INSTALLATION AND OPERATOR'S MANUAL

COAL GUN™ BOILER

Models: S130, S260, S500, S1000



c UL us LISTED

IMPORTANT: IN ORDER TO ACHIEVE SAFE AND SATISFACTORY RESULTS FROM YOUR ALTERNATE HEATING SYSTEMS, INC. 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.

WARNING: 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 210^0 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 210^0 Fahrenheit.

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Record Model and Serial Number Below

Model:

Serial:

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The Coal Gun™ is listed by Underwriter's Laboratories, INC.

Coal Gun boilers bearing the mark seen at right are thereby designated as listed boilers.
UL File Number MH46626



Revision: 091209

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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 authorized Alternate Heating Systems, LLC. dealer or 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, LLC. boilers can be supplied with the ASME “H” stamp and National Board number for an additional fee when requested prior to purchase. Alternate Heating Systems boilers are built to rigid quality control standards. You can be assured of receiving a high quality product.

BOILER INSTALLATION

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.



CAUTION:

A building fire could be started if the boiler is installed too close to walls, furniture, carpet or draperies.

The boiler must stand on a noncombustible material such as brick, stone tile or concrete. **NEVER** place a boiler directly on a wood floor. The noncombustible material upon which the boiler stands should 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. 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

1. The room should be well lighted and should have a source of emergency light.

2. A convenient water supply should be available for boiler flushing and to clean the boiler room floor.

3. Unobstructed floor drains.

4. A boiler must not be installed where there is the possibility of the accumulation of explosive vapors.

5. 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 boiler malfunctions.

Note: Ventilation fans in the boiler and fuel storage rooms must not create negative pressure, as this would adversely affect boiler operation. This applies at the room location of the intake end of the auger as well

6. Electrical disconnect at point of entrance to boiler room.

7. 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. All Alternate Heating Systems boilers have at least one lifting lug in the center of the top. On some units lifting lugs in the front and rear are provided. Use caution whenever moving a boiler. When choosing the equipment to move and/or position the boiler, always be sure of the load rating on the equipment prior to use.

A ratchet puller (come along) device may be needed to move a boiler where the ground level changes in elevation. AHS suggests that professional movers should be used in any unpredictable situation. This is to prevent damage to the product, facility and to eliminate the potential for bodily injury.

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. Use of a pallet jack with the Coal Gun™ requires that the boiler be skidded or that the installer has made other provisions to insert a pallet jack under the boiler base without causing damage. 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 the installation is in compliance with all building, plumbing and electrical codes.

A qualified technician experienced in boiler installations is recommended for the installation of 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 for Coal Stoker boilers when measured from the exterior of the boiler are 30 in to the rear (end of boiler with fan assembly), 36 in to the right side (when facing the front of the boiler), 16 in on the left, 18 in from the hopper top and 24 in to the front (end of boiler with sight tube). For commercial and residential installations, many boiler codes require a minimum of 3 feet of clearance on all sides. It is the customer's responsibility to determine whether the installation complies with local code or insurance company requirements. Refer to Appendix A: Boiler Specification Diagrams for exterior dimensions of the various models.

GENERAL CHIMNEY REQUIREMENTS

One of the most important considerations in installing a wood or coal burning boiler is the type of chimney that will be used. The condition and construction of the chimney is important to provide sufficient draft. The Coal Gun produces its own draft during the on cycle, but the chimney produces the draft during the off cycle. It is necessary to have continual draft, even during the off cycle, in order to move Carbon Monoxide, sulfur, and other gases out of the boiler.

NOTE: For insurance and building code compliance check with your local building inspector and insurance agent.

Natural drafts in a chimney result from two factors. First, draft is created by the aspirating effects of air currents blowing across the top of the chimney. Second, drafts are also produced when the temperature of the flue gases is higher than the atmosphere around the chimney. For this reason a chimney must be kept warm (about 250^{o} F) for proper draft to occur. Please see Draft Control section in this manual for more information.

It is more difficult to maintain sufficient temperature in an exposed chimney, or one that

is very large, than a chimney that is protected from outside temperature extremes.

The chimney must be sufficiently tall (at least 20 feet for masonry chimneys) and should extend at least three feet above the highest part of the roof to prevent downdrafts. The chimney must be leak-free from the standpoint of air entering through cracks or other chimney defects or through loose stovepipe fittings.

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 (refer to Figure 2). 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.

Never decrease the cross-sectional area of the stovepipe/chimney because the velocity of the exhaust will increase thus increasing the likelihood of particle discharge in the exhaust.

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 0.04 inches in the tube.

A barometric damper or draft regulator must be installed in the smoke pipe or flue connector when installing the coal boiler. Manually operated dampers must not be used! The draft regulator should be adjusted to maintain a draft of .04″ to .06″ during operation.



CAUTION:
SUFFOCATION HAZARD

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.

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. There is usually sufficient leakage in older homes, but in well-insulated homes it may be necessary to provide additional outside air into the home.

STOVEPIPE

Use only 22-24 gauge 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 U.L. listed insulated stovepipe must be used. Stovepipe that runs along the outside walls of a building must also be U.L. 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 (however, this provision does not apply to the Coal Gun because there is not sufficient gas generated in the exhaust to cause creosote).

PROPER CHIMNEY CONNECTION

The boiler must be connected to a class "A" chimney (22 gauge preferred, stainless steel is recommended).

WARNING:
CODE COMPLIANCE

Use of aluminum Type B gas vent for solid fuels is unsafe and prohibited by the National Fire Protection Association Code.

Use of aluminum Type B gas vent for solid fuels is unsafe and prohibited by the National Fire Protection Association Code. The recommended method for connecting the boiler to the chimney is to place a T-joint at the top of the vertical section leading from the breach (exhaust) flange. The rear opening must be covered with a cap, which can be removed for cleaning and inspection. A horizontal run must be included, with provision for pipe disassembly, for pipe inspection and removal of any fly ash that accumulates. If the horizontal run to the chimney is inclined, it will encourage any fly ash, which drops in the pipe to fall back into the ash separator.

If a second change of direction is required before entering the chimney a cleanout "T" should be placed at this point also as indicated in Figure 1. Each joint should be secured with three sheet metal screws and sealed with high temperature sealant capable of withstanding 650° F. Any horizontal pipe should be pitched upward toward the chimney at least ¼" for each foot of horizontal run. Ensure that there is at least 18" clearance between horizontal piping and combustible ceiling. Ensure that the chimney connection pipe extends at least 2" into the chimney, but does not extend so far into the chimney that it blocks airflow. A "T" must always be used where the stovepipe changes directions (rather than elbow) to allow for cleanout.

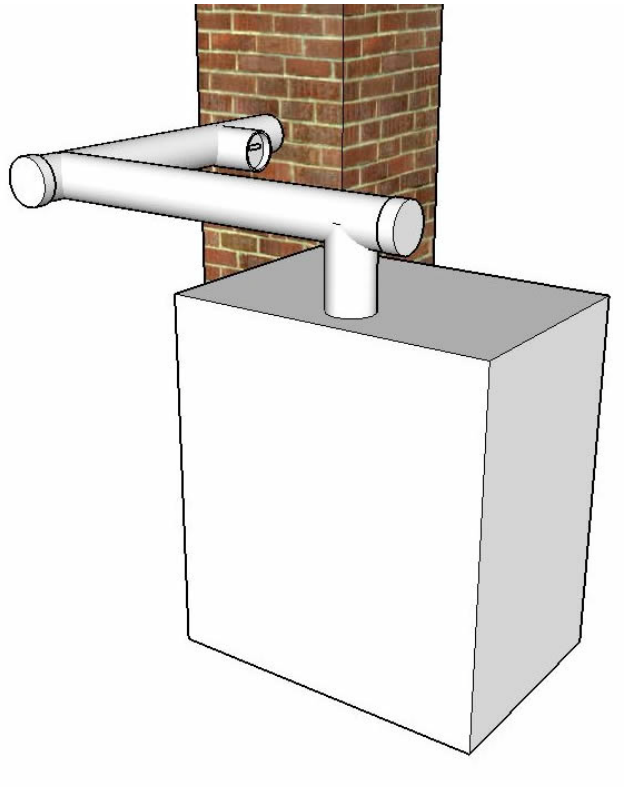


Figure 1: Proper chimney connection

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 use of a thimble that provides a diameter of not less than three times the diameter of the stovepipe. (see Figure 2)

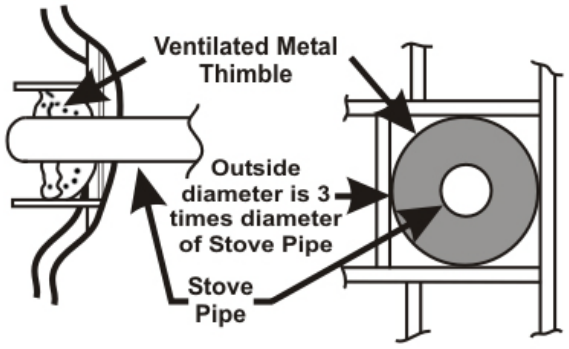


Figure 2: Stove pipe passing through wall

COMBUSTION AIR SUPPLY

It is important to make provision for adequate supply of combustion air, either via natural infiltration through a door or window or by ducting outside. If combustion air is ducted from the outside, then install a metal vent pipe of sufficient diameter for the boiler to be used. Contact Alternate Heating Systems if an outside air ducting kit is required.

When the intake is ducted outside, inspect the opening regularly to be sure that it does not become obstructed by debris.

DRAFT CONTROLS

Where excessive natural draft exists, a barometric damper is required to prevent the boiler from overheating. The likelihood of this condition increases with increased chimney height. It is a good idea to include a barometric damper when chimneys are taller than 20 feet. The standard type "M" field control with a "T" is recommended for satisfactory performance. Excessive draft through the boiler will allow an excessive amount of heat from the boiler to escape up the chimney. A draft control will help reduce this loss.

NOTE: The information in the rest of this section is provided by **Field Controls, LLC**, Kinston, North Carolina, 252.522.3031. This information is used with their permission. Some information may not apply to coal burning systems. The information is taken from Field Controls, LLC website at: www.fieldcontrols.com/draftcontrol.php. See the Field Controls website for specific models of draft controls or to place an order.

For proper operation and efficient fuel consumption in oil, gas and/or coal-fired heating appliances, draft must remain relatively constant, and above .04 inches water column, as measured with a manometer. When it is, combustion is more complete, fuels are utilized efficiently and money is saved.

Field Draft Controls maintain consistent draft by counteracting the negative forces caused by changes in temperature and barometric pressure, and the effects of wind.

How Draft Controls Work

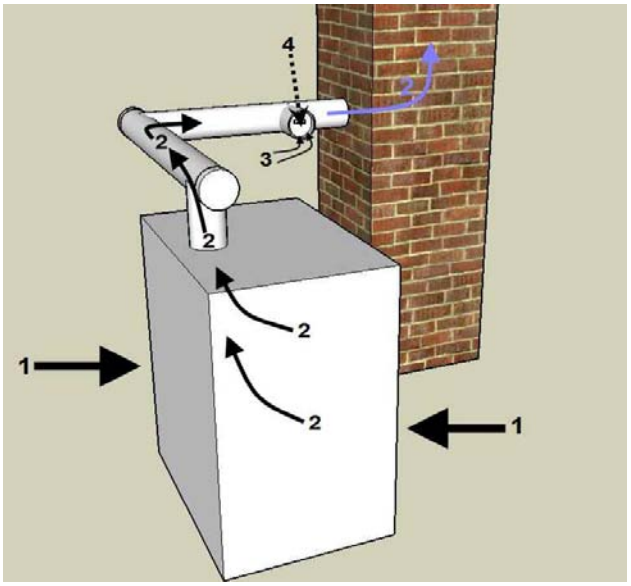
NOTE: See diagram below which has been modified for this manual.

Static pressure of the cool air (1) exerts pressure on the outside of the furnace or boiler, the breaching, and stack.

The pressure difference between the room air and heated gas (air) causes products of combustion (2) to flow (draft) through the unit and rise through the breaching and chimney.

Room temperature air (3) enters through the barometric draft control (4) in the precise amount needed to overcome the excess drafts caused by temperature variations, wind fluctuations and barometric pressure changes.

Combustion of fuel is completed and the process is stabilized. The velocity of combustion gases through the heat exchanger is slowed so more heat is extracted. The unit operates more efficiently, reliably and requires less maintenance.



Choosing The Right Size

(Sizing the Control)

Simple rules of thumb to guide size selections:

1.Use a draft control the same size as the flue pipe, that is, a 6" control for a 6" round pipe, a 12" control for a 12" pipe, etc.

2.For intermediate sizes of smoke pipe, use the next larger size draft control to provide ample capacity. It is a simple matter to install a round control on a pipe an inch or so larger or smaller than the control.

3.If the flue pipe or breaching is square, use the round equivalent. For example - on a 14" x 14" breaching use a 14" control. Little flow occurs in the corners of a square pipe so that its capacity is approximately the same as a round pipe of the same diameter.

4.If the breaching is rectangular or oval, compute its cross-sectional area and select a draft control having the same or a greater nominal cross-sectional area. A breaching 14" high x 10" wide would have a cross-sectional area of 140 square inches. From the table, select a 14" control with a cross-sectional area of 154 sq. inches.

5.Where a control larger than 32" is required, use more than one regulator with combined cross-sectional areas equal to or greater than that of the breaching. When chimneys are of an unusual height or if the draft to be maintained is either very high or very low, it is advisable to deviate from the rules of thumb outlined here. Refer to the larger table.

