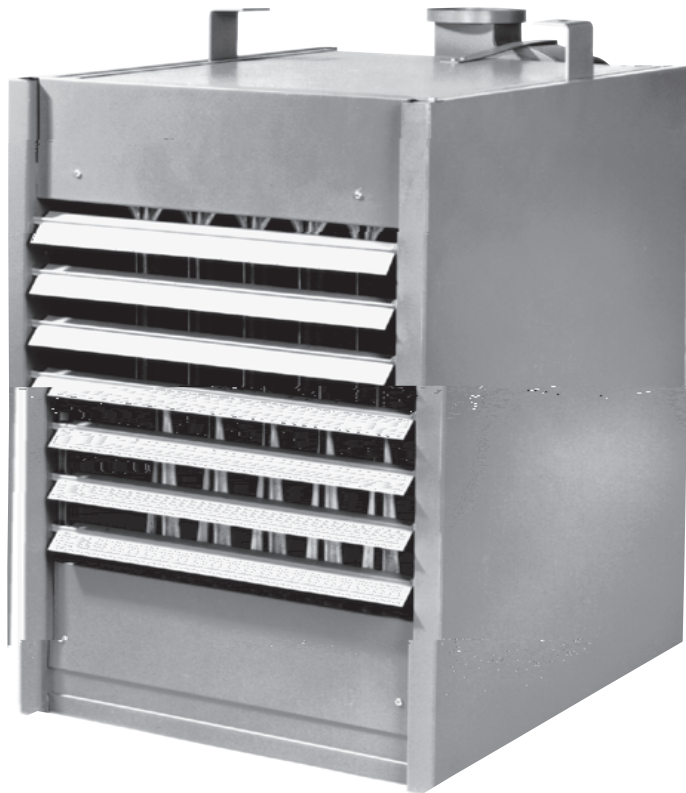




# Installation Operation Maintenance

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## High Efficiency Propeller Fan Gas Unit Heater



GHND  
GHPD

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July 2007

**GHND-SVX01A-EN**



## Preface and Warnings and Cautions

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**Literature Change History:** GHND-SVX01A-EN (May 2007)

**Note:** *One copy of this document ships inside the control panel of each unit and is customer property. It must be retained by the unit's maintenance personnel.*

This booklet describes proper installation, operation, and maintenance procedures for the high efficiency propeller fan gas unit heater. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized.

It is important that periodic maintenance be performed to help assure trouble free operation. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

**Note:** *All phases of this installation must comply with the NATIONAL, STATE & LOCAL CODES. In addition to local codes, the installation must conform with National Electric Code -ANSI/NFPA NO. 70 LATEST REVISION.*

**Warnings and Cautions.** Notice that warnings and cautions appear at appropriate intervals throughout this manual. Warnings are provided to alert installing contractors to potential hazards that could result in personal injury or death, while cautions are designed to alert personnel to conditions that could result in equipment damage.

Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

**⚠ WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**⚠ CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

**CAUTION:** Indicates a situation that may result in equipment or property-damage only accidents.

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# Model Number Description

Trane products are identified by a multiple character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric model number is shown below. It will enable the owner of Service Engineer to define operation, components and accessories.

Model Number	G	H	N	D	010	A	D	C	1	0	0	0	E+
Digit number	1	2	3	4	5,6,7	8	9	10	11	12	13	14	15

### ***DIGIT 1 – Gas heating equipment***

### ***DIGIT 2 – Unit type***

- B = High efficiency centrifugal fan unit heater
- c = Centrifugal fan unit heater
- D = Indoor duct furnace
- E = Centrifugal fan unit heater with enclosure
- H = High efficiency propeller fan unit heater
- P = Propeller fan unit heater
- L = High efficiency indoor duct furnace

### ***DIGIT 3 – Fuel***

- N = Natural gas
- P = LP gas (propane)

### ***DIGIT 4 – Development sequence***

- D = Fourth generation

### ***DIGITS 5, 6, 7 – Input capacity single furnace***

003 = 30 Mbh	017 = 175 MBh
004 = 45 Mbh	020 = 200 Mbh
005 = 50 Mbh	022 = 225 Mbh
006 = 60 Mbh	025 = 250 Mbh
007 = 75 Mbh	030 = 300 Mbh
010 = 100 Mbh	035 = 350 Mbh
012 = 125 Mbh	040 = 400 Mbh
015 = 150 Mbh	

### ***DIGIT 8 – Main power supply***

- A = 115/60/1
- B = 230/60/1
- C = 208/60/30
- D = 230/60/3
- E = 460/60/3

### ***DIGIT 9 – Gas control option***

- A = Single stage, standing pilot
- D = Single stage, intermittent pilot ignition
- E = Two stage, intermittent pilot ignition
- H = Electric model w/ room thermostat, intermittent pilot ignition
- J = Electric model w/ duct thermostat, intermittent pilot ignition
- L = Electric model w/ external 4-20 mA input
- N = Electric model w/ external 0-10 vbc input
- T = Single stage direct spark ignition

### ***DIGIT 10 – Design sequence***

- F = Sixth design

### ***Digit 11 – Exchanger material***

- 1 = Aluminized steel
- 2 = # 409 stainless steel
- 3 = # 321 stainless steel

### ***DIGIT 12 – Rooftop arrangements***

- 0 = None (indoor unit)

### ***DIGIT 13 – Rooftop heating unit motor selection***

- 0= None (indoor unit and rooftop duct furnace)

### ***DIGIT 14 – Rooftop fan selection***

- 0 = None (indoor unit and rooftop duct furnace)

### ***DIGIT 15 – Miscellaneous options all units***

- 0 = None
- A = # 409 stainless steel burners
- B = Orifices for elevation above 2000 feet (specify elevation)

### **Centrifugal fan unit heater (std. w/ and w/out enclosure or high efficiency)**

- C = # 409 stainless steel draft diverter
- D = Summer-Winter switch
- E = Vertical Louvers
- H = Duct discharge flange
- J = Totally enclosed motor

### **Propeller fan unit heater (std. or high efficiency)**

- C = # 409 stainless steel draft diverter
- D = Summer-Winter switch
- E = Vertical louvers

### **Duct Furnace (indoor) std. or high efficiency**

- C = # 409 stainless steel draft diverter
- D = Summer-Winter switch
- F = Horizontal louvers
- G = Horizontal and vertical louvers
- K = Side access burner drawer
- L = Fan time delay control

## General Information

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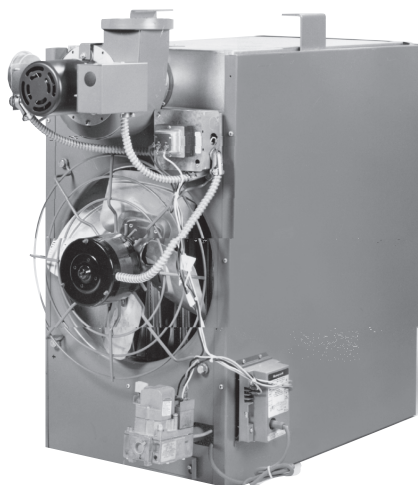
### Description

The High Efficiency Propeller Fan Gas Unit Heater is a factory assembled, power vented, low static pressure type propeller fan heater designed to be suspended within the space to be heated. THESE HEATERS ARE NOT TO BE CONNECTED TO DUCTWORK. The designs are certified by CSA International as providing a minimum of 80% thermal efficiency, and approved for use in California. Do not alter these units in any way. If you have any questions after reading this manual, contact the manufacturer.

**Figure 1. Front view, High Efficiency Propeller Fan Gas Unit Heater**



**Figure 2. Rear view, High Efficiency Propeller Fan Gas Unit Heaters**



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## General Safety Information

### General Safety Information

 **WARNING**

**Hazardous Service Procedures!**

The maintenance and troubleshooting procedures recommended in this section of the manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. When possible, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

*Note: IMPORTANT! This product must be installed by a licensed plumber or gas fitter when installed within the Commonwealth of Massachusetts.*

**Installation must be made in accordance with local codes, or in absence of local codes with the latest edition of ANSI Standard Z223.1 (N.F.P.A. No.54) National Fuel Gas Code.** All of the ANSI and NFPA Standards referred to in these installation instructions are those that were applicable at the time the design of this appliance was certified. The ANSI Standards are available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY, 10036 or [www.ansi.org](http://www.ansi.org). The NFPA Standards are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269. These unit heaters are designed for use in airplane hangars when installed in accordance with ANSI/NFPA No. 409 and in public garages when installed in accordance with NFPA No. 88A and NFPA No. 88B.

If installed in Canada, the installation must conform with local building codes, or in absence of local building codes, with CGA-B149.1 "Installation Codes for Natural Gas Burning Appliances and Equipment" or

CGA-B149.2 "Installation Codes for Propane Gas Burning Appliances and Equipment". These Unit Heaters have been designed and certified to comply with CGA 2.6. Also see sections on installation in AIRCRAFT HANGARS and PUBLIC GARAGES.

 **WARNING**

**Altering Unit!**

Do not alter the unit heater. Failure to follow instructions could result in death or serious injury.

 **WARNING**

**Hazardous Voltage and Gas!**

Turn off the gas supply and disconnect all electric power, including remote disconnects before servicing unit. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to turn off gas or disconnect power before servicing could result in death or serious injury.

Follow installation instructions CAREFULLY to avoid creating unsafe conditions. All external wiring must conform to applicable current local codes, and to the latest edition of the National Electric Code ANSI/NFPA No. 70. In Canada, all external wiring must conform to the Canadian Electric Code, Part 1 CSA Standard C22.1. All wiring should be done and checked by a qualified electrician, using copper wire only. All gas connections should be made and leak-tested by a suitably qualified individual, per instructions in

this manual. Also follow procedures listed on the "Gas Equipment Start-Up Sheet" located in this manual.

Use only the fuel for which the heater is designed (see rating plate). Using LP gas in a heater that requires natural gas, or vice versa, will create the risk of gas leaks, carbon monoxide poisoning and explosion.

**Note:** *IMPORTANT! Do not attempt to convert the heater for use with a fuel other than the one intended.*

Make certain that the power source conforms to the electrical requirements of the heater.

 **WARNING**  
**Ground Wire!**

**All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with NEC and applicable local codes. Failure to follow this instruction could result in death or serious injuries.**

Special attention must be given to any grounding information pertaining to this heater. To prevent the risk of electrocution, the heater must be securely and adequately grounded. This should be accomplished by connecting a grounded conductor between the service panel and the heater. To ensure a proper ground, the grounding means must be tested by a qualified electrician.

Do not insert fingers or foreign objects into the heater or its air moving device. Do not block or tamper with the heater in any manner while in operation or just after it has been turned off, as some parts may be hot enough to cause injury.

This heater is intended for general heating applications ONLY. It must NOT be used in potentially dangerous locations such as flammable, explosive, chemical-laden or wet atmospheres.

Do not attach ductwork to this product or use it as a makeup air heater. Such usage voids the warranty and will create unsafe operation.

In cases in which property damage may result from malfunction of the heater, a backup system or a temperature sensitive alarm should be used.

