

Installation & Operation Manual



Waste Oil Boiler Models:

EL-200B, EL-375B, and EL-500B

115V/60Hz



Designed to save. Built to last. TM



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Caution!

Before you begin installation and operation of your boiler, read this manual completely, and save it for future reference!

IMPROPER INSTALLATION, OPERATION, OR MAINTENANCE OF THE BOILER SYSTEM CAN CREATE HAZARDOUS CONDITIONS AND WILL VOID THE WARRANTY AND U.L. LISTING

- This boiler is UL listed for commercial and industrial use only.
- Refer to Section 1 for safety information and precautions.
- Installation of the unit shall be made in accordance with all state and local codes which may differ from information provided in this manual. Installations in Canada shall be in accordance with the regulations of authorities having jurisdiction and installation practice shall be made according to CSA standard B139, Installation Code for Oil Burning Equipment.
- Product improvements are occurring regularly, so the products may vary slightly from what is shown in this manual.
- If you have any questions or concerns during the installation or operation of the boiler, contact your local service representative or EnergyLogic.

Thank you for purchasing an EnergyLogic boiler. Record the Unit I.D. Number below for future reference. Please register your unit to activate your warranty by visiting EnergyLogic's website at www.energylogic.com/register . If you have any issues registering, please contact us at 615-471-5200.

I.D. Number:

(Located on the vessel skins, near the spec. label.)

Installed By:

(Service Company, Address, Contact Name, Phone Number)

Date of Installation:

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1. Safety, Codes and Regulations

Thank you for the purchase of an EnergyLogic used oil boiler. EnergyLogic boilers are thoroughly tested for safe, long-term operation. However, proper installation, fuel quality control, and regular maintenance are required to ensure safe, long-term operation. Please read and understand this manual completely before attempting to install, operate, or service the boiler. Post this instruction manual and maintain it in legible condition. If you have any questions, call your local service provider or the number below for EnergyLogic Technical Service.

1.1 Conventions Used in this Manual

For your safety, this manual uses the following definitions and signal words to identify hazards:

⚠ DANGER **Danger:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations.

⚠ WARNING **Warning:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION **Caution:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION **Caution (without alert symbol):** Indicates an unsafe practice which, if not avoided, may result in product or property damage. Also used for general alerts.

Product safety labels and their meaning (labels not used on all products):



Electrical Shock / Electrocutation



Hand Crush / Force From Side



Flammable Material



Explosion



Burn Hazard / Hot Surface



Explosion / Release of Pressure

1.2 General Warnings

- **⚠ WARNING** The EnergyLogic burner is to be used only in the EnergyLogic boiler provided. Do not attempt to use the burner for other purposes.
- **⚠ WARNING** Do not tamper with the unit or controls – call your service technician.
- **⚠ WARNING** Do not attempt to use unit with broken or damaged components.
- **⚠ WARNING** Do not allow unqualified personnel to install or service the boiler, electrical system, or flue system. Contact EnergyLogic for help with finding a qualified installation and service company. Failure to install and maintain your boiler properly will void your warranty and the UL listings.
- **⚠ WARNING** Do not attempt to start the burner when excess oil has accumulated, when the boiler is full of vapor, or when the combustion chamber is very hot.
- **⚠ WARNING** Do not start the burner unless all cleanout panels are secure in place.
- **⚠ CAUTION** KEEP THE FUEL VALVE NEAREST THE SUPPLY TANK SHUT OFF WHEN THE BURNER IS SHUT OFF FOR EXTENDED PERIODS.
- **⚠ CAUTION** Turn off power to the burner when the burner is off for extended periods.
- **⚠ WARNING** The boiler is designed to be installed in a manner that restricts its access.
- **⚠ CAUTION** USED OILS CONTAIN HEAVY METALLIC COMPOUNDS AND FOREIGN MATERIALS. WHEN BURNED, THESE COMPOUNDS ARE EMITTED FROM OR DEPOSITED WITHIN THIS HEATING APPLIANCE AND THEREFORE CARE SHOULD BE TAKEN WHEN USING, CLEANING AND MAINTAINING THIS EQUIPMENT.
- **⚠ CAUTION** EnergyLogic recommends that the building, domestic hot water system or process have a secondary heat source during times the boiler is down for maintenance or service. Used oil boilers require maintenance. Also, used oil may sometimes be unavailable or burn poorly due to contaminants (such as water) in the oil.

1.3 Safety Hazards

There are potential hazards associated with operation of this or any other boiler. In addition to the codes and regulations listed in the following section, general safety rules and precautions should be followed at all times to prevent accidents that could lead to personal injury, death or property damage. Only those qualified should perform the tasks. Specific safety hazards include:

⚠ DANGER Electricity: The EnergyLogic boiler operates on 115V/60Hz electrical power. Turn power off at the circuit breaker and lock it out prior to performing any work on the boiler system or any of the components. Make sure covers are in place during normal use. Use only copper conductors.

⚠ WARNING Liquid Fuels: Used oils must be handled properly to prevent spills. Uncontained oil leaks may contaminate the local water supply. Ensure that all national and local codes are

followed in regards to the requirements for spill containment and SPCC paperwork. Oil leaks pose slip/fall hazards, and pose a risk for fires. **DO NOT USE GASOLINE OR ANY OIL CONTAINING GASOLINE.** Do not add any cleaning fluids or oil additives to the used oil burned in this appliance. The use of unauthorized fuels will void the warranty and U.L. listing. See section 1.5.1 for a list of allowable fuels. The end user of the boiler is responsible for ensuring that all correct precautions are taken in managing their used oil.

⚠ WARNING Combustion Exhaust Gases: The exhaust products from the combustion are dangerous to breathe. The boiler must be attached to a flue which properly vents the exhaust out of the building to the atmosphere at all times, to assure safe and proper operation of the burner. If proper draft cannot be established, changes to the building construction or a draft inducer will be required in order to provide adequate make-up air.

⚠ CAUTION Safe Maintenance: Used oil contains mineral additives and deposits called “ash” that will not burn. Ash collects in the boiler and flue with regular use over time. Ash must be cleaned out of the combustion chamber/heat exchanger and flue pipe on a scheduled basis. Follow the minimum maintenance instructed in section 8. Wear proper protective clothing; including gloves, safety glasses, and a dust mask or respirator whenever any cleaning is performed, including the cleaning of the heat exchanger, flue piping and exhaust stack.

⚠ WARNING Vapor/Dust Ignition: Do not store or use gasoline or other flammable liquids or vapors near this boiler, as they may be ignited by the burner. Do not operate the boiler in dusty or otherwise dangerous environments.

⚠ WARNING Flammable liquids: Do not create a fire or explosion hazard by using or placing flammable liquids such as gasoline or solvents near the boiler. A flammable liquid is any liquid that has a closed-cup flash point below 100°F (37.8°C), as determined by the test procedures and apparatus set forth in 1.7.4 of NFPA 30.

⚠ WARNING Minimum Clearance – Safe clearance to combustibles (Section 1.6) shall be adhered to.

⚠ WARNING Height, Weight, Guarding and General Safe Practices: The boilers are installed with flue systems at heights which pose a risk for injuries due to a fall. Many of the components are heavy, and pose the risk of injury with improper lifting and handling. Always follow safe practices and use proper equipment. Never climb on the equipment. Do not take risks when installing or servicing the equipment. All cover plates, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing. Failure to observe general safety rules and to follow safety rules specific to the tools and equipment used or being worked on may result in product/property damage, personal injury or death.

1.4 Codes and Regulations

The installation, operation, and maintenance of the boiler system in the United States must be performed by qualified personnel in accordance with this manual and all national, state, and local codes / regulations, as well as the following standards of the National Fire Protection Association (NFPA) and the American Society of Mechanical Engineers (ASME):

ASME	Boiler Code Section IV
ASME CSD-1	Controls and Safety Devices for Automatically Fired Boilers
NFPA 31	Standard for the Installation of Oil Burning Equipment
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Code for Motor Fuel Dispensing Facilities and Repair Garages
NFPA 70	National Electric Code
NFPA 88A	Standard for Parking Structures
NFPA 88B	Standard for Repair Garages
NFPA 211	Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

These standards are available from the NFPA at www.nfpa.org, and from the ASME at <http://www.asme.org/>.

Similarly, the installation, operation, and maintenance of the boiler system in Canada must be performed by qualified personnel in accordance with this manual and in accordance with all the regulation authorities having jurisdiction, as well as CSA Standard B 139, Installation Code for Oil Burning Equipment, B140.0 – General Requirements for Oil Burning Equipment, B140.7.2 – Oil Fired Steam and Hot Water Boilers for Commercial and Industrial Use, B214 – Installation Code for Hydronic Heating Systems. Electrical installation in Canada shall be in accordance with C22.1 - Canadian Electrical Code, Part I. CSA standards are available at www.csa.ca.

A qualified installer is an individual or agency who is responsible for the installation and adjustment of the equipment and who is properly licensed and experienced to install oil burning equipment in accordance with all codes and ordinances.

In the United States, make sure you comply with all EPA regulations concerning the gathering and storing of used oil, and operation of the boiler. Specifically, CFR Title 40 Part 279 covers managing used oil. As well, make sure you comply with local codes and regulations.

In Canada, only used oil generated on the premises of the owner may be used in this equipment unless written authorization is obtained from the regulatory authority. Comply with Canadian regulations regarding the management and storing of used oil, as well as any local codes and authorities having jurisdiction

1.5 Fuels and Fuel Management

The boiler system is composed of several components and subsystems that work together for efficient and safe operation. In order for the system to function as designed, good fuel management practice must be followed.

1.5.1 Fuels

EnergyLogic boilers are listed by Underwriters' Laboratories (U.L.) for the U.S. and Canada, operating on the following fuels:

- Used Crankcase Oil.
- Used Automatic Transmission Fluid.
- ASTM D396 No. 2 Fuel Oil.



DO NOT USE GASOLINE OR ANY OIL CONTAINING GASOLINE.

Fuel mixtures must have a minimum flash point of 140°F (60°C) and the maximum flash point of approximately 400°F (204°C). Mixtures shall not contain hazardous waste.

⚠ WARNING Never mix inappropriate or hazardous material with the used oil. Examples of substances that should never be added include but are not limited to:

- Gasoline
- Kerosene
- Hazardous Waste
- Anti-freeze
- Carburetor Cleaner
- Paint Thinner
- Any Chlorinated Material
- Parts Washer Solvents
- Oil Additives
- Animal Fats
- Brake Fluid

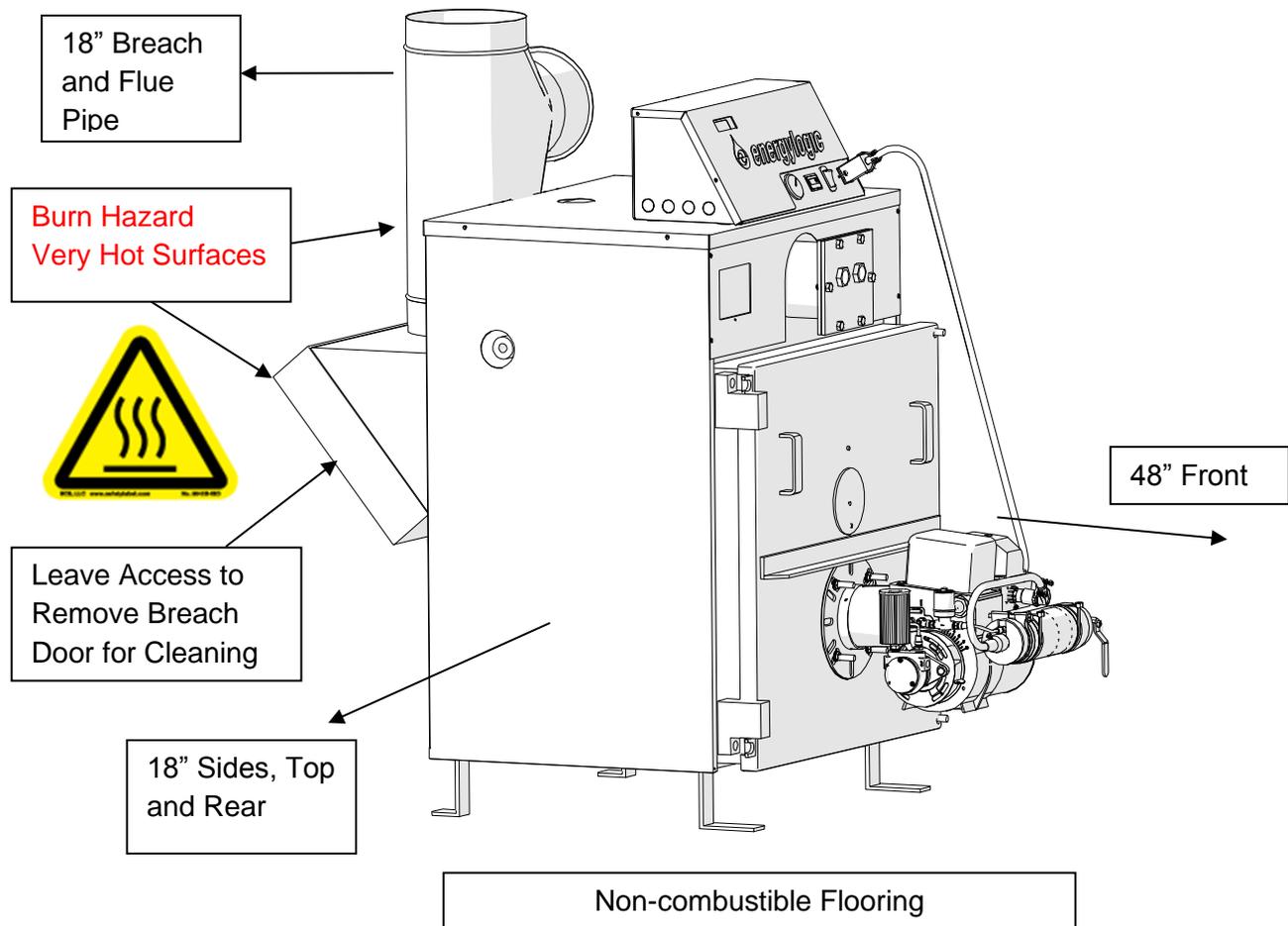
⚠ WARNING *The addition of inappropriate substances to the fuel is not approved and can lead to poor equipment performance, premature product failure, and/or explosive/hazardous conditions. Burning of fuels that contain unapproved substances will void the product warranty and the UL listing. If you have any question about what is contained in your used oil, it is your responsibility to have the oil analyzed prior to burning.*

Contact EnergyLogic Technical Services if you have questions about a particular fuel type, or if you need fuel analysis. For a nominal fee, EnergyLogic Technical Services will provide a professional fuel analysis. You will be provided with instructions in order to collect an oil sample to be sent out for analysis. Specify the type of analysis that is needed.

1.6 Clearances to Combustible Surfaces

⚠ WARNING It is of the utmost importance that the installation conforms to the minimum clearances to combustible surfaces (Material made of or surfaced with wood, compressed paper, plant fibers, plastics, or other material that can ignite and burn, whether flame proofed or not, or whether plastered or unplastered). Consult applicable codes and regulations for precedence. Non-compliance to minimum clearances may result in fire, explosion, personal injury or death. The U.L. Listing specifies: "For all boilers rated for 50 psi or less and for all water boilers, installation clearances are Form III." & "The boilers are intended for installation on noncombustible flooring." The clearances for each model follow:

Minimum clearance from:	Model		
	EL-200B	EL-375B	EL-500B
Top & pipe connections	18"	18"	18"
Front - (burner location)	48"	48"	48"
Sides	18"	18"	18"
Rear	18"	18"	18"
Flue Pipe	18"	18"	18"
Bottom	Must be on non-combustible flooring.		



Minimum Clearances

2. Installation Considerations

EnergyLogic boilers are designed to operate reliably over a wide range of conditions. However, it is important to read this section before installation to prevent unnecessary work or problems.

2.1 Technical Guidelines

1. Most components of your boiler are factory-tested to ensure proper operation. Do not tamper with factory settings or fittings. The settings on the AquaSmart may be adjusted.
2. Pre-assembled fittings are sealed with thread-locker sealant and do not require additional tightening.
3. Always supply power through a dedicated, hard-wired (copper only), 115VAC/60Hz circuit with a 20 Amp maximum breaker. Check local codes.
4. Do not use the provided thread-locker sealant on flare fittings. Use the provided sealant on all NPT fuel line connections only.
5. Do not use Teflon tape on any fuel connections. Loose strands may block small orifices, affecting unit operation or may damage components.
6. Route all fuel lines inside building to prevent exposure to cold weather. If this is not practical, call EnergyLogic for application support.
7. Locate boiler and tank in a dry area above 50°F (10°C) at all times.
8. If not installing the pump to an EnergyLogic Tank, mount it according to guidelines in the EnergyLogic Top Suction Kit packaging instructions.
9. Do not kink copper tubing. Route tubing as straight and vertical as possible to avoid air pockets.
10. Maximize vertical run of flue and minimize horizontal run. Allow access for clean-out.
11. Do not allow your tank to run out of fuel. If the tank runs out of fuel, air and contamination will be introduced into the fuel delivery system. An optional EnergyLogic low-level cut off switch is recommended to prevent low fuel operation.
12. Never use compression fittings for fuel tubing connections, as they will leak and cause the burner to shut down.
13. Care should be taken not to over tighten or cross thread brass fittings.
14. Applying a thin film of anti-seize compound to burner gasket may reduce gasket sticking to vessel when servicing.
15. Another source of heat is recommended for periods when the boiler may be off-line for maintenance or for any other reason.

2.2 Tools Required

Below is a recommended list of tools and equipment that may be used to aid in the installation of the EnergyLogic boiler. This is a minimum list for a simple system, excluding the hydronics and plumbing.

5/16" Combination Wrench	Pipe Wrench Set
3/8" Combination Wrench	Flat Blade Screwdriver
7/16" Combination Wrench (x2)	1/4" Hex Wrench or Driver
1/2" Combination Wrench	Wire Cutter (to remove tie straps)
5/8" Combination Wrench	Lift Device
1 1/16" Combination Wrench	Safety Ladder or Lift
3/4" Combination Wrench	(Tools Required for Flue Kit Installation)

2.3 Boiler Placement Guide

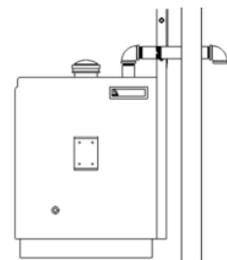
It is important to plan the boiler and tank placement, wiring, piping and flue prior to installation.

Electrical Wiring - Will the layout of your building allow safe routing and installation of electrical wiring to the boiler? Check your local building codes. The EnergyLogic boiler requires 115VAC/60Hz power, supplied through a dedicated, hard wired, circuit breaker – 20 Amp maximum. Use copper conductors only. **⚠ DANGER** *Electricity is very dangerous. Wiring must be installed by a qualified electrician. In the U.S., consult the National Electric Code (NEC) and local building codes for additional requirements. In Canada, consult the Canadian Electrical Code, Part I.*

Flue Pipe - Is ceiling/roof or wall location suitable for a flue pipe to pass through? Are any obstacles present at interior or exterior locations? Check your roof warranty about penetration of the flue pipe. Check your local building and fire codes.

Combustion and Make Up Air Requirements – **⚠ WARNING** It is necessary to ensure that adequate air for safe combustion is provided for oil-burning appliances and equipment. Refer to NFPA 31, Chapter 5 for requirements based on the total input BTU rating of all appliances in the space. In Canada, reference CSA Standard B139/CGA B149.

Tanks - The oil tank is to be vented to the outside of the building. Oil temperature should be maintained at 50°F (10°) and above. Tank shall be at least 5 feet away from any source of heat and should not obstruct service meters, electrical panels, or shut off valves. Check building, environmental and fire codes for containment and other restrictions.



Minimum Clearance – **⚠ WARNING** *Safe clearances to combustibles (Section 1.6) shall be adhered to. A non-combustible flooring structure is required for the boiler.*

Distance from Flammable Liquids – **▲ WARNING** Do not create a fire or explosion hazard by using or placing flammable liquids such as gasoline or solvents near the boiler. *A flammable liquid is any liquid that has a closed-cup flash point below 100°F (37.8°C), as determined by the test procedures and apparatus set forth in 1.7.4 of NFPA 30.*

Access - Position the used oil storage tank to provide adequate access to filling ports, filter, drain valve and pump. Leave an unobstructed path for shop vehicles and equipment. Consider access needed for service (heat exchanger cleaning, flue cleaning, removal of breech panels, burner access, etc.). Installation of system piping should not hinder required access for service.

Vessel Placement in Motor Fuel Dispensing Facilities and Repair Garages – Heat producing appliances shall not be allowed unless installed with provisions outlined in NFPA 30A, section 7.6.

Structural requirements (Canada) – In Canada, the structure in which the used oil burning appliance is housed shall be no less than 4.6m (15ft) high at the point where the appliance is situated and have a minimum length and width of 6m (20ft) and a minimum floor area of 37m² (400ft²). In addition, the installation including flue stack height requirements and distance from property line shall be in accordance with the authorities having jurisdiction concerning environmental quality as well as fuel, fire, and electrical safety and Table 7 in CSA B140.0-03 (clause 22.3.2).

Other Considerations for EnergyLogic Boilers:

- They are constructed with ASME certified pressure vessels (30 psi maximum pressure).
The ASME  stamp is located on boiler plate on the vessel under a removable panel.
- They have Canadian Registration. The CRN number is located on the boiler plate.
- They are UL Listed in the US and Canada. The UL mark and specification label are on a boiler panel.
- They are fire-tube boilers. This means that hot combustion gases flow through tubes, transferring heat to water that surrounds the tubes.
- They are carbon steel boilers. With a ¼” steel shell, they are of a durable construction, and much lighter than cast iron models. Since they are carbon steel however, there are some restrictions on the return water temperature to prevent corrosion (minimum return temperature of 140°F).
- They are wet-based boilers. This means that the combustion chamber and tubes are surrounded by water that keeps the steel cool and prevents chamber deterioration.
- They are non-condensing boilers. This means that the flue gases are not allowed to cool enough to create condensation. Due to sulfur in the oil, condensation would create sulfuric acid which would quickly corrode the boiler tubes and chamber.

3. Assembly and Installation –Vessel, Tank, Pump and Suction Fuel Line

This section instructs installing the fuel delivery system (side suction or top suction) and mounting the vessel.

3.1 Unpacking and Inspection

After unpacking your new boiler, make sure you have received the proper parts and quantities shown in the checklist on the following page. For missing parts, contact EnergyLogic. If any parts were damaged during shipment, please contact your shipping carrier.

3.2 Warranty Registration

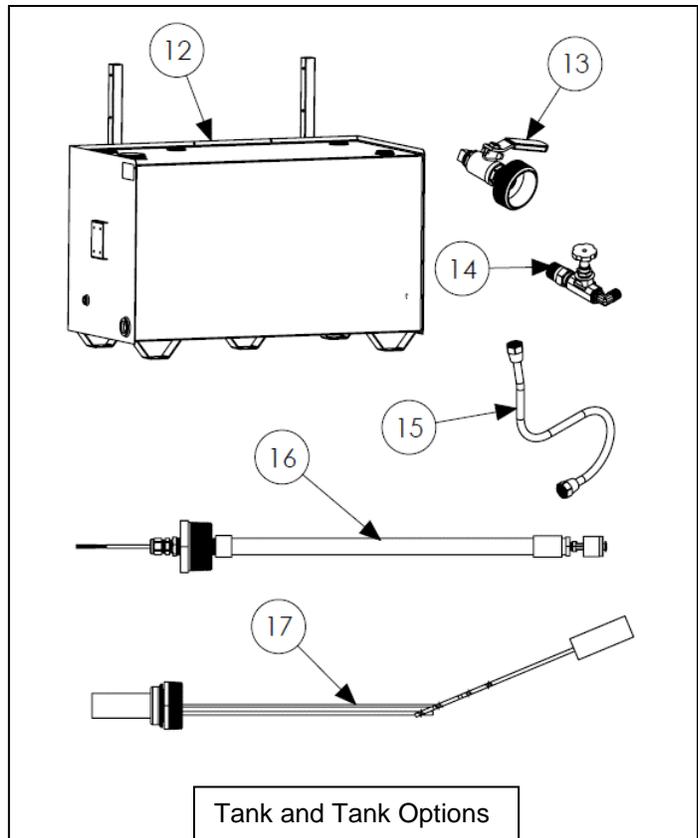
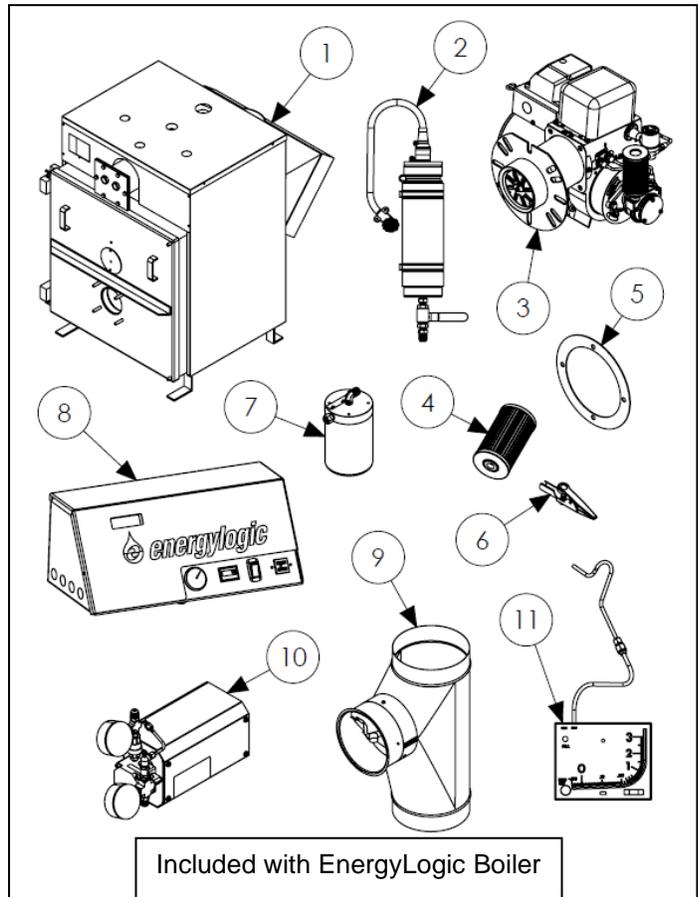
IMPORTANT: You must register your boiler with EnergyLogic for the warranty to become active and to receive technical service.

Please take a few minutes to fill out the Warranty Registration Form.

Note: Your Warranty Registration Form may be found in the accessory box where you located this manual. You may register quickly and easily online at www.energylogic.com/register, mail the completed form to EnergyLogic at 5901 Crossings Blvd., Antioch, TN 37013, or call the number below with the information from the form ready.

Checklist

		No.	Item	Qty.
Boiler complete (minus flue kit)	Boiler Assembly with Side Suction Fuel Pick Up	1	Boiler Vessel Assembly 1a. Boiler Vessel with Trim Kit (Located in Flue Opening) 1b. Boiler Panels and Insulation.	1
		2	Preheater Assembly	1
		3	Burner Assembly	1
		4	Air Compressor Filter	1
		5	Burner Gasket	1
		6	Alligator Clips	2
		7	Filter Head and Fuel Filter	1
		8	Control Box Assembly	1
		9	Barometric Damper and Tee Assembly	1
		10	Pump Assembly with Gauges	1
		11	Draft Gauge Assembly (provided with bundles only)	1
		Thread Sealant Tube (not shown)	1	
	Tank Assy	12	EnergyLogic Workbench Tank	1
		13	Drain Valve Assembly	1
	Side Suction Kit	14	FireStop Valve Assembly	4
		15	3/8" Copper Suction Line with Flare Nuts	1
		16	Low Fuel Cut Off Switch Assembly	1
17		Swing-Arm Fuel Gauge	1	

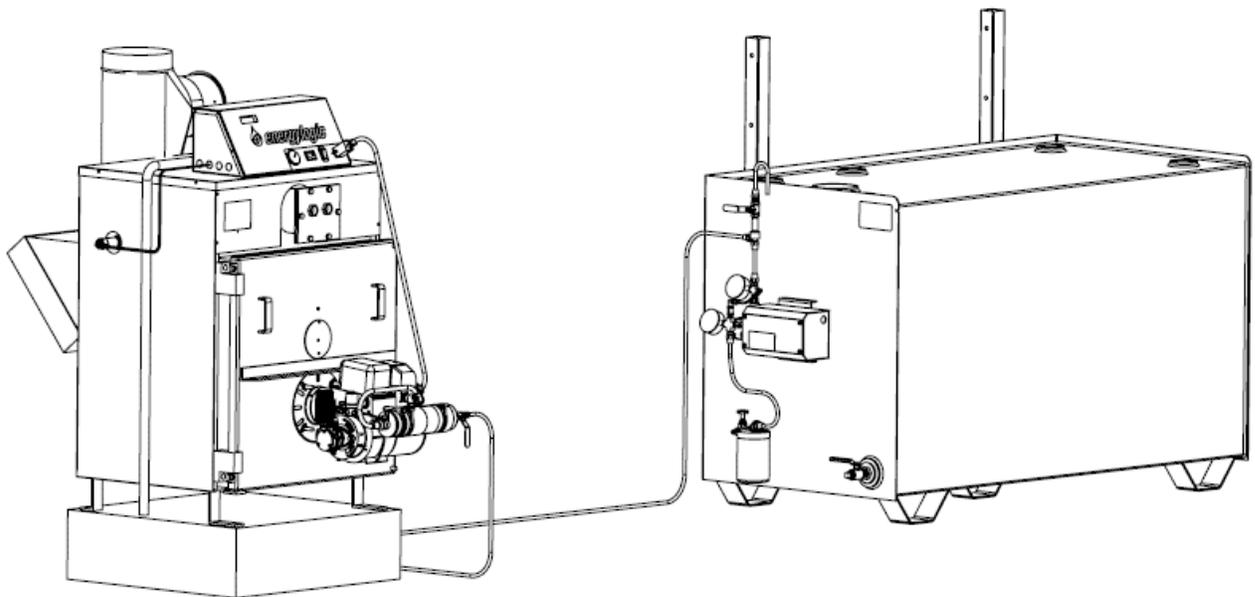


3.3 Boiler Vessel Installation

Note: This manual covers the installation of a single boiler and pump. If you are installing multiple boilers in the same building, contact your local dealer or EnergyLogic for additional installation options.

3.3.1 Vessel Installation

1. Uncrate and locate the vessel near the desired location.
2. Once the boiler vessel is in place, the vessel may be anchored.
3. Be sure to remove the trim package that contains the fittings and gauges. This is to be found in the rear breech / chimney connector.
4. Consider the following:
 - Prior to placement, a licensed electrician shall install a dedicated 115vac/60Hz service junction box (switchable and lockable) in close proximity to the vessel location (preferably within 5 feet).
 - A non-combustible platform or flooring structure is required.
 - Pay special attention to Codes and Regulations in Section 1.4, and all local codes and regulations.
 - Refer to section 2.3 for placement guidelines / restrictions for the boiler. The placement is critical for proper operation and efficient servicing.



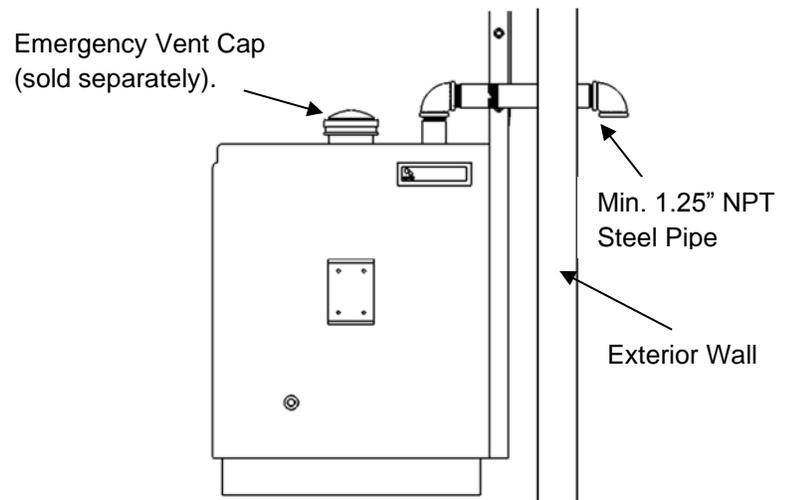
EnergyLogic Boiler with EnergyLogic Tank

3.4 Preparing the EnergyLogic Used-Oil Tank

If you are not installing an EnergyLogic Tank, first verify that your used oil storage system meets all applicable codes and requirements, then proceed to the instructions for installing the metering pump.

