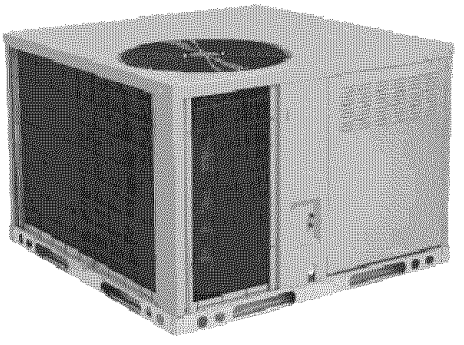
Installation Instructions

PDX3 Series

PACKAGED DUAL FUEL UNITS



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ARI PERFORMANCE CERTIFIED
ARI Standard 210/240
Unitary Heat Pumps

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EFFICIENCY RATING CERTIFIED
Gama

International Comfort Products, LLC
Lewisburg, TN. 37091

518 01 1601 00 2-22-06

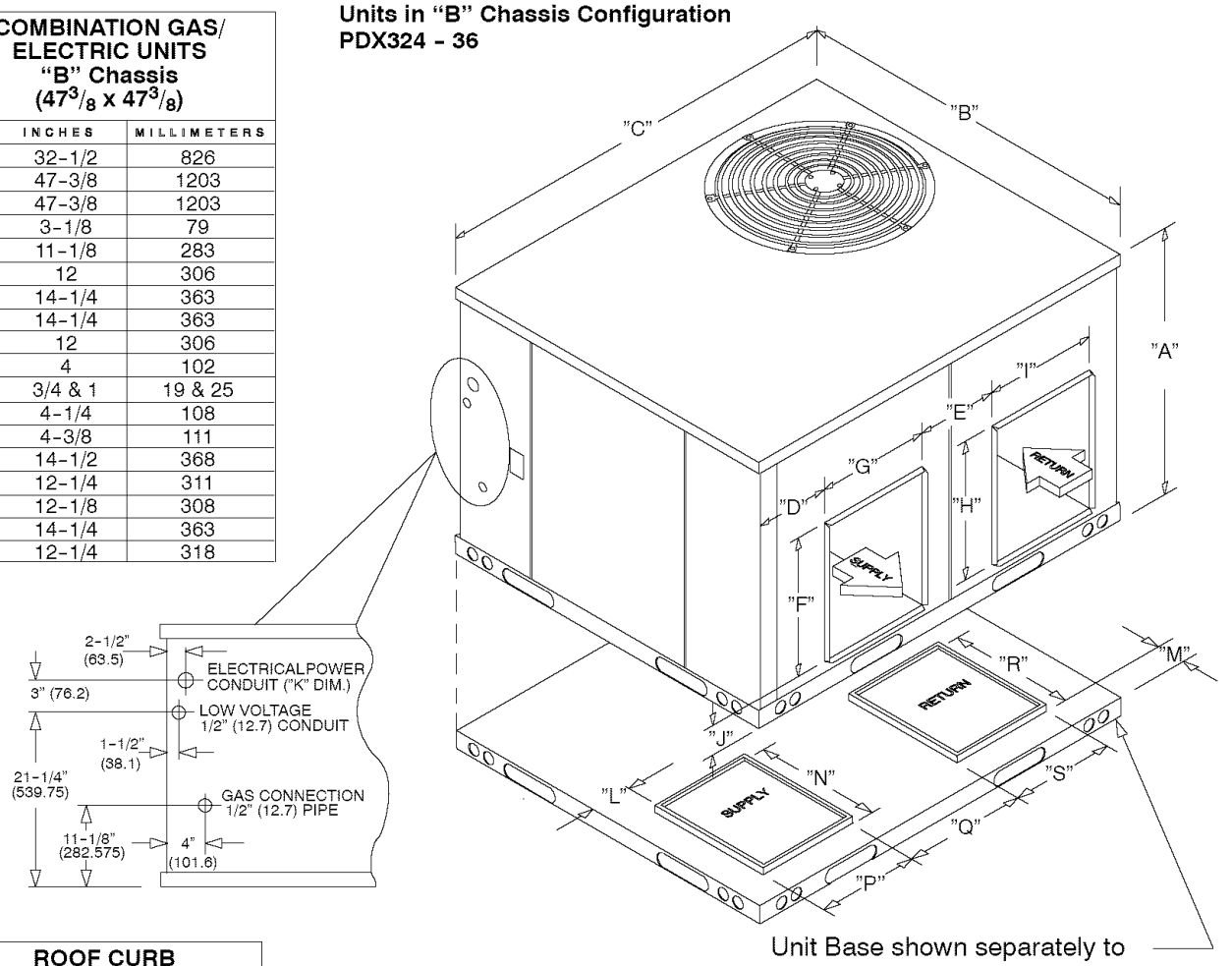
Printed in U.S.A.
Code: PDX3

1. Unit Dimensions

"B" CHASSIS UNIT DIMENSIONS

COMBINATION GAS/ ELECTRIC UNITS "B" Chassis ($47^3/_8$ x $47^3/_8$)		
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

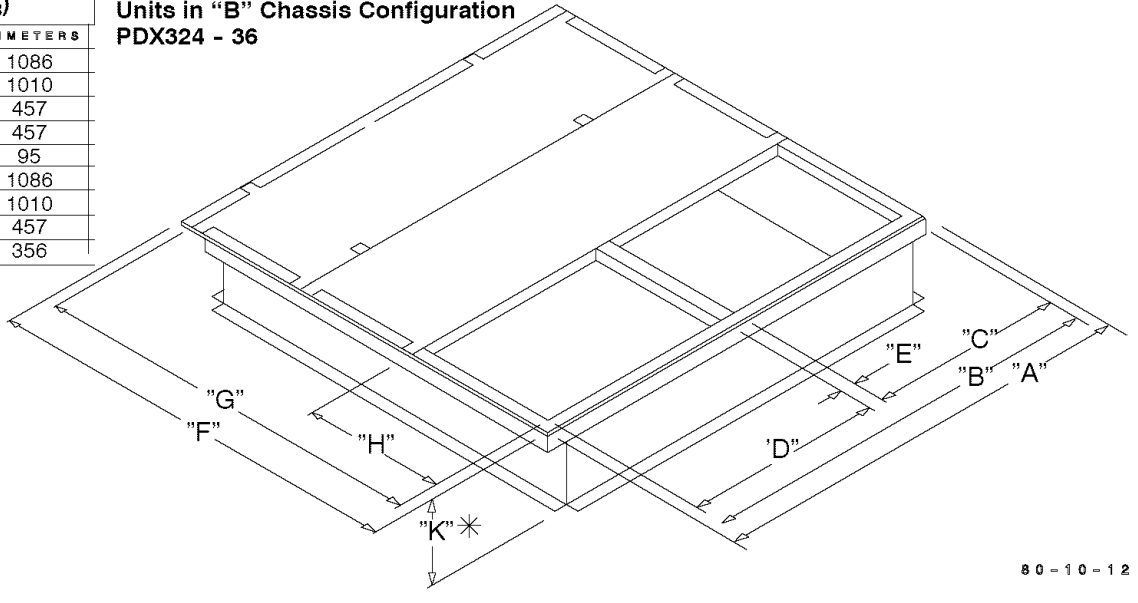
Units in "B" Chassis Configuration
PDX324 - 36



Unit Base shown separately to illustrate bottom of duct openings.

