

Bio-King™

Corn & Wood Pellet Furnace

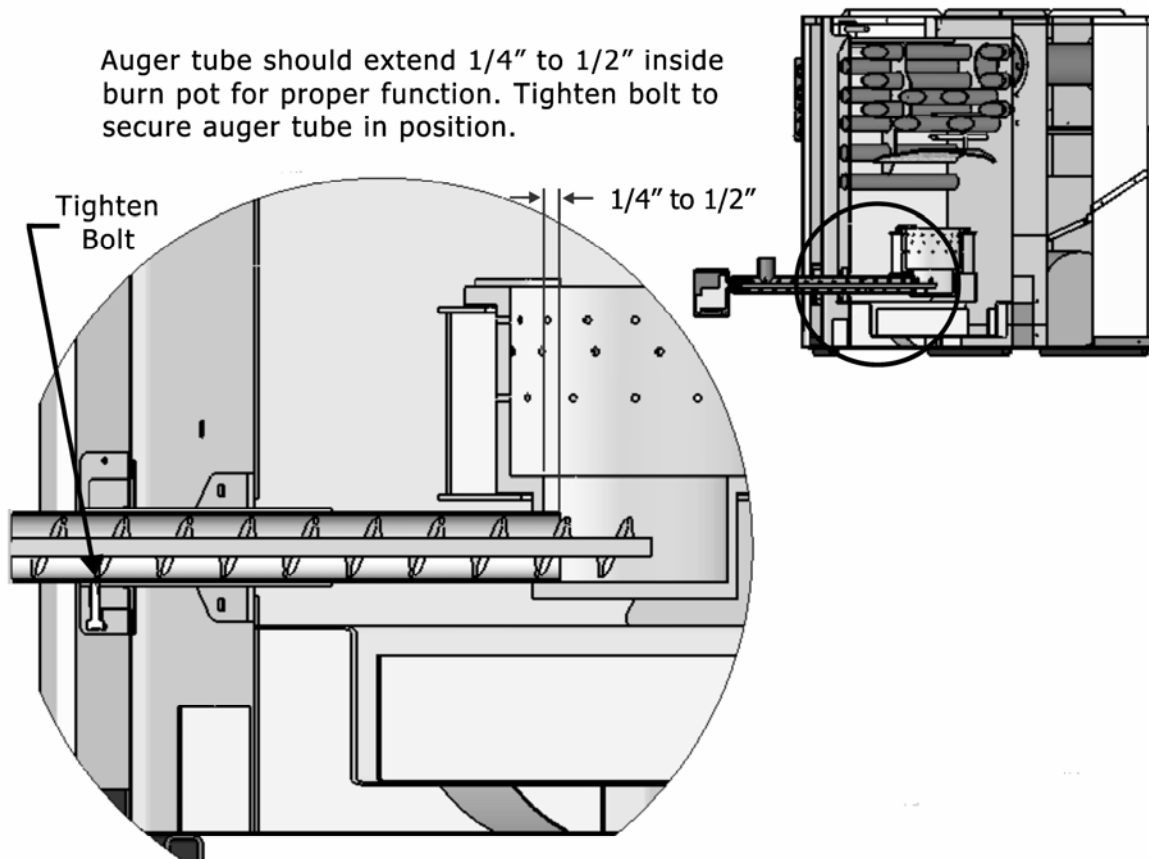
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TECHNICAL UPDATE

| PRODUCT ID | UPDATE DESCRIPTION | RELEASE DATE |
|-------------|---------------------------------|--------------|
| Model BK140 | Furnace Auger Tube Installation | 11/09/06 |

If the auger tube is not positioned properly and locked in place, the auger will bind on the bottom of the burn pot. This will cause the auger motor to stop.

Auger tube should extend 1/4" to 1/2" inside burn pot for proper function. Tighten bolt to secure auger tube in position.



Bio-KingTM

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Model BK140

Installation, Operation, & Maintenance Manual



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Installation, Operation, & Maintenance Manual

Congratulations on your purchase of an Energy King™ Corn & Wood Pellet Furnace!

It makes sense to use a heat source that utilizes resources that are readily available, easily renewable and good for our environment. With the rising cost of heating with conventional fuels, it makes even more sense to use alternative heat sources.

All of our Energy King™ products are meticulously designed for serious heating and tested to ensure safety and ease of operation along with durable and reliable performance. This manual describes the installation, operation and maintenance of your Energy King™ Corn & Wood Pellet Furnace.

Save these instructions.

Before installing your Energy King™ Furnace, please read and be sure you understand the entire owner's manual and safety instructions.

Refer to markings on the appliance for additional instructions.

This furnace has been designed to use independently or as an add-on to your existing heating system. However, the installation of any furnace is not a do-it-yourself project. **To ensure the furnace will operate safely and efficiently, a qualified installer must perform the installation.** With proper installation, operation and maintenance, we are confident your furnace will give you years of efficient, reliable and comfortable service.

Thank you for choosing the Energy King™ Corn & Wood Pellet Furnace.

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Safety Instructions



Failure to follow these safety instructions may result in property damage, bodily injury or even death.

- ▲ Read this entire manual before installing, operating or maintaining this product. Proper installation of this furnace is crucial for safe and efficient operation. Save these instructions for later use.
- ▲ This heating appliance must be installed in accordance with local codes and regulations. Contact your local building or fire officials about installation restrictions and inspection requirements in your area.
- ▲ All minimum clearances to combustible materials must be followed.
- ▲ Do not connect this heating appliance to a chimney flue serving any other heating device.
- ▲ Install in an area with adequate air for combustion and ventilation. The use of outside air may be required for safe operation of this furnace.
- ▲ Disconnect all power to the furnace at the breaker box or service panel before performing routine maintenance and service. Allow the furnace to cool before servicing.
- ▲ The moving parts of this product can cause severe injury to body parts that may get near them. Keep all body parts away from moving parts when there is power to the furnace.
- ▲ Establish a routine for the storage of fuel, care of the appliance and firing techniques.
- ▲ The furnace door, ash pan door and hopper lid must be closed tightly during operation. All seals must be maintained in good condition.
- ▲ This furnace is designed to burn dry shelled corn or wood pellet fuel only. Burning of any other type of fuel voids your warranty.
- ▲ Do not burn treated corn. Treatment chemicals can be unknown and their inhalation can result in serious health problems or death.
- ▲ CAUTION – Hot Surfaces: Keep children away! Do not touch furnace during operation.
- ▲ Do not place clothing or other flammable materials on or near this appliance.
- ▲ Do not use, store or dispose of flammable liquids near the furnace.
- ▲ DANGER – Risk of Fire or Explosion: Do not burn garbage, gasoline, naphtha, drain or engine oil, or other flammable liquids or inappropriate materials in this furnace.
- ▲ Do not use chemicals or fluids, such as gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or freshen up a fire in this furnace.
- ▲ Dispose of ashes with care. Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal.
- ▲ A working smoke detector must be installed in the same room as this product.

We are constantly improving and updating our products in order to provide the highest quality and value possible. RJM Manufacturing, Inc., the manufacturer of this product, reserves the right to alter its products, their specifications and/or prices without notice

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Specifications



| | |
|---|---|
| Model Number | BK140 |
| Furnace Dimensions (H x W x D) | 50" x 26" x 44" |
| Furnace Weight | 625 lbs |
| Hopper - Galvanized, Sloped Bottom | Standard |
| Hopper Dimensions (H x W x D) | 48" x 30" x 44" |
| Hopper Weight | 145 lbs |
| Hopper Capacity | 12 Bushels / 672 lbs |
| Heating Capacity (BTUs per Hour) | 30,000 ¹ - 140,000 ¹ |
| Blower Capacity | 1800 CFM (3-Speed) |
| Electrical Requirements | 115 Volts, 60HZ, 1 Phase, 15 Amp Circuit |
| Cast Iron Furnace Door | 12" x 11" |
| Cast Iron Ash Door | 10" x 5" |
| Removable Ash Pan | Standard |
| Heat Exchanger | Standard |
| Cast Iron Burn Pot - Bottom Feed | Standard |
| Firebox | 12 Gauge |
| Flue Size | 6" |
| Warm Air Outlet Size (Plenum) | 18" x 18" |
| Cold Air Return with Filter | 18" x 14" |
| Filter Size | 18" x 25" |
| Complies with Test Standards for the U.S.; Manufactured Home Approved | UL 391-99 ASTM E 1509-04 |

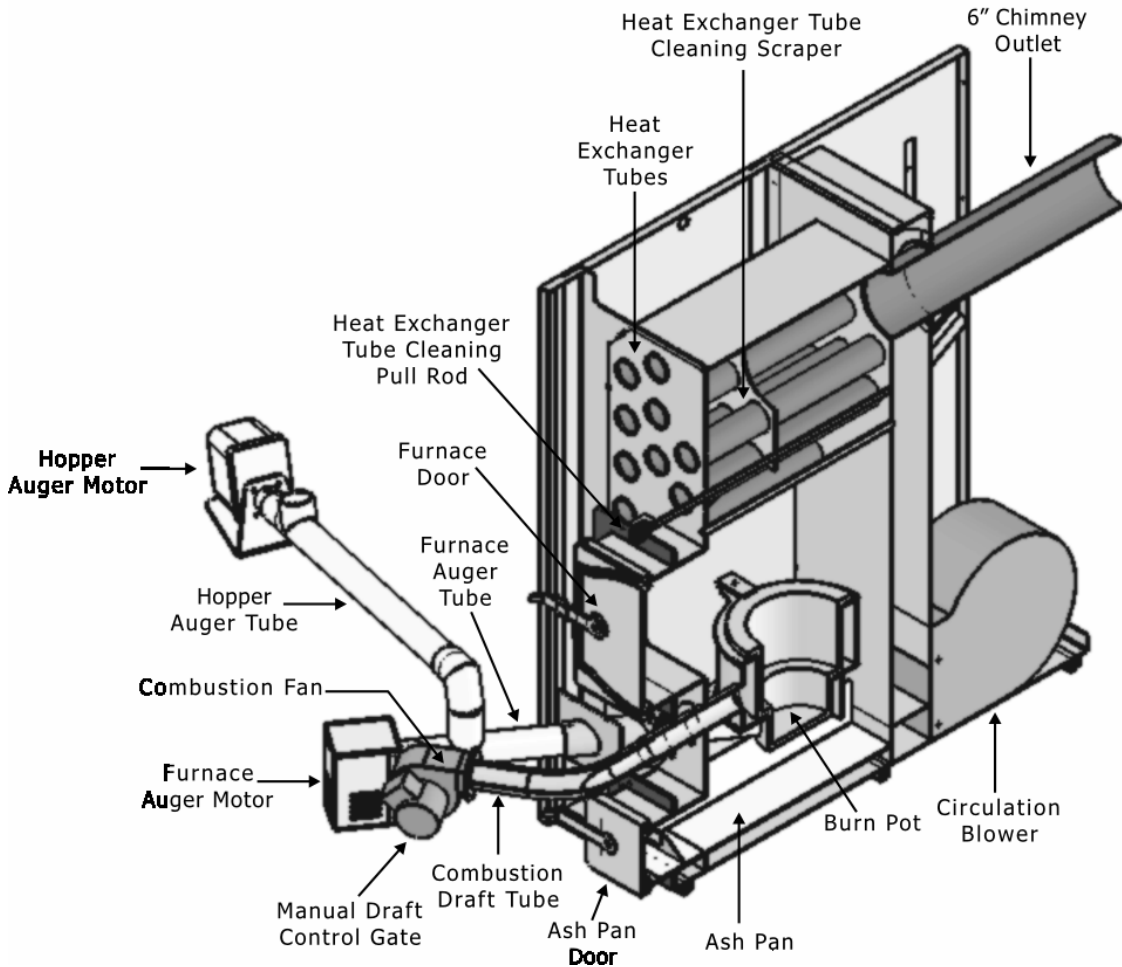
¹ BTU output will vary depending on the quality of fuel. Use PFI listed fuels for best results.

