

**SUPERIOR
BIO-MASS
CORN BURNING
FURNACE
MANUAL**

The following information is designed to acquaint you with the controls, safety features, and simplicity of the superior shelled corn burning furnace.

The serviceman should follow a fixed and logical step-by-step procedure in order to quickly and definitely pinpoint the area of actual trouble.

The superior furnace is equipped with the following operating components:

Fan Control/Limit Switch

The high limit switch is a safety control designed to shut off voltage to the furnace/bin gear motors and combustion blower should the furnace become overheated. It is preset at 200 degrees and should not be adjusted. The fan control is preset but can be adjusted according to individual air temperature requirements.

Low Limit Switch

The low limit switch is a safety control designed to prevent the flow of corn until burner has been ignited and furnace has reached operating temperature. The low limit switch will also prevent the flow of corn if furnace operating temperature is not maintained, (i.e. bin runs out of corn or power outage occurs.)

Combustion Blower

The combustion blower provides combustion air through air ports in burner. The motor is 120v and is energized by depressing toggle switch to start position or on heating demand from the thermostat.

AUGER METERING SYSTEM

Auger is driven by a gear motor. Timing module which can be adjusted to change volumes of fuel.

Furnace Gear Motor Assembly

The furnace gear motor assembly is 120v and is energized on heating demand from the thermostat. The furnace auger assembly delivers corn to the Burn Pot.

Thermostat Relay

Step-down 120v to 24v transformer provides low voltage to thermostat via R & G terminals. When thermostat is realized, normally closed switch provides 120v power to furnace timer. When thermostat is engaged, normally open switch provides 120v power to gear motors and combustion blower via timer socket.

Timer

The timer on/off cycle controls delivery of corn by gear motors when thermostat is relaxed. The appropriate on/off cycle maintains burner pilot fire.

Toggle Switch On/Off/(Start)

Double Pole/Double Throw switch. In START position (momentary) provides 120v to combustion blower. In ON position provides 120v to thermostat relay. Furnace must reach operating temperature closing low limit switch and activating gear motors before turning switch to ON position.

SEQUENCE OF OPERATION - LIGHTING UNIT

- 1) Add dry, (14% - 15% moisture) clean corn to holding bin. (USDA #3 corn or better)
- 2) Turn on electrical power to the furnace.
- 3) Turn thermostat to highest setting.
- 4) Fill burner to the top with kindling wood and paper, light paper and close door.
- 5) Depress on/off/start toggle switch to start position. Middle and Upper switch contacts will close. 120v power will activate combustion blower and provide power to fan limit switch.
- 6) 120v will continue through fan limit to low limit switch. Low limit switch contacts will close when furnace reaches operating temperature.
- 7) 120v power continues back to toggle switch and to thermostat relay. Step-down 120v to 24v transformer provides low voltage to thermostat.
- 8) 120v power is provided via normally open switch of thermostat. Relay to terminals 3 & 6 of timer socket activating gear motors.
- 9) Turn toggle switch to ON position. Middle and lower contacts of switch close.
- 10) Combustion blower and gear remain engaged as long as thermostat calls for heat.

SEQUENCE OF OPERATION - BURNER LIGHTING ESTABLISHED

- 1) Thermostat calls for heat (R & G) 120v power will be provided to normally open switch of thermostat relay to terminals 3 & 6 of timer socket activating combustion blower and gear motors.
- 2) If thermostat is in the relaxed position 120v power will be provided to the normally closed switch of thermostat relay to terminals 2, 1, & 8 of timer socket.
- 3) When timer is in ON position cycle power is supplied from terminals 1 & 8 to terminals 3 & 6 of timer socket activating combustion blower and gear motors.
- 4) When timer is in OFF position cycle power is supplied from terminals 1 & 8 to terminals 4 & 5 of timer socket. (Terminals 4 & 5 are not used)
- 5) Fan and limit control energize main furnace blower when helix of control senses preset temperature.

THE FOLLOWING ITEMS MUST BE CHECKED BEFORE FURTHER DIAGNOSIS IS MADE:

Review federal, state, and local codes to determine if problem could be caused by improper installation.

Check for correct wiring and voltage. 120v primary, 24v secondary.

Make sure thermostat anticipator setting is correct. Heat anticipator should be 3.2. Adjust up or down as necessary.

Make sure barometric damper is installed and chimney draft is correct. Chimney draft should be .04 water column draft.

Check quality of corn. USDA Number 3 corn or better is recommended.. Excess fines will cause eventual fire outage.

