



**MANUFACTURED BY:**



4109 CAPITAL CIRCLE  
JANESVILLE, WISCONSIN 53546  
1-800-753-1601  
FAX 1-608-757-7878  
[www.lanair.com](http://www.lanair.com)

**INSTALLATION AND OPERATING INSTRUCTIONS**

**MODEL  
HI-320**



**LISTED MH 14518 (N)**

**ALL INSTALLATIONS MUST BE MADE IN ACCORDANCE WITH STATE AND LOCAL  
CODES, WHICH MAY DIFFER FROM THIS MANUAL.**

**HEATER MUST BE INSTALLED AND/OR INSPECTED BY A LICENSED HEATING  
CONTRACTOR BEFORE OPERATION.**

**NOT FOR RESIDENTIAL USE.**

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# SECTION 1 WARRANTY

Please fill out warranty card and return it within 30 days to:

**Lenan Corp./LANAIR**  
4109 Capital Circle  
Janesville, WI 53546

1.2 Lenan Corp. (Manufacturer) warrants to the original purchaser of this used oil heater, that it will repair or replace at Lenan Corporation's option, any part which is in normal use proves to be defective in material or workmanship, within a period of one year from the date of purchase, provided same is returned (transportation pre-paid) F.O.B Janesville Wisconsin, for Lenan Corporation's inspection and warranty determination. Normal wear and tear items are not covered. Lenan Corporation does not warrant paint finish. The warranty does not cover labor charges involved with part replacement or service unless pre-authorized in writing. Lenan Corporation may also require photographs of the heater installation for warranty determination.

1.3 Conditions that will Void Warranty:

Use of liquids such as: Solvents, Brake Fluid, Gasoline, K-1, Kerosene, Paint Thinners, Gear Lube, Transformer Oil, Cutting Oils, antifreeze, water or any other liquid not approved for use.

Tampering with internal components.

Heater has not been installed in accordance with the manual.

Unit has not been serviced in accordance with the manual.

Any part has been altered or misused.

Any part, other than those supplied by Lenan Corp., are used to operate this heater.

This warranty is limited to the original purchaser only, and is void if moved from the original site of installation.

## SECTION 2 GENERAL INFORMATION AND HAZARDS

2.1 The Lanair Heater provides the owner with a dependable, versatile and simple means of burning No. 1 and No. 2 fuel oils, 10W through 50W used crankcase oils, and used automatic transmission fluids. Maintained correctly, the heater will give you years of service. Please carefully read this owners manual. If in any case you have a problem with your heater, or its installation, you should contact the Lenan customer service department at 800-753-1601.

### 2.2 DIMENSIONS

HI-320 Height: 29" Width: 54" Depth: 53" Weight: 475 LBS

### 2.3 FIRING CAPACITIES

HI-320 Nozzle @ .222 gallons/hour, No. 2 fuel oil

2.4 This heater is for commercial or industrial use only.

2.5 The installation of this equipment is to be done in accordance with all state and local codes or authorities having jurisdiction over environmental control, fuel, fire, and electrical safety.

2.6 N.F.P.A. (National Fire Protection Association Publications for Heater Installation)

NFPA No. 30 Flammable and Combustible Liquids Code

NFPA No. 31 Standard for the Installation of Oil/Burning Equipment

NFPA No. 70 National Electrical Code

NFPA No. 80 A&B Repair Garages and Parking Structures

NFPA No. 211 Standard for Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances

The above standards are available from the N.F.P.A. National fire Protection Association, Battery March Park, Quincy, MA 02269.

## SECTION 2 CONTINUED

- 2.7 An experienced, qualified heating contractor must install this heater and system.
- 2.8 This heater is not designed for attachment or use with ductwork (unless a ductable model has been purchased).
- 2.9 This heater is designed to burn the following approved fuels:
- Used 10W through 50W Crankcase Oils
- Used Automatic Transmission Fluid
- No. 1 and No. 2 Fuel Oils
- 2.10 **Do not attempt to start the burner when excess oil, oil vapor, or fumes have accumulated! Never press the red button on the oil primary control more than twice! This could cause excess vapor, or fuel to ignite causing damage to the heater and/or chimney.**
- 2.11 **Do not** store or use gasoline, or any other flammable liquid and/or vapors near this heater.
- 2.12 This heater **is not** designed for use in **hazardous atmospheres** such as: Paint Shops, Feed Mills, installations where explosive, or flammable conditions are present or could occur.
- 2.13 **WARNING!**  
Lanair heaters rely on natural draft. Down drafts (positive pressures) in the heaters chimney will occur in buildings where negative pressures are created by exhaust fans, (car exhaust, paint booths, etc). Do not try to use a power vent to overcome a down draft (positive pressure). An adequate make-up air system is required when exhaust fans are used (consult your heating contractor).

## SECTION 3 HEATER INSTALLATION

- 3.1 Do not install the heater on a combustible surface of any kind.
- 3.2 Install the heater in a location to utilize total heat throw.
- 3.3 Install the heater in a location to permit a correct outdoor chimney exit to eliminate down drafts, and provide easy chimney installation and maintenance.
- 3.4 Install the heater in a location to permit the fuel supply to be as close as possible.
- 3.5 Do not install the heater more than 10 feet above the top of the fuel supply tank.
- 3.6 Before suspending the heater check the supporting structure and reinforce if necessary to support the weight of the heater/system. Refer to Section 2.2.

### 3.7 **Minimum Clearance to combustibles**

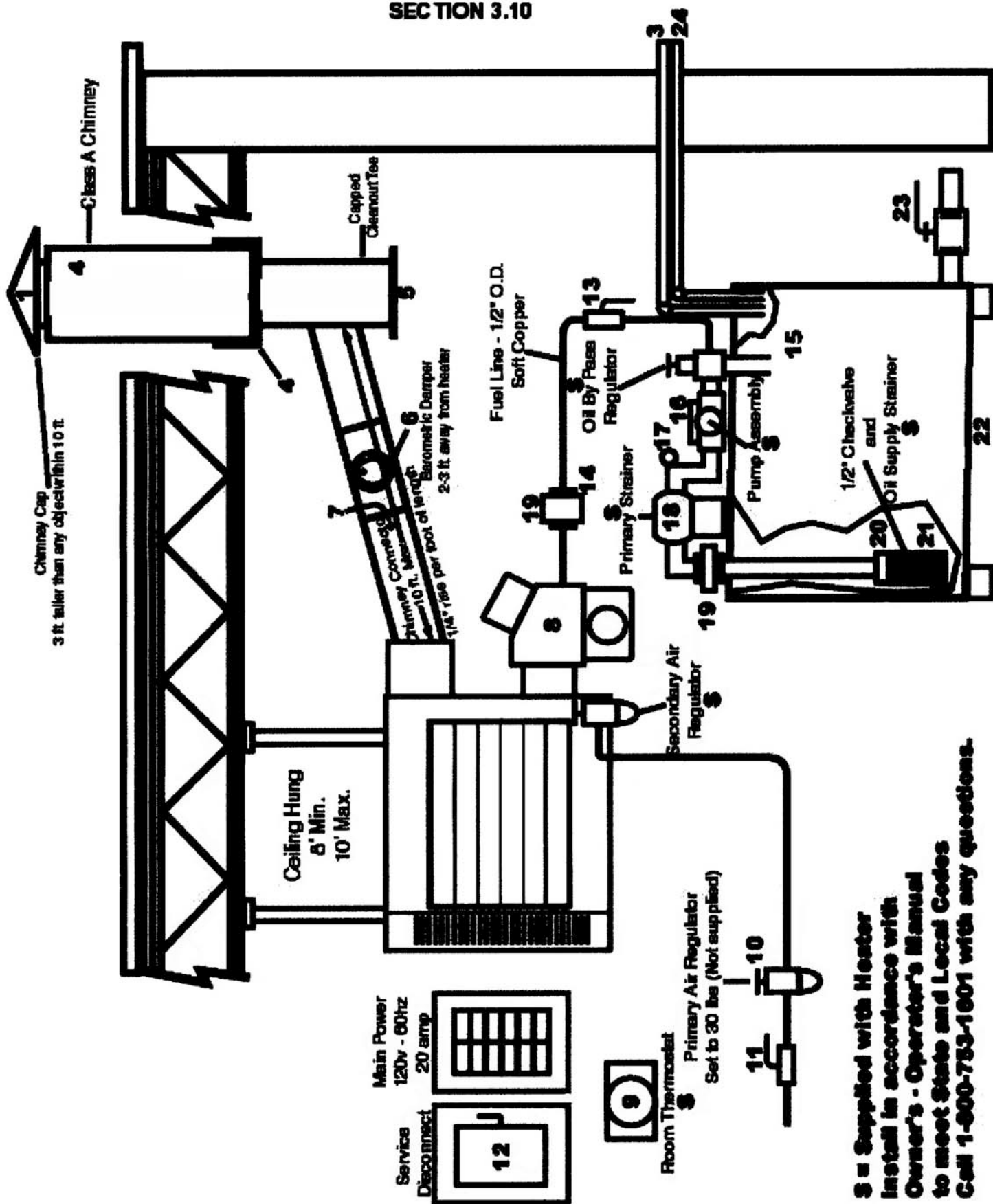
Top	6"	Chimney Connector	18"
Sides	18"	Rear	18"
Front	24"	Bottom	18"

- 3.8 Use 3/8" steel threaded rod to suspend the heater from a capable load carrying ceiling structure when not using the Lanair® Waste Oil Storage Tank.
- 3.9 The heater must be suspended level for proper operation. A heater that is installed not level could cause a hazardous situation in which personal injury or property damage may result.
- 3.10 Installation Diagram (See page 6A).

## **IDENTIFICATION OF INSTALLATION**

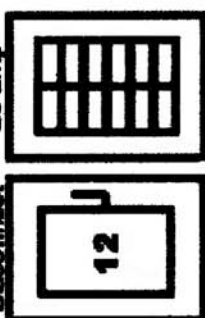
1. Chimney Cap
2. Class "A" Insulated Chimney
3. Tank Vent
4. Non-Combustible Collar
5. Chimney Clean-Out
6. Barometric Draft Control
7. Draft Reading Port
8. Burner
9. Room Thermostat
10. Primary Air Regulator
11. Shut-Off Valve
12. Electrical Disconnect
13. Shut-Off Valve
14. Fuel Pressure By-Pass Regulator
15. Overflow/Return Line
16. Fuel Pump
17. Vacuum Gauge
18. Suction Line Strainer
19. Union
20. Check Valve
21. Pick-Up Tube Strainer
22. Supply Tank
23. Water/Sludge Drain
24. Fill Pipe

SECTION 3.10



Main Power  
120v - 60hz  
20 amp

Service  
Disconnect



Room Thermostat  
Primary Air Regulator  
Set to 30 lbs (Not supplied)



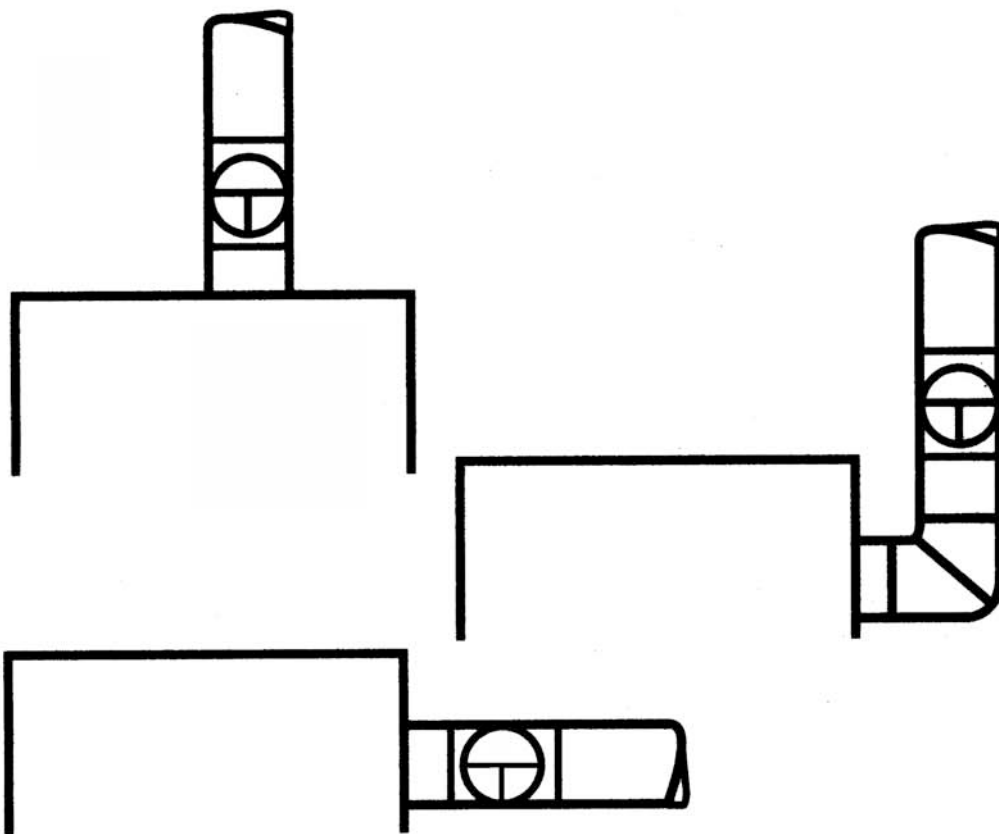
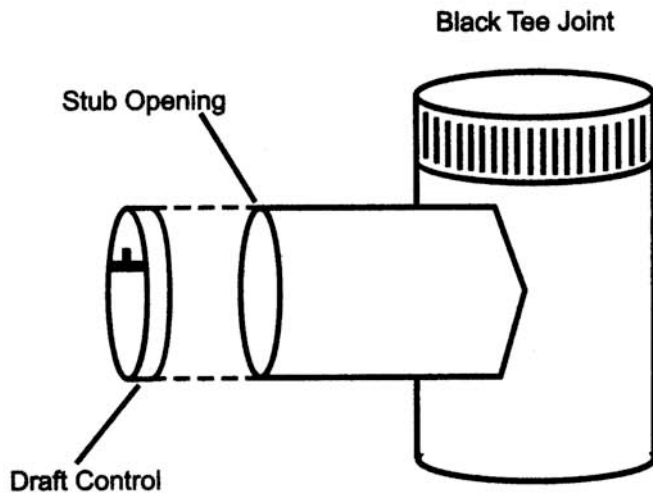
**S = Supplied with Heater  
Install in accordance with  
Owner's - Operator's Manual  
to meet State and Local Codes  
Call 1-800-753-1601 with any questions.**



## SECTION 4 CHIMNEY INSTALLATION

- 4.1 Failure to provide proper venting of the heater exhaust gases could result in death, serious injury, and/or property damage **FOLLOW CHIMNEY MANUFACTURERS INSTRUCTIONS.**
- 4.2 Safe operation of any gravity vented heating appliance requires a proper air make-up system to prevent the heater exhaust gases from being drawn into the building. These gases could cause death, serious injury, and/or property damage. Exhaust fans, paint booths may cause draft problems.
- 4.3 **Never** vent this heater into another heating appliances chimney. **Never** vent into 'Class B" chimney. Gas heaters use "Class B" chimney, it is rated for a much lower temperature than is required for your waste oil furnace. This heater must have its own separate "**Class A**" chimney.
- 4.4 Inspect and maintain the chimney on an annual basis.
- 4.5 Install a U.L. listed barometric damper in the chimney. Do not reduce or enlarge the vent pipe.
- 4.6 **Do not** use more than one 90° elbow. Each 90° elbow equals a 10' run of chimney. The maximum run for the chimney connector is 30'.
- 4.7 To prevent the drawing of exhaust gases into the building, keep the barometric draft control at least 24" from the heater, exhaust fan etc..
- 4.8 Position the draft control as shown. Chimney angle gate pins must be horizontal for proper operation.
- 4.9 Secure all connections in the chimney connector with 3 screws per joint.
- 4.10 The chimney connector clearance to **any** combustible material is 18". The "Class A" chimney clearance to **any** combustible is 2". Follow the manufacturers instructions.
- 4.11 Do not install heat re-claimers, manual draft controls, or any other type of restrictive control in the chimney.

**SECTION 4 CONTINUED  
CHIMNEY INSTALLATION**



Draft Control Placement Examples

**The Barometric Damper must be installed 24" – 36" from the heater.**

## SECTION 4 CONTINUED

- 4.12 Install a clean out tee with a cap, at the transition of the chimney. **FOLLOW CHIMNEY MANUFACTURERS INSTRUCTIONS.**
- 4.13 Use “Class A” insulated chimney pipe to vent exhaust gases through wall, ceilings, attics, roofs, combustibles, etc..
- 4.13 Vent chimney at least 3 feet above the roof and at least 3 feet higher than any portion of the building, roof, or obstruction within 10 feet of the chimney.
- 4.14 The chimney cap should be at least 3’ above the chimney exit.
- 4.15 Do not use a rotating chimney cap. Use a non-restrictive “Class A” cap made for the type of “Class A” chimney you are using. Follow chimney manufacturers instruction.**
- 4.16 The chimney must be capable of producing a negative -.02 W.C. draft when cold and -.06 W.C. draft when hot. Refer to Section 5 Draft Instructions. Refer to Section 3.10 for typical Chimney Installation.
- 4.17 If you are unable to attain the proper draft, check for exhaust fans in the building. To test if there is a problem, open an overhead door and see if you now have the proper draft. You may have to add one or more sections of “Class A” chimney to the roof to get the proper draft.
- 4.18 The heater and chimney must be installed in accordance with all state and local codes. The heater must be installed in accordance with the specifications listed in this manual. The chimney must be installed per the chimney manufacturers instruction. Use “**Class A**” chimney only.

**FOLLOW THE CHIMNEY MANUFACTURERS  
INSTALLATION INSTRUCTION AS WELL AS STATE  
AND LOCAL FIRE CODES.**

## **SECTION 5 DRAFT**

The Lanair heater should have a (negative) -.02 draft reading when cold, and a (negative) -.06 when hot. Check the heater when it is running after 45 minutes. If the reading is not what it should be, adjust the barometric damper according to the instructions provided with the damper. The draft reading should be taken with a manometer. Consult your heating contractor, or manometers can be purchased from the Lenan customer service department 800-753-1601.

## **SECTION 6 FUEL SUPPLY TANK INSTALLATION**

**If using a Lanair supply tank follow instructions included with the tank.**

- 6.1 The fuel supply tank and supply lines must be installed in accordance with the National Fire Protection Association requirements, as well as State and Local ordinances. See Section 2.
- 6.2 Regulations require oil storage tanks located inside not too exceed 275 gallons individually, and are not to exceed a total capacity of 550 gallons in one building. Check State and Local codes.
- 6.3 Locate the fuel supply tank inside the building as close to the heater as possible. It should be no further than 25 feet from the heater to avoid oil flow problems.
- 6.4 The fuel supply tank must be mounted below the burner and the by-pass regulator. Mounting the fuel supply tank above the burner will create head pressure and overfire the burner voiding the warranty.
- 6.5 Pitch the fuel supply 2° with the drain valve at the lowest end to drain off water and sludge. Sludge may have to manually be removed.
- 6.6 Some ordinances may require the fuel supply tank to be vented to outside, and above the roofline. Check State and Local codes. Keep the vent clear.
- 6.7 Install the fuel tank fill pipe at the end of the tank and above the drain.
- 6.8 Label the fuel tank for the recommended fuels. See Section 1.3.
- 6.9 Strain all fuel with a 50 X 50 mesh strainer before putting fuel into the tank.
- 6.10 When filling the fuel tank with a motorized pump, never leave unattended to prevent over filling and/or spillage.
- 6.11 Keep vent cap on the fuel tank when not filling.
- 6.12 Refer to Section 3.10 for typical fuel tank installation.

