INSTALLATION AND OPERATOR'S MANUAL

READ THIS MANUAL BEFORE INSTALLING OR USING YOUR YOUR MULTI-FUEL BOILER

MULTI-FUEL HAND-FIRED COAL BOILER

Models: WC40, WOC40, WC55, WOC55, WC70, WOC70, WC100, WOC100

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

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

ALTERNATE HEATING SYSTEMS
2393 LITTLE EGYPT RD
HARRISONVILLE, PA 17228
717-987-0099
WWW.ALTERNATEHEATINGSYSTEMS.COM
EMAIL:SERVICE@WOODGUN.COM

Record Model and Serial Number Below:

Model:
Serial Number:
Date of Purchase:

Revision: 07/10/17

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Introduction

The purpose of this manual is to assist you in the installation, operation and maintenance of your new boiler in order to achieve the best performance possible. We recommend that the unit be installed by an experienced boiler installation technician who has a thorough knowledge of hydronic heating systems and boilers. Should your installation require a steam boiler, it is even more important that experienced personnel be consulted to ensure that the necessary safety controls are installed and properly wired.

Read the entire instruction manual carefully and understand it thoroughly before installing or operating this unit. Save these instructions and review them periodically to refresh your memory regarding safe operating practices and routine maintenance required.

All Alternate Heating Systems (AHS) boilers can be supplied with the "H" stamp and National Board number for an additional fee when requested prior to purchase. All Alternate Heating Systems boilers are built in our own facilities to the most rigid quality control standard so that you can be assured of the highest quality product.

ALWAYS WEAR GLOVES WHEN ATTENDING TO THIS HEATER.

THIS HEATER IS NOT AN INCINERATOR. DO NOT BURN GARBAGE, PAINTED OR TREATED WOOD.

DO NOT LEAVE SMALL CHILDREN UNATTENDED WHILE IN THE ROOM WITH THIS HEATER.

DO NOT INSTALL IN A ROOM USED FOR SLEEPING!

DO NOT OVERFIRE - IF HEATER OR CHIMNEY CONNECTOR GLOWS, YOU ARE OVERFIRING.

NEVER USE GASOLINE, LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER WHILE IT IS IN USE.

CAUTION! THIS HEATER IS HOT WHILE IN OPERATION. KEEP COMBUSTIBLES SUCH AS FURNITURE, FUEL, AND DRAPERIES OUTSIDE OF LISTED CLEARANCES.

THIS HEATER IS NOT APPROVED FOR INSTALLATION IN MOBILE HOMES!

INSTALLATION IS TO BE PERFORMED BY A QUALIFIED INSTALLER. INSTALLATION WILL COMPLY WITH ALL THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION OVER THE INSTALLATION.

Installation

To achieve safe and satisfactory results from your Alternate Heating Systems Multi-Fuel boiler, these installation and operation guidelines must be strictly adhered to. You must also check local building codes in your area to ensure compliance.

GENERAL CHIMNEY REQUIREMENTS

One of the most important considerations in installing a Multi-Fuel boiler is the type of chimney that will be used. The condition and construction of the chimney is important to providing sufficient draft. Having sufficient draft is in turn important for safe, efficient operation. The chimney produces the draft, not the stove.

Draft

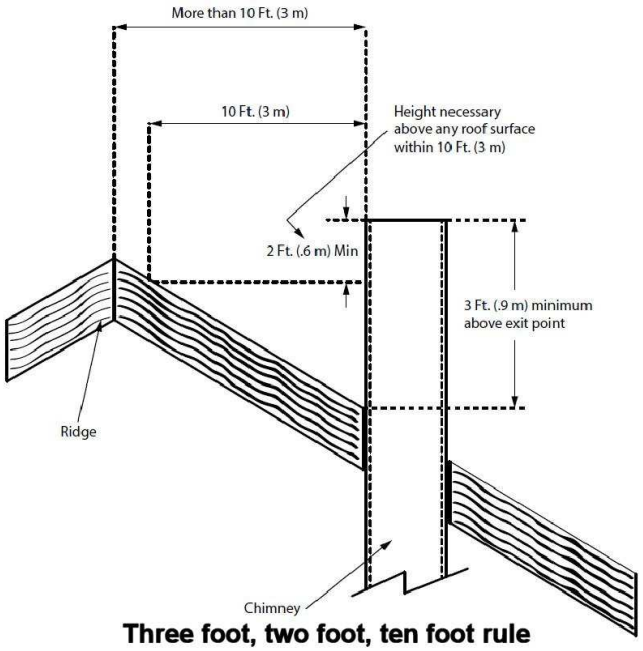
Draft is created by a pressure differential between the bottom and the top of the chimney. Chimney height, air moving across the top of the chimney, and warmer air in the chimney than outside will all result in greater pressure differences and stronger draft. A warm chimney drafts better than a cold one. For this reason a chimney drafts best when kept warm. It is more difficult to maintain sufficient temperature in an exposed chimney. A larger chimney, or one with a lot of thermal mass will also present more problems than a chimney that is protected from outside temperature extremes. A chimney must be kept warm (about 250° F) for proper draft to occur. A chimney's height, expressed as the difference between the top opening and the flue pipe connection on the appliance, contributes to draft because atmospheric pressure is naturally lower at the chimney top than bottom. See Draft Control section in this manual for more information.

⚠ CAUTION

CREOSOTE BUILDUP PROBLEMS

Poor chimneys with cold walls can cause creosote buildup. Sharp bends and horizontal flues should also be avoided. The exhaust must be kept moving through the piping/flue to prevent creosote buildup. If a horizontal section must be used, it must rise slightly to prevent dead air space.

The chimney must be sufficiently tall (at least 20 feet for masonry chimneys) and should extend several feet above the highest part of the roof to prevent downdrafts. Follow code requirements for your area and consult a chimney professional. Keep in mind the 3-2-10 rule, as depicted below. The chimney must be leak-free from the standpoint of air entering through cracks or other chimney defects or through loose stovepipe fittings.



3-2-10 Rule for Chimneys

Technical Aspects of Chimney Performance

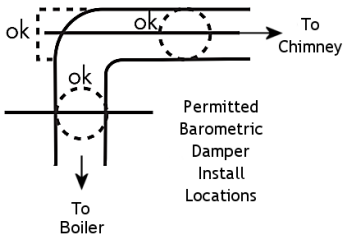
A device called a manometer is used in describing the technical performance of a chimney. A manometer is an instrument used for measuring the pressure of liquids and gases. An analog manometer consists of a glass tube filled with a liquid and mounted in front of a measuring scale against which the liquid level can be measured. If a manometer were connected to a leak-free chimney with a leak-free connection, then the draft in the chimney should exert enough pressure (or pull) against the water in the manometer to cause it to move at least -.04 inches in the tube. For units to be operated on coal, limit maximum draft to -.08 inches. Use of a barometric damper may be required.

Dwyer Manometer

To measure the draft, drill a hole in the connector pipe and attach a draft meter or manometer. First, check the draft above the barometric damper (if installed). Then check it below the barometric damper and make your damper adjustment to where it opens to prevent the draft from going higher than -.08 inches of water column. If the chimney is incapable of supplying the required draft, it will need to be improved. See the section on Common Chimney Problems for more information.

Barometric Damper

A barometric damper is a device that allows room air to enter the chimney, bypassing the air intake on the heater. A heater and chimney combination that drafts well will occasionally produce more draft than is desired. Excessive draft can lead to overfiring. It will also lead to reduced efficiency, as more heat will end up going up the chimney. A barometric damper is used on a coal fired heater to limit maximum draft to -.08 column inches. The barometric damper needs to be the same diameter as the stove collar. It is to be installed in the chimney connecting pipe as shown below.



It is important to check the chimney draft when the seasons change to ensure draft settings are correct. Changes may be needed when transitioning from winter heating to summer heating (domestic water heating). The amount of draft will change from one season to the next. It is not uncommon to add a draft inducer in warmer seasons to maintain the recommended -.04 to -.07 inches of water column.

Barometric Damper

Combustion Air (Make Up Air)

The airflow through the system and out the chimney means that oxygen is leaving the home and will create an oxygen deficit if this air is not replaced. Adequate combustion air is critical for the performance of your heater. There is usually sufficient leakage in older homes to provide for this, but in well-insulated homes it may be necessary to provide additional outside air into the home.

Combustion air can be provided with a duct to the outside. A louvered vent can also be used.

Masonry Chimneys

If you plan on using a preexisting masonry chimney, have it thoroughly inspected and cleaned. Any faults which make the chimney unsafe and unusable must be repaired prior to use. These can include improper height, structural defects, blockages, inadequate clearance to combustibles, unsealed openings into other rooms of the house, signs of creosote or smoke leakage, a loose or absent clean-out door, or absence of a liner.

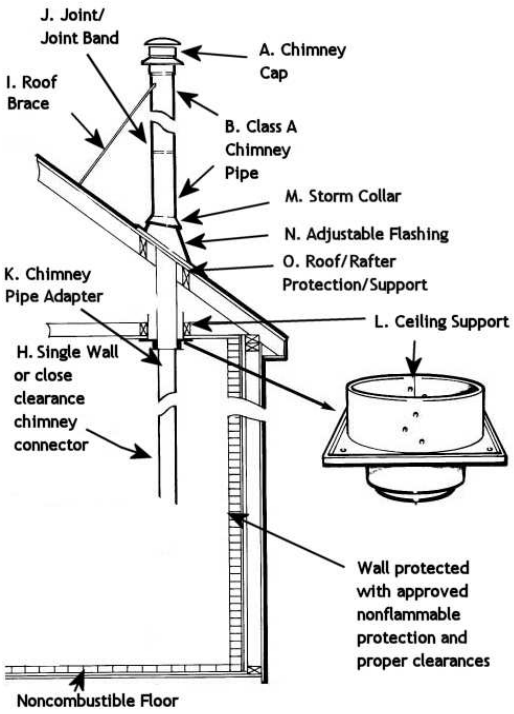
When connecting to a masonry chimney, several provisions are standard. First, whether the chimney connector is vented to the chimney through a thimble or a breech pipe, neither must pass beyond the inner surface of the chimney liner, and both must be firmly cemented in place with refractory cement. (A thimble is a masonry pipe which is inserted through the chimney wall, and is frequently the preferred method; a breech pipe is a piece of steel pipe used the same way.) In Canada, a breech pipe has ridges or protrusions to lock it firmly into the refractory cement. In either case, the chimney connector vents to the chimney through the thimble or breech pipe. See wall pass-through information in the section on stove pipe.

Prefabricated Chimneys

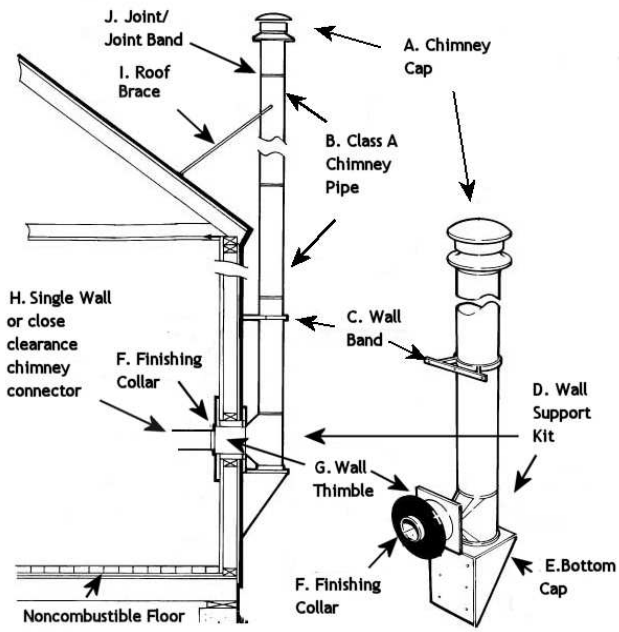
When venting your boiler using a prefabricated chimney, be sure to contact local building code authorities, and to follow the manufacturer's instructions exactly. Use only the manufacturer's parts; do not use makeshift installation techniques. All prefabricated chimneys must be tested to either the U.S. or Canadian high-temperature standards, UL 103 or ULC-629.

