



INSTALLATION AND OPERATOR'S MANUAL

B SERIES WASTE OIL BOILER – B300 • B500 • B1000

SAVE THESE INSTRUCTIONS



IMPORTANT: IN ORDER TO ACHIEVE SAFE AND SATISFACTORY RESULTS FROM YOUR ALTERNATE HEATING SYSTEMS BOILER, READ SAFETY RULES AND INSTRUCTIONS CAREFULLY BEFORE INSTALLING AND OPERATING. ALL INSTALLATIONS MUST BE IN ACCORDANCE WITH STATE AND LOCAL CODES. SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE.



Your Alternate Heating Systems Boiler is capable of generating very hot temperatures. Boiler temperatures and flames in the ignition box area are capable of causing ignition or explosion of explosive or flammable products or explosion of the boiler itself if maximum safe water temperature is exceeded. Maximum safe water temperature is 200° Fahrenheit. Flammable or explosive products must never be stored in the same room or in the vicinity of a boiler, and the boiler water temperature must never be allowed to exceed 200° Fahrenheit.

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Record Model and Serial Number Below:
Model:
Serial Number:
Date of Purchase:

REV 170120

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INTRODUCTION

The Alternate Heating Systems used oil-fired boilers have been specifically designed for burning No. 2 fuel oil, used motor oil, transmission oil, and mixtures not exceeding 50 SAE. These boilers have unique features not found on conventional boiler designs.

Alternate Heating Systems manufactures the boiler vessel to ASME standards. Used oil combustion technology differs significantly from burners designed for No. 2 fuel oil only. Additionally, used oil combustion in the boiler can produce adverse results not encountered in warm air heat exchangers. Various boiler models may have different electrical exchangers. Various boiler models may have different electrical components and control logic due to the diversity of boiler installations and options available. The appropriate “ladder logic” electrical diagram is provided with each unit.

The draft inducing fan is essential for proper operation of the boiler. This fan serves two functions: creating a negative pressure in the combustion chamber, and a positive pressure in the ash recovery cyclone. Waste oil combustion produces an ash residue which clings to all exposed fireside surfaces on the boiler. The aspirating effect of the draft inducing fan pulls much of this ash through the heat exchanger and deposits it in the ash receiver of the cyclone. However, some ash accumulation will occur in the firing chamber and the fire tubes which must be cleansed out periodically to maintain proper heat transfer efficiency.

Easy access to the fire tubes is provided by the large door on the rear of the boiler. A tube brush is provided with boiler models that have multiple tubes. **CAUTION: DO NOT OPEN THE ACCESS DOOR UNLESS THE POWER HAS BEEN TURNED OFF.** There is an opening in the lower part of the inspection door for secondary combustion air. This opening must never be covered or closed in any manner.

The fan cover assembly can be removed by loosening the retainer nuts. When replacing the fan cover assembly, attention must be given to tightening the retainer nuts evenly to ensure a proper seating of the gasket on the edge of the swirl chamber. These nuts should be checked periodically and tightened if necessary to prevent ash leakage.

The draft inducing fan is activated first in the startup sequence. This reduces the possibility of smoke release when the burner ignites. The control logic also contains a draft sensing switch which must detect a pressure differential within the unit or the burner will not operate.

This boiler must be installed by a qualified technician, knowledgeable in hot water heating system design requirements.

These boilers may have one or more hot water heating coils to produce domestic hot water for car washes, showers, etc. Consult the enclosed diagram for an appropriate method for piping the domestic coils. If the boiler coil serves hand taps it must have a tempering valve to ensure that excessively hot water does not contact humans.

If anything in this manual is unclear or technical assistance is required, contact your authorized representative or call Alternate Heating Systems, Inc. at 717-987-0099 or email sales@alternateheatingsystems.com

CODE INFORMATION

Purchase of an Alternate Heating Systems multi-oil boiler is a wise investment. To maximize the return on this investment you must read the manual. It contains installation instructions, diagnostic procedures, burner cleaning, maintenance procedures, and parts ordering information. Follow the installation instructions very carefully.

You can expect years of reliable performance with a properly installed and maintained system.

NOTE: THIS BOILER CANNOT BE USED FOR RESIDENTIAL USE!

The installation of the equipment shall be in accordance with the codes and regulations of authorities (state or local) having jurisdiction over environmental control, fuel, fire, and electrical safety. The installation of equipment in the United States must consider the requirements of the following publications of the National Fire Protection Association, Battery March Park, Quincy, Massachusetts 02269:

N.F.P.A. No. 30	Flammable and Combustible Liquids Code
N.F.P.A. No. 31	Standard for installation of oil burning equipment
N.F.P.A. No. 88A	Standard for parking Structures
N.F.P.A. No. 88B	Standard for Repair Garages
N.F.P.A. No. 211	Standard for Chimney, Fireplaces Vents and Solid fuel Burning Appliances

The installation of equipment in Canada must consider the requirements of CSA, Standard B 139, Installation code for Oil Burning Equipment.

NOTE: Installation, operating, and maintenance permits from each of the above authorities may be required, as well as municipal permits.

Please read and save your manual for future reference. Read your installation manual thoroughly first in order to insure that your new heating system operates properly.

Minimum Clearances Between Boiler and Combustibles:

Above	12"	Chimney Connector	18"
Sides	24"	Cyclone	18"
Rear	36"		
Front	36"		

This boiler is listed for burning #2 fuel oil, used motor oil, and transmission oils with mixtures not exceeding 50 S.A.E.

DO NOT BURN unknown garbage oils, gasoline, naphtha, or chlorinated cleaning solvents in this boiler.

PACKING LIST

Warranty Card
Manual

Packed with Boiler

Relief Valve
Temperature/Pressure Gauge
Cyclone w/Ash Pan
Tube Brush
Tube Brush Handle
Draft Box
Draft Box Elbow
Draft Sensor Riser w/Cap
Silicone Gasket
Assortment of Bolt, Nuts & Washers
Fan Cover Assembly

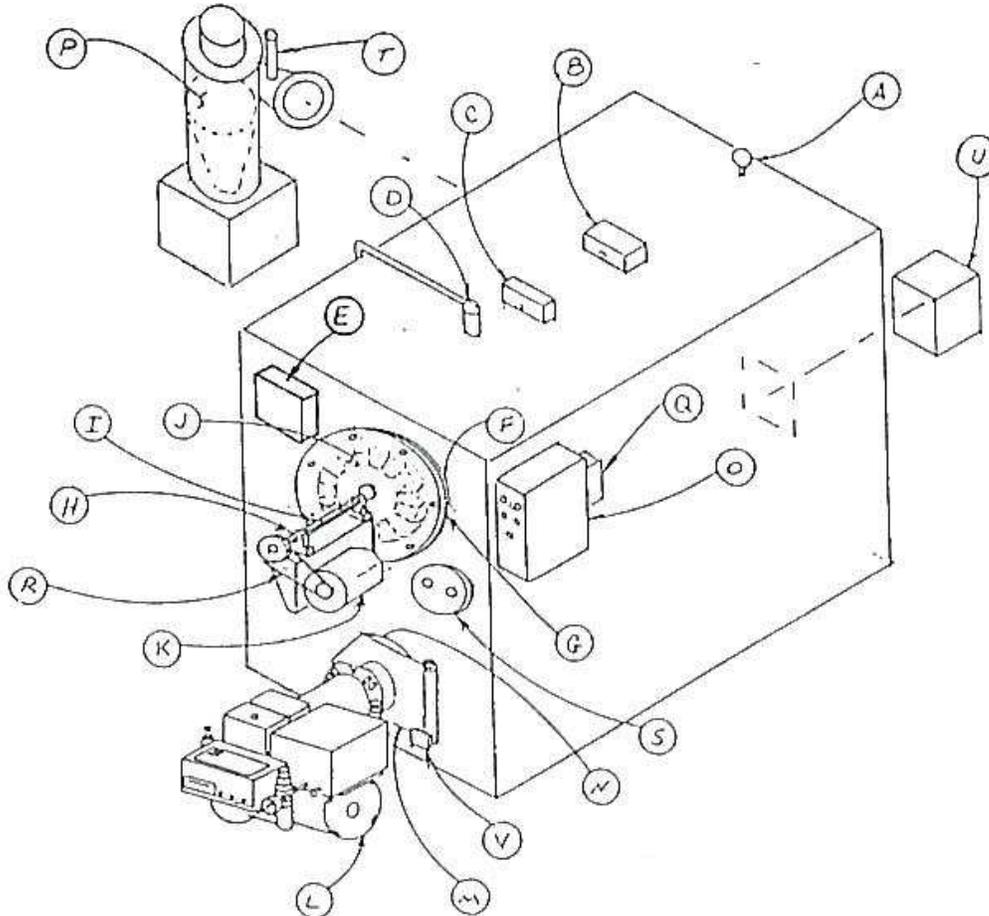
Tube Brush Extension
Fan Cover Jib Arm

Options - Packed Separately if Purchased

Transfer pump
Accessory Kit:
 In-line oil filter
 In-Line Oil filter Base
3/4" check Valve
3/4" Suction Screen
Thermostat
Burner
Mini air compressor with relay and fittings
Tank connections and fittings kit

Component Identification – Waste Oil Boiler

COMPONENT IDENTIFICATION – WASTE OIL BOILER

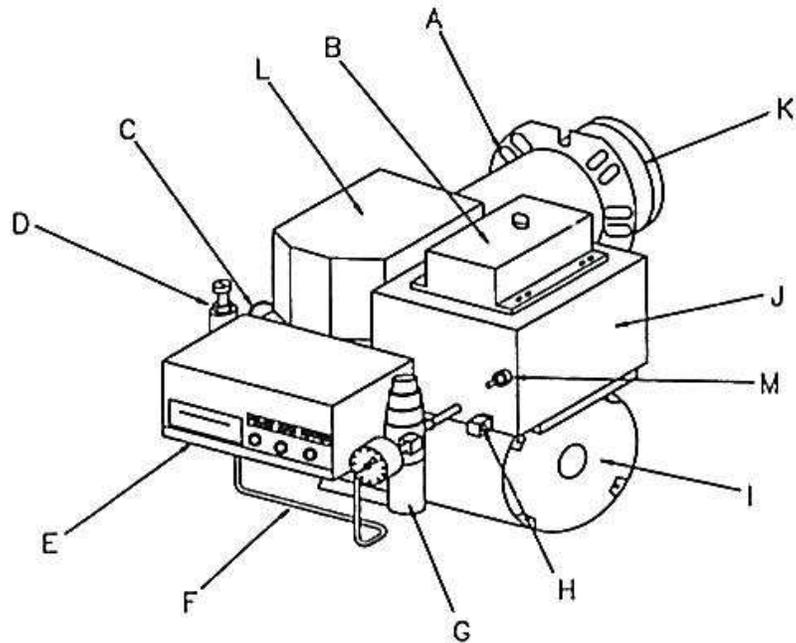


- | | |
|-------------------------------|-----------------------------|
| A. Temperature/Pressure Gauge | L. Waste Oil Burner |
| B. Operation Control | M. Burner Mount |
| C. Hi-Limit Control | N. Burner Mount Gasket |
| D. Relief Valve | O. Electrical Panel |
| E. Low Water Cutoff | P. Cyclone & Pan & Funnel |
| F. Abrasion Shield | Q. Pressure Sensor |
| G. Ceramic Heat Shield | R. ID Fan Belt |
| H. Flange Bearing | S. Domestic Coil |
| I. Fan Shaft | T. Draft Sensor Riser & Cap |
| J. ID Fan | U. Draft Box & Elbow |
| K. ID Fan Motor | V. Door Micro Switch |

—NOTE—
THE ELECTRICAL CONTROLS MAY
VARY IN LOCATION ON TOP OF THE BOILER.

