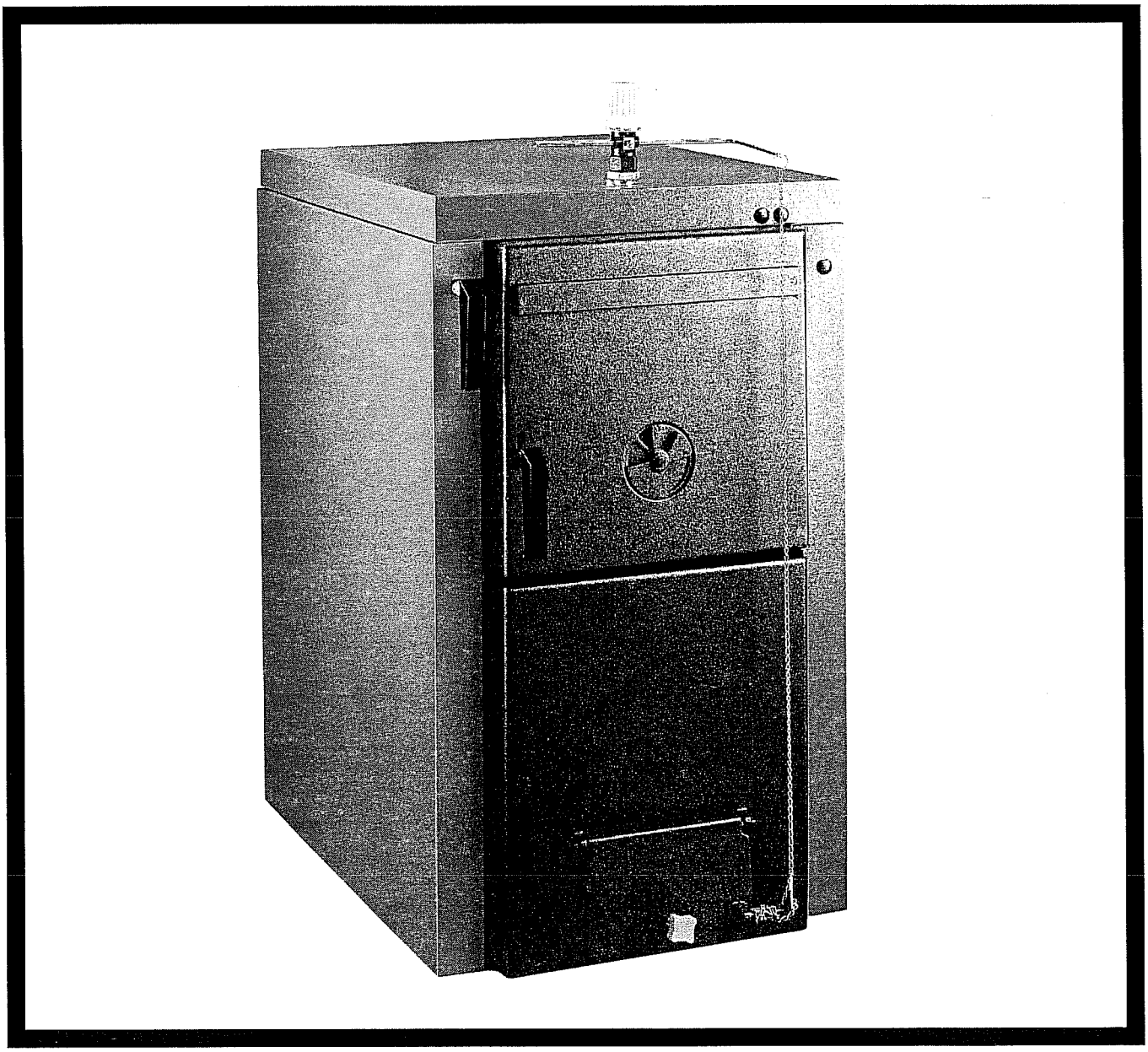
BHS 131ML-11/01 USA

Buderus

HYDRONIC SYSTEMS

Assembly, Maintenance, and Operating Instructions

Buderus G131 Cast Iron Wood/Coal Boiler



SAVE THESE INSTRUCTIONS!

This assembly, maintenance and operating manual must be kept near the boiler.

Table of Contents

General Guidelines 1

The installation, maintenance and service of this boiler, including the installation of the venting system and electrical work must only be carried out by a qualified contractor.

All work shall be performed in strict accordance with the requirements of state and local regulating agencies and codes pertaining to hot water boiler installations. After start-up the owner or its representative should be instructed about the boiler operation and be given the maintenance and operating instructions manual.

Boiler cleaning and maintenance must be carried out once annually. This shall include an overall check of the heating system. Any discrepancies must be corrected immediately.

NOTE: This manual is for reference only. This manual does NOT purport to address all design, installation and safety considerations. It is the responsibility of the user of this manual to determine the applicability and safety of each individual application and ensure its compliance with local building codes.

It is expected that the user/installer is a licensed heating contractor with knowledge of accepted industry practices for the installation and maintenance of the equipment and various applications of the equipment involved.

Important Information 2

This boiler is intended for wood or coal use only. Do not use boiler for burning garbage, or flammable liquids.

The boiler is to be installed by a qualified contractor familiar with state and local regulations.

No chemicals are to be used for igniting the fire **or** for cleaning the boiler.

NEVER operate with boiler door or cleaning door open or ajar.

The chimney and flue pipes of solid fuel burning units require frequent inspection and maintenance. Poor efficiency and the possibility of a soot fire will occur if proper maintenance is not performed.

Adequate combustion air must be provided to maintain a clean fire and proper ventilation. Operating the boiler without an adequate supply of combustion air can be hazardous.

The relief valve should be set at 30 PSI and the optional dump zone control should be no higher than 220° F maximum.

NEVER store ashes in a flammable container.

Inspect smoke pipe regularly for corrosion. If it is severely corroded; it should be replaced.

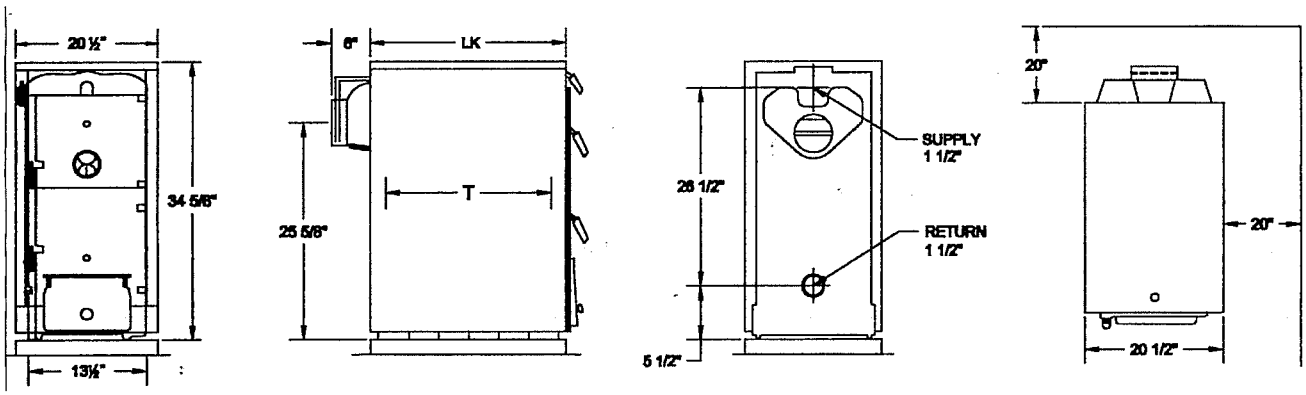
An automatic air eliminator MUST be installed on or near the boiler. Failure to do so will cause damage to the Samson control and possible cracking of the sections.