## SECTION 7 FUEL SUPPLY PUMP/PIPING

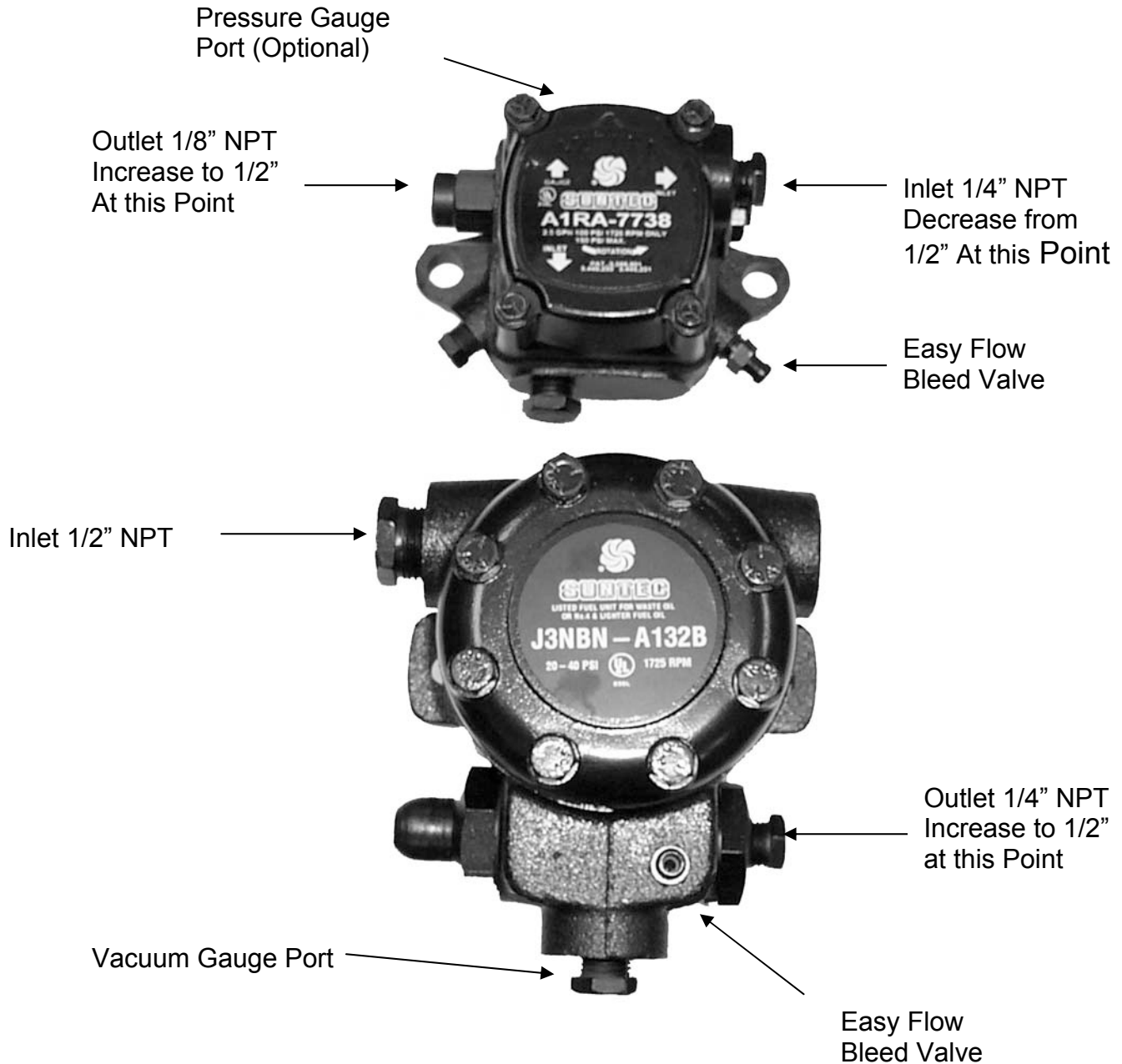
- 7.1 Mount the fuel supply pump in a **Horizontal** position (shaft horizontal) near the fuel supply tank.
- 7.2 The oil pump has a maximum suction lift of 14 feet. Suction lift is the length of pipe run from the bottom of the pick up strainer to the fuel supply pump.
- 7.3 The fuel pump/motor are for indoor use **only**.
- 7.4 The fuel pump contains an internal strainer that periodically needs to be cleaned. This internal strainer is mounted behind the pump cover. Before removing the pump cover make sure you have a new gasket on hand. Contact the Lenan customer service department for the proper gasket for your model of pump, at 800-753-1601.
- 7.5 Install the suction supply line from the inlet side of the fuel pump into the fuel tank opposite the drain.
- 7.6 Install a 1/2" inside diameter (.493) steel pipe, or 1/2" outside diameter copper throughout the suction supply line and pick up tube. The use of smaller line, or rubber, plastic or hydraulic line is unsafe and **will void** your warranty.
- 7.7 Use thread sealing compound on all pipe thread connections. **Do Not** use Teflon Tape.
- 7.8 Install the suction line strainer in the suction line. Make sure the suction line strainer is 6" off the bottom of the tank. The suction line strainer may be mounted horizontally or vertically. Consider accessibility.
- 7.9 Install a 1/2" NPT pipe union between the suction line strainer and the pick up tube to allow for service on the pick up tube.
- 7.10 Install the check valve (arrow facing towards the pump) on the bottom of the pick up tube.
- 7.11 Install a vacuum gauge in the suction line. This gauge will indicate when service is needed on the strainer, pump, connections, or fuel level.

## SECTION 7 CONTINUED

- 7.12 Install a 1/2" inside diameter (.493) steel pipe, or 1/2" outside diameter copper from the fuel by-pass regulator (port marked "O") to the fuel supply pump. Do not allow this line to protrude into the tank more than 1". The use of smaller line, or rubber, plastic or hydraulic line is unsafe and **will void** your warranty.
- 7.13 **Do not** allow the fuel level in the tank to cover the return line.
- 7.14 Install the fuel supply line from the fuel by-pass regulator (port B) to the inlet port on the left side of the burner using 1/2" inside diameter (.493) steel pipe, or 1/2" outside diameter copper tubing. The maximum distance of this line is 25 feet. The fuel supply line must be run below the burner at all times. If the fuel supply line runs above the burner it will create head pressure. This head pressure will overfire the burner voiding the warranty.
- 7.15 Install a union in the supply line close to the burner for service.
- 7.16 Install a shut-off valve in the fuel supply line at the fuel by-pass regulator for service.
- 7.17 **Use 37° flare fittings on all copper tubing connections.** Do not use compression fittings.
- 7.18 Keep the fuel supply lines 1" off any outside walls.
- 7.19 The fuel supply line must gradually rise to the burner. It should not be higher than the burner.
- 7.20 **Clean all lines**, fittings, and parts internally before assembly. A small burr or piece of rust could plug the nozzle. See Section 3.10 for an illustration of a typical pump and piping installation.

# SECTION 7 CONTINUED

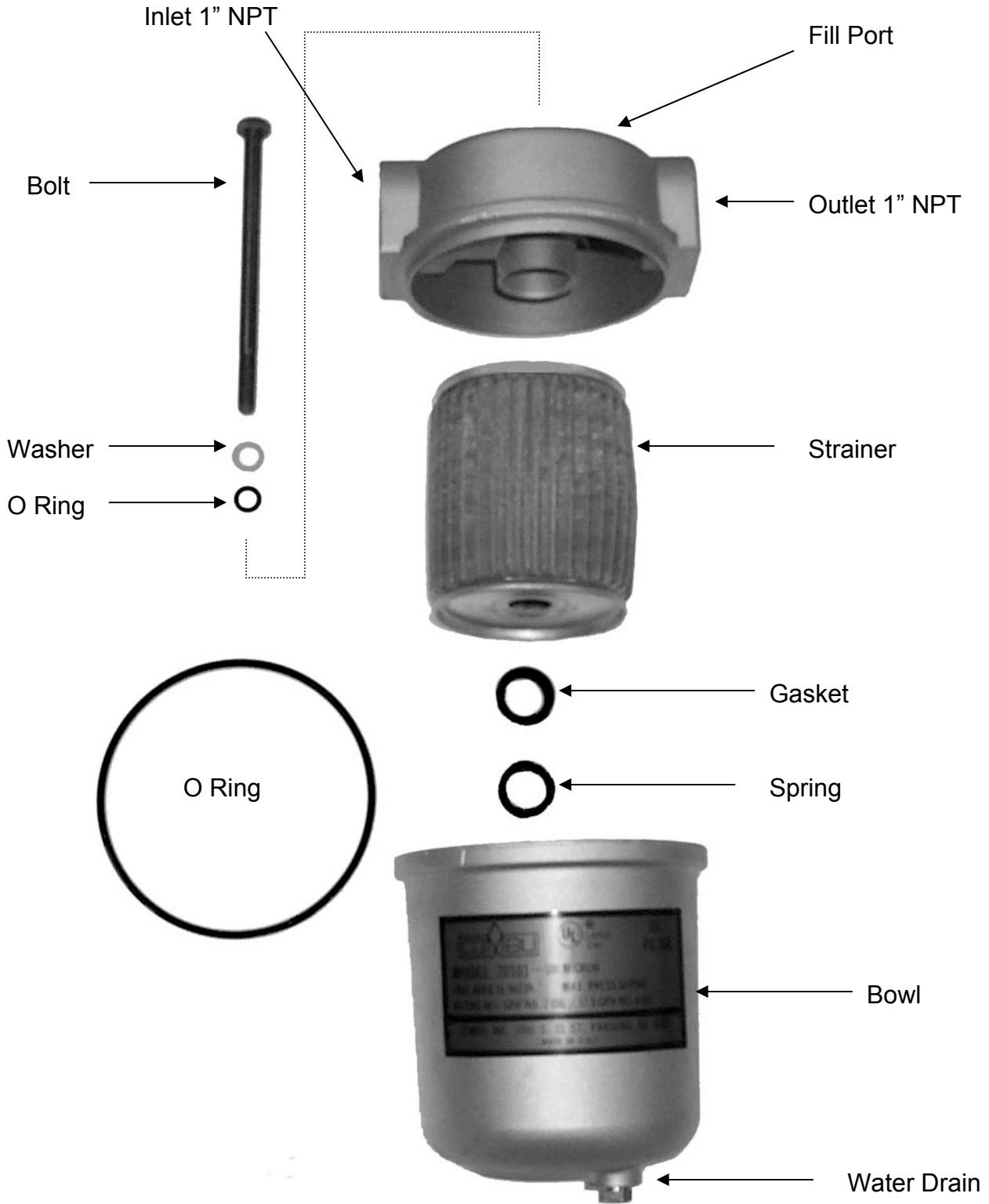
STANDARD PUMP ASSEMBLY MODEL A1RA-7738  
MAXIMUM PIPE LENGTH 25 FEET USING 1/2" PIPE  
14 FOOT MAXIMUM LIFT



UPGRADE PUMP ASSEMBLY MODEL J  
MAXIMUM PIPE LENGTH 90 FEET USING 1" PIPE  
10 FOOT MAXIMUM LIFT



# SECTION 7 CONTINUED



## SECTION 7 CONTINUED



Bottom View of the Aluminum Oil By-Pass Regulator

- B.** Port to the oil inlet on the burner assembly. Install  $\frac{1}{2}$ " O.D. min. copper tubing, or  $\frac{1}{2}$ " schedule 40 pipe. Failure to install this line properly will result in damage to your heater, and will void your warranty
- T.** Port to the oil supply tank for the overflow return line. Install  $\frac{1}{2}$ " O.D. min. copper tubing. or  $\frac{1}{2}$ " schedule 40 pipe. This line **MUST** run straight into the tank, and should not be submerged in oil. No elbows should be used. Failure to install this line properly will result in damage to your heater, and will void your warranty.
- P.** Port from the outlet side of your fuel supply pump. Install  $\frac{1}{2}$ " O.D. min. copper tubing, or  $\frac{1}{2}$ " schedule 40 pipe. Failure to install this line properly will result in damage to your heater, and will void your warranty.

## **SECTION 8 COMPRESSED AIR SUPPLY INSTALLATION**

- 8.1 Install an air pressure supply line connection to the air filter/regulator on the rear of the heater.
- 8.2 The air supply source must be capable of producing 1.0 CFM @ 100 PSI.
- 8.3 Install a shut off valve in the air supply line for service.
- 8.4 Install a primary air filter/regulator with a gauge (capable of reading line pressure) in the air supply line prior to the air filter/regulator mounted on the furnace. The primary air filter/regulator is not supplied with the furnace.
- 8.5 If the primary air regulator does not have a filter with a bowl, a condensate drain leg must be installed in the air supply line.
- 8.6 Install a quick disconnect at the air filter/regulator on the furnace for service.
- 8.7 For the ease of installation install a flexible air line (.250 I.D. minimum) from the quick disconnect to the primary air regulator.
- 8.8 The air supply line must be pitched uphill from the primary regulator to the furnace to prevent condensation from entering your burner.
- 8.9 Open all air shut off valves, and set the primary air regulator at 30 PSI.
- 8.10 Set the air filter/regulator on the rear of the furnace to 15 LBS. Refer to Section 3.10 for a typical air pressure supply installation.

# SECTION 9 MAIN ELECTRICAL SERVICE INSTALLATION

## CAUTION: HAZARD OF ELECTRICAL SHOCK

- 9.1 All wiring must comply with the National Electrical Code. State and Local Ordinances, and be wired by a qualified electrician.
- 9.2 Electrical service **MUST** be connected to a separate 20 AMP, 120 VAC, 60 HZ single phase circuit.
- 9.3 Electrical service connections are made in the electrical junction box on the back or side of the heater.
- 9.4 The heater must have a safety equipment ground from the main electrical service, stranded 12 GA minimum.
- 9.5 The electrical conductors for electrical service to the heater **MUST** be stranded 12 GA minimum.
- 9.6 Install a manual service disconnect near the heater, and label its function.
- 9.7 The supply voltage must be maintained at a minimum 110 VAC.
- 9.8 The electrical conductors from the main electrical service must be within approved conduit.
- 9.9 Keep all electrical conductors and conduit away from the chimney connector as well as any other hot surfaces. Refer to Section 18 Wiring Diagram for color code, etc. Keep the power off until the heater is ready to be started. Refer to Section 13 Start Up Procedure.

## CAUTION: HAZARD OF ELECTRICAL SHOCK

# SECTION 10 FUEL SUPPLY PUMP ELECTRICAL INSTALLATION

## CAUTION: HAZARD OF ELECTRICAL SHOCK

- 10.1 All wiring must comply with the National Electrical Code, State and Local Ordinances, and be wired by a qualified electrician.
- 10.2 The electrical conductors to the fuel pump motor **MUST** be stranded 14 GA minimum.
- 10.3 The electrical service connections for the fuel pump motor are made in the electrical junction box on the back or side of the heater.
- 10.4 The pump motor **MUST** have a safety equipment ground from the main electrical service, stranded 12 GA minimum.
- 10.5 The electrical conductors from the electrical junction box to the pump motor must be within approved conduit.
- 10.6 Keep all electrical conductors and conduit away from the chimney connector as well as any other hot surfaces. Refer to Section 18 Wiring Diagram for color code, etc. Keep the power off until the heater is ready to be started. Refer to Section 13 Start Up Procedure.

## CAUTION: HAZARD OF ELECTRICAL SHOCK

# SECTION 11 ROOM THERMOSTAT INSTALLATION

## CAUTION: HAZARD OF ELECTRICAL SHOCK

- 11.1 All wiring must comply with the National Electrical Code, State and Local Ordinances, and be wired by a qualified electrician.
- 11.2 Install the room thermostat in accordance with the directions furnished with the thermostat.
- 11.3 Use two conductor thermostat wire for the connection of the thermostat to the T.T. terminals of the oil primary control that is mounted on top of the burners electrical box.
- 11.4 Mount the thermostat 5 feet above the floor on an inside wall away from the heater's warm air path.
- 11.5 The electrical current for thermostat is 24 V, and is provided by the oil primary control.
- 11.6 Keep the thermostat wire away from the chimney connector, or any other hot surfaces. Refer to Section 3.1 for a typical thermostat installation.

# SECTION 12 FURNACE CONTROLS AND OPERATION

## 12.1 Room Thermostat:

The room thermostat automatically controls the on/off operation of the heater according to the setting of the desired room temperature. The thermostat works in conjunction with the oil primary safety control.

## 12.2 Oil Primary Safety Control/Cad Cell:

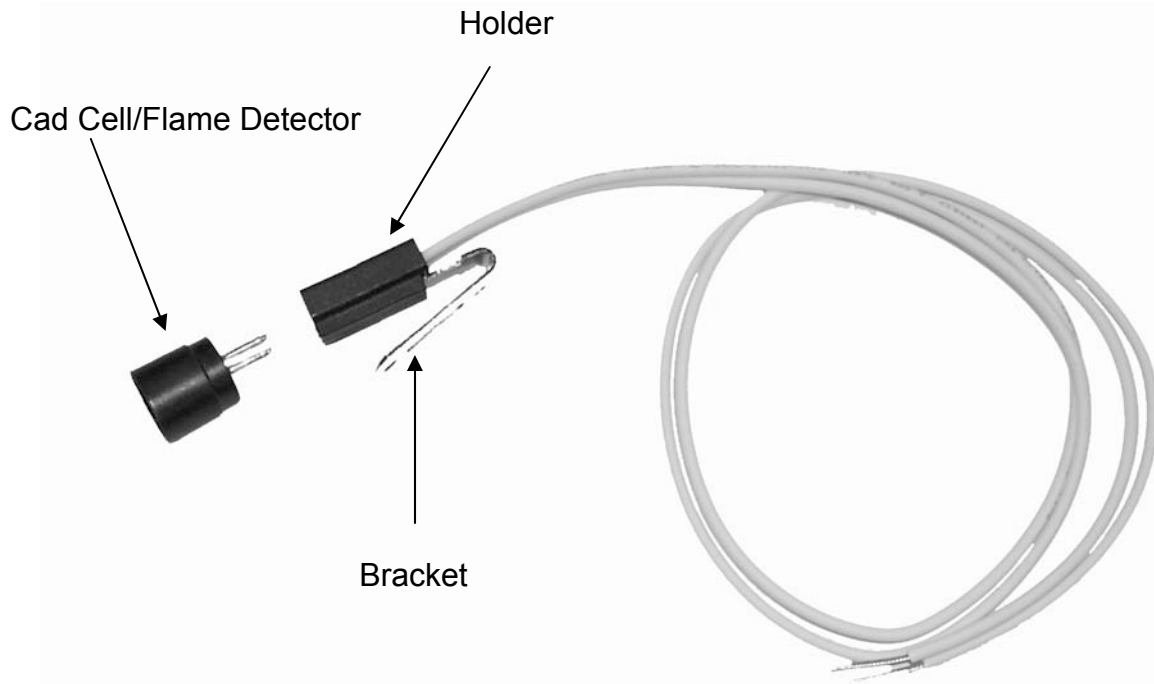
The oil primary control is mounted on top of the burner's electrical box. When the thermostat calls for heat the oil primary control starts the burner by switching on the air solenoid valve, ignition transformer, combustion air blower, and the fuel pump. The oil primary control works in conjunction with the cadmium sulfide cell (cad cell). The cad cell is mounted inside the burner cover, and faces the flame. The cad cell monitors the light level inside the combustion chamber to insure there is a flame present. If there is a loss of flame the primary control will go into its recycle mode. After 1-2 minutes the primary control will restart the burner. When this happens if there is a flame present, the burner will continue to function. If on start up no flame is established in 30 seconds the primary control will lock out.

**CAUTION:** Do not press the reset button more than twice. If the burner fails to start refer to Section 17 Trouble Shooting.

## 12.3 Fan/Limit Control

The fan/limit control performs 3 functions. The fan/limit control monitors the temperature of the air inside the cabinet. When the air reaches a set point (usually 120° F) it will switch on the heater fan. When the temperature in the cabinet drops below 90° F the fan/limit control will turn the fan off.