Burner Components

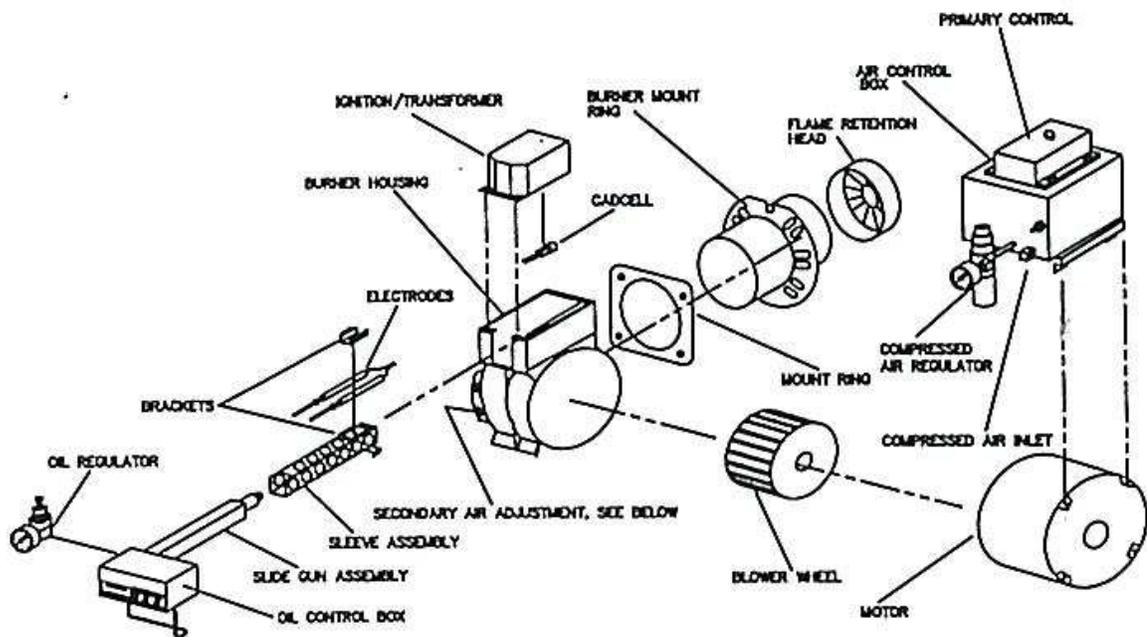
BURNER COMPONENTS



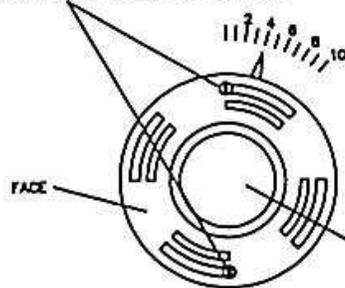
- A. BURNER MOUNT RING
- B. IGNITION CONTROL
- C. SECONDARY AIR BANDS
- D. FUEL OIL REGULATOR & SUPPLY CONNECTION
- E. SLIDE GUN ASSEMBLY
- F. REGULATED PRIMARY AIR LINE
- G. AIR REGULATOR
- H. AIR SUPPLY CONNECTION
- I. MOTOR
- J. AIR CONTROL BOX
- K. FLAME RETENTION HEAD
- L. IGNITOR
- M. FUEL PRIMING SWITCH

Burner Components – Parts Breakdown

BURNER COMPONENTS - PARTS BREAKDOWN



LOCKING SCREW, LOOSEN TO ADJUST FACE



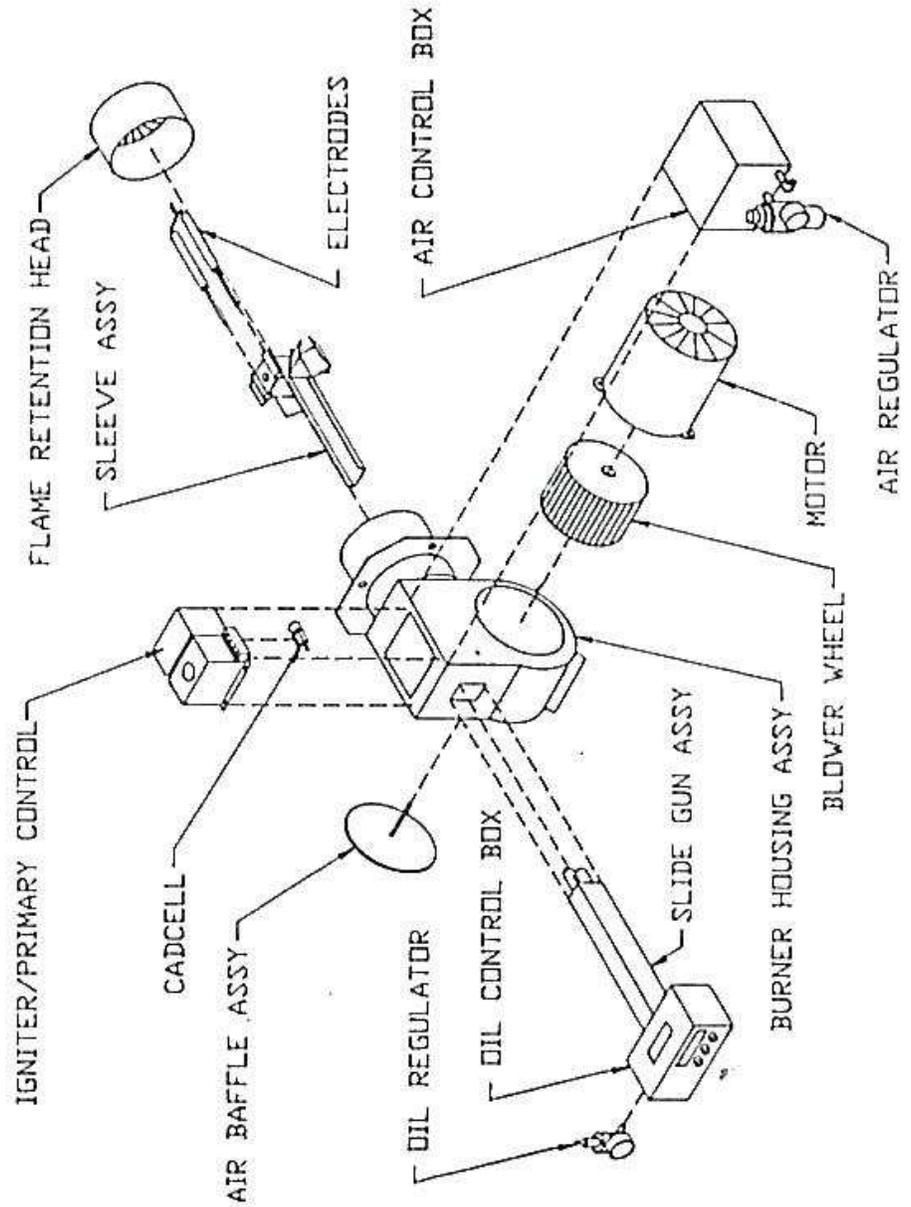
SECONDARY AIR ADJUSTMENT

TO MAKE ADJUSTMENTS
SLOWLY TURN FACE
TO ADJACENT INDICATOR MARK.
"0" IS MINIMUM AIR, "10" IS MAXIMUM.
DO NOT ADJUST UNTIL UNDERSTANDING
WHAT RESULTS WILL TAKE PLACE. READ MANUAL.

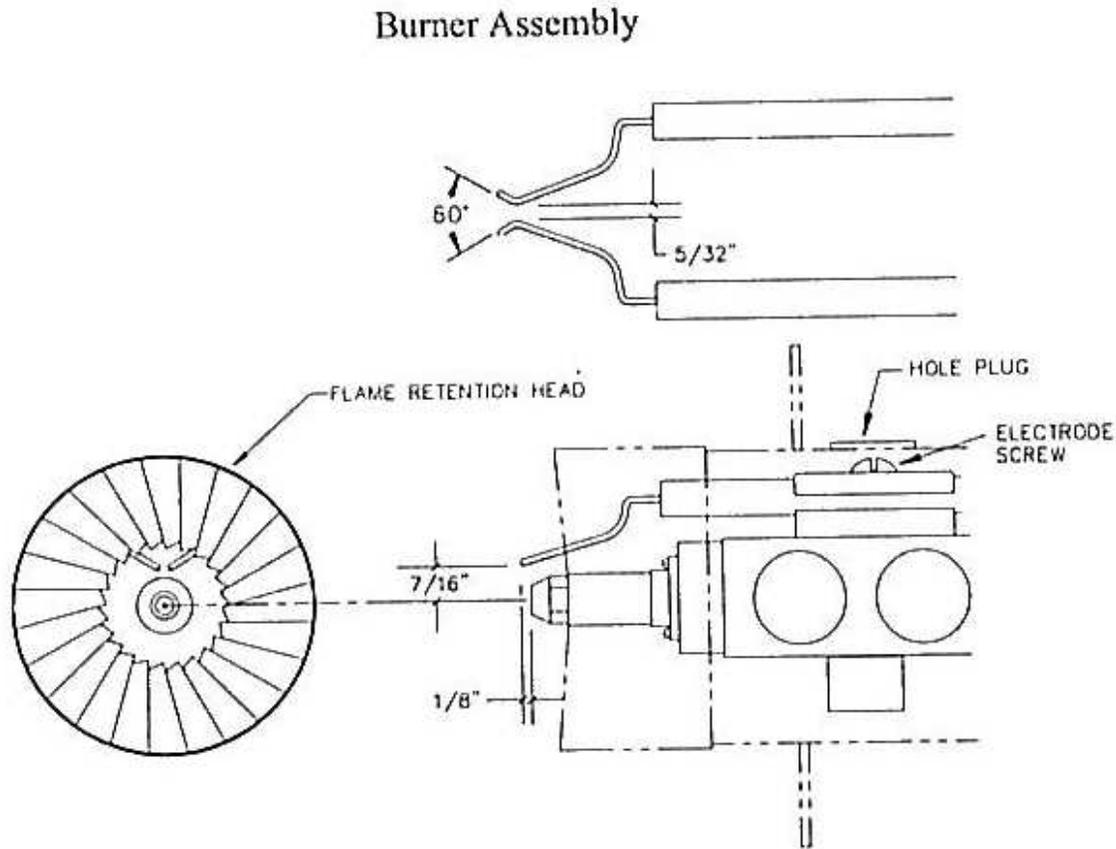
CENTER OPENING MUST ALWAYS BE PLUGGED OR COVERED.

Waste Oil - B10 Burner Components

WO-B10 BURNER COMPONENTS



Burner Assembly Setup



1. Prior to installing the burner, examine flame retention head and ignition electrode position. This illustration shows a single nozzle WO-B5 Burner. Follow this same procedure for the two nozzle WO-B10 Burner.
If needed, make adjustments to the electrodes after removing the “hole plug” on top of burner tube near mount flange.
 - A. With screwdriver, loosen (do not remove) screw holding electrode clamping plate.
 - B. Adjust electrodes as shown.
 - C. Retighten screw snugly but do not over tighten. Insulation on electrodes may crack.
 - D. Examine electrode position after tightening screw to be sure position has not changed.
 - E. Replace hole plug.
2. Install burner onto fire chamber mount port and secure with lock nuts. Be careful when installing the burner into the fire chamber. Damage to the retention head can occur if it contacts the studs or port. Install electrical flex cable and wire from burner into field junction box and secure.
3. Connect burner power cord to cord coming from junction box. Do not force! Internal moldings permit only one orientation of connection. Tighten locking ring to secure.

PLANNING INSTALLATION

Sizing Boiler Correctly

In order to make a prudent choice when determining the size of a waste oil boiler required for an installation, it is necessary to do a heat loss survey of the building.

If the unit is equipped with a domestic hot water coil, this fact will need to be considered when sizing. Drawing hot water at a rate of 3 gallons per minute requires approximately 150,000 BTUH, assuming a temperature rise of 100 degrees F (55 degrees C). Other unusual factors such as supplying heat for a pool or hot tub should be considered.

NOTE: B500 max flow is 50 GPM at 20 degrees temperature difference

B1000 max flow is 100 GPM at 20 degrees

temperature difference

Rigging and Positioning of Boiler

Do not attempt to move or off-load the boiler without the aid of a crane or dolly. Most waste oil models have a lifting lug in the center of the top while on some units two lifting lugs in the front and rear are provided.

Once on the floor level where it will be installed, the unit may be rolled on pipe or by means of a pallet jack. The waste oil boiler must be placed on a concrete slab, or other rigid pad of non-combustible material, with sufficient strength to adequately support the boiler, including its contents of water.