Disclaimer: No guarantee is made regarding the heating capacity of this furnace. The actual area that this unit will heat depends on factors such as conditions of the building, heat loss, type of construction, amount and type of air movement, and the location of the furnace.

Component Cutaway View



Please note that not all parts are shown or described.



6" Chimney Outlet. Venting must be provided using a lined masonry chimney or a listed type HT pre-fab chimney. The chimney exhausts smoke and flue gases that are a natural result of combustion and provides "draft" to the furnace. Draft is the force that moves air from the burn chamber up through the chimney.

Circulation Blower. The three-speed circulation blower, operated by the fan limit control, forces air on all sides of the firebox, through the heat exchanger tubes, then into the home's duct system. The blower can be manually adjusted to run faster or slower to correspond to the amount of heat being produced.

Burn Pot Cast Iron Burn Chamber. Fuel is delivered by the augers to the bottom of the burn pot. A series of holes in the burn pot allows combustion air to enter the chamber.

Residue ash rises up on the incoming fuel and is spilled over the sides of the burn pot into the ash pan below

Furnace Auger. After a fire has been established, the furnace auger automatically pushes fuel to the bottom of the burn pot.

Ash Pan. Designed for easy cleanup of fine ash accumulation. Do not operate the furnace with the ash pan door open; keep it closed except to remove ashes. The ash pan door gasket provides an airtight seal and should be inspected to ensure that it is in good condition at all times. The gasket must be replaced if it becomes damaged or worn.

Combustion Fan. This fan supplies air for combustion.

Fuel Feed System. The thermostat activates the fuel feed system for precise temperature control. When the thermostat calls for heat, fuel is delivered to the bottom of the burn pot by the auger feed system.

Hopper Auger. This auger feeds fuel from the hopper to the furnace auger.

Heat Exchanger Tubes. The firebox provides over 24 square feet of heat transfer area, with an additional 11 square feet of heat transfer area supplied by the 20-tube heat exchanger system. Each tube is 2 ¼" in diameter. A built in heat exchanger tube scraper allows you to easily remove ash residue that accumulates on the outside of the exchanger tubes.

Adjustable Timers. The furnace is equipped with *Low Fire* and *High Fire Timers*. The *Low Fire Timer* can be set to cycle the fuel feed system for a short period of time followed by a longer period of no combustion fan or auger activity. The low fire activity is similar to a pilot light on a conventional furnace.

When starting a fire or when the thermostat drops below the set temperature, fuel is fed according to the *High Fire Timer* settings. In this mode, the combustion fan remains on while the augers cycle on and off in response to the timer settings.

BTU Variable Adjustment / High Fire Timer. The furnace still cycles with the thermostat, but the heat output is easily changed from 30,000 to 140,000 BTUs with adjustment of the timers.

Fan Limit Control. This control automatically starts and stops the circulation blower. It also features a limit switch which will cut power to the augers and combustion fan if the temperature exceeds the set limit, while the circulation blower continues to run to cool the furnace.

Hopper. Fuel is stored in the hopper until the auger transfers it into the fuel feed system. Never overfill the hopper.

Hopper Lid. The lid fits securely over the top of the hopper. Always operate the furnace with the lid closed securely. Inspect the hopper lid seal to ensure that it is in good condition. Replace seal if it is worn or damaged.

Clearances to Combustibles



Clearances to combustibles are the minimum distances allowed to any combustible object. Failure to strictly maintain these clearances will present a serious safety hazard.

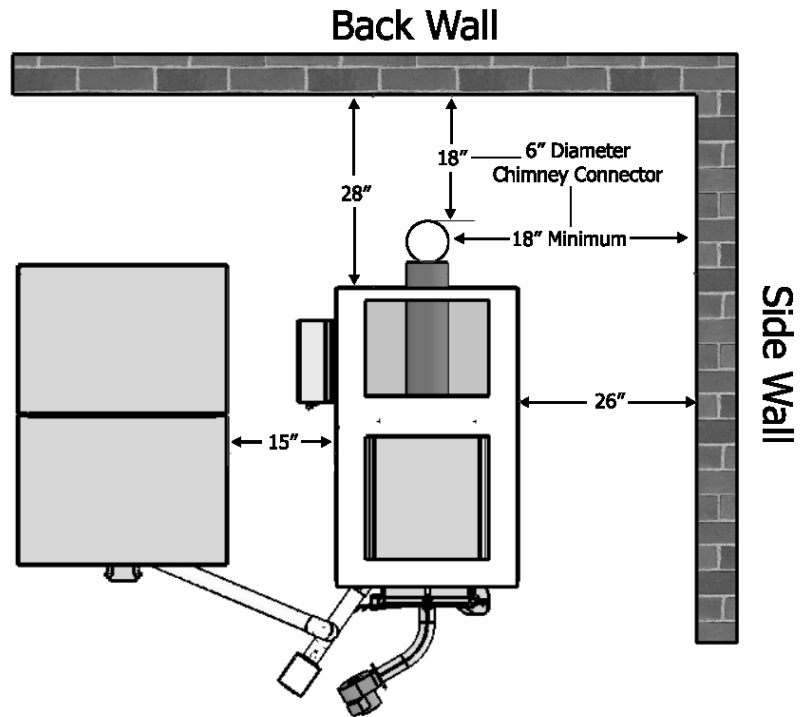
While these are minimum clearances that must be maintained, consideration should also be given to having access around the unit for cleaning, fueling, maintenance and repair.

Floor Protection

Floor protection must be provided because of possible spillage of ashes and burning fuel. The furnace must be installed on a non-combustible floor or 3/8-inch thick fireproof millboard or equivalent. The non-combustible material must be placed underneath the furnace, extend at least 16 inches (400 mm) in front of the unit and 8 inches

(200 mm) on either side of the fuel loading and ash removal doors. Additionally, the non-combustible material must extend at least 2 inches (50 mm) on either side of the chimney connector. Consult your local dealer for possible sources of non-combustible floor protection material acceptable for use.

INSTALL CHIMNEY VENTING IN ACCORDANCE WITH CLEARANCES SPECIFIED BY THE MANUFACTURER OF THE CHIMNEY.



Furnace. The minimum distances the furnace may be to a combustible surface are:

- Unit to Back Wall28"
- Unit to Side Wall26"

Chimney Connector. The minimum distances the chimney connector may be to a combustible surface are:

- Connector to Back Wall18"
- Connector to Side Wall18"

Plenum. The minimum distance the warm air outlet (plenum) may be to a combustible surface is 2".

Preinstallation Considerations



This furnace is intended for use in buildings or for manufactured home installation. Please check with local authorities and obtain the necessary permits prior to installing this furnace. Before the position of the furnace can be decided, a few questions should be considered:

1. Will this furnace be used as a primary (central) furnace, or will it be installed as an add-on to your existing furnace?
2. Can the furnace be vented properly?
 - a. Will exhaust be vented where fumes can build up or be drawn into the lower levels of the structure, or will fumes and fly ash affect the exterior of the structure or someone else's?
 - b. Is your chimney appropriate for this application? This furnace requires installation into an all-fuel or a listed type HT pre-fab chimney.
 - c. Has your chimney been inspected? For your safety, it is important your chimney be clean and free from defect or damage prior to installing your furnace.
3. The furnace may require an outside air source for combustion air. Will this be easily accessed in your desired location?
4. Are there any local regulations governing the use and placement of the furnace?
5. Can the furnace be installed safely?
 - a. The furnace should not be installed in a location where it could come into contact with curtains, drapes, walls, carpeting, or other combustible surfaces, and must not be installed in a sleeping room.
 - b. Will your desired location require floor protection?
 - c. The clearances specified in this manual are minimum clearances. Any reduction must be approved by the regulatory authority and is not recommended by RJM Manufacturing, Inc.
6. How close is the electrical source? The power source must conform to the requirements shown under "Specifications."
7. Will the furnace be easily accessible for cleaning, refueling, maintenance and repair?
8. Are there any structural reasons why the furnace cannot be placed where you want?

Finally, do you have a reliable, consistent source of fuel for your furnace? Please see "Fuel Requirements" for further information on fuel supply.

BURN SHELLLED CORN OR WOOD PELLETS ONLY.

⚠ WARNING Risk of Fire: Do not store fuel or other combustible material within the marked installation clearances.

It is important to use fuel that is clean, dry and consistent. Biomass furnaces, such as your Energy King Corn & Wood Pellet Furnace, naturally produce ash and clinkers as byproducts of the burning process. Even with Energy King's highly efficient design, your furnace will still produce some amount of ash which will need to be cleaned periodically. The type and quality of fuel you burn affects the amount of ash produced and the performance of your furnace. To assist you in determining which fuel to use, here are some guidelines for you to consider:

Corn

- The furnace has been tested for operation with shelled corn containing 15% or less moisture. We recommend using shelled field corn with a moisture level of about 11% to 13% moisture for efficient operation of this unit. Corn with over 14% moisture has a lower BTU value and will be hard to burn on the low fire setting.
- Typically, burning corn requires more combustion air than wood pellets. When burning corn, make sure your furnace's draft settings are adjusted accordingly.
- It is not necessary to mix corn with wood pellets; however, some people have had success burning a 50/50 mix.
- Corn must be clean and free from debris such as cobs, twigs, stalks, stones, etc. Unclean corn can cause excess ash and unwanted deposits in your furnace. Damage caused by dirty corn and other foreign objects is not covered by your warranty.
- You can ask your fuel supplier for clean corn—it can usually be purchased in bulk or bagged from most elevators, feed stores or even your local farmer.
- We recommend trying several different brands to determine which brand is most efficient for your furnace.

- The use of cracked corn or waxy corn is not recommended. Using treated (seed) corn as fuel is dangerous to occupants. Seed corn is treated with chemical pesticides that are harmful or fatal if swallowed and which, when burned, may cause damage. **Burning seed corn voids the furnace warranty.**

Storage

- Do not store fuel within the appliance installation clearances or within the space required for refueling, ash removal and other routine maintenance operations.
- Store your corn in a dry place and keep the bags or containers sealed to prevent it from absorbing excess moisture. Excess moisture will cause your corn to burn poorly and generate mold.
- If possible, store your corn in a tightly sealed container. In addition to preventing the corn from absorbing moisture, this will also help prevent rodents from becoming a problem.
- Do not carry your corn supply over into the next heating season unless properly stored. If you do carry over your corn supply, be sure to check it for proper moisture content.

BURN SHELLLED CORN OR WOOD PELLETS ONLY.

WARNING Risk of Fire: Do not store fuel or other combustible material within the marked installation clearances.

