# Boiler Installation and Owners Manual

A-MAIZE-ING HEAT

LDJ Manufacturing, Inc. • Pella, IA


## Model LDJ991 Boiler

## Model LDJ991-10 Boiler

## Model 14 Bin

Made in America to Heat American Homes with American Grown Grain

LDJ991_E01_R03_2006.03

This manual explains the proper installation, operation, and maintenance of your A-MAIZE-ING HEAT® boiler. Study and understand these instructions thoroughly before installing, operating, or maintaining the boiler. Failure to do so could result in serious injury or death and/or equipment damage. Consult your A-MAIZE-ING HEAT® dealer or LDJ Manufacturing, Inc. if you do not understand the instructions in this manual or need additional information.

LDJ Manufacturing, Inc. recommends that you retain this manual for future reference of operation, maintenance, and parts information.

The instructions, illustrations, and specifications in this manual are based on the latest information available at the time of publication. Your boiler may have product improvements and options not yet contained in this manual.

LDJ Manufacturing, Inc. reserves the right to make changes at any time without notice or obligation.

Additional copies of these instructions are available from LDJ Manufacturing, Inc.

A-MAIZE-ING HEAT

LDJ Manufacturing, Inc. • Pella, IA

Boiler tested and certified by Underwriters Laboratories


**LDJ Manufacturing, Inc.**
**1833 Highway 163**
**Pella, Iowa 50219, USA**

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## WARRANTY

LDJ Manufacturing, Inc. warrants the A-MAIZE-ING HEAT® boiler against any defects in workmanship and materials for a period of one (1) year after the date of purchase. LDJ Manufacturing, Inc. will repair or replace as necessary any defective parts within the warranty period.

LDJ Manufacturing, Inc. warrants the boiler and burner only, for a period of five (5) years after the date of purchase. LDJ Manufacturing, Inc. will replace any defective boiler or burner parts free of charge within the five (5) year period. All boiler and burner claims will be limited to parts only, labor is not provided.

This warranty does not take effect until the warranty registration card is sent in. If the card is not filled out and returned to LDJ Manufacturing, Inc. within 30 days of date of purchase, warranty claims on your unit may be denied. All warranty claims must be reported to the nearest A-MAIZE-ING HEAT® dealer.

## DISCLAIMER OF LIABILITY

The foregoing warranty constitutes the only warranty made by LDJ Manufacturing, Inc. regarding the A-MAIZE-ING HEAT® boiler. LDJ Manufacturing, Inc. makes no warranty as to the merchantability or as to the fitness of this product for any particular purpose. LDJ Manufacturing, Inc. disclaims any and all liability for damages, consequential or otherwise, cost or expense of any sort or nature arising out of the use of the A-MAIZE-ING HEAT® boiler or any alleged defect in design, manufacture, assembly, instructions, or labeling thereof.

## WELCOME TO THE A-MAIZING-HEAT® BOILER

Congratulations on your purchase of the A-MAIZE-ING HEAT® biomass fueled boiler. We are honored that you selected the A-MAIZE-ING HEAT® boiler. The A-MAIZE-ING HEAT® boiler is the first biomass fired boiler to be listed by Underwriters Laboratories. The UL listing is your assurance of a safe and quality product.

As convenience fuels become more expensive and less abundant, corn and pellets as fuel are becoming very attractive and viable as alternative heat sources. With high energy costs it makes sense to use a heat source that utilizes a resource that is readily available and cost effective.

LDJ Manufacturing, Inc. believes that there is no substitute for safety and quality. You can have confidence that your A-MAIZE-ING HEAT® boiler will serve your heating needs now, and for years to come. We emphasize that you follow our policy of SAFETY FIRST when installing and using your A-MAIZE-ING HEAT® boiler. The installation and owners manual must be read before installing and operating your A-MAIZE-ING HEAT® boiler.

Your A-MAIZE-ING HEAT® boiler is a practical alternative heat source specifically designed for residential use. Proper care of this appliance should result in many years of service and comfort. An annual checkup by a certified HVAC service person is recommended.

If you have any problems, questions, or concerns, please contact your nearest A-MAIZE-ING HEAT® dealer, or contact LDJ Manufacturing, Inc. at 866-535-7667 for information on the dealer nearest you.

## SAFETY INSTRUCTIONS

**⚠WARNING** **Failure to follow these safety instructions may result in serious injury or death and/or property damage.**

- Do not install or use this product unless the instructions within this manual have been carefully read and understood.
- This heating appliance must be installed in accordance with local codes.
- Installation is to be performed by a qualified installer, according to state and local codes.
- Maintain adequate minimum clearances to combustible materials (refer to “Boiler Clearances and Accessibility” on page 5).
- Install in an area with adequate air for combustion and ventilation: **a minimum of 60 cubic feet per minute.**
- Do not connect this heating appliance to a chimney flue serving any other heating device.
- Disconnect all power to the unit before performing routine maintenance or service. Before servicing, allow the unit to cool.
- Establish a regular service and maintenance schedule for efficiency and safe operation (refer to page page 17). Have a qualified service person perform tasks you are not familiar with.

**⚠CAUTION** **Children and adults should be alerted to potential high service temperatures of the burner door. KEEP CHILDREN AWAY!**

**⚠DANGER** **Risk of fire or explosion. Do not burn gasoline, oil, garbage or other flammable substances.**

**⚠WARNING** **Do not burn treated corn. Treatment chemicals can be unknown and their inhalation can result in serious health problems or death.**

- Do not place clothing or other flammable materials on or near this appliance.
- 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 burying in soil or otherwise dispensed, they should be retained in the closed container until all clinkers have thoroughly cooled.

## CONTACT INFORMATION

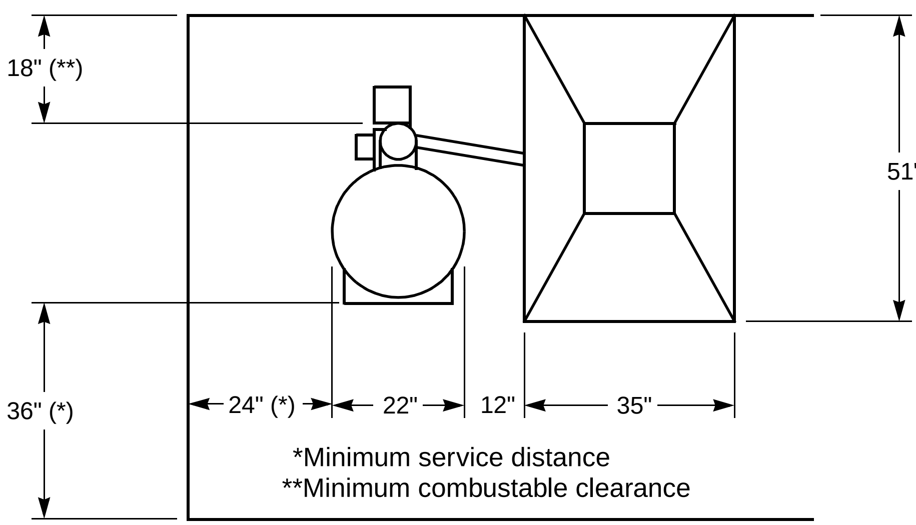
*If you have any questions about this product or its installation, please contact us:*

| | |
|---|---|
| **Address** | LDJ Manufacturing, Inc.<br>1833 Hwy 163<br>Pella, Iowa 50219 |
| **Phone** | 641 • 620 • 9412<br>866 • 535 • 7667 |
| **Fax** | 641 • 620 • 8302 |
| **Website** | www.cornheat.com |
| **Email** | info@ldj-products.com |

## INSTALLATION AND LOCATION CONSIDERATIONS

**WARNING** **Failure to install the A-MAIZE-ING HEAT® boiler according to the guidelines and instructions contained within this manual may result in serious injury or death, property damage, or voiding of the warranty.**

## Boiler Clearances and Accessibility




The following are the minimum distances the boiler may be to a combustable surface:

top .......... 32"
either side .......... 6"
front .......... 30"
back cabinet surface .......... 6"
flue connector on back .......... 18"

For ease of service, the following minimum distances are recommended:

top .......... 32"
side opposite bin .......... 24"
front .......... 36"
rear-most surface on back (boiler or flue) .......... 18"

The overall dimensions of the A-MAIZE-ING HEAT® boiler are as follows:

boiler cabinet width .......... 22"
boiler cabinet depth (with door) .......... 36"
boiler cabinet height .......... 59"
storage bin width .......... 35"
storage bin depth .......... 51"
storage bin height .......... 47"
overall width when assembled
(as configured above) .......... 67"

## Combustion Air Requirements

**⚠WARNING** **Failure to provide adequate combustion air can lead to increased carbon monoxide production and increased emissions of combustion gases into the building, which may cause death or serious injury.**

**The boiler must have a minumum supply of 60 cubic feet of air per minute.** Consult a qualified boiler installer to analyze if the air supply is adequate. In newer air-tight homes, the combustion air may need to be brought in from the outside.

## Venting

**⚠WARNING** **Failure to provide correct chimney venting can lead to increased carbon monoxide production and increased emissions of combustion gases into the building, which may cause death or serious injury.**

**Do not connect this heating appliance to a chimney flue serving any other heating device.**

Venting may be provided using a lined masonry chimney or a listed chimney (class ‘A’). The chimney has two functions:

1. To exhaust smoke and flue gases that are the result of combustion.
2. To provide “draft” to the boiler. This provides a continous supply of fresh air into the appliance so that proper combustion is possible.

### Important Installation Points

- The connection from the heating appliance to the chimney must be made using 6" black pipe.
- Avoid using more than two elbows in connecting the boiler to the chimney.
- Any horizontal runs of connector pipe should have a minimum rise of 1/4" per foot of run to allow condensation to flow back to the firebox.
- A minimum distance of 18" must be maintained between the connection pipe and combustible wall surfaces.
- A minimum distance of 32" must be maintained between the connection pipe and combustable ceiling surfaces.

### Masonry Chimney

An existing lined masonry chimney must be cleaned and inspected. All connections made to the chimney must comply with NFPA Standard 211 and all applicable building codes. Consult a qualified boiler installer and/or local building inspector to make sure the chimney and connections comply and are safe.

### Listed Chimney

A listed chimney must be rated for a solid-fuel burning appliance and must comply with NFPA Standard 211 and all applicable building codes. Consult a qualified boiler installer and/or local building inspector to make sure the chimney and connections comply.

For more information on venting with listed chimneys, refer to “Venting Information” on page 29.