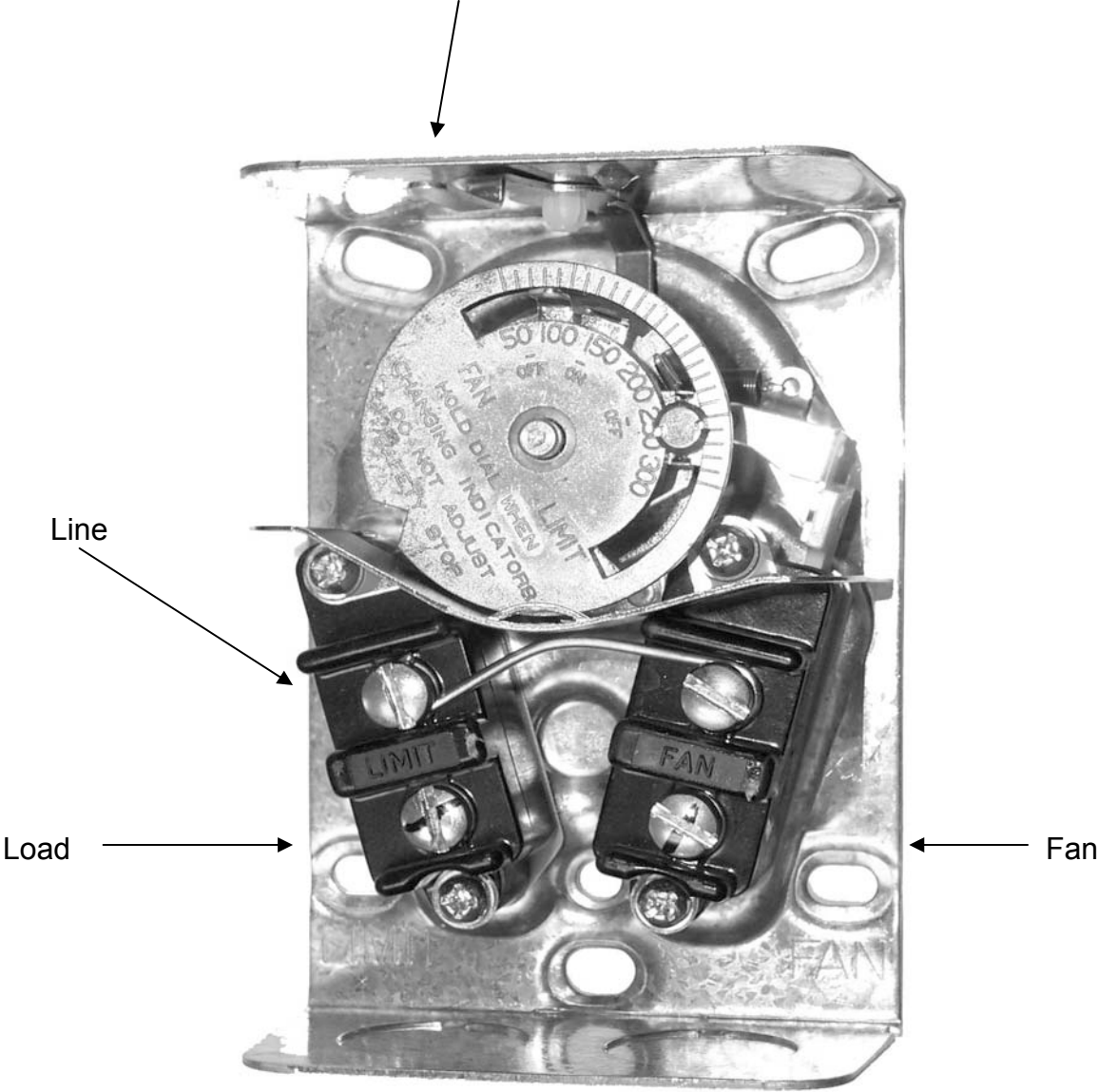
# CAD CELL



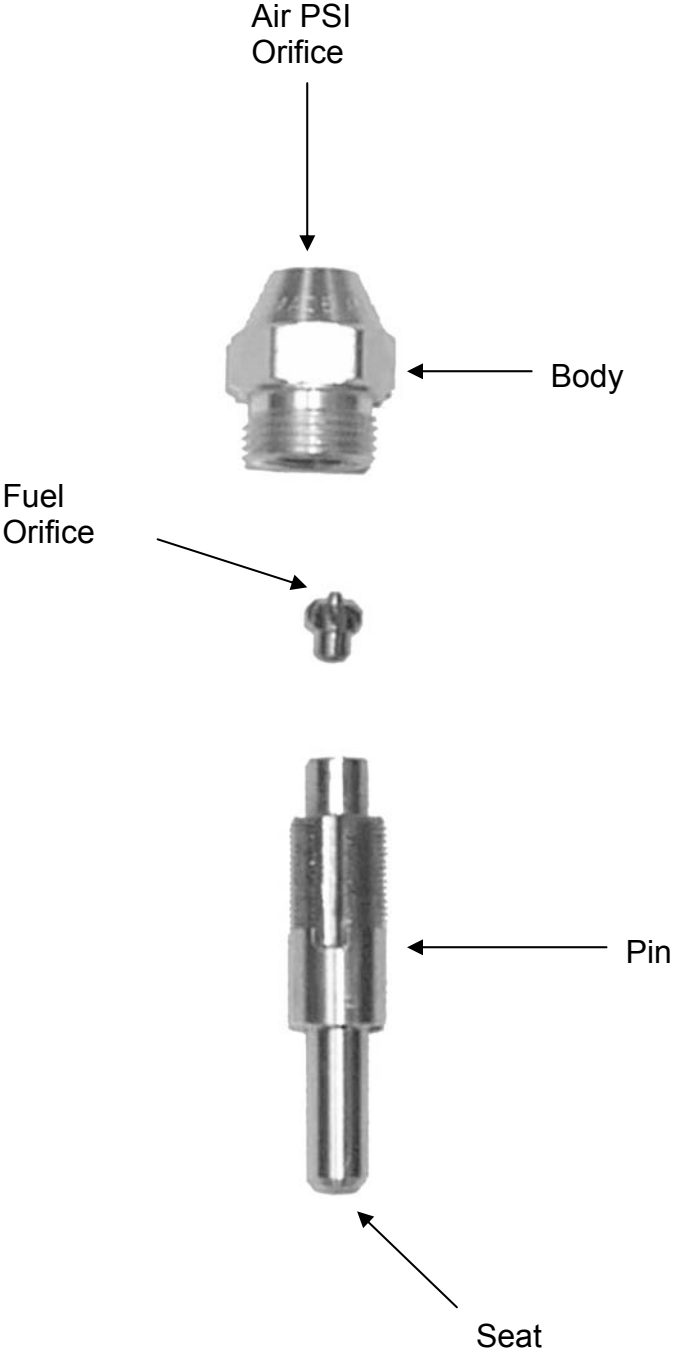


# FAN LIMIT CONTROL

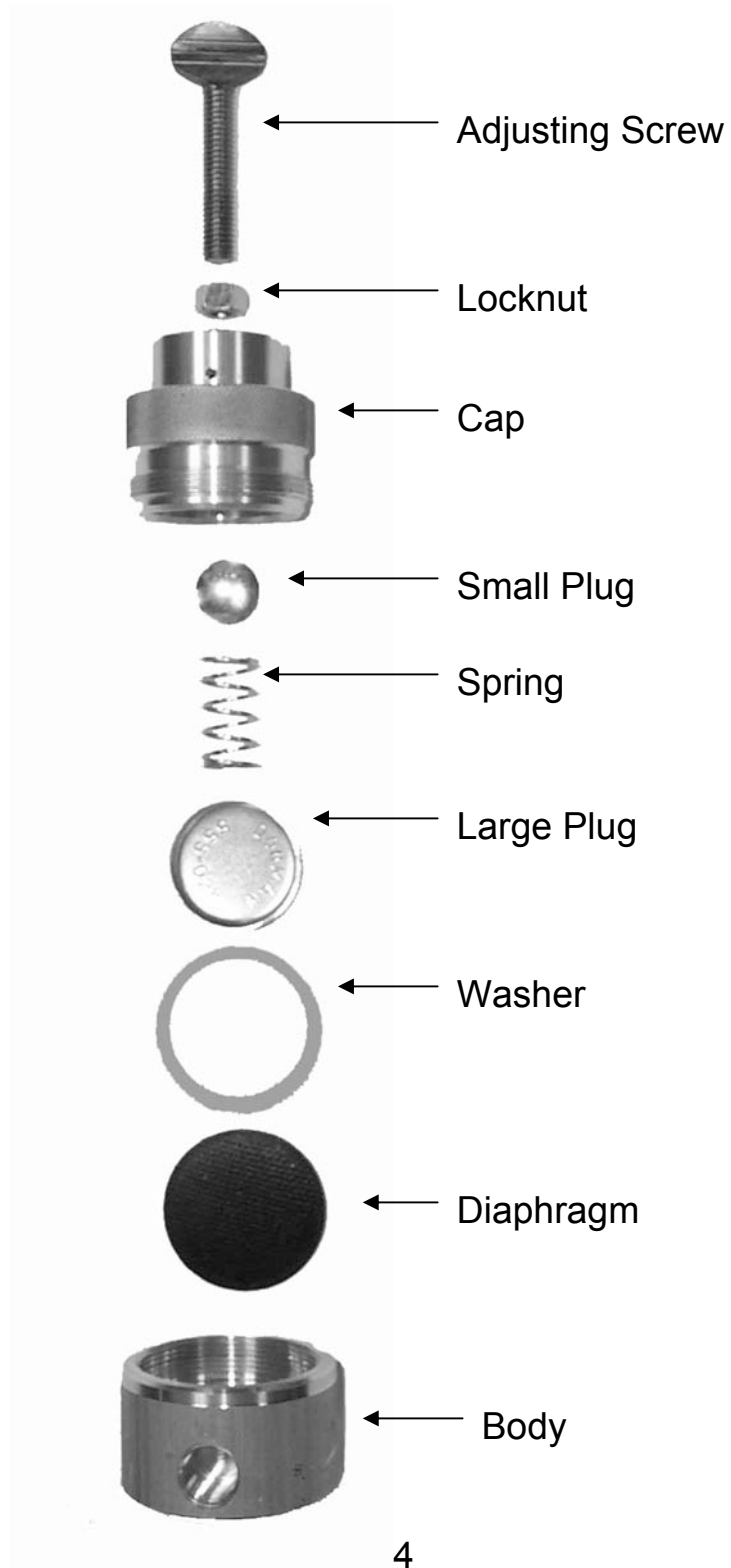
Manual/Automatic Fan  
Operation Lever



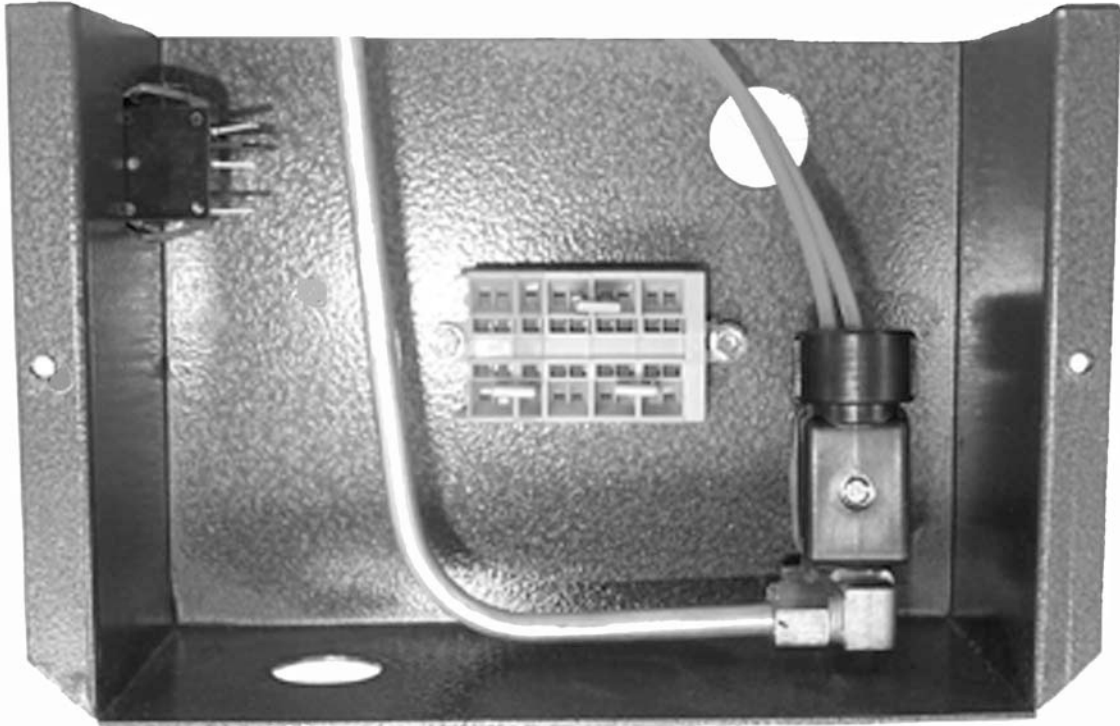
# NOZZLE



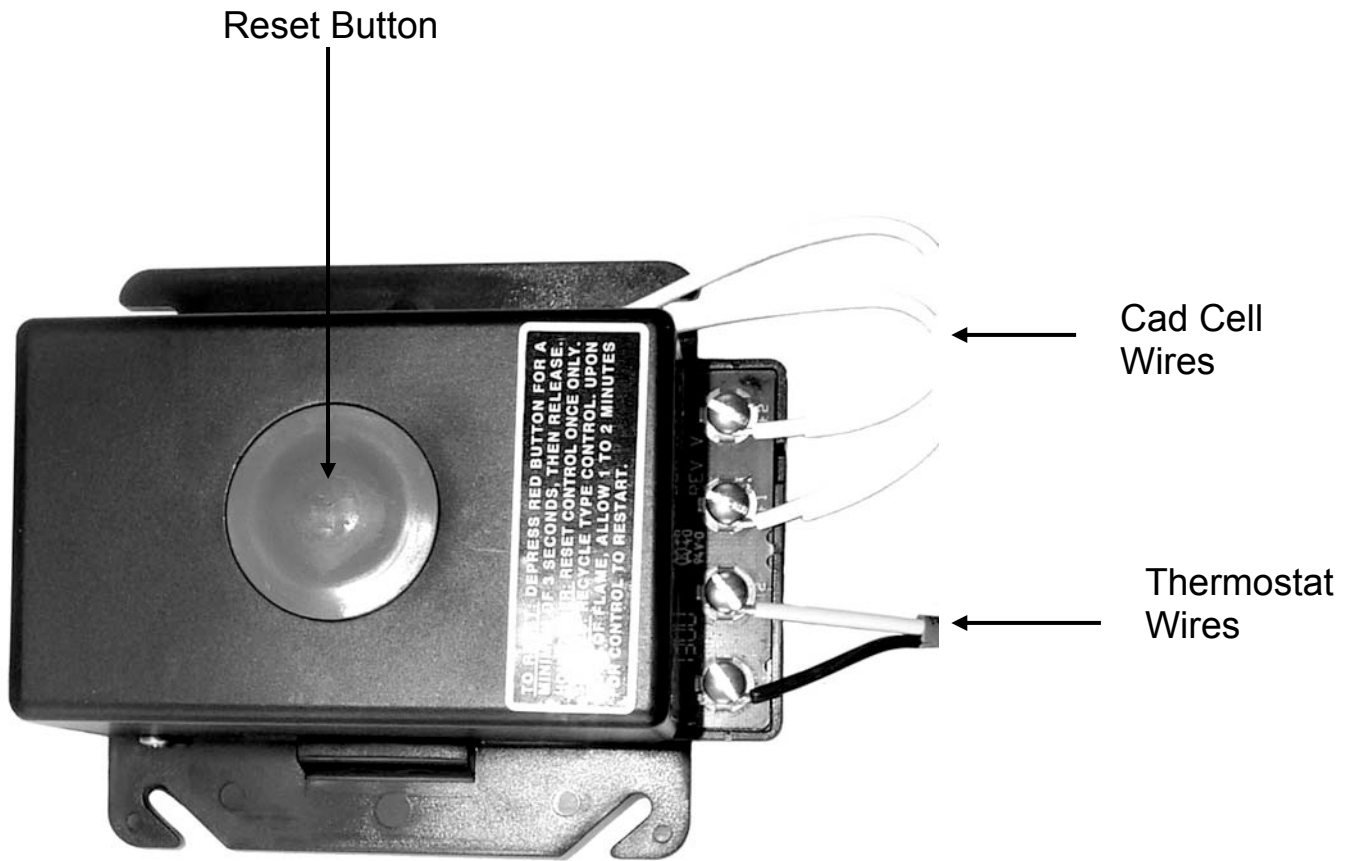
# FUEL BY-PASS REGULATOR



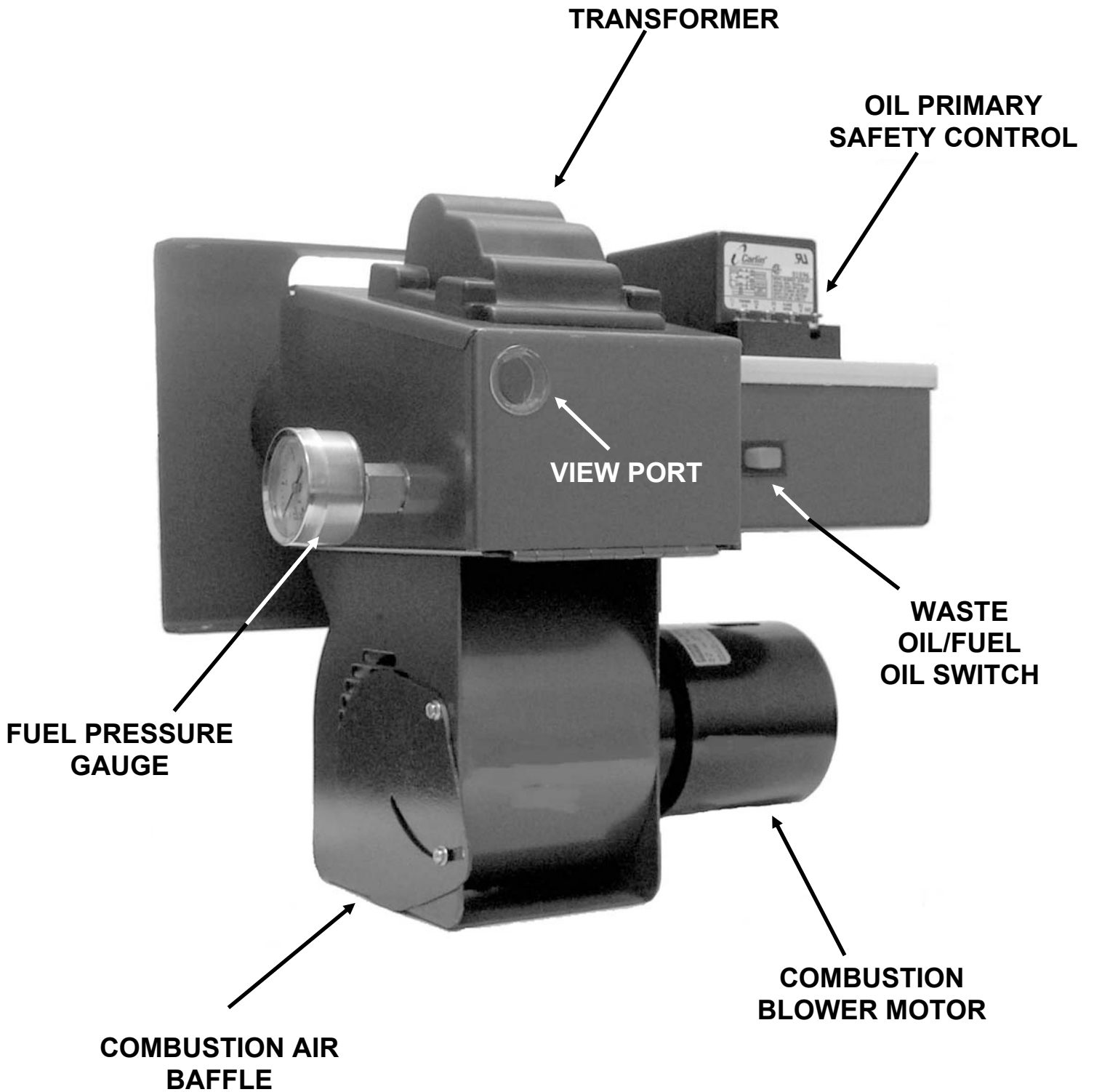
# BURNER ELECTRICAL BOX



# OIL PRIMARY SAFETY CONTROL



# BURNER



## SECTION 12 CONTINUED

### 12.3 Fan/Limit Control (continued):

The Fan/Limit Control contains an external slide switch to turn the axial fan on manual by-passing its automatic function.

The Fan/Limit Control monitors the temperature of the air inside the cabinet. When the temperature exceeds a fixed set point it switches the burner (Oil Primary Control) off until the temperature drops to a safe level. The burner will then restart.

**“CAUTION”** This means the heater has reached its “High Limit”, the cause must be determined and corrected before further use (overfiring the unit is normally what causes this condition). The Fan/Limit Control is located on the top on the front of the cabinet.

### 12.4 Barometric Draft Control:

The Barometric Draft Control automatically maintains a pre-set chimney draft, and is located in the chimney connector.

### 12.5 Air Filter/Regulator:

The Air Filter/Regulator performs two functions:

1. It removes condensation and dirt from the air.
2. It controls the amount of air pressure reaching the nozzle and air operated fuel valve.

The Air/Filter Regulator is mounted on the cabinet near the burner.

### 12.6 Electric Air Solenoid Valve:

The Electric Air Solenoid Valve is controlled by the Oil Primary Control. It acts as a shut-off valve, (it's open during operation, and closed when the burner is off).

The Electric Air Solenoid Valve is located inside of the burner's electrical box (See page 18E).

## SECTION 12 CONTINUED

### 12.7 Air Operated Fuel Valve:

The Air Operated Fuel Valve controls fuel flow out the nozzle. When the Electric Air Solenoid Valve opens and air pressure pushes on the fuel valve diaphragm, the plunger moves off the nozzle seat allowing fuel to enter the nozzle.

The Air Operated Fuel Valve is located on the back of the air preheater (See page 51).

### 12.8 Air/Oil Preheater:

The Air/Oil Preheater is an assembly that preheats the atomizing air and fuel to a predetermined temperature to properly combust used oil.

The Air/Oil Preheater is located in the burner (See Page 51).

### 12.9 Snap Disc:

The Snap Disc accurately controls the temperature of the air/oil preheater assembly with two resistance type cartridge-heating elements.

The Snap Disc is mounted on the oil preheater inside the burner.

### 12.10 Nozzle:

The Nozzle uses air pressure to help pull fuel through its small orifice, and to atomize the fuel for proper combustion.

The Nozzle is located on the end of the air preheater opposite the fuel valve.

Replace the Nozzle annually, as they are prone to wear by contaminants in waste oil (See Page 18C).

### 12.11 Fuel By-Pass Regulator:

The Fuel By-Pass regulator controls the pressure of the fuel to the nozzle.

The Fuel By-Pass regulator is located in the line between the outlet side of the pump and the burner.



## SECTION 12 CONTINUED

### 12.12 Fuel Supply Pump:

The Fuel Supply Pump pumps fuel from your oil storage tank to the burner. The Fuel Supply Pump should be located as close to the fuel supply tank as possible.

The Fuel Supply Pump must be mounted horizontally (Shaft).

## SECTION 13 START UP PROCEDURE

- 13.1 Make sure the main electrical service for the heater is turned off, and locked out.
- 13.2 Fill the oil supply tank with an approved fuel to a level that is above the pick-up tube check valve.
- 13.3 Check for proper draft in the chimney. The draft must read  $-.02$  W.C. cold.
- 13.4 Make sure there is air pressure at the heaters air filter/regulator, set it at 12 PSI. Set the primary regulator on the air supply line to 30 PSI.
- 13.5 Set the fan/limit control slide switch to automatic.
- 13.6 Check the combustion air adjustment baffle for proper setting. Refer to Section 15 Flame adjustment.
- 13.7 Set the room thermostat below room temperature (OFF).
- 13.8 Push the reset button on the oil primary control for 3 seconds.
- 13.9 Turn the main electrical service **ON**.
- 13.10 Flip the lighted rocker switch for preheating on the burner electrical box to the ON position (Preheater OFF the light is off, Preheater ON the light is on.).
- 13.11 Prime the fuel supply pump. Refer to Section 14, Priming the Fuel Supply Pump.
- 13.12 If using waste 10W-50W oil or automatic transmission fluid for fuel, flip the preheater rocker switch on (light ON, and **wait 5-7 minutes** for the preheater assembly to reach operating temperature. Leave the preheater switch OFF if using No. 1 or No. 2 fuel oil.).
- 13.13 Turn the room thermostat up above the room temperature. The burner will now fire, check the sight glass on the rear of the burner also inspect the flame through the inspection port. (See page 26AA for proper flame settings.).

## SECTION 13 CONTINUED

13.14 Adjust the burner air filter/regulator to 12 PSI, and the primary air regulator to 30 PSI.

**NOTE:** 12 PSI on the air filter/regulator is the starting point, you may need to adjust from there when **VISUALLY SETTING THE FLAME.** See page 26, flame adjustment, and page 26AA.