WASTE OIL BOILER ASSEMBLY

Cyclone Ash Separator

Once the waste oil boiler has been positioned, the cyclone ash collector should be attached to the flange on the right side of the boiler. Apply a strip of 1/8" x 1/2" self-stick sponge rubber to the boiler flange before attaching the cyclone to the boiler flange using three 5/16-18 x 3/4 IN bolts and matching washers. For the B1000 the bolts will consist of 4 – 3/8-16 x 1 IN bolts and matching washers. To apply, carefully remove the paper backing from the rubber strip to expose the adhesive. Overlap the strip approximately 1" and cut off the excess material with a knife or scissors. The adhesive will hold the gasket in place until the cyclone assembly is positioned.

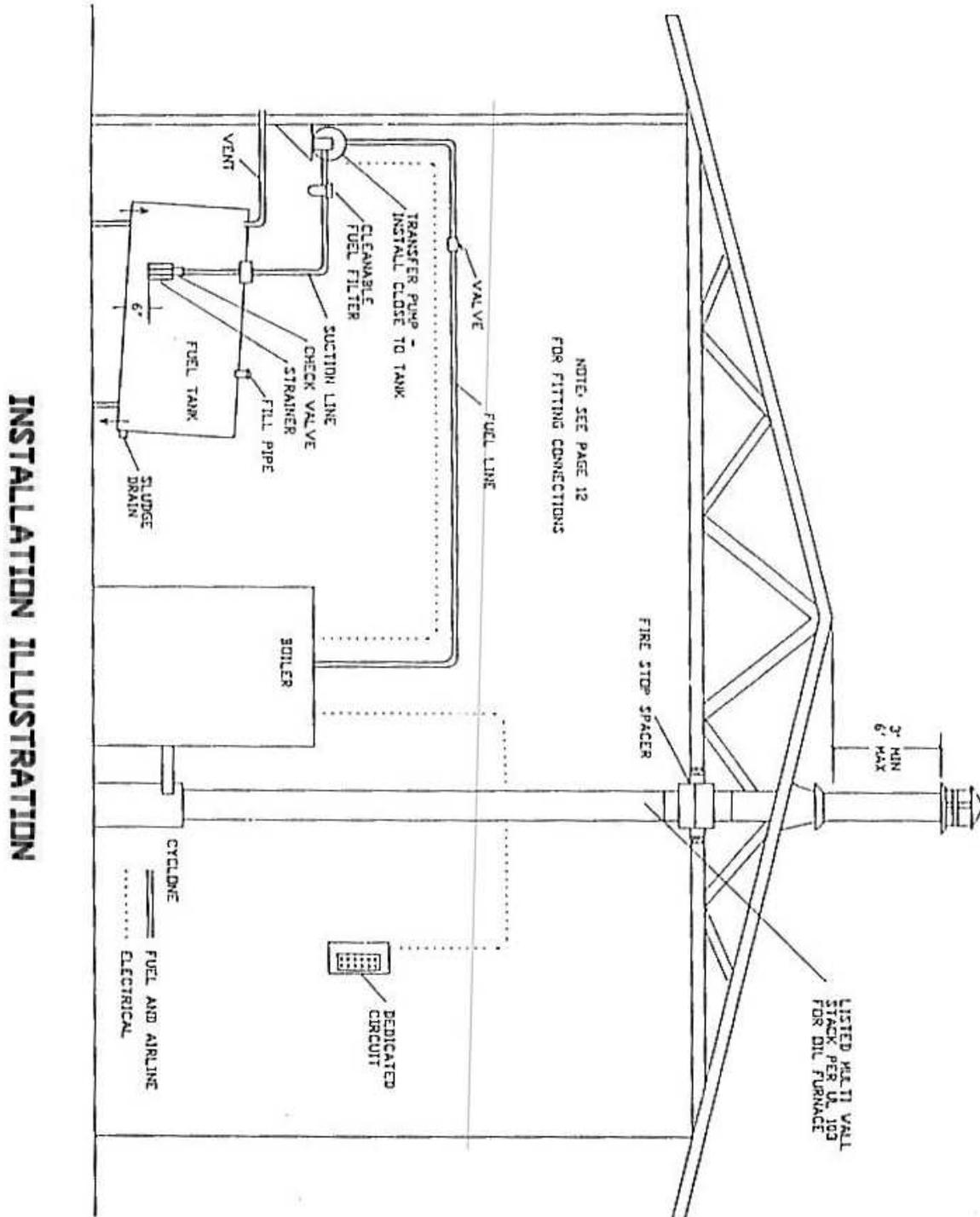
Draft Inducer Fan Assembly

The draft inducing fan assembly may be shipped in a separate box. The fiberglass rope gasket must fit neatly in the groove without overlap or wrinkles. When tightening down the fan assemble nuts, alternate studs and apply equal pressure until the gasket seals firmly against the end of the swirl chamber.

CAUTION: DO NOT TIGHTEN NUTS EXCESSIVELY AS THEY MAY DAMAGE THE GASKET OR THE CERAMIC BOARD HEAT SHIELD.

The wires leading from the fan motor must be inserted into the electrical box on the rear of the unit and connected as indicated in the wiring diagram of the particular model at hand.

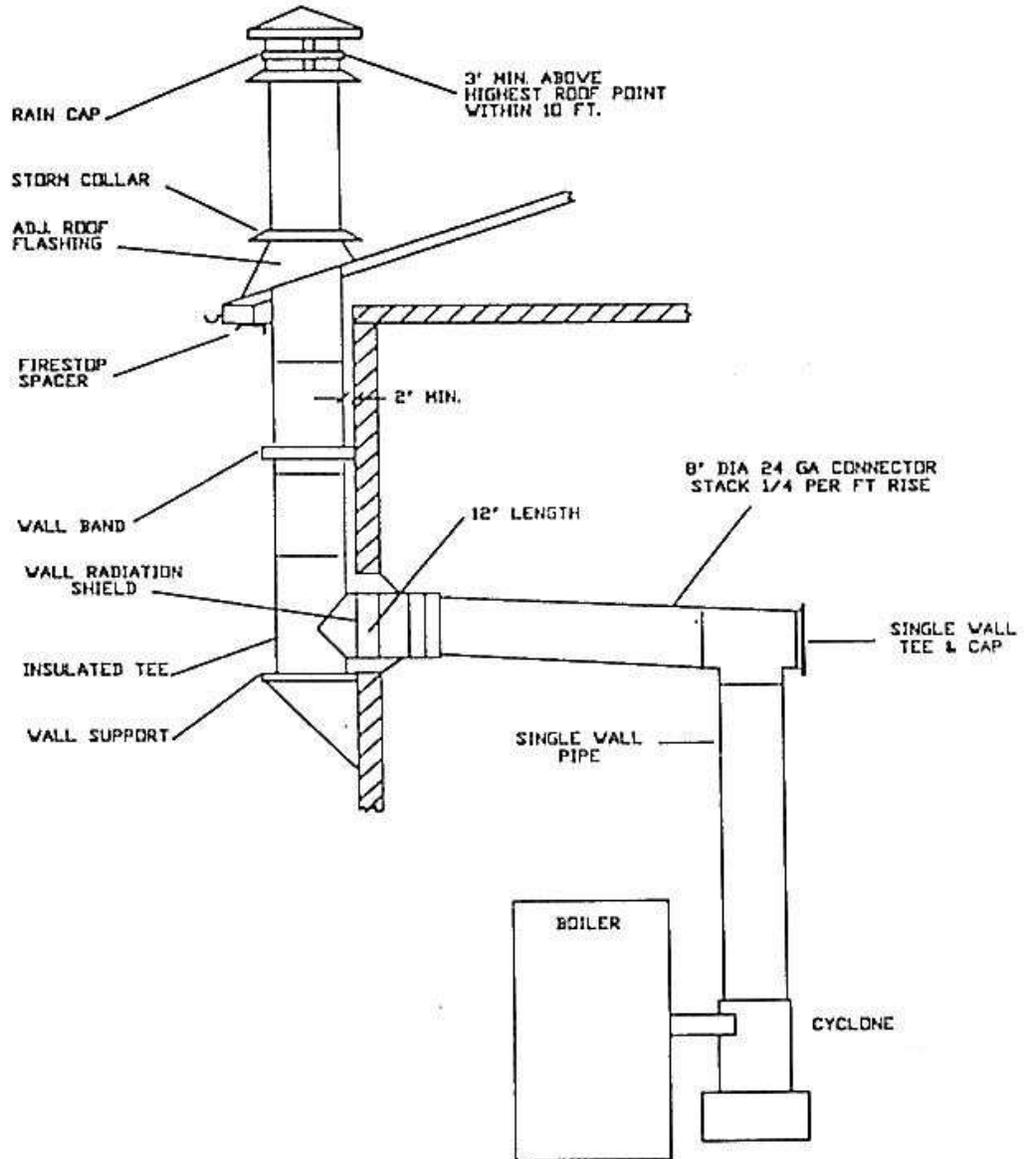
Installation Illustration



INSTALLATION ILLUSTRATION

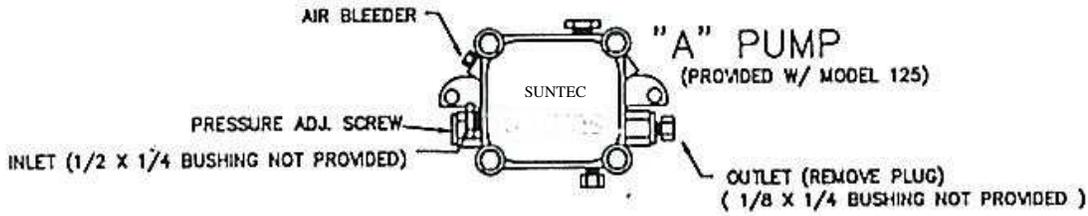
Alternate Stack Installation

ALTERNATE STACK INSTALLATION

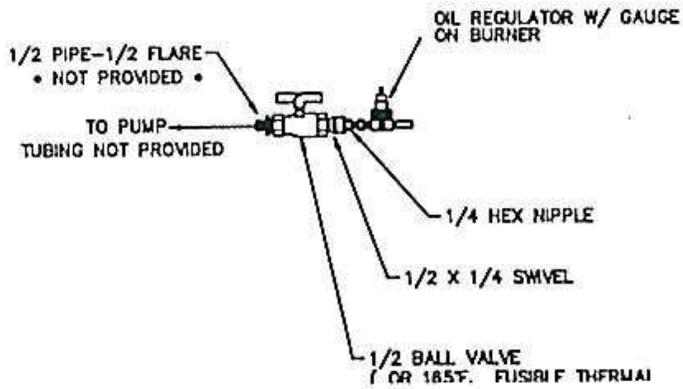
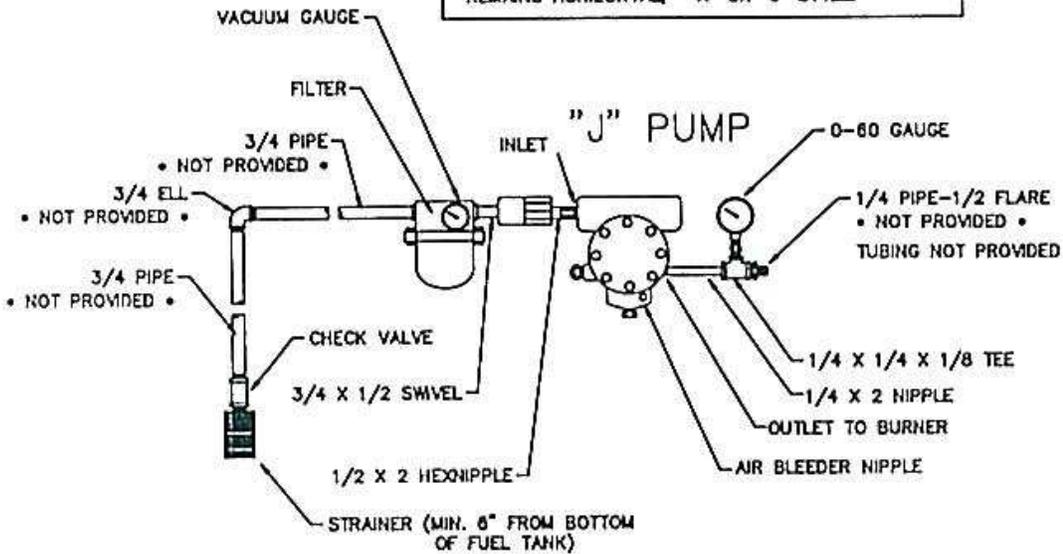