## Barometric Draft Controls

**IMPORTANT:** In order for the boiler to operate correctly, 0.04" to 0.06" water column of draft during low-fire operation must be established and maintained. Low-fire operation is when the thermostat is satisfied and no fuel is being augered into the burner. If the chimney draft is too high, the fire will go out. If the draft is too low, smoke may back up into the boiler and storage bin, creating a possible hazard.

The procedure for establishing the proper chimney draft will be discussed in the “Installation” section starting on page 7.

For more information on the barometric draft regulator, refer to “Barometric Draft Control Information” on page 31.

# INSTALLATION

## Required Tools

- Flat bit screwdrivers
- Phillips screwdriver
- 5/16" hex driver
- 3/8" hex driver
- 7/16" wrench
- 7/16" socket
- Drill and 1/4" bit

## Unpacking and Setup - Boiler

**IMPORTANT:** Before unpacking and assembling the A-MAIZE-ING HEAT® boiler, review the “Installation and Location Considerations” section starting on page 5 for the proper placement of the boiler and storage bin.

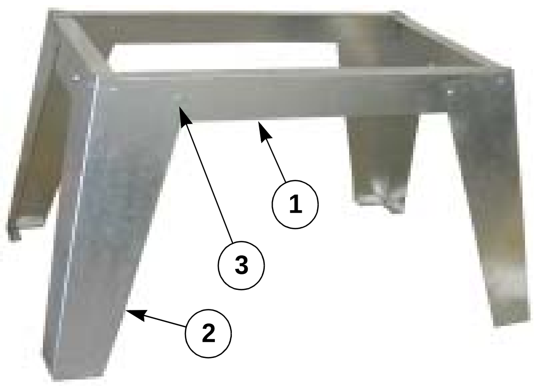
**Step 1:** Remove all shipping materials and remove boiler from pallet.

**Step 2:** Place boiler at desired location.

**Step 3:** Remove auger motor assembly and hardware package from ash pan drawer.

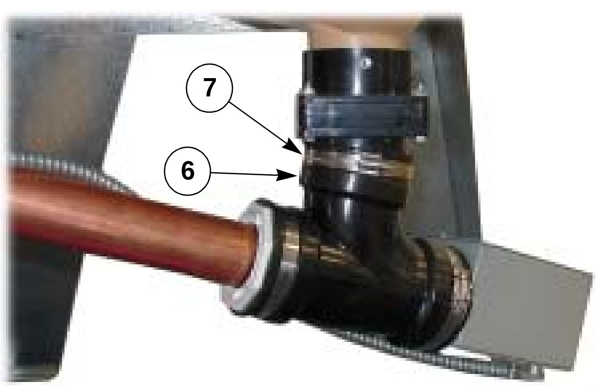
## Unpacking and Setup - Storage Bin

**Step 1:** Remove base parts and storage bin from shipping container.



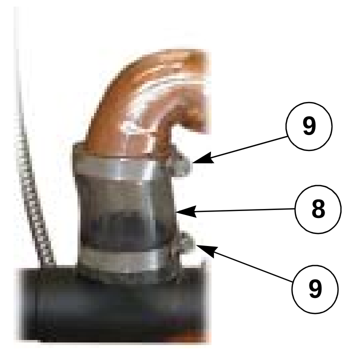

**Step 2:** Assemble base rails **(1)** and legs **(2)** together with sixteen 1/4"-20 x 1/2" bolts **(3)** and nuts.


**Step 3:** Position storage bin **(4)** on top of base **(5)**. Make sure it is level and fitted against base at all corners.

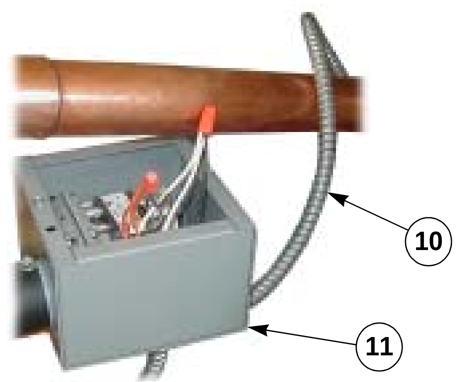



**Step 4:** Slide auger boot **(6)** with clamp **(7)** over bin outlet. Tighten clamp securely.

**Step 5:** Install two sheet metals screws through clamp, auger boot, and into the bin outlet for a permanent connection.




**Step 6:** Install coupler **(8)** between bin auger tube and boiler fuel inlet. Secure with two hose clamps **(9)**.




**Step 7:** Attach flexible conduit **(10)** from bin auger to boiler auger motor housing **(11)** with a conduit locknut.

**Step 8:** Connect one black bin auger motor wire to the two orange wires in the auger motor housing with a wire nut connector.

**Step 9:** Connect the other black bin auger motor wire to the two white wires in the auger motor housing with a wire nut connector.

**Step 10:** Install cover on auger motor housing.

## Plumbing

**IMPORTANT:** For information on connecting the A-MAIZE-ING HEAT® boiler for a particular application, contact and use the services of a certified boiler installer.

## Chimney Vent

**⚠WARNING** **Failure to provide correct chimney venting can lead to increased carbon monoxide production and increased emissions of combustion gases into the building, which may cause death or serious injury.**

**Do not connect this heating appliance to a chimney flue serving any other heating device.**

**Step 1:** Make sure an approved lined masonry or listed chimney is installed for the A-MAIZE-ING HEAT® boiler. All chimneys and connections made to the chimney must comply with NFPA Standard 211 and all applicable building codes. Consult a qualified boiler installer and/or local building inspector to make sure the chimney and connections comply.

Refer to “Venting” on page 6 and “Venting Information” on page 29 for additional information.

**Step 2:** Make sure the boiler and storage bin are correctly placed. Refer to “Boiler Clearances and Accessibility” on page 5 for proper clearance dimensions.

**Step 3:** Connect boiler to chimney with 6" metal flue pipe using sheet metal screws to secure (refer to “Venting” on page 6).

### Barometric Draft Control

Install the barometric draft control according to the directions beginning on page 31. It will be adjusted (refer to “Draft Adjustment” on page 14) after the installation of the boiler is complete and a fire has been built

### Draft Guage

The draft guage is installed to monitor the chimney draft measured in inches of water column. The A-MAIZE-ING HEAT® boiler requires 0.04 to 0.06 water column inches of draft.

*Install the draft guage as follows:*

**NOTE:** There are parts in the kit that will not be used in this installation.

**Step 1:** Remove gauge and installation accessories from box.

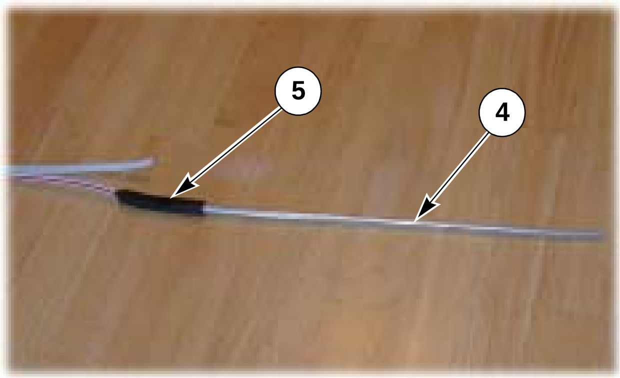
**Step 2:** Select an installation location close to the flue pipe where the gauge can remain level.


**Step 3:** Hold gauge in position and install one 1-3/4" screw through top hole **(1)**; do not fully tighten.

**Step 4:** Level unit with bubble level **(2)** located in face of unit and install a second 1-3/4" screw through bottom hole **(3)**; do not fully tighten.

**Step 5:** Check level of unit and tighten screws.

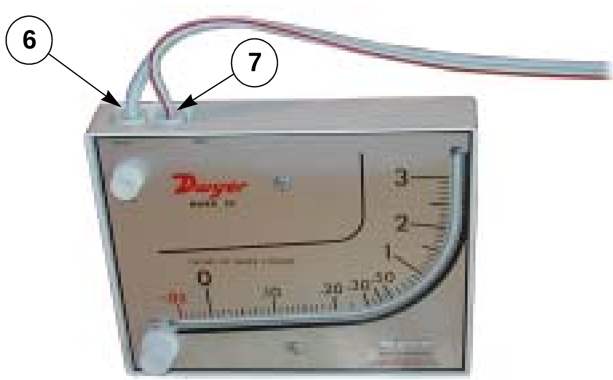
**Step 6:** Drill a 1/4" hole into the flue connection pipe at a location between the boiler flue connection and the barometic draft control.




**Step 7:** Straighten the aluminum tube **(4)** included with the draft gauge kit.

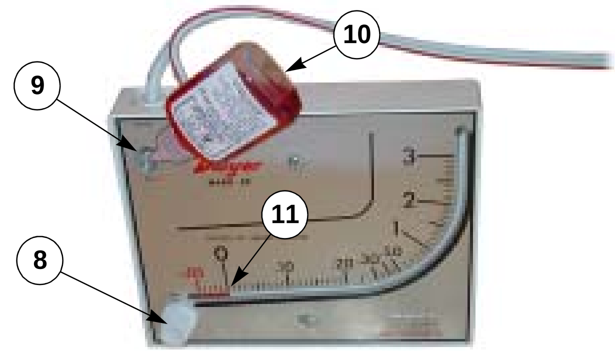
**Step 8:** Uncoil the white rubber tubing and slip the black rubber connection **(5)** over one end of the aluminum tube. The other tube will just hang and be left unconnected.

**Step 9:** At the opposite end of the double tubing, split the two individual hoses apart for about 1-1/2".




**Step 10:** At the top of the unit, connect the hoses to it.

- Connect the all white hose to the port marked HIGH **(6)**.
- Connect the white hose with the red line to the port marked LOW **(7)**.




**Step 11:** Turn the ZERO SET **(8)** knob counter-clockwise 2 to 3 turns.

**Step 12:** Loosen and remove the FILL **(9)** plug.

**Step 13:** Open the bottle of red gage oil **(10)** and install nozzle top.

**Step 14:** Carefully pour oil into the FILL opening until the red gage oil reaches ZERO **(11)**.

**Step 15:** Re-install FILL plug.

**Step 16:** If the red gage oil is not exactly on ZERO, adjust it by turning the ZERO SET knob clockwise or counter-clockwise.

