Service
&
Troubleshooting Guide
For the
Pellet & Corn
Digital Control System

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Exploded View Diagram Section

The stoves with the Versa Grate Burn System are shown in the following order:

The stoves with the Multi-Fuel Burn System are shown in the following order:

Addendums to the Service Manual

Introduction to the Revolution Burn System

Troubleshooting Flow Charts for the SCF-Revolution

Troubleshooting Flow Charts for the SCF-Revolution

Troubleshooting Flow Charts for the Ashby

All remaining Ashby Components can use the Flow Charts listed in previous sections of the Manual. For more information please refer to page 184

Introduction to St. Croix Pellet Stoves with the Versa Grate System. Models include: Afton Bay, Hastings, Prescott EXP, Prescott EXL and the York Insert.

There are 2 pellet stove configurations that we offer; the Freestanding stove and Insert stove, all of which produce similar heat output BTU ratings. The unique method by which this fuel is burnt produces high efficiency ratings while maintaining an extremely low ash content level.

St. Croix Stoves with the Versa Grate System are approved to burn Pellets (See PFI Pellet Standards on page 10), Cherry Pits and a 50%-50% mixture of Pellets and Corn; currently wood pellets are being manufactured throughout the United States and in Canada. Cherry Pits and Corn use is limited to regional areas in the country where these fuels are readily available. **Cherry Pits have higher Ash Content and will increase the Daily Maintenance. There are no Standards covering Cherry Pits as a fuel. Mixing Pellets with Corn will increase the daily maintenance of the stove.**

All St. Croix stoves have been safety tested to the following standards, where they apply:

LISTED (PELLET, CHERRY PIT OR PELLET/CORN MIX) BURNING SPACE HEATER. ALSO SUITABLE FOR MOBILE HOME INSTALLATION. TESTED PER UL 1482, /ULC S627/APFI/ASTM E 1509-04. THIS PELLET BURNING APPLIANCE HAS BEEN TESTED AND LISTED FOR USE IN MANUFACTURED HOMES IN ACCORDANCE WITH OREGON ADMINISTRATIVE RULES 814-23-900 THROUGH 814-23-909

The following four fans/motors are standard in all St. Croix Wood Pellet Stove models, they are the: Combustion Exhaust Fan, Room Air Fan, Auger Motor and the Self-Cleaning Grate Motor.

The Digital Control Boards enhances the reliability of stove performance and also increases the simplicity of customer operations. The stove requires a 120 Volt AC power source and the Pellet stove draws a nominal current value of up to 5 Amperes during start up with the Igniter running, dropping to 3 Amps during normal operation. The addition of Diagnostic Features to the control board allows problems to be quickly identified and direct the service person to the area of the stove needing service. The St. Croix Digital Control Board also offers the unique “SmartStat” Thermostat feature. This allows the control board to maintain a fire in the stove during peak heating season, when a constant source of heat is needed, but to also shut itself down and relight itself when the heat demand is only periodic. This is accomplished by allowing the stove to pilot on the low setting for an hour before shutting down completely. Wireless remote programmable Thermostat systems can also be used.

The stove operates using a **top feed** auger system; where the fuel is stored in a 40 to 90 pound hopper (depending on the model), then auger driven up through the auger tube and gravity dropped from the drop tube into the Burn Pot. The stove also operates using a **Negative Pressure System**, where exhaust gases are being expelled through the exhaust port at a faster rate than which fresh air can be delivered into the inlet port. Since an internal negative pressure system exists, the potential for smoke and other hazardous gases escaping from within the firebox and out into the room have been considerably decreased in comparison to a positive pressure system. When using a negative pressure system, room air actually wants to be pulled into the firebox as opposed to a positive pressure system, where exhaust gases are being forced from the firebox and potentially into the room.

Pellet stoves are typically an automated controlled heating appliance, where extensive supervision generally is not necessary during operation, ***but even so, it's wise to be educated on various combustion characteristics that may cause potential safety hazards***; such as a situation where excessive smoke and black soot may adhere to the viewing glass surface, this is a sign of either too many pellets or not enough air to create the correct combustion ratio. A black shiny build-up that is difficult to remove, is an indication of too much air and can lead to creosote build-up in the stove. It's important to understand the significance of how a correctly installed and well-maintained pellet stove can greatly affect the performance and safety level of operation. Even though there is considerably less work to burning a pellet or corn stove in comparison to a conventional wood stove; a daily, periodic and yearly preventive maintenance program faithfully needs to be followed. The type of fuel and the amount of fuel burned daily along with other various conditions will contribute to the frequency of required stove maintenance.

Wood Pellets

Wood Pellet Manufacturing

Quality wood pellets for residential heating are made from clean wood wastes. Chips, sawdust, slabs and other wood wastes are used. These products are ground, dried or have water added, extruded through a die, cooled, screened, bagged and placed on pallets.

The quality of the pellet is determined by the quality of the raw material, the pelleting process and its subsequent handling.

The quality of the raw material will vary based upon the specie of tree and where the tree grows. Also important is whether the raw material contains any bark and dirt, the length of time the raw material is exposed to weather, how its handled and stored.

The pelleting process affects the quality of the pellet. High quality pellets will meet the PFI "PREMIUM" standards. Poorer quality pellets may be too long, short, soft, high in moisture, ash and saw dust.

Why Pellets Burn

Simply stated, wood is stored energy from the sun. This stored energy, when heated, breaks down into a gaseous state much like natural gas and carbon.
When these gases and carbon are in the proper environment both of them will burn and produce heat.

How Pellets Burn

When wood is heated above approximately 500°F, part of it begins to break down into a gaseous state. These gases will burn when they are in the presence of oxygen and a temperature above approximately 1100°F. These gases burn as a yellow, white flame.

The remaining energy in wood is carbon. Carbon will begin to burn in the presence of oxygen and at temperatures around 500°F. Pure carbon burns as a flameless glow.

Approximately 70% of the energy in wood comes from gases. Approximately 30% of the energy comes from carbon.

Temperatures in a pellet fire may run as high as 1,900° to 2,300°F. At these temperatures complete combustion can take place. These temperatures are also hot enough for some minerals to melt and fuse into clinkers.

The proper amount of oxygen must be mixed with the gases and carbon, in a hot enough environment for combustion to take place. The three T's are often used to describe these requirements of combustion. These are Time, Temperature, and Turbulence. An improper balance of any one of these items will cause a loss of combustion efficiency or cause the fire to go out.

A properly designed and operating wood pellet stove will provide for the correct balance of all the requirements of combustion. These are:

- Time
- Temperature
- Turbulence
- Fuel
- Oxygen

When pellets are burned properly combustion efficiency can be in the 99.9% range.

Too low a draft setting may provide inadequate air for a high fuel setting. A plugged burn grate will also reduce the amount of combustion air. Too high a draft setting may provide too much air and velocity. This will cool the burn grate area too much for a low burn to be maintained and can result in creosote forming in the stove and venting system.

Learning how a properly burning flame looks, what drafts are needed for various settings, the quality of fuel burned and it's characteristics are essential in diagnosing and solving operating problems related to the pellet fuel.

The major product from burning wood is:

1) Heat. Since there is not 100% combustion of the wood pellet, there are two by-products, plus water, from burning pellets. These are:

    * Carbon monoxide and unburned gases (Exhaust gases)
    * Ash

St. Croix stoves are designed to effectively handle the elimination of the by-products of combustion.
St. Croix stoves are engineered to transfer a designed amount of the heat produced into the area around the stove. Exhaust temperatures may vary from approximately 200°F to 450°F.

Ash & Clinkers

In addition to gases and carbon, wood contains various minerals. After the gases and carbon burns these minerals remain and are referred to as "ash".

Most ash will be blown out of the burn grate and settle in the ash pan. Ash that is very light may travel along with the exhaust gases. This ash is called "fly ash". It often settles in various areas of the stove and exhaust pipe. Improper cleaning of fly ash will result in restriction of combustion air. The results are a poor burning fire.
Some ash is heavy enough to remain in the burn grate unless it is removed with high air velocity or through mechanical means. If attempts are made to remove all ash with air velocity alone, the air to fuel ratio will be out of balance. When this happens pellets may be blown out of the burn grate and the efficiency of burn will be lowered.

When ash is exposed to temperatures that exceed the melting point of the ash, for long enough time, "CLINKERS" will form. Clinkers cannot be removed with air velocity. They quickly shut off primary combustion air and smother the fire.

St. Croix's Versa Grate System" helps in the removal of ash from the burn grate. The self-cleaning grate helps to minimize clinkering, but will not eliminate all clinkers and helps in removing ash from the burn grate. The Versa Grate System should be used with pellets that meet or exceed the PFI's "Premium" pellet fuel quality standards. Many Standard Grade pellets will not work in Residential pellet heating appliances.

Assessing Pellet Quality

Pellets are an important component of a residential wood pellet heating system.

A complete residential wood pellet heating system consists of 1) the pellet stove, 2) the installation, 3) the fuel, 4) operation and maintenance. When any one of these factors does not meet required specifications, the operation of the stove will be compromised.

Pellets, however, are often the least understood and most often ignored component in DIAGNOSING a pellet stove.

St. Croix or any other pellet stove is not designed to run on just any pellet that is available. A minimum pellet quality is required. The residential pellet heating industry is just developing in some parts of the country. Pellets in these areas have been unavailable or may not meet the Pellet Fuel Institute (PFI) standards. Fortunately most pellets in most parts of the country are satisfactory. ***Dealers soon learn that the "Proof of pellet quality is in its consistent performance, not on stated specifications"!***

Pellets may vary from company to company, from load to load and even from bag to bag. The range of pellet quality may become even greater as more pellet mills come on line.

Pellet characteristics that affect the ability of a unit to operate effective are identified by PFI and are shown below. They are:

Pellet Fuel Institute (PFI) Pellet Standards

Characteristics	PFI Standards
-Amount of fines	Max. 1%
-Weight per cubic foot	Min. 40#
-Moisture content	Max. 8%
-Length (max.)	Max. 1.5"
-Diameter	.235"(¼") to .35" ($^3/_8$")
-Amount of ash	
*Premium	Max. .75%
* Standard	Max. 2.50%

Additional Considerations

-Consistent size
-Flow characteristics
-Ash characteristics; light, heavy, sandy
-Clinkering characteristics

Pellets that are minimum in just one characteristic may prove to be unsatisfactory for some residential uses.

NOTE: Owners in some parts of the country are "screening" pellets to eliminate the "fines" or sawdust from the pellets. Screening results in a more uniform flow of pellets in the hopper, more complete burning of the fuel, less ash on the heat exchange tubes, in the ash traps and in the exhaust system and pipes.

Screening pellets that have visible sawdust in them will improve combustion efficiencies and decrease maintenance.

Pellet screening equipment is available commercially or may be homemade.

Determining Acceptable Pellet Quality

Some important questions in determining pellet quality are:

1) Have the pellets been tested against the PFI standard?

2) Does the pellet company use the same quality of raw material throughout the year?

3) How consistent is each sack and each load of pellets performing for the consumer?

Assessing Visual Characteristics:

1) **Volume per ton:** Full pellets that vary in height probably vary in weight per cubic foot. Lack of density, an increase in fines and moisture tend to increase volume and decrease weight per volume. Lower density pellets contain fewer BTU for the same volume as do more dense pellets and generally provide less heat at the same fuel setting than higher density pellets.

2) **Fines:** Pellet quality drops as the amount of fines increase up to and above the 1% allowed in the PFI standards. Pellets with excessive fines are unacceptable unless they are screened.

3) **Size and Uniformity:** Pellets approximately ¼" diameter and $^{3}/_{8}$" to ¾" length are desired. Pellets of this size flow and feed more evenly than larger, longer pellets.

4) **Stickiness:** Pellets made from wood that is higher in resin, such as most softwood pellets, can have a "stickiness" that may be hard to detect. However, such pellets tend to bridge easily and flow less freely. These pellets flow very poorly as the amount of fines increase.

Assessing Performance Characteristics

How pellets perform from the hopper to the ash tray is the true test of the quality of a pellet. The following are characteristics important in determining quality of a pellet.

1) **Feed Rates:** Pellets approximately ¼ inch in diameter, ½ inch long, free from fines, that have a slick coating and are dry and dense, feed faster and more evenly than pellets not having these characteristics.

   Pounds of pellets fed per hour can vary up to 50% on the same settings, due to differences in pellet quality. When pounds fed per hour vary at the same settings, so does the BTU output vary.

2) **Clinkers:** Clinkers can only form from the minerals in the wood. Minerals, principally silica, when melted by high firebox temperatures, can fuse into clinkers. Clinkers can be of the hard, slick, glassy type or a more porous type.

   Temperatures at which clinkers will form in the burn box will vary based on the type and percent of minerals in the pellets. Pellets that clinker have been considered unsatisfactory for residential wood pellet heating. However, St. Croix's Versa Grate System allows the burning of a much wider range of pellets than other top fed pellet stoves.

3) **Ash:** The type and amount of ash can vary greatly in pellets. Some ash may be light in weight and easily blown out of the burn grate. ***Heavier ash may pose a removal problem and if not manually removed (several times daily in some cases)*** will plug burn grate holes and reduce air flow.

   Ash content of pellets tends to increase as the age of the raw material, the amount of dirt and the amount of bark in the pellet increases.

4) **BTU:** Most woods are assumed to provide approximately 8,600 BTU per pound of wood. As ash content, moisture content and the amount of time dead wood is exposed to the elements increases, the BTUs per pound goes down.

PLEASE NOTE: THE QUALITY OF SOME FUELS IS SUCH THAT THEY ARE NOT SATISFACTORY FOR BURNING IN PELLET STOVES. LOCAL DEALERS MUST KNOW AND INFORM CUSTOMERS ABOUT THE QUALITY OF THEIR PELLETS!

Pre-Delivery Check – Pellet Stoves with the Versa Grate system

One of the easiest ways to prevent problems in the field is to inspect the unit before leaving to install the stove. Offer the customer the option of Pre-Burning the stove for them, to burn off the odors associated with the first burn.

The following checklist is to be used to quickly inspect the stove:

WARNING: Use caution when inspecting electrical connections to prevent contact with live circuits.

1. Once the unit has been unboxed, check the unit for hidden freight damage.
2. If any painted surfaces are scuffed up use the appropriate touch-up paint to re-paint the area.
3. Open side doors and inspect all wiring connections.
4. Make sure the Manual packet is inside the stove for the owner of the stove.

Next turn the stove on by pressing the button labeled 2 in Figure 1 to make sure all motors and blowers are running.

a. Both of the blowers come on at line voltage. Listen for any blower noise or excessive vibration. After approximately 30 seconds the Convection blower will shut off.
b. The ON-OFF light comes on and starts blinking. The Feed Rate/ Heat Advance light should be at level #1.
c. The auger comes on and runs for 2 minutes.
d. The Igniter comes on and stays on until the Proof of Fire switch locks in.
e. The Versa Grate Motor comes on.
f. **Five minutes** after turning the stove on the auger will start feeding pellets on level #1. It will remain on level #1 until it senses the Proof of Fire switch.

Verify points a through f and then bypass the Proof of Fire switch to advance the stove into the program for normal operation. Once the Proof of Fire Switch has been bypassed you will see the following:

g. The ON/Off light will quit blinking and stay on constantly.
h. The Convection Fan comes on.
i. Slide the Thermostat switch to T-Stat and/or StartStat mode. The ON/OFF light will start blinking again.

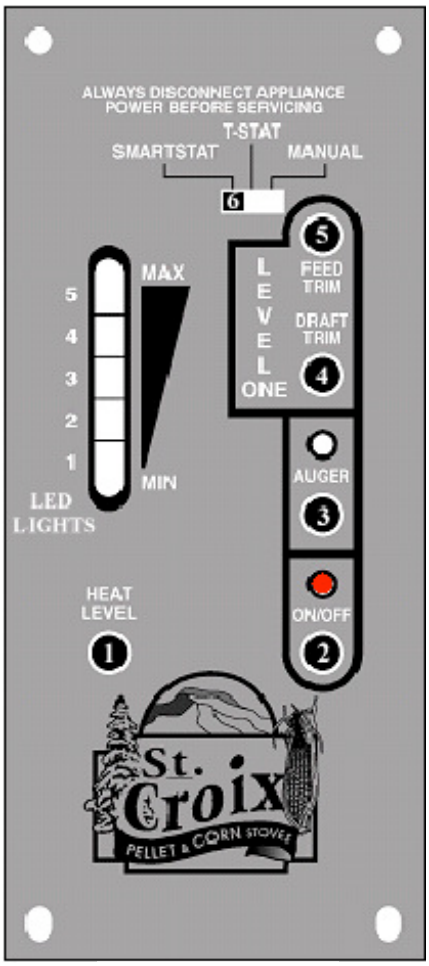
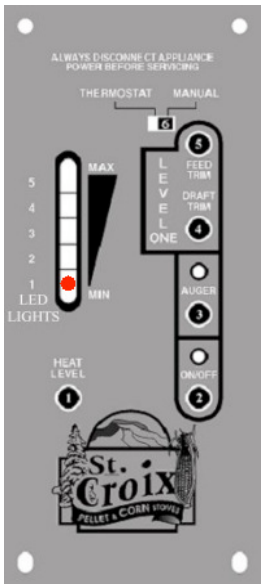
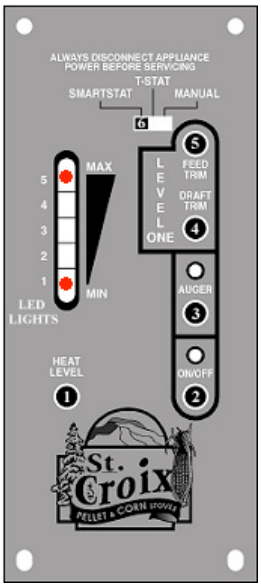


Figure 1



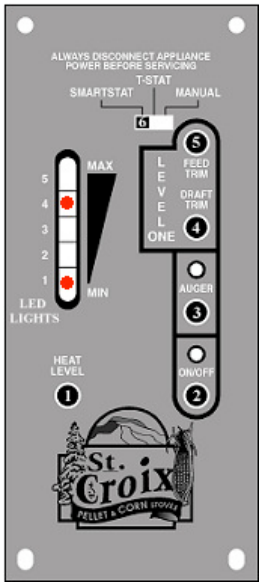
Level 1 On Time
1.50 seconds
Default setting

Figure 2



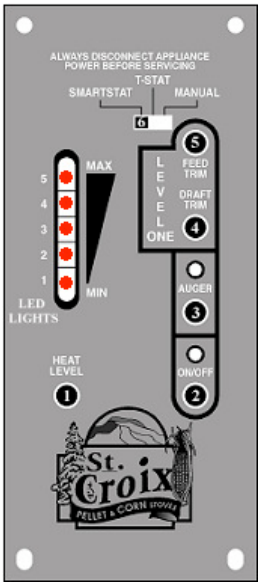
Level 1 On Time
1.75 seconds
Auger Trim

Figure 3



Level 1 On Time
1.25 seconds
Auger Trim

Figure 4



Fan Button Adjusts
Combustion fan on
level 1 only.

Figure 5

j. The Auger ON Time for level 1 is adjustable to fine-tune the stove. Once the stove is turned on the #1 LED should be on. See Figure 2 above - This has an ON Time of 1.5 seconds

k. Press the **Feed Trim** button (button #5, see Figure 1) once and the #1 **and** #5 light will come on. See figure 3 above – This has an On Time of 1.75 seconds.
Press the **Feed Trim** button (5) again and the #1 **and** #4 light will come on. See figure 4 - This has an On Time of 1.25 seconds.
Press the **Feed trim** button again and the #1 light (Default Setting) comes back on. (See Figure 2)

This is a method to Fine Tune the amount of **Heat** and/or the **Burn Characteristics** on the #1 setting by adjusting the Auger **On Time** of level 1. **This adjustment will not affect levels 2 through 5.**

l. The Draft Trim button (button #4, see Figure 1) allows for adjusting the Exhaust fan voltage on Heat Level 1 only. Push the button and the all of the LED Lights in the light bar will flash once. (See figure 5) This decreases the Exhaust fan voltage approximately 5 volts below the default setting. Push the button a second time and all of the LED Lights in the light bar will flash twice. This decreases the voltage approximately another 5 volts. Pushing the button a 3rd time will reset the voltage to the default setting. **This adjustment is available to fine tune the Draft fan voltage on the #1 Heat Level setting only.**

m. Press the **Heat Advance** button (button #1, see Figure 1) and advance the setting to level #5. The control board slowly ramps up by advancing to the next level and waiting for 2 minutes at each level until it reaches level 5. This allows the stove to start up smoothly with out overloading the burn pot. After each 2-minute delay you will hear the blowers pick up in speed.
n. Press the **Auger button** and the auger will feed pellets until the button is released. This may be used to manually prime the auger tube if needed.

This concludes the Pre-Delivery check. See Troubleshooting section to correct any problems found.

Pre-Burning at the Dealership

We recommend that all stoves be pre-burned at the dealership prior to being installed. This is true regardless if it is customer installed or professionally installed.

We have found that the majority of service calls within the first 30 days of sale of the stove could have been prevented if the stove had been pre-burned at the dealership. The advantages are:

a) Saves time and expense of corrective action should the stove have a defective part.
b) Increases owner confidence that he is getting a stove that has been tested by his "local dealer" to ensure customer satisfaction with the product.
c) Eliminates break-in odors and ensures the owner they're getting a "ready to burn stove".
d) Saves dealers money by reducing service calls that could have been prevented.

Vacuum Check (Negative Pressure) - Vacuum readings have value in determining if there is a significant problem with the stove, such as the main or ash door seal, or the stove installation. This test should be performed on a cold stove with the damper at the **Factory Pre-Set** position. Do not make any adjustments with the fan button before checking the vacuum reading.

Note: Make sure the damper is set to the Factory setting before delivering the stove to the customer or before they pick up the stove.

- ✓ Before any stove leaves the store, verify cold stove pressures to double check for a problem with the gaskets or a firebox leak in the stove. See readings listed below.

Normal Draft Readings:

Use a tee to simultaneously hook up the Vacuum Switch and a **Magnehelic Gauge** to check the vacuum reading. See Figure 6 on Page 19.

COLD STOVE: No fire, Power on, Empty Hopper, Damper Pre-set.

READING: .15” - .30” WC Negative Pressure (Higher readings are OK), the readings on an insert will be on the lower end of the range shown.

The Vacuum switch has a set point of .05” of Negative Pressure. A reading of less than .1”WC Negative Pressure is marginal and requires a closer look.

NOTE: If the stove has been brought in from a cold environment (an unheated warehouse), the reading you get may be lower than normal. The High Temp Lubrication used in the Combustion fan does not allow the fan to spin as easily as a fan at room temperature.

Figure 6

Factors that Decrease the Draft Readings once the unit is installed.

a) Altitude**
b) The following factors are in addition to installation procedure:
c) Increasing the exhaust pipe vertical length without increasing exhaust pipe diameter when required for installation. **
d) Increasing the horizontal exhaust pipe length. **
e) Increasing the number of tees and elbows: the exhaust vent piping will, for most applications, have two (2) 90-degree bends. More than three (3) bends in the exhaust vent is allowed but is NOT RECOMMENDED.
f) Increasing the air inlet pipe length recommended for installation without increasing the diameter of the pipe. It is recommended to increase the air inlet pipe to 3" diameter for runs over ten (10) feet and at elevation over 4000'. Excessive runs (15 feet+) should be avoided.
g) Back pressure on the stove caused by wind direction and velocity directly into the exhaust termination point.
h) Increasing the number of elbows in the inlet pipe run.

See guidelines on the next page for the venting configurations of a pellet stove.

Venting Guidelines

	Type of Installation	Size	Recommendation
*	1) Less then 10' Horizontal	3"	Acceptable
*	2) 10' to 12' Horizontal	4"	Recommended
*	3) Over 12' Horizontal	4"	Required

NOTE: Horizontal installation with runs greater than 12' is NOT RECOMMENDED.

	4) Vertical less than 15'	3"	Acceptable
*	5) Over 15' Vertical	4"	Recommended
*	6) Above 4000' elevation	4"	Recommended

* **Elbows** substantially reduce the overall acceptable length, 4" vent recommended in vent systems with more than 2 elbows in the installation. ***Note: Four (4) inch vent may be used in all installations. If in doubt, use 4" vent.***

Factors That Increase the Draft Readings

a) Air draw on the stove caused by wind direction and velocity perpendicular to the exhaust termination point. The **"Venturi"** effect draws air out of the stove faster, thus increasing the vacuum in the stove.

b) Tall chimneys that have good natural draft will increase draft readings.

Direct Vent Installations and the use of Battery Back-Up Systems

Although the stoves have been tested and approved for direct vent installations and many customers choose to hook up their pellet using this type of installation. We recommend that there be a minimum of a 3' vertical rise to help prevent excessive smoke backup in case of a power failure to the stove. This is helpful, but wind could still cause smoke to spill into the home if it puts back-pressure on the vent system. We recommend the use of a battery backup system if the customer has a problem with intermittent power failures. A good quality Computer back-up system will work as long as it provides **"PURE SINE WAVE" output and has a minimum rating of 750 VA.** These type of back-ups will usually provide anywhere from 15 to 45 minutes of back up power. There are systems on the market specifically designed for pellets stoves requiring "PURE SINE WAVE" which will offer longer back-up times by utilizing one or more deep cycle batteries hooked to the back-up system.

St. Croix does not market a Battery Back-Up system for the pellet stoves.

Flame Pattern Interpretation

The most effective method by which to determine the proper ratio of combustion air to pellet fuel is to observe the flame pattern. This should only be observed after the stove has been operating at the desired Heat Adjust Selection for a period of time. Even though a Negative Air Pressure Gauge measures quite accurately; visual observation of the flame pattern tends to be a highly effective diagnostic tool as well. Flame pattern height will vary relatively proportional to each Heat Adjust Selection made. Unfortunately poor combustion can be caused by multiple factors and only through proper diagnosis can the correct cause be found. Pellet fuel inconsistencies tend to be one of the largest factors that contribute to flame pattern irregularities. Faithfully following the Preventive Maintenance program and/or making slight Air Inlet Damper adjustments can usually easily correct the flame pattern. The #1 setting is usually the most difficult to adjust and the control board offers several feedrate adjustments (Feed trim Button) and several combustion fan adjustments (Draft Trim Button). See section covering the control board for more info.

Flame Pattern Characteristics

Correct Flame Pattern - Bright yellowish-white flame with a brisk movement, having sharp pointed tips extending up towards the Heat Exchange Tubes while forming a fan-like shape. Small amounts of ash and some live sparks being blown out from the Burn Pot area is considered normal operation.

Incorrect Flame Pattern - Dark orange-brown flame with a lazy movement, having black smoky tips curling up and over the Heat Exchange Tubes while forming a fireball-like shape. Small amounts of Ash or Live Sparks being blown out from the Burn Pot area is considered abnormal operation. Extremely black soot forming on the ceramic glass surface is a sign of very poor combustion (not enough combustion air) and should not be overlooked. At the other end of the spectrum; an extremely brisk flame which blows large pieces of live coal out from the Burn Pot area and causes stubborn shiny black build-up on the glass (too much combustion air) is also considered undesirable and can lead to **Creosote** build-up in the stove and vent system

During the Pre Delivery burn is a good time to check the parameters of each of the 5 Heat levels. See the Data Table shown in Figure 7 on Page 22.

A **Voltmeter** and a **Stopwatch** are essential to perform the measurements shown in the data table on the next page. The following table shows the default settings of the control board, meaning the Auger Trim button and the Fan button haven't been used to make adjustments.

When checking the readings of a stove that is not burning, bypass the Proof of Fire Switch to check all 5 settings of the control board. **Remember there is a 2-minute delay between each level before advancing to the next level.**

Data Table

The Cycle Time. equals the ON time & OFF Time combined and is based on an 11.5 second Cycle time.

Heat Level Selection	Auger ON (Seconds)	Combustion Fan Voltage +/- 3 Volts	Convection Fan Voltage +/- 3 Volts	Pellet Fuel (Lbs./Hour) +/- 10%
Start-Up Cycle	2 minutes	100 Volts	OFF	NA
1	1.5	90 Volts	83 Volts	1.25 Lbs.
2	2.5	98 Volts	90 Volts	2.00 Lbs.
3	3.5	105 volts	98 Volts	3.15 Lbs
4	4.5	111 volts	103 Volts	3.7 Lbs.
5	5.5	120 volts	120 Volts	4.5 Lbs.

Figure 7

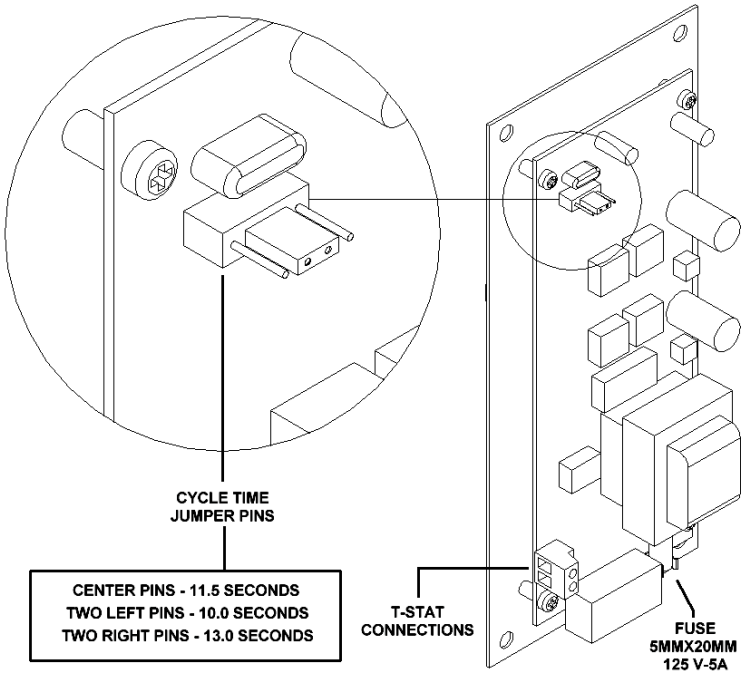


Figure 8

Feed Rate Adjustment

The Default Cycle Time is 11.5 seconds. Please see figure 8 to the left.

The 11.5-second cycle can be changed to 10 seconds by placing the jumper on the 2 pins to the left. This should only be done if the fuel used feeds slowly. Please read Point 1 "Feed Rates" on page 12 for more information regarding "Assessing Performance Quality of pellets". **Use Caution when switching to a shorter Cycle Time.**

Certain fuels (Mainly Corn and Small Grains) tend to feed faster and may need to be slowed down. Placing the jumper on the 2 pins to the right will change the Cycle Time to 13.0 seconds.

Preventive Maintenance

Preventive maintenance is important to maintain the life of any appliance you own. The same is true with the St. Croix stoves. This stove has been designed in such a way to minimize preventive maintenance, thus minimizing any corrective maintenance, while maintaining a very user-friendly pellet stove. Just like the owner of a car would perform preventive maintenance, the owner of a pellet stove **must** perform preventive maintenance to maximize its performance. **The interval of time for each maintenance item will vary depending on the fuel used**. Lack of preventive maintenance will result in a poor operating stove, poor flame patterns, excessive smoke and possible stove damage.

CAUTION: FAILURE TO KEEP YOUR STOVE CLEAN, AS DESCRIBED IN THIS MANUAL, COULD RESULT IN POOR OPERATION, INEFFICIENT FUEL USAGE AND A POSSIBLE SAFETY HAZARD! THE DEALER SHOULD INSTRUCT THE CUSTOMER HOW TO MAINTAIN THE UNIT AT THE TIME OF PURCHASE. DO NOT ASSUME THEY WILL UNDERSTAND HOW TO PERFORM THE MAINTENANCE. IT IS THE CUSTOMER'S RESPONSIBILITY TO DETERMINE THE MAINTENANCE FREQUENCY.

Types of Preventive Maintenance-Stoves with the Versa grate System

Daily Maintenance (as needed) - Performed by Customer.

a) Inspect the burn grate and burn pot. Clean as needed. To clean ashes below the burn grate pull the ash Clean-Out Rod, in and out, see Fig. 22 on Page 51. **Be sure to leave the rod pushed in after this maintenance has been performed.**
b) Clean out the ash pan.
c) Clean the window.
d) Clean/polish the plated surfaces with a soft cloth and a mild glass cleaner.
e) Inspect the flame for a sharp, white/yellow flame.
f) Clean the heat exchangers by pulling the Tube scraper back and forth.

Periodic Maintenance (Every month or as needed) - Performed by Customer or Service Tech.

a) Clear the burn grate holes.
b) Clean out the ash traps in the lower corners of the back wall of the firebox and behind the Ash Pan. Remove the covers and vacuum those areas. **See Figure 19 on Page 46 for location of Ash Traps.**
c) Clean the combustion chamber floor.
d) Clean the hopper.
e) Clean/dust the area under the hopper.
f) Inspect and clean, as needed, the PL vent tees and exhaust system.
g) Inspect and clean, as needed the combustion and convection (room air) fan blades.

Yearly Maintenance (Every 6 to 12 months or as needed) - We recommend this service be performed by Service Tech.

a) Perform steps listed in the Daily and Periodic Maintenance above.
b) Remove all sawdust, pellets and ash from the stove after the burning season.
c) Inspect and clean the entire exhaust system.
d) Inspect and clear any obstructions from the air inlet piping.
e) Inspect door and ash pan gaskets.

Breaking Down Troubleshooting

Electrical Wiring/Component Failure

When called to service a stove problem, it is best to get as much information from the customer as possible. Many problems can be isolated over the phone. This practice of asking the "right" questions will save you time and also instill customer confidence. This shows you are prepared to solve the problem in a timely manner.

If the stove is still in use, but doesn't seem to be burning correctly, some typical questions to ask include:

1. How long has the stove been in use?
2. Have you changed brands of pellets?
3. Is the malfunction consistent of intermittent?
4. Is the noise or malfunction at certain heat settings?
5. How long has this been happening?
6. Is it getting progressively worse?
7. Has it been maintained regularly as in routine maintenance?
8. Does the flame pattern change when a door or window is opened?
9. If it is a noise problem, does the noise increase as the Heat Level is turned up?

If the stove is shutting down, won't stay running or seems completely dead, some typical questions to ask include:

1. Is there power to the outlet the stove is plugged into?
2. Have you checked the fuse on the back of the control board?
3. Is there a diagnostic light is flashing? (#2, #3 or #4 LED Light)

Electrical Component Failures

Although we take every measure possible to ensure reliability of our stoves, there may be some component failures.

All electrical components can be tested in place on the stove using a multi-meter.

A component's failure to operate may be due to several different causes:

- **The fuse on the Control Board. Check this first.** ***(See Figure 8 on page 22 for the location of the fuse on the Control Board).*** **Replace with 125 Volt, 5 Amp, 5 MM x 20 MM fuse.**

- **The Component fails.**

- **The Device that controls the component fails.**

- **The Wiring Harness to or from the component is opened or shorted.**

Wiring Diagram

St. Croix Stoves with Versa Grate System

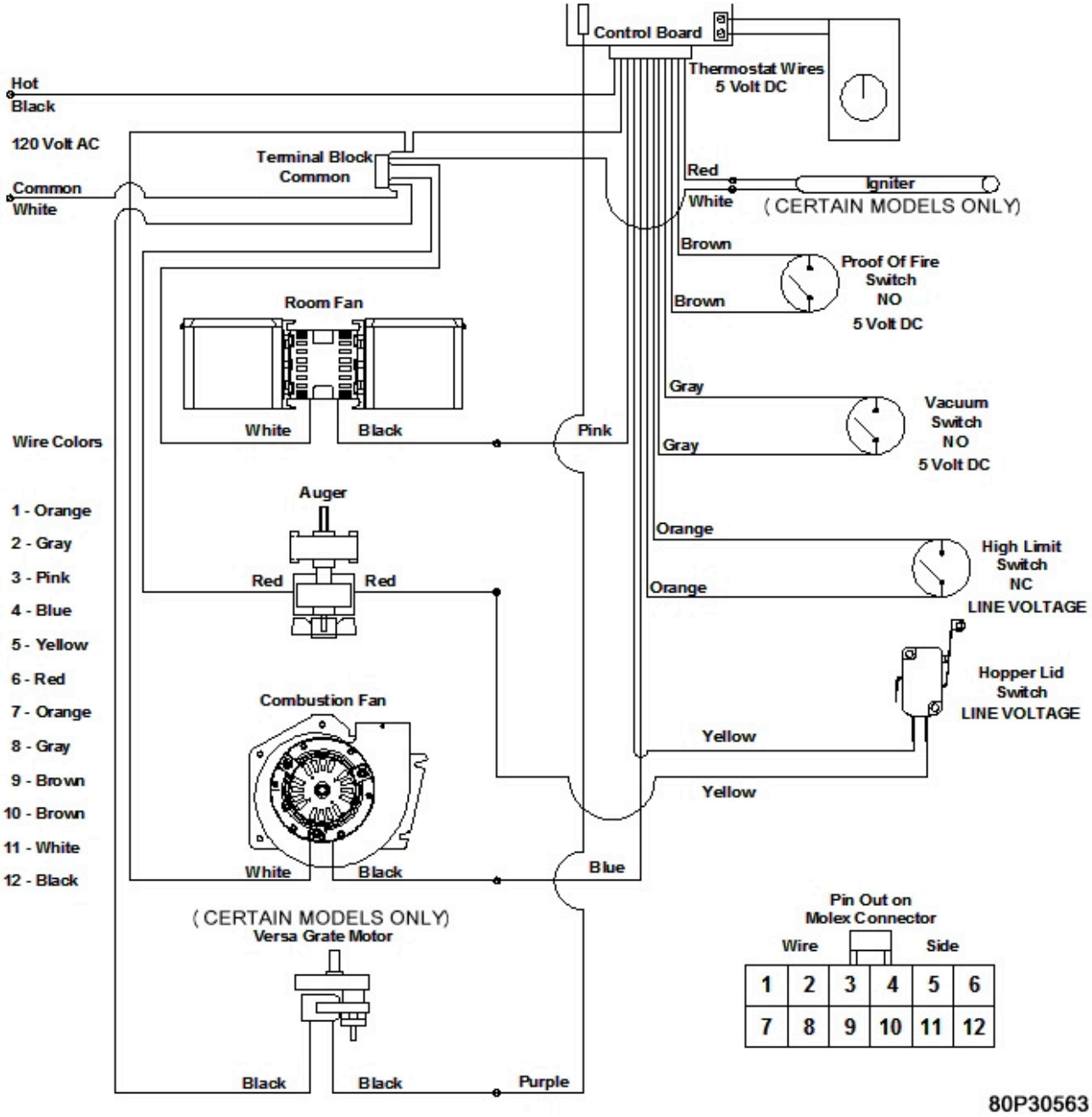


Figure 9

The Electrical Components listed in this Schematic are present in all models with the Versa Grate Burn System.

When diagnosing a problem in a stove the following four areas of the stove must be considered.

a. Electrical
b. Mechanical
c. Air Flow
d. Fuel Flow

Electrical

There are up to14 electrical components used in the Stoves designed with the Versa Grate Burn System. Please look at the parts breakdown in each models manuals for exact location of these parts.

1. Digital Control board – Check fuses first
2. Auger motor
3. Versa Grate Motor (also called **a Versa Grate Motor**)
4. Convection Fan (also called **a Room Fan**)
5. Combustion Fan (also called **a Exhaust Fan**)
6. Igniter (also called **a Cartridge Heater**)
7. Power cord
8. Wiring Harness
9. Wiring Terminal Block
10. T-Stat Wire Terminal – Only on the Freestanding Models.

The remaining electrical components make up the Safety Sensors to shut down the stove when sensing a malfunction or to disable the Auger motor.

11. Vacuum Switch (also called an **Air Switch**)
12. High Limit Switch (also called an **Over-Temp Switch**)
13. Proof of Fire Switch (also called the **Low Limit Switch**)
14. Hopper Lid Switch

Electrical Requirements:

The stove requires 120 volts AC voltage. Typical line voltage may vary plus or minus 5%. This means when testing the circuit before plugging the stove in you will see voltages that may vary from what we list in the Service Manual. Test the circuit the stove is plugged into first before plugging the stove in. If you have reason to believe the voltage is higher or lower than it should be, the Utility Co. should be contacted to provide the proper voltage. The stove draws 5 Amps when the igniter is running during start-up and drops to 3 Amps during normal operation.

The Digital Control Board

The buttons on the board function as follows: *(Refer to Figure 10. The touch pad buttons are labeled with the* ***White*** *numbers 1 through 6)*

1. The **Advance Heat** button will advance the setting between level 1 and 5. Once you reach level 5, it will drop back to level 1. Each level has a LED light to indicate where the board is set.

2. The **On/Off** button turns the stove on and also acts as the toggle switch to reset the board after the board switches to Diagnostic mode.

3. The **Auger button** will allow the customer to manually auger pellets into the burn pot on start up when needed.

4. The **Draft Trim button** allows for adjusting the Exhaust fan voltage on level 1 only. Push the button and the LEDs flash once to decrease the voltage 5 volts. Push the button a second time and the LEDs flash twice to decrease the voltage another 5 volts. Pushing the button a 3rd time will reset the voltage to the normal setting. This adjustment is only needed when there is a problem with a chimney that has excessive natural draft and the stove is going out on the #1 setting because of too much draft. See Figure 6 on Page 19.

5. The **Auger Trim** button will allow the feed rate to be adjusted on level 1 only. There are 3 levels for the # 1 setting**, #1 Normal, #1 High and #1 Low.** The LED lights will light up as follows to indicate which level #1 is running.

6. The **Thermostat Mode Switch** gives 3 modes of operation for running the stove.

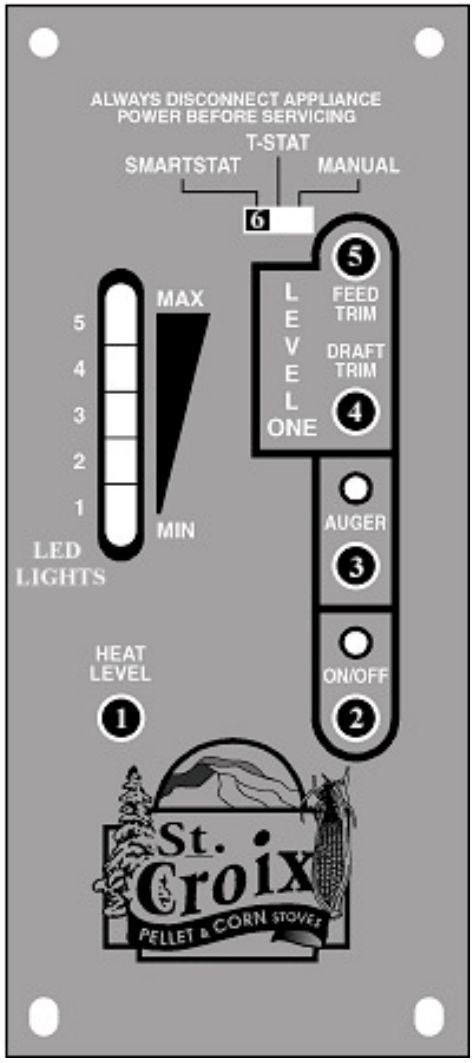


Figure 10

a. The first LED only indicates the **Normal** #1 setting. (1.5 second on time) See Figure 3 on Page 17.

b. The first and fifth LED lights indicate the #1 **High** setting. (1.75 second on time) See Figure 5 on Page 17.

c. The first and fourth LED lights indicate the #1 **Low** setting. (1.25 second on time) See Figure 4 on Page 17.

A Closer Look – Why and When does the ON/OFF Light blink?

It is important to understand how the LED lights function when the stove is in use. Let's take a look at the ON/OFF light. The ON/OFF light indicates more than the fact that the stove is running. The light blinks when first turning the stove on until the room fan starts blowing warm air into the room. This means the **"PROOF OF FIRE"** switch has sensed a fire in the stove by monitoring the Exhaust temperatures. **When running the stove on a Thermostat the light remains ON when the thermostat is calling for heat and starts blinking when the heat demand has been met.** Once the heat demand has been met the stove drops to the #1 setting and pilots for 1 hour (this is what we call the St. Croix **"SmartStat Feature")**. During this 1 hour the light showing the Heat Level is on the selected level, the Auger Light comes on and off when the auger is running and **the ON/OFF light is blinking**. If the thermostat doesn't call for heat during that hour the stove will shut down and wait for the thermostat to call for heat again. While the stove is shut down waiting for the thermostat to call for heat again **all lights are off except the ON/OFF light**, which is blinking.

REMEMBER: A blinking ON/OFF light may mean one of 3 things:

a. The stove is in start-up mode. The light indicating which Heat level has been selected will be on and 5 minutes after the stove has been started the auger light will come on.
b. When running in Thermostat Mode with the Thermostat **not calling for Heat**. Other lights that are on while the Thermostat is in this mode are the Heat level light and the auger light will come on when the auger runs.
c. The stove is shut down waiting for the thermostat to call for heat. All other lights will be off at this time

Fine Tune the level 1 Heat Setting if a little more heat or a little less heat is desired on the lowest level. This may be needed depending on the type of pellets that are used. Short pellets feed faster than long pellets. The same is true with hardwood pellets compared to softwood pellets. *(Refer to Figures 3 through 5 on Page 17 to see how the LED lights function when adjusting the Level 1 Heat Setting.)*

Fine Tuning the Combustion fan for level one is a little more complex. Usually when venting the stove in a direct vent situation, this adjustment is not needed. When venting into an existing chimney or running the pellet vent chimney all the way above the roof, an adjustment may be needed to compensate for the additional Natural Draft in the chimney. Use the damper on the back of the stove first try and adjust for too much air on the low. As a final resort use the fan button to reduce the fan voltage. Press the Fan Button and all the LED lights on the Heat Advance bar light up simultaneously. This reduces the Combustion Fan voltage approximately 5 volts. Press the button again and the all lights flash twice, reducing the voltage again. Press the button a third time and the lights all flash once and the board reverts to the default Combustion Fan voltage. (*Refer to figure 5 0n Page 17 to see how the lights flash when adjusting the Combustion Fan voltage.)*

CAUTION: Using the fan button in a direct vent situation more than one adjustment may cause the Vacuum Switch alarm to shut the stove down by reducing the fan speed which in turn reduces the vacuum in the stove. (Vacuum switch requires a minimum of .05" WC of negative pressure)

REMEMBER: Any adjustments to the board by using the Trim buttons will be lost in the event there is a power failure or if the unit is unplugged. The Control Board does not have a Memory Function. **Tell the customer to make a note of the final adjustment to the control board for future reference.**

Diagnostic Features

The Control Board offers a certain level of diagnostics to help in trouble shooting the stove. The three areas that are diagnosed by sensors in the stove are:

1. **Vacuum – Sensed in the Firebox and Ash pan area of the stove.**
2. **Minimum Heat– Proof of Fire sensed by monitoring the Exhaust Temperatures**
3. **Over Temp – Senses if the Firebox area gets too hot.**

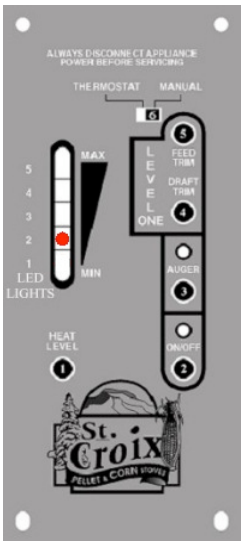


Figure 11
Vacuum Diagnostic light

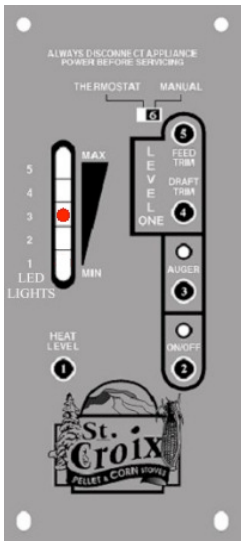


Figure 12
Proof of Fire Diagnostic light

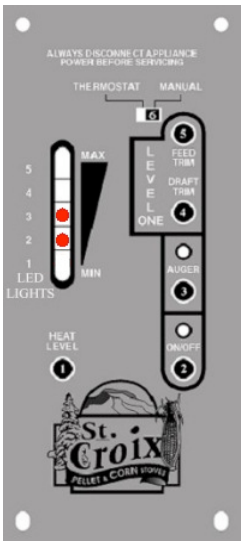


Figure 13
Proof of Fire Diagnostic light

LED light 2 flashing - The number 2 LED light on the Heat advance bar will **flash** if the control board senses a loss of vacuum. The stove shuts down and the Number 2 LED light starts flashing **approximately 60 seconds after** a loss of vacuum has been sensed. (Fig 11)

LED light 3 flashing - The number 3 LED light on the Heat advance bar will **flash** if the control board senses a loss of Proof of Fire. The stove shuts down and the Number 3 LED light starts flashing ***after the stove cools down and the fans shut off.*** Approximately 30 minutes. (Fig 12)

LED light 2 and 3 flashing at the same time – This will indicate that the High Limit Switch has tripped and shut the unit down. Reset the High Limit Switch before diagnosing the unit. (Fig 13)

1. Vacuum

Loss of vacuum may be causes by:

a. Operator error or neglect

- Leaving the Main Door open too long
- Forgetting to close the Main Door
- Leaving the Ashpan Door open too long
- Forgetting to close the Ashpan Door
- Allowing the Chimney to get plugged.
- Allowing the Ash Traps to get plugged.

If an owner calls in with a #2 diagnostic light flashing, first cover all items listed that may be caused by incorrect operation of the stove. Quiz the owner about their habits in regards to the Periodic maintenance. If they have been lax in cleaning the Ash Traps *(See Figure 19 on Page 46)* and venting system, have them first clean their stove and try it again.

b. Component Failure. Which components may be the cause?

- Combustion Fan
- Vacuum switch
- Control Board
- Vacuum hose
- Wiring harness
- Wiring connections

Check the simplest item first.

Check to see if the combustion Fan comes on.

- ✓ If the combustion Fan isn't running, check the wiring connections at the fan.
- ✓ Check the wiring connections on the opposite end at the Terminal Block (white wire) and at the Molex connector (Blue wire) that plugs into the control board. They may look OK, but in fact may not be making contact with the pins from the control board. Push the Blue wire into the Molex connector to ensure they are seated properly.
- ✓ Check both wires in the harness for continuity if needed with an OHM meter. (White and Blue wire)
- ✓ Check for voltage at the fan; if voltage is present and the fan isn't running replace the combustion fan.

Check the control board.

- ✓ Check for voltage at the pin out for the Blue wire at the control board. If no voltage is present replace the control board.

Check all wiring connections related to the Vacuum Switch.

- ✓ Check the 2 **Gray** wires that are plugged into the vacuum switch.

- ✓ If the wires are plugged in, check the opposite ends that are plugged into the control board. Make sure the wires a fully pushed into the Molex connector that plugs into the control board. They may look OK, but in fact may not be making contact the pins from the control board. Push the Gray wires into the Molex connector to ensure they are seated properly.
- ✓ Check the **Gray** wires for continuity if needed with an OHM meter.

If all wires and connections are correct, check the vacuum switch.

- ✓ Unplug the 2 **Gray** wires and jump them together. Run the stove and see if that corrected the problem.
- ✓ If the stoves runs, check the vacuum reading in the stove using a manometer connected to the vacuum hose. Be sure to leave the 2 **Gray** wires jumped together or the stove will shut down again. The Set point for the Vacuum Switch is .05" WC negative pressure. The stove typically has a reading between .1" and .25" WC negative pressure. Reading gets lower as the units heats up.
- ✓ If the vacuum reading is relatively low, check the intake air damper to see if it is wide open. Adjusting the damper to a position that is more closed will increase the Vacuum reading.

If dealing with an intermittent Vacuum problem do not overlook the possibly that a combustion fan that is getting too hot and the **Thermal Protection** is shutting the fan down. If you suspect the Thermal Protection is shutting the fan down, check the combustion fan **immediately** after the stove shuts down. Once the fan cools down it may start running again.

2. Heat

The number 3 LED light on the Heat Advance bar will flash if a "Minimum Heat Related" event occurs. If the Proof of Fire switch senses that the Exhaust Temperatures drop below 100 Degrees F, will shut the stove down and the number 3 LED light will flash ***after the stove cools down and the fans shut off***. This may take approximately 30 minutes, depending on how hot the stove is when the "Proof of Fire Switch" opens.

This may be caused by:

a. Operator error

b. Component Failure.

Which component may be the cause?

- ❑ High Limit Switch
- ❑ Proof of Fire Switch
- ❑ Control Board
- ❑ Wiring Harness
- ❑ Wiring Connections

When the stove shuts down, and the number 3 LED light is blinking, **let's look at the simplest solution first.** The following 2 items are Operator error.

Open the hopper and see if the unit has run out of pellets.

- ✓ If the hopper is empty, fill the hopper and re-light the stove.

Open the Main Door of the unit and look in the burnpot. Are there unburned pellets in the burnpot? Unburned pellets in the pot usually means the stove is running on a low setting and the damper is wide open. This causes the pellets to burn too fast during low burn and the fire eventually goes out. Since the Proof of Fire Switch is still closed at this point the auger will continue to feed pellets until the P.O.F. switch drops out and the stove shuts down.

- ✓ Adjust the damper for a low burn or Fine-Tune the level 1 feedrate using the Feed Trim button. If the stove is hooked to a tall vertical Chimney with good draft, use the Draft Trim button to adjust the combustion fan voltage to compensate for extra draft.

The Draft adjustment listed above would not prevent the stove from re-lighting and may be due to a failure to make the **initial start-up adjustments** after a new stove is installed.

When troubleshooting the components, keep in mind that the **High Limit (Stove Overheating) and the Proof of Fire (Exhaust Temperatures too low) Switches** may actually be sensing a problem in the unit and are not necessarily failing.

If the above mentioned items are not the cause **and all the pellets in the burnpot are burned up**, then the auger shut off before the fire went out in the burnpot, consuming all fuel in the pot. **Again let's start with the simplest scenarios.**

First turn the stove on and see if it feeds pellets during the start-up cycle.

ATTENTION: The auger will only run for 2 minutes after the control board is turned on and then shuts off to complete the ignition cycle. Be sure to check it during the initial 2 minutes.

If it doesn't feed pellets, check the following:

- ✓ Check to see if the Auger Motor is running but the auger is not turning. This may indicate either a **loose setscrew** on the auger shaft or a stripped out **gearbox**.
- ✓ If the Auger Motor tries to start and immediately stops usually means a foreign object is stuck in the auger system or the Auger is jammed on pellets. **First** take a quick look up the drop chute area in the front of the stove to make sure it's not jammed there. Dislodge the pellets if a jam is found.

- ✓ If nothing is found in the drop chute area, empty the hopper and visually inspect the opening to the auger. If nothing is found, the auger will have to be pulled from the hopper to see if the obstruction is farther up in the tube.
- ✓ If the Auger Motor does not appear to be running or trying to run, it may be a problem with the power to the motor. Check for **intermittent** Line voltage on the **Yellow** wire plugged into the auger Motor. Voltage should be cycling ON and OFF when the Auger light on the control board blinks.
- ✓ If there isn't any voltage at the Auger, ***carefully*** check for voltage on the pin-out on the control board. If no **Intermittent** voltage is present on the control board, the control board is bad and needs to be replaced.

Second - let's look at the **Proof of Fire** switch. This is a **Normally Open** switch that closes on rise at 110 F. The following items would involve a situation where the stove sensed temperatures in the exhaust system below the normal Operation range.

- ✓ Remove the **P.O.F** switch from the fan and heat up the contact surface of the switch with a lighter until you hear a click (approximately 5 seconds). Test the switch with an Ohm meter for continuity. The switch should be closed. If it takes significantly longer than 5 seconds or if it doesn't click at all and never closes or if the switch is constantly closed and never opens, replace the switch
- ✓ If the switch is not defective, unplug the 2 **Brown** wires from the switch and jump them together. Turn the stove on and wait 5 minutes. After five minutes you should see 2 things:

    1. The room fan comes on.

    2. The ON/OFF light will quit blinking and be ON constantly.

- ✓ If the 2 items listed above do not occur and the ON/OFF light keeps blinking, check to make sure the **Brown** wires are inserted properly into the Molex connector that plugs into the control board. They may appear to be inserted properly, but sometimes are not connected to the pins on the control board.
- ✓ If they are inserted properly, use an OHM meter and check both **Brown** wires for continuity.
- ✓ As a last resort the control board should be replaced. If this problem is intermittent, it most likely is not the control board.

Remember: Once the stove is turned on, both fans come on for 30 seconds, then the room fan shuts off and goes into a Start-up Cycle, the auger will run for 2 minutes and the igniter will light the stove. If the control board does *not* sense the P.O.F. switch in the first 15 minutes the #3 LED light will start blinking (First Generation Boards only, Second Generation Boards flash the #2 and #3 light at the same time). This takes approximately 20 minutes

Third - let's look at the High Limit Switch. This is a **Normally Closed** switch that opens on rise at 250 F. Check if it's tripped and shut the stove off. It must be manually reset to allow the auger to run again. The following items would involve a situation where the stove sensed temperatures above the normal range.

Attention: There is a difference in Diagnostic Lights between first Generation Digital Control Boards and second Generation Control Boards. First generation control boards do not have a separate Diagnostic light. If the High Limit trips the auger shuts off and eventually when the stove shuts down the #3 LED starts to flash.

Second Generation Digital Control Boards have a Diagnostic code specifically for the High Limit Switch. The #2 and #3 LED lights flash at the same time.

Items to check if the switch has tripped:

- ✓ If the **Manual High Limit** switch has been reset and the stove **starts up**, look for a reason that would cause the High Limit Switch to trip.

a) Inspect the **Convection blower** and see if it is running once the **Proof of Fire** switch locks in. If the convection fan isn't running, inspect the wiring for a loose connection.
b) Check to see if the Convection blower is getting **voltage** from the control board. If voltage is present, **Hot-wire** the fan to double check the blower. If the blower still doesn't come on, replace the blower.
c) If there isn't any voltage at the fan and the fan runs when Hot-wired, **carefully** check for voltage on the pin-out on the control board. If no voltage is present at the control board indicates a bad Control Board and needs to be replaced. (See note on previous page indicating when voltage is present. Voltage reading will be between 80 volts and line voltage.)
d) If the blower is running and the stove has been in use for some time, check the blower for a build-up of dust, lint or pet hair. When the squirrel cage gets dirty, it can't move the proper amount of air and the stove could overheat and shut down.

- ✓ If the switch has been reset and **the auger does not come on** the next time you start the stove, unplug the 2 **Orange** wires from the switch and check the switch for continuity. Replace if it's defective.
- ✓ Unplug the **Orange** wires and check for voltage at the **Orange** wires. ***First Generation Digital Control Boards have Line Voltage on that circuit. Second and Third Generation Digital Control Boards have 5 volts DC.*** *(First Generation Control Boards do not have the Thermostat Slide Switch on the front of the board .All other generations have the slide switch.)*
- ✓ If there isn't any voltage on any of the **Orange** wires, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board the control board is bad and needs to be replaced. **Remember: There will only be voltage on one pin at the control board.**
- ✓ If the switch is not defective, check to make sure the **Orange** wires are inserted properly into the Molex connector that plugs into the control board. They may appear to be inserted properly, but sometimes are not connected to the pins on the control board.

- ✓ If they are inserted properly, use an OHM meter and check both **Orange** wires for continuity.
- ✓ As a last resort the control board should be replaced. If this problem is intermittent, it most likely is not the control board.

The Auger Motor

Auger Motor - Located near the back-center of the stove and mounted to the Auger Shaft. This 2-RPM motor rotates the Auger Shaft, which in turn feeds the wood pellets into the Burn Pot. The Auger Motor rotates when the Auger Light is ON, the duration of the ON and OFF cycle will vary depending upon which level has been selected using the Heat Advance button, level 1 through level 5.

Let's focus on circumstances that could interrupt power to the motor. **Power (line voltage) is applied to the auger motor intermittently.** If the auger motor is not running when it should, check the following:

Check to see if the **Manual Reset High Limit** switch has tripped. This will prevent the Auger motor from running.
Check the Fuse on the back of the control board, replace with a 120 Volt, 5 Amp fuse, 5 MM x 20 MM fast acting fuse. (See Figure 8 on Page 22) First Generation Digital Control Boards have 2 fuses, check the fuse labeled F1.
Check for power on the Auger motor circuit.

- ✓ Check all wiring connections to the Auger Motor. The auger Motor has 2 **Red** wires. One wire is plugged into the Terminal block; this is where all the Common connections are made. The other wire is plugged into a **Yellow** wire, which is the Hot connection to the motor. The **Yellow** wire will send an intermittent line voltage signal to the Auger motor.
- ✓ Check the Yellow wire for voltage.
- ✓ If there isn't any voltage, check the **Yellow** wire for continuity using an Ohm meter.
- ✓ Check the wire connection on the opposite end at the Molex connector (**Yellow** wire) that plugs into the control board. They may look OK, but in fact may not be making contact to the pins from the control board. Push the Yellow wire into the Molex connector to ensure it is seated properly.
- ✓ Check the wiring connections at the Terminal Block where the white wire plugs in.
- ✓ Hot-wire the Auger motor using a cord with a ¼" Male and ¼" Female connector to make sure the auger motor is not defective.
- ✓ If there isn't any voltage on the Auger circuit, ***carefully*** check for voltage on the pin-out on the control board. If no **Intermittent** voltage is present on the control board, the control board is bad and needs to be replaced.

The Versa Grate System

Versa Grate Motor - Located in the back of the stove and mounted to the sheet metal base. This 1RPM motor drives a cam-rod system, which ultimately slides the Grate Bottom back and forth beneath the Main Grate Body. This particular motion agitates the air passing through the Self-Cleaning Grate to improve the combustion process and also help prevent clinkers from forming on the surface of the Shaker Plate.

All of the St. Croix Pellet stoves have the Versa Grate System in them. Most of the parts involved are used in common with all the Pellet models we offer. The location is the same in each stove. The York insert uses a different mounting bracket and slightly different orientation of the System in the stove.

Please refer to the 2 diagrams showing the difference between the system used in the freestanding models and the system used in the York insert.

Components - All Freestanding models

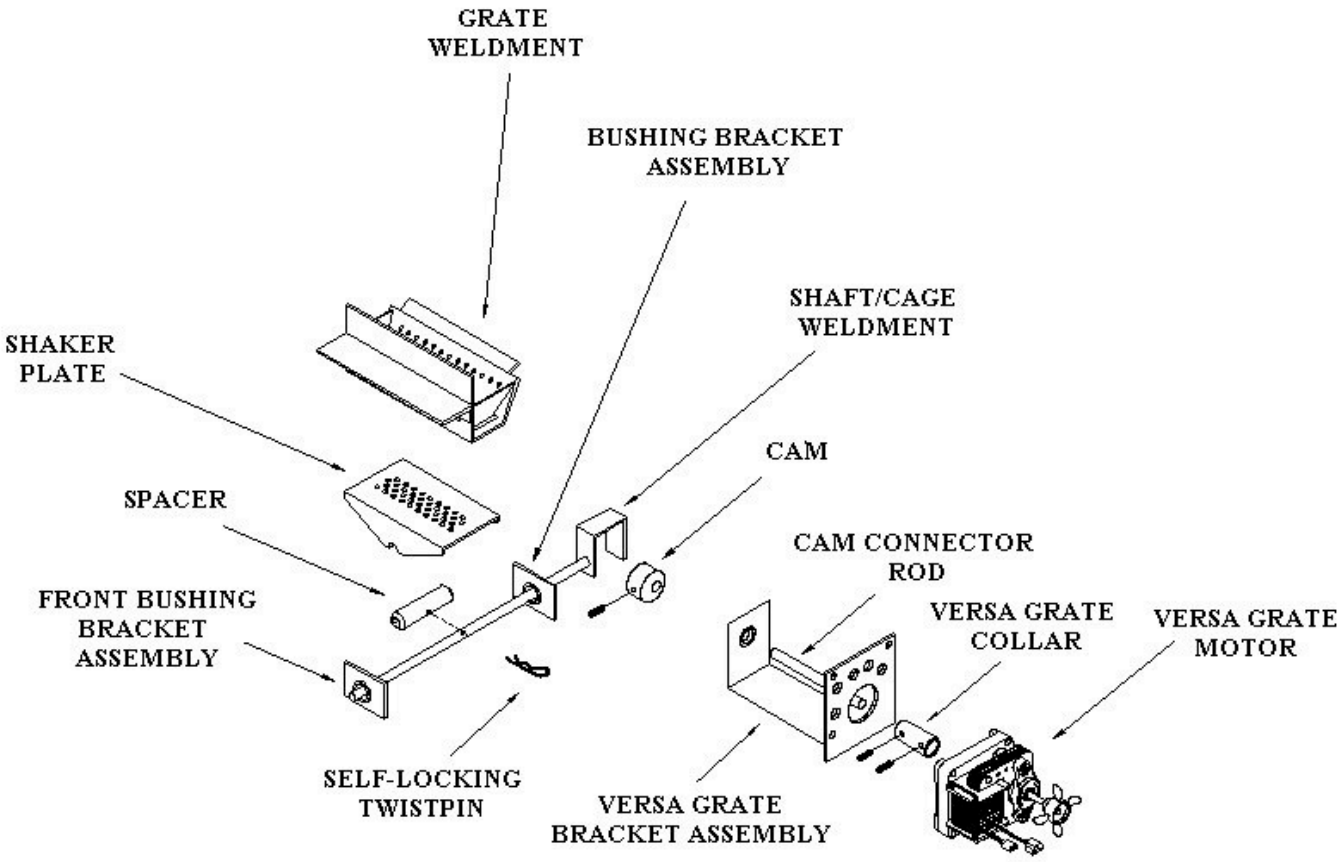


Figure 14

Components – York insert

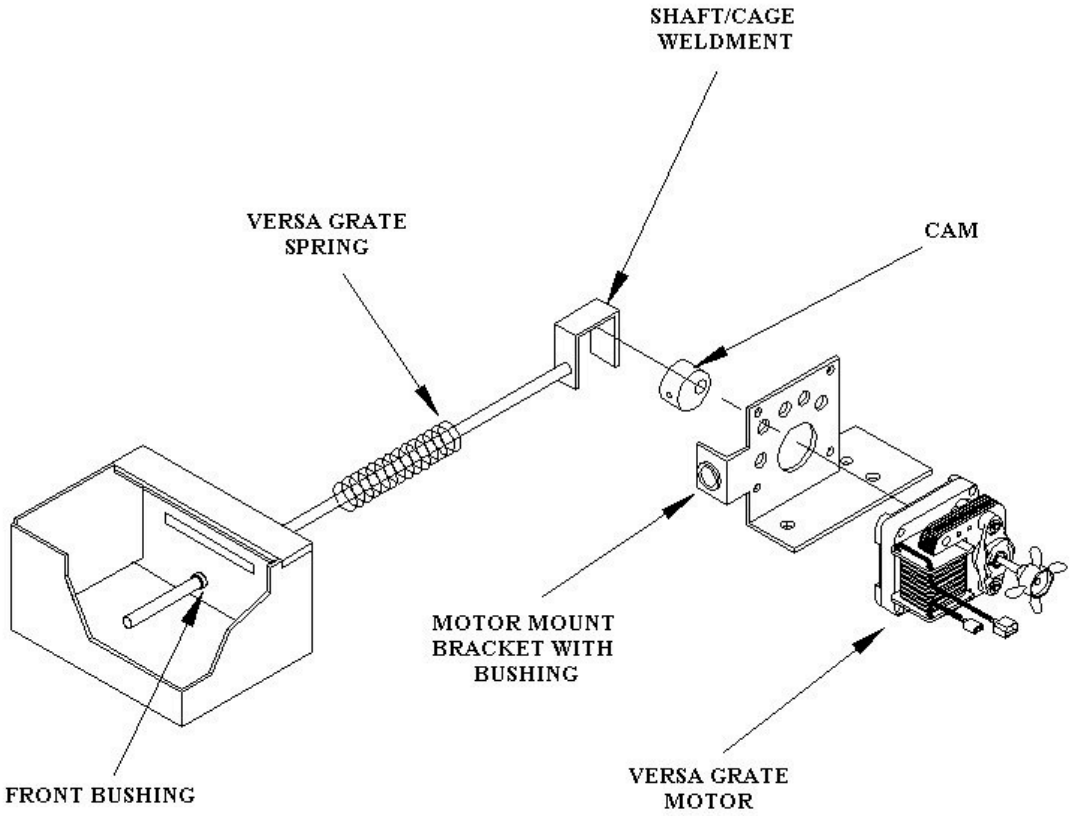


Figure 15

Remember: It is important when ordering replacement parts to look in the specific parts list for each model. Parts may vary slightly from model to model.

