

# Installation Instructions

**PGAA / PGAD / PGMD / PGME**

**1<sup>1</sup>/<sub>2</sub> to 5 TON**

**Single Phase, Combination Units  
Gas Heat / Electric Cool**

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# 1. 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.



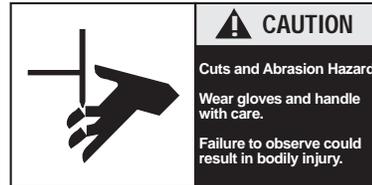
## Warning Label

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.



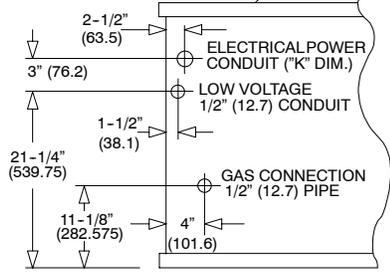
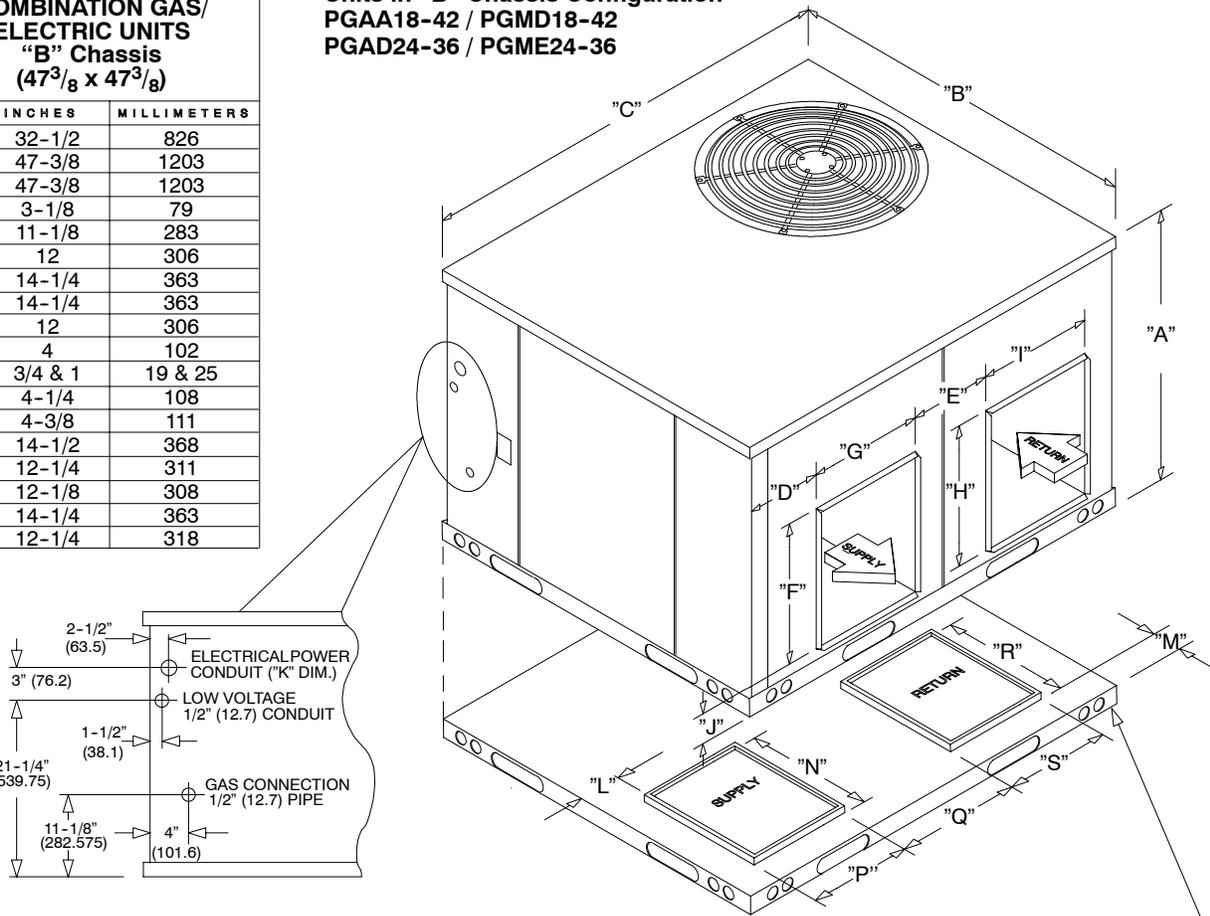
## 2. Unit Dimensions

# "B" CHASSIS UNIT DIMENSIONS

### COMBINATION GAS/ ELECTRIC UNITS "B" Chassis (47<sup>3</sup>/<sub>8</sub> x 47<sup>3</sup>/<sub>8</sub>)

DIM.	INCHES	MILLIMETERS
A	32-1/2	826
B	47-3/8	1203
C	47-3/8	1203
D	3-1/8	79
E	11-1/8	283
F	12	306
G	14-1/4	363
H	14-1/4	363
I	12	306
J	4	102
K	3/4 & 1	19 & 25
L	4-1/4	108
M	4-3/8	111
N	14-1/2	368
P	12-1/4	311
Q	12-1/8	308
R	14-1/4	363
S	12-1/4	318

### Units in "B" Chassis Configuration PGAA18-42 / PGMD18-42 PGAD24-36 / PGME24-36

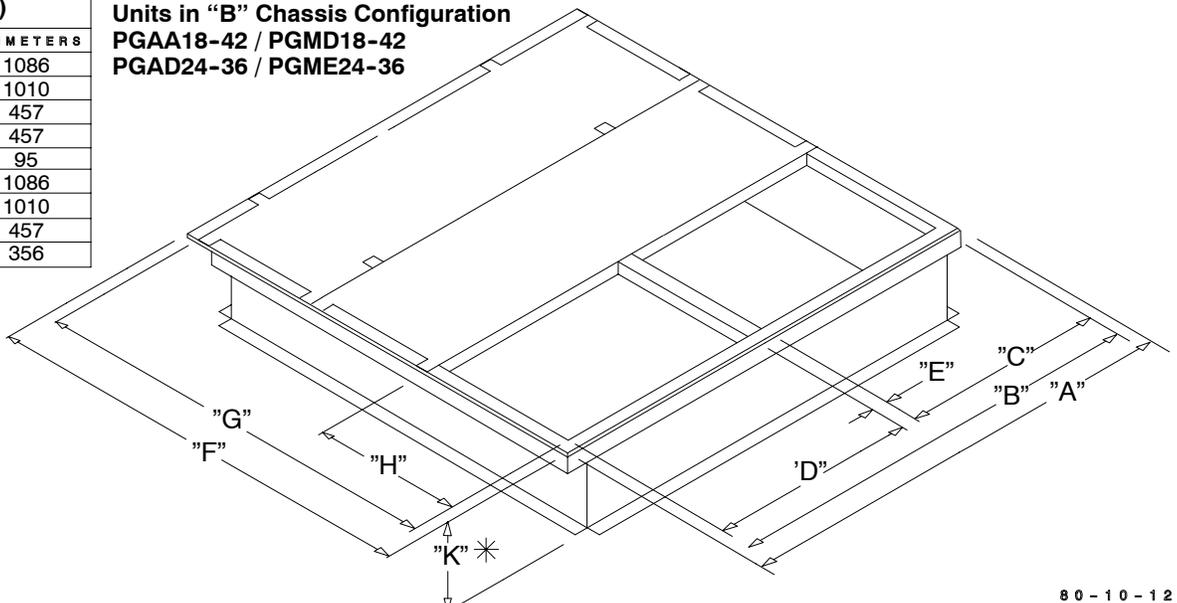


UNIT BASE SHOWN SEPARATELY TO ILLUSTRATE BOTTOM DUCT OPENINGS

### ROOF CURB for units in "B" Chassis (47<sup>3</sup>/<sub>8</sub> x 47<sup>3</sup>/<sub>8</sub>)

DIM.	INCHES	MILLIMETERS
A	42-3/4	1086
B	39-3/4	1010
C	18	457
D	18	457
E	3-3/4	95
F	42-3/4	1086
G	39-3/4	1010
H	18	457
K*	14	356

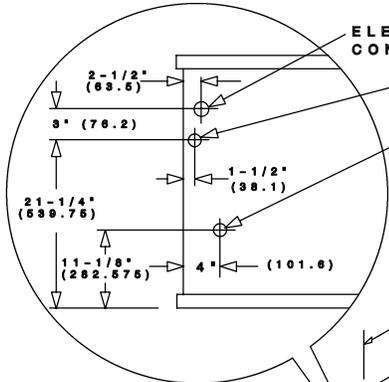
### Units in "B" Chassis Configuration PGAA18-42 / PGMD18-42 PGAD24-36 / PGME24-36