Pellets

The Pellet Fuels Institute (PFI) establishes standards for pellet fuel. Pellet fuel manufacturers voluntarily follow these standards, but homeowners should know what to look for. The PFI standards for residential quality pellets are:

| | |
|-------------|---|
| Length | 1.5 inches, maximum |
| Diameter | .235 to .350 inches (approx 1/4" to 3/8") |
| Fines | 2# maximum per 40# bag |
| Salts | .005 % by weight, maximum |
| Ash Content | <ul style="list-style-type: none">▪ Premium Quality: .75% by weight, max (.3# per 40# of pellets)▪ Standard Quality: 2.5% by weight, max (1# per 40# of pellets) |

- The Energy King Corn & Wood Pellet furnace has been tested for operation with wood pellets.
 - Fines are pieces of sawdust that were not properly pelletized, or are the result of pellets breaking down during handling, transportation or storage. Fines can create dust in your home and interfere with the flow of pellets in your hopper, including plugging your hopper, jamming your auger or plugging your exhaust system. Fines can be sifted out by installing a pellet screener.
 - Salt in pellets can cause furnace deterioration (rust).
 - Pellet manufacturers should be able to show test results for BTUs, ash content, and the amount of fines in their product. Do not hesitate to contact the pellet manufacturer if you have questions or concerns.
- Again, we recommend trying several different brands to determine which brand is most efficient for your furnace.
- Storage**
- Do not store fuel within the appliance installation clearances or within the space required for refueling, ash removal and other routine maintenance operations.
 - All pellet fuel should be stored in a clean, dry place and at a safe distance from the furnace. **Do not burn wet pellets.**
 - Do not carry your pellet supply over into the next heating season unless properly stored. Pellets left over the summer can draw moisture which causes excess ash and may plug the auger. Additionally, the moisture may cause the pellets to degrade making them unusable.

⚠ WARNING

Risk of Fire:

- Do not operate with flue draft exceeding .06 in. (14.95 Pa) water column.
- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances.
- Inspect and clean flues and chimney regularly.

⚠ CAUTION

Do not connect this furnace to a chimney flue serving another appliance.

General Requirements

The installation of any solid fuel heating appliance is not a do-it-yourself project. A qualified heating specialist should install this furnace. Check with your fire department and building inspector for local, state and federal codes regulating installation.

Solid fuel heating appliance related fires are caused almost exclusively by installation, operation or maintenance errors. A smoke detector in “working” condition should be a part of every Energy King furnace installation. This is the most inexpensive insurance you can buy.

The furnace is designed to be used in conjunction with a listed gas- or oil-fired furnace or as a central furnace.

Floor Protection

Floor protection must be provided because of possible spillage of ashes and burning fuel. The furnace must be installed on a non-combustible floor or 3/8-inch thick fireproof millboard or equivalent. The non-combustible material must be placed underneath the furnace, extend at least 16 inches (400 mm) in front of the unit and 8 inches (200 mm) on either side of the fuel loading and ash removal doors. Additionally, the non-combustible material must extend at least 2 inches (50 mm) on either side of the chimney connector. Consult your local dealer for possible sources of non-combustible

floor protection material acceptable for use.

As Primary Furnace

Locate the furnace as close to the new or existing chimney as possible and as central to the heat distribution system as practical. Additionally, the furnace should be placed so that you can easily complete operation and maintenance procedures. Strictly adhere to all requirements pertaining to clearance to combustibles, combustion air, venting system, draft control, duct system and thermostat installation.

As Add-On Furnace

The furnace is designed to be used in conjunction with a listed gas- or oil-fired furnace, but not all furnaces will accept an add-on application. Some small furnaces, and especially counterflow or downflow furnaces, may not be used in an add-on installation. Before installing your Energy King furnace, consult your heating contractor and your local and state building codes to determine if your existing furnace is compatible with the Energy King Corn & Wood Pellet Furnace.

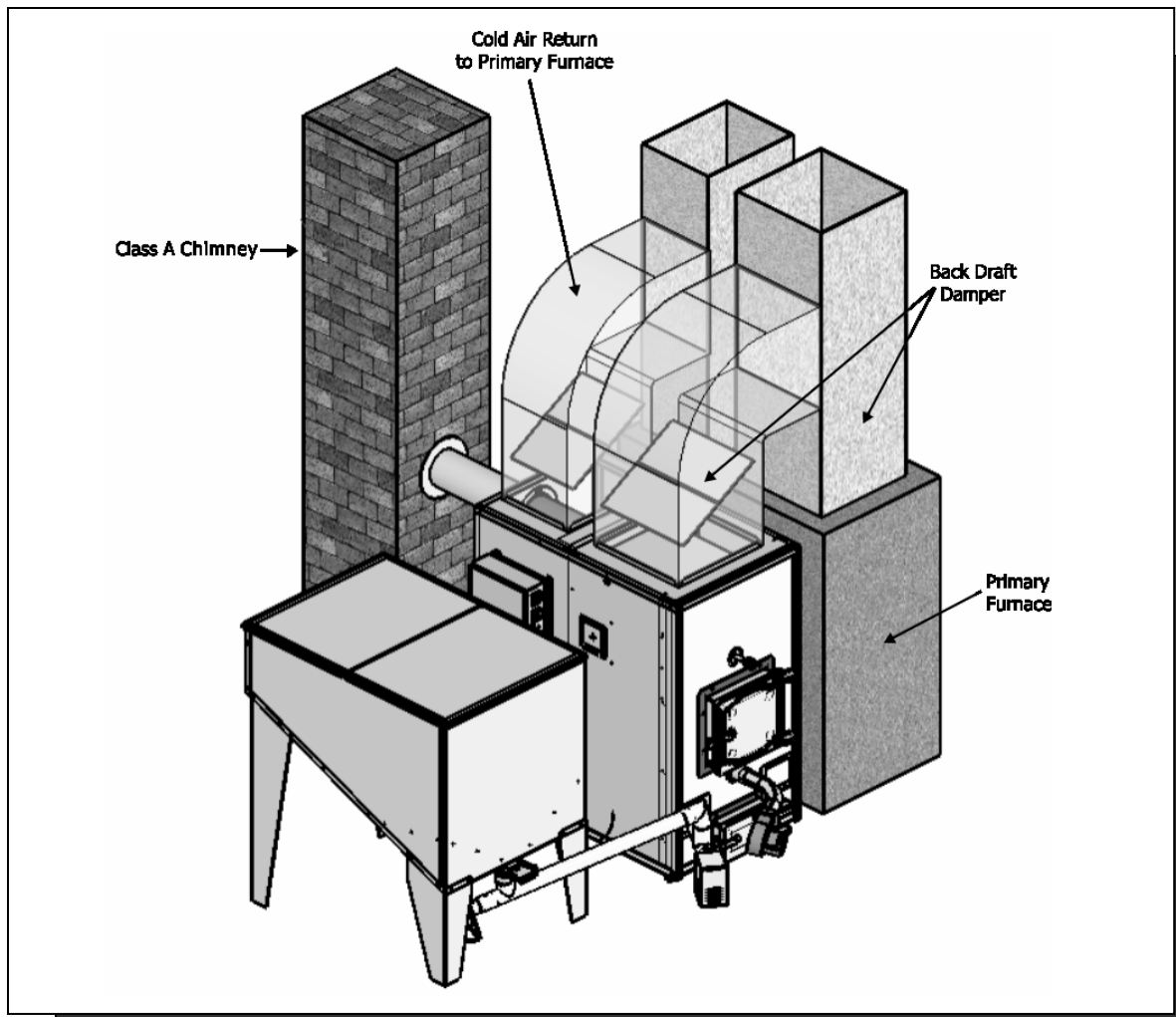
The CFM capability between the blower on the existing unit and the add-on unit must be compatible. If all of these conditions are met, then the combined static pressure may not exceed that established by the existing furnace.

CAUTION

Do not connect the Energy King warm air supply outlet into the cold air return inlet of the central furnace. The components of the central furnace could overheat causing the central furnace to operate other than intended.

Once it has been determined that your existing furnace will accept an add-on installation, a 6-inch minimum clearance is required between the Energy King furnace and your existing furnace.

We recommend a parallel installation, with a direct (ducted) feed of return air to the Energy King Furnace. The installation of two back draft dampers as shown in this illustration ensures that when either unit is operating by itself the hot air will flow into the home, and not flow back through the other furnace.



Most Common Add-On Arrangement

Combustion Air Requirements



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 furnace must have a minimum supply of 70 cubic feet of air per minute.

Furnaces must have air (oxygen) for proper combustion. The incomplete combustion that takes place when a furnace is "air starved" causes carbon monoxide (CO) production in quantities that can be dangerous inside a building. Combustion air from outside may need to be brought in to prevent "air starvation." Although an outside air source is strongly recommended for all installations, it may be necessary if:

- The furnace does not draw steadily, smells, experiences smoke roll-out, burns poorly, or backdrafts whether or not there is combustion present.
- Any of the above symptoms are alleviated by opening a window slightly on a calm day.
- The house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air.
- There is excessive condensation on windows in the winter.
- A ventilation system is installed in the house.

Consult a qualified furnace installer to analyze whether the air supply in your installation environment is adequate.

Venting System



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 the Energy King to any chimney flue servicing any other heating appliance.



Risk of Fire: Inspect and clean flues and chimney regularly.

Consult a qualified furnace installer, your local building inspector and your fire officials to make sure the chimney and all connections conform to all local, state and national codes.

Installation

Your venting system is an extremely important part of your furnace installation and has two key functions:

1. To exhaust smoke and flue gases which are the natural result of combustion.
2. To provide "draft." The draft pulls a continuous supply of fresh air into the furnace for proper combustion.

A chimney connector and chimney make up the venting system and must be properly installed and maintained to protect against a fire. Consult a venting professional.

The Energy King requires installation into an "all-fuel" or listed type HT pre-fab chimney. An existing chimney must be cleaned and inspected to be sure it is clean and free from defect or damage. All connections made to the chimney must comply with NFPA Standard 211 and all applicable building codes.

Masonry Chimney

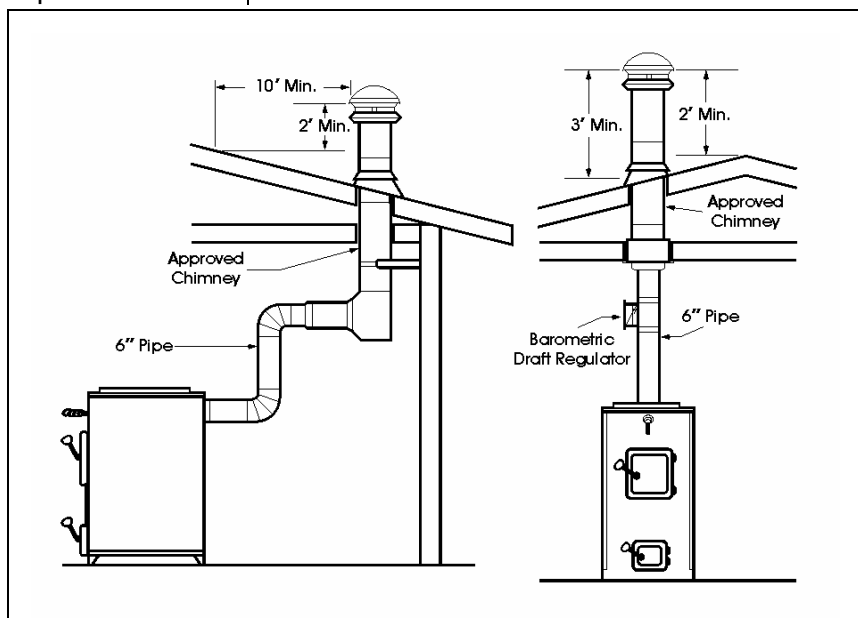
When connecting into an existing masonry chimney, an approved liner must be used in the chimney. An unlined chimney could remain cold and cause a downward pressure which creates the environment for poor

burning, incomplete combustion or backdraft.

