

Installation **Instructions**

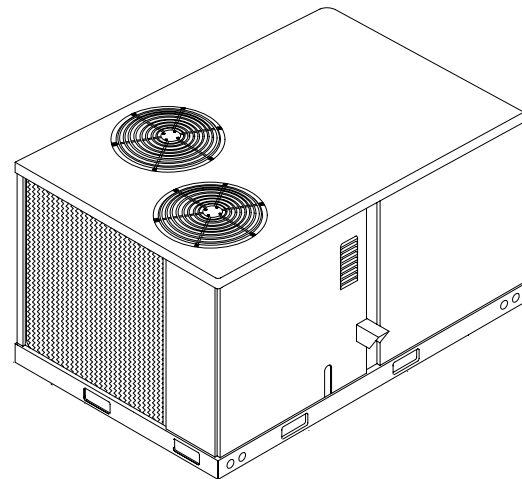
- Safety Labeling & Rules
- Installation Requirements
- Location / Clearances
- Gas Supply / Piping
- Wiring
- Air Distribution
- Ductwork Connections
- Start-Up
- Maintenance
- Hoisting / Rigging

Models

Three Phase
208–230, 460, 575 Volt

PGS072–150

PGE072–150



COMBINATION UNITS
ELECTRIC COOL / GAS HEAT

Table of Contents

Safety Labeling and Signal Words	2
Danger, Warning and Caution	2
Unit Dimensions	3–4
Safe Installation Requirements	5
Location And Set-up	6
Access Panels	6
Clearances	6
Minimum Clearances to Combustible and non-Combustible Construction (Horizontal & DownFlow)	6
Installation	8
Ground Level Installation	8
Rooftop Installation	8
Hoisting	8
Air Intake and Flue Exhaust Hoods	9
Converting to Horizontal Operation	9
Condensate Drain	9
Gas Supply and Piping	10
Orifices	10
Orifice Sizes	10
Gas Piping	10
Gas Pipe Size	11
English Measurements / Metric Measurements	11
Piping At Unit	12
Connecting the Gas Piping	12
Leak Checks	13
Electrical Wiring	14
Line Voltage Wiring	14
Line Connections	14
Converting 230V Units to 208V	14
Field Installed Equipment	14
Low Voltage Wiring	15
Low Voltage Wiring With Economizer Option	15
Thermostat	15
Heat Anticipator	15
Final Check	15
Air Distribution System	16
Ductwork	16
Ductwork Connections	16
Circulating Blower	16
Determining Blower Speed	16
Circulating Blower Performance Data	17–26

Adjustable Belt Drive Blower	27
Start-up Procedure	28
Blower and Phasing Check	28
High Heat Checks	29
Heating Operation/Temperature Rise Check	30
Cooling Checks	30
Turning Off the Unit	31
Heating	31
Cooling	31
Operation And Maintenance Instructions	32
Starting the Unit After Shutdown	32
Heating	32
Cooling	32
Thermostat Fan Switch Operation	32
Integrated Gas Controller Operation	32
Limit Switch	33
Burner Ignition	33
Monthly Maintenance and Inspection Checks	33
Vent Assembly	33
Main Burner Flame	33
Air Filters (Factory Installed)	33
Disposable Replacement Filters	33
Condenser Coil	34
Condensate Drain	34
Annual Maintenance and Inspection	34
Circulating Air Blower	34
Inspection & Cleaning Of Burner Assy./Heat Exchangers/Flue Gas Passages	34–35
Troubleshooting	36
Table 1 – LED Error Code Description	36
Table 2 – LED Trouble Shooting Error Codes	36
Trouble Shooting – Cooling Service	37
Trouble Shooting – Heating Service	38
Start-Up Checklist	39

Safety Labeling and Signal Words

Danger, Warning and Caution

The signal words **DANGER**, **WARNING** and **CAUTION** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING** and **CAUTION** will be used on product labels and throughout this manual and other manuals that may apply to the product.

Signal Words

DANGER – Immediate hazards which **WILL** result in severe personal injury or death.

WARNING – Hazards or unsafe practices which **COULD** result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which **COULD** result in minor personal injury or product or property damage.

Signal Words in Manuals

The signal word **WARNING** is used throughout this manual in the following manner:

WARNING

The signal word **CAUTION** is used throughout this manual in the following manner:

CAUTION

Product Labeling

Signal words are used in combination with colors and/or pictures on product labels. Following are examples of product labels with explanations of the colors used.

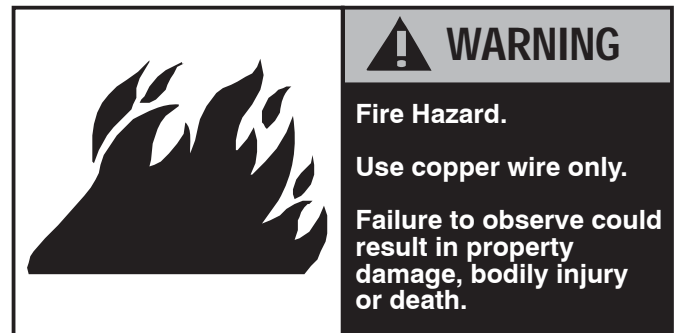
Danger Label

White lettering on a black background except the word **DANGER** which is white with a red background.



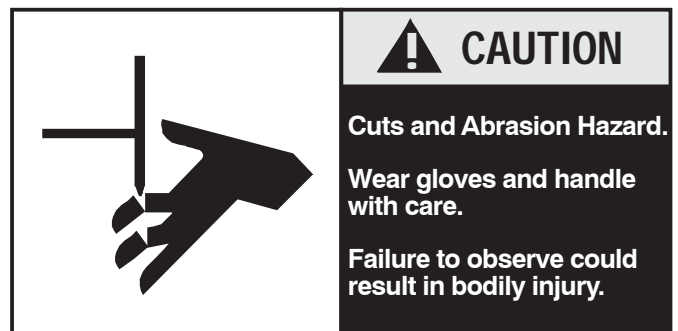
Warning Label

White lettering on a black background except the word **WARNING** which is black with an orange background.



Caution Label

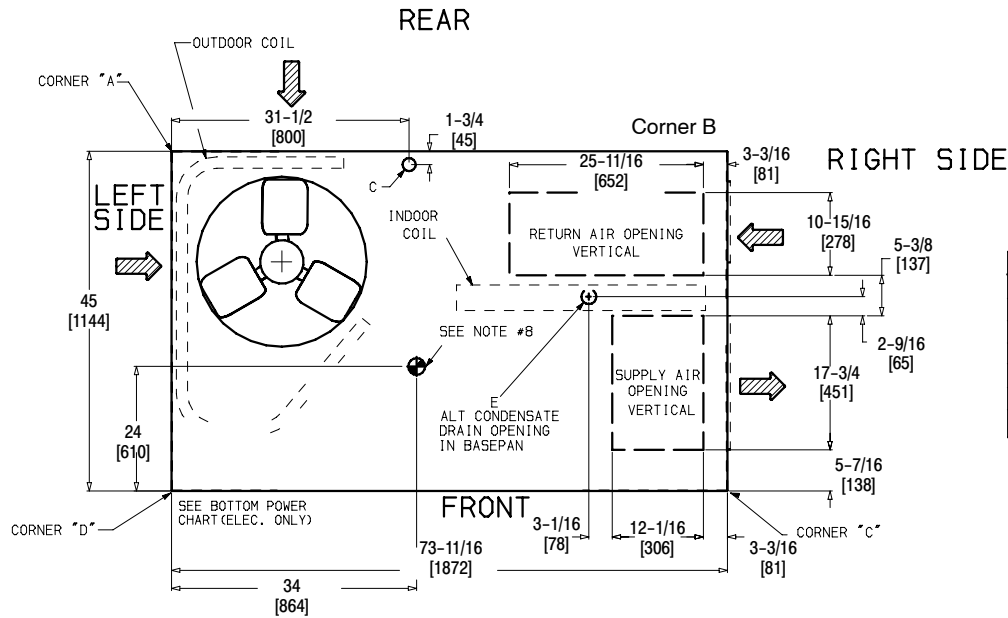
White lettering on a black background except the word **CAUTION** which is black with a yellow background.



BASE UNIT WEIGHT AND DIMENSIONS – PGS/E072

Unit	Total Weight		Corner A		Corner B		Corner C		Corner D		Dim K	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	ft-in	mm
PGS072	565	256	165	75	136	62	200	91	64	29	12-3/8	315
PGE072	615	279	147	67	142	65	160	73	166	75	19-3/16	847

All measurements in inches (mm)

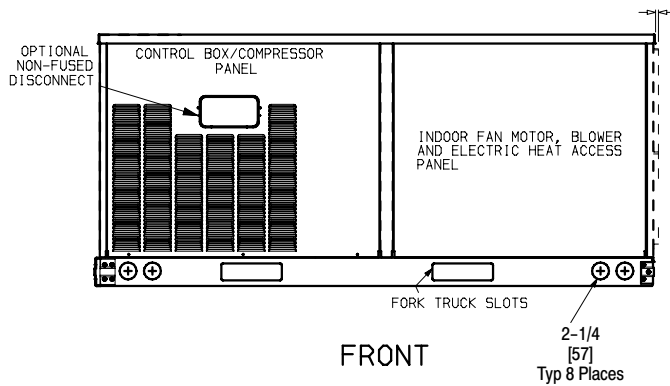
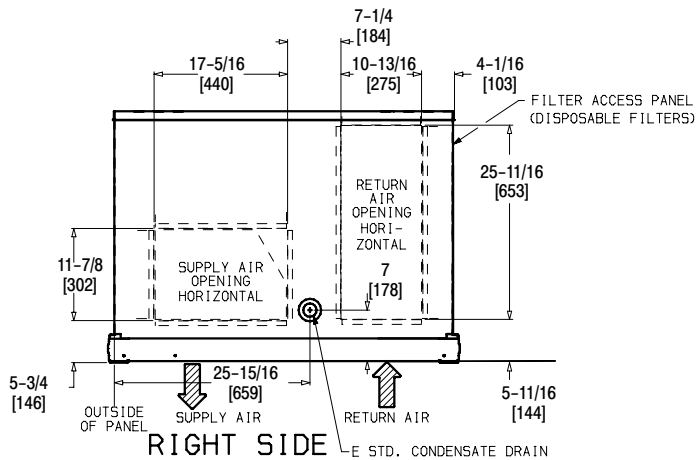
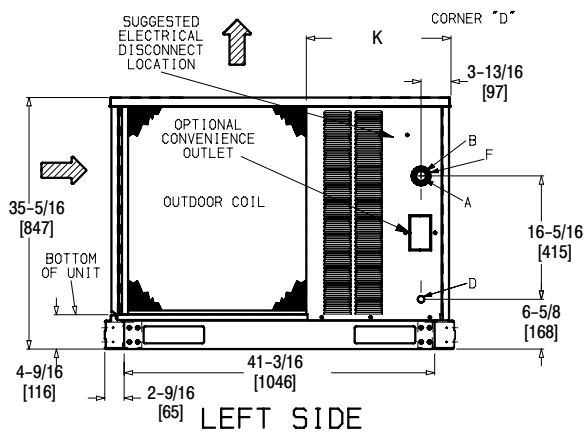


THREADED CONDUIT SIZE	WIRE USE	REQUIRED HOLE SIZES (MAX.)
1/2"	ACC	7/8" [22]
1/2"	24	7/8" [22]
3/4"	Power*	1-1/8" [28.4]
1-1/4" FPT	Power*	1-3/4" [44.4]
1/2" FPT	GAS	1-1/4" [31.8]
3/4" FPT	GAS	1-5/8" [41.3]

* Select either 3/4" or 1-1/4" for power, depending on wire size.

	Connection Sizes – PGE072
A	1–3/8" Dia (35) Field Power Supply Hole
B	2" Dia (51) Power Supply Knockout
C	1–3/4" Dia (44) Charging Port Hole
D	7/8" Dia (22) Field Control Wiring Hole
E	3/4"–14 NPT Condensate Drain
F	1/2"–14NPT Gas Connection
G	2–1/2" Dia (64) Power Supply Knockout

	Connection Sizes – PGS072
A	1–3/8" Dia (35) Field Power Supply Hole
B	2" Dia (51) Power Supply Knockout
C	2–1/2" Dia (44) Charging Port Hole
D	7/8" Dia (22) Field Control Wiring Hole
E	3/4"–14 NPT Condensate Drain
F	1/2"–14 NPT Gas Connection



Unit	Total		Corner A		Corner B		Corner C		Corner D		Dim A		Dim B		Dim C	
Size	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	ft-in	mm	ft-in	mm	ft-in	mm
090	870	395	189	86	161	73	239	109	280	127	1-2 ⁷ / ₈	378	3-5 ⁵ / ₁₆	1050	2-9 ¹¹ / ₁₆	856
102	880	399	191	87	153	74	242	110	284	129	3-3 ⁷ / ₈	1013	3-5 ⁵ / ₁₆	1050	2-9 ¹¹ / ₁₆	856
120	1035	489	225	102	192	87	285	129	333	151	2-5 ⁷ / ₈	759	4-1 ¹⁵ / ₁₆	1253	3-3 ³ / ₈	924
150	1050	476	228	103	195	88	289	131	338	153	1-2 ⁷ / ₈	378	4-1 ¹⁵ / ₁₆	1253	3-3 ³ / ₈	924