13.15 Adjust the fuel pressure gauge on the left side of the burner to read.

	<u>No. 1 &amp; No. 2 Fuel Oil</u>	<u>Approved Waste Oil</u>
Model HI-320	5-6 LBS.	5-6 LBS.

**NOTE:** Adjust the thumb screw on the fuel bypass regulator clockwise to increase pressure, and counter clockwise to decrease pressure to the burner. The oil pressures listed above are a starting point, you may need to adjust from there when **VISUALLY SETTING THE FLAME.** See page 26, flame adjustment, and page 26AA.

13.16 Adjust the barometric damper to obtain a draft of -.06 W.C. while the heater is hot and operating.

**NOTE:** It is **VERY IMPORTANT** that the barometric damper is set to the required settings to ensure the natural draft of exhaust gases. See page 7 section 4.7, and page 10, section 5.

13.17 Depending on the type of fuel used, the elevation, temperature, and oil viscosity, the combustion air baffle will need to be adjusted for optimum performance. Refer to section 15, Flame Adjustment 15.5.

13.18 When the room thermostat setting is met the burner will shut off, but the fan will continue to operate until the cabinet temperature drops to 90° F.

# Fuel Pressure Gauge



## SECTION 14 PRIMING THE FUEL PUMP

- 14.1 The fuel level in the supply tank must be above the check valve on the pick-up tube.
- 14.2 Remove the bowl of the suction line strainer, and fill with clean fuel. Replace the strainer bowl.
- 14.3 Remove the two yellow wires from the F-F terminal on the oil primary control. Install a jumper wire between the F-F terminals. Refer to section 17, Trouble Shooting 17.2.
- 14.4 Adjust the air filter/regulator on the heater to -0- PSI.
- 14.5 Remove the fuel supply line from the burner, and position a container to catch the fuel.
- 14.6 Back the thumb screw out (CCW) on the by-pass regulator until it is free, then turn (CW) two turns to seat the diaphragm.
- 14.7 Loosen the bleeder screw on the pump one turn, and attach a piece of 3/16" ID clear plastic tubing. The tubing should be long enough to allow the fuel to be returned to the tank.
- 14.8 Turn the room thermostat above room temperature, or to the "ON" position.
- 14.9 Momentarily disconnect one end of the jumper wire at the F-F terminals on the oil primary. The fuel pump will now start.
- 14.10 Observe the clear tubing attached to the bleeder screw on the pump. When a steady stream of fuel (no air bubbles) flows close the bleeder screw. Remove the tubing from the bleeder screw.

## SECTION 14 PRIMING THE FUEL PUMP CONTINUED

- 14.11 Observe the end of the fuel supply line that is disconnected from the burner. Allow a steady stream (no air bubbles) of fuel to flow into the container for several minutes. This will flush any debris from the fuel line that could potentially plug the nozzle. The vacuum gauge reading should not exceed 5" HG of vacuum.
- 14.12 Turn the room thermostat below room temperature or "OFF". The fuel supply pump will now stop.
- 14.13 Reconnect the fuel supply line to the burner.
- 14.14 Remove the jumper wire from the F-F terminals on the oil primary control, reattach the yellow cad cell wires.
- 14.15 Adjust the burner air filter/regulator to 17 PSI.
- 14.16 If the fuel supply pump prime, or fuel stream has air in it (spurting, fluctuating flow) there is likely a leak in the suction side of the plumbing. Refer to section 17, trouble-shooting, flow chart #2. The burner should now be ready to fire. Return to section 13, 13.12.

# COMBUSTION AIR ADJUSTMENT BAFFLE



## SECTION 15 FLAME ADJUSTMENT

- 15.1 Start heater, let it run for at least 15 minutes to reach operating temperature before proceeding.
- 15.2 Check chimney draft, set the barometric damper to -.06 WC when hot and running.
- 15.3 Check the atomizing air pressure, set the air filter/regulator on the heater to 15 PSI as a starting point.
- 15.4 Check the fuel pressure gauge on the burner, set to:

	<u>Model HI-240</u>	<u>Model HI-320</u>
No. 1 and No. 2 Fuel Oil	3-4 LBS.	5-6 LBS.
Used Crankcase Oil 10W-50W	3-4 LBS.	5-6 LBS.
Used Automatic Transmission Fluid	3-4 LBS.	5-6 LBS.

Adjust the thumb screw on the fuel by-pass regulator. Lock into position. The flame should **extend no more than 3/4** of the way into the chamber.

**NOTE:** The above pressure is a starting point, depending on your installation you may need further adjustment. Always **VISUALLY SET THE FLAME** See page 26A.

- 15.5 Loosen the combustion air adjustment baffle, slowly close the baffle in 1/16" increments until the heater (flame) starts to rumble. Then slowly open the baffle in 1/16" increments until the rumbling stops, (wait 2 minutes between adjustments) finally open the baffle an additional 1/8" to provide excess oxygen. Secure the baffle, (See page 26A).

**NOTE:** mechanical equipment like gauges and regulators are not always 100 percent accurate, **VISUAL INSPECTION OF THE FLAME IS REQUIRED** in order to properly dial in the flame settings, see page 26AA.



# FLAME ADJUSTMENT/VISUAL

## Flame is overfired.

Dark yellow, to orange in color.

The flame is hitting the target end filling the chamber with a smoky flame.

Correct immediately or chamber may be damaged.

Decrease fuel pressure, and adjust combustion air baffle. Air pressure may also need to be adjusted.

---

## Flame is underfired.

The flame is like a blow torch.

Light yellow, to white in color.

Flame is too short.

Check to see if preheater block is hot.

Check air PSI, it may be too high. Adjust in 1 LB. Increments.

Oil pressure and the combustion air baffle may need adjustment.

---

## The flame is full.

Bright yellow in color.

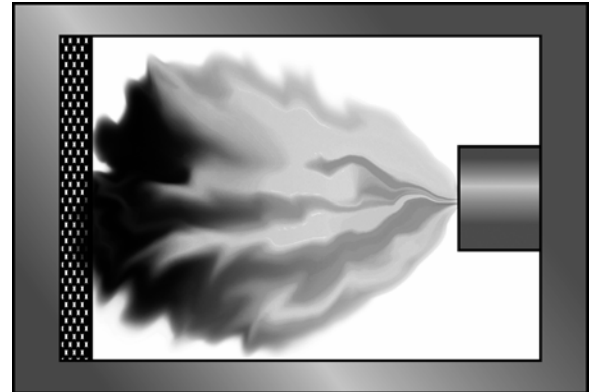
Flame extends 3/4 into the chamber.

Flame is not impinging on the target brick.

If you need assistance with flame adjustment, please call Lenan's Parts and Service Department.

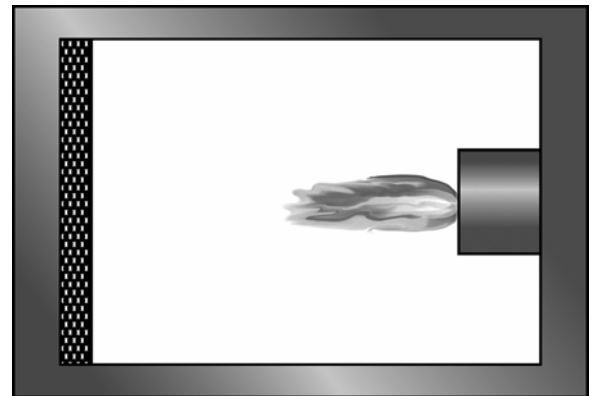
## BAD FLAME

The flame is too big creating an over fire condition.



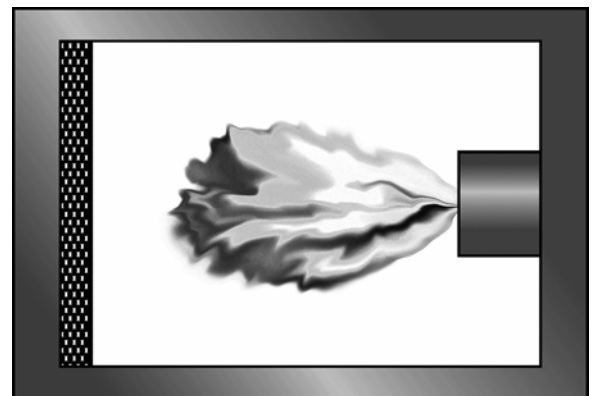
## BAD FLAME

The flame is too short.



## GOOD FLAME

Flame length 3/4 of the way to the target end.



## SECTION 15 CONTINUED

- 15.6 Lift the inspection port cover on the front of the combustion chamber to observe the flame. **“Wear adequate face and eye protection”**. The flame tips should extend 3/4 of the way into the combustion chamber. When the unit is adjusted properly the ash inside the chamber will be white to off white.

Flame tips touching the target brick (end of the chamber) will cause combustion chamber damage. This condition may be caused by a worn nozzle, or excess burner fuel pressure. When this condition exists, the ash in the chamber will be brown to black.

**15.7 Problems:** Too large of a flame, dark yellow in color.

1. Too much fuel pressure.
2. Not enough combustion air.
3. Not enough atomizing air pressure.
4. Ash inside the chamber is dark brown to sooty black in color.

**Do not over fire your heater.**

**Immediately** adjust the burner to the proper flame length to prevent damage to your heater.

**Problems:** Too small a flame, similar to a blowtorch.

1. Too much atomizing air pressure.
2. Too much combustion air pressure.
3. Not enough fuel pressure.

**Do not over fire your heater.**

**Immediately** adjust the burner to the proper flame length to prevent damage to your heater.

**Solutions:**

1. Correct fuel pressure setting.
2. Flame tips reach 3/4 of the way into the chamber.
3. Flame has slightly yellow/orange tips.
4. No black smoke coming from the chimney.
5. Ash inside the chamber is white to off white in color.

**Check for correct flame adjustments weekly.**

# SECTION 15 AIR FILTER/REGULATOR



## SECTION 15 CONTINUED

- 15.8 Lift the inspection port cover on the front of the combustion chamber to observe the flame. **“Wear adequate face and eye protection”**. The flame tips should extend 3/4 of the way into the combustion chamber. When the unit is adjusted properly the ash inside the chamber will be white to off white.

Flame tips touching the target brick (end of the chamber) will cause combustion chamber damage. This condition may be caused by a worn nozzle, or excess burner fuel pressure. When this condition exists the ash in the chamber will be brown to black.

- 15.9 **Problems:** Too large of a flame, dark yellow in color.
1. Too much fuel pressure.
  2. Not enough combustion air.
  3. Not enough atomizing air pressure.
  4. Ash inside the chamber is dark brown to sooty black in color.

**Do not over fire your heater.**

**Immediately** adjust the burner to the proper flame length to prevent damage to your heater.

**Problems:** Too small a flame, similar to a blowtorch.

1. Too much atomizing air pressure.
2. Too much combustion air pressure.
3. Not enough fuel pressure.

**Do not over fire your heater.**

**Immediately** adjust the burner to the proper flame length to prevent damage to your heater.

**Solutions:**

1. Correct fuel pressure setting.
2. Flame tips reach 3/4 of the way into the chamber.
3. Flame has slightly yellow/orange tips.
4. No black smoke coming from the chimney.
5. Ash inside the chamber is white to off white in color.

**Check for correct flame adjustments weekly.**

# SECTION 16 MAINTENANCE SCHEDULE/SERVICE ADJUSTMENTS

## 16.1 DAILY:

- A. Check fuel supply tank level (pre-strain all fuels).
- B. Note vacuum gauge reading on suction line (refer to Section 17 17.4-17.7).
- C. Check atomizing air pressure at the air filter regulator set to 12 PSI. Drain water from the bowl.
- D. Check the fuel pressure on the burner gauge, set to the correct pressure for the type of fuel used (refer to section 13.15). **Visually inspect the flame** (refer to page 26AA).
- E. Check manometer, set draft to -.02 when cold, -.06hot.
- F. If the heater is not to be used for more than 12 hours (overnight), flip the preheater rocker switch off (light off). This saves wear and tear on the preheaters and cuts down on maintenance.

## 16.2 WEEKLY:

- A. Drain water/anti-freeze from the fuel supply tank
- B. Check the air pressure setting on the primary air regulator, set at 30 PSI.
- C. Drain water from the air pressure supply line drain leg, and primary regulator.
- D. Inspect the combustion chamber, ash build up, and flame. Wear adequate eye protection.

## 16.3 MONTHLY:

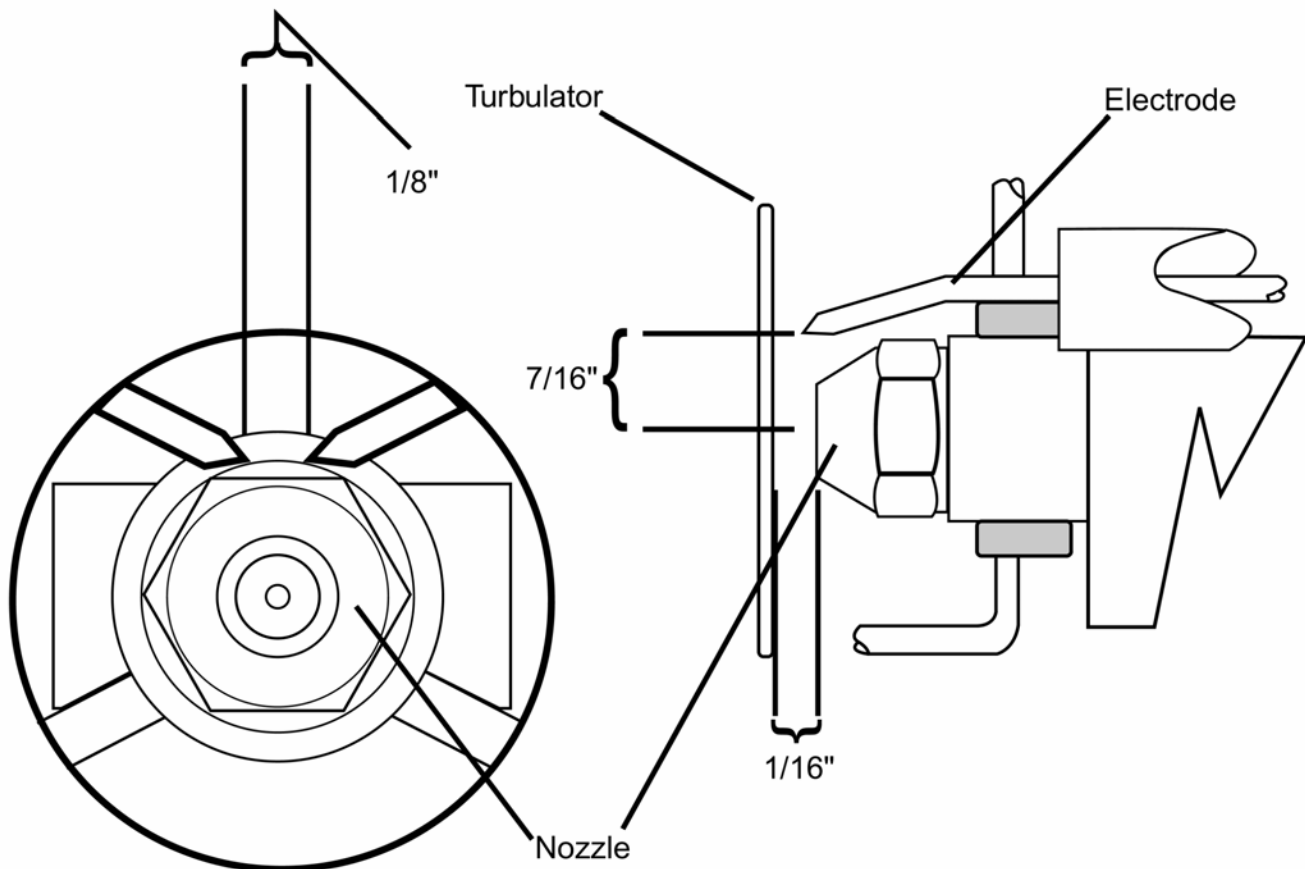
- A. Clean the combustion chamber, heat exchanger. Inspect the firebrick. **Caution: wear protective clothing, use a respirator, and protect eyes and face when cleaning. Do not breathe dust from the combustion chamber. Wash thoroughly with soap and water after cleaning.**
- B. Clean the chimney, chimney connector, and barometric draft control.
- C. Clean pump strainer, suction line strainer, and pick-up tube strainer. Re-prime the pump (refer to section 14).
- D. Check for dirt build up on the combustion blower wheel. Keep clean.

## SECTION 16 CONTINUED

### 16.4 **YEARLY:** (Season Shut Down)

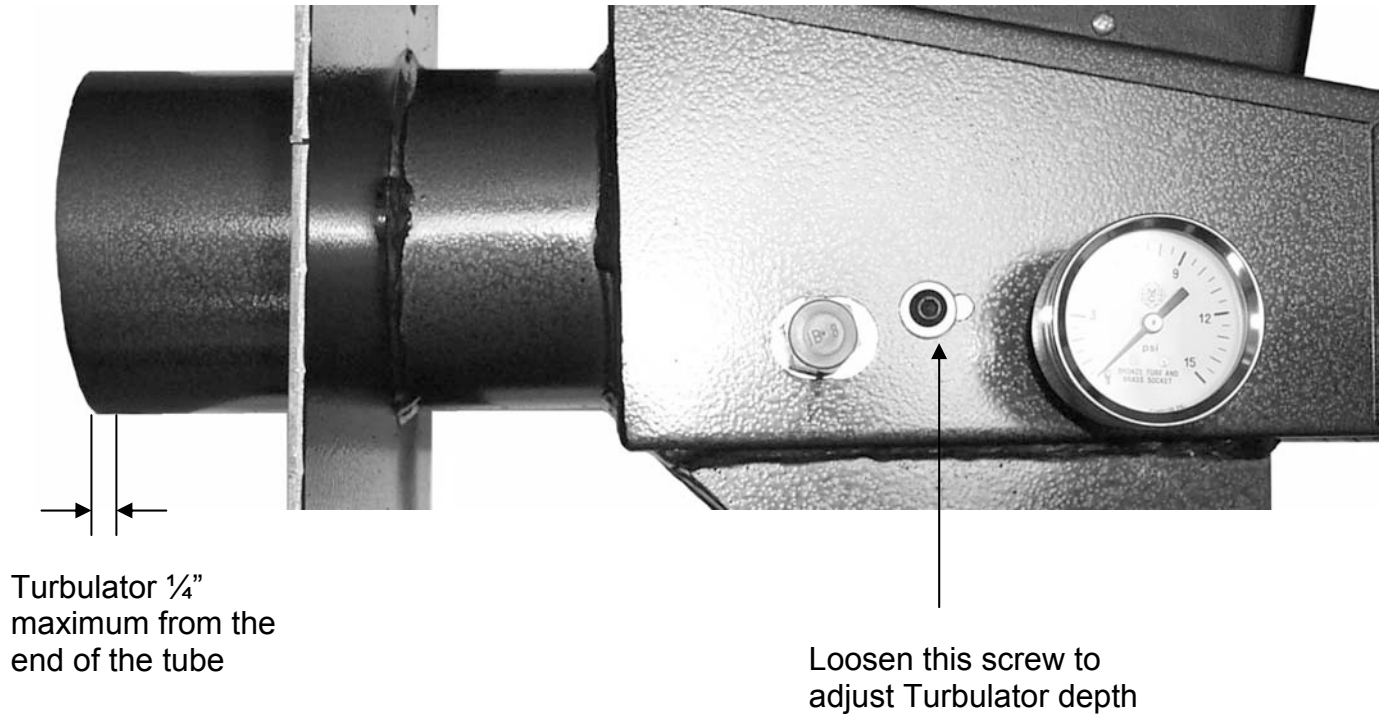
- A. Shut off main power supply to furnace.
- B. Perform monthly service/maintenance.
- C. Flip air/fuel preheater switch off for the summer.
- D. Shut off air supply line, and back out secondary air regulator.
- E. Remove air / fuel preheater assembly, disassemble and clean.
- F. Remove air turbulator and clean.
- G. Replace nozzle and nozzle quad ring.
- H. Replace electrodes.
- I. Lubricate all motors, follow the specifications on the motor rating plate.
- J. Remove fuel supply pump cover and drain, replace, refill with brand new 20W oil.
- K. Drain and manually clean the inside of the fuel supply tank.
- L. Clean the combustion blower, axial fan blades, and fan cage.

### 16.5 ELECTRODE -TURBULATOR ADJUSTMENT:



## SECTION 16 CONTINUED

### 16.6 Preheater Air Tube adjustment.



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# SECTION 17 TROUBLE SHOOTING GUIDE

## 17.1 Initial Diagnosis:

When an operating problem occurs, a determination must be made whether or not the fuel pump is pumping a sufficient amount of oil that contains no air or water.

### Take these steps:

1. Adjust the burner air regulator to -0- PSI.
2. Turn preheater rocker switch off (red light off).
3. Shut off oil supply line valve to the burner.
4. Remove the fuel supply line from the supply tank.
5. Attach a flexible piece of tubing at least 3 feet long to the outlet on the return side of the oil by-pass regulator.
6. Insert the tubing into the bottom of a large jar.
7. Jump the cad cell circuit and start the fuel pump, refer to Section 17 (17.2).
8. Attempt to fill the jar above the open end of the tubing.
9. If the pump will not pump fuel, attempt to prime the pump (Section 14). If the pump won't prime refer to Section 17 Trouble Shooting, Flow Chart #2.
10. If no air or water is present the flow must be determined.
11. Pump fuel for 1 minute into a graduated container, if the flow rate is less the 250 MILS/Minute (8 ½ Ounces), refer to Section 17 Troubleshooting Flow Chart #2.
12. If the flow rate is more than 250 MILS/minute (8 ½ Ounces), refer to Section 17 Troubleshooting Flow Chart #3.
13. After repairs are made, remove the cad cell jumper wire, and reconnect the cad cell wires to the oil primary.