SERVICE CHECK OUT PROCEDURES

1. *Combustion Blower will not engage in start position*

	Electrical Check	What To Do
a.	No power to furnace	Check supply voltage.
b.	Connect voltmeter to combustion blower in motor housing black & white leads.	Power indicated - replace combustion blower No power indicated - replace toggle switch

2. *After furnace ignition and operating temperature reached gear motors will not engage.*

	Electrical Check	What To Do
a.	Thermostat not calling for heat.	Turn thermostat to highest setting.
b.	If gear motors do not engage unhook thermostat wire at relay and jump R & G terminals.	If gear motors engage check thermostat wiring. If gear motors do not engage continue with R & G terminals jumped.
c.	With Voltmeter check power at fan switch load.	No power - Check fuse and supply voltage.
d.	If power indicated, with voltmeter check power at fan limit.	No power - Replace fan switch.
e.	If power indicated, with voltmeter check power through low limit switch.	No power - Replace low limit switch.
f.	If power indicated, with voltmeter check power at thermostat relay	No power - Check wire connections from low limit.
g.	If power indicated, with voltmeter check 24V (G & C) terminals at transformer.	No power indicated - replace thermal relay.
h.	If power indicated, with voltmeter check power to normally open switch.	No power - Replace thermostat relay thermostat relay.

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|----|---|--|
| i. | If power indicated, with voltmeter check power to gear motor/s. | No power - check connections in timer socket.
Power indicated - Replace gear motor/s. |
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3. *Gear motors engage in START position at operating temperature but will not engage in ON position.*

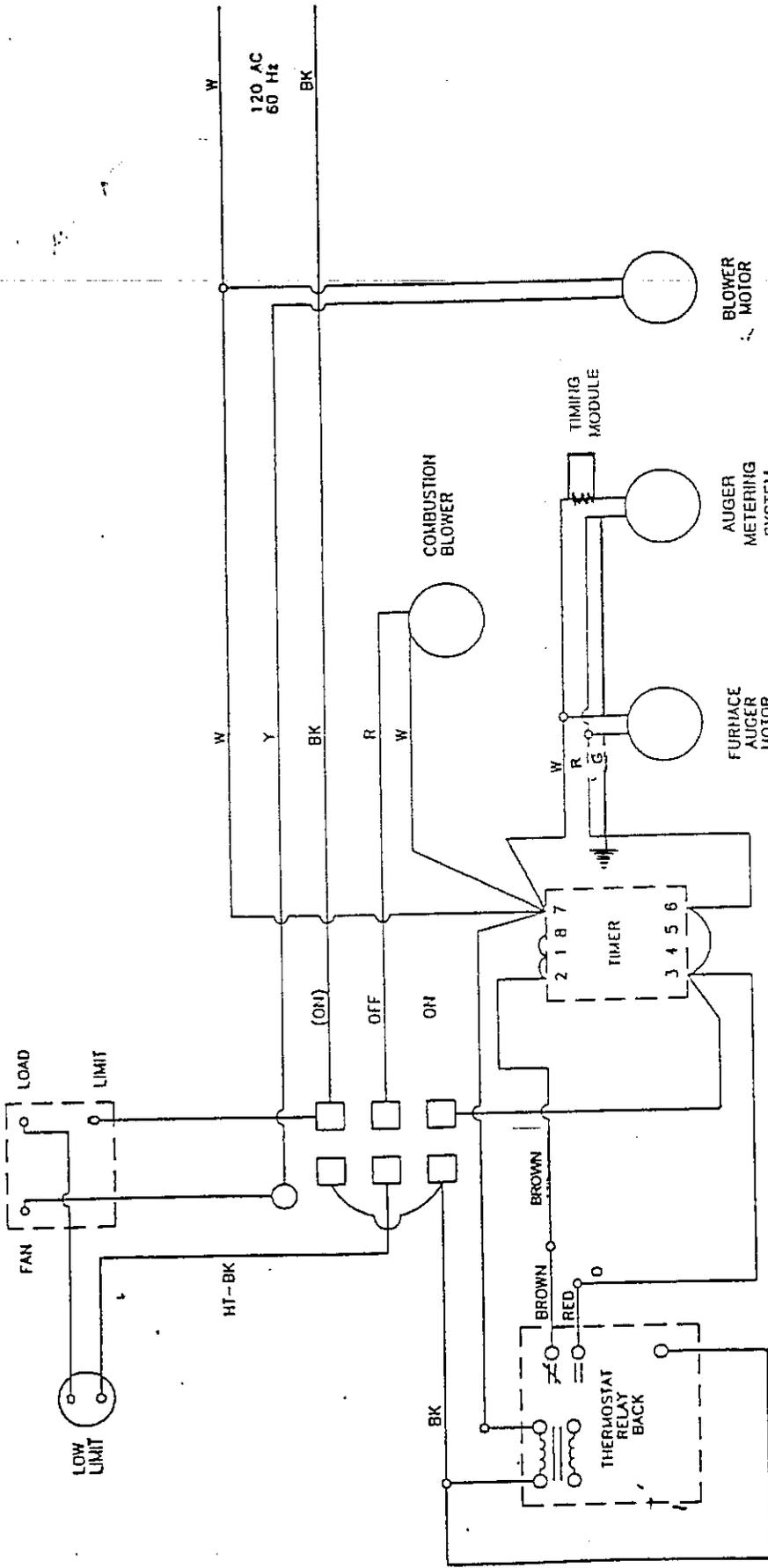
- | Electrical Check | What To Do |
|-------------------------|------------------------|
| a. Bad wire connections | Check connections |
| b. Faulty toggle switch | Replace toggle switch. |
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4. *Thermostat in relaxed setting - timer will not activate*