Your manufactured chimney may contain more parts than is shown in the subsequent diagrams. Include all required items in your installation. A chimney cap (A) serves to keep rain and snow from entering the chimney. An approved Class A chimney (B) is required for the Multi-Fuel boilers. Wall Bands (C) must be deployed for support per manufacturer's recommendations. A manufacturer's Wall Support Kit (D) will contain required items for supporting the chimney. Such kits will cost less than individual items purchased separately. A Bottom Cap (E, location marked, but actual cap not shown) allows for cleaning. A Finishing Collar (F) provides inside wall protection. A Wall Thimble (G) provides for required clearance between the chimney pipe passing through a flammable wall. The Chimney Connector (H) must be approved single wall, or an approved low clearance pipe, installed with required clearances in place. A Roof Brace (I) is required for chimneys that extend more than a certain distance, as referenced by the manufacturer's instructions, from the roof. Manufactured chimneys may feature a built in "twist lock" at each joint, but a Joint Band (J) is still normally required to secure pipe at the joint. An approved Chimney Pipe Adapter (K) is required. A Ceiling Support (L) will provide structural support for the chimney and is typically part of a kit that includes items that maintain required clearances to flammables. A Storm Collar (M), and Adjustable Flashing (N) prevent water from entering the home by running down the outside of the chimney. Additional items or a kit (O) provide additional mounting support or fire protection to the roof joists or other roof components.

Inside Chimney



Outside Chimney



COMMON CHIMNEY PROBLEMS

In order to have a properly operating heating system, the chimney needs to be capable of providing sufficient draft. To measure the draft, drill a hole in the connector pipe and attach a draft meter or manometer. First, check the draft above the barometric damper (if installed). Then check it below the barometric damper and make your damper adjustment to where it opens to prevent the draft from going higher than -.08 inches of water column. If the chimney is incapable of supplying the required draft, it will need to be improved. The approach to improving draft in an existing chimney may include one or more of the following: raising chimney height, adding or changing the flue liner, or selecting a different style of cap to be placed on the top of the chimney. Reasons for insufficient draft include (but are not limited to) the following:

1. Leaking chimney - Air leaking in around a loose fitting cleanout door, joints or seams in connector pipe are not secured properly, cracks or other defects in masonry.
2. Chimney needs to be cleaned.

Note: Chimneys need regular maintenance and cleaning. If a chimney is not cleaned on a frequent basis, it will affect draft, as well as be a contributing factor to a potential chimney fire.

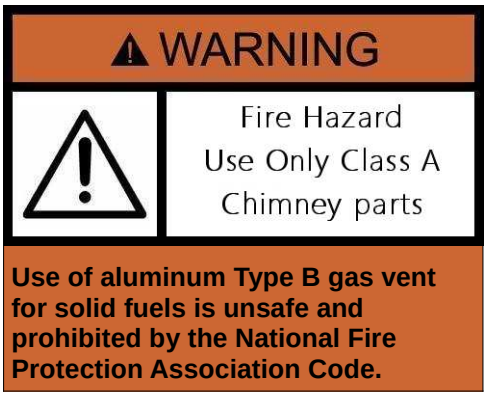
3. Improper chimney height - Chimney does not extend to a sufficient height above the roof line. (Remember the 3 ft.-2 ft.-10 ft. rule)
4. Obstructions in the chimney - Make sure the chimney has been cleaned. Different animals have been known to build nests in chimneys.
5. Trees or other topographical barriers - Trees that are taller than the house can cause the air currents to flow downward over the peak of the roof. This would lead to a down draft effect on the chimney. This can also be caused by adjacent buildings or structures. It could even be from a different peak on the same structure.
6. Improperly sized flue - Too small of a chimney is incapable of moving the volume of air necessary. Too large of a flue could have trouble warming up to create the necessary upward flow.
7. Chimney offsets - Offset chimneys should be avoided if possible. Not only can the offset

affect draft, it is also a place for debris to collect over time.

8. Too many elbows - The flue connector has more than two elbows in it. Sometimes, depending on overall chimney performance, one elbow could be too many.
9. Vent sharing - No more than one heating appliance shall vent into a single flue.

If smoke is observed puffing out of the stove or connecting pipe, it is likely that there is an issue with draft. Review the above list for potential causes.

PROPER CHIMNEY CONNECTION



The boiler must be connected to a Class A chimney. Use of aluminum Type B gas vent for solid fuels is unsafe and prohibited by the National Fire Protection Association Code. There are three types of Class A chimneys:

1. Masonry with a tile liner, including brick, block, stone, etc. It must be supported by a ground-level foundation.

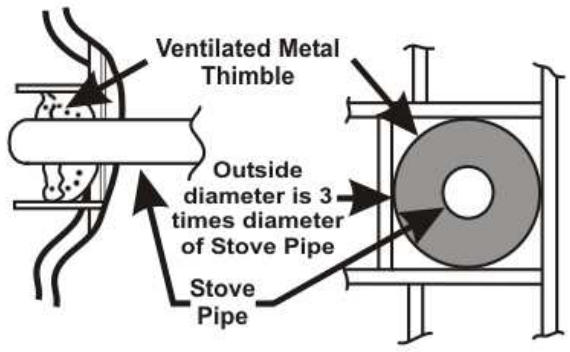
2. Insulated “Class A” manufactured chimney, listed and certified by a national test agency.

3. Triple-walled metal “Class A” chimney, listed and certified by a national test agency.

If your masonry chimney has not been used for some time, have it inspected by a qualified person (building inspector, fire department personnel, etc.). If a listed and certified manufactured chimney is to be used, make certain it is installed in accordance with the manufacturers instructions and all local codes. Use only the manufacturer's parts, and use all parts required in order to follow the manufacturer's guidelines. Do not use makeshift installation techniques. A Multi-Fuel boiler can perform only as well as its venting system allows it to.

It is recommended that overall flue connecting pipe length be kept to a minimum. Any horizontal runs must slope upward towards the chimney, with a minimum rise of 1/4 inch per foot. Use a minimum number of elbows, preferably no more than two, to make the chimney connection.

Particular attention should be paid to the point where a flue passes through a wall or ceiling. The pass-thru should always be made with insulated pipe and the proper accessories, or include the use of a thimble surrounded by masonry that provides a diameter of not less than three times the diameter of the stovepipe. You must consult local codes for your application. If the chimney must go through a combustible wall, be sure to use a metal thimble specially designed for this purpose. The proper way to install a thimble is to cut an oversize hole in the sheetrock about 6 or 7 inches larger than the thimble. However, be sure to follow the manufacturer’s directions that come with the thimble. A metal ring shield is used to cover the hole. This way air can circulate and cool the area around the passageway.



Stove pipe passing through wall

STOVEPIPE

Use 24 gauge or heavier single wall stove pipe in open areas no closer than 18 inches from walls or ceiling. If the stovepipe must be closer than 18 inches from the nearest wall or ceiling, or if it must go through walls, closets, or boxed in areas, then UL listed insulated stovepipe must be used. Pipe that runs along the outside walls of a building must also be UL listed insulated pipe, even if it runs along a non-combustible outside wall. This requirement is in place in order to prevent cooling of the stovepipe which in turn cools the rising smoke and causes creosote to form quickly. The diameter of stovepipe must be at least 8 inches.

⚠ CAUTION

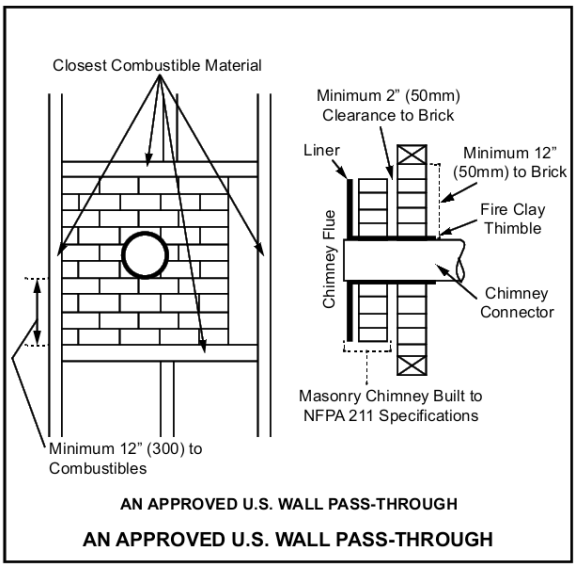
SUFFOCATION HAZARD

Manual Dampers must not be installed in the flue pipe. Improper operation could result in death.

Note: Do not decrease the diameter of chimney pipe to less than that of the flue collar! Chimney connector and flue must be 8 inches in diameter or greater.

Wall Pass-Through: United States

In the U.S., the national code is NFPA 211. While many localities adopt this standard, be sure to check with local authorities before beginning your installation. The NFPA (National Fire Protection Association) permits four methods for passing through a combustible wall. A commonly used method to pass through a wall directly to a masonry chimney is to clear a minimum 12"(300 mm) around the entire chimney connector, and fill it with brick masonry which is at least 3.5"(90 mm) thick. A fireclay liner, minimum 3/8" (9 mm) wall thickness must run through the brick wall to the chimney liner (but not beyond the inner surface of the liner). It must be cemented in place with refractory cement. This method is illustrated. For details on the other three options, refer to the most recent edition of the NFPA 211 code.

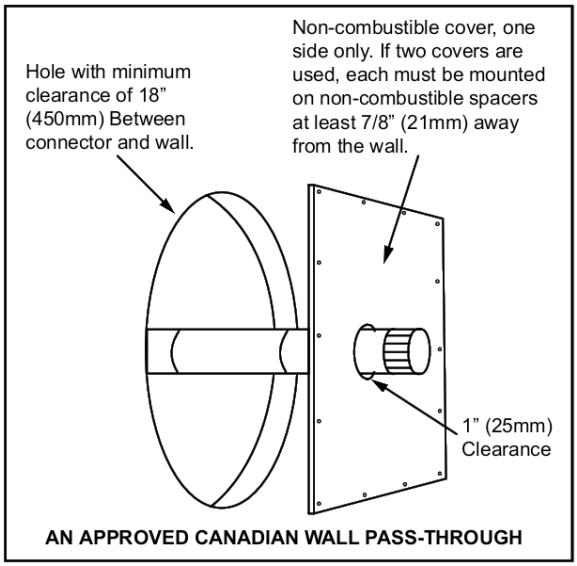


AN APPROVED U.S. WALL PASS-THROUGH

U.S. Wall Pass-Through

Wall Pass-Through: Canada

Three methods are approved by the Canadian Standards Association. The diagram following this paragraph shows one method requiring an 18" (450mm) air space between the connector and the wall. It allows use of one or two covers as described in the diagram. The two other methods are described in detail in the current issue of CAN/CSA B365, the national standard.



Canadian Wall Pass-Through

IN CASE OF CHIMNEY FIRE

1. Be sure everyone is out of the house.
2. Call the fire department. (In the event the fire is out before they get there, you will want them to inspect the structure and make sure there is no latent damage or hazard.)
3. Shut the boiler down by turning the main power off.
4. If you have a chimney fire, use a chemical flare type fire extinguisher. If you don't have an extinguisher, go to step 4.
5. Using a water hose, wet down the area of the roof surrounding the chimney. Do not wet the chimney itself or try to put water down the flue as it will very likely damage the flue tiles.
6. Contact a chimney professional to inspect your chimney for damages.

IN CASE OF RUNAWAY FIRE

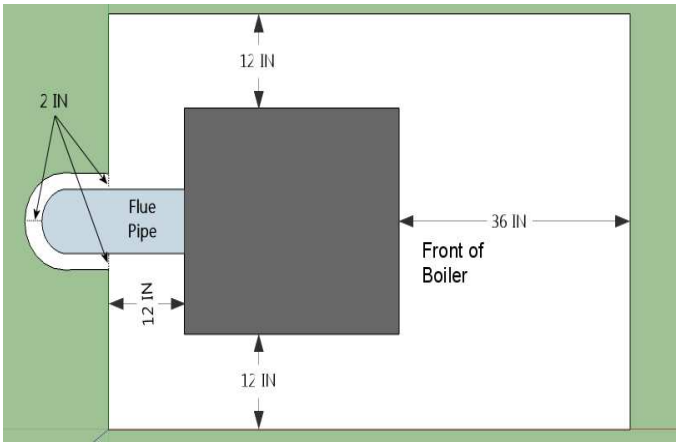
1. Shut the boiler down by disconnecting power.
2. Be sure the draft inducer is off and/or make sure the barometric damper opens. (Excessive draft can cause a runaway fire.)
3. Maintain continued circulation of boiler water to remove heat from the boiler and if boiler is equipped with a domestic coil run hot water.

