

Waste Oil Fired Boiler 280-480

Installation, operation and service instructions
120v Manual

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Important Information

Waste oil contains various unknown materials and may also contain random amounts of gasoline or other volatile fuels. Specific safety and handling precautions should be considered when cleaning, maintaining and operating waste oil boilers.

It is recommended to use a filter or some kind of strainer when pouring waste oils into the storage tank(s). This will increase chances of catching any particulates prior to the pump filter(s) to insure a cleaner fuel source.

WARNING:

Waste oil boilers should not be used in any hazardous areas that may contain flammable or volatile vapors or even combustible dusts. It is not recommended to use a waste oil boilers in any areas that may have chlorinated or similar chemical vapors. This will cause deterioration & corrosion of the metals the equipment is constructed of (this would void the warranty). Antifreeze does not burn and will interrupt the performance of the unit and potentially shut down completely until re-primed and restarted. If too much antifreeze is present just like water, the unit will not fire. Do not expose units to water, moisture or rain. This is an inside unit, not designed for outdoor use.

Oils and different Viscosities that can be burnt, but not limited to:

*Used Motor Oils *Transmission Fluid *Hydraulic Fluids *Diesel Fuels

Do not use old contaminated oils or fuels and keep in mind underground tanks and outdoor oil storage could have unknown amounts of water and moisture, outside barrels will leak water and moistures through the bunghole.

IMPORTANT:

The instructions and information within this manual are provided to remind you of any warnings and to assure you have properly and successfully setup the equipment purchased. The information is also intended to help the end user/installer be aware of the operations and service required for optimal performance. These boilers are recommended for primary or an auxiliary source of heat but are not recommended for use as the sole source of heat in case of any expected or unexpected downtime with the unit. If a steady supply of fuel is not present or interrupted at the burner unit, the burner unit will shut down. Be prepared with an alternate source of heat to insure the building and all pipes are not at risk of freezing temperatures.

Taking Delivery of Equipment:

When taking delivery of your equipment, please be sure to check the shipment for any potential damages (MorrHeat is not responsible for any damaged shipments if signed for non-damaged). If any damage is identified upon delivery, either sign for as damaged goods specifically noting in detail the apparent damage / or / refuse the shipment completely and be sure to file a claim with the shipping company **immediately** regardless of the damage.

Notice

To insure the best performance, optimal efficiencies and heat output of the heating unit, it is recommended and necessary to become familiar with your unit and the procedures needed with initially starting, running, cleaning and maintaining the heating unit.

It is important to remember when burning used or dirty oils that contaminants could be present. Because of various contaminants, be aware of needing to change filters when needed. Keep the chamber and heat exchanger(s) passageways clean. Make sure the fuel pump is primed and lines are free of any debris, air bubbles or interruptions.

Draft is just as important as the rest; bad draft can cause serious problems and not allow the gasses within the unit to correctly leave the heating unit. Correct draft is needed for optimal performance. Bad draft will cause over-fire or overheating due to bottling up the heat or creating back pressure back in to the heating unit. If black smoke is present, bad draft, bad combustion or both is occurring.

Burner & Pump Specifications

BURNER ASSEMBLY

Performance Ratings

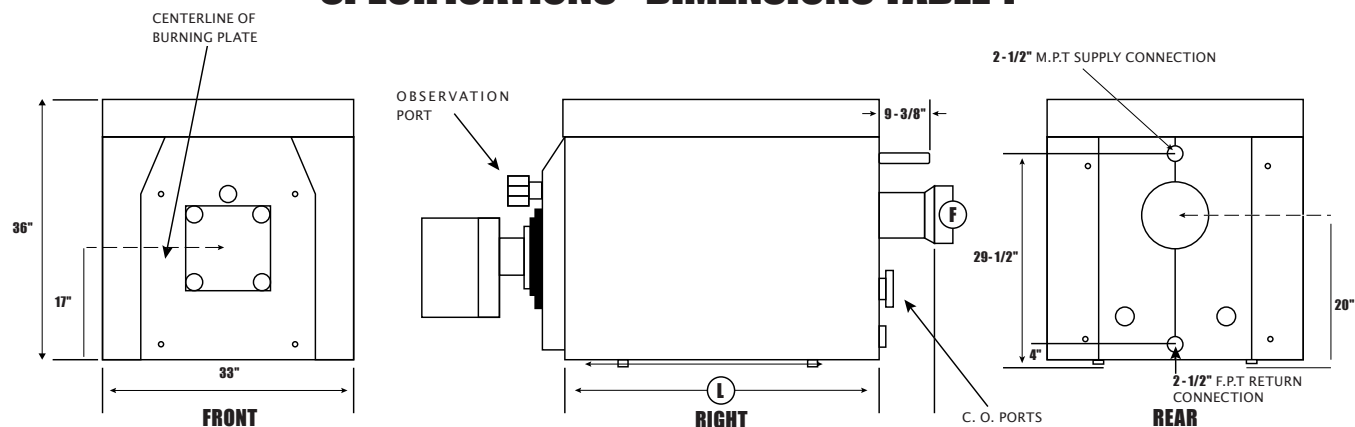
Voltage	–	120v
Cycles	–	60Hz
Total Operating Amperage (Burner Only)	Amp	8.4
Total Operating Amperage (Burner & Oil Pump)	Amp	10.5
Electrical Operating Consumption (Burner Only)	Watts	970
Electrical Operating Consumption (Burner & Oil Pump)	Watts	1,212
Weight	Lbs	36.5
Oil Primary	Amp	0.2
Oil Valve	Amp	0.075
Pre-Heater Block	Amp	4.2
Pre-Heater Controller Board	Amp	0.011
Igniter Transformer	Amp	0.3
Burner Motor	Amp	3.6

PUMP ASSEMBLY

Performance Ratings

Voltage	–	120v
Cycles	–	60Hz
Total Operating Amperage (Pump Assy Only)	Amps	2.1
Electrical Operating Consumption (Pump Assy Only)	Watts	241.5
Weight	Lbs	16
Oil Valve	Amps	0.075
Pump Motor	Amps	2.0

SPECIFICATIONS - DIMENSIONS TABLE 1



Boiler Model	OIL GPH	APPROX. DRY WEIGHT LBS.	Vent Connect DIA" (F)	I-B-R VENT DIA"	DIM" (L)	WATER CONTENT GAL.
MHB280	2.0	1301	10	8	42	22.2
MHB360	2.5	1654	10	10	52	28.5
MHB480	3.0	1831	10	10	57	31.7

Note: All dimensions are inches

* Gross I-B-R rating has been determined under the I-B-R provisions governing forced draft conditions (0.10 inch W.C positive pressure at the boiler flue gas outlet.

** Net ratings are based on piping and pickup allowance 1.15.

*** I-B-R Vent Diameter size is the pipe size used from boiler vent connector (F) to Termination of stub stack: Max Height 15' (For forced draft firing only). For chimney venting consult National Fuel Gas Code.

Product Description

The MHB Series boilers are a three pass Scotch Marine design, with fully water backed heat transfer surfaces. Boilers are designed for use in forced hot water heating systems up to 75 PSI water working pressure. They may be used with burners firing gas or oil. Boiler-Burner units operate with a positive pressure overfire and may be vented using a conventional chimney with a balanced draft or pressurized vent systems.

The boiler block (heat exchanger) is factory assembled using cast iron push nipples. This heat exchanger has horizontal flue passages through which the products of combustion make three distinct passes to maximize the heat transfer process.

Inspect Shipment

Any claims for damage or shortage must be filed immediately against the carrier by the consignee. No claims for variances from, or shortage in orders, will be considered unless presented within 7 days after receipt of goods. Boiler shipment comes on two separate pallets.

NOTE: Burner, when ordered, is shipped separately

1. Wood pallet with:
 - A. Boiler block with baffles installed in flue passages.
2. Wood pallet with shrink wrapped boxes:
 - A. Box of jacket parts.
 - B. Box marked #1 (Manifold Box)
 - a. Supply and return manifold with gaskets, mounting studs, nuts and washers.
 - b. Return diffuser and gaskets.
 - c. (2) 3/4" Male x Female extensions coupling for optional controls.
 - C. Box marked #2 (Control Box)
 - a. L4008A Hi-Limit with 3/4" well and capillary clip.
 - b. Tridicator Gauge
 - c. Relief Valve
 - d. Bag of refractory mix to insulate burner blast tube in front door.
 - e. Instruction manual
 - f. Boiler rating tag and A.S.M.E. Tag
 - g. Flame Sight Assembly
 - h. (4) Spacers to secure back jacket panel.
 - D. Box marked #3
 - a. Quadrant locking damper

Before Install

CODE REQUIREMENTS:

Installation must comply with all state, local and utility codes. When required, the installation must conform to A.S.M.E. safety code for controls and safety devices for automatically fired boilers No. CSD-1.

RULES FOR SAFE INSTALLATION AND OPERATION:

1. Read this owner's manual and the rules for safe operation carefully. Failure to follow the rules for safe operation and the instructions could cause a malfunction of the boiler and result in depth, serious bodily injury, and/or property damage.
2. Be certain burner is designed for the type of fuel to be used. Overfiring will result in premature failure of the boiler sections and cause dangerous operation.
3. Locate the boiler as close to the chimney as practical (See Fig. 1,2,3)
Observe the minimum clearances outlined in (Fig. 1). Remember to allow room for the boiler door to open with the burner mounted.
4. Make sure that the surface on which the boiler is to be installed is capable of supporting the weight of the boiler, burner, and all other equipment supported by the surface.
5. A boiler pad is strongly recommended (see Fig. 1). This pad is to be made of poured concrete. It should be at least 4 inches thick and should cover the entire area under the boiler (not just under the legs).
6. Make sure that the location chosen for the boiler will provide adequate air for combustion and ventilation (See Fig. 2). Also make sure that fuel and electrical requirements can be satisfied at the boiler location chosen.
7. For typical boiler/heating system piping which incorporates a blending pump, or for primary secondary pumped system See Fig. 4, 5, 6.
8. The heating system design shall not permit the boiler's return water temperature to be lower than 130°F for a significant period of time. This will prevent fireside corrosion and

Boiler Room Air Requirement

WARNING

Failure to provide an adequate supply of fresh air for combustion will result in hazardous operating conditions. Do not use an exhaust fan in the boiler room.

1. To ensure safe, efficient operation, the boiler system must be supplied with sufficient air for combustion and ventilation. (See Fig. 2)
2. Unless properly controlled, avoid the use of forced ventilation, since it can create an undesirable pressure differential between boiler room and air source.
3. All boilers located in confined rooms should have free access to ventilation and combustion air from two permanent opening. One opening should terminate within 12" of the ceiling, the other 12" of the floor. Each opening shall have at least 1 sq. inch free area per 1,000 btu/hr. of burner input. Opening should freely connect with areas having adequate infiltration of outside air.

When air comes directly from outdoors, again use two openings as explained above, except:

- Direct connection or vertical ducting allow 1 sq. inch per 4,000 btu/hr.
- Direct connection through horizontal ducting allow 1 sq. inch per 2,000 btu/hr.
- All ducting shall be the same size as opening but no less than 3 x 3 or 9 sq. inches.