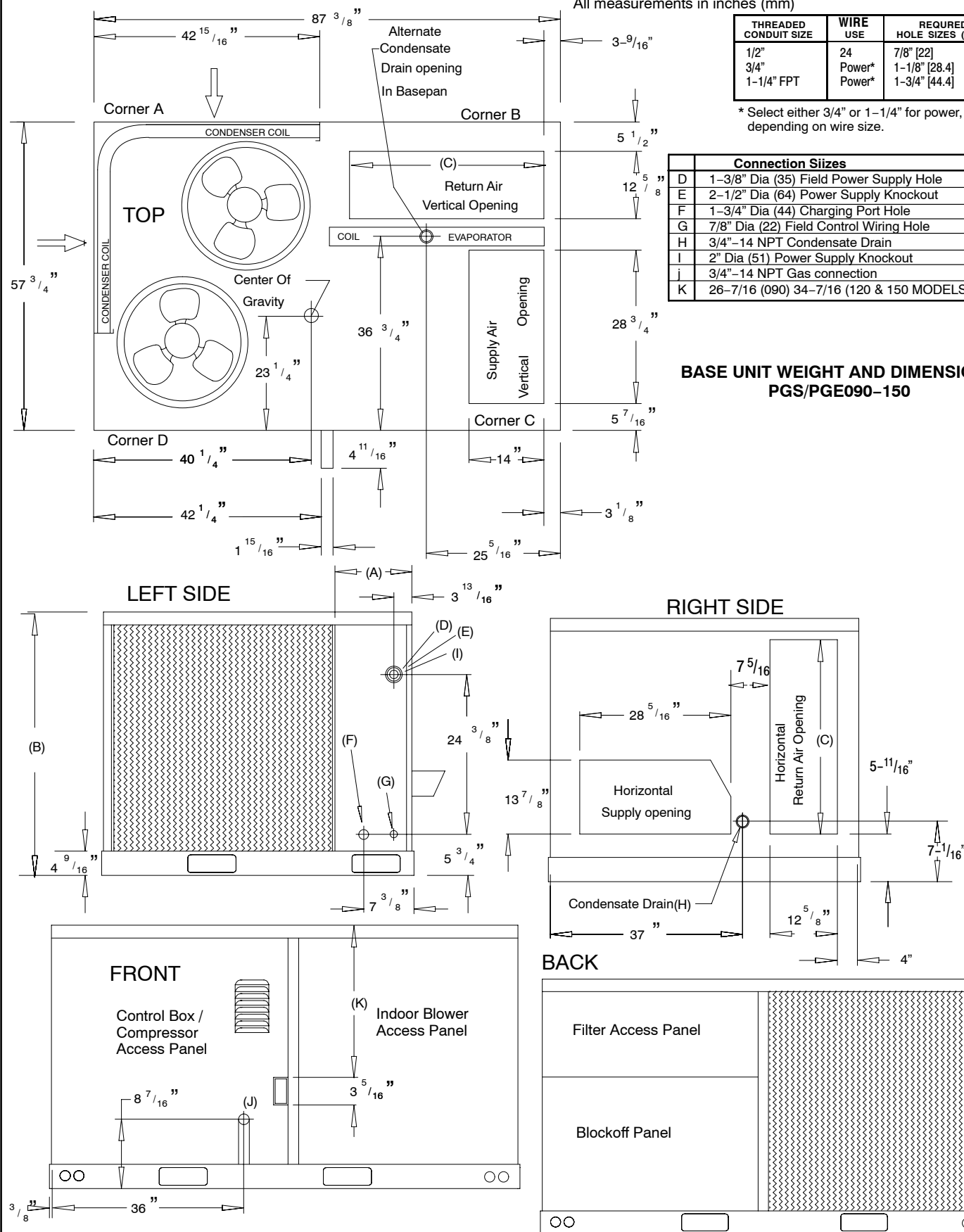
All measurements in inches (mm)

THREADED CONDUIT SIZE	WIRE USE	REQUIRED HOLE SIZES (MAX.)
1/2"	24	7/8" [22]
3/4"	Power*	1-1/8" [28.4]
1-1/4" FPT	Power*	1-3/4" [44.4]

* Select either 3/4" or 1-1/4" for power, depending on wire size.

Connection Sizes	
D	1-3/8" Dia (35) Field Power Supply Hole
E	2-1/2" Dia (64) Power Supply Knockout
F	1-3/4" Dia (44) Charging Port Hole
G	7/8" Dia (22) Field Control Wiring Hole
H	3/4"-14 NPT Condensate Drain
I	2" Dia (51) Power Supply Knockout
J	3/4"-14 NPT Gas connection
K	26-7/16 (090) 34-7/16 (120 & 150 MODELS)

BASE UNIT WEIGHT AND DIMENSIONS PGS/PGE090-150



Safe Installation Requirements

WARNING

Installation or repairs made by unqualified persons can result in hazards to you and others. Installation must conform with local building codes or, in the absence of local codes, with National Fuel Gas Code NFPA 54/ANSI Z223.1–1988 or current edition and National Electrical Code ANSI/NFPA 70–1990 or current edition. In Canada the National Standard CAN/CGA 1–B149.1 or current edition and CSA C.22.1 – Canadian Electrical Code Part 1 or current edition.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures, equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in furnace malfunction, property damage, personal injury and/or death.

- Installation **MUST** conform to the most current version of the following standards or a superseding standard.

In the United States:

- National Fuel Gas Code NFPA 54/ANSI Z223.1–1988
- National Electrical Code ANSI/NFPA 70–1990

In Canada:

- National Standard CAN/CGA 1–B149.1
- CSA C.22.1 – Canadian Electrical Code Part 1.
- Do **NOT** use this furnace as a construction heater.
- Use only the type of gas approved for this furnace (see rating plate).
- Do **NOT** use open flame to test for gas leak.
- Seal supply and return air ducts.

NOTE: It is the personal responsibility and obligation of the customer to contact a qualified installer to ensure that the installation is adequate and conforms to governing codes and ordinances.

CAUTION

It is recommended that a qualified service technician check the heat exchanger integrity a minimum of every two (2) years.

Do not install unit in an indoor location. Do not locate unit air inlets near exhaust vents or other sources of contaminated air.

Be sure that unit is installed so that snow will not block the combustion intake or flue outlet.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

Locate mechanical draft system flue assembly at least 48 inches from any opening through which combustion products could enter the building, or as local codes dictate, and at least 48 inches from an adjacent building or combustible material. When unit is located adjacent to public walkways, flue assembly must be at least 7 feet above grade.

Flue vent discharge must have a minimum horizontal clearance of 48 inches from electric and gas meters, gas regulators, and gas relief equipment.

Flue gas can deteriorate building materials. Orient unit so that flue gas will not affect building materials.

Adequate combustion–air space must be provided for proper operation of this equipment. Be sure that installation complies with all local codes and Section 5.3, Air for Combustion and Ventilation, NFGC (National Fuel gas Code), ANSI (American National Standards Institute) Z223.1 –latest year and addendum Z223.1A latest year. In Canada, installation must be accordance with CAN1B149.1 and CAN1.B149.2 installation codes for gas burning appliances.

Location And Set-up

The unit is designed for outdoor installation **ONLY**. The unit may be installed on a level concrete mounting base (or other adequate platform) at ground level or on a flat rooftop with an adequate platform. If using as a downflow model, use a roof curb. Typical installations are shown in **Figures 2**.

Access Panels

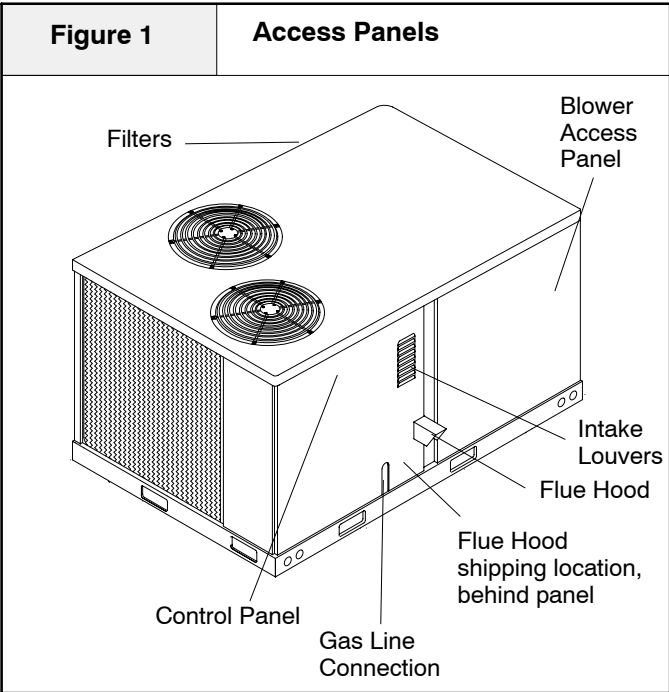
CAUTION

Unit will **NOT** operate properly without all access panels in place. Access panels are shown in **Figure 1**.

Unit **MUST NOT** be moved unless all access panels are in place.

WARNING

Carbon monoxide poisoning hazard.
Keep blower access panels in place.
Failure to keep blower access panels in place can result in bodily injury and/or death.



Clearances

The location **MUST** allow for minimum clearances and should not be adjacent to an area where the unit's operating sound level might be objectionable.

Minimum clearances, as specified below, **MUST** be maintained to provide adequate fire protection, adequate combustion air, and room for service personnel. In addition, local codes **MUST** be observed.

Do **NOT** install the unit in a location that will permit discharged air from the condenser to recirculate to the condenser inlet.

Do **NOT** install the unit in a location that will permit discharged air from the furnace exhaust flue to recirculate into the unit or into the intake vent of any other equipment or ventilation system.

CAUTION

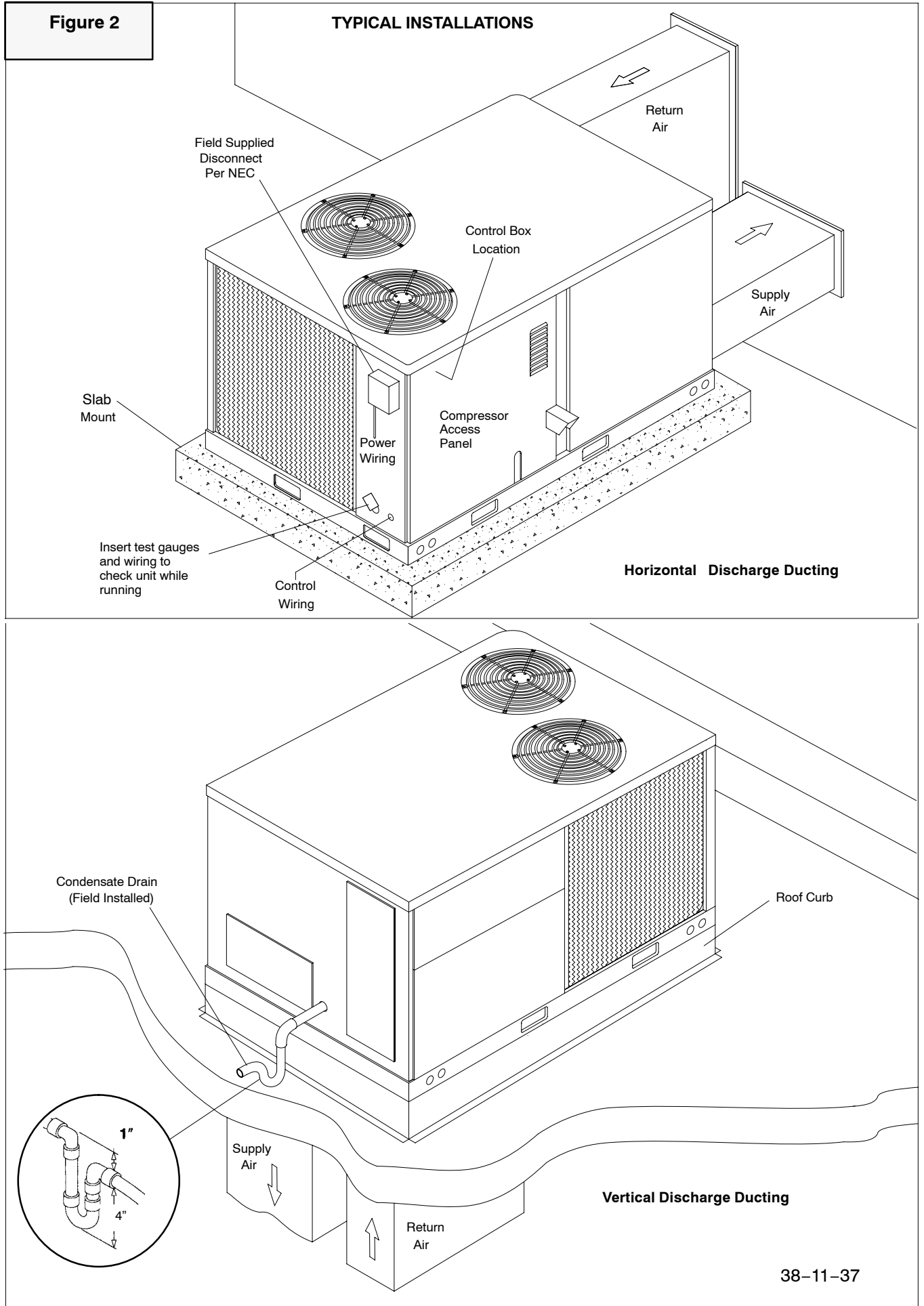
Do **NOT** operate unit in a corrosive atmosphere containing chlorine, fluorine, or any other corrosive chemicals.

Minimum Clearances to Combustible and non-Combustible Construction (Horizontal & DownFlow)

Flue Side and combustible surfaces	48"
Bottom of Unit and combustible surfaces with no curb	1"
Condenser Coil, one side	36"
other side (which side is optional)	12"
Overhead clearance	60"
Control Box Side	42"
Horizontal Duct Connections Side	0"

Figure 2

TYPICAL INSTALLATIONS



38-11-37

Installation

CAUTION

Unit will **NOT** operate properly unless it is installed level front to rear and side to side.

The slope **MUST NOT** be greater than $\frac{1}{8}$ " per foot (10mm per meter). For side to side leveling, the control box side **MUST** always be lower.

Ground Level Installation

Ground level platform requirements:

- The unit **MUST** be situated to provide safe access for servicing.
- Platform may be made of either concrete or pressure treated wood and **MUST** be level and strong enough to support unit weight.
- Position platform separate from building foundation.
- Install in well-drained area, with top surface of platform above grade level.
- Platform **MUST** be high enough to allow for proper condensate trap installation and drainage. See **Figure 4** and associated text for more information about condensate drainage.

Rooftop Installation

Rooftop platform requirements:

- The unit **MUST** be situated to provide safe access for servicing.
- The existing roof structure **MUST** be adequate to support the weight of the unit or the roof **MUST** be reinforced.

Check the weight of the unit in relation to the roof structure and local building codes or ordinances and reinforce roof structure if necessary. See page 3 of this manual for unit weights and corner weights.

- Support for the unit **MUST** be level and strong enough to carry unit weight. The support may consist of a platform or a combination of platform and roof beams or curb.

The platform may be constructed of pressure treated wood and may be covered with Class A, B or C roof covering.

- Platform **MUST** allow for proper condensate trap installation and drainage. See **Figure 4** and associated text for more information about condensate drainage.

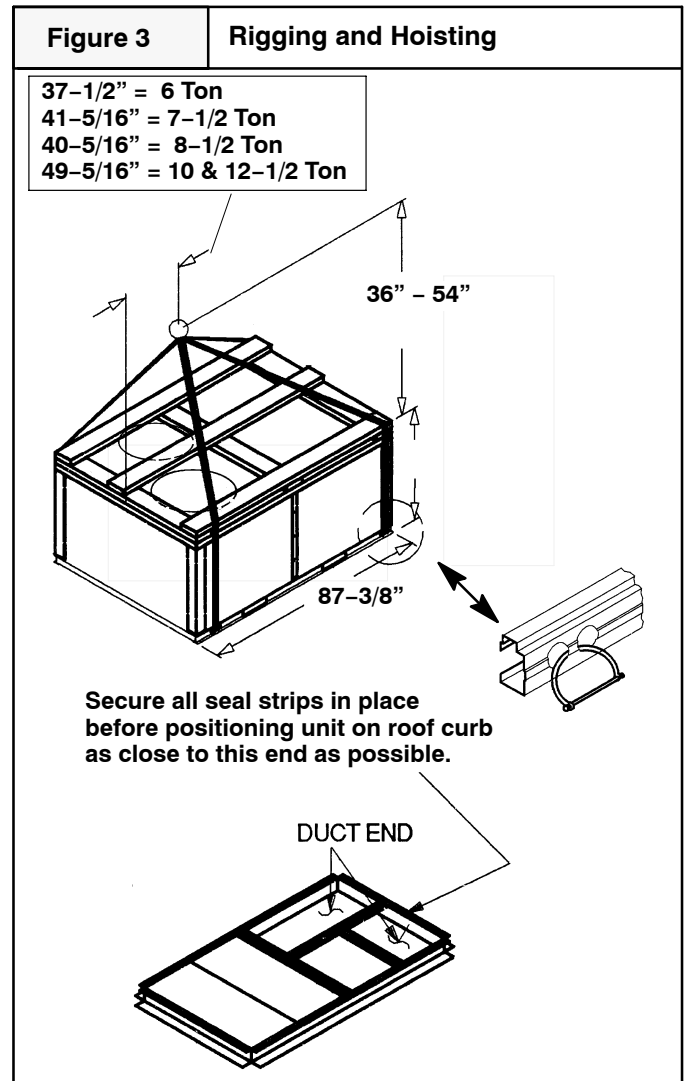
NOTE: MAKE SURE DOWNFLOW SUPPLY AND RETURN AIR DUCTS ARE FREE OF OBSTRUCTIONS BEFORE INSTALLING UNIT ON ROOF CURB OR ANY DOWNFLOW APPLICATION. Remove all forklift supports, covers, cardboard, etc., from the downflow return and supply air ducts.

