



**Service
&
Troubleshooting Guide
For the
Digital Control System**

Even Temp, Inc.
P.O. Box 127
Waco, NE 68460
PHONE: 402-728-5255
FAX: 402-728-5379
EMAIL: support@eventempinc.com
WEB ADDRESS: www.eventempinc.com

Table of Contents	Page
Introduction to St. Croix Stoves	4
Wood Pellets	5
Wood Pellet Manufacturing	6
Why Pellets Burn	6
How pellets burn	6
Ash And Clinkers	7
Assessing Pellet Quality	7
PFI Wood Pellet Standards	8
Shelled Corn	10
Why Burn Corn	11
How Corn Burns	11
Products of Combustion	11
Clinkers	12
Burning “Poor Quality” Corn	12
 Pellet Stoves 	
Pre-Delivery Check	13
Pre-Burning at the Dealership	15
Vacuum Check	16
Direct Vent Installations and Battery Back-Ups	18
Flame Pattern Interpretation and Characteristics	19
Data Table	20
Preventative Maintenance	21
Breaking down Trouble shooting	22
Wiring Diagram	23
Component Layout – Insert	24
Component Layout – Freestanding models	25
Electrical	26
Digital Control Board & Diagnostic features	27 – 35
Auger Motor	35
Versa Grate System & Troubleshooting	37 – 41
Convection Fan	42
Combustion Fan	43
Igniter	44
Power Cord, Wiring Harness & Terminal Block	45

Safety Features	45
Vacuum Switch	45
Manual Reset High Limit Switch	46
Proof Of Fire Switch	46
Mechanical System	47
Door Assembly	47
Ash Door	47
Ash Traps	47
Heat Exchange Tubes	48
Heat Exchange Tube Scraper	48
Heat Exchange Baffle	49
Hot Air Plenum	49
Warm Air Plenum	49
Auger Assembly	49
Air inlet Damper	50
Versa Grate System	50
Ash Clean-out System	50
Air Flow Diagrams	51
Combustion Air / Exhaust Flow	51
Convection Air / Room Air Flow	52
Fuel Flow Diagram & Side Cut-Away View	53
Trouble Shooting Flow Charts	54
Digital Control Board	54
Auger Motor - Electrical	55
Auger Motor – Mechanical	55
Versa Grate Motor – Electrical	56
Versa Grate Motor – Mechanical	56
Convection Fan	57
Combustion Fan	58
Igniter	58
Vacuum Switch	59
High Limit Switch	61
Proof of Fire Switch	62

Introduction to St.Croix Stoves

St. Croix Wood Pellet Stoves are designed to burn premium wood pellets; currently wood pellets are being manufactured throughout the United States and in Canada. The unique method by which this fuel is burnt produces high efficiency ratings while maintaining an extremely low ash content level. There are 2 pellet stove configurations that we offer; the Freestanding stove and Insert stove, all of which produce similar heat output BTU ratings.

St. Croix Corn Stoves are designed to burn clean, shelled corn with 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. The St. Croix corn burning system is Patent Pending, producing high efficiency ratings that completely burn the corn until only the clinker remains. The burn system allows the Clinker to be removed without losing the fire in the burnpot. Currently only freestanding corn stoves are being offered, with an Insert and an Add On Furnace to be offered soon.

All St. Croix Pellet and Corn stoves have been safety tested to the following standards:

Tested per: UL1482 (7/90)/ULC S627/CSA, B366.2M/APFI/ASTM E 1509
Tested and Listed for use in Manufactured Homes in accordance with Oregon
Administrative Rules: 814-23-900 thru 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 following three fans/motors are standard in all St. Croix Corn Stove models, they are the: Combustion Exhaust Fan, Room Air Fan and 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 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 Corn Stove 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 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 wood pellets or corn are stored in either a 40 or 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.

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. 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

Making Pellets

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 very low flame to be maintained.

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 uses a "self cleaning grate" to assure the removal of ash from the burn grate. The self-cleaning grate works well to prevent clinking and as an aid in removing ash from the burn grate. The self-cleaning grate may be used in all areas where pellets meet either the PFI's "Premium" or "Standard" pellet fuel quality standards.

Assessing Pellets 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 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 effectively are identified by PFI and are shown below. They are:

Pellet Fuel Institute (PFI) Pellet Standards

<u>Characteristics</u>	<u>PFI Standards</u>
-Amount of fines	Max. 1%
-Weight per cubic foot	Min. 40#
-Moisture content	Max. 8%
-Length (max.)	Max. 1.5"
-Diameter	.235" (1/4") 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 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 self-cleaning grate 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, (several times daily in some cases), or mechanically removed, will plug burn grate holes and reduce air now.

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!

Shelled Corn

Growing Corn

Corn may end up being considered the “Ultimate” Renewable Fuel. A new “Crop” of fuel can be produced every year and the storage and transportation system is in place to move the fuel around the country.

Why burn Corn

The savings that burning corn offers is what makes a St. Croix Corn stove a highly sought after product. Traditionally the price of corn hovers between \$2 and \$3 a bushel. This offers a significant savings when compared to Natural Gas, Oil, Propane, Electricity and wood. The availability of corn in bulk quantities is to be considered before purchasing a corn stove. If the only corn that is available is bagged corn marketed as feed, then a corn stove may not offer the savings you typically see over pellets. 50 Lb. Bags of corn, sold as feed, is many times more than twice as expensive as corn purchased directly from the grain elevator or a farmer.

How Corn Burns

The St. Croix corn clinker theory. And why we do what we do.

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

We believe that corn doesn't burn as well when it is disturbed in the burn pot. Stirring the corn around in the burnpot does prevent the clinker from forming, but it also lowers the temperature in the burnpot. 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. Corn 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 corn 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 corn. When corn 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 corn 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 corn burning system allows the corn to be burned efficiently and completely in a relatively small burn pot. Very little 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 corn stove will burn up all the available fuel in corn, leaving only a 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 corn 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 corn drops to the bottom of a clean pot and the cycle repeats itself.

Burning “Poor Quality” Corn

Many times we are asked the question if damaged or moldy corn 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 corn without explaining it may not work.

BTU content of corn

For all practical purposes the BTU content of corn is similar to what you see in pellets. The BTU content may vary from one variety of corn to the other and the moisture content will also affect it.

Pre-Delivery Check – Pellet 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 to make sure all motors and blowers are running. The stoves ship with the control board set up in the fully automatic “**SmartStat**” mode. There is a thermostat wire terminal on the back of the stove with a jumper wire in it. (*See Figure 1 On Page 14*). This will cause the stove to come on the moment the stove is plugged in. If the control board does not respond when the stove is plugged in, double-check to make sure the thermostat wires are jumped together. Next double-check the fuses on the back of the control board. See Figure 2 on Page 13 to find the location of the fuses. Refer to figure 13 on Page 26 for information regarding function of the buttons on the control board. The following sequence should happen once the stove comes on:

- 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. It will stay on until the Proof of Fire switch locks in.
- e. The Versa Grate Motor comes on.
- f. Five minutes after the stove came on the auger will start feeding pellets on level #1. It will remain on level #1 until it senses the Proof of Fire switch.

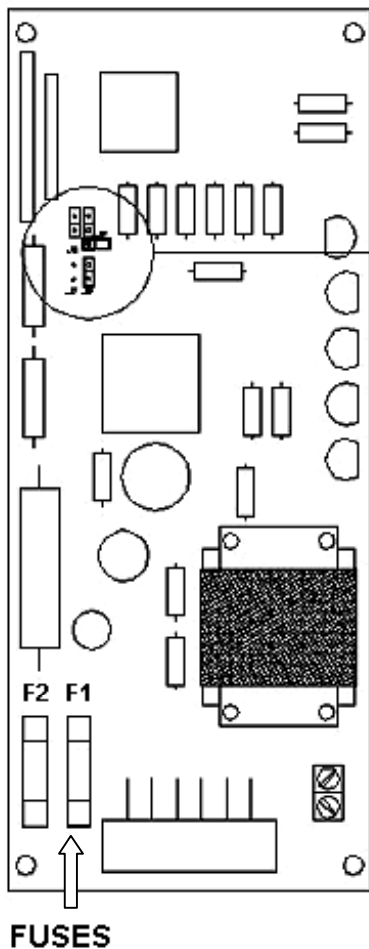
Verify points a through f and then bypass the Proof of Fire switch to advance the stove into the program for normal operation.

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. Remove the wire from the Thermostat wire terminal on the back of the stove. The ON/OFF light will start blinking again. (See Figure 1 below)



Figure1
Thermostat Wire Terminal on back of stove



ATTENTION: If the customer wants to operate the stove in Manual Mode, convert the stove at this time. See the enlargement of the jumper pin area of the control board and follow the directions below.

Jumper J9 enables the “SmartStat” Thermostat Mode with the Jumper cap placed on both pins (Factory Setting). To convert the stove to Manual Mode operation, remove the cap from the pins *and* put the wire back in the Thermostat Wire Terminal on the back of the stove. It must be put back in place for Manual Mode operation.

Save jumper cap in a secure place for future use.

Do not tamper with the J8 jumper pins. They are open and should remain that way.

Figure 2

- 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 3 on Page15 – This has an ON Time of 1.5 seconds

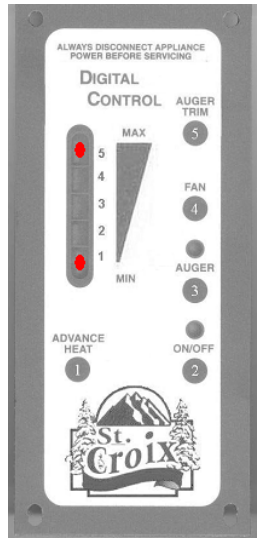
- k. Press the **Auger Trim** button once and the #1 and #5 light will come on. See figure 4 below – This has an On Time of 1.75 seconds. Press the **Auger Trim** button again and the #1 and #4 light will come on. See figure 5 below - This has an On Time of 1.25 seconds. Press the **Auger trim** button again and the #1 light comes back on.