ROOF CURB for units in "B" Chassis ($47^3/_8$ x $47^3/_8$)		
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

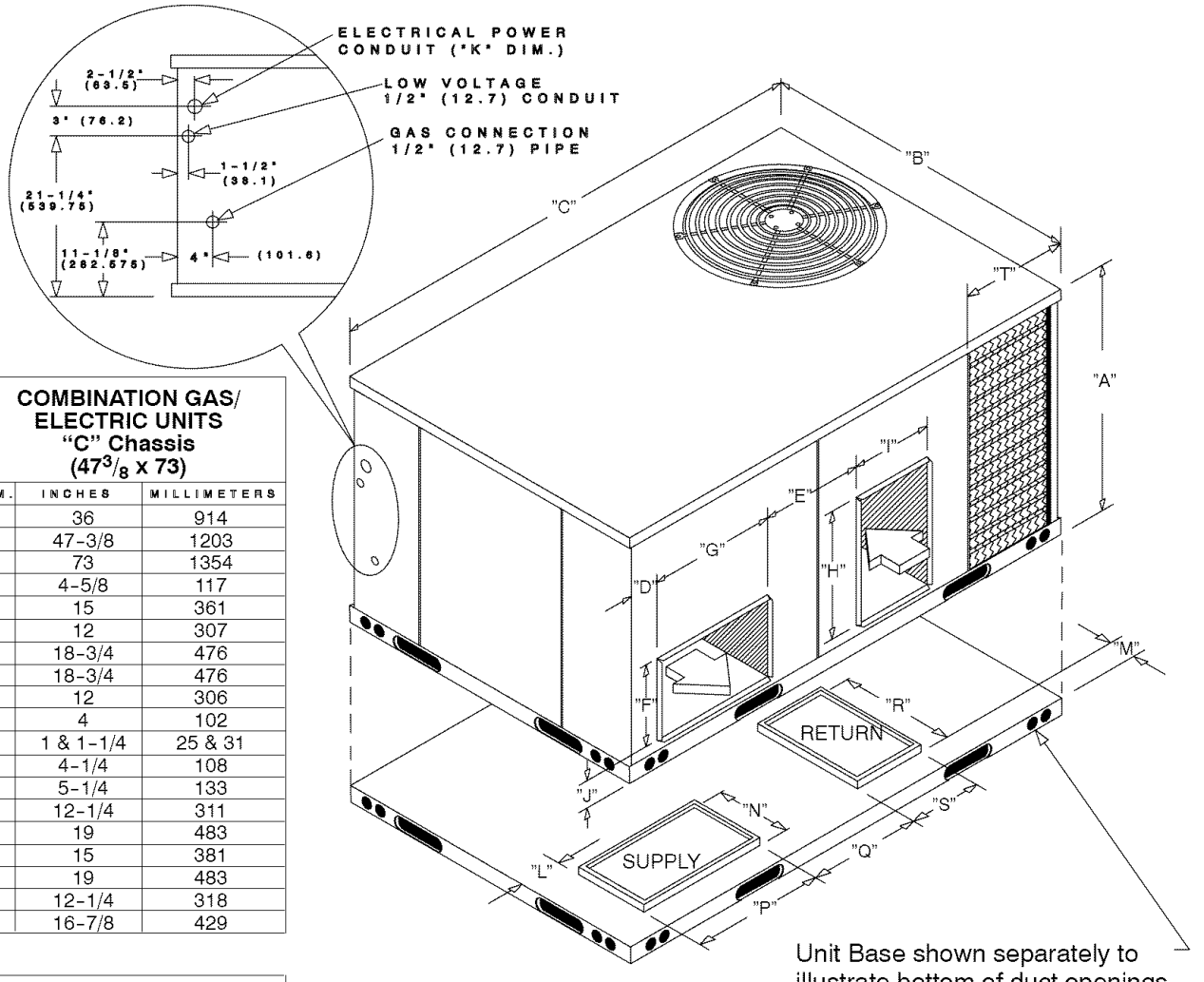
Units in "B" Chassis Configuration
PDX324 - 36



80-10-12

* Roof curbs are also available in 8" (203) and 24" (610) heights (K Dimensions).

"C" CHASSIS UNIT DIMENSIONS



Unit Base shown separately to illustrate bottom of duct openings.

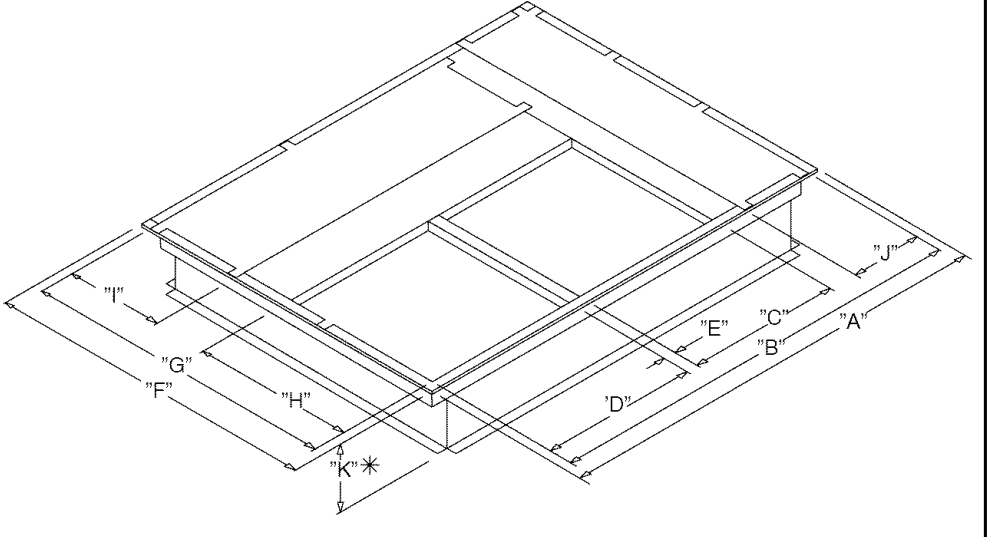
COMBINATION GAS/ ELECTRIC UNITS "C" Chassis ($47^3/_8$ x 73)

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 ($47^3/_8$ 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 PDX342-60



* Roof curbs are also available in 8" (203) and 24" (610) heights (K Dimensions).

2. SAFE INSTALLATION REQUIREMENTS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags, and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

⚠ WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISON HAZARD

Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, fire, or an explosion which could result in personal injury or unit damage. Consult a qualified installer, service agency, or gas supplier for information or assistance. The qualified installer or agency must use only factory-authorized kits or accessories when modifying this product.

⚠ WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISON HAZARD

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

Before performing service or maintenance operations on unit, turn off gas supply to unit. *Then* turn off unit main power switch and install lockout tag.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words **DANGER**, **WARNING**, **CAUTION**, and **NOTE**. These words are used with the safety-alert symbol. **DANGER** identifies the most serious hazards which **will** result in serious injury or death. **WARNING** signifies a hazard which **could** result in serious injury or death. **CAUTION** is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. **NOTE** is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

These instructions cover minimum requirements and conform to existing national standards and safety codes. In some instances, these instructions exceed certain local codes and ordinances, especially those that may not have kept up with changing residential construction practices. We require these instructions as a minimum for a safe installation.

⚠ WARNING

FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISON HAZARD

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

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 National Fuel Gas Code NFPA 54-2005/ANSI Z223.1-2005 and the National Electrical Code NFPA70-2005 or in Canada the National Standard CAN/CGA B149-1 and CSA C.22.1 - Canadian Electrical Code Part 1.

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.

SAFETY CONSIDERATIONS

- Use only with type of gas approved for this unit. Refer to unit rating plate.
- Install this unit only in a location and position as specified in section 3 of this manual.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections.
- Always install unit to operate within the unit's intended temperature-rise range with a duct system, which has an external static pressure within the allowable range, as specified in section 9. Refer to unit rating plate for the allowable external static pressures.
- All connecting ductwork to the unit (supply and return) must be sealed to the unit casing.
- Do **NOT** use this furnace as a construction heater.
- Check to see that filters are installed correctly and are the proper type an 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.

