



Operating Manual

S-Series Air Curtain Burner

Equipped With
Electric Motor and VFD Speed Control
S116E S119E S220E S223E, S327 S330E

**Above Ground Self Contained
Refractory Walled Air Curtain Burner**

"Better Economically - Better Environmentally"



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**Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD)
OPERATING MANUAL**



S-327



S-327



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**Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD)
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S-220E Electric Series FireBox

NOTICE:
All electrical connections and installations must be made by a licensed local electrician according to respective codes and regulations by the local competent authorities.

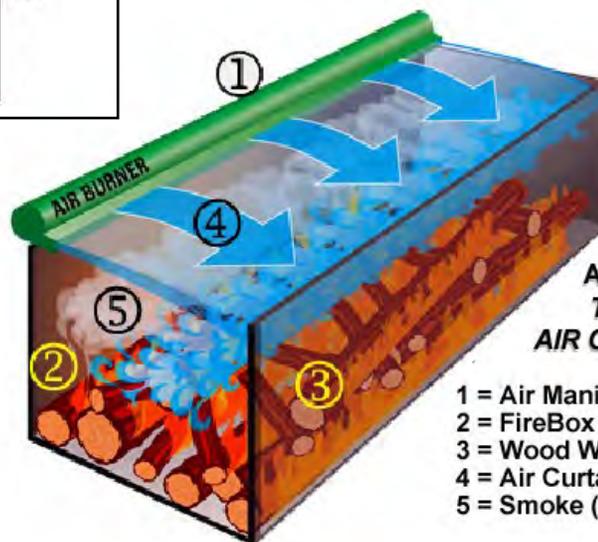
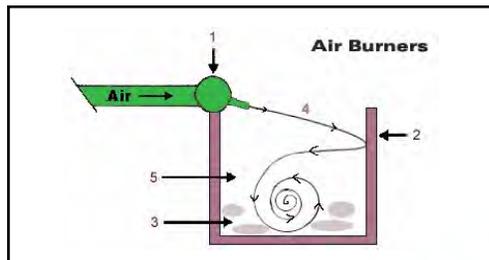


Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

PRINCIPLE OF AIR CURTAIN INCINERATION

OPERATION

Air curtain incinerators are designed primarily as a pollution control device. Using a Diesel engine or electric motor driven fan, these machines generate a curtain of air with a very particular mass flow and velocity. This curtain of air acts as a trap over the top of an earthen trench or thermo-ceramic lined FireBox. The wood debris is dumped into the trench or FireBox and then ignited (usually with a propane torch or with a small amount of Diesel fuel) just as you would light any other pile of wood you intended to burn. Once the fire has gained strength the air curtain is turned on. The air curtain traps most of the smoke particles and causes them to re-burn under the air curtain where the temperatures may exceed 1,800° F (950° C). These machines do not inject any fuels into the fire, the fire is sustained only by adding more wood debris. The air from the air curtain is not heated.



AIR BURNERS, INC. THE PRINCIPLE OF AIR CURTAIN BURNING

- 1 = Air Manifold
- 2 = FireBox Refractory Wall
- 3 = Wood Waste or Wood Fuel
- 4 = Air Curtain (left to right)
- 5 = Smoke (PM or Black Carbon)



**Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD)
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GENERAL DESCRIPTION S-SERIES

The self-contained refractory walled air curtain system is manufactured as an over-the-road transportable combustion system designed to reduce clean wood waste and vegetative growth to ash in a safe, controlled burning process without excessive particulate emissions. The FireBox is open to the ground, except for the Roll-off versions; they have a floor to accommodate the roll-off rail system.

The standard S-Series machines are offered in several sizes. The smallest is the S116 (16 ft. firebox) and the largest is the S330 (30 ft. firebox). The table below shows the approximate dimensions.

Above-Ground Air Curtain Burner Dimensions					
Model	Overall Size L x W x H	FireBox L x W x H	Weight lbs.	Fuel gal/hr.	Average Thru-put
S330	40' 4" x 11' 10" x 9' 6"	30' 2" x 8' 5" x 8' 1"	59,000	3.0	11-13
S327	37' 4" x 11' 10" x 9' 6"	27' 2" x 8' 5" x 8' 1"	54,600	3.0	9-11
S223	33' 3" x 8' 6" x 8' 6"	22' 11" x 6' 2" x 7' 1"	40,250	2.0	7-9
S220	30' 1" x 8' 6" x 8' 6"	19' 8" x 6' 2" x 7' 1"	36,650	2.0	5-7
S119	27' 3" x 7' 2" x 7' 4"	19 x 5' x 6'	30,100	1.9	3-5
S119R*	27' 6" x 7' 2" x 8' 3"	19 x 5' x 6'	39,900	1.9	3-5
S116	24' 7" x 7' 2" x 7' 4"	16' x 5' x 6'	27,500	1.9	2-4
S116R*	24' 11" x 7' 2" x 8' 3"	16' x 5' x 6'	36,300	1.9	2-4
T24	19' 8" x 7' 8" x 5' 8"	12' x 4' x 4'	9,983	0.35	½-1

* Cable-hoist version; Hook-lift version is 5" shorter

- Diesel Engine Version:** S330 & S327: HATZ 4H50TIC (Tier 4 Final) or equivalent engine.
S223, S220, S-119 & S-116: HATZ 3H50TIC (Tier 4 Final) or equivalent engine.
- Drive System:** PTO & mechanical direct coupling drive.
- Electric Motor Version:** Motor: 3-Phase, heavy-duty, with enclosed pre-programmed variable frequency speed controller (VFD); Power in: Three Phase 480V, 50Hz or 60Hz, or selected other voltages;
Drive System: Direct drive.
- Options:** Ash clean-out rake - price will be quoted for plain faceplate (S300) or universal quick disconnect (S200 & S100); Steel floor: Ember screen (S200 & S100 only); Rough-terrain removable dolly.
- Fuel Consumption:** Indicated fuel consumption rates approximated.
- Through-Put:** Through-put depends on many factors, such as nature and type of wood waste, its moisture content, prescribed opacity limits, operator skills, elevation of location, etc. The figures stated here are guidelines only. If more specific information is required, please contact the Factory.
- NOTES:** All weights and dimension are approximate.
Dimensional drawings can be provided on request.
Subject to change without notice.



Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

GENERAL DESCRIPTION S-SERIES (E-VERSION)

When delivered to a job site, the S-Series machine is ready for use as soon as it is off-loaded and properly connected to a power source. The entire system is built on a skid type base frame which is designed for easy movement over the ground. The forward equipment deck supports an Electric Motor and a Variable Frequency Speed Controller (VFD). The motor is directly coupled with the fan. When viewed from the front of the unit, the patented air disbursement manifold is mounted on the left top side of the combustion chamber. The back of the FireBox is fitted with refractory lined doors that allow ash removal and access to the burn chamber.

The electric motor that turns the fan is controlled by the VFD unit housed securely behind the front deck enclosure in a NEMA IV housing. The high velocity air is sent down the manifold through the vanes and directed to the outlet nozzles. A balanced and distributed air flow is directed across the top of the box and then reflected down into the combustion zone.

The curtain of air acts as a top over the FireBox, trapping a large percentage of the escaping particulate matter (smoke) and causing it to burn down even further under the curtain before finally escaping through the curtain as a hot gas. The air from the nozzles travels across the FireBox creating the air curtain effect; then it reflects off the far side thermo-ceramic wall adding oxygen to the combustion zone helping to generate a hotter more complete fire. This additional agitation helps prevent the fire from starving for oxygen as the ash builds up during burning operations.

All of this is carefully engineered to provide the correct amount of air at the correct velocity. It is sometimes thought that more air flow will actually increase the burn rate. This is **INCORRECT**. Modifying the air flow will actually have the opposite effect and reduce the machine's through-put. Additionally, it will reduce the machine's ability to meet air quality minimum standards. There is a maximum rate at which wood can burn. Trying to exceed that rate by adding more air to an air curtain burner causes two major problems:

- 1) It will cool the fire reducing combustion efficiency creating more smoke (carbon dioxide and nitrogen enriched). This will begin a circular effect of further reducing the oxygen and further reducing combustion efficiency. The result is your through-put drops and smoke increases.
- 2) Increasing the air flow beyond design standards will over-pressurize the Fire-Box causing larger sized particles to be ejected from the FireBox. Besides violating the EPA limits for PM (particulate matter) the larger hotter embers ejected will pose a much greater fire hazard.



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FireBox in Operation:
Particulate Matter (PM) trapped by Air Curtain and re-burned



S-327 Rear Doors Open

IMPORTANT:

Notice, how dirt is placed all around the inside bottom to close any openings under the skids that may be caused by uneven terrain. This will prevent smoke from escaping.



Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

SAFETY CONSIDERATIONS

READ ALL SECTIONS OF THIS MANUAL BEFORE YOU BEGIN BURNING OPERATIONS

The S-Series machine operator is dealing with fire on a daily basis; it is very important that each and every individual involved with the machine be alert and practice very rigid safety precautions.

When you are running the S-Series unit, you are responsible for assuring that it is operated in the safest possible manner at all times. If you notice something wrong, correct it immediately, and if you cannot correct it, find someone who can and/or shut down the machine.

Basic Safety Points:

- 1) **The unit should be placed on cleared, earthen dirt.**
The unit should be placed on level ground to facilitate loading, dumping and moving of the unit. The rear doors weigh approximately 2,000 lbs. each and should not be opened, if the unit is inclined on any axis more than 5 degrees.
- 2) **The unit should be placed such that no combustible material is stored within a minimum 100 foot clearance in any direction.**
The S-Series units do not have a bottom and should not be located over combustibles such as dry grass or peat moss. In addition *hot embers* will escape from the unit and, depending on the wind, will land on the ground around the unit. The unit should not be located within 100 feet of any stored combustible materials. The waste material to be burned during the day's operation can be staged within the 100 foot perimeter to facilitate loading. The operator must monitor the loading pile to insure embers do not ignite the loading pile. The combustible materials to be stored for burning at a later date must be stored outside the 100 foot perimeter or in accordance with the chart on page 6 of this manual which suggests adjustments for wind speed.
- 3) **The unit should not be operated when the wind speeds reach 20 MPH, as the potential to carry hot embers is significantly increased.**
As an operator you should always be aware of wind speed and direction. Increased wind speed will affect the integrity of the "air curtain" and will cause hot embers to travel farther. See the wind speed chart regarding suggested set-back on page 6.

DANGER:
Watch for the danger notices throughout this manual.



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- 4) **NEVER use highly combustible materials to light the unit.**
Highly combustible materials such as gasoline, refined spirits, etc. ignite at an explosive rate which may cause serious injury or death. The safest method to start the fire in the FireBox is to use materials such as paper and kindling wood. In the absence of these materials or when starting materials with a high moisture content use Diesel fuel as an acceptable option.
- 5) **NEVER climb on the unit to view or light the fire.**
Use the ladder built into the unit and never go beyond the top step, or use a step ladder or similar platform located at a safe distance from the unit. Do not stand along the rails or on top of the S-Series unit under any circumstance.

DANGER: Falling into the FireBox will cause serious injury or death.

- 6) **Shut the unit down in an emergency.**
Stop loading the unit, stop the air flow by pressing the STOP Button on the control panel or by disengaging the master switch on the external power supply line. Dump dirt or sand on to the fire. Water should only be used as a last resort, as it will likely damage the refractory panels.

WIND SPEED VS. SAFE DISTANCE			
	Approximate Safe Distance for:		
Wind Speed (MPH)	Structures (Houses, etc.)	Woods/Trees	Stored Brush Piles
10	300'	150'	100'
12	300'	150'	100'
14	300'	200'	150'
16	400'	250'	150'
18	400'	250'	200'
20	500'	250'	200'

DANGER: The above distances serve as a GUIDELINE ONLY! You MUST ALWAYS observe the down range area regardless of the wind speed. You must always observe local fire ordinances and directives from the local fire department or other authorities.

7) Personal Safety

Operators need to be aware of the following potential hazards:

A) Flying hot embers being released from the fire. Operators or anyone within the 100 foot radius of the fire should wear appropriate fire resistant clothing. The ideal outwear for an operator would include a “Nomex” jacket, leather gloves, eye protection, hard hat, cotton work jeans and steel-toe boots. Operators should never wear synthetic material (i.e. polyester) around the fire, as this type of material can melt and cause injury. Additionally, some synthetic materials will support combustion and could be very dangerous around fire. One hundred percent cotton materials would be the minimum, cotton treated with a fire retardant would be better and fire proof materials like “Nomex” would be best.

B) Noise ear protection is recommended around the machines. It is a good practice to wear approved ear protection when working in close proximity to the fan and engine.

C) Hot Panels. The backs of the thermo-ceramic panels and parts of the steel structure can reach temperatures as high as 500 degrees Fahrenheit . Caution should be taken to insure operator and visitors do not come in contact with these hot areas.

D) Ash and dust can be released during the operation and during cleaning. Operators should wear appropriate breathing masks to protect themselves from inhaling the dust and ash.



DANGER: You must insure debris does not build up on the equipment front deck. It must be kept clean at all times during operation to prevent a fire that would damage or destroy the motor and accessories.



HOW TO SET UP THE MACHINE

A) POSITIONING THE UNIT

The S-Series units are totally self-contained and ready to use upon delivery to the job site. The electrically powered S-Series units are built on a skid base that is designed to facilitate dragging the unit into position near the on-site external electric power connection and grounding rod. The weights of the various units are given in the General Description section. Ensure lifting or tow cables are certified for these weights.

With respect to the prevailing wind direction, the unit should be positioned such that the wind comes over the back of the manifold. This is the preferred position. It is also acceptable to have the wind blow into the manifold. It is discouraged, however, to have the wind come from either end of the machine, as this will tend to disrupt the air curtain.

DANGER: When you tow (drag) the S-Series units, especially in soft soil, watch that the dirt does not build up under the panels and lift the panels off the rails. Never walk inside the box when it is being towed. Typically, the softer soils will require a longer cable. If the rear of the unit sinks in soft soil while it is being towed, use another vehicle to follow and carry some of the load. If you are still having trouble dragging the unit, try a different length of tow cable. Always stay clear of the tow cable while the dragging operation is underway.

B) PRE-OPERATION CHECKS:

1. Check Ground Wire connection from grounding lug to grounding rod and power pole (on left side of FireBox below the air fan) and repair if needed.
2. Check intake air filter for cooling fan on VFD (lower left side) for cleanliness (open small access door, setup may vary).
3. Make sure Fan Speed Switch is set to OFF Position before turning main power switch to ON.



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HOW TO SET UP THE MACHINE

C) STARTING/SHUT-DOWN

Electric Motor and VFD

Starting: Ensure that an appropriate ground wire is properly connected to the grounding lug (See Page 23) and the grounding rod.

Ensure that the power on the main external breaker or switch is turned on.

Insure that the FAN SPEED SWITCH is placed in Position OFF.

Insure the red POWER BUTTON is OFF (pushed in).

Set the MAIN POWER SWITCH to the ON position; this will connect power to the unit. Wait 15 seconds for the VFD to boot up before going to the next step.

Pull out the red POWER BUTTON (ON Position).

Load FireBox and start fire per Operating Manual Page 13.

Set AIR CURTAIN FAN SPEED CONTROLLER to Position NORMAL 2. Once the machine is fully operational, you may select Position NORMAL 1 for energy conservation, as long as this does not result in excessive particulate (smoke) release.

Shut-down: Turn AIR CURTAIN FAN SPEED CONTROLLER to OFF. Wait 15 seconds for the VFD to boot down before going to the next step.

Push in the red POWER BUTTON to turn off power to Motor.

Set MAIN POWER SWITCH to OFF.



Control Panel



Control Switches, Indicator Lights & Hour Meter



SITE PREPARATION

THE GOALS TO GOOD SITE PREPARATION ARE:

- To place the wood piles for easy access.
- To sort the waste wood pile.
- To organize the inflow of new wood waste.

When locating the FireBox;

Consider access for your truck and trailer to load and unload the FireBox. Ensure there is enough room to maneuver your truck and trailer.

Consider where the waste piles will be located. We generally recommend two waste piles (explained in next section).

Consider the predominate wind direction. Hot embers will be escaping from the Fire-Box during all burning operations.

Consider the available 480V three-phase power pole connection and underground feed to the FireBox from there. Power to be supplied pursuant to Local Code and the FireBox must also be properly grounded by a grounding rod pursuant to local code.

DANGER: This machine DOES NOT prevent hot embers from escaping. This machine is designed primarily as a pollution control device to reduce the smoke (particulate matter) generated from burning clean wood waste.



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SITE PREPARATION

Faster operation through staging the wood piles

Air Burners FireBoxes were designed primarily as a pollution control device, but operated correctly they will burn clean wood two or three times faster than open burning. To achieve the best throughput the fire must remain at the highest temperature possible. You achieve this by remembering three rules;

- 1) **Don't smother the fire with a huge load or a load of very dense material.**
- 2) **Load "less more often" smaller bucket loads more often.**
- 3) **Sort out a pile of your best burnable wood, use it to create a hot fire.**

The basic principle of operation is not too different from a campfire. You use your best wood to get it started and, if the fire dies down you add some more good wood to bring it back up. The big difference is that on your campfire you are probably not adding root balls and leaves and pine needles. These are the high moisture content and dense materials that bring the fire temperature down.

The temperature drops (smoke increases) and your burn rate slows down, if you overload the machine with materials that have high moisture content such as tree branches with leaves and needles, or green branches such as palm fronds. While these are certainly ok to burn in the FireBox, you want to add them to a hot fire so they dry out and ignite quickly. To keep the temperature up and to maintain the highest throughput of waste you



should mix the very burnable wood with the less burnable materials throughout the course of the burning operation. The most common way to accomplish this is to stage a pile of the most burnable materials or what we call the "two pile system."

"If it's burning clean, it's burning hot. If there is smoke, you're losing money."



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SITE PREPARATION

The “Two Pile System”

For an efficient operation you would have two piles:

The **first pile** or “main debris” pile, is the material being generated from the landfill or transfer station operation and is located away from the ember path, but with good access to your loading machinery.

The **second pile** or “good wood” pile is your best and most burnable wood. When you first setup the site the operator should spend some time sorting through the main debris pile pulling out what appears to be your best and most burnable materials. This is the material you will start the fire with, this is the material that will give you a good hot burning base fire. You will also draw from the good wood pile throughout the day, if you should need to stoke up the fire (more on this in the following sections).

As the FireBox operator is drawing from the main debris pile throughout the day he should continue to replenish the “good wood” pile as necessary. The good wood pile only needs to be enough material to stoke-up the fire if needed and enough material to get you started the next day.

IMPORTANT WARNING ABOUT BURNING OF PALLETS

Wooden Pallets, especially spent pallets burn extremely hot. DO NOT load the FireBox above approximately 3/4 of the height of the burn chamber. Heat damage to the manifold and other structure may occur which would not be covered under your Limited Factory Warranty.

DANGER: You must insure debris does not build up on the equipment front deck. It must be kept clean at all times during operation to prevent a fire that would damage or destroy the motor and accessories.



LOADING AND STARTING THE FIREBOX

THE GOALS IN STARTING AN S-SERIES UNIT ARE:

- To achieve an even fire across the length of the box.
- To start the fire from the bottom of the initial pile.
- To build a hot base fire.

There are two methods for lighting the unit; a cold start and a hot start. A cold start means the FireBox is clean and has no hot coals left from a previous burn. A hot start uses heat from the coals of the previous days burn.

COLD START

Unit should be on level ground, the air fan should be off, but the main power switch should be on with the speed control set to zero.

To prevent smoke from escaping under the box, shovel dirt along the inside bottom edges of the panels. It will only need a couple inches to prevent the smoke from escaping underneath the unit. This is generally only a concern on hard ground and it usually only lasts for the first hour of burning. As burning continues the ash will build up and seal off the bottom of the unit as well.

Load your most burnable material (materials from the “Good Wood” pile as discussed in the previous section) which is the smaller, drier and cleaner wood, into the FireBox to a level of about half way up. Ensure the entire bottom area of the FireBox is covered. If you are using Diesel fuel to assist in the lighting, spray it (approximately 10 gallons) across the top of this first load of wood. Be sure to get some Diesel on the wood near the lighting holes in the FireBox side and on the wood towards the back. This will help make it easier to light.

DANGER: If you are using an accelerant, first insure there are NO HOT COALS remaining in the FireBox.

DANGER: DO NOT use highly volatile accelerants, such as gasoline or kerosene, to light the fire. These fluids ignite almost explosively and may cause injury or death.



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LOADING AND STARTING THE FIREBOX

LOADING AN S-SERIES UNIT

You can load the FireBox from either side, but we recommend loading from the manifold side because (1) it is safest and (2) it tends to increase the life of the manifold, as it reduces the chance for it to be accidentally damaged.



Once you have this smaller material loaded and your accelerant added (if used) load some larger, heavier material on top, such as logs or big branches. Load these heavier materials, also from your “good wood” pile, to a height just below the manifold nozzles. This heavier material will help compress the smaller material which will give you a better light-off. If there are large air spaces between the materials in the FireBox the heat will not build up as quickly and the fire may be more difficult to light.

This material once burning will become your hot base fire to support continued burning. Use your best and driest materials (good wood) for startup as this will form a strong base for continued burning plus it will start quicker and burn hotter. If you will be burning stumps, then it is best to load them after the first hour of burning when the fire is up to full temperature.

The level of material in the FireBox for light-off should be kept just below the manifold nozzles.

If you are using Diesel fuel as an igniter it is sometimes helpful to add a second coat to the top load again, ENSURE THERE ARE NO HOT COALS REMAINING IN THE UNIT before adding the accelerant.

Your goal is to develop a good hot base fire and to maintain a good hot fire throughout your burning operation. This will give you the cleanest burn and the most throughput.

There is always smoke on start-up as all of the material in the box contains moisture, compared to later in the burn operation when only the new material you are loading contains moisture. Plus, the air curtain cannot be fully engaged until the fire has strengthened or you run the risk of blowing out the fire.

DANGER: NEVER stand on the machine, as you may fall in causing serious injury or death.

LOADING AND STARTING THE FIREBOX

To minimize start-up smoke you can:

- Use your driest materials.
- Ensure your materials do not retain dirt or sand.
- Use Diesel fuel to accelerate the light up.

COLD START LIGHTING

The air should be off. The main power switch should be ON with the Speed Controller set to OFF and Red Push Button OFF (pushed in).

2. For best results and quickest light up, start the fire from the bottom because fire will spread up much better than it will spread down.
3. Use a propane torch (like a weed burner) or oil soaked rags on poles to light the fire.
4. The fire must be started from the access doors in the panels on the manifold side of the unit.



Access Door for Lighting

If you are using Diesel fuel as a starter, let the fire burn until you begin to see wisps of white smoke replacing the wisps of black smoke from the Diesel fuel, or if you are using propane torches wait until the fire has strengthened and flames are reaching the top of the FireBox. Then engage the air setting the speed controller to Position Normal 1. As the fire burns stronger increase the air by switching to Position Normal 2.

Don't increase the air too quickly as you can "blow" the fire out. If you add air and the smoke gets heavy then reduce the fan speed and let the fire "catch-up." Once it clears up you can increase the air again.

Sometimes it is helpful to "fan" the fire during the start-up phase. You accomplish this by increasing the air fan RPM's for 3 to 8 minutes, then decreasing them (i.e. Position Normal 1 up to Position Normal 2 and back down to Position Normal 1). This sometimes helps to spread the fire throughout the material. How much air to add and when to add it during startup will vary with the type of materials being burned.



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LOADING AND STARTING THE FIREBOX

HOT START

A hot start uses the coals from the previous day's burning operation. Depending on how much ash is in the unit a hot start can be done once or twice before the unit will need to be emptied. The more ash in the FireBox that you start with the LESS room you have for burning new materials.

First, insure there are enough coals remaining to generate enough heat to get the new waste materials burning. You CANNOT add an accelerant, if the waste materials do not light, as that would be too dangerous. You can use propane torches in the lighting holes, if you have trouble with a hot start. If the material does not light, the FireBox must be emptied before trying a cold start with the use of an accelerant.

DANGER: Do not use an accelerant for a Hot Start, as it may ignite unexpectedly and cause injury or death.

HOT START LIGHTING

Similarly to a cold start you begin with your best and most burnable materials.

- 1) Load the FireBox to about one third or half way with the "Good Wood". The wood should begin burning as soon as you start loading.
- 2) Set the fan speed at Position Normal 2. This should help fan the flames and spread the fire. If you experience heavy smoke then reduce the RPM's by switching to Position Normal 1 or disengage the air fan altogether by switching to Position OFF. Be cautious not to "blow out" the fire.
- 3) As the fire begins to heat up, increase the RPM's to the maximum Position Normal 2.



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HOW TO FEED A FIRE

It will generally take 30 to 60 minutes for the fire to build to a point where the temperatures are sufficient for the unit to be operating with minimal smoke.

1. Add material from your “Good Wood” pile slowly for the first hour. It takes about an hour for the fire to reach minimum temperature. Your goal is to achieve an even and hot fire across the unit.
2. If you get excessive smoke and ash when you load the wood waste while dropping the load through the air curtain, then you may need to turn the RPM’s down temporarily. This may especially be required earlier in the burn operation.
3. Take caution when loading the unit that the material to be burned is not “dumped” in the box too quickly causing hot embers to be thrown from the unit.
4. If you have an area in the box that is smoking, this indicates the temperature is low in that area. Add material from the Good Wood pile to increase the fire temperature. Once that area is burning add some of the heavier material.
5. The rate at which you load the unit varies depending on moisture content of the materials and the temperature of the fire. If you overload the box you will notice an increase in white smoke. White smoke is an indication that the temperature is dropping. If the smoke increases stop loading until the fire has caught-up. You can also bring the temperature up by adding materials from the “Good Wood” pile.
6. For the highest throughput load “*LESS MORE OFTEN.*” Smaller bucket loads more often will give the materials a better chance to burn and will result in your highest throughput of material. Oversized bucket loads may smother the fire for a short period before it ignites this will slow the burning down and reduce your daily throughput.
7. The load in the box should not go higher than one (1) foot below the manifold. If the material is piled higher it will begin to break the air curtain and more smoke will escape.

The fire should be loaded continuously throughout the day in order to maintain operating temperatures. If the fire is not loaded continuously, the temperature will drop, the through-put will go down and more smoke will escape.

“If it’s burning clean, it’s burning hot, If there is smoke, you’re losing money.”



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SHUTDOWN

HOW TO BURN FIRE DOWN FOR SHUT DOWN

All loading should stop one or two hours before you intend to put the fire out.

As the fire burns down, maintain the air speed until the box begins to smoke. As the smoke increases reduce the air speed in increments to Positions Normal 1 and the Cool Down Position. This will help to reduce the smoke.

The air in the manifold needs air flow, both to accelerate the burn down and to protect the manifold from warping due to excessive heat. **DO NOT shut off the air flow (turn off the motor) while there are still flames within 24 inches of the manifold.** Doing so may cause elevated temperatures to warp the manifold, nozzle assembly, etc. Your warranty does NOT cover damage due to excessive heat.

Once the fire has burned down to about one or two feet and flames are not visible near the manifold, it will be safe to turn the SPEED SWITCH to the COOL-DOWN mode. After appropriate burn-down time, turn the SPEED SWITCH to OFF and push the RED POWER BUTTON to OFF. Finally, turn the Main FireBox Fan Switch counterclockwise to the horizontal OFF position.

Make sure the fire is contained as necessary to comply with your local regulations. **Do not spray the refractory walls with water, as this will damage them.**

Some local authorities allow the FireBox to be secured and the embers to smolder all night. There is generally no smoke from this smoldering. Insure the work site is secured or has a constant security guard to prevent any people or animals from getting near the FireBox. The inside temperatures of the FireBox will remain very high most of the night.

If you are not allowed to smolder through the night, then verify that the fire inside is completely out. If it is still burning or smoldering you can either water down the embers or you can use sand or dirt to cover the remaining hot spots. Ensure the fire is out and the job site secure before you leave.

DANGER: Falling into the FireBox will cause serious injury or death.



ASH REMOVAL

HOW TO EMPTY THE S-SERIES UNITS

The FireBox will operate with up to 3 feet of ash inside, but as the ash gets deeper the efficiency of the unit goes down. Three feet of ash would represent approximately 20 hours of burning. The FireBox should not be run with over 3 feet of ash inside.

We recommend removing the ash every morning before burning operations begin. This will give you maximum capacity in the FireBox and the ash will be easier to handle.

DANGER: When removing ash from the FireBox be aware of the wind direction and insure all operators wear appropriate face masks to prevent inhaling the ash.

There is only one way to empty the ash out of the electrically powered FireBox, namely, by excavating it out.

EXCAVATING

The ash can be remove by reaching in with an excavator or by driving into the box with a small skip loader type vehicle and scooping the ash out. **Remember to use the appropriate breathing apparatus, especially if you drive in the FireBox and be cautious of any remaining hot embers.**

DANGER: When removing ashes from the FireBox, make sure that no hot ashes, embers, burning or hot materials are carried by the wind to places where they could start a fire!



TROUBLESHOOTING

1. Fire will not start.

Material in FireBox has too much air space. To correct, load heavy material such as stumps to make the lower material pack down. Use torches and light from the bottom so the fire burns up.

2. Fire burning at one end.

Load heavy materials directly on top of the burning area. This causes the flames to fan out in an effort to reach the top of the pile. As the fire begins to spread, keep material piled on top of the flames until the entire FireBox is burning.

3. Fire smoking too much.

The most common reason for a smoking fire is too much dirt or dense materials going into the FireBox and reducing the heat. You must make sure the wood waste material is free from large amounts of dirt. Load from your "Good Wood" pile to bring the temperature back up.

You may have overloaded the FireBox or loaded the box too fast. Example; if you only have 1 ton of material burning you can not load in 3 tons of material. The new material will smother the fire. Stop loading and let the fire catch up. The material you are loading may have a very high moisture content. You can either load at a slower rate or mix the wetter material with dryer material.

If you are letting the fire burn down or the load in the box is less than 3 feet deep, you may need to turn the air down by reducing the motor speed.

4. Smoke from one area of the box

The area is probably not burning well. Add smaller material from your "Good Wood" pile to this area to help build the fire. As the smoke clears add heavier material.

5. Smoke from under the base rails or bottom of panels.

Loose dirt was not properly shoveled around inside of box to seal between panel bottoms and the ground. To fix, shovel dirt around the outside where the smoke is escaping. Once the ash inside builds up this will stop.

MAINTENANCE AND CARE

A. Daily Check List:

1. Ensure that the ground wire is properly connected to the FireBox grounding lug and the grounding rod and that the wire gauge meets AWG of local code.
2. Ensure that the VFD cooling fan intake air filter is clean (lower left; to remove filter reach under rain hood and loosen two (2) thumbscrews holding filter access door. (Position and type may vary).
3. Insure that the external power grid from the power company is providing proper power to the pole (480V balanced three-phase). Brown-outs (voltage deficiency or under voltage) or excessive voltage spikes can cause default shut-downs by the VFD protective circuitry. Such default shut down requires the powering off of the VFD to initiate an automatic reset of the unit. As the air fan would not be supplying air to the manifold for the reset period of time, such shut down should be absolutely avoided, once there is a fire in the FireBox to prevent warping of the manifold. Do not operate the Fire-Box S-Series (Electric), if weather conditions may indicate a possible interruption of power during the work day.
4. Do not wash down the NEMA IV enclosure with a water hose, as water may enter through the cooling fan vents.



Cooling Fan Rain Hood
(Position, type or cover may vary)

B. Periodic Maintenance

1. Grease the electric motor bearings (very sparingly, consult electric motor booklet/manual).
2. Grease both (inside and outside) air fan bearings every 2-4 months on models with fan-to-motor coupling where the air fan is not coupled directly to the motor (*Do NOT over-grease*)
3. For FireBox models equipped with a coupling connecting the air fan to the motor, inspect the adjustment of the coupler hubs and realign them by re-adjusting the motor mounts as needed.*)

*) For instructions see Appendix A

**ALWAYS INSURE THAT THE FIREBOX UNIT IS PROPERLY GROUNDED. CHECK
GROUND CONNECTION AT GROUNDING LUG AND GROUNDING ROD.
CHECK GROUND WIRE AND GROUD WIRE GAUGE (AWG).
FOLLOW LOCAL CODES.**



Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

VFD SERVICING SPECIFICATIONS

Other than as indicated under Periodic Maintenance, there are no user-serviceable parts. Should the VFD require attention or re-programming, a qualified technician should be engaged to perform this work.

There are no supply voltage (480V) circuit breakers or fuses inside the NEMA enclosure, only three internal control circuit fuses. Call the factory for programming support, if needed.

NOTICE: All electrical connections and installations must be made by a licensed local electrician according to respective codes and regulations by the competent authorities.

MOTOR / VFD WIRING

Power:

480V balanced three-phase into control box from power pole (grid) and min. 460V three-phase out from control box to electric motor. The motor is rated at 460V to allow for a voltage drop of up to approximately 20V by the VFD. The unit can be set to handle either 50Hz or 60Hz power.

The S-330E/S-327E is fitted with a 75 HP (56 kW) and the S-220E and S-100E Series are fitted with a 30 HP (22.4 kW) premium three-phase motor.

Air Fan Rotation:

Fan Rotation is clockwise as viewed from the motor end or counter-clockwise as seen from the outside of the FireBox. The motor rotation is set at the factory and the VFD is programmed also at the factory for the proper speed settings (Positions are 0-1-2-3).



Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

Default Shut-down of VFD and Motor / VFD Wiring (Continued)

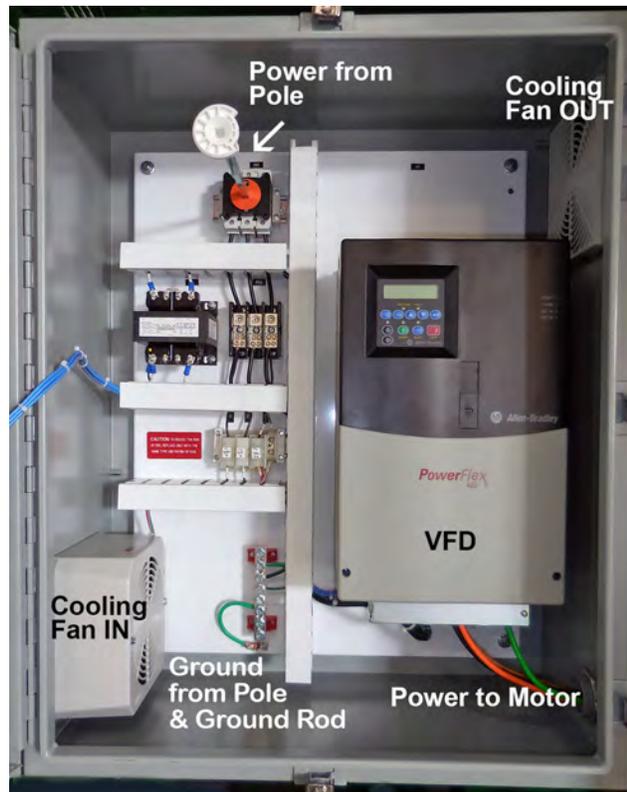
The external power lead of proper gauge (AWG) must be connected to the power distribution block in the upper left corner (see right photo; (VFD model and connection block may vary)).

The unit may be shipped without a NEMA housing cutout for the external power lead feedthrough. It may have to be positioned and provided by the local licensed electrician.

A main breaker or fuse switch (not supplied) must be installed externally per local code.

Ensure proper grounding of the unit per local code and connect a grounding rod to the grounding lug on the I-beam located on the left side below the main air curtain fan. Use proper wire gauge.

NOTE: The VFD is set to “Coast-to-Stop”. That means the power to the motor is not turned off when setting the Fan Speed Control Switch to OFF, but the speed is reduced to 0 by the frequency settings. The fan may continue to rotate slowly. Always push in the red STOP BUTTON to completely shut off the power to the motor/fan, then turn off the MAIN POWER SWITCH. See also the Start/Stop instructions on Page 9.



View inside the NEMA IV box (door open)
Components shown may vary.



Grounding Lug

NOTICE: All electrical connections and installations must be made by a licensed local electrician according to respective codes and regulations by the competent authorities.



THERMO-CERAMIC PATCHING COMPOUND

For minor repair of S-Series refractory panels and doors.

Air Burners Part # 6900-1003 Thermo-Ceramic Wet Pre-Mix

NOTE: This is an air cured product, reseal unused portion immediately.
Once opened the shelf life is one (1) year.

Directions:

- 1) Cracking of the panels is normal as they flex in the heat. Filling the cracks every 6 months or as needed will extend the life of your Thermo-Ceramic Panels.
- 2) Air Burners patching compound is pre-mixed and ready to use (may require some stirring).
- 3) Storage: Compound should be stored indoors in a frost free location.
- 4) Preparation: The area in and around the damaged area to be patched must be cleaned and brushed to provide the best surface for the compound to adhere. Remove all loose refractory and debris from the area to be patched.
- 5) Wet the cleaned surface with a light spray or damp cloth.
- 6) Installation: Using a trowel or similar tool, pack the refractory compound material into cracks and into areas where the refractory is missing. To achieve proper thickness, trim off the excess material using a sharp flat blade or the side of the trowel.
- 7) Allow the material to harden overnight before placing the FireBox back into service. After the compound has hardened operate the FireBox under normal conditions.

**Contact Air Burners, Inc., should you require assistance with
this maintenance tasks. Send Email to support@airburners.com,
call 772-220-7303 or 888-566-3900
(Customer Support)**



Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

LIFTING POINTS



There are four designated lifting pad eyes for lifting all FireBox units by crane, two on each side. **Only lift by attaching straps or cables to these four pad eyes.** Their locations are marked with yellow lifting point labels with *up-arrows*.

The Stair Guard is shipped in place, secured with a bolt and nut (red circle in photo to right). The bolt should be replaced with a suitable padlock, before the Fire-Box is placed into service.





Series (E) Refractory Walled Air Curtain Burner (Electric Motor & VFD) OPERATING MANUAL

CHECKING COUPLING ALIGNMENT

This Technical Memorandum covers FireBox Models equipped with Dodge Raptor Couplings. The S-327 and S-330 use Size E30 (Air Burners Replacement Part Number 5000-2120) and all other FireBox models use Size E20 (Air Burners Replacement Part Number 5000-5123). Certain FireBoxes equipped with electric motors are also fitted with Dodge Raptor couplings. The general coupling information in this Technical Memorandum applies to them also.



SHAFT HUB ELEMENT HUB PTO

The coupling shown above is an E20 with the protective guard removed.

TOOLS REQUIRED

Coupling hubs should be aligned using straight edges or calipers. Laser alignment tools, or other precision alignment equipment can be used but are not required.

Tools

1. Two open-end wrenches, 3/4"
2. Torque wrench
3. Sockets/wrenches, 9/16" & 7/16"
4. Straight Edge Ruler or Calipers

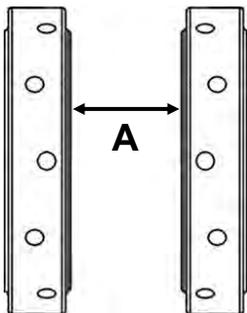
WEAR PROTECTIVE GEAR

Step 1 Preparation

1. Lock out engine/motor to prevent accidental start which could cause injury.
2. Remove the protective metal guard (Not shown in image above) from fan.
3. Take off the element by removing the Grade A bolts holding the two halves together. Bolts should be used only one time. All bolts use thread locking patches.
4. If any coupling adjustments are required, be prepared to realign the engine by adjusting the four engine isolators until the measurements of Steps 2, 3 and 4 are achieved.

Step 2 Verify Gap Between Hubs

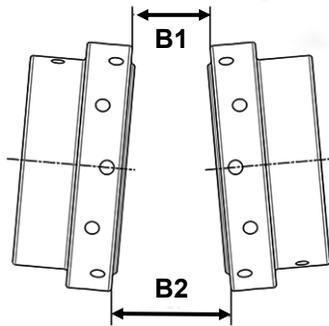
1. Measure the distance "A" between the hubs with calipers or other appropriate tool
2. If needed, set distance "A" as follows:



GAP MEASUREMENT "A"		
E20	2.46"	62mm
E30	2.55"	65mm

CHECKING COUPLING ALIGNMENT

Step 3 Verify Angular Alignment of Hubs

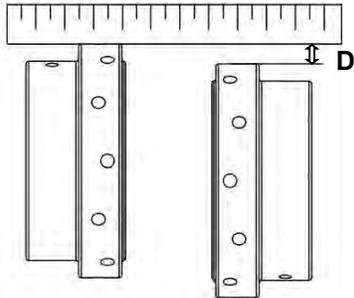


$$C=B2-B1$$

1. Measure the distance "B" between the hubs with calipers or other appropriate tool at four places on the outer diameter of the hub 90° apart.
2. Use the "B2" and "B1" measurements to calculate "C" by subtracting the smaller measurement from the larger number, and do this for each of the 90° apart planes.
3. Adjust the engine isolators until the "C" measurements of both planes do not exceed these Angular Values:

ANGULAR VALUE "C"		
E20	0.235"	6mm
E30	0.284"	7.2mm

Step 4 Verify Parallel Alignment of Hubs



D is the distance between straight edge and lower outer hub edge

1. Check parallel misalignment by placing a straight edge across the outside diameter of the hubs and measuring the gap between the straight edge and the hub at four locations 90° apart.
2. Adjust the engine isolators until the "D" measurements do not exceed these Parallel Values.

PARALLEL VALUE "D"		
E20	0.188"	4.8mm
E30	0.188"	4.8mm

Step 5 Element Installation

1. Place first element half on hubs and hand-tighten the flange head bolts. When tightening the bolts, start at the center bolt hole and then install the bolts on the neighboring holes.
2. Place the second half of the element on the hubs and follow the same procedure. Hand-tighten the flange head bolts.
3. Use a torque wrench to tighten all fasteners for the E20 and E30 to these torque values (same for both):

ELEMENT BOLT TORQUE VALUES				
	Bolt Size	In-lbs	ft-lbs	Nm
E20 & E30	3/8	502	42	57