Pump Installation

PUMP INSTALLATION

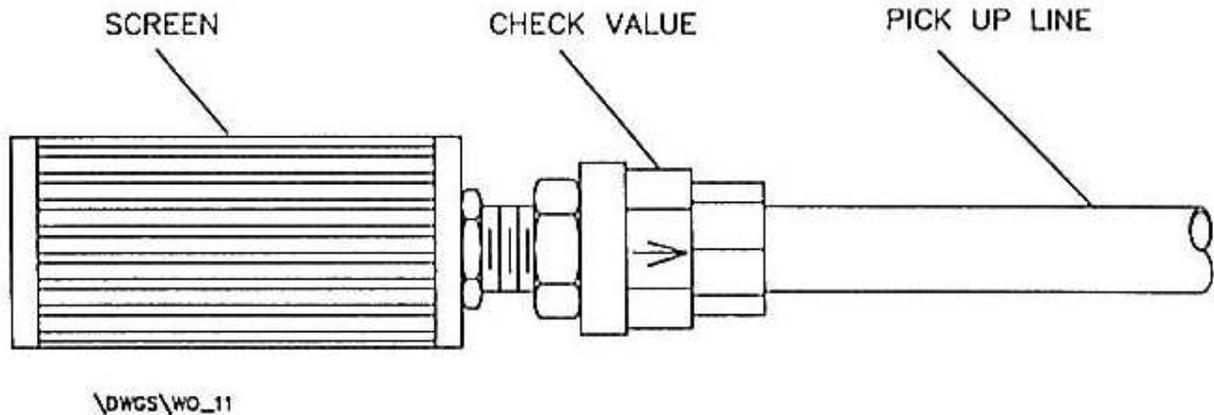


ANY PUMP POSITION ACCEPTABLE PROVIDING SHAFT REMAINS HORIZONTAL, "A" OR "J" STYLE.



FUEL LINE INSTALLATION

1. Install fuel tank to have a gravity drain so water and sludge can be drained from bottom of the tank periodically.
2. Assemble suction screen and check valve – note direction arrow on check valve.



3. Assemble oil pump pick up (suction) line and insert into storage tank. Keep bottom of screen at least 6” off bottom of tank to allow settling of sludge and water below the screen. The screen filters the oil and the check valve prevents the oil in the line from flowing back to the tank.
4. Locate oil pump close to fuel storage tank. Do **not** exceed 12 feet vertical lift.
5. A 100 mesh or micron oil filter is required on the suction side of the oil pump. A second filter of 40 micron is encouraged to further protect the burner components from fouling and thus extending the time between maintenancing.
6. From the pump run a ½ metal line to within 36” of burner then reduce to flexible 3/8” OD metal tubing prior to burner. This will allow burner removal without disconnection for service. If pump is more than 75 feet from furnace, use a 1” diameter fuel line. Install a cutoff valve near the burner.
7. Do not secure the last fitting before the burner. The fuel line must be purged. Instructions to do this are provided on upcoming electrical section.

COMPRESSED AIR SUPPLY

1. A minimum of 2 CFM air supply at 40 psi is required for the WO-B5 burners.

A minimum of 5 CFM air supply at 40 psi is required for the WO-B10 burners.

Connect compressed air line to inlet fitting on the burner. See preceding burner component diagrams for location of fitting.

BOILER ROOM REQUIREMENTS

- A. Room should be well lighted and should have a source of emergency light.
- B. Convenient water supply available for boiler flushing and to clean the boiler room floor.
- C. Unobstructed floor drains.
- D. Must have adequate air supply, which must be kept clear at all times.

Since the combustion process requires a supply of air at all times, it is essential that provisions are made to supply adequate air to the boiler room. This air supply is necessary to insure complete combustion, a clean fire, and to prevent nuisance shutdowns due to excessively dirty burner parts. Air from the outside may be provided through ducts, fixed louvers, or motorized louvers.

BOILER CONDITIONER/SEALANT

AHS provides two bottles of Boiler Conditioner/Sealant with the purchase of your boiler. When filling your boiler with water for the **first** time, mix content of each bottle with 2 gallons of warm water. Pour into boiler opening. Replace plug. An MSDS is available upon request.

WATER TREATMENT

Proper treatment of make up water and boiler water are necessary to prevent scale or other deposits and corrosion within the boiler. The absence of adequate external and internal treatments can lead to operation upsets or total boiler failure. Where a choice is available the pretreatment external to the boiler is always preferred and more reliable than treatment within the boiler.

Instructions for feed water treatment as prepared by a competent feed water chemist should be followed. Do not experiment with homemade treatment methods or compounds.

Representative samples of feed water and boiler water need to be analyzed frequently to ensure that they are in specification. The following terms and guidelines are to be used in conjunction with the advice of a water treatment specialist.

PH

- The Ph value of your boiler water is a number between zero and fourteen. Values below seven are acidic while values above seven are basic.
- The Ph factor is the most important factor influencing scale forming or the corrosive tendencies of boiler water. It should be adjusted to between a minimum of 10.5 and a maximum of 11.0 to prevent acidic corrosion of boiler tubes and plates and to provide for the precipitation of scale forming salts.
- Below a Ph of 5.0 the water is acidic enough to dissolve the steel boiler plates. Under these conditions the steel gradually becomes thinner and thinner until its destruction. At a Ph between 5 and 9.4 pitting of steel plates will occur at a rate depending on the amount of dissolved oxygen in the boiler.

DISSOLVED OXYGEN

Dissolved oxygen is caused by the solubility of atmospheric oxygen into the supply water. Aeration of city water supply is frequently used to remove other noxious gasses. Efficient aeration results in saturation of the water with oxygen.

- The majority of corrosion problems are directly related to the quantity of dissolved oxygen in the boiler water. Elimination of the corrosive effect of dissolved oxygen can be accomplished both directly or chemically.
- Direct or mechanical removal of dissolved oxygen is done through the use of deaerator. Chemical deaeration is done through the introduction of specific chemicals in the boiler to react with the oxygen.
- The dissolved oxygen content should be maintained at a minimum but at no time should it exceed 0.007 mg/l.

SULFITES

- Sodium sulfite is generally used for the chemical removal of dissolved oxygen within the boiler water. To assure the rapid and complete removal of the oxygen entering the boiler feed water system the concentration of sulfite in the boiler must be maintained at a minimum of 120 p.p.m. (parts per million).

SOLIDS

- Solids can be broken up into two categories of either suspended and dissolved. Suspended solids are those which could be removed by filtration while dissolved solids are in solution with the water.
- The best test for the determination of solids content of the boiler water is through a conductance test.
- The conductance value of boiler water varies by the various ionized salts present. The conductance can be used to measure the total dissolved solids in the boiler water and to serve as an accurate means for the control of solids through the use of blow down.
- Another test which is sometimes used as a gauge of solids is to measure the chloride present in the boiler water. The ratio of chlorides in the boiler water to that of the feed water can be used as a means to determine the amount of blow down required. The chloride test is unsuitable for feed water with low incoming concentrations and the concentrations in the feed water must be averaged over time for accuracy.
- High boiler solids will lead to foaming, priming, surging, and carry over. These items may only be overcome by proper daily blow down of the boiler.

ALKALINITY

- The alkalinity of boiler water should be sufficiently high enough to protect shell and plates against acidic corrosion, but not that high to produce carryover. A minimum value for alkalinity for adequate protection is 200 p.p.m.
- High boiler alkalinity those which are in excess of 700 p.p.m. should be avoided. Values higher than this can lead to embrittlement of the steel.

PHOSPHATES

Phosphates are used to react with calcium hardness in the boiler water. In order for this reaction to take place it is important to maintain a Ph at a minimum value of 9.50. It is desirable to keep the concentration of

phosphates in the water to 30-50 p.p.m. in order for the complete reaction of the phosphates with the calcium hardness entering the boiler through the feed water.

HARDNESS

- The hardness of water is caused by calcium and magnesium ions, which will vary greatly throughout the country depending on the source of the water.
- In boilers the hardness of the water can cause the formation of scale and sludge or mud. The hardness must be removed in the makeup water to the return system. Total hardness should not exceed 50 p.p.m.

OILS

- Every effort should be made to prevent oils from getting into the boiler water. Oil causes foaming or combines with suspended solids to form a sludge, which can cause the overheating of boiler plates. If oil does not get into the boiler, the boiler should be taken immediately out of service & thoroughly cleaned.

ADDITIONAL INFORMATION:

- Each gallon of water circulated through the system delivers a definite quantity of heat which is dependent on the water temperature drop for which the system is designed. Water temperature drop is the difference between the temperatures of the water leaving the boiler and the water returning to the boiler.
- It will be noted that the smaller water temperature drops result in less BTU/H capacity per GPM. This means an increase in the GPM requirements of the pump. It has been found that a 20 degree water temperature drop usually provides the most economical selection of pump and pipe sizes.
- It should be noted that under actual operating conditions the temperature drop usually is considerably less than that for which the system is designed and will not appreciably affect the outputs of the heat distributing units. The temperature drop provides a starting point for determining the number of BTU/H which will be delivered to the heat distributing units by the circulation of each gallon of water per minute.
- In accordance with the definition of a BTU, if one pound of water drops one degree Fahrenheit as it circulates through the forced hot water heating system, then one BTU is given off. A gallon of water, weighing approximately 8.3 lbs. At the temperatures used in a system, will give off 8.3 BTU if it drops one degree as it is circulated through the system. One gallon per minute for 60 minutes, or one hour, will, if it drops one degree, give off $8.3 \times 60 = 498$ BTU/H.
- Using 500 rather than 498 for easier figuring, the design water temperature drop multiplied by 500 is the BTU/H (BTU per hour) delivered by the system when one GPM is circulated through the system.
- The proper pump capacity is determined by dividing the calculated BTU/H heat loss of the structure by the BTU/H carrying capacity of each gallon per minute calculated. In a system designed for a 20 degree water temperature drop, one GPM equals 10,000 BTU/H.

Source: Better Heating-Cooling Council Handbook

ELECTRICAL COMPONENTS

All electrical wiring must be done in accordance with the National Electrical Code, N.F.P.A. #70 for furnaces installed in the U.S. and in accordance with C.S.A. Standard C22.1, Canadian Electrical Code, Part 1, for furnaces installed in Canada.

Run all wiring in conduit to the junction box on Boiler – use minimum of 10 gauge wire.

Install a wall mounted switch or breaker with 120V, 60HZ, 30AMP service. A fusible bimetallic switch should be located near the boiler.

The B175, B300, and B500 have a 115V, 30AMP service. The B1000 has a 115V, 30AMP service with either a 230V, 15AMP service or 3PH, 15AMP service.

Wiring Connections Within Main Control Panel

B 500 230v AC 20 Amps

Note: See wiring schematic later in this manual. If problems occur, consult the Troubleshooting section.

1. Connect GREEN ground wire from power supply to the Ground (green/yellow) Terminal Block.
2. Connect White wire (N-common) from power supply to Letter N Terminal Block
3. Connect L1 (115v) from power supply to L1 Terminal Block
4. Connect L2 (115v) from power supply to L2 Terminal Block
5. Prior to connecting oil transfer pump motor into control circuit, wire motor direct and check rotation (arrow on pump). If it is not correct, reverse rotation per instruction on motor name plate. With proper rotation confirmed, proceed to purge oil lines as follows:
 - a) Open 3/8 bleeder port at lower front of pump
 - b) Disconnect fuel line at burner
 - c) Start pump
 - d) Allow air to escape then close bleeder port
 - e) Pump at least one quart of fuel through disconnected line
 - f) Stop pump and remove direct wiring
 - g) Reconnect fuel line to burner.
6. Connect wire from number 60 Terminal Block (115v) to oil pump and connect the WHITE pump wire to Letter N Terminal Block.
7. Optional mini air compressor connections:
 - a) Mount relay box next to furnace junction box.
 - b) Run BLACK and WHITE wire from relay coil to main control box. Attach BLACK wire to Terminal Number 16 and WHITE wire to Terminal Letter N.
 - c) Run a BLACK wire from relay common contact terminal to junction box and attach it to Terminal L1, or separate power source if required.
 - d) Run BLACK, WHITE, AND GREEN wires in conduit from mini compressor to junction box.
 - e) NOTE: Allow extra length on BLACK wire so it can pass through junction box and attach N.O. contact.
 - f) Attach GREEN wire from mini compressor to ground lug.
 - g) Connect WHITE wire from mini compressor to Terminal Number N.

