



Model F and B Gas-Fired, Gravity-Vented Unit Heaters

REZNOR Thomas & Betts

INSTALLATION FORM RGM 434 (Version A)

Obsoletes 434-8

APPLIES TO: Installation/Operation/Service

Table of Contents

Installation and Operation	Paragraphs 1-24
Check Installation and Start-Up	Paragraph 25
Optional Equipment	Paragraphs 26-33
Service/Maintenance/Troubleshooting	Paragraphs 34-44

Index by Page No.

Belt Tension	20
Blocked Vent Switch	21, 30
Blower	28
Blower Motor	19
Blower Rotation	20
Blower Speed Adjustment	20
Blower/Filter Cabinet (Optional)	26
Burner Air Adjustment	21
Burner Orifices	28
Burner Rack Removal	26
Burners	21
Flash Carryover	28
Check Installation and Start-Up	22
Clearances	6
Combustion Air	6
Confined Space Installation	6
Dimensions	3

Index by Page No.

Downturn Air Nozzles (Optional)	23
Duct Flange (Model B Option)	24
Electrical Supply and Connections	12
Energy Cutoff Control (ECO)	21, 29
Fan	28, 29
Fan Control	20
Fan Motor	19
Gas Piping and Pressures	11
Gas Valve	21, 29
Guards (Model B Option)	25
Hanger Kits (Optional)	8
HAZARD INTENSITY LEVELS	2
Heat Exchanger	28
Ignition Systems	21, 28
Installation Codes	2
Limit Control	21, 29
Unit Heater Location	5

Index by Page No.

Multiple Heater Control (Optional)	25
Operating Sequence	22
Pilot	21, 27
Polytube Adapter (Model B Option) ..	24
SERVICE AND MAINTENANCE	26
Start-Up	22
Suspending the Unit	8
Thermostat Connections	12, 19
Troubleshooting	31
Uncrating and Preparation	5
Gas Valve	21, 29
Vent	9, 29
Horizontal/Vertical Vent Outlet	6
Power Venter (Optional)	24
Vertical Louvers (Optional)	23
Warranty	2
TYPICAL WIRING DIAGRAMS .	13-18

REFERENCE: Replacement Parts, Form RGM 726

FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances. See Hazard Levels, Page 2.

WARNING: Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

GENERAL

Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction. The instructions in this manual apply to the unit heater models shown on the right.

Model	Fuel	Vent	Air Delivery
F	Gas-Fired	Gravity	Propeller Fan
B	Gas-Fired	Gravity	Centrifugal Blower (heater may be attached to ductwork)

HAZARD INTENSITY LEVELS

- 1. DANGER:** Failure to comply will result in severe personal injury or death and/or property damage.
- 2. WARNING:** Failure to comply could result in severe personal injury or death and/or property damage.
- 3. CAUTION:** Failure to comply could result in minor personal injury and/or property damage.

1. Installation Codes

The gas-fired unit heaters covered in this manual are design-certified by the American Gas Association and approved by the Canadian Gas Association for use with either natural or propane gas. The type of gas for which your heater is equipped and the correct firing rate are shown on the rating plate attached to your unit. Electrical characteristics are shown on the motor nameplate and on the unit rating plate.

These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code (latest edition). A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2 Installation Code for Gas Burning Appliances and Equipment. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.

Clearances from the heater and vent to combustible construction or material in storage must conform with the National Fuel Gas Code ANSI Z223.1a (latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160°F by continued operation of the heater.

Special Installations (Aircraft Hangars/Garages)

Installations in aircraft hangars should be in accordance with ANSI/NFPA No. 409 (latest edition), Standard for Aircraft Hangars; in public garages in accordance with ANSI/NFPA No. 88A (latest edition), Standard for Parking Structures; and for repair garages in accordance with ANSI/NFPA No. 88B (latest edition), Standard for Repair Garages. ANSI/NFPA-88 (latest edition) specifies overhead heaters must be installed at least eight feet above the floor. In Canada, installations in aircraft hangars should be in accordance with the requirements of the enforcing authorities, and in public garages in accordance with CAN/CGA B149 codes.

ANSI/NFPA 409 (latest edition) specifies a clearance of ten feet to the bottom of the heater from the highest surface of the top of the wing or engine enclosure of whatever aircraft would be the highest to be housed in the hangar, and a minimum clearance of eight feet from the floor in other sections of aircraft hangars, such as the offices, and shops which communicate with areas used for servicing or storage. The heaters must be located so as to be protected from damage by aircraft or other objects such as cranes and movable scaffolding. In addition, the heaters must be located so as to be accessible for servicing, adjustment, etc.

2. Warranty

Refer to limited warranty information on the warranty card in the "Owner's Envelope".

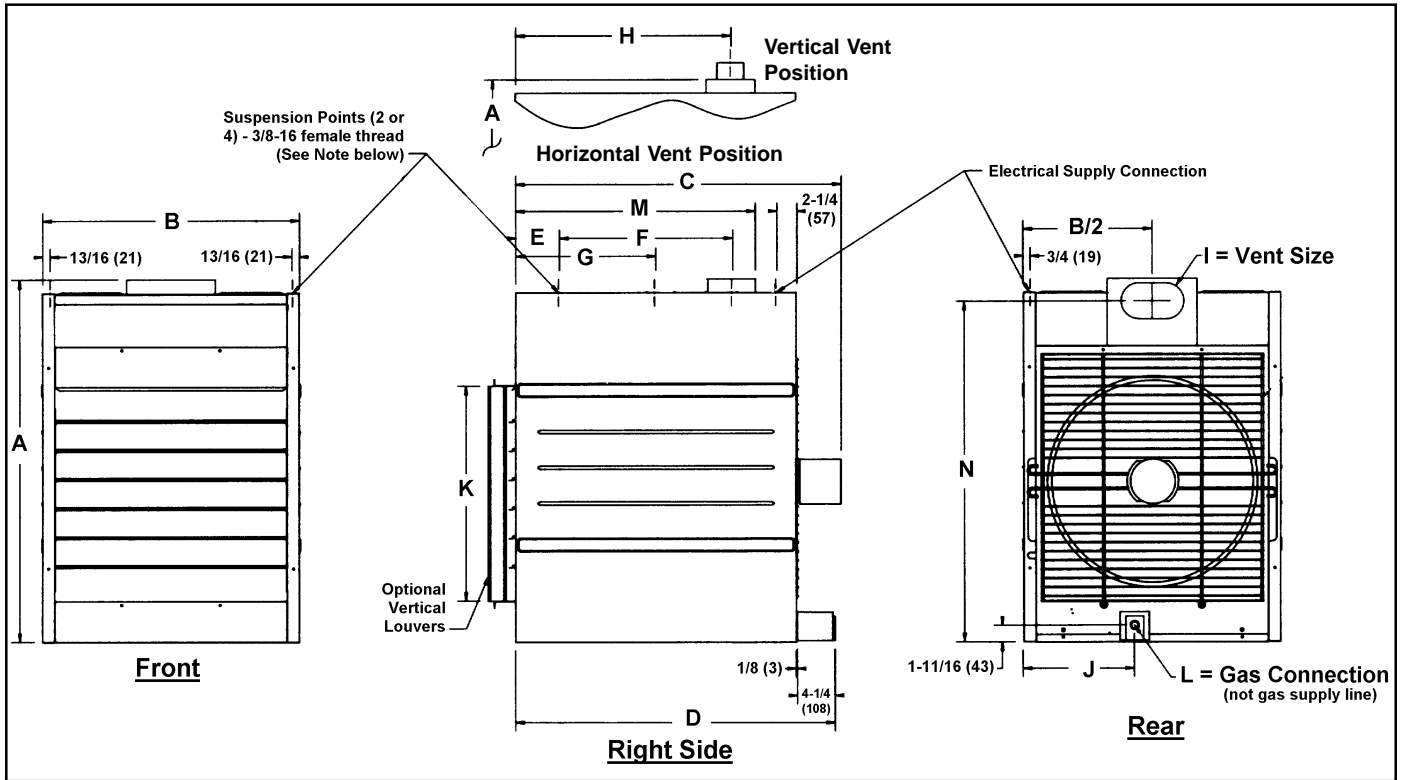
WARRANTY: Warranty is void if.....

- Unit Heaters are used in atmospheres containing flammable vapors or atmospheres containing chlorinated or halogenated hydrocarbons or airborne silicone substances.**
- Wiring is not in accordance with the diagram furnished with the heater.**
- Unit is installed without proper clearances to combustible materials or located in a confined space without proper ventilation and air for combustion. (See Paragraphs 6 and 7.)**
- Fan-type unit heater is connected to a duct system.**

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3. Dimensions

Fan-Type, Gravity-Vented Unit Heater



Dimensions (inches)

Size	A	B	C	D	E	F	G	H	I	J	K	L		M	N
												Nat	Pro		
25	30-5/32	13-9/16	27-1/16	31-7/16	5-27/32	14-7/16	14-1/32	19	4 Rnd	10-9/32	16	1/2	1/2	21-1/2	27-21/32
50	30-5/32	13-9/16	27-1/16	31-7/16	5-27/32	14-7/16	14-1/32	19	4 Rnd	10-9/32	16	1/2	1/2	21-1/2	27-21/32
75	30-5/32	15-9/16	27-1/16	31-7/16	5-27/32	14-7/16	14-1/32	19	5 Oval	10-17/32	16	1/2	1/2	21-1/2	27-21/32
100	30-5/32	17-9/16	30-7/16	31-7/16	5-27/32	14-7/16	14-1/32	19	6 Oval	12-29/32	16	1/2	1/2	21-1/2	27-21/32
125	32	23-5/16	30-7/16	31-7/16	5-27/32	14-7/16	14-1/32	17-15/16	7 Oval	14-7/16	16	1/2	1/2	21-1/2	28-1/2
165	40-5/32	20-5/16	35-7/16	35-15/16	4-7/8	19-15/32	15-23/32	23-13/32	8 Oval	14-9/32	24	1/2	1/2	27	36-25/32
200	40-5/32	23-5/16	36-3/16	35-15/16	4-7/8	19-15/32	15-23/32	23-13/32	8 Oval	14-13/32	24	1/2	1/2	27	36-25/32
250	40-5/32	28-13/16	36-3/16	35-15/16	4-7/8	19-15/32	15-23/32	21-13/16	10 Oval	12-11/32	24	1/2	1/2	27	38-3/8
300	40-5/32	28-13/16	36-11/16	35-15/16	4-7/8	19-15/32	15-23/32	21-13/16	10 Oval	12-11/32	24	3/4	1/2	27	38-3/8
400	40-5/32	37-1/16	37-5/16	35-15/16	4-7/8	19-15/32	15-23/32	21-13/16	12 Oval	13	24	3/4	1/2	27	38-3/8

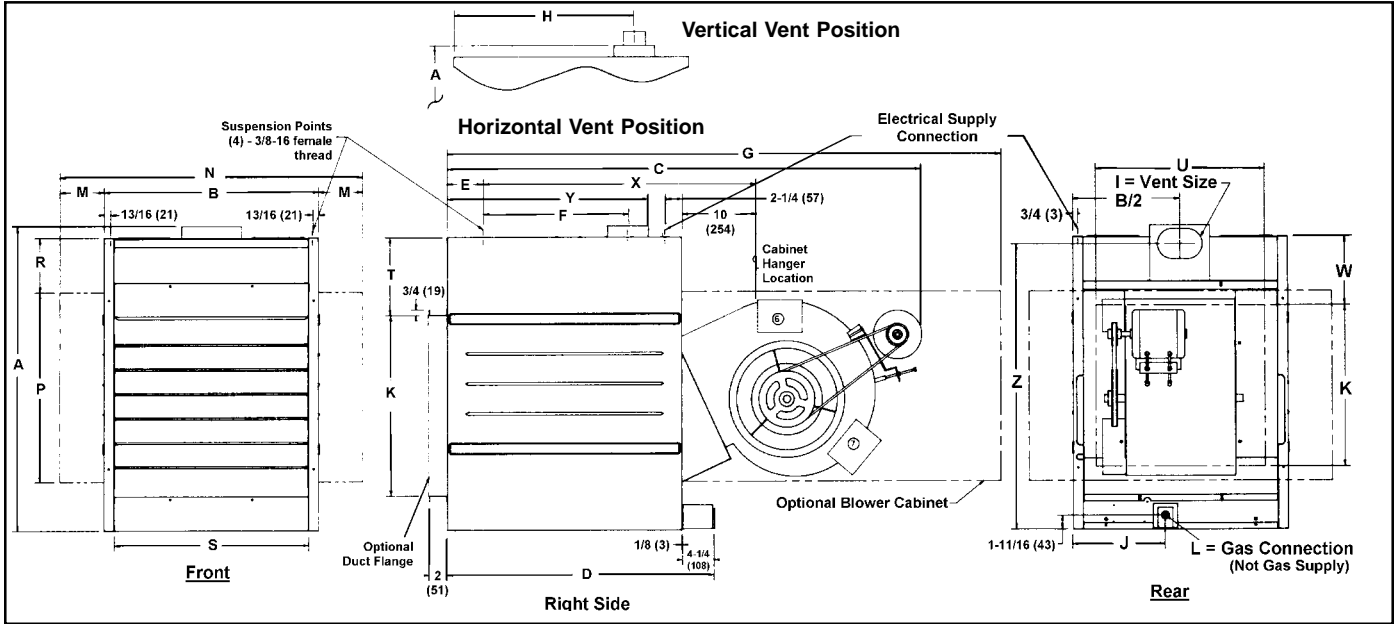
Dimensions (mm)

Size	A	B	C	D	E	F	G	H	I	J	K	L		M	N
												Nat	Pro		
25	766	344	687	799	148	367	356	19	102 Rnd	261	406	13	13	546	702
50	766	344	687	799	148	367	356	19	102 Rnd	261	406	13	13	546	702
75	766	395	687	799	148	367	356	19	127 Oval	267	406	13	13	546	702
100	766	446	773	799	148	367	356	19	152 Oval	328	406	13	13	546	702
125	813	592	773	799	148	367	356	17-15/16	178 Oval	367	406	13	13	546	724
165	1020	516	900	913	124	498	399	23-13/32	203 Oval	363	610	13	13	686	934
200	1020	592	919	913	124	498	399	23-13/32	203 Oval	366	610	13	13	686	934
250	1020	732	919	913	124	498	399	21-13/16	254 Oval	314	610	13	13	686	975
300	1020	732	932	913	124	498	399	21-13/16	254 Oval	314	610	19	13	686	975
400	1020	941	948	913	124	498	399	21-13/16	305 Oval	330	610	19	13	686	975

Suspension Notes: Use Dimension "G" for two-point suspension and "E" and "F" for four-point suspension. (Two-point suspension is standard; four-point is optional. Four-point suspension is available either factory or field installed.)

3. Dimensions (cont'd)

Blower-Type, Gravity-Vented Unit Heater



Dimensions (inches)

Size	A	B	C Ⓢ	D	E	FⓄ Hanger	G Ⓛ Ⓜ	H	I	J	K Ⓛ Ⓜ	L	
												Nat	Pro
25	30-5/32	13-9/16	43-3/8	31-7/16	5-27/32	14-7/16	61-3/8	19	4 Rnd	10-9/32	16	1/2	1/2
50	30-5/32	13-9/16	50	31-7/16	5-27/32	14-7/16	61-3/8	19	4 Rnd	10-9/32	16	1/2	1/2
75	30-5/32	15-9/16	50	31-7/16	5-27/32	14-7/16	61-3/8	19	5 Oval	10-17/32	16	1/2	1/2
100	30-5/32	17-9/16	50	31-7/16	5-27/32	14-7/16	61-3/8	19	6 Oval	12-29/32	16	1/2	1/2
125	32	23-5/16	47-1/2	31-7/16	5-27/32	14-7/16	65-29/32	17-15/16	7 Oval	14-7/16	16	1/2	1/2
165	40-5/32	20-5/16	61	35-15/16	4-7/8	19-15/32	76-1/8	23-13/32	8 Oval	14-9/32	24	1/2	1/2
200	40-5/32	23-5/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	23-13/32	8 Oval	14-13/32	24	1/2	1/2
250	43-9/16	28-13/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	21-13/16	10 Oval	12-11/32	24	1/2	1/2
300	43-9/16	28-13/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	21-13/16	10 Oval	12-11/32	24	3/4	1/2
400	43-9/16	37-1/16	66-1/2	35-15/16	4-7/8	19-15/32	76-1/8	21-13/16	12 Oval	13	24	3/4	1/2

Size	MⓄ	NⓄ	PⓄ	RⓄ	SⓄ	TⓄ	UⓄ	WⓄ	XⓄ Hanger	Y	Z
25	3-23/32	20-15/16	17-3/4	5-1/4	10-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
50	3-23/32	20-15/16	17-3/4	5-1/4	10-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
75	2-23/32	20-15/16	17-3/4	5-1/4	12-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
100	1-23/32	20-15/16	17-3/4	5-1/4	14-3/4	8-7/16	14-3/4	6-3/16	31-7/32	21-1/2	27-21/32
125	1-11/32	25-15/16	17-3/4	5-1/4	20-1/2	8-7/16	20-1/2	6-3/16	35-3/4	21-1/2	28-1/2
165	2-27/32	25-15/16	25-1/4	7-1/4	17-1/2	11-7/16	20-1/2	7-15/16	36-11/16	27	36-25/32
200	1-11/32	25-15/16	25-1/4	7-1/4	20-1/2	11-7/16	20-1/2	7-15/16	36-11/16	27	36-25/32
250	5-29/32	40-9/16	25-1/4	7-1/4	26	11-7/16	26	7-15/16	36-11/16	27	38-3/8
300	5-29/32	40-9/16	25-1/4	7-1/4	26	11-7/16	26	7-15/16	36-11/16	27	38-3/8
400	6-25/32	50-9/16	25-1/4	7-1/4	34-1/4	11-7/16	34-1/4	7-15/16	36-11/16	27	38-3/8

Dimensions (inches)

Size	A	B	C Ⓢ	D	E	FⓄ Hanger	G Ⓛ Ⓜ	H	I	J	K Ⓛ Ⓜ	L	
												Nat	Pro
25	30-5/32	344	1102	799	148	367	1559	483	102 Rnd	261	406	13	13
50	30-5/32	344	1270	799	148	367	1559	483	102 Rnd	261	406	13	13
75	30-5/32	395	1270	799	148	367	1559	483	127 Oval	267	406	13	13
100	30-5/32	446	1270	799	148	367	1559	483	152 Oval	328	406	13	13
125	32	592	1207	799	148	367	1674	456	178 Oval	367	406	13	13
165	40-5/32	516	1549	913	124	495	1934	595	203 Oval	363	610	13	13
200	40-5/32	592	1689	913	124	495	1934	595	203 Oval	366	610	13	13
250	43-9/16	732	1689	913	124	495	1934	544	254 Oval	314	610	13	13
300	43-9/16	732	1689	913	124	495	1934	544	254 Oval	314	610	19	13
400	43-9/16	914	1689	913	124	495	1934	544	305 Oval	330	610	19	13

Size	M⌀	N⌀	P⌀	R⌀	S⌀	T⌀	U⌀	W⌀	X⊗ Hanger	Y	Z
25	94	532	481	133	273	214	375	157	793	546	702
50	94	532	481	133	273	214	375	157	793	546	702
75	69	532	481	133	324	214	375	157	793	546	702
100	44	532	481	133	375	214	375	157	793	546	702
125	34	532	481	133	521	214	521	157	908	546	724
165	72	659	641	184	445	291	521	202	932	686	934
200	34	659	641	184	521	291	521	202	932	686	934
250	150	1030	641	184	660	291	660	202	932	686	975
300	150	1030	641	184	660	291	660	202	932	686	975
400	172	1284	641	184	870	291	870	202	932	686	975

NOTES	①When equipped with optional blower cabinet.	⑤Use with 4-point suspension with blower cabinet.
	②When equipped with optional duct flange.	⑥Contactor is standard on Models 300 and 400; optional on other sizes.
	③Dimension includes a 3/4" flange on the rear of the blower cabinet.	⑦Contactor location with optional three phase motors on Sizes 50, 75, 100 and 125.
	④Use with 4-point suspension without blower cabinet. If installing hanger kit Option CK19, suspension points change; see Paragraph 9.	⑧Deduct 6-5/8" on Sizes 50, 75, and 100 when equipped with direct drive motor.

