

Form No. RGM 465



**REZNOR®  
WASTE OIL FIRED BOILER**

# **Installation and Reference Guide**

**Model RAB**

**Sizes 140, 235, 350, 500**

**Model RAB boilers meet EPA  
requirements for disposal of used oil.**

# **IMPORTANT Notice to Owner and Installer**

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**To ensure the long term benefits of burning your used oil in a Reznor® Waste Oil Fired Boiler, it is necessary to become familiar with the correct installation and maintenance of your new boiler. Before installing or operating, make sure you have read and understand this manual and the boiler manual.**

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## **IMPROPER INSTALLATION OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.**

**The most critical sections of this manual are**

- **Correct Draft Over Fire - Page 20**
- **General Maintenance Requirements - Page 22**

**Identical to any gas or oil burner, without adequate draft over the fire, the combustion gases cannot escape resulting in an overheated combustion chamber. Even if the burner is installed correctly and adequate draft achieved, a flue passage blockage will affect the draft. Burning used oil is similar to burning wood. A fine gray ash accumulates in the chamber and flue passages. This accumulation of ash will eventually affect the draft. It is important to remove this ash before the draft is affected.**

**These topics are discussed in detail on the pages listed above. Please familiarize yourself with these sections of your manual. Spending a few minutes to review this material will assure that you receive the return on investment that you expect from your boiler.**

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# Installation

## Introduction

## Use

This boiler is for commercial or industrial use only.

The boiler should be installed by an experienced installer thoroughly trained and experienced with the installation of oil-fired appliances. The installer should be familiar with the special precautions necessary in the handling and storage of used automotive oils which may contain small amounts of gasoline.

## Codes and Regulations

Installation must comply with:

### In the United States

- The Standard for the Installation of Oil Burning Equipment NFPA 31
- The National Electrical code NFPA 70
- Federal, State, and local municipal codes

### In Canada

- CSA Standard B139-M91, Installation Code for Oil Burning Equipment
- CSA Standard C22.1-Canadian Electrical Code, Part 1
- Federal, Provincial, and local municipal codes
- Installation, operating and maintenance permits may be required from regulation authorities covering environmental quality, fuel, fire and electrical safety. Municipal permits may also be required.
- Regulation requires that only used oil generated on the premises of the owner may be burned in this equipment unless written authorization is obtained from the regulatory authority.

## Warranty

For Warranty information, refer to the Limited Warranty form in the Owner's Envelope.

## WARRANTY IS VOID IF ....

1. Wiring is not in accordance with diagram furnished with the heater.
2. Boiler is operated in presence of chlorinated vapors.
3. Boiler is not maintained in accordance with maintenance requirements.  
FAILURE TO CLEAN THE COMBUSTION CHAMBER ON A REGULAR BASIS.
4. Other-than-specified fuel is burned.

## Safety Warnings



## Conventions Used in this Manual

### Hazard Intensity Levels

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**DANGER:** Failure to comply will result in severe personal injury or death, and/or property damage.

**WARNING:** Failure to comply can result in severe personal injury or death and/or property

**CAUTION:** Failure to comply could result in minor personal injury and or personal damage.

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NOTE: Additional Warnings are also included throughout this manual.

## Secondary Heat Source

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**CAUTION:** These boilers are designed to provide economic disposal of used oils. Used oil is an inconsistent fuel and may contain water and/or foreign materials which may cause the unit to shut down. A secondary source of heat should always be provided to the building; do not depend on used oil as your only source of heat. This will prevent building damage should the heater become inoperable during subfreezing weather.

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## Fuels

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**WARNING:** Approved fuels are No. 2 fuel oil, automotive transmission fluid, and crankcase oils up to 50 weight. Do not attempt to burn any grade of gasoline, paint thinner, or non-approved fluids.

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**WARNING:** Do not attempt to burn any grade of gasoline, paint thinners, or non-approved fluids. Adequate ventilation must be provided in any enclosure where storage tanks, pumps or accessories are installed.

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## Hazardous Atmosphere

This boiler is not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons.

# Safety Warnings Continued

## Venting

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**WARNING:** Failure to provide proper venting could result in death, serious injury, and/or property damage. Units must be installed with a flue connection, draft regulator, draft inducer, and proper vent to the outside of the building. Safe operation of any gravity-vented oil-burning equipment requires a properly operating vent system, correct provision for combustion air, and regular maintenance and inspection.

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## Air for Combustion

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**WARNING:** Care should be exercised to ensure that an adequate supply of combustion air is available and free to enter the air openings on all burners. Room openings must equal one square inch per each 1,000 BTU heat input.

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## Non-Compliance

Failure to install or maintain this boiler properly will void the warranty.

# Unpacking and Inspection

Check the boiler for any damage that may have occurred in shipment! If damage is found, file a claim with the transport company. Your unit was inspected at the factory prior to crating and was in perfect condition at that time. Open the boxes and verify receipt of all parts.

# Additional Parts

Shipped with each boiler is a remote fuel pump, a draft inducer and a carton of parts. The carton contains parts required for installation. Before beginning actual installation, verify that the remote fuel pump, the draft inducer, and all the parts listed on page 7 are at the installation site.



**Pump**



**Draft Inducer**  
P/N 174705, 115V for Sizes  
140, 235, 350  
175993, 230V for Size 500

# Parts Carton

Part No.	Description
91919	① Thermostat
96388	② Oil Filter
135986	③ Vacuum Gauge
110320	④ Foot Valve
130952	⑤ Oil Pump Inlet Manifold
37866	⑥ Draft Regulator (shipped in separate carton)
121030	⑦ Recycling Window Decal
121603	⑧ Warning label (for inlet to fuel storage system/tank)
136864	⑨ Foot Valve Strainer
176300	⑩ Draft Proving Switch



# Boiler Location

**Do not attempt to install this boiler until you have read and understand this manual!**

Refer to Boiler Mounting requirements for specific requirements for mounting Models RAB350 and RAB500.

Measure all distances to comply with the specific code requirements and minimum clearances listed below.

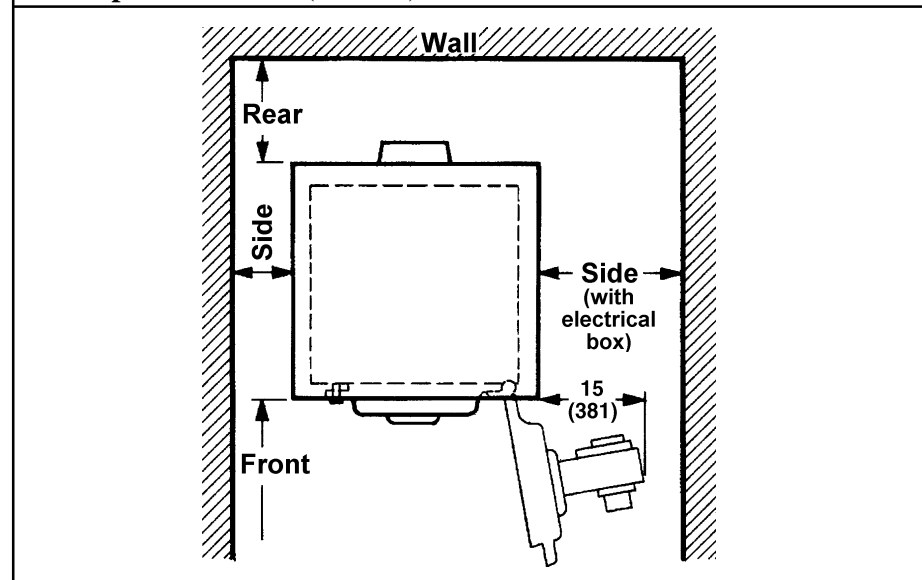
Refer to the section on Venting including vent requirements and recommendations.

Locate the boiler so that suitable means shall be provided to facilitate regular cleaning and maintenance.

**WARNING: You must comply with all requirements on distance from heater to combustibles.**

## Minimum Clearances (inches and mm)

<b>Front</b>	Recommended for service access - <b>Size 140</b> - 87" (2210mm); <b>Size 235</b> - 71" (1803mm); <b>Size 350</b> - 85" (2159mm); <b>Size 500</b> - 97" (2462mm) <i>Absolute Minimum - All Sizes - 36" (914mm)</i>
<b>Side (with electrical box)</b>	Recommended for service access - 24" (610mm) <i>Absolute Minimum - 15" (381mm)</i>
<b>Side (opposite electrical box)</b>	12" (305mm)
<b>Rear</b>	Recommended for service access - 41" (1041mm) <i>Absolute Minimum - 36" (914mm)</i>
<b>Flue Pipe</b>	18" (457mm)



**WARNING: Clearances apply to all combustibles. Do not leave paper, rags, or any moveable combustibles near the burner or store gasoline or any other flammable fluid near this appliance.**

In Canada, for additional information on installation clearances, refer to CAN/CSA-B139-M91, "Installation Code for Oil Burning Equipment," Clause 7.0 - Installation Clearances.



## Fuel Tank, Pump, and Supply Lines

## General Requirements

Model RAB boilers are approved to burn used crankcase oil, transmission fluid, and No. 2 fuel oil. Maximum fuel input for a Model 140 is 1.0 GPH (3.8 L/H); for a Model 235 is 1.7 GPH (6.4 L/H); for a Model 350 is 2.5 GPH (9.5 L/H); and for a Model 500 is 3.6 GPH (13.7 L/H)

The oil supply tank and fuel lines must be installed in accordance with the National Board of Fire Underwriters requirements and all local ordinances. A UL-listed tank such as Reznor® Model OT-250 or equivalent must be used.

**In the U.S.**, regulations require that storage tanks located inside buildings shall not exceed 275 gallons (1,041 L) individual capacity or 550 gallons (2,082 L) aggregate capacity in one building.

**In Canada**, regulations require storage tanks located inside buildings shall not exceed 550 gallons (2,082 L) individual capacity or 1,100 gallons (4,164 L) aggregate in one building.

Check with the local Fire Marshall to assure compliance with local ordinances and codes. *Installation of the tank and supply lines is the responsibility of the installer.*

## Fuel Tank

## Fuel Tank

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**CAUTION: It is recommended that used oil be at a temperature of 50°F or higher when it enters the pump. At a temperature below 50°F, oil becomes more viscous and difficult to pump. The heater may fire at a reduced rate and become erratic resulting in nuisance shutdowns.**

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Install either a UL listed Reznor® Model OT-250 oil supply tank or a field-supplied equivalent indoor storage tank.

- If installing a Model OT-250 tank, follow the installation requirements and instructions on the tank.
- If installing a field-supplied tank, follow the manufacturer's instructions.
- The used oil supply tank should be no closer than 5 ft (1.5 M) and no farther than 50 ft (15 M) from the boiler. If the tank is lower than the boiler, height from the pump to the boiler should be no more than 15 ft (4.5 M).

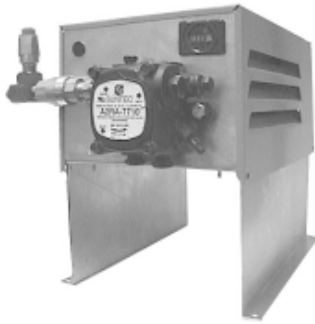
See the illustrations on pages 11 and 12 for examples of tank and line installation.

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**WARNINGS: Never pour gasoline or used oil containing gasoline into the supply tank. Adequate ventilation must be provided in any enclosures where storage tanks, pumps, or accessories are installed.**

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## Pump



## Remote Fuel Pump

The Model OT-250 tank has a platform designed for attaching the remote fuel pump.

- Mount the remote pump assembly in an upright, horizontal position as shown in the illustration.
- Attach the fuel pump legs permanently either on the platform, directly to a field-supplied tank, or in a location within five feet of the oil tank.

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**NOTE: Do not mount the pump assembly in a vertical or inverted position. Pump must be indoors.**

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## Oil Supply Line Installation

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**CAUTION: Do not use TEFLON<sup>®</sup> based pipe dope or TEFLON<sup>®</sup> tape to seal any pipe connections. (TEFLON<sup>®</sup> is a registered trademark of DuPont chemical.) Use of TEFLON<sup>®</sup> based pipe dope or TEFLON<sup>®</sup> tape will void the pump warranty.**

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## Supply Lines

Read this section carefully before installing any supply lines. Since a suction line leak is nearly impossible to find, take your time to assure all connections are leak-free during installation. **Supply lines and fittings are furnished by the installer.** See the following illustration for minimum fittings required. Length of pipe and tubing depends on the installation.

Run the suction line, using 1/2" standard black iron pipe, between the inlet side of the filter and the foot valve. (Refer to the illustration.) A fuel line filter with a cleanable strainer, a foot valve, a foot valve strainer, and a vacuum gauge are provided with the heater. To prevent air from entering the line, do not use union connections at joints. Install the suction line components as illustrated. With the vacuum gauge mounted on the outlet side of the filter, the gauge will indicate any suction line restriction including a dirty filter. A pump inlet manifold is supplied for direct connection of the filter to the inlet of the pump.

The supply line between the outlet side of the fuel pump and the heater should be 3/8" O.D. copper tubing with a minimum of 1/32" wall thickness with 45° flare fittings. The supply line must continually rise. A lift height of up to 15 ft (4.5 M) is acceptable with a maximum total length of 60 feet (18 M) of tubing.

**Do not install manual valves in the supply line.**

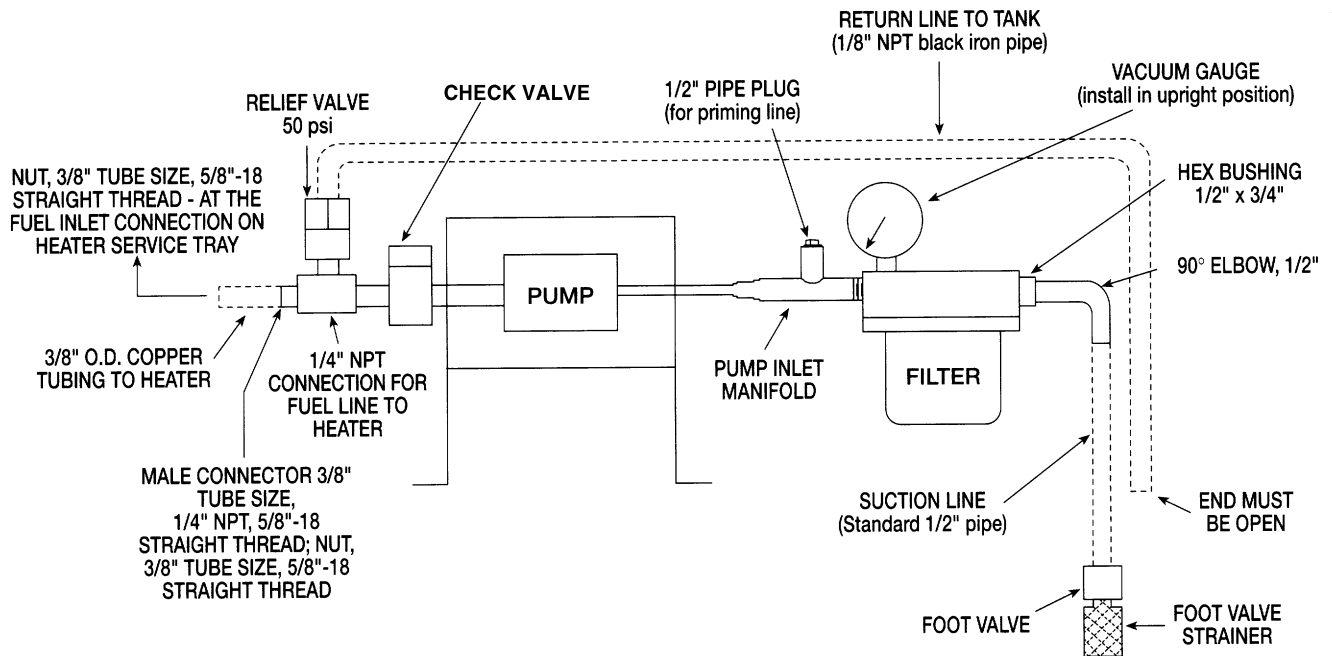
Connect the fuel line to the heater at the connection on the corner of the service tray.