Boiler Operational Data 3

Boiler Operating Data

Maximum operating temperature:	194° F (90° C)
Maximum operating pressure:	30 PSI
Fuels:	Wood/Coal

Technical Data 4



Boiler Model	Number of Sections	Boiler Output BTU/hr Coal	Boiler Output BTU/hr Wood	Firebox Length in. T	Dimension LK in.	Boiler Weight Lbs.	Water Content Gal.	Flue Outlet Diameter in.	Chimney Draft Req'd in W.C.
G131-6	6	119,000	82,000	21	26 3/8	761	12	6	-.06
G131-8	8	159,000	109,000	28 3/8	34 1/4	926	14.5	6	-.08

Shipping Components 5

The block and the jacket of the boiler are delivered together on a skid. The ash door and the loading door are already assembled to the block. The ash pan is inside the boiler, in the lower part of the block.

A Sampson firing control is supplied with the boiler.

The draft damper is already assembled in the breach.

Some accessories and the thermal insulation are in the cardboard box containing the boiler jacket.

The box also contains a cleaning brush.

A B-Kit containing:

1 - 1 1/2" Supply manifold
1 - 1 1/2" Return manifold
1 - 30 PSI Pressure relief valve
1 - Pressure and temperature gauge
1 - 3/4" Boiler drain cock
3 - 1/4" Plug (for plugging 1/4" tapping in the return and supply manifold)
1 - 3/4" 90° St. Elbow (for vertical positioning of pressure relief valve)
1 - Honeywell L6006A-1012 Aquastat (control of the shunt pump)
1 - Flue outlet adapter for 6" vent pipe
1 - Sampson Controller
1 - Taco 007 circulator pump
1 - 3/4" Cast iron flange set

Safety Information (Installation) 6

All instructions and schematics are provided for reference purposes. Your state and local regulators may dictate that alternate procedures be used. All local codes take precedence over these installation instructions.

The over-temperature dump zone control is optional, Honeywell (L6006A-1012).

The pressure relief valve should be vented to an open floor drain to prevent damage to finished basements.

Any water leaks in the system should be sealed, no matter how small. Continuous feeding of fresh water into any heating system can damage or block the boiler water ways.

Boiler Sizing

This equipment is designed for both whole house or add-on applications. Size the wood/coal boiler to the firing rate of the burner that you are replacing or adding on to.

Overloading during mild weather will cause heavier than normal creosote formation.

Creosote formation will occur in any wood burning appliance. A regular cleaning schedule is **MANDATORY.**

Boiler Location 7

The boiler should be located as close to the chimney as possible and it is recommended that the smoke pipe should not exceed 10 feet in length. Use as few elbows and tees as possible as they act as ash and creosote traps.

The smoke pipe from a solid fuel unit must always rise from the unit to the chimney flue. A 1 inch-rise per 10 feet is minimum which must be maintained. **NEVER** slope the smoke pipe downward.

If used in conjunction with another heating unit, use as little piping as possible to minimize heat loss.

The boiler should be mounted on a raised pad (2 inch minimum) of non-combustible material. The front edge of the boiler should be aligned with the front edge of the pad so that ashes do not interfere with the operation of the air door.

A minimum clearance of 20 inches from the top, sides, rear and 48 inches at the front for cleaning and feeding is required.

NOTE: **Local codes may require greater clearances and those requirements must be met.**

For pad dimensions, see the chart below:

Boiler Size	G 131-6	G 131-8
Foundation Length (in.)	27	35
Foundation Width (in.)	20 1/2	20 1/2

Chimney 8

The boiler must be connected to a chimney which is approved for solid fuel burning in your area.

Suggested guidelines for the chimney are that it be:

- Of greater size than the smoke pipe diameter
- Fully ceramic tile lined
- Higher than the peak of the house
- Unobstructed by overhanging trees
- Equipped with a clean-out
- Easily inspected visually from the clean-out up the flueway to the exit
- Free of protrusions in the flueway
- Not shared with fireplaces, stoves, or room heaters. In most locations, a gas appliance may NOT be vented into the same chimney as a coal or wood boiler.
- Open at the top (not screened)

With multiple appliances sharing a common chimney, it is possible for the wood/coal boiler to smoke lightly out through the upper feed door during loading.

When venting a wood/coal boiler into a common chimney with an oil fired boiler, the oil fired boiler vent connection must be below the vent connection of the wood/coal boiler. This will prevent wood/coal smoke from entering the oil fired boiler.

Draft Control

A barometric draft control may be used on coal burning equipment to prevent excessive draft. A barometric draft control should not be used for wood firing. The barometric draft control will allow cool air to enter the smoke pipe. This cool air will increase creosote build-up in wood burning chimneys. The barometric draft control for coal burning should be located in the vent connector between the boiler and chimney.

Setting up the Boiler 9

Place the boiler body on the foundation as described in the boiler location section. The ash door must be flush with the front edge at the foundation. Level the boiler from side to side and front to rear using metal chocks or shims as required before any piping is installed. Inspect the cement between the sections. Replace with furnace cement any section where the cement has cracked or fallen out.

Put the Sampson firing controller into the front tapping on top of the unit.

> **NOTE**: This tapping is not tapered and will require hemp or teflon tape to seal.
>
> Position the controller such that the set screw is to the rear of the boiler.

Loosen the set screw, remove the wood plug, and insert the long end of the "L" bracket into the Samson controller.

Keep the short end of the "L" as near to level as possible and align it with the air door eyehook and tighten the screw set.

Turn the thumbscrew until the air door opens 1/8" for a minimum air setting.

Connect the control chain into the air door, tighten until the "L" is horizontal, and tighten the lock nut which is on the outside of the door.

Connect the boiler into the hot water piping system. The correct placement and use of valves, unions, flow control valves, air vents, and fittings are the responsibility of the contractor.

> **NOTE**: If a new automatic fill valve is installed, it should be connected to the piping. **NEVER** put cold water directly into a hot boiler.

Attach the flue outlet adapter that is supplied to the flue outlet collar of the boiler. Connect the smoke pipe from the adapter to the chimney. Use screws to secure the smoke pipe sections together.

Near Boiler Piping

Install the 1 1/2" flanged connection and the 1 1/2" supply manifold (provided) to the upper rear flange connection on the boiler. Orient the manifold so that the temperature/pressure gauge is facing in the desired direction.

Install the temperature/pressure gauge into the supply manifold.