Important venting installation clearances and points for proper operation and safety:

- The connection from the furnace to the chimney must be made using 6" black or blue steel material with a minimum 24 gauge.
- A minimum distance of 18" must be maintained between the chimney connector and combustible ceiling surfaces.
- A minimum of 18" must be maintained between the chimney connector and the backwall and sidewalls.
- Avoid using more than two elbows in connecting the furnace to the chimney.
- Any horizontal runs of connector pipe should have a minimum rise of 1/2" per linear foot.
- Secure all connector pipe joints with at least three sheet metal screws.
- Use extra support hangers or brackets every three feet if it is absolutely necessary to have a run of more than six feet, which is not recommended.

The chimney must be at least 3 feet higher than the highest point where it passes through the roof, and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally.



Barometric Draft Control

WARNING Risk of Fire: Do not operate with the flue draft exceeding .06" water column.

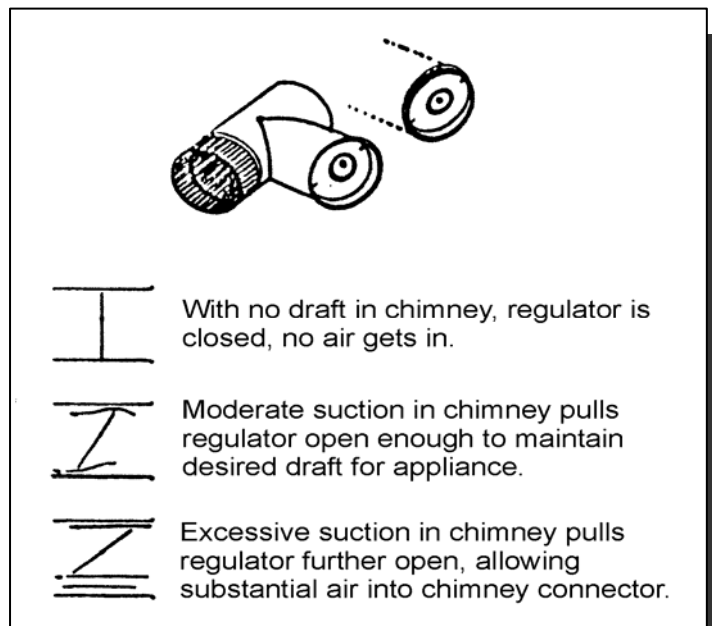
Proper draft must be provided for your Energy King furnace. Draft is the force that moves air from the furnace up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography,

nearby obstructions and other factors. Too much draft may cause the fire to burn too fast in the low fire mode. Inadequate draft may cause smoke to back up into the furnace and the hopper creating a possible hazard.

A barometric draft regulator must be installed in the chimney connector.

Draft regulators limit the draft (the suction pulling air into the furnace firebox). A pivoted, counterbalanced flap is pulled open by the draft when the draft reaches a critical amount. This permits air to enter the chimney, thus preventing the draft in the furnace from rising any higher.

Draft is measured in inches of water column.



On extremely tall chimneys or chimneys larger than 6", it may be necessary to install a second barometric draft control, or reduce the outlet opening of the chimney to approximately 28 square inches, or both, to maintain the chimney draft to 0.04" to 0.06" water column of draft.

After installation of the furnace is complete and a fire has been built, the chimney draft should be established and maintained from 0.04" to 0.06" water column of draft. If this setting is exceeded, it could cause a solid fuel fire to burn out of control.

Duct System



Do not connect the Energy King warm air supply outlet into the cold air return inlet of the central furnace. The components of the central furnace could overheat causing the central furnace to operate other than intended.

The duct or air distribution system circulates heated and/or cooled air to all the conditioned rooms in a house. They must be properly designed and installed to be efficient, maintain uniform temperatures throughout the house, operate quietly, and not adversely affect comfort or indoor air quality. Important duct system installation details for safe and efficient operation of your Energy King furnace:

- The warm-air-supply duct system must be constructed of materials with a minimum temperature rating of 250 degrees Fahrenheit.
- The ducts, fittings and registers should be sized so that the total external static pressure does not exceed 0.2.
- Every Energy King furnace **must** be installed with a cold air return.
- The plenum should be 18 inches by 18 inches and should be no closer than 2 inches from the ceiling or any combustible material.
 - This clearance is critical during a power outage since excessive heat buildup in the plenum top may be dangerous.
 - Plenum must be constructed of metal and be installed in accordance with NFPA 90-B, 1993, 2-1.3

Furnace Assembly

The entire installation should be planned before putting the furnace in place to ensure compliance with all the requirements outlined in the owner's manual and any applicable markings on the appliance. The furnace requires minimal assembly, but there are a few things you will need to do:

Step 1 Remove all shipping materials and any protective plastic covering on the cabinetry of the furnace.

Step 2 To prevent damage during shipment, the furnace door is shipped inside the firebox and the ash door is shipped inside the ash pan. Remove the

doors from the firebox and ash pan. Remove the door hinge pins sealed onto the unit door hinges. Place the hinges on the doors and then slide the doors into place on the unit.

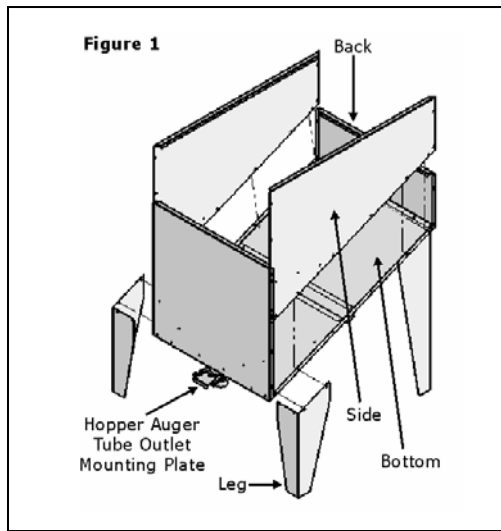
Step 3 A curved baffle with two hooks is also shipped inside the firebox. Remove the baffle from the firebox and hook it onto the rod located inside the firebox above the furnace door frame and below the center heat exchanger tubes. For an optimal burn, the baffle should be centered on the rod, which is approximately 2" back from the top edge of the inside of the furnace door frame.

Hopper Assembly

Finger-tighten all bolts until the hopper box and legs are assembled. Then, mechanically tighten all bolts.

Step 1 Remove hopper parts and hardware package from the shipping container.

Step 2 Assemble the bottom and two side pieces together with $\frac{1}{4}$ " bolts and nuts, aligning the predrilled holes on all pieces.



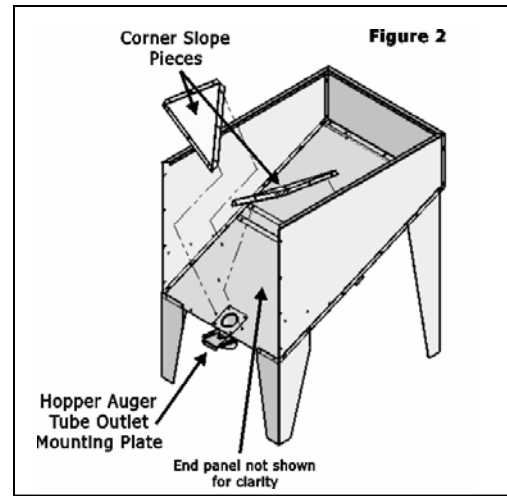
Step 3 Bolt the front and back pieces to the assembled bottom and sides, again aligning the predrilled holes.

Step 4 Bolt the four legs to the assembled hopper aligning the predrilled holes.

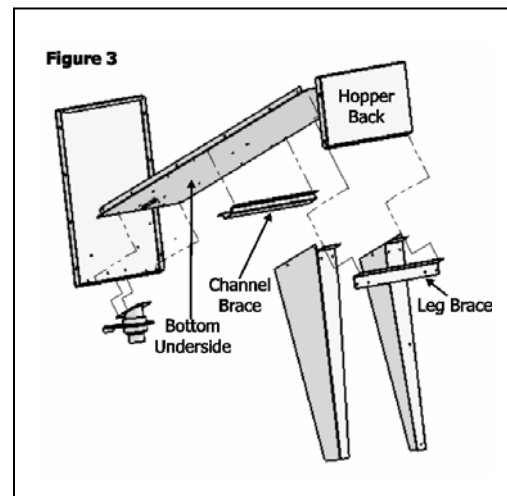
Step 5 Level the hopper and mechanically tighten all bolts.

Step 6 Align a triangular corner slope piece with the predrilled holes on the front of the inside bottom and the side of the hopper. Bolt in place with four $\frac{1}{4}$ " bolts (see Figure 2). Repeat the process with the other corner slope piece.

Step 7 Bolt the Auger Tube Mounting Plate to the underside of the hopper feed outlet.



Step 8 Align the leg brace with the predrilled holes on the back legs and bolt in place (see Figure 3).



Step 9 Mount the channel brace to the underside of the bottom of the hopper with the bolts provided (see Figure 3).

Step 10 Place the two lid pieces face down on a flat surface. Join the two pieces of the lid and the hinge aligning the predrilled holes in the lid pieces and hinge. Cut the 1" wide foam-backed, self-sticking seal to size and place on all edges of the underside of the hopper lid.

Furnace Auger and Hopper Auger Connections

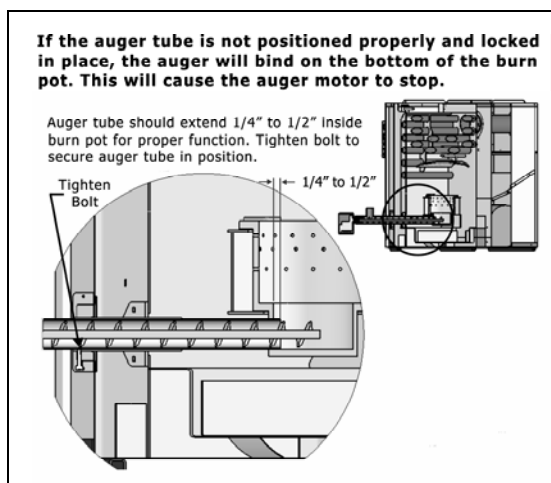
The hopper and the furnace should be positioned in the selected location before making these connections.



Step 1 Remove the furnace auger assembly (short auger) from the shipping carton.

Step 2 Remove the furnace auger and motor assembly from the furnace auger tube by removing the bolt on the tube and sliding the motor and auger from the tube. Set the motor and auger aside.

Step 3 Insert the auger tube into the furnace outlet located on the left side of the unit. Tap the tube in until it extends $\frac{1}{4}$ " to $\frac{1}{2}$ " inside the burn pot.



Step 4 Tighten the bolt located on the bottom of the tube to lock the tube in place.

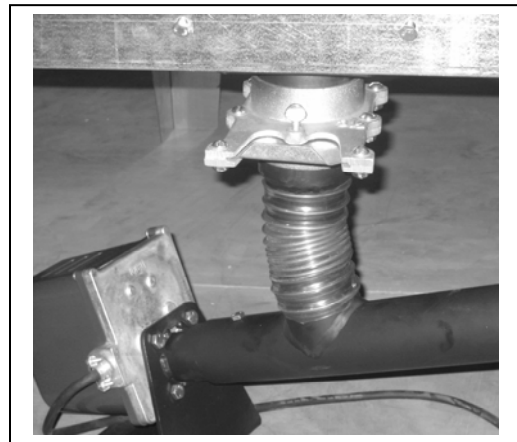
Step 5 Clamp down the two locking bolts on the burn pot.

Step 6 Insert the furnace auger and motor assembly into the furnace auger tube. The auger should protrude 3" into the burn pot when the assembly is complete.

Step 7 Replace the bolt in the hole located on the top of the furnace auger tube and tighten.

Step 8 Remove the hopper auger assembly from the shipping carton and locate the hopper downspout assembly.