 **WARNING**  
**Flammable Vapors!**

**When connecting to existing gas lines be sure to valve off the gas supply ahead of connection point. To avoid explosion or possible fire, always purge all residual gas from piping before cutting into existing line or removing threaded fittings. Failure to remove all gas vapors could result in death or serious injury or equipment or property-only-damage.**





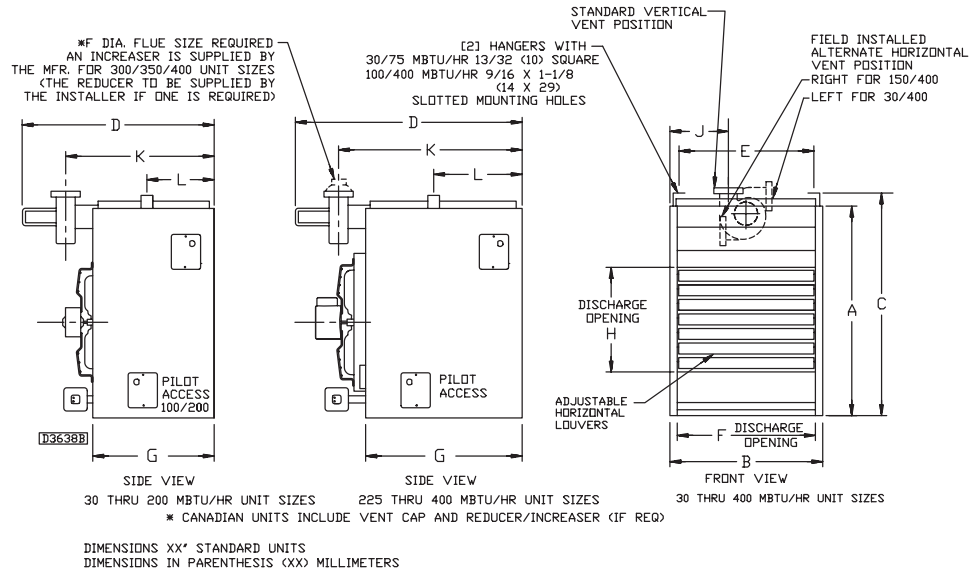
## General Information

Unit Size	30	45	60	75	100	125	150	175	200	225	250	300	350	400
<b>PERFORMANCE DATA ‡</b>														
Input BTU/Hr	30,000	45,000	60,000	75,000	100,000	125,000	150,000	175,000	200,000	225,000	250,000	300,000	350,000	400,000
Output BTU/Hr	24,000	36,000	48,000	60,000	80,000	100,000	120,000	140,000	160,000	180,000	200,000	240,000	280,000	320,000
Thermal Efficiency (%)	80	80	80	80	80	80	80	80	80	80	80	80	80	80
Free Air Delivery CFM	750	800	1,050	1,100	1,480	1,650	2,200	2,530	2,640	2,700	3,100	4,400	5,000	5,300
Air Temperature Rise Deg. F	30	42	42	50	50	56	50	51	56	61	60	50	52	56
Outlet Velocity FPM	680	720	610	640	775	910	1,045	1,070	1,010	950	980	1,100	1,150	1,050
Full Load Amps at 115V	4.5	4.5	4.5	4.5	5.8	6	7.2	8.2	8.2	8.2	8.2	11.2	13.2	13.2
MOTOR DATA : Motor HP	1/30	1/30	1/30	1/30	1/20	1/10	1/4	1/3	1/3	1/3	1/3	1/4	1/3	1/3
Motor Type	SP	SP	SP	SP	SP	SP	PSC	PSC	PSC	PSC	PSC	PSC	PSC	PSC
R.P.M.	1,050	1,050	1,050	1,050	1,050	1,050	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Amps @ 115V	1.3	1.3	1.3	1.3	2.6	2.8	4	4.5	4.5	4.5	4.5	8	9	9
<b>DIMENSIONAL DATA in.</b>														
"A" Height to Top of Unit	25-3/4	25-3/4	25-3/4	25-3/4	31-1/4	31-1/4	36-1/4	36-1/4	36-1/4	36-1/4	36-1/4	36-1/4	36-1/4	36-1/4
"B" Width of Unit	14	14	17-1/2	17-1/2	17-7/8	20-5/8	20-5/8	23-3/8	26-1/8	28-7/8	31-5/8	37-1/8	42-5/8	48-1/8
"C" Height to Top of Hanger	27-1/2	27-1/2	27-1/2	27-1/2	34-1/8	34-1/8	39-1/8	39-1/8	39-1/8	39-1/8	39-1/8	39-1/8	39-1/8	39-1/8
"D" Depth to Rear of Housing	30-3/8	30-3/8	30-3/8	30-3/8	37-1/2	37-1/2	37-1/2	37-1/2	37-1/2	37-1/2	37-1/2	37-1/2	37-1/2	37-1/2
"E" Hanging Distance Width	11	11	16-1/2	16-1/2	14-1/2	17-1/4	17-1/4	20	22-3/4	25-1/2	28-1/4	33-3/4	39-1/4	44-3/4
"F" Discharge Opening Width	10	10	15-1/2	15-1/2	15-3/8	18-1/8	18-1/8	20-7/8	23-5/8	26-3/8	29-1/8	34-5/8	40-1/8	45-5/8
"G" Depth to Unit Side Jacket	19-3/8	19-3/8	19-3/8	19-3/8	26-3/4	26-3/4	26-3/4	26-3/4	26-3/4	26-3/4	26-3/4	26-3/4	26-3/4	26-3/4
"H" Discharge Opening Height	16-1/4	16-1/4	16-1/4	16-1/4	18	18	18	18	18	18	18	18	18	18
"J" to Centerline of Flue	4	4	5-3/4	5-3/4	5-7/8	7-1/4	7-1/4	8-5/8	10	11-1/4	12-3/4	15-1/2	18-1/4	21
"K" Depth to Centerline of Flue	23-5/8	23-5/8	23-5/8	23-5/8	30-5/8	30-5/8	30-5/8	30-5/8	30-5/8	30-5/8	30-5/8	30-5/8	30-5/8	30-5/8
"L" Hanger Location	13-3/4	13-3/4	13-1/2	13-1/2	16-1/4	16-3/4	16-3/8	16-3/8	16-3/8	16-3/4	16-3/4	16-3/4	16-3/4	16-3/4
Flue Size Dia.-in.*	4	4	4	4	4	4	4	4	5	5	5	6	6	6
Fan Diameter-in.	12	12	14	14	14	16	16	18	18	18	18	(2) 16	(2) 18	(2) 18
Gas Inlet-Natural Gas-in.	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4	3/4	3/4	3/4
Gas Inlet-LP Gas-in.	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2				1/2 or 3/4		
Approx. Shipping Wt lb.	79	94	109	119	174	197	219	238	249	275	305	350	414	461

**Note 1.** ‡Ratings shown are for unit installations at elevations between 0 and 2,000 ft. For unit installations in U.S.A. above 2,000 ft. (610m), the unit input must be derated 4% for each 1,000 ft. (305m) above sea level; refer to local codes,

# General Information

**Figure 3. Dimensions standard units**



# Installation

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Do not install unit heaters in corrosive or flammable atmospheres! Premature failure of, or severe damage to the unit will result!

**Note: IMPORTANT!**

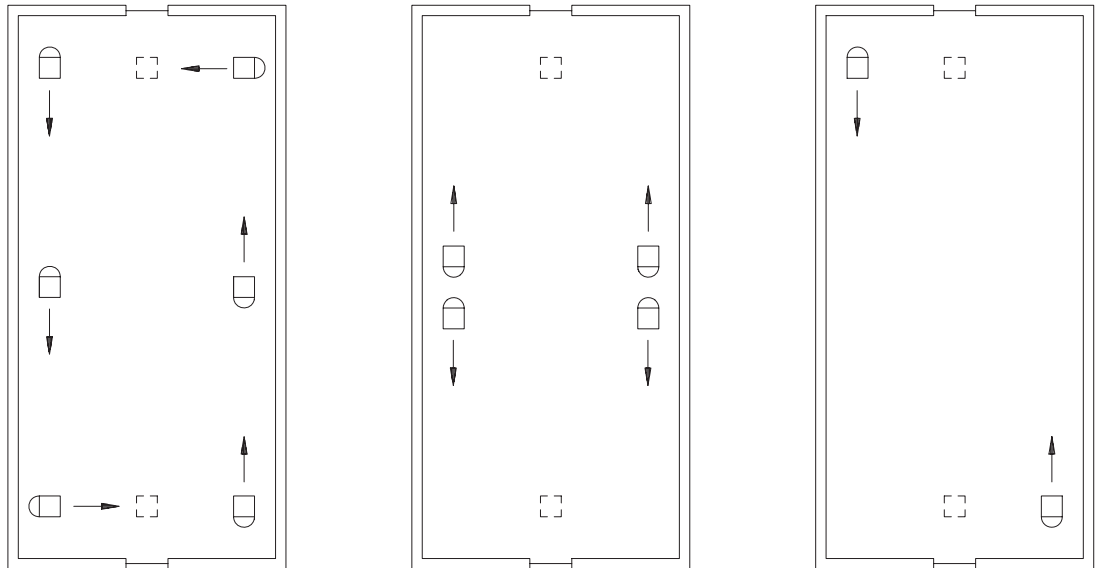
*Avoid locations where extreme drafts can affect burner operation. Unit heaters must not be installed in locations where air for combustion would contain chlorinated, halogenated or acidic vapors. If located in such an environment, premature failure of the unit will occur!*

Since the unit is equipped with an automatic gas ignition system, the unit heater must be installed such that the gas ignition control system is not directly exposed to water spray, rain or dripping water.

**Note:** Location of unit heaters is related directly to the selection of sizes. Basic rules are as follows

**Figure 4. Heater location**

## HEATER LOCATION





## Installation

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**MOUNTING HEIGHT:** Unit Heaters must be installed at a minimum of 8 feet (2.4m) above the floor, measured to the bottom of the unit. At heights above 8 feet (2.4m), less efficient air distribution will result. Occasionally unit heaters must be mounted at heights of 12 to 16 feet (3.7 to 4.9m) in order to clear obstacles. When this is the case, it is advisable to use centrifugal blower unit heaters.

**AIRCRAFT HANGARS:** Unit Heaters must be installed in aircraft hangars and public garages as follows: In aircraft hangars, unit heaters must be at least 10 feet (3.1m) above the upper surface of wings or engine enclosures of the highest aircraft to be stored in the hangar and 8 feet (2.4m) above the floor in shops, offices and other sections of the hangar where aircraft are not stored or housed. Refer to current ANSI/NFPA No. 409, Aircraft Hangars. In Canada, installation is suitable in aircraft hangars when acceptable to the enforcing authorities.

**PUBLIC GARAGES:** In repair garages, unit heaters must be at least 8 feet (2.4m) above the floor. Refer to the latest edition of NFPA No. 88B, Repair Garages.

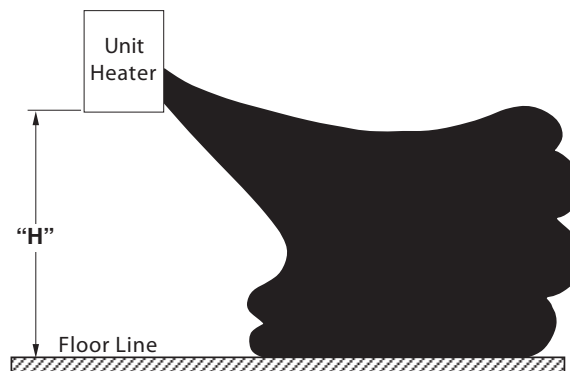
In parking structures, unit heaters must be installed so that the burner flames are located a minimum of 18 inches (457mm) above the floor or protected by a partition not less than 18 inches (457mm) high. However, any unit heater mounted in a parking structure less than 8 ft. (2.4m) above the floor must be equipped with an OSHA approved fan guard. Refer to the latest edition of NFPA 88A, Parking Structures.

In Canada, installation must be in accordance with the latest edition of CGA-B149 "Installation Codes for Gas Burning Appliances and Equipment."

**AIR DISTRIBUTION:** Direct air towards areas of maximum heat loss. When multiple heaters are involved, circulation of air around the perimeter is recommended where heated air flows along exposed walls. Satisfactory results can also be obtained where multiple heaters are located toward the center of the area with heated air directed toward the outside walls. Be careful to avoid all obstacles and obstructions which could

impede the warm air distribution patterns. Heat throw distances are presented in Table 2, and Figure 2A.