Control Size	Nominal Cross-Sectional Area (Sq. In.)
6”	28
7”	38
8”	50
9”	63
10”	78
12”	113
14”	154
16”	201
18”	255
20”	314
24”	452
28”	616
32”	804

Diameter of Flue or Breeching	If Chimney Height is	Use This Size Control	If Chimney Height is	Use This Size Control	If Chimney Height is	Use this size Control
4	15’ or less	4”	16’ or more	5”	N/A	N/A
5	15’ or less	5”	16’ or more	6”	N/A	N/A
6	15’ or less	6”	16’ or more	7”	N/A	N/A
7	15’ or less	7”	16’ or more	8”	N/A	N/A
8	15’ or less	8”	16’ or more	9”	N/A	N/A
9	15’ or less	9”	16’ – 30’	10”	31’ or more	12”
10	20’ or less	10”	21’ – 40’	12”	41’ or more	14”
11	20’ or less	12”	21’ – 40’	12”	41’ or more	14”
12	20’ or less	12”	21’ – 40’	14”	41’ or more	16”
13	22’ or less	14”	23’ – 45’	16”	46’ or more	18”
14	22’ or less	14”	23’ – 45’	16”	46’ or more	18”
15	22’ or less	16”	23’ – 45’	16”	46’ or more	18”
16	30’ or less	16”	31’ – 50’	18”	51’ or more	20”
17	30’ or less	18”	31’ – 50’	20”	51’ or more	20”
18	30’ or less	18”	31’ – 50’	20”	51’ or more	20”
19	30’ or less	20”	31’ – 50’	20”	51’ or more	24”
20	30’ or less	20”	31’ – 50’	20”	51’ or more	24”
21	30’ or less	20”	31’ – 50’	24”	51’ or more	24”
22	30’ or less	24”	31’ – 50’	24”	51’ or more	24”
23	35’ or less	24”	36’ – 60’	24”	61’ or more	28”
24	35’ or less	24”	36’ – 60’	24”	61’ or more	28”
25	35’ or less	28”	36’ – 60’	28”	61’ or more	28”
26	40’ or less	28”	41’ – 70’	28”	71’ or more	28”
27	40’ or less	28”	41’ – 70’	28”	71’ – 100’	28”
28	50’ or less	28”	51’ – 100’	32”	100’ or more	32”
29	50’ or less	28”	51’ – 100’	32”	100’ or more	32”
30	50’ or less	32”	51’ – 100’	32”	100’ or more	32”
31	50’ or less	32”	51’ – 100’	32”	100’ or more	Two 24”
32	50’ or less	32”	51’ – 100’	32”	100’ or more	One 24” One 28”
33	50’ or less	32”	51’ – 100’	One 32” One 20”	100’ or more	One 32” One 24”
34	50’ or less	32”	51’ – 100’	One 32” One 24”	100’ or more	One 32” One 24”

BOILER PIPING FOR HYDRONIC SYSTEMS

Normal operating temperature for the Coal Gun is 180° F. This allows for optimum operation and less fly ash accumulation on heat exchange surfaces. Water returning to the boiler from zones should be about 160° F, and at no time (after initial startup) should be lower than 150° F.

> **Note:** Hydronic and steam distribution and system design are ultimately the responsibility of the customer or installer.

Due to the design requirements of the various Coal Gun™ models, the tappings are not always in the same location on each boiler model. Appendix A: Boiler Specification Diagrams provides detailed information on how each model should be connected. The washout plugs in the bottom of the unit are a requirement of the ASME boiler code and must be closed before filling the unit with water.

> **Note:** Be sure to close all ports in the unit before filling the unit with water.

A boiler drain should be inserted in the tapping on the opposite side of the boiler from the tapping used for the return. Optionally, a "T" and short nipple could be attached to the return tapping for the location of the boiler drain.

Piping the Boiler in Parallel with Another Boiler

The Coal Gun™ may be connected to a heating system supplied by one or more boilers that are already in place. There are many possible configurations that allow for an existing boiler to function as a backup to the Coal Gun™. For sample illustrations of multiple boiler configurations, see Appendix I.

A minimum of 1" diameter pipe should be used for this connection on model S130. In any event, the pipe size must be determined by taking into account the distance involved and flow required.

Pressure Relief Valve

The pressure relief valve is factory installed. A length of copper pipe must be connected to the pressure relief valve continuing to a point 6" from the floor. Extending the pipe to the floor is a requirement of building codes. It reduces the likelihood that a release of boiler pressure would scald anyone standing near the boiler.

If the Coal Gun™ is installed as the primary boiler it is necessary to provide for water supply using a pressure regulating valve and backflow prevention valve in the feed water line.

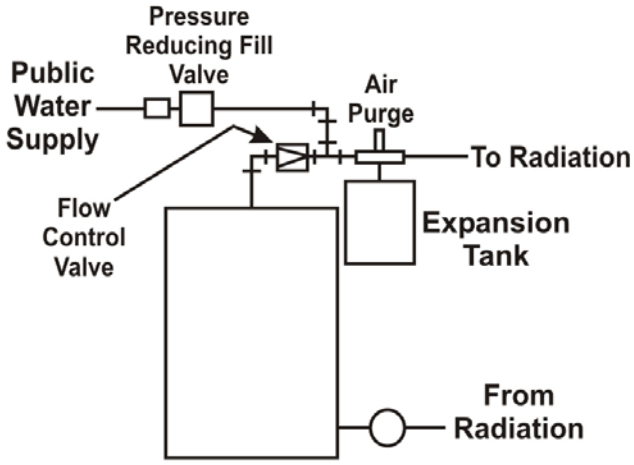


Figure 3: Pressure regulating valve and backflow prevention valve configuration

CAUTION

It is very important to provide adequate expansion tank capacity based on the total volume of water in the system, particularly when the Coal Gun™ is added to an existing boiler.

It is very important to provide adequate expansion tank capacity based on the total volume of water in the system. This is particularly true if the Coal Gun™ is added to

an existing boiler. Check the chart to determine the water capacity of the Coal Gun™ installed. The expansion tank or air cushion tank installed originally may not be adequate for the additional volume of the Coal Gun™.



IMPORTANT

Some states require that all hydronic heating systems have a low-water cut-off control.

Some states require that all hydronic heating systems have a low-water cut-off control. In cases where this control is required it should be located in a "T" placed in the supply riser just above the tapping in the boiler. The S500 and larger Wood units are supplied with a low water cut-off from the factory since the ASME code requires that any heating boiler with a calculated heat transfer capacity of 400,000 BTUH or greater must be so equipped. On the S500 and S1000 the low water control should be located in tapping "FF" which is to the side of the 4" domestic coil tapping.

BOILER CONDITIONER / SEALANT

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

BOILER PIPING AND CONTROLS FOR STEAM SYSTEMS

All Coal Gun™ models are available with steam tappings and controls upon special order. When installing a steam boiler, be sure that the installation conforms to all state and local codes.

All steam boilers will be supplied with a low water cut-off, which fits into a special tapping on the rear of a Coal Gun steam boiler. This control must never be hot wired or disconnected since it prevents the boiler from firing should the water level drop below the safe operating level.

A water level gauge glass is also provided to give a visual indicator of the level of water in the boiler. An automatic water feeder (mechanical type) or combination water feeder/low water control such as a McDonnell-Miller model 47-2 is required to ensure that the proper water level is maintained. Some states or cities require two low-water control devices in series. The two controls described above will meet this requirement.



CAUTION

It is very important that a steam boiler be properly leveled so that the water feeder and low water cutoff controls function properly. Connecting multiple steam boilers requires further special attention and must be performed by a trained professional.

It is critical in steam applications to take into account the BTU rating of the radiators in the system. If the boiler cannot meet this capacity, there will be areas that do not receive heat.

Steam boilers also have a different wiring sequence, so the proper wiring diagram must be consulted (see Appendix A: Boiler Specification Diagrams).

FORCED HOT AIR SYSTEMS (WATER TO AIR COIL IN DUCT)

The Coal Gun™ boiler may be easily adapted to any forced hot air heating system by installing a heat exchange coil in the supply duct. The size and type of coil or heat exchanger required may be established after several factors are determined. These factors include: the heat output required (BTUH), the capacity of the existing fan blower (CFM) and the size of the

duct or plenum where the coil will be installed. Sizing of the air coil will be the responsibility of customer and/or installer.

The coil creates increased resistance to air flow, so this factor must be considered when determining the final airflow. Design water temperature is usually 180° F, and a desirable output air temperature is 115° - 125° F. The coil is connected in the same manner as in other types of radiation heating equipment. The thermostat should be wired to both the fan blower and the circulator pump.

If a hole was cut in existing ducting to install the coil, the opening should be closed tightly with a metal cover and sealed with duct tape.

DOMESTIC HOT WATER COIL PIPING

The Coal Gun™ may be fitted with a domestic hot water coil, which threads into a 4" tapping in the boiler. Multiple coils can be installed into larger boilers, the total number dependent on the size of the boiler and the number of fittings made available at time of manufacture. There are three methods for plumbing the domestic coil. One way is to connect the coil in series with an existing hot water heater.

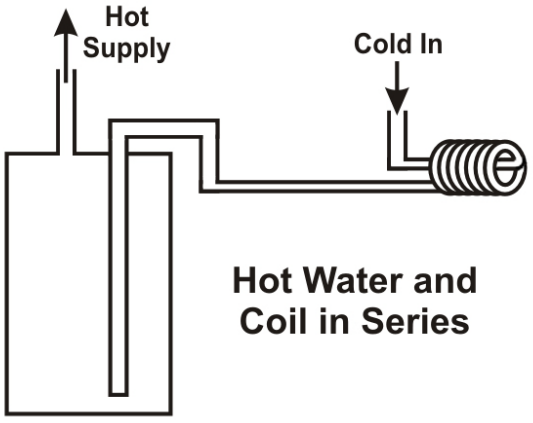


Figure 4: Plumbing – Coil in Series

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 below indicates how this can be done.

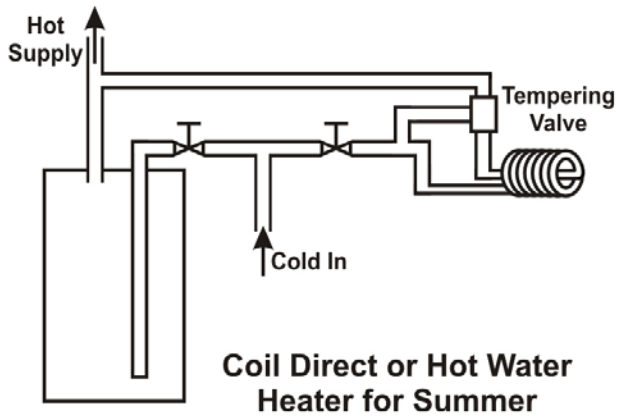


Figure 5: Plumbing – Coil in Parallel

CAUTION: BURN DANGER!

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.

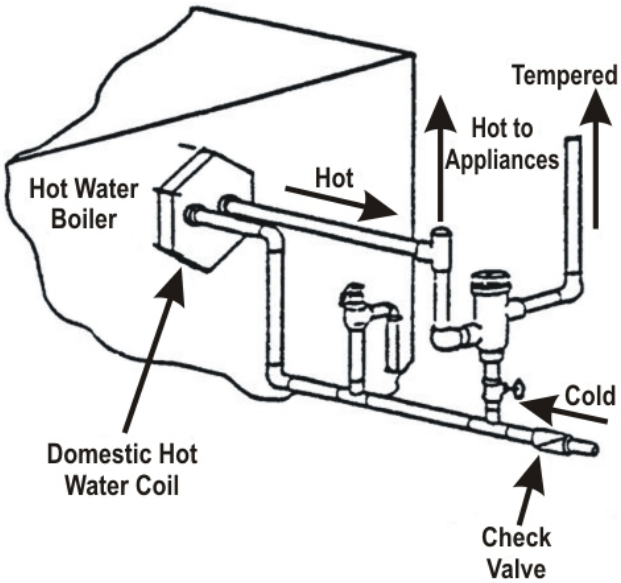


Figure 6: Tempering valve

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 (see Figure 7).

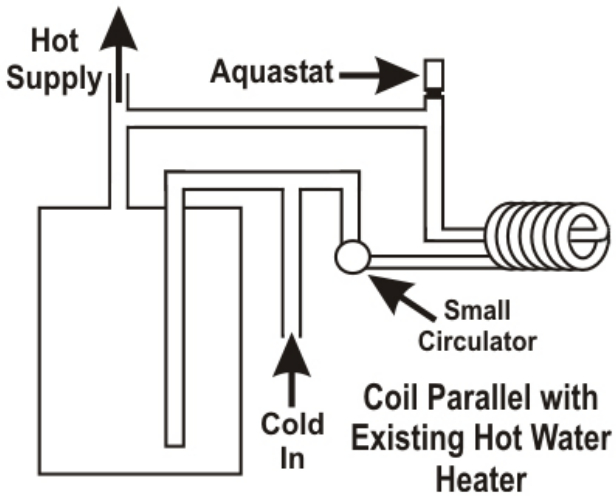


Figure 7: Plumbing – Coil with circulator

ILLUSTRATED INSTRUCTIONS FOR INSTALLING COAL HOPPER ON S130 AND S260

Step 1: Disconnect all power to the boiler.

Step 2: Loosen hopper collar snug screws until they are flush with the hopper collar as shown below.