Hoisting

NOTE: All access panels **MUST** be secured in place before hoisting.

The unit should be hoisted with two lifting slings. Attach the slings to rigging shackles that have been hooked through holes in the base rail. See **Figure 3**.

Inspect unit for transportation damage. File any claim with transportation agency. Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit.



Air Intake and Flue Exhaust Hoods

CAUTION

The flue exhaust hood **MUST** be installed for the unit to operate properly.

Flue hood is shipped screwed to the burner compartment base pan. Remove from shipping location and, using screws provided, install flue hood and screen in location shown in **Figure 1**.

Converting to Horizontal Operation

These units are shipped ready for downflow operation but are adaptable to horizontal use. To convert to horizontal operation, follow these steps:

Remove screws from side horizontal supply and return panels (see **Figure 4**).

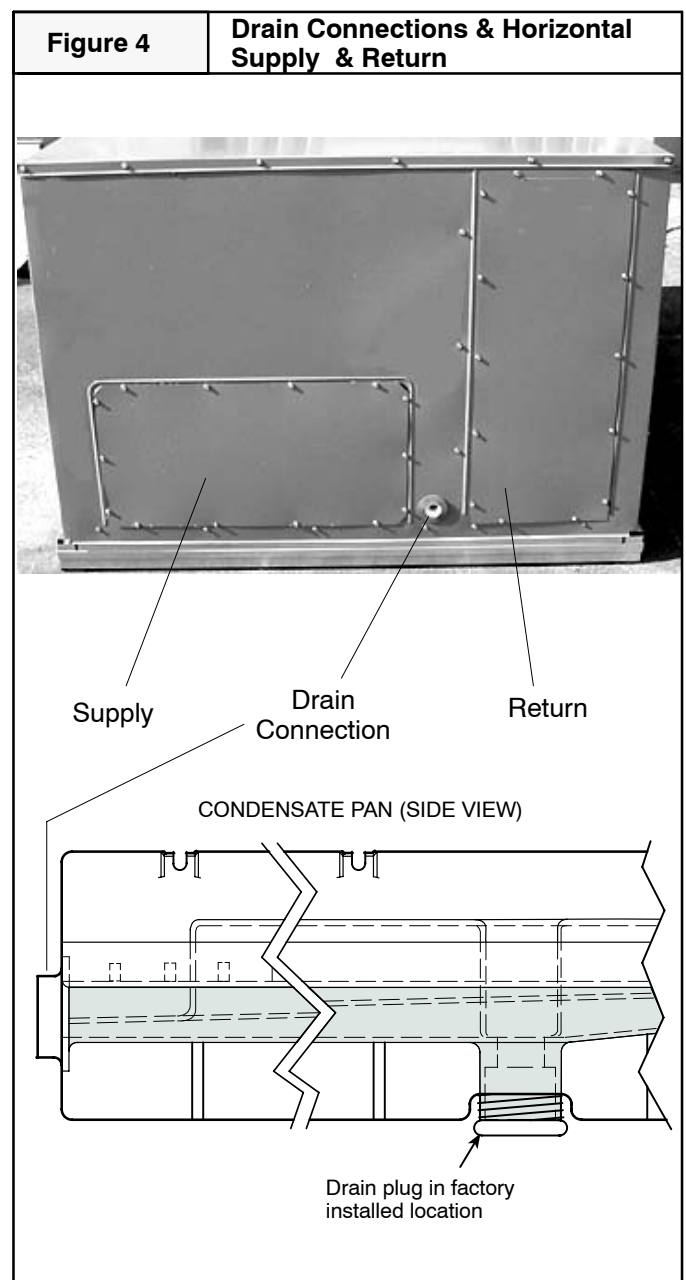
Using the same screws install horizontal supply and return panels on downflow supply and return openings with insulation side down. Install from inside of unit.

Condensate Drain

The unit's 3/4 -in. condensate drain connections are located on the bottom and side of the unit. Unit discharge connections do not determine the use of drain connections; either drain connection can be used with vertical or horizontal applications.

When using the standard side drain connection, ensure the red plug in the alternate bottom connection is tight before installing the unit.

To use the bottom drain connection for a roof curb installation, relocate the factory-installed plug from the bottom connection to the side connection. **See Fig.4**. The piping for the condensate drain and external trap can be completed after the unit is in place.



All units must have an external trap for condensate drainage. Install a trap at least 4 in. deep and protect against freeze-up. If a drain line is installed downstream from the external trap, pitch the line away from the unit at 1 in. per 10 ft of run. Do not use a pipe size smaller than the unit connection.

The circulating blower and the condenser fan create a negative pressure on the condensate drain line that will prevent the condensate from draining properly without a trap.

Gas Supply and Piping

NOTE: There are many types of liquefied petroleum (LP) gases. In this manual, the term LP gas refers to *propane* gas only.

The UL/CSA rating plate located on the side panel of the unit contains the model number, type of gas, gas input rating, and other important information.

WARNING

Fire and/or explosion hazard.

Make certain the unit is equipped to operate on the type of gas available. Models designated as natural gas are to be used with natural gas only. Models designated for use with liquefied petroleum (LP) gas are shipped with orifices sized for commercially pure propane gas. They **MUST NOT** be used with butane or a mixture of butane and propane unless properly sized orifices are installed by a licensed LP installer.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Orifices

Orifice Sizes

Orifice sizes **MUST** be matched to the heating value of the gas. Check with your gas supplier for heating values.

NOTE: This unit has a two-stage gas valve and **MUST NOT** be derated. Orifice changes should **ONLY** be made if necessary for conversion to LP gas and/or for high altitude.

NOTE: An LP Conversion Kit is available through unit supplier. The kit contains pilot and burner orifices, a two-stage LP gas valve and an instruction manual, **MUST** be used for conversion to LP gas.

NOTE: For elevations above 2000 feet (610 meters), the Btu (kJ) input rating **MUST** be reduced by 4% for each 1000 feet (305 meters) above sea level. **See Figure 5.**

Figure 5		Altitude Compensation		
ELEVATION (Ft)	125,000, 180,000, AND 224,000 BTUH NOMINAL INPUT		250,000 BTUH NOMINAL INPUT	
	Natural Gas Orifice Size†	Liquid Propane Orifice Size†	Natural Gas Orifice Size†	Liquid Propane Orifice Size†
0-2,000	31	41	30	38
2,000	32	42	30	39
3,000	32	42	31	40
4,000	32	42	32	41
5,000	33	43	33	42
6,000	34	43	34	43
7,000	35	44	35	43
8,000	36	44	36	44
9,000	37	45	37	44
10,000	38	46	38	45
11,000	39	47	39	45
12,000	40	47	40	46
13,000	41	48	41	47
14,000	42	48	42	47

*As the height above sea level increases, there is less oxygen per cubic foot of air. Therefore, heat input rate should be reduced at higher altitudes.
†Orifice available through your local distributor.

Gas Piping

The gas supply line **MUST** be of adequate size to handle the Btu/hr requirements and length of the run for the unit being installed. Determine the minimum pipe size from the tables in **Figures 6 and 7**. Base the length of the run from the gas meter or source to the unit.

Btu ratings of all other gas appliances **MUST** be considered for sizing of main gas line. Check gas line to installation for compliance with local codes or, in the absence of local codes, with the National Fuel Gas Code NFPA/ANSI Z223.1-1990 (or current edition) or in Canada the National Standard CAN/CGA 1-B149.1 (or current edition).

Gas Pipe Size

English Measurements

Figure 6		Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe				
NATURAL GAS						
Pipe Length (Includes Fittings)	Btu/hr (in thousands)					
	3/4"	1"	1 1/4"	1 1/2"	2"	
20'	--	350	730	1,100	2,100	
40'	--	245	500	760	1,450	
60'	--	--	400	610	1,150	
80'	--	--	350	530	990	
100'	--	--	305	460	870	
125'	--	--	275	410	780	
150'	--	--	250	380	710	
175'	--	--	225	350	650	
200'	--	--	210	320	610	
LP GAS*						
Pipe Length (Includes Fittings)	Btu/hr (in thousands)					
	1/2"	3/4"	1"	1 1/4"	1 1/2"	
20'	--	393	732	1,496	2,299	
40'	--	267	504	1,039	1,559	
60'	--	217	409	834	1,275	
80'	--	--	346	724	1,086	
100'	--	--	307	630	976	
125'	--	--	275	567	866	
150'	--	--	252	511	787	
<p>* If copper tubing is used, see the following applicable publications to determine type and size requirements:</p> <p>In the United States, the National Fuel Gas Code NFPA 54/ANSI Z223.1-1988 (or current edition).</p> <p>In Canada, the National Standard CAN/CGA 1-B149.1 (or current edition).</p>						

Metric Measurements

Figure 7		Gas Pipe Size, Length and kW** Capacity for Schedule 40 Iron Pipe				
NATURAL GAS						
Pipe Length (Includes Fittings)	kW**					
	3/4"	1"	1 1/4"	1 1/2"	2"	
6.1m	--	103	214	322	615	
12.2m	--	72	147	223	425	
18.3m	--	--	117	179	337	
24.4m	--	--	103	155	290	
30.5m	--	--	89	135	255	
38.1m	--	--	81	120	229	
45.7m	--	--	73	111	208	
53.3m	--	--	66	103	191	
61.0m	--	--	62	94	179	
LP GAS*						
Pipe Length (Includes Fittings)	kW**					
	1/2"	3/4"	1"	1 1/4"	1 1/2"	
6.1m	--	115	215	438	674	
12.2m	--	78	148	305	457	
18.3m	--	64	120	244	374	
24.4m	--	--	101	212	318	
30.5m	--	--	90	185	286	
38.1m	--	--	81	166	254	
45.7m	--	--	74	150	231	
<p>* If copper tubing is used, see the following applicable publications to determine type and size requirements:</p> <p>In the United States, the National Fuel Gas Code NFPA 54/ANSI Z223.1–1988 (or current edition).</p> <p>In Canada, the National Standard CAN/CGA 1–B149.1 (or current edition).</p> <p>**kW (kilowatts) is the metric equivalent of Btu/hr.</p>						

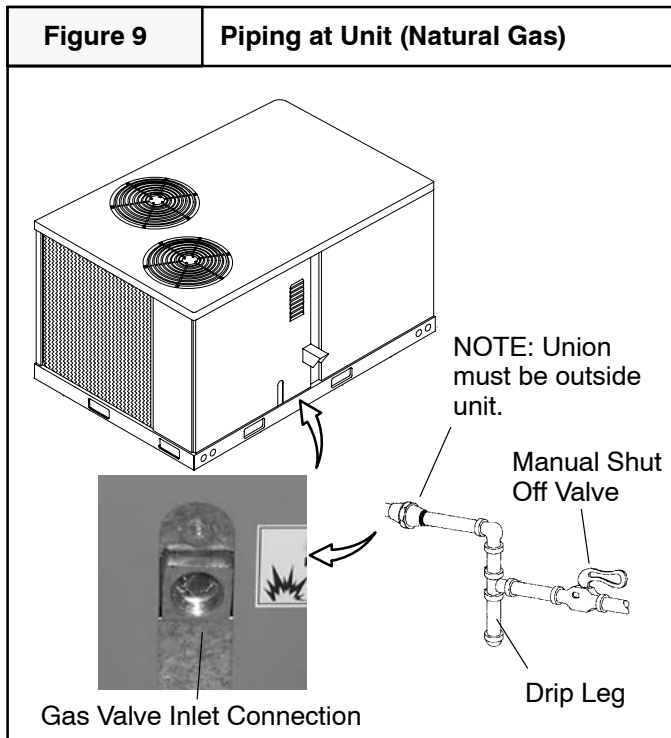
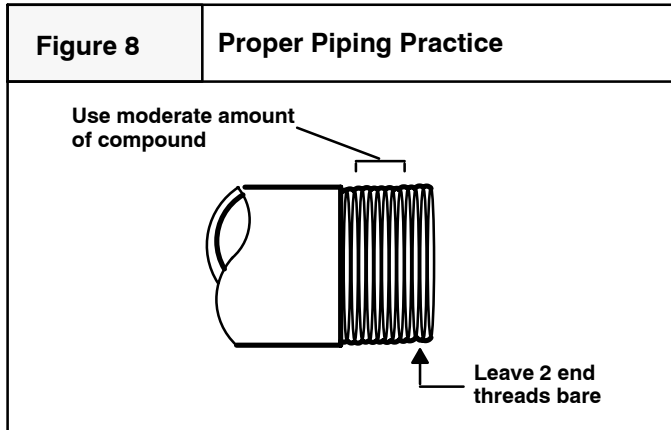
Piping At Unit

Connecting the Gas Piping

Refer to **Figure 9** for the general layout of the unit. It shows the basic fittings needed.

The following rules apply:

1. Use black iron pipe and fittings for natural gas.
2. Use pipe joint compound on male threads only. Pipe joint compound **MUST** be resistant to the action of LP gases. Do **NOT** use teflon tape or similar materials. See **Figure 8**.



3. Use ground joint unions.

WARNING

Fire and/or explosion hazard.

Gas connector MUST be properly installed and can NOT be used inside the furnace.

Failure to do so can result in property damage, bodily injury, and/or death.

4. Install a drip leg to trap dirt and moisture before it can enter the gas valve. Drip leg **MUST** be a minimum of 3" (76mm) long.
5. Install a manual shut off valve.
6. Provide a 1/8" NPT test gauge connection immediately upstream of the gas supply connection to the furnace.
7. If installation is for LP gas:
 - a. Have a licensed LP gas dealer make all connections from storage tank to unit.
 - b. **TWO-STAGE REGULATION** is required.
 - c. If copper tubing is used, usage **MUST** comply with limitations set forth in National Fuel Gas Code NFPA 54/ANSI Z223.1-1990 (or latest edition) or in Canada the National Standard CAN/CGA 1-B149.1 (or latest edition).
8. Hold a flat-jawed wrench on the squared end of the gas valve when tightening the supply pipe going into the gas valve (see **Figure 9**). This will prevent turning or damaging the gas valve and wiring and/or misaligning the burners.