B 1000 230v AC 20Amps

Note: See wiring schematic later in this manual. If problems occur, consult the Troubleshooting section.

1. Connect GREEN ground wire from power supply to the Ground (green/yellow) Terminal Block.
2. Connect White wire (N-common) from power supply to Letter N Terminal Block

3. Connect L1 (115v) from power supply to L1 Terminal Block
4. Connect L2 (115v) from power supply to L2 Terminal Block
5. Prior to connecting oil transfer pump motor into control circuit, wire motor direct and check rotation (arrow on pump). If it is not correct, reverse rotation per instruction on motor name plate. With proper rotation confirmed, proceed to purge oil lines as follows:
 - a) Open 3/8 bleeder port at lower front of pump
 - b) Disconnect fuel line at burner
 - c) Start pump
 - d) Allow air to escape then close bleeder port
 - e) Pump at least one quart of fuel through disconnected line
 - f) Stop pump and remove direct wiring
 - g) Reconnect fuel line to burner.
6. Connect wire from number 60 Terminal Block (115v) to oil pump and connect the WHITE pump wire to Letter N Terminal Block.
7. Optional mini air compressor connections:
 - a) Mount relay box next to furnace junction box.
 - b) Run BLACK and WHITE wire from relay coil to main control box. Attach BLACK wire to Terminal Number 16 and WHITE wire to Terminal Letter N.
 - c) Run a BLACK wire from relay common contact terminal to junction box and attach it to Terminal L1, or separate power source if required.
 - d) Run BLACK, WHITE, AND GREEN wires in conduit from mini compressor to junction box.
 - e) NOTE: Allow extra length on BLACK wire so it can pass through junction box and attach N.O. contact.
 - f) Attach GREEN wire from mini compressor to ground lug.
 - g) Connect WHITE wire from mini compressor to Terminal Number N.

PRIMARY CONTROL FUNCTION

Safety Lockout

CAUTION: DO NOT PUSH THE RESET BUTTON IF THE BURNER FAILS AND THE BOILER IS HOT! PUSHING THE RESET BUTTON AT THIS TIME CAN FORCE UNBURNED FUEL INTO THE HOT COMBUSTION CHAMBER AND CAUSE AN EXPLOSION HAZARD.

When the primary control locks out, there is a malfunction. Determine the cause. The primary control is a safety device similar to a breaker in an electrical circuit. It will lock out when:

1. The CAD cell (electronic eye) detects no flame for over 15 seconds.
2. There is a malfunctioning oil pump, circulating fan, burner motor, or interruption in electrical supply or air supply.
3. The CAD cell is defective, lens is dirty, or flame is weak.
4. The primary control is defective.

When the ceramic liner of the combustion chamber is cool to the touch, observe oil pressure reading on the regulator; push the reset button and determine whether oil pressure is present. If the gauge shows normal oil pressure, and the burner does not fire, **DO NOT** push the reset button repeatedly, as this will flood the boiler. If the gauge shows no oil pressure, locate and correct fuel supply problem.

Special Features

Your boiler has a hinged oil burner door assembly. This door allows cleaning of the oil burner flame retention head, electrode assembly, and nozzle by swinging oil burner door open (**CAUTION: POWER TO BURNER MUST BE SHUT OFF BEFORE SERVICING THIS BURNER. DO NOT ATTEMPT TO FIRE THE BURNER WHILE DOOR IS OPEN**).

It is suggested to use quick disconnects for the air and oil lines to the oil burner. A good grade of hydraulic disconnect should be used. These can be found at a farm implement supply store.

NOTE: CAD CELL SHOULD READ BETWEEN 300 TO 1000 OHMS DURING BURNER OPERATION.

FINE TUNING THE BURNER

Due to variations in waste oils, the air and oil pressure regulator settings are approximate. Final adjustments need to be made with your specific fuel.

Observe the flame pattern through the observation port and make all adjustments while observing the flame.

1. The ideal flame will appear bright yellow/white in color with no visible smoke emitting from the chimney.
2. If the flame appears dull yellow and red in color, it is oxygen starved.
3. Secondary air is admitted through the adjustable air bands on the side of the burner. Start at setting #3.
4. Ideal operating condition is 10% to 12% CO₂ with smoke test at trace to #1.
5. Do not allow flame to touch or impinge on the opposite end of boiler.
6. Air/Fuel adjustment should be verified by a Bacharach Stack Test.
7. The fuel flow rate is controlled by nozzle size and oil pressure. If the flame mushrooms on the target plate with oil pressure less than 1 PSI, replace the nozzle with a smaller size.

The burner atomizing, primary, and secondary air adjustments allow for ideal air/fuel ratios assuring peak performance and combustion efficiency. Excess secondary air will reduce efficiency.

TROUBLESHOOTING

Burner Fails to Ignite:

- 1) Check air pressure. Starting pressure should be approximately 12 PSI for Model B175 and 16 PSI for Models B300, B500, and B1000.
- 2) Check oil pressure. Starting pressure should be approximately 3 PSI.
- 3) Determine whether fuel supply is adequate.
- 4) Check oil filters in line. NOTE: All filters in the oil line need to be checked periodically.
- 5) Check for condensation in compressed air line.
- 6) No spark at igniter.S

NOTE: Switch off power source before working on wiring. Only qualified persons should service burner controls.

- a) Check for loose connections in wiring.
 - b) Check igniters for correct spacing (See Page 8 for details).
 - c) Check for spark jumping across end of porcelain insulators.
 - d) Check for cracked porcelain insulators. Remove both and examine.
 - e) Check for carbon buildup on points of igniters.
 - f) Check ignition wire (orange) from primary control for output voltage of 100V.
- 7) If oil flow is restricted, producing an irregular flame, shut down. Remove slide gun assembly (See Page 21). Inspect nozzle and clean or replace as required.

Excessive Fluttering or Pulsating Flame

- A. Excessive draft
- B. Air leaks in oil pump suction line
- C. Dirty or plugged fuel filter
- D. Nozzle gaskets or O-Ring seals in nozzle assembly defective
- E. Water or anti-freeze in the fuel
- F. Condensation in the compressed air supply

Flame Failure

Failure of air preheater in nozzle gun assembly.

- A. Failure of heat sensor for preheater.
- B. Improper primary or secondary air adjustments.
- C. Fuel pump not operating.
- D. Water or anti-freeze in oil.
- E. Dirty or plugged fuel filter.
- F. Igniters improperly adjusted.
- G. Obstruction in nozzle – clean or replace (See Page 21).

Primary Control Locks Out on Safety

- A. Flame failure or weak flame.
- B. Flame oxygen starved due to low draft or down draft.
- C. Igniter failure (Review Page 8)
- D. CAD Cell is defective or in need of cleaning.
- E. CAD Cell out of position or view of flame is blocked.
- F. Primary control defective

Smoke On Ignition

- Air pressure set too low (set at approximately 12 to 14 PSI for Model B175 or set at 16 to 18 PSI for Models B300, B500, and B1000).
- Carbon buildup on igniter points
- Igniter points improperly positioned.

CHECKLIST FOR ELECTRICAL PANEL PROBLEMS

Fan Will Not Run

1. Main fuse must be closed.
2. Control circuit fuse Terminal 20 (in boiler electrical box) must be closed, 115V.
3. Turn main power switch on; power at Terminal Number 2.
4. Control circuit switch on, Terminal No. 2, 115V.
5. Boiler must be filled with water, Terminal No. 3, 115V.
6. Boiler must be calling for heat, Terminal Nos. 4 and 5, 115V.
7. For 115V system, the fan relay will be energized (3CR). This closes contacts 3CR and Terminal No. 19 will be 115V.
8. For 230V, single phase system, the fan contactor will be energized. This closes the fan contactor providing 230V across Terminals 25 and 26.
9. For 230/460, 3 phase operation, consult special instructions.

Lack of Power to Burner

1. Fan must be running.
2. Pressure switch must close Terminal No. 6, 115V and after delay, Terminal No. 7, 115V.
3. Burner fuse closed.
4. Terminal No. 12, 13, and 14, 115V.

Burner Shutdown After Initial Firing

1. Turn pre-heat switch on.
2. Terminal No. 15, 115V, pre-heat indicator light
3. If burner fails to light, refer to burner troubleshooting checklist.

Oil Pump Will Not Run

1. Terminal No. 16 must be 115V.
2. Oil pump fuse must be closed.
3. Terminal No. 10 and 11 must be 115V.

MAINTENANCE AND INSPECTION SCHEDULE

A properly cleaned and maintained furnace operates efficiently and prevents possible soot fires.

CAUTION:

Waste oil contains heavy metal compounds and foreign materials. When burned, the compounds are deposited within the furnace. When cleaning the unit, including connector pipe and chimney, protective

clothing, including gloves, face mask and respirator must be worn. All waste materials removed when cleaning the system should be stored in a closed non-combustible container until properly disposed.

Do not store cleaning solvents and materials near the furnace.

Check nozzle, retention head, and igniters frequently for buildup of residue until experience indicates maximum allowable interval before removing for service. A flame inspection mirror is useful for a routine check of the nozzle, ignition, and retention head while the unit is operating. However, the slide gun assembly, sleeve assembly or complete burner must be removed for periodic ignitor position check, cleaning, and other servicing that may be needed.

SERVICING THE BURNER

The nozzle and electrodes can be serviced without removing burner from boiler. The burner is mounted on a hinged burner mount which allows access to burner nozzle when opened.

To remove the slide gun assembly:

Switch off power to furnace

1. Disconnect air and oil lines
2. Remove mount screw on left side of burner
3. Pull assembly which disconnects electrical plug and withdraw from burner housing
4. Inspect nozzle. If it appears dirty, remove and clean with solvents and soft cloth
5. If wear is evident, install a new nozzle
6. Inspect O-Rings: replace if worn, torn, or deformed

To remove the electrode sleeve assembly with nozzle gun assembly removed:

1. Remove ignition transformer (2 screws in hinge)
2. Remove (2) sleeve retainer screws on burner tube
3. Withdraw sleeve assembly from burner
4. Inspect the electrode tip and insulators. If cracked or discolored, replace
5. Clean any carbon deposits from tips

To adjust electrodes to nozzle:

1. Insert slide gun assembly into sleeve
2. Adjust Electrodes. Reassemble to burner.

To remove burner for complete servicing:

1. Switch power off.
2. Disconnect air and oil lines
3. Disconnect electrical connections and conduit from junction box
4. Remove (3) attach nuts
5. Lift burner slightly and withdraw
6. Remove slide gun assembly and electrode sleeve assembly per previously listed procedures – inspect, clean, and replace parts as needed
7. Remove flame retention head and clean head and burner housing
8. Reassemble burner and set aside until heat exchanger is cleaned

BOILER MAINTENANCE

- Disconnect all incoming electrical power prior to servicing this boiler.
- Use Extreme caution around boiler piping and the McDonnell & Miller low water cut off since they may be hot (if provided).
- Accumulation of ash produces numerous adverse effects. Reduced heat transfer (U.S. Bureau of Mines) Research by the U.S. Bureau of Mines has determined that 1/32-inch of soot coating causes 9.5% loss of boiler efficiency. The following table shows how soot thickness effects efficiency

1/32 – inch of soot	9.5% loss of efficiency
1/16 – inch of soot	26% loss of efficiency
1/8- inch of soot	45% loss of efficiency
3/16 – inch of soot	69% loss of efficiency

- The life of your boiler can only be measured by the care given to it by those who are charged with the responsibility of boiler maintenance. A log of the following items should be maintained in the boiler room at all times. A sample recording sheet is the rear of the section.

Daily boiler check/maintenance list

1. Observe operating pressures are normal.
2. Observe operating temperatures are normal
3. Listen for any unusual noises and correct as necessary.

Weekly boiler check/maintenance list

1. Observe condition of flame.
2. Check fuel valves-open limit switch and make aural and visual check.
3. Check fuel supply.
4. Observe operation of circulating pump(s).
5. Check all filters and water traps in the oil and air supply lines
6. Clean and/or replace filters as experience dictates.

