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Form No. RGM 465

RAY HARDING
CALL 745 2910

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 _____



Installation and Reference Guide

Model RAB

Sizes 140, 235, 350, 500

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



Thomas & Betts

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MANUFACTURER OF GAS, OIL, ELECTRIC HEATING AND VENTILATING SYSTEMS
Trademark Note: Reznor® is registered in the United States and other countries. All other
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8/00 YL Form RGM 465 (Version .1)

IMPORTANT Notice to Owner and Installer

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.

**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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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.)

Hour Meter/Cleaning Record

Cleaning Date	Meter Reading	Initials	Cleaning Date	Meter Reading	Initials

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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.

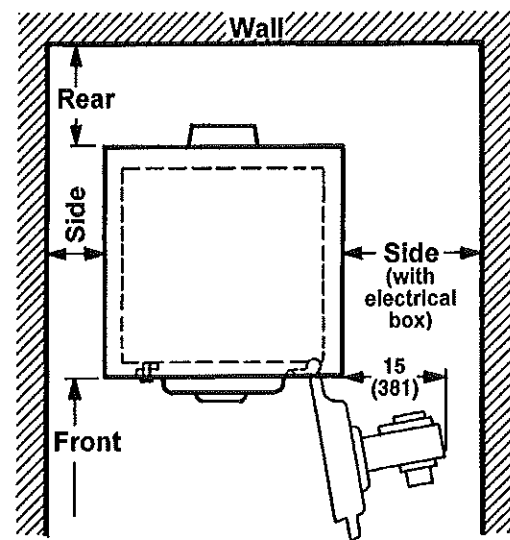
Measure all distances to comply with the specific code requirements and minimum clearances listed below.

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.

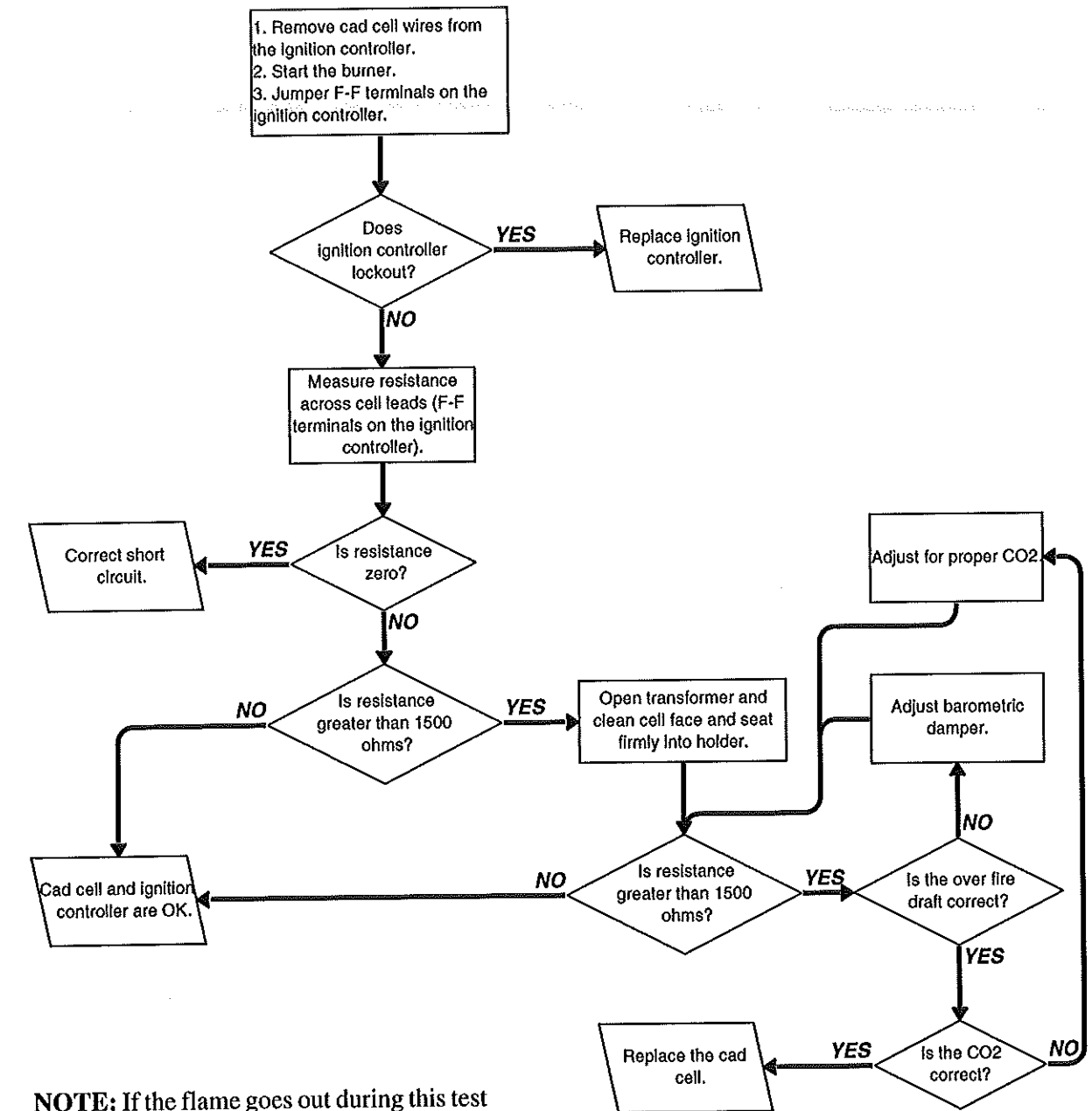
Front	Recommended for service access - Size 140 - 87" (2210mm); Size 235 - 71" (1803mm); Size 350 - 85" (2159mm); Size 500 - 97" (2462mm) Absolute Minimum - All Sizes - 36" (914mm)
Side (with electrical box)	Recommended for service access - 24" (610mm) Absolute Minimum - 15" (381mm)
Side (opposite electrical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

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.