- | Electrical Check | What To Do |
|--|---|
| a. With voltmeter check power at thermostat relay load. | No power - Check wire connections at toggle switch. |
| b. If power indicated, with voltmeter check power to thermal relay normally closed switch. | No power - replace thermostat relay. |
| c. If power indicated, with voltmeter check timer socket terminals 2, 1, & 8. | No power - Check wire connections to timer socket. |
| d. If power indicated, with timer on check power to timer socket terminals 3 & 6. | No power -replace timer. |
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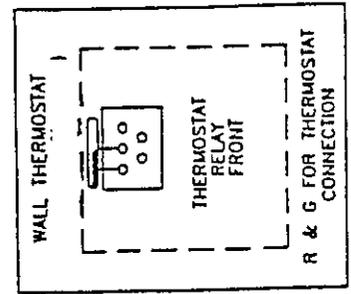
5. *While furnace ignited furnace blower will not run.*

- | Electrical Check | What to do |
|--|---|
| a. Push in manual button of fan to furnace fan switch and check power to blower. | No power - Check wire connections. Still no power replace fan switch. |
| b. If power indicated. | Check connections to blower. If connections secure replace motor. |
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WIRE COLOR	CODE
BLACK	BK
HI-TEMP BLACK	HT - BK
WHITE	W
YELLOW	Y
RED	R
BROWN	BROWN
GREEN GROUND	G

SUPERIOR BIO-MASS FURNACE WIRING DIAGRAM



ULC LISTED

APPROVED ELECTRICAL COMPONENTS

*SUPERIOR CORN FURNACE LIGHTING
INSTRUCTIONS*

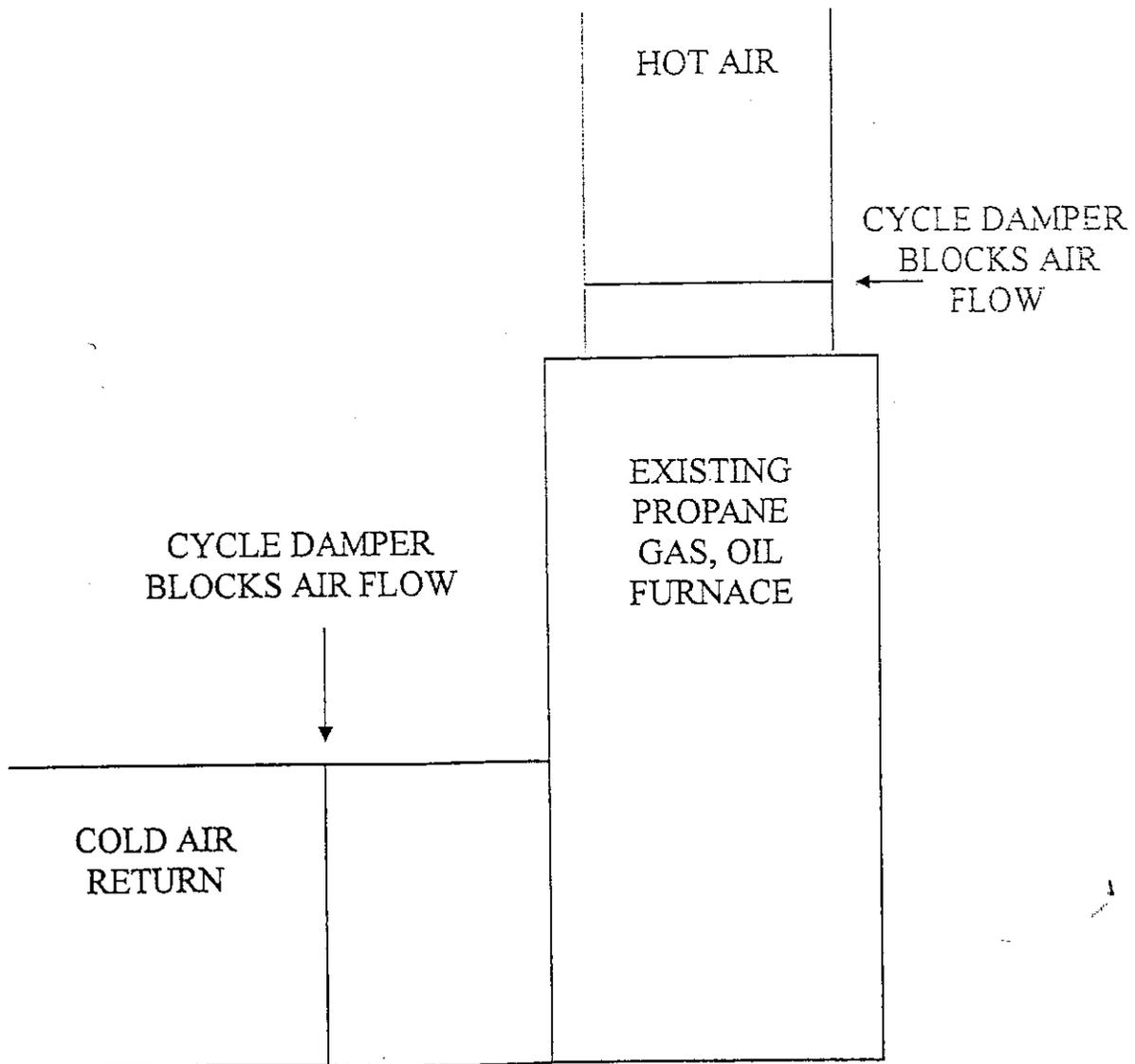
- 1. Fill burn pot with 14 to 15% moisture corn 1 inch below bottom set of air holes.**
- 2. Add paper and wood kindling, fill burner right to the top with good hardwood. Light paper and close door.**
- 3. Thermostat must be on highest setting.**
- 4. Hold toggle switch to start position, you will hear combustion blower start. Low limit switch contacts will close when furnace reaches operating temperature and you will hear augers start, set toggle switch to ON position.**