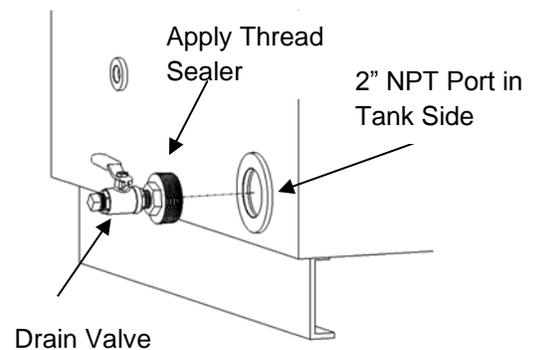
3.4.1 Tank Vent Installation – EnergyLogic Tanks

Once the tank is in place, install a tank vent (not included). This requires a minimum 1.25 inch NPT steel pipe routed through an exterior wall, terminated with a 90° elbow turned down (figure). A mushroom-style cap may be used to terminate the vent as an alternative to the down-turned elbow. Install appropriate Emergency Venting. EnergyLogic offers an emergency vent cap with capacity of 53,000 cu. ft./hr./1501 cu. m/hr. This optional accessory can be installed into a 4 inch NPT port (figure).



3.4.2 Drain Valve Installation – EnergyLogic Tanks

Install the tank drain valve in a port along the bottom of the tank as shown in figure. Use the provided thread sealer on the threads during installation. Note: Some tanks come with the drain valve already installed. **CAUTION** *The drain valve is necessary for draining water from the bottom of the tank. The drain valve is shown in closed position in figure. A plug should be installed in the drain valve to prevent accidental spills.*

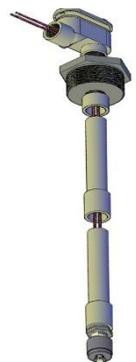


Drain valve installation.

CAUTION *After all components have been installed on the tank, make sure that all unused tank openings are properly plugged.*

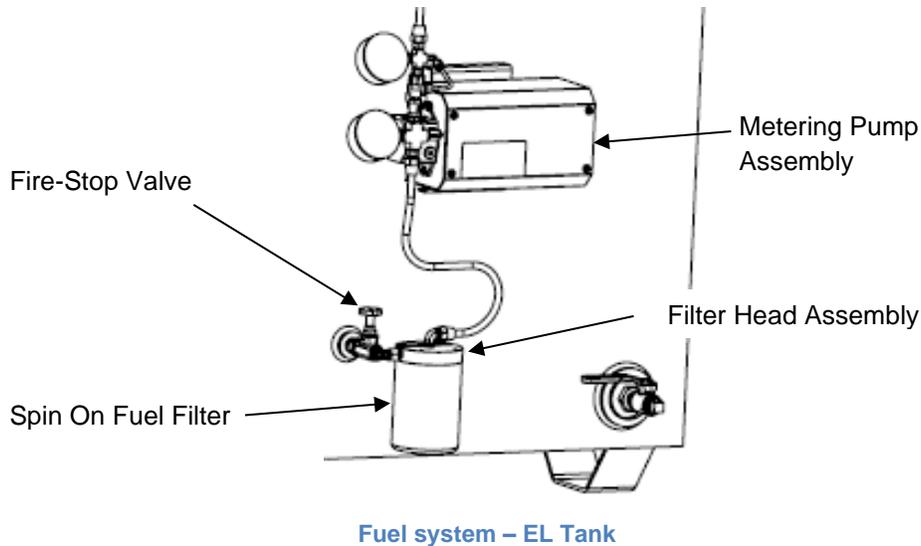
3.4.3 Low Fuel Cutoff Switch – EnergyLogic Tanks

The low fuel cutoff switch is an optional accessory that will automatically shut off the burner if the tank is nearly out of fuel. This prevents the pump from losing prime. The float switch operates by interrupting the thermostat circuit when the fuel level is too low. Install the accessory according to the packaged instructions.



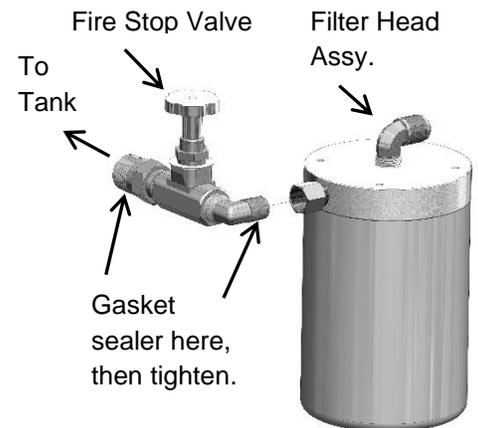
3.5 Fuel Metering Pump and Filter Installation – EnergyLogic Tank (continue to section 3.6 if you don't have EL tank).

On EnergyLogic Tanks, the fuel pump components are mounted on the side as shown. Follow the steps below to first install the firestop valve and filter head, and then install the pump.



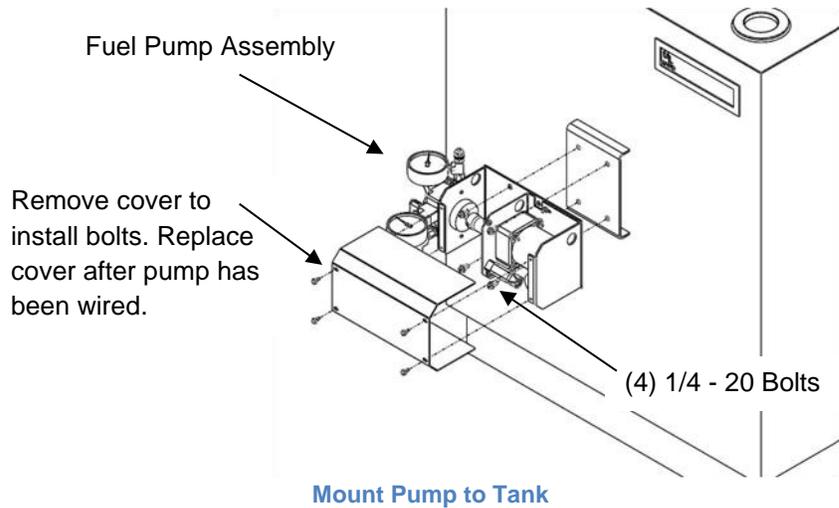
3.5.1 Fire Stop Valve and Filter Head Installation – EL Tank

Decide which end of the tank is the best location for your pump. On EL 250 gallon and 500 gallon tanks, the pump may be mounted to either end. To install the firestop valve, first apply gasket sealer to the 1/4" NPT fitting and screw the fire stop valve to the fuel filter head, fully tighten the NPT threads, using a second wrench to prevent loosening other connections. Then apply sealer to the 1/2" NPT fitting and screw the entire filter head assembly with firestop valve into the 1/2" NPT port in the side of the tank (located about 10" up from the floor).



3.5.2 Metering Pump Installation – EL Tank

Mount the pump to the integrated bracket on the EnergyLogic tank using (4) 1/4-20 bolts

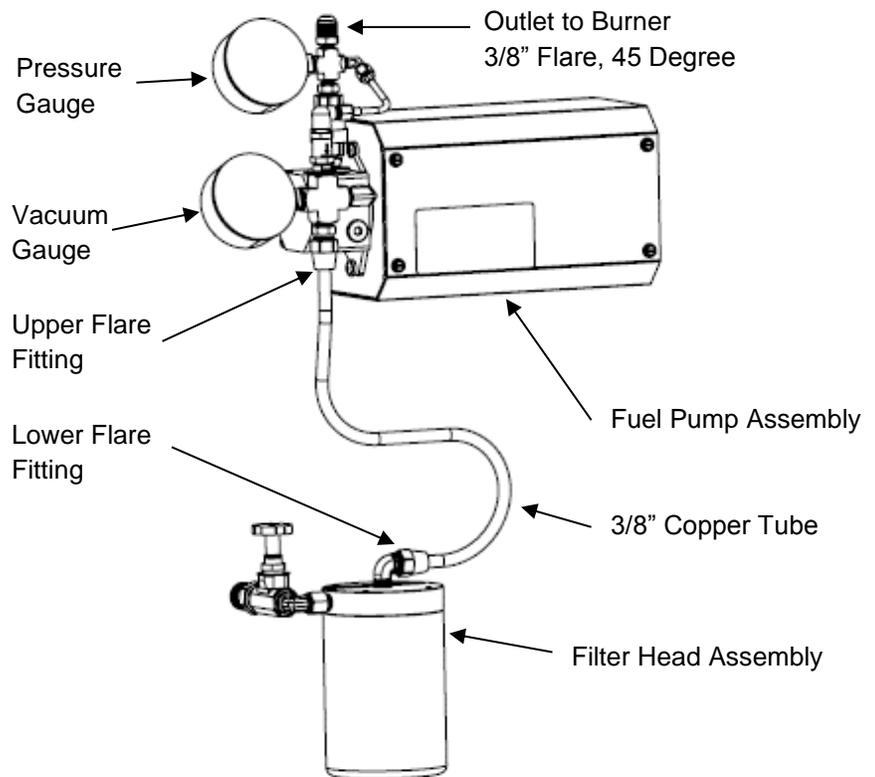


3.5.3 Pump Tubing Installation – EL Tank

Install the tubing as follows:

CAUTION *The pump fittings are sealed and leak tested at the factory. Use a second (backup) wrench when installing the flare fittings to ensure that you do not turn the pump fittings and create a leak.*

1. Locate the short 3/8" copper tube assembly. Carefully install the tube (without kinking) into position as shown.
2. Thread (do not tighten) upper 3/8-inch flare nut onto the flare fitting on the fuel pump inlet. *Do not apply gasket sealer to the flare fittings.*
3. Thread lower fitting onto the filter head fitting.
4. Tighten both flare nuts. Use a backup wrench - do not over-tighten.



Suction Tubing Installation.

3.6 Metering Pump Installation – Non-EL Tank (skip if you have EL tank)

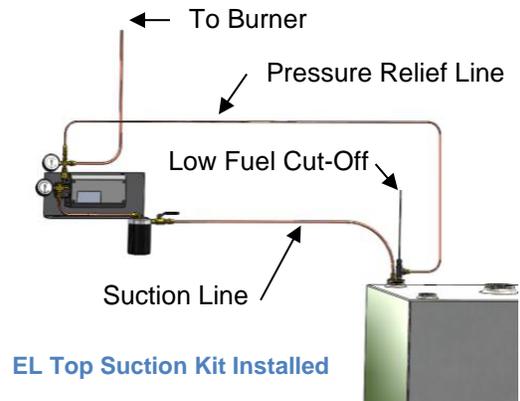
If you are metering fuel directly from a tank not supplied by EnergyLogic, the top suction method may be used. Verify regulations prior to installation. Contact your authorized EnergyLogic dealer to purchase an EnergyLogic Top Suction Kit if one was not included in your original purchase. The use of a genuine EnergyLogic Top Suction Kit will help to avoid common fuel delivery issues with this type of installation.

Installation of the Top Suction System:

1. If you purchased an EnergyLogic Top Suction Kit, follow the instructions included in the packaging. Refer to the following for general guidelines.

Guidelines for Top Suction Method:

- Keep in mind that the main storage tank will need to have enough capacity to allow for separation of water from the used oil. Never meter oil directly from oil drums or totes.
- EnergyLogic's fuel pump is designed for interior use only (must be mounted inside a protective structure). The minimum recommended fuel temperature is 50°F.
- The pump may be mounted to a nearby wall, within 6' of the tank, using appropriate fasteners. Four mounting holes are available in the pump housing once the cover is removed. The ideal placement of pump is with the inlet above the filter head assembly, which should be mounted above the tank fitting. Maximum vertical lift for the suction line should not exceed 6 feet (2m). This includes the portion of line inside of the tank.
- The EL Filter Head Assembly is to be placed such that it filters the oil prior to pump. A shut off valve should be placed prior to the filter head in order to do a vacuum check.
- The Filter Head must be supported properly. Soft copper tubing can twist easily.
- The pump assembly and wiring connections must be at least 18 inches (46 cm) above the floor to meet National Fire Protection Association (NFPA) codes for repair garages.
- The inlet to the suction line should be at least 8 inches (20 cm) off the bottom of the tank, to prevent water and sludge from entering the system.
- Use minimum 3/8" OD x 1/32" wall thickness copper tubing. Never create loops or high points that trap air.
- Use 45-degree flares on the copper tubing. Loose fittings or cracked flares cause problems. Suction leaks allow air to get sucked into the fuel system. All suction leaks must be eliminated.
- Used-oil contains water from condensation. A drain valve on the bottom of the tank should be used regularly to remove water and sludge that separates out of the oil and settles to the bottom of the tank. If your tank does not have a drain valve, you must have the tank pumped out completely (periodically) to remove the water and sludge.



4. Installation of Boiler Components

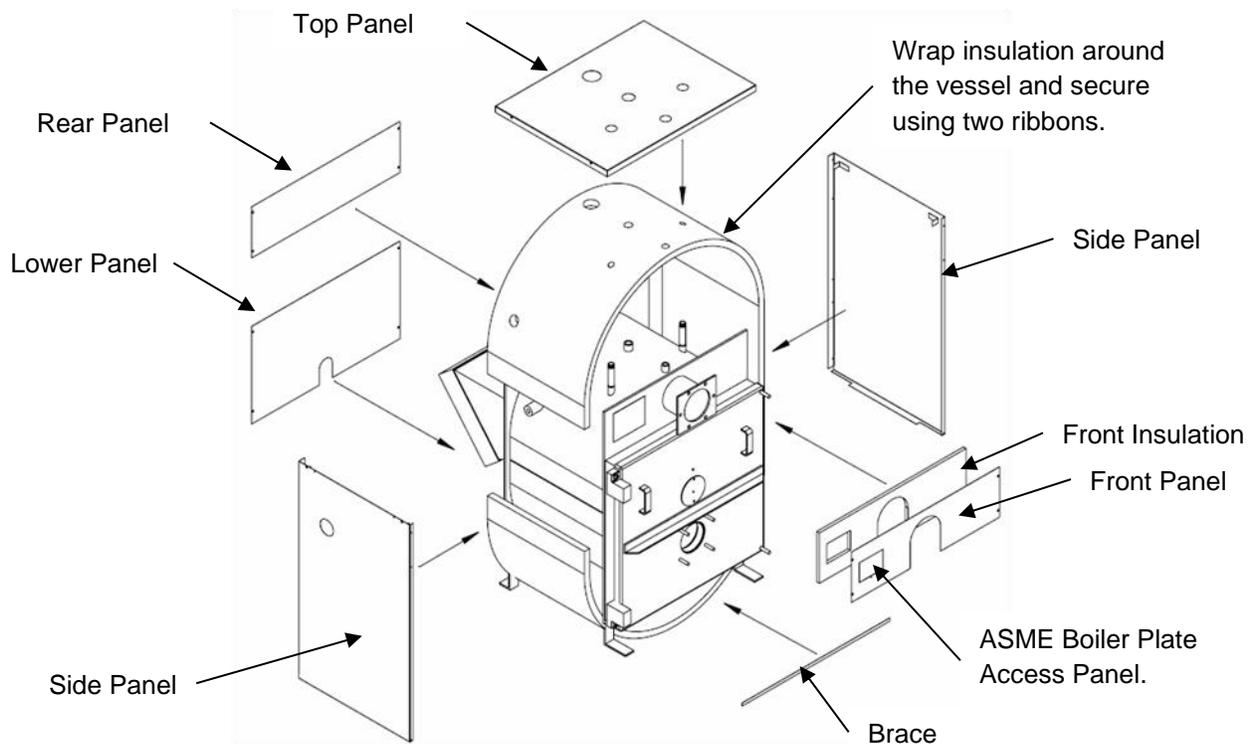
With the vessel in place, you are ready to attach the cabinet panels and insulation, the control cabinet and wiring, the optional domestic coil, and the burner/preheater assembly. Then, you will install the fuel tubing from the pump discharge to the preheater. Finally, your hydronics professional will connect the hydronic piping system to the boiler – and fill the system.

NOTE: Before installing insulation, remove the Trim Kit (contains drain valve and pressure relief valve) from inside the breech/flue. Install the drain valve in the side port near the bottom.

4.1 Vessel Panel and Insulation Assembly

Install the cabinet panels and insulation as follows:

1. Open the box containing the insulation, panels, and hardware.
2. Wrap the insulation around the boiler vessel, lining up the cut outs for the ports and drain. Make additional cuts if needed. Use the ribbon provided to secure the insulation around the vessel.
3. Install the insulation for the front panel. Make sure that the insulation is cut out to provide a view of the ASME boiler plate.
4. After the insulation is in place, install the panels as they are shown in the figure below. Secure using the sheet metal screws provided. **NOTE:** Install the side panels to the front and rear panels first. Then, install the remaining panels.

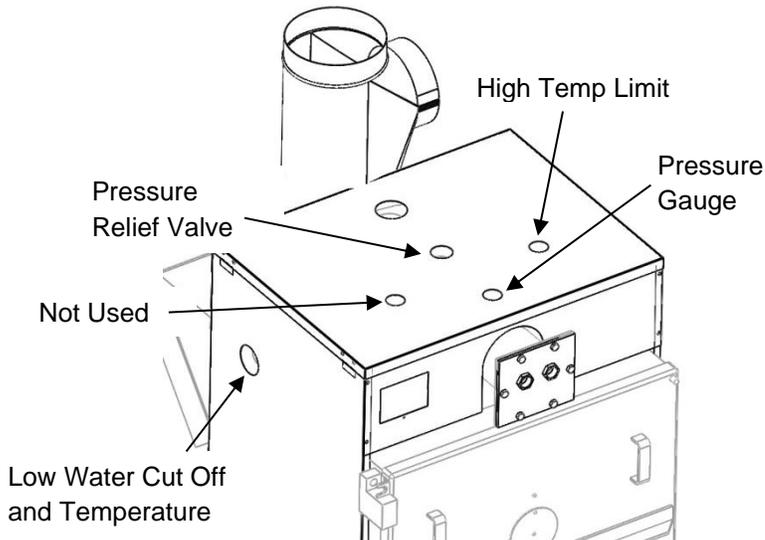


Assembling Insulation and Panels (EL-200B shown)

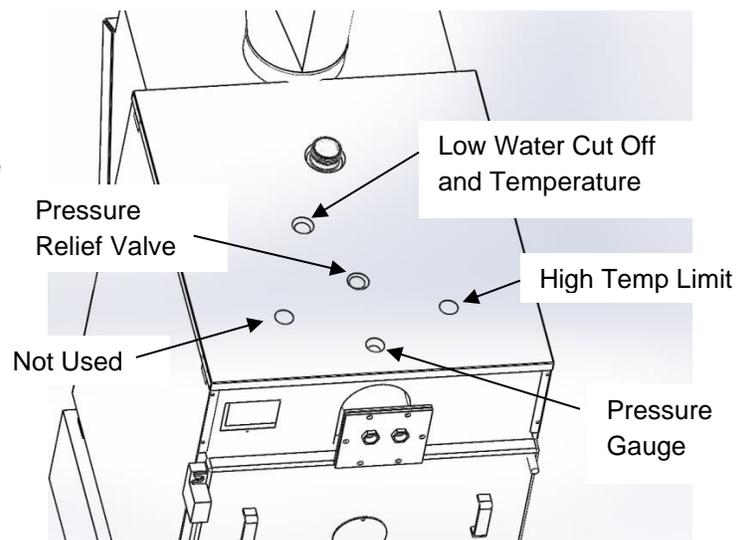
4.2 Boiler Control Assembly Installation

4.2.1 Boiler Ports

The boiler ports used for the control and safety devices are shown in the figures below.



Ports on EL-200B

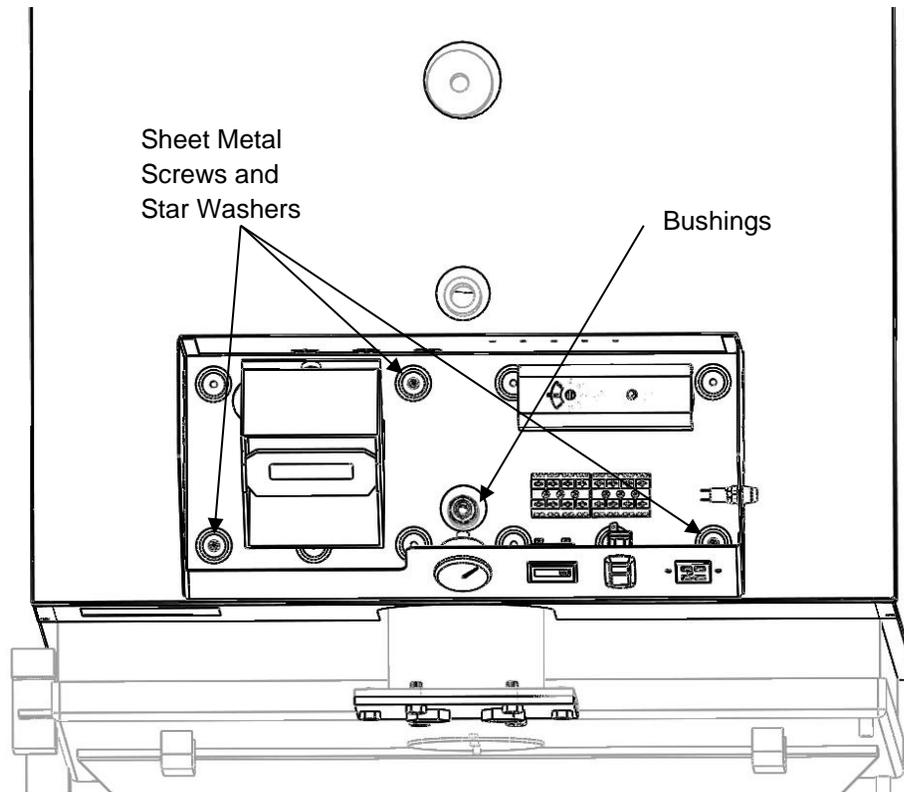


Ports on EL-375B or EL-500B

4.2.2 Control Cabinet Install

The boiler control cabinet is pre-wired at the factory. Install the cabinet as follows:

1. Remove the cabinet assembly from the carton.
2. Remove the cover and locate the plastic parts bag.
3. Find the $\frac{1}{2}$ " MP x $\frac{1}{4}$ " FP and $\frac{1}{4}$ " MP x $\frac{1}{8}$ " FP bushings. Install in the pressure gauge port location. Use appropriate sealant or Teflon tape to prevent leaks.
4. Position the control cabinet assembly on top of the boiler by centering the clearance hole over the pressure port fittings.
5. Drive at least three (3) self-drilling, sheet metal screws and #10 star washers to attach the control cabinet base to the top of the boiler cabinet.



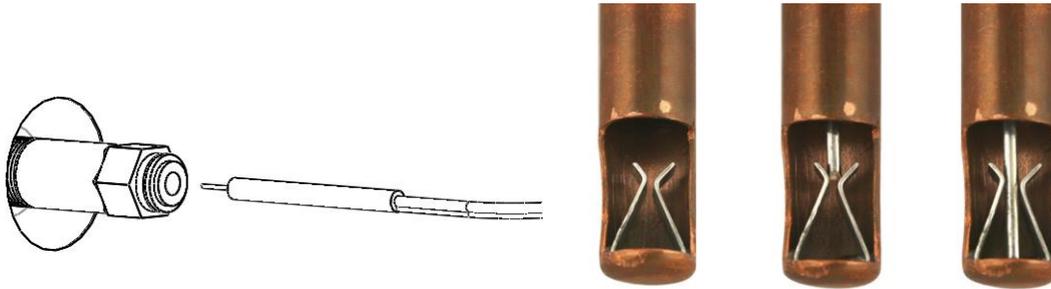
Bushing Install and Cabinet Alignment

4.2.3 Low Water Cutoff and Temperature Well and Probe Installation

EnergyLogic uses the Beckett AquaSmart Boiler Control, which performs the aquastat and low-water-cut-off (LWCO) functions using a single sensor and well. The current wells are made of machined brass, instead of the original plastic design. The brass wells are backwards compatible, so they can be used with existing sensors.

Note that the LWCO signal flows from the sensor, through the copper end of the well, through the water to the boiler vessel, into the brass well, and then back to the sensor through the green wire. Thus, if there is no water then the circuit is broken. To install the well and probe:

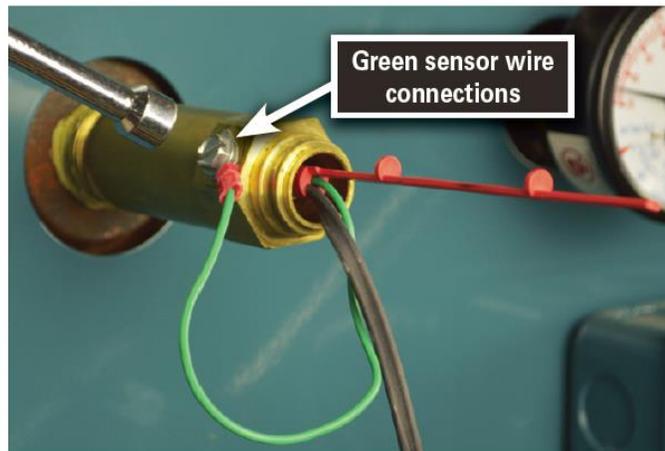
1. Remove the brass thermowell from the packaging and install it in the location shown in Section 4.2.1 for the correct boiler model.
2. Apply pipe sealant (suitable for brass) to the thermowell threads. Avoid getting sealant on the insulating sleeve around the copper tube. **CAUTION DO NOT USE TEFLON TAPE AS THIS CAN INTERFERE WITH THE ELECTRICAL SIGNAL.**
3. Install the well and tighten until leak free. Max torque is 60 ft-lbs.
4. Make sure the inside of the well is dry. Insert the sensor probe into the thermowell so that the pin is fully engaged in the clip, and bottoms out on the copper, as shown in the picture that follows.



- Route the black cable from the sensor probe through one of the knockouts in the control cabinet (use plastic insert in knockout hole) and into the AquaSmart Controller. Plug the black cable into the AquaSmart as shown below.



- Connect the green cable directly to the brass well as shown below (shorten if desired).

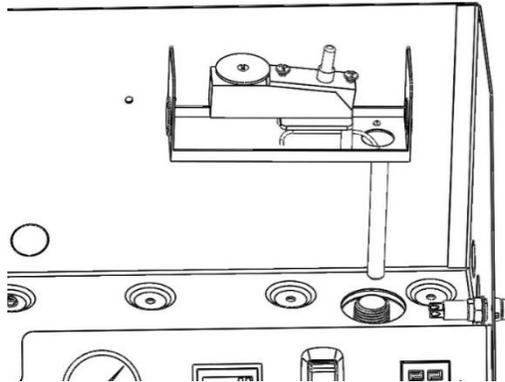


NOTICE The inside of the well must be dry before installing sensor. Moisture in the well could lead to premature failure.

CAUTION For proper operation, there must be a secure electrical connection between the green sensor wire from the Temperature/LWCO sensor and the metal boiler vessel containing the boiler water. Failure to provide a secure electrical connection will result in the 7610 control locking out and displaying, "LOCKOUT - WATER LOW."

4.2.4 High-Limit Temperature Controller Installation

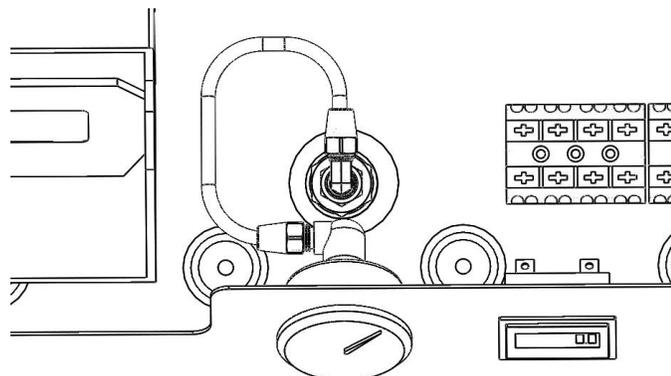
1. Remove the cover from the high-limit temperature control.
2. Gently extend the probe a few inches by straightening the small copper tubing.
3. Liberally apply the thermally conductive grease (provided) to the probe and well.
4. Insert the aquastat probe into the thermal well until it bottoms out.



5. Install the control over the thermal well. Using the clamp provided on the bottom of the control, secure the control to the well. The screws to tighten the clamp are located inside of the control, on either side of the probe opening.
6. Make sure that the control is set to 230°F. **CAUTION** Do not increase the setting.

4.2.5 Pressure Gauge Installation

1. Install the 1/8" MP x 3/16" flare fitting in the previously installed bushing. Use appropriate sealant or Teflon tape (on the pipe threads, not the flares) to prevent leaks. Orient the elbow as shown in the figure below.



2. Carefully bend the 3/16" flared copper tube assembly provided to mate with the two elbows.
3. Tighten the flare fittings using a 7/16" wrench.

4.2.6 AquaSmart Controller Settings (See AquaSmart Manual for Additional Details)

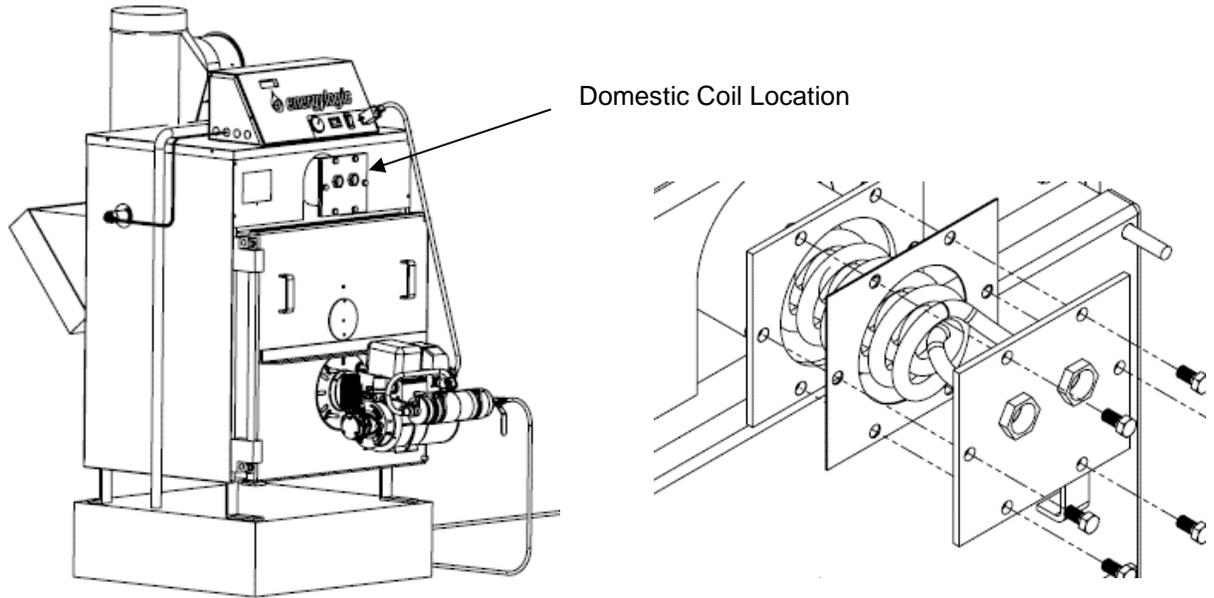
1. Wire power (120V/60 Hz, Single Phase, 20 Amp Max, Dedicated Circuit) to L1 (line) and L2 (neutral) of the terminal block and attach the ground wire to one of the green ground screws provided (see wiring diagram). **⚠ DANGER** This work should only be done by qualified personell.
2. Turn on the power switch on the front of the cabinet to power up the control. Open the door of the AquaSmart. The control is pre-wired except for zone control connections.
3. Set “HI” to the temperature that you want the water to reach during a call for heat. Set “LO” to the temperature that you want the water to maintain in the vessel when there is not a call for heat. Set DIFF to an amount that you want the LO setting temperature to cycle between. Note: The Hi limit cannot be set less than 15°F above the Lo limit setting. **CAUTION** Do not set the low limit below 140°F. The default HI setting is 180°F. The default LO setting is 140°F. The default DIFF HI and LO is 10°F.
4. If a room thermostat (or other device) is to be used to call for heat, the factory-installed jumper wire will need to be removed from the TW-TR terminals and replaced with wiring (24V) from the thermostat. If the jumper is not removed, the control will always sense a call for heat. If this is the case, the burner will always cycle between the high temperature limit and its set differential.
5. If using the circulation pump control on the AquaSmart, wire the pump control across terminals Blu and W of the terminal block (see wiring diagram). Use a 115V coil relay to provide separate power to the pump. The relay is necessary to make sure that the controller is not overloaded by the addition of the pump. Make sure to connect according to NEC code, with approved metal conduit. Note: Many installations use separate controls for the pump. **CAUTION** Regardless of the pump control method used, be aware of the requirement for a minimum of 140°F return water temperature. If this requirement is not met, the vessel warranty is void.

4.3 Pressure Relief Valve Installation

Install the 30-psi pressure relief valve in the port shown in Section 4.2.1. Use pipe dope on the threads. Make sure to install metal piping from the relief valve, routed according to code, to a safe place for discharge.

4.4 Domestic Coil (Optional Accessory)

The boiler vessel has provision for an optional domestic coil (2 on EL-500B), which is a compact heat exchanger that can be used for heating potable (clean) water in an open loop circuit. Call if you have a need for this accessory. If you are installing a domestic coil, follow the instructions that came with the coil, or call EnergyLogic Technical Support for assistance.