Minimum Clearances (inches and mm)

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.
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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.

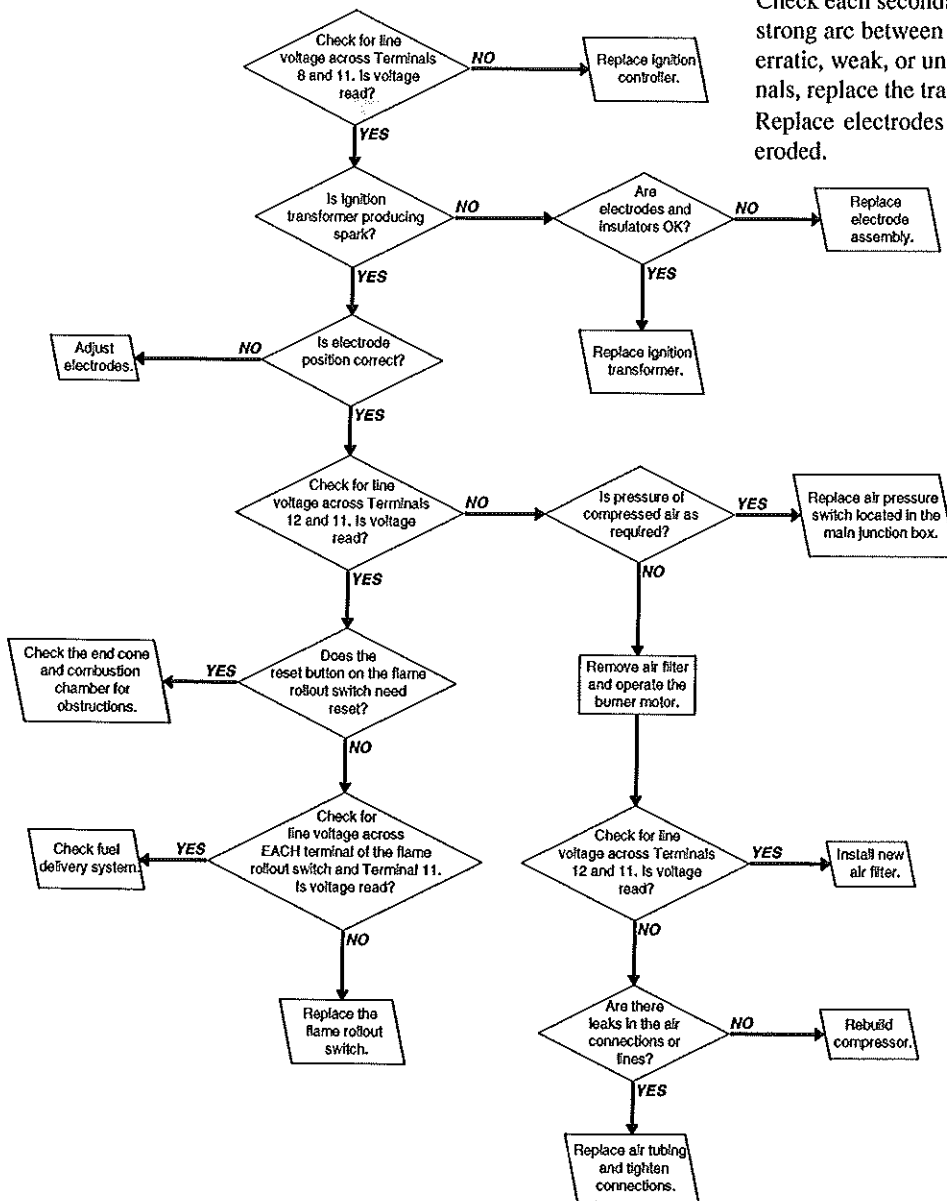
Check each secondary output terminal by drawing a strong arc between the spring and base. If the arc is erratic, weak, or unbalanced between the two terminals, replace the transformer.

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



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

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.

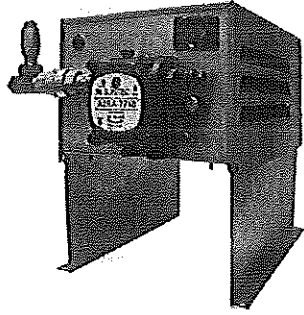
Install either a UL listed Reznor® Model OT-250 oil supply tank or a field-supplied equivalent indoor storage tank.

- 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.

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.

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.