**Figure 5. Heat throw distances**



**Table 2. Standard applications, heat throw distances (approximate)**

"H"	UNIT SIZE													
	30,000	45,000	60,000	75,000	100,000	125,000	150,000	175,000	200,000	225,000	250,000	300,000	350,000	400,000
8	33	33	33	40	60	65	70	75	80	85	90	105	110	120
10	28	28	28	35	54	56	60	64	68	72	78	90	95	100
12	NR	NR	NR	NR	44	46	49	57	61	65	68	80	84	90
15	NR	NR	NR	NR	NR	NR	45	49	52	56	60	70	74	80
20	NR	NR	NR	NR	NR	NR	NR	NR	46	50	54	63	66	70

**Note 2.** NR=Not recommended  
H=Distance from floor to bottom of the unit.

Unit heaters should not be installed to maintain low temperatures and/or freeze protection of buildings. A minimum of 50°F (10°C) thermostat setting must be maintained. If unit heaters are operated to maintain lower than 50°F (10°C), hot flue gases are cooled inside the heat exchanger to a point where water vapor (a flue gas by-product) condenses onto the heat exchanger walls. The result is a mildly corrosive acid that prematurely corrodes the aluminized heat exchanger and can actually drip water down from the unit heater onto floor surface. Additional unit heaters should be installed if a minimum 50°F (10°C) thermostat setting cannot be maintained.

**AIR FOR COMBUSTION: The Unit Heater shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting, and the maintenance of ambient temperature at safe limits under normal conditions of use.** The Unit Heater shall be located in such a manner as not to interfere with proper circulation of air within the confined space. When buildings are so tight that normal infiltration does not meet air requirements, outside air shall be introduced per Sections 1.3.4.2 and 1.3.4.3 of ANSI Z223.1 for combustion requirements. A permanent opening or openings having a total free area of not less than one square inch per 5,000 BTU/HR. (1.5 Kw) of total input rating of all appliances within the space shall be provided.



## Installation

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**Note:** *Unit heater sizing should be based on heat loss calculations where the unit heater output equals or exceeds heat loss. Heater output is approximately 80% of input BTU/HR. rating.*

### Clearances:

Each Gas Unit Heater shall be located with respect to building construction and other equipment so as to permit access to the Unit Heater. Clearance between walls and the vertical sides of the Unit Heater shall be no less than 18 inches (457mm). A minimum clearance of 6 inches (152mm) must be maintained between the top of the Unit Heater and the ceiling. The bottom of the Unit Heater must be no less than 12 inches (305 mm) from any combustible. However, in order to ensure access to the burner compartment, a minimum distance of 21 inches (533 mm) is required. The distance between the flue collector and any combustible must be no less than 6 inches (152mm). Also see AIR FOR COMBUSTION and VENTING sections.

**Note:** *Increasing the clearance distances may be necessary if there is a possibility of distortion or discoloration of adjacent materials.*

**Note:** *IMPORTANT! Make certain that the lifting methods used to lift the heater and the method of suspension used in the field installation of the heater are capable of uniformly supporting the weight of the heater at all times.*

Make certain that the structure to which the heater is mounted is capable of supporting its weight. Under no circumstances must the gas lines, the venting system or the electrical conduit be used to support the heater; or should any other objects (i.e. ladder, person) lean against the heater, gas lines, venting system or the electrical conduit for support.

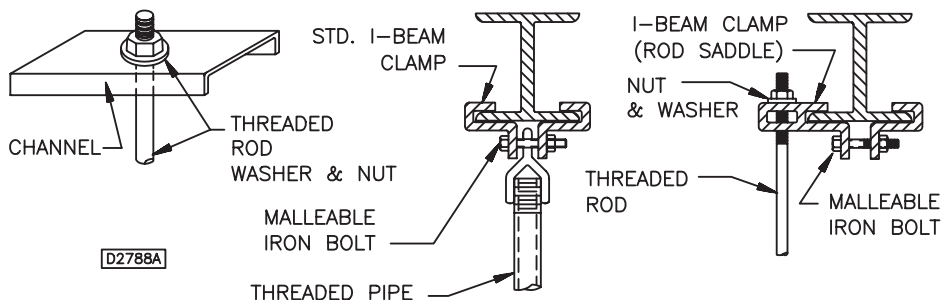
Unit heaters must be hung level from side to side and from front to back. Failure to do so will result in poor performance and or premature failure of the unit.

Insure that all hardware used in the suspension of each unit heater is more than adequate for the job. Refer to figures 1-5 and dimensional data per table 1 for suspension of units.

**Figure 6. Heater Mounting**

## HEATER MOUNTING

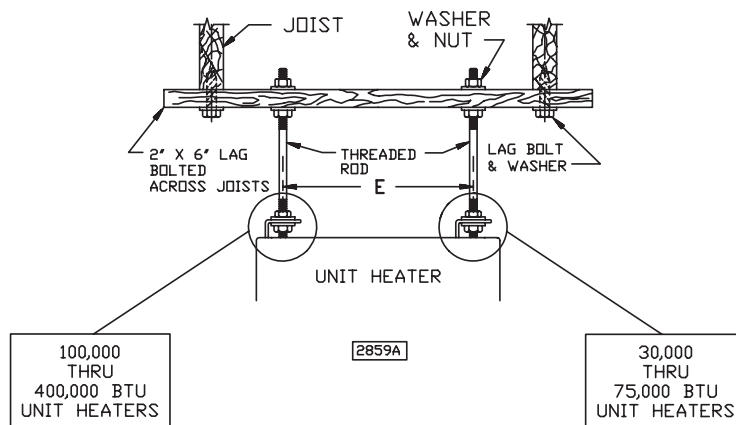
\* STEEL CONSTRUCTION



**Note 3.** All hanging hardware and wood is not included with the unit (to be field supplied).

**Figure 7. Heater mounting 30/400 MBTU Unit Sizes**

\* WOOD CONSTRUCTION JOISTS





# Gas Supply Piping

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## WARNING

### Flammable Vapors!

When connecting to existing gas lines be sure to valve off the gas supply ahead of connection point. To avoid explosion or possible fire, always purge all residual gas from piping before cutting into existing line or removing threaded fittings. Failure to remove all gas vapors could result in death or serious injury or equipment or property-only-damage.

## Pipe Sizing

To provide adequate gas pressure at the gas unit heater, size the gas piping as follows:

1. Find the cu ft/hr by using the following formula:

$$\text{Cu ft/hr} = \frac{\text{Input}}{\text{Btu per Cu ft}}$$

2. Refer to Table 1. Match "Pipe Run in Feet" with appropriate "Gas Input - Cu Ft/Hr" figure. This figure can then be matched to the pipe size at the end of the column.

Example: It is determined that a 67 foot (20.4m) run of gas pipe is required to connect a 200 MBTU gas unit heater to a 1,000 Btu/cu. ft (0.29 kW) natural gas supply.

$$200,000 \text{ Btu/hr} = \frac{200 \text{ Cu ft/hr}}{1,000 \text{ Btu/cu ft}}$$

Using Table 1, a 1 inch pipe is needed.

**Note:** See General Safety Information section for English/SI (metric) unit conversion factors.

**Note:** If more than one gas unit heater is to be served by the same piping arrangement, the total cubic feet per hour input and length of pipe must be considered.

**Note:** If the gas unit heater is to be fired with LP gas, see Table 3 or consult the local LP gas dealer for pipe size information.

## WARNING

### Hazard of Explosion and Fire!

Heater installation for use with propane (LP-gas) must be made by a qualified LP-Gas Dealer or LP-Gas Installer to ensure all appropriate codes, installation procedures, and precautions have been followed. Failure to follow these instructions could result in death or serious injury.

Before any connection is made to an existing line supplying other gas appliances, contact the local gas company to make certain that the existing line is of adequate size to handle the combined load.



## Gas Pipe Size

**Table 3.**

**Maximum Capacity of Pipe in Cubic Feet of Gas per Hour (Cubic Meters per Hour) for Gas Pressures of 0.5 psig (3.5 kPa) or Less, and a Pressure Drop of 0.5 Inch Water Column (124.4 Pa)(Based on a 0.60 Specific Gravity Gas)**

Nominal Iron Pipe Size	Internal Dia.	Length of Pipe, Feet													
		10	20	30	40	50	60	70	80	90	100	125	150	175	200
1/2	0.622	175	120	97	82	73	66	61	57	53	50	44	40	37	35
3/4	0.824	360	250	200	170	151	138	125	118	110	103	93	84	77	72
1	1.049	680	465	375	320	285	260	240	220	205	195	175	160	145	135
1 1/4	1.38	1400	950	770	660	580	530	490	460	430	400	360	325	300	280
1 1/2	1.61	2100	1460	1180	990	900	810	750	690	650	620	550	500	460	430
2	2.067	3950	2750	2200	1900	1680	1520	1400	1300	1220	1150	1020	950	850	800
2 1/2	2.469	6300	4350	3520	3000	2650	2400	2250	2050	1950	1850	1650	1500	1370	1280
3	3.068	11000	7700	6250	5300	4750	4300	3900	3700	3450	3250	2950	2650	2450	2280
4	4.026	23000	15800	12800	10900	9700	8800	8100	7500	7200	6700	6000	5500	5000	4600

**Notes:** Determine the required Cu. Ft. / Hr. by dividing the rated heater input by 1000. For SI / Metric measurements: Convert unit Btu. / Hr. to kilowatts. Multiply the units input (kW) by 0.0965 to determine Cubic Meters / Hour.

**Notes:** FOR NATURAL GAS: Select the pipe size directly from the table.

**Notes:** FOR PROPANE GAS: Multiply the Cu. Ft. / Hr. (Cubic Meters per Hour) value by 0.633; then use the table.

### Pipe Installation

#### **WARNING**

##### **Hazard of Explosion of Fire!**

Heater installation for use with propane (LP-gas) must be made by a qualified LP-Gas Dealer or LP-Gas Installer to ensure all appropriate codes, installation procedures, and precautions have been followed. Failure to follow these instructions could result in death or serious injury.

1. Install the gas piping in accordance with applicable local codes.
2. Check gas supply pressure. Each unit heater must be connected to a manifold pressure and a gas supply capable of supplying its full rated capacity (refer to Table 4). A field LP tank regulator must be used to limit the supply pressure to maximum of 14 in. W.C. (3.5 kPa). All piping should be sized in accordance with the latest edition of ANSI Standard Z223.1, National Fuel Gas Code; in Canada, according to CGA-B149. See Tables 1 and 3 for correct gas supply piping size. If gas pressure is excessive on natural gas applications, install a pressure regulating valve in the line upstream from the main shutoff valve.
3. Adequately support the piping to prevent strain on the gas manifold and controls.
4. To prevent the mixing of moisture with gas, run the take-off piping from the top, or side, of the main.
5. Standard gas duct furnaces, optional two-stage units are supplied with a combination valve which includes:
  - (a) Manual "A" valve
  - (b) Manual "B" valve
  - (c) Solenoid valve
  - (d) Pilot safety
  - (e) Pressure regulatorand then pipe directly into combination valve (see Figure 4).
6. A 1/8 in. N.P.T. plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the appliance
7. Provide a drip leg in the gas piping near the gas unit heater. A ground joint union and a manual gas shutoff valve should be installed ahead of the unit heater controls to permit servicing. The manual main shutoff valve must be located external to the jacket. See Figure 1, Pipe installation standard controls.

#### **WARNING**

##### **Hazard of Explosion!**

Never use an open flame to detect gas leaks. Explosive conditions may occur. Use a leak test solution or other approved methods for leak testing. Failure to follow recommended safe leak test procedures could result in death or serious injury or equipment or property-only-damage.

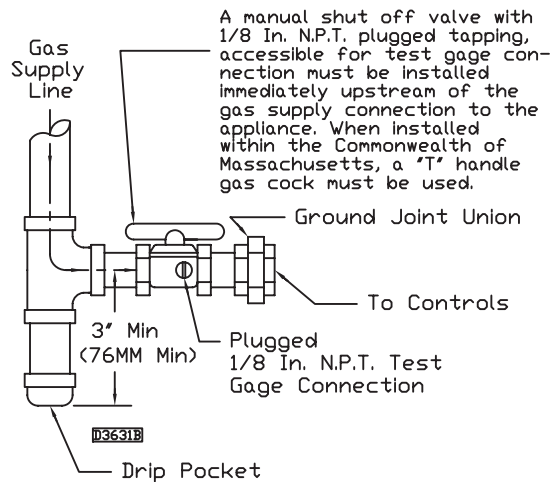
8. Make certain that all connections have been adequately doped and tightened.