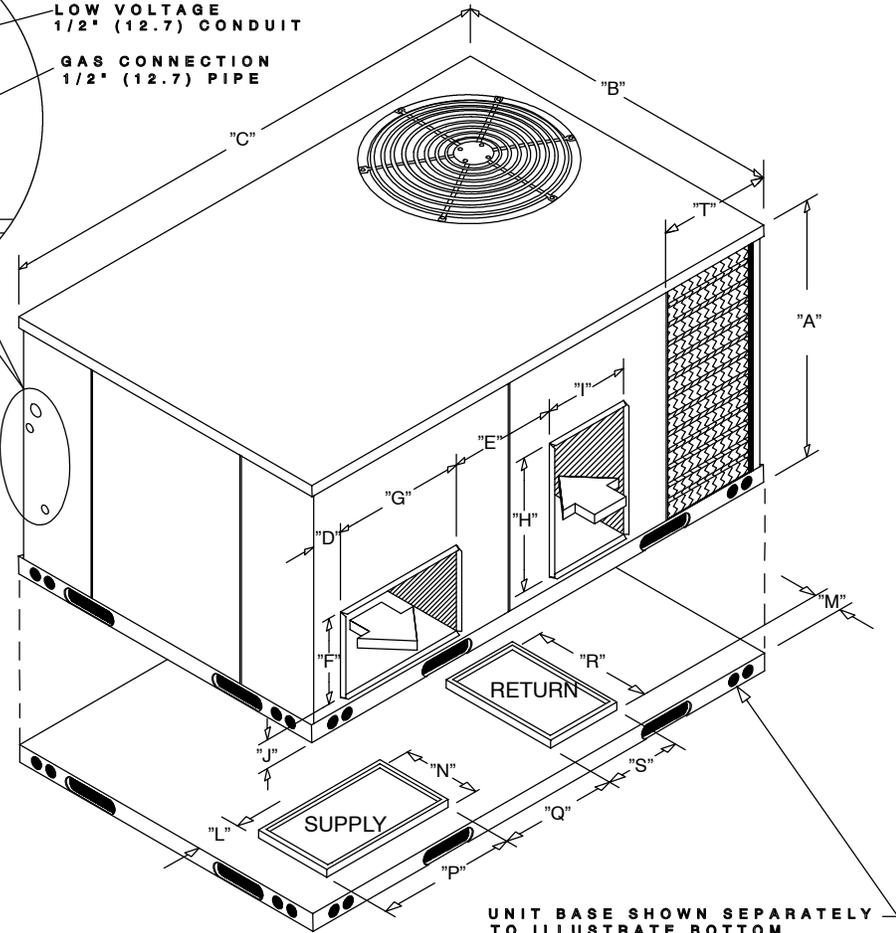
\* ROOF CURBS ARE ALSO AVAILABLE IN 8" (203) AND 24" (610) HEIGHTS (K DIMENSION).

80-10-12

# "C" CHASSIS UNIT DIMENSIONS



ELECTRICAL POWER  
 CONDUIT ("K" DIM.)  
 LOW VOLTAGE  
 1/2" (12.7) CONDUIT  
 GAS CONNECTION  
 1/2" (12.7) PIPE



UNIT BASE SHOWN SEPARATELY TO ILLUSTRATE BOTTOM DUCT OPENINGS

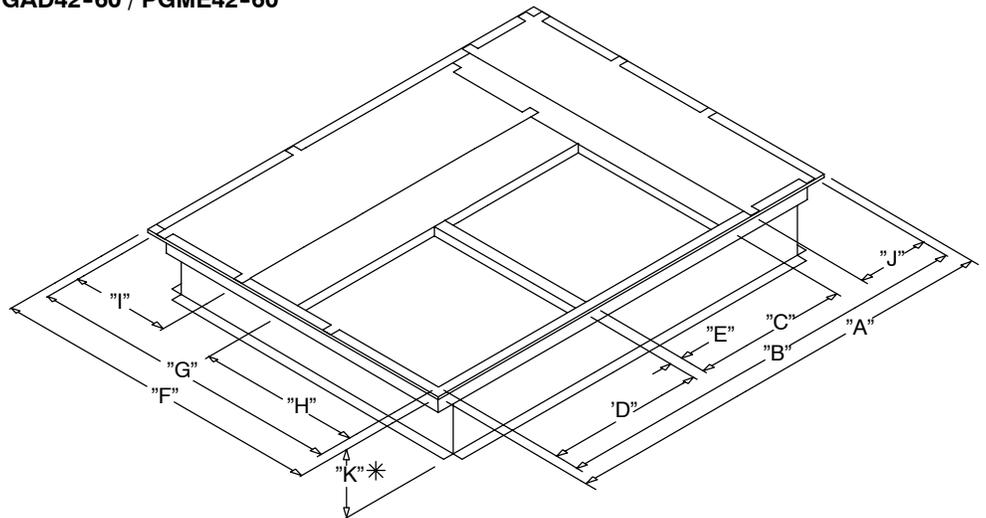
## COMBINATION GAS/ ELECTRIC UNITS "C" Chassis (47<sup>3</sup>/<sub>8</sub> x 73)

DIM.	INCHES	MILLIMETERS
A	36	914
B	47-3/8	1203
C	73	1354
D	4-5/8	117
E	15	361
F	12	307
G	18-3/4	476
H	18-3/4	476
I	12	306
J	4	102
K	1 & 1-1/4	25 & 31
L	4-1/4	108
M	5-1/4	133
N	12-1/4	311
P	19	483
Q	15	381
R	19	483
S	12-1/4	318
T	16-7/8	429

## ROOF CURB for "C" Chassis (47<sup>3</sup>/<sub>8</sub> x 73)

DIM.	INCHES	MILLIMETERS
A	67-3/4	1721
B	64-3/4	1645
C	23	584
D	23	584
E	2-1/2	64
F	42-3/4	1086
G	39-3/4	1010
H	23	584
I	12	305
J	12	305
K*	14	356

## Units in "C" Chassis Configuration PGAA48-60 / PGMD48-60 PGAD42-60 / PGME42-60



\* ROOF CURBS ARE ALSO AVAILABLE IN 8" (203) AND 24" (610) HEIGHTS (K DIMENSION).

### 3. 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 the ANSI Z223.1 and the National Electrical Code NFPA70-current edition or in Canada the National Standard CAN/CGA B149-1 and CSA C.22.1 - Canadian Electrical Code Part 1.

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

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

- 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.
- Check to see that filters are installed correctly and are the proper type and size.

**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.

**⚠ WARNING**

**FIRE, EXPLOSION, OR CARBON MONOXIDE POISONING HAZARDS**

Failure to have the furnace inspected and maintained could result in death, bodily injury, and/or property damage.

It is recommended that a qualified service technician check the heat exchanger integrity every two (2) years, after the first four (4) years of operation.

### 4. LOCATING THE UNIT

#### ACCESS PANELS

See **FIGURE 1** for a general view of unit and location of access panels.

**⚠ WARNING**

**CARBON MONOXIDE POISONING HAZARD.**

Failure to keep blower door closed could result in bodily injury and/or death.

Keep blower door closed.

#### CLEARANCES

The location **MUST** allow for minimum clearances and should not be adjacent to a patio or other area where the unit's operating sound level might be objectionable. The combustion air inlet openings **MUST** not be obstructed (see **FIGURE 1**). In addition, local codes **MUST** be observed.

**NOTE:** Units with built in filter racks ("C" Chassis 48 x 73 models), need a 26" minimum clearance at front of unit for removal of filters. See chart below if unit is going to be placed near combustible construction or materials.

While minimum clearances are acceptable for safety reasons, they may not allow adequate air circulation around the unit for proper operation in the cooling mode. Whenever possible, it is desirable to allow additional clearance, especially around the condenser inlet and discharge openings.