⚠ CAUTION

UNIT RELIABILITY HAZARD

Failure to follow this caution may reduce unit reliability.

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.

INTRODUCTION

The PDX3 unit is a fully self-contained, combination Category I gas heating / electric heat pump unit designed for outdoor installation (See pages 2 and 3 for unit dimensions). All unit sizes have return and discharge openings for both horizontal and downflow configurations, and are factory-shipped with all downflow duct openings covered.

Units may be installed either on a rooftop, cement slab, or directly on the ground if local codes permit.

Models with a "1" in the twelfth position of the model number are dedicated Low NOx units designed for California installations. The emissions of these models do not exceed 40 nanograms of nitrogen oxide emissions per joule of heat output as shipped from the factory, and must be installed in California Air Quality Management Districts or any other regions in North America where a Low NOx rule exists.

3. 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 follow this warning could result in personal 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 available filter racks (3-1/2 to 5 ton), need a 26" minimum clearance at side 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.

⚠ CAUTION

UNIT DAMAGE HAZARD

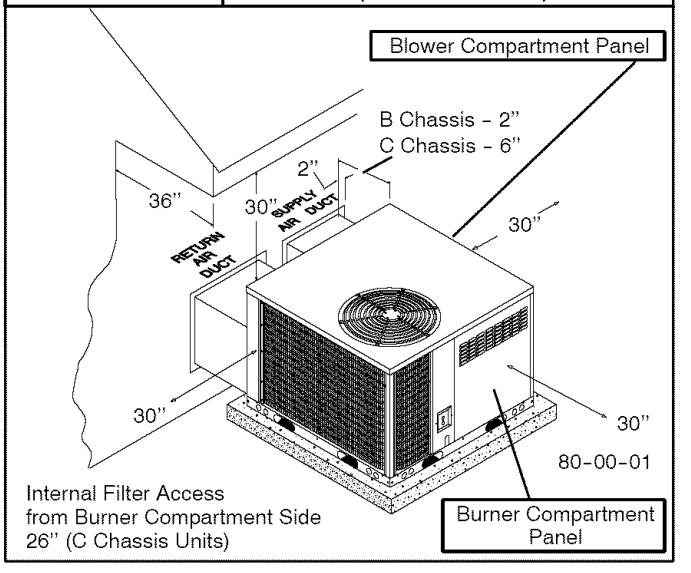
Failure to follow this caution may result in shorten life of unit components.

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"
Condenser Inlet	30"
Blower Service (Side)	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"

FIGURE 1 Minimum Clearances and Access Panels (B Chassis Shown)



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 $^1/_8$" 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 the last page 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 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 10** on the back cover of this manual for illustrated rigging instructions and weight chart.

DOWNFLOW CONVERSION

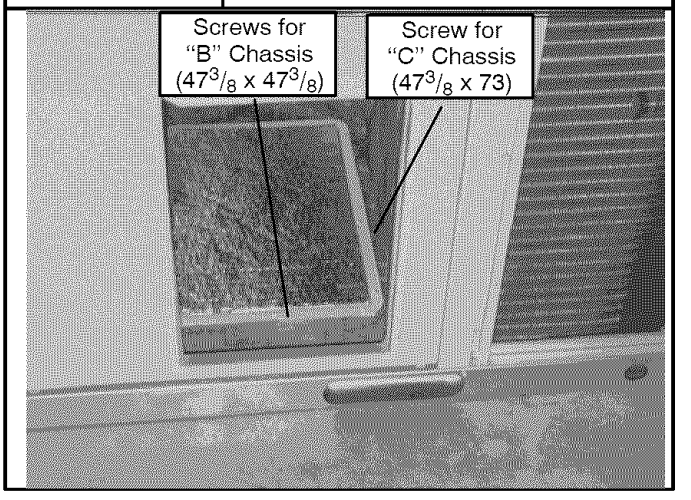
NOTE: *In downflow applications with roof curbs or jack stands, the center rail under the unit must be removed. The center rail is attached to the base rail with screws.*

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.

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.

FIGURE 2 Heating Vent Assembly

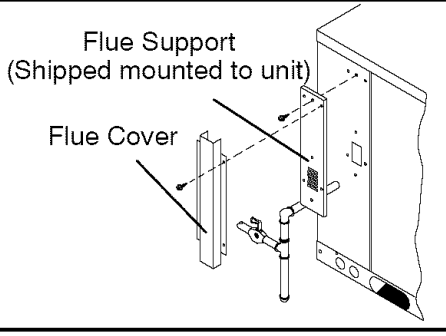


2. Install the removed plates on the horizontal return and supply air openings.
3. Install roof curb on the building. Be sure to follow all directions included with curb and all applicable building codes in your installation. See page 2 or 3 for appropriate roof curb to use.

Heating Vent Assembly

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

FIGURE 3 Heating Vent Assembly



⚠ CAUTION

UNIT DAMAGE

Failure to follow this caution may result in unit damage.

Do not operate the unit without the vent assembly installed.

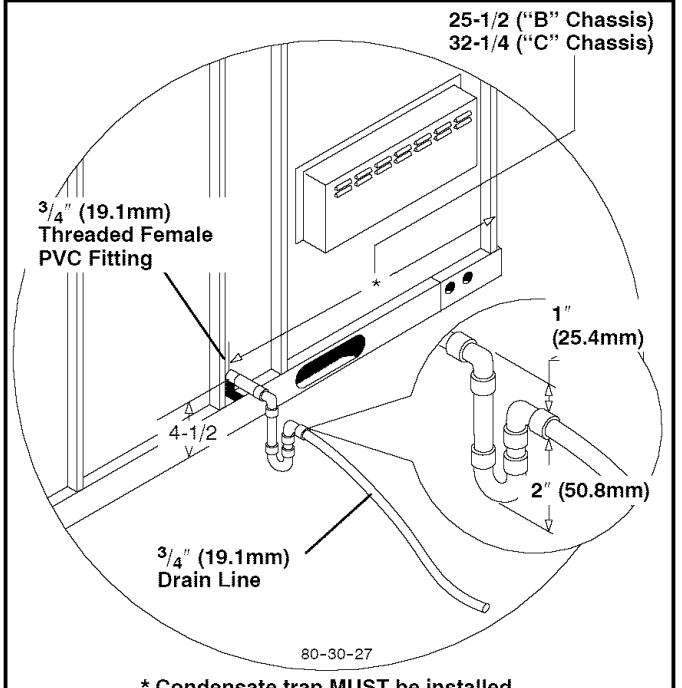
Condensate Drain

The condensate drain outlet is a $^3/_4$" (19.1mm) female PVC connection located at the bottom of the unit to the right of the filter access panel (see **FIGURE 4**).

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 $^3/_4$" (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.

FIGURE 4 — **Condensate Drain Information***



* Condensate trap MUST be installed.

4. PRE-EXISTING COMMON VENT CHECK

If the installation of this new combination gas heat/electric cool unit involves removing an existing gas-fired furnace from a common vent system with other gas-fired appliances (gas-fired hot water heater, etc.), the existing vent system must be checked and inspected by a qualified technician. The qualified technician can determine if the existing vent system will properly vent the flue products of the remaining gas-fired appliances. In many cases, the existing vent system may be oversized for the remaining appliances.

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

⚠ WARNING

FIRE OR EXPLOSION HAZARD

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

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.

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 NFPA 54-2005/ANSI Z223.1-2005 or in Canada the National Standard CAN/CGA B149-1 or current editions.