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.**



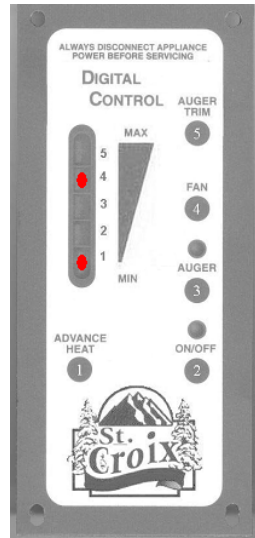
Level 1 On Time
1.50 seconds
Default setting

Figure 3



Level 1 On Time
1.75 seconds
Auger Trim

Figure 4



Level 1 On Time
1.25 seconds
Auger Trim

Figure 5



Fan Button Adjusts
Combustion fan on
level 1 only.

Figure 6

- l. Press the **Heat Advance** button 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.
- m. 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.
- n. 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, reducing the fan voltage approximately another 6 volts. Press the button again and the lights all flash once and the board reverts to the default Combustion Fan voltage. See Figure 6 above.

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 orders 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 in the FULL OPEN position. Do not make any adjustments with the fan button before checking the vacuum reading.

Note: Once Vacuum had been checked, return the damper to the Factory setting, before delivering the stove.

- ✓ 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 17.

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

READING: .15" WC Negative Pressure - .30" 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 may require 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:

- 1) Increasing the exhaust pipe vertical length without increasing exhaust pipe diameter when required for installation. **
- 2) Increasing the horizontal exhaust pipe length. **
- 3) 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.
- 4) 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.
- 5) Back pressure on the stove caused by wind direction and velocity directly into the exhaust termination point.
- 6) 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 than 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"	Recommended
* 5) Over 15' Vertical	4"	Required
* 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. When in doubt use the next larger size.

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", that will offer longer back-up times by utilizing one or more deep cycle batteries hooked in series 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 (Auger trim Button) and several combustion fan adjustments (Fan 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 end 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 orangish-brown flame with a lazy movement, having black smoky end tips curling up and over the Heat Exchange Tubes while forming a fireball-like shape. Some Ash or Live Sparks not 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.

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 8 on Page 20.

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.

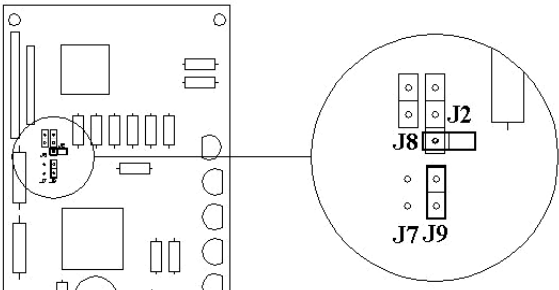
When trying to check the readings of a stove that is not burning the Proof of Fire Switch must be by-passed to check all 5 settings of the control board. Remember there is a 2-minute delay between each level before it advances to the next level.

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	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 8



Feedrate Adjustment

The 11.5-second cycle can be changed to 10 seconds, by removing the jumper cap from the bottom pin on the J2 Jumper and placing it on the bottom 2 pins of the J2 Jumper. See enlargement of the pin area in the circle to the left.

If the feedrate of a stove seems low, contact the St. Croix Technical Department at 1-800-331-8862 to see if jumping the J2 jumper is the correct solution to the problem. **Do not make this adjustment without a reason.** By placing the jumper cap on the bottom 2 pins of the J2 Jumper the cycle time changes from 11.5 seconds to 10 seconds. This increases the percentage of ON time in relation to the OFF time causing the feedrate to increase.

Figure 9

Preventive Maintenance

Preventive maintenance is important to maintain the life of any appliance you own. The same is true with the St. Croix pellet 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 pellet stove. Just like the owner of a car would perform preventive maintenance, the owner of a pellet stove would perform preventive maintenance to maximize its performance. The interval of time for each maintenance item will vary depending on the fuel used, as discussed previously in the section entitled "Wood Pellets". Improper or 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! IT IS THE CUSTOMERS RESPONSIBILITY TO DETERMINE THE MAINTENANCE FREQUENCY.

Types of Preventive Maintenance

Daily Maintenance (as needed 1 to 7 days) - 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. 24 on Page 53. **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 ash off of baffle by the heat exchangers.

Periodic Maintenance (as needed 1 to 3 months) - 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 clips and vacuum the area. **See Figure 21 on Page 48 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 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, 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. Have you changed brands of pellets?
3. Is the malfunction consistent or 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 adjust 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 2 fuses on the back of the control board?
3. Is there a diagnostic light is flashing? (#2 or #3 LED Light)

Electrical Component Failures

Although we take every measure possible to ensure reliability of our stoves, there may be some component failures. Fortunately, there are only twelve electrical components:

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, they are:

- **The fuses on the control Board. The F1 fuse protects the Auger circuit and the F2 Fuse protects the entire control board. Check these first. (See Figure 2 on page 14 for the location of the fuses on the control board). Replace with 250 Volt, 5 Amp, 5 MM x 20 MM fast acting 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 Pellet stoves

See Figures 11 and 12 on pages 24 and 25 showing the location of the Electrical Components in the stove.