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

**⚠ WARNING**

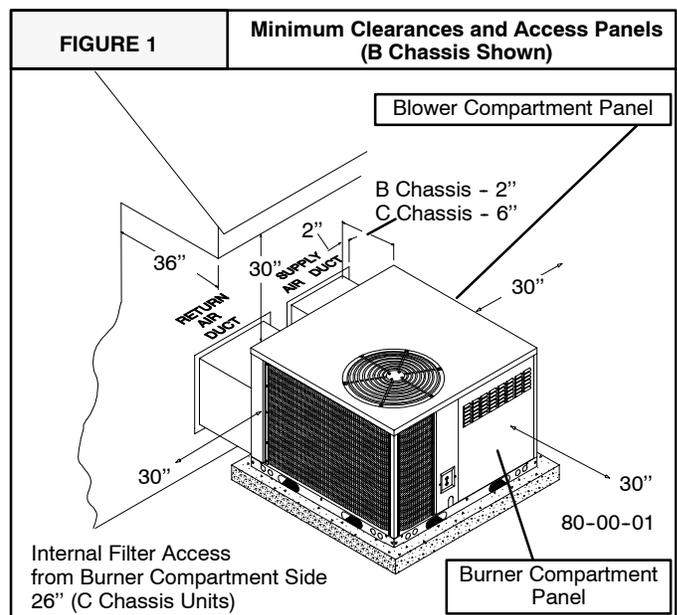
**REDUCED UNIT LIFE HAZARD**

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

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

#### Minimum Clearances to Combustible Construction

Furnace Plenum	2"
Duct Side	2" (6" on large chassis models)
Condenser Inlet Side	30"
Blower Service (Rear)	30"
Control Service Side	
(Front Combustion Air Inlet)	30"
Clearance between 3 Ft. Overhang	
and Top of Unit	30"
Combustible Base	
(Wood or Class A, B or C	
roof covering material)	0"



#### INSTALLATION

#### NOTICE

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 drain 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 **FIGURE 21** in the back cover of this manual for unit 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.
- See *Hoisting* section below for hoisting instructions.

## 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.

Two spreader bars **MUST** be placed on top of the unit to protect the unit from damage from the pressure exerted by the slings. Make sure that all equipment is adequate to handle the weight of the unit and that the slings will not allow the unit to shift.

Refer to **FIGURE 21** on the back cover of this manual for illustrated rigging instructions and weight chart.

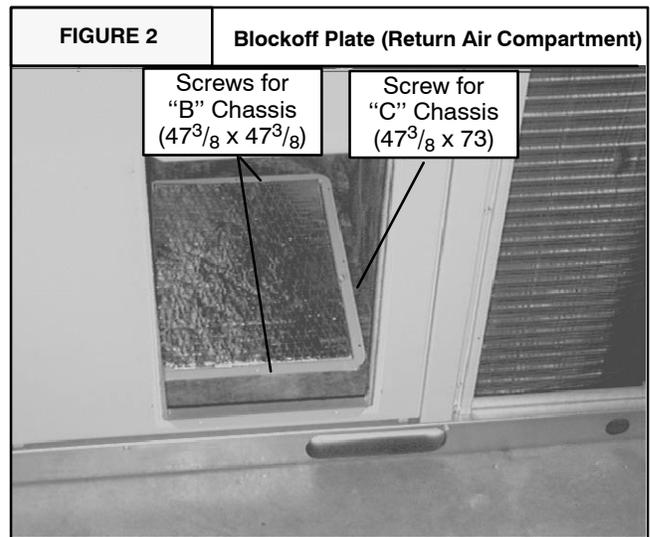
## DOWNFLOW CONVERSION

These units are adaptable to downflow use. To convert to downflow use, follow these steps:

1. Remove the blockoff plates found in the return air compartment and the supply air compartment. See **FIGURE 2**.

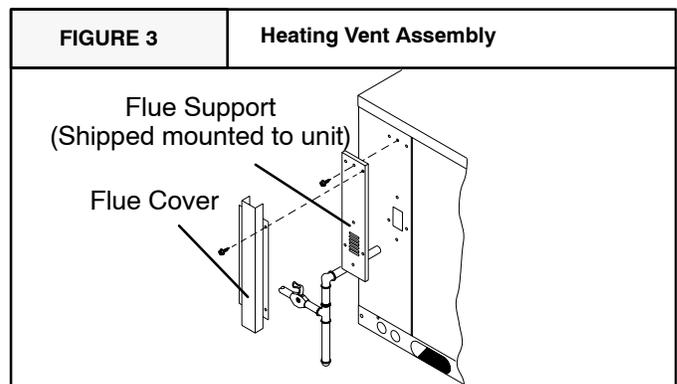
**NOTE:** Blockoff plate in the supply air compartment only contains one screw. If reinstalling plate, back part of plate **MUST** fit into mating dimples on flange. To reinstall, slant plate into dimples, then put plate into position and fasten with screw.

2. Install the removed plates on the horizontal return and supply air openings.
3. Install roof curb on the building. Be sure to follow all directions included with curb and all applicable building codes in your installation. (See **Pages 2 or 3** for appropriate curb to use with your model.)



## Heating Vent Assembly

The flue cover is packed with screws in the return air compartment. Refer to **FIGURE 3** and assemble as shown.

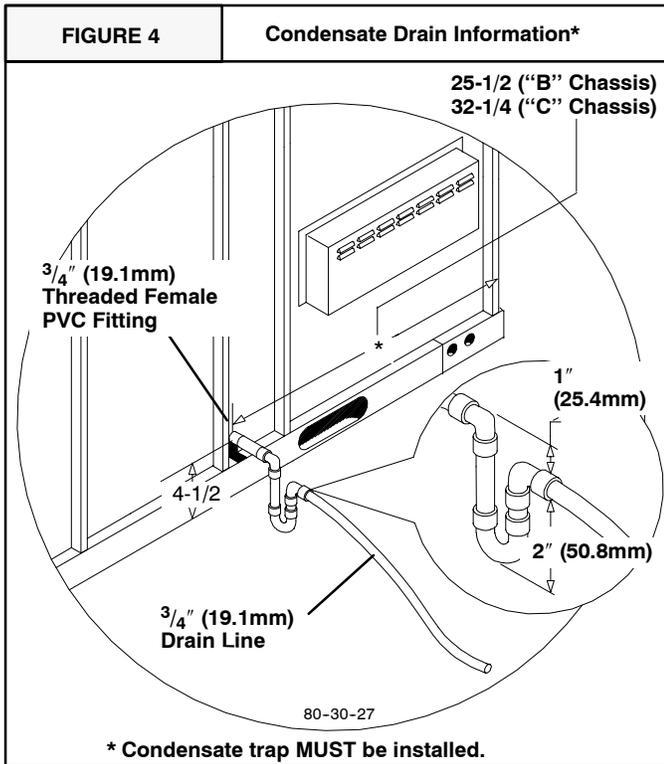


## Condensate Drain

The condensate drain outlet is a  $\frac{3}{4}$ " (19.1mm) threaded female PVC connection located at the bottom of the unit to the right of the filter access panel (see **FIGURE 4**). Condensate drain outlet **MUST** be held with wrench when installing trap and drain line.

The circulating blower creates a negative pressure on the condensate drain line that can prevent the condensate from draining properly. To combat this negative pressure, a field supplied condensate trap that will allow a standing column of water of at least 2" (50.8mm) **MUST** be installed. Top of outlet from trap **MUST** be at least 1" (25.4mm) below top of outlet from unit. **Install the trap as near to the unit as possible for proper drainage.**

A  $\frac{3}{4}$ " (19.1mm) drain line **MUST** be installed if required by local codes or if location of unit requires it. Run the drain line to an open drain or other suitable disposal point.



## 5. PRE-EXISTING COMMON VENT CHECK

If the installation of the combination unit involves removing an existing furnace from a common vent with other appliances, the existing venting system will probably be too large for the remaining appliances and they will not vent properly. The existing venting system **MUST** be checked by a qualified technician to ensure it is properly sized and vents properly.

## 6. GAS SUPPLY AND PIPING

**NOTE:** Because there are many types of liquified petroleum (LP) gases, the term LP as used in this manual refers to *propane* gas. If you intend to use any type of LP gas, proper precautions **MUST** be used in the handling, piping, and use of such gas. **NOTE:** In Canada, installations **MUST** be performed by licensed LP installers.

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

**⚠ WARNING**

**FIRE AND/OR EXPLOSION HAZARD.**

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

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 liquified 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.

## 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 for natural gas from the table in **FIGURE 5** or **FIGURE 6**. Base the length of the run from the gas meter or source to the unit.

### Gas Pipe Size

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 ANSI Z223.1 or in Canada the National Standard CAN/CGA B149-1 or current editions.

<b>FIGURE 5</b>		<b>Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe (English)</b>				
<b>NATURAL GAS</b>						
Pipe Length (Includes Fittings)	Btu/hr (in thousands)					
	3/4"	1"	1 1/4"	1 1/2"	2"	
20'	190	350	730	1,100	2,100	
40'	130	245	500	760	1,450	
60'	105	195	400	610	1,150	
<b>LP GAS</b>						
Pipe Length (Includes Fittings)	Btu/hr (in thousands)					
	1/2"	3/4"	1"	1 1/4"	1 1/2"	
20'	189	393	732	1,496	2,299	
40'	129	267	504	1,039	1,559	
60'	103	217	409	834	1,275	

<b>FIGURE 6</b>		<b>Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe (English)</b>				
<b>NATURAL GAS</b>						
Pipe Length (Includes Fittings)	kW**					
	3/4"	1"	1 1/4"	1 1/2"	2"	
6.1m	56	103	214	322	615	
12.2m	38	72	147	223	425	
18.3m	31	57	117	179	337	
<b>LP GAS</b>						
Pipe Length (Includes Fittings)	kW**					
	1/2"	3/4"	1"	1 1/4"	1 1/2"	
6.1m	55	115	215	438	674	
12.2m	38	78	148	305	457	
18.3m	30	64	120	244	374	

\*\*kW (Kilowatts) is the metric equivalent of Btu/hr.