CAUTION

Overtightening assembly may cause damage to the gas valve and/or wiring and may misalign the burners.

9. Tighten all joints securely.

Leak Checks

1. Gas pressure **MUST NOT** exceed 1/2 PSIG (3450 Pa). If gas piping is to be checked with pressures above 1/2 PSIG (3450 Pa), the gas valve and the manual shut off valve **MUST** be disconnected from the line during testing.
2. Before pressure checking the gas piping to the furnace, shut **OFF** the manual shut off valve for the furnace.

WARNING

Fire and/or explosion hazard.

Never exceed specified pressures. Higher pressures may damage the gas valve. Such damage may result in overfiring and possible heat exchanger failure.

Failure to follow this warning can result in property damage, personal injury, and/or death.

3. Test all pipes for leaks.
4. Apply soap suds or a liquid detergent to each joint. A leak is indicated when bubbles form.

WARNING

Fire and/or explosion hazard.

Do NOT use a match or open flame to test for leaks.

An open flame or spark can result in property damage, bodily injury, and/or death.

5. Be sure to check burner orifices for leaks.
6. Correct even the smallest leak at once.

Electrical Wiring

WARNING

Electrical shock hazard.

Shut off electric power at unit disconnect or service panel before making any electrical connections.

Unit MUST be grounded to electrical service panel.

Failure to follow this warning can result in property damage, personal injury, and/or death.

NOTE: All electrical work **MUST** conform with the requirements of local codes and ordinances and in the United States the National Electrical Code ANSI/NFPA70–1990 (or current edition) and in Canada CSA C.22.1 – Canadian Electrical Code Part 1 (or current edition). Provide line voltage power supply from a separate protected circuit with a

disconnect switch (when required) located within sight of the unit. Supply voltage, amperage, wire, fuse and disconnect switch sizes **MUST** conform with specifications on the unit rating plate.

Wiring **MUST** be protected from possible mechanical damage and **MUST NOT** interfere with removal of access panels, filters, etc.

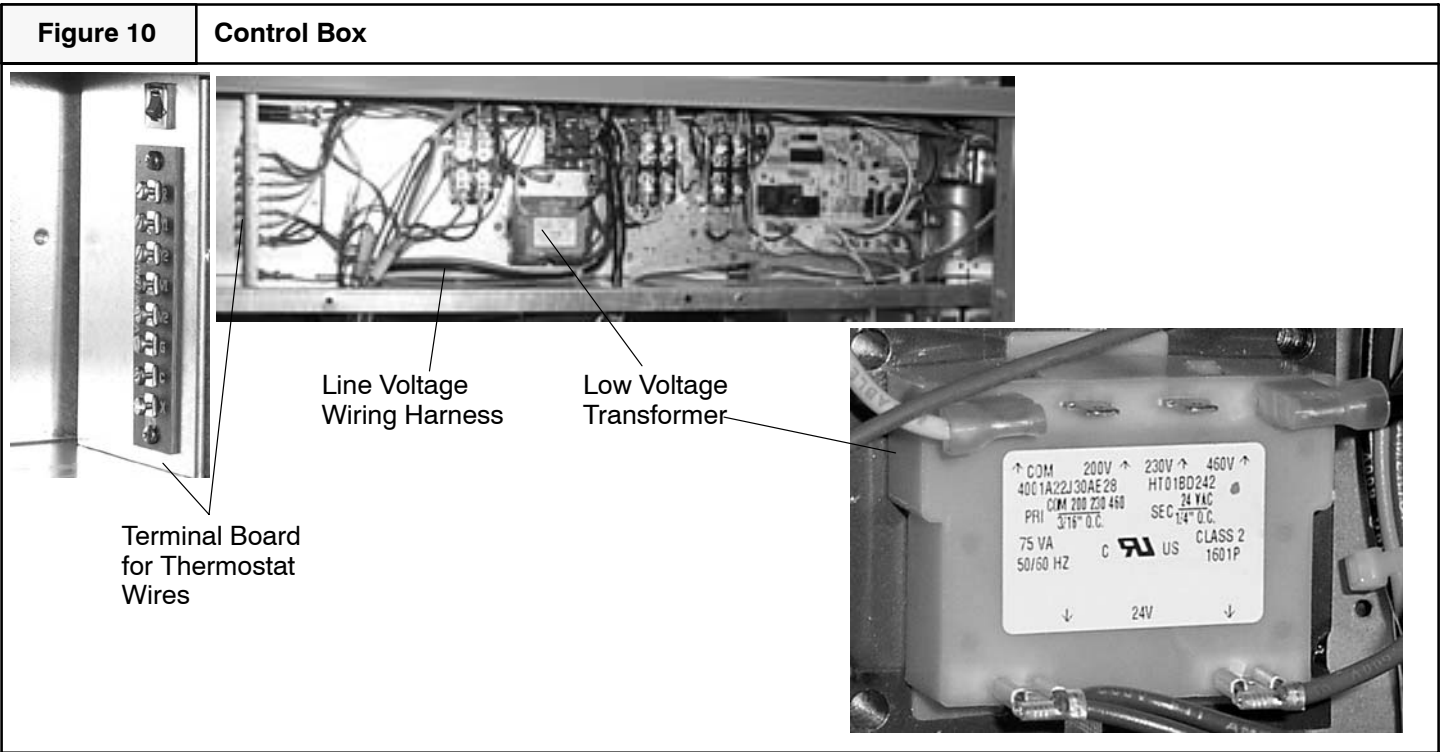
All exposed wiring or connections **MUST** be made with weatherproof cable or wire unless installed in conduit.

Connections for line voltage are made in the control box section. Low voltage connections are made at the terminal board on the left hand side of the control box (see **Figure 10**).

For access to high and low voltage connections, remove the compressor access panel. (see **Figure 1 & 9**).

Line Voltage Wiring

Line voltage wires enter the unit through the double knockout on the end of the unit next to the compressors. (see **Figure 1 and page 3**). Do **NOT** complete line voltage connections until unit is permanently grounded. All line voltage connections and the ground connection **MUST** be made with copper wire.



Line Connections

Complete the line service connections to the terminal connections in the control box. Refer to applicable wiring diagram. Check all screw terminals to ensure they are tight.

Converting 230V Units to 208V

To convert 230V units to 208V:

1. Turn electric power **OFF**.

2. Remove control box access panel and open control box. Locate the 24V control transformer.
3. Remove wires from the terminal labeled '230V' on the 24V control transformer and reconnect them to the 200V terminal of the 24V control transformer.
4. Close control box and replace control box access panel.

Field Installed Equipment

All wiring done in the field between the unit and other devices, or between separate devices that are field installed and

located, **MUST** not exceed the temperature limitations for type T wire and **MUST** be installed according to the manufacturer's instructions for the devices.

Low Voltage Wiring

Low voltage wiring connections for the thermostat are made at the 24V terminal board which is located on the left hand side of the control box. For access, remove the compressor access panel. Refer to the wiring diagram and the instructions included with the thermostat.

Low Voltage Wiring With Economizer Option

The economizer electrical harness taps into **Y1** and **Y2** on the low voltage terminal board. Low voltage wires from the thermostat are connected to **Y1** and **Y2** with or without an economizer.

Thermostat

NOTE: Do NOT attempt to use a thermostat designed for electric heat or heat pump use. Such thermostats will NOT control the unit properly.

The thermostat **MUST** be a field supplied 2 stage cooling, 2 stage gas heating thermostat.

The location of the thermostat has an important effect on the operation of the unit. **FOLLOW THE INSTRUCTIONS INCLUDED WITH THE THERMOSTAT FOR CORRECT LOCATION, MOUNTING AND WIRING.**

Route thermostat cable or equivalent single leads of colored wire from subbase terminals to low-voltage connections on unit, shown on **Figures 10 & 11**, as described in Steps 1–4 below.

1. If unit is mounted on roof curb and accessory thru-the-bottom connection is used, route wire through connector provided in accessory kit through the unit basepan.
2. Pass control wires through the hole provided on unit.

3. Feed wire through the raceway built into the corner post to the 24-v barrier located on the left side of the control box. See **Figure 11**. The raceway provides the UL-required (Underwriters' Laboratories) clearance between the high-and low-voltage wiring.
4. Connect thermostat wires to screw terminals of low-voltage terminal board.



Heat Anticipator

Set the thermostat heat anticipator to 0.14 amp for the first stage and 0.20 amp for the second stage.

Final Check

Make a final wiring check to be sure system is correctly wired. Inspect field installed wiring and the routing to ensure that rubbing or chafing due to vibration will not occur.

Air Distribution System

Ductwork

NOTE: The total heat loss from the structure as expressed in total Btu/hr **MUST** be calculated by manufacturer's method or in accordance with "A.S.H.R.A.E. Guide" or "Manual N – Load Calculations" published by the Air Conditioning Contractors of America or in Canada H.R.A.I. "Manual N". The total heat loss calculated should be equal to or less than the heating capacity. Output based on D.O.E. test procedures, steady state efficiency times input.

Ductwork, supply registers, and return air grilles **MUST** be designed and sized to handle the greater of the units heating or cooling air volume requirements. If the unit is connected to an existing system, the ductwork **MUST** be checked to make sure it is adequate. Extra runs or larger duct sizes may have to be installed. **Use only non-combustible type insulation on supply plenum or supply ductwork within 6 feet of unit.**

Maximum recommended velocity in trunk ducts is 1000 feet per minute (5.08 m/s). Velocity in branches should not exceed 800 feet per minute (4.06 m/s).

Ductwork installed outdoors should have a minimum of 2" (50.8mm) of fiberglass insulation and a weatherproof vapor barrier. It should also be protected against damage. Caulk and flashing, or other means adequate to provide a permanent weather seal should be used.

Ductwork installed in attics or other areas exposed to outside temperatures should be installed with a minimum of 2" (50.8mm) fiberglass insulation and have an indoor type vapor barrier.

Ductwork Connections

The use of flexible, **non-combustible** connectors between main trunk ducts and supply and return air plenums is recommended to minimize vibration transmission .

Field Fabricate Ductwork

Secure all ducts to roof curb and building structure on vertical units. Do not connect ductwork to unit. For horizontal applications, field supplied flanges should be attached to horizontal discharge openings and all ductwork secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts PGSSing through an unconditioned space must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

A minimum clearance is not required around ductwork. Cabinet return-air static shall not exceed -.45 in. wg without an economizer.

The units are designed for a minimum heating operation continuous return-air temperature of 50 F (dry bulb), or an intermittent operation down to 45 F (dry bulb), such as when used with a night set-back thermostat.

Circulating Blower

Determining Blower Speed

1. From the system design, determine the external static pressure (ESP) for the supply ducts, return ducts and registers, diffusers, grilles, dampers, heaters and special filters (if any).
2. If unit is to be set up in cooling mode, add .08" W.C. (20 Pa) for wet coil operation to the total ESP determined in Step 1.
3. For static additions due to installation of an economizer or manual air dampers, add .05 inches to ESP.
4. From the system design, determine the desired airflow in CFM (L/s). See **Figure 12** for CFM to L/s conversion table.
5. To determine the blower speed necessary to obtain the desired CFM (L/s), see the Circulating Blower Performance Data for the unit located on the pages that immediately follow.
6. Compare required RPM to unit's factory setting for blower RPM (see Blower Performance Tables). If different from the RPM your installation requires, the blower speed will need to be changed.
7. Following the circulating Blower Performance Data table is a table that shows how many turns open the adjustable blower motor pulley needs to be to obtain the required RPM.
8. To change the blower speed, see pages 20 and 21 .

Figure 12		Metric Conversions: Cubic Feet per Minute (CFM) to Liters per Second (L/s); Inches of Water Column (In. W.C.) to PGScals (Pa)													
CFM	L/s	CFM	L/s	CFM	L/s	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa	In. W.C.	Pa
50	24	2550	1203	5050	2383	0.01	2	0.51	127	1.01	251	1.51	376	2.01	501
100	47	2600	1227	5100	2407	0.02	5	0.52	130	1.02	254	1.52	379	2.02	503
150	71	2650	1251	5150	2430	0.03	7	0.53	132	1.03	257	1.53	381	2.03	506
200	94	2700	1274	5200	2454	0.04	10	0.54	135	1.04	259	1.54	384	2.04	508
250	118	2750	1298	5250	2477	0.05	12	0.55	137	1.05	262	1.55	386	2.05	511
300	142	2800	1321	5300	2501	0.06	15	0.56	139	1.06	264	1.56	389	2.06	513
350	165	2850	1345	5350	2525	0.07	17	0.57	142	1.07	267	1.57	391	2.07	516
400	189	2900	1369	5400	2548	0.08	20	0.58	144	1.08	269	1.58	394	2.08	518
450	212	2950	1392	5450	2572	0.09	22	0.59	147	1.09	271	1.59	396	2.09	521
500	236	3000	1416	5500	2595	0.10	25	0.60	149	1.10	274	1.60	399	2.10	523
550	260	3050	1439	5550	2619	0.11	27	0.61	152	1.11	276	1.61	401	2.11	526
600	283	3100	1463	5600	2643	0.12	30	0.62	154	1.12	279	1.62	404	2.12	528
650	307	3150	1486	5650	2666	0.13	32	0.63	157	1.13	281	1.63	406	2.13	531
700	330	3200	1510	5700	2690	0.14	35	0.64	159	1.14	284	1.64	408	2.14	533
750	354	3250	1534	5750	2713	0.15	37	0.65	162	1.15	286	1.65	411	2.15	536
800	378	3300	1557	5800	2737	0.16	40	0.66	164	1.16	289	1.66	413	2.16	538
850	401	3350	1581	5850	2761	0.17	42	0.67	167	1.17	291	1.67	416	2.17	541
900	425	3400	1604	5900	2784	0.18	45	0.68	169	1.18	294	1.68	418	2.18	543
950	448	3450	1628	5950	2808	0.19	47	0.69	172	1.19	296	1.69	421	2.19	545
1000	472	3500	1652	6000	2831	0.20	50	0.70	174	1.20	299	1.70	423	2.20	548
1050	495	3550	1675	6050	2855	0.21	52	0.71	177	1.21	301	1.71	426	2.21	550
1100	519	3600	1699	6100	2879	0.22	55	0.72	179	1.22	304	1.72	428	2.22	553
1150	543	3650	1722	6150	2902	0.23	57	0.73	182	1.23	306	1.73	431	2.23	555
1200	566	3700	1746	6200	2926	0.24	60	0.74	184	1.24	309	1.74	433	2.24	558
1250	590	3750	1770	6250	2949	0.25	62	0.75	187	1.25	311	1.75	436	2.25	560
1300	613	3800	1793	6300	2973	0.26	65	0.76	189	1.26	314	1.76	438	2.26	563
1350	637	3850	1817	6350	2997	0.27	67	0.77	192	1.27	316	1.77	441	2.27	565
1400	661	3900	1840	6400	3020	0.28	70	0.78	194	1.28	319	1.78	443	2.28	568
1450	684	3950	1864	6450	3044	0.29	72	0.79	197	1.29	321	1.79	446	2.29	570
1500	708	4000	1888	6500	3067	0.30	75	0.80	199	1.30	324	1.80	448	2.30	573
1550	731	4050	1911	6550	3091	0.31	77	0.81	202	1.31	326	1.81	451	2.31	575
1600	755	4100	1935	6600	3115	0.32	80	0.82	204	1.32	329	1.82	453	2.32	578
1650	779	4150	1958	6650	3138	0.33	82	0.83	207	1.33	331	1.83	456	2.33	580
1700	802	4200	1982	6700	3162	0.34	85	0.84	209	1.34	334	1.84	458	2.34	583
1750	826	4250	2006	6750	3185	0.35	87	0.85	212	1.35	336	1.85	461	2.35	585
1800	849	4300	2029	6800	3209	0.36	90	0.86	214	1.36	339	1.86	463	2.36	588
1850	873	4350	2053	6850	3233	0.37	92	0.87	217	1.37	341	1.87	466	2.37	590
1900	897	4400	2076	6900	3256	0.38	95	0.88	219	1.38	344	1.88	468	2.38	593
1950	920	4450	2100	6950	3280	0.39	97	0.89	222	1.39	346	1.89	471	2.39	595
2000	944	4500	2124	7000	3303	0.40	100	0.90	224	1.40	349	1.90	473	2.40	598
2050	967	4550	2147	7050	3327	0.41	102	0.91	227	1.41	351	1.91	476	2.41	600
2100	991	4600	2171	7100	3350	0.42	105	0.92	229	1.42	354	1.92	478	2.42	603
2150	1015	4650	2194	7150	3374	0.43	107	0.93	232	1.43	356	1.93	481	2.43	605
2200	1038	4700	2218	7200	3398	0.44	110	0.94	234	1.44	359	1.94	483	2.44	608
2250	1062	4750	2242	7250	3421	0.45	112	0.95	237	1.45	361	1.95	486	2.45	610
2300	1085	4800	2265	7300	3445	0.46	115	0.96	239	1.46	364	1.96	488	2.46	613
2350	1109	4850	2289	7350	3468	0.47	117	0.97	242	1.47	366	1.97	491	2.47	615
2400	1133	4900	2312	7400	3492	0.48	120	0.98	244	1.48	369	1.98	493	2.48	618
2450	1156	4950	2336	7450	3516	0.49	122	0.99	247	1.49	371	1.99	496	2.49	620
2500	1180	5000	2360	7500	3539	0.50	125	1.00	249	1.50	374	2.00	498	2.50	623