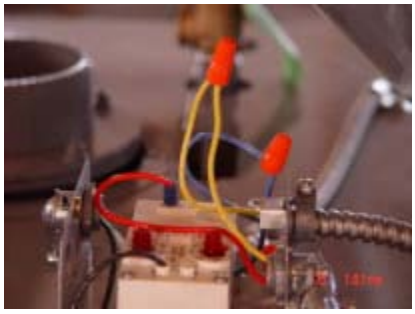
Step 3: Remove cover of high-limit aquastat box on top of boiler.



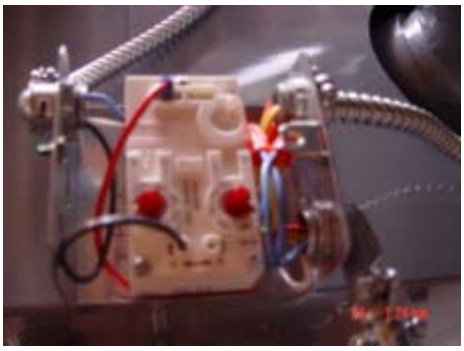
Step 4: Insert hopper tube into the hopper collar and tighten screws until snug. You may wish to make sure that the hopper is level or adjust to your preference.



Step 5: Insert wires from hopper into the empty conduit coupler on the side of the aquastat box. Feed conduit through coupler and tighten until conduit is snugly attached. Locate the blue and yellow wires already inside the aquastat box. Connect color to color to the hopper wires.



Step 6: Tuck all wiring down into the side of the aquastat box.



Step 7: Replace cover and connect/reconnect power.



ELECTRICAL CONNECTIONS IN THE COAL GUN ™

All Coal Guns are pre wired to maintain boiler water temperature at approximately 180° F.

S130/S260

The S130 and S260 Coal Guns require a dedicated power circuit of 120 volts, 15 ampere. On models equipped with a thermal ash control, power connections are in the large enclosure for that control. On models with a timer for ash removal, power connections are in the 4" X 4" box that holds the main switch.

S500/ S100

The S500 and S1000 Coal Gun normally require a dedicated power circuit of 230 volts, 20 amperes, single phase. Other power options can be arranged at the time of ordering the boiler. Power connections for the S500 and S1000 are at the appropriate terminals in the main control enclosure.

CONTROLS

Coal Guns for hydronic heating have no provision for control wiring connections to building thermostats. As stated previously, the boilers are designed and wired to maintain water temperature. The control scheme for Coal Gun boilers requires that building thermostats control distribution of the hot water, usually by circulator pumps, zone valves, or both. Hydronic Coal Guns are supplied with dual aquastats. The R-W terminals on the dual aquastat may be used to control a circulator for high water temperature over-ride situations, sometimes known as a "dump zone." If these terminals are used to directly power a zone, the maximum current draw is 3 amps.

Control Settings

The Coal Gun is provided with a high limit control, a combination operating limit control, dump zone control, and either an electronic ash temperature monitoring control or timer-based ash removal control. It is very important to follow these setting guidelines for proper operation of the boiler.

The operating limit is designed to maintain boiler temperature under normal operating conditions. The normal setting range for this control is from 150° F to 180° F. The normal factory setting is 180° F.

The dump zone temperature control is designed to operate one or more heat zones to prevent high boiler temperatures from occurring during low load conditions. This setting should be set 20° F above the operating limit setting with a maximum setting of 200° F. Also refer to the dump zone wiring instructions for specific use applications. See Appendix H for example dump zone wiring applications.

The ash temperature monitoring control incorporates a digital process controller for operating the coal grate motor based on ash temperature in the grate area. This process offers significant advantages, including the following: It maintains active monitoring of grate temperature during periods of low demand. This monitoring, and subsequent cycling of grates, takes place whether the boiler fan operates or not. This control also reduces the likelihood of unburnt coal being dumped into the ash pan.

This control is factory set to 130° F and should not be adjusted to more than 10° F higher or lower than the factory setting for best operation (refer to Appendix G for instructions). When reading the digital readout, *PV* refers to the *process variable,* or actual ash temperature reading. *SV* refers to the *setpoint variable,* or the temperature setpoint of the control. Based on factory settings, when the temperature of the ash drops to 10° F below the reading indicated at *SV* the grates will cycle on, operating until ash temperature climbs to the *SV* value.

The power switches are located on the front of the control panel. The “Main” switch will shut off all power to the unit. The “Grate” switch will shut down the grate motor function.

WARNING:

Fuses must be replaced with the same amperage and fuse type as supplied with the unit!

The S130 and S260 have two external fuses on the control panel. The 15A fuse supplies protection to all boiler functions. The 2A fuse supplies protection for the grate motor circuit.

Steam

Steam Coal Guns require a connection to a building thermostat. The switching relay on the Steam Coal Gun has two T terminals to which a low voltage thermostat must be connected.

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 this heat rise to occur without exceeding 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 210° F, with the high limit set point adjusted to 10° - 20° lower. When this high limit is exceeded, and temperature reaches the dump zone limit, one or more zones will be energized and heat distributed until temperatures fall sufficiently. See Appendix H for a variety of dump zone wiring examples.

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 (for this type of dump zone, see Appendix H, Example 5).

WARNING:

DO NOT OPEN THE DOORS OR OPERATE THIS UNIT DURING A POWER FAILURE.

Non Powered Dump Zone

Some states or municipalities require a way to dump boiler heat in the event that power loss occurs. Figure 9 shows an application example of how this is accomplished. Pipe to a dump zone must be a minimum of ¾ in. Larger diameters may be needed as boiler size increases.

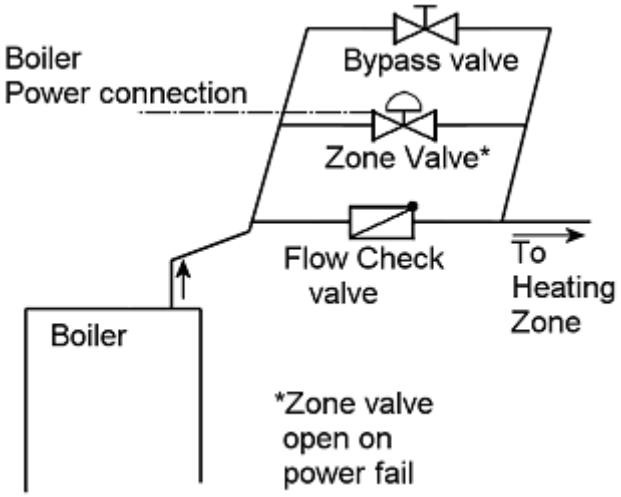


Figure 9: Non-Powered Dump Zone

This arrangement will allow a gravity flow of heat release in the event of a power failure. For other dump zone applications, see Appendix H.

OPERATING INFORMATION

Please read this manual before operating the boiler. Important requirements and instructions must be followed for safety and satisfactory operation of the boiler.

The quality and burning characteristics of coal vary widely so it is important to use the type of coal for which the Coal Gun™ was designed. Best results will be obtained using pea-size anthracite having a high ash fusion temperature. All bituminous or lignite types of coal are unacceptable for use in the Coal Gun.



WARNING:

Be sure the boiler vessel is full of water and pressurized before starting a fire. Never attempt to add water to a hot boiler if found to be only partially full. Allow the unit to cool before adding water to the boiler. Failure to do so could result in death or severe injury along with damage to boiler and surrounding property.

LIGHTING THE COAL GUM™



CAUTION

NEVER use chemicals or flammable liquids to start the fire. DO NOT burn garbage, other types of coal or any other fuel not approved for this unit

When starting a fire, it is advantageous for both the system and the house to be cold. This allows the Coal Gun to establish a good burn before reaching maximum temperature, after which the draft induction fan that powers combustion will shut down. Before starting the fire, turn off the grate switch (grate switch is sometimes located on opposite side of the boiler, per customer request) and fill the hopper full of pea or buckwheat coal.

At this point, when you look into the coal pot through the sight hole cover, you will see coal lying close to the opening. Insert several fire starters (such as Rutland Safe Lite) so that they are nearly covered by the coal. Light the starters. When they are burning and unlikely to be extinguished by the draft provided by the draft-inducing fan, turn the boiler on. The draft-inducing fan will be heard running. Make sure that the sight hole cover is pulled up against the seat (see Operation of Sight Hole Cover below). Allow the Coal Gun™ to run for two to three hours (this allows the coal in the coal pot to burn). After this time turn the grate on. The first time the grates cycle, there will be unburned coal in the ash tub. This may be placed back into the hopper.

The S130 and S260 Coal Gun™ require an ash tub, which can be obtained from Alternate Heating Systems, Inc. or your local hardware store.

The use of emergency power from a backup generator is necessary for operating the Coal Gun™ during a power failure. Without backup power, the fire in the Coal Gun will gradually go out. The boiler will be unable to supply heat without backup power.

OPERATION OF SIGHT HOLE COVER

The proper operation of the sight hole cover is crucial both in the off cycle and during fan operation. The cover position during the off cycle must be open allowing a gap of 3/8” or more between it and cover seat. This allows air

to by-pass the fire bed, preventing over heating of unit during the off cycle.



Sight Tube Cover in Open Position

When the fan is running, and unit is full of coal, the sight hole cover must be drawn against the cover seat automatically and held there during the time the fan runs. This is necessary to force combustion air through the fire bed rather than across the top.



Sight Tube Cover in Closed Position

Chimney draft conditions and fuel conditions both affect the balance necessary to achieve the sight hole cover function. Adjustment of the nut and spring tension holding sight hole cover is often necessary after installation. When this adjustment has been made, be sure to reattach the shield over the site tube. In the above photos, the shield has been removed so that the sight tube cover may be observed.

SHUTTING DOWN THE COAL GUN

When the heating season has ended, or in anticipation of a long period with no demand for heat, it will be desirable to allow the fire to go out in the Coal Gun™. Unlike non-solid fuel boilers, the fire in the Coal Gun will not go out instantly; it will necessarily have to "coast" to a stop.

The procedure for shutdown is to turn off the boiler "Main" switch and to simply wait until the fire goes out. It will be important during this time to maintain the sight tube cover in the open position, as seen in Figure 10. Without power to the draft-inducing fan, the boiler cannot actively fire and will over a period of days lose the fire. When the fire has gone out and the boiler has cooled sufficiently, the cleanout procedure described in Appendix D may be performed. This procedure is generally conducted at the end of each heating season.

AUTOMATIC FUEL DELIVERY SYSTEMS

The Coal Gun has two methods of fuel delivery – a hopper, or an auger and hopper in combination. When the hopper alone is used, the Coal Gun can run unattended for up to seven days. When used alone, the hopper must be filled by hand with a scoop or bucket. After the hopper is filled the lid MUST be placed on the hopper for combustion to occur properly. Coal is then fed by gravity from the hopper into the burn chamber.

WARNING:

The hopper lid must be on at all times during operation of the unit. Failure to keep the hopper covered could result in uncontrolled air entering the fire bed and extreme overheating.

If an auger is used to feed coal, the hopper and lid are still also used except the lid is designed with a hole to allow the coal to fall from the auger through the lid and into the hopper. The auger must be equipped with a snout, and the snout of the auger must be securely attached to the sealed hopper lid. The lid must be oriented on the hopper so that the coal falls from the auger snout into the hopper on the opposite side of the hopper from the coal-level sensor as seen in Figure 12.

BASIC AUGER OPERATION

These instructions apply only to Coal Gun™ systems supplied with auger feed:

The automatic auger switch has 3 positions:

Off – disables auger function (middle position)

Manual – This position energizes the auger at all times (for maintenance only)

Automatic – Use this position to operate the auger in automatic feed mode. The auger will be controlled by the hopper level sensor and will maintain the level of coal in the hopper.

The level sensor responds to the proximity of coal. As the hopper empties, coal will fall away from the sensor. After a programmed delay, normally one minute, the sensor will turn on the auger. The sensor will turn off the auger once a sufficient amount of coal makes contact with it.



Figure 12: Proper Auger Position

AUGER ASSEMBLY

The auger should be mounted to and connected to the hopper lid. It must also be supported by suspension from the ceiling or overhead structural framing so that the weight of the auger does not rest on the hopper lid.

GRATE TIMER OPERATION

The grate timer is a 10-minute repeat timer. The number at the dial pointer is the number of minutes the grate motor will run out of every 10 minutes the fan runs. It is important to observe ash conditions along with the level of fire in the feed tube and adjust the timer to correct problems in either area. If unburned coal appears with the ash, decrease the timer setting, that is, turn the dial to a lower number. If the fire climbs into the feed tube, increase the timer setting, that is, set the dial on a higher number. Adjust the timer in small increments.



WARNING:

If the hopper is empty while the unit is burning, add only small amounts of coal for the first half hour in order to prevent ignition of flammable gases in flue pipe area.

THERMO ASH-MONITORING GRATE CONTROL OPERATION

Ash that contains fuel that is not fully combusted will be a higher temperature than ash coming from thoroughly combusted fuel. The Thermo Ash-Monitoring Control automatically monitors the temperature of the ash leaving the coal pot. This provides a feedback mechanism for grate regulation that reduces the need for post install adjustments. Typically, no adjustment other than the factory adjustment is necessary to have the boiler perform at peak power output throughout the burn season (a minor on-site adjustment may be necessary when the boiler is first installed). With the Thermo Ash Monitoring controlled grate, it is possible for the fire to remain lit for days during low usage periods without having to adjust the grate controls by hand, as would be necessary in a timer-based grate control system.

If an ash temperature sensor is used, it should be set at 130° for normal operation. During periods of light demand, reducing the setting to 120° will aid in maintaining the proper level of coal in the coal pot.