### PIPING AT UNIT

#### Connections

**NOTE:** The rules listed apply to natural and LP gas pipe installations.

1. If installation is for LP gas, have LP gas installer use **TWO-STAGE REGULATION** and make all connections from storage tank to unit.
2. Use black iron or steel pipe and fittings or other pipe approved by local code.
3. If copper tubing is used, it **MUST** comply with limitation set in Fuel Gas Code.

**NOTE:** If a gas connector is used, it **MUST** be acceptable to local authority. Connector **MUST NOT** be used inside the furnace or be secured or supported by the furnace or ductwork.

**⚠ WARNING**

**FIRE OR EXPLOSION HAZARD.**

Failure to properly install metal gas connector could result in death, bodily injury and/or property damage.

A flexible corrugated metal gas connector must be properly installed, shall not extend through the side of the furnace, and shall not be used inside the furnace.

Black iron pipe shall be installed at the furnace gas control valve and extend a minimum of 2" outside furnace.

- Use pipe joint compound on external (male) threads **ONLY**. Joint compound **MUST** be resistant to any chemical action of LP gases). Do **NOT** put pipe compound on last 2 threads of pipe.
- Use ground joint unions and install a drip leg no less than 3 inches (76 mm) long to trap dirt and moisture before it can enter gas valve.

**⚠ WARNING**

**FIRE HAZARD**

Failure to follow safety warnings exactly could result in serious injury, death, and/or property damage.

Use wrench to hold furnace gas control valve when turning elbows and gas line to prevent damage to the gas control valve and furnace.

- Use a wrench on gas valve when making connections to prevent gas valve from turning. Do **NOT** use a pipe wrench on the gas valve body.

- Provide a 1/8 inch (3mm) National Pipe Thread (NPT) plug for test gauge connection immediately upstream of the gas supply connection to the furnace if none is supplied with the gas valve of unit.
- Install a manual shutoff valve and tighten all joints securely.
- Make sure pilot tube and burner orifices are checked for leakage.

**ORIFICES**

**Orifice Sizes**

Orifice sizes **MUST** be matched to the heating value of the gas (see **FIGURE 7** and **TABLE 1 & 2**). Check with your gas supplier and the National Fuel Gas Code ANSI Z223.1.

**NOTE:** An LP Conversion Kit **MUST** be used for conversion to LP gas.

FIGURE 7		Orifice Sizes	
Gas Type	Specific Gravity	Btu/ft <sup>3</sup> (kJ/L)	Pilot Orifice Sizes
Natural	0.60	1030	.018*
Propane	1.52	2500	.011*

\*Adjust pilot flame as needed

Table 1	NATURAL GAS ORIFICE SIZING								
	MEAN ELEVATION FEET ABOVE SEA LEVEL								
	0 to 2000		2001 to 4000	4001 to 5000	5001 to 6000	6001 to 7000	7001 to 8000	8001 to 9000	9001 to 10000
Models	Orifice Drill #	Kit Number	Orifice Drill #						
PGAA, PGMD (All Sizes)	44	1172664	45	46	47	47	48	48	49
PGAD, PGME (All Sizes)	44	1172664	45	46	47	47	48	48	49

**NOTE:** The orifice sizes in the chart above derate the input rate at 4% per 1000 feet above sea level for altitudes exceeding 2000 feet above sea level. If converting from LP gas to Natural Gas at altitudes exceeding 2000 feet above sea level, a .018 pilot orifice (part # 503211) and gas valve conversion kit (part # 1147772) are required for conversion **OR** use kit # 1172664 plus the required orifice size # shown in Table 1. Natural Gas data is based on 0.60 specific gravity, a heating value of 1030 Btu/Cu.Ft., and 3.5" W.C. manifold pressure. For fuels with different specific gravity, consult the National Fuel Gas Code ANSI Z223.1-2002/NFPA 54-2002 or National Standard of Canada, Natural Gas and Propane Installation Code CSA B149.1-00.

Table 2	LP GAS ORIFICE SIZING					
	MEAN ELEVATION FEET ABOVE SEA LEVEL					
	0 to 4000		4001 to 9000		9001 to 10,000	
Models	Orifice Drill #	Kit Number	Orifice Drill #	Kit Number	Orifice Drill #	Kit Number
PGAA, PGMD (All Sizes)	55	1172663	56	1172665	57	1172666
PGAD, PGME (All Sizes)	55	1172663	56	1172665	57	1172666

**NOTE:** The orifice sizes in the chart above derate the input rate at 4% per 1000 feet above sea level for altitudes exceeding 2000 feet above sea level. LP Gas data is based on 1.52 specific gravity, a heating value of 2500 Btu/Cu.Ft., and 10.0" W.C. manifold pressure. For fuels with different specific gravity, consult the National Fuel Gas Code ANSI Z223.1-2002/NFPA 54-2002 or National Standard of Canada, Natural Gas and Propane Installation Code CSA B149.1-00.

## Changing Orifices

### **⚠ WARNING**

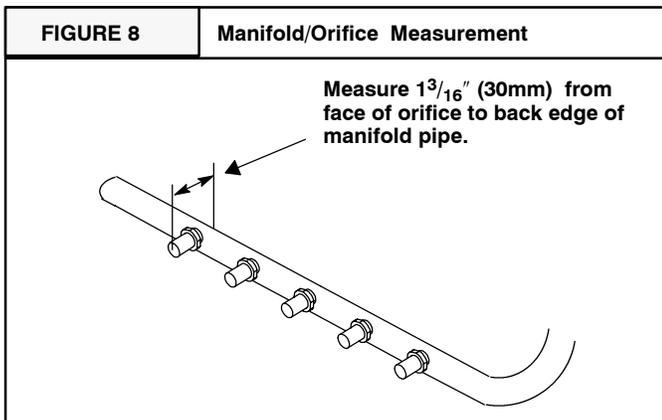
**ELECTRICAL SHOCK, FIRE AND/OR EXPLOSION HAZARD.**

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

Shut off electric power at unit disconnect or service panel and shut off gas at manual shut off valve before beginning the following procedure.

Changing orifices requires a qualified service technician.

1. Shut **OFF** gas at manual shut off valve.
2. Shut **OFF** electric power at unit disconnect or service panel. If unit is still running, allow 2.5 minutes after gas shut off before turning off power.
3. Disconnect the wires from the gas valve.
4. Remove the four screws holding the manifold to the manifold brackets.
5. Carefully remove the manifold with the gas valve attached.
6. Remove the orifices from the manifold with a  $\frac{7}{16}$ " box end or socket wrench.
7. Check to be sure that the size of each orifice is correct for the Btu input desired.



8. Install the correct orifices. Gauge the size of the orifices with a new twist drill bit of the correct size.

Make sure that the orifices go in straight so that they form a right angle ( $90^\circ$ ) to the manifold pipe.

Tighten the orifices so that there is a  $1\frac{3}{16}$ " (30mm) distance between the faces of the orifices to the back of the manifold pipe.

Measure the distance with a set of calipers. If you do not have a calipers, you can use an adjustable wrench and measure between the face of the jaws.

9. Reassemble in reverse order.

## 7. ELECTRICAL WIRING

### **⚠ WARNING**

Electrical shock hazard.

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

Disconnect power at fuse box or service panel before making any electrical connections.  
Unit **MUST** be grounded to electrical service panel.

**NOTE:** All electrical work **MUST** conform with the requirements of local codes and ordinances and the National Electrical Code ANSI/NFPA-No. 70-1990 or current edition. Provide line voltage power supply from a separate fused circuit with a disconnect switch located within sight of the unit.

For access, remove the heater access panel and the control box cover. See **FIGURE 1** for access panel location. Wiring **MUST** be protected from possible mechanical damage.

### Line Voltage Wiring

Connections for line voltage are made in the unit control box. For access, remove the burner access panel and the control box cover.

### Ground Connections

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.

A ground lug is installed in the control box for the ground connection. Use a copper conductor of the appropriate size from the unit to a grounded connection in the electrical service panel or a properly driven and electrically grounded ground rod. See warning above.

### Line Connections

Complete the line service connections to the contactor 'L' terminals inside the control box. Refer to applicable wiring diagram. Check all screw terminals to ensure they are tight.

### THERMOSTAT/HEAT ANTICIPATOR

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

Set the thermostat heat anticipator to .58 in accordance with thermostat instructions.

### Final Electrical Check

1. 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.

**NOTE:** Wiring **MUST** be installed so it is protected from possible mechanical damage.

## 8. DUCTWORK

Maximum recommended velocity in trunk ducts is 1000 feet per minute. Velocity in branches should not exceed 800 feet per minute.

