM PANEL.
  - ☑ CHECK CONTROLS PROVIDED (WIRED AS SHOWN)
- IF ANY OF THE ORIGINAL WIRE AS SUPPLIED MUST BE REPLACED, IT MUST BE REPLACED WITH ITS EQUIVALENT, 105°C OR 150°C AS NOTED.

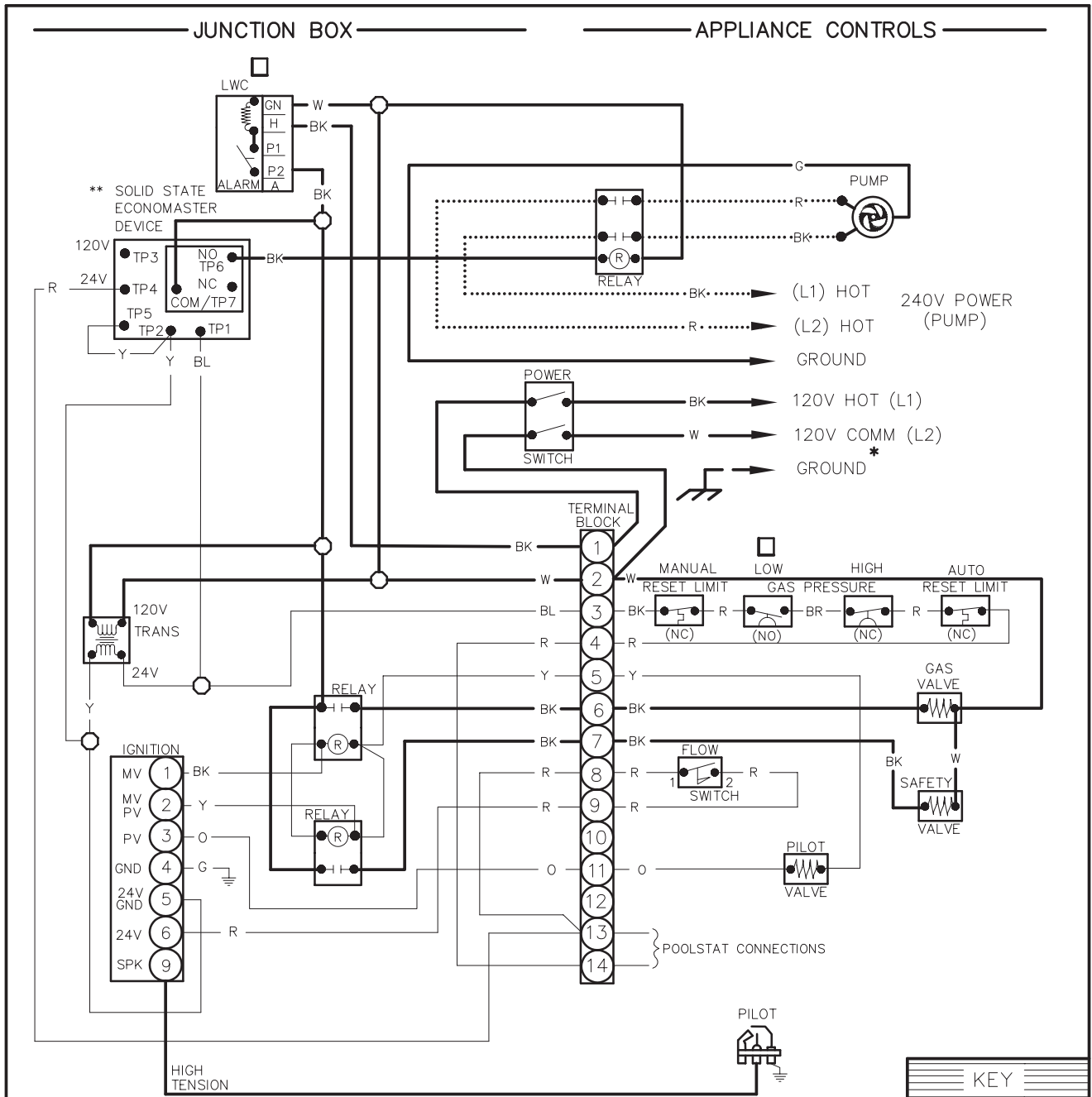
KEY	
—	24V 105°C
—	120V 105°C
- - -	120V 150°C
⋯	240V 105°C
○	WIRE NUT
⊙	GROUND
BK	BLACK
BR	BROWN
R	RED
O	ORANGE
Y	YELLOW
G	GREEN
BL	BLUE
V	VIOLET
W	WHITE