The 50 psi relief valve supplied with the pump and a return line of 1/8" NPT black iron pipe must be installed as illustrated. All piping should be

# Oil Supply Line Installation Continued

protected from possible damage and be rigidly fastened in place in a workmanlike manner. Do not use TEFLON® based pipe dope or TEFLON® tape at the connections in an oil line. Use an oil-resistant pipe dope. Do not use union connections in the suction line (line between the oil supply and the remote pump); union connections are not recommended for use in any portion of an oil supply line.

**NOTE:** Care must be exercised to ensure leak-free connections.



## Mounting the Boiler

## General Requirements

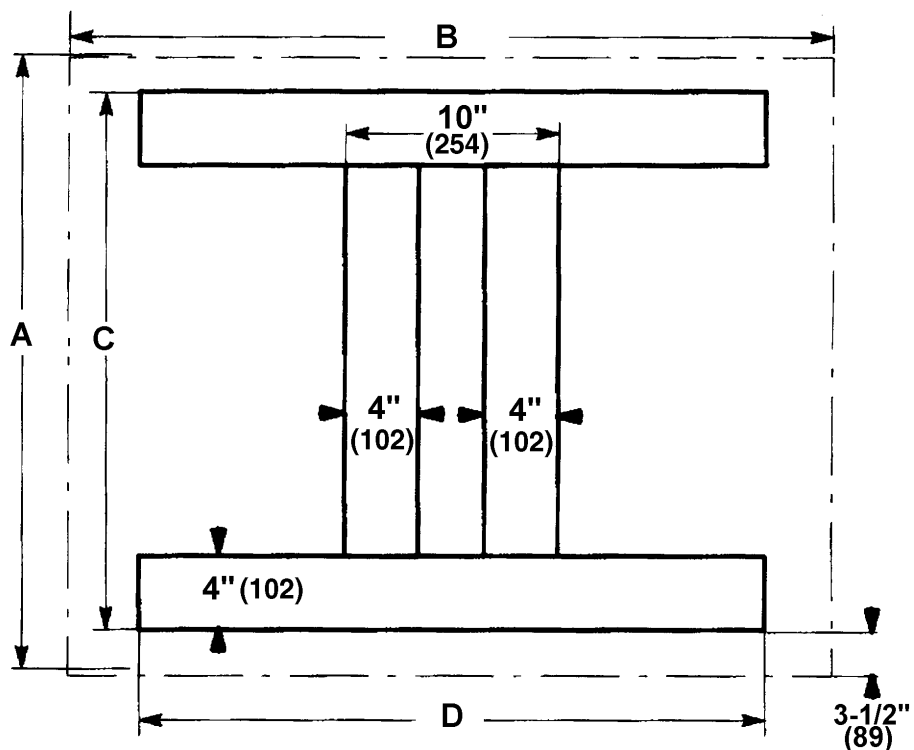
Before preparing a place for the boiler, check the supporting structure to ensure it has sufficient load-carrying capacity to support the weight of the heater.

Model	Net Dry Weight		Operating Weight	
	lbs	kg	lbs	kg
RAB140	550	250	684	311
RAB235	750	341	938	426
RAB350	1247	566	1562	709
RAB500	1635	742	2074	941

## Boiler Foundation Requirements

The boiler must be placed on a level, smooth concrete base of sufficient strength. Sizes 350 and 500 require either 4" x 1/4" flat steel plate or 4" x 2" x 1/4" angle iron to be cemented in the platform as illustrated. Dimensions of the foundation and support strips for Sizes 350 and 500.

	RAB 350		RAB 500	
	inches	mm	inches	mm
A - Foundation Length	36	914	48-1/2	1232
B - Foundation Width	33-1/2	851	33-1/2	851
C - Support Length	28-3/4	730	41-1/4	1048
D - Support Width	20	508	20	508



## Venting the Boiler

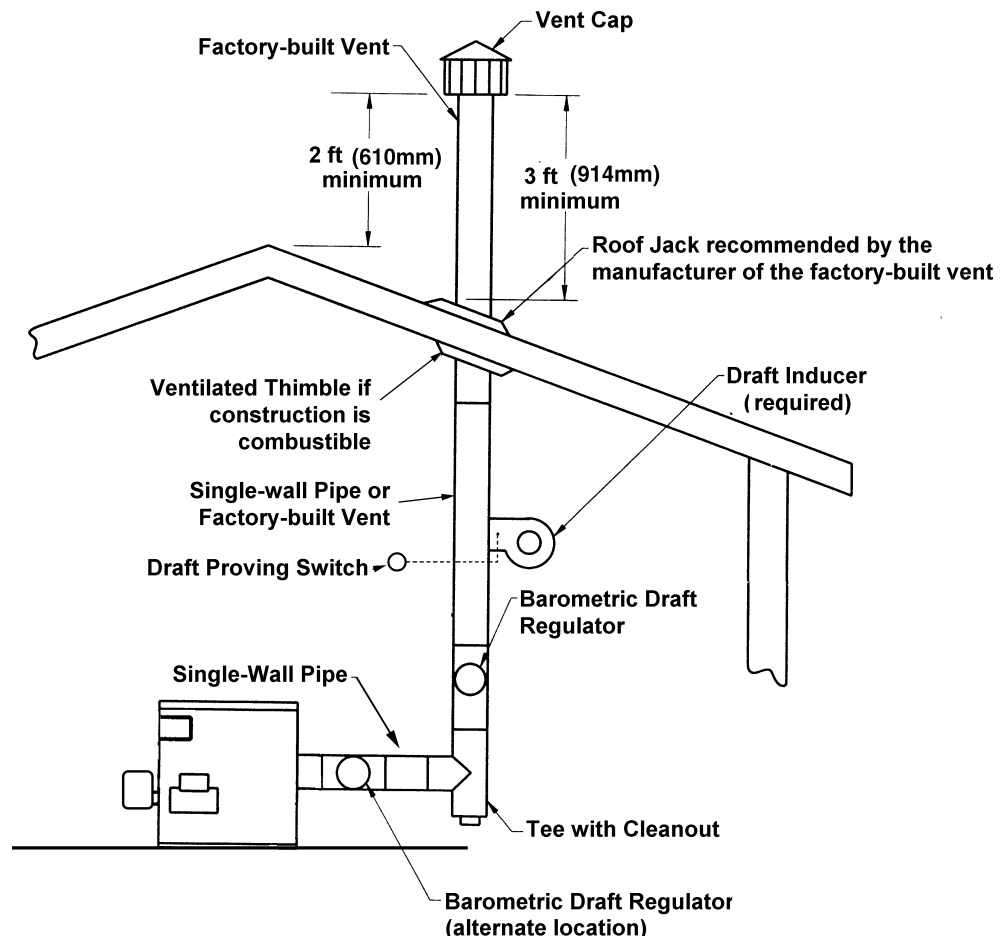
**WARNING: Failure to provide proper venting could result in death, serious injury, and/or property damage. Units must be installed with a flue connection and proper vent to the outside of the building. Safe operation of any gravity-vented oil-burning equipment requires a properly operating vent system, correct provision for combustion air, and regular maintenance and inspection.**

The vent system must comply with all local codes and in the event that local codes do not exist, the vent system must comply with a regional or national code.

## General Guidelines for the Vent System

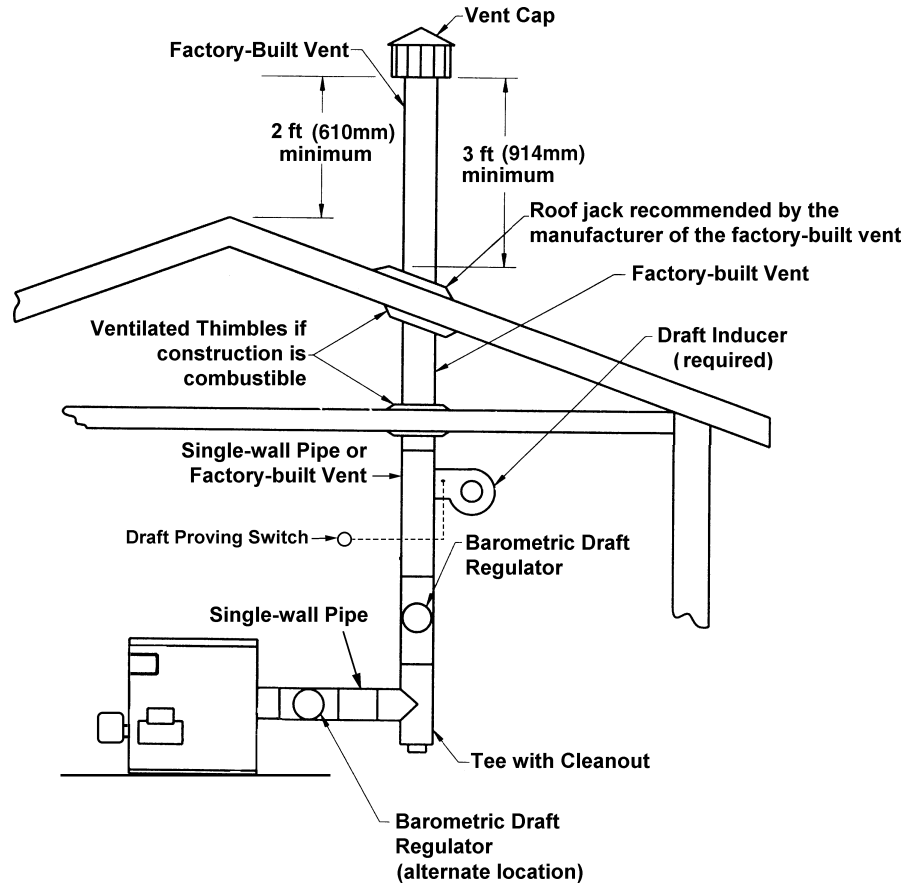
The requirements for the vent system are dependent on (1) the location of the boiler within a building and (2) the type of building.

- If the boiler and the vent system are within the same heated space, single wall pipe may be used inside the building. The portion of the vent system outside the building must be a factory-built vent that is approved to Standard UL 103 or UL 641. See illustration below.



- Any portion of the vent system that passes through an unheated space or a concealed area such as an “attic” must be a factory-built vent that is approved to Standard UL 103 or UL 641. See illustration . . . .

- The boiler may be vented into a masonry chimney that complies with the BOCA National Mechanical Code for low-heat appliances or other building code requirements for low-heat appliances.



## Requirements for the Vent System (read all before beginning installation)

- Pipe/Joints/Clearances:** Single-wall pipe must be a minimum of 24 gauge galvanized steel. Vent collar diameter is 6” (152mm) for Sizes 140 and 235; and 7” (178mm) for Sizes 350 and 500. Sizes 350 and 500 require transition to 8” (203mm) vent pipe. Each joint must be secured with three screws or rivets. If installing a factory-built vent, follow the manufacturer’s instructions.

If the vent system passes through a combustible wall, material or roof, for single wall pipe, maintain 18” (457mm) clearance or install a ventilated thimble that is not less than 12” (305mm) larger than the diameter of the vent pipe. If installing a factory-built vent, follow the manufacturer’s instructions.

- Vent Size:** Sizes 140 and 235 - the vent system must be at least 6” (152mm) in diameter. Sizes 350 and 500 -- the vent system must be at least 8” (203mm).
- Horizontal Length and Slope:** The horizontal portion of the vent must not exceed 15 feet (4.5M) and may include up to three elbows. Horizontal portions must be sloped upward 1/4” for each foot of pipe.
- Vertical Vent:** If installing a factory-built vent, follow the manufacturer’s instructions.

If a masonry chimney is used, a thimble that is permanently cemented in place with high temperature cement should be used to permit easy cleaning of the chimney. The end of the vent pipe must not extend past the inside wall of the chimney.

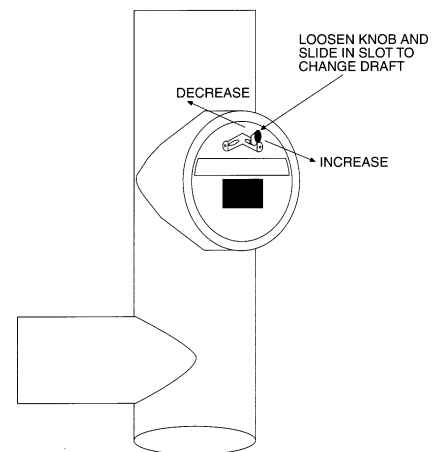
## Vent System Requirements (cont'd)

- **Support:** The vent system must be adequately supported using non-combustible strapping or supports to carry the weight of the vent and wind load. Do not use the boiler to provide support for the vent system.
- **Barometric Draft Regulator (see below):** A barometric draft regulator which is the same diameter as the vent pipe *must* be used, and it should be located close to the heater. **Do not** install a manual damper or any other device that will obstruct the free flow of the flue gases.
- **Draft Inducer (see below):** A draft inducer is required; follow the manufacturer's instructions and wire according to the wiring diagram.
- **Draft Proving Switch:** Mount the switch on any vertical surface within 5 feet (1.5M) of the draft inducer. Do not mount it on the inducer or on any other surface with a temperature in excess of 160°F. Wire according to the wiring diagram.
- **Terminal End:** The vent must terminate at least 3 feet (914mm) above the highest point of exit and at least 2 feet (610mm) higher than any portion of a building or obstruction within 10 feet (3M) of the chimney. Install a vent cap on the terminal end of the vent. A Reznor (Option CC1) or Type L Breidert Air-x-hauster® vent cap is recommended. A different style of vent cap could cause nuisance problems. (Type L Air X-hauster® is a trademark of the G. C. Breidert Company.)

