INSTALLATION, OPERATING
and
SERVICE MANUAL

EPA NON CATALYTIC WOOD HEATER WFA-70
EPA WOOD/ELECTRIC WOOD HEATER WFA-70 E

All installations must be made in accordance with local and provincial or state codes which may differ from the manual.

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NOTICE TO HOMEOWNER:
READ THESE INSTRUCTIONS
SAVE THESE INSTRUCTIONS

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SOLID FUEL EPA WOOD HEATER MODEL WFA-70

General Instructions

It is the responsibility of the consignee of the wood heater to examine the package for damage and, if found, to note the same on the Carrier's Bill of Lading.

Package Contents:
#1 - Heat exchanger with all panels installed, blower with motor, belt and pulleys installed, filters installed, secondary air assembly installed, and instruction booklet in blower compartment. Brick rack, draft fan c/w thermostat, 2 brick, baffles and barometric draft regulator in firebox.

#2 - 3 Boxes of 8 Full Firebrick (24 bricks)

Installation

*Check with provincial, state or local codes concerning clearances, chimney requirements and other installation procedures before installation. Some codes may vary from the requirements set forth in this manual.

Minimum Installation Clearance From Combustible Material

FROM	MINIMUM CLEARANCE
Fire door end	48”
One Side	6”
Other Side (Walkway)	24”
Blower door end	30”
Flue Pipe	18”
Plenum and Takeoff Ducts to 6’ from Wood Heater	6”
Duct beyond 6' from Wood Heater	1/2”
Return air plenum and take off ducts to 6’ from wood heater	6”
Floor non-combustible	

Solid fuel or other combustibles must not be stored within the above clearances.

1. Install brick in firebox according to Fig. 2 and baffles according to Fig. 3. After brick is in position place 2” of sand in bottom of firebox. (Use pit sand only.) Install draft fan & thermostat according to Wiring Diagram Fig.4.

2. Do not use a manual flue damper with this wood heater.

3. **Caution**: If this wood heater is used as a replacement for an existing furnace observe the following:
   a. Make sure there is a minimum of 6” clearance above the warm air plenum and return as far as 6 feet out from the wood heater. Beyond 6 feet there must be a minimum of 1/2” clearance.
   b. Metal return air ducts must be used. (No combustible materials in return air ducts.)
   c. Use flue pipe as per B365 Clause 5.

This wood heater must be connected to a chimney approved for wood burning appliances, ie. ULC S629 (Canada) and UL103 (US), or a masonry chimney conforming to the requirements of provincial regulations or, in the absence of such regulations, to the requirements of the National Building Code of Canada. Newmac recommends a 7" round or 7" square chimney flue (inside dimension). It is the responsibility of the installer to ensure there is sufficient draft in all cases. Draft should be between -0.03 and -0.05 ins wc. No other appliance should be connected to this chimney flue, unless the installation conforms to clause 5 of B365.

amended May 2009

The installation must conform with the regulations of the local authorities having jurisdiction with the applicable Electrical Code, and with the regulations in C.S.A. Standard B365 "The Installation Code for Solid Fuel Burning Appliances and Equipment".

Flue pipe connections must be secured with metal screws and have as few elbows as possible. This wood heater should be installed by a qualified furnace serviceman.

Caution:
The flue collar is sized so that a trade size flue pipe fits snugly inside it. Joints in flue pipes, including the connection at the appliance and the chimney, shall have at least 30 mm (1 3/16 inch) over lap. Flue pipe connections must be secured with at least 3 metal screws or an equivalent mechanical means; and be made tight in accordance with good practice.
The flue products may contain carbon monoxide particularly when the wood fire is being starved for air (made to burn at slow rate). Therefore, the flue pipe must seal tight and must not be inserted into the return air stream of the circulating blower.
Wood storage should conform to local bylaws, and should not be within minimum clearances for combustible surfaces as shown above. This wood heater must be installed by a qualified serviceman.

NOTE:

COMBUSTION AIR: Where fans are used in the fuel storage area, they should be installed so as not to create negative pressures in the room where the solid fuel burning appliance is located.

OUTSIDE COMBUSTION AIR: Provision for outside combustion air may be necessary to ensure that fuel-burning appliances do not discharge products of combustion into the house. Guidelines to determine the need for additional combustion air or not may not be adequate for every situation. If in doubt, it is advisable to provide additional air.
Outside combustion air may be required if:

1. the solid-fuel-fired appliance does not draw steadily, experiences smoke roll-out, burns poorly, or back-drafts whether or not there is combustion present.
2. existing fuel-fired equipment in the house, such as fireplaces or other heating appliances, smell, do not operate properly, suffer smoke roll-out when operated, or back-draft whether or not there is combustion present;
3. any of the above symptoms are alleviated by opening a window slightly on a calm (windless) day;
4. the house is equipped with a well-sealed vapor barrier and tight fitting windows and/or has any powered devices which exhaust house air;
5. there is excessive condensation on windows in the winter; or
6. a ventilation system is installed in the house.

If these or other indications that infiltration air is inadequate, additional combustion air should be provided from the outdoors.

DUCT INSTALLATION: Not to be connected to ductwork that is still connected to another furnace.
Because the unit may be used as a gravity furnace when the power is off, the following is recommended:

1. Locate the furnace as centrally as possible in the home so the best warm air distribution may be enjoyed.
2. Use an extended plenum (central duct) at least one size larger than called for in National Warm Air Standards.
3. Use a minimum pipe size of six inches diameter in runs and in no case smaller than five inches diameter.
4. Slope extended plenums and runs as much as possible to facilitate gravity flow of warm air.

BELT TENSION: When adjusting the proper pulley setting make certain that the belt is able to flex approximately one inch without movement of the motor pulley.

IMPORTANT: This furnace must have a MINIMUM return air duct size equal to 250 sq. in. and a MINIMUM supply air duct size equal to 180 sq. in. The supply air extended plenum should extend 8 – 10 feet out from the wood heater, then gradually transitioned to the end of the duct system to provide a .20" W.C. static pressure.

HUMIDIFIER
Install the humidifier in the return air plenum. This prevents possible damage due to excessive temperatures when there is a power failure.
Metal connecting ducting from the warm air plenum is recommended rather than plastic ducting.

BURNING WOOD OPERATING INSTRUCTIONS

When installation is complete, close the supply switch and turn the thermostat above room temperature.
Check to make sure the forced draft fan above the fire door is operating when the thermostat is set above room temperature.
The draft fan should be off when thermostat is set below room temperature.
The maximum draft is not to be more than - .05 as damage may result to the furnace when operated as a gravity unit.
The circulating air blower speed is adjusted at the factory to give an adequate temperature rise under most conditions. However, because of various temperatures that can result from burning wood, the blower speed can be adjusted by the motor pulley. Under no circumstances should the temperature rise be more than 80^{o}F (27^{o}F).

NOTE:

Before loading the fire box, turn the thermostat up to insure that the draft fan is on. This provides an air curtain to avoid smoke roll out during loading and fans the coals to assist the ignition process of your new fuel. It also helps to promote draft when there is inadequate draft. After the fire is established, set the thermostat to desired temperature.
Turn TIMER PAST 2 HOURS AND SET LOCKOUT LEVER SO TIMER DOOR REMAINS OPEN. This allows Secondary Air into to firebox for necessary combustion air and clean burning. This timer door should remain locked open for normal operation.

To start the fire, turn up the thermostat to **Maximum** setting to turn **ON** Forced Draft Fan. Place some newspaper crumpled up in the bottom of the firebox on top of the minimum requirement of 2" of sand , ash or firebrick. Add some small kindling and light the fire. When the fire starts add some larger pieces of kindling or wood until you have a good fire. The idea is to ultimately end up with a good bed of ash and coals which helps to maintain a good controllable fire.

When reloading the firebox there will be a build up of ash and coals from the previous fire. Rake the coals mixed with ash to the front of the firebox which places the coals at the front. Load in your wood and the fire should light in a few minutes.

Return Thermostat in main living space to regular setting.

When the firebox gets full of ash (within two inches of door level), in the morning, before loading the firebox, push or rake the coals to the rear of the firebox. Remove the ash from the front of the firebox using the shovel supplied for this purpose. When the ashes only are removed from the front, rake the coals from the back to the front. Load with wood and the fire will again be burning in a few minutes. The fire burns best when the ashes are 3" to 4" below the fire door level.

For safe operating procedure, refer to the "Notice" label on the wood heater.

COMBUSTION AIR CONTROL
The amount of combustion air allowed to enter into the firebox can be controlled by means of the Daft Control slide on the draft fan mounting plate. Set this slide plate to the position that allows sufficient combustion air in for the type of solid fuel being burned. Normally the setting is in the center between maximum and minimum, then if additional control is needed it can be adjusted accordingly. For burning wood it will vary with size and type. DO NOT LET THE COALS/ASHES BUILD UP ANY HIGHER THAN HALF WAY UP THE FIRE BOX LINER. When there is a buildup of coals fully open the slide plate to reduce the coals.

