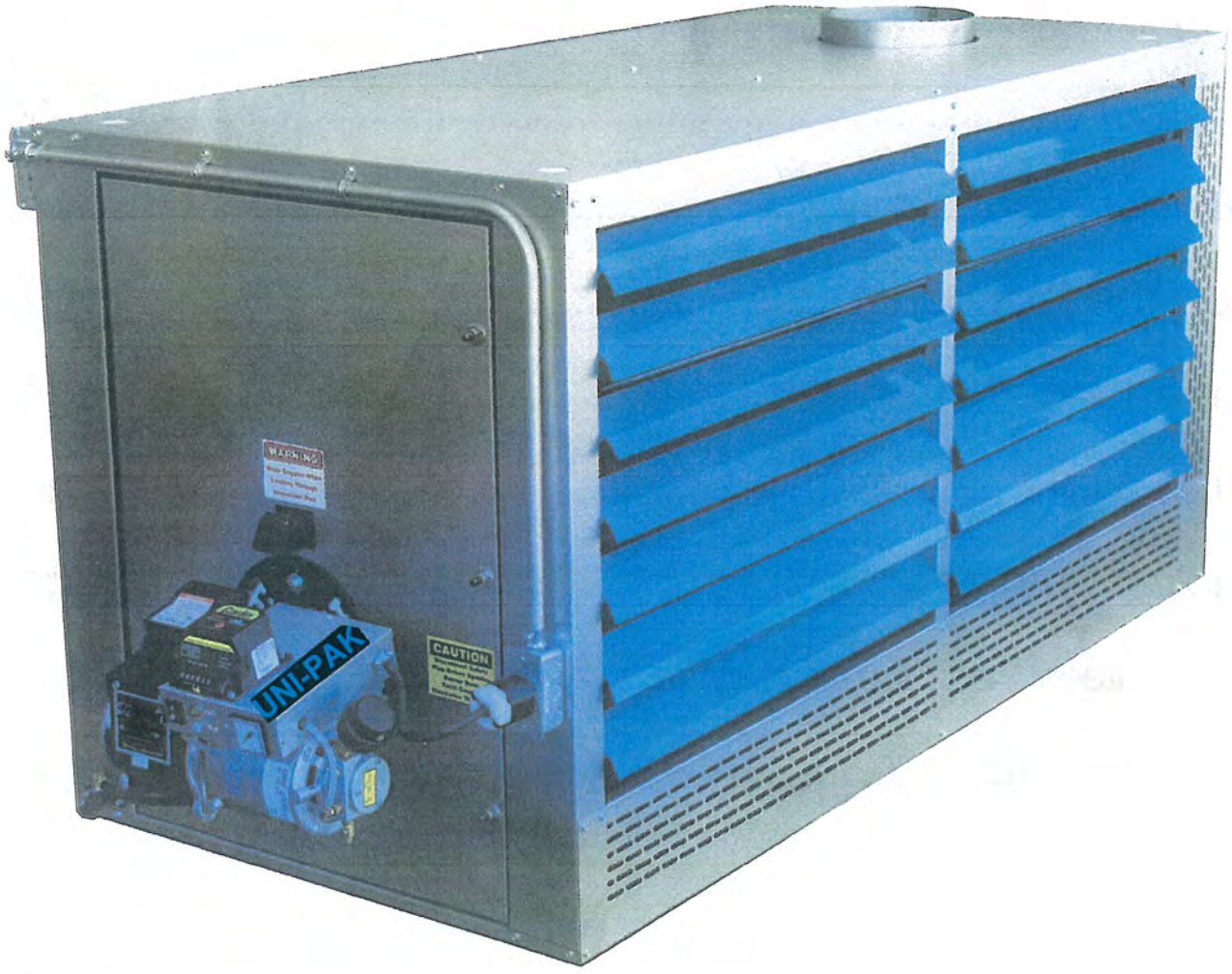
Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Heater

Installation, Operation and Service Instructions

AWH/DWH-500 120v Manual



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PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture.** UNI-PAK burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired heaters. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This heater was designed to be a primary or auxiliary heat source, but not the only source of heat. And provide economical disposal of waste oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the heater, the main heating system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT

Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in a UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the heater 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 passage. 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 UNI-PAK heater.

Specifications

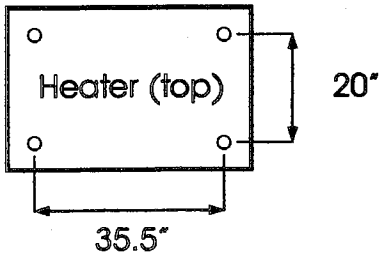
BTU INPUT:	500,000
BTU OUTPUT:	410,000
GALLONS PER HOUR:	3.4
REQUIRED VOLTS:	115
AMPs FULL LOAD:	20.7
FAN MOTOR HP:	2 @ 1/3 each
FAN MOTOR RPM:	1075
CFM (FREE AIR):	9001
CFM w/ DUCTWORK @ 100 ft.:	3701
EFFECTIVE AIR FLOW:	100 ft
FLUE SIZE:	8"
WEIGHT:	660 lbs
L x W x H (including burner):	84" x 38" x 34.5"
SHIPPING WEIGHT:	725 lbs
SHIPPING DIMENSIONS (L x W x H):	92" x 44" x 50"

Notes:

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. EconoHeat reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. These appliances are designed for commercial or industrial use only. Installation and use of this waste-oil burning appliance shall be in accordance with the Standard for the Installation of Oil Burning Equipment-ANS/NFPA 31-1987, and National Electric Code - ANSI/NFPA 70-1990 and the requirements of the inspection authorities having jurisdiction.
3. Output depends on BTU content of oil used.
4. Atomizing Air Pressure for all fuels 10 P.S.I.
5. Furnace not to be used with air filters.
6. Intended maximum outlet air temp. 200 degrees F. (93 degrees C) or less.
7. **Clearance from combustible materials on all models not to be less than:**

TOP- 18"	**BOTTOM- 18"**	**SIDES- 18"**
REAR- 18"	**FRONT- 48"**	**FLUE PIPE- 18"**

Mounting Dimensions:



Installation Procedures

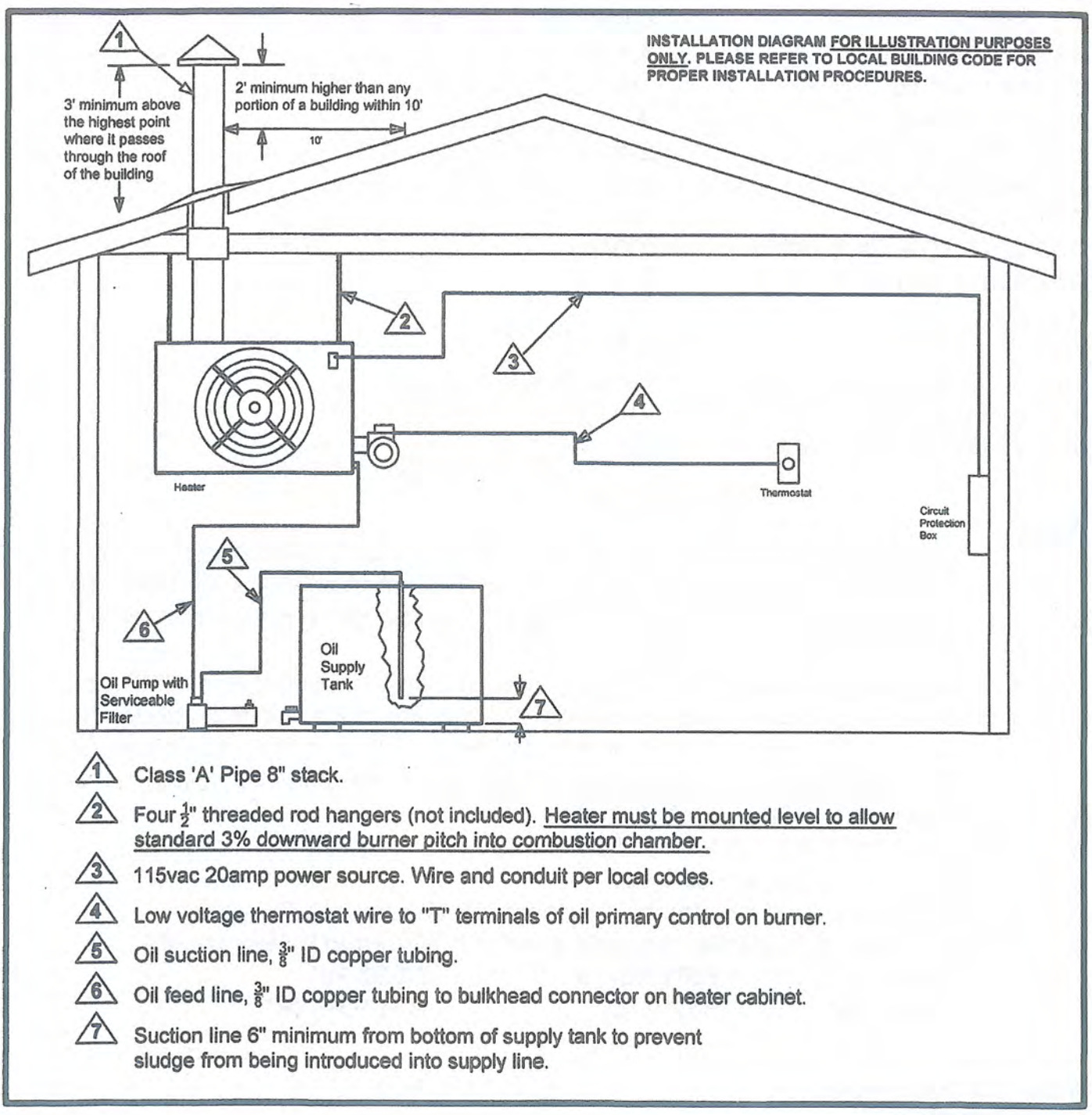


Figure 1 – Installation Diagram

Stack Installation

1. Install a barometric damper (NOT included) in the stack if the draft up the stack exceeds -.08. Draft up the stack must be minimum -.04 to -.06 inches of water column. Check with draft meter 12" from the top of the heater in (stack) or flue pipe. The over fire draft should be a minimum of -.02- check through flame inspection port. Closing the damper door can increase draft.
2. For optional draft inducers or power vent wiring, See Figure 2. One of these devices must be installed where back draft is present. In building or correct draft cannot be achieved.

Oil Supply Tubing

1. Use ONLY 1/2" or 3/4" nominal ID copper tubing with flare fittings only on the fuel suction from the tank to the heater. **Do NOT use ferrule fittings or Teflon tape on any pipe-fittings.**
2. Keep suction line approximately 6" from bottom of oil tank to prevent suction of sludge. Drain accumulated sludge and water from tank periodically.
3. Use only an inside oil storage tank to supply heater. **Do not draw from an outside tank,** especially not an underground tank, directly to heater. A separate transfer pump from an outside tank with proper filtration to the inside supply tank is acceptable and available from UNI-PAK.
4. Connect 1/2" or 3/4" oil supply line from the supply tank through the filter (figure 1) to the pump inlet located same side as bleeder port (figure 4).

Wiring

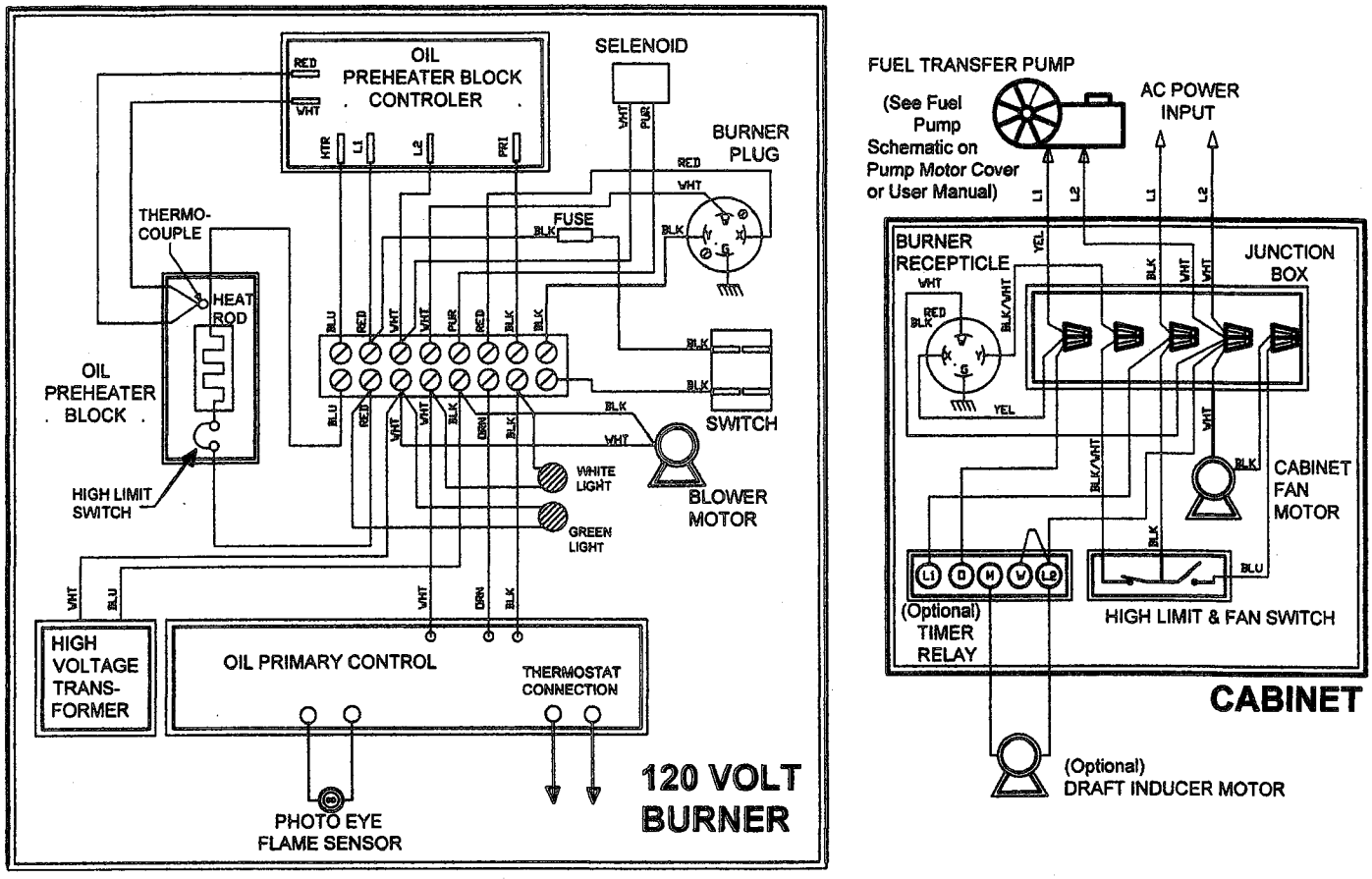


Figure 2 - Wiring Diagram

1. Wire 120V into main electrical box mounted on burner backside of heater cabinet with separate circuit **20-amp protection using 12-gauge wire.** Connect power line to black wire and all whites (NEUTRAL or COMMON) together. **IMPORTANT**, Connect ground wire to ground mounting point in main junction box (green screw).
2. Connect wires from main junction box to remote oil pump power, yellow to yellow and neutral common white to white.
3. Wire low voltage thermostat into "T" marked terminals on oil primary control on burner (Box on burner gun assembly with red reset button - figure 3).

Ducting

All unit heaters are designed with a condenser-type pressure propeller fan for air deliver, and have been successfully field ducted (see specifications). Call factory for further assistance if needed.

Oil Burner

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment - ANSI/NFPA 31 - 1987, and National Electric Code - ANSI/NFPA 70 - 1990 and the requirements of the inspection authorities having jurisdiction.

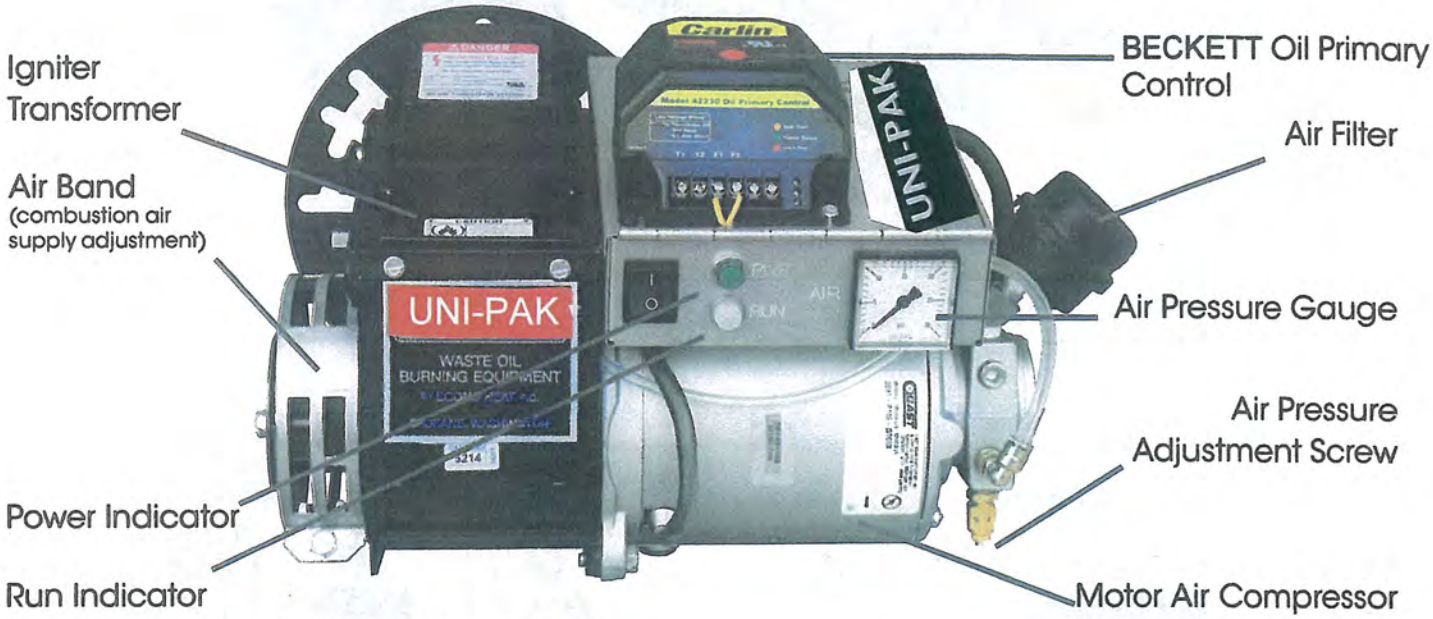


Figure 3 - Oil Burner (Back View Closed)

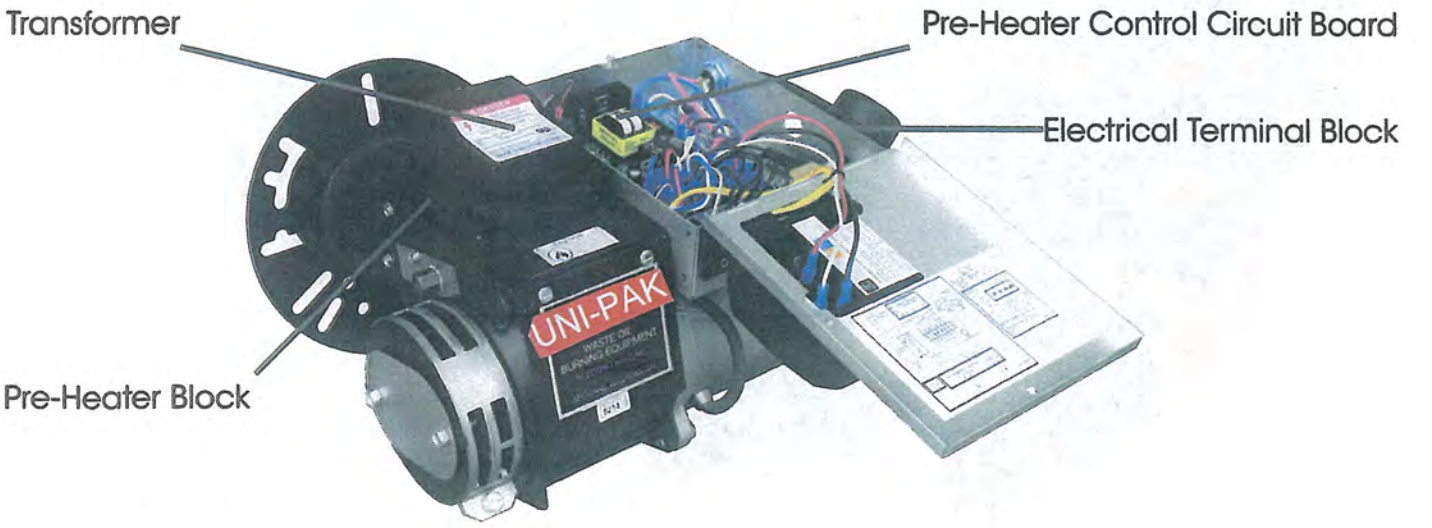


Figure 4 - Oil Burner (Back View Opened)

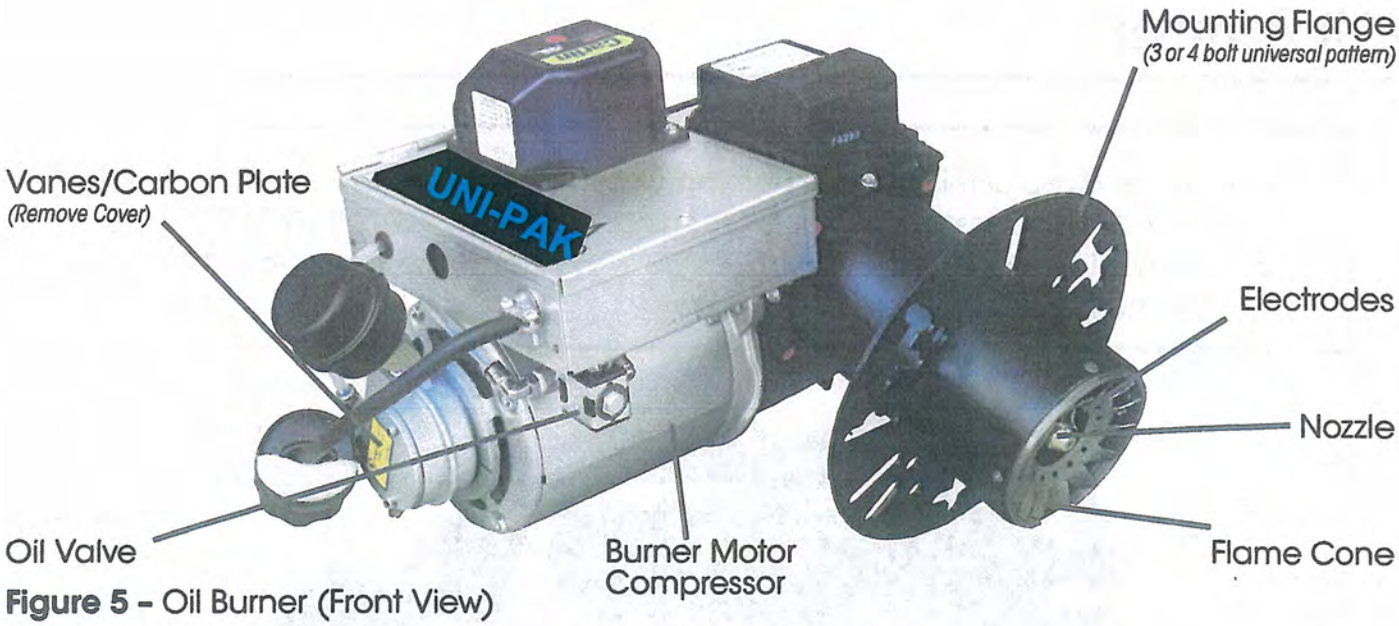


Figure 5 - Oil Burner (Front View)

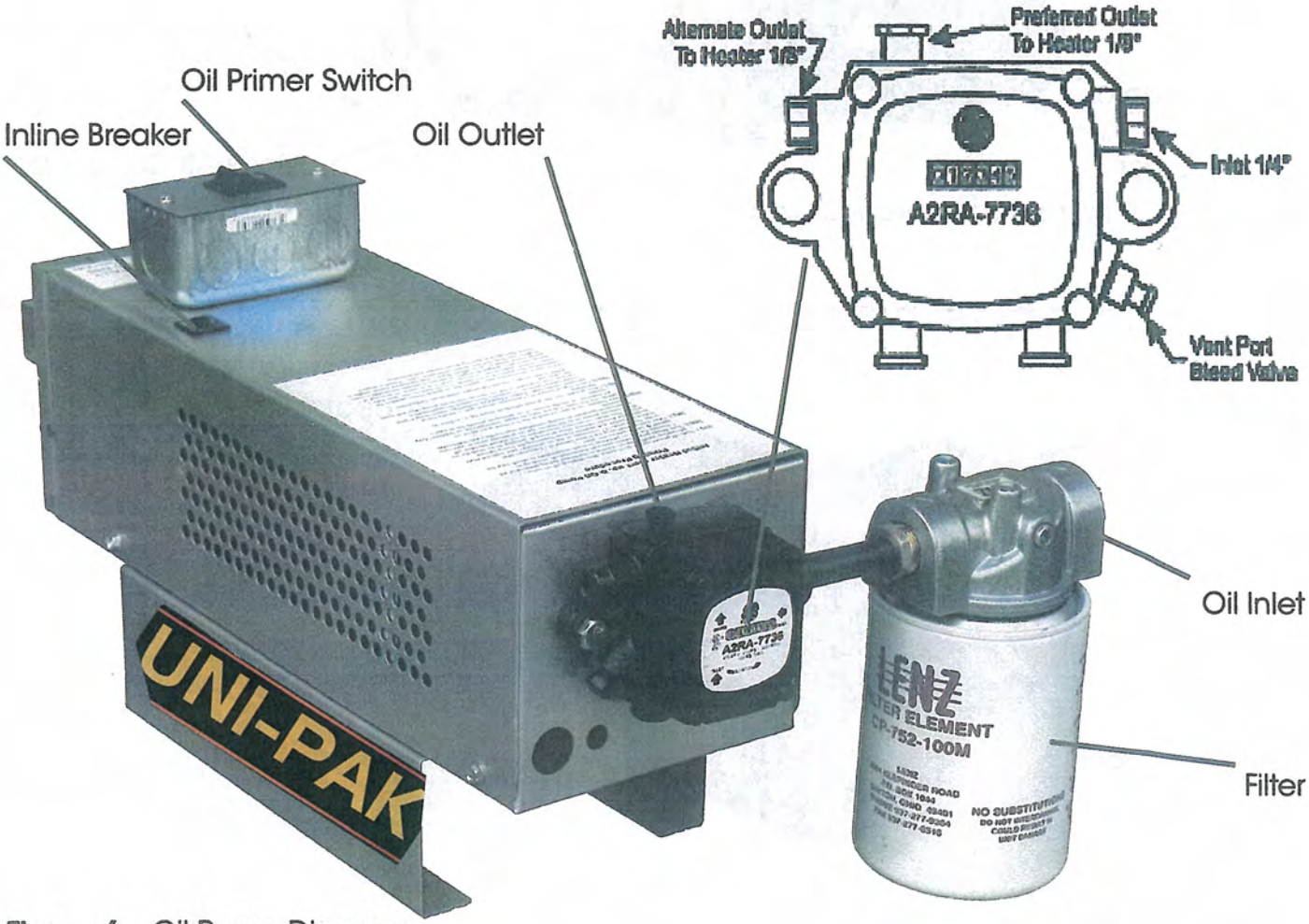


Figure 6 - Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

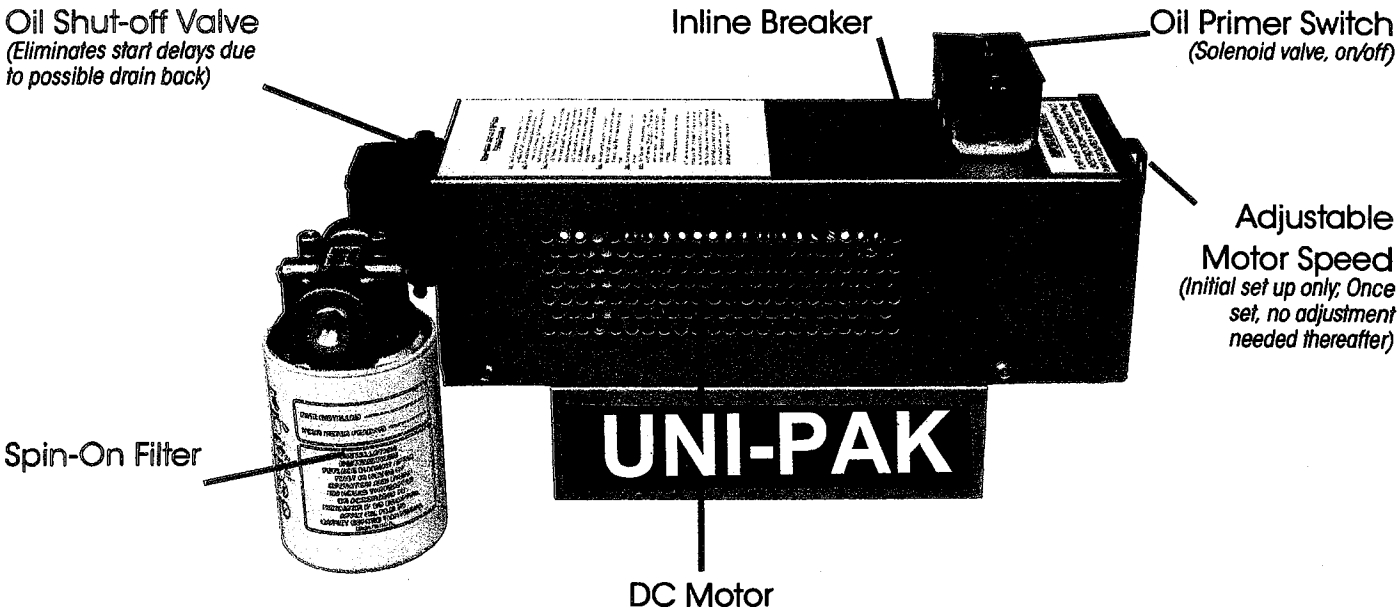
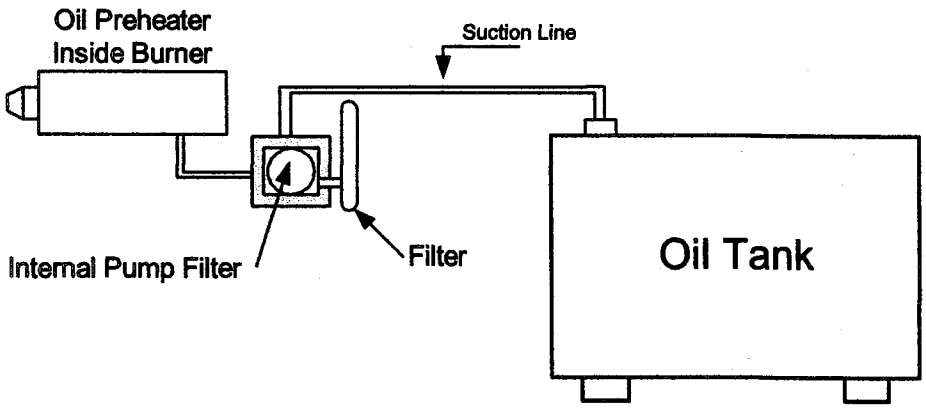


Figure 7 - Oil Pump Assembly

Oil Burner Technology

Atomization Through Low Pressure Preheat & Air Induction At Nozzle



UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block and is pre-heated to operating thermo set-point, and this along with high pressure (100 psi to 200 psi depending on model) break up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 3) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 9) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 5) Senses flame in combustion chamber and signals oil primary when no flame is present (located under hinged transformer).
- **Igniter Springs:** (figure 5) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Pre-Heater Control Circuit Board:** (figure 9) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** (figure 9) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 9) High-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5 & 6) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 3) Motor turns the burner blower, fan and oil pump.
- **Gallons per Hour (GPH)**: Determined by pump pressure and nozzle profile size, varying by model/unit size.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Initial Start Procedure

1. **IMPORTANT** - Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory for help if needed.
3. Switch the burner to the on position. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo setpoint, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner. Burner operated via room thermostat.
4. Jump the "T" terminals (thermostat terminals) on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary, not before burner tries to run or operate. This will allow the burner to run during the pump priming process - **don't forget to remove jumpers when primed.**
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 4). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove the temporary jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Pre-set at factory combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from establishing.

Inspect flame length through inspection door located above burner gun assembly. Flame should reach **no further than ½ to ¾ way down combustion tube. NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START IS PRESENT.**

Suggested Maintenance Schedule

Every application varies. Monitor your needed schedules.

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Filter screen located in the pancake style housing (figure 12 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Remove one (1) x 9/16 nut from the burner side of the cabinet to swing the burner away from the unit to easily access and clean the nozzle and flame-cone. (figure 6 below).
- Open the bolt on door on clean-out sides of the furnace. The bolt-on door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepa filter recommended) (figure 10 below).
- Check Suntec pump filter. Remove pump cover for access (figure 11 below). **CAUTION:** Be careful of gasket; clean if needed.

YEARLY

- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 8 below). Due to erosion, adjustment may change.
- Replace nozzle as needed when flame deteriorates with no retention at flame cone, depending on usage (figures 6, 7, 8 and 9 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 6 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner securing nuts, remove the burner side clean-out door. Remove nozzle with 5/8" socket (figures 6 and 7 below).

ELECTRODE ADJUSTMENTS

Electrodes are adjusted at time of manufacture. However, they should be check periodically and at time of installation, to be sure they are set as noted in the following dimensional drawing. Swing burner clean out door back for inspection (figures 8 and 10 below). **CAUTION: TURN OFF MAIN ELECTRIC SUPPLY SWITCH BEFORE CHECKING OR ADJUSTING ELECTRODE SETTING.**

NOZZLE POSITION IN RELATION TO ENDCONE/BURNER TUBE

Tip of nozzle must be ¼" ahead of inside radius of end-cone. If nozzle is behind inside radius of end-cone, coking will occur and end cone can become clogged (figure 8 below).

IMPORTANT NOTE: be sure nozzle is centered, if nozzle is higher than center, press nozzle down to bottom out pre-heater stand.

To adjust, remove burner from cabinet (figure 6 below), loosen Preheat Sink securing nut and set screw, push fore or aft as needed. **WARNING:** This adjustment is done at the factory and should not be moved unless figure 8 dimensions have been altered.

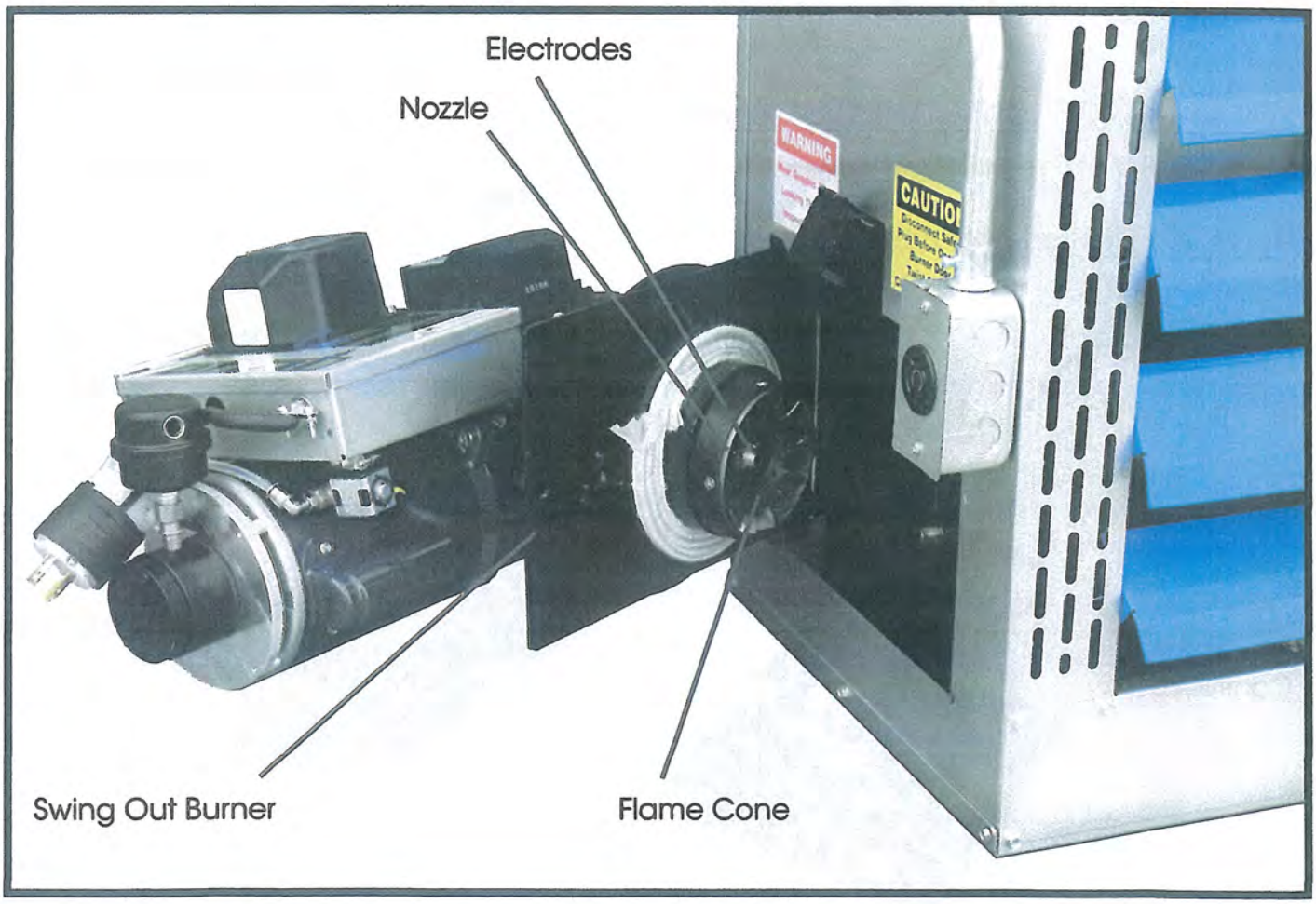
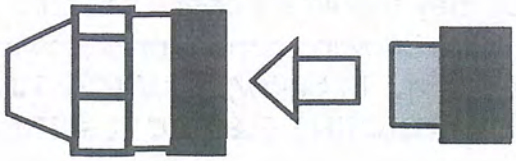
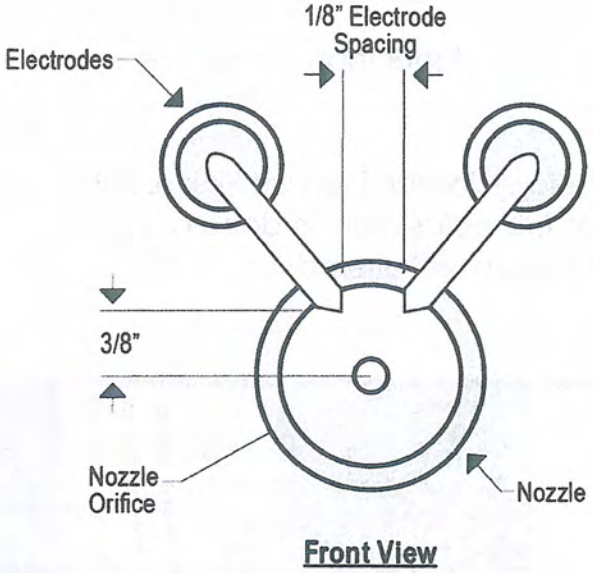


Figure 8 – Burner Door View



When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 9 - Nozzle Assembly Detail



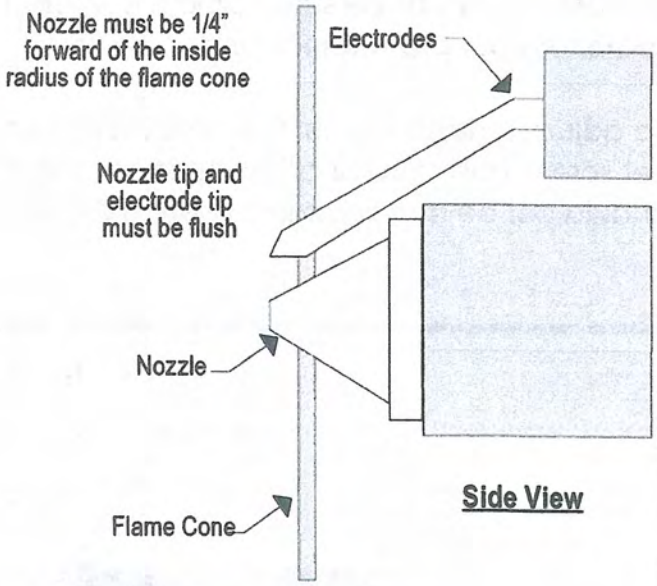


Figure 10 - Electrode Adjustment Detail

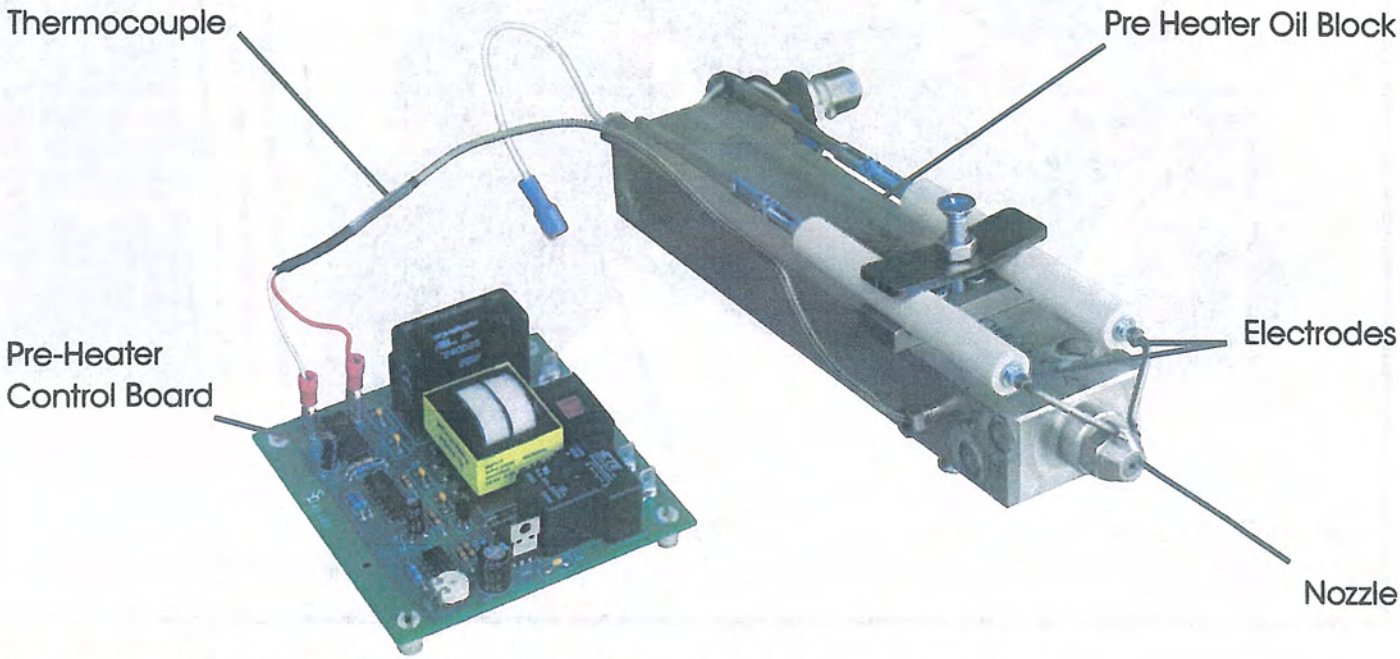


Figure 11 - Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 12 – Pump Strainer

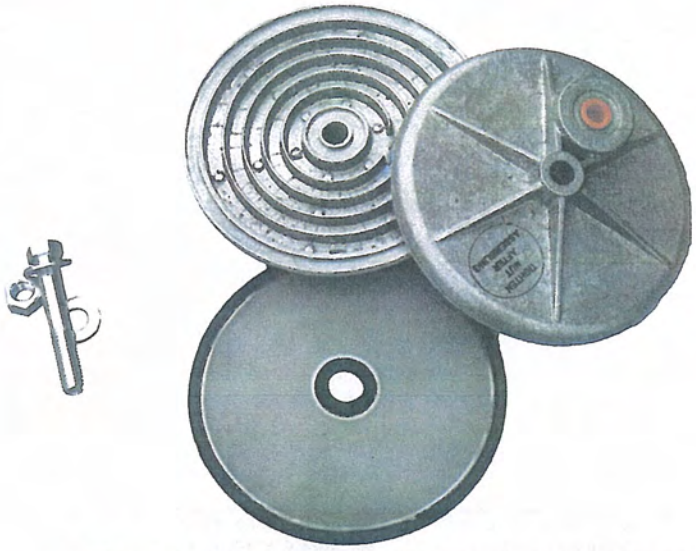


Figure 13 – Oil Filter (Pancake Style Filter)

Troubleshooting

♦Most Likely •Less Likely ♣Least Likely

Symptom	Cause	Remedy
1. Heater shuts off	♦ Manual reset	♦ Requiring manual restart by reset button on.
2. Loss of prime overnight	♦ Vacuum air leak in fuel line	♦ Check all fuel connections. Tighten fittings.
Won't hold vacuum	♣ Plugged pump screen	♣ Check pump screen, may need cleaning-to access, remove pump cover
IS TANK EMPTY?	• Plugged filter or tank oil empty	• Clean filter. Using vent port, reprime pump (Figures 6 & 7).
3. Fails to start.	♦ Vacuum Leak	♦ Open bleeder port if air present. Check and tighten fittings.
	♦ Inadequate Fuel Supply	♦ Clean filter. Check all fuel connections. Tighten fittings.
	• No Pressure	• Check, may need cleaning—to access, remove pump cover.
		• Using vent port, reprime pump (Figures 6 & 7).
	• No Pre-heat	• Be sure all wiring to pre-heater is tight-no loose connections.
		• Bad firerod – replace; continuity at terminals.
	• Auto start circuit not functioning	• Check circuit control board and replace if necessary (call factory).
		• Check continuity at terminals of firerod limit snap switch. Replace if needed.
	• No Arc	• Check springs to electrode rod adjustment (under transformer) make sure they make good contact. Open burner door and make sure electrode tips aren't touching flame cone or one another. Readjust.
4. Hard starting diminished	♦ Partially plugged filter.	♦ Clean filter. Using vent bleeder port on pump, re-prime pump (See Figure 6 & 7) flame.
	♣ Out of fuel	♣ Refill Storage.
	♣ No oil to burner	♣ Check pump screen – remove pump cover; clean if needed. Using vent bleeder port, *re-prime pump*. (Figures 6 & 7)
	• Inadequate combustion air from burner	• Remove nozzle and check for foreign objects. (Figures 9 & 10)
		• Aluminum Block Pre-heater inside burner may not build up carbon. If carbon is present, thermocouple heat sensor wire could have open circuit. Heat control board may have blown circuit and circuit board fuse. Inspect both and replace either if needed (Figure 10). Back draft in combustion chamber may be present. Check draft up flue pipe & over fire at vision port.
	• Air band open too far	• Close air band—while viewing flame; open air band slowly until combustion chamber is clear, not orange.
5. Heater cycles frequently, without thermostat temperature setting being achieved in area to be heated.	♦ Heater over firing, Inadequate combustion air from burner	♦ Investigate and locate reason for over firing. Check and clean end cone turbulator if needed.
	♣ Temperature setting wrong On high limit fan safety switch	♣ Check temperature setting and adjust as necessary.
	• High limit safety switch bad	• Replace high limit fan safety switch.
6. Heater rumbles and excessive heat blow back from flame vision port.	♦Pump setting wrong	♣ Clean ash buildup in combustion chamber, exchange and vent flue pipe.
	♣ Draft incorrect. If proper draft can't be achieved, consider any exhaust fans in building if added since initial install.	♣ Set draft. Clean out combustion chamber and exchangers of ash. Check draft-reset if needed.
7. Heater establishes flame but locks out or shuts off. Need to reset primary.	♦ Photo eye cant see flame.	♦ Clean photo eye which is clouded by back draft smoke.
	♣ Due to back draft. Flame end cone may have ash.	♣ Swing open burner door and clean ash build up from flame end cone. (See Figure 5 & 8).
	• Bad or uncontrolled flame due to nozzle erosion	• Replace nozzle
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present.	♦ May need to install power vent/draft inducer's in stack. (See Figure 2 for wiring).
	♣ Excessive ash buildup/Heater	♣ Clean ash and soot from combustion chamber and heat exchangers.
9. Poor or reduced heat production.	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris.
	♣ Entire fuel supply may be plugged.	♣ Clean filter both, oil strainer and check oil pump screen.
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers.
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled.	

Troubleshooting Continued

Symptom	Cause	Remedy
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present	♦ May need to install power vent/draft inducers in stack (see figure 2 for wiring)
	♣ Excessive ash buildup	♣ Clean ash and soot from combustion chamber and heat exchangers
9. Poor or reduced heat production	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris
	♣ Entire fuel supply may be plugged	♣ Clean filter, both oil strainer and check oil pump screen
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled	

(15) Year Limited Warranty

UNI-PAK (manufacturer) warrants to the purchaser of Unit Heaters listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Combustion chamber and heat exchanger ten (15) years limited, full repair or replacement (parts only), first three (3) fullly covered / last seven (7) 50% coverage
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

WH (15) Year Limited Warranty Cont.

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- Unit heater is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

NOTE: Combustion Chamber Warranty is specific to material and workmanship. Workmanship means UNI-PAK warranties the welds are good and will hold. Material means they will not corrode through due to sulfur in the ash that accumulates during operation. Warranty does not apply to units that experience overheating stress cracks. These are not incurred because the materials are inadequate for the application nor are they results of a weld breaking lose because of bad penetration, which is easily recognized by the metal left beneath the weld. These cracks occur as a direct result of (1) improper draft, either by inadequate initial installation and setup, which requires (a) establishing a proper draft during installation (b) back draft has occurred due to ash buildup, backing up hot gas passageways in either the exchangers, the stack, or both. (2) Over firing by setting oil supply pressure too high (see manual for proper setting) these are all cases of thermal overload.

*Under normal use only. If misuse or abuse is deemed apparent after inspection, warranty is void.

Warranty Card

Please fill out, tear off and return to manufacturer within sixty (60) days of purchase, or warranty will not be valid. Please print or type.

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Heater

Installation, Operation and Service Instructions

AWH/DWH-350 120v Manual

Table of Contents

PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture.** UNI-PAK burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired heaters. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This heater was designed to be a primary or auxiliary heat source, but not the only source of heat. And provide economical disposal of waste oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the heater, the main heating system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT

Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in a UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the heater 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 passage. 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 UNI-PAK heater.

Specifications

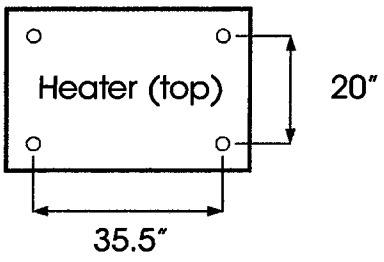
BTU INPUT:	350,000
BTU OUTPUT:	300,000
GALLONS PER HOUR:	2.4
REQUIRED VOLTS:	115
AMPs FULL LOAD:	18.7
FAN MOTOR HP:	2 @ 1/4 each
FAN MOTOR RPM:	1075
CFM (FREE AIR):	6275
CFM w/ DUCTWORK @ 100 ft.:	1600
EFFECTIVE AIR FLOW:	80 ft
FLUE SIZE:	8"
WEIGHT:	400 lbs
L x W x H (including burner):	66" x 29.5" x 28.5"
SHIPPING WEIGHT:	575 lbs
SHIPPING DIMENSIONS (L x W x H):	76" x 38" x 49"

Notes:

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. EconoHeat reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. These appliances are designed for commercial or industrial use only. Installation and use of this waste-oil burning appliance shall be in accordance with the Standard for the Installation of Oil Burning Equipment-ANS/NFPA 31-1987, and National Electric Code - ANSI/NFPA 70-1990 and the requirements of the inspection authorities having jurisdiction.
3. Output depends on BTU content of oil used.
4. Atomizing Air Pressure for all fuels 10 P.S.I.
5. Furnace not to be used with air filters.
6. Intended maximum outlet air temp. 200 degrees F. (93 degrees C) or less.
7. **Clearance from combustible materials on all models not to be less than:**

TOP- 18"	**BOTTOM- 18"**	**SIDES- 18"**
REAR- 18"	**FRONT- 48"**	**FLUE PIPE- 18"**

Mounting Dimensions:



Installation Procedures

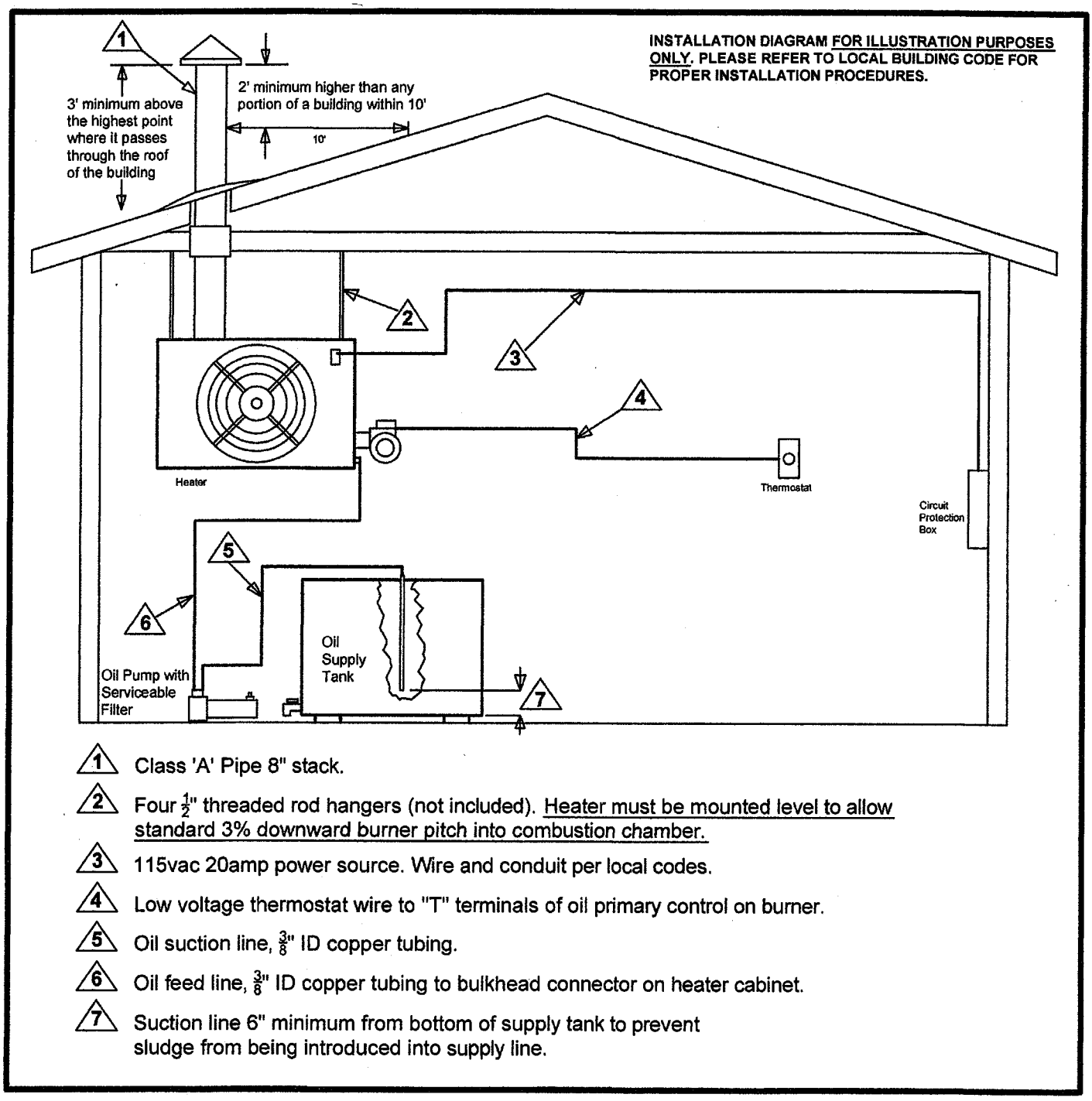


Figure 1 - Installation Diagram

Stack Installation

1. Install a barometric damper (NOT included) in the stack if the draft up the stack exceeds -.08. Draft up the stack must be minimum -.04 to -.06 inches of water column. Check with draft meter 12" from the top of the heater in (stack) or flue pipe. The over fire draft should be a minimum of -.02- check through flame inspection port. Closing the damper door can increase draft.
2. For optional draft inducers or power vent wiring, See Figure 2. One of these devices must be installed where back draft is present. In building or correct draft cannot be achieved.

Oil Supply Tubing

1. Use ONLY 1/2" or 3/4" nominal ID copper tubing with flare fittings only on the fuel suction from the tank to the heater. **Do NOT use ferrule fittings or Teflon tape on any pipe-fittings.**
2. Keep suction line approximately 6" from bottom of oil tank to prevent suction of sludge. Drain accumulated sludge and water from tank periodically.
3. Use only an inside oil storage tank to supply heater. **Do not draw from an outside tank,** especially not an underground tank, directly to heater. A separate transfer pump from an outside tank with proper filtration to the inside supply tank is acceptable and available from UNI-PAK.
4. Connect 1/2" or 3/4" oil supply line from the supply tank through the filter (figure 1) to the pump inlet located same side as bleeder port (figure 4).

Wiring

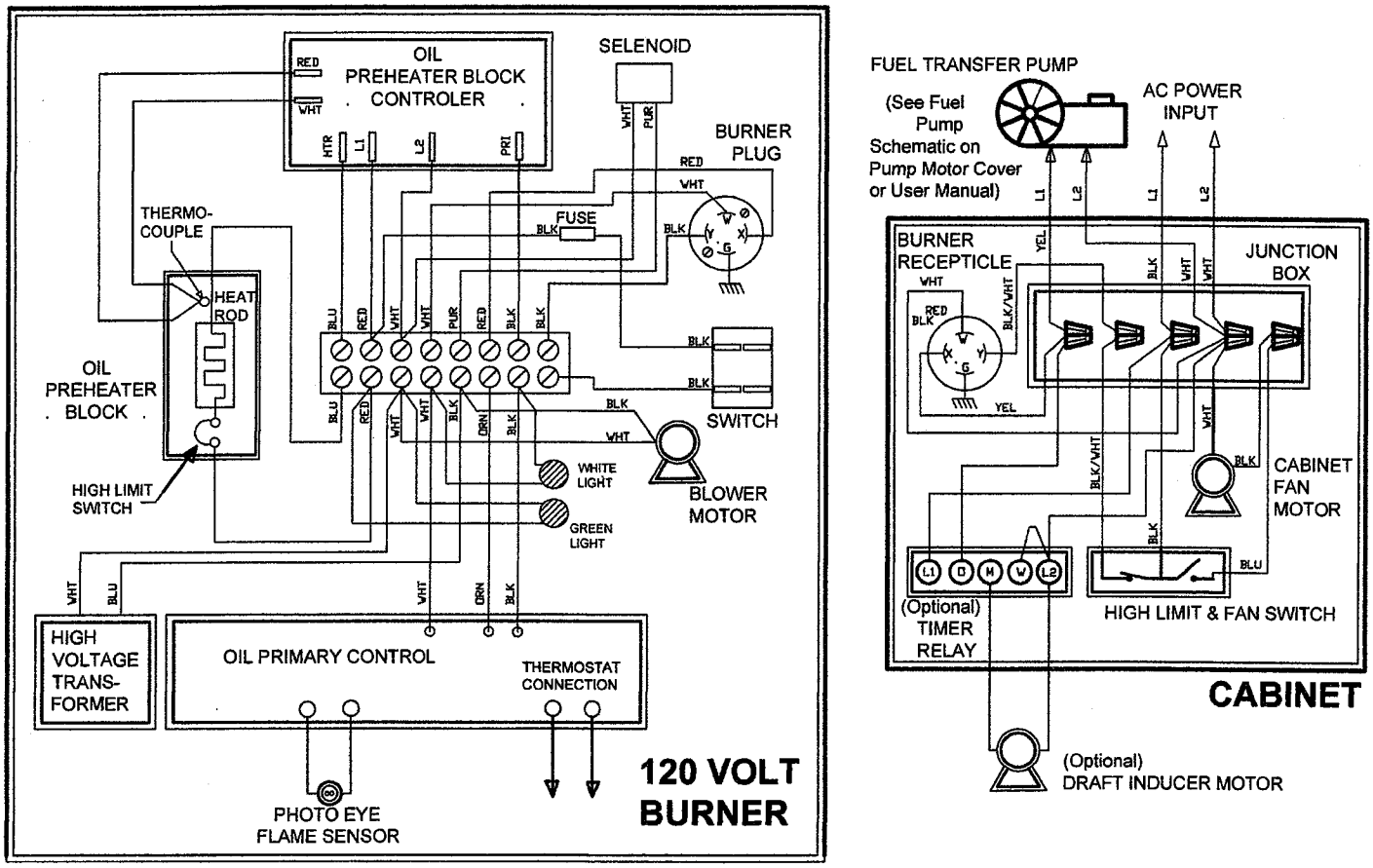


Figure 2 - Wiring Diagram

1. Wire 120V into main electrical box mounted on burner backside of heater cabinet with separate circuit **20-amp protection using 12-gauge wire.** Connect power line to black wire and all whites (NEUTRAL or COMMON) together. **IMPORTANT**, Connect ground wire to ground mounting point in main junction box (green screw).
2. Connect wires from main junction box to remote oil pump power, yellow to yellow and neutral common white to white.
3. Wire low voltage thermostat into "T" marked terminals on oil primary control on burner (Box on burner gun assembly with red reset button - figure 3).

Ducting

All unit heaters are designed with a condenser-type pressure propeller fan for air deliver, and have been successfully field ducted (see specifications). Call factory for further assistance if needed.

Oil Burner

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment - ANSI/NFPA 31 - 1987, and National Electric Code - ANSI/NFPA 70 - 1990 and the requirements of the inspection authorities having jurisdiction.

Figure 3 - Oil Burner (Back View Closed)

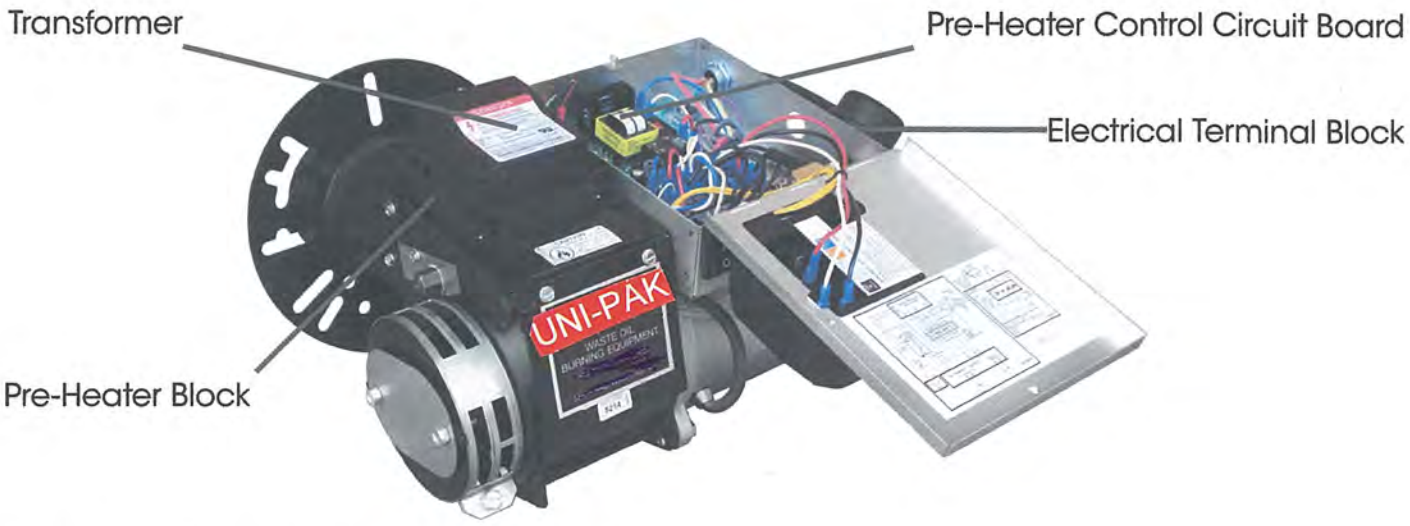


Figure 4 - Oil Burner (Back View Opened)

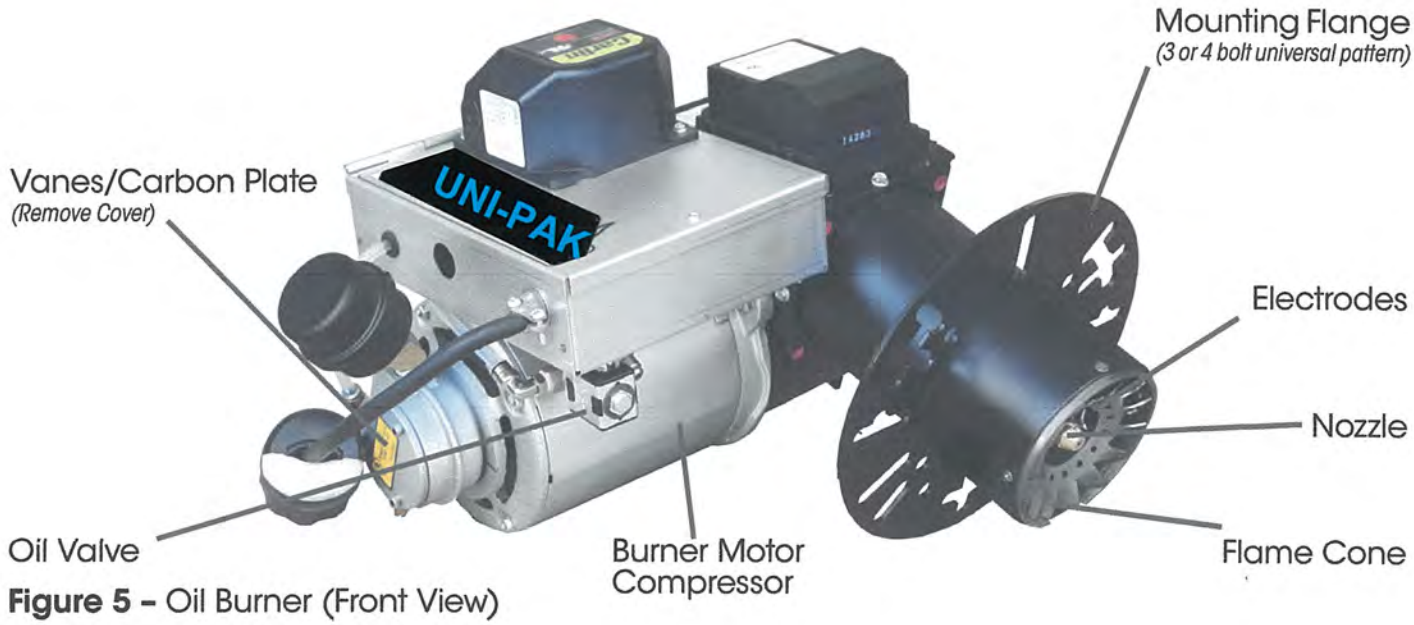


Figure 5 – Oil Burner (Front View)

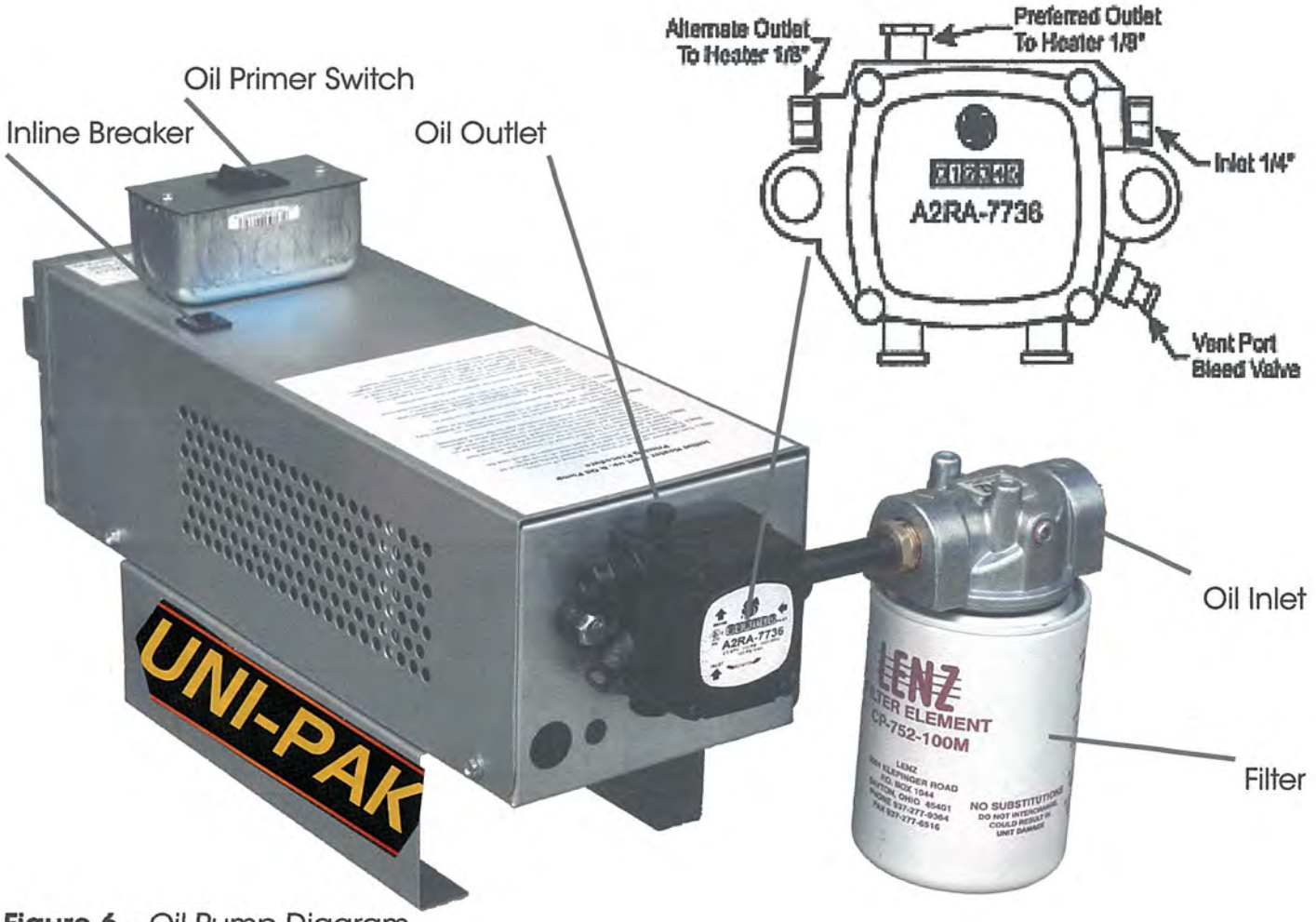
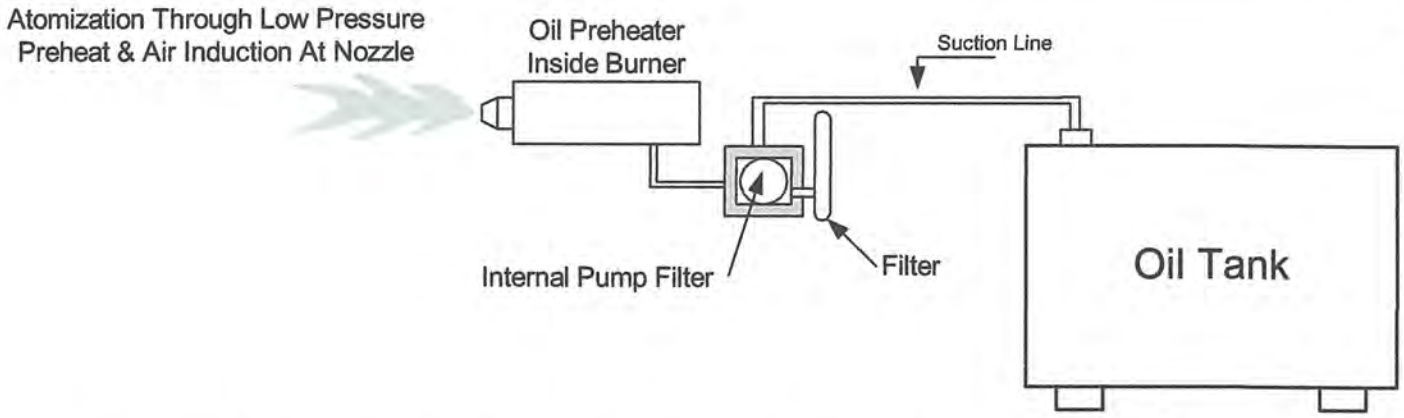


Figure 6 – Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

Figure 7 – Oil Pump Assembly

Oil Burner Technology



UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block and is pre-heated to operating thermo set-point, and this along with high pressure (100 psi to 200 psi depending on model) break up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 3) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 9) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 5) Senses flame in combustion chamber and signals oil primary when no flame is present (located under hinged transformer).
- **Igniter Springs:** (figure 5) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Pre-Heater Control Circuit Board:** (figure 9) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** (figure 9) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 9) High-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5 & 6) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 3) Motor turns the burner blower, fan and oil pump.
- **Gallons per Hour (GPH)**: Determined by pump pressure and nozzle profile size, varying by model/unit size.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Initial Start Procedure

1. **IMPORTANT -** Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory **for help if needed.**
3. Switch the burner to the on position. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo setpoint, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner. Burner operated via room thermostat.
4. Jump the "T" terminals (thermostat terminals) on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary, not before burner tries to run or operate. This will allow the burner to run during the pump priming process - **don't forget to remove jumpers when primed.**
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 4). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove the temporary jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Pre-set at factory combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from establishing.

Inspect flame length through inspection door located above burner gun assembly. Flame should reach **no further than ½ to ¾ way down combustion tube. NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START IS PRESENT.**

Suggested Maintenance Schedule

Every application varies. Monitor your needed schedules.

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Filter screen located in the pancake style housing (figure 12 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Remove one (1) x 9/16 nut from the burner side of the cabinet to swing the burner away from the unit to easily access and clean the nozzle and flame-cone. (figure 6 below).
- Open the bolt on door on clean-out sides of the furnace. The bolt-on door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepa filter recommended) (figure 10 below).
- Check Suntec pump filter. Remove pump cover for access (figure 11 below). **CAUTION:** Be careful of gasket; clean if needed.

YEARLY

- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 8 below). Due to erosion, adjustment may change.
- Replace nozzle as needed when flame deteriorates with no retention at flame cone, depending on usage (figures 6, 7, 8 and 9 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 6 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner securing nuts, remove the burner side clean-out door. Remove nozzle with 5/8" socket (figures 6 and 7 below).

ELECTRODE ADJUSTMENTS

Electrodes are adjusted at time of manufacture. However, they should be check periodically and at time of installation, to be sure they are set as noted in the following dimensional drawing. Swing burner clean out door back for inspection (figures 8 and 10 below). **CAUTION: TURN OFF MAIN ELECTRIC SUPPLY SWITCH BEFORE CHECKING OR ADJUSTING ELECTRODE SETTING.**

NOZZLE POSITION IN RELATION TO ENDCONE/BURNER TUBE

Tip of nozzle must be ¼" ahead of inside radius of end-cone. If nozzle is behind inside radius of end-cone, coking will occur and end cone can become clogged (figure 8 below).

IMPORTANT NOTE: be sure nozzle is centered, if nozzle is higher than center, press nozzle down to bottom out pre-heater stand.

To adjust, remove burner from cabinet (figure 6 below), loosen Preheat Sink securing nut and set screw, push fore or aft as needed. **WARNING:** This adjustment is done at the factory and should not be moved unless figure 8 dimensions have been altered.

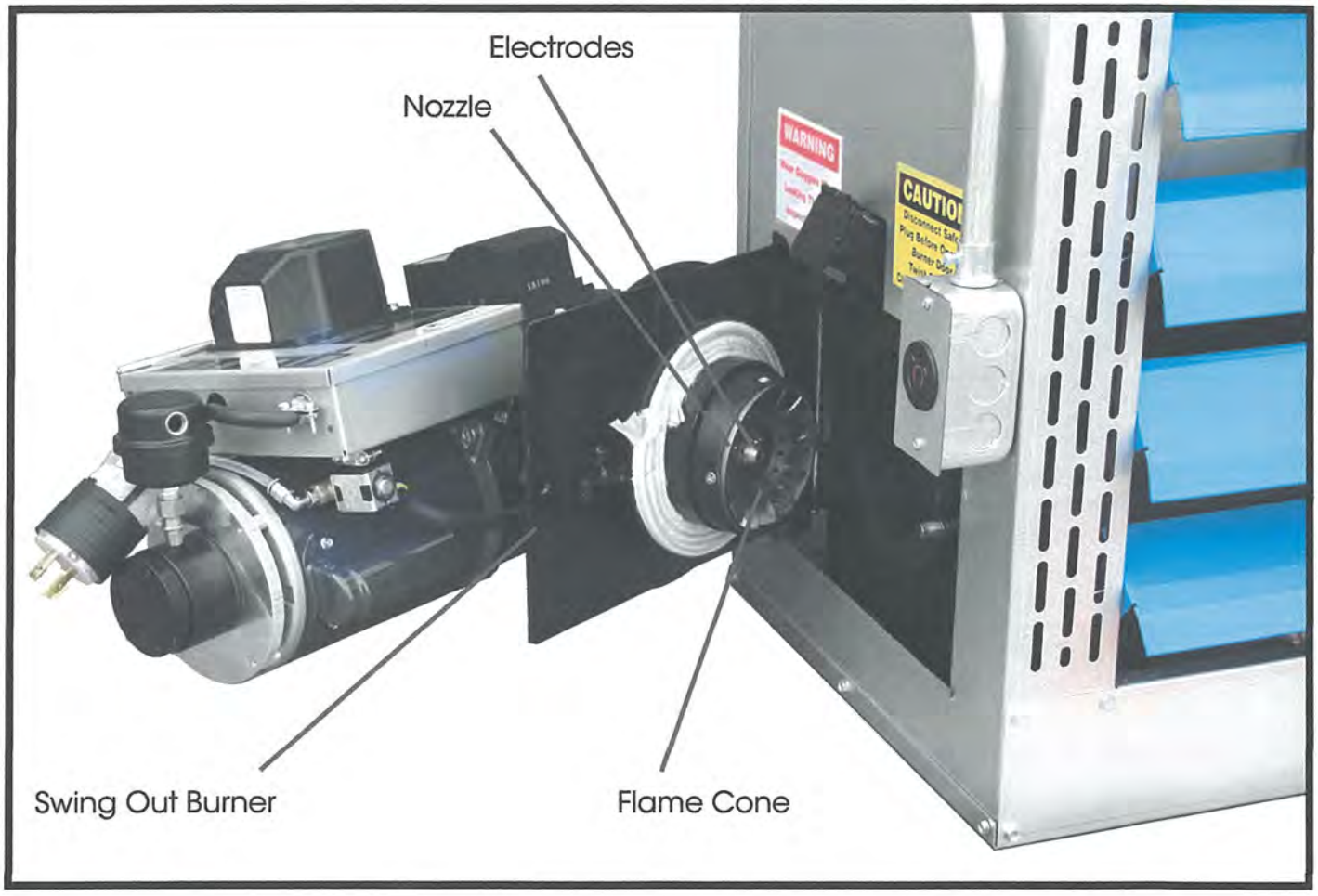


Figure 8 – Burner Door View

When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 9 – Nozzle Assembly Detail

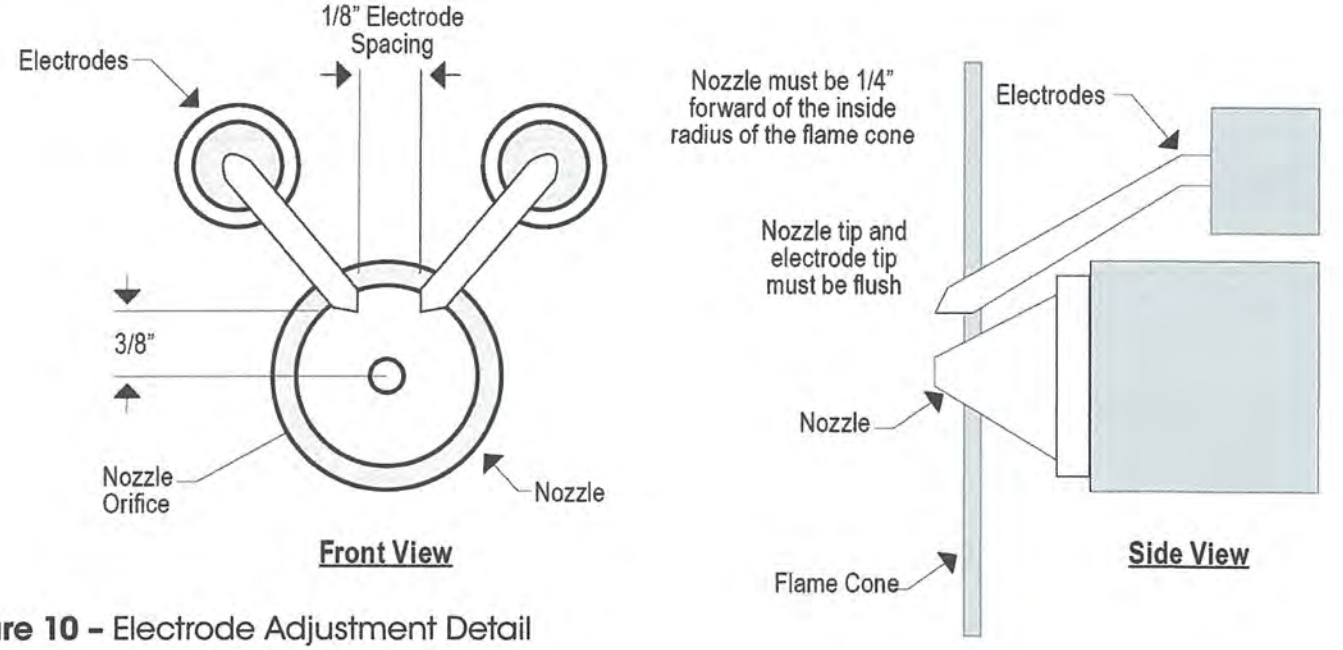


Figure 10 – Electrode Adjustment Detail

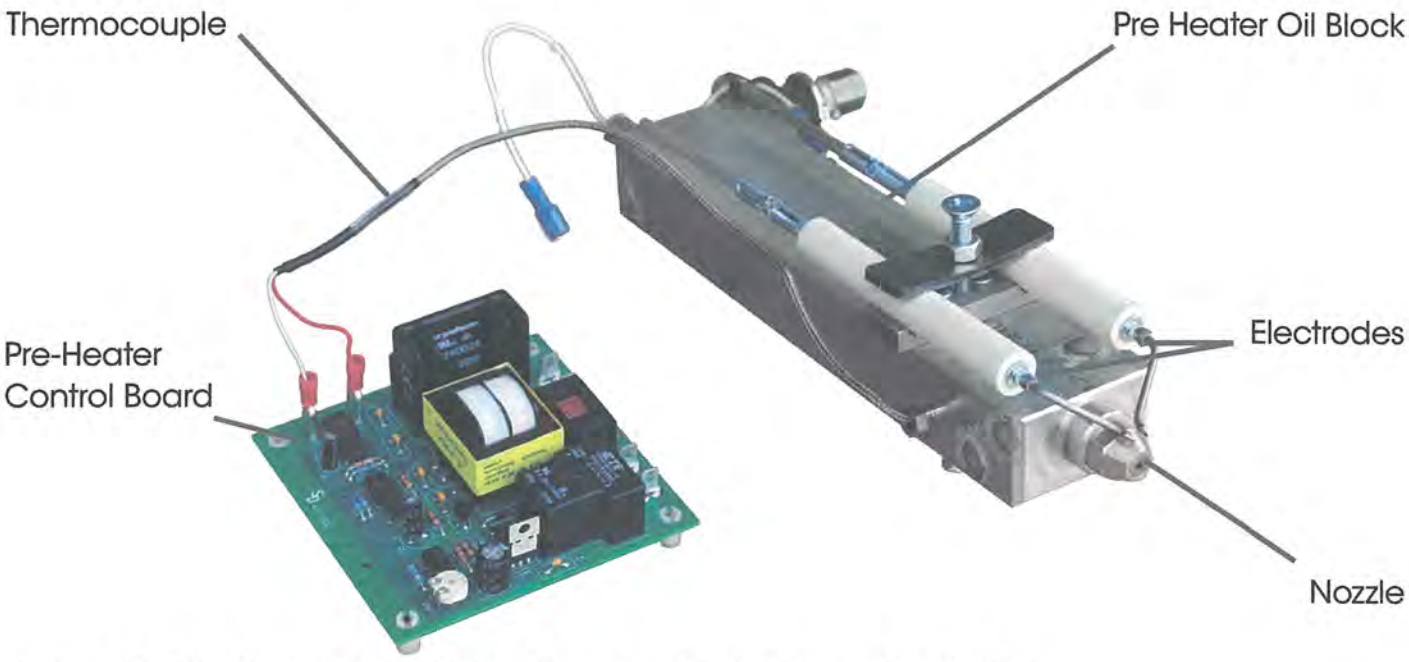


Figure 11 – Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 12 – Pump Strainer

Figure 13 – Oil Filter (Pancake Style Filter)

Troubleshooting

♦Most Likely •Less Likely ♣Least Likely

Symptom	Cause	Remedy
1. Heater shuts off	♦ Manual reset	♦ Requiring manual restart by reset button on.
2. Loss of prime overnight	♦ Vacuum air leak in fuel line	♦ Check all fuel connections. Tighten fittings.
Won't hold vacuum	♣ Plugged pump screen	♣ Check pump screen, may need cleaning-to access, remove pump cover
IS TANK EMPTY?	• Plugged filter or tank oil empty	• Clean filter. Using vent port, reprime pump (Figures 6 & 7).
3. Fails to start.	♦ Vacuum Leak	♦ Open bleeder port if air present. Check and tighten fittings.
	♦ Inadequate Fuel Supply	♦ Clean filter. Check all fuel connections. Tighten fittings.
	• No Pressure	• Check, may need cleaning—to access, remove pump cover.
		• Using vent port, reprime pump (Figures 6 & 7).
	• No Pre-heat	• Be sure all wiring to pre-heater is tight-no loose connections.
		• Bad firerod – replace; continuity at terminals.
	• Auto start circuit not functioning	• Check circuit control board and replace if necessary (call factory).
		• Check continuity at terminals of firerod limit snap switch. Replace if needed.
	• No Arc	• Check springs to electrode rod adjustment (under transformer) make sure they make good contact. Open burner door and make sure electrode tips aren't touching flame cone or one another. Readjust.
4. Hard starting diminished	♦ Partially plugged filter.	♦ Clean filter. Using vent bleeder port on pump, re-prime pump (See Figure 6 & 7) flame.
	♣ Out of fuel	♣ Refill Storage.
	♣ No oil to burner	♣ Check pump screen – remove pump cover; clean if needed. *Using vent bleeder port, re-prime pump.* (Figures 6 & 7)
	• Inadequate combustion air from burner	• Remove nozzle and check for foreign objects. (Figures 9 & 10)
		• Aluminum Block Pre-heater inside burner may not build up carbon. If carbon is present, thermocouple heat sensor wire could have open circuit. Heat control board may have blown circuit and circuit board fuse. Inspect both and replace either if needed (Figure 10). Back draft in combustion chamber may be present. Check draft up flue pipe & over fire at vision port.
	• Air band open too far	• Close air band—while viewing flame; open air band slowly until combustion chamber is clear, not orange.
5. Heater cycles frequently, without thermostat temperature setting being achieved in area to be heated.	♦ Heater over firing, Inadequate combustion air from burner	♦ Investigate and locate reason for over firing. Check and clean end cone turbulator if needed.
	♣ Temperature setting wrong On high limit fan safety switch	♣ Check temperature setting and adjust as necessary.
	• High limit safety switch bad	• Replace high limit fan safety switch.
6. Heater rumbles and excessive heat blow back from flame vision port.	♦Pump setting wrong	♣ Clean ash buildup in combustion chamber, exchange and vent flue pipe.
	♣ Draft incorrect. If proper draft can't be achieved, consider any exhaust fans in building if added since initial install.	♣ Set draft. Clean out combustion chamber and exchangers of ash. Check draft-reset if needed.
7. Heater establishes flame but locks out or shuts off. Need to reset primary.	♦ Photo eye cant see flame.	♦ Clean photo eye which is clouded by back draft smoke.
	♣ Due to back draft. Flame end cone may have ash.	♣ Swing open burner door and clean ash build up from flame end cone. (See Figure 5 & 8).
	• Bad or uncontrolled flame due to nozzle erosion	• Replace nozzle
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present.	♦ May need to install power vent/draft inducer's in stack. (See Figure 2 for wiring).
	♣ Excessive ash buildup/Heater	♣ Clean ash and soot from combustion chamber and heat exchangers.
9. Poor or reduced heat production.	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris.
	♣ Entire fuel supply may be plugged.	♣ Clean filter both, oil strainer and check oil pump screen.
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers.
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled.	