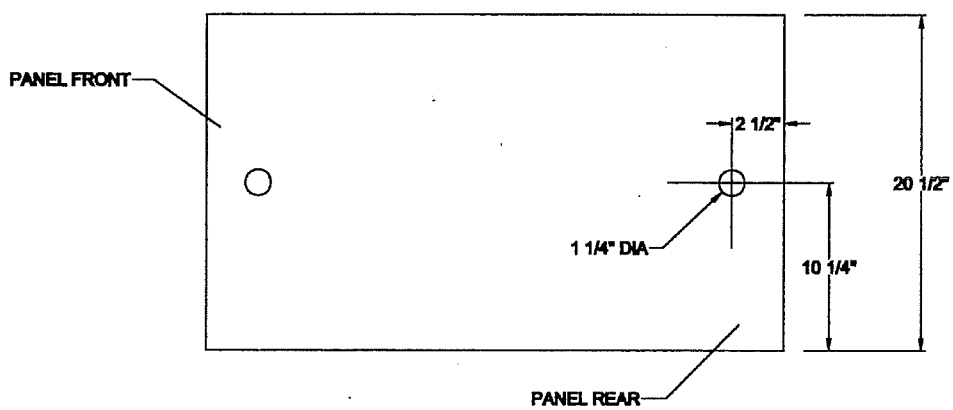
Install the pressure relief valve into the supply manifold in a vertical position using the 3/4" 90° St. Elbow (provided).

Install the 1 1/2" flanged connection and the 1 1/2" return manifold (provided) into the lower rear flange connection on the boiler.

Install the shunt pump (provided) and the flow check or check valve (not provided) in the piping between each one of the 1" connections on both the supply and return manifolds (see piping schematic).

Install a 1 1/2" x 1/2" x 1 1/2" tee (not provided) on the outlet of the supply manifold for installation of a dump zone control (L6006A-1012 not provided). See piping schematic for dump zone piping if used. If a dump zone is not used install 1/2" plug (not provided) into the tee.

Remove the factory installed well from the 1/2" tapping at the top rear of the boiler. Install the Honeywell 1/2" aquastat well for the L6006A aquastat (provided) for control of the shunt pump at this location. A hole will have to be cut into the jacket top panel for the Honeywell aquastat well (see hole location below).



Jacket Assembly 10

1) Install (4) Brass studs on top of the left and right side panels using nuts and lock washers provided.
   - Screw in sheet metal screws (4) at the bottom rear of the left and right side panels, leaving a 1/16" gap.
   - Insert plastic bushings (2) into the left side panel at top front and rear, slide the damper rod shaft through the bushings in the left side panel.

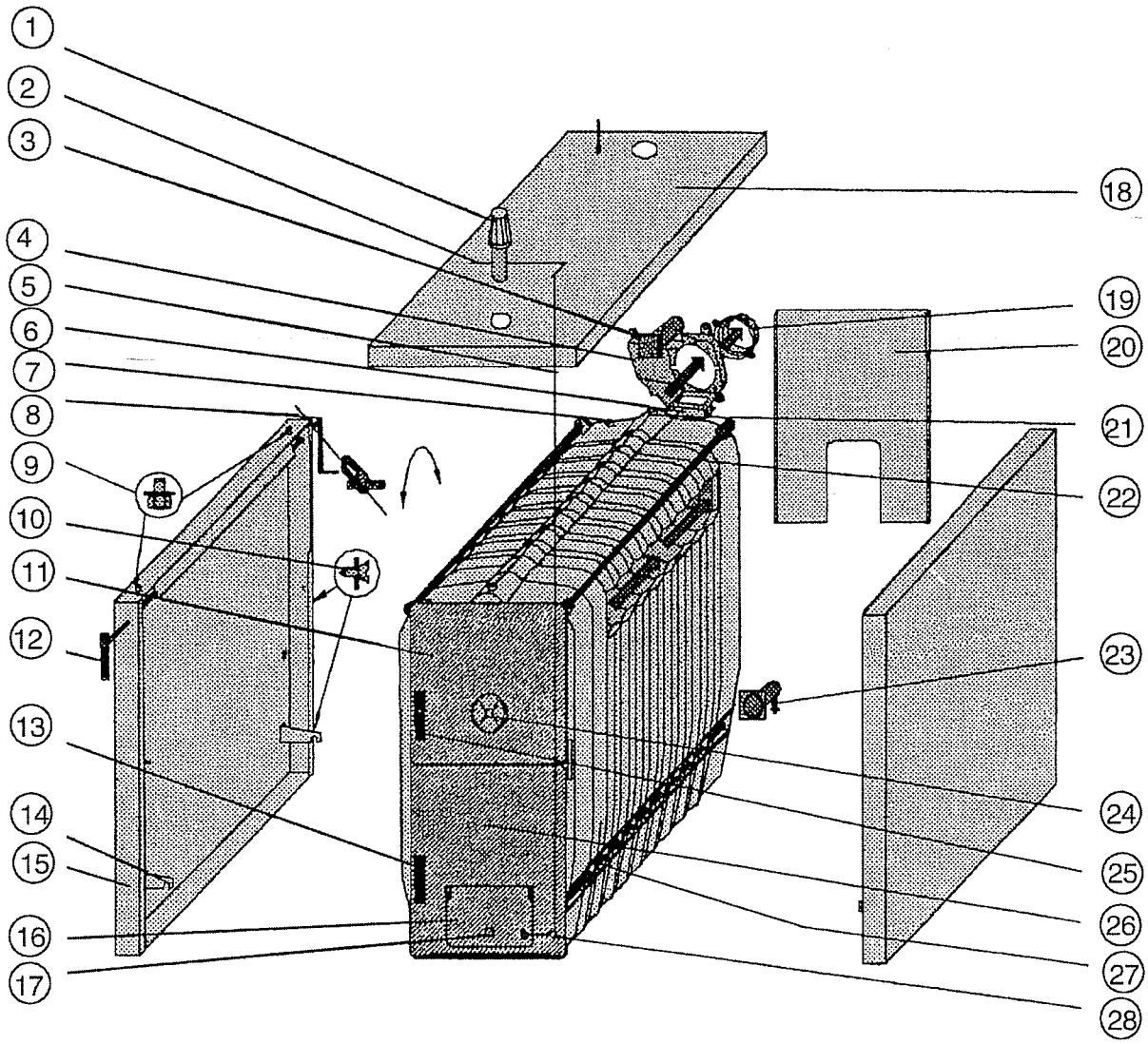
2) Install the left side panel on the Boiler.
   - Loosen the bottom tie rod nuts.
   - Mount Panel with the hooks of the panel on the lower tie rod and the tab at the top of the panel over the top tie rod.
   - Tighten the tie rod nuts.

3) Install the right side panel on the boiler
   - Loosen the bottom tie rod nuts.
   - Mount panel with the hooks of the panel on the lower tie rod and the tab at the top of the panel over the top tie rod.
   - Tighten the tie rod nuts.