Remember to compensate for louver blockage when calculating free air. Refer to the manufacturer's instructions or use the general guild:

WOOD LOUVERS allow 20–25% free air, METAL LOUVERS or GRILLES allow 60%–70% free air. Any louvers dampers should lock open or interlock with the burner to open automatically when the boiler operates.

FIG. 2 | RECOMMENDED BOILER ROOM VENTILATION & COMBUSTION AIR

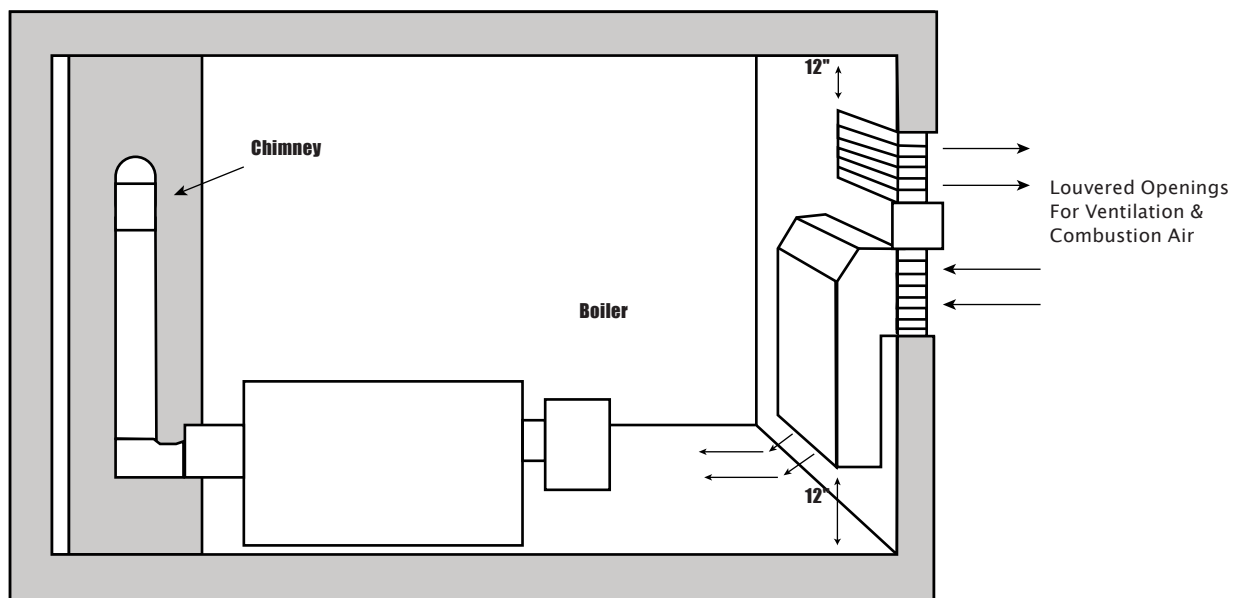
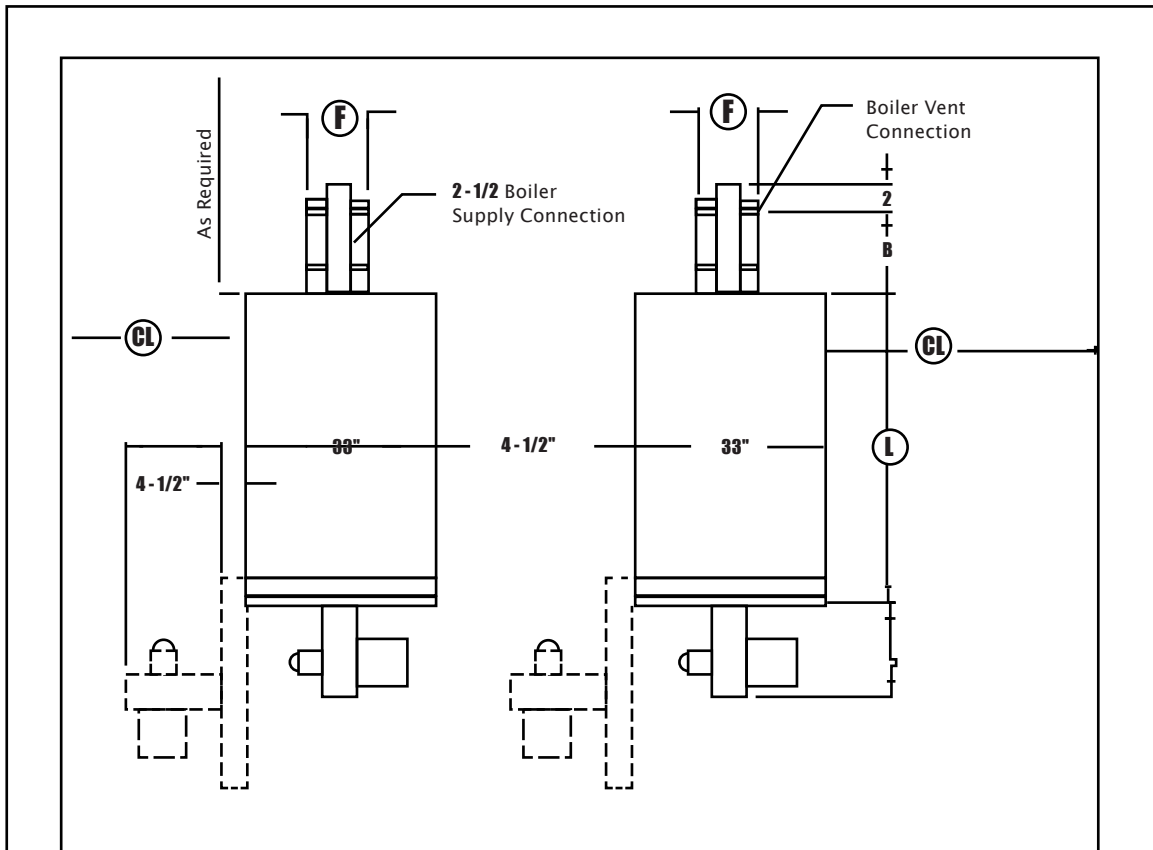


FIG. 1 | TYPICAL BOILER ROOM LAYOUT



BOILER MODEL	VENT CONNECTION DIA" F	DIMENSIONS" L
MHB280	10	42
MHB360	10	52
MHB480	10	57

Notes:

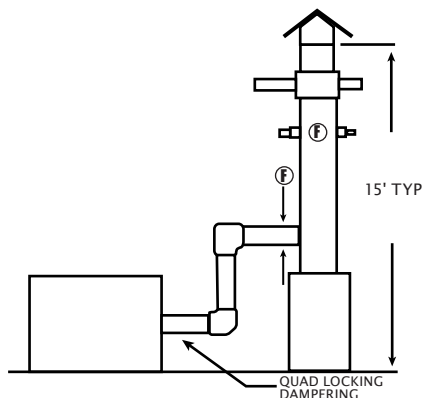
1. CL Dimensions as per job specs, and applicable codes.
2. B Dimensions of burners other than shown, consult crown.

FIG. 3 | CHIMNEY OR VENT SYSTEM

The MorrHeat boilers operates with positive pressure throughout the boiler furnace and flue passages. The over-fire pressure will vary according to boiler size. Consult local building codes for proper installation of vent system relative to the fuel being burned. See burner manufactures draft recomendation.

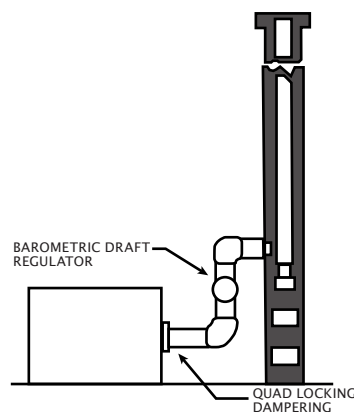
FORCED DRAFT

Boiler breech & stub vent operate at positive pressure. Entire system must be gas tight . Stub vent height must be limited to prevent negative draft. Should negative draft occur install a barometric draft regulator.



BALANCED DRAFT

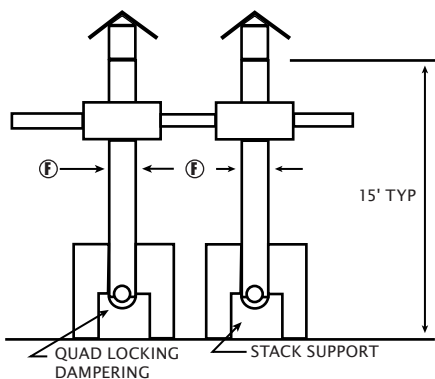
Boiler operates with positive pressure overfire. Chimney provides negative pressure that is balanced with a barometric draft control.



MULTIPLE BOILERS

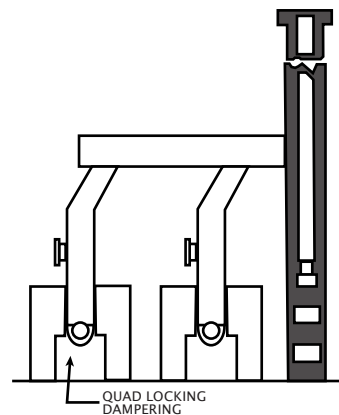
Boiler, breech & stub ven operate a positive pressure: entire system must be gas tight: Stub vent height must be limited to prevent negative draft: should negative draft occur, install a barometric draft regulator.

EACH BOILER MUST HAVE A STUB VENT.



MULTIPLE BOILERS

Conventional chimney with multiple boiler balanced draft.



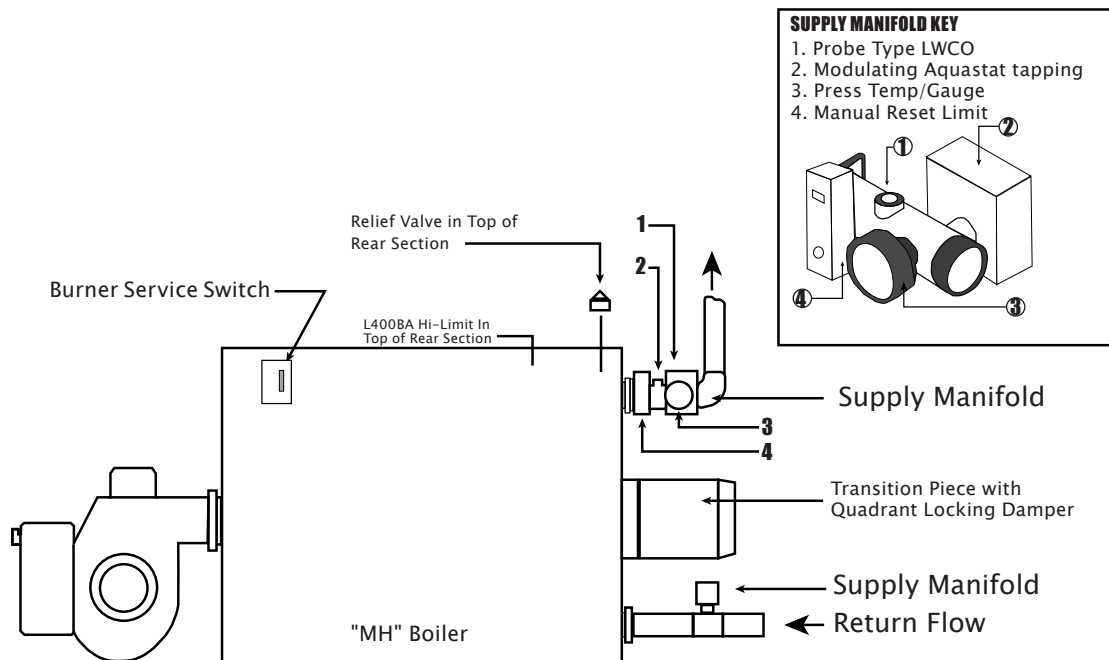
Venting Installation

1. When installing the vent pipe, be sure all connections are fastened correctly to insure no leaks and proper draft is achieved. Minimum draft through the unit is, $-.02$ – with draft meter. Draft up the stack must be $-.04$ to $-.06$ inches of water column when checking a draft meter for proper draft readings.
2. If proper or desired draft isn't easily achieved, a third party draft inducer or power vent may be needed to prevent back draft from occurring (not provided).
3. Install a barometric damper (NOT included) in the stack only 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 boiler and damper. The draft should be a minimum of $-.02$ – checked through flame inspection port.
4. Keep the draft moving. If draft is too slow or bottles up, this could create a back draft and over-fire or over heat the unit. If a damper is present, losing the damper will increase draft make sure passageways are clean and clear.