4. Uncrating and Preparation

This unit was test operated and inspected at the factory prior to crating and was in operating condition. If the heater has incurred any damage in shipment, file a claim with the transporting agency.

Check the rating plate for the gas specifications and electrical characteristics of the heater to be sure that they are compatible with the gas and electric supplies at the installation site. Read this booklet and become familiar with the installation requirements of your particular heater. If you do not have knowledge of local requirements, check with the local gas company or any other local agencies who might have requirements concerning this installation. Before beginning, make preparations for necessary supplies, tools, and manpower.

Check to see if there are any field-installed options that need to be assembled to the heater prior to installation. Each of the option packages includes a list of components and step-by-step instructions. For a brief description of optional hanger kits, refer to Paragraph 9 For a brief explanation of other frequently specified field-installed options, see Paragraphs 26-33. After becoming familiar with the instructions, assemble and install the options that are required for your heater.

Unless the crate bottom has been removed for option installation, leave it attached until after the heater has been suspended. If the crate bottom has been removed, the bottom of the heater must be supported with plywood or appropriately placed boards. Without adequate support, the bottom access panel could be damaged.

To protect the unit during shipping, the **blower model** has special supports that must be removed before installation. Follow these instructions to remove:

Blower Support Legs -- Remove the two blower support legs and screws.

Motor Shipping Block - Remove the wooden block located under the motor bracket. Find the two rubber pads shipped in the instruction envelope. Place these pads on the ends of the motor bracket bolts.

Motor Shipping Plate -- Blower models that are equipped with motors of 3/4 HP or less have a metal shipping plate attached between the motor and the blower housing. Remove and discard the shipping plate.

Note: On units factory equipped with an optional belt guard, the belt guard must be removed in order to reach the shipping plate.

5. Unit Heater Location

WARNING: Avoid installing a unit heater in extremely drafty areas. Extreme drafts can shorten the life of the heat exchanger and/or cause safety problems.

For best results, the heater should be placed with certain rules in mind. In general, a unit should be located from 8 to 12 feet above the floor. Units should always be arranged to blow toward or along exposed wall surfaces, if possible. Where two or more units are installed in the same room, a general scheme of air circulation should be maintained for best results.

Suspended heaters are most effective when located as close to the working zone as possible, and this fact should be kept in mind when determining the mounting heights to be used. However, care should be exercised to avoid directing the discharged air directly on the room occupants.

Partitions, columns, counters, or other obstructions should be taken into consideration when locating the unit heater so that a minimum quantity of airflow will be deflected by such obstacles.

When units are located in the center of the space to be heated, the air should be discharged toward the exposed walls. In large areas, units should be located to discharge air along exposed walls with extra units provided to discharge air in toward the center of the area.

At those points where infiltration of cold air is excessive, such as at entrance doors and shipping doors, it is desirable to locate the unit so that it will discharge directly toward the source of cold air from a distance of 15 to 20 feet.

Units should not be installed closer than 18 inches from any wall.

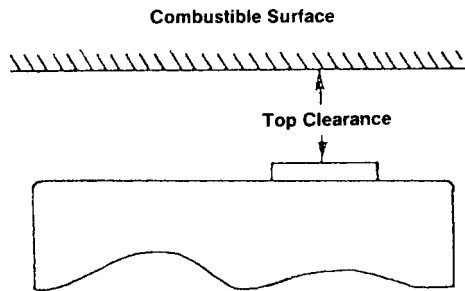
CAUTION: Do not locate the heater where it may be exposed to water spray, rain or dripping water.

6. Clearances and Combustion Air

Units must be installed so that the following clearances are provided for combustion air space, service and inspection, and for proper spacing from combustible construction.

Model Type	Size	Required Clearances				
		Top	Flue Connector	Sides	Bottom	Rear
Fan	25 - 125	2" *	6"	18"	12" **	24" ***
	165 - 400	6" *	6"	18"	12" **	24" ***
Blower	25 - 400	6" *	6"	18"	12" **	24" ***

Notes: * Measure Top Clearance as illustrated.



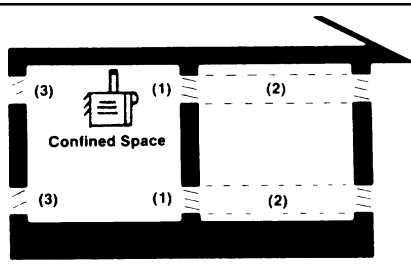
** When supplied with optional downturn nozzle, bottom clearance is 42". For service purposes, on standard units, bottom clearance exceeding minimum (12") is not required but may be desirable.

*** For servicing purposes only, rear **must** have 24" clearance.

7. Combustion Air Requirements for a Heater Located in a Confined Space

Do not install a unit in a confined space without providing wall openings leading to and from the space. Provide openings near the floor and ceiling for ventilation and air for combustion as shown in Figure 1, depending on the combustion air source as noted in Items 1, 2, and 3 below the illustration.

Figure 1 - Confined Space: A space whose volume is less than 50 cubic feet per 1000 BTUH of the installed appliance input rating



Add total BTUH of all appliances in the confined space and divide by figures below for square inch free area size of each (top and bottom) opening.

1. Air from inside the building -- openings 1 square inch free area per 1000 BTUH. Never less than 100 square inches free area for each opening. See (1) in Figure 1.

2. Air from outside through duct -- openings 1 square inch free area per 2000 BTUH. See (2) in Figure 1.

3. Air direct from outside -- openings 1 square inch free area per 4000 BTUH. See (3) in Figure 1.

NOTE: For further details on supplying combustion air to a confined space, see the National Fuel Gas Code ANSI Z223.1a (latest edition).

All fuel-burning equipment must be supplied with the air that enters into the combustion process and is then vented to the outdoors. Sufficient air must enter the equipment location to replace that exhausted through the heater vent system. In the past, the infiltration of outside air assumed in heat loss calculations (one air change per hour) was assumed to be sufficient. However, current construction methods utilizing more insulation, vapor barriers, tighter fitting and gasketed doors and windows or weather-stripping, and mechanical exhaust fans may now require the introduction of outside air through wall openings or ducts.

The requirements for combustion and ventilation air depend upon whether the unit is located in a confined or unconfined space. An "unconfined space" is defined as a space whose volume is not less than 50 cubic feet per 1000 BTUH of the installed appliance. **Under all conditions**, enough air must be provided to ensure there will not be a negative pressure condition within the equipment room or space. For specific requirements for confined space installation, see Paragraph 7.

8. Horizontal/Vertical Vent Outlet

All heaters are designed for either a horizontal or vertical vent outlet. Sizes 25, 50, 75, 100, 165, and 200 are shipped with the vent outlet installed in the horizontal position. Sizes 125, 250, 300, and 400 require field assembly of the vent outlet. When the outlet is in the horizontal position, it is recommended that a 12-18" piece of straight pipe be connected to the outlet before installing an elbow.

WARNING: Sizes 125, 250, 300 and 400 require field assembly of the flue outlet. Follow the instructions carefully. Failure to provide proper venting could result in death, serious injury and/or property damage.

8.1 Horizontal/Vertical Vent Outlet -- Sizes 25, 50, 75, 100, 165 and 200

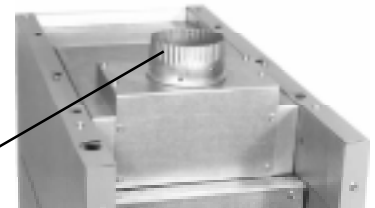
The heater in these sizes is shipped with the vent outlet in the horizontal position. If a vertical vent outlet connection is needed, reverse the positions of the flat cover plate and the flue collar assembly. See Figure 2.

Figure 2 - Vent Outlet Positions



Sizes 25, 50, 75, 100, 165, and 200 - Vent is factory assembled in the horizontal position.

Sizes 25, 50, 75, 100, 165, and 200 - Change the position of the flue collar assembly for a vertical vent outlet



IMPORTANT INSTALLATION NOTE: The instructions and illustrations in Sections 8.2 and 8.3 show the vent outlet being assembled in the horizontal position. To assemble the vent outlet in the vertical position, follow the instructions **REVERSING** the positions of the flue collar assembly and the cover.

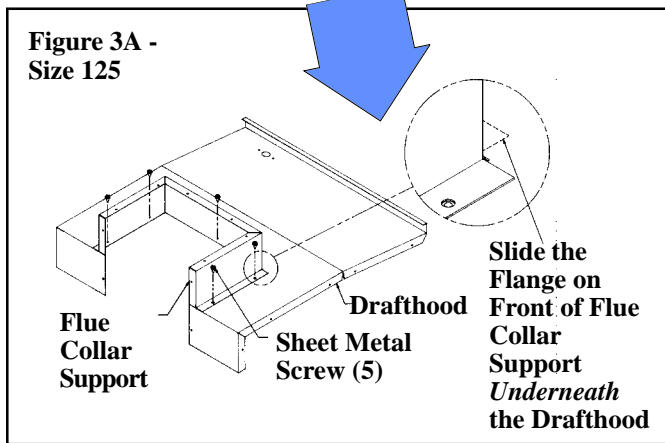
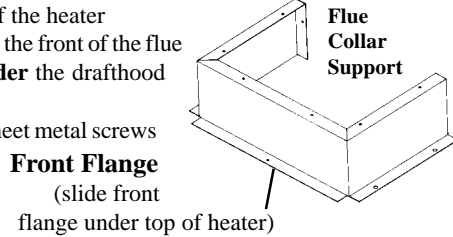
8.2 Assembly Instructions for Vent Outlet - Size 125

A size 125 heater requires field assembly of the vent outlet. The three sheet metal pieces and a parts bag including the instructions and screws are shipped attached to the draft hood of the heater.

1. Remove the two center screws (one on each side) that are holding the three flue outlet pieces in place during shipping. Use these screws and the 16 screws (#10x1/2" sheet metal screws) in the plastic bag.

2. Attach the Flue Collar Support - Size 125

- Position the support with the opening toward the back of the heater
- Slide the flange on the front of the flue collar support **under** the draft hood (top of the heater)
- Fasten with five sheet metal screws



3. Attach the Flue Collar Assembly - Size 125 (See Installation Note, page 6)

- Position the flue collar assembly over the rear opening
- Fasten with four sheet metal screws

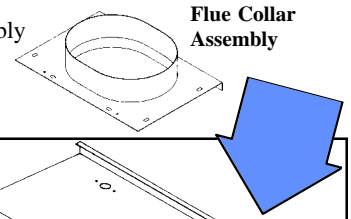
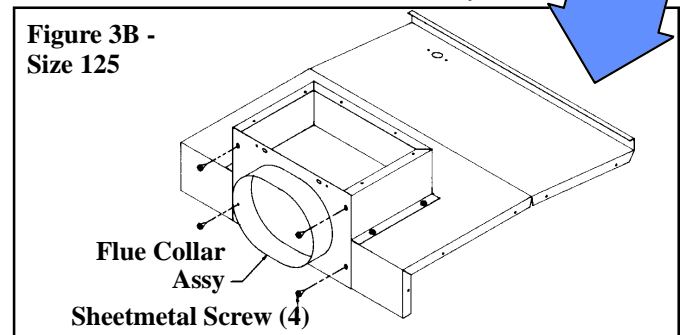


Figure 3B - Size 125



4. Attach the Cover - Size 125

- Position the flat cover over the top opening
- Fasten on the top and back with eight sheet metal screws

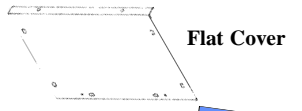
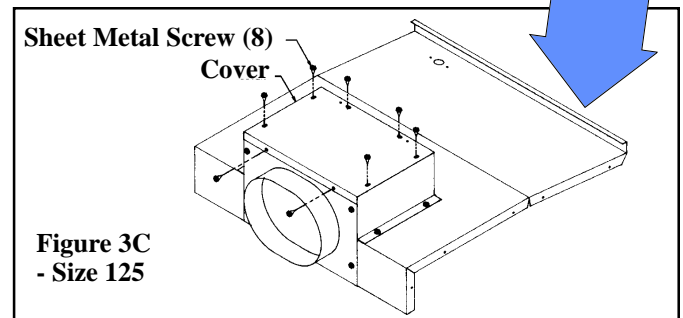


Figure 3C - Size 125



8.3 Assembly Instructions for Vent Outlet - Sizes 250, 300 and 400

The vent outlet on these heaters requires field assembly. The three sheet metal pieces and a parts bag including the instructions and screws are shipped attached to the draft hood of the heater.

1. Remove the two center screws (one on each side) that are holding the three flue outlet pieces in place during shipping. Use these screws and the 24 screws (#10x1/2" sheet metal screws) in the plastic bag.

2. Attach the Flue Collar Support - Sizes 250, 300, 400

- Position the support around the hole in the draft hood with the opening toward the back of the heater
- Fasten with nine sheet metal screws

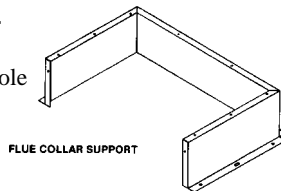
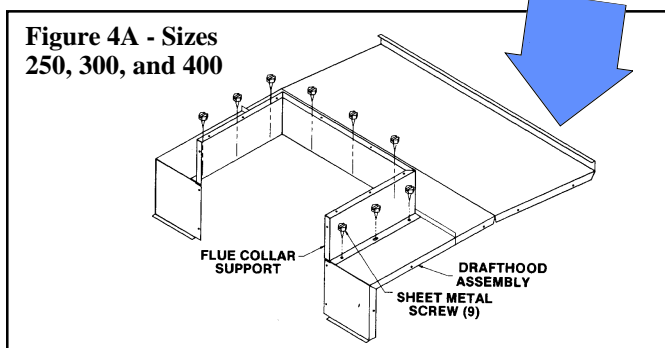


Figure 4A - Sizes 250, 300, and 400



3. Attach the Flue Collar Assembly - Sizes 250, 300, 400 (See Installation Note, page 6)

- Position the flue collar assembly over the rear opening
- Fasten with seven sheet metal screws

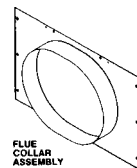
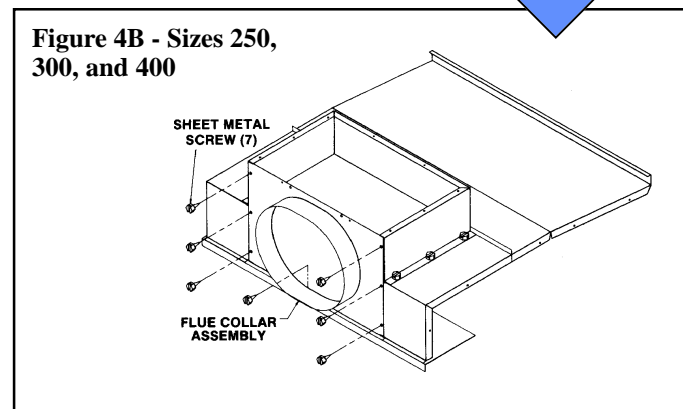


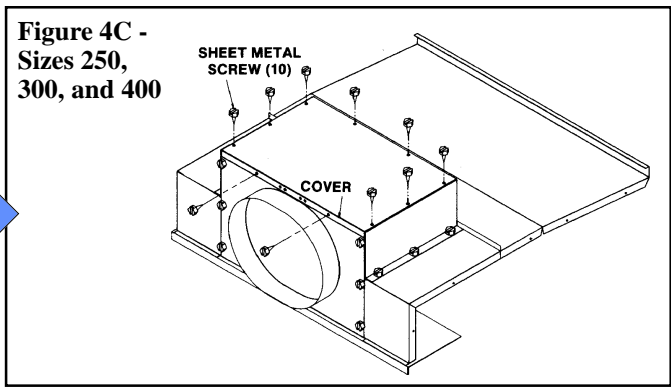
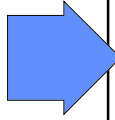
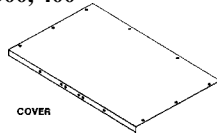
Figure 4B - Sizes 250, 300, and 400



8.3 Assembly Instructions for Vent Outlet - Sizes 250, 300 and 400 (cont'd)

4. Attach the Cover - Sizes 250, 300, 400

- Position the flat cover over the top opening
- Fasten on the top and back with ten sheet metal screws



9. Suspending the Unit

Before suspending the unit, check the supporting structure to be used to verify that it has sufficient load-carrying capacity to support the weight of the unit.

Model Type		Net Weight									
		Size									
		25	50	75	100	125	165	200	250	300	400
Fan	lbs	72	79	88	97	127	149	170	204	221	276
	kg	33	36	40	44	58	68	77	93	100	125
Blower	lbs	93	100	114	126	150	201	235	273	296	390
	kg	42	45	52	57	68	91	107	124	134	177

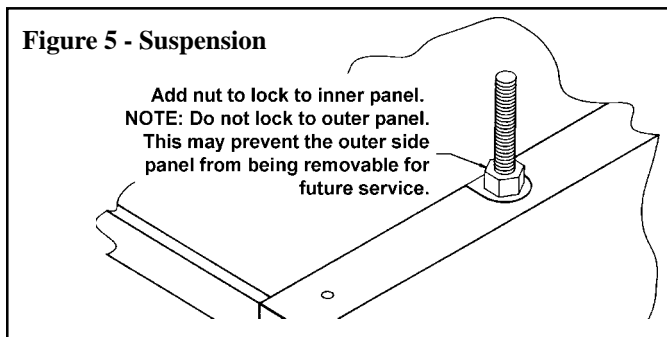
NOTE: If the installation includes an optional stepdown transformer kit (Option CF or CG), the stepdown transformer bracket is part of the heater suspension and must be installed prior to hanging the heater. Follow the instructions on the installation sheet included with the option kit.