Do not alter or increase the firing rate above the maximum indicated on the listing plate. This may cause burner to over fire.

Monthly boiler check/maintenance list

1. Safety relief valve – try lever test.
2. Test flame detection devices.
3. Oil boilers-fuel temperature and pressure interlocks.
4. Test limit controls
5. Test operating controls
6. Check boiler room floor drains for proper operation
7. Inspect fuel systems in boiler room.
8. Check condition of heating surfaces.
9. Perform draft and combustion test.
10. Test low water cut-off.
11. Check coil plate and spud gaskets.
12. Remove cyclone ash pan and empty ash in proper container. Replace ash pan and close door.
13. Remove fan assembly and clean tubes. Use tube brush to run through tubes.

14. Open inspection door and vacuum ash from combustion chamber.

Two or Three Times During Heating Season

1. Remove connector pipe, clean out cover located in tee
2. Tap sides of pipe to remove ash deposits
3. Inspect ceramic board on inspection door for wear – replace if badly worn.
4. Follow initial startup procedures

End of Heating Season

1. Turn off power to boiler
2. Clean boiler and burner thoroughly
3. Replace any worn out, damaged parts, nozzle, and filters.
4. Flush oil pump with #2 fuel oil or kerosene
5. Close fuel oil valve nearest supply tank during non-heating season
6. Close fuel oil valve nearest supply tank during non-heating season
7. Drain water and sludge from fuel tank
8. Clean connector pipe and chimney thoroughly
9. Reinstall burner
10. Startup procedures for new heating season are the same as initial startup
11. Routine burner maintenance.
12. Routine maintenance of circulating pump(s).
13. Relief Valve Pop test.
14. Combustion and draft tests.
15. Inspect expansion tank.
16. Inspect boiler room louvers or fresh air intake.

Door Hinge Adjustment

For proper operation of the waste oil boiler, it is important that the inspection door have an air-tight seal. All have a simple adjustment mechanism on the hinge plate and latch which permits the door to be moved tighter as the gasket compresses during service. To adjust the hinge, open the door, loosen the bolts which hold the hinge plate, and bump the door toward the door frame and re-tighten. Be careful not to make it so tight as to prevent the latch side from closing properly.

To adjust the latch side of the doors with handles, remove the two bolts that secure the latch keeper in place and remove one of the spacer shims. Two shims are inserted at assembly; one of which is 1/8" thick and the other 1/16" thick. Remove the thin one first and, if more adjustment is required later, it can be used to replace the thicker one to gain more adjustment.

Periodically, lubricate the door handle wear pad, door hinges, and door handle with the Tri-Flow lubricant, WD-40, or similar household lubricant.

Door Seal Replacement

If the gasket becomes damaged or deteriorates to the extent that a good seal cannot be obtained through the adjustment procedure, it should be replaced. Remove the old gasket rope and clean the groove well before inserting new rope. Use 5/8" or 7/8" diameter, high density fiberglass rope.

Cleaning the Flue Passages

Under normal operating conditions the flue passages will need to be cleaned. If excessive soot has built up on the flue passages they can be cleaned following this procedure.

1. Open the front cleanout door. Care must be taken when removing these doors not to damage the insulating ceramic board. Be sure electric power is off to prevent accidental burner firing.
2. Open the fan assembly and gasket on rear of boiler.
3. Using a flue brush, brush the accumulated soot and scale starting in the rear of the boiler brushing the top, proceed to brush down the heat exchanger.
4. Brush the side wall of the firebox through the burner opening.
5. Carefully vacuum the soot and scale which is now laying in the chamber of the boiler.

Maintenance – Testing – Inspection Log

Maintenance, Testing and Inspection Log		Building:	Month:	Year:																												
Hot Water Heating Boilers		Address:	Fuel Type:	Boiler No.:																												
Person(s) to be notified in Emergency (Name & Telephone No.):																																
DAILY CHECKS																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
(1) Record Pressure																																
(2) Record Boiler Water Temperature																																
(3) Record Flue Gas Temperature																																
WEEKLY CHECKS (Enter Date)																																
	WEEK 1				WEEK 2				WEEK 3				WEEK 4																			
(1) Observe Flame Condition																																
(2) Observe Circulating Pumps																																
MONTHLY CHECKS (Enter Date)																																
(1) Manual Ltr Relief Valve																																
(2) Review Condition of or Test each item	(A) Flame Detection Devices																															
	(B) Limit Controls																															
	(C) Operating Controls																															
	(D) Floor Drains																															
	(E) Fuel Piping																															
(3) Observe Gages Glass on Expansion Tank																																
(4) Combustion Air Adequate / Unobstructed																																
General Comments:																																

R 59001

FAN ASSEMBLY MAINTENANCE

CAUTION: Be sure to disconnect power to the unit before servicing or removing the fan.

The fan-motor assembly may be removed by loosening the nuts from the studs which hold it in place.

If the gasket is damaged, all of the old material must be removed and a new gasket inserted. Use only 5/8" diameter, high density fiberglass rope.

On units which have a shaft drive fan, the bearings and belt should be checked every three months. The fan belt may be tightened by means of adjustment screw on motor mount. To check for proper alignment of the pulleys, lay a straight edge across both pulleys and adjust until it touches at all points.

After replacing the fan-motor assembly on shaft drive models, turn the fan over by hand to ensure that it does not bind. If a tight spot is evident, loosen the locking collars on the shaft and move it in until it touches and mark the shaft. Then pull the shaft out until the fan touches and mark the shaft. Position the shaft midway between the two marks and re-tighten the collars. Be certain to replace the belt guard if it was removed for servicing.

NOTE: Pillow block fan shaft bearings are permanently sealed and do not require lubrication. Premature bearing failure can be caused by forcing an excessive amount of grease which ruptures the seal allowing all the lubricant to run out as soon as the bearing becomes warm.

USED OIL SEQUENCE OF EVENTS

- a) Connect the proper voltage to the control panel, as well as air and oil supply lines to the used oil burner.
- b) With all the panel switches open, close the main power switch. This will close the main contractor allowing the main power indicator to light. Power will also be at the main fuse block.
- c) Turn pre-heat switch on. The pre-heat indicator on the main panel and the red indicator on the burner will light. The electric element in the slide gun will be activated. Once the thermostat in the slide gun is satisfied, the red light on the burner will turn off. The burner is now ready for the starting sequence.
- d) Set the high limit pressuretrol (normally the dual aquastat) at 10 PSI and the operation pressuretrol at 6 PSI. The boiler must be filled with water. A lack of boiler water will cause the control circuit to be open due to the low water cutoff (Line 4).
- e) Close the control circuit switch. When the boiler pressure is below the pressuretrol set point, the pressuretrols close and the control circuit goes to a call for heat (Line 4).
- f) On a call for heat, (3CR relay for B175, B300, B500 and ID fan contractor for B1000) will activate causing the ID fan motor to run (Line 18).
- g) As the fan runs, a pressure differential develops between the intake and the discharge, closing the pressure switch contacts (Line 5).
- h) On the pressure switch closing, the adjustable solid state timer times out a pre-set period (usually 5-10 seconds) and then energizes relays 2CR and 4CR and the operation indicator on the main panel (Line 5, 6, and 7). As contacts 2CR and 4CR close, the primary control of the burner is energized (Line 12).
- i) The terminals T-T on the primary control must be connected in order to close internal contacts. The primary opens the air solenoid (Line 33) and closes the OPT relay (Line 35), oil pump relay 1CR (Line 15), and air proving relay 5CR (Line 16).

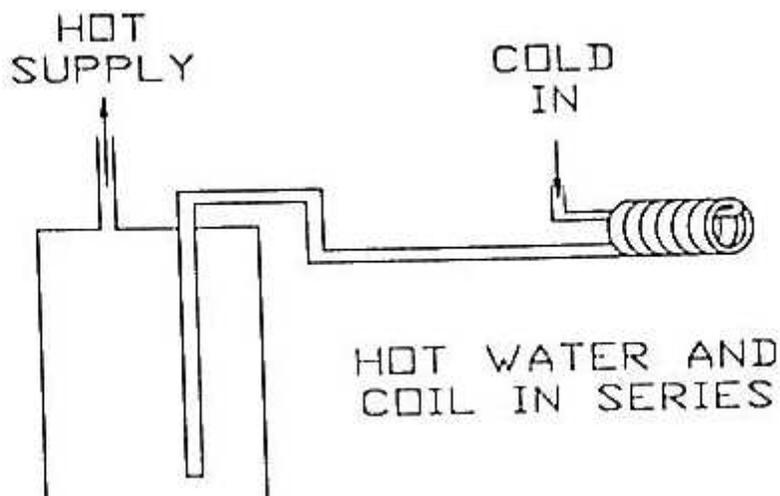
- j) As the air solenoid opens, compressed air enters the air tank and the air proving switch. When air pressure of 20 PSI is provided, the air proving switch closes and provides power to the transformer, burner motor, oil solenoid, block thermostat, and green indicator lights (Line 23 to 29).
- k) Adjust the air pressure between 12 and 18 PSI and oil pressure between 3 and 6 PSI.
- l) The pre-heated oil and air are mixed at the nozzle and the fuel is atomized as the electrodes arc for ignition.
- m) Ignition must occur within 15 seconds or the primary control will lock out and require a manual reset. The reset button is on the primary control of the burner.
- n) It may be necessary to reset the control several times to get the oil pumped to the heater block on initial firing. **NOTE: If a prime switch is provided with your burner it can be activated to prime the pump.**
- o) When ignition occurs and combustion is sustained, the boiler water temperature will rise and pressure will develop.
- p) When the boiler pressure reaches the operation pressuretrol's set point, the oil burner will shut down. The burner will restart after a pressure drop of 4 PSI in the boiler vessel. This would be a call for heat and the burner firing sequence would start over.

INSTALLATION OPTIONS

Domestic Hot Water Coil

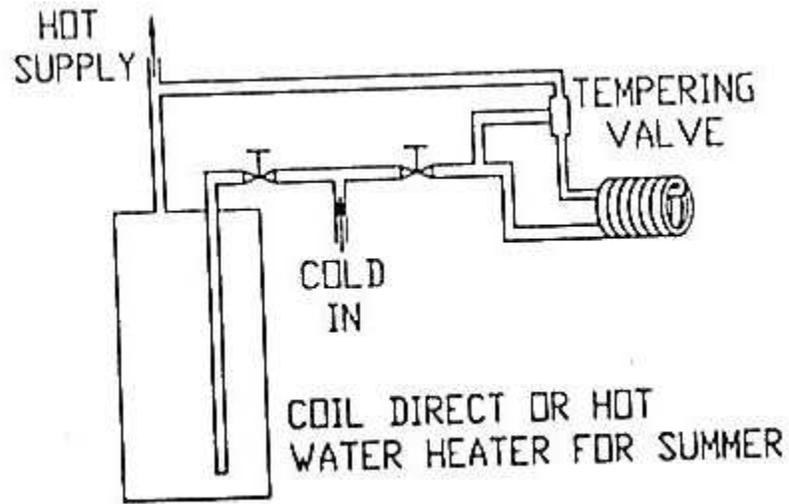
These coils can be factory or field installed. Coils are rated at 5 GPM. The coils can be used for domestic hot water and wash bays. You can also use these coils to pre-heat water in hot water heaters.

There are three methods for plumbing the domestic coil. One way is to connect the coil in series with an existing hot water heater.