REMOVAL AND DISPOSAL OF ASHES

Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground well away from all combustible materials pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in a closed container until all cinders have thoroughly cooled to prevent inadvertently starting a fire.

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 external to the boiler is always preferred and more reliable than treatment within the boiler.

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

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

Ph

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

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

Below a Ph of 5.0 the water is acidic enough to dissolve the steel boiler plates. Under these conditions the steel gradually becomes thinner and thinner until it is destroyed. At a Ph between 5 and 9.4 pitting of steel plates will occur at a rate dependant 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 not 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 either 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.

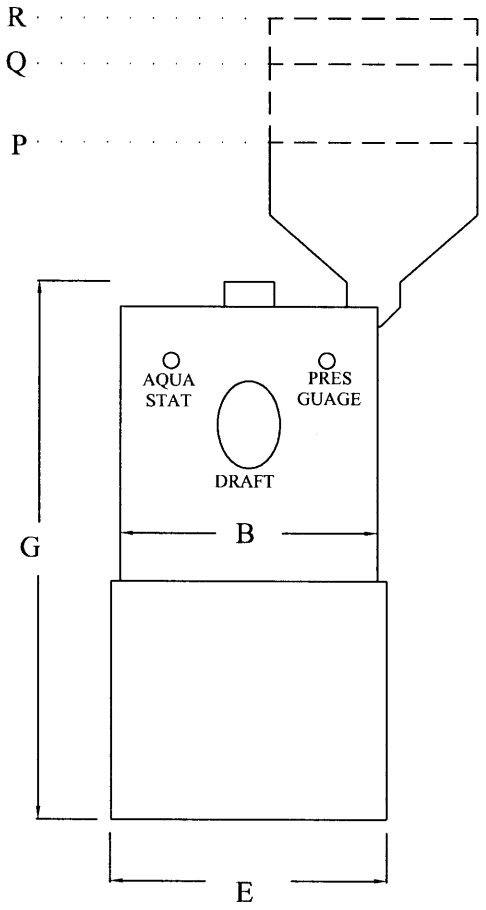
OILS

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,

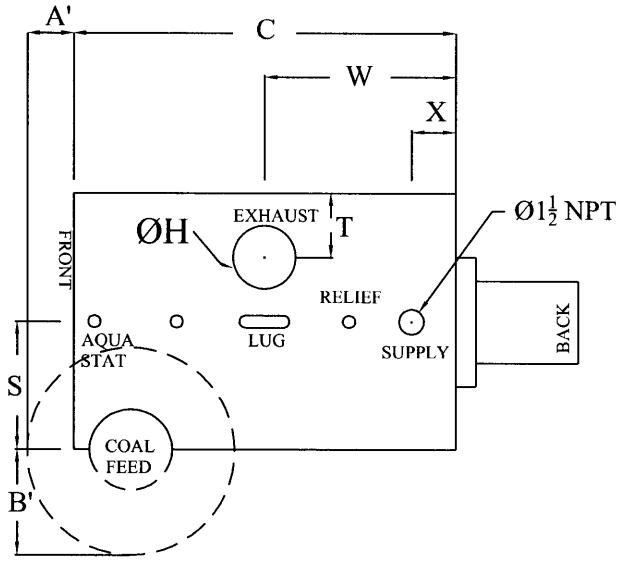
the boiler should immediately be taken out of service and thoroughly cleaned.

APPENDIX A: BOILER SPECIFICATION DIAGRAMS

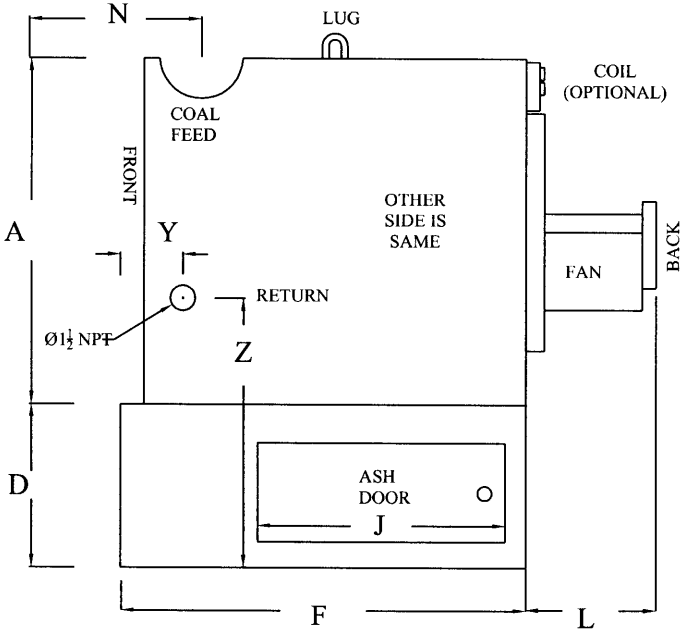
S130 - S260 COAL GUN SPECIFICATION DIAGRAM



FRONT VIEW



TOP VIEW



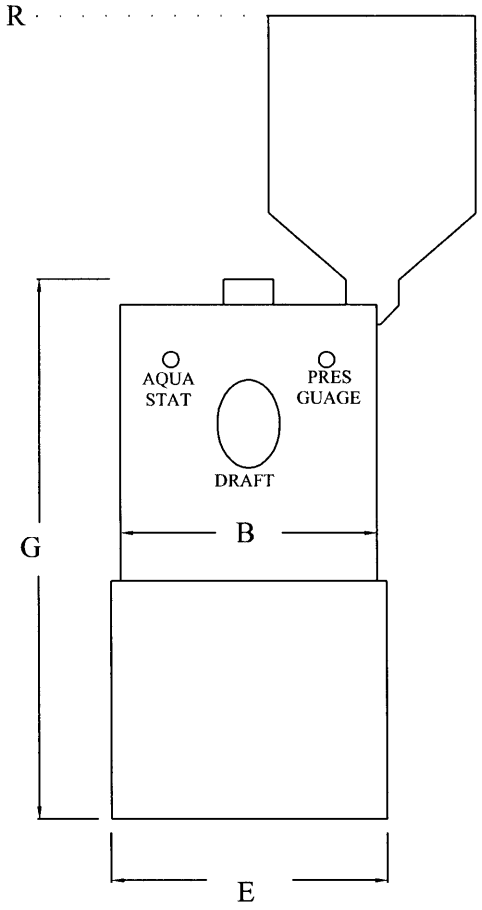
SIDE VIEW

	A	B	C	D	E	F	G	H	J	L	N	O	P	Q	R	S	T	W	X	Y	Z	A'	B'
	BOILER HEIGHT	BOILER WIDTH	BOILER LENGTH	BASE HEIGHT	BASE WIDTH	BASE LENGTH	TOTAL HEIGHT	FLUE OPENING	ASH DOOR WIDTH	FAN MOTOR LENGTH	COAL FEED	FAN MOTOR HP	TOTAL HEIGHT SM HOPPER	TOTAL HEIGHT MED HOPPER	TOTAL HEIGHT LG HOPPER	CENTER LINE	EXHAUST LOC	EXHAUST LOC	SUPPLY LOC	RETURN LOC	RETURN HEIGHT	HOPPER OVERHANG	HOPPER OVERHANG
S130	22	21	31	19	24	33	45	5	23	12	10	1/4	58	62	68	10	5	15.5	3.5	5	22	4	8.5
S260	26	25	45	21	25	48	50	6	23	19	13	1/2	63	67	73	12	6	26.5	4	7	22.5	4	8.5

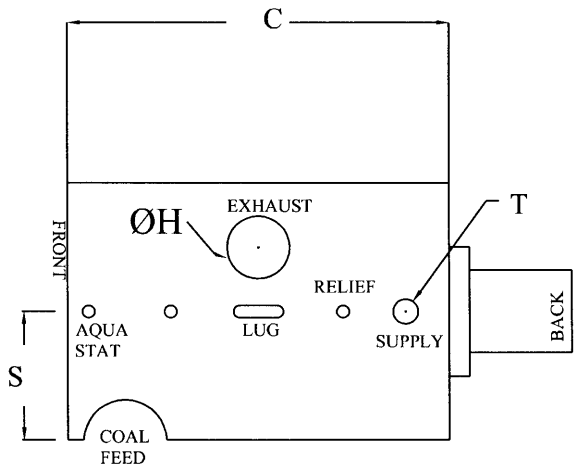
All dimensions in inches unless otherwise specified.

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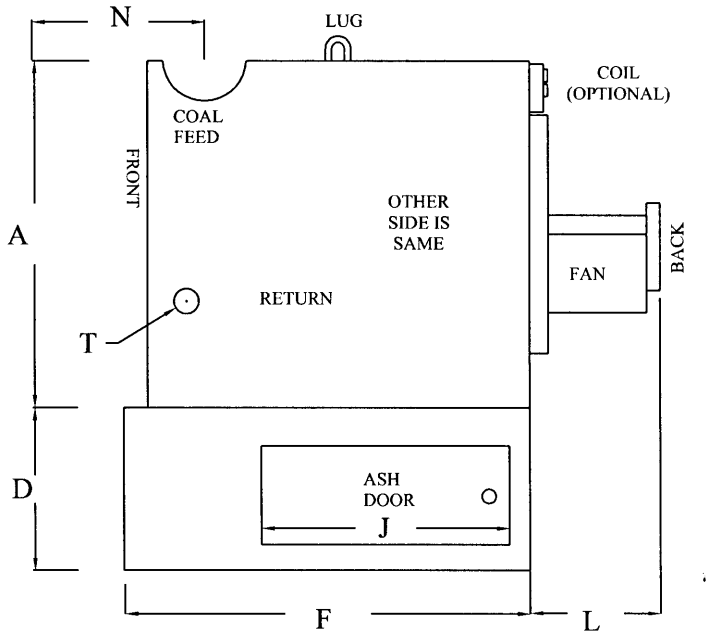
COAL GUN SPECIFICATION DIAGRAM



FRONT VIEW



TOP VIEW



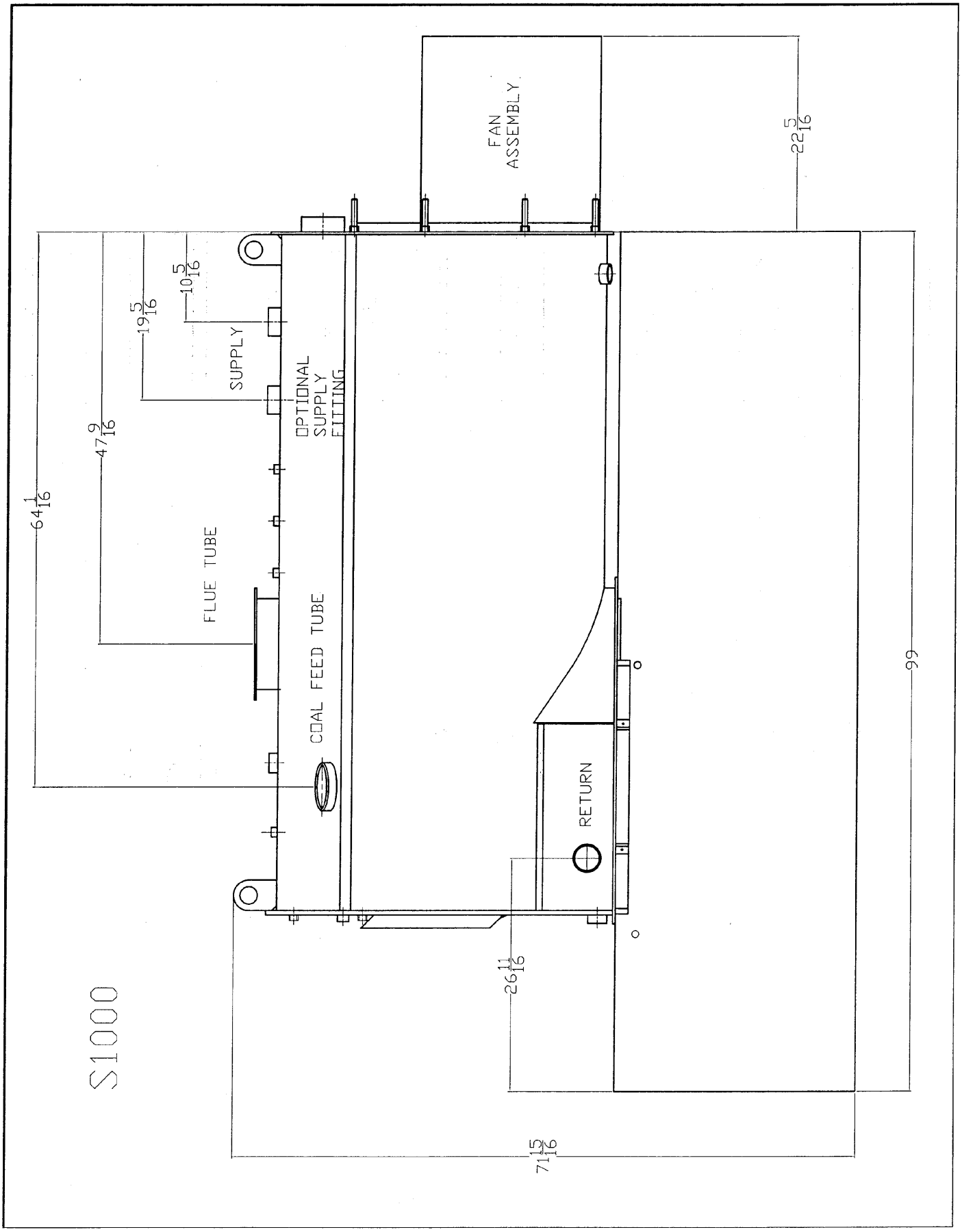
SIDE VIEW

	A	B	C	D	E	F	G	H	J	L	N	O	R	S	T
	BOILER HEIGHT	BOILER WIDTH	BOILER LENGTH	BASE HEIGHT	BASE WIDTH	BASE LENGTH	TOTAL HEIGHT	FLUE OPENING	ASH DOOR WIDTH	FAN MOTOR LENGTH	COAL FEED	FAN MOTOR HP	HEIGHT WITH HOPPER	CENTER LINE	TAPPING SIZE
S500	34	33	62	24	30	63	58	8	28	19	15	3/4	83	15 1/2	2
S1000	41	40	74	28	36	85	69	10	28	22	27	1 1/2	94	19	2 1/2

All dimensions in inches unless otherwise specified.