FIGURE 9		Capacities Air Delivery		
Nominal Tons Air Conditioning	Nominal Air Flow Cubic Feet per Minute	Recommended Filter Sizes Sq. In. Surface Area/Nominal Size		Unit Size Heating Input 1000 x Btuh
		Disposable Filters	Cleanable Filters	
Up Thru 2	800-900	400 or 20 x 25	246 or 15 x 20	40 and 50
2 1/2	900-1100	487 or 20 x 30	301 or 14 x 25	40, 50, 75 and 100
3	1100-1300	576 or 14 x 25 (2Req.)	356 or 16 x 25	40, 50, 75 and 100
3 1/2	1300-1500	665 or 16 x 25 (2Req.)	411 or 20 x25 (2Req.)	75, 100 and 125
4	1500-1700	753 or 20 x 25 (2 Req.)	466 or 20 x 25	100 and 125
4 1/2	1700-1900	841 or 20 x 25 (2 Req.)	521 or 24 x 25	125
5	1900-2100	960 or 20 x 30 (2 Req.)	575 or 24 x 25	125
6 1/3	2300-2500	1108 or 20 x 30 (2 Req.)	685 or 24 x 30	150

NOTE: Minimum recommended filter areas are based on a velocity of 325 ft./min. for disposable filters and 525 ft./min. for high velocity filters (washable).

**NOTE:** Ductwork sizing affects temperature rise and cooling temperature differential. Be sure to properly size ductwork to the capacity and airflow characteristics of your unit. Failure to do so can affect limit controls, compressors, motors, and other components and will lead to premature failure of components. This will also adversely affect day to day unit performance. Refer to rating plate and *Temperature Rise Check*, **Page 11**.

### Ductwork Insulation

Ductwork installed outdoors should have a minimum of 2" fiberglass insulation and a weatherproof vapor barrier. It should be protected against damage. Caulking and flashings, 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" 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 .

**NOTE:** Connect supply and return air plenums to unit in a manner that will allow the top of the unit to be removed without removing plenums. Plenums **MUST** be individually sealed to unit casing with ducts terminating inside structure.

### FILTERS

All return air **MUST** pass through a filter before entering the unit. An electronic air cleaner, optional filter racks, or other accessible filter arrangement **MUST** be installed in the *return* air ductwork. Minimum recommended filter areas are listed in **FIGURE 9** and are based on a velocity of 325 ft/min for disposable filters and 525 ft/min for high velocity filters (washable).

### CAUTION

**DO NOT OPERATE THE UNIT WITHOUT A FILTER.**

## 9. START-UP PROCEDURES

### **⚠ WARNING**

**FIRE AND/OR EXPLOSION HAZARD.**

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

**Do NOT attempt to light the pilot or burner with a match or flame of any kind.**

### CHECK BEFORE STARTING

1. Check that the blower motor speed terminal block or the setting of the variable speed pulley is running the correct heating and cooling speeds.
2. Check to see that clean, properly sized air filters are installed.
3. Replace all service access panels.

### Manifold Gas Pressure Adjustment

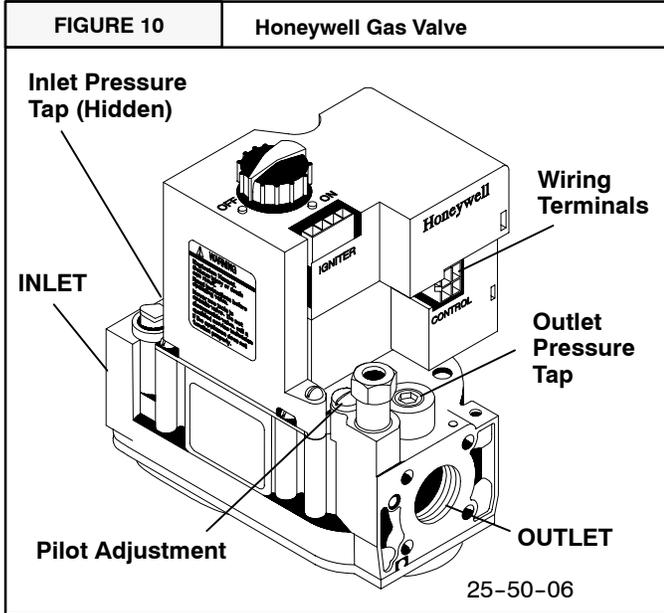
**NOTE:** Make adjustment to manifold pressure with burners operating.

## ⚠ **WARNING**

### **FIRE OR EXPLOSION HAZARD.**

Failure to properly seal duct could result in personal injury and/or death.

Turn OFF gas at shut off before connecting U-tube manometer.



### **GAS PRESSURES**

1. Do **NOT** allow gas supply pressure to fall below the listed minimums. Doing so will decrease input to furnace. Refer to **FIGURE 11** for gas supply pressures.
2. Gas input **MUST NOT** exceed rated input shown on rating plate.
3. Do **NOT** allow pressures to exceed the maximum limits as listed in **FIGURE 11**.

FIGURE 11	Gas Pressures	
	Natural Gas	LP Gas
Minimum Inlet	4.5" W.C. (1120 Pa)	11" W.C. (2740 Pa)
Recommended Inlet	7" W.C. (1740 Pa)	11" W.C. (2740 Pa)
Maximum Inlet	13" W.C. (3230 Pa)	13" W.C. (3230 Pa)
Manifold Pressure	3.5" W.C. (870 Pa)	10" W.C. (2490 Pa)

### **Manifold Pressures**

1. With gas **OFF**, Connect U-Tube manometer to tapped opening on gas valve. Use manometer with a 0 to 12 inches water column range.

FIGURE 12	Manifold Pressure Settings
Gas Type	Manifold Pressure
Natural	3.5 Inches Water Column (870 Pa)
Propane	10 Inches Water Column (2490 Pa)

2. Turn gas **ON** and remove adjustment screw cover on gas valve. Turn counterclockwise to decrease pressure and clockwise to increase.

**NOTE:** Adjustment screw cover **MUST** be placed on gas valve before reading manifold pressure and operating furnace.

## ⚠ **WARNING**

### **FIRE AND/OR EXPLOSION HAZARD.**

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

Do **NOT** adjust manifold pressure more than  $\pm 0.3$  inches water column to obtain rated input.

3. Set pressure to value shown in **FIGURE 12**,  $\pm 0.07$ kPa (0.3 inches) water column. Pressure is also listed on furnace rating plate. In **NO** case should final manifold pressure vary more than  $\pm 0.07$ kPa (0.3 inches) water column.

### **CIRCULATING AIR BLOWER**

Check the unit's operation as outlined in the following instructions. If any unusual sparking, odors or unusual noises are encountered, shut off electric power immediately. Recheck for wiring errors, or obstructions in or near blower motors.

1. Set thermostat Heat-Cool selector to **OFF**.
2. Set thermostat fan switch to **AUTO**.
3. Turn electric power **ON**. Nothing should start running.
4. Turn manual gas valve **ON**.
5. Turn gas control valve **ON**.
6. Set thermostat fan switch to **ON**.
7. Reset thermostat fan switch to **AUTO**.

### **HEATING START-UP PROCEDURE**

1. Adjust thermostat setting above room temperature and set thermostat selector to **HEAT**. The combustion air blower should come **ON**.
2. The ignitor should begin to glow and pilot flame should light. Refer to Lighting/Operating Instructions label located on Burner Access Panel of unit.

**NOTE:** On a call for heat the ignitor and pilot valve will remain energized until a flame is detected by the flame sensor. It may take several minutes to purge the air out of the gas lines at initial start-up of the unit.

3. Once the flame sensor detects that a flame is present, the hot surface ignitor will de-energize and the main burners will light from the pilot.
4. 30 seconds after the burners light, the circulating blower should begin to run.

## ⚠ **WARNING**

### **FIRE AND/OR EXPLOSION HAZARD.**

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

Do **NOT** attempt to light the pilot or burner with a match or flame of any kind.

### **Temperature Rise Check**

**NOTE:** Air temperature rise is the temperature difference between supply and return air. With a properly designed distribution system, the proper amount of temperature rise will normally be

obtained when the unit is operating at rated input with the recommended blower speed.

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

To check the temperature rise through the unit, place thermometers in the supply and return air ducts as close to the unit as possible.