POWER FAILURE
In case of prolonged power failure, remove the blower access door and air filters. The draft fan will be off, so if more combustion air is needed for the wood fire, open the slide plate. Return the slide plate to the normal position when power comes back on.
DO NOT CHARGE the fire box higher than half way up the liner as overheating may result.

FUEL

Seasoned cordwood will give the most heat. Your wood heater will burn most any type of firewood. Seasoned hardwood produces more heat, and will hold a fire longer, leaving a hotter coal bed than seasoned softwood. **Coal should never be used in a heater designed for burning wood.** Never use driftwood that has been in salt water. The salt content will cause corrosion that will destroy the stainless steel in the Class A chimney, the flue connector and the firebox.

Hard wood cut to 19” maximum length, and split 4” to 10” cross section is recommended for best operating efficiency.
CAUTION: Burn untreated firewood only. Wood containing preservative, metal foils, coal, plastic, garbage, sulfur or oil is environmentally hazardous and will damage the appliance.

LOADING OF FUEL

Do not overfill the firebox above the firebrick. A burned-out heat chamber may result. Do not use artificial or wax logs.

Build fire on the floor of the firebox. Do not use additional grates or andirons to support the fire as these may create excessive heat.

For the most heat, combustion air must be able to circulate around and through the fire. Do not block the air entrances inside the firebox with ashes. When loading each additional fuel charge, clear the ashes away from the lower primary air orifices at the bottom of the door opening.

PREPARATION AND STORAGE OF FUEL

Solid fuel should be cut and split prior to the heating season and stored in a well, aired dry place. Do not store fuel within the furnace clearances or within the space required for fuelling or ash removal. Fuel should be kept at least 5ft clear (1.5m) from the wood heater. The space around the wood heater should be kept free of litter and wood residue.

TYPES OF COMBUSTION AIR FOR WOOD HEATING

Unlike older airtight box heating appliances, low emission wood heaters have more than one location and control for supplying combustion air into the firebox. These additional air inlets allow for near complete combustion of wood gases and particulates. Thus it is important to understand how these different air supplies work.

PRIMARY AIR starts the fire. Opening or closing this air supply then regulates how fast the wood heater will burn. Primary air is supplied by the following: an adjustable slide plate to vary the burn rate and a room thermostat. Use the Primary Air Control (PAC) slide plate knob on the left side of draft fan to control the burn rate. Always start the fire with the PAC set on high and leave it on high until the secondary flames continue to burn after the PAC has been adjusted to a lower setting. Adjust the PAC accordingly when refueling. A hot coal bed requires less Primary Air to restart a fresh load of firewood.

The thermostat also controls the amount of primary air entering the unit by turning on the draft fan. Turn up the thermostat 10 to 20 minutes when reloading for a good start, then turn it down.

It is very important to keep the secondary flames burning to maximize heat output and minimize air pollution, so some experimentation will be necessary because each installation is different. Wood moisture content will also affect the amount of time that a unit will need to burn on high after each reload.

SECONDARY AIR allows the wood heater to burn clean. This preheated air enters the upper firebox just below the baffle plate. This superheated air mixed with the wood gases and flames ignites, reaching temperatures in the 1100F to 1600F range. Without Secondary Air these volatile gases would exit the wood heater unburned as creosote, smoke, particulates, and high levels of Carbon Monoxide, greatly decreasing efficiency. Heat comes from burning the wood gases, not the wood, which itself turns into black charcoal after the gases are all released. Secondary air increases a furnaces efficiency by approximately 40% greatly reducing the amount of wood required for a heating season (up to 1/3 less wood).

SECONDARY AIR TIMER (SAT) is located on the right side of the draft fan.
NEVER ATTEMPT TO BURN YOUR WOOD HEATER WITH THE TIMER KNOB SET IN THE OFF POSITION. THIS CLOSES OFF THE SECONDARY AIR AND YOUR WOOD HEATER WILL BURN DIRTY AND PRODUCE CREOSOTE.

THE SAT SHOULD BE LEFT IN THE OPEN POSITION AND LOCKED WITH THE TIMER STOP LEVER SET ON "HI" AND YOUR FURNACE WILL BURN OPTIMALLY. IT IS NOT NECESSARY TO USE THE TIMER EXCEPT IF YOU WISH TO EXTEND THE LENGTH OF THE COAL BED TIME, AFTER THE WOOD HAS FINISHED BURNING
The Secondary Air Timer (SAT) is used to control the duration of secondary air entering the wood heater. When burning the wood heater be sure the timer is set to open (Timer Knob past Two Hours and Timer Lever to "HI").

The SAT is only used if you wish to extend the coal bed time on Medium Low or Low setting. To do so:

1. GENTLY rotate Timer Knob clockwise to 2.5 to 3 hours for Medium Low and 3 to 3.5 hours for Low as designated on the timer plate.

2. Turn the timer lever down to "LO" to allow the timer to close. Observe that the timer closes after there are no more flames present

3. THE TIMER MUST BE OPENED AND THE LEVER SET TO "HI" BEFORE ADDING MORE FUEL.

4. The above settings are based upon a 15 foot chimney. The actual settings may vary slightly due to your chimney height and the outside temperatures. Taller chimneys and colder outside temperatures cause a furnace to burn faster. This means the SA timer does not have to be opened as long. The same is true of wood moisture – drier fuel will burn faster than wetter fuel.

WATCH YOUR CHIMNEY – If you cannot see any visible smoke coming out of your chimney, you are operating your wood heater correctly. If you can see smoke, then adjust what you are doing so the smoke disappears. Remember, smoke equals lost heat!

Rotate timer past 2 hours and then rotate timer stop lever towards "HI" position to lock secondary air open

For medium low and low burn rates turn timer to desired time setting and rotate timer stop lever toward "LO".



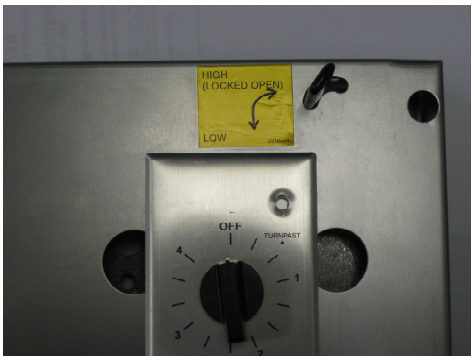
LIGHTING and OPERATION

1. IMPORTANT! – NEVER OPERATE THIS WOOD HEATER WITHOUT THE SECONDARY AIR TIMER IN THE LOCKED OPEN POSITION WHEN LIGHTING A FIRE OR RELOADING!
2. Set the PAC slider and the thermostat on HIGH to provide maximum draft.
3. Note that the Secondary Air Inlet is in the" LOCKED OPEN POSITION" See Fig. 1A and 1B.
4. Open loading door and start fire, using ample kindling to ensure rapid ignition.
5. Prime chimney if necessary by lighting dry newspaper at the very back of the firebox. A candle will also work and not smoke up the room if cold air blows out the newspaper.
6. Light fire and close loading door to 1 inch.
7. Wait 5 to 10 minutes then add smaller pieces seasoned firewood. (See section concerning Fuel).
8. Set the PAC slider to maintain desired temperature in room. Medium setting is normally satisfactory. Once fire is established set the slider to the desired burn rate, which will maintain a steady room temperature as the thermostat cycles.

Fig. 1A – Locked Open Position



Fig. 1B – Timer Operating Positioning



Note: Even when timer door closes some secondary air can still enter wood heater to maintain a bright coal bed.

CAUTION: Do not operate wood heater with the loading door open. Continuous operation with a door open will cause severe overheating and warping. This wood heater is designed for Thermostatic operation.

REFUELING

The loading door should be closed at all times except when refueling. Before opening the loading door, make sure the thermostat is turned up and the draft fan on. Allow the fire to burn rather briskly for a few minutes. Then open the loading door slowly. By allowing the fire to increase for a short period, a high draft condition has eliminated smoke in the firebox and the temperature has been raised which prevents a back or down draft.

MAINTENANCE

Failure to follow these instructions may result in poor efficiency, excessive corrosion of the heat exchanger and the possibility of a creosote fire.

DAILY: Clean out Ashes. Ashes must be put in a metal container with a lid on it before moving the ashes to the outdoors.

MONTHLY: Wood heater heat exchanger and flue pipe – Ashes must be removed on a minimum of a monthly basis depending on the ash build up. The complete heat exchanger and flue pipe should be thoroughly inspected for creosote deposits, ash buildup, etc. Creosote or ash deposits must be removed by scraping and/or brushing the deposits from the heat exchanger surfaces (the baffle may have to be removed, see Fig.3). An industrial vacuum cleaner may be used to assist in the removal of such deposits. A complete cleaning must be done immediately at the end of each heating season. If this is not done, condensation from the summer months, or any other source, will mix with the ash or creosote and cause corrosion of the heat exchanger. Corrosion is not covered under warranty.