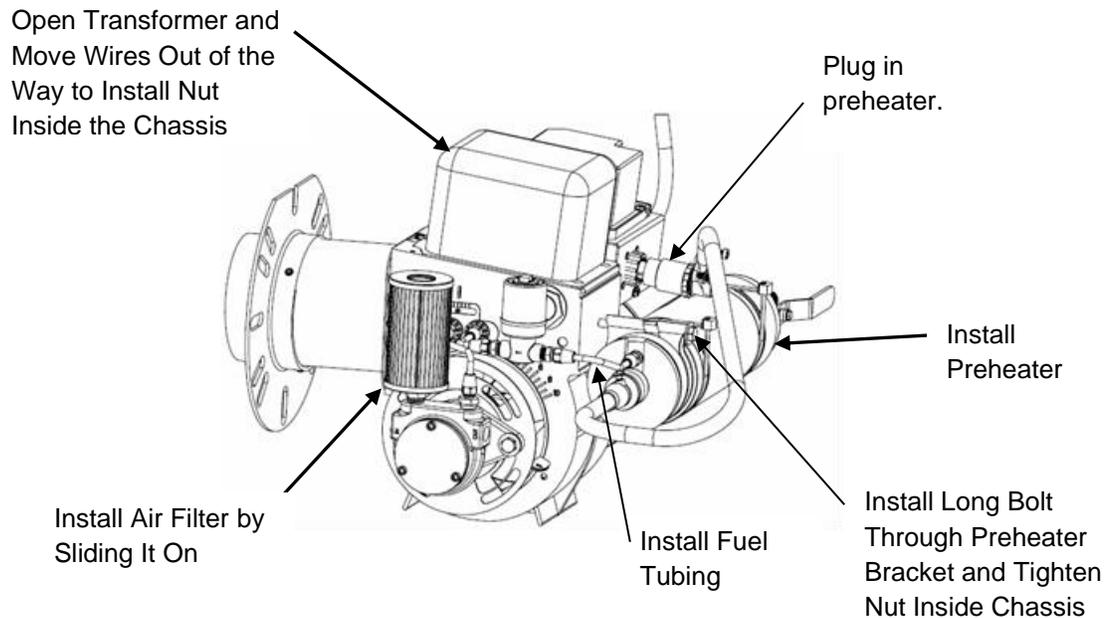
Domestic Coil

4.5 Preheater Assembly

Before installing the burner to the vessel, install the preheater, as follows:

Instructions for Model EL-200B:

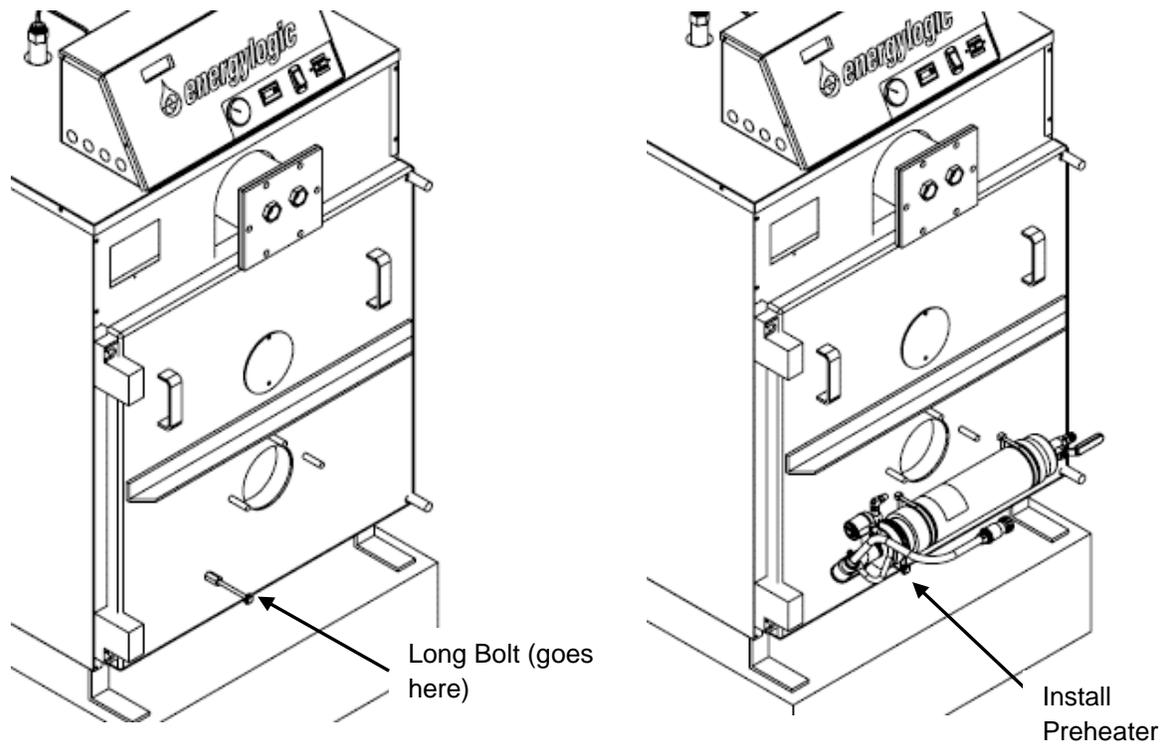
1. Use the long bolt and nut (provided with the preheater) to install the preheater on the burner chassis as shown in figure below. The hole in the chassis is pre-drilled. It is necessary to open the transformer gently lift the wires out of the way to install the nut on the bolt. Return wires to their original location and close the transformer when complete.
2. Remove the shipping caps on the preheater and burner. Note: The preheater and burner are tested during manufacturing, so a small amount of oil may be present.
3. Cut the tie strap holding the 1/8" copper tubing, and thread (do not tighten) the fittings onto the burner solenoid valve and preheater, as shown in the figure.
4. Tighten the fuel tubing fittings and the long preheater bolt.
5. Screw the plug end of the conduit into the receptacle on the burner wire box.
6. Install the air filter by pressing it onto the compressor inlet.



EL-200B Preheater Assembly (to burner).

Instructions for Model EL-375B and EL-500B:

1. Use the long bolt (provided with the preheater) to install the preheater. For the EL-375B and the EL500B, the preheater installs directly to the vessel door. **NOTE:** The preheater installs on top of the bolt.
2. Align the preheater with a slight upward slope to allow air to escape. Do not tighten the bolt completely until you have installed the fuel tubing to the preheater in the next section.



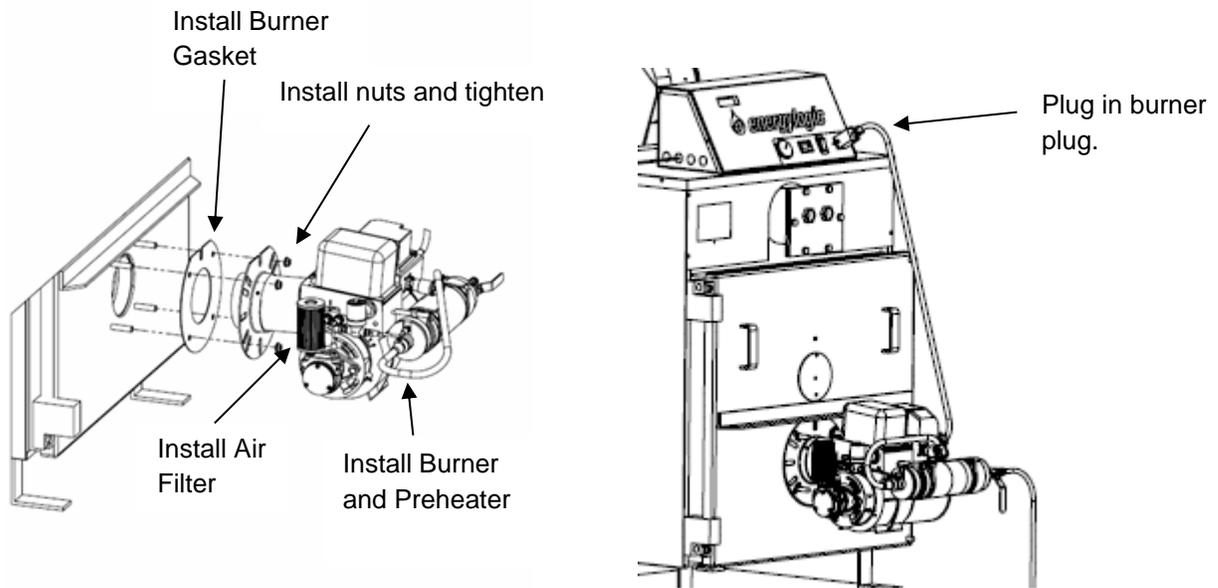
Installation of Preheater to Vessel Door for EL-375B and EL-500B
 NOTE: The Preheater Mounts on Top of the Bolt.

4.6 Burner/Vessel Assembly

Now, the burner can be installed on the boiler vessel. This is done as follows:

⚠ WARNING *The burner assembly is heavy. Handle with care.*

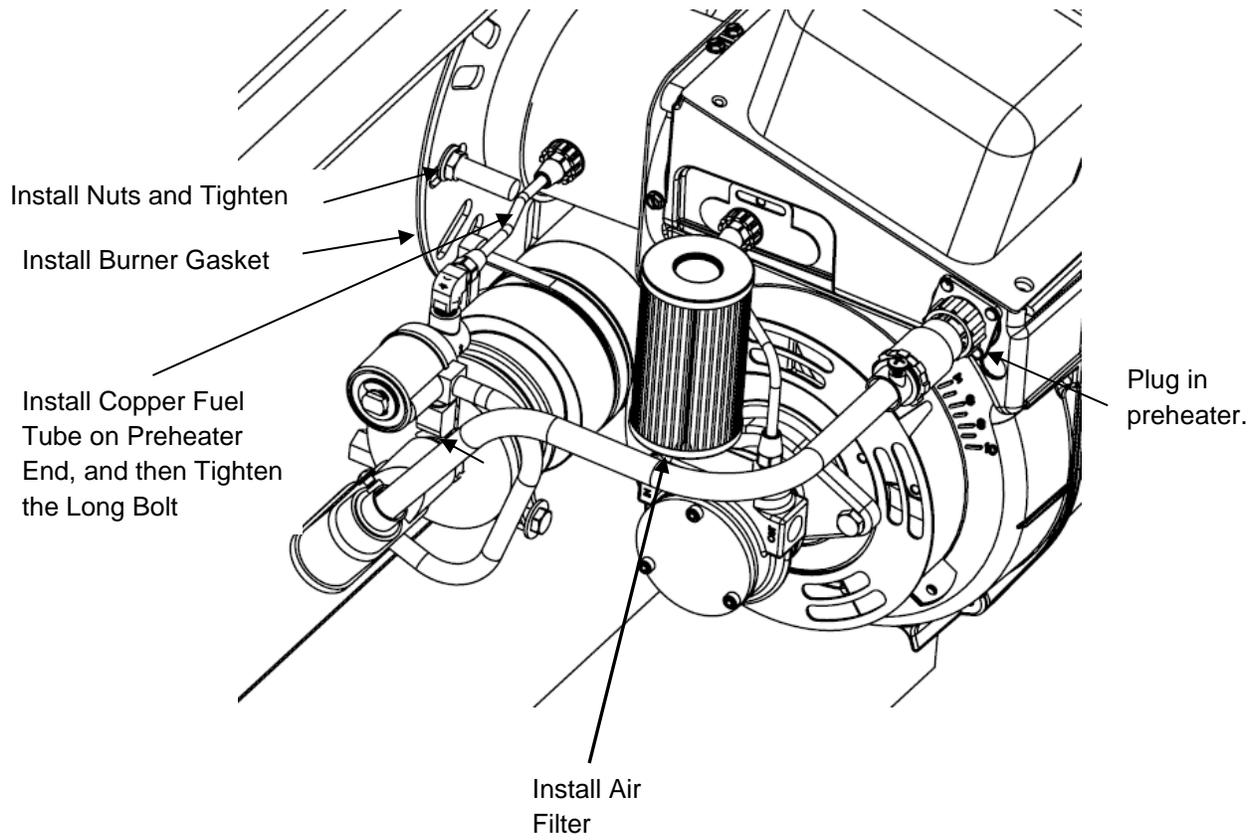
1. Remove the nuts from the studs on the boiler door
2. Install the burner gasket onto the studs. **NOTE:** Gasket sealer should not be used on this gasket. Apply a thin film of anti-seize compound to the vessel side of the burner gasket to help reduce gasket sticking when servicing.
3. Inspect the retention head and electrodes for proper settings (refer to Section 8.5.6).
4. Mount the burner assembly onto the vessel by inserting the burner over the studs.
5. Reinstall and tighten the nuts.
6. Plug the burner harness into the vessel wiring box (refer to figure). The plug fits only one way. This completes this step for the EL-200B. If you are installing an EL-375B or EL-500B, continue to step 7 to connect the preheater to the burner. **⚠ DANGER**
Always unplug the burner before doing any service work on it. Attempting to swing the vessel door open while the burner is plugged in may damage the plug or cable.



Installation of Burner on EL-200B.

For models EL375 and EL500B, continue with the following steps.

7. Remove the shipping caps on the preheater and burner. Note: The preheater and burner are tested during manufacturing, so a small amount of oil may be present when the caps are removed.
8. Thread (do not tighten) the small copper tube assembly onto the flare fittings on the preheater solenoid valve and burner air tube.
9. Tighten the fuel tubing fittings and the long preheater bolt. (Do not over tighten.)
10. Screw the plug end of the preheater conduit into the receptacle on the burner chassis.
11. Install the air filter by pressing it onto the compressor inlet.



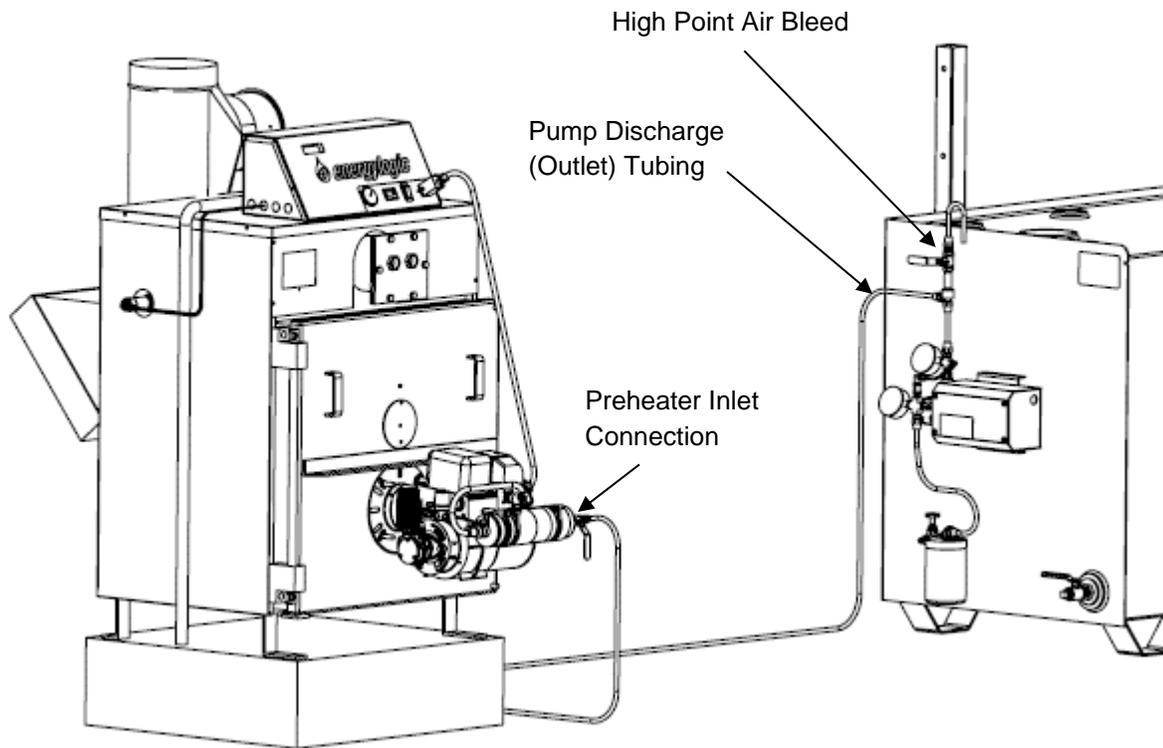
Installation of Burner on EL-375B and EL-500B.

4.7 Fuel Pump Discharge (Outlet) Tubing Installation

Now that you have installed the burner, you will install the fuel discharge tubing (not provided).

4.7.1 Pump Discharge Tubing Installation

The tubing is installed as follows (refer to figure):



Routing of Discharge Fuel Tubing - Tank Mount

1. Remove the cap on the fuel pump discharge (outlet) port.
2. Plan the route for fuel tubing (3/8-inch outer diameter copper and 45 Deg. flare fittings) between the pump and the boiler. **CAUTION** *Be careful not to kink or place sharp bends in the fuel tubing. Do not form any loops in the tubing, as trapped air will cause issues with performance.*
3. Slide a flare fitting over one end of the copper tubing and use a flaring tool to flare the end of the tube. Make sure the flare is smooth, with no cracks.
4. Thread (do not tighten) the flare fitting to the fuel pump outlet fitting.
5. Route the fuel tubing. Refer to guidelines in the next section.
6. Remove the preheater inlet cap. **Note:** The preheater was tested during manufacturing. A small amount of oil may be present when the cap is removed.
7. Cut the tubing to the correct length, slide on a flare fitting, and flare the end.
8. Thread (do not tighten) the fuel tubing fitting to the preheater inlet.
9. Tighten the fuel line flare fittings. Make sure to use a second wrench to prevent loosening of the existing fittings.

4.7.2 Pump Discharge (Outlet) Tubing Installation – Guidelines

The following guidelines are provided:

Pump Discharge Tubing Considerations:

- Use 3/8" O.D. copper tubing, with 1/32" wall thickness.
- Run tubing with an upward slope towards the preheater, with no loops or high points to trap air. Realizing that the preheater is low to the ground on most boiler installations and that the line will likely need to drop down at one point, install a high-point-bleed kit (accessory available from EnergyLogic) wherever the discharge line routing steps down to provide a means to bleed trapped air in the line during priming. Run tubing as straight as possible.
- Use 45° flare connections for copper tube. Never use compression fittings.
- Maximum vertical rise of discharge piping is 30 feet.
- Maximum total length of discharge piping is 150 feet.
- Discharge line from the metering pump must be run indoors, with a minimum ambient temperature of 50°F (10°C).
- Installation of a shut-off valve after the fuel pump will make routine maintenance easier. It will prevent loss of oil in the discharge line if the pump discharge connection is to be loosened for priming or other maintenance.
- If the tank is not visible from the burner, the use of a remote system gauge kit (accessory available from EnergyLogic) is recommended in order to have convenient pressure readings available at the burner.

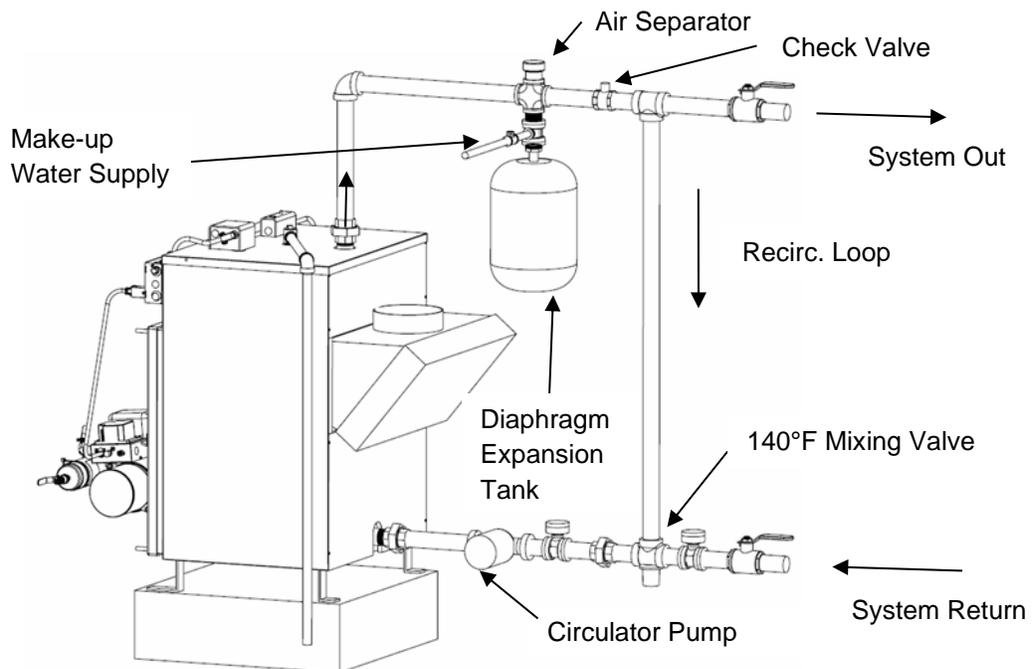
4.8 Hydronics Connection and Boiler Mixing Valve Installation

4.8.1 Hydronics Installation – Key Points

- **CAUTION** The EL Boiler is a low pressure (30 psi), hot water boiler. When an EL boiler is incorporated into an existing hydronics system with other types of boilers, it is important to know what the system pressure will be. Injection pumps and pressure reducing valves can allow incorporation of a low pressure boiler into a higher loop pressure application.
- **CAUTION** The return water temperature to the boiler must be above 140°F. If water temperatures at the return are consistently lower than 140°F, the boiler will sweat on the fire-side of the tube causing coking, and corrosion; thus voiding the warranty.
- **CAUTION** Boiler water must be oxygen-free (use an air/water separator and oxygen barrier piping) if the water is through the main vessel (closed-loop system). For applications where water is being pulled directly from main water supplies, open tanks, or pools, the water should be routed through the domestic coil. An oxygen-rich water supply through the carbon steel portion of the boiler heat exchanger will result in corrosion and accelerated vessel degradation, voiding the warranty.

4.8.2 Hydronics Set Up

The EL boiler package provides controls to monitor water level and temperature, but does not provide all the necessary hydronics components. Closed-loop boiler systems typically have the following components installed on the water side (actual components should be determined by the hydronics expert):

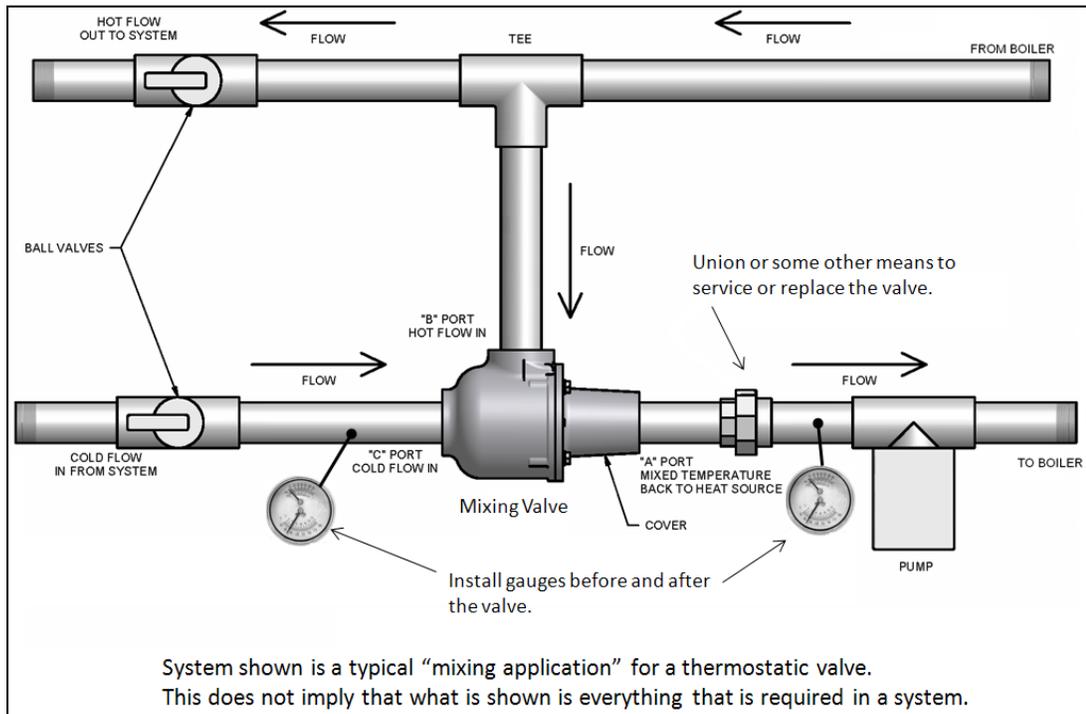


Hydronics System Example.

- Circulator pump – sized for desired flow rate, modulating actuator and pocket stat.
- Air diaphragm expansion tank – used to prevent system pressure spikes as the loop water temperature increases. Size this accordingly based on the BTU net output.
- Air/water separator – used to remove air from the initial water charge in a closed-loop system.
- Water make-up valve – provides make-up water for small losses in the loop over time.
- Miscellaneous valves and gauges. Check valves and isolation valves are essential to ensuring proper water flow and serviceability. Gauges are used to monitor the system.

4.8.3 Boiler Mixing Valve Set Up

CAUTION A thermostatic mixing valve is highly recommended as one means of assuring that the water returning to the boiler is consistently above the minimum required temperature of 140°F. This valve, along with circulation control based on a minimum circulating water temperature will protect the boiler from cold water. EnergyLogic offers boiler mixing valve kits. A typical installation for the valve is shown in the following diagram:



Boiler Mixing Valve Arrangement

4.9 Filling the System

1. When the boiler system piping is complete, add heating-grade antifreeze into the vessel through the gauge port on the top prior to filling the system with water. A 25% to 50% solution is typical; however, the climate of use will dictate the freezing protection required. It is recommended that the percent solution used be based on the minimum necessary for freeze protection. The antifreeze must be propylene-based, hydronic grade for heating systems, rated for high temperature operation. RV grade solution will not hold up, and should never be used.
2. For reference, following are the vessel capacities for the various models.
 - a. EL-200B 30 gallons
 - b. EL-375B 43 gallons
 - c. EL-500B 52 gallons

Additional capacity for the piping system must be estimated specific to the application.

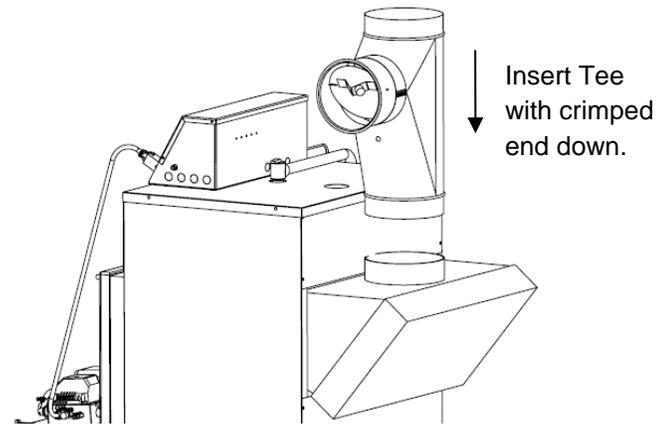
3. Inspect all connections for leaks.

5. Exhaust Flue System Installation

The exhaust system is critical for the safe operation of the boiler, as it exhausts the products of combustion out of the building to the ambient environment.

5.1 Barometric Damper Tee Installation

The barometric damper tee helps to regulate draft pressure through varying ambient conditions. Install the tee with the crimped end pointing downward by sliding it into the heat exchanger outlet until the crimped section is completely inserted (refer to figure).



Installation of Tee and Damper.

5.2 Flue Piping Installation

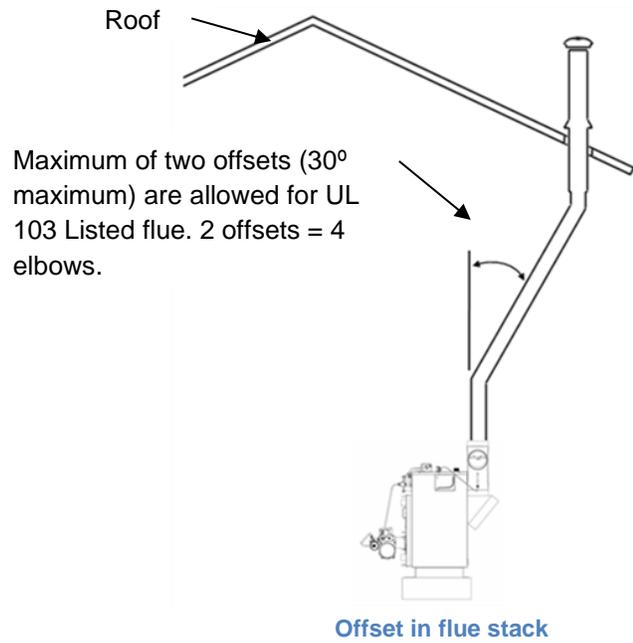
The flue piping exhausts products of combustion out of the building into the ambient environment.

⚠ WARNING *You may have a basic knowledge of carpentry and the use of hand tools. However, it is important that you review all safety rules in this section, and all safety rules in the manuals provided with your manufactured flue kit. If you have any doubt about your ability to complete the installation in a safe and workmanlike manner, you should arrange for a professional installation. For more regulatory information regarding flue pipe installation, consult NFPA 31 and your local fire protection and building codes.*

Flue System Installation Steps and Considerations:

- Review this section completely. Choose and purchase a factory-built flue kit that complies with U.L. standard 103 Type HT - rated 1000°F (538°C) continuous operation, or equivalent.
- The EL-200B and the EL-375B require 8-inch diameter flue.
- The EL-500B requires a 10-inch diameter flue.
- For your convenience, EnergyLogic offers flue kits for EnergyLogic boilers. Contact your EnergyLogic dealer to purchase.
- **⚠ WARNING** Read and follow the product and safety instructions included with your selected flue kit. If product instructions were not included, contact the manufacturer of your kit to obtain the instructions. If unsure of your ability to properly install the flue system, hire a professional installer or contact EnergyLogic for assistance.

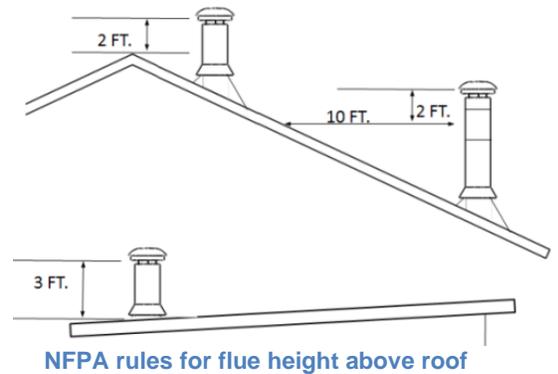
- Contact your local building or fire officials about restrictions and an installation inspection.
- Run the flue vertical from the damper tee out through the roof. If this is not possible, two offsets (30° maximum) are allowable for U.L. 103 Listed Flue Kits (refer to figure).



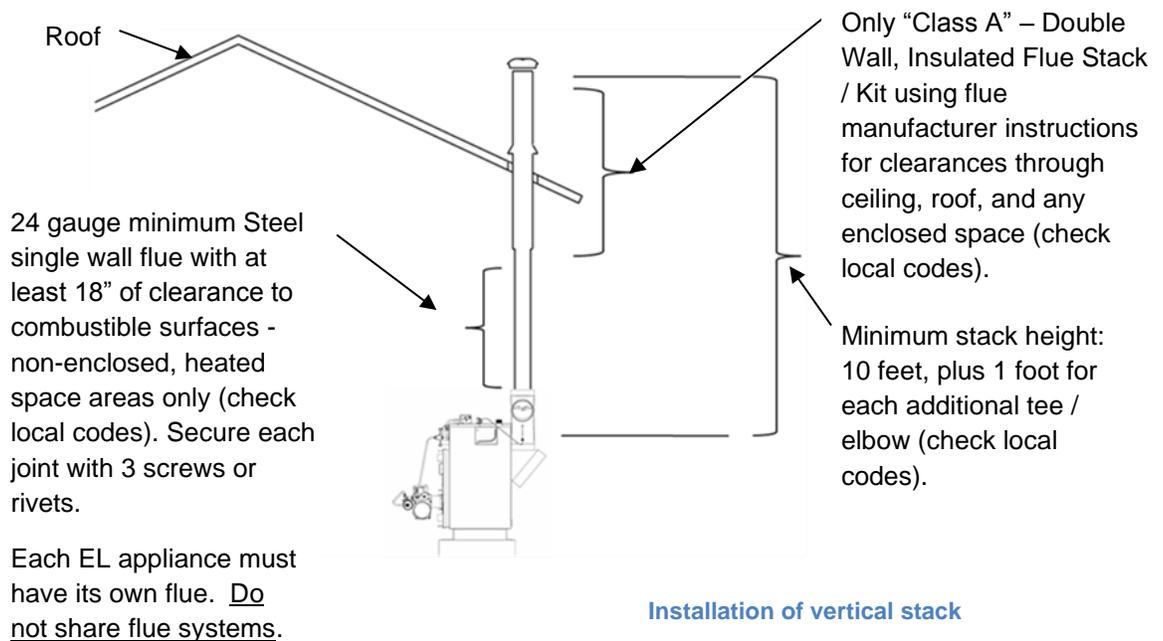
- **⚠ WARNING** Single wall flue (minimum wall thickness of 24 Gauge steel) may be used in heated space, but must be kept a minimum distance (air space only) of 18 inches (46 cm) from combustible surfaces (check building and fire codes for precedence). THE PORTION OF THE FLUE SYSTEM THAT PASS THROUGH UNHEATED SPACE / CONCEALED AREAS AND THE PORTION OUTSIDE THE BUILDING IS TO BE A CLASS-A DOUBLE WALL FACTORY-BUILT FLUE KIT THAT IS APPROVED TO STANDARD U.L. 103, OR EQUIVALENT. Refer to the manufacturer’s instructions on the minimum clearance required for the double-wall product used. Install flue system per the flue manufacturer’s instructions, making sure that adherence to the instructions will fully comply with national safety standards such as NFPA 31, 54, and 211. Refer to fire and building codes for further requirements.