Versa Grate Maintenance

Part of the Yearly Maintenance is lubricating the moving parts that make up the Versa Grate system. We recommend using a **High Temp Anti-Seize** in paste form. This should be applied in the areas indicated in Figures 16 and 17 on Page 38.

If a customer calls complaining of a "Squealing" Sound, refer them to the Maintenance Section of the manual for information on how to maintain this area of the stove. This is not considered a Warranty Issue.

Versa Grate Lubrication – All Freestanding models

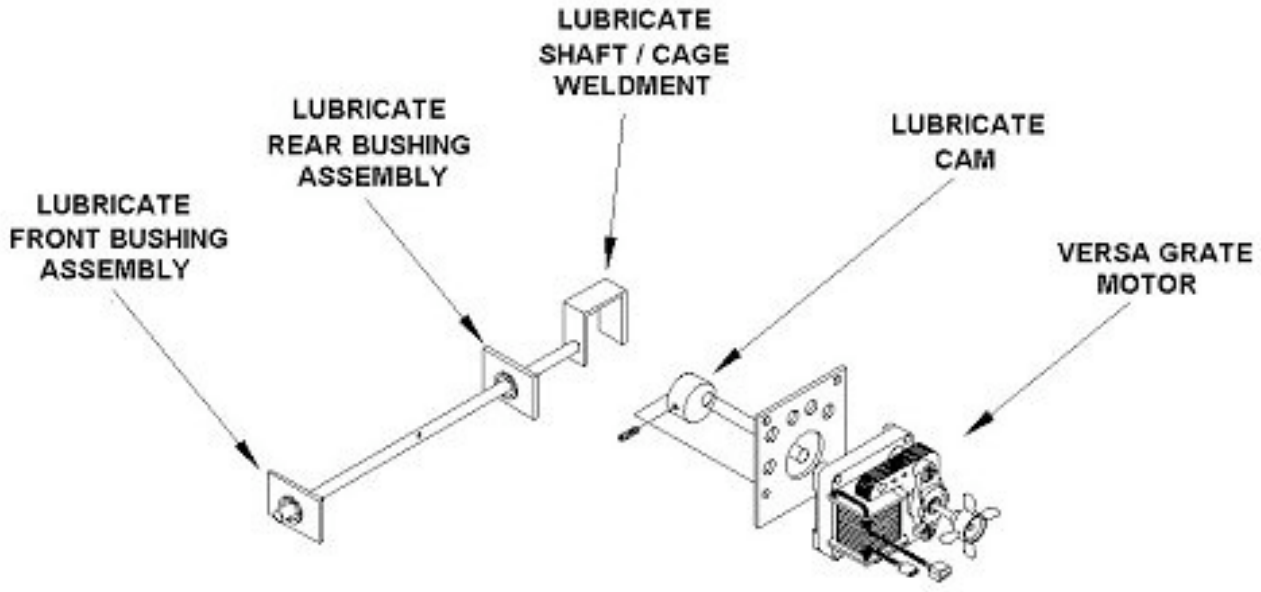


Figure 16

Versa Grate Lubrication – York Insert models

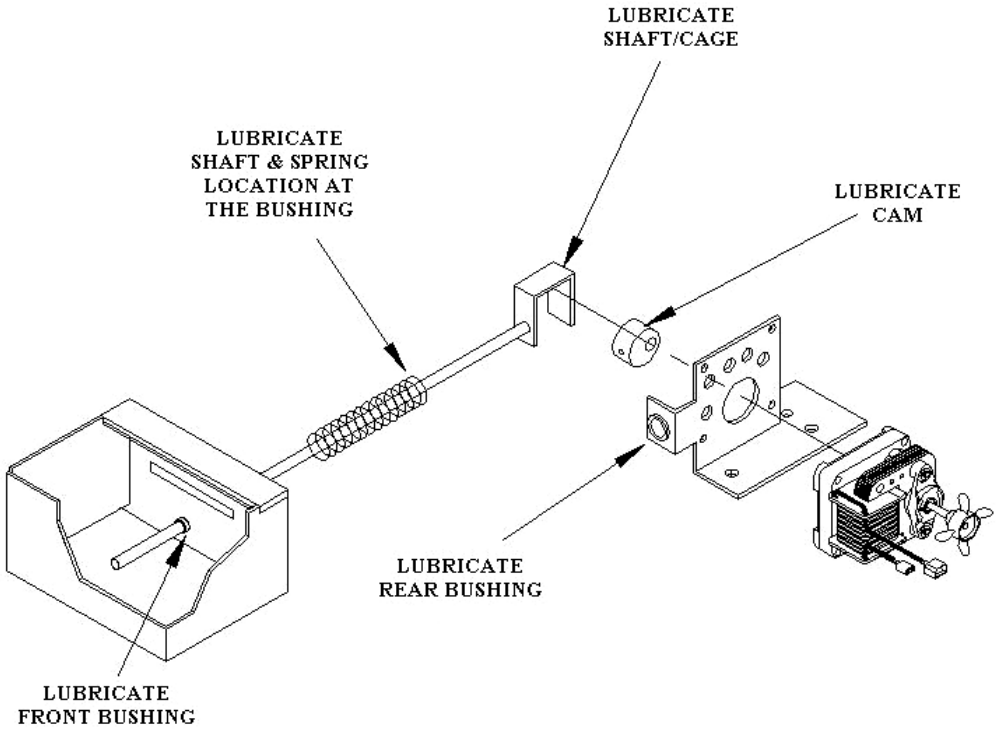


Figure 17

Versa Grate System – Troubleshooting

In trouble- shooting this system we will be looking at the electrical and the mechanical part of the system.

The Versa Grate System should be running at all times when the stove is turned on. The power is supplied to the versa grate motor through the **Purple** Wire in the Harness.

Electrical - As an electrical component, the troubleshooting of the Versa Grate Motor can be broken down to a defective gear motor, a defective control board, or issues related to the wiring. The Versa Grate Motor has 2 **Black** wires. One is connected to the Terminal Block in the back of the stove, making the Common connection. The other is plugged into the **Purple** wire in the harness. If the motor is not running:

- ✓ Check to see if there is voltage at the **Purple** wire in the harness.
- ✓ If there isn't any voltage there, check to make sure the **Purple** wire is plugged in properly to the control board.
- ✓ If there isn't any voltage at the control board, the board is bad and needs to be replaced.

Remember: The stove must be turned on when checking for voltage.

- ✓ If there is voltage at the motor and the motor isn't running, the motor is bad and needs to be replaced.

Mechanical – If the motor is running, but the Grate in the stove is not moving back or forth, there may be a problem in the mechanical components. There are 2 areas to look at. (*See figure 18 on page 40 for detail.)*

- ✓ First see if the Cotter pin is inserted through the Spacer and Shaft/Cage weldment. This positions the Shaker Plate below the Grate weldment. If the pin is missing the Shaker plate will not move the way it should. The Shaker Plate should move back and forth about ¾". The movement is Front to Back as you look at the burnpot. **To see the pin, pull the Grate Weldment and Shaker Plate out of the stove.**
- ✓ The other components that could prevent the Versa Grate from moving are located in the back of the stove. See the Cam and Versa Grate Collar in the respective parts diagrams. The York Insert will only have the Cam; all Freestanding models have the Cam and The Versa Grate Collar. These attach to the Motor and Cam Connector Rod *(Freestanding Models only*) with setscrews. If any of the setscrews are loose, this will prevent the Versa grate from moving.

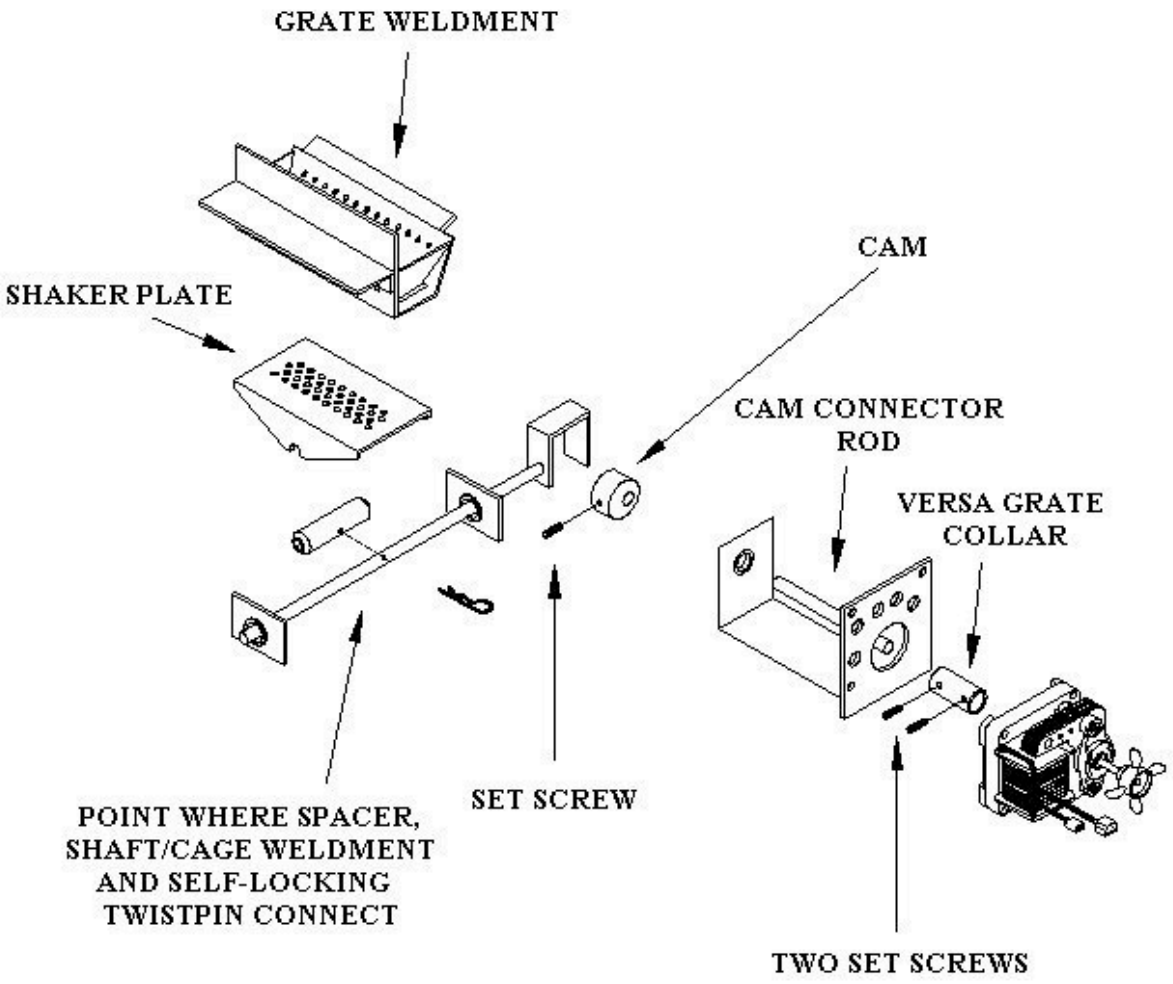


Figure 18

Details of Freestanding stoves and Inserts vary slightly; see Figure 16 and 17 on Page 38 for differences.

Convection Fan

Room Air Fan – In the York Insert the fan is located near the back right-hand-side of the stove under the hopper and mounted to the sheet metal Air Jacket. In all Freestanding models the fan is located, either in the back of the pedestal or behind the Belly Ash pan in the Leg models. Heat that is generated within the Heat Exchanger can easily be transferred into the room; through use of this fan. The Room Air Fan draws cool air from the room, through the back of the stove, past the internal electrical components for cooling circulation, and then is forced through nine Heat Exchange Tubes (Insert models) and sixteen Heat Exchange tubes in the Freestanding models to heat the room.
As an electrical component, the troubleshooting of the convention fan can be broken down to a defective fan, a defective control board, or issues related to the wiring. If the stove lights up and the room fan never comes on the High limit sensor would eventually shut the stove down. Follow these steps to troubleshoot the convection fan:

- ✓ Check the wiring connections to the fan. The **White** wire from the fan connects to the Terminal Block in the back of the stove and the **Black** wire from the fan is connected to the **Pink** wire in the wiring harness.
- ✓ If all connections are tight, check for Voltage at the pink wire.

Attention: The control board sends power to the Convection blower for the first 30 seconds after turning the stove on and then shuts it off. If in doubt, bypass the Proof of Fire Switch and wait 5 minutes to check for voltage coming from the control board. After waiting 5 minutes you should see the ON/OFF light quit blinking and stay on constant. At that point you should read approximately 80 volts.

- ✓ Hot Wire the fan, using a power cord with 2 ¼" Male spade connectors at this time to see if the fan is defective. If the fan runs, continue trouble shooting the fan circuit in the stove.
- ✓ If there isn't any voltage on the **Pink** wire, check to make sure the **Pink** wire is inserted properly into the Molex connector that plugs into the control board. The wire may appear to be inserted properly, but sometimes is not connected to the pin on the control board. Push the Pink wire into the Molex connector to ensure it is seated properly.
- ✓ Check the **Pink** wire in the harness for continuity if needed with an OHM meter.
- ✓ If the wire is inserted properly, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board, the control board is bad and needs to be replaced. (*See note above indicating when voltage is present, voltage reading will be between 80 volts and line voltage.)*

NOTE: The Vacuum switch will affect the way the Convection fan behaves. If the Vacuum switch is closed when the stove is turned on, the convection fan will not run the initial 30 seconds, but will turn on after 5 minutes. This may happen if the switch is defective or if a stove is running in Fully Automatic "SmartStat" mode in the cool down phase and the Thermostat calls for heat again.

Combustion Fan

Exhaust Fan - Located near the back left hand side of the stove under the hopper and mounted on top of the exhaust manifold. This multi-functional fan is used to draw either inside, or in some cases outside, combustion air into the firebox area of the stove and then expel the exhaust gases out through the exhaust manifold and into the atmosphere.

The Advance Heat button will run the Combustion Exhaust Fan at 5 variable speed settings; there are a total of 5 Heat selections available. The first four selections increase the fan speed proportionally; while the last selection runs at the maximum speed setting. Air is drawn into the stove in 2 locations. The first is Combustion air, which travels through the Air Inlet tube into the Burn Pot area; this is where oxygen and wood pellets get mixed with heat to produce the combusted by-product, which gets sent out the exhaust port. The second location is the Air Wash System; this is where air gets forced down the inner surface of the ceramic glass to provide a clean glass surface for viewing the flame.

As an electrical component, the troubleshooting of the combustion fan can be broken down to a defective fan, a defective control board, or issues related to the wiring. If the stove lights up and the Combustion fan never comes on the Vacuum switch would shut the stove down after approximately 45 seconds. Follow these steps to troubleshoot the convection fan:

- ✓ Check the wiring connections to the fan. The **White** wire from the fan connects to a White wire in the Harness that connects to the Terminal Block in the back of the stove and the **Black** wire from the fan is connected to the **Blue** wire in the wiring harness. There is a 3rd wire coming from the Combustion fan that is not used in the models with the digital control board. This is a **Brown** wire and it is tied back in the harness.
- ✓ If all connections are tight, check for Voltage at the **Blue** wire.

Attention: The control board sends *line voltage* to the Combustion blower for the first 30 seconds after turning the stove on and then it drops to a lower voltage for the start-up cycle. The voltage is approximately 90 volts.

- ✓ Hot Wire the fan, using a power cord with a ¼" Male and ¼" Female spade connector at this time to see if the fan is defective. If the fan runs, continue trouble shooting the fan circuit in the stove. Replace it if it doesn't.
- ✓ If there isn't any voltage on the **Blue** wire and the Combustion fan runs when Hot-wired, check to make sure the **Blue** wire is inserted properly into the Molex connector that plugs into the control board. The wire may appear to be inserted properly, but sometimes is not connected to the pin on the control board. Push the Blue wire into the Molex connector to ensure it is seated properly.

- ✓ If the wire is inserted properly, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board, the control board is bad and needs to be replaced.
- ✓ Check both wires in the harness for continuity if needed with an OHM meter. (White and Blue wire)

Igniter

Cartridge Heater – A Hot Rod heating element used in the process of igniting the pellets during the start-up cycle.

As an electrical component, the troubleshooting of the Igniter can be broken down to a defective Igniter, a defective control board, or issues related to the wiring. The igniter should always come on during the start-up cycle of the stove to light the pellets. However, if the High Limit Switch is tripped the Igniter and Auger will not come on, preventing the stove from lighting.

- ✓ Check the wiring connections to the Igniter. The 2 wires from the Igniter connect to a **White** wire in the harness and a **Red** wire in the harness. If all connections are tight, check for Voltage at the **Red** wire.

Attention: The control board sends power to the blowers for the first 30 seconds after turning the stove on and then the convection fan shuts off. At this point the stove will go into the start-up cycle and the auger feeds pellets for 2 minutes and the Igniter comes on. The igniter will run at least 5 minutes and/or shut off when the Proof of Fire switch locks in.

- ✓ If there isn't any voltage at the **Red** wire, check to make sure the **Red** wire is inserted properly into the Molex connector that plugs into the control board. The wire may appear to be inserted properly, but sometimes is not connected to the pin on the control board. Push the Red wire into the Molex connector to ensure it is seated properly.
- ✓ If the wire is inserted properly, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board, the control board is bad and needs to be replaced. (*See note above indicating when voltage is present, voltage reading should be line voltage)* If there isn't any voltage present on the control board, the control board is defective and needs replacing.
- ✓ Check the **Red** wire in the harness for continuity if needed with an OHM meter.
- ✓ If voltage is present at the igniter, unplug the wires and use an Ohm meter and check the Igniter for continuity. If the circuit is open the Igniter is burnt out and needs replaced. If there is continuity, take an Ohm reading. You should see a reading of approximately 58 Ohms. An Igniter with a reading that significantly varies from 58 Ohm should be replaced.

Power Cord, Wiring Harness & Terminal Block

These are items that are frequently overlooked when troubleshooting the stove. When Diagnosing electrical problems be sure to first check all wires for damage, make sure all connections are tight. Check all wires in the Molex plug at the control board. If all else fails check wires that appear to be in good condition for continuity. It may be a problem that you can't see. Use a good quality digital Volt/Ohm meter to check for Continuity.

Safety Features - The remaining electrical components make up the sensors that monitor the stoves for concerns that require the stove to be shut down.

Vacuum Switch

Vacuum Switch – Normally Open, Set Point .05" WC negative Pressure. To troubleshoot the Vacuum switch refer to the section covering the diagnostic features of the Control Board covering the #2 LED diagnostic light or check the Troubleshooting Flow Charts.

This switch senses the vacuum (Negative Pressure) in the Firebox and Ash pan area. Located on the left-hand-side of the stove and mounted to the hopper. If the Combustion blower fails, the Main Door or the Ash pan door are left open or the Exhaust Venting system is obstructed, power to the Auger Motor will be interrupted after a 60 second delay and shut down the fuel feed system. At this point the **#2 LED diagnostic light** will start blinking.

Strong wind gusts or obstructed exhaust vents in which large amounts of soot have accumulated, debris has blown around it, birds have built nests in it, etc. may prevent enough Vacuum to build up in the stove body to close the Vacuum Switch. After of losing vacuum power to the Auger Motor will be interrupted after a 60 second delay. The Room Air Fan and the Combustion Exhaust Fan and the Versa Grate Motor continue to run until the Proof of Fire switch opens and the unit shuts down.

Remember: When performing daily maintenance tasks that involve opening the Main door or the Ash pan door, the control board will shut the stove down after approximately 60 seconds. If performing several tasks that would take longer, close the door and let vacuum re-establish before the stove shuts down and then continue with the maintenance.

High Limit Switch

Manual Reset High-Limit switch, 250°F Disc, Normally Closed – To troubleshoot the High Limit switch refer to the section covering the diagnostic features of the Control Board covering Diagnostics or check the Troubleshooting Flow Charts.

This is a **Normally Closed** switch located near the left-hand-side of the stove and mounted directly on the sheet metal Air Jacket. Under normal operating conditions the Air jacket temperature registers below 250°F and the High-Limit 250°F Disc will read Normally Closed; this condition supplies power to the Anger Motor. During extreme operating conditions where temperatures within the sheet metal Air Jacket exceed 250°F the power to the Auger Motor will become interrupted and immediately shutdown the fuel feed system. ***The auger will not operate until the switch has been manually reset.***
The Room Air Fan, the Combustion Fan and the Versa Grate Motor continue to run until the Proof of Fire Switch measures temperatures below 90 degrees in the exhaust system and the P.O.F. switch drops out. At this time the #3 Diagnostic LED light will start blinking with a First Generation Digital Control Board and the #2 and #3 LED light flashes with a second Generation Control Board. *(First Generation Control Boards do not have the Thermostat Slide Switch on the front of the board .All other generations have the slide switch.)*

Remember: If the switch trips due to excessive temperatures, it must be reset to allow the auger to run.

Proof of Fire Switch

Proof of Fire Switch - 110°F Disc, Normally Open - To troubleshoot the High Limit switch refer to the section covering the diagnostic features of the Control Board covering the #3 LED diagnostic light or check the Troubleshooting Flow Charts.

The Proof of Fire switch will sense if the exhaust temperatures rise above 110 F. This indicates a successful lighting of the stove. Once the **Proof of Fire** switch closes, the Convection Fan turns on and blows warm air into the room and the control board switches from the" Start-up" program to the "Normal Operation" Program.

The #3 LED light will start blinking only if the temperature drops in the Exhaust system and the Proof of Fire switch opens without the stove first being shut off.

Hopper Lid Switch

Hopper lid switch – This switch is wired to the Normally Open connectors of the switch. Closing the hopper lid will close the circuit to the auger motor and feed pellets to the Burn Pot.

Mechanical Components in the Stove

Door Assembly

Location: The door assembly is in the front center of the stove. The assembly consists of the cast iron door on the Prescott EXL & EXP models, or a metal frame door on the Hastings models or a Bay metal frame door, the window, the door latch and gasket.

Purpose: The door provides access to the firebox and holds the window glass. The gaskets provide airtight seals into the firebox. The latch secures the door. It **must** remain closed during operation of the stove. The gaskets must make an airtight seal to create Negative Pressure for the stove to operate properly.

Ash Door

Location: The Ash Door is located in the front of Pedestal or in front of the Belly Pan on leg models.

Purpose: The ash door provides access to the ash pan. It is latched with quick release latches or with knobs. The door **must** be tightly closed during operation. The ash door gaskets must fit tight against the front of the pedestal or belly pan to create Negative Pressure for the stove to operate properly.

Ash Traps

Location: The Ash traps are located in the back wall of the stove behind 2 cover plates and a third clean-out behind the ash pan in certain models.

Purpose: The two ash trap openings allow access to the hot air plenums for removal of ash build-up in this area. The Ash Trap that is located behind the Ash Pan allows access to the transition area from the Firebox to the Exhaust Fan. To clean this area in earlier models, a flexible cable was used to. Please see the new Service Video for information on how the run the cable.

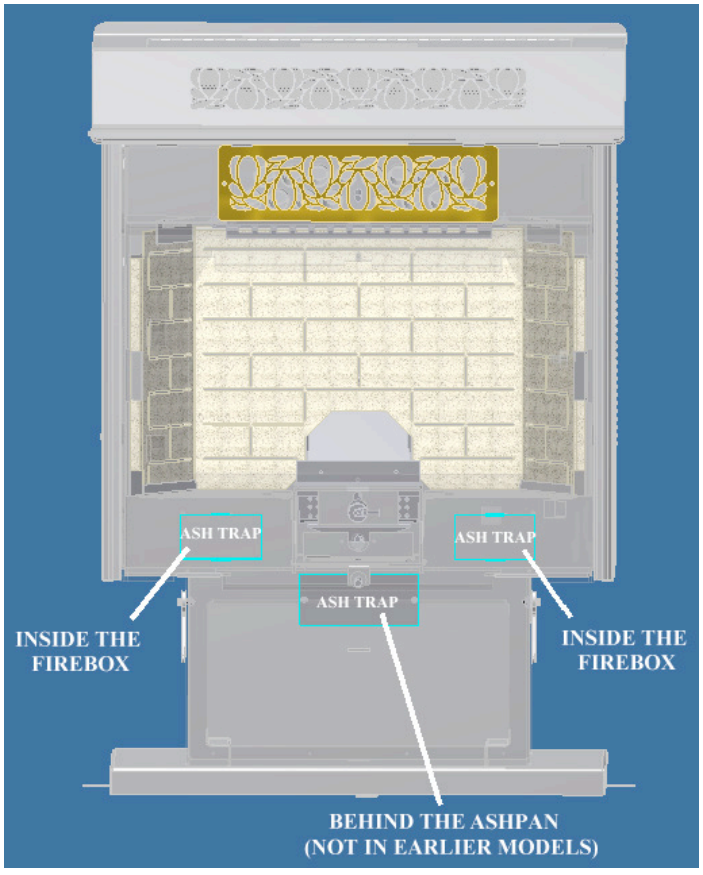


Figure 19
Ash Trap Location
All Freestanding Stoves

Heat Exchange Tubes

Location: The heat exchange tubes are located in the top of the firebox. The back ends of the tubes are over the hot air plenum. The front of the tubes extend through the front wall of the stove. There are 16 Heat Exchange tubes in the Freestanding models and 9 Heat Exchange tubes in the York Insert.

Purpose: The heat exchange tubes transfer heat from the firebox into the room air that is blown through the tubes.

Heat Exchange Tube Scraper

Location: Above the door, extending through the Hot Air opening. See Figure 21 and 22 on Pages 50 and 51.

Purpose: This rod when pulled back and forth cleans the heat exchange tubes of ash buildup.

Heat Exchange Baffle

Location: The baffle is located below the Heat Exchange Tubes. The front of the baffle has 2 tabs that slide into 2 keyhole slots to attach the baffle to the top of the firebox area. The back edge is lifted up and slides over the back wall of the stove. This prevents the baffle from falling out. See Figure 22 on Page 51.

Purpose: The baffle forces the Heated Exhaust gases towards the front of the stove and flow along the full length of the heat exchange tubes. This increases the heat exchange efficiency of the stove, by keeping the heated gases in the stove longer.

Air Plenum – Hot Air Plenum

Location: The hot air plenum is located behind the firebox and is part of the Burn system of the stove. See Figure 20 on Page 50.

Purpose: The hot air plenum carries the hot exhaust gases from the firebox to the exhaust chamber. This plenum also houses the **"Ash Whips".** These whips help remove fly ash from the exhaust gases and deposit them in the Ash Traps.

Air Plenum – Warm Air Plenum

Location: The warm air plenum carries room air from the convection fan, past the hot air plenum where it picks up heat. The room air is then delivered through the heat tubes into the room. See Figure 21 on Page 50.

Purpose: The warm air plenum is located behind the hot air plenum and is part of the Heat Exchange System.

Auger Assembly

Location: The auger is located in the bottom center of the hopper. See Figure 22 0n Page 51.

Purpose: The auger is the mechanism that transports pellets from the hopper to the burn grate. The 2 RPM motor located at the back of the auger is controlled by the Digital Control Board and is cycled on and off at varying rates depending on the selected Heat Setting. The **ON** time **increases** and the **OFF** time **decreases** when the Heat Setting is advanced to a higher setting.

Air Intake Tube

Location: The Air Intake Tube is located on the rear of all freestanding stoves. It is controlled with a remote damper cable on the York Insert. The 2" diameter tube has a butterfly damper in the tube to control the Combustion Air. For more information please read the Operations Manual of each model.

Purpose: The inlet damper is to adjust combustion airflow to match the characteristics of specific air inlet and chimney configurations and can be adjusted to allow for a broad range of pellet quality.

Versa Grate – Self Cleaning Grate System

Location: The Versa Grate Assembly is located in the lower, center part of the stove. It starts in the Firebox in the burn box and below the Grate Weldment, with the Shaft/Cage weldment extending back through the air plenums and ends in the lower back part of the stove at the Versa Grate motor and motor mount. *(See Figures 14 through 18 on pages 36 through 40 and figure 22 on page 51.)*

Purpose: The purpose of the Versa Grate is to allow for the burning of a wide range of pellet fuels by keeping the burn grate clean of ash buildup and minimize clinker build-up.

Ash Clean-Out System

Location: This clean-out system consists of a slide bottom in the burn box area. It is located in the bottom of the burn box area. It consists of an Inner plate that prevents the ashes from bridging below the pot, a bottom plate that opens and closes to let the ashes fall through to the Ashpan and a rod extending through the front of the stove to work the mechanism. See Figure 22 on Page 51 for the location of the Ash Clean-Out Rod.

Purpose: The Versa Grate system acts in many ways like a "Shaker Grate" in a wood stove. The "Shaker Plate" is constantly moving back and forth during operation of the stove, resulting in an amount of ashes ending below the Grate System. The build-up of ashes **must** be removed to maintain proper combustion airflow the pellets in the Burnpot. It is best to start a routine of "Shaking" the ashes down at least once a day.

Air Flow

Combustion Air / Exhaust Flow

The flow of Combustion air (also called Exhaust Flow) through all freestanding St. Croix pellet stoves follows a path similar to the one shown in the example below.

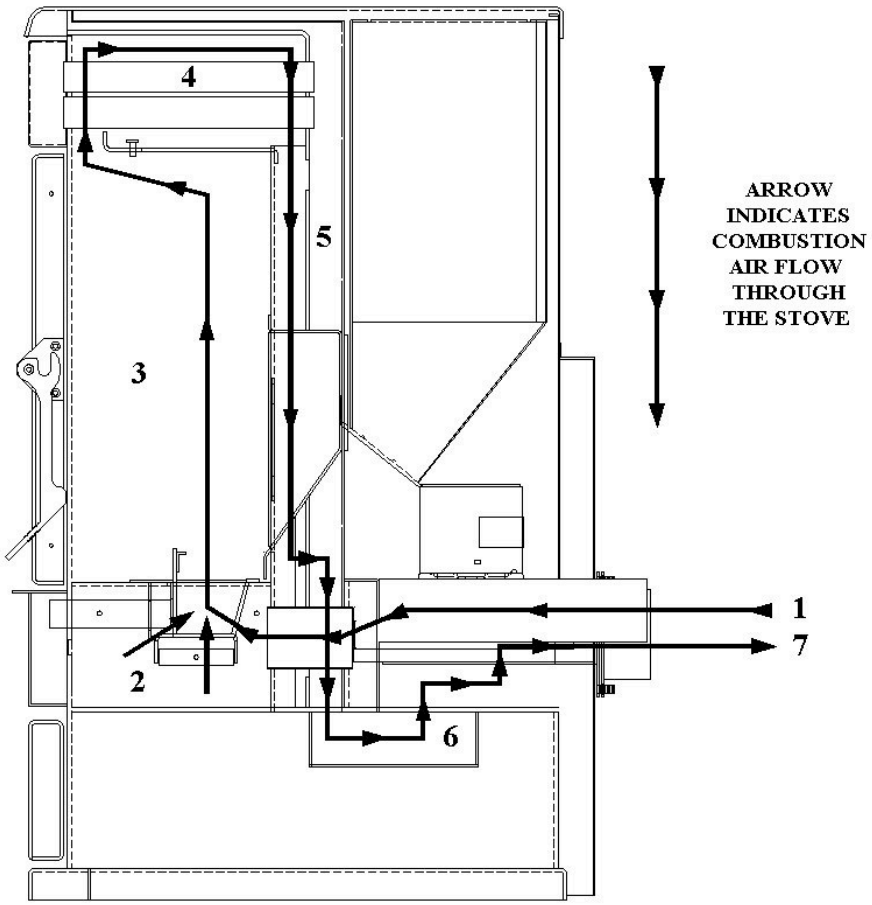


Figure 20

Legend:

1 – Air Intake Tube
2 – Burn Box Area
3 – Firebox Area
4 – Heat Exchange Area
5 – Hot Air Plenum
6 – Exhaust Duct Area
7 – Exhaust Outlet

Convection Air / Room Air Flow

The flow of Convection air (also called Room Air) through all freestanding St. Croix pellet stoves follows a path similar to the one shown in the example below.

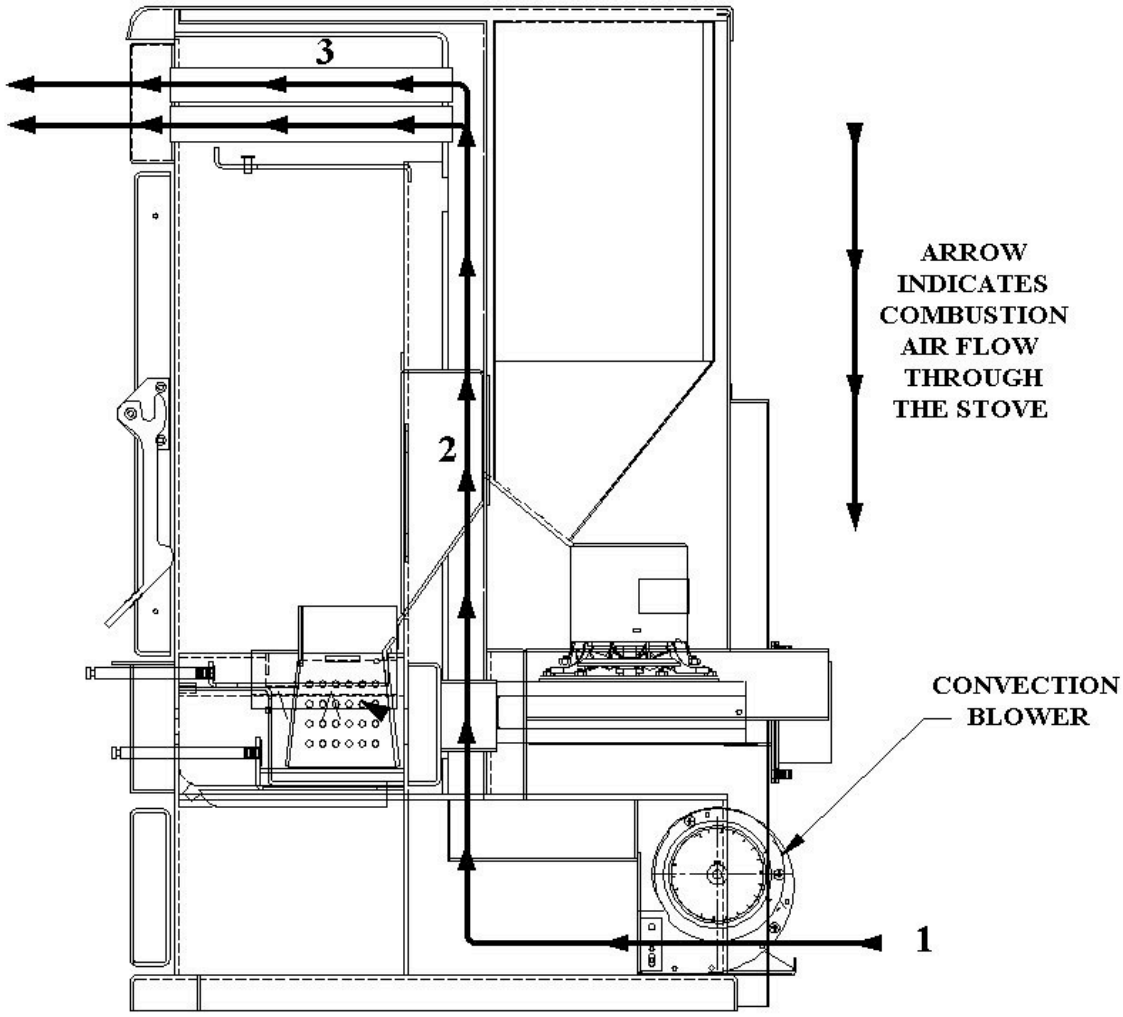


Figure 21

Legend:

1 – Convection Air Blower
2 – Warm Air Plenum
3 – Heat Exchange Tubes

Fuel Flow - Pellets

The flow of Pellets through all freestanding St. Croix pellet stoves, follows a path similar to the one shown in the example below.

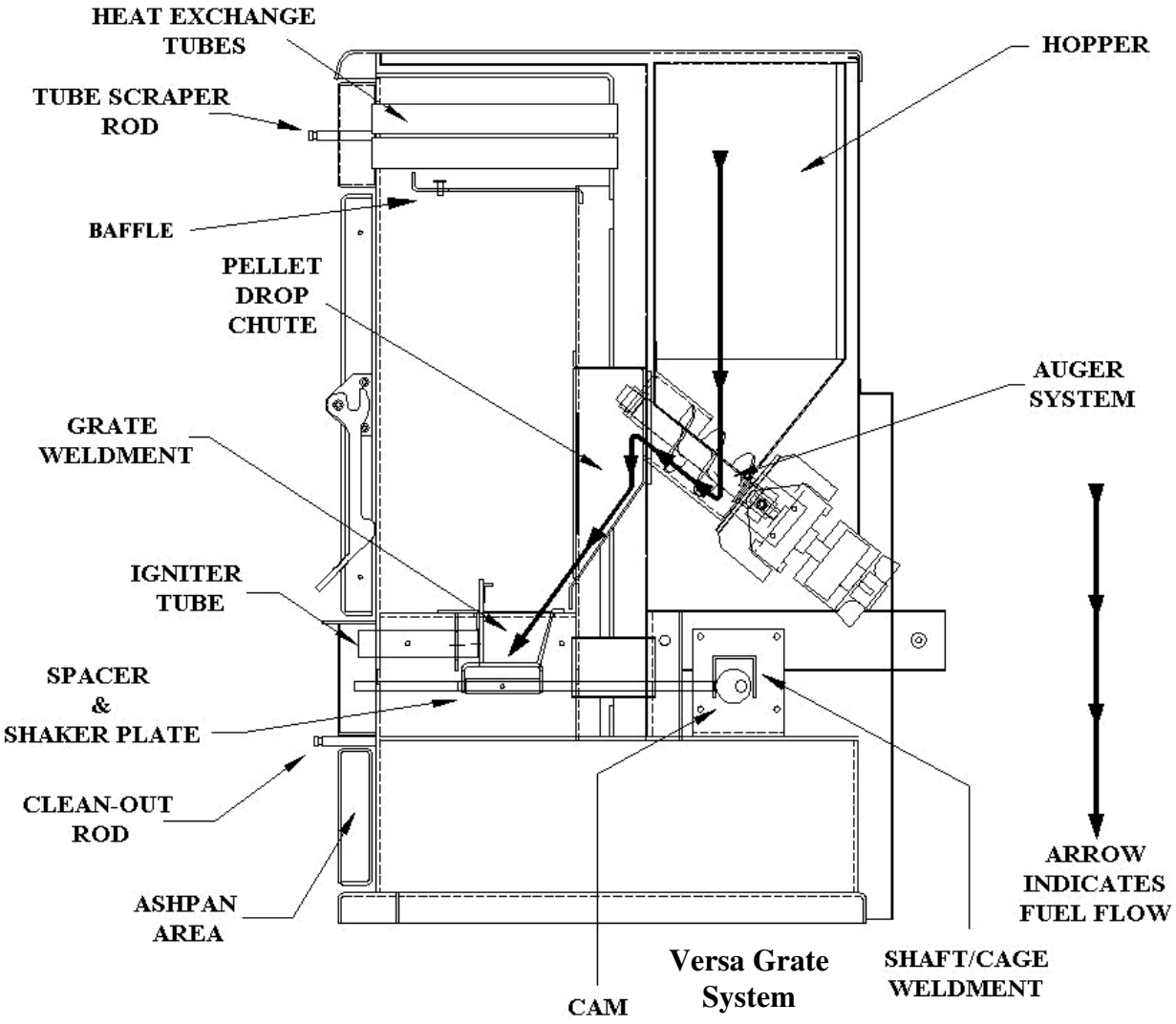


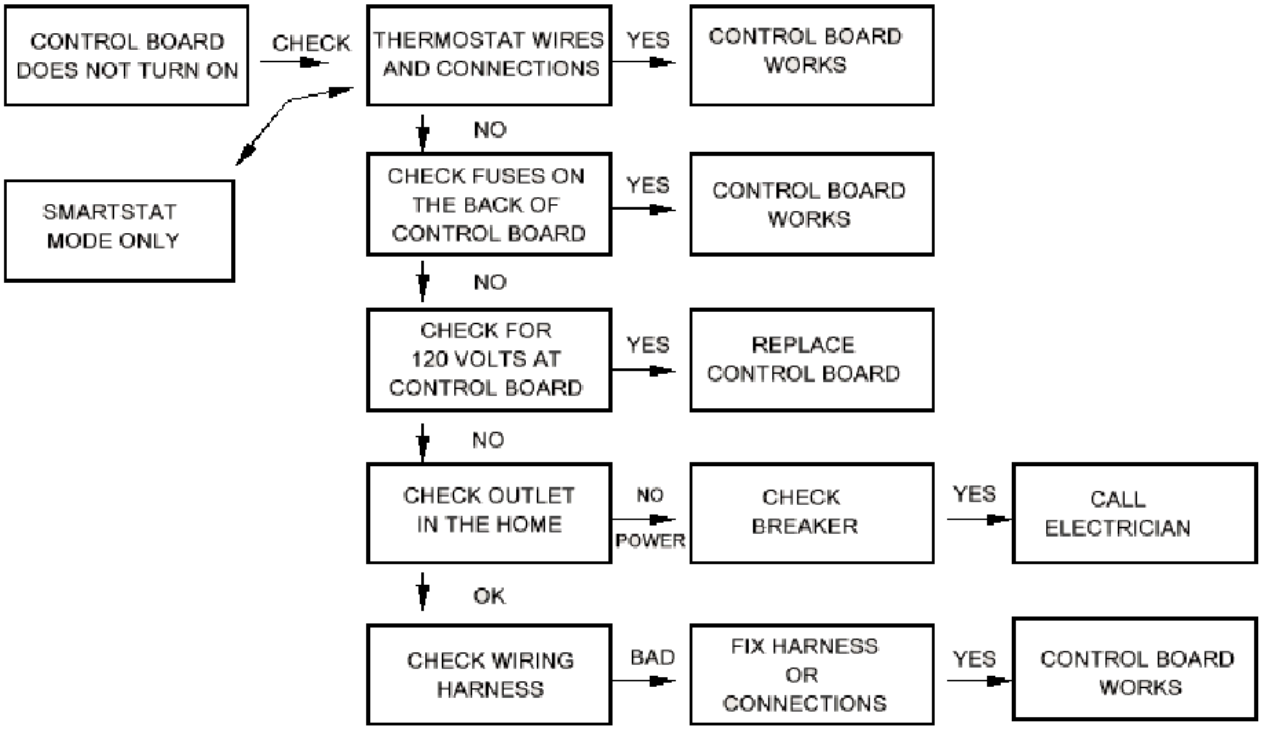
Figure 22

Also shown in the diagram above is the **Versa grate System**, showing the location of the Shaft/Cage weldment, the Cam, the Spacer, the Shaker Plate and the Grate Weldment.

Note the orientation of the **Igniter Tube** through the Front of the stove. This greatly improves the ease of Installation of an igniter, if replacement is needed.

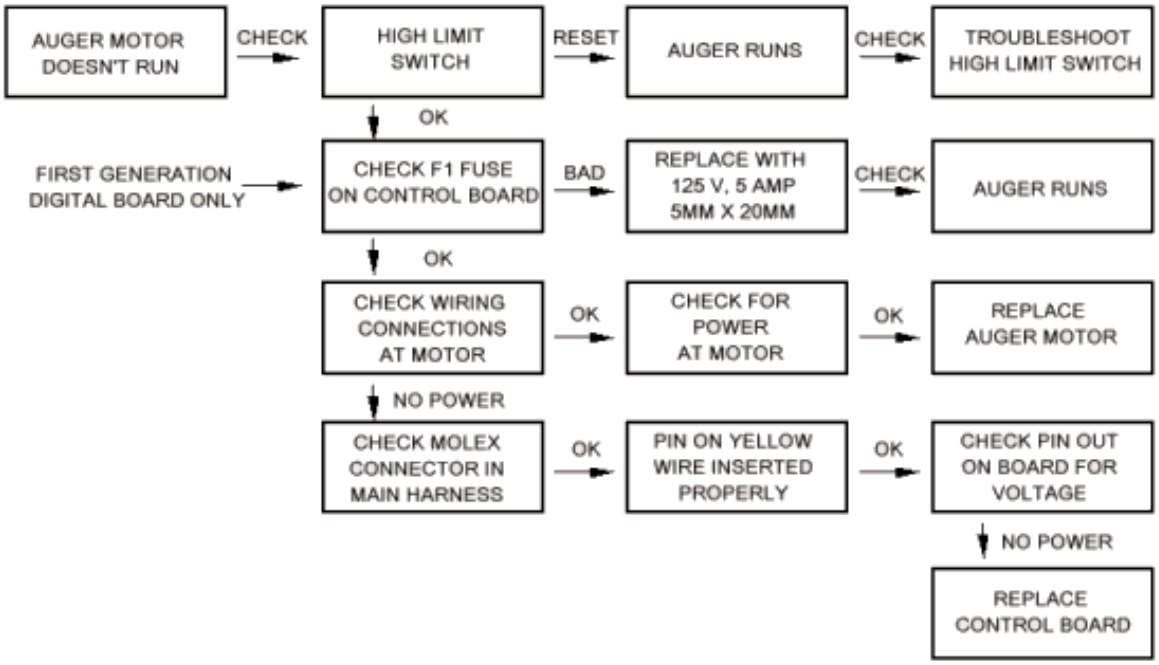
Troubleshooting Flow Charts

Digital Control Board – Board seems dead



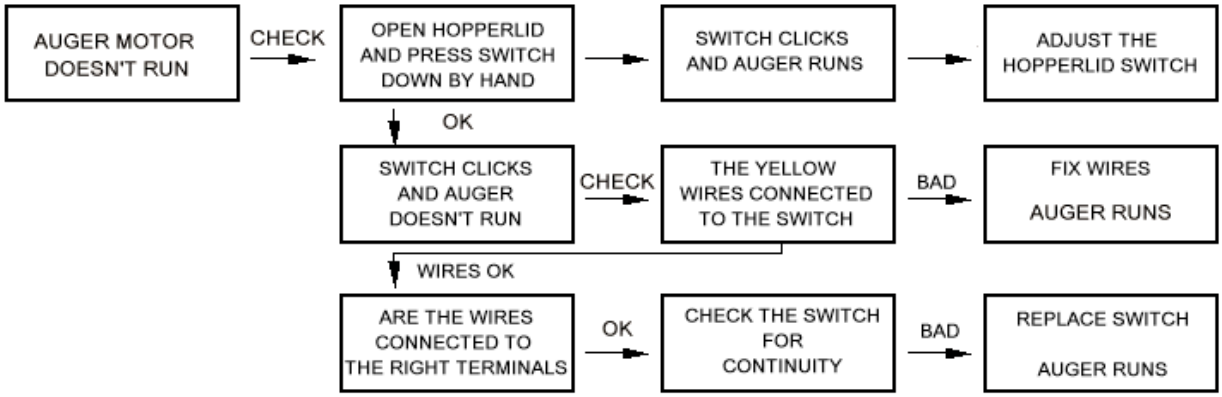
Digital Control Board – Fan Self Test at Start-Up

Auger Motor - Electrical

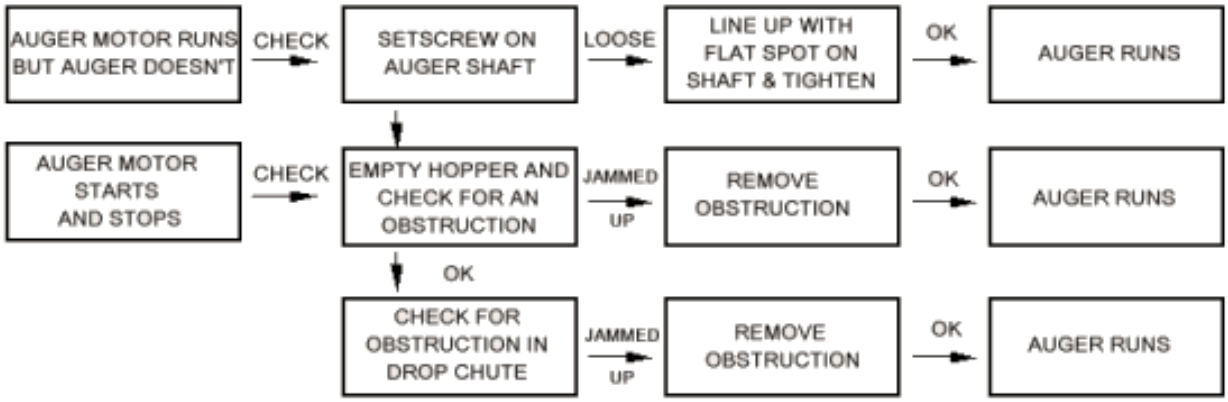


Remember: Checking for Voltage either at the Harness or directly at the Pin-Out of the control board can only be done when the Auger should be running. The auger runs for 2 minutes during the Start-Up Cycle or runs at a #1 level 5 minutes after the stove is first turned on. Hot-wiring the fan direct with a power cord is also a good way to check the Auger motor.

Hopperlid Switch

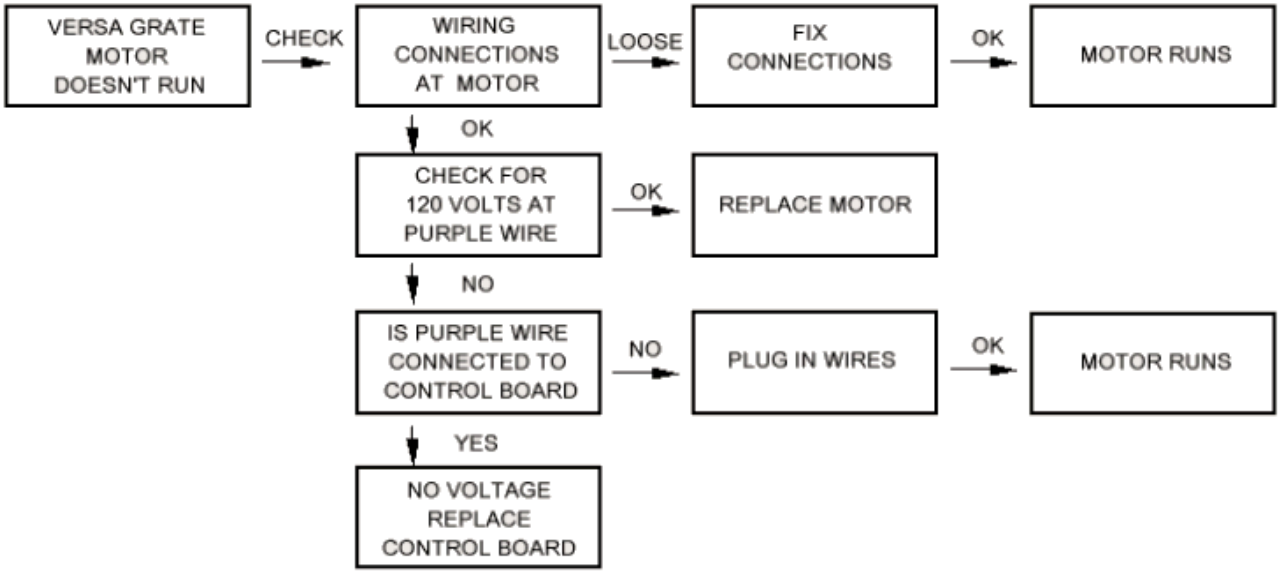


Auger Motor – Mechanical

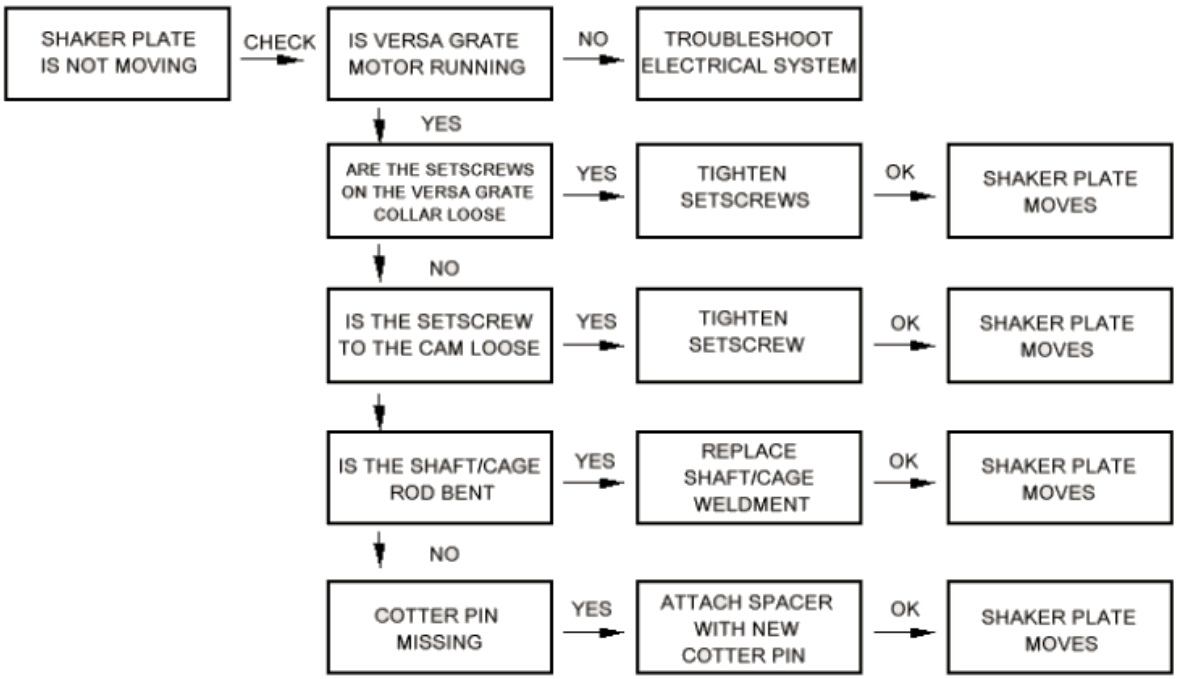


Notice there are 2 areas to look for an obstruction if the auger is jammed. Many times the Drop-Chute is ignored. This may be where the jam originates, and cleaning the auger tube ***only*** is half of the job.

Versa Grate Motor – Electrical

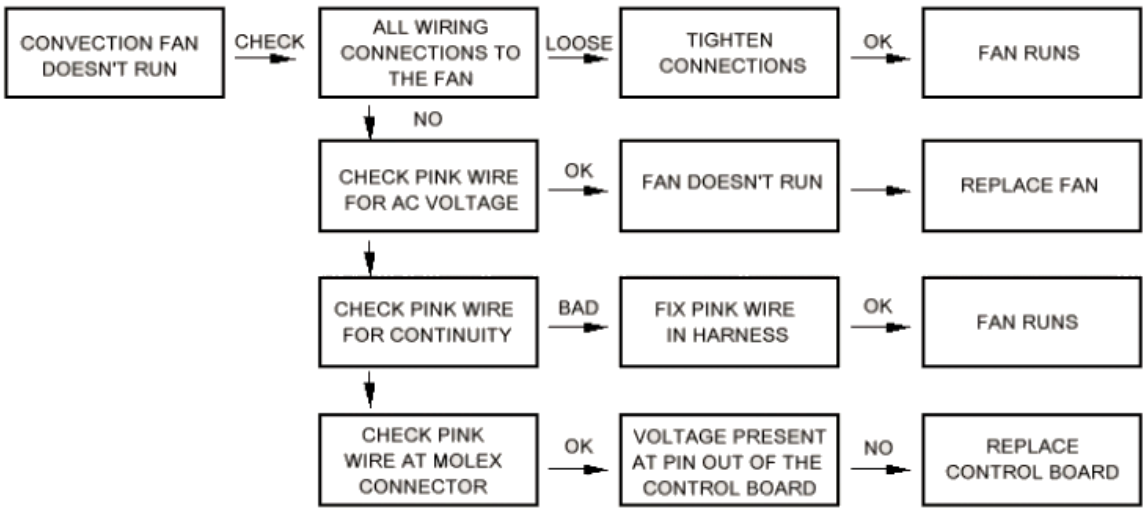


Versa Grate Motor – Mechanical



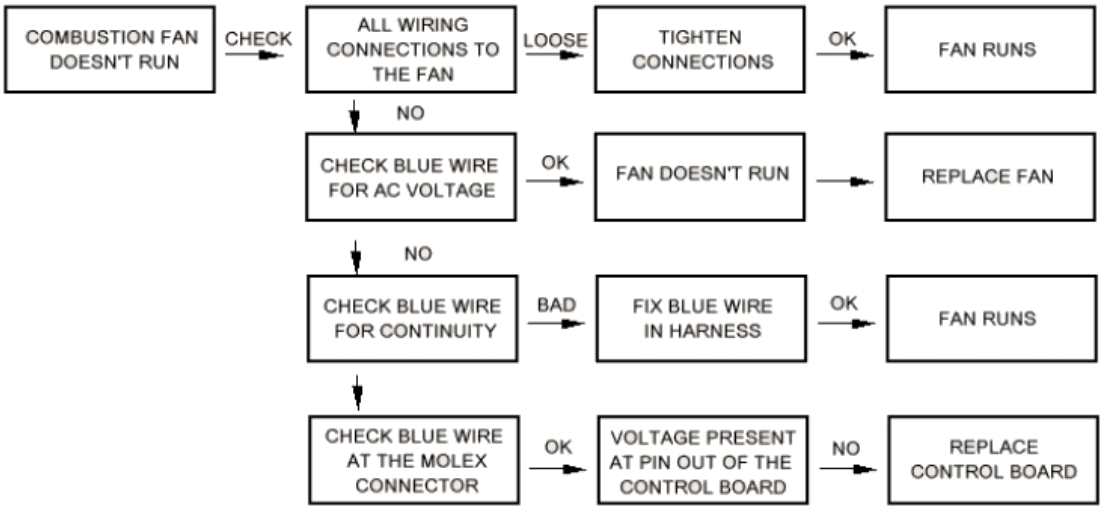
Convection fan

Attention: The control board sends power to the Convection blower for the first 30 seconds after turning the stove on and then shuts it off. If in doubt, bypass the Proof of Fire Switch and wait 5 minutes to check for voltage coming from the control board. After waiting 5 minutes you should see the ON/OFF light quit blinking and stay on constant. At that point you should read approximately 80 volts.



When in doubt Hot-Wire the fan to a direct source of power to see if fan runs using a cord with two ¼" insulated Male connectors.

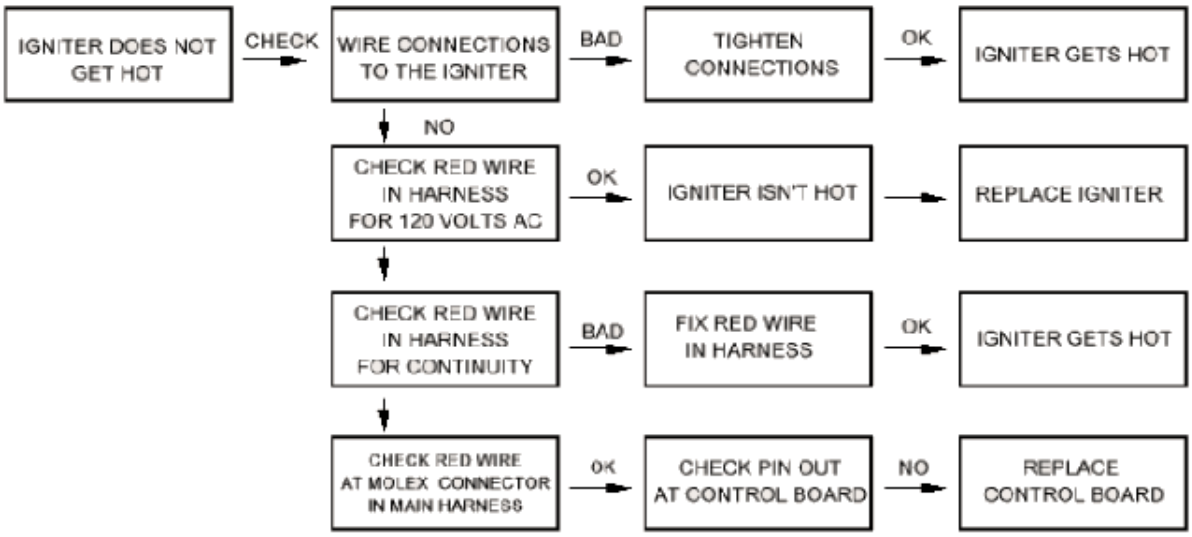
Combustion fan



When in doubt Hot-Wire the fan to a direct source of power to see if fan runs using a cord with a ¼" insulated Male connector and ¼" insulated Female connector.

Igniter

Attention: The control board sends power to the blowers for the first 30 seconds after turning the stove on and then the convection fan shuts off. At this point the stove will go into the start-up cycle and the auger feeds pellets for 2 minutes and the Igniter comes on. The igniter will run at least 5 minutes and/or shut off when the Proof of Fire switch locks in.



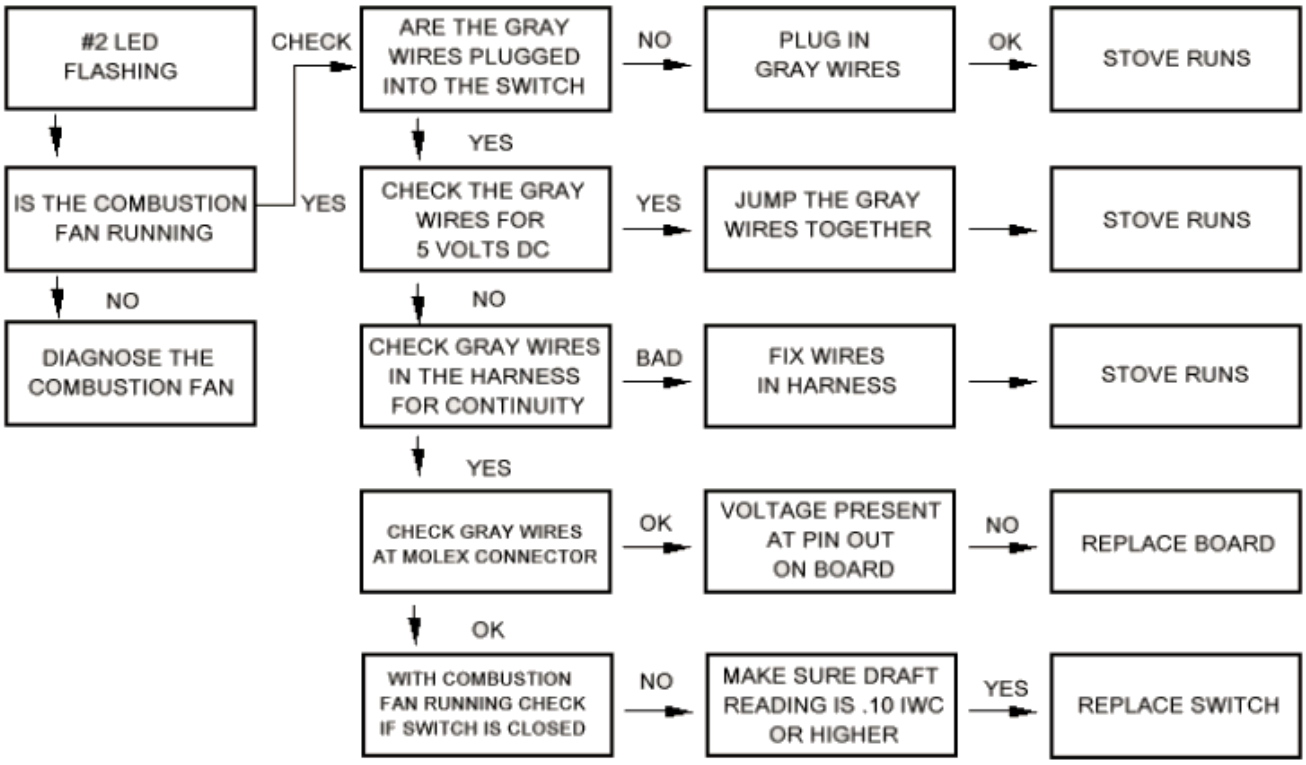
To test an Igniter with an Ohm meter, the reading will be approximately 57 Ohms. If you get a reading that is significantly different and the igniter does not get hot enough to ignite pellets, replace the igniter.

Vacuum Switch

Loss of vacuum may be causes by Operator error or neglect

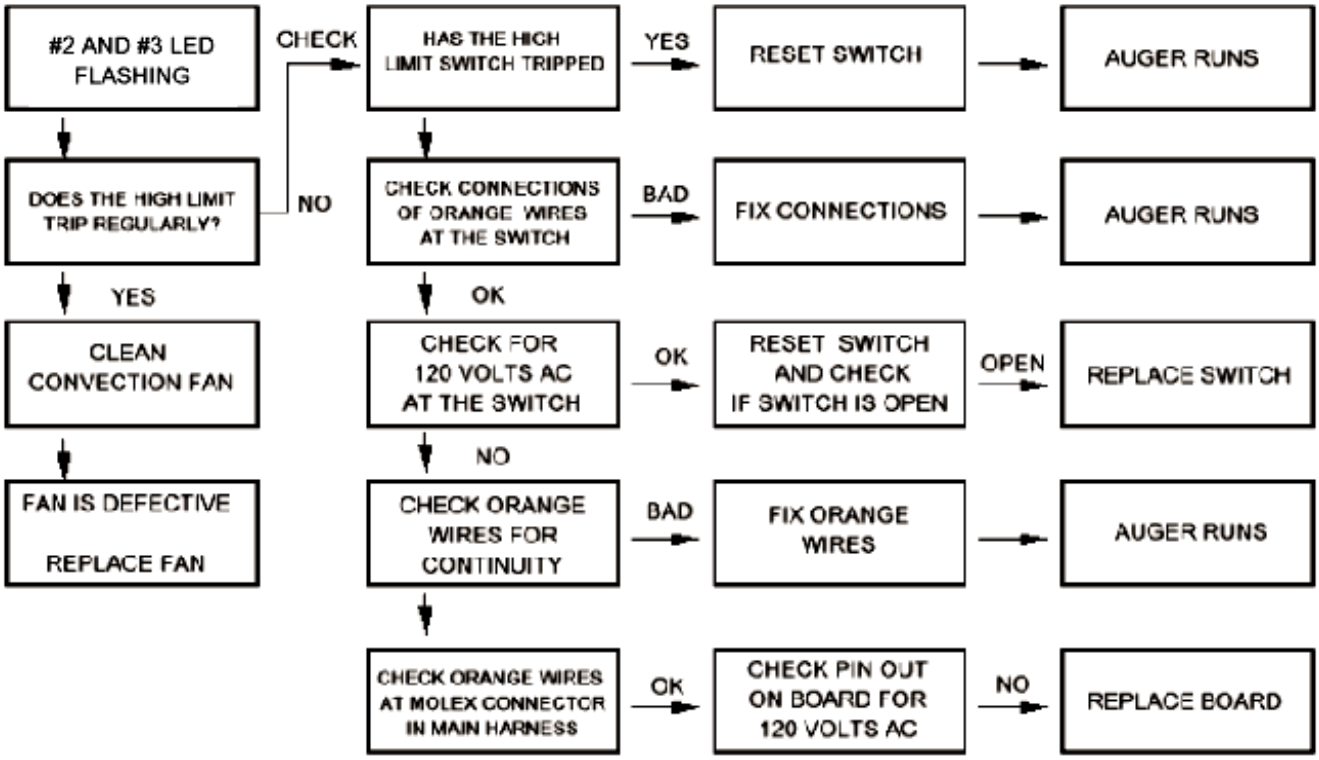
- Leaving the Main Door open too long
- Forgetting to close the Main Door
- Leaving the Ashpan Door open too long
- Forgetting to close the Ashpan Door
- Allowing the Chimney to get plugged.

If an owner calls in with a #2 diagnostic light flashing, first cover all items listed that may be caused by incorrect operation of the stove. Quiz the owner about their habits in regards to the Periodic maintenance. If they have been lax in cleaning the Ash Traps and venting system, have them first clean their stove and try it again.