CIRCULATING BLOWER PERFORMANCE - PGS/E072 - Standard Motor (Belt Drive)* (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
1800	919	561	1010	663	1095	771	1174	886	1250	1008	1321	1137	1390	1273	1455	1415	1518	1563	1579	1718
1900	960	648	1047	754	1129	867	1206	986	1279	1111	1348	1243	1415	1381	1479	1526	1541	1677	1601	1834
2000	1001	744	1085	855	1163	972	1238	1095	1309	1224	1377	1359	1442	1500	1505	1648	1565	1801	1624	1961
2100	1043	850	1123	965	1199	1086	1271	1213	1340	1346	1406	1485	1470	1629	1531	1780	1591	1936	1648	2098
2200	1085	966	1162	1086	1235	1211	1305	1342	1372	1479	1437	1621	1499	1769	1559	1923	1617	2082	-	-
2300	1127	1092	1201	1217	1272	1347	1340	1482	1405	1623	1468	1769	1529	1920	1587	2077	-	-	-	-
2400	1169	1229	1241	1359	1310	1493	1375	1633	1439	1778	1500	1928	1559	2083	-	-	-	-	-	-
2500	1212	1378	1281	1513	1348	1652	1412	1796	1473	1945	1533	2098	-	-	-	-	-	-	-	-
2600	1255	1539	1322	1678	1386	1822	1448	1970	1508	2124	-	-	-	-	-	-	-	-	-	-
2700	1298	1713	1363	1857	1425	2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2800	1341	1899	1404	2048	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2900	1384	2099	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 1070 to 1460 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 2.40.

CIRCULATING BLOWER PERFORMANCE - PGS090 - Standard Motor (Belt Drive)* (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
2250	505	527	586	687	658	859	723	1044	783	1242	838	1451	891	1673	941	1906	988	2150	-	-
2300	513	556	592	718	663	893	728	1080	787	1280	843	1492	895	1715	944	1949	991	2195	-	-
2400	528	617	605	785	675	965	738	1156	797	1360	851	1575	903	1801	952	2039	-	-	-	-
2500	543	683	618	857	686	1041	749	1238	806	1445	860	1664	911	1894	960	2135	-	-	-	-
2550	550	718	625	894	692	1082	754	1280	811	1490	865	1711	916	1943	964	2185	-	-	-	-
2600	558	754	632	933	698	1123	760	1324	816	1536	870	1759	920	1993	968	2237	-	-	-	-
2700	574	830	646	1015	711	1210	771	1416	827	1633	879	1859	929	2097	-	-	-	-	-	-
2800	589	912	660	1103	723	1303	782	1514	838	1735	889	1966	939	2207	-	-	-	-	-	-
2900	605	999	674	1196	736	1401	794	1617	848	1843	900	2078	-	-	-	-	-	-	-	-
3000	621	1092	688	1295	749	1506	806	1727	860	1957	910	2197	-	-	-	-	-	-	-	-
3100	637	1191	702	1400	763	1617	819	1842	871	2077	-	-	-	-	-	-	-	-	-	-
3200	653	1297	717	1511	776	1733	831	1964	883	2204	-	-	-	-	-	-	-	-	-	-
3300	670	1408	732	1629	790	1857	844	2093	-	-	-	-	-	-	-	-	-	-	-	-
3400	686	1526	747	1753	804	1987	857	2228	-	-	-	-	-	-	-	-	-	-	-	-
3500	703	1652	762	1884	818	2123	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3600	719	1783	777	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3700	736	1923	793	2167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3750	744	1995	801	2243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 590 to 840 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 2.40.

CIRCULATING BLOWER PERFORMANCE - PGE090 - Standard Motor (Belt Drive)* (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
2250	505	484	586	681	657	901	722	1142	782	1403	838	1683	891	1981	-	-	-	-	-	-
2300	513	509	592	708	663	931	727	1174	787	1437	842	1719	895	2019	-	-	-	-	-	-
2400	528	561	605	766	675	993	738	1241	796	1508	851	1793	903	2097	-	-	-	-	-	-
2500	543	617	618	828	686	1060	748	1312	806	1583	860	1873	911	2180	-	-	-	-	-	-
2550	550	647	625	860	692	1095	754	1349	811	1623	865	1914	916	2223	-	-	-	-	-	-
2600	558	677	632	894	698	1131	759	1388	816	1664	869	1957	-	-	-	-	-	-	-	-
2700	574	742	646	964	711	1207	770	1469	826	1749	879	2046	-	-	-	-	-	-	-	-
2800	589	811	660	1039	723	1287	782	1554	837	1839	889	2140	-	-	-	-	-	-	-	-
2900	605	885	674	1119	736	1372	794	1644	848	1933	899	2239	-	-	-	-	-	-	-	-
3000	621	963	688	1204	749	1463	806	1740	859	2033	-	-	-	-	-	-	-	-	-	-
3100	637	1046	702	1293	763	1558	818	1840	871	2139	-	-	-	-	-	-	-	-	-	-
3200	653	1135	717	1388	776	1658	831	1946	-	-	-	-	-	-	-	-	-	-	-	-
3300	670	1228	732	1488	789	1764	843	2057	-	-	-	-	-	-	-	-	-	-	-	-
3400	686	1328	747	1593	803	1876	856	2174	-	-	-	-	-	-	-	-	-	-	-	-
3500	703	1433	762	1705	817	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3600	719	1543	777	1822	832	2116	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3700	736	1660	793	1944	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3750	745	1721	801	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 590 to 840 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 2.40.

CIRCULATING BLOWER PERFORMANCE - PGS102 - Standard Motor (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
2550	550	718	625	894	692	1082	754	1280	811	1490	865	1711	916	1943	964	2185	-	-	-	-
2600	558	754	632	933	698	1123	760	1324	816	1536	870	1759	920	1993	968	2237	-	-	-	-
2700	574	830	646	1015	711	1210	771	1416	827	1633	879	1859	929	2097	-	-	-	-	-	-
2800	589	912	660	1103	723	1303	782	1514	838	1735	889	1966	939	2207	-	-	-	-	-	-
2900	605	999	674	1196	736	1401	794	1617	848	1843	900	2078	-	-	-	-	-	-	-	-
3000	621	1092	688	1295	749	1506	806	1727	860	1957	910	2197	-	-	-	-	-	-	-	-
3100	637	1191	702	1400	763	1617	819	1842	871	2077	-	-	-	-	-	-	-	-	-	-
3200	653	1297	717	1511	776	1733	831	1964	883	2204	-	-	-	-	-	-	-	-	-	-
3300	670	1408	732	1629	790	1857	844	2093	-	-	-	-	-	-	-	-	-	-	-	-
3400	686	1526	747	1753	804	1987	857	2228	-	-	-	-	-	-	-	-	-	-	-	-
3500	703	1652	762	1884	818	2123	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3600	719	1783	777	2022	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3700	736	1923	793	2167	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3750	744	1995	801	2243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3800	753	2069	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3900	770	2224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 685 to 935 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 2.40.

CIRCULATING BLOWER PERFORMANCE - PGE102 - Standard Motor (Belt Drive) (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
2550	550	647	625	860	692	1095	754	1349	811	1623	865	1914	916	2223	-	-	-	-	-	-
2600	558	677	632	894	698	1131	760	1388	816	1664	869	1957	-	-	-	-	-	-	-	-
2700	574	742	646	964	710	1207	770	1469	826	1749	879	2046	-	-	-	-	-	-	-	-
2800	589	811	660	1039	723	1287	782	1554	837	1839	889	2140	-	-	-	-	-	-	-	-
2900	605	885	673	1119	736	1372	794	1644	848	1933	899	2239	-	-	-	-	-	-	-	-
3000	621	963	688	1204	749	1463	806	1740	859	2033	-	-	-	-	-	-	-	-	-	-
3100	637	1046	702	1293	763	1558	819	1840	871	2139	-	-	-	-	-	-	-	-	-	-
3200	653	1135	717	1388	776	1658	831	1946	-	-	-	-	-	-	-	-	-	-	-	-
3300	670	1228	732	1488	790	1764	843	2057	-	-	-	-	-	-	-	-	-	-	-	-
3400	686	1328	747	1593	803	1876	856	2174	-	-	-	-	-	-	-	-	-	-	-	-
3500	703	1433	762	1705	817	1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3600	719	1543	777	1822	832	2116	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3700	736	1660	793	1944	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3750	744	1721	801	2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3800	753	1783	808	2074	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3900	770	1912	824	2209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4000	787	2047	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4100	804	2189	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 685 to 935 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 2.40.

CIRCULATING BLOWER PERFORMANCE - PGS/E120 - Standard Motor (Belt Drive) (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
3000	555	630	629	765	696	904	757	1048	814	1198	867	1353	918	1513	966	1680	1012	1852	1056	2029
3100	568	686	641	825	706	968	766	1115	823	1269	876	1427	926	1590	973	1760	1019	1934	-	-
3200	582	745	652	888	717	1035	776	1186	832	1343	884	1504	934	1671	981	1843	1026	2020	-	-
3300	595	808	664	955	728	1106	786	1261	841	1421	893	1586	942	1755	988	1930	1033	2111	-	-
3400	609	874	677	1026	739	1181	797	1340	851	1503	902	1671	950	1844	996	2022	-	-	-	-
3500	623	945	689	1100	750	1259	807	1422	860	1589	911	1760	959	1937	-	-	-	-	-	-
3600	636	1019	702	1179	762	1341	817	1508	870	1679	920	1854	967	2033	-	-	-	-	-	-
3700	650	1097	714	1261	773	1428	828	1598	880	1772	929	1951	-	-	-	-	-	-	-	-
3800	664	1179	727	1347	785	1518	839	1693	890	1870	939	2053	-	-	-	-	-	-	-	-
3900	678	1266	740	1438	797	1613	850	1791	901	1973	-	-	-	-	-	-	-	-	-	-
4000	693	1356	753	1533	809	1712	861	1894	911	2080	-	-	-	-	-	-	-	-	-	-
4100	707	1451	766	1632	821	1816	873	2002	-	-	-	-	-	-	-	-	-	-	-	-
4200	721	1551	779	1736	833	1924	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4300	735	1656	792	1845	846	2037	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4400	750	1764	806	1958	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4500	764	1879	819	2077	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4600	779	1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 685 to 935 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 2.40.

CIRCULATING BLOWER PERFORMANCE - PGS/E150 - Standard Motor (Belt Drive) (Horizontal Discharge)																				
Airflow CFM	EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
3700	676	1106	747	1328	811	1552	871	1779	927	2008	981	2240	1031	2473	1079	2709	1125	2948	1169	3189
3800	690	1185	760	1414	823	1644	882	1876	938	2111	990	2348	1040	2587	1088	2828	1133	3073	1170	3319
3900	705	1269	773	1503	835	1739	894	1977	948	2217	1000	2459	1050	2705	1097	2951	1142	3201	1186	3452
4000	719	1357	786	1597	848	1838	905	2082	959	2328	1011	2576	1059	2826	1106	3079	1151	3334	-	-
4100	734	1449	799	1695	860	1942	917	2192	970	2443	1021	2697	1069	2953	1116	3210	-	-	-	-
4200	748	1545	813	1797	872	2050	928	2305	981	2562	1031	2822	1079	3083	1125	3347	-	-	-	-
4300	763	1646	826	1903	885	2162	940	2423	992	2686	1042	2951	1089	3218	-	-	-	-	-	-
4400	778	1751	840	2014	898	2279	952	2546	1004	2814	1053	3085	1100	3357	-	-	-	-	-	-
4500	792	1860	853	2130	910	2401	964	2673	1015	2947	1064	3224	-	-	-	-	-	-	-	-
4600	807	1975	867	2250	923	2527	976	2805	1027	3085	1075	3367	-	-	-	-	-	-	-	-
4700	822	2094	881	2375	936	2658	989	2942	1038	3227	-	-	-	-	-	-	-	-	-	-
4800	837	2218	895	2505	949	2794	1001	3093	1050	3375	-	-	-	-	-	-	-	-	-	-
4900	852	2347	909	2640	963	2935	1014	3230	-	-	-	-	-	-	-	-	-	-	-	-
5000	867	2482	923	2781	976	3081	1026	3383	-	-	-	-	-	-	-	-	-	-	-	-
5100	882	2622	937	2926	989	3232	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5200	897	2766	951	3077	1003	3389	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5300	912	2917	966	3233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5400	927	3073	980	3395	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5500	943	3234	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5600	958	3402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

LEGEND

Watts = Input Watts to motor.

* Motor drive range: 860 to 1080 rpm. All other rpms require a field-supplied drive.