⚠ WARNING Improper installation of the flue system could result in property damage, serious injury or death.

- Avoid 90-degree elbows and horizontal runs.
- Properly support the flue stack. Do not rely on the boiler to support the total load of the flue system. Follow the flue manufacturer’s instructions for support kits.
- Use a dedicated flue system for each EL appliance. Do not share a flue system with another appliance or fireplace.
- The flue is required to extend at least 3 feet above the highest point where it passes through the roof of a building, and at least 2 feet higher than any portion of a building within 10 feet (NFPA 31, 54 and 211 – see figure). For increased margin, EnergyLogic recommends extending the flue further than the minimum guidelines.
- Minimum stack height: 10 feet, plus 1 foot for each additional tee / elbow. Refer to local codes, which may require additional stack height based on BTU input.



- In Canada, installation including stack height requirements and distance from property line shall be in accordance with the authorities having jurisdiction concerning environmental quality as well as fuel, fire, and electrical safety and Table 7 in CSA B140.0-03 (clause 22.3.2).
- Install single-wall flue pipe with the crimped end down, so that ash and moisture inside the flue are maintained inside the flue/boiler, rather than leaking out and running down the outside of the flue pipe. A single-wall to double-wall adaptor is included with EnergyLogic flue kits.
- Terminate the flue pipe with an all-weather wind cap. Note that bug/bird screens are NOT recommended, as they can become clogged with ash.
- During start up (section 7), you will verify that the flue system (along with conditions inside the room or building) provide for adequate draft. **⚠ WARNING** Do not operate your boiler if you cannot achieve proper draft. Contact EnergyLogic Technical Service for assistance.

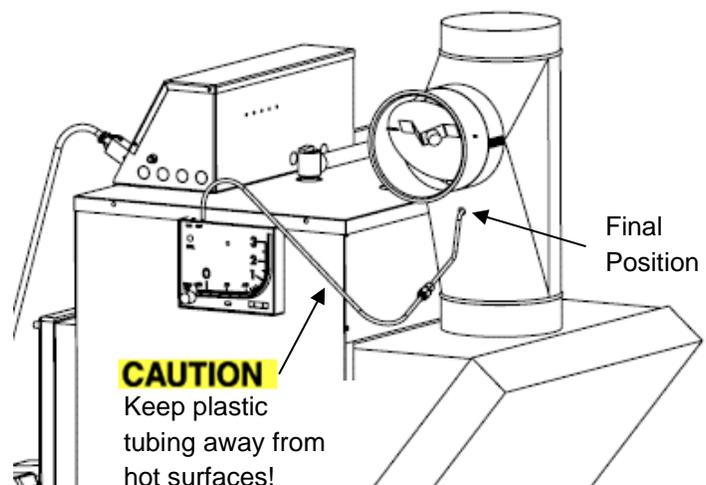
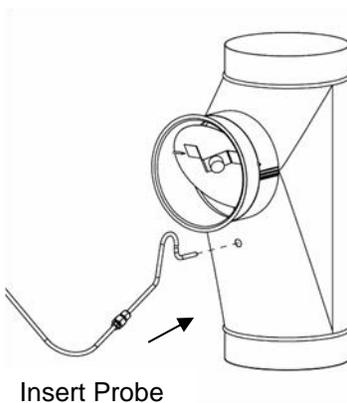
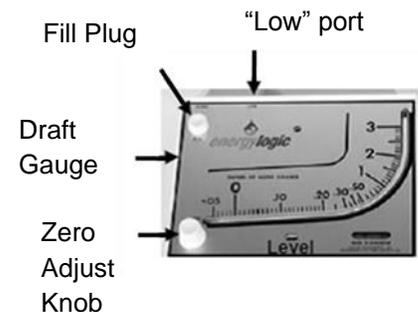


⚠ WARNING A negative pressure inside the building may impede intake of combustion air to the burner, which may result in a hazard from smoke inhalation and/or fire. Use of exhaust fans in your shop without adequate make-up air may create a negative pressure. There are other possible causes as well. Corrective measures must be taken before operating the appliance if the correct draft setting cannot be achieved. Contact EnergyLogic or consult a local professional for assistance

5.3 Draft Gauge Installation (included with some packages)

The draft gauge is a precision inclined-vertical manometer. Permanently installing the EnergyLogic draft gauge allows you to monitor the draft during operation.

1. Mount and level the draft gauge to the boiler cabinet using the screws provided with the gauge. **Note:** There is a level built into the gauge. Mount on an insulated panel or other area that will not be exposed to direct or radiant heat.
2. Turn Zero Adjustment Knob clockwise until it stops, then turn counterclockwise (3) full turns to allow for future adjustment.
3. Remove gauge Fill Plug and open red fluid bottle provided with gauge.
4. Slowly pour small amounts of fluid (typically 1/4 of the bottle is used) into “fill” opening until it reaches zero on the scale. Replace the fill plug. Minor adjustments can be made by adjusting the knob to zero the gauge.
5. Attach the one end of the plastic tube (packaged with the gauge) to the draft gauge port labeled “Low” at top of the gauge. **Note:** Only one tube is needed. If a double tube is provided, it may be split apart.
6. Locate the draft gauge probe, which is a piece of stainless steel tubing with a “U” bend in it. Thread a ¼-inch barbed fitting (included in the gauge packaging) to the draft gauge probe. **Note:** There is extra hardware in the gauge packaging that is not used.
7. Cut the tube to the needed length and attach the free end to the barbed fitting.
8. Confirm that the gauge is level and reading “zero” with the probe in your hand, in still air. If not, adjust the gauge to read zero using the zero adjust knob.
9. Insert the open end of probe into barometric damper tee draft gauge probe hole as shown in figure below. **CAUTION** Do not route the plastic tubing near non-insulated parts of the vessel, breech or flue as heat will damage the tubing. If necessary, provide protection to the tubing or use wire to hold it off hot surfaces.



Draft Gauge Probe Installation

6. Electrical System Installation

Power requirements: a dedicated, hard wired 115VAC/60Hz circuit with a 20 amp maximum circuit breaker. Verify voltage is 115VAC at dedicated breaker prior to connecting to boiler. Use copper conductors only. A wiring diagram is provided in the Appendices. **⚠ DANGER** *Electricity is very dangerous. Wiring should be completed by a qualified electrician. Consult the National Electric Code (NEC) and local codes for additional requirements. In Canada, consult the Canadian Electrical Code, Part I.*

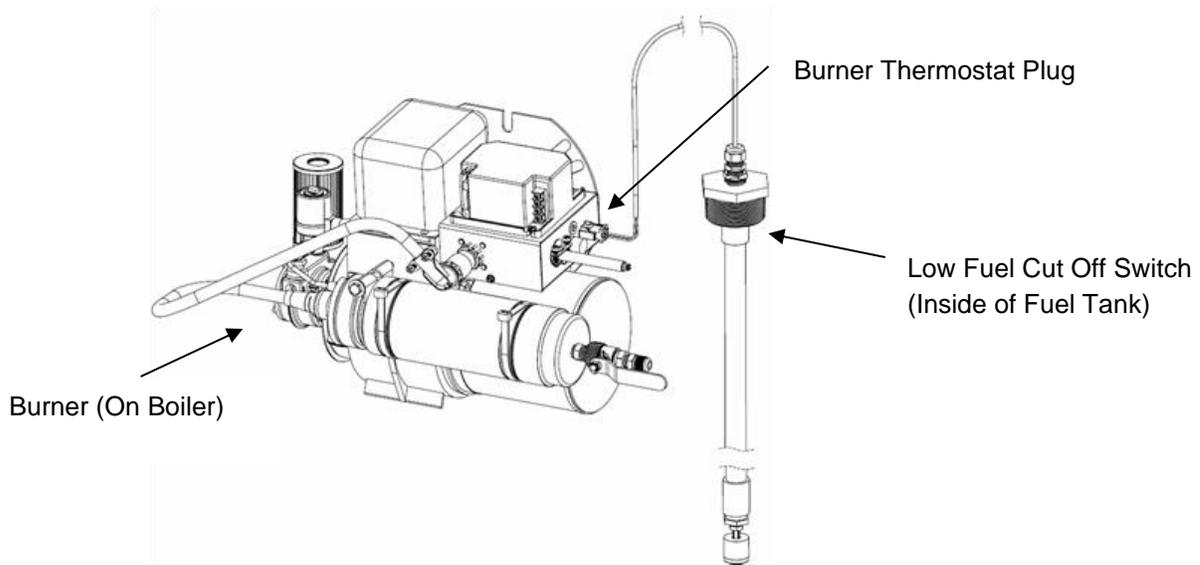
6.1 Wall Thermostat and Low Fuel Cut-Off Switch Installation (Optional Accessories)

6.1.1 Wall Thermostat Installation

The wall thermostat signals to the AquaSmart temperature controller when a call for heat is required. Refer to section 4.2 on the installation of the Aquasmart controller. If using a thermostat, the factory-installed jumper wire will need to be removed from the Aquasmart controller, and the thermostat wiring will be installed across the thermostat terminals on the aquastat temperature controller.

6.1.2 Low Fuel Cut-Off Installation

The burner wiring box has a thermostat plug (jumpered). If a low fuel cut-off switch is installed in the fuel tank, the switch wiring will need to be connected at the burner thermostat plug as follows.



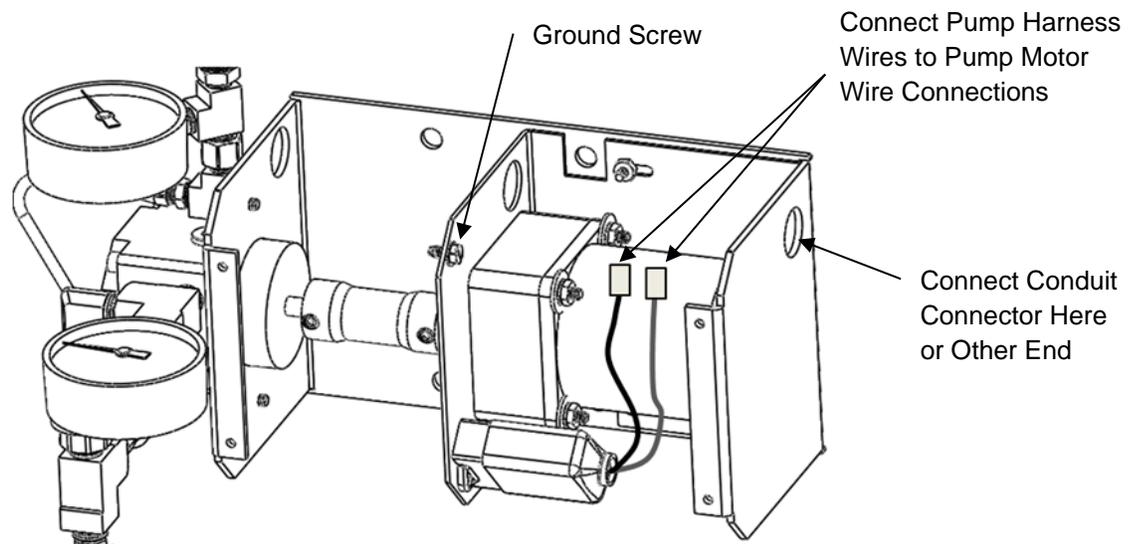
Low Fuel Cut Off Installation.

6.2 Fuel Pump Power Connection

▲ DANGER Make sure that boiler control box assembly is not connected to power or make sure that the power is shut off and locked out prior to connecting the fuel pump.

The final step in connecting the fuel system is to run the power conduit from the boiler vessel wiring box to the fuel pump. This is completed as follows:

1. If not already removed, remove the fuel pump housing cover.
2. Route (16 AWG) gauge wire to the metering pump from the control box (ORG and W marked "pump"). Use copper conductors only, and wire to code.
3. Connect the conduit to the fuel pump bracket. The knock out hole is provided on the end of the pump housing.
4. Using insulated, crimp-on connectors, connect the hot wire to one motor wire connector (it does not matter which one), and the white wire to the remaining motor wire connector.
5. Connect the green (ground) wire to the ground screw on the middle housing bracket.
6. Reinstall the fuel pump housing cover.
7. Connect the other end of the conduit to the Orange and White connectors at the terminal strip in the control box. Connect the ground wire to one of the green grounding screws.



Wire Connections to the Metering Pump.

6.3 Main Electrical Connection

⚠ DANGER *Personally verify that the main circuit is OFF and Locked Out before making any wiring connections. Use only copper conductors. All wiring installations should meet National Electric Code (NEC) and local guidelines. Canadian wiring installations are to be done in accordance with the Canadian Electrical Code, Part I.*

Install the main electrical connection as follows (refer to figure):

1. Have a certified electrician install a wall mounted junction box near the boiler vessel. It is recommended that the box be switchable with a lock-out feature. Verify the use of a dedicated circuit (115VAC/single phase circuit breaker, 20 Amp maximum - wired to code for the size and type of service used. Make sure circuit is SWITCHED OFF prior to the next step.
2. From the junction box installed in step 1., route one black wire, one white wire, and one ground wire (12 AWG Minimum), in conduit, to the control box assembly.
3. Connect the black wire from the conduit to the L1 (black) connection in the terminal block in the control box, the white wire to the L2 (white) connection, and the green wire to one of the ground screws.

NOTE: Each section of the terminal block has four connected wiring terminals, which can accept individual wires. To install a wire, strip the end 3/8". Then push down the "+" tab with a screwdriver above the desired location and slide the wire into the hole. Release the tab and pull the wire to make sure it is locked in place.

4. Refer to the wiring diagram in Section 10.1 for additional information.

CAUTION Do NOT allow wiring to rest on or against hot surfaces (damper tee, boiler breech, etc.)!

7. Startup and Operation

Once setup properly, EnergyLogic boilers are designed to operate reliably over a wide range of conditions with minimal adjustment. This section is provided to make sure that the boiler is set up properly, and to provide instructions on the initial start-up.

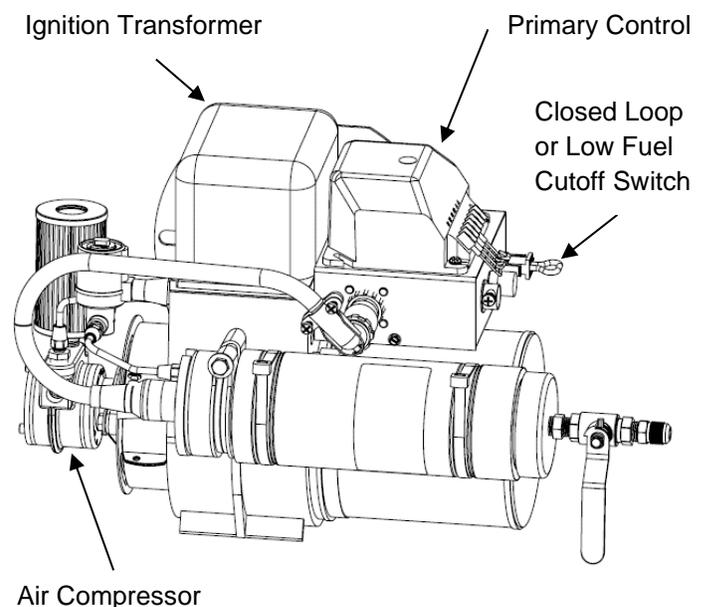
7.1 Do's and Don'ts/Tech Tips

1. Read each procedure completely before performing the steps.
2. Do not burn gasoline or kerosene in your boiler.
3. Do not place chlorinated solvents into the tank.
4. Do not burn antifreeze coolant (ethylene glycol) in your boiler.
5. Regularly check for water and/or coolant in the fuel tank at the tank drain.
6. Do not allow your fuel tank to run out of fuel (avoid the hassles of small particle contamination and re-priming of the fuel system).
7. Document the pressure and vacuum readings of the boiler after it has been operated several hours. This will assist with future diagnostics, if necessary.
8. Do not place fuel suspected of having debris or shavings into the tank.
9. STORE THIS MANUAL IN AN ACCESSIBLE LOCATION.
10. Only use EnergyLogic fuel filters with 140 micron/metal mesh specifications. Do not use paper element filters.
11. PERFORM THE RECOMMENDED PERIODIC MAINTENANCE.
12. Unplug the burner during the off season (summer) to prevent coking of the preheater and nozzle.

7.2 Burner Operation

During normal operation, the boiler operates as follows:

1. The AquaSmart controller measures the water temperature in the boiler and turns on power to the burner primary control (see figure) based on a call for heat or the low limit temperature setting.
2. If the preheater is hot enough to close the internal thermostat (120°F) and the low fuel cutoff circuit is closed, then the primary control starts the burner.
3. The burner motor comes on, which starts the combustion air blower and compressor.



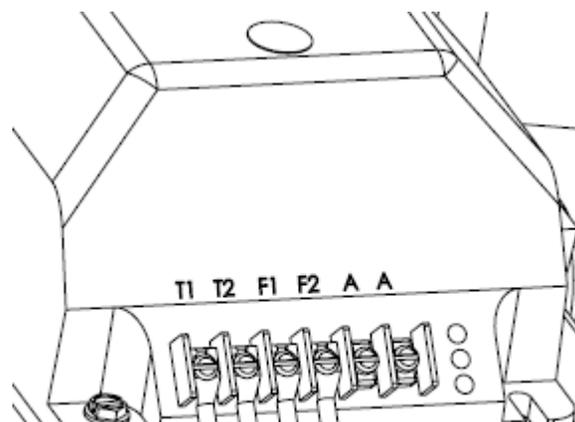
4. The ignition transformer is powered to spark the igniter.
5. The fuel pump turns on and the solenoid valve opens to start delivering fuel.
6. Within 15 seconds the flame lights, and is recognized by the cad cell.
7. The burner continues firing and the water is heated through the heat exchange tubes.
8. The AquaSmart controls the circulation pump to deliver hot water to the system.
9. The burner continues to fire until the aquastat temperature controller determines that combustion is no longer needed due to low limit differential or high limit water temperature settings being reached.
10. Power is removed from the primary control, which shuts the burner off, but power continues to flow to the standby oil heaters to keep the oil hot for the next firing.

The Primary Control (shown in figure) is pre-programmed and is not adjustable. The important interface points are as follows:

- The two T-Terminals (red wires) are for the thermostat signal. To simulate a closed thermostat, you can jumper across the two T terminals with an alligator clip or wire. However, the AquaSmart must first be calling for the boiler to fire in order for the Primary Control to be powered.
- The two F-Terminals (yellow wires) are for the cad cell signal. The cad cell is a light sensor inside the burner that senses the flame. To simulate a flame, you can jumper across the two F terminals with an alligator clip. However, this must be done after the burner has started, but before the trial for ignition time has run out.

⚠ WARNING Do not leave the T and F terminals jumped during normal boiler operation, as this bypasses several safety checks and may cause excessive oil to be deposited in the combustion chamber, creating a fire or explosion hazard. For the same reason, do not leave the T and F terminals jumped for more than 30 seconds if oil is being sprayed but not being burned.

- The reset button (red button on top of the primary control) is used to reset the controller, in case of a failed start attempt or flameout.
- The LED(s) (on some models) are used to indicate proper burner operation or errors.



7.3 Safety Systems and Warnings

Several systems are built into the burner controls to ensure that the burner operates safely:

Preheater Thermostat: This device prevents the primary control from attempting to start the burner with fuel that is too cold (120°F). In addition, if the oil temperature drops below the limit while the burner is firing, the burner will shut down.

Cad Cell: The Cad Cell detects the light emitted by the flame to determine that the flame is on. If the burner does not light within 15 seconds, or if the flame goes out for any reason, the controller will shut down the burner. This prevents the accumulation of unburned fuel in the combustion chamber, potentially generating smoke, rumbling or misfiring of the burner.

Primary Control: If the burner fails to light, or loses flame for any reason, the Primary Control will trip and shut down the burner. To reset, press the red button on top of the primary control. Note, it may be necessary to hold the button down for one minute to get the control to reset.

⚠ WARNING Multiple resets may allow oil to accumulate in the heat exchanger, therefore do not reset more than one or two times. Call for service from an authorized professional if controller continues to trip.

⚠ WARNING DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED IN THE CHAMBER, WHEN THE BOILER IS FULL OF VAPOR, OR WHEN THE COMBUSTION CHAMBER IS VERY HOT.

7.4 Boiler Startup

Prior to the initial startup of the boiler, it is important to make sure the fuel system is properly primed to remove air bubbles that will cause nuisance flameouts. Once the burner is operating, the system is checked and necessary adjustments are made.

CAUTION *Fuel vacuum side leaks that cause air to get into the fuel system are a major cause of nuisance burner shut-downs. It is critical to eliminate all vacuum side leaks from the fuel lines!*

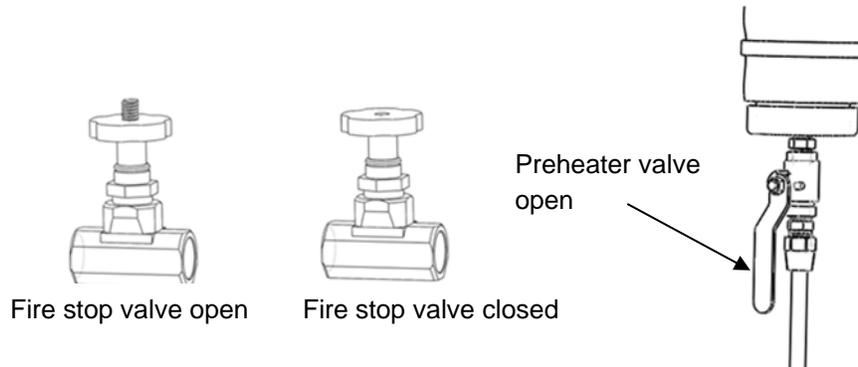
⚠ WARNING DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED IN THE CHAMBER, WHEN THE BOILER IS FULL OF VAPOR, OR WHEN THE COMBUSTION CHAMBER IS VERY HOT. Refer to section 8.5.1 (heat exchanger cleaning) for instructions on removal of excess oil.

⚠ WARNING DO NOT START THE BURNER UNLESS ALL CLEANOUT PANELS ARE SECURE IN PLACE.

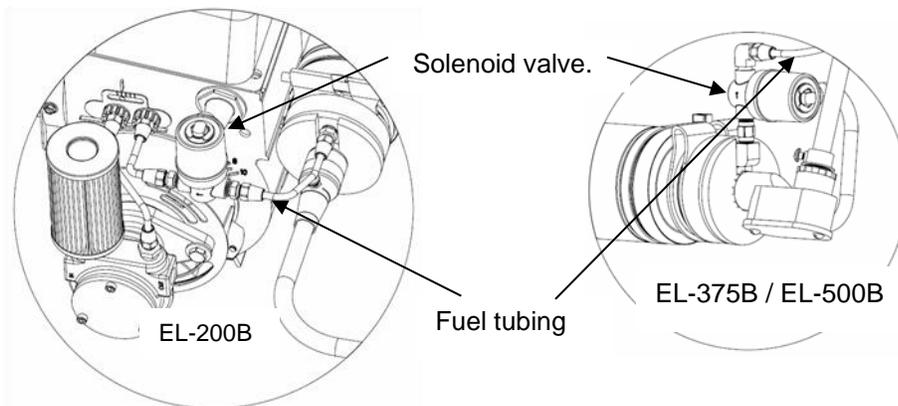
7.4.1 Fuel System Priming

This section explains how to prime the metering pump. **CAUTION** Use a second (backup) wrench when removing or installing the flare fittings, plugs or caps to ensure that you do not turn threaded fittings or the preheater cap and create a leak.

1. Make sure the used oil storage tank has adequate oil, with oil level above the low fuel cut off float switch (if equipped).
2. Ensure the fire-stop valve (if equipped), all hand valves, and the preheater valve are open. (refer to figure)



3. Fill the Fuel Filter with fuel (pre-filtered used oil or non-synthetic, new ATF) to speed the priming process and to reduce amount of air in system. Hand-tighten the filter (apply thin film of oil to gasket).
4. Switch on the main power to the boiler, and make sure that the burner and preheater are plugged in.
5. Have oil absorbing rags handy to catch oil.
6. Using a 7/16" wrench, disconnect the outlet end of the small fuel tubing at the preheater outlet (refer to figure).



7. Loosen the inlet fitting of the small fuel tubing and pivot it so that it is pointed down. Then, re-tighten the fitting to seal during priming.
8. Place a container under the open end to catch oil coming out of the preheater.
9. Make sure that the boiler vessel is filled with water and the AquaSmart Controller is calling for heat (primary control is powered). Push the manual reset button on the High

Limit Aquastat Control (in case it is tripped). Jump one set of alligator clips across the T-T terminals (red wires) of the primary control to tell the control to fire the burner. The primary control will start the burner. (F-F must not be jumped yet.)

10. Once the burner motor starts, immediately jumper across the F-F terminals (yellow wires) of the primary control with another alligator clip to simulate the cad cell seeing a flame. If jumped properly, the burner will continue to operate without tripping.
11. Verify that the pump is running. Whenever the burner is operating, the pump should be operating as well.
12. It will take some time (10 – 30 minutes, depending on the unit size and length of tubing between the pump and preheater) for the fuel to reach and fill the preheater.
13. If there is a high point air bleed in the fuel tubing, place a bucket under the bleed to catch fuel that comes out, open the bleed valve and close the valve going into the preheater. Once fuel is flowing steadily from the bleed line with no air bubbles, reopen the preheater valve and close the bleed valve.
14. Once fuel is flowing steadily from the tube at the top of the preheater into the container with no air bubbles visible, the system is primed. **⚠ CAUTION** *The preheater and fuel coming out may be hot.*
15. If all the air has been bled from the lines, the pressure should go immediately to around 60 psi when the preheater valve is closed. **⚠ CAUTION** *Fuel may spray out forcefully when the valve is reopened if there is air in the line.*
16. Check for leaks.
17. Once priming and leak checks are completed, remove the alligator clips from the terminals. **⚠ WARNING** *Do not leave the T-T and/or F-F terminals jumped during normal boiler operation, as this bypasses several safety checks.*
18. Reconnect the fuel tubing at the preheater / solenoid valve / burner.

7.4.2 Starting the Boiler

Important: Prior to starting the boiler, allow the preheater to heat the fuel until the outlet of the preheater is hot. This may take up to 30 minutes. The preheater thermostat circuit will close once fuel temperature reaches approximately 120°F. Once the fuel is hot, start the boiler as follows:

⚠ WARNING DO NOT ATTEMPT TO START THE BURNER WHEN EXCESS OIL HAS ACCUMULATED, WHEN THE BOILER IS FULL OF VAPOR, OR WHEN THE COMBUSTION CHAMBER IS VERY HOT. Refer to section 8.5.1 (heat exchanger cleaning) for instructions on removal of excess oil.

⚠ WARNING DO NOT START THE BURNER UNLESS ALL CLEANOUT PANELS ARE SECURE IN PLACE.

1. Verify the primary control does not need to be reset by pressing the red reset button. You also may need to reset the Low Water Cut-Off and High Temperature Limit Controllers.

2. Set the wall thermostat or other control device to a high temperature to send a call for heat and start the boiler.
3. It may take a few attempts for the burner to light on the initial start, as the nozzle block will not be filled with fuel yet.
4. If the burner will not light, proceed to the troubleshooting section of the manual or call EnergyLogic Technical Service.
5. **⚠️ WARNING** Continue to the next section for important checks and adjustments.

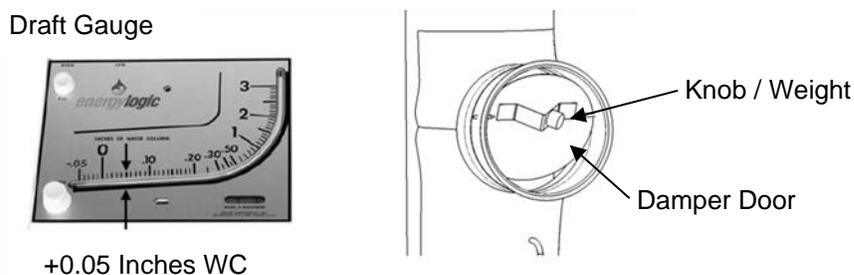
7.4.3 Burner System Checkout

Once the boiler starts operating, make the following checks and adjustments:

⚠️ WARNING *If you are unable to obtain the proper adjustments, do not run the boiler. If you cannot resolve the issue, call EnergyLogic Technical Services for assistance.*

Exhaust System: Check that the flue exhaust is flowing properly, and there are no exhaust leaks inside the building. Check the outside flue pipe to ensure that no black smoke is present. If smoke is present and the draft below is correct, call EnergyLogic Technical Service for assistance.

Draft Adjustment: After operating the boiler for about 15 minutes, verify the draft gauge is reading 0.05 inches of water column, WC (refer to figure).



Draft reading and adjustment

- If the draft gauge reading is below 0.05 inches of WC: Loosen the adjustment weight on the barometric damper door, then slide it to the right or closer to the damper door pivot axis, and retighten it.
- If the draft gauge reading is above 0.05 in. WC: Slide the weight to the left or away from the damper door pivot axis, and retighten it.
- Verify that the reading remains at 0.05 inches of WC with exhaust fans and vented appliances on in your building and all doors and windows closed. **⚠️ WARNING** *A negative pressure inside the building may impede intake of combustion air to the burner, which may result in a hazard from smoke inhalation and/or fire. Use of exhaust fans in your shop without adequate make-up air may create a negative pressure. There are other possible causes as well. Corrective measures must be taken if the correct draft setting cannot be achieved.*

⚠ WARNING *If you are unable to adjust the damper door to obtain 0.05 inches WC, there is not enough draft for proper exhaust. Do not run the boiler under this condition. If you cannot resolve the issue, call EnergyLogic Technical Services for assistance.*

Note: The draft gauge should read 0.0 inches of WC when the draft gauge probe is removed from the stack (If not, make sure the gauge is level, and readjust the zero knob). If the boiler is not running, the draft gauge with the probe installed into the stack will read near zero, but depending on ambient conditions may fluctuate between 0 and 0.03 inches of WC.

⚠ CAUTION *The probe may be hot.*

Fuel Pressure Gauge: The fuel pressure gauge on the pump outlet should read approximately 3-20 psi, with the higher pressures for longer runs or colder fuel.

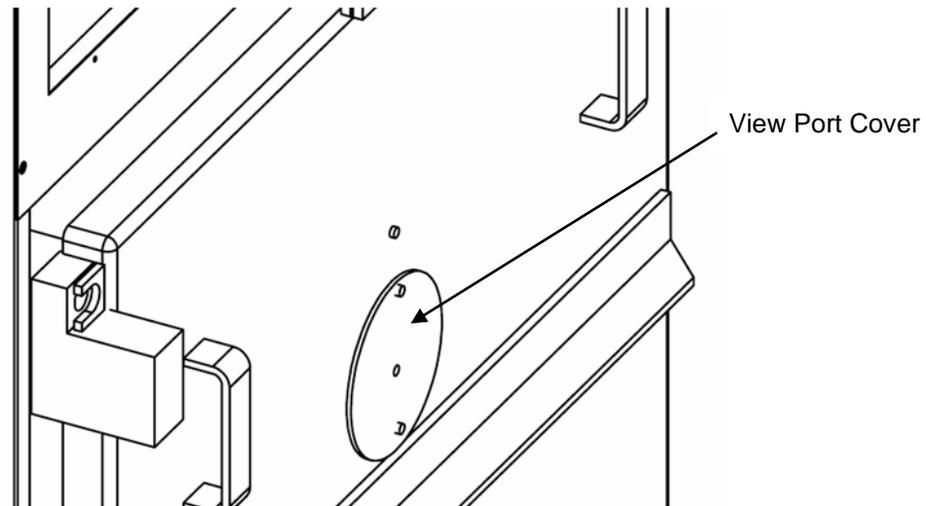
- If the fuel pressure reading is high, inspect the fuel tubing between the pump and burner. Look for crimped tubing or obstructions in the preheater or nozzle block assembly. Repair as necessary.