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

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

Oil Supply Line Installation

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

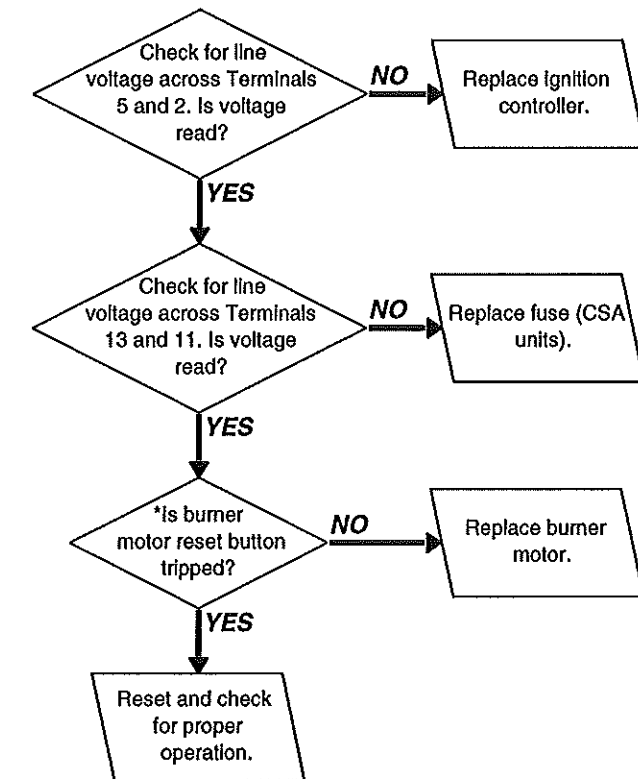
Troubleshooting Continued

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.**

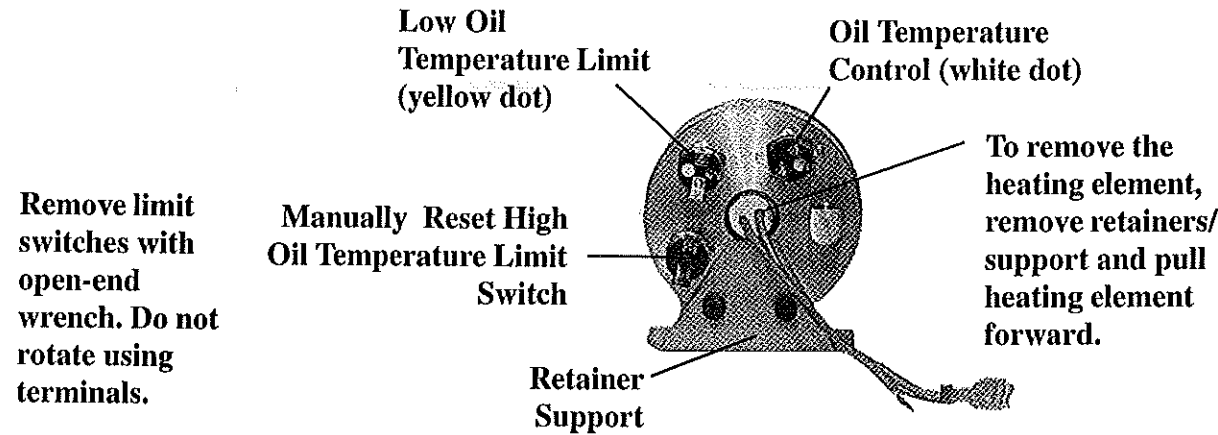


*Reset button on the motor activates when the motor is overheated. Motor amp draw must be less than the full load amps on the motor rating plate. Verify the motor is operating correctly.

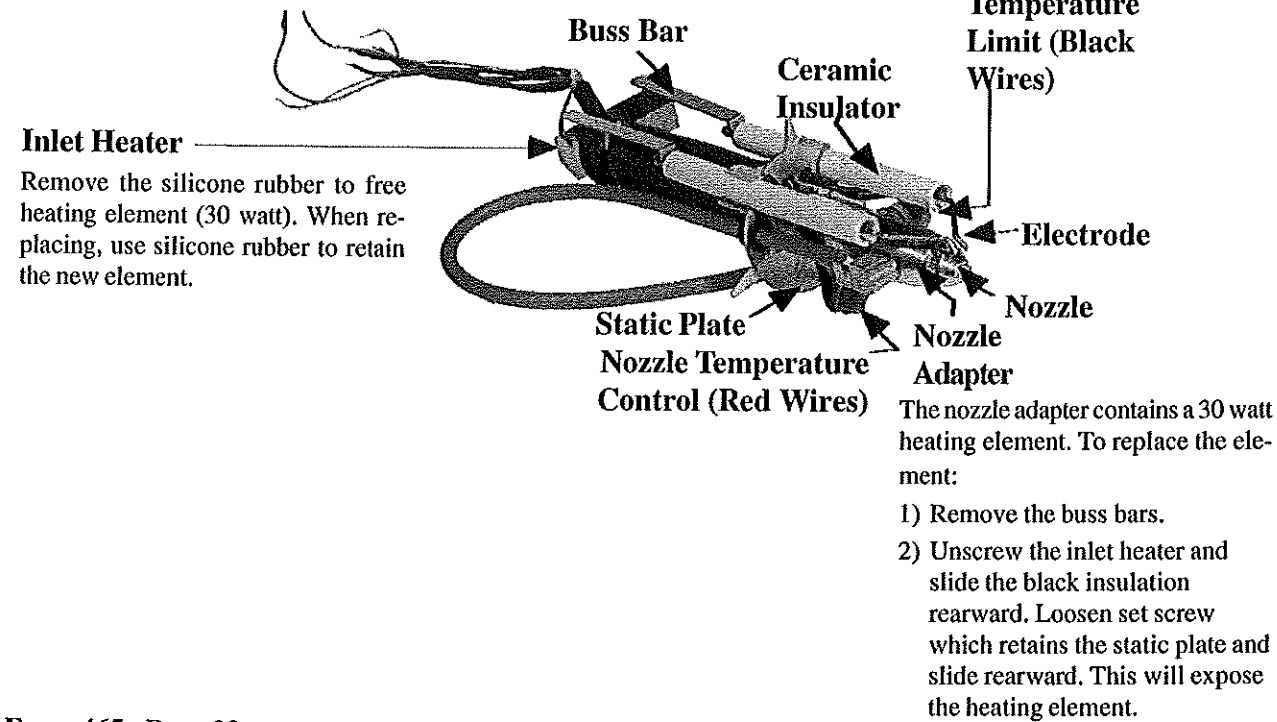
Oil Heat Exchanger and Fuel Line Assembly Reference Chart No. 1, page 37

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

Refer to illustration on page 36.