NOTE: Establish a routine for the storage of firewood, care of the appliance, and firing techniques. Check daily for creosote buildup until experience shows how often cleaning is necessary. Be aware that the hotter the fire, the less creosote is deposited and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Have a clearly understood plan to handle a chimney fire.

CHIMNEY: Chemical chimney cleaners are not recommended as they could damage the wood heater heat exchanger and flue pipe. One of the most efficient methods to clean a chimney is to lower a stiff brush (chimney brush) tied to a heavy weight down the chimney on a rope. Work the brush up and down the chimney to scrape the accumulated creosote and soot off the chimney walls. Remove the residue from the cleanout at the base of the chimney.

ANNUALLY: In the spring, after the wood heater is shut down for the summer, clean the heat exchanger of all soot, ash and creosote accumulation, remove all ashes, clean the flue pipe and clean the chimney. KEEP THE FIREDOOR OPEN APPROXIMATELY 2” TO INSURE MOISTURE REMOVAL DURING SUMMER.

NOTICE

IMPORTANT:

- This wood heater is tested to CSA B366.1.
- This wood heater must be installed according to CSA Standard B365 “Installation Code for Solid-Fuel Burning Appliances and Equipment”.
- The solid fuel side of this wood heater is designed to burn wood only.
- Proper flue draft must be maintained to allow combustion gases to flow freely out the chimney.
- ONLY ULC S629-650 C or masonry chimney is acceptable.

FOR SAFE OPERATION:

- Load fuel carefully or damage may result.
- Do not load solid fuel higher than the fire box liner.
- Do not use chemical or fluid fire starters.
- Do not attempt to light a fire when there is oil vapour present.
- Minimum flue draft - .03” W.C.
- Maximum flue draft - .05” W.C.
- Do not burn garbage, manufactured fire logs, gasoline, naptha or crankcase oil.
- Keep the wood heater doors tightly closed except for refueling and cleaning.
- Maintain all door seals in good condition.
- To maintain wood heater efficiency and prevent soot fires, clean the heat exchanger, flue pipes, and chimney at the end of each heating season and as frequently as required during the heating season to prevent soot accumulation. The wood heater and flue must be in good condition. Turn off power to the wood heater when cleaning the wood heater and flue.
- Do not store fuel or combustible material within the wood heater clearances.
- Do not use salt wood (driftwood gathered from the seashore).
- Return air ducts are to be “metal” not “wooden”.

TO PREVENT DAMAGE:

- Do not set the flue draft above - .05” W.C. as the fire could burn out of control.
- Do not open the furnace door slide plate damper during normal operation.
- Wood heater requires a minimum of 2” of sand or wood ash in bottom of firebox.

SPECIAL PROCEDURES

POWER FAILURE:

1. Remove the blower access door and air filters for better air circulation. If the wood heater is in an enclosed area (furnace room) open the door to the room.
2. If equipped, to control the fire open the slide plate damper in the wood heater door. THIS DAMPER SHOULD BE CLOSED FOR NORMAL OPERATION.
3. Do not load the firebox higher than half way up the fire box liner.

SOOT FIRE

Close all sources of air that can reach the fire through the wood heater and draft regulator. Insure the draft fan above the fire door is turned off. Do not attempt to take the flue pipes down until the fire has been completely extinguished.

RUNAWAY FIRE

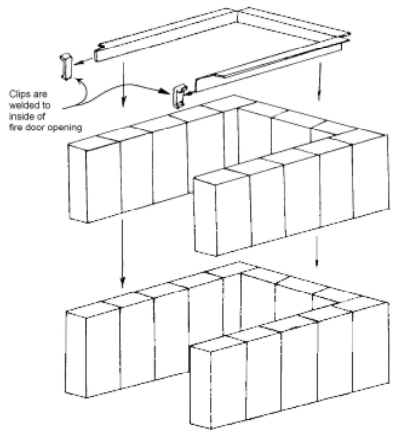
This can be caused by too high a flue draft or excessive fueling.

1. Close all sources of air to the wood heater. Insure draft fan is turned off.
2. Set the barometric draft regulator wide open to reduce draft. The excessive heat caused by a runaway fire may damage the wood heater safety controls. Their operation should be checked before the wood heater is returned to service. After a soot or runaway fire inspect chimney connection and chimney.

MINIMUM INSTALLATION CLEARANCES FROM COMBUSTIBLE MATERIAL

Fire door end – 48”
One side – 6”
Other side (walkway) – 24”
Blower door end – 30”
Flue Pipe – 18”
Plenum and takeoff ducts to 6’ from wood heater – 6”
Duct beyond 6’ from wood heater – 1/2”
Floor non-combustible

Fig. 2 –Firebox Installation Procedure



INSTALLING BRICK

1. Place one (1) brick on end in the center at back of wood heater
2. Place brick lock in wood heater brick lock hooks
3. While holding brick lock up, place one (1) brick on end on top of brick previously placed in back (this should hold brick lock up to correct height)
4. Install brick by starting at front, putting one (1) bottom brick in place then slide one (1) top brick in place. Repeat this procedure, going down both sides, and then do brick at back last.
5. Lower brick lock into place.

Fig. 3 –Secondary Air Installation Instructions

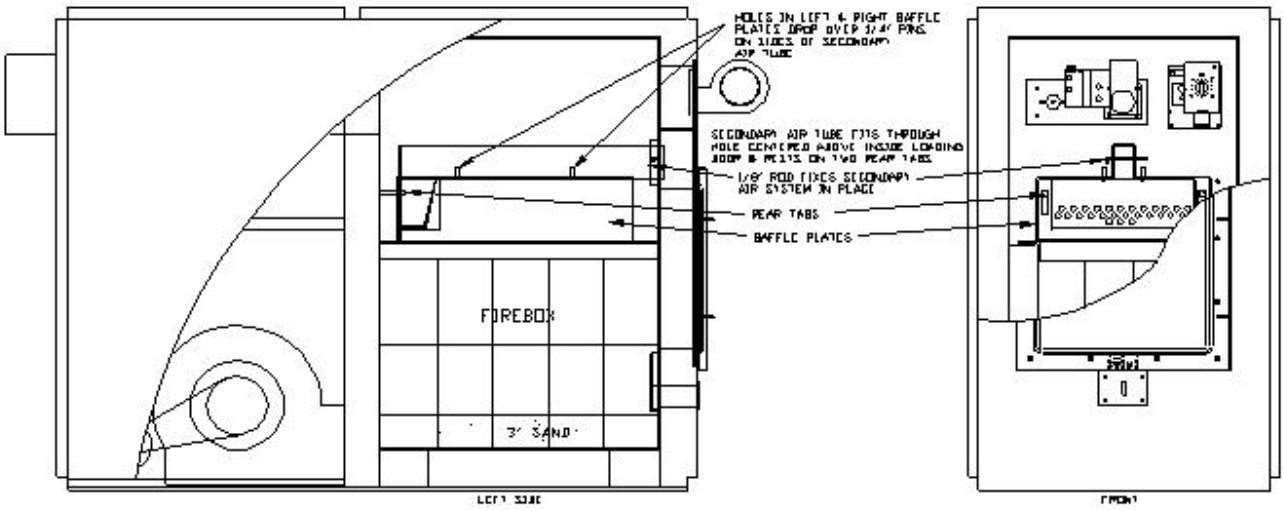


Fig. 4 – Wood Heater Wiring
(when equipped with R8222A Relay or equivalent)