COMBUSTION AIR SUPPLY

It is important to make provision for adequate supply of combustion air, either natural infiltration through a door or window or by ducting outside air into the boiler room. Newer, tightly constructed homes can present special challenges regarding combustion air (also referred to as "make up air".

BOILER LOCATION

Wood & Coal Burning Boilers are designed to radiate as much heat as possible, but this heat can be dangerous if the boiler is improperly installed. The boiler must stand on a noncombustible material such as brick, stone tile or concrete. The floor needs to be flat and must be able to support the boiler's weight, the weight of the fluid in the system, plus the weight of piping and other attachments. NEVER place a boiler directly on a wood floor. If a noncombustible material is used under the boiler to protect a combustible floor, than this material must extend at least 12 inches beyond the base of the boiler in the rear and on the sides and at least 36 inches in front. Floor protection must also extend 2 inches beyond flue connecting pipe also. See the floor protection diagram below for installation guidelines.



Floor Protection Diagram

The boiler must be installed in an area dedicated to the boiler and its related equipment. This area must be partitioned or separated from any living area of a residence. The room must have a constant fresh air supply to assure proper combustion of the fuel as well as ventilation of any by-products of combustion.

Boiler Room Requirements

- ✓ The room should be well lighted and should have a source of emergency light.
- ✓ A convenient water supply should be available for boiler flushing and to clean the boiler room floor.
- ✓ Unobstructed floor drains need to be available.
- ✓ Must have adequate air supply, which must be kept clear at all times. Since the combustion process requires a supply of air at all times, it is essential that provisions are made to supply adequate air to the boiler room. This air supply is necessary to insure complete combustion and venting of any gases or smoke that would be emitted from this solid fuel burning boiler in case the boiler malfunctions.
- ✓ Electrical disconnect at point of entrance to boiler room.
- ✓ Walls and ceiling must be of fire rated construction. Consult local or state codes for requirements.

RIGGING AND POSITIONING OF BOILER

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

Once on the floor level where it will be installed the unit may be rolled on pipe or may be moved by means of a pallet jack. The boiler must be placed on a concrete slab or other rigid pad of non-combustible material with sufficient strength to adequately support the boiler including its contents of water. The boiler should be positioned as closely as possible to the chimney. The smoke pipe must pitch continually upward toward the chimney and be as straight as possible. Level the boiler after it has been positioned.

Before proceeding with installation, inquire with local building officials to ensure that all building, plumbing and electrical codes will be complied with. It is required that a qualified technician experienced in boiler installations install this unit. Wiring on the boiler must be properly grounded.

⚠ WARNING

BUILDING CODE COMPLIANCE

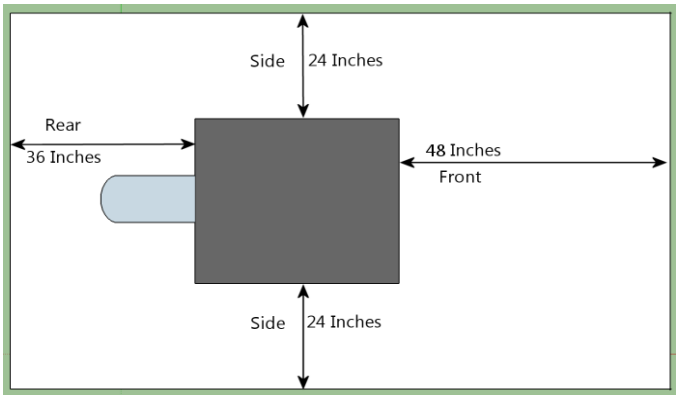
The installation of this unit must comply with state and local requirements and must be inspected by the state or local building inspector where required.

NOTE: This unit is not approved nor is it recommended for use in mobile homes.

Clearances Required for Safety and Operation

It is important to provide sufficient clearance around the boiler for convenient servicing and cleanout. The required minimums as measured from the boiler vessel are shown below:

Front:	48 Inches
Right:	24 Inches
Rear:	36 Inches
Left:	24 Inches



Boiler Clearances

Refer to Appendix B: Specifications for exterior dimensions of the various models. For commercial and residential installations most boiler codes require a minimum of 3 feet of clearance on all sides.

BOILER DUMP ZONE APPLICATIONS

Unlike oil or gas fired boilers, solid fuel boilers will still produce some additional heat after the call for heat has ended. This will cause the boiler temperature to rise if no zones are calling for heat. It is possible to see temperature rise 30° F or more under a low or no load condition. This will take place until the boiler's radiation losses match the heat gain. It is recommended that a dump zone be connected to dissipate this excess heat to one or more zones in the system. Setting the operating limit no higher than 180° F allows for the heat rise to occur without exceeding the recommended maximum temperatures.

The dump zone aquastat can be used to activate a zone valve or circulator as a dry contact switch. A common setting for dump zone actuation would be 200° F, with the high limit set point adjusted to 10° F lower. When this high limit is exceeded, and temperature continues to rise until it reaches the dump zone limit, one or more zones will be energized and heat distributed until temperatures fall sufficiently.

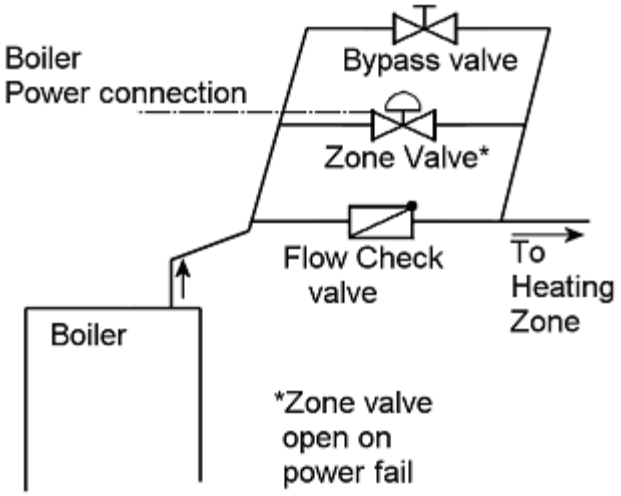
If the dump zone is connected to provide heat to a domestic hot water tank or heat exchanger, a mixing valve must be installed on the potable system supply to prevent an unsafe condition of overheating the domestic hot water. The mixing valve outlet should be set no higher than 125° F for potable use.

Non Powered Dump Zone

A non powered dump zone is often required to meet code requirements. This provides a way to dump boiler heat in the event that power loss occurs. This hot-water circulation loop shall be able to dissipate at least 10% of the estimated rated heat output of the solid-fuel boiler when circulation is reduced because of an electrical power failure. The loop can only be made inoperative by a deliberate manual action. The design parameters for sizing shall be a pipe size equal to or greater than 3/4 inch

(18 mm), room temperature of 65°F (18°C), and mean water temperature of 180°F (82°C).

The loop shall be positioned above the boiler, with features that promote natural thermal circulation of the water. The piping must be such that excessive pressure will not develop in any portion of the boiler or system. Larger diameters may be needed as boiler size increases. The accompanying figure below shows an application example of how this is accomplished. This arrangement will allow a gravity flow of heat release in the event of a power failure.



Non-Powered Dump Zone

⚠ WARNING

EXPLOSION HAZARD

The temperature of the dump zone aquastat should be set no higher than 200° for the aquastat to work effectively. Setting the temperature higher than this can allow the water to boil before the circulator has time to move the hot water away from the boiler.

DOMESTIC HOT WATER FROM YOUR BOILER: DOMESTIC COIL OPTION

⚠ CAUTION

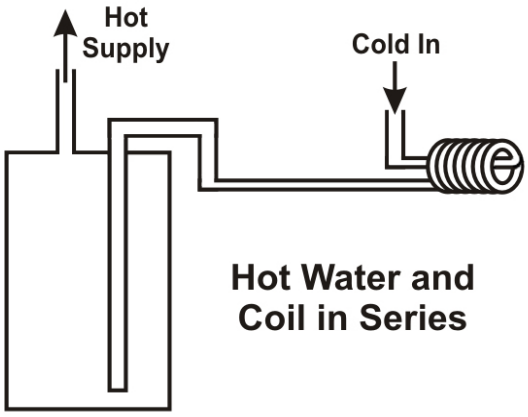
BURN HAZARD

A tempering valve should be installed in the hot water supply line to reduce the temperature of the hot water to a safe level.

This option is used in the Alternate Heating Systems Multi-Fuel boiler to supply hot water for domestic home use. With this option in place, your boiler can provide large amounts of hot water heated by low cost solid fuel. These coils operate on the principle of heating water as it passes through fine copper tubing immersed in the boiler water, instead of a separate tank. The AHS coil is rated to produce 5 gallons per minute when the temperature of the water in the boiler is at 200° Fahrenheit.

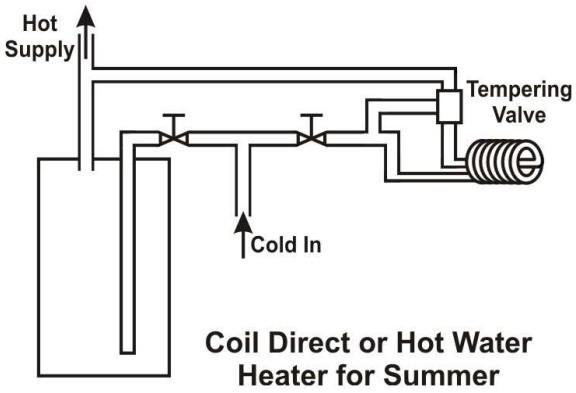
A tempering valve should be installed in the hot water supply line to reduce the temperature of the hot water coming from the domestic coil to a safe level. The tempering valve may be obtained from your Alternate Heating Systems dealer, local plumber or plumbing supply. This will also ensure a constant water temperature at the tap. If hot water is supplied to an automatic dishwasher, a line can be run directly to this appliance ahead of the tempering valve. Be sure to check maximum water temperature capability of the dishwasher before installing water-feed lines to a dishwasher in this manner.

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



Plumbing – Coil in Series

A second method of plumbing the domestic coil is to connect the coil in parallel with an existing water heater so that the conventional water heater may be used when the Coal Gun™ is not being fired (for example in the summer). The diagram that follows indicates how this can be done.

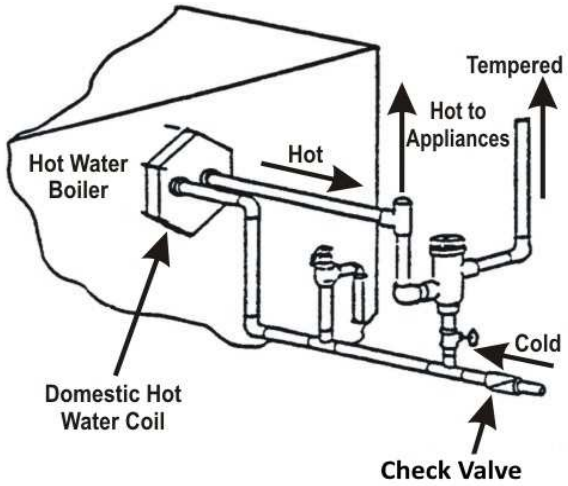


Plumbing – Coil in Parallel

⚠ CAUTION

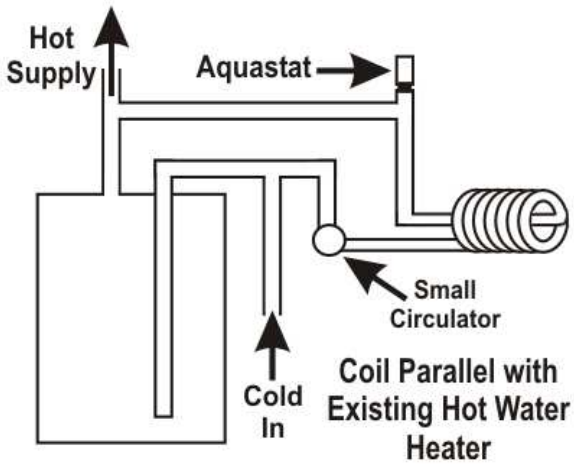
SCALD
HAZARD

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



Tempering valve

The third method of plumbing the domestic coil uses a small pump to circulate water continuously between the coil and existing hot water heater. It is also necessary to include a tempering valve or temperature controller on the supply side of the storage tank/water heater to prevent super-heated water from reaching the domestic hot water tank and, ultimately, the faucets.