4) Place the top panel on the boiler over the (4) Brass studs on top left and right side panel. Cut a hole in the top panel for the Honeywell aquastat well for the L6006A shunt pump control (provided). (See page 11 for hole location dimensions)

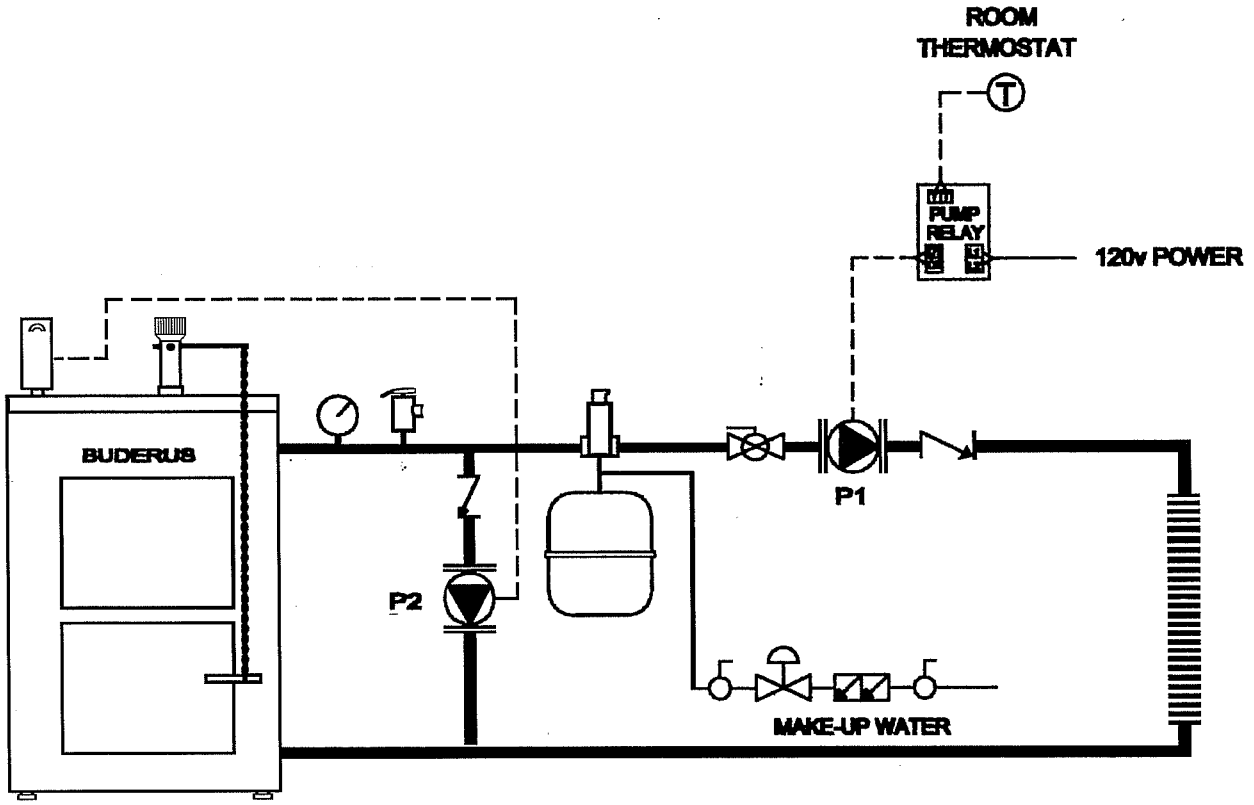
5) Install the rear panel
   - Place the insulation provided on the rear panel
   - Place the rear panel over the sheet metal screws on rear of the left and right side panels.

Jacket Assembly cont. 10



1. Sampson Controller
2. "L" Arm
3. Supply Manifold
4. Breach
5. Control Chain
6. Rear Jacket Panel Insulation
7. Tie Rod Upper
8. Damper Rod Shaft & Linkage
9. Brass Studs
10. Sheetmetal Screws
11. Upper Door
12. Damper Rod Handle
13. Lower Door Handle
14. Tie Rod Hook
15. Left Side Jacket Panel
16. Air Door
17. Minimum Air Setter
18. Top Jacket Panel
19. Flue Outlet Adapter
20. Rear Jacket Panel
21. Right Jacket Panel
22. Upper Tie Rod
23. Return Manifold
24. Air Rosette
25. Upper Door Handle
26. Lower Door
27. Lower Tie Rod
28. Eye Hook

Wood/Coal Boiler with Shunt Pump



Description

The shunt pump (P2) controlled by the L6006A in the boiler, is on if the boiler water temperature is below 150° F. This will provide flow through the boiler all of the time and prevent condensation from taking place in the boiler flueways.

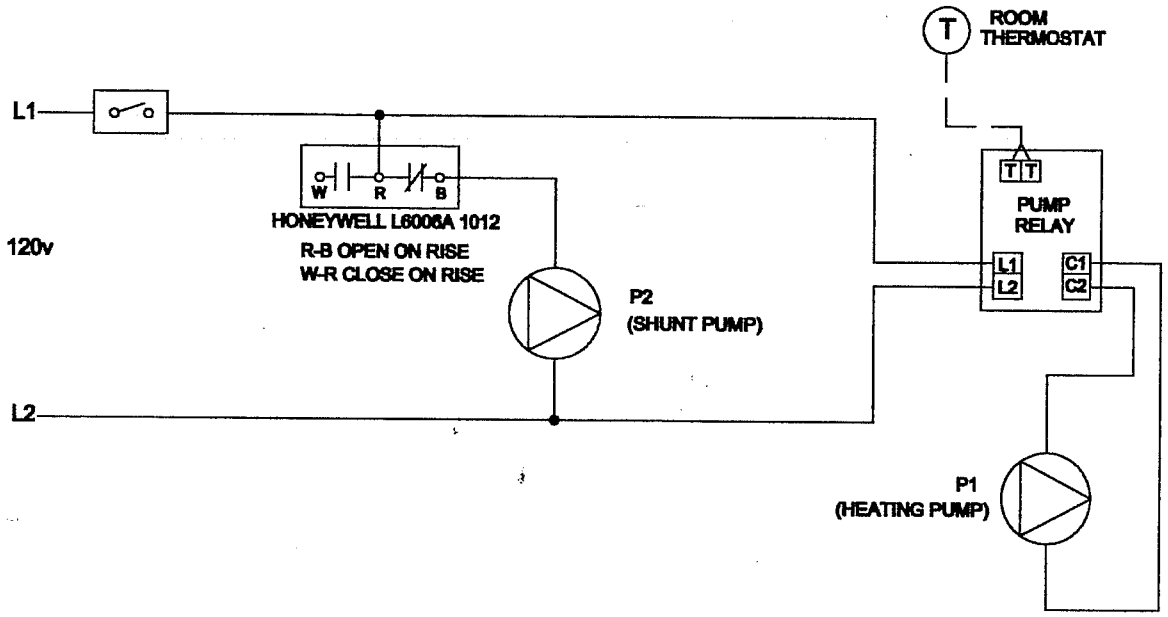
On a call for heat by the room thermostat the heating pump (P1) is turned on.

When the boiler water temperature reaches 150° F the shunt pump control (L6006A) in the boiler will turn the shunt pump (P2) off.