**Step 17:** Slide the aluminum tube about 2" to 3" into the hole drilled into the flue.

**Step 18:** The draft gauge is now ready to be used.

## Electrical Connections

**⚠WARNING** **Turn off electric power at the breaker box or service panel before making any electical connections. The ground connection must be completed before making line voltage connections. Failure to do so can result in electrical shock, severe personal injury, or death.**

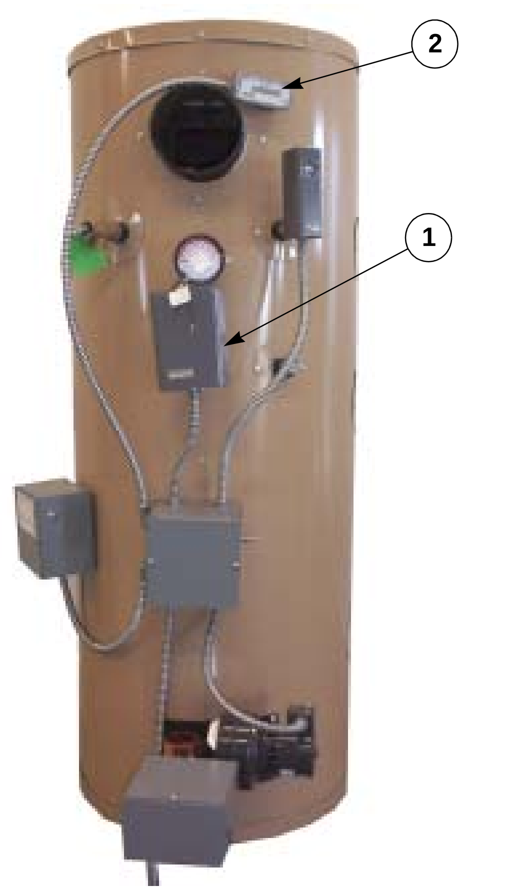
**⚠WARNING** **The boiler cabinet must be permanently grounded. A ground screw is provided in the junction box for this purpose. Failure to properly ground the furnace cabinet can result in fire, electrical shock, personal injury, or death.**

### Electrical Supply

**IMPORTANT:** All electrical work must conform to local codes and ordinances or with the National Electrical Code. If unfamiliar with wiring and codes, have a licensed electrician perform the electrical connection.

The electrical supply to the boiler should be from a 120V, 15 amp protected circuit. Make all connections inside box **(1)**:

- Black wire to black wire
- White wire to white wire
- Ground wire (green) to ground terminal.




### Thermostat

A thermostat is not included with the A-MAIZE-ING HEAT® boiler. Read and follow all directions included with the thermostat. The location of the thermostat has an important effect on the overall performance of the boiler.

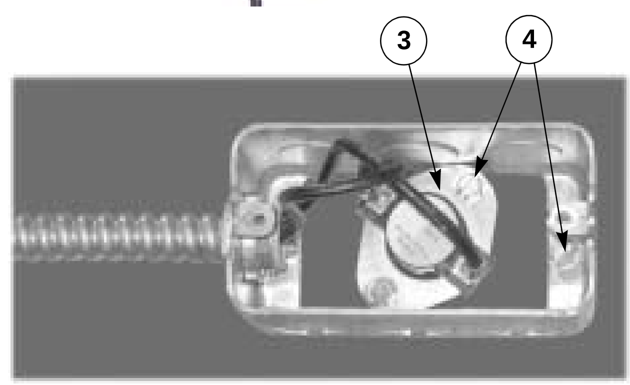
Also read and follow all directions inside the cover of the Aquastat relay box **(1)**.

### Low-Limit Switch

**Step 1:** Take low-limit switch box **(2)** and locate on chimney vent.

**Step 2:** Attach box and switch **(3)** to chimney vent with four sheetmetal screws **(4)**.

**IMPORTANT:** Make sure switch **(3)** is turned as shown to prevent terminal contact with box.



## OPERATION

# Burner Lighting

**IMPORTANT:** Corn or pellets containing stalks, fines, dirt, etc. may cause the augers to plug, resulting in excessive wear and possible auger motor failure. Also, burning treated corn is not recommended because of increased clinker buildup and the extinguishing properties of the treatment used on the corn.

**NOTE:** If the boiler has ash and clinkers left over from a previous burn in the burner pot, they must be completely removed before lighting a new fire.

**NOTE: Use of powdered graphite.**

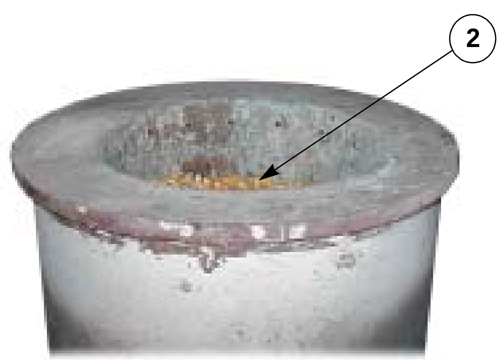
- During the initial lighting of the boiler, skip *step* 1 and only add 2 to 3 cups of corn or pellets to the storage bin.
- Then add 1 tablespoon of powdered graphite.
- Continue with *steps* 2 through 7 below.
- As this mixture feeds into the storage bin auger, repeat this procedure one more time.
- The powdered graphite will lubricate the storage bin auger until it begins to polish from the flow of corn/pellets.
- This operation should be repeated at the beginning of each heating season.
- This operation should also be repeated if the hopper is allowed to run empty and a sticky smoke film coats the storage bin auger tube.
- Powdered graphite may also be added about once a month at a time when the storage bin is low on fuel to help the auger stay lubricated and polished.

**NOTE:** When lighting the LDJ991-10 boiler (variable BTU output), always light it with the boiler set for 100,000 BTU output. After the boiler has run for thirty minutes, make the desired adjustments to the output. Refer to “Variable BTU Timer (LDJ991-10 only)” on page 16 for more information.


**Step 1:** Fill the storage bin **(1)** with dry (15% or less moisture) and clean (USDA #2 or better) corn or pellets.

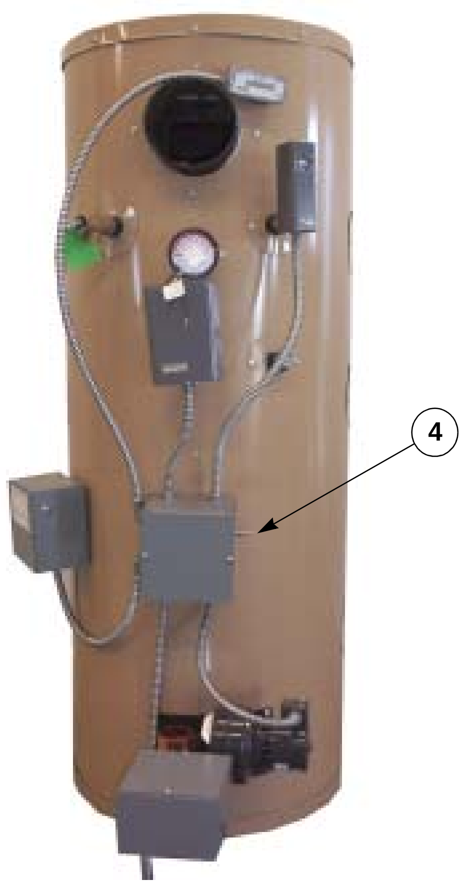
**Step 2:** Turn on electrical power to the boiler.

**Step 3:** Turn the thermostat to its highest setting.




**Step 4:** Fill the burner pot with corn/pellets **(2)** to the lower set of air holes on the inside of the burner.


**Step 5:** Finish filling the burner pot with kindling wood and paper, or pelletized wood **(3)**. Gelled fire starter may be used as a substitute for the paper.




**Step 6:** Light fire and move the START/OFF/ON switch **(4)** to START. This will start the burner blower only (the auger motors will not turn until the boiler has reached operating temperature). Keep the switch in the START position for 5 to 10 minutes, or until you see a good even fire.


**Step 7:** With the fire **(5)** well started, move the START/OFF/ON switch to ON.

**Step 8:** Set wall thermostat to desired temperature.

**Step 9:** If the corn/pellets do not completely ignite, it may be necessary to add more kindling a couple of times to get it completely burning.

## Draft Adjustment

After the boiler has been lit and has cycled a few times, the chimney draft will need to be adjusted.

The barometric draft control, installed in the metal flue pipe connecting the boiler to the chimney, must be adjusted so the A-MAIZE-ING HEAT® boiler has 0.04 to 0.06 water column inches of draft. Refer to “Barometric Draft Control Information” on page 31 for adjustment instructions.

The draft gauge installed earlier (refer to “Draft Guage” on page 9) will be used to set the barometric draft control.

**IMPORTANT:** The chimney draft should never exceed 0.06 water column inches. On extremely tall chimneys or chimneys larger than 6" in diameter, it may be necessary to install a secone barometric draft control, or to reduce the outlet opening of the chimney to approximately 28 square inches, or both to maintain the chimney draft at 0.04 to 0.06 water column inches.

## Boiler Operation

### Typical Operation Cycle

**NOTE:** After the boiler has been properly lit and the operating temperature has been reached (refer to “Burner Lighting” on page 12), only the thermostat needs to be set to maintain the desired temperature. The thermostat, boiler temperature sensors, and timers control the augers and pumps.

*A typical boiler operation cycle is as follows:*

**Step 1:** Thermostat activates the Aquastat relay to turn on hot water circulation pump.

**Step 2:** If the water temperature is too cool, the fuel feed system is activated. The combustion fan starts and the augers feed fuel into the burner (HIGH FIRE).

**Step 3:** The water heats up in the boiler until the Aquastat relay reaches set point — the fuel feed system then stops.

**Step 4:** If the thermostat setting is satisfied, the Aquastat relay will then stop the hot water circulation pump.

**Step 5:** To maintain the fire, a boiler timer will activate the fuel feed system for a short period of time followed by a longer period of no fan or auger activity (LOW FIRE).

**NOTE:** The LOW FIRE timer is factory set to cycle at 2 minutes ON and 6 minutes OFF. This is a suggested setting, but can be adjusted depending upon user experience.

### Clinker Buildup

The A-MAIZE-ING HEAT® boiler feeds the corn/pellets into the bottom of the burner, thereby creating conditions for efficient fuel consumption. The residual ash (clinkers) are then spilled over the top of the burner ring, falling into the ash pan below. This process cleans the burner chamber.

**IMPORTANT:** If the boiler is installed in an application that causes the boiler to run almost continously, or if incorrect types of corn/pellets are burned, large clinkers can form. These clinkers can stick to burner pot and eventually extinquish the fire. They must loosened and removed with the clinker tool.

**NOTE:** If your boiler has been installed in an application where it runs almost continuously, and you are experiencing problems, contact LDJ Manufacturing, Inc. for assistance.