Troubleshooting Continued

Symptom	Cause	Remedy
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present	♦ May need to install power vent/draft inducers in stack (see figure 2 for wiring)
	♣ Excessive ash buildup	♣ Clean ash and soot from combustion chamber and heat exchangers
9. Poor or reduced heat production	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris
	♣ Entire fuel supply may be plugged	♣ Clean filter, both oil strainer and check oil pump screen
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled	

(15) Year Limited Warranty

UNI-PAK (manufacturer) warrants to the purchaser of Unit Heaters listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Combustion chamber and heat exchanger ten (15) years limited, full repair or replacement (parts only), first three (3) fullly covered / last seven (7) 50% coverage
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

WH (15) Year Limited Warranty Cont.

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- Unit heater is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

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Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Heater

Installation, operation and service instructions

AWH-75/DWH-75 120v Manual

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PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture.** UNI-PAK burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired heaters. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This heater was designed to be a primary or auxiliary heat source, but not the only source of heat. And provide economical disposal of waste oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the heater, the main heating system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT
Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in a UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the heater 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 passage. 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 UNI-PAK heater.

Specifications

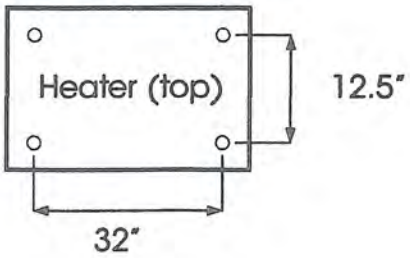
BTU INPUT:	75,000
BTU OUTPUT:	60,000
GALLONS PER HOUR:	0.5
REQUIRED VOLTS:	115
AMPs FULL LOAD:	10.5
FAN MOTOR HP:	1/10
FAN MOTOR RPM:	1625 – 1550
CFM (FREE AIR):	1500 – 1400
EFFECTIVE AIR FLOW:	50 ft
FLUE SIZE:	6"
WEIGHT:	150 lbs
L x W x H (including burner):	50" x 24" x 24"
SHIPPING WEIGHT:	260 lbs
SHIPPING DIMENSIONS (L x W x H):	60" x 34" x 30"

Notes:

1. All illustrations and specifications contained are based on the latest information available at the time of publication approval. EconoHeat reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. These appliances are designed for commercial or industrial use only. Installation and use of this waste-oil burning appliance shall be in accordance with the Standard for the Installation of Oil Burning Equipment-ANS/NFPA 31-1987, and National Electric Code - ANSI/NFPA 70-1990 and the requirements of the inspection authorities having jurisdiction.
3. Output depends on BTU content of oil used.
4. Furnace not to be used with air filters.
5. Intended maximum outlet air temp. 200 degrees F. (93 degrees C) or less.
6. **Clearance from combustible materials on all models not to be less than:**

TOP- 18"	**BOTTOM- 18"**	**SIDES- 18"**
REAR- 18"	**FRONT- 48"**	**FLUE PIPE- 18"**

Mounting Dimensions:



Installation Procedures

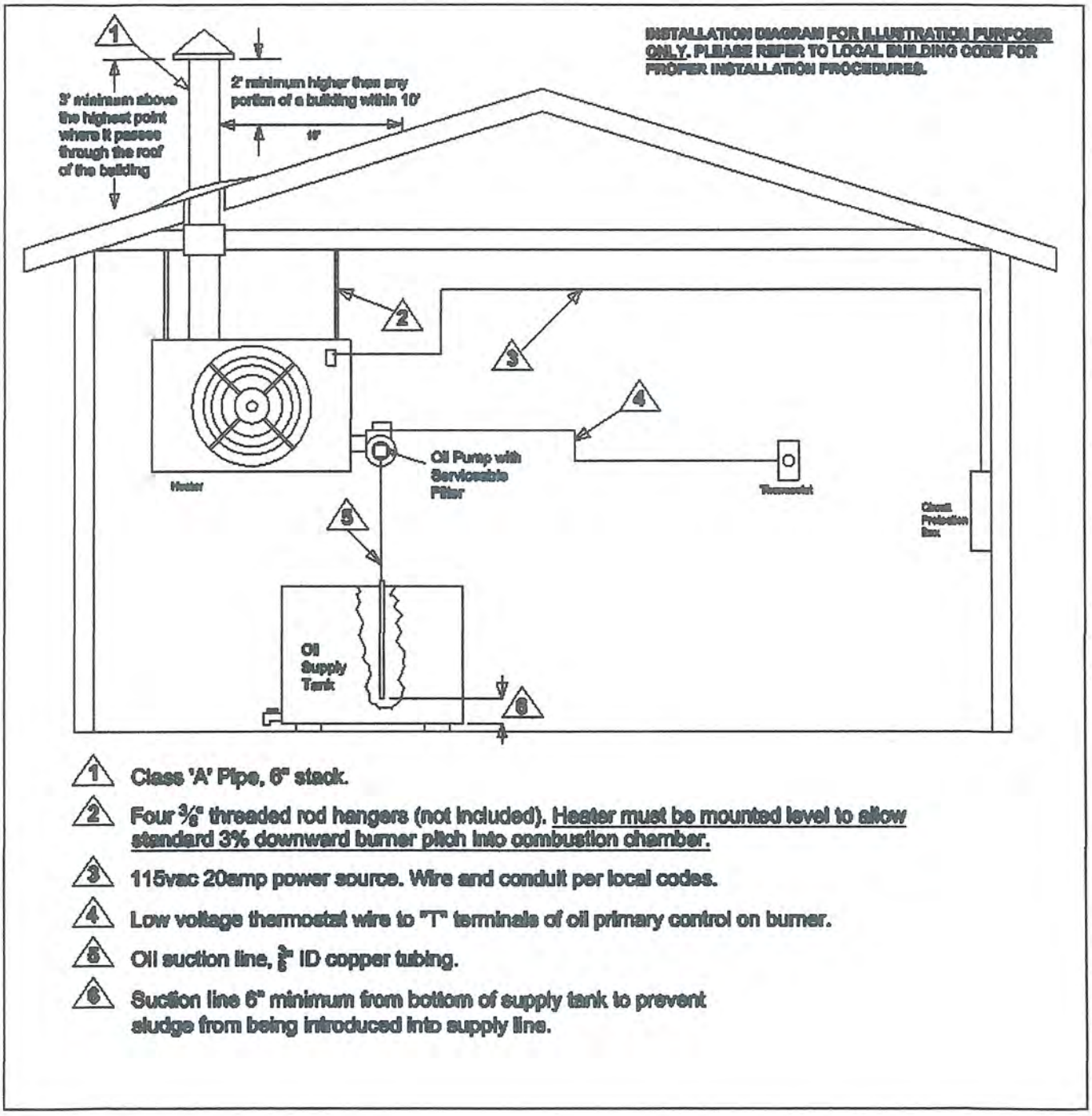


Figure 1 – Installation Diagram

Stack Installation

1. Install a barometric damper (NOT included) in the stack if the draft up the stack exceeds -.08. Draft up the stack must be -.04 to -.06 inches of water column. Check with draft meter between the top of the heater and damper. The over fire draft should be a minimum of -.02- check through flame inspection port. Closing the damper door can increase draft.
2. For optional draft inducers or power vent wiring, See Figure 2. One of these devices must be installed where back draft is present. In building or correct draft cannot be achieved.

Oil Supply Tubing

1. Use ONLY 3/8" nominal ID copper tubing with flare fittings only on the fuel suction from the tank to the heater. **Do NOT use ferrule fittings or Teflon tape on any pipe-fittings.**
2. Keep suction line approximately 6" from bottom of oil tank to prevent suction of sludge. Drain accumulated sludge and water from tank periodically.
3. Use only an inside oil storage tank to supply heater. **Do not draw from an outside tank,** especially not an underground tank, directly to heater. A separate transfer pump from an outside tank with proper filtration to the inside supply tank is acceptable and available from EconoHeat.
4 **The fuel supply pump included with heater is to be mounted at tank level or below** (figure 1). This pump turns slowly requiring a number of minutes to accomplish purging ALL air, if bubbles, skips, even slight pulsations in the oil flow from pumps bleeder port is unacceptable and must be removed assuring proper oil flow to heater. Otherwise, the flame sensor will not see enough flame and heater will lockout. **NOTE: PUMP ASSEMBLY MUST BE MOUNTED HORIZONTAL.**
5. Connect 3/8" oil supply line from the supply tank through the filter (figure 1) to the pump inlet located same side as bleeder port (figure 6). Continue oil supply line from pump outlet to bulk head fitting secured to cabinet at left side of burner assembly (bulk head fitting has fuel flex hose connecting it to burner).

Wiring

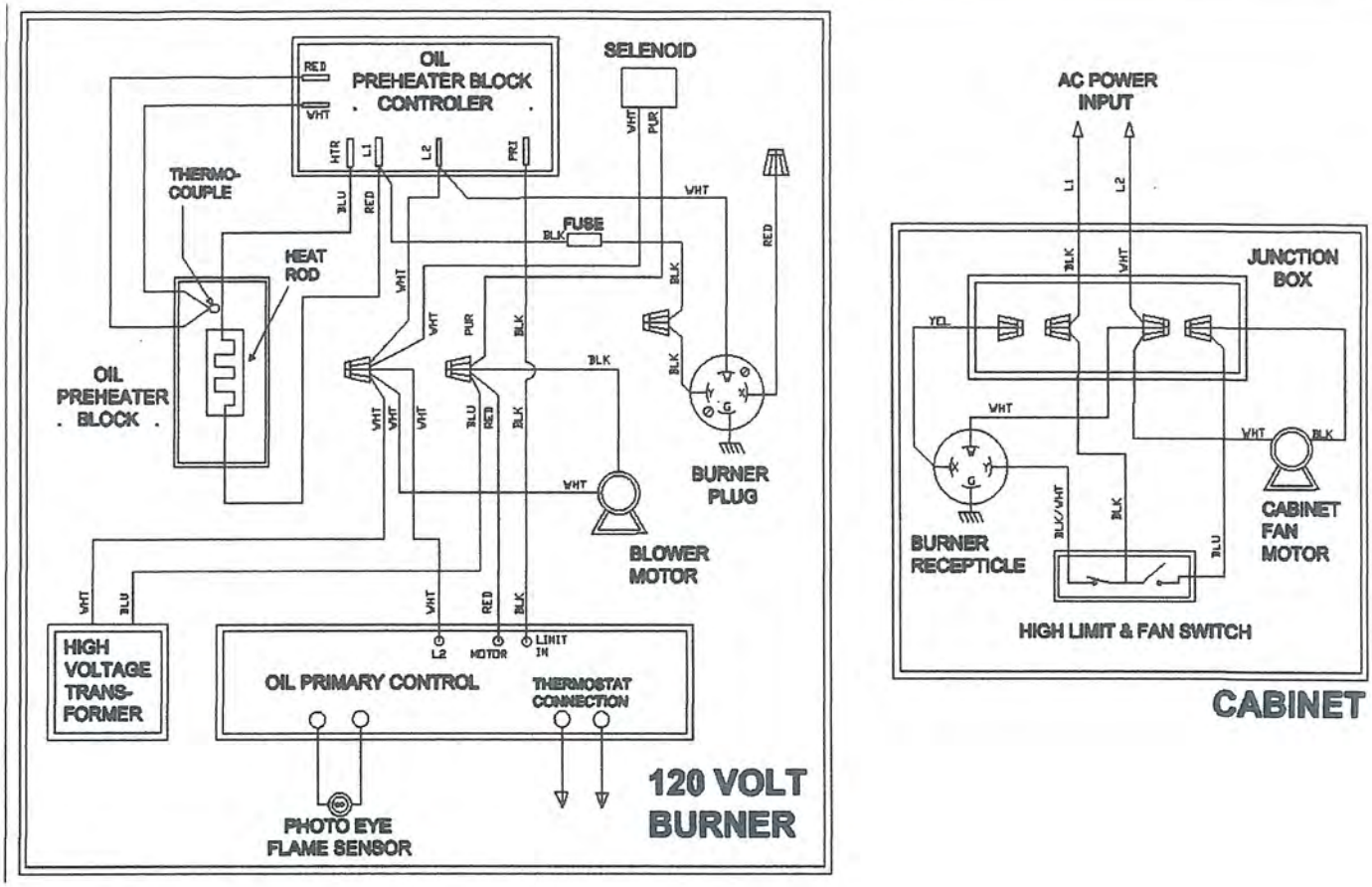


Figure 2 - Wiring Diagram

1. Wire 120V into main electrical box mounted on burner backside of heater cabinet with separate circuit **20-amp protection using 12-gauge wire.** Connect power line to black wire and all whites (NEUTRAL or COMMON) together. **IMPORTANT**, Connect ground wire to ground mounting point in main junction box (green screw).
2. Wire low voltage thermostat into "T" marked terminals on oil primary control on burner (Box on burner gun assembly with red reset button - figure 3).

Oil Burner

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment - ANSI/NFPA 31 - 1987, and National Electric Code - ANSI/NFPA 70 - 1990 and the requirements of the inspection authorities having jurisdiction.

Figure 3 - Oil Burner (Back View Closed)

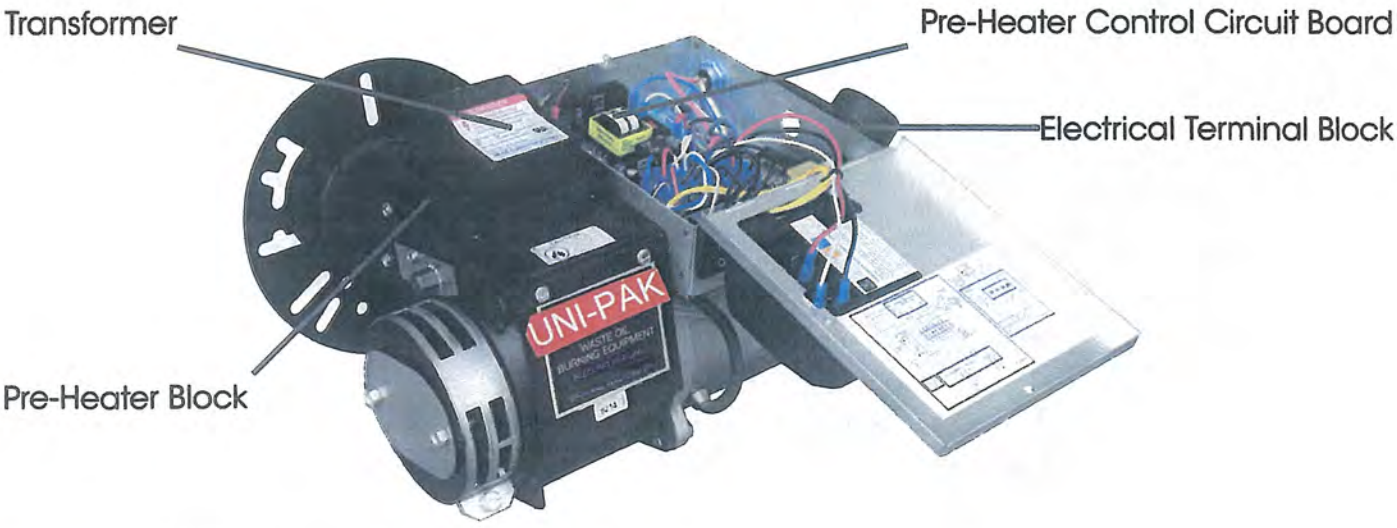


Figure 4 - Oil Burner (Back View Opened)

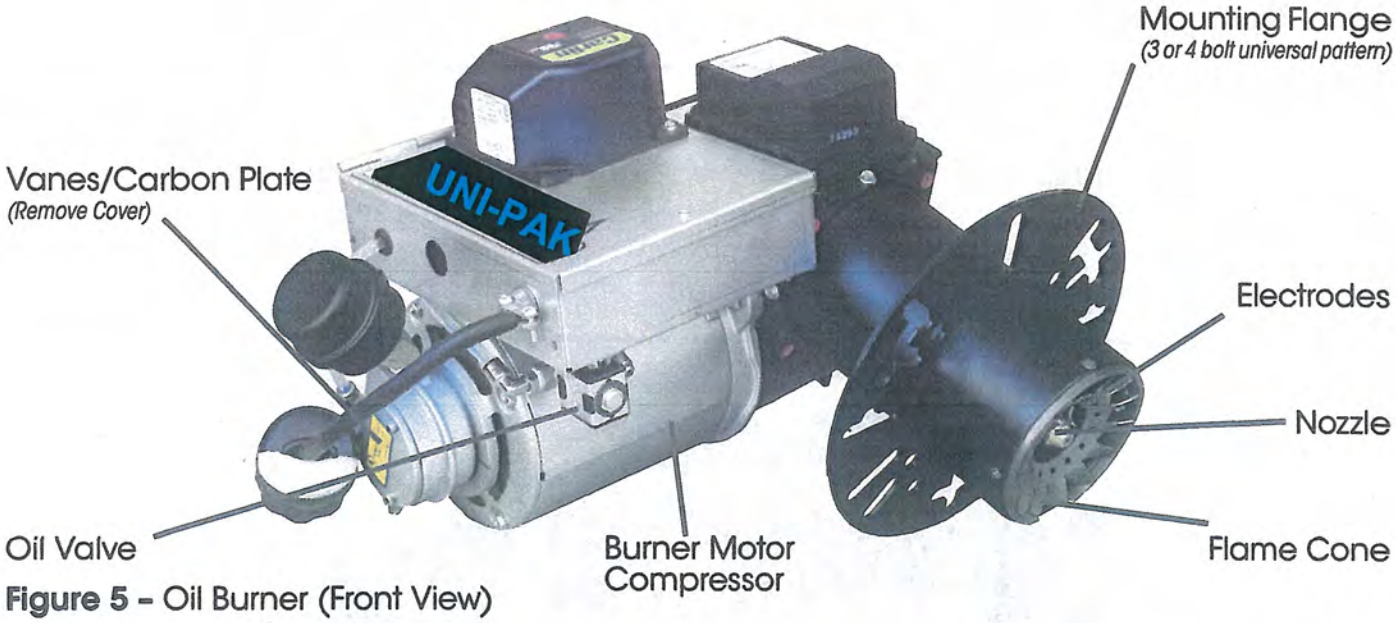


Figure 5 - Oil Burner (Front View)

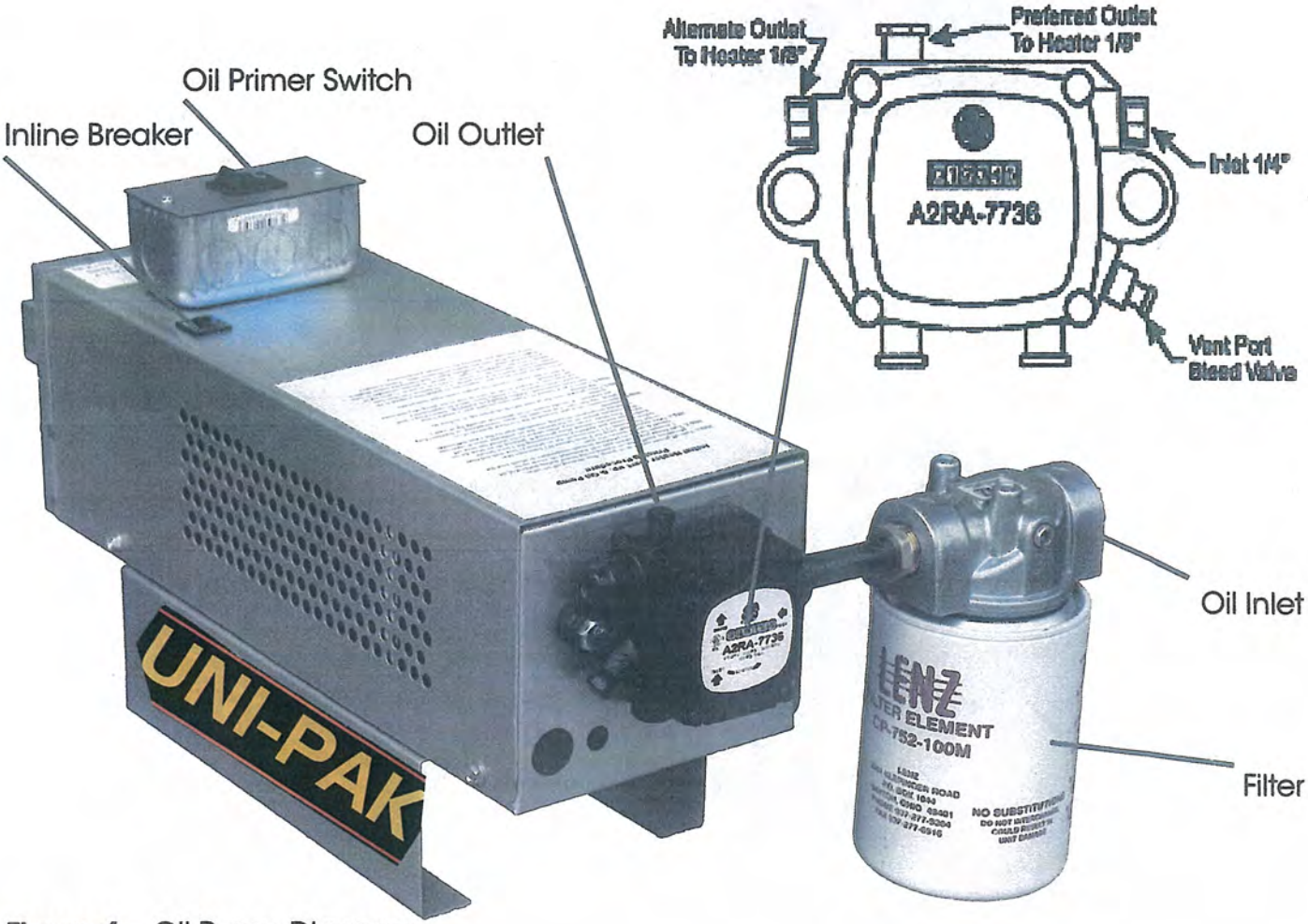


Figure 6 - Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

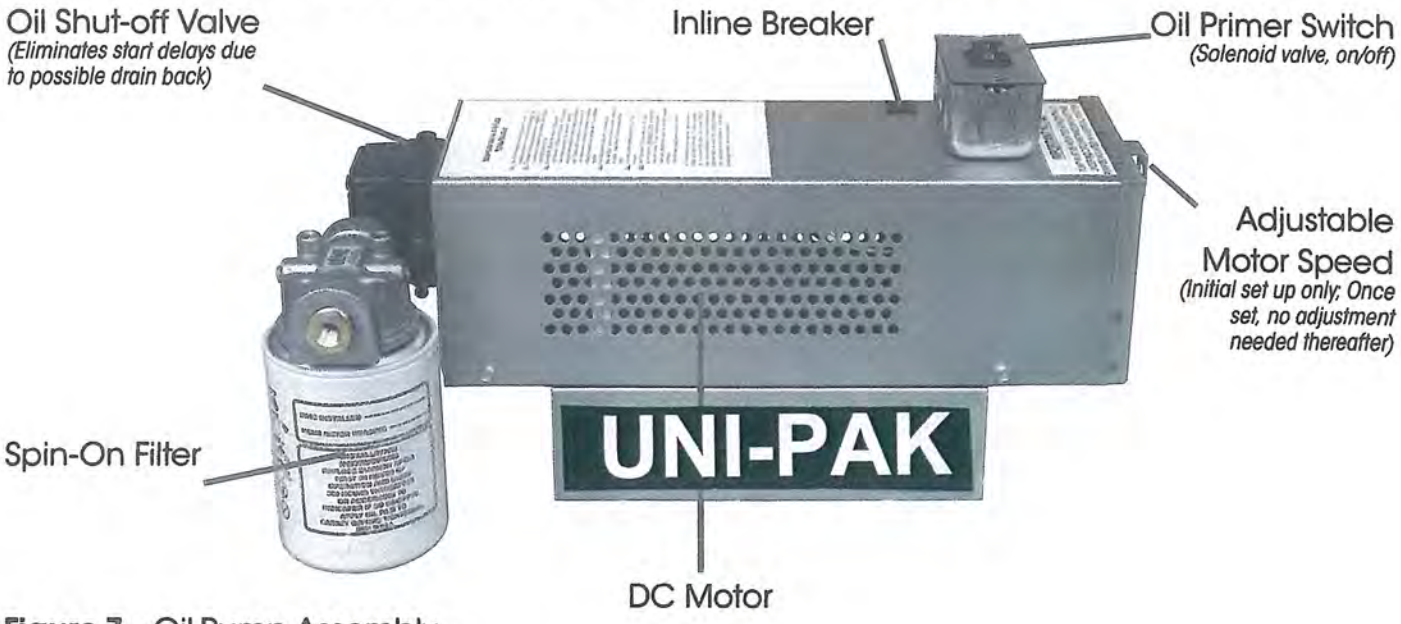
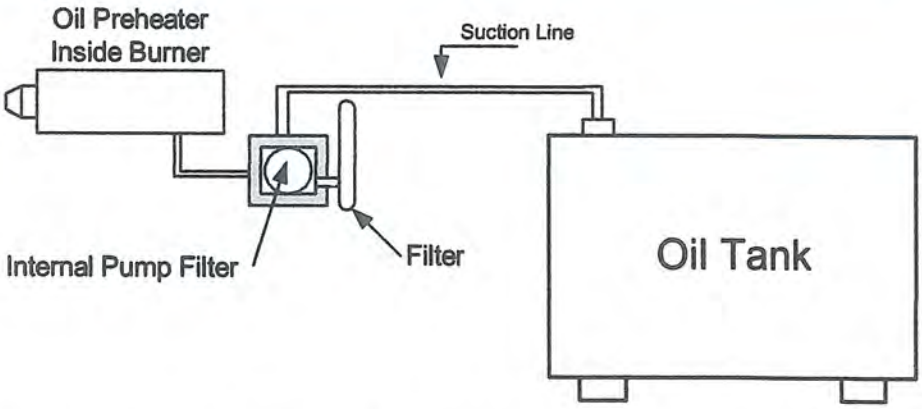


Figure 7 – Oil Pump Assembly

Oil Burner Technology

Atomization Through Low Pressure
Preheat & Air Induction At Nozzle



UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block and is pre-heated to operating thermo set-point, and this along with high pressure (100 psi to 200 psi depending on model) break up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 3) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 9) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 5) Senses flame in combustion chamber and signals oil primary when no flame is present (located under hinged transformer).
- **Igniter Springs:** (figure 5) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Pre-Heater Control Circuit Board:** (figure 9) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** (figure 9) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 9) High-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5 & 6) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 3) Motor turns the burner blower, fan and oil pump.
- **Gallons per Hour (GPH)**: Determined by pump pressure and nozzle profile size, varying by model/unit size.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Initial Start Procedure

1. **IMPORTANT** – Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory **for help if needed.**
3. Switch the burner to the on position. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo setpoint, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner. Burner operated via room thermostat.
4. Jump the "T" terminals (thermostat terminals) on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary, not before burner tries to run or operate. This will allow the burner to run during the pump priming process – **don't forget to remove jumpers when primed.**
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 4). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove the temporary jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Pre-set at factory combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from establishing.

Inspect flame length through inspection door located above burner gun assembly. Flame should reach **no further than ½ to ¾ way down combustion tube. NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START IS PRESENT.**

Suggested Maintenance Schedule

Every application varies. Monitor your needed schedules.

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Filter screen located in the pancake style housing (figure 12 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Remove one (1) x 9/16 nut from the burner side of the cabinet to swing the burner away from the unit to easily access and clean the nozzle and flame-cone. (figure 6 below).
- Open the bolt on door on clean-out sides of the furnace. The bolt-on door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepa filter recommended) (figure 10 below).
- Check Suntec pump filter. Remove pump cover for access (figure 11 below). **CAUTION:** Be careful of gasket; clean if needed.

YEARLY

- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 8 below). Due to erosion, adjustment may change.
- Replace nozzle as needed when flame deteriorates with no retention at flame cone, depending on usage (figures 6, 7, 8 and 9 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 6 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner securing nuts, remove the burner side clean-out door. Remove nozzle with 5/8" socket (figures 6 and 7 below).

ELECTRODE ADJUSTMENTS

Electrodes are adjusted at time of manufacture. However, they should be check periodically and at time of installation, to be sure they are set as noted in the following dimensional drawing. Swing burner clean out door back for inspection (figures 8 and 10 below). **CAUTION: TURN OFF MAIN ELECTRIC SUPPLY SWITCH BEFORE CHECKING OR ADJUSTING ELECTRODE SETTING.**

NOZZLE POSITION IN RELATION TO ENDCONE/BURNER TUBE

Tip of nozzle must be ¼" ahead of inside radius of end-cone. If nozzle is behind inside radius of end-cone, coking will occur and end cone can become clogged (figure 8 below).

IMPORTANT NOTE: be sure nozzle is centered, if nozzle is higher than center, press nozzle down to bottom out pre-heater stand.

To adjust, remove burner from cabinet (figure 6 below), loosen Preheat Sink securing nut and set screw, push fore or aft as needed. **WARNING:** This adjustment is done at the factory and should not be moved unless figure 8 dimensions have been altered.

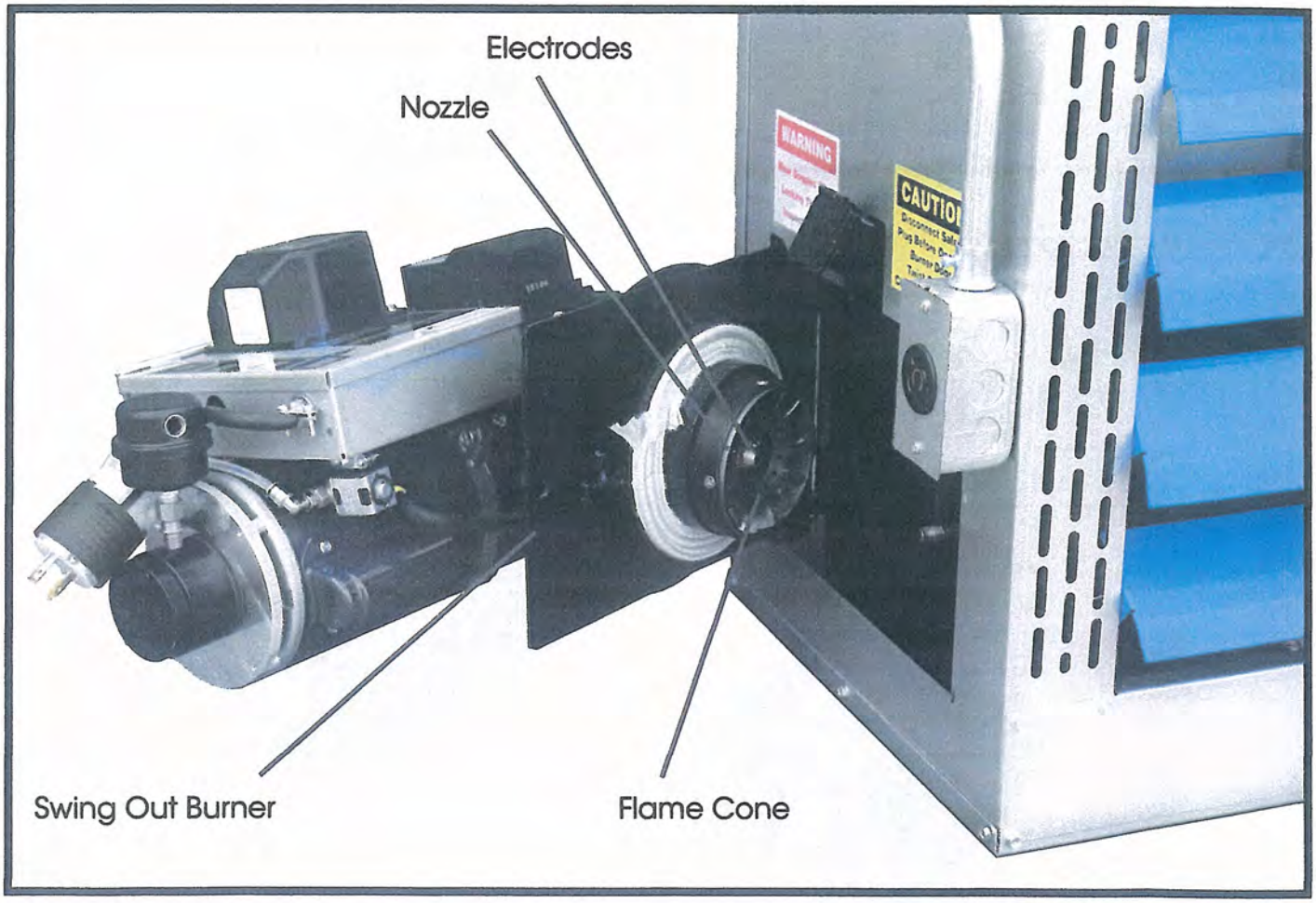
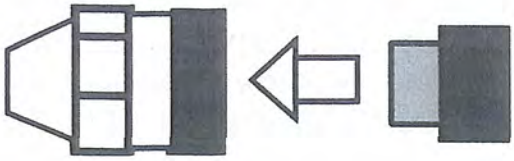


Figure 8 - Burner Door View



When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 9 - Nozzle Assembly Detail

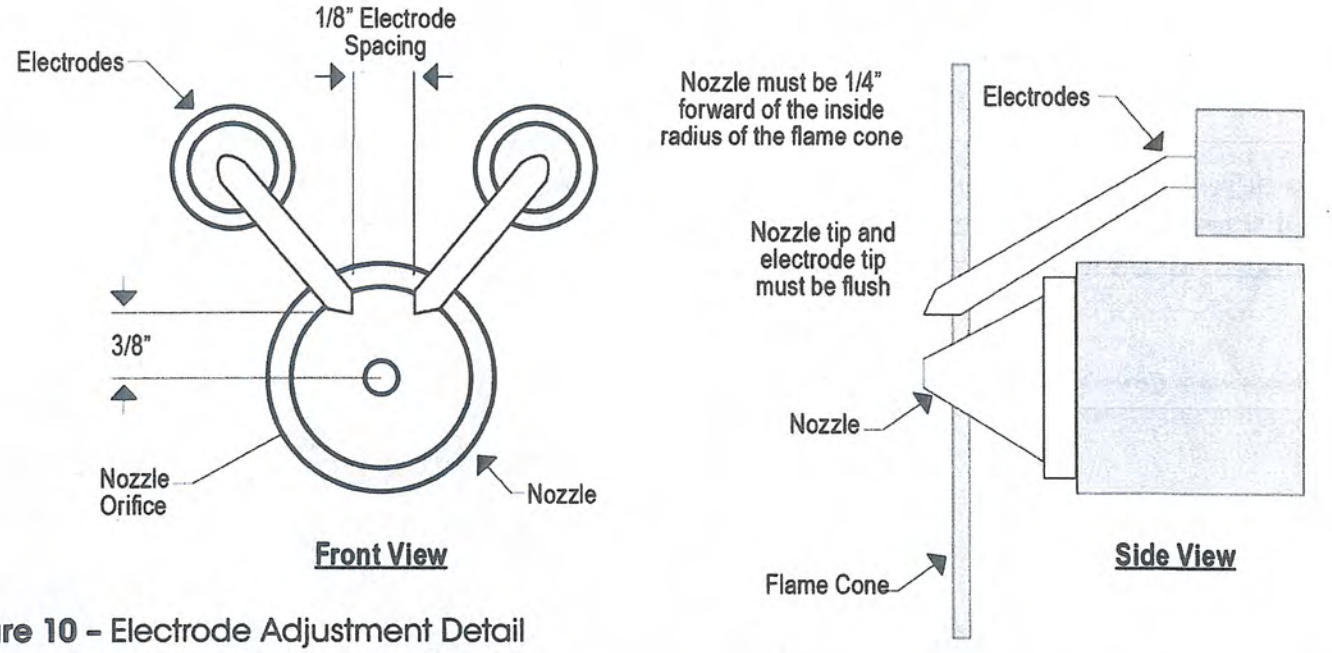


Figure 10 - Electrode Adjustment Detail

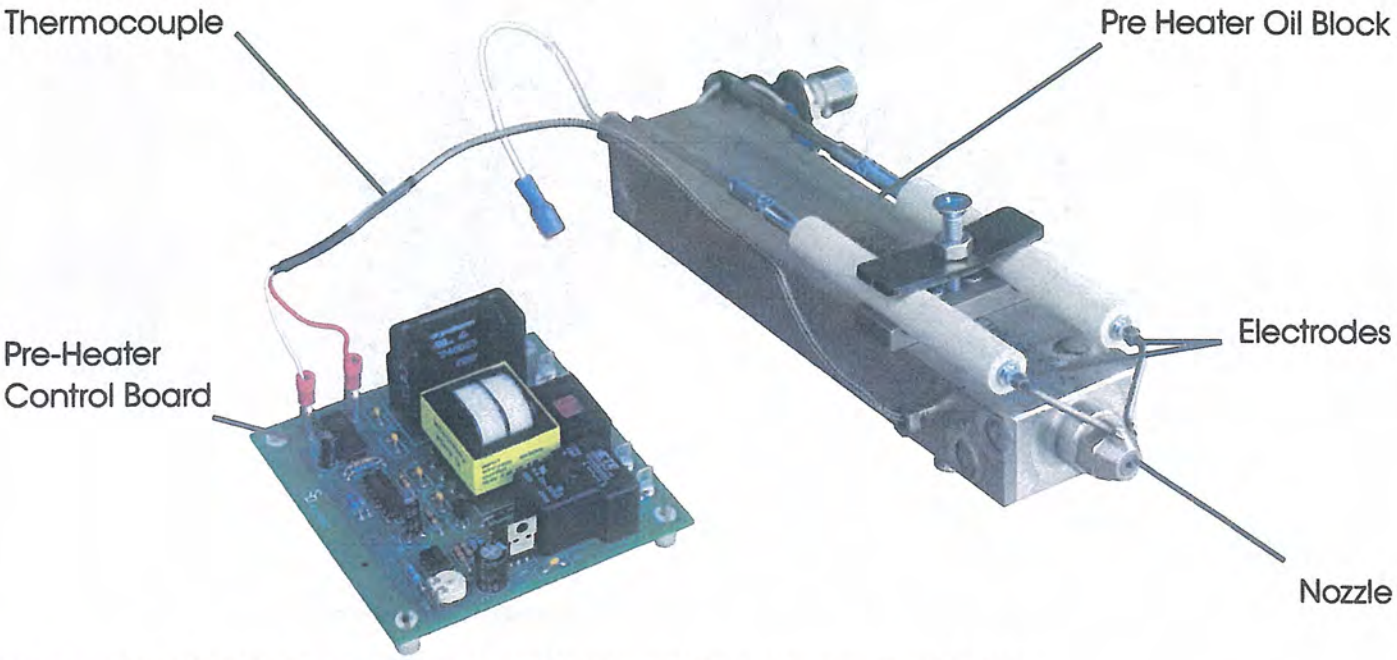


Figure 11 - Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 12 - Pump Strainer

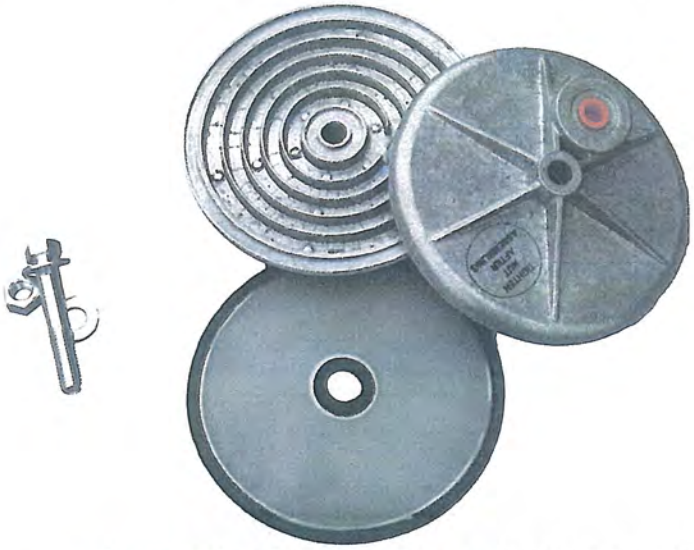


Figure 13 - Oil Filter (Pancake Style Filter)

Troubleshooting

♦Most Likely •Less Likely ♣Least Likely

Symptom	Cause	Remedy
1. Heater shuts off	♦ Manual reset	♦ Requiring manual restart by reset button on.
2. Loss of prime overnight Won't hold vacuum IS TANK EMPTY?	♦ Vacuum air leak in fuel line	♦ Check all fuel connections. Tighten fittings.
	♣ Plugged pump screen	♣ Check pump screen, may need cleaning-to access, remove pump cover
	• Plugged filter or tank oil empty	• Clean filter. Using vent port, reprime pump (Figures 6 & 7).
3. Fails to start.	♦ Vacuum Leak	♦ Open bleeder port if air present. Check and tighten fittings.
	♦ Inadequate Fuel Supply	♦ Clean filter. Check all fuel connections. Tighten fittings.
	• No Pressure	• Check, may need cleaning—to access, remove pump cover.
		• Using vent port, reprime pump (Figures 6 & 7).
	• No Pre-heat	• Be sure all wiring to pre-heater is tight-no loose connections.
		• Bad firerod – replace; continuity at terminals.
	• Auto start circuit not functioning	• Check circuit control board and replace if necessary (call factory).
		• Check continuity at terminals of firerod limit snap switch. Replace if needed.
	• No Arc	• Check springs to electrode rod adjustment (under transformer) make sure they make good contact. Open burner door and make sure electrode tips aren't touching flame cone or one another. Readjust.
4. Hard starting diminished	♦ Partially plugged filter.	♦ Clean filter. Using vent bleeder port on pump, re-prime pump (See Figure 6 & 7) flame.
	♣ Out of fuel	♣ Refill Storage.
	♣ No oil to burner	♣ Check pump screen – remove pump cover; clean if needed. Using vent bleeder port, re-prime pump. (Figures 6 & 7)
	• Inadequate combustion air from burner	• Remove nozzle and check for foreign objects. (Figures 9 & 10)
		• Aluminum Block Pre-heater inside burner may not build up carbon. If carbon is present, thermocouple heat sensor wire could have open circuit. Heat control board may have blown circuit and circuit board fuse. Inspect both and replace either if needed (Figure 10). Back draft in combustion chamber may be present. Check draft up flue pipe & over fire at vision port.
	• Air band open too far	• Close air band—while viewing flame; open air band slowly until combustion chamber is clear, not orange.
5. Heater cycles frequently, without thermostat temperature setting being achieved in area to be heated.	♦ Heater over firing, Inadequate combustion air from burner	♦ Investigate and locate reason for over firing. Check and clean end cone turbulator if needed.
	♣ Temperature setting wrong On high limit fan safety switch	♣ Check temperature setting and adjust as necessary.
	• High limit safety switch bad	• Replace high limit fan safety switch.
6. Heater rumbles and excessive heat blow back from flame vision port.	♦Pump setting wrong	♣ Clean ash buildup in combustion chamber, exchange and vent flue pipe.
	♣ Draft incorrect. If proper draft can't be achieved, consider any exhaust fans in building if added since initial install.	♣ Set draft. Clean out combustion chamber and exchangers of ash. Check draft-reset if needed.
7. Heater establishes flame but locks out or shuts off. Need to reset primary.	♦ Photo eye cant see flame.	♦ Clean photo eye which is clouded by back draft smoke.
	♣ Due to back draft. Flame end cone may have ash.	♣ Swing open burner door and clean ash build up from flame end cone. (See Figure 5 & 8).
	• Bad or uncontrolled flame due to nozzle erosion	• Replace nozzle
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present.	♦ May need to install power vent/draft inducer's in stack. (See Figure 2 for wiring).
	♣ Excessive ash buildup/Heater	♣ Clean ash and soot from combustion chamber and heat exchangers.
9. Poor or reduced heat production.	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris.
	♣ Entire fuel supply may be plugged.	♣ Clean filter both, oil strainer and check oil pump screen.
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers.
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled.	

Troubleshooting Continued

Symptom	Cause	Remedy
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present	♦ May need to install power vent/draft inducers in stack (see figure 2 for wiring)
	♣ Excessive ash buildup	♣ Clean ash and soot from combustion chamber and heat exchangers
9. Poor or reduced heat production	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris
	♣ Entire fuel supply may be plugged	♣ Clean filter, both oil strainer and check oil pump screen
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled	

OWH-75 Ten (15) Year Limited Warranty

UNI-PAK (manufacturer) warrants to the purchaser of Unit Heaters listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Combustion chamber and heat exchanger ten (15) years limited, full repair or replacement (parts only), first three (3) fullly covered / last seven (7) 50% coverage
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

WH-75 (15) Year Limited Warranty Cont.

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- Unit heater is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

NOTE: Combustion Chamber Warranty is specific to material and workmanship. Workmanship means UNI-PAK warranties the welds are good and will hold. Material means they will not corrode through due to sulfur in the ash that accumulates during operation. Warranty does not apply to units that experience overheating stress cracks. These are not incurred because the materials are inadequate for the application nor are they results of a weld breaking lose because of bad penetration, which is easily recognized by the metal left beneath the weld. These cracks occur as a direct result of (1) improper draft, either by inadequate initial installation and setup, which requires (a) establishing a proper draft during installation (b) back draft has occurred due to ash buildup, backing up hot gas passageways in either the exchangers, the stack, or both. (2) Over firing by setting oil supply pressure too high (see manual for proper setting) these are all cases of thermal overload.

*Under normal use only. If misuse or abuse is deemed apparent after inspection, warranty is void.

Warranty Card

Please fill out, tear off and return to manufacturer within sixty (60) days of purchase, or warranty will not be valid. Please print or type.

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Heater

Installation, operation and service instructions

AWH/DWH-150 120v Manual

UNI-PAK• Rev 01/2017

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PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture.** UNI-PAK burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired heaters. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This heater was designed to be a primary or auxiliary heat source, but not the only source of heat. And provide economical disposal of waste oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the heater, the main heating system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT

Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in a UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the heater 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 passage. 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 UNI-PAK heater.

Specifications

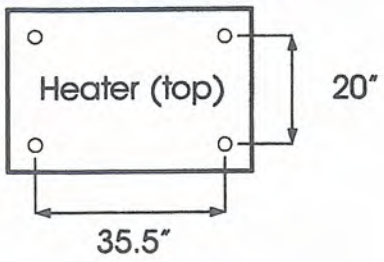
BTU INPUT:	150,000
BTU OUTPUT:	120,000
GALLONS PER HOUR:	1
REQUIRED VOLTS:	115
AMPs FULL LOAD:	14.6
FAN MOTOR HP:	1/4
FAN MOTOR RPM:	1075
CFM (FREE AIR):	3762
CFM w/ DUCTWORK @ 100 ft.:	1380
EFFECTIVE AIR FLOW:	60 ft
FLUE SIZE:	8"
WEIGHT:	240 lbs
L x W x H (including burner):	54" x 22" x 25.5"
SHIPPING WEIGHT:	375 lbs
SHIPPING DIMENSIONS (L x W x H):	64.5" x 30" x 49"

Notes:

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. EconoHeat reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. These appliances are designed for commercial or industrial use only. Installation and use of this waste-oil burning appliance shall be in accordance with the Standard for the Installation of Oil Burning Equipment-ANS/NFPA 31-1987, and National Electric Code - ANSI/NFPA 70-1990 and the requirements of the inspection authorities having jurisdiction.
3. Output depends on BTU content of oil used.
4. Atomizing Air Pressure for all fuels 10 P.S.I.
5. Furnace not to be used with air filters.
6. Intended maximum outlet air temp. 200 degrees F. (93 degrees C) or less.
7. **Clearance from combustible materials on all models not to be less than:**

TOP- 18"	**BOTTOM- 18"**	**SIDES- 18"**
REAR- 18"	**FRONT- 48"**	**FLUE PIPE- 18"**

Mounting Dimensions:



Wiring

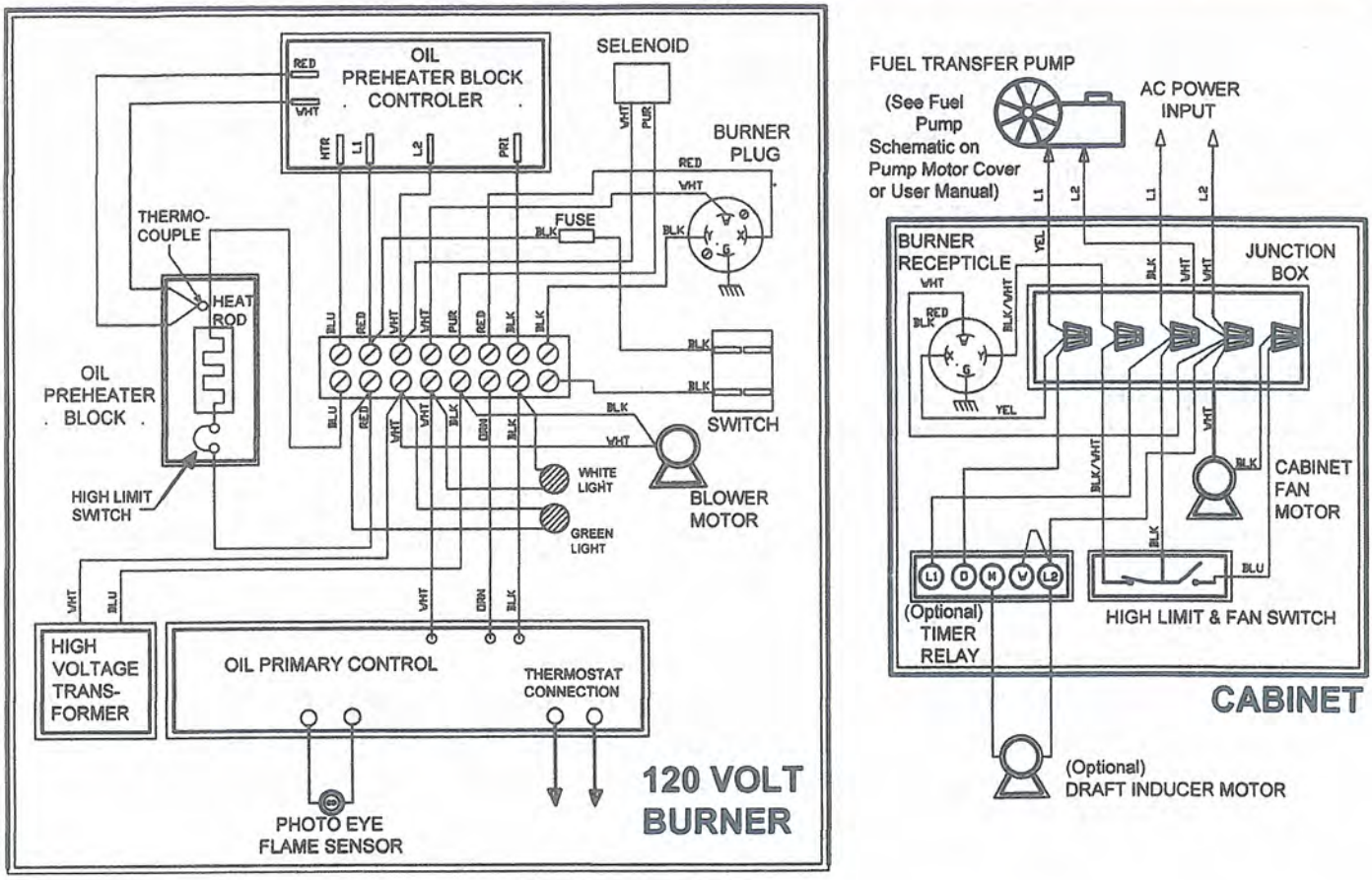


Figure 2 – Wiring Diagram

1. Wire 120V into main electrical box mounted on burner backside of heater cabinet with separate circuit **20-amp protection using 12-gauge wire.** Connect power line to black wire and all whites (NEUTRAL or COMMON) together. **IMPORTANT**, Connect ground wire to ground mounting point in main junction box (green screw).
2. Connect wires from main junction box to remote oil pump power, yellow to yellow and neutral common white to white.
3. Wire low voltage thermostat into "T" marked terminals on oil primary control on burner (Box on burner gun assembly with red reset button – figure 3).

Ducting

All unit heaters are designed with a condenser-type pressure propeller fan for air deliver, and have been successfully field ducted (see specifications). Call factory for further assistance if needed.

Oil Burner

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment - ANSI/NFPA 31 - 1987, and National Electric Code - ANSI/NFPA 70 - 1990 and the requirements of the inspection authorities having jurisdiction.

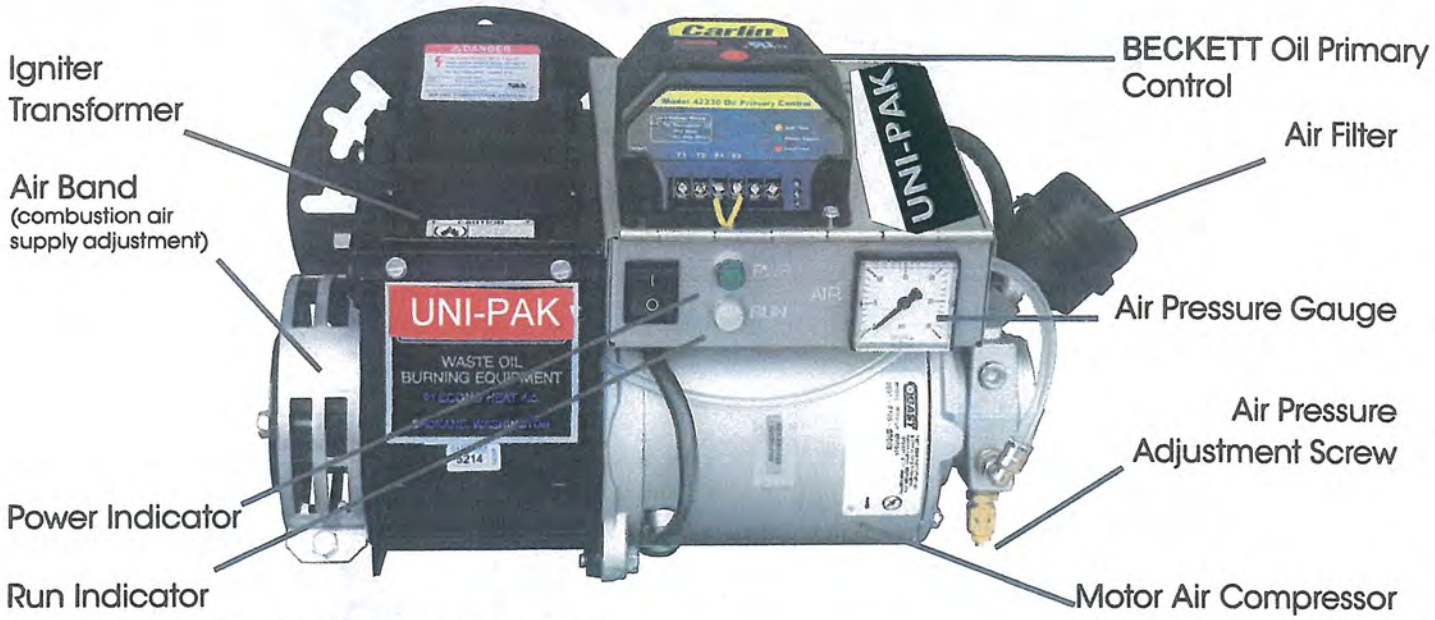


Figure 3 - Oil Burner (Back View Closed)

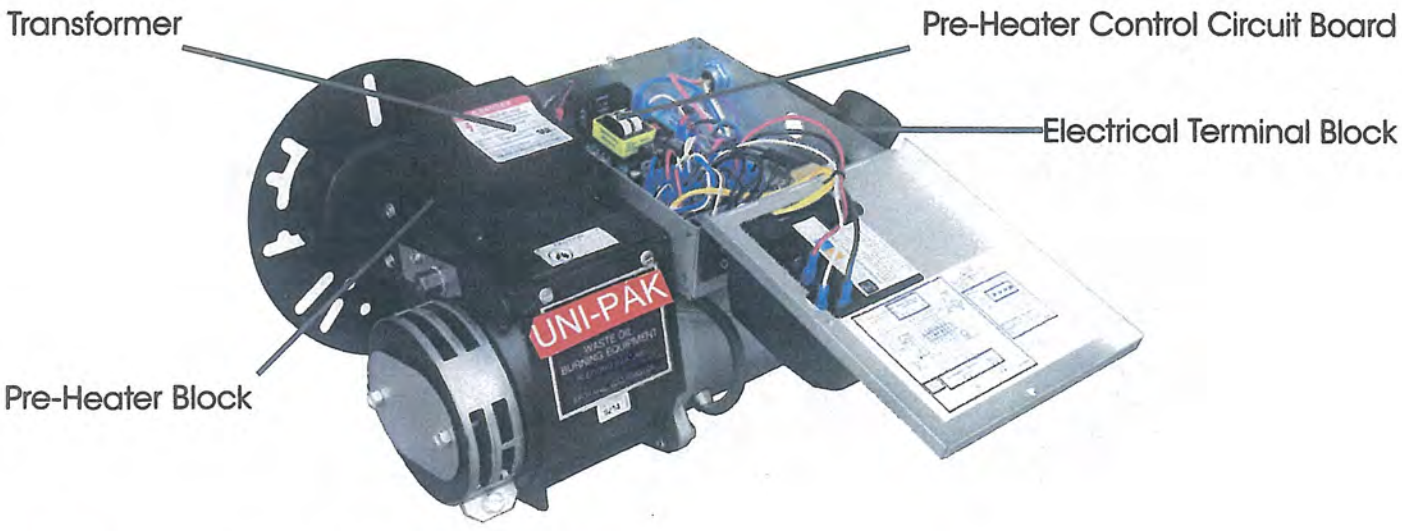


Figure 4 - Oil Burner (Back View Opened)

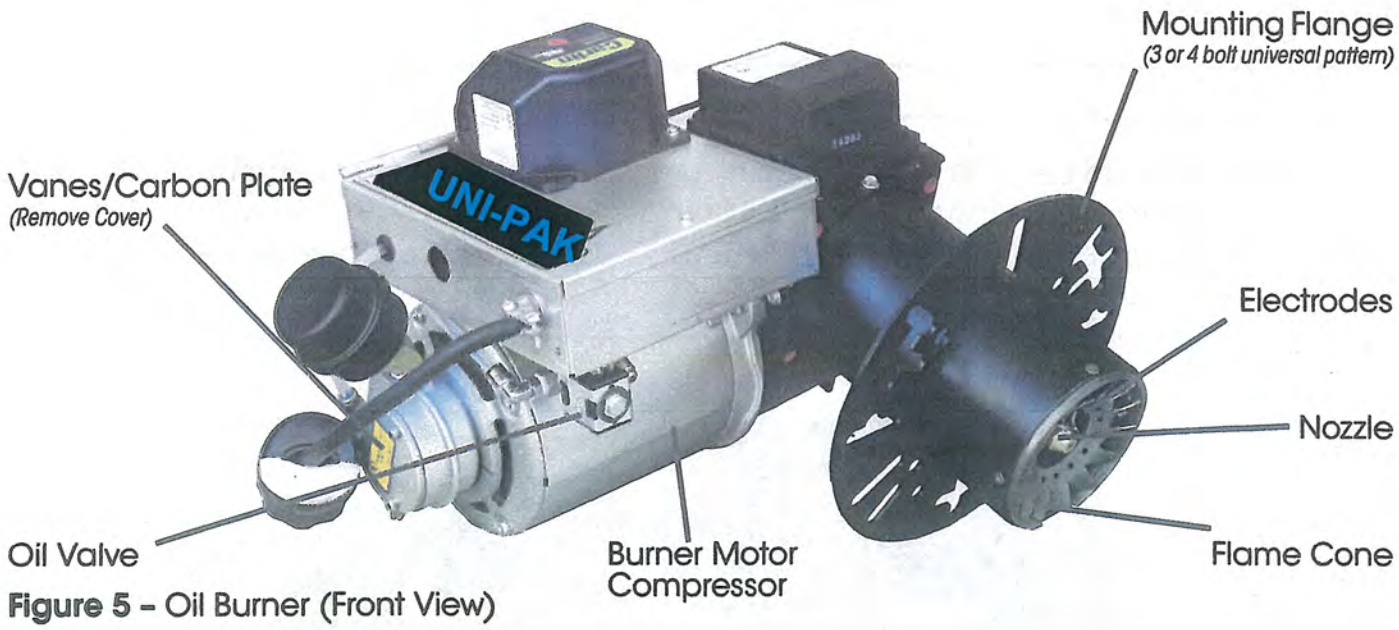


Figure 5 – Oil Burner (Front View)

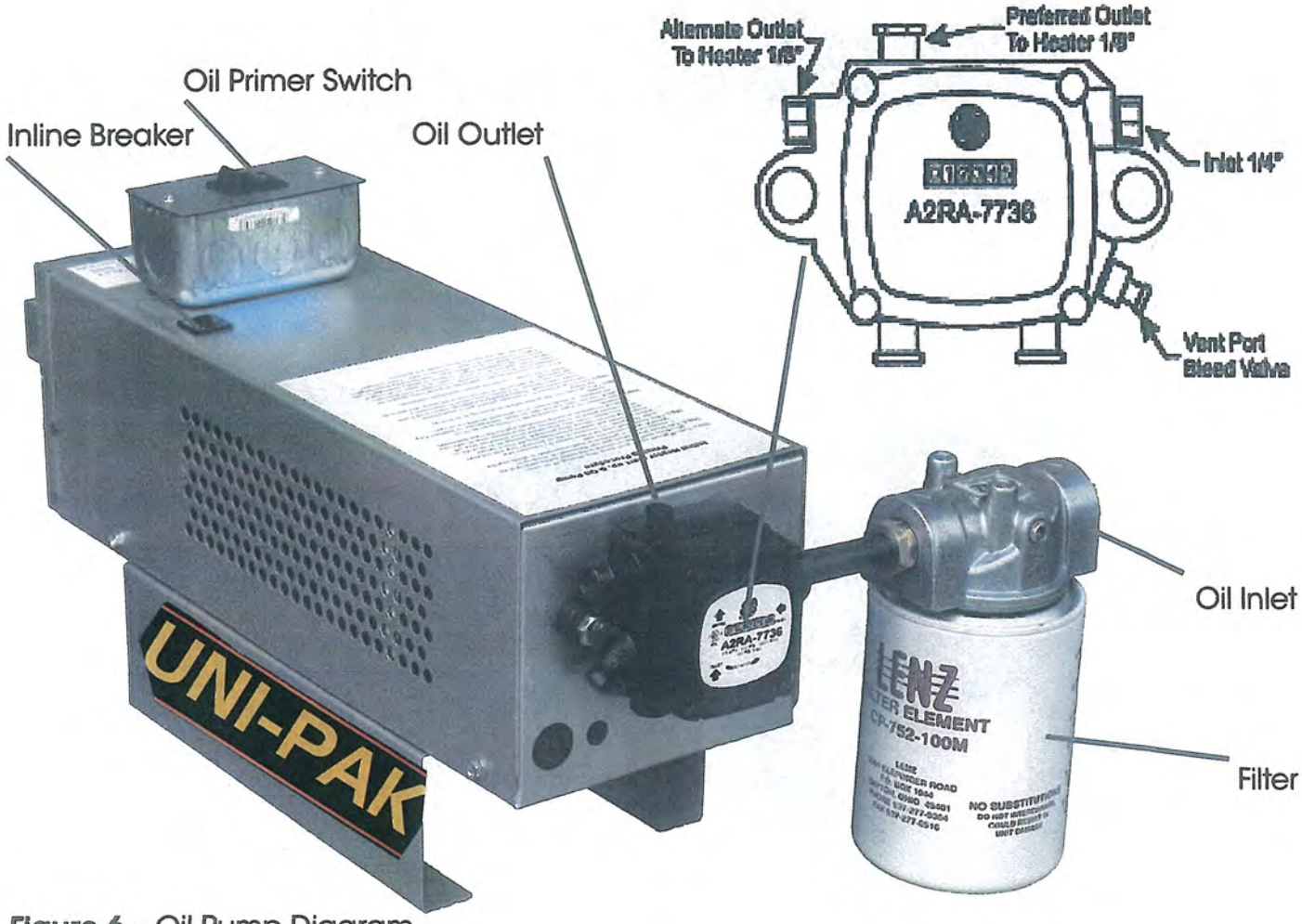
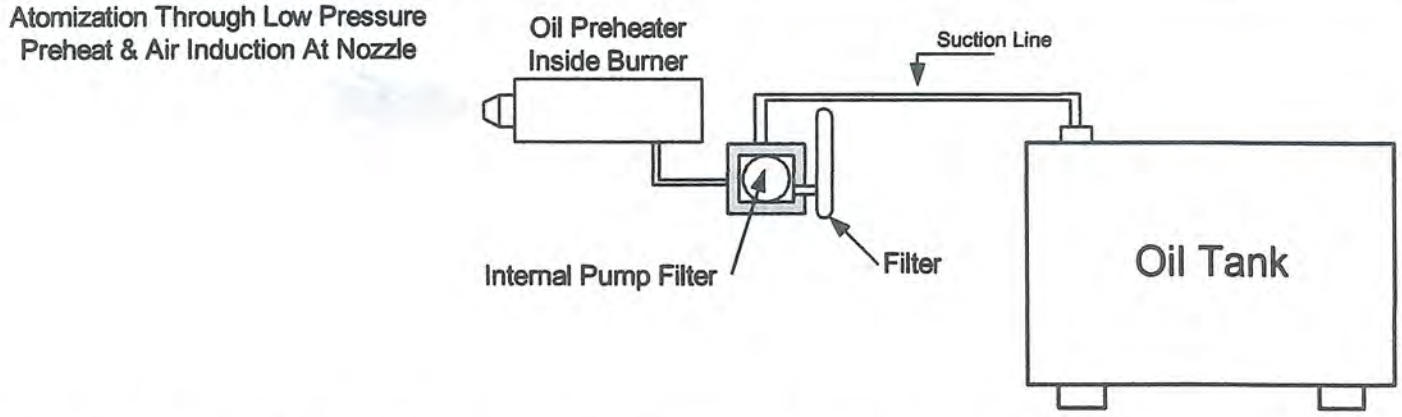


Figure 6 – Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

Figure 7 – Oil Pump Assembly

Oil Burner Technology



UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block and is pre-heated to operating thermo set-point, and this along with high pressure (100 psi to 200 psi depending on model) break up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 3) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 9) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 5) Senses flame in combustion chamber and signals oil primary when no flame is present (located under hinged transformer).
- **Igniter Springs:** (figure 5) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Pre-Heater Control Circuit Board:** (figure 9) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** (figure 9) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 9) High-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5 & 6) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 3) Motor turns the burner blower, fan and oil pump.
- **Gallons per Hour (GPH)**: Determined by pump pressure and nozzle profile size, varying by model/unit size.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Initial Start Procedure

1. **IMPORTANT** – Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory **for help if needed.**
3. Switch the burner to the on position. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo setpoint, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner. Burner operated via room thermostat.
4. Jump the "T" terminals (thermostat terminals) on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary, not before burner tries to run or operate. This will allow the burner to run during the pump priming process – **don't forget to remove jumpers when primed.**
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 4). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove the temporary jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Pre-set at factory combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from establishing.

Inspect flame length through inspection door located above burner gun assembly. Flame should reach **no further than ½ to ¾ way down combustion tube. NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START IS PRESENT.**

Suggested Maintenance Schedule

Every application varies. Monitor your needed schedules.

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Filter screen located in the pancake style housing (figure 12 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Remove one (1) x 9/16 nut from the burner side of the cabinet to swing the burner away from the unit to easily access and clean the nozzle and flame-cone. (figure 6 below).
- Open the bolt on door on clean-out sides of the furnace. The bolt-on door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepa filter recommended) (figure 10 below).
- Check Suntec pump filter. Remove pump cover for access (figure 11 below). **CAUTION:** Be careful of gasket; clean if needed.

YEARLY

- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 8 below). Due to erosion, adjustment may change.
- Replace nozzle as needed when flame deteriorates with no retention at flame cone, depending on usage (figures 6, 7, 8 and 9 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 6 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner securing nuts, remove the burner side clean-out door. Remove nozzle with 5/8" socket (figures 6 and 7 below).

ELECTRODE ADJUSTMENTS

Electrodes are adjusted at time of manufacture. However, they should be check periodically and at time of installation, to be sure they are set as noted in the following dimensional drawing. Swing burner clean out door back for inspection (figures 8 and 10 below). **CAUTION: TURN OFF MAIN ELECTRIC SUPPLY SWITCH BEFORE CHECKING OR ADJUSTING ELECTRODE SETTING.**

NOZZLE POSITION IN RELATION TO ENDCONE/BURNER TUBE

Tip of nozzle must be ¼" ahead of inside radius of end-cone. If nozzle is behind inside radius of end-cone, coking will occur and end cone can become clogged (figure 8 below).

IMPORTANT NOTE: be sure nozzle is centered, if nozzle is higher than center, press nozzle down to bottom out pre-heater stand.

To adjust, remove burner from cabinet (figure 6 below), loosen Preheat Sink securing nut and set screw, push fore or aft as needed. **WARNING:** This adjustment is done at the factory and should not be moved unless figure 8 dimensions have been altered.

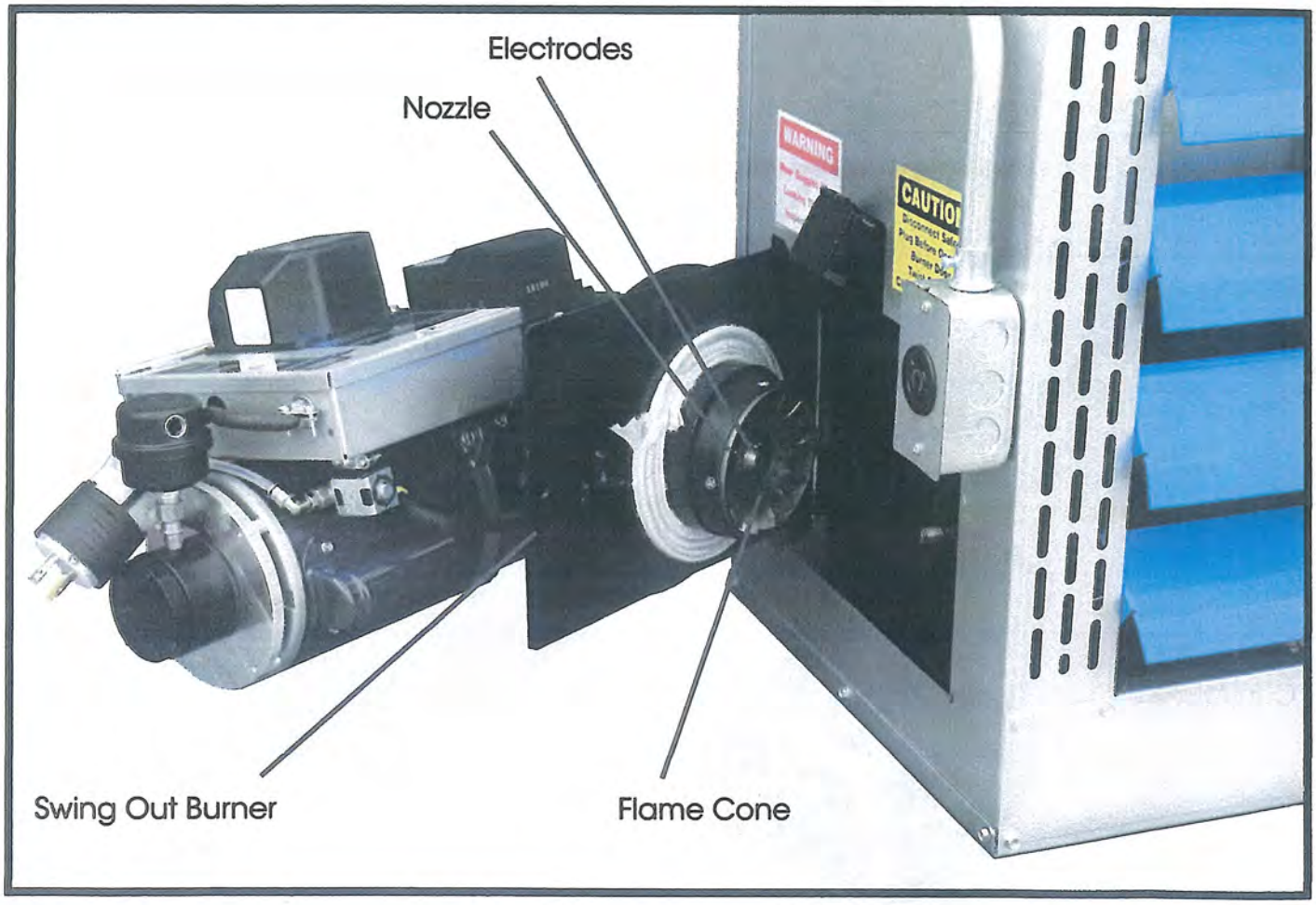
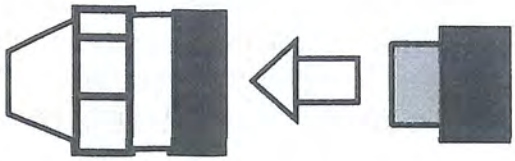
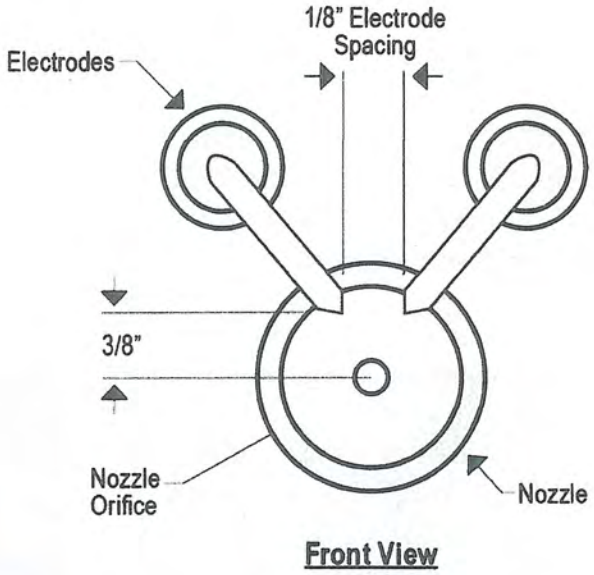


Figure 8 – Burner Door View



When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 9 - Nozzle Assembly Detail



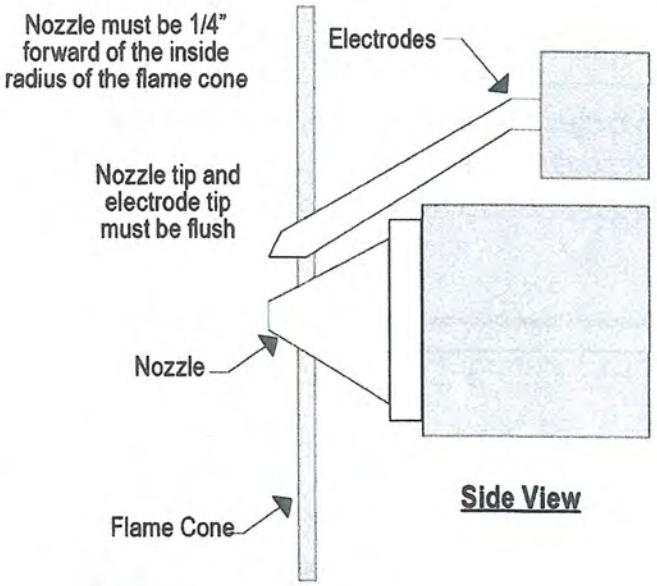


Figure 10 - Electrode Adjustment Detail

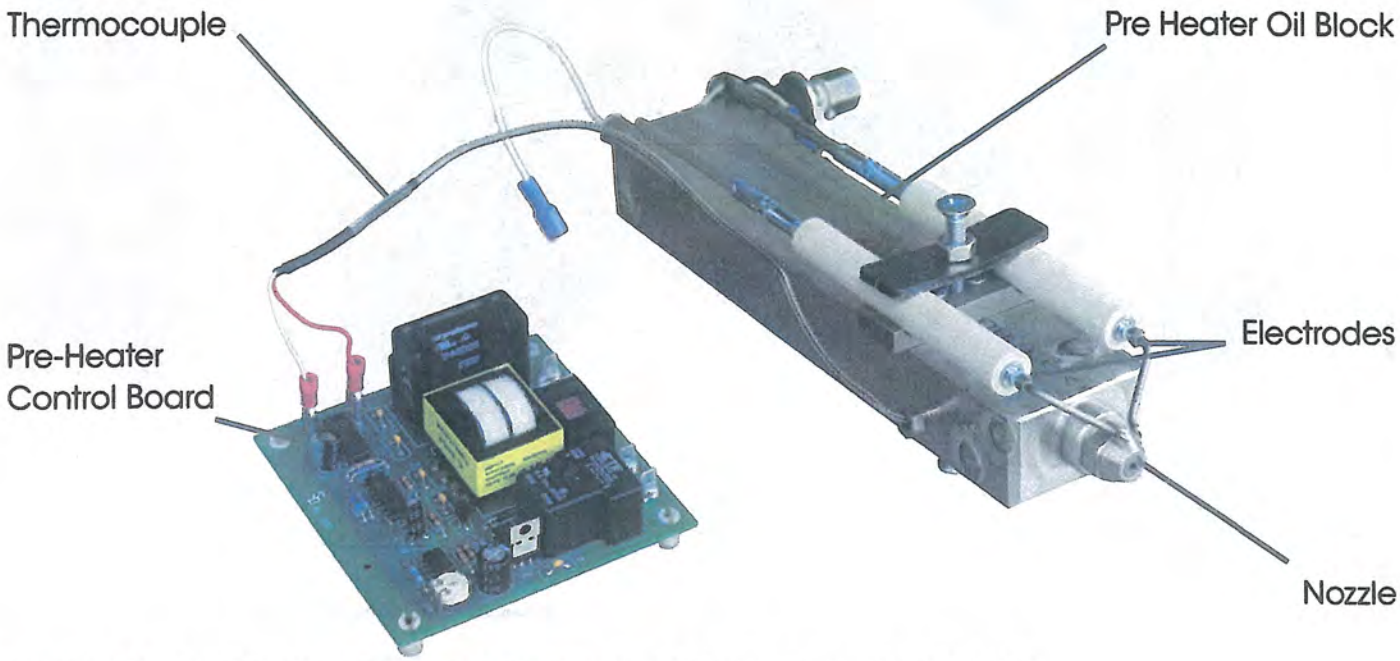


Figure 11 - Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 12 – Pump Strainer

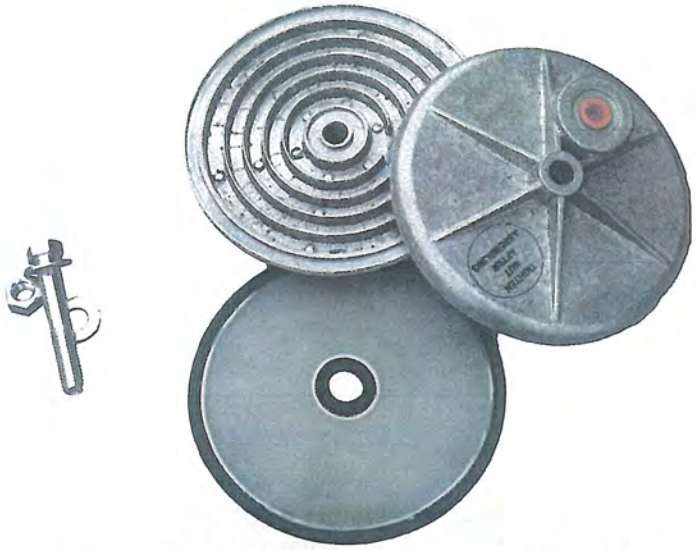


Figure 13 – Oil Filter (Pancake Style Filter)

Troubleshooting

♦Most Likely •Less Likely ♣Least Likely

Symptom	Cause	Remedy
1. Heater shuts off	♦ Manual reset	♦ Requiring manual restart by reset button on.
2. Loss of prime overnight	♦ Vacuum air leak in fuel line	♦ Check all fuel connections. Tighten fittings.
Won't hold vacuum	♣ Plugged pump screen	♣ Check pump screen, may need cleaning-to access, remove pump cover
IS TANK EMPTY?	• Plugged filter or tank oil empty	• Clean filter. Using vent port, reprime pump (Figures 6 & 7).
3. Fails to start.	♦ Vacuum Leak	♦ Open bleeder port if air present. Check and tighten fittings.
	♦ Inadequate Fuel Supply	♦ Clean filter. Check all fuel connections. Tighten fittings.
	• No Pressure	• Check, may need cleaning—to access, remove pump cover.
		• Using vent port, reprime pump (Figures 6 & 7).
	• No Pre-heat	• Be sure all wiring to pre-heater is tight-no loose connections.
		• Bad firerod – replace; continuity at terminals.
	• Auto start circuit not functioning	• Check circuit control board and replace if necessary (call factory).
		• Check continuity at terminals of firerod limit snap switch. Replace if needed.
	• No Arc	• Check springs to electrode rod adjustment (under transformer) make sure they make good contact. Open burner door and make sure electrode tips aren't touching flame cone or one another. Readjust.
4. Hard starting diminished	♦ Partially plugged filter.	♦ Clean filter. Using vent bleeder port on pump, re-prime pump (See Figure 6 & 7) flame.
	♣ Out of fuel	♣ Refill Storage.
	♣ No oil to burner	♣ Check pump screen – remove pump cover; clean if needed. Using vent bleeder port, re-prime pump. (Figures 6 & 7)
	• Inadequate combustion air from burner	• Remove nozzle and check for foreign objects. (Figures 9 & 10)
		• Aluminum Block Pre-heater inside burner may not build up carbon. If carbon is present, thermocouple heat sensor wire could have open circuit. Heat control board may have blown circuit and circuit board fuse. Inspect both and replace either if needed (Figure 10). Back draft in combustion chamber may be present. Check draft up flue pipe & over fire at vision port.
	• Air band open too far	• Close air band—while viewing flame; open air band slowly until combustion chamber is clear, not orange.
5. Heater cycles frequently, without thermostat temperature setting being achieved in area to be heated.	♦ Heater over firing, Inadequate combustion air from burner	♦ Investigate and locate reason for over firing. Check and clean end cone turbulator if needed.
	♣ Temperature setting wrong On high limit fan safety switch	♣ Check temperature setting and adjust as necessary.
	• High limit safety switch bad	• Replace high limit fan safety switch.
6. Heater rumbles and excessive heat blow back from flame vision port.	♦Pump setting wrong	♣ Clean ash buildup in combustion chamber, exchange and vent flue pipe.
	♣ Draft incorrect. If proper draft can't be achieved, consider any exhaust fans in building if added since initial install.	♣ Set draft. Clean out combustion chamber and exchangers of ash. Check draft-reset if needed.
7. Heater establishes flame but locks out or shuts off. Need to reset primary.	♦ Photo eye cant see flame.	♦ Clean photo eye which is clouded by back draft smoke.
	♣ Due to back draft. Flame end cone may have ash.	♣ Swing open burner door and clean ash build up from flame end cone. (See Figure 5 & 8).
	• Bad or uncontrolled flame due to nozzle erosion	• Replace nozzle
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present.	♦ May need to install power vent/draft inducer's in stack. (See Figure 2 for wiring).
	♣ Excessive ash buildup/Heater	♣ Clean ash and soot from combustion chamber and heat exchangers.
9. Poor or reduced heat production.	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris.
	♣ Entire fuel supply may be plugged.	♣ Clean filter both, oil strainer and check oil pump screen.
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers.
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled.	