Maximum continuous bhp is 3.70.

PGS Series PERFORMANCE DATA (CONT.)

Evaporator-Fan Motor Efficiency	
Unit PGS	Motor Efficiency (%)
072	84
090-120	80

All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

EVAPORATOR-FAN MOTOR PERFORMANCE

Unit PGS	Evaporator-Fan Motor	Unit Voltage	Max. Acceptable Continuous BHP*	Max. Acceptable Operating Watts	Max. AMP Draw
072	Standard	208/230	2.40	2120	5.2
		460			3.0
		575			3.0
090	Standard	208/230	2.40	2120	6.7
		460			3.0
		575			3.0
102	Standard	208/230	2.40	2120	6.7
		460			3.0
		575			3.0
120	Standard	208/230	2.40	2120	6.7
		460			3.0
		575			3.0
150	Standard	208/230	3.70	3313	12.2
		460			5.5
		575			5.5

LEGEND

BHP = Brake Horsepower

* Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with confidence. Using your

fan motors up to the horsepower ratings shown in this table will not result in nuisance tripping or premature motor failure. Unit Warranty will not be affected.

FAN RPM MOTOR PULLEY SETTINGS

Unit PGS	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6
072 ¹	1460	1420	1380	1345	1305	1265	1225	1185	1150	1110	1070	-	-
072 ²	1685	1589	1557	1525	1493	1460	1428	1396	1364	1332	1300	-	-
090 ¹	840	815	790	765	740	715	690	665	635	615	590	-	-
090 ²	1080	1025	1007	988	970	952	933	915	897	878	860	-	-
102 ¹	935	910	885	860	835	810	785	760	735	710	685	-	-
102 ²	1080	1025	1007	988	970	952	933	915	897	878	860	-	-
120 ¹	935	910	885	860	835	810	785	760	735	710	685	-	-
120 ²	1130	1112	1087	1062	1067	1012	987	962	937	912	887	862	830
150 ¹	1080	1060	1035	1015	990	970	950	925	905	880	860	-	-

* Approximate fan rpm shown.

PGE Series PERFORMANCE DATA (CONT.)

Evaporator–Fan Motor Efficiency	
Unit PGE	Motor Efficiency (%)
072	84
090	80
102	80
120/150	85

All indoor–fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

EVAPORATOR–FAN MOTOR PERFORMANCE

Unit PGE	Evaporator–Fan Motor	Unit Voltage	Max. Acceptable Continuous BHP*	Max. Acceptable Operating Watts	Max. AMP Draw
072	Standard	208/230	2.40	2120	5.2
		460			3.0
		575			3.0
090	Standard	208/230	2.40	2120	6.7
		460			3.0
		575			3.0
102	Standard	208/230	2.40	2120	6.7
		460			3.0
		575			3.0
120	Standard	208/230	2.40	2120	6.7
		460			3.0
		575			3.0
150	Standard	208/230	3.70	3313	12.2
		460			5.5
		575			5.5

LEGEND

BHP = Brake Horsepower

* Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with

confidence. Using your fan motors up to the horsepower ratings shown in this table will not result in nuisance tripping or premature motor failure. Unit Warranty will not be affected.

FAN RPM MOTOR PULLEY SETTINGS

Unit PGE	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1–1/2	2	2–1/2	3	3–1/2	4	4–1/2	5	5–1/2	6
072 ¹	1460	1421	1382	1343	1304	1265	1226	1187	1148	1109	1070	–	–
072 ²	1685	1647	1608	1570	1531	1493	1454	1416	1377	1339	1300	–	–
090 ¹	840	815	790	765	740	715	690	665	635	615	590	–	–
090 ²	1080	1025	1007	988	970	952	933	915	897	878	860	–	–
102 ¹	935	910	885	860	835	810	785	760	735	710	685	–	–
102 ²	1080	1025	1007	988	970	952	933	915	897	878	860	–	–
120 ¹	935	910	885	860	835	810	785	760	735	710	685	–	–
120 ²	1130	1112	1087	1062	1067	1012	987	962	937	912	887	862	830
150 ¹	1080	1060	1035	1015	990	970	950	925	905	880	860	–	–

* Approximate fan rpm shown.

Adjustable Belt Drive Blower

WARNING

Personal injury hazard.

Use extreme care during the following procedures and obey Safety Information.

Failure to do so may result in personal injury.

The following safety rules **MUST** always be followed when working near belt drive.

Always Turn The Power Off

Turn electric power to the unit **OFF** before you begin working on it.

Always Wear Protective Clothing

NEVER wear loose or bulky clothes, such as neckties, exposed shirttails, loose sleeves, or lab coats around belt drives. Wear gloves while inspecting sheaves to avoid nicks, burrs, or sharply worn pulley edges.

The blower speed is changed by adjusting the variable speed pulley mounted on the blower motor.

If the blower speed needed is different than the speed of the blower as shipped, follow the steps below to change the blower speed. Before changing the blower speed, read the above safety rules first.

1. Turn electric power **OFF**.
2. Remove the side blower access panel (see **Figure 1**).
3. Loosen belt by loosening fan motor mounting plate nuts. Loosen movable pulley flange setscrew.
4. Remove the belt. Do **NOT** attempt to pry off belt with tools or fingers.
5. Loosen set screw on the outer half of the adjustable pulley.
6. To set the blower for a desired CFM (L/s), first turn the outer half of the adjustable pulley clockwise until it meets the inner half of the pulley.
7. Turn the outer half of the adjustable pulley counterclockwise the correct number of turns to obtain the desired CFM (L/s).

NOTE: To increase the blower speed, turn the outer half of the adjustable pulley clockwise. To decrease the blower speed, turn the outer half of the adjustable pulley counterclockwise.

Figure 13

Motor Mount Assembly

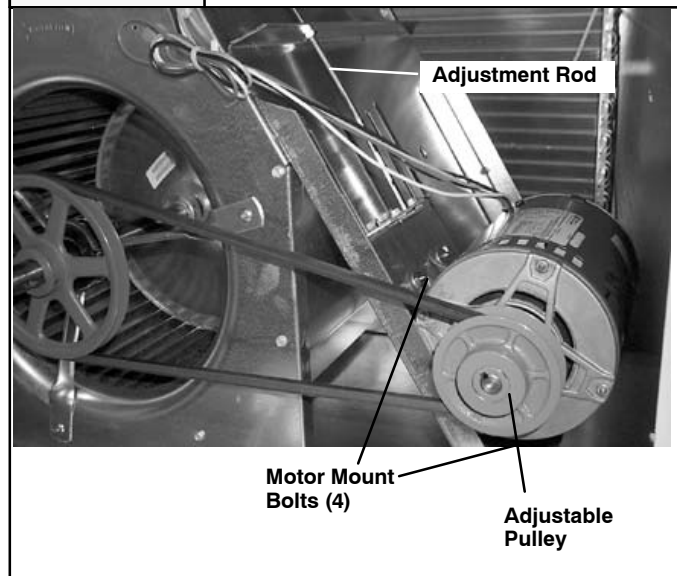
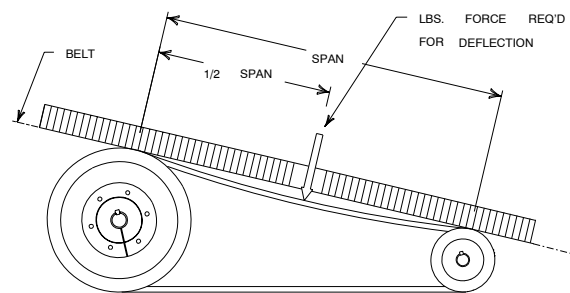


Figure 14

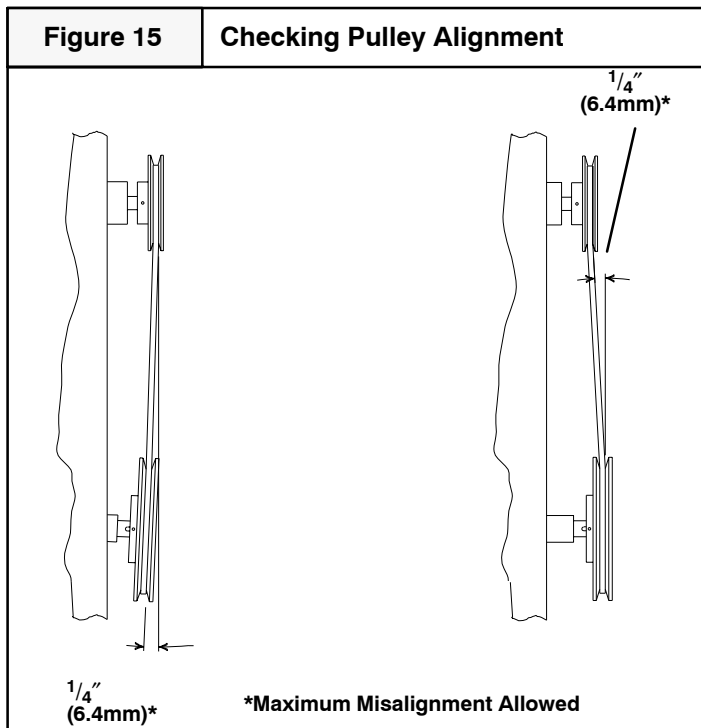
Checking Tension and Deflection

PG(S/E)072 – 1/2" deflection with 8–10 lbs. of force.
PG(S/E)090 – 1/2" deflection with 8–10 lbs. of force.
PG(S/E)102 – 1/2" deflection with 8–10 lbs. of force.
PG(S/E)120 – 1/2" deflection with 5–10 lbs. of force.
PG(S/E)150 – 1/2" deflection with 5–10 lbs. of force.



8. Tighten set screw(s).
9. Put on belt.
10. Slide motor mounting plate until the belt has enough tension at the proper deflection. Use one of the commer-

cially available belt tension gauges to set the correct tension at the proper deflection (see **Figure 13 & 14**).



11. Use a straight-edge (angle iron, straight piece of board or anything with a good straight surface or edge) to check the alignment of the blower pulley with blower motor pulley (see **Figure 15**).

It may be necessary to back the tension off the belt temporarily and tighten one of the motor mount bolts before it is possible to adjust the angle of the blower motor.

12. Adjust bolt and nut on mounting plate to secure motor in fixed position.
13. Ensure that all bolts, nuts and screws are tightened and ensure that all tools, gloves, etc. are removed from unit.
14. Replace side blower access panel before Start-up.
15. During Start-up, listen for any unusual noises or vibrations.
16. Shut down the unit after it runs for a while and check the bearings and motor. If they feel hot, the belt tension may be too tight, bearings may be misaligned or not lubricated correctly, etc.
17. It is a good idea to retension a new belt after a run-in period of about 24 hours. A run-in period of overnight or during a lunch break is better than no run-in period at all.

Start-up Procedure

WARNING

Electrical shock, fire and/or explosion hazard.

Use extreme care during all of the following checks and procedures.

Make sure Electric Power and/or Gas supply is turned OFF as instructed in appropriate steps.

Failure to follow this warning can result in property damage, personal injury, and/or death.

WARNING

Moving parts hazard.

Do NOT put hands or any other object in, on or around the motor, belt or blower wheel. Ensure that there are no objects in, on or around the motor, belt or blower wheel before turning electric power on.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Check the unit's operation as outlined in the following instructions.

Blower and Phasing Check

1. Shut **OFF** electric power at unit disconnect.
2. Shut **OFF** gas valve and manual shut off valve (see **Figure 17**).
3. Check to see that clean, properly sized air filters are installed.
4. Check to see that everything inside the unit is clear and ready to operate safely. Ensure that there are no objects in, on or around the motor, belt or blower wheel.
5. Set thermostat Heat-Cool selector to **OFF**.
6. Set thermostat fan switch to **AUTO**.

7. Turn **ON** electric power. Nothing should start running. If any unusual arcing, odors or noises are encountered, shut **OFF** electric power immediately and check for wiring errors.

NOTE: The circulation blower motor and compressor(s) are three phase and are factory synchronized for proper rotation. *Even if the circulation blower motor comes on and air seems to be circulating, it is possible that the blower motor rotation is incorrect due to improper phasing.* The scroll compressor(s) (if equipped) will run backwards under this condition and be damaged. It is therefore necessary to check for proper rotation.

CAUTION

Do NOT operate the unit with the compressor(s) running until proper blower rotation has been confirmed by running the following test.

8. Set thermostat fan switch to **ON**. The circulating air blower should come **ON**.

- Shut **OFF** electric power at unit disconnect and visually observe the direction of the blower rotation as it slows down. Do **NOT** put hands or any other object in, on or around the belt, motor or blower wheel.

CAUTION

If blower rotation is incorrect, shut electric power **OFF** at unit disconnect and reverse any two supply wires at field connections **ONLY**. Do **NOT** reverse the blower and/or compressor leads or rewire any internal wiring. After re-wiring is done, repeat blower rotation check to ensure that blower rotation is now correct.

- If blower rotation is correct, reset thermostat fan switch to **AUTO**. The circulating air blower should go **OFF**. Nothing should be running.
- Shut **OFF** electric power at unit disconnect.

WARNING

Fire and/or explosion hazard.

Never exceed specified pressures. Higher pressures may damage the gas valve. Such damage may result in overfiring and possible heat exchanger failure.

Failure to follow this warning can result in property damage, personal injury, and/or death.

High Heat Checks

- Be sure that gas valve and manual shut off valve are **OFF**.
- Be sure that electric power is **OFF**.
- Remove inlet plug from gas valve (see **Figure 17 & 18**). Insert $\frac{1}{8}$ " NPT barbed fitting into inlet for use as supply line pressure tap.
- Connect U-Tube manometer to barbed fitting. Use a manometer with a 0–12" (0–3 Pa) range.
- Remove outlet plug from gas valve. Insert $\frac{1}{8}$ " NPT barbed fitting into outlet for use as manifold pressure tap.
- Connect U-Tube manometer to barbed fitting.
- To check the supply gas pressure at high heat, place a jumper between the **R** and **W1** and **W2** terminals on the low voltage terminal board.
- Turn **ON** electric power. The combustion blower should come **ON**.
- Turn **ON** gas valve (see **Figure 17 & 18**).
- Turn **ON** the manual shut off valve. The unit will fire at high heat.