Fuel Supply Lines

- Use only 3/8" ID copper tubing with flare fittings from the tank to the fuel pump assembly and the fuel pump assembly to the heating unit. Ferrule fittings are not recommended and Teflon tape is not needed. Using a Teflon tape or liquids that dry on the threads increases the potential of creating a piece or flake of the material that could block passage-ways.
- Always keep the fuel suction line at least six to eight inches (6" – 8") from the bottom of the oil storage tank to prevent sucking water and sludge from the bottom of the tank. Drain water and sludge from the bottom of the storage tank when needed.
- It is recommended to use an inside supply tank vs. an outside or underground tank. If pulling from an underground tank it is possible a secondary transfer pump would be needed (Not Provided). Outside storage tanks or barrels can have water mixed in with the fuel supply. This will create issues (Not Recommended).
- The fuel pump assembly that comes standard with every unit needs to be mounted at tank level or below. Setting the fuel pump assembly at ground level will function properly. The fuel pump will push oil up to 100ft horizontal & up to 25 ft vertical.
- Be sure when priming or bleeding the fuel pump that you allow enough time to completely burp any and all air within the system out of the fuel pump and fuel lines. If any skips or slight interruptions are still present in the system, it is likely the unit will not properly ignite or run without a steady and consistent fuel supply. The flame sensor needs to recognize flame in the chamber or it will not ignite.
- It is necessary to connect the 3/8" ID copper fuel line from the storage tank to the filter housing, to the fuel pump inlet that is located on the same side as the bleeder valve. Once connections are secure, continue the fuel line from the fuel pump assembly to the burner assemble.

FIG. 13 | BOILER CONTROLS AND ACCESSORY LOCATION



1. Install relief valve, tridicator and L4008A operating high limit as shown in Fig 13.
2. Connect feed water and piping system to boiler. Perform appropriate Hydrostatic test in accordance with A.S.M.E. code and authorities jurisdiction.
3. Attach quadrant locking damper and seal with High Temperature silicone sealant.

Boiler Assembly & Wiring

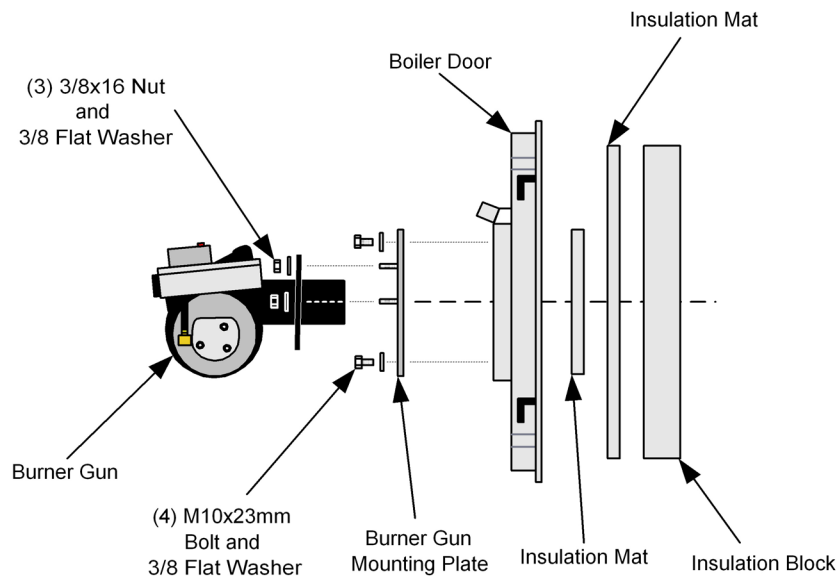
ATTENTION - Disconnect source before installing burner or servicing, can cause severe injury or death. All wiring should be done in accordance with rules of the National Electrical Code ANSI/NFPA – 70 latest edition and any State or Local codes having jurisdiction.

1. **Before Any Wiring Is Done** - Check burner voltage/cycle/phase. It must be compatible with the electricity furnished at job site.
2. Wiring diagram is found in burner instruction manual. Follow diagram for proper wiring of burner and controls.
3. Where burner motor voltage differs from control voltage, supply proper voltage to each.
4. Use properly sized fused disconnect and conductors for burner motor and control circuit.

Burner Mounting

NOTICE:

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.



Single Zone Wiring

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 aquastat relay as follows (also see Fig. 31 or 32):

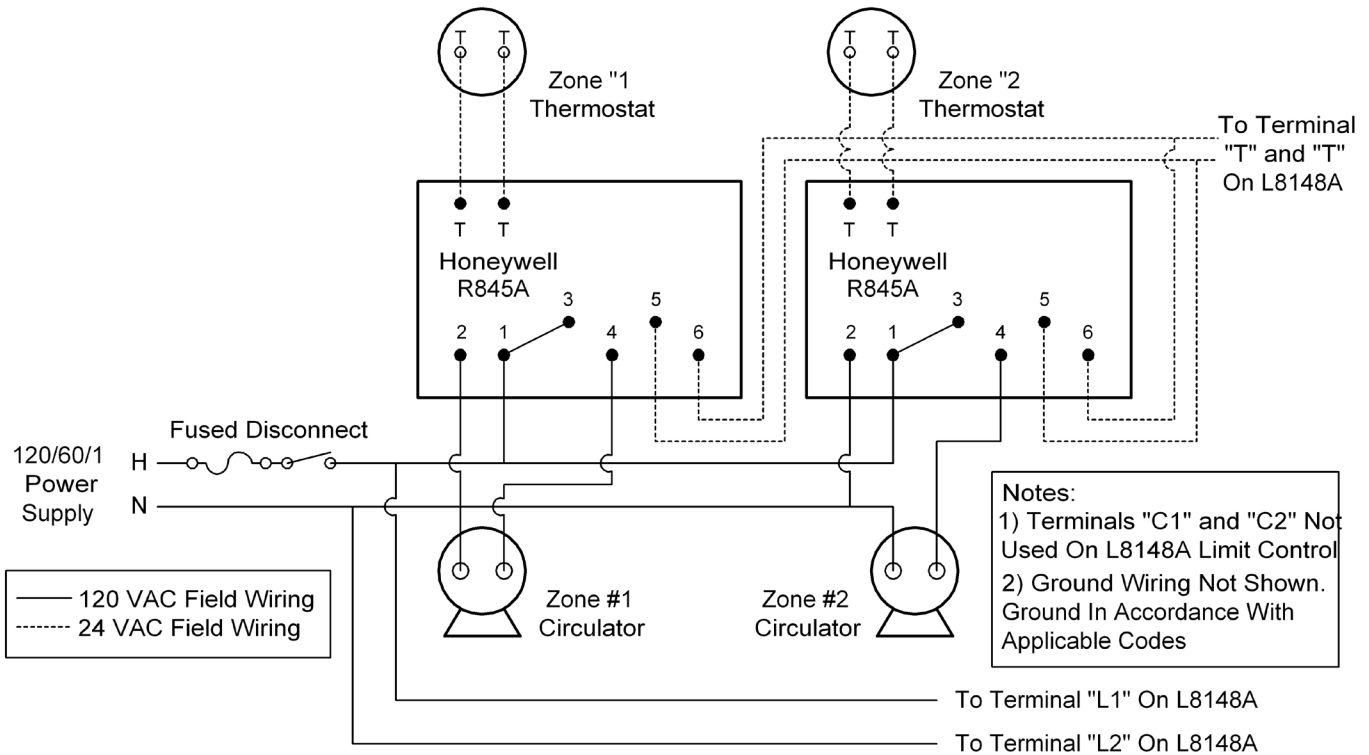
- Hot ("black") – Terminal "L1"
- Neutral ("white") – Terminal "L2"
- Ground ("Green" or bare) – Ground screw on case of L8148A

2. Thermostat Wiring – Follow thermostat manufacturer instructions. To ensure 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 2 circuit between thermostat and boiler. Connect thermostat wire leads to terminals "T" and "T" inside L8148A aquastat relay.