CHECKED BY:	
APPROVED BY:	
ORIG E.O.	3180
	12/13/99
CHG E.O.	3560
	9/29/06
<i>Raypak</i>	

<b>WIRING DIAGRAM IID ECONOMASTER</b>	
<b>FIRING MODE: ON/OFF</b>	
INPUTS:	2,100,000 THRU 2,499,000 BTUH
SIZE:	2100-2500
TYPE:	P

152456	2
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# Wiring Diagram—Models 3001-4001



**NOTES:**

POWER TO APPLIANCE MUST BE INTERLOCKED WITH MAIN SYSTEM FILTER PUMP.

**\* USE GROUND CLIP PROVIDED. FAILURE TO PROVIDE PROPER GROUND MAY RESULT IN LOCK-OUT**

**\*\* PUMP DELAY ADJUSTABLE BETWEEN 3-10 MINUTES.**

CHECK CONTROLS PROVIDED (WIRED AS SHOWN)  
REPLACE WIRING WITH 105°C WIRE ONLY

CHECKED BY:

APPROVED BY:

ORIG E.O. **3180**  
**12/27/99**

CHG E.O. **3335**  
**8/29/00**



**WIRING DIAGRAM IID ECONOMASTER  
FIRING MODE-ON/OFF**

INPUTS: 3,000,000 THRU 4,000,000 BTUH

SIZE: **3001-4001**

TYPE: **P**

**152457**

**1**

**KEY**

- 24V
- ..... 240V
- 120V
- - - 120V FIELD WIRE
- WIRE NUT
- BK - BLACK
- BR - BROWN
- R - RED
- O - ORANGE
- Y - YELLOW
- G - GREEN
- BL - BLUE
- V - VIOLET
- W - WHITE

# SERVICING

## General Location Of Controls

### Models 926-1826

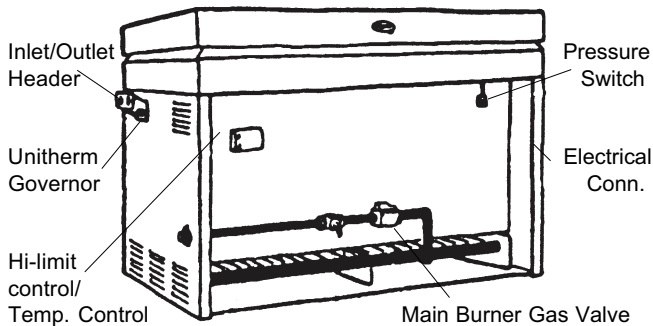


Fig. 28: General Location of Controls  
(Models 926-1826)

### Models 2100-4001

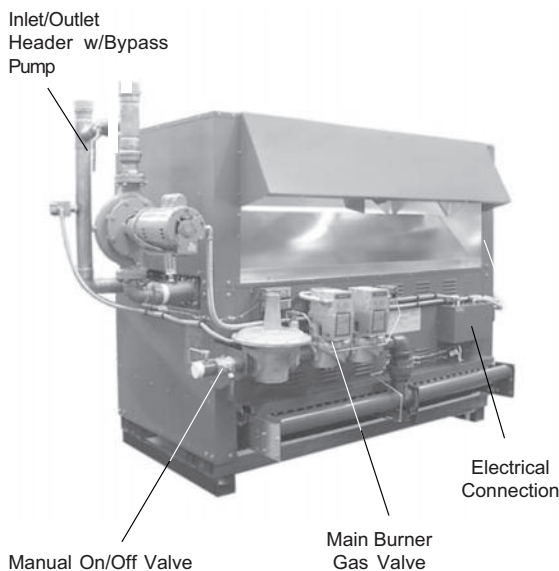


Fig. 29: General Location of Controls  
(Models 2100-4001)

## Temperature Control

The pool water temperature is controlled by the pool thermostat. The heater water temperature high limit is controlled by the manual reset high limit.