Troubleshooting Continued

Symptom	Cause	Remedy
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present	♦ May need to install power vent/draft inducers in stack (see figure 2 for wiring)
	♣ Excessive ash buildup	♣ Clean ash and soot from combustion chamber and heat exchangers
9. Poor or reduced heat production	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris
	♣ Entire fuel supply may be plugged	♣ Clean filter, both oil strainer and check oil pump screen
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled	

(15) Year Limited Warranty

UNI-PAK (manufacturer) warrants to the purchaser of Unit Heaters listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Combustion chamber and heat exchanger ten (15) years limited, full repair or replacement (parts only), first three (3) fullly covered / last seven (7) 50% coverage
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

WH (15) Year Limited Warranty Cont.

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- Unit heater is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

NOTE: Combustion Chamber Warranty is specific to material and workmanship. Workmanship means UNI-PAK warranties the welds are good and will hold. Material means they will not corrode through due to sulfur in the ash that accumulates during operation. Warranty does not apply to units that experience overheating stress cracks. These are not incurred because the materials are inadequate for the application nor are they results of a weld breaking lose because of bad penetration, which is easily recognized by the metal left beneath the weld. These cracks occur as a direct result of (1) improper draft, either by inadequate initial installation and setup, which requires (a) establishing a proper draft during installation (b) back draft has occurred due to ash buildup, backing up hot gas passageways in either the exchangers, the stack, or both. (2) Over firing by setting oil supply pressure too high (see manual for proper setting) these are all cases of thermal overload.

*Under normal use only. If misuse or abuse is deemed apparent after inspection, warranty is void.

Warranty Card

Please fill out, tear off and return to manufacturer within sixty (60) days of purchase, or warranty will not be valid. Please print or type.

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

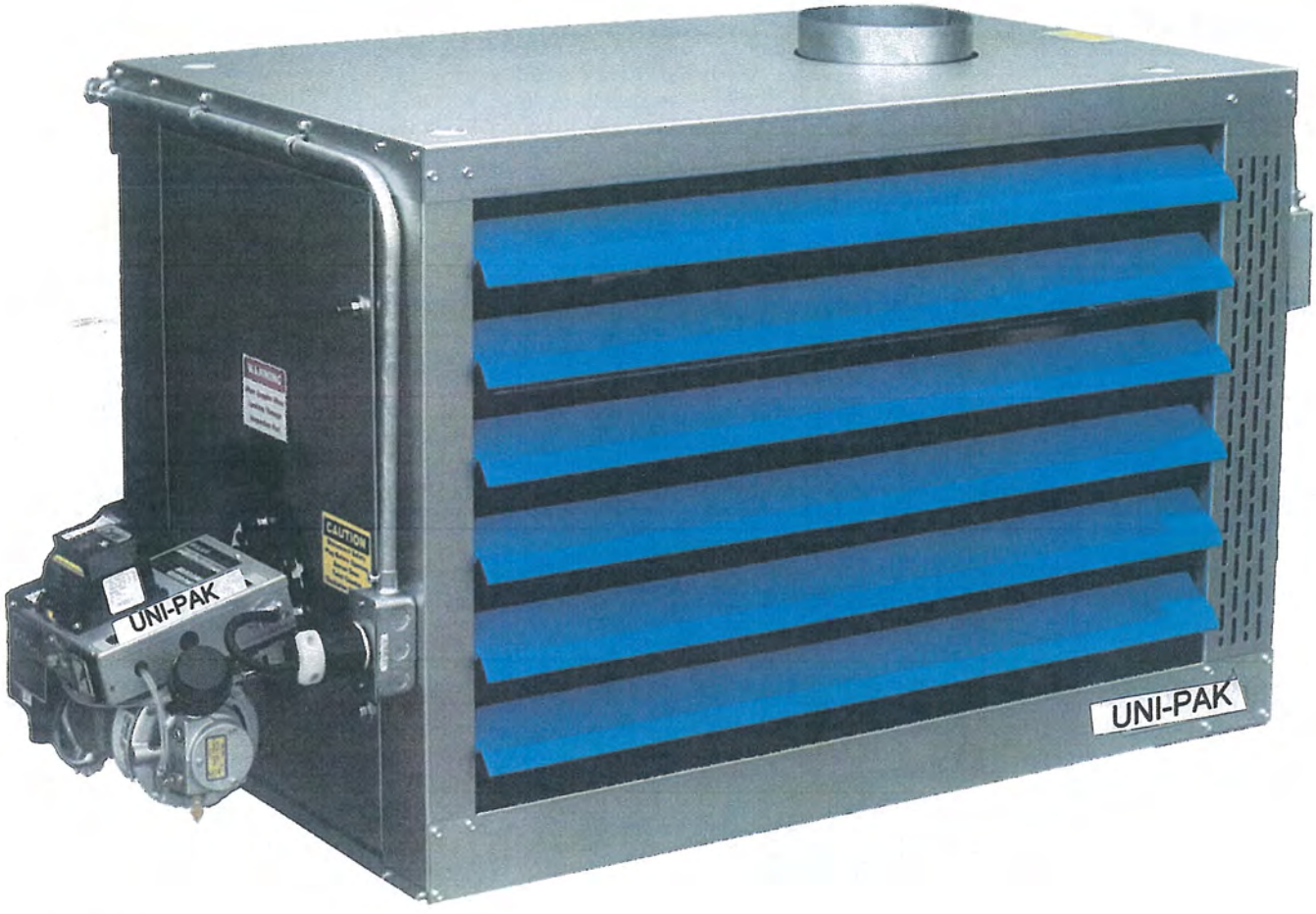
Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Heater

Installation, Operation and Service Instructions

AWH/DWH-250 120v Manual



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Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture.** UNI-PAK burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired heaters. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This heater was designed to be a primary or auxiliary heat source, but not the only source of heat. And provide economical disposal of waste oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the heater, the main heating system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT
Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in a UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the heater 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 passage. 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 UNI-PAK heater.

Specifications

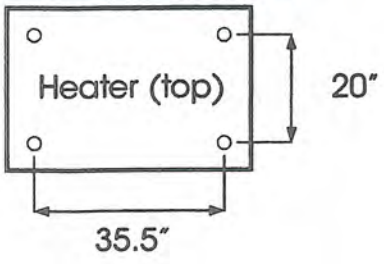
BTU INPUT:	250,000
BTU OUTPUT:	215,000
GALLONS PER HOUR:	1.75
REQUIRED VOLTS:	115
AMPs FULL LOAD:	15.6
FAN MOTOR HP:	1/3
FAN MOTOR RPM:	1075
CFM (FREE AIR):	4466
CFM w/ DUCTWORK @ 100 ft.:	2000
EFFECTIVE AIR FLOW:	70 ft
FLUE SIZE:	8"
WEIGHT:	365 lbs
L x W x H (including burner):	56" x 30" x 28.5"
SHIPPING WEIGHT:	535 lbs
SHIPPING DIMENSIONS (L x W x H):	64.5" x 39" x 49"

Notes:

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. EconoHeat reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. These appliances are designed for commercial or industrial use only. Installation and use of this waste-oil burning appliance shall be in accordance with the Standard for the Installation of Oil Burning Equipment-ANS/NFPA 31-1987, and National Electric Code - ANSI/NFPA 70-1990 and the requirements of the inspection authorities having jurisdiction.
3. Output depends on BTU content of oil used.
4. Atomizing Air Pressure for all fuels 10 P.S.I.
5. Furnace not to be used with air filters.
6. Intended maximum outlet air temp. 200 degrees F. (93 degrees C) or less.
7. **Clearance from combustible materials on all models not to be less than:**

TOP- 18"	**BOTTOM- 18"**	**SIDES- 18"**
REAR- 18"	**FRONT- 48"**	**FLUE PIPE- 18"**

Mounting Dimensions:



Installation Procedures

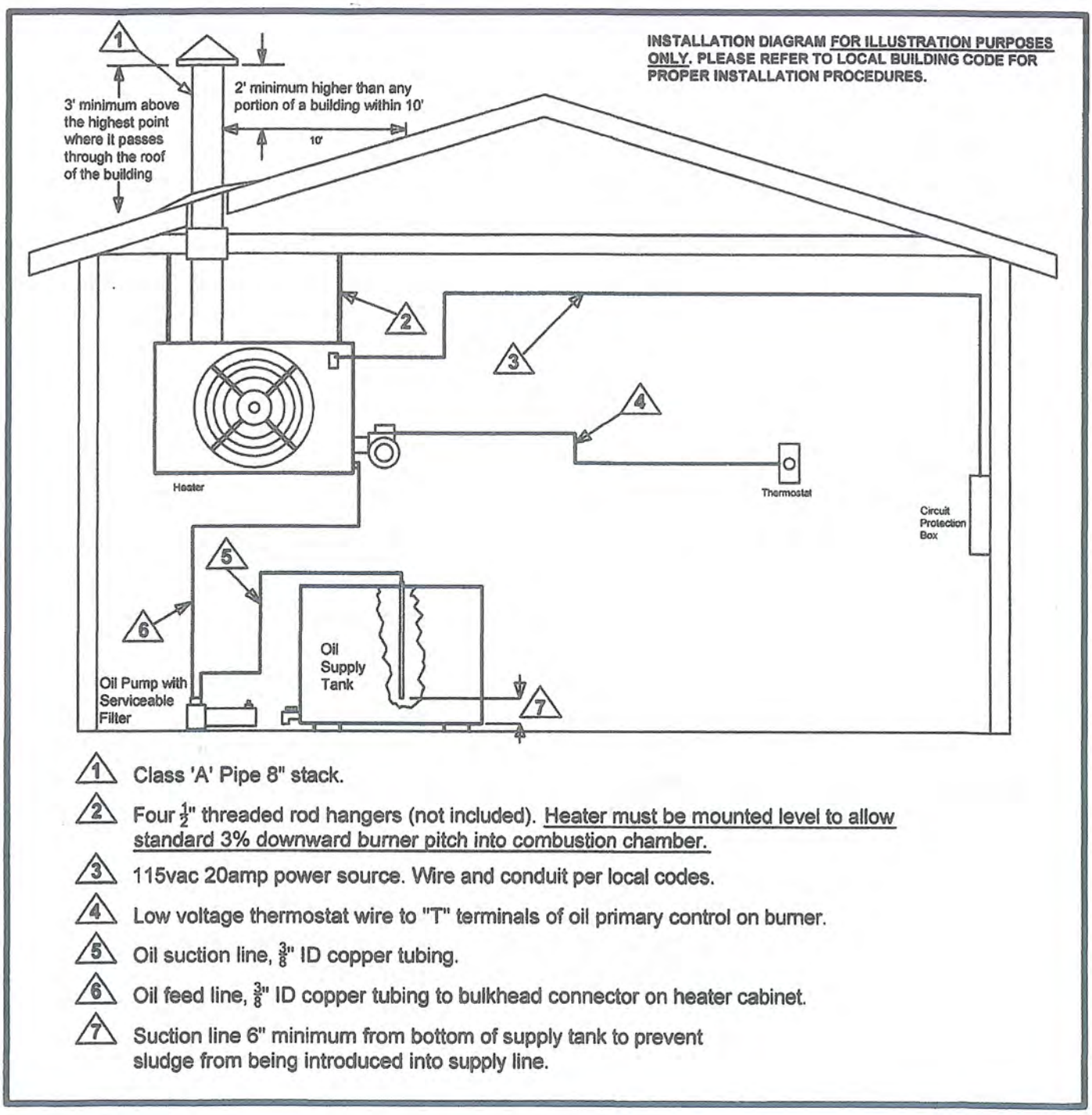


Figure 1 - Installation Diagram

Stack Installation

1. Install a barometric damper (NOT included) in the stack if the draft up the stack exceeds -.08. Draft up the stack must be minimum -.04 to -.06 inches of water column. Check with draft meter 12" from the top of the heater in (stack) or flue pipe. The over fire draft should be a minimum of -.02- check through flame inspection port. Closing the damper door can increase draft.
2. For optional draft inducers or power vent wiring, See Figure 2. One of these devices must be installed where back draft is present. In building or correct draft cannot be achieved.

Oil Supply Tubing

1. Use ONLY 1/2" or 3/4" nominal ID copper tubing with flare fittings only on the fuel suction from the tank to the heater. **Do NOT use ferrule fittings or Teflon tape on any pipe-fittings.**
2. Keep suction line approximately 6" from bottom of oil tank to prevent suction of sludge. Drain accumulated sludge and water from tank periodically.
3. Use only an inside oil storage tank to supply heater. **Do not draw from an outside tank,** especially not an underground tank, directly to heater. A separate transfer pump from an outside tank with proper filtration to the inside supply tank is acceptable and available from UNI-PAK.
4. Connect 1/2" or 3/4" oil supply line from the supply tank through the filter (figure 1) to the pump inlet located same side as bleeder port (figure 4).

Wiring

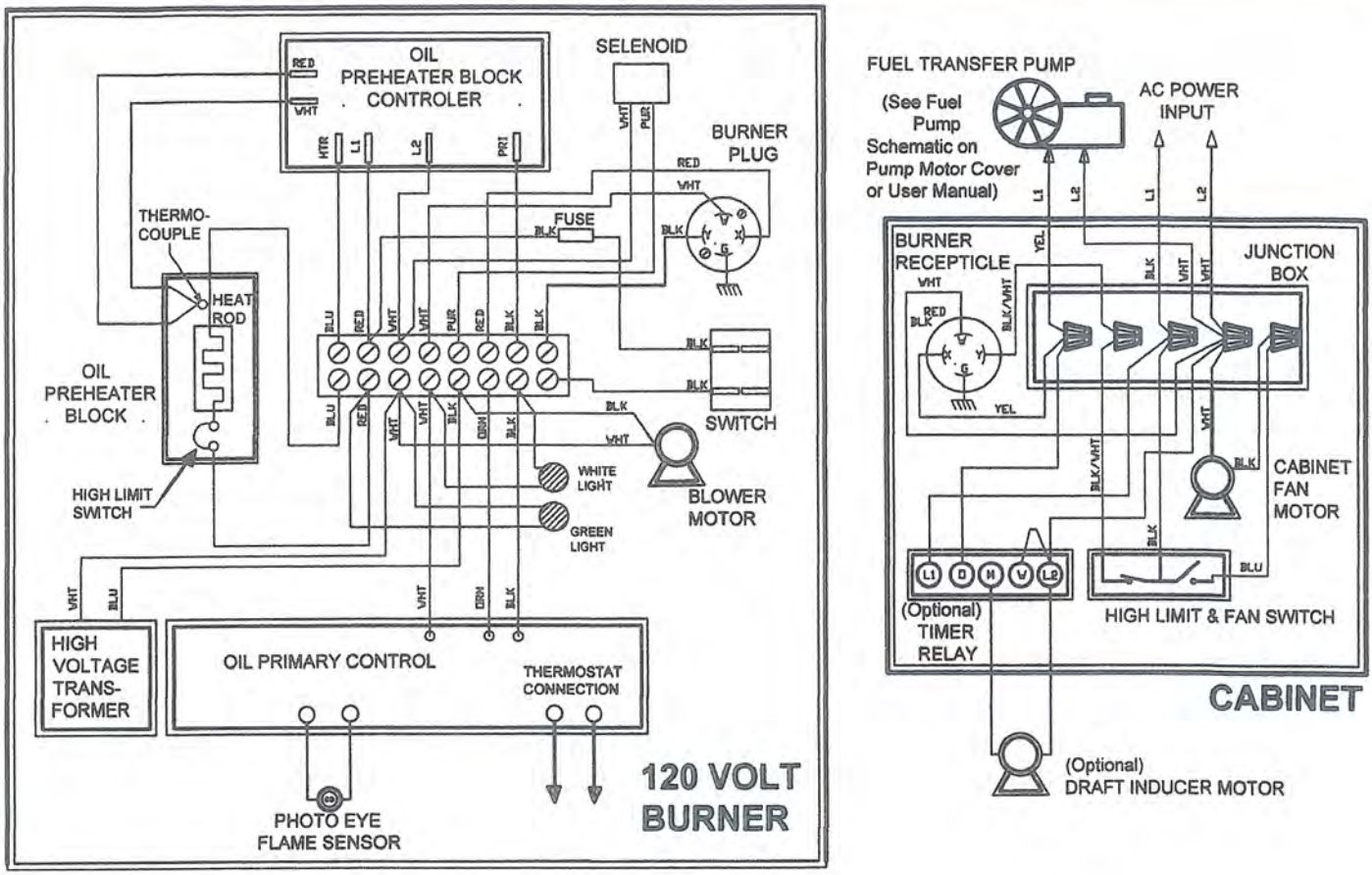


Figure 2 - Wiring Diagram

1. Wire 120V into main electrical box mounted on burner backside of heater cabinet with separate circuit **20-amp protection using 12-gauge wire.** Connect power line to black wire and all whites (NEUTRAL or COMMON) together. **IMPORTANT**, Connect ground wire to ground mounting point in main junction box (green screw).
2. Connect wires from main junction box to remote oil pump power, yellow to yellow and neutral common white to white.
3. Wire low voltage thermostat into "T" marked terminals on oil primary control on burner (Box on burner gun assembly with red reset button - figure 3).

Ducting

All unit heaters are designed with a condenser-type pressure propeller fan for air deliver, and have been successfully field ducted (see specifications). Call factory for further assistance if needed.

Oil Burner

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment - ANSI/NFPA 31 - 1987, and National Electric Code - ANSI/NFPA 70 - 1990 and the requirements of the inspection authorities having jurisdiction.

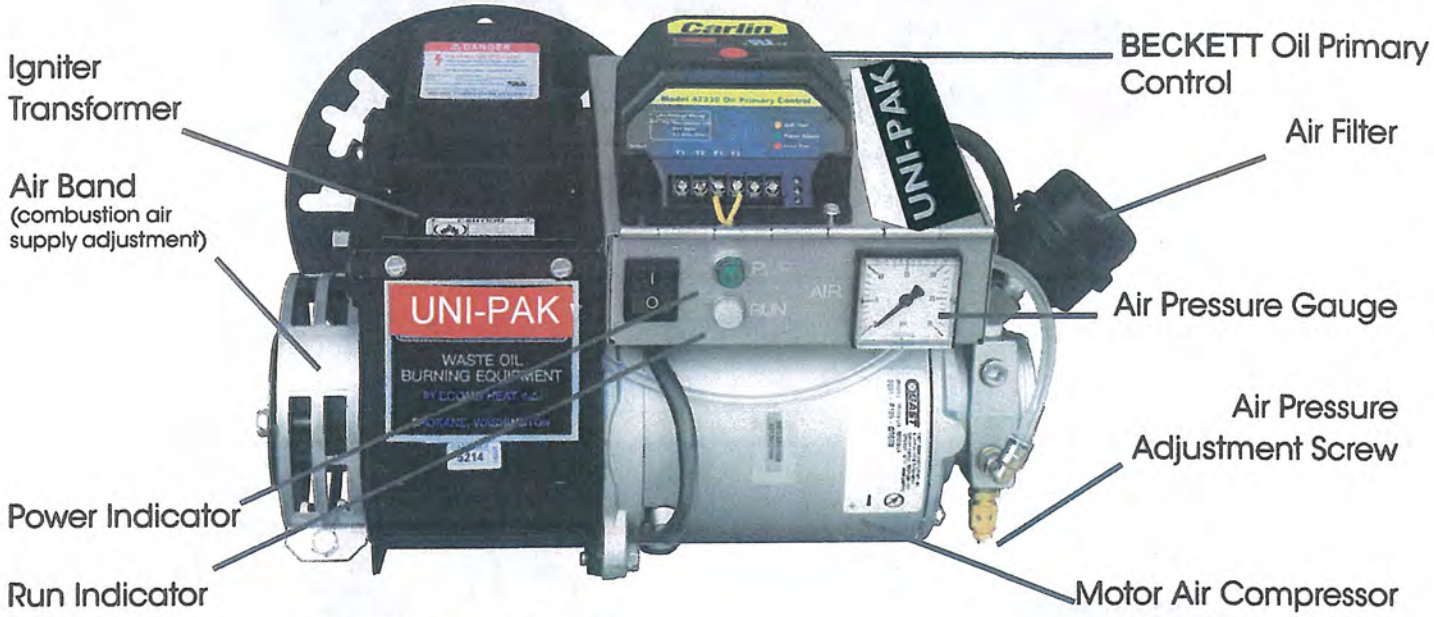


Figure 3 - Oil Burner (Back View Closed)

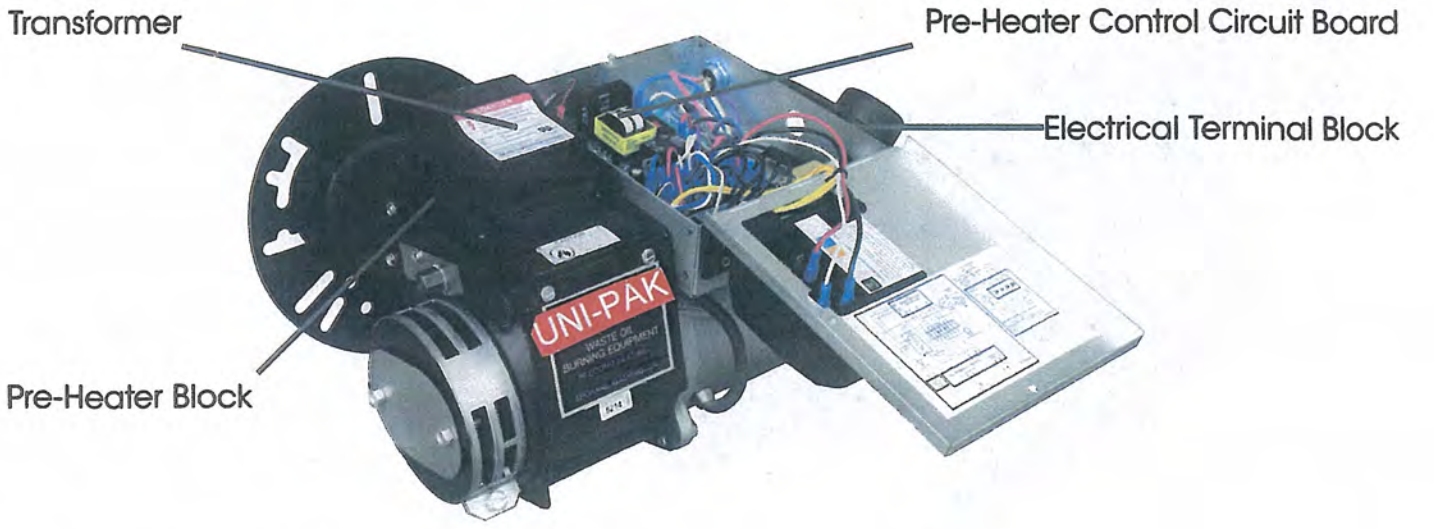


Figure 4 - Oil Burner (Back View Opened)

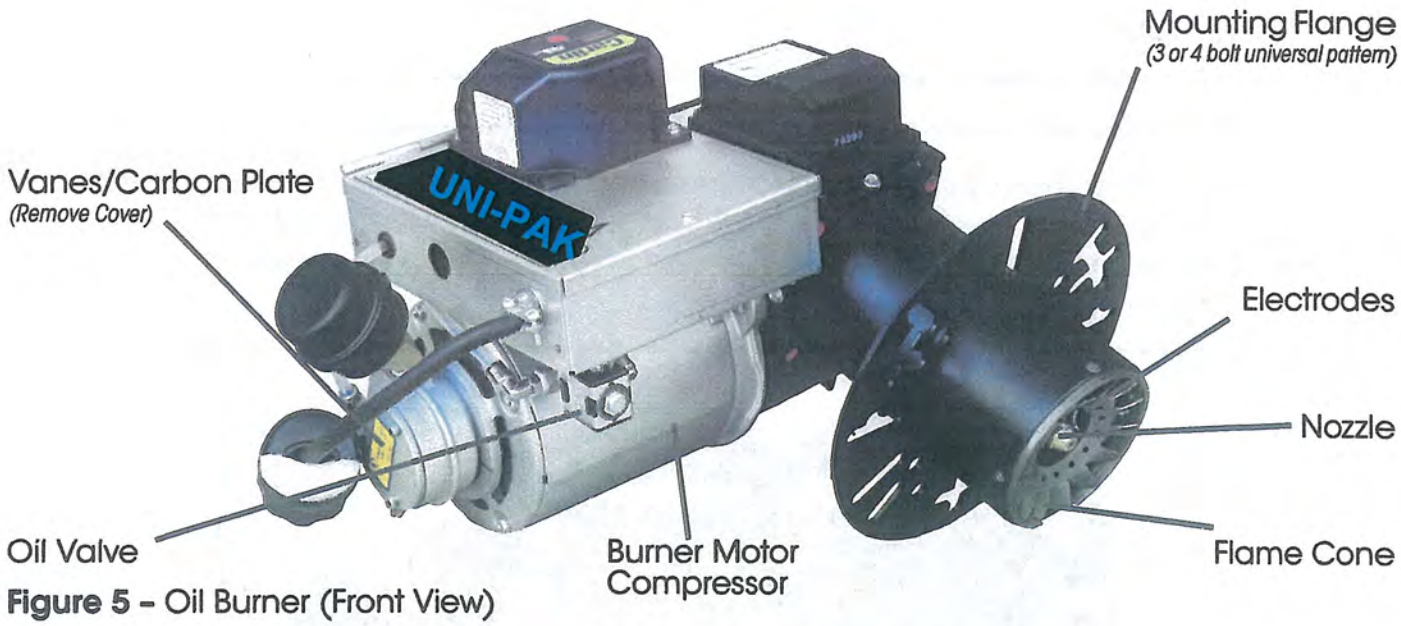


Figure 5 – Oil Burner (Front View)

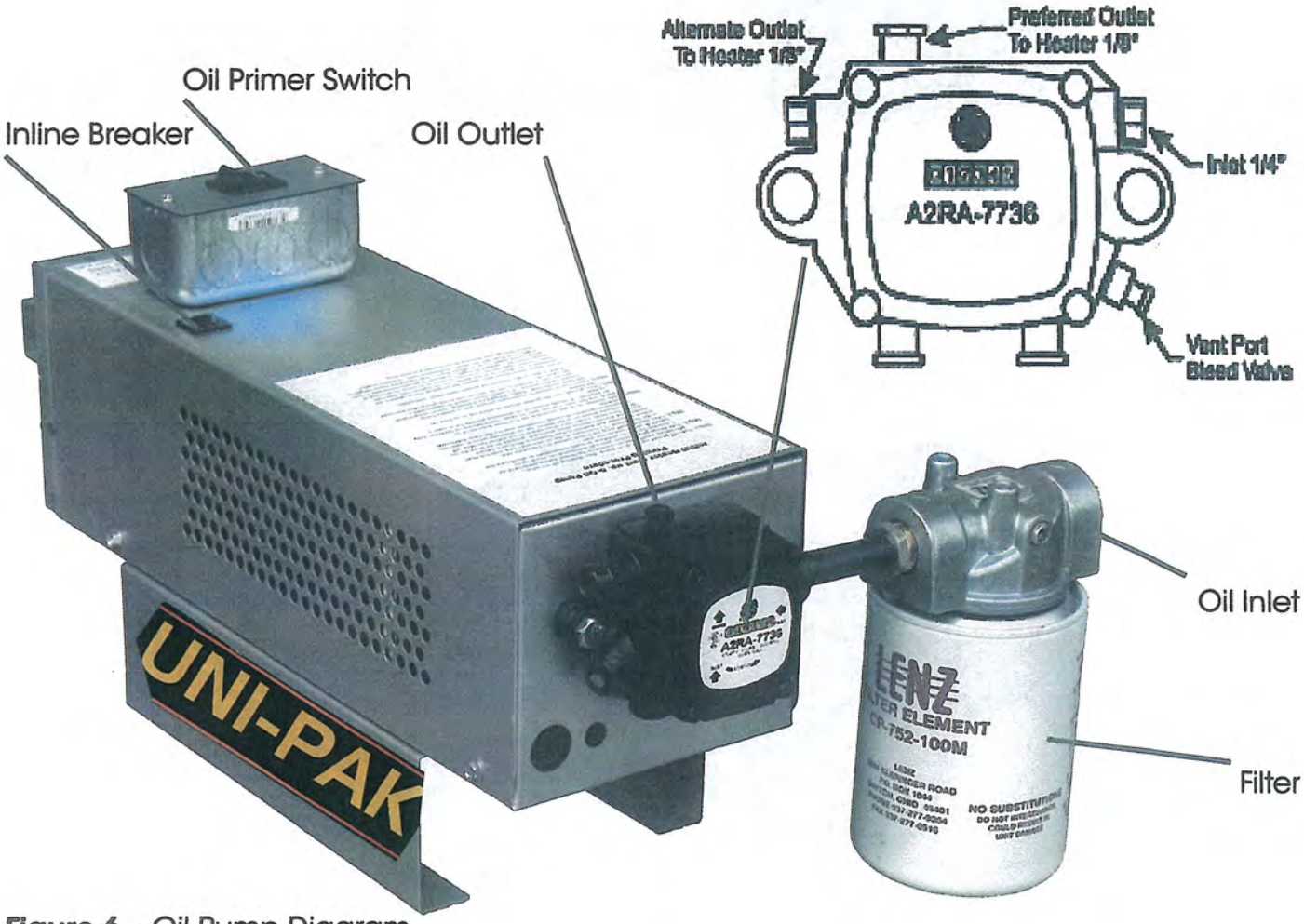


Figure 6 – Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

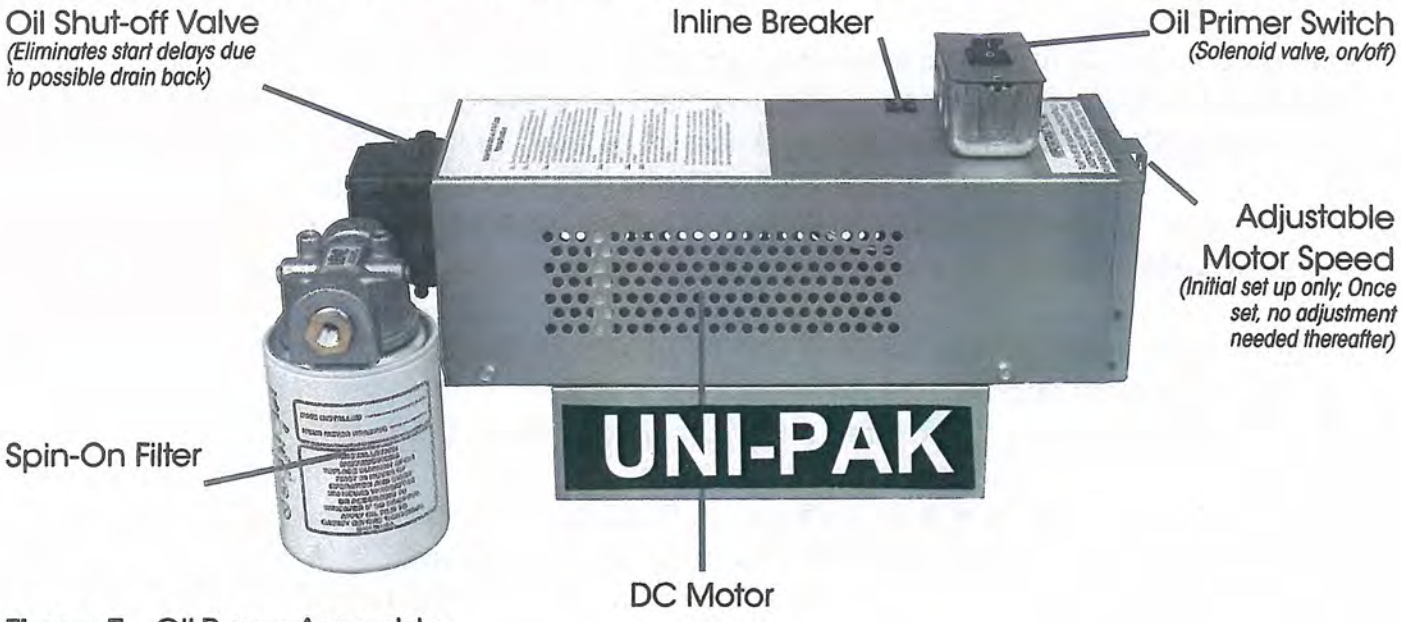
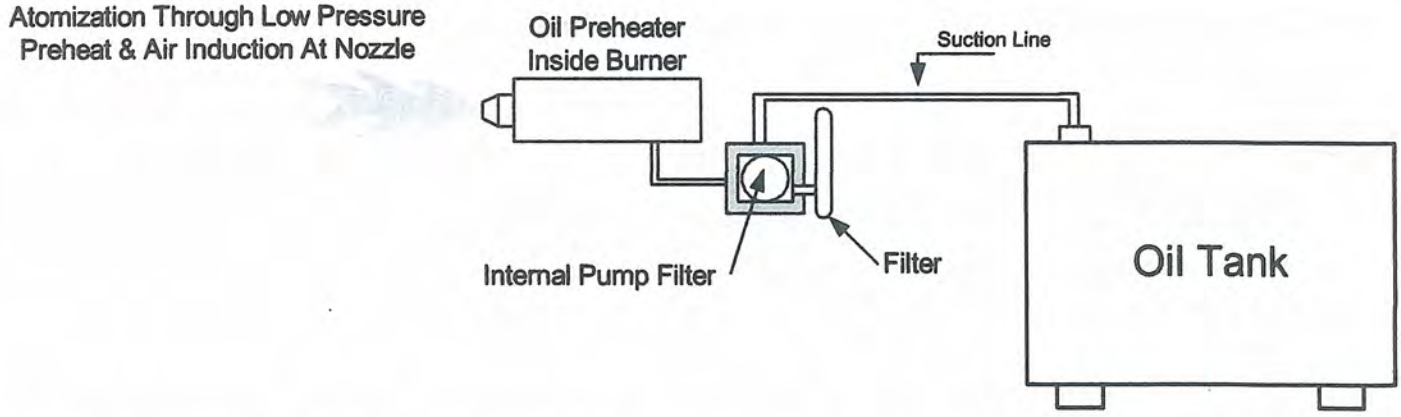


Figure 7 – Oil Pump Assembly

Oil Burner Technology



UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block and is pre-heated to operating thermo set-point, and this along with high pressure (100 psi to 200 psi depending on model) break up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 3) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 9) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 5) Senses flame in combustion chamber and signals oil primary when no flame is present (located under hinged transformer).
- **Igniter Springs:** (figure 5) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Pre-Heater Control Circuit Board:** (figure 9) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** (figure 9) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 9) High-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5 & 6) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 3) Motor turns the burner blower, fan and oil pump.
- **Gallons per Hour (GPH)**: Determined by pump pressure and nozzle profile size, varying by model/unit size.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Initial Start Procedure

1. **IMPORTANT -** Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory **for help if needed.**
3. Switch the burner to the on position. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo setpoint, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner. Burner operated via room thermostat.
4. Jump the "T" terminals (thermostat terminals) on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary, not before burner tries to run or operate. This will allow the burner to run during the pump priming process - **don't forget to remove jumpers when primed.**
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 4). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove the temporary jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Pre-set at factory combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from establishing.

Inspect flame length through inspection door located above burner gun assembly. Flame should reach **no further than ½ to ¾ way down combustion tube. NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START IS PRESENT.**

Suggested Maintenance Schedule

Every application varies. Monitor your needed schedules.

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Filter screen located in the pancake style housing (figure 12 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Remove one (1) x 9/16 nut from the burner side of the cabinet to swing the burner away from the unit to easily access and clean the nozzle and flame-cone. (figure 6 below).
- Open the bolt on door on clean-out sides of the furnace. The bolt-on door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepa filter recommended) (figure 10 below).
- Check Suntec pump filter. Remove pump cover for access (figure 11 below). **CAUTION:** Be careful of gasket; clean if needed.

YEARLY

- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 8 below). Due to erosion, adjustment may change.
- Replace nozzle as needed when flame deteriorates with no retention at flame cone, depending on usage (figures 6, 7, 8 and 9 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 6 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner securing nuts, remove the burner side clean-out door. Remove nozzle with 5/8" socket (figures 6 and 7 below).

ELECTRODE ADJUSTMENTS

Electrodes are adjusted at time of manufacture. However, they should be check periodically and at time of installation, to be sure they are set as noted in the following dimensional drawing. Swing burner clean out door back for inspection (figures 8 and 10 below). **CAUTION: TURN OFF MAIN ELECTRIC SUPPLY SWITCH BEFORE CHECKING OR ADJUSTING ELECTRODE SETTING.**

NOZZLE POSITION IN RELATION TO ENDCONE/BURNER TUBE

Tip of nozzle must be ¼" ahead of inside radius of end-cone. If nozzle is behind inside radius of end-cone, coking will occur and end cone can become clogged (figure 8 below).

IMPORTANT NOTE: be sure nozzle is centered, if nozzle is higher than center, press nozzle down to bottom out pre-heater stand.

To adjust, remove burner from cabinet (figure 6 below), loosen Preheat Sink securing nut and set screw, push fore or aft as needed. **WARNING:** This adjustment is done at the factory and should not be moved unless figure 8 dimensions have been altered.

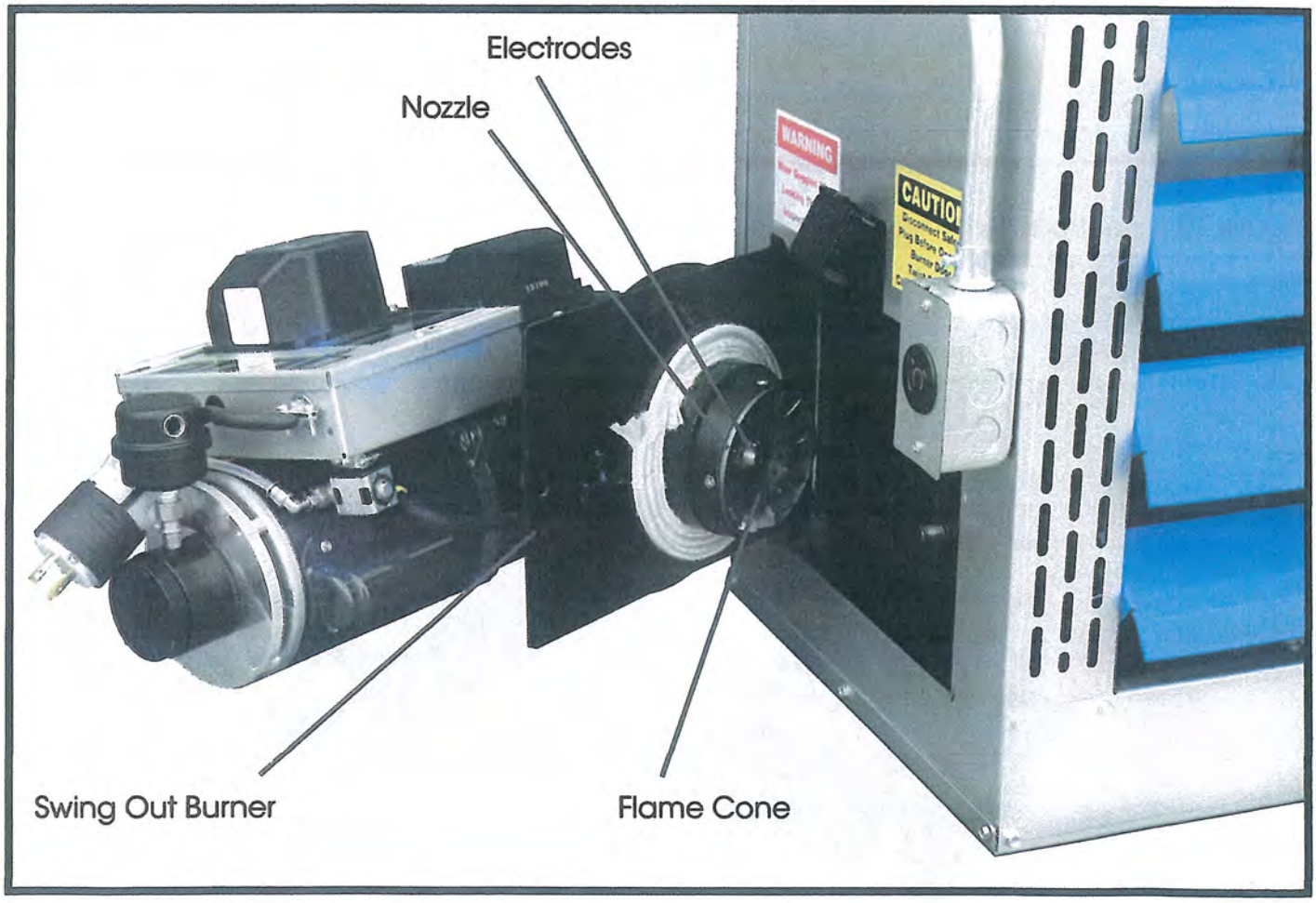
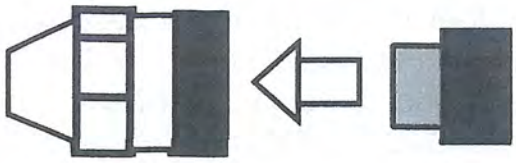


Figure 8 - Burner Door View



When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 9 - Nozzle Assembly Detail

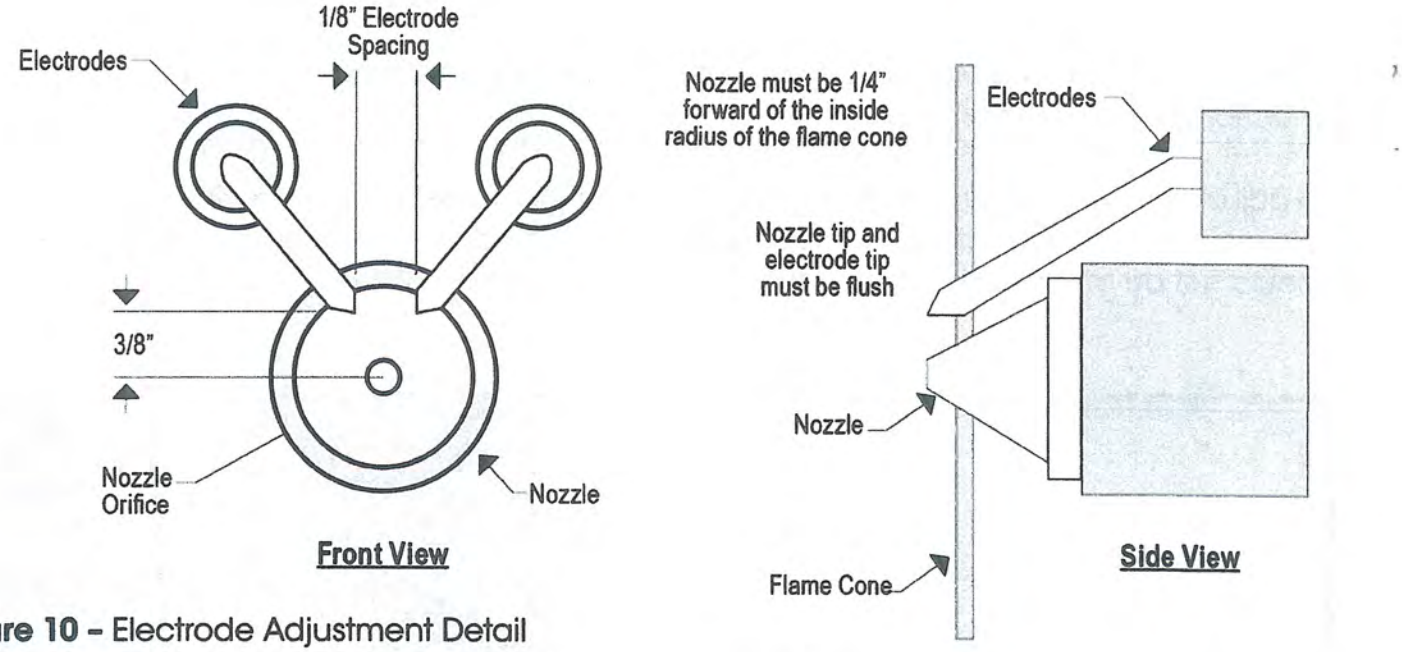


Figure 10 - Electrode Adjustment Detail

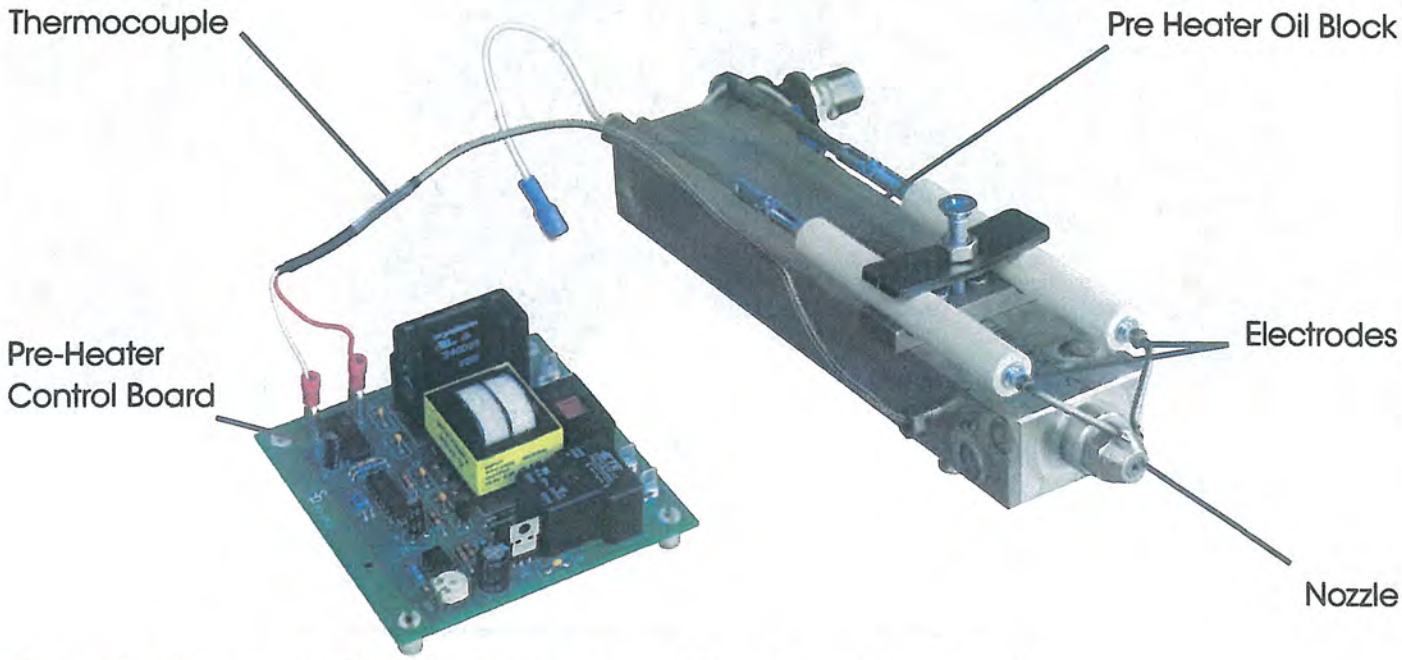


Figure 11 - Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 12 – Pump Strainer

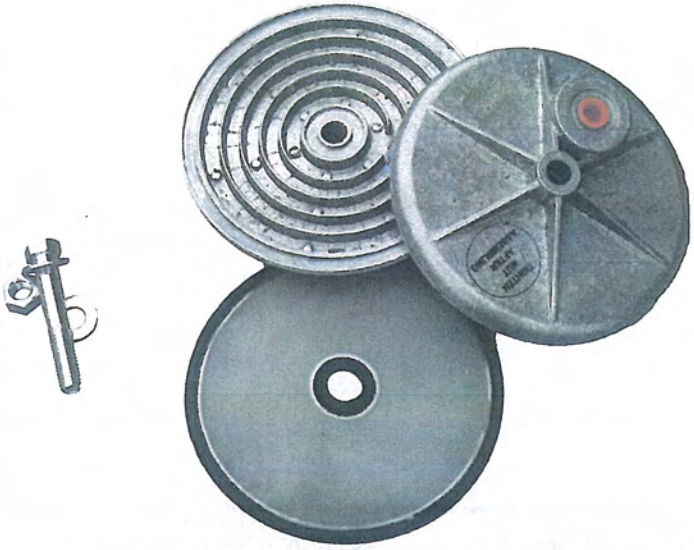


Figure 13 – Oil Filter (Pancake Style Filter)

Troubleshooting

♦Most Likely •Less Likely ♣Least Likely

Symptom	Cause	Remedy
1. Heater shuts off	♦ Manual reset	♦ Requiring manual restart by reset button on.
2. Loss of prime overnight	♦ Vacuum air leak in fuel line	♦ Check all fuel connections. Tighten fittings.
Won't hold vacuum	♣ Plugged pump screen	♣ Check pump screen, may need cleaning-to access, remove pump cover
IS TANK EMPTY?	• Plugged filter or tank oil empty	• Clean filter. Using vent port, reprime pump (Figures 6 & 7).
3. Fails to start.	♦ Vacuum Leak	♦ Open bleeder port if air present. Check and tighten fittings.
	♦ Inadequate Fuel Supply	♦ Clean filter. Check all fuel connections. Tighten fittings.
	• No Pressure	• Check, may need cleaning—to access, remove pump cover.
		• Using vent port, reprime pump (Figures 6 & 7).
	• No Pre-heat	• Be sure all wiring to pre-heater is tight-no loose connections.
		• Bad firerod – replace; continuity at terminals.
	• Auto start circuit not functioning	• Check circuit control board and replace if necessary (call factory).
		• Check continuity at terminals of firerod limit snap switch. Replace if needed.
	• No Arc	• Check springs to electrode rod adjustment (under transformer) make sure they make good contact. Open burner door and make sure electrode tips aren't touching flame cone or one another. Readjust.
4. Hard starting diminished	♦ Partially plugged filter.	♦ Clean filter. Using vent bleeder port on pump, re-prime pump (See Figure 6 & 7) flame.
	♣ Out of fuel	♣ Refill Storage.
	♣ No oil to burner	♣ Check pump screen – remove pump cover; clean if needed. *Using vent bleeder port, re-prime pump.* (Figures 6 & 7)
	• Inadequate combustion air from burner	• Remove nozzle and check for foreign objects. (Figures 9 & 10)
		• Aluminum Block Pre-heater inside burner may not build up carbon. If carbon is present, thermocouple heat sensor wire could have open circuit. Heat control board may have blown circuit and circuit board fuse. Inspect both and replace either if needed (Figure 10). Back draft in combustion chamber may be present. Check draft up flue pipe & over fire at vision port.
	• Air band open too far	• Close air band—while viewing flame; open air band slowly until combustion chamber is clear, not orange.
5. Heater cycles frequently, without thermostat temperature setting being achieved in area to be heated.	♦ Heater over firing, Inadequate combustion air from burner	♦ Investigate and locate reason for over firing. Check and clean end cone turbulator if needed.
	♣ Temperature setting wrong On high limit fan safety switch	♣ Check temperature setting and adjust as necessary.
	• High limit safety switch bad	• Replace high limit fan safety switch.
6. Heater rumbles and excessive heat blow back from flame vision port.	♦Pump setting wrong	♣ Clean ash buildup in combustion chamber, exchange and vent flue pipe.
	♣ Draft incorrect. If proper draft can't be achieved, consider any exhaust fans in building if added since initial install.	♣ Set draft. Clean out combustion chamber and exchangers of ash. Check draft-reset if needed.
7. Heater establishes flame but locks out or shuts off. Need to reset primary.	♦ Photo eye cant see flame.	♦ Clean photo eye which is clouded by back draft smoke.
	♣ Due to back draft. Flame end cone may have ash.	♣ Swing open burner door and clean ash build up from flame end cone. (See Figure 5 & 8).
	• Bad or uncontrolled flame due to nozzle erosion	• Replace nozzle
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present.	♦ May need to install power vent/draft inducer's in stack. (See Figure 2 for wiring).
	♣ Excessive ash buildup/Heater	♣ Clean ash and soot from combustion chamber and heat exchangers.
9. Poor or reduced heat production.	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris.
	♣ Entire fuel supply may be plugged.	♣ Clean filter both, oil strainer and check oil pump screen.
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers.
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled.	

Troubleshooting Continued

Symptom	Cause	Remedy
8. Proper draft setting cannot be achieved	♦ Negative draft in building or exhaust fans present	♦ May need to install power vent/draft inducers in stack (see figure 2 for wiring)
	♣ Excessive ash buildup	♣ Clean ash and soot from combustion chamber and heat exchangers
9. Poor or reduced heat production	♦ Flame too small	♦ Nozzle or preheater block may be plugged with carbon debris
	♣ Entire fuel supply may be plugged	♣ Clean filter, both oil strainer and check oil pump screen
	• Excessive ash buildup exchangers	• Clean ash from combustion chamber and exchangers
	• Through vision port, check flame to see if flame is smaller than usual or too large and uncontrolled	

(15) Year Limited Warranty

UNI-PAK (manufacturer) warrants to the purchaser of Unit Heaters listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Combustion chamber and heat exchanger ten (15) years limited, full repair or replacement (parts only), first three (3) fullly covered / last seven (7) 50% coverage
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

WH (15) Year Limited Warranty Cont.

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- Unit heater is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

NOTE: Combustion Chamber Warranty is specific to material and workmanship. Workmanship means UNI-PAK warranties the welds are good and will hold. Material means they will not corrode through due to sulfur in the ash that accumulates during operation. Warranty does not apply to units that experience overheating stress cracks. These are not incurred because the materials are inadequate for the application nor are they results of a weld breaking lose because of bad penetration, which is easily recognized by the metal left beneath the weld. These cracks occur as a direct result of (1) improper draft, either by inadequate initial installation and setup, which requires (a) establishing a proper draft during installation (b) back draft has occurred due to ash buildup, backing up hot gas passageways in either the exchangers, the stack, or both. (2) Over firing by setting oil supply pressure too high (see manual for proper setting) these are all cases of thermal overload.

*Under normal use only. If misuse or abuse is deemed apparent after inspection, warranty is void.

Warranty Card

Please fill out, tear off and return to manufacturer within sixty (60) days of purchase, or warranty will not be valid. Please print or type.

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

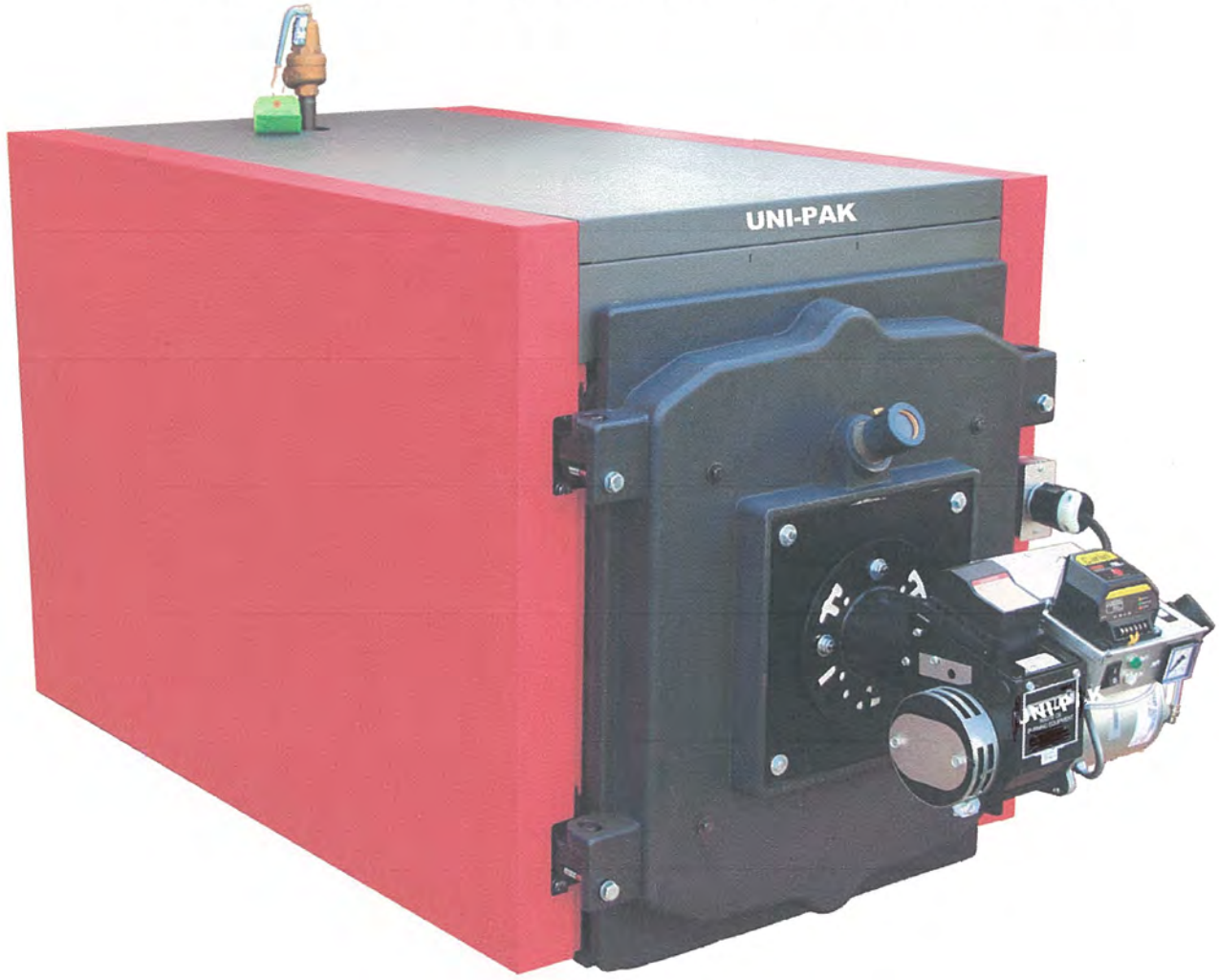
Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Boiler

Installation, Operation and Service Instructions

WB-25, WB-35, WB-50 120v Manual



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PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture. If installed in high moisture atmosphere, a special cover for the integrated air compressor must be obtained from factory to avoid rusting of internal raw metals. If this occurs, see trouble-shooting guide for remedy.** OMNI burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired boiler. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This product was designed to provide an economical disposal of wast oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the burner, the main system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT

Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in a UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the boiler 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 passage. 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 UNI-PAK boiler.

Note: All illustrations and specifications contained herein are based on latest information available at the time of publication. UNI-PAK reserves the right to make changes at any time without notice.

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment – ANSI/NFPA 31 – 1987, and National Electric Code – ANSI/NFPA 70 – 1990 and the requirements of the inspection authorities having jurisdiction.

Figure 1 – Oil Burner (Back View Closed)

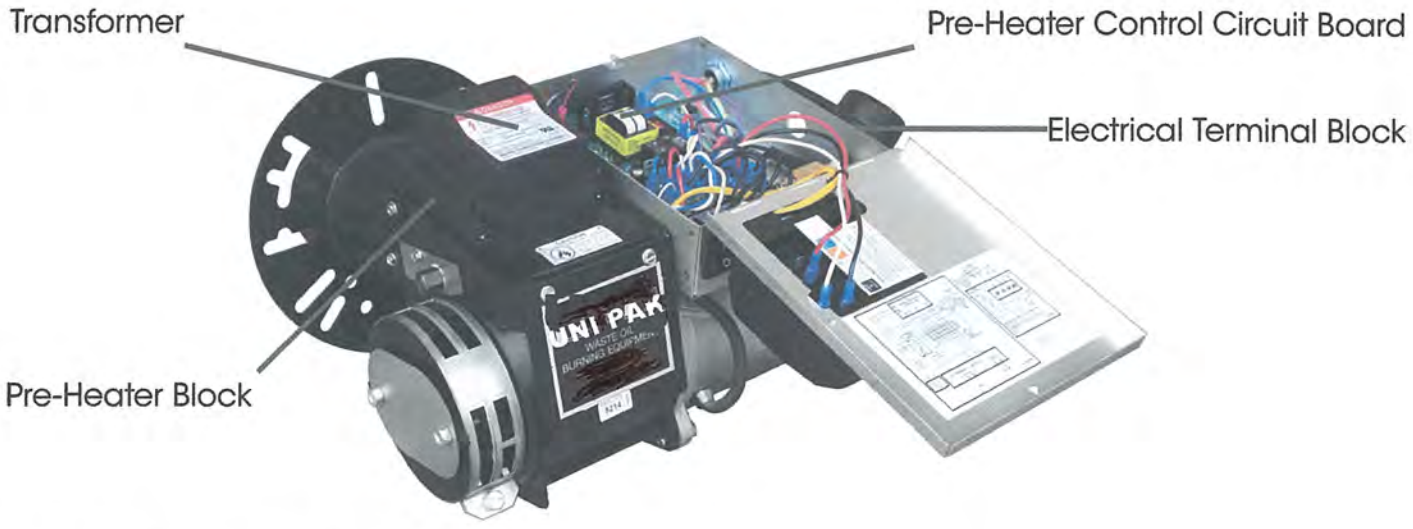


Figure 2 – Oil Burner (Back View Opened)

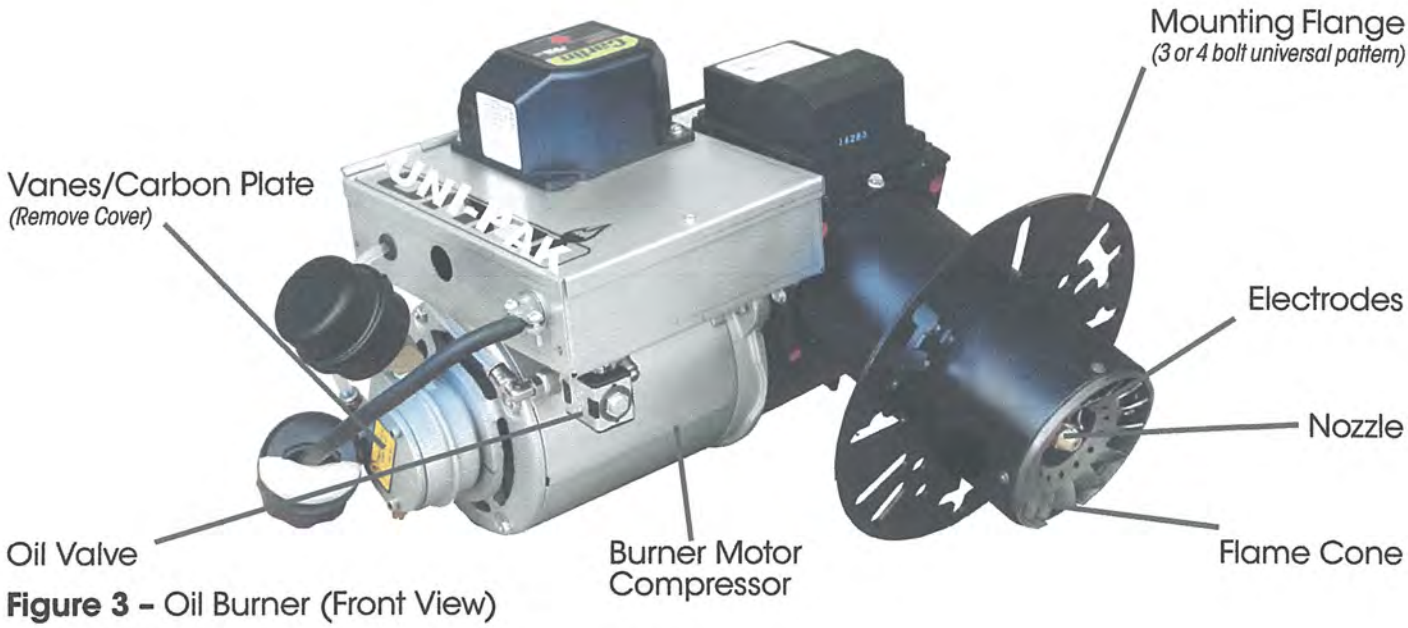


Figure 3 – Oil Burner (Front View)

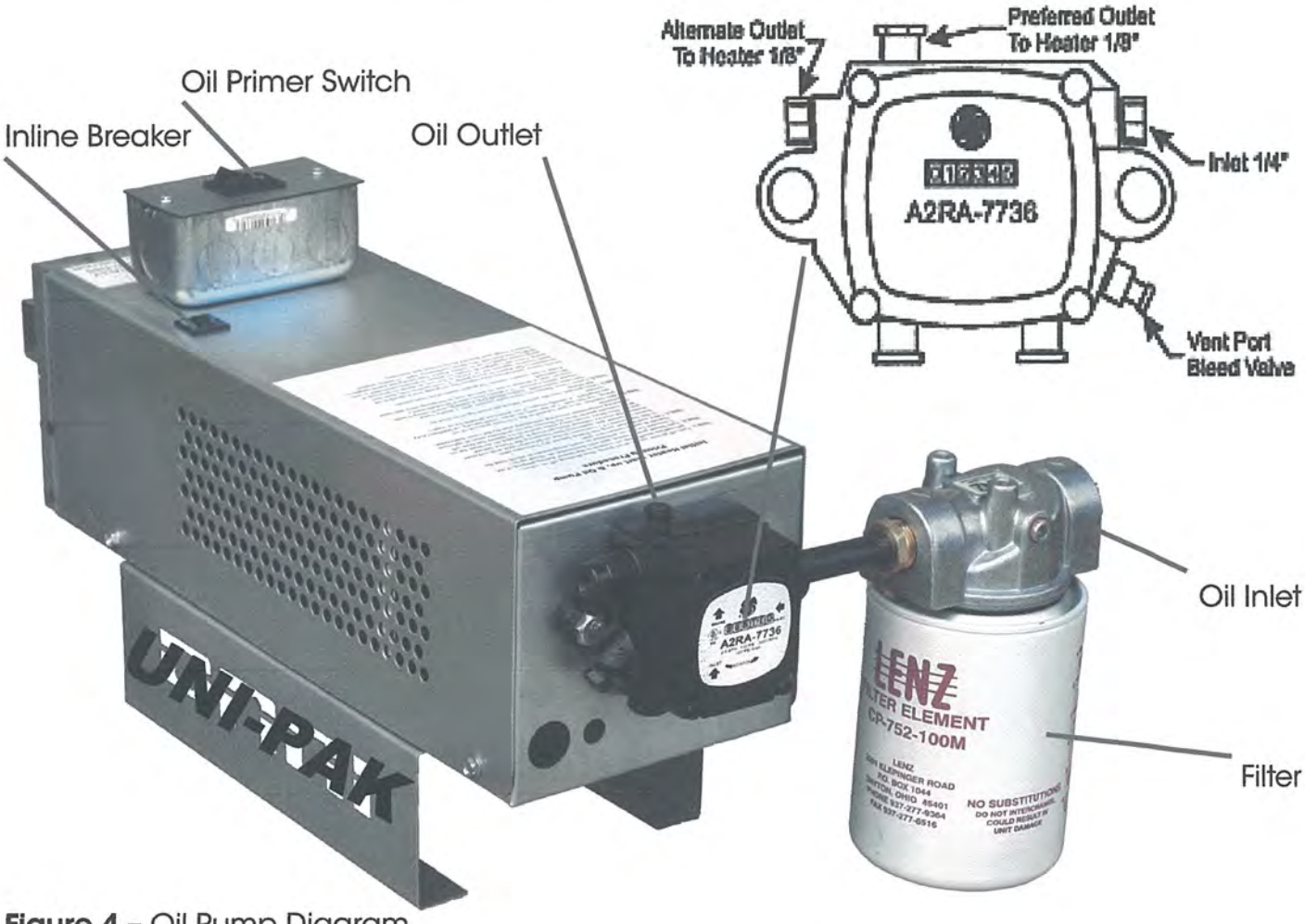
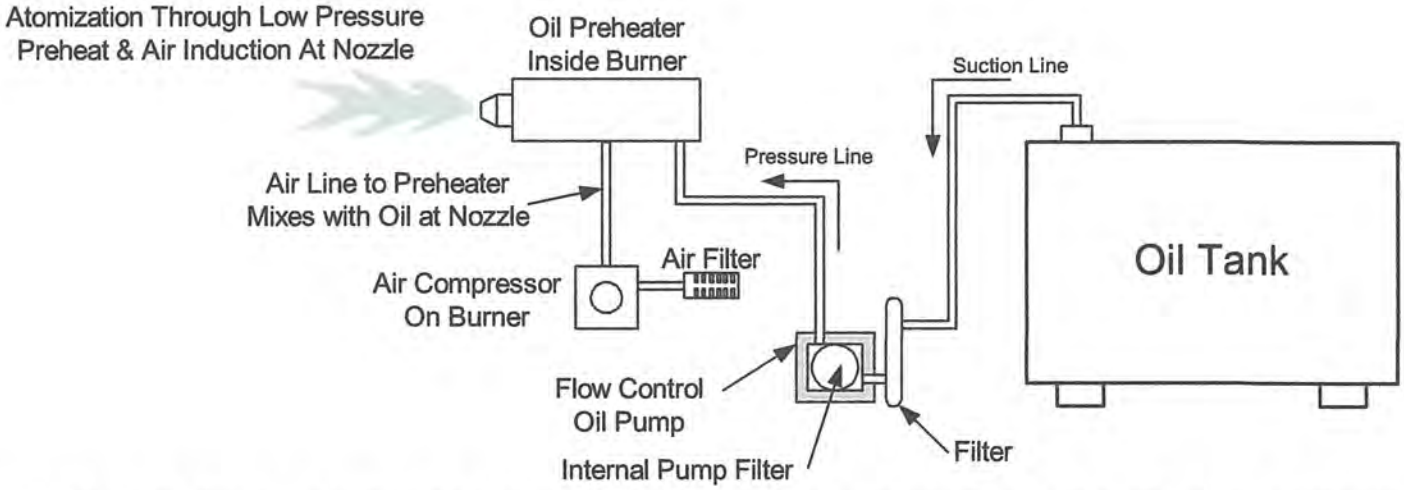


Figure 4 – Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

Figure 5 - Oil Pump Assembly

Oil Burner Technology



UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil and air prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block (figure 4) and is pre-heated to operating thermo set-point, then compressed air from the air compressor (figure 3) is mixed with the oil prior to spraying out the nozzle similar to fuel injection, by breaking up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle (figure 5) provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone (figure 5) providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 5) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Air Band:** (figure 3) Adjusts amount of air introduced into the combustion chamber. Air band is adjusted at the factory for optimum performance, approx. ½ to ¾ inch open. **NO FIELD ADJUSTMENT REQUIRED** unless in high altitudes application where minor adjustment may be required.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 4) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 4) Senses flame in combustion chamber and signals oil primary when no flame is present.
- **Igniter Springs:** (figure 4) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Air Pressure Gauge:** (figure 3) Displays air pressure supplied by on-board air compressor.
- **Air Compressor:** (figure 3) Supplies air used within pre-heater block to aid in atomization of the oil.
- **Air Muffler/Filter:** (figure 3) Filters air and muffles the sound generated by the compressor.
- **Pre-Heater Control Circuit Board:** (figure 4) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo set-point or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo set-point.
- **Electrodes:** (figure 4 and 5) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 5) Low-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 5) Multi-task motor turns the burner blower and integrated air compressor.
- **Air Pressure Adjuster:** (figure 3) Adjusts the air pressure going to the pre-heater block. Should be adjusted between 12 PSI and 13PSI as indicated on the Air Pressure Gauge on the burner for thorough burn of the waste oil. ***Note: In order to insure proper air adjustment, air gauge must read 0 when burner is cycled off or powered down.***
- **Oil Pressure Adjustment:** Adjust flame length in the heater combustion chamber viewed through the inspection port located directly above the burner gun assembly by increasing CW or decreasing CCW the adjuster located on the oil delivery pump (figure7). The adjuster increases or decreases the pump motors RPM, which increases or decreases the delivery of fuel to the burner. When you increase or decrease the fuel to the burner, you will notice the flame length will increase or decrease. Adjust flame length so flame is just slightly less than halfway down main combustion chamber tube.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Oil Burner/Pump Specifications

Burner Assembly Performance Ratings

Voltage	115 VAC
Cycles	60Hz
Total Operating Amperage (Burner Only)	8.4 Amps
Total Operating Amperage (Burner and Oil Pump)	10.5 Amps
Electrical Operating Consumption (Burner Only)	970 Watts
Electrical Operating Consumption (Burner and Oil Pump)	1,212 Watts
Weight	36.5 Lbs.
Oil Primary	0.2 Amps
Oil Valve	0.075 Amps
Pre-Heater Block	4.2 Amps
Pre-Heater Controller Board	0.011 Amps
Igniter Transformer	0.3 Amps
Burner Motor	3.6 Amps

Pump Assembly Performance Ratings

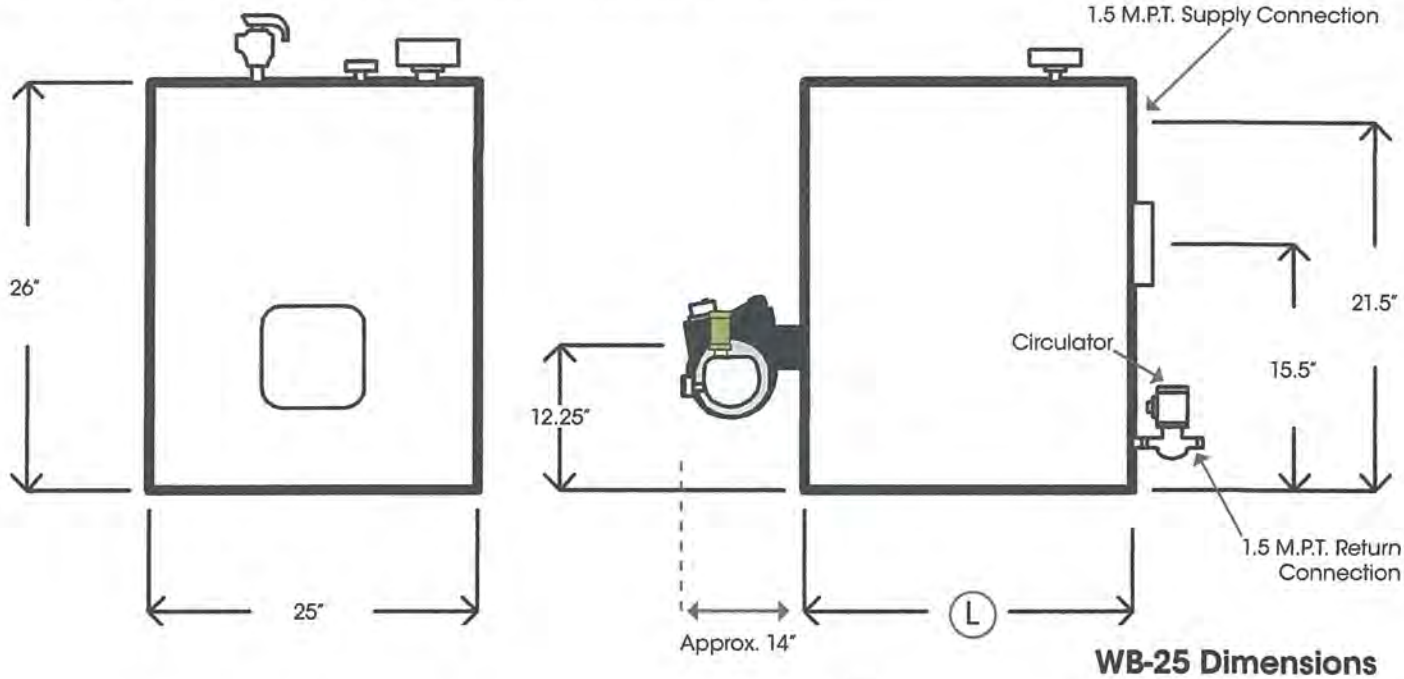
Voltage	115 VAC
Cycles	60Hz
Total Operating Amperage (Pump Assembly Only)	2.1 Amps
Electrical Operating Consumption (Pump Assembly Only)	241.5 Watts
Weight	16 Lbs.
Oil Valve	0.075 Amps
Pump Motor	2.0 Amps

Boiler Specifications

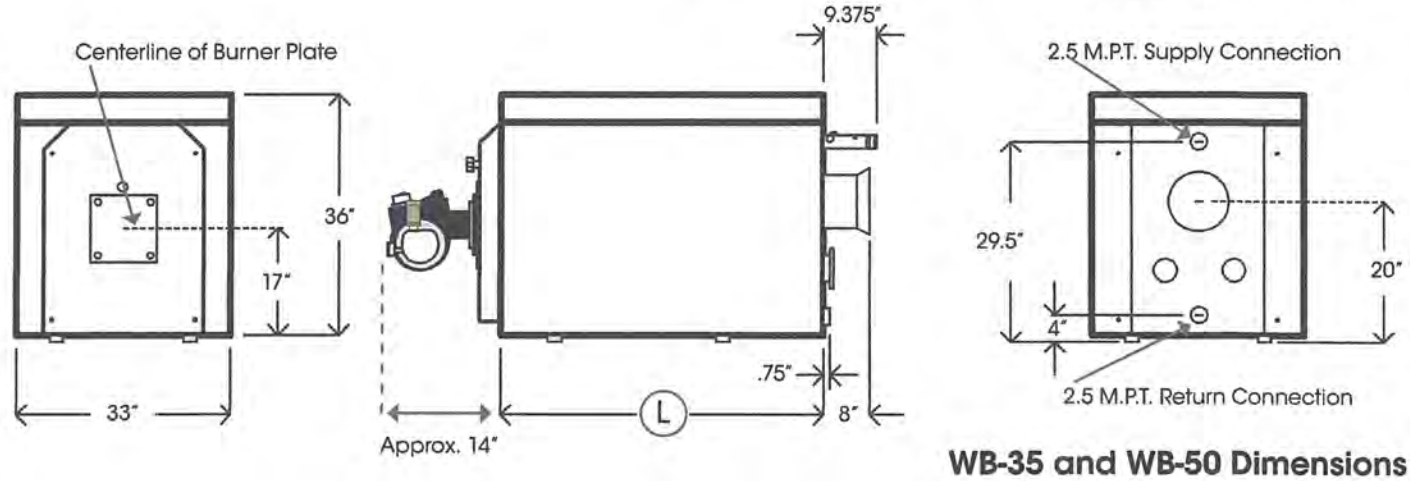
Boiler Manual	Burner GPH	Input BTU's	Output Capacity BTU's	Net Rating Water BTU/hr	Rating Water Sq. Ft.	Approx. Dry Weight (Lbs)	Vent Connect Diameter (Inches)	Diameter "L" Inches	Water Content Gallons	Max Water Working Pressure
WB-25	1.7	250,000	212,000	184,700	1,450	902	7	44-1/4	10.8	60PSI
WB-35	2.4	350,000	297,500	258,600	2,030	1654	10	52	28.5	75PSI
WB-50	3.3	500,000	425,000	369,500	2,900	1831	10	57	31.7	75PSI

Notes:

1. Net ratings shown are based on piping and pick-up allowance of 1.15.
2. Net ratings in square feet are base on 170° Fahrenheit average water temperature in radiators. For higher water temperatures, select boiler based on basis of net ratings in BTU per hour.
3. Firing rate in G.P.H. is based on oil having heat value of 150,000 BTU/gallon.
4. 4% reduction of output for every 1,000 feet of elevation.



WB-25 Dimensions



WB-35 and WB-50 Dimensions

Standard Equipment

Components	Model 250	Model 350	Model 500
Factory Assembled Cast Iron Sections	X	X	X
Flow Control Oil Supply Pump	X	X	X
Waste Oil Burner	X	X	X
Insulated Jacket	X	X	X
Long Well (35-1020)	X	X	X
Short Well (35-1010)	X	X	X
High Operating Limit (L4008A)		X	X
Supply Manifold	X	X	X
Refractory Insulated Hinged Front Door w/ Sight Glass	X	X	X
ASME Relief Valve 30 PSI	X	X	X
Spin-on Oil Filter	X	X	X
Low Water Cut-off Control	X	X	X
Manual Reset High Limit Aquastat Control (L4006E)	X	X	X
10" Damper		X	X
Temperature/Pressure Gauge	X	X	X

Important Code Requirements

Installations must comply with all state, local, and utility codes, laws, regulations, and ordinances, and CSA standard B139. Where required by the authority having jurisdiction, the installation must conform to American society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

All electrical wiring must be done in accordance with the National Electrical codes latest edition and all state and local codes.

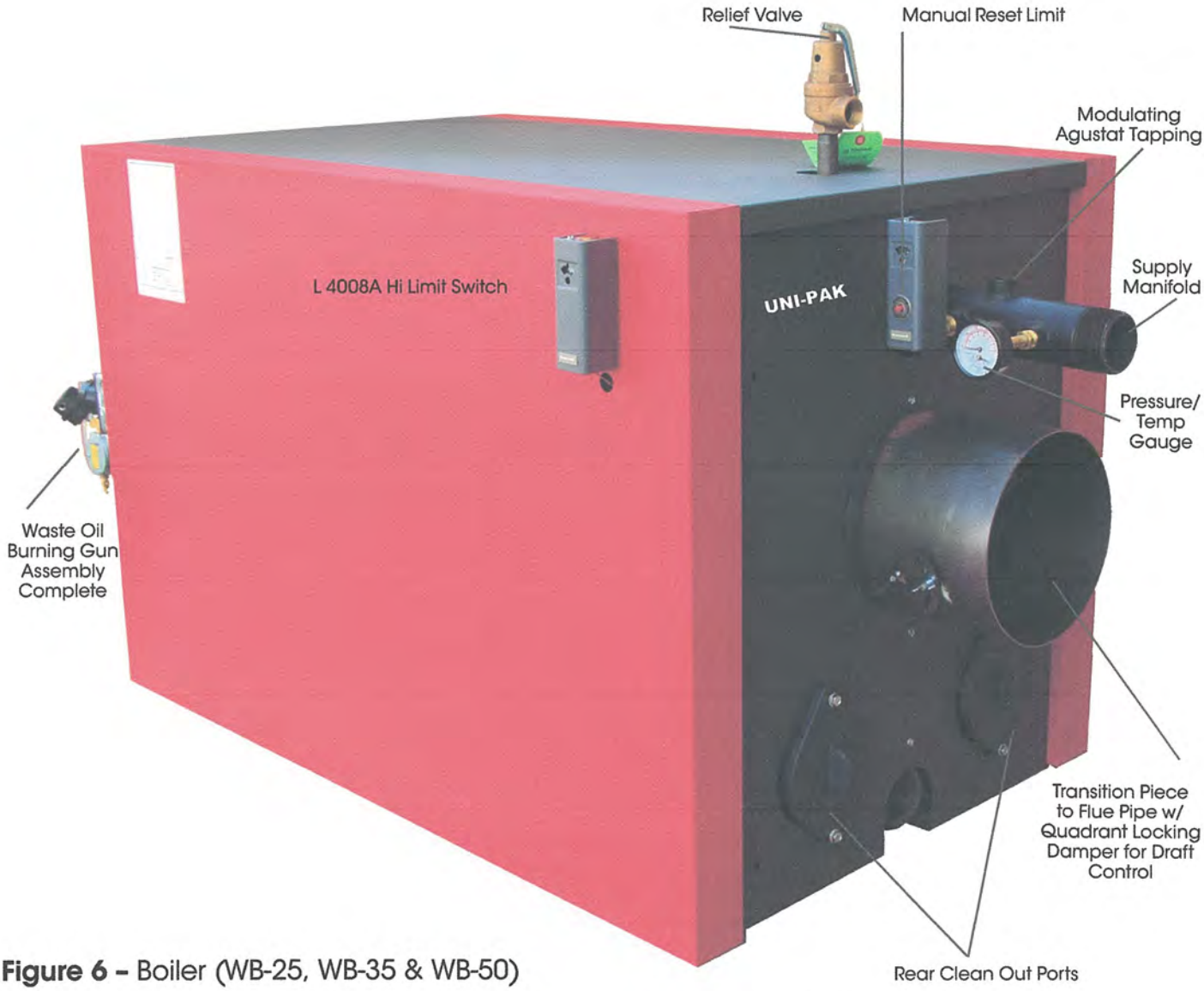
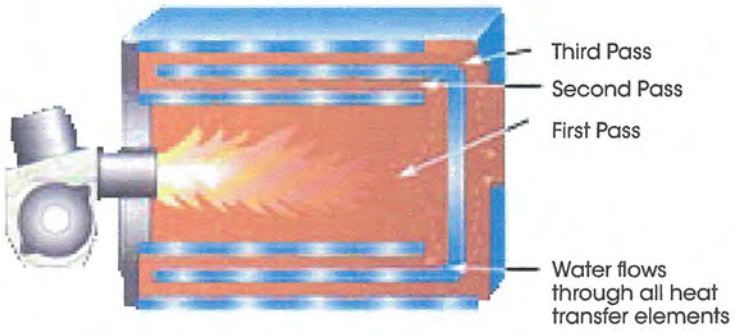


Figure 6 - Boiler (WB-25, WB-35 & WB-50)

WB series boilers are three pass Scotch Marine design with fully water backed transfer surfaces. Boilers are designed for use in forced hot water heating systems. Heating is supplied by a Waste Oil Burner that burns all petroleum products any weight combination up to SAE 90W as well as fuel oils. Boiler–Burner units operate with no less than 0.01WC or greater over fire and may be vented using a conventional chimney.

UNI-PAK Three Pass Design



Combustion Air Supply

WARNING

Failure to provide an adequate supply of fresh air for combustion will result in hazardous operating conditions. If you use a fireplace or a kitchen or bathroom exhaust fan, you should install an outside air intake. These devices will rob the boiler and water heater of combustion air.

1. In unconfined spaces in buildings infiltration may be adequate to provide air for combustion and ventilation. However, in buildings of unusually tight construction, additional air must be provided as described in Item2. (b) below.
2. Boiler located in confined space: [Note: Confined space may be defined as a space whose volume is less than 50 cubic feet per 1000 Btuh of total input of all appliances installed in that space.]
   a) All air from inside of building: Providing infiltration in the rest of the building is adequate, the confined space may be provided with two permanent openings communicating directly with another room or rooms of sufficient volume that the total volume of all spaces meets the criteria for unconfined space. One opening must be within 12 inches of the bottom of the enclosure. See Figure 7.
   b) All Air From Outdoors:
   The confined space shall be provided with two permanent openings, one within 12 inches of the top and another within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or crawl or attic spaces which communicate freely with the outdoors.