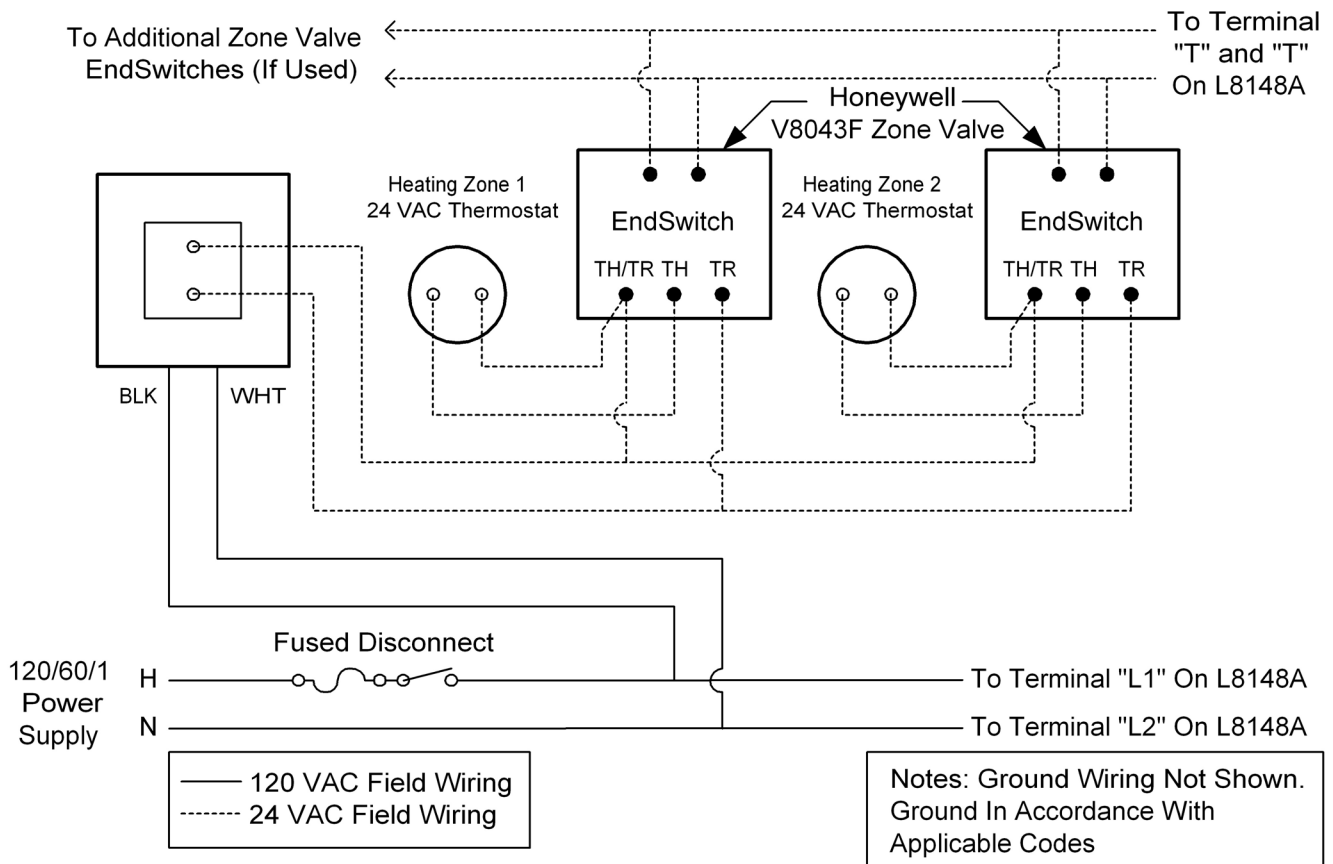
1. Multiple Circulator Zones – Figure 35 shows wiring for two or more circulator zones using Honeywell R845A's. One R845A is required for each circulator zone. Circulator terminals "C1" and "C2" on the L8148A are not used. A DPST Honeywell RA832A may be substituted in place of the R845A using the "X" and "X" terminals in place of the "5" and "6" terminals on 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.

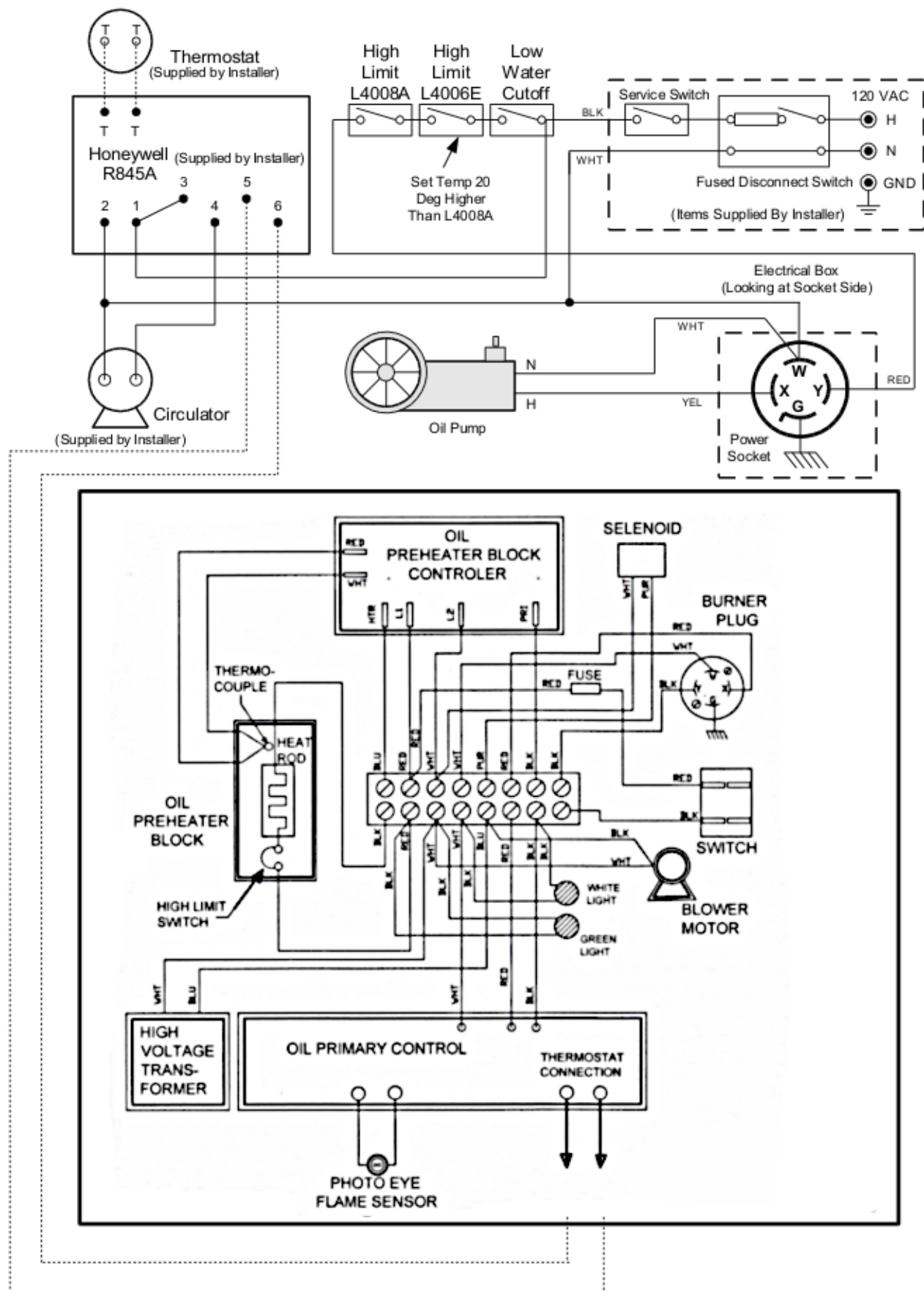
2. Multiple Zones using Zone Valves – Figure 34 shows wiring for multiple zones using Honeywell V8043F zone valves. This wiring diagram may be used for other 24-volt zone valves as long as they are equipped with end switches. Do not attempt to use the transformer on the L8148A to power the zone valves: use a separate transformer. Up to five V8043Fs may be powered by one 48V A 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.

Example 1.

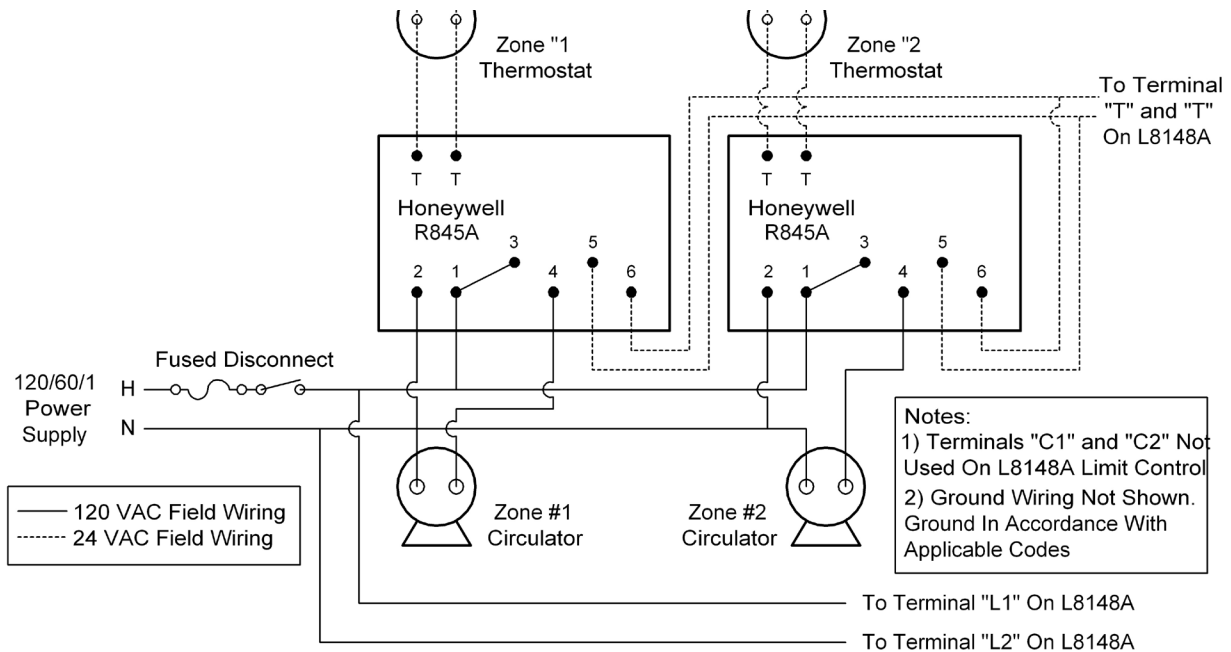


Example 2.





**Fig. 35 Wiring Diagram,
Zone Wiring Using Honeywell V8043F Valves**
(Factory Boiler Wiring Not Shown – Fig 33 | Fig 34)



**Fig. 36 Wiring Diagram,
Circulator Zone Wiring Using Honeywell R845A's**
(Factory Diagram Wiring Not Shown – See Fig 33 | 34)