## Pipe Installation

**Note:** *IMPORTANT! Do not overtighten the inlet gas piping into the valve. This may cause stresses that would crack the valve!*

**Note:** *Use pipe joint sealant resistant to the action of liquefied petroleum gases regardless of gas conducted.*

**Figure 8. Pipe installation, standard controls**



The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.5 kPa).

The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.5 kPa).

**Table 4. Single stage gas piping requirements**

Gas Type	Natural Gas	Propane (LP) Gas
Manifold Pressure	3.5 in. W.C.	10.0 in. W.C.
	14.0 in. W.C. Max.	14.0 in. W.C. Max.
Supply Inlet Pressure	5.0 in. W.C. Min.	11.0 in W.C. Min.

Notes: For single stage application only at normal altitudes.

**Table 5. Two stage gas piping requirements**

Gas Type	Natural Gas	Propane (LP) Gas
Supply Inlet Pressure	6.5 in. W.C. Min.	11.5 in. W.C. Min.

Notes: \*\*For two stage applications only at normal altitudes; two stage applications do not apply to the 30/75 MBH models.



## Electrical Connections

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**⚠ WARNING**  
**Hazardous Voltage!**

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

**⚠ WARNING**  
**Ground Wire!**

All field-installed wiring must be completed by qualified personnel. All field-installed wiring must comply with NEC and applicable local codes. Failure to follow this instruction could result in death or serious injuries.

Standard units are shipped for use on 115 volt, 60 hertz single phase electric power. The motor nameplate and electrical rating on the transformer should be checked before energizing the unit heater electrical system. All external wiring must conform to the latest edition of the ANSI/NFPA No. 70, National Electrical Code and applicable current local codes; in Canada, to the Canadian Electrical Code, Part 1 CSA Standard C22.1.

It is recommended that the electrical power supply to each unit heater be provided by a separate, fused and permanently live electrical circuit. A disconnect switch of suitable electrical rating for each unit heater should be located as close to the gas valve and controls as possible. Each unit heater must be electrically grounded in accordance with the latest edition of the National Electric Code, ANSI/NFPA No. 70 or CSA Standard C22.1.

The transformer supplied with this unit heater is internally fused. Any overload or short circuit will ruin the transformer.

## Thermostat Wiring and Location

**Note:** *The thermostat must be mounted on a vertical vibration-free surface free from air currents and in accordance with the furnished instructions.*

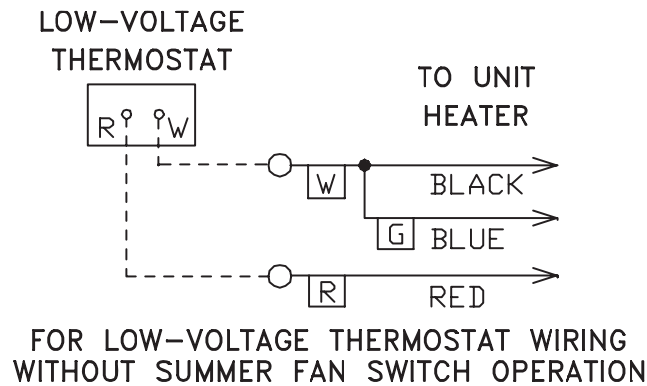
Mount the thermostat approximately 5 feet (1.5 m) above the floor in an area where it will be exposed to a free circulation of average temperature air. Always refer to the thermostat instructions as well as our unit wiring diagram and wire accordingly. Avoid mounting the thermostat in the following locations:

1. Cold areas - Outside walls or areas where drafts may affect the operation of the control.
2. Hot areas - Areas where the sun's rays, radiation, or warm air currents may affect control operation.
3. Dead areas - Areas where air cannot circulate freely, such as behind doors or in corners.

## Thermostat wiring and location

Thermostat wires tagged "W" and "G" must be connected together except when using a general purpose "SPDT" 24VAC relay and a standard thermostat with subbase, or when using low voltage thermostats. Also refer to Figure 9 for other wiring connections.

**Figure 9. Thermostat Wiring**



### THERMOSTAT HEAT ANTICIPATOR ADJUSTMENTS:

The initial heat anticipator setpoint should equal the thermostat's current amperage draw when the unit is firing. This setpoint should be measured for the best results. Use the recommended ranges as a guide. If further information is needed, consult your thermostat manufacturer's instructions.

Recommended Heat Anticipator Setting Ranges:

	25 ft. (7.6m)	50 ft. (15.2m)
<b>Gas Ignition Type</b>	<b>T'stat Wiring</b>	<b>T'stat Wiring</b>
For Power Vented Units:	0.85 to 0.90 A	0.90 to 1.1 A
Intermittent (Spark)		Max. Setting on thermostat

### FAN TIME DELAY CONTROL

Leads from time delay controls are factory wired to the junction box. The fan control is a time delay relay (approximately 45 seconds ON, 65 seconds OFF). The fan control is rated at 17 amps.

**Note:** The start-up fan delay must not exceed 90 seconds from a cold start.

**Note:** For all wiring connections, refer to the wiring diagram that your unit is equipped with (either affixed to the side jacket or enclosed in your unit's installation instruction envelope). Should any original wire supplied with the heater have to be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C.

Should any high limit switch wires have to be replaced, they must be replaced with wiring material having a temperature rating of 200°C minimum.



# Venting for Power Vented Unit Heaters

**⚠️ WARNING!**  
**Carbon Monoxide Poisoning!**

**Each unit must have an individual vent pipe and vent terminal per furnace section! Each unit MUST NOT be connected to other vent systems or to a chimney. Failure to follow this instruction could result in death or serious injuries.**

**All unit heaters must be vented!** All venting installations shall be in accordance with the latest edition of Part 7, venting of Equipment of the National Fuel Gas Code, ANSI Z223.1, or applicable provisions of local building codes for natural or power vented units.

Power vented units are designed to be used with single wall vent pipe utilizing horizontal or vertical venting arrangements (see Figures 6, 7 and 8). These arrangements may **terminate external** to the building using either a single wall or double wall (Type B) vent. See Figures 6 thru 10 for special installation requirements regarding these venting conditions.

**Note:** *IMPORTANT! Your venting system must not be blocked by any snow, snow drifts, or any foreign matter. Inspect your venting system to ensure adequate ventilation exists at all times! Failure to heed these warnings could result in Carbon Monoxide Poisoning (symptoms include grogginess, lethargy, inappropriate tiredness, or flu-like symptoms).*

**Note:** *Do not use a type B (double wall) vent internally within the building on power vented units!*

If double wall venting is used, components which are UL Listed and approved for Category III positive pressure venting systems **MUST** be used.

A Briedart Type L, Field Starkap or an equivalent vent cap must be supplied by the customer for each power vented unit. The vent pipe diameter **MUST** be as specified in the table 1 ("D" Dia. Flue Opening). A reducer must be field installed for 100 through 175 MBH Unit Sizes (Canadian units include this required reducer). All 300 through 400 MBH Unit sizes are factory equipped with the required flue increaser. Refer to Figures 9 through 10D for additional requirements.

### Vent Systems - Termination Clearance Requirements

Structure	Minimum Clearances for Termination Locations
Door, window or any gravity air inlet	4 feet below
	4 feet horizontally
	1 foot above
Forced air inlet within 10 ft.	3 feet above
Adjoining building or parapet	6 feet
Adjacent public walkways	7 feet above grade

## Venting for Power Vented Unit Heaters

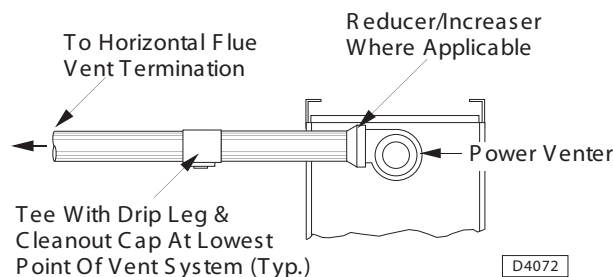
The venting system for these appliances shall terminate at least four feet (1.2m) below, four feet (1.2m) horizontal from, or one foot (0.3m) above any door, window, or gravity air inlet into any building.

Through the wall vents for these appliances shall NOT terminate over public walkways, or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.

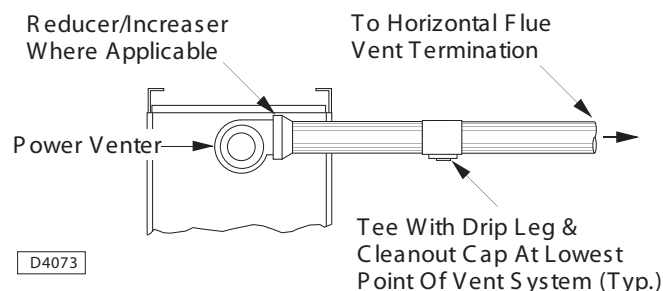
The vent pipe equivalent length must be 5 ft. (1.5m) minimum and must not exceed 50 ft. (15.2m). Equivalent length is the total length of straight sections PLUS 15 ft. (4.6m) for each 90 degree elbow, 8 ft. (2.4m) for each 45 degree elbow, and 10 ft. (3.0m) for the vent cap.

Maintain 6 in. (152mm) between vent pipe and combustible materials. A minimum of 12 in. (305mm) of straight pipe is required from the venter outlet before installing an elbow in the vent system. **An elbow should never be attached directly to the venter!**

**Figure 10. Horizontal left vent position, (rear view of unit heater)**

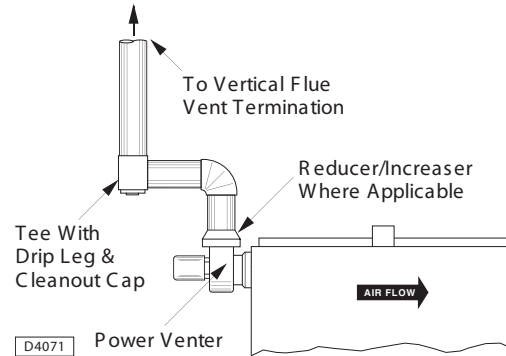


**Figure 11. Horizontal right vent position, (rear view of unit heater)**



## Venting for Power Vented Unit Heaters

**Figure 12. Vertical Vent Position (side view of unit heater)**



Use single wall pipe constructed of 26 gauge galvanized steel or material of equivalent durability and corrosion resistance for the vent system. For installation in Canada, use pipe constructed from 0.025 inch thick aluminum or 0.018 inch thick stainless steel.

**⚠ CAUTION**  
**Equipment Damage!**

**Never use a pipe of a diameter other than that specified in Table 1! Never use PVC or other nonmetallic pipe for venting! To do so may result in serious damage to the unit.**

Any run of single wall vent pipe passing through an unheated space must be insulated with an insulation suitable to 550°F.

The vent terminal must be installed with a minimum clearance of four feet (1.2m) from electric meters, gas meters, regulators and relief equipment.

Seal ALL vent pipe joints and seams to prevent leakage. Use General Electric RTV-108 or Dow-Corning RTV-732 silicone sealant (or equivalent); or 3M #425 aluminum foil tape (or equivalent).

The vent system must be installed to prevent collection of condensate. Vertical vent pipes should be equipped with condensate drains. Pitch horizontal pipes downward 1/4 in. per foot (21mm per meter) toward outlet for condensate drainage.

Horizontal portions of the venting system shall be supported at maximum intervals of four feet (1.2m) to prevent sagging (in Canada, support at 3 feet (1m) minimum intervals).

Insulate single wall vent pipe exposed to cold air or running through unheated areas.

**⚠ WARNING!**  
**Carbon Monoxide Poisoning!**

**Each unit must have an individual vent pipe and vent terminal per furnace section! Each unit MUST NOT be connected to other vent systems or to a chimney. Failure to follow this instruction could result in death or serious injuries.**

Horizontal Venting: Units are shipped from the factory set up for vertical venting.