## Draft Regulator

A barometric draft regulator is shipped with this boiler and **MUST** be installed in the flue near the boiler flue connection.

Refer to the illustrations on pages 13 and 14 for recommended locations. To install, follow the manufacturer's instructions packaged with the draft regulator.



## Draft Inducer and Draft Proving Switch

A draft inducer and a draft proving switch are shipped with this boiler and **MUST be installed**. Refer to the illustrations on pages 13 and 14 for the recommended location for the draft inducer. Follow the manufacturer's instructions packaged with the draft inducer. Mount the switch vertically within five feet (1.5M) of the draft inducer; do not mount on the draft inducer. To connect the switch and wiring, refer to the wiring diagram on the boiler or on pages 44-45 of this booklet.

# Electrical Supply Connections

**DANGER: Make sure that the main circuit is OFF before making any wiring connections. All wiring must be done in accordance with appropriate Codes!**

## Pump Power Installation

## Connect Power to Remote Oil Pump

To connect the electrical power from the burner to the oil pump,

- Use a 3 conductor, 14 gauge wire system - two 115 volt conductors and a ground. Use BX if permitted, but make certain to follow local codes for running conduit.
- Refer to the wiring diagram for connecting terminals.

## Main Power

To install main power to the system (check the table below and the rating plate on the boiler for current requirements),

- **Sizes 140, 235 and 350** - Use #10 gauge stranded copper wire to run a dedicated 115 volt, single phase, line from the power source to a junction box mounted on the wall behind the boiler or as required by appropriate codes.
- **Size 500** - Use #10 gauge stranded copper wire to run a dedicated 230 volt, three phase, line from the power source to a junction box mounted on the wall behind the boiler or as required by appropriate codes.
- Run the length of appropriate conduit from the boiler to the junction box.
- Connect the black wire to the hot lead.
- Connect the white wire to the neutral lead.
- Connect the green wire to the ground lead.
- Install a fused manual reset, line voltage switch (field supplied) in this main line
- Electrical Ratings

Model	Total Current Amperes	Minimum Circuit Ampacity	Maximum Fuse Size (Supply)
RAB140	10	13	20
RAB235	11	14	20
RAB350	17	22	30
RAB500	8	11	20

**NOTE:** Total amperes does not include water circulation or other field-installed controls.

## Heating Thermostat

A 24-volt thermostat is furnished as standard equipment.

**DO NOT** attempt to wire relays or other accessories to the thermostat connections as these are not load terminals.

**DO NOT** install on or suspend the thermostat from the heater

**DO NOT** install thermostat on a cold outside wall

To install the thermostat,

- Locate the thermostat five feet above the floor on an inside wall, not in the path of warm or cold air currents nor in corners where air may be pocketed
- Remove the thermostat cover
- Make sure the heat anticipator dial is set at 0.2 amps
- Connect the wires through the back of the thermostat to the R & W terminals
- Set the ON/OFF switch on the heater electrical box to the "OFF" position and connect the thermostat wires to the two "T" terminals on the ignition controller.



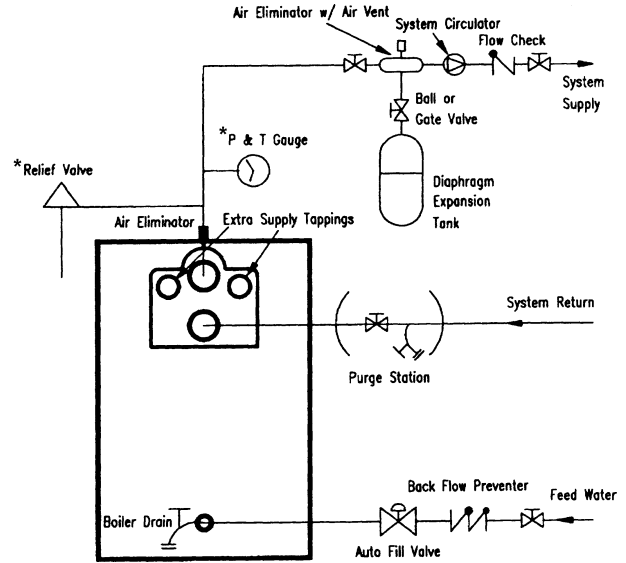
# Water Piping Connections

For additional information, consult the boiler literature.

## Supply and Return Connections

	140	235	350	500
Supply	1-1/2"	1-1/2"	2"	2"
Return	1-1/2"	1-1/2"	2"	2"

For overall system protection, it is recommended to install a filter and sludge removal system in the boiler return piping.



Placement of field-supplied hydronic accessories as published by the boiler manufacturer.

\*The relief valve and pressure/temperature gauge are factory-installed on the supply manifold.

# Water Controls on the Boiler

**Relief Valve (30 psi)** - The relief valve is installed in the supply manifold. Pipe the relief valve discharge to a floor drain in accordance with local code requirements.

**Pressure and Temperature Gauge** - A gauge that reads both water pressure and temperature is installed in a special tap in the supply manifold.

**Aquastat** - The adjustable aquastat located on the top rear of the boiler controls burner operation to maintain the temperature of the water in the boiler. The aquastat has a temperature range from 140° to 240°F. It is recommended that the water temperature be set at 160°F or higher. If the application requires water temperatures below 160°F, the use of tempering valves is recommended.

**Low-Water Cutoff** - The low-water cutoff switch is a non-adjustable control also located on top of the boiler. When the boiler and piping are not full of water, the switch will activate (contacts will open) to shutoff power to the burner.

# Water Quality Requirements

**Fill Water Requirement** - Water with alkalinity <200 mg/li for initial system filling

**Makeup Water Requirement** - Water with alkalinity <30 mg/li

## System Water Requirements

- pH value (@ 77°F) ..... 9.0 - 10.0
- Acid Capacity ..... 3.0 - 50 mg/li
- Oxygen (O<sub>2</sub>) ..... .01%
- Phosphate (P205) ..... 2.5%
- Sodium Sulfate (NA2S03) .... 1 - 4%

**CAUTION: Water heated inside this boiler is not potable.**

# Start-Up

## Burner Start-Up System Check

### Check Test - Prior to Start-Up

You should check your system completely before operating it.

- Remove all shipping supports including the three metal bands in the combustion chamber.
- Check clearances from combustibles. Be certain that the clearances are in compliance with the appropriate Codes.
- Check that all unions or threaded fittings are snug and do not rotate.
- Check to verify that the boiler is level.
- Check the electrical supply. Be sure that all wire gauges are as recommended and that the supply voltage is as stated on the rating plate. Determine that fusing or circuit breakers are adequate for the load.
- Check the vent. Be sure that vent pipe or chimney meet the requirements and appropriate codes. A UL or CSA/UL listed draft regulator and draft inducer are required. A Reznor® (Option CC1) or Type L Breidert Air-X-hauster® vent cap is recommended. (Type L Air-X-hauster® is a trademark of The G. C. Breidert Company.)
- Check the oil supply. Fill the supply tank to at least six inches from the top of the foot valve. **NOTE:** Always screen waste oil with a 70-80 mesh strainer when filling the supply tank.
- Fill the boiler *and* piping system with water; refer to water quality requirements on page 17. **All air must be removed from the system.** When the boiler and piping system is full of water, the low-water cutoff control's contacts will close, sending the supply voltage back to the main control box.

## Oil Priming and Leak Check

For control locations, refer to illustration on page 36.

### Priming and Checking the System

The oil supply line to the burner must be full of oil and free of air for proper burner operation.

**NOTE:** Priming the oil line could take up to 30 minutes depending on the length of the line.

**Follow the procedure below to fill the oil line.**

1. Be sure the oil tank is filled to at least six inches above the top of the foot valve.

## Oil Priming and Leak Check Continued

2. Set manual disconnect switch to the ON position.
3. Fill the suction line (line between the supply tank and the pump) with clean waste oil or new oil.
4. Locate the rubber tubing connecting the pressure switch in the main control box and the compressor.
  - Disconnect the tubing at the fitting on the compressor. This will prevent oil from flowing to the burner.
5. Remove the cad-cell wire from the F1-F2 terminals of the ignition controller.
  - Either attach a piece of tubing to the bleeder valve on the strainer tee (see page 24) on the burner assembly or place a container underneath to collect oil.
  - Loosen the bleeder valve.
6. Set the thermostat to a temperature above room temperature.

**NOTE:** On initial start-up it will take approximately ten minutes to heat the oil. Once the oil is warm enough, the green light will come on and the unit will be ready to start. This delay only occurs on initial start-up or when the disconnect switch has been turned off for an extended time.

- After the motor starts, place a jumper across the cad-cell terminals (F1-F2) on the ignition controller.
- Observe the remote fuel pump motor to make certain it is running.
- Open the bleeder valve on the remote pump and wait until a full flow of oil is obtained without any air.

**IMPORTANT NOTE:** If air bubbles are present and do not stop, there is a suction line leak.

- Check the piping between the tank and the pump and correct the leak.
- Once a full flow of oil is present without any sign of air, close the bleeder valve on the remote pump.
- Observe the bleeder valve at the strainer tee and wait until a full flow of oil is obtained without any air.
- Tighten the bleeder valve on the strainer tee and remove the oil container.

**NOTE:** DO NOT replace the rubber tubing previously disconnected from the compressor and DO NOT re-connect the cad-cell wires.

7. Allow the system to operate for several minutes.
  - Check the system for leaks at all connections.
  - Observe the return line to the tank - oil should be flowing.
  - Correct all leaks and re-test the system.
8. If the system checks out as having no leaks, turn disconnect OFF, replace the rubber tubing and cad-cell wires removed earlier.
9. Remove the jumper from the F1-F2 terminals of the ignition controller.

## You are now ready to start your system.

## Burner Start-Up

## Start-Up Procedure

After installing and testing your unit, follow the procedure below to start the system.

- Turn on the main electrical supply.
- Set the manual disconnect switch to the “ON” position.
- Set the adjustable water temperature setting. Recommended water temperature is 160°F (71°C) or higher.
- Set the thermostat to a temperature above room temperature.

**NOTE:** When the low oil temperature limit senses the proper oil temperature, the green light on the main control box will come on and the burner will fire.

A 10-minute delay may occur before firing depending on the system and the oil temperature. The delay only occurs on initial start-up or after an electrical power interruption.

If the system does not automatically try to re-light, then the controller is in the “lockout” condition and must be reset by depressing the red button on the controller and holding it down for four seconds.

Once the system is purged of all air and oil reaches the nozzle, ignition will occur.

## Check-Test

## Check Test - After Start-up

Check that there is sufficient draft for proper combustion. A negative draft of .01”-.02” w.c. is required in the combustion chamber over the fire.

**NOTE: Draft measurements must be checked anytime there is a change in the air band setting.**

### Instructions for Measuring Draft Over Fire:

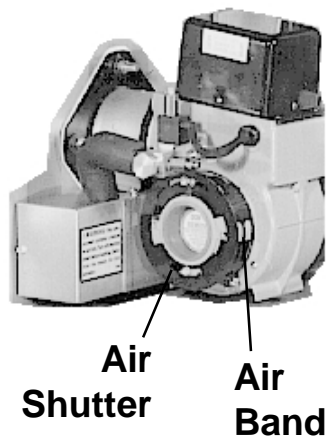
- Remove the outer cover on the front of the boiler. Slightly pick up the panel, tilt it toward you, and slide up to clear the burner.
- Locate the observation port and the metal plug in the boiler door. Remove the metal plug.
- Insert draft gauge (such as Dwyer pressure gauge). Measurement must read at least a negative .01” w.c. to negative .02” w.c.
- If measurement is not as required, adjust draft regulator until measurement is within the proper limits.
- Replace the metal plug in the boiler door and the outer cover.

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**WARNING: If there is insufficient draft, it will create a back pressure resulting in oil fumes in the building and/or pulsating when the burner starts and stops. It may cause excess deposits of soot and overheat the heat exchanger resulting in premature failure of the chamber. THIS TYPE OF FAILURE IS NOT COVERED UNDER THE WARRANTY.**

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## Check-Test Continued



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**CAUTION:** If there is a backdraft or downdraft, do not continue operation of the boiler until the situation is corrected. Equipment and/or property damage could result. Back pressure (backdraft or downdraft) may be caused by the chimney being lower than surrounding objects, such as buildings, hills, trees, rooftops, etc. It may be caused by an exhaust fan in the building. The air intake in the room where the heater is installed must be of sufficient size so that there is no change in the draft reading in the flue with the exhaust fan running.

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If there is too much draft, it could cause ignition problems, erratic burner, and loss of thermal efficiency. To correct this problem adjust the barometric damper to reduce the draft.

■ **Check combustion air and air band settings.**

The boiler is shipped from the factory with air band and air shutter set for normal sea level operation. Ordinarily these settings should not require adjustment. However, certain field conditions such as high altitude may require a change. We recommend that the need for a change be determined by the use of instruments. When obtaining the CO<sub>2</sub> readings, do so with a hot system that has the correct draft settings. With a clean heat exchanger, these settings should result in Bacharach smoke readings not greater than No. 1 and thermal efficiencies of approximately 82%.

**If it is necessary to change the air band settings, the draft measurement must be rechecked.**

- Check the boiler for water leaks. If a leak is found, discontinue operation and contact your distributor.
- While the pump is running, record the vacuum gauge reading and post it on or near the remote pump assembly.  
The maximum allowable vacuum rise is 10" Hg. (Example: With a new oil filter, if the vacuum gauge indicates a suction line vacuum of 3" Hg, the maximum allow gauge reading is 13" Hg.)
- Display adhesive "Waste Oil Recycling" decal on entry door or window.
- Adhere tank warning label at location visible when filling the tank or at a point where fuel is first introduced to a transfer piping system.
- Return all instruction manuals to the "Owner's Envelope." Follow the instructions on the envelope to keep manuals available for future reference.

# Maintenance

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## General Maintenance Requirements

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**WARNING: Turn off electric power to the unit before doing any service or maintenance on the boiler.**

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When burning used automotive diesel and truck oils, this boiler will require more frequent service than conventional oil-fired equipment. All used oils contain a small amount of ash. This ash is similar in texture to that found in wood burning fireplaces, and varies with the types of oil used. **FAILURE TO REMOVE THIS ASH ON A REGULAR BASIS WILL VOID THE WARRANTY.**

The recommended maintenance schedule below is a minimum. More frequent maintenance may be required depending on the type and amount of oil burned.

## General Maintenance Schedule

### Daily:

- Check the oil level in the supply tank to be certain an adequate supply is available. Do not let your tank run out of fuel. Running out of fuel oil will require you to re-prime the system.