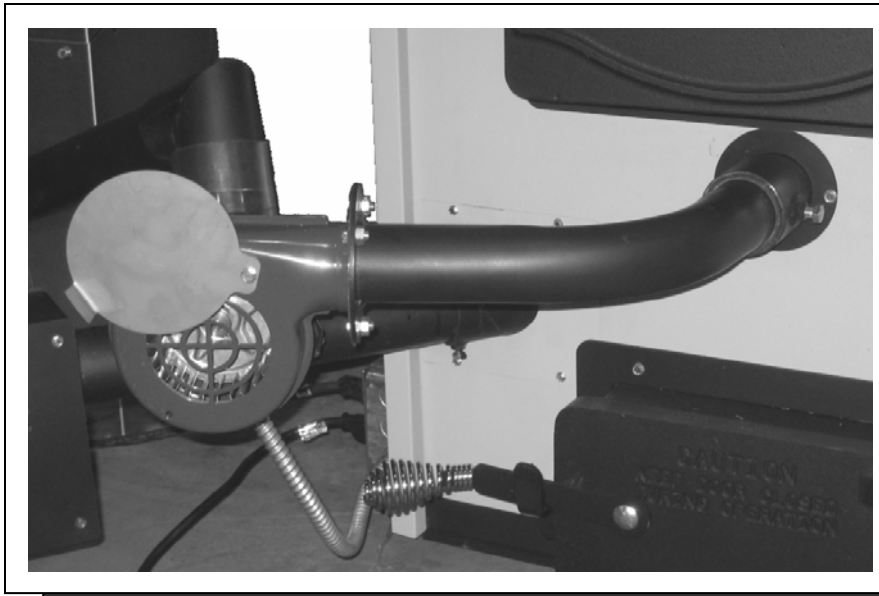
Step 9 Bolt the hopper downspout assembly mounting plate to the bottom of the hopper.



Step 10 Place the other end of the flexible tube connector over the hopper auger tube outlet.

Step 11 Locate the metal elbow and slide it over the other end of the hopper tube outlet.

Combustion Fan Assembly



Step 1 Unpack the combustion fan and draft tube from the shipping carton.

Step 2 Insert the combustion fan draft tube into the draft tube outlet located below the furnace door.

Step 3 Tighten the bolt on the right underside of the draft tube outlet to fix the tube in place.

Step 4 Bolt the draft tube flange to the combustion fan flange.

Electrical Connections



Turn off electric power at the breaker box or service panel before making any electrical 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.

All electrical work must conform to local codes and ordinances or with the National Electrical Code. A licensed electrician should perform the electrical connection if you are unfamiliar with wiring and codes.

The electrical supply to the furnace should be from a 115V, 60HZ, 1 Phase, 15 amp protected circuit. Make sure the power source conforms to these requirements. It is highly recommended

that you run a separate circuit to assure constant power.

A complete electrical diagram is located on the control box and in the back of the owner's manual. The numbers identifying the wires on the diagram have a corresponding number stamped into the wires in the control box. Refer to this diagram whenever any electrical connections are made or electrical service is required on the unit.

Thermostat Installation

The location of the thermostat has an important effect on the overall performance of the furnace. For best operation, mount the thermostat in a central location on a draft-free wall. If it must be installed on an exterior wall, insulate the back side of the mounting plate. Please carefully follow the thermostat manufacturer's installation instructions provided with the thermostat. Use thermostat wire (18/2).

Control Box

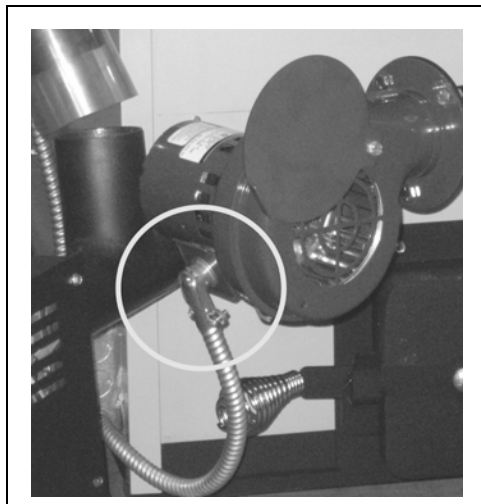
The control box is pre-wired, but the final 3-wire electrical connection from the breaker box or service panel to the control box requires completion. Refer to the wiring diagram when making this connection:

Ground → Green
Hot → Black – L1
Neutral → White – L2

Combustion Fan

To complete the electrical connection to the combustion fan:

Step 1 Remove the two screws located on the cover plate of the combustion fan motor junction box and remove the cover plate.



Step 2 Tap out the electrical knock out plug.

Step 3 Locate the 90° conduit connector and flexible conduit in the hardware package. Install the connector on the combustion fan.

Step 4 Thread the wires on the receptacle box through the conduit. Insert the flexible conduit into the 90° connector and tighten the machine screws.

Step 5 Connect the conduit wires to the motor lead wires in the motor junction box with wire nuts.

Step 6 Replace the cover plate and two screws taking care not to pinch the wires.

Auger Motors



Always disconnect all power to the furnace at the breaker box or service panel and allow it to cool before performing any cleaning or maintenance.

The augers may begin moving at any time while the furnace is connected to the electrical service. They can cause severe injury to body parts that get near them. Keep fingers and other objects away from the augers.

The auger motors are completely pre-wired and plug into the electric receptacle box located on the side of the furnace. Use care when routing the electric cord to the receptacle.

IMPORTANT The auger motors *must be replaced with the manufacturer's original equipment. The auger motors are designed to run at specific RPMs and are made exclusively for this product.*

IMPORTANT Do not use the receptacle box mounted on the furnace cabinet to provide power to any other equipment.

Controls and Adjustments

The furnace controls are designed to enhance the safe and flexible operation of the unit. Before starting your first fire, make sure you know the location of each control and fully understand their function and operation.

Some of the controls are set at the factory and must only be adjusted by an Authorized Dealer. Other controls are shipped with a factory setting, but can be adjusted to meet various heating requirements in different installation environments. However, before making any optional adjustments, it is recommended that the first fire be allowed to burn for some time using the factory settings to understand how the unit is heating in your particular installation.

Start / Off / Run Toggle Switch

The switch allows electricity to flow to the furnace's electrical components.

Start. The *Start* setting is used when lighting a fire and is selected by moving the toggle switch to the top position.

Off. The *Off* setting is used to shut down the furnace and is selected by moving the toggle switch to the middle position. The fuel feed system and combustion fan will shut down and the fire will go out. The circulation blower continues to operate until the firebox and heat exchanger are cool and the fan limit control contacts open to stop the blower.

Run. The *Run* setting is used once the *Proof of Fire Sensor* (green light) is on and is selected by moving the toggle switch to the bottom position. The fuel feed system and combustion fan operate automatically according to the settings of the *Low Fire* and *High Fire / Variable BTU Timers*.

Auger On Sensor

When lit, the *Auger On* (yellow) light indicates that the augers are turning and fuel is being transferred from the hopper to the burn pot.



Auger Manual Override

This push button control is located next to the yellow light (*Auger On Sensor*) and is used to manually operate the augers to feed fuel from the hopper to the burn pot. It is primarily used when *priming* the fuel feed system before starting the first fire or any time the hopper has run out of fuel.

Proof of Fire (POF) Sensor

The green *Proof of Fire Sensor* light comes on when a fire is established and the unit has reached operating temperature. At this point, the *Start /Off / Run* toggle switch can be set to the *Run* mode. The furnace now operates automatically with the thermostat.

Combustion Fan Manual Override

This ON/OFF toggle switch is located next to the Red Light. When the light is lit, the combustion fan is ON or READY.

An optimal fire is one that has a flame that is blue in color with a yellow tip. A weak, lazy, dirty, dark yellow or orange flame indicates that more combustion air is required to produce a good quality fire. Adjusting the *Manual Draft Control Gate*, located on the side of the combustion fan, to allow more combustion air to enter the burn chamber will improve the quality of the flame.

While making this adjustment, you will want to visually monitor the fire using the following procedures:

1. With the combustion fan ON, open the furnace door slowly and only as much as is required to check the fire. (See **IMPORTANT** note below.)
2. Open the *Manual Draft Control Gate* in small increments.
3. Continue to monitor the fire and adjust the *Gate* in small increments until the optimal flame is seen and the fire is actively burning.

IMPORTANT

If you experience any smoke spillage when you first open the furnace door in Step 1, you will need to close the furnace door and manually turn the combustion fan OFF using the *Combustion Fan Manual Override* toggle switch. Smoke spillage is more likely to occur if there are marginal chimney draft conditions or if the auger tubes are almost empty.

If smoke spillage does occur, close the furnace door and turn the *Combustion Fan Manual Override* toggle switch to OFF. Then slowly open the furnace door enough to be able to manually stir the fire in the burn pot to remove or break up any clumps which tend to form when an unbalanced air-fuel mixture condition is present. Once this is done, repeat the steps listed above.

Operation



Fuel Feed Rate & Variable BTU Adjustment

To provide flexibility in the operation of the furnace, adjustable timers are set to automatically control the fuel feed rate, which in turn changes the heating capacity of the unit.

High Fire Timer

When starting a fire or when the thermostat drops below the set temperature, the unit will feed fuel according to the *High Fire Timer* settings. In this mode, the combustion fan remains on while the augers cycle on and off in response to the timer settings.

The *High Fire Timer Scale* is expressed in seconds – “1.5” = 15 seconds, “2.0” = 20 seconds, “3.0” = 30 seconds. The scale is set at the factory and any adjustments made to the scale should only be performed by an Authorized Dealer.

The factory sets the timer to operate at 70,000 BTUs. To adjust the time OFF, Green Line, turn the outer ring of the timer. To adjust the time ON, Red Line, turn the smaller dial located in the center of the timer.



BTU Timer Settings ■ High Fire Timer

| BTU Output | Time OFF Green | Time ON Red | Manual Draft Control Gate |
|--|-------------------|----------------|------------------------------|
| High Burn Approx 140,000 BTUs | 0.0 | 3.0 | ¾ to Full Open |
| Medium Burn Approx 70,000 BTUs | 1.5 | 1.5 | ¼ to ½ Open |
| Low Burn Approx 30,000 BTUs | 1.5 | 1.0 | ¼ Open |

Variable BTU Output

The furnace still cycles with the thermostat, but the heat output is easily changed from 30,000 to 140,000 BTUs by adjusting the *High Fire* and *Low Fire Timers*. In the early fall, you can set the capacity for a lower BTU output and then readily change the setting to 140,000 BTUs during the peak of the winter heating season. Always start with the settings for 70,000 BTU output and then make further adjustments after the furnace has run for approximately an hour. The chart above provides the approximate BTU Output at different settings. The actual BTU output will vary with the type and quality of fuel and the chimney draft.

Low Fire Timer

To maintain a low fire when the thermostat is satisfied, the *Low Fire Timer* can be set to cycle the fuel feed system for a short period of time followed by a longer period of no combustion fan or auger activity. The low fire activity is similar to a pilot light. 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 should be consistent. Adjusting the ON and OFF cycle time controls the amount of fuel going into the burn pot.

The *Low Fire Timer Scale* is expressed in minutes. The scale is set at the factory and any adjustments made to the scale should only be performed by an Authorized Dealer.

A suggested *Low Fire Time* is set at the factory to cycle at 4 minutes OFF and 2 minutes ON. Adjustments may need to be made to the suggested ON/OFF cycle time depending on the fuel being used and the particular installation environment. To adjust the time OFF, Green Line, turn the outer ring of the timer. To adjust the time ON, Red Line, turn the smaller dial located in the center of the timer.