Vacuum Gauge: The vacuum gauge on the inlet of the pump should read between 0 and 5 inches of mercury (Hg) for a Side Suction system. For Top Suction systems, the vacuum reading should be between 1 and 6 inches of Hg.

- If the vacuum reading is reading above normal, check the following:
 - Inlet to the suction line is clear of obstructions and all valves are open.
 - Fuel filter must be clean (was it clogged with sludge from the tank?).
 - Oil must be above 50°F (10°C).
 - Review how the pump is mounted (section 3).

Burn Quality – Visual Check: When the burner is operating properly, the flame is bright yellow. To verify the flame color, remove the sight-hole cover on the boiler door, as shown in the figure. Remove the insulation plug. Insert the insulation plug and close the viewport after checking the flame. If the flame is other than bright yellow, this indicates improper combustion. Contact EnergyLogic Technical Service for help.

⚠ CAUTION *The boiler door and view port cover are hot. Wear gloves and safety glasses when inspecting the flame. View from a distance of at least 18 inches (46 cm). Do not leave viewport open during normal operation.*



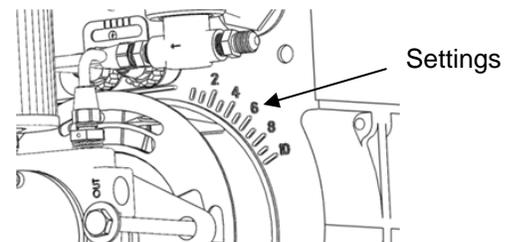
Visual Flame Inspection

Burn Quality – CO₂ Exhaust Measurement: A qualified service technician with an exhaust combustion analyzer can make adjustments to the air shutter if required. Measurements are taken through the draft gauge probe port. Exhaust gas carbon dioxide readings should be as follows for a clean boiler:

- 11% ± 1%

A qualified service technician may adjust the air shutter, as shown in the figure. Loosen the locking screws, then rotate the shutter and retighten the locking screws. A higher number allows more air into the burner. A lower number setting allows less air. The factory recommended settings normally work well, but higher altitude locations may require adjustments:

- EL-200B = 7
- EL-375B = 6
- EL-500B = 9



Shutter Settings.

Burn Quality – Smoke Measurement: A qualified service technician may measure smoke content, following procedures of his smoke pump.

- Acceptable results per smoke pump comparison chart = zero/trace smoke spot.
- A yellow- brown smoke spot color is normal when burning used oil due to the presence of non-combustibles.
- The absence of black or dark grey soot indicates complete combustion.

Flame Monitoring Cad Cell: A qualified service technician may check the cad cell [Flame on]

- Disconnect the cad cell leads from the FF terminals on the controller.
- Set the Aquastat to start the burner and use a jumper between the FF terminals to keep it from tripping.
- Measure the resistance (ohms) of the cad cell by probing across the cad cell lead wires.
- An acceptable resistance is 0 to 500 ohms for a clean burner and heat exchanger with the flame on.
- Change the Aquastat setting to turn off the burner. The resistance reading with no flame should be greater than 5000 ohms. Your meter may register “OL” if out of limit.
- **⚠ CAUTION** Make sure all jumpers have been removed and the CAD cell wires are reconnected properly when testing is complete.

7.5 Everyday Operation of Your EnergyLogic Used Oil Boiler

Once installed and checked, operate your EnergyLogic Boiler as follows:

Daily Operation.

- Set the controls to the desired temperature settings.
- You should not let the temperature of the room get below 50°F (10°C), or the oil will become very thick, which may cause fuel delivery issues.
- To shut down the boiler in an emergency, turn off the power at switch on the Control Cabinet, the user-installed, switched junction box or the main breaker.

Manage the Used Oil.

- Do not put unapproved substances into your used oil storage tank. See section 1.5.1 for a list of approved fuels.
- Monitor the bottom of your tank for water and drain it off on a regular basis.
- Don't let your oil tank run dry. Don't risk introduction of air into the fuel delivery system. You will save yourself much time and trouble by keeping your tank filled with oil. If you don't have one, consider installing an optional EnergyLogic Low-Fuel Cut-Off Switch to turn off the burner at low fuel levels.
- When filling the tank be careful not to agitate the oil so that air/sludge are not introduced into the fuel pump. It is best to leave the boiler off while filling the tank.
- Pre-screen the oil prior to putting it into the tank. Occasionally have your tank drained and cleaned.

Monitor the System.

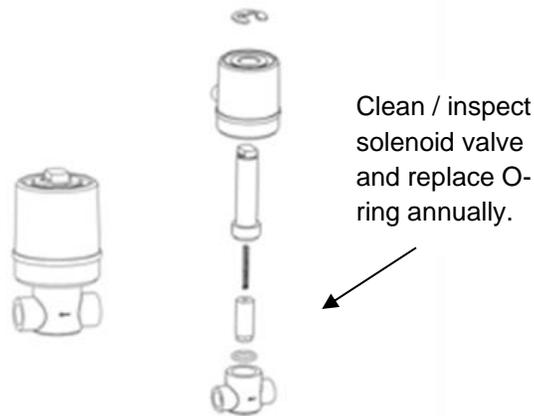
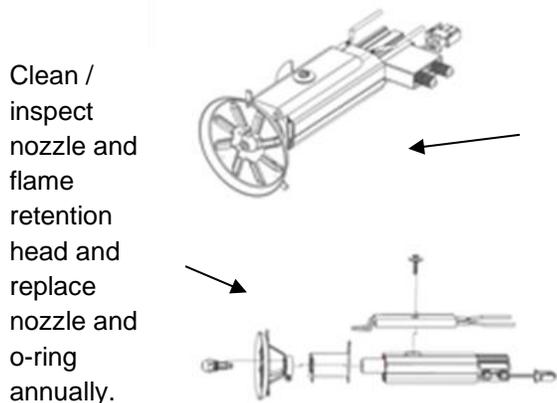
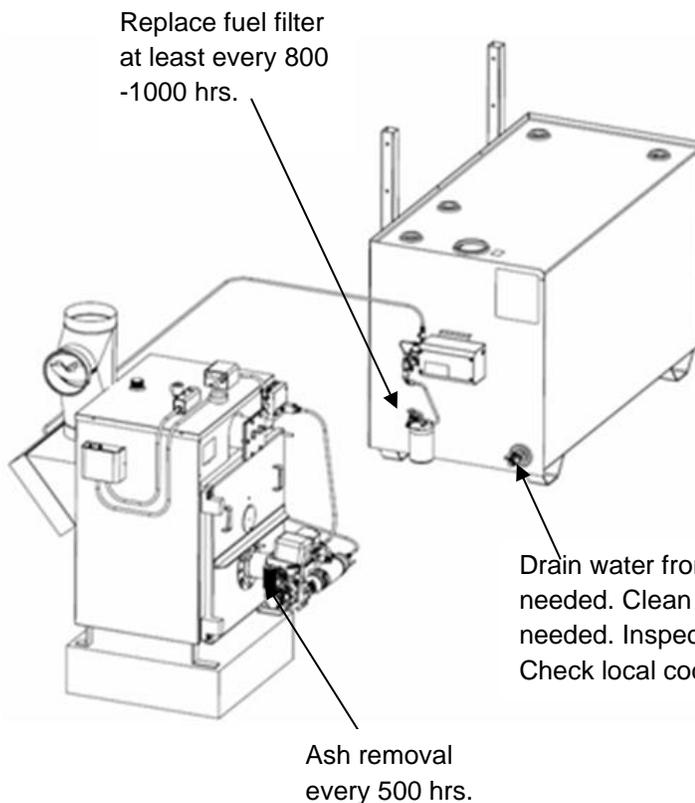
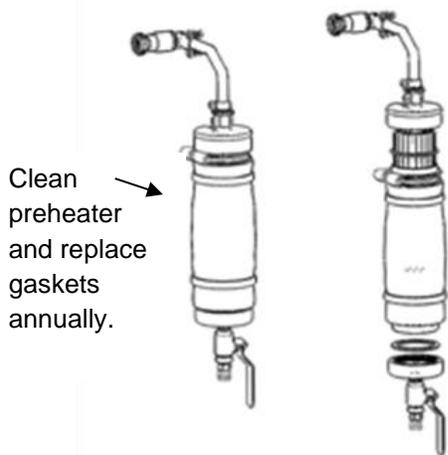
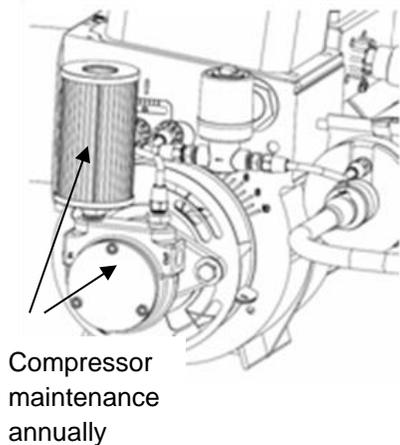
- After your initial set up, monitor the system gauge readings on a regular schedule to assure that the system is stable. Record the readings and any maintenance performed in the maintenance log (refer to section 8) to track your system performance over time.
- Maintain your boiler. Regular maintenance will help to keep the boiler running reliable and efficient for many years.

Summer Blower Operation and Shutdown

- Perform seasonal maintenance.
- Unplug the burner if the boiler is not going to be used for an extended period of time.
- Refer to shutdown procedure in Section 8.6.

8. Maintenance

Regular maintenance is required to keep your EnergyLogic boiler operating reliably and efficiently. For best results, purchase an EnergyLogic boiler annual maintenance kit (PN 05000029 for EL-200B or 05000030 for EL-375/500B), which includes nozzle, preheater /burner/solenoid gaskets & O-rings, and fuel and air filters. An EnergyLogic burner maintenance brush kit (PN 05000071), an EnergyLogic furnace cleaning tool (PN 14033227), and boiler tube and flue brushes (call for info) are the best tools to use for maintenance.



8.1 Service Contracts

If you are not qualified or do not wish to perform the boiler maintenance yourself, contact EnergyLogic for the location of our nearest dealer or service provider. Putting a service contract in place is the best way to make sure that the required maintenance is completed regularly and your system will operate reliably when needed, saving you both time and money.

8.2 Safety Warnings – Lockout/Tagout

There are many potential hazards associated with working on this equipment, including electricity, heat, heights, dust and chemicals. **⚠ DANGER** *Make sure the main electrical circuit is off and locked out / tagged out prior to performing maintenance.* **⚠ CAUTION** *Wear proper safety equipment for the tasks, including a HEPA quality dust mask to avoid inhalation of ash dust when cleaning the heat exchanger or flue. Use suitable access aids/equipment when working on the boiler. Do not climb on the boiler. General safety rules and precautions should be followed at all times to prevent any accidents that could lead to personal injury or property damage. Only those qualified should perform these tasks.*

8.3 Monitoring System Performance over Time

EnergyLogic recommends that you monitor and record your system gauge readings regularly over time, in order to diagnose issues that may arise. For example, if the pump vacuum gauge initially read 2 inches Hg, but over time has risen to 10 inches Hg, it is an indication that the fuel filter is most likely clogged up. Record the system gauge readings on your maintenance schedule and log. Have this log handy if you call EnergyLogic for technical support.

8.4 Maintenance Schedule and Parts

The recommended maintenance interval and log is shown on the following page. Check your local codes and regulations for maintenance frequency requirements that may take precedence. Use of certain fuels or other conditions may require more frequent maintenance. Make a copy of the maintenance log and use it to record the maintenance and system performance readings over time. Contact your EnergyLogic dealer or call EnergyLogic for service parts. EnergyLogic offers convenient annual maintenance kits and cleaning tools made specifically for your boiler. Economical bulk packs of fuel and air filters are available as well.

⚠ CAUTION The maintenance schedule is the minimum recommended, but if you see smoke or have trip outs then the unit must be shut down and serviced immediately before running it again. Increase the maintenance as your situation requires.



Used Oil Burning Boiler Maintenance Schedule and Log

Have this record available when calling for support.

Customer / address: _____

Unit ID _____

Pump ID _____

Service	Schedule*	Initial and Date of Service:
Clean ash from heat exchanger, flue, damper, draft gauge probe, Electrode Tips, and Retention Head	Every 500 hours of operation (or as required by code)	
Replace fuel filter :	800 to 1,000 hours or when vacuum gauge reading increases more than 5 in. Hg compared to clean filter readings.	
Drain fluid (water) from bottom of used oil tank	Check monthly, drain as needed.	
Clean in-tank fuel pickup strainer / auxiliary fuel strainers.	As needed based on vacuum readings.	
Clean Fuel Tank	As needed or required by code.	
Clean Preheater Assembly / replace gaskets.	Annually	
Clean burner blower wheel	Annually	
Clean nozzle line assembly / replace o-ring	Annually	
Check / adjust retention head & electrode settings	Annually	
Clean solenoid valve / replace o-ring	Annually	
Check air compressor pressure performance, replace filter, maintenance.	Annually	
Clean cad cell lens	Annually	
Test / Inspect Low Water Cut-Off Control	Annually	
Check / Replace Domestic Coil Gasket(s)	Annually	
Check Condition & Service Closed System Fluid	Annually	
Check/replace burner gasket	Annually	
Test fire furnace after maintenance and check for proper burner adjustment	After every maintenance	
Gauge Readings (After Maintenance)	Pump Vacuum Reading:	
	Pump Pressure Reading:	
	Draft Gauge Reading:	
	Hour Meter Reading:	
	Inlet (to vessel) fluid temperature Vessel pressure Burner Air Shutter Setting:	

Service Company: _____ Contact: _____

*Maintenance schedule is recommended minimum. Cease operation and service immediately if there are signs of smoking, clogging, rumbling or other abnormal operation. Increase maintenance frequency as your situation requires.

8.5 Maintenance Procedures

The following sections provide detail on how to perform the recommended maintenance. If you have questions or need assistance, contact EnergyLogic Technical Service.

8.5.1 Heat Exchanger Cleaning / Door and Access Insulation Checks

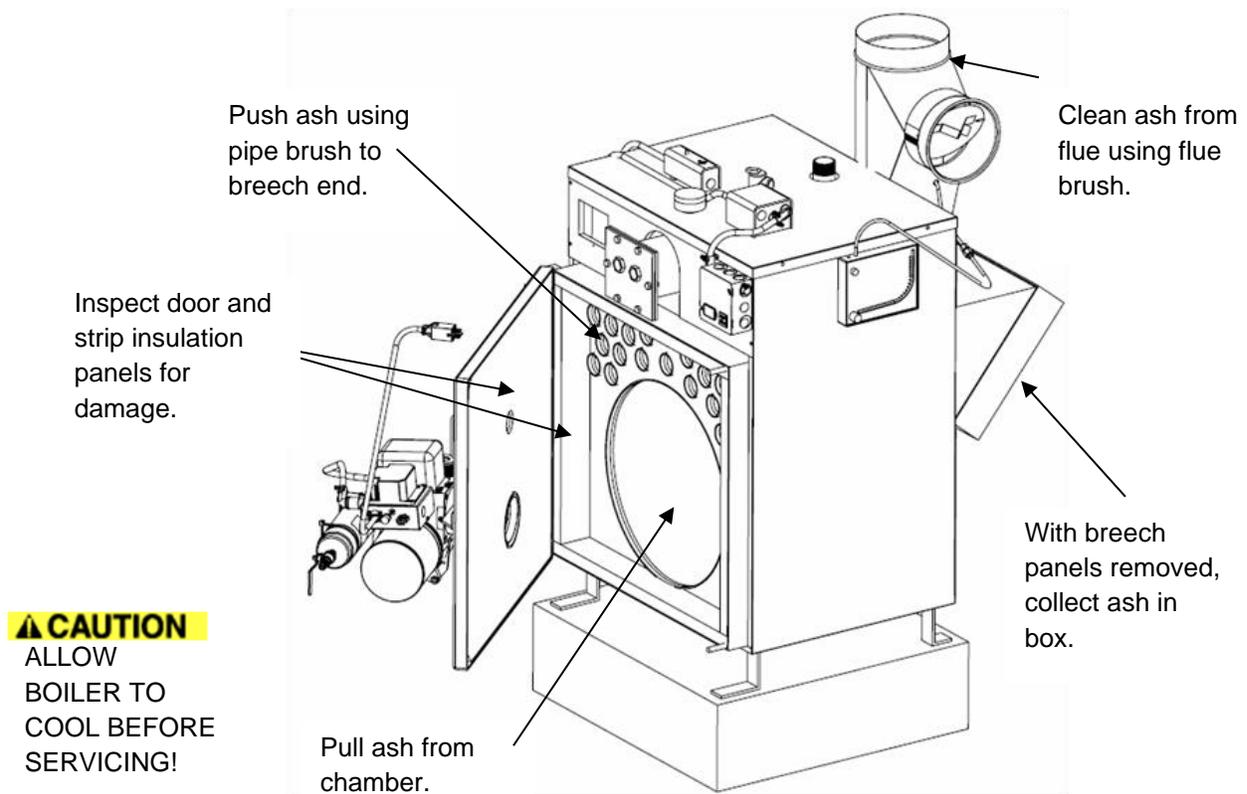
How often?

Cleaning / Inspection: Once every 500 hours of operation (*or if there are signs of incomplete combustion or smoke*). Or, to remove accumulated oil as needed. Replace Insulation: If damaged, or at least once every 5 years.

Tools Required:

5/16 in. & 1/2 in. sockets, 3/4 in. open-ended wrench, EnergyLogic Furnace Cleaning Tool (PN 14033227), chimney brush, pipe brushes, work gloves, dust mask and safety glasses, large heavy-duty plastic trash bag and box. For your convenience, EnergyLogic offers convenient boiler and flue brush accessories.

⚠ DANGER Personally verify that the main power is turned off and locked out at the circuit breaker.



Cleaning Heat Exchanger and Flue

Procedure:

1. **⚠ CAUTION** If boiler is hot, allow it to cool before cleaning. Wear all safety equipment.
2. Unplug the burner at the vessel wiring box.
3. Close the hand valve on the bottom of the preheater.
4. Disconnect the 3/8 in. copper fuel tubing at the bottom of the preheater.
5. Remove the two nuts from the boiler access door and swing the door open.
6. Accessing the interior of the heat exchanger through the door opening, use the furnace cleaning tool (optional accessory) to pull ash forward from the main chamber. Use boiler tube brush (optional accessory) to push the ash to the opposite end of the tubes into the breech. A shop vacuum may also be used to remove ash. Use wire brushes to clean all the metal surfaces of the heat exchanger. Lightly brush the ash off of the hinged door and burner air tube. **CAUTION** *Be careful not to damage the insulation.*
7. Remove the back access panel from the breech. **⚠ CAUTION** Make sure it is cool before servicing. The panel will have ash build up on it, so position a box underneath it to catch the ash.
8. Gently clean the damper and draft gage tube. Gently tap the flue pipe and allow ash to fall into the box. Run the chimney brush (optional accessory) into the flue. Clean all flue pipe from other access points if extension rods do not reach.
9. Clean out the breech.
10. Remove the box and properly dispose of the ash.
11. Inspect the cleaned heat exchanger and flue. Inspect the boiler insulation. If parts are found to be damaged, replace the damaged parts. If the insulation is damaged, inspect the inside of the vessel wire box for heat damage to the wiring. *If the door / access panel insulation is more than 5 years old, replace regardless of condition.*
⚠ CAUTION *Do not run the system with damaged parts.*
12. Reattach the back access panel.
13. Swing the door over the two studs to close and reinstall the nuts.
14. Reinstall the fuel tubing on the preheater and open the hand valve.
15. **⚠ WARNING** Make sure to perform start-up (7.4.2) and system checks (7.4.3) after every maintenance cycle. Record the checks, maintenance performed, and gauge readings in the maintenance log.

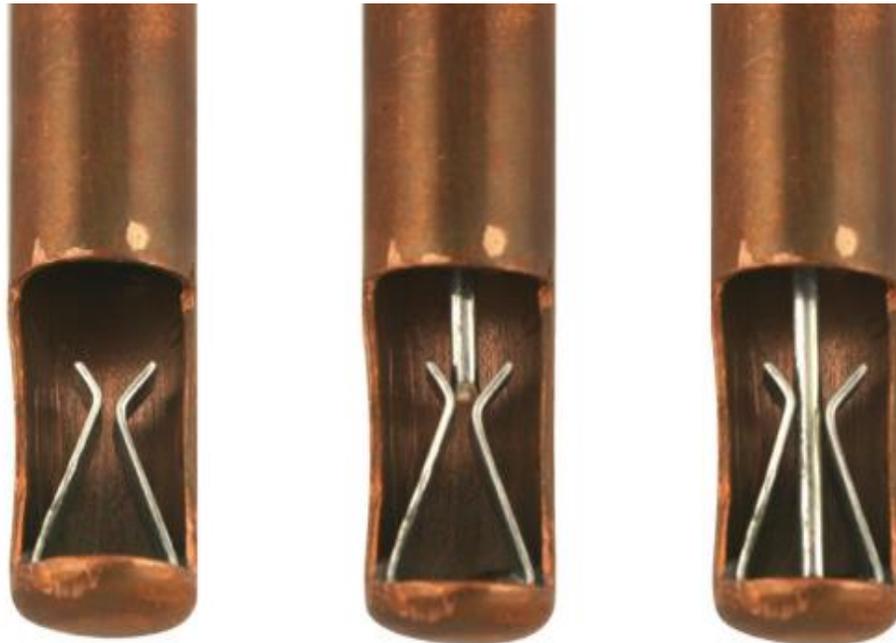
8.5.2 Testing the Low Water Cut Off (LWCO)

How often?

Test annually.

Procedure - All Models:

1. Turn electric power ON to energize AquaSmart control. Perform the following tests to verify the LWCO function.
2. Remove the retention clip from end of the sensor port.
3. Pull the sensor probe partially out of the sensor thermowell to disengage the pin from the clip inside the tube (see). you should feel it when the pin disengages. The sensor should cause the AquaSmart display to indicate, "LOCKOUT - LOW WATER" after the LWCO Off Delay times out. If it does not, replace the sensor.
4. Once testing is completed, fully insert the sensor probe into the thermowell so that the pin is fully engaged in the clip.



8.5.3 Fuel Oil Filter Replacement

How often?

Every 800 – 1000 hours of operation, or when the vacuum gauge reads 5 inches Hg higher than readings taken with a clean filter.

Tools Required:

Safety glasses, rubber gloves.

Replacement Parts:

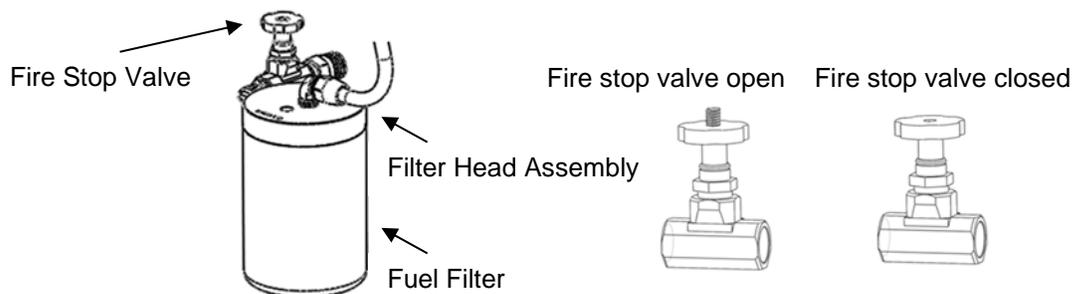
EnergyLogic Spin-On Fuel Filter (PN 20270185)

Spec: Hydraulic/140 Micron/Metal Mesh, max. working pressure 200 psi, 25 GPM capacity.

Note: Use only genuine EnergyLogic parts to avoid damage and maintain UL status.

Procedure - All Models:

1. Wear all safety equipment.
2. Close the Fire-Stop Valve or ball valve(s) at the filter head.
3. Spin the Fuel Filter off the Filter Head Assembly - counter-clockwise. Dispose of the fuel filter properly.
4. Clean any debris from the filter head assembly.
5. Fill new Fuel Filter with non-synthetic ATF or pre-filtered used oil to quicken the priming process. Do not use new oil or synthetic ATF to fill the filter. Apply a thin film of oil to the gasket.
6. Spin the Fuel Filter onto the Strainer Housing - clockwise. Hand-tighten the filter. Record the meter hours and date on the new filter.
7. Open Fire-Stop Valve or ball valve.
8. Refer to Section 7.4.1 “Fuel System Priming” for the priming procedure to ensure no air remains in the fuel system.



Filter Head and Valves

8.5.4 Preheater Cleaning

How often?

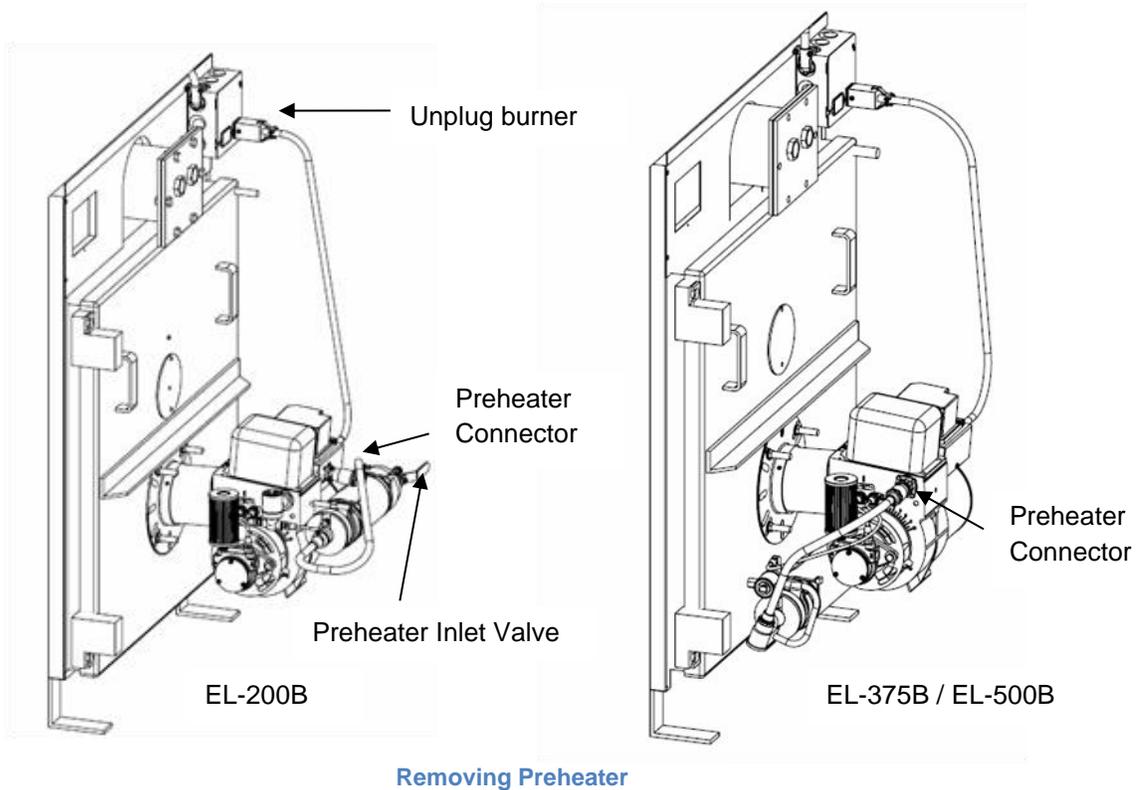
Once per year.

Tools Required:

3/4 in. wrench, pipe wrench or vice, wire brush, brake cleaner or parts washer fluid, safety glasses, rubber gloves.

Replacement Parts:

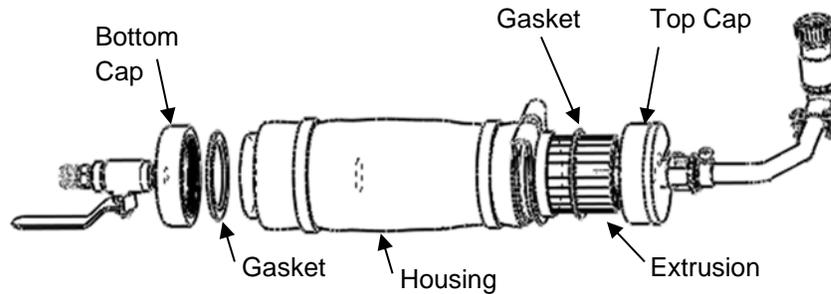
Preheater Gaskets (Qty.= 2 - PN 20940122)



Procedure - All Models (refer to figures):

1. Wear all safety equipment.
2. Unplug the burner at the vessel wiring box.
3. Disconnect the Preheater Connector at the Burner, allow it to cool. **CAUTION** Until the preheater has cooled, the parts and the oil are hot.
4. Close the preheater inlet valve and disconnect the fuel tubing from the Inlet and Outlet Ports of the Preheater.
5. Remove the Preheater mounting bolt and Preheater.

6. Open the Preheater Valve and drain fuel into your tank.



Cleaning Preheater

7. Hold Top Cap (outlet) firmly in a vice or with a pipe wrench and unscrew the housing to expose the finned aluminum Extrusion. **CAUTION** Do not attempt to unscrew the Extrusion from the top cap. Do not spray the electrical wiring and components with parts washing fluid. This will damage the electrical circuits in the Preheater and void warranty.
8. Remove old gasket found in the cap above the Extrusion.
9. Use a wire brush and parts washer fluid to clean the Extrusion—clean thoroughly to remove all loose debris that could block passages. **Note:** Filling most of the housing with parts washer fluid and placing the Extrusion back into the housing to soak, may quicken the process.
10. Clean the housing and Top Cap with parts washer fluid.
11. Unscrew the Bottom Cap (inlet) from the housing.
12. Remove the old gasket from the cap.
13. Clean the cap and valve, then replace the gasket.
14. Reinstall the Bottom Cap onto the housing.
15. Replace the Top Cap gasket by carefully sliding it over the extrusion.
16. Reinstall the Extrusion/Top Cap onto the housing. Do not over-tighten.
17. Remount the Preheater onto the burner.
18. Reconnect the fuel tubing to the Inlet and Outlet ports of the Preheater.
19. Refer to Section 7.4.1. “Fuel System Priming” for the priming procedure to ensure no air remains in the fuel system.
20. Make sure no leaks are present at the Top and Bottom Caps of the Preheater.
21. **⚠ WARNING** Make sure to perform start-up (7.4.2) and system checks (7.4.3) after every maintenance cycle. Record the checks, maintenance performed, and gauge readings in the maintenance log.

8.5.5 Nozzle Line Assembly Cleaning

How often?

Once per year or if the nozzle becomes blocked with debris (if blocked, a higher operating fuel pressure will be seen on the pump pressure gauge).

Tools Required:

7/16 in., 1/2 in., 3/4 in. and 17mm (boxed end/12-pt.) wrenches, 5/8 in. socket/ratchet, 5/8 in. wrench, 1/4 in. nut driver, hex wrench, vise, flat-blade screwdriver, small wire brush or pipe cleaner (from optional maintenance accessory brush kit), parts washer fluid, shop air gun, safety glasses, rubber gloves.

Replacement Parts:

Nozzle O-ring (PN 20213152) or Nozzle (PN 20210123 for EL-200B, PN 20210124 for EL375B/EL500B)

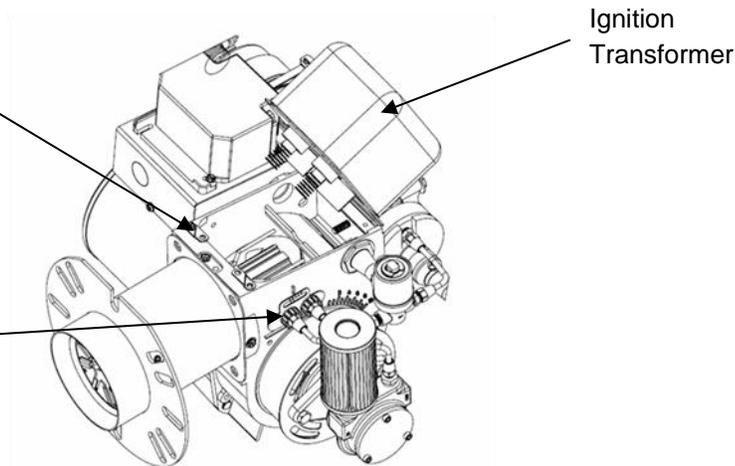
▲ DANGER *Personally verify that the main power is turned off and locked out at the circuit breaker.*

Procedure - All Models (Refer to figures):

1. Wear all safety equipment.

Loosen screws and swing up the transformer. Disconnect 2-pin connector (underneath).