FIGURE 5 — **Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe (English)**

NATURAL GAS					
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

LP GAS					
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

FIGURE 6	Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe (Metric)				
NATURAL GAS					
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
LP GAS					
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 flexible 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. Do not use a connector which has previously serviced another gas appliance. Always use a new listed connector.

⚠ WARNING

FIRE OR EXPLOSION HAZARD

Failure to do so could result in personal injury, death and/or property damage.

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

4. 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.
5. 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.

⚠ CAUTION

UNIT OPERATION AND COMPONENT DAMAGE HAZARD

Failure to follow this caution may result in misaligned burners, flame rollout and or unit damage.

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

6. 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.
7. 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.
8. Install a manual shutoff valve and tighten all joints securely.

LEAK CHECK /PRESSURE TESTING OF GAS SUPPLY PIPING

⚠ WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warnings could result in personal injury, death or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections.

The unit and its equipment shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of .5 psi (3.5kPa).

The unit must be isolated from the gas supply piping system by closing the equipment shut off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than .5 psi (3.5 kPa).

ORIFICES

Orifice Sizes

Orifice sizes **MUST** be matched to the heating value of the gas (see **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.

NOTE: For elevations above 2000 feet (610 meters), the Btu input rating **MUST** be reduced by 4% for each 1000 feet (305 meters) above sea level, unless the gas supplier's Btu/ft^3 content has already been adjusted for altitude. Check **Table 1 & 2** for the proper orifice sizes.

TABLE 1 & 2: Equivalent Orifice Sizes at High Altitudes

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
Nominal Heating Size	Orifice Drill #	Kit Number	Orifice Drill #	Orifice Drill #	Orifice Drill #	Orifice Drill #	Orifice Drill #	Orifice Drill #	Orifice Drill #
All Sizes	44	1173863	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, use part number 330732-401, 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/ft^3., and 3.5" W.C. manifold pressure. For fuels with different specific gravity, consult the National Fuel Gas Code NFPA 54-2005/ANSI Z223.1-2005 or National Standard of Canada, Natural Gas and Propane Installation Code CSA B149.1-05.

Table 2	LP GAS ORIFICE SIZING									
	MEAN ELEVATION FEET ABOVE SEA LEVEL									
	0 to 2000		2001 to 4000		4001 to 7000		7001 to 9000		9001 to 10,000	
Nominal Heating Size	Orifice Drill #	Kit Number	Orifice Drill #	Kit Number	Orifice Drill #	Kit Number	Orifice Drill #	Kit Number	Orifice Drill #	Kit Number
All Sizes	55	1173857	55	1173857	56	1173859	56	1173859	57	1173861

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/ft^3., and 10.0" W.C. manifold pressure. For fuels with different specific gravity, consult the National Fuel Gas Code NFPA 54-2005/ANSI Z223.1-2005 or National Standard of Canada, Natural Gas and Propane Installation Code CSA B149.1-05.

Changing Orifices

⚠ WARNING

ELECTRICAL SHOCK, FIRE AND/OR EXPLOSION HAZARD

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

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.

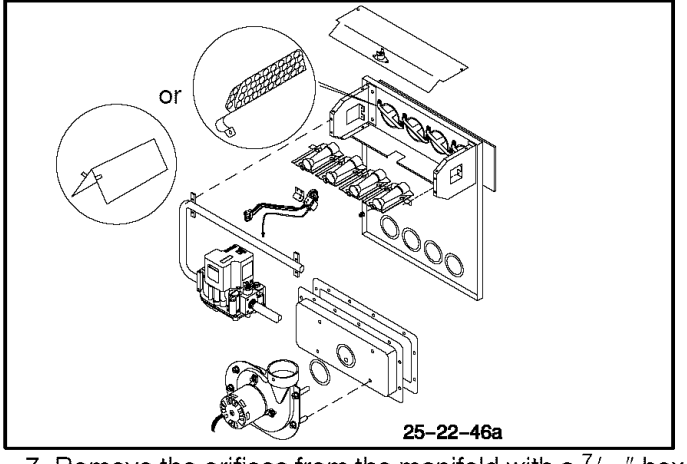
1. Shut **OFF** gas at manual shut off valve.
2. Shut **OFF** electric power at unit disconnect or service panel. If unit is still running, allow 3 minutes after gas shut off before turning off power.
3. Disconnect the wires from the gas valve, sparker, and flame sensor.
4. Remove the four screws holding the manifold to the manifold brackets.
5. Carefully remove the manifold with the gas valve attached.
6. If unit has v-shaped NOx baffles installed in the firing tubes, they must be removed when converting to LP. Some baffles may be attached by screws. Replace screws after removing NOx baffles (**figure 7).**

⚠ WARNING

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

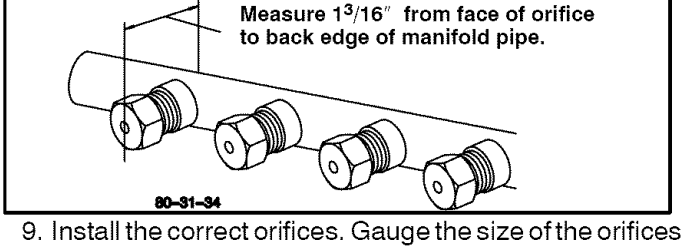
NOx baffles for use with Natural Gas units ONLY. If LP Gas is required, NOx inserts must be removed.

FIGURE 7 Removing NOx Baffles



7. Remove the orifices from the manifold with a $^7/_{16}$" box end or socket wrench.
8. Check to be sure that the size of each orifice is correct for the Btu input desired.

FIGURE 8 Manifold/Orifice Measurement



9. 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°) to the manifold pipe.
   Tighten the orifices so that there is a $1^3/_{16}$" 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.
10. Reassemble in reverse order.

6. ELECTRICAL WIRING

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

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

The unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of serious injury if an electrical fault should occur. This ground may consist of an electrical wire connected to the unit ground lug in the control compartment, or conduit approved for electrical ground when installed in accordance with National Electric Code (NEC) NFPA 70, National Fuel Gas Code NFPA 54-2005/ANSI Z223.1-2005 and local electrical codes. In Canada, follow Canadian Electrical Code CSA (Canadian Standards Association) C22.1 and local electrical codes.

⚠ CAUTION

REDUCED EQUIPMENT LIFE HAZARD

Failure to follow these cautions could result in damage to the unit being installed.

1) Make all electrical connections in accordance with National Electric code (NEC) NFPA 70, National Fuel Gas Code NFPA 54-2005/ANSI Z223.1-2005 and local electrical codes governing such wiring. In Canada, all electrical connections must be in accordance with CSA standard C22.1, Canadian Electrical Code Part 1, and applicable local codes. Refer to unit wiring diagram.
2) Use only copper conductor for connections between field-supplied electrical disconnect switch and unit. DO NOT USE ALUMINUM WIRE.
3) Be sure that high-voltage power to unit is within operating voltage range indicated on unit rating plate.
4) Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc. Consult local power company for correction of improper voltage and/or phase imbalance.

For access, remove the burner access panel. See **Figure 1** for access panel location. Wiring **MUST** be protected from possible mechanical damage.

Disconnect Switch

The unit must have separate electrical service with a field-supplied, waterproof, disconnect switch mounted at, or within sight from, the unit. Refer to the unit rating plate for maximum fuse/circuit breaker size and minimum circuit amps (ampacity) for wire sizing.

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 area 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 Voltage Wiring

Connections for line voltage are made in the unit control box area. Refer to wiring diagram located on the Burner Access panel. For access, remove the burner access panel.