Low Fire Timer ■ Factory Setting

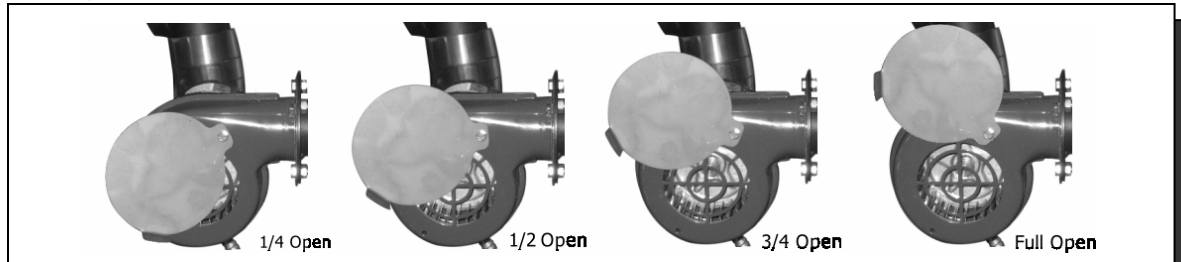
| Time OFF Green | Time ON Red |
|-------------------|----------------|
| .4 | .2 |

Keep in mind that the furnace is constantly producing some heat while the furnace is in the low fire or pilot mode. Choosing a lower pilot setting may require the barometric damper to be adjusted to match the lower feed rate. Monitor how the furnace is operating after a change is made, and if needed, adjust the barometric damper.

If the fire goes out at the low fire setting, the fuel may not be feeding fast enough indicating the *Low Fire Timer* should be adjusted. It may also be difficult to maintain a fire in this mode if wet fuel is being used. You may need to decrease the amount of OFF time.

Manual Draft Control Gate

The *Manual Draft Control Gate* located on the side of the combustion fan controls the air-fuel mixture during the *High Fire Mode* only. Adjustments to the draft gate should only be made when the combustion fan is running. Opening the gate increases the amount of combustion air entering the burn chamber resulting in a more intense fire. For more information on adjusting the *Gate* refer to the "Combustion Fan Manual Override" description.



Circulation Blower

The three-speed circulation blower, operated by the fan limit control, forces air on all sides of the firebox, through the heat exchanger tubes, then into the home's duct system. The blower can be manually adjusted to run faster or slower to correspond to the amount of heat being produced. When the feed rate and BTU output is higher, the circulation blower should be set to run on high for maximum heat transfer. Similarly, it can be set at the low or medium speed when the unit is operated at lower feed and BTU rates.

Fan Limit Control

The fan limit control not only starts and stops the circulation blower with the correct temperature, but also features a limit setting. If the furnace temperature should ever rise above the set limit, the control cuts power to the fuel feed system and combustion fan, but keeps the circulation blower operating to cool the heat exchanger.

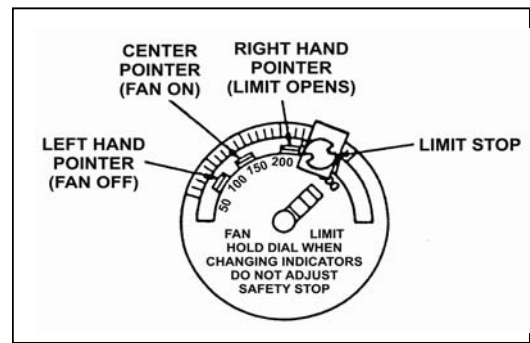
Normal fan limit settings are

140° ON
110° OFF

For adjustment of these settings, see drawing.

Remove the cover of the fan limit control by grasping the cover at the top and bottom and pull outward.

Set Pointers. Hold dial securely with one hand and move the pointers with the other hand. Do not force the pointers past any stops on the dial even though the dial may be graduated beyond the stops.



Do not change the limit stop setting.

Limit. The limit pointer should never be set any higher than the setting recommended by the furnace manufacturer.

Fan. Move the "Fan On" pointer so that its straight edge indicates the temperature at which the fan contacts should close to start the circulation blower. Move the "Fan Off" pointer so that its straight edge indicates the temperature at which the fan contacts should open to stop the blower.

First Fire

WARNING Risk of Fire

- Do not operate with flue draft exceeding .06" of water column.
- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances.
- Inspect and clean flues and chimney regularly.

Before lighting your first fire, inspect your furnace to ensure that it has been properly installed and that all safety requirements have been met. During your inspection pay particular attention to the clearances to combustibles, venting, ducting and thermostat installation instructions. Next, make sure that the hopper and firebox are clear of all objects. Do not fully load your furnace or open all draft controls completely until you become familiar with the operation of your furnace.

Some odors may be given off a new furnace during the initial few hours of burning while the steel and the paint are being cured. Ventilating the room until the odors disappear is recommended.

Priming the Fuel Feed System

CAUTION

Always disconnect all power to the furnace at the breaker box or service panel and allow it to cool before performing any cleaning or maintenance.

The augers may begin moving at any time while the furnace is connected to the electrical service. They can cause severe injury to body parts that get near them. Keep fingers and other objects away from the augers.

When lighting your furnace for the first time or any time the hopper has run out of fuel, the auger tube will be empty. Fill the hopper with fuel and press the *Auger Manual Override* button in and hold it in until corn or wood pellets are transferred to the bottom of the burn pot. It is possible to continue to press the *Auger Manual Override* button until the recommended amount of fuel for starting a fire has been transferred to the burn pot; however, adding fuel by hand to the correct level may be more efficient when starting a fire. **Never add fuel by hand to an existing fire.**

DANGER

Risk of Fire or Explosion

Do not burn garbage, gasoline, drain oil or other flammable liquids.

Starting a Fire

1. Fill the hopper with dry, clean corn or wood pellets.
2. Turn on electrical power to the combustion fan and auger motors by moving the *Start / Off / Run Toggle Switch* to the up, *Start*, position.
3. Make sure the *Fan Limit Control* is set on *Auto* and that the remote thermostat is set above room temperature.
4. Once the fuel feed system is *primed*, it is recommended that you fill the burn pot with fuel by hand:

Corn. Fill the burn pot to approximately 1" below the lower set of air holes.

Wood Pellets. Fill the burn pot to approximately 1" above the lower set of air holes.

5. Finish filling the burn pot with wood pellets or kindling wood and paper. A small amount of fire starter gel spread evenly over the pellets or kindling wood may be used as a substitute for the paper. Even if you are burning corn, wood pellets make an excellent source of starter fuel.

Corn has a dense shell that can be difficult to start and bring up to temperature.

6. Light the paper or starter gel and securely close the furnace door. The combustion fan will start pushing combustion air into the burn pot, increasing the flame.
7. After approximately 5 minutes, the green *Proof of Fire (POF)* light on the control box should come on. If the corn or wood pellets do not completely ignite and the *Proof of Fire* light fails to come on, it may be necessary to add more kindling to get the fire burning completely.
8. Once you have *Proof of Fire*, move the *Start / Off / Run Toggle Switch* to the *Run* position by moving the switch down to the lowest level.
9. Adjust the *manual draft control gate* $\frac{1}{4}$ to $\frac{1}{2}$ open.
10. The fuel feed system will begin to operate when the furnace has reached operating temperature.
11. Adjust the thermostat to the desired temperature.

CAUTION

Hot Surfaces

- **Keep children away.**
- **Do not touch during operation.**

Shutting Off the Furnace

Move the *Start / Off / Run Toggle Switch* to the *Off* position. The combustion fan and fuel feed system will stop and the fire will go out. The circulation blower will continue to run until the heat exchanger is cool.

Typical Operation Cycle



WARNING Risk of Fire

- Do not operate with flue draft exceeding .06" of water column.
- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances.
- Inspect and clean flues and chimney regularly.

After a fire has been established and the operating temperature has been reached, only the thermostat needs to be set to maintain the desired temperature.

Fuel in the form of corn or wood pellets is stored in the hopper and is automatically moved to the burn pot at a controlled rate. When your home cools, the thermostat located in the living area of the home activates the fuel feed system. The combustion fan starts forcing combustion air into the burn chamber, and the fuel feed augers move fuel into the burn pot. The fuel rate, or heat output, is set with the BTU Variable Adjustment/High Fire Timer.

As the fuel burns in the burn pot, the resulting heat is transferred to the firebox and heat exchange area. The 3-speed circulation blower is activated when the temperature sensor of the fan limit control indicates that air has been heated to the fan limit control ON temperature setting.

The circulation blower pushes air around the firebox, through the heat exchanger tubes and into the plenum.

When the thermostat setting is satisfied, it will shut off the fuel feed system and the combustion fan. The fan limit control turns off the 3-speed circulation blower when the control sensor indicates that the heat exchanger is cool.

During the time that the thermostat is satisfied, the adjustable Low Fire Timer maintains a fire in the furnace similar to a "pilot light." In this mode, the Low Fire Timer cycles the fuel feed system for a short period of time followed by a longer period of no combustion fan or auger activity.

Your furnace can run efficiently over extended periods of time and at different heat output levels as long as the fuel supply is uninterrupted and cleaning and maintenance are performed routinely.

Power Failure Instructions



CAUTION Do not operate the furnace during a power failure.

After power is restored, verify that there is power to the furnace. Remove the ash from the burn pot and restart the fire using the procedures described in "Starting a Fire."

Periodic maintenance is required to continue the performance of your furnace. As with any solid fuel appliance, the need for and frequency of cleaning depends on the amount and quality of fuel burned, the quality of the fire, and the length of time since the last cleaning. Weekly cleaning may be required in warmer weather, whereas monthly cleaning may be enough in colder weather.



Risk of electric shock. Disconnect power at the service panel or breaker box before servicing furnace.



Keep the area around the furnace clean and free of dust and debris.

Creosote - Formation and Need for Removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire.

Check daily for creosote build up until experience shows how often cleaning is necessary. The chimney connector and chimney should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

Be aware that the hotter the fire, the less creosote is deposited, and that weekly cleaning may be necessary in mild weather, even though monthly cleaning may be enough in the coldest months.

Have a clearly understood plan to handle a chimney fire.

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 noncombustible floor 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 the closed container until all ash and cinders have thoroughly cooled. Do not place any other waste materials in this container.

NOTE: EMBERS REMAIN HOT FOR MANY DAYS. STORE IN A SAFE PLACE AWAY FROM COMBUSTIBLES.

Gasket and Filter Replacement

Some of the components of your furnace are equipped with gaskets to ensure safe operation and an airtight seal. When these gaskets become worn or damaged, you will need to replace them. Under certain conditions, the failure of the hopper seal may result in emission of products of combustion from the hopper.

Routinely check the gaskets on these components and replace them if they are worn or damaged:

- Hopper Lid
- Furnace Door
- Ash Pan Door

Door and Ash Pan Gasket Replacement

To replace the gasket, you will need gasket cement and 5/8 inch, high temperature rope gasket which are available from your dealer or hardware store. Remove the door and lay it face down. Find the ends of the gasket and pull it off. Take a screwdriver and remove excess gasket glue from the channel. Lay a medium bead of new gasket cement around the gasket channel. Lay the new door gasket in the channel, cutting off any excess gasket rope. Reattach the door and keep the door closed until the gasket cement dries.

Hopper Lid Gasket Replacement

You will need 1-inch wide foam-backed, self-sticking gasket strip which is available from your dealer or hardware store. Remove the lid and lay it face down. Find the ends of the current gasket and pull it off. Cut the new gasket strip to size and lay the strips along all edges of the hopper lid. Replace the lid on the hopper.