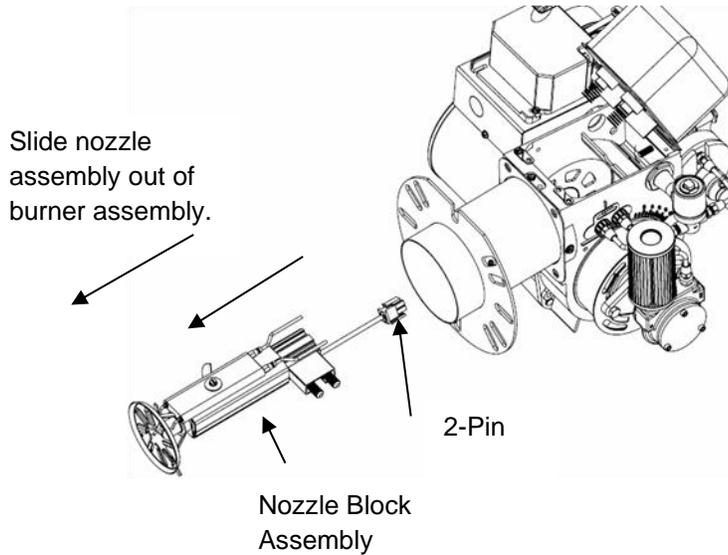
Flare and knurled nuts. Loosen fuel and air tubing connections from nozzle assembly.



Disconnect Nozzle Block

2. Remove the burner from the boiler (refer to previous sections).
3. Using a 7/16" wrench, disconnect the fuel and air tubing from the Nozzle Block.
4. Using a 17mm boxed-end/12-pt.wrench, remove the knurled nuts from the Nozzle Block (refer to figure).
5. Using a flat-blade screwdriver, loosen the Ignition Transformer screws, and lift the Ignition Transformer back on its hinge.

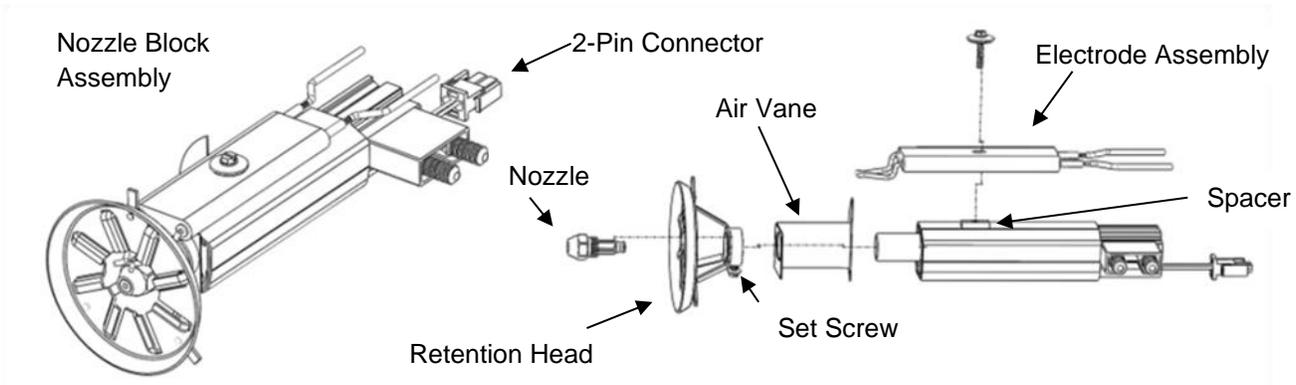
6. Disconnect nozzle heater Two-Pin Connector.



Removing Nozzle Block

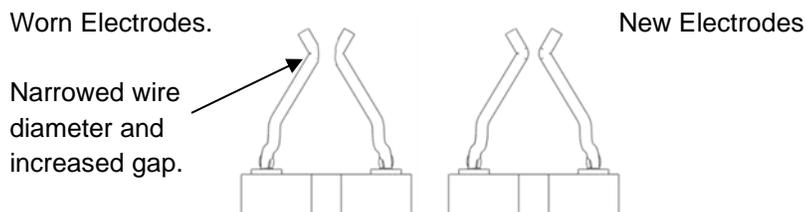
7. Slide Nozzle Block Assembly out through the air tube.

8. Unscrew the Electrode Screw and remove the Electrode from the Nozzle Assembly.



Disassemble Nozzle Block

9. Inspect the electrode wire for excessive wear and the porcelain for cracks - replace as necessary.



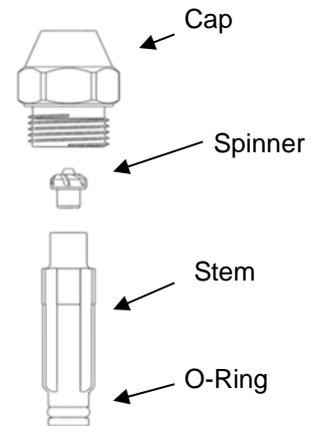
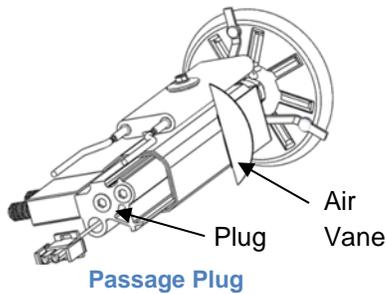
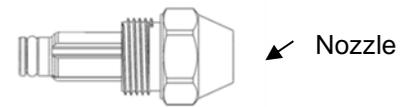
Inspect for Damage and Wear

10. Remove the Retention Head by loosening the collar set screw.

11. Slide the Air Vane off the Nozzle Line Assembly.

12. Using a 5/8 in. socket/ratchet, remove the Nozzle from the Nozzle Block Assembly.

13. Using a pair of pliers and a towel, gently clamp the stem of the Nozzle (a small spinner is loosely contained inside the Nozzle) and spin (counter-clockwise) the cap from the stem. *Skip Steps 13 – 17 if installing a new nozzle.
14. Clean all the parts with parts washing fluid.
15. Replace the stem o-ring.
16. Holding the stem vertically, place the spinner on top of the stem. Then, thread the nozzle Cap onto the stem.
17. Tighten the nozzle Cap to the stem.



Disassemble Nozzle

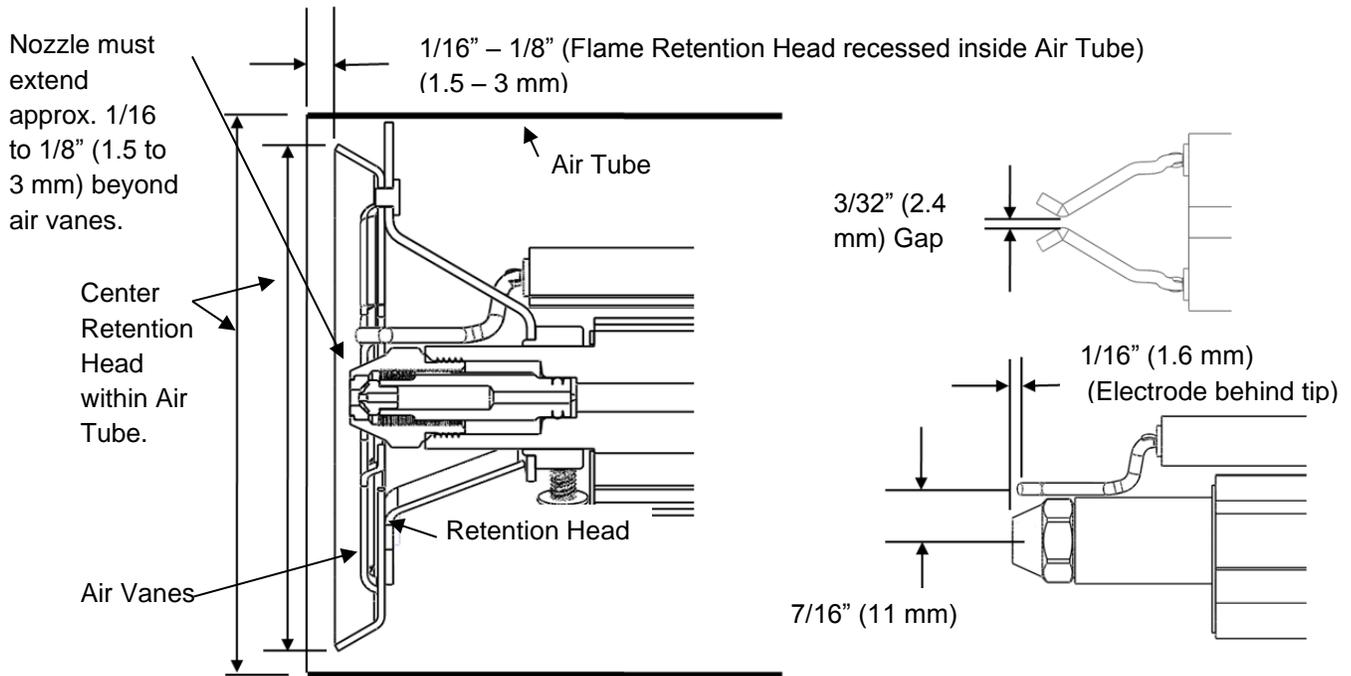
18. The passage through the nozzle block for the nozzle has a plug at the opposite end of the nozzle which must be removed for complete cleaning of the Passage - use thread sealer during reinstallation (refer to figure).
19. **IMPORTANT!**—Being careful not to apply parts washer fluid to the heater wiring harness, clean the nozzle passage of the Nozzle Block. Make sure parts are clean and dry prior to reassembly.
20. Refer to the following section for Flame Retention Head and Electrode Settings and reassemble the Nozzle Line Assembly. **CAUTION** Be sure to re-install the air vane (shown in figure) in the proper location – opposite side of bulkhead fitting). Failure to install this component properly will result in an off-center flame, which may damage the heat exchanger and void the heat exchanger warranty.
21. **WARNING** Make sure to perform start-up (7.4.2) and system checks (7.4.3) after every maintenance cycle. Record the checks, maintenance performed, and gauge readings in the maintenance log.

8.5.6 Retention Head and Electrode Settings

How often?

Once per year (refer to 8.5.5, Nozzle Line Cleaning)

Procedure - All Models. **NOTE:** There are two Electrode/Retention Head designs: one where the electrode wires make two 90-degree bends (called "Double Bend"), and one with a single angled bend. The "Single Bend" design only goes with Retention Heads with the added center cutout.

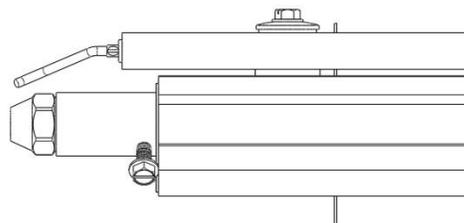


Settings for Retention Head & Electrodes – "Double Bend" Electrodes

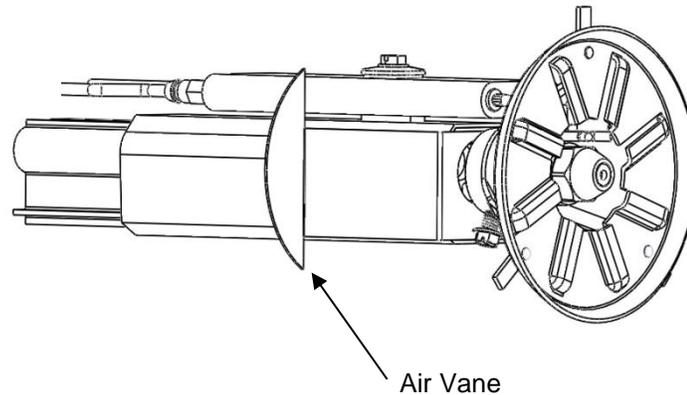
Refer to Section 8.5.5 for removal of nozzle block and electrode assembly. Inspect the locations of the electrode components. If adjustments are necessary, use needle-nose pliers to carefully adjust electrode wires. Use the following specifications:

- The Electrode Gap: $3/32$ " (2.4 mm).
- Electrode Tips must be $1/16$ " (1.6 mm) behind the tip of the Nozzle.
- Nozzle protrudes approximately $1/8$ " (3 mm) beyond Retention Head vanes.
- Vertical location of electrode wires: $7/16$ " (1.6 mm) from center nozzle to wires. Make sure that there is a gap between the electrode wires and the nozzle. Make sure there is a gap between the retention head inner diameter and the electrode wires.

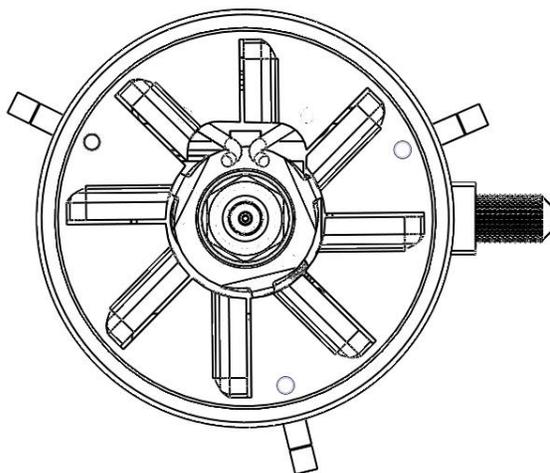
NOTE: For the "Single Bend" electrode, the same settings are used, but the electrode wires come down at an angle, as shown below.



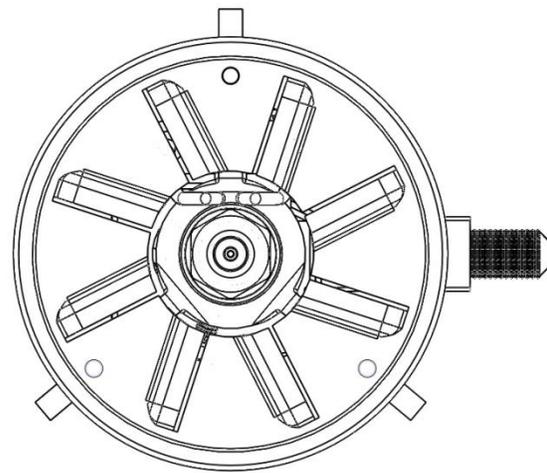
- Retention Head is recessed approximately 1/16" - 1/8" (1.5 – 3 mm) into the Air Tube.
- Retention Head is centered within the Air Tube. If not centered, straighten the centering Tabs of the Retention Head if they are bent. Loosen the knurled nuts, center the Retention Head and retighten the knurled nuts if necessary.
- Make sure air vane is properly installed, on the left side when looking from the nozzle end. It should be locked in place by the retention head base.



- For the “Double Bend” electrodes, the retention head should be installed with one leg vertical, and the electrodes straddle that leg.
- For the “Single Bend” electrodes, the extra cutout in the center hole of the retention head should be centered vertically, and the electrodes are mounted in that cutout between two legs. A tab on the collar of the retention head fits into the channel on the bottom of the electrode ceramic for alignment. (See figures below.)



Single Bend Retention Head & Electrode Orientation



Double Bend Retention Head & Electrode Orientation

8.5.7 Solenoid Valve Cleaning

How often?

Once per year or if the solenoid valve is blocked with debris (higher operating pressure will be seen on the pressure gauge).

Tools Required:

5/16 inch and 7/16 inch wrenches, flat-blade screwdriver, small wire brush or pipe cleaner, pocket pick, parts washer fluid, shop air gun, rubber gloves, safety glasses.

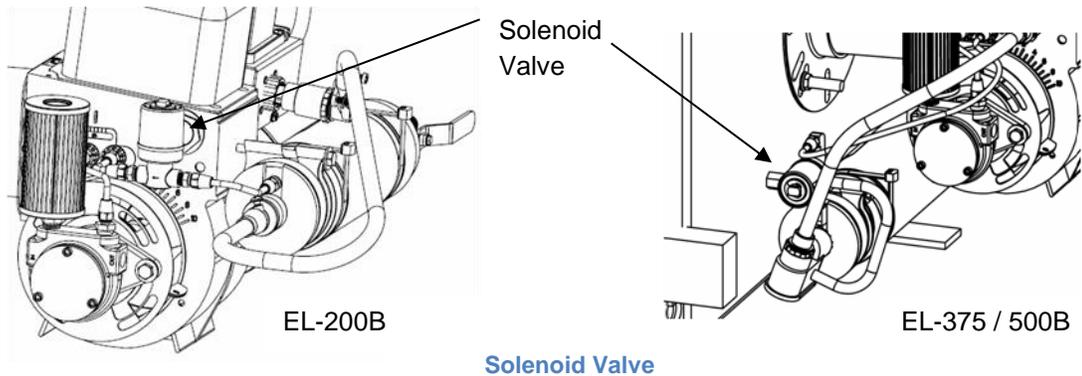
Replacement Parts:

Solenoid O-ring (PN 20293199). Nucleus w/ Spring (PN 20293198).

⚠ DANGER Personally verify that the main power is turned off and locked out at the circuit breaker. **⚠ CAUTION** Small parts – do not drop / lose.

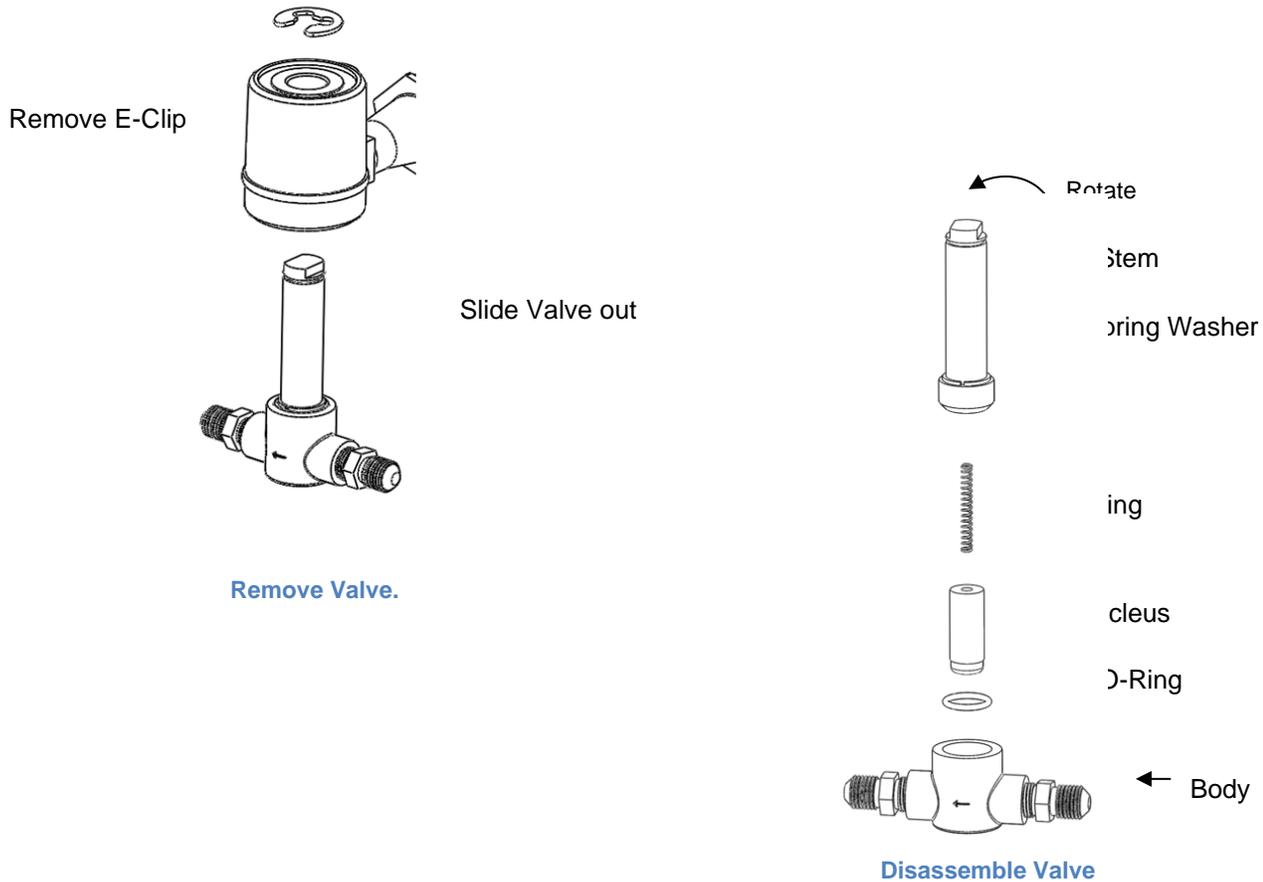
Procedure - All Models (refer to figures):

1. Wear all safety equipment.



2. Remove the fuel fittings from the Solenoid Valve.
3. Loosen the fittings at the other end of the fuel tubing at the preheater and burner nozzle block. Rotate any tubing out of the way.
4. Remove the E-Clip from the top of the solenoid. Slide the solenoid body and stem from the bottom of the housing (you may need to rotate the housing).
5. Using a 5/16 in. wrench, unscrew the valve stem from the body by turning the stem counterclockwise. Secure the body while turning the stem.
6. Inspect the Body for any abnormalities or debris in the inlet/outlet ports and internal cavity.
7. Inspect the O-ring. Replace if damaged.
8. Inspect the seal at the end of the nucleus and note if it has an excessive impression from where it seals in the internal cavity of the body. Replace if damaged – nucleus and spring, sold separately.
9. Clean out the inside of the stem with parts washer fluid, then blow dry.
10. Remove excessive carbon build up with a small pick, making sure not to damage any surfaces.

11. Reassemble the Solenoid Valve in reverse order of disassembly. Make sure the arrow is pointing in the correct direction of flow.
12. For the EL-500B only: There is an additional solenoid valve on the fuel metering pump. Service this valve whenever the burner solenoid valve is serviced.
13. **⚠ WARNING** Make sure to perform start up (7.4.2) and system checks (7.4.3) after every maintenance cycle. Record the checks, maintenance performed, and gauge readings in the maintenance log.



8.5.8 Air Compressor Maintenance

How often?

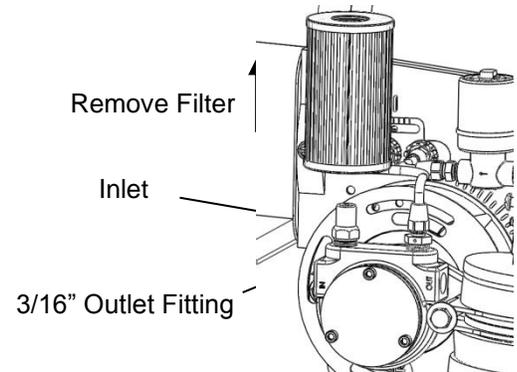
Once per year. More often for dusty conditions.

Tools Required:

1/8 inch Allen wrench, 7/16-inch wrench, flat-blade screwdriver, EnergyLogic Air Compressor Pressure Gauge Kit (PN 05000092), Gast compressor cleaning fluid, shop towel, rubber gloves, safety glasses.

Procedure - All Models (refer to figures):

1. Wear all safety equipment.
2. Replace the compressor air filter annually (PN 20210112).
3. Check the air compressor output by using the EnergyLogic compressor test kit (PN 14012100). Remove the copper tubing from the outlet of the compressor and from the bulkhead fitting on the burner. Attach one of the tubes in the kit to the 3/16" outlet fitting on the compressor, and the



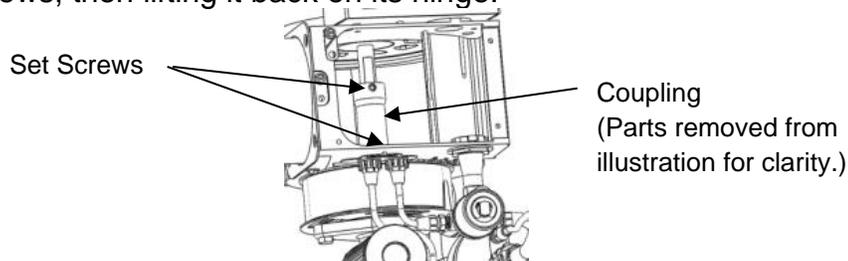
Air Compressor

other tubing to the bulkhead fitting. Attach both tubes to the gauge in the kit. Be careful to not make kinks in the tubing.

4. Start the burner by moving the wall thermostat above room temperature and note the air compressor output on the gauge. If the gauge reading is in the 9-11 PSI range for the EL-200B or in the 13-15 PSI range for the EL-375B or EL500B, the air compressor is operating as designed and no further maintenance is required. Remove the test kit and reinstall the 3/16" tubing, for normal operation.
5. If the gauge reading is below the normal range, check/do the following:

A. Coupling

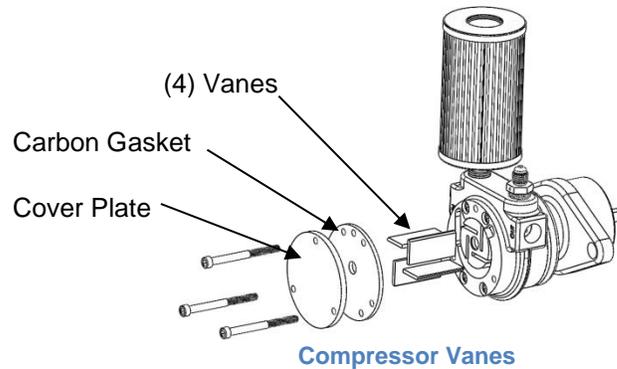
1. Inspect the air compressor coupling by unplugging the burner, loosening the Ignition transformer screws, then lifting it back on its hinge.



Coupling to Compressor

2. Spin the squirrel cage and note if the coupling slips on the burner motor or air compressor shaft.
3. If the coupling is slipping, use a 1/8 inch Allen wrench to tighten the set screw.
4. If the set screws are tight, inspect the metal ends of the coupling for damage. Replace as necessary.

B. Vanes



1. Using a 9/64 inch Allen wrench, carefully remove the air compressor cover plate and carbon gasket.
2. Inspect the carbon gasket for wear—reverse if worn or replace as necessary.
3. Spin the squirrel cage using a screwdriver.
4. If the vanes do not move in their slots as the rotor turns, clean the vanes. Clean the vanes and compressor body using Gast compressor cleaning fluid or suitable equivalent. Note: Do not use petroleum solvents, such as engine degreasers. These fluids leave unwanted residues behind that may cause the vanes to stick and/or bind. If the vanes are worn out, you may purchase a vane replacement kit (PN 05000096).
5. Reassemble the air compressor. Be careful not to over-tighten the cover plate.

C. Cleaning

CAUTION Wear Safety Glasses.

1. Disconnect the fitting at the air compressor outlet.
2. Disconnect the preheater outlet tubing from the solenoid valve and run into a bucket to catch the oil.
3. Jump the primary control T-terminals, then F-terminals to operate the burner.
4. Feed several drops of the Gast compressor cleaning fluid into the air compressor inlet and catch the spray at the outlet using a shop towel.
5. Allow the burner to run 3-4 minutes to flush out all the fluid from the air compressor, then remove the jumpers.
6. Replace the air compressor filter, reconnect the outlet tubing.
7. Reconnect the preheater outlet tubing.

WARNING Make sure to perform start-up (7.4.2) and system checks (7.4.3) after every maintenance cycle. Record the checks, maintenance performed, and gauge readings in the maintenance log.

8.6 Seasonal Shut Down & Start Up

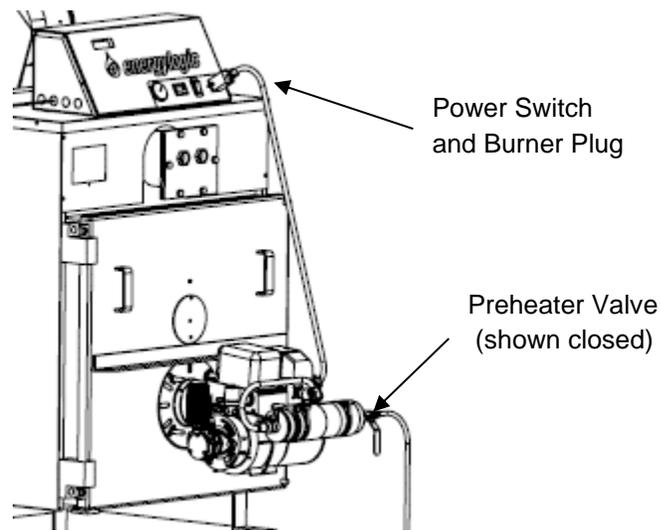
EnergyLogic strongly recommends that you remove power from the preheater when the boiler will not be in use for two weeks or longer. This is accomplished by simply switching the control box switch to off (0).

Shut Down Procedure (refer to figure):

1. Switch the control box switch to off (0) and unplug the burner.
2. Close the preheater valve—rotate clockwise.
3. Disconnect the fuel line at the preheater inlet.
4. Open the preheater valve and drain the oil from the preheater.
5. Perform annual maintenance. Refer to maintenance log.
6. Leave the boiler door open slightly.

Start Up Procedure:

1. Inspect the flue wind cap for obstructions such as bird nests or leaves.
2. Perform annual maintenance tasks if not yet completed. Refer to maintenance log.
3. Make sure that the used oil storage tank has enough oil.
4. Switch the control box switch to on (1).
5. Refer back to Section 7.4.1 to re-prime the fuel system.
6. Make sure everything is in place, and start the boiler (Section 7.4.2).
7. Perform system checks (Section 7.4.3), and review section 7.4.4 for operation.
8. **⚠ WARNING** Recheck the systems (Section 7.4.3) to make sure the boiler is operating properly.



Seasonal Shutdown

9. Troubleshooting

Your EnergyLogic boiler is designed and built for years of reliable service with regular maintenance. Should you experience trouble, refer to this section for troubleshooting guidance. A qualified serviceman may perform the tests in this section.

⚠ CAUTION *Do not tamper with the unit or controls – call your service technician or EnergyLogic for support.*

⚠ DANGER Only qualified servicemen are to perform the testing procedures. Testing may include working with high voltage electricity, which if mishandled may cause serious injury or death.

Start Here – First Steps of Trouble Shooting.

It has been our experience that many problems can be traced to improper installation, improper maintenance, or unintended results from changes made to the system or surrounding structures. So, the first steps in troubleshooting shall always begin with the following:

1. Verify installation and environmental factors. Remember that even if the original installation was properly performed, there can be unintended results from changes made to the building or structure. Common things to verify are:
 - a. Is the fuel in the tank low? Has it run dry, and the pump lost prime?
 - b. Has the water in the boiler run low?
 - c. Fuel Pump and Filter Installation. Dirty Filter?
 - d. Fuel condition changed (bad fuel, water in fuel)?
 - e. Adequate combustion and make up air. Have exhaust fans or other devices been added to the building that may create a negative pressure within the building? Has another fuel burning appliance been added to the building or room? Consider make up air requirements for all appliances.
 - f. Exhaust Flue System: Check draft setting. Have changes taken place on the roof that might affect the flue stack? Any obstructions (birds nest, etc.).
 - g. Is the circuit still dedicated, or has it been compromised by the addition of other appliances to the circuit? Is the power clean?
 - h. Do unauthorized persons have access to the system? Have the controls been tampered with? Check factory settings (start-up section).
2. Verify maintenance. If maintenance has not been performed timely and properly – STOP – perform ALL maintenance (Sec. 8) before troubleshooting. Smoke, soot, trouble in lighting-off or tripping out can all be caused by lack of maintenance or improper maintenance.

9.1 Troubleshooting Condition Table

Behavior	Part to Check
01. The burner does not operate when there is a call for heat.	<ol style="list-style-type: none"> 1. Wall T-Stat (See Section 9.3) 2. Boiler Controls (See Section 9.3) 3. Low Fuel Cutoff (Check Continuity) 4. Burner Plug (See Section 9.2) 5. Primary Controller (Section 9.3) 6. Preheater (See Section 9.3)
02. The burner runs 15-45 seconds then stops and the red button of the primary control requires reset (popped up or red light on).	<ol style="list-style-type: none"> 1. Burner Motor (See Section 9.2) 2. Primary Controller (See Section 9.3) 3. Cad Cell (See Section 9.3) 4. Tank/Tank Controls (See Section 9.2) 5. Pump/Filter (See Section 9.2) 6. Fuel Quality (See Section 9.2) 7. Transformer/Electrode (See Section 9.3) 8. Air Compressor (See Section 9.2)
03. The boiler has a build-up (coke tree) at the front of the burner in the heat exchanger (combustion chamber) after running many hours.	<ol style="list-style-type: none"> 1. Inlet Water Temperture (See Section 9.2) 2. Solenoid Valve (See Section 9.3) 3. Heat Exchanger Clogged (See Section 9.2) 4. Damper Tee/Manometer (See Section 9.2) 5. Air Compressor or Burner Shutter Setting (See Section 9.2) 6. Pump/Filter (See Section 9.2) 7. Nozzle Clogged or Leaking. 8. Fuel Quality (See Section 9.2)
04. Smoke is seen from the external flue cap or internal damper, or the boiler is running rough.	<ol style="list-style-type: none"> 1. Go to Section 9.1, Item 3.
05. The unit frequently requires reset in the mornings.	<ol style="list-style-type: none"> 1. Pump/Filter (See Section 9.2) 2. Go to Section 9.1, item 2.
06. The wall thermostat will not shut the burner off.	<ol style="list-style-type: none"> 1. Wall T-Stat (See Section 9.3) 2. Boiler Controls (See Section 9.3) 3. Primary Controller (See Section 9.3)
07. The boiler no longer provides enough heat.	<ol style="list-style-type: none"> 1. Heat Exchanger (See Section 9.2) 2. Water Circulator (See Section 9.3) 3. Damper Tee/Manometer (Sec. 9.2) 4. Burner Motor (See Section 9.2) 5. Air Compressor or Burner shutter setting (See Section 9.2)
08. The burner cycles on and off every few minutes	<ol style="list-style-type: none"> 1. Inlet Water Temperature (See Section 9.2) 2. Go to section 9.1, item 1.