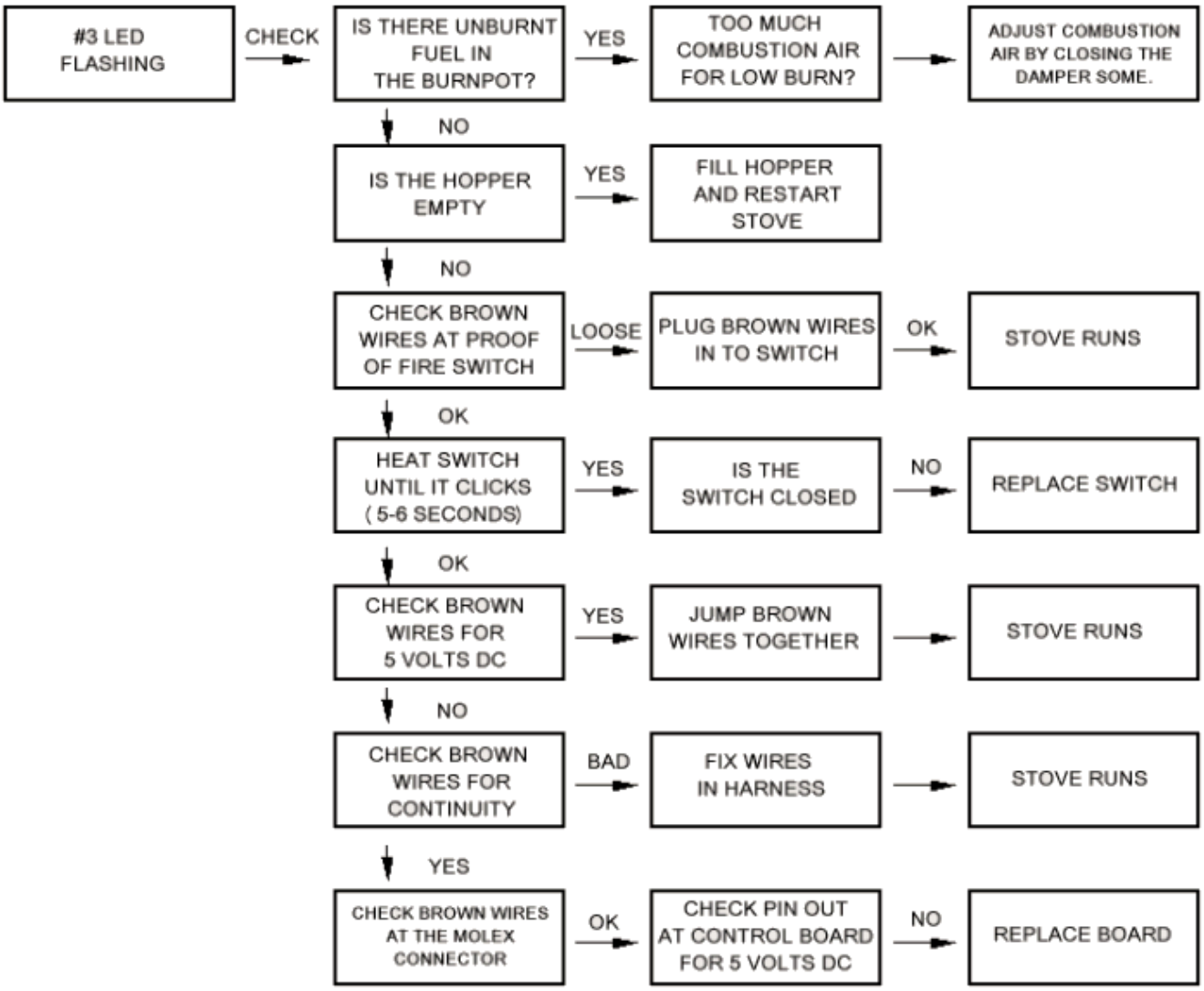
High Limit Switch

The High Limit Switch shuts the stove down in an Over-Temp situation. This usually involves the room air fan. The fan may be defective or the fan may need cleaning. If the squirrel cages become dirty they can't move enough air to keep the stove cool enough when running on the higher settings. If the High Limit trips more than once a closer look should be given to this area of the stove.



The new control boards have 5 volts DC on the orange wires, not 120 volts AC

Proof of Fire Switch



Section B

St. Croix Stoves with the Multi-Fuel Burn System – Models include: Auburn, Greenfield and Lancaster.

There are 2 Multi-Fuel stove configurations that we offer; the Freestanding stove and Insert stove, all of which produce similar heat output BTU ratings.

St. Croix Stoves with the Multi-Fuel Burn System are approved to burn Corn, Pellets, Cherry Pits, Wheat, Rye and Distiller's Grain Pellets. Cherry Pits, Corn, Wheat & Rye are limited to regional areas in the country where these fuels are readily available. Grain must have a moisture content of 15% or less. **The presence of large quantities of grain dust, pieces of stalk or pieces of cobs too large to fit through the auger system will cause problems in the feed system. Cherry Pits have higher Ash Content and will increase the Daily Maintenance. There are no Standards covering Corn, Wheat, Rye or Cherry Pits to be used as a fuel. Buyer beware when purchasing these fuels.**

The St. Croix Multi-Fuel system is Patent Pending, producing high efficiency ratings that completely burn the fuel until only the clinker remains. The burn system allows the Clinker to be removed without loosing the fire in the burnpot.

All St. Croix Multi-Fuel stoves have been safety tested to the following standards, where they apply:

LISTED CORN, WHEAT, RYE, PELLET, CHERRY PITS & DISTILLERS GRAIN BURNING SPACE HEATER. ALSO SUITABLE FOR MOBILE HOME INSTALLATION. TESTED PER UL 1482/ULC S628/APFI/ASTM E 1509-04 and CAN/CSA B415.1-00 THIS APPLIANCE HAS BEEN TESTED AND LISTED FOR USE IN MANUFACTURED HOMES IN ACCORDANCE WITH OREGON ADMINISTRATIVE RULES 814-23-900 THROUGH 814-23-909

The following three fans/motors are standard in all St. Croix Multi Fuel Stove models, they are the: Combustion Exhaust Fan, Room Air Fan and the Auger Motor.

The new Digital control Board enhances the reliability of stove performance and also increases the simplicity of customer operations. The stove requires a 120 Volt AC power source and draws a nominal current value of 3 Amps during normal operation. The addition of diagnostic features to the control board allows problems to be quickly identified and direct the service person to the area of the stove needing service. The St. Croix Digital Control Board also offers a Thermostat feature. The unit drops to a low burn setting if the thermostat is not calling for heat. Wireless remote programmable Thermostat systems can also be used.

The stove operates using a **top feed** auger system; where the fuel isstored in a 40 to 90 pound hopper, then auger driven up through the auger tube and gravity dropped from the drop tube into the Burn Pot. The stove also operates using a **negative pressure system**, where exhaust gases are being expelled through the exhaust port at a faster rate than which fresh air can be delivered into the inlet port. Since an internal negative pressure system exists, the potential for smoke and other hazardous gases escaping from within the firebox and out into the room have been considerably decreased in comparison to a positive pressure system. The reason for this is that when using a negative pressure system, room air actually wants to be pulled into the firebox as opposed to a positive pressure system, where exhaust gases are being forced from the firebox and potentially into the room.

Multi-Fuel stoves are typically an automated controlled heating appliance, where extensive supervision generally is not necessary during operation, but even so, it's wise to be educated on various combustion characteristics that may cause potential safety hazards; such as a situation where excessive smoke and black soot may adhere to the viewing glass surface, this is a sign of either too many pellets or not enough air to create the correct combustion ratio. A black shiny build-up that is difficult to remove is an indication of too much air and can lead to **creosote** build-up in the stove. It's important to understand the significance of how a correctly installed and well-maintained pellet stove can greatly affect the performance and safety level of operation. Even though there is considerably less work to burning a Multi-Fuel stove in comparison to a conventional wood stove; a daily, periodic and yearly preventive maintenance program needs to be faithfully followed. The type of fuel and the amount of fuel burned daily along with other various conditions will contribute to the frequency of required stove maintenance.

APPROVED FUELS

SHELLED CORN

Shelled corn must be 15% or less moisture content. The keys to satisfactory performance are: proper operation of the stove, diligent maintenance and burning only dry, clean, quality corn. Corn dust must be screened prior to using.

NOTE: Corn with excessive grain dust must be screened, by sifting with 3/16" mesh screening. Large pieces of cob may plug the auger.

Clinkers and ash are a by-product of burning corn and are not caused by your stove. Stove performance can be quickly and severely reduced if poor quality corn is used. Contact your dealer for more information on where to get high quality corn to burn in your new corn stove.

Store corn in a tight container use other methods to ensure they do not become rain soaked or absorb moisture from damp or wet floors. This will also prevent rodents from becoming a problem. Do not store corn within stove installation clearances or within the space required for clinker removal.

The stove is not warranted against damage caused by poor quality corn, incorrect operation, poor maintenance or incorrect installation.

PELLETS - Contact your dealer for more information on PFI approved wood pellet fuels.

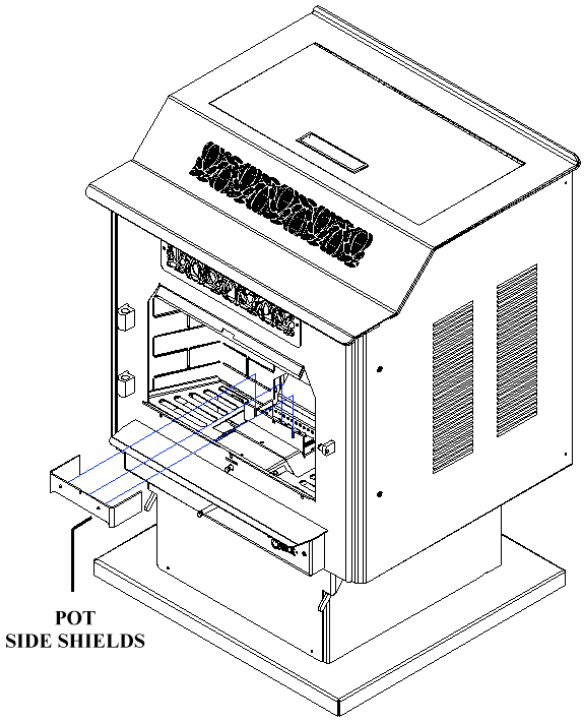


Figure 1

St. Croix Multi-Fuel stoves come equipped with a burn pot installed that has removable side shields.

When burning pellets or any other fuels *mixed with pellets,* the side shields must be removed. Failure to remove the side shields will prevent fuel from spilling into the Ash Pan in the event the pot overloads. See figure 1 showing the removal of the side shields. The shields lift up and are removed without needing any tools.

CHERRY PITS - No Standard exists for Cherry Pits used as Fuel. *Inspect fuel before buying.*

When burning cherry pits or any other fuels *mixed with cherry pits,* the side shields must be removed. Failure to remove the side shields will prevent fuel from spilling into the Ash Pan in the event the pot overloads. See figure 1 showing the removal of the side shields. The shields lift up and are removed without needing any tools.

DISTILLER'S GRAIN PELLETS - No Standard exists for Distillers Grain used as Fuel. *Inspect fuel before buying.*

When burning Distiller's Grain pellets or any other fuels *mixed with Distiller Grain Pellets,* the side shields must be removed. Failure to remove the side shields will prevent fuel from spilling into the Ash Pan in the event the pot overloads. See figure 1 showing the removal of the side shields. The shields lift up and are removed without needing any tools.

Distiller's Grain is a byproduct of producing Ethanol and has higher oil content than corn itself. Due to this the stove may require more frequent cleaning. Soot may rapidly form in the exhaust system if the air is not set properly. Check the exhaust frequently when burning Distiller's Grain pellets.

WHEAT - No Standard exists for Wheat used as Fuel. *Inspect fuel before buying.*

Wheat is a small grain and burns in a similar manner as corn. It forms a clinker in the Burn Pot that tends to stick to the sides of the pot. The clinker may need to be pushed into the Ash Pan using a long narrow screwdriver. Slide the Screwdriver through the fingers of the Coal Rake to push the Clinker.

Since Wheat is a small lightweight grain, more residue will blow out of the Burn Pot as it burns. If an excessive amount seems to be blowing out of the pot, adjust the damper by closing it a small amount at a time.

RYE - No Standard exists for Rye used as Fuel. *Inspect fuel before buying.*

Rye is a small grain and burns in a similar manner as corn. It forms a clinker in the Burn Pot that tends to stick to the sides of the pot. The clinker may need to be pushed into the Ash Pan using a long narrow screwdriver. Slide the Screwdriver through the fingers of the Coal Rake to push the Clinker.

Rye is also a small lightweight grain; more residue will blow out of the Burn Pot as it burns. If an excessive amount seems to be blowing out of the pot, adjust the damper by closing it a small amount at a time.

The St. Croix Clinker Theory.

Some manufacturers of Multi-Fuel stoves use complicated stirring mechanisms to break up the clinker in the burn pot. **We feel that is a mistake.**

We believe that Grain doesn't burn as well when it is disturbed in the burn pot. Stirring the fuel around in the burn pot *does* prevent the clinker from forming, but it also *lowers* the temperature in the burn pot. This in turn leads to incomplete combustion, a dirty burn, and more maintenance to remove black build up in the stove and vent system and wasted fuel. Grain needs high temperatures and proper airflow in the burn pot to burn properly. That energy (high temperature) is stored in the clinker that is being formed in the burn pot. It glows red-hot and provides the heat needed to ignite the grain that is being fed into the burn pot. When the clinker is broken up that constant source of energy is lost and now it becomes more difficult to burn these fuels. When grain is not burning properly it tends to stick together and form a clump in the burn pot. It is impossible for air to flow through this clump and soon the pot will overload and the fire goes out. This is where some manufacturers use the stirring mechanism to break up the clump of fuel to maintain proper airflow or others use large burn pots to handle this problem (Smaller burn pots are better). The truth is neither is needed. The St. Croix Multi-Fuel Burn System allows the fuel to be burned efficiently and completely in a relatively small burn pot. Very little unburned residue ends up in the ash pan.

Products of Combustion

a. The **main** product of combustion is heat. This is what we are looking for.
b. Water in the form of condensation. This should be closely watched.
c. Flue gases. Flue temperatures will vary between 200 and 450 degrees.
d. Clinker & Ash residue.

Clinkers

The Patent Pending Burn System of a St. Croix Multi-Fuel stove will burn up all the available fuel leaving only the clinker residue in the pot. This will cause the pot to eventually fill up. The clinker removal system allows the clinker to be removed by keeping the burning fuel suspended above the "Coal Rake" in the pot while the "slide Out "bottom is pulled out to let the clinker drop into the ash pan. After closing the bottom of the pot the coal rake is pulled back out of the stove and the burning fuel drops to the bottom of a clean pot and the cycle repeats itself.

Burning "Poor Quality" Grain

Many times we are asked the question if damaged or moldy grain may be burnt in the stove. We consider it an experimental approach to the use of our stoves. If it burns, then go for it. If it doesn't, find a source of clean corn with a moisture content of 15% or less. Do not sell a stove to a customer planning to burn this type of fuel **without explaining it may not work.**

How do these Fuels compare? ***(Information gathered from the Internet)***

- **Pellets: 8400 BTU – 9200 BTU per pound**
- **Corn: 7000 BTU – 9500 BTU per pound (Penn State: reduce 90 BTU per 1% moisture above 15%)**
- **Wheat: 8000 BTU per pound**
- **Rye: 8000 BTU per pound**
- **Cherry Pits: 9500 BTU per pound**
- **Distiller's Grain Pellets: 9400 BTU per pound**
- **Feed Rates vary from fuel to fuel**

Pre-Delivery Check – Multi-Fuel Stoves

One of the easiest ways to prevent problems in the field is to inspect the unit before leaving to install the stove. Offer the customer the option to Pre-Burn the stove for them to burn off the odors associated with the first burn.

The following checklist is to be used to quickly inspect the stove:

WARNING: Use caution when inspecting electrical connections to prevent contact with live circuits.

1. Once the unit has been unboxed, check the unit for hidden freight damage.
2. If any painted surfaces are scuffed up use the appropriate touch-up paint to re-paint the area.
3. Open side doors and inspect all wiring connections.
4. Make sure the Manual packet is inside the stove for the owner of the stove.

Next turn the stove on by pressing the button labeled #2 to make sure all motors and blowers are running.

a. Both of the blowers come on at line voltage. Listen for any blower noise or excessive vibration. After approximately 30 seconds the Convection blower will shut off.
b. The ON-OFF light comes on and starts blinking. The Feed Rate/ Heat Advance light should be at level #1.
c. Five minutes after starting the stove, the auger will start feeding fuel on level #1. It will remain on level #1 until it senses the Proof of Fire switch.

Verify points a through c and then bypass the Proof of Fire switch to advance the stove into the program for normal operation.
Once the Proof of Fire Switch has been bypassed you will see the following:

d. The ON/Off light will quit blinking and stay ON constantly.
e. The Convection Fan will come on.
f. Slide the Thermostat switch to T-Stat mode. The ON/OFF light will start blinking again.

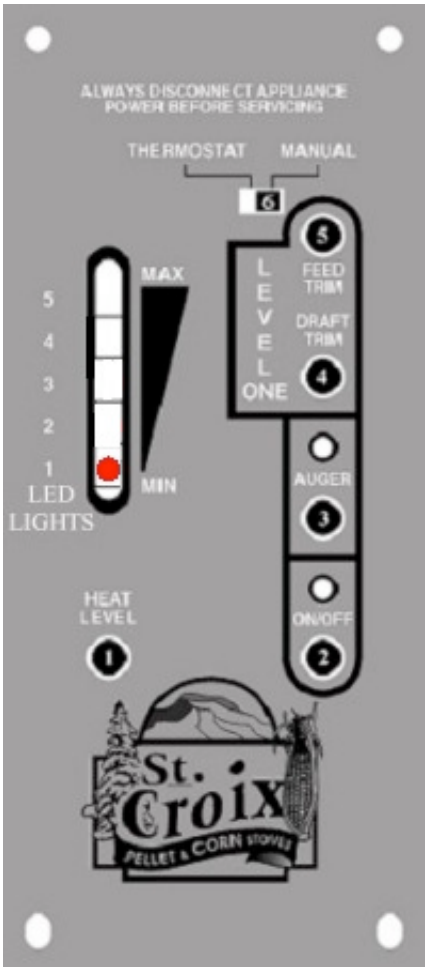
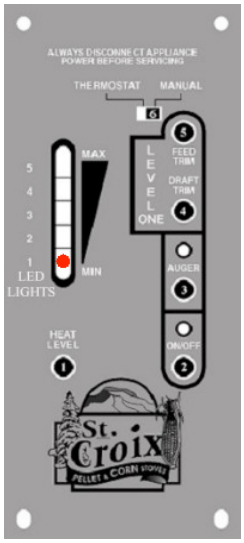
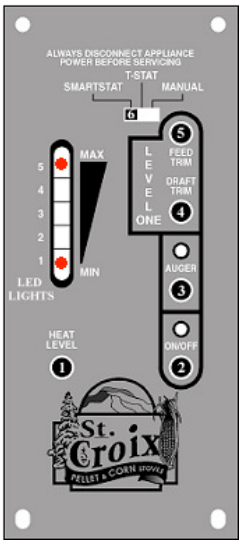


Figure 2



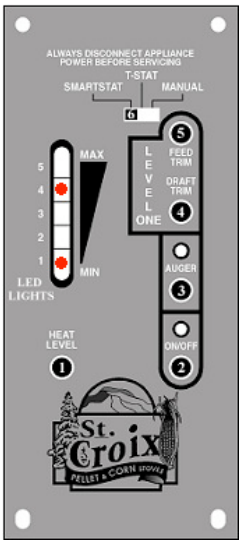
Level 1 On Time
1.50 seconds
Default setting

Figure 3



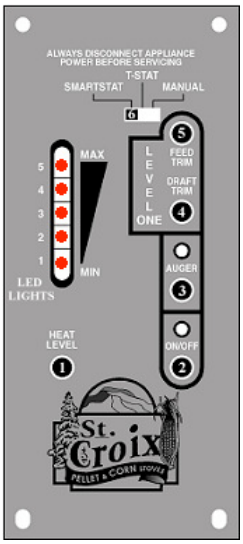
Level 1 On Time
1.75 seconds
Auger Trim

Figure 4



Level 1 On Time
1.25 seconds
Auger Trim

Figure 5



Draft Trim Button
Adjusts Combustion
fan on level 1 only.

Figure 6

g. The Auger ON Time for level 1 is adjustable to fine-tune the stove. Once the stove is turned on the #1 LED should be on. See Figure 3 above - This has an ON Time of 1.5 seconds
h. Press the **Feed Trim** button (button #5, see Figure 2) once and the #1 **and** #5 light will come on. See figure 4 above – This has an On Time of 1.75 seconds.
i. Press the **Feed Trim** button (button #5, see Figure 2) again and the #1 **and** #4 light will come on. See figure 5 - This has an On Time of 1.25 seconds.
j. Press the **Feed trim** button again and the #1 light (Default Setting) comes back on. (See Figure 3)

This is a method to Fine Tune the amount of **Heat** and/or the **Burn Characteristics** on the #1 setting by adjusting the Auger **On Time** of level 1. **This adjustment will not affect levels 2 through 5.**

k. The Draft Trim button (button #4, see Figure 2) allows for adjusting the Exhaust fan voltage on Heat Level 1 only. Push the button and the all of the LED Lights in the light bar will flash once. (See figure 6 above) This decreases the Exhaust fan voltage approximately 5 volts below the default setting. Push the button a second time and all of the LED Lights in the light bar will flash twice. This decreases the voltage approximately another 5 volts. Pushing the button a 3rd time will reset the voltage to the default setting. **This adjustment is available to fine tune the Draft fan voltage on the #1 Heat Level setting only.**

m. Press the **Heat Advance** button (button #1, see Figure 2) and advance the setting to level #5. The control board slowly ramps up by advancing to the next level and waiting for 5 minutes at each level until it reaches level 5. This allows the stove to start up smoothly with out overloading the burn pot. After each 5-minute delay you will hear the blowers pick up in speed.
n. Press the **Auger button** and the auger will feed pellets until the button is released. This may be used to manually prime the auger tube if needed.

This concludes the Pre-Delivery check. See Troubleshooting section to correct any problems found.

Pre-Burning at the Dealership

We recommend that all stoves be pre-burned at the dealership prior to being installed. This is true regardless if it is customer installed or professionally installed.

We have found that the majority of service calls within the first 30 days of sale of the stove could have been prevented if the stove had been pre-burned at the dealership. They are:

a) Saves time and expense of corrective action should the stove have a defective part.
b) Increases owner confidence that he is getting a stove that has been tested by his "local dealer" to ensure customer satisfaction with the product.
c) Eliminates break-in odors and ensures the owner they're getting a "ready to burn stove".
d) Saves dealers money by reducing service calls that could have been prevented.

Vacuum Check (Negative Pressure) - Vacuum readings have value in determining if there is a significant problem with the stove, such as the main or ash door seal, or the stove installation. This test should be performed on a cold stove with the damper at the **Factory Setting**. Do not make any adjustments with the fan button before checking the vacuum reading.

- ✓ Before any stove leaves the store, verify cold stove pressures to double check for a door gasket or firebox leak problem in the stove. See readings listed below.

Normal Draft Readings:

Use a tee to simultaneously hook up the Vacuum Switch and a Magnehelic Gauge to check the vacuum reading. *(See figure 7 on page 68)*

COLD STOVE: No fire, Power on, Empty Hopper, Damper full open.

READING: .10” WC Negative Pressure - .20” WC Negative Pressure

The Vacuum switch has a set point of .05” of Negative Pressure. A reading of less than .1”WC Negative Pressure is marginal and requires a closer look.

NOTE: If the stove has been brought in from a cold environment (an unheated warehouse), the reading you get may be lower than normal. This is due to the High Temp Lubrication used in the Combustion fan not allowing the fan to spin as easily as a fan at room temperature.

Figure 7

Factors that Decrease the Draft Readings

a) Altitude**
b) The following factors are in addition to installation procedure:
c) Increasing the exhaust pipe vertical length without increasing exhaust pipe diameter when required for installation. **
d) Increasing the horizontal exhaust pipe length. **
e) Increasing the number of tees and elbows: the exhaust vent piping will, for most applications, have two (2) 90-degree bends. More than three (3) bends in the exhaust vent is NOT RECOMMENDED.
f) Increasing the air inlet pipe length recommended for installation without increasing the diameter of the pipe. It is recommended to increase the air inlet pipe to 3" diameter for runs over ten (10) feet and at elevation over 4000'. Excessive runs (12 to 15 feet+) should be avoided.

g) Back pressure on the stove caused by wind direction and velocity directly into the exhaust termination point.
h) Increasing the number of elbows in the inlet pipe run.

See guidelines on the next page for the venting configurations of a Multi-Fuel stove.

Venting Guidelines

	Type of Installation	Size	Recommendation
*	1) Less then 10' Horizontal	3"	Acceptable
*	2) 10' to 12' Horizontal	4"	Recommended
*	3) Over 12' Horizontal	4"	Required

NOTE: Horizontal installation with runs greater than 12' is NOT RECOMMENDED.

	4) Vertical less than 15'	3"	Acceptable
*	5) Over 15' Vertical	4"	Recommended
*	6) Above 4000' elevation	4"	Recommended

* **Elbows** substantially reduce the overall acceptable length, 4" vent recommended in vent systems with more than 2 elbows in the installation. ***Note: Four (4) inch vent may be used in all installations. If in doubt, use 4" vent.***

Factors that Increase the Draft Readings

a) Air draw on the stove caused by wind direction and velocity perpendicular to the exhaust termination point. The "Venturi" effect draws air out of the stove faster, thus increasing the vacuum in the stove.
b) Tall chimneys that have good natural draft will increase draft readings.

Direct Vent Installations and the use of Battery Back-ups

Although the stoves have been tested and approved for direct vent installations and many customers choose to hook up their Multi-Fuel Stoves using this type of installation. We recommend that there be a minimum of a 3' vertical rise to help prevent excessive smoke backup in case of a power failure to the stove. This is helpful, but wind could still cause smoke to spill into the home if it puts back-pressure on the vent system. We recommend the use of a battery backup system if the customer has a problem with intermittent power failures. A good quality Computer back-up system will work as long as it provides **"PURE SINE WAVE"** output. These type of back-ups will usually provide anywhere from 15 to 45 minutes of back up power. There are systems on the market specifically designed for Corn stoves requiring "PURE SINE WAVE" that will offer longer back-up times by utilizing one or more deep cycle batteries hooked to the back-up system.

St. Croix does not market a Battery Back-Up system for the Corn stoves.

Flame Pattern Interpretation and Burn Characteristics

The most effective method by which to determine the proper ratio of combustion air to fuel is to observe the flame pattern. This should only be observed after the stove has been operating at the desired Heat Adjust Selection for a period of time. Even though a Negative Air Pressure Gauge measures quite accurately, visual observation of the flame pattern and burn characteristics inside the burn pot tend to be a highly effective diagnostic tools as well. Flame pattern height will vary relatively proportional to each Heat Adjust Selection made. Unfortunately poor combustion can be caused by multiple factors and only through proper diagnosis can the correct cause be found. Inconsistencies in the Fuel tend to be one of the largest factors that contribute to flame pattern irregularities and improper burning. Faithfully following the Preventive Maintenance program and/or making slight Air Inlet Damper adjustments can usually easily correct the flame pattern. The #1 setting is usually the most difficult to adjust and the control board offers several feed rate adjustments (Auger trim Button). The Draft Trim Button should only be used in the event the stove is hooked to an existing chimney that already has a good draft. Improper use of the Draft Trim Button may cause the stove to shut down because of a low vacuum reading.

Flame Pattern Characteristics

Correct Flame Pattern - Bright yellowish-white flame with a brisk movement, having a pointed tip extending up towards the Heat Exchange Tubes while forming a tall flame that is wide as it exits the burn pot and narrows as it gets taller. A small amount of live sparks being blown out from the Burn Pot area is considered normal operation.

Incorrect Flame Pattern - Dark Orange flame with a lazy movement and the Corn, Wheat or Rye fusing together in a clump is an indication of the pot becoming unbalanced. The pot will most likely overload and go out. Ash or Live Sparks **not being** blown out of the Burn Pot area is considered abnormal operation. Extremely black soot forming on the ceramic glass surface is a sign of very poor combustion (not enough combustion air) and should not be overlooked.

During the Pre Delivery burn is a good time to check the parameters of each of the 5 Heat levels.

A Voltmeter and a Stopwatch are essential to perform the measurements shown in the data table on the next page. The following table on Page 63 shows the default settings of the control board, meaning the Auger Trim button and the Fan button haven't been used to make adjustments.

When checking the readings of a stove that is not burning, bypass the Proof of Fire Switch to check all 5 settings of the control board. **Remember there is a 5-minute delay between each level before advancing to the next level.**

Data Table

Based on the default 11.5 second Cycle Time. Cycle time equals the ON time & OFF Time combined.

Heat Level Selection	Auger ON (Seconds)	Combustion Fan Voltage +/- 3 Volts	Convection Fan Voltage +/- 3 Volts	Corn Fuel (Lbs./Hour) +/- 10%
Start-Up Cycle	Off for the first 5 minutes	100 Volts	OFF	NA
1	1.5	90 Volts	83 Volts	1.7 Lbs.
2	2.0	98 Volts	90 Volts	2.25 Lbs.
3	2.5	105 volts	98 Volts	3.1 Lbs
4	3.0	111 volts	103 Volts	3.7 Lbs.
5	3.5	120 volts	120 Volts	4.25 Lbs.

Figure 8

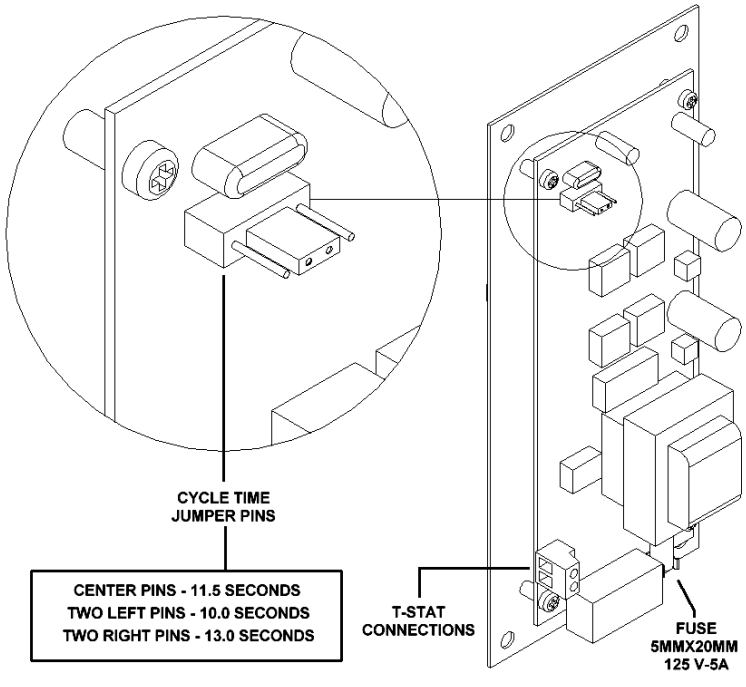


Figure 9

Feed Rate Adjustment

The Default Cycle Time is 11.5 seconds. Please see figure 9 to the left.

The 11.5-second cycle can be changed to 13 seconds by placing the jumper on the 2 pins to the right.

Certain fuels (Mainly Corn and Small Grains) tend to feed faster and may need to be slowed down. Placing the jumper on the 2 pins to the right will give the stove an Optimum Air to Fuel Ratio.

Preventive Maintenance

Preventive maintenance is important to give you trouble free operation of any product you own. The same is true with the St. Croix Multi-Fuel stove. This stove has been designed in such a way to minimize preventive maintenance, thus minimizing any corrective maintenance, while maintaining a very user friendly stove. Just like the owner of a car would perform preventive maintenance, the owner of a Multi-Fuel stove would perform preventive maintenance to maximize its performance. The interval of time for each maintenance item will vary depending on the Quality of fuel used and the quantity of Fuel burnt.. Improper Maintenance and/or lack of preventive maintenance will result in a poor operating stove, poor flame patterns, excessive smoke and possible stove damage.

Daily Maintenance - (Performed by Customer)

a) First remove the Clinker from the previous day from the Ash pan. This applies to the Lancaster and Greenfield models only These models have a small Ash pan
b) Inspect the burn grate and burn pot. Drop the clinker out of the Burn pot as needed. This may vary, when burning grain, as a **"Rule of Thumb"** the Clinker must be removed every 44 hours when the stove is continuously running on the low setting and every 18 hours when the stove is continuously running on the high setting.
c) When burning Pellets or Cherry Pits the ash in the pot must be removed more frequently. The frequency depends on the quality of the pellets and amount of fuel burned.

How to Drop the Clinker

1 – Push in the "Coal Rake" and "shave" off the hot coals.

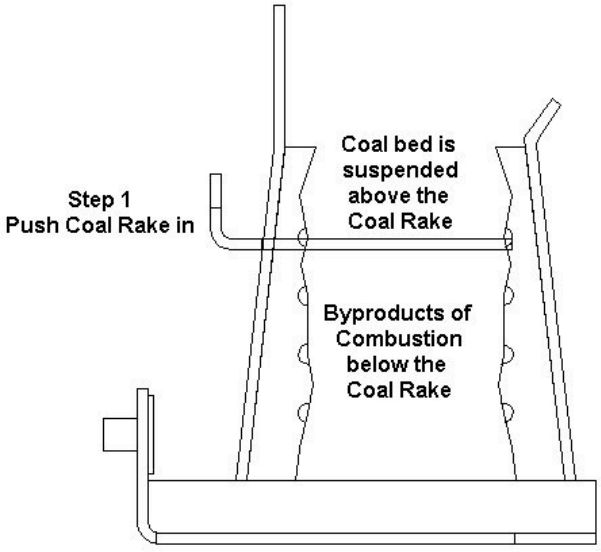


Figure 10

2 – Pull out Slide Bottom to drop the Ash, Clinker and remaining residue into the ash pan.

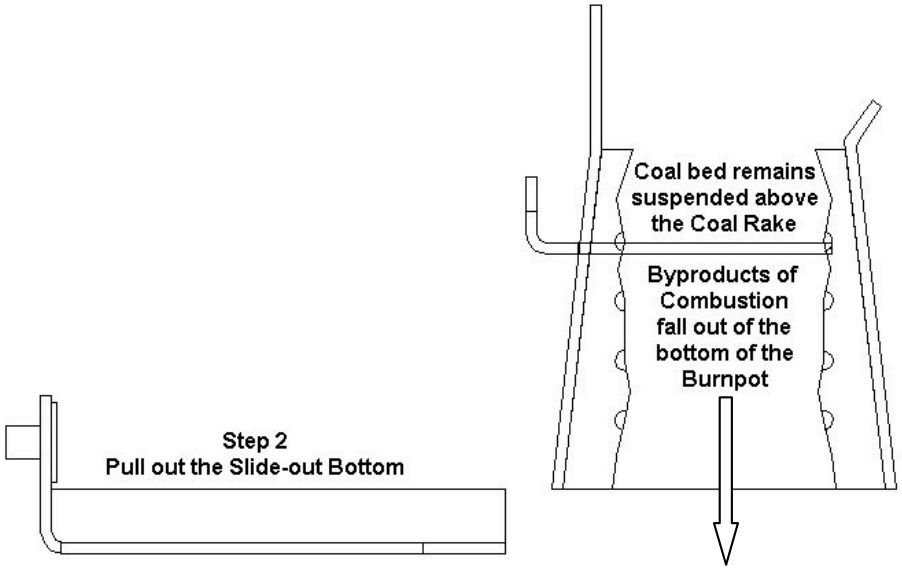


Figure 11

3 – Push in the Slide Bottom.

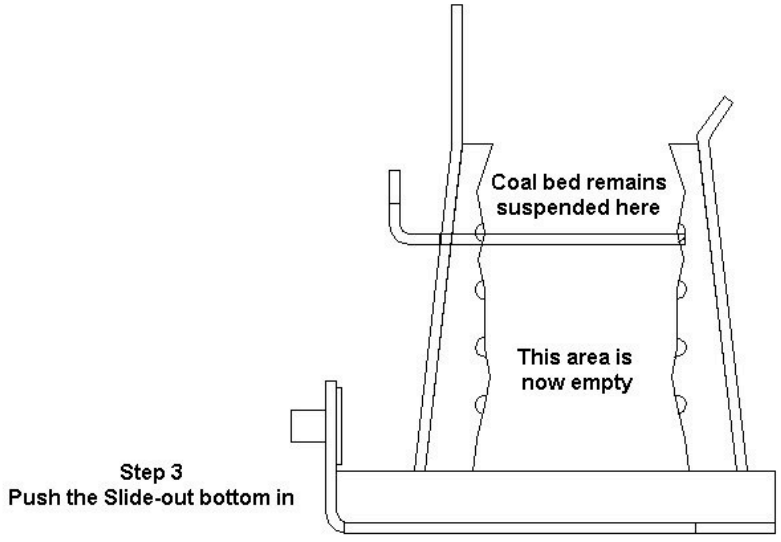


Figure 12

4 – Pull out the "Coal Rake" and drop the hot coals in the Burn Pot.

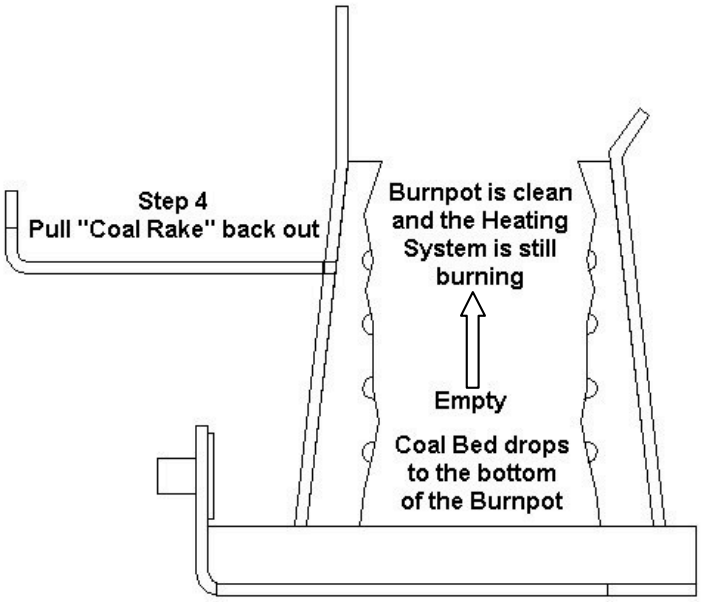


Figure 13

c) Clean the window.
d) Clean/polish the plated surfaces with a soft cloth and a mild glass cleaner.
e) Inspect the flame for a sharp, white/yellow flame.
f) Clean ash off of the heat exchangers by pulling the Tube Scraper in and out.

Periodic Maintenance (as needed) - Performed by Customer or Service Tech

a) Clear the burn grate holes.
b) Clean out the ash traps in the lower corners of the back wall of the firebox. Remove the covers and vacuum the area. (See Figure 19 on Page 92 for location of Ash Traps)
c) Clean the combustion chamber floor.
d) Clean the hopper.
e) Clean/dust the area under the hopper.
f) Inspect and clean, as needed, the PL vent tees and exhaust vents.
g) Inspect and clean, as needed the combustion and convection (room air) fan blades.

Yearly Maintenance (as needed 6 to 12 months) - (We recommend service be performed by Service Tech)

a) Perform steps 1 and 2 above.
b) Remove all dust, Corn and ash from the stove after the burning season.
c) Inspect and clean the entire exhaust system.
d) Inspect and clear any obstructions from the air inlet piping.
e) Inspect door and ash pan gaskets.

Trouble Shooting Corn Stoves

Electrical Wiring/Component Failure

When called to service a stove problem it is best to get as much information from the customer as possible, many problems can be isolated over the phone. This practice of asking the "right" questions will save you time and also instill customer confidence, in being prepared to solve his problem in a timely manner.

If the stove is still in use, but doesn't seem to be burning correctly, some typical questions to ask include:

1. How long has the stove been in use?
2. Has the quality of the Fuel changed?
3. Is the malfunction consistent of intermittent?
4. Is the noise or malfunction at certain heat settings?
5. How long has this been happening?
6. Is it getting progressively worse?
7. Has it been maintained regularly as in routine maintenance?
8. Does the flame pattern change when a door or window is opened?
9. If it is a noise problem does the noise increase as the heat level is turned up?

If the stove is shutting down, won't stay running or seems completely dead, some typical questions to ask include:

4. Is there power to the outlet the stove is plugged into?
5. Have you checked the fuse on the back of the control board?
6. Is there a diagnostic light is flashing? (#2, #3 or #2 & #3 LED Light)

Electrical Component Failures

Although we take every measure possible to ensure reliability of our stoves, there may be some component failures.

All electrical components can be tested in place on the stove using a multi-meter.

A component's failure to operate may be due to several different causes:

- **The fuse on the Control Board. Check this first.** ***(See Figure 9 on page 71 for the location of the fuse on the Control Board).*** **Replace with 125 Volt, 5 Amp, 5 MM x 20 MM fuse.**

- **The Component fails.**

- **The Device that controls the component fails.**

- **The Wiring Harness to or from the component is opened or shorted.**

Wiring Diagram – all St. Croix Corn Stoves

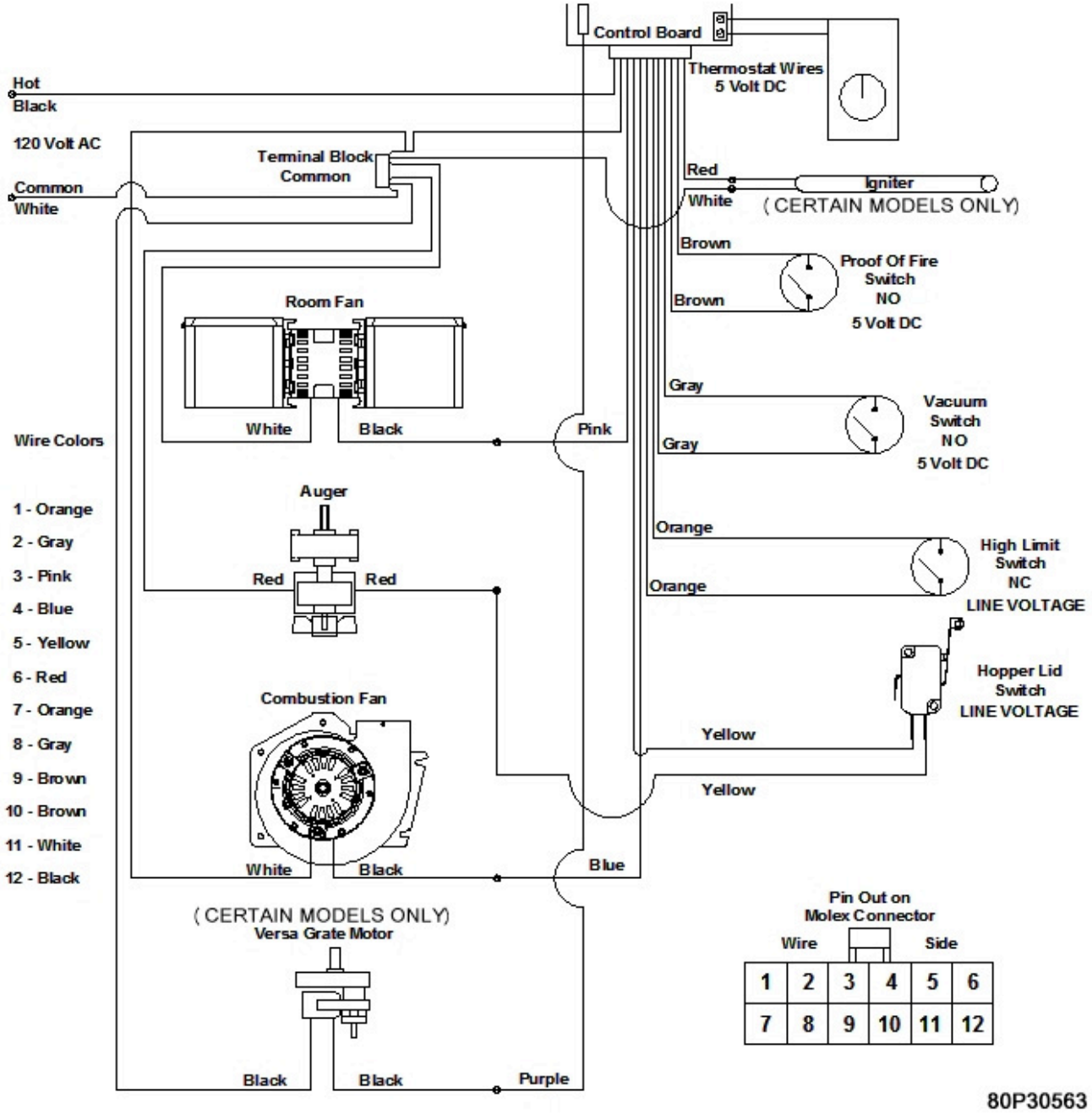


Figure 14

The Electrical Components listed in this Schematic are present in all Multi-Fuel models ***with the exception of the Versa Grate motor and the Igniter***.

When diagnosing a problem in a stove the following four areas of the stove must be considered.

a) Electrical
b) Mechanical
c) Air Flow
d) Fuel Flow

Electrical

There are 12 electrical components in a St. Croix Corn stove. See Figure 15 on Page 78.

1. Digital Control board – Check fuses first
2. Auger motor
3. Versa Grate Motor (also called **a Moving Grate Motor**)
4. Convection Fan (also called **a Room Fan**)
5. Combustion Fan (also called **a Exhaust Fan**)
6. Power cord
7. Wiring Harness
8. Wiring Terminal Block

The remaining electrical components make up the Safety Sensors to shut down the stove when sensing a malfunction or to disable the Auger motor.

9. Vacuum Switch (also called an **Air Switch**)
10. High Limit Switch (also called an **Over-Temp Switch**)
11. Proof of Fire Switch (also called the **Low Limit Switch**)
12. Hopper Lid Switch.

Electrical Requirements:

The stove requires 120 volts AC voltage. Typical line voltage may vary plus or minus 5%. This means when testing the circuit before plugging the stove in you will see voltages as low as 114 Volts. Test the circuit first before plugging the stove in. If you have reason to believe the voltage is higher or lower than it should be, the Utility Co. should be contacted to provide the proper voltage. The stove draws 3 Amps during normal operation.

The Digital Control Board

The buttons on the board function as follows: *(Refer to Figure 15. The touch pad buttons are labeled with the white numbers 1 through 6)*

1. The heat advance button (1) will advance the setting between level 1 and 5. Once you reach level 5, it will drop back to level 1. Each level has a LED light to indicate where the board is set.

2. The On/Off button (2) turns the stove on and also acts as the toggle switch to reset the board after the board switches to Diagnostic mode.

3. The auger button (3) will allow the customer to manually auger Corn into the burn pot on start up when needed.

4. The Draft Trim (4) button allows for adjusting the Exhaust fan voltage on **level 1** only. Push the button and the LEDs flash once to decrease the voltage 5 volts. Push the button a second time and the LEDs flash twice to decrease the voltage another 5 volts. Pushing the button a 3rd time will reset the voltage to the normal setting. This adjustment is helpful when there is a problem with a chimney that has excessive natural draft and the stove is going out on the #1 setting because of too much draft.

4. The Feed Trim (5) button will allow the feed rate to be adjusted on level 1 only. There are 3 levels for the # 1 setting**, #1 Normal, #1 High and #1 Low.** The LED lights will light up as follows to indicate which level #1 is running.

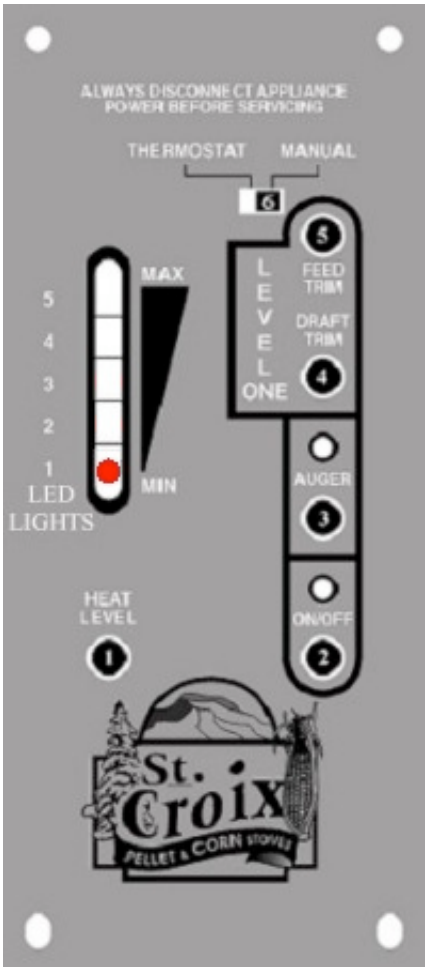


Figure 15

a. The first LED only indicates the **Normal** #1 setting. (1.5 second on time). See Figure 3 on page 66.

b. The first and fourth LED lights indicate the #1 **Low** setting. (1.25 second on time) See Figure 4 on page 66.

c. The first and fifth LED lights indicate the #1 **High** setting. (1.75 second on time) See Figure 4 on page 66.

A Closer Look

It is important to understand how the LED lights function when the stove is in use. Let's take a look at the ON/OFF light. The ON/OFF light indicates more than the fact that the stove is running. The light blinks when first turning the stove on until the room fan starts blowing warm air into the room. This means the **"PROOF OF FIRE"** switch has sensed a fire in the stove by monitoring the Exhaust temperatures.

When operating the stove on a Thermostat, the light remains ON when the thermostat is calling for heat and starts blinking when the heat demand has been met. Once the heat demand has been met the stove drops to the #1 setting and pilots, during this time the LED light showing the selected Heat level does not change, but **the ON/OFF light blinks**.

REMEMBER: A blinking ON/OFF light may mean one of 2 things:

1. The stove is in start-up mode.

2. The stove is in pilot mode.

Use the Feed Trim Button (5) to Fine Tune the level 1 Heat Setting if a little more heat or a little less heat is desired on the lowest level. This may be needed depending on the type of Fuel that is used. The BTU content of the approved fuels varies and adjusting the control board may be needed. *Refer to Figures 3 through 5 on Page 66 to see how the LED lights light up when adjusting the Level 1 Heat Setting.*

Use the Draft Trim Button (4) Fine Tuning the Combustion Fan for level one is a little more complex. Usually when venting the stove in a direct vent situation, this adjustment is not needed. When venting into an existing chimney or running the venting system all the way above the roof, an adjustment may be needed to compensate for the additional Natural Draft in the chimney. Use the damper on the back of the stove first try and adjust for too much air on the low. As a final resort use the fan button to reduce the fan voltage. Press the Fan Button and all the LED lights on the Heat Advance bar light up simultaneously. This reduces the Combustion Fan voltage approximately 6 volts. Press the button again and the all lights flash twice. Press the button a third time and the lights all flash once again and the board reverts to the default Combustion Fan voltage. (*Refer to figure 6 on Page 66 to see how the lights flash when adjusting the Combustion Fan voltage.)*

CAUTION: Using the Draft Trim Button (4) in a direct vent situation may cause the Vacuum Switch alarm to shut the stove down by reducing the fan speed, which in turn reduces the vacuum in the stove. (Vacuum switch requires a minimum of .05" WC of negative pressure)

REMEMBER: Any adjustments to the board by using the Trim buttons will be lost in the event there is a power failure or the unit is unplugged. Tell the customer to make a note of the final adjustment to the control board for future reference.

Diagnostic Features

The control board offers a certain level of diagnostics to help in trouble shooting the stove. The two areas that are diagnosed by sensors in the stove are:

1. **Vacuum – Sensed in the Firebox and Ash pan area of the stove.**
2. **Heat – Proof of Fire sensed in the Exhaust Temperatures of the stove.**
3. **High Limit – Over Temp situation sensed in the Firebox.**

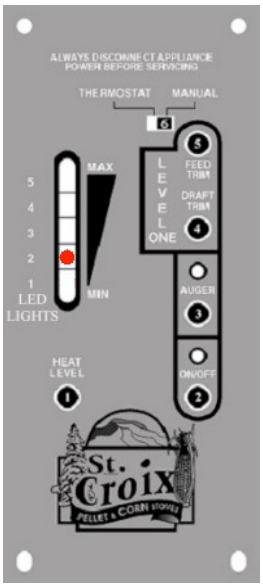


Figure 16
Vacuum Diagnostic light

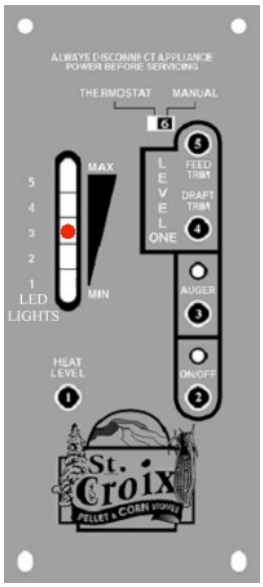


Figure 17
Proof of Fire Diagnostic light

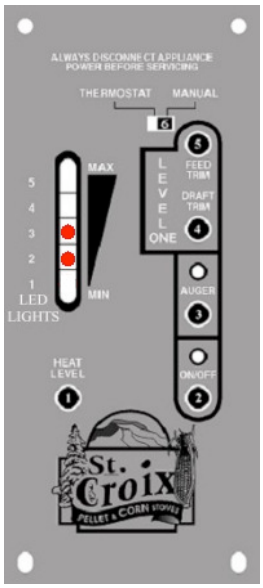


Figure 18
High Limit Diagnostic lights

LED light 2 flashing - The number 2 LED light on the Heat advance bar will **flash** if the control board senses a loss of vacuum. The stove shuts down and the Number 2 LED light starts flashing **approximately 60 seconds after** a loss of vacuum has been sensed. (Fig 16)

LED light 3 flashing - The number 3 LED light on the Heat advance bar will **flash** if the control board senses that the Proof of Fire Switch opens. The stove shuts down and the Number 3 LED light starts flashing ***after the stove cools down and the fans shut off.*** Approximately 30 minutes. (Fig 17)

LED light 2 and 3 flashing at the same time – This will indicate that the High Limit Switch has tripped and shut the unit down. Reset the High Limit Switch before diagnosing the unit. (Fig 18) ***First Generation Digital Control Boards do not have this feature.***

1. Vacuum

Loss of vacuum may be causes by:

a. Operator error or neglect

- Leaving the Main Door open too long
- Forgetting to close the Main Door
- Leaving the Ash pan Door open too long
- Forgetting to close the Ash pan Door
- Allowing the Chimney to get plugged.

If an owner calls in with a #2 diagnostic light flashing, first cover all items listed above that may be caused by incorrect operation of the stove. Quiz the owner about their habits in regards to the Periodic maintenance. If they have been lax in cleaning the Ash Traps and venting system, have them first clean their stove and try it again.

b. Component Failure. Which components may be the cause?

- Combustion Fan
- Vacuum switch
- Control Board
- Vacuum hose
- Wiring harness
- Wiring connections

Let's check the simplest item first:

Check to see if the combustion Fan comes on.

- ✓ If the combustion Fan isn't running, check the wiring connections at the fan.
- ✓ Check the wiring connections on the opposite end at the Terminal Block (white wire) and at the Molex connector (Blue wire) that plugs into the control board. They may look OK, but in fact may not be making contact the pins from the control board. Push the Blue wire into the Molex connector to ensure they are seated properly.
- ✓ Check both wires in the harness for continuity if needed with an OHM meter. (White and Blue wire)
- ✓ Check for voltage at the fan; if voltage is present and the fan isn't running replace the combustion fan.

Check the control board.

- ✓ Check for voltage at the pin out for the Blue wire at the control board. If no voltage is present replace the control board.

Check all wiring connections related to the Vacuum system first.

- ✓ Check the 2 **Gray** wires that are plugged into the vacuum switch.
- ✓ If the wires are plugged in, check the opposite ends that are plugged into the control board. Make sure the wires a fully pushed into the Molex connector that plugs into the control board. They may look OK, but in fact may not be making contact the pins from the control board. Push the 2 Gray wires into the Molex connector to ensure they are seated properly.
- ✓ Check the **Gray** wires for continuity if needed with an OHM meter.

If all wires and connections are correct, check the vacuum switch.

- ✓ Unplug the 2 **Gray** wires and jump them together. Run the stove and see if that corrected the problem.
- ✓ If the stoves runs, check the vacuum reading in the stove using a magnehelic gauge connected to the vacuum hose. Be sure to leave the 2 **Gray** wires jumped together or the stove will shut down again. The Set Point for the Vacuum Switch is .05" WC negative pressure. The stove typically has a reading of between .1" and .20" WC negative pressure. *See Figure 7 on Page 68 for information on how to check the vacuum reading.*
- ✓ If the vacuum reading is relatively low, check the intake air damper to see if it is wide open. Adjusting the damper to a position that is more closed will increase the Vacuum reading.

If dealing with an intermittent Vacuum problem do not overlook the possibly that a combustion fan that is getting too hot and the **Thermal Protection** is shutting the fan down. If you suspect the Thermal Protection is shutting the fan down, check the combustion fan **immediately** after the stove shuts down. Once the fan cools down it may start running again.

2. Heat

The number 3 LED light on the Heat Advance bar will flash if a "Heat Related" event occurs. The stove shuts down and the number 3 LED light starts after the stove cools down and the fans shut off. This may take approximately 30 minutes, depending on how hot the stove is when the "Heat Related" event occurs.

This may be caused by:

a. Operator error

b. Component Failure. Which component may be the cause?

- ❑ High Limit Switch
- ❑ Proof of Fire Switch
- ❑ Control Board
- ❑ Wiring Harness
- ❑ Wiring Connections

When the stove shuts down and the number 3 LED light is blinking let's look at the **simplest** solution first. The following 2 items are Operator error.

Open the hopper and see if the unit has run out of fuel.

- ✓ If the hopper is empty, fill the hopper and re-light the stove.

Open the Main Door of the unit and look in the burnpot. Is there unburned fuel in the burnpot? Unburned fuel in the pot usually means the stove is running on a low setting and the damper is wide open. This causes the fuel to burn too fast during low burn and the fire eventually goes out. Since the Proof of Fire Switch is still closed at this point the auger will continue to feed pellets until the P.O.F. switch drops out and the stove shuts down.

- ✓ Adjust the damper for a low burn or Fine-Tune the level 1 feedrate using the Feed Trim button. If the stove is hooked to a tall vertical Chimney with good draft, use the Draft Trim button to adjust the combustion fan voltage to compensate for extra draft.

The Draft adjustment listed above would not prevent the stove from re-lighting and may be due to a failure to make the **initial start-up adjustments** after a new stove is installed.

When trouble shooting the components, keep in mind that the **High Limit (Stove Overheating) and the Proof of Fire (Exhaust Temperatures too low) Switches** may actually be sensing a problem in the unit and are not necessarily failing.

If the above mentioned items are not the cause **and all the corn in the burnpot is burned up**, then the auger shut off before the fire went out in the burnpot, consuming all fuel in the pot. Again let's start with the simplest scenarios.

First turn the stove on and see if it feeds fuel during the start-up cycle.

ATTENTION: The auger does not run during the first 5 minutes after the control board is turned on and then starts to feed on the #1 level until the Proof of Fire switch closes. Be sure to wait until the auger should be running or press the Auger Button.

If it doesn't feed fuel, check the following:

- ✓ Check to see if the Auger Motor is running, but the auger is not turning. This may indicate either a **loose setscrew** on the auger shaft or a stripped out **gearbox**.
- ✓ If the Auger Motor tries to start and immediately stops usually means a foreign object is stuck in the auger system or the Auger is jammed. Take a quick look up the drop chute area in the front of the stove to make sure it's not jammed there. Dislodge anything that could be causing a jam.

- ✓ If nothing is found in the drop chute area, empty the hopper and visually inspect the opening to the auger. If nothing is found, the auger will have to be pulled from the hopper to see if the obstruction is farther up in the tube.
- ✓ If the Auger Motor does not appear to be running or trying to run, it may be a problem with the power to the motor. Check for **intermittent** Line voltage on the **Yellow** wire plugged into the auger Motor. Voltage should be cycling ON and OFF when the Auger light on the control board blinks.
- ✓ Make sure the wires a fully pushed into the Molex connector that plugs into the control board. They may look OK, but in fact may not be making contact with the pins from the control board. Push the Yellow wire into the Molex connector to ensure they are seated properly.
- ✓ If there isn't any voltage at the Auger, ***carefully*** check for voltage on the pin-out on the control board. If no **Intermittent** voltage is present on the control board, the control board is bad and needs to be replaced.

Second let's look at the High Limit Switch. This is a normally closed switch that opens on rise at 250 F. Check if it's tripped and shut the stove off. It must be manually reset to allow the auger to run again. The following items would involve a situation where the stove sensed temperatures above the normal range.

Attention: There is a difference in Diagnostic Lights between first Generation Digital Control Boards and second Generation Control Boards. First generation control boards do not have a separate Diagnostic light. If the High Limit trips the auger shuts off and eventually when the stove shuts down the #3 LED starts to flash.

Second Generation Digital Control Boards have a Diagnostic code specifically for the High Limit Switch. The #2 and #3 LED lights flash at the same time.

If the switch has been reset, and the stove starts up as it normally would, look for a reason that would cause the stove to shut down.

Attention: The control board sends power to the Convection blower for the first 30 seconds after turning the stove on and then shuts it off. If in doubt, bypass the Proof of Fire Switch and check for voltage coming from the control board.

a. Inspect the Convection blower and see if it is running once the Proof of Fire switch locks in. If the convection fan isn't running, inspect the wiring for a loose connection.

b. Check to see if the fan is getting voltage from the control board. If voltage is present, hot-wire the fan to double check the blower. If the blower still doesn't come on, replace the blower.

c. If there isn't any voltage at the fan, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board, the control board is bad and needs to be replaced. (*Voltage is line voltage for 30 seconds after the unit is turned on. The fan does not come back on until the P.O.F. Switch is closed 5 minutes later and then the voltage is around 80 volts.)*

d. If the blower is running and the stove has been in use for some time, check the blower for a build-up of dust, lint or pet hair. When the squirrel cage gets dirty, it can't move the proper amount of air and the stove could overheat and shut down.

- ✓ If the switch has been reset and the auger does not come on the next time you start the stove, remove the 2 **Orange** wires from the switch and check the switch for continuity. Replace if it's defective.
- ✓ Unplug the **Orange** wires and check for voltage at the **Orange** wires. ***First Generation Digital Control Boards have Line Voltage on that circuit. Second and Third Generation Digital Control Boards have 5 volts DC***. *(First Generation Control Boards do not have the Thermostat Slide Switch on the front of the board .All other generations have the slide switch.)*
- ✓ If there isn't any voltage on any of the **Orange** wires, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board the control board is bad and needs to be replaced. **Remember: There will only be voltage on one pin at the control board.**
- ✓ If the switch is not defective, check to make sure the **Orange** wires are inserted properly into the Molex connector that plugs into the control board. They may appear to be inserted properly, but sometimes are not connected to the pins on the control board. Push the 2 Orange wires into the Molex connector to ensure they are seated properly.
- ✓ If they are inserted properly, use an OHM meter and check both **Orange** wires for continuity.
- ✓ As a last resort the control board should be replaced. If this problem is intermittent, it most likely is not the control board.

Remember: Once the stove is turned on, both fans come on for 30 seconds, and then the room fan shuts off and goes into a Start-up Cycle. If the high limit switch is tripped, the auger will *not* come on after the initial 5-minute delay. The control board will not sense the P.O.F. switch in the first 15 minutes and the stove will eventually shut down. At this time the #3 LED light will start blinking (First Generation Boards only, Second Generation Boards flash the #2 and #3 light at the same time). This takes approximately 20 minutes

Third let's look at the **Proof of Fire** switch. This is a normally open switch that closes on rise at 110 F. The following items would involve a situation where the stove sensed temperatures in the exhaust system below the normal range.

- ✓ Remove the **P.O.F** switch from the fan and heat up the contact surface of the switch with a lighter until you hear a click (approximately 5 seconds). Test the switch with an Ohm meter for continuity. The switch should be

closed. If it takes significantly longer than 5 seconds, if it doesn't click at all and never closes, or if the switch is constantly closed and never opens, replace the switch.

- ✓ If the switch is not defective, unplug the 2 **Brown** wires from the switch and jump them together. Turn the stove on and wait 5 minutes. After five minutes you should see 2 things:

    1. The room fan comes on.

    2. The ON/OFF light will quit blinking and be ON constantly.

- ✓ If the 2 items listed above do not occur and the ON/OFF light keeps blinking, check to make sure the **Brown** wires are inserted properly into the Molex connector that plugs into the control board. They may appear to be inserted properly, but sometimes are not connected to the pins on the control board. Push the 2 Brown wires into the Molex connector to ensure they are seated properly.
- ✓ If they are inserted properly, use an OHM meter and check both **Brown** wires for continuity.
- ✓ As a last resort the control board should be replaced. If this problem is intermittent, it most likely is not the control board.

Remember: Once the stove is turned on, both fans come on for 30 seconds, and then the room fan shuts off and goes into the Start-up Cycle. If the control board does *not* sense the P.O.F. switch in the first 15 minutes, the stove will shut down and once all fans shut down the #3 LED light will start blinking.

The Auger Motor

Auger Motor - Located near the back-center of the stove and mounted to the Auger Shaft. This 2-RPM motor rotates the Auger Shaft, which in turn feeds the fuel into the Burn Pot. The Auger Motor rotates when the Auger Light is ON, the duration of the ON and OFF cycle will vary depending upon which level has been selected using the Heat Advance button, level 1 through level 5.

Assuming the diagnostic lights are not indicating a problem that has shut down the stove and the auger is not jammed in any way, let's focus on circumstances that could interrupt power to the motor. Power (line voltage) is applied to the auger motor intermittently. If the auger motor is not running when it should, check the following:

Check to see if the High Limit switch has tripped. This will prevent the Auger motor from running.

Check the Fuse on the back of the control board, replace with a 120 Volt, 5 Amp fuse, 5 MM x 20 MM fast acting fuse. First Generation Digital Control Boards have 2 fuses, check the fuse labeled F1. (See Figure 9 on Page 71)

Check for power on the Auger motor circuit.

- ✓ Check all wiring connections to the Auger Motor. The auger Motor has 2 **Red** wires. One wire is plugged into the Terminal block; this is where all the Common connections are made. The other wire is plugged into a **Yellow** wire, which is the Hot connection to the motor. The **Yellow** wire will send an intermittent line voltage signal to the Auger motor.
- ✓ Check the Yellow wire for voltage.
- ✓ If there isn't any voltage, check the **Yellow** wire for continuity using an Ohm meter.
- ✓ Check the wire connection on the opposite end at the Molex connector (**Yellow** wire) that plugs into the control board. They may look OK, but in fact may not be making contact the pins from the control board. Push the Yellow wire into the Molex connector to ensure they are seated properly.
- ✓ Check the wiring connections at the Terminal Block where the white wire plugs in.
- ✓ Hot-wire the Auger motor using a cord with a ¼" Male and ¼" Female connector to make sure the auger motor is not defective.
- ✓ If there isn't any voltage on the Auger circuit, ***carefully*** check for voltage on the pin-out on the control board. If no **Intermittent** voltage is present on the control board, the control board is bad and needs to be replaced.

Convection Fan

Room Air Fan – In all Freestanding Multi-Fuel stove models the fan is located, either in the back of the pedestal or behind the Belly Ash pan in the Leg models. Heat that has generated within the Heat Exchange system can easily be transferred into the room through use of this fan. The Room Air Fan draws cool air from the room, through the back of the stove, past the internal electrical components for cooling circulation, and then is forced through sixteen Heat Exchange Tubes to heat the room.

As an electrical component, the troubleshooting of the convention fan can be broken down to a defective fan, a defective control board, or issues related to the wiring. If the stove lights up and the room fan never comes on the High limit sensor would eventually shut the stove down. Follow these steps to troubleshoot the convection fan:

- ✓ Check the wiring connections to the fan. The **White** wire from the fan connects to the Terminal Block in the back of the stove and the **Black** wire from the fan is connected to the **Pink** wire in the wiring harness.
- ✓ If all connections are tight, check for Voltage at the pink wire.

Attention: The control board sends power to the Convection blower for the first 30 seconds after turning the stove on and then shuts it off. If in doubt, bypass the Proof of Fire Switch and wait 5 minutes to check for voltage coming from the control board. After waiting 5 minutes you should see the ON/OFF light quit blinking and stay on constant. At that point you should read approximately 80 volts.