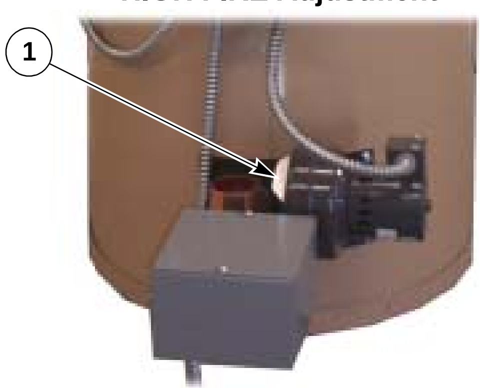
## Power Failure Instructions

**NOTE:** If a power failure does not last longer than 20 to 30 minutes, the boiler will cycle back to operation without starting the fire. If the power failure lasts an extended period of time, the clinkers will have to be cleaned out of the burner pot and the fire restarted.

**IMPORTANT:** When ashes are removed from the ash pan, they 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 burying in soil or otherwise dispensed, they should be retained in the closed container until all clinkers have thoroughly cooled.

## Summary of Settings and Operation

**HIGH FIRE Adjustment**

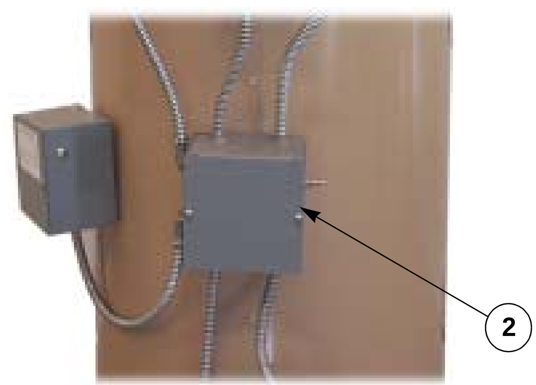



Adjustment of the combustion gate **(1)** on the side of the combustion blower controls fuel air mixture during high fire only. Only adjust this opening when the combustion blower is running. Its adjustment should yield an intense fire that consumes the fuel at the same rate it is augered in.

**LOW FIRE Adjustment**

The rate of burn during low fire operation is controlled by the amount of chimney draft. Chimney draft must remain below 0.06 water column inches and be consistant (refer to “Draft Adjustment” on page 14).

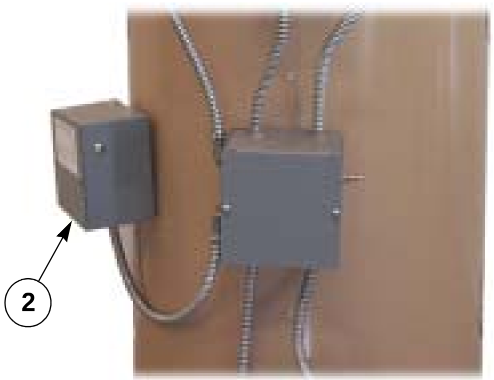
To maintain the fire, the low fire timer will activate the fuel feed system for a short period of time followed by a longer period of no fan or auger activity (LOW FIRE). Adjusting the on and off cycle time controls the amount of fuel going into the burner pot during low fire operation.




The LOW FIRE timer is located inside box **(2)** and is factory set to cycle at 2 minutes ON and 6 minutes OFF. This is a suggested setting, but can be adjusted depending upon user experience.

After approximately 24 hours of operation, a layer of ash and clinkers forms in the combustion area. After they form, the OFF time can be increased to reduce the amount of fuel consumed during low fire.

**Variable BTU Timer (LDJ991-10 only)**




The variable BTU timer is located inside box **(3)** and is to vary the BTU output of the boiler.

Below are suggested timer settings to obtain various BTU outputs from the LDJ991-10 boiler when burning corn. The actual BTU output may vary depending upon the characteristics of the fuel being burned. Contact LDJ Manufacturing for settings for other fuels (pellets, etc.).

The green arrow indicates the number of seconds the timer is OFF (“1.5” = 15 seconds) and the red arrow indicates the number of seconds the timer is ON.

**IMPORTANT:** When adjusting the boiler, always start with the settings for 100,000 BTU output and then make further adjustments after the boiler has run for thirty minutes.

| BTU Output | Green Arrow | Red Arrow | Combustion Gate |
|---|---|---|---|
| 165,000 | 0 | 3.0 | full to half open |
| 132,000 | 1.5 | 3.0 | full to half open |
| 100,000 | 1.5 | 2.0 | half to one quarter open |
| 90,000 | 1.5 | 1.5 | half to one quarter open |
| 80,000 | 1.5 | 1.0 | half to one quarter open |

**MAINTENANCE**

## Daily Maintenance

- **Inspect Burner**
  During use, ash and clinkers will be pushed out over the top of the burner pot **(1)** as fuel is augered in at the bottom. Clinkers that appear to be stuck to the side of the burner must be loosened with the included clinker tool.

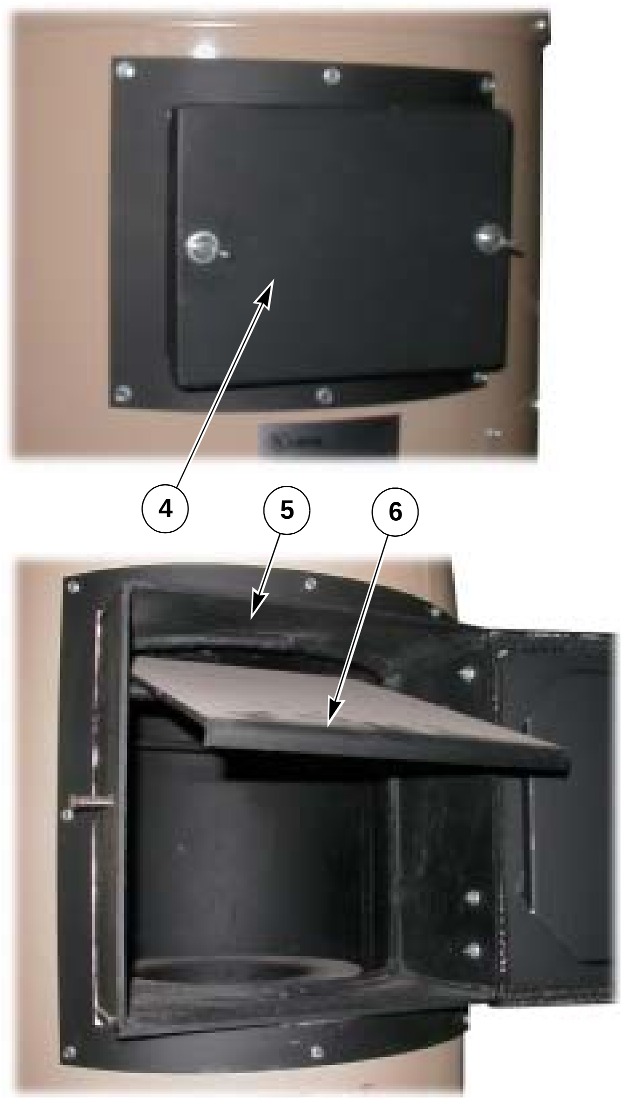

- **Check Fuel Supply**
  Check level of corn/pellets in storage bin **(2)**. Refill as necessary to maintain an adequate supply.


## Weekly Maintenance

- **Check Ash Drawer**
  Check ash drawer **(3)** and empty as needed. 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 burying in soil or otherwise dispensed, they should be retained in the closed container until all clinkers have thoroughly cooled.

## Monthly Maintenance

- **Inspect and Clean Flue Tubes**
  Perform this operation only through access cover **(4)** when the boiler has a low fire. If the fire is completely out, it is more easily performed through door **(5)** with heat plate **(6)** removed. Use the flue cleaning brush (supplied) to clean out the 15 flue tubes.




## Annual Maintenance

- **Inspect Chimney Pipe**
  Remove and inspect all chimney pipe connections. Clean out ash buildup in pipes. Replace any pipe showing any signs of “burning through”.

- **Inspect Motors**
  Clean, oil, and inspect all blower, auger, and pump motors. This includes the burner fan, burner auger, storage bin auger, and circulation pump.

**TROUBLESHOOTING**

## Tips for Good Combustion

Trouble-free operation of the boiler requires clean and dry corn, correct draft, and sufficient combustion air.

Most burn problems in the boilers and boilers are because of a few common problems. Before making any repairs, replacing components, etc. check for these common problems:

- wet corn (best moisture is 12-14%)
- dirty corn (lots of ground up corn and fines)
- wrong variety or type of corn, such as high-oil, waxy, or treated (seed corn)
- improper draft (too little or too much)
- insufficient combustion air (not enough fresh air supply, or combustion blower not open far enough).

*Take the following steps to ensure best results:*

- use 12-14% moisture, standard variety, clean corn from a local farmer
- make sure draft is set correctly
- make sure sufficient combustion air is supplied.

*Refer to the tables below for detailed troubleshooting:*

## Initial Setup Quick Check

| Problem | Possible Causes |
|---|---|
| Fire won't start | Initial startup may require use of kindling wood two or three times before the corn begins to burn completely. |
| Chimney draft too high | On tall or large chimneys, a second barometric regulator may be required, or it may be necessary to reduce the outlet opening to approximately 28 square inches. |
| Boiler inefficiency | Incorrect timing during low fire operation. After 24 hours of initial operation, OFF time may be adjusted. Refer to "Operation" on page 12 for timing adjustment information. |
| Boiler overheating | System not full of water and not at normal operating pressure. |
| | Circulation pump not operating correctly; check circulation pump. |

## Operation Quick Check

| Problem | Possible Causes |
|---|---|
| Fire won't start | Leftover ash and clinker buildup from previous use. |
| Fire goes out | Chimney draft too high; clinkers are building up. |
| Boiler inefficient and has too much ash | Wet or dirty corn; not enough combustion air; not enough draft; not enough OFF time during low fire operation. |