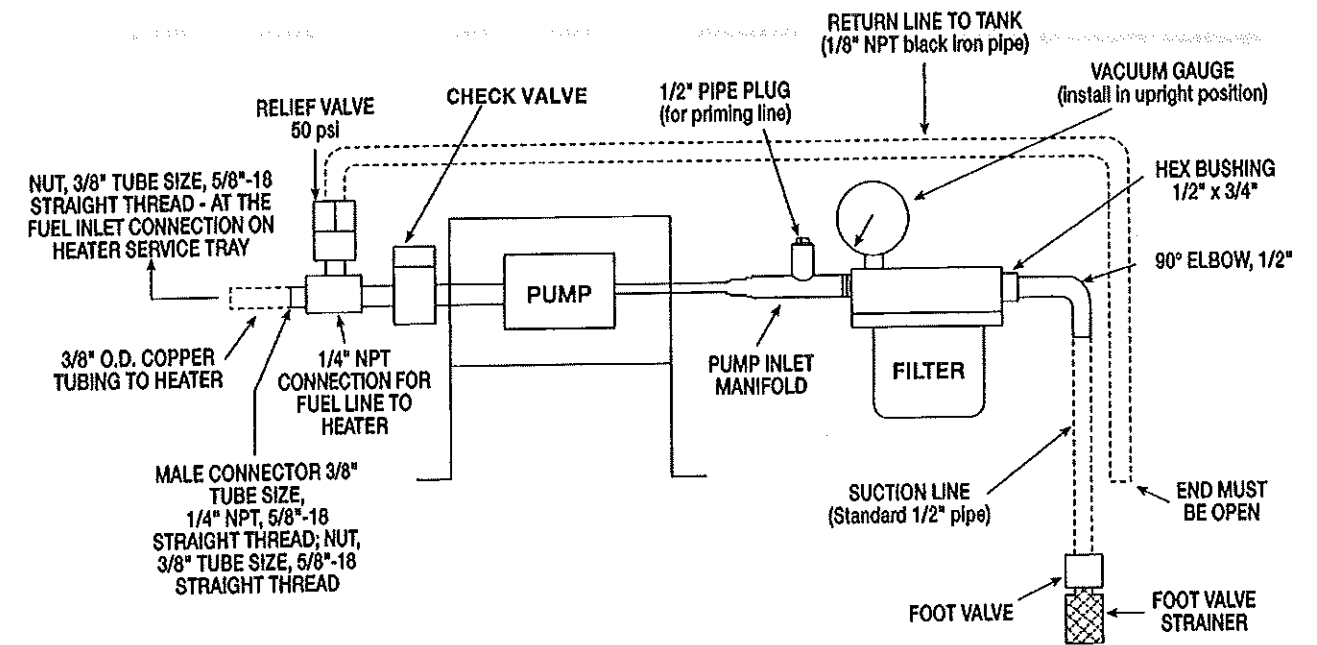
Locations and Replacement Instructions for the Two 30 Watt Heating Elements in the Fuel Line Assembly



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

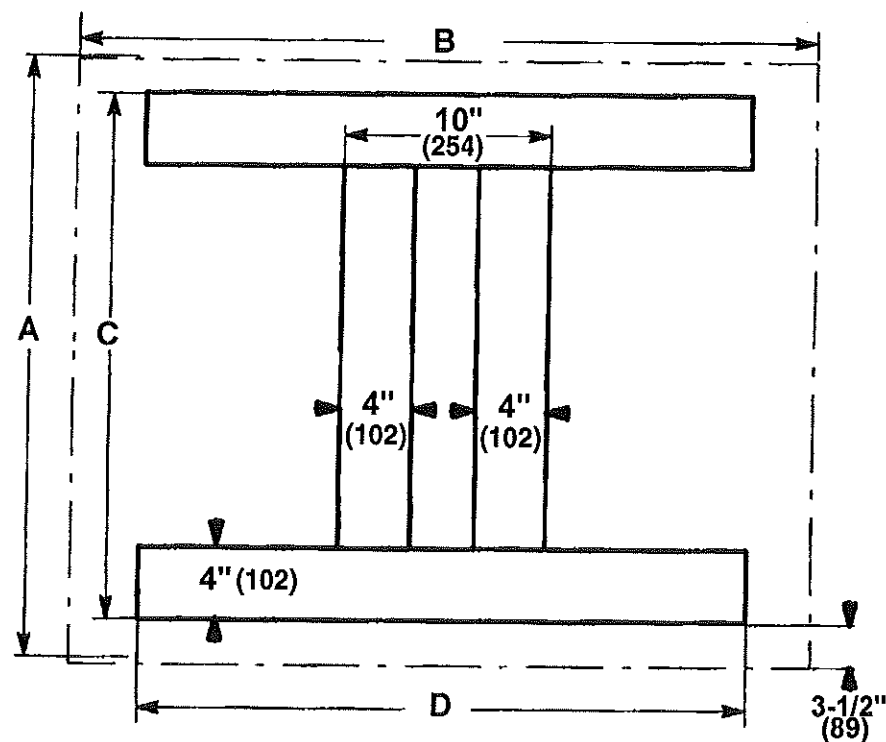
Before preparing a place for the boiler, check the supporting structure to ensure it has sufficient load-carrying capacity to support the weight of the heater.

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



Troubleshooting Continued

Refer to illustration on page 36.