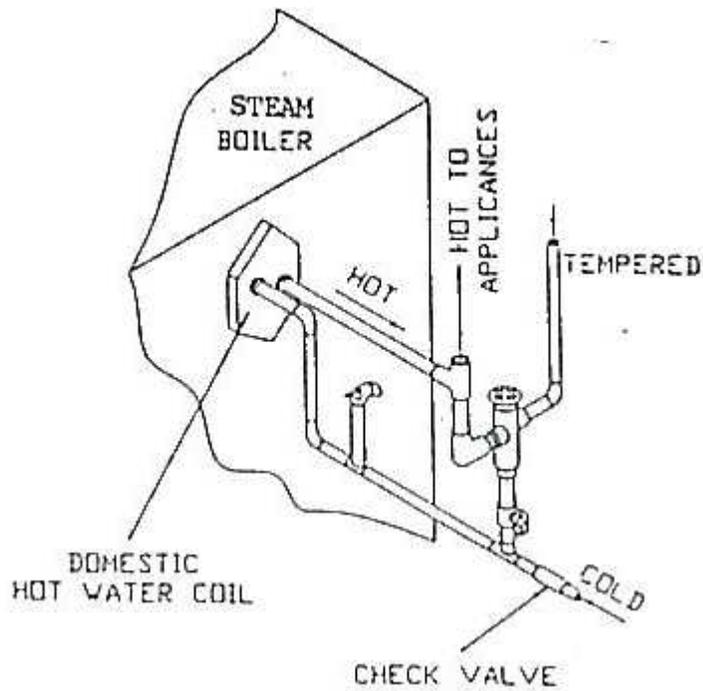
PLUMBING – COIL IN SERIES

A second method is to connect the coil in parallel with an existing water heater so that the conventional water heater may be used when the waste oil boiler is not being fired, in the summer, for example. The diagram below indicates how this can be done.

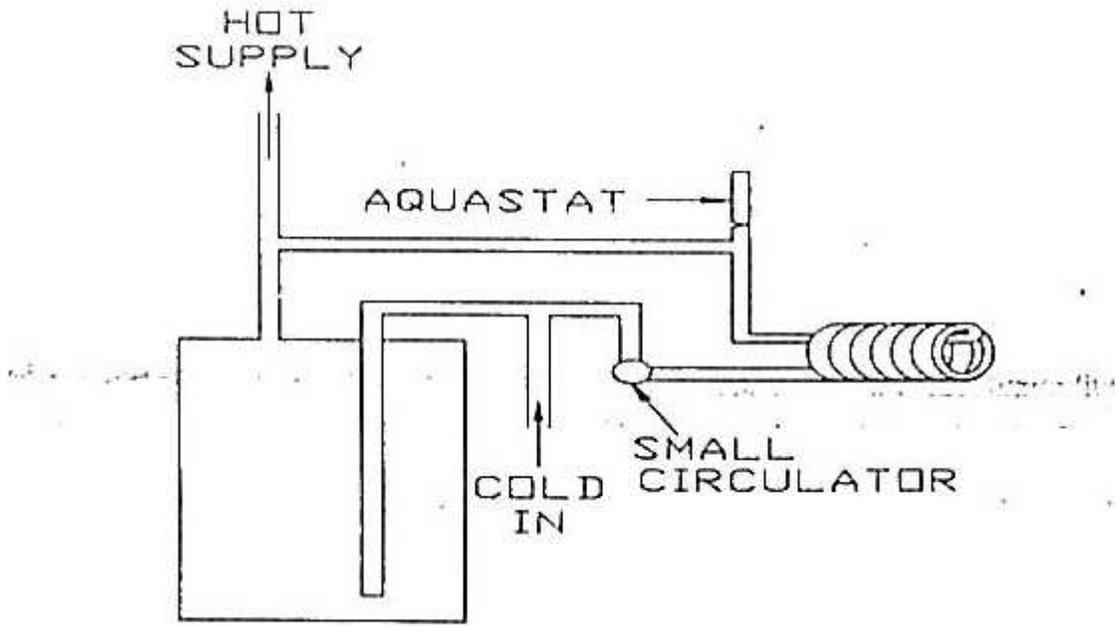


PLUMBING – COIL IN PARALLEL

NOTE: Installation where the coil discharges directly into the hot water distribution system, a tempering valve must be included to limit the temperature of the water at the faucet to a safe level.

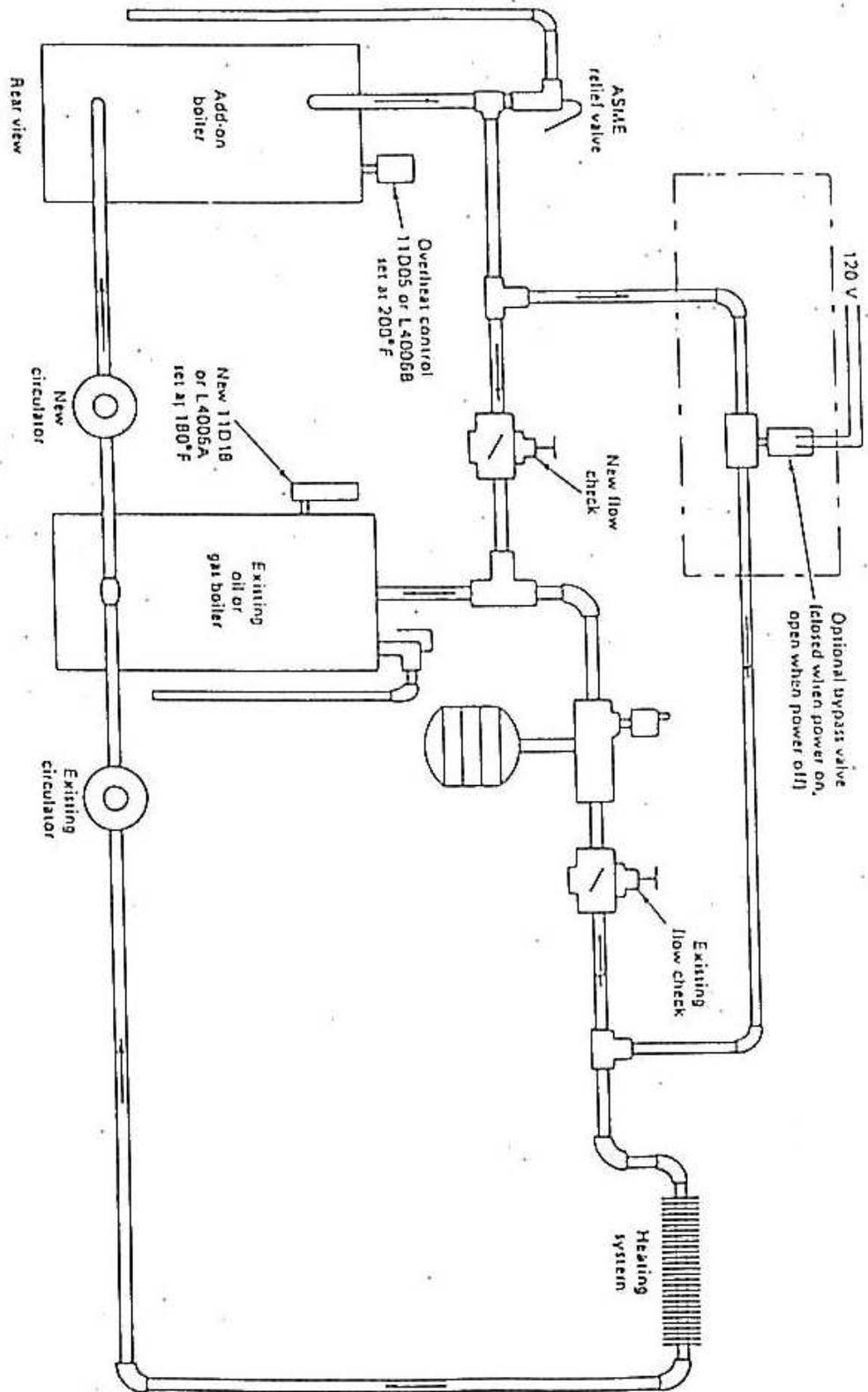


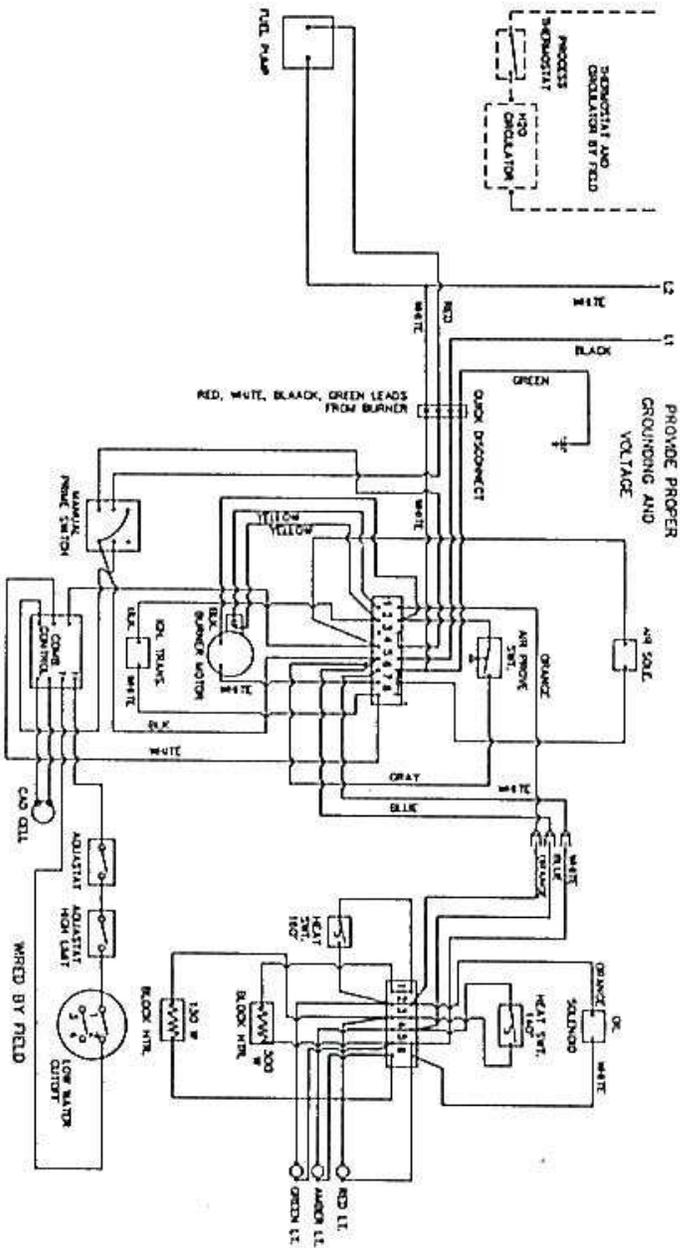
The third method uses a small pump to circulate water continuously between the coil and existing hot water heater. It is also necessary to include a tempering valve on the supply side of the storage tank/water heater.