## Poor Combustion

| Problem | Explanation | What to do |
|---|---|---|
| Problems lighting fire | Leftover ash and clinker buildup. | Clean out all ash and clinkers before attempting to relight boiler. |
| Poor combustion | Dirty corn (especially dense fines), cobs or stalks in corn can restrict air flow preventing combustion. | Avoid dirty corn. If possible purchase corn from local farmer; |
| | Wet corn burns poorly | Use corn that is 12-14% moisture. |
| | Wrong variety or treated corn, using specialty corn. | Use of treated corn (seed corn), waxy or high oil varieties is not recommended. |
| | Insufficient draft can cause the unit to smoke back into the boiler and storage bin. Insufficient draft can also limit the amount of combustion air that the boiler can put back into the chamber. | Boiler requires 0.04 to 0.06 inches water column draft (chimney draft) on low fire. |
| | Not enough combustion air available to boiler. If the combustion blower is not open far enough, insufficient combustion air will be supplied during high fire operation (i.e. when fuel is being augered in), even if chimney draft is sufficient. | 60 cubic feet per minute minimum of fresh air is required. |
| Clinker build-up | Burning the wrong type or quality of corn or pellets can cause excess clinker buildup due to extra materials and fire extinguishing effect. Improper installation causing the boiler to run on high fire for an extended period can also result in clinker formation | Loosen clinkers manually with a clinker tool. |
| Corn doesn't feed smoothly into burn chamber | Sliding surfaces can become sticky if boiler is new, has been out of service, or if the hopper has run empty (causing smoke to coat the hopper auger). | When starting the boiler initially, or at the beginning of each season, or whenever the hopper has been run empty, it may be necessary to use powdered graphite to reduce friction and allow corn to flow freely. |
| Augers are plugged or won't turn or hopper auger is pushing out of position | Buildup of clinkers or foreign material (possible mechanical or motor damage). | Clean out burn chamber and check operation. Use only clean corn. Do not use treated seed corn, hi-oil corn, or waxy corn. |
| | Corn cob or stalk is stuck in auger; boiler has smoked back through the auger tube causing a build up of sticky residue. | Clean/repair as necessary. |
| | Burn auger has stopped, forcing hopper auger to bind up. | Clean/repair as necessary. |

| Problem | Explanation | What to do |
|---|---|---|
| Loses fire when weather warms up or won't stay lit in low fire mode | Too much time between idle cycles **(indicated by corn burned down into the pot)**. | Try changing timer — if set at 2 & 10, change to 2 & 8 (experimentation may be necessary). |
| | Not enough time between idle cycles **(indicated by fire pushing out the top).** | Try changing timer — if set at 2 & 6, change to 2 & 7 (experimentation may be necessary). |

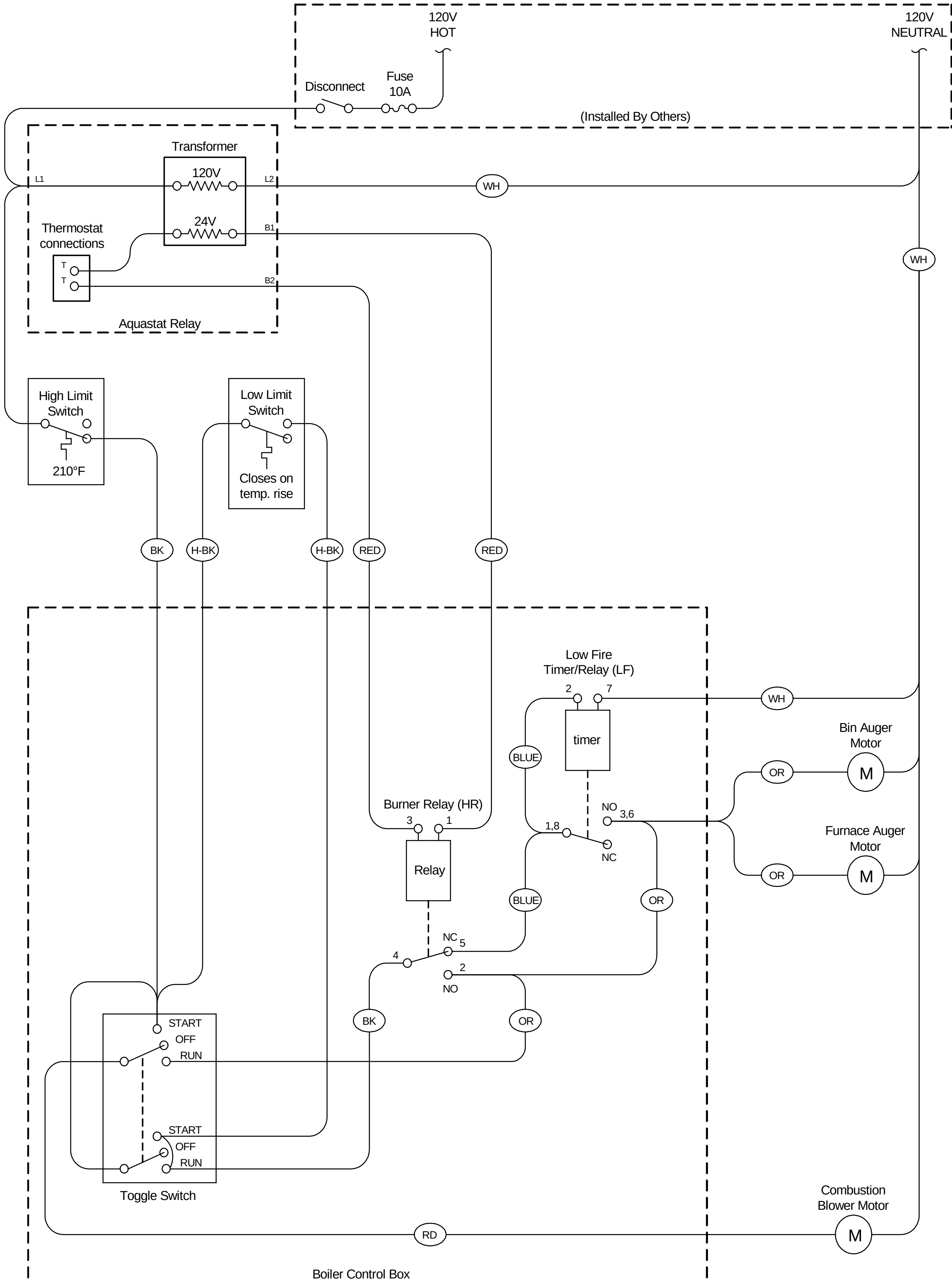
## Inefficient Operation and/or Operating Too Hot

| Problem | Explanation | What to do |
|---|---|---|
| Burns too hot / runs out of corn | Excessive draft will pull too much air through the burn chamber, causing the fire to burn faster than the corn can be supplied. | Chimney draft should never exceed 0.06 inches water column draft. Verify correct installation; install second barometric regulator if necessary (refer to "Barometric Draft Control Information" on page 31). |
| Boiler keeps opening high limit switch | System not full of water and not at normal operating pressure. | Check for cause of water leakage and loss of operating pressure. |
| | Circulation pump not operating correctly. | Check circulation pump. |
| Loses fire when weather warms up or won't stay lit in low fire mode | Too much time between idle cycles **(indicated by corn burned down into the pot)**. | Try changing timer — if set at 2 & 10, change to 2 & 8 (experimentation may be necessary). |
| | Not enough time between idle cycles **(indicated by fire pushing out the top).** | Try changing timer — if set at 2 & 6, change to 2 & 7 (experimentation may be necessary). |

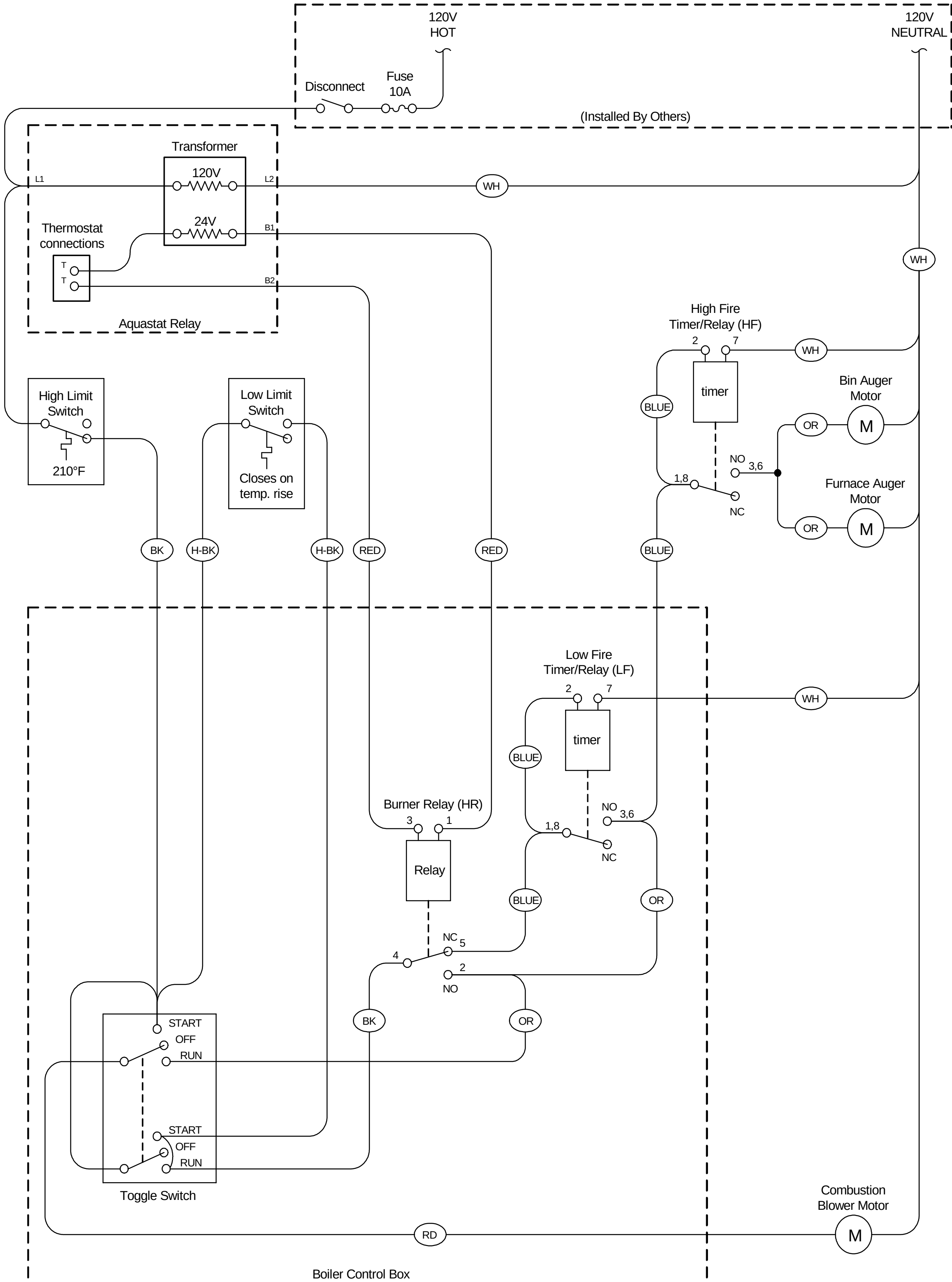
## Mechanical / Electrical

| Problem | Explanation | What to do |
|---|---|---|
| Boiler auger, bin auger, and combustion fan all do not operate | High limit switch defective or disconnected. All power for the boiler auger, bin auger, and combustion fan is supplied through the High Limit Switch. | Verify power to high limit switch.<br>Verify high limit switch is closed when boiler is cool. |
| Combustion fan will operate but boiler auger and bin auger, do not operate | Variable input timer defective. | Check variable input timer. |
| | Low limit switch defective. | Check low limit switch. |
| | Defective heat relay or no HEAT signal from thermostat or defective 24V transformer. | Verify that transformer is okay.<br>Verify HEAT signal from thermostat.<br>Check heat relay. |
| | The START/OFF/ON switch left in START position after starting fire in burn pot. | Change switch to ON. |