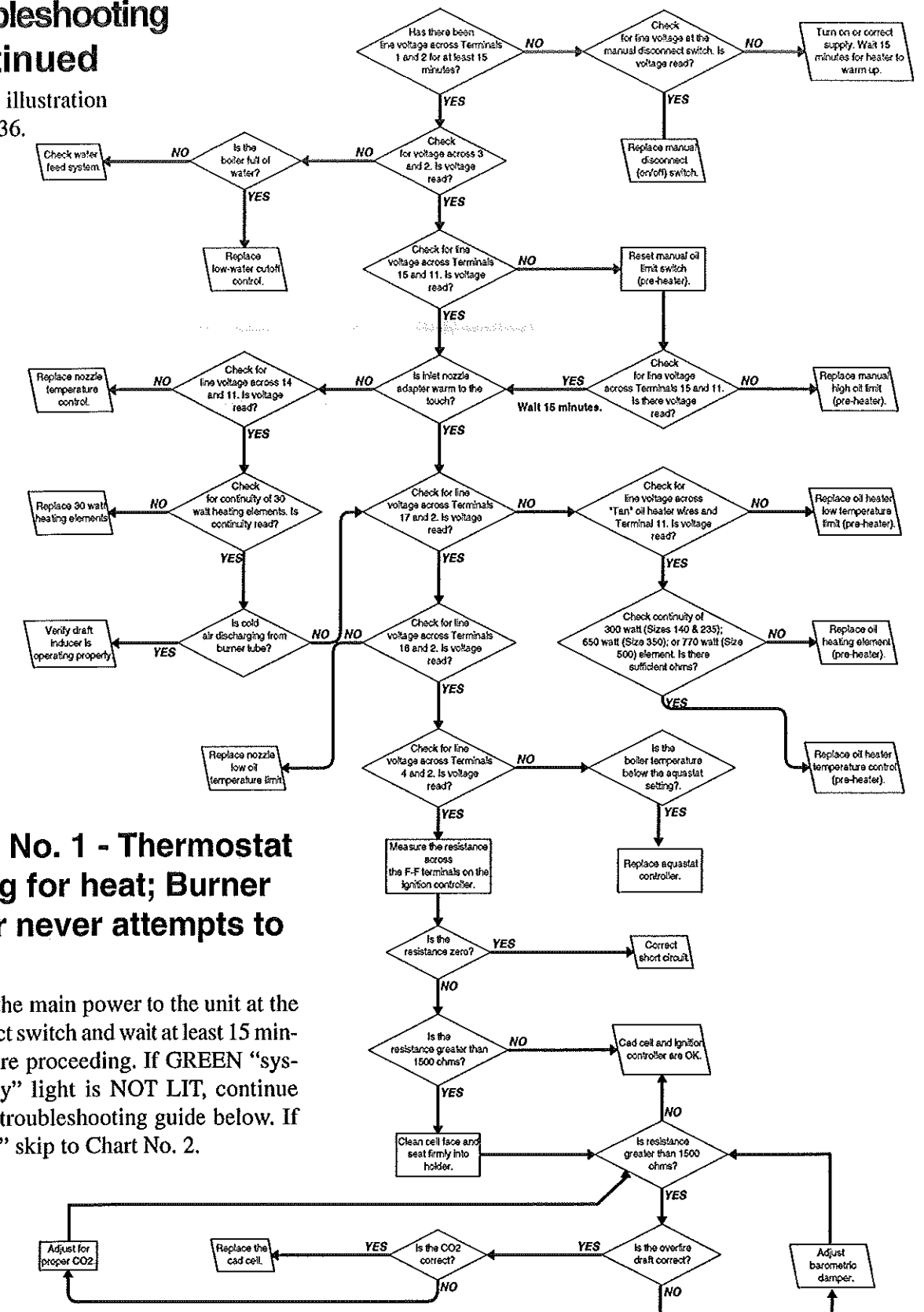
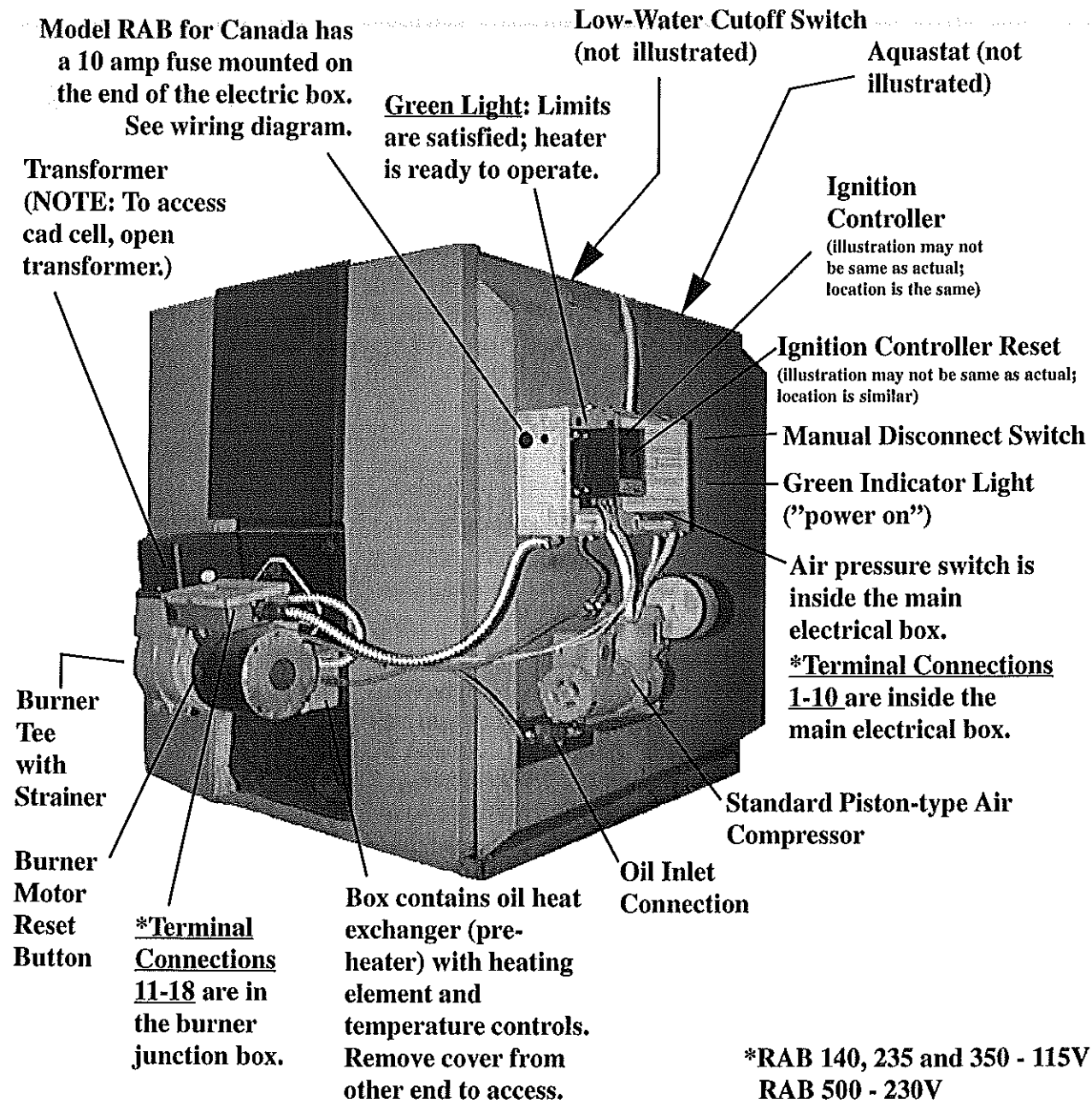