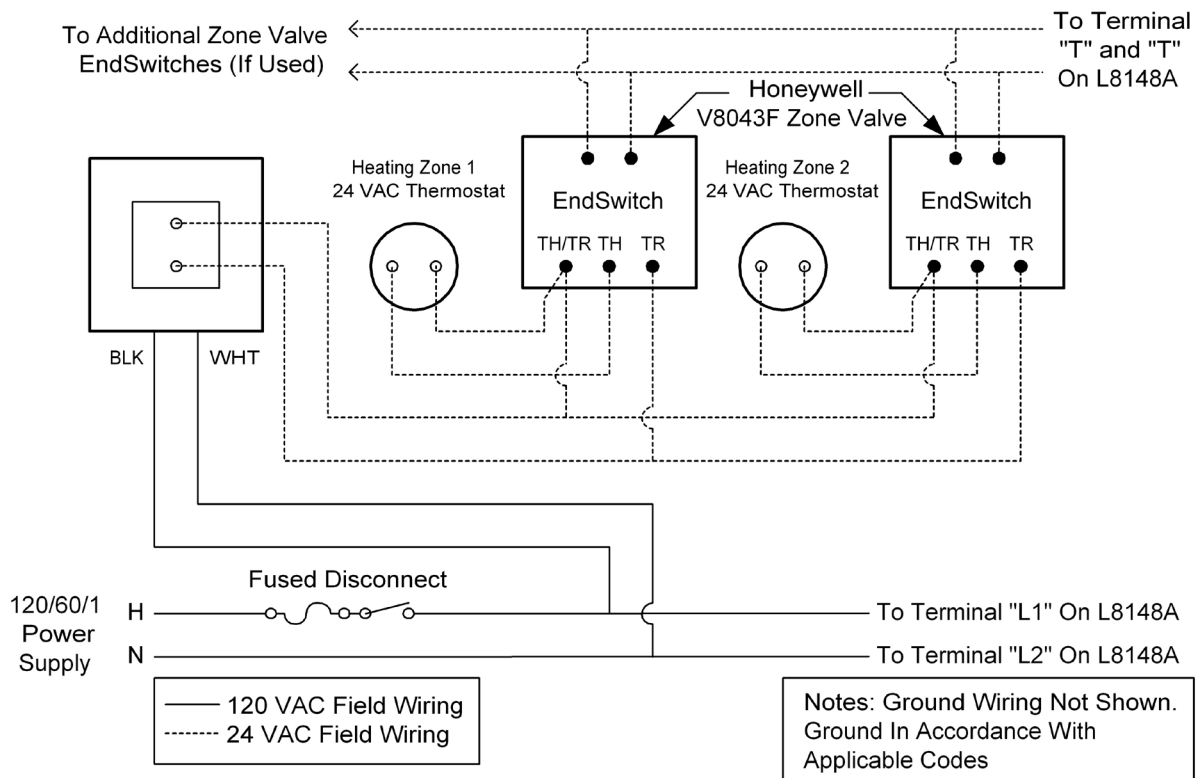
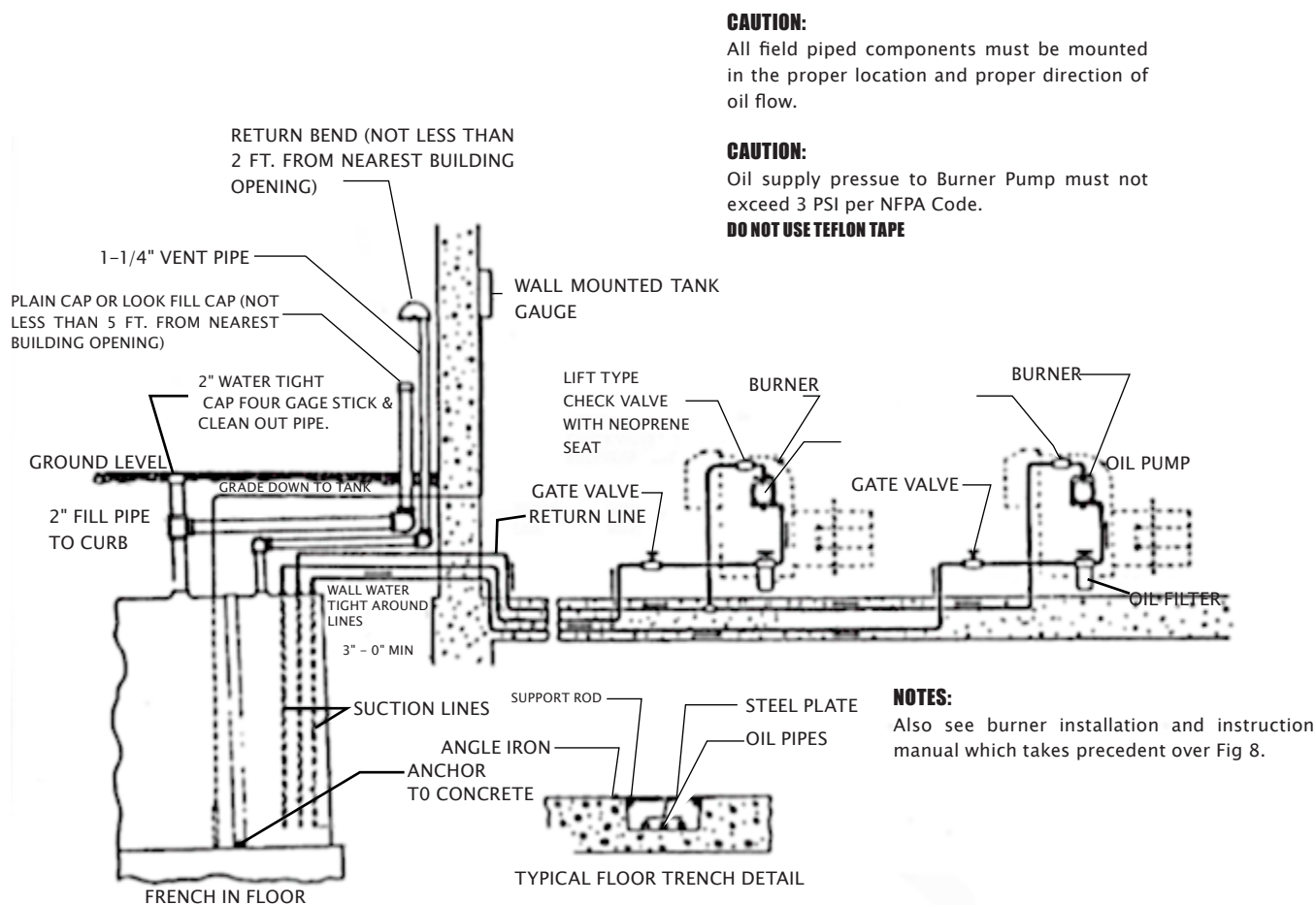
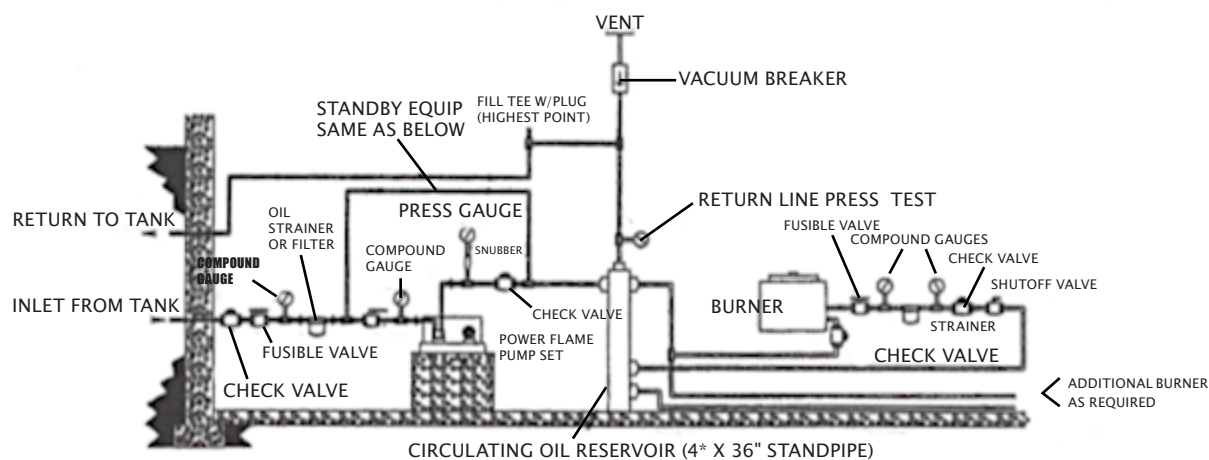


FIG. 8 | TYPICAL OIL BURNER PIPING DIAGRAMS



Multiple Burner System Piping Schematic (flooded section)



Boiler Assembly & Installation

All boilers are shipped with the boilers sections assembled and hydrostatically tested at the factory.

1. Position boiler on proper load bearing concrete pad on floor.
2. Attach supply manifold as shown in Figure 10.

FIG. 10 | SUPPLY MANIFOLD ASSEMBLY

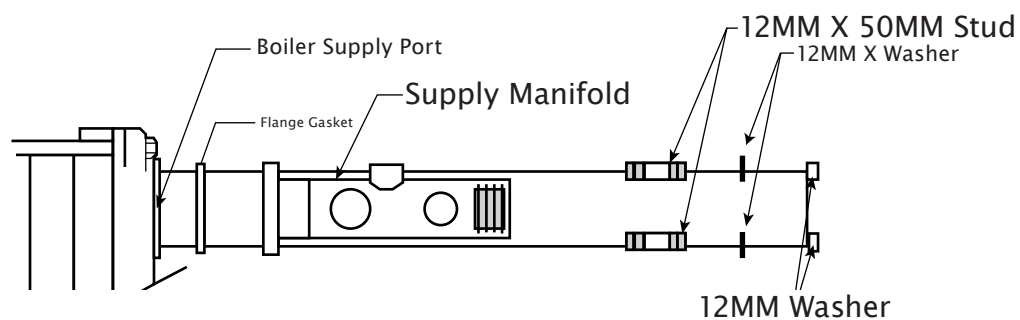
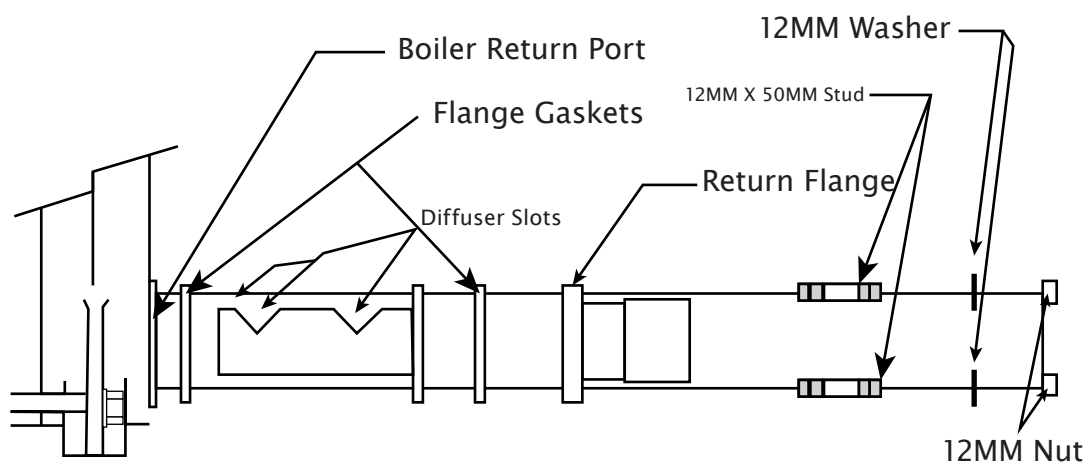


FIG. 11 | RETURN DIFFUSER INSTALLATION



Oil Burner Technology

MorrHeat's waste oil burner technology improves the efficiency of the oil burn process by continuously burning the waste oil with no interruptions.

The waste oil enters into the Oil Pre-Heater Block and is pre-heated to a specific temperature setpoint. Then compressed air from the air compressor is infused with the oil prior to spraying out the nozzle by breaking up the oil particles into a finer mist or spray. The electrodes mounted above the nozzle provide an electrical arc across the electrodes to ignite the fine oil mist as it sprays out of the nozzle. Once ignited the flame is forced into a vortex caused by the burners blower and flame cone providing a very efficient and thorough burn. **[See pg 10-11 Parts & Component]**



oil Burner Components



- Igniter Transformer: Supplies high voltage to the electrodes generating electrical arc igniting the oil. Transfers the high voltage from the igniter transformer to the electrodes.



- Solenoid Oil Valve: Opens when burner is running and closes 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. Air band is adjusted at the factory for optimum performance, closed to 1" inch open.