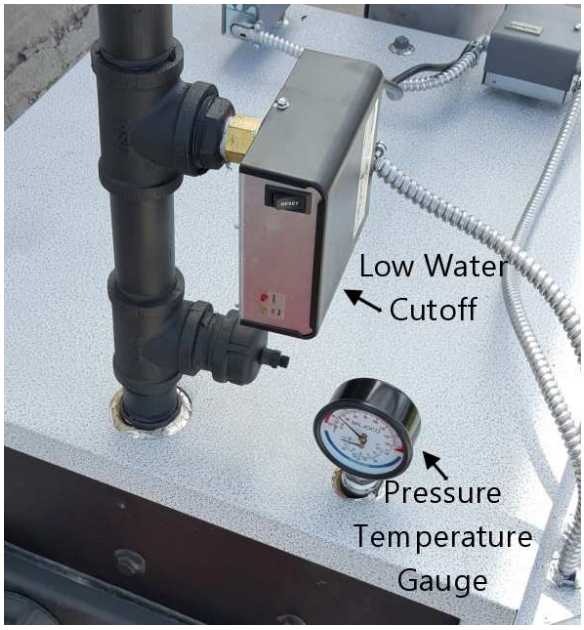


Plumbing – Coil with circulator

LOW WATER CUTOFF UTILIZATION

A low water cutoff is required to prevent the boiler from actively firing under a low water condition. If water is lost from the boiler vessel or distribution system, such that heat cannot be distributed from the boiler, the low water cutoff will shut off power to the draft control or forced draft fan, preventing the boiler from actively firing. The

low water cutoff is to be installed in a Tee on the supply riser 6 – 12 inches above the boiler, as shown in the following photo of the top of an SF170 boiler.



Low Water Cutoff
Pressure Temperature Gauge

Low Water Cutoff Testing

After installing the unit operate the system. Carefully observe the operation of all components through at least one complete cycle. Be sure to include a check to the high limit switch operation (shuts down at 200) and the operating limit switch operation(shuts down at 180). Make any corrections needed then repeat the checkout. Repeat until system operates properly.

Low Water Cutoff Troubleshooting

If the boiler does not shut down when the water drops below the probe:

1. Remove power immediately and re-check wiring.

2. Remove power and check for adequate clearance from the probe to any surface within the boiler or tee. IF THE BOILER DOES NOT FIRE

(A) Make sure water is at probe and probe lead wire is properly secured to the terminal.

(B) Check for proper ground between probe and boiler shell. Excessive use of Teflon tape or sealing compound may insulate the probe from the boiler shell.

3. Re-check wiring and test for correct incoming voltage. IF THE RED LED LAMP IS ON The red LED lamp indicates that the control is locked-out. This feature will activate if the boiler experiences a low water condition exceeding 30 seconds in duration. IMPORTANT: Do not reset control until the cause of the low water condition is corrected. CAUTION: Do not add water until boiler is cool.

Low Water Cutoff Offline Testing

If you suspect that a temperature control device (aquastat) is not working properly. The component can be pulled from the system to be checked. Place the capillary in a container of water that can be safely heated to within the temperature range of the device (150-180F). Use a thermometer that has a temperature range well above the temperature you will heat the water to. Make note of the temperature that the device is set to. Heat the water up above the devices set point and listen for an audible click from the device letting you know that the contacts have changed state. If the temperature at which the device changes state is within 10° F of the reading on the thermometer then device is working properly. If the temperature at which the device changes state and the reading on the thermometer is more than 10° F different then the device should be replaced with a new one. It is not advisable to service these devices.

Low Water Cutoff Maintenance

To ensure optimum performance, inspect probe annually. Clean any scale or build-up from the probe using a scouring pad or steel wool. Re-install the probe and test.

Aquastats: High Limit

The high limit aquastat functions as a safety in the event that the operate limit aquastat fails to turn off draft actuation at the proper temperature. Aquastats can fail to operate at the correct temperature, due to wandering from their original calibration, or fail outright, by not opening or

closing the contained switch at all. Checking the high limit aquastat would involve bypassing the operate limit until temperature rises to the setting on the high limit. If the high limit aquastat fails to open its internal switch, defined by the draft actuator or force draft fan continuing to provide draft, or by persistence of continuity when tested a multimeter, it should be replaced. The high limit aquastat is installed in one of two fittings on the top of the boiler, near the back.

Auastat: Operating Limit

The operate limit aquastat is normally closed, and opens on temperature rise. It will either have a fixed or adjustable differential, to allow for a proper length of cycle for optimum firing. The factory setting will be about 180° F. The boiler will quit firing once the set temperature has been reach. When the temperature falls to the number of degrees below 180° determined by differential, the boiler will resume active firing mode. Testing is best done with a multimeter, testing either for continuity/lack of continuity under the expected conditions, or testing for presence or absence of current across the internal switch. If the aquastat does not function at the correct temperature, based on a reference thermometer or the temperature gauge on the boiler, it should be replaced.

Forced Draft Motor/Draft Actuator

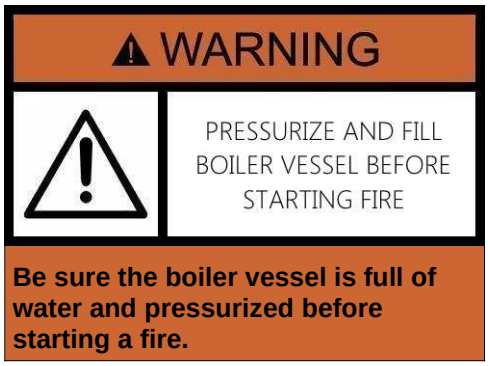
Both the forced draft fan motor, and the motor that opens the draft actuator are self contained, thermally protected motors. They are typically replaced, and not repaired when they fail to function. When their function is expected, test for the presence of current in the leads supplying power. If power is not being provided, use the wiring diagram to further troubleshoot why power is absent from the circuit. If power is present, but the forced draft fan motor, or draft actuator, is not functioning replace the affected component.

Samson Controller

Your Multi-Fuel boiler may optionally include the Samson thermomechanical draft control. This controller requires no electricity to operate. It is ideal for off grid and other minimum power configurations. It is highly recommended that this controller be used along with another aquastat for a dump zone control and that a gravity powered loop be available as well. For off grid systems, the entire heating loop can be a gravity powered, single zone system.

Operation and Maintenance

Legacy Stoves coal boilers are designed for burning coal with maximum efficiency and convenience in hand-fired boilers.



WOOD VS COAL

Note: Your Multi-Fuel boiler is only approved for coal. EPA regulations prohibit the use of these models for wood burning. You must use an EPA approved appliance for burning wood.

The Multi-Fuel boiler will heat safely and effectively when fired with wood, but DOES NOT meet EPA emissions regulations for wood burning. The amount of wood that can be safely loaded is determined by the firebox dimensions. Wood should be loaded length-wise from front to back, and not in quantities likely to lead to wood pieces falling out the load door.

The conditions required for burning the two fuels efficiently are considerably different. With coal the combustion air must be drawn up through the bed of coal, whereas with wood the air should enter through the draft control mounted on the door and the live coals should be held in the center of the fire to maintain a higher temperature for most efficient combustion. Alternate Heating Systems Multi-Fuel 70 and 100 series' boiler's, and 40 and 55 series built before April 15, 2016, feature a grate system with a unique rotary design. This Rolla-Grate system allows the air opening size to be increased from a nearly solid bottom to a very large exposed area, appropriate to the fuel being used. Cast iron grates are used in 40 and 55 series Multi-Fuel boilers built after April 15, 2016.

Wood is only to be used for start-up to prepare the boiler for starting a coal fire.

STARTING A FIRE

Starting a Wood Fire

Place seven or eight sheets of crumpled newspaper or similarly suitable paper onto the top of the grates. Next, lay in some small kindling wood (approximately 3/4" or less) on top of the newspaper. Layer the kindling in a cross-cross fashion to allow for maximum air flow through the material. Light the paper nearest the center of the door opening. Once the paper is lit, you may partly close the door, leaving it slightly ajar to provide extra combustion air. Add a few small pieces of firewood when the kindling is burning well. You may elect to leave the door slightly ajar until the larger pieces of wood start to flame. Then as the fire becomes well established and boiler water temperature rises toward normal operating temperature, close the load door with the boiler main switch on. The forced draft fan will then provide combustion air to the fire. The boiler operate aquastat can then maintain the fire based on heating system demand. When a bed of burning charcoal is in place, your boiler is ready for starting a coal fire.

Starting a Coal Fire

Note: If your heating system has been satisfied and there is no call for heat and the forced draft fan has powered down, find a way to create a call for heat in the system. This is necessary so that the forced draft fan feeds air to the coal fire. You will not successfully ignite the coal, and you are likely to put the fire out if the forced draft fan is not running when you attempt to switch the fire to burning coal.

To start a coal fire, first start the fire with wood as previously described. Once the wood fire is well established, and a bed of burning charcoal is forming in the bottom of the firebox, add a layer of coal to the fire. Only add a shallow depth (approximately two inches) of coal at first. Make sure air is actively feeding the fire from underneath. As signs of coal ignition appear, consisting mainly of evidence of flame, an additional layer of coal may be added. Layers can be added until the bed is about 10 inches deep, as long as you do not add too much coal at once.

Coal types

Alternate Heating Systems Coal-Wood Boilers operate best when a good grade of hard coal is burned since it has a high output of energy and low ash and sulfur content. Either “stove” or “nut” size should be used. The larger size of these two produces the hottest fire because it allows freer movement of air through the burning mass. However “nut” size hard coal will burn longer at a more even rate and a mixture of the two sizes may prove to be the most ideal.

Good grades of soft coal can be burned in the Alternate Heating Systems Coal-Wood Boilers provided the ash and sulfur content is low enough. Soft coals generally produce considerably more ash than do hard coals and also tend to “clinker” (or fuse together) producing lumps of ash residue that can be hard to remove through the grates. In severe cases, when they cannot be broken up to the point that they will drop through the grates, they may need to be removed through the load door. Be sure to wear gloves and use tongs, and to have a suitable ash container with a lid to put them in. You may choose to let the fire go out before removal, but the clinkers will still take considerable time to cool.

When adding coal to the fire it is important not to smother the fire, preventing a free flow of combustion air though the burning fuel. When adding new coal to the fire, coal with a higher percentage of volatiles, especially true of soft coal, will require more top air-flow. This can be accommodated using the manual controls on the load door. Part of the way through a burn cycle, the volatiles will have been burnt off, and the manual draft controls can be adjusted to allow less air across the top of the fire.

Note: Once the fire has faded, it is easy to smother it by adding too much coal too fast, or to lose the fire by shaking the grates. Only shake the grates when the fire is well established.

Maintaining a Coal Fire

The coal in an operating coal boiler needs to have some depth of unburned coal in order to maintain a

fire. If you are new to burning coal, you may underestimate this required depth. In addition, since the fire burns from underneath, instead of on top as for wood, it can be challenging to estimate the depth of unburned coal that is in the firebox. If the fire has begun to fade and weaken in vigor, do NOT shake the grates. Add only a small amount of coal at first, and provide abundant air from underneath in order to help it recover. Once the fire recovers, you may then shake the grates and/or add more coal. If you lose the fire, it is likely that the grates were shaken too much too soon, or too much coal was added to a lazy fire.