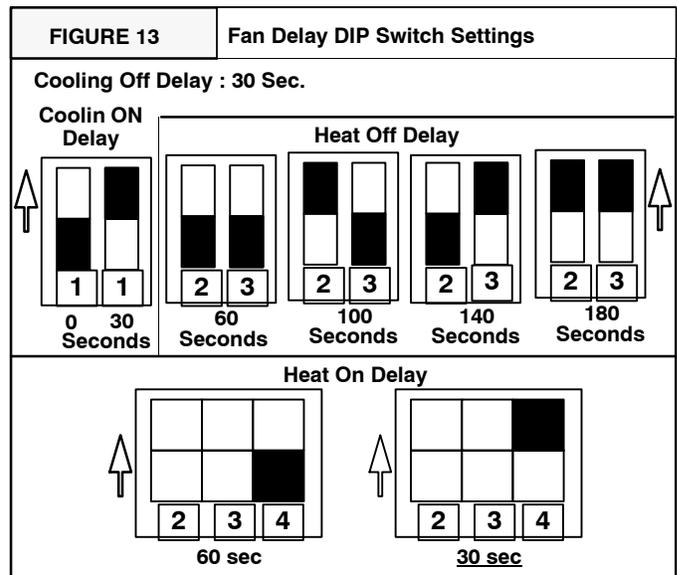
Open **ALL** registers and duct dampers. Operate unit **AT LEAST** 15 minutes before taking readings.

If the correct amount of temperature rise is not obtained when operating on the recommended blower speed, it may be necessary to change the blower speed. A faster blower speed will decrease the temperature rise. A slower blower speed will increase the temperature rise.

**NOTE:** The blower speed **MUST** be set to give the correct air temperature rise through the furnace as marked on the rating plate. See **FIGURE 14** for more information.

2. After 15 minutes of operation check the limit control function by blocking the return air grille(s).  
After several minutes the main burners and pilot should go **OFF**. The circulating air blower should continue to run.  
Remove air restrictions. Pilot and main burners should relight after a cool down period of a few minutes.
3. Adjust the thermostat setting below room temperature.  
Pilot and main burners and combustion air blower should go **OFF**.  
The circulating air blower should continue to run for 60, 100, 140 or 180 seconds. This time is adjustable. See **Figure 14** for more information.
4. Set thermostat Heat-Cool selector to **OFF**.

## FAN CONTROL CHECK



The Fan Control has adjustable settings for the circulating air blower to delay it “ON” and “OFF”.

1. The “ON” delay is factory pre-set at 30 seconds. It can be adjusted to 60 seconds.
2. The “OFF” delay is factory preset at 140 seconds. It can be adjusted to 60, 100 and 180 seconds, respectively.

Refer to **Figure 13** for proper DIP switch settings.

3. Operate the furnace and ensure that the blower turns **ON** and **OFF** at the appropriate time to provide the desired comfort level.

## SPEED TAPS

After determining necessary CFM and speed tap data, follow the steps below to change speeds.

1. Refer to **FIGURE 14** and locate the speed tap block on blower motor.
2. The yellow lead **MUST** always be connected to the speed tap block at the common quick connect terminal. The terminal is identified as **COM**. Also, this is the only lead which is  $\frac{3}{16}$ " wide. All other quick connects are  $\frac{1}{4}$ " wide.
3. If it has been determined that cooling and heating speeds are needed on the same speed tap, remove the red heating lead from the speed tap block and connect it to the insulated male terminal on the black cooling lead. Then place the insulated black female quick connect to the required speed tap.

## CONTINUOUS FAN OPERATION

An optional terminal may be provided on the electronic fan control located in the electrical control box for operation of the continuous fan option. This connection is intended for the low speed motor tap, and has a lower contact rating (8 amps) than the heat and cool taps. When the low speed blower lead is connected to this terminal, this will provide low speed blower operation whenever the other two speeds (**Heat** or **Cool**) are not energized.

Thoroughly check the system after modification to ensure the proper operation of the circulating air blower in all modes of operation.

## Separate Speed Selections for Heat, Cool and Continuous Fan

Connect low speed lead from circulating motor to the “**Cont**” terminal at the electronic fan control. The appropriate motor leads should already be connected to the “**Heat**” and “**Cool**” terminals.

**Note:** See next section “*Heating and Continuous Blower Speed the Same*” if low speed is required for heating to obtain desired temperature rise.

**Heating and Continuous Blower Speed the Same**

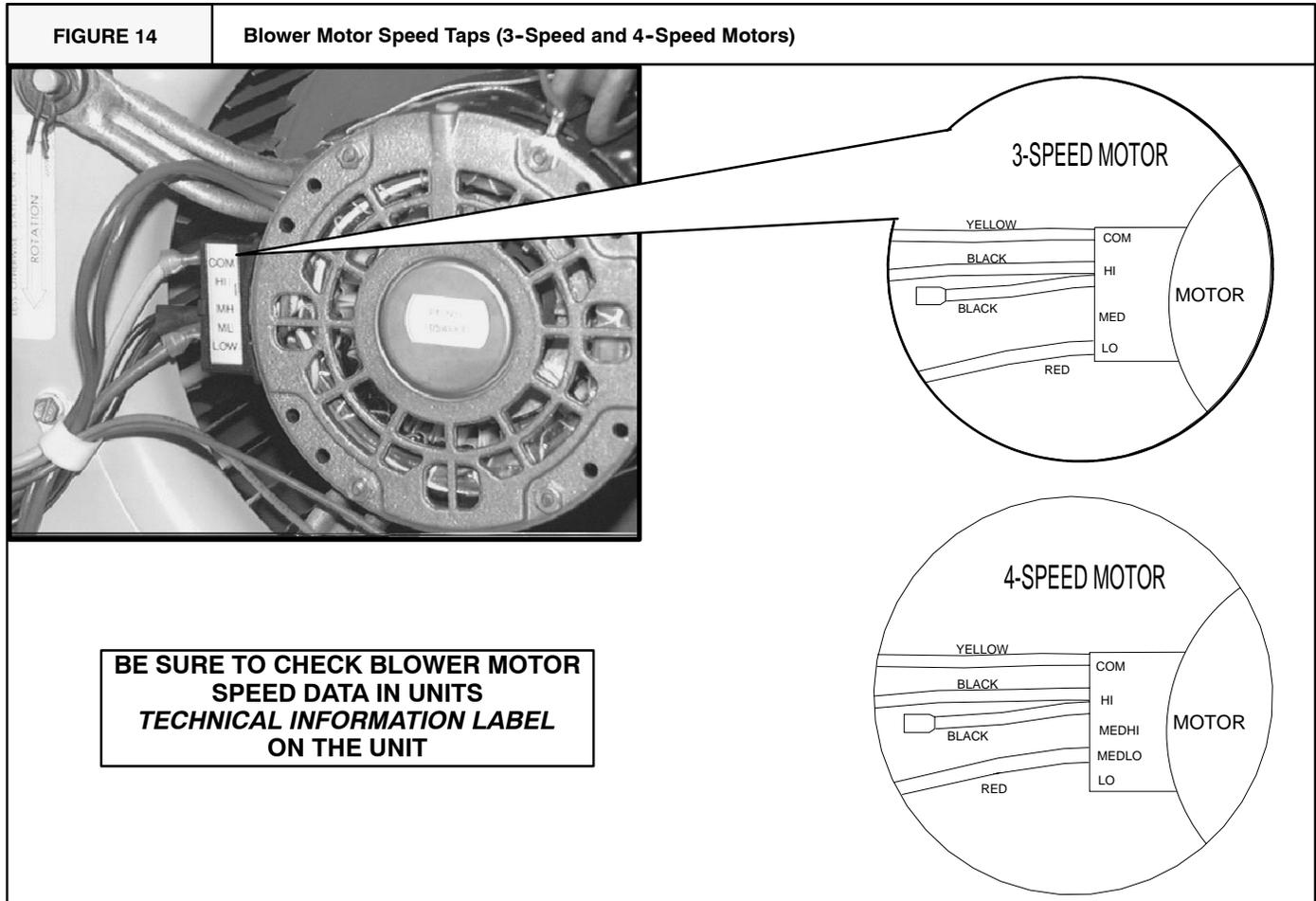
If it is necessary to operate the heating speed and continuous blower speed using the same blower speed, connect a jumper between the “Heat” and “Cont” terminals on the blower.

Note: There should be only **ONE** motor lead going to the “Heat” and “Cont” terminals.

**COOLING**

1. Turn electric power **OFF**
2. Set thermostat Heat-Cool select to **COOL**.
3. Adjust thermostat setting to below room temperature.

4. Turn power **ON**, for approximately one minute, then **OFF**. During power application check the following:
  - a. Contactor – Contacts Closing
  - b. Compressor – **ON**
  - c. Condenser fan motor – **ON**
  - d. Circulating Air Blower – **ON** after a 30 second delay
5. Turn power **OFF**, check the following:
  - a. Contactor contacts opening.
  - b. Compressor – **OFF**
  - c. Condenser fan motor – **OFF**
  - d. Circulating blower – **OFF** after a 30 second delay.



**10. OPERATION**

**⚠ WARNING**  
**ELECTRICAL SHOCK HAZARD.**

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

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

**COMBUSTION/INDOOR FAN CONTROL**

All functions of the combustion and indoor blower are controlled by the fan control module.