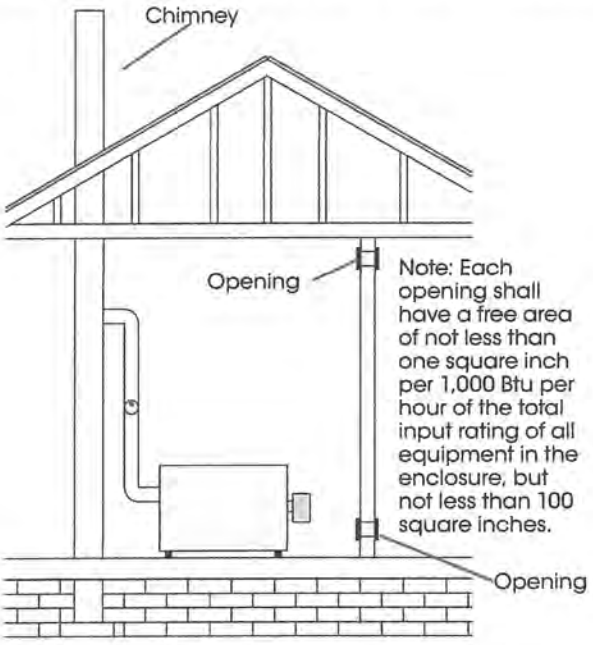


Figure 7 – Air from inside

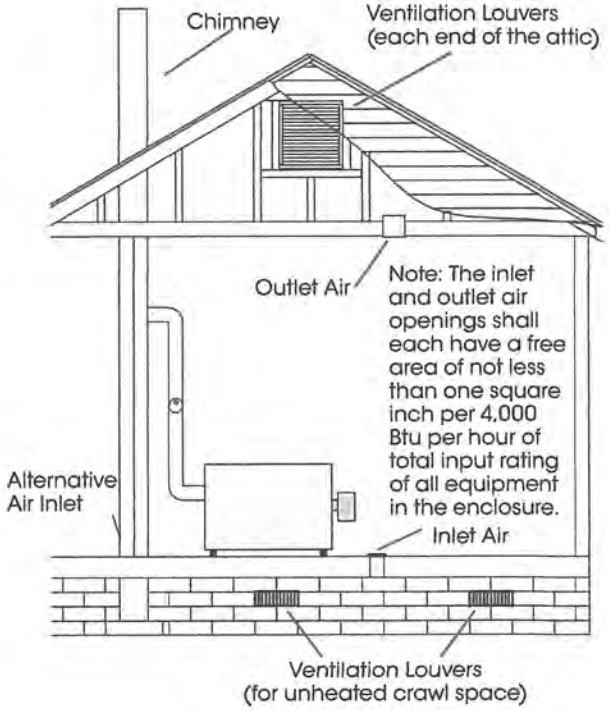


Figure 8 – Air from outdoors

NOTE: All wall openings directly to outdoors must be screened to prevent entry by birds or small animals.

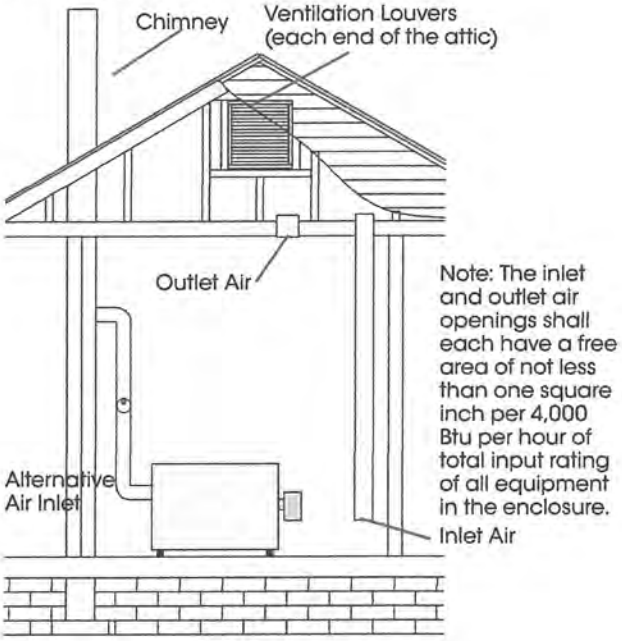
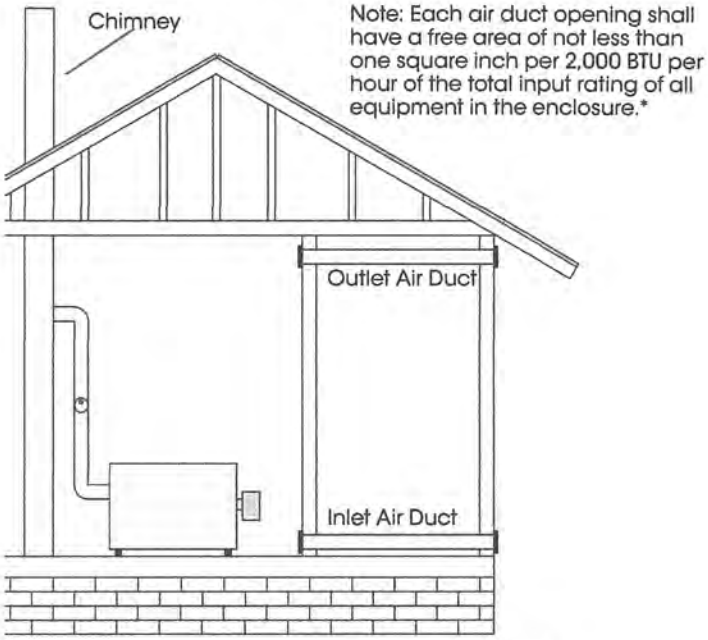


Figure 9 – With vertical ducts



*If the equipment room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of not less than one square inch per 4,000 BTU per hour of the total input rating of all equipment in the enclosure.

Figure 10 – With horizontal ducts

Chimney or Vent Requirements

WARNING

Inspect existing chimney to make sure it is clean, the right size, properly constructed and in good condition before installing boiler. Failure to do so may cause a hazardous operating condition.

Table 1: Minimum Recommended Breaching and Chimney Size

Boiler Model	Minimum Breaching Diameter (inches)	Minimum Recommend Chimney Diameter (inches)	Minimum Recommend Chimney Height (feet)
WB-25	7"	8"	20'
WB-35	10"	10"	15'
WB-50	10"	10"	15'

NOTE: Venting must conform with applicable local codes and National Board of Fire Underwriters.

1. Chimney must be a Class A chimney.

2. This is a high efficiency boiler which operates with a low stack temperature which may be subject to condensation in a cool or improperly designed chimney. Accordingly, the right vent or liner is very important.
   - Masonry chimney with three walls exposed to outdoors may require the use of a 316 stainless steel liner.
   - Masonry chimney with all inside walls—use a tile liner.
3. Breaching
   - See Table 1 for minimum recommended breaching and chimney sizes.
   - Keep run boiler to chimney as short as possible.
   - Use as few elbows as possible.
   - Slope upward towards chimney at not less than 1/4" per foot.
   - Use a sealed-in thimble for the chimney connection.
   - Connect together all sections and fittings with sheet metal screws and seal with silicone sealant.
4. When more than one appliance is connected to the same chimney, the chimney's internal cross-sectional area must be at a minimum equal to the area of the largest vent plus 50% of the area of each additional vent.
5. Clearances—vent pipe between boiler and chimney must be a minimum of 6" from any combustible material.
6. An oil-fired unit shall be connected to a flue having sufficient draft at all times, to assure safe proper operation of the unit.

SIDE-WALL VENTING---IMPORTANT NOTE

Two problems arise when side wall venting any oil appliance;

1. There can be an accelerated rate at which soot builds up on the cad-cell, spinner, etc.
2. There is the potential for severe soot damage to the side of the structure in the event that the boiler operates at a high smoke level. This can happen for many reasons, some of which are out of the control of both the installer and appliance manufacturer.

EconoHeat recommends the use of a chimney to vent our residential oil boilers. If a power venter must be used, it is the responsibility of the installer and power vent manufacturer to "engineer" the power vent system.

ECONOHEAT WILL ASSUME NO RESPONSIBILITY FOR SOOT DAMAGE TO SIDING FROM A POWER VENTED OIL BOILER. THIS APPLIES REGARDLESS OF THE CAUSE OF THE SOOTING.

Locating the Boiler

WARNING

Boiler must not be installed in an area where gasoline, paint or other combustible materials or flammable vapors or liquids are present.

Consider all piping and venting connections before selecting a location. Locate as close to the chimney as possible, observing the following clearances requirements from combustible surfaces:

Front – Additional clearance is required for insertion and removal of the Tube Insert as noted for each model:

WB-25	38.5"
WB-35	38.5"
WB-50	43.5"

Top – 6" above controls
Left Side – 6"
Right Side – 6"
Back – 18"

Boiler is not intended for installation on combustible floor. Further, to facilitate servicing it is desirable to raise the boiler at least 8" off the floor. It is recommended that concrete blocks be employed to build up a foundation. Ensure that top surface of foundation is level.

Installing the Boiler

1. Move the boiler as close as possible to its final location in the crate.
2. Remove the two lag screws holding the rear feet to the skid.
3. Remove the front jacket panel. Cut the band holding the front of the boiler to the skid.
4. Move the boiler into the final position.
5. Waste Oil Piping: USE ONLY 3/8" nominal ID copper piping with flare fittings only on the oil suction from the tank to the oil pump and oil pump to burner. **DO NOT use ferrule fittings or teflon tape on any pipe fittings.** Keep suction line approximately 6" from bottom of oil tank to prevent suction of sludge (Figure 11). Use only an inside oil storage tank. **Do not** draw from an outside tank, especially not an underground tank directly to burner. A separate transfer pump from an outside tank with proper filtration to the inside supply tank is acceptable.
6. The fuel pump included with burner is to be mounted at tank level or below. **PUMP MUST BE MOUNTED HORIZONTAL AND LOCATED NEXT TO WASTE OIL SUPPLY TANK.**

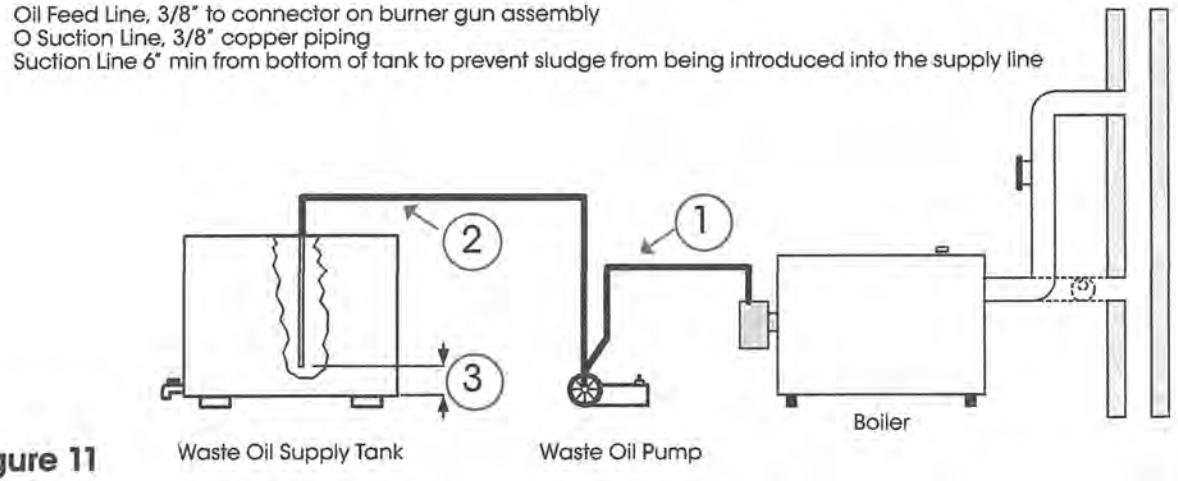


Figure 11

Breaching Installation

The over fire draft should be minimum of -0.02 or more. Refer to Table 1 for minimum breaching sizes. Breaching run should be as short as possible with as few elbows a practical. Unless marginal draft conditions exist, a barometric draft control must be installed in the breaching and should be approximately 18 inches from the boiler breaching connection. Breaching should not project into the chimney beyond the inside wall of the chimney. Connect the breaching to the chimney with a thimble or slip joint to facilitate cleaning. See Figure 12.

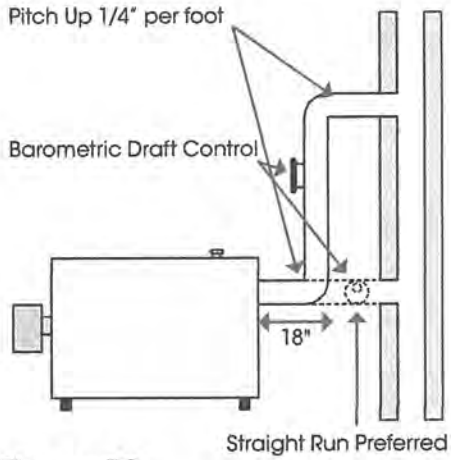


Figure 12

Installing the Boiler Controls & Accessories

1. Accessories for Boilers WB-25:
   a) Take the L-7248C Aquastat relay, the well, the pressure relief valve with pipe nipple and the temperature/pressure gauge from the large carton. Install in taps provided at the rear of the boiler as shown in Figure 13.

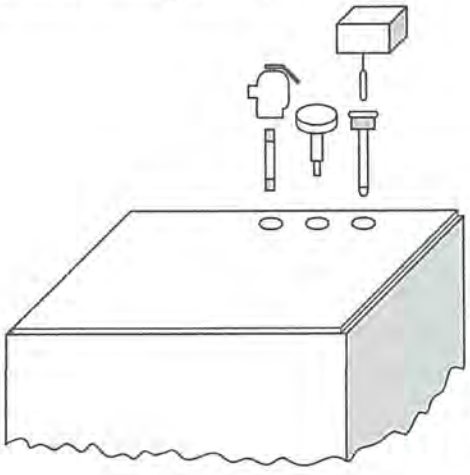


Figure 13

b) Take the boiler drain from the same carton and connect it to the 3/4 inch opening of the 1 1/4 x 3/4 x 1 1/4 inch tee in the boiler return manifold at the bottom rear of boiler.
c) Install 1 1/4 x 3" Nipple and Circulator Flange.
d) Remove the circulating pump from its carton in the crate and mount it to the pump flange on the end of the return manifold.

2. Bare Boiler:
   a) The pressure relief valve and temperature/pressure gauge are supplied with the boiler and should be mounted as shown in Figure 13.
   b) The bare boiler does not include the return manifold. The installer must make up his own manifold to connect to the 2 x 1 1/4 inch bushing which is supplied in the boiler supply and return ports, and must provide his own boiler drain and circulating pump.

3. Accessories for Boilers WB-35 and WB-50:

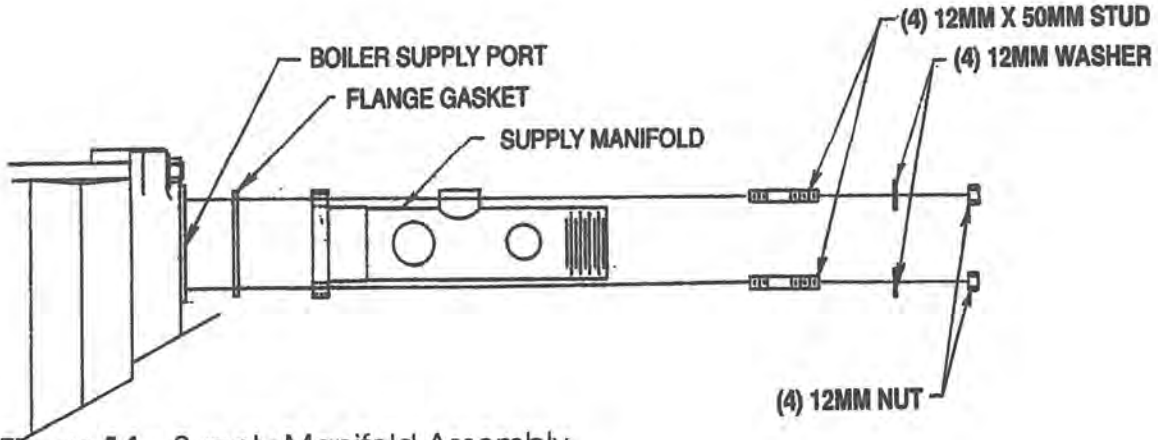


Figure 14 - Supply Manifold Assembly

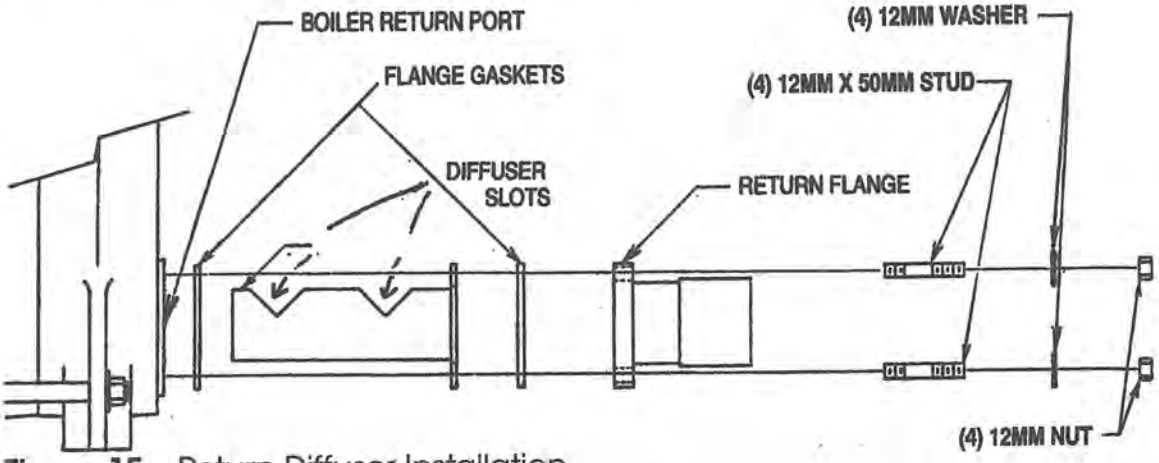


Figure 15 - Return Diffuser Installation

a) Attach supply manifold as shown in Figure 14.
b) Install return port diffuser and attach return flange as shown in Figure 15. Make sure diffuser SLOTS face upward.
c) **Screw threading used on these parts are metric.** ***There is no English thread equivalent to the nuts or studs supplied. Attempts to use any English threaded stud in place of those supplied will damage the boiler block.***

Water Piping Connections

1. To make the piping connections to the boiler ready to connect to the system piping, the following will also be required at a minimum:
   - 1 - Air Purger (same size as supply pipe)
   - 1 - Pressure reducing Fill Valve
   - 1 - Expansion Tank (sized to system design requirements)
   - 1 - Automatic Air Vent
2. The following accessories may also be required, depending upon overall system design and code requirements:
   - 1 - Low Water Cutoff may be required (Electronic Probe Type 550 LWCL included) if boiler is located above radiation level. Check requirements of state or local code bodies and insurance companies. If required use a probe-type designed for water system use and install in tee in supply piping above the boiler.
   - 1 - Manual Reset High Limit----Required by some state or local codes. Also required if system is to comply with ASME code.
   - 1 - Backflow Preventer----- Required by many State and local codes.
3. Additional circulating pumps or zone valves may also be required if the system is to be multi-zone or if it is to include a domestic hot water storage tank with coil.
4. There are two types of expansion tanks used, the closed type and the pre-pressurized diaphragm tank Most new installations use the diaphragm type tank, however some installations still employ the closed type tank.
   - Piping Connections with closed type expansion tank—See Figure 16. Piping from tee in supply to tank should be 3/4 inch. If horizontal piping is employed, pipe must be pitched up toward tank 1/4 inch per foot.
   - Piping connections with diaphragm expansion tank— See Figure 17. The cold water feed to the pressure reducing fill valve may be piped with 1/2 inch pipe.

WARNING

The expansion tank must be properly sized to system requirements. An under-sized expansion tank will cause system water to be lost through the relief valve and make-up water to be introduced through the fill valve. Continual introduction of fresh water into the system will cause mineral build-up in the boiler sections and eventual section failure.

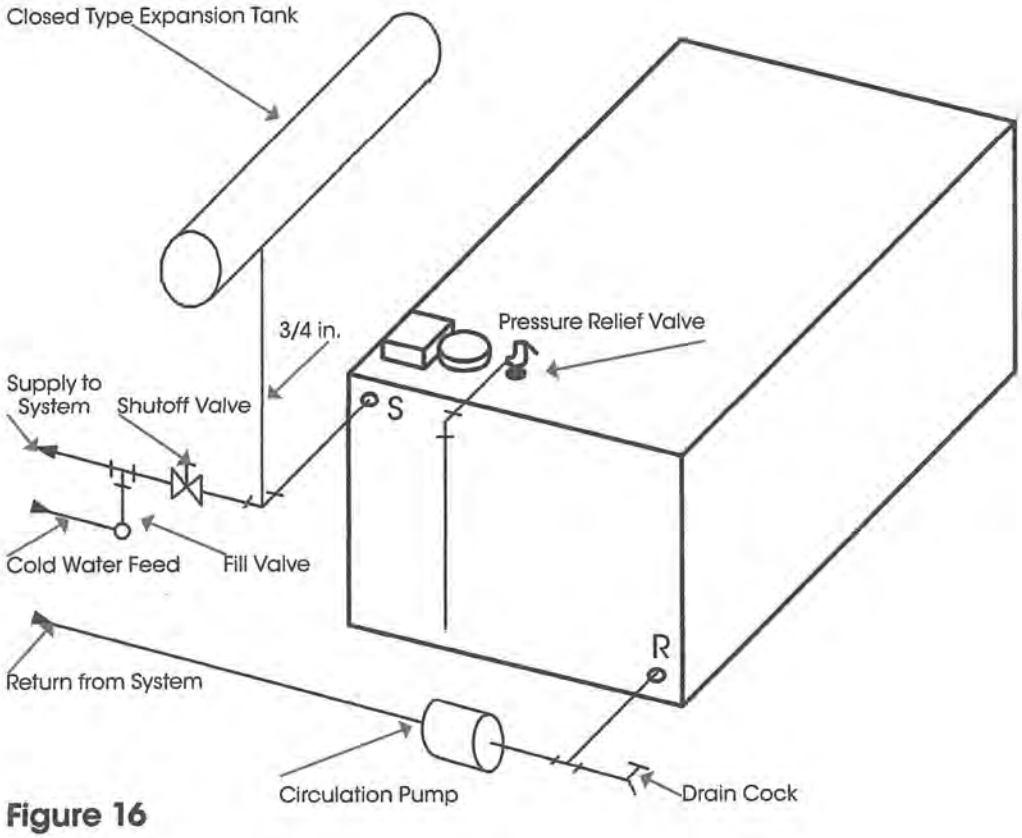


Figure 16

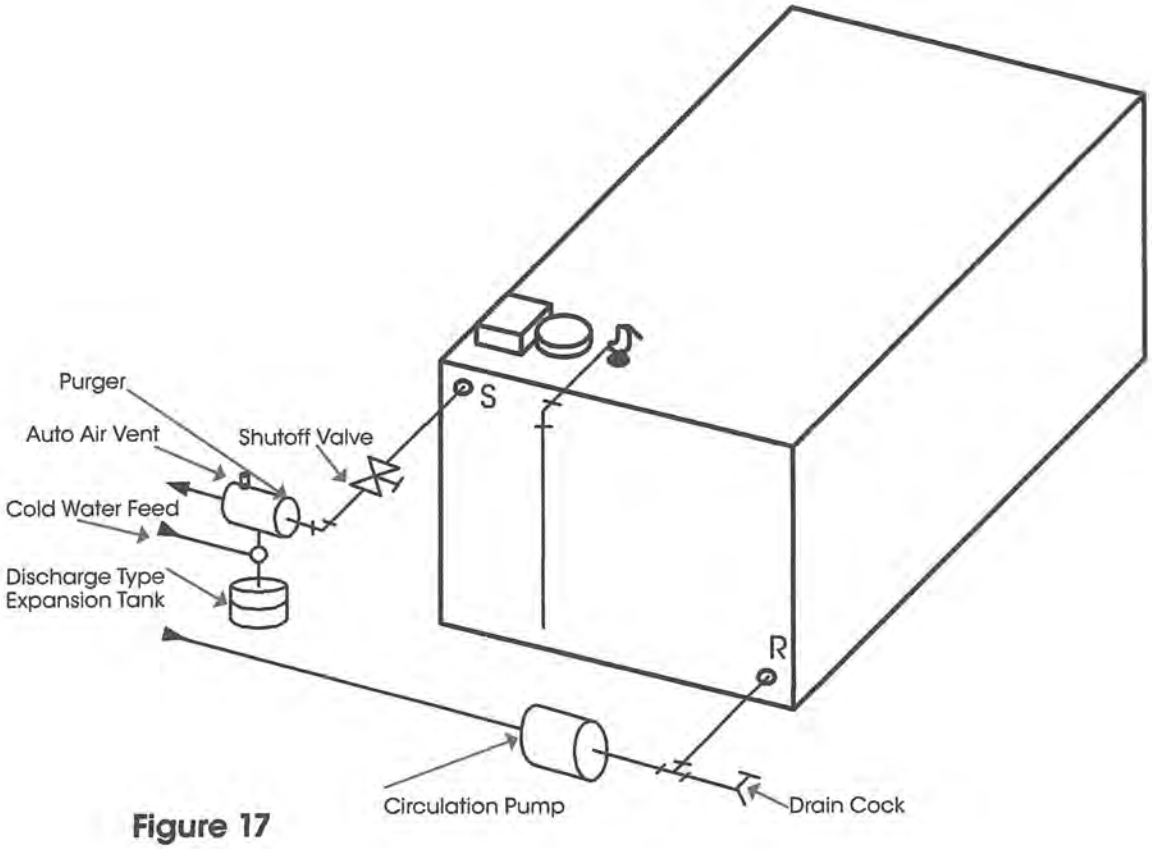


Figure 17

System Piping

WARNING

Discharge piping from relief valve must be piped to a drain or must terminate 6" above floor to eliminate damage to the structure or personal injury. It must not be piped to a point where freezing might occur.

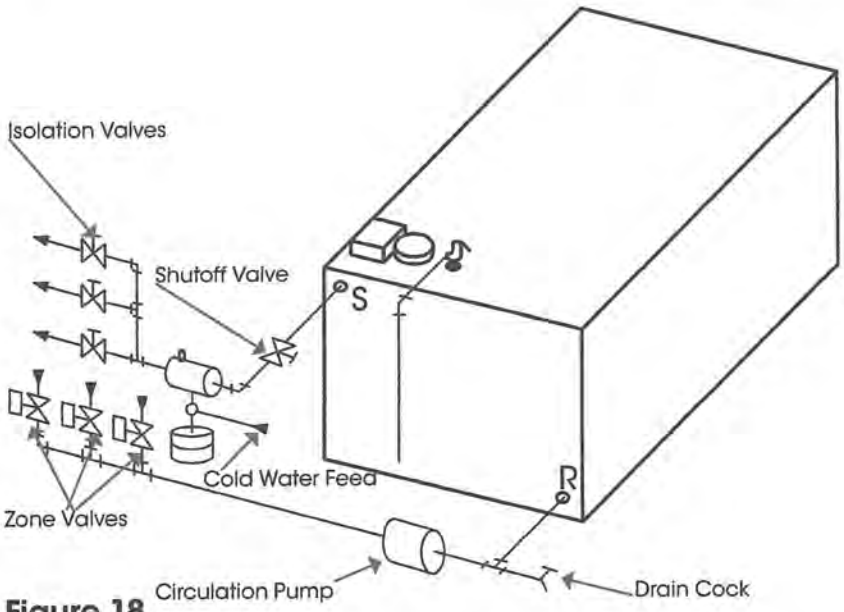


Figure 18

Supply and return and system piping should be sized by determining the pressure drop, required flow rate and pump capacity.

1. Multiple zoning with zone valves: Install a balancing valve in each zone and adjust so that flow is about the same in each zone. See Figure 18.

2. Multiple zoning with circulation: Each pump will require a separate relay (Honeywell R845A or White Rodgers 829A-845, or equivalent). Install a flow control valve in each zone including the indirect water heater to prevent gravity circulation. Install a balancing valve in each zone and adjust so that flow in each zone is about the same. See Figure 19.

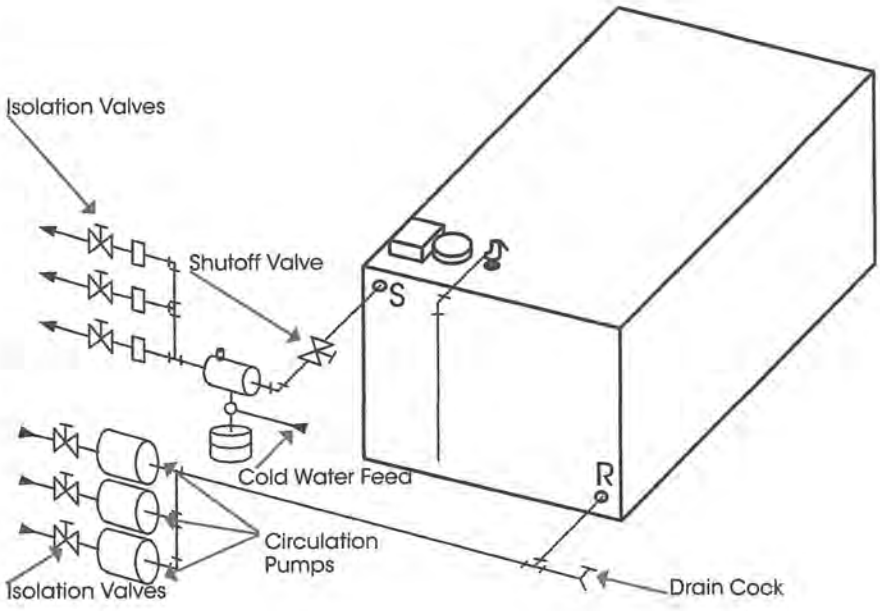


Figure 19

3. Radiant panel or other low temperature system: The temperature of the system water coming back to the return port of the boiler must not be permitted to drop below about 135 Degree F for an extended period of time. Return water temperatures of 130 Degree F or lower will cause condensation on the exterior surface of the heat exchanger and corrosion and eventual heat exchanger failure will result. Radiant floor and ceiling panel heating systems typically operate with maximum supply water temperatures of 140 Degree F or less. A standard piping arrangement would, under these circumstances, permit return water temperatures of 120 Degree F and lower. Accordingly, such systems must be piped such that the return water temperature will be high enough at all times to prevent condensation. See Figure 20.

NOTE: Bypass A shown in Figure 20, below, should *not* exceed 12 inches in length. If it is not practical to maintain a 12 inch length or less then increase the pipe size of the bypass by one size.

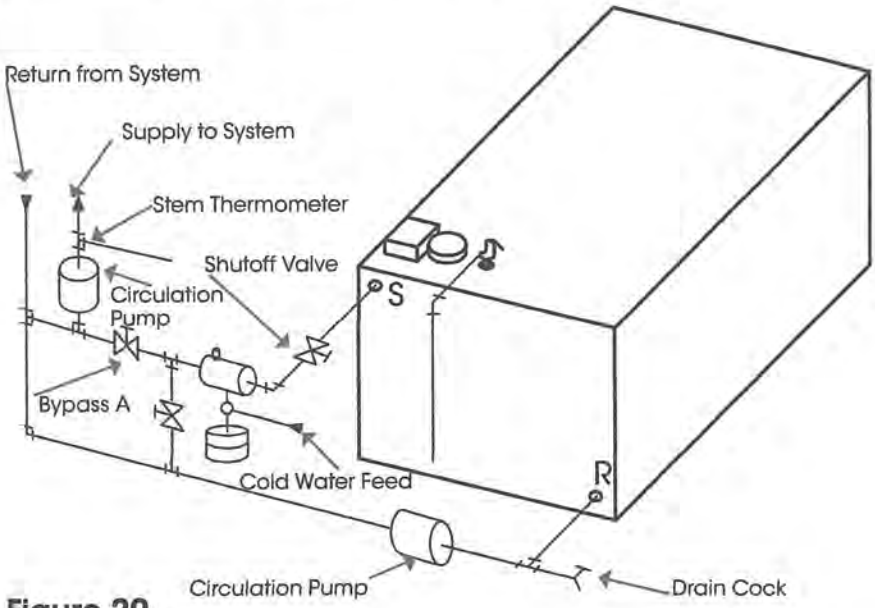


Figure 20

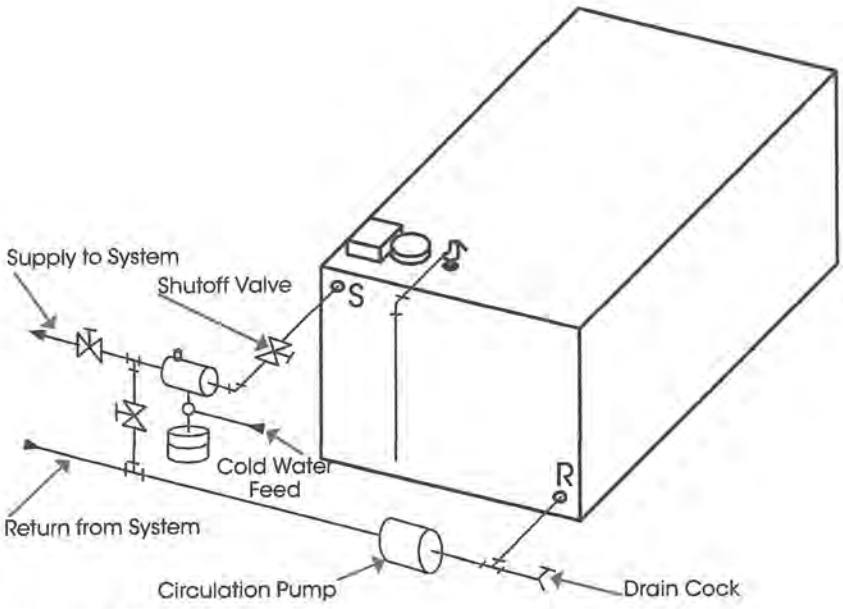


Figure 21

4. Large water content systems: Such systems as converted gravity systems, old systems with cast iron radiators, and also newer systems that employ outdoor reset control present a potential problem with low return water temperatures and condensation. The boiler must be protected from condensation in such cases by using a by-pass as shown in Figure 21.

5. Integrated system (heat and domestic hot water): With a single heating zone priority for domestic hot water may be provided through the use of a 3-port zone valve. This system assures that full boiler output is available to recover the storage tank quickly and should be used where supply of domestic hot water on demand is critical. For this application use a full throated valve with a minimum pressure drop. See Figure 22.

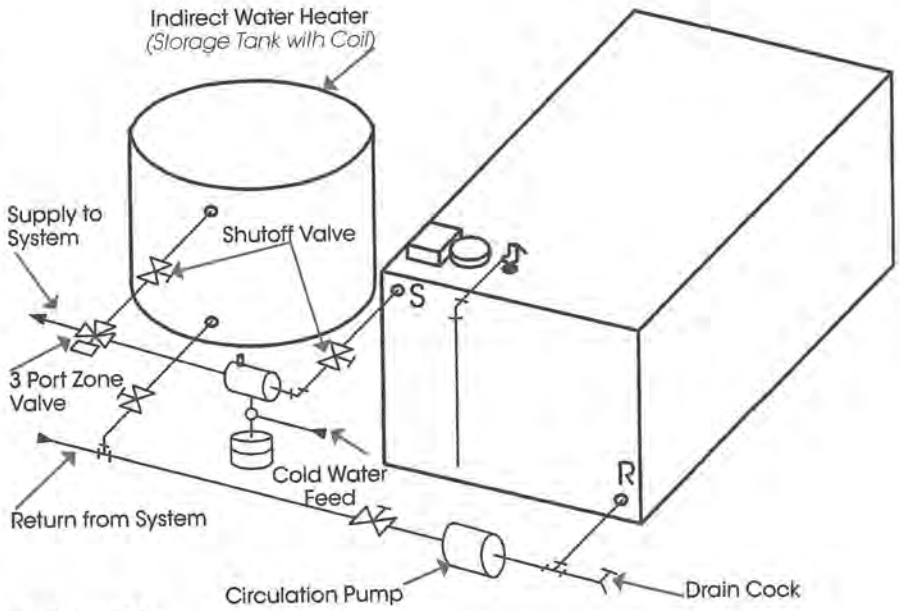


Figure 22

6. Integrated system with multiple heating zones and no priority for domestic hot water using zone valves: Where the boiler output is large relative to the heating capacity of the coil in the indirect water heater priority for domestic hot water is not necessary. Further, with multiple heating zones there is less likelihood that all zones will call for heat at once and require full boiler output for heating. Because the tank is usually close to the boiler, the pressure drop through the coil circuit will generally be less than through a heating zone circuit, which will provide some measure of priority for domestic hot water. This can be enhanced by increasing the pipe size to the coil e.g. if 3/4 inch pipe is used on the heating zones run 1 inch pipe to the coil. (See Figure 23.) Should priority for domestic hot water be mandatory, it can be provided as shown in Wiring Section, Figure 24.

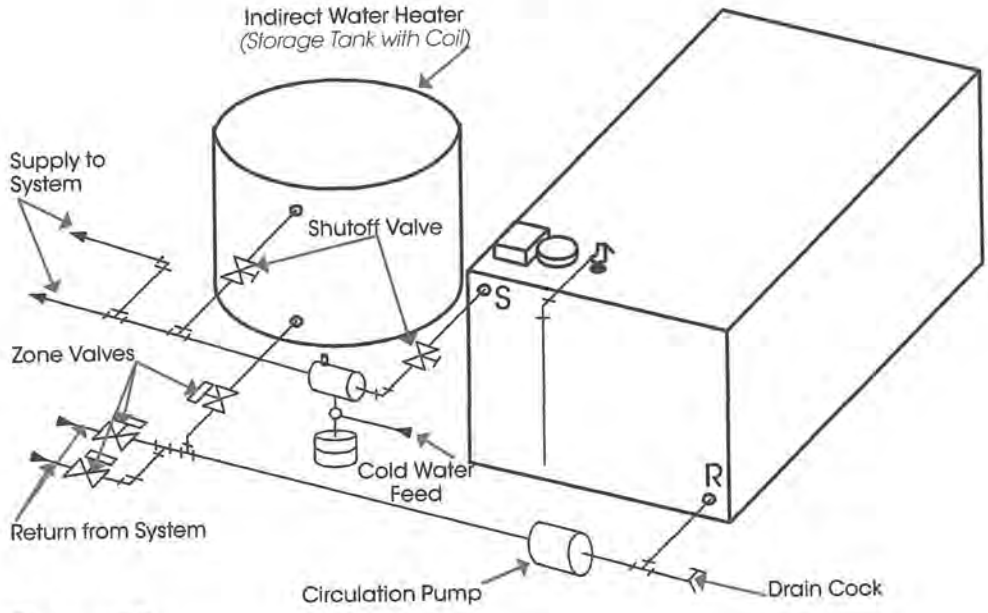


Figure 23

7. Integrated system, single or multiple heating zones, using circulating pumps rather than zone valves: Each pump will require a separate relay (Honeywell R845A or White Rodgers 828A-845, or equivalent). Install a flow control valve in each zone including the indirect water heater to prevent gravity circulation. Install a balancing valve in each zone and adjust so that flow in each zone is about the same. (see Figure 24.) While this basic system does not provide priority for domestic hot water, priority can be provided as shown in Wiring Section, Figure 27.

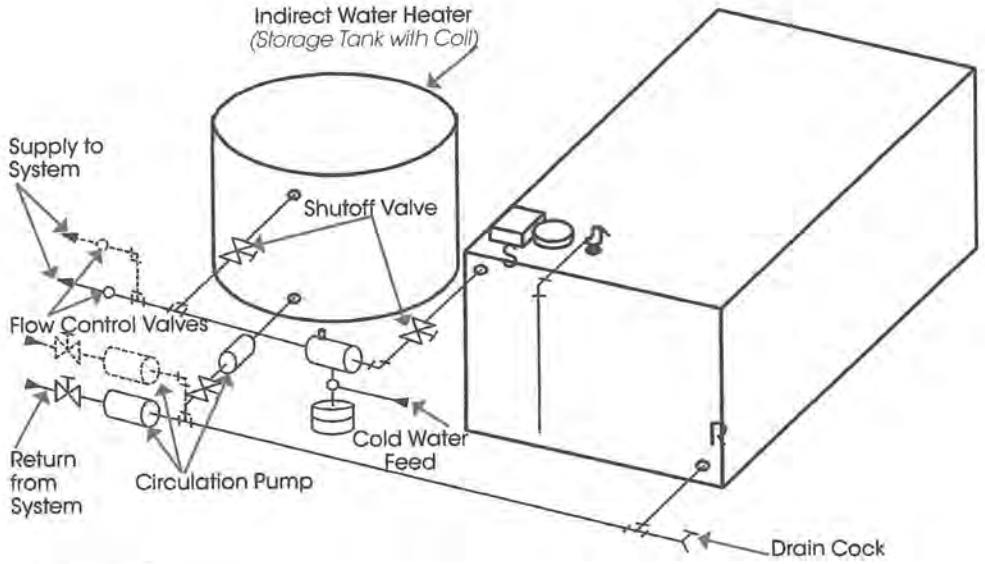


Figure 24

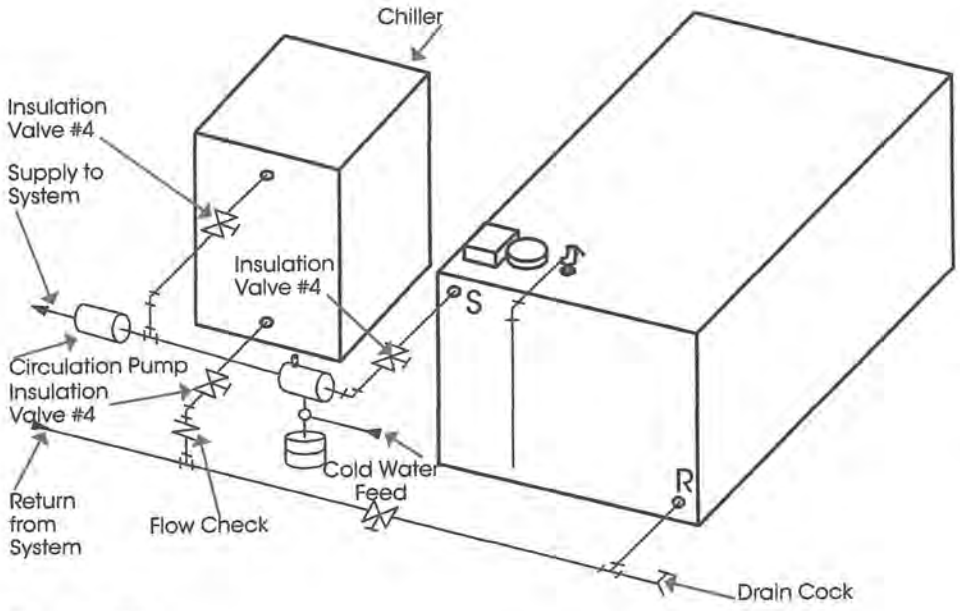
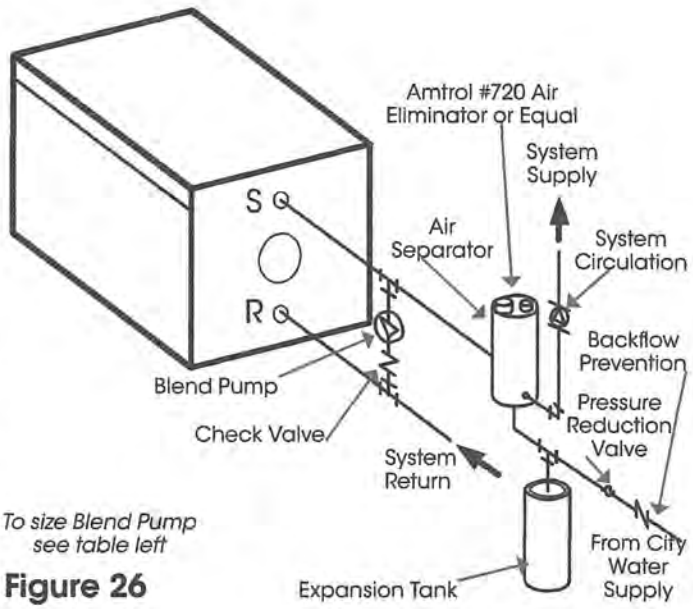


Figure 25

8. Combination heating/ cooling system with chilled water: The chiller must be piped in parallel with the boiler and isolation valves installed to prevent the chilled water from circulating through the boiler and heated water from circulating through the chiller. See Figure 25.

9. Single boiler piping with blend pump: When burner is operating the water flow throughout the boiler shall be not less than 1.8 GPM for each 100,000 BTU/HR of gross boiler output. Size blend pump accordingly. See table below and Figure 26.

Blend Pump		Primary/ Secondary Pump
Boiler Model	GPM	GPM
OWB-35	16.3	78.9
OWB-50	19.6	94.9
Maximum water flow resistance for boilers is 14" w.c.		



To size Blend Pump see table left

Figure 26

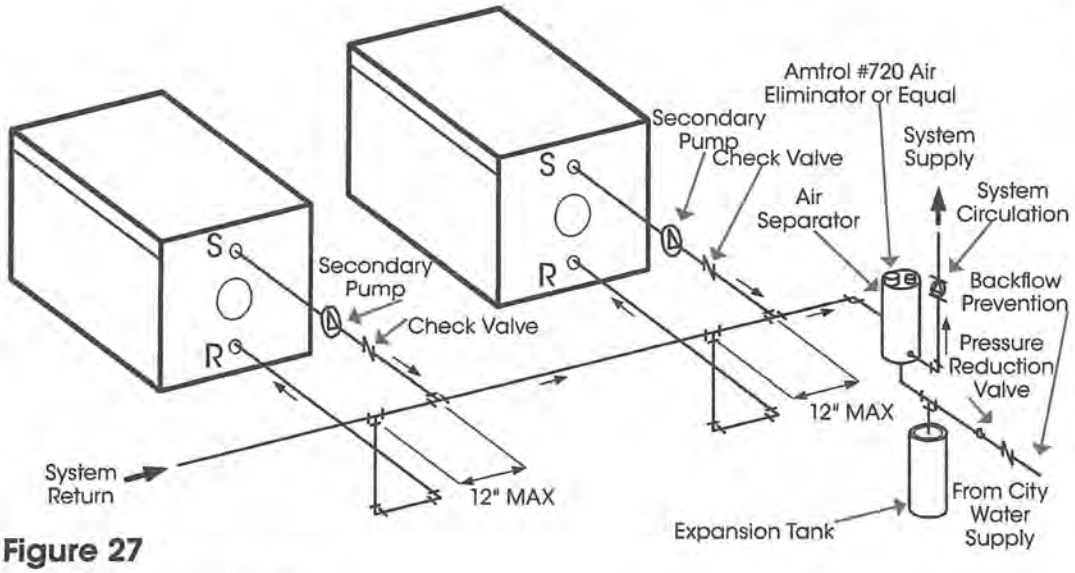


Figure 27

10. Single or multiple boiler piping for primary/secondary pumping: Size secondary pump GPM at gross boiler output for 20" Drop. When calculating pump head, the maximum boiler resistance for any boiler will not exceed 14 in. W.C. head. See Figure 27.

11. Multiple boiler piping, reverse return flow with blend pump: See Figure 28.

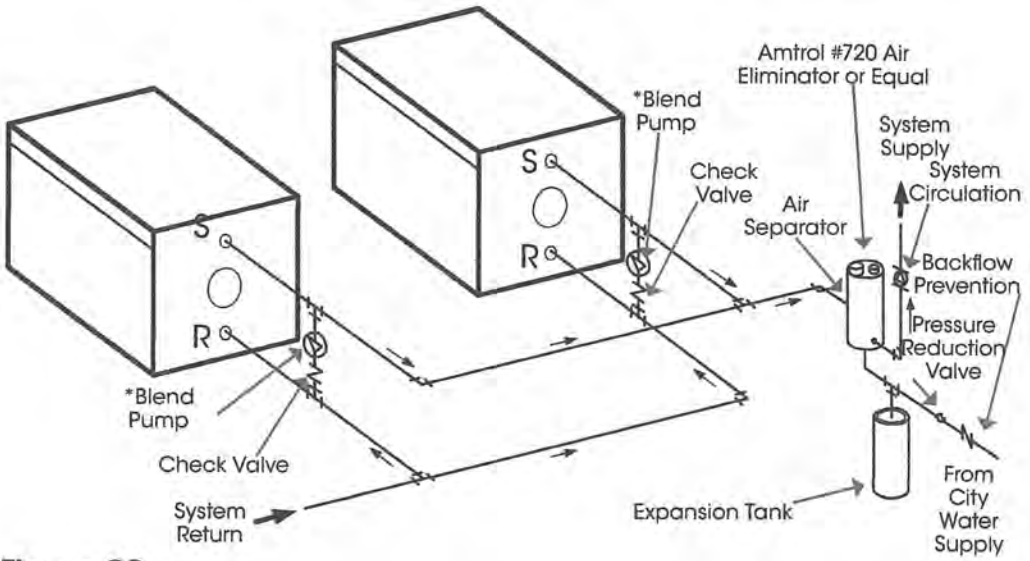


Figure 28

Burner Mounting

Note: When the burner is field installed, the installer must fill in the space between the burner blast tube and the insulation block on the inside of the burner door with refractory mix provided

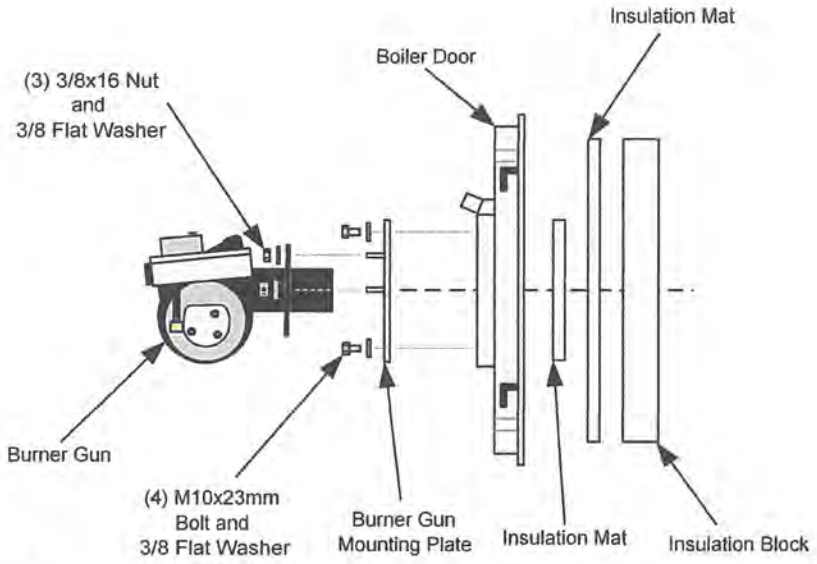


Figure 29 - WB-25, WB-35 and WB-50 Burner Mounting & Boiler Door Detail

Boiler Jacket Assembly

WB-35 and WB-50 Jacket Installation Instructions

- Screw the four extension setscrews (43) into the four outer holes in the corners of the rear sections. Securely tighten the setscrews and other fastening bolts of the flue outlet cover (22)
- Place the large wraparound insulation mat (40) over boiler block (aluminum foil side facing out).
- Place smaller piece of insulation on top of wraparound insulation. This will provide double thick insulation on top of the boiler block.
- Remove flue collector clean-out covers (62)
- Push the two smaller pieces of insulation (60) onto the flue collector (22) so that the four extension setscrews (43) protrude through the insulation.
- Attach rear jacket panels (36) and (38) to the two extension screws(43) using the M6x10 pan head screws. Screw the rear panels together in the center using sheet metal screws provided. Reattach the clean-out covers.
- Place right and left side panels (93) (94) into the factory mounted hinge bracket (18) and hook into the rear panels (36) (38).
- Hook center panel (33) with flange edge down between side panels (93) and (94).
- Attach the upper front trim panel (41) between the right and left side panels over the front door.
- Place the top panel (86) in position. Hook to the side panels.
- Remove sight glass plug in front door and install sight glass assembly. Sight Glass (25) Sight Glass Tube Cap(26) and Sight Class Gasket(48).

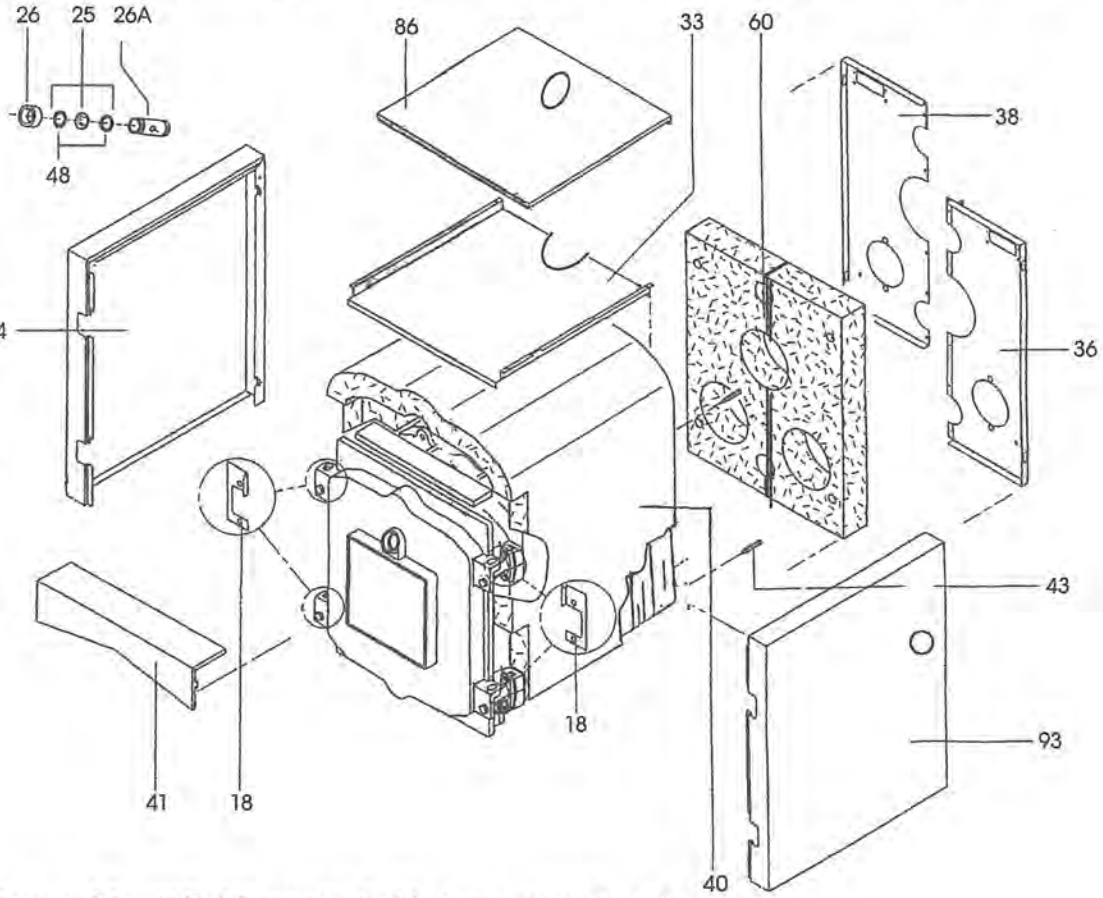


Figure 30 - WB-35 and WB-50 Assembly Detail

OWB-25 Jacket Installation Instructions

- Attach the rear jacket mounting brackets (7) to rear tie rod ends on back of boiler using the 12mm nut (9) provided on the end of each tie rod.
- Attach the rear jacket panel (3) to the rear jacket mounting bracket using the 1/4-20 screws (11) ans nuts (10) provided.
- Assemble front jacket mounting bracket (23) to the heat exchanger using the two M10x16mm cap screws (27).
- Drape the foil faced fiberglass insulation mat (not shown) over the top and sides of the boiler. Make sure that the insulation is behind the Door Hinge and Front Mounting Bracket and that the tappings in the top of the boiler are not covered by the insulation.
- Attach one door bracket (18) to the bottom of both the left and right side jacket panels. Use two 8-32x1/2" screws (19) and nuts (20) to assemble each door bracket.
- Attach the left and right side jacket panels to the boiler. The front end of the right side panel is attached to the hinge using 10-24x3/4 screws (21). The front end of the left side panel is also attached to the front jacket mounting bracket (23) using 10-24x3/4 screws. The rear of both the left and right panels are attached to the rear panel using #10x1/2 sheet metal screws.
- Install a #10x1/2 sheet metal screw into the remaining hole in the rear of the right side jacket panel which secures the rear of the wireway.
- Attach the top jacket panel (5) using four #10x1/2 sheet metal screws.
- Attach the flue collector cover (4) using four #10x 1/2 sheet metal screws.
- Press the door switch (16) into the door switch bracket (17). Connect the door switch leads to the switch (it does not matter which wire is connected to which side of the switch). Attach the door switch bracket to the right side jacket panel using a 10-24x3/4 machine screw (21).
- Mount the door knobs (25) to the front panel (24) using two 8-32x1/4 screws (26).
- Mount the front jacket panel on the boiler.
- Connect the loose end of the 6" conduit assembly to the limit control. Connect the black wire to terminal "B1" and the white wire to terminal "B2".

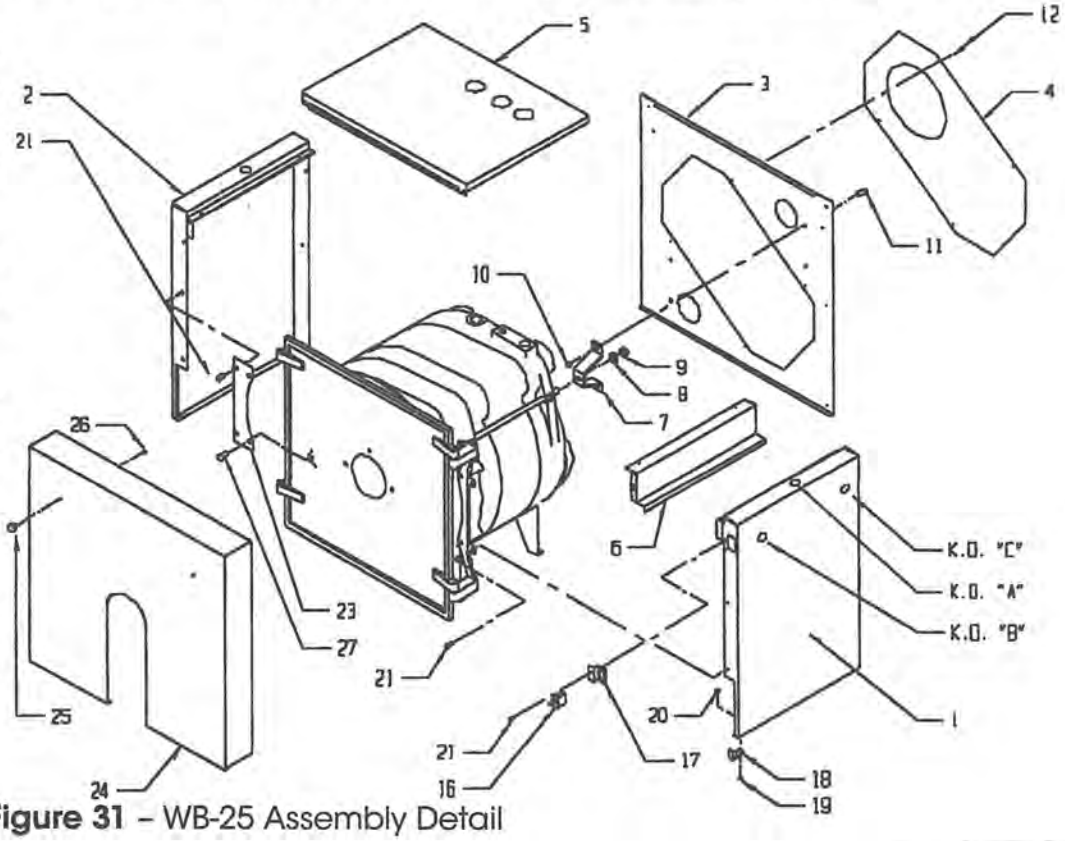
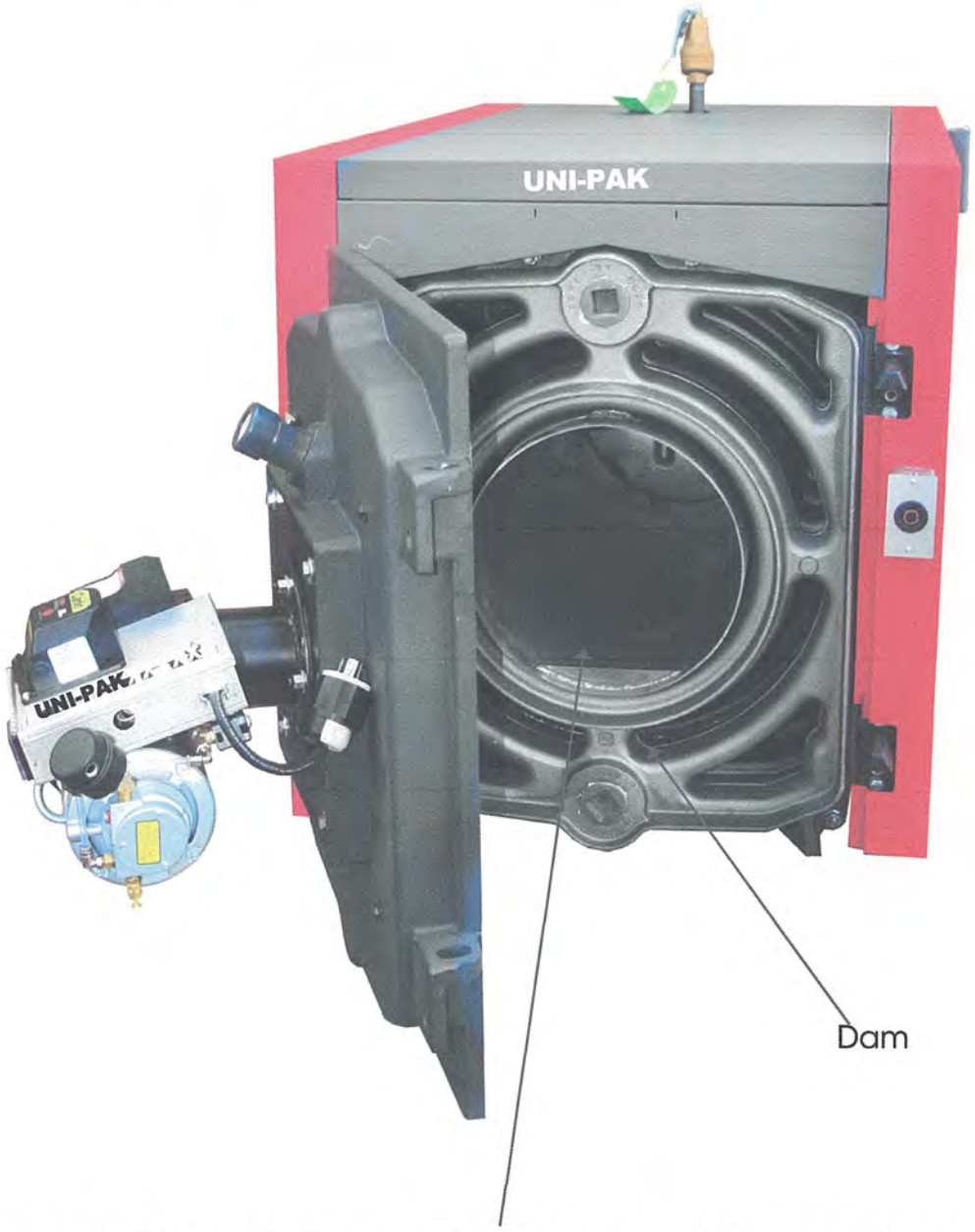


Figure 31 – WB-25 Assembly Detail

Boiler Tube Insert Assembly



Install Stainless Steel Tube Insert with external stitch weld touching first water section high point of casting and the dam located at the 6 o'clock position (bottom of boiler). When boiler door is closed, stainless tube will embed into door refractory at least 1/4".

Wiring

WARNING

All wiring and grounding must be done in accordance with the authority having jurisdiction or, in the absence of such authority, with the National Electrical Code (ANSI/NFPA70).

1. 120 Volt Wiring—The boiler should be provided with its own 20A branch circuit with fused disconnect. All 120 volt connections are made inside the L8148A aqua-stat relay as follows (also see Fig. 31 or 32):
   - Hot ("black")- Terminal "L1"
   - Neutral ("white")- Terminal "L2"
   - Ground ("Green" or bare)- Ground screw on case of L8148A
2. Thermostat Wiring—Follow thermostat manufacturer instructions. To insure proper thermostat operation, avoid installation in areas of poor air circulation, hot spots (near any heat source or in direct sunlight), cold spots (outside walls, walls adjacent to unheated areas, locations subject to drafts). Provide Class II circuit between thermostat and boiler. Connect thermostat wire leads to terminals "T" and "T" inside L8148A aqua-stat relay.

Wiring Variations

1. Multiple Circulator Zones—Figure 36 shows wiring for two or more circulator zones using Honeywell R845As. One R845A is required for each circulator zone. Circulator terminals "C1" and "C2" on the L8148A are not used. A DPST Honeywell RA832A may be substituted in place of the R845A using the "X" and "X" terminals in place of the "5" and "6" terminals on a R845A. A call for heat from any thermostat will energize the DPST relay in that zone"s R845A. When this relay is energized, electrical continuity is created between terminals 3 and 4, energizing the circulator for that zone. At the same time, electrical continuity is created between terminals 5 and 6 on the R845A, creating a current path from terminal "T" to "T" on the L8148A. Assuming that the supply water temperature is below the high limit setting, the normal ignition sequence will be initiated.
2. Multiple Zones using Zone Valves—Figure 35 shows wiring for multiple zones using Honeywell V8043F zone valves. This wiring diagram may be used for other 24-volt zone valves as long as they are equipped with end switches. Do not attempt to use the transformer on the L8148A to power the zone valves; use a separate transformer. Up to five V8043Fs may be powered by one 48VA transformer, such as the Honeywell AT87A. A call for heat from a given thermostat will result in the application of 24 volts across the TH and TR terminals on the corresponding zone valve, energizing the zone valve motor. The zone valve opens and the end switch contacts are then made. The end switches are connected in parallel with each other and to the "T" and "T" thermostat connections so that any zone valve that opens will also start the circulator and fire the boiler(assuming the high limit is not open). Zone valve terminal TH/TR has no internal connection on the zone valve; it is merely a "binding post" used to connect two or more wires.

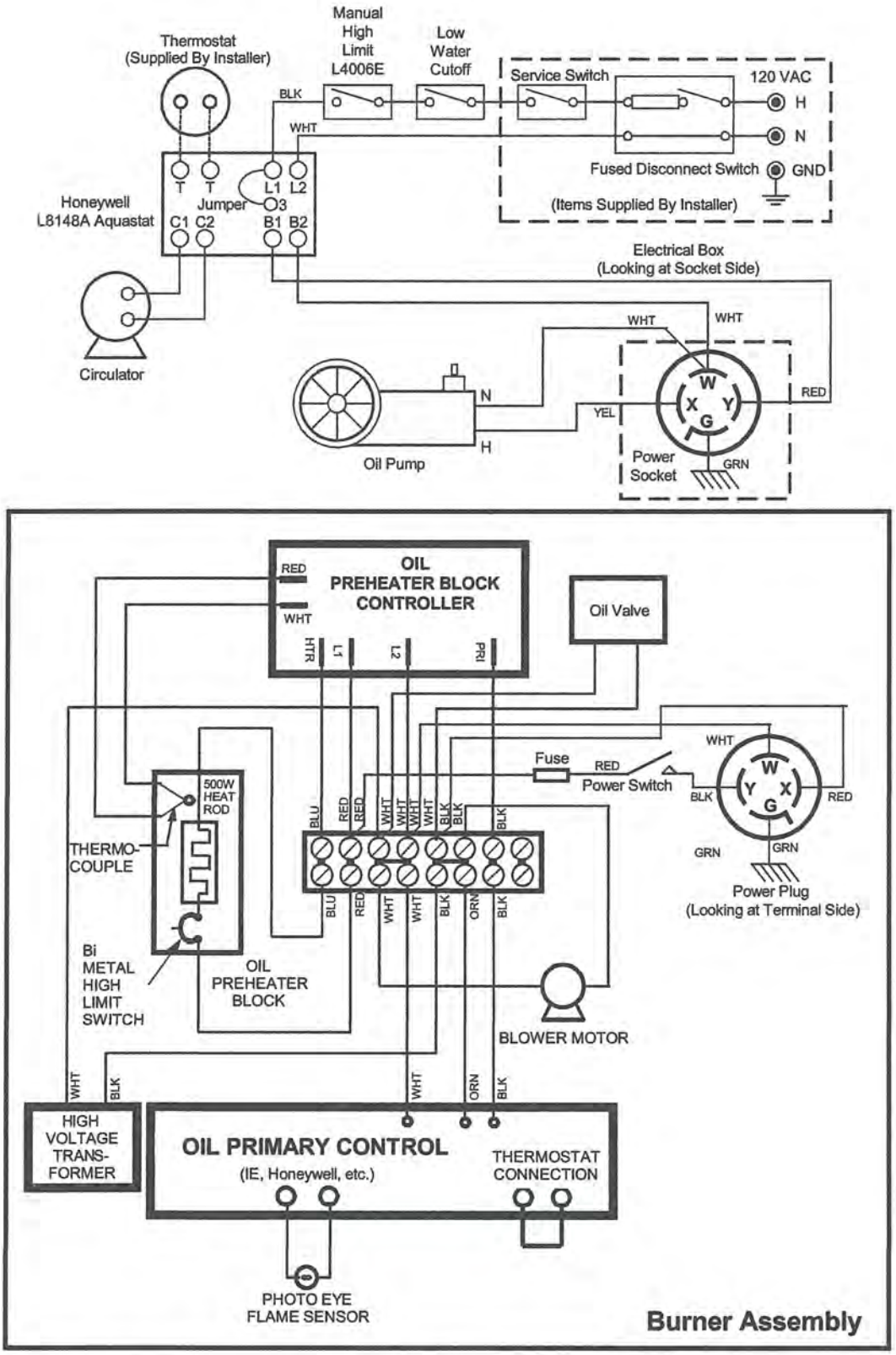


Figure 32 – Wiring diagram, single heat zone only, OWB-25

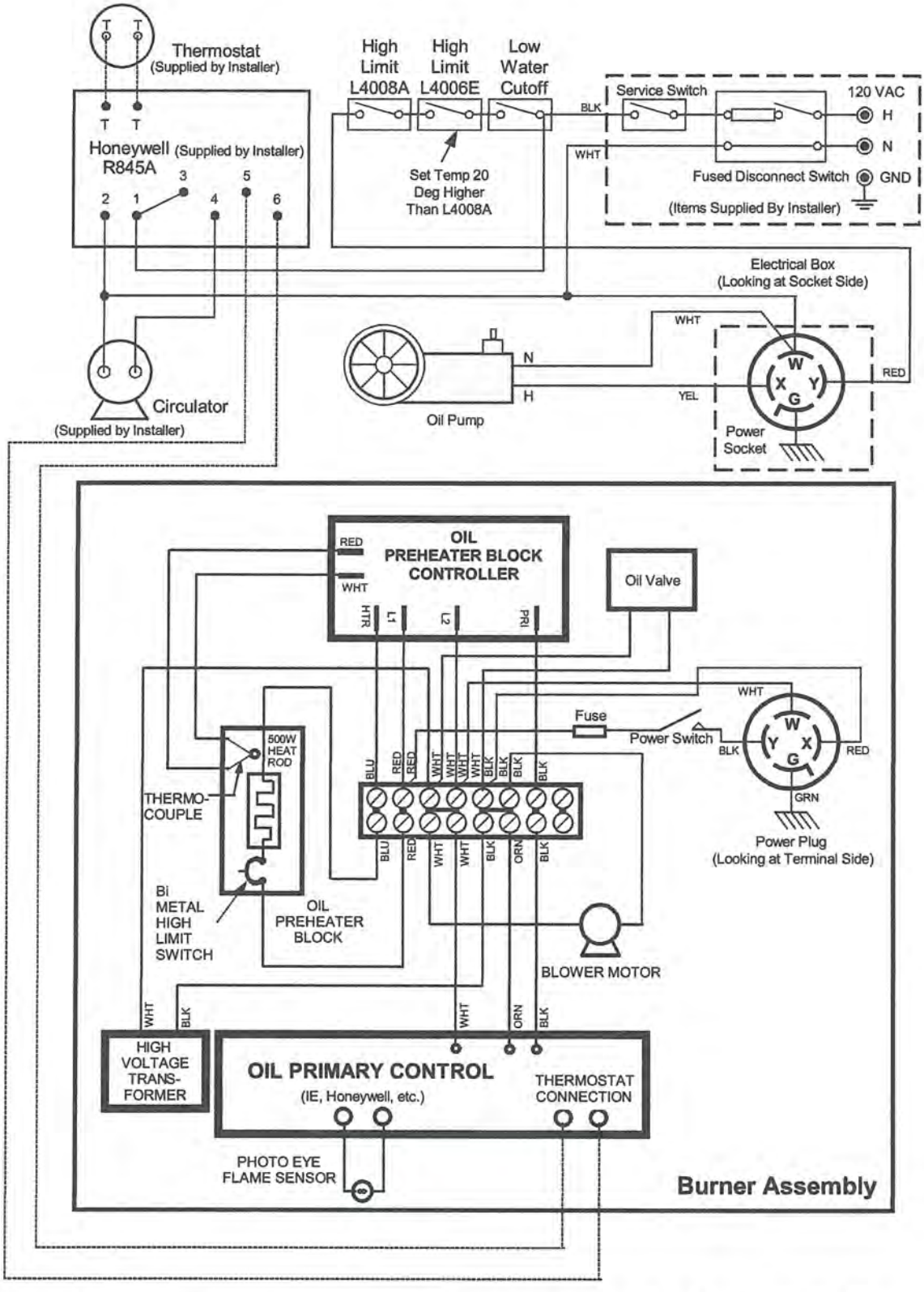


Figure 33 – Wiring diagram, single heat zone only, OWB-35 and OWB-50

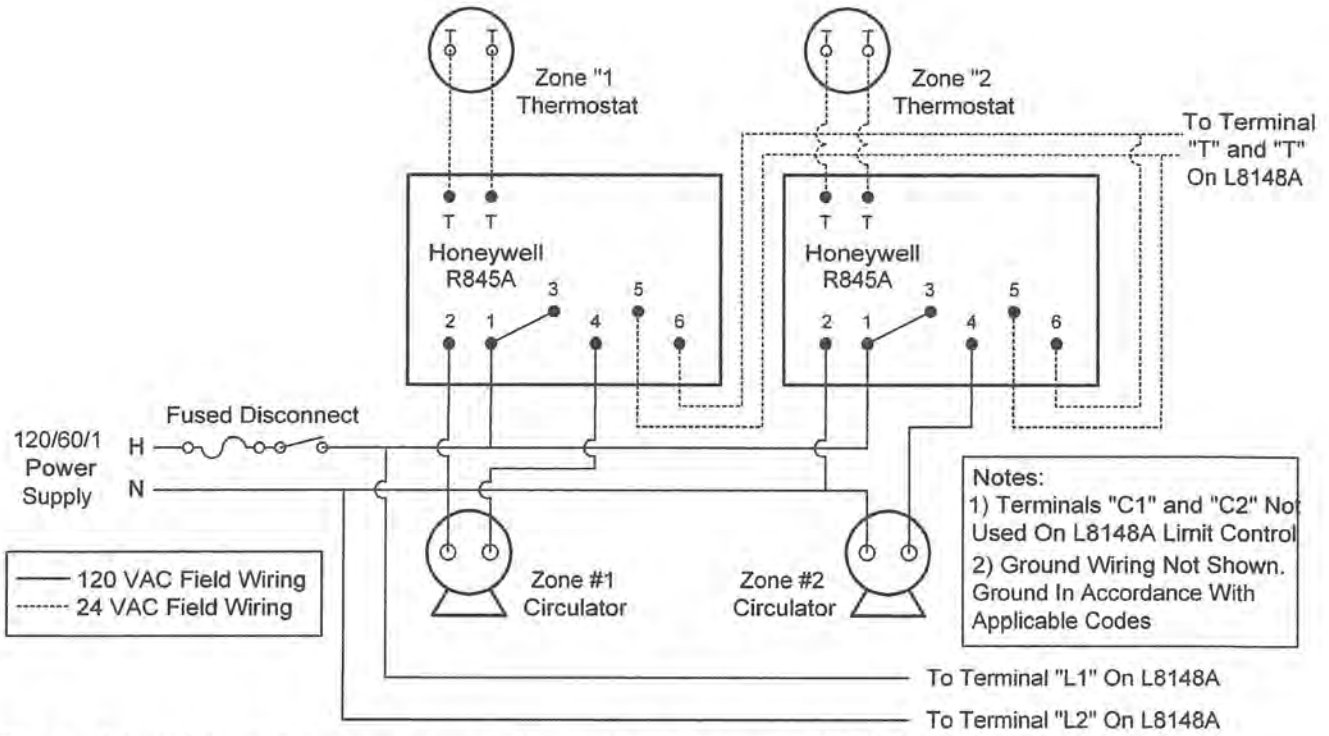


Figure 34 – Wiring diagram, zone wiring using Honeywell V8043F valves (factory boiler wiring not shown here – see figure 32 or 33)

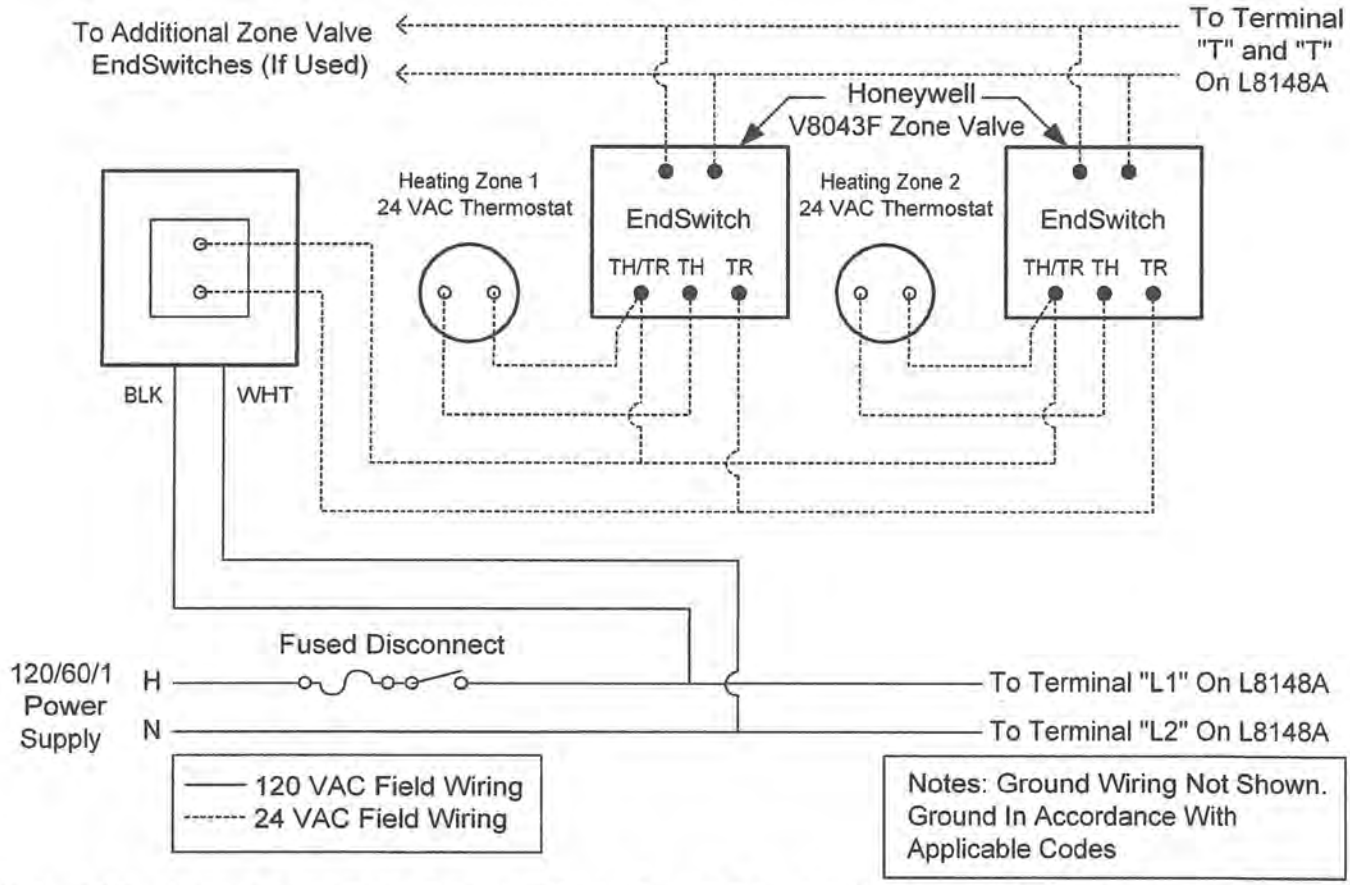


Figure 35 – Wiring diagram, circulator zone wiring using Honeywell R845A valves (factory boiler wiring not shown here – see figure 32 or 33)

Boiler Start-up and Adjustments

FILL SYSTEM

1. Close manual air vents (if used) and automatic air vents. Attach hose to boiler drain on return connection and run to a drain or to outdoors. Open drain cock and close shutoff valve on boiler supply pipe.
2. HEATING ONLY – SINGLE ZONE SYSTEM – Open manual valve in cold water feed line and set the fill valve to fast fill. Allow water to flow through the system and out the hose until there is a steady flow of water through the hose with no air bubbles. Next, open the shutoff valve in the drain until air bubbles cease. Then take the fill valve off fast fill, close the drain cock, remove the hose and open all automatic air vents. Also open all manual air vents one at a time and close when water squirts out. Observe the temperature/pressure gauge. System pressure with a cold fill should be in the 12 to 14 psi range.
3. MULTI-ZONE SYSTEMS-HEATING ONLY OR HEAT & DOMESTIC HOT WATER WITH ZONE VALVES – To ensure good circulation through all zones with no air pockets, each zone should be purged of air individually. With all zone valves in the manual open position let water flow through the system by opening the drain cocks so water can exit the system through a hose as in 1 above. When the system seems to be full and free of air, close the drain cock, and the shutoff valve on the boiler supply pipe, leaving the manual valve on the cold water feed open. Now release the manual openers to close all but one zone valve. Open the drain cock and put the fill valve on fast fill. When the flow through hose becomes steady with no air bubbles, take the fill valve off fast fill and then close the drain cock. Repeat this procedure with each zone until all zones have been purged. Open the shutoff valve on the boiler supply pipe. Then open all manual air vents one at a time. When water sprays out of the air vents should have the cap loosened so it can vent air.
4. MULTI-ZONE SYSTEMS ZONED WITH CIRCULATORS – Following the same procedures as in 3 above using the manual shutoff valves to isolate a zone instead of zone valves.
5. Check system pressure on the temperature/pressure gauge on the boiler. Pressure should be in the 12 to 14 psi range. If pressure is over 14 psi drain a little water out with the drain cock. Watch gauge for a few minutes to ensure pressure does not build back up. If pressure is too high with system cold there is a good possibility the relief valve will blow off when the system is brought up to temperature. Too high a pressure with the system cold indicates a faulty fill valve.

Waste Oil Burner Start-up Procedure

1. **IMPORTANT -** Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Oil pump motor turns at low RPM's and would take significant time to complete priming process if not pre-filled. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory or see our website for help, www.econoheat.com
3. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo set-point, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner components and oil pump.
4. Making sure the thermostat is turned off, apply power to the burner. Switch burner main power switch to ON position. After allowing the oil pre-heater time to establish temperature set-point, approximately 5 minutes. Jump the "T" terminals on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary. This will allow the burner to run during the pump priming process.
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 6). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove temporarily jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Adjust air supply of integrated air compressor to 12–13 P.S.I. This is factory preset, however, due to freight handling settings may be compromised.
7. Combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from starting.

   Inspect flame length through inspection door located above burner gun assembly. End of flame should reach **no further than ½ way down combustion tube.** To accomplish this flame length, use adjustment knob on opposite side of oil pump. **NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START.**

Water Treatment

Generally no water treatment will be required. Care should be taken to ensure that the system does not lose water from leaks, or continual relief valve operation since continual make-up water will reduce boiler life.

Maintenance Schedule

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Spin-On Filter or Filter screen located in the pancake style housing (figure 14 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Open the burner side clean-out door to access and clean flame cone (figure 5 above, and figure 8 below).
- Open the swing out doors on both sides of the furnace. The swing out door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepafilter filter recommended) (figure 12 below).
- Clean Suntec pump filter. Remove pump cover for access (figure 13 below). **CAUTION:** Be careful of gasket.
- Clean air compressor filter element.

YEARLY

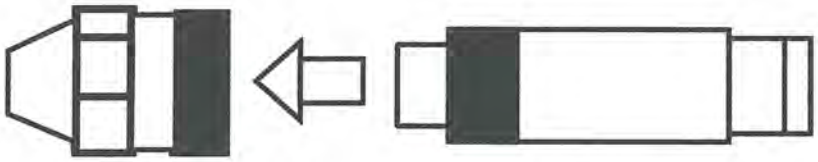
- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 10 below). Due to erosion, adjustment may change.
- Replace nozzle every 3-5 years depending on usage (figure 5 above, and figures 9, 10 and 11 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 8 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner door securing nuts, swing open the burner side clean-out door. Remove nozzle with 5/8" socket (figures 8 and 9 below).

BOILER

1. Clean Boiler using procedure below.
2. Check all water system piping for leaks. Repair any found.
3. Check pressure relief valve operation by opening with manual lever. If it fails to relieve, replace immediately.
4. Check operation of safety controls, low water cutoff and manual reset high limit (if provided).
5. Check breeching connections to ensure there are no flue gas leaks. Seal any leaks found with High Temperature Silicone Sealant.
6. Check flue gas temperature at the test point in the breeching. If gross flue gas temperature is 550 degrees F or above, suspect that cleaning of the boiler flue-ways is required.