A **fan-type unit heater** is equipped with standard two-point suspension. A 3/8-16 threaded hanger bracket assembly is located on each side of the heater. If a fan-type unit has been ordered with optional, factory-installed, four-point suspension (Option BJ6), it will have two threaded hanger brackets on each side.

A **blower-type heater** is equipped with standard four-point suspension. Two 3/8-16 threaded hanger bracket assemblies are located on each side of the unit. Each hanger bracket assembly is designed for threaded rod attachment.

For both "standard" and "optional" suspension point dimensions, see Dimension Tables in Paragraph 3. (Note: If installing Option CK19 hanger kit, suspension points change; see Figure 7B.)

WARNING: Suspend the heater only from the threaded hanger brackets. Do not suspend from the heater side panel.



When the heater is lifted for suspension, the bottom must be protected. If the wooden crate bottom has been removed, the bottom of the heater will have to be supported with plywood or other appropriately placed material. If the bottom is not supported, the bottom access panel could

be damaged. Also, when lifting a blower unit, support the blower and motor to prevent the unit from tipping.

All blower models have legs that support the blower assembly during shipping. After the unit is suspended, these legs should be removed.

Be sure that the threaded hanger rods are locked to the heater as shown in Figure 5.

WARNING: Unit must be level for proper operation. Do not place or add additional weight to the suspended heater. See Hazard Levels, page 2.

If an **optional downturn air nozzle** is used, the unit must be suspended from four points to ensure level suspension. Two hanger brackets are included in the downturn option package and must be field-installed on fan-type units with standard two-point suspension. For additional information, refer to Paragraph 27 and the instructions that are furnished with the option package.

When **blower-type** units are equipped with an **optional blower/filter cabinet**, there are two suspension points on the blower cabinet hanger bar. Suspend a unit equipped with a blower/filter cabinet from four points, using the two heater hanger bracket assemblies closest to the front of the heater and the two suspension points on the blower/filter cabinet.

If one of the four optional, field-installed hanger kits has been ordered for your heater, it will have been shipped separately. Each option package includes a list of components and complete, step-by-step assembly instructions.

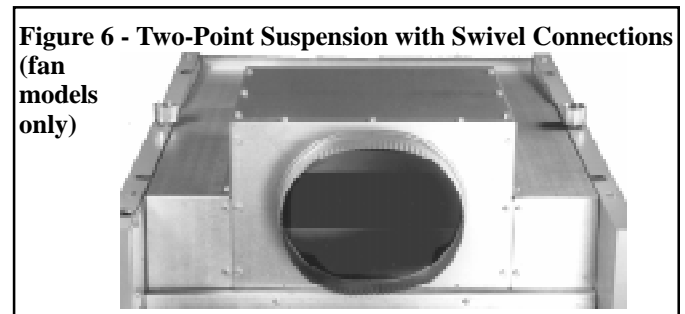
Optional, Field-Installed Hanger Kits:

1) Four-Point Suspension (fan models only) - Option CK7

This option kit is designed to convert a fan-type heater from standard two-point suspension to four-point suspension. The kit contains two additional hanger brackets.

2) Two-Point Swivel Connectors (fan models only) - Option CK8 (See Figure 6.)

The purpose of this option kit is to adapt the standard hanger bracket so that the heater can be suspended from 1", threaded, stationary pipe. The swivel connector screws "into" the threaded hanger bracket on the heater and "onto" the 1" threaded pipe used for hanging the heater. The kit includes two swivel hanger connector assemblies and two lock washers.



3) Four-Point with Swivel Connectors (fan-models only) - Option CK9 (See Figure 7A)

This option package is designed to convert a fan-type heater from standard two-point suspension to four-point suspension with swivel connectors. By installing this kit the standard fan-type heater can be hung from four 1", threaded, stationary pipes. The kit includes two hanger bracket assemblies, four swivel hanger connector assemblies and four lock washers.

4) Four-Point Swivel Connectors - Option CK10 (See Figure 7A)

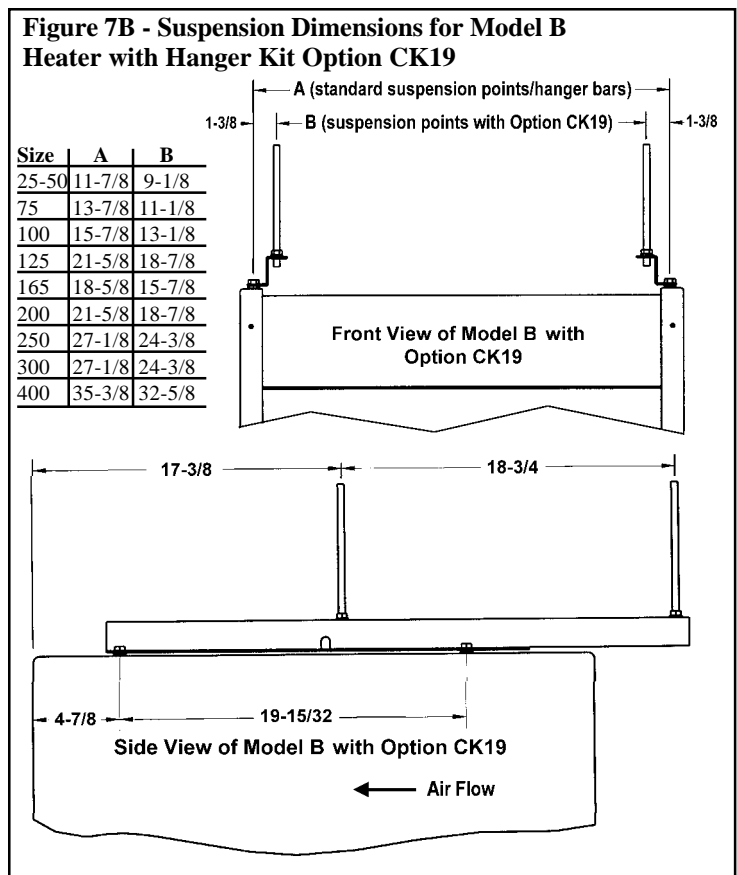
This option package is used on a heater that is already equipped with four-point suspension to adapt it for suspension from four 1", threaded, stationary pipes. The kit includes four swivel hanger connector assemblies and four lock washers.



5) Special Four-Point Suspension with Nearly Equal Loading (applies to blower models only) - Option CK19

This suspension option is designed for special applications when a suspension system is needed that has nearly equal loading at all four suspension points. Use this option in installations with spring isolation designed for seismic protection or when threaded rod hangers are longer than twelve inches.

Suspension points change with the addition of hanger kit Option CK19; see Figure 7B.



10. Venting

DANGER: Failure to provide proper venting could result in death, serious injury, and/or property damage. This heater must be installed with a vent connection and proper vent to the outside of the building. Install vent in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1 (latest edition) or applicable provision of national, state or local codes. A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2, Installation Code for Gas Burning Appliances and Equipment, and applicable local codes. Also, follow venting recommendations listed below.

Safe operation of any gravity-vented gas equipment requires a properly operating vent system, correct provision for the combustion air (See Paragraphs 6-7) and regular maintenance and inspection (See page 27). See Hazard Levels, page 2.

Heaters have the following vent outlet sizes:

Model Size	Size Configuration of Horizontal/Vertical Vent Outlet
25 - 50	4" Round
75	5" Oval
100	6" Oval
125	7" Oval
165 - 200	8" Oval
250 - 300	10" Oval
400	12" Oval

NOTE: Standard units manufactured prior to 10/89 (Serial No. Date Code prior to AOJ) have a round fixed vertical vent outlet in the size listed. Units manufactured prior to 10/89 with Option BT1 have the horizontal/vertical vent outlet.

Venting Requirements - All Models

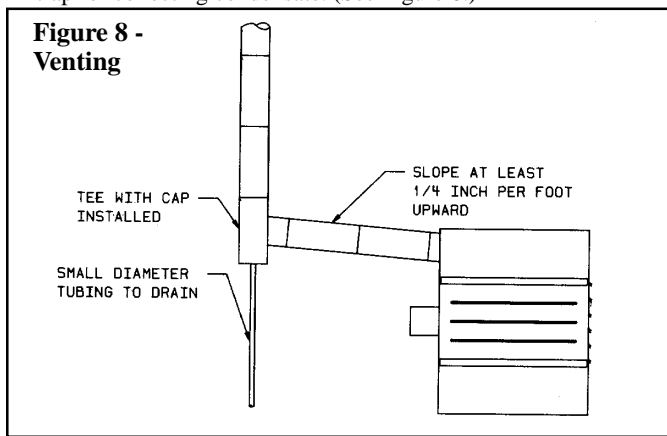
1. Provide a minimum clearance of 18" between the draft hood relief opening and any obstruction. Do not expose the relief opening to wind drafts from any source such as from an overhead door or adjacent air handling equipment.
2. The unit is equipped with a built-in draft diverter, consequently an external draft diverter **MUST NOT** be installed in the vent connector or any internal alterations made. Do not install a manual damper or other fixed restriction in the vent connector.
3. Vent pipe should be a minimum of 24 gauge galvanized steel or other non-corrosive material. Double wall, Type B vent such as Metalbestos or Amerivent is recommended. Where it is necessary to run the vent pipe through an exterior wall of combustible materials, a suitable thimble must be used. The vent pipe shall have a clearance of at least six inches from combustible materials, or as is specified by the double-wall vent pipe manufacturer.
4. With the outlet on the heater in the horizontal position, it is recommended that a 12-18" piece of straight pipe be connected to the flue collar before installing an elbow. The horizontal vent pipe run should have a uniform rise of at least 1/4" per foot of horizontal run in the direction of discharge. The length of the lateral run

10. Venting (cont'd)

Venting Requirements - All Models (cont'd)

must not exceed lengths showing in the vent tables of the National Fuel Gas Code or the Canadian Installation Code for Gas Burning Appliances (See Tables 1 and 2).

5. Lateral runs should be supported every six feet using a non-combustible material, such as strap steel or chain. Do not rely on the drafthood or heater for support of either horizontal or vertical vent pipe.
6. Vent connectors serving Category I heaters shall not be connected into any portion of a mechanical draft system operating under positive pressure.
7. Where it is necessary to use a long run of vent pipe, or where the vent pipe is exposed to cold air, condensation within the pipe may occur. There are two ways to overcome or eliminate this problem.
 - (a) Prevent condensation by insulating the pipe so that the temperature of the flue products never drops below 250°F.
 - (b) Use double-wall, Type B vent pipe which is recommended for the reduction or elimination of condensate problems. Where extreme conditions are present and condensate is anticipated, install a trap for collecting condensate. (See Figure 8.)



8. The vent connection may be made into a suitable permanent chimney or into a gas vent. The effective area of the vent connector, gas vent or chimney when connected to a single appliance shall not be less than the area of the appliance drafthood outlet or in accordance with approved venting methods. The effective area of the gas vent or chimney when connected to more than one appliance shall not be less than the area of the largest vent connector plus 50% of the areas of additional vent connectors or in accordance with approved venting methods.

Minimum permissible height of the vertical vent is five feet providing no horizontal vent pipe connector is used. If a horizontal vent connector is necessary, consult Tables 1 and 2 or the National Fuel Gas Code or the Canadian Installation Code for Gas Burning Appliances, for the maximum permissible length of a horizontal pipe run (vent connector) for a given vertical height of gas vent.

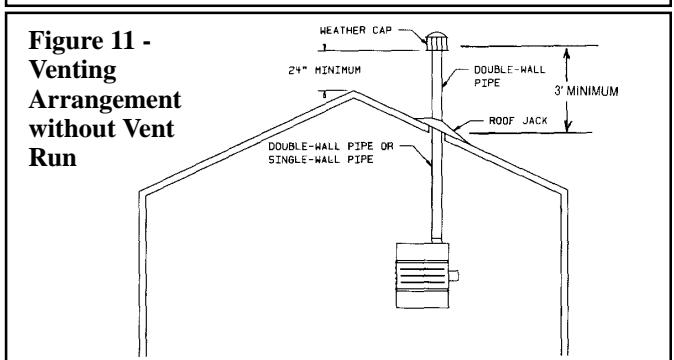
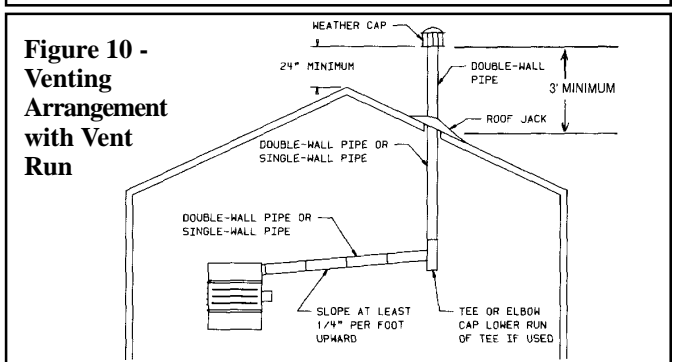
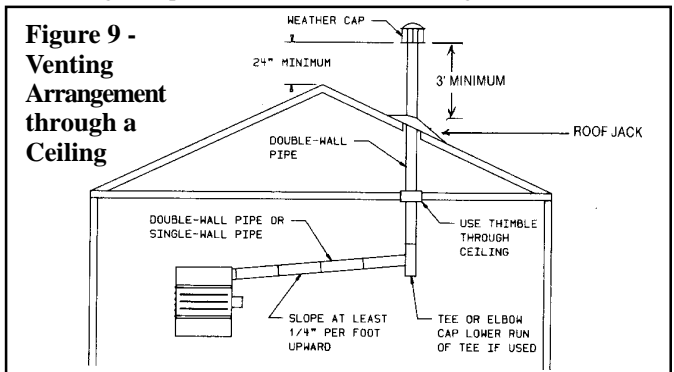
Table 1 - Maximum Horizontal Run for Double Wall Type B Connector and Double-Wall Type B Vent

Model Sizes	25/50	75	100	125	165/200	250/300	400
Vertical	Vent Diameter						
Height of Vent	4"	5"	6"	7"	8"	10"	12"
7'	2'	6'	6'	6'	6'	6'	6'
9'	6'	6'	7'	16'	16'	16'	16'
10'	8'	10'	16'	20'	20'	20'	20'
15'	12'	16'	16'	30'	30'	30'	30'
20'	16'	20'	30'	30'	30'	30'	30'
30'	18'	20'	40'	40'	40'	40'	40'

Table 2 - Maximum Horizontal Run for Single Wall Metal Pipe

Model Sizes	25/50	75	100	125	165/200	250/300	400
Vertical	Vent Diameter						
Height of Vent	4"	5"	6"	7"	8"	10"	12"
6'	2'	2'	2'	2'	2'	2'	2'
8'	2'	5'	5'	10'	10'	10'	10'
10'	2'	5'	10'	15'	15'	15'	15'
15'	2'	5'	10'	15'	20'	20'	20'
20'	N.R.		10'	15'	20'	20'	20'

The gas vent or chimney should extend at least three feet above the highest point where it passes through a roof of a building and at least two feet higher than any portion of a building or obstruction within a horizontal distance of ten feet. A suitable weather cap should be installed on the end of the vent pipe to prevent rain or snow from entering the open end. See illustrations in Figures 9, 10, and 11.



9. If the unit heater is installed in a space served by a large exhaust fan, be sure that the exhaust fan does not affect the operation of the heater or the satisfactory venting of its products of combustion. If a negative pressure exists, as evidenced by a downdraft, a factory-designed mechanical motor drive venter (Option CA) should be installed. (The addition of a power venter allows for horizontal venting and alters the venting requirements including the vent pipe size and length. For additional installation information on an optional power venter, refer to Paragraph 28. Complete information is included in the venter package.)

In severe negative pressure conditions, makeup air equipment may be necessary.

11. Gas Piping and Pressures

WARNING

This appliance is equipped for a maximum gas supply pressure of 1/2 pound, 8 ounces, or 14 inches water column. Supply pressure higher than 1/2 pound requires installation of an additional service regulator external to the unit.

PRESSURE TESTING SUPPLY PIPING

Test Pressures Above 1/2 PSI: Disconnect the heater and manual valve from the gas supply line which is to be tested. Cap or plug the supply line.

Test Pressures Below 1/2 PSI: Before testing, close the manual valve on the heater.

All piping must be in accordance with requirements outlined in the National Fuel Gas Code ANSI/Z223.1a (latest edition), published by the American Gas Association or CAN/CGA-B149.1 and B149.2, published by the Canadian Gas Association (See Paragraph 1). Gas supply piping installation should conform with good practice and with local codes.

Unit heaters for natural gas are orificed for operation with gas having a heating value of 1000 (+ or - 50) BTUH per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orificing.

Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.

Install a ground joint union and manual shut-off valve upstream of the unit control system, as shown in Figure 12. The 1/8" plugged tapping in the shut-off valve provides connection for supply line pressure test gauge. The National Fuel Gas Code requires the installation of a trap with a minimum 3" drip leg. Local codes may require a minimum drip leg longer than 3" (typically 6").

Gas connection sizes are included in the Dimensional Tables in Paragraph 3. After all connections are made, disconnect the pilot supply at the control valve and bleed the system of air. Reconnect the pilot line and leak-test all connections by brushing on a soap solution.

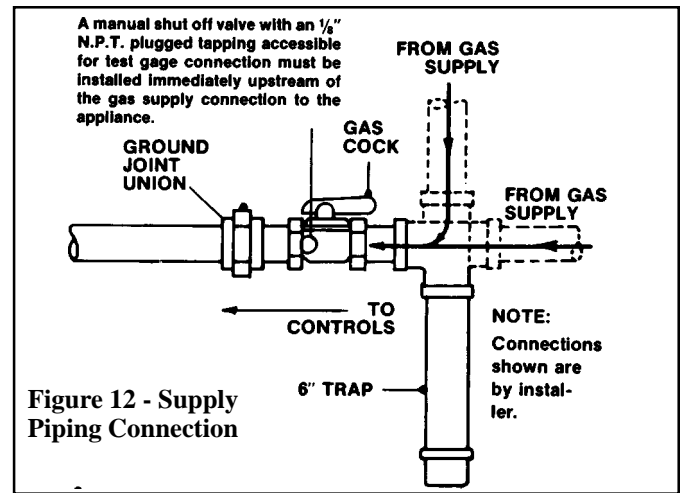


Figure 12 - Supply Piping Connection

WARNING: All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage or death.

Manifold or Orifice Pressure Settings

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the steps of the "Check-Test-Start" procedure in Paragraph 25. The following warnings and instructions apply.

