

CATALYTIC COMBUSTORS

Here is how your catalytic combuster works

The catalytic combustor is a ceramic honeycomb with hundreds of cells. If you looked at the inside of each cell with a microscope, you would see that the walls are uneven and filled with minute nooks and crannies. Precious metals, such as platinum, are sprayed on the inside of these cells to coat all of the nooks and crannies. This creates the largest possible surface area to interact with the wood smoke. The catalytic combustor in your stove is very similar to the one in the exhaust system of your automobile and works to achieve the same results - high efficiency and clean air!

When you first start a fire, you should bypass your catalytic combustor and let the smoke go directly out your chimney. Once your wood smoke reaches 500°F, it is hot enough to ignite the catalytic combustor. As the wood smoke passes through the cells in the combustor, the smoke reacts with the precious metals lining the inside of the honeycomb and burns again. In this way, you are burning your wood twice, and getting more heat.

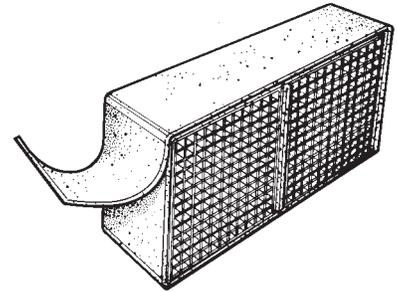
Without a catalytic combustor, between 5-40% of the chemical energy contained in wood simply escapes up the chimney when wood is burned. Energy laden gasses are exhausted up the chimney or they are condensed on the inside of the chimney flue as creosote. The slower the burn, the greater the amount of energy that is not used. A long smoldering fire is the least efficient use of energy in wood, yet it produces lots of smoke, which is the fuel supply for the catalytic combustor.

Most of the chemical compounds in wood smoke are combustible. High temperatures (in excess of 1100-1200° Fahrenheit) can loosen the bonds of these chemical compounds and “burn” wood smoke. A stove that “burns” these compounds and uses smoke as additional fuel will burn more efficiently and produce more heat, while reducing creosote and air pollution at the same time. Most stoves cannot consistently produce temperatures in excess of 1100°F-1200°F degrees, particularly during long burning times, but your catalytic combustor allows you to burn smoke starting at just 500°F!

Your catalytic combustor can get the most efficiency out of every piece of wood if it has three things: temperature, turbulence, and time.

- 1. Temperature.** The catalytic combustor can only start burning the gases in the wood smoke after the smoke is at least 500°F. Before the smoke reaches that temperature, it will simply “gum-up” the cells of your combustor.
- 2. Turbulence.** The wood smoke can interact best with the precious metals inside the honeycomb cells if there is some variation in the air flow. This increased turbulence enables more of the wood smoke to come into contact with more of the nooks and crannies in the honeycomb cells. The expanded metal screen that sits in front of your catalytic combustor creates this turbulence. It also protects the catalytic combustor from direct flame contact.
- 3. Time.** Once the temperature and turbulence are achieved, the catalytic combustor just needs to have enough time to burn all the gases in the wood smoke. For this reason, it is best to minimize the amount of air you allow into the firebox once you have engaged the combustor. **Allowing too much air into the firebox speeds up the rate at which the fire burns and allows more wood smoke to pass through the combustor than it can handle at one time.** Too much air also allows unburned wood smoke (and heat) to go up the chimney. The ideal air setting is one that allows enough air to keep the wood burning and producing smoke, but not so much that the smoke is racing through the combustor without being burned.

With proper care, a new catalytic combustor will give years of fuel savings and lowered emissions. By following some simple guidelines, you can ensure yourself maximum combustor performance and longevity. Your catalytic converter is designed to last for 12-14,000 hours of use. You can ensure yourself of getting the maximum life from your combustor by following these simple guidelines:



The catalytic combustor is made up of two square honeycombs, assembled with white felt-like gasket to make one rectangular unit.