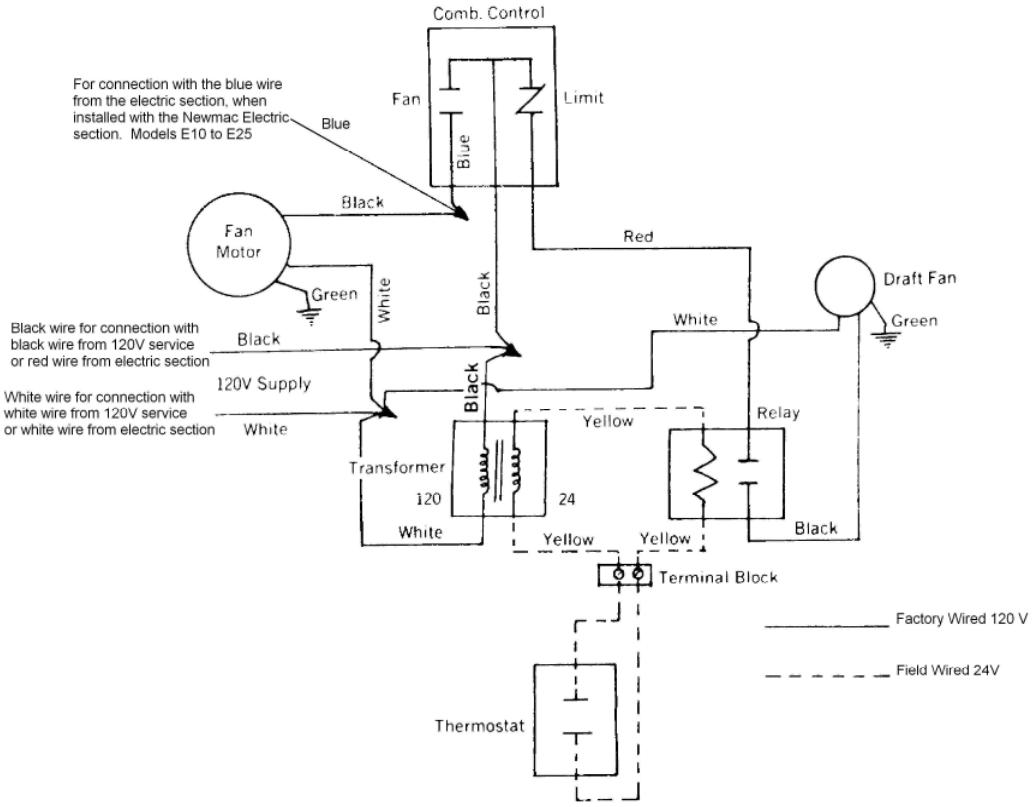


Fig. 5 – Control Location and Combustion Air Flow

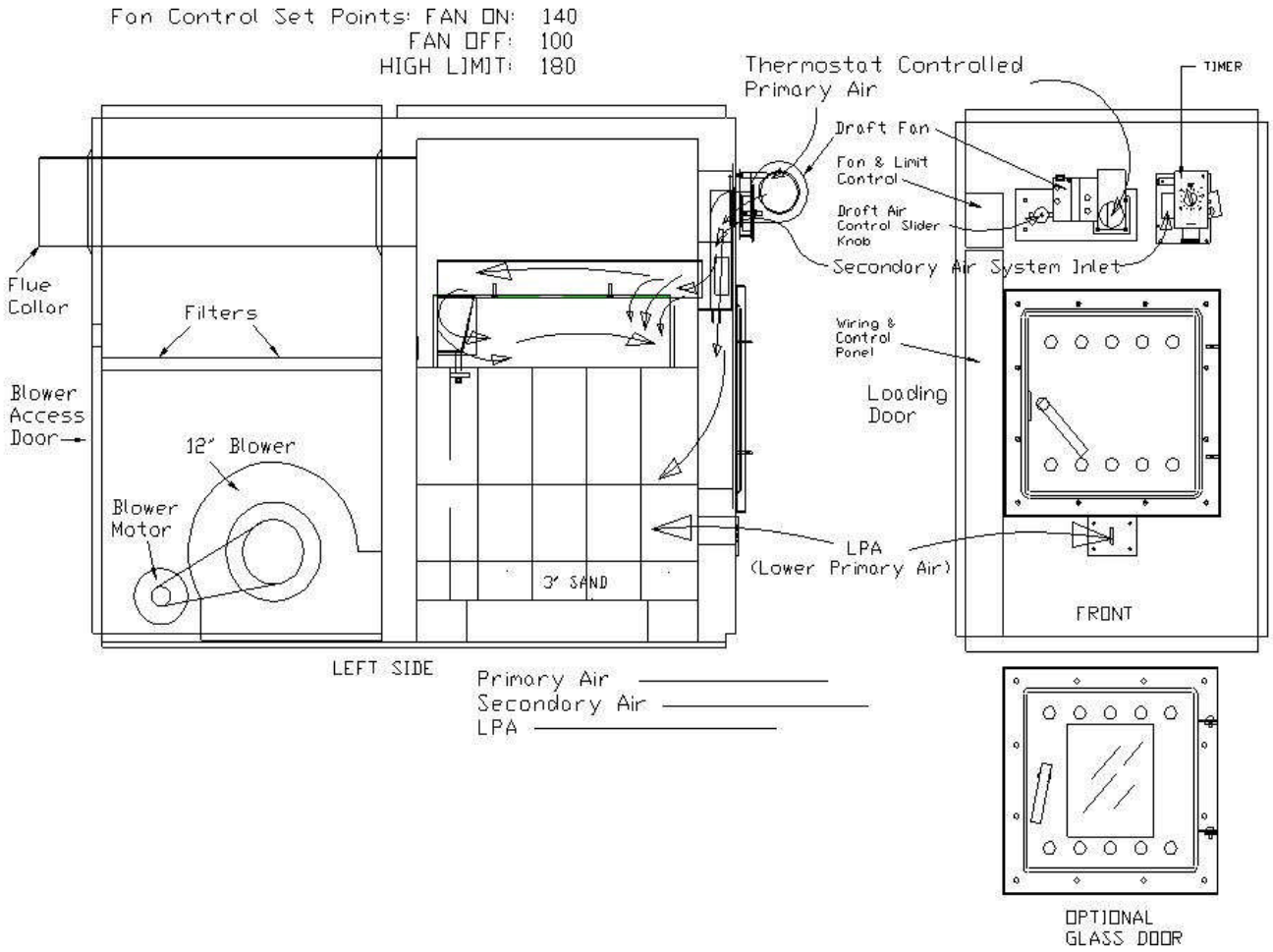
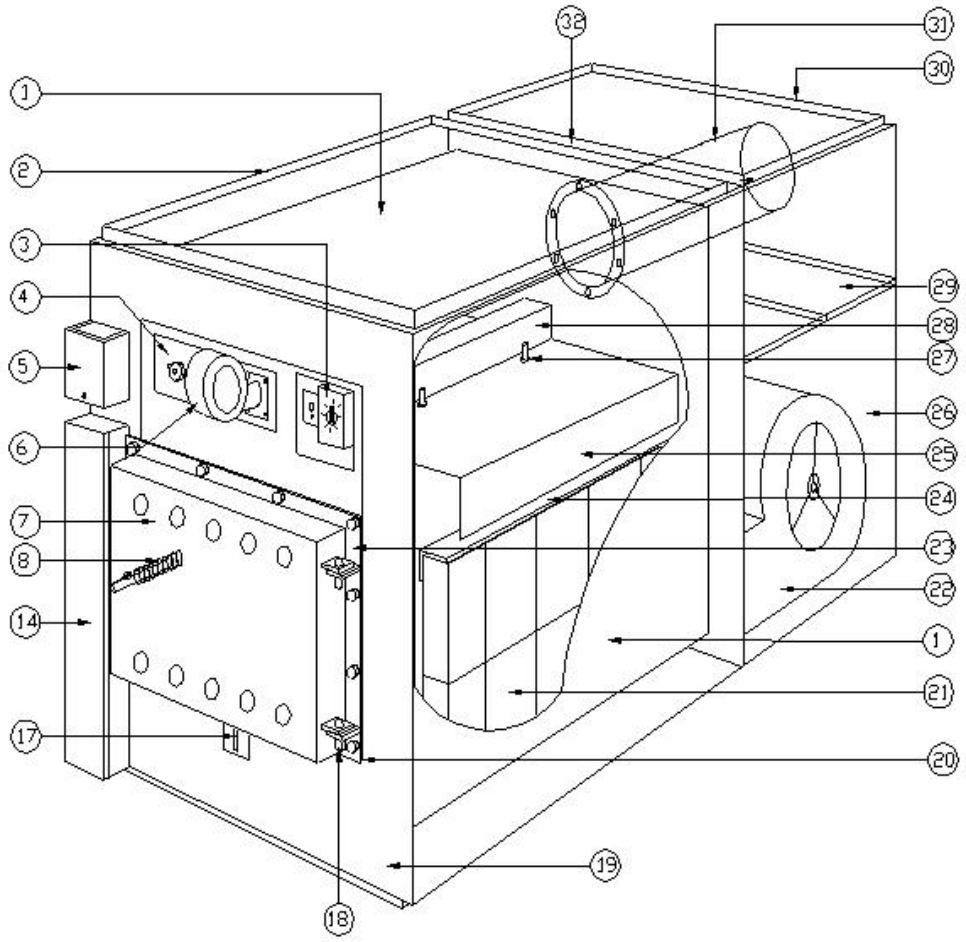
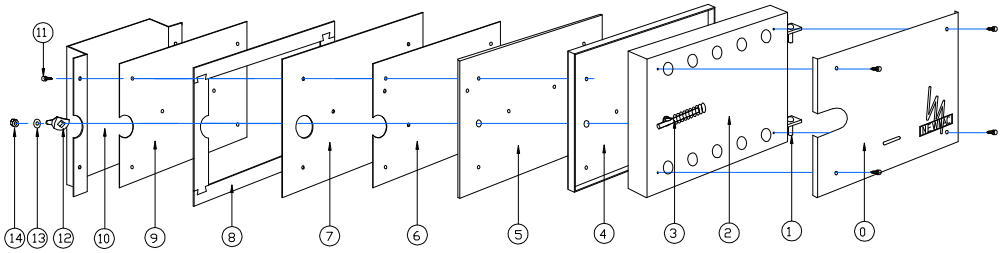