If the fire has gone out, shake the grates to remove most (but not all) of the ash. When you start to see tiny pieces of black coal dropping into the ash pan, stop shaking. You can then build a wood fire right on top of the coal that remains, and start the process over again.

OTHER GENERAL OPERATING GUIDELINES

Be sure children are advised of the danger of boilers, and keep them away from the boiler. Always keep clothing like boots, shoes, mittens, hats and coats at least 3 feet away from the stove. Never let unsupervised children operate a boiler. Always wear gloves when managing the boiler, whether opening doors, adding fuel or removing ash.

Keep kindling wood and logs at least 3 feet away from the boiler.

NEVER use any liquid fire starter or highly flammable substance to light your boiler. **ALWAYS** instruct small children to stay away from the boiler while you are lighting it.

ALWAYS check for combustible materials around your stove before leaving the house or going to bed at night and remove immediately.

DO NOT BURN GREEN WOOD in your boiler. You will be wasting fuel and increasing the danger of a chimney fire due to large amounts of creosote produced by green wood. You can get as much as 40% more heat from a log simply by letting it dry out. Season the wood at least six months or longer before burning.

The best type of fuel for your Alternate Heating Systems Multi-fuel boiler is Anthracite coal. Among wood species, hickory, oak and locust are great for establishing a bed of charcoal that burns with lots of energy contribution for starting a coal fire. It takes nearly twice as much pine wood to equal the amount of heat produced by oak or hickory, and softwood such as pine will produce considerably more creosote.

If you regularly start new fires with wood, it is advisable to burn your stove hot for at least ½ to ¾ of an hour each day to help limit the buildup of creosote in the stovepipe. Burning coal, the fuel intended to be used in the Multi-Fuel boiler is your best option. Exhaust produced by burning Anthracite coal will chemically react with creosote and loosen it from the chimney liner and flue connecting pipe. You can then easily remove this material from the pipe and the chimney cleanout. If you have a metal chimney, tap it from time to time and listen for a loose rattling. If audible, this sound indicates that creosote is building up.

CO55 WITH OIL AUTO SWITCHOVER

Coal/Solid Fuel - This position will keep the boiler in coal mode operation only. The oil Burner will never run in this setting.

AUTO - If the boiler operating temperature is achieved in wood mode, turn mode switch to **AUTO**, and then turn **MAIN** switch off and back on to set this operation. The boiler will remain in the **SOLID FUEL** mode of operation until the water temperature falls to the switchover set point (usually 160°). At this point, the boiler will switch to **OIL** mode automatically and remain in **OIL** mode until the switch is turned back to **SOLID FUEL**.

Operating Sequence for Auto Mode

- In wood mode – bring boiler to operating temp 180°– 190°
- Turn MODE switch to AUTO
- Turn MAIN switch off then on
- Boiler is set for Auto switchover

OIL - This position is for oil burner operation only.

CONDITIONING OF BOILER WATER

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

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

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

Ph

The Ph value of your boiler water is a number between zero and fourteen. Values below seven are acidic while values above seven are basic.

The Ph factor is the most important factor influencing scale forming or the corrosive tendencies of boiler water. It should be adjusted to between a minimum of 10.5 and a maximum of 11.0 to prevent acidic corrosion of boiler tubes and plates and to provide for the precipitation of scale forming salts.

Below a Ph of 5.0 the water is acidic enough to dissolve the steel boiler plates. Under these conditions the steel gradually becomes thinner and thinner until it is destroyed. At a Ph between 5 and 9.4 pitting of steel plates will occur at a rate dependent upon the amount of dissolved oxygen in the boiler.

Dissolved Oxygen

Aeration of city water supply is frequently used to remove other noxious gasses, however, efficient aeration results in saturation of the water with oxygen. The majority of corrosion problems are directly related to the quantity of dissolved oxygen in the boiler water. Elimination of the corrosive effect of dissolved oxygen can be accomplished either directly or chemically.

Direct or mechanical removal of dissolved oxygen is done through the use of a de-aerator. Chemical de-aeration is done through the introduction of specific chemicals in the boiler to react with the oxygen. The dissolved oxygen content should be maintained at a minimum but at no time should it exceed 0.007 mg/l.

SULFITES

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

SOLIDS

Solids can be broken up into two categories of both suspended and dissolved. Suspended solids are those that can be removed by filtration while dissolved solids are in solution with the water.

The best test for the determination of the solids content of the boiler water is through a conductance test. The conductance value of boiler water varies by the various ionized salts present. The conductance can be used to measure the total dissolved solids in the boiler water and to serve as an accurate means for the control of solids through the use of blow down.

Another test that is sometimes used as a measure of solids is to measure the chloride present in the boiler water. The ratio of chlorides in the boiler water to that of the feed water can be used as a means to determine the amount of blow down required. The chloride test is unsuitable for feed water with low incoming concentrations, and the concentrations in the feed water must be averaged over time for accuracy.

High boiler solids will lead to foaming, priming, surging, and carry over. These conditions may only be overcome by proper daily blow down of the boiler.

ALKALINITY

The alkalinity of boiler water should be sufficiently high enough to protect shell and plates against acidic corrosion, but not so high as to produce carryover. A minimum value for alkalinity for adequate protection is 200 ppm.

High boiler alkalinity (in excess of 700 ppm) should be avoided. Values higher than this can cause the steel to become brittle.

PHOSPHATES

Phosphates are used to react with calcium hardness in the boiler water. In order for this reaction to take place it is important to maintain a Ph at a minimum value of 9.50. It is desirable to keep the concentration of phosphates in the water to 30-50 ppm to enable the complete reaction of the phosphates with the calcium hardness entering the boiler through the feed water.

HARDNESS

The hardness of water is caused by calcium and magnesium ions. Water hardness will vary greatly throughout the country depending on the source of the water.

In boilers hard water can cause the formation of scale and sludge or mud. The hardness must be removed in the makeup water to the return system. Total hardness should not exceed 50 ppm.

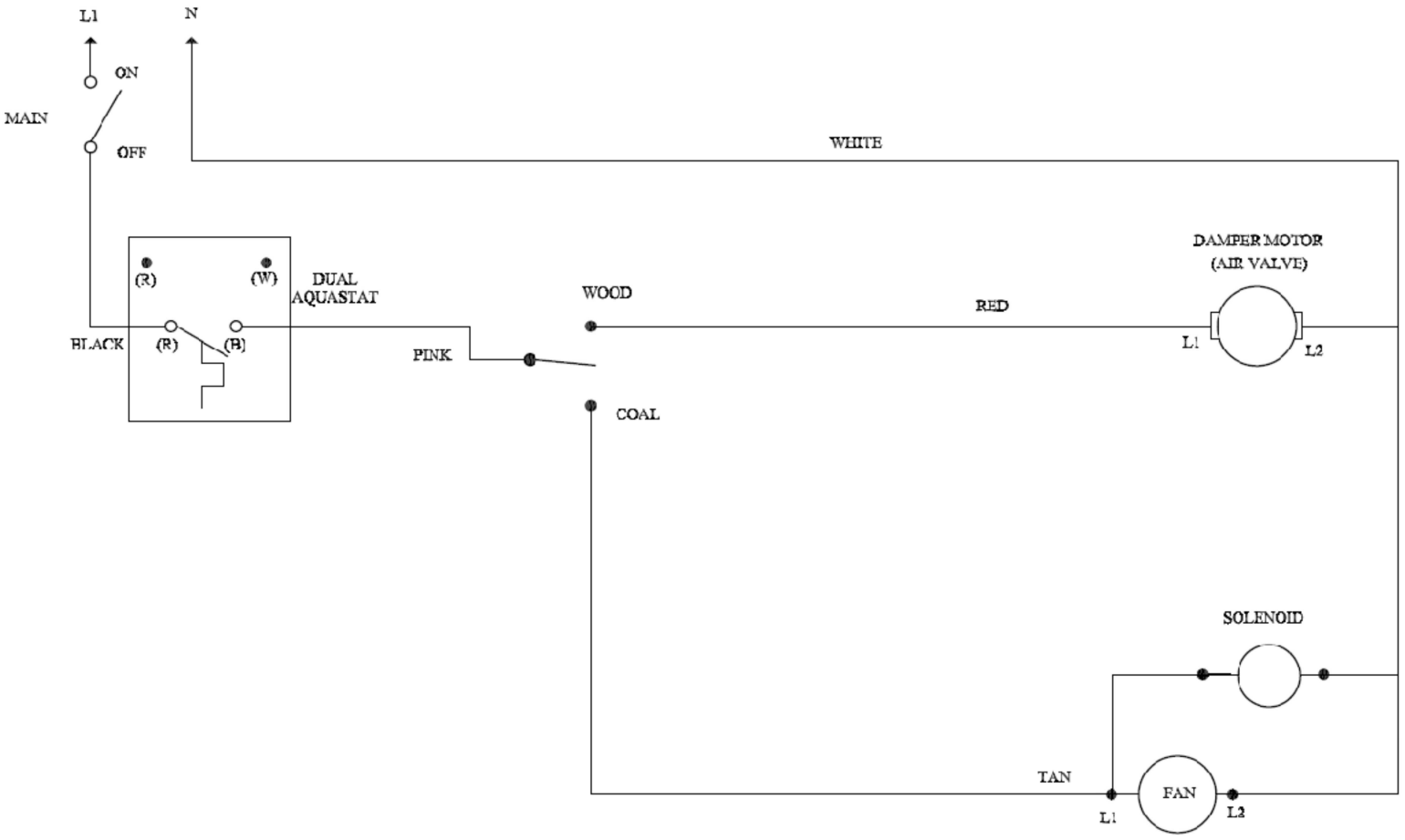
OILS

Every effort should be made to prevent oils from getting into the boiler water. Oil causes foaming or combines with suspended solids to form a sludge, which can cause the overheating of boiler plates. If oil does get into the boiler, the boiler should immediately be taken out of service and thoroughly cleaned.