### Weekly:

- Check the vacuum gauge on the filter for an indication that the oil line filter and/or motor pump screen needs cleaning.
- Check the hour meter. **Cleaning is recommended every 300 hours.** If needed, clean the combustion chamber, the flueway passages, the flue pipe, and draft inducer. Record the hour meter reading for future reference. A Maintenance Record Chart is provided in the Appendix for this record.

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**WARNING: Wear protective clothing, including gloves and a face mask or respirator. Dispose of ash properly. See the warning statement on cleaning the combustion chamber.**

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### Monthly:

- If the weekly hour meter check has not indicated a need for cleaning, inspect the combustion chamber, flueway passages, flue pipe, and draft inducer. Clean if necessary.
- Inspect the burner tube insulator.
- Drain water from the bottom of the supply tank until a steady stream of oil is obtained.

## Every Six months:

- Clean the oil strainer at the burner.
- Clean the foot valve screen.
- Replace the air filter.
- Clean the end cone.
- Replace the oil nozzle.
- Check for oil leaks.
- Inspect the electrodes
- Inspect the combustion chamber liner.
- Clean the pre-heater.
- Clean the external surfaces.

**NOTE:** A maintenance record chart is provided in the Appendix.

## Maintenance Procedures

### Replacing the Supply Line Filter and Cleaning Internal Pump Screen

Replacing the filter and cleaning the pump screen requires breaking the suction line. The suction line is the portion of the supply line from the tank to the remote pump. If air leaks develop in the suction line, the burner will not operate properly.

Follow all instructions, including “recharging the Suction Line,” (page 24) to avoid creating an air leak.

Supply  
Line  
Filter



### Replacing the Supply Line Filter

Unscrew the replaceable “canister” portion from the bottom of the supply line filter and replace (Replacement filter canister is P/N 176535.)

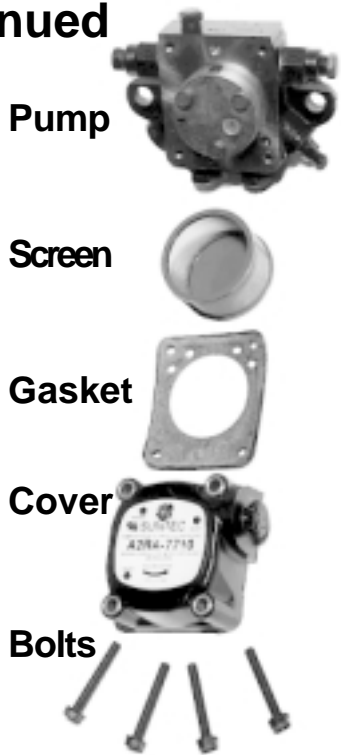
Be sure replacement filter canister is tight so there are no air leaks created.

### Cleaning the Internal Pump Screen

#### 1. Check the Screen

- Disconnect the inlet oil line from the pump.
- Using a flashlight, look into the pump inlet.
  - a) If the portion of screen visible at the inlet appears to be clogged, go to Step 2.

## Cleaning the Pump Continued



b) If the screen appears unclogged, reconnect the inlet line making sure that the connection is tight. Do not remove the pump cover. Go to the instructions for “Recharging the Suction Line” (below).

### 2. Remove and Clean the Screen

- To access the screen, the pump cover must be removed.
- Remove the four bolts that hold the pump cover. (Be careful, pump is full of oil).
- Remove the cover being careful not to lose or damage the gasket.
- Remove the circular screen and clean with a solvent and compressed air.

**NOTE:** If the screen is damaged during cleaning, replace it with Reznor P/N 123450.

### 3. Reassemble the pump

- Check the gasket and if a replacement is needed, replace it with Reznor P/N 123451.
- Re-assemble the pump and reconnect the inlet oil line being sure that the connection is tight.

## Recharging the Suction Line

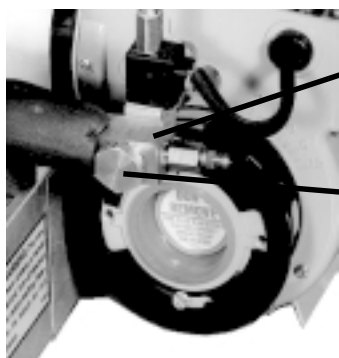
- Remove the fill plug from the inlet manifold and slowly fill the suction line with oil (allow time for air to escape).
- Replace the plug.
- Check vacuum gauge connections and filter housing to be sure that everything is tight. The suction line must be full of oil and all connections tight for the heater to operate properly.

**NOTE:** Refer to the section, “Priming and Leak Check” (starting on page 18) for check list and instructions.

## Cleaning the Burner Oil Strainer

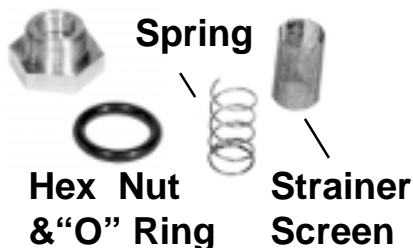
### Instructions for cleaning the burner oil strainer:

- Identify the strainer tee located in the fuel line just upstream from the burner.
- Remove the hex nut from the end of the strainer tee, being careful not to lose the “O” ring.
- Remove the spring and strainer from the inside of the tee. Clean by washing both the spring and screen with a solvent.



**Oil Strainer Tee**

**Remove Hex Nut, Strainer Screen & Spring**



- Reinsert the cleaned screen and spring into the tee. With the “O” ring in place, re-attach the hex nut.



## Maintenance Continued

### Cleaning Combustion Chamber, Flueway Passages, Flue Pipe, and Draft Inducer

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**WARNING: Waste oils may contain engine-wear metal compounds and foreign materials. When burned, these compounds are deposited within or exhausted from this boiler. Therefore, care should be taken when using, cleaning and maintaining this equipment.**

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Whenever any cleaning, including the flue pipe and exhaust stack is done, proper protective equipment, including gloves and a face mask or respirator, must be worn.

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**WARNING: Turn off electric power before inspecting or cleaning the unit. Shut off the return water and drain into supply connection. Allow unit to cool.**

---

### Inspecting the Combustion Chamber

To determine need for cleaning, inspect the combustion chamber and flueway passages through the access door on the end of the boiler (where burner is mounted).

- Remove the outer cover on the front of the boiler. Slightly pick up the panel, tilt it toward you, and slide up to clear the burner.
- Remove the bolts (Sizes 140 & 235, 2 bolts, 16mm socket; Sizes 350 and 500, 4 bolts, 18mm socket) and open the hinged access door, being careful not to damage burner. (NOTE: Remove only the door bolts; do not remove any other bolts.)
- Shine a flashlight into the flueway passages. As little as 1/16" of ash buildup on the internal surfaces can dramatically decrease the thermal efficiency.
- If the ash buildup is over 1/16", proceed with the steps for "Removing Soot and Ash", page 26.

**NOTE:** You cannot adequately do this inspection through the flame observation port.

If cleaning of the combustion chamber and flue passages is not required, either proceed to "Cleaning the Burner End Cone, page 28" while the door is open, or close and secure the door and replace the front outer cover.

## Maintenance Continued

## Cleaning Combustion Chamber, Flueway Passages, Flue Pipe, and Draft Inducer Continued

## Removing Soot and Ash

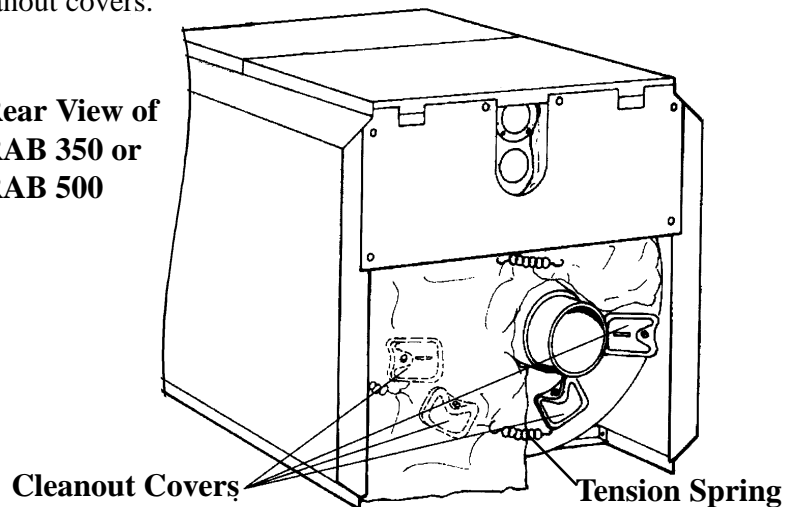
**WARNING:** The ash that is removed from this heater may contain heavy metal compounds that are environmentally undesirable and should be disposed of in a conscientious manner. Wear protective clothing, including gloves and a face mask or respirator.

- 1) These instructions assume that the boiler door remains open following the inspection. If the door is closed, follow the instructions on page 25 for inspecting the chamber.
- 2) **Sizes 350 and 500 - Remove the cleanout covers on the rear of the boiler.** See the illustration below.

Locate and remove the screws that hold the lower rear panel. Remove the panel.

Below the vent connection, remove the tension spring holding the insulation. Lift the insulation to reveal the cleanout covers. Remove the cleanout covers.

**Rear View of RAB 350 or RAB 500**



- 3) Disconnect the vent pipe.
- 4) In the combustion chamber and flueway passages, use a shop vacuum to remove the ash. Use a stiff brush to loosen soot from the flue passages. Use a softer brush in the combustion chamber being careful not to damage the liner. Vacuum accumulated soot and ash.
- 5) Check the integrity of the combustion chamber liner and the sealing ropes on the cleanout covers and the burner door. Replace liner if deteriorated. Replace gasket material if damaged or hardened. If replacements are needed, use replacement liner and gaskets specifically designed for the purpose.
- 6) Clean the vent pipe. At least every other cleaning, dismantle and clean the draft inducer. Clean the wheel with a degreaser that will retard future buildup of dirt.
- 7) When cleaning is complete on Sizes 350 and 500, re-attach the cleanout covers and re-install the back outer cover.
- 8) If cleaning the burner, see the instructions on page 28. When cleaning is complete, re-assemble all parts. Close the boiler door and tighten the bolts evenly. Re-install the front cover.

# Repairing or Replacing the Combustion Chamber Liner

Determine the condition of the liner.

If the liner has only cracks, it may be patched with a ceramic fiber product specifically designed for the purpose. The patching material (**P/N 176148**) comes in a tube and may be applied by using a caulking gun. Follow the instructions on the caulking and fill in all cracks in the liner.

If the liner has deteriorated, replace it with the liner kit designed for that model and size.

<b>Model RAB</b>	<b>140/235</b>	<b>350/500</b>
<b>Burner Tube Insulator and Combustion Chamber Liner Kit</b>	<b>175994</b>	<b>175995</b>
<i>Consisting of:</i>		
Combustion Chamber Back Plate Liner	174682	174682
Combustion Chamber Liner	174701	174700
Combustion Opening Liner	--	174702
Burner Tube Insulator	174703	174703
Liner Support Bands (3)	176299	176299

## Installing Replacement Combustion Chamber Liner

### Tools Required

- Sizes 140 & 235, 16mm socket; Sizes 350 & 500, 18mm socket - to open the door
- To mold the liner with your hands, latex gloves are recommended
- If the back plate of the combustion chamber cannot be reached, an extension tool is needed
- The three metal bands supplied with the liner kit

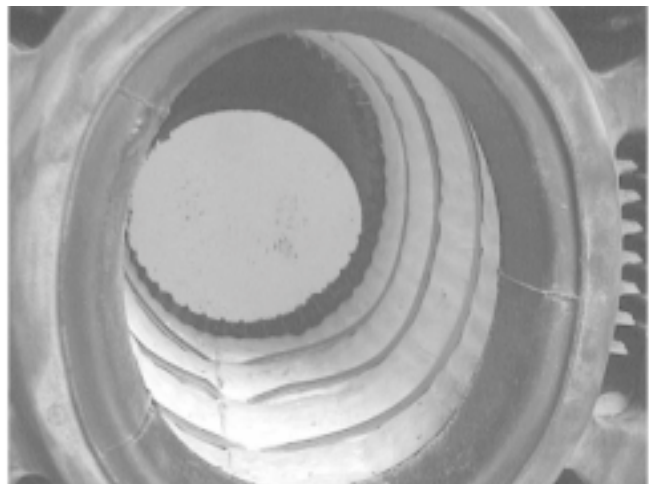
### Instructions

Verify that the kit is the appropriate size for the boiler being serviced. Follow the illustrated instructions (Form RGM CPW-44) that are included with the liner kit.

**Size 140 or 235 with a new liner installed**

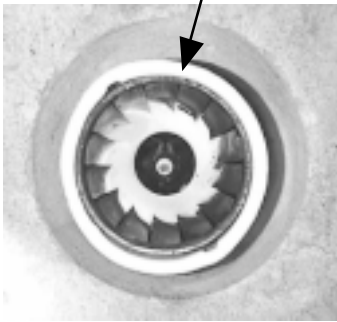


**Size 350 or 500 with a new liner installed**



## Maintenance Procedures Continued

**Burner Tube Insulator, P/N 174703**



## Cleaning the Burner End Cone, Nozzle and Electrodes

1. To access the burner
  - Remove the outer cover on the front of the boiler. Slightly pick up the panel, tilt it toward you, and slide up to clear the burner.
  - Remove the bolts and open the hinged access door to reveal burner end cone, nozzle and electrodes.
2. To Remove/Clean the End Cone
  - Remove the screws that hold the end cone to the burner tube.
  - Remove and clean the inside of the end cone using a stiff wire brush.
  - Check the end cone for deterioration and replace if deterioration exists.
  - If the end cone/burner tube insulator is damaged, it *must* be replaced for proper operation. The insulator, P/N 174703, is included in the liner kit (see page 27) or may be ordered separately. To replace, align the slots in the inside of the new insulator with the screw heads on the end cone. Slide the insulator over the end cone until it is flush with the end cone opening. Rotate the insulator approximately 1" to lock it in place.
3. To Remove the Nozzle (requires both a 1" and a 5/8" open-end wrench)
  - To prevent the fuel line assembly from twisting, use a 1" open-end wrench to hold the nozzle adapter while removing the nozzle with a 5/8" open-end wrench.
  - Clean by blowing high pressure compressed air through the nozzle.
  - If nozzle face appears worn, replace the oil nozzle. Annual nozzle replacement is recommended. This nozzle is custom designed. **Do not substitute nozzle.**

Nozzle for RAB	140	235	350	500
Replacement P/N	102997	102997	129382	157041

- Replace the end cone.
- NOTE: Be sure NOT to damage the "O" ring on the nozzle. If the "O" ring appears damaged, replace the nozzle.

