

SOLID FUEL FURNACE **OWNER MANUAL**



For Models: 8095, 8130, 8150

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NOTICE

Please Consult
with your local HVAC company
for local city and state codes
prior to installing this system

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ROYALL

**Royall Furnace
Installation / Operating Instructions
For Models: 8095/8130/8150**

Congratulations on your purchase of a Royall solid fuel heating appliance!

Your Royall Furnace is designed for a lifetime of durable, reliable performance and easy operation. This manual describes some installation instructions, operation, and maintenance of your furnace. With proper installation and maintenance, your Royall furnace will give you a lifetime of trouble free service.

**The Installation Of This Furnace
IS NOT A 'DO IT YOURSELF PROJECT'**

NOTICE

To ensure proper safety, operation and warranty coverage, the installation must be performed by a qualified Installer with specific knowledge of central heating systems

Royall Products will not be held liable for catastrophic damages due to neglect

Royall Products

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WEBSITE

royallfurnace.com

EMAIL

info@royallproducts.com

PARTS/SALES

shoproyall.com

SAFETY INSTRUCTIONS

- Read this entire manual before operating or maintaining this furnace.
- Save these instructions for later review.

THIS FURNACE MUST BE INSTALLED IN ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES AND REGULATIONS

NOTICE

FAILURE TO FOLLOW THESE SAFETY INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY OR DEATH

DO NOT

- ... install the furnace in a mobile or manufactured home, this can be dangerous and will void your warranty. This furnace has not been tested to meet the strict requirements for installation into a mobile or manufactured home.
- ... connect the furnace to any chimney flue that services any other appliance.
- ... use petroleum based cleaning or sealing compounds within the furnace system.
- ... store wood within the minimum clearance to the furnace
- ... use chemicals, kerosene or other flammable liquids to start the fire, severe burns could result
- ... store combustible liquids or materials near the furnace.
- ... start a fire if flammable vapors or dust are present. An explosion can result.
- ... burn garbage, gasoline, naphtha, or engine oil for any reason
- ... burn tires, telephone poles, railroad ties, treated wood, colored paper, garbage, cardboard or yard waste. In many areas this is illegal and will damage the furnace. Burning anything other than approved fuels will void the warranty.

CAUTION - HOT SURFACES

Keep Children Away! Do Not Touch The Furnace During Operation.

This furnace is designed to burn air-dried wood or anthracite or bituminous coal only. Burning any other type of fuel will void your warranty.

Install in an area with adequate air circulation for combustion and ventilation. The use of outside air may be required for safe operation.

Contact your local building or fire officials about combustion air requirements or installation requirements in your area.

All minimum clearances to combustible materials must be strictly followed

DO

- ... install this furnace on a non-combustible floor or 3/8" thick fireproof millboard or equivalent.
- ... disconnect all power to the furnace at the breaker box or service panel before performing maintenance or service. Always allow the furnace to cool before servicing.
- ... keep the fuel and ash doors tightly closed during operation. All seals must be maintained in good condition.
- ... dispose of ashes with care. Ashes should be placed in a metal container with a tight fitting lid. All coal contains small amounts of dangerous elements. It is essential that all coal ash be disposed of in a municipally designed area.
- ... use caution when opening the fuel loading door during operation. Opening the fuel loading door rapidly can cause smoke or flashback to occur.
- ... install a working smoke detector in the same room as the furnace, Royall Products also recommends installing a carbon monoxide detector in the living area of the home.
- ... keep a working fire extinguisher on hand in the event of a fire

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The Best Residential Wood Furnace Heating Solution

Wood furnaces that are designed for years of quality, maintenance free service.

We're committed to building the best performing, longest lasting wood furnace available. The tradition that started in 1968 continues today with our efficient series of indoor wood furnaces designed with a forced draft system that directs air below the cast iron furnace grates efficiently burning wood from the bottom. The systems connect easily to any existing conventional air heating system you already have in place, or as a supplement to an existing heating system.

Each indoor wood furnace we build is hand crafted with state of the art equipment and built to code for use in any location. With a heat output of 95,000 to 150,000 btu, Royall can help you heat your home or business to almost any temperature for a fraction of what you're heating costs are now.

FURNACE SPECIFICATIONS

Long Lasting **High** Efficiency **Easy** To Use

You can expect outstanding wintertime comfort and savings from your Royall wood furnace. These systems offer comfortable consistent warmth all winter long. Winters are not going to get any warmer any time soon, so we provide wood furnace systems from 95,000 btu up to 150,000 btu with the ability to withstand everything nature can throw at you.

Description	8095	8130	8150
Overall Furnace Dimensions (HxWxD)	38"x22.5"x41"	48"x24.5"x42"	48"x24.5"x42"
Steel Construction	10g and 12g	10g and 12g	10g and 12g
Shipping Weight	500 lbs	550 lbs	625 lbs
Heating Capacity - BTU's	95,000	130,000	150,000
Efficiency	78%	78%	78%
Maximum Log Length	26"	26"	26"
Firebox Capacity	5.6 Cu Ft	7.4 Cu Ft	7.4 Cu Ft
Fuel Loading Door Size (HxW)	10"x14"	10"x14"	10"x14"
Ash Removal Door Size (HxW)	5"x7"	5"x7"	5"x7"
Sliding Smoke Baffle	Standard	Standard	Standard
Collar Size / Flue Size (Rear Vent)	8" / 6"	8" / 6"	8" / 6"
Draft Control, Forced Draft	50 cfm	50 cfm	50 cfm
Steel Shaker Grates	Standard	Standard	Standard
Steel Stationary Grates	Optional	Optional	Optional
Insulated Cabinet	Standard	Standard	Standard
Full Firebrick Lining	Standard	Standard	Standard
Circulation Blower	Optional	Optional	Optional
Circulation Blower Filter Box	Optional	Optional	Optional
Secondary Domestic Heat Exchanger	Optional	Optional	Optional

COMPONENT DESCRIPTIONS

6" Chimney Outlet: Venting must be provided using a lined masonry chimney or alisted UL 103 type HT chimney. The chimney exhausts smoke and flue gasses that are a natural result of combustion and provides 'draft' to the furnace. Draft is the force that moves air from the burn chamber up through the chimney.

Plenum Opening: Allows you to connect the furnace into the buildings warm air supply duct.

Steel Doors: Heavy steel fuel loading and ash removal doors are secured to the furnace using door pins. The door gaskets provide an airtight seal and should be inspected regularly to ensure that they are in good condition at all times. The gasket must be replaced if it becomes damaged or worn. Do not operate the furnace with the fuel loading or ash removal doors open.

Steel Shaker Grates: This is where you build your fire. The handle to control the shaker grates is located at the front of the furnace, on the left side of the ash removal door.

Firebrick: 2000 degree, heat retentive firebrick protects the sides of the furnace burn chamber.

Ash Removal Pan: Designed for easy cleanup of fine ash and accumulation. Do not operate the furnace with the ash removal pan installed inside.

Sliding Smoke Baffle: When open, the baffle allows smoke and flue gasses to flow into the chimney connector without restrictions. When closed, smoke and flue gasses are diverted around the baffle, creating a longer path for the heated air and allowing the furnace to extract the maximum amount of heat from the fire.

Draft Fan: Also called a combustion fan, will supply air for combustion by forcing air into the burn chamber when your thermostat calls for heat.

Circulation Blower: The three speed circulation blower, operated by the fan limit control, forces air into the buildings duct system. The circulation fan can be adjusted to run faster or slower to correspond to the amount of heat being produced.

Filter Box: Provides air filtration for your cool air return system. A non-combustible filter is required when using the optional filter box.

Domestic Hot Water Tube (Optional): Used for heating domestic water.

PREINSTALLATION CONSIDERATIONS

Always check with local authorities and obtain the necessary permits prior to having the furnace installed. This furnace must be installed in accordance with local, state, and national codes and regulations

Before the position of the furnace can be decided, a few things need to be considered

Most Important, Do You Have A Reliable, Consistent Source Of Fuel For Your Furnace?

- ☑ Will this furnace be used as a primary (central) furnace, or will it be installed as an add-on to an existing central heating system?
- ☑ Can the furnace be properly vented?
- ☑ Is the chimney appropriate for the application? (This furnace requires installation into a UL103 Type HT all-fuel chimney. Do not connect this furnace to a chimney flue that is serving another appliance.)
- ☑ Has the chimney been inspected? It's important that the chimney be clean and free from defects or damage prior to having the installation performed by a qualified installer.
- ☑ This furnace may require an outside source of air for combustion. Can this be easily accessed in the desired furnace installation location?
- ☑ Are there any local, state or national codes or regulations governing the usage and placement of the furnace?
- ☑ How close is the electrical source that is required for the furnace installation? The electrical connection must conform to any local, state or national codes or regulations.
- ☑ Can the furnace be installed safely?
- ☑ The furnace should not be installed in a location where it could come into contact with curtains, drapes, walls, carpeting, or other combustible surfaces. The furnace must not be installed in a room that is slept in.
- ☑ The clearances in the manual are minimum clearances. Any reduction in furnace clearances must be approved by the regulatory authority and is not recommended by Royall Products.
- ☑ Will the furnace location require floor protection?
- ☑ Will the furnace location be easily accessible for all refueling, maintenance, repair, and cleaning?
- ☑ Are there any structural reasons that may prevent furnace placement?

You have the perfect combination of comfort and energy efficiency

PREINSTALLATION CONSIDERATIONS

BURN ONLY AIR-DRIED WOOD, OR ANTHRACITE OR BITUMINOUS COAL ONLY

WARNING! Risk Of Fire: Do not store fuel or other combustible material within the minimum installation clearances.

It is important to utilize wood based fuel that is clean, dry and consistent. Solid fuel furnaces naturally produce ash as a byproduct of the burning process. Even with the furnaces highly efficient design it will produce some amount of ash that will need to be cleaned out diligently to avoid creating extreme heat below the grating system that would lead to premature grate failure.

WOOD

The Royall furnace has been tested for operation with air-dried wood.

Wood should be seasoned (dried) for at least 12 months prior to burning. Properly seasoned wood should only contain about 20%-25% moisture content. Properly seasoned wood should be split as soon as possible and loosely stacked in a dry spot for at least 12 months.

You should never burn wet or 'green' wood in the furnace. Burning wet or 'green' wood not only reduces the efficiency of the furnace, but will also increase dangerous creosote build up in the furnace and the chimney.

Softwoods, such as Pine and Fir, are easily ignited and burn rapidly with high heat flames. Utilizing softwoods means you spend more time reloading the furnace and more difficulty achieving an overnight burn.

It's best to use dense hardwoods for a longer lasting fire. Ideally, you should burn a mixture of hardwoods and softwoods. Use the hotter, faster burning softwoods to start the fire, and denser hardwoods to maintain a longer lasting fire.

COAL

The Royall furnace has been tested for operation with anthracite (hard) or bituminous (soft) coal

Anthracite: Also known as Hard Coal, anthracite is a hard, lustrous coal with a high carbon content that burns with a clean blue, nearly smokeless flame

Bituminous: Also known as Soft Coal, bituminous coal is a soft type of coal that has a high sulfur content that burns with a yellow, smoky flame.

Bituminous coal tends to contain more impurities and sulfur than anthracite coal, which may decrease the expected lifespan of your Royall furnace and its components. If you choose to utilize bituminous coal, be sure to select only high-grade bituminous coal.

Coal Size: Your Royall furnace is designed to utilize coal that is nut size or larger.

INSTALLATION CONSIDERATIONS

The installation of the Royall Furnace is not a do-it-yourself project. The furnace should be installed by a qualified installer with specific knowledge of central heating systems

Solid-fuel furnace related fires are caused almost exclusively by installation, operation, or maintenance errors. A working smoke detector must be part of every furnace installation, this is the most cheapest insurance you can buy. For additional safety Royall Products recommends installing smoke detectors and carbon monoxide detectors in the living areas of the house.

The Royall furnace is designed to be used in conjunction with a gas or oil fired furnace, or as a single furnace.

FOUNDATION

The furnace must be located on a level 2" minimum thickness concrete foundation pad. At a minimum, there must be a non-combustible pad (concrete, brick, or paver) 6" wider than the furnace, extending out 48" from the front of the furnace.

A non-combustible pad must be installed in front of the furnace to contain any sparks or coals falling out of the loading door or the ash door. Fire can result causing sever personal injury, death or substantial property damage.

Do not install in an area where flammables are kept

INSTALLED AS A PRIMARY FURNACE

Locate the furnace as close to the existing chimney as possible, and as central to the heat distribution as practical.

SIDES: The furnace must have a clearance of 18" from the sidewall of the furnace to combustibles.

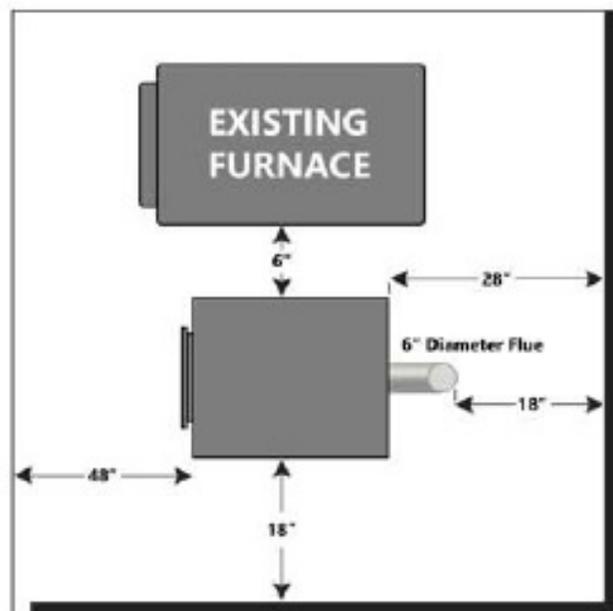
FRONT: A minimum clearance of 48" from the front of the furnace to combustibles.

REAR: A minimum clearance of 28" from the rear of the furnace to combustibles.

TOP: A minimum clearance of 18" from the top of the furnace to combustibles.

STOVEPIPE: A minimum clearance of 18" from the rear of the stovepipe, and 20" from the sides of the stovepipe to combustibles.

If the furnace is utilized as an add-on to your current system, a minimum clearance of 6" is required.



INSTALLATION CONSIDERATIONS

INSTALLED AS AN ADD-ON FURNACE

The Royall furnace is designed to be used in conjunction with a listed gas or oil fired furnace, however not all furnaces will accept an add-on application. Some smaller furnaces, especially counter-flow or down-flow furnaces may not be used in an add-on installation

If the existing furnace will accept an add-on installation, Royall Products recommends a parallel installation with a direct (ducted) feed or return air to the Royall furnace.

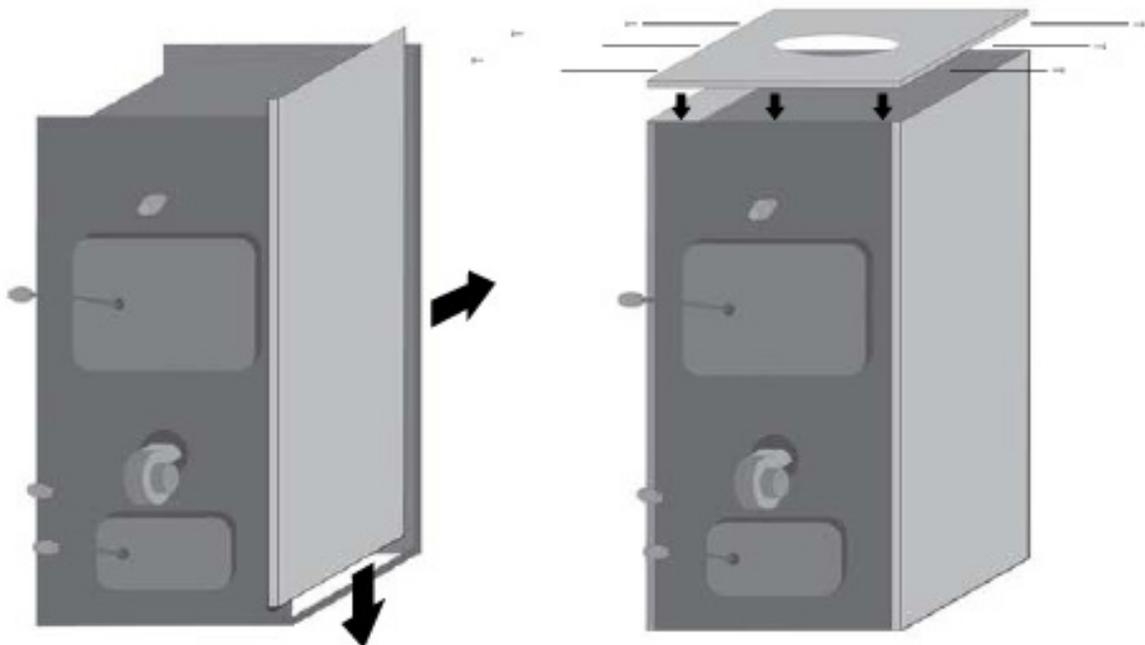
The CFM (cubic feet per minute) capability between the circulation blower on the existing furnace and the add-on furnace must be compatible. The combined static pressure may not exceed that established by the existing furnace.

The installation of two backflow dampers will ensure that when either furnace is operated independently so hot air will not flow back thru the other furnace.

SHROUD ASSEMBLY

The furnace arrives with the shroud already installed. If the shroud needs to be removed in order to cut the opening for duct work, you can re-install the shroud as follows

- ▶ Shroud sides are installed from the top. The 'S' bent edges on the shroud sides grip the flanges on the bottom of the furnace
- ▶ Then slide the side from front to back until the rear 'S' bends grip the back of the furnace.
- ▶ The shroud cover fits snugly over the front, rear, and sides using '6' sheet metal screws to attach it.



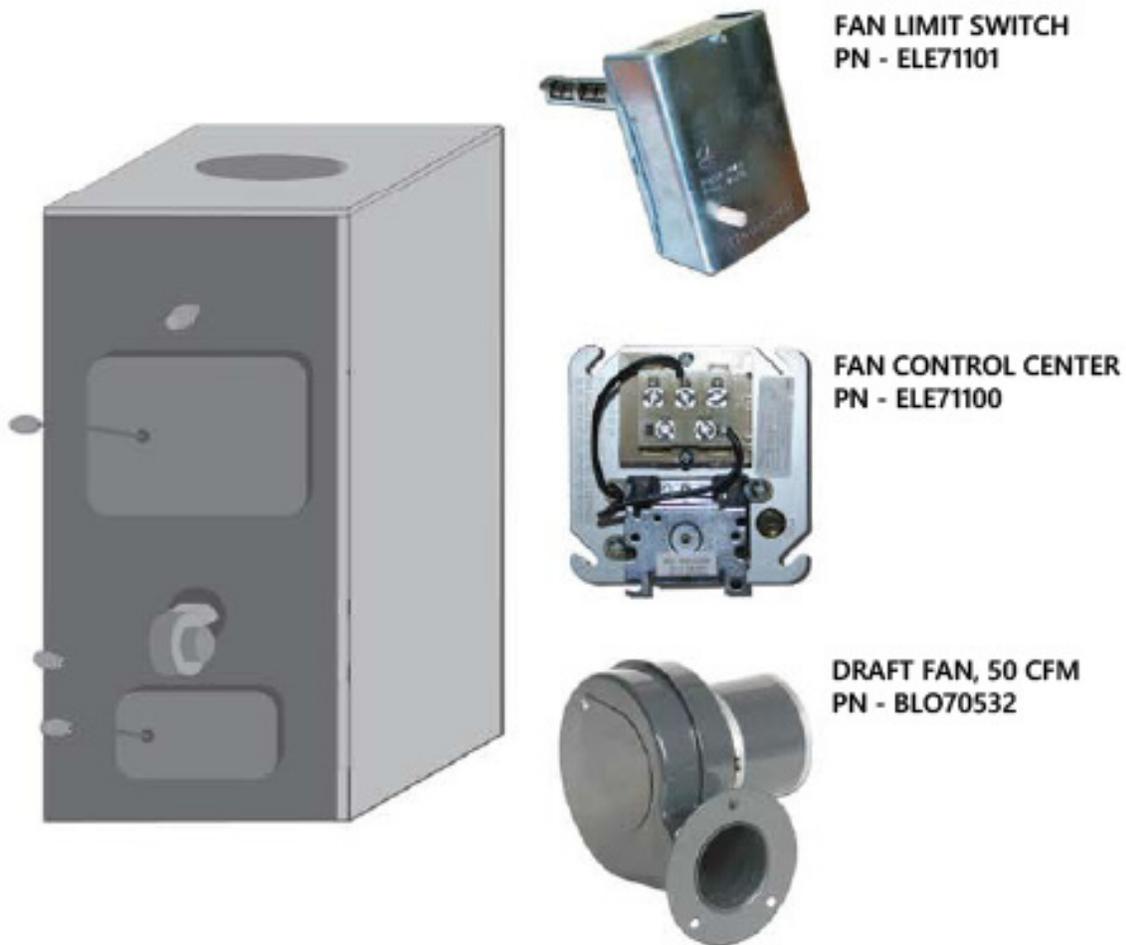
INSTALLATION CONSIDERATIONS

ELECTRICAL COMPONENT IDENTIFICATION

FAN LIMIT SWITCH: The fan limit switch may be located on either side of the unit. This component acts like a thermostat, telling the draft fan when to come on and when to shut off. The white push-button located on the component allows manual (draft fan runs always), or automatic (turns the unit off and on depending upon the system temperature).

FAN CONTROL CENTER: This component is basically just a switch that is triggered from the on or off signal coming from the fan limit switch. This controls the actual activation of the draft fan.

DRAFT FAN: This provides forced air into the bottom of the burn chamber under the grates. This improves combustion and pushes exhaust gases out enhancing natural chimney draft, ensuring better fuel efficiency and a cleaner burn.

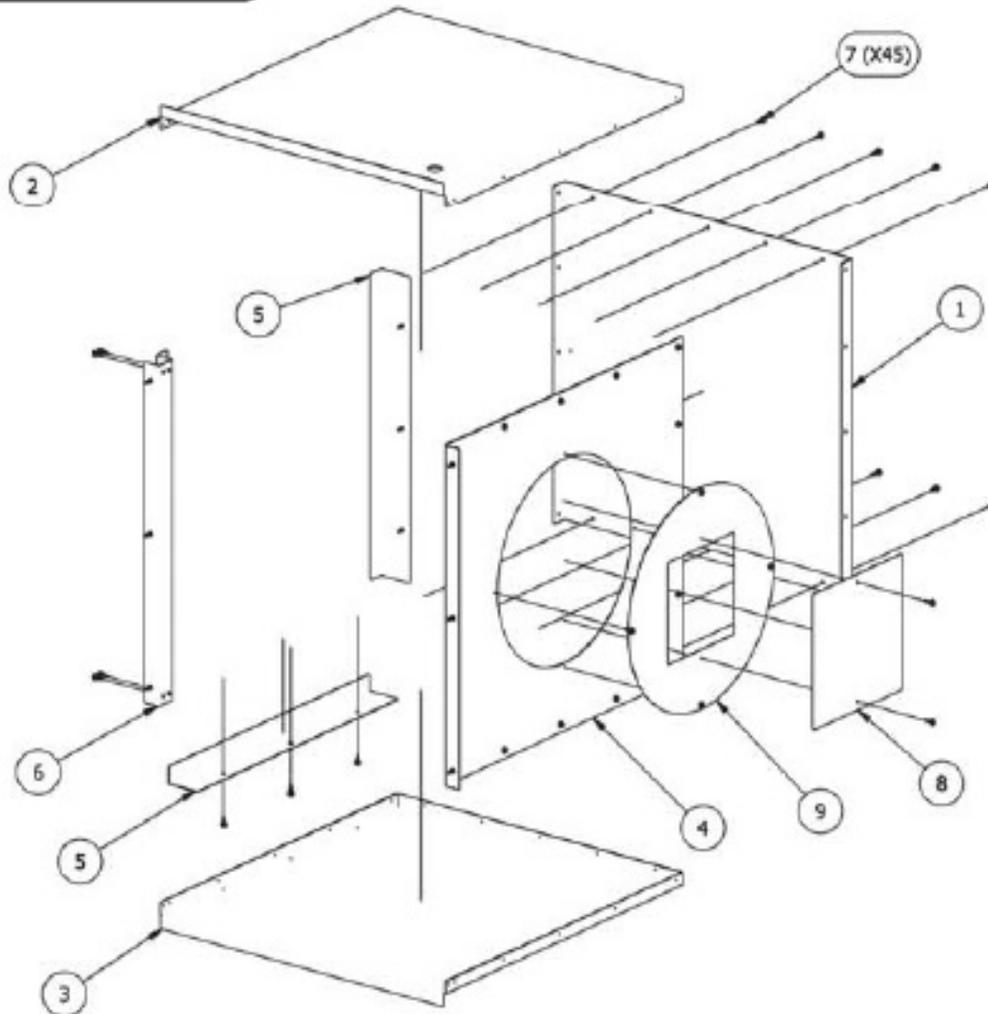


INSTALLATION CONSIDERATIONS

FILTER BOX ASSEMBLY

The optional Royall furnace filter box would need to be assembled before use with the optional circulation fan

- 1 - Filter Box Back
- 2 - Filter Box Top
- 3 - Filter Box Bottom
- 4 - Filter Box Side
- 5 - Filter Box 'L' Bracket
- 6 - Filter Box 'Z' Bracket
- 7 - Hex Head #8-18x1/2"
- 8 - Filter Box Cover
- 9 - Filter Box Cover 2



INSTALLATION CONSIDERATIONS

COMBUSTION AIR REQUIREMENTS

WARNING: Failure to provide adequate combustion air can lead to increased carbon monoxide production and increased emissions of combustion gasses into the building, which may cause serious injury or death.

The Royall furnace requires a minimum air supply of 50 CFM (cubic feet per minute)

All solid fuel burning furnaces must have a flow of air for proper combustion. The incomplete combustion that takes place when the furnace is 'air starved' causes carbon monoxide production in quantities that can become dangerous inside a closed building.

Although an outside air source is strongly recommended for all installations, it may be necessary if:

- ▶ The furnace does not draw steadily, smells, experiences smoke roll out, burns poorly or back drafts whether or not there is combustion present.
- ▶ The building is equipped with a well sealed vapor barrier, tight fitting windows, or any powered device which exhausts house air, such as a clothes dryer.
- ▶ These symptoms are readily alleviated by opening a windows slightly to create some forward air pressure.

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



INSTALLATION CONSIDERATIONS

FURNACE VENTING SYSTEM

WARNING:

- ▶ Failure to provide correct chimney venting can lead to increased carbon monoxide production and increased emissions or combustion gases into the building, which may cause serious injury or death.
- ▶ Do not connect the furnace to any chimney flue servicing any other appliance.
- ▶ Risk of Fire: Inspect and clean flues and chimney regularly

Consult a qualified furnace installer, your local building inspector, or fire officials to ensure that the chimney and all connections confirm to all local, state, and national codes and regulations.

Your furnace venting system is an extremely important part of any solid fuel heating appliance installation and provides two key functions:

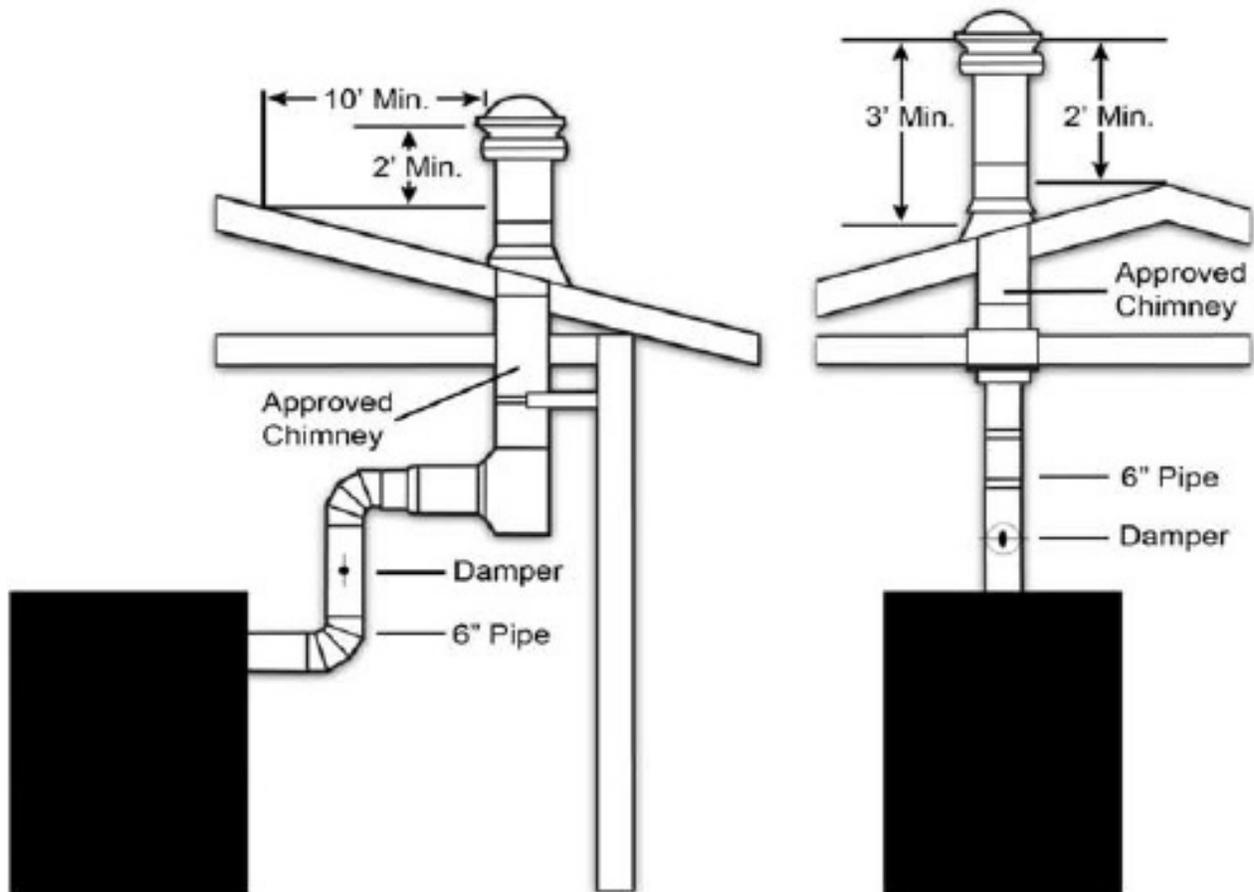
- ▶ To exhaust smoke and flue gases which are the natural result of combustion
- ▶ To provide 'draft'. The draft provides a continuous supply of fresh air into the furnace for proper combustion

The chimney connector and chimney make up the venting system and must be properly installed and maintained to protect against a fire. The Royall furnace requires installation into a listed UL103 Type HT all-fuel chimney. A minimum 24 gauge black steel chimney connector is required. All connections must comply with NFPA standard 211 and all applicable building codes and regulations. For best performance Royall recommends using class A insulated chimney pipe, which is known as 'double wall' as opposed to triple wall pipe or an air cooled chimney

Important venting installation clearances and points for proper operation and safety

- ▶ Secure all connector pipe joints with at least three sheet metal screws
- ▶ The connection from the Royall furnace to the chimney must be made using 6" black steel material with a minimum 24 gauge material. Do not use galvanized steel.
- ▶ Horizontal runs of chimney connector pipe should have a minimum of 1/3" rise per linear foot.
- ▶ A minimum distance of 18" must be maintained between the chimney connector and the backwall, a minimum of 20" must be maintained between the chimney connector and the sidewalls.
- ▶ Avoid using more than two elbows when connecting the furnace to the chimney.
- ▶ The chimney must be at least 3' higher than the highest point where it passes through the roof, and at least 2' higher than the highest part of the roof that is within 10' of the chimney. For best results Royall recommends a chimney height of at least 12 feet.

INSTALLATION CONSIDERATIONS



MASONRY CHIMNEY

When connecting to an existing masonry chimney, an approved liner must be used in the chimney. An unlined chimney could remain cold causing a downward pressure that creates a poor burning environment, incomplete combustion, or backdraft.

CHIMNEY CONNECTOR

Furnace to chimney connections must be made with 6" black steel material with a minimum 24 gauge. Do not use galvanized steel. For proper operation, the connector should be as short as possible. Horizontal lengths of chimney connector should have an upward slope of 1/2 inch per foot. Extra support hangers or brackets should be located every three feet. Connector lengths of more than 6 feet are not recommended.

Chimney connector sections must be attached to the heating appliance and to each other with the crimped end toward the furnace. Secure all connector pipe joints with at least 3 sheet metal screws. Avoid using more than two elbows when connecting the furnace to the chimney. Never use the chimney pipe as a chimney.

Do not pass the chimney connector through a combustible wall or ceiling.

INSTALLATION CONSIDERATIONS

AIR DUCT INSTALLATION

The duct or air distribution system circulates heated and or cooled air to all the conditioned rooms in the building. They must be properly designed and installed to be efficient, maintain a uniform temperature thruout the building, and not adversely affect comfort or indoor air quality.

Every Royall furnace must be installed with a cold air return. Return air must be equal in size to the heated air outlets, and preferably 10% larger. The plenum must be constructed of a minimum 28 guage galvanized metal, and installed in accordance with NFPA guidelines. The plenum should be 18" for all Royall furnace models.

The plenum must be no closer than 2 inches form the ceiling or any combustible material. This clearance is critical during a power outage since excessive heat buildup in the plenum top can be dangerous.

When connecting the plenum to your warm air supply duct system, never supply less than 150 square inches of constant heated air outlet area.

The warm air supply duct system must be constructed of materials with a minimum temperature rating of 250 degrees farenheit.

The ducts, fitting and registers should be sized so that the total external static pressure does not exceed 0.2 pa.

Ductwork clearance requirements vary, contact your local building inspector, or fire officials concerning installation restrictions and inspection requirements in your area.

Ductwork installation must confirm to local, state and national codes and regulations.

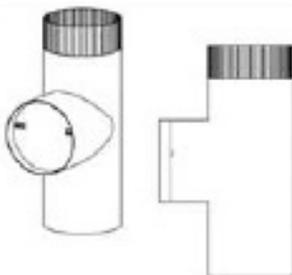
BAROMETRIC DRAFT CONTROL

A barometric draft regulator must be installed into the chimney connector of the furnace.

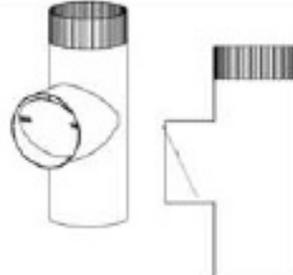
The barometric draft regulator limits the draft (the suction pulling air into the furnace burn chamber). A pivoting counterbalanced flap is pulled open by the draft when the draft reaches a crital amount. This permits air to enter the chimney, preventing the draft in the furnace from rising any higher.

The amount fo draft in your chimney depends upon the length, local geography, nearby obstructions along with other factors. Too much draft can cause the fire to burn too fast, while inadequate draft may cause smoke to back up into the furnace causing a possible hazard. After installation of the Furnace is completed and a fire has been built, the chimney draft should be established and maintained from .04" to .06" water column of draft. If this setting is exceeded, it can cause the furnace fire to burn out of control.

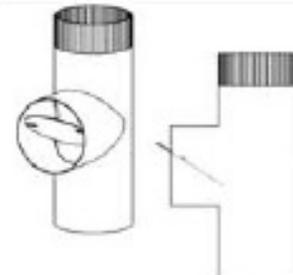
With no draft in the chimney the draft control remains closed allowing no air to enter



Moderate draft in the chimney will pull the damper control open just enough to maintain the correct draft



Excessive draft in the chimney will pull the draft control further open allowing more air into the chimney



FURNACE OPERATION

Please read the section in its entirety prior to the first firing of the Royall furnace. It's very important that you follow these suggestions and limitations in order to maintain your warranty and to guarantee a long life of your Royall furnace.

The Royall furnace is designed to burn for about 6-8 hours per load of wood. If the furnace is constantly fired with full flames and only running for a 2-4 hour burn cycle, it is being overfired. Your building requirements may be too great for the size of the furnace purchased. Forced firing or abuse can be detected upon inspection and will void your warranty.

During the warm season between Spring and Fall, you should control the heat output by limiting the amount of fuel, rather than the air supply. Shorter hotter fires will allow your Royall furnace to operate at maximum efficiency with minimum emissions.

For best combustion efficiency, chimney temperature should be 350 degrees F to 450 degrees F. Royall recommends that you monitor chimney temperature.

FIRST FIRE

Before lighting the first fire, inspect the furnace to ensure that it has been properly installed and that all safety requirements have been met. During the inspection, pay particular attention to the clearances around the furnace to combustibles, venting, and thermostat installation.

Check Draft fan and Circulation Blower Operation: Setting the fan limit control switch to 'manual' should turn on the draft fan located on the front of the furnace. Placing the fan limit back in 'automatic', and turning the wall thermostat to a high temperature should turn on the circulation fan. Return the thermostat to the desired setting.

Make sure the burn chamber and ash removal area are clear of all objects. Do not fully load the Royall furnace or open all draft controls completely until you become familiar with the operation of your Furnace.

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

TYPICAL OPERATION CYCLE

After the fire is established and the operating temperature has been reached, only the thermostat needs to be set to maintain the desired temperature. As the room cools, the thermostat of the building activated the draft control system.

When the thermostat is satisfied, it will turn off the forced air draft fan allowing the fire to die down until the next time the thermostat calls for heat.

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

FURNACE OPERATION

DURING A POWER FAILURE

Always closely monitor the operation of the Royall furnace during a power failure

To operate your Royall furnace in the event of a power failure:

- ▶ Close the sliding smoke baffle
- ▶ Remove the air filter
- ▶ Open all registers
- ▶ Do not load the furnace more than 1/4 full

Use extreme caution when operating the furnace during a power failure. Over firing can damage the furnace and it's components along with voiding your warranty. This may result in property damage, bodily injury or even death.

STARTING A FIRE

All chimney hookups are different. After a few fires you will find the best way to start the fire in the furnace.

The Royall furnace is capable of holding very large logs, Do not attempt to add a log that is larger than the 26" maximum log length into the furnace. You will achieve the best efficiency when you add only the amount of wood needed for a 6-8 hour burn time.

- ▶ Pull the sliding smoke baffle (above the fuel loading door) out to about 4 inches to open
- ▶ Place a small amount of crumpled paper in the center of the burn chamber, crisscross a couple of dry, 3/4 inch thick pieces of kindling wood on top, then several small pieces of firewood.
- ▶ It will take 5-10 minutes for the fire to establish itself. Once you have some red hot embers, continue to add larger pieces of wood. Vary the position of the wood in the burn chamber to maximize the exposed surface area of the wood.
- ▶ Never overload the burn chamber, do not load wood more than 8 inches above the firebrick.
- ▶ After loading the furnace, and the fire is established, push the sliding smoke baffle back in fully.

REFUELING THE FURNACE

- ▶ Pull the sliding smoke baffle all the way out.
- ▶ Turn off the furnace, so that the draft fan does not blow residual smoke out the loading door.
- ▶ Wait 15 seconds for any residual smoke inside to dissipate, slowly open the fuel loading door 1-2 inches. Never stand in front of the fuel loading door when refueling, always stand to the side. The sudden rush of air into the burn chamber can cause a surprise backdraft condition and flame over for a moment.
- ▶ Rake the hot embers over the grates evenly, put a few smaller pieces of wood on the coals first, then load with larger pieces of wood.
- ▶ Close the fuel loading door, push the sliding smoke baffle in, and turn the furnace back on.

FURNACE MAINTENANCE

The Royall furnace requires periodic maintenance in order to continue providing optimum performance. As with any solid fuel furnace, the frequency of cleaning will depend upon the amount and quality of the fuel that is burned. The quality of the fire, and the length of time since the last cleaning are also factors to consider. Weekly cleaning may be required in warmer weather, whereas monthly cleaning may be enough in colder weather.

Before the first fire of each new season, check all installations and accessories to ensure a safe burning process

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

CREOSOTE FORMATION AND REMOVAL

When wood is burned slowly, it produces tar and other organic vapors which combine with expelled moisture to form creosote. The creosote vapors condense in the firebox and the chimney flue of a slow burning fire. Over time creosote residue accumulates and can be ignited creating an extremely hot fire, the results of which can turn tragic.

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

Be aware the hotter the fire, the less creosote is deposited. Creosote normally only forms with damp wood and/or low temperature fires. You may have cut wood standing outside for year or two, but it's still picking up some moisture from rain, snow, and humidity.

Have a clear understandable plan in place to handle a chimney fire

DISPOSAL OF FURNACE ASHES

Do not keep the ash removal tray stored inside of the furnace during operation

Ashes should be placed in a metal container with a tight fitting metal lid. The closed container of ashes should be stored on a non-combustible floor well away from any combustible materials prior to final disposal.

The furnace ash should be retained in the closed container until all ash and cinders have thoroughly cooled. Do not place any other waste material into this container.

Embers can remain hot for many days. Always store in a safe place away from combustibles.

Never use a conventional vacuum cleaner or a shop vacuum to remove the ashes from the furnace. Ashes can remain hot for many days, and when trapped inside a conventional vacuum can cause a fire hazard.

Failure to remove the ashes will result in damage to the grate system over time.

FURNACE MAINTENANCE

GASKET ROPE MAINTENANCE

The fuel loading door and ash removal door are equipped with rope gasket to ensure safe operation and an airtight seal. When these gaskets become worn or damaged they need to be replaced.

REPLACEMENT OF GASKET ROPE (Requirements)

DOOR SIZE	MODEL	DOOR PART NUMBER	GASKET ROPE REQUIRED	PART NUMBER
10"x14" Fuel 5"x7" Ash	8095/8130/8150	CAS71040 CAS71043	4'-5" of 5/8" Gasket Rope 3'-5" of 5/8" Gasket Rope	GAS71089
<div style="background-color: black; color: white; padding: 5px; text-align: center;"> These products are available on ShopRoyall.com </div>			High Temperature Adhesive Caulk	GAS71083

- ▶ Remove the door from the furnace by opening the door and then lifting it up off of the door pins.
- ▶ Locate the ends of the old gasket material and pull it off of the door.
- ▶ Using a flat screwdriver, remove any excess gasket cement and obstructions from the gasket channel
- ▶ Lay a 1/2" bead of the high temperature adhesive caulk around the entire gasket channel
- ▶ Starting between the door hinge ears, place the new gasket rope into the gasket channel bunching it tightly together forming a hard base and an airtight seal.
- ▶ When completed, replace the door back on the hinge pins. Prepare the gasket rope by rubbing some of the soot from inside the furnace onto the new gasket rope. This will prevent the new gasket rope from sticking to the furnace.
- ▶ Allow roughly 24 hours for the high temperature caulk to cure, use caution during this period when opening the door(s) to avoid pulling the gasket rope out of the gasket rope channel.



FURNACE TROUBLESHOOTING

Be sure to maintain your furnace's cleanliness at all times, by emptying the accumulated ash regularly. We recommend establishing a routine inspection of the door gaskets and replacing when necessary.

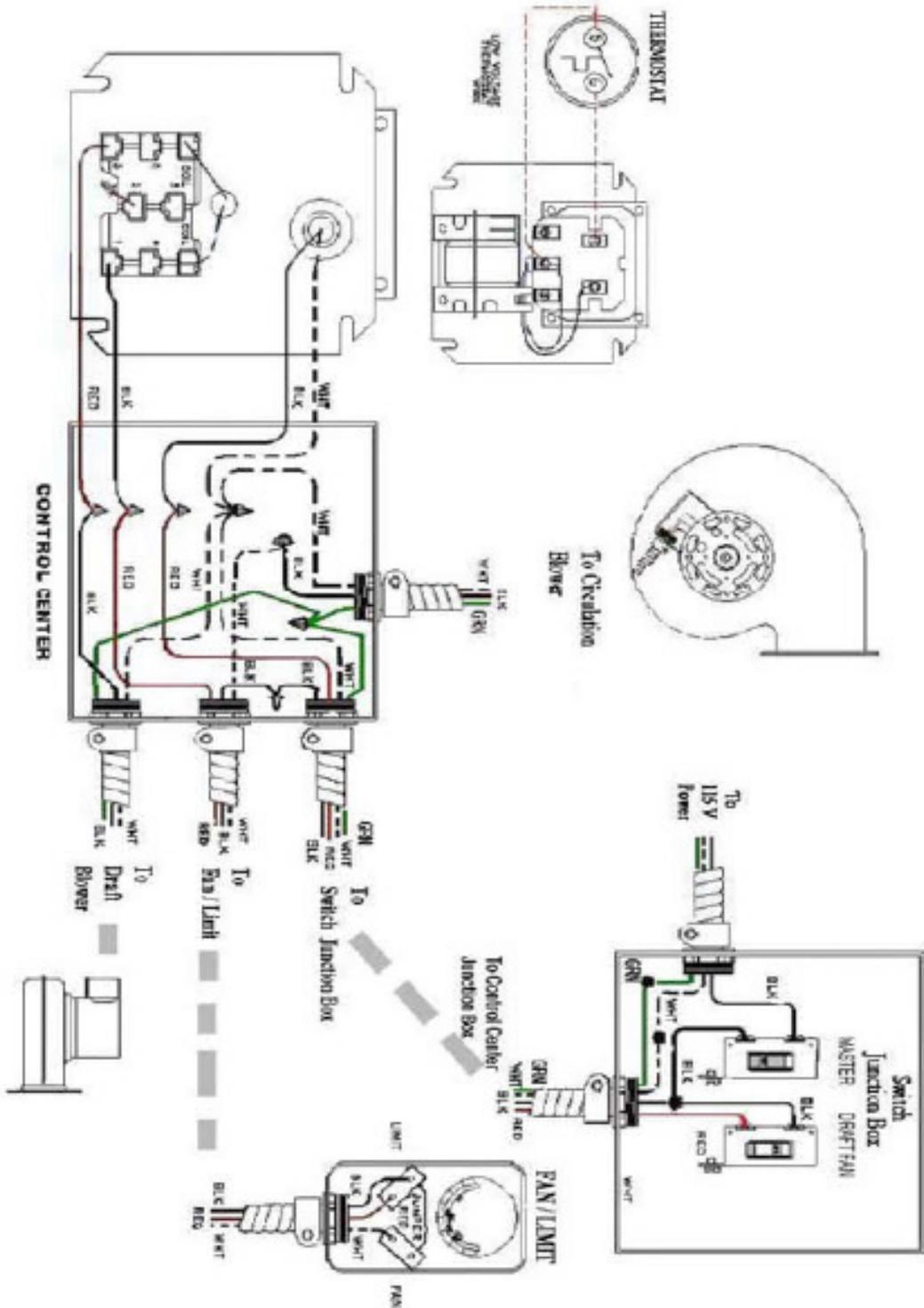
PROBLEM	CAUSE / SOLUTION
Fire is difficult to start, smokey, or starts but will not stay lit	<p>Make sure all furnace doors are tightly closed and the gaskets are in good condition. If ashes are allowed to accumulate in the furnace it will block the flow of forced air. Never allow the ashes to build up under the grates this will cause premature failure of the grates.</p> <p>Your exhaust or combustion system may be blocked. Verify all vents and pipes are free from obstruction and draft controls are operating correctly. Check the chimney for possible downdraft caused by taller surrounding trees or any buildings. The chimney may need to be extended or a chimney cap installed.</p>
Overall poor combustion or difficulty maintaining a 'pilot' fire.	<p>Check the quality of your fuel!</p> <p>Your building may have negative pressure. If the building is too airtight the furnace cannot get enough air for proper combustion. Outside air may need to be provided to the furnace.</p>
Smoke is visible or you smell fumes in the building	<p>Ensure that all doors are tightly closed and all door gaskets are in good condition. Check your exhaust or combustion system for blockage. Verify that all vents and pipes are free from obstruction and that the draft control is operating correctly. The venting may have been improperly installed. If the furnace is smoking from vents, ducts, or from the draft controls, immediately shut down the furnace, ventilate the area, and contact your heating contractor.</p>
Excessive Combustion (fire)	<p>The chimney draft may be excessive, adjust the barometric damper to maintain the flue draft setting from .04" to .06" (14.95 pa) water column.</p>
Excessive Creosote Formation	<p>Excessive creosote is normally only formed when using wet/damp wood or maintaining a low burn temperature.</p> <p>During warmer weather, you may need to adjust your firing practices. For maximum efficiency and minimum emissions, try shorter, hotter fires rather than large, slow burning fires. The venting may be improperly installed resulting in a decrease of air flow.</p>
Excessive Ash	<p>Check the quality of your fuel. Utilize good quality hardwoods with your furnace.</p>

FURNACE TROUBLESHOOTING

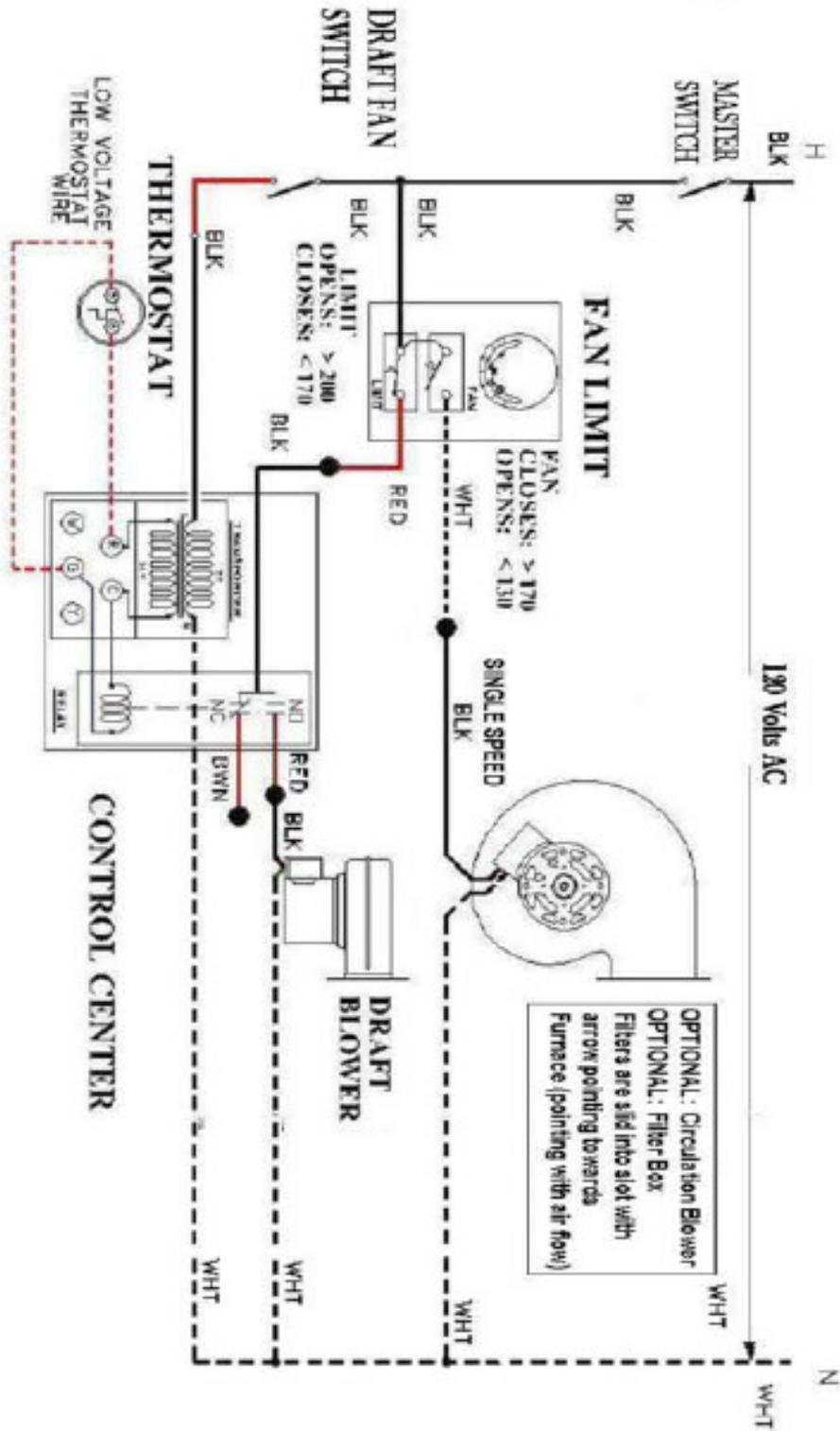
Be sure to maintain your furnace's cleanliness at all times, by emptying the accumulated ash regularly. We recommend establishing a routine inspection of the door gaskets and replacing when necessary.

PROBLEM	CAUSE / SOLUTION
Fire is difficult to start, smokey, or starts but will not stay lit	<p>Make sure all furnace doors are tightly closed and the gaskets are in good condition. If ashes are allowed to accumulate in the furnace it will block the flow of forced air. Never allow the ashes to build up under the grates this will cause premature failure of the grates.</p> <p>Your exhaust or combustion system may be blocked. Verify all vents and pipes are free from obstruction and draft controls are operating correctly. Check the chimney for possible downdraft caused by taller surrounding trees or any buildings. The chimney may need to be extended or a chimney cap installed.</p>
Partially burned or unburned fuel in the combustion area	More air for proper combustion may be needed. Verify that your draft controls are working properly and that your exhaust and combustion air systems are clean and free from obstruction.
The furnace is burning too much fuel, or the fuel burns off too quickly	The chimney draft may be excessive. Adjust the barometric damper to maintain flue draft settings from .04" to .06" of water column. Do not operate with a flue draft exceeding .06" (14.95 Pa) water column.
The circulation blower runs continuously, cycles on and off too much, or won't run at all	<p>Make sure the fan limit control is set to Auto and not Manual</p> <p>The fan limit control On/Off temperature setting may need to be adjusted. The On/Off settings may be set too close together. The fan limit control default settings are 160°/180°/200°. This means if the furnace is below 160° it will turn on the draft fan until the temperature reaches 180° then turn off the draft fan. The 200° setting is a safety measure that turns off the furnace when the temperature is reached.</p> <p>The furnace may have a faulty fan limit control, fan control center, or draft fan. Replacement parts are available at ShopRoyall.com</p>
The furnace has power but is not responding	<p>Verify the power supply for adequate voltage.</p> <p>The furnace may not have been installed correctly. Contact your installer.</p>
Getting shocked when touching the furnace	The furnace may not be properly grounded, or may have a loose wire. Disconnect power and verify all connections. The furnace may have experienced a power surge. Contact your installer.

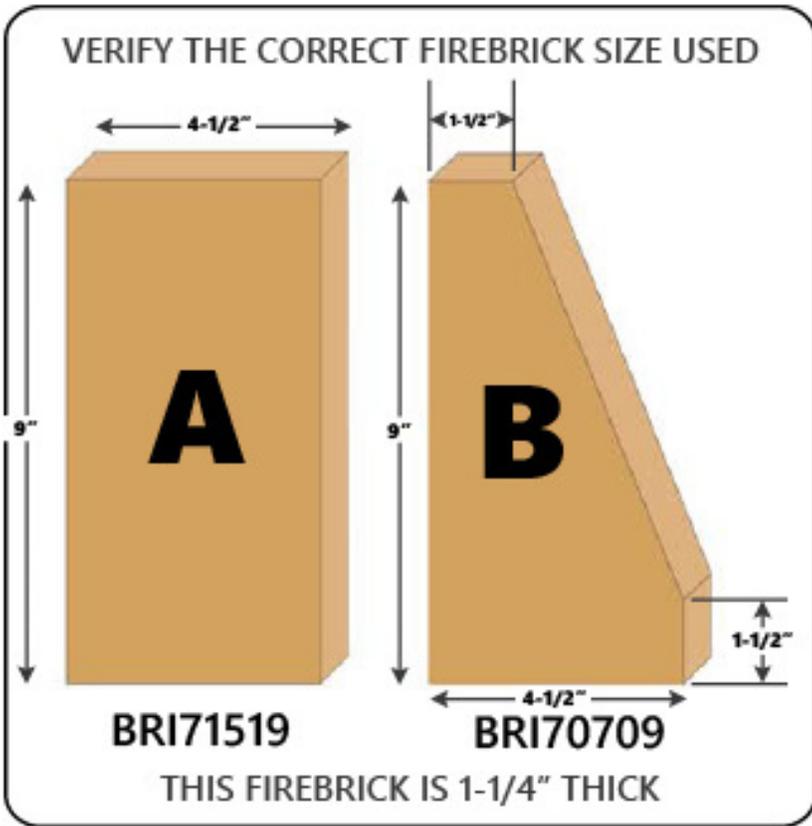
FURNACE WIRING



FURNACE WIRING



FURNACE FIREBRICK PLACEMENT

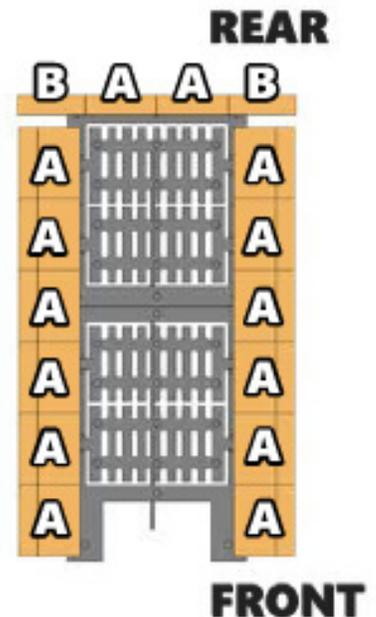
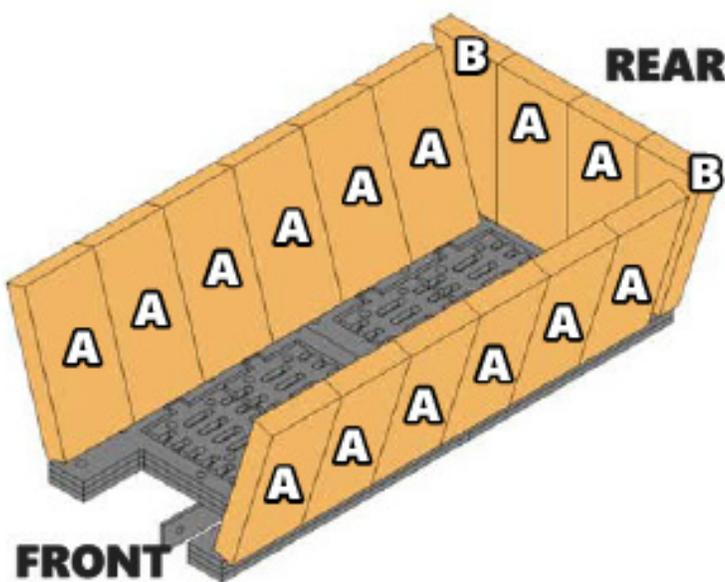


ROYALL FURNACE FIREBRICK REQUIREMENTS

(14) 9" X 4-1/2" X 1-1/4"
(BRICK A, #BRI71519)

(2) 9" X 4-1/2" X 1-1/4" X 1-1/4"
(BRICK B, #BRI70709)

CORRECT FIREBRICK PLACEMENT FOR ROYALL FURNACE



GET REPLACEMENT PARTS ONLINE - SHOPROYALL.COM

FURNACE REPLACEMENT PARTS LIST

BRI71519	Firebrick, 9" x 4-1/2" x 1-1/4"
BRI70709	Firebrick 9" x 4-1/2" x 1-1/4" x 1-1/4"
CAS70833	Small Baffle Plate (8095 Only)
CAS71039	T-Bar
CAS71040	10" x 14" Fuel Door
CAS71043	Ash Pan Door
CAS71044	Front Grate Frame
CAS71045	Partial Grate
CAS71046	Rear Grate Frame
CAS71047	Rocker Grate
CAS71048	S-Hook for Rocker Grate System
CAS70832	Large Baffle Plate
FUR50010	Damper Plate
FUR50193	Damper Rod, 24"
HAR70532	50 cfm Draft Blower
HAR71096	3-Speed Circulation Blower
HAR71099	Circulation Blower Replacement Motor Only
HAR71101	Fan Limit Switch
HAR71100	Fan Control Center
GAS71085	Draft Fan Blower Gasket
GAS71089	Gasket Rope, 5/8" (4-1/2" fuel door) (3-1/2" ash door)
GAS71083	Gasket Cement Caulk

THESE PARTS ARE
AVAILABLE ONLINE AT **shop**
ROYALL
WWW.SHOPROYALL.COM

**IF YOU NEED ADDITIONAL
ASSISTANCE, CALL...**

**MON-FRI 8AM-4PM CST
608-768-8508**

FURNACE WARRANTY

We make every effort to ensure that all Royall furnaces and components adhere to our strict safety standards. However, should you receive a product or component that doesn't function as intended, please follow the instructions below for making a warranty claim. We will replace or repair the part, as outlined in the applicable warranty as soon as possible to keep your Royall furnace functioning safely and efficiently as intended.

FURNACE UNITS ONLY

To make a warranty claim for a faulty Royall furnace, contact us at 608-768-8508

When contacting us for a warranty claim on a furnace, please have the following information available:

- Model Number
- Serial Number
- Purchase Date
- Purchaser Name, Address, and Telephone

All transportation charges are to be paid by the purchaser.

COMPONENT PARTS ONLY

To make a warranty claim for faulty furnace parts

Please complete a warranty claim form and return it to us. All warranty claim requests must be made in writing. A verbal warranty claim request will not be processed.

When contacting us for a warranty claim on a furnace, please have the following information available:

- Model Number
- Serial Number
- Purchase Date
- Purchaser Name, Address, and Telephone

Once we receive your completed warranty claim form, we will ship a replacement for the faulty part(s). All Transportation charges are to be paid for by the purchaser. However, if the faulty part is returned to us, we will provide return shipping via a UPS call tag.

Royall reserves the right to refuse any warranty claim, subject to the terms, conditions and restrictions of the warranty agreement found in this Royall operation manual.

FURNACE WARRANTY

LIMITED WARRANTY

Who is covered?

You are covered under this warranty if you the original purchaser of a new Royall furnace and your purchase was made through an authorized distributor or dealer of the Royall furnace.

How long does the coverage last?

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

Burn chamber: The burn chamber is warranted for six (6) years on a prorated basis. The replacement value will decrease each year until the maximum life of the warranty exhausts any replacement value. Replacement value is reduced according to the following schedule and will be calculated on the cost of the burn chamber at the time the part is repaired or replaced. We will provide you with a credit to be applied towards the cost of the repair or replacement part.

Year 1	Full Warranty
Year 2	80% Credit
Year 3	60% Credit
Year 4	40% Credit
Year 5	25% Credit
Year 6	15% Credit

Grating and Doors: The grating and doors are warranted for one (1) year and include the fuel loading door, ash removal door, and grating system.

Electrical Components: The electrical components are warranted for one (1) year and include, but not limited to, the circulation fan, combustion fan, fan limit switch, and fan control box.

What is covered by this warranty?

The warranty covers defects in materials or workmanship in your new Royall furnace

What is not covered by this warranty?

If your furnace has not been installed, operated and maintained in strict accordance with the instructions provided in this manual

If any part has been damaged in shipment, modified, altered, tampered with, abused, or has been subject to accident or misuse.

If your furnace has been altered or repaired in a manner which, in our sole judgement, affects its performance, stability, or reliability.

If parts not made or supplied by us have been used in connection with the furnace. If n our sole judgement, affects its performance, stability, or reliability.

To transportation charges on furnaces and furnace parts submitted for repair or replacement.

FURNACE WARRANTY

What is not covered by this warranty (continued)

To expendible, replaceable or wear items, such as firebrick, gaskets, paint, handles, and other items that in our judgement are expendible, replaceable or wear items.

To any other heating system or systems to which the furnace may be attached.

To any other smoke pipes, heat pipes, chimney, hardware, ducting, vents, or other accessories used for the installation and venting or ducting of the appliance.

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

What will we do to correct problems?

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

How can you get service?

If warranty service is needed during the warranty period, notify your installation company. If they are unavailable contact Royall directly. Provide your name, address, phone number, serial number, model number of the furnace, dat of purchase, name and address of the installer and a description of the problem.

Disclaimer of Implied Warranties and Consequential Damages

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

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

No employee or representative of Royall Proucts, LLC. is authorized to change this limited warranty in any way or grant any other warranty unless such change is made in writing by an officer of Royall Products, LLC., at its home office.

Your responsibility under the warranty

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

It is your responsibility to read the user manual, operate and maintain the furnace in accordance with all instructions and safety procedures. Failure to do so is a misuse of the furnace.

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

FURNACE COMPONENT INFORMATION



WHITE-RODGERS

5D51-35, -78 & -90
Fan & Limit Control

INSTALLATION INSTRUCTIONS

Operator: Save these instructions for future use!

FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE INSTALLING OR OPERATING THIS CONTROL COULD CAUSE PERSONAL INJURY AND/OR PROPERTY DAMAGE.

DESCRIPTION

This fan and limit control combines, in one enclosure, a fan switch with an adjustable differential which operates the blower in a forced warm air furnace and a limit switch with a fixed differential which automatically shuts off the burner if the furnace temperature exceeds a predetermined high point.

A summer fan switch is incorporated in this control to provide a convenient method for manual operation of the fan for air circulation during the summer.

PRECAUTIONS

THIS CONTROL MUST BE INSTALLED BY A QUALIFIED INSTALLER.

All wiring must conform to local and national electrical codes and ordinances.

This control is a precision instrument, and should be handled carefully. Rough handling or distorting components could cause the control to malfunction.

This control has been accurately calibrated at the factory. Any attempt to re-calibrate this control will void the White-Rodgers warranty.

WARNING

Do not use on circuits exceeding specified voltages. Higher voltages will damage control and could cause shock or fire hazard.

If in doubt about whether your wiring is millivolt, low or line voltage, have it inspected by a qualified heating and air conditioning contractor or a licensed electrician.

CAUTION

To prevent electrical shock and/or equipment damage, disconnect electric power to system at main fuse or circuit breaker box until installation is complete.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Following installation or replacement, follow appliance manufacturers' recommended installation/service instructions to insure proper operation.

INSTALLATION

Removing Cover

To remove cover from control, grasp cover at top and bottom and pull outward. Grasping the cover by its sides will make removal more difficult.

Location

1. The bimetal element should not be too close to any hot surfaces of the heat exchanger. The element should always be at least 3" away from any hot surfaces unless the position has been determined acceptable by the furnace manufacturer.

2. If this is a new application, please consult the original equipment manufacturer for proper location.

Mounting, For Flush Mounting (Vertical or Sloping Surface)

1. Insert the element tube into the bonnet and attach control case with #10 screws. (Two screws, diagonally located, are sufficient.)
2. Replace control cover after wiring and making any adjustments to the settings.



WHITE-RODGERS DIVISION
EMERSON ELECTRIC CO.
9797 REAVIS RD., ST. LOUIS, MO. 63123-0390
(314) 577-1300, FAX (314) 577-1517
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(905) 475-4653, FAX (905) 475-4625

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PART NO. 37-1558B
Replaces 37-1558-1
9714

FURNACE COMPONENT INFORMATION

Wiring

All wiring must conform to local and national electrical codes and ordinances.

Connect in accordance with the wiring diagrams provided by the equipment manufacturer. If none are provided, the following represents a typical installation.

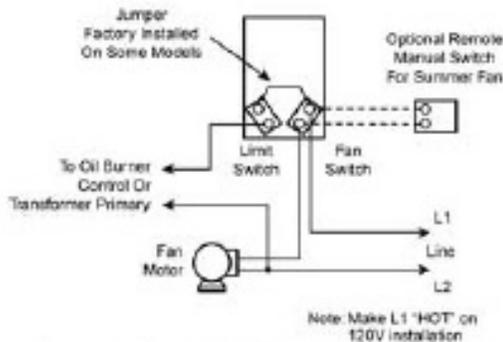


Diagram Using Limit In Line Voltage Circuit

CAUTION: Line voltage jumper is factory installed on some models. This jumper must be removed when limit switch is used in low voltage or millivolt circuit.

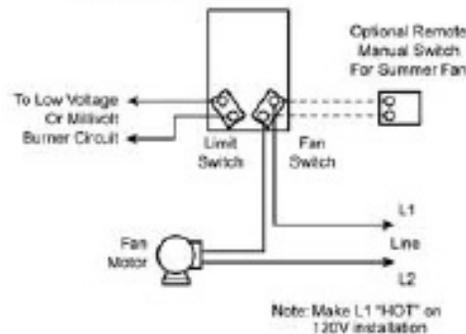


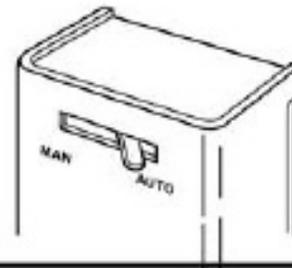
Diagram Using Limit In Low Voltage or Millivolt Circuit

OPERATION

SUMMER FAN OPERATION

The cover does not have to be removed to access the lever. To turn the fan on, slide the lever to the left "MAN" position. To turn the fan off, slide the lever to the right "AUTO" position.

For automatic operation of the fan during the heating or cooling season, the lever must be in the "AUTO" position.



SETTING THE DIAL

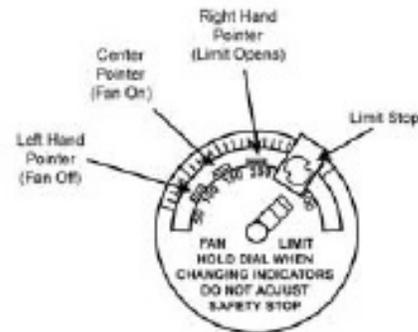
To set pointers, hold dial securely with one hand and move the pointers with the other hand. Do not force the pointers past any stops on the dial even though the dial may be graduated beyond the stops.

Limit

Move the right hand pointer so that its straight edge indicates the temperature at which the contacts should open. The limit pointer should never be set any higher than the setting recommended by the furnace manufacturer.

Fan

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



FURNACE COMPONENT INFORMATION

 **WHITE-RODGERS**

Fan Control Centers Installation Instructions

GENERAL PRECAUTIONARY INFORMATION

THIS CONTROL MUST BE INSTALLED BY A QUALIFIED INSTALLER.

All wiring must conform to local and national electrical codes and ordinances.

WARNING

Do not use on circuits exceeding specified voltage. Higher voltages will damage control and could cause shock or fire hazard.

NOTE

If power disconnect switch is not in sight, lock it in the OFF position and tag it to prevent unexpected application of power.

CAUTION

To prevent electrical shock and/or equipment damage, disconnect electric power to system at main fuse or circuit breaker box until installation is complete.

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Following installation or replacement, follow appliance manufacturers' recommended installation/service instructions to insure proper operation.

DESCRIPTION

The fan control center provides low voltage control of line voltage circuits and can be used to control two-speed blower motors and auxiliary circuits in heating or cooling equipment.

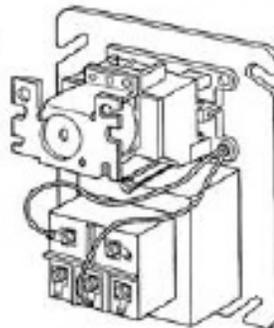
FEATURES:

Class II (40 V.A.) inherently energy limiting transformer
Nonresettable, nonreplaceable overcurrent protection
For general use in Class II, heating or cooling applications.

Low voltage terminal board with standard terminal designation for easy wiring.

16 gauge lead wires with quick-connect plug-in terminals provide wiring flexibility.

Mounts on standard 4 x 4 junction box.



INSTALLATION

Turn off electrical power to heating and cooling systems. Record the positions and color codes of the leads on the existing relay. Also record all external wiring connections (line and low voltage).

Use the color-coded terminal leads installed on the new fan control center to duplicate the wiring of the existing control. Make sure all connecting points are the same for both relays.

NOTE

Lead wires connecting the low voltage relay coil to terminals "C" and "G" on the low voltage terminal panel are factory installed to prevent accidental connection to the line voltage circuit. When making line-voltage connections, be sure no connections are made to low-voltage control circuit.

Make all line voltage connections following the information recorded previously.

Mount the fan control center on the junction box.

Connect low voltage wiring to terminal board on fan control center following hookups recorded previously.

NOTE

Unused transformer input leads must be insulated.
Energize system and check for proper operation.


EMERSON

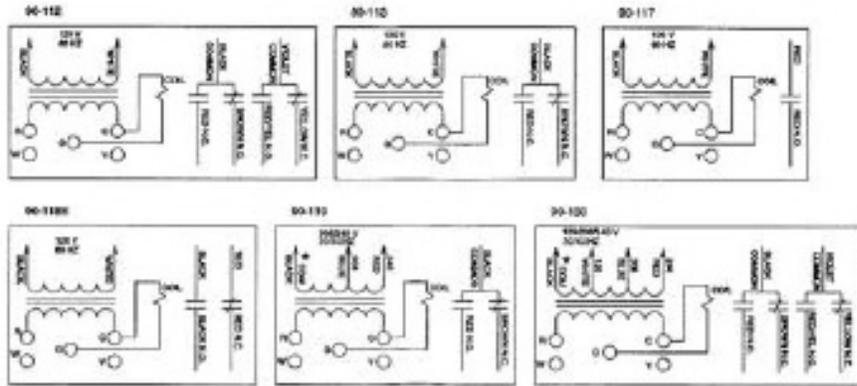
White-Rodgers is a division
of Emerson Electric Co.
www.white-rodgers.com

PART NO. 37-5786C
Replaces 37-5780B
0834

FURNACE COMPONENT INFORMATION

UL US UL Recognized for US and Canada.
File Number E73541.

Model Number	Transformer						Relay	Contact Ratings			
	Primary			Secondary				120 VAC (amps)		240 VAC (amps)	
	Voltage	Hz	Connections	Voltage	VA	Connections		Full Load	Locked Rotor	Full Load	Locked Rotor
90-112	120	60	Color coded leads, pre-stripped	24V	40	Terminal board with 5 screw terminals	DPDT	13.8	82.8	6.9	41.4
90-113	120	60	Color coded leads, pre-stripped	24V	40	Terminal board with 5 screw terminals	SPDT	13.8	82.8	6.9	41.4
90-117	120	60	Color coded leads, pre-stripped	24V	40	Terminal board with 5 screw terminals	SPNO	13.8	82.8	6.9	41.4
90-118E	120	60	Color coded leads, pre-stripped	24V	40	Terminal board with 5 screw terminals	SPNO SPNC	13.8	82.8	6.9	41.4
90-119	208/240	50/60	Color coded leads, pre-stripped	24V	40	Terminal board with 5 screw terminals	SPDT	13.8	82.8	6.9	41.4
90-130	120/ 208/240	50/60	Color coded leads, pre-stripped	24V	40	Terminal board with 5 screw terminals	DPDT	13.8	82.8	6.9	41.4



* Block is common with respect to transformer winding, not external circuit.

The Emerson logo is a
trademark and a service mark.