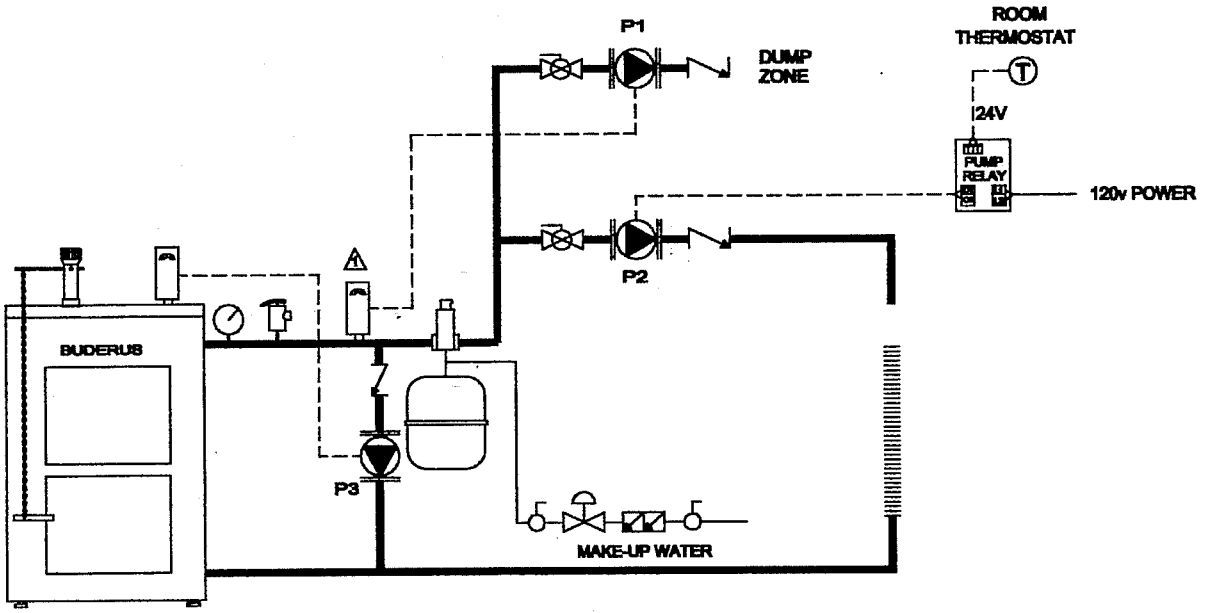
The heating pump (P1) will continue to run until the room thermostat is satisfied.

The shunt pump (P2) is turned on again by the L6006A control when the boiler water temperature drops below150° F.

Wood/Coal Boiler with Shunt Pump



Wood/Coal Boiler with Optional Dump Zone



Description

The shunt pump (P3) controlled by the L6006A in the boiler, is on if the boiler water temperature is below 150° F.

On a call for heat by the room thermostat the heating pump (P2) is turned on.

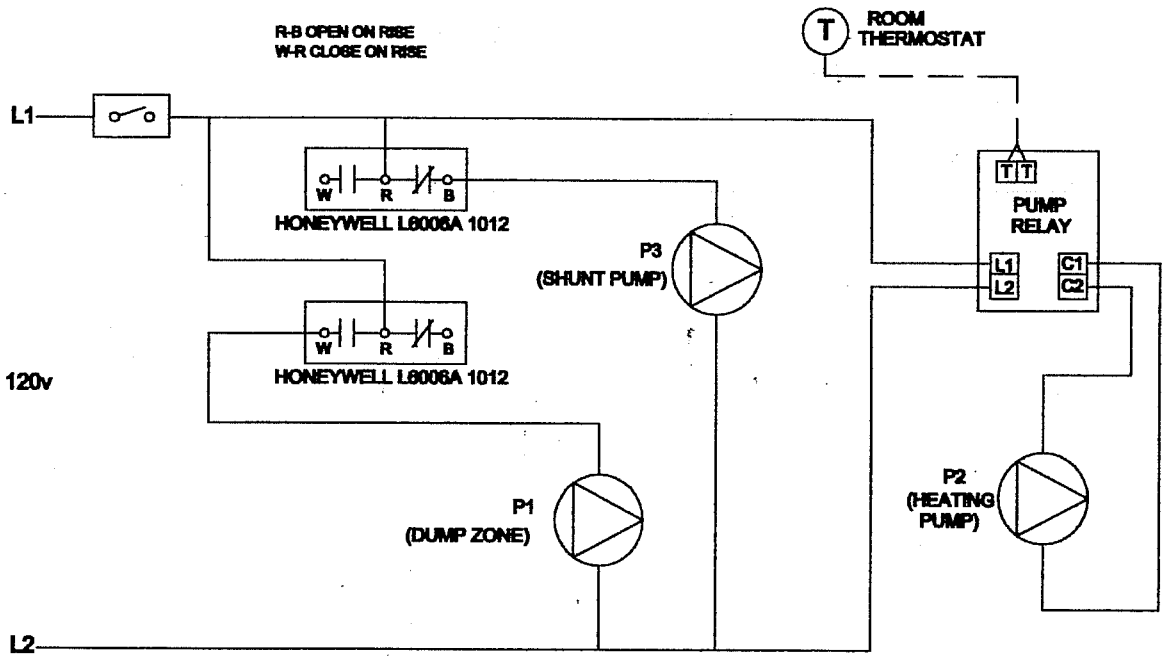
When the boiler water temperature reaches 150° F the shunt pump control (L6006A) in the boiler will turn the shunt pump (P3) off.

Should the boiler water temperature reach 210° F, the dump zone control L6006A in the supply piping will turn on the Dump zone pump (P1). The dump zone pump will run until the boiler water temperature drops to 190° F and the L6006A control in the supply piping turns off the dump zone pump (P1).

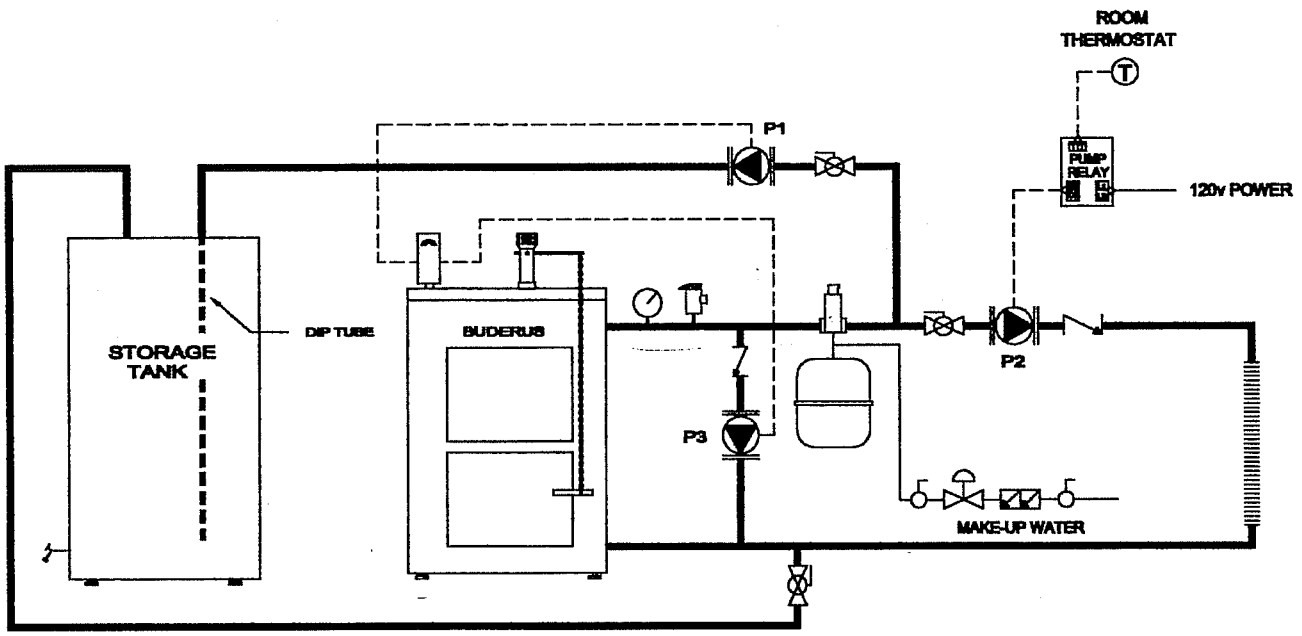
The heating zone pump (P2) will continue to run until the room thermostat is satisfied.