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Specifications subject to change without notice.


FAN ASSEMBLY
22 5/16
10 5/16
19 5/16
SUPPLY
OPTIONAL SUPPLY FITTING
47 9/16
64 1/16
FLUE TUBE
COAL FEED TUBE
RETURN
99
26 11/16
71 15/16
S1000

ADDITIONAL SPECIFICATIONS

Pressure Drop

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

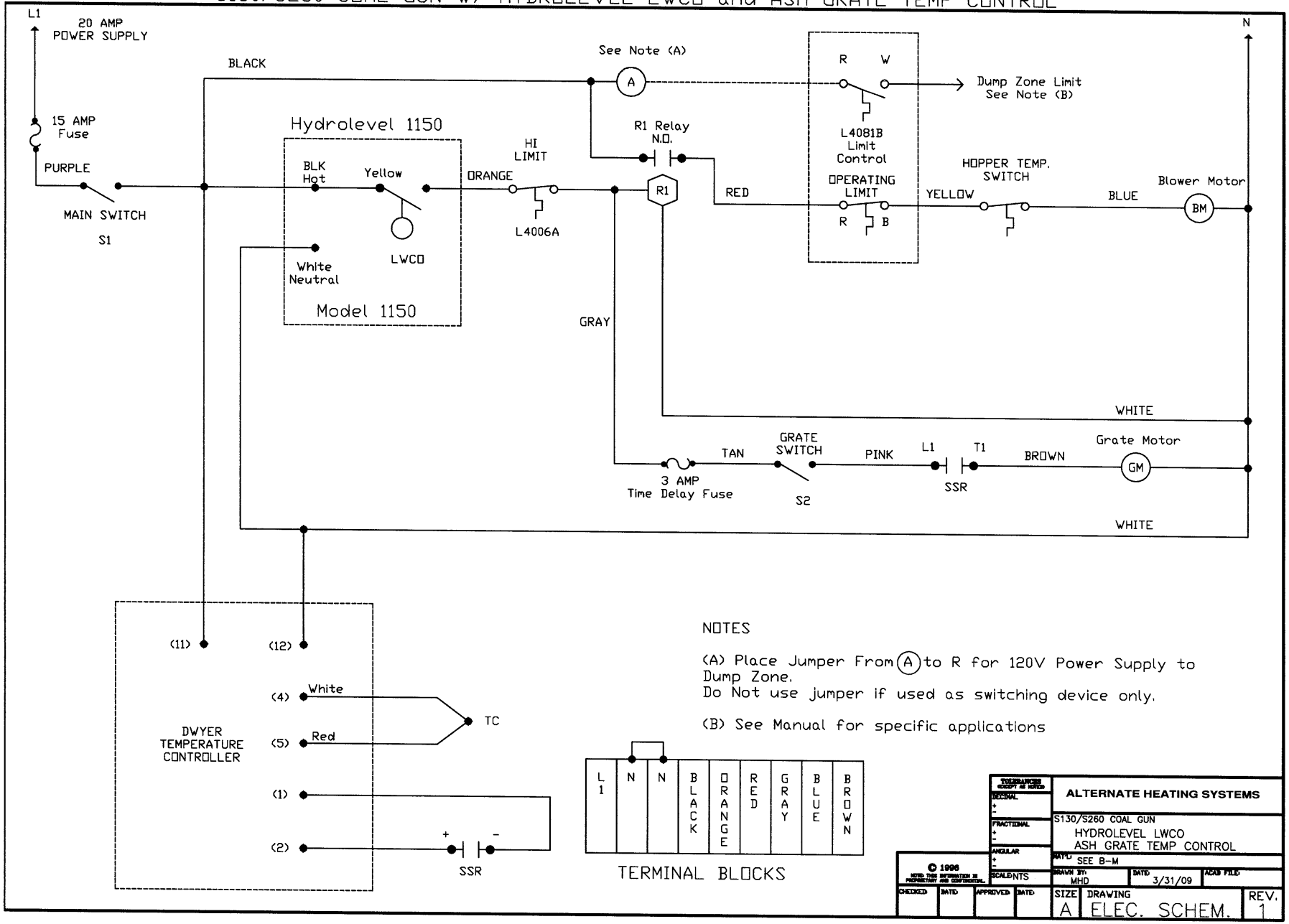
Explanation of GPM Flow

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

APPENDIX B: WIRING DIAGRAMS

S130/S260 COAL GUN W/ HYDROLEVEL LWCO and ASH GRATE TEMP CONTROL



NOTES

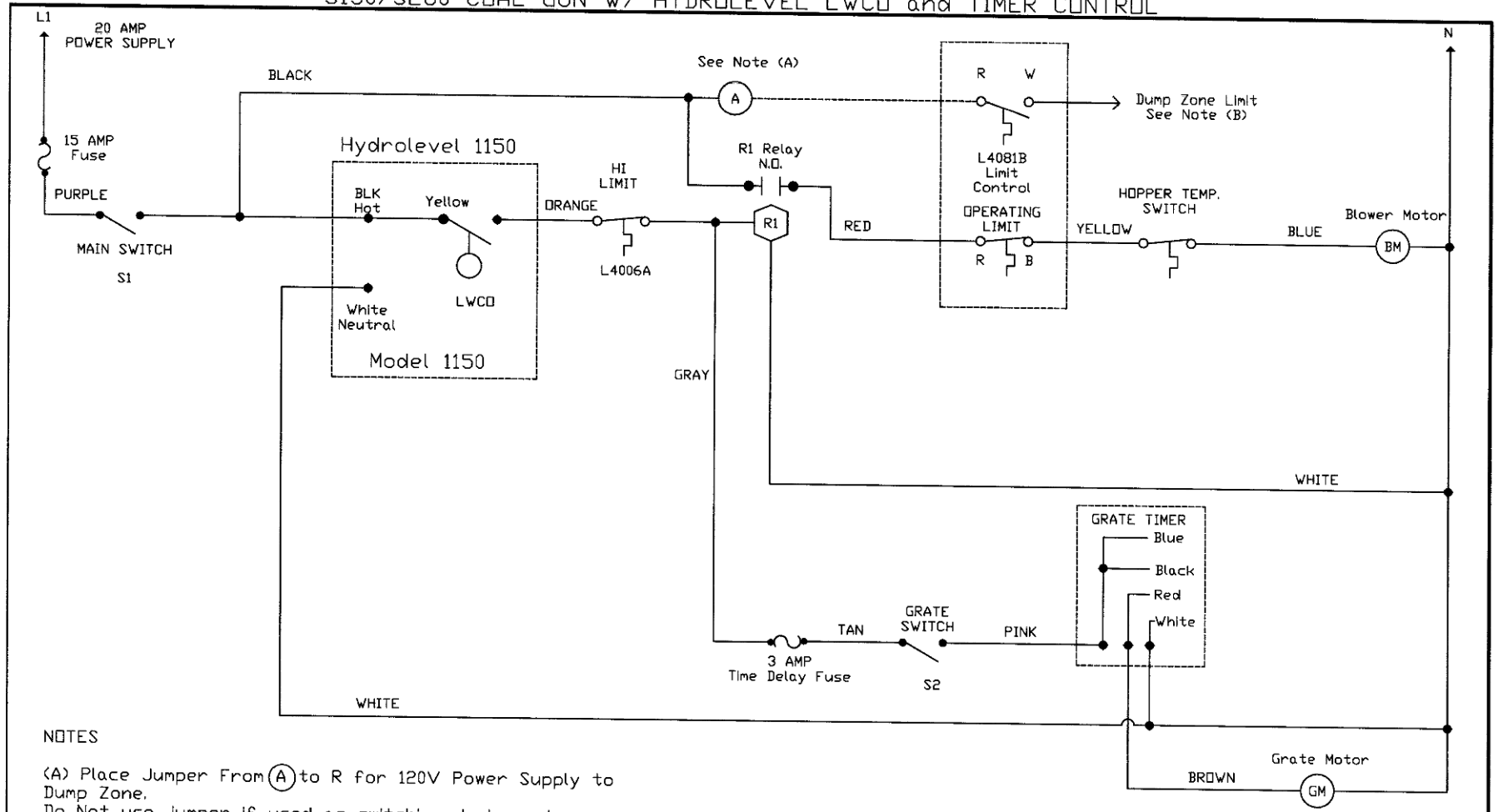
(A) Place Jumper From (A) to R for 120V Power Supply to Dump Zone.
Do Not use jumper if used as switching device only.

(B) See Manual for specific applications

	ALTERNATE HEATING SYSTEMS
	S130/S260 COAL GUN HYDROLEVEL LWCO ASH GRATE TEMP CONTROL
	SEE B-M
DRAWN BY: MHD	DATE: 3/31/09
SIZE: A	DRAWING: ELEC. SCHEM.
REV. 1	

© 1996

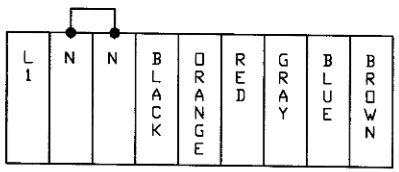
S130/S260 COAL GUN W/ HYDROLEVEL LWCO and TIMER CONTROL



NOTES

(A) Place Jumper From (A) to R for 120V Power Supply to Dump Zone.
Do Not use jumper if used as switching device only.