BOILER CLEANING

Turn off the power with the line switch. Disconnect the electrical plug at the J-Box by the Aquastat Relay. Remove the four hex head bolts from the outer corners of the burner mounting plate and swing open the burner door with burner mounted to provide access to the boiler flue-ways. Remove sludge and deposits from Stainless Steel Insert. When all deposits are removed, close burner door, and plug in the electrical lead, restore the power and turn burner on. If a boiler is to be shut down and taken out of service for a period of time, the boiler should be cleaned immediately upon shut down while the flue-ways are still warm. When the boiler gets cold, the deposits harden making cleaning difficult. Further, hardened deposits will absorb moisture and cause corrosion.



When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 36 - Nozzle Assembly Detail

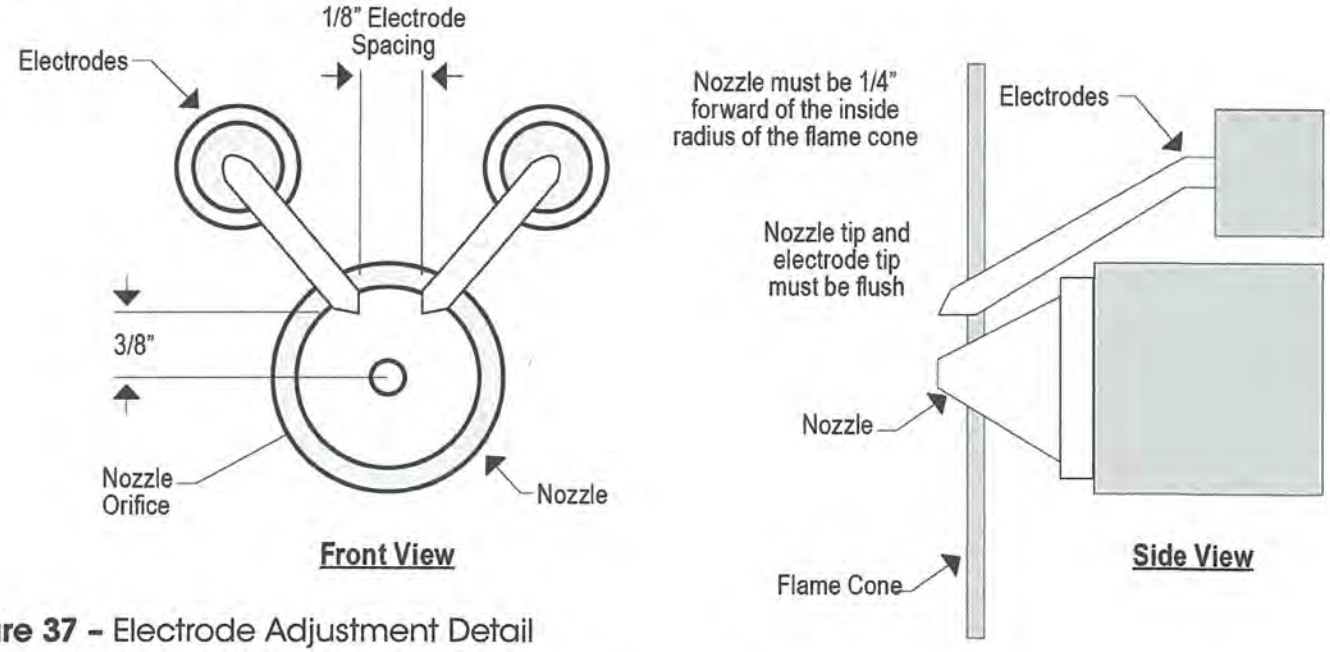


Figure 37 - Electrode Adjustment Detail

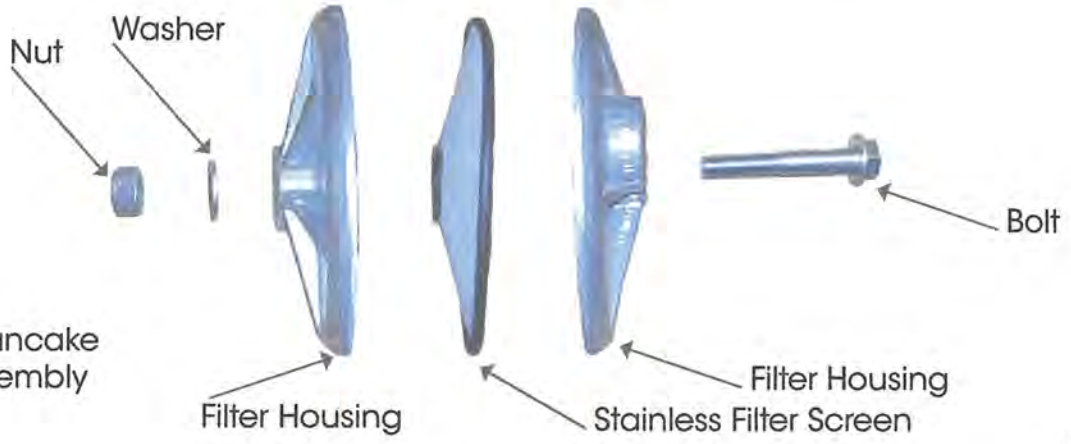


Figure 38 - Pancake Style Filter Assembly

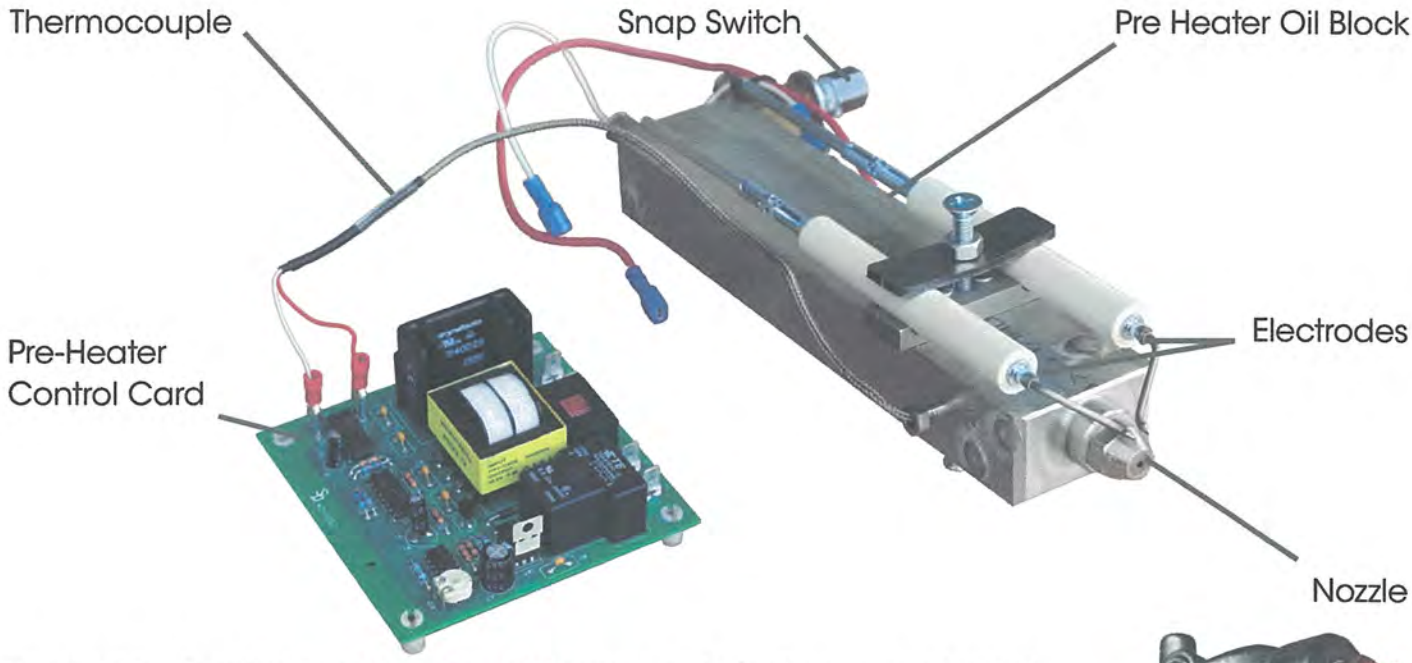


Figure 39 - Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 40 - Pump Strainer

Figure 41 - Oil Filter (Spin-On Filter above, Pancake Style Filter below)

Freeze Protection

Where freeze protection is required use antifreeze made especially for hydrolic systems such as inhibited Propylene Glycol. DO NOT use automotive type antifreeze. Follow antifreeze manufacturer's directions for quantity. A 50% solution provides protection to -30 degree F. For boiler water content see page 11.

Troubleshooting

NO HEAT:

- Check burner power switch and make sure power is available to the whole control system.
- If included in system, check low-water cutoff and/or manual reset high limit.
- Check room thermostat(s) and zone valves or pump relays (if used).
- Make sure there is oil in tank.
- Inquire if reset button on burner oil primary control has been tripped. If reset button continues to trip then **DO NOT ATTEMPT TO START BURNER**. Open burner door by disconnecting the plug-in lead and remove the four hex head bolts. Examine the combustion chamber for unburned oil and oil vapor. If present, clean up oil. With burner door open check cad cell for soot or dirt deposits, check nozzle and if clogged, replace with nozzle of identical make and style. Check electrodes for proper gap and for soot or oil deposits. Also check porcelains for cracks. Close burner door and re-connect electric cord. Press reset button while watching through the observation port. If burner fires immediately and flame looks good, cycle several times. If burner does not fire immediately, or if it fires but flame looks ragged and/or smoky, shut burner down and check the fuel delivery system. The problem may be air in the intake line so tighten all fittings and tighten the unused intake port plug. Also check the filter cover and gasket. Also check the pump filter and clean it with a brush and fuel oil or kerosene if it looks dirty.

INADEQUATE HEAT:

- Check thermostat and heat anticipatory setting. A wrong setting can cause short cycling and inadequate heating.
- Check to see if the distribution system is air-bound. If pump and boiler are running and the pipe connection to the boiler supply port is hot, check the pipe temperature at the inlet to the first radiator. If it is cool or only lukewarm, then the problem is lack of circulation. Look for air in the system, a valve partially closed, a zone valve failed in the closed position, a pump failure. The most common fault is air in the system.

RELIEF VALVE LEAKS CONSTANTLY:

- Check system pressure. With system hot, pressure should be in the 20 psi to 25 psi range, not to exceed 25 psi. With system cold, pressure should be in the 12-14 psi range. If pressure is over these ranges, then suspect the pressure reducing fill valve or the expansion tank. A diaphragm tank may be too small, may have a ruptured diaphragm (this would cause a very sharp rise in pressure as system water heats up and a sudden opening of the relief valve) or may be over-pressurized. A closed type expansion tank may be undersized, may be improperly piped to the boiler, may be water logged.
- Relief valve may be defective, or it may have foreign material lodged on the seat.

UNI-PAK Waste Oil Boiler Limited Warranty

UNI-PAK warrants to the purchaser of Unit Heaters listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Boiler cast iron jacket, one (1) year (parts only)
- Stainless steel combustion tube Insert, five (5) years limited (part only)
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- Unit heater is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty.**UNI-PAK is not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

- -

Warranty Card

Please fill out, tear off and return to manufacturer within sixty (60) days of purchase, or warranty will not be valid. Please print or type.

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

Waste Oil Fired Equipment

UNI-PAK

Waste Oil Fired Boiler

Installation, Operation and Service Instructions

AWB/DWB-9, AWB/DWB-15 120v Manual

Table of Contents

PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning, and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture. If installed in high moisture atmosphere, a special cover for the integrated air compressor must be obtained from factory to avoid rusting of internal raw metals. If this occurs, see trouble-shooting guide for remedy.** UNI-PAK burns the widest range of used and new oils including, but not limited to: used motor oils up to 90 weight, transmission and hydraulic fluid, used synthetic oils, crude oil, vegetable, fish, and mineral oil,all diesel fuel and many more. Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the installation, operation, and service of UNI-PAK Waste oil fired boiler. The following instructions should be carefully followed for obtaining the best possible installation, operation, and service conditions. Specifications are subject to change without notice. This product was designed to provide an economical disposal of wast oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the burner, the main system should be set above freezing which will prevent any building damage if the waste oil heater were to become inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon un-crating units, check rating plate for certainty of electrical and mechanical characteristics. Also, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing, check packing slip for indications of possible backorder of those parts or components. Otherwise, a claim must be filed for those missing parts.

IMPORTANT

Notice to the owner and installer

To enjoy the long-term benefits of burning your used oil in an UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct installation operation and maintenance of your new furnace. Before installing or operating this appliance, make sure you read and understand this manual.

IMPROPER INSTALLATION, ALTERATIONS, OR LACK OF MAINTENANCE WILL VOID THE WARRANTY.

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line Installation**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Even if the boiler 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 passage. 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 UNI-PAK boiler.

Note: All illustrations and specifications contained herein are based on latest information available at the time of publication. UNI-PAK reserves the right to make changes at any time without notice.

Oil Burner

WARNING

Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment - ANSI/NFPA 31 - 1987, and National Electric Code - ANSI/NFPA 70 - 1990 and the requirements of the inspection authorities having jurisdiction.

Figure 1 - Oil Burner (Back View Closed)

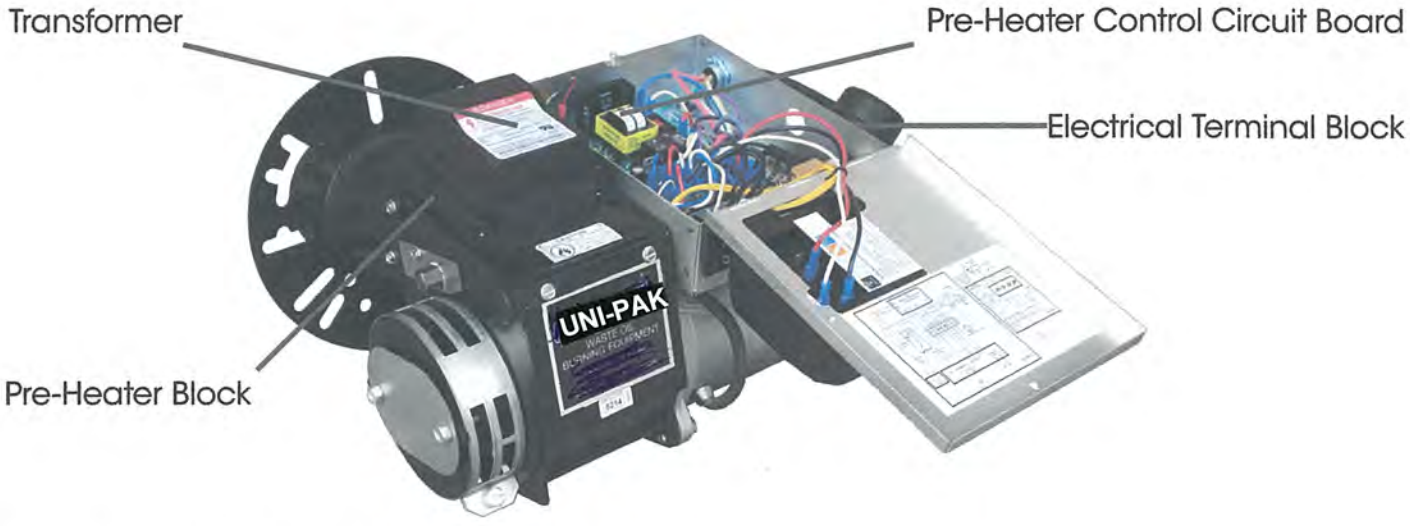


Figure 2 - Oil Burner (Back View Opened)

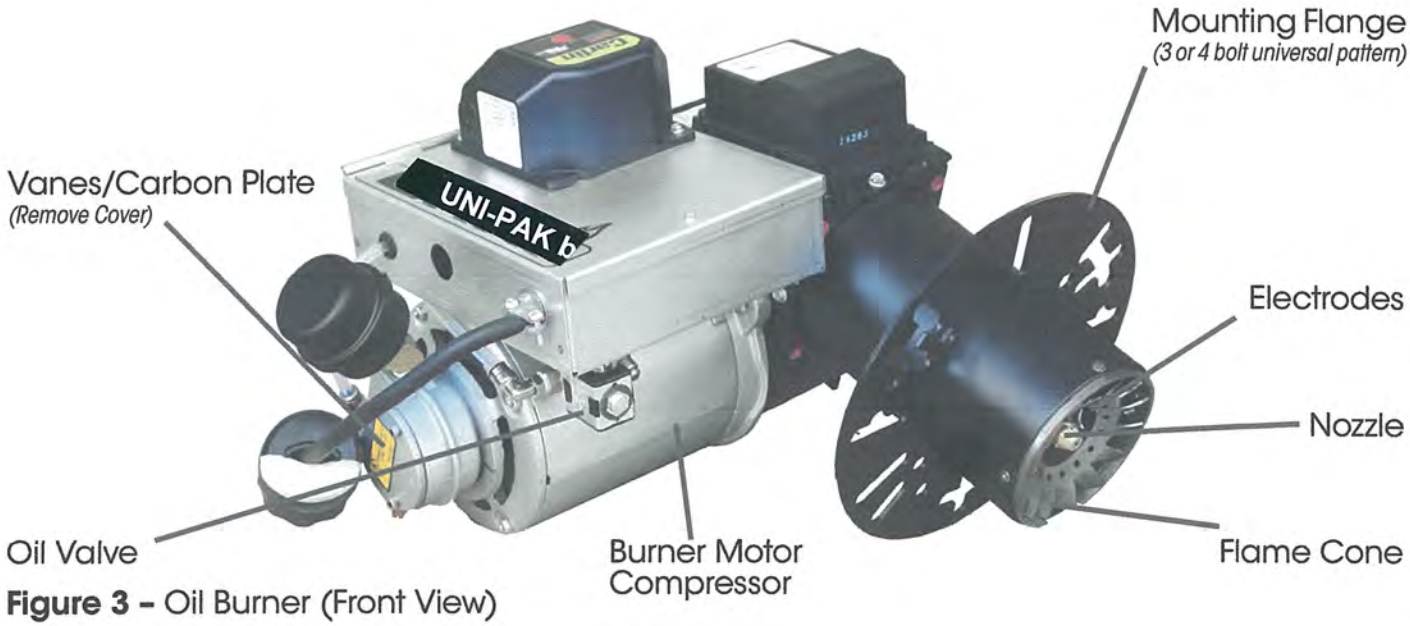


Figure 3 – Oil Burner (Front View)

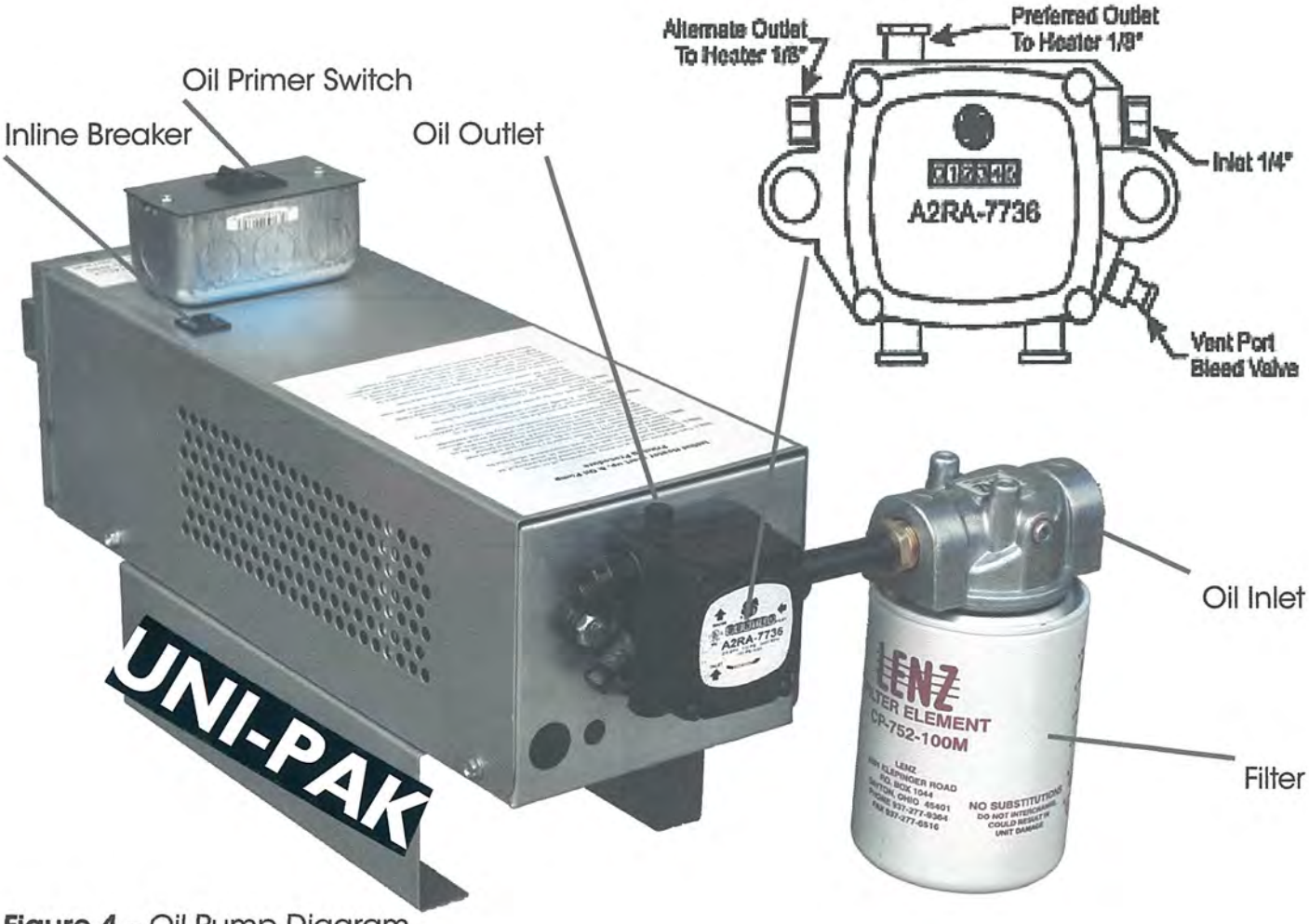
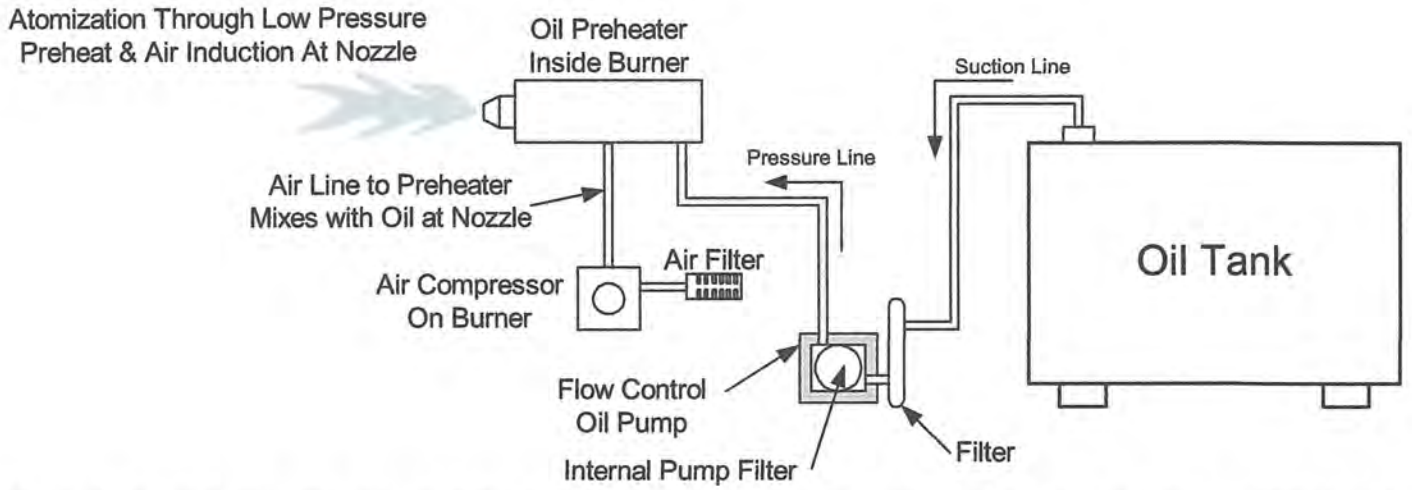


Figure 4 – Oil Pump Diagram

Oil Flow Control Supply Pump has the ability to control flame even when various viscosities are used- furnace or stove oil to 90 weight straight- flame remains stable

Figure 5 – Oil Pump Assembly

Oil Burner Technology



OMNI's patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil and air prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block (figure 4) and is pre-heated to operating thermo set-point, then compressed air from the air compressor (figure 3) is mixed with the oil prior to spraying out the nozzle similar to fuel injection, by breaking up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle (figure 5) provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone (figure 5) providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 3) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- ***Oil Valve:*** *(figure 5) energizes when burner is running and de-energizes when burner is not running* eliminating bleed back of oil out of the Pre-heater block.
- **Air Band:** (figure 3) Adjusts amount of air introduced into the combustion chamber. Air band is adjusted at the factory for optimum performance, approx. ½ to ¾ inch open. **NO FIELD ADJUSTMENT REQUIRED** unless in high altitudes application where minor adjustment may be required.
- **Oil Primary Control:** (figure 3) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 4) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 4) Senses flame in combustion chamber and signals oil primary when no flame is present.
- **Igniter Springs:** (figure 4) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Air Pressure Gauge:** (figure 3) Displays air pressure supplied by on-board air compressor.
- **Air Compressor:** (figure 3) Supplies air used within pre-heater block to aid in atomization of the oil.
- **Air Muffler/Filter:** (figure 3) Filters air and muffles the sound generated by the compressor.
- **Pre-Heater Control Circuit Board:** (figure 4) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo set-point or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo set-point.
- **Electrodes:** (figure 4 and 5) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 5) Low-pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 5) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 5) Multi-task motor turns the burner blower and integrated air compressor.
- **Air Pressure Adjuster:** (figure 3) Adjusts the air pressure going to the pre-heater block. Should be adjusted between 12 PSI and 13PSI as indicated on the Air Pressure Gauge on the burner for thorough burn of the waste oil. ***Note: In order to insure proper air adjustment, air gauge must read 0 when burner is cycled off or powered down.***
- **Oil Pressure Adjustment:** Adjust flame length in the heater combustion chamber viewed through the inspection port located directly above the burner gun assembly by increasing CW or decreasing CCW the adjuster located on the oil delivery pump (figure7). The adjuster increases or decreases the pump motors RPM, which increases or decreases the delivery of fuel to the burner. When you increase or decrease the fuel to the burner, you will notice the flame length will increase or decrease. Adjust flame length so flame is just slightly less than halfway down main combustion chamber tube.

IMPORTANT:

- **Power Indicator:** (figure 3) Indicates when power is present at the burner.
- **Run Indicator:** (figure 3) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

Oil Burner/Pump Specifications

Burner Assembly Performance Ratings

Voltage	115 VAC
Cycles	60Hz
Total Operating Amperage (Burner Only)	8.4 Amps
Total Operating Amperage (Burner and Oil Pump)	10.5 Amps
Electrical Operating Consumption (Burner Only)	970 Watts
Electrical Operating Consumption (Burner and Oil Pump)	1,212 Watts
Weight	36.5 Lbs.
Oil Primary	0.2 Amps
Oil Valve	0.075 Amps
Pre-Heater Block	4.2 Amps
Pre-Heater Controller Board	0.011 Amps
Igniter Transformer	0.3 Amps
Burner Motor	3.6 Amps

Pump Assembly Performance Ratings

Voltage	115 VAC
Cycles	60Hz
Total Operating Amperage (Pump Assembly Only)	2.1 Amps
Electrical Operating Consumption (Pump Assembly Only)	241.5 Watts
Weight	16 Lbs.
Oil Valve	0.075 Amps
Pump Motor	2.0 Amps

Boiler Specifications

Boiler Manual	CSA Input (kW)	CSA Output (kW)	Net AHRI Rating (kW)	A.F.U.E (%)	Boiler Dimensions (D x W x H) *Includes Burner*	Approx. Dry Weight (Lbs)	Vent Connect Diameter (Inches)	Water Content Gallons	Max Water Working Pressure
OWB-9	41	36	31	86.8	43" x 19.75" x 52.75"	447	5	11.6	30PSI
OWB-15	72	63	55	86.9	46.5" x 22.5" x 59.5"	725	6	19.3	35PSI

Notes:

1. Combustion results are based on 11.0% to 13.5% CO2 with fuel oil #2 and a hot water heating system supply temperature of 167° F (75° C), return 140° F (60° C).
2. Max. operating pressure is 45 psig in all Canadian provinces where a CRN is not required, and in the U.S.A.
3. Measured flue gas temperature with combustion air temperature of 68° F (20° C).
4. A 5" vent pipe adapter is shipped with models WB-9. The vent pipe adapter is not supplied with boiler model OWB-15.

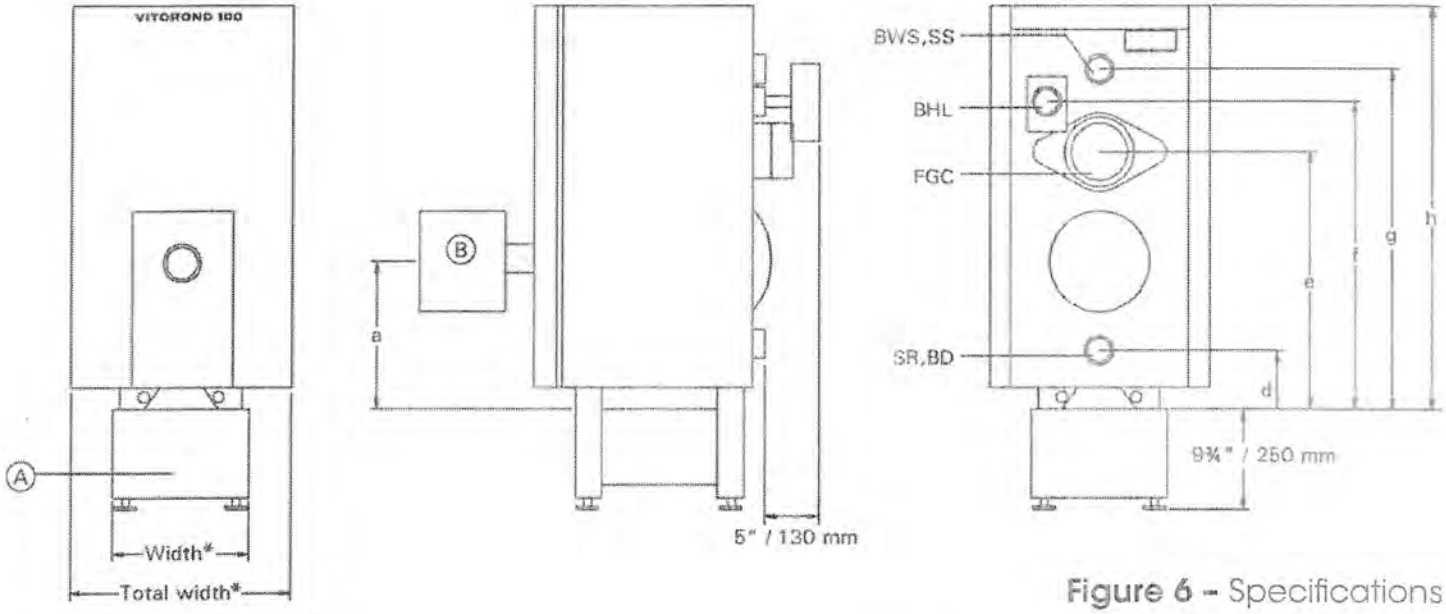


Figure 6 – Specifications

Legend

BD Boiler Drain
BTS Boiler Temperature Sensor
BWR Boiler Water Return
BWS Boiler Water Supply
FGC Flue Gas Collar
SR Safety Return
SS Safety Supply
BHL Boiler High Limit (with outdoor reset module)
Ⓐ Boiler Stand
Ⓑ Burner

Boiler Model	WB-9	WB-15
Measurement a:	13.25"	13.75"
Measurement b:	3"	3"
Measurement c:	12.5"	9.5"
Measurement d:	5.5"	4.25"
Measurement e:	23"	27.75"
Measurement f:	26.25"	32.25"
Measurement g:	28.5"	34.75"
Measurement h:	33"	39.75"
Measurement k:	5.5"	6.5"

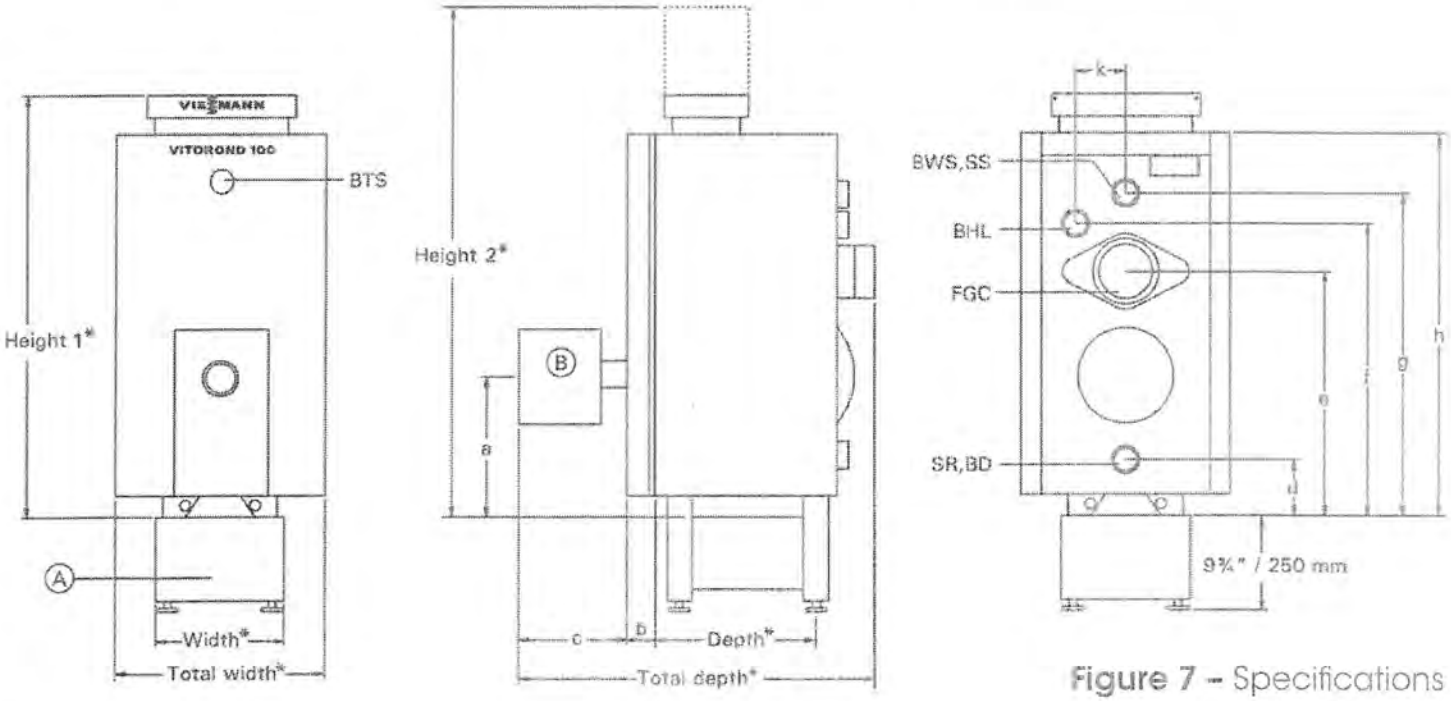


Figure 7 – Specifications

Clearances

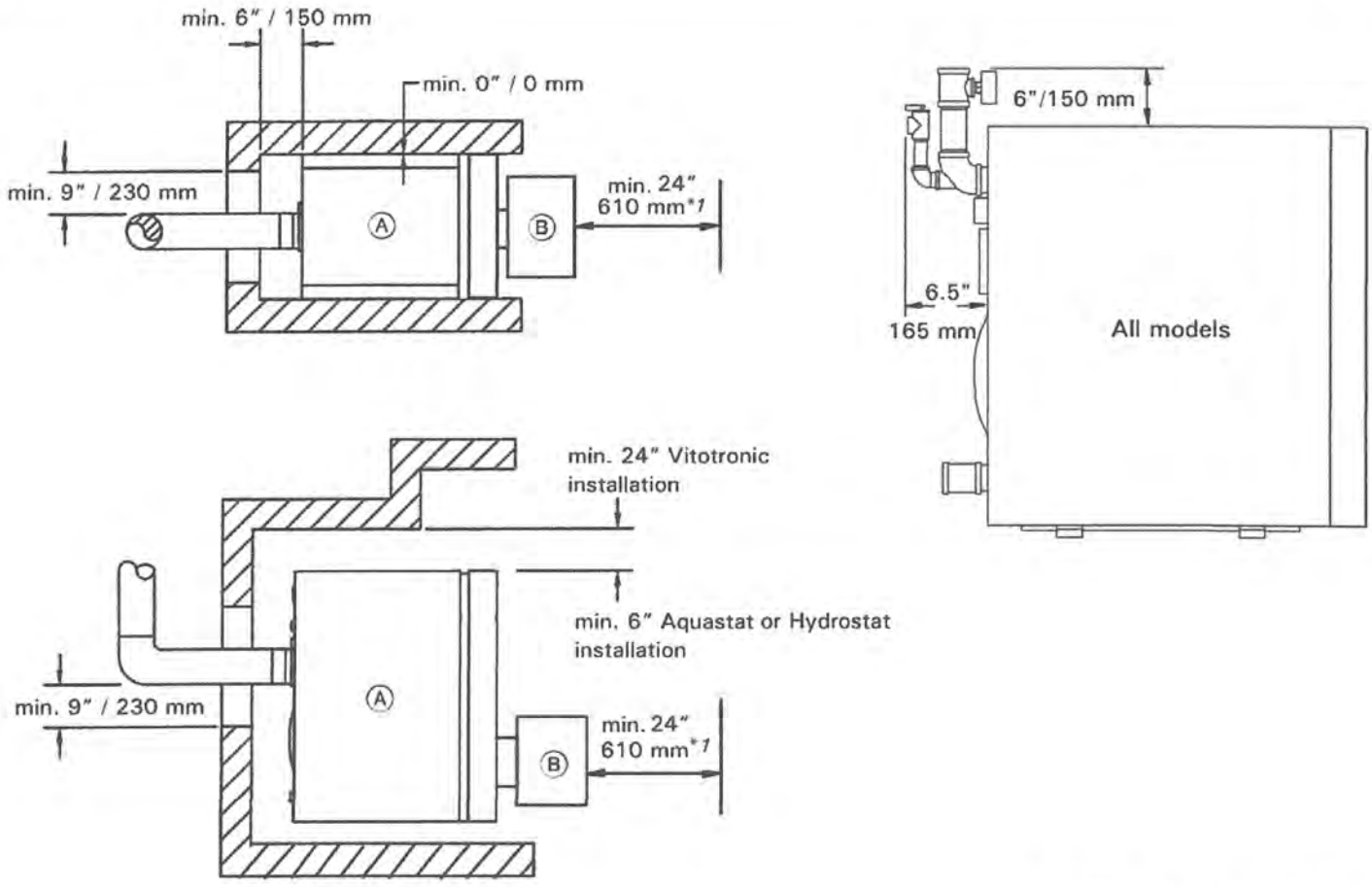


Figure 8 - Clearances

Standard Installation:

Boiler Model	WB-9	WB-15
Rear	6"	6"
Sides	0"	0"
Flue	9"	9"
Floor	Combustibles	

Alcove Installation:

Boiler Model	WB-9	WB-15
Rear	6"	6"
Sides	0"	0"
Flue	9"	9"
Top	6"	6"
Floor	Combustibles	

Burner (chimney & direct vent application)

Boiler Model	WB-9	WB-15
Pump pressure	175 psig	175 psig
Oil nozzle flow rate	1.0 @ 175	1.75 @ 175
Air tube length	7"	9"
Air tube insertion	3.625"	7.25"

System Design Considerations

Chimney
For proper operation of the UNI-PAK boiler, all products of combustion must be safely vented to the outdoors, while ensuring that flue gases do not cool prematurely. It is critical that the chimney system be properly designed to handle the flue gas temperatures which the UNI-PAK boiler produces.
Flue gases which cool too quickly and produce condensation lead to damages if the chimney diameter is too large and the chimney system is not well insulated. If a calculated chimney diameter lies between two values, the larger diameter should be selected.

Intermediate section
The intermediate (vertical and horizontal) section of venting between the boiler vent pipe collar and the chimney must be of the identical diameter as the vent connection of the boiler. Use the shortest possible path between the boiler and the chimney. A maximum of two elbows may be installed in the intermediate section. Avoid the use of two level 90° elbows.
The intermediate section must be sealed pressure tight at the boiler vent pipe collar and at the chimney connection. Ensure any test port for combustion values is sealed as well. The chimney connection length between the boiler vent pipe collar and the chimney may be installed with insulation. We recommend consulting a reputable chimney installer for advice in project-specific circumstances. Barometric damper must be used!

Note: Direct Vent exhaust system operates under a positive pressure developed by the burner. Make sure all vent connections and observation ports on the boiler are sealed air tight by tightening screws and using high temperature silicone sealant if necessary.
The vent components must be supplied without any alteration except for the length of the flex pipe which can be cut to the desired length.

Warranty
Our warranty does not cover damages resulting from the following:

- installation or service by unqualified and not licensed personnel
- corrosion caused by flue gas condensation due to low boiler water and/or return water temperatures
- operation with contaminated fill and supplementary feed water

For detailed warranty information, please read warranty sheet supplied with product.

Combustion air supply
The boiler must not be located in areas or rooms where chemicals containing chlorine, bromine, fluorine, or other corrosive chemicals are stored. Examples include refrigerants, bleach, paint, paint thinner, hair spray, cleaning solvents, water softener salt, etc. The combustion air must not be contaminated with the above mentioned, or other aggressive or corrosive chemicals. Boiler should never be installed in areas where excessive dust, high humidity, or risk of frost exist. Ensure adequate ventilation and supply of fresh combustion air. Consult Viessmann with uncertainties in regard to a suitable boiler installation location.

This boiler/burner unit needs clean fresh air for safe operation and must be installed so that there are provisions for adequate combustion and ventilation air. For oil-fired boilers, use the "Installation Code for Oil Burning Equipment CAN/CSA-B139" (Canada), or NFPA 31 (USA) and/or provisions of local codes. The sizing methods outlined in the above codes should be used when installing a round duct to supply combustion air from the outside. Observe local jurisdictional requirements.

System layout

The boiler water temperature limit is factory set to 167° F (75° C) (Vitotronic only). The boiler water temperature limit can be increased by altering the adjustable high limit to increase the supply water temperature. To minimize piping losses of the system however, we recommend that the radiation and domestic hot water production in the system be designed for a 158° F (70° C) boiler supply water temperature (new systems).

Water quality

Treatment for boiler feed water should be considered in areas of known problems, such as where a high mineral content and hardness exist. In areas where freezing might occur, an antifreeze may be added to the system water to protect the system.

Please adhere to the specifications given by the antifreeze manufacturer. Do not use automotive silicate based antifreeze. Please observe that an antifreeze/water mixture may require a backflow preventer within the automatic water feed and influence components such as diaphragm expansion tanks, radiation, etc. A 40% antifreeze content will provide freeze-up protection to -10° F (-23° C). Do not use antifreeze other than specifically made for hot water heating systems.

System also may contain components which might be negatively affected by antifreeze. Check total system frequently when filled with antifreeze. Advise system operator/ultimate owner that system is filled with a glycol mix. The heating contractor must provide an MSDS (Material Safety Data Sheet) for the antifreeze used to the system operator/ultimate owner.

Oxygen diffusion barrier underfloor tubing

The boiler warranty does not cover leaks resulting from corrosion caused by the use of underfloor plastic tubing without an oxygen diffusion barrier. Such systems must have the non-oxygen diffusion barrier tubing separated from the boiler with a heat exchanger. Viessmann recommends the use of underfloor plastic tubing with an oxygen diffusion barrier.

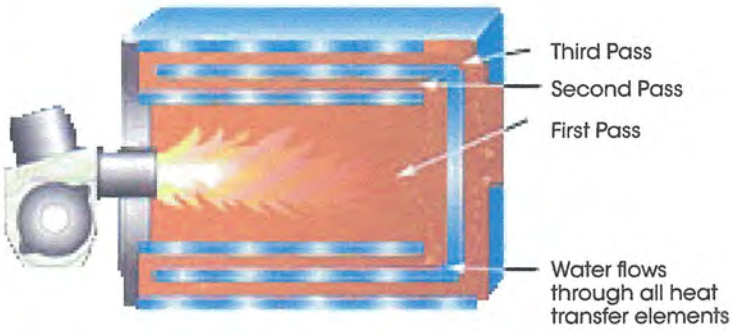
Low water cut-off

A low water cut-off may be required by local codes. If boiler is installed above the radiation level, a low water cut-off device of approved type must be installed in all instances. An approved type low water cut-off device must be provided by the, heating contractor. Do not install an isolation valve between the boiler and the low water cut-off. Hydrostat control model 3250 PLUS is equipped with low water cut-off.

Figure 10 – Boiler (WB-9 & WB-15)

WB series boilers are three pass Scotch Marine design with fully water backed transfer surfaces. Boilers are designed for use in forced hot water heating systems. Heating is supplied by a Waste Oil Burner that burns all petroleum products any weight combination up to SAE 90W as well as fuel oils. Boiler–Burner units operate with no less than 0.01WC or greater over fire and may be vented using a conventional chimney.

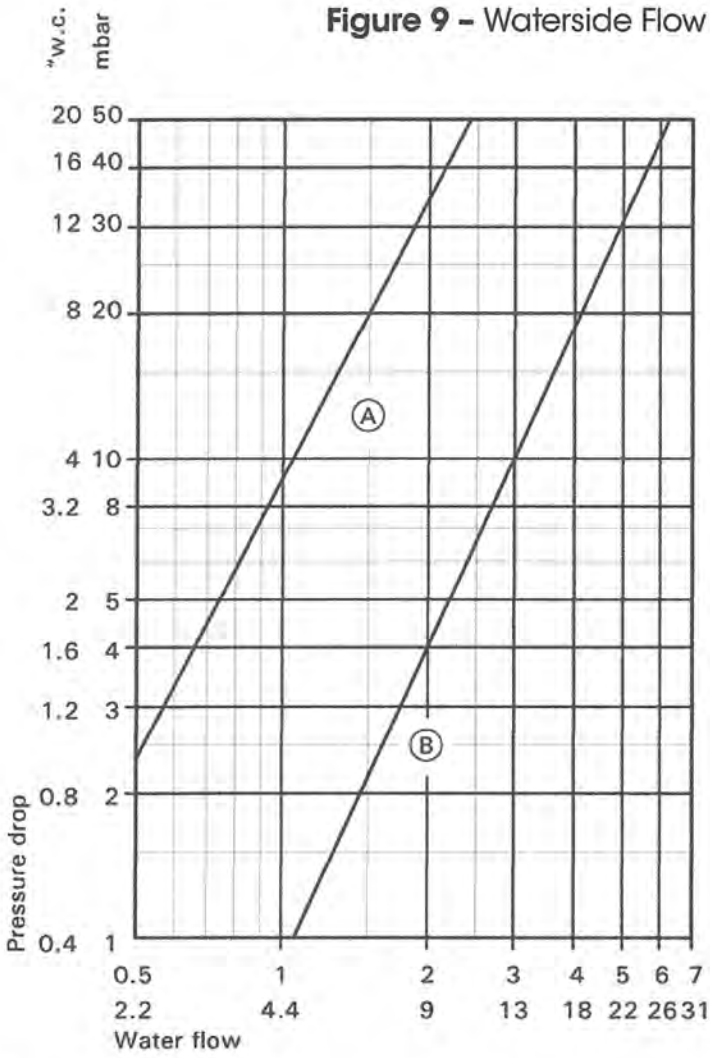
UNI-PAK Three Pass Design



System Design Considerations *(continued)*

Waterside flow

Figure 9 – Waterside Flow



Flow rates

The relationship between boiler flow rate and temperature rise is according to the formula: Boiler output (Btu/h) = 500 x flow (USGPM) x Rise (°F)

The following chart lists typical flow rates for the boiler:

Boiler Model	WB-9	WB-15
20° F rise	12.2	21.5
30° F rise	8.1	14.3
USGPM	✓	✓

General

The schematics on the following pages are to be seen as guidelines only. They further do not display all system varieties, safety devices, or concepts possible. Specific system layouts may be further discussed with the sales representative office.

Clearances

A minimum of 2" circumferential clearance from non-insulated hot water pipes to combustible construction must be maintained. In cases where the pipes are insulated with pipe insulation of appropriate and sufficient thickness and insulation values, the above clearance may be reduced to 0".

Legend: Ⓐ WB-9; Ⓑ WB-15

Important Code Requirements

Installations must comply with all state, local, and utility codes, laws, regulations, and ordinances, and CSA standard B139. Where required by the authority having jurisdiction, the installation must conform to American society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

All electrical wiring must be done in accordance with the National Electrical codes latest edition and all state and local codes.

Combustion Air Supply

WARNING

Failure to provide an adequate supply of fresh air for combustion will result in hazardous operating conditions. If you use a fireplace or a kitchen or bathroom exhaust fan, you should install an outside air intake. These devices will rob the boiler and water heater of combustion air.

1. In unconfined spaces in buildings infiltration may be adequate to provide air for combustion and ventilation. However, in buildings of unusually tight construction, additional air must be provided as described in Item2. (b) below.
2. Boiler located in confined space: [Note: Confined space may be defined as a space whose volume is less than 50 cubic feet per 1000 Btuh of total input of all appliances installed in that space.]
   a) All air from inside of building: Providing infiltration in the rest of the building is adequate, the confined space may be provided with two permanent openings communicating directly with another room or rooms of sufficient volume that the total volume of all spaces meets the criteria for unconfined space. One opening must be within 12 inches of the bottom of the enclosure. See Figure 11.
   b) All Air From Outdoors:
   The confined space shall be provided with two permanent openings, one within 12 inches of the top and another within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or crawl or attic spaces which communicate freely with the outdoors.

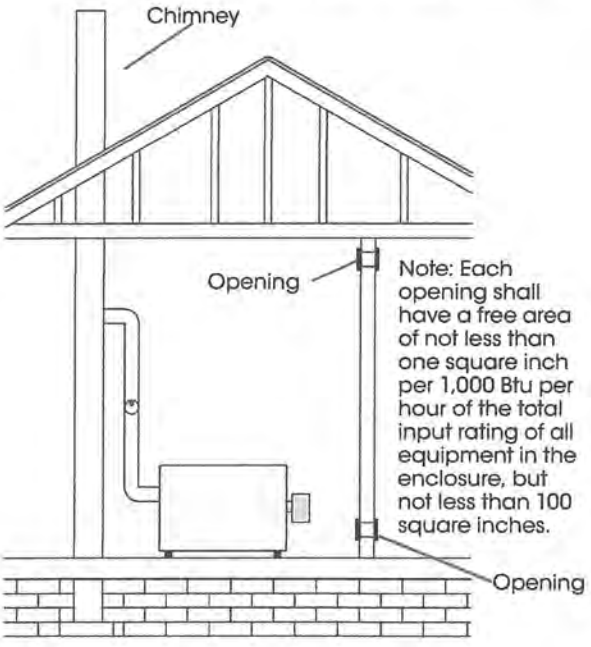


Figure 11 - Air from inside

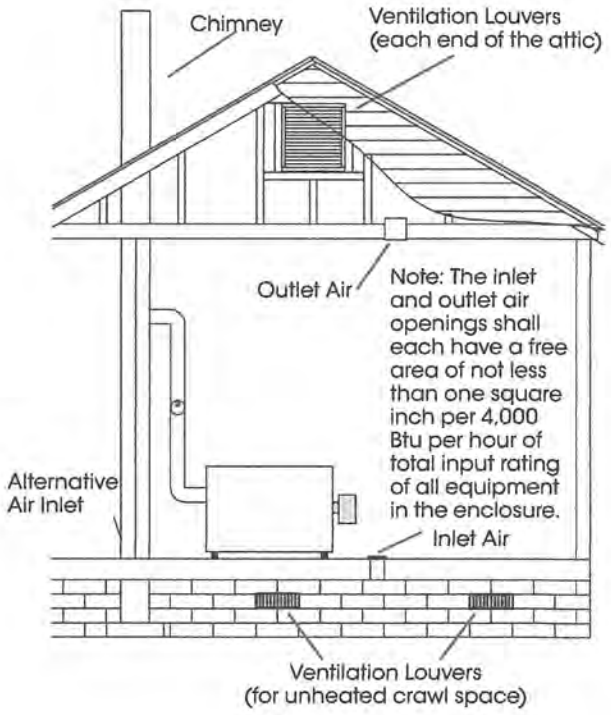


Figure 12 - Air from outdoors

NOTE: All wall openings directly to outdoors must be screened to prevent entry by birds or small animals.

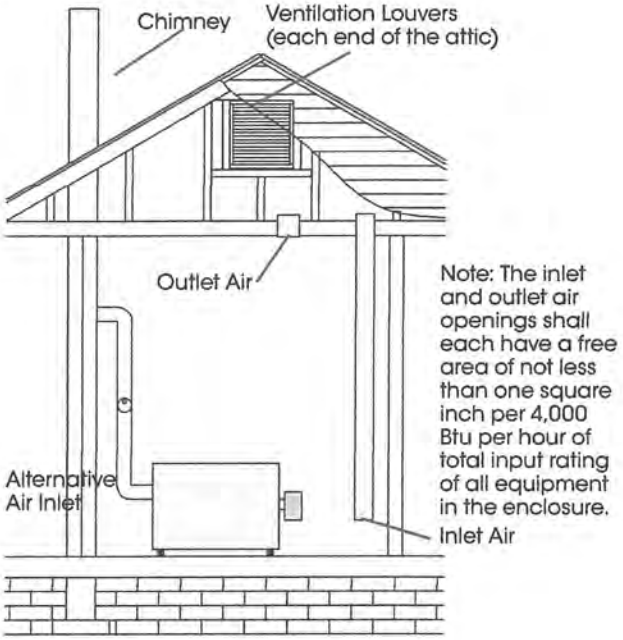
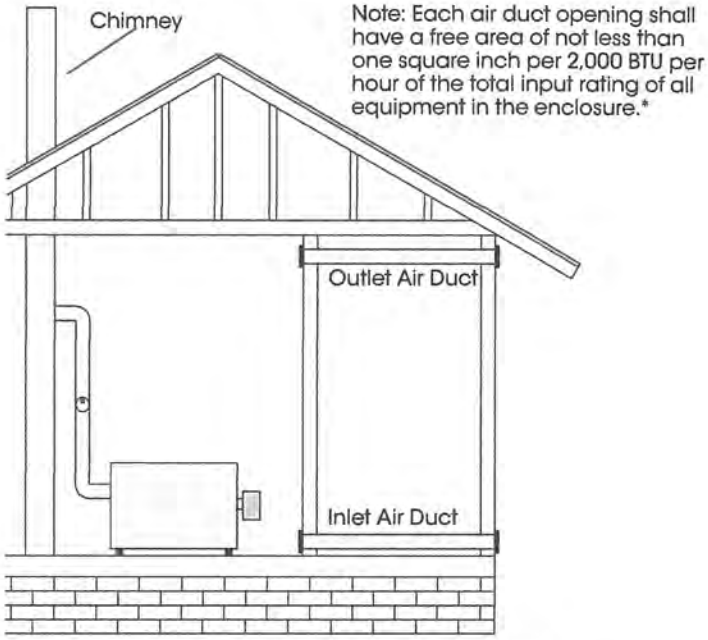


Figure 13 - With vertical ducts



*If the equipment room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of not less than one square inch per 4,000 BTU per hour of the total input rating of all equipment in the enclosure.

Figure 14 - With horizontal ducts

Chimney or Vent Requirements

WARNING

Inspect existing chimney to make sure it is clean, the right size, properly constructed and in good condition before installing boiler. Failure to do so may cause a hazardous operating condition.

Table 1: Minimum Recommended Breaching and Chimney Size

Boiler Model	Minimum Breaching Diameter (inches)	Minimum Recommend Chimney Diameter (inches)	Minimum Recommend Chimney Height (feet)
WB-9	6"	7"	15'
WB-15	7"	8"	15'

NOTE: Venting must conform with applicable local codes and National Board of Fire Underwriters.

1. Chimney must be a Class A chimney.

2. This is a high efficiency boiler which operates with a low stack temperature which may be subject to condensation in a cool or improperly designed chimney. Accordingly, the right vent or liner is very important.
   - Masonry chimney with three walls exposed to outdoors may require the use of a 316 stainless steel liner.
   - Masonry chimney with all inside walls—use a tile liner.
3. Breaching
   - See Table 1 for minimum recommended breaching and chimney sizes.
   - Keep run boiler to chimney as short as possible.
   - Use as few elbows as possible.
   - Slope upward towards chimney at not less than 1/4" per foot.
   - Use a sealed-in thimble for the chimney connection.
   - Connect together all sections and fittings with sheet metal screws and seal with silicone sealant.
4. When more than one appliance is connected to the same chimney, the chimney's internal cross-sectional area must be at a minimum equal to the area of the largest vent plus 50% of the area of each additional vent.
5. Clearances—vent pipe between boiler and chimney must be a minimum of 6" from any combustible material.
6. An oil-fired unit shall be connected to a flue having sufficient draft at all times, to assure safe proper operation of the unit.

SIDE-WALL VENTING---IMPORTANT NOTE

Two problems arise when side wall venting any oil appliance;

1. There can be an accelerated rate at which soot builds up on the cad-cell, spinner, etc.
2. There is the potential for severe soot damage to the side of the structure in the event that the boiler operates at a high smoke level. This can happen for many reasons, some of which are out of the control of both the installer and appliance manufacturer.

EconoHeat recommends the use of a chimney to vent our residential oil boilers. If a power venter must be used, it is the responsibility of the installer and power vent manufacturer to "engineer" the power vent system.

WILL ASSUME NO RESPONSIBILITY FOR SOOT DAMAGE TO SIDING FROM A POWER VENTED OIL BOILER. THIS APPLIES REGARDLESS OF THE CAUSE OF THE SOOTING.

Installing the Boiler

Hydrostat

Boiler in a heating/cooling application

Cooling season starts: close valve v1 and open valve v2
Heating season starts: close valve v2 and open valve v1

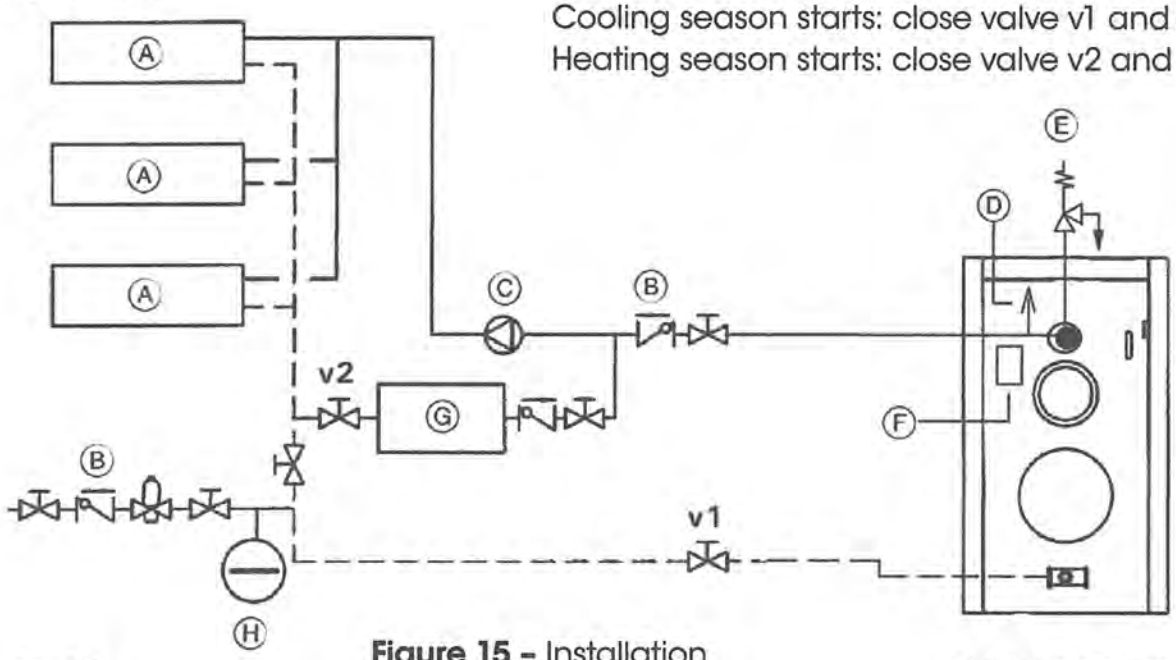


Figure 15 - Installation

Legend

A	Heating/Cooling unit
B	Spring-loaded flow check valve
C	Circulation pump
D	Automatic air vent,
E	Pressure relief valve
F	Hydrostat 3250-Plus (with low water cut-off)
G	Water chiller
H	Expansion tank

IMPORTANT

We strongly suggest that the valves be labeled "v1" and v2."

Description

Hydrostat model 3250-Plus is equipped with a low water cut-off feature in combination with 'electro well' sensor well. The function can be set to operate in automatic (default) or manual reset mode. Do not disable this function it may be required by local codes.

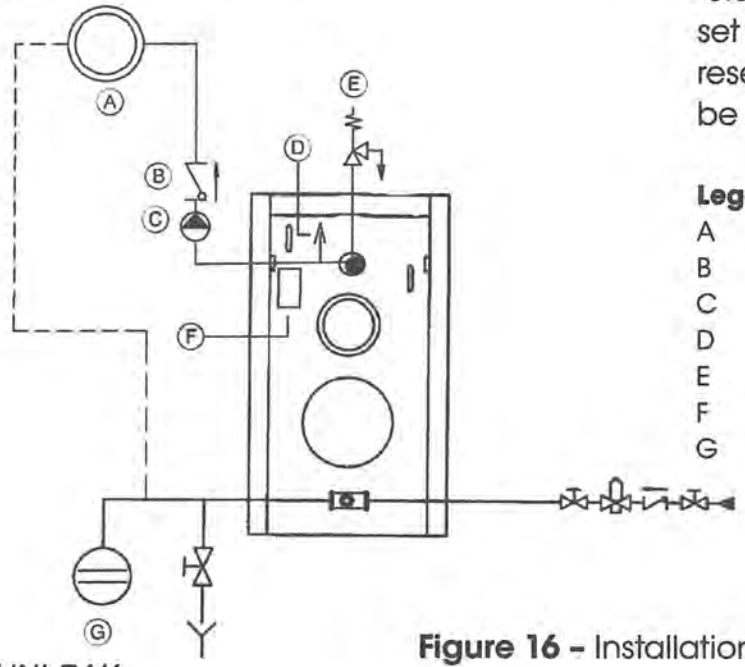


Figure 16 - Installation

Legend

A	Heating circuit
B	Spring-loaded flow check valve
C	Circulation pump
D	Automatic air vent,
E	Pressure relief valve
F	Hydrostat 3250-Plus (with low water cut-off)
G	Expansion tank

Vitotronic

Without mixing valve
e.g. with Vitotronic 100, Model KW10B

Legend

A	Heating circuit
B	Spring-loaded flow check valve
C	Circulation pump
D	Automatic air vent, (field supplied), pressure relief valve, and temperature pressure gage
E	Expansion tank
F	Low water cut-off (if required)

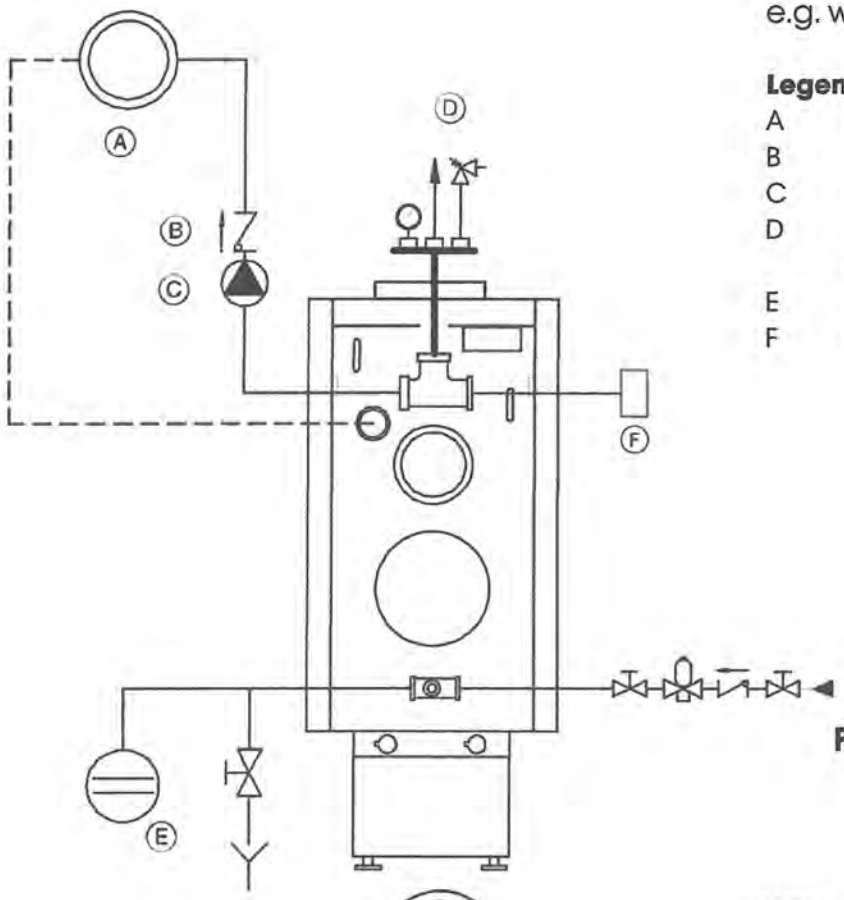


Figure 16 – Installation

Without mixing valve and with DHW
e.g. with UNI-PAK100, KW10B

Legend

A	Heating circuit
B	Spring-loaded flow check valve
C	Circulation pump
D	Automatic air vent, (field supplied), pressure relief valve, and temperature pressure gage
E	Expansion tank
E	Domestic hot water storage tank (indirect-fired)
F	Low water cut-off (if required
G	DHW storage tank indirect fire

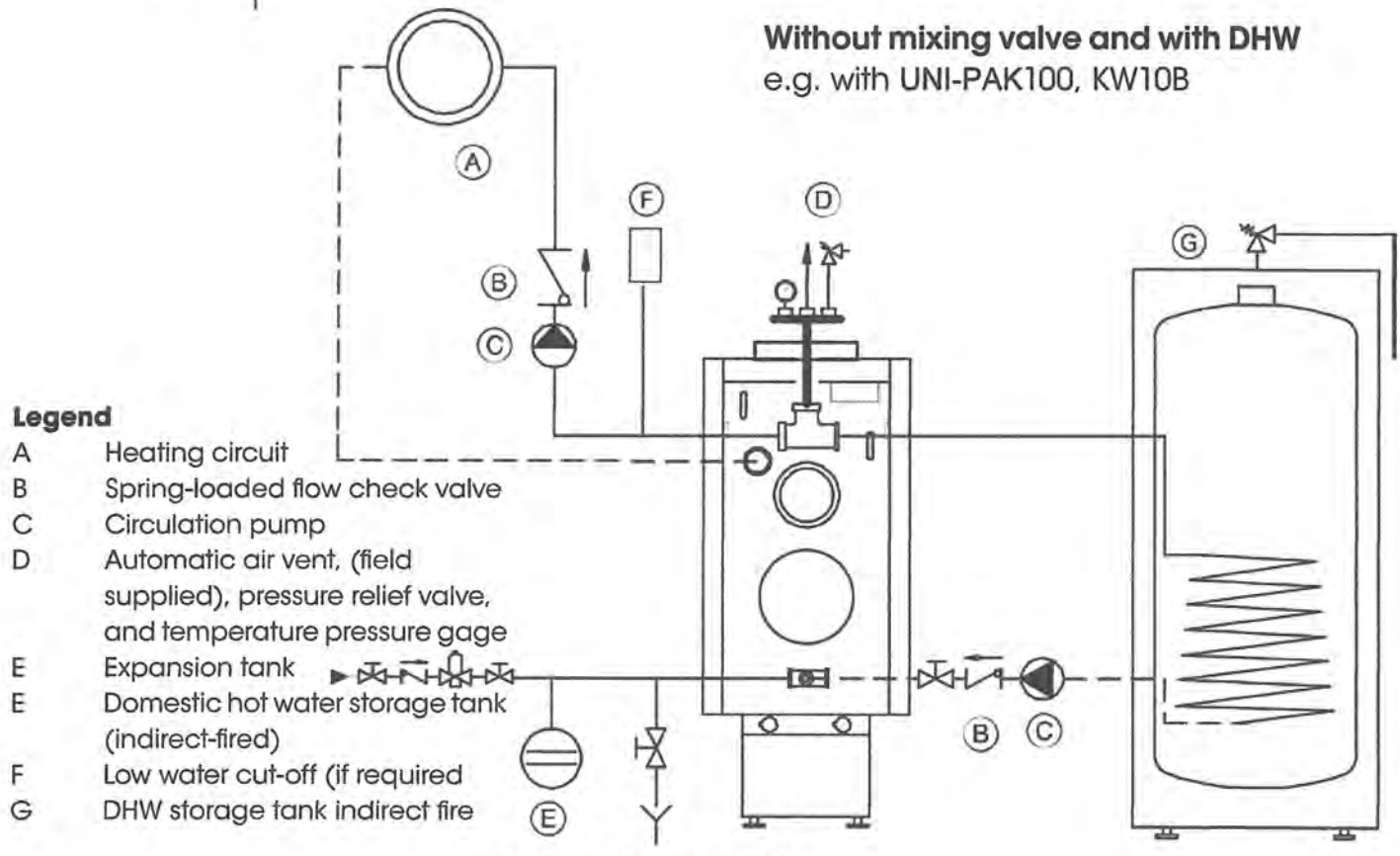


Figure 17 – Installation

Vitotronic *(continued)*

With one low-temperature circuit with 4-way mixing valve, and with domestic hot water production.
e.g. with UNI-PAK 200, Model KW2 combined with one mixing valve actuator accessory kit

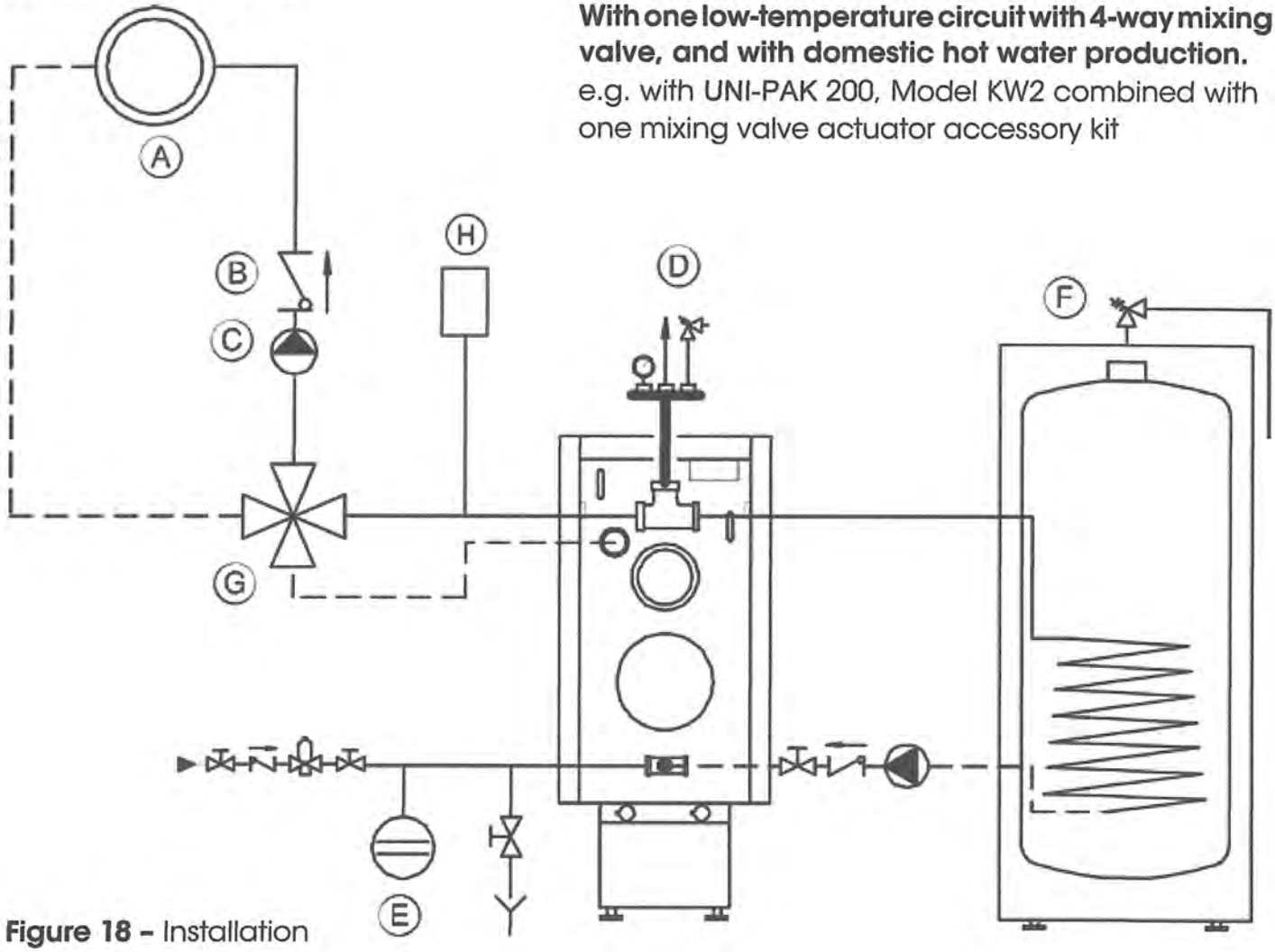
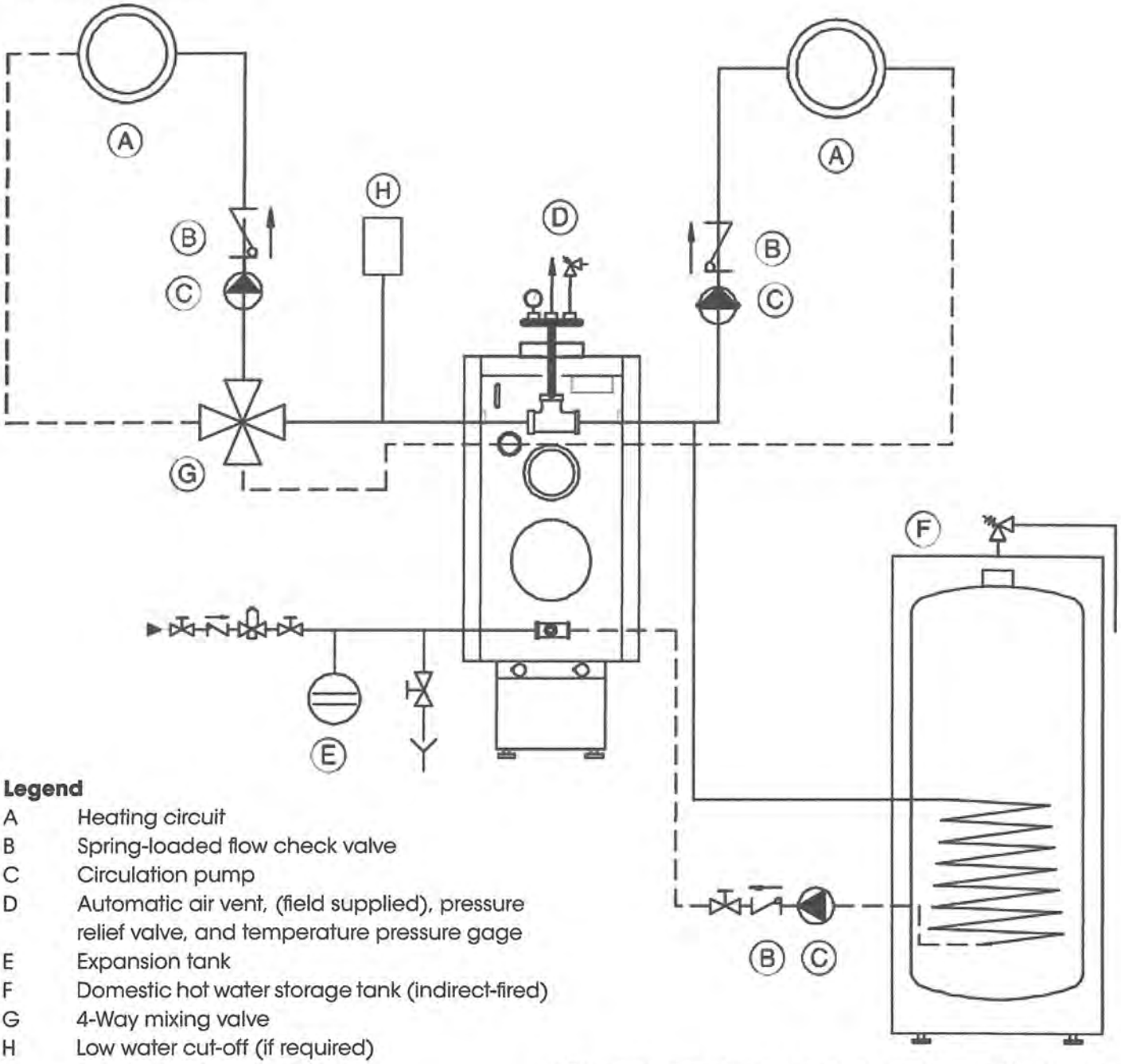


Figure 18 – Installation

Legend

A	Heating circuit
B	Spring-loaded flow check valve
C	Circulation pump
D	Automatic air vent, (field supplied), pressure relief valve, and temperature pressure gage
E	Expansion tank
F	Domestic hot water storage tank (indirect-fired)
G	4-Way mixing valve
H	Low water cut-off (if required)



Legend

A	Heating circuit
B	Spring-loaded flow check valve
C	Circulation pump
D	Automatic air vent, (field supplied), pressure relief valve, and temperature pressure gage
E	Expansion tank
F	Domestic hot water storage tank (indirect-fired)
G	4-Way mixing valve
H	Low water cut-off (if required)

With one low-temperature circuit with 4-way mixing valve,one high temperature circuit, and with domestic hot water production.
e.g. with UNI-PAK 200, Model KW2 combined with one mixing valve actuator accessory kit

Figure 19 – Installation

Burner Mounting

Burner mounts easily on the swing out chamber door of the boiler with four (4) metric M8x20 HEX bolts and four (4) M8x24 fender washers.

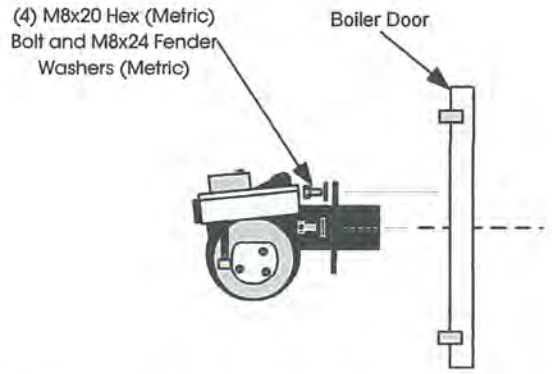


Figure 20 – OB-9 and WB-15 chamber swing door burner mounting

Boiler Jacket Assembly

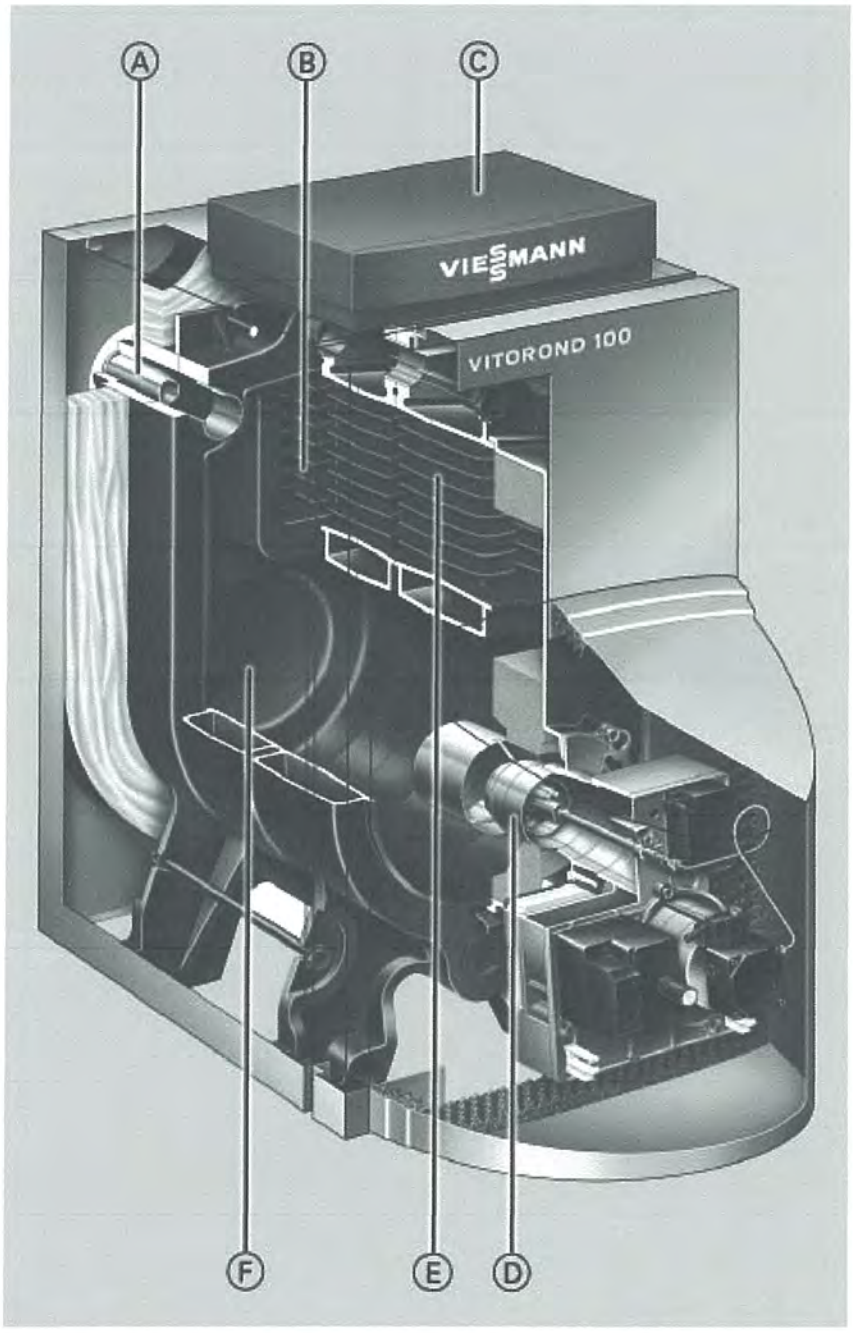


Figure 21 – Boiler Jacket

A Special return water flow control injector
B Eutectoplex heat exchanger surface of special homogeneous gray cast iron
C UNI-PAK 100 - indoor/outdoor digital boiler and heating system control
D Oil burner
E Third pass
F Combustion chamber*1

*1 Stainless steel combustion chamber insert not shown. Boiler/burner and controls combination may not be exactly as illustrated.

Wiring

WARNING

All wiring and grounding must be done in accordance with the authority having jurisdiction or, in the absence of such authority, with the National Electrical Code (ANSI/NFPA70).

1. 120 Volt Wiring—The boiler should be provided with its own 20A branch circuit with fused disconnect. All 120 volt connections are made inside the L8148A aqua-stat relay as follows (also see Fig. 31 or 32):
   - Hot ("black")- Terminal "L1"
   - Neutral ("white")- Terminal "L2"
   - Ground ("Green" or bare)- Ground screw on case of L8148A
2. Thermostat Wiring—Follow thermostat manufacturer instructions. To insure proper thermostat operation, avoid installation in areas of poor air circulation, hot spots (near any heat source or in direct sunlight), cold spots (outside walls, walls adjacent to unheated areas, locations subject to drafts). Provide Class II circuit between thermostat and boiler. Connect thermostat wire leads to terminals "T" and "T" inside L8148A aqua-stat relay.

Wiring Variations

1. Multiple Circulator Zones—Figure 22 shows wiring for two or more circulator zones using Honeywell R845As. One R845A is required for each circulator zone. Circulator terminals "C1" and "C2" on the L8148A are not used. A DPST Honeywell RA832A may be substituted in place of the R845A using the "X" and "X" terminals in place of the "5" and "6" terminals on a R845A. A call for heat from any thermostat will energize the DPST relay in that zone"s R845A. When this relay is energized, electrical continuity is created between terminals 3 and 4, energizing the circulator for that zone. At the same time, electrical continuity is created between terminals 5 and 6 on the R845A, creating a current path from terminal "T" to "T" on the L8148A. Assuming that the supply water temperature is below the high limit setting, the normal ignition sequence will be initiated.
2. Multiple Zones using Zone Valves—Figure 21 shows wiring for multiple zones using Honeywell V8043F zone valves. This wiring diagram may be used for other 24-volt zone valves as long as they are equipped with end switches. Do not attempt to use the transformer on the L8148A to power the zone valves; use a separate transformer. Up to five V8043Fs may be powered by one 48VA transformer, such as the Honeywell AT87A. A call for heat from a given thermostat will result in the application of 24 volts across the TH and TR terminals on the corresponding zone valve, energizing the zone valve motor. The zone valve opens and the end switch contacts are then made. The end switches are connected in parallel with each other and to the "T" and "T" thermostat connections so that any zone valve that opens will also start the circulator and fire the boiler(assuming the high limit is not open). Zone valve terminal TH/TR has no internal connection on the zone valve; it is merely a "binding post" used to connect two or more wires.