4. Inspect the Electrodes
  - The electrode porcelain insulators must be free from carbon, oil, dirt, pinhole leaks, cracks, moisture and evidence of over-the-surface arc tracking. Otherwise, short circuiting could cause ignition problems. If any of these conditions exist, replace with new porcelain insulators.
  - If a need for service or replacement is determined, see instructions on page 30.
5. Reassemble

# Removing Fuel Line Assembly to Service Controls and Spark Electrodes (Alternate method for servicing nozzle)

**WARNING: Turn off the electric power before removing the fuel line assembly.**

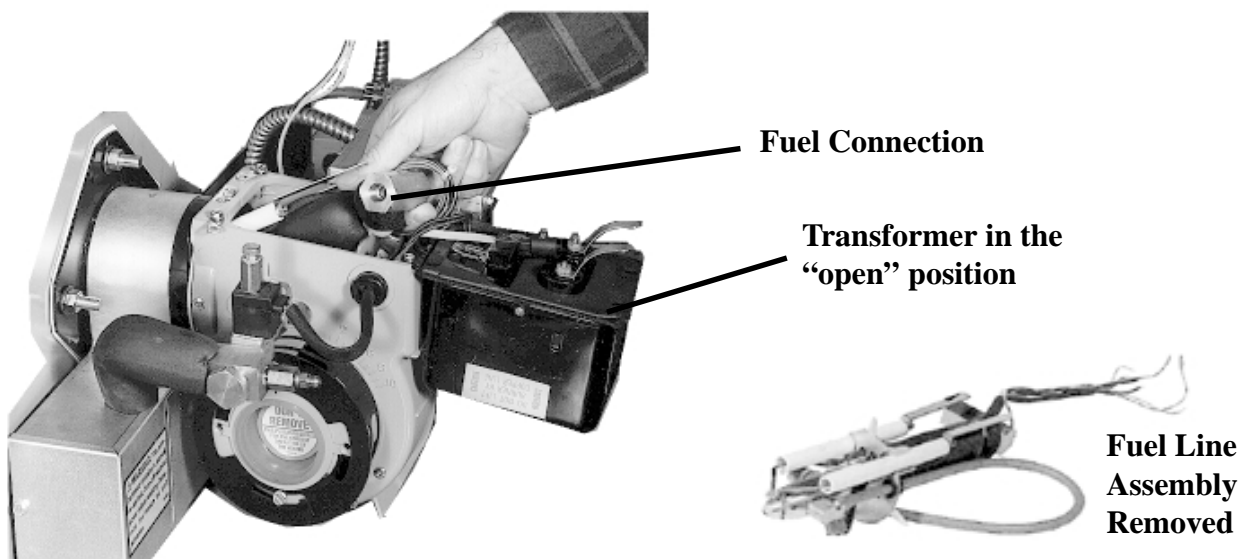
NOTE: In order to service the fuel line assembly controls and spark electrodes, it is necessary to remove the fuel line assembly.

## Removing the Fuel Line Assembly



**Escutcheon Plate**

1. Loosen the connection nut one or two turns.
2. Disconnect the fuel connection assembly by loosening the 5/16" inverted flare fitting. Do not change the position of the escutcheon plate.
  - Pull the fuel connection assembly clear of the burner housing.
3. Loosen the two transformer hold-down screws.
  - Lift the hinged transformer to its open position.
4. There are eight wires in the fuel line assembly wire bundle.
  - Mark and disconnect the wires from their terminals in the burner junction box.
5. Disconnect the nozzle air hose from the fitting at the air compressor.
  - Pull the hose through the opening "into" the burner housing.
6. The fuel line assembly may now be removed by either
  - Pulling the assembly up slightly and toward the rear of the burner housing.
  - OR removing the burner and end cone and pulling straight out of the blast tube. See page 28 for details.



## Maintenance Procedures Continued

## Removing Fuel Line Assembly to Service Continued

## Servicing/Replacing Spark Electrodes

To service or replace the Spark Electrodes

Remove any carbon formation on the spark electrodes.

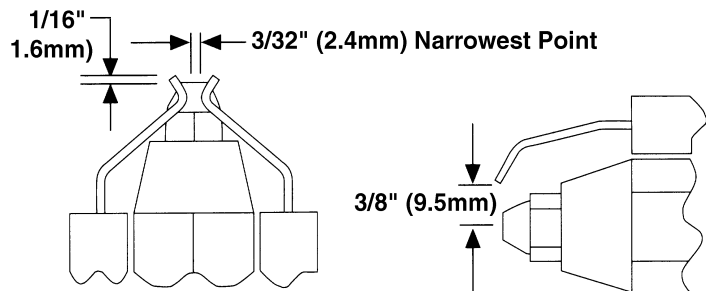
- Check the electrodes for deterioration and the insulators for cracks or damage.
- Replace the electrode assemblies if any damage or deterioration exists.
- After service or replacement, check the position of the electrodes.
- Adjust the electrode location precisely.

## Electrode Adjustment

Check the placement of the electrodes according to the illustration below. If adjustments are required, loosen the 1/4" screw. Make adjustments in the order listed below. Recheck, and if necessary, re-adjust until electrodes are in proper position.

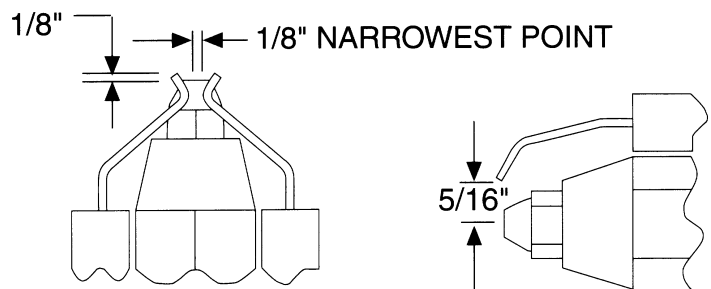
### Sizes 140 and 235

- 1) From center of nozzle orifice to electrode - **up 3/8"**
- 2) Electrode Gap (distance between electrodes - **3/32"**
- 3) Relationship of the end of the electrodes to the tip of the nozzle - **1/16" ahead**
- 4) Relationship of the tip of the nozzle to the inside radius of the end cone -- **Flush to 1/16" ahead - NEVER BEHIND**



### Sizes 350 and 500

- 1) From center of nozzle orifice to electrode - **up 5/16"**
- 2) Electrode Gap (distance between electrodes - **1/8"**
- 3) Relationship of the end of the electrodes to the tip of the nozzle - **1/8" ahead**
- 4) Relationship of the tip of the nozzle to the inside radius of the end cone -- **Flush to 1/16" ahead - NEVER BEHIND**



## Reassembling the Fuel Line Assembly

1. To reassemble the Fuel Line Assembly
  - Slide the fuel line assembly into the burner housing and the burner tube.
2. Connect the fuel connection assembly to the fuel line assembly.
  - Tighten the 5/16" inverted flare nut firmly. Then tighten the connection nut. Do not move the escutcheon plate.
  - Check the spacing between the oil nozzle and the end cone. Refer to Electrode Adjustment, page 30.
3. Connect the eight wires in the fuel line assembly wiring bundle. Refer to the wiring diagram in the Appendix of this manual or the wiring diagram on the boiler.
4. Push the air line hose out through the burner housing and reconnect it to the air compressor.
5. Close the spark transformer cover and attach with the two screws. Be certain transformer clips make contact with the electrodes.

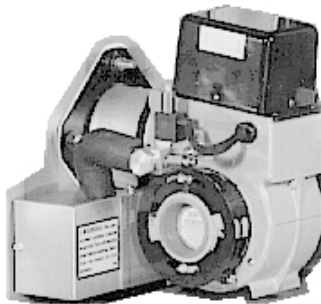
**NOTE:** Once assembly is in place, verify that the nozzle, end cone, and electrodes are correctly located.

## Cleaning Oil Pre-Heater System (U.S. Patent No. 5,080,579)

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**WARNING: Turn off the electric power and allow the pre-heater to cool before servicing.**

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**Pre-Heater  
Box**



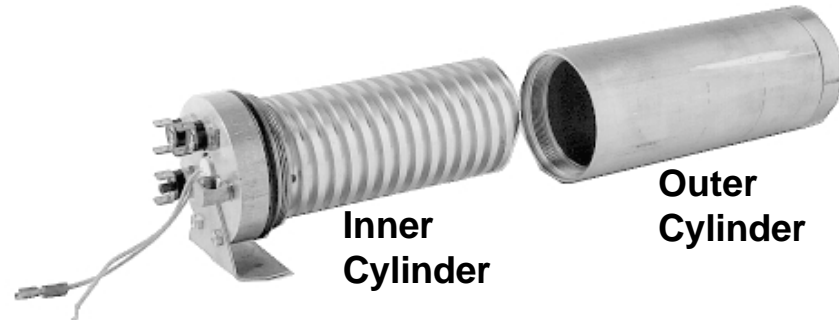
**Pre-Heater  
Controls**

1. Remove the Pre-Heater from the Pre-Heater Box
  - Remove the corner panel from the end of the box. The pre-heater controls are visible.
  - Disconnect the fuel lines at the inlet and outlet connections.  
**NOTE:** There will be oil in the lines.
  - Disconnect wires to the temperature controls.
  - Disconnect the heating element wires.
  - Remove the screw that attaches the pre-heater front support to the bottom of the box.
  - Slide the cylindrical aluminium pre-heater out of the box.
3. Clean the Pre-heater
  - Place the pre-heater in a vice and carefully remove the outer cylinder and the "O" ring. **NOTE:** There will be oil in the pre-heater.
  - Clean the inner section with a cloth and degreaser such as carburetor cleaner. Be careful not to "clean" the electrical controls. Do not immerse in cleaning fluid.

## Maintenance Procedures Continued

### Cleaning Oil Pre-Heater System Continued

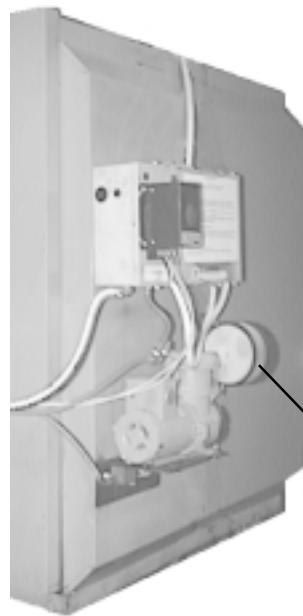
- Clean the outer portion of the cylinder with degreaser.



#### 4. Reassemble the Pre-Heater

- Check the “O” ring. If a new one is required, replace with P/N 132224.
- Reassemble the cylinder pieces with “O” ring in place.
- Slide the pre-heater in the box and attach the front support. Reconnect the wires and the fuel lines and close the corner cover.

## Replacing the Compressed Air Filter



Locate the compressed air filter.

- Remove the wing nut, the cover plate, and the filter.
- Properly discard the old filter and replace with a new filter (Reznor P/N 107216, Wix Filter No. 43274, or NAPA No. 2374).
- Fasten with cover and wing nut.

**Compressed Air Filter**

## Water Level Control

**NOTE:** A continuous need for makeup water indicates a leak in the system. This causes corrosion to all system components and must be fixed immediately. Boiler warranty is voided if problem is not corrected.  
**Form 465, Page 32**

- Maximum operating pressure is 58 psi (4bar). Maintain the water pressure within the required levels.
- Verify system water level; add water and vent as needed. Automatically add water to the system and vent during operation. If continuous makeup water must be added to the system, determine and correct the problem.
- Fill and makeup water must comply with requirements on page 17.
- For additional information, consult boiler manufacturer literature.



# Service Notes

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## General Service

Reznor® used oil fired boilers have been designed and manufactured to provide years of trouble free operation.

However, as with any type of mechanical equipment, it can malfunction. For your safety, we suggest that if you are unfamiliar with servicing this type of equipment, contact a qualified service person. The material contained in this section is prepared to aid an experienced service person in diagnosing problems and repairing the burner on a Reznor Model RAB used oil boiler.

## Burner Operation

### How the used-oil burner on a Reznor® Model RAB boiler operates

When service is necessary, it is always helpful to understand the operation of the device being serviced. With this in mind, the following information has been prepared. Because of the many unique features of the burner, we as the designer and manufacturer believe that it will be worth your time to read this information before beginning any service function.

This burner differs from the burner on most residential and commercial oil furnaces and used oil heaters or boilers in that the oil pump meters the volume of oil supplied to the burner. A constant volume of oil is delivered by the pump to the burner regardless of the oil viscosity. Oil pressure at the outlet of the pump will vary depending upon oil grade, the length and height of the supply line, and the oil temperature.

If a pressure in excess of 50 psi is experienced at the pump, a relief valve will open and return the oil to the supply tank.

Oil pressure at the atomizing nozzle will vary from .25 psi to 4 psi depending on the type of oil being burned. Nozzle oil pressure is not critical because compressed air is used to atomize the oil.

A solenoid valve and a check valve control the oil flow. The solenoid valve located adjacent to the burner housing performs two tasks. The primary task is to prevent oil from flowing into the combustion chamber due to oil expansion in the heater. The second task is to assist in preventing oil from flowing backwards. The check valve at the pump is used to prevent backwards flow of oil in both the heater supply line and the suction line to the pump. Both the solenoid valve and the pump motor are turned on and off by the ignition controller.

To properly atomize the different types of used oil, the oil must be heated. The oil flows through an aluminum heat exchanger (pre-heater) with a heating element. Sizes 140 and 235 have a 300 watt element; Size 350 has a 650 watt element; and Size 500 has a 770 watt element. This oil heater which is

## Burner Operation Continued

external to the burner preheats the oil to approximately 175°F. A pair of 30 watt heating elements on the fuel line and nozzle assembly within the burner maintain an oil atomizing temperature of 160°F. Temperature sensors prevent burner operation until the proper temperatures are attained. Oil temperature is maintained continuously as long as the electrical power is on to the heater.

Compressed air for atomizing the used oil is supplied by a piston-type compressor mounted on the side of the boiler. Models RAB 140 and 235 require air pressure within a 9 to 12 psi range for proper oil atomization. Model RAB 350 requires air pressure in a range of 12 to 15 psi. Model RAB 500 requires 12 to 16 psi. To assure that the correct atomizing air pressure is available, a pressure switch permits oil flow to the nozzle only when the minimum psi required for that size of burner is sensed.

Combustion air is supplied by a blower contained in the burner housing. An adjustable air shutter and air band located on the outside of the burner housing control the quantity of combustion air. Both are preset at the factory and should be changed only if the CO<sub>2</sub> measurement indicates the need to do so. See Check-Test-Start, for instructions for measuring CO<sub>2</sub>. (NOTE: These settings will require adjustment for high altitude operation.)

Ignition of the atomized oil and combustion air mixture is accomplished by a high voltage spark across the two electrodes located near the atomizing nozzle. Ignition of the oil is detected by a cadmium sulfide flame sensor. Light produced by the flame lowers the electrical resistance of the cad cell. This change is sensed by the ignition controller which allows a continued flow of oil and shuts off the spark transformer after a 30-second trial-for-ignition period.