## 17.2 Bypassing the oil primary safety circuit:

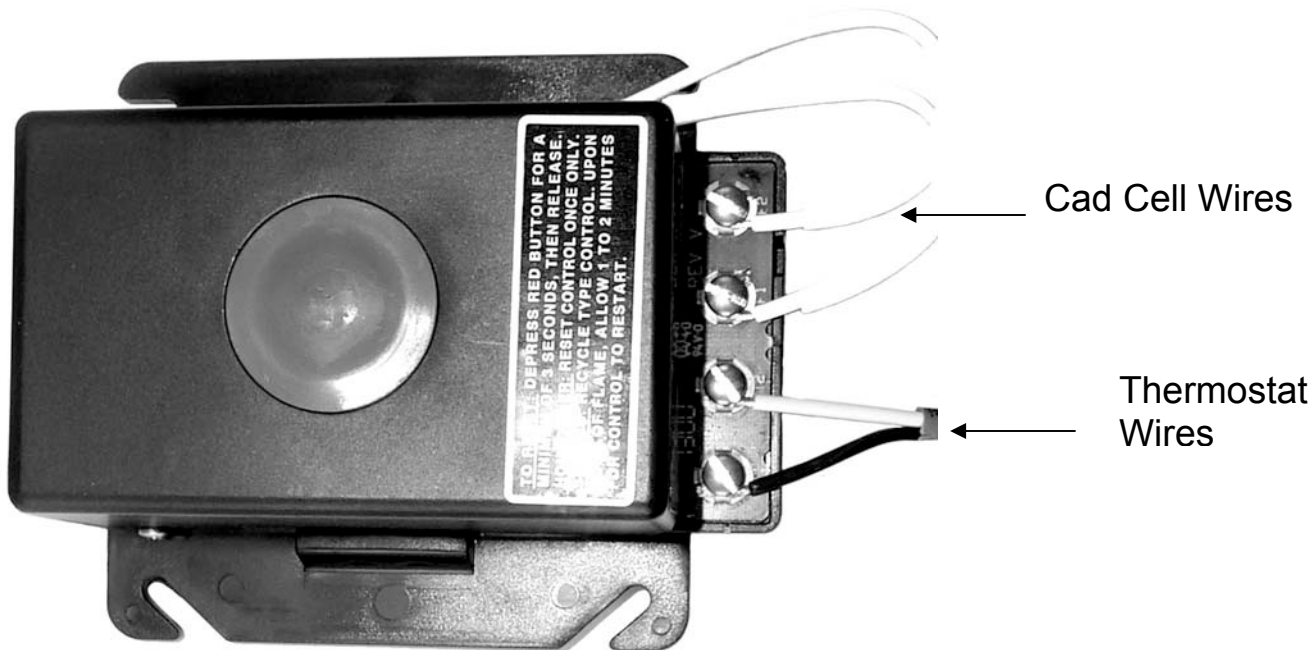
Some trouble-shooting test may require the cad cell safety circuit in the oil primary control to be bypassed, to do this:

1. Remove the 2 yellow wires from the F-F terminals on the oil primary control.

**Warning: Do not operate the heater if the safety circuit is not working!**

## SECTION 17 CONTINUED

2. Install a jumper wire between the two F-F terminals.
3. Push reset button for 2 seconds.
4. Turn room thermostat up so that it calls for heat.
5. Disable the air operated fuel valve.
6. To activate the oil primary momentarily disconnect one end of the jumper wire on the F-F terminals. The burner will attempt to fire.
7. **IMPORTANT** remove the jumper wire when testing is complete, and replace the cad cell wires. **Do not run the heater with the cad cell wires disconnected.**



### 17.3 Disabling the air operated fuel valve:

Note: Most trouble shooting tests will require the air operated fuel valve to be disabled, to do this:

1. Adjust the heater air filter/regulator to -0- PSI.

### 17.4 Vacuum Gauge reading hints:

No reading 0-1 HG,

1. Pump not operating.
2. Pump air locked and needs priming. Refer to section 14.
3. Vacuum leak:
  - a. Pump shaft seal
  - b. Pump cover gasket
  - c. Pipe connections suction side
  - d. Suction strainer gaskets
  - e. Low fuel level in tank
4. Strainer in pump cover severely plugged.

## SECTION 17 CONTINUED

### 17.5 Vacuum gauge reading hints:

Low to normal reading, 1-6 inches HG.

1. Pump operating properly.
2. Fuel being used has a low viscosity.
  - a. Fuel oil is being used.
  - b. Fuel is at room temperature (warm).
  - c. High level of gasoline in the fuel (use approved fuels only).

### 17.6 Vacuum gauge reading hints:

High reading, 7 inches of HG, or more.

1. Fuel being used has too high of a viscosity.
  - a. Fuel is too cold.
  - b. Fuel contains gear lubes (use approved fuels only).
2. Suction line strainer dirty or plugged.
3. Pick-up tube strainer dirty or plugged
4. Check valve installed wrong or stuck.

### 17.7 Vacuum reading hints:

1. Reading fluctuates (jumps).
2. Vacuum leaks in the suction side of the piping to the pump.
3. Low fuel level in the tank.

### 17.8 Burner fuel pressure gauge reading hints:

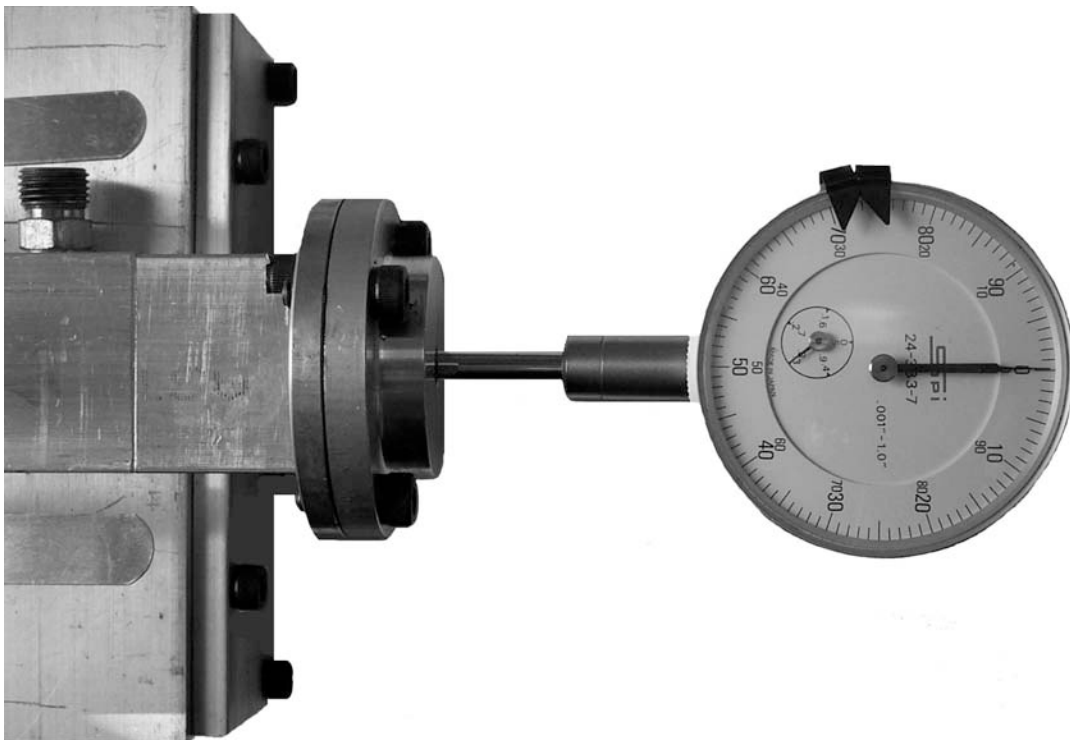
1. Fuel gauge fluctuates (jumps).
  - a. Water/anti freeze in fuel.
  - b. Air in fuel, refer to Section 17, Flow Chart #2.
  - c. Quad ring seal for the nozzle may be damaged.
  - d. Seal in adaptor block may be worn or damaged.
  - e. Fuel pressure regulator seal leaking or dirty.
  - f. Suction line strainer plugged or dirty.
2. Reading gradually decreases.
  - a. Fuel pump output decreasing.
  - b. Fuel viscosity decreasing.
  - c. Orifice in nozzle is wearing.
3. Reading gradually increases.
  - a. Fuel pump output increasing.
  - b. Fuel viscosity increasing (cold fuel, and/or gear lube).
  - c. Orifice in nozzle is becoming plugged.

## SECTION 17 CONTINUED

4. Reading drops to -0- PSI when the burner is off.
  - a. Dirt between the diaphragm and the seat in the by-pass regulator.
  - b. Dirt between the plunger and the nozzle seat.
  - c. Leak in the plumbing connections.
  - d. Leak in the preheater assembly (damaged or missing o ring).
  - e. Fuel preheater switch is off.

### 17.9 Steps to check the air operated fuel valve:

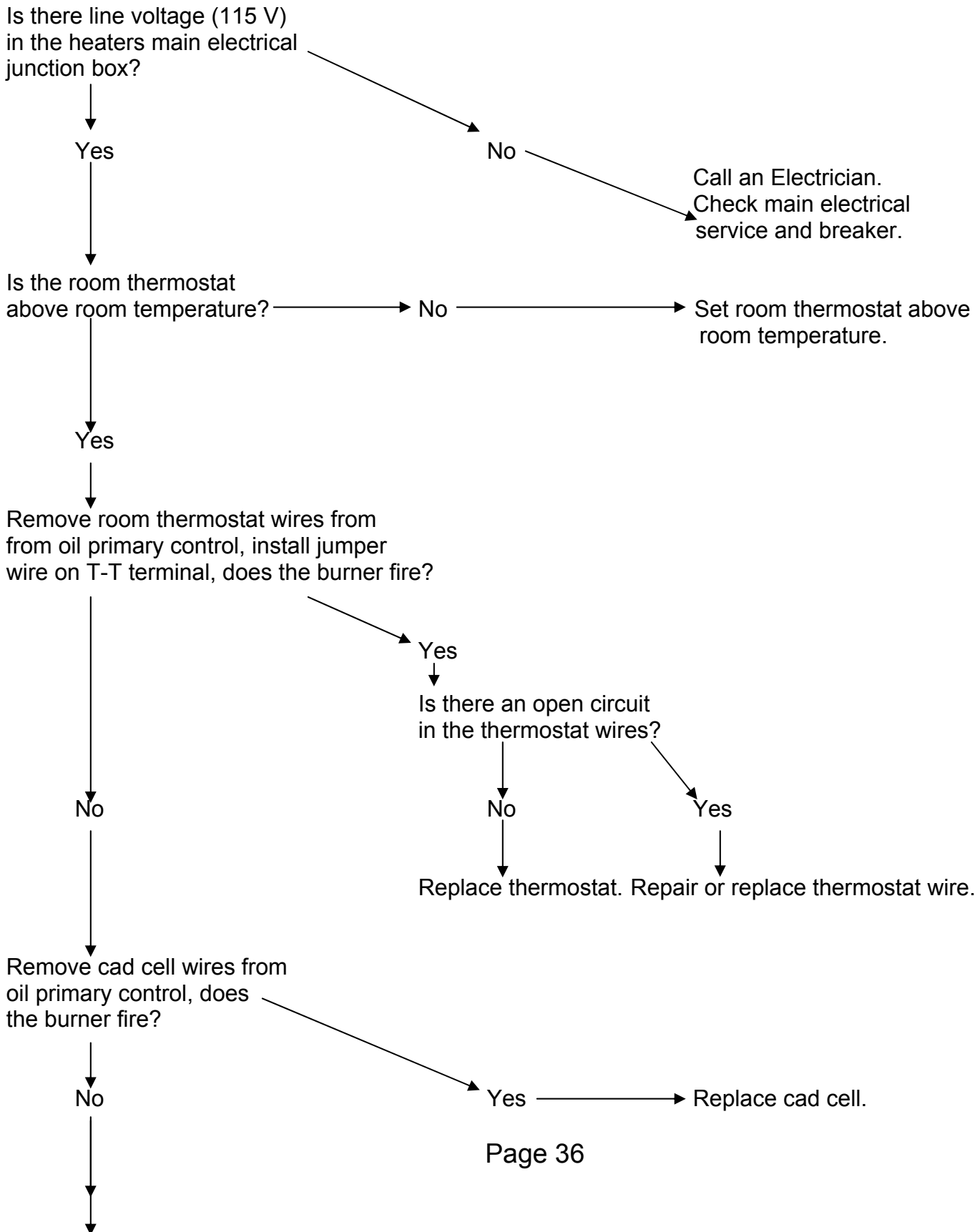
1. Disconnect the two transformer wires from the terminal block in the burner. Jump the cad cell circuit, refer to Section 17 (17.2).
2. Disconnect the fuel supply pump orange wire from the terminal block inside the burner.
3. Set the dial indicator as shown on the diaphragm piston.
4. Zero the dial indicator.
5. Start the burner so that the air valve opens.
6. Note the dial indicator, it should read +.015 to .050, which references the diaphragm piston travel.

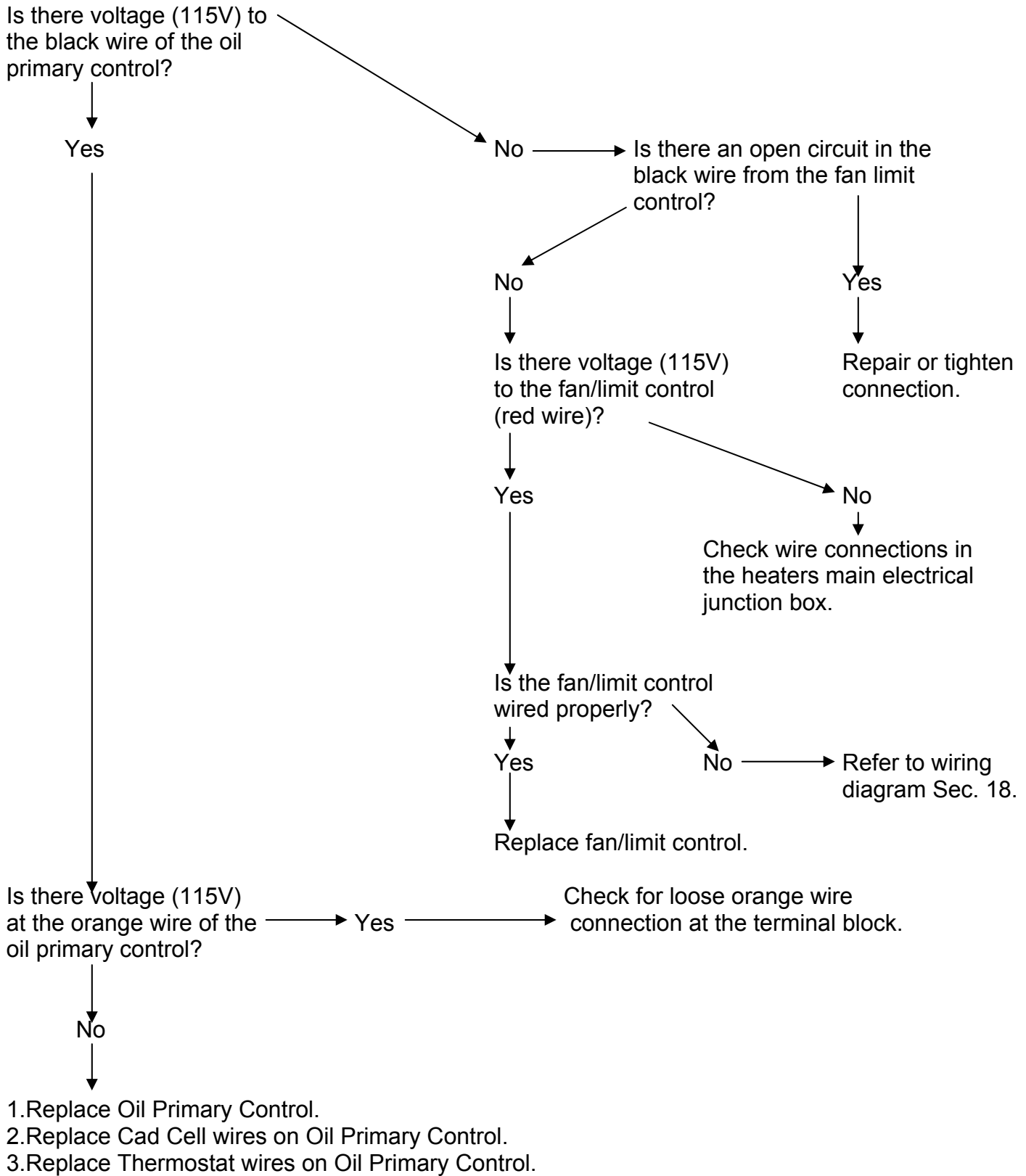


# Section 17 Trouble Shooting Flow Chart #1

## Caution: Hazard of Electrical Shock

**Symptoms:** Burner Will not attempt to fire. (Oil Primary Reset)





Questions or Comments? Call Lenan Service Department (800)753-1601.

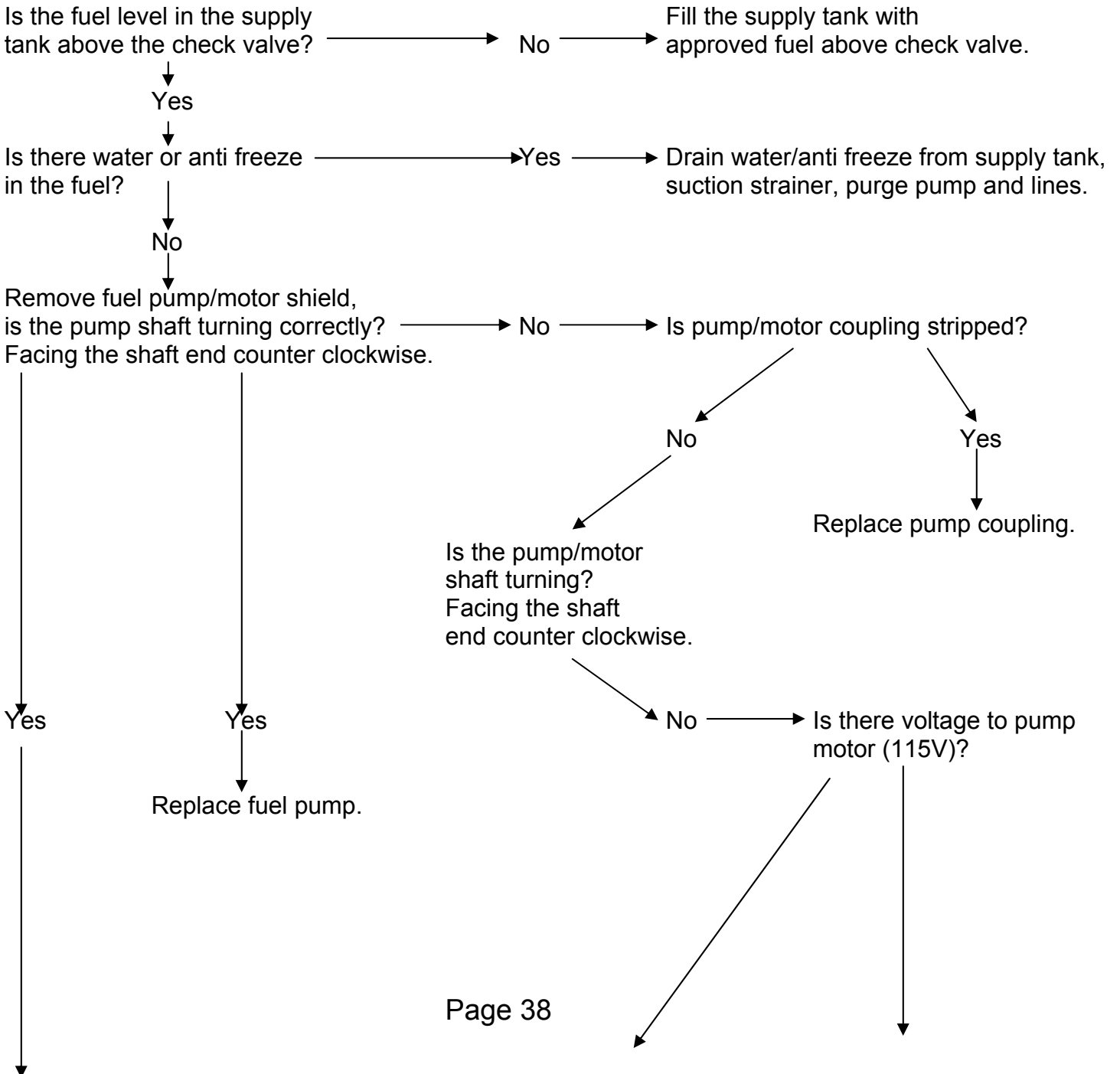
## Section 17 Trouble Shooting Flow chart #2