- Oil Primary Control: 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. Hard lock-out may require holding the reset for 30-45 secs.



- 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, to shut down or lock-out the system from operating.



- Air Pressure Gauge: Displays air pressure supplied by onboard air compressor. (8-14 PSI depending on unit)



- Air Muffler/Filter: Filters air and quiets the sound generated by the compressor.



- Pre-Heater Control Circuit Board: Controls temperature of the Oil Pre-Heater Block and controls safety feature of not allowing burner to energize until oil has established operating temperature setpoint or shutdown burner if Pre-Heater Block temperature falls below shutdown temperature 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. (3 pc. and cleanable)



- **Flame Cone:** Flame cone forces the flame into a swirl pattern improving the flame for a complete burn.



- **Burner Motor:** Multitask motor turns the burner blower and integrated air creates combustion and atomization air at the same time.



- **Air Pressure Adjuster:** Adjusts the air pressure going to the pre-heater block. Should be adjusted between 8 PSI and 14 PSI as indicated on the Air Pressure Gauge.



- **Oil Filter With Housing:** The fuel filter with housing allows an easy spin on/off feature making it simple when changing filters. Pre-filters the oil prior to the burner.



- **Suntec/Webster Fuel Pump:** Single stage fuel pump will push the waste oil 25 ft. vertical, and 100 ft. horizontal. (Always run fuel lines up to the burner, never down, or you could create an air pocket in the system – Hard to Bleed)



- **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, this process could take 3–4 minutes to pre-heat the system.

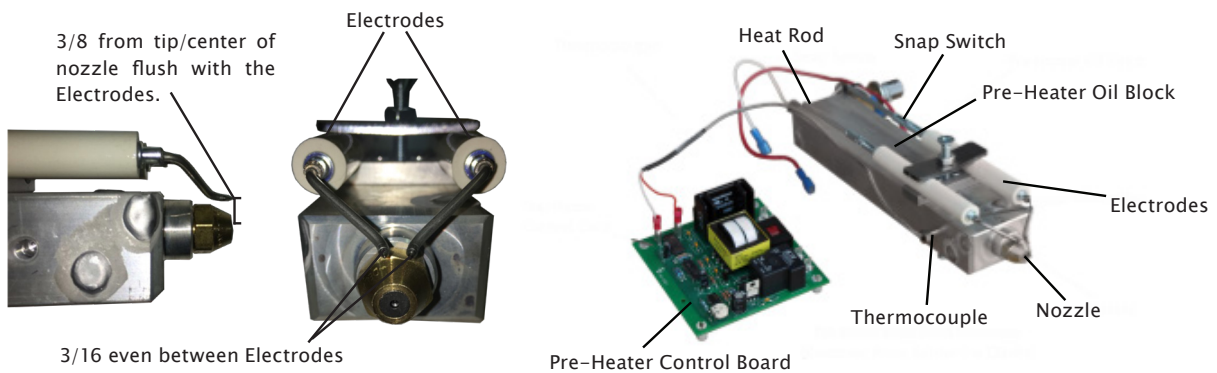
References (Nozzle|Electrode|Burner & Pump)

Nozzle Assembly

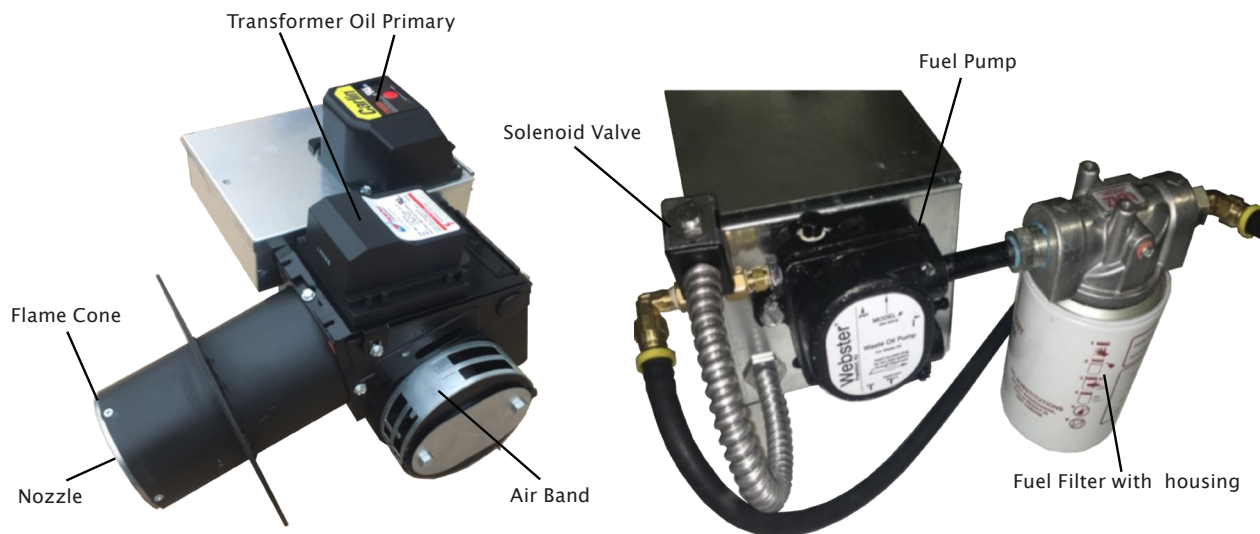


When cleaning, inspect all three pieces thoroughly.

Electrode Adjustment



Burner & Pump Assembly



Boiler Start-up & Adjustments

1. Close manual air vents (if used) and automatic air vents. Attach the hose to boiler drain on return connection and run to drain or to outdoors. Open drain cock and close shutoff valve on the boiler supply pipe.

2. HEATING ONLY – SINGLE ZONE SYSTEME ---

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 those 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 procedure 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 the 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 the pressure is too high with

Filling Boiler

1. Fill boiler and system in accordance with job specification. System pressure should be set to have 5 PSI pressure at the highest point in the heating system. Boiler pressure gauge will indicate pressure relative to the height of water column from the boiler to the highest point, plus the additional 5 PSI.

Example - To calculate cold fill pressure:

Highest point in system above boiler is 40'; $40 + 2.31 = 17.32$ (1 PSI = 2.31 Ft. W.C.)

Add 5 PSI to 17.32 = 22.32 PSI; boiler pressure gauge will indicate 22.32 PSI (cold fill pressure).

Caution

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.

2. Purge air from boiler and system.

Caution

Never purge system while boiler is in operation, also never run cold water into a hot/empty boiler

Burner Startup - All Fuels

Warning

DO NOT start or operate burner unless boiler and heating system pumps are ON and boiler has minimum system water flow of 1.8 GPM for each 100,000 BTU/HR, of Gross boiler output. Refer to Table 2. Consult Burner Manufacturer's Instruction Manual for proper start-up procedure

All Fuels - General Start Up

A thoroughly qualified burner technician should be employed to provide the initial burner start up, as well as any subsequent servicing.

A representative of the owner and/or the person or persons responsible for operating and maintaining the unit should be present during the initial start up. A service representative may also be required by the local utility on gas fired equipment. Instruction regarding the proper care and maintenance of the unit should be outlined with these people present.

1. Lock open boiler smoke outlet damper
2. Start burner
3. Heat up system
4. Drill hole in smoke outlet transition piece between boiler and damper blade and run combustion tests.
5. Adjust burner using combustion test equipment.
6. Adjust quadrant locking outlet damper to .05" to .1" W.C. positive at the smoke outlet.
7. Secure damper.
8. Seal combustion sample hole and smoke outlet connections using high temp silicone sealant. Also seal the breeching smoke pipe joints and seams and connection to chimney.
9. After burner has been adjusted and while it is operating, check front door for leakage of the flue gas. Should leakage occur, tighten door closure bolts. Also adjust door hinge bolts.

Prevention

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.

Freeze Protection

Where freeze protection is required to use antifreeze made especially for hydronic 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.

Initial Start Procedure

1. Make sure the heating unit and all components have been properly and securely installed.
2. Check that all electrical connections and hook-ups are properly wired and connected.
3. It is recommended prior to priming the fuel pump and bleeding the air to pre-fill the fuel filter to help speed up the process. For a secondary check you can always pressurize the fuel lines to eliminate any potential leaks in the line or fittings. Consistent fuel supply to the burner is very important.
4. Check that venting connections are properly installed and connected from the heating unit.
5. While first starting the unit it may take several minutes to get the oil in the pre-heater block up to temperature. Once the oil reaches the desired temperature, oil is then supplied through the fuel pump assembly and burner assembly. Make sure burner and pump are turned on.
6. Optimal draft when running the unit is another very important part of the process. Be sure desired draft is achieved while burner is running. If exhaust fans are present in the building, it is possible you will need a draft inducer or power vent of some kind (not provided).
7. Thermostat must be off while supplying power to the burner assembly.
8. After the oil in the pre-heater block has hit the desired temperature, while the burner is running, briefly jump the "F" terminals on the oil primary to allow the burner to run during the fuel pump and priming procedure.
9. After bleeding the fuel pump and flame is established at the burner assembly, remove the temporary jumpers on the "F" terminals on the oil primary control. This allows the safety features of the controls to operate properly.
10. Adjust air pressure to 8-14psi if needed.(can vary due to geographic area) (pre set from manufacturer)
11. Air band on the side of the burner assembly should be closed to 1" open (pre set from manufacturer) Open too far can cause delayed start or no fire.
13. After properly running and all minor adjustments, if any, are made (pre set from manufacturer) Check inspection port for bright yellow not orange flame.
14. Flame should be halfway or less down the chamber.
15. Use adjustment screw on the air compressor to achieve proper air (8-14 psi)
16. Contact installer or manufacturer for fuel pump adjustment if needed

DO NOT START BOILER WHEN DELAYED START HAS OCCURRED AND CHAMBER / HEAT EXCHANGERS ARE HOT, LET UNIT COOL BEFORE ATTEMPTING ANOTHER RESTART & CHECK FOR ACCESSIVE OIL IN THE CHAMBER PRIOR TO RESTART. TOO MUCH OIL IN THE CHAMBER UPON RESTART CAN CAUSE A BACKFIRE IN THE COMBUSTION CHAMBER. IF TOO MUCH OIL IS PRESENT, IT IS RECOMMENDED TO CLEAN OR WIPE UP AS MUCH AS POSSIBLE BEFORE A RESTART TO AVOID THIS FROM HAPPENING.

Maintenance

IT IS RECOMMENDED THAT YOUR FACILITY GETS ON A REGULAR MAINTENANCE SCHEDULE AND OR SET REMINDERS OF CLEANING AND MAINTENANCE OF THE HEATING UNIT, TANK, OIL FILTER, AIR FILTERS AND ALL OTHER WORKING COMPONENT AND CONSUMABLES THAT MAY NEED ATTENTION OR REPLACED BEFORE OR DURING SEASON.