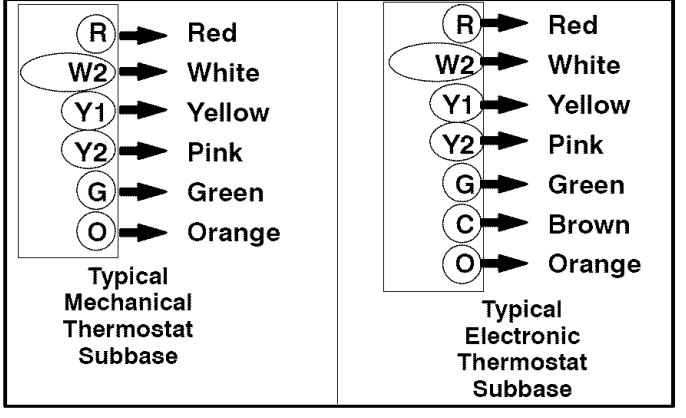
1. Run the high voltage (L1, L2) and ground leads into the control box.
2. Connect ground lead to chassis ground connection.
3. Connect L1 to pressure lug connection 11 of the compressor contactor.
4. Connect L2 to pressure lug connection 23 of the compressor contactor.

Thermostat / Low Voltage Wiring

Location of the thermostat has an important effect on home comfort. FOLLOW THE THERMOSTAT INSTRUCTION MANUAL FOR CORRECT LOCATION, MOUNTING, AND WIRING.

A two-stage dual fuel-compatible thermostat is required for proper operation. Thermostat should have the following terminals: "R", "W2", "Y1", "Y2", "G", and "O". Some electronic thermostats use low voltage from the unit for power for temperature display and programming. These electronic thermostats will have a "C" terminal. The outdoor unit has color-coded wires for easy connection. Using wire nuts, follow **figure 9** for proper connections:

FIGURE 9 Thermostat Connections



THERMOSTAT HEAT ANTICIPATOR

Some thermostats have an adjustable heat anticipator. The heat anticipator prevents temperature overshoot in heating mode. If the heat doesn't turn off until the set point temperature on the thermostat is exceeded, then the anticipator setting is too low. If the heat turns off before the thermostat reaches the set point temperature on the thermostat, then the anticipator setting is too high. Follow the thermostat instruction manual for proper adjustment of the heat anticipator.

BALANCE POINT TEMPERATURES

The dual fuel models require a dual fuel thermostat for proper operation. A dual fuel thermostat allows a balance point temperature to be programmed into the thermostat and has an outdoor temperature sensor that must be installed outside. Follow the thermostat installation instructions for proper location of outdoor sensor. The dual fuel unit operates either in heat pump mode or gas heat mode, but NEVER both modes at the same time.

There are 2 different balance point temperatures to consider when programming the thermostat: Economic and Load.

Economic Balance Point Temperature

The economic balance point temperature is the outdoor temperature where the utility cost of running in heat pump mode is the same as running in gas heat mode. If the outdoor temperature is above the economic balance point temperature, then the heat pump mode will be less costly. If the outdoor temperature is below the economic balance point temperature, then the gas heat mode will be less costly. The economic balance point temperature is affected by electrical utility cost, gas utility cost, and model size.

Knowing the utility cost of electricity and gas, the economic balance point temperature can be determined using **Figure 10.**

Figure 10 - Economic Balance Point Temperature Chart

Cost Ratio*	Economic Balance Point Temperature (°F)					
	PDX324 040	PDX330 060	PDX336 080	PDX342 080	PDX348 120	PDX360 120
0.075	0	0	0	0	0	2
0.100	18	18	17	18	17	21
0.125	38	29	32	37	29	33
0.1375	45	35	39	45	36	38
0.150	52	40	45	56	43	49

* Cost Ratio is the electrical cost, in $ per kilowatt-hour, divided by the gas cost, in $ per therm.

Example: A PDX342080 is installed in a residence where the electrical utility cost is 9 cents per kilowatt-hour and the gas cost is 90 cents per therm. Proceed as follows:

1. $.09/$.90 = .1
2. Using **Figure 10**, a PDX342080 with a .1 cost ratio => Economic Balance Point Temperature = 18°F

Some utilities have a sliding cost based on consumption. In this case, take the total bill and divide by the total consumption to determine the average utility cost.

Some natural gas suppliers sell gas by every 100 cubic feet (CCF) of gas. For an approximate gas cost per therm, multiply CCF by 97. Example: A price of $.01 per CCF is approximately equivalent to $.97 per therm.

> Note: The 97 multiplier is based on a typical heating value of 1030 Btu per cubic foot of natural gas. For a more accurate cost, contact your gas supplier to obtain the Btu content of natural gas in your area. Divide 100,000 by the actual Btu content per cubic foot to obtain the correct multiplier.

If the economic balance point is chosen, keep in mind that utility rates fluctuate substantially over time. Review monthly utility bills and re-calculate economic balance points as necessary.

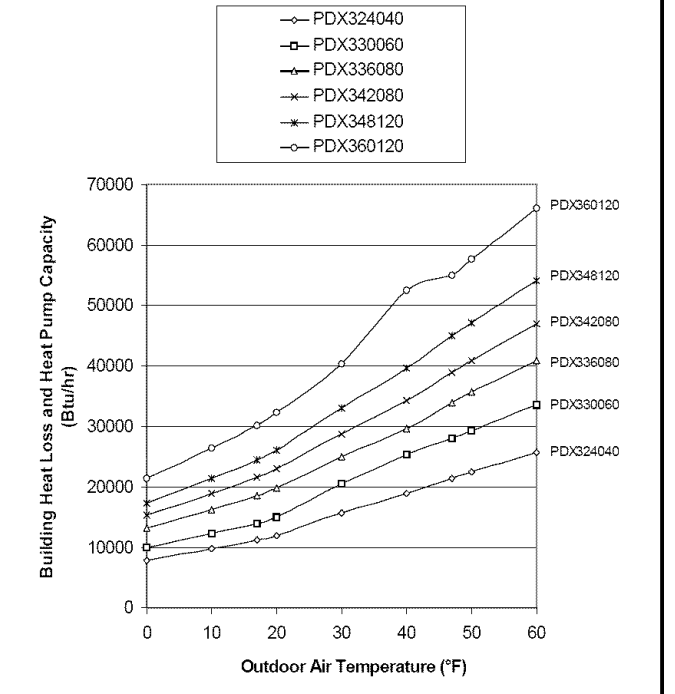
Load Balance Point Temperature

The load balance point temperature is the outdoor temperature at which the load may be met using either heat pump mode or gas heat mode. If the outdoor temperature is above the load balance point temperature, the demand for heat may be met using the heat pump mode. If the outdoor temperature is below the load balance point temperature, the gas heat mode is required to meet the building load.

To find the load balance point temperature, a load calculation must be performed on the building. The load calculation must be performed at 3 different outdoor temperatures and graphed on **Figure 11**. Plot the three load calculations at their appropriate outdoor temperatures and draw a smooth line through the 3 points. NOTE: The line connecting the 3 points may not be a straight line.

Locate where the building load line intersects the appropriate model capacity line. This is the load balance point temperature.

Figure 11 Load Balance Point Temperature



No matter what the balance point temperature is set at, the unit will automatically switch to gas heat if the heat pump is not able to meet the demand of the house. Calculating the load balance point temperature and programming it into the thermostat will minimize temperature fluctuations in the house.

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.

7. DUCTWORK

Ductwork Sizing

The maximum recommended velocity in trunk ducts is 1000 feet per minute. The maximum recommended velocity in branch ducts is 800 feet per minute.

Ductwork sizing affects the discharge temperature, airflow velocity, and efficiency of the system. Be sure to properly size ductwork to the capacity of the unit and to the airflow requirements of the conditioned space. Failure to properly size ductwork can result in inadequate airflow and poor efficiency. Undersized ductwork may result in tripped limit controls and premature failure of compressors, motors and other components.