Chart No. 1 - Thermostat calling for heat; Burner motor never attempts to run.

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.

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



Venting the Boiler

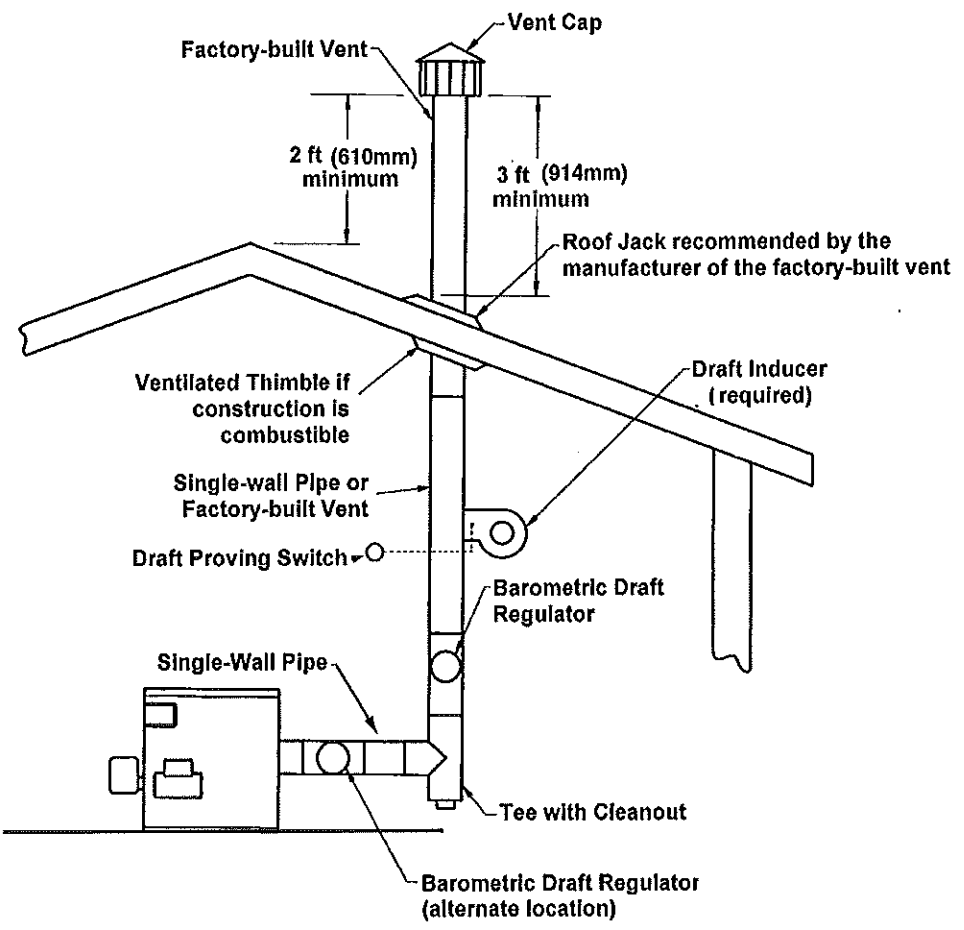
WARNING: Failure to provide proper venting could result in death, serious injury, and/or property damage. Units must be installed with a flue connection and proper vent to the outside of the building. Safe operation of any gravity-vented oil-burning equipment requires a properly operating vent system,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

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.

General Guidelines for the Vent System



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.