- ✓ Hot Wire the fan, using a power cord with a ¼" Male and ¼" Female spade connector at this time to see if the fan is defective. If the fan runs, continue trouble shooting the fan circuit in the stove.
- ✓ If there isn't any voltage on the **Pink** wire, check to make sure the **Pink** wire is inserted properly into the Molex connector that plugs into the control board. The wire may appear to be inserted properly, but sometimes is not connected to the pin on the control board. Push the Pink wire into the Molex connector to ensure they are seated properly.
- ✓ Check the **Pink** wire in the harness for continuity if needed using an OHM meter.
- ✓ If the wire is inserted properly, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board, the control board is bad and needs to be replaced. (*See note on page 79 on when voltage is present)*
- ✓ If there isn't any voltage present on the control board, the control board is defective and needs replacing. *(See note below)*

NOTE: The Vacuum switch will affect the way the Convection fan behaves. If the Vacuum switch is closed when the stove is turned on, the convection fan will not run the initial 30 seconds, but will turn on after 5 minutes. This may happen if the switch is defective.

Combustion Fan

Exhaust Fan - Located near the back left-hand-side of the stove under the hopper and mounted on top of the exhaust manifold. This multi-functional fan is used to draw either inside, or in some cases outside, combustion air into the firebox area of the stove and then expel the exhausted gases out through the exhaust manifold and into the atmosphere.

The Advance Heat button will run the Combustion Exhaust Fan at 5 variable speed settings; there are a total of 5 Heat selections available. The first four selections increase the fan speed proportionally; while the last selection runs at the maximum speed setting. Air is drawn into the stove in 2 locations. The first is Combustion air, which travels through the Air Inlet tube into the Burn Pot area; this is where air and fuel get mixed with heat to produce the combusted by-product, which gets sent out the exhaust port. The second location is the Air Wash System; this is where air gets forced down the inner surface of the ceramic glass to provide a clean glass surface for viewing the flame.

As an electrical component, the troubleshooting of the combustion fan can be broken down to a defective fan, a defective control board, or issues related to the wiring. If the stove lights up and the Combustion fan never comes on the Vacuum switch would shut the stove down after approximately 45 seconds. Follow these steps to troubleshoot the convection fan:

- ✓ Check the wiring connections to the fan. The **White** wire from the fan connects to a White wire in the Harness that connects to the Terminal Block in the back of the stove and the **Black** wire from the fan is connected to the **Blue** wire in the wiring harness. There is a 3rd wire coming from the Combustion fan that is not used in the models with the digital control board. This is a **Brown** wire and it is tied back in the harness.
- ✓ If all connections are tight, check for Voltage at the **Blue** wire.

Attention: The control board sends *line voltage* to the Combustion blower for the first 30 seconds after turning the stove on and then it drops to a lower voltage for the start-up cycle. The voltage is approximately 90 volts.

- ✓ Hot Wire the fan, using a power cord with a ¼" Male and ¼" Female spade connector at this time to see if the fan is defective. If the fan runs, continue trouble shooting the fan circuit in the stove. Replace it if it doesn't.
- ✓ If there isn't any voltage on the **Blue** wire, check to make sure the **Blue** wire is inserted properly into the Molex connector that plugs into the control board. The wire may appear to be inserted properly, but sometimes is not connected to the pin on the control board. Push the Blue wire into the Molex connector to ensure they are seated properly.
- ✓ If the wire is inserted properly, ***carefully*** check for voltage on the pin-out on the control board. If no voltage is present on the control board, the control board is bad and needs to be replaced.
- ✓ Check both wires in the harness for continuity if needed with an OHM meter. (White and Blue wire)

Power Cord, Wiring Harness & Terminal Block

These are items that are frequently overlooked when troubleshooting the stove. When Diagnosing electrical problems, be sure to first check all wires for damage and make sure all connections are tight. Check all wires in the Molex plug at the control board. If all else fails check wires that appear to be in good condition for continuity. It may be a problem that you can't see. Use a good quality digital Volt/Ohm meter to check for Continuity.

Safety Features - The remaining electrical components make up the sensors that monitor the stoves for concerns that require the stove to be shut down.

Vacuum Switch

Vacuum Switch – Normally Open, Set Point .05" WC negative Pressure. To troubleshoot the Vacuum switch refer to the section covering the diagnostic features of the Control Board covering the #2 LED diagnostic light.

This switch senses the vacuum (Negative Pressure) in the Firebox and Ash pan area. Located on the left-hand-side of the stove and mounted to the hopper. If the Combustion blower fails, the Main Door or the Ash pan door are left open or the Exhaust Venting system is obstructed, power to the Auger Motor will be interrupted after a 60 second delay and shut down the fuel feed system. At this point the **#2 LED diagnostic light** will start blinking.

Strong wind gusts or obstructed exhaust vents by which large amounts of soot have accumulated, debris has blown around it, birds have built nests in it, etc. may prevent enough Vacuum to build up in the stove body to close the Vacuum Switch. After approximately 60 seconds of losing vacuum power to the Auger Motor will be interrupted. The Room Air Fan and the Combustion Exhaust Fan and the Versa Grate Motor continue to run until the Proof Of Fire switch opens and the fans shut off.

Remember: When performing daily maintenance tasks that involve opening the Main door or the Ash pan door the control board will shut the stove down after approximately 60 seconds. If performing several tasks that would take longer, close the door and let vacuum re-establish before the stove shuts down and then continue.

High Limit Switch

Manual Reset High-Limit switch, 250°F Disc, Normally Closed – To troubleshoot the High Limit switch refer to the section covering the diagnostic features of the Control Board covering the #2 and #3 LED diagnostic light.

This is a **Normally Closed** switch located near the left-hand-side of the stove and mounted directly on the sheet metal Air Jacket. Under normal operating conditions the Air jacket temperature registers below 250°F and the High-Limit 250°F Disc-Thermostat will read Normally Closed; this condition supplies power to the Anger Motor. During extreme operating conditions where temperatures within the sheet metal Air Jacket exceed 250°F the power to the Auger Motor will become interrupted and immediately shutdown the fuel feed system. The auger will not operate until the switch has been manually reset.

The Room Air Fan, the Combustion Fan and the Versa Grate Motor continue to run until the Proof of Fire Switch measures temperatures below 90 degrees in the exhaust system and the P.O.F. switch drops out. At this time the #3 Diagnostic LED light will start blinking with a First Generation Digital Control Board and the #2 and #3 LED light flashes with a Second Generation Control Board. *(First Generation Control Boards do not have the Thermostat Slide Switch on the front of the board .All other generations have the slide switch.)*

Remember: If the switch trips due to excessive temperatures, it must be reset to allow the auger to run. If auger does not run for any reason, check this first.

Proof of Fire Switch

Proof of Fire Switch - 110°F Disc, Normally Open - To troubleshoot the High Limit switch refer to the section covering the diagnostic features of the Control Board covering the #3 LED diagnostic light.

The Proof of Fire switch will sense if the exhaust temperatures rise above 110 F. This indicates a successful lighting of the stove. Once the **Proof of Fire** switch closes, the Convection Fan turns on and blows warm air into the room and the control board switches from the" Start-up" program to the "Normal Operation" Program.

If the temperature drops in the Exhaust system and the Proof of Fire switch opens, without the stove first being shut off, once the fans shut off the #3 LED light will start blinking.

Hopper Lid Switch

Hopper lid switch – This switch is wired to the Normally Open connectors of the switch. Closing the hopper lid will close the circuit to the auger motor and feed pellets to the Burn Pot.

Mechanical System

Door Assembly

Location: The door assembly is in the front center of the stove.

The assembly consists of the cast iron door on the Prescott EXL & EXP models, or a metal frame door on the Hastings models or a Bay metal frame door, the window, the door latch and gasket.

Purpose: The door provides access to the firebox and holds the window glass. The gaskets provide airtight seals into the firebox. The latch secures the door. It **must** remain closed during operation of the stove. The gaskets must make an airtight seal to create Negative Pressure for the stove to operate properly.

Ash Door

Location: The Ash Door is located in the front of Pedestal or in front of the Belly Pan on leg models.

Purpose: The ash door provides access to the ash pan. It is latched with quick release latches. The door **must** be tightly closed during operation. The ash door gaskets must fit tight against the front of the pedestal or belly pan to create Negative Pressure for the stove to operate properly.

Ash Traps

Location: The Ash traps are located in the back wall of the stove behind 2 cover plates and a third clean-out behind the ash pan in certain models.

Purpose: The two ash trap openings allow access to the hot air plenums for removal of ash build-up in this area. The Ash Trap that is located behind the Ash Pan allows access to the transition area from the Firebox to the Exhaust Fan. To clean this area in earlier models, a flexible cable was used to. Please see the new Service Video for information on how the run the cable.

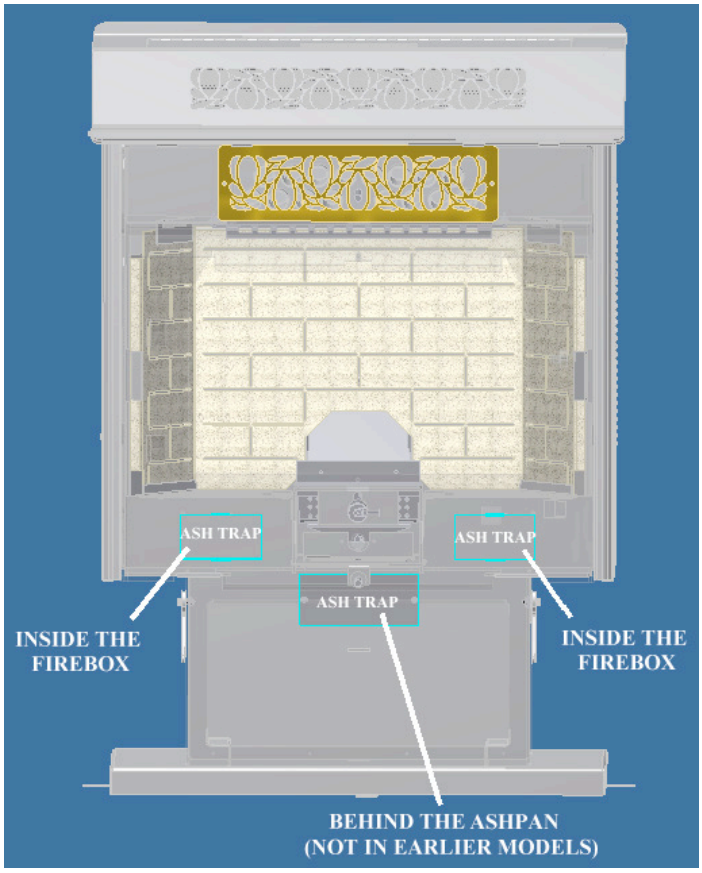


Figure 19
Ash Trap Location
All Freestanding Stoves

Heat Exchange Tubes

Location: The heat exchange tubes are located in the top of the firebox. The back ends of the tubes are over the hot air plenum. The front of the tubes extend through the front wall of the stove. There are 16 Heat Exchange tubes in the Multi Fuel stoves

Purpose: The heat exchange tubes transfer heat from the firebox into the room air that is blown through the tubes.

Heat Exchange Tube Scraper

Location: Above the door, extending through the Hot Air opening. See Figure 22 on Page 97.

Purpose: This rod when pulled back and forth cleans the heat exchange tubes of ash buildup.

Heat Exchange Baffle

Location: The baffle is located below the Heat Exchange Tubes. The front has 2 screws welded to the baffle that are slid into 2 keyhole slots to attach the baffle to the top of the firebox area. The back edge is lifted up and slid over the back wall of the stove. This prevents the baffle from falling out. See Figure 22 on Page 97.

Purpose: The baffle forces the Heated Exhaust gases towards the front of the stove and flow along the full length of the heat exchange tubes. This increases the heat exchange efficiency of the stove, by keeping the heated gases in the stove longer.

Air Plenum – Hot Air Plenum

Location: The hot air plenum is located behind the firebox and is part of the Burn system of the stove. See Figure 20 on Page 95.

Purpose: The hot air plenum carries the hot exhaust gases from the firebox to the exhaust chamber. This plenum also houses the **"Ash Whips".** These whips help remove fly ash from the exhaust gases and deposit them in the Ash Traps.

Air Plenum – Warm Air Plenum

Location: The warm air plenum carries room air from the convection fan, past the hot air plenum where it picks up heat. The room air is then delivered through the heat tubes into the room. See Figure 21 on Page 96.

Purpose: The warm air plenum is located behind the hot air plenum and is part of the Heat Exchange System.

Auger Assembly

Location: The auger is located in the bottom center of the hopper. See Figure 22 on Page 97.

Purpose: The auger is the mechanism that transports Corn from the hopper to the burn grate. The 2 RPM motor located at the back of the auger is controlled by the Digital Control Board and is cycled on and off at varying rates depending on the selected Heat Setting. The **ON** time **increases** and the **OFF** time **decreases** when the Heat Setting is advanced to a higher setting.

Air Inlet Damper

Location: The Air Intake Tube is located on the rear of all stoves. The 2" diameter tube has a butterfly damper in the tube to control the Combustion Air. See Figure 20 on Page 95.

Purpose: The inlet damper is to adjust combustion airflow to match the characteristics of specific air inlet and chimney configurations and can be adjusted for different venting configurations.

Clinker Removal System – Coal Rake

Location: The Coal Rake sits in the upper area of the Burn Pot. See figure 22 on page 97. See Figure 10 through 13 on Pages 72 through 74 for more information on dropping the Clinker.

Purpose: To allow the clinker to be dropped out of the bottom of the Burn pot without loosing the fire in the pot. The Coal Rake keeps the burning corn suspended in the top area of the pot, while dropping the clinker.

Clinker Removal System – Slide-Out Bottom

Location: The Slide-Out Bottom is located below the Burn Pot and the lower rod is used to pull the slide open to drop the clinker. See figure 22 on page 97. See Figures 10 through 13 on Pages 72 through 74 for more information on dropping the clinker

Purpose: Once the Burn Pot has filled with clinker residue the clinker can be dropped out through the bottom of the pot.

Air Flow

Combustion Air / Exhaust Flow

The flow of Combustion air (also called Exhaust Flow) through all St. Croix Multi-Fuel stoves follows a path similar to the one shown in the example below.

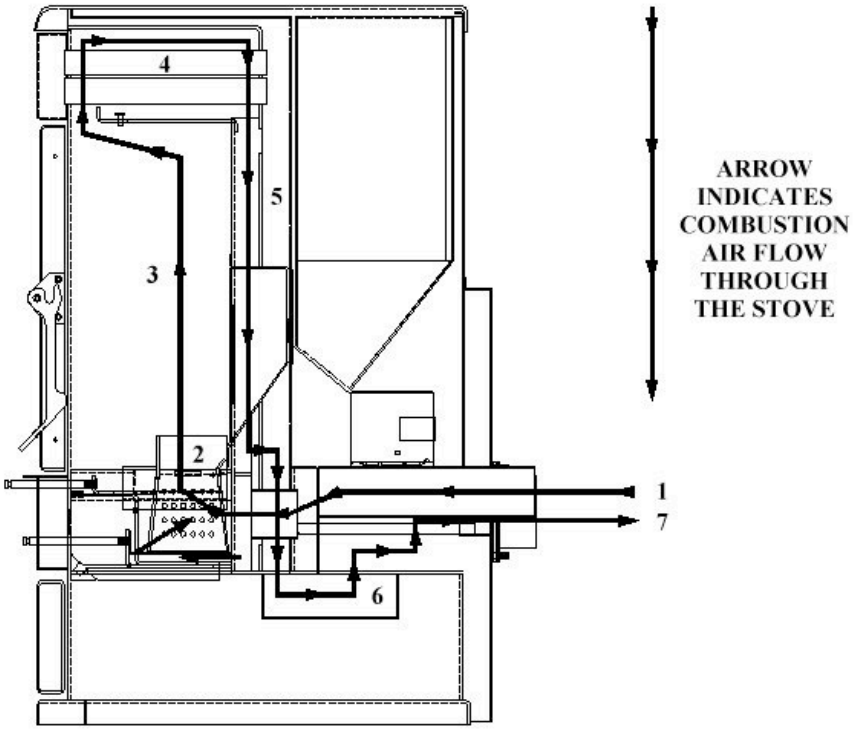


Figure 20

Legend:

1 – Air intake tube
2 – Burn Pot
3 – Firebox Area
4 – Heat Exchange Area
5 – Hot Air Plenum
6 – Exhaust Duct area
7 – Exhaust Outlet

Convection Air / Room Air Flow

The flow of Convection air (also called Room Air) through all St. Croix Multi-Fuel stoves follows a path similar to the one shown in the example below.

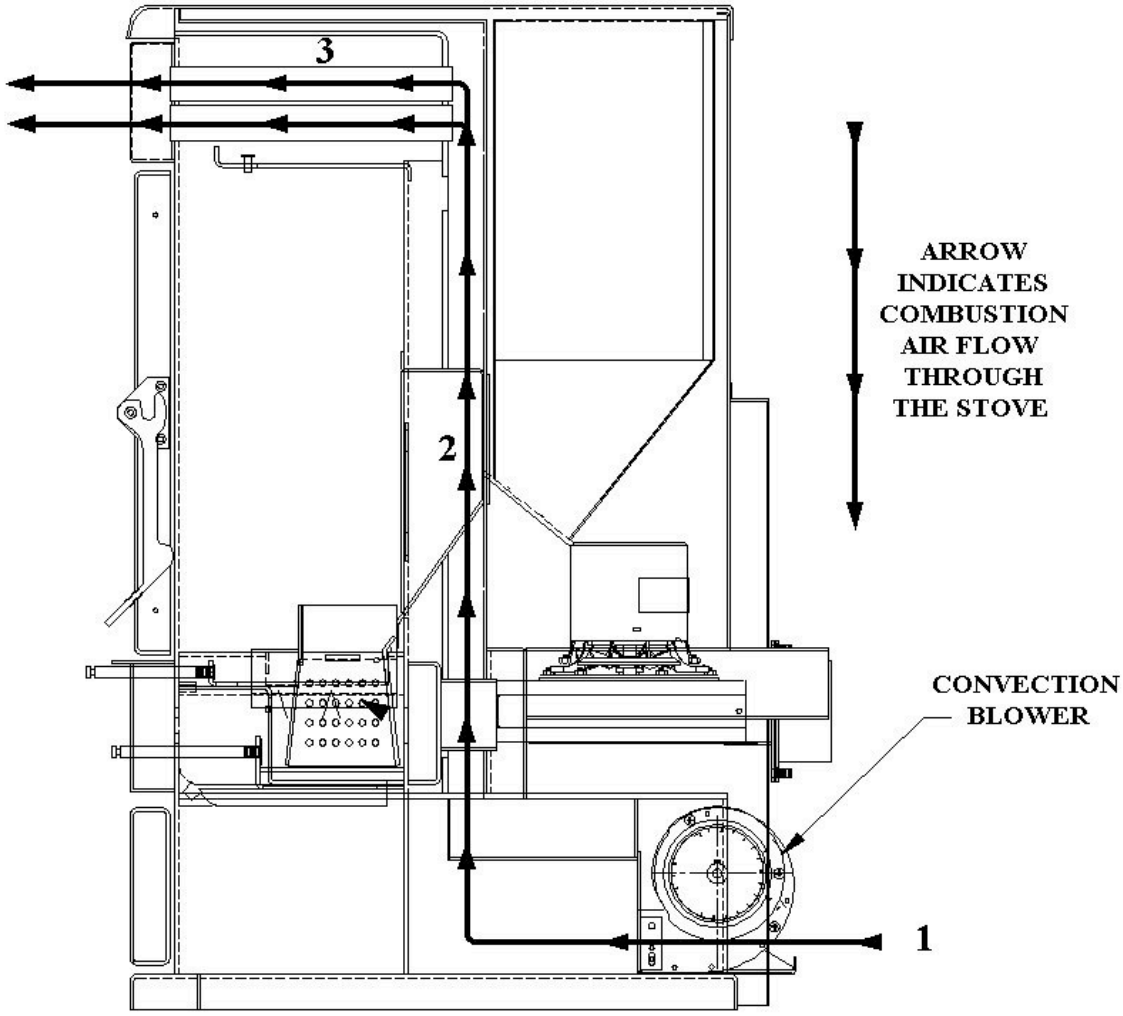


Figure 21

Legend:

1 – Convection air blower
2 – Warm Air Plenum
3 – Heat Exchange Tubes

Fuel Flow – Multi-Fuel Stoves

The flow of Corn through all freestanding St. Croix Corn stoves, follows a path similar to the one shown in the example below.

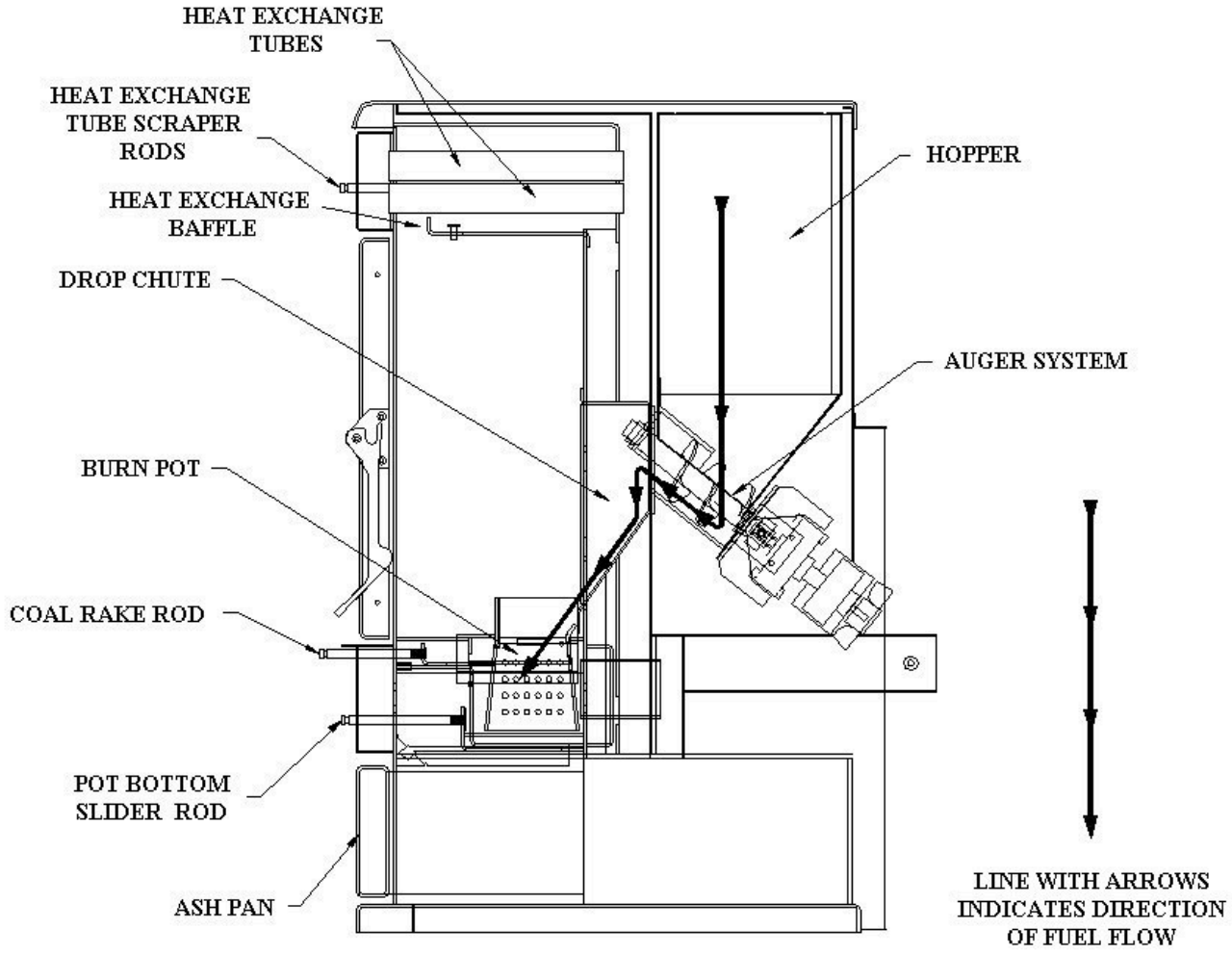
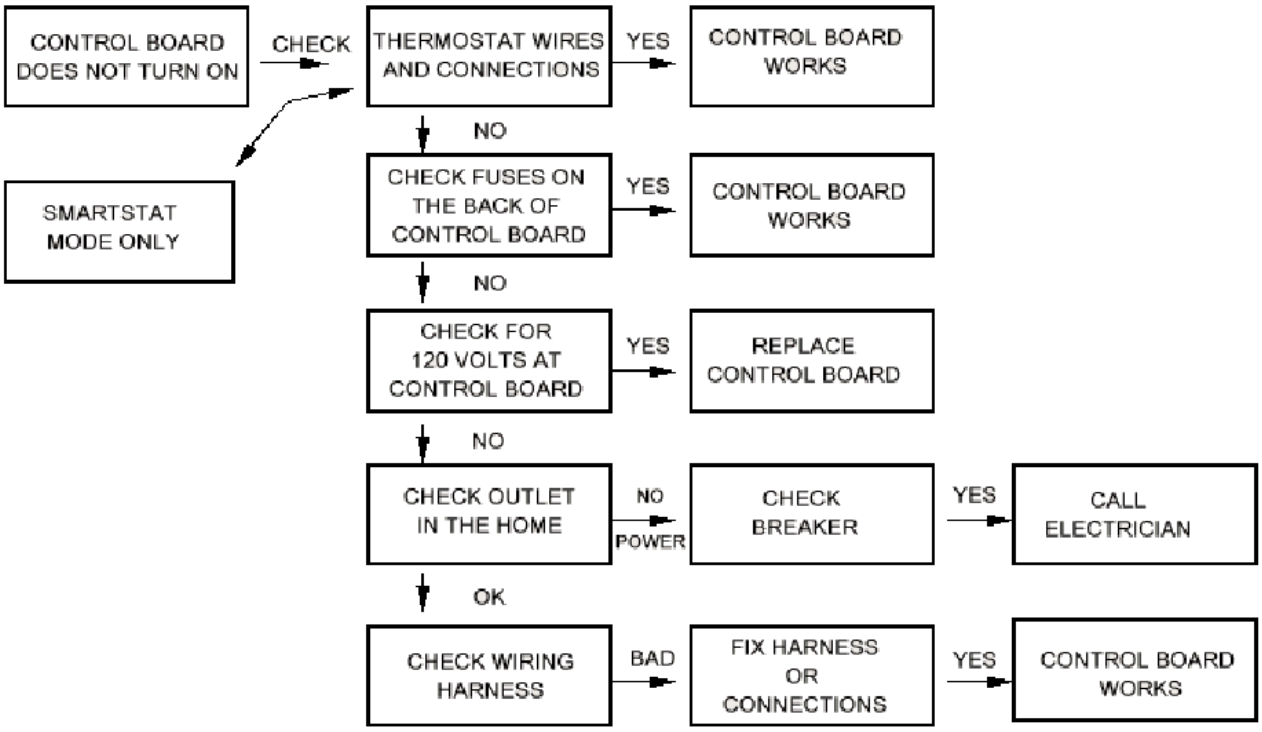


Figure 22

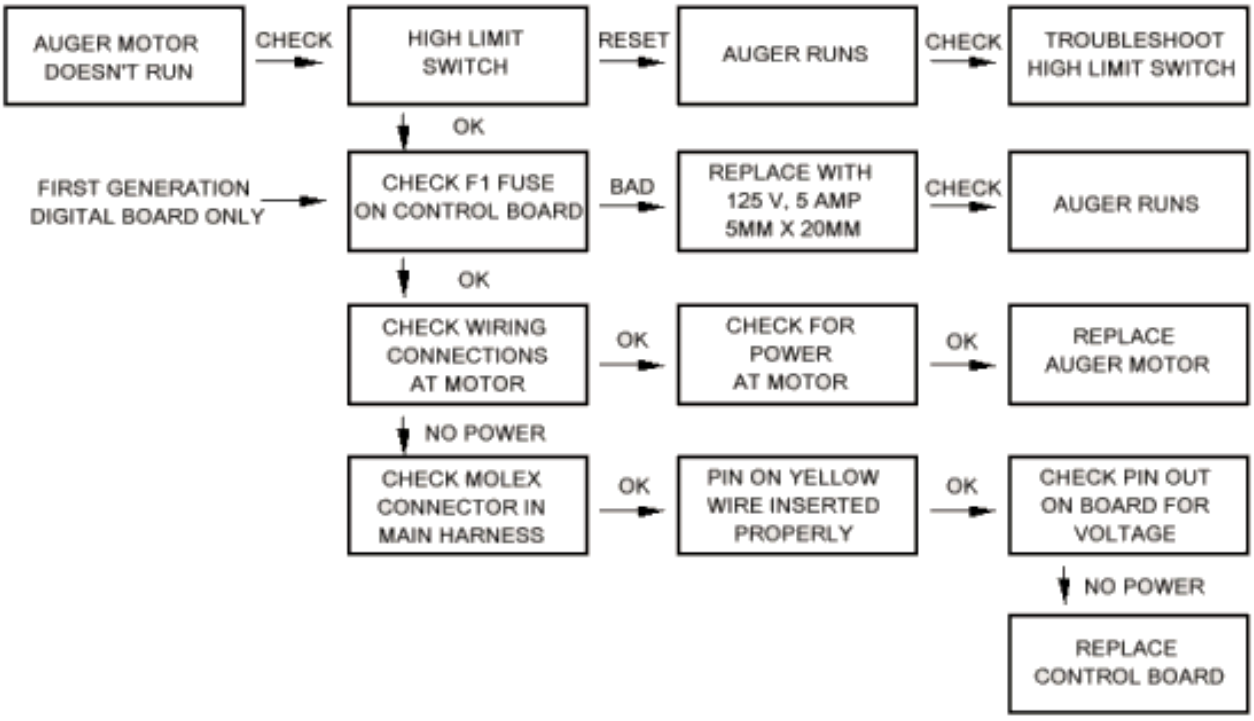
Troubleshooting Flow Charts

Digital Control Board – Board seems dead



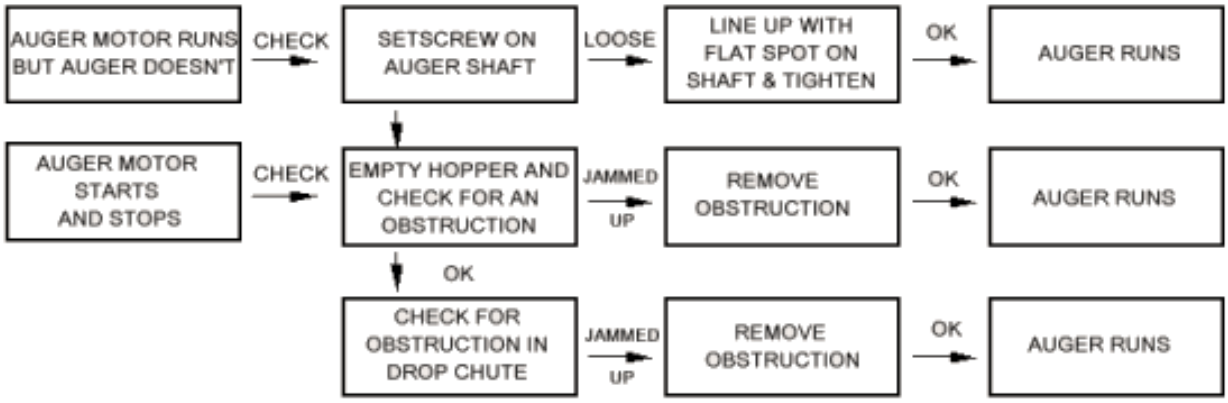
Digital Control Board – Fan Self Test at Start-Up

Auger Motor - Electrical



Remember: Checking for Voltage either at the Harness or directly at the Pin-Out of the control board can only be done when the Auger should be running. The auger runs for 2 minutes during the Start-Up Cycle or runs at a #1 level 5 minutes after the stove is first turned on. Hot-wiring the fan direct with a power cord is also a good way to check the Auger motor.

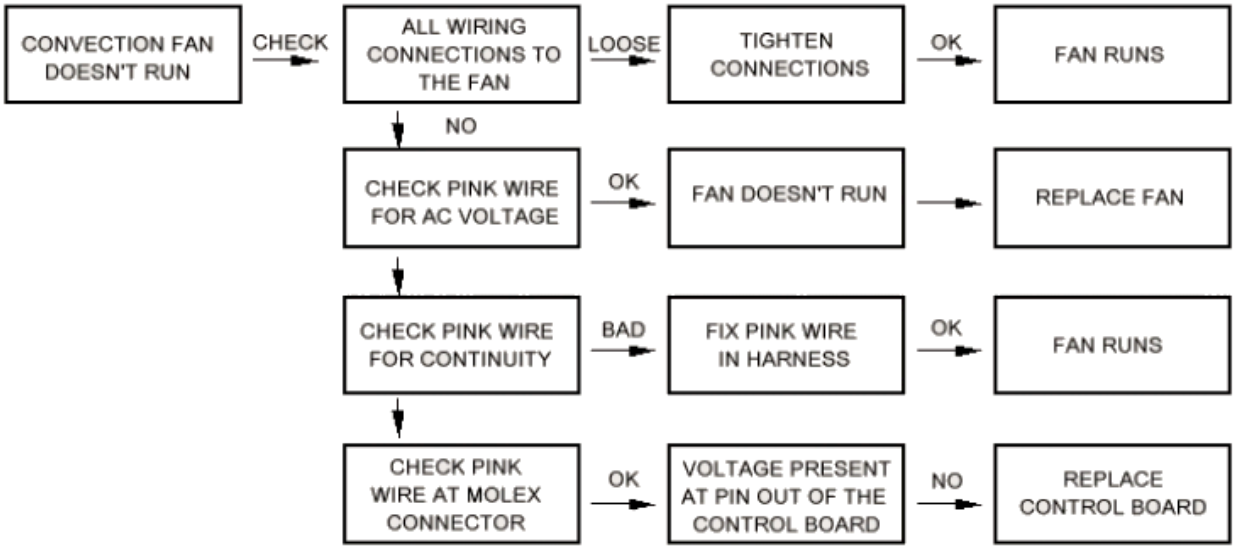
Auger Motor – Mechanical



Notice there are 2 areas to look for an obstruction if the auger is jammed. Many times the Drop-Chute is ignored. This may be where the jam originates, and cleaning the auger tube ***only*** is half of the job.

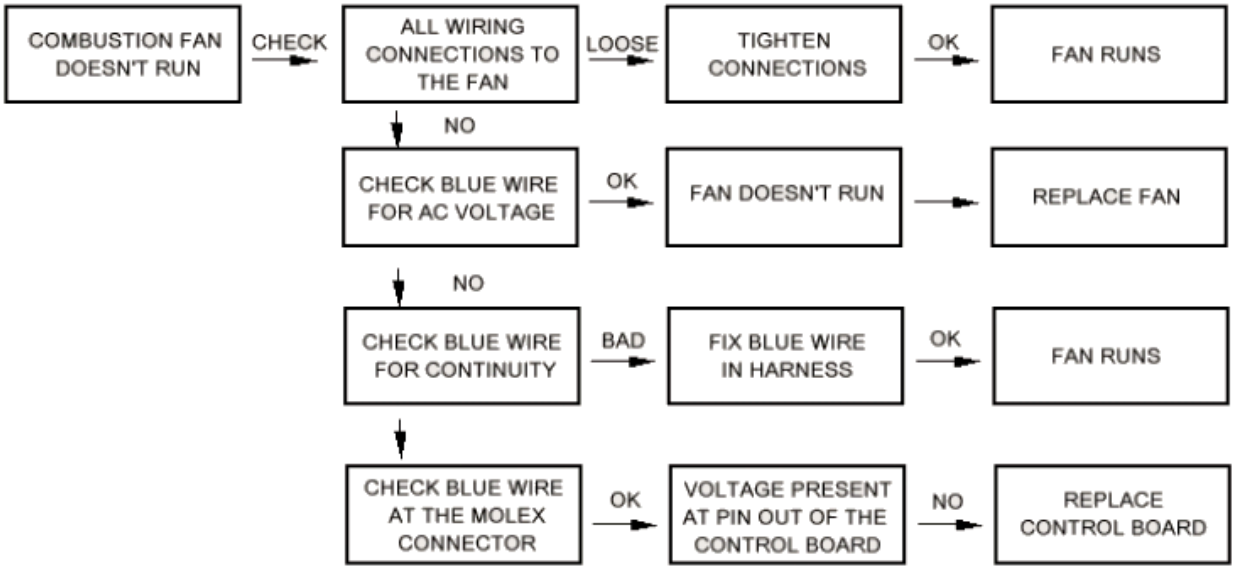
Convection Fan

Attention: The control board sends power to the Convection blower for the first 30 seconds after turning the stove on and then shuts it off. If in doubt, bypass the Proof of Fire Switch and wait 5 minutes to check for voltage coming from the control board. After waiting 5 minutes you should see the ON/OFF light quit blinking and stay on constant. At that point you should read approximately 80 volts.



When in doubt Hot-Wire the fan to a direct source of power to see if fan runs using a cord with two ¼" insulated Male connectors.

Combustion Fan



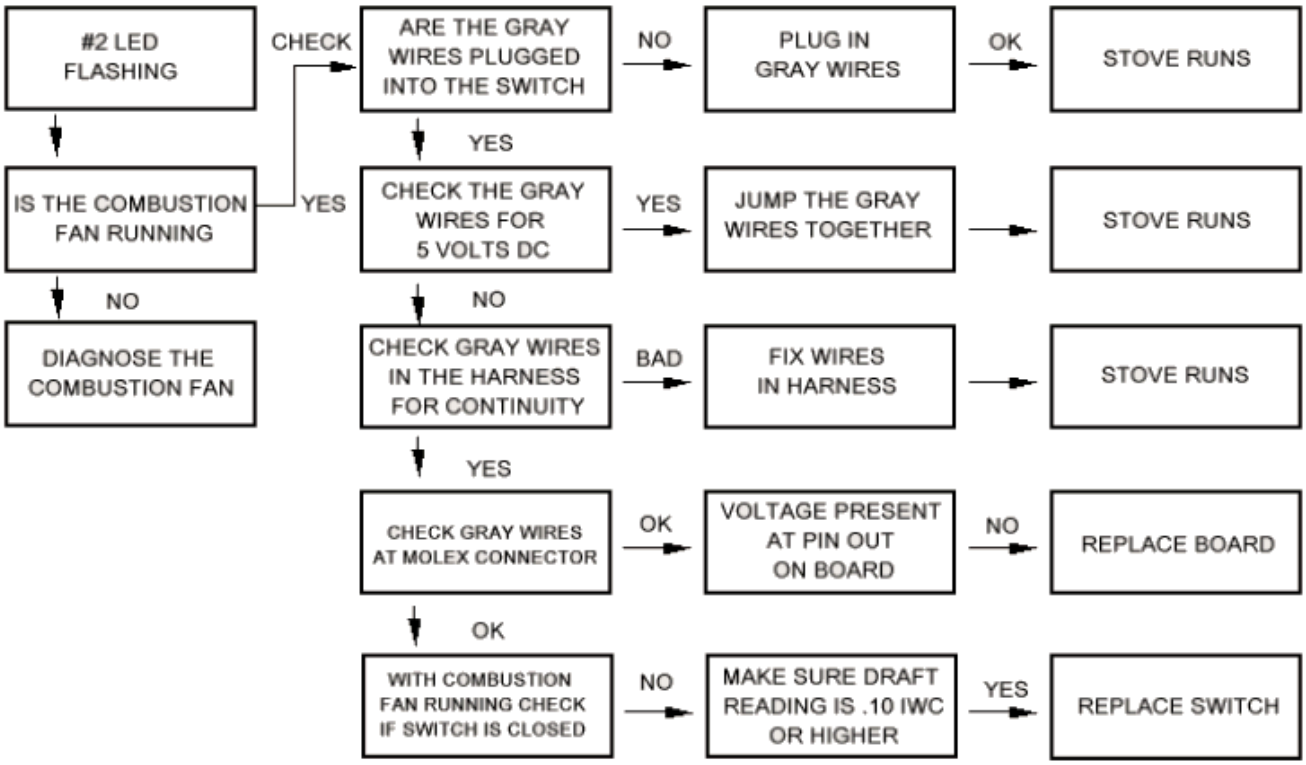
When in doubt Hot-Wire the fan to a direct source of power to see if fan runs using a cord with a ¼" insulated Male connector and ¼" insulated Female connector.

Vacuum Switch

Loss of vacuum may be causes by Operator error or neglect

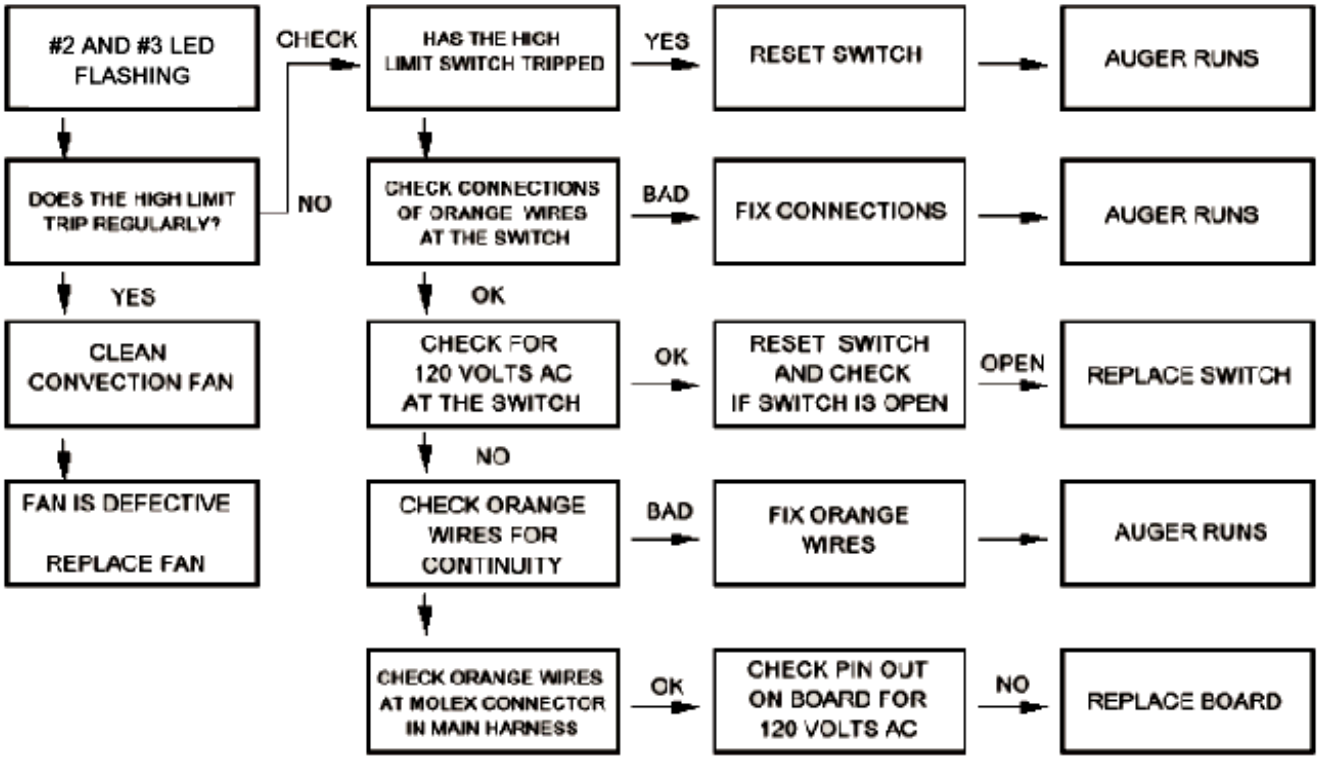
- Leaving the Main Door open too long
- Forgetting to close the Main Door
- Leaving the Ashpan Door open too long
- Forgetting to close the Ashpan Door
- Allowing the Chimney to get plugged.

If an owner calls in with a #2 diagnostic light flashing, first cover all items listed that may be caused by incorrect operation of the stove. Quiz the owner about their habits in regards to the Periodic maintenance. If they have been lax in cleaning the Ash Traps and venting system, have them first clean their stove and try it again.



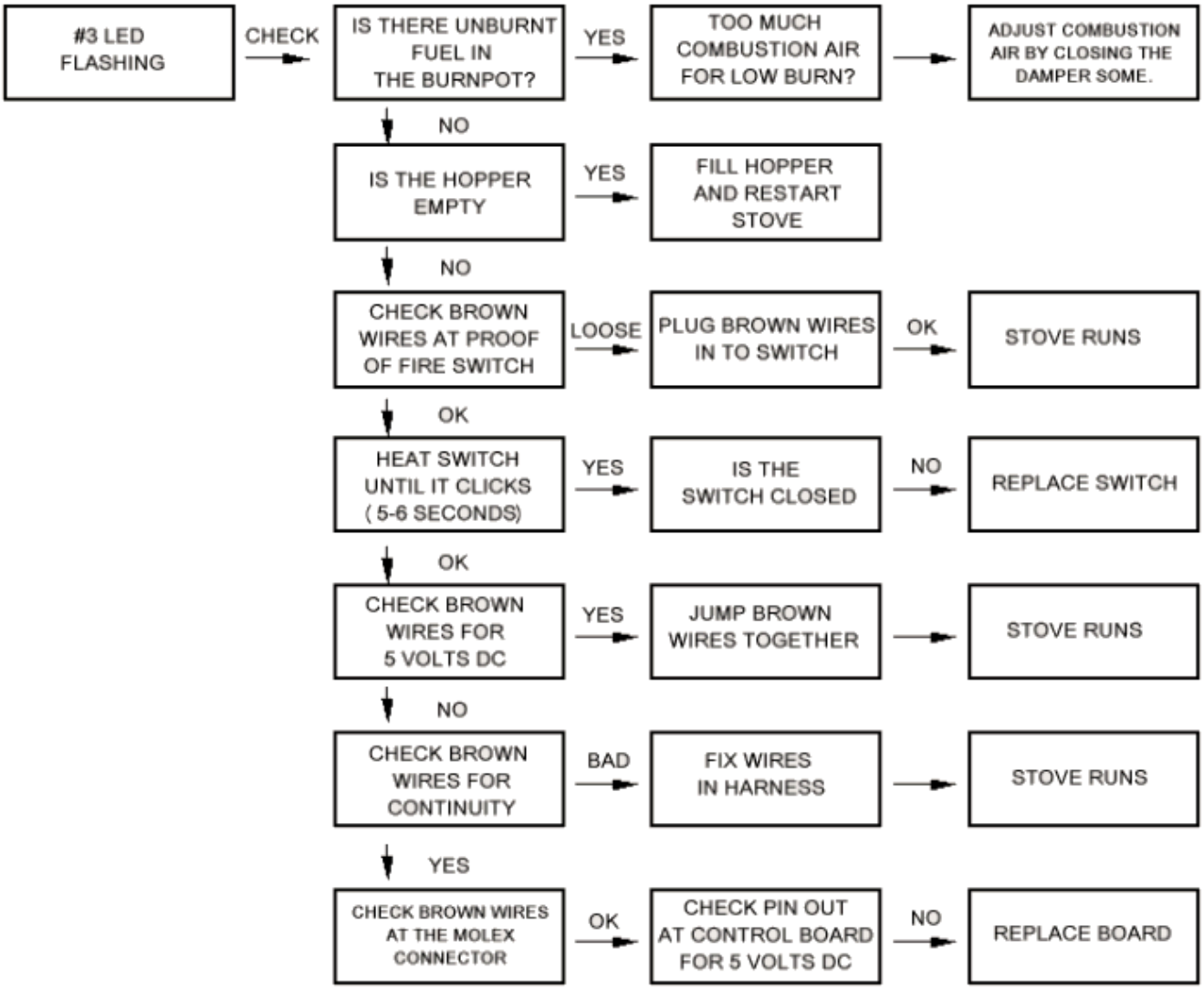
High Limit Switch

The High Limit Switch shuts the stove down in an Over-Temp situation. This usually involves the room air fan. The fan may be defective or the fan may need cleaning. If the squirrel cages become dirty they can't move enough air to keep the stove cool enough when running on the higher settings. If the High Limit trips more than once a closer look should be given to this area of the stove.

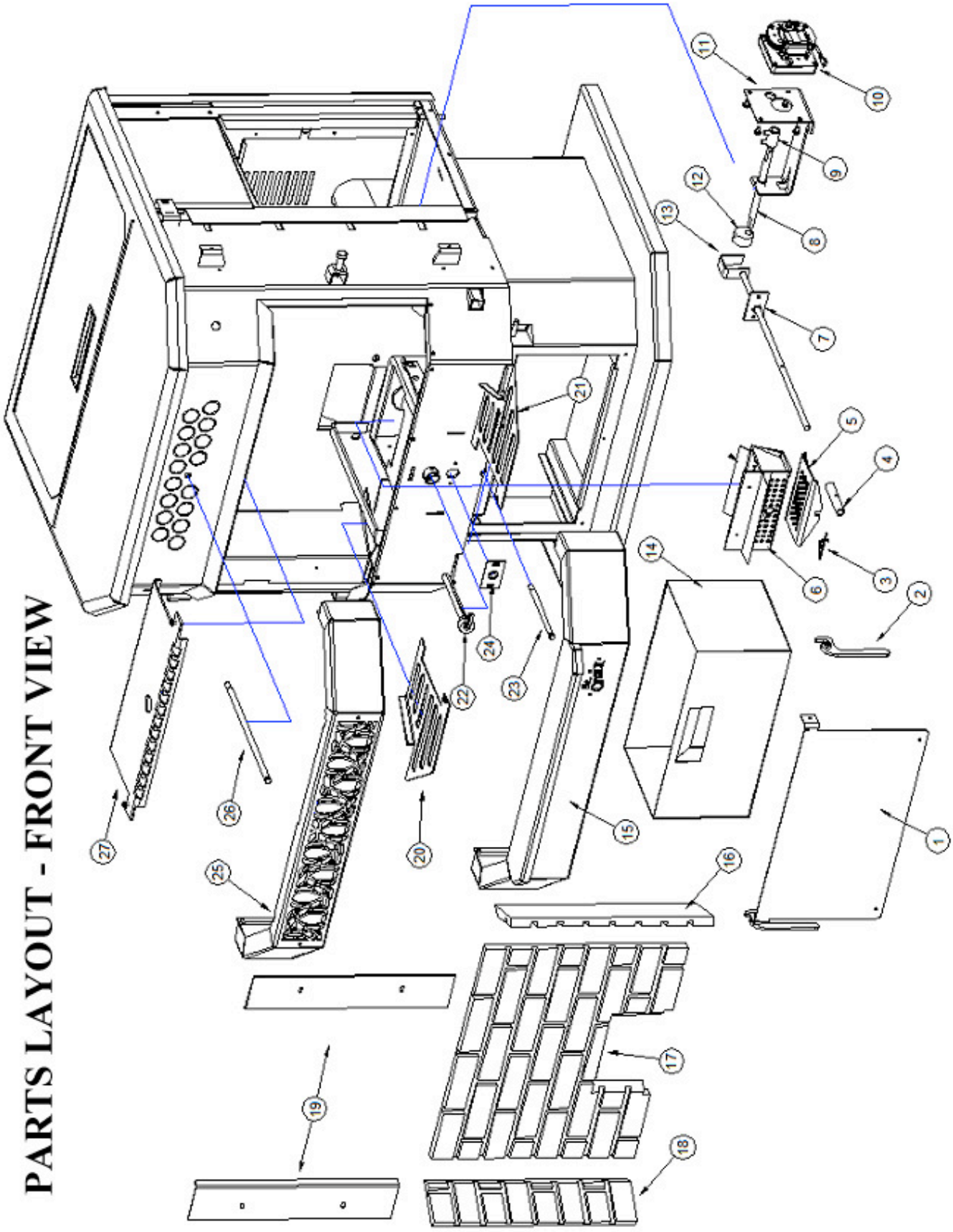


The new control boards have 5 volts DC on the orange wires, not 120 volts AC

Proof of Fire Switch

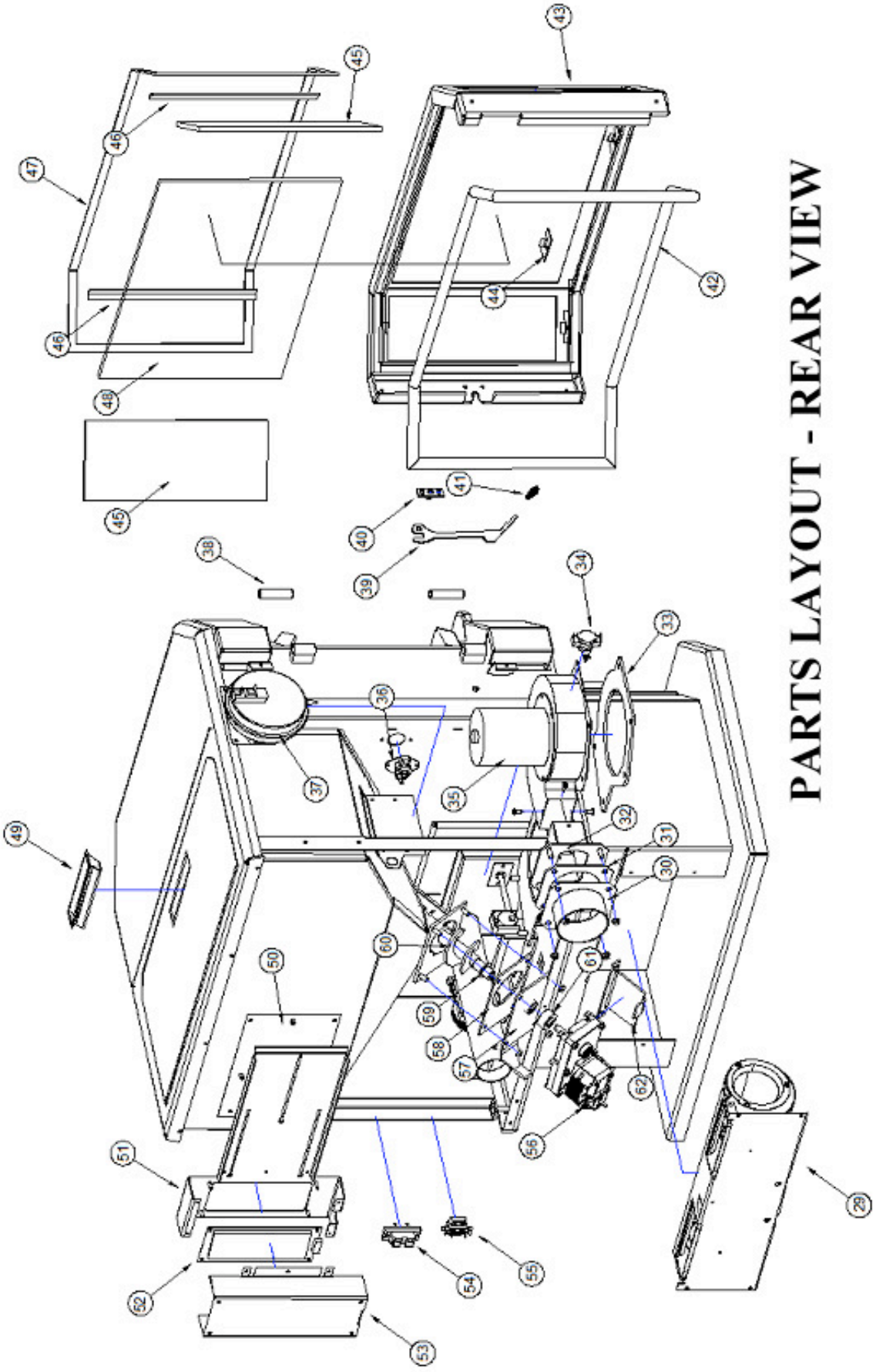


Afton Bay - Part Numbers



CAUTION: The electrical components of the stove are not owner serviceable. Call your dealer for proper diagnosis of electrical problems and service to those components.

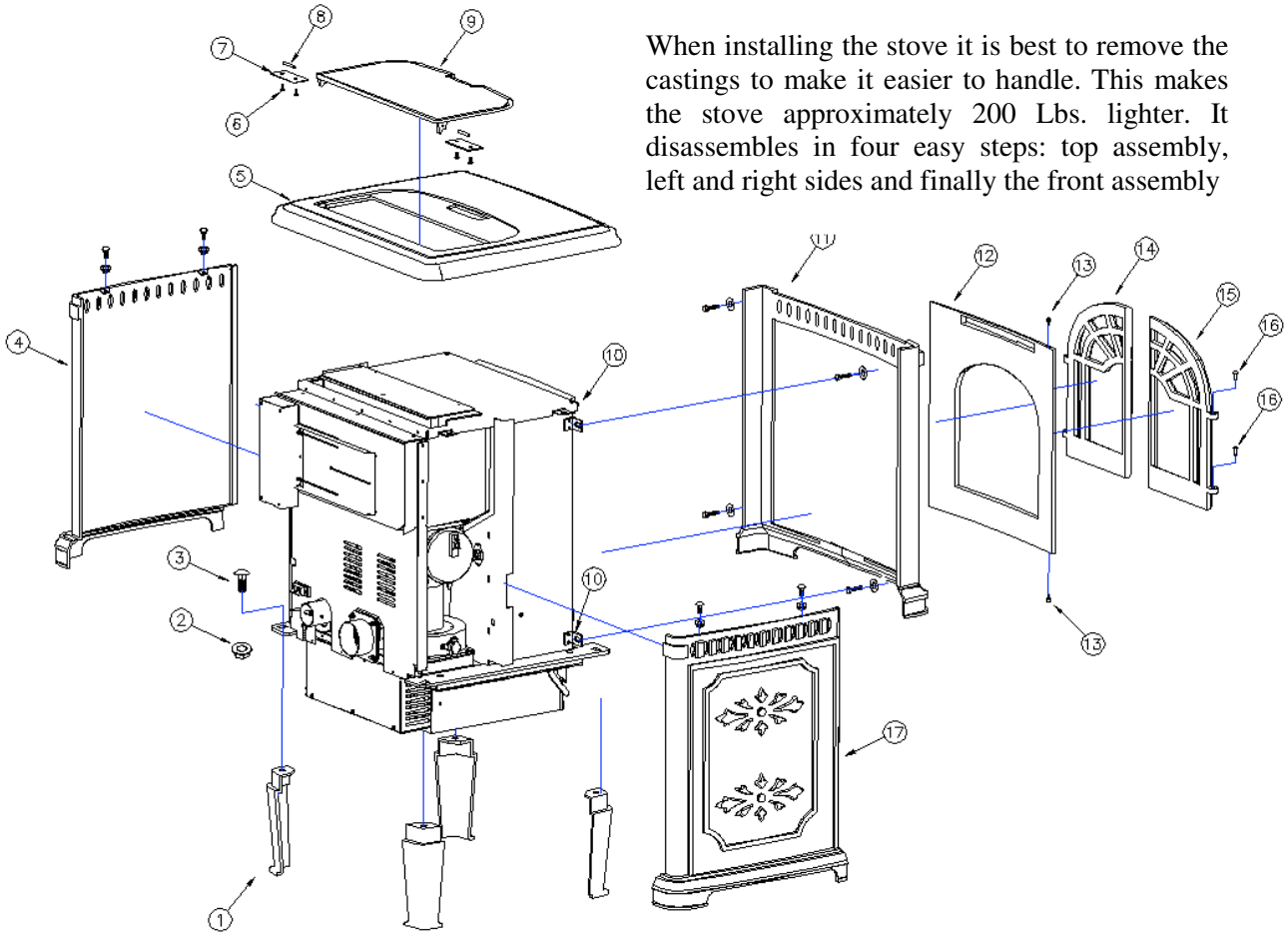
#	PART NUMBER	DESCRIPTION
1	80P53727-R	ASH PAN DOOR WELDMENT
2	80P52762-R	ASH PAN DOOR HANDLE
3	98360A100	SELF LOCKING TWIST PIN
4	80P50553-R	SPACER
5	80P52038-R	SHAKER PLATE
6	80P52980-R	GRATE WELDMENT
7	80P52955-R	REAR BUSHING ASSEMBLY
8	80P52376-R	CAM CONNECTOR ROD
9	80P52372-R	VERSA GRATE COLLAR W/ SETSCREW
10	80P20296-R	VERSA GRATE MOTOR
11	80P52953-R	VERSA GRATE BRACKET ASSEMBLY
12	80P50560-R	CAM
13	80P53695-R	SHAFT/CAGE WELDMENT
14	80P53726-R	ASH PAN WELDMENT
15	80P53794-R	LOWER PANEL
16	80P30593 –R	STEEL BRICK PANEL – RIGHT SIDE
17	80P30577-R	STEEL BRICK PANEL – BACK
18	80P30594 –R	STEEL BRICK PANEL – LEFT SIDE
19	80P52744-R	SIDE TRIM PLATE
20	80P52745-R	DECORATIVE GRILL – LEFT SIDE
21	80P30196-R	DECORATIVE GRILL – RIGHT SIDE
22	80P52727-R	IGNITER/HOT ROD
23	80P52627-R	ASH CLEANOUT ROD
24	80P52954-R	FRONT BUSHING ASSEMBLY
25	80P53770-R	HOT AIR BOX
26	80P52567-R	TUBE SCRAPER ROD
27	80P52944-R	HEAT EXCHANGE BAFFLE


PARTS LAYOUT - REAR VIEW

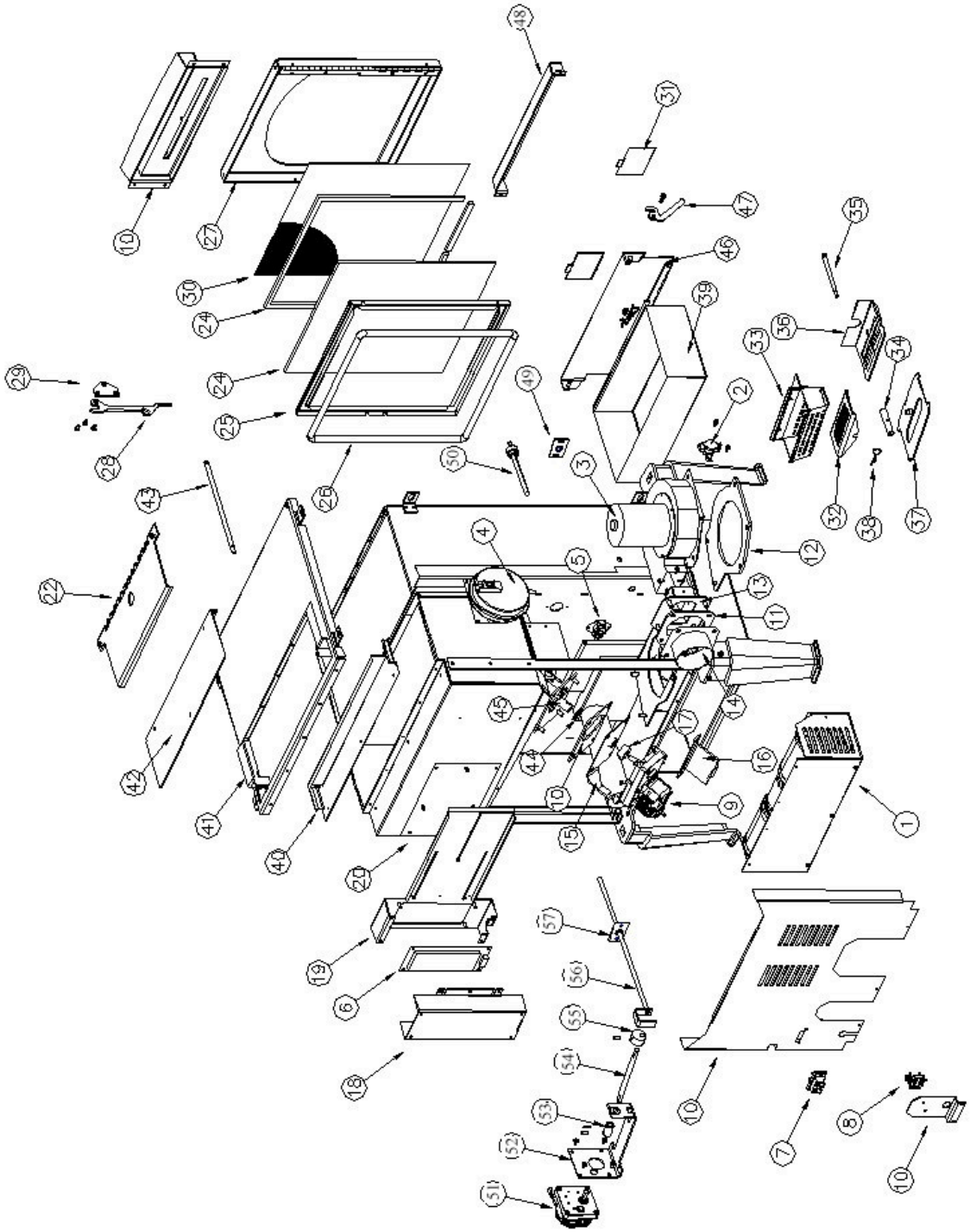
#	PART NUMBER	DESCRIPTION
29	80P53669-R	CONVECTION FAN ASSEMBLY
30	80P52887-R	QUICK CONNECT PIPE ASSEMBLY
31	80P52232-R	QUICK DISCONNECT GASKET
32	80P53667-R	EXHAUST ADAPTER PLATE WELDMENT
33	80P20168-R	COMBUSTION FAN GASKET
34	80P20038-R	PROOF OF FIRE SWITCH
35	80P20001-R	COMBUSTION FAN
36	80P52629-R	MANUAL RESET HIGH LIMIT SWITCH
37	80P52628-R	VACUUM SWITCH
38	80P65021-R	BAY DOOR HINGE PINS – ½”X 2”
39	80P53773-R	BAY DOOR HANDLE
40	80P53723-R	HANDLE MOUNT PLATE ASSEMBLY
41	80P20131-R	SMALL BRASS COIL FOR DOOR HANDLE
42	80P20026-R	DOOR GASKET – 5/8” ROPE
43	80P53724-R	BLACK DOOR FRAME WELDMENT
44	80P52796-R	GLASS CLIP
45	80P20035-R	SIDE BAY GLASS
46	80P20024-R	¾” GLASS GASKET
47	80P20027-R	5/8” GLASS GASKET
48	80P20034-R	FRONT GLASS
49	80P20183-R	HOPPER HANDLE PULL
50	80P53681-R	SLIDE-TOP STANDOFF PLATE ASSEMBLY
51	80P53785-R	CONTROL BOARD MOUNT BOX
52	80P22348-R	CONTROL BOARD
53	80P52658-R	CONTROL BOARD HARNESS RESTRAINT
54	80P30045-R	WIRE TERMINAL – THERMOSTAT
55	80P52630-R	TERMINAL BLOCK
56	80P20278-R	AUGER MOTOR
57	80P52957-R	MOTOR MOUNT BRACKET ASSEMBLY
58	80P20245-R	AUGER GASKET
59	80P50858-R	AUGER BUSHING WASHER
60	80P53666-R	AUGER/SHAFT WELDMENT
61	80P20248-R	5/8” COLLAR WITH SETSCREW
62	80P30191-R	MOTOR RETAINER BRACKET