WARNING: Manifold gas pressure must never exceed 3.5" w.c. for natural gas and 10" w.c. for propane gas.

For Natural Gas: Manifold gas pressure is regulated by the combination valve to 3.5" w.c. Inlet pressure to the valve must be a minimum of 5" w.c. or as noted on the rating plate and a maximum of 14" w.c.

For Propane Gas: Manifold gas pressure is regulated by the combination valve to 10" w.c. Inlet pressure to the valve must be a minimum of 11" w.c. and a maximum of 14" w.c.

Sizing a Gas Supply Line

Capacity of Piping												
Cubic Feet per Hour based on 0.3" w.c. Pressure Drop												
Specific Gravity for Natural Gas -- 0.6 (Natural Gas -- 1000 BTU/Cubic Ft)												
Specific Gravity for Propane Gas -- 1.6 (Propane Gas -- 2550 BTU/Cubic Ft)												
Length of Pipe	Diameter of Pipe											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
20'	92	56	190	116	350	214	730	445	1100	671	2100	1281
30'	73	45	152	93	285	174	590	360	890	543	1650	1007
40'	63	38	130	79	245	149	500	305	760	464	1450	885
50'	56	34	115	70	215	131	440	268	670	409	1270	775
60'	50	31	105	64	195	119	400	244	610	372	1105	674
70'	46	28	96	59	180	110	370	226	560	342	1050	641
80'	43	26	90	55	170	104	350	214	530	323	990	604
90'	40	24	84	51	160	98	320	195	490	299	930	567
100'	38	23	79	48	150	92	305	186	460	281	870	531
125'	34	21	72	44	130	79	275	168	410	250	780	476
150'	31	19	64	39	120	73	250	153	380	232	710	433
175'	28	17	59	36	110	67	225	137	350	214	650	397
200'	26	16	55	34	100	61	210	128	320	195	610	372

Note: When sizing supply lines, consider possibilities of future expansion and increased requirements. Refer to National Fuel Gas Code for additional information on line sizing.

11. Gas Piping and Pressures (cont'd)

Manifold Pressure Settings (cont'd)

Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being used both when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time.

Instructions to Check Manifold Pressure:

1) With the manual valve (on the combination valve) positioned to prevent flow to the main burners, connect a manometer to the 1/8" pipe outlet pressure tap in the valve. NOTE: A manometer (fluid-filled gauge)

is recommended rather than a spring type gauge due to the difficulty of maintaining calibration of a spring type gauge.

2) Open the valve and operate the heater. Measure the gas pressure to the manifold. Normally adjustments should not be necessary to the factory preset regulator.

If adjustment is necessary, set pressure to correct settings by turning the regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure.

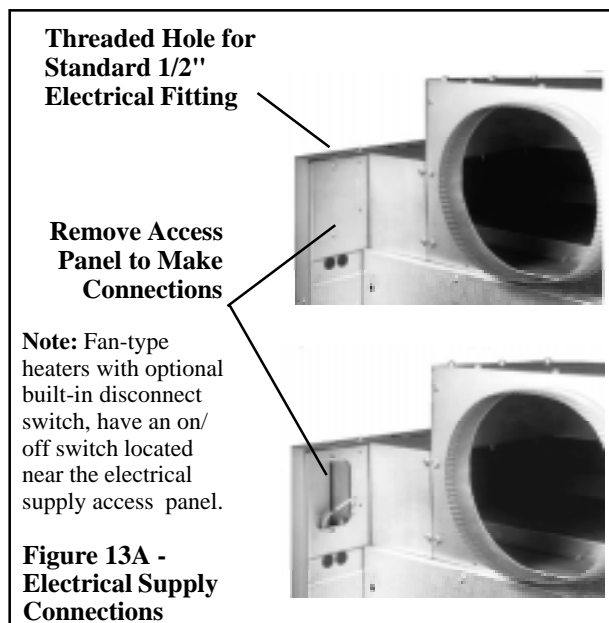
Consult the valve manufacturer's literature provided with the heater for more detailed information.

12. Electrical Supply and Connections

All electrical wiring and connections, including electrical grounding MUST be made in accordance with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.1. In addition, the installer should be aware of any local ordinances or gas company requirements that might apply.

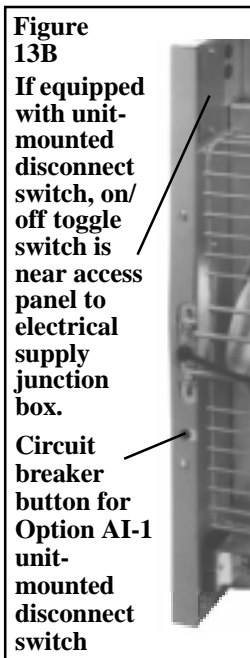
Check the rating plate on the heater for the supply voltage and current requirements. A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel to the heater. All external wiring must be within approved conduit and have a minimum temperature rise of 60°C. Conduit from the disconnect switch must be run so as not to interfere with the service panels of the heater.

The electrical supply connects at the top back of the heater in the left corner (left when facing the back of the heater). A threaded hole is provided for a standard 1/2" electrical fitting. See Figure 13A. The wiring access panel is easily removed for field connections. Consult the wiring diagram supplied with your heater. Replace the panel after the wiring connections are made.



If the heater has field-installed options that require electrical connections, consult the instruction sheet and wiring diagram supplied in the option package.

A fan-type heater may be equipped with a built-in fused disconnect switch (Option AI-1). If the heater is equipped with a built-in disconnect switch, a two-position toggle (on/off) switch is located near the electrical supply access panel (See Figures 13A and 13B). This switch may be used to disconnect the power when servicing the heater other than in the supply junction box.



next six pages, showing standard single-stage heating with standard matchlit pilot and optional intermittent spark pilot with and without lockout.

WARNINGS: On a heater with a unit disconnect switch (Option AI-1), if the power is turned off at the switch, the supply lead in the electrical supply junction box (Figure 13A) remains energized. If service is to be done in the supply junction box, turn off the power at the remote disconnect switch.

If you turn off the power supply, turn off the gas.

Specific wiring diagrams that include standard and factory-installed options are on with the heater. Check the wiring diagram to identify optional equipment.

The operating sequence of the heater can be found on the heater wiring diagram and is published in Paragraph 25, Check Installation and Start-Up. Typical wiring diagrams are on the

CAUTION: FAN-TYPE MODEL FOR OPTIONAL 50 HERTZ OPERATION

A fan-type heater with Option AK11 is designed for operation from a 220-240V/50Hz/single phase power source. Connection to any other voltage or frequency source may cause failure of the equipment and/or damage to persons or property.

In the event that this product is purchased or destined for export markets, the buyer is responsible for meeting any and all local codes covering installation and labeling of the product. The equipment as provided by the manufacturer is A.G.A. design-certified and comes with English-only labels and installation instructions.

13. Thermostat and Thermostat Connections

A thermostat is not standard equipment but is an installation requirement. Use either an optional thermostat available with the heater or a field-supplied thermostat. Install according to the thermostat manufacturer's instructions. Make sure that the heat anticipator setting on the thermostat is in accordance with the amperage value noted on the wiring diagram of your heater.

(continued on page 19)

TYPICAL WIRING DIAGRAMS -- Pages 13 - 18

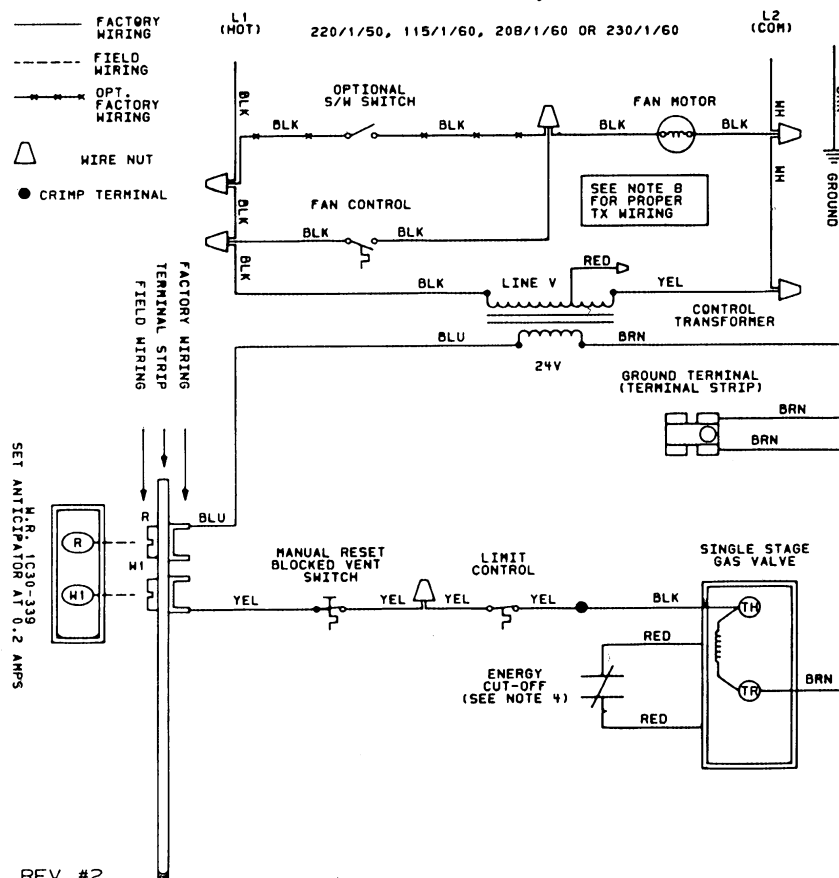
FAN-TYPE, GRAVITY-VENTED, MODEL SIZES 25-400 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the fan motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
 2. The following controls are factory installed options: summer/winter switch
 3. Dotted wiring installed by others.
 4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
 5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
 6. Use 18 ga. wire for all wiring on the unit.
 7. Line and fan motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
 8. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
- On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
- On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



W.D. 113192

REV #2

Field Control Wiring Length and Gauge		
Total Wire Length	Distance from Unit to Control	Minimum Recommended Wire Gauge
150'	75'	#18 gauge
250'	125'	#16 gauge
350'	175'	#14 gauge

CAUTION: If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C, except for blocked vent switch, limit control, energy cutoff, and sensor lead wires which must be 150°C. See Hazard Levels, page 2.

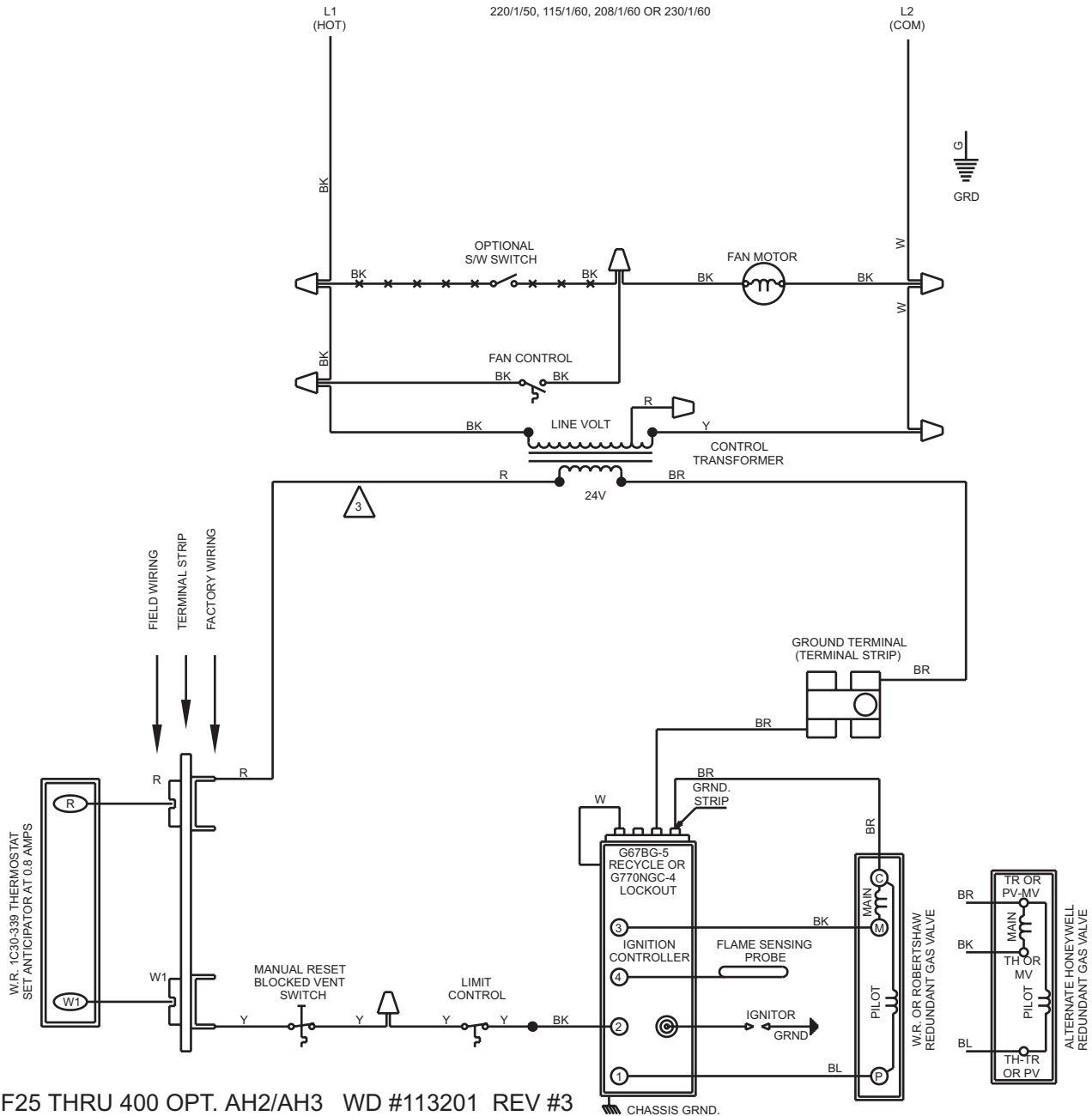
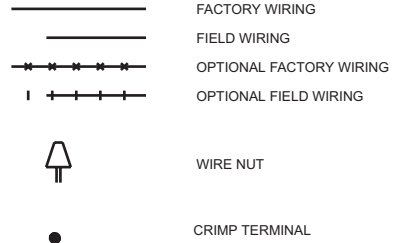
FAN-TYPE, GRAVITY-VENTED, MODEL SIZES 25-400 WITH INTERMITTENT SPARK PILOT WITH OR WITHOUT TIMED LOCKOUT, SINGLE STAGE HEATING, NATURAL /PROPANE

OPERATING SEQUENCE

1. SET THERMOSTAT AT LOWEST SETTING.
2. TURN ON MAIN AND PILOT MANUAL GAS VALVES.
3. TURN ON POWER TO UNIT.
4. SET THERMOSTAT AT DESIRED SETTING.
5. THERMOSTAT CALLS FOR HEAT FIRING UNIT AT FULL RATE AFTER PILOT PROVING SEQUENCE.
6. FAN CONTROL SENSES HEAT EXCHANGER TEMPERATURE ENERGIZING THE FAN MOTOR.
7. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION THE SAFETY SWITCH CLOSSES THE MAIN VALVE AND RECYCLES THE SPARK GAP. ON UNITS EQUIPPED WITH THE G770NGC-4 LOCKOUT CONTROL, IF PILOT IS NOT ESTABLISHED WITHIN 120 SECONDS (APPROX.) UNIT LOCKS OUT AND MUST BE RESET BY INTERRUPTING POWER TO CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).

NOTES

1. THE FOLLOWING CONTROLS ARE FIELD INSTALLED OPTIONS:
THERMOSTAT
2. THE FOLLOWING CONTROLS ARE FACTORY INSTALLED OPTIONS:
S/W SWITCH
3. DOTTED WIRING INSTALLED BY OTHERS.
4. CAUTION: IF ANY OF THE ORIGINAL WIRING AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 DEGREES C., EXCEPT FOR SENSOR LEAD WIRE, BLOCKED VENT SWITCH AND LIMIT WIRING WHICH MUST BE 150 DEGREES C.
5. USE #18 GA WIRE FOR ALL WIRING ON UNIT.
6. LINE AND FAN MOTOR BRANCH WIRE SIZES SHOULD BE OF A SIZE TO PREVENT VOLTAGE DROPS BEYOND 5% OF SUPPLY LINE VOLTAGE.
7. ON 230V. UNITS THE CONTROL TRANSFORMER HAS A DUAL VOLTAGE PRIMARY.
FOR 230V. UNITS USE BLACK AND YELLOW LEADS (CAP RED).
FOR 208V. UNITS USE BLACK AND RED LEADS (CAP YELLOW).
ON 115V. UNITS THE CONTROL TRANSFORMER IS A SINGLE VOLTAGE PRIMARY.
FOR 115V. UNITS USE BLACK AND YELLOW LEADS.
8. SEE INSTALLATION INSTRUCTIONS FOR GREATER DETAIL.



BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 25-100 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE, DIRECT DRIVE

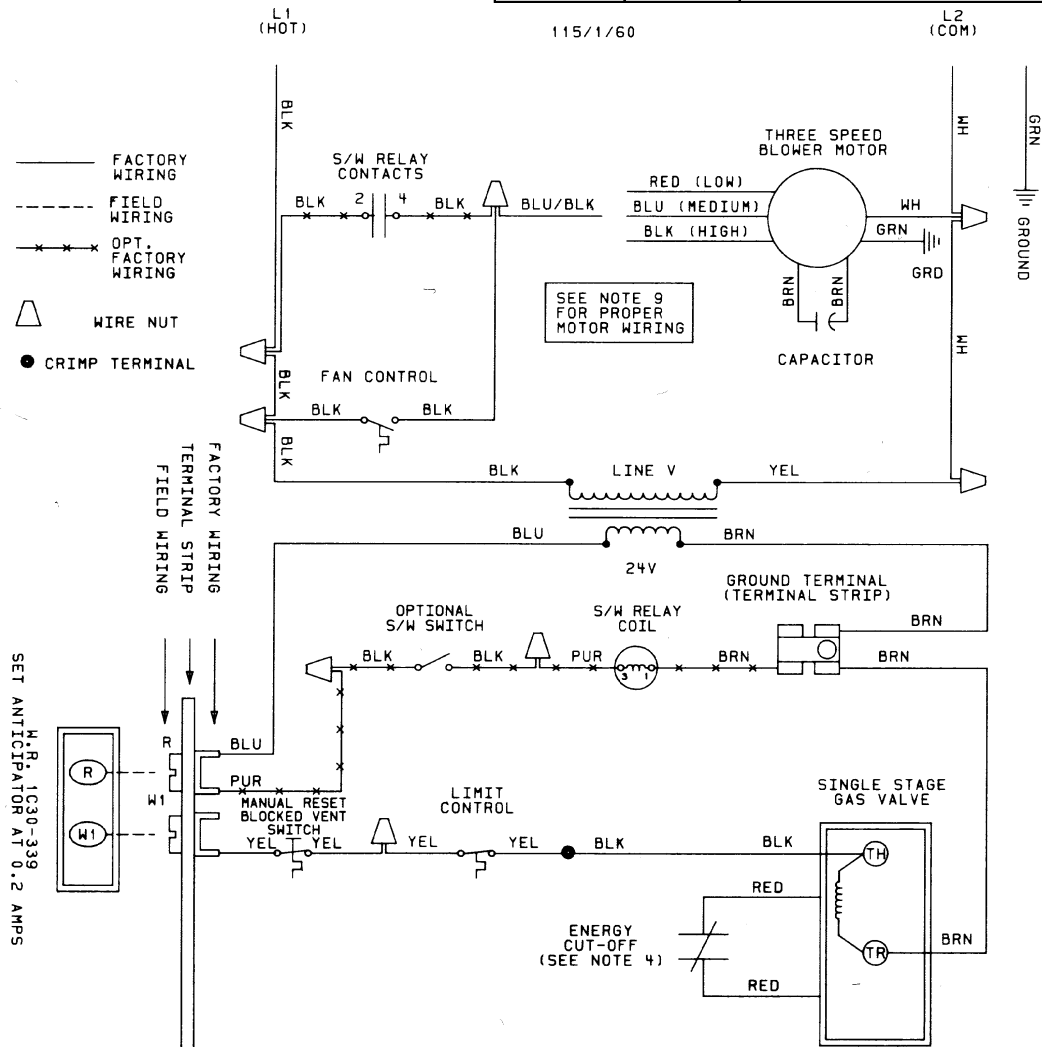
Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower circuit wiring on the unit.
7. Use 18 ga. wire for all wiring except blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. Three-speed motor connections are as follows:
* Factory-wired speed
speed

Model Size	Speed	Use these Two Motor Wires
25	*Medium	*Blue and White
	Low	Red and White
50	*High	*Black and White
	Medium	Blue and White
75	High	Black and White
	*Medium	*Blue and White
	Low	Red and White
100	*High	*Black and White
	Medium	Blue and White
	Low	Red and White



W.D. 113217

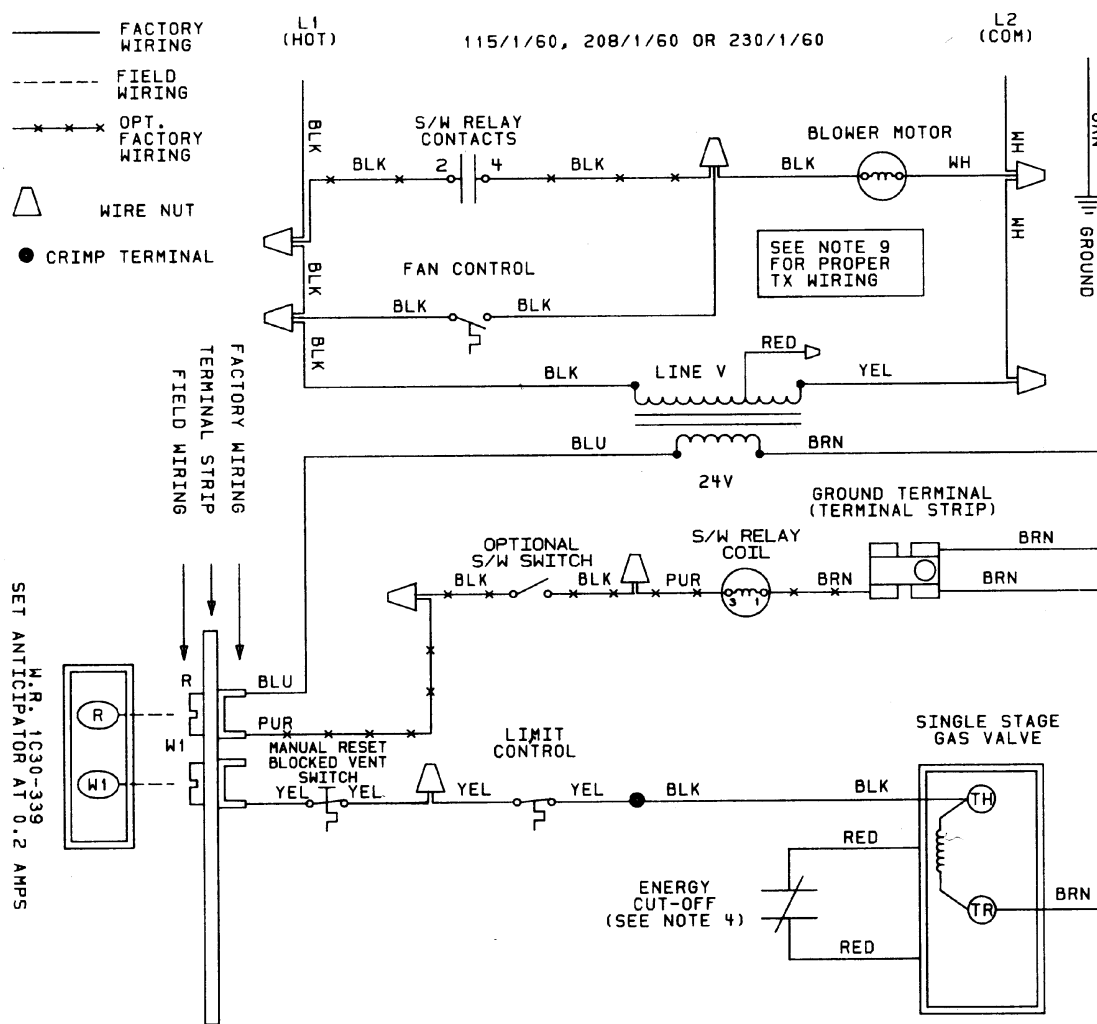
BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 50-250 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE, BELT DRIVE (Note: Belt drive is standard on Sizes 125-400; Optional on Sizes 50-100.)

Wiring Notes

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower motor circuit wiring on unit.
7. Use 18 ga. wire for all wiring on the unit except for blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



W.D. 113218

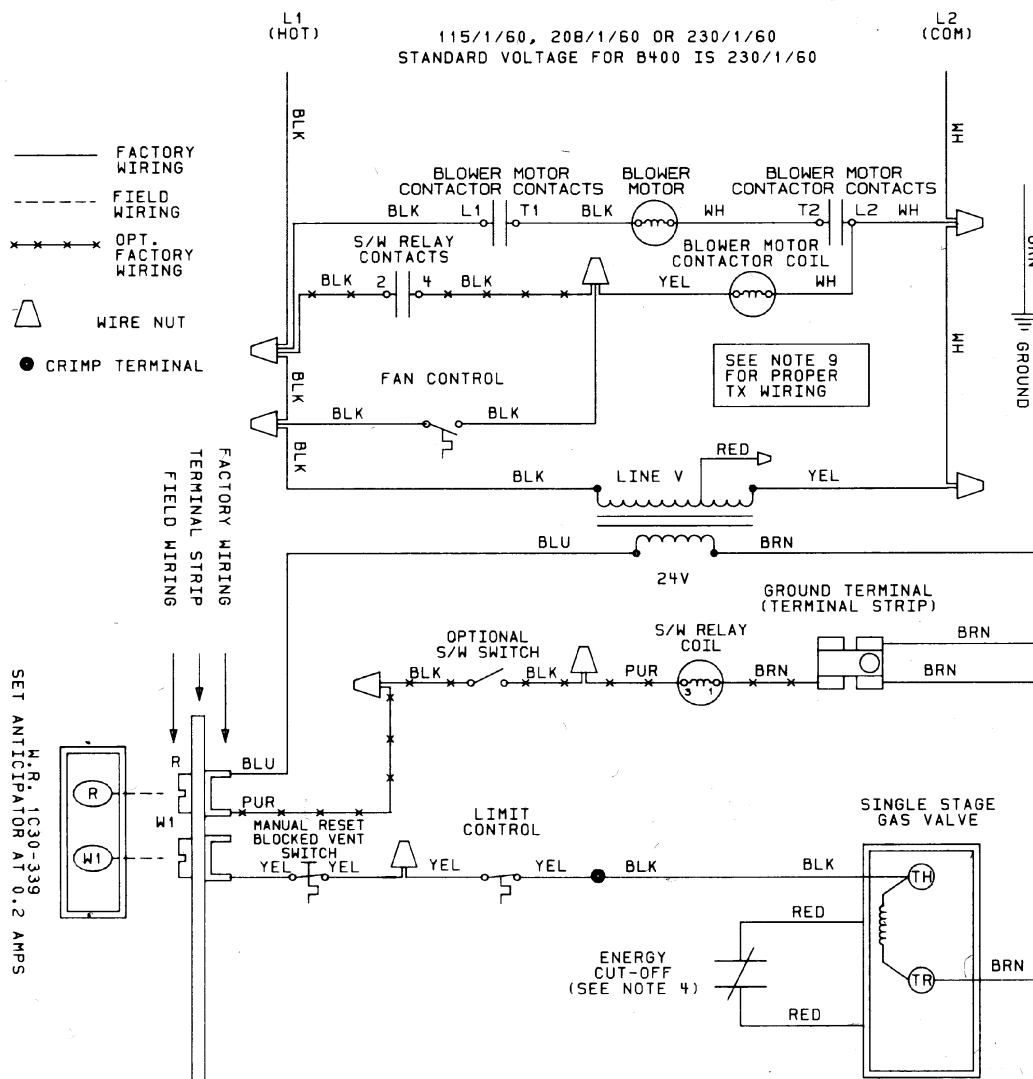
BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 165-400 WITH MATCH LIT PILOT, SINGLE STAGE HEATING, NATURAL /PROPANE, BELT DRIVE, BLOWER MOTOR CONTACTOR (Note: Motor contactor is standard on Sizes 300 and 400; Optional on other sizes.)

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Warning:** An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of failure and the replacement of the fan and limit control wiring before the unit can be returned to service.
5. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
6. Use 14 ga. wire for blower motor circuit wiring on unit.
7. Use 18 ga. wire for all wiring on the unit except for blower motor circuit.
8. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
9. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.



W.D. 113219

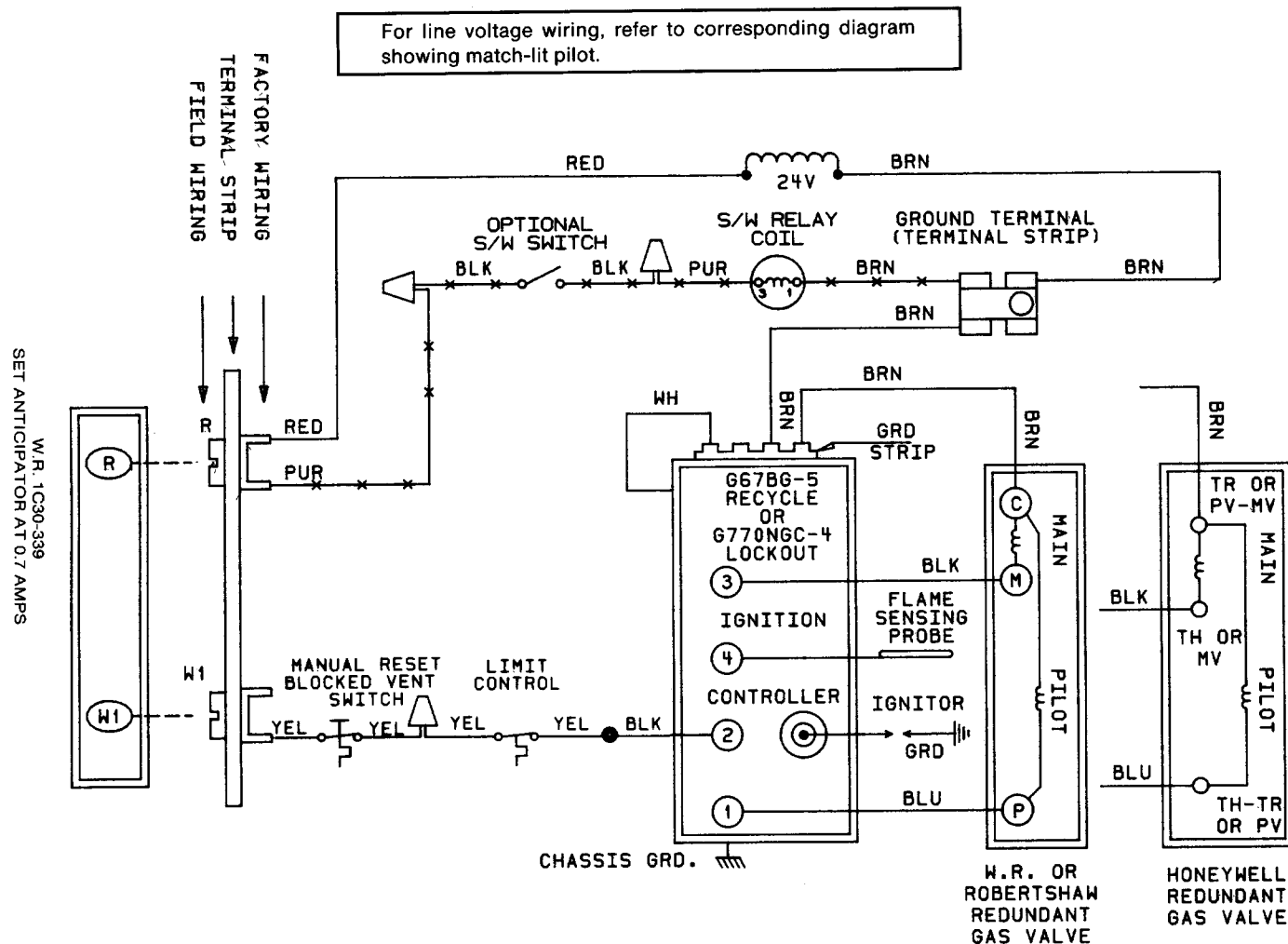
BLOWER-TYPE, GRAVITY-VENTED, MODEL SIZES 25-400 WITH INTERMITTENT SPARK PILOT WITH OR WITHOUT TIMED LOCKOUT (For line voltage wiring, refer to the corresponding diagram showing match-lit pilot.)

Operating Sequence

1. Set the thermostat at its lowest setting.
2. Follow lighting instructions and establish pilot.
3. Turn on power to the unit.
4. Set the thermostat at desired setting.
5. Thermostat calls for heat, firing unit at full rate.
6. Fan control senses heat exchanger temperature, energizing the blower motor.

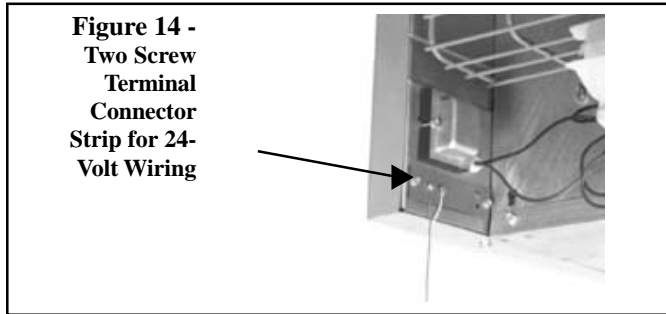
Wiring Notes

1. The following controls are field installed options: thermostat.
2. The following controls are factory installed options: summer/winter switch
3. Dotted wiring installed by others.
4. **Caution:** If any of the original wire as supplied with the appliance must be replaced with wiring material having a temperature rating of at least 105°C, except for energy cutoff, limit control, and blocked vent switch wires which must be 150°C.
5. Use 14 ga. wire for blower motor circuit wiring on unit.
6. Use 18 ga. wire for all wiring on the unit except for blower motor circuit.
7. Line and blower motor branch wire sizes should be of a size to prevent voltage drops beyond 5% of the supply line voltage.
8. On 230V units, the control transformer has a dual voltage primary.
For 230V units, use black and yellow leads (cap red).
On 208V units, the control transformer has a dual voltage primary.
For 208V units, use black and red leads (cap yellow).
On 115V units, the control transformer is single voltage primary.
For 115V units, use black and yellow leads.

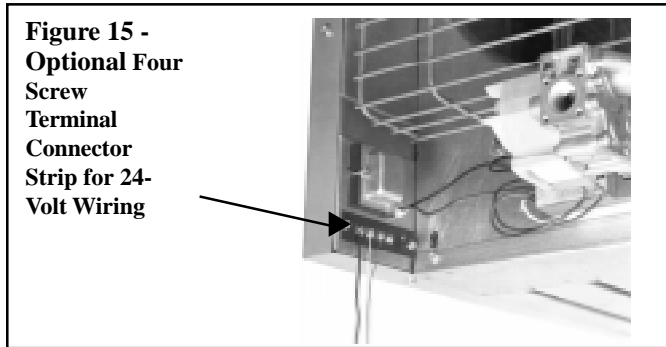


13. Thermostat and Thermostat Connections cont'd

Terminal Strip Connections - The standard heater is equipped with a two-screw terminal connector strip (See Figure 14) for easy connection to the low voltage controls (24V).