Appendix A: Wiring Diagrams

MULTI-FUEL BOILERS WITH DAMPER MOTOR AND FAN ELECTRICAL SCHEMATIC

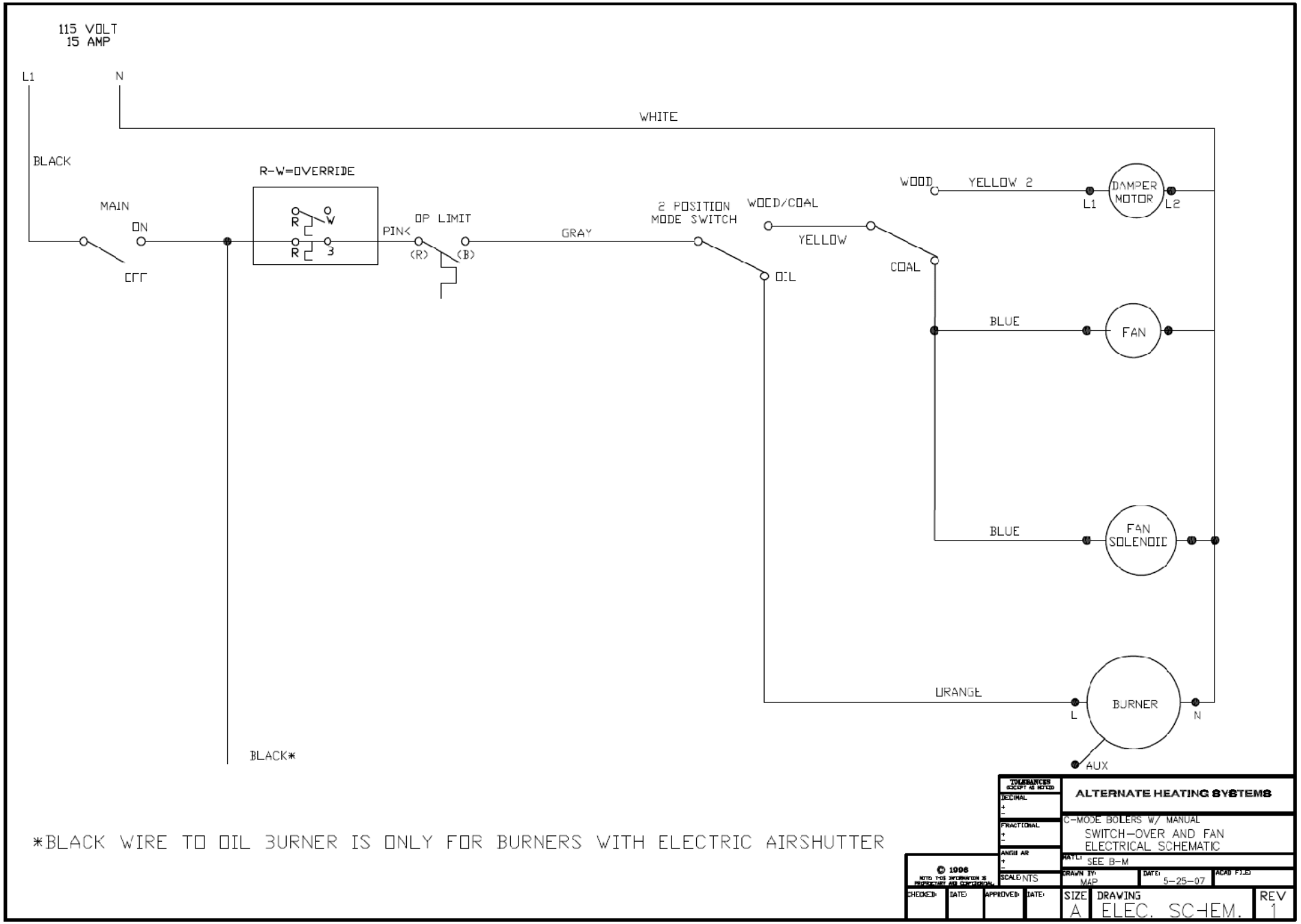
115 VOLTS - 15 AMP



CONTROLS FOR C40, C55, C70 C100 W DAMPER MOTOR AND FAN

Date Revised: 03/20/12

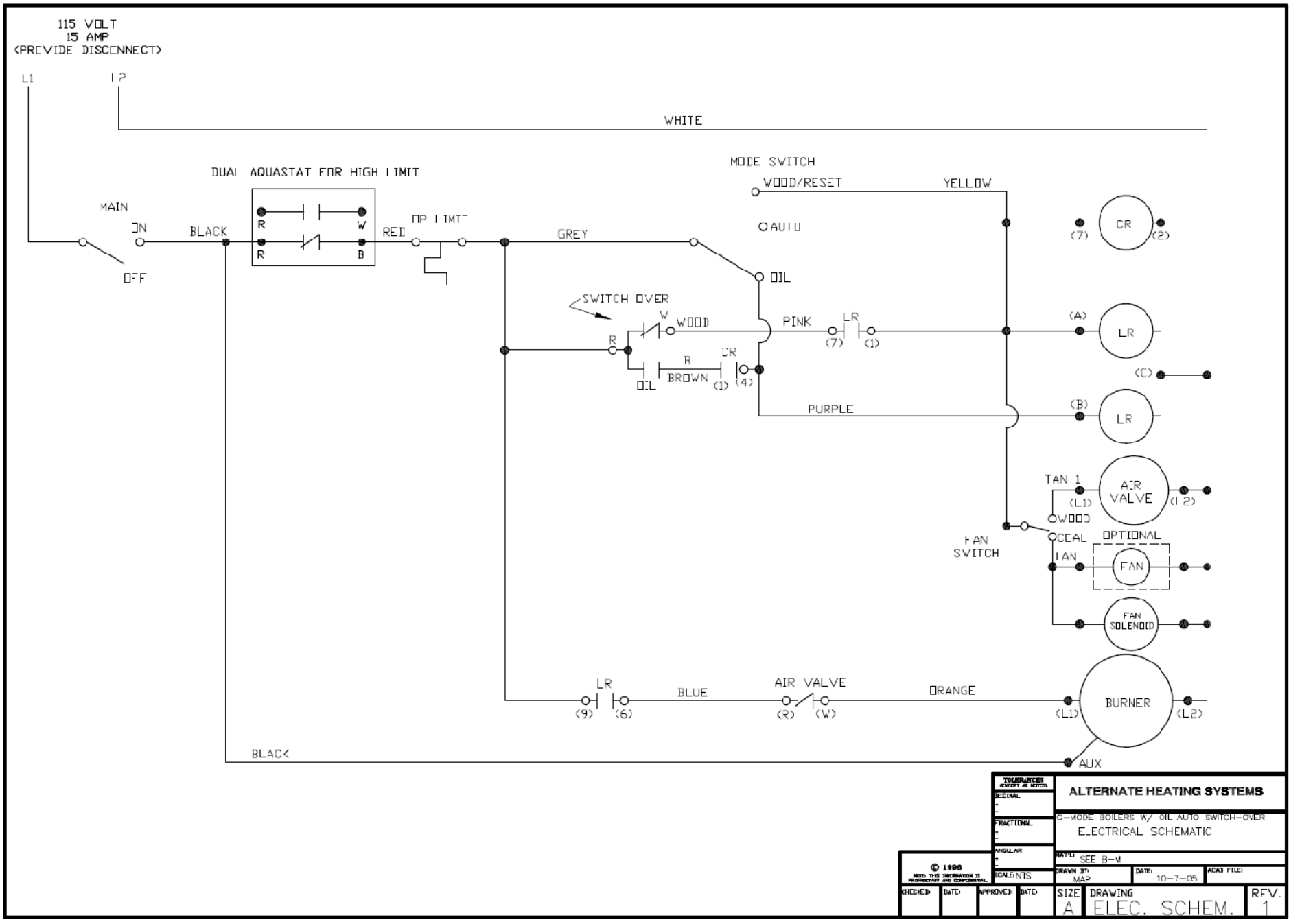
C-MODEL BOILERS W/ MANUAL SWITCHOVER AND FAN ELECTRICAL SCHEMATIC



*BLACK WIRE TO OIL BURNER IS ONLY FOR BURNERS WITH ELECTRIC AIRSHUTTER

TOLERANCES (EXCEPT AS NOTED)	ALTERNATE HEATING SYSTEMS
DECIMAL ±	C-MODE BOILERS W/ MANUAL SWITCH-OVER AND FAN ELECTRICAL SCHEMATIC
FRACTIONAL ±	MATL: SEE B-M
ANGULAR ±	DRAWN BY: MAP — DATE: 5-25-07 — ACAD FILE:
SCALE: NTS	CHECKED: — DATE: — APPROVED: — DATE:
© 1998 NOTE: THIS INFORMATION IS PROPRIETARY AND CONFIDENTIAL	SIZE: A — DRAWING: ELEC. SCHEM. — REV: 1

C-MODEL BOILERS W/ OIL AUTO SWITCHOVER ELECTRICAL SCHEMATIC



Appendix B: Specifications

Model:	WOC40	WOC55	WOC70	WOC100
Coal	180,000	225,000	265,000	400,000
Oil (MAX)*	200,000	225,000	250,000	400,000
Heating Surface	28 Ft^2	32 Ft^2	33 Ft^2	56 Ft^2
Water Capacity	44 Gal.	59 Gal.	70 Gal.	100 Gal.
Firebox Capacity	8 Ft^3	10Ft^3	14 Ft^3	22 Ft^3
Coal Capacity	N/A	200 lbs	250 lbs	400 lbs
Max. Log Length	24"	24"	36"	38"
Door Opening	14"x14"	14"x14"	14"x14"	16"x16"
Height	47"	54"	59"	64"
Width	28"	28"	28"	34"
Depth	48"	48"	40"	62"
Flue Height (to ctr)	35"	45"	45"	50"
Flue Size	8"	8"	8"	8"
Weight (lbs)	1230	1,400	1,450	2,130

Model:	WC40	WC55	WC70	WC100
Coal	150,000	225,000	265,000	400,000
Heating Surface	20 Ft^2	27 Ft^2	33 Ft^2	50 Ft^2
Water Capacity	40 Gal.	55 Gal.	70 Gal.	95 Gal.
Firebox Capacity	7.5 Ft^3	10 Ft^3	14 Ft^3	22 Ft^3
Coal Capacity	125 lbs.	200 lbs.	250 lbs	400 lbs.
Max. Log Length	24"	24"	36"	38"
Door Opening	14" x14"	14" x14"	14"x14"	16" x16"
Height	44"	54"	59"	64"
Width	28"	28"	28"	34"
Depth	36"	36"	40"	50"
Flue Height (to ctr)	35"	45"	45"	50"
Flue Size	8"	8"	8"	8"
Weight (lbs)	1,050	1,220	1,450	1,950

*Specifications and design subject to change without notice.
All specifications shown are approximate.

ADDITIONAL SPECIFICATIONS

Pressure Drop

Pressure Drop (Line Loss) within the boiler is less than the pipe rating of the pipe fitting used on the boiler, so there is no appreciable, internal pressure drop.

Explanation of GPM Flow

The following are given as examples of gallons per minute water flow required to deliver hot water in order to provide heating of a given number of degrees and at a certain BTU level:

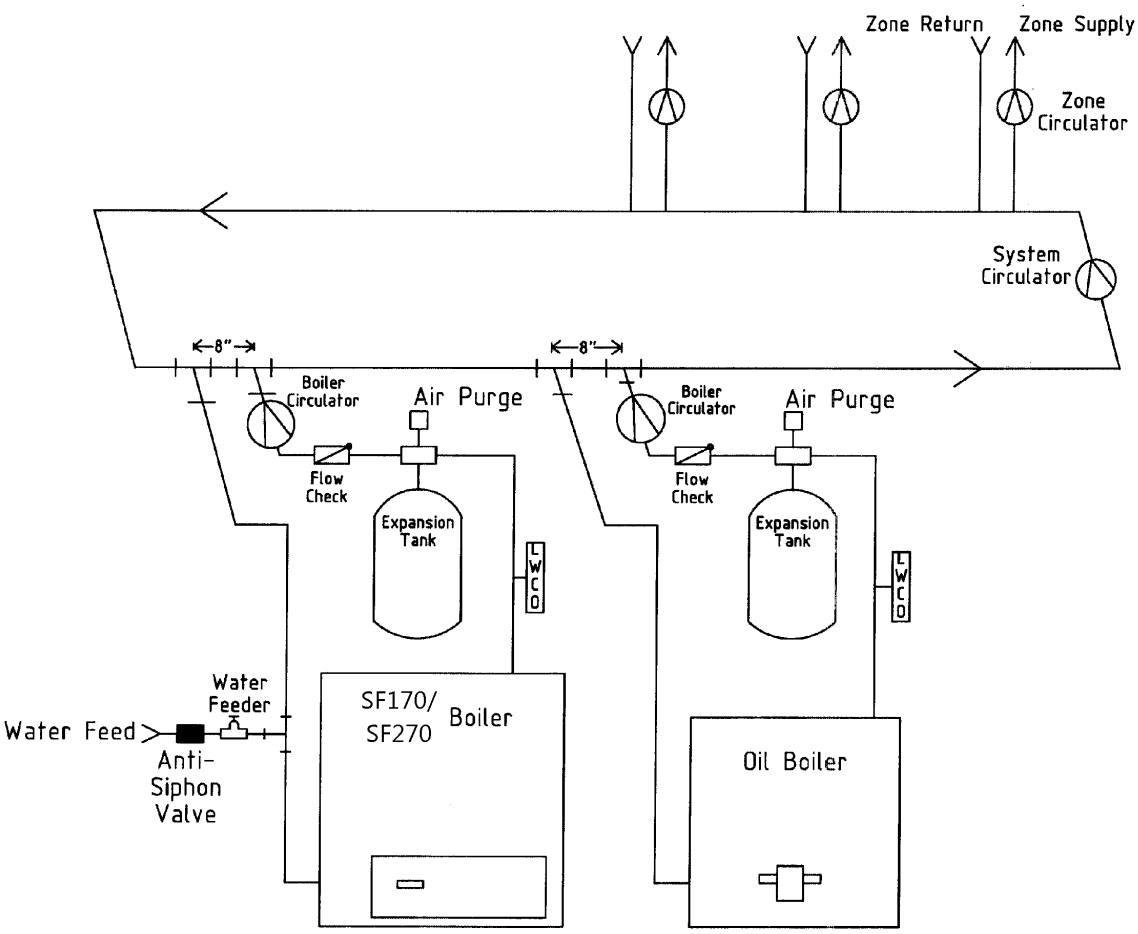
- 500K BTU's at 20° F temperature differential requires 50 gallons per minute.
- 250K BTU's at 20° F temperature differential requires 25 gallons per minute
- 1M BTU's at 20° F temperature differential requires 100 gallons per minute

As you can see from the above, with a 20° F temperature differential, 10 gallons per minute of flow is required for each 100,000 BTU / Hour transferred.