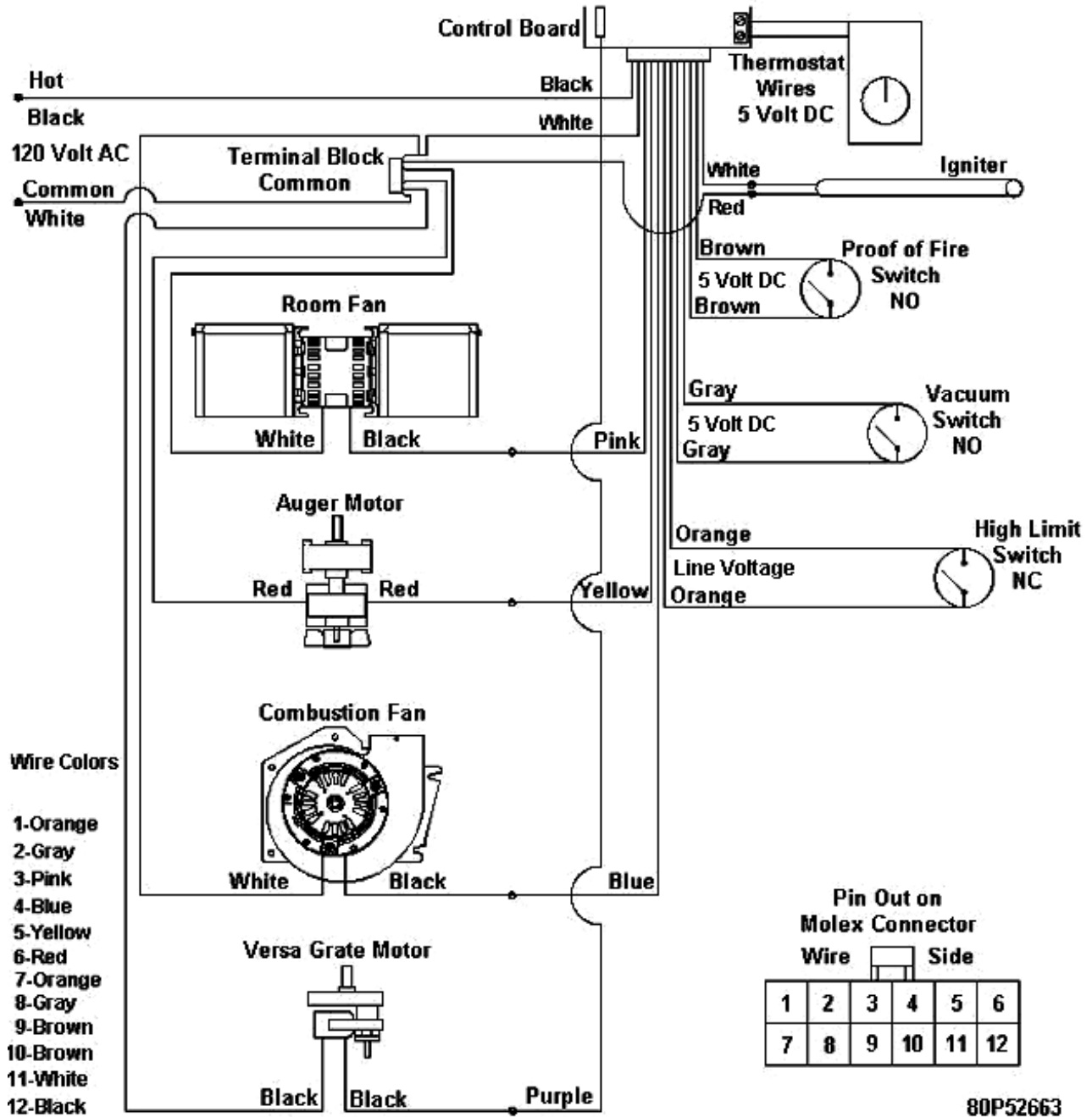


Figure 10

York Insert Electrical component Layout

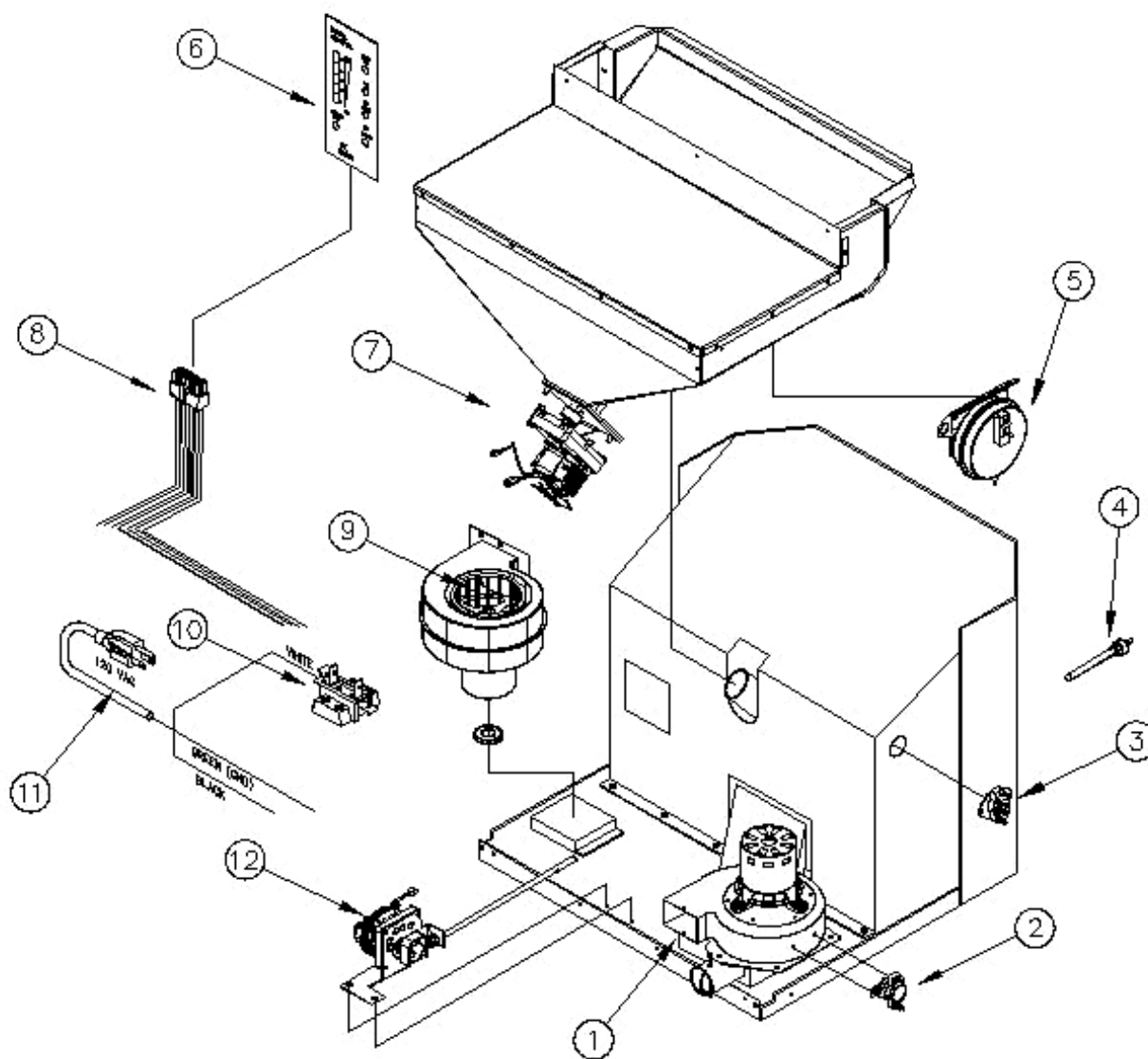


Figure 11

Legend:

- | | |
|--|---|
| <ul style="list-style-type: none"> 1. Combustion Fan – 80P20001-R 2. Proof of Fire Switch – 80P20038-R 3. Manual Reset High Limit – 80P52629-R 4. Igniter – 80P52677-R 5. Vacuum Switch – 80P52628-R 6. Digital Control board–80P22348-R | <ul style="list-style-type: none"> 7. Auger Motor – 80P20278-R 8. Wiring Harness – 80P30074-R 9. Convection Fan – 80P20000-R 10. Terminal Block – 80P52630-R 11. Power Cord – 80P20004-R 12. Versa Grate Motor – 80P20296-R |
|--|---|

St. Croix Freestanding Models Electrical component Layout

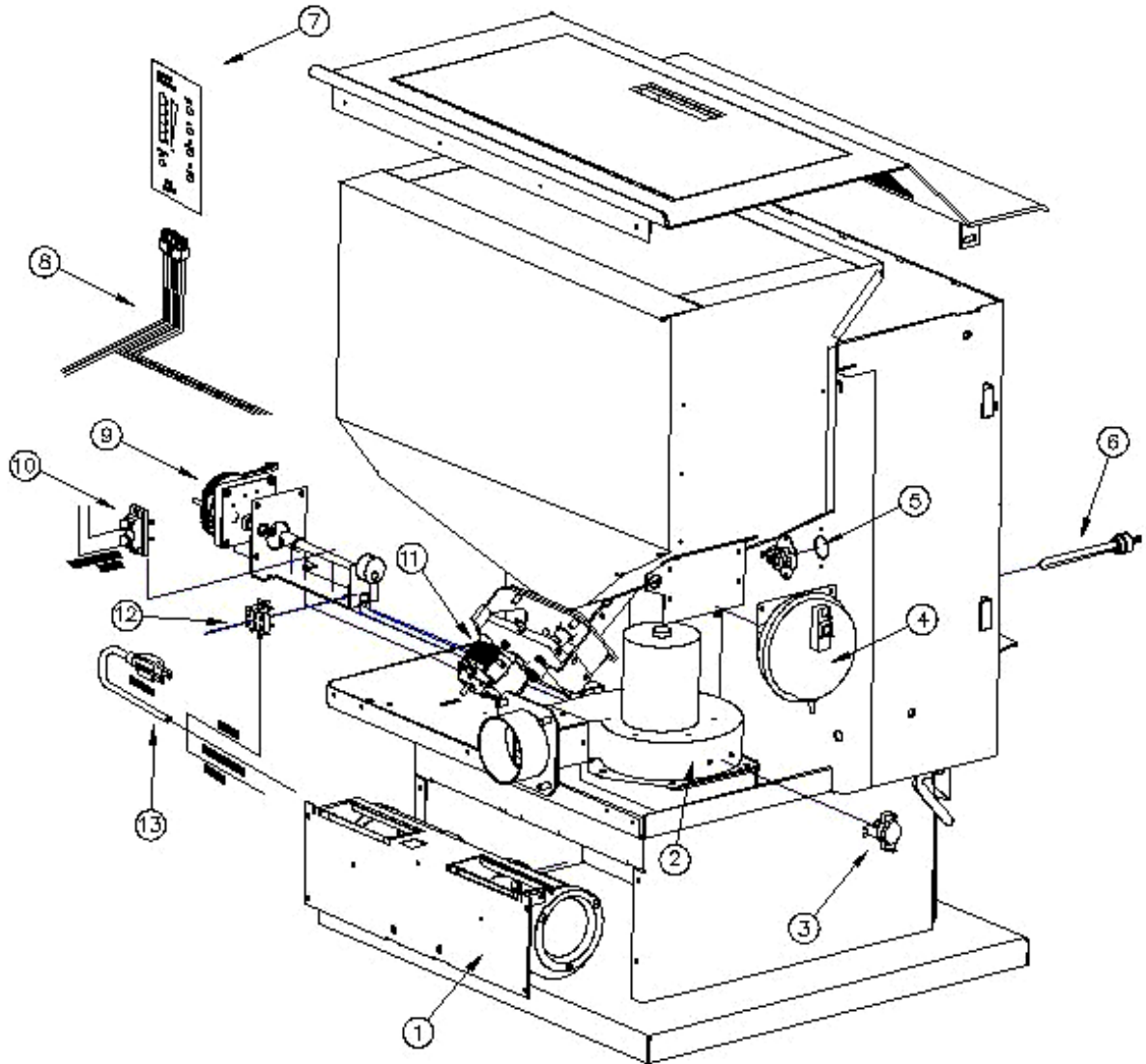


Figure 12

Legend:

- | | |
|---|---------------------------------------|
| 1. Convection Fan – 80P20003-R | 8. Wiring Harness – 80P30074-R |
| 2. Combustion Fan – 80P20001A-R | 9. Versa Grate Motor – 80P20296-R |
| 3. Proof of Fire Switch – 80P20038-R | 10. T-stat Wire Terminal – 80P30043-R |
| 4. Vacuum Switch – 80P52628-R | 11. Auger Motor – 80P20278-R |
| 5. Manual Reset High Limit – 80P52629-R | 12. Terminal Block – 80P52630-R |
| 6. Igniter – 80P52677-R | 13. Power Cord – 80P20004-R |
| 7. Digital Control board – 80P22348-R | |

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 on an Insert and 13 electrical components on the Freestanding St. Croix Pellet stoves. See Figures 11 and 12 on Pages 24 and 25.

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. 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

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**)

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 between 114 to 126 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 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 13. The touch pad buttons are labeled with the **White** numbers 1 through 5)

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 **Fan** 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 15.

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.

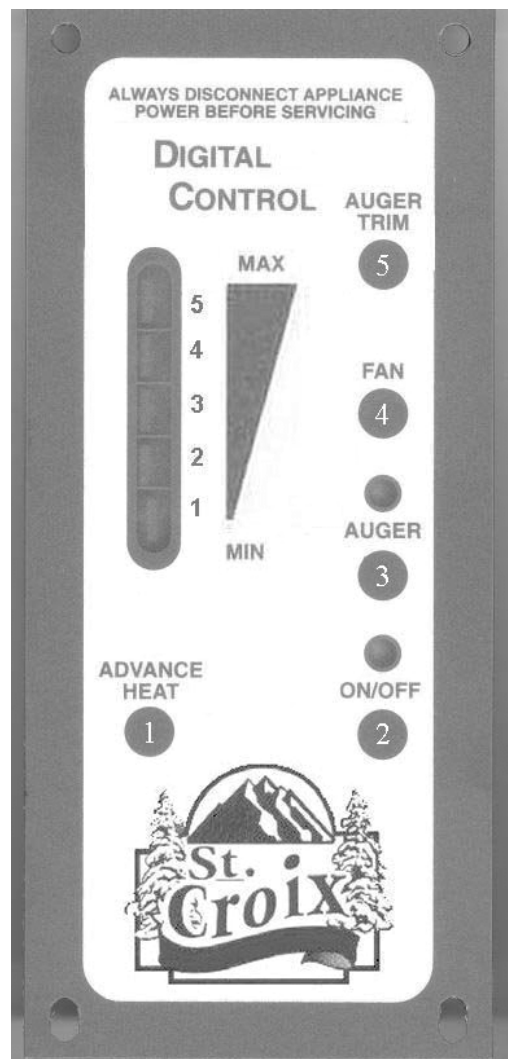


Figure13

- The first LED only indicates the **Normal** #1 setting. (1.5 second on time) See Figure 3 on Page 15.
- The first and fifth LED lights indicate the #1 **High** setting. (1.75 second on time) See Figure 5 on Page 15.
- The first and fourth LED lights indicate the #1 **Low** setting. (1.25 second on time) See Figure 4 on Page 15.

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. The stove is in the 1-hour pilot mode. The light indicating which Heat level has been selected will be on 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 15 to see how the LED lights light up 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 6 volts. Press the button again and the all lights flash twice. Press the button again and the lights all flash once and the board reverts to the default Combustion Fan voltage. *(Refer to figure 6 on Page 15 to see how the lights flash when adjusting the Combustion Fan voltage.)*

CAUTION: Using the fan button 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 units 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 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.**



Figure 14
Vacuum 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 **after approximately 60 seconds** once a loss of vacuum has been sensed.