9.2 Troubleshooting Trees

Part	Action/Question	Response
Burner Blower	1. Check Air Shutter Setting. What is the air shutter setting?	Correct settings are: 200B=7, 375B=6 and 500B=9.
Air Compressor	1. See Air Compressor Maintenance (Section 8.5.8) for testing air pressure.	Follow procedure in Section 8.5.8 for Air Compressor Maintenance
Burner Motor	1. Verify the burner motor reset status.	In operational mode - Go to next Action/Question Popped up (thermally tripped) - Reset motor by pressing in red button
	2. Verify electrical connections to the terminal strip from the burner motor under the primary control	If connections are loose, frayed or missing, repair and go to next Action/Question
	3. Visually inspect the coupling and blower wheel on the burner by flipping back the transformer. Is everything tight and free of interference?	Yes - Go to next Action/Question
		No - Remedy the Issue or Replace damage/worn parts
	4. With burner unplugged, try to spin the burner blower wheel.	Yes - Go to Next Component
		No - Verify operational status by following the steps in the Air Compressor Maintenance in Section 8.5.8 starting with section B of the Procedure. If okay, replace burner motor
Burner Plug	1. Check the connections underneath the burner plug casing (male end). Are the connections tight and free of damage?	Yes - Go to Next Action/Question
		No - Repair connections
Damper Tee /Manometer	1. Verify that the door swings freely. What is the reading on the draft gauge with the unit running? Is it 0 with the probe removed. If not zero the gauge per instructions in Section 5.3.	Between 0.03 and 0.07, then go to next Component. Otherwise adjust the weight on damper door. If still less than 0.03, then add one piece of flue to exterior or add a draft inducer. If greater than 0.07, add another damper tee and adjust its weight.
Fuel Quality	1. If the oil in the tank is below 50°F, allow for oil to warm or add filter band heater.	Oil going through the pump should be at a minimum of 50°F. This might require heat tape or other methods of heating the fuel
	2. Was fuel recently added?	Yes - Go to Next Action/Question
		No - {Skip Next Action/Question}

	3. What was in the recently added fuel?	Standard Mix - Go to Next Action/Question/Component
		Unknown/Cold/New Oil/Non Standard Mix - Call EnergyLogic Technical Services group for an Oil Analysis to be performed
	4. When was the tank last drained of water and other fall out materials?	Used Oil Storage Tanks should be drained annually from the bottom most drain port until only oil flows from the tank
	5. When was the oil last analyzed?	EnergyLogic recommends that an oil analysis be performed annually
	6. Analysis Results (If EL does not have the results, could we get them)	Consult EnergyLogic Technical Services group for oil analysis interpretation
Inlet Water	1. Return Water Temperature?	EnergyLogic requires that return water to the boiler system be a minimum of 140°F
Heat Exchanger	1. Clean Heat Exchanger and Flue: See Heat Exchanger Cleaning in Section 8.5.1.	The entire boiler should be maintained and cleaned according to the maintenance schedule.
Pump/Filter	1. Check Fuel Pump Motor. Is the fuel pump motor running while the burner is running?	Yes - Go to Next Action/Question/Component No - See Metering Pump Assembly Testing in Section 9.3
	2. Check Fuel Pressure: Turn boiler on or reset the red button of the primary control. What is the fuel pressure reading (gauge at pump outlet-PSI) while burner is running?	0 or erratically fluctuating then Go to step 4. If greater than 20 psi, see Nozzle/Solenoid cleaning, or between 3 and 15 (normal) go to next component check.
	3. Fuel line check. Do the fuel lines contact an exterior/cold wall?	Yes - If fuel line is in contact with an exterior wall, this could result in extra load on the pump. If fuel line is cold, add spacers (at least .5 inches) to eliminate contact with the exterior wall
		No - Go to Next Action/Question
4. Check Fuel Vacuum: Turn boiler on or reset the red button of the primary control. What is the fuel vacuum reading (gauge at pump inlet-inches Hg) during the time the burner is running?	Zero or erratically fluctuating then Go to Next Action/Question, or 1 to 10 In./Hg then Go to Action/Question 6, or 10 in./Hg or higher (for more vertical suction distance, allow more vacuum) then Replace oil filter -see filter replacement. If you are using a non-	

		EnergyLogic tank with strainer, inspect the strainer for debris.
	5. See Metering Pump Assembly Testing Procedure in Section 9.3	If Metering Pump Assembly Tested Good, go to next Component. Otherwise repair/replace necessary components
	6. (SKIP - for gravity fed Pumps w/plenty of fuel) Check for Air Leaks: Check all fittings from the pump back to the tank for suction side air leaks (make sure pipe sealant is used for all threaded connections). Inspect for cracked flares, tighten fittings and look for cracked lines. If you see no evidence of leaks, try soap and air pressure test on the suction side lines by pressurizing at the inlet through the 3/8-inch copper line that leaves the fire-stop valve at the tank.	Yes - Repair/Replace leaking component(s)
		No - Go to Next Component
Tank/Tank Controls	1. In the tank from which the metering pump is supplied, is the fuel pickup submerged into the oil source?	Yes - Go to Next Action/Question
		No - Fill Tank
	2. Is there continuity across the wires for the Low Level Cutoff Switch?	Yes - Go to Next Action/Question
		No - Replace Switch
	3. Check wire connections from Switch to thermostat plug on primary control. Are all connections properly secured?	Yes - Go to Next Component
		No - Repair connections

9.3 Testing Procedures

⚠ DANGER Only qualified servicemen are to perform the testing procedures. Many of the tests involve high voltage electricity, which if mishandled may cause serious injury or death.

9.3.1 Wall Thermostat (if equipped) and Burner Thermostat Circuit Testing

Tools Needed:

Digital Multi-Meter

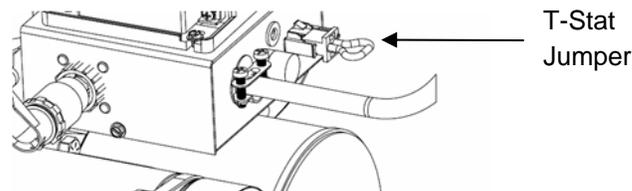
Wall Thermostat Function:

Monitors the temperature of the room and compares it to the set desired temperature. When the room temperature falls below the desired, it sends a signal (by closing a switch providing continuity) to the AquaSmart controller - initiating the call for heat.

Note: During this test, if the thermostat does not function as stated, call Technical Services for assistance, or Customer Service to order a new thermostat.

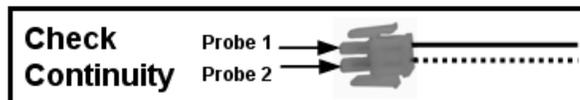
Procedure:

1. Disconnect the jumper wire (or low fuel cut-off wires) from the burner by removing the T-Stat plug (see image below) and verify the pins on the plug and receptacle are straight and secure.



2. If the system has a Fuel Low Cutoff Switch
 - a. Verify the fuel level in the tank is above the switch float. If not, then fill.
 - b. Check for continuity across the wires of the float switch.

If no continuity, remove the fuel switch and verify when the float is in the up position, the continuity status. No continuity = replace switch, Continuity = check fuel status



3. Disconnect the Thermostat wire from the AquaSmart. Set the thermostat to a temperature high enough to call for heat.
4. Using the ohm meter, connect the leads to each end of the T-Stat wires.
5. You should see continuity across the leads, check the wire connections at the thermostat and recheck.

9.3.2 Water Circulator Pump Testing

Tools Required:

Flat blade screwdriver or nut driver, volt meter.

Circulator Function:

Circulates water through the hydronics closed loop system in order to provide heat.

▲ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

Procedure:

1. Make sure that there is a call for heat or jumper the thermostat circuit on the AquaSmart.
2. Allow the burner to heat the boiler vessel until the temperature in the vessel is above the low limit setting (plus differential setting minus 10°F). Above this temperature, the pump will be called upon to operate.
3. Check the voltage across the AquaSmart terminals C1 and C2. There should be 115 volts.
 - a. If not, replace the AquaSmart controller.
 - b. If there is 115v, check the voltage at the circulator pump.
 - i. If there is not 115v at the pump, check and repair the circuit between the controller and the pump.
 - ii. If there is 115v at the pump but the pump does not run, replace the pump.

Note: If using a relay from the C1 and C2 to power the pump, check the function of the relay circuit prior to checking the pump.

9.3.3 Cad Cell Testing

Tools Required:

Flat-blade screwdriver, 120VAC capable Digital Multi-Meter (Ohms)

Cad Cell Function:

The Cad Cell senses the flame and lowers its resistance, which signals the primary controller to continue to power the burner during the call for heat. The normal flame sensing range is less than 1600 ohms. With a reading greater than 1600 ohms, the primary controller does not recognize that a flame is present and will stop the burner as a safety precaution.

Note: During this test, if the Cad Cell does not function as stated, call Technical Services for assistance, or Customer Service to order a new Cad Cell.

Procedure:

1. Unplug the burner plug from its receptacle.
2. Loosen or remove two ignition transformer screws. The cad cell is located on the underside of the ignition transformer. Lift the ignition transformer and inspect the yellow cad cell leads for cuts or breaks.
3. Inspect the cad cell for signs of overheating, such as melted plastic or coating of soot. Clean or replace if you see any of these signs.
4. Gently wipe dust off the cad cell lens with a soft clean cloth (DO NOT use solvents on lens).
5. Set your multi-meter to the 100 ohm or 1K ohm range.
6. On the primary control, use the multi-meter to check across the "F" terminals.
 - a. The reading should be very high in the dark (30K ohms+ with ignition transformer closed) and very low in light (below 1600 ohms with ignition transformer lifted open).
7. Return the Transformer to its operating position and plug in the burner.

9.3.4 Metering Pump Assembly Testing

Tools Required:

1/8" Allen wrench, 3/4" wrench, Flat-blade screwdriver, 120VAC capable Digital Multi-Meter, alligator clips or a jumper wire, Tachometer, stop watch and a graduated cylinder (ounce or milliliter).

Metering Pump Assembly Function:

Pumps fuel from the tank to the preheater and burner during the call for heat (given the preheater is up to temperature)

Note: During this test, if the Pump Assembly does not function as stated, call Technical Services for assistance, or Customer Service to order service parts.

⚠ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

Procedure:

1. Remove the pump assembly cover.
2. Inspect the coupler for damage or wear and make sure the set screws are tight and positioned on the flats of the two shafts. If worn or damaged, replace.
3. Inspect the condition of, and rotate by hand, the shafts (pump and gear box). If worn or damaged, replace.
4. Verify the gear box model number to the EnergyLogic model number. Refer to the following table.

	Pump Shaft Speed	Gear Box Model
Model	115V	115V
200B	241 - 300	3GN6KA
375B	483 - 600	3GN3KA
500B	161 - 200	3GN9KA

5. Jumper the T-T terminals, as soon as you hear the burner start, jumper the F-F terminals.
6. **⚠ CAUTION** Use Caution when approaching the pump assembly, rotating parts will be in operation.
7. Chattering from the gear box usually means damaged gearing. If chattering is heard or felt, replace the gear box.
8. Close the ball valve at the bottom of the preheater.
9. Using a multi-meter, verify the voltage across the wires going to the pump motor, should be around 115V AC.
 - a. If voltage is not present, check the wires from the pump conduit to the wiring box and in the primary control to ensure a secure fit and connections are proper (refer to wiring diagram for wire location and colors).
 - b. If voltage is present, but the motor does not function
 - i. Remove jumper terminals from the T-T and F-F terminals.
 - ii. Unhook the pink wire from the pump motor capacitor and hook it into the conduit wire feeding the black wire going to the capacitor.
 - iii. Jumper the primary as in Step 5.

1. If the motor runs, the capacitor is bad and must be replaced.
 2. If the motor does not run, remove jumpers from the primary.
 3. Remove the coupler from the pump assembly, and jumper the primary as in Step 5
 - a. If the motor runs
 - i. Remove jumpers and test with capacitor.
 1. If the motor runs with the capacitor, then the pump is seized and should be replaced.
 2. If motor does not run, replace capacitor.
 - b. If motor does not run, replace motor.
10. With pump operating and preheater ball valve closed, verify that the pump outlet pressure is around 60 psi (pump is now in bypass).

Speed testing with a tachometer

11. Test pump shaft speed per tachometer instruction and compare to values found in the table under step 4.

Perform a suction test on system

12. Close fire stop valve and push down on the stem. Or, close ball valve.
13. Run pump until the vacuum gauge reads 15 in/Hg (should quickly reach), and stop pump.
14. Cap the discharge side of the pump and note the vacuum gauge reading.
15. Wait 30 minutes.
16. Vacuum gauge reading should be the same as noted in step 14.
 - a. If not, check fittings and connections and retest, looking for signs of vacuum leaks.

Flow test

17. Disconnect the 3/16" copper line from the inlet of the solenoid valve at the top of the preheater (you will use this tube to catch oil coming from the preheater.).
18. Have the graduated cylinder located so as to catch oil from the tube in step 17.
19. Start timing once the burner turns on by applying jumpers to the T & F terminals.
20. Allow to run for 120 seconds (2 minutes) and remove jumpers.
21. Fluid levels should be near the listed values in the following table.

Model	Listed Flow Rates [gph]	Flow [oz/120 seconds]	Flow [ml/120 seconds]
200B	1.40	6.0	176.7
375B	2.70	11.5	340.7
500B	3.60	15.4	454.2

9.3.5 Preheater and Nozzle PTC Testing Procedure

Tools Required:

1/4", 5/16" wrenches, alligator clips or jumper wire, 120VAC capable Digital Multi-Meter DMM, temperature probe, or the TPI combustion analyzer with a type K thermocouple attached.

Preheater/Nozzle PTC Function:

Heats the fuel to a temperature over 120°F for proper combustion. There are standby PTCs in the Preheater and the Nozzle that are energized whenever there is power to the burner in order to keep the fuel warm for immediate start up. When the burner is firing, there are extra run PTCs in the Preheater that energize to heat the fuel as it flows to the nozzle. **Note:** During this test, if the preheater does not function as stated, call Technical Services for assistance, or Customer Service to order a new preheater.

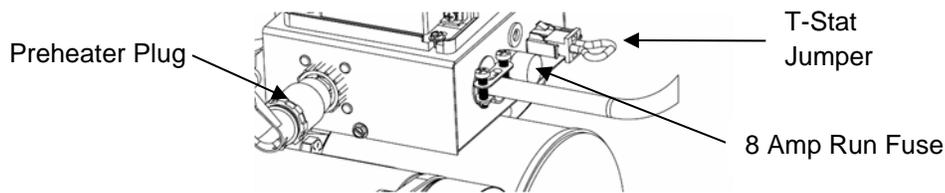
⚠ CAUTION The preheaters are on at all times, making the nozzle block and external preheater assembly very hot to the touch.

⚠ CAUTION Make sure the Preheater has recently been maintained. Neglect will negatively affect the results of testing

⚠ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

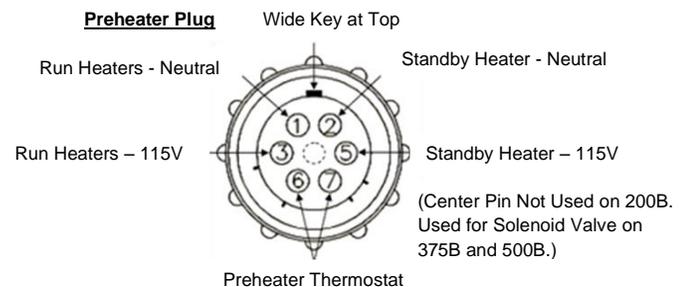
Procedure:

1. With the burner unplugged, verify the pins at the preheater plug and receptacle are straight and secure.
2. Check the 8 Amp fuse (refer to figure below). If the fuse is blown, there is a high probability that at least one of the run PTCs has shorted out.



3. Remove the thermostat connector / jumper from the side of the primary control and/or any jumpers across the T-T terminals.
4. Disconnect the preheater plug. Allow the preheater to cool, and check the following with the digital multi-meter:

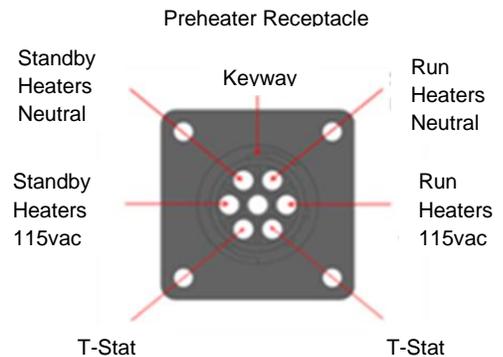
- a. Verify that the circuit between the two thermostat pins is open (if preheater is cool) or closed (if preheater is hot).
- b. Verify that there is a resistance of 100-1000 ohms between the standby power and neutral pins.
- c. Verify that there is a resistance of 100-1000 ohms between the run power and neutral pins.



If any of these tests fail, the preheater will need to be replaced.

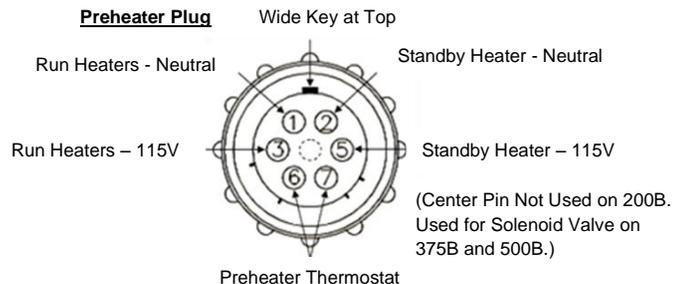
5. Plug the burner in. Unplug the preheater. Turn the preheater ball valve off. Verify power by testing for 120VAC across the preheater receptacle (see figure).

- a. Verify power across the preheater receptacle Standby Heater pins.
- b. **Note:** This should only be performed with the burner fully attached to the boiler vessel. Next, jump across the TT and FF terminals on the Primary Control. Verify power across the preheater receptacle Run Heater pins.
- c. Remove the jumpers from the TT and FF terminals, return the plug to the receptacle and open the ball valve when finished.



6. If the tests in step 4 and 5 are successful, plug the preheater into the receptacle and allow the preheater to heat up. After 30 minutes, the standby PTC should have heated the oil to the point where the preheater thermostat should have closed. **Note:** If the room temperature is below 50°F, allow additional time.

- a. Using the temperature probe (or TPI combustion analyzer with a type K thermocouple attached), touch the thermocouple probe to the surface of the top preheater cap (under the insulation). It should register above 120°F.
- b. Unplug the preheater and check for continuity across the thermostat pins of the preheater plug (refer to figure). If the preheater is hot, but there is no continuity across the thermostat pins, the preheater will need to be replaced.



7. If the burner does not light off well, there may be a problem with the Nozzle Block Standby PTC. To check the Nozzle Block Standby PTC: Remove the screws and flip back the transformer on top of the burner to expose the nozzle block.
 - a. Using the temperature probe (or TPI combustion analyzer with a type K thermocouple attached), touch the thermocouple probe to the surface of the nozzle extrusion, it should register above 120°F
 - b. Unplug the burner and check the physical connection and pins of the white PTC electrical plug.
 - c. Return the transformer to its operational position. Plug the burner in.
8. If the burner starts okay, but then trips after a few minutes, then restarts again repeatedly, then the run pills may not be providing enough heat or the incoming oil is cold. If the incoming oil to the preheater is above 50°F and the preheater cannot maintain temperature, the preheater will need to be cleaned or replaced.

9.3.6 Primary Control Testing

Tools Required:

Flat-blade screwdriver, alligator clip or piece of jumper wire.

Primary Controller Function:

Processes the call for heat and distributes power to the necessary components in order to operate the burner. During the startup and heating cycle, the primary controller insures that there is combustion, and shuts down the burner if there is no flame.

▲ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

Note: During this test, if the Primary Controller does not function as stated, call Technical Services for assistance, or Customer Service to order a new Controller.

Procedure:

1. Disconnect one of the red wires from one of the “T” terminals on the burner primary control.
2. Set the thermostat or AquaSmart to a setting so there is a call for the burner to fire.
3. Disconnect one of the yellow wires going to the F-F terminals on the primary.

Testing the Ignition Monitoring Function of the Primary Control

4. Use an alligator clip or jumper wire to connect the two T-T terminals
 - a. Burner should run for several seconds and then trip, requiring reset. If this happens, the primary control is working properly.
 - b. If the burner does not trip, the primary control should be replaced.

Note: With the T-T terminals jumped (primary control not tripped and one of the yellow wires disconnected), if the burner does not operate, verify that the primary is receiving power (120V) by checking the voltage across the black and white terminals beneath the primary control, and sending power out (120V) by checking the voltage across the orange and white terminals beneath the primary control.

Testing the Flame Monitoring Function of the Primary Control

5. Use an alligator clip or jumper wire to connect the T-T terminals.
6. When burner starts, use an alligator clip or jumper wire to connect the F-F terminals and allow to run for 1 minute.
7. Remove jumper from F-F terminals
 - a. Burner should run for several seconds and then trip, requiring reset. If this happens, the primary control is working properly.
 - b. If the burner does not trip, the primary control should be replaced.

Completing the Test

8. Reconnect the yellow wire removed in Step 2.
9. Return the AquaSmart or Thermostat setting to an appropriate temperature.
10. Reconnect the red

9.3.7 Solenoid Valve Testing

Tools Required:

7/16" wrench, Flat-blade screwdriver, 120VAC capable Digital Multi-Meter and alligator clips or jumper wires.

Solenoid Valve Function:

Blocks flow of the fuel from the preheater to the nozzle block when burner is not operating, and allows for flow during burner operation. The valve is a Normally Closed Valve.

Note: During this test, if the Solenoid does not function as stated, call Technical Services for assistance, or Customer Service to order a new Solenoid Valve.

CAUTION Make sure the Solenoid has recently been maintained. Neglect will negatively affect the results of testing.

⚠ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

Procedure:

1. Unplug the burner plug from its receptacle. Unplug preheater.
2. Remove the primary control cover plate, allowing access to the terminal strip under controller.
3. Find the solenoid valve wires, purple and white of the same gauge, and remove from terminal strip.
4. Using a multi-meter, test for continuity across the solenoid wires. There should be continuity across wires.
5. Leaving the purple and white wires disconnected, loosely replace the primary cover.
6. Remove copper tubing from between the solenoid and the nozzle (have cup or disposable towel ready to catch oil).
7. **⚠ CAUTION Wear Safety Glasses for the following steps!**
8. Plug in the burner and jumper the T-T terminals.
9. After the burner starts, jumper the F-F terminals.
10. Holding the cup near the open end of the solenoid valve, observe to see if the valve leaks while the burner is running. The valve should not leak during operation.
11. Remove the T-T and F-F terminal jumpers.
12. Unplug the burner plug from its receptacle. Reconnect the solenoid to the terminal strip. Plug the burner back in.
13. Apply the jumpers as in steps 9 and 10.
14. The solenoid should open and oil should flow out of the solenoid.
 - a. If oil does not flow, verify 105-120VAC is supplied to the solenoid from the terminal strip.
15. Remove the jumpers from the T-T terminals, then the F-F terminals and unplug the burner.
16. Return the wires, primary, copper and preheater plug to their operational positions.
17. Plug in the burner.

9.3.8 Top Suction Kit Testing

Tools Required:

Tools Required:

Adjustable wrenches, alligator clips

Top Suction Kit Function:

Save time/money and increase reliability when delivering fuel from the top of various types of tanks. An EnergyLogic Top Suction Kit combines fuel pick-up with a foot valve and a low fuel cut off switch. The fuel pick-up line has a copper tube, increasing reliability of the fuel delivery. An EnergyLogic Low Fuel Cutoff Switch is provided to interrupt operation when the fuel level in the tank is low, reducing the chance of introducing air into the fuel lines.

Note: During this test, if the Top Suction Kit does not function as stated, call Technical Services for assistance.

Note: To check low fuel cut-off function, see Thermostat Testing (Section 9.3.1).

Procedure:

1. Run the pump vacuum check (Section 9.3.4, steps 12 –16) and make sure that you have proper and tight flare connections. If there is a leak, repair it or call for assistance.
2. Disconnect the 3/8" copper tube at union above the tank. Disconnect wiring for low fuel cut-off switch.
3. Remove the suction copper and foot valve from tank.
4. Clean the oil from the suction copper and foot valve thoroughly.
5. With the suction copper vertical (as it mounts in the tank), fill the tube with oil. Place a clean paper towel under the foot valve.
6. Let the filled assembly set for 20 minutes. Inspect for oil leaks on the paper towel.
7. If there is evidence of a leak, and it can be located, repair if possible using thread sealant. If repair is not possible, call for assistance or order replacement parts.

9.3.9 Iron Core Transformer Testing

Tools Required:

Flat-blade screwdriver, 120VAC capable Digital Multi-Meter (must have mA AC capability) and alligator clips or a jumper wire.

Transformer Function:

Transforms 120 Volts into a low ampere, high voltage (10,000 V) supply to the electrode. This provides the spark needed for combustion.

Note: During this test, if the Transformer does not function as stated, call Technical Services for assistance, or Customer Service to order a service part.

⚠ WARNING EnergyLogic does not recommend the use of a screwdriver or any other conductor to contact the transformer springs other than the testing procedure below!

⚠ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

Procedure:

1. Unplug the preheater. Close the hand valve on the preheater.
2. Use the screwdriver to loosen the primary control mounting cover and lift to allow access to terminal strip underneath.
3. With the burner plugged in, jumper the T-T terminals to simulate a call for heat. When the burner starts, jumper the F-F terminals on the primary control.
4. Find the Black wires coming from the transformer and cautiously check the voltage across the terminals. Should read between 105 and 120 volts AC.
 - a. If reading is not within range, call your electrician to rectify voltage issue. There may be an issue with your local power company.
5. Remove jumpers from T-T and F-F terminals.
6. Unplug the burner plug from its receptacle.
7. Loosen or remove two ignition transformer screws.
8. Tilt back the transformer.
9. Verify that the springs are making contact with the electrode extensions by visually aligning the springs with the extensions. If they are misaligned, reshape the springs to ensure good contact. If soot is present, clean with wire brush or emery cloth.
10. **Use Caution when approaching the transformer springs! They will be energized with step 11.**
11. Plug in the burner and replace the jumpers as in step 3. You will need to disconnect one of the yellow, cad cell wires from the primary control for the burner to restart.

Using a digital multi-meter:

12. Using your digital multi-meter
 - a. Without an amp clamp (must have mA AC capability)
 - i. Set the reading to amperes.
 - ii. Test amperes from spring to spring.
 - iii. Reading should be between 20mA and 26mA with a nominal of 23mA. (transformer should be labeled)

- b. With an amp clamp (must have mA AC capability)
 - i. With burner plug unplugged, run wire from spring to spring of the transformer.
 - ii. Plug in the burner and apply jumpers as in step 11.
 - iii. Using the amp clamp around the wire, read the amperes.
 1. Reading should be between 20mA and 26mA with a nominal of 23mA. (transformer should be labeled)
13. Remove jumpers from T-T and F-F terminals.
14. Unplug the burner plug from its receptacle.
15. Return the Transformer and Primary Controller to its operating position and plug in the burner.
16. Open the hand valve on the preheater, and plug it in.

9.3.10 Boiler Control Testing / Wiring

Tools Required:

Flat blade screwdriver, nut driver, volt meter.

Controller Function:

- Low Water Cut-Off (function of AquaSmart control): Will shut off power to the burner in the case that the water level in the vessel is too low.
- High Temperature Limit Controller: Will shut off power to the burner in the case that the water temperature exceeds the limit set on the controller.
- Temperature Control (function of AquaSmart control): Operates the burner and circulation pump based on a call for heat and the low limit setting (minimum temperature maintained in the vessel).

Note: During this test, if the Controllers do not function as stated, call Technical Services for assistance, or Customer Service to order a service part.

▲ DANGER *During a portion of this test, high voltage electrical components will be energized. Only a certified electrician is to perform the following procedures, and with extreme caution.*

Procedure:

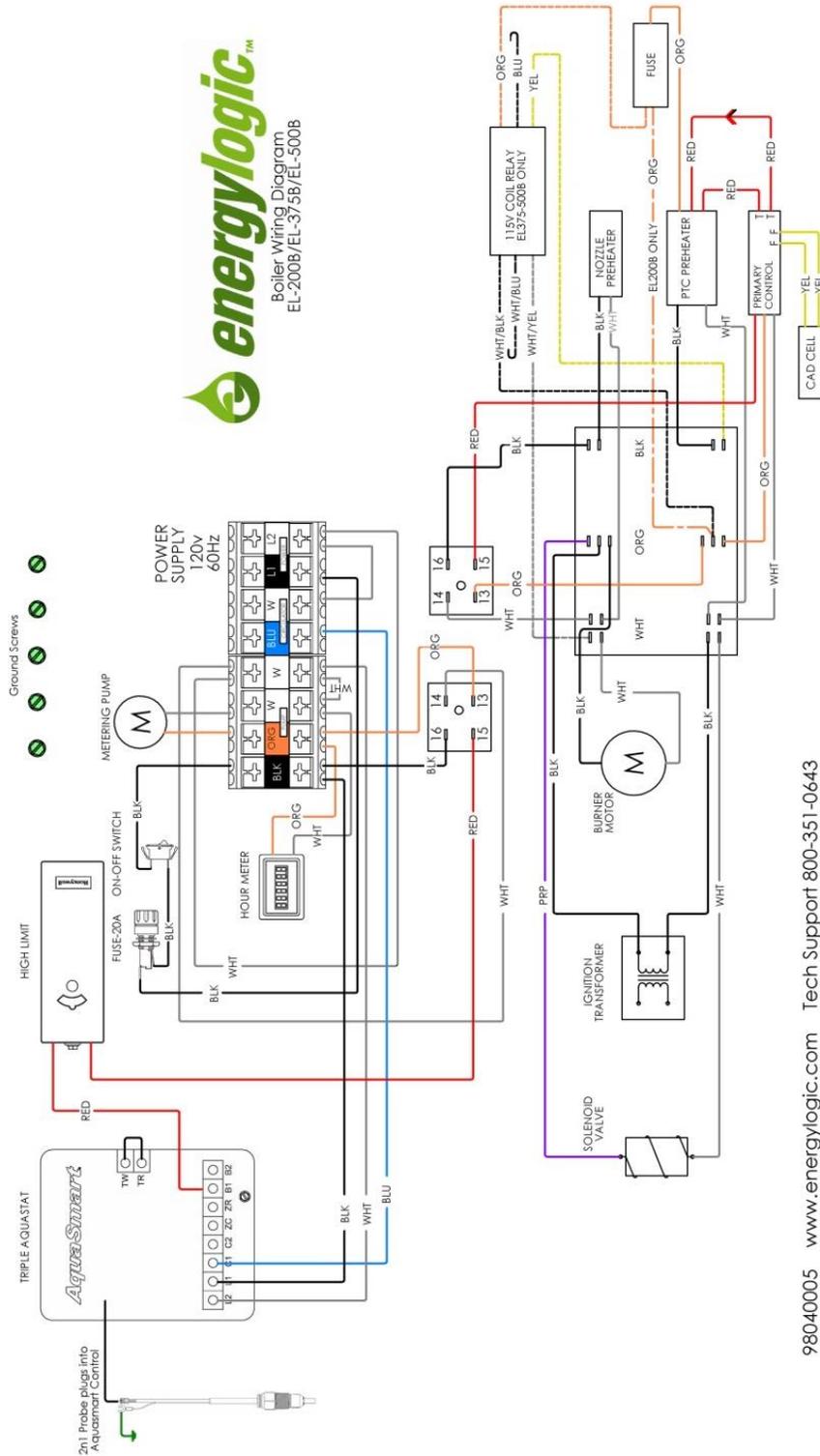
1. Look at the control display which can be seen through the window in the control box cover. If the display is blank, check to see that the on-off switch is in the on (1) position. If there is still no display, then check the fuse in the right side of the control box. If the fuse is good, go to step 2
2. Take the control box cover off of the control box. The unit wiring diagram is on the inside of the cover. Loosen the screw holding the door to the AquaSmart control and swing the door open. Check for voltage between L1-L2. If there is no voltage, then check the power supply to the boiler. If there is voltage between L1-L2, then the AquaSmart control has failed and must be replaced.
3. The AquaSmart control will display the condition of the system:
 - a. HEATING WATER WTR: 74° F. This means the control is sending voltage out on B1-B2 to run the burner. Also, the water temperature is indicated. Check for voltage. If there is no voltage between B1-B2 then the AquaSmart has failed and must be replaced.
 - b. STANDBY WTR: 162°F. The boiler is at a temperature set point and the AquaSmart has turned off voltage at B1-B2.
 - c. LOCKOUT WATER LOW: The control has sensed low water in the vessel. Pull the sensor from the well and inspect for damage or corrosion. If the sensor is OK, put it back into the well ensuring that the tip is bottomed in the well so that it is in the clip in the bottom of the well. Confirm that the green wire from the sensor is not damaged and is connected to a ground screw in the control box. If the probe, well and grounding wire are OK, then check the vessel for water level. Once water in the vessel is established, press and hold the ENTER (RESET) button on the AquaSmart control for 5 full seconds. The control should go to state “a” above.
4. If there is voltage between B1-B2 on the AquaSmart, then check that the red button on the High Limit is pushed in and the setting is at 230°. Check for voltage between

terminals 14-15 of the receptacle for the burner plug. If there is no voltage there, the High Limit is failed and must be replaced.