## Pressure Switch

The pressure switch, or heater actuator on Models 926-1223 equipped with a Unitherm Governor, ensures that the heater operates only when the filter pump is in operation. It is factory set at 1.75 PSI for deck level installations. When the heater is located below the level of the spa or pool, it may be necessary to reset the pressure switch to compensate for the no-flow static head. If it is necessary to reset the pressure switch, we recommend the following procedure.

## Pressure Switch Adjustment

1. Make sure the pool filter is clean before adjusting the switch.
2. Set the heater control to the OFF mode.
3. Turn the filter pump on and confirm that the pressure switch is closed (use a multimeter to check). If the pressure switch fails to close, either the switch setting is too high or the filter pump is not supplying enough pressure.
4. Turn the heater ON.
5. Manually turn the pressure adjustment knob clockwise until the heater shuts off. (A flat screw driver may be necessary if knob is too tight).
6. Slowly turn the adjustment knob counter-clockwise until the heater calls for heat again.
7. Turn an additional 1/2 turn counter-clockwise.
8. While the heater is running, check the adjustment by turning the pump off and on several times. The burners should shut off immediately when the pump is turned off. If it does not, repeat the above steps until proper operation is observed.



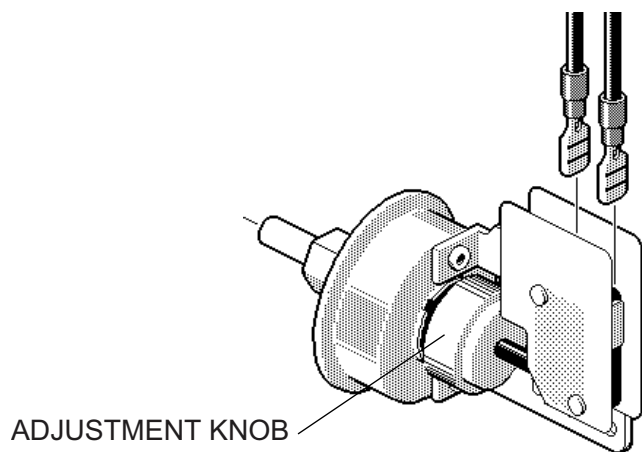


Fig. 30: Pressure Switch Adjustment Range

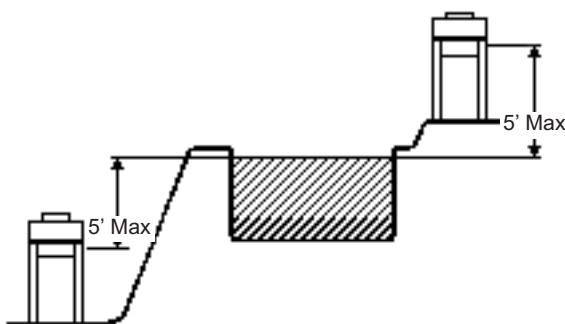


Fig. 31: Heat Exchanger Height Above/Below Pool

**NOTE:** If heater is installed outside of the limits shown, a flow switch must be used in place of the pressure switch when mounted and wired adjacent to the heater.

## Two-Speed Pumps

In some cases, the flow on the low speed is insufficient to operate the heater. This is apparent when the pressure switch cannot be further adjusted or if the heater makes banging noises. In these cases, the pump must be run at high speed when heating the water.

**CAUTION:** Do not operate the heater without the function of a properly adjusted pressure switch.

## Pilot Safety

The heater employs a pilot safety which closes the main gas valve within 8/10ths of a second whenever the pilot flame is interrupted. Pilot flame is automatically lit when the device is powered. Unit performs its own safety check and opens the main valve only after the pilot is proven to be lit.