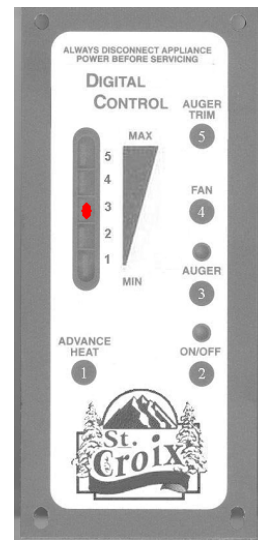


Figure 15
Proof of Fire Diagnostic light

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 **once the stove cools down and the fans shut off**. Approximately 30 minutes.

1. Vacuum

Loss of vacuum may be caused 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 21 on Page 48*) 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

The component list dealing with Vacuum problems will need a closer look. **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.
 - ✓ 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 are 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.
 - ✓ 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 stove 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 vacuum should be at least .05” WC negative pressure. The stove typically has a reading of between .1” and .25” WC negative pressure.
 - ✓ 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 problem most likely it will be a problem in the wiring system related to a faulty connection or possibly a combustion fan that is getting too hot and the **Thermal Override** is shutting it down. This would likely be seen when the stove is running on the higher settings and the combustion fan should be checked **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 Proof of Fire switch sensing that the Exhaust Temperatures drop below 100 Degrees F causes this. The stove shuts down and the number 3 LED light will start 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 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 small amount of pellets of a low burn to burn too fast and the fire eventually goes out before the Proof of Fire Switch drops out. 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 auger trim button. If the stove is hooked to a tall vertical Chimney with good draft, use the Fan button to adjust the combustion fan voltage to compensate for extra draft.

The 2nd item listed above would not prevent the stove from re-lighting and may be considered part of the **initial start-up adjustments.**

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 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 that time frame.

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. 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 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.

Items to check:

- ✓ Once the **Manual High Limit** 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 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.

- I. 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.
- II. 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.

III. 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 on the control board, the control board is bad 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.)*

IV. 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.

- ✓ Once 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 line voltage at the **Orange** wires. Only one wire will show line voltage when they are unplugged.
- ✓ 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.

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. If the high limit switch is tripped during this time, the auger and igniter will *not* come on and light the stove. 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. 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.
- ✓ 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 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 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.

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 **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 labeled F1, replace with a 250 Volt, 5 Amp fuse, 5 MM x 20 MM fast acting fuse. (See Figure 2 on Page 14)
- 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.
 - ✓ 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.
 - ✓ 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 near the back-center 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 Grate Bottom surface.

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. However 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

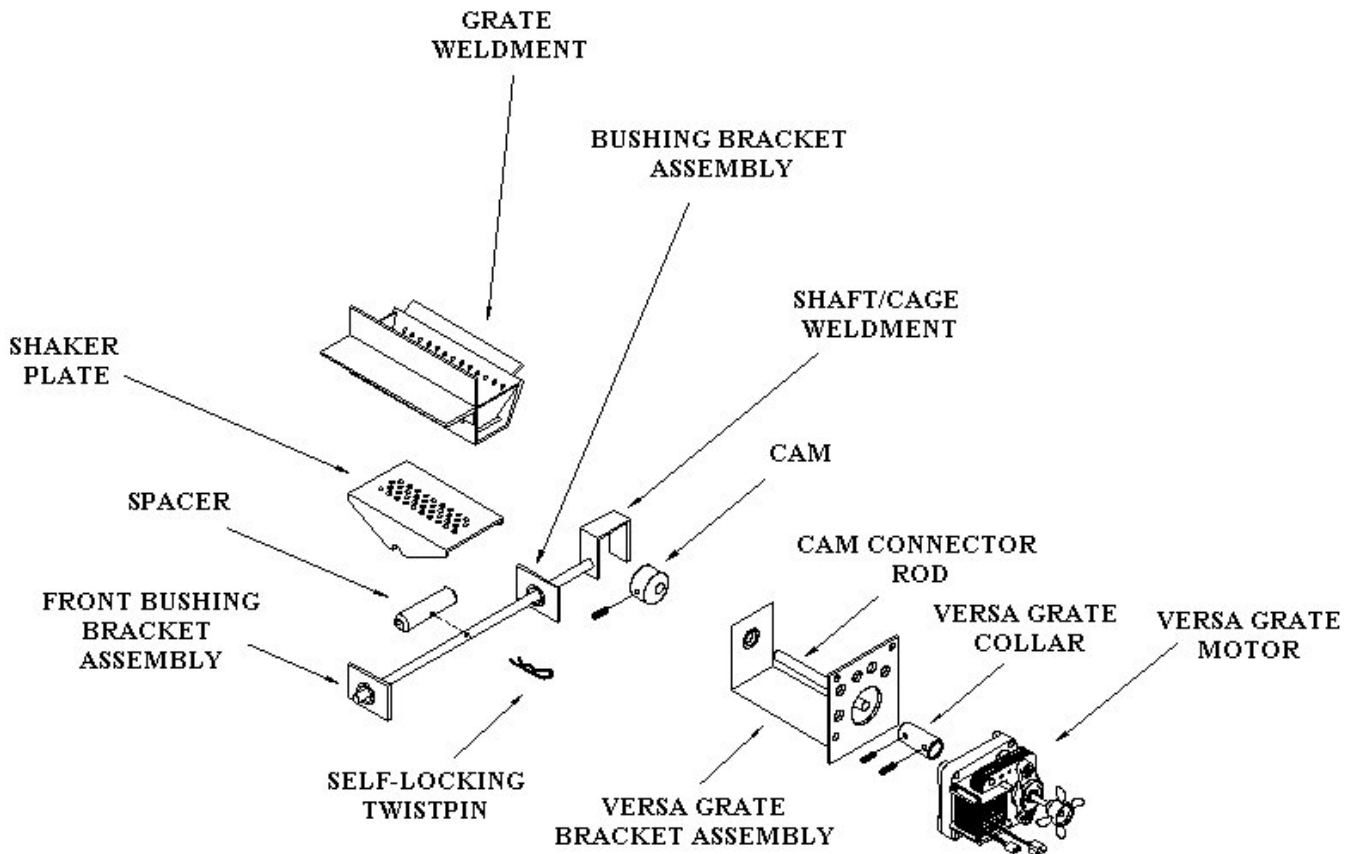


Figure 16

Components – York insert

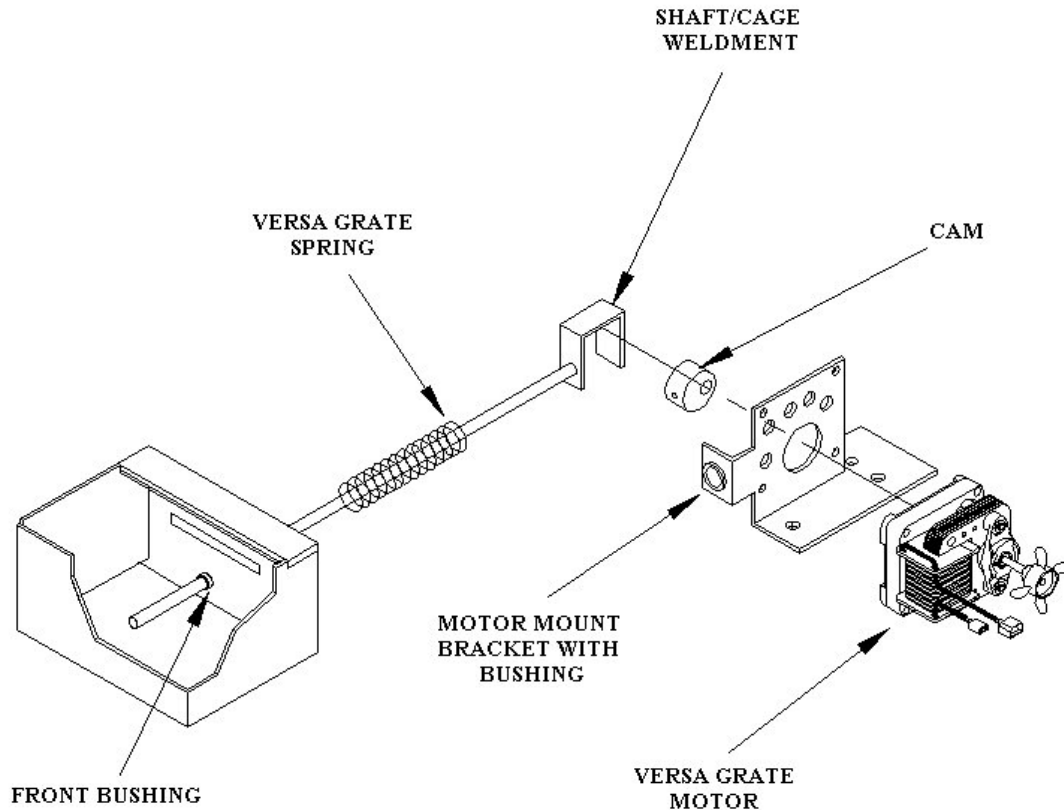


Figure 17

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 18 and 19 on Page 39.