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- 1) Burn only natural well seasoned wood.
- 2) Wait until the stove top thermometer reads 250°F (500 degrees inside of firebox) to engage combuster.
- 3) Bypass the combuster before reloading and leave the bypass open for 10-15 minutes after reloading.
- 4) Don't overfire the stove. See page 14
- 5) Clean the combuster regularly. See below

You can also obtain a lot of useful information by logging on to the web site of the maker of our catalytic converters- (www.appliedceramics.com). Other very useful web sites on all aspects of wood burning are (www.hearth.com), (www.woodheat.org), and (www.csia.org). CSIA is the Chimney Safety Institute of America.

Inspection & Cleaning

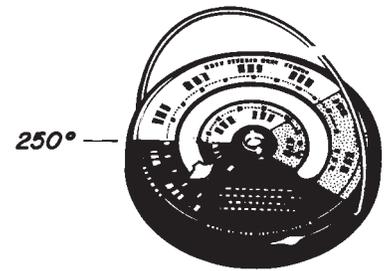
Each new Fireview stove comes installed with a catalytic combuster. The combuster consists of a two block ceramic honeycomb wrapped with a fibrous material (interam gasket) and masking tape to hold it together. **Do not remove the tape.** This is enclosed in a two piece cast iron box, which is held in place during shipment with two bolts and washers. Remove these two bolts and save them if you plan to move your stove in the future. Removing the two bolts will make future inspection and cleaning much easier. Catalytic combustors typically have a life span of between 4-6 years with periodic maintenance. There are a few ways to tell if your catalyst needs to be replaced. If you are experiencing a more sluggish performance than usual, and there is excess smoke exiting your chimney during operation, then the catalyst may need to be replaced. Because the catalyst is made out of a ceramic material, the high temperatures flowing through it may cause slight cracking of the cells of the combuster. This is normal and you should not be alarmed. You will not have to replace the catalyst because of these cracks or slight deterioration. This may last quite a while before you would need to change the combuster but just be gentle with it.

HOW TO INSPECT AND CLEAN YOUR COMBUSTOR

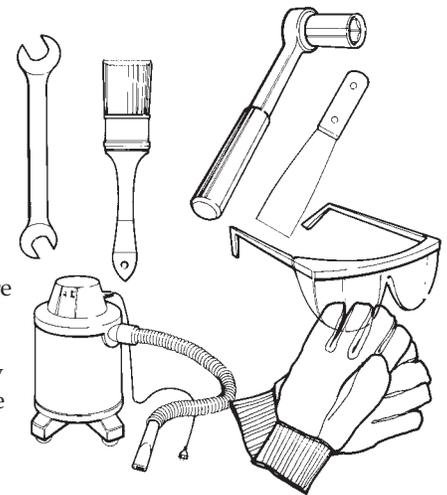
Plan to inspect and clean the catalytic combuster in your new stove **every 4-6 weeks**, and remove any fly ash that may have accumulated on it. An accumulation of fly ash can reduce the draft causing back puffing, sluggish burning, and inefficient heating performance. You should check, and clean thoroughly, the combuster before the heating season begins, as well as every 4-6 weeks. The catalyst may develop some small cracks. This is normal and does not mean the catalyst needs to be replaced. If there is severe crumbling, this is an indication of overfiring and review of the operation of the stove is required. Just be sure to handle it gently. If you are just brushing or vacuuming the catalyst, **you do not need to remove it from the cast iron frame.**

Tools needed: (1) 1/2" wrench, (2) vacuum cleaner-preferably one that is designed for ash removal, or soft bristled paint brush, and (3) work gloves and safety glasses.

- 1) Be sure the fire is out, and the stove is cold. If you are using a vacuum it is very important that the stove is cold for a few days because it is possible that some of the ash left in the stove may still be burning and could damage your vacuum and possibly be dangerous. There are special vacuums available for ash cleaning. Open the top lid and lean it back. You can also remove the top lid by lifting it out of the two "rest back" holes on the top plate. If you haven't already, use the 1/2" wrench to remove the two bolts that secure the combuster in place. You will not need to save these bolts unless you plan to move your stove in the future. Tilt the combuster box slightly, and lift it out of the stove.