# START-UP PROCEDURES

## Before Start-Up

### Burners

Clean main burners and air louvers of dust, lint and debris. Keep heater area clear and free from combustibles, flammable liquids, and chemicals. Do not obstruct the flow of combustion and ventilating air.

### Water

Water must be flowing through the heater.

## Start-Up

**CAUTION:** Propane gas is heavier than air and sinks to the ground. Exercise extreme care in lighting heater in confined areas.

## Lighting Instructions

1. Close all gas valves. Turn off electric power supply wait 5 minutes.
2. Open manual pilot valve. Turn on electric power, pilot is automatically lighted.
3. Open main gas valve.
4. Set temperature controls to desired temperature.

## To Shut Down

Close all manual gas valves. Turn off electric power.

## After Start-Up

### Pilot System Checkout Procedure

1. Turn on power to the ignition systems and turn gas supply off.
2. Check ignition module as follows:
  - a. Set the thermostat above pool water temperature to turn heater on.
  - b. Watch for continuous spark at the pilot burner.
  - c. Time the spark operation. Time must be within the lockout timing period (15 or 90 seconds).
  - d. Turn thermostat down to turn off heater and wait 60 seconds on lockout models before beginning step 3.
3. Turn on gas supply.
4. Set thermostat above pool water temperature to turn on heater.
5. Systems should start as follows:
  - a. Spark will turn on and pilot gas valve will open at once. Pilot burner should ignite after gas reaches the pilot burner.
  - b. Spark ignition should cut off when pilot flame is established.
  - c. Main gas valve should open and main burner should ignite after gas reaches the burner port.

## INSPECTION PROCEDURES

### Burners

Clean main burners and air louvers of dust, lint and debris. Keep heater area clear and free from combustibles and flammable liquids. Do not obstruct the flow of combustion and ventilating air. Make visual check of burner and pilot flame. Yellow flame indicates clogging of air openings. Lifting or blowing flame indicates high gas pressure. Low flame indicates low gas pressure.

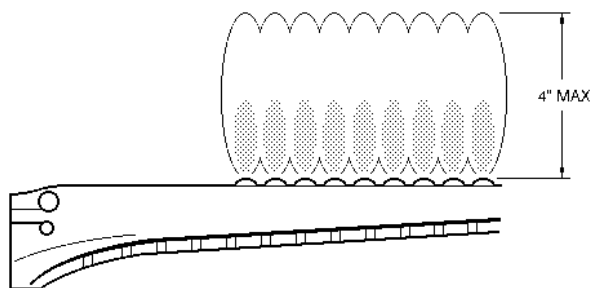


Fig. 32: Main Burner Flame



Fig. 33: Pilot Burner Flame

Feel inlet and outlet pipes. Outlet should be only slightly warmer than inlet. It should not be hot.

**WARNING:** Should overheating occur or the gas supply fails to shut off, turn off the manual gas control to the appliance.

## CONTROLS

Check all controls to see that they are operational. To check electric safety turn off main burner. Observe pilot burner when shutting off pilot gas. Ignition spark should go on. Main gas valve will also drop out.

# SERVICING PROCEDURES

## Tube Cleaning Procedure (Typical)

Establish a regular inspection schedule, the frequency depending on the local water condition and severity of service. Do not let the tubes clog up solidly. Clean out deposits over 1/16" in thickness.

Although the illustration shows the mechanical cleaning procedure of a small heater, it is typical of all sizes. The heater may be cleaned from the return header side as shown, without breaking pipe connections. It is preferable, however, to remove both headers for better visibility through the tubes and to be sure the ground up lime dust does not get into the system.

Note that you do not remove the top pan or the heat exchanger, generally.

After reaming, mount the wire brush in lieu of the auger and clean out the debris remaining in the tubes. Another method is to remove the heat exchanger, ream tubes and immerse heat exchanger in non-inhibited de-scale solvent.

## Burner Drawer Removal

1. Shut off power and gas supply to the pool heater. Disconnect union(s) and pilot tubing, then loosen and remove burner-hold down screws.
2. Disconnect wires at gas valve and slide burner drawer out.