If for some reason, ignition does not occur or the flame goes out during the trial period, the primary control will lockout. To restart, the safety switch must be manually reset by pushing the red reset button on the control. Depress and hold for four seconds.

If the instructions in this manual are followed, excessive amounts of unburned oil will not accumulate inside the combustion chamber. If the caution statement about resetting the controller more than one time is not heeded, then unburned oil will accumulate in the combustion chamber. **If unburned oil accumulates, DO NOT** attempt to fire the boiler and burn off the oil. Remove the combustion chamber access panels as described in Maintenance Section, "Inspecting and Removing Soot and Ash". Wipe out any accumulated oil with cloth rags. Properly dispose of the rags.

If the flame fails during normal operation, the burner will go into a 90-second "recycle" mode (allow 60-120 seconds for recycle period) followed automatically by a new trial for ignition.

If power fails, the burner will shut down and normal trial for ignition will begin on call for heat when the power is restored.

---

**CAUTION: Do not reset the primary control more than one time. If the burner does not ignite, contact your service person.**

---

# Troubleshooting

## Oil Burner Troubleshooting

To diagnose malfunctions properly, the following test equipment is required:

- 1) An electrical test meter that can measure AC volts, ohms, and amps;
- 2) A combustion analyzer kit to measure oxygen and/or carbon dioxide, smoke, stack temperature, and draft; and
- 3) Two pressure gauges with scales of 0-100 PSIG and 0-30 PSIG.

Before test firing, check the combustion chamber for an excessive accumulation of unburned oil and restore to safe condition before firing. (See page 25.)

---

**WARNING: Do not attempt to start the burner when excess oil has accumulated, when the combustion chamber is full of vapor, or when the combustion chamber is very hot.**

---

NOTE: Refer to the troubleshooting guide below to select the appropriate troubleshooting chart.

### Check the Indicator Lights

Light	Location (on the Electrical Box)	Function
GREEN	On the side next to disconnect (on/off) switch	Indicates that the main power is on to the heater
GREEN	On the fixed-cover portion above the ignition controller	Indicates that all limits have been satisfied and the unit is ready to operate

## Troubleshooting Chart Guide

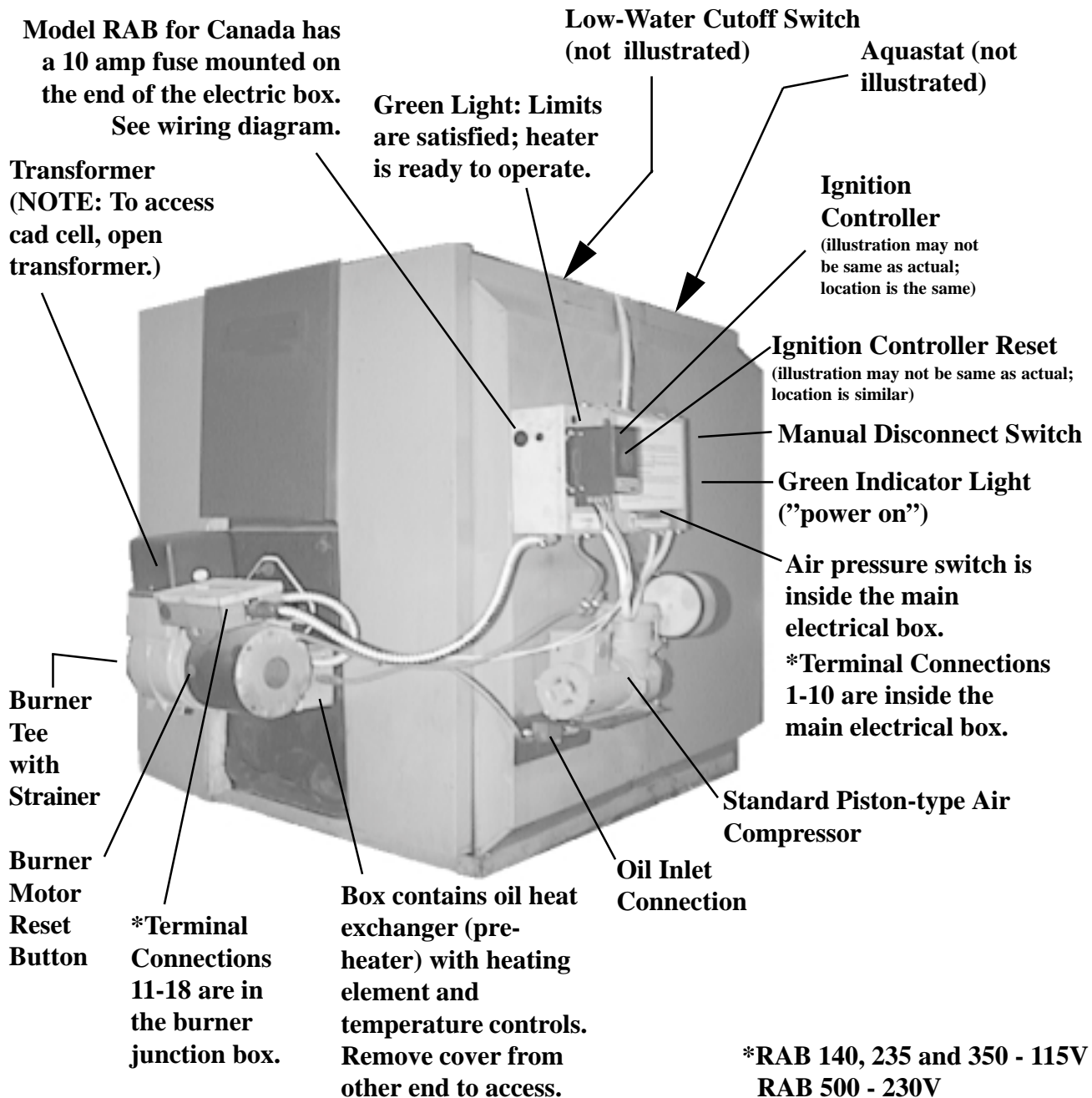
### Symptoms

### Chart

With thermostat calling for heat, burner motor never attempts to run (Green “power on” light is lit; Green “system ready” light is not lit). .....	<b>Chart No. 1, page 37</b>
Chart 1 check completed, but burner motor never attempts to run. With thermostat calling for heat, burner motor runs momentarily. ....	<b>Chart No. 2, page 39</b>
System does not attempt to ignite. ....	<b>Chart No. 3, page 40</b>
Burner ignites and burns steadily until system goes into lockout. ....	<b>Chart No. 4, page 41</b>
Burner operation erratic/unstable flame pattern. ....	<b>Chart No. 5, page 42</b>
Oil delivery system troubleshooting. ....	<b>Chart No. 6, page 43</b>

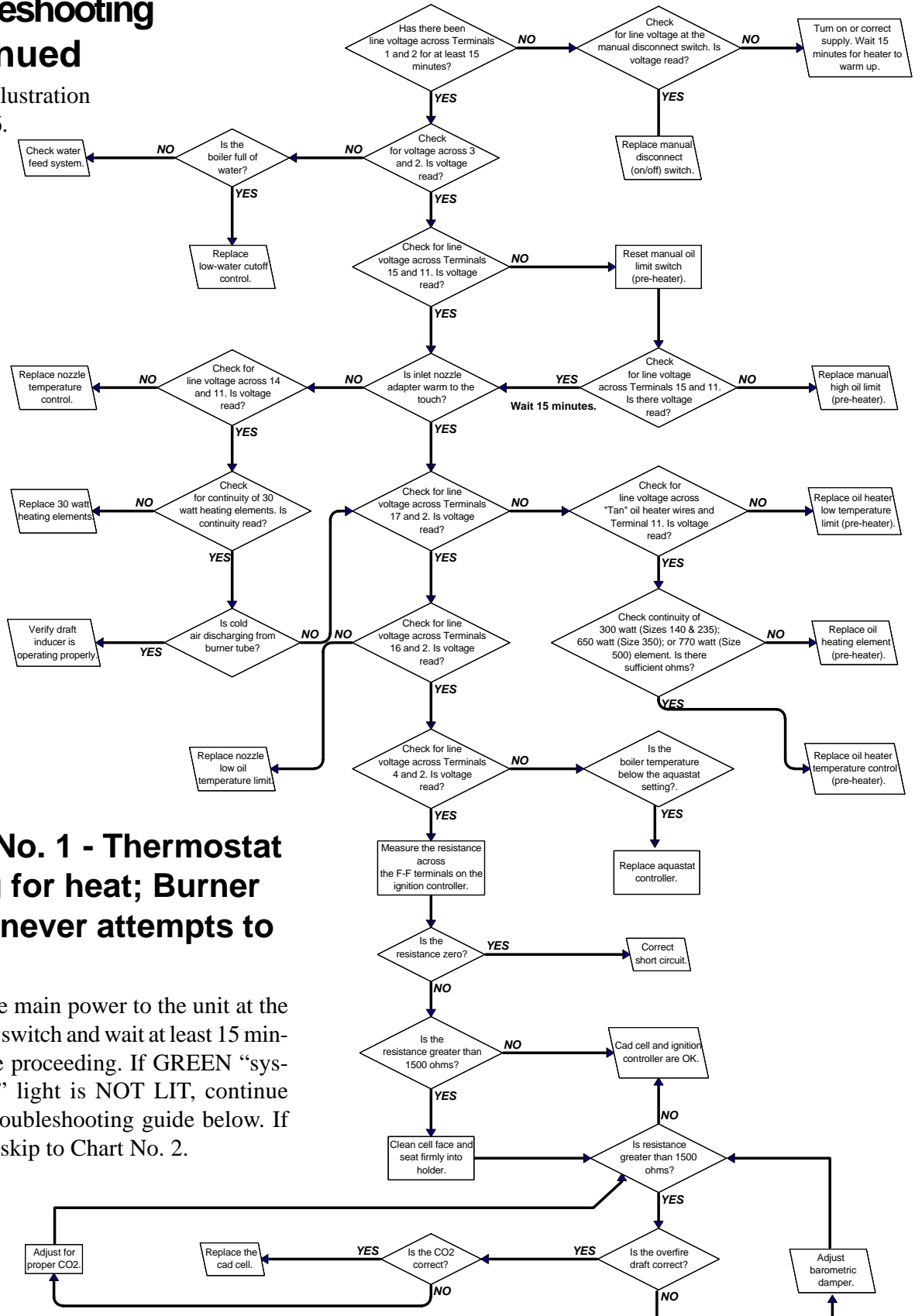
**CAUTION:** The items on the Troubleshooting Charts that are marked with an asterisk represent events that have occurred due to the improper functioning of the heater. It is necessary to observe the operation of the heater to determine what caused these events to occur.

## Location of Components Referenced in Troubleshooting Charts



# Troubleshooting Continued

Refer to illustration on page 36.



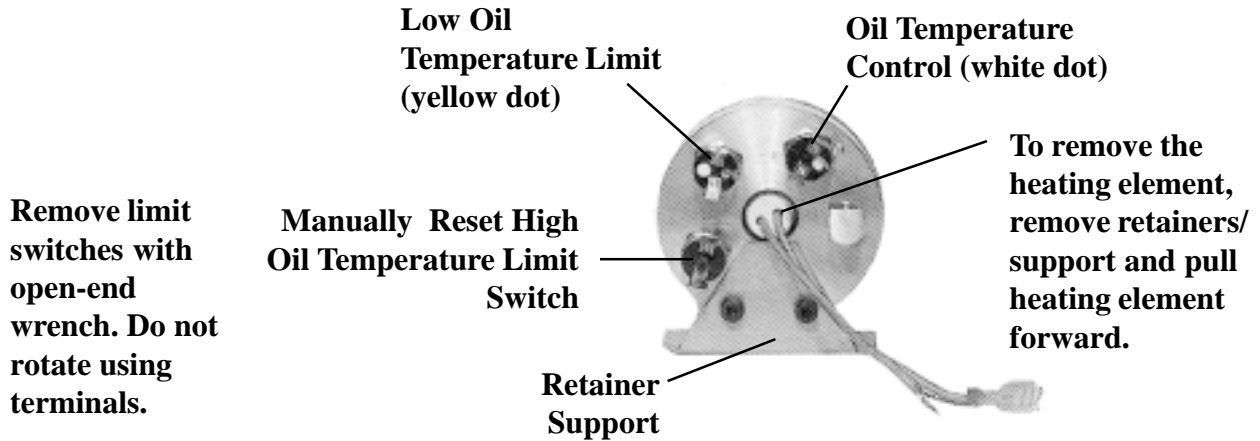
## Chart No. 1 - Thermostat calling for heat; Burner motor never attempts to run.

Turn on the main power to the unit at the disconnect switch and wait at least 15 minutes before proceeding. If GREEN "system ready" light is NOT LIT, continue with the troubleshooting guide below. If it is "ON" skip to Chart No. 2.

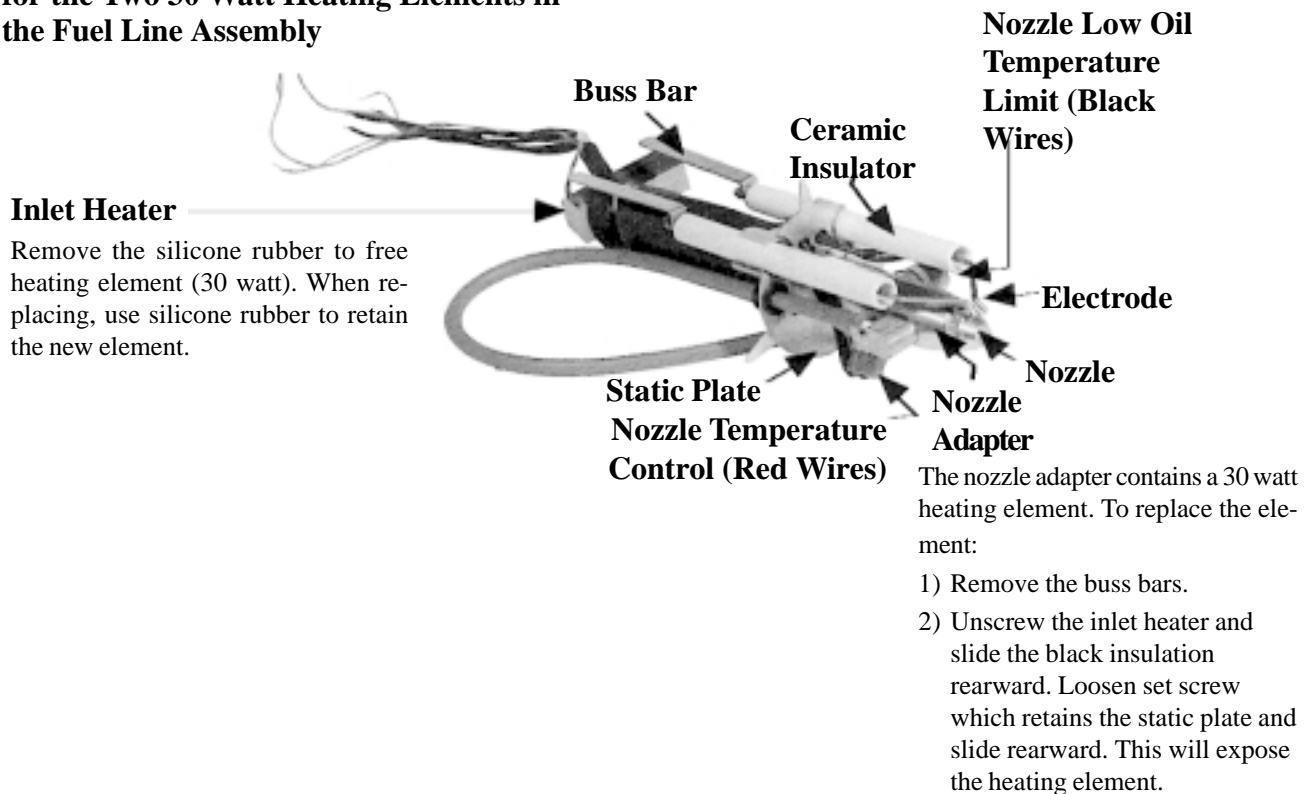
# Oil Heat Exchanger and Fuel Line Assembly Reference Chart No. 1, page 37

## Locations and Replacement Instructions for Heating Element and Temperature Controls on Oil Pre-heat Heat Exchanger

Refer to illustration on page 36.