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

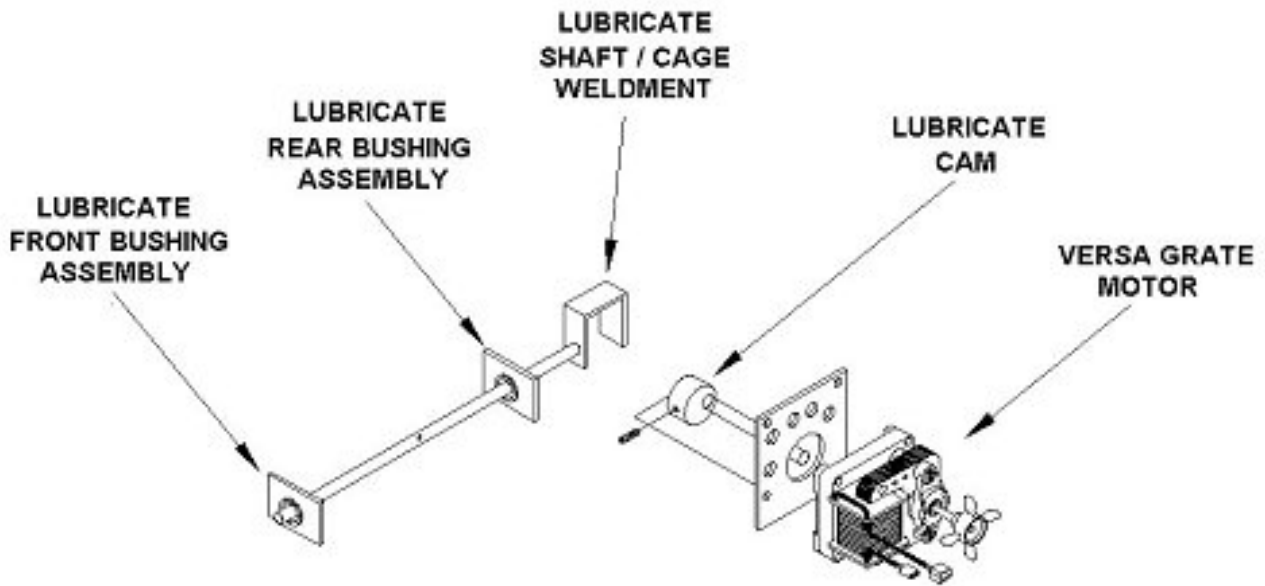


Figure 18

Versa Grate Lubrication – York Insert models

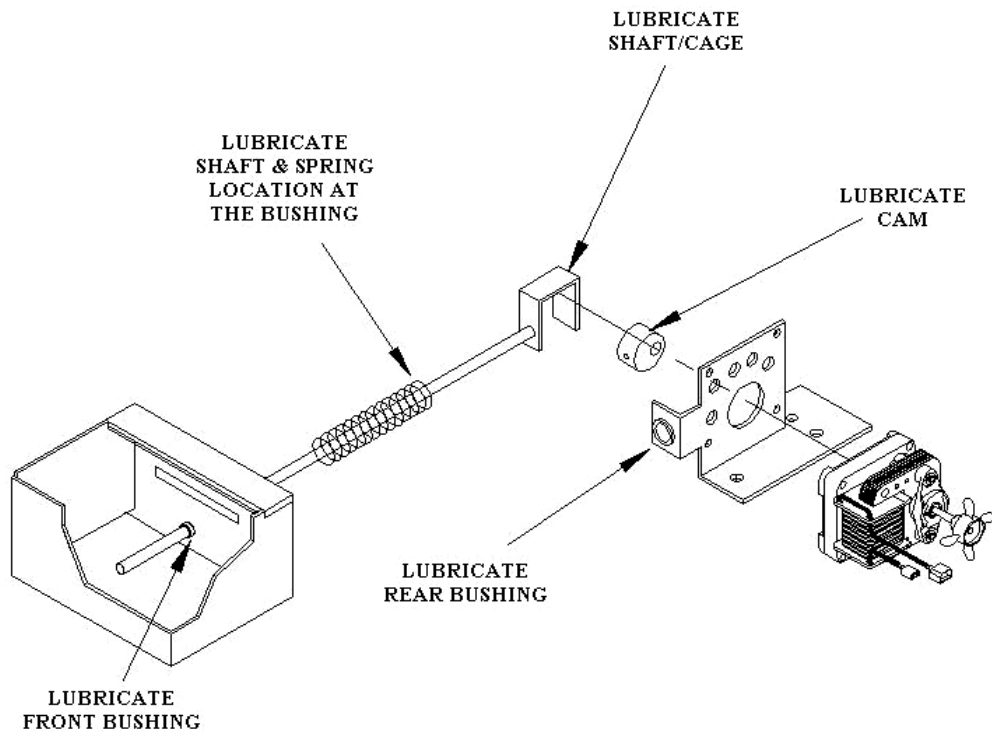


Figure 19

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 that is connected to a short Purple wire soldered to the backside of the control board.

- **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 soldered properly to the back of the control board and there is voltage at the 1/4" Male connector.
 - ✓ 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 20 on page 41 for detail.*)
 - ✓ First see if the Self-Locking Twist 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 3/4". 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.

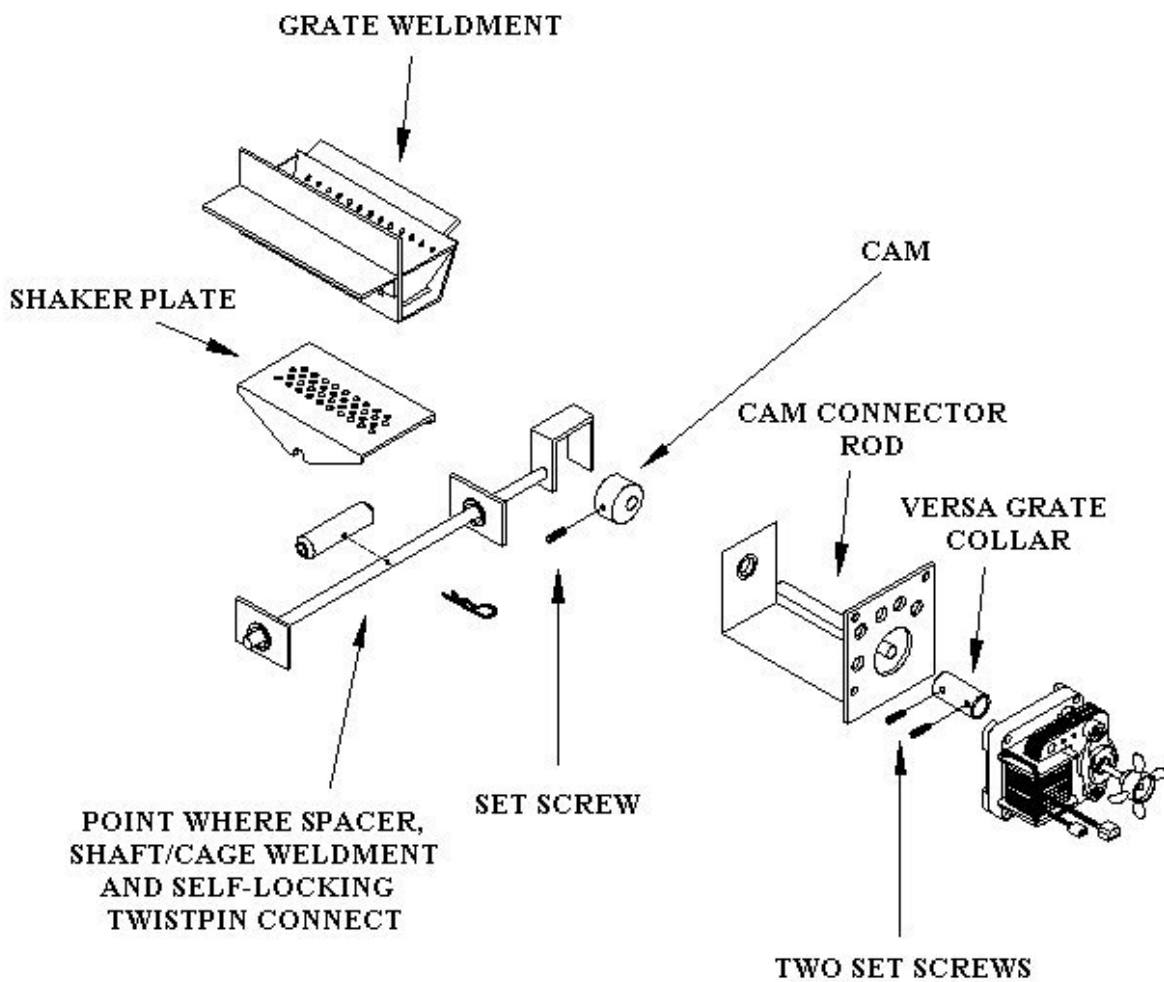


Figure 20

Details of Freestanding stoves and Inserts vary slightly; see Figures 16 and 17 on Pages 37 and 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 has generated within the Heat Exchange 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 convection 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 troubleshooting 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.
- ✓ 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.*)
- ✓ 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 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 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 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. Incoming line voltage will cause this to vary some.

- ✓ 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.
- ✓ 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 on 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.
- ✓ 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 become interrupted and immediately shut down the fuel feed system and 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 45 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 45 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 #3 LED diagnostic light 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-Thermostat will read Normally Closed; this condition supplies power to the Auger 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.

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 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.

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.

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.

Operation: The door is hinged on the left side. 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.

Operation: The ash door is hinged on the bottom. 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 fly-ash traps are located in the back wall of the stove behind 2 cover plates.

Purpose: The two ash trap openings allow access to the hot air plenums for removal of ash build-up in this area. See Figure 21 on Page 48.

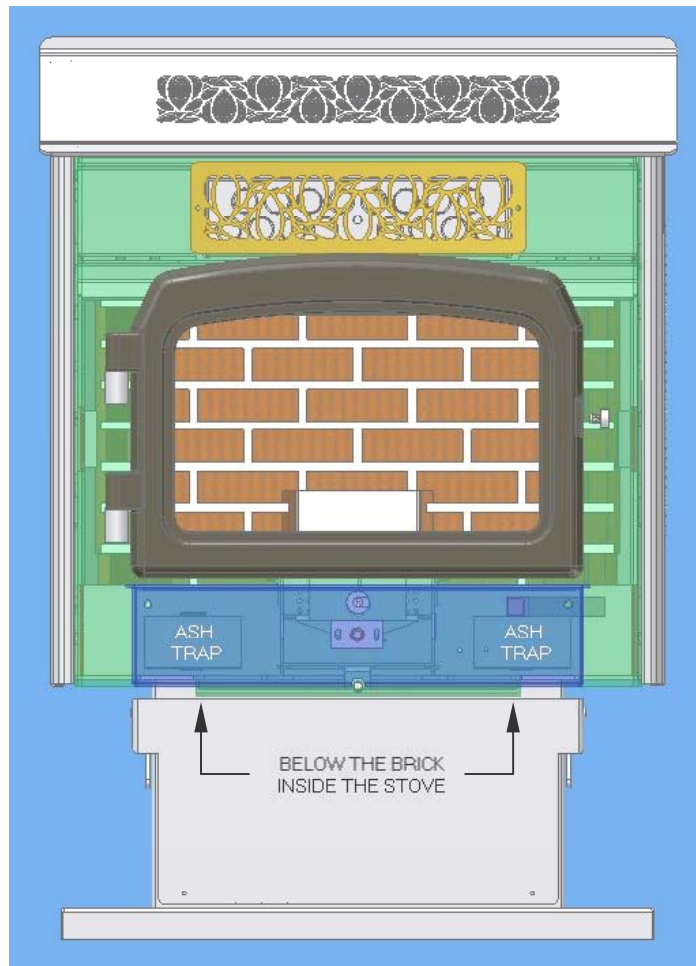


Figure 21
Ash Trap location – All stoves

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 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 24 on Page 53.