Fig. 6 – Wood Heater Parts List



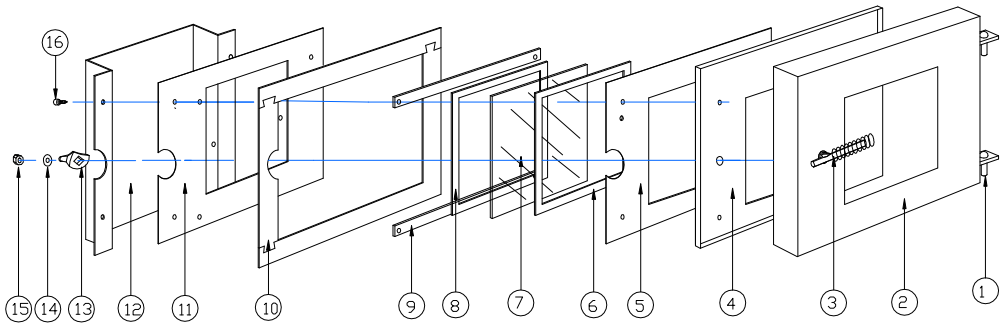
1	4060472	Heat Exchanger	21	2030010	Firebrick
2	4120211	LH Side Panel	22	2040103	Blower
3	4100162	Secondary Air Timer Assy	23	4110102	Firedoor Frame
4	5300012	Draft Slide Plate Assy	24	4060468	Brick Rack
5	2010017	Fan & Limit Control	25	3100714	Baffle (2 piece)
6	2040001	Draft Fan	26	4120321	Blower Access Panel
7	4120507	Firedoor Assy Less Frame	27		Baffle Pins (See #28)
8	5300009	Door Handle	28	4060466	Secondary Air System Assly
14	4120418	Control Channel Cover	29	2180001	Filters (2 – 12” x 24”)
17	3100716	Lower Primary Air Plate	30	4120504	Small Panel
18	2160001	Door Pins (2)	31	4060469	7” Stainless Steel Flue
19	4120506	Front Panel	32	4120421	Top Rail Panel
20		Firedoor Frame Insulator		5300020	Firedoor & Frame Gasket Set

Fig. 7 - Standard Firedoor Breakdown



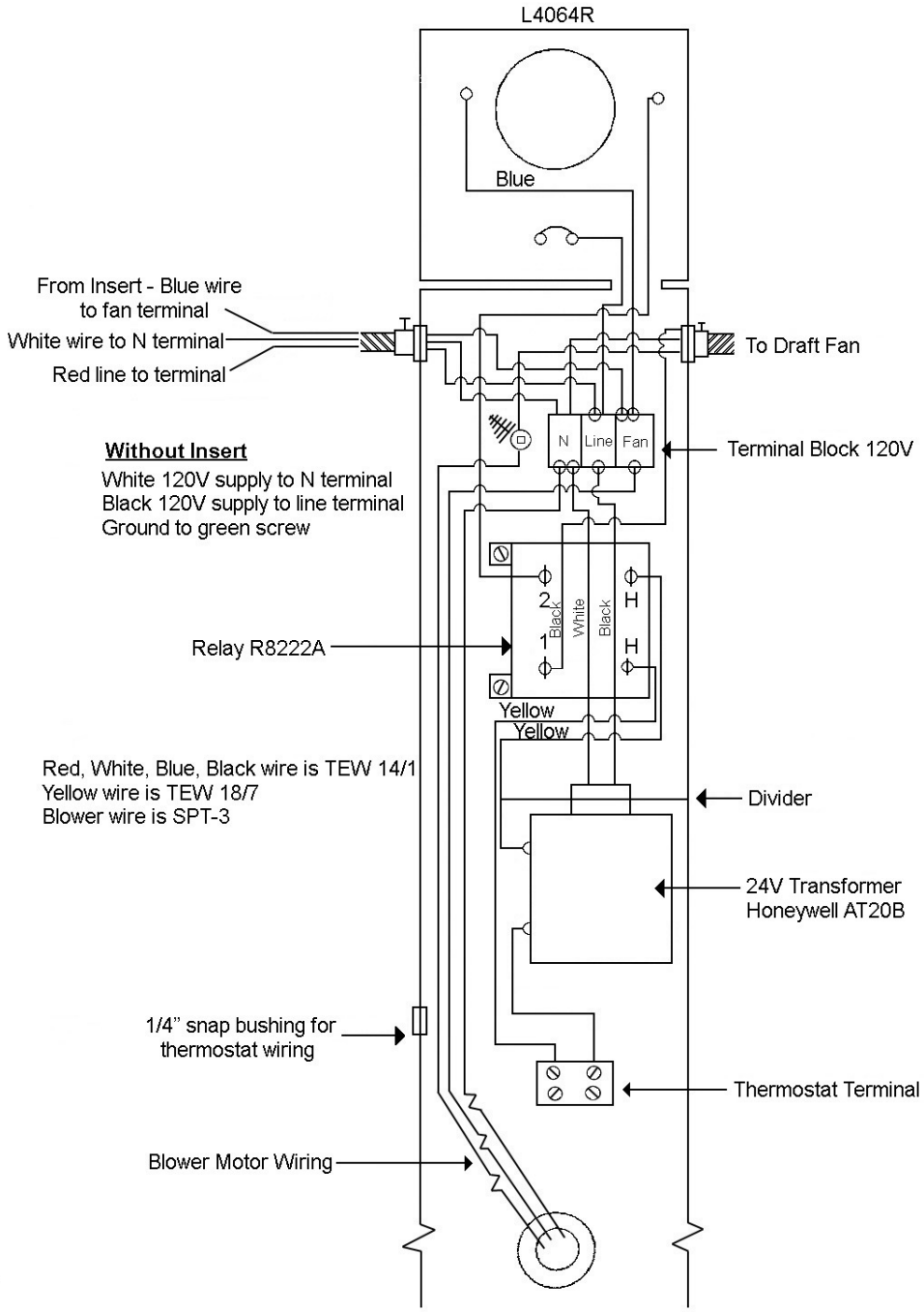
0		Firedoor Shield	8	2080002	Dovetail Set
1	2160001	Door Pins (2)	9	3160455	Liner
2	4120507	Firedoor Assly Less Frame	10	3160456	Air Chute
3	5300009	Firedoor Handle Complete	11		Bolts
4	3160362	Inner Panel	12		Latch (Part of 5300009)
5	2080111	¼" Insulation	13		Washer (Part of 5300009)
6	3160366	Spacer	14		Hex Nut (Part of 5300009)
7	2080017	Insulation			

Fig. 8 - Optional Glass Firedoor Breakdown



1		Door Pins (2)	9		Glass Retainers
2		Firedoor Assly Less Frame	10		Dovetail Gasket Set
3		Firedoor Handle Complete	11		20 GA Metal Plate
4		Inner Panel	12		Air Chute
5		¼" Insulator	13		Door Latch
6		Glass Gasket	14		Washer
7		5 MM Ceramic Glass (8"x10")	15		¼" Hex Nut
8		Glass Gasket	16		Lag Bolts (4)

Fig. 9 - Physical Wire Location



PREPARATION OF WOOD

Once I have my wood at home, how do I prepare it for burning?

The wood must be cut to length to suit the firebox of the stove, furnace, or fireplace in which it is to be burned. An 8' log may be cut into four, six or eight pieces, depending on the desired length. Splitting the wood greatly facilitates drying and reduces the wood to a more manageable size.

How much moisture is contained in wood?

Many softwoods have a moisture content in the vicinity of 55 percent when they are freshly cut. The popular hardwoods have moisture contents of about 45 percent. Air dried wood has a moisture content of about 15 percent and kiln dried wood may have a moisture content of less than 10 percent when it is fresh from the kiln.

What causes wood to rot?

When wood is cut, it is very susceptible to the growth of fungi, which converts the wood to water, carbon dioxide, and heat, just as does a fire. This rotting decreases the wood's energy. The fungi are most productive when three conditions are met: the temperature is between 60^0 F and 90^0 F, the wood's moisture content is above 30 percent, and ample oxygen is available. Thus, wood does not rot appreciably when it is dry, in the winter, or when it is submerged in the water, but it should not be allowed to lie on the ground during the summer.

How can this rotting be prevented?

When the wood has been cut into stovewood lengths, and split, it should be piled outside during the months of June, July, and August. Two poles should be placed on the ground to serve as rails to keep the firewood off the moist ground and the wood should be piled up in such a way that it is well exposed to the sun and the wind. The moisture content of the wood will drop until it reaches equilibrium with the ambient weather conditions. When the relative humidity is 60 percent, the equilibrium moisture content is about 11 percent. When the wood has reached this equilibrium moisture content, it is said to be "air dried." Around mid August, it should be placed under cover so that it will not reabsorb moisture from the rain and snow before it is used.

Why this concern about allowing the wood to dry?

Green or wet wood is undesirable for several reasons. Green or wet wood tends to mildew and rot which causes a significant reduction in the thermal value. When green or wet wood is burned, it may take 20 to 25 percent of the thermal value of the wood heat to evaporate and drive off the moisture, which is contained. Green wood does not burn easily and, in order to keep the fire burning, it is often necessary to add a lot of fuel and provide excessive draft, thereby decreasing the efficiency of the unit. The excess air needed for combustion must be heated and it escapes up the chimney wasting heat that should be used to heat the house.