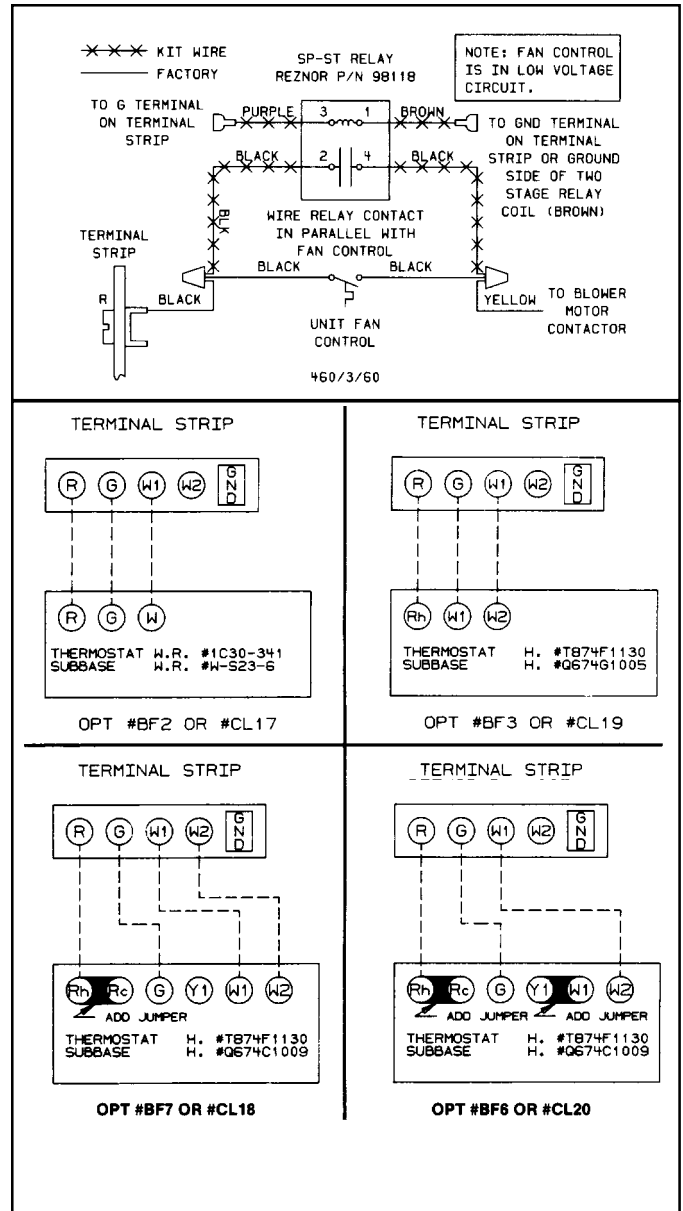
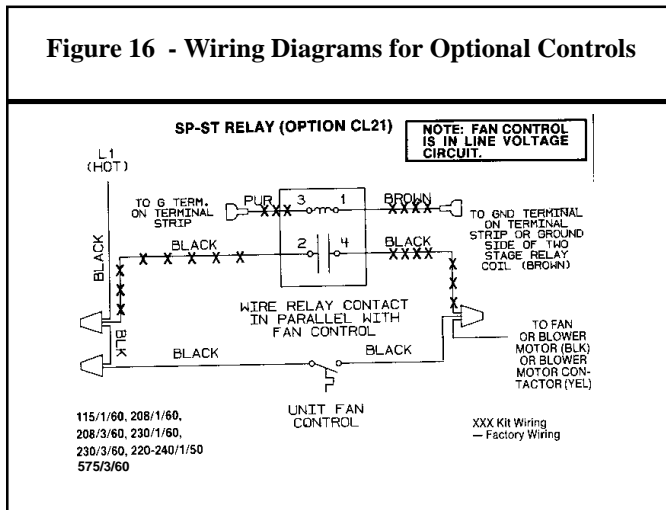
When factory-installed options require two-stage thermostat control, the heater is equipped with a SP-ST relay and a four-screw terminal connector strip (See Figure 15).



If your heater requires field installation of the four-screw terminal strip and the relay, follow the instructions packaged with the relay or thermostat option.

There are some unique wiring requirements with the installation of the optional controls (relay and two-stage). Figure 16 illustrates the wiring of the relay and the connections required for optional thermostat control.

Multiple Heater Control - These unit heaters are not designed for multiple unit connection to one thermostat. If you require that more than one unit be controlled by a single thermostat, it will be necessary to use relays in the circuit. Options CL31 and CL32 provide the necessary parts and instructions for multiple heater control. For more information on these options, see Paragraph 32.



14. Fan Motor

Fan motors are equipped with thermal overload protection of the automatic reset type. Should the motor refuse to run, it may be because of improper current characteristics. Make certain that the correct voltage is available at the motor.

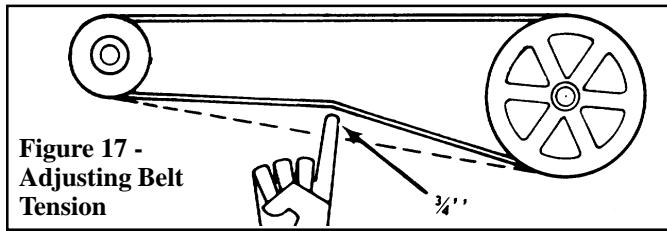
NOTE: If the unit is equipped with an optional totally enclosed motor, the horsepower may be larger than the standard motor. Refer to the motor nameplate to verify horsepower.

15. Blower Motor

Blower Model Sizes 25-100 are standardly equipped with a direct drive motor; an optional belt drive motor is available on Sizes 50-100. Blower Model Sizes 125-400 have an adjustable belt drive motor.

As part of the Check/Test/Start (Paragraph 25), check the belt for proper tension. Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 1/2-3/4". (See Figure 17.) After correct tension is achieved, re-tighten the locknut on the adjusting screw.

15. Blower Motor (cont'd)



Most blower motors are equipped with thermal overload protection of the automatic reset type. If a motor is not equipped with thermal overload protection, the unit will be equipped with a starter. The adjustable setting on the starter will be factory set to match the amp draw of the motor and sealed. No change should be made to starter set unless the original motor is replaced.

Starters are supplied from the factory for manual reset operation. If an overload condition is experienced, the condition must be corrected, and the starter must be manually reset.

After the installation is complete including all ductwork, check the amp draw of the motor with an amp meter to verify that the motor amp rating on the motor nameplate is not being exceeded. Amps may be adjusted downward by reducing blower speed or by increasing the duct system static pressure. The temperature rise must be within the range specified on the unit rating plate.

16. Blower Speed Adjustment

The blower speed may be adjusted to achieve the desired outlet temperature, as long as the adjustment is within the temperature rise and the static pressure limits shown on the heater rating plate. **Direct drive motors** are factory set as indicated in the chart below. **Belt drive motors** are factory set at the midpoint between maximum and minimum blower speeds.

If the duct resistance is low, the blower may deliver too high an air volume; or if the heater is operated without ductwork, it may deliver sufficient excess air to overload the motor, causing the overload protector to cycle the motor. Reducing the blower speed will correct these conditions. If ductwork is added to an installation, it may be necessary to increase the blower speed. Decreasing blower speed will increase outlet temperature; increasing blower speed will decrease outlet temperature.

Blower Model Sizes 25-100 with Direct Drive

Direct drive blower motors have multi-speed taps for speed adjustment. If your installation requires an adjustment of the blower speed, the motor may be re-wired to an alternate tap by following these instructions.

1. Turn off the gas and the electric power.
2. Remove the left (left when facing the back of the unit) outer side panel of the heater to reveal the wiring connections.
3. Consult the wiring diagram on the heater and follow the chart below to choose the wire for the desired adjustment. The asterisk(*) indicates the factory-wired speed.

Model Size	Speed	Use these Two Motor Wires
25	*Medium	*Blue and White
	Low	Red and White
50	*High	*Black and White
	Medium	Blue and White
75	High	Black and White
	*Medium	*Blue and White
	Low	Red and White
100	*High	*Black and White
	Medium	Blue and White
	Low	Red and White

4. Cut the crimped cap from the end of the wire that you intend to use and strip the insulation.
5. Disconnect the factory-wired connection and re-wire, using the newly stripped wire.
6. Put a wire nut on the end of the blower motor wire that was disconnected.
7. Replace the heater side panel and turn on the gas and the electric.

Blower Model Sizes 50-400 with Belt Drive

The belt drive on these units is equipped with an adjustable pulley which permits adjustment of the blower speed. Follow these instructions to adjust the blower speed.

1. Turn off the gas and the electric power.
2. Loosen belt tension and remove the belt.
3. Loosen the set screw on the side of the pulley away from the motor.
4. **To increase the blower speed, decreasing outlet temperature**, turn the adjustable half of the pulley inward. **To decrease the blower speed, increasing the outlet temperature**, turn the adjustable half of the pulley outward. One turn of the pulley will change the speed 8-10%.
5. Tighten the set screw on the flat portion of the pulley shaft.
6. Replace the belt and adjust the belt tension. Adjust tension by turning the adjusting screw on the motor base until the belt can be depressed 1/2-3/4". (See Figure 17.) Re-tighten the lock nut on the adjusting screw.
7. Turn on the gas and electric. Light the heater following the instructions on the lighting instruction plate.
8. Check the motor amps with an amp meter. The maximum motor amp rating on the motor nameplate must not be exceeded.

CAUTION: An external duct system static pressure not within the limits shown on the rating plate or improper adjustment of the motor pulley or belt may overload the motor.

17. Blower Rotation

Each blower housing is marked for proper rotation. Rotation may be changed on single-phase motors by re-wiring in the motor terminal box. Three-phase motors may be reversed by interchanging two wires on the 3-phase supply connections.

18. Fan Control

1. A fan control provides the following:
 - (a) Delay of fan or blower operation to prevent the discharge of cold air.
 - (b) Fan or blower operation as long as the unit is hot.
2. The fan control provides additional safety by keeping the fan or blower in operation in the event that the gas valve fails to close when the thermostat is satisfied.
3. To be sure that the fan or blower can continue to operate, the power supply to the heater **MUST NOT** be interrupted except when servicing the unit.
4. If the customer wants the heater off at night, the gas valve circuit **SHOULD BE OPENED** by a single pole switch wired in series with the thermostat. Some thermostats are provided with this feature.
5. Multiple units controlled from a single thermostat are shut off in the same manner. For proper operation, be sure the fan control wiring is observed.

WARNING: If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.

NOTE: Low ambient temperatures (less than 40°F) may cause false cycling of the fan/blower. To prevent this, a time delay relay can be added to the unit (available with single-stage gas valve only) to activate the fan/blower electrically independent of the heat exchanger or the room temperature. The low ambient fan control relay can be factory installed; Option BF8 will appear on the heater wiring diagram. Or, the relay can be field installed; order Option CQ3 (P/N 112779). This relay is in addition to the fan control **The fan control is a safety device and should never be removed from the heater circuit.**

19. Blocked Vent Switch

The blocked vent switch is a heat-activated, manually reset, safety device that interrupts the electric supply to the gas valve when the vent is 100% blocked. The sensor is located near the relief opening of the draft hood. The switch is located on the front top of the draft hood.

If the sensor detects heated flue gases in the draft hood relief opening area, the blocked vent safety device will activate to shut down the heater. The cause for the switch shutting down the heater must be determined and corrected. The blocked vent switch is designed to activate when the vent is blocked but may also be affected by a negative building pressure or an inadequate vent system.

After the problem has been corrected, push the manual reset button on the blocked vent switch to restart the heater.

NOTE: Effective April 1991, all gravity vented unit heaters include a blocked vent shut-off system. Units manufactured prior to April 1991 do not include a blocked vent shut-off system.

WARNING: In the event the Blocked Vent Sensor causes the heater to shut off, determine and correct the cause. Failure to do so could result in personal injury or death.

20. Limit and Energy Cutoff Controls

All models are equipped with an automatic, non-adjustable reset limit control that acts to interrupt the electric supply to the redundant main operating valve in case of motor failure or lack of air flow due to restrictions at the inlet or outlet. On standard units with a match-lit pilot, the ECO control acts as a super high limit, giving redundant safety control and is calibrated to open at a much higher temperature than the standard automatic reset limit. (NOTE: Heaters with optional spark pilot manufactured prior to 8/99 have an ECO control.)

An ECO interruption can be caused by the failure of the automatic reset limit in combination with the following:

1. Automatic gas valve stuck in the open position.
2. Restricted airflow over the heat exchanger due to motor failure, loose fan blade, broken blower belt, or defective fan control.
3. Failed or ruptured gas pressure regulator.
4. Improper wiring.

WARNING: An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or miswiring, and will require correction of the cause of failure and the replacement of the fan and limit control and wiring before the unit can be returned to service. See Hazard Levels, page 2.

21. Gas Valve

Main operating valve is powered by the 24-volt control circuit through thermostat and safety controls. The main control valve is of the diaphragm type with magnetic pilot servo bleed operators, providing regulated gas flow preset at the factory. The valve body also incorporates a

magnetic valve providing pilot gas control for the optional electronic ignitor system and redundant or dual valve safety shutoff function.

WARNING: The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting the unit to ensure positive closure. See Hazard Levels, page 2.

22. Pilot and Ignition Systems

The match-lit standing pilot is standard equipment. The safety pilot function is actuated by a thermocouple in the pilot flame.

The optional pilot on these heaters is a spark ignited intermittent safety pilot system that shuts off the pilot gas flow between heat cycles (Option AH2). The ignition controller in the spark pilot system provides the high voltage spark to ignite the pilot gas and also acts as the flame safety device. After ignition of the pilot gas, the control electronically senses the pilot flame. (A separate solid metal probe in the pilot burner assembly is employed for the flame sensing function. A low voltage electrical signal is imposed on that metal probe which is electrically isolated from ground. When the pilot flame impinges on the flame sensing probe, the flame acts as a conduction path to ground. The pilot flame rectifies and completes the DC circuit. The ignition controller acknowledges the flame and energizes the main gas valve.)

If you are installing a propane unit with spark pilot, it will have Option AH3 which in addition to the Option AH2 safety devices, incorporates a lockout device that stops the gas flow to the pilot if the pilot fails to light in 120 seconds. The spark pilot system with lockout requires manual reset by interruption of the thermostat circuit. Natural gas units may be equipped with either Option AH2 or AH3.

Refer to the wiring diagram supplied with the heater for pilot system identification and proper wiring.

23. Burners

These unit heaters have individually formed steel burners with accurately die-formed ports to give controlled flame stability without lifting or flashback with either natural or propane gas. The burners are lightweight and factory mounted in an assembly which permits them to be removed as a unit for inspection or service.

24. Burner Air Adjustment

All sizes of these unit heaters that are equipped with standard aluminum burners are designed to operate without burner air shutters when fueled with either natural or propane gas. However, Sizes 165 through 400 equipped with optional stainless steel burners (Option AD2) require air shutters (Option AE1) when used with propane gas (Option AA2).

Optional air shutters, either factory or field installed, are available for any size model for use where unusual conditions cause excess primary aeration.

Before making any adjustments to the air shutters, allow the heater to operate for about fifteen minutes. The air shutter adjustment screws can be reached by opening the bottom panel. (Remove the two screws located at the rear of the bottom panel and allow the panel to hinge down from the front.) The adjustment screws for the air shutters are visible at the rear of the burner rack. See Figure 18.

When making the adjustment, close the air shutters no more than is necessary to eliminate the problem condition.

Observe the flame for yellow-tipping. A limited amount of yellow-tipping is permissible for liquefied petroleum gases. Other fuels should not display any yellow-tipping.

Two adjustment screws are used (See Figure 18). Rotating the screws clockwise closes the shutters, reducing the primary air supply. Coun-

24. Burner Air Adjustment (cont'd)

terclockwise rotation opens the shutters, increasing the primary air supply. The two adjustment screws should be rotated alternately to open or close the shutters. Attempting to gain adjustment by not alternating between the two screws may cause the shutters to bind.

After proper adjustment has been completed, eliminating the problem condition, close the bottom panel and replace the retaining screws.

Figure 18 - Air Shutter Adjustment Screws -- Alternate Turning Screws When Adjusting Shutter



DANGER: Failure to install and/or adjust air shutters according to directions could cause property damage, personal injury, and or death.

25. Check Installation and Start-Up

Check the installation prior to start-up:

- Check suspension. Unit must be secure and level.
- Blower Model** - Check to be sure that all shipping supports have been removed. Rubber feet must be on the motor bracket bolts. See Paragraph 4.
- Check clearances from combustibles. Requirements are shown in Paragraph 6.
- Check vent system to be sure that it is installed according to the instructions in Paragraph 10.
- Check piping for leaks and proper gas line pressure. Bleed gas lines of trapped air. See paragraph 11.
- Check electrical wiring. Be sure all wire gauges are as recommended. A service disconnect switch should be used. Verify that fusing or circuit breakers are adequate for the load use.
- Check that any field-installed options have been included in the installation.
- Blower Model** - Check belt tension. See Paragraph 15.

Start-Up

Typical Operating Sequence for Units with Standard Standing (Match-Lit) Pilot:

1. Turn on the manual gas valve.

2. Follow the lighting instructions and establish pilot. To light the pilot, either use the "lighter" hole in the bottom panel of the heater (Figure 19) or open the bottom panel (Figure 20).

Figure 19



To open the bottom panel, unscrew the two sheet metal screws located at the rear of the bottom panel.

The bottom panel will hinge down from the front of the heater.

Figure 20



Close the bottom panel after establishing pilot flame.

3. Turn on the power, energizing the control transformer in series with the limit control.
4. Set the thermostat to call for heat, energizing the main gas valve.
5. Fan control senses heat exchanger temperature, energizing the fan or blower motor.
6. When the thermostat is satisfied, the main gas valve is de-energized, shutting off the gas supply to the main burner.
7. When the unit has cooled, the fan control opens, shutting off the blower or fan motor.

Typical Operating Sequence for Units with Optional Spark Pilot System with or without Timed Lockout:

1. Set the thermostat at its lowest setting.
2. Turn on the main and pilot manual gas valves.
3. Turn on the power to the unit.
4. Set the thermostat at the desired setting.
5. Thermostat calls for heat, firing the unit at full rate after pilot proving sequence.
6. Fan Control senses heat exchanger temperature, energizing the fan or blower motor.

7. If the flame is extinguished during the main burner operation, the safety switch closes the main valve and recycles the spark. On units equipped with a lockout device (Option AH3), if the pilot is not established within 120 seconds, the unit locks out and must be reset by interrupting the power to the control circuit. (See lighting instructions on the heater.)

Check installation after start-up:

With the unit in operation, measure manifold gas pressure. Manifold pressure for natural gas should be 3.5" w.c. and 10" w.c. for propane gas. See Paragraph 11.

- Turn the unit off and on, pausing two minutes between each cycle. Observe for smooth ignition.
- Check drafthood relief opening for positive pressure.
- Blower Model** - Check motor amps with an amp meter. The maximum amp rating on the motor nameplate must not be exceeded.
- Place 'Owner's Envelope' containing Limited Warranty Card, this booklet, and any optional information in an accessible location near the heater. Follow the instructions on the envelope.

DANGER: The gas burner in this gas-fired equipment is designed and equipped to provide safe and economically controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. Safe operation of indirect-fired gas burning equipment requires a properly operating vent system which vents all flue products to the outside atmosphere. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.

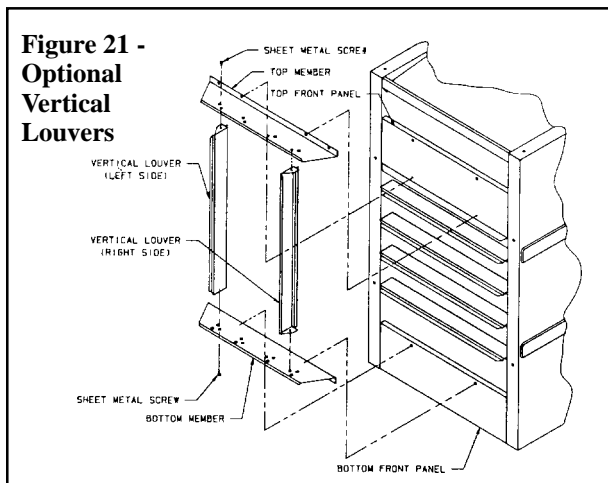
Always comply with the combustion air requirements in the installation codes and in Paragraphs 6 and 7. Combustion air at the burner should be regulated only by manufacturer-provided equipment. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. Indoor units installed in a confined space must be supplied with air for combustion as required by Code and in Paragraph 7 of this heater installation manual. MAINTAIN THE VENT SYSTEM IN STRUCTURALLY SOUND AND PROPERLY OPERATING CONDITION.