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 24 on Page 53.

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 22 on Page 51.

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 23 on Page 52.

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 24 On Page 53.

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 Inlet Damper

Location: The air inlet damper is located on the rear of all freestanding stoves and 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. See Figure 22 on Page 51.

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 Figure 24 on Page 53.

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 24 on Page 53.

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.

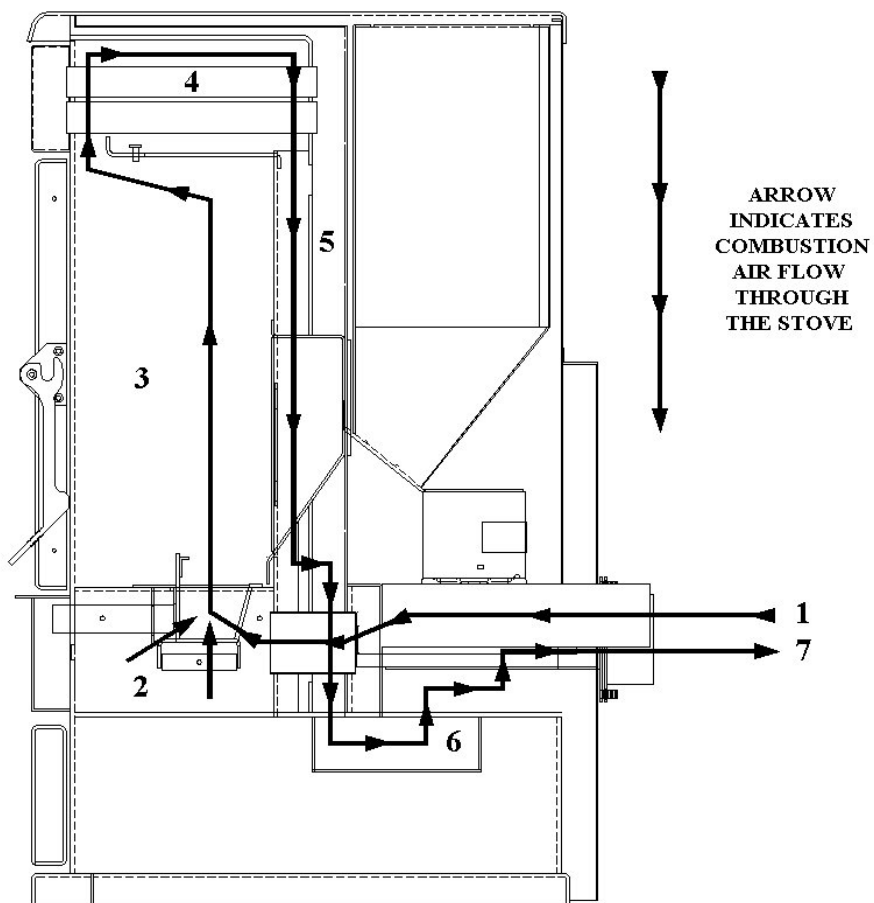


Figure22

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.

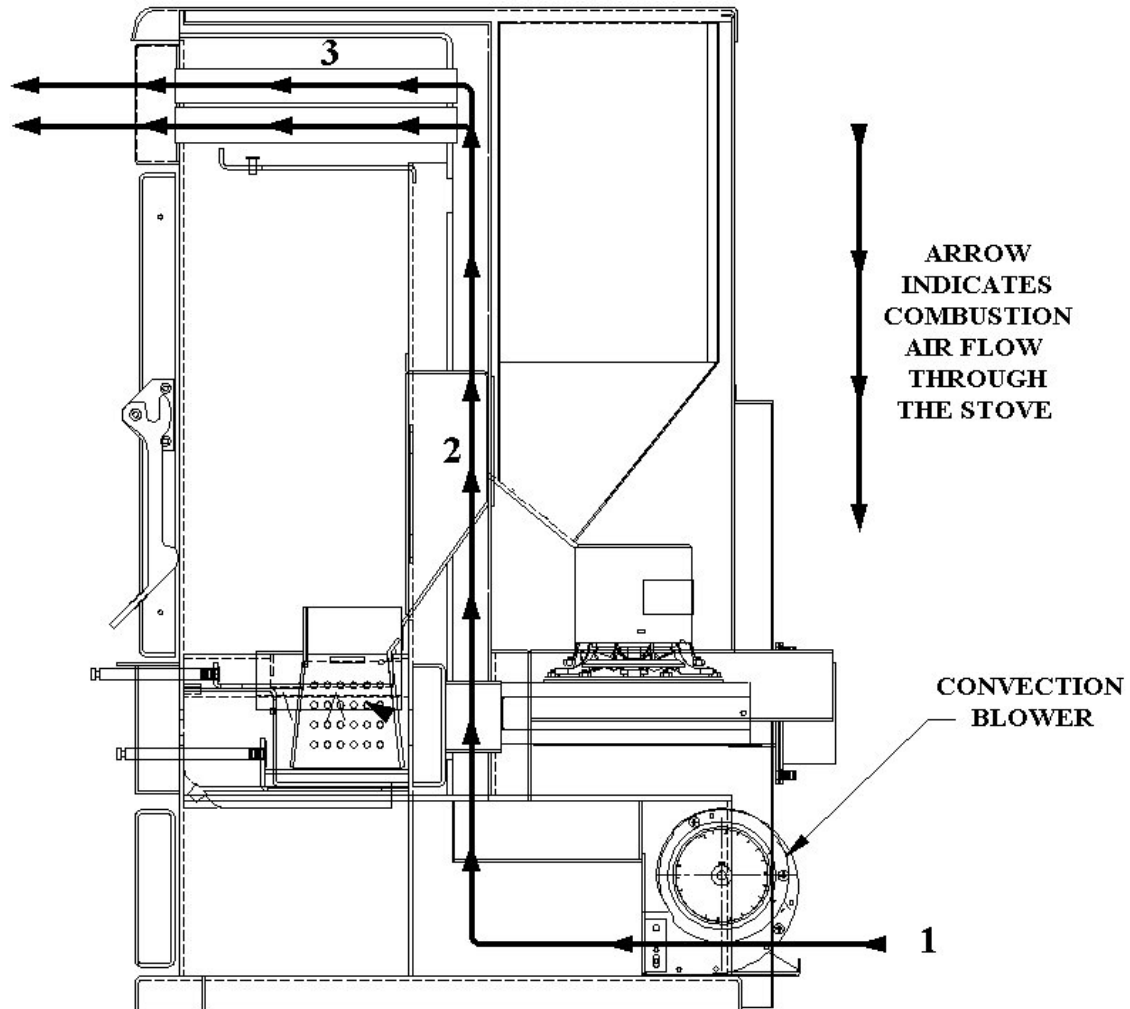


Figure 23

Legend:

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

Fuel Flow - Pellets

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

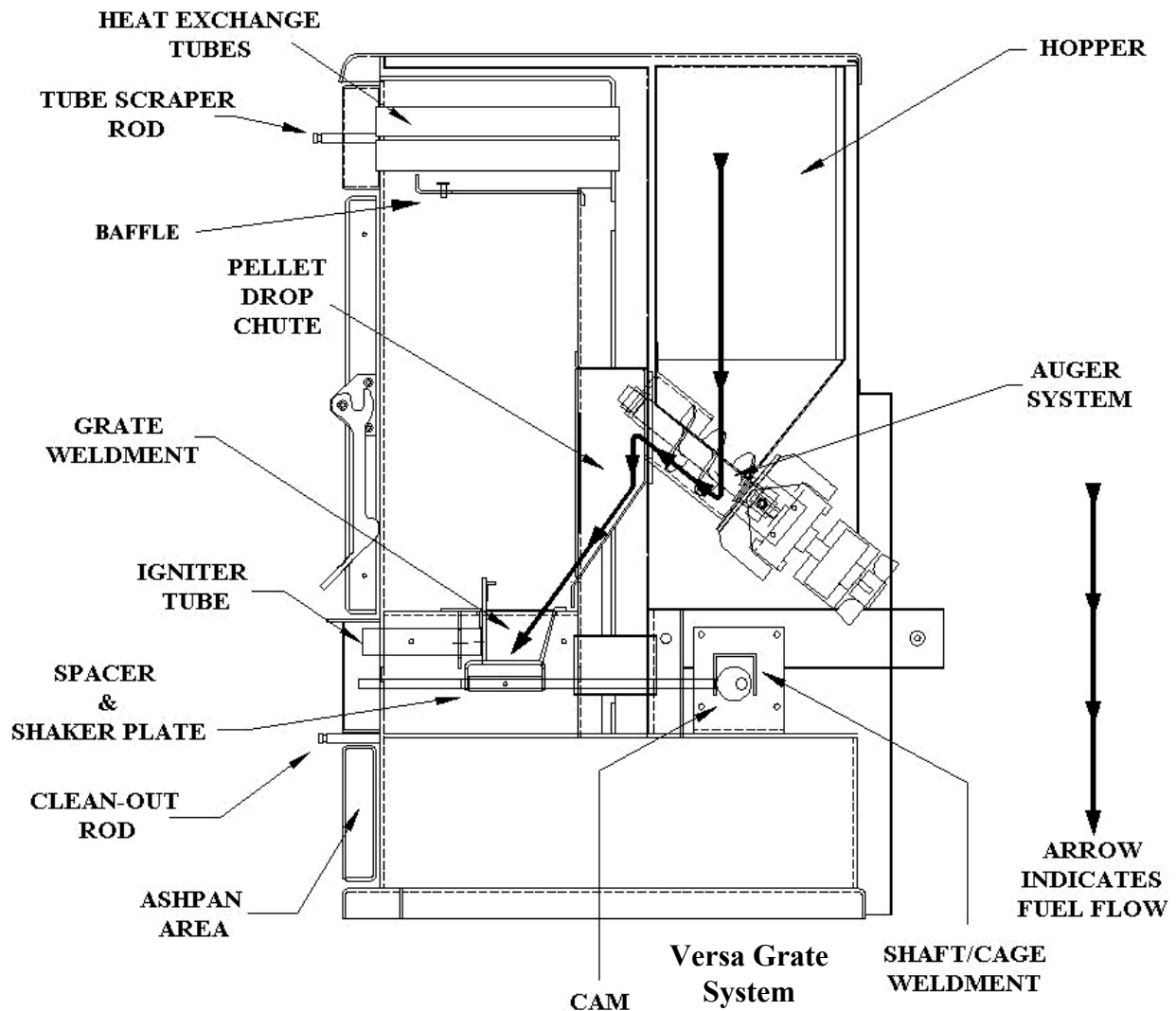


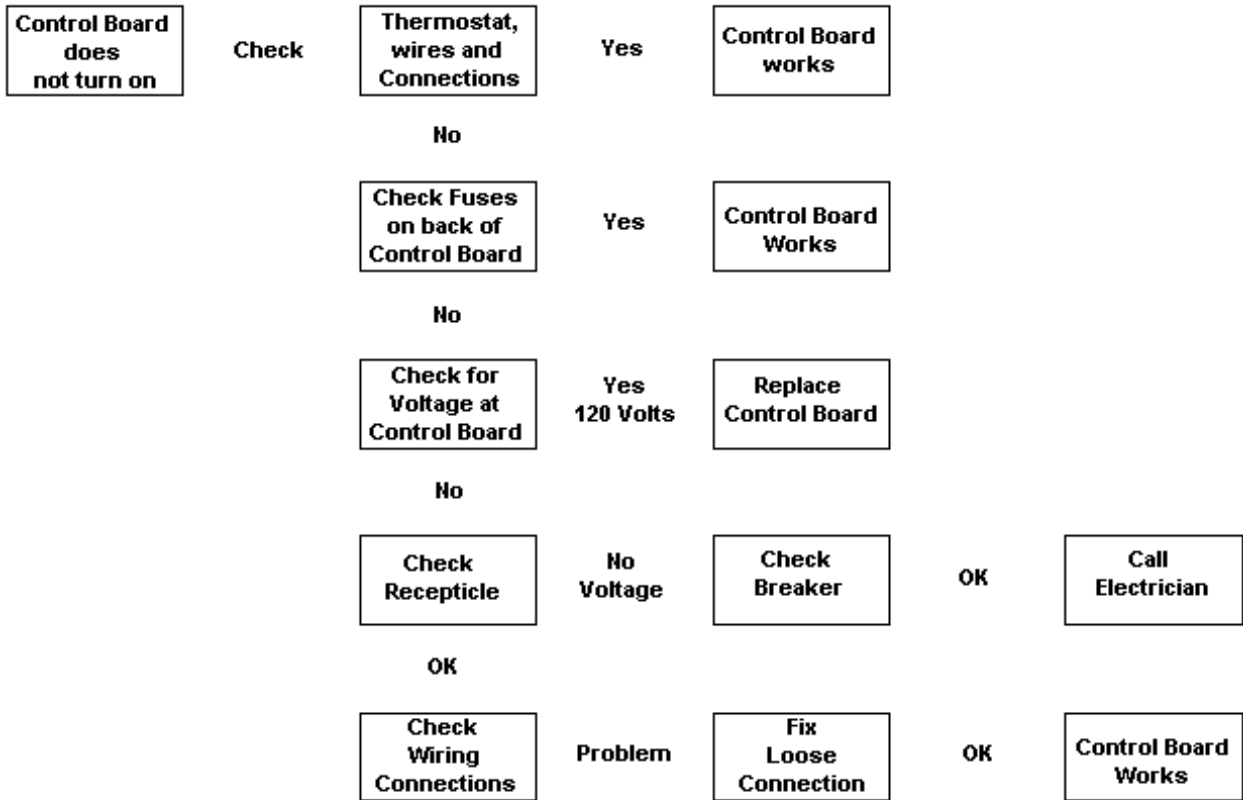
Figure 24

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

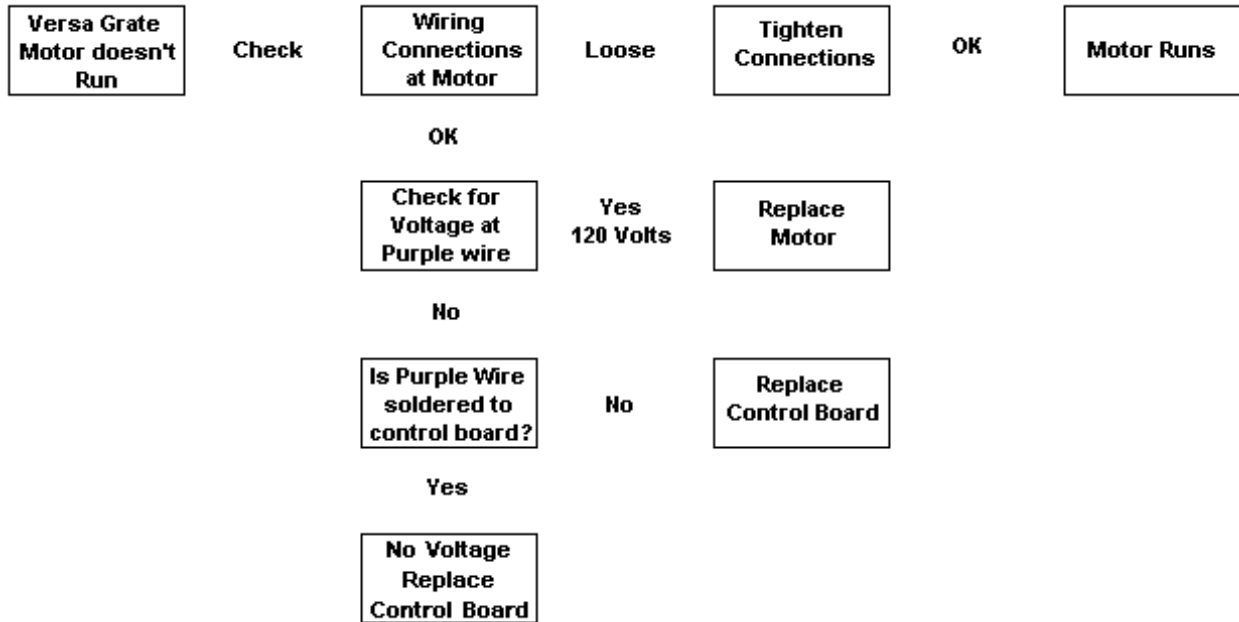
Digital Control Board – Board seems dead



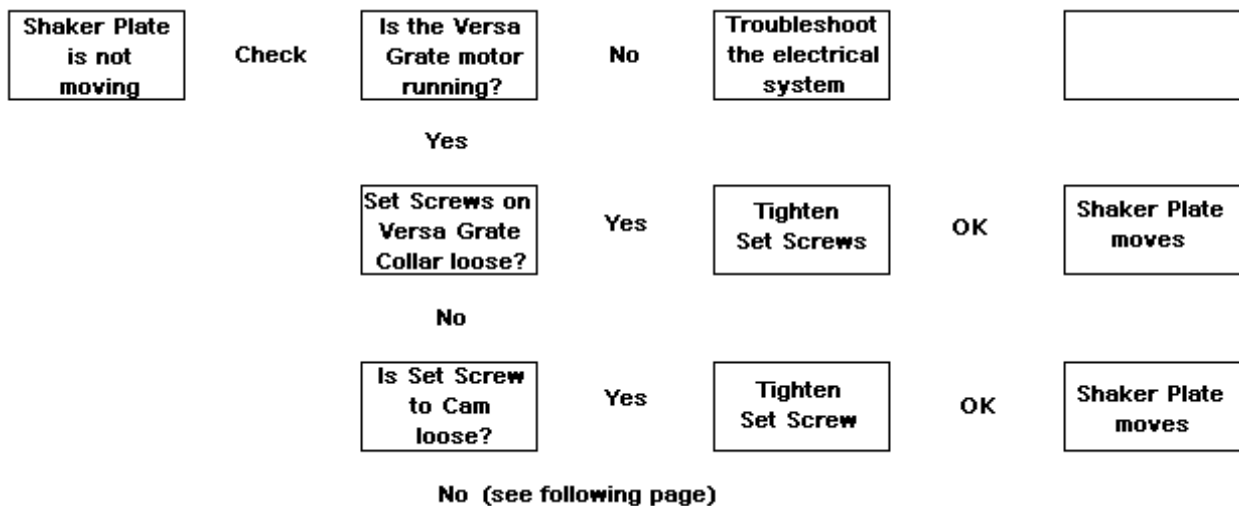
Digital Control Board – Fan Self Test at Start-Up



Versa Grate Motor – Electrical



Versa Grate Motor – Mechanical



Versa Grate Motor – Mechanical (Continued from previous page.)