# WIRING DIAGRAM: LDJ991 100,000 BTU BOILER

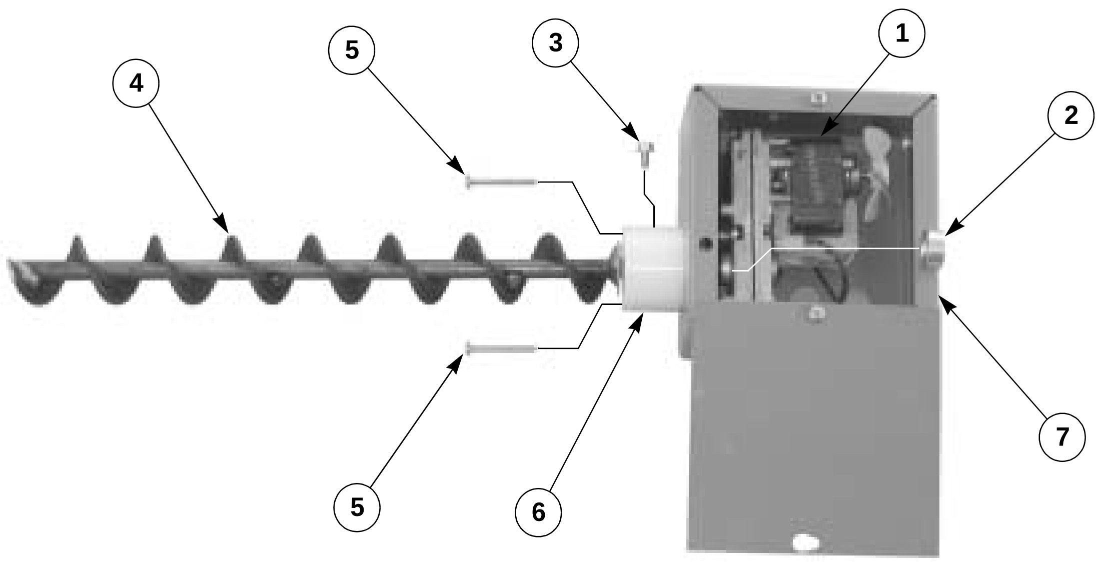


# WIRING DIAGRAM: LDJ991-10 165,000 BTU VARIABLE RATE BOILER



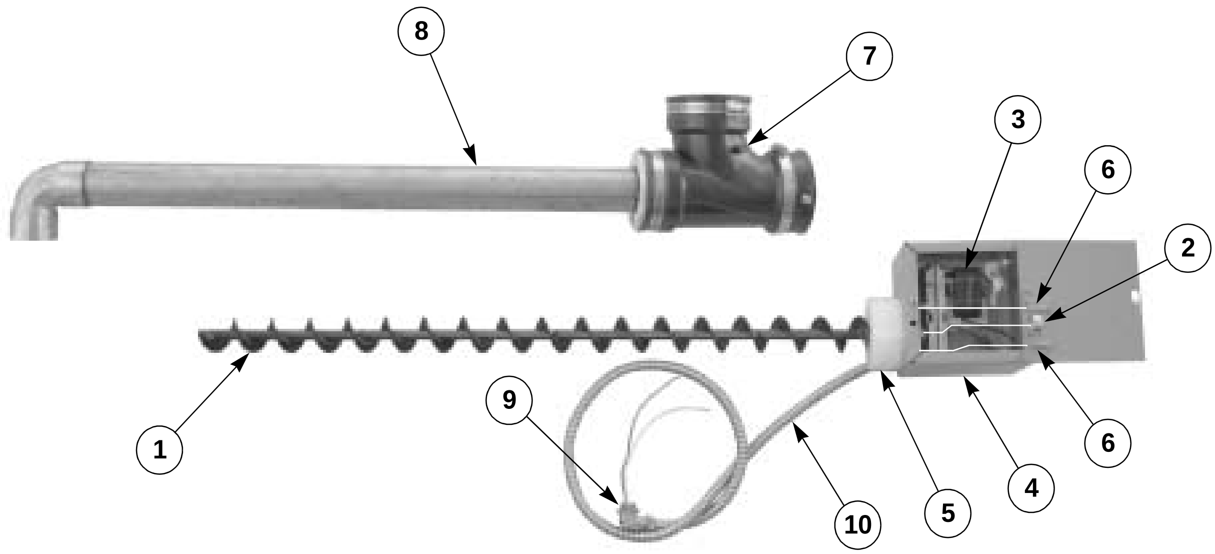
## REPAIR PARTS

### Burn Pot Auger



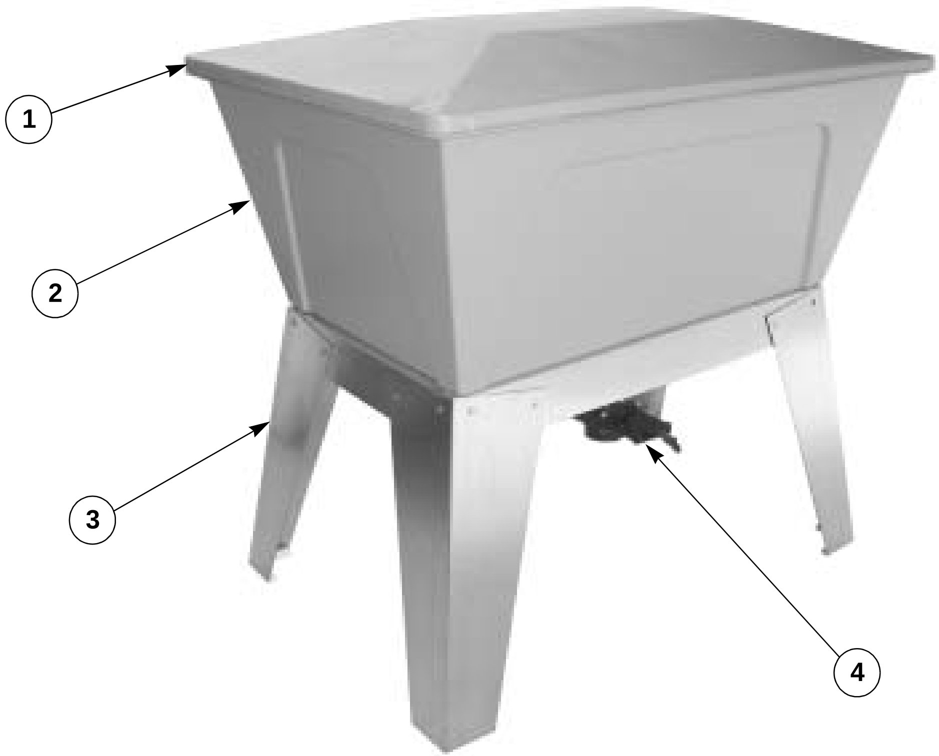

| Ref | Part Number | Part Description | Quantity Used | |
|---|---|---|---|---|
| | | | LDJ991 | LDJ991-10 |
| 1 | 1900 | Burn Pot Auger Motor - 4 rpm | 1 | — |
| 1 | 2000 | Burn Pot Auger Motor - 6 rpm | — | 1 |
| 2 | 3180 | Lock Collar | 1 | 1 |
| 3 | 1980 | Bolt, 1/4" x 1/2" Self Tapping | 1 | 1 |
| 4 | 3200 | Burn Pot Auger Flighting | 1 | 1 |
| 5 | 2070 | Screw - Sheet Metal, #10 x 1-3/4" | 2 | 2 |
| 6 | 3000 | Auger Support | 1 | 1 |
| 7 | 1410 | 6" x 6" Box | 1 | 1 |

## Hopper Bin Auger



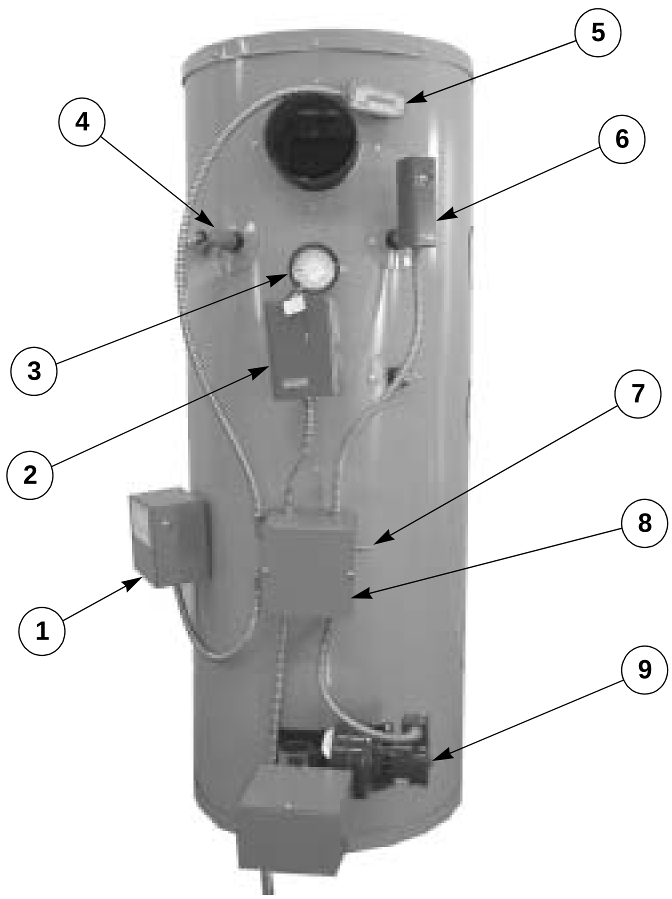

| Ref | Part Number | Part Description | Quantity Used | |
|---|---|---|---|---|
| | | | LDJ991 | LDJ991-10 |
| 1 | A-3220 | Bin Auger Flighting | 1 | 1 |
| 2 | 3180 | Lock Collar | 1 | 1 |
| 3 | 1880 | Bin Auger Motor - 2 rpm | 1 | — |
| 3 | 1900 | Bin Auger Motor - 4 rpm | — | 1 |
| 4 | 1410 | 6" x 6" Box | 1 | 1 |
| 5 | A-3070 | Auger Support | 1 | 1 |
| 6 | 5000 | Lag Bolt - 1/4" x 1" | 2 | 2 |
| 7 | 7530 | Rubber Tee | 1 | 1 |
| 8 | A-7540 | Bin Auger Tube | 1 | 1 |
| 9 | 1480 | Conduit Fitting | 1 | 1 |
| 10 | A-1550 | Flex Conduit | 1 | 1 |