OPTIONAL EQUIPMENT

This section contains a brief description of the more frequently specified field-installed options. All option packages include complete assembly and installation instructions.

26. Optional Vertical Louvers - Option CD1

The purpose of the addition of optional vertical louvers is to increase the air pattern spread. The vertical louver assembly is designed to be field assembled and installed. Refer to the instructions packaged with Option CD1 for a list of components and step-by-step installation instructions. (Do not add optional vertical louvers to a fan-type heater with downturn nozzle Option CD3. See Paragraph 27.)



CAUTION: To avoid getting burned, adjust louvers prior to heater operation. If louvers need re-adjusting after start-up, wear protective gloves.

27. Optional Downturn Air Nozzles - Options CD2, CD3, CD4, and CD5

OUTLET NOZZLE OPT. CD2 AND CD4

Sizes	"A"	Range of Air Deflection
25-125	9"	25°-65°
165-400	13"	25°-65°

OUTLET NOZZLE OPT. CD3 AND CD5

Sizes	"A"	Range of Air Deflection
25-125	16-1/2"	50°-90°
165-400	23-1/2"	50°-90°

Figure 22 - Optional Downturn Nozzles

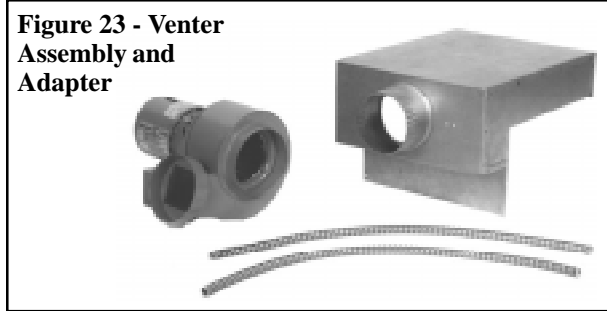
27. Optional Downturn Air Nozzles (cont'd)

Unit heaters may be specified with optional downturn air nozzles to direct the discharge tempered air. The nozzles are shipped separately for field assembly and installation. The horizontal louvers are removed from the heater and re-installed into the outlet of the downturn nozzle.

The addition of a downturn nozzle requires four-point heater suspension. Two hanger brackets are included with downturn nozzle options and must be added to fan-type heaters with standard two-point suspension. Suspension point dimensions are found in Dimension Charts in Paragraph 3. On fan-type heaters, do not install Option CD5 or use vertical louvers with Option CD3.

28. Optional Power Venter - Option CA

Option CA is a motorized vent exhauster that is designed to permit the operation of these gravity-vented heaters in areas of negative pressure up to 0.15" w.c. or where horizontal venting is re-



quired.

NOTE: Do not install an Option CA venter on a heater equipped with voltage option AK11, 220-240/1/50 Hertz.

The option package includes complete installation and wiring instructions. The venter is wired so that when the thermostat calls for heat, the thermostat contacts close the circuit which, after a delay of approximately 40 seconds, starts the venter. When the venter starts, air from the venter blower closes an air flow switch that is built into the venter. The closing of the air flow switch completes the electric circuit to the burner controls, opening the gas valve. When the thermostat is satisfied, the thermostat closes the gas valve and de-energizes the time delay relay. Approximately 40 seconds after the thermostat is satisfied, the air flow switch resets to the open position.

The addition of the optional power venter changes the vent size requirements of the heater. The vent sizes and allowable vent lengths are listed in the installation instructions included in the option package.

The option package also includes two hanger brackets to convert a fan-type heater to four-point suspension. Four-point suspension is required to maintain the unit in a level position without putting stress on the gas valve or piping.

29. Optional Duct Flange - Option CD9 (Blower Models only)

Blower-type unit heaters may be connected to ductwork. The duct flange option is designed to adapt the heater outlet (supply side) for connection to ductwork.

Ductwork connection sizes are shown in the chart on below.

Follow the installation instructions included with the option package.

Blower Model Size	Duct Connection Sizes (inches) with Optional Duct Flange							
	25-50	75	100	125	165	200	250-300	400
Height	15-7/8	15-7/8	15-7/8	15-7/8	23-7/8	23-7/8	23-7/8	23-7/8
Width	10-3/4	12-3/4	14-3/4	20-1/2	17-1/2	20-1/2	26	34-1/4

30. Optional Polytube Adapter - Options CD6, CD8, and CD11 (Blower Models only)

The polytube adapter option is designed to adapt this blower-type heater for use with polytube ductwork. The use of polytubes for air distribution is common in greenhouse applications and some industrial applications. A polytube distribution system delivers warm air to a specific area, reducing the need for complete area heating. The polytube adapter is available in three installation designs making it adaptable to many applications and building structures.

WARNINGS: This adapter is to be used only on units equipped with a blower. At no time should the free area in the polytube be less than the listed minimum. Failure to comply with these warnings could result in severe personal injury, death and/or property damage.

The chart on page 25 shows specification information covering the use of polytubes with these blower-type unit heaters.

The polytube adapter option package does not include polytubing. Poly tubing can be obtained from a supply distributor such as FOF Products, Inc., P. O. Box E, 1505 Racine Street, Delevan, WI 53115; ACME Engineering Co., P.O. Box 978, Muskogee, OK 74402; or any local greenhouse supply distributor. Some local code authorities require the polytube material to be a listed material. Consult code authority having jurisdiction and the polytube supplier to determine the appropriate polytube material and recommended methods of suspension.

Figure 24 - Polytube Adapter

Illustration shows Option CD8, Polytube Adapter for Floor-Mounted Heater. Options CD6 and CD11 are for Suspended Heaters.

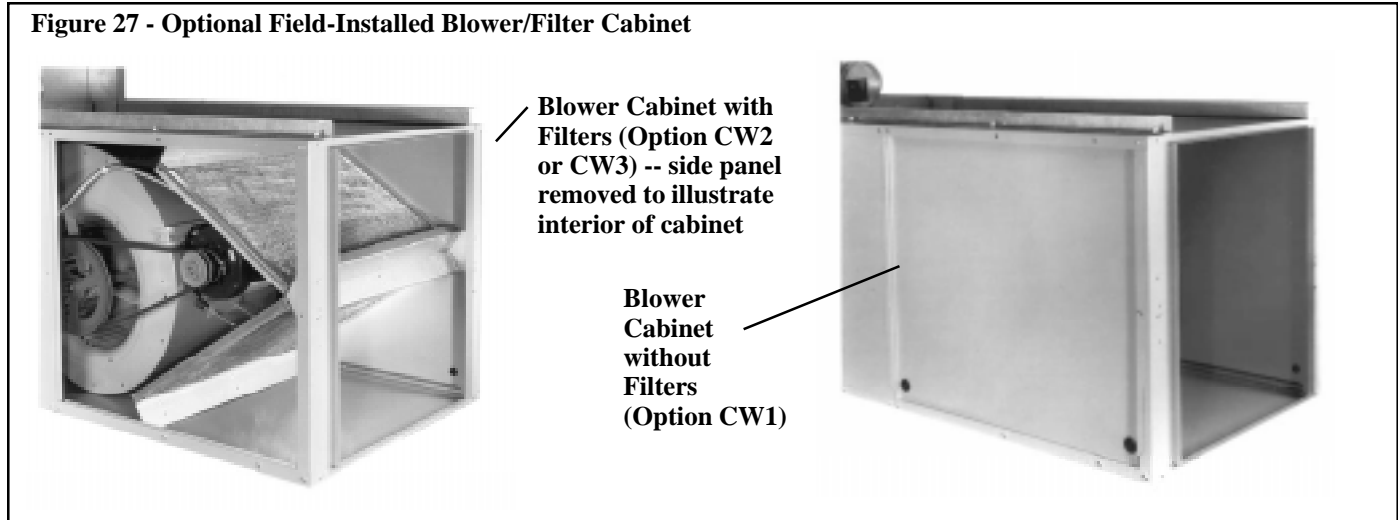


33. Optional Blower/Filter Cabinet - Options CW1, CW2, or CW3 (Blower Models Only)

The blower/filter cabinet option is available for all sizes. The blower/filter cabinet is shipped separately for field assembly and installation. The cabinet is adaptable for use with either 1" or 2" filters and may be connected to a return air duct (includes 3/4" duct flange). Option CW1 does not include filters; CW2 includes 1" permanent aluminum filters; and CW3 includes 2" permanent aluminum filters.

Model Size	Qty	Filter Size	Replacement P/N	
			1" Filter	2" Filter
25-125	1	20 x 20	101608	101621
165-200	1	16 x 25	101609	101622
	1	20 x 25	101610	101623
250-300	2	16 x 20	101607	101620
	2	20 x 20	101608	101621
400	2	16 x 25	101609	101622
	2	20 x 25	101610	101623

Figure 27 - Optional Field-Installed Blower/Filter Cabinet



SERVICE AND MAINTENANCE

WARNING: If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.

This unit will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.

The following procedures should be carried out at least annually (See Paragraphs 34-43 for specific instructions.):

1. Clean all dirt and grease from the primary and secondary combustion air openings.
2. **Fan Models** - Clean the fan blade, fan guard, and motor.
3. **Blower Models** - Clean the blower, the belt guard, the inlet guard, and motor of all dirt and grease. Check the blower belt for tension and wear. Replace a worn belt that may fail before the next scheduled maintenance check.
4. Clean the heat exchanger both internally and externally.
5. Check the pilot burner and main burners for scale, dust, or lint accumulation. Clean as needed.
6. Check the vent system for soundness. Replace any parts that do not appear sound.
7. Check the wiring for any damaged wire. Replace damaged wiring. (See Paragraph 12 for replacement wiring requirements.)

NOTE: Use only factory-authorized replacement parts.

34. Burner Rack Removal

These unit heaters have a convenient bottom access panel. The pilot is attainable with the bottom panel open. With the access panel removed, the burner rack assembly will hinge down from the front. Use the following step-by-step instructions for removal of the bottom access panel and the complete burner rack assembly.

Instructions for Burner Rack Removal (See Figures 28-33.)

1. Shut the gas supply off ahead of the combination valve.
2. Turn off electric supply.
3. Remove the two sheet metal screws located at the rear of the bottom panel.
4. Allow bottom panel to hinge down from the front.
5. Push in one of the two spring-loaded hinge pins located at the front of the bottom panel (inside), and completely remove the bottom panel.
6. The bottom of the pilot is now visible. Do the following:
 - (a) Disconnect the pilot tubing from the pilot burner.

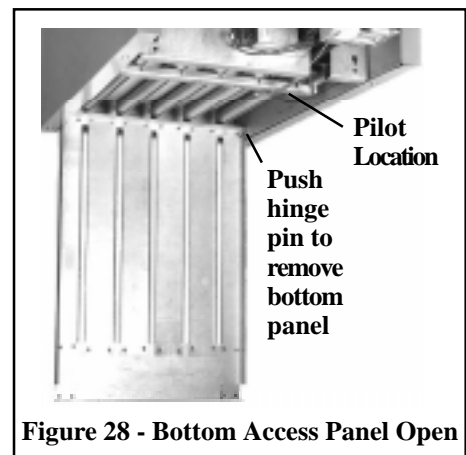


Figure 28 - Bottom Access Panel Open

(b) For standing pilot, disconnect the thermocouple from the valve.

(c) For optional spark pilot, disconnect the flame sensing wire and high tension (spark) lead from the ignition controller.

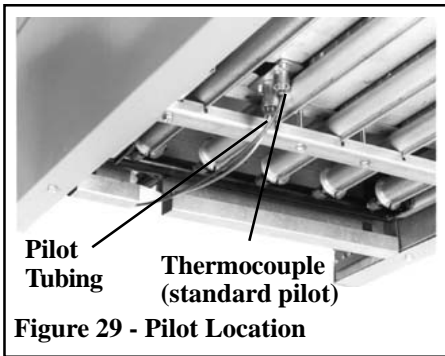


Figure 29 - Pilot Location

7A. Heaters manufactured beginning 8/91

factured beginning 8/91

(Serial No. Date Code AQH) - The burner rack support is indexed as illustrated in Figure 30. While supporting the burner rack, remove the screws (two or three) that hold the burner rack support. (For screw location, refer to Figure 30.) Remove the burner rack support allowing the burner rack assembly to swing down (See Figure 31).

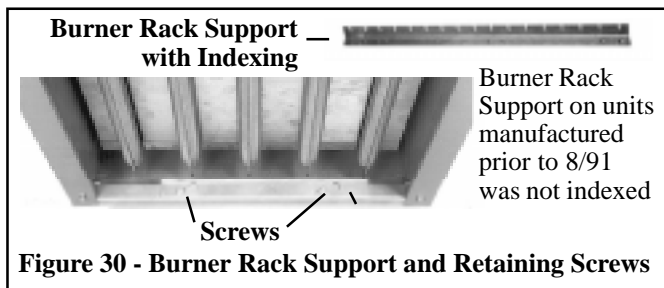


Figure 30 - Burner Rack Support and Retaining Screws

7B. Heaters manufactured prior to 8/91

(Serial No. Date Code AQH) **Loosen** the sheet metal screws (two or three) located at the front of the burner rack assembly. See Figure 30. These screws retain the burner rack support. While supporting the burner rack assembly, slide the burner rack support and remove it from the screws, allowing the burner rack assembly to swing down (See Figure 31).

8. To Remove the Burner Rack -- With the burner rack assembly "hanging" down, lift up on the rear and slide the assembly up and out of the manifold support brackets.

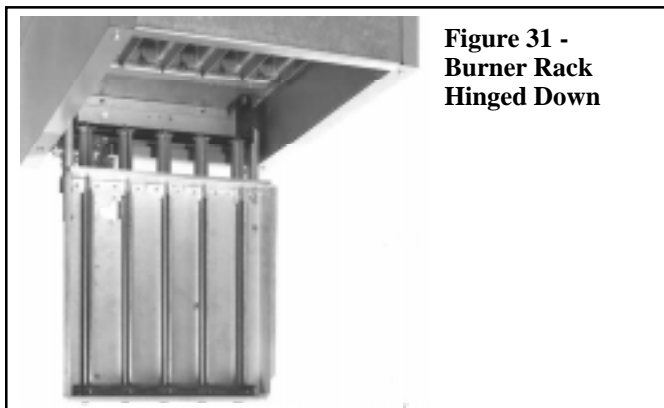


Figure 31 - Burner Rack Hinged Down

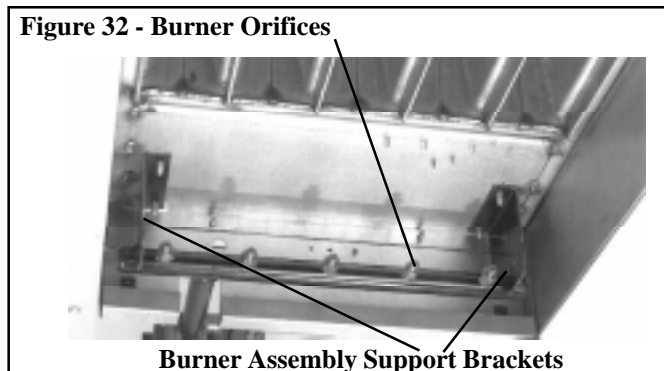


Figure 32 - Burner Orifices

Burner Assembly Support Brackets

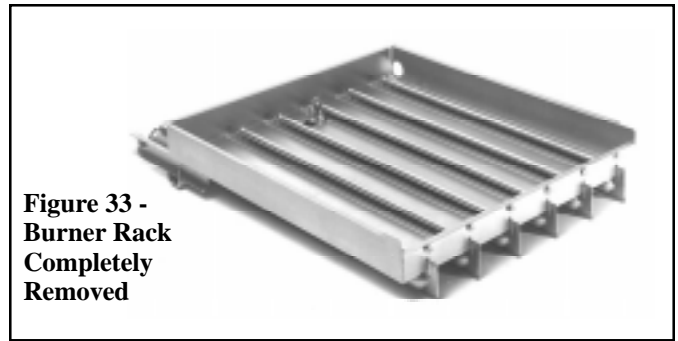


Figure 33 - Burner Rack Completely Removed

9. To remove the individual burners:

- a. Remove the flash carryover (one screw per burner).
- b. With the burner rack upside down, remove the sheet metal screws (located at the rear) that retain the burner holddown.
- c. Lift the rear of the burner upward slightly and pull back, removing the individual burners.
- d. To replace individual burners, reverse the above procedure.



Figure 34 - Individual Burners

10. To replace the burner rack assembly and the bottom panel, reverse the above procedure (Steps 1-8).

Individual burners may be cleaned using air pressure. Use an air nozzle to blow out scale and dust accumulation from the burner ports. Alternately, blow through burner ports and venturi.

CAUTION: Eye protection is recommended.

Use a fine wire to dislodge any stubborn particles. Do not use anything that might change the port size.

When any service is completed, be careful to reassemble correctly to ensure that no unsafe conditions are created. When re-lighting, always follow the lighting instructions on the heater.

35. Pilot and Ignition Systems

The pilot can be serviced by opening the bottom access panel of the heater. Follow the first four steps of instructions for Burner Rack Removal, Paragraph 34. Remove the pilot for maintenance or service, such as checking the wiring and cleaning the orifice.

In the event the pilot flame is short and/or yellow, check the pilot orifice for blockage caused by lint or dust accumulation. Remove the

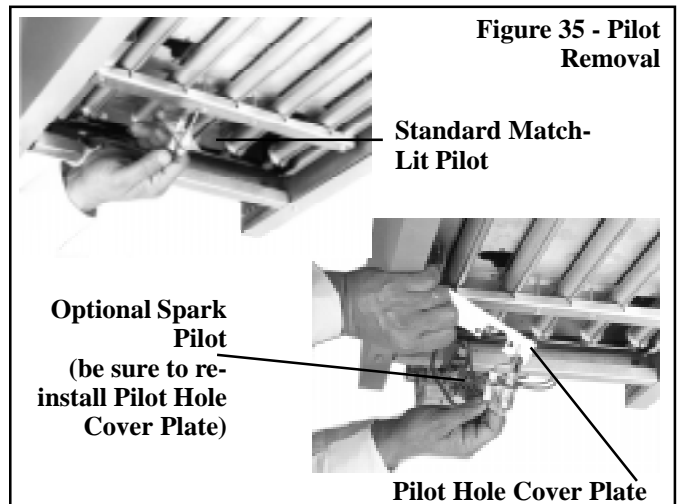


Figure 35 - Pilot Removal

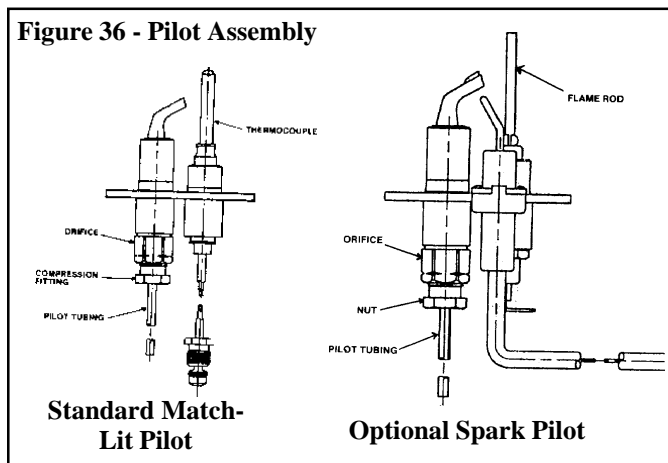
Standard Match-Lit Pilot

Optional Spark Pilot (be sure to re-install Pilot Hole Cover Plate)

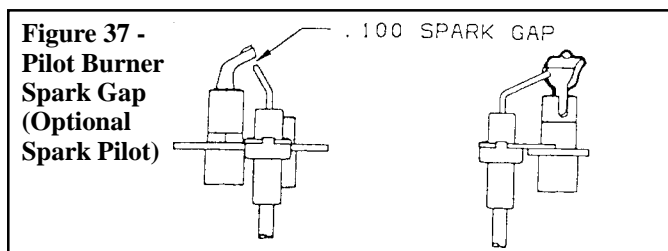
Pilot Hole Cover Plate

35. Pilot & Ignition Systems (cont'd)

pilot orifice and clean with air pressure. Check and clean the aeration slot in the pilot burner.