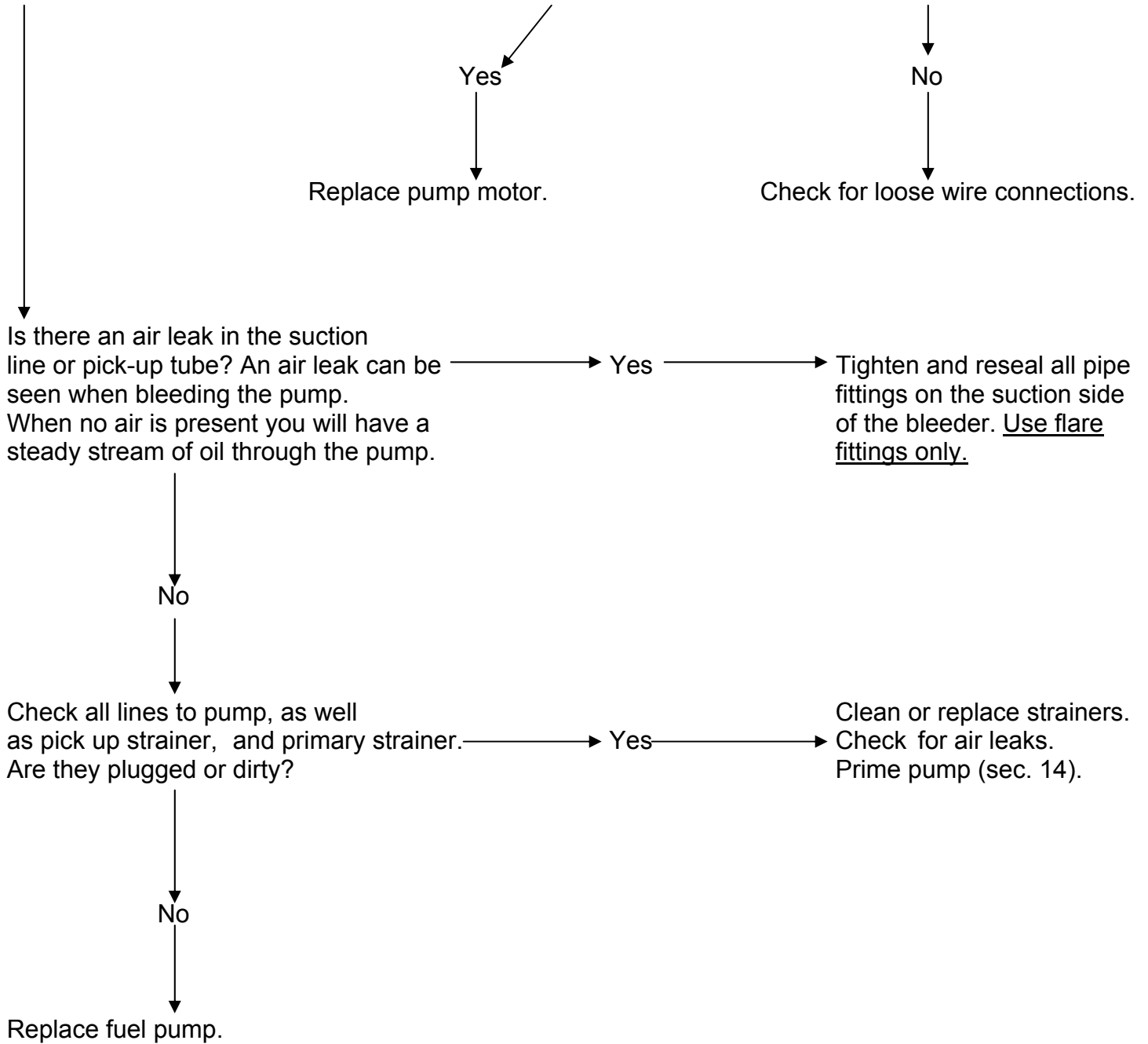
# Caution: Hazard of Electrical Shock

**Symptoms:**

1. Burner attempts to fire.
2. Poor flame.
3. No flame established.
4. No or low fuel output (refer to Sec. 17, 17.1).
5. Air in the oil, this can be seen when you bleed pump.
6. Oil Primary locked out.

**Note:** Disable air operated fuel valve. Adjust burner air filter regulator to -0- psi.







## Section 17 Trouble Shooting Flow Chart #3

# Caution: Hazard of Electrical Shock

### Symptoms:

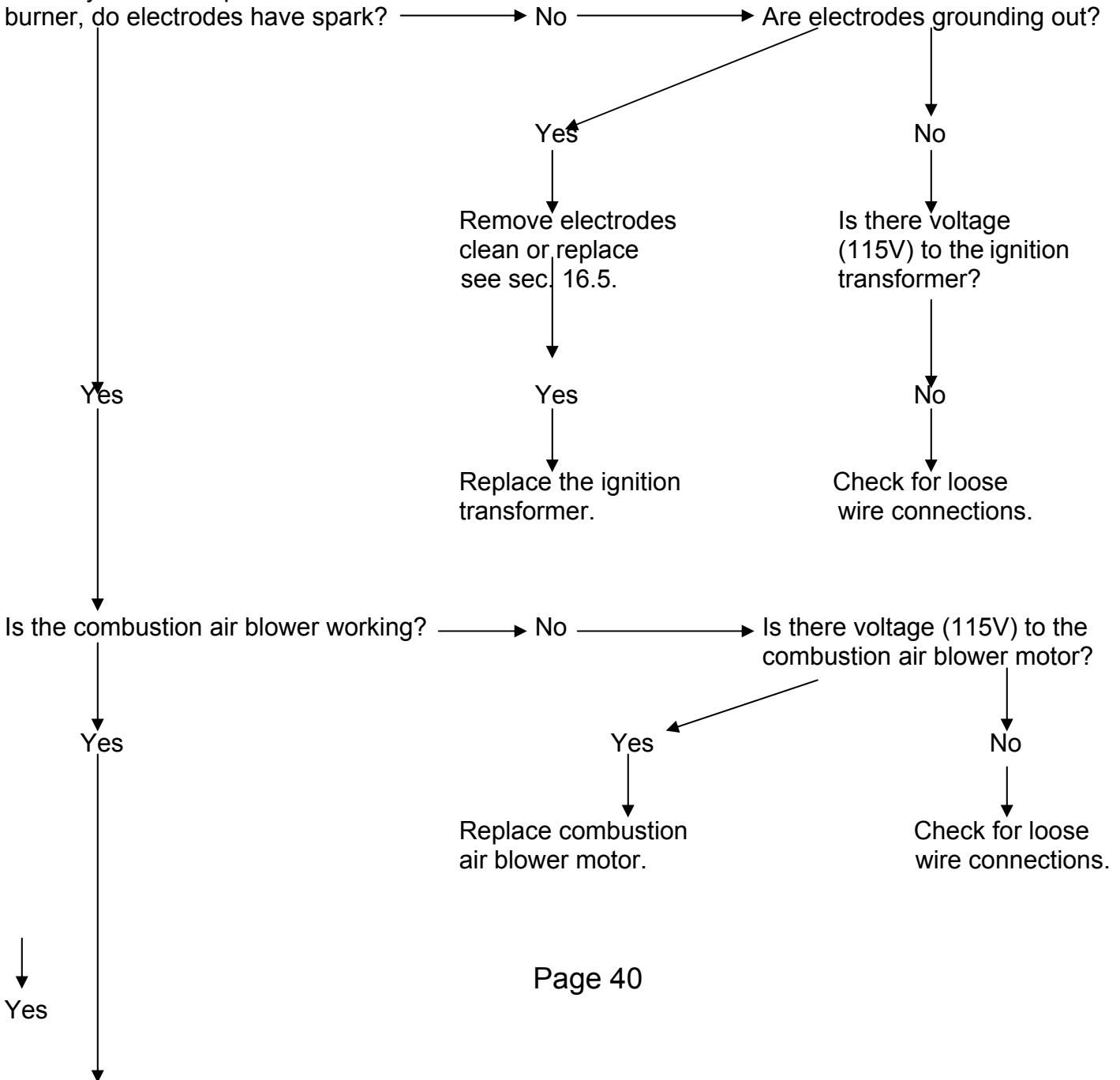
1. Burner attempts to fire.
2. Poor flame.
3. No flame established.
4. Correct fuel output (see sec. 17, 17.1).
5. Oil Primary may lock out.

Note: Disable air operated fuel valve. Adjust burner air filter regulator to -0- PSI.

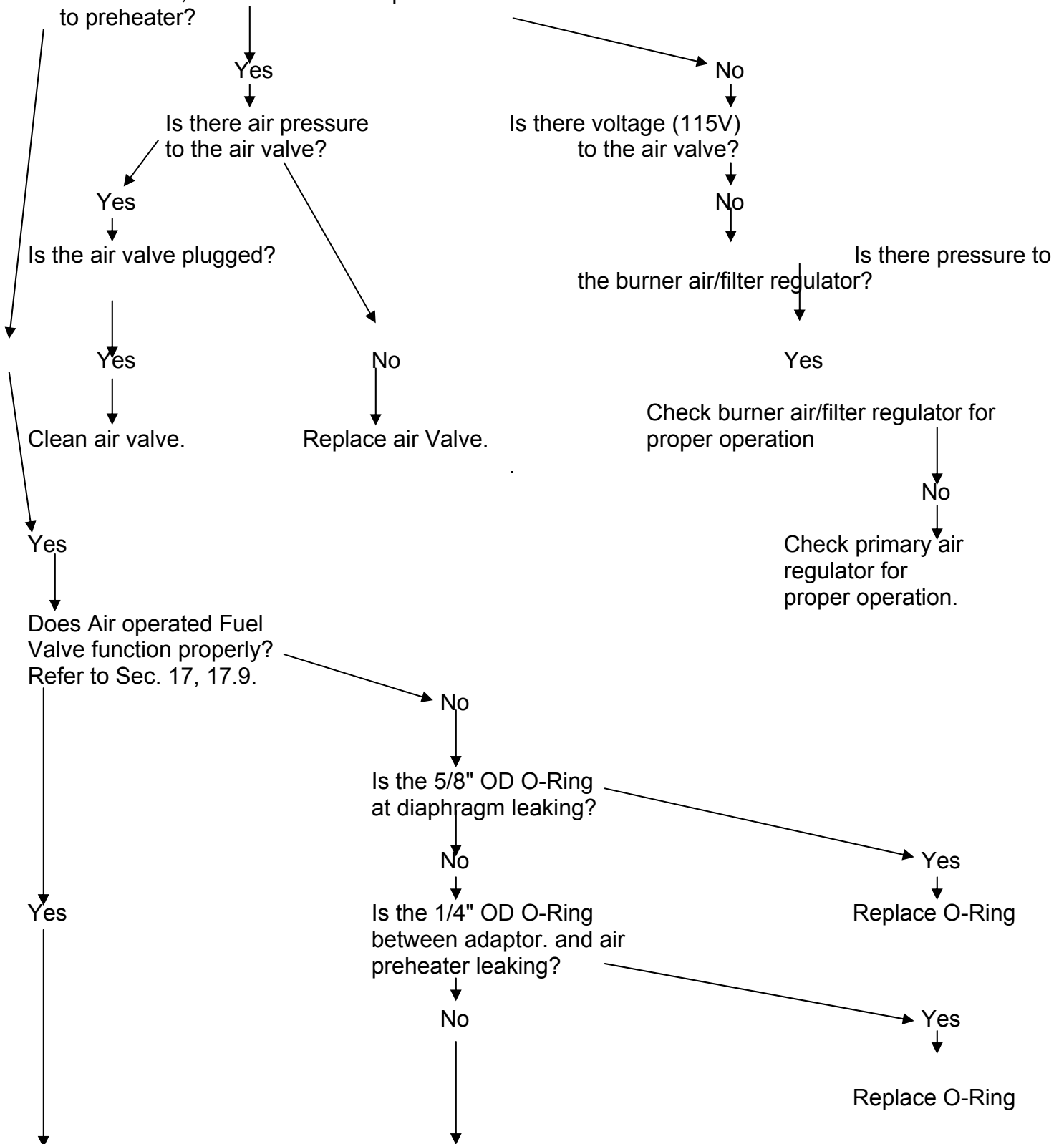
Look in inspection port at rear of burner.

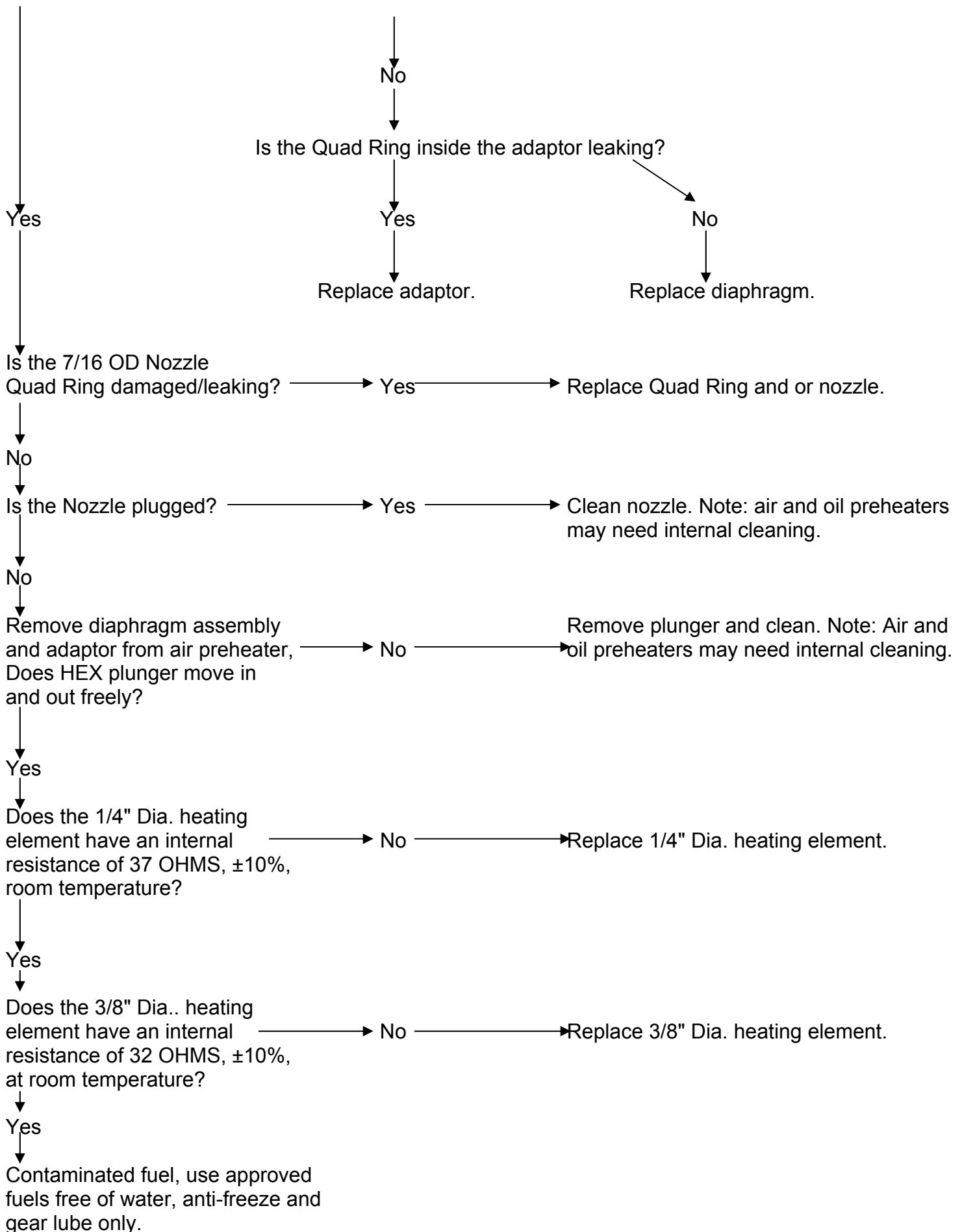
Wear eye and face protection. Start

burner, do electrodes have spark? →



1. Jump the cad cell circuit. See Sec. 17,17.2.
2. Disable transformer, **Caution Hazard of Electrical Shock**. Disconnect neutral wire from terminal and oil primary wire in burner electrical junction box.
3. Adjust burner air/filter regulator to 11-12 PSI.
4. Disconnect air line at air preheater.
5. Start burner, does the air valve open and allow air to exit air line to preheater?



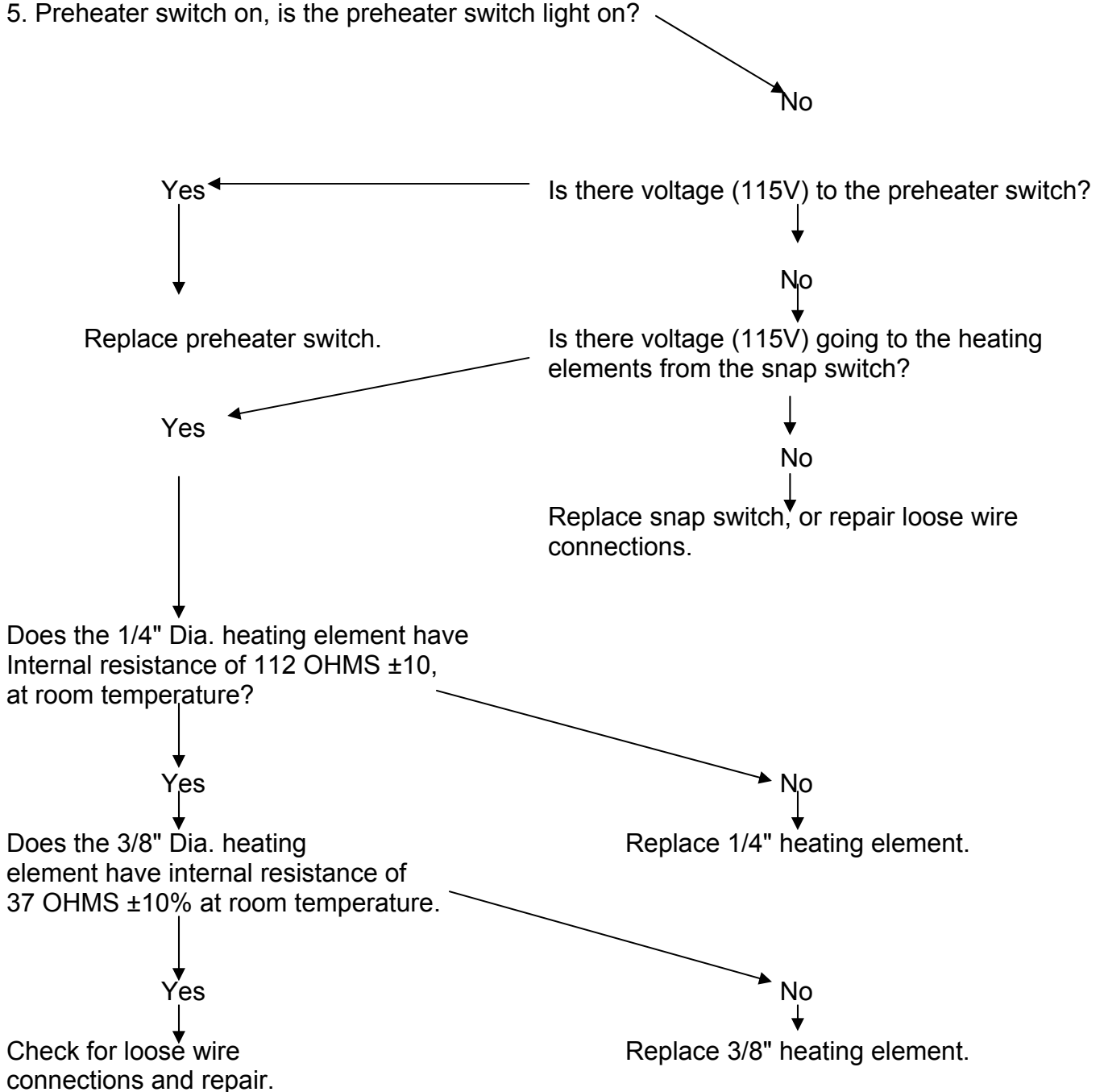


# Section 17 Trouble Shooting Flow Chart #4

## "Caution: Hazard Of Electrical Shock"

**Symptoms:**

1. Preheater cold with preheater switch on?
2. Burner attempts to fire but fails?
3. Unable to establish a flame?
4. Oil Primary locks out?
5. Preheater switch on, is the preheater switch light on?



## SUPPLEMENTAL TROUBLESHOOTING GUIDE

### Chart #1

<u>Symptom</u>	<u>Possible Cause</u>	<u>Corrective Action</u>
A. Burner will not start.	1. Main power turned off, or disconnected.	1. Check disconnect. Using a multi-meter make sure you have 120 V at junction box.
	2. Thermostat defective	2. Re-install thermostat. Make sure thermostat is installed properly (See Page # 17).
	3. Oil Primary defective or safety switch of oil primary.	3. Test oil primary, or reset.

### Chart #2 & #3

B. Burner attempts to fire, and has a poor flame, or no flame.	1. Fuel supply low, or contaminated.	1. Fill supply tank if low. Drain if contaminated.
	2. Supply pump defective or improperly installed. No fuel to the nozzle.	2. Test supply pump, check fuel lines for suction leaks. Install supply pump and supply lines as per page #11 to #13c.
	3. Air regulator or air solenoid defective.	3. Test air regulator, and solenoid, if defective replace.
	4. Ignition transformer defective.	4. Test transformer should have 120 V input, and 10,000 V output (metal case) 14,000 V (plastic case).
	5. Air preheater diaphragm defective.	4. Clean air preheater and replace diaphragm.

# Supplemental Trouble Shooting Guide Continued

<u>Symptom</u>	<u>Possible Cause</u>	<u>Corrective Action</u>
A. Burner will not start.	1. Main electrical power circuit breaker tripped.	1. Reset Breaker.
	2. Service disconnect switch off or fuse blown.	2. Turn switch on or replace fuse.
	3. Thermostat turned down/ improperly installed/ defective.	3. Turn thermostat up, check wires/test components/replace.
	4. Oil primary safety tripped/defective.	4. Reset/test components, replace if needed.
	5. Too much light showing on cad cell/defective.	5. Eliminate light to cad cell. Test component.
	6. Fan/Limit control reached high/limit, or is defective	6. Check fan/limit control settings (See page 13B) or test components.
B. Burner attempts to fire, but does not establish a flame.	1. Low oil in supply tank or contaminated fuel.	1. Fill tank, or drain and clean tank.
	2. Plugged or worn nozzle.	2. Clean or replace.
	3. Fuel pressure gauge fluctuating/pumping system.	3. See section 7, Page 12.
	4. Preheater switch is turned off off or defective, or defective cartridge heater.	4. Turn switch on or test switch and cartridge cartridge heater.
	5. Transformer/electrodes not sparking.	5. Test transformer/look for shorts & repair. Replace electrodes/ transformer.
	6. No air pressure/defective regulator/defective solenoid.	6. Turn compressor on/test regulator/solenoid. Replace defective components.