**On a call for heat:**

The fan control energizes the combustion blower. Once the combustion air proving switch closes, the ignition sequence begins. The fan control will sense when the main operator of gas valve has been energized thereby firing the burners and starting the “delay on” timing sequence of the indoor blower.

**NOTE:** If the control senses that one of the safety limits has opened, the combustion and indoor fans will operate until the limit resets.

**On a call for cooling:**

The fan control delays the start of the indoor blower for 30 sec-

onds. Once the thermostat is satisfied, the fan control will operate the blower for 30 additional seconds.

### SCROLL ANTI-CYCLE TIMER

Single phase scroll compressor equipped units are equipped with an anti-cycle device which delays start of the compressor in the event of a power interruption. This feature is to allow pressure equalization throughout the system and to prevent possible reverse rotation of the scroll compressor.

## 11. MAINTENANCE

### MONTHLY MAINTENANCE AND INSPECTION CHECKS

#### Air Filters

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. Replace filters with the arrows on the side pointing in the direction of air flow. Dirty filters are the most common cause of inadequate heating or cooling performance, and of compressor failures.

<p><b>⚠ CAUTION</b></p> <p><b>RISK OF REDUCED EQUIPMENT LIFE</b></p> <p>Failure to follow these Caution will result in premature furnace component failure.</p> <p>Use of excessively dirty and/or restrictive air filters may increase furnace operating temperatures and shorten the life of the furnace.</p>
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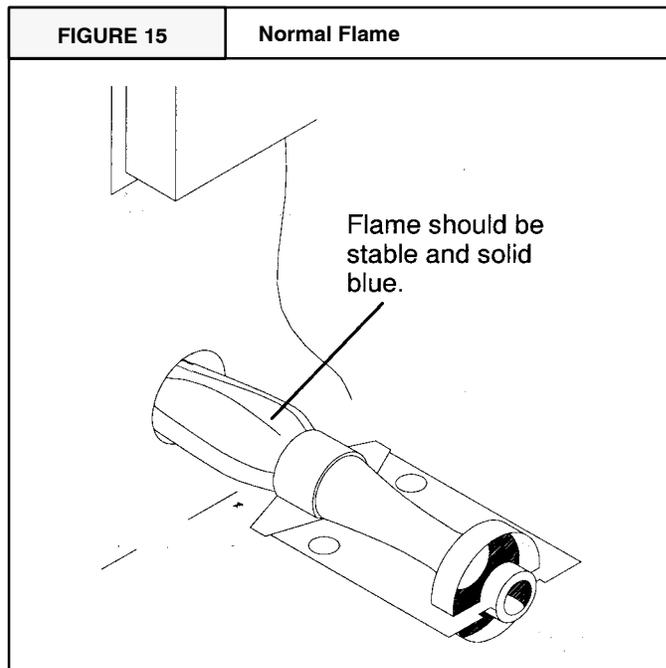
### HEATING SEASON CHECKS (MONTHLY)

#### Pilot Flame

While the main burner is on, the flame should envelop the upper part of the flame sensor.

#### Main Burner Flame

Flames should be stable and solid blue, (dust may cause orange tips or they may have wisps of yellow, but they **MUST** not have solid yellow tips). They should extend directly into the heat exchanger tubes. Main burner flame should be inspected monthly.



Using a light and mirror (as required) inspect the inside of the vent hood and the inlet air opening in the burner compartment. Look for soot and severe rust or corrosion and any obstructions due to leaves, spiderwebs, etc. Clean as required.

### COOLING SEASON CHECKS (MONTHLY)

#### Condenser Coil

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

#### Condensate Drain

Check for condensate drainage. Clean as required.

**NOTE:** When unit is operating in cooling mode under high humidity ambient conditions, condensate can form in the burner compartment and may drip from the front of the compartment. This condition is **NOT** harmful to the unit.

### ANNUAL MAINTENANCE AND INSPECTION

<p><b>⚠ WARNING</b></p> <p><b>ELECTRICAL SHOCK HAZARD.</b></p> <p>Failure to follow this warning could result in personal injury, and/or death.</p> <p>Turn off electric power supply at disconnect switch or service panel before removing any access or service panel from unit.</p>
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The annual inspection should include lubrication and cleaning as required to ensure efficient operation of the unit. To simplify access, remove all access panels and the top from the unit if possible .

## Condenser Fan Motor

Oil the condenser fan motor after five years of operation and every five years thereafter.

### VENT ASSEMBLY

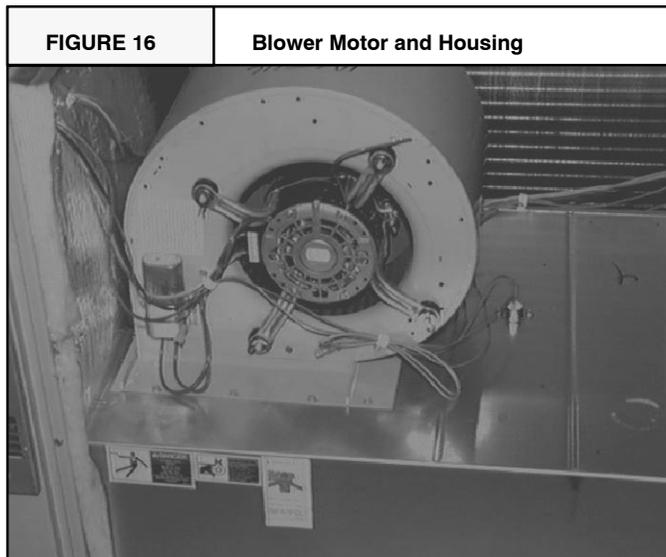
<p><b>⚠ WARNING</b></p> <p><b>BURN HAZARD.</b></p> <p>Failure to follow this warning could result in personal injury.</p> <p>Flue cover may be hot! Allow adequate time for flue cover to cool.</p>
---

Use SAE 10W30 motor oil. To oil, remove the hole plugs from the motor end bells and add several drops (approximately 1/2 teaspoonful) of oil with a squeeze type, flexible tube oiler. Replace hole plugs after oiling. Do not over oil.

Clean the surrounding area and the condenser and evaporator coils. Use caution to avoid damage to coil fins.

### BLOWER MOTOR ACCESS

Refer to **FIGURE 16** for a view of blower motor and compartment.



#### Method 1

This method allows you to work on the motor and housing while still in the unit. The blower motor can be replaced with this method, but some may prefer to work on the housing assembly separately. If this is your preference, use method 2.

1. Remove the blower access panel
2. Remove the four screws securing the blower motor housing. If unit has a support bracket, remove the two screws securing the bracket.
3. Remove the two red wires attached to the limit switch.
4. Slide entire housing toward you. This will allow easier access to the speed tap block, motor, and wires.
5. After access, replace all wires, screws, and connections.

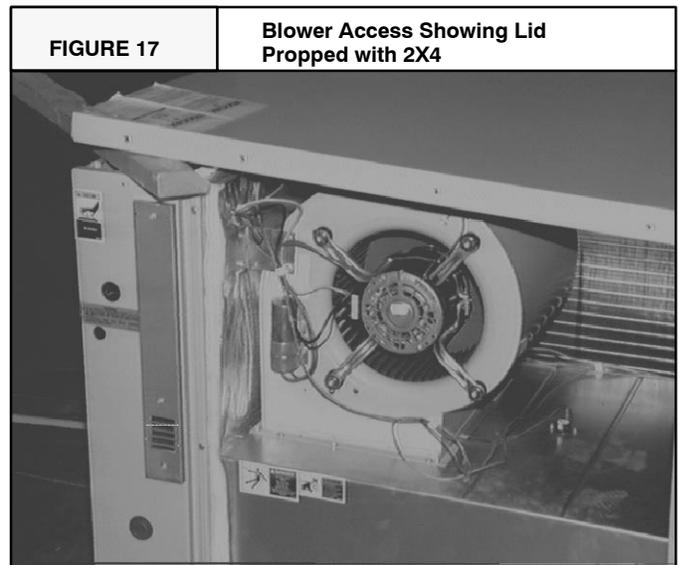
#### Motor removal and replacement

The blower motor may be replaced while accessing it using method 1. To replace motor, reach behind blower housing and locate blower wheel set nut. Loosen set nut, all wires from motor, and four pins on mounting cradle. Pull motor towards you. To replace motor, reverse this procedure.

#### Method 2

This method is required to replace or repair blower wheel, blower housing, or any unreachable components behind blower assembly.

1. Repeat steps 1 through 4 in method 1.
2. Remove all screws around rim of unit top, (except screws which are inaccessible because of proximity to structure).
3. Raise unit top at corner of unit closest to blower at least 2" and place a sturdy brace at least 2" thick between top and unit corner. See **FIGURE 17**. A 2X4 piece of wood is ideal for this.
4. Disconnect all wires from housing and slide housing out of unit. Reverse this process to reinstall.