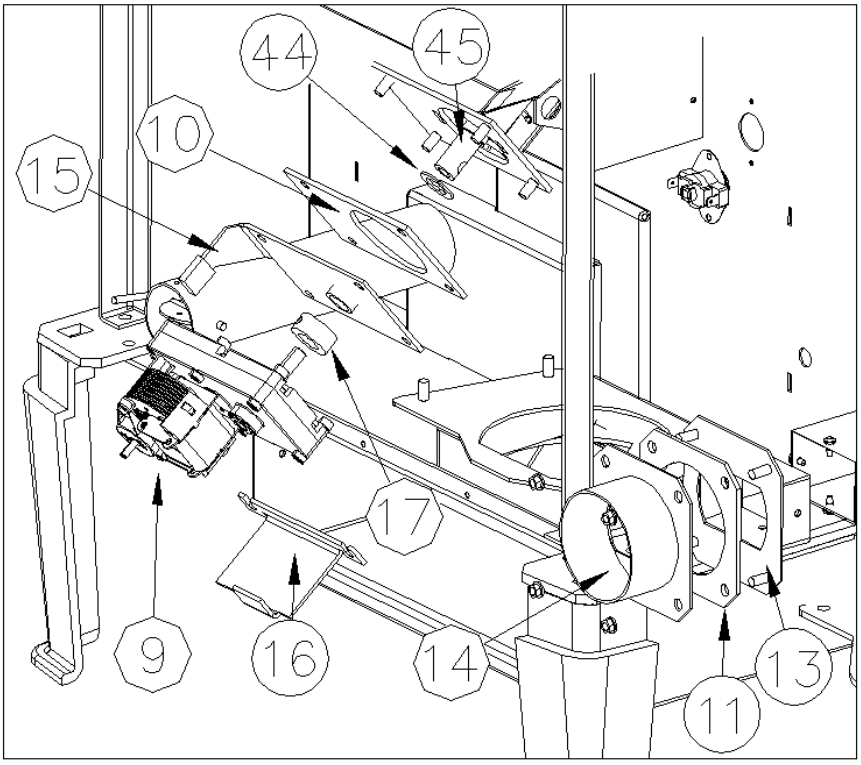
Hastings Cast iron Parts

When installing the stove it is best to remove the castings to make it easier to handle. This makes the stove approximately 200 Lbs. lighter. It disassembles in four easy steps: top assembly, left and right sides and finally the front assembly



#	PART NUMBER		DESCRIPTION
	BLACK	FERRIS GRAY	
1	80P20083-R	80P20083-GR	CAST LEG
2	1/2HFW	←	1/2-13 WHIZNUT
3	1/2X1-1/2CB	←	1/2-13 X 1-1/2 CARRIAGE BOLT
4	80P20090-R	80P20090-GR	CAST SIDE PANEL – RIGHT
5	8OP20088-R	80P20088-GR	CAST TOP
6	80P20102-R	←	MOUNTING SCREWS – CAST HOPPER LID
7	80P20108-R	←	MOUNTING PLATE – CAST HOPPER LID
8	80P20099-R	←	HINGE PINS – CAST HOPPR LID
9	80P20089-R	←	CAST HOPPER LID
10	80P52650-R	←	MOUNTING BRACKET – CAST FRONT PANEL
11	80P20093-R	80P20093-GR	CAST FRONT FRAME
12	80P20094-R	80P20094-GR	CAST FRONT PANEL
13	80P20100-R	←	HINGE PINS – CAST FRONT PANEL
14	80P20098-R	80P20098-GR	CAST DOOR – RIGHT
15	80P20097-R	80P20097-GR	CAST DOOR – LEFT
16	80P20101-R	←	HINGE PINS – CAST DOORS
17	80P20092-R	80P20093-GR	CAST SIDE PANEL – LEFT





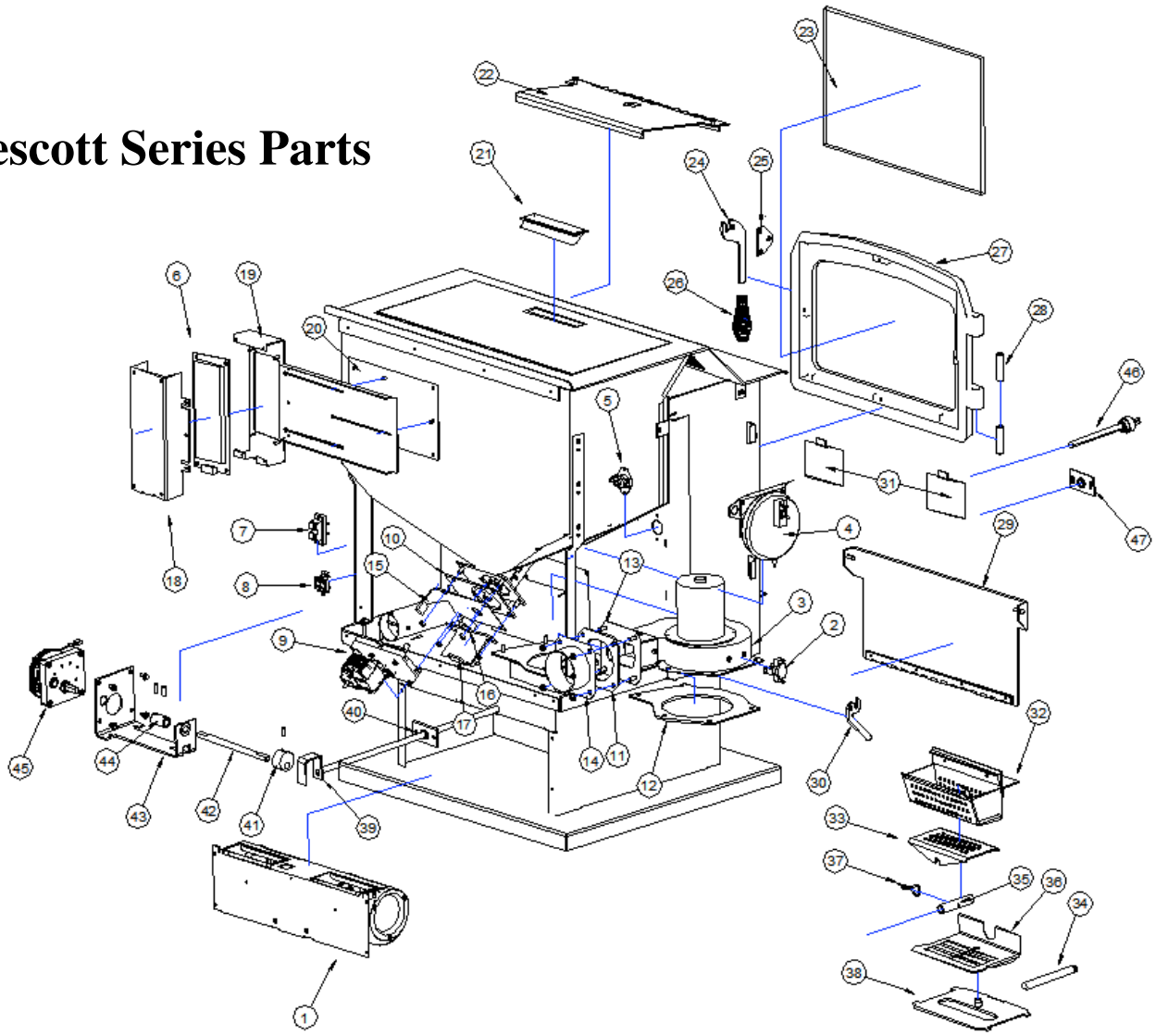
#	PART NUMBER	DESCRIPTION
1	80P53670-R	CONVECTION FAN ASSEMBLY
2	80P20038-R	PROOF OF FIRE SWITCH
3	80P20001-R	COMBUSTION FAN
4	80P52628-R	VACUUM SWITCH
5	80P52629-R	MANUAL RESET HIGH LIMIT
6	80P52632-R	CONTROL BOARD
7	80P30045-R	T-STAT WIRE TERMINAL
8	80P52630-R	WIRING TERMINAL BLOCK
9	80P20278-R	AUGER MOTOR
10	80P20245-R	AUGER GASKET
11	80P52232-R	QUICK DISCONNECT GASKET
12	80P20168-R	COMBUSTION FAN GASKET
13	80P53650-R	EXHAUST ADAPTER WELDMENT
14	80P52887-R	PIPE CONNECTOR ASSEMBLY
15	80P52957-R	AUGER MOUNT BRACKET ASSEMBLY
16	80P30191-R	AUGER MOTOR RETAINER BRACKET
17	80P20248-R	5/8” COLLAR WITH SETSCREW
18	80P52658-R	CONTROL BOARD COVER
19	80P53785-R	CONTROL BOARD MOUNT BOX
20	80P53681-R	SLIDE TOP STANDOFF PLATE
21	80P20183-R	PLASTIC HOPPER HANDLE
22	80P52944-R	HEAT EXCHANGE BAFFLE
23	80P52375-R	GLASS FOR DOOR
24	80P20022-R	GLASS GASKET KIT
25	80P52357-R	GLASS RETAINER

26	**80P20132-R**	**DOOR GASKET KIT**
27	**80P52947-R**	**DOOR FRAME WELDMENT**
28	**80P53773-R**	**DOOR HANDLE**
29	**80P53677-R**	**HANDLE MOUNT PLATE ASSEMBLY**
30	**80P52773-P**	**DOOR SCREEN**
31	**80P52237-R**	**ASH CLEANOUT COVER**
32	**80P52038-R**	**SHAKER PLATE**
33	**80P52980-R**	**GRATE WELDMENT**
34	**80P50553-R**	**SPACER**
35	**80P52643-R**	**ASH CLEANOUT ROD**
36	**80P52765-R**	**INSIDE SLIDE**
37	**80P52967-R**	**POT SLIDER ASSEMBLY**
38	**98360A100**	**SELF LOCKING TWIST PIN**
39	**80P53666-R**	**ASH PAN**
40	**80P52679-R**	**REAR HOPPER SEAL**
41	**80P53684-R**	**FALSE TOP ASSEMBLY**
42	**80P53682-R**	**HOPPER LID ASEMBLY**
43	**80P52567-R**	**TUBE SCRAPER ROD**
44	**80P50858-R**	**AUGER BUSHING WASHER**
45	**80P52956-R**	**AUGER WELDMENT**
46	**80P53632-R**	**BELLY PAN DOOR WELDMENT**
47	**80P52645-R**	**BELLY PAN DOOR HANDLE**
48	**80P52652-R**	**ASH LIP**
49	**80P52954-R**	**FRONT BUSHING ASSEMBLY**
50	**80P52677-R**	**IGNITER/HOT ROD**
51	**80P20296-R**	**VERSA GRATE MOTOR**
52	**80P52953-R**	**VERSA GRATE BRACKET ASSEMBLY**
53	**80P52372-R**	**VERSA GRATE COLLAR W/ SETSCREW**
54	**80P52376-R**	**CAM CONNECTOR ROD**
55	**80P50560-R**	**CAM**
56	**80P52981-R**	**SHAFT/CAGE WELDMENT**
57	**80P52955-R**	**REAR BUSHING ASSEMBLY**

PARTS NOT SHOWN

58	**80P30571-R**	**STEEL BRICK – RIGHT PANEL**
59	**80P30570-R**	**STEEL BRICK – BACK PANEL**
60	**80P30569-R**	**STEEL BRICK – LEFT PANEL**
61	**80P52436-R**	**DECORATIVE GRILL – LEFT SIDE**
62	**80P52436-R**	**DECORATIVE GRILL – RIGHT SIDE**

Prescott Series Parts



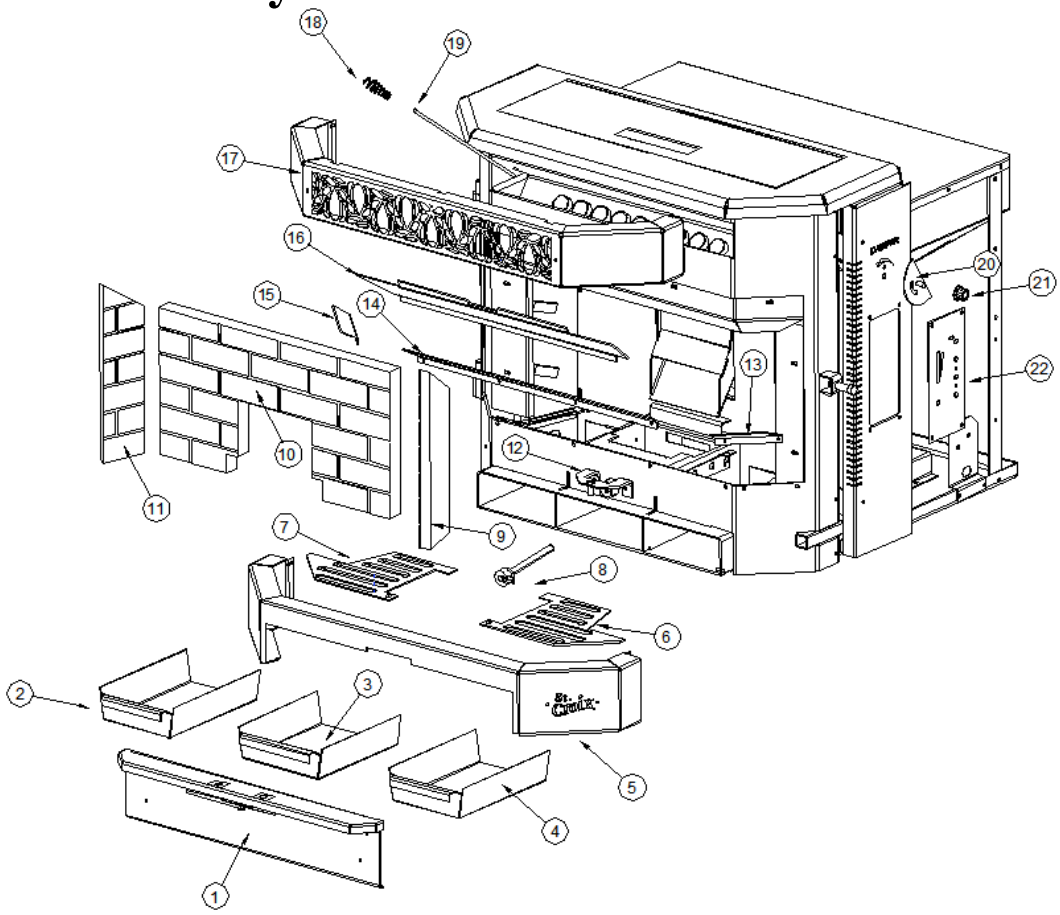
#	PART NUMBER	DESCRIPTION
1	80P20003-R	CONVECTION FAN
2	80P20038-R	PROOF OF FIRE SWITCH
3	80P20001-R	COMBUSTION FAN
4	80P52628-R	VACUUM SWITCH
5	80P52629-R	MANUAL RESET HIGH LIMIT
6	80P22348-R	CONTROL BOARD
7	80P30045-R	T-STAT WIRE TERMINAL
8	80P52630-R	WIRING TERMINAL BLOCK
9	80P20278-R	AUGER MOTOR
10	80P20245-R	AUGER GASKET
11	80P52232-R	QUICK DISCONNECT GASKET
12	80P20168-R	COMBUSTION FAN GASKET
13	80P53650-R	EXHAUST ADAPTER WELDMENT
14	80P52887-R	PIPE CONNECTOR ASSEMBLY
15	80P52957-R	AUGER MOUNT BRACKET ASSEMBLY

#	PART NUMBER	DESCRIPTION
16	80P20248-R	5/8" COLLAR WITH SETSCREW
17	80P30191-R	AUGER MOTOR RETAINER BRACKET
18	80P52658-R	CONTROL BOARD COVER
19	80P53785-R	CONTROL BOARD MOUNT BOX
20	80P53681-R	SLIDE TOP STANDOFF PLATE
21	80P20183-R	PLASTIC HOPPER HANDLE
22	80P52944-R	HEAT EXCHANGE BAFFLE
23	80P20033-R	GLASS FOR CAST DOOR
24	80P53707-R	DOOR HANDLE
25	80P53694-R	HANDLE MOUNT PLATE ASSEMBLY
25	**80P20036-BN**	**NICKEL COIL FOR DOOR HANDLE**
26	**80P20036-R**	**GOLD COIL FOR DOOR HANDLE**
26	**80P20091-R**	**BLACK DOOR FRAME**
26	**80P20032-R**	**GOLD DOOR FRAME**
27	**80P20106-R**	**NICKEL DOOR FRAME**
28	80P65021-R	½" DOWEL HINGE PIN
29	80P52668-R	ASH PAN DOOR ASSEMBLY
30	80P52645-R	ASH DOOR HANDLE
31	80P52237-R	ASH CLEAN OUT COVERS
32	80P52980-R	GRATE WELDMENT
33	80P52038-R	SHAKER PLATE
34	80P52592-R	POT SLIDER CLEAN OUT ROD
35	80P50553-R	SPACER
36	80P52765-R	INSIDE SLIDE
37	90596A029	SELF LOCKING TWIST PIN
38	80P53698-R	POT SLIDER ASSEMBLY
39	80P53695-R	SHAFT/CAGE WELDMENT
40	80P52955-R	REAR BUSHING ASSEMBLY
41	80P50560-R	CAM
42	80P52376-R	CAM CONNECTOR ROD
43	80P52953-R	VERSA GRATE BRACKET ASSEMBLY
44	80P52372-R	VERSA GRATE COLLAR W/ SETSCREWS
45	80P20296-R	VERSA GRATE MOTOR
46	80P52727-R	IGNITER (HOT ROD)
47	80P52954-R	FRONT BUSHING ASSEMBLY
48	80P30579-R	STEEL BRICK – RIGHT SIDE
49	80P30578-R	STEEL BRICK – BACK PANEL
50	80P30577-R	STEEL BRICK – LEFT SIDE
51	80P52775-R	DECORATIVE GRILL – LEFT SIDE
52	80P52774-R	DECORATIVE GRILL – RIGHT SIDE

PARTS NOT SHOWN

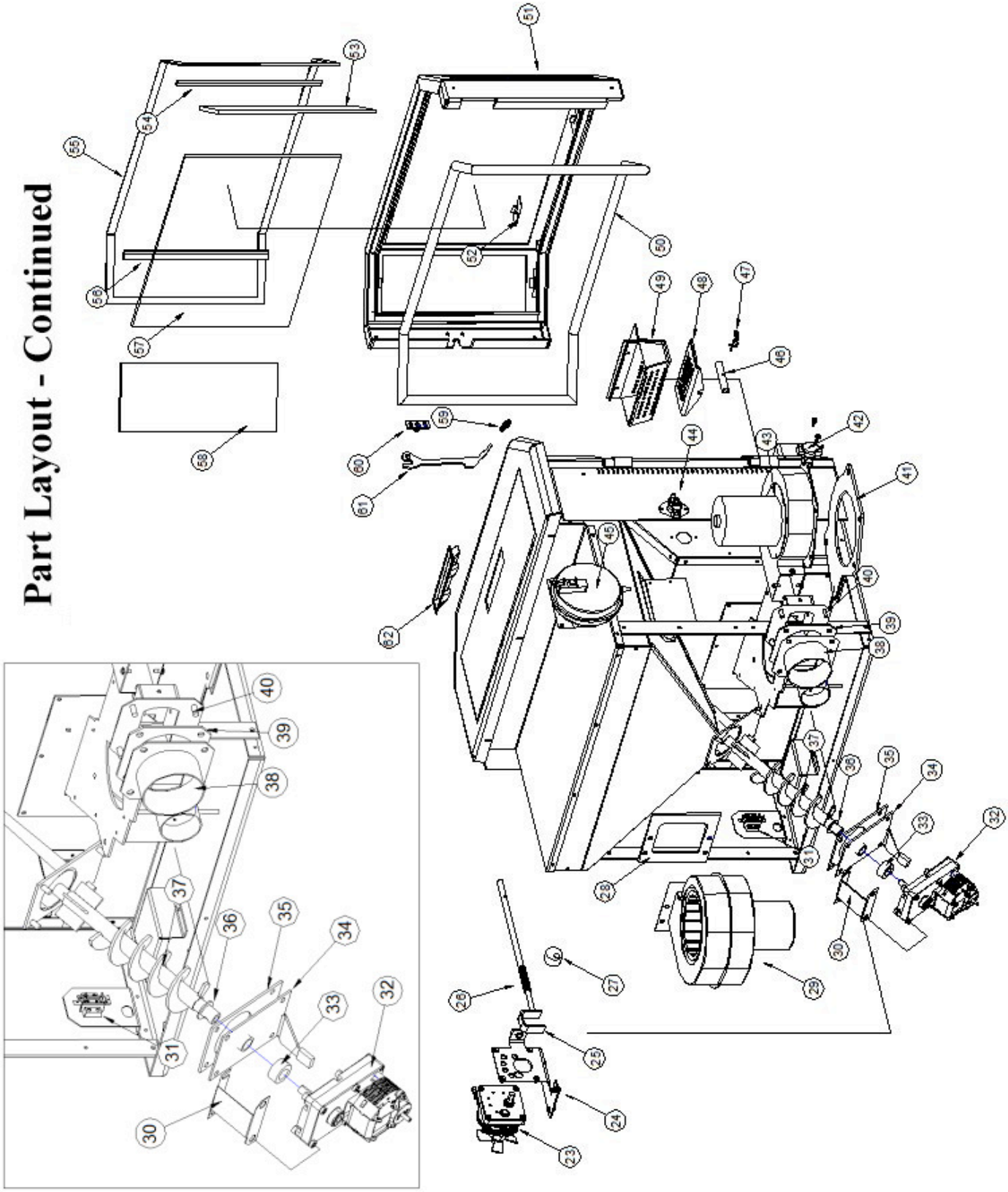
	80P20027-R	5/8" FLAT GLASS GASKET
	80P60083-R	GLASS RETAINER CLIP
	08P20026-R	5/8" DOOR ROPE GASKET
	80P20025-R	ASH PAN DOOR GASKET
	80P20004-R	POWER CORD
	80P21403-R	WIRING HARNESS
	80P52946-R	ASH PAN
	80P53666-R	AUGER SHAFT WELDMENT
	80P20057-R	125VOLT 5 AMP FUSE

York Parts Layout



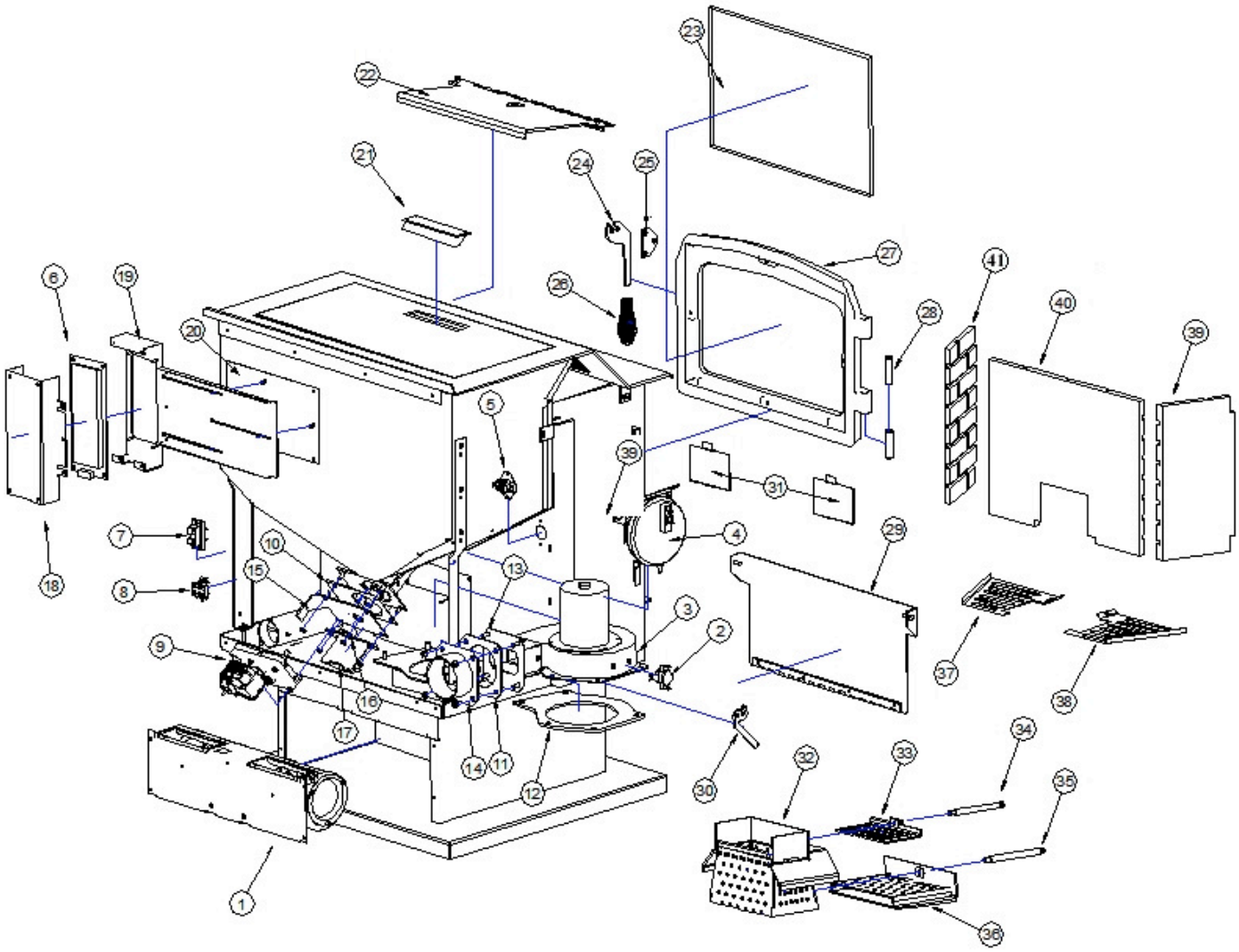
#	PART NUMBER	DESCRIPTION
1	80P52893-R	ASH LIP/DOOR
2	80P52897-R	SIDE ASHPAN
3	80P52899-R	CENTER ASHPAN
4	80P52897-R	SIDE ASHPAN
5	80P52901-R	LOWER TRIM PANEL
6	80P52263-R	DECORATIVE GRILL – RIGHT
7	80P52263-R	DECORATIVE GRILL – LEFT
8	80P52677-R	IGNITER/HOT ROD
9	80P30575-R	STEEL BRICK PANEL – RIGHT SIDE
10	80P30572-R	STEEL BRICK PANEL – BACK
11	80P30576-R	STEEL BRICK PANEL – LEFT SIDE
12	80P53616-R	LATCH BLOCK ASSEMBLY
13	80P52144-R	RIGHT ASH LIP
14	80P52145-R	LEFT ASH LIP
15	80P52146-R	CENTER ASH LIP
16	80P52087-R	HEAT EXCHANGE BAFFLE
17	80P53770-R	HOT AIR BOX
18	80P20306-R	SMALL BRASS COIL
19	80P52099-R	TUBE SCRAPER ROD
20	80P53788-R	DAMPER CONTROL PLATE ASSEMBLY
21	92N4114	DAMPER CONTROL KNOB
22	80P22348-R	CONTROL BOARD

Part Layout - Continued



#	PART NUMBER	DESCRIPTION
23	80P20296-R	VERSA GRATE MOTOR
24	80P53402-R	MOTOR MOUNT ASSEMBLY
25	80P53400-R	SHAFT/CAGE WELDMENT
26	80P20340-R	VERSA GRATE SPRING
27	80P50560-R	CAM
28	80P20196-R	CONVECTION FAN GASKET
29	80P20000-M	CONVECTION FAN
30	80P50899-R	MOTOR RETAINER BRACKET
31	80P52630-R	TERMINAL BLOCK
32	80P20278-R	AUGER MOTOR
33	80P20248-R	5/8” COLLAR W/ SETSCREW
34	80P52957-R	MOTOR MOUNT BRACKET
35	80P20245-R	AUGER GASKET
36	80P50858-R	AUGER BUSHING WASHER
37	80P53666-R	AUGER WELDMENT
38	80P52887-R	QUICK CONNECT PIPE ASSEMBLY
39	80P52232-R	QUICK DISCONNECT GASKET
40	80P53667-R	EXHAUST ADAPTER PLATE WELDMENT
41	80P20168-R	COMBUSTION FAN GASKET
42	80P20038-R	PROOF OF FIRE SWITCH
43	80P20001-R	COMBUSTION FAN
44	80P52629-R	MANUAL RESET HIGH LIMIT SWITCH
45	80P52628-R	VACUUM SWITCH
46	80P50553-R	SPACER
47	98360A100	SSELF LOCKING TWIST PIN
48	80P52038-R	SHAKER PLATE
49	80P52828-R	GRATE WELDMENT
50	80P20026-R	DOOR GASKET – 5/8” ROPE
51	80P53724-R	BLACK BAY DOOR FRAME
52	80P52796-R	GLASS CLIP
53	80P20035-R	BAY SIDE GLASS
54	80P20024-R	3/4’” WINDOW GASKET W/ ADHESIVE
55	80P20027-R	5/8” WINDOW GASKET W/ ADHESIVE
56	80P20024-R	3/4’” WINDOW GASKET W/ ADHESIVE
57	80P20034-R	CENTER DOOR GLASS
58	80P20035-R	BAY SIDE GLASS
59	80P20131-R	SMALL BRASS HANDLE COIL
60	80P53723-R	HANDLE MOUNT PLATE
61	80P53773-R	DOOR HANDLE
62	80P20183-R	HANDLE PULL – HOPPER
PARTS NOT SHOWN		
63	80P20004-R	POWER CORD
64	80P30074-R	WIRING HARNESS – INSERT
65	80P65021-R	HINGE PINS – MAIN DOOR
66	80P53787-R	DAMPER CABLE ASSEMBLY

Auburn Parts Lay out



#	PART NUMBER	DESCRIPTION
1	80P20003-R	CONVECTION FAN
2	80P20038-R	PROOF OF FIRE SWITCH
3	80P20001-R	COMBUSTION FAN
4	80P52628-R	VACUUM SWITCH
5	80P52629-R	MANUAL RESET HIGH LIMIT
6	80P52632-R	CONTROL BOARD
7	80P30045-R	T-STAT WIRE TERMINAL
8	80P52630-R	WIRING TERMINAL BLOCK
9	80P20278-R	AUGER MOTOR
10	80P20245-R	AUGER GASKET
11	80P52232-R	QUICK DISCONNECT GASKET
12	80P20168-R	COMBUSTION FAN GASKET
13	80P53650-R	EXHAUST ADAPTER WELDMENT
14	80P52887-R	PIPE CONNECTOR ASSEMBLY
15	80P52957-R	AUGER MOUNT BRACKET ASSEMBLY

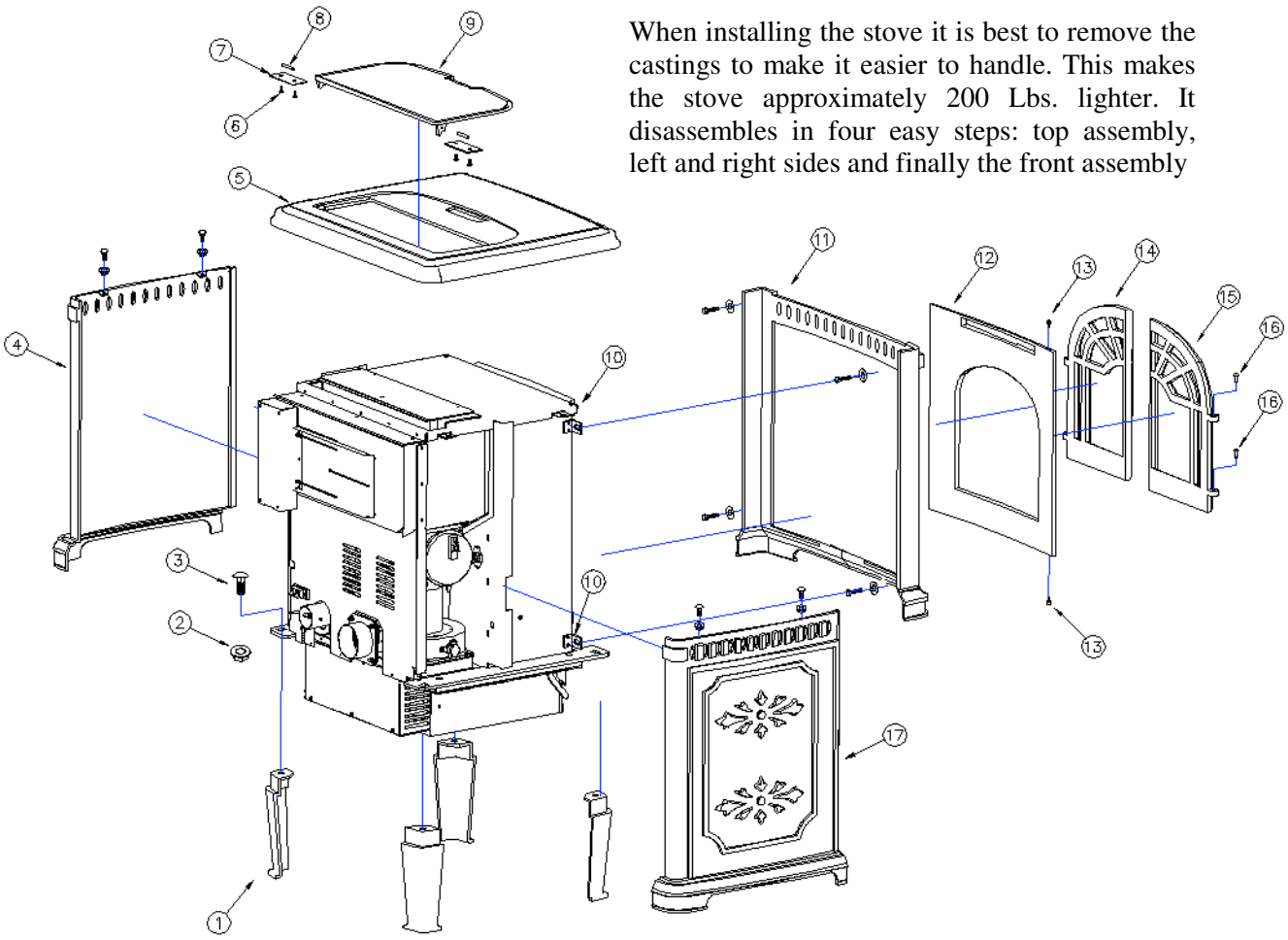
#	PART NUMBER	DESCRIPTION
16	80P20248-R	5/8” COLLAR WITH SETSCREW
17	80P30191-R	AUGER MOTOR RETAINER BRACKET
18	80P52658-R	CONTROL BOARD COVER
19	80P53785-R	CONTROL BOARD MOUNT BOX
20	80P53681-R	SLIDE TOP STANDOFF PLATE
21	80P20183-R	PLASTIC HOPPER HANDLE
22	80P52944-R	HEAT EXCHANGE BAFFLE
23	80P20033-R	GLASS FOR CAST DOOR
24	80P53707-R	DOOR HANDLE
25	80P53694-R	HANDLE MOUNT PLATE ASSEMBLY
25	**80P20036-BN**	**NICKEL COIL FOR DOOR HANDLE**
26	**80P20036-R**	**GOLD COIL FOR DOOR HANDLE**
26	**80P20091-R**	**BLACK DOOR FRAME**
26	**80P20032-R**	**GOLD DOOR FRAME**
27	**80P20106-R**	**NICKEL DOOR FRAME**
28	80P65021-R	½” DOWEL HINGE PIN
29	80P52668-R	ASH PAN DOOR ASSEMBLY
30	80P52645-R	ASH DOOR HANDLE
31	80P52237-R	ASH CLEAN OUT COVERS
32	80P53836-R	CORN POT
33	80P53649-R	COAL RAKE
34	80P52592-R	COAL RAKE ROD
35	80P52627-R	SLIDE OUT BOTTOM ROD
36	80P53657-R	SLIDE OUT BOTTOM
37	80P30050-R	DECORATIVE GRILL – RIGHT SIDE
38	80P30049-R	DECORATIVE GRILL – LEFT SIDE
39	80P30578-R	LEFT SIDE BRICK PANEL-STEEL
40	80P30577-R	BACK BRICK PANEL-STEEL
41	80P30579-R	RIGHT SIDE BRICK PANEL-STEEL

PARTS NOT SHOWN

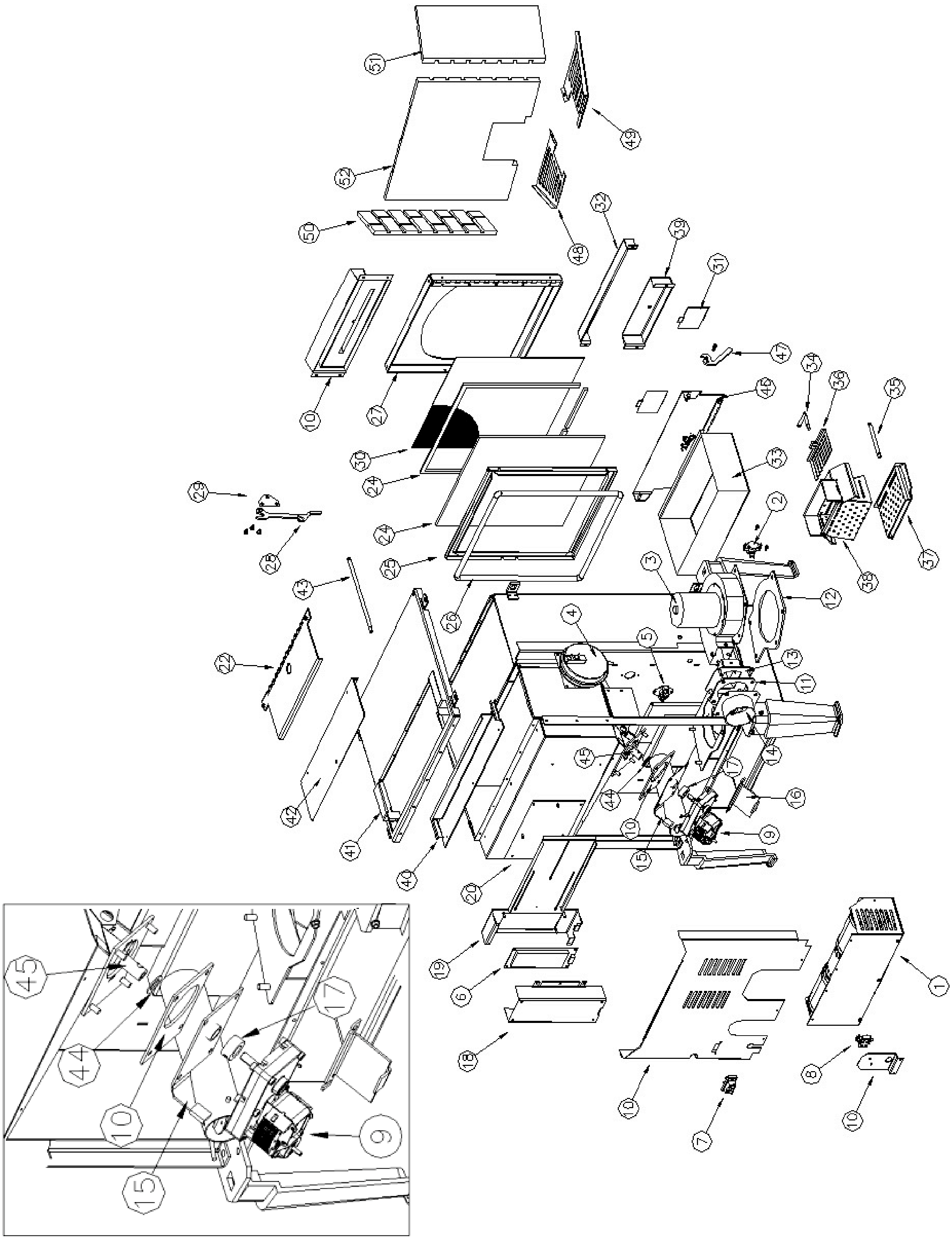
	80P20027-R	5/8” FLAT GLASS GASKET
	80P60083-R	GLASS RETAINER CLIP
	08P20026-R	5/8” DOOR ROPE GASKET
	80P20025-R	ASH PAN DOOR GASKET
	80P20004-R	POWER CORD
	80P52693-R	WIRING HARNESS
	80P52946-R	ASH PAN
	80P53666-R	AUGER SHAFT WELDMENT
	80P20057-R	250 VOLT 5 AMP FUSE

Greenfield Cast iron Parts

When installing the stove it is best to remove the castings to make it easier to handle. This makes the stove approximately 200 Lbs. lighter. It disassembles in four easy steps: top assembly, left and right sides and finally the front assembly



#	PART NUMBER		DESCRIPTION
	BLACK	FERRIS GRAY	
1	80P20083-R	80P20083-GR	CAST LEG
2	1/2HFW	←	1/2-13 WHIZNUT
3	1/2X1-1/2CB	←	1/2-13 X 1-1/2 CARRIAGE BOLT
4	80P20090-R	80P20090-GR	CAST SIDE PANEL – RIGHT
5	8OP20088-R	80P20088-GR	CAST TOP
6	80P20102-R	←	MOUNTING SCREWS – CAST HOPPER LID
7	80P20108-R	←	MOUNTING PLATE – CAST HOPPER LID
8	80P20099-R	←	HINGE PINS – CAST HOPPR LID
9	80P20089-R	←	CAST HOPPER LID
10	80P52650-R	←	MOUNTING BRACKET – CAST FRONT PANEL
11	80P20093-R	80P20093-GR	CAST FRONT FRAME
12	80P20094-R	80P20094-GR	CAST FRONT PANEL
13	80P20100-R	←	HINGE PINS – CAST FRONT PANEL
14	80P20098-R	80P20098-GR	CAST DOOR – RIGHT
15	80P20097-R	80P20097-GR	CAST DOOR – LEFT
16	80P20101-R	←	HINGE PINS – CAST DOORS
17	80P20092-R	80P20093-GR	CAST SIDE PANEL – LEFT



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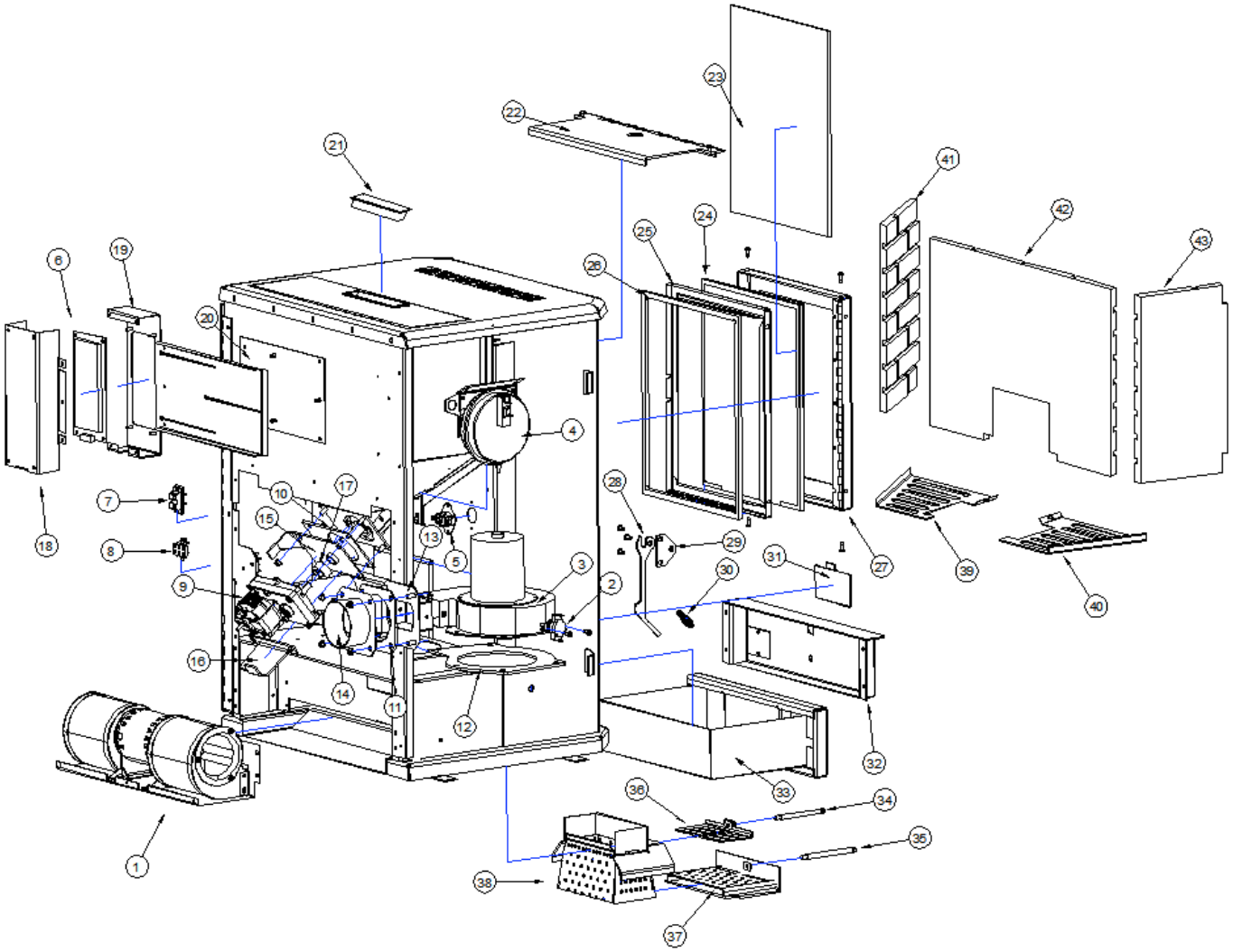
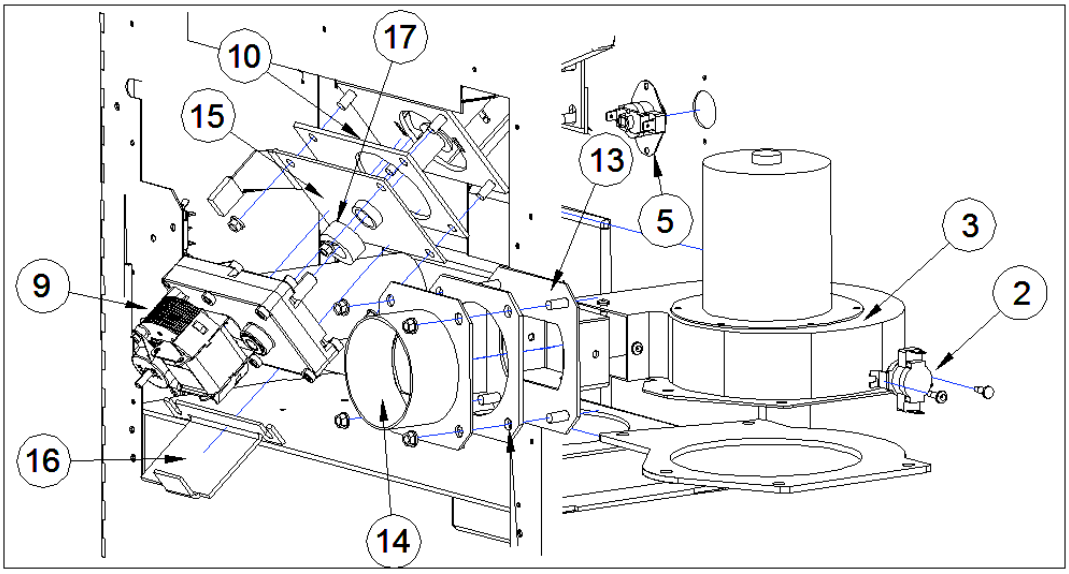
#	PART NUMBER	DESCRIPTION
1	80P53670-R	CONVECTION FAN ASSEMBLY
2	80P20038-R	PROOF OF FIRE SWITCH
3	80P20001-R	COMBUSTION FAN
4	80P52628-R	VACUUM SWITCH
5	80P52629-R	MANUAL RESET HIGH LIMIT
6	80P52632-R	CONTROL BOARD
7	80P30045-R	T-STAT WIRE TERMINAL
8	80P52630-R	WIRING TERMINAL BLOCK
9	80P20278-R	AUGER MOTOR
10	80P20245-R	AUGER GASKET
11	80P52232-R	QUICK DISCONNECT GASKET
12	80P20168-R	COMBUSTION FAN GASKET
13	80P53650-R	EXHAUST ADAPTER WELDMENT
14	80P52887-R	PIPE CONNECTOR ASSEMBLY
15	80P52957-R	AUGER MOUNT BRACKET ASSEMBLY
16	80P30191-R	AUGER MOTOR RETAINER BRACKET
17	80P20248-R	5/8" COLLAR WITH SETSCREW
18	80P52658-R	CONTROL BOARD COVER
19	80P53785-R	CONTROL BOARD MOUNT BOX
20	80P53681-R	SLIDE TOP STANDOFF PLATE
21	80P20183-R	PLASTIC HOPPER HANDLE
22	80P52944-R	HEAT EXCHANGE BAFFLE
23	80P52375-R	GLASS FOR DOOR
24	80P20022-R	GLASS GASKET KIT
25	80P52357-R	GLASS RETAINER
26	80P20132-R	DOOR GASKET KIT
27	80P52947-R	DOOR FRAME WELDMENT
28	80P53773-R	DOOR HANDLE
29	80P53677-R	HANDLE MOUNT PLATE ASSEMBLY
30	80P52773-P	DOOR SCREEN
31	80P52237-R	ASH CLEANOUT COVER
32	80P30043-R	ASH LIP BOX
33	80P53633-R	ASH PAN
34	80P53759-R	COAL RAKE ROD ASSEMBLY
35	80P52592-R	SLIDE OUT BOTTOM ROD
36	80P53619-R	COAL RAKE
37	80P53743-R	SLIDE OUT BOTTOM – GREENFIELD
38	80P53618-R	CORN/WHEAT/RYE POT
39	80P30017-R	SLIDE OUT BOTTOM SNOUT COVER
40	80P52679-R	REAR HOPPER SEAL
41	80P53684-R	FALSE TOP ASSEMBLY
42	80P53682-R	HOPPER LID ASEMBLY
43	80P52567-R	TUBE SCRAPER ROD
44	80P50858-R	AUGER BUSHING WASHER
45	80P52956-R	AUGER WELDMENT
46	80P53632-R	BELLY PAN DOOR WELDMENT
47	80P52645-R	BELLY PAN DOOR HANDLE
48	80P30047-R	DECORATIVE GRILL – LEFT
49	80P30048-R	DECORATIVE GRILL – RIGHT
50	80P30570-R	RIGHT BRICK PANEL – STEEL
51	80P30571-R	BACK BRICK PANEL – STEEL
52	80P30569-R	LEFT BRICK PANEL – STEEL

Lancaster Parts Lay-Out





#	PART NUMBER	DESCRIPTION
1	80P20003-R	CONVECTION FAN
2	80P20038-R	PROOF OF FIRE SWITCH
3	80P20001-R	COMBUSTION FAN
4	80P52628-R	VACUUM SWITCH
5	80P52629-R	MANUAL RESET HIGH LIMIT
6	80P52632-R	CONTROL BOARD
7	80P30045-R	T-STAT WIRE TERMINAL
8	80P52630-R	WIRING TERMINAL BLOCK
9	80P20278-R	AUGER MOTOR
10	80P20245-R	AUGER GASKET
11	80P52232-R	QUICK DISCONNECT GASKET
12	80P20168-R	COMBUSTION FAN GASKET
13	80P53650-R	EXHAUST ADAPTER WELDMENT
14	80P52887-R	PIPE CONNECTOR ASSEMBLY
15	80P52957-R	AUGER MOUNT BRACKET ASSEMBLY
16	80P30191-R	AUGER MOTOR RETAINER BRACKET
17	80P20248-R	5/8” COLLAR WITH SETSCREW
18	80P52658-R	CONTROL BOARD COVER
19	80P53785-R	CONTROL BOARD MOUNT BOX
20	80P53681-R	SLIDE TOP STANDOFF PLATE
21	80P20183-R	PLASTIC HOPPER HANDLE
22	80P52944-R	HEAT EXCHANGE BAFFLE
23	80P52375-R	GLASS FOR DOOR
24	80P20022-R	GLASS GASKET KIT
25	80P52357-R	GLASS RETAINER
26	80P20132-R	DOOR GASKET KIT
27	80P52947-R	DOOR FRAME WELDMENT
28	80P53773-R	DOOR HANDLE
29	80P53677-R	HANDLE MOUNT PLATE ASSEMBLY
30	80P20131-R	GOLD HANDLE COIL
30	80P20131-BN	NICKEL HANDLE COIL
31	80P52237-R	ASH CLEANOUT COVER
32	80P53631-R	ASH LIP
33	80P52946-R	ASH PAN
34	80P52568-R	CORN RAKE ROD
35	80P52592-R	SLIDE OUT BOTTOM ROD
36	80P53619-R	COAL RAKE
37	80P53623-R	SLIDE OUT BOTTOM
38	80P53618-R	CORN POT
39	80P30047-R	DECORATIVE GRILL – LEFT
40	80P30048-R	DECORATIVE GRILL – RIGHT
41	80P30570-R	RIGHT BRICK PANEL – STEEL
42	80P30571-R	BACK BRICK PANEL – STEEL
43	80P30569-R	LEFT BRICK PANEL – STEEL

PARTS NOT SHOWN

	80P20004-R	POWER CORD
	80P52693-R	WIRING HARNESS
	80P52956-R	AUGERSHAFT WELDMENT
	80P20057-R	5 AMP FUSE

SCF-050 Service Manual Addendum

This addendum covers the SCF-050 Multi-Fuel Add-On Furnace heating system. Please read through Section B covering the Multi-Fuel Burn System. The design of this furnace is based on the Freestanding St Croix stoves.

The Electrical Components of this furnace are the same with the following exceptions:

1 - This furnace has a different control board.

2 – The Furnace has a 600-800 CFM Convection Blower

3 – The Furnace has a Fan/Limit Control, which has a dual function. It controls the Room Air Blower and also acts as the High Limit Switch to shut the unit down if temperatures rise above 200 Degrees F. in the Plenum area.

Control Board Features

The Control Board functions slightly differently that the freestanding stove versions. Please read the following description of the Control Board.

a. General Operation of the Furnace.

b. Safety Features, to shut the unit down in the event the sensors detect a problem in the unit.

The Control Board also has Diagnostic Capabilities to help in diagnosing 3 areas in the furnace. These areas are:

1. High Temperature Limit.
2. Proof of Fire Sensor
3. Vacuum in the Firebox

A closer look at the Control Board to the right in figure 1 will explain how the board works. There are five buttons labeled 1 through 5, a slide switch labeled 6 and a LED Light bar with 5 Heat Settings. ***The LED Light bar is also used during the Diagnostic process, see page 80 for more details on Diagnostic Features.***

The buttons on the board function as follows: *(Refer to Figure 1. The touch pad buttons are labeled with the white numbers 1 through 5)*

1. The Heat Level button (1) will advance the setting between level 1 and 5. Once you reach level 5, it will drop back to level 1. Each level has a LED light to indicate where the board is set.

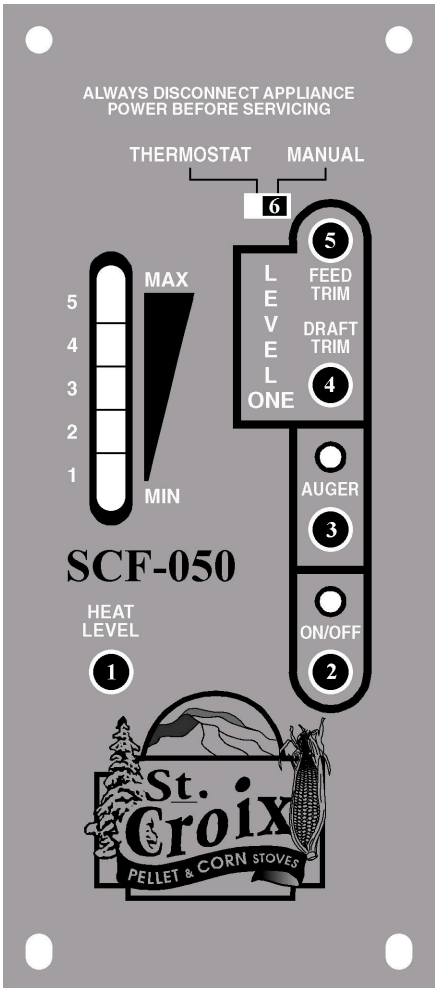


Figure 1

2. The On/Off button (2) turns the Furnace On and Off. It will also reset the board after the board has sensed a problem and is flashing a Diagnostic code.

3. The Auger button (3) will allow the customer to manually auger fuel into the burn pot on start up when needed. This is particularly helpful in priming the Auger Tube when it is empty.

4. The Draft Trim button (4) allows for adjusting the Exhaust fan voltage on Heat Level 1 only. Push the button and the all of the LED Lights in the light bar will flash once (See figure 5). This decreases the voltage approximately 5 volts below the default setting. Push the button a second time and all of the LED Lights in the light bar will flash twice. (See figure 5) This increases the voltage approximately 5 volts above the default setting. Pushing the button a 3rd time will reset the voltage to the default setting. This adjustment is available to fine tune the #1 Heat Level draft setting. This would only be used in the case the furnace was hooked up to a tall Vertical Chimney (to decrease the draft if needed) or if it was connected to a Chimney with a long Horizontal run (to increase the draft if needed).

5. The Feed Trim button (5) will allow the Fuel feed rate to be adjusted on Heat Level 1 only. Heat Level 1 should be seen as the Pilot setting of the furnace, when operating on a Thermostat. Pushing the Feed Trim button (5) will switch between the different adjustments. Heat Level one can be adjusted in the following ways:

a. The first LED only indicates the Normal #1 setting. (2.5 second on time). This is the highest Pilot setting and may be used when heating a larger size home. (See figure 2)

b. The first and fourth LED lights indicate the #1 **Low** setting. (2.0 second on time) This is the medium Pilot setting and may be used when heating a medium size home where less heat is needed when the unit is running in pilot mode. (See figure 3)

c. The first and fifth LED lights indicate the #1 **High** setting. (1.50 second on time) This is the lowest Pilot setting and may be used when heating a small size home where minimal heat is needed when the unit is running in pilot mode. (See figure 4)

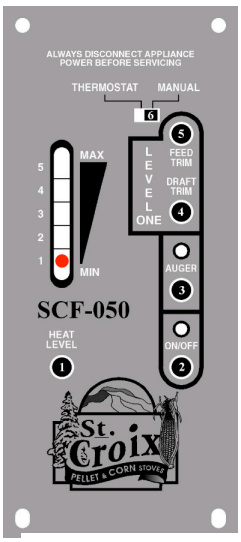


Figure 2

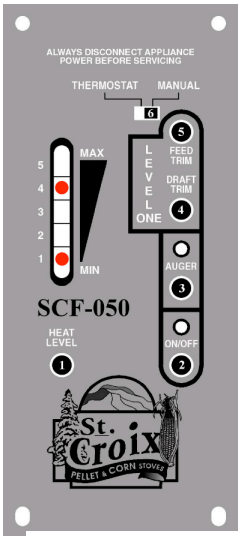


Figure 3

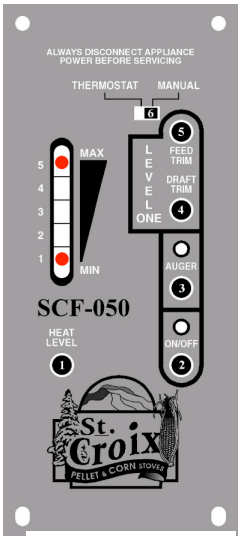


Figure 4

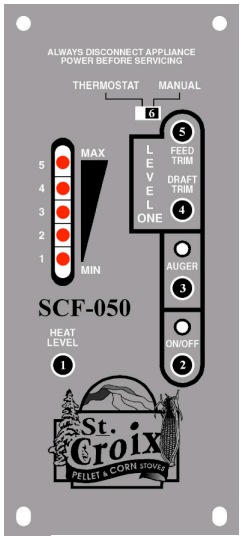


Figure 5

The adjustments described in points 4 and 5 remain in effect as long as the unit is plugged in. If the unit gets unplugged or if there is a power failure the settings are lost and the adjustments would need to be reset.

Troubleshooting Flow Charts for the SCF-050

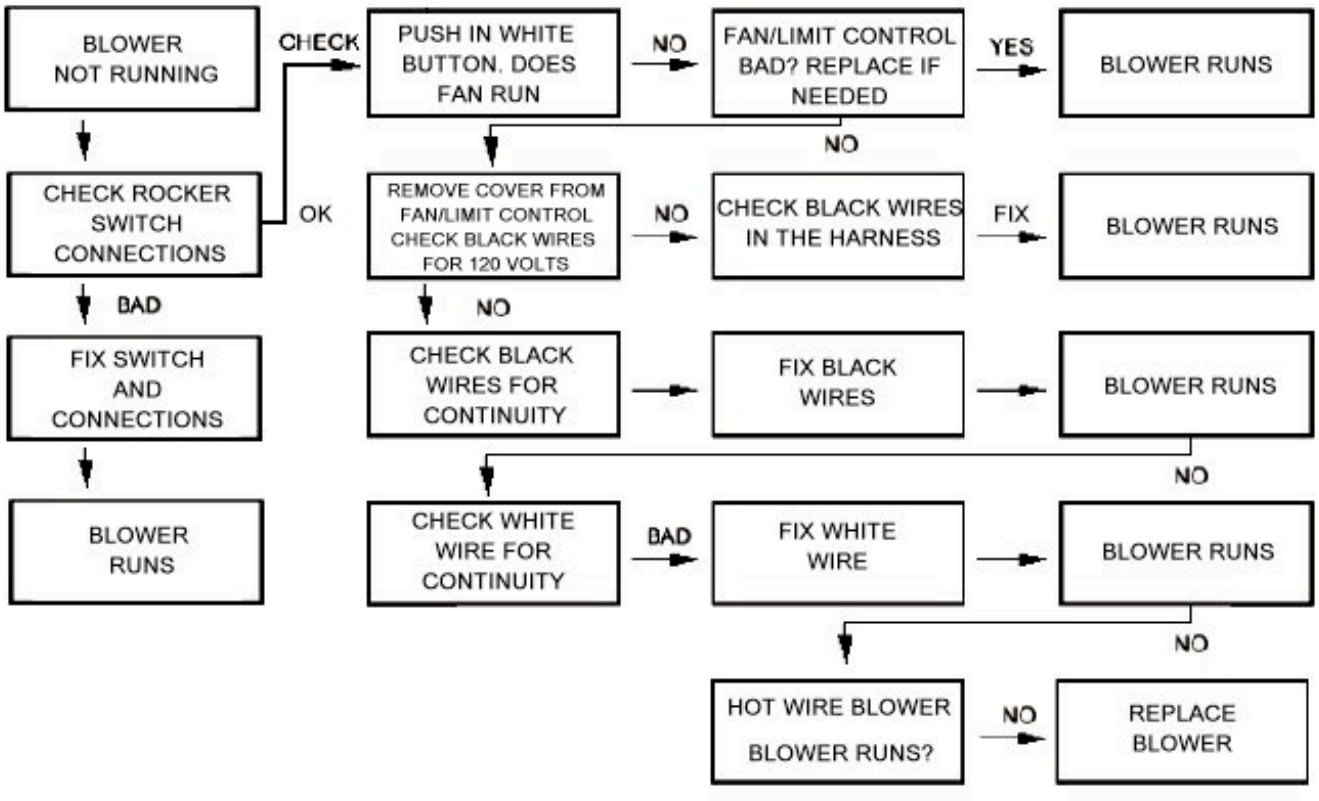
The Trouble shooting **Flow Charts** for the following components will be referenced from Section B of this Service Manual to eliminate duplicating the charts:

Digital Control Board – See page 90
Combustion Blower – See page 92
Vacuum Switch – See page 93
Proof of Fire Switch – See page 95

Troubleshooting Flow Charts

Convection Blower

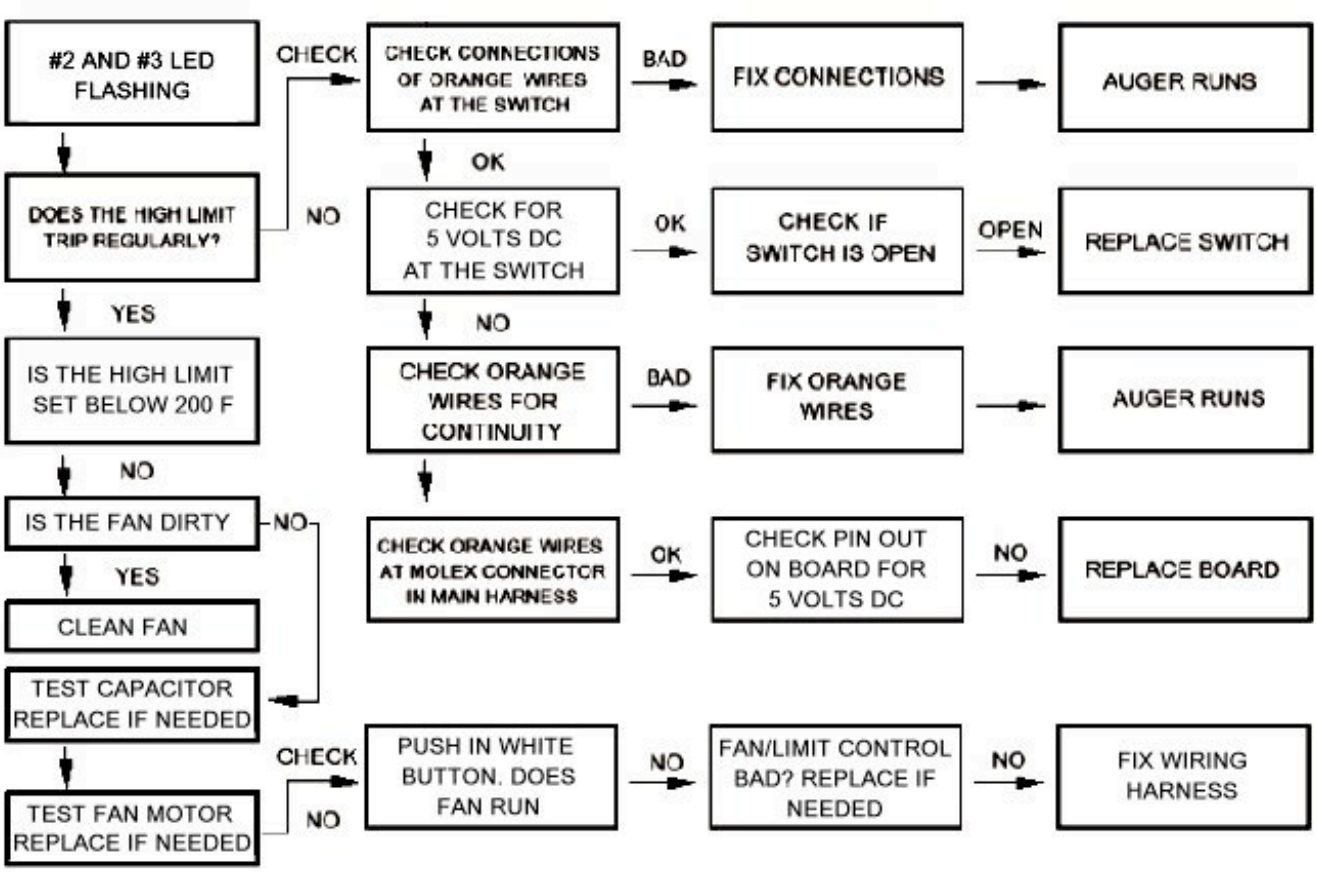
The Convection Blower in the SCF-050 is a 2-speed Blower. The Low speed is 600 CFM and the High speed is 800 CFM. The Blower runs with the aid of a Capacitor. The Fan/Limit Control controls the Blower. The Fan/Limit Control has adjustable settings to operate the blower at different temperature settings.



NOTE: A Blower problem can sometimes be traced back to loose wiring connections at the Capacitor. Check the brown wires that are connected to the Capacitor for loose connections. Use caution when handling Capacitors.

Fan/Limit Control

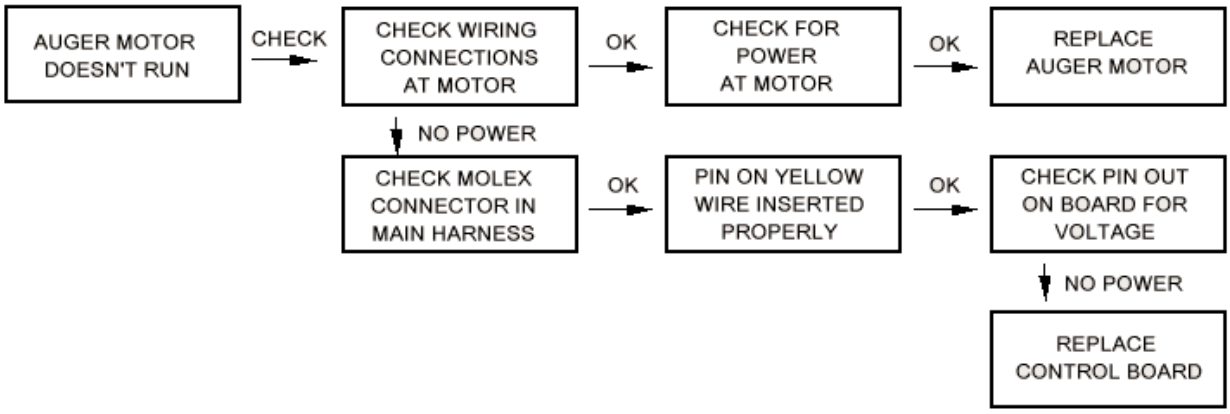
The Fan/Limit Control shuts the furnace down in an Over-Temp situation. This usually involves the room air fan. The fan may be defective or the fan may need cleaning. If the squirrel cage becomes dirty, they can't move enough air to keep the furnace cool enough when running on the higher settings. If the High Limit trips more than once a closer look should be given to Convection Blower of the furnace. The Fan/Limit Control may actually be causing the problem if it is not controlling the fan correctly. The control is adjustable and the settings should be looked at when troubleshooting this area. Setting the Limit setting too low could cause the unit to shut down at the incorrect temperature.