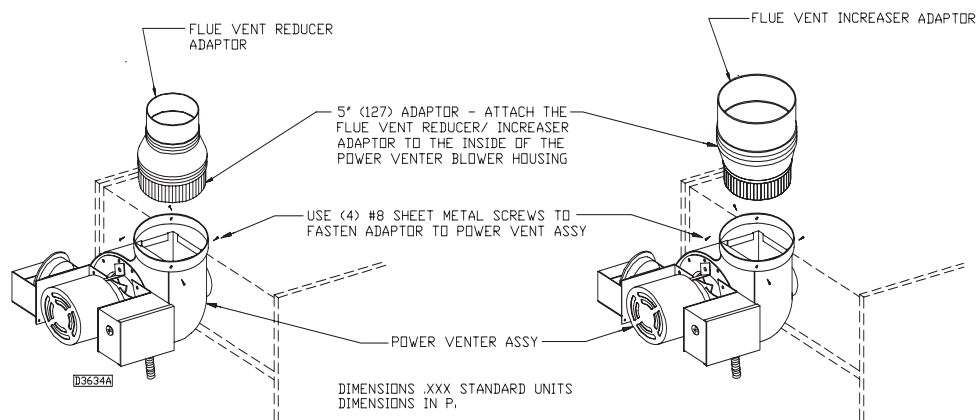
## Venting for Power Vented Unit Heaters

To convert the power venter for horizontal venting, remove the shipping support bracket; refer to Figures 6 through 10 and 24, and follow this procedure:

1. Hold power venter motor in position.
2. Remove the three Phillips-head screws from the motor adaptor plate.
3. Remove the three screws which connect the power venter stack to the power venter housing.
4. Rotate the power venter housing to the horizontal position.
5. Replace screws accordingly.

**Note:** The motor, pressure switch, and junction box bracket **MUST** remain located as shipped from the factory. Rotate *only* the blower housing! If the power venter housing is to be moved to the right horizontal position, the junction box must be rotated 90 degrees CCW to clear the connection. To do this, remove all wires, conduit and conduit connector from the junction box, noting location of wires. Move box, using holes provided. Move 7/8" plug from bottom of box to side. Reconnect all wires according to the unit's wiring diagram.

**Figure 13. Adaptor installation**



REFER TO SPECIFICATION TABLE AND INSTALLATION MANUAL FOR PROPER USAGE.

3. CANADIAN UNITS INCLUDE VENT CAP AND A REDUCER (IF REQUIRED) FURNISHED BY THE MANUFACTURER.

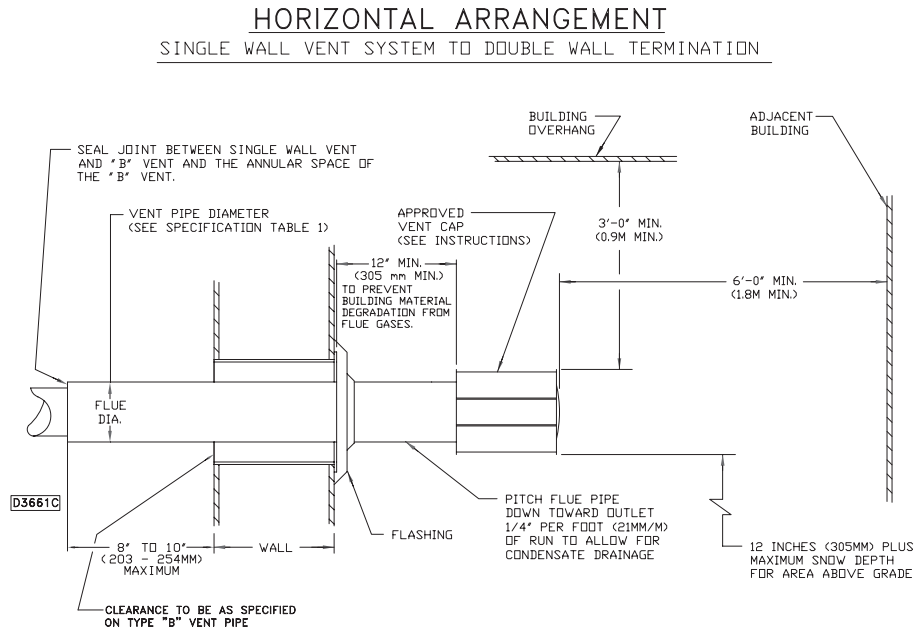
## Venting for Power Vented Unit Heaters

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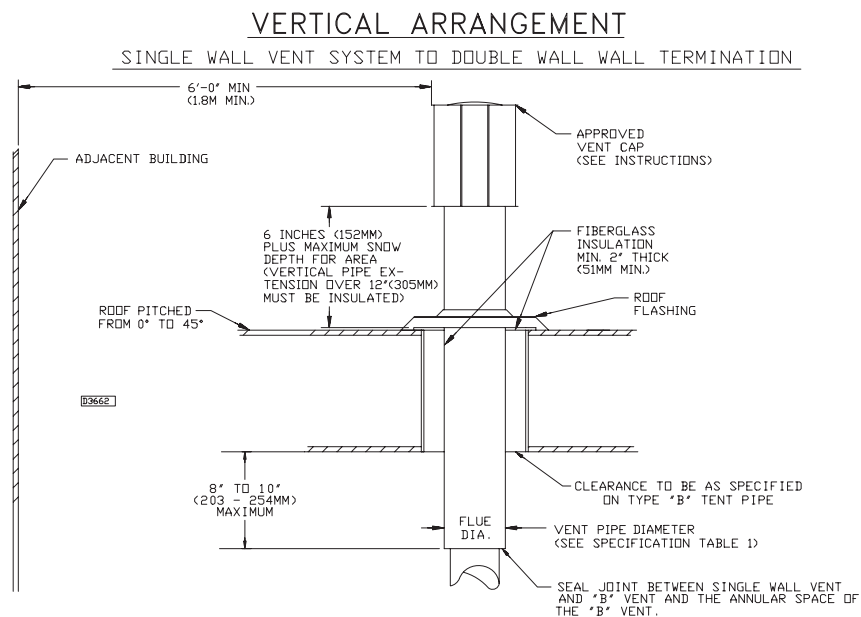
Figure 14. Horizontal arrangement, single wall ve Fs7(II)TJII

# Venting for Power Vented Unit Heaters

**Figure 16. Horizontal arrangement, single wall vent system to double wall termination**



**Figure 17. Vertical arrangement, single wall vent system to double wall termination**





# Operation

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## POWER VENTED PROPELLER UNITS INTERMITTENT (SPARK) PILOT IGNITION

### EXPLANATION OF CONTROLS:

1. The unit heater is equipped with a power venter system consisting of a power venter motor and blower, pressure switch, and sealed flue collector in place of the conventional draft diverter.

**Note:** *IMPORTANT! The addition of external draft hoods or power ventors is not permitted. Addition of such devices may cause severe unit malfunction or failure!*

2. The power venter motor is energized by the room thermostat on a call for heat. The pressure switch measures the flow through the vent system and energizes the indirect spark ignition system when the flow is correct.

**Note:** *IMPORTANT! The pressure switch MUST NOT be bypassed. The unit MUST NOT be fired unless the power venter is operating.*

3. The indirect spark ignition system consists of an ignition control module, a dual combination valve, and a spark-ignited pilot burner. When the pressure switch closes, the pilot valves opens and a spark is generated to light the pilot burner. When flame sensing circuit senses that the pilot flame is established, the main gas valve is opened to supply gas to the main burners. When the thermostat is satisfied, the vent system is deenergized and both valves are closed to stop all flow of gas to the unit.
4. The limit switch interrupts the flow of electric current to the main gas valve in case the heater becomes overheated.
5. The fan switch delays the operation of the fan until the heater is warmed, then keeps the fan running after the gas has been turned off until the useful heat has been removed. The startup fan delay must not exceed 90 seconds from a cold start.
6. The wall thermostat (supplied optionally) is a temperature sensitive switch which operates the vent system and the ignition system to control the temperature of the space being heated. It must be mounted on a vibration free, vertical surface away from air currents, in accordance with the instructions furnished with the thermostat (also refer to Electrical Section).





## Gas Input Rate

### GAS INPUT RATE

Check the gas input rate as follows (Refer to general safety section for metric conversions/SI units):

**Note: IMPORTANT! Never overfire the unit heater, as this may cause unsatisfactory operation or shorten the life of the heater.**

1. Turn off all gas appliances that use gas through the same meter as the unit heater.
2. Turn gas on to the unit heater.
3. Clock the time in seconds required to burn one cubic foot of gas by checking the gas meter.
4. Insert the time required to burn one cubic foot of gas into the following formula and compute the input rate.

$$\frac{3600 \text{ (Sec. Per Hr.)} \times \text{Btu/Cu. Ft}}{\text{Time (Sec.)}} = \text{Input Rate}$$

For example, assume the Btu content of one cubic foot of gas equalled 1000 and that it takes 18 seconds to burn one cubic foot of gas.

$$\frac{3600 \times 1000}{18} = 200,000 \text{ Btu/Hr.}$$

**Note:** If the computation exceeds or is less than 95 percent of the gas Btu/hr. input rating (see Specifications), adjust the gas pressure.

### Gas Pressure Adjustments

Adjust the gas pressure as follows:

1. **NATURAL GAS:** Optimum results are obtained when the unit heater is operating at its full input rating with the manifold pressure of 3.5 inches W.C. (0.9 kPa). Adjustment of the pressure regulator is not normally necessary since it is preset at the factory. However, field adjustment may be made as follows:
  - a. Attach manometer at pressure tap plug adjacent to the control outlet.
  - b. Remove regulator adjustment screw cap, located on combination gas valve.
  - c. With a small screwdriver, rotate the adjustment screw counterclockwise to decrease or clock-wise to increase pressure. Do not force beyond stop limits.
  - d. Replace regulator adjustment screw cap.
2. **PROPANE GAS:** An exact manifold pressure of 10.0 inches W.C. (2.5 kPa) must be maintained for proper operation of the unit heater. If the unit is equipped with a pressure regulator on the combination gas valve, follow steps "a" through "d" above. If the unit is not so equipped, the propane gas supply system pressure must be regulated to attain this manifold operating pressure.
3. The adjusted manifold pressure should not vary more than 10% from the pressure specified in the Main burner orifice schedule table.

**Table 6. Main burner orifice schedule**

Input in 1000 BTU	Type of Gas	Natural	Propane	Number of Burner Orifices
	Heating Value	1075 BTU/Ft3 (40.1 MJ/m3)	2500 BTU/Ft3 (93.1 MJ/m3)	
	Manifold Pressure	3.5" W.C. (0.87kPA)	10" W.C. (2.49 kPA)	
30	FT 3/HR	28	12	2
	ORIFICE DRILL	49	57	
45	FT 3/HR	42	16	3
	ORIFICE DRILL	49	57	
60	FT 3/HR	56	24	4
	ORIFICE DRILL	49	57	
75	FT 3/HR	70	30	5
	ORIFICE DRILL	49	57	
100	FT 3/HR	96	40	4
	ORIFICE DRILL	42	54	
125	FT 3/HR	120	50	5
	ORIFICE DRILL	42	54	
150	FT 3/HR	140	60	6
	ORIFICE DRILL	42	54	
175	FT 3/HR	163	70	7
	ORIFICE DRILL	42	54	
200	FT 3/HR	186	80	8
	ORIFICE DRILL	42	54	
225	FT 3/HR	210	90	9
	ORIFICE DRILL	42	54	
250	FT 3/HR	233	100	10
	ORIFICE DRILL	42	54	
300	FT 3/HR	280	120	12
	ORIFICE DRILL	42	54	
350	FT 3/HR	326	140	14
	ORIFICE DRILL	42	54	
400	FT 3/HR	372	160	16
	ORIFICE DRILL	42	54	

**Notes:** This schedule is for units operating at normal altitudes of 2000 ft. (610m) or less. SPECIAL ORIFICES ARE REQUIRED FOR INSTALLATIONS ABOVE 2,000 FT. (610M).