Ductwork Insulation

Ductwork installed outdoors must have a minimum 2" thick fiberglass "wrap" insulation and a weatherproof vapor barrier installed around it. The insulation and vapor barrier must be protected against potential damage. Caulking, flashing, and other means of providing a permanent weather seal must be used.

Ductwork Connections

The use of flexible, non-combustible connectors between main trunk ducts and supply and return air plenums is permitted. If flexible connectors are used, they should be protected from potential mechanical damage such as punctures and tears.

NOTE: When connecting the supply and return plenums to the unit, make sure that the plenums are sealed against the side casing of the unit and do not interfere with removal of the top of the unit.

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 sizes are listed in **FIGURE 11** and are based on maximum face velocities of 300 ft/min for disposable filters and 600 ft/min for washable (high velocity) filters. See figure 10 for filter sizes.

⚠ CAUTION

REDUCED EQUIPMENT LIFE HAZARD

Failure to follow this caution may result in improper unit operation.

Do not operate the unit without a filter.

Figure 11 **Filter Sizes**

	Disposable Filters		Washable Filters[1]	
	Nominal Size (qty x w x d)	Minimum Area (sq. inches)	Nominal Size (qty x w x d)	Minimum Area (sq. inches)
PDX324040K****	1 x 20" x 20"	384	1 x 10" x 20"	192
PDX330060K****	1 x 20" x 24"	480	1 x 12" x 20"	240
PDX336080K****	2 x 15" x 20"	576	1 x 15" x 20"	288
PDX342080K****	2 x 18" x 20"	672	1 x 18" x 20"	336
PDX348120K****	2 x 20" x 24"	854	1 x 20" x 24"	427
PDX360120K****	2 x 20" x 24"	960	1 x 20" x 24"	480

[1] Washable filter size based on an allowable face velocity of 600 ft/min. Refer to filter manufacturer's specifications for allowable face velocity and required filter area.

8. AIRFLOW ADJUSTMENT

PDX3 SERIES HEATING CHART

					External Static Pressure (in H_2O)															
					.1"		.2"		.3"		.4"		.5"		.6"		.7"		.8"	
Model	Cooling Tons	Heating Input (Btu/hr)	Heating Rise Range (°F)	Speed Tap	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)	CFM	Heating Rise (°F)
PDX324040K****	2	40000	35 - 65	5	1251	NA	1218	NA	1194	NA	1170	NA	1139	NA	1100	NA	1063	NA	988	NA
				4	951	NA	914	NA	883	NA	858	35	811	37	775	38	733	40	697	43
				3	869	NA	842	35	809	37	768	39	736	40	684	43	650	46	599	49
				2	711	42	655	45	623	48	564	53	529	56	481	62	431	NA	392	NA
				1	661	45	478	62	334	NA	262	NA	219	NA	196	NA	NA	NA	NA	NA
PDX330060K****	2.5	60000	35 - 65	5	1255	35	1227	36	1201	37	1164	38	1138	39	1112	40	1077	41	1027	43
				4	1106	40	1080	41	1048	42	1017	44	992	45	954	47	924	48	881	50
				3	958	46	923	48	894	50	857	52	828	54	786	57	750	59	712	62
				2	789	56	747	59	714	62	668	NA	630	NA	582	NA	542	NA	495	NA
				1	754	59	708	63	671	NA	618	NA	584	NA	524	NA	494	NA	443	NA
PDX336080K****	3	80000	35 - 65	4	1630	36	1588	37	1526	39	1477	40	1415	42	1354	44	1287	46	1216	49
				3	1276	46	1242	48	1209	49	1179	50	1150	52	1117	53	1086	55	1045	57
				2	1026	58	994	60	949	62	913	65	871	NA	841	NA	793	NA	735	NA
				1	876	NA	841	NA	794	NA	756	NA	694	NA	651	NA	598	NA	543	NA
PDF342080K****	3.5	80000	35 - 65	5	1569	38	1537	39	1500	40	1463	41	1423	42	1389	43	1353	44	1317	45
				4	1481	40	1448	41	1412	42	1374	43	1336	44	1298	46	1263	47	1226	48
				3	1302	46	1260	47	1219	49	1179	50	1138	52	1103	54	1060	56	1015	58
				2	1170	51	1129	52	1088	54	1050	56	1007	59	963	62	912	65	866	NA
				1	1028	58	969	61	924	64	881	NA	838	NA	789	NA	731	NA	680	NA
PDX348120K****	4	120000	35 - 65	5	2103	42	2051	43	2001	44	1942	46	1878	47	1809	49	1723	52	1632	54
				4	1831	49	1797	49	1763	50	1732	51	1696	52	1661	54	1621	55	1559	57
				3	1680	53	1650	54	1614	55	1578	56	1544	58	1507	59	1470	60	1427	62
				2	1304	NA	1256	NA	1216	NA	1167	NA	1126	NA	1077	NA	1026	NA	979	NA
				1	1173	NA	1127	NA	1085	NA	1027	NA	983	NA	927	NA	881	NA	821	NA
PDX360120K****	5	120000	35 - 65	5	2188	41	2140	42	2096	42	2039	44	1974	45	1905	47	1827	49	1745	51
				4	2091	43	2056	43	2023	44	1987	45	1935	46	1878	47	1811	49	1729	51
				3	1839	48	1807	49	1772	50	1735	51	1702	52	1667	53	1629	55	1590	56
				2	1393	64	1356	NA	1313	NA	1280	NA	1226	NA	1184	NA	1130	NA	1086	NA
				1	1300	NA	1263	NA	1214	NA	1169	NA	1117	NA	1073	NA	1026	NA	975	NA

NA = Not Allowed for heating speed.

CIRCULATING AIR BLOWER SPEEDS

Figure 12 **Factory-Shipped Blower Tap Connections**

Factory-Shipped Blower Tap Connections						
Model	Cooling Tons	Heating Input (Btu/hr)	Heating Rise Range (°F)	Heating Speed Tap (Red)	High Stage Cooling Speed Tap (Black)	Low Stage Cooling Speed Tap (Violet)
PDX324040K****	2	40000	35 - 65	2	3	1
PDX330060K****	2.5	60000	35 - 65	5	4	1
PDX336080K****	3	80000	35 - 65	4	3	1
PDX342080K****	3.5	80000	35 - 65	5	4	2
PDX348120K****	4	120000	35 - 65	4	3	1
PDX360120K****	5	120000	35 - 65	3	4	2

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

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

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

Verify that the proper blower speeds for heating and cooling are selected on the blower motor by removing the blower access panel and inspecting the blower motor. The motor has up to 5 speeds numbered "1", "2", "3", "4", and "5". The wires for the speed selection are as follows:

Red ➡ Gas Heating

Black ➡ High Stage Cooling / High Stage Heat Pump Heating

Violet ➡ Low Stage Cooling / Low Stage Heat Pump Heating

Using the same speed for Gas Heating and Cooling.

If the same speed is required for gas heating and high stage cooling the following procedure must be used:

1. Set Red wire on proper speed selection on blower motor.
2. Remove Black wire from "HI" on Blower Interface Board. Tape end of Black lead using electrical tape.
3. Jumper the Red wire to both the "Heat" terminal and "HI" terminal on the Blower Interface Board.

If the same speed is required for gas heating and low stage cooling, the following procedure must be used:

1. Set Red wire on proper speed selection on blower motor.
2. Remove Violet wire from "LO" on Blower Interface Board. Tape end of Violet lead using electrical tape.
3. Jumper the Red wire to both the "Heat" terminal and the "LO" terminal on the Blower Interface Board.