Make sure the unit is clean prior to every heating season

HIGHLY RECOMMENDED TO TURN POWER OFF OR UNPLUG THE BURNER UNIT WHEN CONDUCTING CLEANING AND MAINTENANCE

Monthly:

- Check the ash build up periodically for optimal performance
- Remove all ash when cleaning the combustion chamber and heat exchangers. The viscosity and oil's being burnt, cleanliness of the oil and run time play a factor when determining a maintenance schedule. Every end user will have a little different schedule with all factors considered for every location and application.
- Check or change oil filter
- Check or change air filters
- Clean flame cone if needed

Twice Per Season:

- Clean or change fuel pump filter. Fuel pump cover comes off to access filter, gasket inside may also need to be replaced.
- Inspect, adjust or replace electrodes if needed (See part description for desired setting)
- Drain excess water and sludge from fuel storage tank(s)

Once Per Season:

- Remove ash build up within the vent pipe
- Replace nozzle if needed (will erode over time). When replacing make sure the nozzle sticks slightly past the end cone (1/4" past inside radius of flame cone) to insure no buildup of oil occurs at the nozzle and flame cone.
- Check the vanes and carbon plates for any chips, cracks or wear within the onboard air compressor, replace vanes and carbon plates if needed.

The cleaner the unit, the better it performs and longer it lasts!

Maintenance Continued...

Periodic observation of the Heating Plant is advised to insure safe efficient operation.

- 1.** Check control operation and setting
- 2.** Check for odors or soot deposit marks. Door seal may need adjusting or vent connections may require additional sealing.
- 3.** Observe burner operation for excessive noise or vibration.
- 4.** Check for water leaks.

Cleaning Tips

Boiler which operate only for heating, need only be cleaned at the end of each heating season. Boilers which operate year round should be cleaned Bi-annually.

It is important that the boiler be cleaned immediately after shut-down and while the cast iron is still warm, firstly because the deposits are more readily removed, and secondly, hardened deposits will absorb moisture and will cause corrosion.

Attention

1. Remove smoke pipe and flue collector at back of boiler
2. Disconnect burner fuel lines as needed to open front door.
3. Remove all flue baffles.
4. Using the cleaning brush, scrub all fireside surfaces in combustion chamber, flue passages and flue collector area.
5. Remove residue and vacuum clean.
6. Check condition of flue baffles and replace as needed.
7. Check front door and flue collector rope seals, replace as needed.
8. Re-assemble and put boiler into operation as needed.

NOTE:

When the boiler is to be "laid-up" at the end of the heating season or out of service for prolonged period of time.

- A.** Make sure all surfaces are clean and dry.
- B.** Open boiler front door and place a tray of calcium chloride in the center of the furnace. This will absorb moisture and keep the heat transfer surfaces dry. When calcium chloride becomes mushy, replace with new.
- C.** Block door approximately 1/4 open.

Troubleshooting

NO HEAT:

1. Check burner power switch and make sure power is available to the whole control system.
 2. If included in the system, check low-water, cutoff and/ or manual reset high limit.
 3. Check room thermostat(s) and zone valves or pump relays (if used).
 4. Make sure there is oil in the tank.
 5. Inquire if reset button on burner oil primary control has been tripped. If the reset button continues to trip them DO NOT ATTEMPT TO START BURNER.
- Open burner door by disconnection 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 a 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 the reset button while watching through the observation port. If burner fires immediately and flame looks good cycle several times.

If the 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 fitting 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:

1. Check thermostat and heat anticipator setting. A wrong setting can cause short cycling and inadequate heating.
2. Check to see if the distribution system is air-bound. If the 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 fir radiator. If it is cool or only lukewarm, then the problem is a lack of circulation. Look for air in the system, a valve partially closed, a zone valve failed in the closed position. pump failure. The most common fault is air in the system.

RELIEF VALVE LEAKS CONSTANTLY:

1. 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 the 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 sudden opening of the relief valve) or maybe over pressurized. A closed type expansion tank may be undersized, may be improperly piped to the boiler, maybe waterlogged.
2. The relief valve may be defective, or it may have foreign material lodged on the seat.

Troubleshooting Continued...

▲ Most likely || ► Less likely || ▼ Least Likely

Problem	Cause	Suggestion
1. Boiler shuts off 2. Loss of prime overnight	<ul style="list-style-type: none"> ▲ Manual reset ▲ Vacuum air leak in air line ► Plugged filter or tank empty ▼ Plugged pump screen 	<ul style="list-style-type: none"> ▲ Required manual reset ▲ Tighten all fuel connections ► Check pump screen ▼ Clean filter (use vent port), reprime pump
3. Fails to Start	<ul style="list-style-type: none"> ▲ Vacuum leak ▲ Inadequate fuel supply ► No pressure ► No pre-heat ► Auto start circuit not functioning ► No arc ► No air pressure 	<ul style="list-style-type: none"> ▲ Open bleeder port if air is present. ▲ Clean filter. Check all fuel connections . Tighten fittings. ► Check, may need cleaning – to access, remove, pump cover. ► Use vent port, and reprime pump. ► Be sure all wiring to pre-boiler is tight. ► Bad heat rod – replace. ► Check circuit control board and replace if necessary. ► Check continuity at terminals of heat rod limit snap switch. ► Check springs to electrode rod adjustment (under transformer) – make sure they have good contact. Open burner door and make sure electrode tips aren't touching flame cone. ► 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 and can't increase	<ul style="list-style-type: none"> ▲ Gauge may be bad. ▲ Intake filter muffler is plugged with dust or dirt. ► Exposed to winter ▼ Compressor vanes may be worn 	<ul style="list-style-type: none"> ▲ Replace gauge ▲ Remove & clean with carburetor cleaner, dry thoroughly. Do not use. ► Remove cover, clean rust with emery cloth ▼ Replace carbon vanes
5. Hard starting (Diminished flame)	<ul style="list-style-type: none"> ▲ Partially plugged filter. ► Restriction in nozzle usually only when initially installed. New lines may have foreign material in them. ► Air band open too far ▼ Out of fuel ▼ No oil to burner 	<ul style="list-style-type: none"> ▲ Clean filter. Using vent port–reprime pump ► Remove nozzle and check for foreign objects ► Aluminium block pre-boiler inside burner should not build up carbon. If carbon 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. ► Close air band – while viewing flame; open air band slowly until combustion chamber a clear, not orange ▼ Refill storage ▼ Clean pump screen – remove pump cover. Using vent port, re-prime pump.

6. Boiler cycles frequently, without set temperature being reached	<ul style="list-style-type: none"> ▲ Boiler over firing ▶ High limit safety switch bad ▼ Temperature setting wrong 	<ul style="list-style-type: none"> ▲ Investigate and locate reason for over firing. I.e nozzle eroded, pump not functioning properly, decrease pump motor speed. ▶ Replace high limit fan safety switch ▼ Check temperature setting and adjust as necessary.
7. Boiler rumbles and excessive heat blow back from flame vision port	<ul style="list-style-type: none"> ▲ Pump setting wrong ▼ Draft incorrect. If proper draft can't be achieved. Boiler could have excessive amount of ash and won't allow sufficient draft 	<ul style="list-style-type: none"> ▲ Pump not functioning properly–over firing. May need RPM readjust. Reset flame slightly less than 1/2 way down tube combustion chamber. Use adjustment knob on pump motor. ▼ Set draft. Clean out combustion chamber and exchangers of ash. Check draft–reset if needed.
8. Boiler establishes flame but locks out or shuts off. Need to reset primary.	<ul style="list-style-type: none"> ▲ Photo eye can't see flame ▼ Due to back draft. Flame end cone may have ash. 	<ul style="list-style-type: none"> ▲ Clean photo eye which is smoked up by back draft smoke. ▼ Swing open burner door and clean ash build up from flame end cone.
9. Proper draft setting can't be achieved	<ul style="list-style-type: none"> ▲ Negative draft in building or exhaust fans present. ▼ Excessive ash buildup/boiler 	<ul style="list-style-type: none"> ▲ May need to install power vent/draft inducer's in stack. ▼ Clean ash and soot from combustion chamber and heat exchangers.
10. Poor or reduced heat production	<ul style="list-style-type: none"> ▲ Flame too small ▶ Excessive ash buildup exchangers ▶ Through vision port, check flame to see if flame is smaller than usual. ▼ Entire fuel supply may be plugged. 	<ul style="list-style-type: none"> ▲ Nozzle may be plugged with debris–usually after filter is cleaned. ▶ Clean ash from combustion chamber and exchangers. ▶ May need to readjust pump RPM. (Use knob on pump motor). ▼ Clean filter both, oil strainer and oil pump screen.

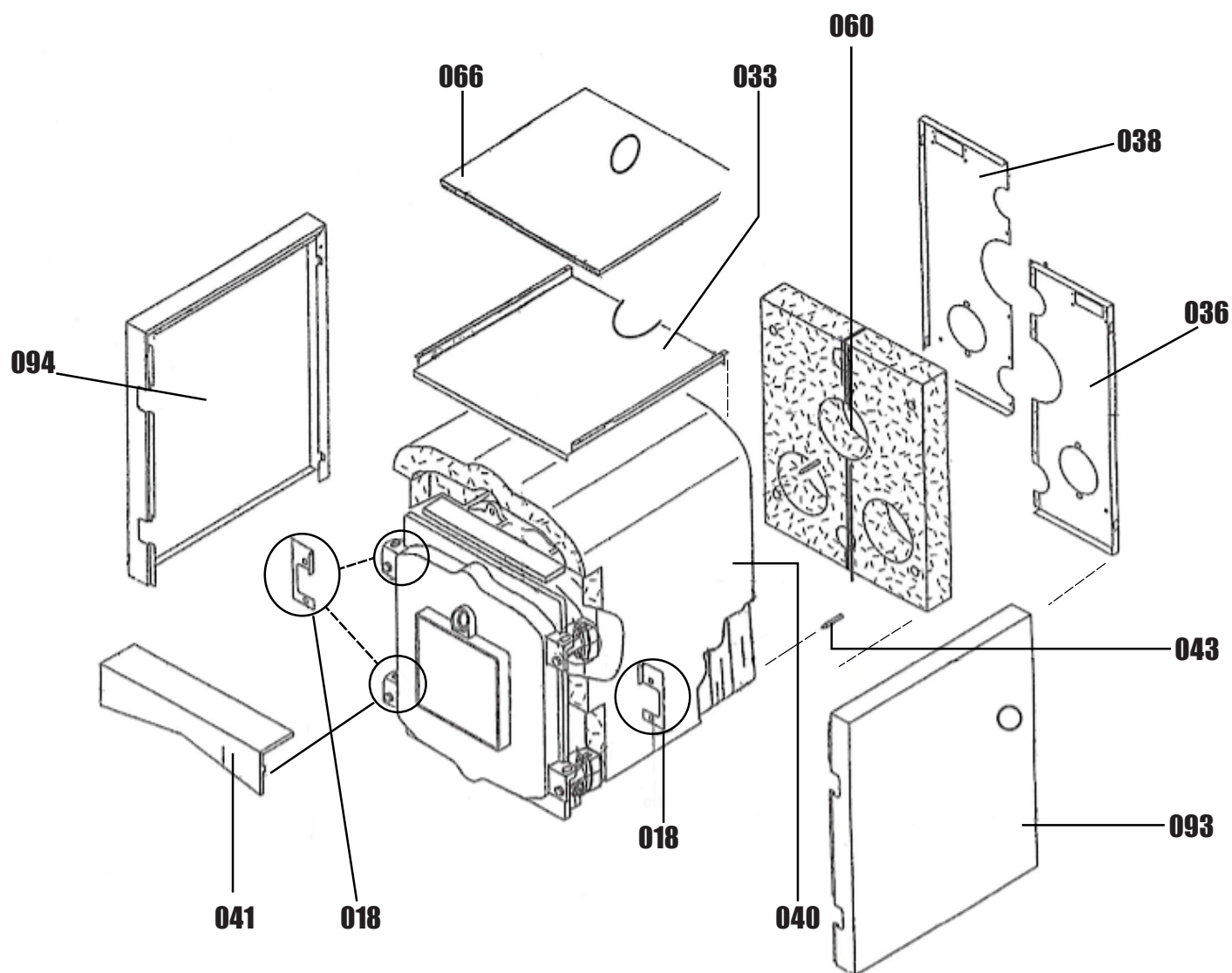
Attention

If you are experiencing technical or servicing issues and haven't been able to diagnose and fix the potential issue, please contact us with any questions Monday – Friday PST. A third party HVAC or mechanical contractor may need to be contacted if trouble shooting over the phone still does not solve the potential issue. If a third party is involved MorrHeat is not responsible for any fee associated with the service provided by a third party.