Shaker Plate is not moving	Check	Is the Shaft/Cage Rod bent?	Yes	Replace Shaft/Cage Weldment	OK	Shaker Plate moves
		No				
		Self-Locking Twistpin missing?	Yes	Fasten Spacer with new Twistpin	OK	Shaker Plate moves

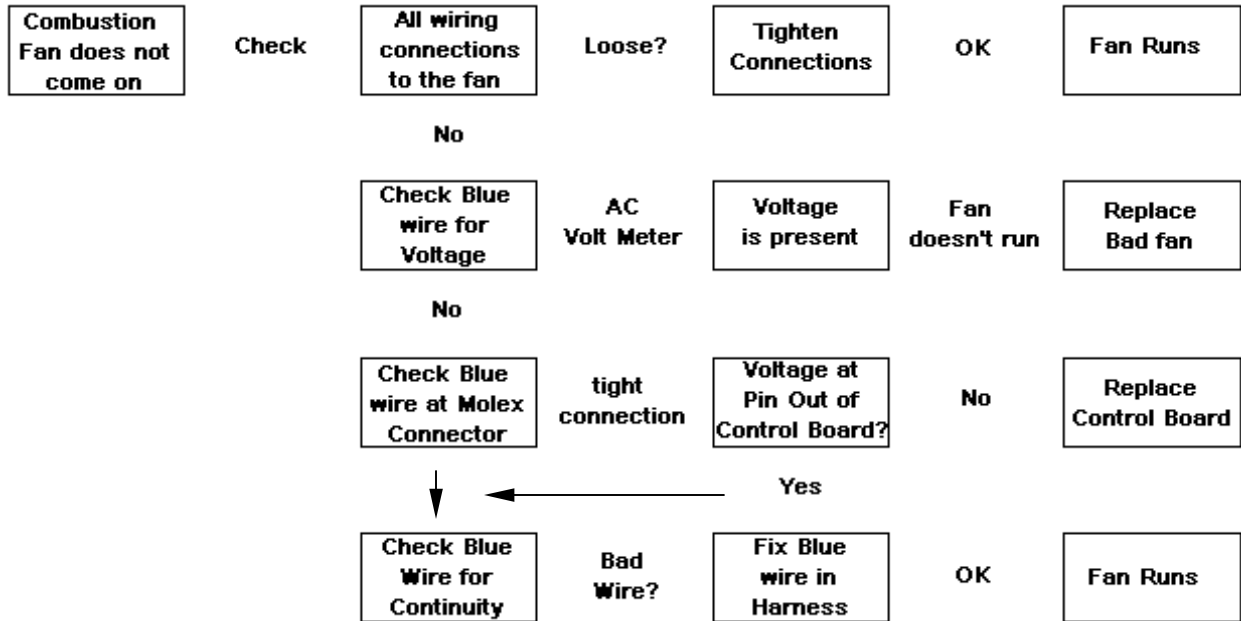
Convection fan

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.

Convection fan does not come on	Check	All wiring connections to the fan	Loose?	Tighten Connections	OK	Fan Runs
		No				
		Check Pink wire for Voltage	See Note above	Voltage is present	Fan doesn't run	Replace Bad fan
		No				
		Check Pink wire at Molex connector	tight connection	Voltage at Pin Out of Control Board?	No	Replace Control Board
				Yes		
		Check Pink wire for Continuity	Bad Wire?	Fix Pink wire in Harness	OK	Fan Runs

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 1/4" insulated Male connector and 1/4" 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.

Continued on next page.

Igniter – Continued from previous page.

Igniter does not get hot	Check	Wiring connections to the igniter	Loose?	Tighten Connections	OK	Igniter gets hot
		No				
	See Note	Check Red Wire for Voltage	AC Volt Meter	Voltage is present	Igniter isn't hot	Replace Igniter
		No				
		Check Red Wire at molex connector	Tight Connection	Voltage at Pin Out of Control Board	No See Note	Replace Control Board
				Yes		
	Use Ohm Meter	Check Red Wire for Continuity	Bad Wire?	Fix Red Wire in Harness	OK	Igniter runs

Vacuum Switch

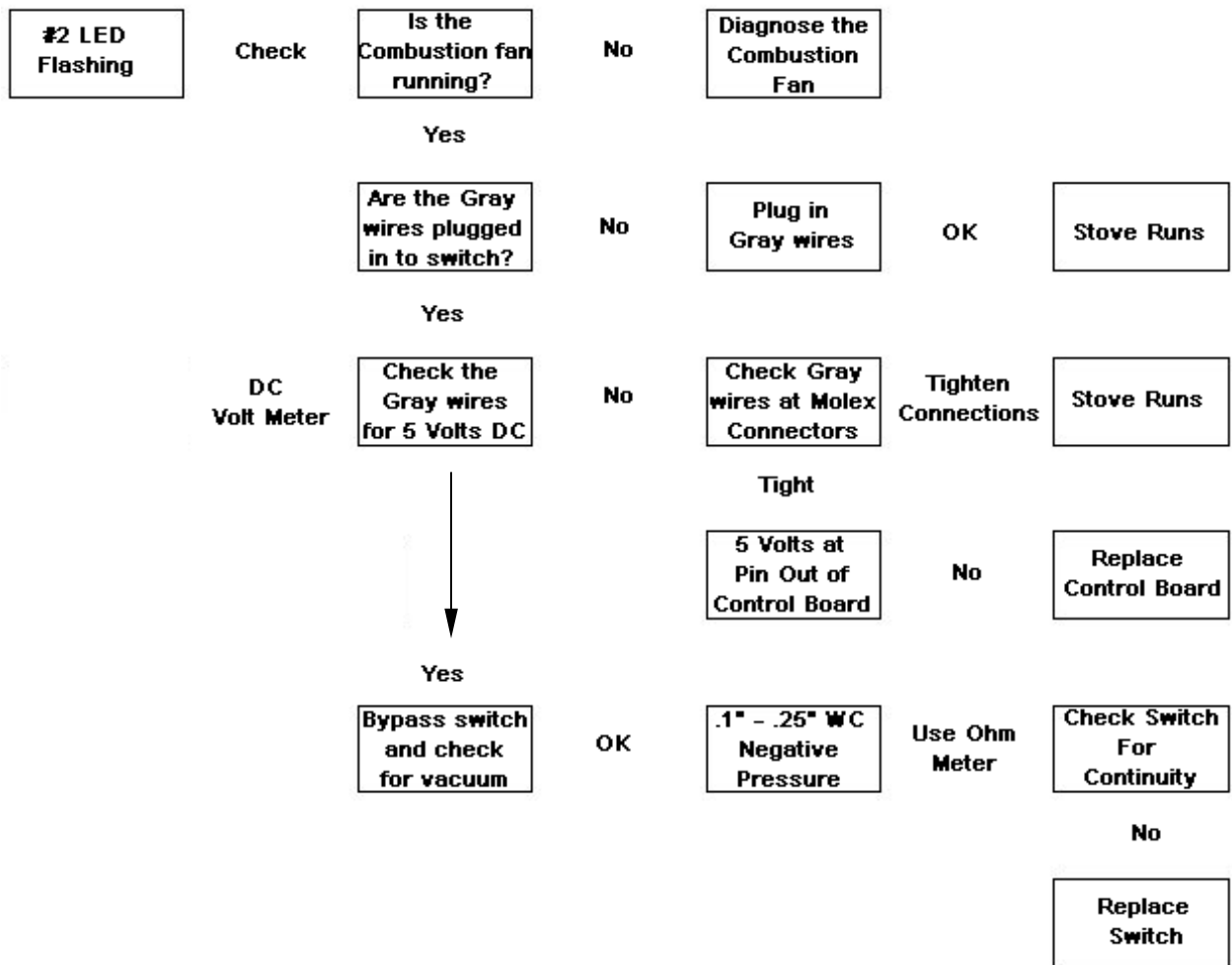
Loss of vacuum may be caused by Operator error or neglect

- 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.

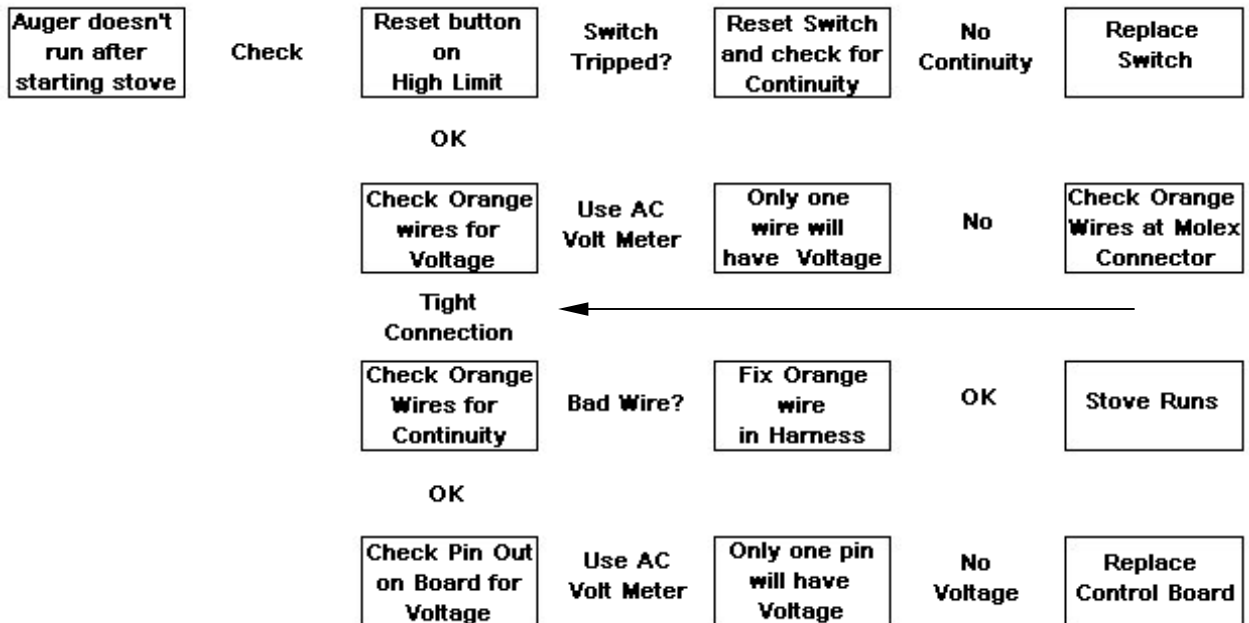
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Vacuum Switch – Continued from previous page



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.



Proof of Fire Switch

#3 LED flashing	Check	Is there unburnt fuel in the pot	Yes	Too much Air for low burn settings	Adjust	Close Damper down for low burn
		No				
		Is the Hopper empty	Yes	Fill hopper and restart stove		
		No				
		Turn Stove on. Does it feed pellets	No	Check the High Limit Switch	Is the switch tripped?	Trouble shoot High Limit Sensor
		No				
		Check Brown wires at Proof of Fire Switch	Loose?	Plug in Brown wires to switch	OK	Stove Runs
		OK				
	Use DC Volt Meter	Unplug wires and check for 5 Volts DC	No	Check Brown wires at Molex Connector	Tighten Connections	Stove Runs
				OK		
				5 Volts DC at Pin Out of Control Board	Yes	Replace Control Board
		Heat Proof of Fire Switch	Clicks after 5 seconds	Check for Continuity	No	Replace Switch