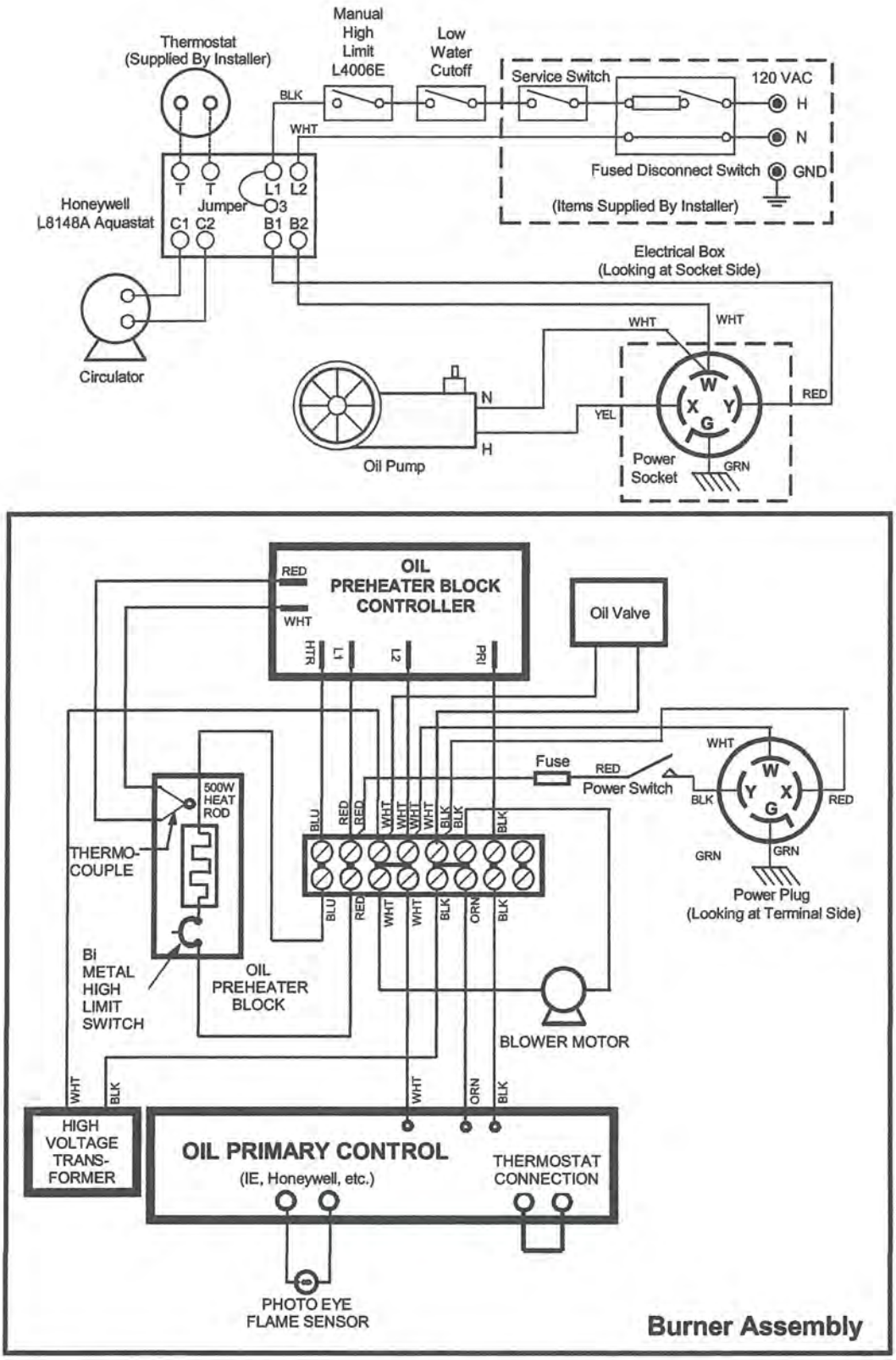


Figure 21 – Wiring diagram, single heat zone only, WB-9 and WB-1

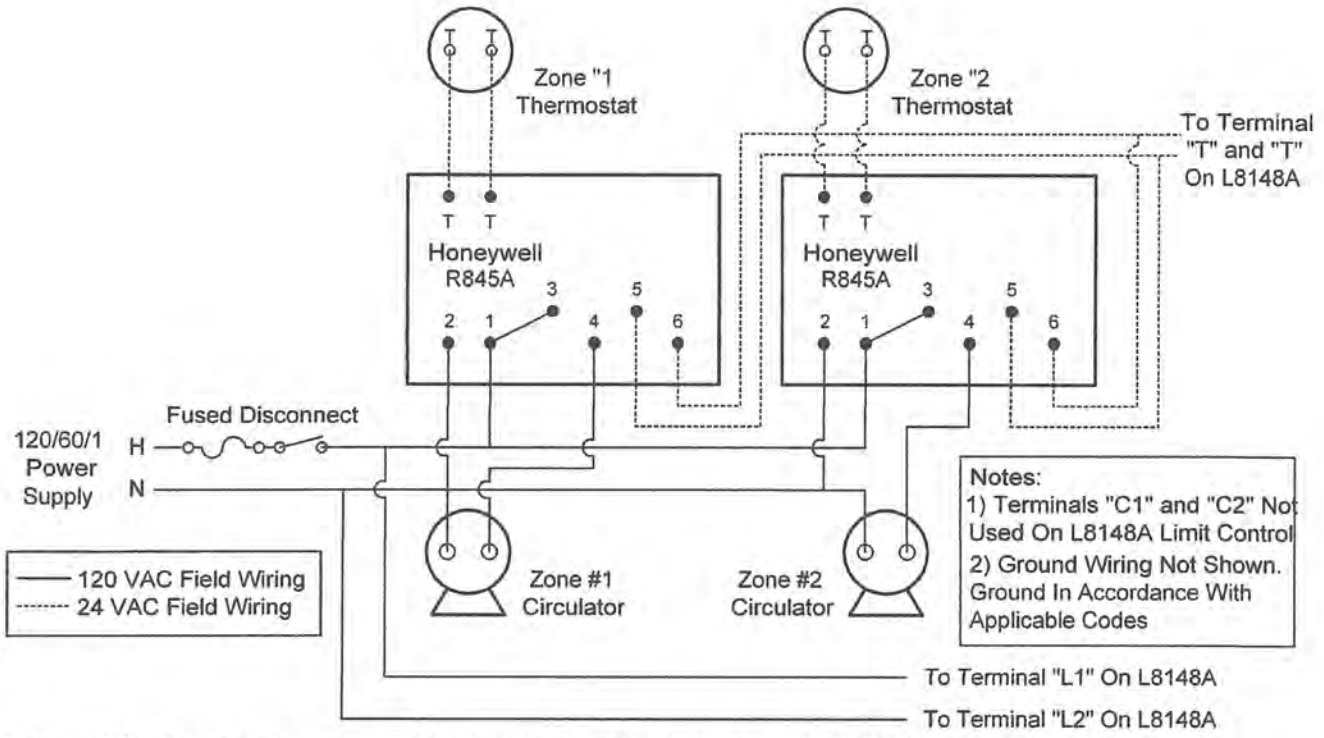


Figure 22 – Wiring diagram, zone wiring using Honeywell V8043F valves (factory boiler wiring not shown here – see figure 21)

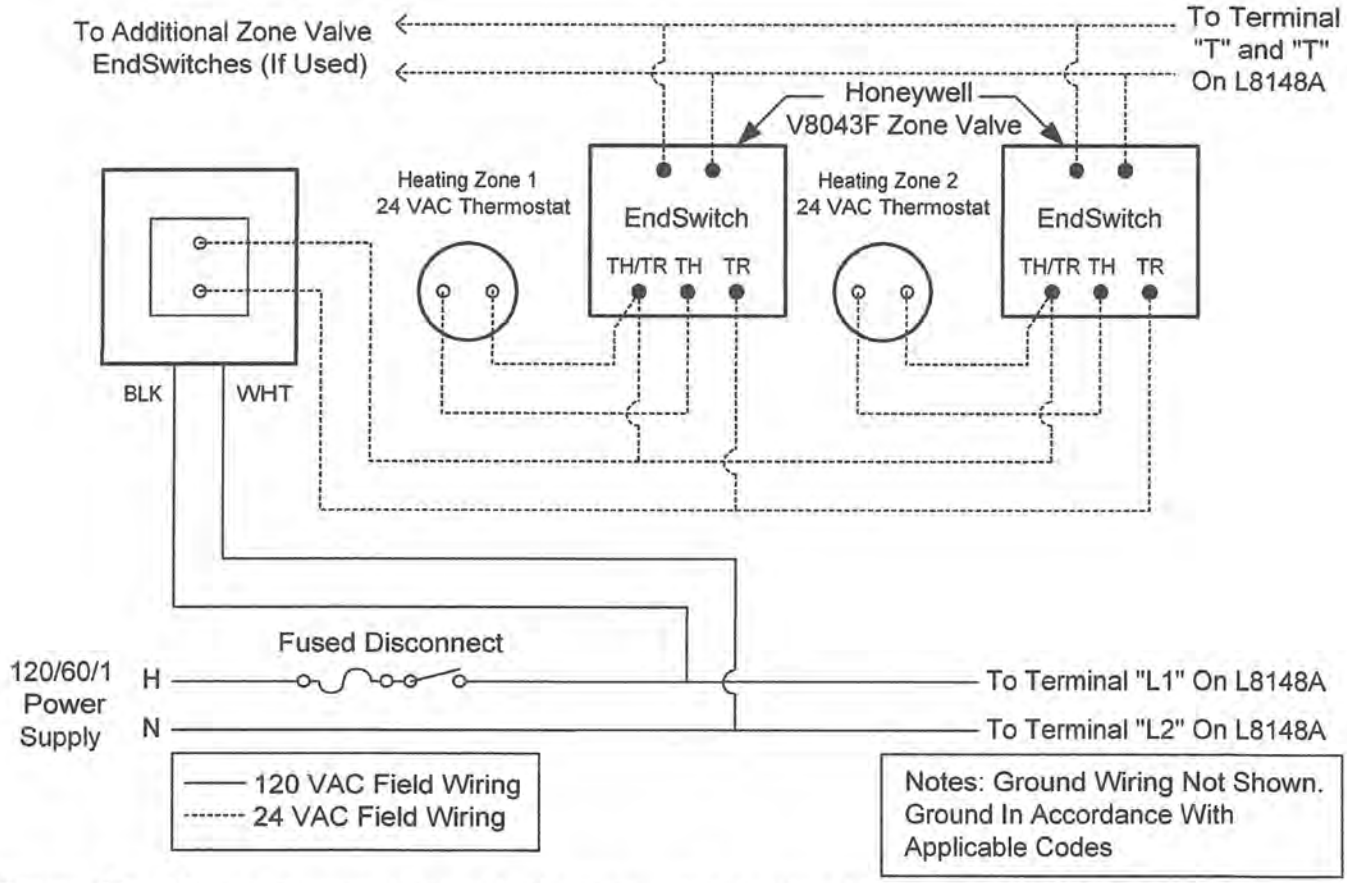


Figure 23 – Wiring diagram, circulator zone wiring using Honeywell R845A valves (factory boiler wiring not shown here – see figure 21)

Boiler Start-up and Adjustments

FILL SYSTEM

1. Close manual air vents (if used) and automatic air vents. Attach hose to boiler drain on return connection and run to a drain or to outdoors. Open drain cock and close shutoff valve on boiler supply pipe.
2. HEATING ONLY – SINGLE ZONE SYSTEM – Open manual valve in cold water feed line and set the fill valve to fast fill. Allow water to flow through the system and out the hose until there is a steady flow of water through the hose with no air bubbles. Next, open the shutoff valve in the drain until air bubbles cease. Then take the fill valve off fast fill, close the drain cock, remove the hose and open all automatic air vents. Also open all manual air vents one at a time and close when water squirts out. Observe the temperature/pressure gauge. System pressure with a cold fill should be in the 12 to 14 psi range.
3. MULTI-ZONE SYSTEMS-HEATING ONLY OR HEAT & DOMESTIC HOT WATER WITH ZONE VALVES – To ensure good circulation through all zones with no air pockets, each zone should be purged of air individually. With all zone valves in the manual open position let water flow through the system by opening the drain cocks so water can exit the system through a hose as in 1 above. When the system seems to be full and free of air, close the drain cock, and the shutoff valve on the boiler supply pipe, leaving the manual valve on the cold water feed open. Now release the manual openers to close all but one zone valve. Open the drain cock and put the fill valve on fast fill. When the flow through hose becomes steady with no air bubbles, take the fill valve off fast fill and then close the drain cock. Repeat this procedure with each zone until all zones have been purged. Open the shutoff valve on the boiler supply pipe. Then open all manual air vents one at a time. When water sprays out of the air vents should have the cap loosened so it can vent air.
4. MULTI-ZONE SYSTEMS ZONED WITH CIRCULATORS – Following the same procedures as in 3 above using the manual shutoff valves to isolate a zone instead of zone valves.
5. Check system pressure on the temperature/pressure gauge on the boiler. Pressure should be in the 12 to 14 psi range. If pressure is over 14 psi drain a little water out with the drain cock. Watch gauge for a few minutes to ensure pressure does not build back up. If pressure is too high with system cold there is a good possibility the relief valve will blow off when the system is brought up to temperature. Too high a pressure with the system cold indicates a faulty fill valve.

Waste Oil Burner Start-up Procedure

1. **IMPORTANT -** Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Oil pump motor turns at low RPM's and would take significant time to complete priming process if not pre-filled. Make sure the oil supply line fittings are air tight. Vacuum leaks are notoriously hard to find. Pressurizing the line with oil in it can help to locate leaks.
2. Proper draft. Draft is the gases traveling through the heater and out the stack or flue. If exhaust fans are present in your building, chances are a draft inducer will be needed. Call our factory or see our website for help,
3. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo set-point, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner components and oil pump.
4. Making sure the thermostat is turned off, apply power to the burner. Switch burner main power switch to ON position. After allowing the oil pre-heater time to establish temperature set-point, approximately 5 minutes. Jump the "T" terminals on the Oil Primary Control (figure 3). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary. This will allow the burner to run during the pump priming process.
5. Priming the oil pump: Open bleeder valve one turn until all air is expelled (figure 6). This may need to be done twice to insure all air is removed. IMPORTANT: When fully purged and flame is established remove temporarily jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
6. Adjust air supply of integrated air compressor to 12–13 P.S.I. This is factory preset, however, due to freight handling settings may be compromised.
7. Combustion air band (figure 3) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from starting.

   Inspect flame length through inspection door located above burner gun assembly. End of flame should reach **no further than ½ way down combustion tube.** To accomplish this flame length, use adjustment knob on opposite side of oil pump. **NEVER ATTEMPT TO START HEATER WHEN COMBUSTION CHAMBER IS HOT AND A DELAYED START.**

Water Treatment

Generally no water treatment will be required. Care should be taken to ensure that the system does not lose water from leaks, or continual relief valve operation since continual make-up water will reduce boiler life.

Maintenance Schedule

WEEKLY

- Drain water from storage tank.

MONTHLY

- Check your ash accumulation for best performance, remove if excessive (the size of unit, type of oil and run time are all contingent factors).
- Change or Replace Spin-On Filter or Filter screen located in the pancake style housing (figure 14 below). **NOTE:** every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON (or more often, depending upon usage or contamination of oil)

- Open the burner side clean-out door to access and clean flame cone (figure 5 above, and figure 8 below).
- Open the swing out doors on both sides of the furnace. The swing out door opposite of the burner assembly requires the removal of the access panel allowing simple entry to the combustion chamber and heat exchanger(s) to vacuum out the accumulated ash & soot (hepafilter recommended) (figure 12 below).
- Clean Suntec pump filter. Remove pump cover for access (figure 13 below). **CAUTION:** Be careful of gasket.
- Clean air compressor filter element.

YEARLY

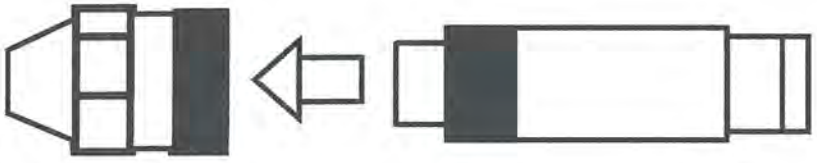
- Clean flue pipe stack-to loosen soot remove stack at top of heater and tap thoroughly. Then vacuum upper heat exchanger(s).
- Inspect electrode adjustment (figure 10 below). Due to erosion, adjustment may change.
- Replace nozzle every 3-5 years depending on usage (figure 5 above, and figures 9, 10 and 11 below). Will lose efficiency due to erosion. This can be accessed by swinging the burner clean out door open (figure 8 below).
- **IMPORTANT:** TO TURN POWER OFF, Remove electrical plug from heater cabinet to burner. Remove 9/16" burner door securing nuts, swing open the burner side clean-out door. Remove nozzle with 5/8" socket (figures 8 and 9 below).

BOILER

1. Clean Boiler using procedure below.
2. Check all water system piping for leaks. Repair any found.
3. Check pressure relief valve operation by opening with manual lever. If it fails to relieve, replace immediately.
4. Check operation of safety controls, low water cutoff and manual reset high limit (if provided).
5. Check breeching connections to ensure there are no flue gas leaks. Seal any leaks found with High Temperature Silicone Sealant.
6. Check flue gas temperature at the test point in the breeching. If gross flue gas temperature is 550 degrees F or above, suspect that cleaning of the boiler flue-ways is required.

BOILER CLEANING

Turn off the power with the line switch. Disconnect the electrical plug at the J-Box by the Aquastat Relay. Remove the four hex head bolts from the outer corners of the burner mounting plate and swing open the burner door with burner mounted to provide access to the boiler flue-ways. Remove sludge and deposits from Stainless Steel Insert. When all deposits are removed, close burner door, and plug in the electrical lead, restore the power and turn burner on. If a boiler is to be shut down and taken out of service for a period of time, the boiler should be cleaned immediately upon shut down while the flue-ways are still warm. When the boiler gets cold, the deposits harden making cleaning difficult. Further, hardened deposits will absorb moisture and cause corrosion.



When cleaning, inspect all three pieces thoroughly. When disassembling and reassembling nozzle, keep facing up as shown.

Figure 24 - Nozzle Assembly Detail

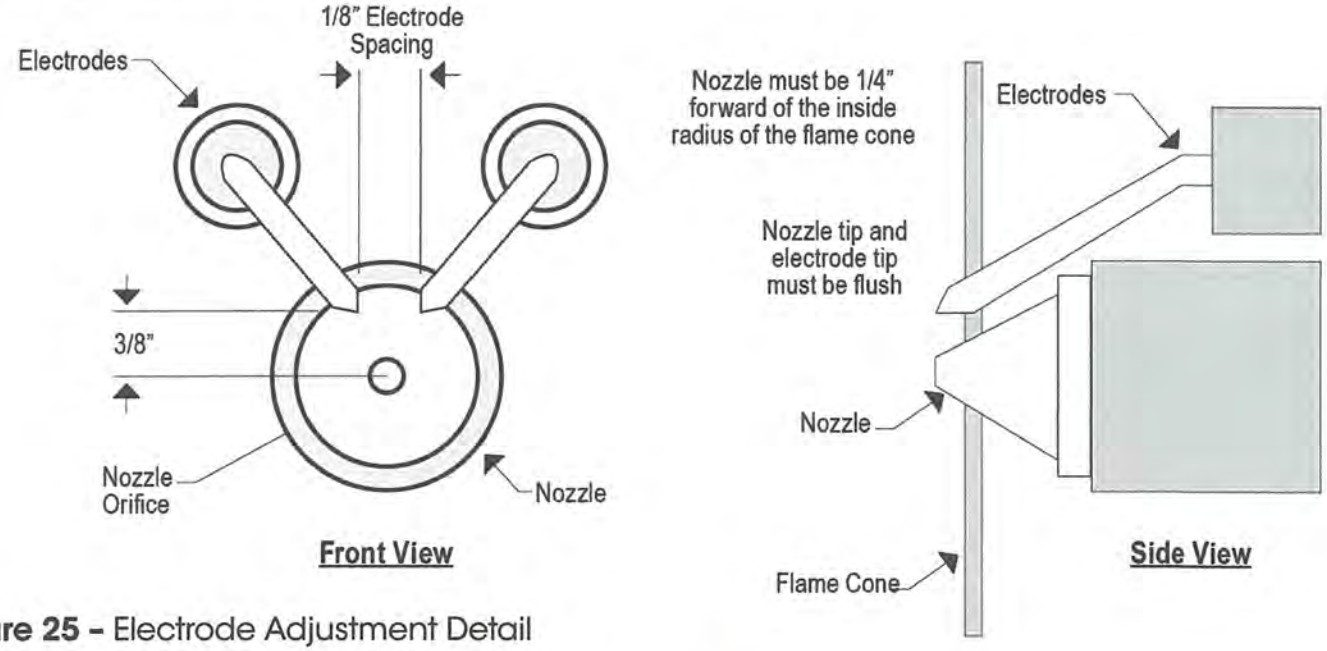


Figure 25 - Electrode Adjustment Detail

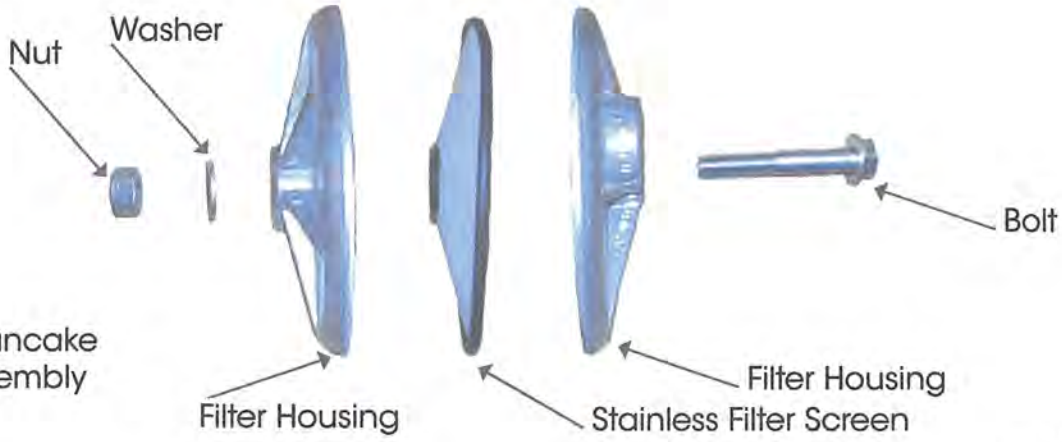


Figure 26 - Pancake Style Filter Assembly

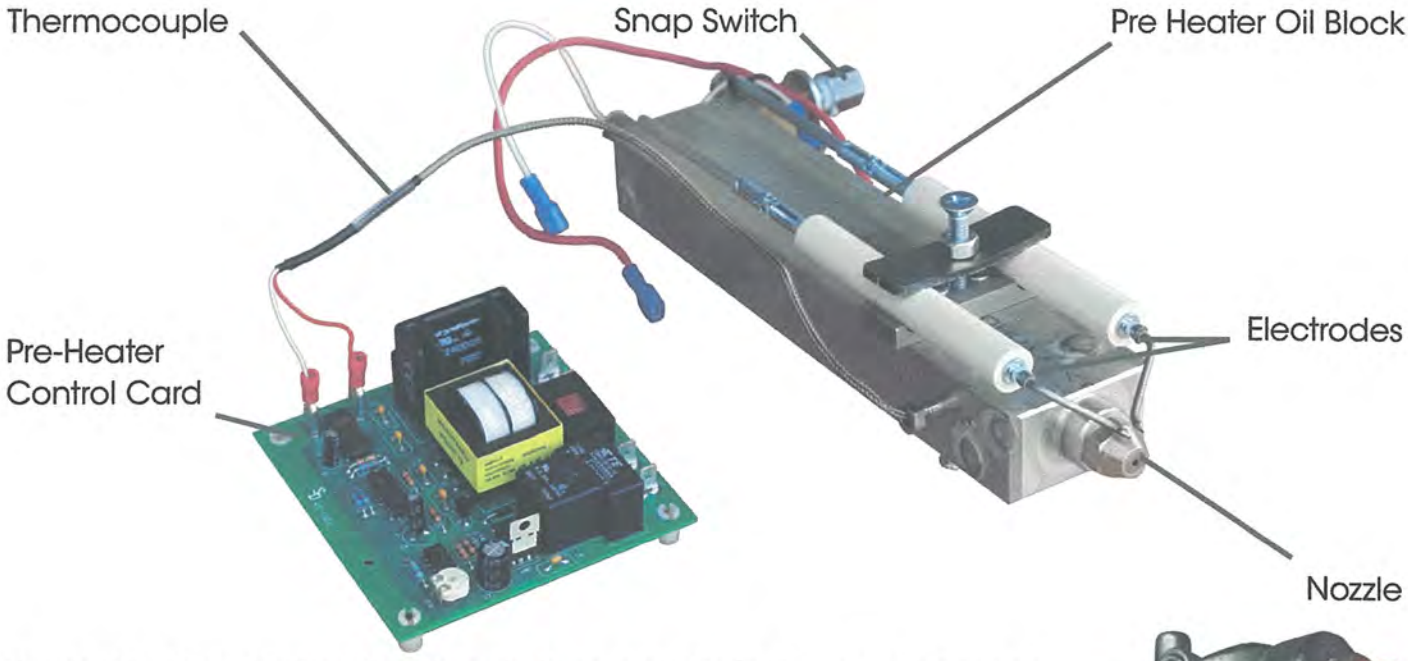


Figure 27 – Pre-Heater Block Detail (Removed From Burner for Clarity)

Remove 4 bolts for access to strainer filter. **CAUTION:** must be careful not to destroy the inner gasket during removal of the housing.

Figure 28 – Pump Strainer

Figure 29 – Oil Filter (Spin-On Filter above, Pancake Style Filter below)

Freeze Protection

Quick Reference

°C	°F	°C	°F	°C	°F
-40	-40	0	+32	+10	+50
-35	-31	+1	+34	+12	+54
-25	-13	+2	+36	+14	+57
-20	-4	+3	+37	+16	+61
-18	0	+4	+39	+18	+64
-16	+3	+5	+41	+20	+68
-14	+7	+6	+43	+25	+77
-12	+10	+7	+45	+30	+86
-10	+14	+8	+46	+35	+95
-9	+16	+9	+48	+40	+104
-8	+18			+50	+122
-7	+19			+60	+140
-6	+21			+70	+158
-5	+23			+80	+176
-4	+25			+90	+194
-3	+27			+100	+212
-2	+28			+110	+230
-1	+30				

Figure 30 - Celsius vs. Fahrenheit

Where freeze protection is required use antifreeze made especially for hydrolic systems such as inhibited Propylene Glycol. DO NOT use automotive type antifreeze. Follow antifreeze manufacturer's directions for quantity. A 50% solution provides protection to -30 degree F. For boiler water content see page 11.

Troubleshooting

NO HEAT:

- Check burner power switch and make sure power is available to the whole control system.
- If included in system, check low-water cutoff and/or manual reset high limit.
- Check room thermostat(s) and zone valves or pump relays (if used).
- Make sure there is oil in tank.
- Inquire if reset button on burner oil primary control has been tripped. If reset button continues to trip then **DO NOT ATTEMPT TO START BURNER**. Open burner door by disconnecting the plug-in lead and remove the four hex head bolts. Examine the combustion chamber for unburned oil and oil vapor. If present, clean up oil. With burner door open check cad cell for soot or dirt deposits, check nozzle and if clogged, replace with nozzle of identical make and style. Check electrodes for proper gap and for soot or oil deposits. Also check porcelains for cracks. Close burner door and re-connect electric cord. Press reset button while watching through the observation port. If burner fires immediately and flame looks good, cycle several times. If burner does not fire immediately, or if it fires but flame looks ragged and/or smoky, shut burner down and check the fuel delivery system. The problem may be air in the intake line so tighten all fittings and tighten the unused intake port plug. Also check the filter cover and gasket. Also check the pump filter and clean it with a brush and fuel oil or kerosene if it looks dirty.

INADEQUATE HEAT:

- Check thermostat and heat anticipatory setting. A wrong setting can cause short cycling and inadequate heating.
- Check to see if the distribution system is air-bound. If pump and boiler are running and the pipe connection to the boiler supply port is hot, check the pipe temperature at the inlet to the first radiator. If it is cool or only lukewarm, then the problem is lack of circulation. Look for air in the system, a valve partially closed, a zone valve failed in the closed position, a pump failure. The most common fault is air in the system.

RELIEF VALVE LEAKS CONSTANTLY:

- Check system pressure. With system hot, pressure should be in the 20 psi to 25 psi range, not to exceed 25 psi. With system cold, pressure should be in the 12-14 psi range. If pressure is over these ranges, then suspect the pressure reducing fill valve or the expansion tank. A diaphragm tank may be too small, may have a ruptured diaphragm (this would cause a very sharp rise in pressure as system water heats up and a sudden opening of the relief valve) or may be over-pressurized. A closed type expansion tank may be undersized, may be improperly piped to the boiler, may be water logged.
- Relief valve may be defective, or it may have foreign material lodged on the seat.

UNI-PAK Waste Oil Boiler Limited Warranty

UNI-PAK(manufacturer) warrants to the purchaser of **Boiler** listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, unit heater is to be sent to the factory with freight prepaid. **UNI-PAK** reserves the right to determine appropriate action for repair or replacement.

*No parts will be accepted by **UNI-PAK** without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.*

Warranty Covers:

- Boiler cast iron jacket, one (1) year (parts only)
- Stainless steel combustion tube Insert, five (5) years limited (part only)
- Oil heater block, twenty (20) years (parts only)
- Oil heater block controller PCB, three (3) years (parts only)
- All other components, one (1) year (parts only)

This warranty is void if:

- **Warranty registration card is not returned within sixty (60) days of purchase**
- Any part or component subject to abuse or altered from original manufactures specifications
- Installation not in accordance with instructions
- Has not been properly maintained, operated or has been misused
- Wiring not in accordance with diagram furnished with unit heater
- **Boiler** is operated in the presence of chlorinated vapors
- Air through unit heater is not in accordance with rating plate and specifications
- Target plate or clean out door warped/discolored from excessive heat

Warranty is limited to the original purchaser and is non-transferable.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAKis not responsible for any labor and/or shipping cost, unless prior authorization in writing has been obtained.**

Warranty Card

Please fill out, tear off and return to manufacturer within sixty (60) days of purchase, or warranty will not be valid. Please print or type.

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Dealer: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Installed By: _____

UNI-PAK

WASTE OIL FIRED MOBILE RADIANT HEATER

Operation and Service Instructions

Manual

MODEL PWH-150

Thank you and congratulations on your purchase of an UNI-PAK Waste Oil Fired Mobile Radiant Heater. You have selected a high quality, precision-engineered piece of equipment, designed to give you many benefits as well as years of outstanding performance.

PRECAUTIONS

Waste oil may contain many foreign materials. Waste oil may also contain gasoline. Therefore, specific precautions on the handling and storage of waste oils are to be observed when using, cleaning and maintaining this heater. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc. WARNING: This appliance is not designated for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Do not expose this unit to rain or moisture. If installed in high moisture atmosphere, a special cover for the integrated air compressor must be obtained from factory to avoid rusting of internal raw metals. If this occurs, see trouble-shooting guide for remedy.** Uses only Fuel oils, Motor oils up to 90wt, Kerosene, Hydraulic fluid, Diesel, Mineral oil, Vegetable oil, Transmission fluid, Synthetic oil (*after it's been used*). Do not use old, contaminated oils that have been stored in underground tanks or outside barrels for long periods of time. Excessive water and sludge may be present, causing quick filter plugging.

NOTES: The instructions contained in this manual apply to the operation and service UNI-PAK Waste oil fired mobile radiant heaters. The following instructions should be carefully followed for obtaining the best possible installation, operation and service conditions. Specifications are subject to change without notice. This heater was designed to be an auxiliary heat source and provide economical disposal of waste oil. Proper operation depends on the consistency of the oil. Any water or foreign material in the oil may cause the unit to shut down. If a continuous stream of oil cannot be guaranteed at the heater, the main heating system should be set above freezing which will prevent any building damage if the waste oil heater were to overcome inoperative during subfreezing weather, i.e. supply tank empty, filter plugged, etc.

UNCRATING: Immediately upon uncrating units, check the unit for any damage that may have been incurred in shipment, if any damage is found, file a claim with the transporting agency. The unit has been tested and inspected at the factory prior to crating and was in perfect condition at that time. If anything is missing check packing slip for indications of possible backorder of those parts or components. Otherwise a claim must be for those missing parts.

IMPORTANT

NOTICE TO OWNER AND INSTALLER

To enjoy the long term benefits of burning your used oil in an UNI-PAK Waste Oil Burning appliance, it is necessary to become familiar with the correct operation and maintenance of your new heater. Before operating this appliance, make sure you read and understand this manual.

IMPROPER OR LACK OF MAINTENANCE WILL VOID THE WARRANTY

The most critical sections of this manual are in order of importance as follows:

- **Basic Operation Knowledge**
- **Oil Suction Line**
- **Correct Draft Over Fire**
- **General Maintenance Requirements**

Identical to any gas or oil furnace, without adequate draft over the fire, the combustion gases cannot escape the furnaces. The flame will lengthen resulting in an overheated combustion chamber. Burning used oil is similar to burning wood. A fine gray ash accumulates in the combustion chamber. This accumulation of ash will eventually affect the performance of the heater and must be removed.

These topics are discussed in detail on the following pages. 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 UNI-PAK Radiant heater.

SPECIFICATIONS

BTU'S/HR OUTPUT	150,000
GALLONS PER HOUR	1.0
VOLTAGE REQUIREMENTS	120V 60Hz Single Phase
AMPS FULL LOAD	8.4 A
WEIGHT	180 LBS
TANK CAPACITY	10.6 Gallons
DIMENSIONS L/W/H	50"x28"x34"

Notes:

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. UNI-PAK reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. Output depends on BTU content of oil used.
3. Atomizing Air Pressure for all fuels 10 P.S.I.

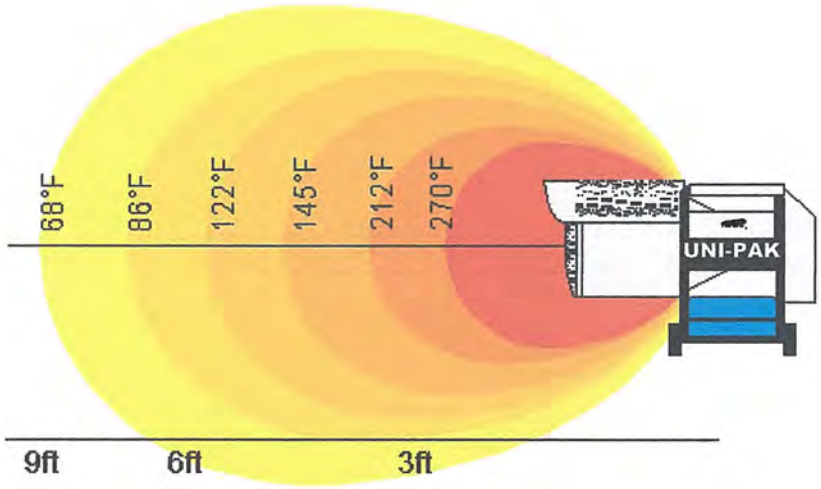


Figure 1 – Temperature Diagram

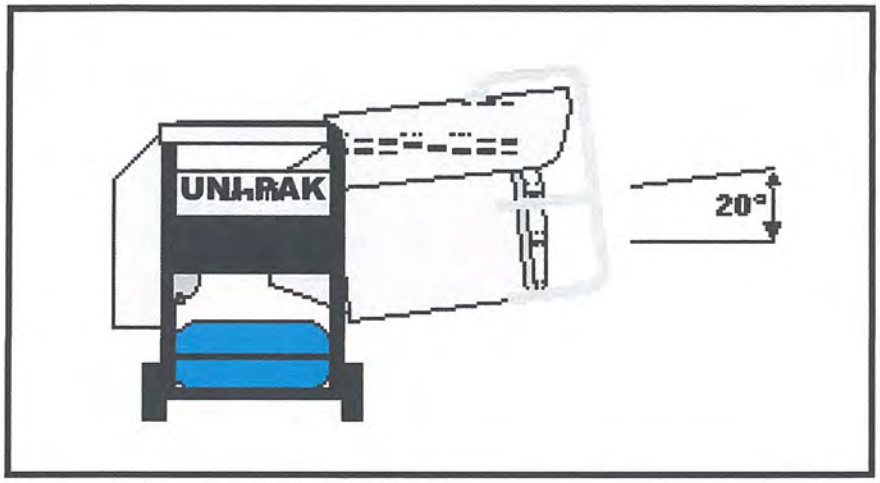


Figure 2 – Inclination

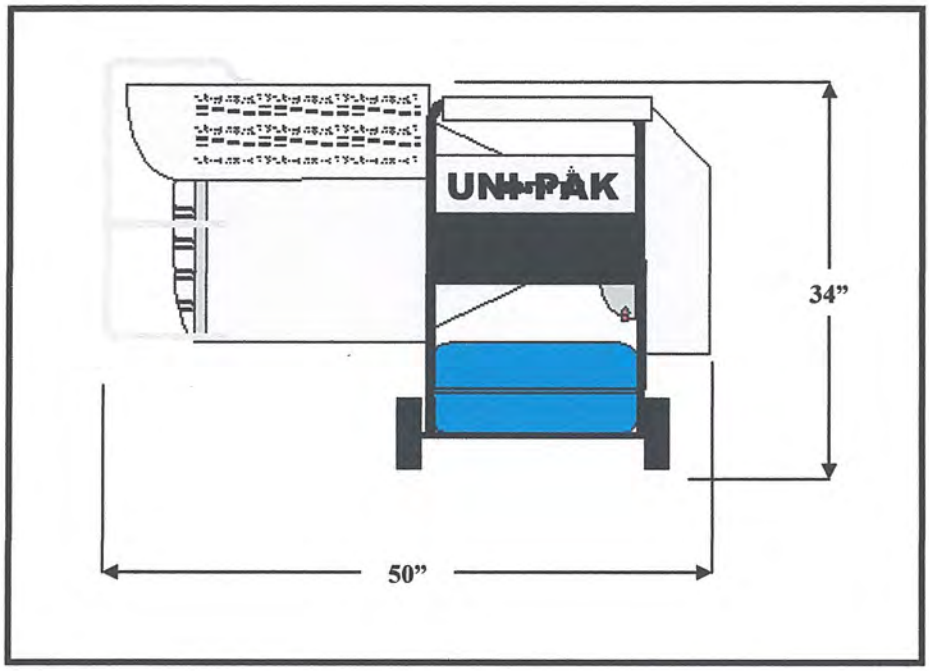
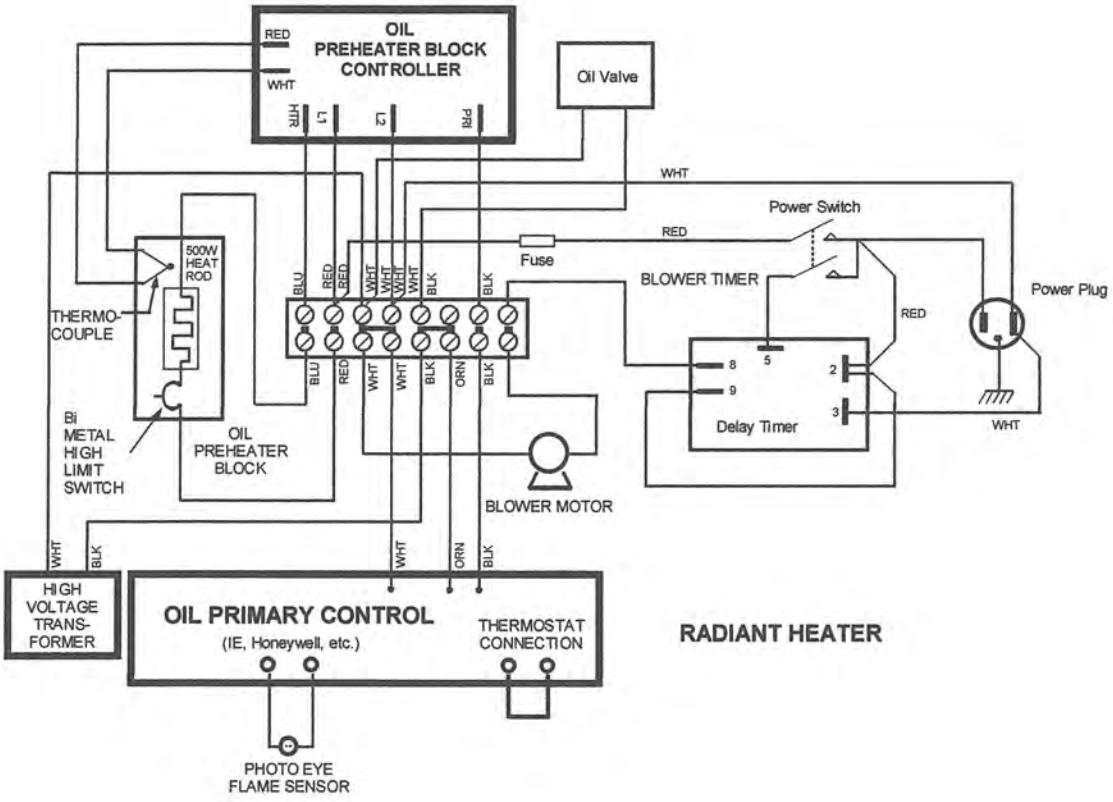


Figure 3 – Dimension

WIRING DIAGRAM



UNI-PAK
OIL BURNER

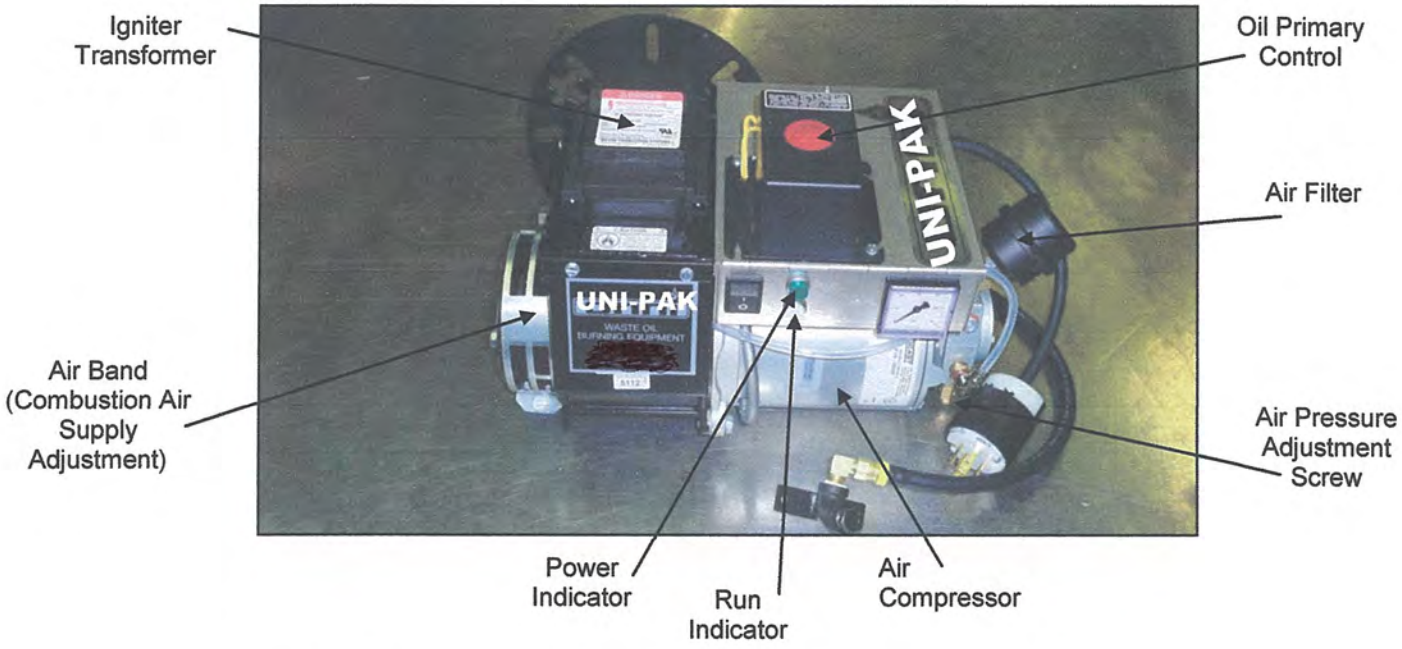


Figure 4 – Oil Burner (Back View Closed)

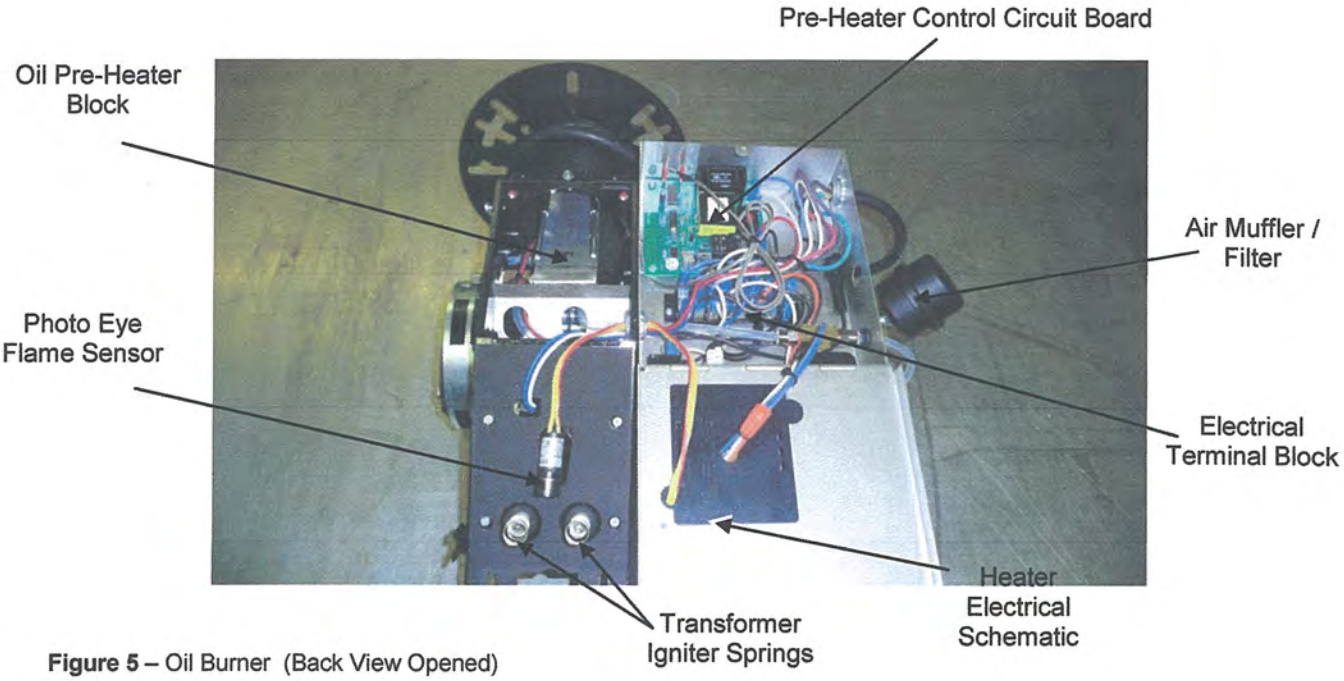


Figure 5 – Oil Burner (Back View Opened)

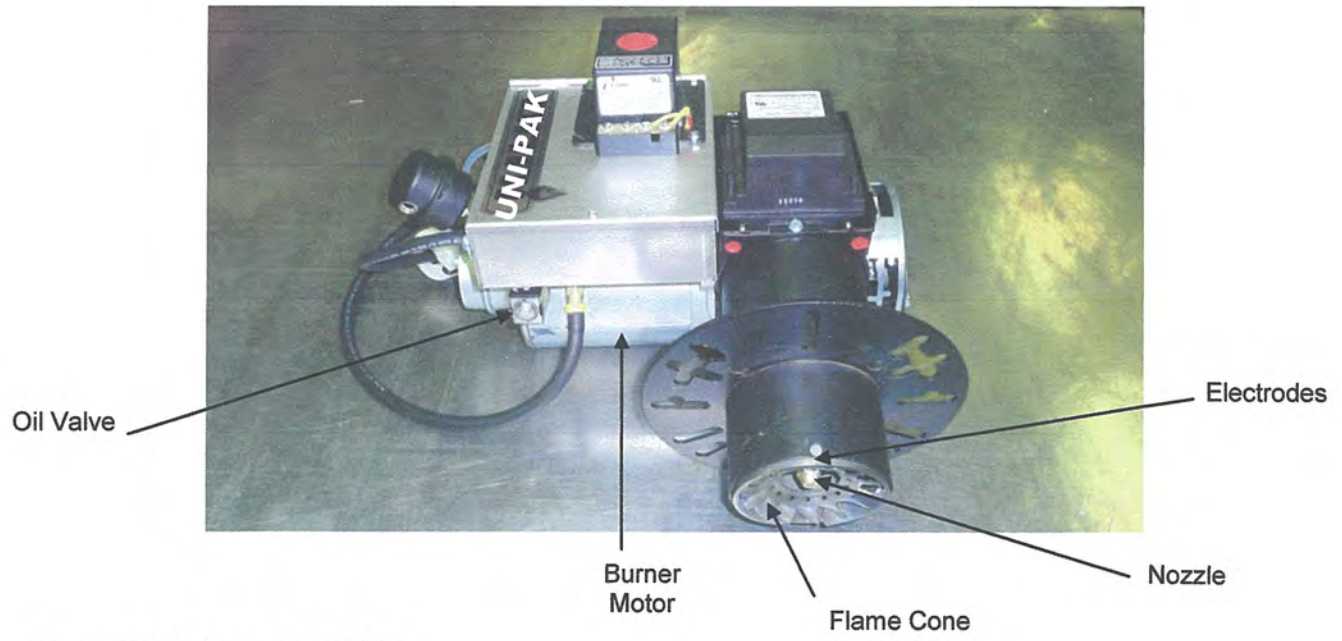


Figure 6 – Oil Burner (Front View)

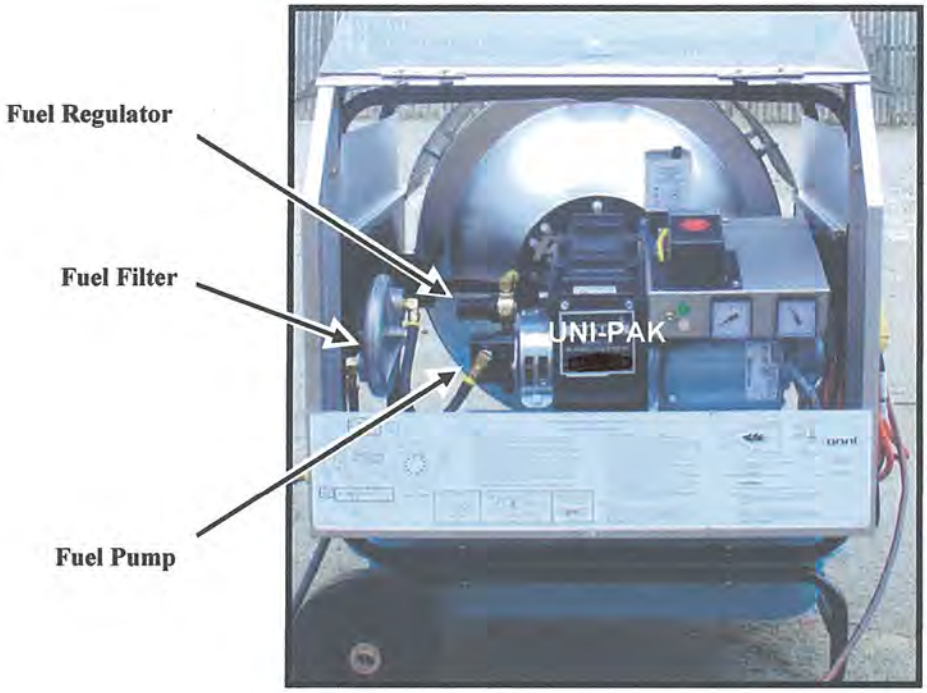


Figure 7 – Radiant Heater (Back View)

UNI-PAK

OIL BURNER TECHNOLOGY

UNI-PAK patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. Optimum atomization (spray) is accomplished by precisely pre-heating the oil and air prior to introduction to the combustion chamber. The waste oil enters into the Oil Pre-Heater Block (figure 5) and is pre-heated to operating thermo setpoint, then compressed air from the air compressor (figure 4) is mixed with the oil prior to spraying out the nozzle similar to fuel injection, by breaking up the oil droplets into a finer mist or spray (atomization). Electrodes mounted just above the nozzle (figure 6) provides continuous electrical arc across electrode to electrode igniting the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a swirl caused by the burners blower and specially designed flame cone (figure 6) providing a very efficient and thorough burn of the waste oil.

Burner Components

- **Igniter Transformer:** (figure 4) Supplies high voltage to the electrodes generating electrical arc igniting the oil.
- **Oil Valve:** (figure 6) energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Air Band:** (figure 4) Adjusts amount of air introduced into the combustion chamber. Air band is adjusted at the factory for optimum performance ½ to ¾ inch. **NO FIELD ADJUSTMENT REQUIRED** unless in high altitudes application where minor adjustment may be required.

- **Oil Primary Control:** (figure 4) Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** (figure 5) Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** (figure 5) Senses flame in combustion chamber and signals oil primary when no flame is present.
- **Igniter Springs:** (figure 5) Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Air Pressure Gauge:** (figure 4) Displays air pressure supplied by onboard air compressor.
- **Air Compressor:** (figure 4) Supplies air used within pre-heater block to aid in atomization of the oil.
- **Air Muffler/Filter:** (figure 5) Filters air and muffles the sound generated by the compressor.
- **Pre-Heater Control Circuit Board:** (figure 5) Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** (figure 6) Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** (figure 6) Low pressure nozzle for oil spray pattern.
- **Flame Cone:** (figure 6) Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** (figure 6) Multitask motor turns the burner blower and integrated air compressor.
- **Air Pressure Adjuster:** (figure 4) Adjusts the air pressure going to the pre-heater block. Should be adjusted between 12 PSI and 13PSI as indicated on the Air Pressure Gauge on the burner for thorough burn of the waste oil.

  Note: In order to insure proper air adjustment, air gauge must read 0 when burner is cycled off or powered down.
- **Oil Pressure Gauge:** (figure 4) Displays oil pressure at the burner. Adjust flame to 3/4 length of combustion chamber (figure 8) by increasing CW or decreasing CCW the adjuster located on the left side of burner (figure 9). The fuel regulator increases or decreases delivery of fuel to the burner. When you increase or decrease the fuel to the burner you will notice the flame length will increase or decrease.

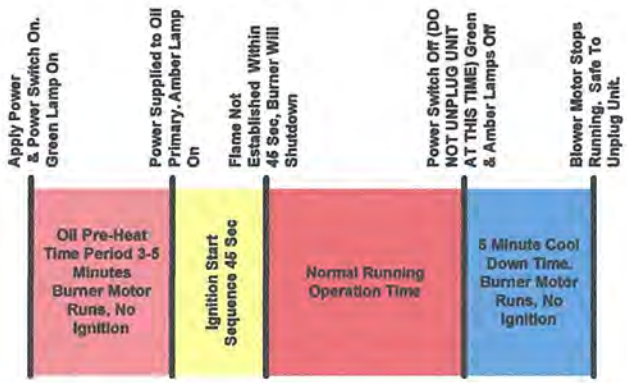
  IMPORTANT:

  Once adjusted for correct flame length, take note of oil gauge setting for bench mark pressure reading needed when burning the specific fuel mixture generated by the owner. PLEASE NOTE- Once flame is set the oil pressure gauge can read various pressures when different viscosities of oils are used. The oil pressure gauge is an indicator of where the PSI reading will be when that oil viscosity is being burned. The oil gauge is used for servicing diagnostics assistance.
- **Power Indicator:** (figure 4) Indicates when power is present at the burner.

- **Run Indicator:** (figure 4) Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.
- **Fuel Pump:** (figure 7, 13) pumps fuel from fuel tank to burner.
- **Fuel Filter:** (figure 7, 14) filters fuel prior to entering pump.
- **Fuel Regulator:** (figure 7, 12) The fuel regulator increases or decreases delivery of fuel to the burner. When you increase or decrease the fuel to the burner you will notice the flame length will increase or decrease. Adjust flame to 3/4 length of combustion chamber (figure 8) by increasing CW or decreasing CCW the fuel regulator located on the left side of burner (figure 9).

INITIAL START PROCEDURE

1. During the initial power up process the burner is locked out from energizing until the oil has been properly pre-heated to operating thermo setpoint, approx 3 to 5 minute duration. Once the oil has been pre-heated, power is then applied to burner componenets and oil pump.
2. Apply power to the heater. Switch heater main power switch to ON position. Burner motor will start to run but will not attempt to ignite. After allowing the oil pre-heater time to establish temperature setpoint, approximately 5 minutes, heater will start to establish flame. Once the burner is running, temporarily jump the "F" terminals on the Oil Primary. This will allow the burner to run during the pump priming process.
3. Priming the oil pump: Open bleeder valve one turn until all air is expelled. This may need to be done twice to insure all air is removed. **IMPORTANT:** When fully purged and flame is established remove temporarily jumpers on "F" terminals of the Oil Primary to allow safety features of the unit to operate properly.
4. Adjust air supply of integrated air compressor to 8-12 P.S.I. This is factory preset, however, due to freight handling settings may be compromised.
5. Combustion air band (figure 4) should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from starting.



Operational Sequence Chart

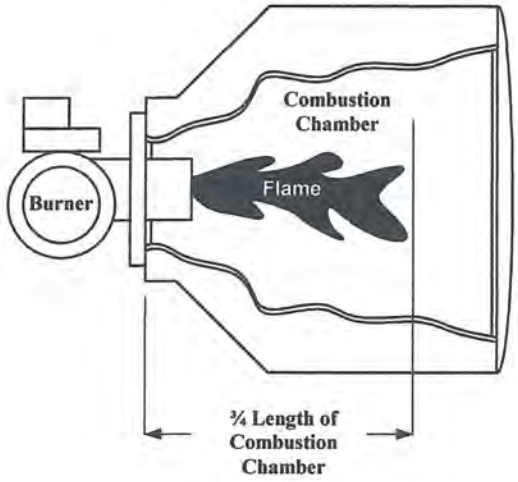


Figure 8 – Flame Adjustment

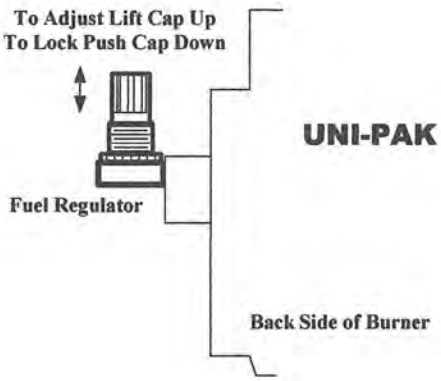


Figure 9 – Fuel Regulator

UNI-PAK

MAINTENANCE SCHEDULE

WEEKLY

--- Drain water from storage tank.

MONTHLY

--- Replace Spin-On Filter or Clean stainless filter screen located in the pancake housing ***as needed***. (*depending on usage*) Monitor : every application is different and may vary depending on contamination of oils being used.

ONCE EACH SEASON
(MORE or LESS DEPENDING UPON USAGE OR CONTAMINATION OF OILS).

--- Clean flame cone. (figure 6).

--- Remove ash deposits from combustion chamber by opening front panel to gain access to ash/drip pan inside combustion chamber. (figure 15).

--- Clean pump strainer. Remove pump cover for access. (figure 13). CAUTION!-Be careful of gasket.

--- Clean air compressor filter element (figure 5).

YEARLY

--- Inspect electrode adjustment. (figure 11). Due to erosion, adjustment may change.

--- Replace nozzle every 3-5 years depending on usage (figure 6, 10). Will lose efficiency due to erosion.

ELECTRODE ADJUSTMENTS
Electrodes are adjusted at time of manufacture. However, they should be check periodically and at time of installation to be sure they are set as noted in the following dimensional drawing. Swing burner door back for inspection. (figure 5, 10, 11)

CAUTION: UNPLUG HEATER BEFORE CHECKING OR ADJUSTING ELECTRODE SETTING.

NOZZLE POSITION IN RELATION TO ENDCONE/BURNER TUBE
Tip of nozzle must be ¼" ahead of inside radius of end-cone. If nozzle is behind inside radius of end-cone, coking will occur and end cone can become clogged. (figure 11). **IMPORTANT NOTE:** be sure nozzle is centered, if nozzle is higher than center, press nozzle down to bottom out pre-heater stand.

To adjust, loosen Preheat Sink securing nut and set screw, push fore or aft as needed.
WARNING: This adjustment is done at the factory and should not be moved unless Fig 10 dimensions have been altered.

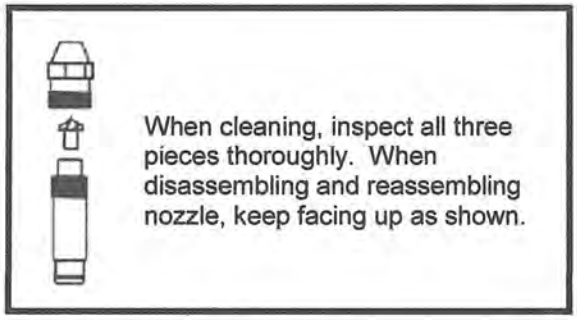


Figure 10 – Nozzle Assembly Detail

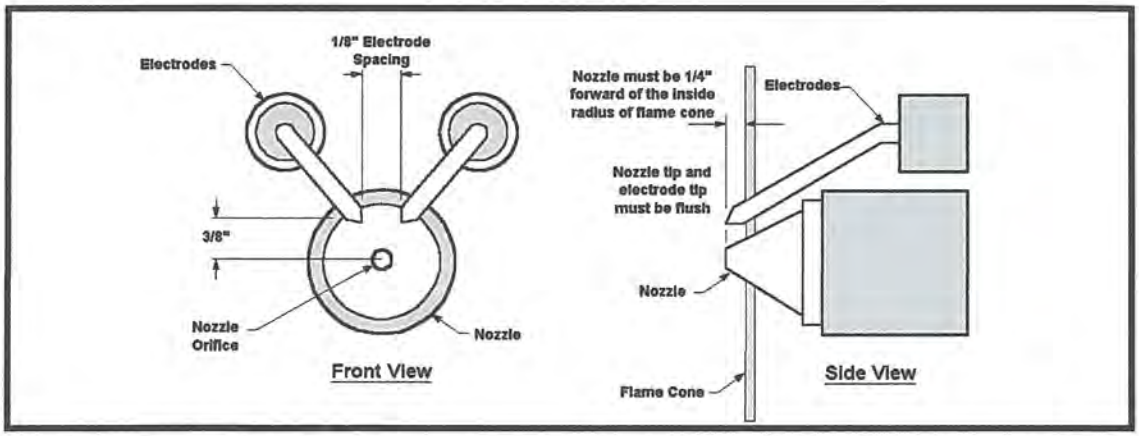


Figure 11 – Electrode Adjustment Detail

Figure 12 – Pre-Heater Block Detail (Removed From Burner for Clarity)

Figure 13 – Fuel Pump

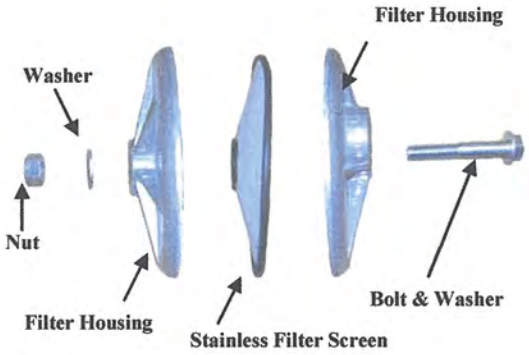


Figure 14 – Old Style Pancake Fuel Filter

New Style Spin-On Filter With Housing

Figure 15 – Combustion Chamber Cleanout Door

TROUBLE SHOOTING

♦Most Likely •Less Likely ♣Least Likely

Symptom	Cause	Remedy
1. Heater shuts off	♦Manual reset	♦Requiring manual restart by reset button on.
2. Loss of prime overnight	♦Vacuum air leak in fuel line	♦Check all fuel connections. Tighten fittings.
Won't hold vacuum	♣Plugged pump screen	♣ Check pump screen, may need cleaning–to access, remove pump cover
IS TANK EMPTY?	• Plugged filter or tank oil empty	• Clean filter. Using vent port, reprime pump (See Figure 6 & 7).
3. Fails to start.	♦Vacuum Leak	♦Open bleeder port if air present. Check and tighten fittings.
	♦Inadequate Fuel Supply	♦Clean filter. Check all fuel connections. Tighten fittings.
	• No Pressure	• Check, may need cleaning—to access, remove pump cover.
		• Using vent port, reprime pump (See Figure 6 & 7)
	•No Pre-heat	• Be sure all wiring to pre-heater is tight–no loose connections.
		• Bad firerod–Replace. Continuity at terminals.
	•Auto start circuit not functioning	• Check circuit control board and replace if necessary.(Call Factory)
		• Check continuity at terminals of firerod limit snap switch. Replace if needed.
	•No Arc	• Check springs to electrode rod adjustment (under transformer) make sure they make good contact. Open burner door and make sure electrode tips aren't touching flame cone. Readjust.
	•No Air Pressure	• Check pressure regulator and adjust. Check air supply line for restrictions or leaks. Pull compressor cover and inspect carbon vanes. May need to replace. Check filter, clean if needed.
4. Reduced air pressure, cannot increase.	♦Gauge may be bad.	♦Replace gauge.
	♦Intake filter muffler is plugged with dust or dirt.	♦ Remove & Clean with carburetor cleaner, dry thoroughly. Do Not Use.
	♣Compressor vanes may be worn.	♣ Replace carbon canes.
	• Exposed to water.	• Remove cover, clean rust with emery cloth.
5. Hard starting diminished flame.	♦Partially plugged filter.	♦Clean filter. Using vent port–reprime pump (See Figure 6 & 7)
	♣Out of fuel	♣Refill Storage.
	♣No oil to burner	♣Clean pump screen–Remove pump cover. Using vent port, reprime pump. (See figure 6 & 7)
	•Restriction in nozzle usually only when initially installed. New lines may have foreign material in them.	•Remove nozzle and check for foreign objects. (See Figure 9 and 11)
		•Aluminum Block Pre-heater inside burner should not build up carbon. If carbon is present, pre-heat circuit is malfunctioning. Thermocouple heat sensor wire could have open circuit. Heat control board may have blown circuit and circuit board fuse. Inspect both and replace either if needed. (See Figure 11).
	•Air band open too far	•Close air band—while viewing flame; open air band slowly until combustion chamber is clear, not orange.
6. Heater cycles frequently, without thermostat	♦Heater over firing.	♦Investigate and locate reason for over firing. I.e., nozzle eroded, pump not functioning properly, decrease pump motor speed.

7. Heater rumbles and excessive heat blow back from flame vision port.	♦Pump setting wrong	♦Pump not functioning properly–over firing. May need RPM readjust. Reset flame slightly less than ½ way down tube combustion chamber. Use adjustment knob on pump motor. (See Figure 7).
8. Heater establishes flame but locks out or shuts off. Need to reset primary.	♦Photo eye cant see flame.	♦Clean photo eye which is smoked up by back draft smoke.
	♦Flame too small	♦Increase pump motor speed (See Figure 7).
9. Poor or reduced heat production.	♦Flame too small ♣Entire fuel supply may be plugged.	♦Nozzle may be plugged with debris–usually after filter is cleaned. ♣Clean filter both, oil strainer and oil pump screen.

UNI-PAK

UNI-PAK Radiant Heater Limited Warranty

UNI-PAK warrants to the purchaser of the Radiant Heater listed above will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, radiant heater is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

No parts will be accepted by UNI-PAK Without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.

Warranty Covers:

1. Combustion Chamber, one (1) year. (Parts Only)
2. Oil Heater Block, twenty (20) years. (Parts Only)
3. Oil Heater Block Controller PCB, three (3) years. (Parts Only)
4. All other components, one (1) year. (Parts Only)

This warranty is void if:

1. Warranty registration card is not returned within thirty (30) days of purchase.
2. Any part or component subject to abuse or altered from original manufactures specifications.
3. Has not been properly maintained, operated or has been misused.
4. Radiant heater is operated in the presence of chlorinated vapors.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor cost unless prior authorization in writing has been obtained.**

UNI-PAK

WARRANTY CARD

Please fill our, tear off and return to manufacturer

Return following warranty information to manufacturer within thirty (30) days of purchase or warranty will not be valid. (Please print or type).

Date of Purchase_____

Serial #_____ Model _____

Customer Name_____

Address_____

City _____ State _____ Zip Code _____

Dealer _____

Address _____

City_____ State _____ Zip Code _____

Installed at _____

UNI-PAK

USED OIL or GAS/PROPANE FIRED AIR COOLED ABSORPTION WATER CHILLER WC-5 Series

INSTALLATION♦STARTUP♦ADJUSTMENT♦MAINTENANCE

WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

— Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

— **WHAT TO DO IF YOU SMELL GAS**

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

— Installation and service must be performed by a qualified installer, service agency or the gas supplier.

IF UNIT OVERHEATS OR UNIT'S GAS VALVE FAILS TO SHUT OFF: DO *NOT* SHUT OFF ELECTRICAL SUPPLY TO UNIT. *INSTEAD*, SHUT "OFF" GAS SUPPLY TO UNIT. CALL SERVICE COMPANY.

WARNING:

Never burn chlorinated solvents mixed with oils or otherwise rapid corrosion to internal metals will occur. An optional chlorine test kit is available from the factory upon request.

NOTE:

The power supply line must not be used to turn the unit "ON" or "OFF". The dedicated control switch in the R-Y line is for this purpose.

The WC-5 Chiller can operate using either used oil or gas/propane. Normal operation of the Chiller will attempt to run on used oil first then automatically switch over to gas or propane if used oil burner is turned off or not operating due to lack of fuel or flame.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

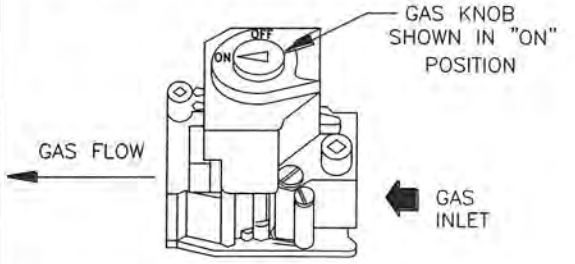
- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in the building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to move the gas control knob. Never use tools. If the knob will not move by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service rechnician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. CHILLER – Set the thermostat to highest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.



5. Turn the gas control knob to "OFF".
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
7. Move gas control knob to "ON".
8. Replace control access panel.
9. Turn on all electric power to the appliance.
10. Set thermostat to desired setting.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to highest setting (chiller).
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn the gas control knob to "OFF". Do not force.
4. Replace control access panel.

C14085–216

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NOTE

Carefully read the information contained in this manual. It contains important instructions regarding installation, use and maintenance safety. Save this manual for any future needs. The manufacturer cannot be held responsible for any damages from improper, erroneous or irrational use.

With the aim of continuously improving of quality of our products, manufacturer reserves the right to change reported instructions and drawings without any prior notice.

1 GENERAL WARNINGS

This manual is an integral and essential part of the product and must be given to the owner.

Only qualified technicians, strictly complying with the manufacturer's instructions and the local standards, should install this product. The manufacturer will not accept responsibility for personal injuries or property damage resulting from improper installation.

Qualified technicians are those having specific technical competence in air conditioning and gas appliances according to international and national standards.

This appliance must be used exclusively for its intended purpose. All chilling applications must be in accordance with the operating specifications of the unit. Any other use is considered improper and, therefore, dangerous. Steps must be taken to avoid improper use and potential dangers.

The fluids used in the sealed refrigerant circuit may cause health problems if inhaled, ingested or when allowed to come into contact with the skin. It is recommended that no work be performed on the sealed refrigerant circuit except by a qualified service technician or engineer. Care should also be taken not to disturb or handle the valves of the chiller's sealed refrigerant circuit.

The manufacturer will not accept contractual or non-contractual liability for damages resulting from improper installation or misuse of the unit or intentional disregard of any of the manufacturer's instructions.

After unpacking the unit, check the unit for integrity. Due to the potential danger, keep all packaging materials (plastic bags, polystyrene foam, nails, etc.) away from children.

Before installation, it is recommended that all chilled water and oil/gas supply piping be flushed. If not flushed prior to installation, residual materials may be left in the piping that could cause improper functioning of the chiller.

The installation of the appliance must conform to the requirements of the authority having jurisdiction or in the absence of such requirements, to the latest edition of the **National Fuel Gas Code, ANSI Z223.1**. If the unit is installed in Canada, the installation must conform to the **Canadian Gas Association Standard CAN1 B149.1** and **.2**.

The chiller's electrical connections and grounding must be in accordance with the latest edition of the **National Electrical Codes, ANSI/NFPA No. 70 (CSA Standard C22.1** when installed in Canada) and with any local codes. To ensure the electrical safety of this appliance, it must be correctly connected to an efficient grounding system. The manufacturer is not responsible for any damages caused by the failure of the grounding system.

In the case of failure and/or poor unit performance, shut the unit down in the proper manner, disconnect the unit's power supply and close the gas valve. Do not attempt any repair and call a qualified technician for service. The chiller should also be disconnected when not in use for a prolonged period of time.

The manufacturer's authorized service technicians, using only original replacement parts, must perform repairs to the product. Failure to adhere to this guideline may compromise the safety of the unit. To ensure the correct operation and efficiency of the unit, it is essential that qualified service technicians perform annual maintenance in accordance with the manufacturer's instructions.

Should the unit be sold or transferred to another owner, it is imperative that this manual be provided for use to the new owner and/or installer.

Under no circumstances should the unit be operated with any safety or electrical component by-passed or defective.

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control, which has been under water.

Before starting the appliance:

A qualified service technician must verify that:

- The electric and oil/gas supplies are the same as indicated on the rating plate
- The fuel supply and water distribution systems are water tight
- The appliance is supplied with the type of fuel for which it is preset
- The oil and gas supply gallons per hour and pressure conform to the oil flow rate and gas pressure indicated on the rating plate.
- The oil/gas supply system is appropriately designed for the BTU and gas rate needed by the unit, and equipped with all safety and control devices prescribed by standards in force.

WARNING

To guarantee the correct operation of the unit and avoid possible failures, **ALWAYS** turn off the unit by means of the thermostat or any switch that controls the operation of the unit.

NEVER turn off the unit by shutting off the power supply.

2 OVERVIEW AND TECHNICAL DATA

2.1 OVERVIEW

The High Efficiency ACF series chiller is a single-block water-chilling unit equipped with an air-cooled condenser and designed for outdoor installation. The absorption cooling cycle is based upon a solution of water and ammonia for the production of chilled water at a temperature as low as 37°F. The chilling system is fed by thermal energy provided by used oil burner or gas burner; therefore, the required electric energy is limited to driving the fan, pump motors and oil burner components. The removal of combustion gases is handled by the appliance's condenser fan and oil burners internal blower, which creates a forced draft.

The combustion fuel is Fuel Oil or Used Oil, Natural Gas or Propane Gas.

Required electric supply is 208 / 230V – 60Hz single phase.

CHILLER'S CONTROL AND SAFETY DEVICES

Electronic Control Board with integrated microprocessor controls the operation of the chiller.

High Temperature Limit Switch (manual reset) is located at the generator wall above the combustion chamber; the switch opens if the generator's sidewall temperature exceeds 330°F; the switch is manual reset. The switch can be reset when the generator sidewall temperature drops below 280°F.

Safety Relief Valve on the sealed circuit is set to release ammonia vapor if internal pressure exceeds 450 psig; the valve closes automatically when pressure is under 450 PSIg

Differential Air Pressure Switch on the combustion circuit stops the burner ignition due to insufficient combustion air flow.

Ignition Control Box controls the burner ignition. Checks the differential air pressure switch and starts the pre-mixer blower. After 30 seconds of purging, the ignition control box opens the gas valve and starts the ignition transformer sparking at the burner for 8 seconds. If no flame is detected, the ignition control box will close the gas valve and retry lighting after an inter-purge period of 30 seconds. The ignition control box will try a total of three times to light. The unit will stop if no flame has been established or detected after the 3 tries.

Dual Gas Valve: two gas valves in the same housing, electrically controlled, which positively stops gas flow when either closes.

Flow Switch monitors the chilled water flow and shuts down the unit when the water flow stops or drops to an insufficient level.

Pre-Heater Control Board located at the oil burner automatically prevents the burner from energizing if the oil is less than 150°F.

Oil Primary Control located on the oil burner locks out the burner operation if flame is not detected within a 45 second time period. Requires manual reset.

Over Temperature Snap Switch located on the oil pre-heater block prevents energizing of the pre-heater block if the temperature exceeds 175°F and will automatically reset when temperature drops below 145°F.

2.2 USED OIL AND GAS FIRED CHILLER OPERATION CYCLE

DESCRIPTION OF THE ABSORPTION REFRIGERANT CYCLE

The fluid used in the cooling cycle is a solution of water and ammonia (see Figure 1). Ammonia is the **refrigerant** and water is the absorbing fluid. In the chiller's generator, the ammonia-water solution is heated to boiling producing both a vapor with a strong concentration of ammonia and a liquid solution with a low concentration of ammonia. Liquid solution with a low concentration of ammonia is called a "weak solution".

The ammonia vapor passes into the rectifier, which separates the water from the vapor. The hot and pressurized ammonia vapor exiting the rectifier enters the condenser where it is cooled and changed to a liquid.

The liquid ammonia is then brought to a lower pressure by means of a restricter and further cooled in a "tube-in-tube" refrigerant heat exchanger. Finally, the liquid ammonia is reduced to a pressure of 39 to 60 psig and a temperature lower than 37°F by a second restricter.

Under this low pressure and temperature condition, liquid ammonia enters the evaporator where the ammonia evaporates due to heat being removed from water returning from the user's required cooling application (thermal blowers, fan-coils, etc.) within the chilled water system.

The cold, low-pressure ammonia vapor exiting the evaporator exchanges heat with the liquid ammonia coming from the condenser in the refrigerant heat exchanger. The ammonia vapor then enters the "solution cooled absorber" where it comes into contact with "weak solution" from the generator that has been brought to a low pressure by means of a restricter.

Inside the "solution cooled absorber" the absorption process starts, i.e. the dilution of ammonia vapor into the "weak solution". The absorption of ammonia vapor is an exothermic process. (i.e. heat is produced) To have the vapor completely absorbed by the solution, the solution exiting the "solution cooled absorber" must be further cooled in a portion of the condenser/absorber coils.

Once the absorption process is complete, the liquid solution contains a high concentration of ammonia, also called "strong solution". A hydraulically driven, diaphragm pump pumps the "strong solution" to the generator at high pressure.

As the "strong solution" is pumped to the generator, it passes through the coil of the rectifier and the solution cooled absorber (the GAX section) where it is preheated before entering the generator. The cycle then starts over.

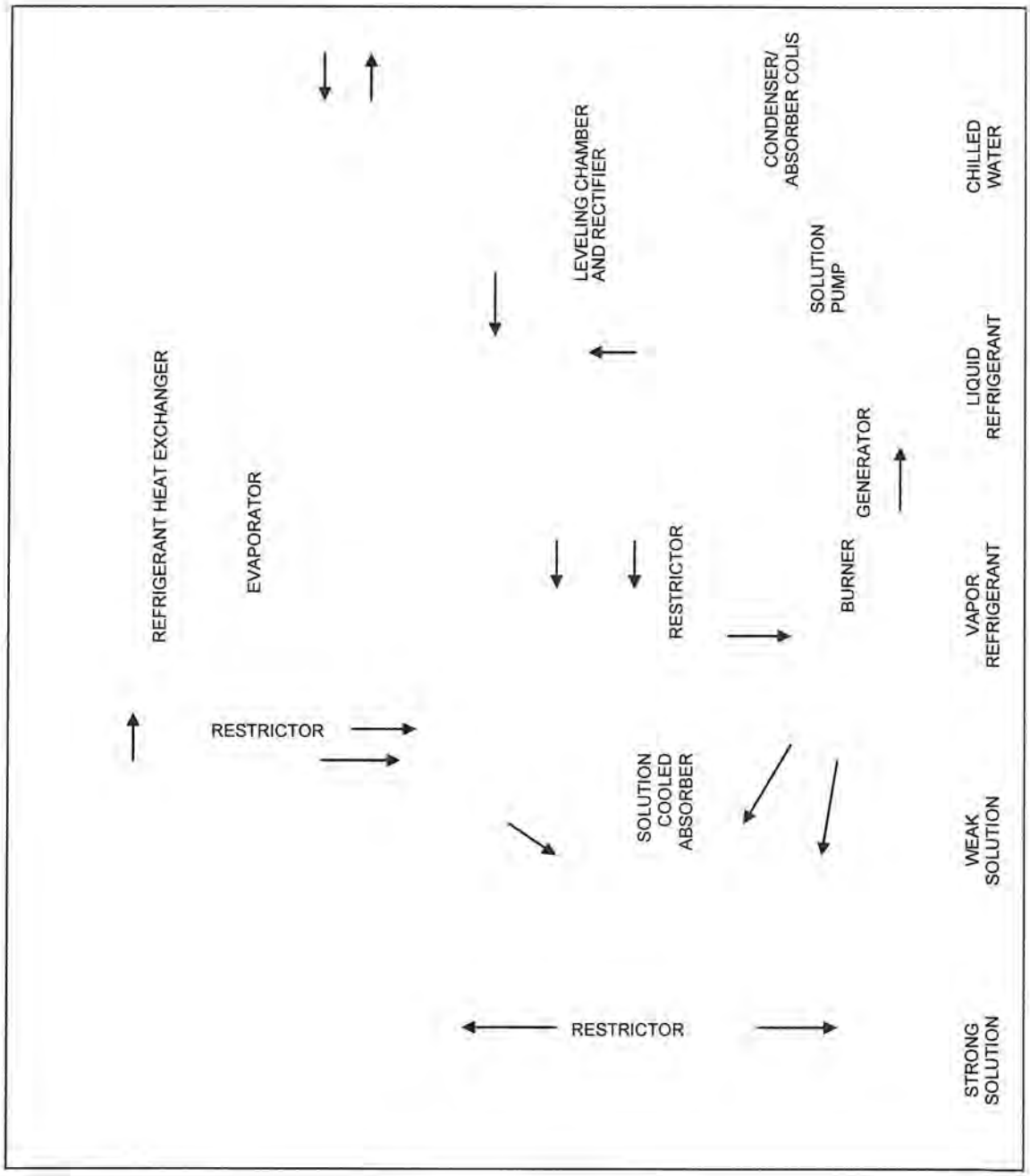


Figure 1 – ABSORPTION REFRIGERANT CYCLE

DESCRIPTION OF THE CHILLER OPERATIONS

All chiller functions and operations are monitored and controlled by the electronic control board.

The temperature probes, placed on the system in order to monitor the operation of the chiller, are transferring the following operating temperatures to the electronic control board:

- outlet chilled water temperature
- inlet chilled water temperature
- ammonia outlet temperature from condenser
- external ambient temperature
- generator temperature

Further control of the chiller's operation is carried out by:

- high temperature limit switch
- high pressure limit switch
- water flow switch
- differential air pressure switch
- chilled water thermostat
- hydraulic pump rotation probe

To control the startup of the chiller, it is necessary to install a **control switch (not included with the unit)**. The switch can be a programmable timer, room thermostat or any other type of on/off switch. **The installer must do installation of this switch**. Approximately 1 second after the control switch is closed, the electronic control board will start the hydraulic pump, condenser fan and water pump (if controlled by the board). Simultaneously, the electronic control board will energize the oil burner if using oil for fuel or the ignition control box if using LP or natural gas. Using LP or natural gas the ignition control box will check the differential air pressure switch's status and then start the ignition sequence. The premixer motor will then start.

Used Oil (Primary): Assuming Oil Pre-heater has established set-point temperature, the Oil Primary will energize the burner blower motor, fuel valve, igniter circuitry, and on-burner air compressor at which time a flame is established. The chiller is then in normal operation.

Natural Gas (Secondary): After a 15-second purge period, the ignition control box will energize the ignition transformer and dual gas valve simultaneously. The ignition transformer sends a high voltage current through the igniter to generate a spark igniting the fuel-air mixture at the burner. When flame is established, the flame sensor signals that fact to the ignition control and the ignition control stops the spark. The chiller is then in normal operation.

After the burning device has established a flame, The Display of the electronic control board, during the normal operation, shows in alternative mode the following information:

- Water inlet temperature (after the symbol)
- Water outlet temperature (after the symbol)
- Temperature difference ΔT (after the symbol)

Used Oil: de-energize the transfer relay which will shut down the Oil Primary causing the oil burner to shut off.

Natural Gas: shutdown the ignition system (i.e. the dual gas valve will close and the premixer motor will stop). The gas burner shuts off.

And 215 seconds later the hydraulic pump, condenser fan and water circulator contacts on the electronic control board open stopping the hydraulic, fan and water pump motors. These motors are ran for the 215 seconds to assure that solution is returned to the generator, residual cooling in evaporator is used and the unit is made ready for the next operating demand.

- **Ammonia-water solution pump:** The unit will stop if 15 seconds after start-up or during the operation of the appliance, no signal is received from the hydraulic pump rotation probe. (fault code E11 will appear on the electronic control board display)
- **Condenser Fan:** The fan's speed depends on the external ambient and condenser outlet temperatures. When ambient temperature is above 91°F, the fan is at full speed. Condenser and external ambient temperatures are monitored continuously. Fault codes will appear on the electronic control board display and the appliance will stop if any of the following occur: condenser overheating - fault code E04; external ambient temperature above 131°F - fault code E05; external ambient temperature below 10°F - fault code E06.
- **Used Oil Burner Cooling Fan:** The fan will be operative whenever the used oil burner is running. It helps in cooling the combustion chamber and burner assembly.
- **Water Pump** (not supplied with the unit): A water pump is used for chilled water circulation. The burner will turn off when the water flow rate is insufficient or stopped for more than 15 seconds and a fault code of E10 will appear on the electronic control board. During a normal shut down, the water pump will, if controlled by the electronic control board, continue to run for 215 seconds.
- **Chilled Water Control:** When the leaving chilled water temperature reaches the set point, the unit will shut down. If the control switch is still calling for cooling, i.e. closed, the unit will restart when the leaving water temperature reaches 1°F above the chilled water thermostat setting.
- **Low Temperature Chilled Water Control:** When the leaving water temperature is below the chilled water thermostat set point, the appliance will be shut down. If the control switch is calling for cooling, i.e. closed, and the water temperature falls below 33°F (fault E03 will appear on the electronic control board display), the water pump will run continuously after the normal shut down time of 215 seconds. The unit will automatically restart when the outlet water temperature reaches 1°F above the chilled water thermostat set point.

  When chiller is running, the following operations are continuously monitored:

  - Temperature probes; in the case of a short circuit or missing signal from the probes, the unit will stop and the respective fault code will display on the electronic board.
  - High temperature limit switch and high pressure limit switch, both are manual reset; The intervention of any of these safeties causes the unit to stop and the respective fault code will display on the electronic board.
  - Oil burner photo eye; detects the absence of flame, If flame is not detected within 45 seconds the Oil Primary will shutdown the oil burner.