The surface thermometer should reach 250 degrees before engaging the combuster.

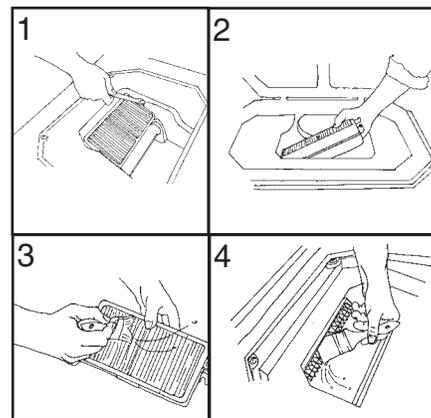


To clean the combuster, you'll need a 1/2" wrench. You should wear gloves and safety glasses. You can clean the actual catalyst with a vacuum cleaner or a soft-bristled brush.

2) Brush or vacuum the combustor thoroughly **from both sides**. **Do not use compressed air to clean the combustor.** This may damage it. Be sure to remove all of the loose fly ash from the combustor. Now is also a good time to remove any ash that may have accumulated on the surface of the baffle and bypass damper area.

A. In the firebox, immediately below the “upstream” of the catalytic combustor, is an expanded metal screen that protects the catalytic combustor from direct flames, and also creates turbulence in the exhaust stream as it enters the catalytic combustor. Vacuum the part of the screen that is visible through the combustor opening. Then open the side-loading door and gently tap the edge of the screen with a poker. This will loosen fly ash along the edges that you could not reach with the vacuum.

B. To reassemble, place the combustor back into its original position. There is only one way that the catalyst will fit onto the baffle plate.



To clean the combustor, (1) loosen the two bolts holding the catalyst in place. (2) Tilt the combustor to remove it from the stove. (3) Brush both sides of the combustor and (4) brush the baffle and stainless steel screen below it.

REPLACING A CATALYTIC COMBUSTOR

Tools needed: (1) 1/2" and 7/16" wrenches; (2) vacuum cleaner—preferably one designed for ash removal. (3) work gloves and safety glasses.

- 1) Lift the top lid and lean it back. You can leave the lid standing up, or remove it altogether by simply picking it up out of the two “rest-backs” that the rear hinges sit in.
- 2) The catalytic combustor is located in a cast iron box. If you haven't already, use the 1/2" wrench to remove the two bolts that hold the combustor box in place. These two bolts are located at either end of the combustor box, and have flat washers under the bolt heads. Save the bolts only if you intend to move the stove in the future.
- 3) To remove the box, tilt it slightly and lift it out of the stove.
- 4) You can separate the top and bottom of the combustor box by removing the two bolts that hold it together with the 7/16" wrench. Clean off any excess gasket inside the frames from the old combustor. Put the gasketed new combustor into the combustor box. It may fit a bit loosely at first, but when the stove is fired, the gasket will expand. Reassemble the combustor box and set it in place back in the stove. Now is a good time to vacuum the ash that may have accumulated in the baffle and bypass areas with a vacuum designed for ash removal.
- 5) Place the magnetic thermometer on the top of the stove, right next to the center divider somewhat above the catalyst.

Frequently Asked Questions

Q. How does the catalytic combustor work?

A. The catalytic combustor loosens the bond that holds the chemicals in wood smoke together. The result of this is that these chemicals begin to burn at temperatures of about 500°F (the normal range of exhaust gas temperatures). Without the catalytic combustor, wood smoke would have to be brought up to a temperature of 1000°F to 1200°F in order to start to burn. Having a stove with a catalytic combustor will generate 25% more heat from each piece of wood, thus reducing the amount of fuel used during the year.

There are three advantages to burning the smoke created by burning wood. First, the smoke becomes another source of fuel, giving you more heat from the same amount of wood. Second, creosote components will be burned up instead of being deposited in your chimney and possibly causing a chimney fire. Third, air pollution will be drastically reduced.