# SUPPLEMENTAL TROUBLESHOOTING GUIDE CONTINUED

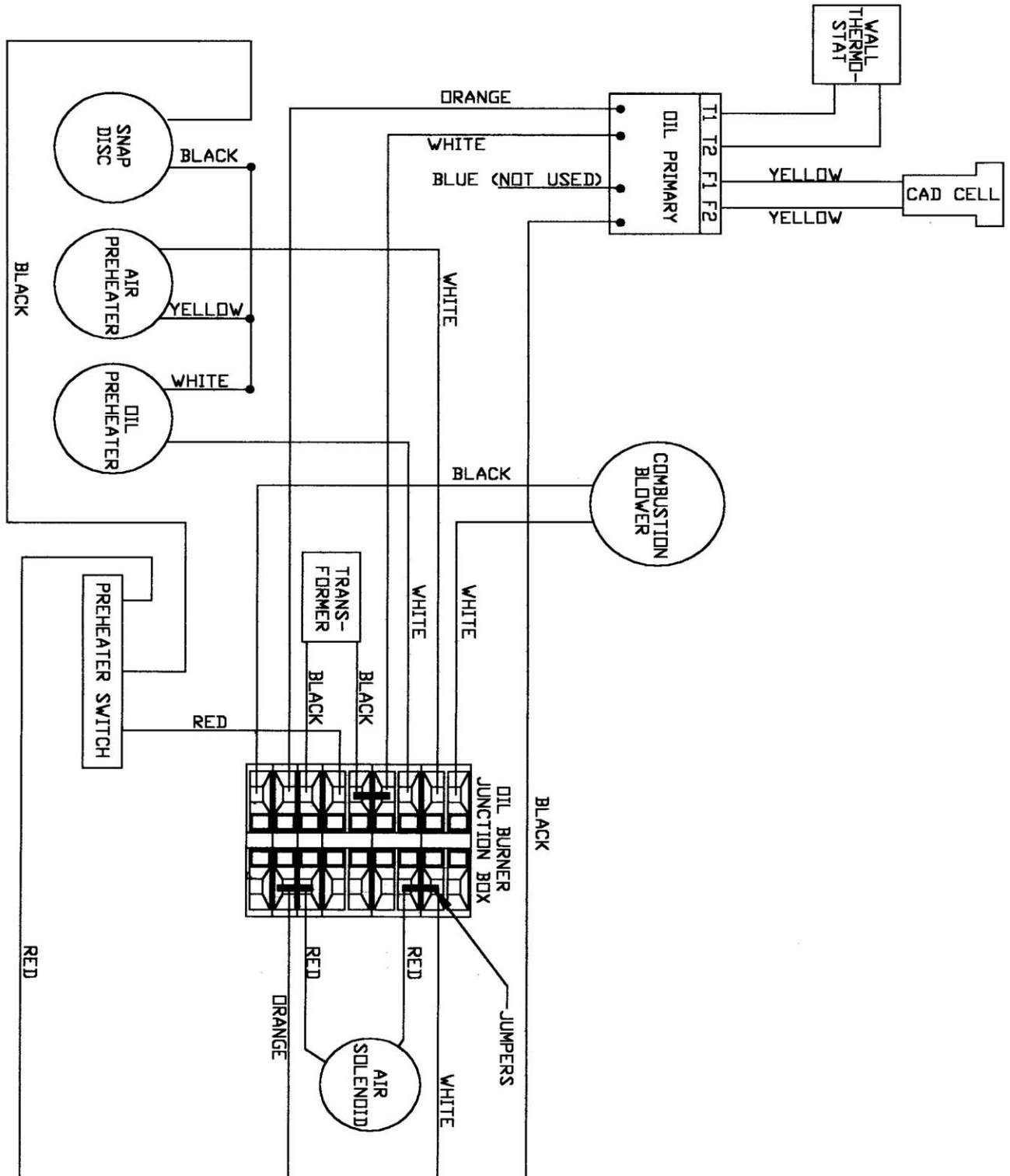
<u>Symptom</u>	<u>Possible Cause</u>	<u>Corrective Action</u>
	7. Water in air system.	7. Clean air preheater and drain water from system.
	8. Combustion blower not properly adjusted or defective.	8. See flame adjustment Section 15, page 26. Replace blower.
	9. Improper draft.	9. Check draft see page 10. Make sure chimney is properly installed.
	10. Plugged heat exchanger, manifold, or chimney.	10. Clean heater including chimney.
C. Burner fires, and then fails on oil primary safety.	1. Contaminated fuel supply. (water/anti freeze/gear lube)	1. Drain and clean fuel supply tank.
	2. Improper draft	2. See B-9.
	3. Plugged heat exchanger, manifold, or chimney.	3. See B-10.
	4. Wrong air pressure.	4. See flame adjustment page 26.
	5. Wrong fuel pressure or pressure fluctuating.	5. See flame adjustment page 26. See fuel piping page 12.
	6. Improper combustion blower setting, or blower is defective.	6. See flame adjustment page 26. See fuel piping page 12.
	7. Oil primary/cad cell defective. Cad cell improperly adjusted. Dirty flame Turbulator.	7. Test components/adjust cad cell/ clean Turbulator.
D. Burner	1. Contaminated fuel supply or dirty fuel filter.	1. Drain and clean supply tank. Clean filter.

# SUPPLEMENTAL TROUBLESHOOTING GUIDE CONTINUED

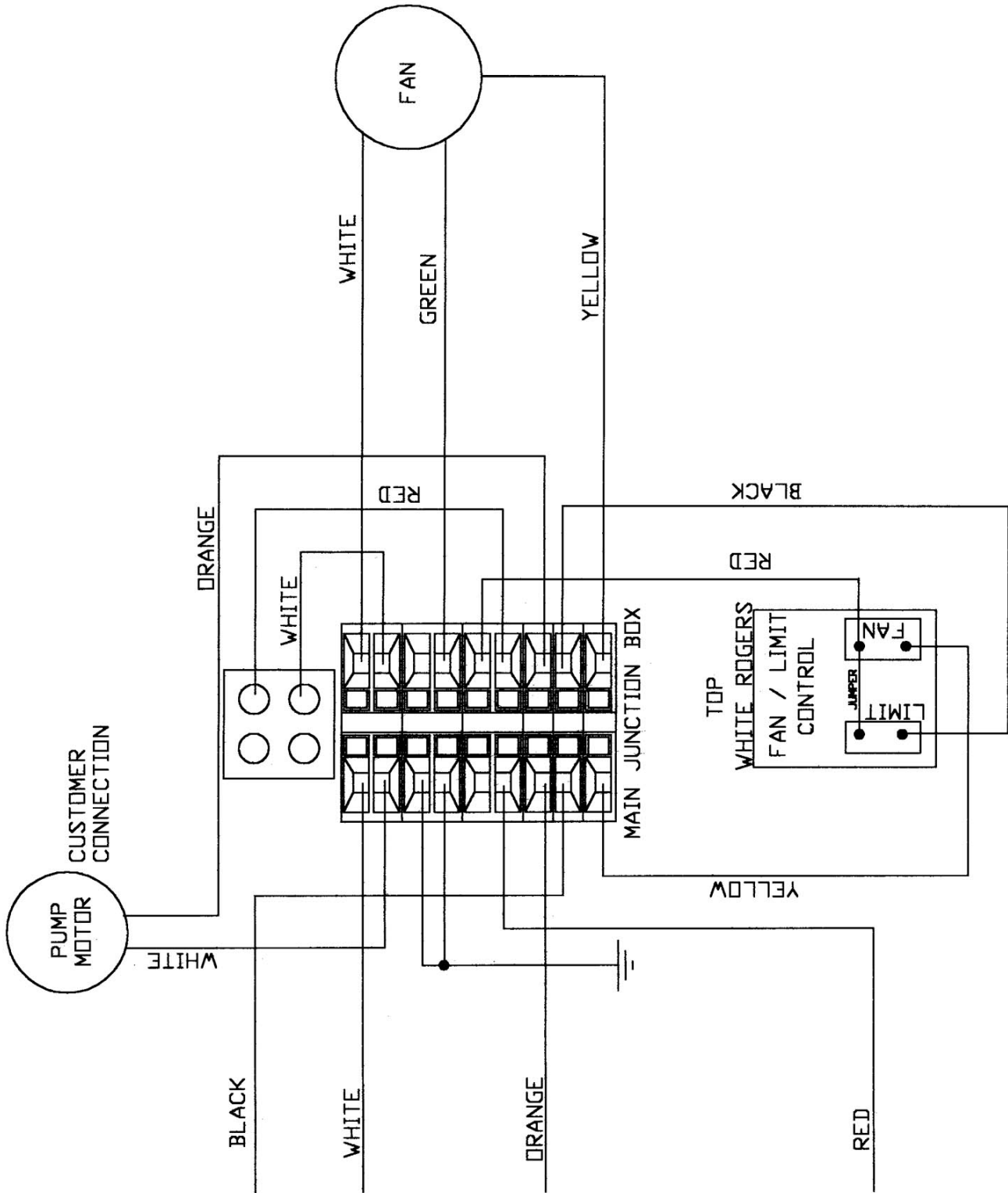
<u>Symptom</u>	<u>Possible Cause</u>	<u>Corrective Action</u>
	2. Improper draft.	2. See B-9.
	3. Plugged heat exchanger, manifold or chimney.	3. See B-10.
	4. Improper air setting, or air settings.	4. See flame adjustment page 26.
	5. Plugged nozzle or preheater assembly.	5. Clean nozzle and/or Preheater assembly.
E. Burner	1. Thermostat set wrong or defective.	1. See page 17, room thermostat installation.
	2. Fan limit control set improperly or defective.	2. See page 18, Section 12 & 12.3.
<b>Chart #4</b>		
A. Preheater assembly not heating.	1. Cartridge heaters defective or disconnected.	1. Test cartridge heaters using an ohms meter. Air heater $112 \Omega \pm 10\%$ . Oil heater $37 \Omega \pm 10\%$ .
	2. Snap switch defective.	2. Test snap switch for continuity if preheater is cold.



# SECTION 18 WIRING DIAGRAM ALL HI MODELS



# SECTION 18 WIRING DIAGRAM ALL HI MODELS







## SECTION 19 PARTS LIST OIL PREHEATER

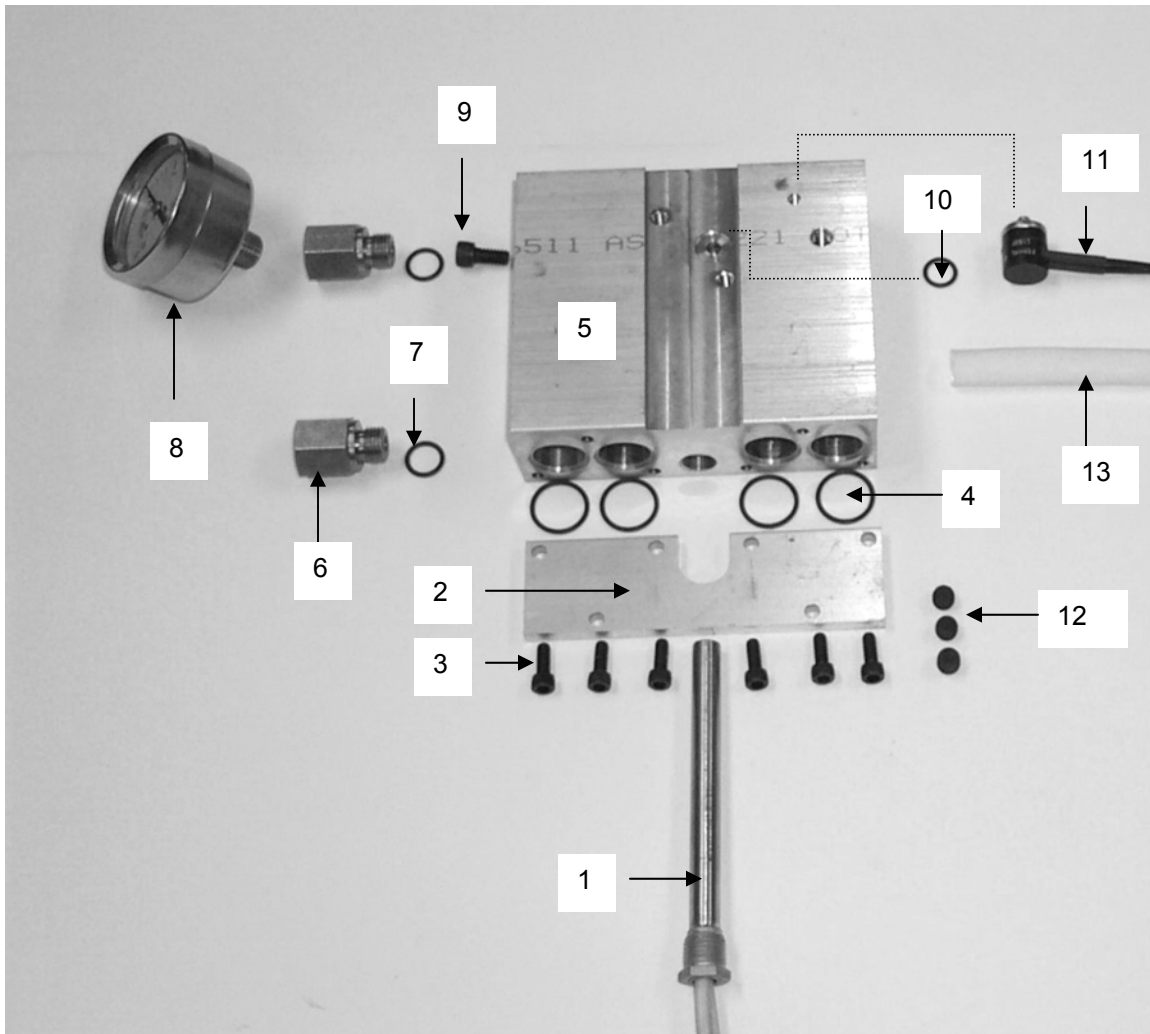
IMPORTANT: Use only Lanair O.E.M. Replacement Parts and O-Rings!

<u>Reference number</u>	<u>Part Number</u>	<u>Quantity</u>	<u>Description</u>
1	8992	1	Cartridge Heater 3/8" Dia.
2	9813	1	Cap Oil Preheater
3	7240	6	Screw
4	9804	4	O-Ring 16/16" OD
5	2901	1	Oil Block
6	9029	2	Fitting
7	9815	2	O-Ring 5/16" OD
8	8498	1	Oil Gauge
9	7242	1	Screw
10	9803	1	O-Ring 1/2"
11	9366	1	Snap Switch
12	7109	3	Pipe Plug
13	9610	1	Sleeve

Items 3,4,7, and 10 are includes in Tune Up Kit 9869

# Oil Preheater HI/FI

IMPORTANT: Use only Lanair O.E.M Replacement Parts and O-Rings!

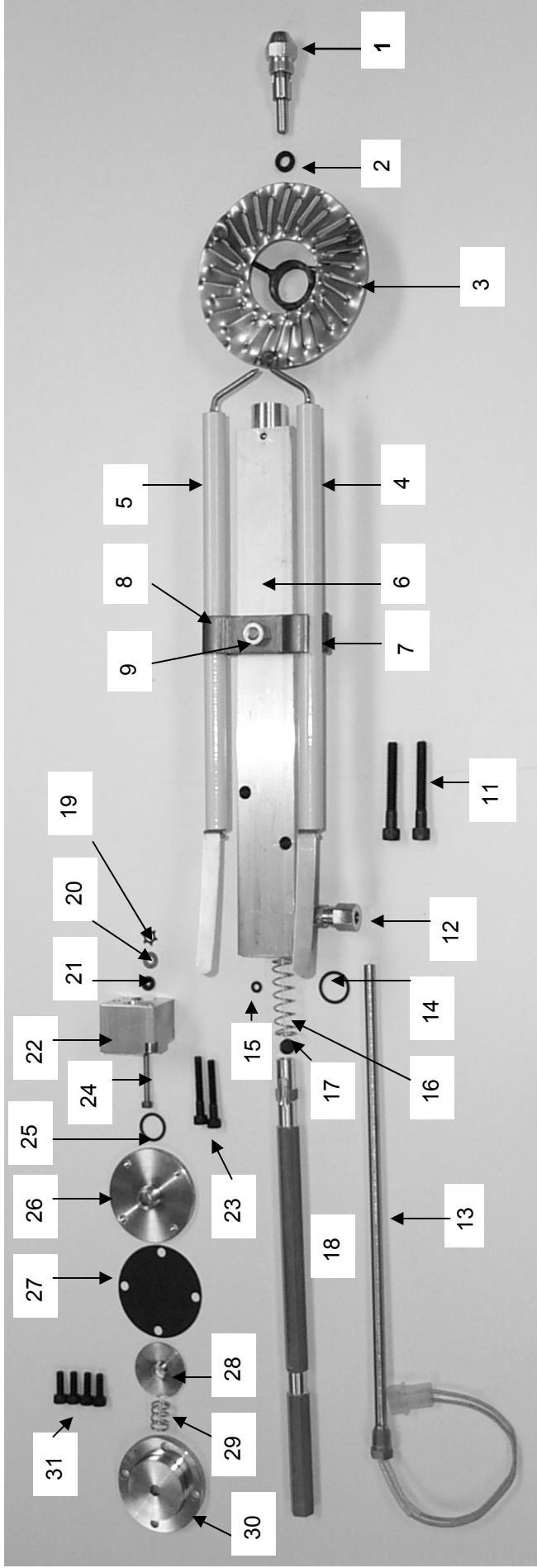


## SECTION 19 PARTS LIST AIR PREHEATER

IMPORTANT: Use only Lanair O.E.M. Replacement Parts and O-Rings!

<u>Reference number</u>	<u>Part Number</u>	<u>Quantity</u>	<u>Description</u>
1	----	1	Nozzle
2	9522	1	Quad-Ring
3	9853	1	Turbulator
4	8945	1	Left Electrode
5	8944	1	Right Electrode
6	9851	1	Air Preheater
7	2343	1	Electrode Holder
8	2342	1	Electrode Clamp
9	7203	1	Nut
10			
11	7245	2	Screw
12	8679	1	Brass Fitting
13	9856	1	Cartridge Heater
14	9725	1	O-Ring 11/16"
15	9524	1	O-Ring 1/4"
16	8985	1	Spring
17	9824	1	Insert
18	9835	1	Plunger
19	8219	1	Clip
20	7246	1	Washer Brass
21	9523	1	Quad-Ring
22	9838	1	Adaptor Block
23	7245	2	Screw
24	9808	1	Pin
25	9726	1	O-Ring 1/2"
26	9822	1	Diaphragm
27	9823	1	Base Diaphragm
28	9822	1	Piston Diaphragm
29	8984	1	Spring
30	9827	1	Cap Diaphragm
31	7240	4	Screw

# SECTION 19 CONTINUED



## Air Preheater FI/HI

**IMPORTANT: Use only Lanair O.E.M Replacement Parts and O-Rings!**

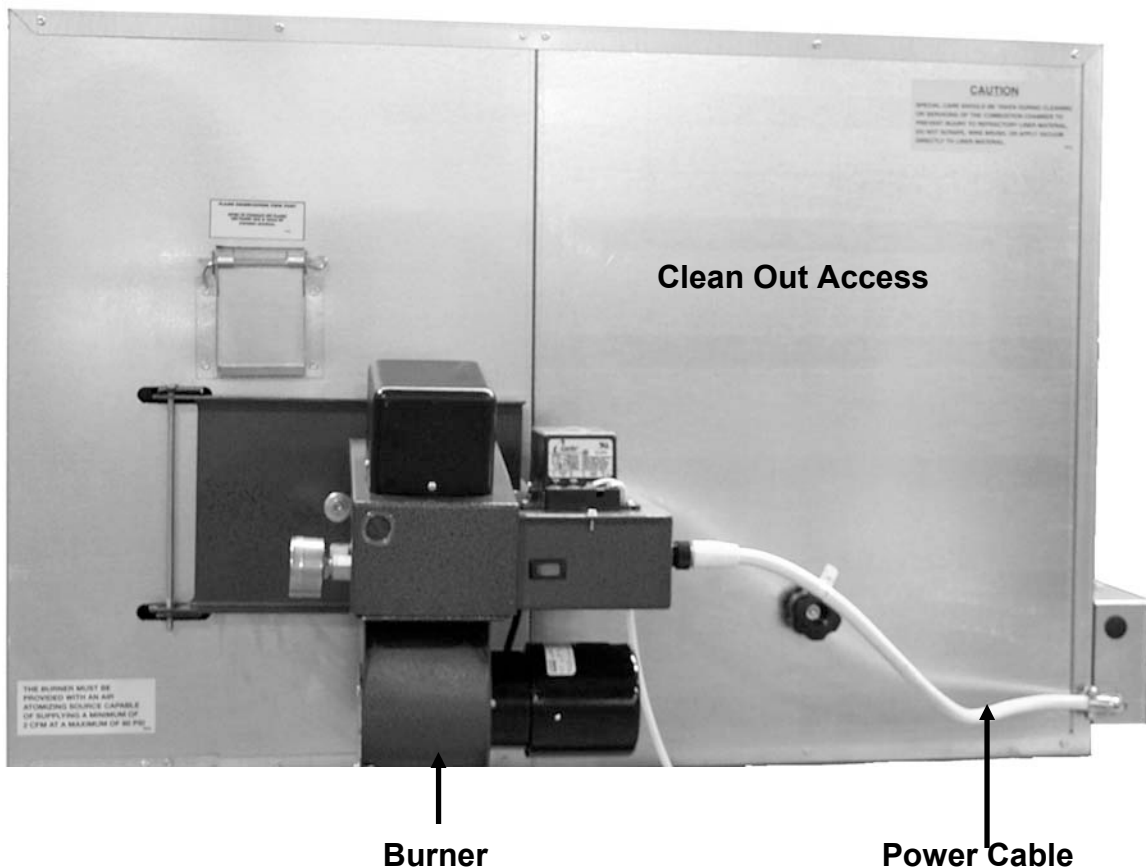


# SECTION 20 HI-320 COMBUSTION CHAMBER/HEAT EXCHANGER CLEANING INSTRUCTIONS

Note: Whenever cleaning of the combustion chamber and heat exchanger are required, proper protective clothing **MUST BE WORN.**

**WARNING: DISCONNECT ALL ELECTRICAL POWER TO HEATER BEFORE SERVICING!**

- 20.1 Turn thermostat to the lowest setting; the heater must be completely cool before attempting to clean the heater (place the fan/limit on the manual position to start the fan and shorten the cooling time if the unit is hot).
- 20.2 Turn off all power to the heater (120 VAC) at the main disconnect. Place the fan/limit switch lever back into the auto position so the fan is off upon restarting.