The shunt pump (P3) is turned on again by the L6006A control when the boiler water temperature drops below150° F.

Wood/Coal Boiler with Optional Dump Zone



Wood/Coal Boiler with Storage Tank



Description

The shunt pump (P3) controlled by the L6006A in the boiler, is on if the boiler water temperature is below 150° F.

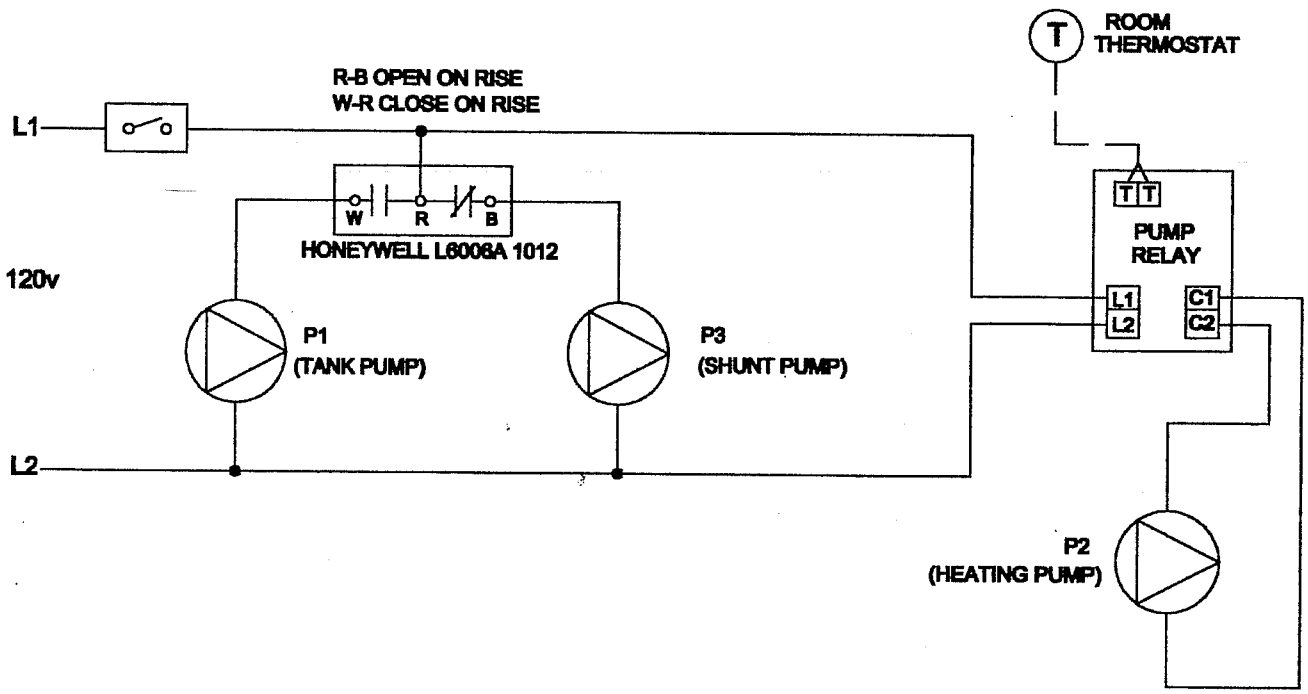
On a call for heat by the room thermostat the heating pump (P2) is turned on.

When the boiler water temperature reaches 150° F the shunt pump control (L6006A) in the boiler will turn the shunt pump (P3) off and the storage tank pump (P1) will be turned on.

The heating pump (P2) will continue to run until the room thermostat is satisfied.

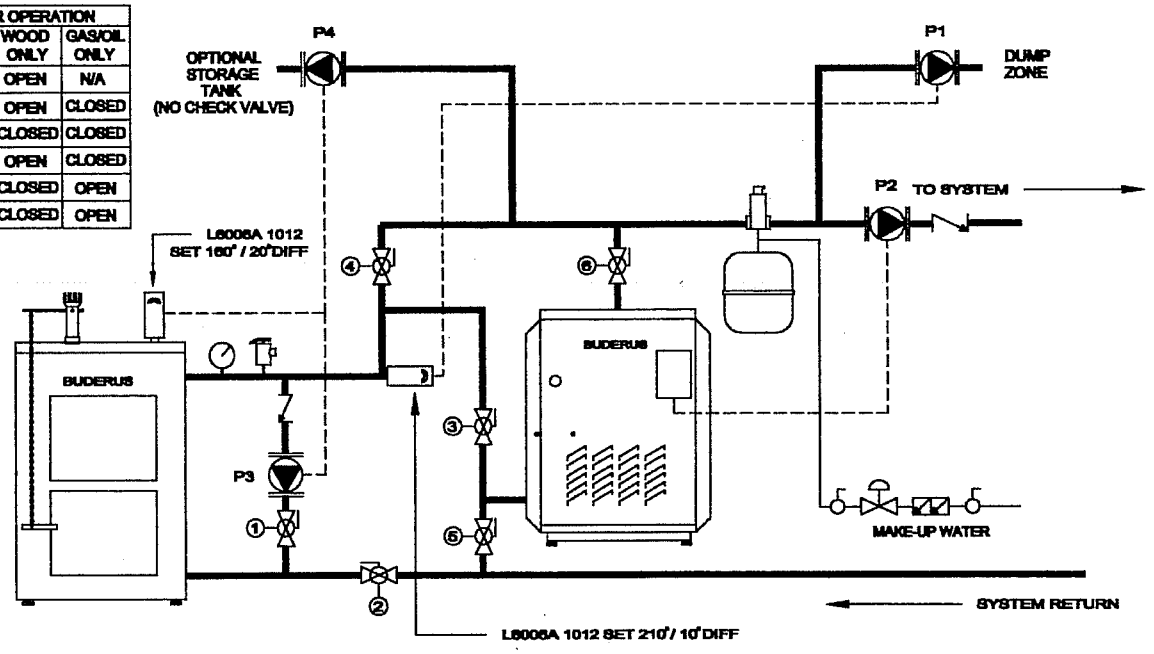
When the boiler water temperature drops below150° F the L6006A control in the boiler will turn the shunt pump (P3) back on and the storage tank pump (P1) will be shut off.