Appendix C: Boiler Piping Diagrams

Primary / Secondary Hook Up – Option 1

Boiler Piping Diagram –



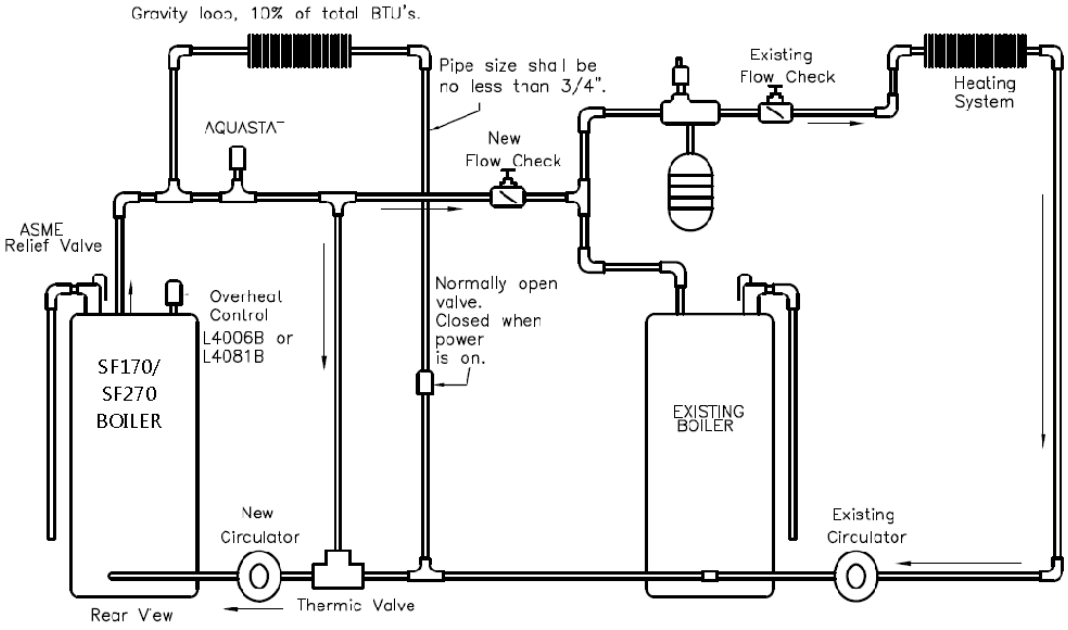
Primary/Secondary System Option 1

Note:

1. **A call for heat from any zone activates Boiler Circulators, System Circulator and Zone Circulator.**
2. **Each Boiler Circulator is also controlled by a low limit to prevent operation when the Boiler is cold.**
3. **Dump zone operation will activate one or more zones, System Circulator and Boiler Circulator.**
4. **Do not bypass temperature supply control system on radiant heat system. In radiant heat applications, permit activation of a call for heat but allow system controls to regulate water temperature.**

Not all system components, valves and devices are shown in this drawing. Actual conditions and application requirements will vary. Please consult a heating expert or your Legacy Stoves dealer for additional information.

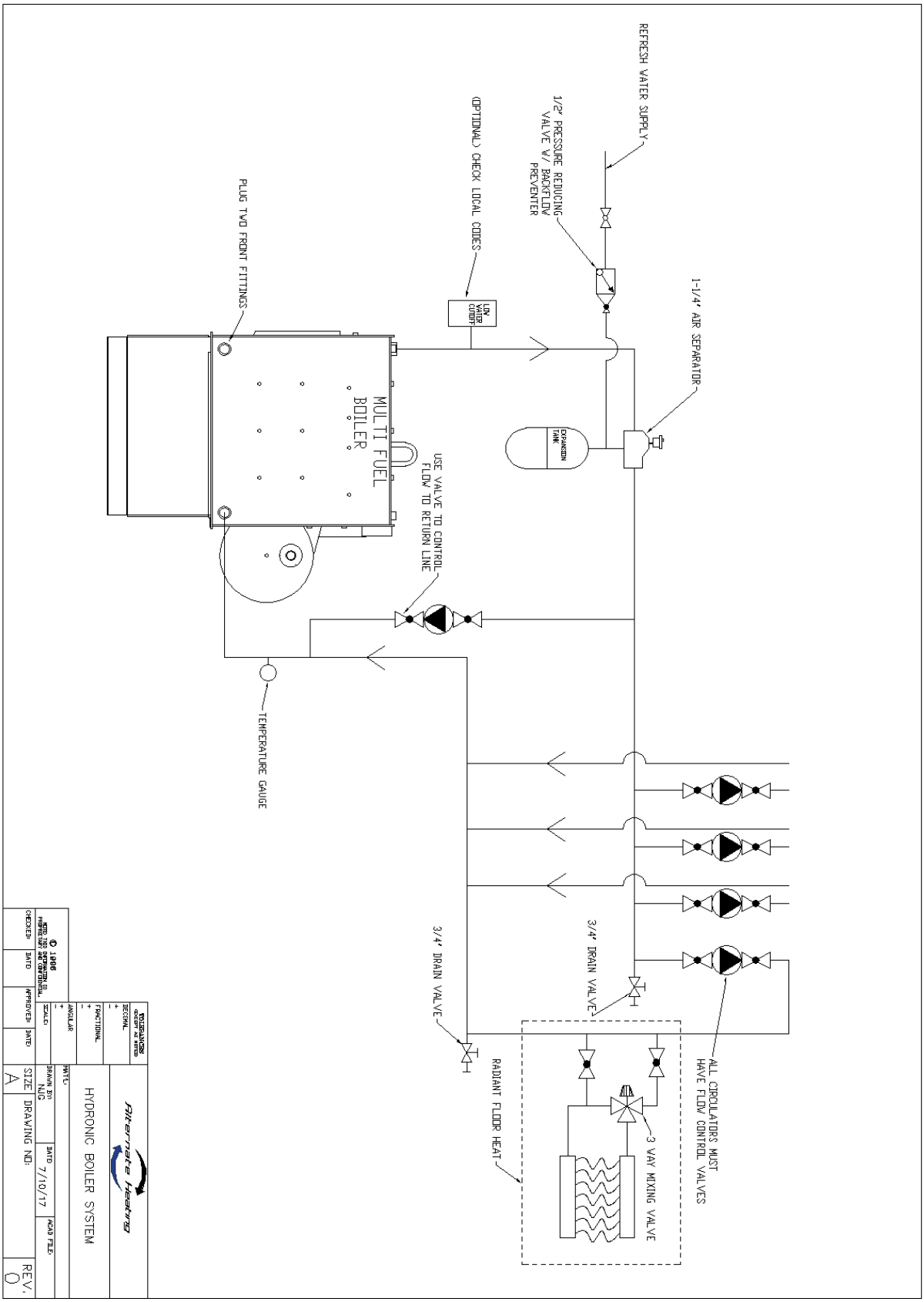
Primary / Secondary Hook Up – Option 2



Boiler Piping Diagram – Primary/Secondary Option 2

Note: The above illustrates one possible method of connecting the Multi-Fuel boilers with an existing boiler. This connection is as follows: using a small circulator (and with the backup boiler piped into the return tapping) run another pipe from the supply tapping T, of the Multi-Fuel boiler to the supply line, of the existing boiler on the lower side of the flow control valve. Use a minimum 1-1/4" pipe to make this connection. The pipe size must be determined by taking into account the distance involved and flow required. The new circulator should be wired to the power for the Multi-Fuel boiler. When power to the Multi-Fuel boiler is on, the circulator should be running. An alternate option is to attach a strap on aquastat on the Multi-Fuel boiler supply line that closes on temperature rise. This will automatically activate the pump at a given temperature. The add-on boiler shall be installed without interfering with the normal delivery of heated water from the original boiler. The add-on boiler shall be installed without affecting the operation of the electrical and mechanical safety controls of the original boiler.

Mutlti-Fuel Single Boiler Hook Up

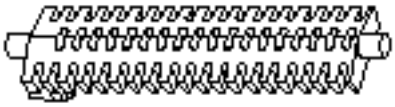


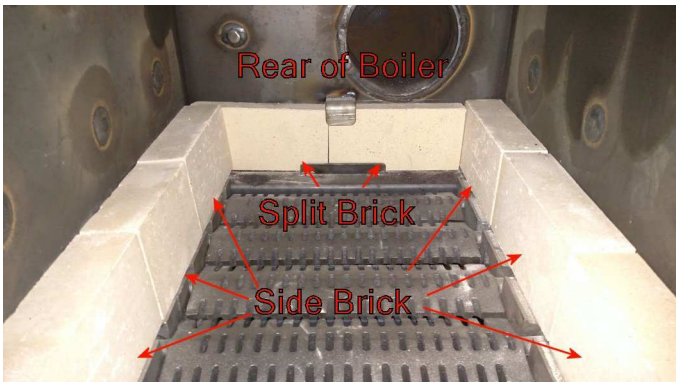
Appendix D: Brick Layout

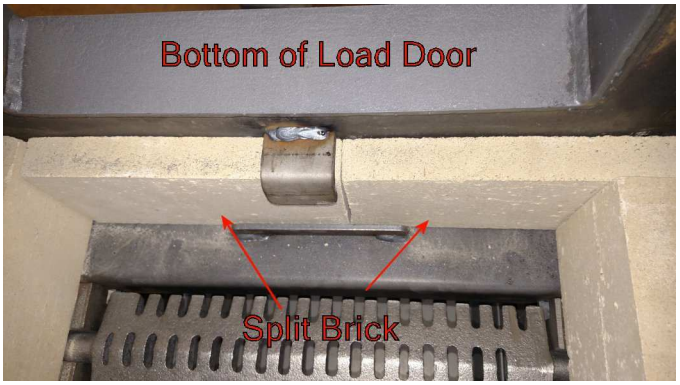
As of Mid April, 2016, the Multi-Fuel 40 and 55 series boilers (WC/WOC40 and WC/WOC55 models) will use the well-proven grate and base designs that are derived from our Legacy Stoves SF270 hand fired coal boilers. This will reduce inventories of unique items between the lines. Rolla-Grate type grates will still be used in the 70 and 100 series for the foreseeable future. Grate and firebrick arrangements are shown in the photos and descriptions below.

FIREBRICK AND GRATE ARRANGEMENT FOR NEW 40/55 SERIES BOILERS

The images at right and below show the rear and front of the firebox. Note that there are 3 Full Brick on each side and 2 split brick in the rear and front. There are Qty 5 of 15 inch cast grates, oriented from side to side, and shaken with a single handle.







Note: Multi-Fuel boilers are safe to fire with wood, but are not EPA approved for continuous firing with wood.