## SECTION 20 HI-320 COMBUSTION CHAMBER/HEAT EXCHANGER CLEANING INSTRUCTIONS CONTINUED

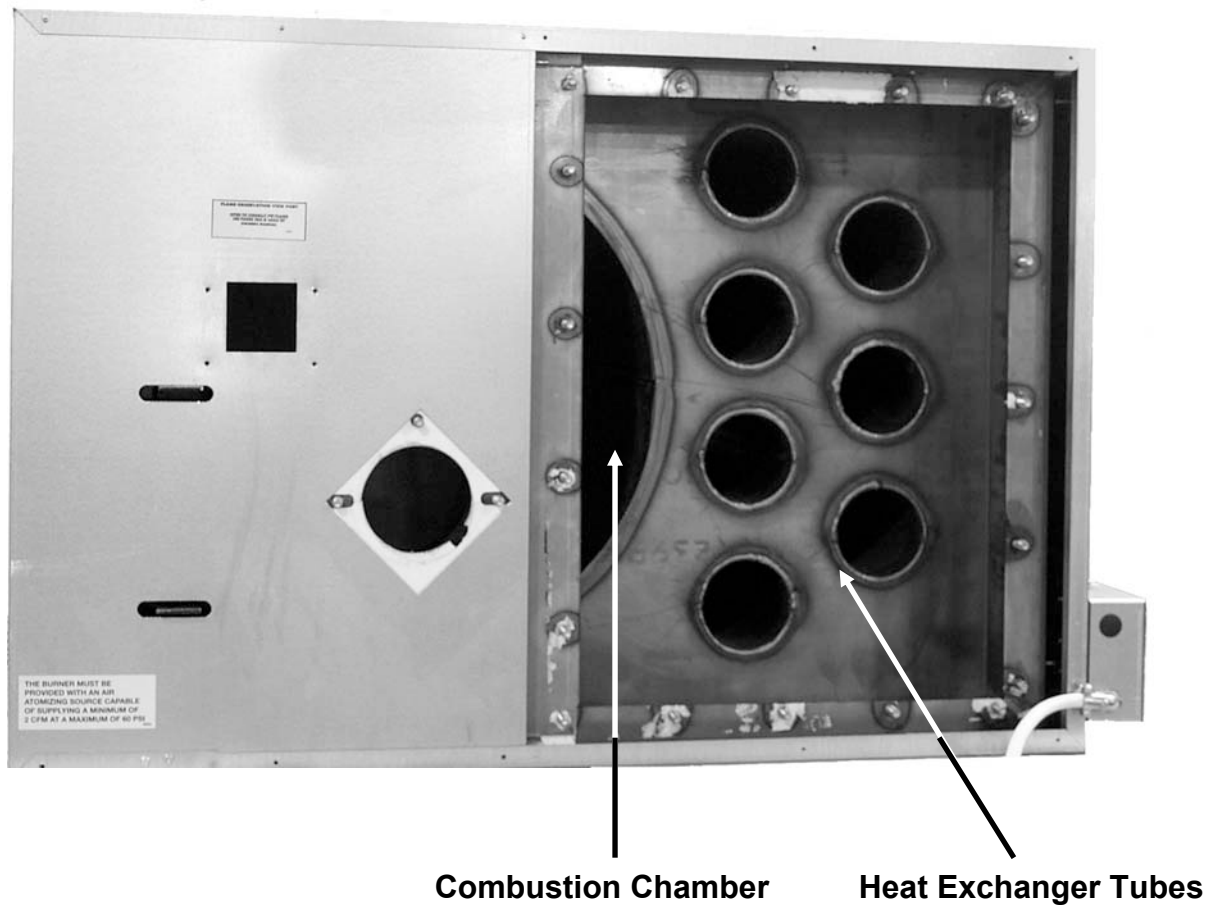
- 20.3 Disconnect power cable from burner. Remove (3) 9/16 nuts and washers from burner swing door. Remove (1) 7/16 nut from hinge pin on left side of burner. **Caution:** The burner is heavy be prepared when working on a ladder.
- 20.4 Remove the clean out access panel cabinet door from the right side of the heater (facing the burner) by removing (6) #8 hex head sheet metal screws.
- 20.5 On the combustion chamber clean out door (inner) spray all of the studs (17-9/16") with penetrating oil to prevent breakage. Allow penetrating oil to soak for 5 min. Remove the brass nuts and washers allowing removal of combustion chamber clean out door. This is a good time to perform your annual burner tune-up. **Caution:** This door is heavy be prepared when working on a ladder.



Combustion Chamber Cleanout Door

# SECTION 20 HI-320 COMBUSTION CHAMBER/HEAT EXCHANGER CLEANING INSTRUCTIONS CONTINUED

- 20.6 Replace combustion chamber and burner cleanout door gasket when ever these panels are removed.



- 20.7 Clean all ash from the combustion chamber/heat exchanger at the end of the heating season. Pull the ash to the front of the heat exchanger tube for easy removal. Shovel all of the ash from the combustion chamber. An industrial type canister vacuum may also be used to remove ash. **NOTE:** Use care when cleaning the combustion chamber area so as not to damage the target brick. **Caution:** When cleaning the combustion chamber/heat exchanger protective clothing must be worn.

## SECTION 20 HI-320 COMBUSTION CHAMBER/HEAT EXCHANGER CLEANING INSTRUCTIONS CONTINUED

- 20.8 Replace all clean out panels. Install new gaskets each time these panels are removed. Replace brass nuts and washers if needed. Install burner replacing the flange gasket. **Caution:** Do not turn on power to the unit at this point.
- 20.9 Remove the chimney connector from the heater and clean all ash from the rear of the heat exchanger (see below). Inspect chimney connector replace if needed. When replacing chimney connector secure it the furnace with a minimum of 3 sheet metal screws. Clean and lubricate hinge pins on the barometric damper. **Caution:** When cleaning the combustion chamber/heat exchanger protective clothing must be worn.



- 20.10 After replacing the chimney, and all clean out panels and cabinet doors reconnect all power at the main breaker box. Turn the thermostat to its lowest setting. Make sure the red light is illuminated on the preheater switch at the rear of the burner. Wait 10 minutes for the preheaters to come up to temperature before firing the heater.

**Do not operate your furnace with clean out panels or cabinet panels removed.**

NOTE: When changing the target brick, call the Lenan Service Department for assistance at 800-753-1601.

**LANAIR 10 YEAR WASTE OIL HEATER COMBUSTION CHAMBER HEAT EXCHANGER LIMITED WARRANTY\***

**LENGTH OF WARRANTY**  
(10 YEARS FROM THE DATE OF PURCHASE)

**NOT COVERED UNDER WARRANTY**

**FIRST THREE YEARS**  
**1 – 3**

Lenair will repair or replace your combustion chamber/heat exchanger **FREE**.\*

A. Any portion of the combustion chamber/heat exchanger if:

1. The heater is not installed per the owner's manual.
  2. The weekly, monthly, and yearly inspection is not done.
  3. If the heater is used for a purpose for which it was not intended.
  4. If the heater is not operated in accordance with the printed instruction in the owner's manual.
  5. If any alterations or unauthorized repairs are made to the unit.
- B. Damage incurred from abuse, neglect, shipping, natural acts, misuse or accident.
- C. Labor cost for service calls for any reason, including:

1. Cleaning or performing required maintenance.
  2. Installation corrections.
  3. Installation of any parts.
- E. Goods purchased under this agreement shall be used exclusively by the buyer, and no other person or third party shall benefit from the expressed or implied warranties contained in this agreement.

**YEARS FOURS TO TEN**  
**4-10**

Lenair will repair or replace your combustion chamber/heat exchanger. You're guaranteed replacement cost will be shared by Lenair 50/50.

**IMPORTANT**

The combustion chamber/heat exchanger must be installed and maintained in accordance with the installation/operating instructions. This warranty does not cover normal wear items i.e.: firebrick, gasket material, nuts, and bolts, etc. The warranty card must be returned within 10 days of the purchase date in order for this warranty to be valid.

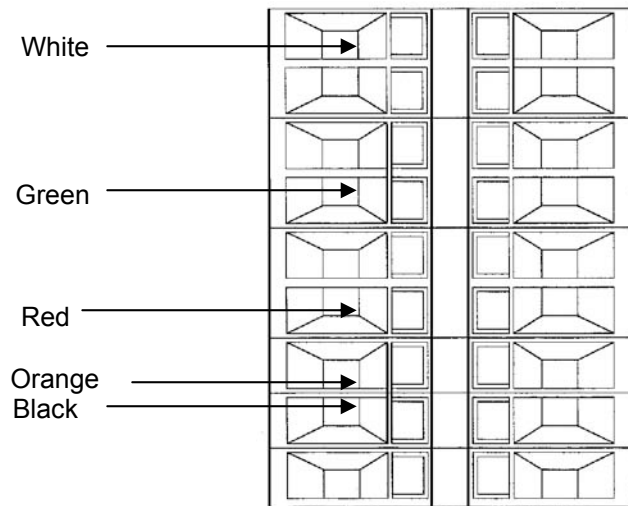
\*Manufacturer's determination regarding repair or replacement is final. The cost of all freight is the owner's responsibility.

Note: the 10-year warranty applies to Lanair FI, HI, and Turbo-Z series heaters.

**LANAIR CORP./LANAIR**  
**4109 CAPITAL CR.**  
**JANESVILLE, WI 53546**  
**1-800-753-1601**  
**WARRANTY PROVISIONS**

# SECTION 22 HI-BURNER WIRING INSTRUCTIONS

Instructions for wiring the yellow cable from the burner to the electrical junction box



# SECTION 23

## APPENDIX TO PUMP INSTRUCTIONS

### Pump and Oil Bypass Regulator Installation Instruction for the Lanair HI Series Heaters, and FI Burner Upgrades.

When using a Lanair® Waste Oil Storage Tank follow instructions included with the tank.

The installer of heating equipment in the United States of America must consider the requirements for the following publications of the National Fire Protection Association.

NFPA No. 30	Flammable and Combustible Liquids Code.
NFPA No. 31	Standard for the Installation of Oil Burning Equipment
NFPA No. 70	National Electric Code
NFPA No. 88-A	Standard for Parking Structure
NFPA No. 88-B	Standard for Repair Garages

### REFER TO THE INSTALLATION DIAGRAM

#### Pump Specifications

Flow:	9.0 GPH Max. Flow
Pressure:	50 PSI Factory Set Internally
Electrical:	120 VAC/5.4 Amps
Port Size:	Inlet 1/4 NPT Outlet 1/8 NPT

All installations must be made in accordance with State and Local Codes, which may differ from the Lenan Owner's Manual. The Heater must be installed and/or inspected by a Licensed Heating Contractor before operation.

1. Mount the fuel supply pump in a, "Horizontal" position (shaft horizontal) near the fuel supply tank.
2. Make the electrical connections from the Heater junction box to the pump motor using 12 AWG insulated wire inside flexible or rigid conduit.
3. The oil pump has a maximum suction lift of 8 feet for No. 1 and No. 2 fuel oil, and a maximum suction lift of 10 feet for used oil and automatic transmission fluid. For additional lift or run call the Lenan Service Department.
4. The Fuel Pump/Motor are for indoor use only.
5. The Fuel Pump contains an internal strainer, and should be cleaned. The strainer is located behind the pump cover. A replacement gasket is available, Lenan part 9817.
6. Install the suction supply line for the standard pump from the inlet side (right hand side) of the fuel pump using 1/4 NPT fitting. When using the upgrade pump install the suction supply line on the left side of the fuel pump using a 1/4 NPT fitting. Install the suction supply line opposite the tank drain.

7. Use 1/2 " inside diameter (.493 steel pipe), or 1/2 " outside diameter copper throughout the suction supply line and pick up tube. When installing a Lanair Waste Oil Storage Tank, follow the plumbing directions included with the tank.
8. Use thread sealing compound on all pipe thread connections. **Do not use Teflon tape!**
9. Install the check valve and suction line strainer on the bottom of the pick up tube. Keep the suction line strainer 6" off the bottom of the tank. The arrow on the check valve shows the proper direction for flow. Consider accessibility for cleaning.
10. Install a 1/2 " NPT pipe union in the pick up for ease of service.
11. Install the primary strainer before the pump. The arrows on the strainer show the proper direction for flow.
12. Install the vacuum gauge in the suction line. This gauge will indicate when service is needed on the primary strainer or pump. It will also indicate a suction line leak as well as low fuel.
13. Install a 1/2" inside diameter (.493 steel pipe), or 1/2 " outside diameter copper tube from the bottom of the Oil Bypass Regulator (the port marked "T") into the fuel tank for an overflow return line.

**Important:** The overflow return line must return straight into the tank. No elbows may be used. This line should not be submerged in the oil. Failure to install this line properly will result in an overfire condition, and void the warranty.

14. **Do Not** allow the fuel level in the tank to cover the overflow return line.
15. Install the fuel supply line from the pump to the Oil Bypass Regulator (Port marked "P") using a 1/2" inside diameter (.493 steel pipe), or 1/2 " outside diameter copper tube.
16. Install the fuel supply line from the Oil Bypass Regulator (Port marked "B") to the inlet port on the left side of the Burner using 1/2" inside diameter (.493 steel pipe), or 1/2 " outside diameter copper tube. The maximum run is 25 feet.
17. Install a union in the fuel supply line at the Burner for service.
18. Install a union in the fuel supply line at the Oil Bypass Regulator for service.
19. Install a shut off valve in the fuel supply line at the Oil Bypass Regulator for service.
20. **Use 37° flare fittings on all copper tube connections. Do not use compression fittings.**
21. Keep the fuel supply line 1" off un-insulated outside walls.
22. The fuel supply line must maintain an upward rise to the burner.



23. Clean all lines, Fittings and parts internally before assembly. Rust, metal shavings, or dirt will clog the burner nozzle.
24. To prime the pumping system, disconnect the union on the pick up tube, and fill the line with new oil. Re-tighten the union. Fill the primary strainer canister with new oil. Make sure all plumbing connections are completed and tightened. Fill the supply tank with the recommended fuel. Disconnect the power supply at the pump, which is supplied from the furnace. **Temporarily** connect a 120 V circuit to the pump, causing it to run.

Caution: Do not connect the temporary power and the permanent power supply lines both to the pump motor both at the same time as this will cause a short, damaging or burning out components.

Open the bleeder port on the pump. Start the pump. When the air is purged, a steady stream of oil will exit the bleeder port. Close bleeder port.

Make sure to disconnect the fuel line from the burner, and put the fuel line in a bucket to catch the oil. Let the oil run until you get a clear stream of oil (no air bubbles). Turn the pump off. Reconnect the fuel lines and electrical connections to the heater. Make sure the waste oil switch on the burner is turned on (red light on). Turn the thermostat up until it calls for heat. Let the furnace run for 15 minutes.

### **Maintenance Schedule**

Weekly: Drain water and sludge from your fuel supply tank. The water and anti-freeze settles to the bottom of the tank. When draining, only open the valve a small amount. If you open the valve all the way you will drain oil instead of water.

Monthly: Clean the oil supply tank filter #8748 and check valve 8662. Clean the primary strainer # 9807. New elements and o-rings are available. Call the Lenan Corporation Service Department (800) 753-1601. Clean the pump strainer located under the pump cover. New gaskets are available. Call the Lenan Corporation Service Department (800) 753-1601.

See the owner's manual for more details.

Yearly: Clean the entire pumping system, filters, lines and oil supply tank. Flush the pump with No. 1 fuel oil to clean out any sludge deposits that may have accumulated.

**Do not run the supply pump dry; this will void the warranty.**

Note: Any abuse or neglect of the pump will void its warranty. The maintenance schedule may be more frequent depending on the type of oil and the severity of the contamination. Refer to “General Information” in the owner’s manual.

### Operation Requirements

1. Oil in the supply tank must not be below 35° F and indoors.
2. Do not operate the supply pump with plugged filter/strainers.
3. Keep the fuel supply tank half full at all times to avoid running the pump dry.
4. Strain all used oils with a 100-mesh strainer before pouring into the supply tank.
5. The supply pump is designed for pumping used oil 10W-50W, automatic transmission fluid, and No. 1 & No. 2 fuel oil.  
**CAUTION: The use of any other fuels will void the warranty.**
6. Use a tank that is UL Listed for the storage of oil, such as the Lenan 195 gallon storage tank.
7. If you lose oil output from the supply pump, clean the filter/strainer, check for loose pipe fitting, and low fuel levels in your tank. Re-prime your pump. Follow the priming instructions, and restart the furnace.

## Bottom View of the Aluminum Oil By-Pass Regulator



- C.** Port to the oil inlet on the burner assembly. Install  $\frac{1}{2}$ " O.D. min. copper tubing, or  $\frac{1}{2}$ " schedule 40 pipe. Failure to install this line properly will result in damage to your heater, and will void your warranty.
- T.** Port to the oil supply tank for the overflow return line. Install  $\frac{1}{2}$ " O.D. min. copper tubing, or  $\frac{1}{2}$ " schedule 40 pipe or larger. This line **MUST** run straight into the tank, and should not be submerged in oil. There can be no elbows or uphill runs. No elbows should be used. Failure to install this line properly will result in damage to your heater, and will void your warranty.
- P.** Port from the outlet side of your fuel supply pump. Install  $\frac{1}{2}$ " O.D. min. copper tubing, or  $\frac{1}{2}$ " schedule 40 pipe. Failure to install this line properly will result in damage to your heater, and will void your warranty.

## **IDENTIFICATION OF INSTALLATION**

1. Chimney Cap
2. Class "A" Insulated Pipe
3. Tank Vent
4. Non-Combustible Collar
5. Chimney Clean-Out
6. Barometric Draft Control
7. Draft Reading Port
8. Burner
9. Room Thermostat
10. Primary Air Regulator
11. Shut-Off Valve
12. Electrical Disconnect
13. Shut-Off Valve
14. Fuel Pressure By-Pass Regulator
15. Overflow/Return Line
16. Fuel Pump
17. Vacuum Gauge
18. Suction Line Strainer
19. Union
20. Check Valve
21. Pick-Up Tube Strainer
22. Supply Tank
23. Water/Sludge Drain
24. Fill Pipe



Pressure Gauge Port (Optional)

Outlet 1/8" NPT  
Increase to 1/2"  
At this Point



Inlet 1/4" NPT  
Decrease From  
1/2" At this Point

Easy Flow  
Bleed Valve

Inlet 1/2" NPT



Outlet 1/4" NPT  
Increase to 1/2"  
at this Point

Vacuum Gauge  
Port

Easy Flow  
Bleed Valve

UPGRADE PUMP ASSEMBLY MODEL J  
MAXIMUM PIPE LENGTH 90 FEET USING 1" PIPE  
10 FOOT MAXIMUM LIFT

## **TOP INSTALLATION ERRORS**

Using the wrong size of supply lines, suction line, or overflow lines. Using anything but a straight run back to the tank on the overflow (NO elbows or horizontal runs of any kind.).

(See the owner's manual)

Not using Class "A" chimney when passing through a combustible or to the outside. Single wall and Class "B" Gas Vent are not safe.

(See the owner's manual)

Not installing or setting the barometric damper on the chimney.

(See the owner's manual)

Not installing a capped clean out tee on the chimney.

(See the owner's manual)

Not having a long enough vertical run of chimney from the capped clean out tee to the rain cap. Installing too many 90° elbows (each elbow equals 10' of run. Max. run 30').

(See the owner's manual)

**Questions or Comments? Call LENAN'S Service  
Department (800) 753-1601**

## **TOP OPERATION ERRORS**

Not using the flame observation view port on the side of the heater to **VISUALLY SET THE FLAME**. (See page 26AA of the owner's manual)

Over firing the heater by using incorrect oil and air pressures. **VISUALLY SET THE FLAME** see page 26 AA in owner's manual. Flame tips should be no more than 3/4 of the way into the combustion chamber.

Not using proper fuel management with the waste oil fuel. Pre-straining all fuels and draining water form the tank weekly. (See the owner's manual)

Using non-recommended fuels. (See the owner's manual)

Not checking the barometric damper setting for the venting of exhaust gases. (See the owner's manual)

Failure to clean the heat exchanger/combustion chamber. (See owner's manual Section 20)

Failure to clean and maintain the burner. (See owner's manual)

**Questions or Comments? Call LENAN'S Service  
Department (800) 753-1601**