**Notes:** When installed in Canada, any references to deration at altitudes in excess of 2000 feet (610m) are to be ignored. At altitudes of 2000 to 4500 feet (610 to 1372m), the unit heaters must be orificed to 90% of the normal altitude rating, and be so marked in accordance with the CSA certification.



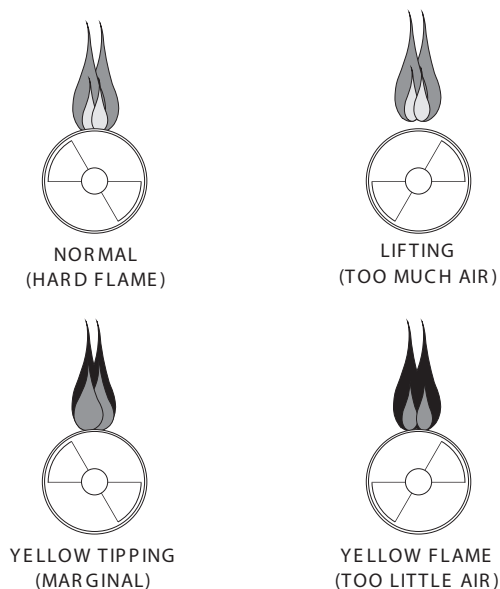
## PRIMARY AIR SHUTTER ADJUSTMENT

After the unit has been operating for at least 15 minutes, adjust the primary air flow to the burners. Turn the friction-locked, manually-rotated air shutters clockwise to close, or counterclockwise to open.

**Note:** *IMPORTANT! For correct air adjustment, close the air shutter until yellow tips in the flame appear. Then open the air shutter to the point just beyond the position where yellow tipping disappears. Refer to Figure 19, Main burner flames.*

**Note:** *There may be momentary and spasmodic orange flashes in the flame. This is caused by the burning of airborne dust particles, and not to be confused with the yellow tipping, which is a stable or permanent situation when there is insufficient primary air.*

**Figure 19. Main burner flames**



## PILOT ADJUSTMENT

1. Remove the pilot adjustment cap.
2. Adjust the pilot screw to provide a properly sized flame.
3. A proper pilot flame is a soft steady flame that envelops 3/8 to 1/2-inch (9.5 to 12.7 mm) of the flame sensor.
4. Replace the pilot adjustment cap.

## MANIFOLD PRESSURE ADJUSTMENT

If the manifold pressure requires minor adjustment, remove the cap from the pressure regulator and turn the adjustment screw clockwise to increase the pressure, or counterclockwise to decrease the pressure. The adjusted manifold pressure should not vary more than 10% from the pressures specified in Table 5.

# Maintenance

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## **WARNING**

### **Hazardous Service Procedures!**

The maintenance and troubleshooting procedures recommended in this section of the manual could result in exposure to electrical, mechanical or other potential safety hazards. Always refer to the safety warnings provided throughout this manual concerning these procedures. When possible, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow all of the recommended safety warnings provided, could result in death or serious injury.

## Periodic Service

*Note: The heater and vent system should be checked once a year by a qualified technician.*

All Maintenance/Service information should be recorded accordingly on the Inspection Sheet provided in this manual.

## **WARNING**

### **Combustible Materials!**

Maintain proper clearance between the unit heat exchanger, vent surfaces and combustible materials. Refer to unit nameplate and installation instructions for proper clearances. Improper clearances could result in a fire hazard. Failure to maintain proper clearances could result in death or serious injury or property damage.

## **WARNING**

### **Hazardous Voltage and Gas!**

Turn off the gas supply and disconnect all electric power, including remote disconnects before servicing unit. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to turn off gas or disconnect power before servicing could result in death or serious injury.

*Note: IMPORTANT! Gas tightness of the safety shut-off valves must be checked on at least an annual basis.*

To check gas tightness of the safety shut-off valves, turn off the manual valve upstream of the appliance combination control. Remove the 1/8 inch pipe plug on the inlet side of the combination control and connect a manometer to that tapping. Turn the manual valve on to apply pressure to the combination control. Note the pressure reading on the manometer, then turn the valve off. A loss of pressure indicates a leak. If a leak is detected, use a soap solution to check all threaded connections. If no leak is found, combination control is faulty and must be replaced before putting appliance back in service.

Should maintenance be required, perform the following inspection and service routine:

1. Inspect the area near the unit to be sure that there is no combustible material located within the minimum clearance requirements listed in this manual.
2. Turn off the manual gas valve and electrical power to the gas unit heater.

3. To clean or replace the main burners, remove the bottom panel and compress the spring by moving the burner toward the manifold. Slide the opposite end of the burner downward from the locating slot while retaining spring is still compressed. Pull the burners away from the heat.
4. With the burners removed, wire brush the inside surfaces of the heat exchanger.
5. Remove any dirt, dust, or other foreign matter from the burners using a wire brush and/or compressed air. Ensure that all parts are unobstructed. Inspect and clean pilot burner if necessary.
6. Reassemble the gas unit heater by replacing all parts in reverse order.
7. Complete the appropriate unit start-up procedure as given in the "Operation" section of this manual (see lighting instruction plate on the unit).
8. Check the burner adjustment. See the "Primary Air Shutter Adjustment" section of this manual.
9. Check all gas control valves and pipe connections for leaks.
10. Check the operation of the automatic gas valve by lowering the setting of the thermostat, stopping the operation of the gas unit heater. The gas valve should close tightly, completely extinguishing the flame on the main burners.
11. Inspect and service the motor/fan assemblies. To maintain efficient air flow, inspect and clean the fan blades and guard to prevent buildup of foreign matter.
12. Check lubrication instructions on the motor. If oiling is required, add 3 to 4 drops of electric motor oil as follows:
  - a. Light Duty - After 3 years or 25,000 hours of operation.
  - b. Average Duty - Annually after 3 years or 8,000 hours of operation.
  - c. Heavy Duty - Annually after 1 year or at least every 1500 hours of operation.

 **CAUTION**

**Bearing Failure!**

**Do not mix greases with different bases within the bearing. Mixing grease within the bearing may result in premature bearing failure.**

13. Check and test the operational functions of all safety devices supplied with your unit.



# Trouble Shooting

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## Trouble Shooting Guide:

### A. Flame lifting from burner ports.

#### *POSSIBLE CAUSE(S)*

1. Pressure regulator set too high.
2. Defective Regulator.
3. Burner orifice too large.

#### *CORRECTIVE ACTION*

- Reset manifold pressure. Refer to "Operation".
- Replace regulator section of combination gas valve or complete valve.
- Check with local gas supplier for proper orifice size and replace. Refer to "Operation".

### B. Flame pops back.

#### *POSSIBLE CAUSE(S)*

1. Excessive primary air.
2. Burner orifice too small.

#### *CORRECTIVE ACTION*

- Close air shutter. Refer to "Operation".
- Check with local gas supplier for proper orifice size and replace. Refer to "Operation".

### C. Noisy flame.

#### *POSSIBLE CAUSE(S)*

1. Too much primary air.
2. Noisy pilot.
3. Irregular orifice causing whistle or resonance.
4. Excessive gas input.

#### *CORRECTIVE ACTION*

- Close air shutter.
- Reduce pilot gas. Refer to "Operation".
- Replace orifice.

- Reset manifold pressure. Refer to “Operation”; Replace regulator section of combination gas valve or complete valve; or Check with local gas supplier for proper orifice size and replace. Refer to “Operation”.

### **D. Yellow tip flame (some yellow tipping on propane gas is permissible).**

#### *POSSIBLE CAUSE(S)*

1. Insufficient primary air.
2. Clogged main burner ports.
3. Misaligned orifices.
4. Clogged flue collector.
5. Air shutter linted.
6. Insufficient combustion.

#### *CORRECTIVE ACTION*

- Open air shutters. Refer to “Operation”.
- Clean main burner ports.
- Replace manifold assembly.
- Clean flue collector.
- Check for dust or lint at air mixer opening and around the air shutter.
- Clean combustion air inlet openings in bottom panel, see “Installation”.

### **E. Floating flame.**

#### *POSSIBLE CAUSE(S)*

1. Blocked venting.
2. Insufficient combustion air.
3. Blocked heat exchanger.
4. Air leak into combustion chamber or flue collector.

#### *CORRECTIVE ACTION*

- Clean flue. Refer to “Installation”.
- Clean combustion air inlet openings in bottom panel, see “Installation”.
- Clean heat exchanger.
- Determine cause and repair accordingly.

### **F. Gas Odor.**

#### *POSSIBLE CAUSE(S)*

- 1. Shut off gas supply immediately!**
2. Blocked heat exchanger/venting.

## Trouble Shooting

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3. Drafts around heater.
4. Negative pressure in building.
5. Blocked flue collector.

### *CORRECTIVE ACTION*

- **Inspect all gas piping and repair.**
- Clean heat exchanger/flue.
- Eliminate drafts. Refer to "Installation".
- See "Installation".
- Clean flue collector.

## **G. Delayed ignition.**

### *POSSIBLE CAUSE(S)*

1. Excessive primary air.
2. Main burner ports clogged near pilot.
3. Pressure regulator set too low.
4. Pilot decreases in size when main burners come on.
5. Pilot flame too small.
6. Drafts around heater.
7. Improper venting.

### *CORRECTIVE ACTION*

- Close air shutter. Refer to "Operation".
- Clean main burner ports.
- Reset manifold pressure. Refer to "Operation".
- Supply piping is inadequately sized. Refer to "Installation".
- Clean pilot orifice. Refer to "Operation".
- Refer to "Installation".

## **H. Failure to Ignite.**

### *POSSIBLE CAUSE(S)*

1. Main gas off.
2. Lack of power at unit.
3. Thermostat not calling for heat.
4. Defective limit switch.
5. Improper thermostat or transformer wiring at gas valve.
6. Defective gas valve.

7. Defective thermostat.
8. Defective transformer.
9. Loose wiring.
10. Defective ignition control.

### *CORRECTIVE ACTION*

- Open all manual gas valves.
- Replace fuse or turn on power supply.
- Turn up thermostat.
- Check limit switch with continuity tester. If open, replace limit switch.
- Check wiring per diagrams.
- Replace gas valve.
- Check thermostat and replace if defective.
- Be sure 115 volts is supplied to the transformer primary, then check for 24 volts at secondary terminal before replacing.
- Check and tighten all wiring connections per diagrams.
- Replace, if necessary. Also see W, X & Y symptoms.

## **J. Condensation of water vapor.**

### *POSSIBLE CAUSE(S)*

1. Improper venting.

### *CORRECTIVE ACTION*

- Refer to "Installation, Venting".

## **K. Burner won't turn off.**

### *POSSIBLE CAUSE(S)*

1. Poor thermostat location.
2. Defective thermostat.
3. Improper thermostat or transformer former wiring at gas valve.
4. Short circuit.
5. Defective or sticking gas valve.
6. Excessive gas supply pressure.

### *CORRECTIVE ACTION*

- Relocate thermostat away from drafts.
- Replace thermostat.
- Check wiring per diagrams.

## Trouble Shooting

---

- Check operation at valve. Look for short (such as staples piercing thermostat wiring), and correct.
- Replace gas valve.
- Refer to "Operation".

### L. Rapid burner cycling.

#### *POSSIBLE CAUSE(S)*

1. Loose electrical connections at gas valve or thermostat.
2. Excessive thermostat heat anticipator.
3. Unit cycling on high limit.
4. Poor thermostat location.
5. Draft on Pilot.
6. Defective ignitor control (if applicable).
7. Unit cycling on high limit.
8. Defective high limit switch.

#### *CORRECTIVE ACTION*

- Tighten all electrical connections.
- Adjust thermostat heat anticipator for longer cycles. Refer to "Operation".
- Check for proper air supply across heat exchanger.
- Relocate thermostat. (Do not mount thermostat on unit).
- Eliminate drafts. Refer to Installation.
- Replace ignitor.
- Check for proper air supply across heat exchanger.
- Jumper limit switch terminals 1 and 2. If burner operates normally, replace switch.