## Gas Valve Removal

1. Shut off gas supply to the pool heater. Remove gas piping to gas valve inlet.
2. Disconnect wires, pilot tubing and bleed line, if required.
3. Turn vertical gas pipe from manifold slightly and unscrew gas valve.
4. Reverse above procedure to re-install.

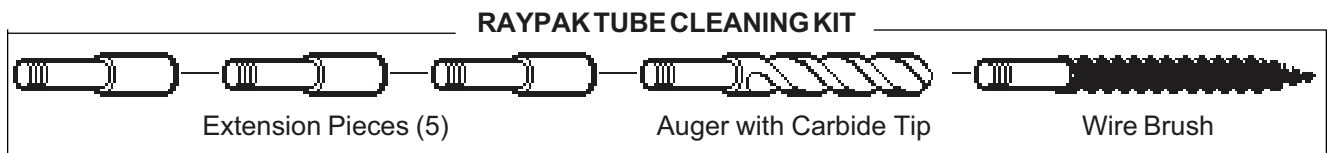


Fig. 34: Tube Cleaning Kit

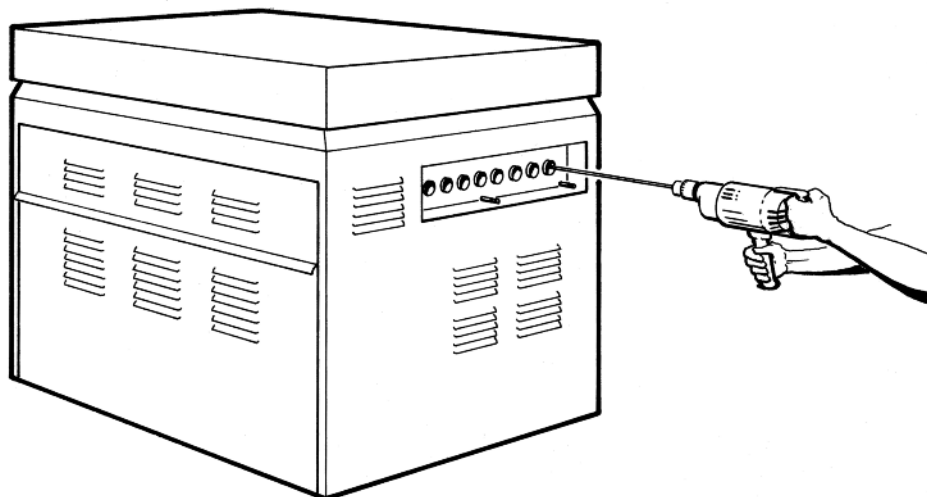


Fig. 35: Tube Cleaning Procedure

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## Main Burner and Orifice Removal

1. Remove screws and burner hold down bracket. NOTE: If the heat exchanger is sooted badly, the burner hold-down bracket and spacer can become distorted from direct flame impingement and this usually necessitates replacement of these parts.
2. Lift burners from slotted spacer and slide from orifices. Clean with a wire brush.
3. Orifices usually do not need to be replaced. To clean, run either copper wire or wood through orifice. Do not enlarge hole. To remove orifice, use a socket wrench and remove the manifold. DO NOT overtighten when reinstalling.

## Pilot Removal and Cleaning

1. Disconnect pilot tubing at pilot and sensor/igniter wire. Remove screws holding pilot bracket to burner drawer.
2. Remove pilot and bracket, clean pilot of debris, small bugs, etc., with wire or small brush.
3. Replace pilot, pilot tubing, sensor ignition wires and check for leaks.

## Heat Exchanger Removal

1. Shut water, gas and electricity off, close valves, relieve pressure and remove relief valve. Remove side inspection panels.
2. Remove top holding screws.
3. Remove draft diverter, lift and remove top and flue collector on stack type models. Remove inspection panels.
4. Loosen bolts and disconnect flange nuts on inlet/outlet header, loosen union(s) at gas pipe, and slide heater away from piping until studs clear the heater.
5. Remove heat exchanger corner brackets.
6. Remove combustion chamber clips at the four corners of the heat exchanger.
7. Lift heat exchanger straight up using caution not to damage refractory.