NOTE

When the appliance is turned off from the control switch (thermostat, programmable timer or similar), the hydraulic pump, fan and water pump (if controlled from electronic board) will **continue to run for the next 215 seconds**.

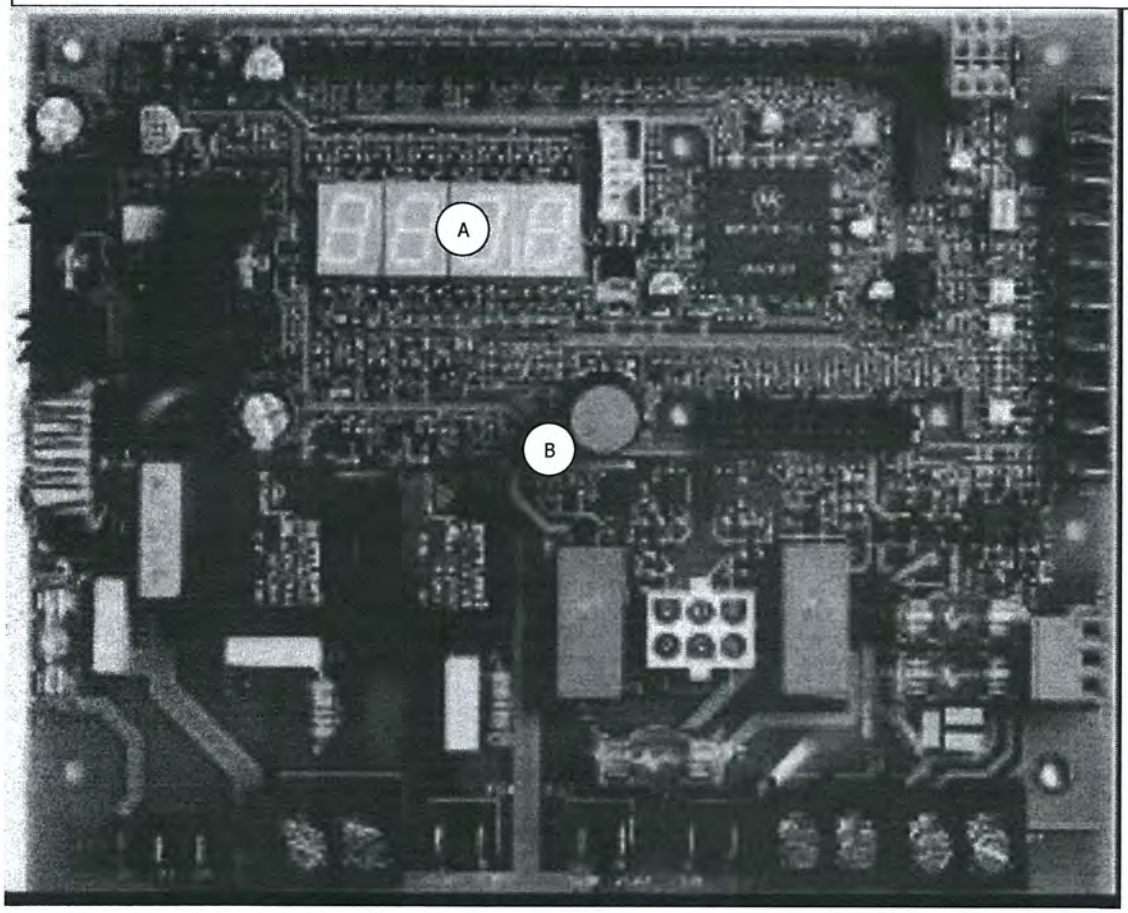


Figure 2 - The S-60 Electronic Control Board

A = 4 digit display shows the operation data (example: chilled water temperature) and possible anomalies. It also displays all relative available information (data, parameters, values, etc...)

B = Regulating Knob (Encoder) allows the scrolling and selection of the information on the display.

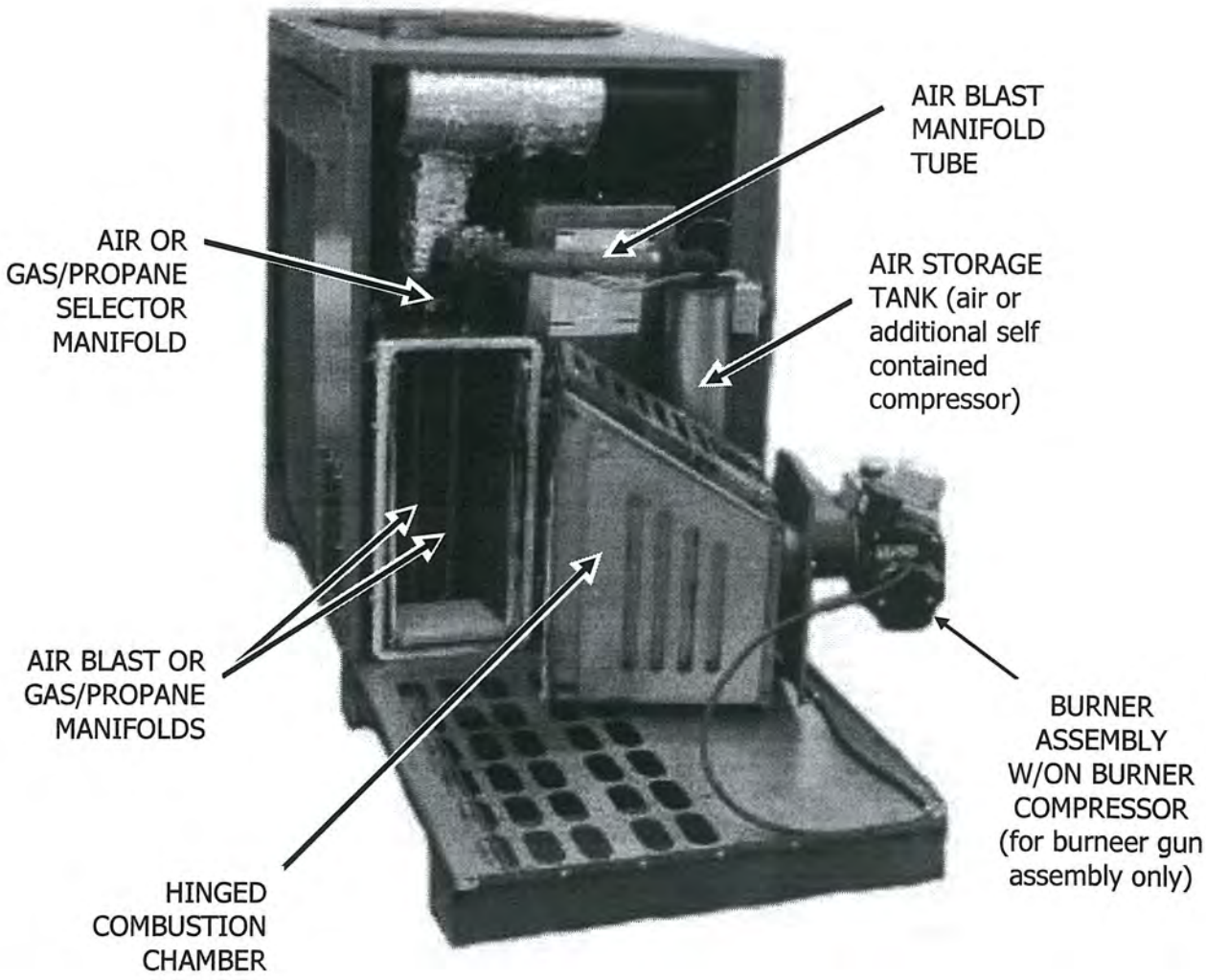


Figure 3 – USED OIL BURNER/COMBUSTION CHAMBER (door open for chamber viewing).

2.3 TECHNICAL DATA[1]

PERFORMANCE RATINGS		
Nominal Cooling Capacity[2]	Btu/hr	60,500
Natural Gas/Used Oil Input	Btu/hr	94,900
Maximum Ambient Operating Temperature	°F	120
Minimum Ambient Operating Temperature	°F	32
Condenser Air Flow[3], Nominal Minimum	CFM CFM	6,000 2,000
Chilled Water Entering Temperature, Maximum	°F	113
Chilled Water Leaving Temperature, Minimum	°F	37.4
Chilled Water Flow, Nominal Minimum Allowable Maximum Allowable	GPM GPM GPM	12.2 11 14.1
Internal Pressure Drop	Feet of Head (psig)	9.7 (4.2)
ELECTRICAL RATINGS		
Required Voltage, 60 Hz, Single Phase[4]	-	208/230
Condenser Fan Motor HP (Variable Speed) Full Load / Locked Rotor Amps, Nominal	- -	1/2 3.1 / 6.2
Hydraulic Pump Motor HP Full Load / Locked Rotor Amps, Nominal	- -	1/2 3.1 / 24.2
Premix Blower Motor HP Full Load / Locked Rotor Amps, Nominal	- -	1/50 .55 / .75
Burner Cooling Fan HP Full Load Amps /Watts	- -	1/4 .85/186.5
Burner/Pump Electrical Requirements Voltage 60Hz Amperage	 VAC Amp	 208/230 6.25
Total Electrical Operating Consumption[5]	kW	2.85
Minimum Circuit Ampacity (MCA)	-	20.4
Maximum Over Current Protection (MOCP) Qty (2) - Field Supplied	Amp	30
PHYSICAL DATA		
Refrigerant Type	-	R717
Unit Chilled Water Volume[6]	Gallons	0.79
Chilled Water Entering and Leaving Connections[7]	FPT	1
Gas Inlet Connection	FPT	1/2
Electrical Entrance Knockouts, Diameter	Inches	7/8
Shipping Weight	Pounds	1450
Operating Weight	Pounds	1350

Table 1 – OWC-5 TECHNICAL DATA

Notes:

1. All illustrations and specifications contained herein are based on the latest information available at the time of publication approval. Econo Heat reserves the right to make changes at any time without notice, in materials, specifications, and models or to discontinue models.
2. Capacity at standard conditions of 95°F ambient temperature. Chilled water Oulet temperature 45°F, chilled water Inlet temperature 55°F. Actual capacity will vary with ambient (condenser) air temperature and leaving water temperature. Capacity characteristics are shown in the table 2. Interpolations between tabled values are permissible, but do not extrpolate.
3. Fan speed is reduced when external temperature is less than 91.4°F.
4. Units are factory- wired for 208-230 volt operation.
5. May vary by ±10% as a function of both power supply and electrical motor input tolerance.
6. "Chilled Water" refers to a solution of quality tap water and 10% by volume of inhibited permanent antifreeze. Higher antifreeze concentrations may be required in certain applications.
7. DO NOT USE FERROUS METAL PIPE OR TUBING in the chilled water circulating system.

TYPICAL CAPACITY CHARACTERISTICS in Btu/hr

AMBIENT AIR TEMPERATURE (°F)	OUTLET CHILLED WATER (°F)			
	37.4	41.0	44.6	48.2
32	59,307	59,912	61,123	62,323
41	59,307	59,912	61,123	62,333
50	59,307	59,912	61,123	62,323
59	59,307	59,912	61,123	62,333
68	59,307	59,912	61,123	62,323
77	58,701	59,912	61,123	62,333
86	54,465	59,307	61,123	62,333
95	40,546	52,650	60,517	61,727
104	-	-	53,255	56,281
113	-	-	40,546	47,203
120	-	-	-	39,336

Table 2 – OWC-5 COOLING CAPACITY

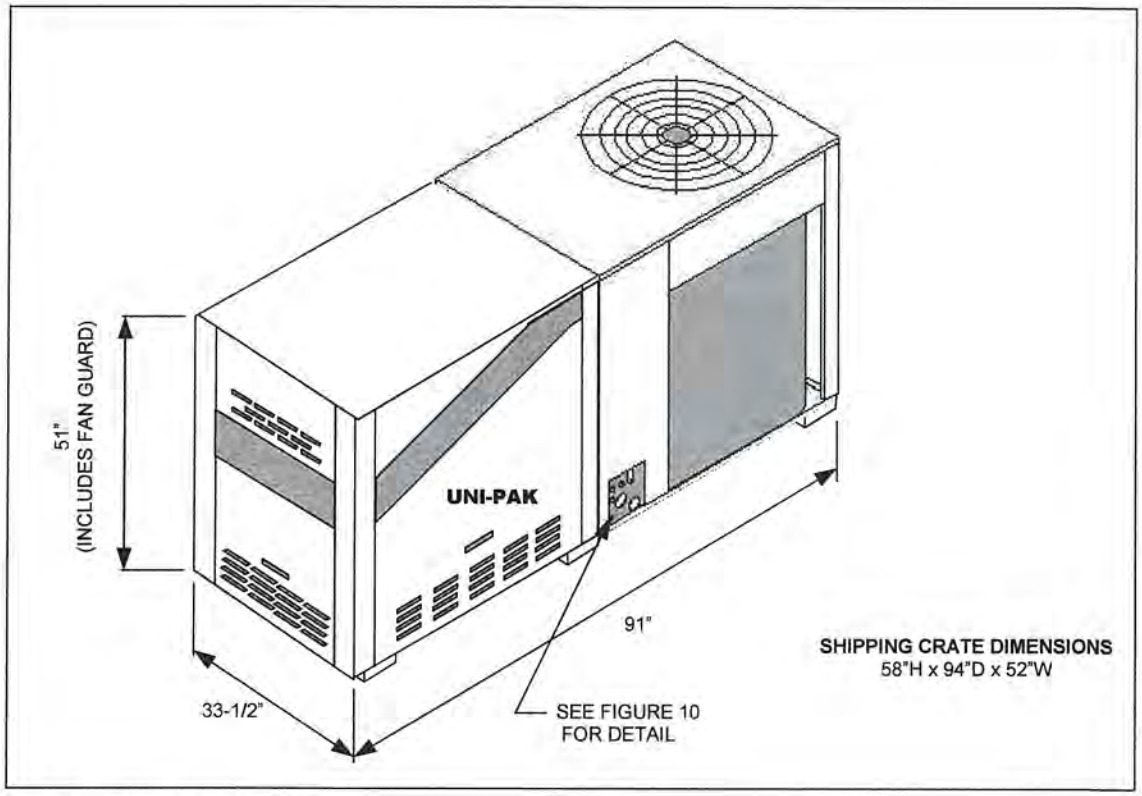
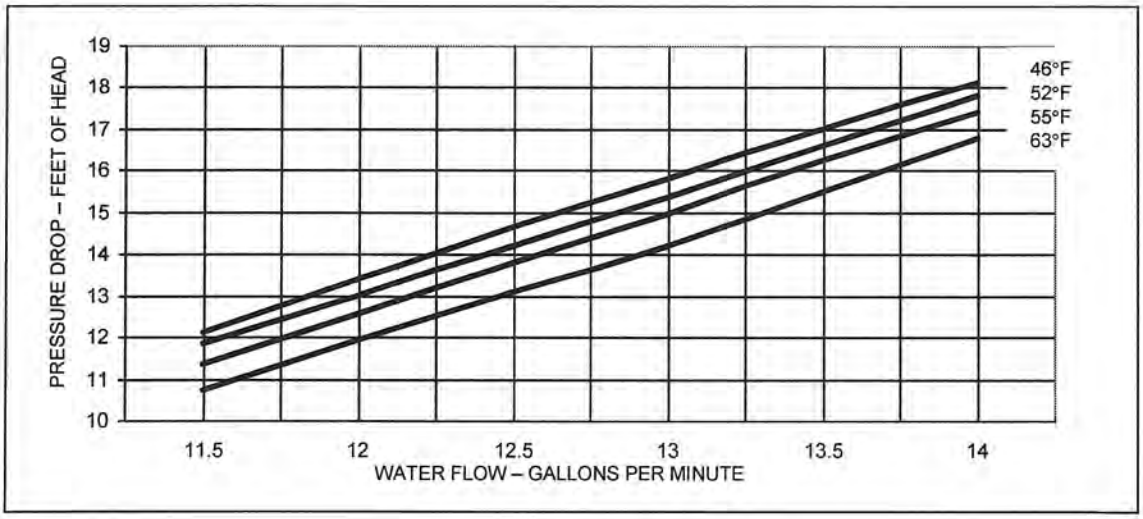


Figure 4 – UNIT'S DIMENSIONS



Graph 1 –UNIT'S PRESSURE DROP AS A FUNCTION OF INLET WATER TEMPERATURE

3 INSTALLATION

3.1 GENERAL RULES

Only qualified technicians, in compliance with the manufacturer's instructions, should carry out the installation and maintenance of the OWC-5 unit. The installation of the appliance must conform to the requirements of the authority having jurisdiction or in the absence of such requirements, to the latest edition of the **National Fuel Gas Code, ANSI Z223.1**. If the unit is installed in Canada, the installation must conform to the **Canadian Gas Association Standard CAN1 B149.1** and **.2**.

All wiring should be installed in accordance with the latest edition of the **National Electrical Codes, ANSI/NFPA No. 70**, **CSA Standard C22.1** when installed in Canada, and with any local codes.

The manufacturer cannot be held responsible for any damages to persons, animals or goods due to improper, erroneous or irrational installation of these appliances.

To ensure a correct installation and maximum unit performances are obtained, the following rules have to be followed:

- Unpack the unit carefully, checking that it has not suffered damage during transport. Each unit is factory tested before shipping, if damage is found report this immediately to the haulage contractor.
- **Each unit must be installed outdoors in an area of free natural air circulation** and does not require particular weather protection.
  In no case must the unit be installed in a room.
- No overhead obstructions should block the outlet of air from the unit top.
- **The unit should not be installed so that the fan discharge is in close proximity to the fresh air intakes of a building or in such a manner that hot or contaminated air from flues, dryer vents, chimney, etc., could be drawn into the unit by the condenser fan.**
- The front and rear sides of the unit must have a minimum clearance of 36 inches and 24 inches, respectively, (for maintenance or servicing) from walls or other stationary constructions. The left and right sides require a minimum distance of 18 inches for proper airflow toward the condenser.
- Be sure that gas supply provided from the gas main meets the manufacturer's specifications. Inlet gas pressure to the unit must not exceed 14.0" W.C. on natural gas or propane gas. The minimum inlet gas pressure at the unit is 5.0" W.C. on natural gas and 11.0" W.C. on propane gas.

WARNING

The electrical safety of the unit is obtained only when it is correctly connected to an efficient grounding system, which meets existing applicable safety standards. Never use gas supply piping to ground the appliances. The ground wire should be longer than power supply wires for safety reasons. If the power supply wires are accidentally stretched, the ground wire will be the last to break. By following this rule, good ground continuity will be assured.

3.2 INSTALLATION OF THE UNIT

HANDLING OF THE UNIT ON SITE

When arriving at the installation site, visually inspect the unit for any signs of damage to the package, which may indicate possible unit damage.

Once on site, the units must remain in the factory packaging and only be unpacked at the moment before installation.

Before locating and unpacking the unit, make a hole in the package to check for ammonia odor. If ammonia odor is present, contact the factory.

LOCATION

The chillers **must be installed outdoors** in an area of free natural air circulation.

The installation inside a room or a building is not allowed.

There must be a minimum clearance of 4 feet horizontally from electric meters, gas meters, regulators, and relief equipment and in no case located above or below these items unless a 4 feet horizontal distance is maintained.

The unit can be installed at ground level, on a platform or on the roof (if it can withstand the weight).

The noise generated by the condenser fan during unit operation is not excessive. However, avoid locating the unit in an area adjacent to bedrooms or neighboring buildings (see Figure 5).

Also, avoid installing the unit in building corners, where air turbulence can take place or the unit noise (reverberation) can be amplified.

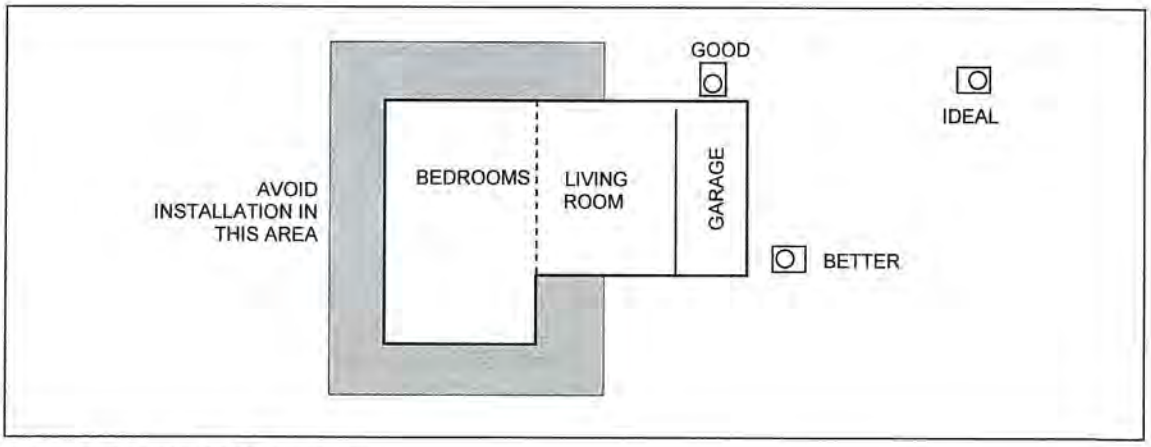


Figure 5 - LOCATION OF THE UNIT

CLEARANCES

A free space is to be provided around the unit to allow for proper unit operation and for servicing. The minimum clearance from walls, obstructions and other units should be as follows (see Figure 6):

- right / left side: 18 inches
- rear side: 24 inches
- front side: 36 inches

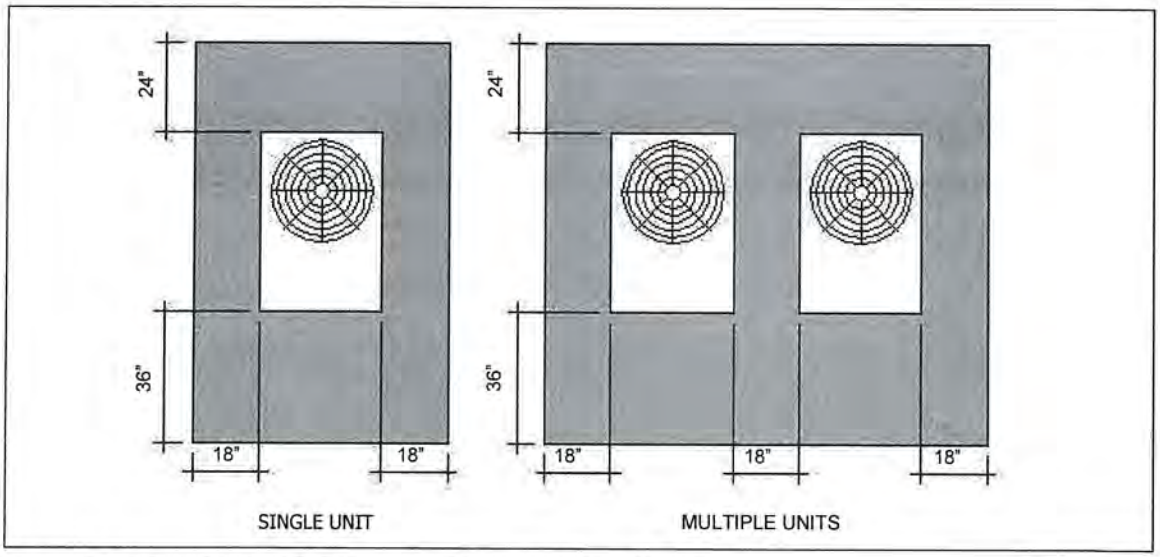


Figure 6 –CLEARANCES FOR CORRECT INSTALLATION OF THE UNIT

There **MUST NOT** be any obstructions or structural overhangs (roof edges, balconies) over the top of the unit. The re-circulation of the air discharged from the condenser results in a poor unit performance.

When the unit is installed in close proximity to buildings, keep the unit away from the roof edge drip line. In no case should the unit be placed within 6 feet of any external air intakes of the building. For installations on balconies or roofs, the unit should not be located within 8 feet from chimney flues, outlets and other such vents. It is important that the unit be located so that hot or contaminated air **IS NOT** drawn into the air intakes of the unit (see Figure 7).

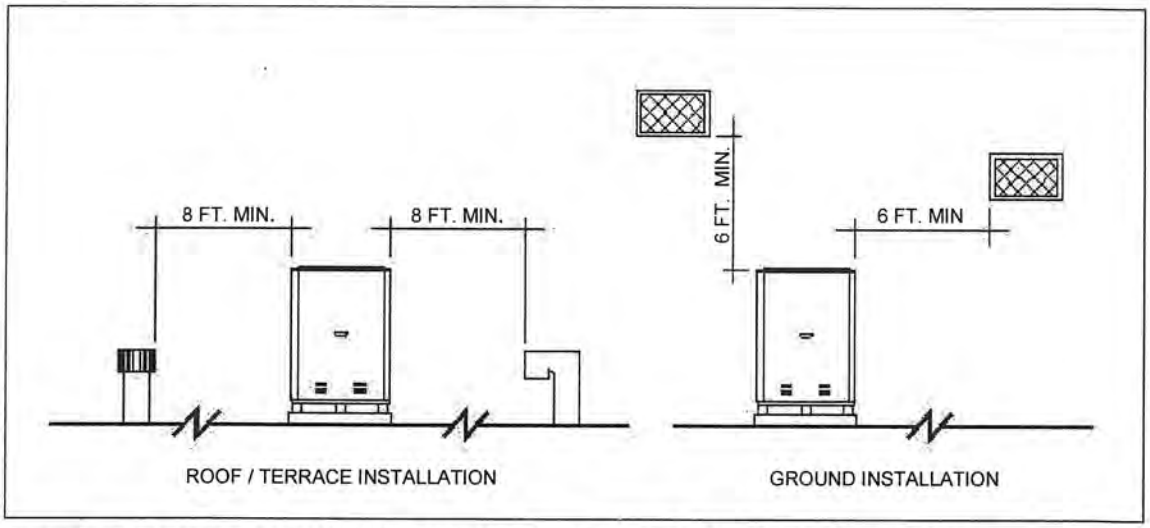


Figure 7 –CLEARANCES FROM VENT OUTLETS, CHIMNEY FLUES AND AIR INTAKE OPENINGS

GROUND INSTALLATION

Ground level units should be supported on a LEVEL concrete pad with a minimum thickness of 4" and slightly larger than the unit base (see Figure 9 for typical slab dimensions). Local soil conditions will actually dictate the slab thickness required to prevent shifting.

Do not allow the concrete slab touch the foundation of a structure. Unit operational noises can be transmitted inside the structure if they are connected.

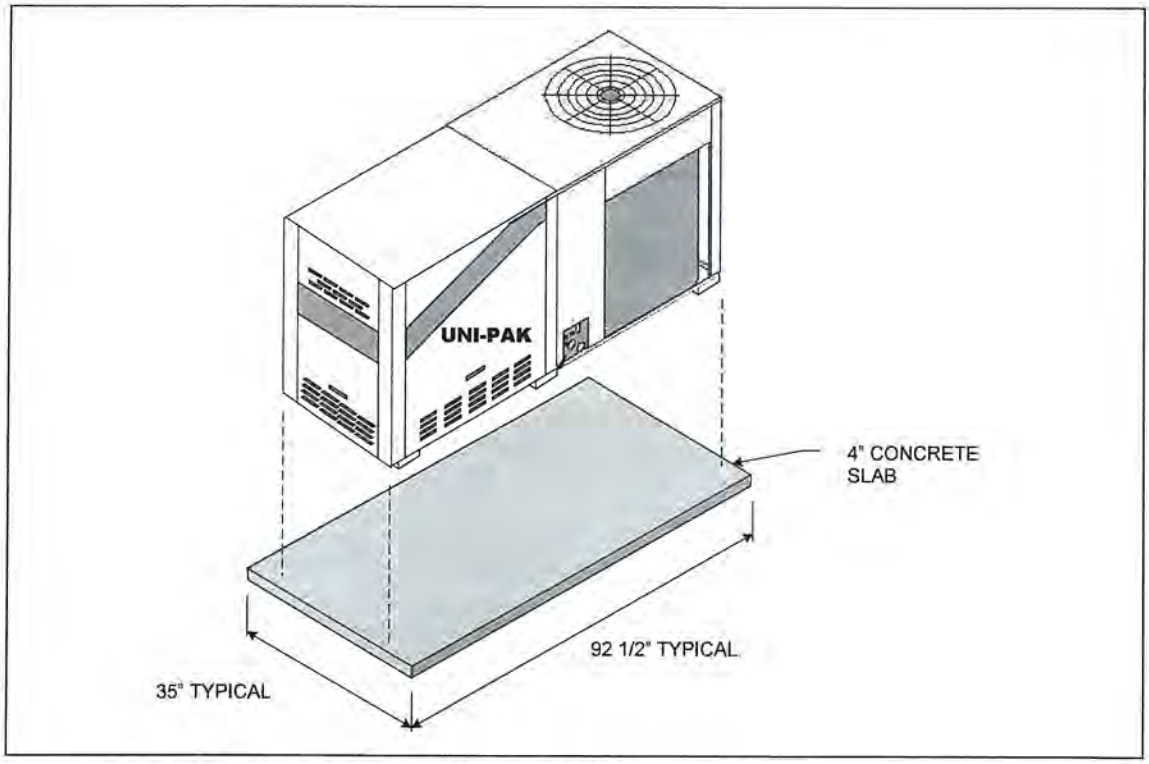


Figure 8 –DIMENSIONS AND THE POSITION OF THE CONCRETE SUPPORTS

ROOF / TERRACE INSTALLATION

If the unit must be lifted by a hoist for installation, leave it on the crate base. Attach hoist lines to the crate base and use spreader bars to prevent the hoist lines from damaging unit's cabinet panels.

Both the unit and the supporting base weight should be sufficiently supported by the roof joists.

Provide for a gangway all around the unit for maintenance purposes.

WARNING: IF ROOF MOUNTED A FIRE PROOF BARRIER IS NEEDED BETWEEN CHILLER AND ROOF

Installation on roofs directly above sleeping quarters should be avoided if possible. If not possible, special consideration must be given to the transmission characteristics of the building structure. The use of vibration isolators under the equipment (acoustically insulated bases) and approved flexible connections (vibration-dampening pipefittings) between the unit and the system piping is recommended.

LEVELING

The unit should be level both front to back and side to side. Place a level on the top of the unit to check for level. If the unit is not level, metal shims are recommended for use under proper corners to obtain level. If the shim(s) thickness exceeds 1/2", support shims should be inserted under the center of the unit.

4 HYDRONIC AND OIL/GAS INSTALLATION

4.1 WATER PIPING DESIGN AND INSTALLATION

Piping for the chiller is to be designed and installed as a closed hydronic circuit.
The following items (not supplied) must be installed close to the unit (see the Figure 9):

- FLEXIBLE CONNECTIONS to avoid vibration transmission to the chiller water lines.
- PRESSURE / TEMPERATURE TAPS in the inlet and outlet chiller water lines to set and measure proper water flow and water temperatures.
- CHILLED WATER FILTER mounted in the water inlet line to remove debris from the chiller water lines.
- REGULATION VALVES for adjusting proper water flow rate.
- WATER PUMP properly sized for system.
- EXPANSION TANK must be properly sized based on the hydronic system size, maximum thermal expansion, and maximum water pressure.
- FILL VALVE for filling, draining or flushing the hydronic system.
- AIR BLEED set at the highest point in the hydronic system for removal of air.

WARNING

To ensure the correct operation of the unit and to avoid the water freezing, add 10% by volume of mono-ethylene glycol (antifreeze) to the circulation water. Add more mono-ethylene glycol as needed for the minimum external temperature of the installation zone (see Table 10).

When using an automatic water charge system, the glycol percentage must be checked once a year.

There must be correct chilled water flow when the unit is operating and during the shut down period (215 seconds, between turning the burner off and complete shutdown of the appliance).

Piping (diameters of tubes etc.) must be sized appropriately in order to ensure the correct chilled water flow necessary for the proper operation of the unit. The water lines should also be sized so the maximum velocity of the water/glycol solution in the lines does not exceed 6 feet per second to avoid excessive noise.

When rigid pipes are used, it is recommended to use flexible connections between the unit and piping to avoid vibration transmission.

All piping must be properly insulated according to federal and local codes to avoid thermal losses and condensate on the water lines. All seams and joints should be carefully made so as to be air and watertight.

For size of water connections on the unit, refer to TECHNICAL DATA sheet in SECTION 2.

Connections at the coil or heat exchanger must be performed in accordance with the recommendations of the coil or heat exchanger manufacturer. For best performance, the supply-chilled water line must attach to the side of the coil or heat exchanger nearest the exit of the leaving cooled medium.

If the heat exchanger is an air coil, the air coil must be installed downstream from the furnace to avoid condensation in the furnace. Additionally if the heat exchanger is an air coil, a "P" trap must be provided to drain condensate. The height of the "P" trap must be sufficient to ensure drainage of condensate. Any horizontal run of the condensate drain line must slope ¼" for each running foot and not be smaller than ¾" I.P.S. to assure the condensate will drain by gravity. The condensate drain line must be insulated and ran to a suitable drain.

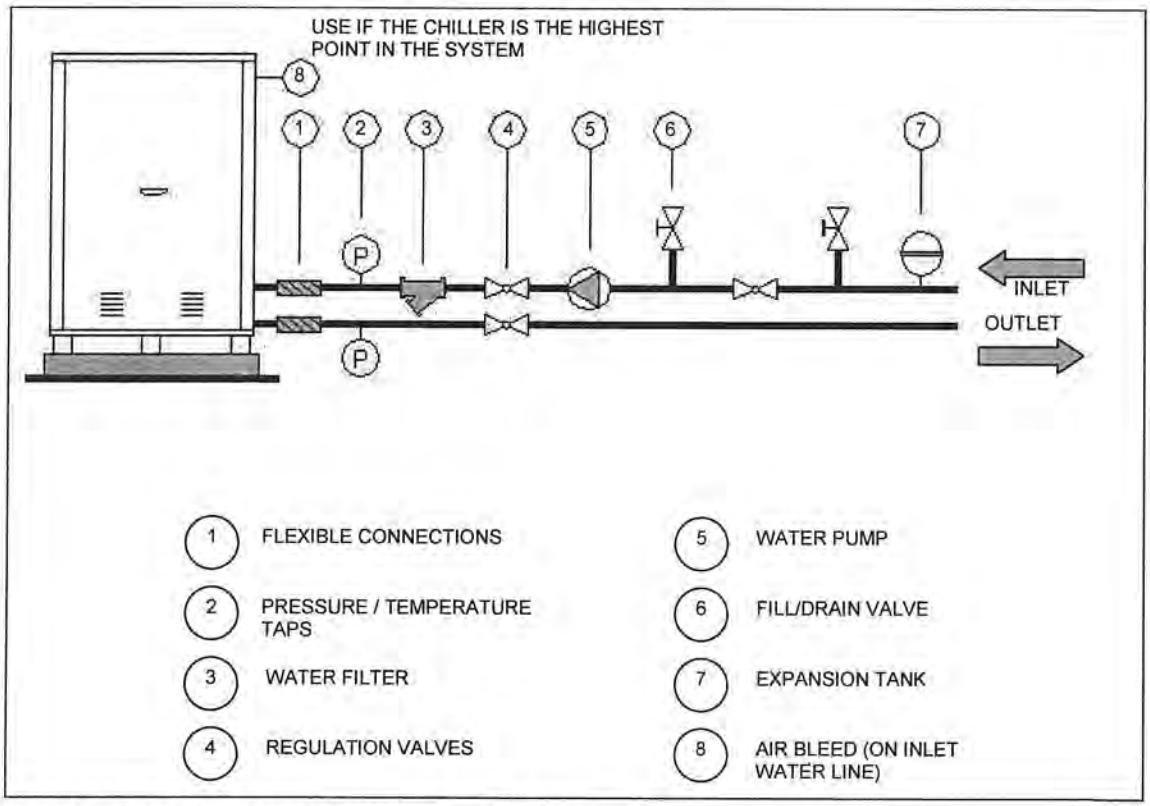


Figure 9 – WATER PIPING DIAGRAM FOR A SINGLE UNIT

4.2 SIZING A SYSTEM PUMP

When sizing a pump, there are two pieces of information that must be found in order to select the appropriate pump:

1. Flow rate (GPM, gallons per minute)
2. Pressure drop (P.D.)

The OWC-5 has a GPM flow rating of 12 (2.4GPM per Ton) with pressure drop of 13.0 feet of head.

Pressure Drop can be determined by several methods. The equivalent length method is the one demonstrated in this document. It converts all valves and fittings in to equivalent length of straight pipe. The pressure drop is determined by the system design (pipe sizes, fittings, equipment). There are two main units of measure for the pressure, Feet of Head and Pounds per Square Inch (psi). These two units of measure are related by equation 1:

Equation 1: 1psi=2.31 Feet of Head

To determine the pressure drop using the equivalent length method, follow these steps:

1. Add up all straight runs of pipe both supply and return.
2. Count all types of fittings by pipe size and pressure drop.
3. Find corresponding "Equivalent Length" of fittings on Table 3.
4. Multiply number of fittings by equivalent length.
5. Add total length of pipe and equivalent length of fitting together to get "Total Length of Pipe".
6. Multiply equivalent length of pipe by friction loss. See Table 4.

7. Find Pressure Drop of Equipment (Chiller and Air Handler). If needed, convert to feet of head by using equation 1. Pressure Drop for OWC-5 is 13 feet of head.
8. Add answers obtained in Steps 6 and 7 together. This is your system "Total Feet of Head"
9. It is recommended that a safety factor of 5 feet of head be added to the number. Round up to the nearest whole number.

Equation 2: Equivalent length of pipe(ft) X $\frac{\text{Friction Loss}}{\text{100 Feet of Pipe}}$ = Total Feet of Head

Equivalent Feet of Straight Pipe for Valves and Fittings+							
Valve or Fitting	Nominal Pipe Size in Inches						
	¾"	1"	1-¼"	1-½"	2"	2-½"	3"
Standard 90° Elbow	2.5	3.0	4.0	5.0	7.0	8.0	10.0
Standard 45° Elbow	1.5	1.8	2.4	3.0	4.0	5.0	6.0
Standard 180° Elbow	3.2	4.1	5.6	6.3	8.2	10	12
Long Radius 90° Elbow	1.4	1.7	2.3	2.6	3.3	4.1	5.0
Miter 90° Elbow	4.0	5.0	7.0	8.0	10.0	12.0	15.0
Miter 45° Elbow	0.9	1.0	1.5	1.8	2.3	2.8	3.2
Sudden Enlargement	1.5	2.0	3.0	3.6	4.8	6.1	8.0
Sudden Contraction	1.0	1..2	1.8	2.2	3.0	3.8	4.9
Square Head Plug Cock	1.3	1.6	2.1	2.5	3.2	3.8	4.8
Gate Valve*	0.5	0.6	0.8	1.0	1.3	1.6	2.0
Ball Valve*	0.3	0.3	0.4	0.5	0.7	0.8	1.0
Globe Valve or Globe Lift Check Valve*	20.0	25.0	35.0	45.0	55.0	65.0	80.0

Table 3 – Equivalent Feet of Straight Pipe for Valves and Fittings

* All valves figured as full open
+ All valves are generalized, check with manufacturer for exact information.

Friction of 50°F Water (Feet of Head per 100 Feet of Pipe)†				
Flow Rate GPM	Type L Copper Tube		Sch. 40 Plastic Pipe	
	Nominal Size	Friction Loss	Nominal Size	Friction Loss
1	½"	2.40	½"	0.50
2	½"	8.04	½"	2.43
3	¾"	2.93	½"	3.27
4	¾"	4.92	½"	5.57
5	¾"	7.31	¾"	4.52
6	1"	2.70	¾"	3.01
7	1"	3.54	1"	1.36
8	1"	4.50	1"	1.58
9	1"	5.58	1"	2.12
10	1"	6.70	1"	2.63
12	1-¼"	3.38	1"	3.77
14	1-¼"	4.48	1-¼"	1.50
16	1-¼"	5.65	1-¼"	1.70
18	1-¼"	7.02	1-¼"	2.00
20	1-¼"	8.43	1-¼"	2.43
22	1-½"	4.52	1-¼"	2.85
24	1-½"	5.30	1-¼"	3.35
26	1-½"	6.10	1-¼"	4.00
28	1-½"	6.97	1-½"	2.00
30	1-½"	7.58	1-½"	2.43
32	1-½"	8.92	1-½"	2.70
34	2"	2.30	1-½"	3.08
36	2"	2.55	1-½"	3.40
38	2"	2.80	1-½"	3.70
40	2"	3.36	1-½"	4.13
42	2"	3.34	1-½"	4.40
44	2"	3.64	1-½"	4.90
46	2"	3.93	1-½"	5.37
48	2"	4.27	2"	1.70
50	2"	5.01	2"	1.83
60	2"	6.95	2"	2.57
70	2"	9.16	2"	3.41
80	2-½"	4.12	2"	4.37
90	2-½"	5.09	2-½"	2.29
100	2-½"	6.14	2-½"	2.78

Table 4 – Water Friction Loss
† Values may very with different manufactures.

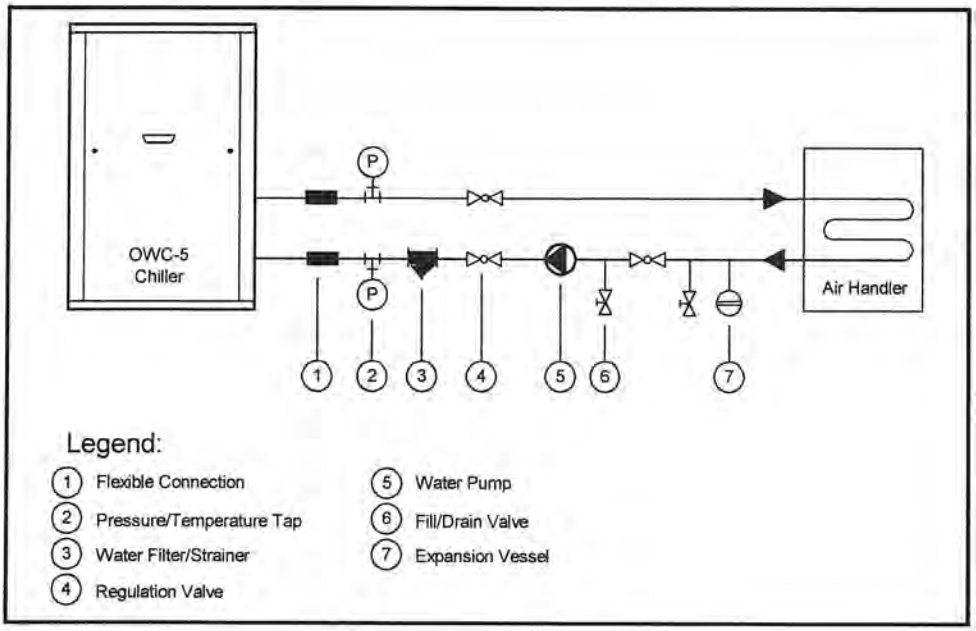


Figure 10 – Piping detail with Air Handler

Size the pump for the system shown in Figure 10. The supply piping is 75' long PVC. The air handler has a 5 ton chilled water coil with a pressure drop of 2.9 psi.

Solution:
First you will need to determine the GPM of the system. The Omni OWC-5 has a flow rate of 12.0 GPM and a pressure drop of 13 feet of head. This is the first piece of information that is needed to size a pump. With this information, the pipe size can be found from Table 4. You will find that 12 GPM has a recommend size of 1" Plastic Pipe with a friction loss of 3.77 feet of head per 100' of pipe.

Now you need to find the pressure drop of the system. To get the total system pressure, you will need to find the following information:

Feet of head from piping + Feet of head from chiller + Feet of head from coils + Feet of head from fittings

Let's do them in order. You already know that there is 75' of PVC pipe for the supply line. This number needs to be doubled to include the return piping as well. You have 150' of 1" PVC pipe with a friction loss of 3.77 feet of head per 100' of pipe. Using Equation 2, you get,

$$\frac{150' \times 3.77}{100'} = 5.7 \text{ feet of head from piping.}$$

We know the pressure drop of the OWC-5 is 13 feet of head. The pressure drop of the air handler coil is 2.9 psi. You will first need to convert this into feet of head using the relationship 1psi = 2.31 feet of head. Multiply 2.9 by 2.31 and it equals 6.7 feet of head.

The last pressure drop you will need is that of the fittings. You need to look at the system and get the total number of fittings by type and size. The sizes and pressure drops are all the same in this example. A listing of the materials and the corresponding equivalent lengths as shown in Table 4 are as follows:

5 - 1" Tees with through flow	*0.9 feet each*	*4.5 feet total*
3 - 1" Ball Valves	*0.3 feet each*	*0.9 feet total*
1 - 1" Strainer	*5.0 feet each*	*5.0 feet total*
2 – 1" Flexible Connection	*Negligible*	*0.0 feet total*

Adding all the equivalent feet together you will get 10.4 feet. If you multiply this by the 3.77 feet of head per 100' (Equation 2), you will find an additional 0.39 feet of head.

You add these calculated numbers together to get.

$$5.7 + 13.0 + 6.7 + 0.4 = \textbf{25.8 feet of head}.$$

After adding the recommended 5 feet of head for a safety factor and rounding up you will get the final answer of 31.

When you go to any pump representative just tell them 12 GPM and 31 feet of head. They can usually take it from there. There may be some additional questions about the type of pump but that will depend on the project.

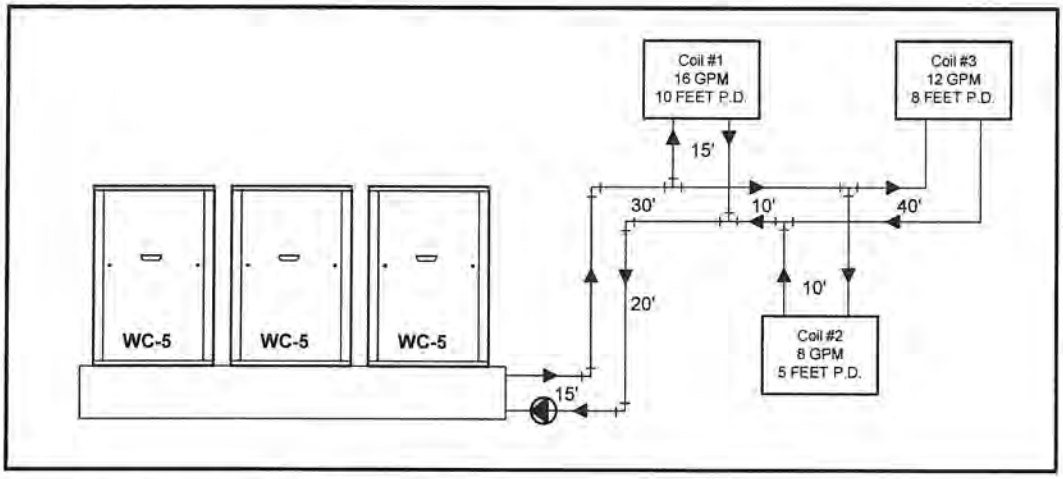


Figure 11 – Piping detail with Air Handler

Size the pump for the system shown in Figure 11. The piping will be copper. This example will focus on an application that has more than one air handler or fan coil. The valves have been left out but tees and elbow will be counted.

Solution:
You can determine the GPM of the system by adding the coil GPMs together. Next you will need to find pipe sizes and friction losses from Table 4.

Starting at Coil #3:
12 GPM → 1¼" Copper pipe with 3.38 feet of head per 100' friction loss
8 GPM → 1" Copper pipe with 4.5 feet of head per 100' friction loss
12 GPM + 8 GPM = 20 GPM → 1¼" Copper pipe with 8.43 feet of head per 100' friction loss
16 GPM → 1¼" Copper pipe with 5.65 feet of head per 100' friction loss
12 GPM + 8 GPM + 16 GPM = 36 GPM → 2" Copper pipe with 2.55 feet of head per 100' friction loss

Now you know all the pipe sizes and their friction losses. You also know the friction loss of all the equipment from Figure 12 and Table 4. You will need to find the equivalent length of pipe for all tees and elbows.

2" 90° Elbow → 7.0' of pipe
2" Tee – Thru → 2.0' of pipe
2" Tee – Branch → 10.0' of pipe
1¼" 90° Elbow → 4.0' of pipe
1¼" Tee – Thru → 1.2' of pipe
1¼" Tee – Branch → 6.0' of pipe

Now, you will need to find the pressure drop is in each loop. To find a loop you start at the chiller go to the coil and then back to the chiller. You will then use the largest value. The calculation for the loop to Coil #3 is shown.

*2" Pipe → (15'+20'+30')*2 = 130'* *2" Elbow → 7'*4 = 28'* *2" Tee – Thru → 2'*2 = 4'*
*1¼" Pipe → 10'*2 = 20'* *1¼" Tee – Thru → 1.2'*2 = 2.4'*
*1¼" Pipe → (40'+10')*2 = 100'* *1¼" Elbow → 4'*2 = 8'*

*162' of 2" pipe * 2.55/100' =* ***4.13*** *feet of head* *22.4' of 1¼" pipe * 8.43/100' =* ***1.89*** *feet of head*
*108' of 1¼" pipe * 3.38/100' =* ***3.65*** *feet of head*

Add in the Coil pressure drop and the Equipment we get **30.7 feet of head**. If you do this for the other two coils and you will get the following: Coil #1 = **29.2 feet of head**; Coil #2 = **25.7 feet of head**. Take the largest number as the feet of head of the pump. When sizing a pump it is usually the drop to the very last coil that determines the feet of head but always do all coils just in case one of the others may determine the feet of head.

Finally, add the 5 feet of head safety factor, round up and get a total of **36 feet of head** for the system.

4.3 SIZING EXPANSION TANK

An expansion tank is required with the new OWC-5 Chiller unit. The expansion tank should be installed at the suction side of the system pump. A diaphragm type expansion tank is recommended (tank should be ASME certified for sizes above 30 gallons) and should be sized specifically for each job based on its characteristics.

NOTE: The following sizing instructions are for example purposes only. Econoheat Inc. does not endorse or specify any particular product brands.

1. Total system water content (see Tables 5 and 6)	_____gallons
2. Minimum system temperature, operating (normally 45°F)	_____°F
3. Maximum system temperature, ambient*	_____°F
4. Minimum operating pressure at tank (static plus 4 PSI)	_____PSIG
5. Maximum operating pressure at tank**	_____PSIG
6. Find and enter "Net Expansion Factor" (use Table 7)	_____
7. Amount of expanded water (Line 1 x Line 6)	_____gallons
8. Find the "Acceptance Volume"	_____
9. Minimum "Total Volume" (Line 7 ÷ Line 8)	_____gallons

***An ambient temperature of at least 100°F should be used unless this temperature could be exceeded in the installed area.**
****Relief Valve Pressure minus 10 PSIG for safety (e.g. 75psig – 10 psig)**

Volume of Water in Piping Gallons per Linear Foot		
Nominal Pipe Size I.D.	Type L Copper	Other Piping
½"	0.012	0.016
¾"	0.025	0.028
1"	0.043	0.045
1-¼"	0.065	0.078
1-½"	0.092	0.105
2"	0.161	0.172
2-½"	0.250	0.250
3"	0.357	0.385
4"	0.625	0.667
5"	1.000	1.000
6"	1.400	1.500
8"	2.430	2.630
10"	3.780	4.200
12"	5.400	5.900

Table 5 – Pipe Sizing

Major System Components		
Equipment	**Size**	**Approximate Volume Gallons**
"A" Coils	1.67 tons	0.8
	3 tons	1.0
	4 tons	1.5
	5 tons	2.0
Duct Coils	3 tons	1.0
	4 tons	1.5
	5 tons	2.0
Fan Coil Units	1.67 tons	1.0
	3 tons	1.0
	4 tons	1.5
	5 tons	2.0

Table 6 – Water Volume

Maximum System Temperature	Minimum System Temperature						
	40°F	50°F	60°F	70°F	80°F	90°F	100°F
60°F	0.00055	0.00490	-	-	-	-	-
70°F	0.00149	0.00143	0.00094	-	-	-	-
80°F	0.00260	0.00254	0.00204	0.00111	-	-	-
90°F	0.00405	0.00399	0.00350	0.00256	0.00145	-	-
100°F	0.00575	0.00569	0.00520	0.00426	0.00315	0.00170	-
110°F	0.00771	0.00765	0.00716	0.00622	0.00511	0.00366	0.00196
120°F	0.01000	0.00990	0.00950	0.00860	0.00740	0.00600	0.00430
130°F	0.01240	0.01230	0.01180	0.01090	0.00980	0.00830	0.00660
140°F	0.01500	0.01490	0.01450	0.01350	0.01240	0.01100	0.00930
150°F	0.01790	0.01780	0.01730	0.01640	0.01530	0.01330	0.01210
160°F	0.02090	0.02080	0.02040	0.01940	0.01810	0.01650	0.01480
170°F	0.02420	0.02410	0.02360	0.02270	0.02160	0.02010	0.01840
180°F	0.02760	0.02750	0.02710	0.02610	0.02500	0.02360	0.02190
190°F	0.03130	0.03120	0.03070	0.02980	0.02870	0.02720	0.02550
200°F	0.03510	0.03500	0.03460	0.03360	0.03250	0.03110	0.02940
210°F	0.03910	0.03900	0.03860	0.03760	0.03650	0.03510	0.03340
220°F	0.04340	0.04330	0.04280	0.04190	0.04080	0.03930	0.03760
230°F	0.04760	0.04750	0.04710	0.04610	0.04500	0.04360	0.04190
240°F	0.05220	0.05210	0.05710	0.05070	0.04960	0.04820	0.04650

Table 7 – Net Expansion Factor

Note: For 50/50 Ethylene Glycol multiply Expansion Factor by 2
For 50/50 Propylene Glycol multiply Expansion Factor by 3

Maximum Operating Pressure PSIG	Minimum Operating Pressure, PSIG										
	5	10	12	15	20	30	40	50	60	70	80
27	0.527	0.408	0.360	0.288	0.168	-	-		-	-	-
30	0.560	0.447	0.403	0.336	0.224	-	-	-	-	-	-
35	0.604	0.503	0.463	0.403	0.302	0.101	-	-	-	-	-
40	0.640	0.548	0.512	0.457	0.366	0.183	-	-	-	-	-
45	0.670	0.586	0.553	0.503	0.419	0.251	0.084	-	-	-	-
50	0.696	0.618	0.587	0.541	0.464	0.309	0.155	-	-	-	-
55	0.717	0.646	0.617	0.574	0.502	0.359	0.215	0.072	-	-	-
60	0.736	0.669	0.643	0.602	0.536	0.402	0.268	0.134	-	-	-
65	0.753	0.690	0.665	0.627	0.565	0.439	0.314	0.188	0.062	-	-
70	0.767	0.708	0.685	0.649	0.590	0.472	0.354	0.236	0.118	-	-
75	0.780	0.725	0.702	0.669	0.613	0.502	0.390	0.279	0.167	0.056	-
80	0.792	0.739	0.718	0.686	0.634	0.528	0.422	0.317	0.211	0.106	-
90	0.812	0.764	0.745	0.716	0.669	0.573	0.478	0.382	0.287	0.191	0.096
100	0.828	0.785	0.767	0.741	0.698	0.610	0.523	0.436	0.347	0.261	0.174
110	0.842	0.802	0.786	0.762	0.723	0.642	0.561	0.481	0.401	0.321	0.241

Table 8 –

The connections for water and gas piping are located at the service plate on the right-side panel of the chiller (see Figure 12).

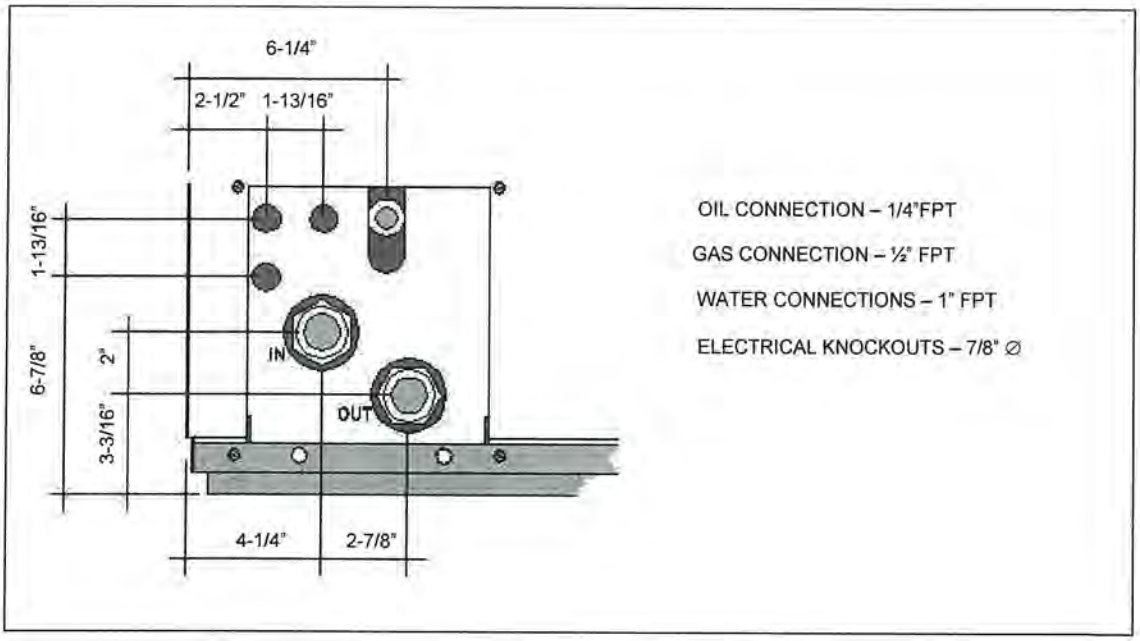


Figure 12 – SERVICE PLATE DIMENSIONS

4.4 GAS SUPPLY PIPING

All gas piping must conform to the latest edition of **National Fuel Gas Code ANSI Z223.1** and all local gas piping codes. In Canada, the gas piping must conform to the **CGA Standard CAN1 B149.1** and **.2**, *"Installation Code for Gas Burning Appliances & Equipment"* and local codes. Your gas utility must be contacted regarding local requirements, type and size of gas lines. Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the chiller, when it underwent the tests specified in the standards shown on the rating plate.

For Natural Gas the minimum inlet gas pressure to the chiller is 5" W.C. and the maximum is 14" W.C. For Propane Gas the minimum inlet gas pressure to the chiller is 11" W.C. and the maximum is 14" W.C.

For size of gas connection to the unit, see Figure 12.

WARNING

Gas supply pressure higher than stated above could damage the gas valve, resulting in a fire hazard.

Vertical gas piping must be trapped and a means provided to drain condensate that may accumulate in the piping during the cold season (see Figure 13). Insulation may also be necessary for the gas piping to prevent excessive accumulations of condensate.

An approved union should be installed in the gas line near the unit and down stream of any external shut-off valve that may be required by local codes.

Use an approved sealing compound resistant to propane gas on all male pipe threads.

The chiller and its gas connections must be leaked tested before placing the chiller in operation.

The chiller and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of the gas piping system at test pressures **in excess of 1/2 psig.**

The chiller must be isolated from the gas supply piping system by closing its individual shut-off valve during any pressure testing of the gas piping system at test pressures **equal to or less than 1/2 psig.**

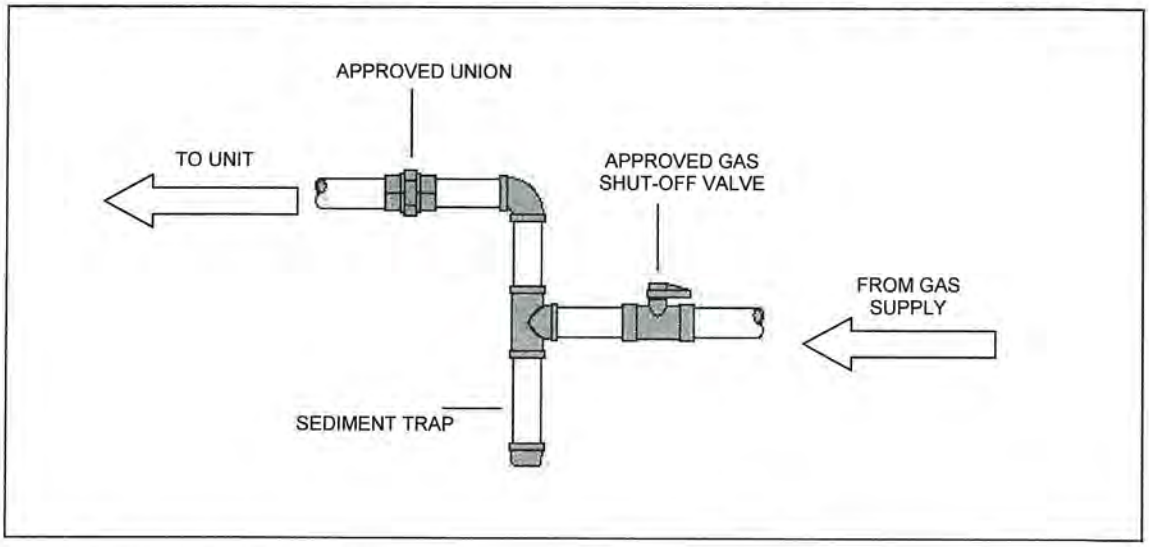


Figure 13 – TYPICAL GAS CONNECTION

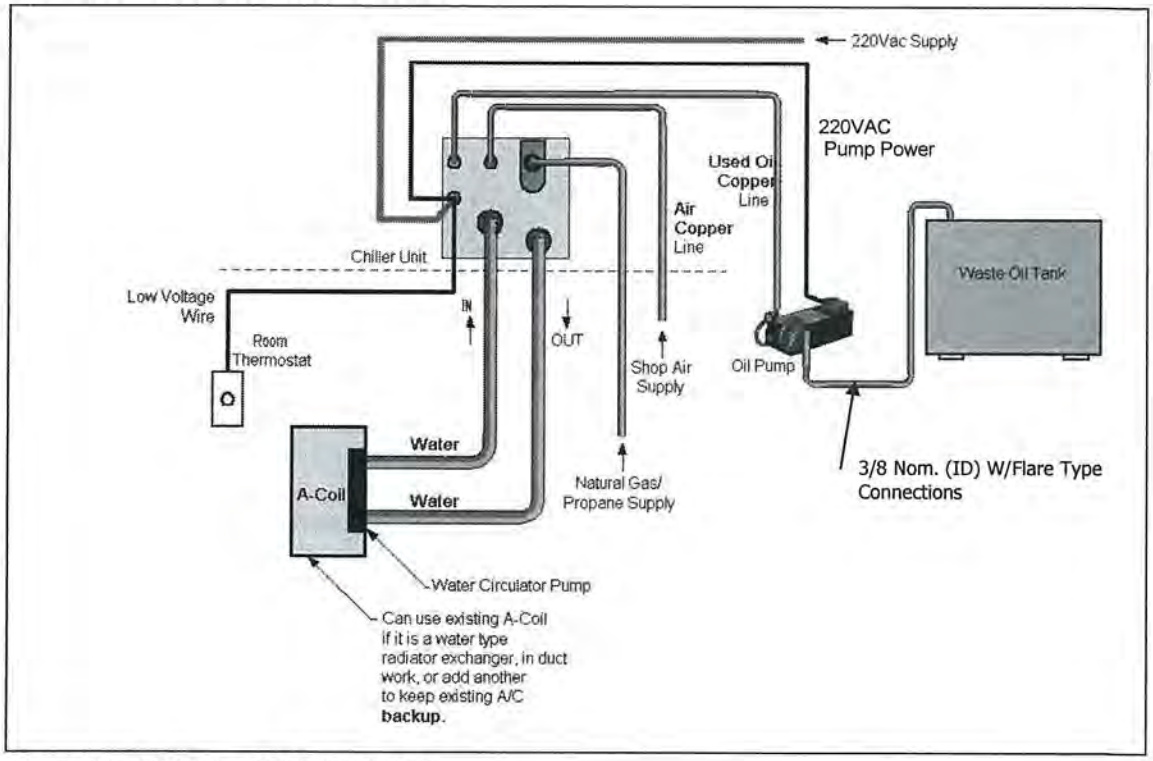


Figure 14 – TYPICAL AC CONNECTIONS

5 ELECTRICAL CONNECTION

5.1 POWER SUPPLY

All wiring should be installed in accordance with the latest edition of the **National Electrical Codes, ANSI/NFPA No. 70**, **CSA Standard C22.1** when installed in Canada, and with any local codes.

The unit's electrical system is pre-wired for single-phase, 208/230 volt and 60Hz operation. The control box includes a 208/230/24 volt transformer to supply low voltage to the control system. The high voltage or line connections to be made at the time of installation consists of connecting 208/230 volt, 60 Hz to the high voltage terminal strip of the control panel. A fused disconnect switch should be installed in the 208/230 volt supply line within sight of and not over 50 feet from the unit (see Figure 16).

NOTE

- An error in wiring installation could cause problems during the unit's operation and could damage the electrical components of the appliance.
- The unit must be electrically grounded in accordance with national requirements.
- **The power supply line must not be used to turn the unit "ON" or "OFF". The dedicated control switch in the R-Y line is for this purpose.**
- Disconnect the power supply lines only when assured that unit is completely shut off.

WARNING

DO NOT OPERATE the unit unless the chilled water system is filled with water and **antifreeze**.

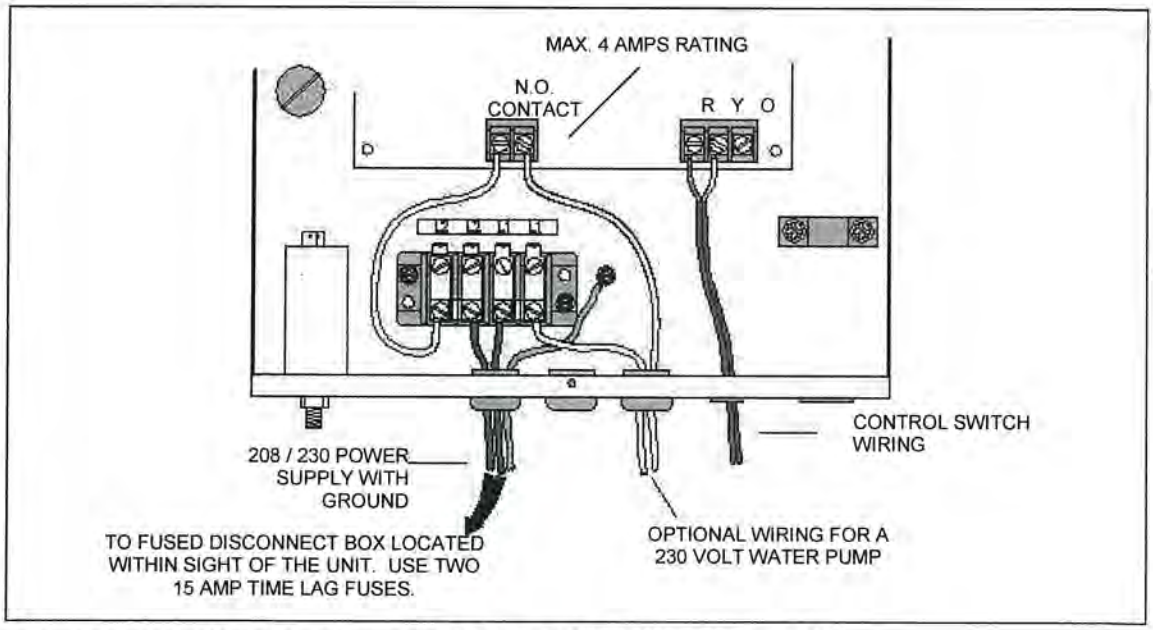


Figure 15 – TYPICAL CONNECTIONS TO BE DONE BY INSTALLER AT THE UNIT

WARNING

If power for the water pump is taken from the high voltage terminal block located in the electrical control box, as show in Figure 15, the minimum circuit ampacity for the unit must be increased above that listed in the TECHNICAL DATA sheet in SECTION 2 to accommodate the additional current draw of the water pump installed. **The maximum current carrying capacity of the N.O. Contact is 4A.** If the current is above 4A, use an additional relay controlled by N.O. Contact on the S-60 board.

5.2 PUMP WIRING

CONTROLLED BY THE UNIT

When the hydronic system's water pump is controlled by the unit, the installer must keep in mind the circuit ampacity, the required water pump voltage, and the current carrying capacity of the N.O. Contact on the electronic control board.

NOTE

When controlled by the S-60 board, the water pump operates while the control switch is closed. The N.O. Contact will open 215 seconds after the control switch opens.

- Wiring a 230 volt water pump with a current requirement less than 4 amperes, see Figure 18.
- Wiring a 230 volt water pump with a current requirement greater than 4 amperes, see Figure 16.
- Wiring a 115 volt water pump with a current requirement less than 4 amperes, see Figure 17.

-

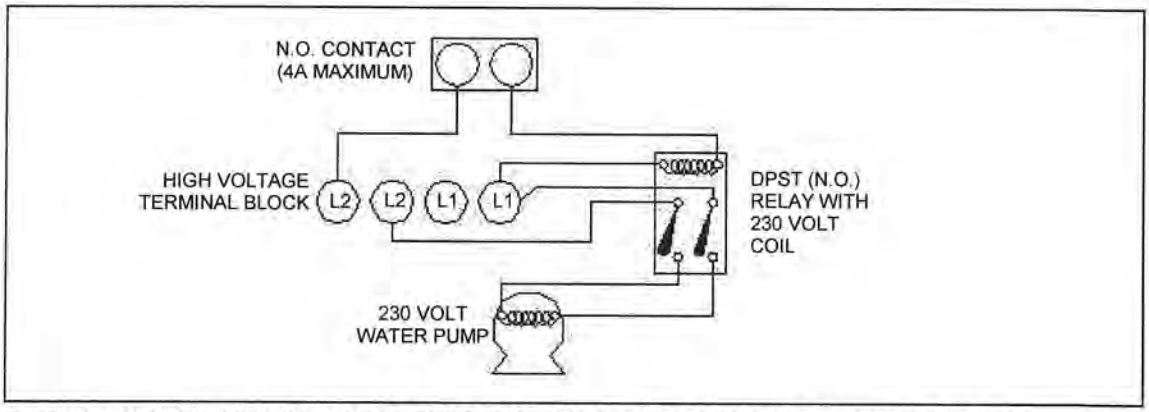


Figure 16 – WIRING A 230 VOLT WATER PUMP THAT EXCEEDS ELECTRONIC BOARD'S 4A RATING

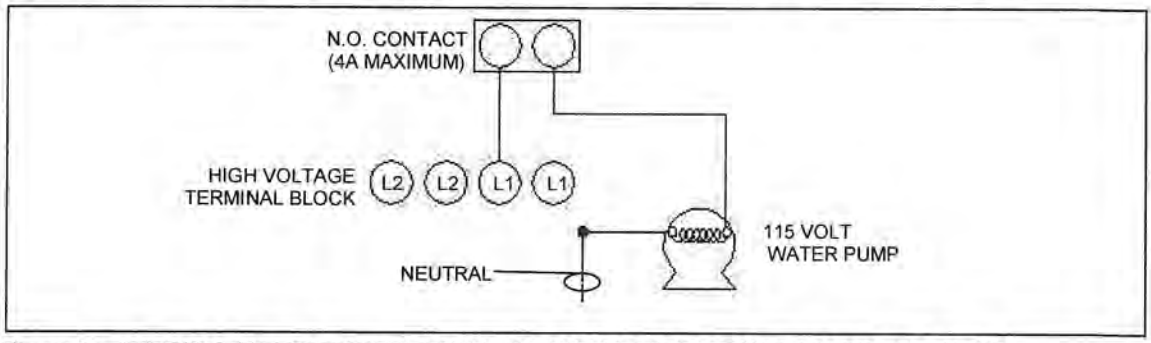


Figure 17 – WIRING A 115 VOLT WATER PUMP THAT MEETS ELECTRONIC BOARD'S 4A RATING

EXTERIOR CONTROL

When the unit does not control the hydronic system's water pump, the installer must ensure that the pump and the unit start at the same time. Also, the pump must continue to run during the unit's cycle down time (215 seconds after the opening of the control switch). See Figure 18.

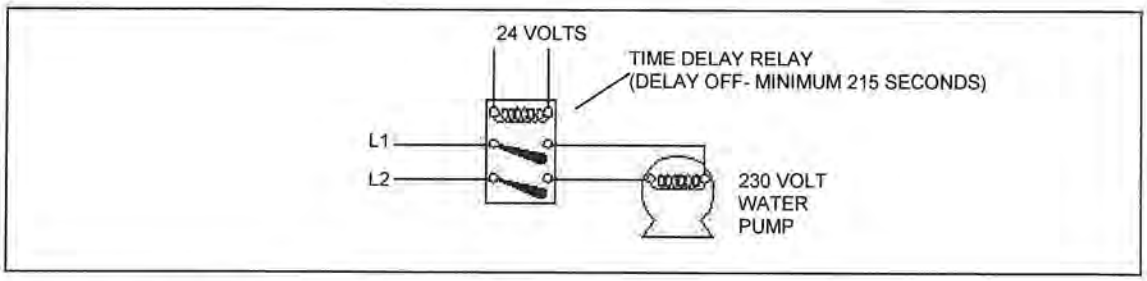


Figure 18 – EXTERIOR CONTROL WIRING FOR A 230 VOLT WATER PUMP

5.3 CONTROL SWITCH WIRING

A control switch that provides an ON / OFF function is to be connected to the R and Y on the S-60 board (see Figure 15). This wiring will carry 24-volt current and it is recommended to use a cable with the correct number of color-coded 18 gauge wires.

Fan, control, or isolation relays must have a 24-volt AC coil, which does not present more than a 0.25 amp load to the control circuit (see Figure 19, Figure 20, and Figure 21).

WARNING

An isolation relay (Kit No. 18010-116) MUST be used to separate the chiller's transformer from any additional equipment having a transformer or damage to the S-60 board will occur.

THERMOSTAT WIRING

Special consideration should be given to the control wiring when the chiller is used in an air conditioning application. For details on wiring additional components, ALWAYS consult the component manufacturer's wiring instructions. The following diagrams give general layouts that can be used:

- Single thermostat for heating and cooling control on a furnace. This system offers constant fan operation at any time, even with power "OFF" to the chiller. It is readily adaptable to a furnace that has a fan relay or can be adapted to a "heating only" furnace with the addition of a fan relay and wiring the furnace controls as shown. Note: An isolation relay must be used in this application.

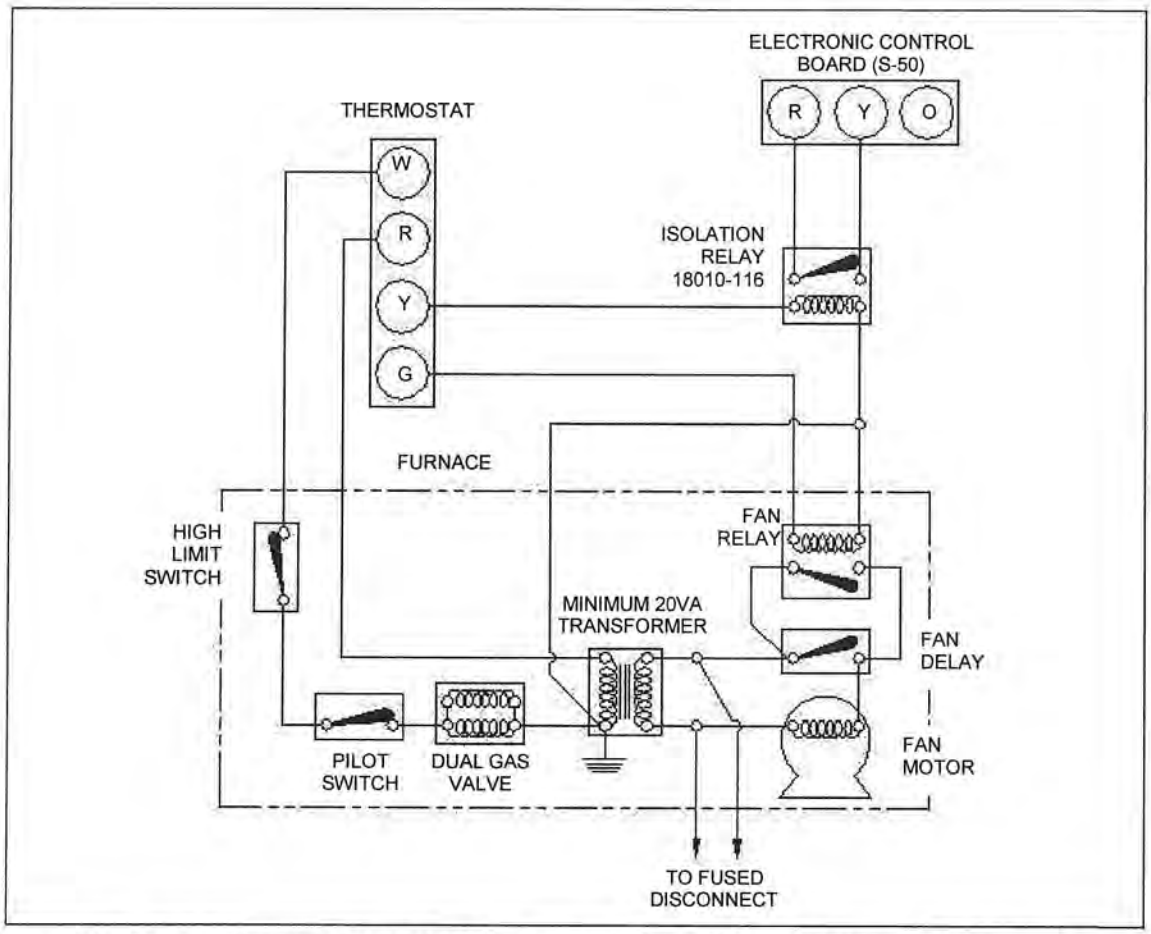


Figure 19 – SINGLE THERMOSTAT USED FOR BOTH HEATING AND COOLING CONTROL ON A FURNACE

- Separate thermostats for heating and cooling control on a furnace. This system does not offer constant fan operation on heating unless the power is "ON" to the chiller and the fan switch on the cooling thermostat is in the "ON" position.

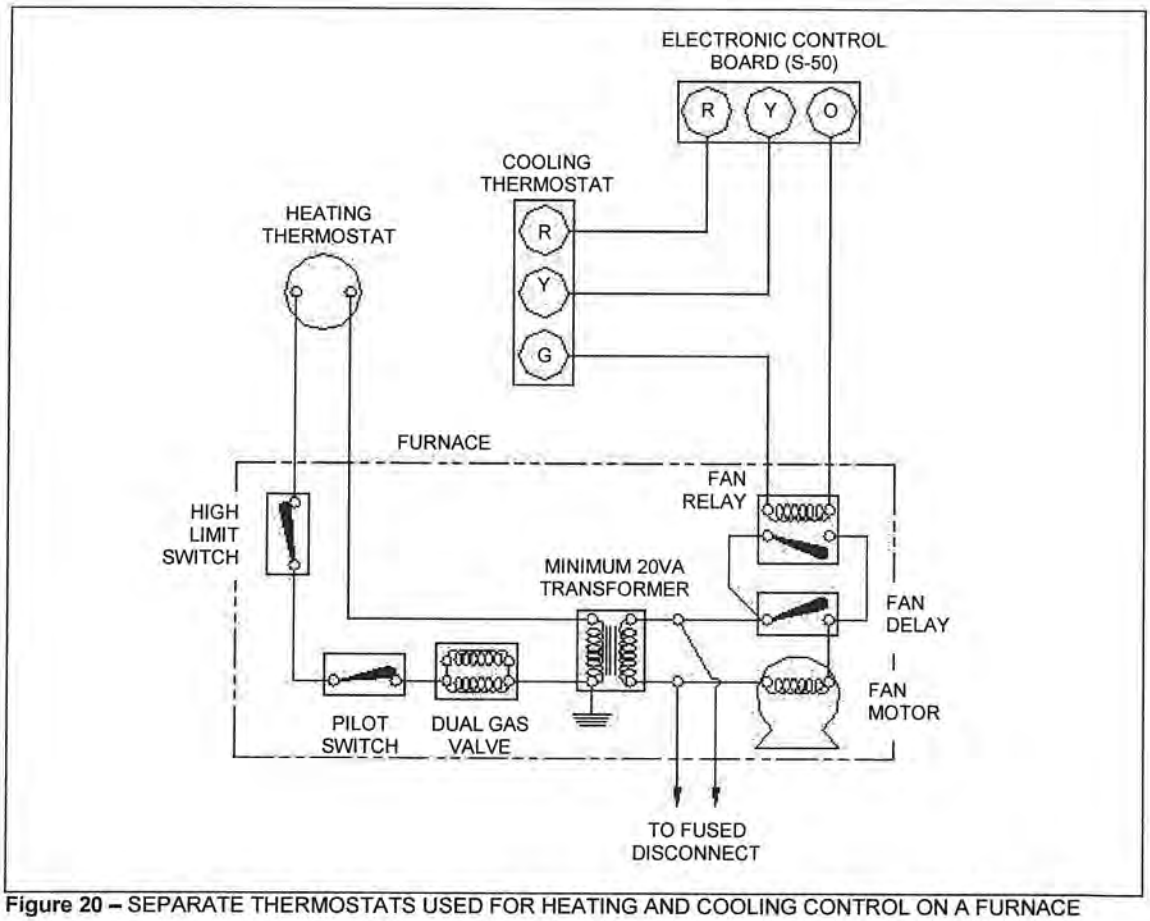


Figure 20 – SEPARATE THERMOSTATS USED FOR HEATING AND COOLING CONTROL ON A FURNACE

- Single thermostat used for cooling control on a fan coil unit. Refer to fan coil manufacturer's instructions for an exact wiring schematic.

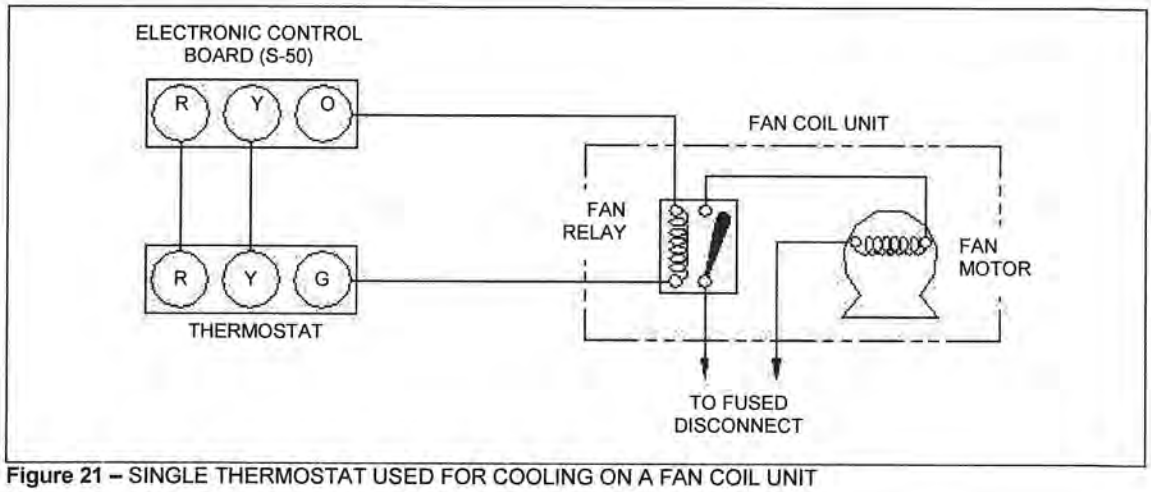


Figure 21 – SINGLE THERMOSTAT USED FOR COOLING ON A FAN COIL UNIT

THERMOSTAT LOCATION

If the control switch is a thermostat, the thermostat should be located on an inside wall about 54 inches above the floor. It should be located so that it will no be affected by any of the following items:

- Discharge air from a supply grille
- Drafts
- Direct sunlight through a window or glass door
- Electrical Appliances such as television, radio or lamps.

The thermostat should be located so that it senses the average temperature of the conditioned space. The thermostat should be mounted according to the manufacturer's instructions (packaged with the thermostat). **THERMOSTATS USING A MERCURY BULB SWITCH MUST BE LEVEL**. The heating anticipator for a thermostat that is used to control an Air Cooled Chiller in conjunction with a heating unit, must be set as required by the heating unit load.

5.4 CHILLER WIRING

If any of the original wire as supplied with the unit must be replaced, it must be replaced with thermoplastic 105°C wire, except igniter wire 230°C, flame sensor, ground, high temperature and pressure switch wires 200°C or equivalents (see Figure 22). **Label all wires prior to disconnection when servicing the controls.** Wiring errors can cause improper and dangerous operation.