Q. How can I tell if the catalytic combustor is working?

A. The most noticeable effect of a combustor is the higher temperatures produced by your stove. Although the catalytic combustor reduces the temperatures at which smoke ignites, the temperature at which the smoke will burn will still be very

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high. A probe thermometer may indicate temperatures as high as 1500-1600°F. Do not operate the stove consistently above these temperatures, as they will hasten the degradation of the catalyst.

A second way to tell if the catalytic combustor is working is by observing the smoke coming out of your chimney. If there is only a small amount of smoke, and/or it's white in color, the catalytic combustor is working. You will see significantly more smoke when the combustor is being bypassed, than when the smoke is being burned by the combustor.

Third, inspection of the chimney should show that there is less soot and creosote than when the combustor is not used. Soot is also different when a combustor is used; it is brown and powdery, instead of black and sticky. Some people enjoy watching the "glow" of the combustor in the upper part of the front window, but the combustor doesn't have to glow to be working. It begins working at 500°F, but only glows when it gets over 1000°F.

Q. How do I maintain my catalytic combustor?

A. **Combustors** should be cleaned **every 4-6 weeks** during the heating season. When the stove is cool, the combustor can be cleaned by vacuuming or brushing both sides of the combustor.

There is a stainless steel screen in front of the catalytic combustor. If this screen becomes partially plugged with fly ash, you can remove the ash by gently tapping on the front of the screen (between the screen and front glass) until the fly ash becomes dislodged.

If the stove does not draft well when the catalytic combustor is engaged and the stainless steel screen is clean, then the combustor cells themselves might be partially plugged with fly ash. If this is the case, you can clean the combustor by removing the combustor and cleaning the cells. If a vacuum cleaner doesn't remove all of the fly ash, you may have to use a pipe cleaner to dislodge the ash, and then follow-up with the vacuum.

Q. How will I know if the combustor is "worn out"?

A. There are three symptoms that will indicate that the catalyst in your stove may not be working: First, your stove will generate noticeably less heat than it will when the catalyst is working. Second, you will notice a dramatic increase in the amount of soot and/or creosote in your stovepipe or chimney. Third, the color of the smoke produced by the stove will change. Smoke will appear black or brownish, instead of clear, white smoke (almost steam) from a catalytic stove.

If you suspect that your catalyst is not working, let the stove cool down and clean the combustor and screen and try it again.

Q. Is it all right to burn my stove hot daily to clean any build up in my chimney system?

A. It is not necessary to burn your stove hot daily to burn off any creosote build up in the chimney. This would be harmful to the catalyst because the **catalyst** is there to **reduce** the particulate matter in the chimney.

You will find more useful information about the catalytic combustor used in your stove at the combustor manufacturer's website-(www.appliedceramics.com), and our website (www.woodstove.com).

CATALYTIC COMBUSTOR WARRANTY

Model 205 Catalytic Fireview Soapstone Stove has a 4-5/8" x 9-1/4" rectangular catalytic combustor, which consists of two sections. The combustor is wrapped with flat interam gasket (see illustration, page 21). These combustors are manufactured by Applied Ceramics.

All catalytic combustors in Woodstock Soapstone Stoves have a three year unconditional warranty, with an additional three years of pro-rated warranty (copy enclosed). Warranty claims should be addressed to:

Applied Ceramics
PO Box 29664
Atlanta, GA 30359

or

Woodstock Soapstone Co.
66 Airpark Road
West Lebanon, NH 03784

Phone 404-448-6888

Phone 800-866-4344

TWO OTHER IMPORTANT POINTS:

- 1) The combustor uses wood smoke as fuel. Most smoke is created in the early stages of the "burn". When a bed of coals is all that remains of your wood, there is little smoke left to fuel the combustor and it will no longer create substantial amounts of heat. Hence, the temperatures on the surface thermometer tend to fall toward the end of the burn, even though the firebox is full of hot coals.
- 2) Since the combustor blocks the path of exiting smoke, it can reduce the draft in your stove. When draft is reduced by warm or rainy weather, open the bypass damper longer when starting the stove to create more draft.