COIL PARALLEL WITH EXISTING HOT WATER HEATER

FUNCTIONS INDEPENDENTLY OR WITH EXISTING SYSTEM





LTR	REVISION	DATE	BY
B	ADDED 00 CORO	6/97	KC
A	REDESIGNED	5/95	KC

UNLESS OTHERWISE SPECIFIED
TOLERANCES ARE

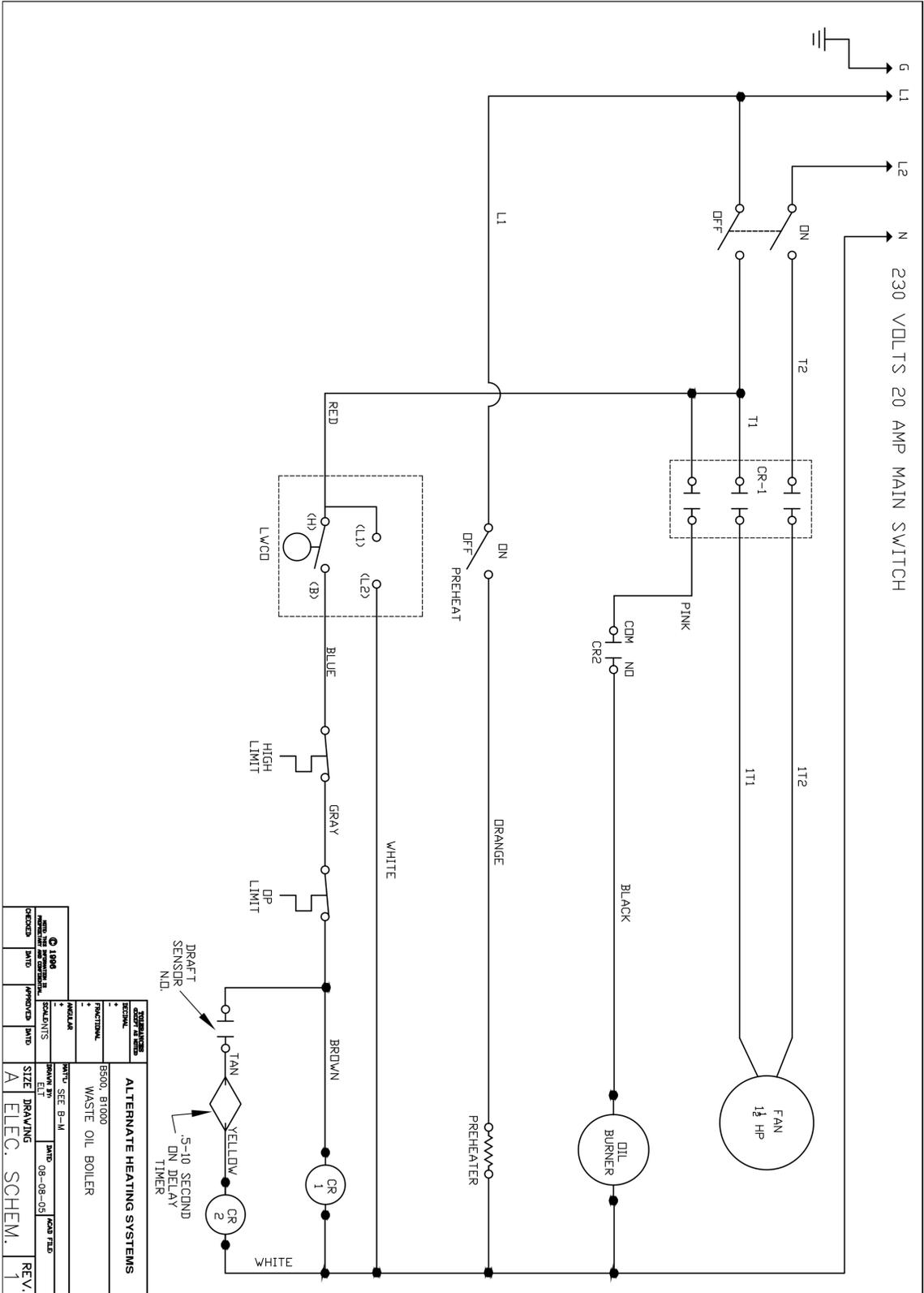
FRACTIONS	DECIMALS	ANGLES
$\pm \frac{1}{32}$	$\pm .005$	$\pm 1'$

NOTE: THIS DRAWING (OR PRINT) IS THE PROPERTY OF THE SHENANDOAH MFG. CO., HARRISONBURG, VA., AND SHALL NOT BE REPRODUCED IN ANY MANNER, NOR USED FOR ANY PURPOSE WHATSOEVER EXCEPT BY WRITTEN PERMISSION OF SHENANDOAH MFG. CO.

ITEM	QUAN	DRAWING NO	DESCRIPTION
Shenandoah Manufacturing Company HARRISONBURG, VIRGINIA TYPICAL BOILER WIRING W/WO-B BURNER			
DATE	JUNE 10, 1994	CHECKED BY	SCALE
DRAWN BY	JASON BARKER	APPROVED BY	NONE
BILL OF MATERIAL NO.	A-	DRAWING NO.	51001132
ORDER NO.		SHEET	1 OF 2
		REV	B

Wiring Schematic – B500-B1000 230 V

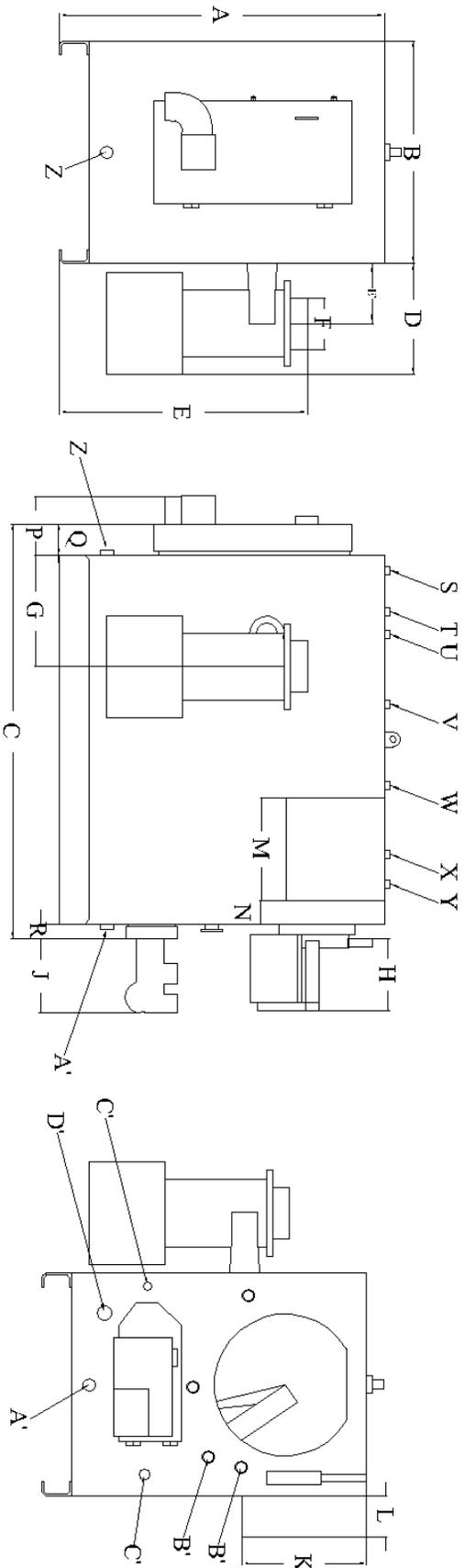
B-500 THRU B-1000 WASTE OIL BOILER ELECTRICAL SCHEMATIC



REVISIONS		APPROVED		DATE	
1	ISSUED	10/10/08	10/10/08	10/10/08	10/10/08
2	REVISED	09/08/08	09/08/08	09/08/08	09/08/08

PROJECT INFORMATION		DRAWING INFORMATION	
PROJECT NO.	B500-B1000	DRAWING NO.	1000 T10
PROJECT NAME	WASTE OIL BOILER	DATE	09-08-08
SCALE	AS SHOWN	REV.	1
DESIGNED BY	SEE B-10	ELEC. SCHEM.	

B SERIES WASTE OIL SPECIFICATION DIAGRAM



For B1000 Waste Oil Boiler Only

- S - Pressure Temp Gauge
- T - Hot Water Supply
- U - Aqua Stat
- V - Aqua Stat
- W - Low Water
- X - Auxiliary
- Y - Relief Valve
- Z - Boiler Drain
- A' - Boiler Drain
- B' - Domestic Coil Fitting
- C' - Cold Water Return

UNIT	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	A'	B'	C'	D'	E'	
B150	38	26	43	14	29	6	9	10	14	16	7	12	5	4	3	3	1/2	1 1/2	1 1/2	3/4	-	3/4	3/4	3/4	-	3/4	4	1 1/2	1 1/2	14
B300	46	32	60	18	32	6	13	17	14	16	7	12	5	5	3	3	1/2	1/2	2	3/4	3/4	3/4	1	1 1/2	1 1/2	4	-	2		
B500	54	34	72	24	43	8	15	17	14	16	7	12	5	6	5	3	1/2	2	3/4	1/2	1/2	1 1/4	1 1/2	1 1/2	2	4	-	2		
B1000	71	42	96	28	47 3/4	8	20	21	14	20	7	16	3	7	5	5	1/2	2 1/2	1/2	3/4	3/4	1 1/2	1 1/2	1 1/2	4	2 1/2	-			

All dimensions in inches unless otherwise specified.

Alternate Heating Systems, Inc.
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 Specifications subject to change without notice.

B Series Waste Oil Specification Diagram

LIMITED WARRANTY

USED OIL BURNERS: B175: B300: B500: : B1000

The manufacturer, ALTERNATE HEATING SYSTEMS, INC., warrants to the original owner, for the periods specified below, that the boiler to which this warranty applies is free from defects in materials and workmanship when installed, operated and maintained in accordance with the printed instructions supplied with the unit.

A. WHAT IS COVERED AND FOR HOW LONG

(All from date of original installation)

- (1) Boiler Vessel, Ten (10) years pro-rated (pro-rated as follows: 5th year – full: 6th year – 40%: 7th year - 30%: 8th year – 20%: 9th year – 10%: 10th year – 10%).

This does not cover any corrosion

or deterioration in boiler vessel due to improper PH levels in water or oxidated water (heating systems that have plastic piping).

- (2) Doors (excluding gasketing, knobs, and ceramic insulation board), draft regulation mechanisms, insulation jacket, draft fan assemble (excluding ceramic heat shield), stack/cyclone assembly, firebox refractory side pieces and center pieces – One (1) year.
- (3) All electrical and plumbing components and controls such as temperature/pressure gauge, safety relief valve, aquastat controllers, electric motor, domestic hot water coil, oil burner, fan shaft bearings, timer, draft motor, etc. purchased by ALTERNATE HEATING SYSTEMS, INC. from other manufacturers, Limited to warranties offered by those manufacturers, usually One (1) year.
- (4) V-belt, pulleys, ceramic board door and fan hear shields, ceramic blanket firebox lining, fasteners, sight glass, smoke flap, door gasket and silicone rubber seal, door handle knobs, paint, wiring and wiring devices-Thirty (30) days.

B. WHAT WE WILL DO AND NOT DO

- (1) Alternate Heating Sys. will repair and replace, at our option, units or component parts found defective after inspection by ALTERNATE HEATING SYSTEMS, INC. or our authorized representative during the periods outlined above.
- (2) ALTERNATE HEATING SYSTEMS, INC. SHALL NOT BE LIABLE UNDER THIS WARRANTY IF:
- (a) the unit or any of its component parts have been subject to misuse, alteration, unauthorized repair, neglect, accident or damage from handling.
- (b) the unit is not installed, operated and maintained in accordance with the printed instructions supplied with the unit and in accordance with local plumbing and/or building coeds.
- (c) the unit is operated above its rated output which is shown on the nameplate attached to the unit and listed in Alternate Heating System's printed literature.
- (d) the unit is fired with fuels other than those recommended by ALTERNATE HEATING SYSTEMS, INC.. this includes fuels recommended by dealers and distributors selling ALTERNATE HEATING SYSTEMS, INC. products if these are not fuels recommended by ALTERNATE HEATING SYSTEMS, INC..

C. WHAT THE CUSTOMER MUST DO

- (1) Contact the dealer who sold you the unit.
- (2) If said dealer cannot be located, contact any other ALTERNATE HEATING SYSTEMS, INC. dealers in your area.
- (3) If you are unable to locate a dealer, submit your warranty claim directly to ALTERNATE HEATING SYSTEMS, INC. at the address listed below.
- (4) When you make an inquiry or warranty request, be sure to include the following information:
- (a) Unit model number
- (b) Serial number
- (c) Date of installation
- (d) Dealer's name
- (e) Type of fuel burned
- (5) The OWNER and not ALTERNATE HEATING SYSTEMS, INC. or its dealers will be liable for the following costs involved in repair or replacement of the defective unit or component part
- (a) All necessary costs in returning the defective unit or component part to the factory or other location designated by ALTERNATE HEATING SYSTEMS, INC..
- (b) All freight and delivery costs of shipping a new or required unit or replacement component part to the owner.
- (c) All labor and other costs incurred in the removal of the defective unit or part and installation of a new or required unit or part.
- (d) Any material required to complete installation of new or required unit or replacement part.

D. LIMITATIONS AND STATE LAW RIGHTS

- (1) ALTERNATE HEATING SYSTEMS, INC. neither assumes nor authorizes any representative or other person to assume for it any other obligation or liability in connection with its products other than expressly written here.
- (2) Implied warranties of merchantability and fitness for a particular purpose are limited to the duration of this LIMITED WARRANTY.
- (3) ALTERNATE HEATING SYSTEMS, INC. shall not be liable for any incidental or consequential damages such as water, smoke or heat damage to property arising directly or indirectly from any defect in its products or their use.
- (4) Some state do not allow limitation on how long an implied warranty lasts and the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.
- (5) This warranty gives you specific legal rights, and may also have other rights, which vary, from state to state.
- (6) The remedies set forth herein shall be the exclusive remedies available to the owner.

ALTERNATE HEATING SYSTEMS
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IMPORTANT - READ AND KEEP IN YOUR POSSESSION