Jacket Attachment

1. Screw the (4) extension setscrews (043) into the four outer holes in teh corners of the rear sections. Securely tighten the setscrews and other fastening bolts of the flue outlet cover (022).
2. Place teh large wraparound insulation mat (040) over boiler block (aluminum foll side facing out).
3. Place smaller piece of insulation on top of wraparound insulation. This will provide double thick insulation top of the boiler block.
4. Remove flue collector clean-out covers (062).
5. Push the two smaller pieces of insulation (060) onto the flue collector (022) so that the four extension setscrews (043) protrude through the insulation.
6. Attach rear jacket panels (036) and (038) to the (2) extensions screws (043) using the M6x10 pan head screws. Screw teh rear panels together in the center using sheet metal screws provided. Reattach the cleanout covers.
7. Place right and left side panels (093) (094) into the factory mounted hinge bracket (018) and hook into the rear panels (036) and (038).
8. Hook center panel (033) with flange edge down between side panels (093) and (094).
9. Attach the upper front trim panel (041) between the right and left side panels over the front door.
10. Place the top panel (086) in position. Hook to the side panels.
11. Remove sight glass plug in front door and install sight glass assembly (023, 025, 026, 048).
12. Attach ASME tag and boiler rating tag at top left of rear jacket panel.

FIG. 12



Parts List

018 Hinge Bracket (Factory Mounting on Boiler)

033 Center Panel

036 Right Rear Panel

038 Left Rear Panel

040 Insulating mat for boiler shell

041 Upper front trim panel

043 Setscrew AF 17 rear jacket panel, spacer piece

060 Rear insulating mat

086 Top Panel

093 Right Side Panel

094 Left Side Panel

Parts List

- 002** Hinge Pin
- 003** Adjusting Pin
- 004** Anchor Rod
- 005** Nipple
- 006** Bolt M 10x40

- 008** Rear Section
- 009** Middle Section
- 010** Front Section
- 012** Boiler door, complete (013–017, 049)
- 013** Insulation mat for boiler door 344x344

- 014** Insulation mat for boiler door 583x745
- 016** Insulation block for boiler door
- 017** Pack 20x15
- 019** Aquastat well
- 022** Flue gas cover with flue connection

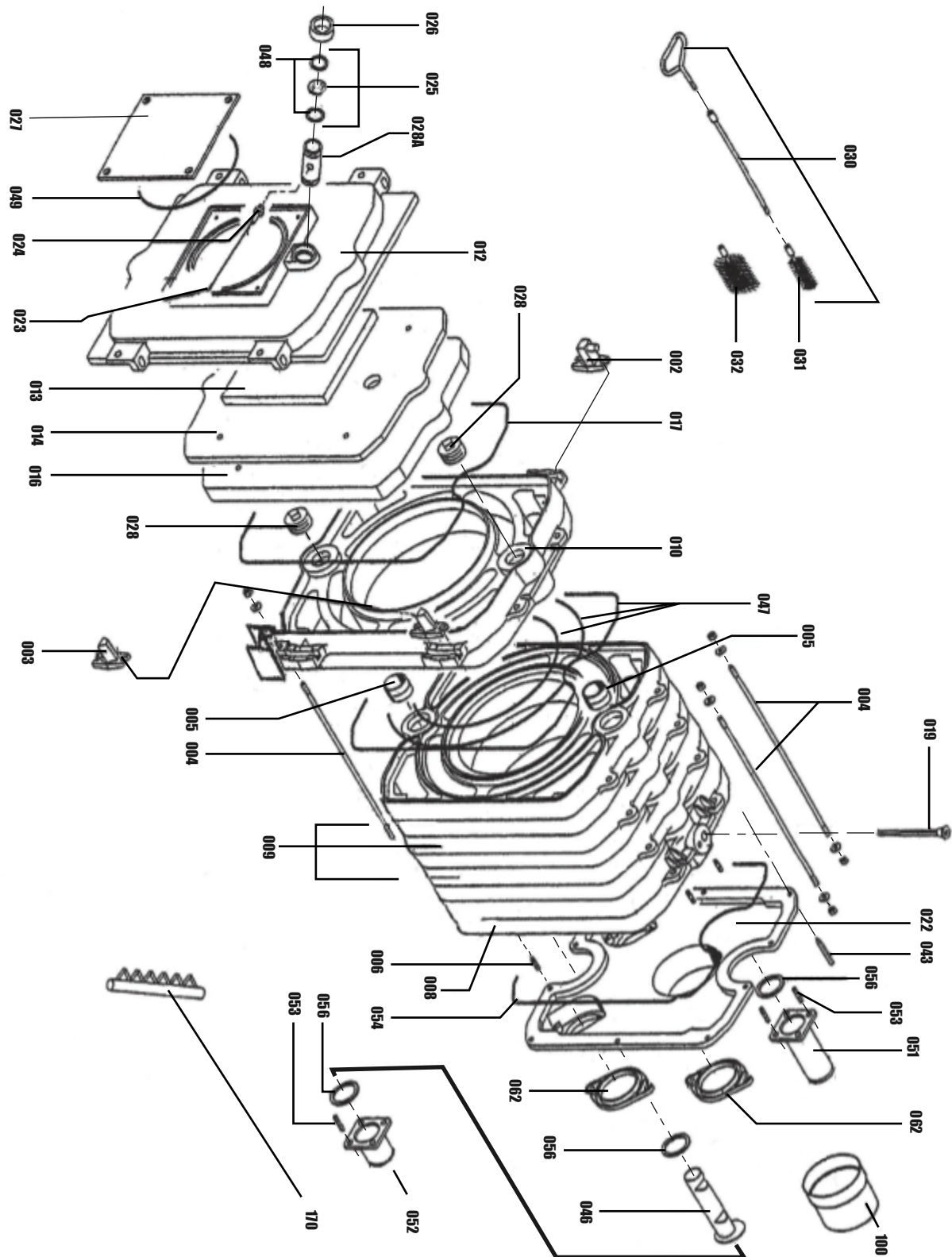
- 023** Hose coupling nipple 1/4"
- 025** Sight glass with seal
- 026** Sight glass and measuring tube cap
- 026A** Sight glass nipple 1-1/4"
- 027** Burner plate

- 028** Stopper 2"
- 030** Cleaning tools, complete (031, 032)
- 043** Jacket spacer complete with set/screw and washer
- 046** Distributor pipe
- 047** Packing cord 7 mm dia. (6m long)

- 048** Gasket for sight glass
- 049** Packing cord 8mm dia (.94 m long)
- 051** Connecting pipe for boiler flow
- 052** Connection pipe for boiler return
- 053** Bolt M 12x50

- 056** Seal 94x65x2 (flange gasket)
- 062** Clean-out cover
- 064** Packing cord 8 mm dia (2.6 in long)
- 071** Retarder 3rd pass (tubetype) FW-6 to FW-9
- 100** Smoke collar transition with quad locking damper

Exploded View



Warranty Information – 10 Year

MorrHeat warrants the materials and workmanship will be free of defects for the duration of the warranty specified. Warranty is valid from the date of delivery and warranty card must be sent in to MorrHeat within 30 days of delivery date. MorrHeat is **not** responsible for damaged goods. Please check your shipment for any damages. If damages are apparent, either sign for the shipment as damaged goods and **file a claim immediately** or refuse the shipment and **file a claim immediately**. Nothing can be done for damaged goods that have been signed for non-damaged, the shipping company will deny those claims if filed and MorrHeat will not be responsible.

Warranty is void if heating unit is improperly installed and neglected of proper routine maintenance. Warranty is also void if contaminants and corrosives have been attempted or burnt in the heating unit. Chemical's such as, **but not limited to**, chlorine can deteriorate the metals when introduced to high temperatures.

If a defect has occurred (bad metals, welds etc.), MorrHeat reserves the right to determine if the defect can be repaired or a complete unit swap is necessary. Pictures of the unit and potential defect will be required. All returned items must be approved by MorrHeat and returned with a RA# (return authorization number). Please call MorrHeat to acquire the RA# information and process.

Warranty Covers:

1. Boiler Cast Iron Jacket, 1 year. (Parts Only)
2. Stainless Steel Combustion Tube Insert, 3 years. (Part Only)
3. Oil Pre-Heater Block, 10 years. (Full)
4. Oil Pre-Heater Block Controller PCB, 1 year. (Full)
5. All other components, 1 year. (Parts Only)

The Pre-Heater block has a ten (10) year full warranty and MorrHeat extends the manufacturer's warranty subject to their terms and conditions, one (1) year on all other parts and components.

Warranty is Void if * :

*Warranty card is not returned within 30 days of delivery date
*Parts or equipment have been altered from original manufactured state
*Installed improperly
*Maintenance has been neglected
*Boiler has been misused
*Wired incorrectly
*Unit has been over fired or over heated
*Unit has been operated in contaminated conditions or exposed to corrosive chemicals, such as but not limited to chlorine
*Warranty is not transferable
*MorrHeat is not responsible for additional labor or freight charges unless there is written and documented arrangements and authorization from MorrHeat.

Warranty Card

REMINDER:

Warranty coverage is specific to the materials and workmanship of the unit and does not cover additional labor and freight charges unless written authorization is provided. Warranty assures and covers welds when maintained and used properly but does not cover stress cracks caused by excessive heat or over fire. Bad draft, back draft or simply too much fuel and too large of flame are a direct cause of an over fire or over heated unit. Neglected maintenance and cleaning the unit is another direct cause to over firing or over heating the unit. Keep your unit clean and maintained properly for best performance and longevity of the unit

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

No parts will be accepted by MorrHeat 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 card must be filled out & Returned within 30 days of delivery date

Date of Purchase: _____

Serial #: _____

Model #: _____

Customer (Company) Name: _____

Address: _____ City: _____

State: _____ Zip Code: _____

Contractor: _____

Address: _____

City: _____ State: _____

Zip Code: _____

Installed By: _____