## Locations and Replacement Instructions for the Two 30 Watt Heating Elements in the Fuel Line Assembly



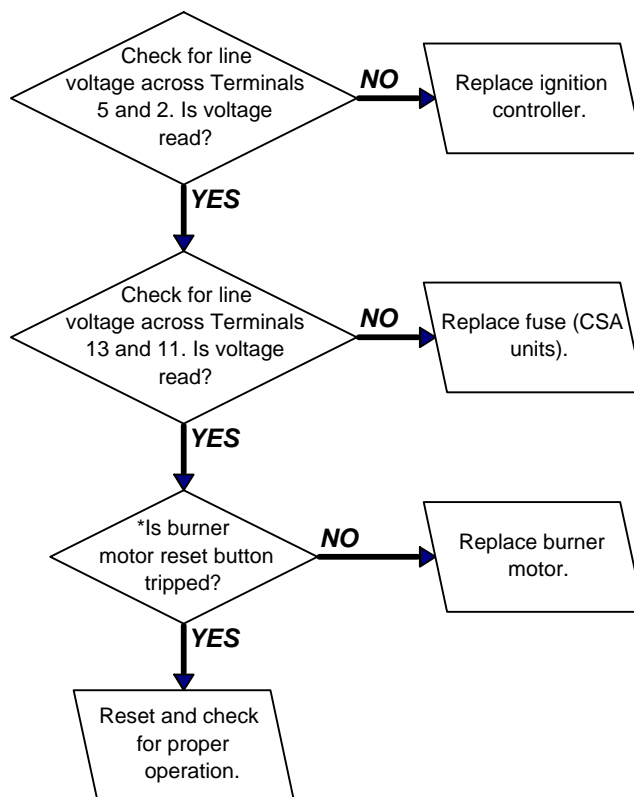
## Troubleshooting Continued

Refer to illustration on page 36.

### Chart No. 2 - Thermostat calling for heat, burner motor never attempts to run (green light is lit) indicating "System Ready". Chart No. 1 has been successfully completed.

**NOTE:** After ignition control is reset, you will have 30 SECONDS to perform the tests shown below before the controller locks out.

Reset ignition control: Press the RED BUTTON, hold for four seconds, and release. DO NOT RESET MORE THAN ONE TIME.



\*Reset button on the motor activates when the motor is overheated. Motor amp draw must be less than the full load amps on the motor rating plate. Verify the motor is operating correctly.

# Troubleshooting Continued

## Chart No. 3 - Thermostat is calling for heat. Burner motor runs for about 30-45 seconds. System does not attempt to ignite.

First, check combustion chamber for excess oil.

**NOTE:** After ignition control is reset, you will have 30 SECONDS to perform the tests shown before the controller locks out.

Reset ignition control: Press the RED BUTTON, hold for four seconds, and release. DO NOT RESET MORE THAN ONE TIME.

### Transformer and Electrode Checks:

Measure voltage between transformer/primary lead and neutral connection. Check transformer, insulators, and electrodes.

The secondary terminals of a good transformer deliver 5000 volts arc to ground, for a total of 10,000 volts between terminals. Measure this with a transformer tester or use a well insulated screwdriver to draw an arc across the two springs. This should be at least 3/4" in length.

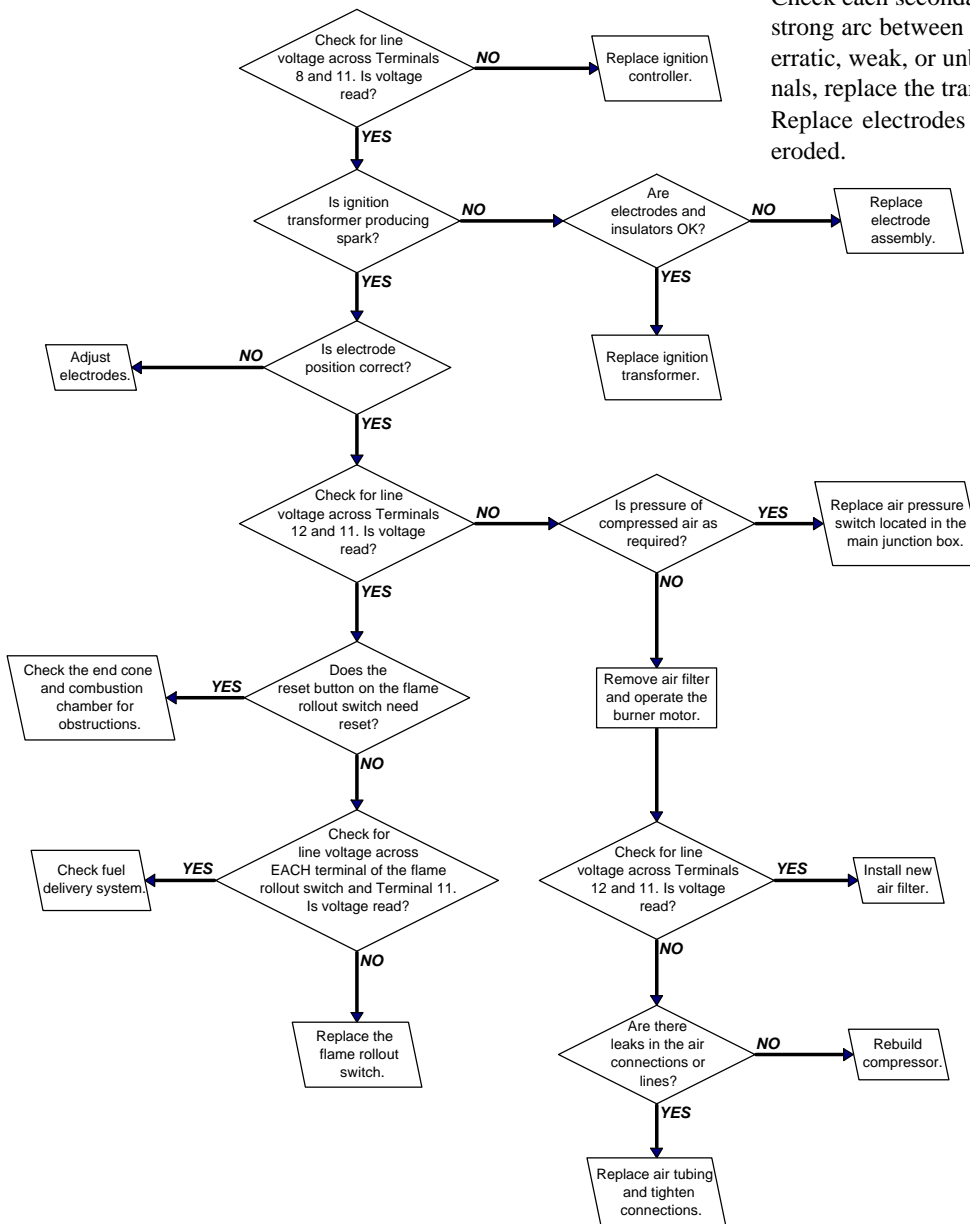
Check each secondary output terminal by drawing a strong arc between the spring and base. If the arc is erratic, weak, or unbalanced between the two terminals, replace the transformer.

Replace electrodes when the tips become worn or eroded.

Replace any insulators that are questionable.

Transformer failures and ignition problem can be caused by the following:

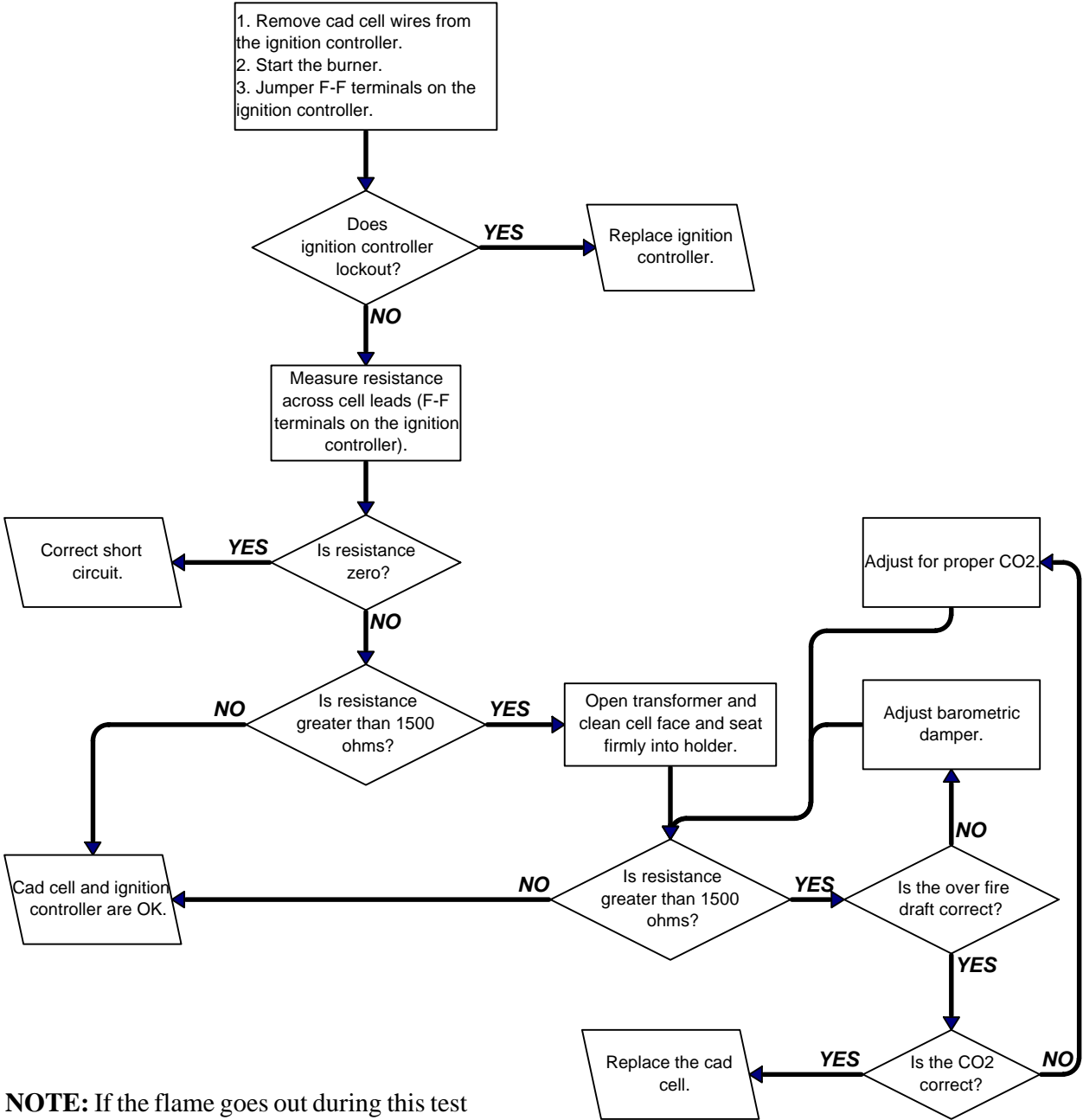
- Excessive gap on the ignition electrodes. Gap should be 3/32".
- High ambient temperatures
- High humidity
- Carbon residue on the porcelain bushings
- Low input line voltage
- Arcing between the ignition electrodes and the transformer springs. They must have good contact.
- Carbon residue, moisture, crazing or pin holes on the insulators
- Improper positioning of nozzle in relation to the radius of the end cone
- Carbon residue on electrode parts