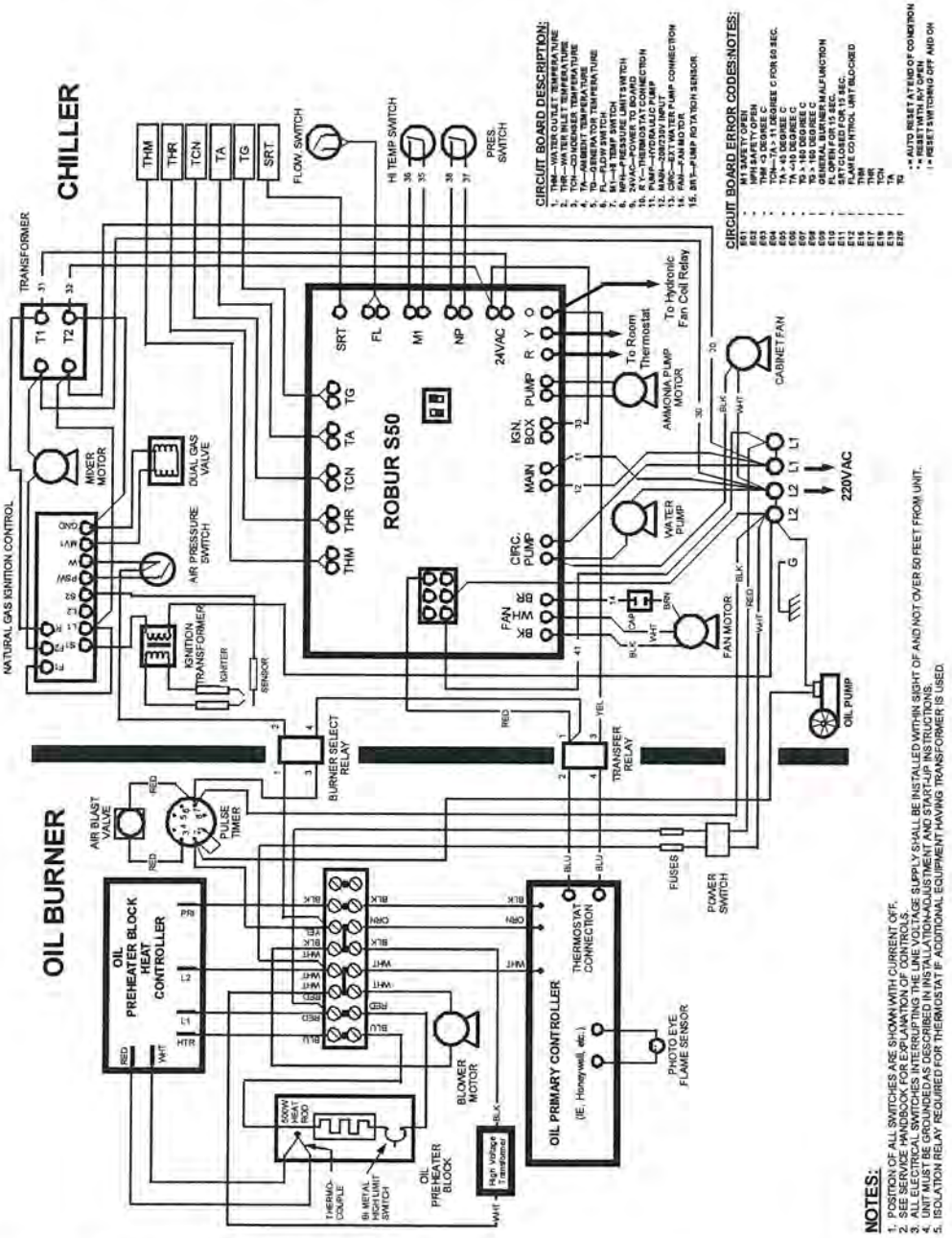


Figure 22 – WIRING DIAGRAM FOR OWC-5

6 START-UP AND ADJUSTMENT

WARNING

This unit should be started-up by an Authorized Technician according to the manufacturer's instructions. The end-user is not authorized to perform start-up and adjustment operations.

The owner's satisfaction is directly related to the correct installation, proper adjustments, and application of the unit. Authorized Technicians must perform the proper system adjustments.

NOTE

The length of the warranty is dependent upon the installation and start-up of the unit by Authorized Technicians. See warranty card for complete details.

DANGEROUS SITUATIONS FOR THE UNIT AND/OR PERSONS

If during the first start-up one of the following conditions is found:

- Unit installed indoors
- The unit turned on and off by using the main electrical switch (not using control switch)
- Antifreeze not added to the water
- Unit damaged or defective due to transport and/or installation

UNUSUAL INSTALLATION CONDITIONS FOR THE UNIT AND/OR PERSONS

All situations or installations in contradiction to the directions/instructions of the manufacturer can or may result in incorrect unit operation.

6.1 DETERMINING VOLUMES OF HYDRONIC SYSTEM AND ANTIFREEZE

WARNING

To ensure correct operation of the unit and to avoid the water freezing, add 10% by volume of inhibited mono-ethylene glycol (antifreeze) to the circulation water. Add more mono-ethylene glycol as needed for the minimum external temperature of the installation zone (see Table 10).

Listed below are recommendations concerning antifreeze to be used:

- Inhibited permanent type antifreeze(propylene or ethylene glycol)
- No sealants in the mixture
- Preferable the color is not blue or green.

The volume of the hydronic circuit must be calculated to figure the volume of antifreeze required for freeze protection. The approximate volume can be calculated by knowing the equivalent feet of pipe and by using the tables below.

Consider all valves, pumps and fittings in water lines to hold the same volume as equivalent length of pipe.

Example of a volume calculation:

OC-5	1.30 Gallons	
5 Ton Duct Coil	2.00 Gallons	
40 FT of 1-1/4" Pipe	3.08 Gallons	(40 Divided by 100 multiplied by 7.7)
Total Volume of Hydronic Circuit	6.38 Gallons	

Volume of Antifreeze required to achieve 10% by volume concentration
6.38 Gallons X 0.10 = 0.638 Gallons.

PIPE SIZE (INCHES)	GALLONS PER 100 FT PIPE
3/4"	2.8
1"	4.1
1-1/4"	7.7
1-1/2"	10.7

Table 9 – PIPE SIZE VS. GALLONS PER 100 FEET OF PIPE

EQUIPMENT	SIZE	VOLUME (GALLONS)
OWC-5	5 TON	1.3
"A"COIL	1.5 TON	0.8
"A" COIL	2 TON	0.8
"A" COIL	3 TON	1.0
"A" COIL	4 TON	1.5
"A" COIL	5 TON	2.0
DUCT COIL	2 TON	0.8
DUCT COIL	3 TON	1.0
DUCT COIL	4 TON	1.5
DUCT COIL	5 TON	2.0
FAN COIL	2 TON	0.8
FAN COIL	3 TON	1.0
FAN COIL	4 TON	1.5
FAN COIL	5 TON	2.0
FAN COIL	5 TON	2.0

Table 10 – APPROXIMATE VOLUMES OF TYPICAL EQUIPMENT

NOTE

The volumes of the coils listed above are approximations only. For exact volume of the coils used, consult the coil manufacturer's specifications.

6.2 FILLING THE WATER PIPING

WARNING

To ensure correct operation of the unit and to avoid the water freezing, add 20% by volume of inhibited glycol (antifreeze) to the circulation water. Add more glycol as needed for the minimum external temperature of the installation zone (see Table 11).

The method described below is **only one of several ways** that can be used to fill the hydronic circuit. A container to mix water and glycol and a water pump to drive the mixture into the hydronic system is required.

1. Open air bleed(s) located at the highest point in the system.
2. Connect the hose between the charging pump and Valve A. Connect a hose to Valve C and place the other end of this hose into the mixing container (see Figure 23).
3. Mix the desired concentration and volume of water/antifreeze in the container. If the container will not hold the volume required to fill hydronic circuit, multiple "batches" must be made.
4. Close Valve B. Open Valve A and Valve C. Start charging pump to push the water/antifreeze mixture into the hydronic system. Air will be removed through the hose on Valve C as the hydronic system fills. Continue to fill the system until the water/antifreeze mixture returns to the mixing container via the hose on Valve C.
5. If the volume in the mixing container is adequate to fill the hydronic system, skip to Step 14. If the volume in the mixing container is inadequate to fill the hydronic system, close Valve A prior to air entering the charging pump and shut the charging pump off.
6. Make a new container of water/antifreeze mixture.
7. Start the charging pump and open Valve A to continue filling hydronic system. Repeat Steps 4 through 6 as needed until hydronic system is filled or until charging pump is incapable of adding any additional mixture due to pump discharge head limitations.

8. If the system is filled, skip to Step 14. If the system is not full, turn on the hydronic system's pump but do not start the unit. Jumping the N.O. CIRC. contacts on the electronic control board can start the hydronic system's pump (if controlled by the electronic control board).
9. "Throttle" Valve B, if necessary to continue filling the hydronic system if the system does not start filling after the hydronic system pump was started.
10. If the volume in the mixing container is not sufficient to fill the hydronic system, close Valve A prior to air entering the charging pump and shut both pumps off.
11. Mix new container of water and antifreeze mixture.
12. Start both pumps and open Valve A.
13. Repeat Steps 9 through 11 until the system is filled and all air is removed from the hydronic system.
14. Close Valve A and Valve C. Shut off all pumps. Open Valve B.
15. Close any manual air bleed valves.
16. Start pumps and open Valve A.
17. Add additional glycol/water mixture until the highest point in the hydronic system has a pressure of at least 4 psig. If the unit is located at the highest point in the system, then pressure at the high point of system should be least 10 psig.
18. Close Valve A and shut down both pumps.
19. Disconnect the charging pump and the mixing container.
20. The hydronic system is now charged.

One way to determine the pressure at the high point of the system is as follows:
1. Shut the pump off and wait for the water/glycol mixture to stop flowing.
2. Measure the water pressure at the unit using the pressure/temperature taps.
3. Measure the vertical distance between the pressure taps and the highest point in the system.
4. Divide the vertical distance (measured in Step 3) by 2.3. (1psig = 2.3 ft.)
   Take the pressure measured at the taps and subtract the answer from Step 4. This equals the pressure at the high point of the system.

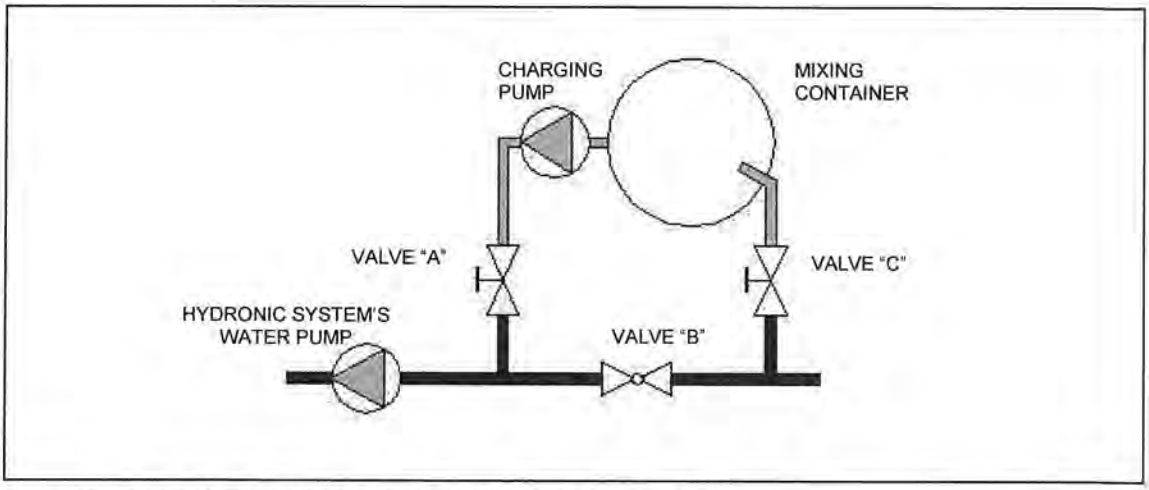
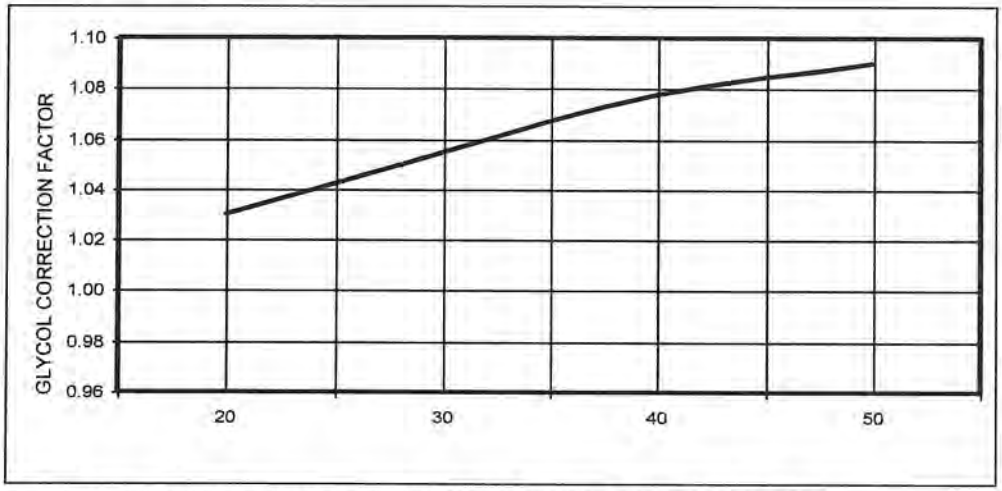


Figure 23 – COMPONENTS USED IN FILLING THE HYDRONIC SYSTEM

TYPE OF ANTIFREEZE	APPROXIMATE PERCENTAGE OF ANTIFREEZE BY VOLUME			
	20	30	40	50
MONO-ETHYLENE GLYCOL	16°F	4°F	-12°F	-35°F

Table 11 – FREEZING POINTS OBTAINED BY VARIOUS CONCENTRATIONS OF MONO-ETHYLENE GLYCOL ANTIFREEZE

Inhibited Propylene or Ethylene Glycol added to the water changes its thermal-physical properties, particularly its density, viscosity and mean specific heat. Graph 2 gives the correction factors for the hydronic system's pressure drop as a function of glycol percentage added to the water. The graph is accurate for water temperatures between 45°F and 55°F. It is important to consider the correction factor for the sizing of the water pipes and water circulation pump. For the unit's internal pressure drop, refer to Graph 1. Example: Total System Pressure Drop x Glycol Correction Factor = Actual Total System Pressure Drop.



Graph 2 – PRESSURE DROP CORRECTION FOR GLYCOL CONCENTRATION

6.3 GAS PRESSURE ADJUSTMENT

The manufacturer supplies the units already adjusted for a particular type of gas. The type of gas can be checked and easily identified by looking at the rating plate on the side of the unit. Nevertheless, before starting the unit it is necessary to check and adjust if necessary the gas input to the burner. Using the table below, locate the proper manifold pressure according to the local gas heating value (BTU content per cubic foot) and specific gravity. This table is based on the correct natural gas input for the model by manifold pressure in inches of water column (in WC).

BTU CONTENT PER CU. FT.	SPECIFIC GRAVITY OF NATURAL GAS			
	.55	.6	.65	.7
950	3.2	3.6	3.9	4.3
975	3.0	3.3	3.7	4.0
1000	2.8	3.1	3.5	3.8
1025	2.6	3.0	3.3	3.6
1050	2.5	2.8	3.1	3.4
1075	2.3	2.6	2.9	3.2
1100	2.2	2.5	2.7	3.0
1125	2.0	2.3	2.5	2.7

PERCENTAGE OF ANTIFREEZE BY VOLUME

Table 12 - MANIFOLD PRESSURE BASED ON GAS INPUT OF 96,500 BTU/HR USING 1113 ORIFICE.

The conditions referred to by the table above are for the guidance of the installer and the CSA design certification does not cover the conditions described therein.

Note: For Propane Gas Models, follow the same instructions as given below for natural gas. The manifold pressure for propane gas should be 10.0" W.C. and adjustment is made at the gas valve regulator. Manifold pressure at 96,500 Btu/Hr. input using 1133 orifice.

1. Turn main gas valve knob to the "OFF" position.
2. Remove the plug on outlet end of gas valve (see Figure 24) and attach pressure tap and manometer.
3. Turn power "ON," and close control switch.
4. Wait for the burner to start up. Due to the presence of air inside the piping, it may be that the burner does not start at the first three attempts and failing to do so the ignition system is locked out. If this happens reset the ignition system by opening the control switch for 5 minutes and then re-closing. Repeat until all the air is purged from the piping and the burner ignites.
5. When the burner ignites read the manometer and compare to the required pressure in Table 12.
6. If necessary change the manifold pressure using the gas valve regulator. The regulator is built into the gas valve. Remove the seal screw and turn adjusting screw clockwise to increase pressure or counter clockwise to reduce pressure. Replace seal screw after adjustment.
7. Open control switch and make sure unit is off.
8. Remove manometer and pressure tap. Replace plug in gas valve.
9. Turn unit on by closing control switch. Check all gas connections with soap for leaks.

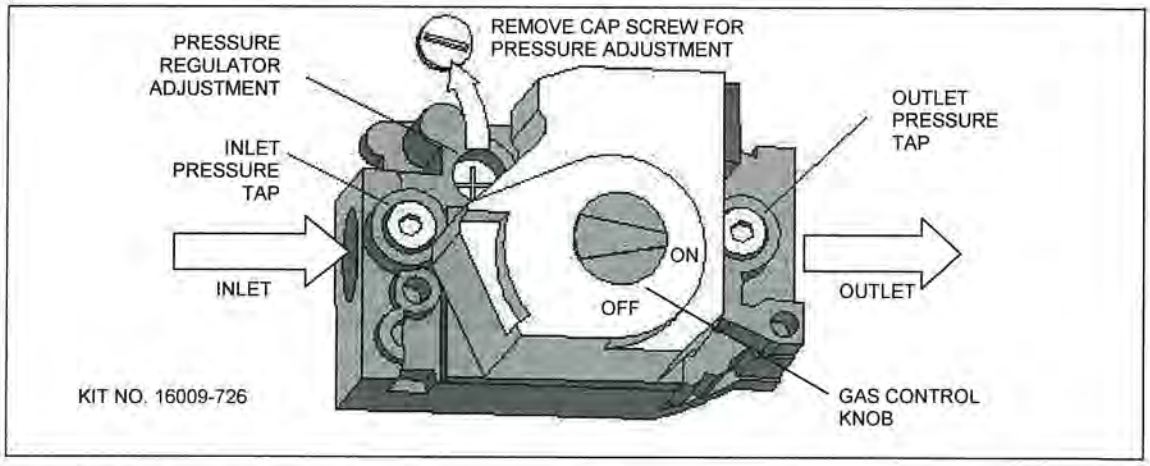


Figure 24 – GAS VALVE

6.4 USED OIL BURNER ADJUSTMENTS

1. **IMPORTANT**- Prior to starting the unit, pre-fill the filter and fuel line with oil to assist priming procedure. Oil pump motor turns at low RPM's and would take significant time to complete priming process if not pre-filled.
2. Making sure the thermostat is turned off, apply power to the Chiller unit. Switch burner main power switch to ON position. After allowing the oil pre-heater time to establish temperature setpoint, approximately 5 minutes. Jump the "T" terminals on the Oil Primary (Figure 25). Once the burner is running, temporarily jump the "F" terminals on the Oil Primary. This will allow the burner to run during the pump priming process.
3. Priming the oil pump: Open bleeder valve one turn until all air is expelled (Figure 28). This may need to be done twice to insure all air is removed. **IMPORTANT:** When fully purged and flame is established remove temporarily jumpers on "F" and "T" terminals of the Oil Primary to allow safety features of the unit to operate properly.
4. Adjust air supply of integrated air compressor to 12 - 13 P.S.I. This is factory preset, however, due to freight handling settings may be compromised.
5. Adjust oil pump motor speed at adjuster post to reed 1.5 PSI on the oil gauge located on the burner.

6. Combustion air band should be open approximately 1/2" or until flame is clear yellow, not orange. Opening the air band too far may cause delayed in starting or even prevent the flame from starting.

6.5 CHILLED WATER TEMPERATURE REGULATION

The electronic control board permits the regulation of the unit's outlet chilled water temperature.

To adjust the outlet water temperature set point, use the chilled water thermostat on the electronic control board (see detail C of Figure 2). The set point range of the outlet water temperature is between 37°F (rotated completely counter-clockwise) and 55°F (rotated completely clockwise).

The design temperature difference, ΔT, between inlet and outlet chilled water is 10°F at rated conditions.

The recommended chilled water temperature for commercial/domestic use is 55°F for inlet water temperature and 45°F for outlet water temperature. The chilled water thermostat is set in the central position of the scale for the above mention temperatures. Rotate clockwise to increase the outlet chilled water temperature setting or counterclockwise to decrease it. The new outlet chilled water temperature set point will be indicated on the electronic control board display for 15 seconds after the adjustment.

The factory default outlet chilled water temperature set point is 42°F.

NOTE

When power is first applied to the unit, **"CAP"** will appear on the display. After few seconds **"H60"**will appear. When the "H60" disappears, the outlet chilled water temperature set point displays for the next 15 seconds.
After the set point disappears, the display shows the actual temperature of the inlet water and ΔT between inlet and outlet water temperatures.

7 USED OIL BURNER

PRECAUTIONS:

- Used oil may contain many foreign materials. Used oil may also contain gasoline, therefore, specific precautions on the handling and storage of used oils are to be observed when using, cleaning and maintaining this burner. **Use a screen in a funnel when pouring oil into storage tank to catch foreign material, i.e., gasket material and sealant fibers, etc.**

- **WARNING: This appliance is not designed for use indoor or in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons.**

- Use only used crank case oil, gear lube oil, hydraulic oils, automatic transmission fluid or #1 and #2 furnace oil. DO NOT use old contaminated oils that have been stored in underground tanks or outside barrels for long periods. Excessive water and sludge may be present, causing quick filter failure. **DO NOT USE NEW MOTOR OILS,** they will not burn thoroughly.

- This appliance is designed for commercial or industrial use only.

WARNING

ONLY Authorized Technicians strictly complying with the manufacturer's instructions and the

local standards should perform installation, maintenance and service on the unit's internal components. Installation and use of this used oil burning appliance shall be in accordance with the standard for the Installation of Oil Burning Equipment – ANSI/NFPA 31 – 1987, and National Electric Code – ANSI/NFPA 70 – 1990 and the requirements of the inspection authorities having jurisdiction.

7.1 OIL BURNER TECHNOLOGY

The patented burner technology improves the efficiency of the oil burn process by continuous stabilization of the oil viscosity. This is accomplished by precisely controlling the pre-heating of the oil and air prior to introduction to the combustion chamber delivering optimum atomization (spray).

During the initial power up process the burner is locked out from energizing until the oil has been pre-heated up to setpoint, approx. 3 to 5 minutes duration. Once the oil has been heated up, power is then applied to burner components and oil pump.

Burner Components

- **Igniter Transformer:** Supplies high voltage to the electrodes generating electrical arc igniting the oil
- **Oil Valve:** energizes when burner is running and de-energizes when burner is not running eliminating bleed back of oil out of the Pre-heater block.
- **Air Band:** Adjusts amount of air introduced into the combustion chamber. (section 6.4.6)
- **Oil Primary:** Controls the oil burner ignition. Checks for flame in the combustion chamber, if no flame is detected within 45 seconds, the oil primary will shutdown the oil burner. To restart the unit, reset the red button on the oil primary.
- **Oil Pre-Heater Block:** Pre-heats the oil and air before entering combustion chamber.
- **Photo Eye:** Senses flame in combustion chamber and signals oil primary when no flame is present.
- **Igniter Springs:** Transfers the high voltage from the igniter transformer to the electrodes (when door is closed)
- **Air Pressure Gauge:** Displays air pressure supplied by onboard air compressor.
- **Air Compressor:** Supplies air used within pre-heater block to aid in atomization of the oil.
- **Air Muffler/Filter:** Filters air and muffles the sound generated by the compressor.
- **Pre-Heater Control Board:** Precisely controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating thermo setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown thermo setpoint.
- **Electrodes:** Provides continuous high voltage electrical arc from electrode to electrode igniting the waste oil as it is being sprayed out of the nozzle.
- **Nozzle:** Low pressure nozzle for oil spray pattern.
- **Flame Cone:** Specially engineered flame cone forces the flame into a swirl pattern improving the burn thoroughness.
- **Burner Motor:** Multitask motor turns the burner blower and integrated air compressor.
- **Oil Pressure Gauge:** Displays oil pressure at the burner. Adjust flame length in the chiller combustion chamber viewed through the inspection port located directly above the burner gun assembly by increasing CW or decreasing CCW the adjuster located on the oil delivery pump. The adjuster increases or decreases the pump motors RPM which increases or decreases the delivery of fuel to the burner. When you increase or decrease the fuel to the burner you will

notice the flame length will increase or decrease. **Adjust flame length** so flame is just slightly less than halfway down main combustion chamber tube.

IMPORTANT:

Once adjusted for correct flame length, take note of oil gauge setting for bench mark pressure reading needed when burning the specific fuel mixture generated by the owner. PLEASE NOTE- Once flame is set the oil pressure gauge can read various pressures when different viscosities of oils are used. The oil pressure gauge is an indicator of where the PSI reading will be when that oil viscosity is being burned. The oil gauge is used for servicing diagnostics assistance.

- **Power Indicator:** Indicates when power is present at the burner.
- **Run Indicator:** Indicates that the burner is ready for operation after the initial pre-heat time of approx. 5 minutes from initial power up.

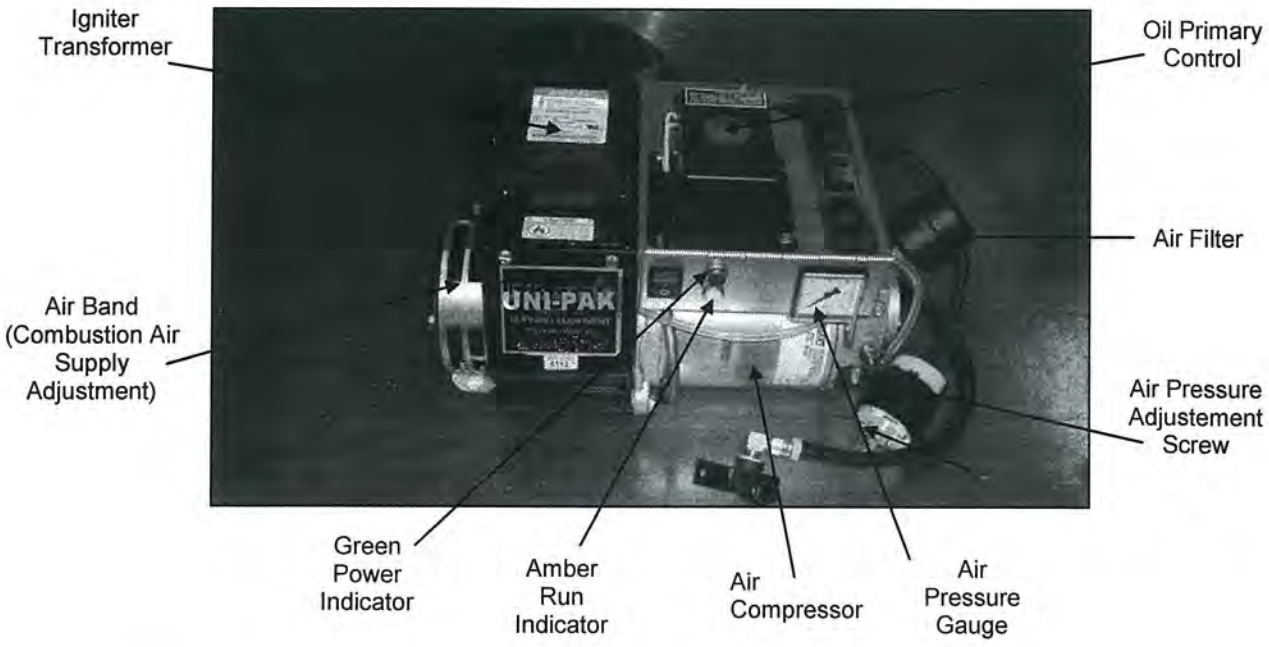


Figure 25 – Oil Burner (Back View Closed)

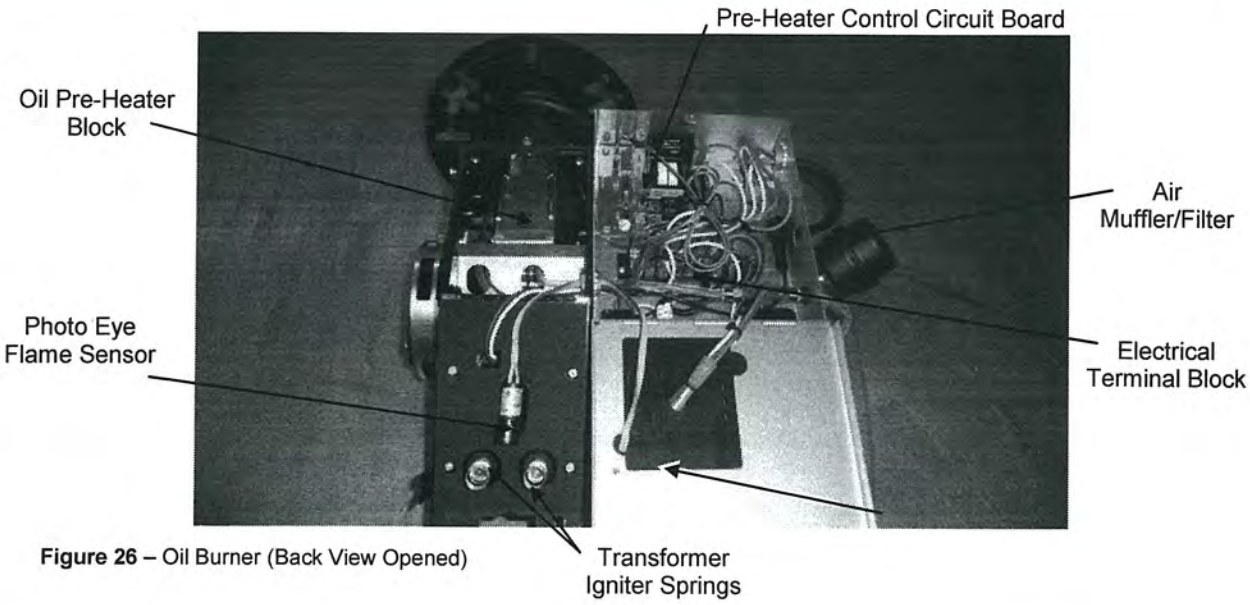


Figure 26 – Oil Burner (Back View Opened)

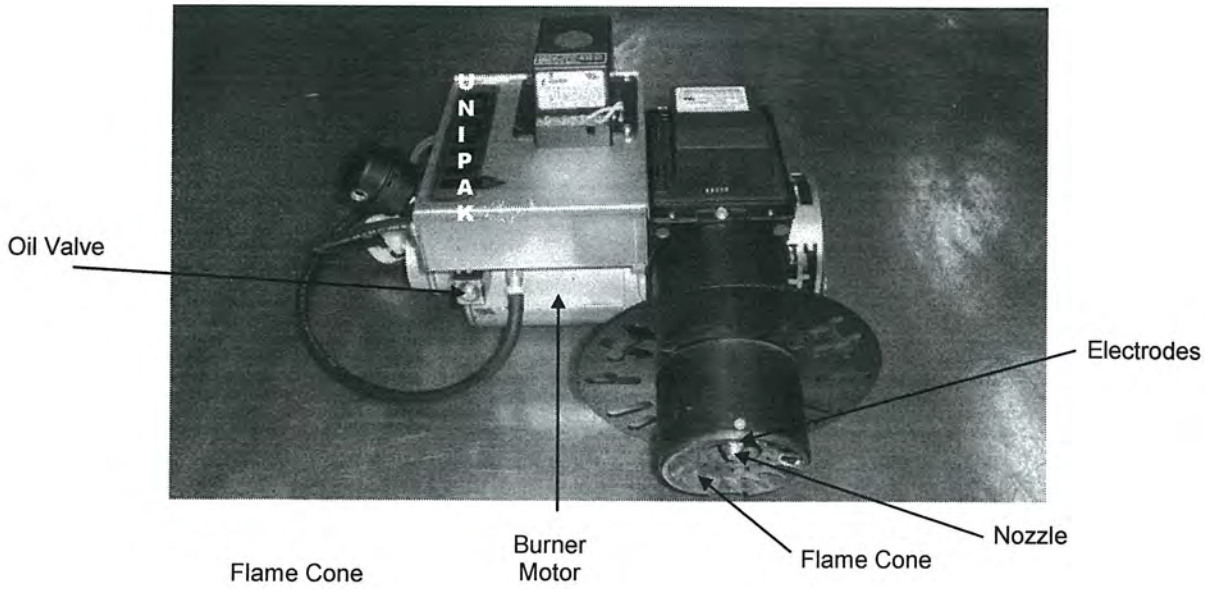


Figure 27 – Oil Burner (Front View)

8 OIL PUMP

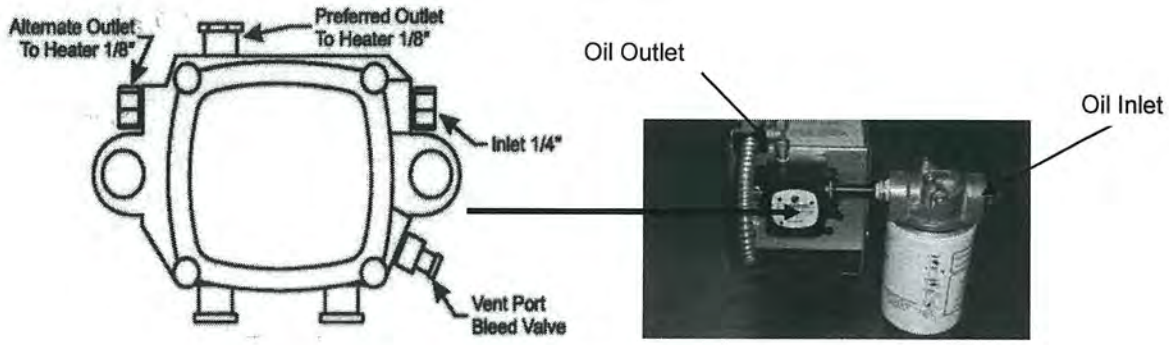


Figure 28 –Oil Pump Diagram (New Style Spin-On Filter)

Figure 29 –Oil Pump

9 SERVICE AND MAINTENANCE

Performing correct preventive service and maintenance will help to guarantee long life of the unit with high efficiency and low maintenance costs.

WARNING

ONLY Authorized Technicians strictly complying with the manufacturer's instructions and the local standards should perform maintenance and service on the unit's internal components.

Lubrication of condenser fan, hydraulic pump, and pre-mixer motor is not recommended.

The operations described below must be performed once a year. If the unit is installed on a heavy-duty installation (industrial plants, 24hr operation etc.), it is necessary to increase the frequency of checks and services.

Maintenance to be performed on the unit:

- Cleaning of the condenser /absorber coils
- Cleaning of the burner (oil and gas)
- Cleaning of the generator
- Inspection of flue gas passage
- Change and check hydraulic pump oil level
- Priming procedure
- Check condition of belts
- Check condenser fan height

NOTE

Before any type of service is performed, ALWAYS shut-off the power supply at the main switch.

CLEANING THE CONDENSER/ABSORBER COILS

It is recommended to clean the condenser / absorber coils regularly since the unit's cooling capacity can be greatly reduced by dirt on the coils (see Figure 30). The user, installer or service technician can perform this operation. To clean condenser / absorber coil proceed as follows:

1. Shut off the power and gas supply.
2. Remove the covering panels.
3. Use a brush to remove dirt from the outside and inside of the condenser/absorber coils.
4. Using water pressure, wash the coils from in to out and from top to bottom. Point the hose down between the two coils and wash all the way around. Care should be taken not to spray electrical components or to damage the aluminum fins.
5. Check that all dirt is removed.
6. Replace the panels.
7. Turn on the power and gas supply.
8. Start unit to check for correct operation.

NOTE

Do not use solvents for cleaning the condenser/absorber coils; this could cause damage to the aluminum fins.

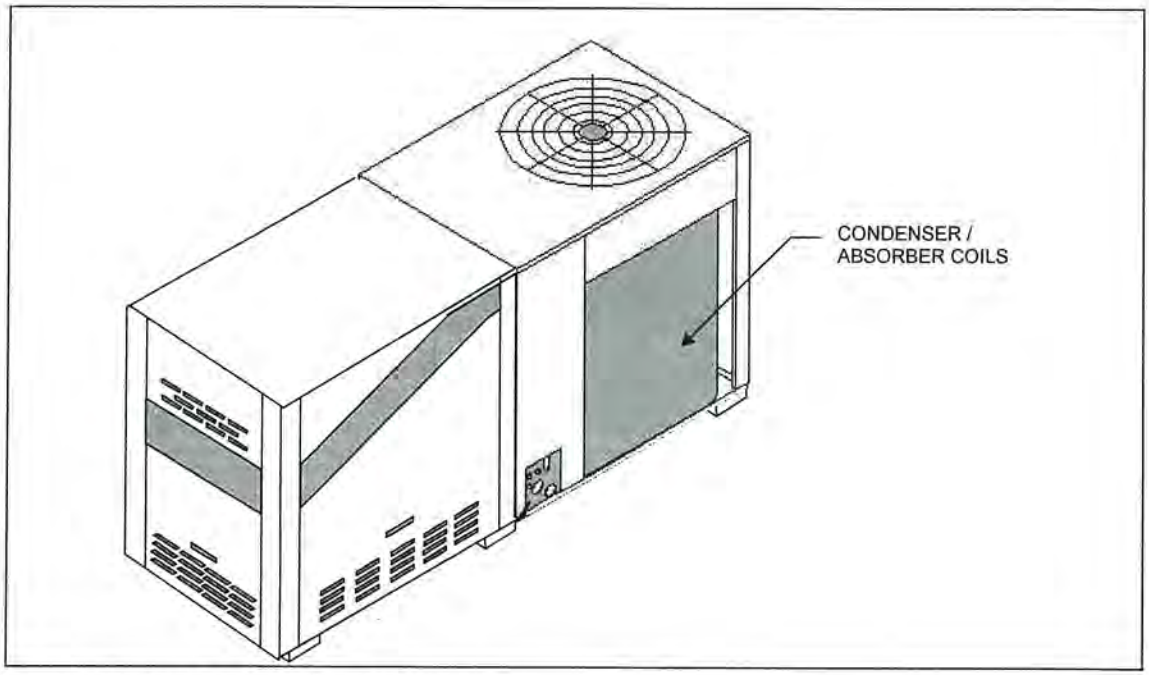


Figure 30 –FINNED CONDENSER / ABSORBER

CLEANING THE BURNER

Tools Needed:

Fiber Bristle Brush
Dust Mask (3M #8710 or equal)
Safety Goggles
Hand Tools

WARNING

ALWAYS wear safety goggles!

1. Shut off gas and electric supply to unit.
2. Remove front panel.
3. Remove bolts and nuts securing premixer blower housing to burner tube flange.
4. Remove screws holding burner and insulation retaining straps.
   Note: Wear a dust mask (3M #8710 or equal NOISH/MSHA TC-21C mask) during burner removal, cleaning, and assembly operations.
5. Pry bottom of burner tube out to clear bottom of generator housing. Pull burner down and out to remove from generator housing.
   Note: Be careful not to distort or damage the burner tube or the igniter and sensor assemblies in the generator housing.
6. Position burner tube with open end down.
7. Clean burner tube ports with fiber bristle brush and shake any debris out of the tube.

8. Inspect burner tube gasket that seals the burner tube to the generator housing and the burner flange gasket that seals burner to premixer blower housing. Replace either gasket if damaged during burner removal process.
9. Replace burner tube in reverse order of removal.
   Note: Make sure the two gaskets are positioned correctly and that generator housing is properly sealed.
10. Turn on gas and electric supply to unit.
11. Start unit and check for correct operation.

CLEANING THE GENERATOR

Tools needed:

Safety Goggles
Dust Mask (3M #8710 or equal)
Soft Bristle Brush
Wire Brush
Hand Tools

WARNING

ALWAYS wear safety goggles!

1. Shut off gas and electric supply to unit.
2. Remove front and top panels.
3. Disconnect wires from ignition transformer mounted on left front panel to control box at the control box end.
4. Remove ignition wires from igniter mounted on combustion chamber.
5. Remove left panel from unit.
6. Remove sensor wire from sensor mounted on generator housing.
7. Remove two screws fastening center partition to air baffle assembly.
8. Remove center partition from unit by pulling partition straight up
9. Remove bolts and nuts securing premix blower housing to burner tube flange.
10. Remove screws holding burner and insulation retaining straps (see Figure 31).
    Note: Wear a dust mask (3M #8710 or equal NOISH/MSHA TC-21C mask) during burner and generator housing removal, cleaning and reassemble operations.
11. Pry bottom of burner tube out to clear bottom of generator housing. Pull burner down and out to remove from front generator housing (see Figure 31).
    Note: Be careful not to distort or damage the burner tube or the igniter and sensor assemblies in the generator housing.
12. Remove sheet metal screws holding front and rear generator housings together (see Figure 31).
13. Lift front half of generator housing out and place out of way.
14. Lift back half of generator housing up to clear lower partition mounted to base pan and then lean it towards back of unit.
15. Clean insulation in front generator housing with soft bristle brush.
16. Clean generator and back generator housing baffle with wire brush. Clean out all soot and debris from between generator fins.
17. Install rear generator housing first. Make sure bottom edge of housing is properly installed over lower generator housing bracket.
18. Install front half of generator housing by placing the bottom edges of the housing and insulation between the lower insulation and the lower generator bracket.
19. Fasten front and rear generator housings together using sheet metal screws.
20. Inspect burner gasket that seals burner tube to the generator housing and the burner gasket that seals burner to premix blower housing. Replace either gasket if damaged during burner removal.
21. Replace burner tube in reverse order of removal.

Note: Make sure the two gaskets are positioned correctly and that generator housing is properly sealed.

22. Reassemble the remaining parts in reverse order.
23. Turn on gas and electric supply to unit.
24. Start unit and check for correct operation.

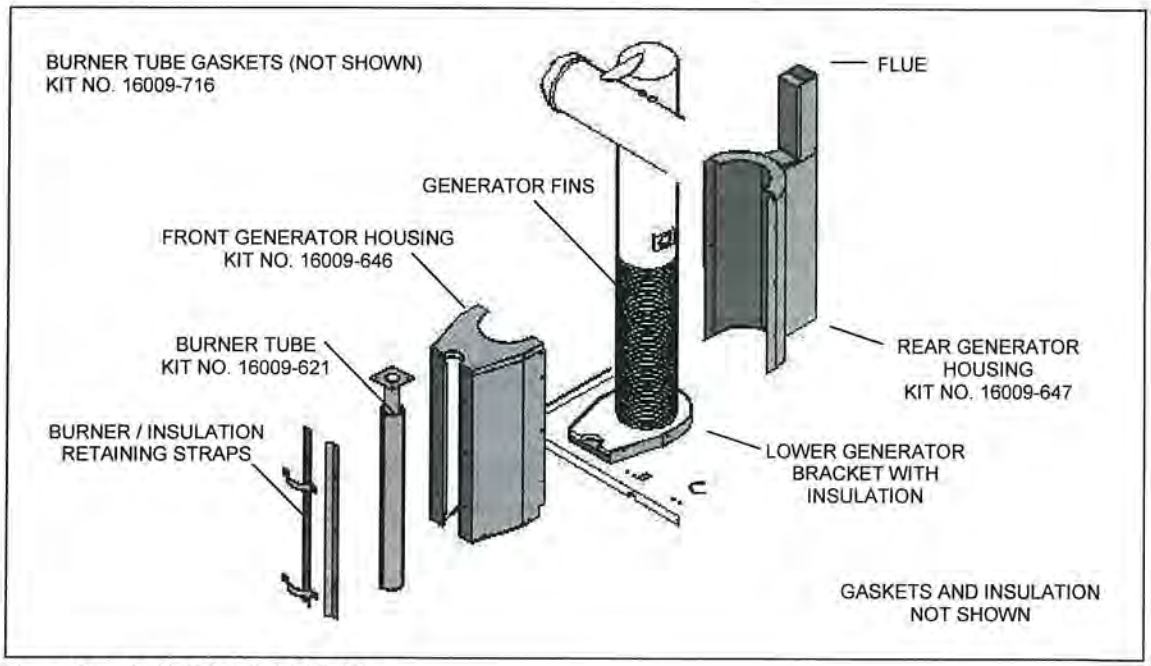


Figure 31 – GENERATOR ASSEMBLY

FLUE GAS PASSAGE INSPECTION AND CLEANING

Early in the year before operating the chiller on cooling, complete the following instructions:

1. Turn off gas and electric supply to the unit.
2. Remove front panel.
3. Remove top panel.
4. Clean the base pan around the generator housing of any debris.
5. Look down the flue opening at the back of the generator housing and clear any debris that may be obstructing the opening (see Figure 31).
6. Look down the air intake chute for combustion air and clear any debris that may be obstructing the opening.
7. Reinstall top panel.
8. Reinstall front door.
9. Turn on gas and electric supply to the unit.
10. Start unit to check for correct operation.

It is recommended that at least once a year a qualified service technician perform routine maintenance on the equipment.

Gas burners do not normally require scheduled servicing; however, deterioration or an accumulation of lint may cause yellowing flame or delayed ignition. Either condition indicates that a service call is required.

CHANGE AND CHECK OIL LEVEL

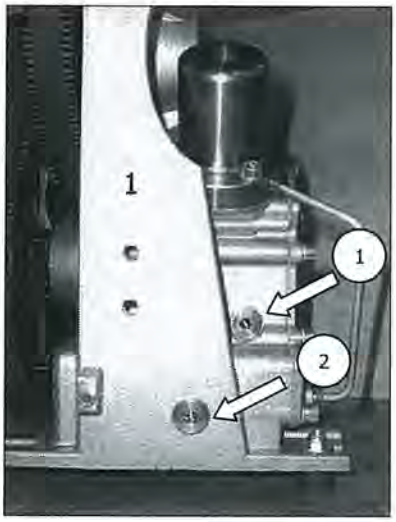
WARNING

DO NOT disconnect the hydraulic pump from the solution pump while performing any of the tasks listed below. If the hydraulic pump is diconnected from the solution pump, the hydraulic pump must be primed. For the procedure to prime the hydraulic pump, consult the "Priming Procedure".

Change the oil after first season of operation. Thereafter, change the oil every five years. The procedure to change the oil is as follows:

1. Turn off the gas and electrical supply.
2. Remove the front panel of the unit; the pump cover can remain in place.
3. A hole is located in the bottom of the base pan to allow the positioning of a container for the collection of the old oil.
4. Unscrew the oil drain plug (No. 2 in Figure 32) using a 6mm hex key wrench.
5. Let the oil drain into the waste oil container (the quantity of oil is about 0.5/0.6 quarts).
6. Replace the oil drain plug. Do not over-tighten.
7. Remove the oil fill plug (No. 1 in Figure 32) using a 6mm hex key wrench.
8. Refill with 0.6 quarts of Servel oil or approved equivalent. Let any excess oil drain from fill plug opening.
9. Replace the oil fill plug. Do not over-tighten.
10. Turn on gas and electrical supply to unit and check for correct hydraulic pump operation.

HYDRAULIC PUMP ASSEMBLY
KIT NO. 16009-660



1 OIL FILLER PLUG

2 OIL DRAIN PLUG

Figure 32 – RIGHT SIDE OF THE HYDRAULIC PUMP

PRIMING PROCEDURE

1. Turn off gas and power supply to the unit.
2. Turn the lower pulley to where the white mark is in the 9 o'clock position (i.e. horizontal).
3. Remove the hydraulic hose's flared-fitting from the hydraulic pump cylinder. Keep the loose end of the hose up, so the oil does not drain out. Fill hose with oil if necessary.
4. Fill the pump cylinder to the top with oil.
5. Tighten the hose's flared-fitting onto the hydraulic pump cylinder.
6. Turn the pulley clockwise to where the white mark is in the 6 o'clock position (the bottom-dead-center BDC as shown in Figure 33).
7. Loosen the hose's flared-fitting from the hydraulic pump. DO NOT REMOVE.

8. Slowly turn the pulley clockwise to the 12 o'clock position (the top-dead center TDC) or until oil emerges around the fitting.
9. Tighten the hose's flared fitting.
10. Spin the lower pulley clockwise and visually check for the counter-clockwise rotation of the pulley. (The counter-clockwise rotation is caused by internal pump pressure).
11. Repeat steps 6 through 10 until the pulley does spin counter-clockwise due to internal pressures.
12. Check the oil level of the hydraulic pump. Follow steps 7 through 9 of the "CHANGE AND CHECK OIL LEVEL" procedure.
13. Clean the basepan and hydraulic pump of any excess oil.
14. Turn on gas and electrical supply to unit and check for correct hydraulic pump operation.

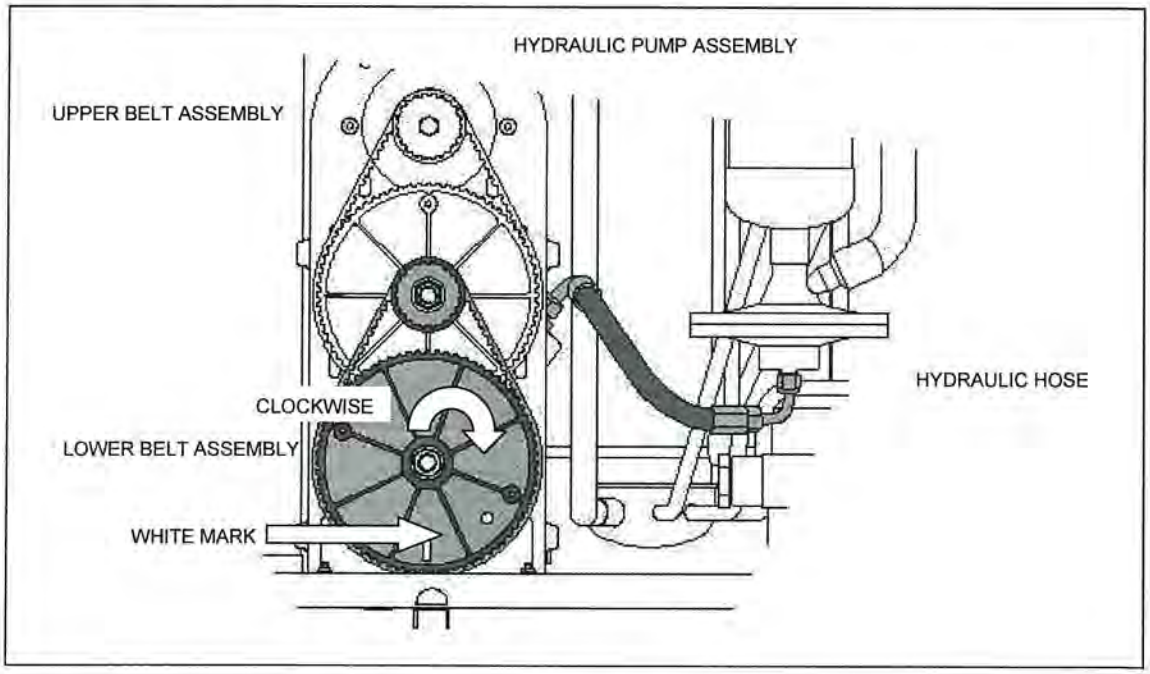


Figure 33 –LOWER PULLEY AT THE 6 O'CLOCK POSITION (BDC)

CHECK CONDITION OF BELTS

When checking condition of belts and pulley, shut-off power to the unit. Check condition of belts for any of the following:

1. Age cracking
2. Wearing of teeth on the belts or pulleys
3. Debris lodged in pulleys
4. Teeth missing on belts or pulleys

If any of the above conditions are present, replace the belt and the mating small pulley. Replace the larger pulley if damaged or worn. Belts should be replaced every 5 years or 5,000 working hours.

CHECK CONDENSER FAN HEIGHT

For proper air flow, the distance between the top edge of the fan blade and the top panel must be between 1-1/4" and 1-1/2". If the fan is at an improper height, adjust the location of the mounting strap around the fan motor.

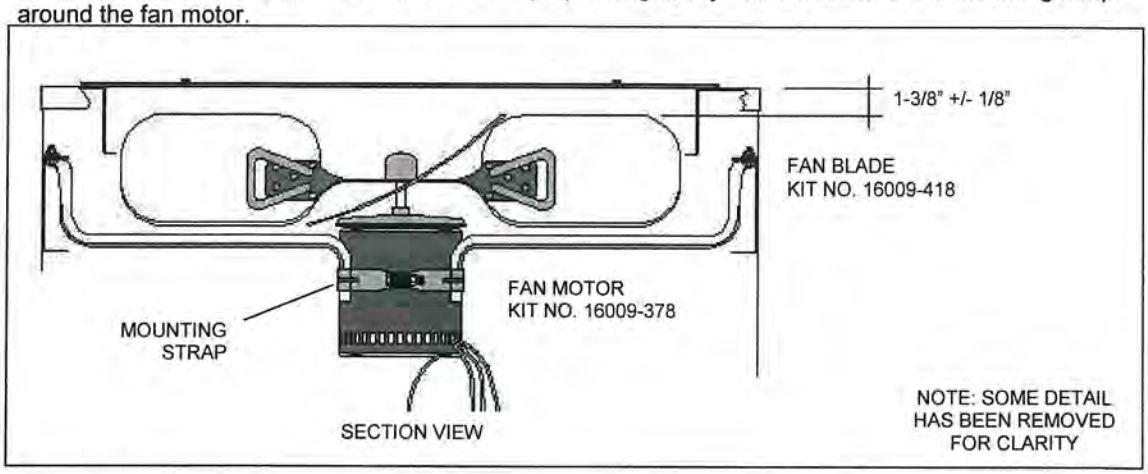


Figure 34 – SECTION VIEW SHOWING PROPER FAN HEIGHT

WASTE OIL BURNER AND PUMP MAINTENANCE AND ADJUSTMENTS

- Waste Oil Burner electrodes are adjusted at time of manufacturing. However, they should be checked periodically and at time of installation to be sure they are set as noted in Figure 35.
- Nozzle position in relation to flame cone/burner tube is critical for low maintenance operation. Periodically check position as per Figure 35. **CAUTION: TURN OFF MAIN ELECTRICAL POWER BEFORE CHECKING OR ADJUSTING ELECTRODE SETTINGS.**

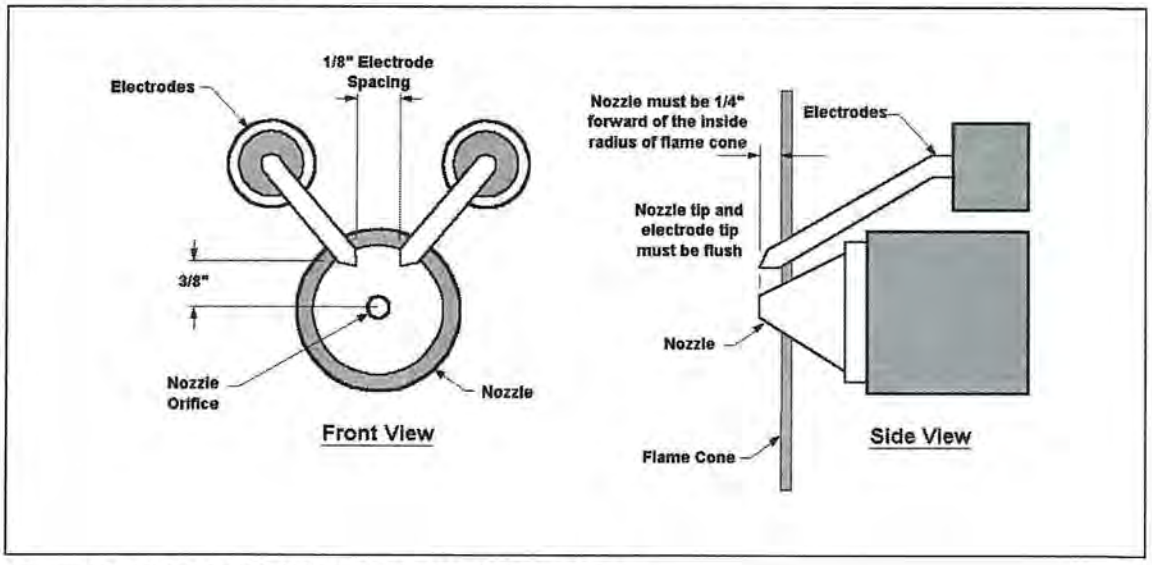


Figure 35 – ELECTRODE AND NOZZLE ADJUSTMENT DETAIL

- Check and clean pump strainer atleast once per season as shown in Figure 36.
- Check,clean or replace oil filter as needed as shown in Figure 37.

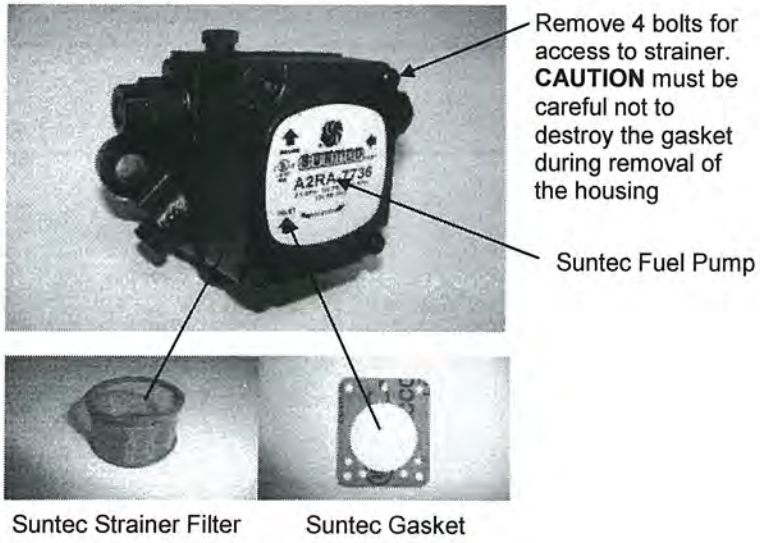


Figure 36 – Pump Strainer

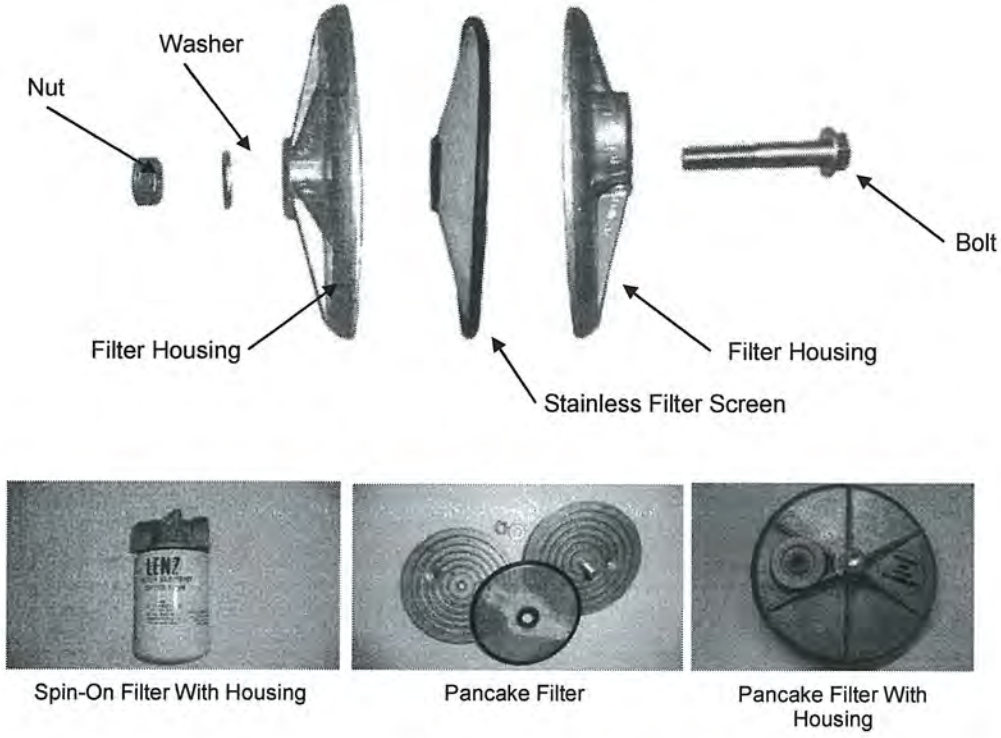


Figure 37 – Oil Filter (New Style Spin-On Filter and Old Style Pancake Filter)

10 TROUBLE-SHOOTING INSTRUCTIONS

ELECTRONIC SYSTEM OF THE OWC-5

The electronic control board of the unit is placed inside the electrical box and is equipped with a 4 digits display, and a regulating knob (encoder).
The DISPLAY (particular A) shows the operation data (example: chilled water temperature) and possible anomalies, through the visualization of the unit codes.
Besides, It is possible to visualize all relative available information (data, parameters, values, etc.).

LEGEND

A 4 digits DISPLAY for visualizing operational and unit codes

B REGULATING KNOB (Encoder) for scrolling/selection of data

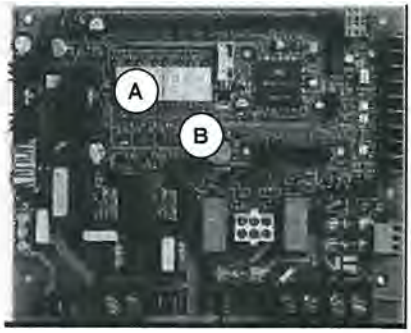


Figure 38 – ELECTRONIC CONTROL BOARD DETAIL

Rotating and pressing the REGULATING KNOB (particular **B**) allows the scrolling and selection of the information on the display.

Through the regulating knob and Display, operation management and control take place.

NOTE

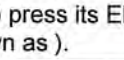
The electronic control board is placed inside the electrical box of the unit and is visible from the front panel.
To interact with the regulating knob (*encoder*) of the electronic control board, it is necessary to remove the front panel of the unit and, without opening the electrical box, to act on the encoder by the supplied tube of about 4-3/4".

Operation Management and Control

The Display of the electronic control board, during the normal operation, shows in alternative mode the following information:

- Water inlet temperature (after the symbol)
- Water outlet temperature (after the symbol)
- Temperature difference ΔT (after the symbol)

If anomalies are found, the electronic  control board will show them on the display and will visualize the relative flashing unit codes. (i.e.). Until the unit code is not deactivated, display will show the unit code flashing. When there are more than one

unit code deactivated, they will be visualized in alternative mode and flashing. To enter the menu of electronic control board (visualization menu) press its ENCODER once: on the display  the 1st menu entry will be visualized (menu 0, shown as).

NOTE

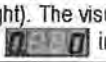
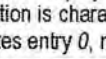
If any information (menu, menu entries, parameters and/or values, etc.) is visualized on the display in flashing mode, it means that this information couldn't be entered.
When an information is not available, the display visualizes :  .

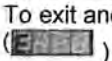
Rotating the encoder, all the other menu will be visualized on the display. To exit and return to the precedent level, it is necessary to select the letter "E") by pressing the encoder.

(

To enter in menu and visualize menu entries it's necessary to stop on the desired menu and press the encoder: on the display the first menu entry of the same menu will be visualized .

NOTE

The menu entries will be identified on the display of the electronic control board through a number, where its maximum value is 3 digits (lined up at right). The visualization is characterized by the presence (on the 1st digit of display) of the menu identification number (example :  indicates entry *0*, menu 0;  indicates menu entry 2, menu 0).

By rotating the encoder, all the other menu entries of the same menu will be visualized on the display. To exit and return to the precedent level (default visualization), it is necessary to select the letter "E" () by pressing the encoder. MENU DESCRIPTION

The electronic control board presents nine menu (from 0 to 8), as follows: MENU 0, 1 and 7 are "Visualization Menu" (data and parameters are readonly). In menu 0 it's possible to visualize the unit operation data detected from the electronic control board; In menu 1 it's possible to realtime visualize the unit operation data and the unit management. In menu 7 a number will represent the state of digital Inlet.

Menu 0: Data Visualization	
Menu 1: Parameter Visualization	
Menu 2: Actions	
Menu 3: End User Adjustment	
Menu 4: Adjustment by (Assistance Centers)	
Menu 5: Adjustment (by Assistance Centers)	
Menu 6: Unit Type Adjustment (by Assistance Centers)	
Menu 7: Digital Inlet Visualization	
Menu 8: Set Password (not manageable)	
"E": Exit	

MENU 2 is an "Execution Menu"; through this menu it's possible execute actions like reset ignition control box and reset errors, as consequence of anomalies detected by the unit. The code will be visualized on the display of the electronic control board.

MENU 3, 4, 5 e 6 are "Adjustment Menu", to adjust the contained information. Menu 3 is relative to the end user, who can eventually (if allowed) modify the value of parameters; an example are cold water set point and the water temperature difference setup.

MENU 4, 5 e 6 are only to be managed by Technical Assistance Authorized Personnel.

NOTE

The electronic control board has three fuses for circuit protection. If the electronic control board does not start up or the condenser fan does not run, remove power from the unit and check the condition of the fuses. The S60 board requires a 10A (condenser fan) and two 2A fuses (electrical board). The size of the fuse is labeled on the electronic control board next to the respective fuse holder.

WARNING

The **maximum** current carrying capacity of the N.O. Contact is **4A.** Refer to Section 5.2, Pump Wiring.

WARNING

An isolation relay **MUST** be used to separate the UNIT transformer from additional equipment having a transformer or damage to the S60 board will occur. Refer to Section 5.3, Control Switch Wiring.

TABLE OF MACHINE CODES (FIRMWARE VERSION 2.003)

The following table gives the codes that may appear on the display of the electronic board on the OWC-5:

	E 0
	FAULT ON RESET CIRCUIT OF FLAME CONTROL UNIT
CODE GENERATED BY:	Fault on reset circuit of flame control unit.
RESET METHOD:	Contact authorised ROBUR Technical Assistance Centre.
	U1
	MANUAL RESET OF THERMOSTAT, GENERATOR LIMIT TEMPERATURE
CODE GENERATED BY:	High temperature detected by limit thermostat on body of generator (T > 330.8 °F).
RESET METHOD:	Reset limit thermostat manually: the ACF will be reset automatically when the cause ceases. If the Machine Code persists, code U1 becomes E 1.
	E 1
	MANUAL RESET OF THERMOSTAT, GENERATOR LIMIT TEMPERATURE
CODE GENERATED BY:	U1 code active for 1 hour, or U1 code generated 3 times in 2 hours of operation.
RESET METHOD:	Contact ROBUR authorized Technical Assistance Centre.
	U2
	EXHAUST FUMES THERMOSTAT AUTOMATIC RESET
CODE GENERATED BY:	High temperature detected by exhaust fumes thermostat (T > 473 °F).
RESET METHOD:	Reset occurs automatically when the condition that generated the code ceases, with hysteresis of 14.4 ° (T < 458.6 °F).
	E 2
	EXHAUST FUMES THERMOSTAT – MANUAL RESET
CODE GENERATED BY:	U2 code active for 1 hour, or U2 code generated 3 times in 2 hours of operation.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If Machine Code U2 and/or E 2 occur again, contact ROBUR authorized Technical Assistance Centre.
	U3
	COLD WATER ANTIFREEZE THERMOSTAT
CODE GENERATED BY:	Low temperature detected by cold outlet water sensor (< 35.6 °F), or sharp drop in temperatures detected by cold outlet or inlet water sensor.
RESET METHOD:	Reset occurs automatically when the condition that generated the code ceases, with hysteresis of 3.6 °.
	U4
	INADEQUATE VENTILATION / CONDENSER OVERHEATING
CODE GENERATED BY:	(TCN TA) values > limit set.
RESET METHOD:	Reset occurs automatically 20 minutes after the Machine Code is generated.
	E 4
	INADEQUATE VENTILATION / CONDENSER OVERHEATING
CODE GENERATED BY:	U4 code generated twice in 2 hours of operation.
RESET METHOD:	Carry out appropriate checks. Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 5

	HIGH AMBIENT TEMPERATURE
CODE GENERATED BY:	High temperature detected by ambient temperature sensor.
RESET METHOD:	Reset occurs automatically when the condition that generated the code ceases, with hysteresis of 3.6 °.
	E 6
	LOW AMBIENT TEMPERATURE
CODE GENERATED BY:	Low temperature detected by ambient temperature sensor
RESET METHOD:	Reset occurs automatically when the condition that generated the code ceases, with hysteresis of 3.6 °.
	U7
	HIGH CONSENSER INLET TEMPERATURE
CODE GENERATED BY:	High temperature detected by condenser inlet temperature sensor (T > 239 °F).
RESET METHOD:	Reset occurs automatically when the condition that generated the code ceases, with hysteresis of 90 ° (T < 149 °F).
	E 7
	HIGH CONSENSER INLET TEMPERATURE
CODE GENERATED BY:	U7 code active for 1 hour, or U7 code generated 3 times in 2 hours of operation.
RESET METHOD:	Carry out appropriate checks. Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 8
	FLAME CONTROL UNIT ERROR
CODE GENERATED BY:	E 12 code on ACF and condenser inlet temperature increasing by over 18 ° within 1 hour.
RESET METHOD:	Carry out appropriate checks. Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	U9
	BURNER MALFUNCTION
CODE GENERATED BY:	Low temperature detected by condenser inlet sensor (after 15 minutes of operation).
RESET METHOD:	Reset occurs automatically 20 minutes after the Machine Code is generated.
	E 9
	BURNER MALFUNCTION
CODE GENERATED BY:	U9 code generated 2 times in 2 hours of operation.
RESET METHOD:	Carry out appropriate checks. Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	U10
	COLD WATER CIRCUIT FLOWMETER: Insufficient chilled water flow
CODE GENERATED BY:	Insufficient cold water flow.
RESET METHOD:	Reset occurs automatically when correct water flow is restored.
	E 10
	COLD WATER CIRCUIT FLOWMETER: Insufficient chilled water flow
CODE GENERATED BY:	U10 code generated 3 times in 2 hours of operation of circulator.
RESET METHOD:	If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	U11

	INSUFFICIENT ROTATION OF OIL PRESSURE PUMP
CODE GENERATED BY:	Insufficient rotation of oil pressure pump.
RESET METHOD:	Reset occurs automatically 20 minutes after the Machine Code is generated.
	E 11
	INSUFFICIENT ROTATION OF OIL PRESSURE PUMP
CODE GENERATED BY:	U11 code generated 2 times in 2 hours of operation.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorized Technical Assistance Centre.
	U12
	FLAME CONTROL UNIT ARREST
CODE GENERATED BY:	Failure to ignite burner with consequent arrest of flame control unit.
RESET METHOD:	Reset occurs automatically 5 seconds after the Machine Code is generated.
	E 12
	FLAME CONTROL UNIT ARREST
CODE GENERATED BY:	Flame arrest signal.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 0. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 16
	COLD OUTLET WATER TEMPERATURE SENSOR DEFECTIVE
CODE GENERATED BY:	Fault (interruption or short circuit) on cold outlet water temperature sensor.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 0. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 17
	COLD INLET WATER TEMPERATURE SENSOR DEFECTIVE
CODE GENERATED BY:	Fault (interruption or short circuit) on cold inlet water temperature sensor.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 18
	CONDENSER OUTLET TEMPERATURE SENSOR DEFECTIVE
CODE GENERATED BY:	Fault (interruption or short circuit) on condenser outlet temperature sensor.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 20
	CONDENSER INLET TEMPERATURE SENSOR DEFECTIVE
CODE GENERATED BY:	Fault (interruption or short circuit) on condenser inlet temperature sensor.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.
	E 21
	ECCESSIVE NUMBER OF RESETS OF FLAME CONTROL UNIT VIA DIRECT DIGITAL
CODE GENERATED BY:	Excessive number of resets performed via DDC (more than 5 resets in 15 minutes).
RESET METHOD:	Contact authorised ROBUR Technical Assistance Centre.
	U77
	ACF: FLOWMETER ON WITH PLANT OPERATING IN HOT MODE

CODE GENERATED WHEN:	The flowmeter of the cold circuit detects water in the circuit, when (and only in such a situation) the ACF is configured for a 2pipe coldhot plant and at that moment is operating in hot mode.
RESET METHOD:	Reset occurs automatically when the condition that generated the code ceases.

U80

INCOMPLETE OPERATING PARAMETERS

CODE GENERATED BY:	Incomplete operating parameters.
RESET METHOD:	The Machine Code remains active until the operating parameters are entered and completed. Contact authorised ROBUR Technical Assistance Centre. NB: If the board is replaced, Code E 80 may appear: this means that ACF characterisation data has not been set.

E 80

WRONG UNIT CHARACTERISATION PARAMETERS

CODE GENERATED BY:	Wrong unit characterisation parameters.
RESET METHOD:	Enter and complete the ACF operating and characterisation parameters: contact authorised ROBUR Technical Assistance Centre. Reset may be performed through the board via menu 2, menu item 1.

U81 U82

INVALID BANK 1 DATA INVALID BANK 2 DATA

CODE GENERATED BY:	Invalid Bank 1 data Invalid Bank 2 data.
RESET METHOD:	Reset occurs automatically 5 seconds after the Machine Code is generated.

E 81 E 82

INVALID BANK 1 DATA INVALID BANK 2 DATA

CODE GENERATED BY:	Invalid Bank 1 data Invalid Bank 2 data.
RESET METHOD:	Enter and complete BANK 1 and BANK 2 data via the appropriate menu: contact authorised ROBUR Technical Assistance Centre. Reset may be performed through the board via menu 2, menu item 1.

E 84

23V TRANSFORMER OR FUSE CONNECTIONS FAULTY

CODE GENERATED BY:	Damage to one of the 2 fuses or one of the power cables on the 23 V~ transformer.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.

E 85

INCORRECT MODULE TYPES SET (from menu 6)

CODE GENERATED WHEN:	The types of module set (from menu 6) do not correspond to those managed by the board.
RESET METHOD:	Contact authorised ROBUR Technical Assistance Centre.

E 86 E 87 E 88 E 89

MEMORY TEST UNSUCCESSFUL

CODE GENERATED BY:	Processor memory errors.
RESET METHOD:	Contact authorised ROBUR Technical Assistance Centre.

E 90

AMBIENT TEMPERATURE SENSOR DEFECTIVE

CODE GENERATED BY:	Interruption or short circuit of ambient temperature sensor.
RESET METHOD:	Reset may be performed through the board via menu 2, menu item 1. If the reset operation is unsuccessful, contact ROBUR authorised Technical Assistance Centre.

11 ADAPTING TO ANOTHER GAS

If the type of gas indicated does not correspond to the type to be used (natural or propane gas) by unit, it must be converted and adapted to the type of gas to be used. The gas orifice (nozzle) must be changed and the gas valve must be converted.

For this operation proceed as follows:

1. 1. Turn off the gas and electrical supply, remove front and left panel.
2. 2. Remove the wires from the gas valve.
3. 3. Remove the ring nut from the threaded gas nozzle.
4. 4. Remove the gas nozzle from gas valve by removing the 4 screws from the valve flange (use 9/64 hex key wrench). Put the o ring in a safe place, to be reused with the new nozzle.
5. 5. Attach the new gas nozzle to the gas valve using the 4 screws to secure valve flange: be sure to put the o ring in the proper site.
6. 6. Tighten the ring nut and reattach wires to the valve.
7. 7. Turn on the gas and electrical supply.
8. 8. Adjust the gas pressure for the gas to be used following the instructions reported in SECTION 6.3 "GAS PRESSURE ADJUSTMENT".
9. 9. Replace the stickers indicating the type of gas for which the unit is preset with the new one, which indicates the type actually being used.

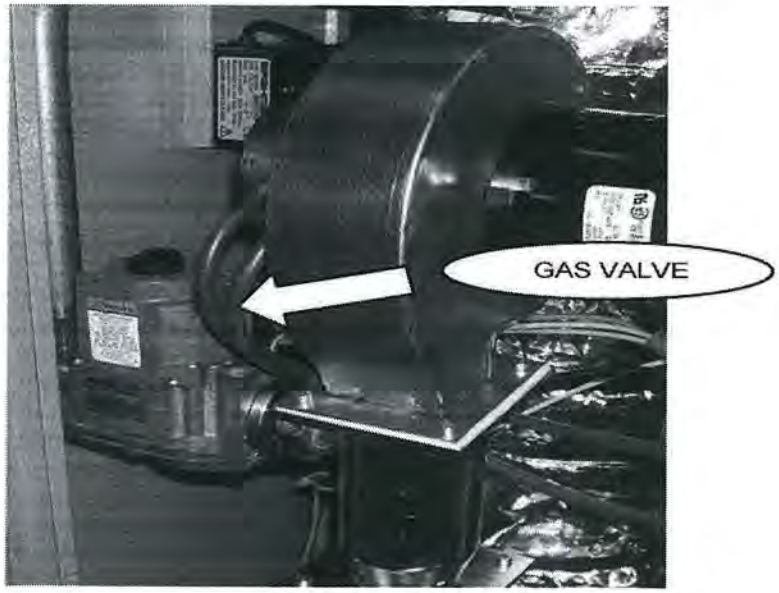


Figure 39 – GAS VALVE

NOTE

ONLY an Authorized Technician can perform the operation described in this section.

12 APPENDIX

ELECTRONIC CONTROL BOARD (S-60)

All chiller functions and operations are monitored and controlled by the electronic control board.

When power is supplied to the unit, the electronic control board will initialize the control program. "**CAP**" will appear on the display. "**H60**" will appear next, showing that the power supply to the board is 60 hertz. The display will next show the chilled water thermostat set point.

The board will then begin to monitor all thermistors and switches to ensure proper and normal working conditions. If a fault occurs with any of the thermistors and switches, a fault code will appear (see Fault Codes on page 59).

If no faults are found and the control switch wired to the R-Y contacts is closed, the electronic control board will start the unit. The hydraulic pump, condenser fan, and water pump (if controlled by the unit) will start. Simultaneously, the electronic control board will energize the ignition control box to begin the ignition sequence (see Ignition Control Box for details).

During operation, the inlet water temperature and temperature differential will appear on the display, indicated respectively by different LEDs (see Section 6.5, Chilled Water Temperature Regulation).

The electronic control board will increase or decrease the condenser fan speed to obtain the designed temperature differential between the external ambient and the condenser outlet. If this maximum allowable temperature differential is not maintained, a fault code will appear (see Page 59, Fault Codes).

If the control switch is opened, the S-60 board will de-energize the ignition control box and begin cycle down. The hydraulic pump, condenser fan, and water pump (if controlled by the unit) will continue to operate for another 215 seconds.

If the chilled water thermostat set point is reached, the S650 board will de-energize the ignition control box and begin cycle down. The hydraulic pump and condenser fan will continue to operate for another 215 seconds. The water pump (if controlled from the S-60) will continue to run until the outlet water temperature is 1°F above the chilled water set point. If the control switch is still closed, the unit will start again.

NOTE

The electronic control board has three 5mm x 20mm fuses for circuit protection. If the electronic control board does not start up or the condenser fan does not run, remove power from the unit and check the condition of the fuses. The S-60 board requires a 10A, 3.15A, and 2A fuse. The size of the fuse is labeled on the electronic control board next to the respective fuse holder (see Figure 41).

WARNING

The **maximum** current carrying capacity of the N.O. Contact is **4A.**.

WARNING

An isolation relay **MUST** be used to separate the unit's transformer from additional equipment having a transformer or damage to the S-60 board will occur. Refer to Section 5.3, Control Switch Wiring. Relay (Kit No. 18010-116)

IGNITION CONTROL BOX

When power is supplied to the unit and consequently to the "R" terminal on the ignition control box, the ignition control will reset, perform a self check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds, and enter thermostat scan state. See Figure 40.

When the control switch is closed, the electronic control board will energize the ignition control box starting the ignition sequence (24 volts applied to the "W" terminal on the ignition box).

The ignition control box will check the differential air pressure switch for open contacts.

- If the differential air pressure switch contacts are closed and stay closed for 30 seconds, an air flow fault will be appear The diagnostic LED on the ignition control box indicates this fault. In this mode, the ignition control box will not start the premixer blower.

If the pressure switch contacts are open, the ignition control box will start the premixer blower.

- An air flow fault will occur if the air pressure switch contacts remain open 30 seconds after the premixer blower starts. The diagnostic LED on the ignition control box indicates this fault. In this mode, the ignition control box will keep the premixer blower energized.

If the air pressure switch contacts close after the premixer blower starts (normal operation), a pre-purge delay begins and the ignition sequence continues.

Next, the ignition control box energizes an ignition transformer that generates a high intensity spark at the igniter to ignite the gas/air mixture (see Figure 41). Simultaneously, the gas valve is energized, allowing the flow of gas to the burner.

The ignition control box continuously monitors the flame sensor for ignition. If the flame sensor detects flame, the ignition transformer is de-energized immediately and the gas valve and premixer blower remain energized.

Should the burner fail to light, or flame is not detected during the first trial for ignition, the gas valve and ignition transformer are de-energized and the ignition control box begins an inter-purge delay before another ignition attempt. The control will attempt two additional ignition trials (total of 3 ignition trials) before going into lockout. Upon lockout, the gas valve will de-energize immediately and the premixer blower will turn off.

The thermostat ("W" terminal), air pressure switch, and burner flame are constantly monitored to assure proper system operation. When the call for flame has ended, i.e. 24volts removed from "W" terminal on ignition control, the gas valve is de-energized immediately. The ignition control then senses loss of flame and de-energizes the premixer blower.

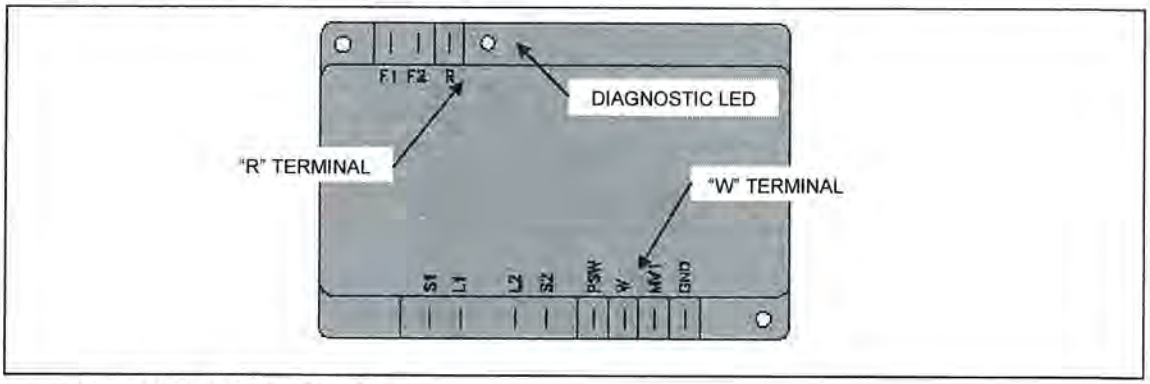


Figure 40 – IGNITION CONTROL BOX

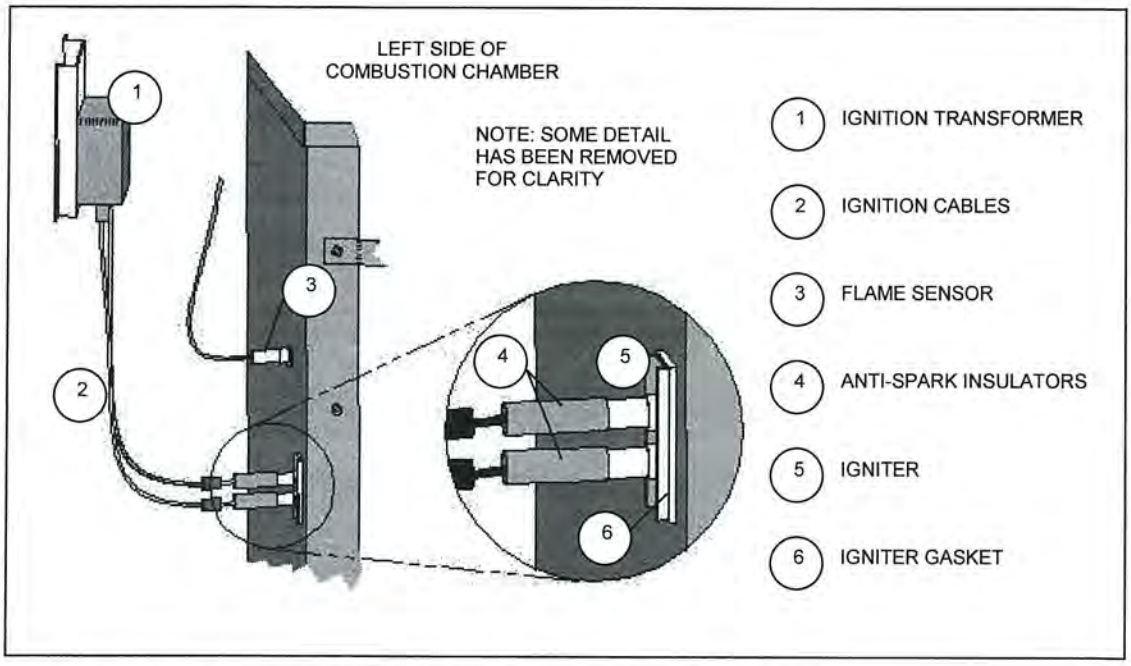


Figure 41 – IGNITION TRANSFORMER, IGNITER ASSEMBLY, AND FLAME SENSOR

UNI-PAK Waste Oil Chiller

Limited Warranty

UNI-PAK warrants to the purchaser of waste oil chiller will be free from defects in materials and workmanship for the durations specified below, which duration begins on the date of delivery to the customer. Customer is responsible for maintaining proof of date of delivery.

If return is deemed necessary for warranty evaluation and determination of repair or replacement, chiller is to be sent to the factory with freight prepaid. UNI-PAK reserves the right to determine appropriate action for repair or replacement.

No parts will be accepted by UNI-PAK without RA# (return authorization number) clearly marked on outside of shipping package. Obtaining RA# requires model and serial numbers, description of part being replaced and nature of defect. Call factory to receive RA#.

Warranty Covers:

Air Cooled Absorption Water Chiller

1. Three Years full repair or replacement (Parts Only)

Waste Oil Burner and Combustion Chamber

1. Combustion Chamber and Heat Exchanger five (5) years *full repair or replacement, additional five (5) years prorated. (Parts Only)
2. Oil Heater Block, twenty (20) years. (Part Only)
3. Oil Heater Block Controller PCB, three (3) years. (Parts Only)
4. All other components, one (1) year. (Parts Only)

This warranty is void if:

1. Warranty registration card is not returned within thirty (30) days of purchase.
2. Any part or component subject to abuse or altered from original manufactures specifications.
3. Installation not in accordance with instructions.
4. Has not been properly maintained, operated or has been misused.
5. Wiring not in accordance with diagram furnished with chiller.
6. Chiller is operated in the presence of chlorinated vapors.

Warranty is limited to the original purchaser.

The above warranty is in lieu of all other warranties expressed or implied. UNI-PAK does not authorize any person or representative to make or assume any other obligation or liability that is not in accordance with above warranty. **UNI-PAK is not responsible for any labor cost unless prior authorization in writing has been obtained.**

NOTE: Combustion Chamber Warranty is specific to material and workmanship. Workmanship means UNI-PAK warranties the welds are good and will hold. Material means they won't corrode through due to sulfur in the ash that accumulates during operation. Warranty does not apply to units that experience overheating stress cracks. These are not incurred because the materials are inadequate for the application nor are they a result of a weld broke lose because of bad penetration. Which is easily recognized by the material being left underneath the weld. These cracks occur as a direct result of improper draft, either by inadequate initial installation and setup which requires (1) establishing a proper draft during installation (2) back draft has occurred due to ash buildup, backing up hot gas passageways either in the exchangers, the stack, or both. (3) Over firing by setting oil supply pressure too high (see manual for proper setting) these are all cases of thermal overload.

* Under normal use only. If misuse or abuse is deemed apparent after inspection, warranty is void.

WARRANTY CARD

Please fill our, tear off and return to manufacturer

Return following warranty information to manufacturer within thirty (30) days of purchase or warranty will not be valid. (Please print or type).

Date of Purchase_____

Serial #_____ Model _____

Customer Name_____

Address_____

City _____ State _____ Zip Code _____

Dealer _____

Address _____

City_____ State _____ Zip Code _____

Installed at _____