What is creosote?

Wood smoke almost always contains some unburned gases and a fog of unburned tar-like liquids. Some of these materials will condense on the inside of the chimney, just as steam condenses on any cold surface. This condensation is a black, tacky, fluid when first formed. When it dries, it is flaky and shiny. Creosote has approximately the same thermal value as fuel oil. Not only does it reduce the effective size of the chimney, but an accumulation of this material constitutes a serious fire hazard.

Does green wood cause creosote?

Yes. Indirectly, green wood does cause creosote. The exhaust gases cool as they rise up the chimney. If the temperature falls below the dew point, any moisture contained in these gases will condense on the inside of the chimney, absorb the various products of incomplete combustion and form creosote. When green wood is burned, the exhaust gases carry a high moisture content in addition, because of the heat required for evaporation, these gases are cooler and more likely to condense than would be the case with dry wood.
Charcoal may be formed more readily if the unit is overcharged, particularly in milder weather. With overcharging (too much wood in unit) the draft fan will be off a greater percentage of time, coals will be

formed which will become covered with ash and in turn will smother the coals to form charcoal. Any coals in the furnace should be stirred before more wood is added to it.
The preceding is an excerpt from a document prepared by the Nova Scotia Energy Council and the Nova Scotia Research Foundation Corporation.

CREOSOTE AND CHIMNEY FIRES

Wood combustion is never perfectly complete. Wood smoke almost always contains some unburned gases and a fog of unburned tar-like liquids. Some of these materials will condense out of the flue gases onto any surface which is not too hot. The condensate is usually dark brown or black, and has an unpleasant acrid odor. It is called creosote. If condensed on a relatively cool surface (such as an exterior stovepipe chimney), the creosote will contain a large amount of water along with the organic compounds, and will thus be very fluid. Water is usually absent if the condensation occurs on surfaces hotter than 150^0F. The condensate may then be thick and sticky, like tacky paint or tar. Creosote may be found almost anywhere in a wood-heating system, from the top of the chimney to the insides of the cover itself.

Creosote which remains in a chimney after its initial formation may later be significantly modified both in physical form and chemical content. The water and the more volatile organic compounds tend to evaporate, leaving the more tar-like substances behind. If these are subsequently heated by the flue gases from a hotter fire (this usually happens), they themselves are further pyrolyzed to the same final solid product that wood is carbon. The physical form is usually flaky, and often shiny on one side. Partially pyrolyzed deposits can have a bubbly appearance. The flakes do not adhere strongly to a stove pipe and thus are easy to brush off; some of the other forms will not budge even under the action of a stiff wire brush.

The amount of creosote deposited depends mostly on two factors – the density of the smoke and fumes from the fire, and the temperature of the surface on which it is condensing. Highest smoke densities occur when a large amount of wood in relatively small pieces is added to a hot bed of coals and the air inlet damper is closed. Here, there is considerable pyrolysis of wood, but little combustion, and little air to dilute the smoke. In practice, creosote generation is higher during low-power, overnight, smoldering burns. Smoke densities are least when combustion is relatively complete, which tends to be the case when the amount of excess air admitted to the wood-burner is high. Leaky stoves, open stoves and fireplaces typically have the least creosote problems.

One way to lower the average smoke density in an airtight stove is to use less wood each time fuel is added, and/or to use larger pieces of wood. In either case, the air supply need not be turned down so much in order to limit the heat output and combustion is likely to be more complete. Of course, if less wood is added, stokings must be more frequent. A related procedure to limit creosote is to leave the air inlet moderately open after adding wood until the wood is mostly reduced to charcoal, and then close the inlet as much as desired. This will promote complete combustion during pyrolysis, when the creosote compounds are being formed, but there will be a significant heat surge while the gases are burning.

Extra air can also be added to the flue gases in the stove pipe; this is what the Ashley creosote inhibitor does. But the net effect of adding dilution air is not obvious or necessarily beneficial. Dilution air will decrease the smoke density, but it will also decrease its temperature. These effects have opposing influences on creosote formation. The National Fire Prevention Association states that dilution air increases chimney deposits. In any case, the cooling effect of dilution air does decrease the heat transfer through the stovepipe and chimney, thus decreasing the system's energy efficiency.

Creosote formation may also depend on the type of wood burned and on its moisture content. Dry hardwoods have a reputation for generating the least creosote, but the quantity can still be very large. No kind of wood eliminates creosote formation.

For a given smoke density near a surface, the cooler the surface, the more creosote will condense on it. The phenomenon is very similar to water vapor condensing on the outside of a glass of ice water on a humid day, except for an inversion – condensation occurs on the inside of a chimney, especially when cold air outside makes the inner chimney surface relatively cool. A stovepipe chimney outside a house on a cold day will be wet on the inside with creosote (including a lot of water) virtually all the time. A well insulated, pre-fabricated metal chimney has the least serious creosote problems; its insulation helps maintain higher temperatures on its inner surface, and its low heat capacity allows it to warm up very quickly after a fire is started. Masonry chimneys frequently accumulate deposits at the beginnings of fires and their interior surfaces take a longer time to warm because the construction is so massive. Any type of chimney which runs up the outside of a house is more susceptible to creosote problems than the same type of chimney rising in the houses' interior, due to the cooling effect of the colder outdoor air on the exterior chimney.

Average flue gas temperatures can be increased by minimizing the length of stovepipe connecting the stove to the chimney. This, of course, will also decrease the energy efficiency of the system, and it is often

true that measures which decrease creosote formation also decrease heating efficiency. For instance, stoves which have energy efficiencies due to their relatively good heat transfer (e.g. the Sevca, lange 6303 and double barrel stoves) are more likely to have chimney creosote problems precisely because they do such a good job extracting heat from the flue gases.

Generally creosote is inevitable and must be lived with. Any kind of chimney deposit decreases the system's heating efficiency. Soot and dried creosote accumulations have a significant insulating effect; less of the heat in the flue gases transferred into a house through dirty stovepipes and chimneys. The most annoying problem can be creosote dripping from a stovepipe or chimney, and the most dangerous problem is chimney fires, during which the creosote, or its pyrolyzed residue, burns.

Creosote dripping can usually be eliminated. Joints in vertical segments of stovepipe will not leak if, at the joints, the smaller, crimped ends always stick down into the receiving end. (Smoke will not leak out of the joints due to this direction of overlap.) Since this is not the usual orientation for stovepipe, a double male fitting may be necessary at some point to connect the stovepipe to the stove, a prefabricated chimney, or a rain cap. Special drip proof adapters are available for connecting some sizes of stovepipe to Metalbestos brand prefabricated chimneys. Common types of stovepipe elbows can leak creosote due to their swivel joints; rigid and accordion type leak proof elbows are available. Horizontal or gently sloping joints between horizontal pipes and/or fittings are the most difficult to seal against dripping. A good high temperature sealant can sometimes help, but is no guarantee. The joint must also be snug, and well secured with sheet metal screws. If all joints are made leak proof, then the creosote will generally drip into the stove, where, when the fire is hot, it will be burned.

Chimney fires occur when the combustible deposits on the inside of a chimney burn. The deposits may be 'raw' creosote, pyrolyzed creosote, or soot. Ignition requires adequate oxygen, which is usually available and sufficiently high temperatures the same conditions as for the ignition and combustion of any fuel. Chimney fires are most likely to occur during a very hot fire, as when cardboard or Christmas tree branches are burned, or even when a stove burns normal wood, but at a higher than normal rate. A crackling sound can often be heard at the beginning of a chimney fire. As the intensity of the fire rises, the stovepipe will sometimes shake violently, air will be very forcefully drawn in through the stove, and the stovepipe may glow red hot. A tall plume of flame and sparks can be seen rising from the top of uncapped chimneys.

The most effective way to suppress a chimney fire is to limit its air supply, although both water and salt are sometimes suggested if a relatively airtight stove is the connected appliance. This is easily done by closing the stove's air-inlet dampers, if all the stovepipe and/or chimney joints are tight, and if no other appliance is connected to the same flue.

In a properly designed and maintained chimney, the only potential hazard related to chimney fires is ignition of the building's roof or surroundings due to sparks and burning embers coming out of the top of the chimney. A spark arresting screen can decrease, but not eliminate this possibility, but spark screens themselves are often not suitable for use with wood fuel because they can become clogged. The chimney itself and the stovepipe, when properly installed, are intended to withstand an occasional chimney fire without danger of ignition of their surroundings. During a chimney fire, one ought to check the roof and surroundings, and possibly wet down critical areas. If the chimney may not be up to safety standards, one should also keep a close watch on all surfaces near the chimney.