Wood/Coal Boiler with Storage Tank



Wood/Coal Boiler with Gas/Oil Boiler

VLV #	BOILER OPERATION BOTH	WOOD ONLY	GAS/OIL ONLY
①	OPEN	OPEN	N/A
②	OPEN	OPEN	CLOSED
③	OPEN	CLOSED	CLOSED
④	CLOSED	OPEN	CLOSED
⑤	CLOSED	CLOSED	OPEN
⑥	OPEN	CLOSED	OPEN



Description

The shunt pump (P3) controlled by the L6006A in the boiler, is on if the boiler water temperature is below 150° F.

On a call for heat by the room thermostat the heating pump (P2) is turned on.

When the wood/coal boiler water temperature reaches 150° F the shunt pump control (L6006A) in the boiler will turn the shunt pump (P3) off.

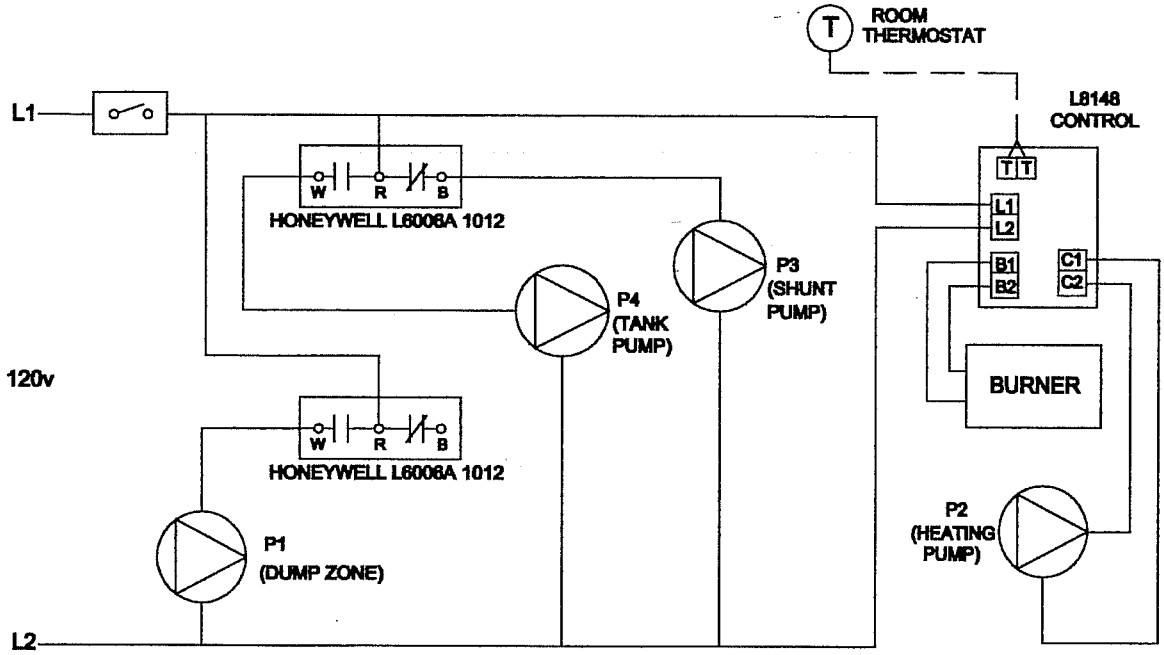
The heating pump (P2) will continue to run until the room thermostat is satisfied.

If the boiler water temperature in the wood/coal boiler reaches 210° F, the dump zone control (L6006A) in the supply piping will turn on the dump zone pump (P1),the dump zone pump will run until the wood/coal boiler water temperature drops to 190° F and the control turns off the dump zone pump (P1).

If the room thermostat is calling for heat and the wood/coal boiler water temperature is below 150° F, the shunt pump will turn on and the oil/gas boiler will fire. The heating pump (P2) will continue to run until the thermostat is satisfied.

If a hot water storage tank (optional) is used and the wood/coal boiler water temperature is above 150° F the L6006A control in the wood/coal boiler will turn the shunt pump (P3) off and the storage tank pump (P4) will be turned on. The storage tank pump (P4) will run until the wood/coal boiler water temperature drops below 150° F.

Wood/Coal Boiler with Gas/Oil Boiler



Wood Firing 12

For maximum burn times, the wood should be cut to length to utilize the entire length of the chamber (see page 5).

A small hot fire is most efficient and hardwood provides the maximum heat for a given amount of wood. The table below compares common woods and gives fuel oil equivalency.

WOOD	Weight per Cord Lbs.	BTU's per Cord Air Dried Wood	Equivalent Value #2 Fuel Oil Gals.
White Pine	1800	17,000,000	120
Aspen	1900	17,500,000	125
Spruce	2100	18,000,000	130
Ash	2900	22,500,000	160
Tamarack	2500	24,000,000	170
Soft Maple	2500	26,000,000	170
Yellow Birch	3000	24,000,000	185
Red Oak	3250	26,000,000	195
Hard Maple	3000	29,000,000	200
Hickory	3600	30,500,000	215

It is not recommended to burn wood when outside temperature is above 30 F. If it is necessary to do so, make a small hot fire rather than a large smoldering fire.

Always start a fire on a clean grate using kindling. Keep the boiler water temperature at 190 F minimum to help reduce creosote build-up. The air rosette on the fill door should always be closed and tightened when burning wood.

To ensure proper combustion, ashes must never be allowed to build up to the level of the bottom of the grate.

Starting a wood fire:

Place crumpled newspaper on the ash grate.

Place kindling on top of newspaper.

Wood Firing cont. 12

Place small to medium size split logs on top of kindling (logs should be seasoned properly).

Open the flue damper using the connecting rod handle at the top left front of the boiler.

Crumple up a couple of sheets of newspaper and place this packing into the breach through the top front door.

Ignite the newspaper packing in the breach with a match (this will create some chimney draft to prevent cold start smoking at the front of the boiler).

When the breach packing is burning, ignite the newspaper at the bottom of the log pile.

When the kindling wood and small logs are burning close the upper door and fully open the rosette.

When the flames change from orange to yellow fill the fire box with larger logs, and close the upper door again.

Adjust the draft damper for desired combustion while viewing the fire through the open rosette. When the desired combustion is established close the rosette.

Calibrate the Sampson Firing Controller as follows:

- Fill the system with water.
- Start a fire in the boiler as described in the wood/coal firing sections.
- Connect the figure-8 hook of the chain to the Samson controller arm and the ring to the air door eyehook.
- Using the white numbers on the Samson controller, set it to 90° C (194°F)
- When the boiler temperature Gauge indicates 194 F, the air door should close to minimum air settings of 1/8" and the chain should be taut. Adjust the chain to this condition.
- This calibration should never need to be rechecked.

Coal Firing 13

Burning times with coal are vastly superior to wood. For best results, it is recommended to burn anthracite (hard) coal of a nut size. Bituminus coal will result in shorter burn times and reduced output.

A proper coal fire takes between one and one and one-half hours to build from scratch. A very hot wood fire must first be prepared on a clean grate. As hot coals form in the wood fire, a small amount of coal (about one gallon) could be added. When this coal has ignited (about ten minutes), additional coal can be added at the rate of one to three gallons every five to ten minutes. NEVER ADD FRESH COAL UNLESS FLAME HAS COME UP THROUGH THE PRIOR LOADING. Coal should be added until a depth of twelve inches is reached. The best condition for a coal fire is to be as deep as it is wide. Fill the chamber to the bottom of the top loading door every time.