(B) See Manual for specific applications

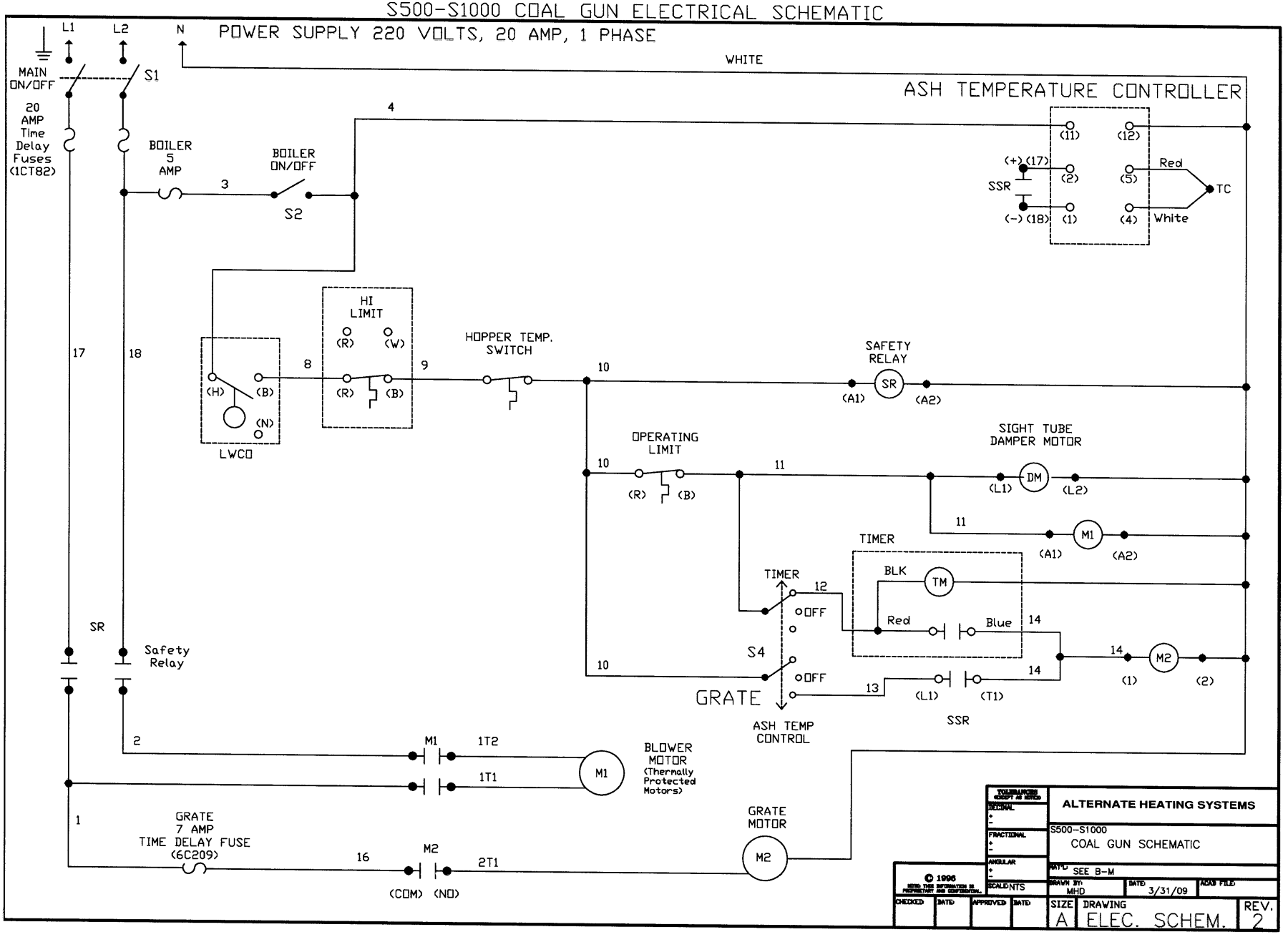


TERMINAL BLOCKS

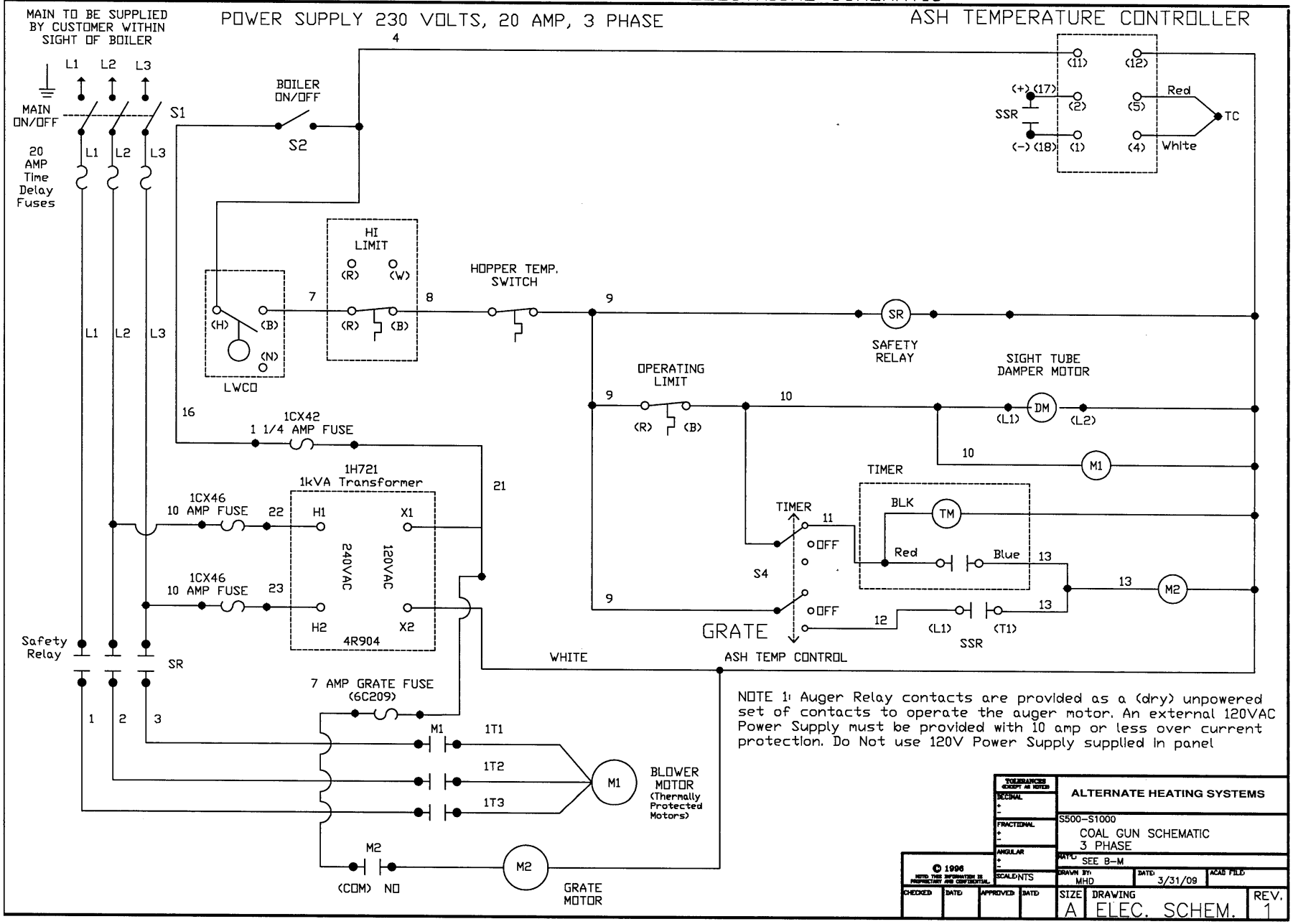
ALTERNATE HEATING SYSTEMS	
S130/S260 COAL GUN HYDROLEVEL LWCO TIMER CONTROL	
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SIZE A	DRAWING ELEC. SCHEM.
REV. 1	

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S500-S1000 COAL GUN ELECTRICAL SCHEMATIC



3 PHASE S500-S1000 COAL GUN ELECTRICAL SCHEMATIC

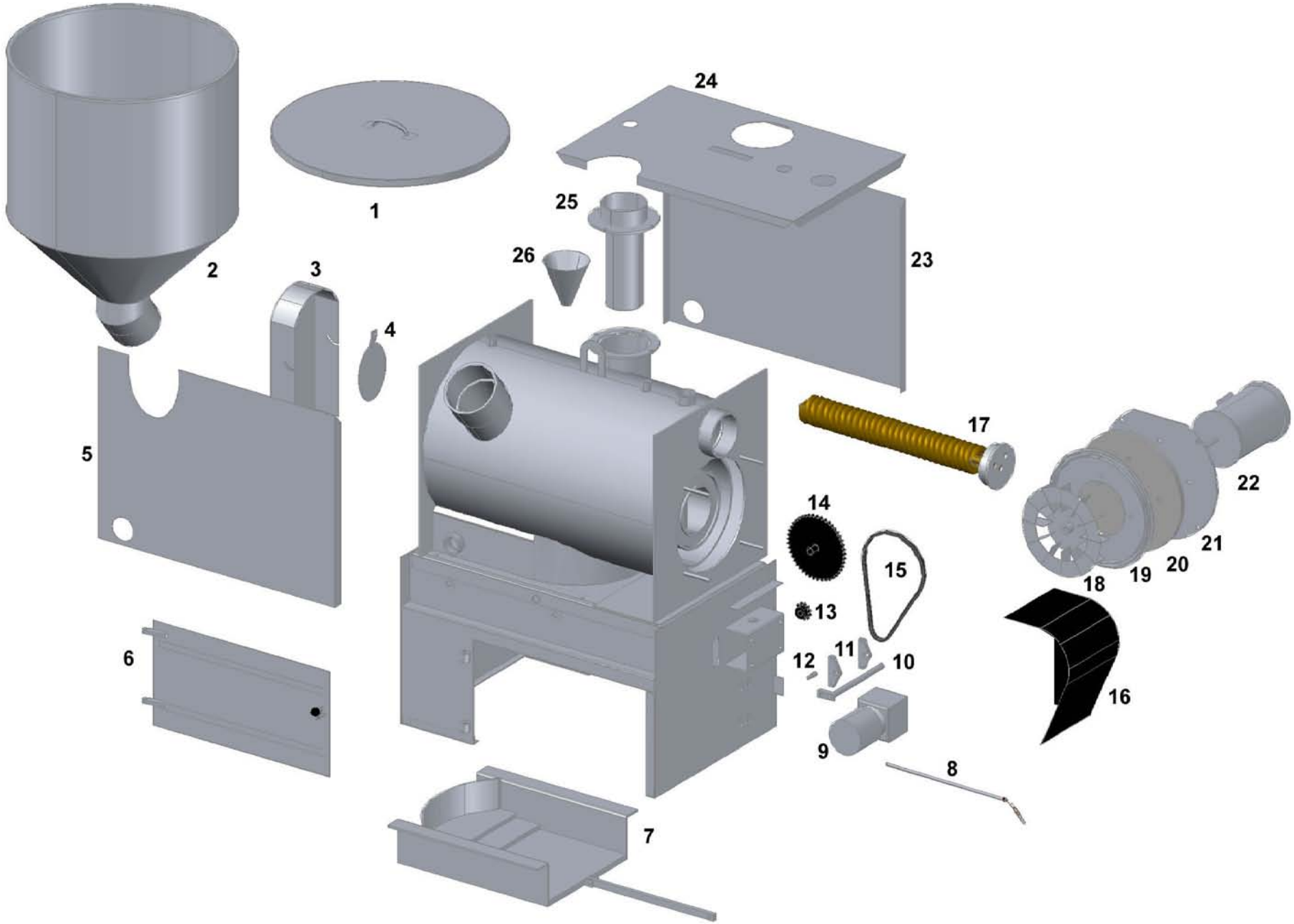


APPENDIX C: EXPLODED PARTS DRAWING

Parts Listing

(As Shown in Exploded Parts Diagram)

1.Hopper Lid
2.Coal Hopper (size varies)
3.Draft Inlet Cover
4.Draft Inlet Flap
5.Right Insulation Cover
6.Grate Base Door
7.Grate Assembly
8.Thermocouple for Thermo-Controlled Grates
9.Grate Motor
10.Pitman assembly
11.Pillow Block Bearings
12.Pitman Connecting Pin
13.Small Grate Motor Sprocket
14.Large Grate Sprocket
15.Chain
16.Chain Guard
17.Domestic Water Coil
18.Fan Disk
19.Abrasion Shield
20.Ceramic Heat Shield
21.Fan Motor Mounting Plate
22.Fan Motor
23.Left Insulation Cover
24.Top Insulation Cover (may be two separate pieces)
25.Flue Tube Assembly
26.Cyclone Funnel


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APPENDIX D: MAINTENANCE

The Alternate Heating Systems Coal Gun™ is designed to provide years of reliable service. Nevertheless, it is necessary to provide basic service in order to maintain optimum efficiency and service from your boiler. We recommend that you have your authorized Alternate Heating Systems dealer provide the seasonal preventative maintenance service. If you decide to provide your own maintenance, the instructions provided here are to be used as a guide. Routine maintenance should be performed every three months on units in continuous operation and at least once each heating season on residential installations.

Before the boiler is serviced, shut off power to the boiler. The coal fire must be completely out. If the boiler has been actively firing, it may take days for the fire to go out completely. Make sure the coal pot, boiler and ash grate are cool.

CLEANING HEAT EXCHANGER AND VENTING SYSTEM

It will be necessary to remove the fan assembly before cleaning the heat exchanger. Removing this assembly is described in a subsequent section of this manual. The exact page number is referenced in the index.

Brush and clean the heat exchanger area and vacuum all material. Remove the smoke pipe from the boiler to the chimney and clean out all debris with a brush. Clean the chimney if necessary. Remove the bolts on the boiler flue outlet and remove the cyclone tube. Clean all deposits from the tube, flue and openings in the heat exchanger tube. Inspect and replace any damaged gaskets *(a fiberglass rope gasket is used for the fan assembly)* and check the ceramic heat shield, replacing as necessary. Check the fan assembly belt on belt-driven units, adjust tension and alignment as needed, replace if worn or damaged.

Reinstall fan assembly, cyclone tube, and smoke pipe. Tighten the fan assembly bolts opposite from each other, using even torque as you work around the assembly. Refasten and seal the smoke pipe.

CLEANING COAL POT, FEED TUBE AND GRATE

Remove and clean the ash pan. Remove remaining coal from the hopper, coal pot and grate. Examine all areas for damage and clean as needed. Remove grate linkage arm and manually move grate back and forth to check bearing condition. Reassemble grate arm. Lubricate grate chain with chain oil and check sprockets for wear.

Other routine maintenance items include:

- ❑Drive belts and roller chains should be inspected and tightened if necessary. To adjust drive belt tension and alignment, loosen motor mount bolts (belt drive units only) and slide motor so as to affect proper tension and alignment. To adjust roller chain tension on grate system, loosen grate motor mount bolts and slide grate motor so as to affect proper chain tension. This will be accomplished when there is about ¼ in of play in the roller chain.
- ❑The fan shaft bearings on belt drive units should be lubricated with a small amount of high temperature service grease such as Drydene Prypoplex EB 2, or the equivalent.
- ❑Several drops of oil should be placed on the pitman shaft bearing blocks.

The chimney connector and chimney should be inspected at least monthly during the heating

season to determine if ash buildup has occurred. If ash accumulates on the walls of the stovepipe and chimney, it restricts the flow of air and reduces draft.

FAN ASSEMBLY REMOVAL/REPAIR

This guide may be used for removal of the fan assembly and repair/removal of the fan impeller. This procedure is required when servicing the fan assembly or heat exchanger area. We recommend you contact your Alternate Heating Systems dealer for this repair procedure.

WARNING:

Disconnect power to boiler before beginning this procedure.

1. Remove electric wires and conduit at fan motor or junction box..

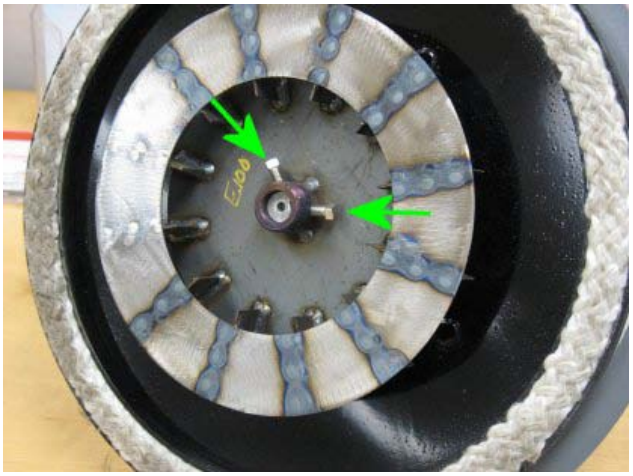
Note: Mark connections before disconnecting wires.