NOTE: The Room Air Fan (Convection Blower) is wired independently from the Control Board. Keep in mind when troubleshooting this area of the furnace that replacing the Control Board will not fix any issues related to the Blower and Fan/Limit Control.

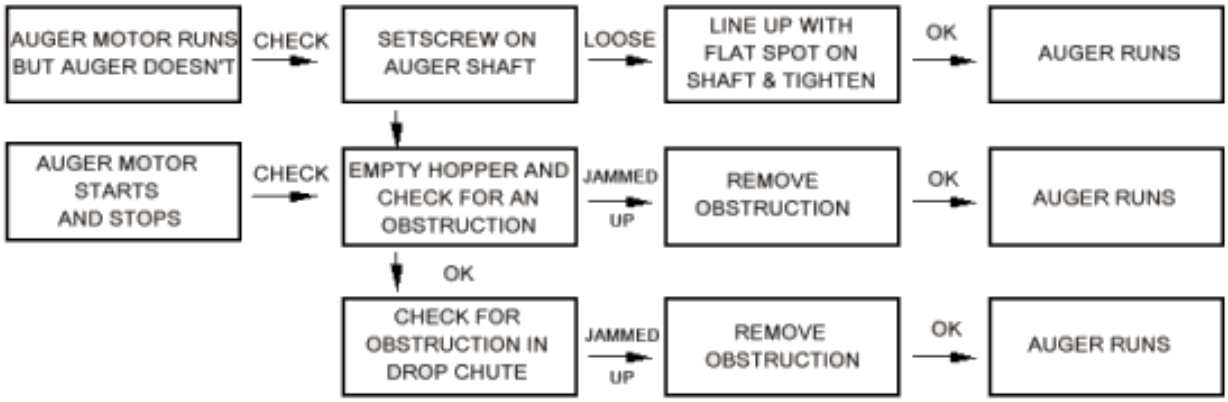
NOTE: A dirty Filter may cause the furnace to run hotter and may contribute to the unit shutting down. Check the filter and replace if needed.

Auger Motor – Electrical



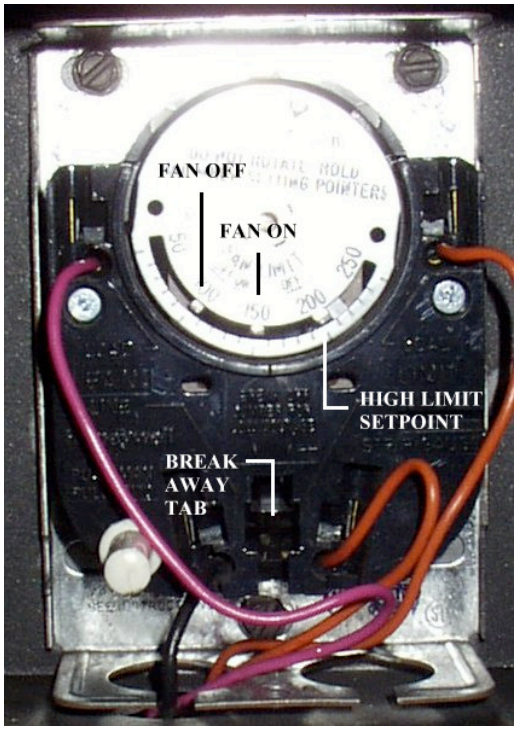
Remember: Checking for Voltage either at the Harness or directly at the Pin-Out of the control board can only be done when the Auger should be running. The auger runs for 2 minutes during the Start-Up Cycle or runs at a #1 level 5 minutes after the stove is first turned on. Hot-wiring the fan direct with a power cord is also a good way to check the Auger motor.

Auger Motor – Mechanical



Notice there are 2 areas to look for an obstruction if the auger is jammed. Many times the Drop-Chute is ignored. This may be where the jam originates, and cleaning the auger tube ***only*** is half of the job.

Fan/Limit Control - Replacement



Before installing the new Fan/Limit Control, be sure to remove the Break-Away tab between the left and right wiring circuits. See figure 6 to the left. After replacing the Fan/Limit Control, remember to adjust the Fan ON and the Fan OFF settings. Failure to adjust these settings may cause the Blower to short cycle.

Figure 6

Feed Rate Adjustment

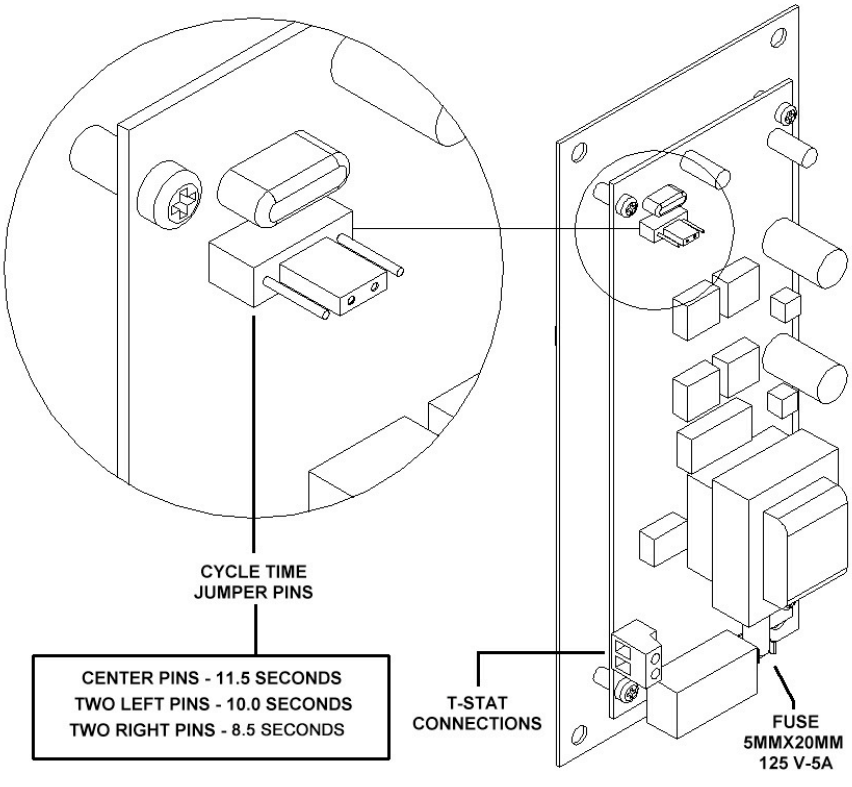


Figure 7

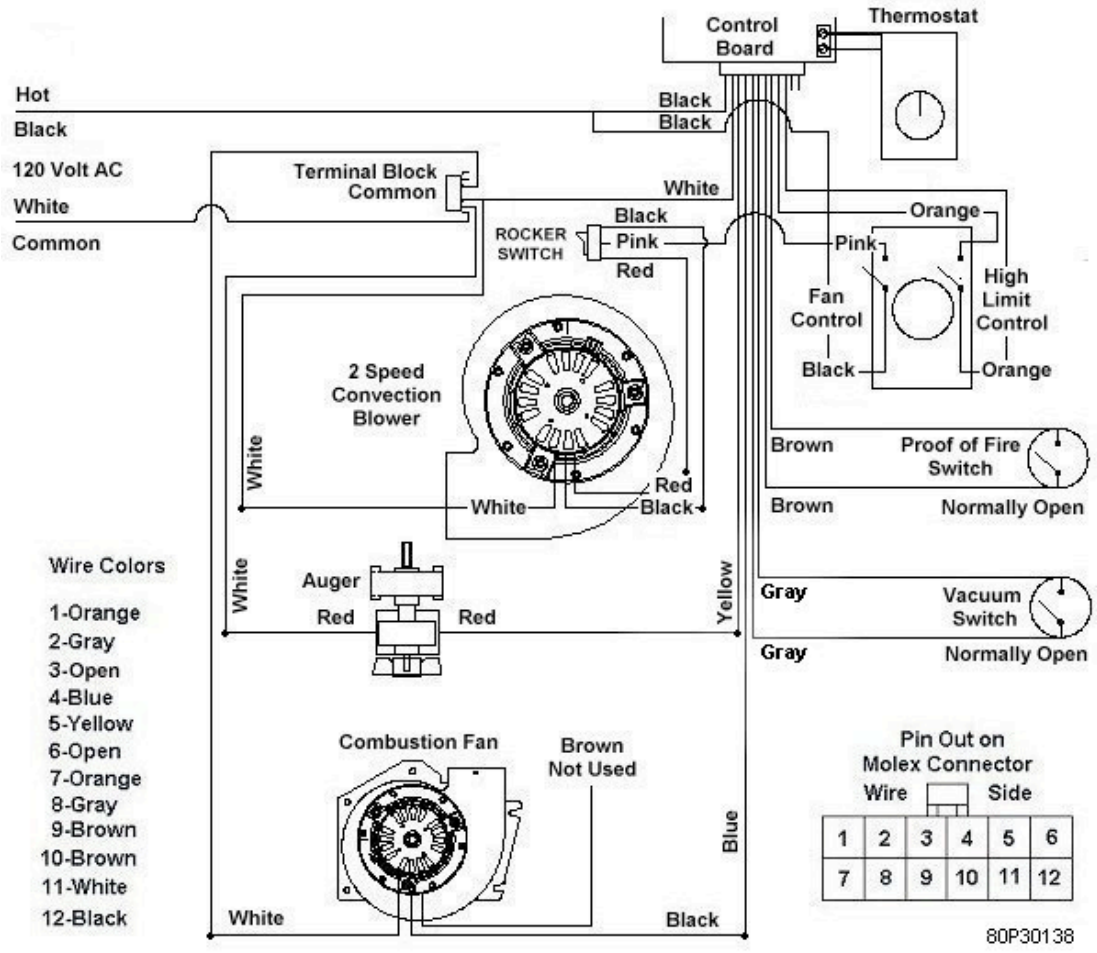
The Default Cycle Time is 10.0 seconds. Please see figure 7 to the left.

The 10.0-second cycle can be changed to 8.5 seconds by placing the jumper on the 2 pins to the Right. This should only be done if the fuel used feeds slowly, such as long Pellets or Cherry Pits.

Use Caution when switching to a shorter Cycle Time. If the pot overloads using a shorter Cycle Time, set the board back to a Longer Cycle Time.

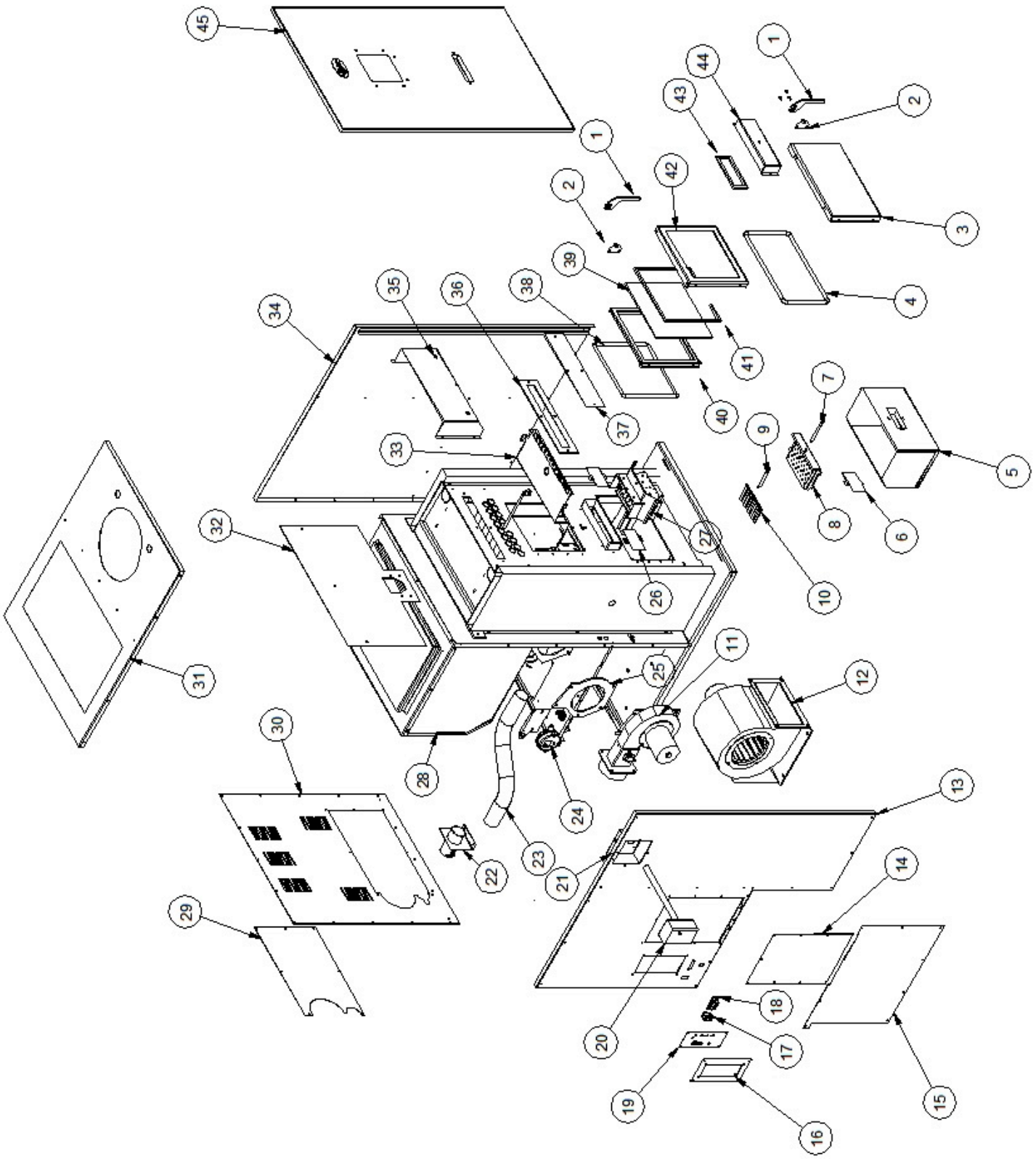
Certain fuels (Mainly Corn and Small Grains) tend to feed faster and may need to be slowed down. Placing the jumper on the 2 Center Pins will change the Cycle Time to 11.5 seconds.

SCF-050 Wiring Schematic

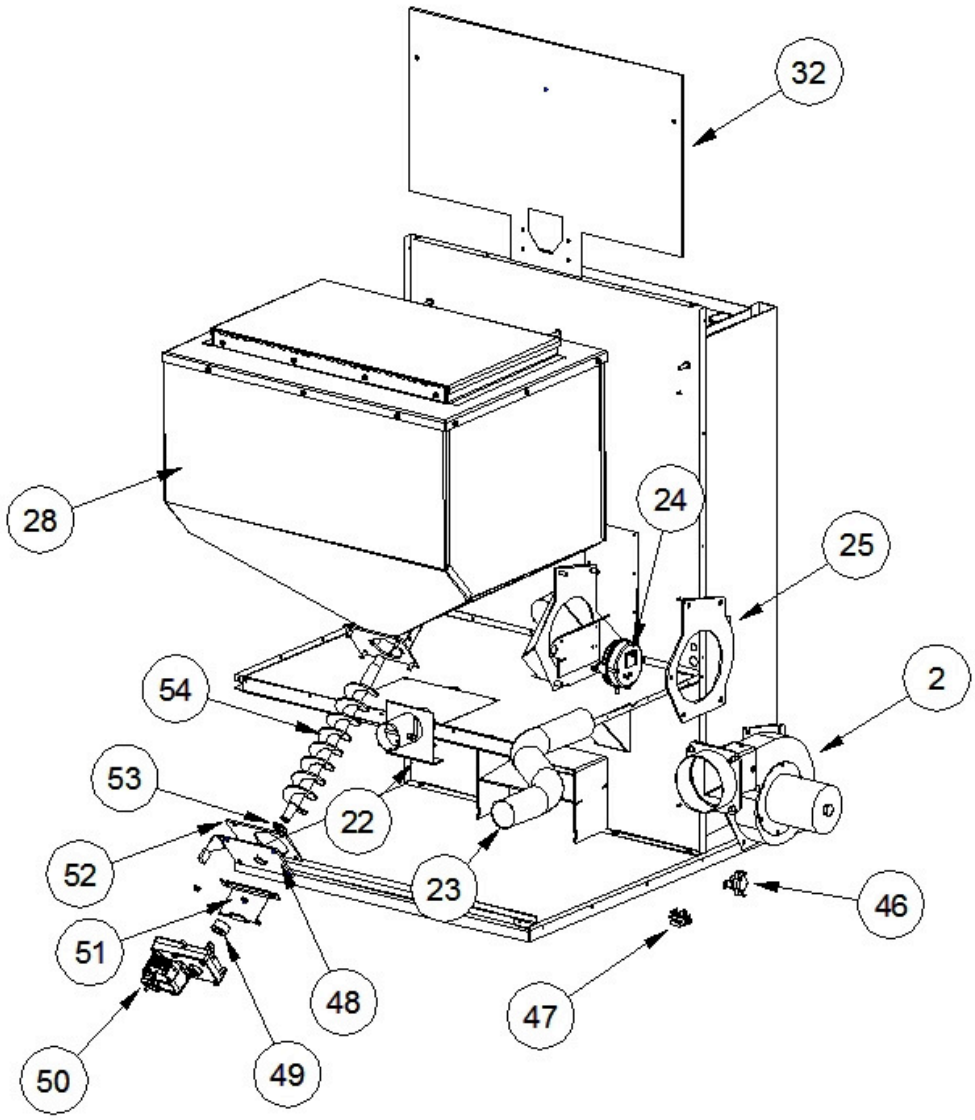


The Electrical Rating of this furnace is: 120 Volt, 60 Hz, 4 AMP. The minimum recommended circuit is 15 Amp. A dedicated circuit for the furnace is recommended.

SCF-050 Parts Lay-out



#	PART NUMBER	DESCRIPTION
1	80P53707-R	DOOR HANDLE
2	80P53677-R	MOUNT PLATE ASSEMBLY
3	80P53797-R	ASH PAN DOOR - COMPLETE
4	80P20132-R	ASH PAN DOOR GASKET – 42”
5	80P53798-R	ASHPAN
6	80P30162-R	ASH PAN AREA CLEANOUT COVER
7	80P52592-R	SLIDER ROD - UNIVERSAL
8	80P53623-R	POT SLIDER ASSEMBLY
9	80P52568-R	COAL RAKE ROD
10	80P53619-R	COAL RAKE
11	80P2001-R	COMBUSTION FAN
12	80P30144-R	CONVECTION BLOWER
13	80P30089-R	CABINET SIDE LEFT
14	80P30102-R	EXHAUST FAN ACCESS PANEL
15	80P30085-R	BLOWER ACCESS PANEL
16	80P53835-R	CONTROL COVVER ASSEMBLY
17	80P30207-R	ROCKER SWITCH – 2 SPEED BLOWER
18	80P30045-R	SPEAKER TERMINAL - THERMOSTAT
19	80P30205-R	CONTROL BOARD – SCF-050
20	80P30147-R	FAN/LIMIT CONTROL
21	80P30169-R	FAN LIMIT MOUNT BOX
22	80P53813-R	INTAKE DAMPER WELDMENT
23	54995K24-R	2” ALIMINUM HOSE – 22”
24	80P30658-R	VACUUM SWITCH
25	80P20168-R	COMBUSTION FAN GASKET
26	80P52237-R	CLEAN OUT COVER PLATE - FIREBOX
27	80P53836 -R	BURN POT WELDMENT
28	80P53810-R	HOPPER - COMPLETE
29	80P30168-R	AUGER ACCESS PLATE
30	80P53843-R	BACK PANEL/FILTER BRACKET ASSEMBLY
31	80P30092-R	CABINET TOP
32	80P30151-R	HOPPER MOUNT GASKET
33	80P30206-R	HEAT EXHANGE BAFFLE
34	80P30090-R	CABINET SIDE - RIGHT
35	80P30094-R	HOT AIR BOX
36	80P30142-R	WATERCOIL ACCESS COVER GASKET
37	80P30119-R	WATERCOIL ACCESS COVER
38	80P20132-R	DOOR GASKET – 40”
39	80P30143-R	DOOR GLASS
40	80P30130-R	GLASS RETAINER
41	80P20022-R	GLASS GASKET – 35”
42	80P30125-R	DOOR FRAME - FIREBOX
43	80P20027-R	SLIDE OUT BOTTOM COVER GASKET – 24”
44	80P30139-R	SLIDE OUT BOTTOM COVER
45	80P53795-R	CABINET FRONT DOOR ASSEMBLY



#	PART NUMBER	DESCRIPTION
46	80P20038-R	PROOF OF FIRE SWITCH
47	80P52630-R	TERMINAL BLOCK
48	80P52957-R	MOTOR MOUNT BRACKET ASSEMBLY
49	80P20248-R	5/8” COLLAR W/ SETSCREW
50	80P20278-R	AUGER MOTOR
51	80P30191-R	MOTOR RETAINER BRACKET
52	80P20245-R	AUGER GASKET
53	80P50858-R	AUGER BUSHING WASHER
54	80P53807-R	AUGER WELDMENT

SCF-050 Data Table

Based on a default Cycle Time of 10.0 seconds.
Cycle time equals the ON time & OFF Time combined.

Heat Level Selection	Auger ON (Seconds)	Combustion Fan Voltage +/- 10%	Convection Fan Voltage +/- 10%	Corn Fuel (Lbs./Hour) +/- 10%
Start-Up Cycle	Off for the first 5 minutes	100 Volts	OFF	NA
1	2.5	90 Volts	120 Volts	2.0 Lbs.
2	3.0	98 Volts	120 Volts	2.75 Lbs.
3	3.5	105 volts	120 Volts	3.5 Lbs
4	4.0	111 volts	120 Volts	4.35 Lbs.
5	4.5	120 volts	120 Volts	5.20 Lbs.

The SCF-050 is approved for Corn, Wheat, Rye, Cherry Pits, Distiller's Grain Pellets and Wood Pellets. Feed rates will vary from fuel to fuel. The above chart is in reference to burning corn.

Revolution Burn System

This addendum covers the SCF-Revolution Add-On Furnace heating system. Please read through Section A and B covering the covering many aspects of burning pellets and burning the approved Grain listed for this design. Much of the design of this furnace is based on the SCF-050.

The Revolution Burn System is a new St. Croix design that is used in 2 models:

SCF-Revolution
Lincoln SCR

This burn system consists of a burn pot with a revolving drum in the bottom. The Drum is divided into 4 sections. The drum rotates every 2 hours to clean the burn pot. As one section rotates out, another section rotates in. The sections rotate through a set of "Cutters" at the bottom that cleans each section as it rotates through.

The SCF-Revolution is based on the same platform as the SCR-050, with some minor differences between the 2 furnaces.

The Revolution Burn Pot System.

A Dual Hopper System. - The small hopper is loaded with pellets for use during Ignition.

There are 34 Heat Exchange Tubes instead of 16.

The Convection blower is a larger 1000CFM Blower

The Lincoln SCR is a combination of the Revolution Technology and our standard stove technology. Some differences include:

The Revolution Burn Pot System.

A Dual Hopper System. - The small hopper is loaded with pellets for use during Ignition.

There are 20 Heat Exchange Tubes instead of 16.

The Convection Blower is 300 CFM instead of 200CFM.

SCF - Revolution

Control Board

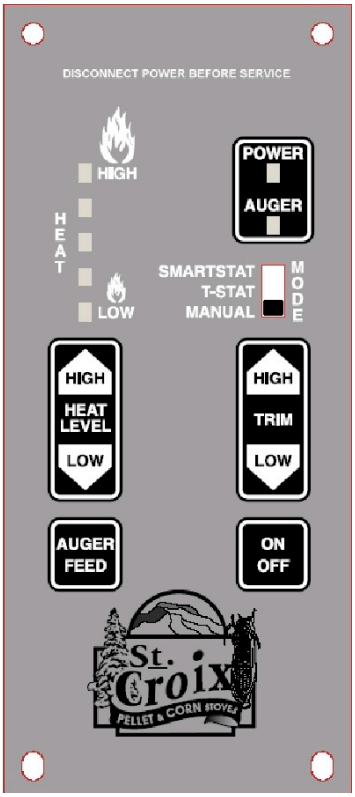


Figure 1

This Control Board offers several advantages as far as being able to make adjustments to the Feed Rates and the Combustion Fan Voltages. All adjustments can now be made from the front of the control board instead of having to access the back side of the board and change jumper settings.

There are 4 different Programs on the board to choose from depending on the choice of fuel (Pellets, Corn Wheat, Rye, Cherry Pits or Distiller's Grain Pellets). They are also to be used to when having difficulty with poor quality fuel. If a fuel is high in Ash Content for instance, a program with a **longer Cycle Time should be used if the pot is overloading.**
To change a program several steps must be followed:

1 - The unit must be OFF and cooled down (P.O.F. Switch must be open)
2 – The Thermostat Slide Switch must be in Manual Mode.
3 – Press and Hold the Auger Feed Button and at then press the High and Low Draft Trim Buttons at the same time. You will see all five LED lights on the Heat Level Bar light up at the same time.

The programs break down as follows:

Program 1 - **The Cycle Time is 8.5 seconds. This program will be the default program when the furnace is first plugged in.** This program is for use with Pellets, Corn, Wheat, Rye, Cherry Pits & Distillers Grain Pellets. *(See figure 2, LED Lights flash Once)*

Program 2. **The Cycle Time is 7.5 seconds.** This program is for use with Pellets, **Good Quality Corn** & Cherry Pits. *(See figure 2, LED Lights flash Twice)*

Program 3. **The Cycle Time is 6.5 seconds.** This program is for use with Pellets & Cherry Pits. *(See figure 2, LED Lights flash Three times)*

Program 4**. The Cycle Time is 5.5 seconds. This program is for use with Pellets & Cherry Pits.** *(See figure 2, LED Lights flash Four times)*

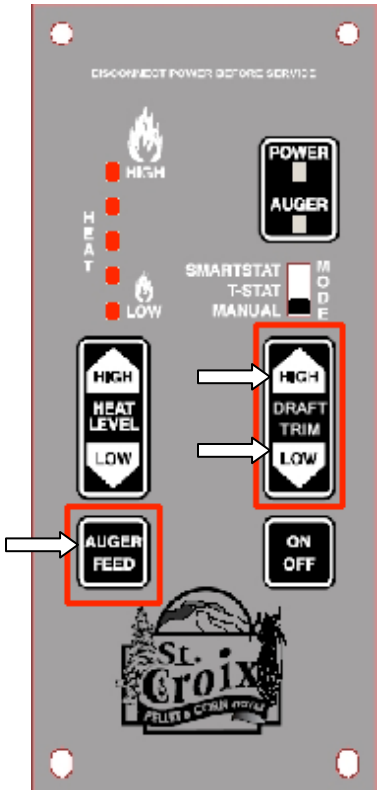


Figure 2

Choosing which program to run the unit depends on several things. First make sure the program matches the fuel being used. After burning the Furnace and adjusting the Draft, is the furnace having difficulty burning the fuel and is the burn pot overloading? If this is the case, then simply adjust the Program to one that uses a longer Cycle Time. This will slow the feedrate down and balance the burn.

Keep in mind there is a huge difference between many fuels on the market and how they burn. Pellets are **approved** to burn in all 4 programs, **but not all pellets are guaranteed to burn in all programs**. The program must be matched to the characteristics of the fuel being used.

How to Adjust the Control Board within each Program

Draft Adjustment - The Fan voltages can be fine-tuned while the furnace is in operation by ***pressing and holding*** the "Auger Feed" button down and then ***either*** pressing the "Draft Trim High" button to advance the voltages higher, ***or*** pressing the "Draft Trim Low" button to decrease the fan voltages. There are 5 levels on the control board and they are indicated by a single flash of the LED's. The default setting is the center LED (see figure 3). This gives 2 adjustments increasing the voltage (LED's 4 & 5) and 2 adjustments decreasing the voltage. (LED's 1 & 2) The voltage is ***increased or decreased*** 2.5 volts with each adjustment.

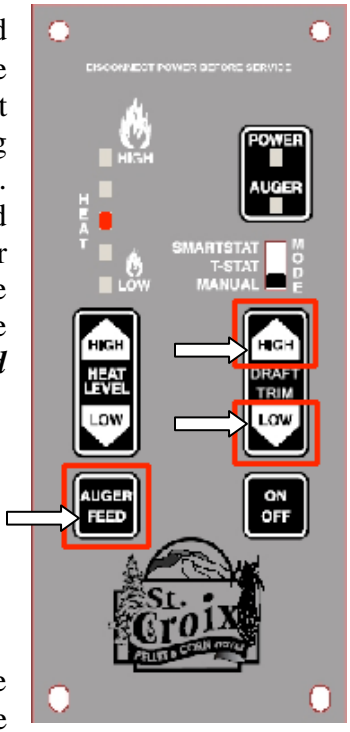


Figure 3

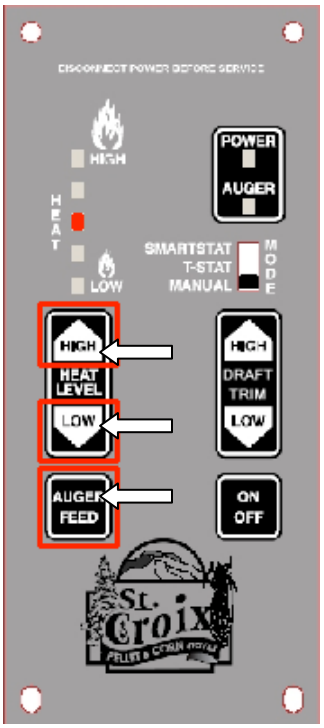


Figure 4

Feedrate Adjustment The feedrate can be fine-tuned while the furnace is in operation by ***pressing and holding*** the "Auger Feed" button down and then ***either*** pressing the "Heat Level High" button to increase the feedrate, ***or*** pressing the "Heat Level Low" button to decrease the feedrate. There are 5 levels on the control board and they are indicated by a single flash of the LED's. The default setting is the center LED (see figure 4). This gives 2 adjustments increasing the feedrate (LED's 4 & 5) and 2 adjustments decreasing the feedrate. (LED's 1 & 2) The ON time is ***increased or decreased*** .25 seconds with each adjustment.

How to adjust the Furnace for different Fuels?

The furnace is approved for 6 fuels. They are Pellets, Cherry Pits, Corn, Wheat, Rye and Distiller's Grain pellets.

They are grouped in 2 categories:

1 – Pellets and Cherry Pits, lower in moisture content and easy to ignite.

2 – Corn, Wheat, Rye and Distillers Grain, these fuels are higher in moisture content and therefore more difficult to start.

The furnace basically has 2 operating modes:

1 - **Manual Mode.** In this mode the operator of the furnace is involved with starting the unit, and is available to monitor the start-up process of the furnace. This mode includes the Manual position and the T-Stat thermostat position. ***Only the ON/OFF button will start the unit up or shut the unit down.***

2 – **SmartStat Mode** is the Automatic Mode. In this mode the Thermostat controls the unit. The furnace starts as soon as the Thermostat calls for heat. The unit shuts off only after the unit pilots for 1 hour with out calling for heat. **If Operating in the SmartStat Mode, make sure the Thermostat is not calling for heat when trying to shut the Lincoln SCR off at the Control Board. Turning the furnace off at the Control Board while the Thermostat is calling for heat, will cause the Control Board to turn the unit right back on.**

During the Break-In period and anytime a switch is made to a different Fuel Category, such as switching from Pellets or Cherry Pits (which have a lower moisture content and starts quicker) to burning Corn, Wheat, Rye and Distiller's Grain (which have a higher moisture content and start slower), the furnace must be set up and adjusted for proper ignition. This means the Damper, Program, Feed and Draft Trim settings must be adjusted in such a manner that after the ignition cycle finishes, the unit transitions to the fuel in the main hopper in a smooth manner without overloading the pot.

How to use T-Stat and SmartStat Mode with the Revolution Technology.

SmartStat Mode is to be used when the temperatures are mild. Adjust the Control Board for mild temperatures. Run the furnace on the lower settings on the control board to prevent the unit from cycling on and off needlessly. If the temperature is 50 degrees outside, it would make sense to run the furnace in SmartStat Mode but with the Heat Level set on #1.This way the unit puts out less heat and will run longer before temperatures in the house rise above the Thermostat setting. This also provides a more even temperature.

When burning Corn, Wheat, Rye and Distiller's Grain Pellets, the program chosen must give a smooth ignition and be able to advance to the Heat Level chosen. If the Pot

overloads during ignition, adjust the Feedrate down or switch Programs until these fuels ignite without overloading the Pot. The units must be adjusted for unattended use.

The adjustments that need to be made are:

1 – Choosing the correct Program for the fuel used.
2 – Adjusting the Damper (if needed)
3 – Adjusting the Feedrate (if needed)
4 – Adjusting the Draft Fan Voltage (if needed)
5 – Adjusting the Heat Level to a lower setting (to prevent the furnace from excessive ON/OFF cycling). This will also help in maintaining an even temperature in the home.

<u>Do not assume the unit functions correctly in SmartStat mode without first adjusting the unit. When burning grain there are many variables and the unit must be fine tuned correctly before allowing the unit to run unattended.</u>

The Revolution Burn Pot System – Removal and Installation.

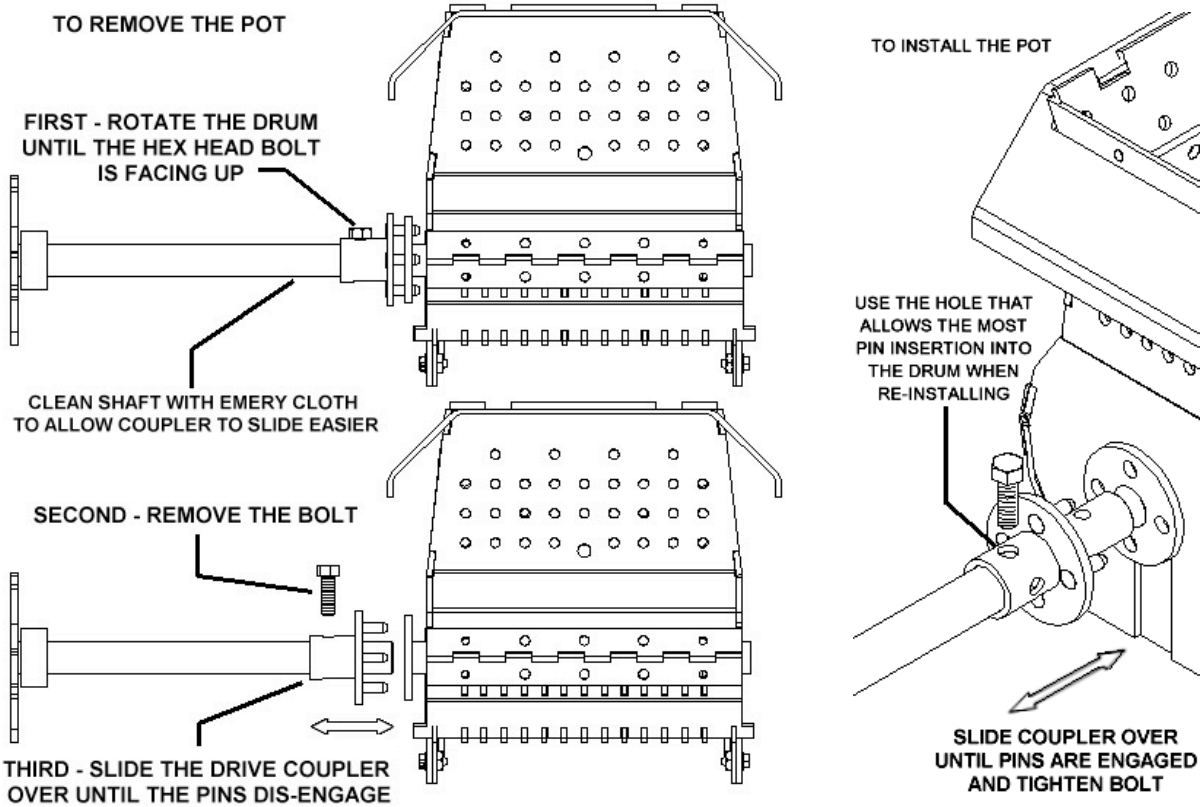


Figure 5

The Revolution Burn System can be removed for maintenance or cleaning if needed, but should only be done if cleaning through the access cover in the front of the furnace is not sufficient.

The Revolution Burn Pot System – Parts Break Down

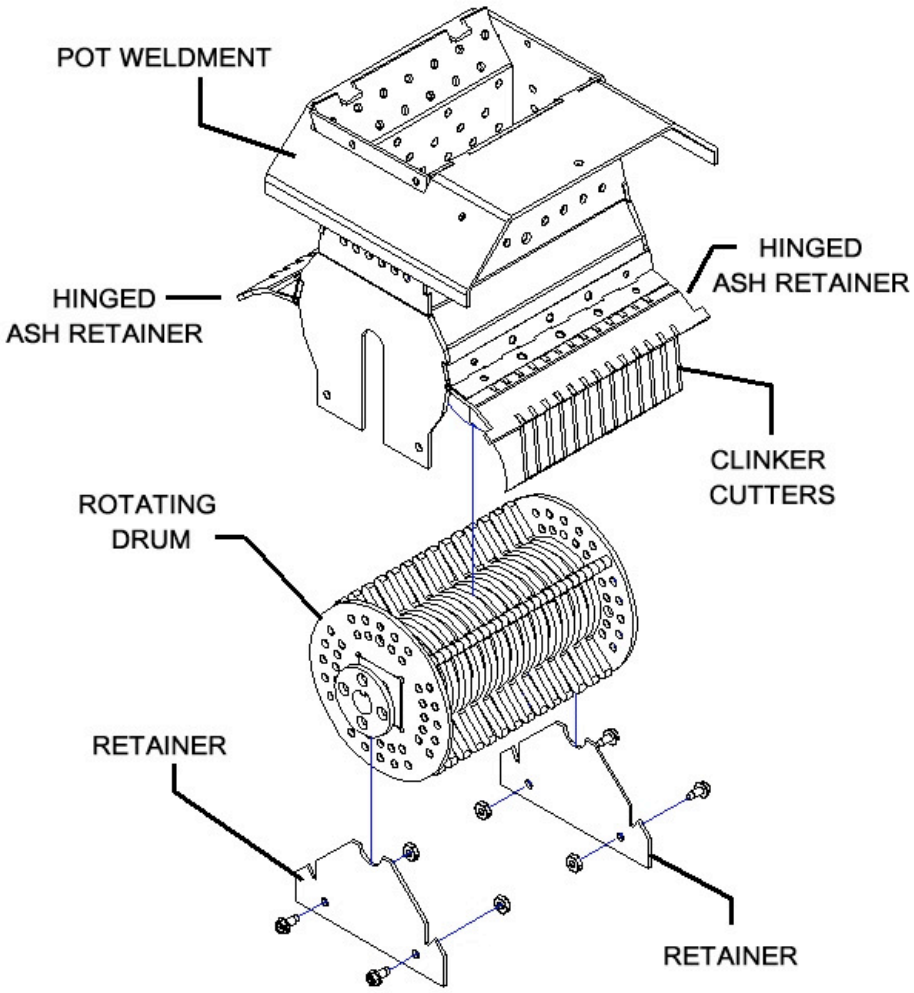


Figure 6

The Revolution Burn System is designed to come apart for maintenance or to replace the Drum if needed.

Revolution Pot Clean-Out Access Cover

There is a cover in the front of the furnace that gives access to cleaning the holes in the front and back of the Revolution burn pot. The holes should be checked periodically to keep the units burning properly. For proper Ignition the hole in the front of the pot for the Igniter needs to be kept open. If a change is noticed in how the Furnace Ignites, shut the unit down and clean the hole. See Figure 7 on the following page for more information.

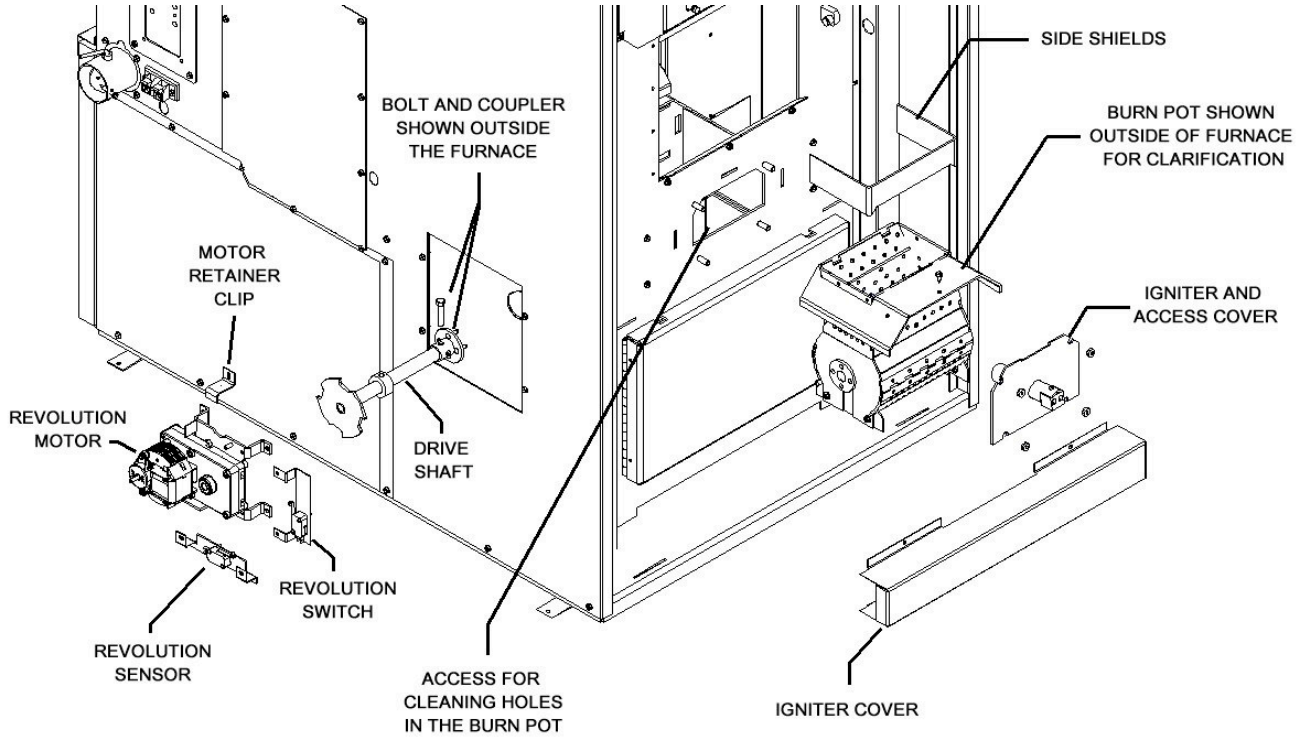


Figure 7

Figure 7 shows an exploded view of how to disassemble all components of the Revolution Burn Pot System. The Burn pot is shown outside the furnace, but when cleaning the holes in the pot it will remain inside the furnace.

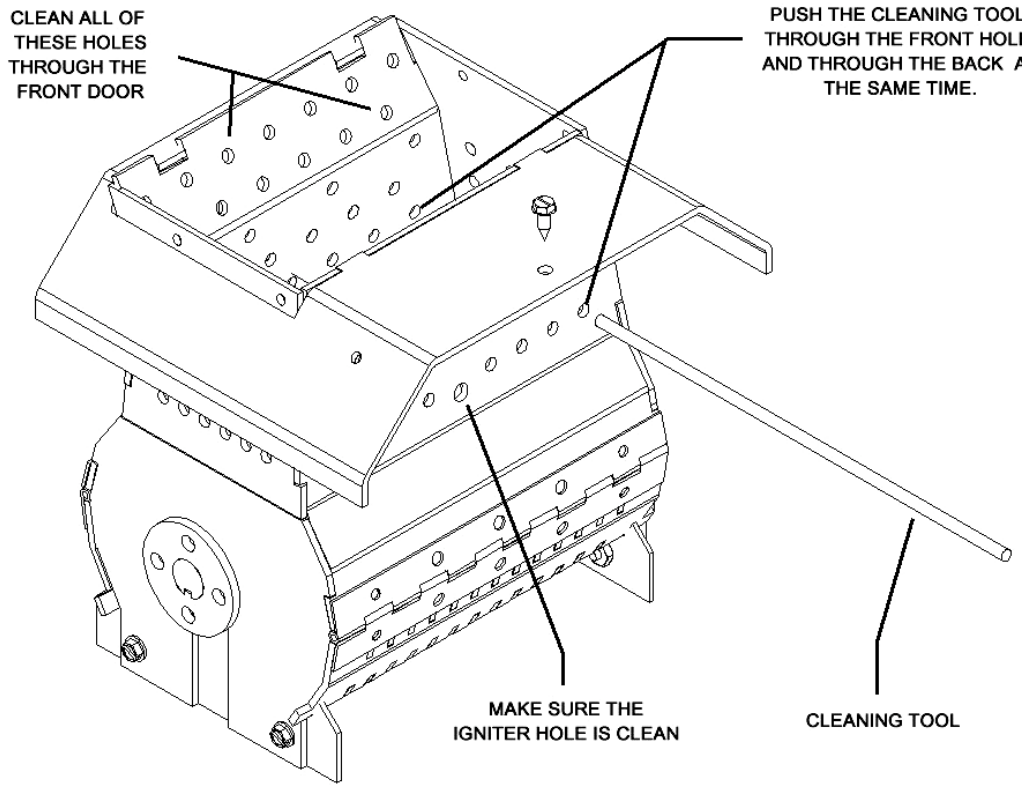


Figure 8

See Figure 7 on the previous page for information on removing the Igniter Cover and Igniter/Access Cover. Once removed use a 3/16" diameter rod or a long Phillips Screw Driver (should be long enough to reach the holes on the back side of the pot).

To clean the holes in the front side and the back side at the same time, simply insert the cleaning tool through one of the front holes and push it all the way through and clean the hole that lines up behind it at the same time. (See Figure 8 on the previous page.)

How to Troubleshoot the Revolution Burn System Switches

As with all New Technology there will be a certain amount of confusion when trying to troubleshoot a unit for the first time. The following section will explain how the Revolution Drive Motor communicates with the Control Board. The Control Board monitors the rotation of the drum. If something outside the norm happens the unit will flash an alarm code on the Control board.

The Diagnostic light indicating a problem with the Revolution design is a flashing #4 LED. (See Figure 9)

This same LED is associated with the High Limit Alarm. This is due to the fact that the Switch that monitors the rotation to the drum is on the same circuit as the High Limit Control. The program is looking at that switch when the drum is supposed to rotate. At all other times the program is viewing this same circuit as the High Limit Circuit. This can cause some confusion when first looking at a unit that is flashing a #4 Alarm.

Let's look at some issues that are related to the switches not being adjusted correctly. Figure 10 on the following page shows the 2 switches that are used in this design.

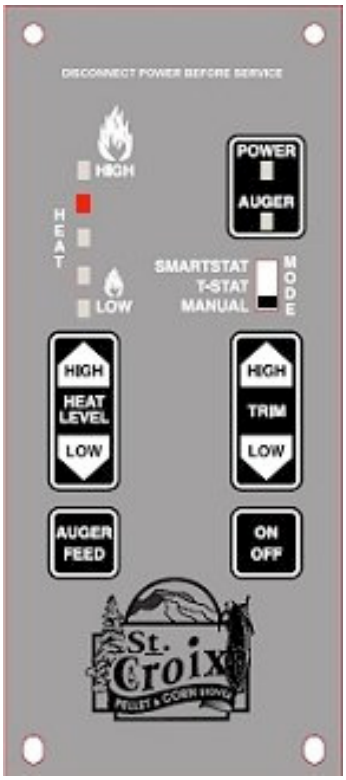


Figure 9

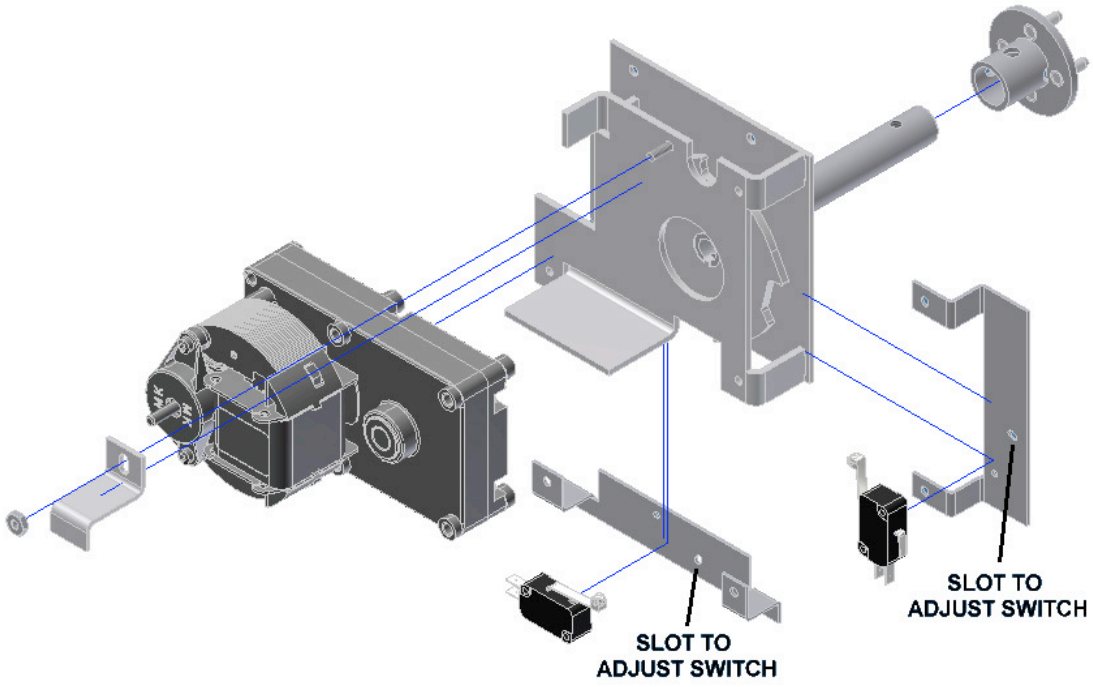


Figure 10
(Lincoln SCR Drive Assembly shown)

Above are the components that make up the Drive system in a unit with the Revolution Burn Pot Design.

A Gear Motor, 2 Switches and a Drive Shaft are the major components along with several brackets that mount these components in the unit.

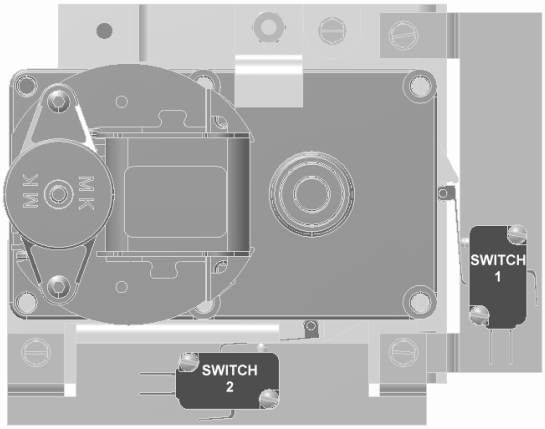


Figure 11

Figure 11 to the left shows a view of the system when looking directly at the motor and the switches. ***It is important to note the location of Switch 1 and Switch 2.***

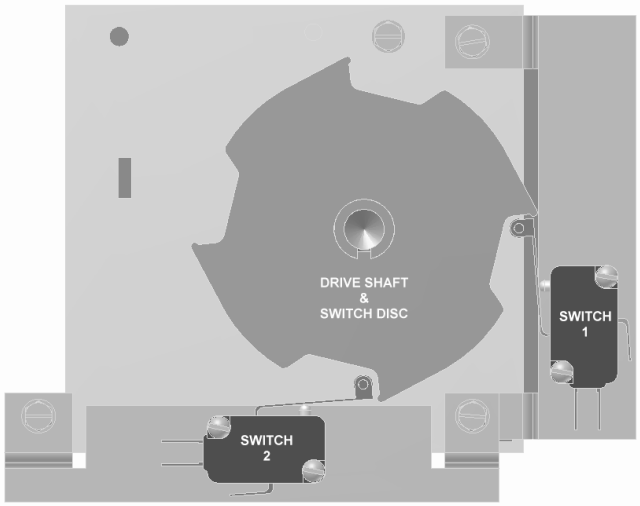
Switch 1 is not monitored by the Control Board. It functions only after the Control Board starts the rotation of the drum in the burn pot.

Switch 2 is monitored by the Control Board to make sure the Drum is rotating when it is supposed to.

The unit will behave differently depending on which switch is not functioning or is not adjusted correctly. The end result is always a #2 Diagnostic Light flashing. Switch #1 is wired to the **Normally Open** Connectors. The voltage on this switch is **120 Volts AC**.

The switch is connected to the **Gearmotor**. Its function is to **complete the Rotation** that was started by the Control Board.

Switch #2 is wired to the **Normally Closed** Connectors. The voltage is **5 Volts DC.** This switch is connected to the **Control Board through the High Limit circuit.** Its function is **to signal to the Control Board that the Drum rotated.**



Please note how the switches drop in the notches in the switch disc.

The position shown in figure 12 is the **Normal Operating** position of both switches.

In these positions:

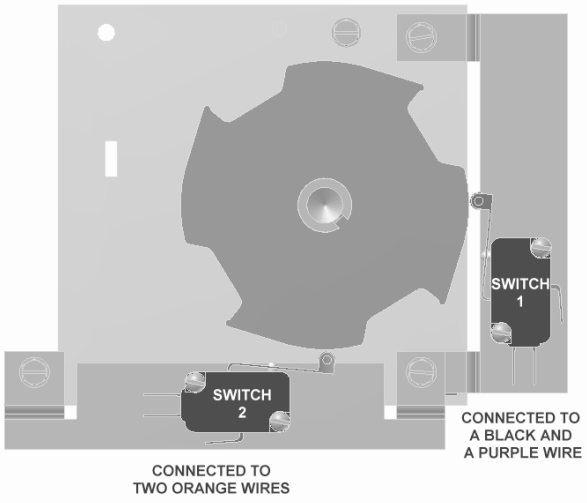
Switch 1 is **Normally Open**

Switch 2 is **Normally Closed**

Figure 12

What happens when the Switches are not adjusted properly?

When the unit is in **Idle Mode,** the Control Board monitors the two Orange wires that are connected to the #2 Switch. This circuit must be closed. The switches should be in the position shown in Figure 12. If the switches are in a similar position as shown in Figure 13, **while in Idle Mode**, the #5 LED light on Control Board will be **ON** (not flashing). ***This indicates the #2 Switch is Open instead of Closed.***



If the #5 light is on will indicate the Control Board is in the **Synchronization Routine**.

In this Routine the Control Board will send power to the gearmotor to rotate the drum until the #2 Switch closes.

If the Drum is jammed, the switches will be on the edge of the disc as shown in Figure 13.

If the pot is jammed, correct the problem before starting the unit.

Figure 13

Following is a description of events if either one of the switches isn't adjusted correctly:

First Example: Switch 1 is not adjusted to close when it is on the edge of the disc.

When the unit is started, the Control Board first looks for vacuum to be detected in the firebox (this takes approximately 60 seconds), and then it sends power through the purple wire to the Gearmotor for 3.5 seconds. This will position the switches on the edge of the disc as seen in figure 13. After the Control board drops out, Switch 1 should be closed and finish the rotation, by sending power through the purple wire back to the gearmotor until the switch drops in the notch and opens the circuit again.

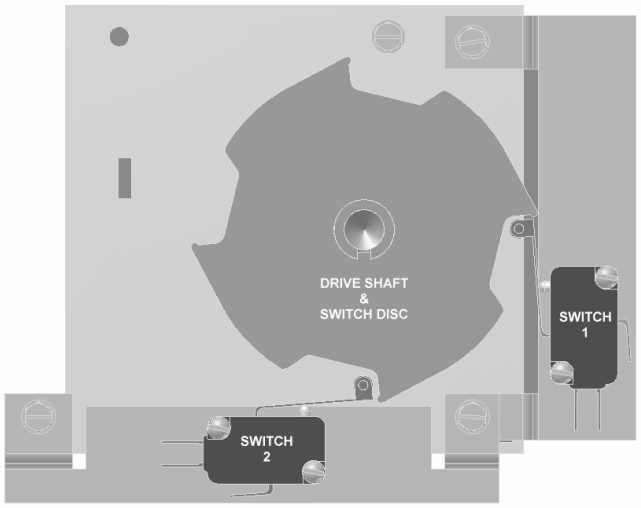
If Switch 1 is not adjusted properly and the switch is not closed when positioned on the edge of the disc, the gearmotor will stop in the position seen in figure 13.

The Control Board detects Switch 2 is Open at this point and continues to the next step. The lights light up on the board and the unit starts feeding fuel to the burnpot.

The Control board is monitoring the circuit Switch 2 is connected to, and the circuit must close again within 20 seconds after the switch opens. Since the switch is stuck in the open position, the unit will go into a #4 Alarm and starts rotating the pot.

Notice the timing in Example 1: Once the pot starts to rotate, the board detects Switch #2 open. This takes approximately 5 seconds. Then the control board starts the pellets to feed, this will continue for another 10 to 15 seconds. The Control Board monitors Switch #2 and does not detect the switch closing and then goes into a #4 Alarm. **Total time approximately 20 seconds**.

Second Example: Switch 2 is not adjusted to open when it is on the edge of the disc.



In the second example the switches start out in the notches as seen in the figure to the left.

During the rotation the switches ride up on the edge of the disc and finish by dropping back into the notches.

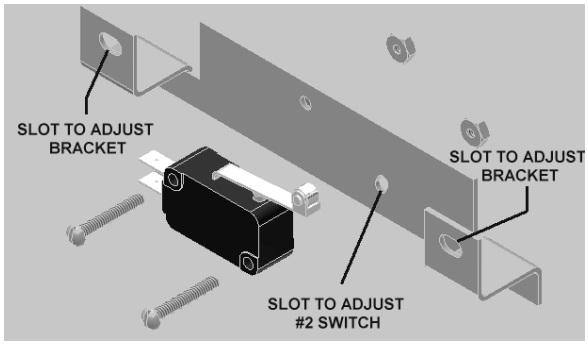
Figure 14

After starting the unit, the Control Board looks at the Vacuum Switch to detect vacuum in the Firebox. After detecting vacuum the Control Board sends power through the purple wire to the Gearmotor for 3.5 seconds. This will position the switches on the edge of the disc as seen in figure 13. After the Control board drops out, ***Switch 1 is now closed and***

finishes the rotation by sending power through the purple wire back to the gearmotor until the switch drops in the notch again. In this example however ***Switch #2 is not adjusted properly and the switch does not open while on the edge of the disc*** as it rotates through and drops back into the notch.

The Control Board does not detect Switch #2 opening when it should. At this point the Control Board immediately goes into #4 Alarm. ***The difference is the Lights that normally come on during Start-Up do not come on and the unit will not start feeding pellets before going into #4 Alarm.***

Notice the timing in Example 2: Once the pot starts to rotate, the board does not detect Switch #2 open. This takes approximately 7.5 seconds. The lights that normally come on, fail to come on and the unit does not start feeding pellets. At this point the unit immediately goes into a #4 Alarm. **Total time approximately 7.5 seconds**.



How adjust the Switches.

Starting with the introduction of the Lincoln SCR the bracket for the #2 Switch will have slots for adjusting the bracket left to right if needed. This adjusts the timing of the switch. The #2 Switch should drop in the notch a fraction of a second before switch #1.

Figure 15

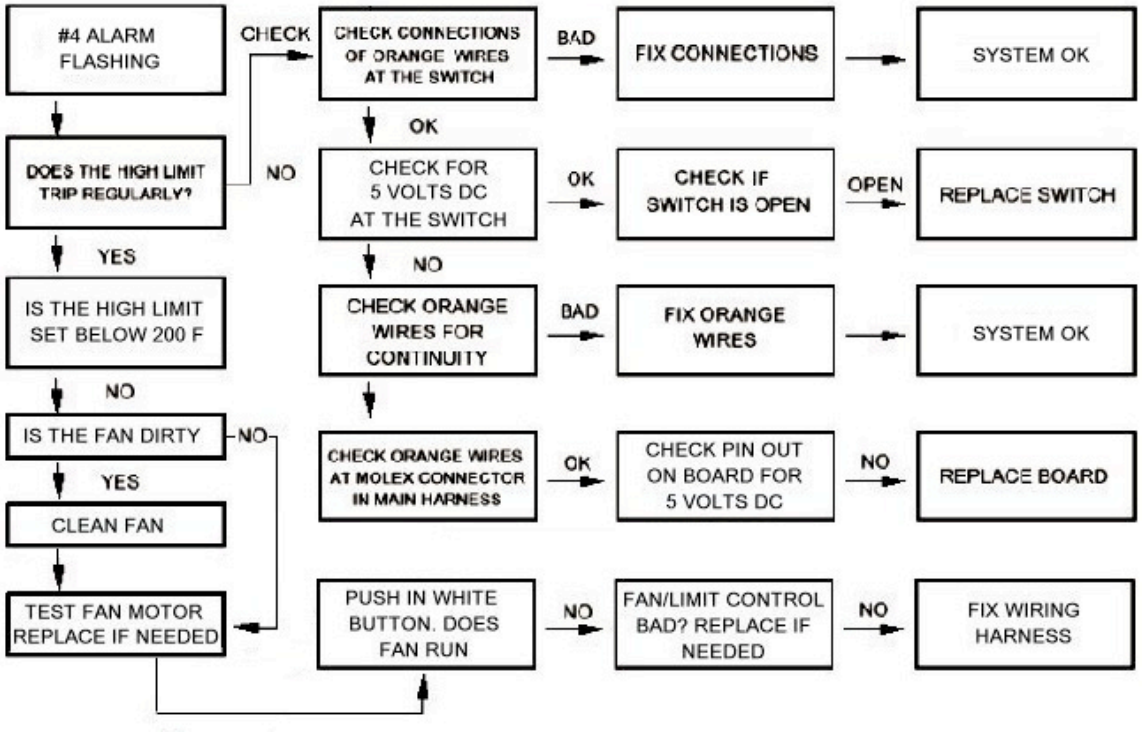
Both brackets currently have the slot to adjust the switches closer to the disc, if needed, to make better contact. Simply loosen the screw and slide the switch closer to the disc. **Remember to tighten the screw when finished adjusting the switch.**

Troubleshooting Flow Charts for the SCF-Revolution

Fan/Limit Control - *Please see Figure 6 on page 129 for more information regarding adjusting or replacing the Fan/Limit Control.*

The Fan/Limit Control shuts the furnace down in an Over-Temp situation. This usually involves the room air fan. The fan may be defective or the fan may need cleaning. If the squirrel cage becomes dirty, they can't move enough air to keep the furnace cool enough when running on the higher settings. If the High Limit trips more than once a closer look should be given to Convection Blower of the furnace. The Fan/Limit Control may actually be causing the problem if it is not controlling the fan correctly. The control is adjustable and the settings should be looked at when troubleshooting this area. Setting the Limit setting too low could cause the unit to shut down at the incorrect temperature.

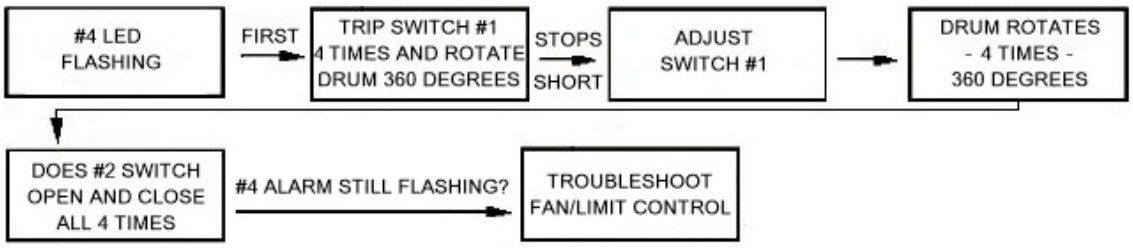
Before using the Fan/Limit Flow chart, verify that the #2 switch is functioning correctly. The 2 orange wires must be making contact through the switch.



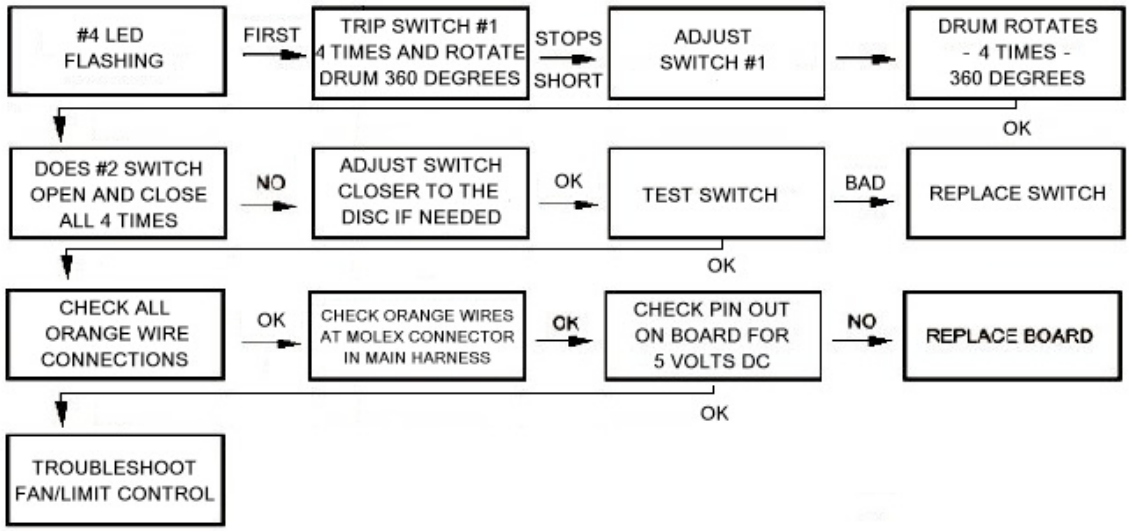
NOTE: The Room Air Fan (Convection Blower) is wired independently from the Control Board. Keep in mind when troubleshooting this area of the furnace that replacing the Control Board will not fix any issues related to the Blower and Fan/Limit Control.

NOTE: A dirty Filter may cause the furnace to run hotter and may contribute to the unit shutting down. Check the filter and replace if needed.

Rotation Motor Switch – Adjustment (#1 Switch, see Figure 14)



Rotation Motor Sensor - Adjustment (#2 Switch, see figure 14) – *The Fan/Limit Control must be working correctly before using this Flow Chart*



Rotation Motor – Mechanical

The Drum could be jammed due to a foreign object being stuck in the drum, or in the event of a failed ignition there is enough unburned fuel in the pot to prevent it from rotating. If this is the problem, unplug the unit and use a vacuum to clean out the fuel in the pot. To clear a foreign object may require that the motor be reversed by hand, as shown in figure 16.