If the heater is equipped with an optional spark pilot, check the spark gap. Spark gap must be maintained to .100". (See Figure 37.) When re-installing the pilot of a heater with optional spark ignition, be sure to include the pilot hole cover plate (See Figure 35).

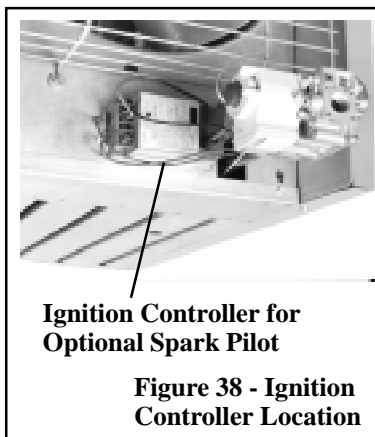


The **ignition controller** of the optional intermittent electronic ignition pilot system is visibly located on the back of the heater. (See Figure 38.) Do not attempt to disassemble the ignition controller. There are no field replaceable components in the control enclosure. However, each heating season the lead wires should be checked for insulation deterioration and good connections.

Proper operation of the electronic spark ignition system requires a minimum flame signal of .2 microamps as measured by a microammeter.

CAUTION: Due to high voltage on pilot spark wire and pilot electrode, do not touch when energized. See Hazard Levels, page 2.

For further information and check out procedure on the optional intermittent electronic ignition pilot system, refer to the manufacturer's control operating instructions supplied with the heater.



Ignition Controller for Optional Spark Pilot

Figure 38 - Ignition Controller Location

36. Burner Orifices

Heaters are shipped with orifices of proper size and type for gas and altitude specified on the order. When ordering replacement orifices, give BTUH content, specific gravity of gas, and altitude, as well as model and serial number of the heater.

Main Burner Orifices (sea level)						
Model Size	Natural Gas			Propane Gas		
	Drill Size	Orifice P/N	Qty	Drill Size	Orifice P/N	Qty
25	51	39650	2	60	95936	2
50	47	84853	3	1.2MM	63003	3
75	45	38678	4	1.3MM	64676	4
100	44	11833	5	55	11830	5
125	44	11833	6	55	11830	6
165	35	11831	5	1.65MM	96344	5
200	35	11831	6	1.65MM	96344	6
250	35	11831	8	1.65MM	96344	8
300	35	11831	9	1.65MM	96344	9
400	35	11831	12	1.65MM	96344	12
Pilot Orifice	Natural - P/N 103034			Propane - P/N 98695		

WARNING: Do not use this table for gas conversion. Additional parts are required; contact your Reznor Distributor.

37. Flash Carryover

See Figure 39. The burner carryover system receives its gas supply from the main burner ports. Check the carryover assembly and also the main burner ports for cleanliness. Clean with air pressure.

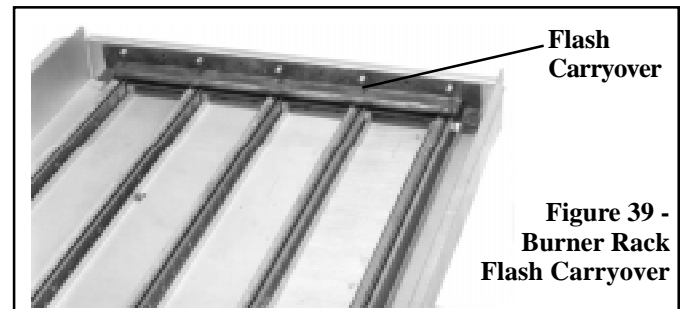


Figure 39 - Burner Rack Flash Carryover

CAUTION: Wearing eye protection when cleaning this heater is recommended.

38. Heat Exchanger

The outside of the heat exchanger can be cleaned from the front of the heater with an air hose and/or a brush. Remove all accumulated dust and grease deposits.

The inner surfaces of the heat exchanger can be reached for cleaning with the burner rack removed. (See Paragraph 34.) Cleaning can be done with a long furnace brush or a heavy wire to which steel wool has been attached. Brush up and down inside each heat exchanger tube until all foreign material is removed. A flashlight is helpful in examining the upper section of the tube.

39. Fan or Blower

Remove dirt and grease from the motor.

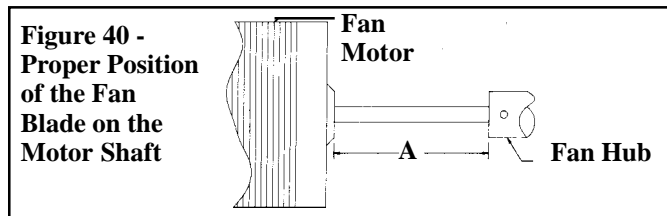
On fan model units, remove dirt and grease from the fan guard and blades. Use care when cleaning the fan blades to prevent causing misalignment or imbalance. Check that the hub of the fan blades is secure to the shaft.

On blower models, remove the grease and dirt from the blower housing and check the belt for wear and proper tension (See Paragraph 15.) Lubricate if the motor has oil cups or grease fittings. The motor supplied as standard has lifetime lubrication and sleeve bearings.

On blower models, check current draw to motor rating plate.

Fan Models: Follow these instructions for replacement of the fan guard, fan motor or fan blades.

1. If the heater is installed, turn off the gas and disconnect the electric power.
2. Remove the left outer side panel (left when facing the rear of the unit). Disconnect the fan motor wires.
3. Depending on the date that the heater was manufactured, it will have either a lower-half fan guard only, two-piece full fan guard, or a one-piece full fan guard. If the unit has a two piece fan guard, remove the tension mounted upper half fan guard and the four screws that hold the lower half. If the unit has a one-piece fan guard, remove all of the screws that retain the fan guard. Remove the assembled parts (the fan guard, the motor, and the fan blade).
4. Disassemble and replace whatever parts are needed and reassemble using whatever part(s) are being replaced and the original parts. If the fan guard is being replaced, it is **important** that the same hardware be used for attaching the motor to the fan guard as was used with the original guard. These screws are especially made to cut through the coating on the fan guard to provide adequate grounding for the motor.



Be sure the fan blade is in proper position on the shaft. Position the fan as shown in Figure 40 according to the chart on the right.

Model Size	Electrical Supply	Set Screw Torque In-Lbs	"A" Hub to Motor
25	60 Hz	80 + or - 10	1-1/4"
50	60 Hz	80 + or - 10	3/8"
75	60 Hz	80 + or - 10	1/8"
25,50,75	50 Hz	80 + or - 10	3-1/4"
100-125	50 or 60 Hz	120 + or - 10	2-1/2"
165-400	50 or 60 Hz	150 + or - 10	2-1/2"

Fan Blade Replacement Instructions (cont'd)

Position the assembly on the heater. Attach the fan guard at the center mounts. (**IMPORTANT:** If replacing the fan guard, use the screws that held the original fan guard. These specially designed screws will cut through the coating on the fan guard to provide a ground for the fan motor.)

Rotate the fan blade to check for adequate clearance. If adjustment is required, loosen the mounting screws, re-position the fan guard, and tighten the screws. Rotate the fan blade and re-check for adequate clearance. Repeat this procedure until the assembly is positioned properly.

5. If necessary, drill the required upper and lower fan guard mounting holes. Attach the fan guard at all upper and lower mounting points using either the screws removed or field-installed sheet metal screws.
6. Reconnect the fan motor wires and replace the outer side panel.
7. Restore power to the heater and turn on the gas. Light, following the instructions on the lighting instruction plate. Check for proper operation.

40. Vent System

Check the vent system at least once a year. Inspection should include all joints, seams, and the vent cap. Replace any defective parts.

41. Operating Gas Valve

The gas valve requires no field maintenance except careful removal of external dirt accumulation and checking of wiring connections. Instructions for testing pressure settings are in Paragraph 11.

WARNING: The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting to the unit to ensure positive closure. See Hazard Levels, page 2.

42. Fan, Limit, and ECO Controls

If it is determined that the fan or limit controls or the ECO device needs replacing, use only factory-authorized replacement parts that are designed for your heater.

WARNING: An ECO circuit interruption is a major failure caused by a malfunction of the primary safety controls or mis-wiring, and will require correction of the cause of the failure and the replacement of the fan and limit controls and wiring before the heater can be returned to service. See Hazard Levels, page 2.

Instructions for replacing fan or limit control and ECO device:

1. Turn off the electric power and shut off the gas supply.
2. Remove the outer left side panel (left when facing the back of the unit). Remove the access panel.
3. Remove defective controls and install new controls in the same mounting holes. Use only factory-authorized replacement parts.
4. Replace access panel and side panel.
5. Turn on the electric power and the gas supply.
6. Relight following the lighting instructions on the heater.

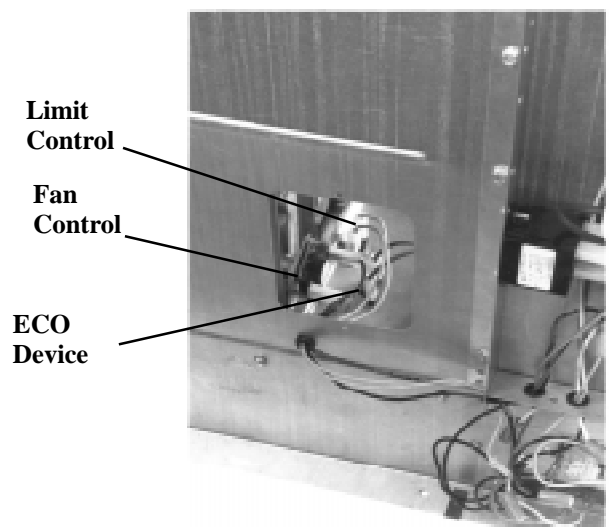


Figure 41 - Side Panel and Access Panel Removed Revealing Controls

43. Blocked Vent Switch

The manual reset blocked vent switch is located on the front top of the draft hood. The sensor is located near the relief opening of the draft hood.

If the blocked vent switch should require replacing, use a factory-authorized replacement switch with the designated temperature setting for the heater.

Blocked Vent Switch				
Model Size	Standard Single-Stage Gas Controls		Optional Two-Stage Gas Controls	
	Temperature Setting	P/N	Temperature Setting	P/N
25	200oF	112751	N/A	N/A
50	225oF	112752	N/A	N/A
100-400	275oF	121275	225oF	112752

44. Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Pilot will not light (match lit system)	<ol style="list-style-type: none"> Pilot cock turned off. Air in gas line. Incorrect lighting procedure. Dirt in pilot orifice. Extremely high or low gas pressure. Bent or kinked pilot tubing. Failed E.C.O. device. 	<ol style="list-style-type: none"> Open valve. Disconnect pilot line at shutoff. Bleed air from gas supply line. Follow instructions on the heater. Remove and clean with compressed air or solvent (do not ream). Check line pressure (See Paragraph 11). Replace tubing. Replace E.C.O. device (See Paragraph 42).
Pilot will not light (spark ignition system)	<ol style="list-style-type: none"> Manual valve not open. Power not turned on or thermostat not calling for heat. Air in gas line. Dirt in pilot orifice. Gas pressure too high or too low. Kinked pilot tubing. Pilot valve does not open. No spark: <ol style="list-style-type: none"> Loose wire connections Transformer failure. Incorrect spark gap. Spark cable shorted to ground. Spark electrode shorted to ground. Drafts affecting pilot. Ignition control not grounded. Faulty ignition controller. Optional lockout device interrupting control circuits. Activated blocked vent switch. 	<ol style="list-style-type: none"> Open manual valve. Turn on power. Check fuse/circuit breaker in disconnect switch. If unit is equipped with unit-mounted disconnect switch, check circuit breaker. (See Paragraph 12.) Check thermostat setting. Bleed gas line. Remove and clean with compressed air or solvent (do not ream). Adjust supply pressure. (See Paragraph 11). Replace tubing. If 24 volt available at valve, replace valve. <ol style="list-style-type: none"> Be certain all wires connections are solid. Be certain 24 volts is available. Maintain spark gap at .100". Replace worn or grounded spark cable. Replace pilot if ceramic spark electrode is cracked or grounded. Make sure all panels are in place and tightly secured to prevent drafts at pilot. Make certain ignition control is grounded to furnace chassis If 24 volt is available to ignition controller and all other causes have been eliminated, replace ignition control. Reset lockout devices by interrupting control at thermostat. Correct venting problem. Reset switch (See paragraph 19).
Pilot lit but gas valve will not open. (All manual valves are open) (Match lit system)	<ol style="list-style-type: none"> Power not turned on or thermostat not calling for heat. Circuit to magnetic valve open. Faulty transformer. Faulty or dirty thermocouple or safety pilot switch, or failed E.C.O. device. Faulty thermostat (See manufacturer's instructions.) Faulty magnetic valve. High gas pressure. Activated blocked vent switch. 	<ol style="list-style-type: none"> Turn on power. Check fuse/circuit breaker in disconnect switch. If unit is equipped with unit-mounted disconnect switch, check circuit breaker. (See Paragraph 12.) Turn up thermostat. Check wiring and connections at transformer and thermostat. Replace transformer. Clean and test with millivolt meter or test kit. Replace defective part. Replace thermostat. Replace valve or magnetic head. Maximum gas pressure 8 oz. or 14" w.c. (See Paragraph 11). Correct venting problem. Reset switch. (See Paragraph 19.)

TROUBLE (cont'd)	PROBABLE CAUSE (cont'd)	REMEDY (cont'd)
Pilot lights, main valve will not open (Spark Ignition system)	<ol style="list-style-type: none"> 1. Manual valve not open. 2. Main valve not operating. <ol style="list-style-type: none"> a) Defective valve. b) Loose wire connections. 3. Ignition control does not power main valve. <ol style="list-style-type: none"> a) Loose wire connections. b) Flame sensor grounded. (Pilot lights - spark continues) c) Gas pressure incorrect. d) Cracked ceramic at sensor. e) Faulty ignition controller. 	<ol style="list-style-type: none"> 1. Open manual valve. 2. <ol style="list-style-type: none"> a) If 24 volt is measured at valve connections and valve remains closed, replace valve. b) Check and tighten all wiring connections. 3. <ol style="list-style-type: none"> a) Check and tighten all wiring connections. b) Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required. c) Set supply pressure at 5" w.c. to 14" w.c. for natural gas and 11" w.c. to 14" w.c. for propane gas. d) Replace sensor. e) See Paragraph 34. If all checks indicate no other cause, replace ignition controller. DO NOT ATTEMPT TO REPAIR IGNITION CONTROLLER. THIS DEVICE HAS NO FIELD REPLACEABLE PARTS.
No heat (Heater Operating)	<ol style="list-style-type: none"> 1. Incorrect manifold pressure or orifices. 2. Cycling on limit control. 3. Improper thermostat location or adjustment. 	<ol style="list-style-type: none"> 1. Check manifold pressure (See Paragraph 11). 2. Check air throughput (See Paragraph 16). 3. See thermostat manufacturer's instructions.
Cold air delivered On Start-up	<ol style="list-style-type: none"> 1. Fan control improperly wired 2. Defective fan control. 	<ol style="list-style-type: none"> 1. Connect as per wiring diagram. 2. Replace fan control.
During Operation	<ol style="list-style-type: none"> 3. Incorrect manifold pressure. 	<ol style="list-style-type: none"> 3. Check manifold line pressure (See Paragraph 11).
Motor will not run	<ol style="list-style-type: none"> 1. Circuit open. 2. Fan control inoperative. 3. Defective motor or capacitor. 	<ol style="list-style-type: none"> 1. Check wiring and connections. . 2. Replace fan control. 3. Replace motor or capacitor.
Motor turns on and off while burner is operating (See Motor cuts out on overload below)	<ol style="list-style-type: none"> 1. Fan control improperly wired. 2. Defective fan control. 3. Poor contact between fan control and heat exchanger tube. Surface contact is required. 4. Motor overload device cycling on and off. 5. Low ambient temperature (less than 40°F) causing false cycling. 	<ol style="list-style-type: none"> 1. Connect as per wiring diagram. 2. Replace fan control. 3. Check for bent mounting or loose mounting screws. 4. Check motor load against motor rating plate. Replace motor if needed. 5. Install fan delay relay kit (See Paragraph 18.)
Fan motor cuts out on overload	<ol style="list-style-type: none"> 1. Low or high voltage supply . 2. Defective motor. 3. Poor air flow. 4. Defective bearing or lubrication. 	<ol style="list-style-type: none"> 1. Correct electric supply. 2. Replace motor. 3. Clean motor, fan and fan guard. 4. Lubricate bearings or replace motor.
Blower motor cuts out on overload	<ol style="list-style-type: none"> 1. Improper motor pulley and/or adjustment. 2. Improper static pressure in the duct system. 3. Low voltage. 	<ol style="list-style-type: none"> 1. See instructions in Paragraph 16. 2. Adjust duct system dampers. 3. Check power supply.

FOR SERVICE OR REPAIR, FOLLOW THESE STEPS IN ORDER:

FIRST: Contact the installer.

Name _____

Address _____

Phone _____

SECOND: Contact the nearest distributor (See telephone Yellow Pages.)

THIRD: Contact: REZNOR®/ Thomas & Betts Corporation

150 McKinley Avenue

Mercer, PA 16137

Phone: (724) 662-4400

Model No. _____

Unit Serial No. _____

Date of Installation _____

Thomas & Betts

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MANUFACTURER OF GAS, OIL, ELECTRIC HEATING AND VENTILATING SYSTEMS

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