CONTINUOUS FAN OPERATION

Continuous fan speed operates at the low stage cooling speed for all models.

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** 0 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 90 second delay on all models.

9. START-UP PROCEDURES

⚠ WARNING

FIRE OR EXPLOSION HAZARD

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

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

CHECK BEFORE STARTING

1. Check that the blower motor speed terminal block 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.

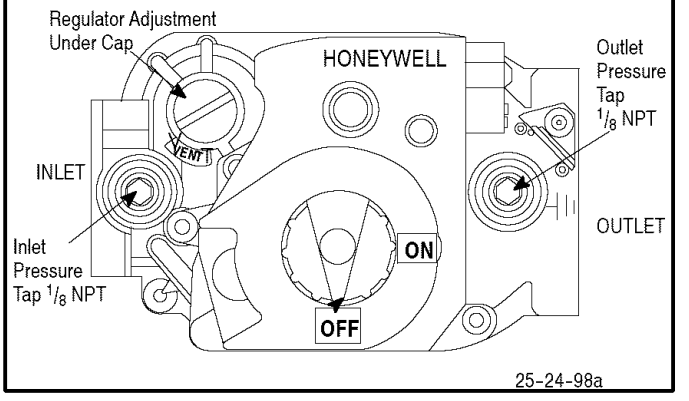
⚠ WARNING

FIRE OR EXPLOSION HAZARD.

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

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

Figure 13 Honeywell Gas Valve



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 14** 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 14**.

Figure 14 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 Pressure Adjustment

Manifold pressures are listed in **Figure 15**. Check manifold pressure using the following procedure.

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

Do NOT adjust manifold pressure more than + 0.3 inches water column to obtain rated input.

3. Set pressure to value shown in **Figure 14**, ± 0.3 inches water column (± 0.07kPa). Pressure is also listed on furnace rating plate. In **NO** case should final manifold pressure vary more than ± 0.3 inches water column (± 0.07kPa).

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**.

GAS HEATING START-UP PROCEDURE

1. Adjust thermostat setting above room temperature and set thermostat selector to **EMERGENCY OR AUXILIARY HEAT**. The combustion air blower should come **ON**.
2. The combustion air blower will run for 15 seconds to purge the combustion chamber.
3. After the 15 second purge, the combustion air blower will remain on. The sparker will turn on to ignite the gas. Make sure the gas valve is in the "ON" position. (Refer to Figure 14 and the instructions label located on Burner Access Panel of unit.

NOTE: On a call for heat the sparker will remain energized for 7 seconds or until a flame is detected by the flame sensor. It may take several ignition attempts to purge the air out of the gas lines at initial start-up of the unit.

4. 30 seconds after the burners light, the circulating blower will begin to run.

⚠ WARNING

FIRE AND/OR EXPLOSION HAZARD

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

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

GAS HEATING INPUT RATE CHECK

The gas input to the unit is determined by measuring the gas flow at the meter. Measuring gas flow at the meter is recommended for natural gas units. To measure the heating input, perform the following steps:

1. Turn off all other gas appliances that use the same meter.
2. Turn off gas supply to unit and attach manifold pressure gauge as instructed in the "Manifold Pressure Adjustment" section.
3. With gas **ON** to the unit and the unit operating, record the number of seconds for the gas meter dial to make one revolution.
4. Divide number of seconds in Step 3 into 3600 (number of seconds in 1 hour).
5. Multiply result of Step 4 by the number of cubic feet shown for one revolution of the meter dial to obtain the cubic feet of gas flow per hour.
6. Multiply result of Step 5 by Btu heating value of gas to obtain total measured input in Btu/hr. Compare this with the heating value shown in **figure 14**. Consult with local gas supplier if the heating value of gas is not known.

Example: Assume that the size of the meter dial is 1 ft^3, one revolution takes 44 seconds, and the heating value of the gas is 1020 Btu/ft^3. Proceed as follows:

1. 38 sec. To complete 1 revolution
2. 3600/38 = 94.7
3. 94.7 x 1 = 94.7
4. 94.7 x 1020 = 96,632 Btu/hr

For this example, the nameplate input is 100,000 Btu/hr, so only a minor change in manifold pressure is required. In no case should the final manifold pressure vary more than ± 0.3" water column from the values in **figure 15**.

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 12** 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.

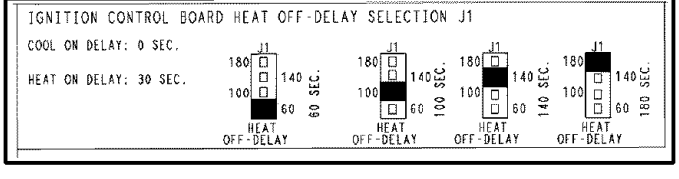
   Main burners and combustion air blower should go **OFF**.

   The circulating air blower should continue to run for 60, 100, 140 or 180 seconds. This time is adjustable. See **Figure 16** for more information.

4. Set thermostat Heat-Cool selector to **OFF**.

FAN CONTROL CHECK

Figure 16 Fan Delay DIP Switch Settings



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

1. The Fan Control has a fixed "ON" delay of 30 seconds, and a field adjustable "OFF" delay of 60, 100, 140 and 180 seconds. The "OFF" delay is factory set at 140 seconds.

Refer to **NO TAG** for proper DIP switch settings.

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

10. OPERATION

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

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

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

Cooling Operation

These units utilize a 2 stage indoor thermostat. With a first stage call for cooling (Y1), the indoor fan (low stage) energizes immediately where as the contactor energizes after a 5 minute time delay (incase of an initial start up) starting the compressor (low stage) and the outdoor fan motor. If the low stage operation cannot satisfy the cooling demand, the second stage cooling (Y2) energizes switching the compressor into high stage cooling through energizing an internal solenoid valve inside the scroll compressor and switching the indoor fan into high stage. When second stage cooling is satisfied, Y2 de-energizes switching the compressor and the indoor fan into low stage cooling. When the low stage cooling demand is met, Y1 de-energizes shutting the compressor, indoor fan and the outdoor fan.

Heating Operation

With a first stage call for heating (Y1), the indoor fan (low stage) energizes immediately whereas the contactor energizes after a 5 minute time delay (incase of an initial start up) starting the compressor (low stage) and the outdoor fan motor. If the low stage operation cannot satisfy the heating demand, the second stage heating (Y2) energizes switching the compressor into high stage heating through energizing an internal solenoid valve inside the scroll compressor and switching the indoor fan into high stage. The auxiliary gas heat is controlled by a third stage (W2). If the auxiliary gas heat is energized, the dual fuel thermostat will deactivate both the low stage heat pump (Y1) and high stage heat pump (Y2) operation.

Scroll Recycle Delay timer

The defrost board is equipped with a recycle delay timer which will delay the start of the compressor for 5 minutes in the event of a power interruption. This sequences power throughout the system and prevents possible reverse rotation of the scroll compressor. The output of the timer controls the compressor contactor via a normally open contact of K3 (T2). The timer starts the delay cycle when the compressor is turned off by removal of "Y." If application of "Y" occurs before the timer has expired, the compressor contactor will not be energized until the timer has expired.

CONTINUOUS FAN OPERATION

With the continuous Indoor fan option selected on the thermostat, G is continuously energized. The system runs low stage (Y1) airflow for continuous fan operation.

Defrost Mode

On a call for defrost:
When the defrost sensor closes in the heating mode, there is a 30, 60, 90 or 120 minute delay before the defrost mode begins. This delay is selected by the position of the dipswitches on the defrost board. Defrost interval timing can be configured by selection switch 1 and 2 on the dipswitch per the following table: See **Figure 17**.