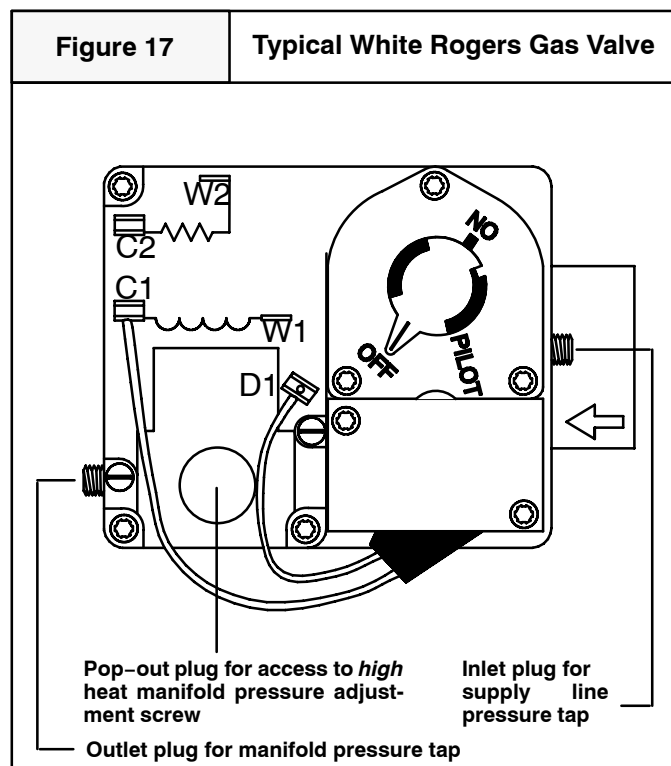
NOTE: Supply line pressures **MUST** be checked with main burners operating and all other gas appliances on same gas line fired at high heat.

- Manometer reading **MUST** be within the minimum and maximum supply gas pressure values listed in **Figure 19**.

If supply gas pressure is not within the minimum and maximum values, turn manual shut off valve **OFF** and contact gas supplier.

- The induced draft motors will start, purging heat exchangers.
- After a call for heating, the main burners should light within 5 seconds. If the burners do not light, then there is a 22-second delay before another 5-second ignition try. If the burners still do not light, the time delay is repeated. If the burners do not light with 15 minutes, there is a lockout. To reset the control, break the 24v power to W1.
- The evaporator-fan motor will turn on 45 seconds after the burners are ignited.
- The evaporator-fan motor will turn off 45 seconds after the thermostat temperature is satisfied.

Figure 16	Supply Gas Pressures	
	Natural Gas	LP Gas
Minimum	4.5" W.C. (1120 Pa)	11" W.C. (2740 Pa)
Recommended	7" W.C. (1740 Pa)	11" W.C. (2740 Pa)
Maximum	13" W.C. (3230 Pa)	13" W.C. (3230 Pa)



- Inspect main burner flames. Flames should be stable and blue.

WARNING

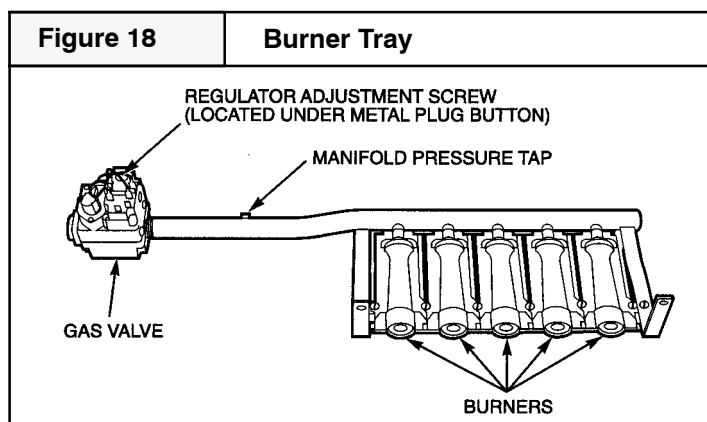
Fire and/or explosion hazard.

Manifold pressure **MUST** be set correctly to obtain rated input.

Failure to properly set input pressure can result in property damage, personal injury, and/or death.

NOTE: Manifold pressures **MUST** be checked with main burners operating.

17. Check manifold pressure on manometer. Manometer reading **MUST** be within range for high values listed in **figure 19**.
 - a. If the manometer reading is not within the range for high heat listed in **Figure 19**, an adjustment **MUST** be made. To adjust the high heat manifold pressure:
 - b. Remove the pop-out plug from the top of the gas valve (see **Figure 17**) to access the high heat manifold pressure adjustment screw.
 - c. To increase the manifold pressure, turn the adjustment screw clockwise. To decrease the manifold pressure, turn the adjustment screw counterclockwise.
 - d. When the manifold pressure is correct, replace pop-out plug.



18. Inspect main burner flames. Flames should be stable and blue.
19. Shut manual shut off valve OFF.
20. Shut gas valve OFF. Allow circulating blower to run before turning electric power off.
21. Shut electric power OFF at unit disconnect.
22. Remove barbed fitting from inlet and replace outlet plug.
23. Remove barbed fitting from outlet and replace outlet plug.
24. Remove jumpers from low voltage terminal board.

Figure 19		Manifold Gas Pressures	
		Natural Gas	LP Gas
High Heat		3.5" W.C. \pm 0.3 (870 Pa \pm 75)	3.5" W.C. \pm 0.3 (2490 Pa \pm 75)

Heating Operation/Temperature Rise Check

1. Open **ALL** registers and duct dampers.
2. Set thermostat Heat–Cool selector to **HEAT**.
3. Set the thermostat as high as it will go.
4. Turn **ON** electric power.
5. Turn **ON** manual shut off valve.
6. Turn gas valve **ON**. Unit should come on at high heat.
7. Operate unit **AT LEAST** 15 minutes, then check temperature rise.
8. To check the temperature rise through the space, place thermometers in the supply and return air ducts as close to the unit as possible.
Keep the economizer dampers (if equipped) completely closed while checking the temperature rise.

NOTE: Temperature rise is the difference between the supply and return air temperatures. If the air distribution system is designed properly, the correct temperature rise is usually obtained when the unit is operating at rated input with the recommended blower speed.

NOTE: The temperature rise must be within the specifications marked on the unit rating plate.

NOTE: It may be necessary to change the blower speed if the correct temperature rise is not obtained. A faster blower speed will decrease the temperature rise. A slower blower speed will increase the temperature rise. To change the blower speed, see Air Distribution system and blower chart.

9. After the correct temperature rise has been obtained, check the limit control function by blocking the return air grille(s).

After several minutes the main burners should go **OFF**. The circulating air blower should continue to run.

Remove air restrictions. Main burners should relight after a cool down period of a few minutes.

10. Adjust the thermostat setting below room temperature.

Main burners, and combustion air blower should go **OFF**.

The circulation air blower should continue to run for approximately 45 seconds.

Cooling Checks

CAUTION

Do NOT operate the unit with the compressor(s) running until proper blower rotation has been confirmed during the Blower and Phasing Check in the previous section. If the phasing is incorrect, the scroll compressor(s) (if equipped) will run backwards and they will be damaged.

1. Be sure that electric power is **OFF**.
2. To check cooling Stage 1, place jumper wires across low voltage terminal board terminals **R** to **G**, **R** to **Y1**.
3. Turn electric power **ON**. Check to see that the following occurs:
 - a. Compressor 1 – **ON**
 - b. Condenser fan motor(s) – **ON**
 - c. Circulation air blower – **ON** with correct rotation and adequate airflow from ductwork.
4. Shut **OFF** electric power at unit disconnect.
5. To check cooling Stage 2, remove jumper wires from **Y1** and place it on **Y2**.

NOTE: Allow 5 minutes between Steps 4 and 6.

6. Turn **ON** electric power. Check to see that the following occurs:
 - a. Compressors 1 & 2 – **ON**
 - b. Condenser fan motor(s) – **ON**
 - c. Circulation air blower – **ON**

c. Circulation air blower – **ON**

7. Shut **OFF** electric power at unit disconnect.
8. Remove jumpers from low voltage terminal board.
9. Replace all service access panels.

Turning Off the Unit

Heating

1. Set thermostat selector to **OFF** and fan switch to **AUTO**.
2. To shut the furnace down completely, shut **OFF** the manual shut off valve. If furnace is running at time of shut-down, wait 2.5 minutes then shut **OFF** electric power supply at disconnect switch or service panel. (No wait is necessary if furnace was not running within 2.5 minutes prior to shut-down.)

Cooling

1. Set thermostat selector to **OFF** and fan switch to **AUTO**.
2. To shut the unit down completely, shut **OFF** electric power supply at disconnect switch or service panel.

Operation And Maintenance Instructions

WARNING

Electrical shock hazard.

Turn off electric power supply at disconnect switch or service panel before removing any access or service panel from unit.

Failure to follow this warning can result in property damage, personal injury, and/or death.

NOTE: An optional low ambient kit is available that allows the unit to operate at temperatures down to 0°F (-18°C).

1. Turn **ON** electric power.
2. Set thermostat to desired temperature and set system switch to **COOL**. The unit will come on and operate automatically under control of the thermostat.

Close all doors and windows. The unit may run continuously for several hours or longer on the initial run because of residual heat and moisture in the building. This is normal for any air conditioning system.

Starting the Unit After Shutdown

WARNING

Carbon monoxide, fire, and/or explosion hazard.

Do not operate the unit on heating (except during service checks) unless all access panels are securely fastened in place. Abnormal and possibly hazardous burner operation could result.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Thermostat Fan Switch Operation

The circulating air blower will run continuously with the fan selector switch in the **ON** position. When the fan selector switch is in the **AUTO** position, the blower will run during each heating or cooling cycle.

Integrated Gas Controller Operation

NOTE: The default value for the evaporator-fan ON and OFF delay is 45 seconds. The Integrated Gas Controller modifies this value when abnormal limit switch cycles occur. Based upon unit operating conditions, the ON delay can be reduced to 0 seconds and the OFF delay can be extended to 180 seconds.

When one flash of the LED (light emitting diode) is observed, the evaporator-fan ON/OFF delay has been modified. If the limit switch trips at the start of the heating cycle during the evaporator ON delay, the time period of the ON delay for the next cycle will be 5 seconds less than the time at which the switch tripped. (Example: If the limit switch trips at 30 seconds, the evaporator-fan ON delay for the next cycle will occur at 25 seconds.) To prevent short-cycling, a 5 second reduction will only occur if a minimum of 10 minutes has elapsed since the last call for heating.

The evaporator-fan OFF delay can also be modified. Once the call for heating has ended, there is a 10-minute period during which the modification can occur. If the limit switch trips during this period, the evaporator-fan OFF delay will increase by 15 seconds on the next cycle. A maximum of 9 trips can occur, extending the evaporator-fan OFF delay to 180 seconds. To restore the original default value, reset the power to the unit.

Heating

1. Set the thermostat to **OFF**.
2. Remove the burner access panel. Shut **OFF** gas valve. Wait 5 minutes.
3. Turn **ON** gas valve (White Rogers valve knobs must be pressed down before turning). Replace burner access panel. Turn **ON** manual shut off valve.
4. Turn **ON** electric power.
5. Set thermostat to desired temperature and set selector to **HEAT**. Unit will come on and operate automatically under control of the thermostat.

Cooling

CAUTION

To prevent possible damage to the compressor(s), do NOT operate on cooling when outdoor temperature is below 35°F (2°C).

Limit Switch

Remove the blower access panel. Limit switch is located on the fan deck. Verify operation of limit by temporarily blocking return air until limit trips.

Burner Ignition

Unit is equipped with a direct spark ignition 100% lockout system. Integrated Gas Unit Controller (IGC) is located in the control box. Module contains a self-diagnostic LED. A single LED on the IGC provides a visual display of operational or sequential problems with when the power supply is interrupted. When a break in power occurs, the module will reset (resulting in a loss of fault history) and the indoor (evaporator) fan ON/OFF times will be reset. The LED error code can be observed through the viewport. During servicing refer to the label on the control box cover **Figure 24** or **Table 1** for an explanation of LED error code descriptions.

If lockout occurs, unit may be adjusted by interrupting power supply to unit for at least 5 seconds.

Monthly Maintenance and Inspection Checks

Vent Assembly

WARNING

Burn Hazard.
Flue cover may be hot! Allow adequate time for flue cover to cool.
Failure to follow this warning can result in personal injury.

Inspect the inside of the vent hood and burner compartment using a light and mirror as necessary. Look for soot and severe rust or corrosion and any obstructions due to leaves, spider webs, etc. Clean as required.

Main Burner Flame

1. Use a long-handled mirror to inspect the main burner flame.

Flames should extend directly into the heat exchanger tubes. Flames should be stable and solid blue (dust may cause momentary specs of orange or yellow).
2. When finished, set thermostat to normal operating setting.

Air Filters (Factory Installed)

CAUTION

Do NOT operate unit without all air filters installed in the unit.

Dirty filters are the most common cause of compressor failures and inadequate heating and cooling performance. Inspect filters at least monthly and replace or clean as required.

Washable filters may be cleaned by soaking in mild detergent

and rinsing with cold water. Install filters so that the arrows on the side point in the direction of air flow.

Filter racks are accessible through the filter access panel.

Disposable Replacement Filters

For 6 ton units: 2 filters 16" x 25" x 2"

For 7-1/2 & 8-1/2 ton units: 4 filters 16" x 20" x 2"

For 10 & 12-1/2 ton units: 4 filters 20" x 20" x 2"

To replace disposable filters: (see **Figure 20**).

1. Remove filter access panel by pulling out on bottom edge.
2. Remove the top filters by pushing up on top rail of filter rack.
3. Remove the bottom filters by pushing up on middle rail of filter rack. See **Figure 20**.
4. Replace bottom filters and then top filters.
5. Replace filter access panel.

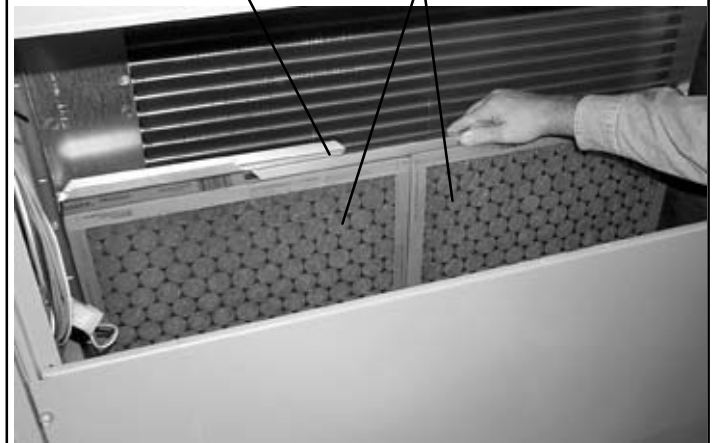
Figure 20

Replacing Filters



Middle rail

Bottom Filters



Condenser Coil

Keep the condenser inlet and outlet area clean and free of leaves, grass clippings and other debris. Grass should be kept short in front of the condenser inlet. Shrubby **MUST** be trimmed back so it is no closer than 30 inches (762 mm) to condenser coil.

Condensate Drain

Check for condensate drainage. Clean as required.

Annual Maintenance and Inspection

WARNING

Electrical Shock, Fire and Explosion Hazards.

Turn off electric power supply at disconnect switch or service panel and gas supply at manual shutoff valve before removing any access or service panel from unit.

Failure to follow this warning can result in property damage, personal injury, and/or death.

The annual inspection should include cleaning as required to ensure efficient operation of the unit.

NOTE: All bearings are sealed and no lubrication is required.

Circulating Air Blower

Visually inspect the blower wheel for accumulations of dirt or lint. Clean the compartment and the blower wheel. If accumulation is excessive on blower wheel or does not remove easily, it will be necessary to remove the blower assembly.