2. Remove the four nuts, which hold the fan assembly to the boiler. These are the outer circle of nuts on the fan plate.



3. Remove the fan assembly from the boiler and place on workbench.

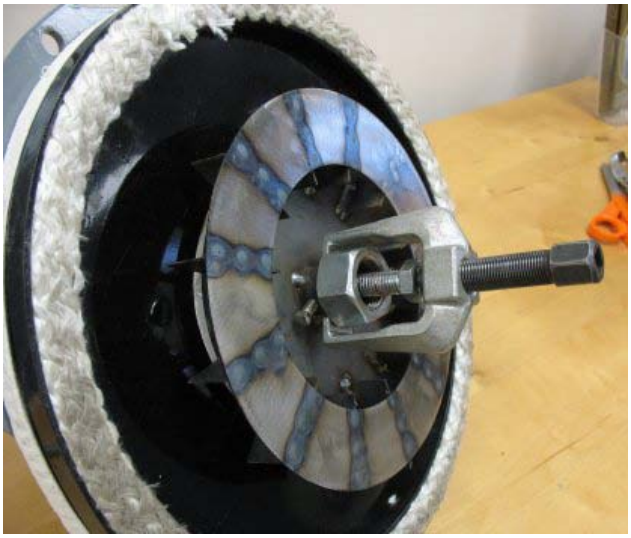
4. Remove the two ¼ - 20 square head set screws in the fan hub.



5. Thread a hex nut, size 1-14 (NF), to the hub of the fan.



6. Using a manual jaw puller attached to the 1-inch nut, carefully pull the fan from the motor shaft.



7. Clean shaft and apply a thin coat of anti seize lubricant to the shaft.
8. Place a new fan on shaft aligning one set screw hole with the keyed part of shaft. Notes: Fan hub should extend ¼ inch beyond the shaft.
9. Apply anti seize to the two set screws and install both securing the fan to the shaft.
10. Attach fan assembly to boiler and reconnect the wires.

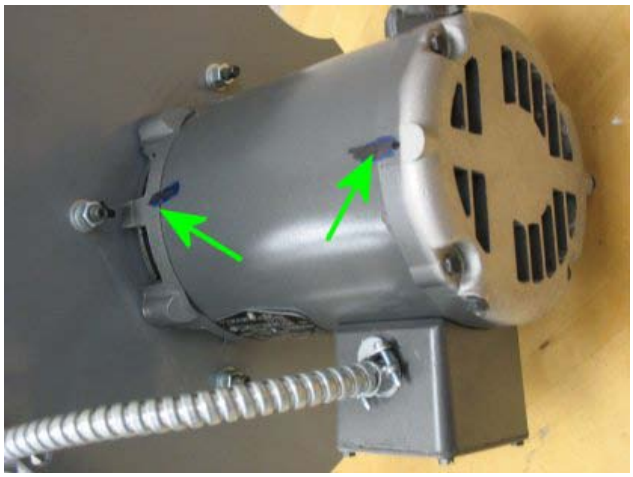
DIRECT DRIVE MOTOR BEARING REPLACEMENT

This guide may be used for replacement of direct drive induction fan motor bearings. We recommend you contact your Alternate Heating Systems dealer for this repair procedure.

WARNING:

Disconnect power to boiler before beginning this procedure.

1. Follow steps 1 – 6 of Fan Assembly Removal/Repair procedure. These will guide the removal of the fan assembly.
2. On bottom of fan assembly, mark all components to assure it can be reassembled in the same orientation.



3. After fan is removed, remove abrasion shield by removing the nuts, which hold it to the fan plate. Note: these are the inner circle of nuts on the fan plate.
4. Using broad putty knife or pry bar, carefully remove the heat shield (ceramic insulation board) from the fan plate.



5. Using a hex key (allen wrench) remove the 4 countersunk screws, which hold the fan plate to the motor.



6. Remove back cover (fan cover) from motor. The illustration in step 2 shows the motor with this cover already removed. It is secured with 3 screws on the outside of the motor.



7. From back of motor, remove the four long screws holding motor and plates together.



8. Set motor on back, shaft end up, on a workbench.

9. Using a small hammer, gently tap up on the end plate at shaft end.



10. The plate along with the armature will come loose which should be gently lifted out.



11. Check to be sure the belleville (cupped spring) washer stayed in the end cap remaining with the motor housing.

12. Remove the two screws holding the bearing to the front end cap and gently tap end cap off.



13. Using a manual jaw puller, remove bearing from shaft.



14. Install new bearing. Do not apply force on outer bearing race.

ADDITIONAL INFORMATION

For additional information on using your boiler safely, obtain a copy of the National Fire Prevention Association publication "Using Coal and Wood Stoves Safely", NFPA No. HS-8-1974. The address of the NFPA is 470 Atlantic, Boston, Massachusetts 02210.

OPERATION AND MAINTENANCE SCHEDULE FOR MODELS S130 AND S260

INTERVAL	ITEM	PROCEDURE
As Needed	Ash removal	Remove ash and observe condition of ash. Adjust grate timer if necessary.
Weekly	Fire bed (when burning poor quality coal)	Check for clinkers and remove if necessary. Note: poor coal quality produces clinkers.
Every 3 months	Roller chains	Lubricate with chain oil and take up slack.
Every 3 months	Drive belt	Check belt condition. Replace or adjust tension.
Every 3 months	Pitman shaft	Lubricate brass bushings with a few drops of oil.
Every 3 months	Fan shaft bearings(belt drive models only)	Grease with high temperature grease.
Every 6 months	Abrasion shield	Check for leakage around gasket. Adjust or replace if necessary.
Every 6 months	Flue pipe	Check for leakage around seams and re-seal if necessary
End of season	Cam bearing on grate	Check to make sure bearings are free to rotate.
End of season	Fire box	Clean and inspect fire box
End of season	Swirl chamber	Clean and inspect Inspect fan condition
End of season	Ceramic heat shield	Check for wear around fan shaft hole – replace if gap is greater than 1/6”
End of season	Flue pipe	Remove flue tube assembly and clean Inspect cyclone funnel

APPENDIX E: TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	SOLUTION
1.Boiler overheating	a) Sight hole cover flap not releasing when fan stops b) Excessive chimney draft c) Aquastat set too high	a) Check spring for proper tension b) Install barometric damper in flue c) Reduce aquastat setting
2. Pressure relief valve vents	a) Expansion tank too small or "water logged" b) High limit aquastat not functioning	a) Add expansion tank capacity necessary for total volume of water in system b) Check wiring and replace aquastat if malfunctioning
3. Fire box not full of coal	a) Obstruction in coal hopper	a) Check hopper
4. Coal burns up inlet tube	a) Grate not removing spent ash b) Fused coal (clinkers) in coal pot	a) Check for problem in grate motor circuit or mechanical linkage b) Remove clinkers (fused coal ash)
5. Fire goes out	a) Insufficient demand to maintain fire	a) Increase heat load
6. Excessive fly ash in chimney	a) Cyclone funnel plugged b) Flue pipe between boiler and chimney too long.	a) Check cyclone funnel and remove restriction. b) Reduce length of pipe run
7. Excessive sulfur odor in boiler room	a) Coal quality low b) Chimney draft problem: 1)Down draft 2)Restriction in Chimney c) Cyclone funnel on Coal Gun has deteriorated	a) Find better quality coal b) Inspect chimney 1) Check chimney design & improve 2) Check & clean chimney c) Replace cyclone funnel
8. Poor boiler performance	a) Inadequate air for combustion b) Obstruction to air flow c) Excessive ash in coal pot	a) Supply adequate air supply b) Inspect and clean swirl chamber. Remove and clean cyclone insert. c) Adjust ash removal controls.

9. Coal gas ignitions (evidenced by an audible bang) during off cycle	a) Poor draft	a) Assure a .04” of water with a manometer. Increase flue height if necessary, or use an auxiliary power vent
10. Coal gas ignitions during on (active firing) cycle	a) High volatile coal or insufficient secondary air	a) Adjust secondary air port on sight tube cover
11. Coal gas ignition at very end of firing cycle	a) Excess chimney draft, resulting in delayed release of sight tube cover	a) Install barometric damper or adjust existing barometric damper to .04” water column
12. Coal gas ignition at beginning of firing cycle	a) Too much coal added to emptied hopper b) Too small a fire relative to coal volume above fire	a) Do not allow hopper to run empty b) Adjust grate controls or increase heat load

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Figure 7: Plumbing – Coil with circulator 12

APPENDIX G: PROGRAMMING GRATE CONTROL

Note: Your grate control comes preprogrammed from the factory. If you merely wish to change the temperature (set value, *SV*) at which the grate operates, this is accomplished by going directly to step 5 on the next page (Setting Grate Operation Control):

Dwyer 16C-2 Programming

INITIAL PROGRAMMING

1. Selecting Input Type

A. Hold ↵ button for three seconds, until you see: InPt

B. Scroll with ▼ or ▲ until you see input type: J1

C. Press ↵

2. Setting Temperature Unit

A. Hold ↵ button for three seconds, until you see: InPt

B. Press ⟲ repeatedly until you see tPUn

C. Scroll with ▼ or ▲ until Fahrenheit is selected F

D. Press ↵ twice

3. Setting Control Method

A. Hold ↵ button for three seconds, until you see: InPt

B. Press ⟲ repeatedly until you see ctrL

C. Use ▼ or ▲ until the readout shows onoF

D. Press ↵ twice.

4. Setting Temperature offset for Grate Control (Heating Hysteresis)

A. Press ↵, the top LED readout will display HtS

B. Use the ▼ or ▲ to set the bottom readout to a value of 10

C. Press ↵ twice

5. Set Grate Operation Temperature

Use ▼ and ▲ to select temperature. When the desired temperature setting is shown in the bottom readout, press ↵. The grate operating temperature is set at the factory to 140° F. When the ash temperature drops to 10° (or whatever offset value is entered in step 4.) below the set value the grate system will remove ash. A.H.S. strongly recommends not setting the S.V. temp below 120° F and not above 150°F.

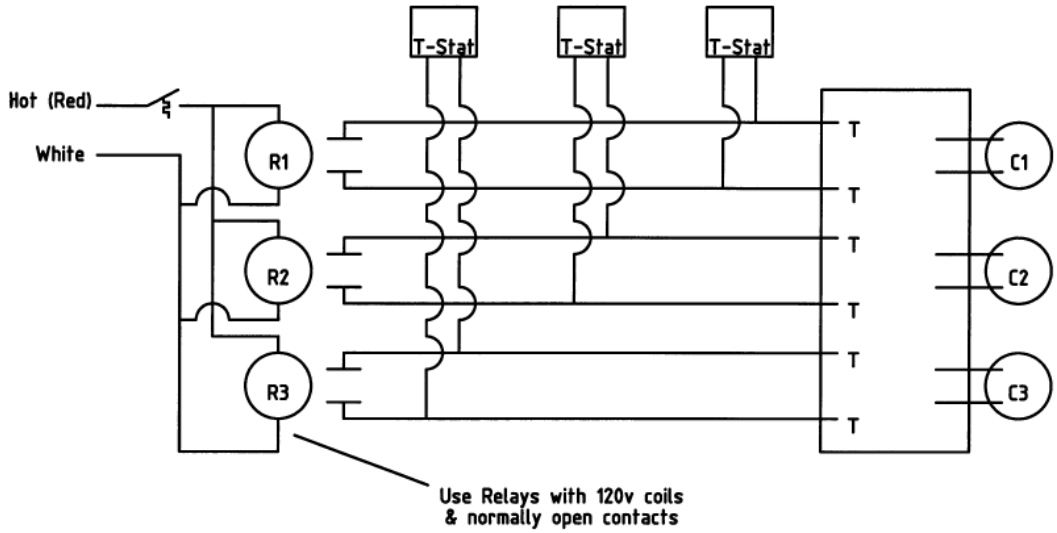
LOCKING CONTROL

Press ⟲ twice, LOC will be displayed, press ▲ to set bottom readout to 1 , Press ↵

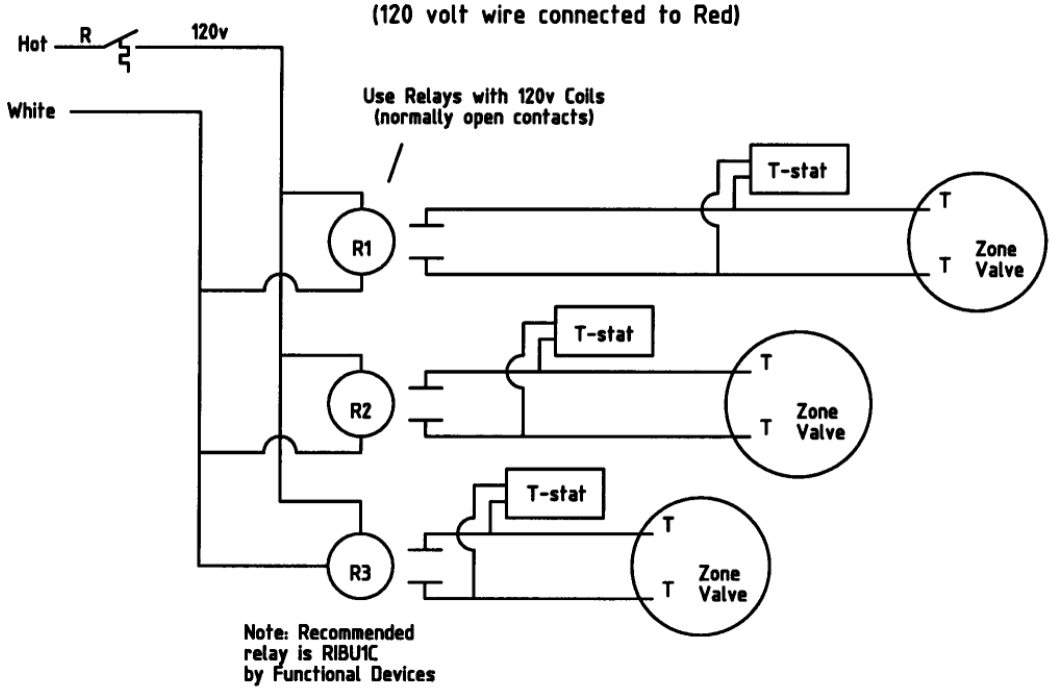
UNLOCKING CONTROLS Press ↵ and ⟲ at the same time (until display blinks). Then set the operation temperature, as in step 5. (Set Grate Operation Temperature) above.