Boiler Model WC/WOC40	Type of Brick	Part Number	Number (Side)	Number (Back)*	Front	Water Tube Brick Layout 1stRow*	2ndRow	3rdRow	4thRow	Back Row Angled
^ PRE 4/15/2016	Split	273-017		4		0	0			4
	Split 2 ½ IN wide	273-018		1		1	1			1
	Full Angled and Grooved	273-019	10							
	Full Angled and Grooved 3 IN wide	273-021	2							

Boiler Model WC/WOC55	Type of Brick	Part Number	Number (Side)	Number (Back)*	Front	Water Tube Brick Layout 1stRow*	2ndRow	3rdRow	4thRow	Back Row Angled
^ PRE 4/15/2016	Split	273-017		4		0	0			4
	Split 2 ½ IN wide	273-018		1		1	1			1
	Full Angled and Grooved	273-019	10							
	Full Angled and Grooved 3 IN wide	273-021	2							

Boiler Model WC/WOC40	Type of Brick	Part Number	Number (Side)	Number (Back)*	Front	Water Tube Brick Layout 1stRow*	2ndRow	3rdRow	4thRow	Back Row Angled
^ POST 4/15/2016	Split	273-017		2	2	0	0			4
	Split 2 ½ IN wide	273-018				1	1			1
	Full Angled and Grooved	273-019								
	FIRE BRICK 9 x 4.5 x 2.5IN	3-40-900450250	6							
	Full Angled and Grooved 3 IN wide	273-021								

Boiler Model WC/WOC55	Type of Brick	Part Number	Number (Side)	Number (Back)*	Front	Water Tube Brick Layout 1stRow*	2ndRow	3rdRow	4thRow	Back Row Angled
^ POST 4/15/2016	Split	273-017		2	2	0	0			4
	Split 2 ½ IN wide	273-018				1	1			1
	Full Angled and Grooved	273-019								
	FIRE BRICK 9 x 4.5 x 2.5IN	3-40-900450250	6							
	Full Angled and Grooved 3 IN wide	273-021								

Boiler Model WC/WOC70	Type of Brick	Part Number	Number (Side)	Number (Back)	Front	Water Tube Brick Layout 1stRow	2ndRow	3rdRow	4thRow	Back Row Angled
	Split	273-017		4		4	4			4
	Split 2 ½ IN wide	263-006		1		1	1			1
	Full Angled and Grooved	273-019	14							
	Full Angled and Grooved 3 IN wide	273-021	2							

Boiler Model WC/WOC100	Type of Brick	Part Number	Number (Side)	Number (Back)	Front	Water Tube Brick Layout 1stRow	2ndRow	3rdRow	4thRow	Back Row Angled
	Split	273-017		5		2	4	4	4	3
	Full Angled and Grooved	273-019	16							
	Split 1 ¾ IN wide	293-009		1			1	1	1	1
	1 ¾ x 4 ½ x 1 ¾ IN	293-011				1				
	Split Beveled	293-010								2
	Full Angled and Grooved 3 IN wide	273-021	2							

*The Multi-Fuel 40 and 55 Series boilers build since 2013 utilize steel angle baffles instead of firebrick in the first three rows

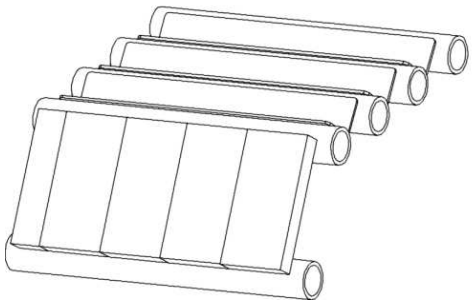
Your boiler may vary slightly from this reference

WATER TUBE BAFFLES/BRICKS

The brick arrangement in your Multi-Fuel boiler will vary depending on which unit you purchased. The chart on the previous page offers a general guide you may use, but your boiler may vary slightly regarding which brick are required. For the 40 and 55 series boilers produced since 2013, there are three angle baffles that go between the first four rows of water tubes. If they are not already in place, you will find them in the ash pan, ready to be installed.

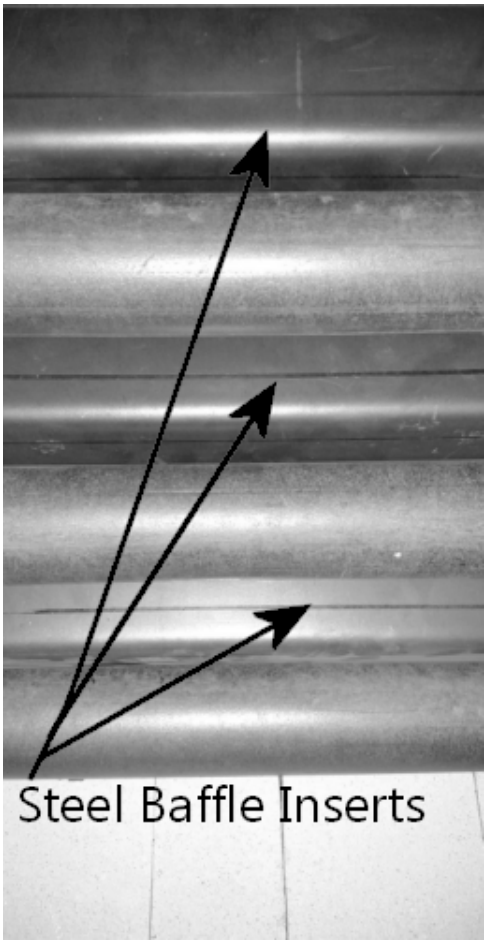
C40/C55 Water Tube Angle Baffle Insert

These are installed by rotating them into position between the front four water tubes and letting them rest in between the tubes with the angle pointing downward, like a “V”. The following diagrams illustrate their position over the water tubes. The C40/C55 have the same number of water tubes. The brick layout is identical between the two lines.



Angled View of Steel Baffles Over Water Tubes

Side View of Steel Angle Baffles in Position



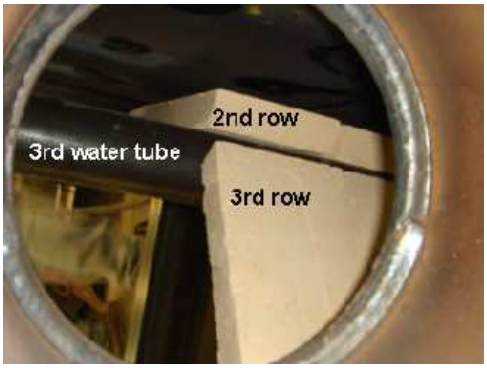
Steel Water Tube Baffle Inserts in Place

For the C70 and C100 series boilers, standard firebrick are placed on top of all rows of the water tubes. The following image shows the water tubes in the top, with firebrick baffles removed. Note the presence of two water tubes running from front to back, at 90 degree angles to the horizontal tubes.

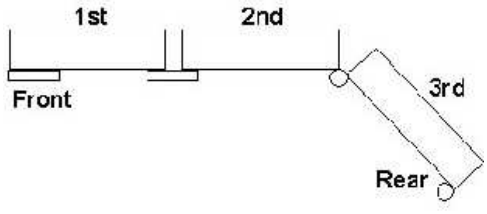
WC70 Top Firebricks Removed

The next image shows the top of the boiler with the brick in place. Firebrick can be positioned by accessing the area above the horizontal water tubes through the load door and through the flue collar, as shown in a subsequent image.

WC70 Top Firebricks in Place



Firebrick Access Through Flue Collar



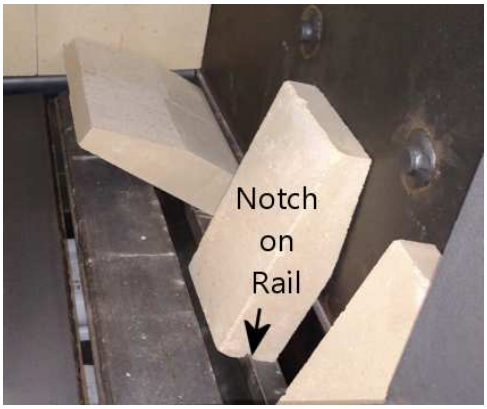
Side View Schematic

Wedge Brick Layout

The wedge shaped bricks are placed with the notch towards the bottom of the boiler. The brick sits on the angle bar with the angled part of the brick towards the wall of the boiler and the flat part of the brick facing inwards. If narrow wedge bricks are included, place these first ion the support rail, toward the front of the boiler.

Side View – Wedge Brick

Wedge Brick in Place



Wedge Brick Placement

LIMITED WARRANTY

MULTI-FUEL COAL BOILERS:
WOC55 WOC55 WOC70 WOC100 WC40 WC55 WC40 WC55 WC70 WC100

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

A. WHAT IS COVERED AND FOR HOW LONG (all from date of original purchase)

1) Boiler Vessel, Ten (10 years pro-rated as follows: 1st to 5th year – full; 6th year – 80%; 7th year – 60%; 8th year – 40%; 9th year – 20%). This warranty does not cover any corrosion or deterioration in boiler vessel due to improper pH levels in water or oxidized water (heating systems that have plastic piping, OR are installed and maintained as open systems). This warranty does not cover corrosion from inside the firebox or heat exchanger areas of the vessel, which is likely to occur from improper operation, installation or burning of unapproved fuels.

2) Doors (excluding gasketing, knobs, and ceramic insulation board), draft regulation mechanisms, insulation jacket, draft fan assembly – One (1) year.

3) All electrical and plumbing components and controls such as temperature/pressure gauge, safety relief valve, aquastat controllers, electric motor, domestic hot water coil, oil burner, fan shaft bearings, timer, draft motor, etc. purchased by Alternate Heating Systems from other manufacturers are limited to warranties offered by those manufacturers, typically One (1) year.

4) Ceramic board door heat shields, firebrick, fasteners, smoke flap, door gasket, silicone rubber seals, door handle knobs, paint, wiring, and wiring devices -Thirty (30) days.

5) Grates – One (1) year, excluding warping, which occurs when ashes are allowed to build up against the bottom of the grates.

B. WHAT WE WILL DO AND NOT DO

1) Alternate Heating Systems will repair and replace, at our option, units or component parts found defective after inspection by Alternate Heating Systems or our authorized representative during the periods outlined above.

2) Alternate Heating Systems SHALL NOT BE LIABLE UNDER THIS WARRANTY IF:

a) the unit or any of its component parts have been subject to misuse, alteration, unauthorized repair, neglect, accident, or damage from handling.

b) the unit is not installed, operated and maintained in accordance with the printed instructions supplied with the unit and in accordance with local plumbing and/or building codes.

c) the unit is operated above its rated output which is shown on the nameplate attached to the unit and listed in Alternate Heating System's printed literature.

d) the unit is fired with fuels other than those recommended by Alternate Heating Systems. This includes fuels recommended by dealers and distributors selling Alternate Heating Systems products if these are not fuels recommended by Alternate Heating Systems.

C. WHAT THE CUSTOMER MUST DO

1) Contact the dealer who sold you the unit.

2) If said dealer cannot be located, contact any other Alternate Heating Systems dealers in your area.

3) If you are unable to locate a dealer, submit your warranty claim directly to Alternate Heating Systems at the address listed below.

4) When you make an inquiry or warranty request, be sure to include the following information:

a) Unit model number
b) Serial number
c) Date of purchase
d) Dealer's name
e) Type of fuel burned

5) The OWNER and not Alternate Heating Systems or its dealers will be liable for the following costs involved in repair or replacement of the defective unit or component part

a) All necessary costs in returning the defective unit or component part to the factory or other location designated by Alternate Heating Systems.

b) All freight and delivery costs of shipping a new or required unit or replacement component part to the owner.

c) All labor and other costs incurred in the removal of the defective unit or part and installation of a new or required unit or part.

d) Any material required to complete installation of new or required unit or replacement part.

D. LIMITATIONS AND STATE LAW RIGHTS

1) Alternate Heating Systems neither assumes nor authorizes any representative or other person to assume for it any other obligation or liability in connection with its products other than expressly written here.

2) Implied warranties of merchantability and fitness for a particular purpose are limited to the duration of this LIMITED WARRANTY.

3) Alternate Heating Systems shall not be liable for any incidental or consequential damages such as water, smoke or heat damage to property arising directly or indirectly from any defect in its products or their use.

4) Some states do not allow limitation on how long an implied warranty lasts and the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

5) This warranty gives you specific legal rights and you may also have other rights, which vary from state to state.

6) The remedies set forth herein shall be the exclusive remedies available to the owner.

ALTERNATE HEATING SYSTEMS
2393 LITTLE EGYPT RD
HARRISONVILLE, PA 17228
(717)-987-0099 ALTERNATEHEATINGSYSTEMS.COM

IMPORTANT: READ AND KEEP IN YOUR POSSESSION!