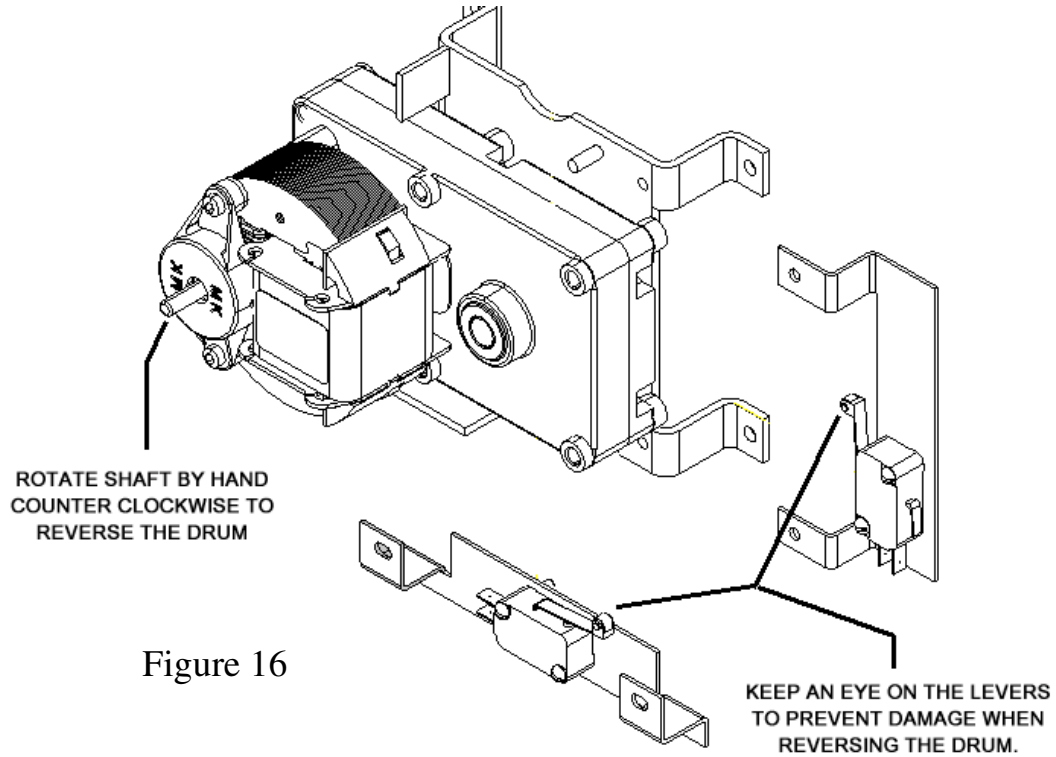
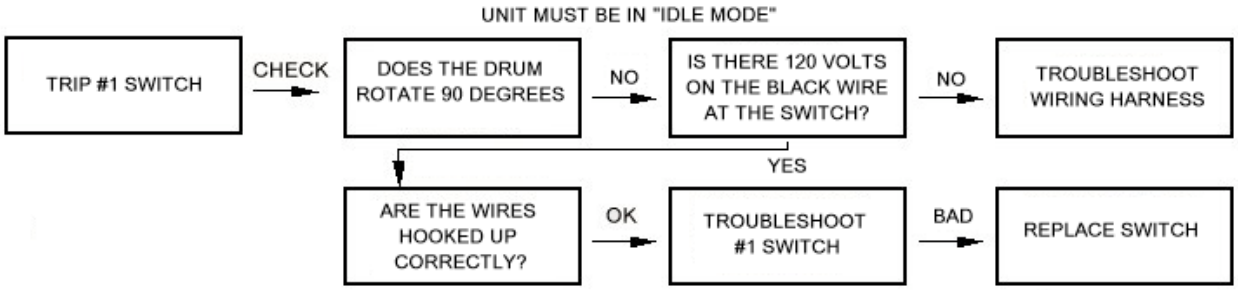
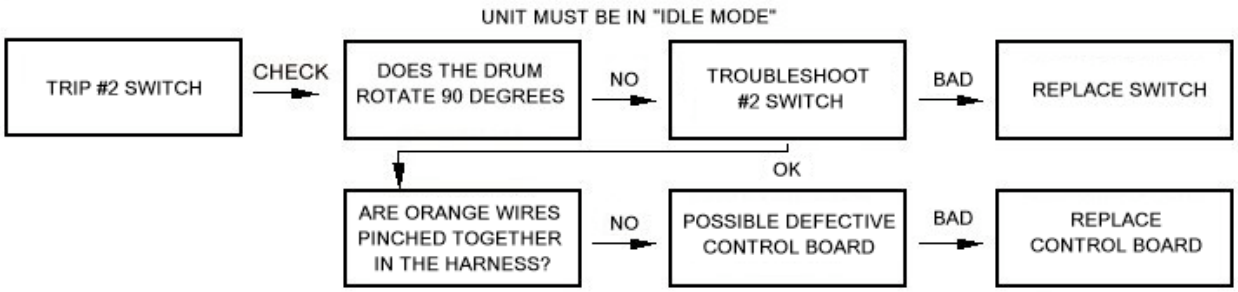


Figure 16

Rotation Motor Switch– Electrical (Switch #1)



Rotation Motor Sensor – Electrical (Switch #2)



Gearmotors – Relay

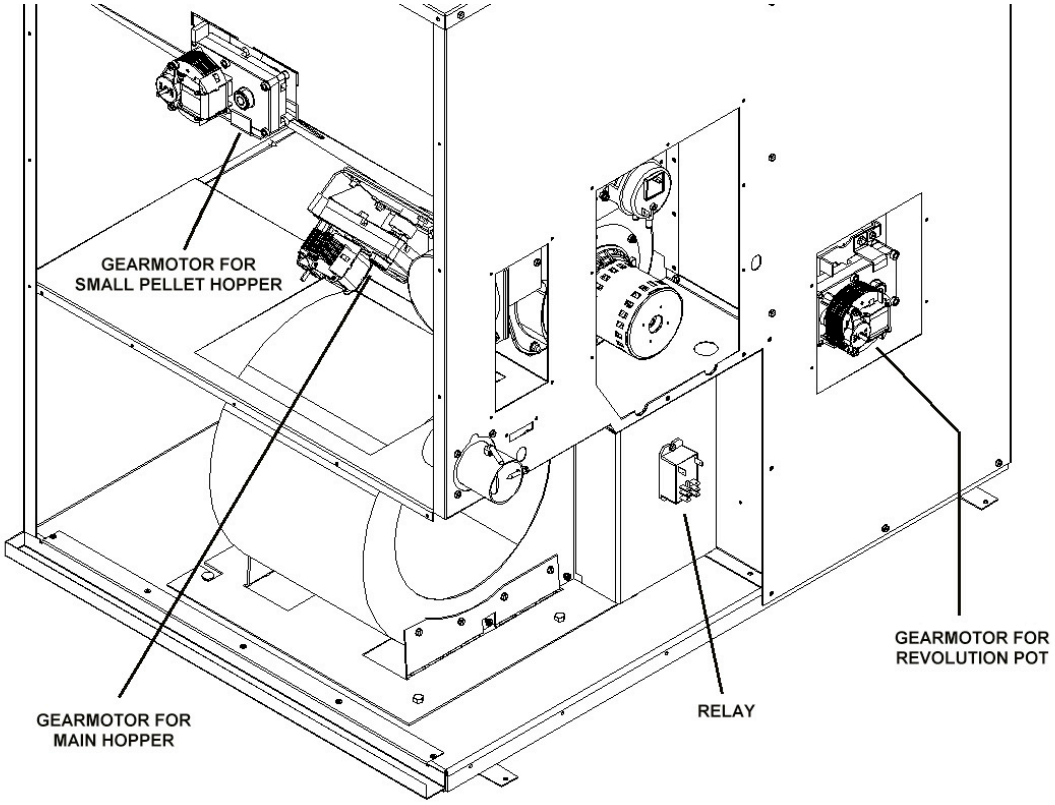


Figure 17

There are 3 gearmotors in the Revolution Technology. Figure 17 shows the location of the 3 motors and the Relay that is used in this design. To trouble shoot any of the Auger Motors it is important to understand the relationship to the Relay they have. Figure 18 explains the wires that are connected to the Relay.

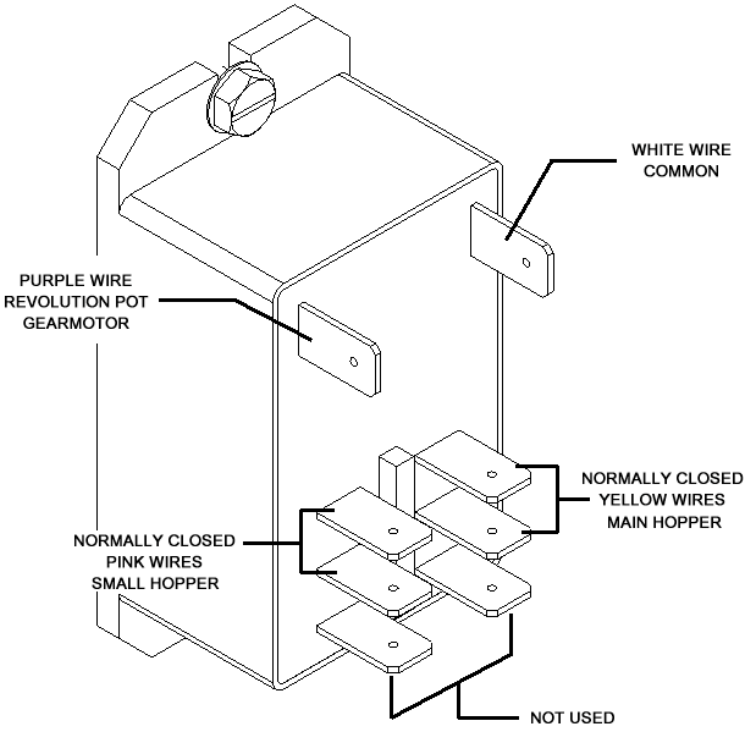


Figure 18

The Small and Main Hopper Auger Motors are wired through the Relay. They are connected to the "Normally Closed" circuit in the Relay. The Relay is wired to the Purple Wire that energizes the Revolution Pot Gearmotor. Any time the Drum is rotating will power the Relay and "Opens" the circuit to both Auger Motors. Any time the Drum gets jammed will keep the Relay energized and prevents the Auger Motors from running.

Small Hopper Auger Motor

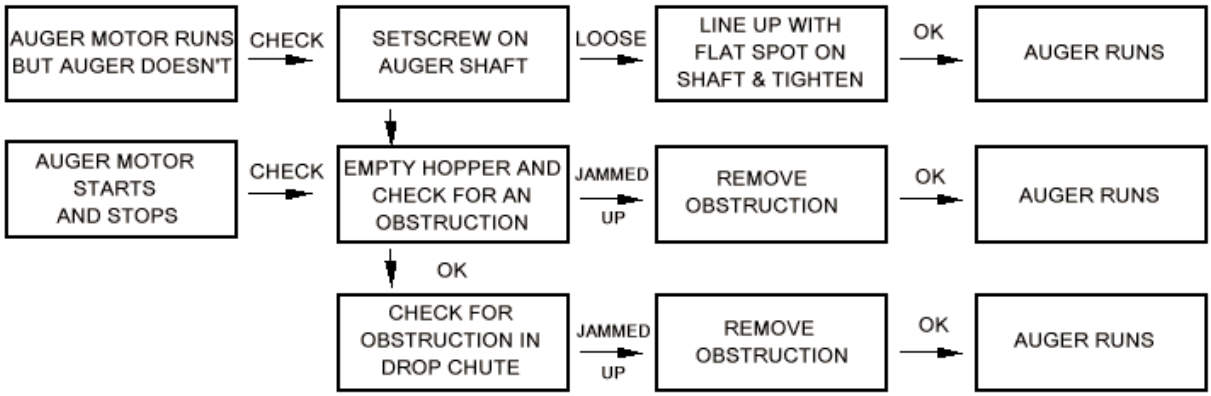
This Auger Motor only runs at certain times. This should be kept in mind when trying to observe if the unit runs or not.

1 – It runs continuously for 3 minutes during ignition. The Auger in the Small Hopper starts after the Drum rotates after the unit has been turned on.

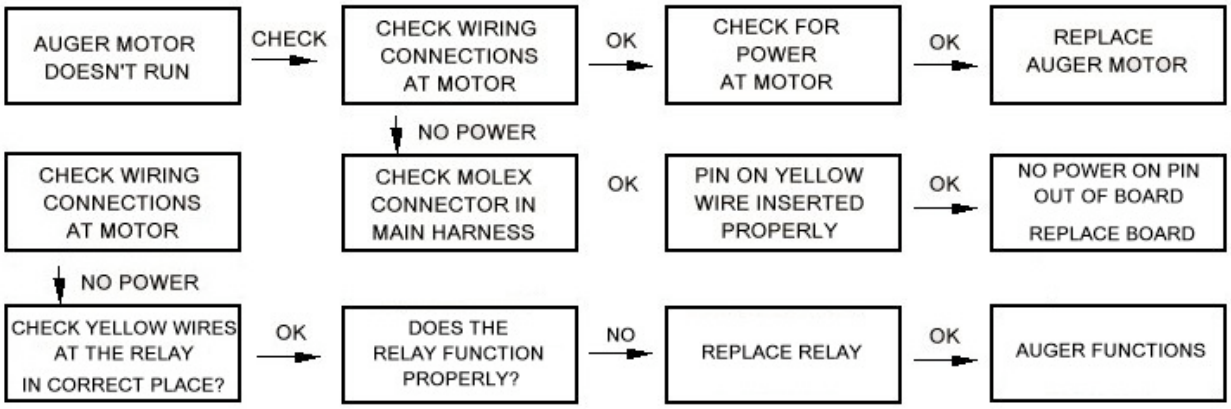
2 – After 3 minutes it is OFF for the next 6 minutes and then resumes trickling in pellets for the next 9 minutes.

3 – The small Hopper feeds pellets for 30 seconds right before the 2–Hour Cleaning Cycle runs and the Drum rotates 90 Degrees.

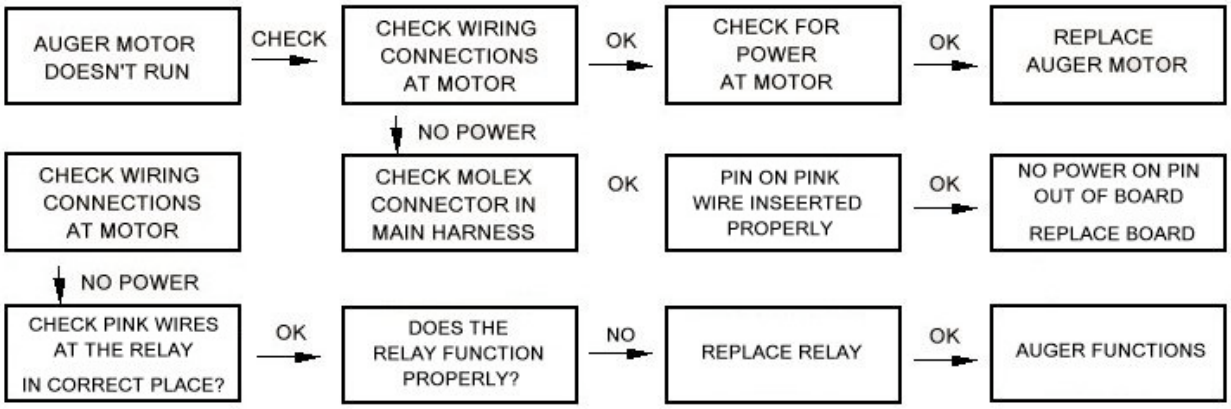
Auger Motor – Mechanical (Both Auger motors)



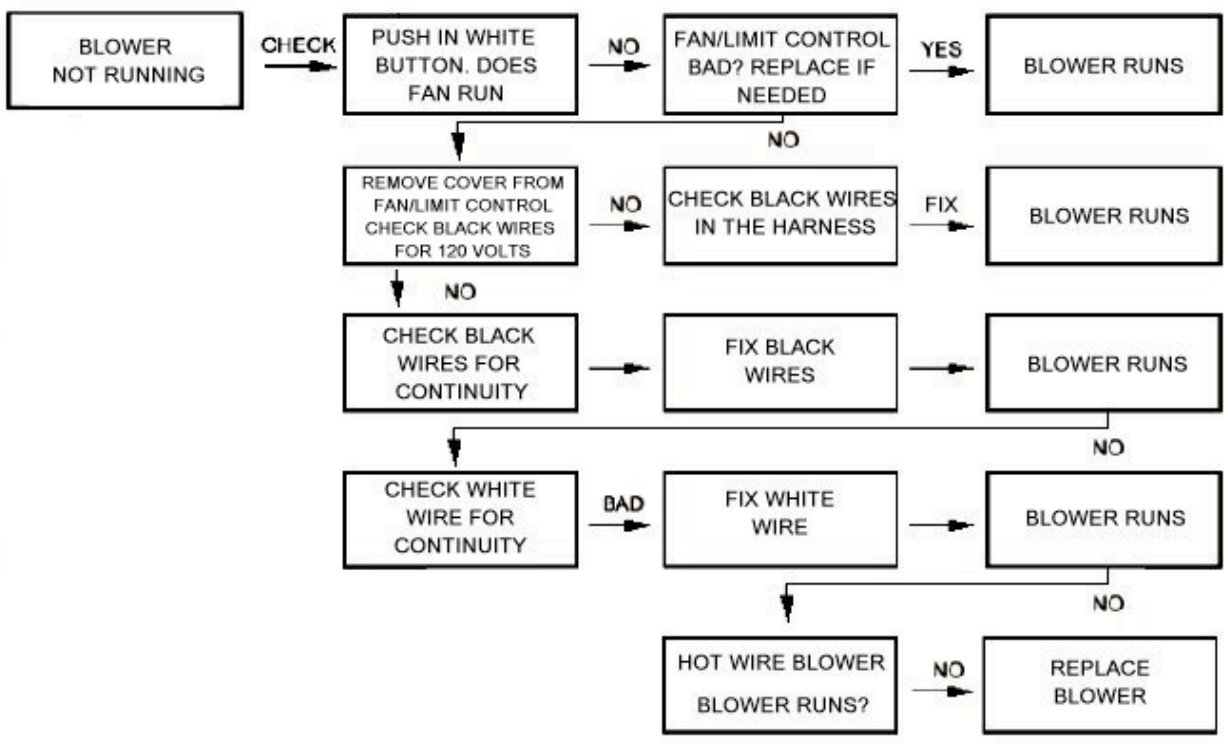
Auger Motor Main Hopper – Electrical



Auger Motor Small Hopper – Electrical



Convection Blower



Digital Control Board

Please refer to page 52 for the Troubleshooting Flow Chart for the Control Board.

Combustion Fan

Please refer to page 56 for the Troubleshooting Flow Chart for the Combustion Fan.

Igniter

Please refer to page 56 for the Troubleshooting Flow Chart for the igniter.

Vacuum Switch

Please refer to page 57 for the Troubleshooting Flow Chart for the Vacuum Switch.

Proof of Fire Switch

Please refer to page 59 for the Troubleshooting Flow Chart for the Proof of Fire Switch.

SCF-Revolution Data Table

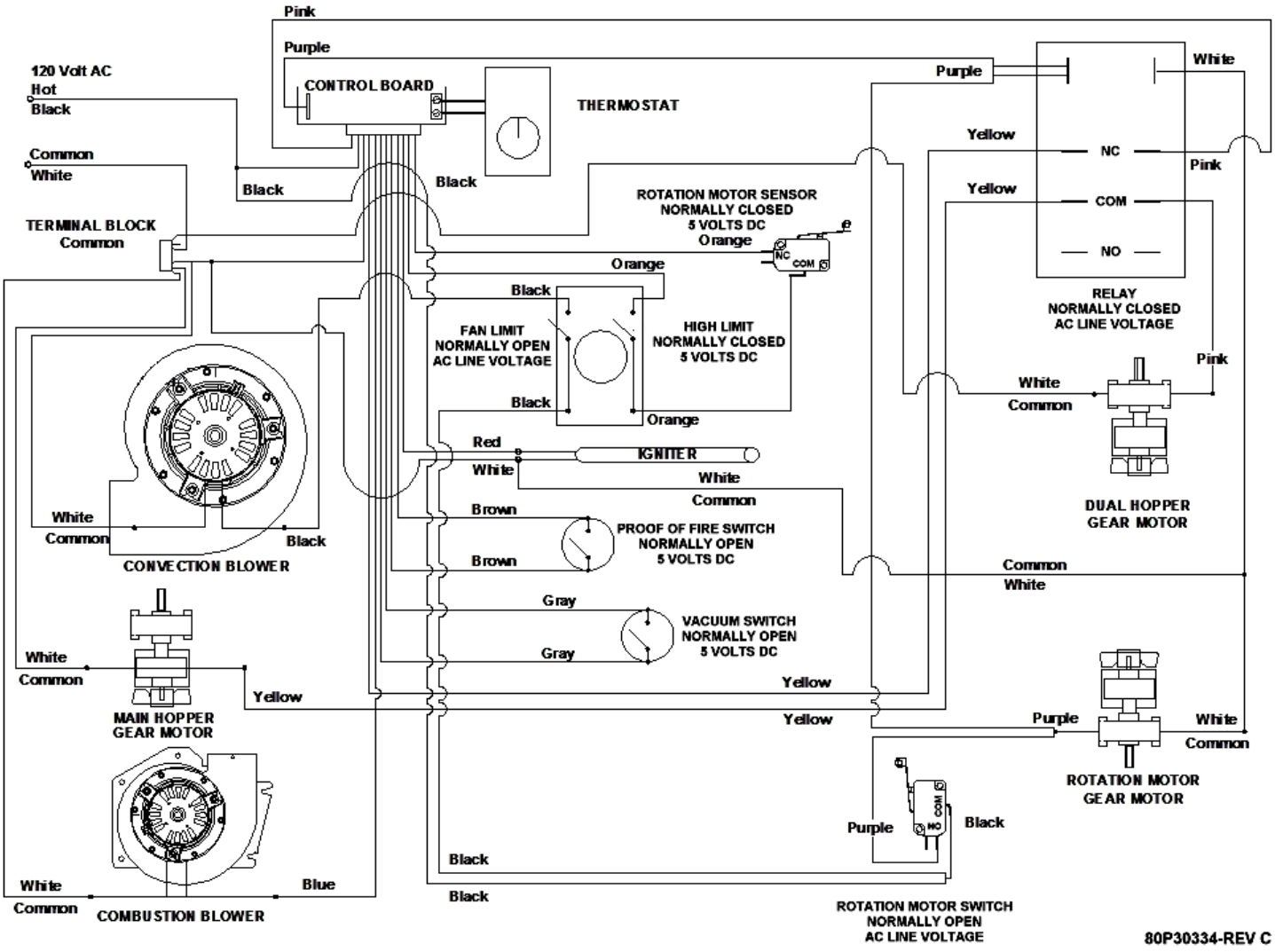
Based on a Cycle Time of 5.5 seconds.
Cycle time equals the ON time & OFF Time combined.

Heat Level Selection	Auger ON (Seconds)	Combustion Fan Voltage +/- 10%	Convection Fan Voltage +/- 10%	Pellets (Lbs./Hour) +/- 10%
Start-Up Cycle	3 min ON 6 Min OFF 9 Min Level 1	Line Volts	OFF	NA
1	2.5	90 Volts	120 Volts	2.5 Lbs.
2	3.0	100 Volts	120 Volts	3.6 Lbs.
3	3.5	106 volts	120 Volts	4.7 Lbs
4	4.0	112 volts	120 Volts	5.8 Lbs.
5	4.5	120 volts	120 Volts	6.9 Lbs.

The Voltages shown in the Chart reflect a line voltage of 120 volts. Actual numbers may vary based on the actual line voltage provided to the control board and the +/- Tolerance of the Electronic Components used in the Control Board.

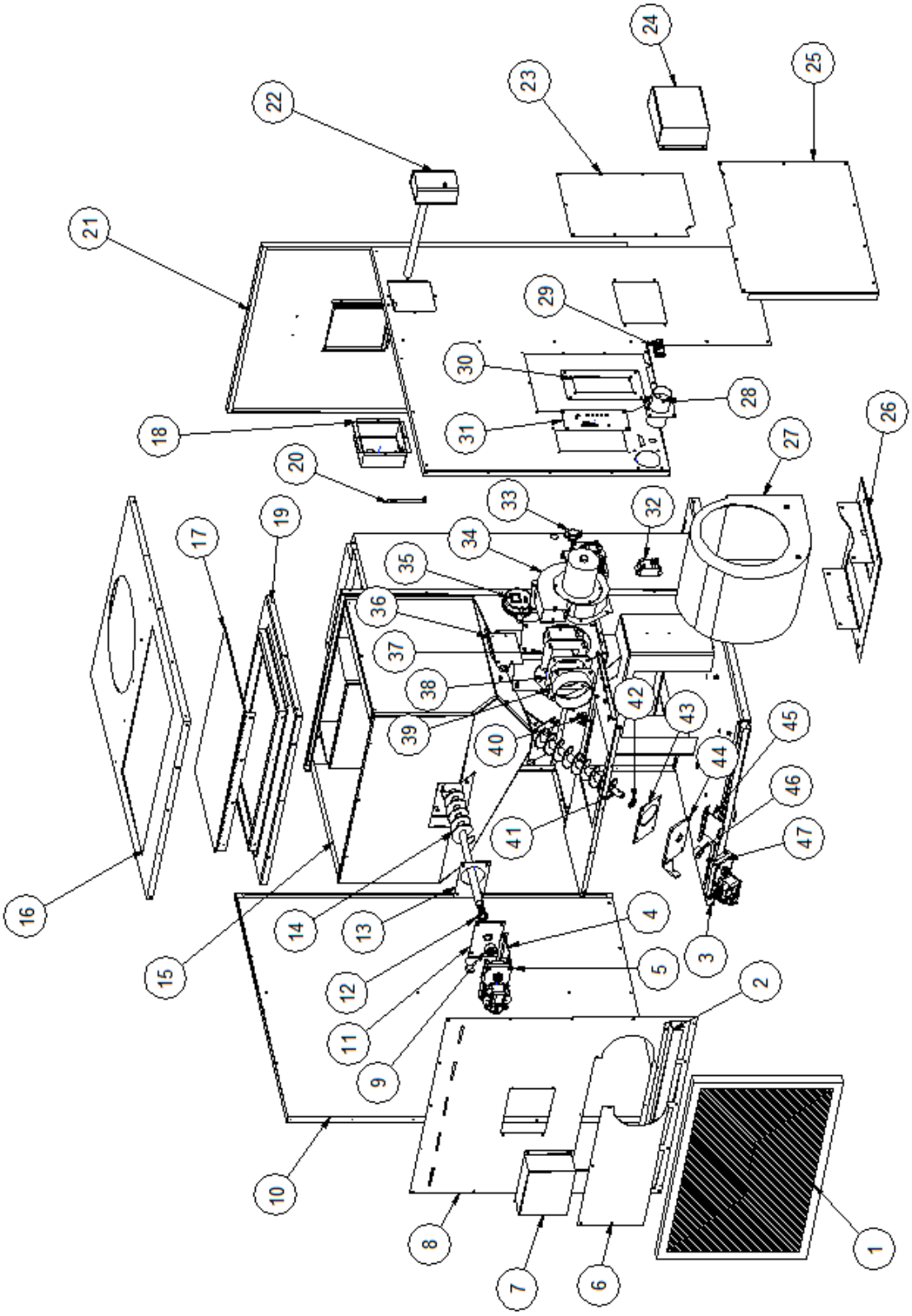
The SCF-Revolution is approved for Corn, Wheat, Rye, Cherry Pits, Distiller's Grain Pellets and Wood Pellets. Feed rates will vary from fuel to fuel and from program to program. The above chart is in reference to burning Pellets in Program 4 which has the highest BTU Rating for Pellets.

Wiring Schematic

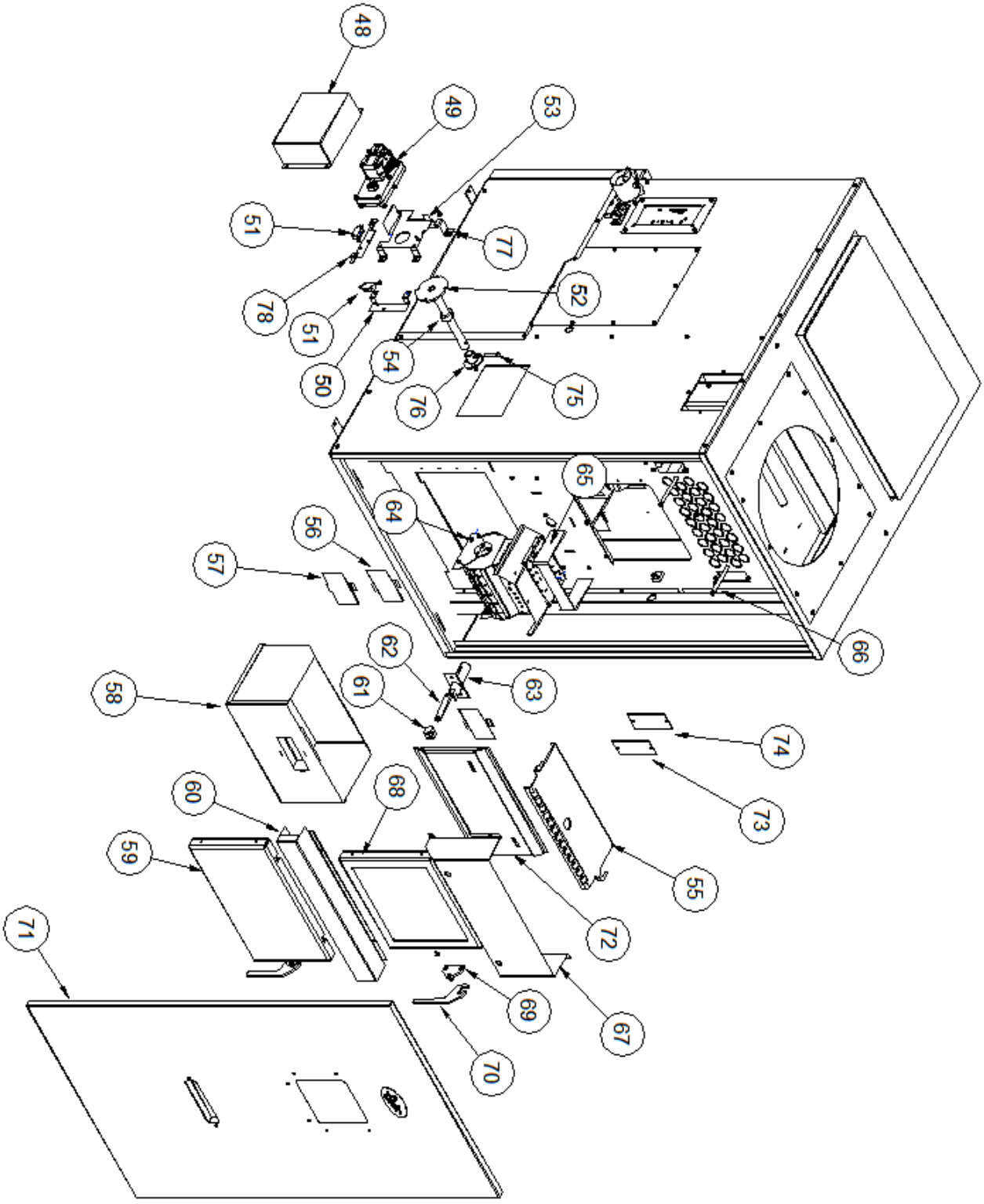


The Electrical Rating of this furnace is: 120 Volt, 60 Hz, 4 AMP. The minimum recommended circuit is 15 Amp. A dedicated circuit for the furnace is recommended.

SCF-Revolution Parts Layout



SCF-Revolution Parts Layout - Continued



#	PART NUMBER	DESCRIPTION
1	80P30330	FILTER 1 X 16 X 25
2	80P30311	FILTER BRACKET - TOP
3	80P30314	FILTER BRACKET - BOTTOM
4	80P30191	MOTOR RETAINER BRACKET
5	80P20278	AUGER MOTOR
6	80P30305	AUGER ACCESS PANEL
7	80P30248	GEAR MOTOR COVER
8	80P30444	CABINET – BACK PANEL
9	80P20248	5/8 COLLAR WITH SETSCREW
10	80P30090	CABINET – RIGHT PANEL
11	80P52957	MOTOR MOUNT BRACKET ASS.
12	80P50858	AUGER BUSHING WASHER
13	80P20245	AUGER GASKET
14	80P53859	HOPPER “B” AUGER WELDMENT
15	80P53853	HOPPER WELDMENT
16	80P30306	CABINET TOP
17	80P53824	HOPPERLID
18	80P30169	FAN LIMIT MOUNT BOX
19	80P53812	HOPPER TOP WELDMENT
20	80P52579	ROD SLIDER TOOL
21	80P53795	CABINET FRONT
22	80P30147	FAN LIMIT CONTROL
23	80P30312	EXHAUST FAN ACCESS PANEL
24	80P30248	GEAR MOTOR COVER
25	80P30313	BLOWER ACCESS PANEL
26	80P30317	BLOWER MOUNT BRACKET
27	80P30445	CONVECTION BLOWER
28	80P53871	INTAKE DAMPER
29	80P30045	WIRE TERMINAL - THERMOSTAT
30	80P53835	CONTROL COVER ASSEMBLY
31	80P30333	CONTROL BOARD
32	80P30431	AUGER MOTOR RELAY
33	80P20038	PROOF OF FIRE SWITCH
34	80P30446	COMBUSTION FAN
35	80P52628	VACUUM SWITCH
36	80P52710	VACUUM SWITCH BRAKET
37	80P53805	EXHAUST ADAPTER PLATE ASS.
38	80P20168	COMBUSTION FAN GASKET
39	80P53804	QUICK CONNECT PIPE ADAPTER
40	80P53630	TERMINAL BRACKET
41	80P53807	AUGER
42	80P50858	AUGER BUSHING WASHER
43	80P20245	AUGER GASKET
44	80P52957	MOTOR MOUNT BRACKET ASS.
45	80P30191	MOTOR RETAINER BRACKET

46	80P20248	5/8 COLLAR WITH SETSCREW
47	80P20278	AUGER MOTOR
48	80P30248	GEAR MOTOR COVER
49	80P20278	AUGER MOTOR
50	80P30250	ROTATION SWITCH BRACKET
51	80P30268	HONEYWELL SWITCH
52	80P53847	POT DRIVE SHAFT
53	80P30209	MOTOR MOUNT BRACKET
54	80P20248	5/8 COLLAR WITH SETSCREW
55	80P30206	HEAT EXCHANGE BAFFLE
56	80P52237	ASH TRAP COVERS
57	80P30162	ASH TRAP COVER BEHIND ASHPAN
58	80P53864	ASH PAN
59	80P53797	ASH PAN DOOR - COMPLETE
60	80P30329	IGNITER COVER
61	80P30327	IGNITER CERAMIC INSULATOR
62	80P30328	CERAMIC IGNITER - ONLY
63	80P53710	IGNITER TUBE WELDMENT
64	80P53958	REVOLUTION POT – MULTI FUEL
65	80P30316	POT SIDE SHIELD
66	80P30155	TUBE SCRAPER RODS
67	80P30094	HOT AIR BOX
68	80P53800	FIREBOX DOOR - COMPLETE
69	80P53677	HANDLE MOUNT PLATE - ONLY
70	80P53707	HANDLE - ONLY
71	80P53795	CABINET FRONT
72	80P30655	BACK BAFFLE
73	80P30687	ROD ACCESS COVER
74	80P30699	ACCESS COVER GASKET
75	1/4-20X3/4HHCS	DRIVE COUPLER BOLT
76	80P53867	DRIVE COUPLER
77	80P53708	MOTOR RETAINER CLIP
78	80P30709	MOTOR SENSOR SWITCH BRACKET

Lincoln SCR

In an effort not to duplicate much of the information from the previous sections please read pages 135 through 146.

The Lincoln SCR is a freestanding stove based on the SCF-Revolution furnace design. There are several small differences between the two.

They are:

1 – The programs on the Control Board. They reflect the lower BTU Rating of the stove.

2 – The Convection Blower (300 CFM)

3 – 20 Heat Exchange Tubes

4 – Manual Reset High limit instead of a Fan/Limit Control

5 – Motor and Drive Assembly for the Revolution Pot is different from the Furnace.

Lincoln SCR Control Board – How is it different from the Furnace?

This Control Board offers the same advantages that were mentioned in the section covering the SCF-Revolution. All adjustments can now be made from the front of the control board instead of having to access the back side of the board and change jumper settings. The difference is in the 4 Programs.

There are 4 different Programs on the board to choose from depending on the choice of fuel (Pellets, Corn Wheat, Rye, Cherry Pits or Distiller's Grain Pellets). They are also to be used to when having difficulty with poor quality fuel. If a fuel is high in Ash Content for instance, a program with a **longer Cycle Time should be used if the pot is overloading.**

To change to a different Program several steps must be followed:

1 - The unit must be OFF and cooled down (P.O.F. Switch must be open)
2 – The Thermostat Slide Switch must be in Manual Mode.
3 – Press and Hold the Auger Feed Button and at then press the High and Low Draft Trim Buttons at the same time. You will see all five LED lights on the Heat Level Bar light up at the same time.

Program 1 - **The Cycle Time is 7.5 seconds. This program will be the default program when the Stove is first plugged in.** This program is for use with Pellets and Cherry Pits.

Program 2 - **The Cycle Time is 8.5 seconds.** This program is for use with Pellets, Corn, Wheat, Rye, Cherry Pits and Distillers Grain Pellets.

Program 3 - **The Cycle Time is 9.5 seconds.** This program is for use with Pellets, Corn, Wheat, Rye, Cherry Pits and Distillers Grain Pellets.

Program 4 - **The Cycle Time is 10.5 seconds.** This program is for use with Pellets, Corn, Wheat, Rye, Cherry Pits and Distillers Grain Pellets.

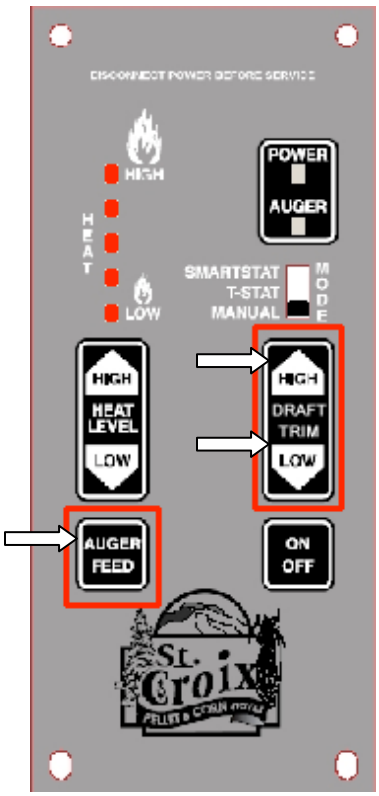
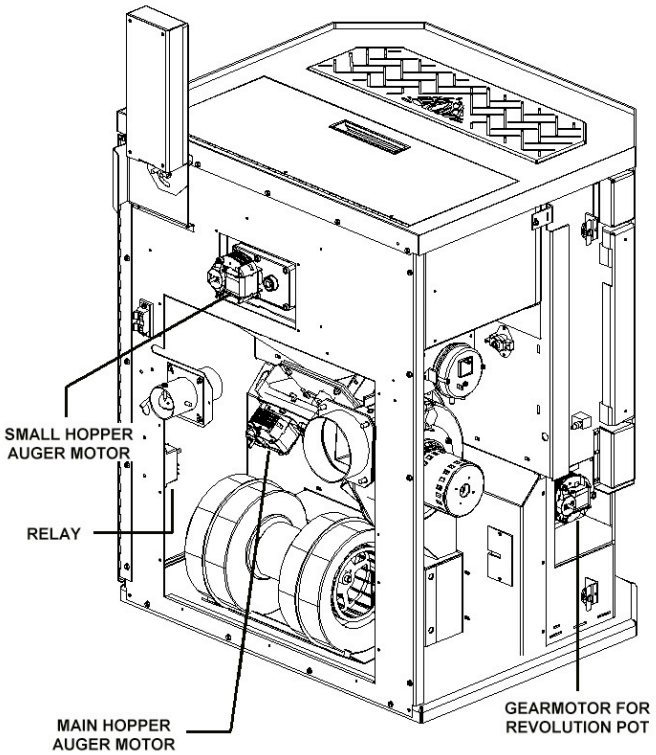


Figure 1



This diagram shows the location of the Relay and also shows how the Revolution Pot Gearmotor is installed. It is installed inside the Ashpan area. The Lincoln SCR uses all of the designs described in the previous section covering the SCF-Revolution. Please read pages 127 through 138 if you haven't already done so.

Figure 2

Troubleshooting Flow Charts for the Lincoln SCR

In an effort not to duplicate information already in this manual we will use any of the SCF-Revolution Furnace Troubleshooting Flow Charts that apply to the Lincoln SCR.

Two Flow Charts specific to The Lincoln SCR are needed.

Convection Blower

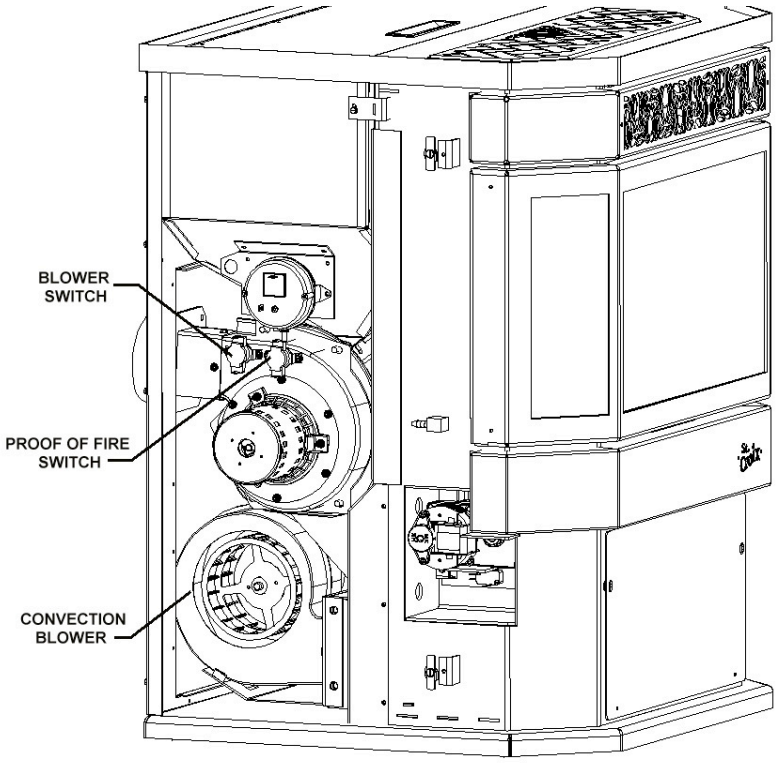
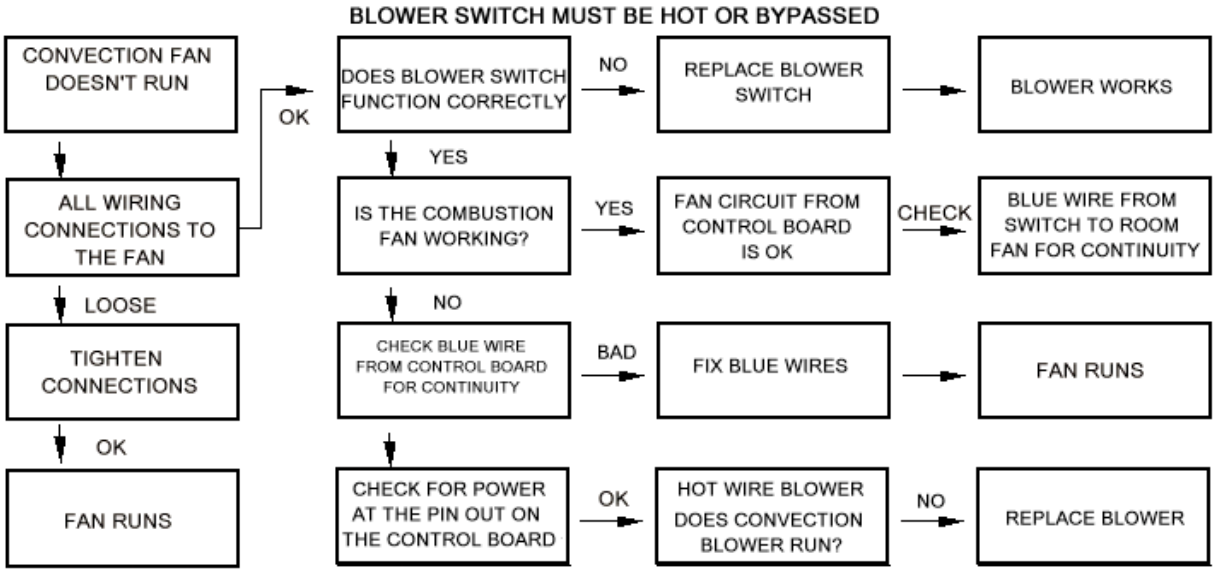


Figure 3

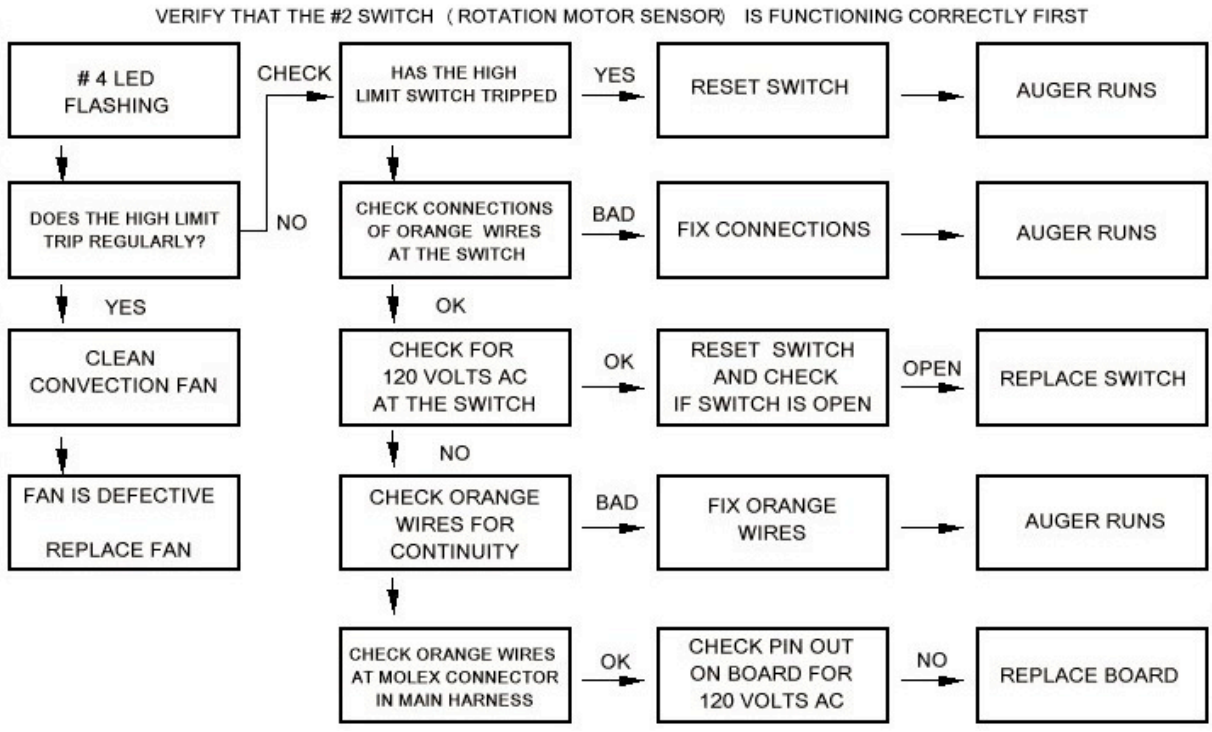
The Lincoln SCR utilizes a separate "Normally Open" Heat Sensing Disc to turn the Convection Blower ON and OFF. The voltage is controlled by the same circuit as the Combustion fan. It is mounted beside the "Proof of Fire" disc. (See figure 3) The Blower Switch has Blue wires plugged into it and the Proof of Fire Switch has Brown wires plugged into it.

This design changes how the initial "Fan Test" runs after turning the unit ON. The Convection Fan will not come on during this test if the unit is cold and the "Blower Switch" is open.



High Limit Switch

Before attempting to troubleshoot the High Limit Switch, be sure to verify that the #2 Rotation Motor switch is closed and is functioning correctly. If the Orange Wires connected to this switch are not closed through the switch will cause a #4 LED Alarm as well.



In an effort not to duplicate much of the information from the previous sections please refer to the following Trouble Shooting Flow Charts:

Rotation Motor Switch – Adjustment (Switch #1) – please see page 147

Rotation Motor Sensor – Adjustment (Switch #2) – please see page 148

Rotation Motor – Mechanical

How to reverse the Rotation Motor – Please see Figure 16 on page 148

Rotation Motor Switch – Electrical (Switch #1) – please see page 149

Rotation Motor Sensor – Electrical (Switch #2) – please see page 149

Relay – please see page 149-150

Auger Motor - Mechanical – please see page 151

Auger Motor Main Hopper- Electrical – please see page 151

Auger Motor Small Hopper - Electrical – please see page 151

Convection Fan – please see page 152

Hopperlid Switch - please see page 53

Igniter – please see page 56

Vacuum Switch – please see page 57

Proof of Fire Switch – please see page 59

Lincoln SCR Data Table

Based on a Cycle Time of 7.5 seconds.

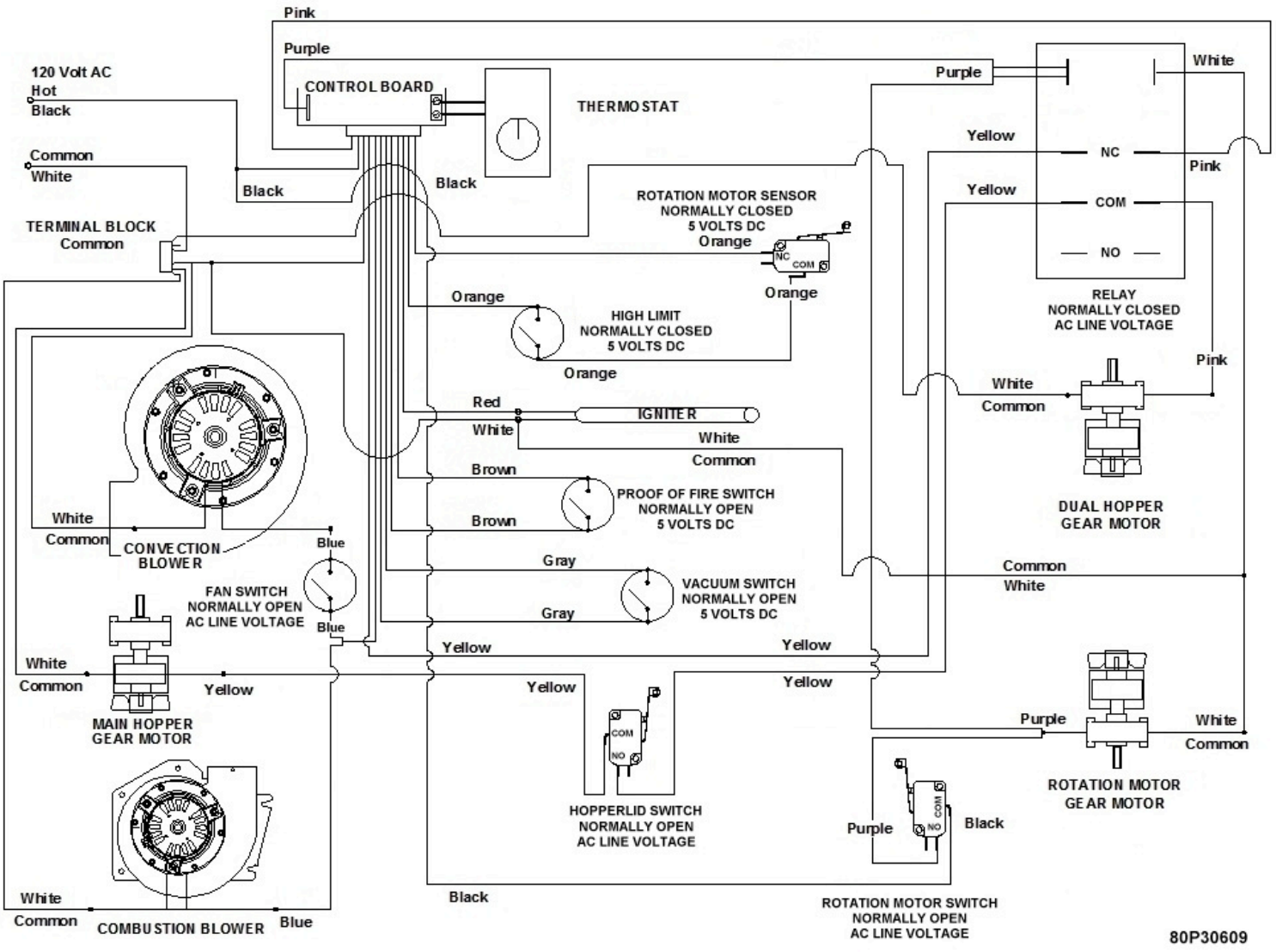
Cycle time equals the ON time & OFF Time combined.

Heat Level Selection	**Auger ON (Seconds)**	**Combustion Fan Voltage +/- 10%**	**Convection Fan Voltage +/- 10%**	**Pellets (Lbs./Hour) +/- 10%**
Start-Up Cycle	3 min ON 6 Min OFF 9 Min Level 1	Line Volts	OFF	NA
1	2.5	90 Volts	90 Volts	1.5 Lbs.
2	3.0	100 Volts	100 Volts	2.6 Lbs.
3	3.5	110 volts	110 Volts	3.7 Lbs
4	4.0	116 volts	116 Volts	4.8 Lbs.
5	4.5	120 volts	120 Volts	5.8 Lbs.

The Voltages shown in the Chart reflect a line voltage of 120 volts. Actual numbers may vary based on the actual line voltage provided to the control board and the +/- Tolerance of the Electronic Components used in the Control Board.

The Lincoln SCR is approved for Corn, Wheat, Rye, Cherry Pits, Distiller's Grain Pellets and Wood Pellets. Feed rates will vary from fuel to fuel and from program to program. The above chart is in reference to burning Pellets in Program 1 which has the highest BTU Rating for Pellets.

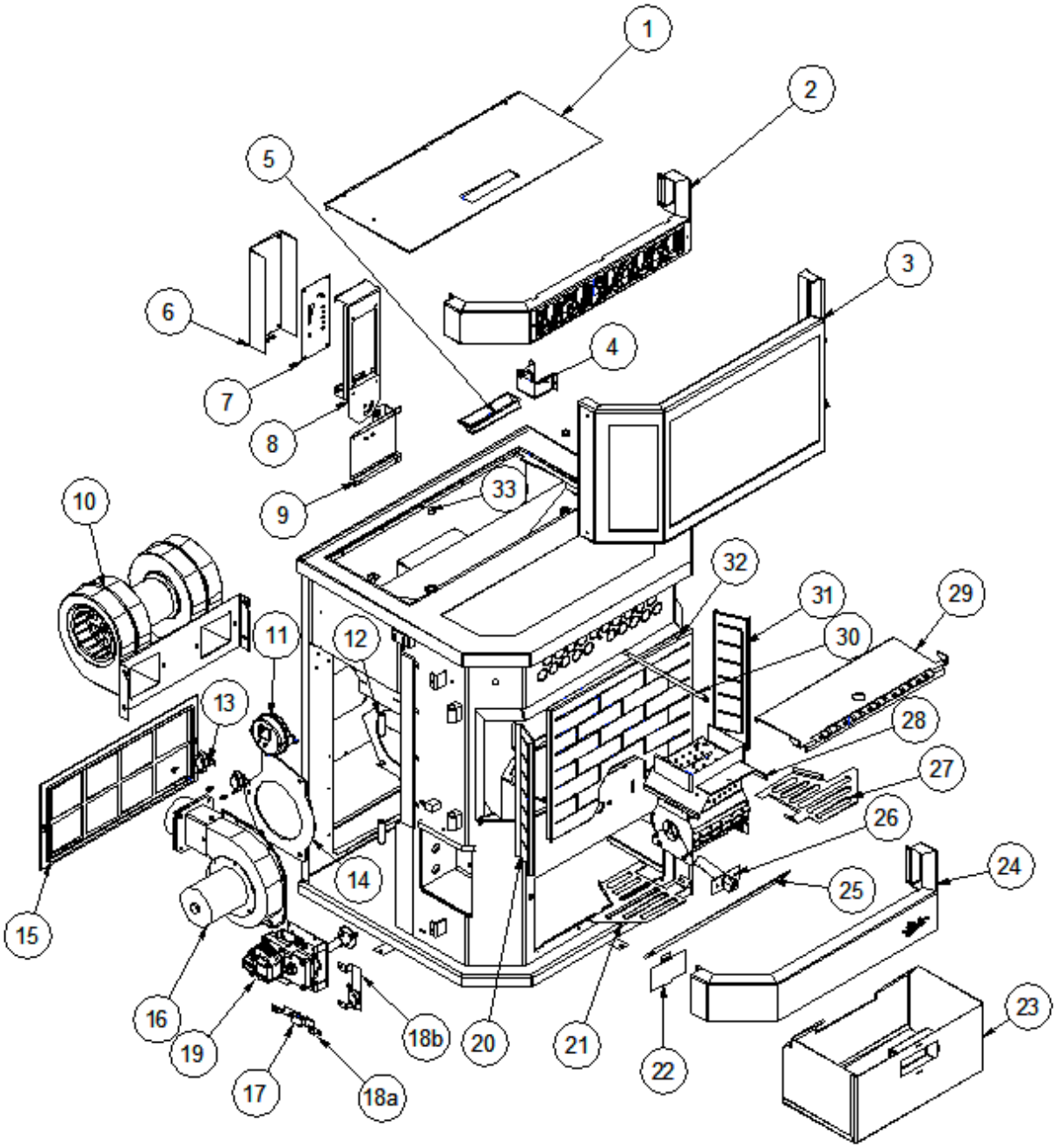
Wiring Schematic



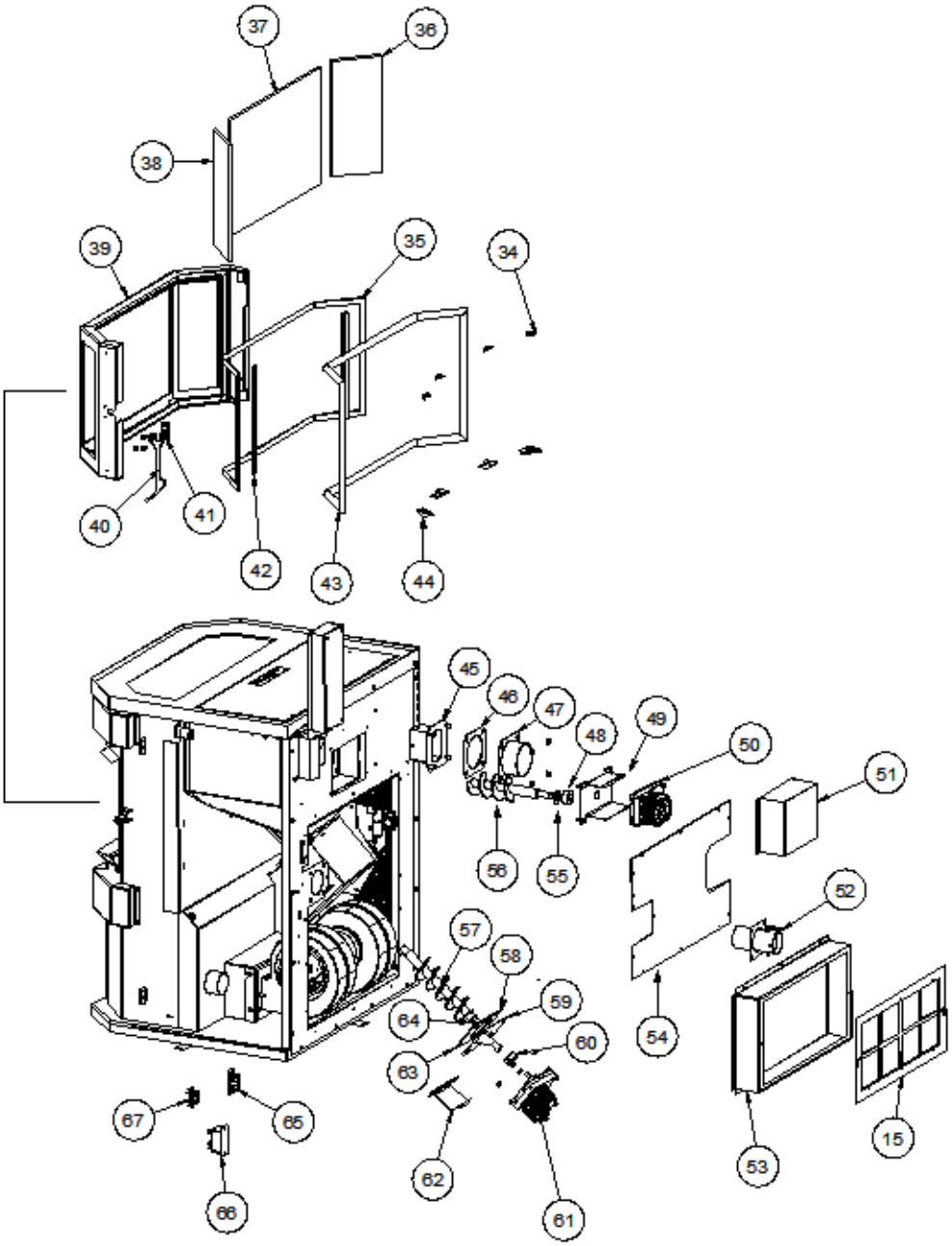
The Electrical Rating of this Stove is: 120 Volt, 60 Hz, 3 AMP. The minimum recommended circuit is 15 Amp. A dedicated circuit for the Stove is recommended.

CAUTION: The electrical components of the Stove are not owner serviceable. Call your dealer for proper diagnosis of electrical problems and service to those components.

Lincoln SCR Parts Layout



Lincoln SCR Parts Layout - Continued



Part Numbers / Description

#	PART NUMBER	DESCRIPTION
1	80P54031	HOPPERLID WELDMENT
2	80P53770	HOT AIR BOX
3	80P53725	BAY DOOR BLACK - COMPLETE
4	80P30697	HOPPER SWITCH BOX (SEE 17 FOR SWITCH)
5	80P20183	HANDLE PULL
6	80P30519	COVER/HARNESS RESTRAINT
7	80P30608	CONTROL BOARD
8	80P53945	CONTROL BOARD BOX
9	80P53992	MOUNT BRACKET ASSEMBLY
10	80P53977	CONVECTION BLOWER ASSEMBLY
11	80P52628	VACUUM SWITCH
12	80P65021	1/2" X 2" DOWEL PIN (2 PER STOVE)
13	80P20038	P.O.F. SWITCH / FAN SWITCH
14	80P20168	COMBUSTION FAN GASKET
15	80P54000	FILTER ASSEMBLY
16	80P53933	COMBUSTION FAN ASSEMBLY
17	80P30268	HONEYWELL SWITCH **(USED IN 3 PLACES)**
18a	80P30709	ROTATION SENSOR BRACKET
18b	80P30707	ROTATION SWITCH BRACKET
19	80P53979	REVOLUTION MOTOR DRIVE ASSEMBLY
20	80P30594	STEEL BRICK – LEFT PANEL
21	80P30492	DECORATIVE GRILL – LEFT HAND
22	80P30162	CLEAN OUT COVER PLATE
23	80P53931	ASH PAN WELDMENT
24	80P30590	LOWER PANEL
25	80P54056	ASH CLEAN OUT COVER
26	80P54047	IGNITER ASSEMBLY
27	80P30493	DECORATIVE GRILL – RIGHT HAND
28	80P53958	REVOLUTION POT - COMPLETE
29	80P30506	HEAT EXCHANGE BAFFLE
30	80P52567	TUBE SCRAPER ROD
31	80P30593	STEEL BRICK – RIGHT PANEL
32	80P30577	STEEL BRICK – BACK PANEL
33	80P30561	HOPPER MAGNETS

34	80P52074	BAY DOOR GLASS CLIP - TOP
35	80P20027	5/8” WINDOW GASKET
36	80P20035	BAY SIDE GLASS
37	80P20034	BAY FRONT GLASS
38	80P20035	BAY SIDE GLASS
39	80P53724	BAY DOOR FRAME - WELDED
40	80P53773	DOOR HANDLE
41	80P53723	MOUNT PLATE ASSEMBLY
42	80P20024	¾” WINDOW GASKET
43	80P30248	5/8” DOOR GASKET, ROPE
44	80P52796	BAY DOOR GLASS CLIP - BOTTOM
45	80P53677	EXHAUST ADAPTER PLATE WELDMENT
46	80P52232	QUICK DISCONNECT GASKET
47	80P52887	QUICK CONNECT PIPE WELDMENT
48	80P20248	5/8" COLLAR WITH SETSCREW
49	80P53990	HOPPER B MOTOR MOUNT ASSEMBLY
50	80P20278	AUGER MOTOR (**USED IN 3 PLACES**)
51	80P30248	ROTATION MOTOR COVER (**USED 2 PLACES**)
52	80P53871	INTAKE DAMPER WELDMENT
53	80P30501	FILTER BOX
54	80P30483	BACK PANEL COVER
55	80P50858	AUGER BUSHING WASHER
56	80P53943	HOPPER B AUGER WELDMENT
57	80P53666	AUGER WELDMENT
58	80P20245	AUGER GASKET
59	80P52957	MOTOR MOUNT BRACKET ASSEMBLY
60	80P20248	5/8" COLLAR WITH SETSCREW
61	80P20278	AUGER MOTOR
62	80P30191	MOTOR RETAINER BRACKET
63	80P20245	AUGER GASKET
64	80P50858	AUGER BUSHING WASHER
65	80P30045	SPEAKER TERMINAL-THERMOSTAT
66	80P30431	RELAY - REVOLUTION MOTOR
67	80P52630	TERMINAL BLOCK
	80P30612	WIRING HARNESS

Ashby Insert Series

The Ashby Series of Inserts consists of Burn Systems we currently use in our Stove Line. The **Ashby-P** uses the Versa Grate System. The **Ashby-MF** uses the Multi-Fuel System

Control Board

The Control Board is the same board as used with the SCF-Revolution and the Lincoln SCR. This version of the board however has two Programs that work for the Versa Grate System and two Programs that work with the Multi-Fuel System.

Before lighting the Insert for the first time, be sure the correct program is chosen.

To change the program on the board, the Insert must be off and the unit must be cold. The programs are identical in operation, except for the Cycle Time. The Cycle time is the total of the ON Time & OFF Time added together. The ON Times are the same between programs, so this means that the OFF Time is increased or decreased, depending on the program chosen.

Program 1. The Cycle Time is 11.5 seconds**.** This program will be the default program when the Ashby is first plugged in. ***This program does not offer self ignition*****.** This program is for use with Pellets, Corn, Wheat and Rye, Cherry Pits & Distillers Grain Pellets.

Program 2. The Cycle Time is 13 seconds. ***This program does not offer self ignition*****.** This program is for use with Pellets, Corn, Wheat and Rye, Cherry Pits & Distillers Grain Pellets.

Program 3. The Cycle Time is 11.5 seconds. ***This Program offers Self-Ignition and is only for units that have the Versa Grate system & Igniter installed*****.** This program is for use with Pellets & Cherry Pits.

Program 4. The Cycle Time is 10 seconds. ***This Program offers Self-Ignition and is only for units that have the Versa Grate system & Igniter installed*****.** This program is for use with Cherry Pits.

As the Cycle Time increases, the feedrate decreases. If the ***incorrect*** program is chosen for a specific fuel, the burnpot will overload. Use caution when using this feature. ***The default programs to use are Program 1 (For Multi-Fuel Units) and Program 3 (For the Versa Grate System).*** The other programs are for "Tweaking" the units for different fuel and installation conditions.

The Ashby Installation and Operations Manual gives detailed instructions on how to operate the unit. To avoid duplicating the information, please read the Ashby manual thoroughly.

This Ashby was designed to be able to switch between the 2 burn systems we offer in our regular stove line. Following is a description showing how to switch out the burn pots.