NOW GO AND SET YOUR THERMOSTAT AND ENJOY THE COMFORTABLE HEAT YOU GET OUT OF THE FUEL YOU GREW YOURSELF.

IMPORTANT

If you are tying into your existing ductwork and leaving your other furnace in place, you must install cycle dampers into the ductwork to block off your other furnace.

If you don't install these dampers, you won't get heat upstairs.



SUPERIOR **INSTALLATION INSTRUCTIONS**

- STEP 1. Position furnace under duct work and level.
- STEP 2. Rest bin on side of furnace and level.
- STEP 3. Temporary fasten legs on bin with self tapping screws.
- STEP 4. Drill 5/16" holes in bin, fasten bolts and nuts.
- STEP 5. Mount bin metering auger under bin and fasten with 2 teck screws.
- STEP 6. Fasten bin to furnace with teck screws on angle iron.

PARTS LIST

Barometric Damper - set at .04 Water Column

Door Handle

Bin Lid Handle

8 5/16 Bolts and Nuts for bin legs

4 self-tapping tech screws to fasten bin to furnace

2 1/4 nuts and bolts for lid on bin

Wire nuts for electrical connections

Seal auger tees with silicon

OWNERS MANUAL - please read it!

Paint match Rust O - X Pebble - available at True Value Hardware Stores

Diffuser Plate mounts above burn pot on angle iron brackets

ATTENTION! TOO MANY FINES IN CORN WILL CAUSE FIRE TO GO OUT

**Now get your furnace set up and enjoy the warmth of SUPERIOR BIOMASS
FURNACE.**

Safety Maintenance

Instructions for disposal of ashes, by means of the following or an equivalent statement:

“Disposal of Ashes

Ashes should be placed in a metal container with a tight - fitting 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. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.”

A description of the buildup of creosote and the recommended procedure for needed removal of creosote, by means of the following or equivalent statement:

“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 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.”

Instructions that the unit is not to be connected to a chimney flue serving another appliance.

Specification of the types of fuels that may be employed and instructions for the fueling procedures.

SUPERIOR COLLECTOR/CLEANER

INSTALLATION AND MAINTENANCE

- 1. Mount collector above bin with small chains or wire from floor joists above or make a bracket to mount collector onto the side of the bin. Make sure that the collector is high enough so the lid can be pushed back when loading.**
- 2. Put lid back on after loading.**
- 3. "Corn In" tube can be connected with 2" black plastic water line or white PVC. The smooth pipe lets corn flow fast and easy.**
- 4. "Vacuum" tube should be connected to a minimum 9 amp vacuum. (The more powerful the vacuum the better).**

MAINTENANCE

- 1. About every 3 bin loads, the filter in the vacuum should be cleaned, depending on how many fines are in corn. (Fines are like drywall dust and will plug filter).**
- 2. Like a swimming pool filter, the screen in collector should be backwashed once or twice a season. You do this by blowing exhaust from vacuum into "vacuum" side of collector. Fines will blow out bottom door.**