#### 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 easily remove, it will be necessary to remove the blower assembly.

Oil blower motor by adding 1/2 teaspoonful (1 cc) of SAE 10W30 to each motor bearing. The blower motor should be oiled after five years of operation and every five years after.

<p><b>⚠ CAUTION</b></p> <p><b>RISK OF REDUCED COMPONENT LIFE</b></p> <p>Failure to follow these Caution could result in premature component failure.</p> <p>Do not use 3 in 1 oil, penetrating oil, WD40 or similar oils to oil motor bearings.</p>
---

#### Burners / Heat Exchangers / Flue Gas Passages

To inspect the burners, heat exchanger and interior flue gas passages, use a light and small mirror on an extension handle.

Check the exterior of the heat exchanger and the interior flue gas passages for any evidence of deterioration due to corrosion, cracking or other causes. If signs of scaling or sooting exist, remove the burners and clean the heat exchanger, as required.

## INSPECTION AND CLEANING OF BURNER ASSEMBLY/HEAT EXCHANGERS/FLUE GAS PASSAGES

### For Qualified Service Technician Only

See **FIGURE 18**, **FIGURE 19** and **FIGURE 20** for identification of parts.

1. Disconnect electrical power to unit.
2. Turn **OFF** gas at manual shut off valve.
3. Remove burner access panel.
4. Remove the vent assembly flue cover.
5. Disconnect gas pipe at union.
6. Disconnect wires from gas valve, note connections.
7. Remove screws that secure the flame shield and remove gas control valve, manifold and burners as an assembly.
8. Remove collector box, injector plate, and restrictor plate, including gaskets. See **FIGURE 19**.
9. Hold the burner assembly vertically and lightly tap it against a wood block. Clean also with a stiff brush. Severe cases of lint clogging may require washing the burners in hot water.
10. Remove turbulators and clean with small brush. Reinspect after cleaning and replace turbulators if defective.
11. Clean flue gas passages by using small brushes and a vacuum cleaner. It may be necessary to fabricate handle extensions for the brushes to reach the areas that require cleaning. Reinspect after cleaning and replace the heat exchanger if defective.
12. Reinstall parts and gaskets in reverse order. On spark to pilot models check the spark gap.  $\frac{1}{8}$  inch is required between the igniter and pilot hood.
13. Turn gas on and check for leaks.
14. Install all access panels, turn power on and check for normal operation.

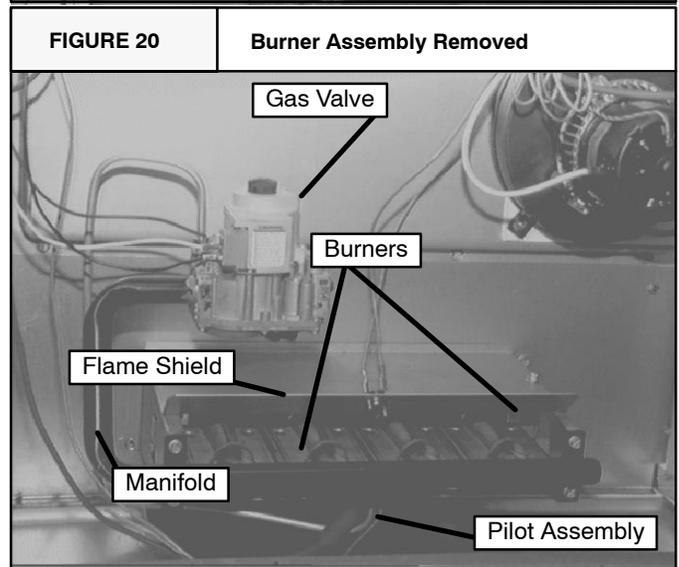
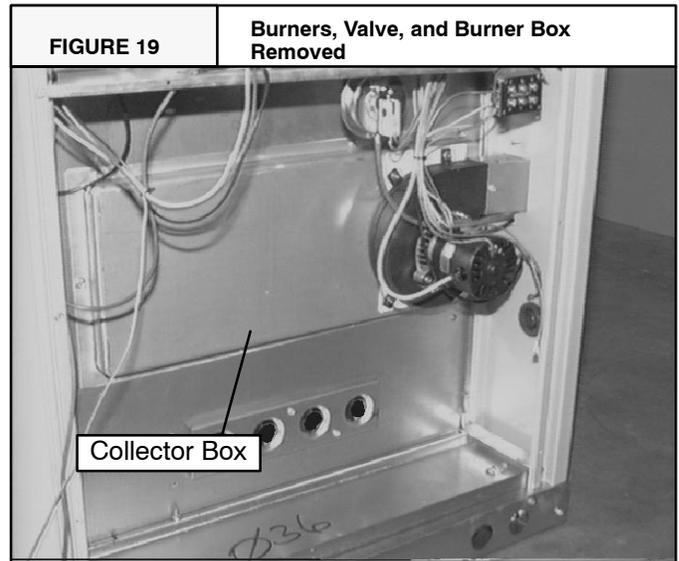
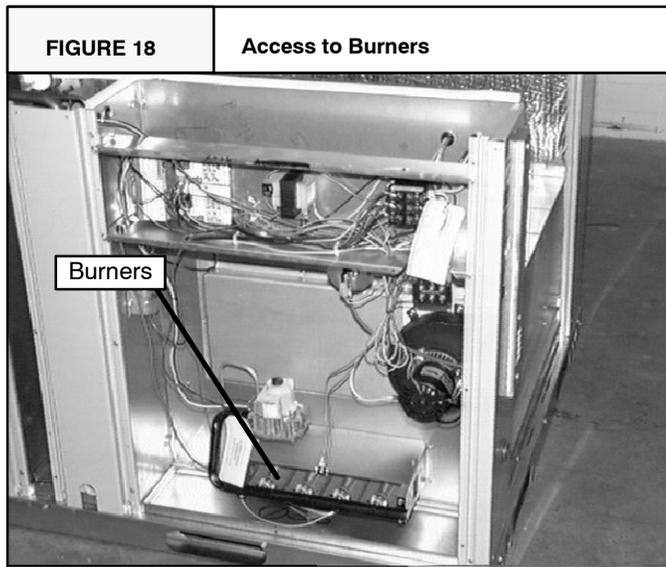


FIGURE 21

Rigging Instructions

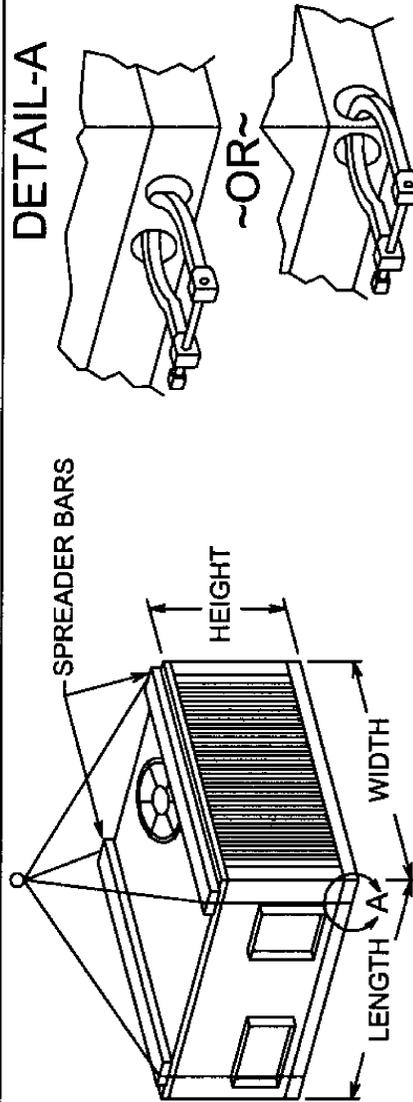
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**RIGGING INSTRUCTIONS**

**FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN PROPERTY DAMAGE, BODILY INJURY OR DEATH.**

**⚠ WARNING**

- ALL PANELS MUST BE IN PLACE WHEN RIGGING AND LIFTING.
- HOOK RIGGING SHACKLES THROUGH HOLES IN BASE RAIL, AS SHOWN IN DETAIL-A.
- USE SPREADER BARS, WHEN RIGGING, TO PREVENT UNIT DAMAGE.
- BE SURE RIGGING AND SHACKLES ARE SUFFICIENT TO HANDLE WEIGHT LISTED BELOW.



CABINET	MAX. LENGTH		MAX. WIDTH		MAX. HEIGHT		MAX. WEIGHT	
	IN	MM	IN	MM	IN	MM	LB	KG
SMALL	52.00	1219	48.00	1219	38.00	965	500	227
LARGE	73.00	1854	48.00	1219	38.00	965	900	409