Removing the Versa Grate System

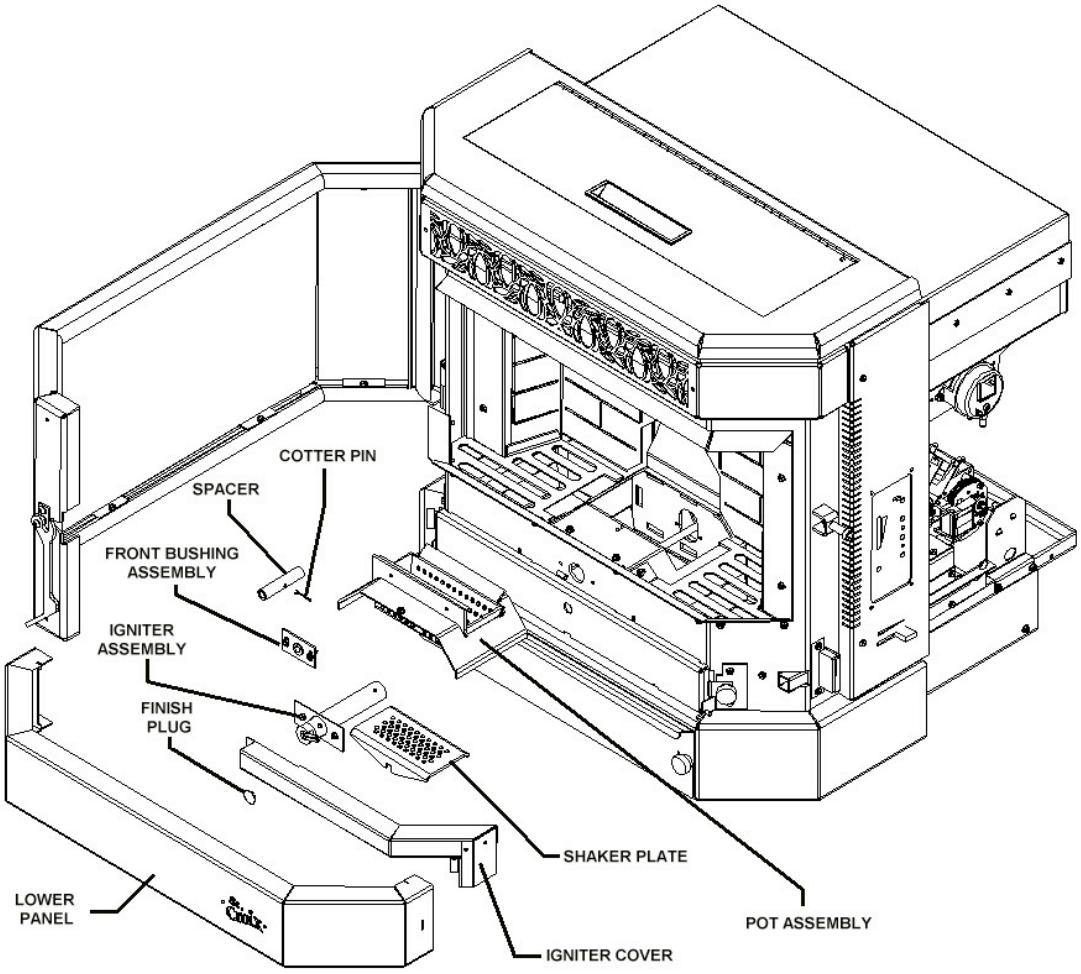


Figure 1

Remove the parts shown in figure 1 in the following order:

1 – Lower panel	2 – Finish Plug	3 – Igniter Cover
4 – Igniter Assembly	5 – Pot Assembly	6 – Shaker Plate
7 – Cotter Pin	8 – Spacer	9 – Front Bushing

After pulling the Cotter Pin, the Spacer and the Front Bushing Assembly may be left in the unit until the Versa Grate system has been pulled from the back side. This will remove the Shaft/Cage Weldment extending from the back and allow the Spacer and Bushing Assembly to be removed with less effort.

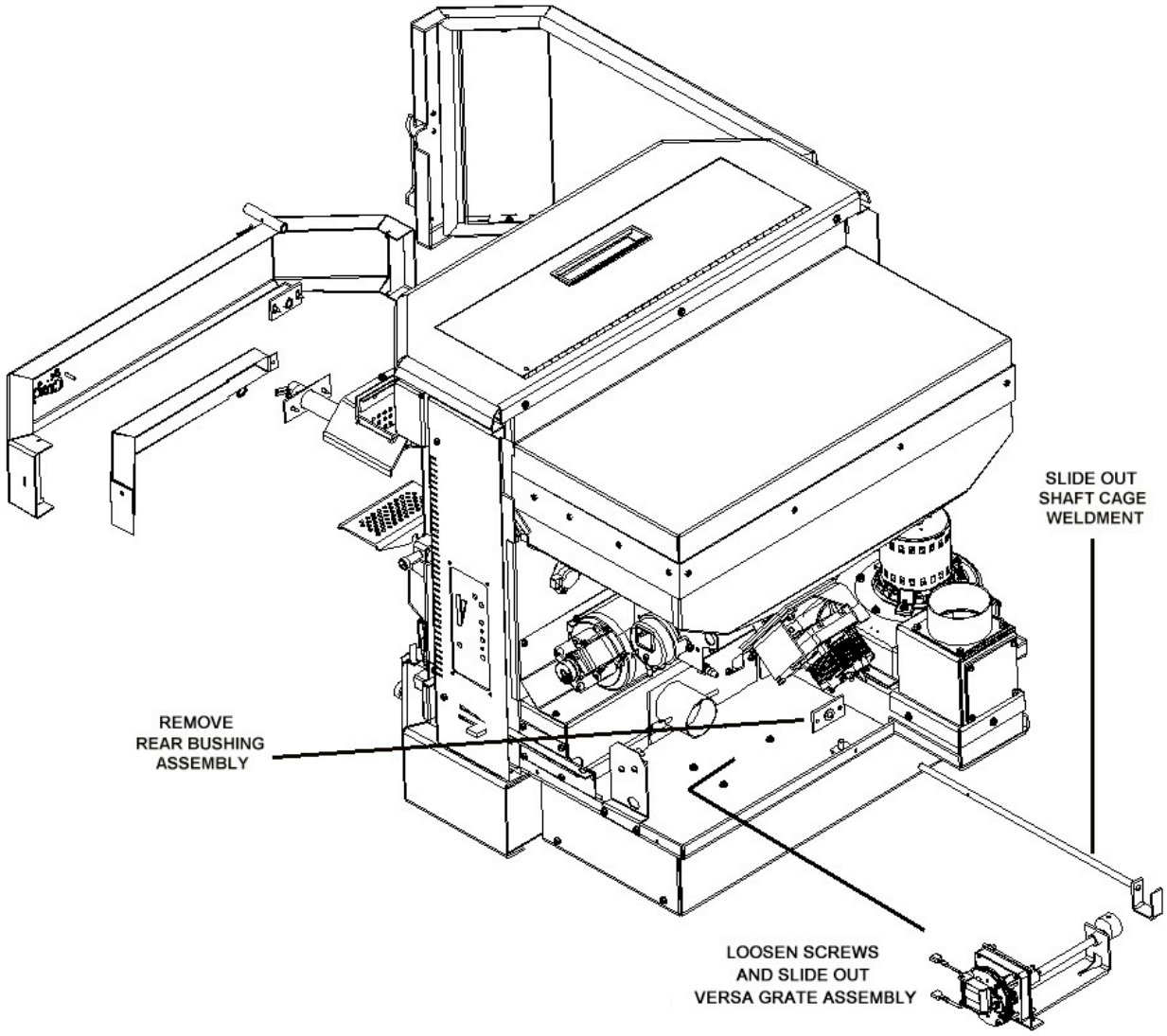


Figure 2

Once the parts have been removed from the front of the insert, remove the parts shown in figure 2 in the following order:

1 – Versa Grate Assembly 2 – Shaft/Cage Weldment 3 – Rear Bushing

For installing these Components and adjusting the Front Bushing assembly see the information on page ?

Installing the Multi-Fuel System

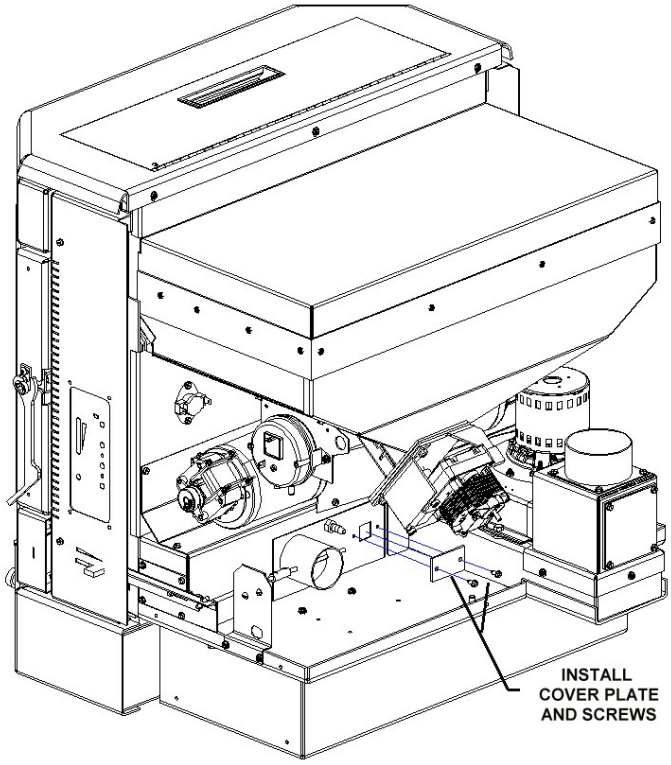


Figure 3

Start by covering the hole on the back side of the unit where the Rear Bushing Assembly was removed.

Attach the Cover plate using the 2 screws that were removed with the Rear Bushing Assembly.

Follow the order listed below for in stalling the components.

1 – Insert the Slide-Out Bottom

2 – Place the Coal Rake in the unit, with the Rod sticking out the front of the unit. Note the orientation of the bend. The bend is facing down. *See Figure 5*

3 – Put the Multi-Fuel Pot into the unit.

4 – Insert the Coal Rake into the slots in the Burn Pot. *See Figure 5*

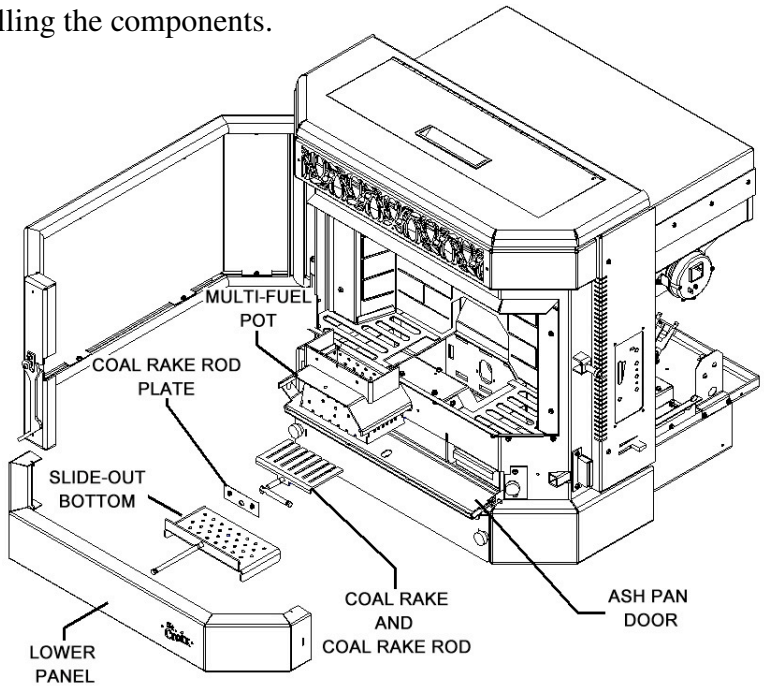


Figure 4

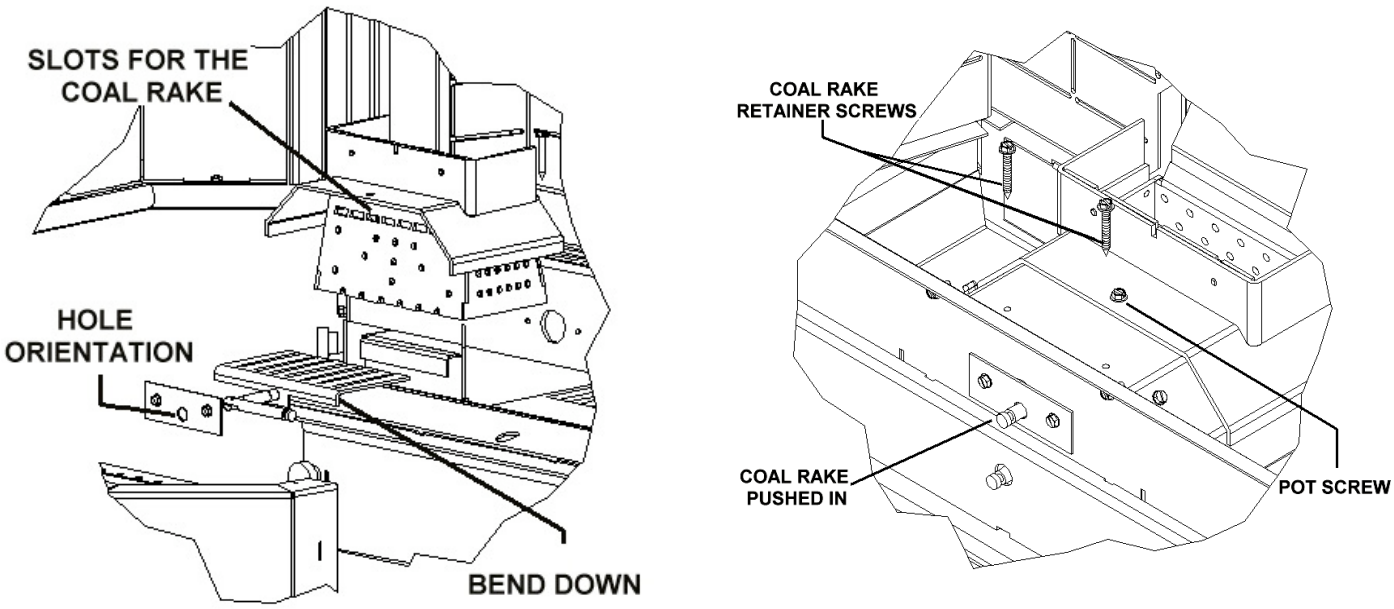


Figure 5

5 – Place the Coal Rake Rod through the hole in the Coal Rake Rod Plate and screw to the front of unit with the screws that held the Igniter assembly in place.

6 – Screw the Multi-Fuel Pot in place.

7 – ***Push the Coal Rake in*** before inserting the two #8 x 1¼" Coal Rake Retainer screws.

8 – Close the Ash Pan Door and install the Lower Panel.

Installing the Versa Grate System

Please refer to Figures 1 and 2 on pages 171 and 172. The sequence for installing the Versa Grate system changes slightly compared to taking the components out. Please follow this sequence:

1 – Install the Rear Bushing Assembly first.

2 – Install the Front Bushing Assembly. It has slots to adjust the Shaker Plate, leave it loose and adjust it later.

3 – Slide the Shaft/Cage Weldment through the Rear Bushing and through the Front Bushing. Do not slide Rod all the way through.

4 – Slide the Spacer on the end of the Rod and line up the holes and insert the Cotter Pin.

5 – Place the Shaker Plate on the Rod and Spacer.

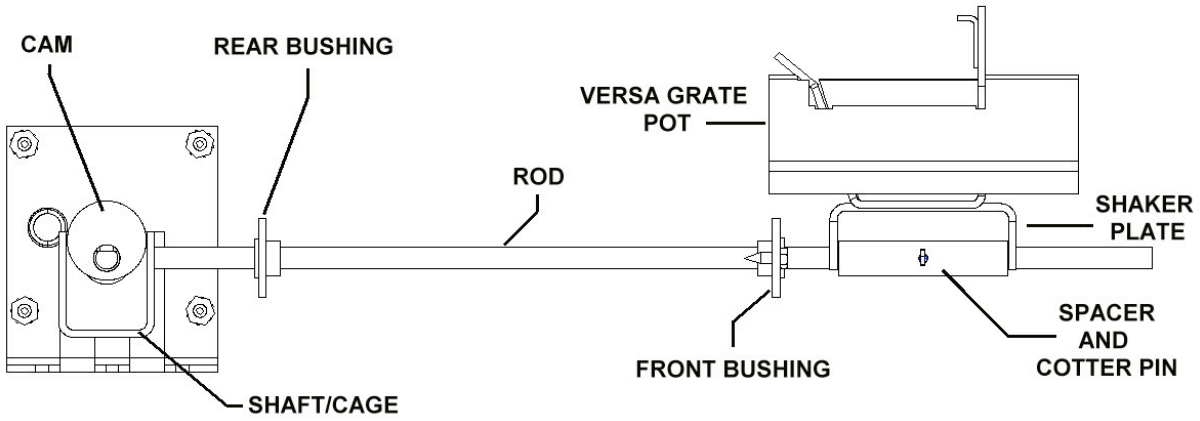


Figure 6

6 – Place the Versa Grate Pot in the stove and check the gap between the Shaker Plate and the bottom of the Grate. The gap should be about 1/16“. A gap that is too large allows the Shaker Plate to rock back and forth on the Rod like Teeter Totter and that can create a gap large enough to allow pellets to drop through. If the Bottom of the Grate actually rests on the Shaker Plate will create noise as the Shaker Plate slides back and forth. Using a 12” extension for the ¼” hex driver bit is helpful in reaching the screws that hold the adjustable Front Bushing Plate in place.

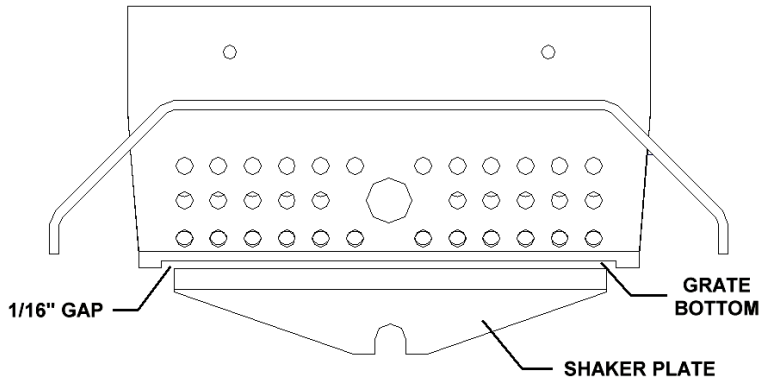


Figure 7

7 – Install the Igniter Assembly with the wires going to the right hand side of the stove. Push the wires through the Conduit Tube and connect them to the Red and White Wire in the harness.

8 – Install the Igniter Cover over the Igniter. The left Igniter screw serves both the igniter and the cover.

9 – Install the Finish Plug and place the Lower Panel.

The Ashby has several features that allow the unit to be adapted to allow a better fit under certain conditions.

Adjustable Hopper Instructions

Step 1 – Remove the 15 screws that hold the Hopper Top in place. Cut through the aluminum taped that seals the hopper and remove the Hopper Top.

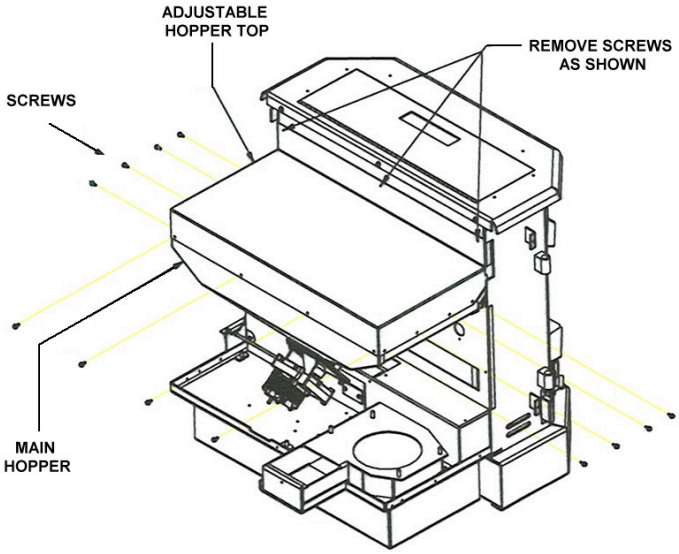
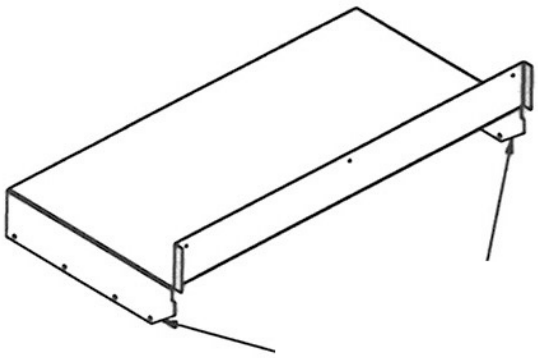


Figure 8



Step 2 – The top can be lowered 2". To utilize the full 2" adjustment the front corners must be removed to lower the top. Break off tabs if needed.

Step 3 – Once the Hopper Top has been lowered to the correct height, use the self-tapping screw to re-attach the top. Screw the back edge of the top back in place using the screws that were removed.

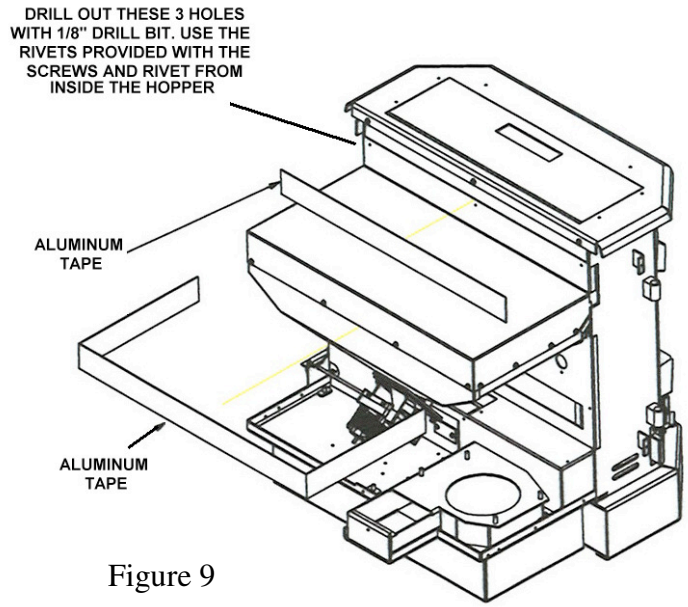


Figure 9

Step 4 – After drilling out the 3 holes in the front lip with a 1/8" drill bit, attach the front lip using the 3 rivets provided in the package. The rivets should be applied from inside the hopper. ***Take care not to drop anything into the hopper.***

Step 5 – Once the top is attached, use the aluminum tape provided to seal all of the seams. This will make the hopper airtight again.

Removable Base Extension and Bolt-On Ashpan

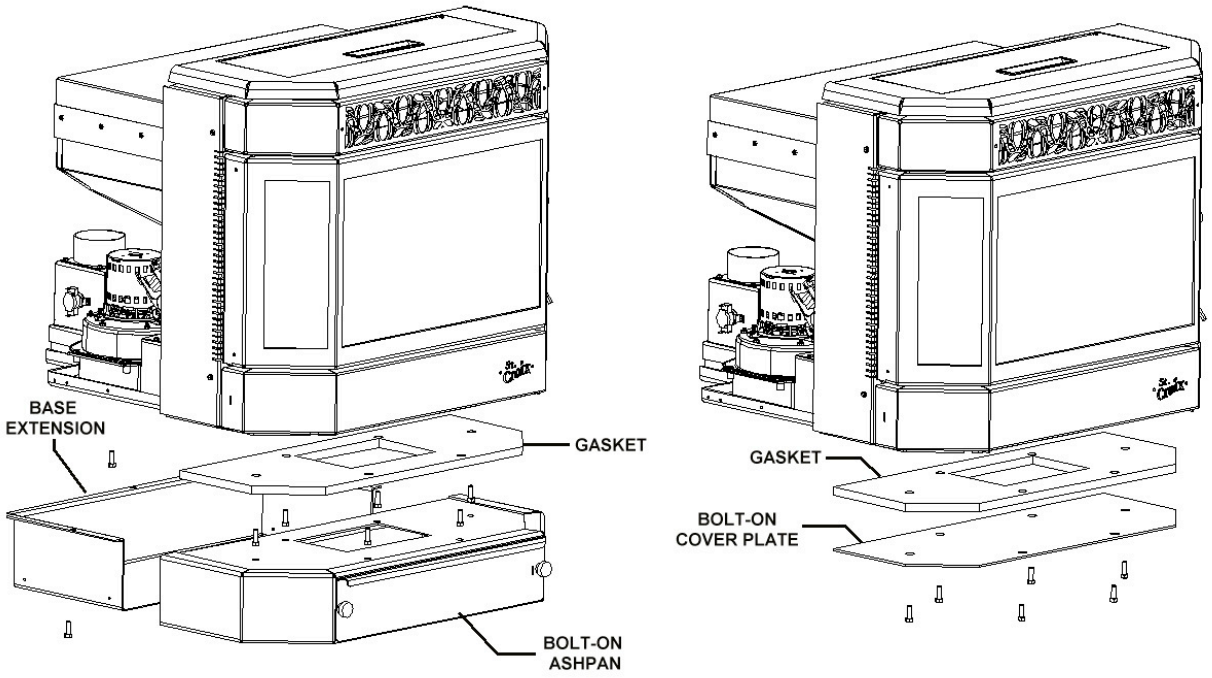


Figure 10

These removable parts show the various different ways to set up the Ashby Insert.

The Multi-Fuel Insert is limited by the fact that the Bolt-On Ashpan is an integral part of that Burn System and cannot be removed.

The unit may fit better in some Zero Clearance manufactured Fireplaces by removing the Bolt-On Base Extension.

An Ashby without the Bolt-On Ashpan must have the Bolt-On Cover Plate and gasket installed close the opening to the Bolt-On Ashpan. ***Be sure to order the correct Surround system when removing the Bolt-On Ashpan.***

Built in Vent Clean-Out System

The Ashby has a unique Clean-Out system built in that allows the vent system to be cleaned out without having to pull the Insert from the fireplace.

Access to this cleanout is behind the left side Clean-Out Cover. Behind the Cover is a Rod that pulls out, opening a Slide Door that allows any Fly-Ash that has built up in the vent system to drop into the Cleanout Area. By using a small vacuum (1.25" O.D.) hose it can now be vacuumed out through the front of the Insert, without having to pull the insert.

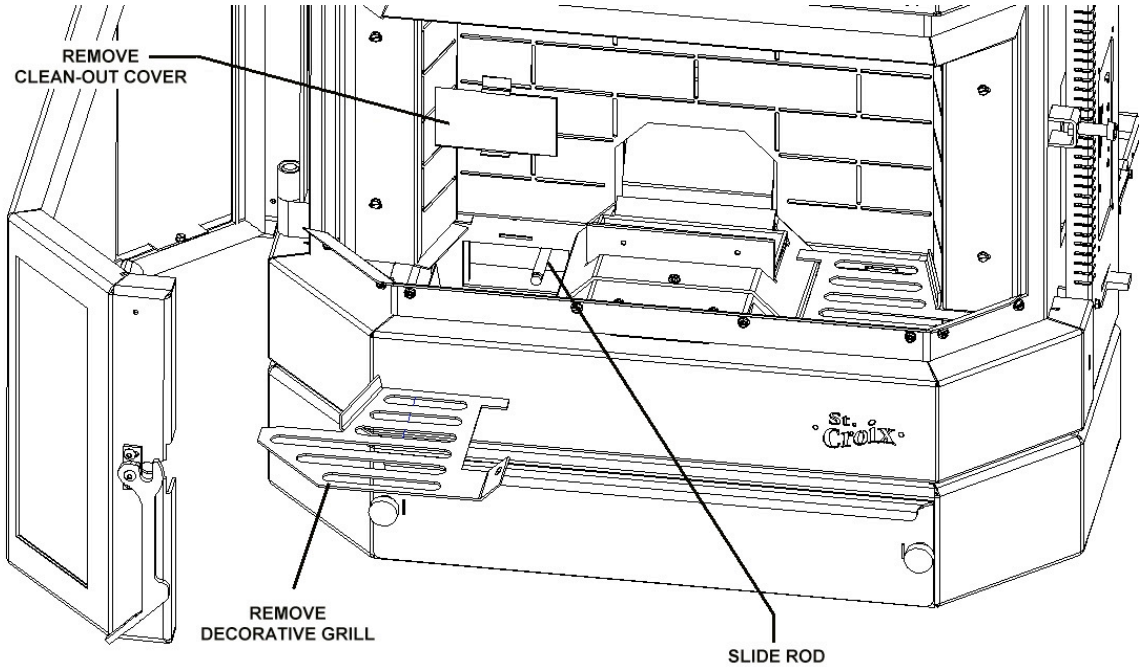


Figure 11

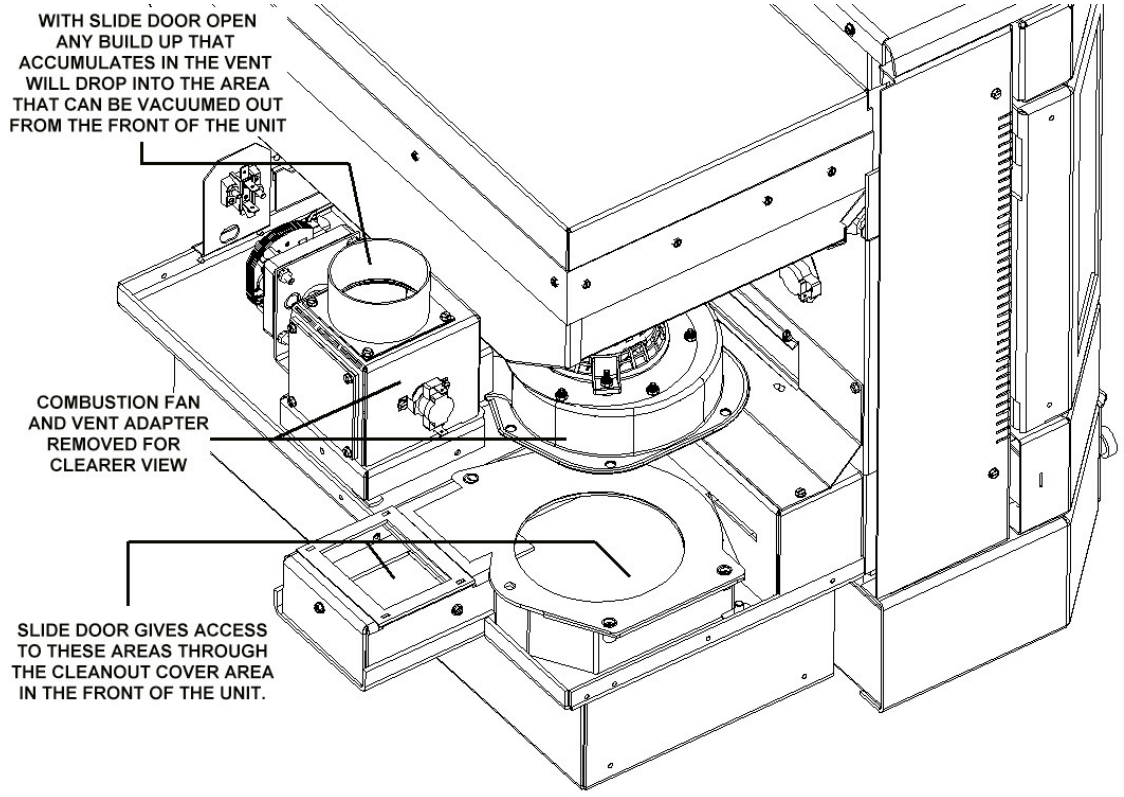


Figure 12

<u>Slide Door must be closed during Normal Operation</u>

Dual High-Limit Switches

The Ashby has a new Convection Blower System. It uses dual Blowers, each with their own motor. Due to this design we have implemented dual High Limit Sensors. A switch is located above each Blower. This allows the control board to react quickly if one or the other blower fails.

The switches have been changed to 200 Degree and they no longer have to be manually reset. Changing to a switch that will automatically reset was due to the location of the switches. This prevents having to pull the unit out to reset a switch.

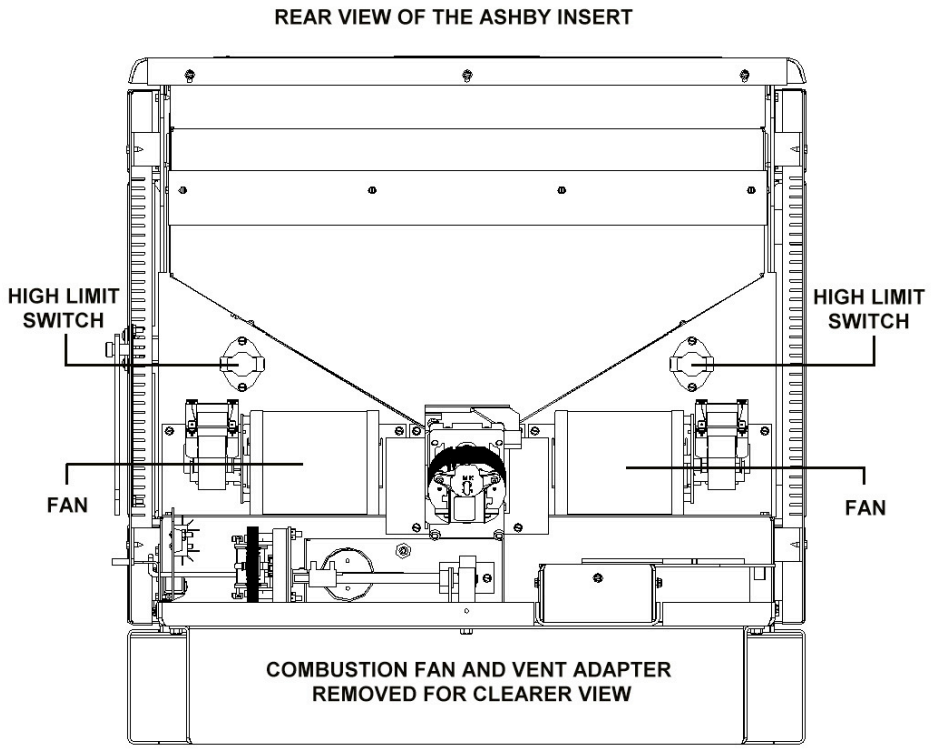


Figure 13

Zero Clearance Cabinet

The Ashby Insert is approved for installation into the St. Croix Zero Clearance Cabinet.

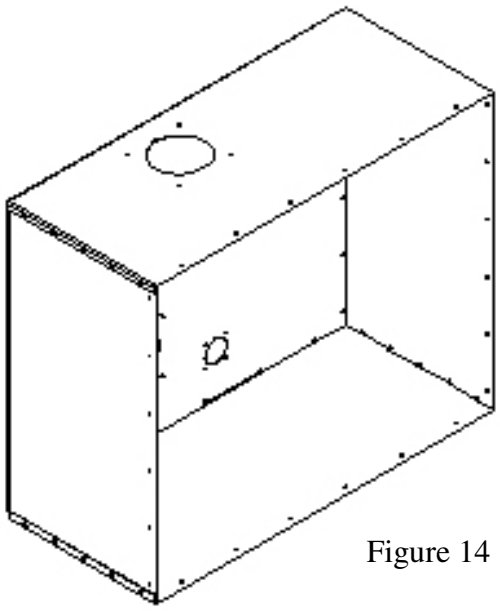
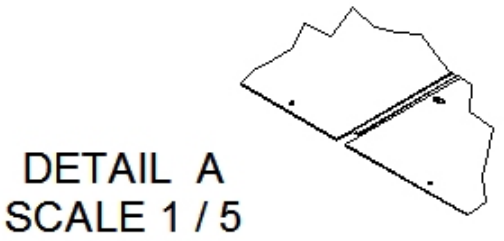


Figure 14

The Cabinet ships knocked down to make it easier to ship. Put together it is a simple metal cabinet that gets framed in

The Ashby can be installed as a Rear Vent System or as a Top Vent System if the situation dictates one or the other.

How to build the Cabinet



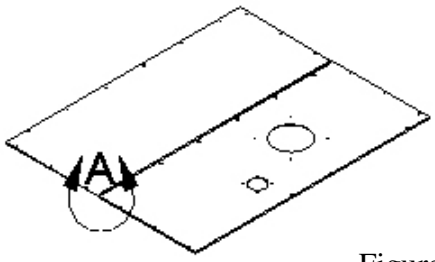


Figure 15

Step 1

Note the orientation of the Vent hole and the Air Intake Hole on the back panels.

Locate the 2 back panels and place the units together as shown and screw the panels together.

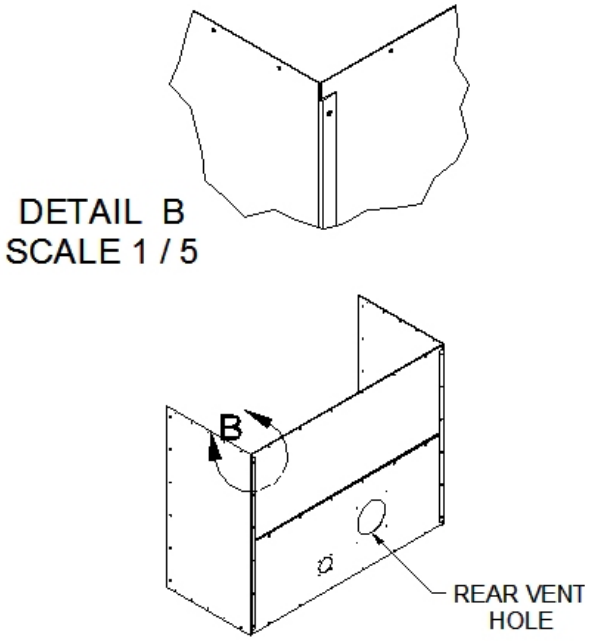


Figure 16

Step 2

Note how the side panels line up with the back section.

Screw both sides to the back section

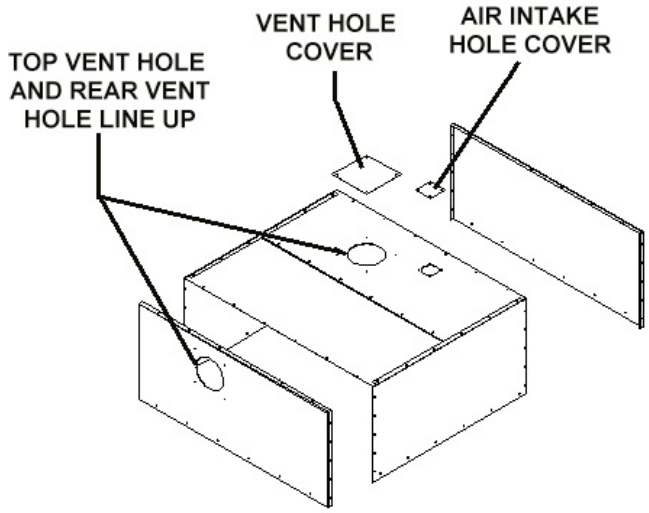


Figure 17

Step 3

Note the location of the Top Vent Hole and the Rear Vent Hole. They must line up with each other as shown in figure 17.

Complete the unit by lining up the Top and Bottom sections and screwing the parts together.

Zero Clearance Install Example

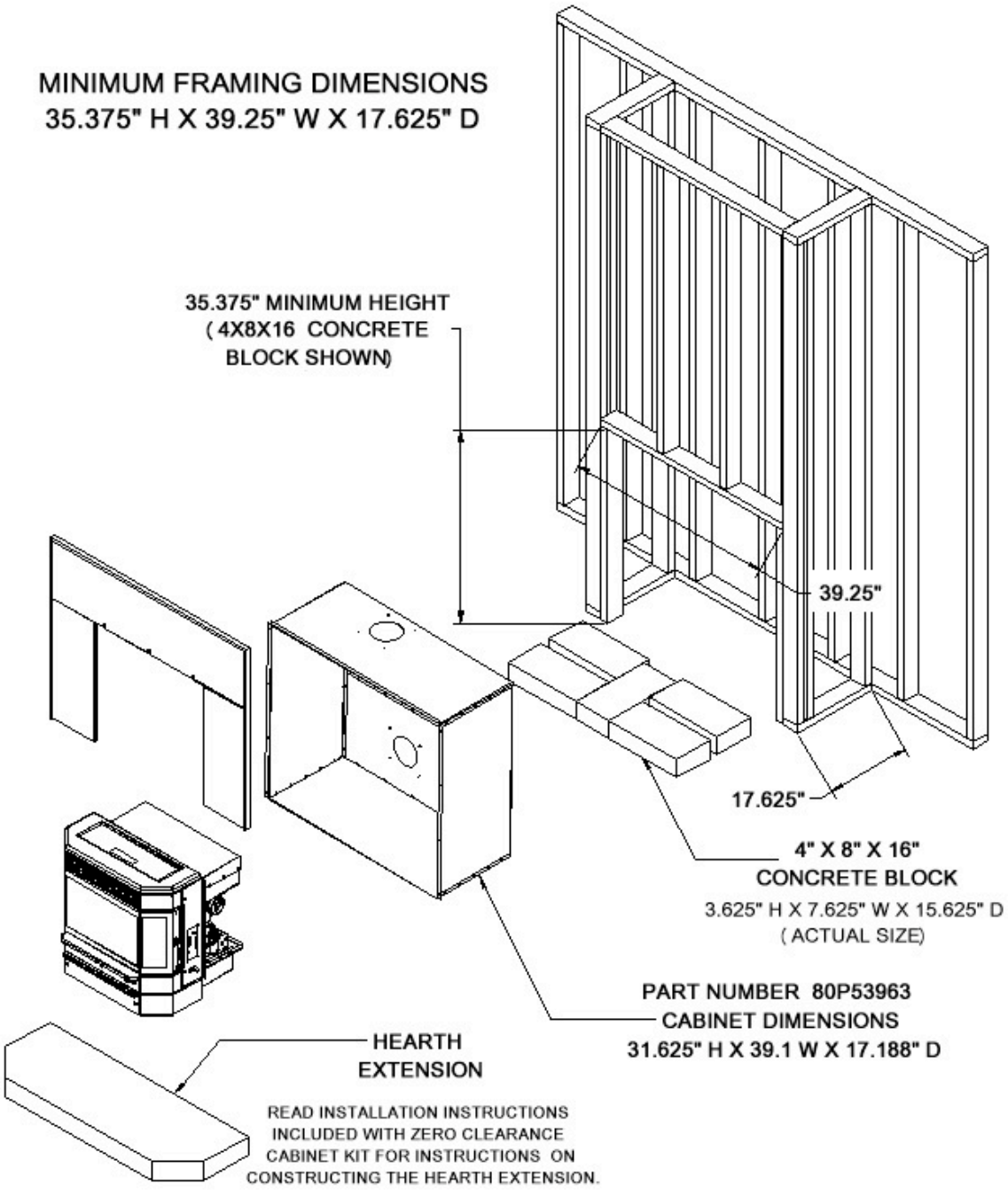


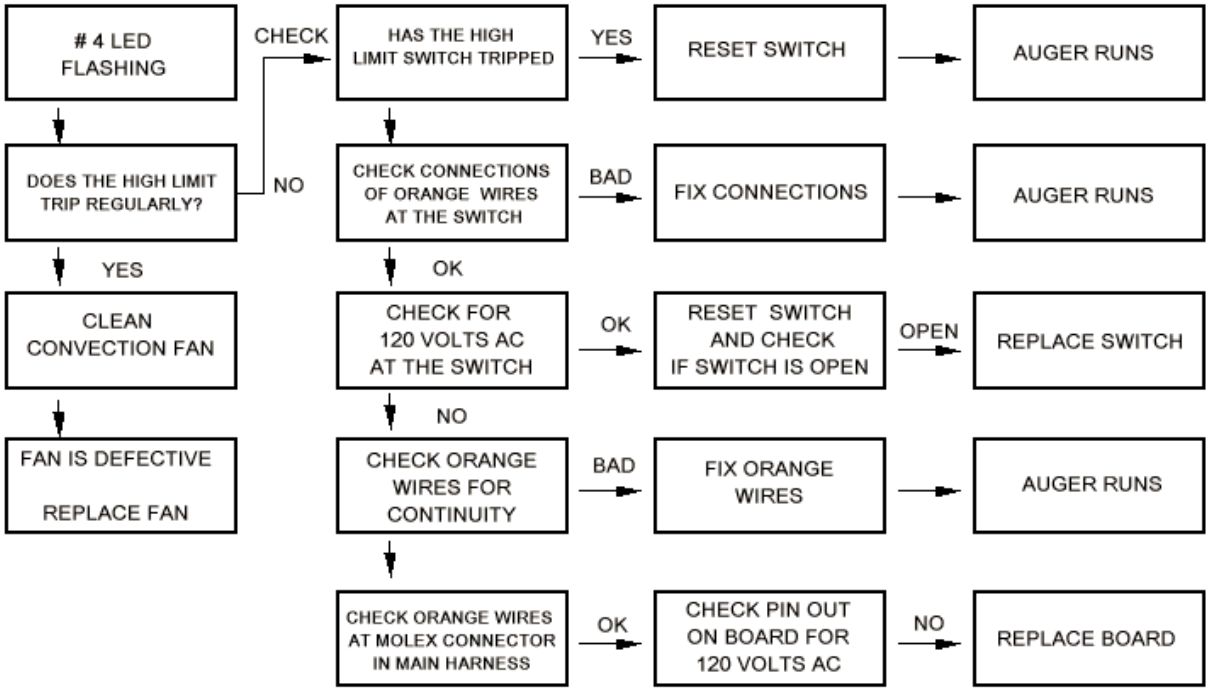
Figure 18

There are many variations that are possible. The unit may be raised up if desired. A larger block may be used if needed, however the size shown is the minimum allowed. If a larger block is used, remember to increase the framing dimensions accordingly.

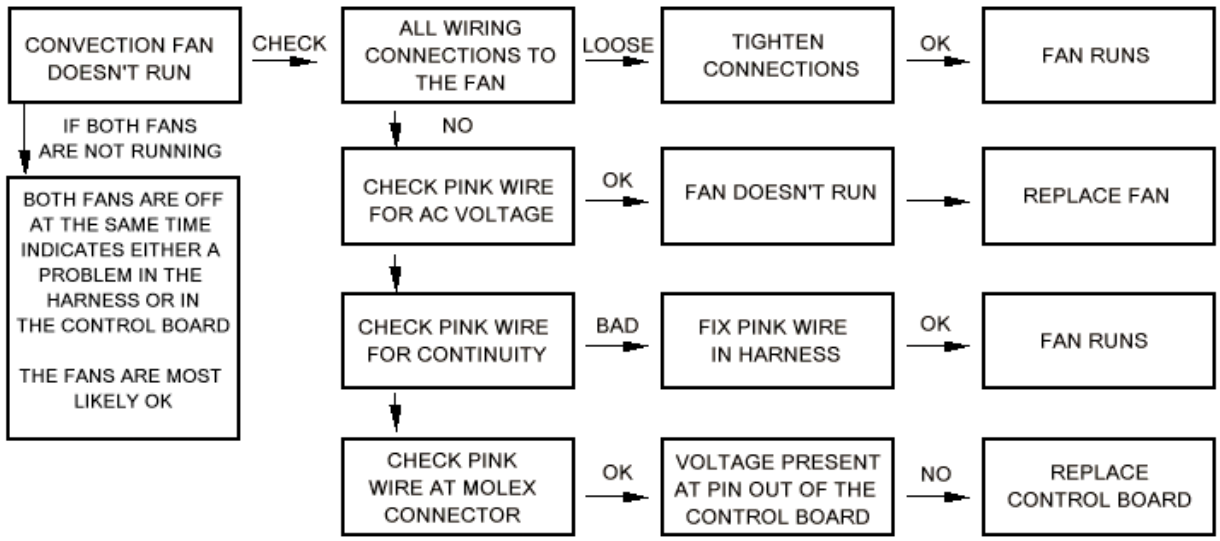
Troubleshooting Flow Charts for the Ashby

The High Limit Flow Chart and Convection Fan Flow Chart are slightly different for the Ashby, please see the following charts.

High Limit Switch



Convection Fans



In an effort not to duplicate much of the information from the previous sections please refer to the following Trouble Shooting Flow Charts:

Digital Control Board – No Power

Please refer to page 52 for the Troubleshooting Flow Chart for the Control Board.

Digital Control Board – Fan Self Test

Please refer to page 52 for the Troubleshooting Flow Chart for the Control Board.

Hopperlid Switch

Please refer to page 53 for the Troubleshooting Flow Chart for the Hopperlid Switch.

Versa Grate Motor - Electrical

Please refer to page 54 for the Troubleshooting Flow Chart for the Versa Grate Motor.

Versa Grate Motor - Mechanical

Please refer to page 55 for the Troubleshooting Flow Chart for the Versa Grate Motor.

Combustion Fan

Please refer to page 56 for the Troubleshooting Flow Chart for the Combustion Fan.

Igniter

Please refer to page 56 for the Troubleshooting Flow Chart for the igniter.

Vacuum Switch

Please refer to page 57 for the Troubleshooting Flow Chart for the Vacuum Switch.

Proof of Fire Switch

Please refer to page 59 for the Troubleshooting Flow Chart for the Proof of Fire Switch.

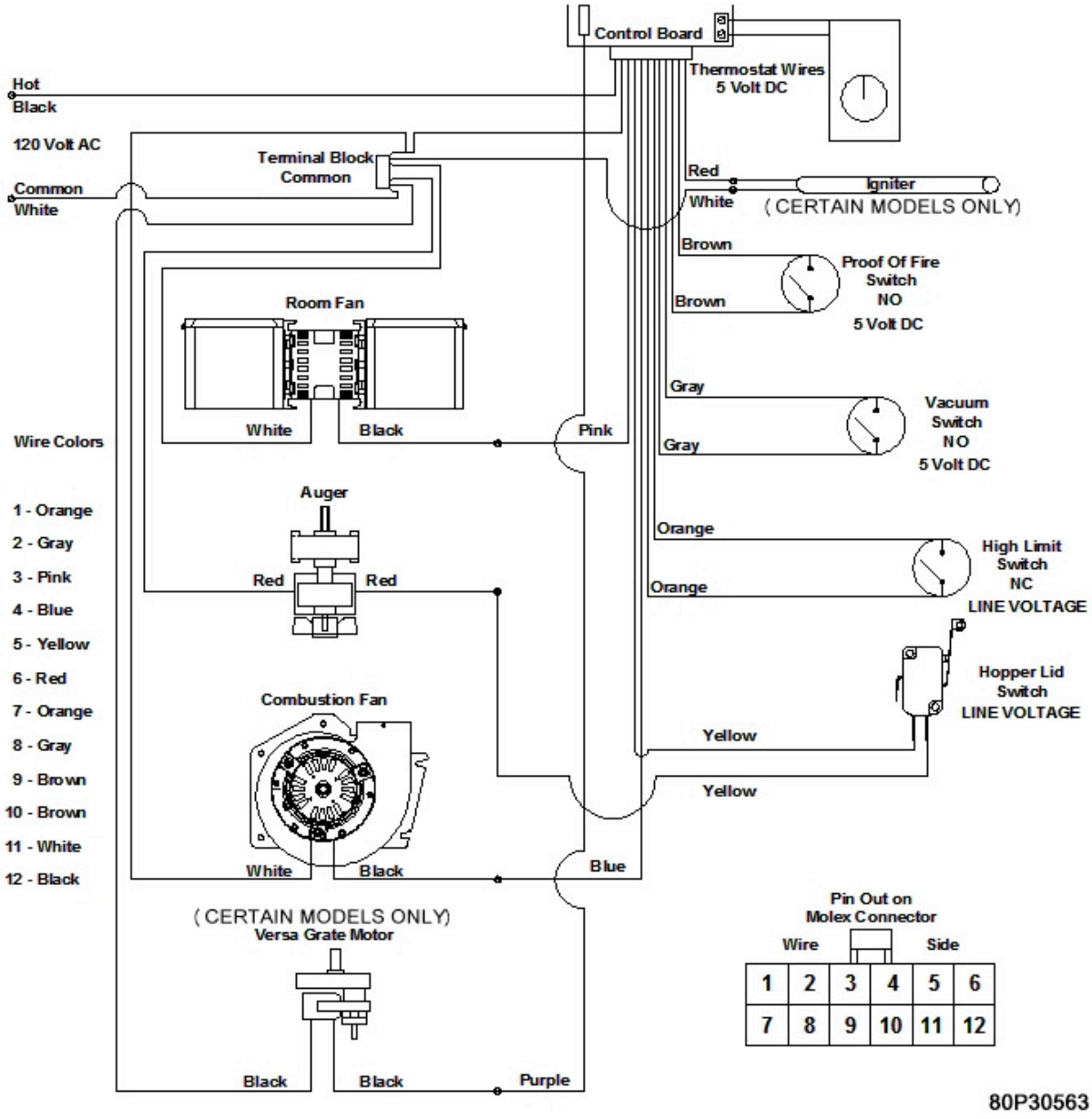
Auger Motor - Electrical

Please refer to page 128 for the Troubleshooting Flow Chart for the Auger Motor.

Auger Motor - Mechanical

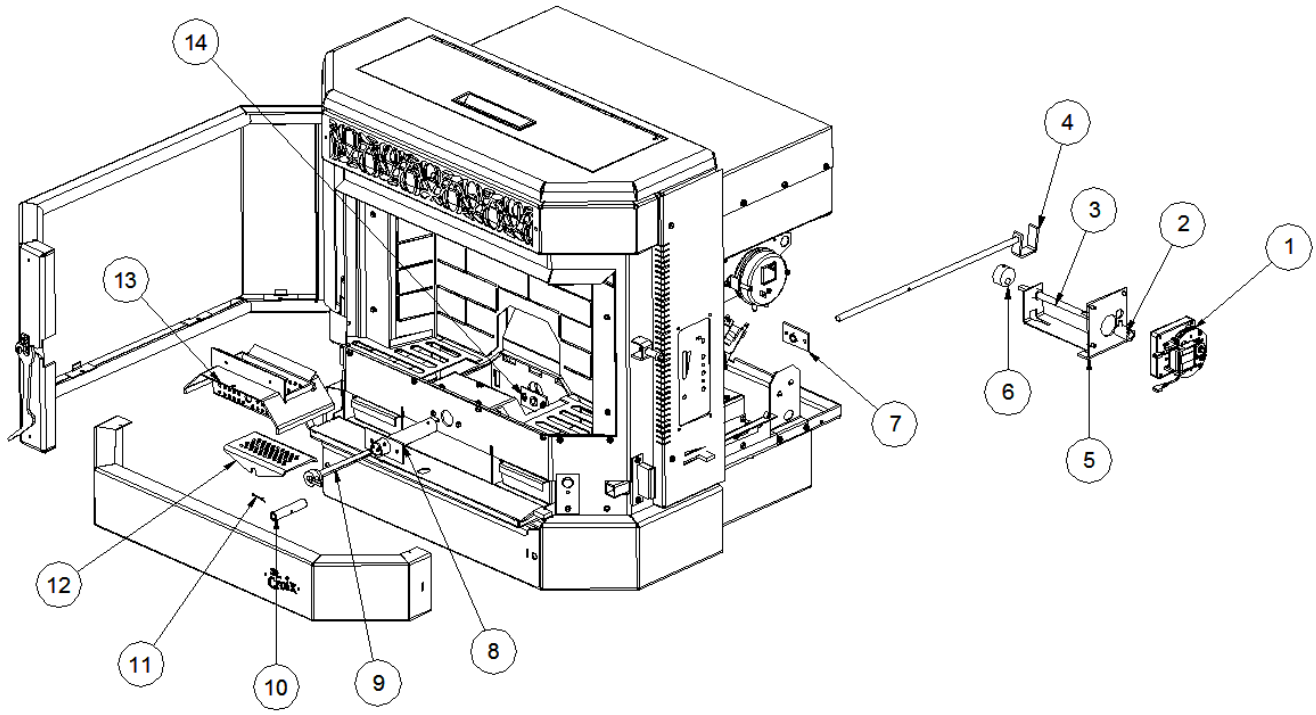
Please refer to page 128 for the Troubleshooting Flow Chart for the Auger Motor.

Ashby Wiring Schematic



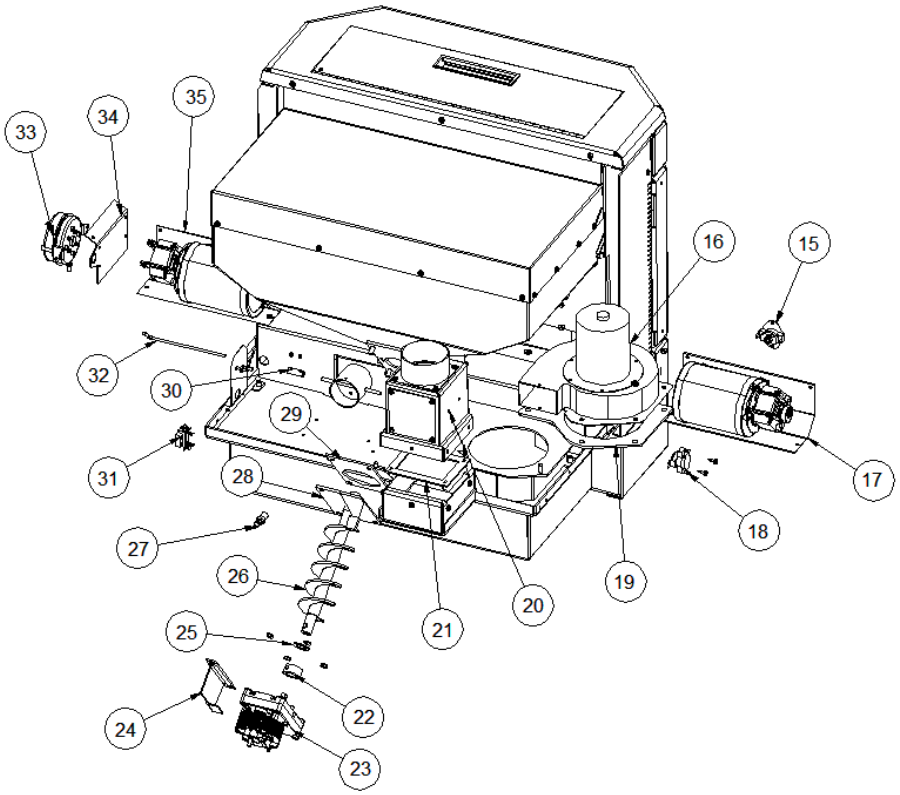
The Electrical Rating of this Multi-Fuel Insert is: 120 Volt, 60 Hz, 4 Amp with the igniter running and approximately 2 Amp with out the igniter running. The minimum recommended circuit is 15 Amp. A dedicated circuit for the Insert is recommended.

Ashby - Parts specific to the Versa Grate System only



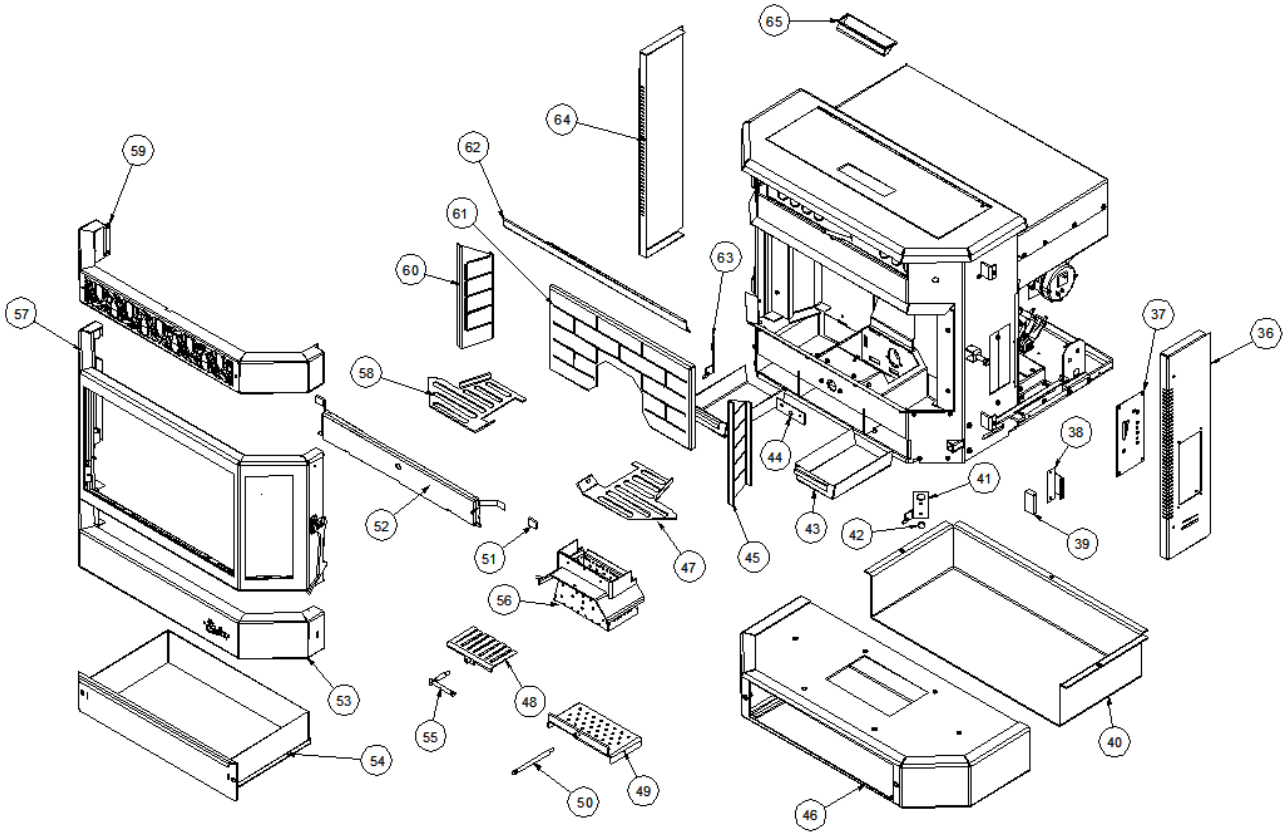
#	PART NUMBER	DESCRIPTION
1	80P20296-R	VERSA GRATE MOTOR
2	80P52372 -R	VERSA GRATE COLLAR W/ SETSCREWS
3	80P52376-R	CAM CONNECTOR ROD
4	80P53695-R	SHAFT/CAGE WELDMENT
5	80P52953-R	VERSA GRATE BRACKET ASSEMBLY
6	80P50560-R	CAM
7	80P52955-R	REAR BUSHING ASSEMBLY
8	80P53914-R	IGNITER TUBE WELDMENT
9	80P52727-R	IGNITER
10	80P50553-R	SPACER
11	98355A070-R	COTTER PIN
12	80P52038-R	SHAKER PLATE
13	80P53884-R	GRATE WELDMENT
14	80P52954-R	FRONT BUSHING ASSEMBLY

Ashby - Parts common to both Burn Systems



#	PART NUMBER	DESCRIPTION
15	80P52629-R	MANUAL RESET HIGH LIMIT SWITCH
16	80P30521-R	COMBUSTION FAN
17	80P30455-R	LEFT CONVECTION FAN
18	80P20038-R	PROOF OF FIRE SWITCH
19	80P30649-R	COMBUSTION FAN GASKET
20	80P53909-R	TOP/REAR VENT ADAPTER
21	80P53911-R	EXHAUST CLEANOUT SLIDE ASSEMBLY
22	80P20248-R	5/8” COLLAR W/ SETSCREW
23	80P20278-R	AUGER MOTOR
24	80P30424-R	MOTOR RETAINER BRACKET
25	80P50858-R	AUGER WASHER
26	80P53666-R	AUGER WELDMENT
27	80P30215-R	BARB FITTING
28	80P52957-R	MOTOR MOUNT BRACKET ASSEMBLY
29	80P20245-R	AUGER GASKET
30	80P30459-R	DAMPER ROD EXTENSION COLLAR
31	80P52630-R	TERMINAL BLOCK
32	80P30368-R	DAMPER INTAKE EXTENSION ROD
33	80P52628-R	VACUUM SWITCH
34	80P30457-R	VACUUM SWITCH BRACKET
35	80P30456-R	RIGHT CONVECTION FAN
36	80P53957	RIGHT SIDE PANEL WITH CLINCH STUDS
37	80P30523	CONTROL BOARD
38	80P30550	MAGNET BRACKET
39	80P30553	MAGNET

Ashby - Parts specific to the Multi-Fuel System only



39	PART NUMBER	DESCRIPTION
40	80P30412	BOLT ON LEVELING BOX
41	80P30354	ASH DOOR HINGE BRACKET - RIGHT
42	80P30561	MAGNET
43	80P30398	SIDE ASH PAN
44	80P30410	COAL RAKE ROD PLATE
45	80P30598	STEEL BRICK PANEL, LEFT
46	80P53901	ASH PAN EXTENSION WELDMENT
47	80P30462	RIGHT DECORATIVE GRILL
48	80P53649	COAL RAKE WELDMENT
49	80P53886	POT SLIDER WELDMENT
50	80P30409	POT SLIDER ROD
51	80P20175	BLACK END CAP
52	80P53885	ASH DOOR
53	80P53964	LOWER PANEL ASSEMBLY
54	80P53900	ASH PAN WELDMENT
55	80P53966	COAL RAKE ROD ASSEMBLY
56	80P53890	MULTI-FUEL POT WELDMENT
57	80P53725	BAY DOOR BLACK - COMPLETE
58	80P30463	LEFT DECORATIVE GRILL
59	80P53770	HOT AIR BOX W/ CLINCH STUDS
60	80P30599	STEEL BRICK PANEL, RIGHT
61	80P30606	STEEL BRICK PANEL, BACK
62	80P30362	HEAT EXCHANGE BAFFLE
63	80P30353	ASH DOOR HINGE BRACKET - LEFT
64	80P30429	SIDE PANEL - LEFT
65	80P20183	HANDLE PULL P2-54

Ashby Multi-Fuel Burn System Data Chart

Based on a default Cycle Time of 11.5 seconds.

Cycle time equals the ON time & OFF Time combined.

The following Chart is in reference to burning Corn in Program 1.

Heat Level Selection	Auger ON (Seconds)	Combustion Fan Voltage +/- 3 Volts	Convection Fan Voltage +/- 3 Volts	Corn Fuel (Lbs./Hour) +/- 10%
Start-Up Cycle	Off for the first 5 minutes	100 Volts	OFF	NA
1	1.5	90 Volts	90 Volts	1.7 Lbs.
2	2.0	98 Volts	98 Volts	2.25 Lbs.
3	2.5	108 volts	108 volts	3.1 Lbs
4	3.0	115 volts	115 volts	3.7 Lbs.
5	3.5	120 volts	120 volts	4.25 Lbs.

The Voltages shown in the Chart reflect a line voltage of 120 volts. Actual numbers may vary based on the actual line voltage provided to the control board and the +/- Tolerance of the Electronic Components used in the Control Board.

The Ashby–MF is approved for Corn, Wheat, Rye, Cherry Pits, Distiller's Grain Pellets and Wood Pellets. Feed rates will vary from fuel to fuel and from program to program. The above chart is in reference to burning Corn in Program 1 which has the highest BTU Rating for Corn.

Ashby Versa Grate Burn System Data Chart

Based on a default Cycle Time of 11.5 seconds.

Cycle time equals the ON time & OFF Time combined.

The following Chart is in reference to burning Pellets in Program 3.

Heat Level Selection	Auger ON (Seconds)	Combustion Fan Voltage +/- 10%	Convection Fan Voltage +/- 10%	Pellets Fuel (Lbs./Hour) +/- 10%
Start-Up Cycle	Off for the first 5 minutes	100 Volts	OFF	NA
1	1.5	90 Volts	90 Volts	1.25 Lbs.
2	2.5	98 Volts	98 Volts	2.00 Lbs.
3	3.5	108 volts	108 volts	3.15 Lbs
4	4.5	115 volts	115 volts	3.7 Lbs.
5	5.5	120 volts	120 volts	4.5 Lbs.

The Voltages shown in the Chart reflect a line voltage of 120 volts. Actual numbers may vary based on the actual line voltage provided to the control board and the +/- Tolerance of the Electronic Components used in the Control Board.

The Ashby-P is approved for Wood Pellets and Cherry Pits. Feed rates will vary from fuel to fuel and from program to program. The above chart is in reference to burning Pellets in Program 1 which has the highest BTU Rating for Pellets.