APPENDIX H: DUMP ZONE WIRING APPLICATIONS

Example 1: Multiple Zones with Circulators
(120 volt wire connected to R)



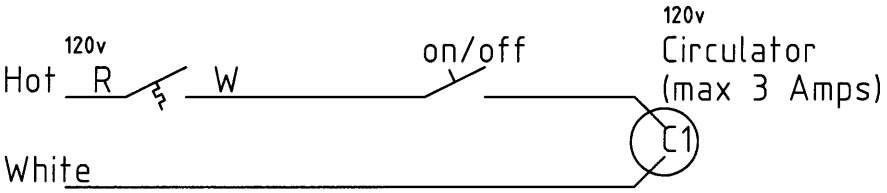
Example 2: Multiple Zone Valves
(120 volt wire connected to Red)



Example #3

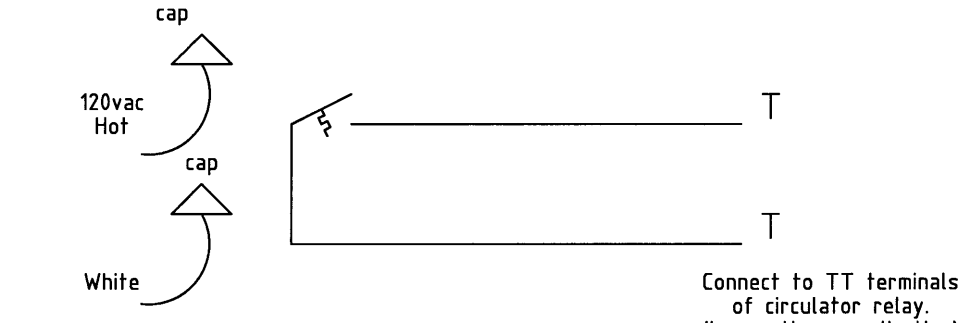
Single Zone Circulator

(120 volt wire connected to R)



Example #4

Use of Dump Zone without use of 120v wire. The control is used as a dry contact switch (low voltage application). Use 300v or higher THHN or THWN rated wire.

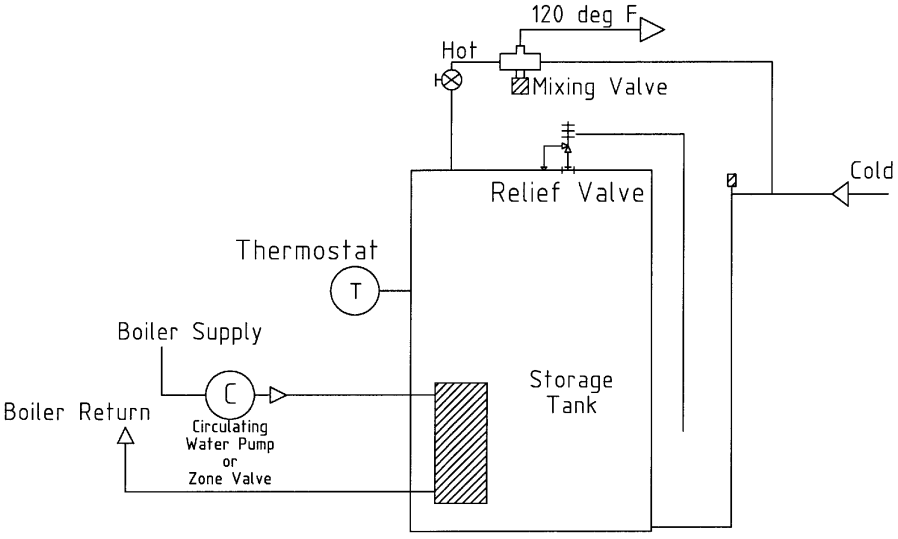


Do not use provided wires with this applicaton.

Connect to TT terminals of circulator relay. (Low voltage application)

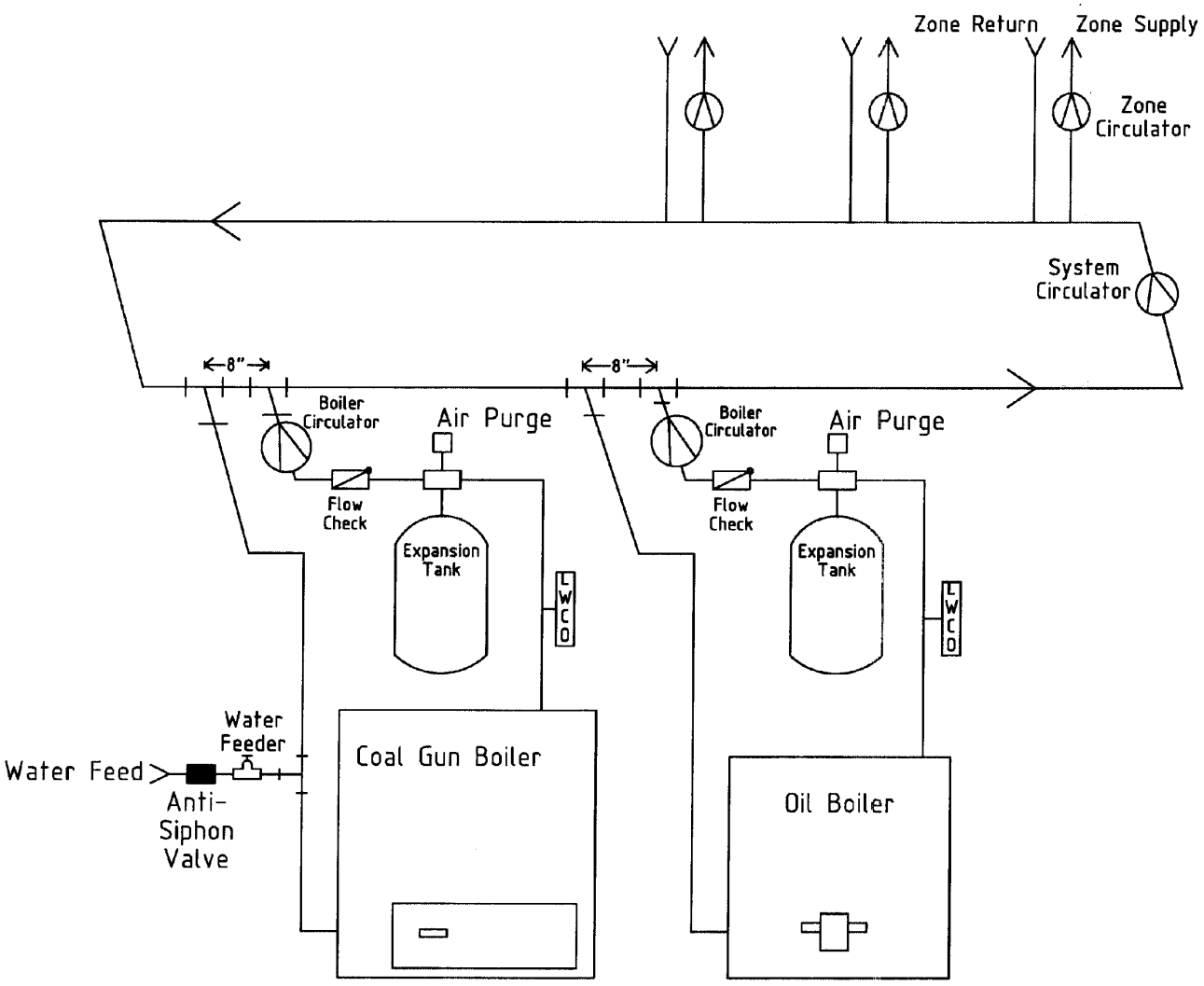
Dump Zone Example 5

(Domestic Water used as Dump Zone)



APPENDIX I: BOILER PIPING EXAMPLES

Coal Gun used in a Primary/Secondary System



Note:

1. A call for heat from any zone activates Boiler Circulators, System Circulator and Zone Circulator.

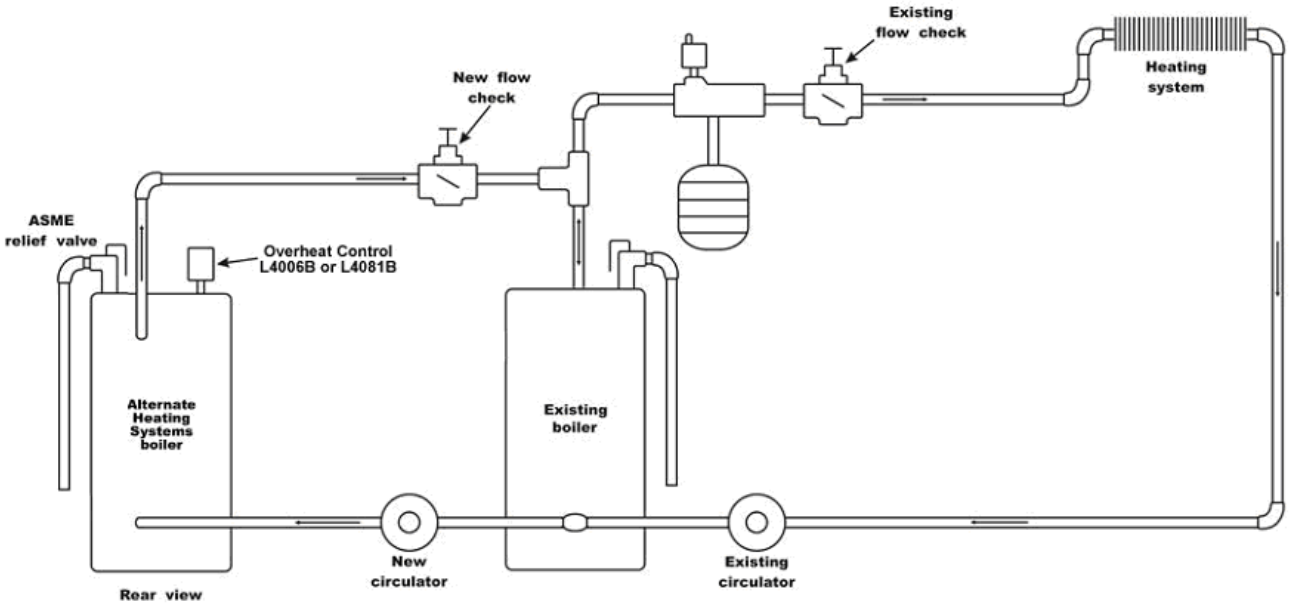
2. Each Boiler Circulator is also controlled by a low limit to prevent operation when the Boiler is cold.

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 Alternate Heating Systems dealer for additional information.

Operating an Alternate Heating Systems Boiler in Parallel with an Existing Boiler



Note: The above illustrates one possible method of connecting the Coal Gun™ 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 Coal Gun™ to the supply line, of the existing boiler on the lower side of the flow control valve. A minimum of 1" diameter pipe should be used for this connection on the model S130. 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 Coal Gun. When power to the Coal Gun is on, the circulator should be running. An alternate option is to attach a strap on aquastat on the Coal Gun supply line that closes on temperature rise. This will automatically activate the pump at a given temperature.

LIMITED WARRANTY

COAL GUN™ COAL STOKER BOILERS: S130 S260 S500 S1000 S1500
COAL/WOOD MULTI-FUEL UPDRAFT BOILERS:
WO55 WOC55 WOC70 WOC100 W40 W55 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 installation)

1)Boiler Vessel, Five (5) years. This does not cover any corrosion or deterioration in boiler vessel due to improper PH levels in water.
2)Doors (excluding gasketing, knobs, and ceramic insulation board), draft regulation mechanisms, insulation jacket, draft fan assembly (excluding ceramic heat shield), stack/cyclone assembly, firebox refactory sidepieces and center pieces – One (1) year.
3)All electrical and plumbing components and controls such as temperature/pressure gauge, safety relief valve, aquastat controllers, electric motor, domestic hot water coil, oil burner, fan shaft bearings, timer, draft motor, etc. purchased by Alternate Heating Systems from other manufacturers are limited to warranties offered by those manufacturers, typically One (1) year.
4)V-belt, pulleys, ceramic board door and fan heat shields, ceramic blanket firebox lining, fasteners, sight glass, smoke flap, door gasket and silicone rubber seal, door handle knobs, paint, wiring, and wiring devices -Thirty (30) days.
5)Coal Gun™ Grate – Five (5) years.

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 installation
d)Dealer's name
e)Type of fuel burned
5)The OWNER and <u>not</u> 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, LLC.
5171 Lincoln Way West
St. Thomas, PA 17252
(717) 369-2102

IMPORTANT: READ AND KEEP IN YOUR POSSESSION!

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