Filter Replacement

The filter is accessed by removing the rear cabinet panel. Unlatch the fasteners and lift the panel up and out. Slide the old filter out of the channel and replace with a new 18" x 25" x 1" filter. Put the cabinet panel back in place and latch the fasteners.

Please use the following timeline as a guide for determining how much maintenance your furnace requires to operate at peak performance.



Inspect flue pipes, joints and seals regularly to ensure that smoke and flue gases are not drawing into, and circulated by, the air circulation system.

Daily

Until a pattern of cleaning requirement is established, inspect and, if necessary, clean the following components daily:

- Clinkers, like ash, are a natural byproduct of burning solid fuels and, like ash, need to be cleaned-out regularly. Clinkers are the solid, glassy and sometimes porous, deposits that form in the bottom of the burn pot and are a result of the minerals contained in your fuel melting at your furnace's high temperatures. Some clinkering is to be expected.
- Ash pan emptied and cleaned. Ash content is a good indicator of fuel efficiency and quality. High quality fuel will produce less ash and fewer clinkers than lower quality fuel.
- Fuel Supply, refilling as necessary.
- Heat exchanger tubes cleaned. The heat exchanger cleaning pull rod is located about the furnace door and moves the cleaning scrapers across the tubes. Pull the rod all the way out and then push it all the way in. Repeat this process two or three times. Be sure the pull rod is all the way in at the end of cleaning.
- Flue Pipes, including joints and seals, should be inspected to ensure that smoke and flue gases are not drawn in and circulated by the air-circulation system.

Every 2 – 3 Days / Weekly

Once a pattern of cleaning requirement is established, the following components should still be monitored on a regular basis:

- Burn Pot
- Heat Exchanger Tubes
- Ash Pan
- Fuel Supply
- Flue pipes, joints and seals

Monthly

The air filter on your furnace should be monitored on a monthly basis and replaced when necessary.

🔥 Seasonally / Every 3 Months / After every 1 – 2 Tons of fuel burned

Until you are familiar with how ash and creosote accumulate with your operating practices, we recommend inspecting your furnace at least once per ton of fuel burned.

- Motors/Blower (Augers, fans, etc.)
- Gaskets (Furnace and Ash Door, Hopper Lid)
- Fresh air intake
- Fuel Storage/Hopper Auger
- Chimney

🔥 Annual / Spring Shutdown

⚠ CAUTION Cleaning the heat exchanger, flue pipe and chimney is especially important at the end of the heating season to minimize corrosion during the summer months caused by accumulated ash.

It is important to give the entire furnace a thorough cleaning:

- Your venting system should be inspected and cleaned annually. Clean and remove fly ash from chimney connector, flue pipes and chimney. Soot buildup should be removed to prevent the risk of a chimney fire and to minimize corrosion during the summer months.
- Scoop out the fuel in the hopper and run the auger until the hopper is empty and fuel stops flowing. Vacuum out the hopper.
 - Do not allow fuel to sit in the hopper over the summer months. Fuel can accumulate moisture over the summer months causing the furnace to rust and the fuel to mold.
- You may wish to spray the inside of the cleaned hopper with an aerosol silicone spray if your furnace is in a high-humidity area.
- Run the augers until the auger tubes are empty.
- Empty, brush and vacuum the burn pot and ash pan.
- Brush and vacuum all areas of the firebox.

Failure to clean and maintain this furnace as indicated can result in poor performance and safety hazards.

Remember: A clean furnace burns efficiently and will remain trouble free!



Always disconnect power to the furnace and allow it to cool before performing any cleaning, maintenance or service.

Many problems in the furnace can be traced to a few commonplace causes and are easily fixed. Before making any repairs or replacing any components, be sure to check for these common problems:

Fuel

- Wet or Dirty Fuel
- Wrong variety or type of fuel, i.e., cracked, waxy or treated (seed) corn

SOLUTION: Empty and clean the hopper. Refill using only high quality, clean, dry fuel. We recommend trying several brands to determine which is most appropriate for your usage. See the “Fuel Requirements” section for further information.

Improper Draft

- Too little or too much draft
- Insufficient combustion air

SOLUTION: Adjust the draft controls and observe until you determine which settings are most appropriate for your usage. See the “Operation” section for further information.

Ash or clinker buildup in the ash pan or burn pot

SOLUTION: Be sure to maintain your furnace’s cleanliness by emptying the ash pan and cleaning the burn pot regularly. See “Maintenance” section for further information.

We also recommend establishing a routine of inspecting gaskets and filters and replacing when necessary. Maintaining your furnace’s cleanliness and adjusting the blower speed, draft controls, and fuel rate will remedy many problems.

Detailed Troubleshooting

Once you have exhausted the above common problems, if you are still experiencing trouble with your furnace, you may wish to consult the following list of problems, or consult your dealer for further assistance.

| Problem(s) | Cause(s) / Solution(s) |
|---|---|
| Fire won't start or starts but won't stay lit | <ul style="list-style-type: none"> ▪ Fuel may not be feeding. Verify there is fuel in the hopper and the augers are receiving power and operating correctly. Fuel should cover the bottom of the burn pot to approximately 4". ▪ If fuel is burned down into the pot, there may be too much time between idle cycles. You may need to adjust the timer settings. ▪ Make sure all doors are closed tightly and all gaskets are in good condition. |
| Fire is weak, lazy, dirty, dark yellow or orange, or startup is slow or smoky | <ul style="list-style-type: none"> ▪ Your fire may need more combustion air. Increase the amount of combustion air by adjusting the manual draft control gate located on the side of the combustion fan. ▪ Your exhaust or combustion air systems may be blocked. Verify all vents and pipes are free from obstruction and the combustion fan is clean and operating correctly. ▪ Your home may have a negative pressure. |
| Smoke is visible or you smell fumes in your home | <ul style="list-style-type: none"> ▪ Verify that the furnace and ash pan doors are closed tightly. ▪ Check all gaskets and replace if worn. ▪ Your venting may be blocked or improperly installed. If the furnace is smoking from vents, the combustion air outlet or the hopper, immediately shut down the furnace, ventilate the area and contact your dealer. ▪ Your home may have a negative pressure. Please contact your dealer. |
| Excessive fire | <ul style="list-style-type: none"> ▪ There may be too much combustion air. Close the manual draft control gate incrementally until the fire is actively, but not excessively, burning. ▪ Adjust the <i>High Fire Timer</i> to provide a longer OFF time. |
| Poor combustion or difficulty keeping a pilot fire | <ul style="list-style-type: none"> ▪ Check the quality of your fuel. Refer to the "Fuel Requirements" section. ▪ Adjust the <i>Low Fire Timer</i> so there are shorter intervals between the ON and OFF times. ▪ Your fire may need more combustion air. Adjust the manual draft control gate located on the side of the combustion fan to increase the amount of combustion air. |

Troubleshooting Guide



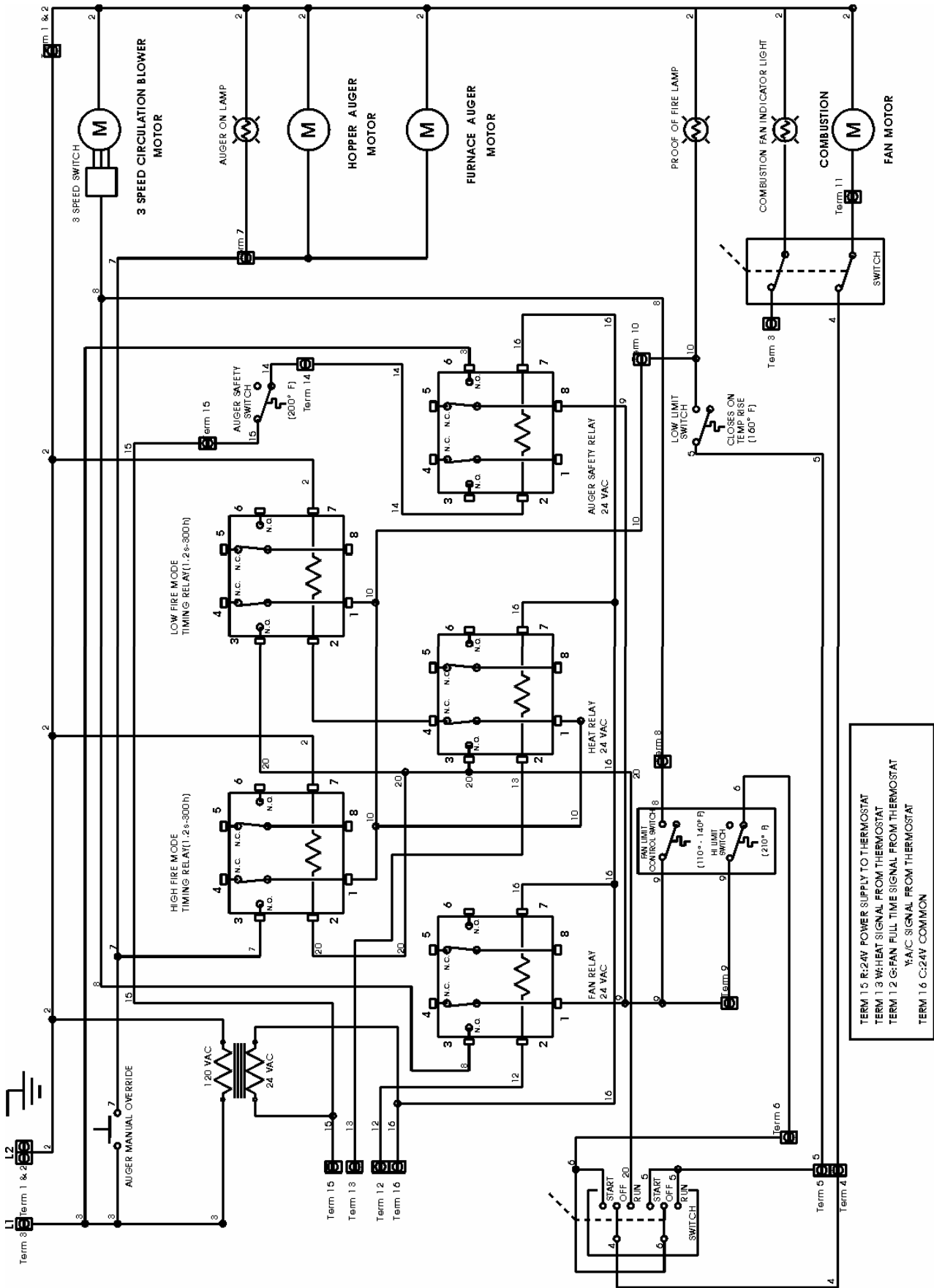
| Problem(s) | Cause(s) / Solution(s) |
|---|---|
| Too much ash | <ul style="list-style-type: none"> ▪ Check the quality of your fuel. Refer to the “Fuel Requirements” section. |
| Clinkers | <ul style="list-style-type: none"> ▪ Clinker buildup may be caused by running your furnace at a burn rate that is too low. The adjustable timers should be changed to increase the burn rate. |
| Ash, soot, or fuel dust in the home | <ul style="list-style-type: none"> ▪ Verify all doors are closed tightly. ▪ Always be sure to handle ashes and refuel the hopper with care and open doors slowly. ▪ Ashes can escape from conventional vacuums. We recommend using a vacuum designed for ashes. ▪ Check all gaskets and replace if worn. ▪ Check your air filter monthly and change as necessary. ▪ Be sure to check the exhaust system for leaks and repair as necessary. ▪ Your home may have a negative pressure. Please contact your dealer. |
| Augers are plugged or won't turn, or are not operating at all, or fuel won't feed | <ul style="list-style-type: none"> ▪ There may be a buildup of clinkers or foreign material, such as cobs, rocks, or fines, which can cause possible mechanical or motor damage. Clean the hopper and augers and repair as necessary. |
| Partially burned or unburned fuel in the combustion area | <ul style="list-style-type: none"> ▪ More air for proper combustion may be needed. Verify that your combustion fan is working properly. If the fan is working correctly, open the draft control gate more to allow more combustion air to enter the burn chamber. |
| The furnace burns too much fuel, or the fuel burns off too quickly | <ul style="list-style-type: none"> ▪ If the above “common problem” solutions do not remedy this problem, the High Fire Timer may need to be adjusted to increase the amount of time OFF. ▪ The chimney draft may be excessive. Adjust the barometric damper to maintain from 0.04” to 0.06” of water column of draft. |
| The furnace is overheating or is burning without regard to the thermostat | <ul style="list-style-type: none"> ▪ Your furnace may have been installed incorrectly. Please contact your installer. |