Some people start chimney fires fairly frequently, as a means of chimney cleaning. This deters very intense chimney fires and the small ones which do happen are always under a watchful eye. Under some circumstances, this practice may be reasonable, but generally it is a risky method to keep a chimney clean. There is always some danger of a house fire, but in addition, any chimney fire is wearing on a chimney; the high temperatures increase the corrosion rate of metals and the thermal expansion of masonry materials encourage crack formation and growth.

Chemical chimney cleaners are available. Opinions on their effectiveness vary, but apparently when used regularly, and as directed, they work, and do not damage chimneys. The usual chimney cleaning method is the oldest human energy and some kind of mechanical tool. A stiff wire brush, a heavy chain (perhaps in a bag) hung with a rope and worked up and down from the top of the chimney, and very small brushes have all been used. Professional chimney sweeps are also reappearing.

Some people clean yearly, other after every few cords of wood burned, but there are so many factors influencing creosote build up that such generalizations are not appropriate in most particular cases. In new installations, or when changes occur (such as a different stove) the chimney should be checked frequently (after 2 weeks, then after a month, then after another 2 months, etc.) until it is clear how frequently cleaning is usually needed.

The preceding is an excerpt from "THE WOODBURNERS ENCYLOPEDIA" published by Vermont Crossroads Press, Inc. – Dec., 1976.

WOOD IS A SAFE CLEAN AND ECONOMICAL FUEL

Species	Approx. Wt. Per Cord	BTU Per Air Dried Cord	Equivalent Value #2 Heating Oil Litre	Cost at 70.0 cents	Cost at 75.0 cents	Cost at 80.0 cents
Hickory	3595	30,600,000	827.4	$579.18	$620.55	$661.92
Hard Maple	3075	29,000,000	784.6	$549.22	$588.45	$627.68
Beech	3240	27,800,000	752.4	$526.68	$564.30	$601.92
Red Oak	3240	27,300,000	738.7	$517.09	$554.03	$590.96
Yellow Birch	3000	26,200,000	709.2	$496.44	$531.90	$567.36
Elm	2750	24,500,000	662.8	$463.96	$497.10	$530.24
Soft Maple	2500	24,000,000	649.2	$454.44	$486.90	$519.36
Tamarack	2500	24,000,000	649.2	$454.44	$486.90	$519.36
Cherry	2550	23,500,000	635.5	$444.85	$476.63	$508.40
Ash	2950	22,600,000	611.4	$427.98	$458.55	$489.12
Spruce	2100	18,100,000	490.1	$343.07	$367.58	$392.08
Hemlock	2100	17,900,000	484.1	$338.87	$363.08	$387.28
Aspen	1900	17,700,000	483.2	$338.24	$362.40	$386.56
White Pine	1800	17,700,000	462.8	$323.96	$347.10	$370.24
Basswood	1900	17,000,000	459.6	$321.72	$344.70	$367.68

Note: To change litres to US gal. multiply by 0.264

For the least amount of wood handling, the wood with the highest heat content is most desirable.

An open fireplace can actually refrigerate a house because it sucks in so much cold air, which is only partially used for combustion. A carefully designed fireplace makes use of perhaps 10 – 15 % of the heat available; most still going up the flue. The well-constructed potbellies get perhaps 20 – 25 % and the automatic, draft regulated, tightly sealed wood heaters get perhaps 50 %.

Notice that the percentage efficiency goes up as the combustion process becomes more and more controlled. The roaring fire is a complete waste of fuel. The best situation is one where the combustion chamber is gas-tight. This allows a controlled fire that toasts the wood and puts the right quantity of wood gas in the right place and at the right temperature for optimal combustion and heat transfer.

The NEWMAC WOOD HEATER toasts the wood to charcoal and the charcoal burns to dust leaving a minute amount of residue. From the above heat values, it can be seen that a cord or Hickory wood is equivalent to $ 248.22 (@ 30.0 cents litre) worth of oil, over twice as much as you would pay for a cord of wood.

Without taking into account all the free wood that is available, EFFICIENT WOOD HEATING cuts your heating costs in half.

MAINTENANCE AND OPERATING BULLETIN

Regarding Solid Fuel Burning Heating Units

The following are some suggestions with reference to the above:

1. MAINTENANCE:

In addition to periodic cleaning, it is most important that the unit be cleaned thoroughly at the end of each heating season. Both the primary and the secondary heat exchangers should be given extra attention with a steel scraper or brush. This will help to prevent rust and corrosion during the high humidity summer months. Also, if the firedoor is left open, it will allow for air to circulate through the units.

2. OPERATION

a. When burning with wood, the minimum setting for the manual draft slide should be in the centre. (This is the slide knob beside the combustion fan above the firedoor). The open setting is for initially starting a wood fire.

b. Do not attempt to burn the solid fuel in the spring or fall when temperatures are mild. This will cause the unit to be shut down for extended periods at a time and will form creosote and soot.

c. In the Solid Fuel units – burn the fuel at maximum draft with good dry wood for an hour or so (once or twice a week). This will help to prevent creosote build up.

d. During the off season, in order to dry out the humidity in the unit, fire the wood heater once a month for at least 30 minutes.

e. The solid fuel wood heater – build a fire with dry wood.

The above details, if adhered to, will extend the longevity of your furnace and provide many years of warm, comfortable heat.

INSTALLATION INSTRUCTIONS

Models E10, E15, E20, E25 Electric Heating Section For Solid Fuel/Electric Wood Heater Model WFA-70

GENERAL

It is the responsibility of the consignee of the unit to examine the package for damage and, if found, to note the same on the Carriers Bill of Lading.
This unit consists of one (1) package which has packed inside: electric heating unit, adaptor, bag of screws, installation instructions and thermostat.

INSTALLATION

1. This unit shall be installed in accordance with the regulations of the Canadian Electrical Code, CSA Standard, C22.1, and Local Governing Bodies.
2. These instructions do not supercede local codes in any way. Local authorities having jurisdiction should be consulted before installation.
3. Consult the Installation, Operating and Service Manual shipped with the wood heater for proper installation of the solid fuel burning unit.
4. Mount the Electrical Component as shown in the accompanying diagram.

DUCT INSTALLATION

1. Before installing the supply air plenum, check that the heating elements are free of foreign material and are not damaged.
2. Install ducting with minimum return air duct size equal to 250 sq. in. and with minimum supply air duct size equal to 180 sq. in. A minimum of 6" clearance above the warm air and return air plenums and takeoffs should be maintained for a distance of 6 feet from the wood heater. Beyond 6 feet there must be a minimum of 1/2" clearance.

WIRING INSTALLATION

1. This wood heater must be connected to a separate fused disconnect switch supplying power to the appliance. The wood heater must be suitably grounded.
2. Install the BX cable containing three wires from the Electric Section to the existing knock-out of the furnace.
3. The white wire in the BX cable from the electric section is connected to the common or white wire existing on the furnace, for standard installation.
4. The red wire in the BX cable from the electric section is connected to the existing black wire coming from line terminal of the L4064 fan limit control, for standard installation.
5. The blue wire in the BX cable from the electric section is connected to the single blue capped wire provided, which operates the circulating blower of the solid fuel furnace.

24 VOLT WIRING ONLY (THERMOSTATS)

1. Install the two thermostats beside each other and in accordance with the instructions packed with them. Set the heat anticipators to 0.4 amps.

(Refer to Fig.11)

2. Connect one wire from electric thermostat to Terminal C on top of Electric section.
3. Connect second wire from the electric thermostat to the screw on the 24V AT20B1007 transformer (that supplies relay) which is located in the control panel of the solid fuel unit.
4. Connect one wire from solid fuel thermostat to Terminal G on top of the Electric section.
5. Connect second wire from solid fuel thermostat to Terminal Block coming from relay on the solid fuel wood heater control panel.
6. Connect wire from Terminal R on top of Electric section to remaining Terminal of the terminal block located in the control panel of the solid fuel unit.