# Troubleshooting Continued

**Chart No. 4 - Burner ignites and burns steadily until the system goes into lockout.**

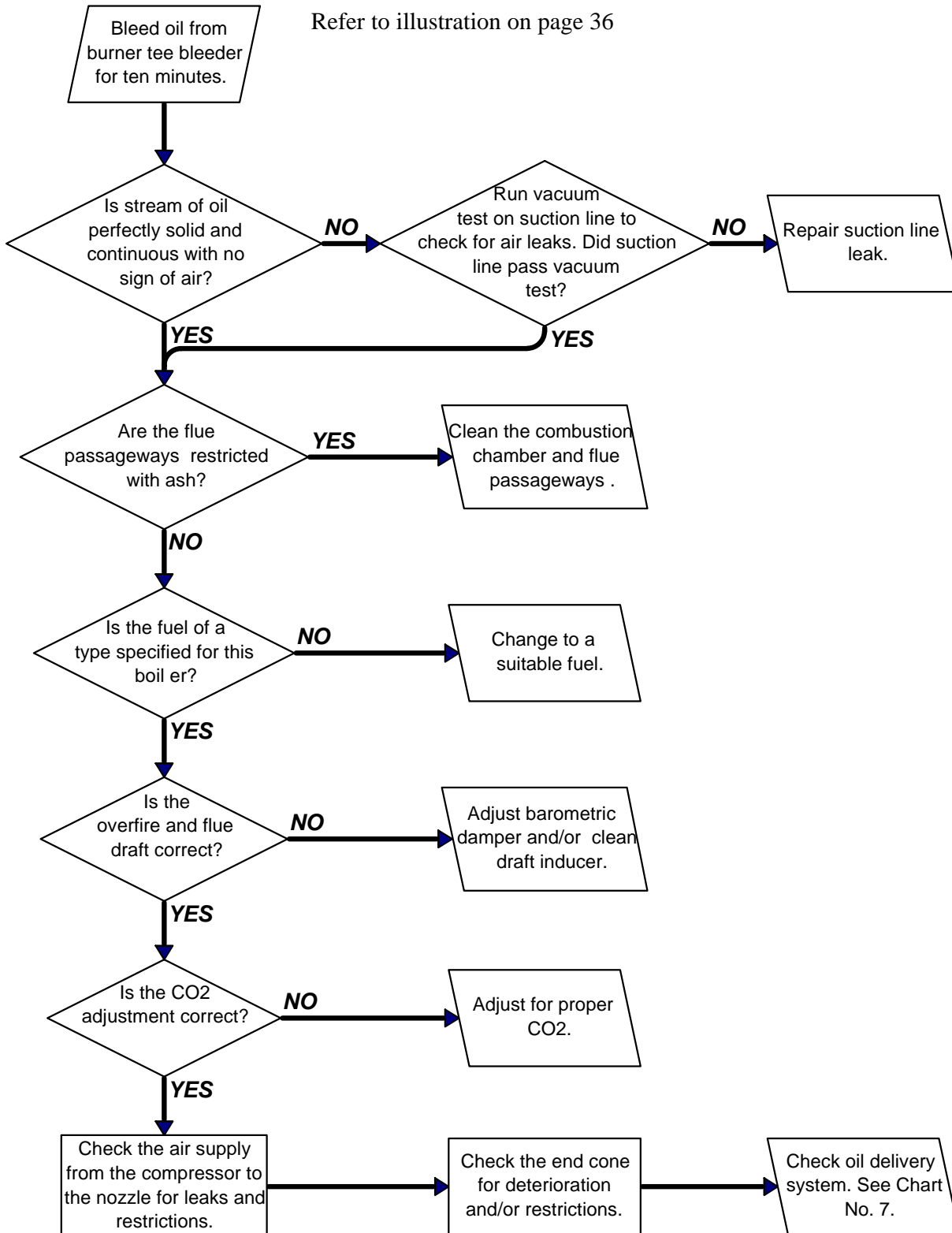


**NOTE:** If the flame goes out during this test and the burner continues to operate, go to Chart No. 5.

# Troubleshooting Continued

## Chart No. 5 - Thermostat calling for heat. Burner operation erratic/unstable flame pattern.

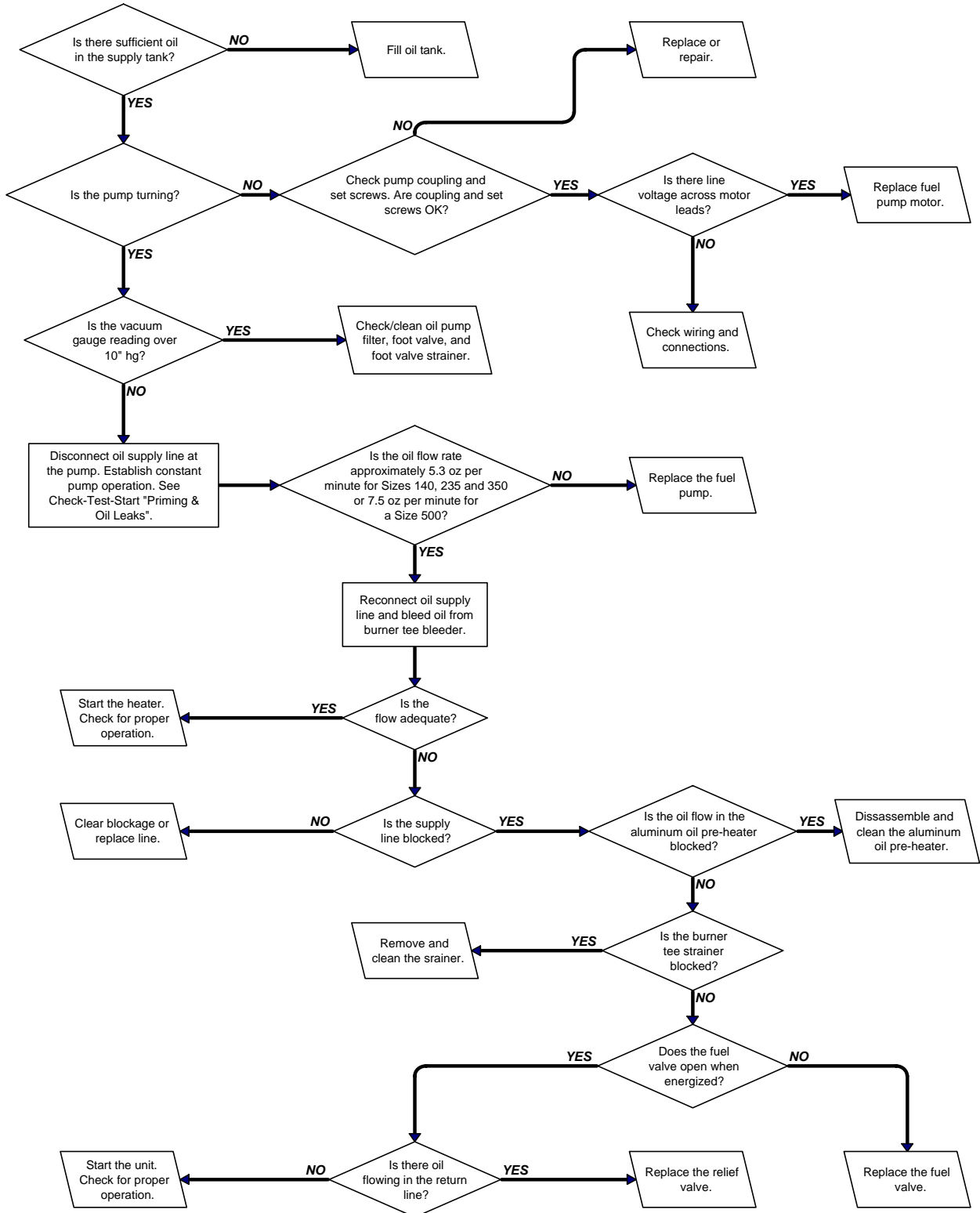
Refer to illustration on page 36



# Troubleshooting Continued

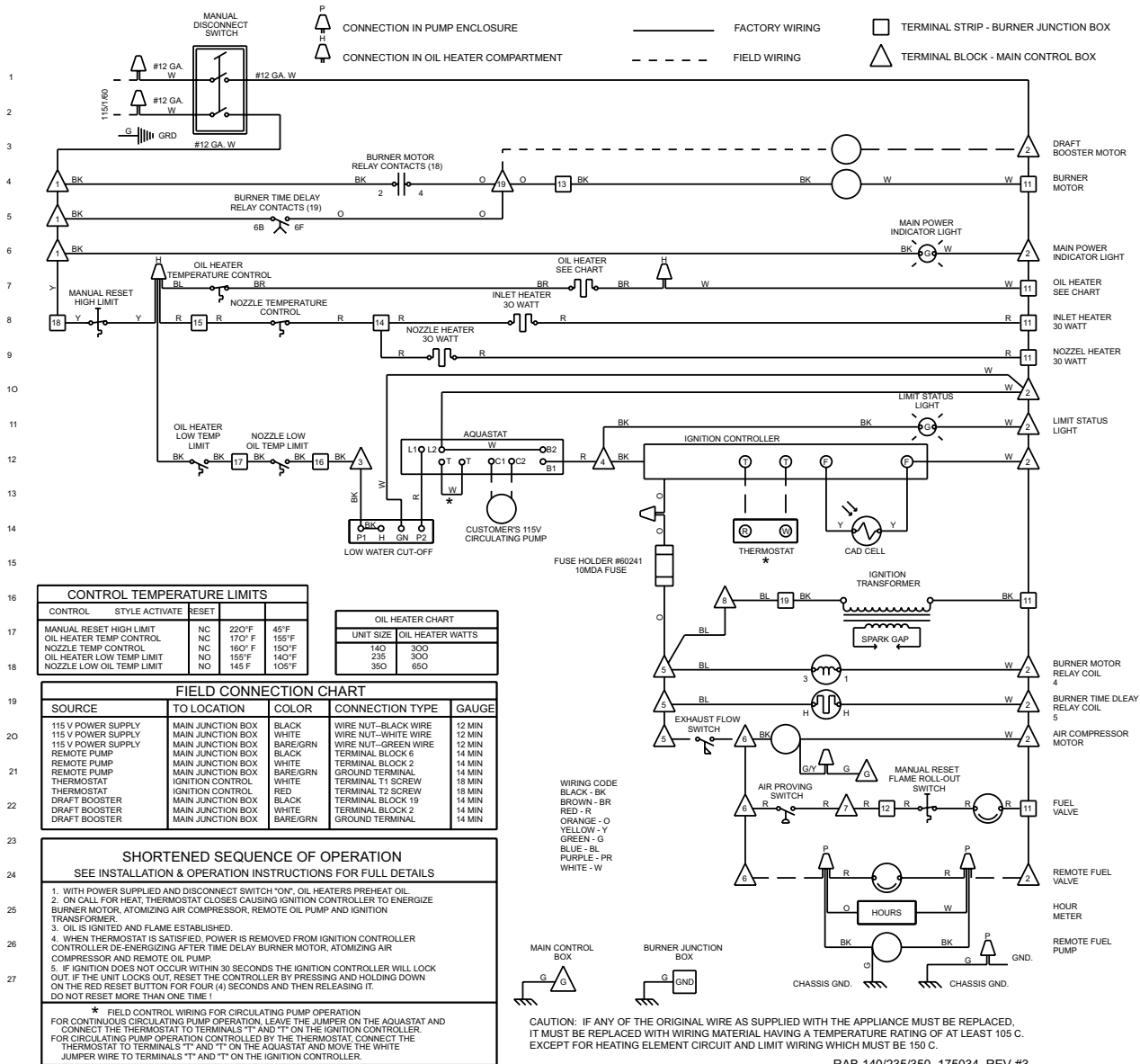
## Chart No. 6 - Oil Delivery System

**CAUTION: If the heater will be shut down for a long period, turn off the electric power.**

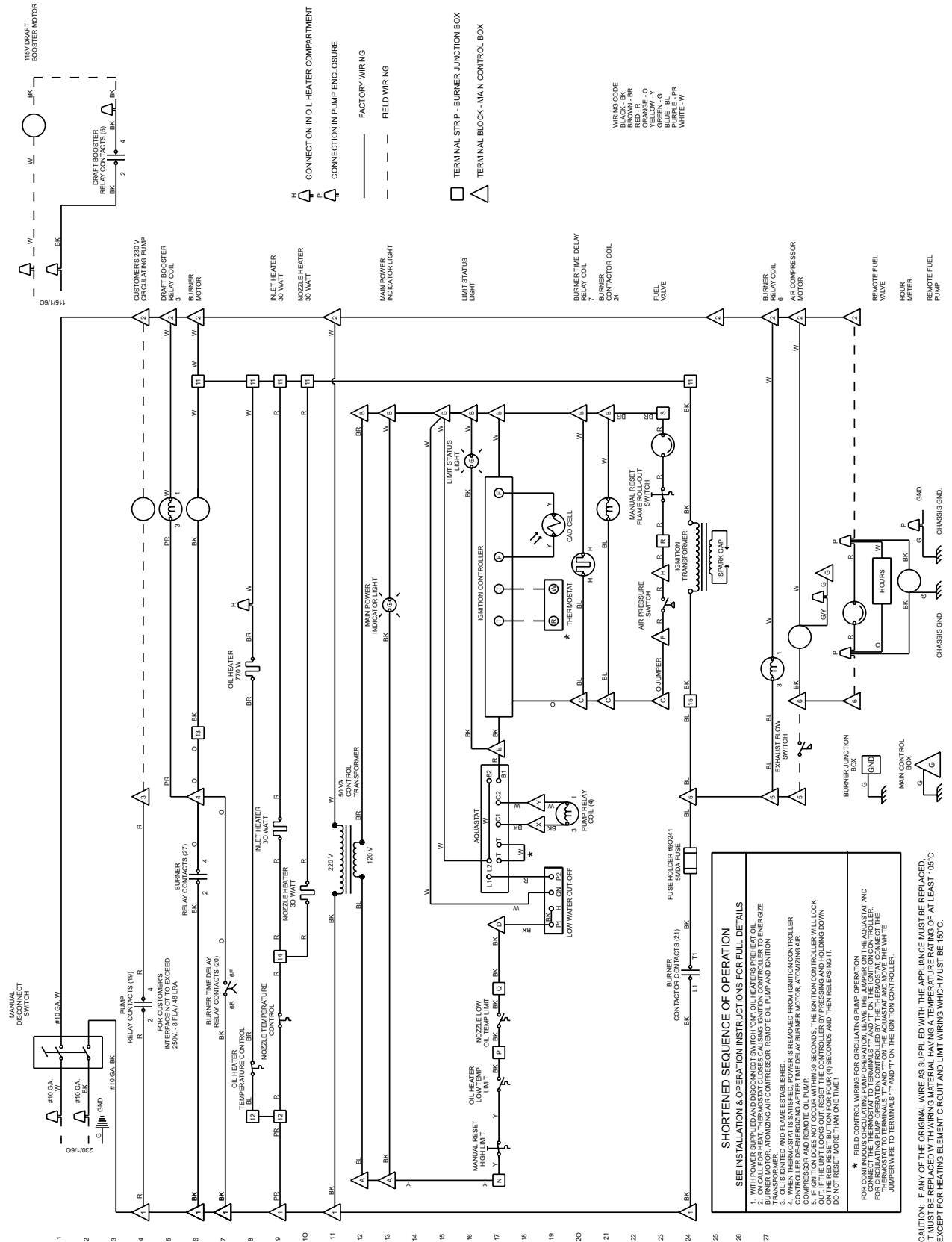


# Appendix

## Wiring Diagram - Models RAB 140, 235, and 350, No. 175034



# Wiring Diagram - Model RAB 500, No. 175035



# Hour Meter/Cleaning Record

Cleaning Date	Meter Reading	Initials	Cleaning Date	Meter Reading	Initials

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**Reference:** Consult Buderus® literature for additional information on the installation, operation, and maintenance of this boiler. (Note: Burner information in Buderus® literature does not apply to this product.)

# Keep this booklet for future reference.

## FOR SERVICE OR REPAIR, FOLLOW THESE STEPS IN ORDER:

FIRST: Contact the Installer

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone \_\_\_\_\_

SECOND: **Contact the nearest distributor** (See Yellow Pages). If no listing, contact Authorized Factory Representative, 1-800-695-1901 (Press 2).

THIRD: Contact: REZNOR®/Thomas & Betts Corporation  
150 McKinley Avenue  
Mercer, PA 16137  
Phone (724) 662-4400

Model No. \_\_\_\_\_

Unit Serial No. \_\_\_\_\_

Date of Installation \_\_\_\_\_



***Thomas & Betts***

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