## Storage Bin - Model 14




| Ref | Part Number | Part Description | Quantity Used | |
|---|---|---|---|---|
| | | | LDJ620-9 | LDJ620-10 |
| 1 | 7520 | Bin Lid | 1 | 1 |
| 2 | 7500 | Bin Cavity | 1 | 1 |
| 3 | 7510 | Bin Base | 1 | 1 |
| 4 | 7520 | Shutoff Valve | 1 | 1 |

## Boiler Electrical




| Ref | Part Number | Part Description | Quantity Used | |
|---|---|---|---|---|
| | | | LDJ991 | LDJ991-10 |
| 1 | 1610 | Varible BTU Timer (inside box) | — | 1 |
| 2 | 1630 | Aquastat Relay (inside box) | 1 | 1 |
| 3 | 1642 | Pressure / Temperature Gauge | 1 | 1 |
| 4 | 1645 | Pressure Relief Valve | 1 | 1 |
| 5 | 1660 | Low-Limit Switch (chimney vent temperature) | 1 | 1 |
| 6 | 1636 | High-Limit Control | 1 | 1 |
| 7 | 1680 | START/OFF/ON Switch | 1 | 1 |
| 8 | 1620 | Low Fire Timer (inside box) | 1 | 1 |
| 9 | 1860 | Combustion Fan | 1 | 1 |

## ADDENDUM

# Venting Information

## Metalbestos Chimney Systems (USA Only - See separate instructions for Canada)

**SHEET S-7**

## Installation Instructions

**Covering - Firestop/ Joist Shield, Trim Plate, Pitched Ceiling Plate and Wall Thimble**

Read Sheets GS and MCS for important clearance and safety precautions before installing any of the parts described by these Sheets. Sheets GS and MCS are packaged with Supports. These include the Ceiling Support, Wall Support, Insulated Tee and Anchor Plate. Sheet MCS is also packaged with Model UT, GT and ST insulated pipe and tee sections.

> ⚠ WARNING
> **Failure to follow the installation instructions could cause FIRE, CARBON MONOXIDE POISONING, OR DEATH. If you are unsure of installation requirements, call the Phone Number listed on the instructions, 1-800-992-8368 or visit www.selkirkinc.com.**

Metalbestos Chimney System (MCS) Model UT, GT and ST require shielded firestops when passing through ceiling joist areas and wall thimbles when passing through walls.

**FIRESTOP/JOIST SHIELD (PART NO. JS)**

**For all MCS Model UT, GT and ST ceiling joist penetrations below the roof (other than that in which a ceiling support is installed), the Firestop / Joist Shield (JS) must be installed.** (Ceiling supports incorporate their own firestops so no supplemental firestopping is required.) The firestop performs the following essential functions for both the dwelling and the chimney.

1. Together with a fully framed opening (all four sides) it acts as a fire stop to control vertical and horizontal spread of any fire external to the chimney. (See additional comments on firestopping.)

2. It stabilizes the chimney in the framed opening and defines and maintains the required two inch AIR SPACE clearance to combustibles.

3. It provides supplemental shielding for joist areas.

**INSTALLATION REQUIREMENTS**

The Firestop/Joist Shield (JS) can be installed on the top or bottom of a joist area but is most effective as a firestop if installed from beneath. As such, unless otherwise directed to do so, install Firestop /Joist Shield (JS) in the orientation shown in Fig. 1A with the plate to the bottom side and the shield extending up through opening (See Fig. 2).

To Install:

1. Frame a level square opening for 2 inches clearance from the outside of the chimney to the framing.

NOTE: If the ceiling is pitched, the JS needs to be installed on the top side and a level frame will need to be built to ensure the JS can be installed level and in a vertical orientation. (See Fig. 3A)

2. Place the Firestop/Joist Shield over the chimney and attach to the framed opening as shown in (See Fig. 2).

3. Nail side flanges into the framing.

4. If installed on top and the Firestop/Joist Shield is to be installed over the flooring, cut a square opening, then place it on top of the flooring, and nail for security.

5. Sub-flooring or finish floor can be placed over the Firestop/Joist Shield edges, provided that 2 inches clearance is maintained from the chimney pipe to the flooring.

6. If the framed opening is larger than necessary, the Firestop/Joist Shield outer edges must be extended by appropriate means (attaching metal plates, 26 gauge galvanized steel or heavier) to completely block the framed opening from any vertical air flow around the chimney.

7. Install the lengths of chimney as necessary to extend through the firestop, securing the joints with locking bands (provided) or three stainless steel sheet metal screws per joint. (See Sheet GS for screw option.)

8. Continue with installation in accordance with the instructions for the other components, as applicable.

9. Enclose the chimney below the Firestop/Joist Shield to prevent any accidental contact with the chimney. Exception - Exposed portions of the chimney which extend into the room in which a freestanding appliance is installed should not be enclosed. In an attic, to prevent blown-in attic insulation from falling against the chimney, either use an Attic Insulation Shield (AIS) or a full enclosure.

**THE FUNCTION OF FIRESTOPPING**

The purpose of firestopping in a chimney system is to prevent or delay the rapid spread of fire (regardless of the cause) in a home or building. Properly installed, the sheetmetal firestop prevents the chimney passageway from becoming an easy pathway for fire to spread from one floor to another.

IMPORTANT - Chimney Sizes 5", 6", 7", and 8" are Type HT.


FIG. 1A FIG. 1B

Firestop/ Joist Shield (JS) Used With MCS Chimney

**FIG. 2** FIRESTOP/ JOIST SHIELD (JS) INSTALLED

**TRIM PLATE (PART NO. TPS)**
**PITCHED CEILING PLATE (PART NO. PCP)**
(Used at ceiling of equipment room only)

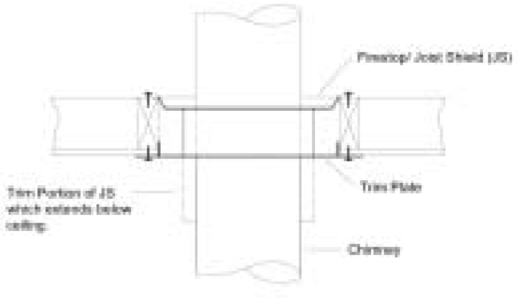
These parts provide for firestopping and a finished appearance for the ceiling opening when the chimney is extended down into the equipment room to a freestanding appliance. (See Figs. 3 and 3A) Use part TPS for flat ceiling installations and part PCP for pitched ceilings. A Firestop/Joist Shield (JS) is used on the top side of the opening in either case.

TPS/PCP installation with JS - The Firestop/Joist Shield (installed on the top side of the framed opening) requires trimming of the portion of the shield which extends beneath the ceiling before installing the TPS or PCP. (See Fig. 3 and Fig. 3A)

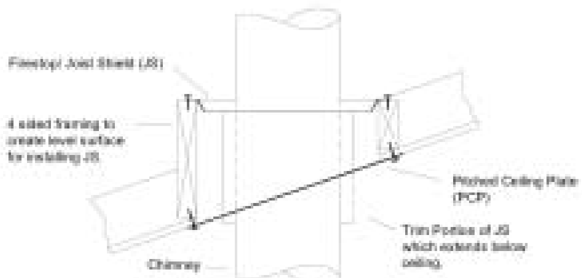
Note: If the ceiling is pitched, a level frame will need to be built to ensure the JS can be installed level and in a vertical orientation. (See Fig 3A)

To trim JS - after setting the JS in position on top of the opening (with open end down), mark a line around the perimeter of the shield at the elevation of the plane of the ceiling (flat or pitched). Use sheetmetal shears to trim the portion of the shield beneath the marked line. The shield should now extend down through the framed opening in the ceiling and end flush with the ceiling surface as shown in Figs. 3 and 3A.

After extending the pipe down through the JS, install the TPS (or PCP if pitched ceiling) by sliding it up around the pipe until it is in contact with the ceiling. Secure the TPS/PCP with screws.




CROSS SECTION - JS IN FLAT CEILING
FIG. 3




CROSS SECTION - JS IN PITCHED CEILING
FIG. 3A

## Wall Thimble

(Part No. WT)

A Wall Thimble (WT) must be installed in combustible Through the Wall installations of the Metalbestos Chimney Systems (except Model SSII where its use is optional). Framing Dimensions are as follows:

11" x 11" for 5" diameter
12" x 12" for 6" diameter
13" x 13" for 7" diameter
14" x 14" for 8" diameter

Installation Requirements

1. Verify Thimble opening is appropriate for diameter of pipe being used.

2. Frame a level, square opening to the appropriate size as noted above.

3. Insert the two halves from opposite sides of the wall. (See Figure 4). The half which incorporates the black painted face plate, is for the interior side of the wall.

4. Engage the shields together until a snug fit is achieved. Level the face plates of the thimble with respect to the opening.

5. Attach the face plates to the wall using screws through the predrilled holes found at each corner.

6. Seal around the perimeter of the Wall Thimble's face plate (on exterior side) with an RTV Silicone Sealant to prevent any rain infiltration. (See Fig. 5)

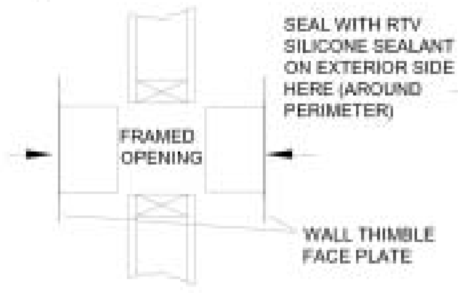
7. Proceed with installation of Wall Support and chimney as described in Sheet S5.