5. If there is voltage at 14-15 on the receptacle, then proceed to Paragraph 9.3.1.

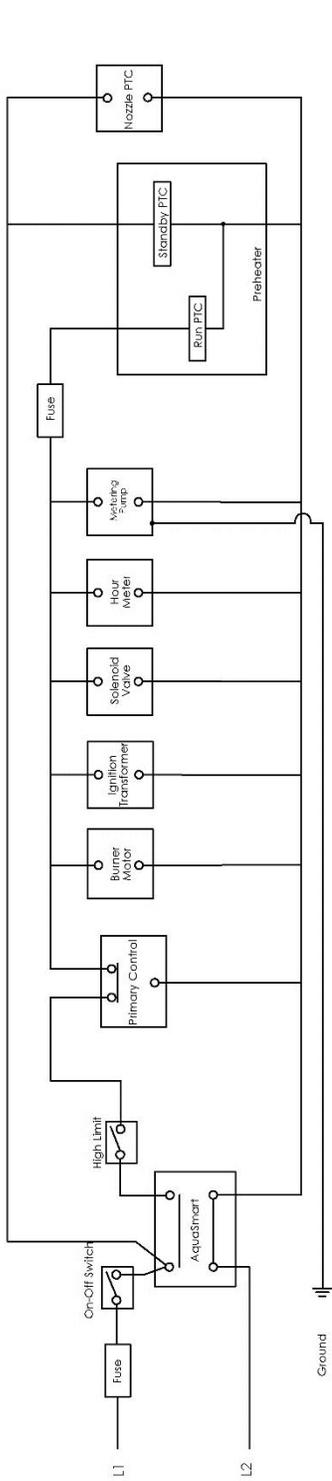
10. Appendices

10.1 Boiler Wiring and Oil Schematic

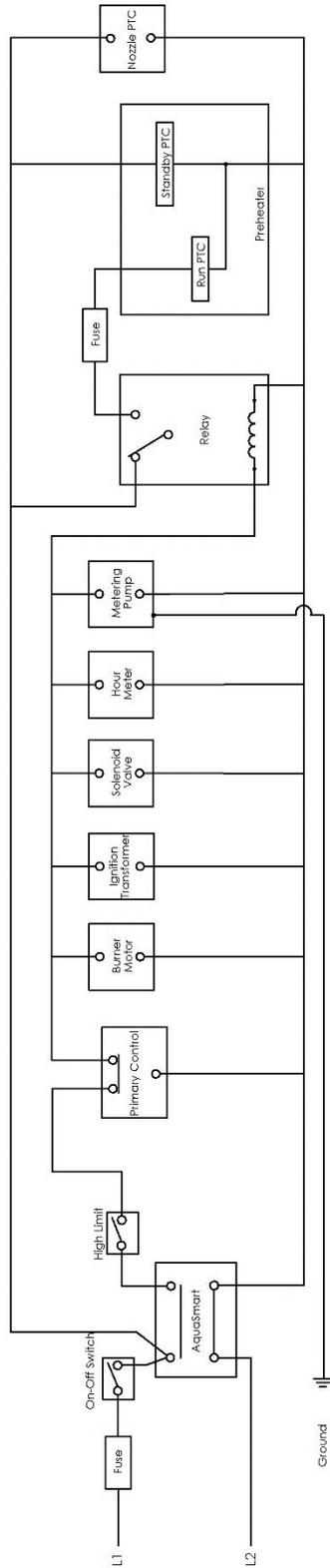


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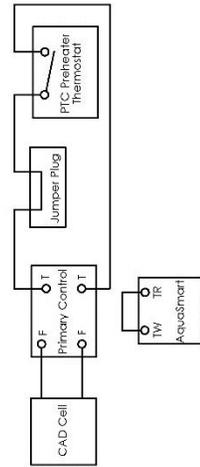
Model 200 Boiler



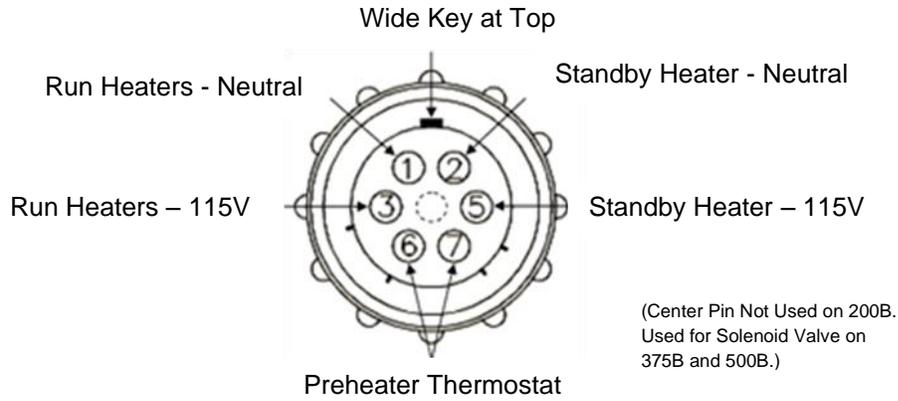
Model 375 and 500 Boiler



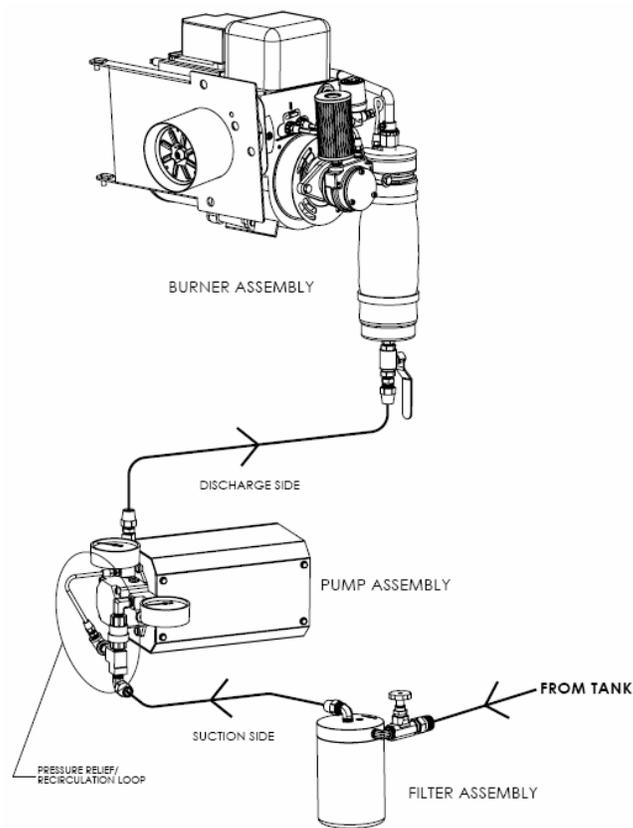
Control Circuit All Models



Preheater Plug Pin Diagram



Oil Schematic



10.2 Boiler Specifications

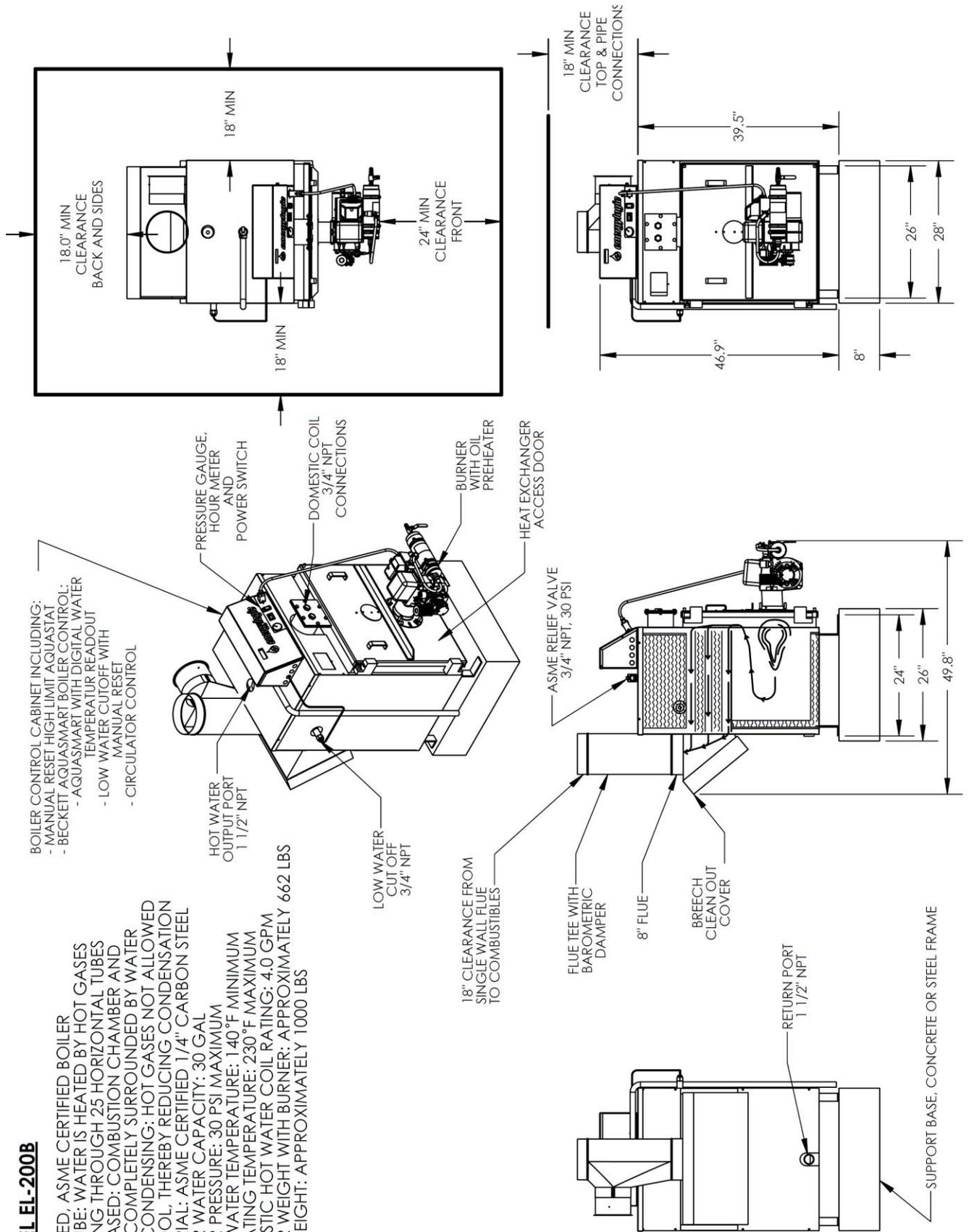
Specification Table:

Multi-Fuel Burning Appliance			
Model Number	Model EL-200B	Model EL-375B	Model EL-500B
Bonnet Capacity Output BTU	160,000 BTU	300,000 BTU	400,000 BTU
Fuel Input	1.4 GPH	2.7 GPH	3.6 GPH
Nozzle Only	No. 30609-5	No. 30609-28	30609-28
Fuels	ASTM D396 No. 2 oil fuel, Used Crankcase Oil, and Used Automatic Transmission fluid	ASTM D396 No. 2 oil fuel, Used Crankcase Oil, and Used Automatic Transmission fluid	ASTM D396 No. 2 oil fuel, Used Crankcase Oil, and Used Automatic Transmission fluid
Designed Outlet Water Temperature	250°F Maximum	250°F Maximum	250°F Maximum
Flue Draft	-0.05" WC	-0.05" WC	-0.05" WC
Atomizing Air Pressure	9-11 PSI	13-15 PSI	13-15 PSI
Circulator Pump	To fit application	To fit application	To fit application
Maximum Fuse Size	20A	20A	20A
Burner Motor	1/5 HP, 115V/60Hz, 3.3A	1/4 HP, 115V/60Hz, 3.5A	1/4 HP, 115V/60Hz, 3.5A
Metering Pump Motor	15Watt, 115V/60Hz, 0.35A	15Watt, 115V/60Hz, 0.35A	15Watt, 115V/60Hz, 0.35A
Ignition Transformer & Control Circuit	115V/60Hz, 2.0A	115V/60Hz, 2.0A	115V/60Hz, 2.0A
Oil Preheaters	115V/60Hz, 2.5A Maximum	115V/60Hz, 3.5A Maximum	115V/60Hz, 3.5A Maximum
Minimum Clearance to Combustible Surfaces	Top & pipe connections- 18" Front - 48" (burner end) Sides - 18" Rear - 18" Flue Pipe - 18" Bottom – must be on non-combustible flooring.	Top & pipe connection - 18" Front - 48" (burner end) Sides - 18" Rear - 18" Flue Pipe - 18" Bottom – must be on non-combustible flooring.	Top & pipe connection - 18" Front - 48" (burner end) Sides - 18" Rear - 18" Flue Pipe - 18" Bottom – must be on non-combustible flooring.
For commercial and industrial use only.			

MODEL EL-200B

- UL LISTED, ASME CERTIFIED BOILER
- FIRE TUBE: WATER IS HEATED BY HOT GASES FLOWING THROUGH 25 HORIZONTAL TUBES
- WET BASED: COMBUSTION CHAMBER AND TUBES COMPLETELY SURROUNDED BY WATER
- NON CONDENSING: HOT GASES NOT ALLOWED TO COOL, THEREBY REDUCING CONDENSATION
- MATERIAL: ASME CERTIFIED 1/4" CARBON STEEL
- BOILER WATER CAPACITY: 30 GAL
- WATER PRESSURE: 30 PSI MAXIMUM
- INLET WATER TEMPERATURE: 140 °F MINIMUM
- OPERATING TEMPERATURE: 230 °F MAXIMUM
- DOMESTIC HOT WATER COIL RATING: 4.0 GPM
- BOILER WEIGHT WITH BURNER: APPROXIMATELY 662 LBS
- WET WEIGHT: APPROXIMATELY 1000 LBS

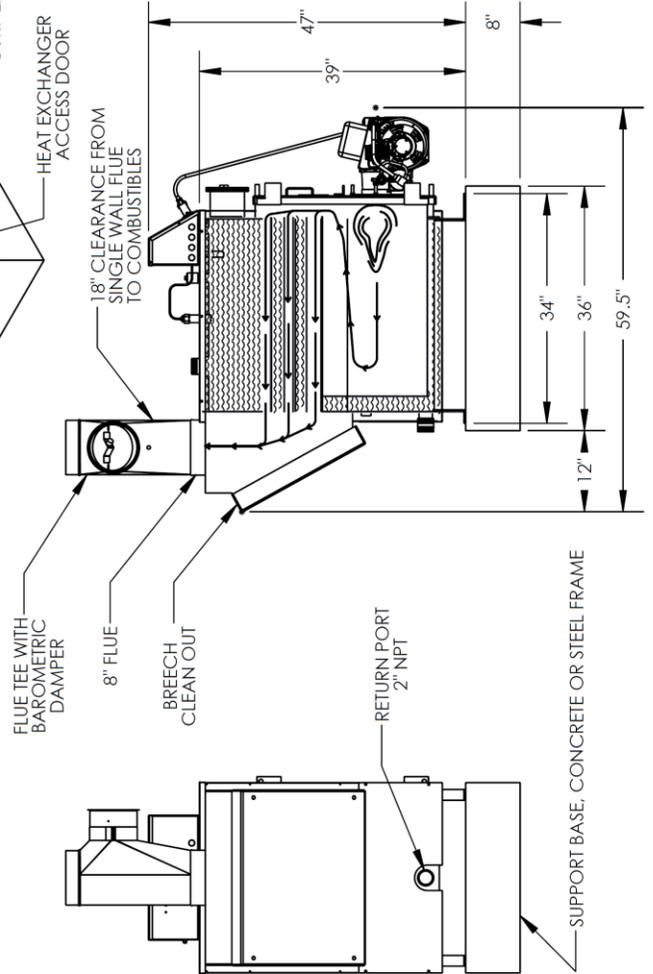
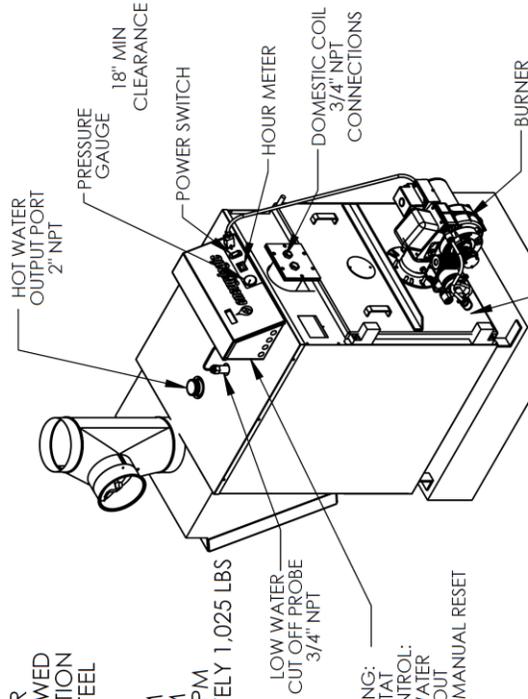
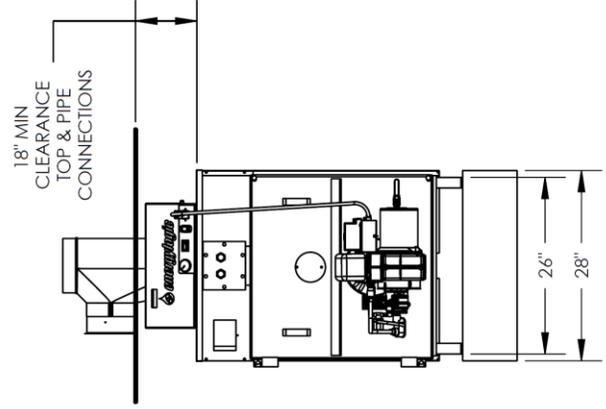
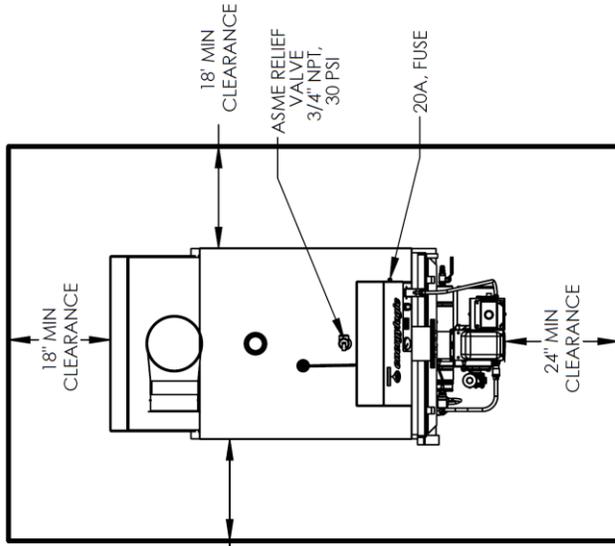
- BOILER CONTROL CABINET INCLUDING:
- MANUAL RESET HIGH LIMIT AQUASTAT
 - BECKETT AQUASMART BOILER CONTROL: TEMPERATURE READOUT
 - LOW WATER CUTOFF WITH MANUAL RESET
 - CIRCULATOR CONTROL



MODEL EL-375B

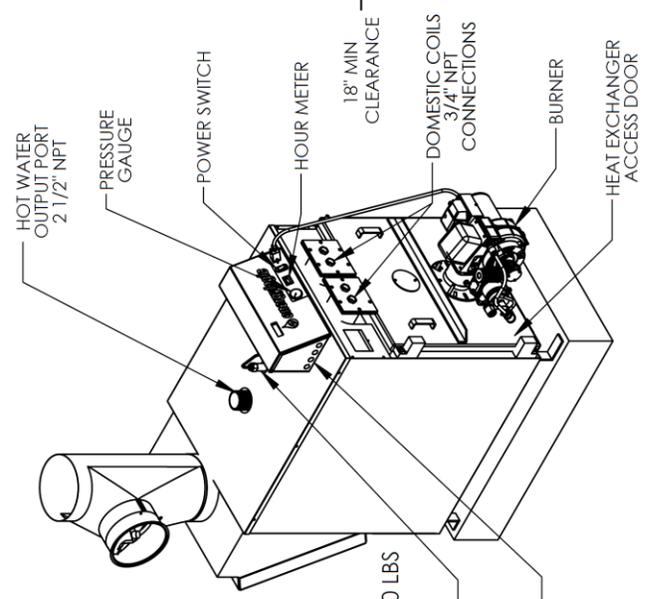
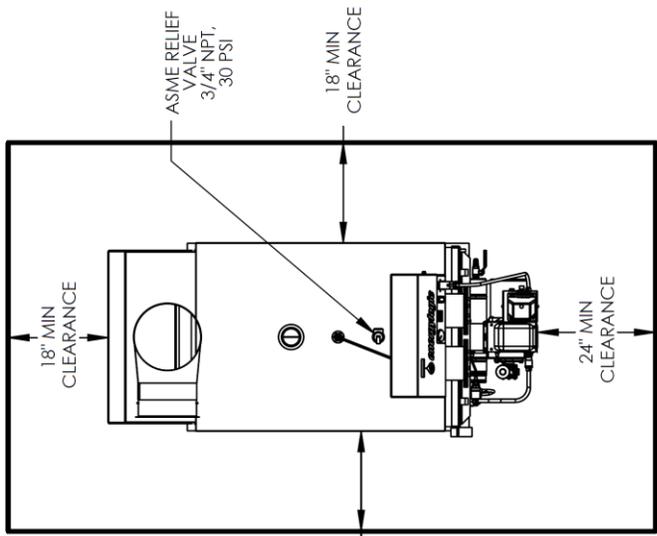
- UL LISTED, ASME CERTIFIED BOILER
- FIRE TUBE: WATER IS HEATED BY HOT GASES FLOWING THROUGH 24 HORIZONTAL TUBES
- WET BASED: COMBUSTION CHAMBER AND TUBES COMPLETELY SURROUNDED BY WATER
- NON CONDENSING: HOT GASES NOT ALLOWED TO COOL, THEREBY REDUCING CONDENSATION
- MATERIAL: ASME CERTIFIED 1/4" CARBON STEEL
- BOILER WATER CAPACITY: 43 GAL
- WATER PRESSURE: 30 PSI MAXIMUM
- INLET WATER TEMPERATURE: 140°F MINIMUM
- OPERATING TEMPERATURE: 230°F MAXIMUM
- DOMESTIC HOT WATER COIL RATING: 6.0 GPM
- BOILER WEIGHT WITH BURNER: APPROXIMATELY 1,025 LBS
- WET WEIGHT: APPROXIMATELY 1,450 LBS

- BOILER CONTROL CABINET INCLUDING:
- MANUAL RESET HIGH LIMIT AQUASTAT
 - BECKETT AQUASmart BOILER CONTROL
 - AQUASTAT WITH DIGITAL WATER TEMPERATURE READOUT
 - LOW WATER CUTOFF WITH MANUAL RESET
 - CIRCULATOR CONTROL

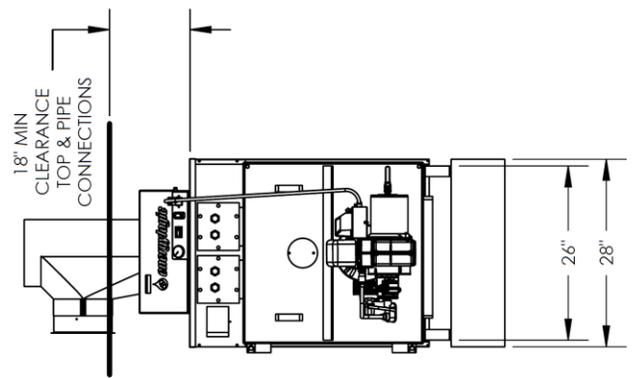
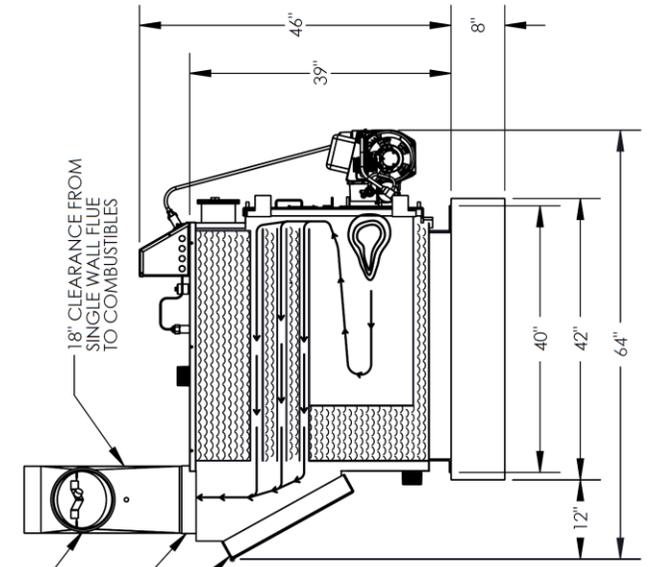
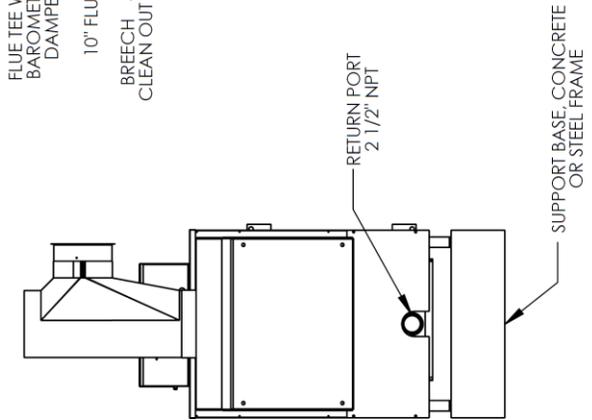


MODEL EL-500B

- UL LISTED, ASME CERTIFIED BOILER
- FIRE TUBE: WATER IS HEATED BY HOT GASES FLOWING THROUGH 24 HORIZONTAL TUBES
- WET BASED: COMBUSTION CHAMBER AND TUBES COMPLETELY SURROUNDED BY WATER
- NON CONDENSING: HOT GASES NOT ALLOWED TO COOL, THEREBY REDUCING CONDENSATION
- MATERIAL: ASME CERTIFIED 1/4" CARBON STEEL
- BOILER WATER CAPACITY: 52 GAL
- WATER PRESSURE: 30 PSI MAXIMUM
- INLET WATER TEMPERATURE: 140°F MINIMUM
- OPERATING TEMPERATURE: 230°F MAXIMUM
- DOMESTIC HOT WATER COIL RATING: 8.0 GPM (X 2)
- BOILER WEIGHT WITH BURNER: APPROXIMATELY 1,300 LBS
- WET WEIGHT: APPROXIMATELY 2,000 LBS



- BOILER CONTROL CABINET INCLUDING:
- MANUAL RESET HIGH LIMIT AQUASTAT
 - AQUASMART BOILER CONTROL:
 - AQUASTAT WITH DIGITAL WATER TEMPERATURE READOUT
 - LOW WATER CUTOFF
 - CIRCULATION CONTROL



10.3 Limited Warranty

EnergyLogic, LLC, MANUFACTURER, warrants to the buyer that **MANUFACTURER'S** boiler be free from defect in material and workmanship according to the provisions and limitations for a period of one (1) year from the Effective Date (as defined below) or 1,500 hours of operation (in-service date), whichever occurs first. The buyer is responsible for registering the unit with the **MANUFACTURER**. If the unit is not registered, the buyer is responsible for maintaining proof of the purchase date of the unit. The warranty coverage period begins on the date (the "Effective Date") of purchase, as established by buyer, or otherwise on the date of manufacture as indicated by the serial number. **No warranty claim examination shall commence until the unit is registered with the MANUFACTURER.**

Non-consumables or parts that are not associated with a maintenance service interval because of normal wear shall be warranted for a period of one (1) years from the Effective Date or 1,500 hours of operation, whichever occurs first. A second year will be activated when the product is registered with the Manufacturer within in the first 30 days of receipt of the Product.

The boiler vessel shall be warranted for a period of ten (10) years from the Effective Date or 15,000 hours of operation, whichever occurs first. Parts coverage is 100% for boiler coil replacement during the first five (5) years from the Effective Date or 7,500 hours of operation (whichever occurs first), with prorated coverage (from the Effective Date) for the remainder of the ten (10) year term.

Parts (including boiler vessel) replaced during the original equipment warranty period as detailed herein shall carry either a one (1) year warranty from the Effective Date or the remainder of the factory warranty for the original equipment, whichever occurs last. In no event shall a part replaced under the original warranty carry a warranty that extends beyond one year from the expiration of the original factory warranty period.

Warranty Exclusions:

1. Consumable parts or any part that is associated with a normal maintenance interval because of normal wear and tear (filters, seals, gaskets, air compressor vanes, batteries, insulation, furnace cabinets).
2. Products or parts which are not maintained in accordance with the service frequency and methods described in the **MANUFACTURER'S** instructions furnished and / or available upon request from the buyer.
3. Parts and products that are not installed and operated according to **MANUFACTURER'S** instructions furnished and / or available upon request from the buyer.
4. Repairs made with parts or accessories which are not genuine EnergyLogic LLC or EnergyLogic LLC approved
5. Installations not in accordance with U.L., NFPA No. 31, federal, state, and local codes and regulations.
6. Labor or other costs incurred in troubleshooting, repair, removal, transportation, installation, service or handling of parts.
7. Claims, representation, or warranty made by any dealer, distributor, or other person that is inconsistent with or is more expansive than the provisions provided herein.
8. Parts that are altered from original specifications of the **MANUFACTURER** or are damaged because of misuse, improper handling, storage, or use in conjunction with other parts not authorized by **MANUFACTURER**.
9. Products that have been moved from the original installation site or that have been sold or exchanged to a person other than the original buyer.
10. Equipment or products installed outside of the continental U.S. or Canada.
11. Products or parts in which the serial number has been altered, defaced, or removed

The buyer must assist the **MANUFACTURER'S** Technical Support group during over-the-phone problem diagnosis in order to help substantiate a warranty condition. A course of action will be determined by the **MANUFACTURER** if repair or replacement is deemed necessary.

MANUFACTURER'S liability under this warranty shall be limited to the repair or replacement of any part or parts that may prove to be defective under such normal operation and use, subject to **MANUFACTURER'S** examination and determination to its satisfaction that such part or parts are so defective.

Obtaining Warranty Service:

If the local Service Provider is unknown, contact **EnergyLogic, LLC** at 5901 Crossings Blvd., Antioch, TN 37013, or at **1-615-471-5290**. A representative will assist you in locating the nearest authorized service provider or in verifying the warranty coverage. The Unit Registration identification number will be required. Please refer to our website at www.energylogic.com for more information.

In order for a warranty claim to be acknowledged by the **MANUFACTURER**, the buyer must be issued a Return Authorization (RA) number and the product must be Warranty Registered. After obtaining an RA number, the buyer must properly package the part to avoid damage during shipment with the RA number visible on the outside of the box. A credit card number must be provided in order for the replacement part to be shipped and the part must be returned within 30 days of receipt of the replacement part in order to avoid charges.

If **MANUFACTURER** determines that a problem with a product or part is not covered under the Limited Warranty, the buyer will be notified and informed of service alternatives available on a fee basis.

DISCLAIMER AND LIMITATION OF DAMAGES: THIS LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, TO THE EXCLUSION OF ANY AND ALL OTHER WARRANTIES OR REPRESENTATIONS THAT MAY BE EXPRESSED OR IMPLIED BY ANY LITERATURE, PACKAGING, SAMPLES, MODELS, DATA OR PERSONS. MANUFACTURER DOES NOT ASSUME, NOR DO WE AUTHORIZE ANY EMPLOYEE, AGENT, OR OTHER PERSON TO ASSUME FOR US, ANY OTHER RESPONSIBILITY OR LIABILITY IN CONNECTION WITH THE SALE OF THE GOODS COVERED HEREBY. MANUFACTURER HEREBY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE. MANUFACTURER'S MAXIMUM LIABILITY HEREUNDER SHALL NEVER EXCEED THE COST OF THE PRODUCT. MANUFACTURER IS NOT RESPONSIBLE FOR OR LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES RESULTING FROM THE USE OF THE GOODS COVERED HEREBY OR ANY BREACH OF WARRANTY OR UNDER ANY OTHER LEGAL THEORY, INCLUDING BUT NOT LIMITED TO CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, LOST PROFITS OR GOODWILL, LOSS OF TIME, INCONVENIENCE, LOST FUEL, LOST SAVINGS, LABOR CHARGES OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES WITH RESPECT TO PERSONS, BUSINESS OR PROPERTY WHETHER AS A RESULT OF BREACH OF WARRANTY OR OTHERWISE. THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES.