

SOLID FUEL FURNACE **INSTALLATION MANUAL**



For Models: 8095, 8130, 8150

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 Wood/Coal Furnaces

Installation and Operating Instructions

Models: 8095, 8130 and 8150

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

Your Royall Wood/Coal Furnace is designed for a lifetime of durable, reliable performance and easy operation. This manual describes the installation, operation and maintenance of your Royall Wood/Coal Furnace.

Save these instructions

Before installing your Royall Wood/Coal Furnace, please read and be sure you understand the entire owner's manual and safety instructions.

Refer to markings on the appliance for additional instructions.

Royall Wood/Coal Furnace has been designed to use independently or as an add-on to an existing central heating system. The installation of any furnace ***is not a do-it-yourself project***. To ensure the Royall Wood/Coal Furnace will operate safely and efficiently, **the installation must be performed by a qualified installer with specific knowledge of central heating systems.**

With proper installation and maintenance, your Royall Wood/Coal Furnace will give you years of trouble free service.

Thank you for choosing the Royall brand products for your home heating needs.

We are constantly improving and updating our products in order to provide the highest quality and value possible. Ark Alloy, LLC, the manufacturer of this product, reserves the right to alter its products, their specifications and/or prices without notice.

ROYALL FURNACE
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Safety Instructions

WARNING: Failure to follow these safety instructions may result in property damage, bodily injury or even death.

- Read this entire manual before installing, operating or maintaining this product. Proper installation of this heating appliance is crucial for safe and efficient operation. Save these instructions for later use.
- ***This heating appliance must be installed in accordance with local, state, and national codes and regulations.*** Contact your local building or fire officials about installation restrictions and inspection requirements in your area.
- ***Do not connect this heating appliance to a chimney flue serving any other appliance.***
- ***Do not install this heating appliance in a mobile or manufactured home—this can be dangerous and will void your warranty.*** This heating appliance has not been tested to meet the strict requirements necessary for installation into a mobile or manufactured home.
- Install in an area with adequate air for combustion and ventilation. The use of outside air may be required for safe operation of this heating appliance. Contact your local building or fire officials about combustion air requirements in your area.
- All minimum clearances to combustible materials must be strictly followed.
- This heating appliance must be installed on a non-combustible floor or 3/8-inch thick fireproof millboard or equivalent. See *installation* for further instructions.
- Disconnect all power to the heating appliance at the breaker box or service panel before performing routine maintenance and service. Allow the heating appliance to cool before servicing.
- **CAUTION – Hot Surfaces:** Keep children away! Do not touch heating appliance during operation.
- Dispose of ashes with care. Ashes should be placed in a metal container with a tight fitting metal lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. All coal contains small amounts of dangerous elements. Therefore it is essential that all coal ash be disposed of in municipally designated areas.
- The fuel loading and ash removal doors must be closed tightly during operation. All seals must be maintained in good condition.
- This Furnace is designed to burn air-dried wood, or anthracite or bituminous coal only. *Burning of any other type of fuel will void your Royall warranty.*
- Do not use, store, or dispose of flammable liquids near the heating appliance.
- **Do not burn:** Treated wood, colored paper, garbage, cardboard, solvents, or trash—burning these may result in toxic fumes, or produce soot and large flakes of char or fly ash. *Burning treated wood, colored paper, garbage, cardboard, solvents or trash can be dangerous and will void your Royall warranty.*
- **DANGER – Risk of Fire or Explosion:** Do not burn garbage, gasoline, naphtha, drain or engine oil, or other flammable liquids or inappropriate materials in this heating appliance.

Do not place clothing or other flammable materials on this heating appliance or within marked clearances to combustibles.
- Do not use chemicals or fluids, such as gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or freshen up a fire in this heating appliance.
- Use caution when opening fuel loading door. Opening fuel loading door rapidly can cause smoke or flame to flash out the door. See *Operation* for further instructions.
- Establish a routine for the storage of fuel, care of the heating appliance and firing techniques.
- A working smoke detector **must** be installed in the same room as this product. For additional safety, Ark Alloy, LLC, also recommends installing working smoke detectors and a listed carbon monoxide warning device in the living area of the home.
- Always keep a working fire extinguisher on hand in case of fire.

The National Fire Protection Association has information available on the safe use of solid-fuel heating appliances. You can contact the NFPA at: National Fire Protection Association, 1 Battery March Park, Quincy, MA 02169-7471 or www.nfpa.org

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Specification

	8095	8130	8150
Overall Dimensions (H x W x D)	22" x 32" x 38"	24" x 32" x 48"	24" x 32" x 48"
Cabinet Dimensions (H x W x D)	22" x 32" x 38"	24" x 32" x 48"	24" x 32" x 48"
Shipping Weight (Approx.)	475 lbs.	525 lbs.	600 lbs.
Heating Capacity-BTU's	95,000	130,000	150,000
Efficiency	78%	78%	78%
Log Length	26"	26"	26"
Sliding Smoke Baffle	Standard	Standard	Standard
Secondary Heat Exchanger	Tubular	Tubular	Tubular
Cast Iron Fuel Loading Door Size (H x W)	10" x 14"	10" x 14"	10" x 14"
Cast Iron Ash Removal Door Size (H x W)	5" x 7"	5" x 7"	5" x 7"
Removable Ash Pan	Standard	Standard	Standard
Flue Size (Rear Vent)	8"	8"	8"
Insulated Cabinet	Standard	Standard	Standard
Double Wall Back	Standard	Standard	Standard
Draft Controls	Standard Forced	Standard Forced	Standard Forced
Cast Iron Stationary (Wood) Grates	Standard	Standard	Standard
Cast Iron Shaker Grates	Optional	Optional	Optional
Cast Iron Baffle	Standard	Standard	Standard
Circulation Blower (Optional)	Optional	Optional	Optional
Filter Box (Optional)	Optional	Optional	Optional

Component Description

8" Chimney Outlet. Venting must be provided using a lined masonry chimney or a listed UL 103 type HT chimney. The chimney exhausts smoke and flue gases 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. See *Venting* for further instructions

Plenum Opening. Allows you to connect the Furnace into your home's warm-air supply duct.

Cast Iron Doors. Heavy cast iron fuel loading and ash removal doors are secured to the Furnace using door pins (4 included). 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.

Cast Iron Shaker Grates (Optional). This is where you build your wood or coal 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-degrees, heat retentive firebrick protects the sides of the Furnace's burn chamber.

Ash Removal Pan. Designed for easy cleanup of fine ash accumulation. Do not operate the Furnace with the ash removal door open; keep it closed except to remove ashes. The ash removal door gasket provides an airtight seal and should be inspected to ensure that it is in good condition at all times. The gasket must be replaced if it becomes damaged or worn.

Draft Dial. If you selected Manual Draft, this spin dial will allow you to regulate the amount of combustion air being controlled primarily by your wall thermostat.

Domestic Hot Water Tube (Optional). For heating domestic water.

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

Combustion Fan. If you selected Forced Air Draft, this fan will supply air for combustion by forcing air into the burn chamber when your wall thermostat call for heat.

Circulation Blower. The three-speed circulation blower, operated by the fan/limit control, forces air on all sides of the burn chamber, then into the home's duct system. The blower can be manually adjusted to run faster or slower to correspond to the amount of heat being produced.

24-V Damper Control Motor. If you selected Automatic Draft, this motor will supply combustion air to the burn chamber by automatically opening the draft damper door when your wall thermostat calls for heat.

Filter Box (Optional). Provides air filtration for your cold-air return system. A non-combustible filter is required when using the optional filter box.

Cast Iron Baffle. Ensures the precise amount of combustion air required to promote the most efficient combustion for either fuel. ROYALL Wood/Coal Furnace uses a cast iron baffle at the front of the chamber, to direct air under the grates.

Preinstallation Consideration

This furnace is intended for use in residential buildings. Do not install this heating appliance in a mobile or manufactured home-*this can be dangerous and will void your warranty*. This heating appliance has not been tested to meet the strict requirements necessary to installation into mobile or manufactured homes.

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

Before the position of the Furnace can be decided, a few questions should be considered.

1. Will this Furnace be used as a primary (central) furnace, or will it be installed as an add-on to your existing central heating system?
2. Can the Furnace be vented properly?
 - Is your chimney appropriate for this application? This Furnace requires installation into a UL103 Type HT all-fuel chimney. **Do not connect this unit to a chimney flue serving another appliance.**
 - Has your chimney been inspected? For your safety, it is important your chimney be clean and free from defect or damage prior to installing your Furnace.
3. This Furnace may require an outside air source of combustion air. Will this be easily accessed in your desired location?
4. Are there any local, state or national codes or regulations governing the use and placement of the Furnace?
5. How close is the electrical source? The power source must conform to the requirements shown in *Specifications*.
6. 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, and must not be installed in a sleeping room.
 - The clearances specified in this manual are minimum clearances. Any reduction must be approved by the regulatory authority and is not recommended by Ark Alloy, LLC.
 - Will your desired location require floor protections?
7. Will the Furnace be easily accessible for cleaning, refueling, maintenance, and repair?
8. Are there any structural reasons why the Furnace cannot be placed where you want?

Finally, do you have a reliable, consistent source of fuel for your Furnace? Please see *Fuel Requirements* for further information on fuel supply.

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



Risk of Fire: Do not store fuel or other combustible material within the marked installation clearances.

It is important to use fuel that is clean, dry and consistent. Solid-fuel Furnaces, such as your Royall Wood/Coal Furnace, naturally produce ash as a byproduct of the burning process. Even with Royall Furnace's highly efficient design, your Furnace will still produce some amount of ash which will need to be cleaned periodically. The type and quality of fuel you burn affects the amount of ash produced and the performance of your Furnace. To assist you in determining which fuel to use, here are some guidelines to consider:

WOOD

Burning wood for heat is as old as civilization itself. More than any other major fuel, wood provides us with energy independence—an easily available, locally produced and renewable source of heat on which we can rely.

- The Royall Wood/Coal Furnace has been tested for operation with air-dried wood.
- Wood should be seasoned (dried) for at least 12 months before burning. Properly seasoned wood should have about 20% - 25% moisture content. To properly season wood, split the logs as soon as possible and loosely stack them in a dry spot for at least 12 months.

You should not burn wet or green wood in your Furnace. Burning wet or green wood in your Furnace will not only reduce the efficiency of your appliance, but also increase the risk of dangerous creosote build-up in your appliance and chimney.

- Softwoods, such as pine and fir, are easily ignited and burn rapidly with hot flames. With softwoods, you will spend more time reloading your Furnace, and will have much more difficulty achieving an overnight burn. For a longer lasting fire, it is best to use more dense hardwoods.
- Ideally, you should burn a mixture of hardwoods and softwoods, using the hotter, faster burning softwoods to start your fire, and denser hardwoods to maintain a longer-lasting fire.

- **DANGER – Risk of Fire or Explosion:** Do not burn garbage, gasoline, naphtha, drain or engine oil, or other flammable liquids or inappropriate materials in this Furnace.
- **DO NOT BURN:** Treated wood, colored paper, garbage, cardboard, solvents, or trash – burning these may result in toxic fumes, or produce soot and large flakes of char or fly ash. *Burning treated wood, colored paper, garbage, cardboard, solvents or trash can be dangerous and will void your Royall warranty.*
- With this in mind, choosing the kind of firewood that is best for you depends on what is available in your area. If hardwoods are unavailable in your area, you can control the burn rate by using larger pieces of wood and by adjusting your draft controls.

Storage

- Do not store fuel within the Furnace installation clearance or within the space required for refueling, ash removal and other routine maintenance operations.
- Store all fuel in a dry location away from the elements. Never burn wet or green wood.

Fuel Requirements

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

WARNING: Risk of Fire: Do not store fuel or other combustible material within the marked installation Clearances.

COAL

One of the world's most widely-used fuel source, coal can provide the energy independence and low fuel prices sought by owners of solid-fuel heating appliances.

- The Royall Wood/Coal 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 and burns with a yellow, smoky flame.
 - Bituminous coal tends to contain more impurities and sulfur than anthracite coal, which may decrease the expected lifespan your ROYALL solid-fuel heating appliance and its components. If you choose to burn bituminous coal, be sure to select only burn high-grade bituminous coal.
 - **Coal Size:** Your Royall Wood/Coal Furnace is designed to use coal that is Nut size or larger.
- **DO NOT BURN:** Treated Wood, colored paper, garbage, cardboard, solvents, or trash—burning these may result in toxic fumes, or produce soot and large flakes of char or fly ash. *Burning treated wood, colored paper, garbage, cardboard, solvents or trash can be dangerous and will void your Royall warranty.*
 - **DANGER—Risk of Fire or Explosion:** Do not burn garbage, gasoline, naphtha, drain or engine oil, or other flammable liquids or inappropriate materials in this Furnace.

Storage

- Store all fuel in a dry location away from the elements. Never burn wet coal.
- Do not store within the Furnace installation clearances or within the space required for refueling, ash removal and other routine maintenance operations.

Installation

WARNING: Risk of Fire:

- Do not operate with flue draft exceeding .06 in. (14.95 Pa) water column.
- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances.
- Inspected and clean flues and chimney regularly.

CAUTION: Do not connect this furnace to a chimney flue serving any other appliance.

General Requirements

The installation of any solid-fuel heating appliance is not a do-it-yourself project. The Royall Wood/Coal Furnace should be installed by a qualified installer with specific knowledge of central heating systems. Check with your fire department and building inspector for local, state, and national codes and regulations regarding installation.

Solid-fuel heating appliance related fires are caused almost exclusively by installation, operation, or maintenance errors. A smoke detector in “working” condition **must** be a part of every Royall solid-fuel heating appliance installation—this is the most expensive insurance you can buy! For additional safety, Ark Alloy, LLC, recommends installing working smoke detectors and a listed carbon monoxide device in the living areas of the home.

The Royall Wood/Coal Furnace is designed to be used in conjunction with a listed gas – or oil-fired furnace, or as a central Furnace.

Foundation

The solid fuel 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 of the appliance extending out 48” from the front of the unit.

DANGER: A non-combustible pad must be installed in front of the unit to contain any sparks or coals falling out of the Loading door or Ash door. Fire can result causing severe personal injury, death or substantial property damage.

*******DO NOT INSTALL IN A GARAGE WHERE FLAMMABLES ARE KEPT*******

Flooring

The solid fuel furnace should be placed on a non-combustible floor which must extend a minimum of 6” beyond the appliance on both sides and back and 48” in front.

DANGER: Do not install appliance on carpeting even if foundation is used. Fire can result, causing severe personal injury, death or substantial property damage.

Installation

As Primary Furnace

- Locate the Royall Wood/Coal Furnace as close to the new or existing chimney as possible and as central to the heat distribution system as practical.
- Additionally, the Royall Wood/Coal Furnace should be placed so that you can easily complete operation and maintenance procedures.
- Strictly adhere to all requirements pertaining to clearances to combustibles, combustion air, venting system, draft control, and thermostat installation.

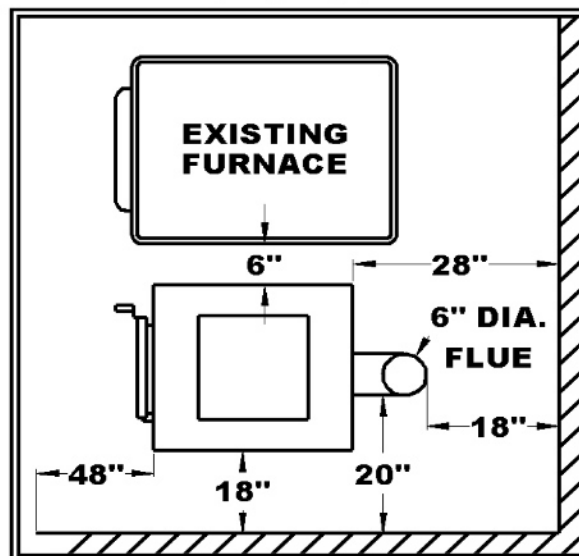
As Add-On Furnace

<p>The Royall Wood/Coal Furnace is designed to be used in conjunction with a listed gas – or – oil fired furnace, but not all furnaces will accept an add-on application. Some small furnaces, and especially counter-flow or down-flow furnaces, may not be used in an add-on installation.</p>	<p>Once it has been determined that your existing furnace will accept an add-on installation, Ark Alley, LLC, recommends a parallel installation, with a direct (ducted) feed or return air to the Royall Wood/Coal Furnace.</p>
<p>The CFM (cubic feet per minute) capability between the blower on the existing furnace and the add-on furnace must be compatible. If all of these conditions are met, then the combined static pressure may not exceed that established by the existing furnace.</p>	<p>Install two backflow dampers to ensure that when either furnace is operating independently, hot air will not flow back through the other furnace.</p>
<p>Before installing your Royall Wood/Coal Furnace, consult your Royall dealer or heating contractor and your local, state and national building codes and regulations to determine if your existing central heating system is compatible with your Royall Wood/Coal Furnace.</p>	<p>When using your Royall Wood/Coal Furnace as an add-on, locate the Royall as close to the new or existing chimney as possible and as close to your existing furnace as practical. However, a minimum clearance of 6" is required between your existing furnace and your Royall Wood/Coal Furnace.</p>

Clearances to Combustibles:

- **Sides:** The Royall must have clearances of 18 inches from the sidewall of the Royall Wood/Coal Furnace to combustibles.
- **Front:** Leave a minimum clearance of 48 Inches in front of your Royall Wood/Coal Furnace. This is for safe, easy loading and Cleaning of your Royall heating appliance.
- **Rear:** The minimum clearance from the rear Of the Royall Wood/Coal Furnace to Combustibles is 28".
- **Top:** The minimum clearance from the top Of the Royall Wood/Coal Furnace to Combustibles if 18".
- **Stovepipe:** Stovepipe must have a minimum Of 18 inches from the rear to combustibles, And a minimum of 20" from sides to Combustibles.
- Additionally, when using your Royall Wood/Coal Furnace as an add-on, a 6" Minimum clearance is required between The ROYALL and your existing furnace.

Figure 1: Clearances to



Installation

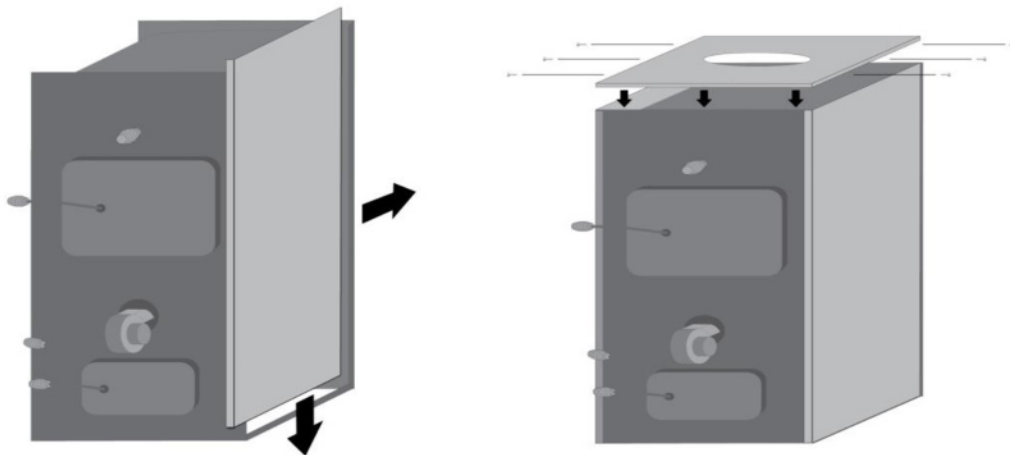
Shroud Preparation

1. Cut opening in the top of the shroud for the hot air duct. Opening should match existing hot air duct dimensions to maintain system balance.
2. For "Series" installation (see page):
 - a. Cover the filter box opening on the rear of the appliance. Manufacture a cover from standard ducting material.
 - b. Cut an opening in shroud side for cold air return duct. Opening should match duct dimensions out of the existing furnace to maintain system balance. Return duct can be located on either side of the appliance.
3. For "Parallel" installation (see page): nothing further is required.

Shroud Assembly

The appliance comes with the shroud installed. The shroud must be removed to cut opening for duct work. Re-install shroud as follows:

1. Shroud sides are installed from the top. The "S" bent edges on the shroud sides grip the flanges on the bottom of the furnace.
2. Then slide the sides front to back until the "S" bends grip the back of the furnace.
3. Shroud top fits snugly over the front, rear and sides per diagram.
4. Use 6 sheet metal screws (3 on each side) to fasten the top to the sides.



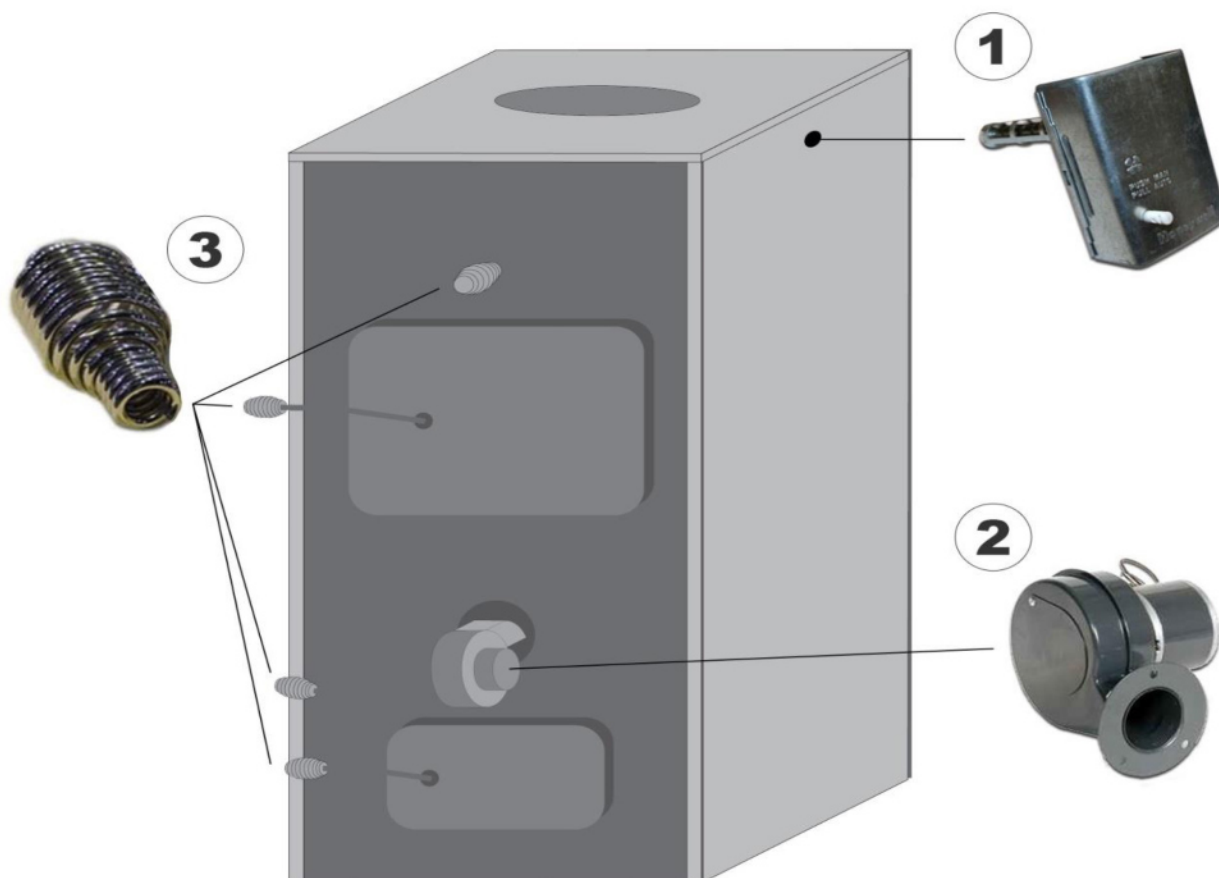
Installation

Component Assembly

1. FAN LIMIT CONTROL
 - a. The fan limit control may be installed on either side.
 - b. Drill a $\frac{3}{4}$ " diameter hole approximately 2-1/2" down centered on the desired side.
 - c. Insert the sensor of the fan limit control with the provided sheet and metal screws.
2. FAN CONTROL CENTER
 - a. The fan control center should be installed on the same side as the fan limit control.
 - b. If installing the furnace parallel with the existing furnace, then mount the fan control center on the filter box (PURCHASED SEPERATELY).
 - c. Attach the 4 x 4 junction box with sheet metal screws.
 - d. Attach transformers/relay plate to junction box.
3. DRAFT BLOWER
 - a. Mount the draft blower using the gasket to the front of the furnace with the three screws furnished.
 - b. Ensure that the gasket seals tightly between the blower and the appliance flange.

WARNING: Failure to mount fan properly will result in the furnace overheating.

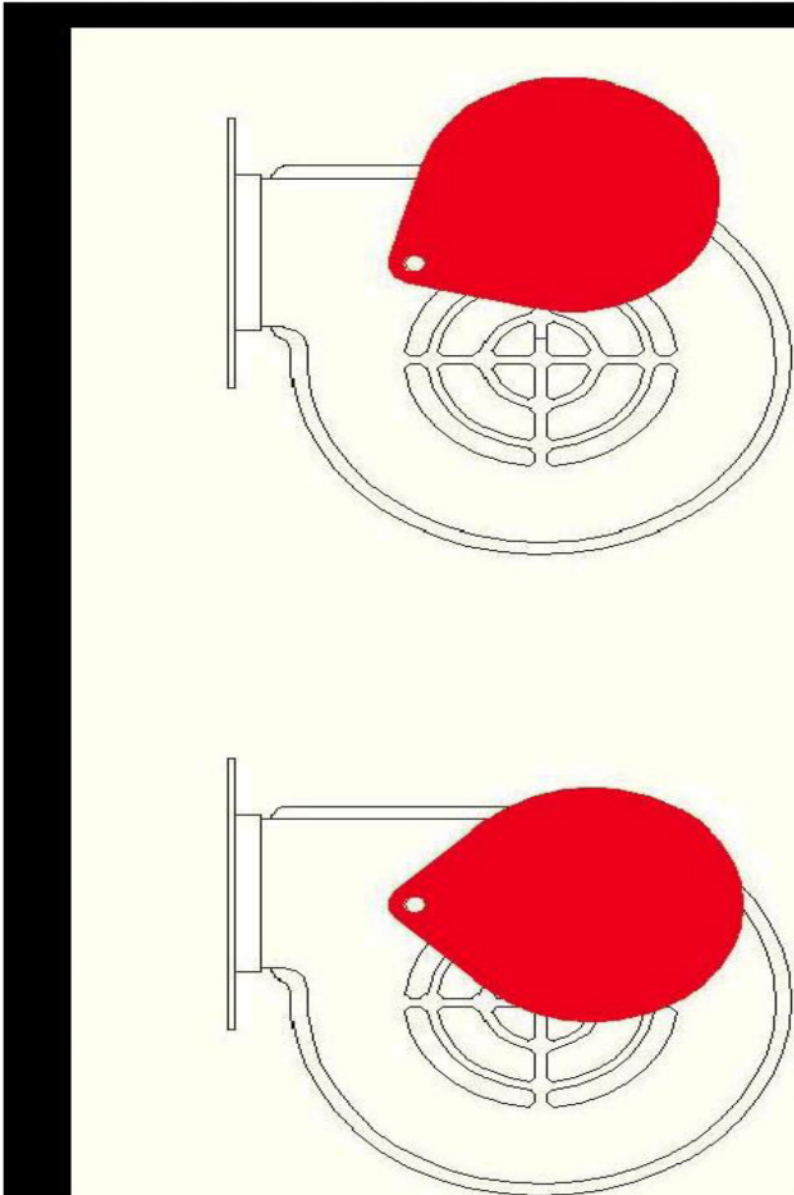
4. SPRING HANDLES (4)
 - a. Turn the spring handles on to the lever in a clockwise direction.



Setting the Draft Damper

The draft damper should be adjusted to allow the circulation blower to continuously circulate 140 degrees heated air instead of cycling until the room thermostat is satisfied. The damper plate can be moved to allow more air into the fire box, increasing temperature quicker.

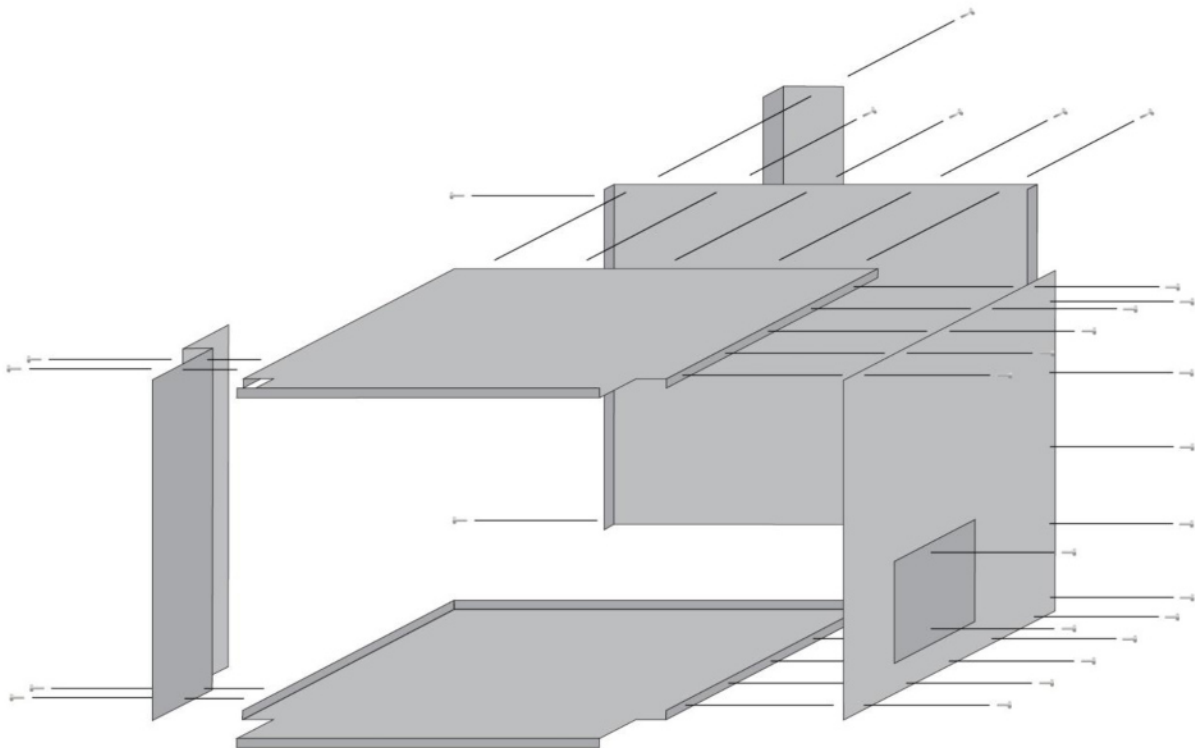
1. Verify that the fan limit settings are proper.
2. Adjust the room thermostat until the draft blower begins to operate.
3. After the furnace plenum temperature reaches 170 (as indicated on the fan limit control), the circulation blower should start. Adjust the draft damper (“dog ear” shaped flap on the draft blower) until the plenum temperature indicated on the fan limit control stabilizes at 140.
4. The draft damper will need periodic adjusting in the spring and fall seasons. If the plenum temperature is consistently above 140 degrees, then close down on the damper. If it is consistently below 140 degrees, then open the damper.



Filter Box (optional)

If installing the Royall furnace in parallel with existing furnace, construct and install the filter box as follows:

1. Mount the circulation blower on the rear end of the appliance using 4-1/4" x 3/4" screws.
2. Assemble and mount the Filter Box over the Circulation Blower using the 1/4" x 3/4" screws already in place.
 - a. The side panel with the 12" hole can be installed on either side of the filter box for convenient installation of the cold air return duct. For better air flow, it is recommended that this panel be installed opposite of the motor of the circulation blower.
 - b. Attach the bottom panel to the two side panels and tap until the panel lock firmly in place.
 - c. Attach the top panel to the side panel opposite of the cold air return duct opening.
 - d. Attach the back panel with sheet metal screws.
 - e. Attach the filter channel to the side panel with the cold air return opening.
 - f. Insert the filter.
3. Mount the fan control center on the side of the filter box.



Combustion Air Requirements

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

The Royall Furnace must have a minimum supply of 70 cubic feet of air per minute.

All fuel-burning appliances must have air (oxygen) for proper combustion. The incomplete combustion that takes place when a solid-fuel appliance is “air-starved” causes carbon monoxide (CO) production in quantities that can be dangerous inside a building. Combustion air from outside may need to be brought in to prevent “air starvation”. Although an outside air source is strongly recommended for all installations, it may be necessary if:

- The Furnace does not draw steadily, smell, experiences smoke roll-out, burns poorly, or back drafts whether or not there is combustion presents.
- Any of the above symptoms are alleviated by opening a window slightly on a calm day.
- The house is equipped with a well-sealed vapor barrier and tight fitting windows and /or has any powered devices which exhaust house air, such as clothes dryers.
- A ventilation system is installed in the house.

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



Installation

Wood Guard

The wood guard protects the draft fan from getting damaged if wood is accidentally dropped during loading.



Venting System

WARNING:

- **Failure to provide correct chimney venting can lead to increased carbon monoxide production and increased emissions of combustion gases into the building, which may cause death or serious injury.**
- **Do not connect the Royall heating appliance to any chimney flue servicing any other appliance.**
- **Risk of Fire: Inspect and clean flues and chimney regularly.**
- **Risk of Fire: Do not operate with the flue draft exceeding .06" (14.95 Pa) water column.**

Consult a qualified Furnace installer, your local building inspector and your fire officials to make sure the chimney and all connections conform to all local, state and national codes and regulations.

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

1. To exhaust smoke and flue gases which are the natural result of combustion.
2. To provide "draft." The draft pulls a continuous supply of fresh air into the furnace for proper combustion.

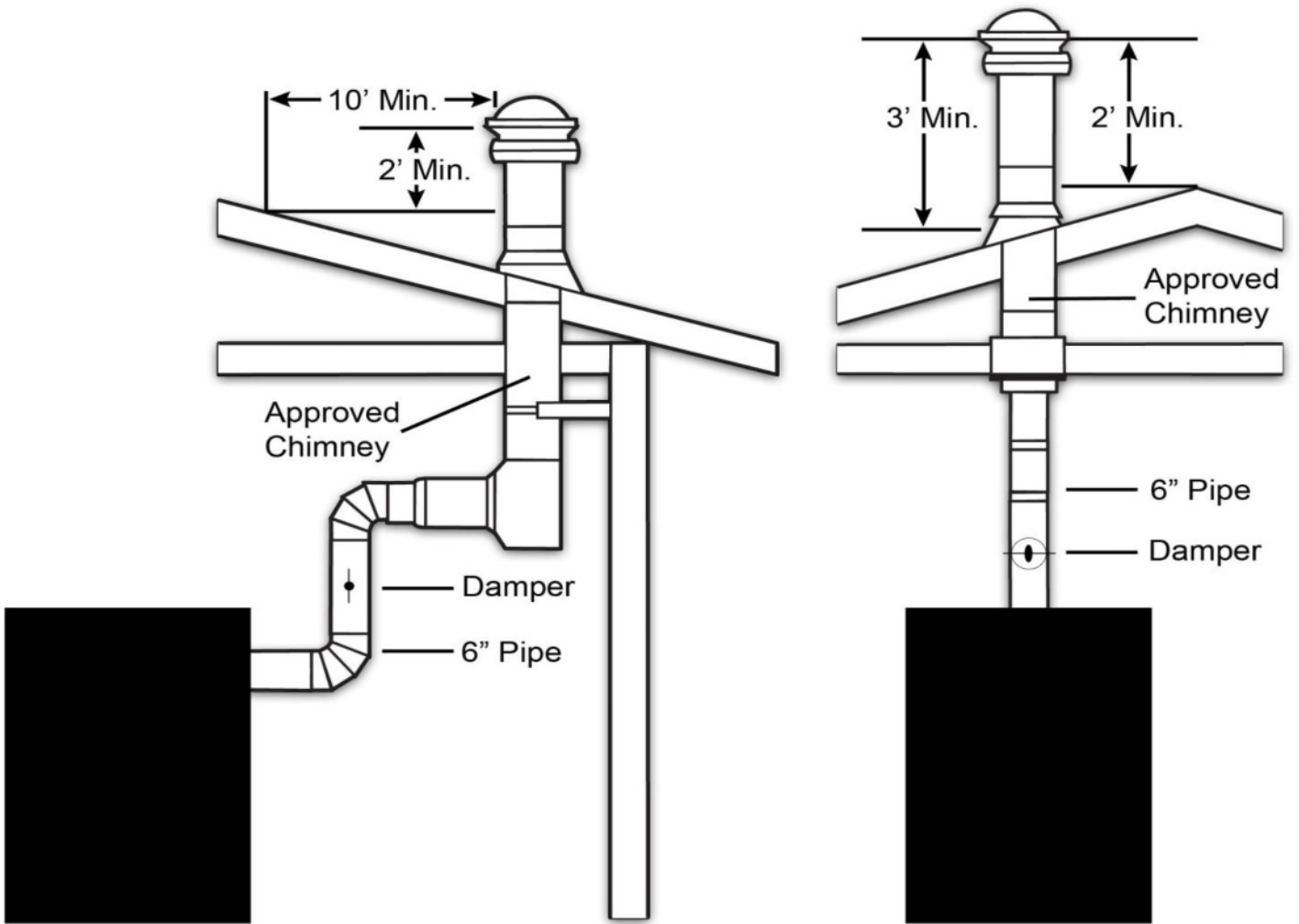
A chimney connector and chimney make up the venting system and must be properly installed and maintained to protect against a fire. Consult a venting professional. The ROYALL Wood/Coal Furnace requires installation into a listed UL103 Type HT all-fuel chimney. Minimum 24 gauge black steel chimney connector is required. An existing chimney must be cleaned and inspected to be sure it is clean and free from defect or damage. All connections must comply with NFPA Standard 211 and all applicable building codes and regulations.

When installing a factory-built chimney, follow all installation instructions provided by the chimney manufacturer.

For best performance, Ark Alloy, LLC, recommends using insulated chimney rather than triple wall or 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 Wood/Coal Furnace to the chimney must be made using 6" black steel material with a minimum 24 gauge. Do not use galvanized steel. See *Chimney Connector*.
- Any horizontal runs of chimney connector pipe should have a minimum of ½-inch per linear foot.
- A minimum distance of 18 inches must be maintained between the chimney connector and combustible ceiling surfaces. A minimum of 18 inches must be maintained between the chimney connector and the backwall and minimum of 20 inches must be maintained between the chimney connector and sidewalls.
- Avoid using more than two elbows in connecting the Royall Wood/Coal Furnace to the chimney.
- Use extra support hangers or brackets every three feet if it is absolutely necessary to have a run of more than six feet, which is not recommended.
- The Chimney must be at least 3 feet higher than the highest point where it passes through the roof, and at least 2 feet higher than the highest part of the roof or structure that is within 10 feet of the chimney, measured horizontally. For best performance, Ark Alloy, LLC, recommends a chimney height of at least 12 feet.



Installation

Masonry Chimney

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

Chimney Connector

The connection from the ROYALL Wood/Coal Furnace to the chimney must be made using 6" black steel material with a minimum 24 gauge. Do not use galvanized steel.

For proper operation, the chimney connector should be as short as possible. Horizontal lengths of chimney connector should have an upward slope of ½-inch per foot. Use extra support hangers or brackets every three feet if it is absolutely necessary to have a run of more than six feet, which is not recommended.

Chimney connector sections must be attached to the heating appliance and to each other with the crimped end toward the heating appliance. Secure all chimney connector pipe joints with at least three sheet metal screws. Avoid using more than two elbows in connecting the Royall Wood/coal Furnace to the chimney.

Never use chimney connector pipe as a chimney.

A minimum distance of 18 inches must be maintained between the chimney connector and combustible ceiling surfaces. A minimum of 18 inches must be maintained between the chimney connector and the backwall and the minimum of 20 inches must be maintained between the chimney connector and sidewalls.

DO NOT PASS CHIMNEY CONNECTOR THROUGH A COMBUSTIBLE WALL OR CEILING.

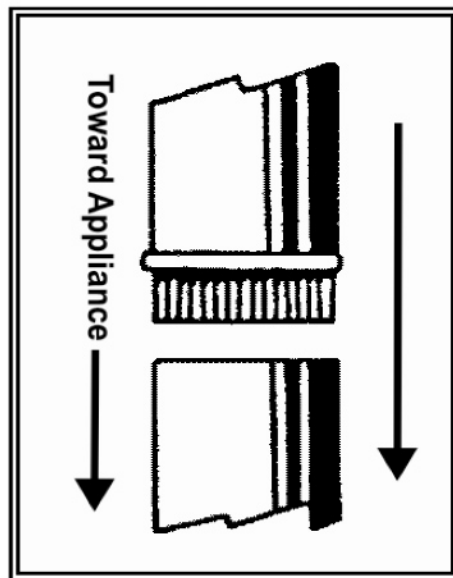


Figure 2: Chimney Connector Section

Installation

Barometric Draft Control

WARNING: Risk of Fire: Do not operate with the flue draft exceeding .06" (14.95 Pa) water column.

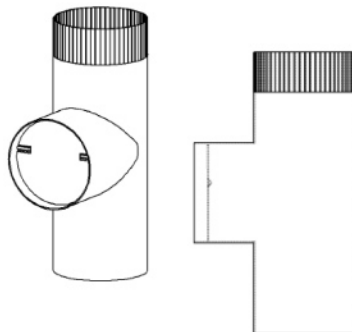
Proper draft must be provided for your Royall Wood/Coal Furnace. Draft is the force that moves air from the furnace up through the chimney, and is measured in inches of water column.

The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause the fire to burn to fast, while inadequate draft may cause smoke to back up into the Royall Wood/Coal Furnace, creating a possible hazard.

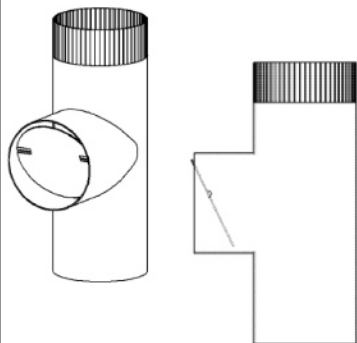
A barometric draft regulator must be installed into the chimney connector. Please see *Figure 13: Barometric Draft Control*.

Barometric draft regulators limit the draft (the suction pulling air into the solid-fuel heating appliance burn chamber). A pivoted, counterbalanced flap is pulled open by the draft when the draft reaches a critical amount. This permits air to enter the chimney, thus preventing the draft in the solid-fuel heating appliance from rising any higher.

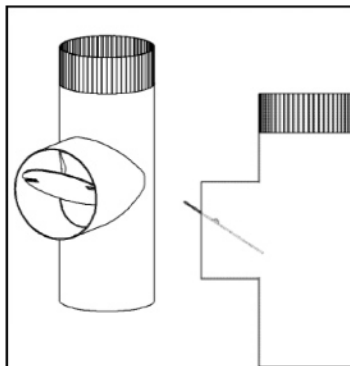
After installation of the Royall Wood/Coal Furnace is complete and a fire has been built, the chimney draft should be established and maintained from .04" to .06" water column of draft. If this setting is exceeded, it could cause a solid fuel fire to burn out of control.



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



Moderate draft in the chimney will pull the barometric draft control open just enough to maintain the appropriate draft for your heating appliance.



Excessive draft in the chimney will pull the barometric draft control further open, allowing more air into the chimney and reducing the

Figure 3: Barometric Draft Control

Installation

Air Duct Installation

CAUTION: Do not connect the Royall heating appliance warm air supply outlet into the cold air return inlet of the central furnace. The components of the central furnace could overheat causing the central furnace to operate other than intended.

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

Important duct system installation details for safe and efficient operation of your Royall Wood/Coal Furnace:

Every Royall Wood/Coal Furnace **must** be installed with a cold air return. Cold air returns must be equal in size to the heated air outlets, and preferable 10% larger.

The plenum must be constructed of metal (minimum 28 gauge galvanized is recommended) and must be installed in accordance with NFPA guidelines.

The plenum should be 18 inches for all models.

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

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

Ductwork clearance requirements vary. Contact your local building or fire officials about installation restrictions and inspection requirements in your area. Ductwork installation must conform to local, state, and national codes and regulations.

Operation

General Instructions

WARNING: Risk of Fire:

- Do not operate with flue draft exceeding .06" (14.95 PA) of water column.
- Do not operate with fuel loading or ash removal doors open.
- Do not store fuel or other combustible material within marked installation clearances.
- Inspect and clean flues and chimney regularly.

CAUTION: Hot Surfaces: Keep children away! Do not touch Furnace during operation.

Please read this manual in its entirety prior to the first firing of your Royall Wood/Coal Furnace. It is very important that you follow these suggestions and limitations in order to maintain your warranty and to guarantee the long life of your Royall Wood/Coal Furnace.

This Royall Wood/Coal Furnace is designed to burn for about 6 to 8 hours per load of wood or Coal. If the ROYALL Wood/Coal Furnace is being fired hot constantly with full flames and operating at only a 2 to 4 hour burn cycle, **it is being overfired**. Your home heating needs may be too great for the size of heating appliance you have purchased. Forced firing or abuse can be detected upon inspection **and will void your warranty**.

The greatest efficiency, you may sometimes need to allow your existing conventional heating system to assist your ROYALL heating appliance in the coldest weather.

During the warm seasons of 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 heating appliance to operate at maximum efficiency and with minimum emissions.

For best combustion efficiency, chimney temperature should be 350-degrees F to 450-degrees F. ROYALL recommends to monitor chimney temperature.

First Fire

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

Check to make sure the circulation blowers are in proper working order.

- To check the circulation blower, use the manual switch on the fan/limit control.
- If you selected Forced Air Draft, you can check the forced draft blower by turning the wall thermostat supplied with your Royall heating appliance to a high temperature. If your draft blower turns on, you may set the wall thermostat to the desired setting.

Next, make sure that the burn chamber and ash removal pan are clear of all objects. Do not fully load your ROYALL Wood/Coal Furnace or open all draft controls completely until you become familiar with the operation of your Royall Wood/Coal Furnace.

Some odors may be given off a new Royall Wood/Coal Furnace during the initial few hours of burning while the steel and the paint are being cured. Ventilating the room until the odors disappear is recommended.

Operation

Typical Operation Cycle

CAUTION: Hot Surfaces: Keep children away! Do not touch Furnace during operation.

After a fire has been established and the operating temperature has been reached, only the thermostat need to be set to maintain the desired temperature.

When your home cools, the thermostat located in the living area of the home activates the draft control system.

- **Automatic Draft:** If you are burning wood, the thermostatically-controlled automatic draft system mounted on the side of the furnace must be used safely and efficiently.
- **Forced Draft:** When burning coal, a forced draft system will provide optimal performance. When the thermostat calls for more heat, the combustion fan turns on, forcing combustion air into your burn chamber.

When the thermostat is satisfied, it will deactivate your automatic or forced air draft control system, allowing the fire to die down until the next time your thermostat call for heat.

NEVER operate this heating appliance with both the automatic and forced draft systems installed at the same time.

The manually operated spin dial located on the ash removal door should only be opened to increase the amount of combustion air entering the burn chamber when you are first starting a fire, or when reloading the unit. Once the fire is established, the spin dial should typically be closed.

The 3-speed circulation blower is activated when the temperature sensor of the fan/limit control indicates that air has been heated to the fan/limit control ON temperature setting. The circulation blower pushes air around the burn chamber, through the heat exchanger are and into the plenum.

Your Royall Wood/Coal Furnace can run efficiently over extended periods of time and at different heat output levels as long as the fuel supply is uninterrupted and cleaning and maintenance are performed routinely.

Power Failure Instructions

WARNING: Always closely monitor the operation of the Royall Wood/Coal Furnace during a power failure.

To operate your ROYALL Wood/Coal Furnace in the event of a power failure:

1. Close draft dial on the ash door.
2. Remove air filter.
3. Open all heat registers.
4. Do not load the Furnace more than $\frac{1}{4}$ full.
5. Keep sliding smoke baffle closed.

Use extreme caution when operating your Royall Wood/Coal Furnace during a power failure. Over-firing can damage the furnace and its components, will void your warranty, and may result in property damage, bodily injury or even death.

Operation

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

Burning Wood

All home chimneys and hookups are different. After a few fires, you will find the best way to start a fire in your Royall Wood/Coal Furnace.

Your Royall Wood/Coal Furnace is capable of holding very large logs. **Do not** try to add a log that is larger than what you can easily place in the Furnace. You will get the best efficiency when you add only the amount of wood needed for a 6 to 8 hour burn.

Starting a Wood Fire

1. Pull the sliding smoke baffle (located above the fuel loading door) out about 4-inches to open.
2. Place a small amount of crumpled paper in the center of your Royall Wood/Coal Furnace. Crisscross a couple of handfuls of dry, $\frac{3}{4}$ " thick kindling wood, then several small pieces of firewood.

Be sure the sliding smoke baffle is fully open.

3. It will take 5 to 10 minutes for the fire to establish itself. Once you have some red-hot burning ember, add larger pieces of wood.
 - a. Vary the position of the wood in the burn chamber to maximize the exposed surface area of each piece of wood.
 - b. Only use wood properly sized for your unit's burn chamber.

Never overload your burn chamber. Do not load wood more than 8" above the top of the firebrick.

4. Push in the sliding smoke baffle after loading your ROYALL and the fire has been established.
5. The burn time is controlled totally by the 24-V Wall Thermostat and either the automatic or the forced air draft controls on the Furnace.

Refueling

To refuel the wood fire in your Royall Wood/Coal Furnace:

1. Pull the sliding smoke baffle out.
2. Open the fuel loading door slowly; open the door about 1" – 2" then wait about 10 seconds before opening fully. *Never stand in front of the fuel loading door when refueling; always stand to the side.*
3. Rake the red-hot embers over the grates evenly.
4. Put a few smaller pieces of wood on the coals first, and then load the Furnace with larger pieces of wood.
5. Close the fuel loading door and sliding smoke baffle.

Operation

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

All home chimneys and hookups are different. After a few fires, you will find the best way to start a fire in your Royall Wood/Coal Furnace.

You will get the best efficiency when you add only the amount of coal needed for a 6 to 8 hour burn.

Note: A full load is not always the best solution for your needs.

Burning Coal

Burning coal will provide a lesson in patience. Take the time necessary to experiment and understand the operation of your Royall Wood/Coal Furnace.

Please keep the following points in mind when burning coal:

1. A Barometric draft control in the chimney connector **must** be used when burning coal.
2. **Never** completely cover the live fire with fresh coal. Always leave a generous area of burning coal at the top and rear of the fire.
3. Always keep the ash pan clean. Coal firing produces much more ash than wood. These ashes must be removed often (possibly daily) in order to avoid piling up too closely to the grates. Removal of the coal ash will allow for passage of primary air to the coal bed and prevent damage or warpage to the grates.
4. A coal fire should not be poked or broken up, as this tends to bring ash to the surface of the coal bed where it may fuse. If the ash fuses, clinkers will form. It may be necessary to remove all unburned material and ash from the burn chamber to remove the clinkers. These should be carefully removed using tongs, and always put into an airtight container.
5. If the fire goes out or does not hold overnight, check for the following:
 - a. Poor Draft
 - b. Incorrect damper settings.
 - c. Coal is not sized to the furnace (see *Fuel Requirements – Coal*).
 - d. Ashes, if allowed to accumulate in the ash pan, will not allow the passage of required air of combustion. Keep the ash pan clean.

Dispose of ashes with care:

Ashes should be placed in a metal container with a tight fitting metal lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal.

All coal contains small amounts of dangerous elements. Therefore it is essential that your coal ash be disposed of in municipally designated area.

Operation

Starting a Coal Fire

1. Pull the sliding smoke baffle (located above the fuel loading door) out about 4-inches to open.
2. Place a small amount of crumpled paper in the center of your ROYALL Wood/Coal Furnace. Crisscross a couple of handfuls of dry, $\frac{3}{4}$ " thick kindling wood, then several small Royall I pieces of firewood. Wait until the wood fire is established with hot, red embers before adding coal.
Be sure the sliding smoke baffle is fully open.
3. It will take 5 to 10 minutes of the wood fire to establish itself. Once you have some red-hot burning embers, add several small shovels of coal over the wood coals until you have a 2" – 3" bed of burning coals. Be sure to give each small layer about 5 – 10 minutes to ignite before covering it with the next layer of coal.
4. After the coal fire is established and spread throughout the burn chamber, gently shake the grate until ashes fall in the ash removal pan. Add larger amounts of coal to build up the coal bed.
Never overload your burn chamber. Do not load coal above the top of the firebricks.
5. Push in the sliding smoke baffle after loading your ROYALL and your fire is established.
6. The burning time is controlled totally by the draft controls on the Furnace. Allow your Royall Wood/Coal Furnace to operate with draft controls full open for approximately 15 minutes or until the fresh coal ignites. When the coal is properly ignited, adjust the thermostat accordingly.

Check the fire periodically to make sure it is spreading throughout the coal bed.

Refueling/Recharging

To refuel/recharge the anthracite coal fire in your Royall Wood/Coal Furnace:

1. Pull the sliding smoke baffle out.
2. Gently shake the grates down.
3. Open the fuel loading door slowly: open the door about 1" – 2" then wait about 15 – 20 seconds before opening fully.

When recharging, fresh coal tends to give off large quantities of volatile gas which may accumulate and possibly ignite, causing a backpuff. Always open the fuel loading door slowly to prevent backpuffing.

Never stand in front of the fuel loading door when refueling: always stand to the side.

4. If the coal fire has died down before recharging, a fresh supply of kindling will need to be added. Only add fresh coal to a deep, hot bed of coals.
5. Spread fresh coal evenly over existing coal, leaving some hot coals exposed in the center of the burn chamber. Be careful not to smother your existing coals.
Never overload your burn chamber. Do not load coal above the top of the firebrick.
6. Close the fuel loading door and sliding smoke baffle.

Operation

Bituminous Recharging

Because bituminous coal has higher sulfur content, bituminous recharging is slightly different from anthracite recharging.

To refuel/recharge the bituminous coal fire in your Royall Woo/Coal Furnace:

1. Pull the sliding smoke baffle out.
2. Gently shake the grates down.
3. Open the fuel loading door slowly: open the door about 1" – 2" then wait about 15 – 20 seconds before opening fully.

When recharging, fresh coal tends to give off large quantities of volatile gas which may accumulate and possibly ignite, causing a backpuff. Always open the fuel loading door slowly to prevent backbuffing.

Never stand in front of the fuel loading door when refueling; always stand to the side.

4. If the coal fire has died down before recharging, a fresh supply of kindling will need to be added. Only add fresh coal to a deep, hot bed of coals.
5. Push the hot coals to the rear of the burn chamber and position fresh coal on the grate in front of the banked coal. Be careful not to smother your existing coals.

Never overload your burn chamber. Do not load coal above the top of the firebrick.

Banking

Banking allows you to recharge your coal fire in such a manner as to retain a hot coal bed throughout the night.

Approximately one hour before retiring for the night, push the coals to the rear of the burn chamber with the coal tapered down in the front.

Be careful not to smother your existing coals.

Never overload your burn chamber. Do not load coal above the top of the firebrick.

Maintenance

Periodic maintenance is required to continue the performance of your Royall Wood/Coal Furnace. As with any solid-fuel heating appliance, the need for and frequency of cleaning depends on the amount and quality of fuel burned, the quality of the fire, and the length of time since the last cleaning. Weekly cleaning may be required in warmer weather, whereas monthly cleaning may be enough in colder weather.

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

DANGER: Risk of electric shock. Disconnect power at the service panel or breaker box before servicing Royall Wood/Coal Furnace.

CAUTION: Keep the area around the Royall Wood/Coal Furnace clean and free of dust and debris.

Creosote – Formation and Need for 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 relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire, the results of which can be tragic.

Check daily for creosote buildup, 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 a creosote buildup has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire.

Be aware that the hotter the fire, the less creosote is deposited, and that weekly cleaning may be necessary in mild weather, even though monthly cleaning may be enough in the coldest months.

Have a clearly understand plan to handle a chimney fire.

Disposal of Ashes

Ashes should be placed in a metal container with a tight fitting metal lid. The closed container of ashes should be placed on a noncombustible floor on the ground, well away from all combustible materials, pending final disposal.

If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all ash and cinders have thoroughly cooled. Do not place any other waste materials in this container.

All coal contains small amounts of dangerous elements. Therefore, it is essential that your coal ash be disposed of in municipally designated area.

NOTE: EMBERS REMAIN HOT FOR MANY DAYS. STORE IN A SAFE PLACE AWAY FROM COMBUSTIBLES.

Never use a conventional vacuum cleaner or a shop vacuum to remove ashes from a solid-fuel heating appliance. Ashes remain hot for many days, and when trapped in a conventional vacuum can cause a fire hazard. Only use a vacuum designed for the safe cleaning and removal of ashes. Failure to remove ashes will result in damage to the grate over time.

Maintenance

Gasket Replacement

The cast iron fuel loading and ash removal doors of your ROYALL Wood/Coal Furnace are equipped with gaskets to ensure safe operation and an airtight seal. When these gaskets become worn or damaged, you will need to replace them.

To replace the door gaskets, you will need 5/8-inch, high temperature rope gasket, available from your Royall dealer or hardware store.

1. Remove the door and lay it face down on a clean, flat surface.
2. Find the ends of the gasket and pull it off.
3. Using a screwdriver, remove any excess gasket cement from the gasket channel.
4. If desired, a small drop of gasket cement may be applied to the corners of the gasket channel.
5. Lay the new door gasket in the channel, cutting off any excess gasket rope.
6. Reattach the door. If gasket cement was applied, keep the door closed until the cement has fully dried.

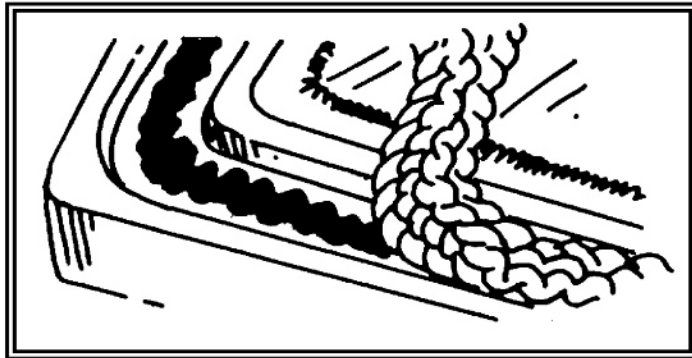


Figure 4: Door Gasket

Maintenance

Routine Maintenance

Please use the following timeline as a guide for determining how much maintenance your Royall Wood/Coal Furnace requires to operate at peak performance. Failure to clean and maintain this Furnace as indicated can result in poor performance and safety hazards.

Please use: *E: Purchase & Service Record* to keep a record of your maintenance and service practices. In the event of a warranty claim, we may request a copy of this record.

CAUTION: Inspect flue pipes, joints and seals regularly to ensure that smoke and flue gases are not drawing into the home.

Daily Until a pattern of cleaning requirement is established, inspect and, if necessary, clean the following components daily:	Monthly The air filter on your Royall Wood/Coal Furnace should be monitored on a regular basis and replaced when necessary.
<ul style="list-style-type: none">• Fuel Supply, refilling as necessary.• Flue Pipes, including joints and seals, should be inspected to ensure that smoke and flue gases are not drawn in and circulated by the air-circulation system.• Ash removal pan should be emptied and cleaned regularly. Ash content is a good indicator of fuel efficiency and quality. High quality fuel will produce less ash than lower quality fuel. Never allow ash to build up to the level of the grates.	Seasonally/Every 3 Months/After every 1 -2 Tons of fuel burned Until you are familiar with how ash and creosote accumulate with your operating practices, we recommend inspecting your Furnace at least once per ton of fuel burned. Particular attention should be given to: <ul style="list-style-type: none">• Draft Control System (blowers, etc.)• Gaskets (Fuel loading and Ash Removal Doors)• Air Filter• Fresh air intake• Chimney
Every 2 -3 Days/Weekly Once a pattern of cleaning requirement is established, the following components should still be monitored on a regular basis: <ul style="list-style-type: none">• Burn chamber• Ash Removal Pan• Flue pipes, joints and seal	

Annual/Spring Shutdown

CAUTION: Cleaning the flue pipe and chimney is especially important at the end of the heating season to minimize corrosion during the summer months caused by accumulated ash.

It is important to give the entire Royall Wood/Coal Furnace a thorough cleaning:

- Your venting system should be inspected and cleaned annually. Clean and remove fly ash from chimney connector, flue pipes and chimney. Soot buildup should be removed to prevent the risk of a chimney fire and to minimize corrosion during the summer months.
- Scoop out any unburned fuel from the burn chamber, and empty and clean the burn chamber, and empty and clean the burn chamber and ash removal pan.
 - Do not allow fuel or ash to sit in the Royall Wood/Coal Furnace over the summer months. Fuel and ash can accumulate moisture over the summer months, having a corrosive effect on metal and cast iron parts, and causing the fuel to mold.

Failure to clean and maintain this Furnace as indicated can result in poor performance and safety hazards.

Please use *Appendix E: Purchase & Service Record* to keep record of your maintenance and service practices. In the event of a warranty claim, we may request a copy of this record.

Remember: A clean Furnace burns efficiently and will remain trouble free!

Troubleshooting Guide

DANGER: Risk of electric shock. Disconnect power at the service panel or breaker box before servicing Royall Wood/Coal Furnace.

Many problems in the Royall Wood/Coal Furnace can be traced to a few common place causes and are easily fixed. Before making any repairs or replacing any components, be sure to check to these common problems:

Fuel

- Wet or Dirty Fuel
Solution: Empty and clean the burn chamber. Refill using only high quality, clean, dry fuel as outlined in *Fuel Requirements*.

Improper Draft

- Too little or too much draft
- Insufficient combustion air
Solution: Adjust the draft controls and observe until you determine which settings are more appropriate for your usage. See *Operation* for further information.

Ash buildup in the ash removal pan

Solution: Be sure to maintain your Royall Wood/Coal Furnace's cleanliness by emptying the ash removal pan regularly. See *Maintenance* for further information.

We also recommend establishing a routine in inspecting gaskets and replacing when necessary. Maintaining your Royall Wood/Coal Furnace's cleanliness and adjusting the draft controls will remedy many problems.

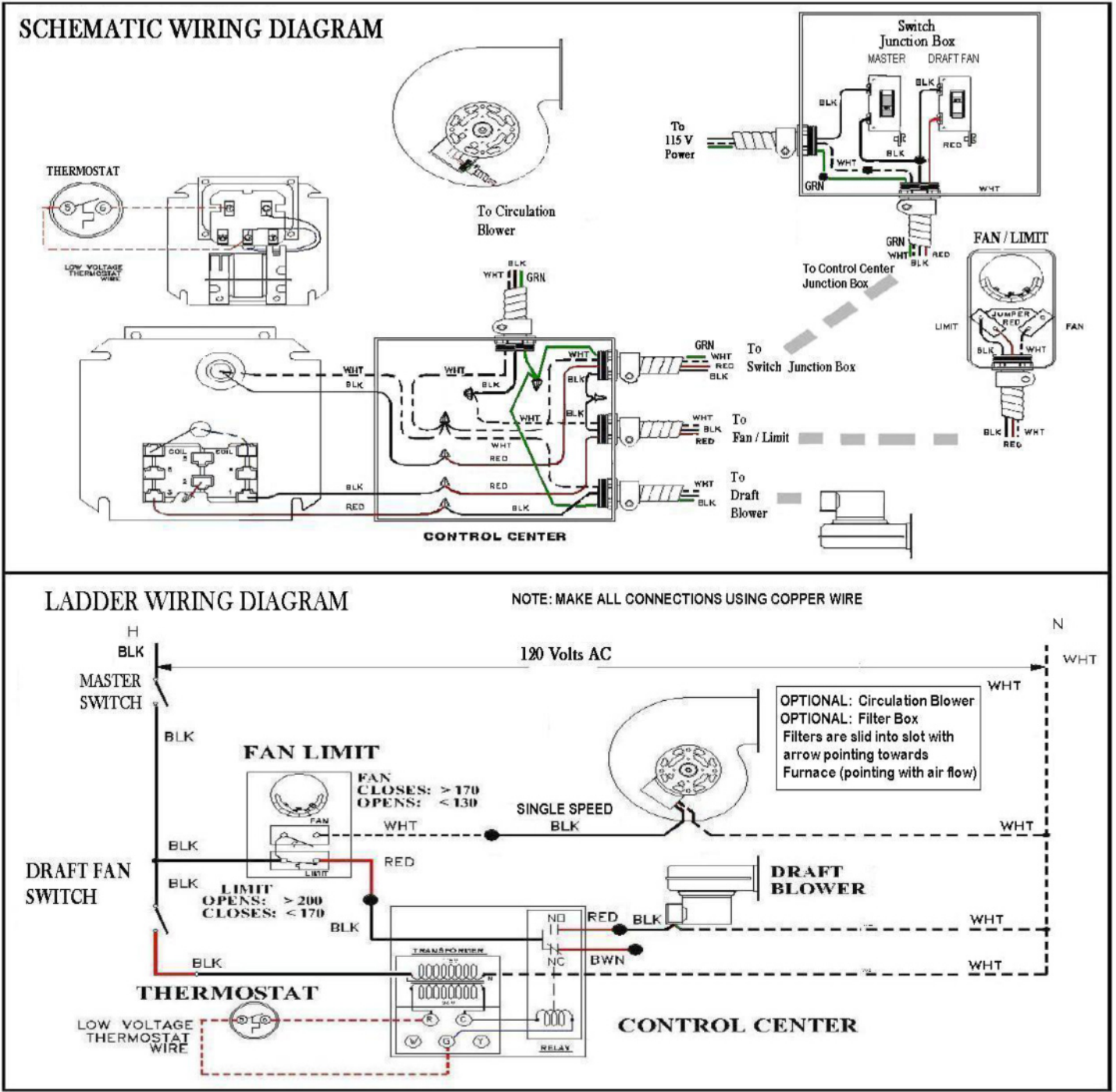
Troubleshooting Guide

Detailed Troubleshooting

Once you have exhausted the above common problems, if you are still experiencing trouble with your Royall Wood/Coal Furnace, you may wish to consult the following list of problems, or consult with your Royall dealer for further assistance.

Problem(s)	Cause(s)/Solution(s)
Fire won't start or starts but won't stay lit, or does not hold out overnight	<p>Make sure all Furnace doors are closed tightly and all gaskets are in good condition.</p> <p>Ashes, if allowed to accumulate in the ash removal pan, will block the passage of combustion air. Verify that your ash removal pan is clean. Never allow ashes to build up to the level of the grates.</p> <p>Your exhaust or combustion air system may be blocked. Verify all vents and pipes are free from obstruction and the draft controls are operating correctly. Check your chimney for downdraft caused by taller surrounding trees or buildings. The chimney may have to be extended or a chimney vent cap installed. Please contact your Royall dealer or heating contractor.</p>
Fire is weak, lazy, or dirty, or startup is slow or smoky	<p>Your exhaust or combustion air systems may be blocked. Verify all vents and pipes are free from obstruction and the draft controls are operating correctly. Your home may have a negative pressure. If your home is too airtight, the Royall heating appliance cannot get enough combustion air to burn properly. You may need to bring outside air to the Royall heating appliance. Please contact your Royall dealer or heating contractor.</p> <p>Check your chimney for downdraft caused by taller surrounding trees or buildings. The chimney may have to be extended or a chimney vent cap installed. Please contact your Royall dealer or heating contractor.</p>
Poor combustion or difficulty maintaining a "pilot" fire.	<p>Check the quality of your fuel. Refer to <i>Fuel Requirements</i>.</p> <p>Your home may have a negative pressure. If your home is too airtight, the Royall heating appliance cannot get enough combustion air to burn properly. You may need to bring outside air to the Royall heating appliance. Please contact your Royall dealer or heating contractor.</p>
Smoke is visible or you smell fumes in your home	<p>Make sure all doors are closed tightly and all gaskets are in good condition. Your exhaust or combustion air systems may be blocked. Verify all vents and pipes are free from obstruction and the draft controls are operating correctly. Your venting may be improperly installed. If the Royall heating appliance is smoking from vents, ducts, or from the draft controls, immediately shut down the Royall heating appliance, ventilate the area, and contact your Royall dealer or heating contractor.</p>
Excessive Fire	<p>The chimney draft may be excessive. Adjust the barometric damper to maintain flue draft settings from .04" to .06" (14.95 Pa) water column.</p>
Excessive Creosote	<p>During warm 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.</p> <p>Your venting may be improperly installed. Verify that the Royall heating appliance is venting according to instructions found in the <i>Installation</i> section. Please contact your Royall dealer or heating contractor.</p>
Too much ash	<p>Check the quality of your fuel. Refer to the <i>Fuel Requirements</i> section.</p>
Ash, soot, or fuel dust in the home	<p>Verify all Furnace doors are closed tightly and all gaskets are in good condition. Always be sure to handle ashes and fuel with care and open doors slowly. Ashes can escape from conventional vacuums. We recommend using a vacuum designed for ashes.</p>

	<ul style="list-style-type: none"> • Be sure to check the exhaust system for leaks and repair as necessary. • Your home may have a negative pressure. If your home is too airtight, the Royall heating appliance cannot get enough combustion air to burn properly. You may need to bring outside air to the Royall heating appliance. Please contact your Royall dealer or heating contractor.
Partially burned or unburned fuel in the combustion area	<ul style="list-style-type: none"> • 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 Royall heating appliance burns too much fuel, or the fuel burns off too quickly	<ul style="list-style-type: none"> • The chimney draft may be excessive. Adjust the barometric damper to maintain flue draft settings from 0.04" to 0.06" of water column. Do not operate with a flue draft exceeding .06 (14.95 Pa) water column.
The Royall heating appliance is overheating or is burning without regard to the thermostat	<ul style="list-style-type: none"> • Your Royall heating appliance may have been installed incorrectly. Please contact your Royall dealer or heating contractor. • The thermostat or thermostat wiring may be faulty. Please contact your Royall dealer or heating contractor.
The Royall heating appliance will not heat the whole house or doesn't produce as much heat as when first installed	<ul style="list-style-type: none"> • Verify that the venting and draft control systems are clean and free from obstruction. Verify that all heat delivery systems are operating correctly.
The circulation blower runs continuously, cycles on and off too much, or won't run at all	<ul style="list-style-type: none"> • Make sure the Fan/limit Control is set on <i>Auto</i> and is not on <i>Manual</i>. • The fan/limit control ON/OFF temperature settings may need to be adjusted. (ON/OFF temperatures may be set too close together). Please see <i>Assembly</i> for recommended fan/limit control settings. • Your furnace may have a faulty fan/limit control or blower motor. Please contact your Royall dealer for replacement parts.
The Royall heating appliance has power but is not responding	<ul style="list-style-type: none"> • Check the power supply for adequate voltage. See the <i>Installation</i> section for power supply requirements. • Your Royall heating appliance may have been installed incorrectly. Please contact your Royall dealer or heating contractor.
The user is shocked when touching the Royall heating appliance	<ul style="list-style-type: none"> • Your Royall heating appliance may not have been properly grounded or may have loose wires or wiring components. Disconnect power to the Royall heating appliance at the breaker box or service panel and verify all connections. Please contact your Royall dealer or heating contractor. • Your Royall heating appliance may have experienced a power surge or power short. Please contact your Royall dealer or heating contractor.



Appendix B: Parts List

Part Number	Part Description
BRI70790	Fire Brick 7 x4-1/2 x2
BRI70791	Fire Brick 9 x2 x 2
BRI70792	Fire Brick 9 x 4.5 x 1.25
BRI70897	Fire Brick 9 x 4.5 x 2
BRI70898	Fire Brick 8.75 x 4.5 x 7 x 2
BRI70899	Fire Brick 8.5 x 4.5 x 2
BRI70900	Fire Brick 2.25 x 9 x 1.25
BRI70901	Fire Brick 9 x 4.5 1 x 1.25
BRI70902	Fire Brick 6.75 x 4.5 x 5.25 x 2

Part Number	Part Description
CAS70833 (8095 ONLY)	Casting-Small Baffle Plate
CAS71039	Casting-T Bar
CAS71040	Casting-Fuel Door 10 x 4
CAS71043	Casting-Ash Pan Door
CAS71044	Casting-Front Frame Gate
CAS71045	Casting-Partial Grate
CAS71046	Casting-Rear Frame Grate
CAS71047	Casting-Rocker Grate
CAS71048	Casting-S Hook for Rocker
CAS70832	Casting-Large Baffle Plate

Part Number	Part Description
FUR50010	Damper Plate
FUR50193	Damper Rod
GAS71083	Gasket Cement Caulk
GAS71085	Draft Fan Blower Gasket
GAS71089	Gasket Rope-5/8" (3.5') For Ash Pan Door
GAS71089	Gasket Rope-5/8" (4.5) for 10 x14 Fuel Door
HAR70532	50 CFM Draft Blower
HAR71096	Circulation Blower
HAR71099	4-Speed Replacement Motor
HAR71100	Fan Limit Switch
HAR71101	Fan Control Center

Appendix C: Warranty Claim Procedure

We make every effort to ensure that all **Royall** heating appliances and components adhere to our strict standards and safety. 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** heating appliance functioning safely and efficiently as intended.

Please register online at <http://www.Royallfurnace.com/>

<u>Parts</u>	<u>Units</u>
To make a warranty claim on faulty parts provided with an Royall heating appliance, please contact your Royall dealer.	To make a warranty claim on a faulty Royall heating appliance, please contact your Royall dealer.
If your Royall dealer is unavailable:	If your Royall dealer is unavailable please contact us at 800-944-2516
1. Please complete a <i>Warranty Claim Form</i> and return it to us. All warranty claim requests must be made in writing; verbal warranty claim requests will not be processed.	When contacting Royall for a warranty claim on a faulty Royall heating appliance, please have the following information ready: <ul style="list-style-type: none"> • Model number • Serial Number • Purchase Date • Purchaser Name, Address, and Telephone
The following information is required when submitting a warranty claim: <ul style="list-style-type: none"> • Model number • Serial Number • Purchase Date • Purchase Name, Address, and Telephone 	Additionally, if you have not mailed in your <i>Warranty Registration Card</i> , we will require a completed <i>Warranty Registration Card</i> to be returned to us along with dated proof of purchase (i.e. a copy of the receipt or invoice).
2. Additionally, if you have not mailed in your <i>Warranty Registration Card</i> to be returned to us along with dated proof of purchase (i.e. a copy of your receipt or invoice.) We may also request a copy of the Service & Maintenance Log located in the Appendix of your Owner's Manual. Without this information, we will not be able to complete your requested warranty claim.	We may also request a copy of the Service & Maintenance Log located in the Appendix of your Owner's Manual. Without this information, we will not be able to complete your requested warranty claim. All transportation charges are to be paid for by the purchaser.
Once we receive your completed <i>Warranty Claim Form</i> and <i>Warranty Registration Card</i> , we will ship a replacement for the faulty part(s). All transportation charges are to be paid for by the purchase. However, if a faulty part is to be returned to us, we will provide return-shipping via a call-tag.	

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

Royall Wood/Coal Furnace

LIMITED WARRANTY

Who is covered?

You are covered under this warranty if you are the original purchaser of a new Royall solid-fuel heating appliance and your purchase was made through an authorized distributor/dealer of the Royall solid-fuel heating appliance.

How long does the coverage last?

The term of this warranty begins on the date of 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

- **Castings.** The castings are warranted for one (1) year and include the fuel loading door, ash removal door, hearth plates, and grates.
- **Electrical Components.** The electrical components are warranted for one (1) year and include, but are not limited to, the draft damper control motor or combustion fan, and all components of the control box.

What is covered by this warranty?

This warranty covers any defects in materials or workmanship in your new Royall solid-fuel heating appliance.

What is not covered by this warranty?

This limited warranty does not apply:

- If your appliance has not been installed, operated and maintained in strict accordance with instructions provided in the Installation, Operation and Maintenance Manual.
- If any part has been damaged in shipment, modified, altered, tampered with, abused, or has been subject to accident or misuse.
- If your appliance has been altered or repaired in a manner which, in our sole judgment, affects its performance, stability or reliability.
- If parts not made or supplied by us have been used in connection with the appliance, if in our sole judgment, such use affects its performance, stability or reliability.
- To transportation charges on appliances and appliance parts submitted for repair or replacement under this warranty.
- To expendable, replaceable or wear items, such as firebrick, gaskets/seals, paint, handles and other items that in our judgment are expendable, replaceable or wear items.
- To any heating system or systems to which the appliance may be attached.

- To any of the 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 appliance has been installed, or to the person or persons and property therein, arising out of the use, or installation of the Royall appliance. The appliance must be installed in compliance with the state, local national building and fire codes and regulations of the area and in strict adherence to the Manufacturer's recommendations.

What will we do to correct problems?

We will repair, or at our option, replace any Royall solid-fuel heating appliance or appliance 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 authorized ENERGY KING dealer. If there is no Royall dealer in your area, contact Ark Alloy, LLC, directly. Provide your name, address, phone number, serial number and model number of the furnace, date of purchase, name and address of installer and a description of the problem.

Disclaimer of Implied Warranties & Consequential Damages

Our obligation under this limited 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 with respect to the sale or use of the items warranted. Such incidental and consequential damages shall include but not be limited to: transportation / freight charges, cost of installation, duty, taxes, charges for service or adjustment, loss of income, rental or substitute equipment, and expenses due 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 ARK ALLOY, 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 ARK ALLOY, LLC, AT ITS HOME OFFICE.

YOUR RESPONSIBILITY UNDER THE WARRANTY

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

It is your responsibility to read the Installation, Operation & Maintenance Manual and to install, operate and maintain the appliance in accordance with all instructions and safety procedures. Failure to do so is a misuse of the appliance.

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

It is your responsibility for any cost incurred by the distributor/dealer for travel to transportation of the product for the purpose of performing a warranty obligation or inspection.

Supplement A: Fan/Limit Control

The following document was prepared and published by Honeywell International for distribution with their models L4064B2640/B fan limit controls.

It is reproduced here for reference purposes ONLY.

Honeywell

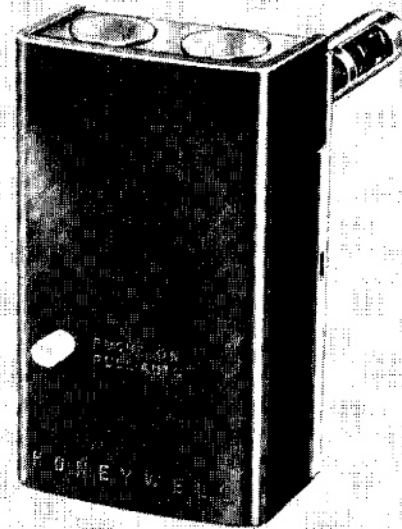
L4064 COMBINATION WARM AIR FAN AND LIMIT CONTROLLERS ARE SUITABLE FOR ALL TYPES OF FORCED AIR HEATING SYSTEMS.

- L4064A-F,J and R turn fan on and off according to plenum temperature.
- L4064T,W,Y and have a bimetal heater switch which turns fan on approximately 20 to 90 seconds under normal conditions after the thermostat calls for heat. Fan turns off according to plenum temperature.
- The L4064B,D,F,R and W have a manual fan switch which overrides the fan set points and keeps the fan running continuously.
- The L4064J and R have a special high temperature range suitable for gravity heating systems (gas, oil, coal, wood).
- Variety of fan and high limit setting ranges available.
- Standard wire push-in terminals and female receptacles are provided to speed installation.
- Rigid or swivel bracket mounting, or surface mounting.
- Suitable for line voltage, low voltage, or millivoltage control applications.
- Slotted wiring knockouts for easy installation.
- Strain relief bushings included with SUPER TRADELINE models protect wiring from field abuse.
- L4064 adapts to most competitive mounting holes for ease in replacement installations.
- SUPER TRADELINE models include deluxe case with mounting adapters for easy installation.

D.Y.
REV. 1-85●

Form Number 68-0024—1
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FAN AND LIMIT CONTROLLERS



L4064A-F, J,R,T,W,Y

SPECIFICATIONS

IMPORTANT

THE SPECIFICATIONS GIVEN IN THIS PUBLICATION DO NOT INCLUDE NORMAL MANUFACTURING TOLERANCES. THEREFORE, THIS UNIT MAY NOT MATCH THE LISTED SPECIFICATIONS EXACTLY. ALSO, THIS PRODUCT IS TESTED AND CALIBRATED UNDER CLOSELY CONTROLLED CONDITIONS, AND SOME MINOR DIFFERENCES IN PERFORMANCE CAN BE EXPECTED IF THOSE CONDITIONS ARE CHANGED.

SUPER TRADELINE MODELS

SUPER TRADELINE models offer features not available on TRADELINE or standard models, and are designed to replace a wide range of Honeywell and competitive models. SUPER TRADELINE models are selected and packaged to provide ease of stocking and handling as well as maximum replacement value. Specifications for SUPER TRADELINE models are the same as those of standard models except as noted below.

SUPER TRADELINE MODEL AVAILABLE:

L4064B Fan and Limit Controller.

SUPER TRADELINE FEATURES INCLUDE:

- Universal adapters for 5/8, 3/4, and 1 in. diameter elements.
- Deluxe (large) case with cover.
- Wiring space for related controls.
- Mounting means—surface or rigid bracket.
- Two round wiring knockouts in top and 2 slotted in bottom of case.
- 857780AFC Stripped Wire (2) with 1/4 in. [6.4 mm] male flag connector attached.
- 110265A Rigid Bracket, single wiring with No. 8-32 setscrew.
- 127123 Steel Bushing with 135236 Wire Snap Ring to adapt insertion element to 1 in. [25.4 mm] hole in plenum.
- 137813 Strain Relief Bushing (2).
- Cross reference label and special instruction sheet.

TRADELINE MODELS

TRADELINE models offer features not available on standard models, and are designed to replace a wide range of Honeywell and competitive models. TRADELINE models are selected and packaged to provide ease of stocking and handling as well as maximum replacement value. Specifications for TRADELINE models are the same as those of standard models except as noted below.

TRADELINE FEATURES INCLUDE:

- Small case with cover.
- Wiring space for related controls.
- Two slotted wiring knockouts in bottom.
- 861503ANT female flag quick-connect terminals with 7 in. of No. 18 leadwire (2).
- 857780AFC male flag quick-connect terminal with 5 in. of No. 14 leadwire (2).
- Cross reference label, warning tag, and special instruction sheet.

ORDERING INFORMATION

WHEN PURCHASING REPLACEMENT AND MODERNIZATION PRODUCTS FROM YOUR TRADELINE WHOLESALER OR YOUR DISTRIBUTOR, REFER TO THE TRADELINE CATALOG OR PRICE SHEETS FOR COMPLETE ORDERING NUMBER, OR SPECIFY—

1. Order number.
2. Insertion depth—L4064A,B,E,F,J,R,T,W,Y only.
3. Adjustable high limit stop, if desired (include desired set point).
4. Accessories, if desired.

IF YOU HAVE ADDITIONAL QUESTIONS, NEED FURTHER INFORMATION, OR WOULD LIKE TO COMMENT ON OUR PRODUCTS OR SERVICES, PLEASE WRITE OR PHONE:

1. YOUR LOCAL HONEYWELL RESIDENTIAL DIVISION SALES OFFICE (CHECK WHITE PAGES OF PHONE DIRECTORY).
2. RESIDENTIAL DIVISION CUSTOMER SERVICE
HONEYWELL INC., 1885 DOUGLAS DRIVE NORTH
MINNEAPOLIS, MINNESOTA 55422-4386 (612)542-7500

IN CANADA—HONEYWELL LIMITED/HONEYWELL LIMITEE, 740 ELLESMERE ROAD, SCARBOROUGH, ONTARIO M1P 2V9. INTERNATIONAL SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES OF THE WORLD.

STANDARD MODELS

MODELS: L4064A-F,J,R,T,W and Y Fan and Limit Controllers. See Tables I and II. Table I gives specifications in Fahrenheit degrees. Table II gives specifications in Celsius degrees.

TABLE I—L4064 SPECIFICATIONS IN DEGREES FAHRENHEIT.

MODEL	SENSING ELEMENT	MANUAL FAN SWITCH	SCALE RANGE	FAN-ON RANGE	FAN-OFF RANGE	HIGH LIMIT RANGE
L4064A	Helical bimetal	No	50 to 250	65 to 215	50 to 200	100 to 250
L4064B		Yes				
L4064C	Flat, spiral bimetal	No	250			
L4064D		Yes				
L4064E	Helical bimetal	No	80 to 350	100 to 305	80 to 290	150 to 350
L4064F		Yes				
L4064J	Helical bimetal	No	50 to 250	None—fan comes on 20 to 90 sec. after call for heat ^a	50 to 200	100 to 250
L4064R		Yes				
L4064T	Helical bimetal	No	50 to 250	None—fan comes on 20 to 90 sec. after call for heat ^a	50 to 200	100 to 250
L4064W		Yes				
L4064Y		No				

^aTime will vary, depending on the voltage applied to the special fan switch heater and on the temperature surrounding the fan switch.

TABLE II—L4064 SPECIFICATIONS IN DEGREES CELSIUS.

MODEL	SENSING ELEMENT	MANUAL FAN SWITCH	SCALE RANGE	FAN-ON RANGE	FAN-OFF RANGE	HIGH LIMIT RANGE
L4064A	Helical bimetal	No	10 to 121	18 to 102	10 to 93	38 to 121
L4064B		Yes				
L4064C	Flat, spiral bimetal	No	121			
L4064D		Yes				
L4064E	Helical bimetal	No	27 to 177	38 to 152	27 to 143	66 to 177
L4064F		Yes				
L4064J	Helical bimetal	No	10 to 121	None—fan comes on 20 to 90 sec. after call for heat ^a	10 to 93	38 to 121
L4064R		Yes				
L4064T	Helical bimetal	No	10 to 121	None—fan comes on 20 to 90 sec. after call for heat ^a	10 to 93	38 to 121
L4064W		Yes				
L4064Y		No				

^aTime will vary, depending on the voltage applied to the special fan switch heater and on the temperature surrounding the fan switch.

ELECTRICAL RATINGS (amperes):

	120 Vac		240 Vac		24 Vac		
	FAN	LIMIT	FAN	LIMIT	FAN	LIMIT	TIMER
Full Load	14	8	7	4	—	—	—
Locked Rotor	84	48	42	24	—	—	—
Max. Amp	—	—	—	—	—	2	.2

Pilot Duty—2 A at 25 Vac; 0.25 A at 0.25 to 12 Vdc.
 Maximum Combined Connected Load—2000 VA.
 L4064T—timer circuit 24 V, 0.085 A.
 HIGH LIMIT DIFFERENTIAL: 25 F [14 C].
 LIMIT STOP SETTING: 160 F to 250 F [72 C to 121 C] in 10 F [5.6 C] increments (specify when ordering).
 MINIMUM SWITCH OPERATING TEMPERATURE:
 L4064A-F,J,R—minus 40 F [minus 40 C].
 L4064T,W,Y—plus 50 F [10 C].
 MAXIMUM SWITCH OPERATING TEMPERATURE:
 L4064A-F,J,R—190 F [88 C].
 L4064T,W,Y—115 F [46 C].
 MAXIMUM ELEMENT TEMPERATURE:
 L4064A-F,T,W,Y—350 F [177 C].
 L4064J,R—250 F [121 C] above limit setting.
 MAXIMUM SURFACE MOUNTING TEMPERATURE:
 190 F [88 C].

MOUNTING DIMENSIONS: See Fig. 1.

MOUNTING MEANS:

L4064A,B,E,F,T,W,Y—rigid or swivel bracket or surface mounting.
 L4064C,D—surface mounting only.
 L4064J,R—rigid or swivel bracket mounting only.

ELEMENT DIMENSIONS:

L4064A,B,E,F,J,R,T,W,Y (helical)—3/4 in. [19.1 mm] diameter; 5, 8, or 11-1/2 in. [127, 203.2 or 292.1 mm] insertion.
 L4064C,D (flat spiral)—1-1/2 in. [38.1 mm] diameter; 1-1/2 in. [38.1 mm] insertion.

ADJUSTMENT MEANS: Adjustable levers on scale-plate.

FINISH: Zinc-plated steel.

WIRING KNOCKOUTS:

L4064A-F,J,R—two in bottom of case, slotted for easy installation.
 L4064T,W,Y—has two knockouts in bottom of case slotted for easy installation.

SUPER TRADELINE versions have two additional knockouts at the top of the case.

UNDERWRITERS LABORATORIES INC. APPROVALS:
 L4064A,B,C,D,T LISTED—File MP466, Guide MBPR;
 L4064E,F,J,R,T,W and Y COMPONENT RECOGNIZED—File MP466, Guide MBPR2.

ACCESSORIES:

1. 110265A Rigid Bracket—single wing, with No. 8-32 setscrew.
2. 129250A Rigid Bracket—double wing, with No. 8-32 setscrew.
3. 32612A Swivel Bracket.
4. 137813 Strain Relief Bushing (2).
5. 857780AFC leadwires (2) with 1/4 in. [6.4 mm] male flag connectors attached.

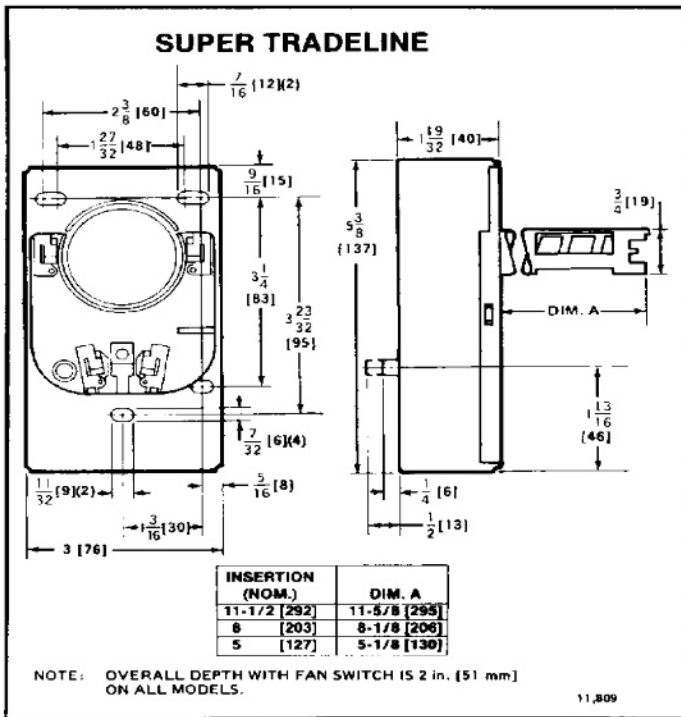


FIG. 1—MOUNTING DIMENSIONS IN in. [mm IN BRACKETS] OF SUPER TRADELINE MODEL.

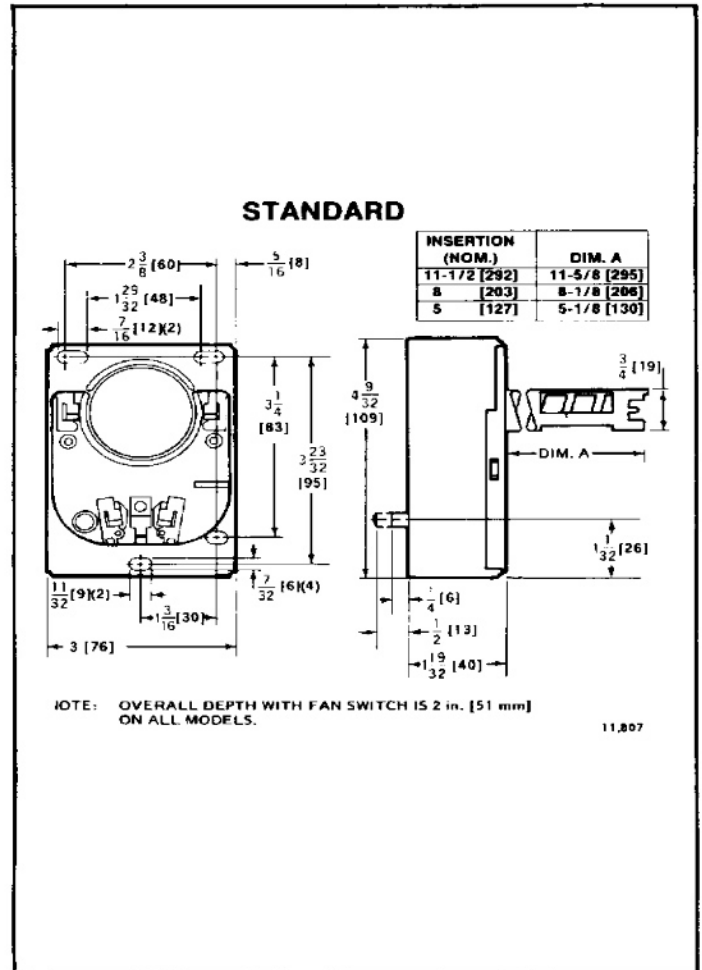


FIG. 2—MOUNTING DIMENSIONS IN in. [mm IN BRACKETS] OF STANDARD AND TRADELINE MODELS.

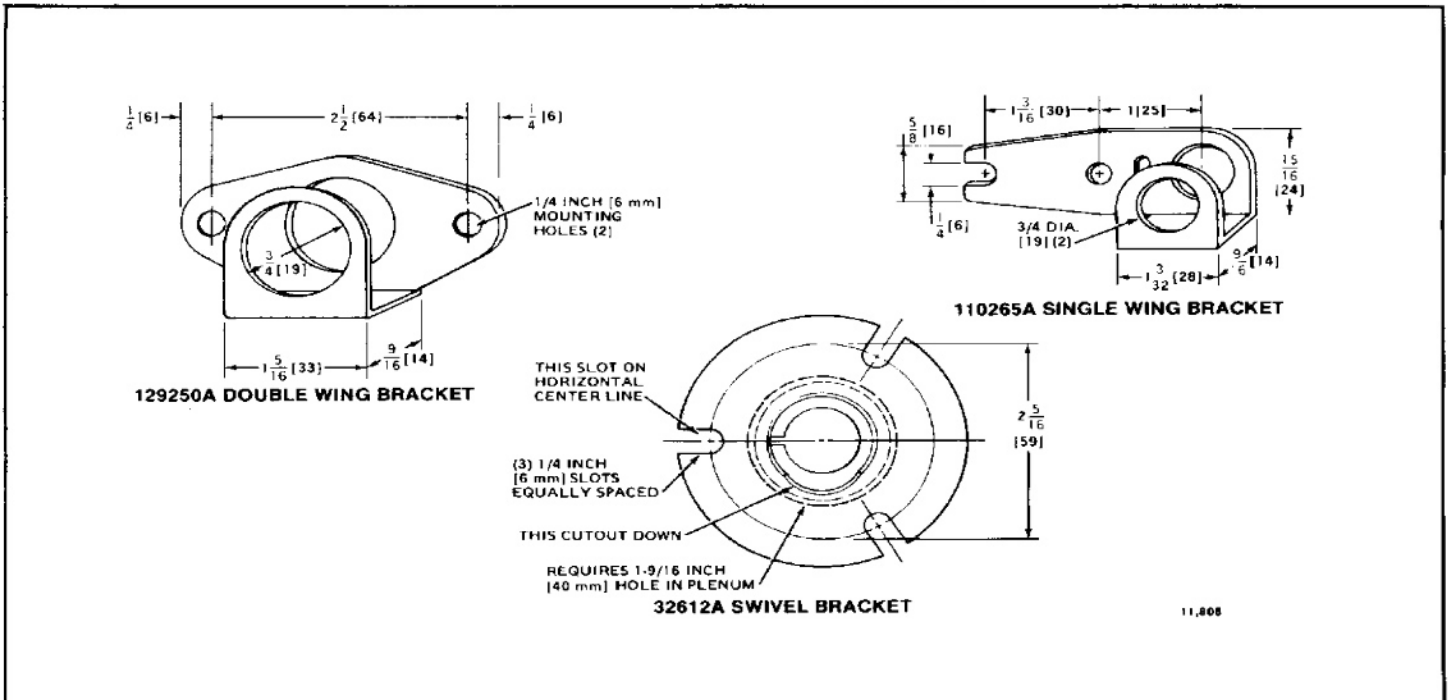


FIG. 3—MOUNTING DIMENSIONS IN in. [mm IN BRACKETS] OF BRACKETS.

INSTALLATION

WHEN INSTALLING THIS PRODUCT. . .

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

WARNING

Failure to remove brass jumper, if limit switch is in low voltage circuit, can cause electrical shock hazard or damage low voltage controls.

CAUTION

1. Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.
2. When connecting cable or conduit to control, avoid straining the control case.

Follow furnace or burner manufacturer's instructions, if available. Do NOT exceed the ratings and limitations given in this section.

LOCATION

If this is a replacement installation, locate the L4064 in the same location as the control being replaced. Sensing tube length should be same as old control. If this is a new installation, the element should be installed only by a trained, experienced service technician according to the furnace manufacturer's instructions. The element must not touch any internal part of the furnace.

NOTE: The electrical rating is at maximum switch temperature of 190 F [88 C]. If plenum surface temperature exceeds 190 F [88 C], heat insulating material or mounting bracket must be used. The L4064J,R require the use of a bracket in gravity systems.

MOUNTING

The devices may be mounted as follows:

- L4064A,B,E,F,T,W,Y—surface mounting or bracket (rigid or swivel).
L4064C,D—surface mounting only.
L4064J,R—bracket (rigid or swivel) mounting only.

SURFACE MOUNTING

L4064A,B,E,F,T,W,Y

Hole in plenum should be just large enough to accommodate the 3/4 in. [19.1 mm] diameter element tube. For adequate clearance, a 13/16 in. [20.6 mm] diameter hole is recommended.

L4064C,D

Hole in plenum should be 1-9/16 in. [39.7 mm] diameter to accommodate the 1-1/2 in. [38.1 mm] diameter element.

ALL MODELS

1. Remove cover by squeezing sides and pulling off. Insert element in plenum and mark location of mounting holes. Make sure the case is snug against the plenum before marking the mounting holes.
2. Punch or drill holes for mounting screws.
3. Place insulation between plenum and case if necessary.
4. Fasten controller securely with mounting screws.

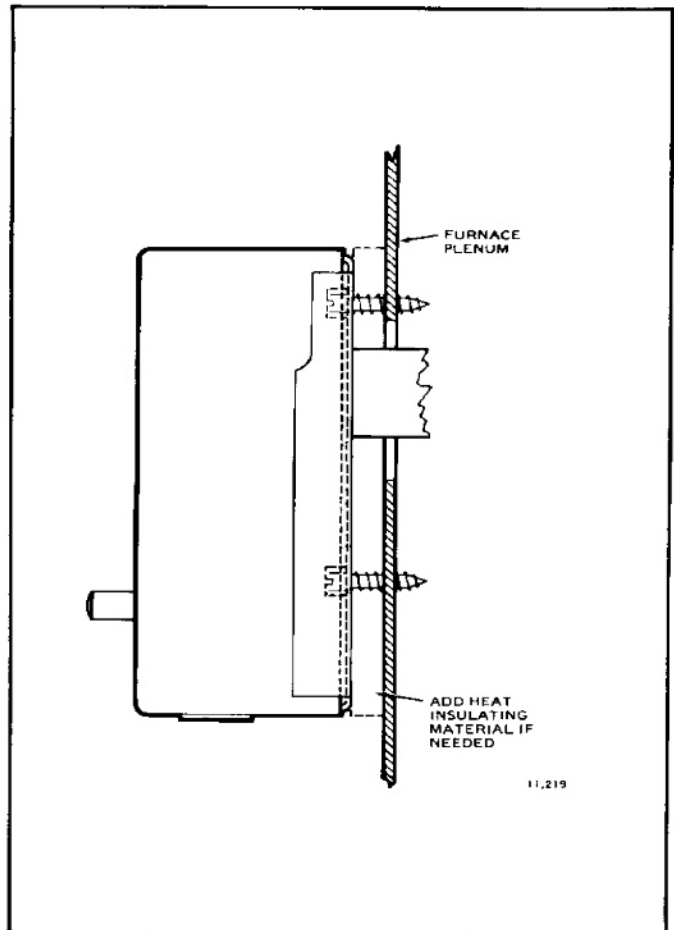


FIG. 4—SURFACE MOUNTING FOR L4064. THE L4064C AND D REQUIRE A 1-1/2 in. [38.1 mm] HOLE FOR ELEMENT INSERTION; ALL OTHER MODELS REQUIRE A 13/16 in. [20.6 mm] HOLE.

SWIVEL MOUNTING

L4064A,B,E,F,J,R,T,W,Y may be swivel-mounted. The swivel bracket requires a 1-9/16 in. [39.7 mm] hole in the plenum (Fig. 5).

1. Use bracket as a template to make the location of mounting holes in plenum. Drill or punch holes for mounting screws.
2. Fasten the bracket in place with furnished screws. Start the screws but do not tighten.
3. Insert element tube through bracket, straighten controller, and fasten. Tighten the mounting screws securely. It may be necessary to rotate the bracket to tighten all screws securely.

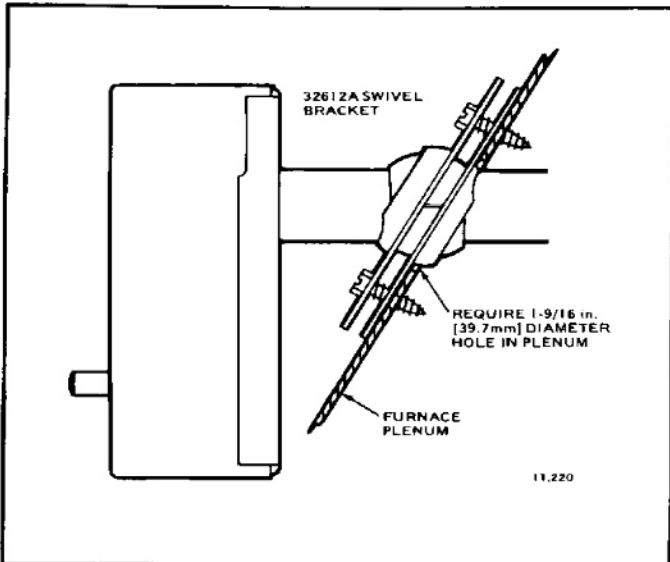


FIG. 5—SWIVEL MOUNTING. REQUIRES A 1-9/16 in. [39.7 mm] DIAMETER HOLE FOR ELEMENT INSERTION.

RIGID BRACKET MOUNTING

WARNING

When mounting control on bracket, setscrew **MUST** strike tube frame, **NOT** sensing element. If setscrew strikes sensing element, the safety limit function can fail and cause fire hazard.

L4064A,B,E,F,J,R,T,W,Y may be mounted using a rigid bracket. The rigid bracket requires a hole 13/16 in. [20.6 mm] diameter for element insertion (Fig. 6).

1. Use bracket as a template to mark the location of mounting holes in plenum. Drill or punch holes for mounting screws.
2. Fasten bracket in place with furnished screws. Tighten the screws securely.
3. Insert element tube through bracket, straighten controller and fasten by tightening setscrew. Be sure screw strikes tube frame and does not strike coiled bimetal sensing element.
4. For replacement installations with existing 1 in. [25.4 mm] diameter hole. SUPER TRADELINE models are supplied with split steel bushings and wire snap ring. Follow the instructions below for using the steel bushing adapter.

STEEL BUSHING ADAPTER (SUPER TRADELINE models)

1. Insert one-half of the split steel bushing through the wire ring (Fig. 7). It may be necessary to spread the ring slightly.
2. Insert the other half of the steel bushing into the ring making sure tabs and ears are at the same ends.
3. Place bushing assembly on element, ear end first.
4. Holding bushing at seams, push firmly to the control end of element.
5. Insert element tube with adapter through bracket, straighten controller and fasten by tightening setscrew. Be sure screw strikes bushing and not coiled bimetal sensing element.

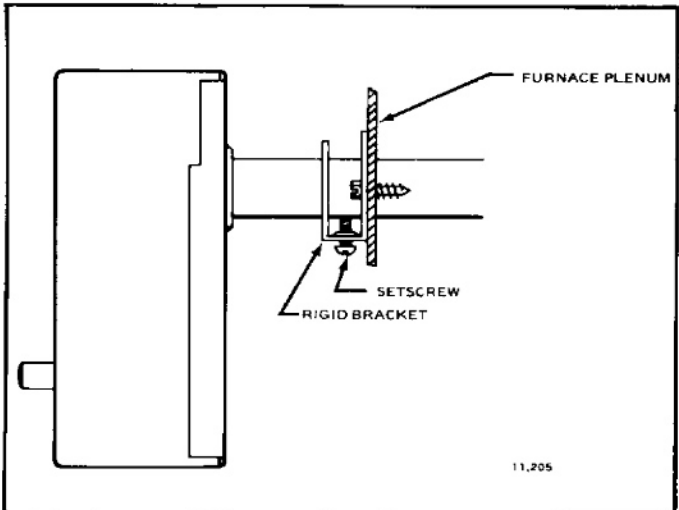


FIG. 6—RIGID BRACKET MOUNTING REQUIRES A HOLE 13/16 in. [20.6 mm] DIAMETER FOR ELEMENT INSERTION.

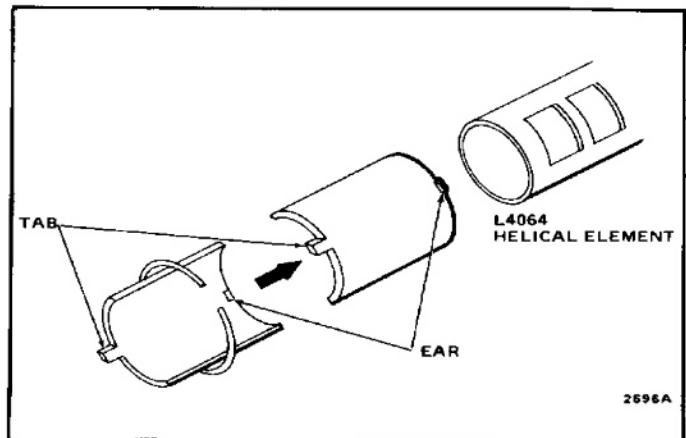


FIG. 7—USING SUPER TRADELINE ADAPTER.

WIRING

Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

All wiring must comply with local electrical codes and ordinances or in the absence of local codes with the National Electrical Code ANSI CI-1981—NFPA 70. Follow burner or furnace manufacturer's instructions if available; otherwise, see Figs. 12 and 13 and proceed as follows.

IMPORTANT

The brass jumper is the breakaway type. It must be removed when the limit is used in the low voltage circuit. To remove jumper, break with a needlenose plier and remove completely. Once removed, it is not replaceable. See Fig. 11 for location.

The slotted knockouts on the bottom of the case and the strain relief bushing (supplied with SUPER TRADELINE models) are provided to simplify the installation procedure and to protect the wires.

1. To remove the slotted knockout(s), use a needlenose pliers as shown in Fig. 8 and pull straight down.

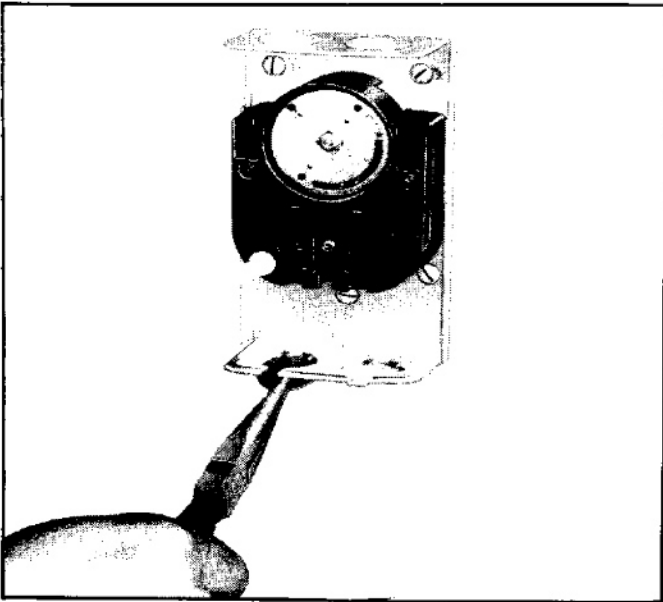


FIG. 8—REMOVING SLOTTED KNOCKOUTS FROM SUPER TRADELINE MODELS.

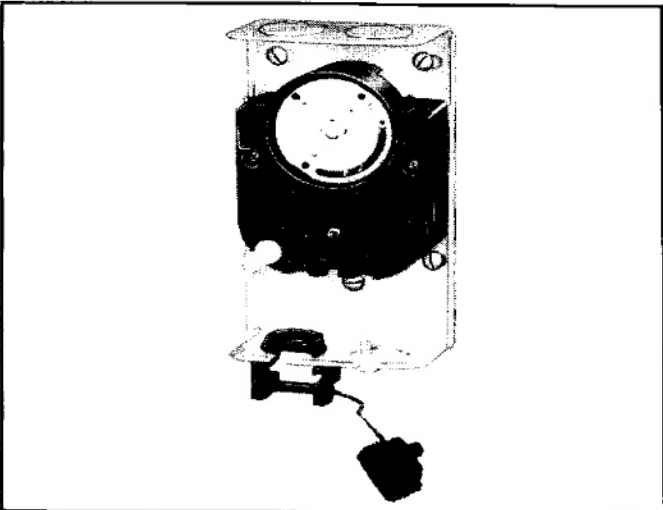


FIG. 9—INSERT STRAIN RELIEF BUSHING.

2. If cable is used, we recommend using a strain relief bushing in the knockout (Fig. 9). Bushing is available from your local electrical supply. The open side of the bushing should face the open side of the knockout.

3. Refer to the following section for types of wiring connections (standard wire push-in terminals or female receptacle).

4. If strain relief bushing is used, close the movable gate when all wires have been connected to the terminals (Fig. 10).

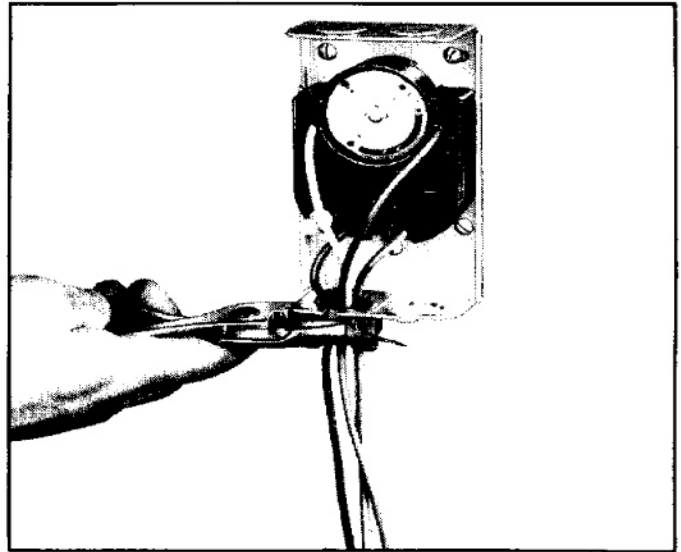


FIG. 10—CLOSING THE STRAIN RELIEF BUSHING.

WIRING CONNECTIONS

When connecting cable or conduit to this controller, use care to avoid strain on the control case. Connections can be made to standard wire push-in terminals or female receptacles for 1/4 in. [4.6 mm] male flag connectors on both the fan and limit switches (Fig. 11). L4064T,W,Y has male push-in terminal for low voltage heater, which requires a 1/4 in. [4.6 mm] female flag connector.

FOR STANDARD WIRE PUSH-IN TERMINALS

Connect wires to the terminals as follows:

1. Use Nos. 14, 16, or 18 solid wire or Nos. 14 or 16 stranded wire, depending on electrical requirement.
2. Strip insulation from wires the distance shown by the strip gauge on the controller. If wire insulation is 4/64 in. [2 mm] thick, strip additional 1/4 in. [6 mm] to ensure wire seats securely in push-in connectors.
3. Solid wire may be inserted directly into the terminal holes. If stranded wire is used, insert a small screwdriver into the slot next to the terminal. Push screwdriver in and hold while inserting wire into terminal (Fig. 11). Remove screwdriver. If stranded wire is solder-dipped, it can be pushed directly into terminal holes.

FOR FEMALE RECEPTACLES

It is recommended that the female receptacles be used for wiring accessory equipment; i.e., electronic air cleaner, humidifier, etc.).

Connect wires to the receptacles as follows:

1. Use Nos. 14 to 18 size wire, depending on electrical requirement.
2. Attach 1/4 in. [4.6 mm] male flag connector to each wire. Two 1/4 in. male flag connectors with leadwires are supplied with TRADELINE and SUPER TRADELINE models.

3. Push male flag connector directly into the female receptacle. Make sure that the flag is forced to the bottom of cavity and wire is in the channel (Fig. 11).

IMPORTANT

Make certain all wires are clear of rotating scaleplate.

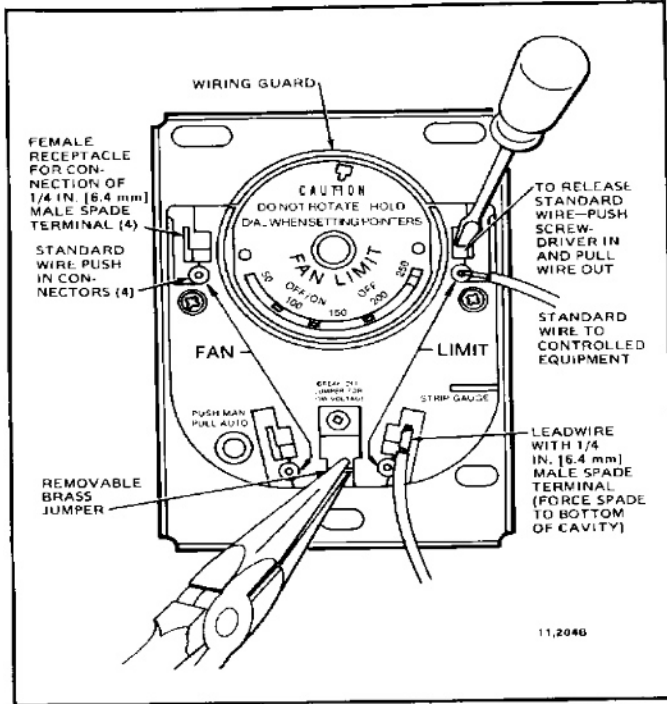
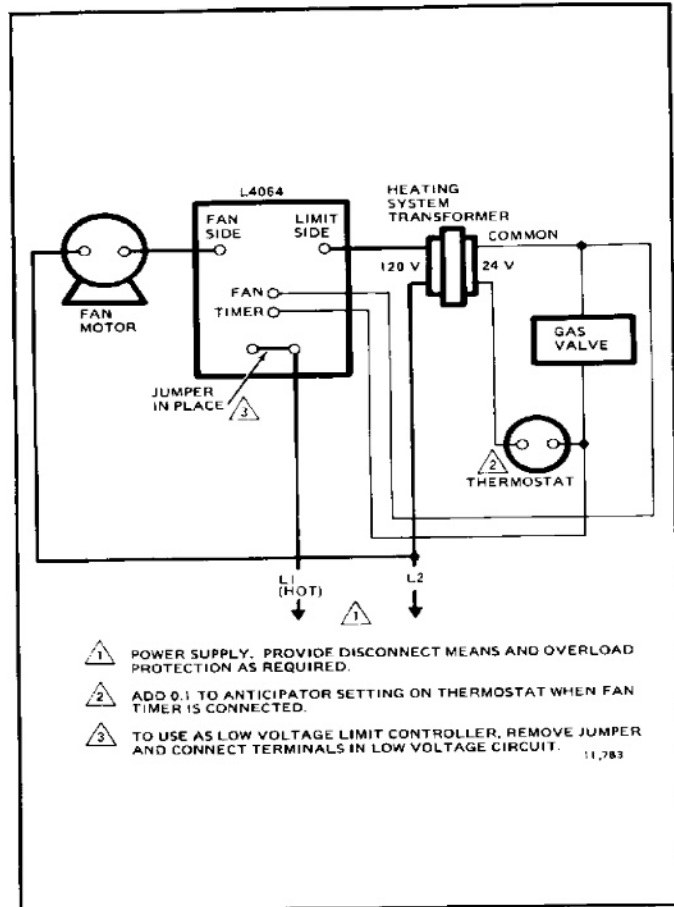


FIG. 11—LOCATION OF WIRING CONNECTIONS.



- 1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
- 2 ADD 0.1 TO ANTICIPATOR SETTING ON THERMOSTAT WHEN FAN TIMER IS CONNECTED.
- 3 TO USE AS LOW VOLTAGE LIMIT CONTROLLER, REMOVE JUMPER AND CONNECT TERMINALS IN LOW VOLTAGE CIRCUIT.

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FIG. 12—L4064T,W,Y 3-WIRE LINE VOLTAGE HOOKUP.

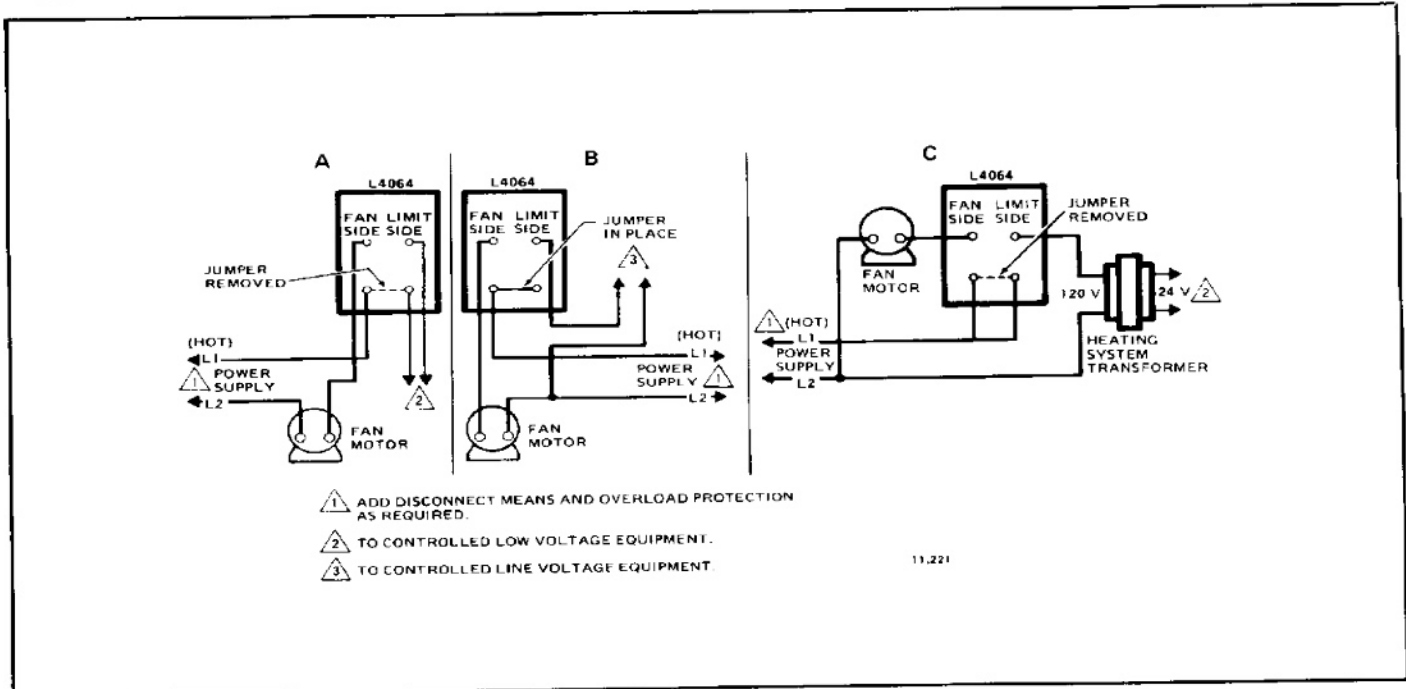


FIG. 13—A: LIMIT IN LOW VOLTAGE CIRCUIT.
 B: LIMIT IN LINE VOLTAGE CIRCUIT.
 C: LIMIT IN LINE VOLTAGE CIRCUIT WITHOUT JUMPER.

SETTINGS AND ADJUSTMENTS

CAUTION

When adjusting the fan and limit set point lever (Fig. 14), hold the scaleplate dial to keep it from turning and straining the sensing element.

IMPORTANT

The L4064T,W,Y use a bimetal heater, in the fan switch, to turn on the fan 20 to 90 seconds* after a call for heat. When the call for heat ends, the fan will continue to run until the fan-off temperature is reached and the bimetal heater switch cools down (2 to 4 minutes). If the L4064T,W or Y is used to replace an L4064A or B, the blower fan may circulate cool air until the plenum heats up. No adjustment of the fan-on time is possible.

Move each set point lever to the control point recommended by the burner or furnace manufacturer. Use gentle finger pressure.

FAN SETTING ADJUSTMENT

1. Move the FAN OFF lever to the temperature at which the fan is to stop to prevent circulation of cool air.

2. Move the FAN ON lever as follows:

L4064A-F—FAN ON range is from 15 F [8.3 C] above the FAN OFF setting to 35 F [19.4 C] below the LIMIT OFF setting.

L4064J,R—FAN ON range is from 20 F [11.1 C] above the FAN OFF setting to 45 F [24.9 C] below the LIMIT OFF setting.

L4064T,W,Y—Move the FAN ON lever as needed for setting the FAN OFF indicator and LIMIT indicator. The FAN ON indicator is nonfunctional on the L4064T; a special bimetal heater acts to turn on the fan 20 to 90 seconds* after a call for heat from the thermostat. On-time will vary, depending on the voltage applied to the bimetal heater and on the temperature surrounding the fan switch.

With connected bimetal heater, fan-off settings will be determined according to Tables III and IV. If not connected, then operation is the same as all other devices.

TABLE III
L4064T,W,Y FAN-ON TIME FROM A COLD START (IN SECONDS)

AMBIENT TEMP. °F	HEATER WRAPPED BIMETAL FAN SWITCH APPLIED VOLTAGE								
	23.0 V			24.0 V			27.6 V		
	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.
50	50	80	120	40	60	90	20	30	40
72	40	60	100	30	50	80	15	25	35
115	30	50	80	20	40	70	10	20	30

NOTE:

- "Fan-off" lever is set at 120° F.
- Lower "fan off" settings will increase "fan-on" timings.

TABLE IV
L4064T,W,Y FAN OFF TIME (SECONDS)

AMBIENT TEMP. °F	HEATER WRAPPED BIMETAL FAN SWITCH APPLIED VOLTAGE								
	23.0 V			24.0 V			27.6 V		
	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.
50	45	75	120	50	90	140	85	130	190
72	55	120	200	60	120	220	90	165	260
115	60	140	235	85	165	270	110	200	280

NOTE:

- The "fan-off" lever is set at 120° F. (Lower setting will decrease fan off time, higher setting will increase fan off time.)
- The bimetal heater is energized once for 15 minutes.
- The fan will keep running until the bimetal timing mechanism (built-in) cools down to below 115° F and the L4064T,W,Y primary sensor temperature drops below the fan off set point. Table IV represents bench test timings where the entire L4064 is at the indicated ambient temperature.

MANUAL FAN SWITCH (L4064B,D,F,R,W)

For constant fan operation (overriding fan setting levers), push the FAN switch button in. For fan to cycle automatically, pull button out.

LIMIT SETTING ADJUSTMENT

These controls have a limit stop which prevents the limit indicator lever from being adjusted beyond the equipment manufacturer's specifications.

1. Push a stiff wire through hole in scaleplate to depress the stop disc not more than 1/16 in. [1.6 mm] to release stop lock (Fig. 14). Stop disc is on back of scaleplate.

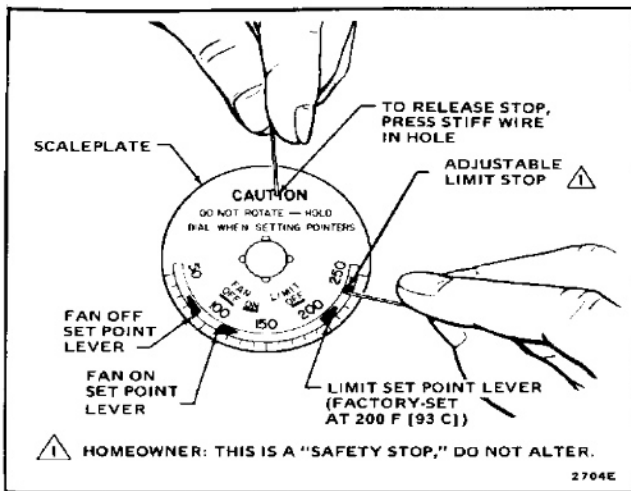


FIG. 14—CHANGING THE HIGH LIMIT STOP.

2. When depressing the stop disc, insert another stiff wire next to limit stop (Fig. 14) and use this wire to move stop to desired setting. If the L4064 is a replacement control, the high limit stop setting should be the same as that of the control being replaced. (Move stop clockwise to lower the setting, counterclockwise to raise it.) Then remove both wires.

3. Set the LIMIT OFF lever to the temperature at which the high limit switch is to open to stop the burner. If the high limit stop has been properly set, the LIMIT OFF lever should be as high as the stop permits.

**The fan on timing can vary depending on applied voltage and switch ambient.*

OPERATION

L4064A-F,J,R—As the plenum temperature rises, the coiled, bimetal sensing element of the control warps and mechanically makes the fan contacts (at the FAN ON temperature setting). During normal operation, the call for heat ends before the LIMIT setting is reached and the fan contacts break as the plenum temperature falls and the FAN OFF setting is reached.

If the call for heat continues until the temperature in the plenum rises to the LIMIT setting, the bimetal element will mechanically break the limit contacts and de-energize the heating control circuit.

L4064T,W,Y—The operation of the L4064T,W,Y are the same except that the controller uses a bimetal heater in the fan switch to make the switch contacts independent of the bimetal sensing element. This heater acts to anticipate the rise in plenum temperature and turns on the fan 20 to 90 seconds* after the thermostat calls for heat. Actual on-time will vary, depending on the voltage applied to the bimetal heater and on the temperature surrounding the fan switch.

**The fan on timing can vary depending on applied voltage and switch ambient.*

CHECKOUT

When installation is complete, disconnect the fan motor circuit at the L4064. Turn on power and set thermostat to call for heat. Burner should come on and limit controller should shut burner off when plenum temperature reaches the limit set point. Turn off power, reconnect the fan switch, turn on power and again set thermostat to call for heat. On L4064A-F,J,R fan should start when plenum temperature has reached fan-on

setting. On L4064T,W,Y, fan should start 20 to 90 seconds after a call for heat. Fan should shut off on all L4064 models (except L4064T,W,Y) when call for heat ends and plenum has cooled to fan-off setting. The L4064T,W,Y shut off the fan when the sensing element and the bimetal heater have cooled to the fan-off setting. This is usually 2 to 4 minutes after the call for heat ends.