Fig. 10 – 240 Volt Supply

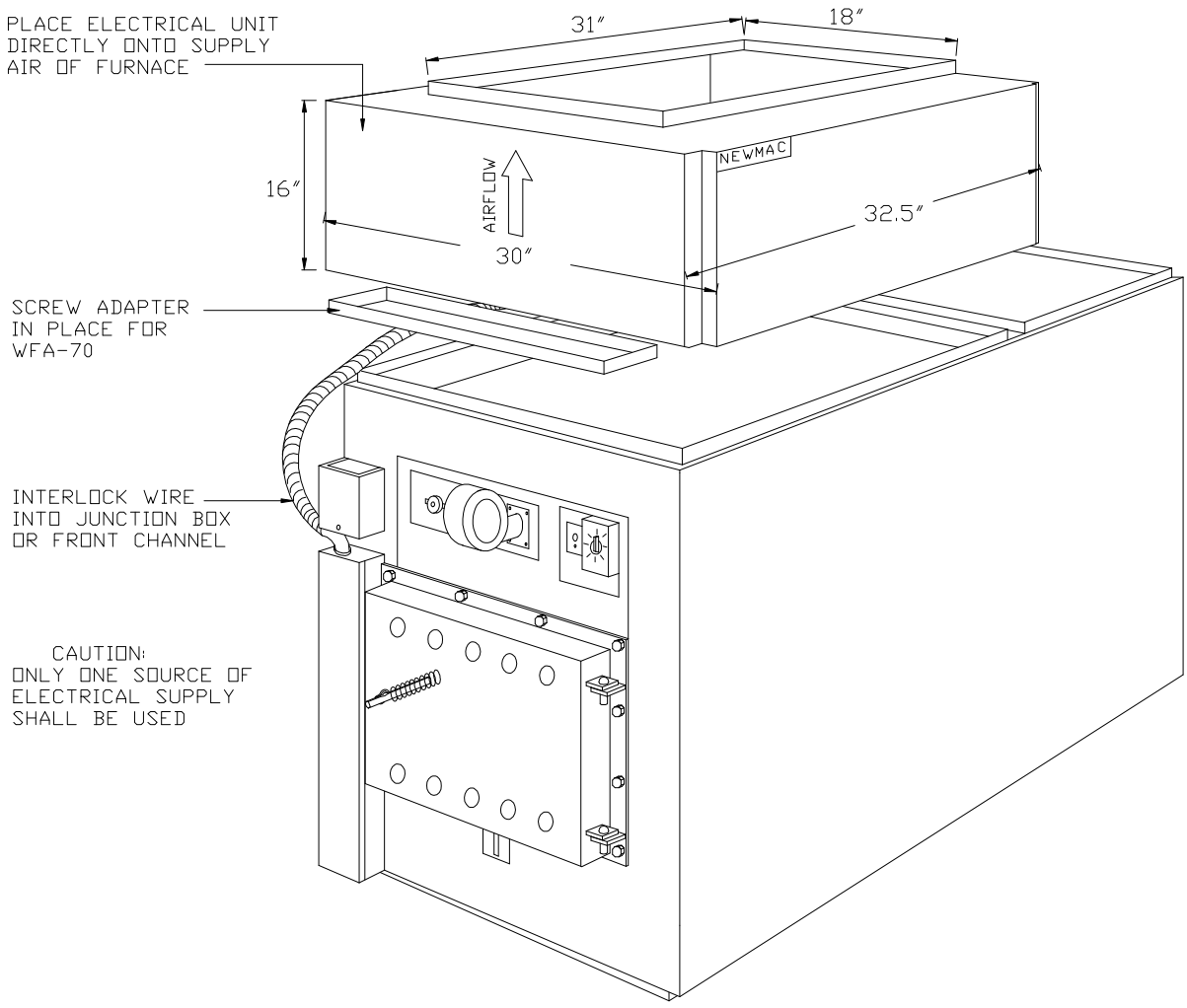
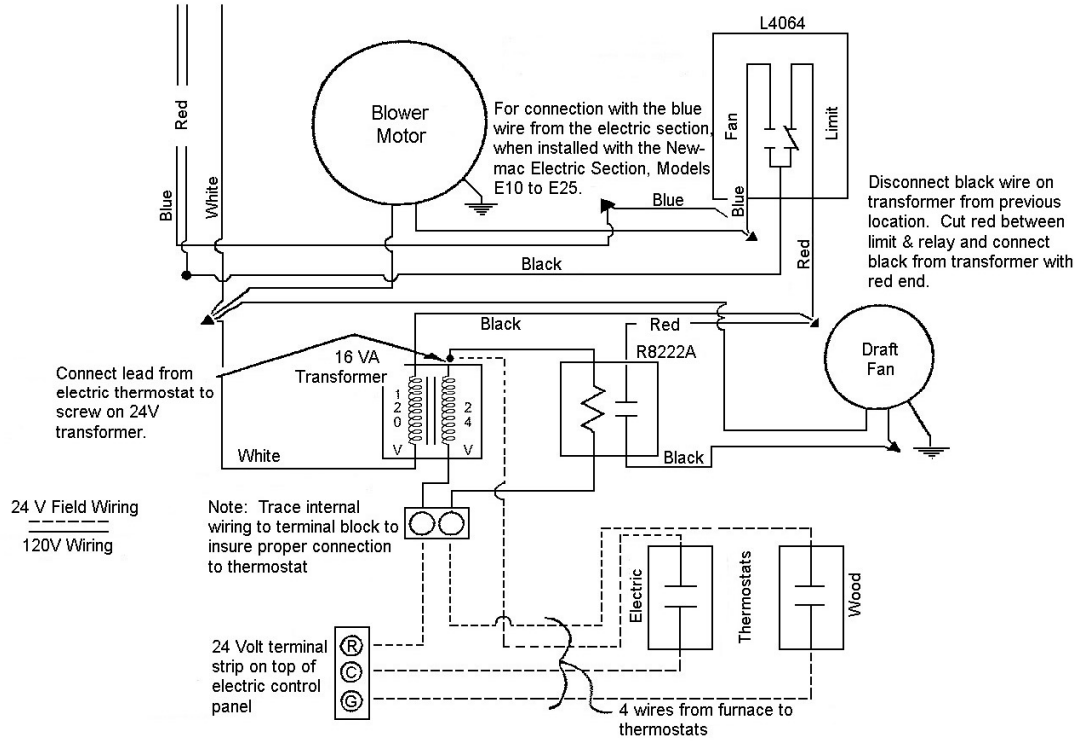


Fig. 11 – Wiring WFA-70 & Electric Insert



NEWMAC MULTI FUEL AND SOLID FUEL HEATING UNIT "LIMITED" WARRANTY

Subject to the following provisions Newmac Mfg. Inc. (Newmac) warrants the heating unit, to the original owner, under normal use and repair, against defects in workmanship and materials, for a period of one calendar year from the date or original installation.
Blower, motor, controls and/or any other electrical or mechanical components, not manufactured by Newmac, are not warranted by Newmac, but are warranted for a period of one year from date of original installation, by their respective manufacturer.
In addition to this comprehensive, unconditional one year, new product warranty, Newmac further warrants the heat exchanger for an additional nine calendar years from date of original installation and in accordance with the declining table as set out below.

THE NEWMAC EXTENDED CONDITIONAL HEAT EXCHANGER WARRANTY PROGRAM

(Warranty protection calculated from date or original installation)

	Owner Warranty Protection	Owner Replacement Charge
First full year	100%	0%
From year one through year two	80%	20%
From year two through year four	60%	40%
From year four through year six	50%	50%
From year six through year eight	40%	60%
From year eight through year ten	20%	80%
From year ten and over	0%	100%

NOTES:

1. Owner Replacement Charges are expressed as a percentage of the replacement retail price prevailing at the time of replacement purchase.
2. Newmac is NOT responsible for:
   A. Labour charges generated by removal of malfunctioning component and re-installation of replacement component.
   B. Freight charges generated by any form of transportation of replacement component.
   C. Any applicable sales tax generated by the purchase of replacement component.
   D. Corrosion is not covered under warranty regardless of cause.

General Conditions and Limitations

The heating unit must be installed by a qualified licensed installer with the Newmac installation instructions. The heating unit must also be installed in accordance with all applicable codes and the National Warm Air Heating and Air Conditioning Association Standards or generally accepted equivalent standards.

The heating unit is NOT designed, or intended for use in a corrosive atmosphere (such as a concentration of acids or halogenated hydrocarbons). The installation, and operation of the unit in such an environment, will be considered as gross misuse, and all warranties will be automatically invalidated.

The heating unit must not be modified away from its published design and/or specifications without prior written authorization, for such modification, from Newmac.

The heating unit must be correctly sized to operate at its designed capability.

The heating unit must be correctly fueled to operate within its designed function.

The heating unit must be maintained and cleaned at regular intervals, and in accordance with instructions contained in the Newmac owner's manual.

Failure to comply with all the above stated qualifying conditions, will render the Newmac Warranty null, and void in its entirety.

This warranty is the only warranty made by Newmac, and furthermore, Newmac does not authorize any person or company to change, or alter, the conditions under which this warranty is provided. Newmac does not authorize any person, or company, to provide any other warranty on its behalf.

For routine service requirements, contact the dealer who installed the equipment originally or an alternate qualified and registered heating dealer or electrician.

As previously stated herein, Newmac does not assume responsibility for costs of delivery or labour charges involved in the replacement of defective component parts.

Newmac shall not be responsible for any consequential damage however caused whether by a defect in the heating unit or any part thereof warranted hereunder or by the negligence of any person.

This warranty is not effective unless the warranty registration card is properly filled out with all of the required information and received at Newmac's factory at the address below within (30) days from the installation date.

NOTE: Keep this warranty certificate and the instruction manual for future reference.

LIMITED WARRANTY REGISTRATION

PLEASE PRINT OR TYPE:

Owner's Name……

Address of Installation……

Date of Installation……..

Dealer's Name……

Dealer's Address……..

Serial No……Wood Heater Model No……WFA -70……

Newmac Mfg. Inc., P.O. Box 9, Lancaster Cr., Debert, NS B0M 1G0