## Heat Exchanger Reassembly

1. Heat exchanger header O-rings should be replaced with new ones.
2. Install inlet-outlet and return water headers and install header retainer nuts and torque nuts evenly.
3. Install the four (4) corner clips between tube sheets and refractory. Replace "V" baffles.
4. Install thermostat sensing bulbs in header wells and replace bulb retaining clips.
5. Install inlet and return pipes in water headers using pipe thread sealant.
6. Install water pressure relief valve, flow switch, and low water cutoff devices if so equipped.
7. Open water supply and return shutoff valves. Fill heater and water piping system with water. Check heater and piping system for leaks at full line pressure. Run system circulating pump for a minimum of 1/2 hour with heater shutoff.
8. Shut down entire system and vent all radiation units and high points in system piping. Check all strainers for debris.
9. Install flue collector, jacket top and inspection panels. Install top holding screws. Install draft diverter and vent piping if so equipped.
10. If gas piping was disconnected, reconnect gas piping system and check for leakage using a soap solution.
11. Double check electrical circuits, grounding connections and pump with wiring diagram supplied with heater.
12. Check for correct water pressure and water level in the system. Make sure that system pump operates immediately on the call for heat. The system is ready for operation.

## Combustion Chamber Removal

To remove the combustion chamber you must first have removed the heat exchanger. Unbolt metal combustion chamber retainer from top and remove combustion chamber panels individually.

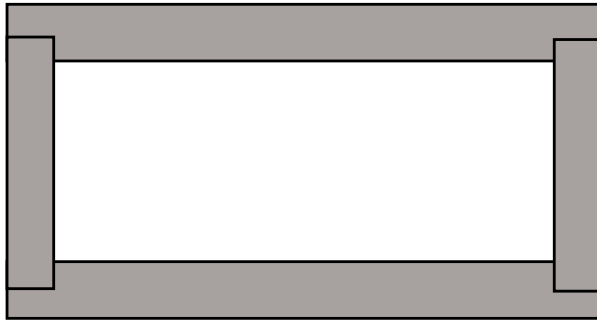


Fig. 36: Refractory Panels—Top View

## Control Well Replacement

Remove top, sensing bulb and clip. Collapse well tube at the open end and with a chisel, push through into the header, and remove the well through header. Insert a new well and roll into place. If a roller is not available, solder the well in place with silver solder.

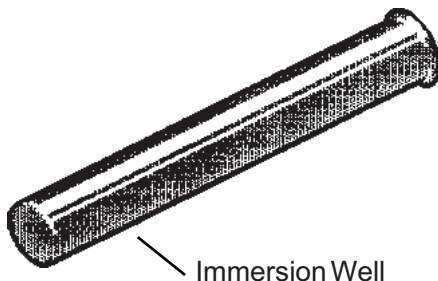


Fig. 37: Immersion Well

## Tube Replacement Procedure

On Raypak tube replacement may be affected without rolling, as a temporary means of repair, provided there are two or more tubes rolled into act as stays on left and right sides. The "O" rings should provide a seal up to 125 PSI working pressure. Use a 3/8" heavy duty reversible drill motor or larger, to power the tube roller. If a reversible drill is not available, after rolling the tube in, remove the drill motor and wrench out the roller. A tube roller is available from the factory.

Shut gas and power off to the unit, close the system off and drain the pool heater. Remove draft diverter. Remove the access panels and jacket top. Lift the

canopy and flue collector off (on models 926-1826, remove the canopy hold-down brackets). Remove "V" baffles over tube(s) to be replaced. If no pipe unions have been provided, use the header as a union, remove the flange nuts off the inlet-outlet header, break gas connection and slide heater away from piping, allowing room to work. Pull wedge clips out of control wells and remove sensing bulbs. Remove flange nuts from the return header and remove header. Lift heat exchanger straight up and out.