**NOTE:**

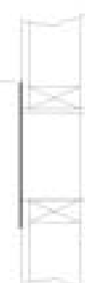
(1) The Wall Thimble accommodates wall thickness of 4 1/2" to 7 1/2". If a larger range is needed due to a thicker wall, it is permissible to field fabricate a metal sleeve extension and rivet or screw it to the shields.

(2) Install Thimble before installing Wall Support Kit and Chimney.

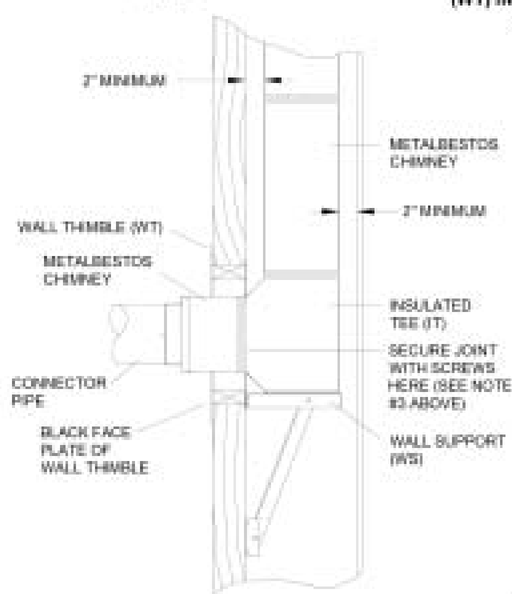
(3) **IMPORTANT:** Due to limited space, Locking Band cannot be used to join the horizontal section passing through Wall Thimble (WT) to snout of Tee. Three #8 x 1/2" Stainless Steel screws should be used. (See Fig. 6 below and Fig. 8 of Sheet GS.)




WALL THIMBLE (WT) HALVES
FIG. 4



WALL THIMBLE (WT) INSTALLED
IG. 5




WALL THIMBLE/ CHIMNEY COMPLETED ASSEMBLY
FIG. 6

SELKIRK.

14801 Quorum Drive Dallas, Texas 75240 1-800-992 VENT (8368)

SELKIRK, LLC
0015141-1203

# Barometric Draft Control Information

## BAROMETRIC DRAFT CONTROLS

***Model:*** **4”-7” RC**

**WARNING:** *Read the installation instructions carefully and completely before proceeding with the installation.*

**ITEMS INCLUDED:**

Barometric Draft Control

**WHEN SHIPPED WITH A COLLAR ADDITIONAL ITEMS:**

Mounting straps, Collar, Mounting Hardware

**GENERAL INFORMATION**

**BAROMETRIC DRAFT CONTROLS WITH OR WITHOUT COLLAR**

The Field RC is furnished as standard equipment on many leading brands of oil fired heating equipment. It is calibrated to allow for easy adjustment to the furnace or boiler manufactures specifications. Designed for draft settings from .02” to .08” inches of W.C.

**CONTROL LOCATIONS**

The control should be located as close as possible to a furnace or boiler and positioned as shown in Figure 1. It should be 18” from a stack switch and at least 18” from a combustible ceiling or wall. Do not locate in a room separated from the appliance. **NOTE:** *When a sheet metal tee is used instead of the collar, the “B” dimension must not be less than indicated for proper operation. (See Figure 2 and Table 1)*

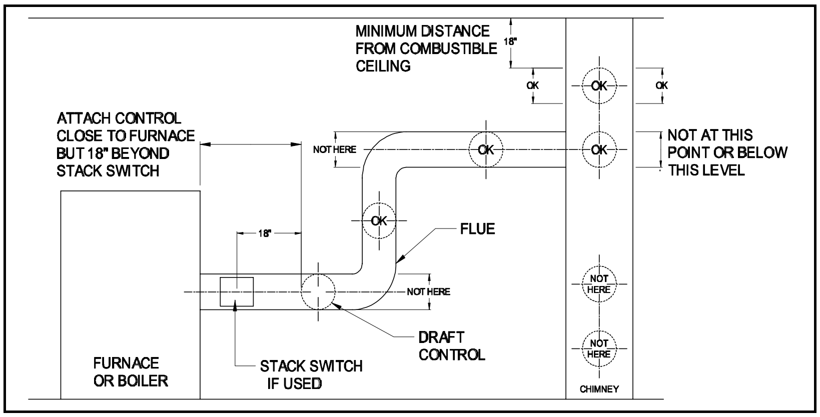



Figure 1

**COLLAR INSTALLATION**

**WHEN SHIPPED WITH A COLLAR**

To attach the collar to the flue, see Figure 2 and follow the instructions as follows:

1. Bend the two ears at the front corners of the collar outward. Bend 90°, ¼” behind the single hole on the straps.
2. Insert clamping screw in ears on collar and bolt the remainder of the collar together.
3. Hold the collar against the side of the flue in the exact position it is to be installed (shown by dotted lines) and mark the outline of the collar on the flue.
4. Cut a hole in the flue about ½” inside of the outline.
5. Make a series of cuts about ½” apart from the edge of this hole to the outline marks.
6. Strap the collar to the flue pipe.
7. Bend the tabs formed by the series of cuts outward against the inside of the collar to make a tight joint.
8. Insert the draft control. (See Installation & Adjustment)

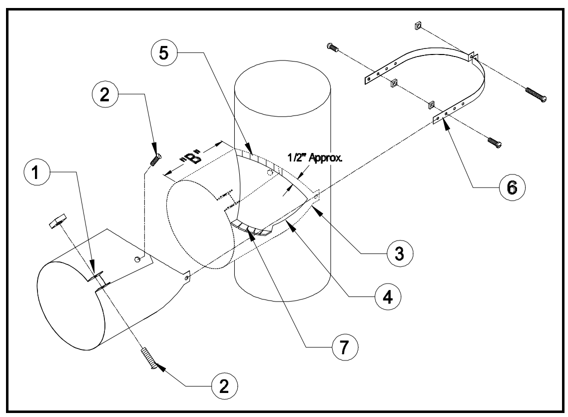



Figure 2

If flue pipe is made of material too heavy to bend out into collar, make the diameter of the opening within ½” of the inside diameter of the collar. Seal with high temperature RTV silicone or high temperature foil tape UL listed for the temperature of the application.

For proper settings and operation of the burner and the draft combustion testing instrumentation and draft gauges must be used.

FIELDCONTROLS
THE VENTING SOLUTIONS COMPANY
2630 Airport Road • Kinston, NC 28504
Phone: 252-522-3031 • FAX: 252-522-0214
www.fieldcontrols.com

**INSTALLATION AND ADJUSTMENT**

**NOTE:** *See sections on control locations and collar installation.*

Insert the draft control into the collar. The front face of the control must be plumb. The pivot points must be level whether the control is on a horizontal, vertical, or sloping flue pipe. Use a spirit level, plumb and level accurately. Secure the control in the collar by tightening the clamping screws. If the collar is not supplied by Field, the control may be held in place by small bolts or sheet metal screws so located as not to interfere with the movement of the gate. When a sheet metal TEE is used instead of the collar, the B dimension must not be less than indicated for proper operation. The "B" dimension prevents the damper gate from obstructing the flue passage way. See Figure 2 and Table 1.

**Table 1**

| *RC SIZE* | *B-DIMENSION* |
|---|---|
| 4 | 2 1/2 in. |
| 5 | 2 1/2 in. |
| 6 | 1 7/8 in. |
| 7 | 2 5/8 in. |

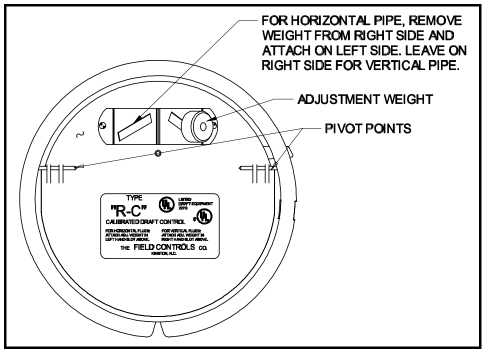



**Figure 3**

**VERTICAL FLUES**

The control is shipped for installation in a vertical flue. The adjustment weight should be in the right hand slot when you face the control. (See Figure 3)

**HORIZONTAL FLUES**

For horizontal flues, remove the weight from the right hand slot and attach it to the left hand slot as shown in Figure 3.

**ADJUSTING THE CONTROL**

The burner must be running when the adjustment of the control is made. The use of a draft gauge is required to accurately set the over fire draft. Set the over fire draft according to the appliance manufactures installation instructions.

Set the control to maintain as low a draft as will give good combustion and meet the requirements for heat. Turn the adjustment weight counter-clockwise to loosen, then slide in slot to the proper position and tighten. The bracket is marked 2,4,6 and 8, which indicates draft settings of .02",.04", etc. (These are drafts in flue adjacent to control, NOT over-fire drafts)

**OIL BURNER COMBUSTION AIR AND OVERFIRE DRAFT SETTING (INCHES OF W.C.)**

After the burner has operated for at least 5 to 10 minutes, take draft readings over the fire. For a domestic oil burner, the over-fire draft should be approximately .02" to .03", although there are some makes of burners which require higher drafts. Follow the burner manufacturer installation instructions for proper settings. There must always be enough draft so that the burner does not puff back into the room at the moment it starts, and there should be no objectionable smoke. $CO_2$ and smoke readings must be taken to determine the proper adjustments.

## ADDITIONAL APPLICATIONS (FOR RC SERIES DRAFT CONTROLS)

**STOKERS**

Adjustments must be made while the stoker is running, with a normal fuel bed depth and its fan adjusted to approximately the correct setting.

A draft gauge must be used to accurately set the overfire draft. Follow the manufacture installation instructions for proper settings. If no instructions are available.

For a domestic stoker, the draft should be set at -.04" OVER THE FIRE, with the STOKER ON. Have just enough draft so that at the moment the stoker starts, it does not gas or puff back into the room through cracks around the fire door (with the fire door closed). If there is objectionable smoke, increase draft slightly.

**HAND FIRED PLANTS**

Adjust the draft control when a good fire is burning. Close any check damper and open wide any internal damper.

Usually a draft of -.06" will be sufficient for cold weather, with reasonably quick pickup after a banked period. But if plant overheats, change to a lower draft setting. Raise the setting if there is not enough heat.

In mild weather when less heat is needed, or the fire is to be banked, close ash pit draft door partly or entirely. If desired, a check damper also can be used when banking the fire.

FIELDCONTROLS
THE VENTING SOLUTIONS COMPANY

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