Inspection And Cleaning Of Burner Assembly/Heat Exchangers/Flue Gas Passages

For Qualified Service Technicians Only

See **Figure 22** for identification of parts.

Main Burners

At the beginning of each heating season, inspect for deterioration, blockage due to corrosion or other causes. Observe the main burner flames and replace burners, if necessary.

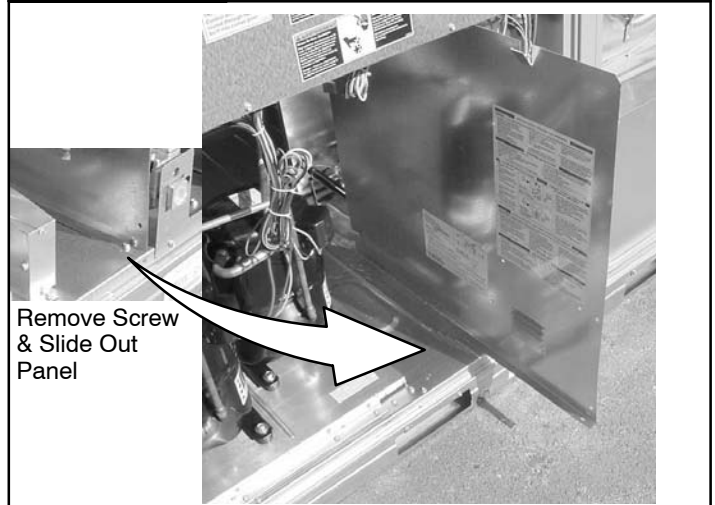
CAUTION

When working on gas train, do not hit or plug orifice spuds.

1. Shut **OFF** manual gas valve.
2. Shut **OFF** power to unit and instal lockout tag.
3. Remove screw holding burner section side panel and remove panel. See **Figure 21**.

Figure 21

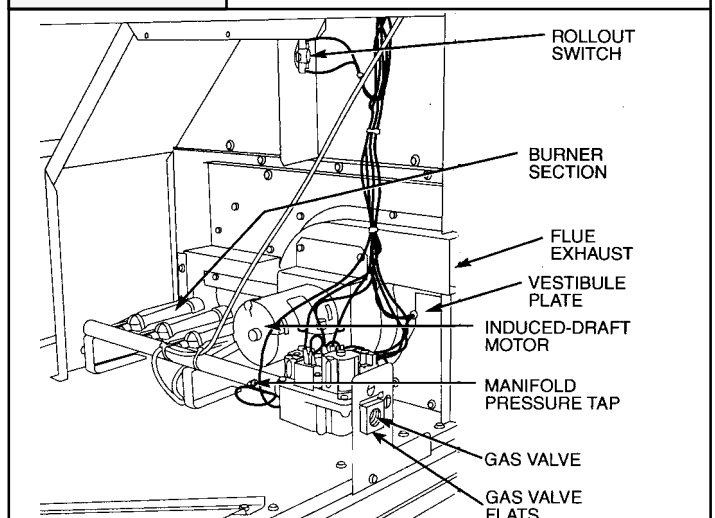
Remove Burner Side Panel



4. Disconnect gas piping at unit gas valve using backup wrench on the flats of the valve body where the gas pipe enters the gas valve.
5. Remove wires connected to gas valve. Mark each wire.
6. Remove wires from ignitor and sensor wires at the Integrated Gas Unit controller.
7. Remove the 2 screws that attach the burner rack to the vestibule plate.
8. Slide the burner tray out of the unit.
9. To reinstall, reverse the procedure outlined above.

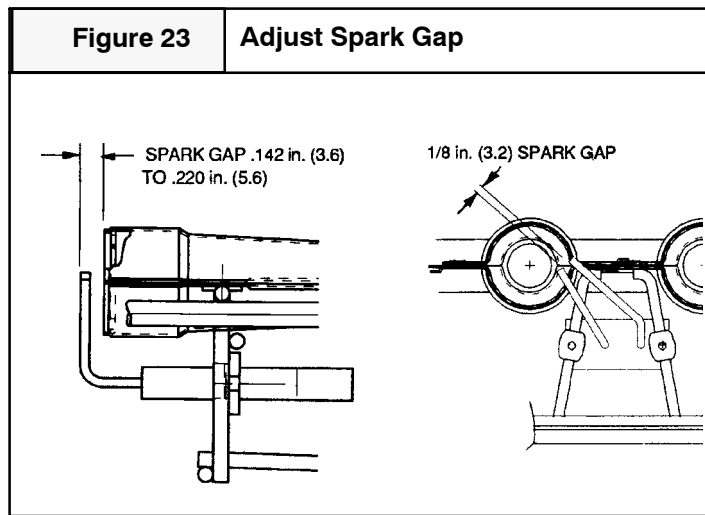
Figure 22

Burner Section Details



Cleaning and Adjustment

1. Remove burner rack from unit as described in Removal and Replacement of Gas Train section, above.
2. Inspect burners; if dirty, remove burners from rack.
3. Using a soft brush, clean burners and cross-over port as required.
4. Adjust spark gap. See **Figure 23**.
5. Reinstall burners on rack.
6. Reinstall burner rack as described in Removal and Replacement of Gas Train section, above.



Flue Gas Passageways

To inspect the flue collector box and upper areas of the heat exchanger:

1. Remove the combustion blower wheel and motor assembly according to directions in Combustion Air Blower section below.
2. Remove the flue cover to inspect the heat exchanger.
3. Clean all surfaces, as required, using a wire brush.

Combustion Air Blower

Clean seasonally to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bimonthly to determine proper cleaning frequency.

To inspect blower wheel, shine a flashlight into draft hood opening. If cleaning is required, remove motor and wheel as follows:

1. Slide burner access panel out.
2. Remove the 6 screws that attach induced-draft motor housing to vestibule plate. **See Figure 22.**
3. The blower wheel can be cleaned at this point. If additional cleaning is required, continue with Steps 4 and 5.
4. To remove blower from the motor shaft, remove 2 setscrews.
5. To remove motor, remove the 4 screws that hold blower housing to mounting plate. Remove the motor cooling fan by removing one setscrew. Then remove nuts that hold motor to mounting plate.
6. To reinstall, reverse the procedure outlined above.

Table 1 – LED Error Code Description*	
LED Indication	Error Code Description
ON	Normal Operation
OFF	Hardware Failure
1 Flash ⁺	Evaporator Fan On/Off Delay Modified
2 Flashes	Limit Switch Fault
3 Flashes	Flame Sense Fault
4 Flashes	4 Consecutive Limit Switch Faults
5 Flashes	Ignition Lockout Fault
6 Flashes	Induced-Draft Motor Fault
7 Flashes	Rollout Switch Fault
8 Flashes	Internal Switch Fault

LEGEND

LED – Light-Emitting Diode

* A 3 second pause exists between LED error code flashes. If more than one error code exists, all applicable codes will be displayed in numerical sequence.

⁺ Indicates a code that is not an error. The unit will continue to operate when this code is displayed.

IMPORTANT: Refer to Troubleshooting Tables for additional information.

Table 2- TROUBLESHOOTING, LED Troubleshooting Error Code

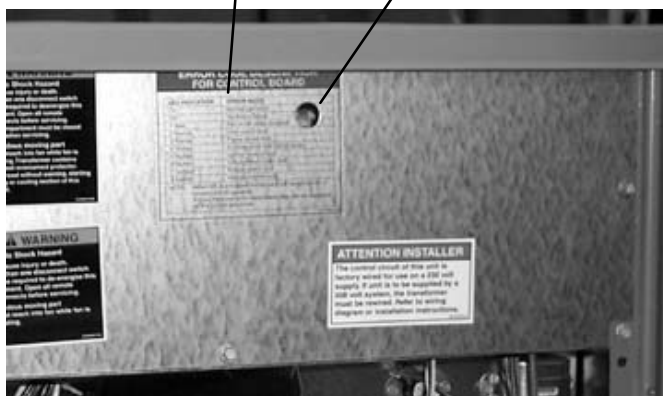
SYMPTOM	CAUSE	REMEDY
Hardware Failure OFF	Loss of power to control module (IGC).	Check 5 amp fuse on IGC, power to unit, 24-v circuit breaker, and transformer. Units without a 24-v circuit breaker have an internal overload in the 24-v transformer. If the overload trips, allow 10 minutes to auto reset.
On/Off Delay Modified 1 Flash	High limit switch opens during heat exchanger warm-up period before fan-on delay expires. Limit switch opens within three minutes after blower-off delay timing in Heating mode.	Ensure unit is fired on rate and temperature rise is correct. Ensure unit's external static pressure is within application guidelines.
Limit Switch Fault 2 Flashes	High temperature limit switch is open.	Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is in accordance with the range on the unit nameplate.
Flame Sense Fault 3 Flashes	The IGC sensed flame that should not be present.	Reset unit. If problem persists, replace control board.
4 Consecutive Limit Switch Faults 4 Flashes	Inadequate airflow to unit.	Check operation of indoor (evaporator) fan motor and that supply-air temperature rise agrees with range on unit nameplate.
Ignition Lockout Fault 5 Flashes	Unit unsuccessfully attempted ignition for 15 minutes.	Check ignitor and flame sensor electrode spacing, gaps, etc. Ensure that flame sense and ignition wires are properly terminated. Verify that unit is obtaining proper amount of gas.
Induced-Draft Motor Fault 6 Flashes	IGC does not sense that induced-draft motor is operating.	Check for proper voltage. If motor is operating, check the speed sensor plug/IGC Terminal J2 connection. Proper connection: PIN 1 – White, PIN 2 – Red, PIN 3 – Black.
Rollout Switch Fault 7 Flashes	Rollout switch has opened.	Rollout switch will automatically reset, but IGC will continue to lock out unit. Check gas valve operation. Ensure that induced draft blower wheel is properly secured to motor shaft. Reset unit at unit disconnect.
Internal Switch Fault 8 Flashes	Microprocessor has sensed an error in the software or hardware.	If error code is not cleared by resetting unit power, replace the IGC.
CAUTION: If the IGC must be replaced, be sure to ground yourself to dissipate any electrical charge that may be present before handling new control board. The IGC is sensitive to static electricity and may be damaged if the necessary precautions are not taken.		IMPORTANT: Refer to Heating troubleshooting chart for additional troubleshooting analysis. LEGEND: IGC – Integrated Gas Controller. LED – Light emitting diode.

Figure 24

Observing LED Error Codes

LED Error Code Description

Visual Hole to Watch LED



TROUBLESHOOTING – Cooling Service

PROBLEM	CAUSE	REMEDY
Compressor and condenser fans will not start.	Power failure	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer, or control relay.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
Compressor will not start but condenser fans run.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective run/start capacitor, overload, or start relay.	Determine cause and replace.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker.
Compressor cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective run/start capacitor, overload, or start relay.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor or capacitor	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor makes excessive noise (Scroll only)	Compressor rotating in wrong direction	Reverse the 3-phase power leads as described in Start-Up section
Compressor operates continuously.	Dirty air filter	Replace filter.
	Unit undersized for load	Decrease load or increase unit size
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Leaking valves in compressor.	Replace compressor.
	Air in system	Recover refrigerant, evacuate system, and recharge.
	Condenser coil dirty or restricted.	Clean coil or remove restriction.
Excessive head pressure.	Dirty air filter	Replace filter.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharged.	Remove excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
Head pressure too low.	Low refrigerant charge	Check for leaks, repair, and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive suction pressure.	High heat load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction pressure too low.	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Insufficient evaporator airflow	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.
Compressor no. 2 will not run.	Unit in economizer mode.	Proper operation; no remedy necessary.

TROUBLESHOOTING – Heating Service

PROBLEM	CAUSE	REMEDY
Burners will not Ignite.	Misaligned spark electrodes.	Check flame ignition and sensor electrode positioning. Adjust as needed.
	No gas at main burners	Check gas line for air purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before attempting to relight unit. Check gas valve.
	Water in gas line	Drain water and install drip leg to trap water.
	No power to furnace.	Check power supply, fuses, wiring, and circuit breaker.
	No 24 v power supply to control circuit.	Check transformer. Transformers with internal overcurrent protection require a cool down period before resetting.
	Miswired or loose connections.	Check all wiring and wirenut connections.
	Burned-out heat anticipator in thermostat.	Replace thermostat.
	Broken thermostat wires.	Run continuity check. Replace wires, if necessary.
Inadequate Heating.	Dirty air filter	Clean all wiring and wirenut connections.
	Gas input to unit too low.	Check gas pressure at manifold. Check gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.
	Unit undersized for application.	Replace with proper unit or add additional unit.
	Restricted airflow.	Clean filter, replace filter, or remove any restrictions.
	Blower speed too low.	Use high speed tap, increase fan speed, or install optional blower as suitable for individual units.
	Limit switch cycles main burners.	Check rotation of blower, thermostat heat anticipator settings, and temperature rise of unit. Adjust as needed.
	Too much outdoor air.	Adjust minimum position. Check economizer operation.
Poor flame characteristics.	Incomplete combustion (lack of combustion air) results in: Aldehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary.
		Cracked heat exchanger.
		Overfired unit – reduce input, change orifices, or adjust gas line or manifold pressure.
		Check vent for restriction. Clean as necessary.
		Check orifice to burner alignment.
Burners will not turn off.	Unit is locked into Heating mode for a one minute minimum.	Wait until mandatory one minute time period has elapsed or power to unit.

I. START-UP CHECKLIST (Remove and store in job file)				
	Model No:	Serial No:		
	Date:	Technician:		
	Unit No:	Job Location:		
		Job Name:		
II. PRE-START-UP (Insert Checkmark in box as each item is completed)				
		Verify that all packing materials have been removed from unit.		
		Remove shipping instructions and brackets from compressors, on select models.		
		Verify that condensate connection is installed per installation instructions.		
		Check all electrical connections and terminals for tightness.		
		Check gas piping for leaks.		
		Check that indoor-air filters are clean and in place.		
		Verify that unit installation is level.		
		Check fan wheels and propellers for location in housing/orifice and setscrew tightness.		
		Ensure belt tension is correct and blower pulleys are properly aligned.		
III. START-UP				
ELECTRICAL				
	Supply Voltage	L1-L2	L2-L3	L3-L1
	Compressor AMPS	L1	L2	L3
	Compressor AMPS	L1	L2	L3
	Indoor-Fan AMPS	L1	L2	L3
TEMPERATURES and PRESSURES				
	Outdoor-Air Temperature			°DB
	Return-Air Temperature			°DB °WB
	Cooling Supply air			°DB °WB
	Gas Heat Supply air			°DB
	Gas Inlet Pressure			In. wg
	Gas Manifold Pressure			In. wg (High Fire) In. wg (Lo Fire)
	Refrigerant Suction Pressure			PSIG-Circuit # 1 PSIG-Circuit # 2
	Refrigerant Temp. (Suction) Pressure			Circuit # 1 Circuit # 2
	Refrigerant Discharge			PSIG-Circuit # 1 PSIG-Circuit # 2
	Discharge Temperature			°F/C-Circuit # 1 °F/C-Circuit # 2
	Verify that 3-phase scroll compressor rotating in correct direction on select models.			