Heat exchanger header o-rings must be replaced with new ones. The tube may be cut out with a hack-saw or hammer and chisel adjacent to both tube sheets, leaving stubs in the tube sheets. Then proceed to collapse stubs in the tube sheets with a chisel or screwdriver. Use caution not to cut into the tube sheet. Replacement tubes will have the fins stripped off longer on one end. The long end is inserted into the opening of the tube sheet first; then the short end is fitted through the opposite tube sheet. If the tube ends become dented or bent, straighten at least four (4) inches back from the tube end by means of a tapered punch.

Insert tube roller into tube opening up to stop against tube, then push center rod in until roller is tight. Be careful to keep replacement tube squared up 1/8" outside each tube sheet. A loose tube will sometimes pull toward the roller. Attach drill motor to tube roller, holding it straight and level. Proceed to expand tube until the tool begins to grab. At this point, 1/2" to 1" should be exposed on the tool shank. Reverse drill motor or wrench out by hand. Care should be exercised to avoid applying excessive torque during rolling operation and to avoid thinning out any part of the tube wall excessively over .015". Use same procedure at the opposite end of the tube.

Apply line pressure test, and re-roll, if necessary, before replacing canopy.

## Procedure For Cleaning Flue Gas Passageways

Soot can clog areas behind fins and cause eventual tube failure. Any sign of soot at base of burners or around outer jacket indicates a need for cleaning.

1. Lift off draft hood and flue collector by removing bolts and screws.
2. Remove "V" baffles from heat exchanger.
3. Remove burner tray.

- Take garden hose and wash heat exchanger, making sure soot is removed from between fins. (Avoid excessive water against refractory).
- Reassemble; when heater is fired, some steam will form from wet refractory. This is normal.

**NOTE:** In extreme cases it may be necessary to remove the heat exchanger completely for cleaning. The simplest method is steam cleaning at a local car wash. **DO NOT WIRE BRUSH!**

**CAUTION:** Soot is combustible, so exercise extreme care.

## Unitherm Governor Replacement

- Shut off water, gas and electricity, close valves, relieve pressure.
- Drain heat exchanger.
- Remove Unitherm Governor.

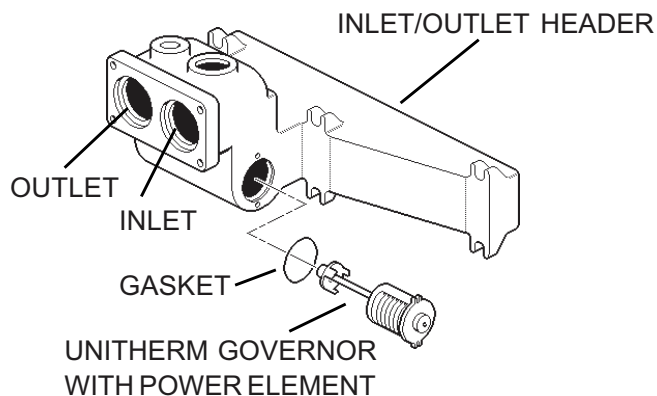


Fig. 38: Unitherm Governor—Models 926–1223

To test operation of Unitherm Governor, place in hot water (110°F or higher) and watch for movement against spring. If no movement, replace.

## MAINTENANCE AND CARE

To be followed one month after initial start-up and then quarterly.

- Inspect top of heater and draft-hood for soot, and open fuel gas passageways.
- Clean main burners and pilot burner of dust and lint.

**CAUTION:** Soot may be combustible. Wet completely when cleaning.

- Inspect and operate all controls and gas valve.
- Make visual check of burner and pilot flame. Flame pattern on main burner and pilot is indicated on page 26. Yellow flame means restriction of air openings. Lifting or blowing flame indicates high gas pressure. Low flame means low gas pressure.
- Clean room air intake openings to ensure adequate flow of combustion and ventilation air.
- Remove header opposite inlet pipes when cleaning and inspect internal tubes for scale deposits. If scale does not form within first quarterly inspection, then inspect annually thereafter.

**CAUTION:** Combustion air must not be contaminated by corrosive chemical fumes which can damage the heater and void the warranty.

- Keep heater air clear and free from combustible materials and other flammable and corrosive vapors and liquids.
- Keep moving parts lubricated.
- Manual operation of pressure/temperature relief valve at least once a year.