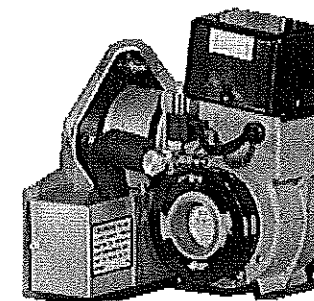
Reassembling the Fuel Line Assembly

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)

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



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

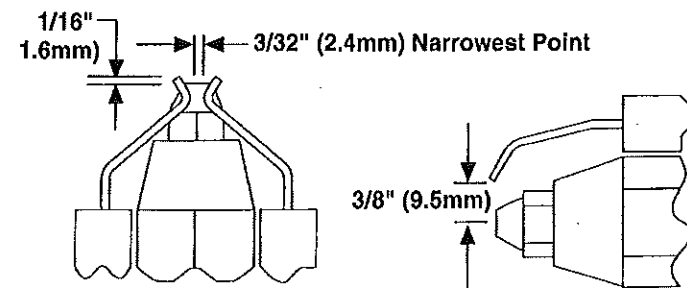
Removing Fuel Line Assembly to Service Continued

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.

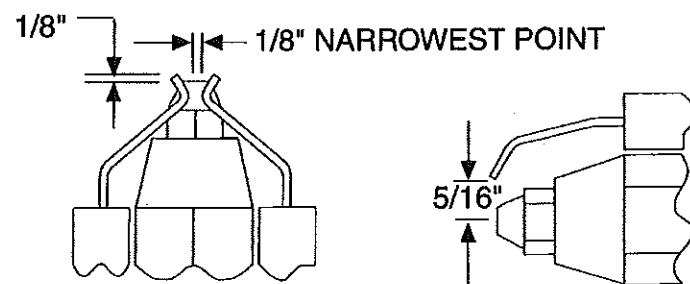
Sizes 140 and 235

- 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**



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.

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.

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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.

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.

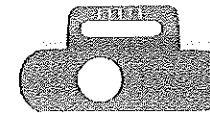
Removing Fuel Line Assembly to Service Controls and Spark Electrodes (Alternate method for servicing nozzle)

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

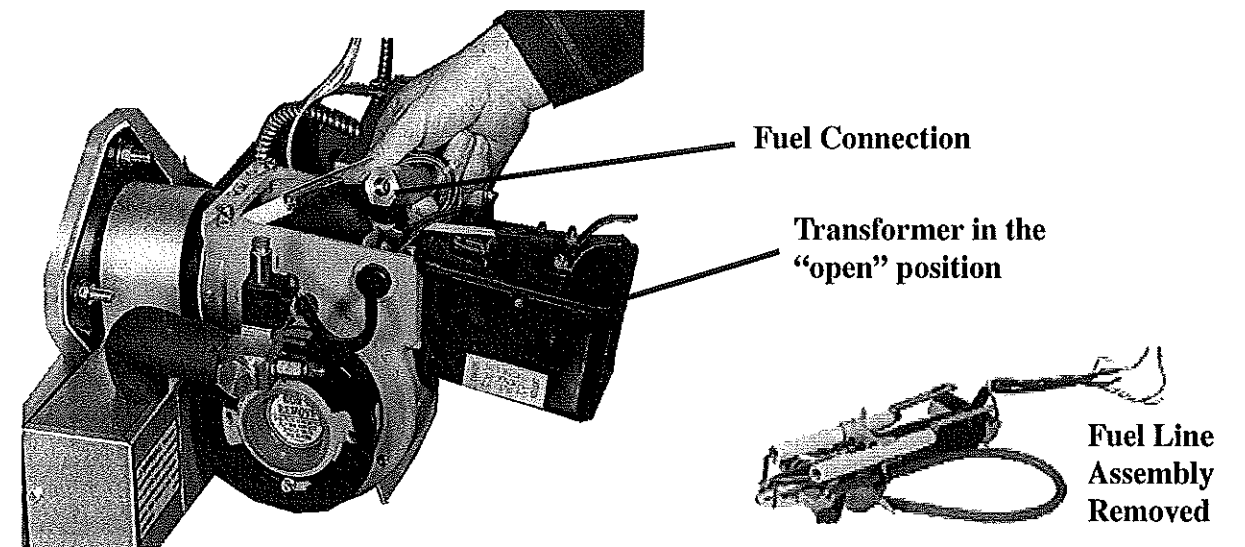
NOTE: In order to service the fuel line assembly controls and spark electrodes, it is necessary to remove the fuel line assembly.

Removing the Fuel Line Assembly

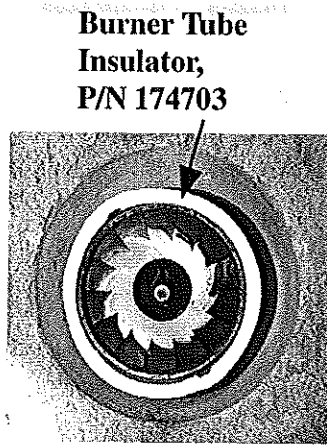
1. Loosen the connection nut one or two turns.
2. Disconnect the fuel connection assembly by loosening the 5/16" inverted flare fitting. Do not change the position of the escutcheon plate.
 - Pull the fuel connection assembly clear of the burner housing.
3. Loosen the two transformer hold-down screws.
 - 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.



Escutcheon Plate



Maintenance Procedures Continued



Burner Tube Insulator, P/N 174703

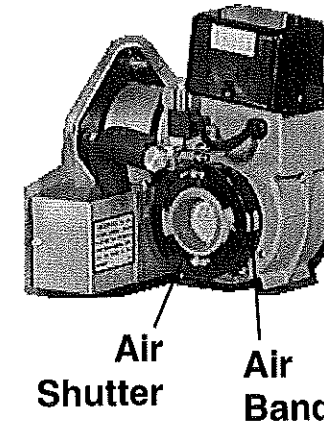
Cleaning the Burner End Cone, Nozzle and Electrodes

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

Check-Test Continued



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.