### M. Noisy.

#### *POSSIBLE CAUSE(S)*

1. Fan blades loose.
2. Fan blades dirty.
3. Vibration isolator6Span o4 ViBet his ar-4.1 TIVE ACTION





## Trouble Shooting

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## Trouble Shooting

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### *CORRECTIVE ACTION*

- Check and tighten all wiring connections per diagrams. Thermostat wires tagged "W" and "G" must be connected together (unless special thermostats are used; if so, see thermostat wiring diagram). See electrical connections.
- Replace motor.
- Check for 24V across H terminals on fan time delay switch. If 24V is present, jumper terminals numbered 1 and 3. If motor runs, the fan switch is defective and must be replaced. If 24V is not present, check wiring per diagrams.

### **P. Fan motor turns on and off while burner is operating.**

#### *POSSIBLE CAUSE(S)*

- *Fan switch heater element improperly wired.*
- *Defective fan switch.*
- *Motor overload protector cycling on and off.*
- *Motor not properly oiled.*

#### *CORRECTIVE ACTION*

Be sure fan switch heater terminals are connected per diagrams.

Replace fan switch.

Check motor amps against motor name plate rating, check voltage, replace fan motor if defective.

Refer to label on motor.

### **Q. Fan motor will not stop.**

#### *POSSIBLE CAUSE(S)*

1. Improperly wired fan control.
2. Main burners not lighting while thermostat calls for heat.
3. Defective fan switch.

#### *CORRECTIVE ACTION*

- Check all wiring.
- Refer to H or N symptoms.
- Replace fan switch.

### **R. Not enough heat.**

#### *POSSIBLE CAUSE(S)*

1. Incorrect gas input.
2. Heater undersized.

3. Thermostat malfunction.
4. Heater cycling on limit control.

### *CORRECTIVE ACTION*

- Refer to "Operation".
- This is especially true when the heated space is enlarged. Have the heat loss calculated and compare to the heater output (80% of input). Your gas supplier or installer can furnish this information. If heater is under sized, add additional heaters.
- Replace thermostat.
- There should be NO ducts attached to the front of this heater. Check air movement through heat exchanger. Check voltage to fan motor. Clean fan blade and heat exchanger and oil fan motor.

## **T. Too much heat.**

### *POSSIBLE CAUSE(S)*

1. Thermostat malfunction.
2. Heater runs continuously.

### *CORRECTIVE ACTION*

- Replace thermostat.
- Check wiring per diagrams; Check operation at valve. Look for short (such as staples piercing thermostat wiring), and correct; Replace gas valve; Refer to "Operation".

## **U. Cold air is delivered on start up.**

### *POSSIBLE CAUSE(S)*

1. Fan switch heater element improperly wired.

### *CORRECTIVE ACTION*

- Be sure fan switch heater terminals are connected per diagrams.

## **V. Cold air is delivered during heater operation.**

### *POSSIBLE CAUSE(S)*

1. Incorrect manifold pressure or input.
2. Voltage to unit too high.
3. Air through put too high.

### *CORRECTIVE ACTION*

- Refer to "Operation".
- Check motor voltage with fan running. Should be 115 volts AC.
- Refer to "Operation".

### W. No Spark.

#### *POSSIBLE CAUSE(S)*

1. Thermostat not calling for heat.
2. No low voltage.
3. Spark gap closed or too wide.
4. Broken or cracked ceramic on spark electrode.

#### *CORRECTIVE ACTION*

- Close thermostat contacts.
- Check for 24V across 24V terminals of S8600.
- Set gap to 0.1".
- Replace pilot assembly.

### X. Spark present but pilot does not light.

#### *POSSIBLE CAUSE(S)*

1. *Loose S8600 connections.*
2. *Improper gas pressure.*
3. *Is spark in pilot gas stream?*
4. *No pilot gas — do not use match to test - presence of gas is easily detected by the odor.*

#### *CORRECTIVE ACTION*

- Check all connections, term. PV feeds 24V to pilot valve.
- Check pressure — pressure that is either too high or too low may cause a problem.
- Spark should arc from electrode.
- Check pilot line for kinks. Ensure there are no drafts.

### Y. Pilot lights — Main valve does not energize.

#### *POSSIBLE CAUSE(S)*

1. *Loose S8600 connections.*
2. *Cracked or broken sensor ceramic.*
3. *Check sensor/spark lead for continuity.*
4. *Measure 24 volts from term. MV to term. MV/PV.*

#### *CORRECTIVE ACTION*

- Check connections-term. MV feeds main valve.
- Replace pilot assembly.
- Replace if needed.

- If present, replace main valve; if not, replace S8600 Igniter.

### **Z. Hi-Limit switch tripping.**

#### *POSSIBLE CAUSE(S)*

1. *Vertical run of flue is too short.*
2. *Unit is overfiring.*
3. *Air flow too low*

#### *CORRECTIVE ACTION*

- Lengthen vertical run of flue pipe (see venting).
- Burner orifice may be too large: verify/replace if required.
- Increase air flow; check fan size. Check for proper voltage.
- Replace.

### **AA. Noisy power venter.**

#### *POSSIBLE CAUSE(S)*

1. *Power venter wheel loose.*
2. *Power venter wheel dirty.*
3. *Power venter wheel rubbing housing.*
4. *Bearings are dry.*

#### *CORRECTIVE ACTION*

- Replace or tighten.
- Clean power venter wheel.
- Realign power venter wheel.
- Oil bearings on power venter motor. (Refer to label on motor).

### **BB. Power venter will not run.**

#### *POSSIBLE CAUSE(S)*

1. *Loose wiring.*
2. *Defective motor overload protector or defective motor.*
3. *Defective power venter relay.*

#### *CORRECTIVE ACTION*

- Check and tighten all wiring connections per diagrams. Thermostat wires tagged "W" and "G" must be connected together (unless special thermostats are used; if so, see thermostat wiring diagram). See electrical connections.
- Replace motor.

## Trouble Shooting

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- Check for 24V across 1 and 3 terminals on fan relay. If 24V is present, jumper terminals numbered 2 and 4. If motor runs, the relay is defective and must be replaced. If 24V is not present, check wiring per diagrams.

### **CC. Power venter motor turns on and off while burner is operating.**

#### *POSSIBLE CAUSE(S)*

1. *Fan relay heater element improperly wired.*
2. *Defective venter relay switch.*
3. *Motor overload protector cycling on and off.*
4. *Motor not properly oiled.*

#### *CORRECTIVE ACTION*

- Be sure venter relay heater terminals are connected per diagrams.
- Replace venter relay.
- Check motor amps against motor name plate rating, check voltage, replace power venter motor if defective.
- Refer to label on motor.

### **DD. Power venter motor will not stop.**

#### *POSSIBLE CAUSE(S)*

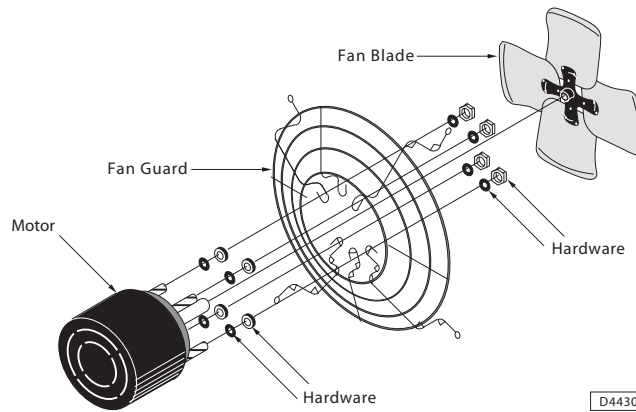
1. *Improperly wired venter relay.*
2. *Main burners not lighting while thermostat calls for heat.*
3. *Defective venter relay.*

#### *CORRECTIVE ACTION*

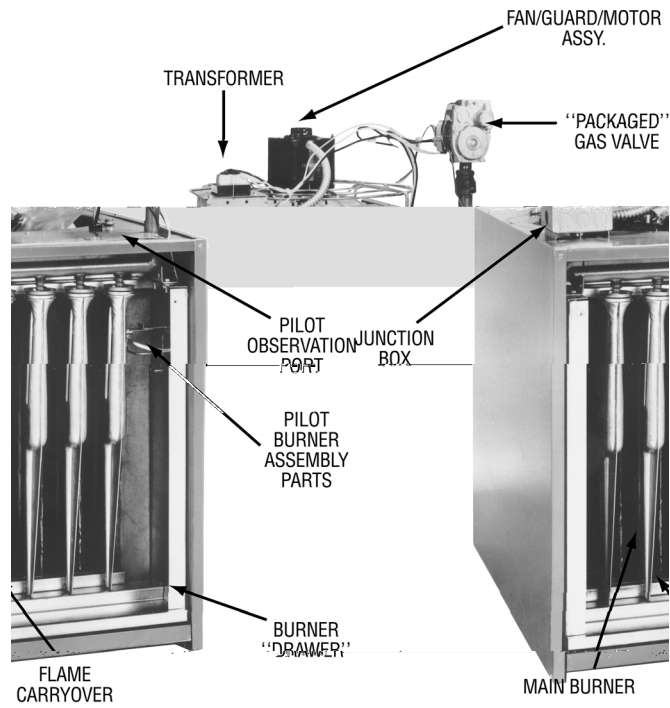
- Check all wiring.
- Refer to H & N symptoms.
- Replace venter relay.

# Part Identification

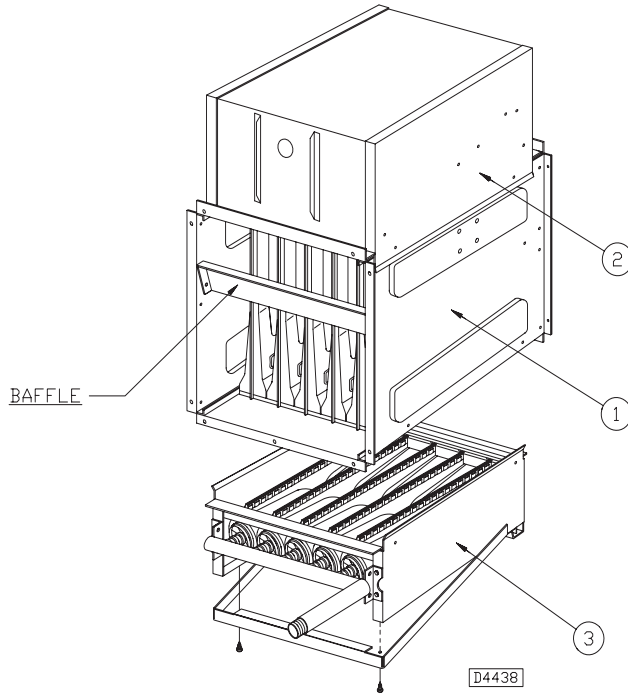
**Figure 20. Propeller parts: 115/1/60 motor fan guard fan blade hardware**



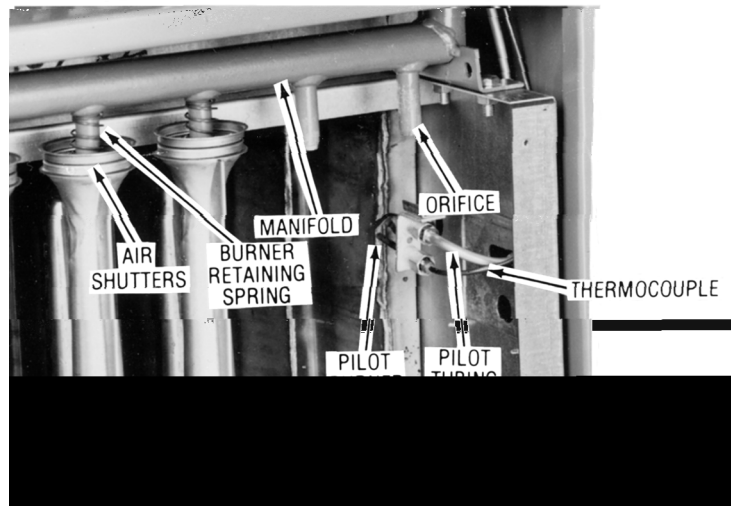
**Figure 21. Component parts, bottom view**