Troubleshooting Guide



| Problem | Cause(s) / Solution(s) |
|---|---|
| The furnace will not heat the whole house or doesn't produce as much heat as when first installed | <ul style="list-style-type: none"> ▪ The filter may be dirty. Check the filter monthly and replace if necessary. ▪ The heat exchanger, venting system, blower or fan may require cleaning. Clean the heat exchanger system and verify that the venting system is clean and free from obstruction. Verify that the blower and fan are operating correctly. ▪ The furnace's BTU output may not be appropriate for the size of your home. |
| The furnace burns without regard to the thermostat | <ul style="list-style-type: none"> ▪ The thermostat or thermostat wiring may be faulty. Please contact your dealer. ▪ The furnace's BTU output may not be appropriate for the size of your home. Please contact your dealer. |
| The furnace cycles on and off before the thermostat is satisfied | <ul style="list-style-type: none"> ▪ The furnace's BTU output may not be appropriate for the size of your home. Please contact your dealer. |
| The circulation blower runs continuously | <ul style="list-style-type: none"> ▪ Make sure the Fan Limit Control is set on <i>Auto</i> and is not on <i>Manual</i>. ▪ The fan limit control ON/OFF temperature settings may need to be adjusted. ▪ Your furnace may have a faulty fan limit control. Please contact your dealer for replacement parts. |
| The circulation blower cycles on and off too much, or won't run at all | <ul style="list-style-type: none"> ▪ The ON/OFF temperature settings of the fan limit control may need to be adjusted (ON/OFF temperatures set too close together.) |
| The furnace has power but is not responding | <ul style="list-style-type: none"> ▪ Check the power supply for adequate voltage. ▪ Please contact your dealer. |
| The furnace fails to go into <i>Low Fire</i> mode | <ul style="list-style-type: none"> ▪ The thermostat may be faulty or there is a relay failure. Please contact your dealer. |
| The user is shocked when touching furnace | <ul style="list-style-type: none"> ▪ Your furnace may not have been properly grounded or may have loose wires or wiring components. Disconnect power to the furnace at the breaker box or service panel and verify all connections. ▪ Your furnace may have experienced a power surge or power short. Please contact your dealer. |

Appendix A - Wiring Diagram



TERM 15 R:24V POWER SUPPLY TO THERMOSTAT
 TERM 13 W:HEAT SIGNAL FROM THERMOSTAT
 TERM 12 G:FAN FULL TIME SIGNAL FROM THERMOSTAT
 TERM 16 C:24V COMMON

Appendix B – Parts List



Hopper and Hopper Auger

| Part Number | Part Description |
|----------------|---|
| 6-2-HOPPER-1 | Hopper with Lid (Complete Assembly) – 12 Bushel |
| 8-1-HAUGERASSY | Hopper Auger Assembly (Auger, Motor, Tube) |
| 8-2-2000 | Hopper Auger |
| 8-2-2100 | Hopper Auger Motor |
| 8-2-2200 | Hopper Auger Tube |
| 8-GAS-1FB | Lid Gasket - 1" Foam Back, Self-Sticking |
| | |

Furnace Auger

| Part Number | Part Description |
|----------------|---|
| 8-1-FAUGERASSY | Furnace Auger Assembly (Auger, Motor, Tube) |
| 8-2-1000 | Furnace Auger |
| 8-2-1100 | Furnace Auger Motor |
| 8-2-1200 | Furnace Auger Tube |
| | |

Circulation Blower / Combustion Fan / Fan Limit Control

| Part Number | Part Description |
|-----------------|---|
| 8-1-CIRBLWRASSY | Circulation Blower, 3-Speed – Complete Assembly |
| 8-2-3000 | Circulation Blower Motor |
| 8-2-3100 | Circulation Blower 3-Speed Switch |
| 8-2-3200 | Circulation Blower Housing |
| 8-MOT-COMBLOWER | Combustion Fan |
| 8-ELE-FANLIMIT | Fan Limit Control |
| 8-ELE-24VTHERMO | Thermostat – 24 Volt Wall |

Appendix B – Parts List



Control Box

| Part Number | Part Description |
|------------------|--|
| 8-ELE-HFIRETIM | High Fire Timer |
| 8-ELE-LFIRETIM | Low Fire Timer |
| 8-ELE-SORSWITCH | Start/Off/Run Toggle Switch |
| 8-ELE-AMOSWITCH | Auger Manual Override Push Button Switch |
| 8-ELE-CFMOSWITCH | Combustion Fan Manual Override Switch |
| 8-ELE-POFLAMP | Proof of Fire (POF) Lamp - Green |
| 8-ELE-AUGLAMP | Auger On Lamp - Yellow |
| 8-ELE-COMBLAMP | Combustion Fan Indicator Lamp - Red |
| 8-ELE-ASR24VAC | Auger Safety Relay – 24 VAC |
| 8-ELE-LFIREREL | Low Fire Mode Timing Relay |
| 8-ELE-HFIREREL | High Fire Mode Timing Relay |
| 8-ELE-FANREL | Fan Relay – 24 VAC |
| 8-ELE-HEATREL | Heat Relay – 24 VAC |
| 8-ELE-24VTRANS | 110 VAC – 24 Volt Transformer |

Furnace

| Part Number | Part Description |
|---------------|---|
| 7-1-1000 | Cabinet Panel – Control Side/Left |
| 7-1-1010 | Cabinet Panel – Right Side |
| 7-1-1020 | Cabinet Panel – Rear Top |
| 7-1-1030 | Cabinet Panel – Rear Access |
| 7-1-1040 | Cabinet Panel - Front |
| 7-1-1050 | Cabinet Panel - Top |
| 7-1-2000 | Burn Pot |
| 8-MISC-SCRROD | Heat Exchanger Cleaning Scraper Pull Rod |
| 8-HAN-5/8 | Spring Handle -5/8" |
| 8-GAS-5/8HTR | Gasket – Furnace Door/Ash Pan – 5/8" Hi Temp Rope |

Bio-King™ Corn & Wood Pellet Furnace Limited Warranty

Who is covered?

You are covered under this warranty if you are the original purchaser of a new Energy King heating appliance and your purchase was made through an authorized distributor/dealer of the Energy King appliance.

How long does the coverage last?

The term of this warranty begins on the date of original purchase as evidenced by your purchase receipt, subject to the terms, conditions and restrictions of this agreement. Coverage is extended to you for the following time periods:

- **Firebox.** The firebox, including the baffle, is warranted for five (5) years on a prorated basis. The replacement value will decrease each year until the maximum life of the warranty exhausts any replacement value. Replacement value is reduced 20% per year and will be calculated on the cost of the firebox or baffle at the time the part is repaired or replaced. We will provide you with a credit to be applied towards the cost of the repair or replacement part.
- **Castings.** The castings are warranted for one (1) year and include the burn pot, furnace door and ash pan door.
- **Electrical Components.** The electrical components are warranted for one (1) year and include, but are not limited to, the circulation blower, combustion fan, fan limit control, auger motors, and all components of the control box.
- **Hopper.** The hopper and hopper lid are warranted for a one (1) year period.

What is covered by this warranty?

This warranty covers any defects in materials or workmanship in your new Energy King heating appliance.

What is not covered by this warranty?

This limited warranty does not apply:

- If your appliance has not been installed, operated and maintained in strict accordance with instructions provided in the Installation, Operation and Maintenance Manual.
- If any part has been damaged in shipment, modified, altered, tampered with, abused, or has been subject to accident or misuse.
- If your appliance has been altered or repaired in a manner which, in our sole judgment, affects its performance, stability or reliability.
- If parts not made or supplied by us have been used in connection with the appliance, if in our sole judgment, such use affects its performance, stability or reliability.
- To transportation charges on appliances and appliance parts submitted for repair or replacement under this warranty.
- To expendable, replaceable or wear items, such as gaskets/seals, paint, handles and other items that in our judgment are expendable, replaceable or wear items.
- To any heating system or systems to which the appliance may be attached.
- To any of the smoke pipes, heat pipes, chimney, hardware, ducting, vents, or other accessories used for the installation and venting or ducting of the appliance.

We are not responsible for installation and will not be liable in any respect under the terms of the warranty for injury or damage to the building structure in which the appliance has been installed, or to the person or persons and property therein, arising out of the use, or installation of the Energy King appliance. The appliance must be installed in compliance with the local and state building and fire codes of the area and in strict adherence to the Manufacturer's recommendations.

What will we do to correct problems?

We will repair, or at our option, replace any Energy King appliance or appliance part, which upon inspection shows a defect in materials or workmanship.

How can you get service?

If warranty service is needed during the warranty period, notify your authorized dealer. If there is no dealer in your area, contact RJM Manufacturing, Inc. directly. Provide your name, address, phone number, serial number and model number of the furnace, date of purchase, name and address of installer and a description of the problem.

Disclaimer of Implied Warranties & Consequential Damages

Our obligation under this limited warranty, to the extent allowed by law, is in lieu of all warranties, implied or expressed, including implied warranties of merchantability and fitness for a particular purpose and any liability for incidental and consequential damages with respect to the sale or use of the items warranted. Such incidental and consequential damages shall include but not be limited to: transportation / freight charges, cost of installation, duty, taxes, charges for service or adjustment, loss of income, rental or substitute equipment, and expenses due to loss, damage, detention or delay in the delivery of equipment or parts resulting from acts beyond our control.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitation of implied warranties, so the limitations or exclusions in this limited warranty may not apply to you.

NO EMPLOYEE OR REPRESENTATIVE OF RJM MANUFACTURING, INC. IS AUTHORIZED TO CHANGE THIS LIMITED WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY UNLESS SUCH CHANGE IS MADE IN WRITING BY AN OFFICER OF RJM MANUFACTURING, INC. AT ITS HOME OFFICE.

YOUR RESPONSIBILITY UNDER THE WARRANTY

It is your responsibility to ensure that the appliance is installed in compliance with local, state and federal building and fire codes regulating installation and inspection.

It is your responsibility to complete the warranty card and return it to the address indicated within 30 days of the purchase. You must also keep your receipt as proof of date of purchase. Failure to do so will mean that you may not later make a claim under this warranty.

It is your responsibility to read the Installation, Operation & Maintenance Manual and to install, operate and maintain the appliance in accordance with all instructions and safety procedures. Failure to do so is a misuse of the appliance.

It is your responsibility to inspect the appliance and to have any part(s) repaired or replaced when continued operation would cause damage or excessive wear to other parts or cause a safety hazard.

It is your responsibility for any cost incurred by the distributor/dealer for travel to or transportation of the product for the purpose of performing a warranty obligation or inspection.



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