When removing ash from burning coal, it is very important to follow the correct procedure. Do not poke the fire unnecessarily as it will cause ashes to plug the grate, reducing output and efficiency. The fire should be tended twice daily and typically three times in very cold weather.

To remove ashes first open the bottom cleaning door and pull out ash pan several inches to catch spillage. Next insert the coal riddling tool along the outside edges first. In this position, the surface of the tool is the vertical position. Draw the tool in and out of the boiler using care not to contact the rear wall as it could cause a crack and leak. After poking both outside edges, begin to work towards the center of the grate. Continue drawing in and out until live red coals begin to fall into the ash pan. It is very important to be sure that all dead ashes are removed from the rear of the boiler. The most common mistakes are: poking or loading the fire too frequently, or leaving dead ashes on the rear section.

Approximately 30% of the chamber should still have live coals when refueling to prevent smothering the fire.

The opening of the air rosette on the feed door should be open about 3/4 of an inch minimum.

Storage

Coal may be stored indoors or outdoors providing safety precautions are taken. The following guidelines will result in safe storage and maximum efficiency.

1. The storage area should be free of all flammable materials that burn easily.
2. The storage area should be cool (75 F or lower) as excessive heat will drive some of the fuel content of the coal out in gas form.
3. The storage area should be protected from rain and snow. Alternate wetting and drying of coal will reduce the heating efficiency of the coal. Do not place wet coal on top of dry. For this reason, coal deliveries should be scheduled when the coal bin is almost empty. If this is not possible, move all dry coal to one side of the bin and place the new, wet coal on the other side.

The boiler must be connected to a chimney which is approved for solid fuel firing in your area.

Maintenance 14

Inspect the flue pipe and chimney monthly or as required and clean as needed. The smoke hood is provided with a clean-out cover to simplify cleaning.

Visually inspect the door gaskets. A coating of light grease will help prevent sticking to the boiler caused by creosote formation.

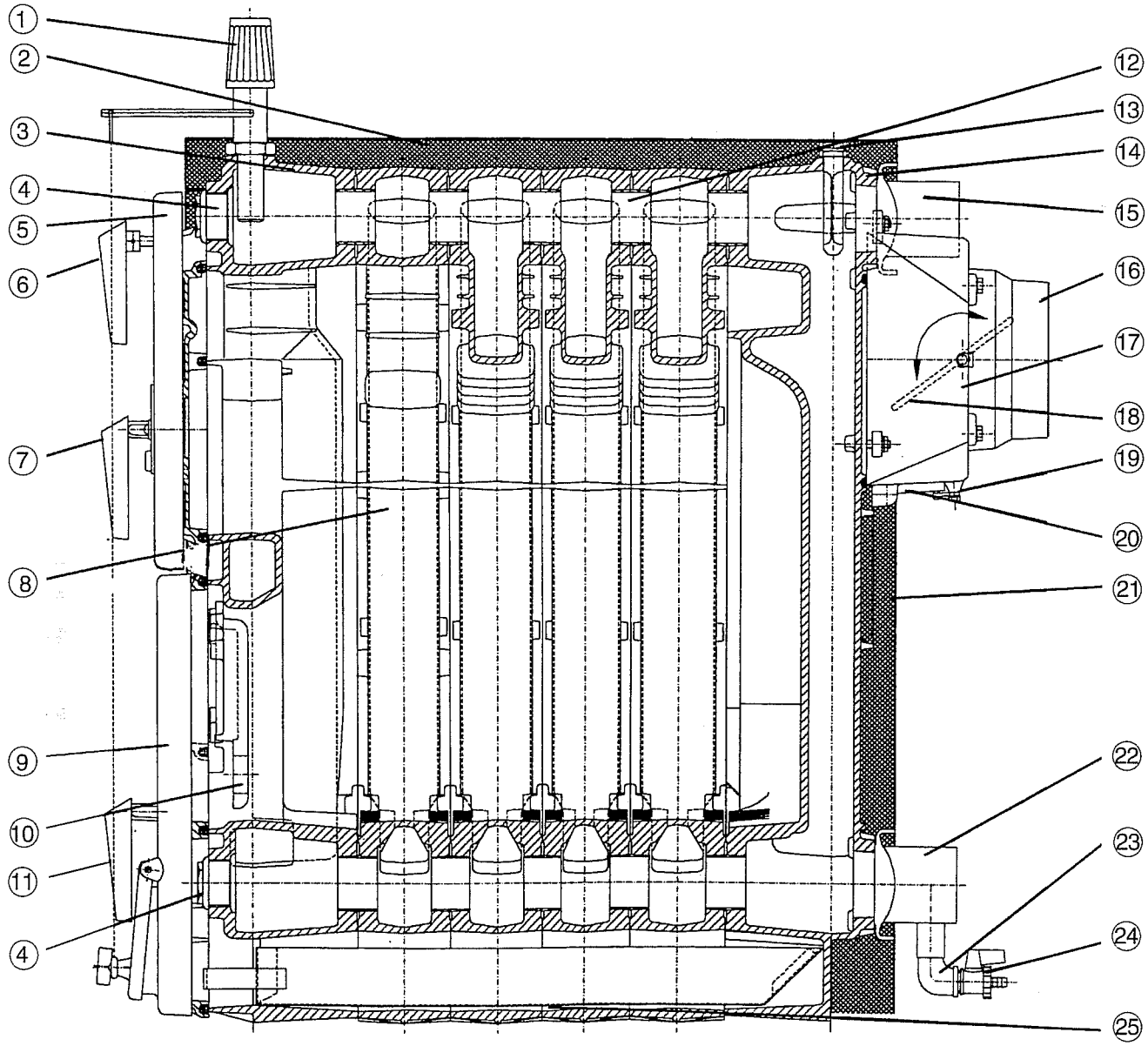
Creosote build up in the boiler can be prevented by having hot fires, but periodic cleaning is required. Using the brush provided, clean the boiler unit when it is cool.

OPERATION IN THE EVENT OF POWER FAILURE

In the event of a power failure during the heating season, special operation must be followed:

The flow check valves in the system should be opened to allow some heated water to circulate through the system by convection (have installer demonstrate). This will partially heat the house, prevent frozen pipes and remove some heat from the boiler.

The Sampson controller will still regulate the fire to some extent. However, without the circulator running, the boiler can not dispose of that heat as rapidly as normal. Therefore, the boiler should be fired conservatively and watched carefully. The temperature of the boiler water should not exceed 230° F to prevent the pressure relief valve from opening.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Boiler Parts List

1. Sampson Control
2. Jacket Top Panel
3. Front section
4. Plug 1 1/2"
5. Firing Door
6. Flue damper handle
7. Firing door handle
8. Middle section
9. Ash door
10. Combustion chamber door
11. Handle ash door
12. Push nipple
13. Aquastat well tapping
14. Rear section
15. Supply manifold
16. Flue outlet
17. Flue cowl
18. Flue damper
19. Cleaning cover site
20. Cleaning cover wing nut
21. Jacket rear panel
22. Return manifold
23. 90° elbow 3/4"
24. Drain cock 3/4"
25. Ash pan
26. Flue Outlet Adapter (not shown)

Buderus

HYDRONIC SYSTEMS

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