**Figure 22. Internal furnace components**

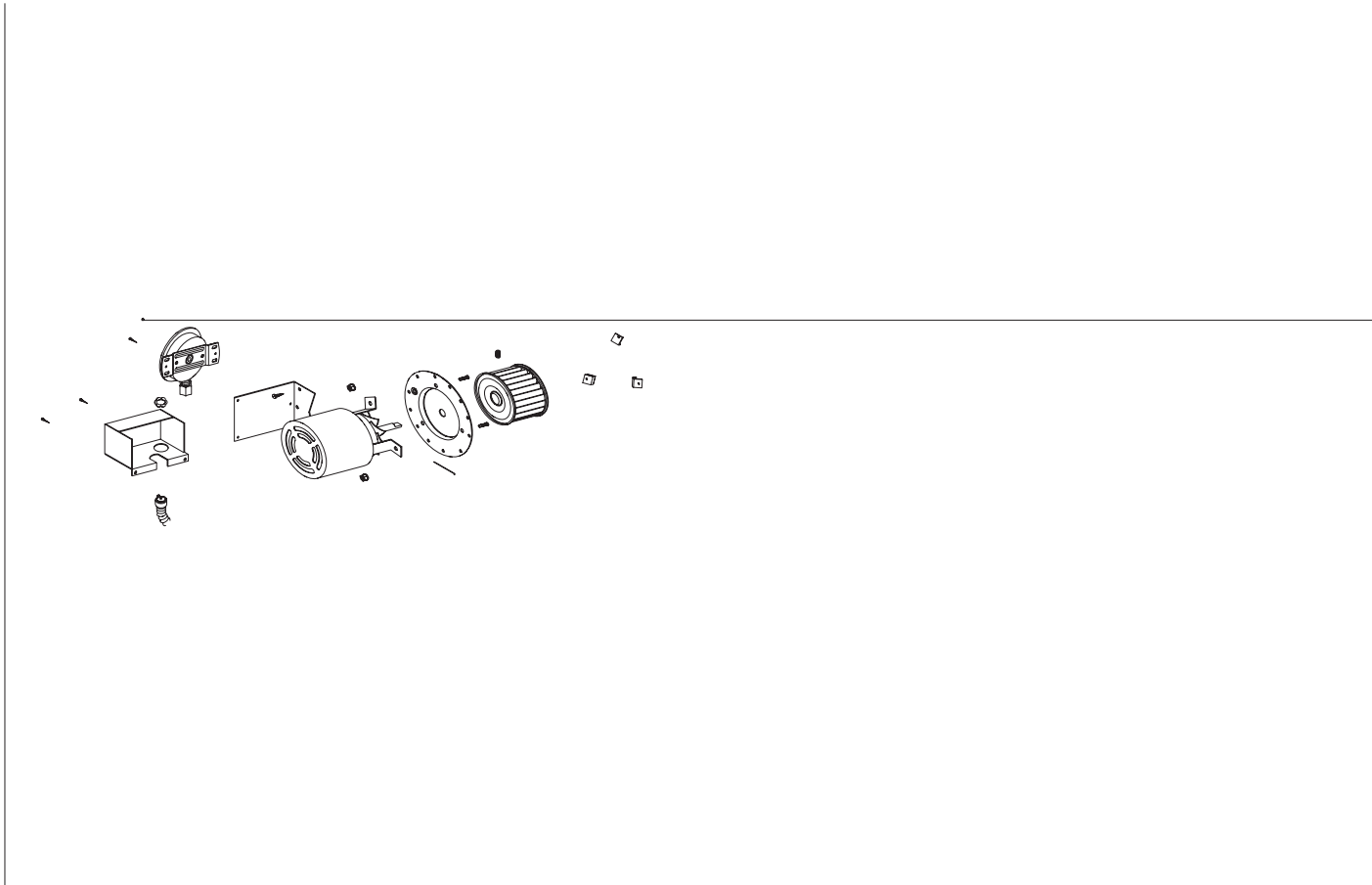


**Figure 23. Burner assembly parts**





**Figure 24. Power vent assembly**



- Note 1.** For item No. 6, use counter-clockwise rotation.
- Note 2.** DO NOT OVERTIGHTEN CELCON NUT! HAND TIGHTEN ONLY! DO NOT USE TOOLS!  
Approximate 1/3 turn maximum or 8 inch pounds is sufficient from the point where the tube does not slip in or out.
- Note 3.** Flue Sizes:  
30/75 units: 4" dia. flue outlet Reducer required – To be supplied by installer.  
100/175 units: 4" dia. flue outlet Reducer required – To be supplied by installer.  
200/250 units: 5" dia. flue outlet (no adapter required).  
300/400 units: 6" dia. flue outlet Increaser required – To be supplied by manufacturer.

## Part Identification

### Installation of Power Vented Motor

## INSTALLATION INSTRUCTIONS FOR FIELD REPLACEMENT OF POWER VENTER MOTOR

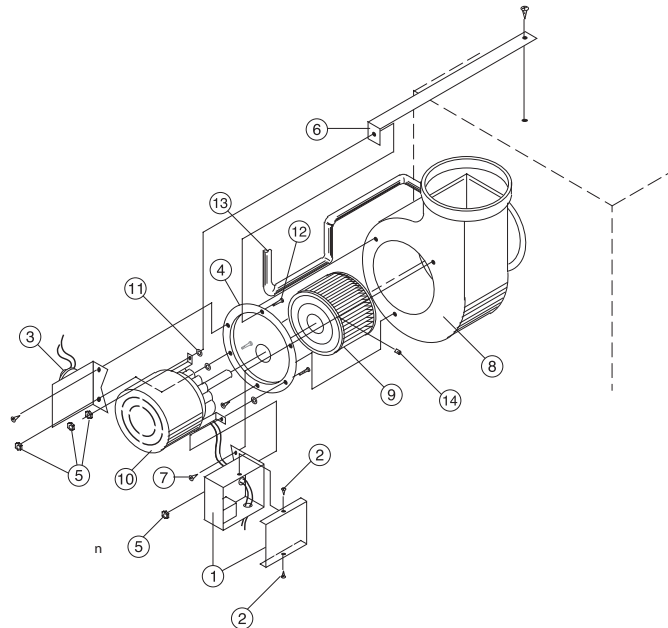
### WARNING

#### Hazardous Voltage and Gas!

Turn off the gas supply and disconnect all electric power, including remote disconnects before servicing unit. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to turn off gas or disconnect power before servicing could result in death or serious injury.

*Note:* All hardware (screws, nuts, washers) that will be removed from the unit will be reused for this motor replacement. **DO NOT LOSE ANY OF THESE PARTS!**

**Figure 25. Power venter motor part identification**



REF. NO.	DESCRIPTION
1	Relay Junction Box/Mounting Bracket Assembly
2	#8 Drill Screws (2 required)
3	Pressure/Mounting Bracket Assembly
4	Mounting Plate Adapter
5	Keps Nut w/External Tooth Lockwasher (4 required)
6	Motor Support Shipping Bracket
7	Phillips Head Screws (3 required)
8	Power Venter Blower Housing
9	Blower Wheel
10	Motor
11	Space Washers (3 required)
12	Machine Screw (3 required)
13	Sensing Tube
14	Set Screw

### TOOLS AND PARTS NEEDED:

Wire Stripper and Crimper; Slotted Head and #2 Phillips Head Screwdriver; 3/8" Wrench; 1/8" Allen Wrench (long handle); marker; (1) 1/4" push on terminal for Wire.

### **Note:**

1. Remove the cover from the Relay Junction Box (Item 1) by removing two screws (Item 2) top and bottom. Disconnect both wires from the motor lead ends. One is connected to terminal #4 on the venter relay, and the other is connected with a wire nut to a black wire.
2. Remove the sensing tube (Item 13) from the Pressure Switch/Mounting Bracket (Item 3) at motor end only. Separated Combustion Units: Remove both tubes at motor end only note location.
3. Mark locations of the Relay Junction Box and Pressure Switch Mounting Brackets along with the Motor (Item 10) mounts on the Mounting Adapter Plate (Item 4) - using a marker.
4. Remove nut (Item 5) that secures the Motor Support Shipping Bracket (Item 6) to the Mounting Adapter Plate. Pull this bracket away from the Motor Mounting Adapter Plate.
5. Remove three phillips head screws (Item 7) on the Motor Mounting Adapter Plate. Remove the Motor/Blower Wheel/Adapter Plate assembly from the Power Venter Blower Housing (Item 8).
6. Remove the Blower Wheel (Item 9) from the motor shaft - by removing the set screw (Item 14) using a 1/8" Allen Wrench.
7. Remove the three Motor Mounting Nuts (Item 5), Space Washers (Item 11), and Screws (Item 12). Do not loose these parts! Using caution - the motor will disengage from the Mounting Adapter Plate, along with the Relay Junction Box and Pressure Switch Mounting Brackets will also disengage.
8. Reverse Order to install the new Power Venter Motor.
9. TEST FIRE THE UNIT FOR A FEW CYCLES, MAKING SURE THAT THE UNIT IS OPERATING SATISFACTORY.



# Gas Equipment Start-Up

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Customer \_\_\_\_\_ Job Name & Number \_\_\_\_\_

## PRE-INSPECTION INFORMATION

With power and gas off.

**Type of Equip.** Unit Heater, Duct Furnace, Indoor, Rooftop

Serial Number \_\_\_\_\_ Model Number \_\_\_\_\_

Name Plate Voltage: \_\_\_\_\_ Name Plate Amperage: \_\_\_\_\_

Type of Gas: Natural or LP

### **Tank Capacity**

\_\_\_\_\_ lbs. Rating: \_\_\_\_\_ BTU @ \_\_\_\_\_ °F

\_\_\_\_\_ kg \_\_\_\_\_ kw @ \_\_\_\_\_ °C

Are all panels, doors, vent caps in place?

Has the unit suffered any external damage? Damage \_\_\_\_\_

Does the gas piping and electric wiring appear to be installed in a professional manner?

Has the gas and electric been inspected by the local authority having jurisdiction?

Is the gas supply properly sized for the equipment?

Were the installation instructions followed when the equipment was installed?

Have all field installed controls been installed?

Do you understand all the controls on this equipment? If not, contact your wholesaler or rep.

(DO NOT START this equipment unless you fully understand the controls.)

## GENERAL (with power and gas off)

Make certain all packing has been removed.

Tighten all electrical terminals and connections.

Check damper linkages for tightness.

Check all fans & blowers for free movement.

Check all controls for proper settings.

Check all set screws on blowers and bearings.

Check belt tightness.

## BLOWER (with power on and gas off)

Check voltage L1 \_\_\_\_ L2 \_\_\_\_ L3 \_\_\_\_

Check rotation of main blower.

Check motor amps L1 \_\_\_\_ L2 \_\_\_\_ L3 \_\_\_\_

Blower RPM \_\_\_\_\_

Check air filters. (Record quantity & size.)

## GAS HEATING (with power and gas on)

Inlet gas pressure. \_\_\_\_ in. W.C. or \_\_\_\_ kPa

Pilot & main burner ignition.

Manifold gas pressure. \_\_\_\_ in. W.C. or \_\_\_\_ kPa

Cycle on HIGH LIMIT.

Cycle firestat and/or freezestat.

Check electronic modulation. Set at: \_\_\_\_\_

Check mechanical modulation. Set at: \_\_\_\_\_

Cycle and check all other controls not listed.

Check operation of remote panel.

Entering air temp. \_\_\_\_ °F or \_\_\_\_ °C

Discharge air temp. (high fire) \_\_\_\_ °F. or \_\_\_\_ °C

External static pressure \_\_\_\_\_ in. W.C.

Cycle by thermostat or operating control.

## Remarks:

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