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 CO₂ 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

General Maintenance Requirements

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

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.

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.

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.

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.

Model RAB	140/235	350/500
Burner Tube Insulator and Combustion Chamber Liner Kit	175994	175995
<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

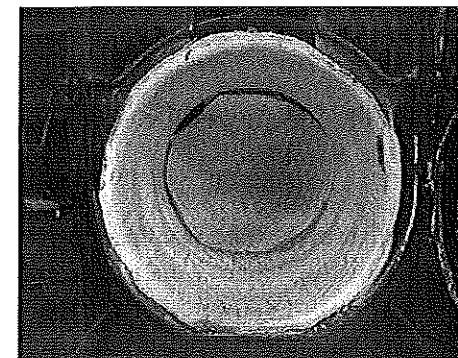
Tools Required

- 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

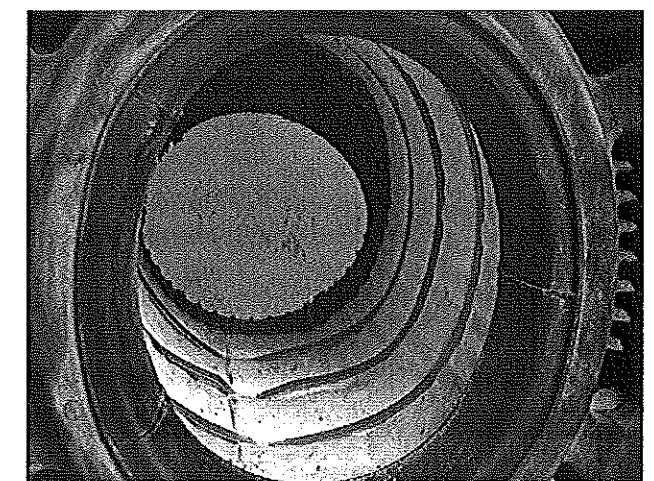
Instructions

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 Continued

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

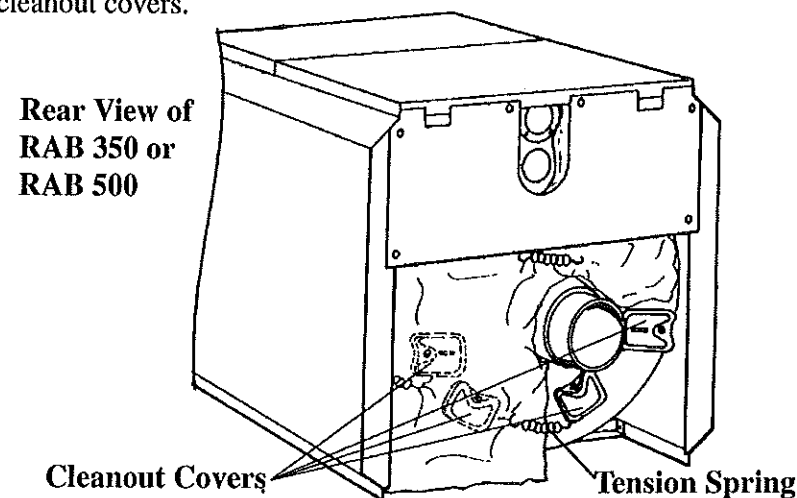
Removing Soot and Ash

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.



- 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.

Form 465, Page 26

Maintenance Procedures



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.

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.

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.)

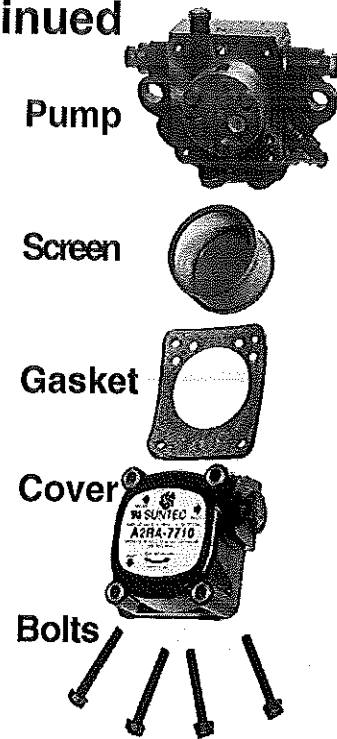
Be sure replacement filter canister is tight so there are no air leaks created.

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

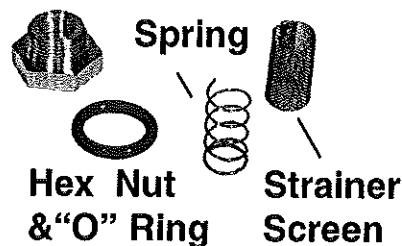
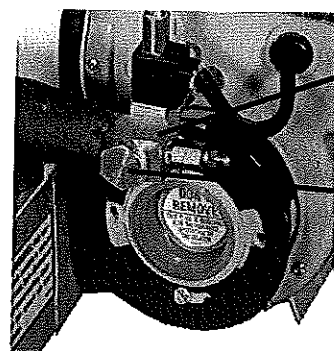
- Remove the fill plug from the inlet manifold and slowly fill the suction line with oil (allow time for air to escape).
- Replace the plug.
- Check vacuum gauge connections and filter housing to be sure that everything is tight. The suction line must be full of oil and all connections tight for the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



- 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

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.

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.

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.