Switch 1	Switch 2	Time
ON	OFF	30 Minutes
OFF	ON	60 Minutes
OFF	OFF	90 Minutes
ON	ON	120 Minutes

NOTES:

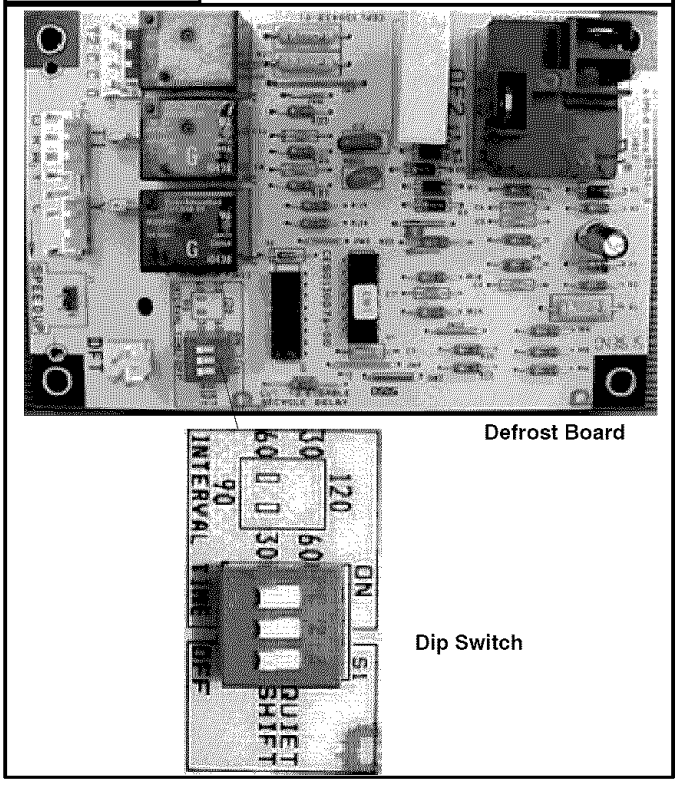
1. The backup defrost terminate time is fixed at 10 minutes.
2. The compressor recycle delay timer is 5 minutes.
3. The power interrupt response is minimum 17 msec. to maximum 35 msec.
4. Quite shift compressor recycle delay is 30 seconds.

In normal defrost mode, the following sequence will occur after the set delay:

1. Condenser fan off.
2. Reversing valve energized to cooling and auxiliary gas heat (W2) is energized.
3. After defrost sensor opens or a maximum of 10 minutes; the condenser fan is energized (after 20 seconds) and the reversing valve is de-energized to the heat mode. The call for heating is completed by the auxiliary gas heat. ON the next call for heat, the heat pump will be used for heat, provided the outdoor temperature is above the balance point.
4. Should the system indoor thermostat be satisfied during the defrost cycle, the control will de-energize the reversing valve and auxiliary heat outputs and "hold" the defrost timer until the next call for heat, at which time the defrost cycle will be completed.

Service testing: the pins marked "speed up" when momentarily shorted together (for 5 seconds) and released, will defeat the 5 minutes recycle delay timer and allow the compressor contactor to be immediately energized, thus forcing a defrost cycle. Termination of this forced mode will be by the defrost thermostat or the 10 minute backup timer, provided the defrost thermostat was closed when the defrost was "forces." If the defrost thermostat was not closed, at the time of the "forced defrost," the defrost mode will remain for 30 seconds and then terminate.

Figure 17 Defrost Board & Dip Switches



COMBUSTION/INDOOR FAN CONTROL

All functions of the combustion and indoor blower are controlled by the ignition control board and interface board.

On a call for auxiliary gas heat:
The ignition control energizes the combustion blower. Once the combustion air proving switch closes, the ignition sequence begins. The ignition 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 heat pump heating and cooling:
The fan control board starts the indoor blower immediately. Once the thermostat is satisfied, the fan control will operate the blower for 90 additional seconds.

11. MAINTENANCE

MONTHLY MAINTENANCE AND INSPECTION CHECKS

Air Filters

⚠ CAUTION

REDUCED EQUIPMENT LIFE HAZARD

Failure to follow this cautions may result in damage to the unit being installed.

Do not operate the unit without a filter.

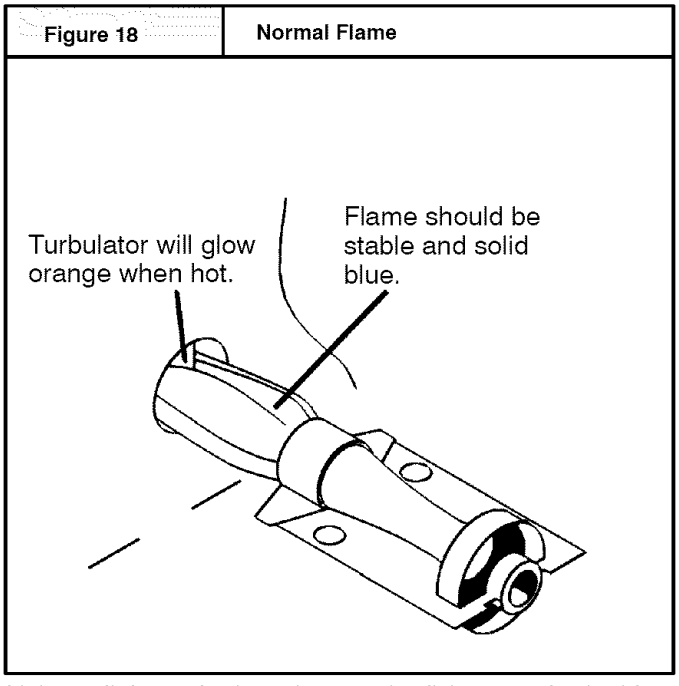
Inspect filters at least monthly and replace or clean as required. Washable filters may be cleaned by soaking in mild detergent and rinsing with cold water. Replace filters with the arrows on the side pointing in the direction of air flow. Dirty filters are the most common cause of inadequate heating or cooling performance, and of compressor failures.

HEATING SEASON CHECKS (MONTHLY)

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 and the turbulators should glow orange (after about five minutes of operation). Main burner flame should be inspected monthly.

Figure 18 Normal Flame



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.

ANNUAL MAINTENANCE AND INSPECTION

⚠ WARNING

ELECTRICAL SHOCK HAZARD.

Failure to follow this warning could result in 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.

The annual inspection should include 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

Note: The condenser fan motor is permanently lubricated. No further lubrication is required. Do not attempt to lubricate the condenser fan motor.

VENT ASSEMBLY

⚠ CAUTION

BURN HAZARD.

Failure to follow this caution may result in personal injury or property damage.

Flue cover may be hot! Allow adequate time for flue cover to cool.

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

BLOWER MOTOR ACCESS

Refer to **Figure 19** for a view of blower motor and compartment.

1. Remove the blower access panel
2. Remove the three 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.

Motor removal and replacement

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

1. Remove all screws around rim of unit top, (except screws which are inaccessible because of proximity to structure).
2. 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. A 2X4 piece of wood is ideal for this.
3. 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.

Note: The blower motor is permanently lubricated. No further lubrication is required. Do not attempt to lubricate the blower motor.

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 19** 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 pipe.
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.
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. 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.
11. Reinstall parts and gaskets in reverse order. On direct spark models check the spark gap. $^1/_8$ inch is required between the sparker electrodes.
12. Turn gas on and check for leaks.
13. Install all access panels, turn power on and check for normal operation.

REFRIGERANT CIRCUIT

For Qualified Service Technician Only

Annually inspect all refrigerant tubing connections and the unit base for oil accumulations. Detecting oil generally indicates a refrigerant leak.

⚠ WARNING

ENVIRONMENTAL HAZARD.

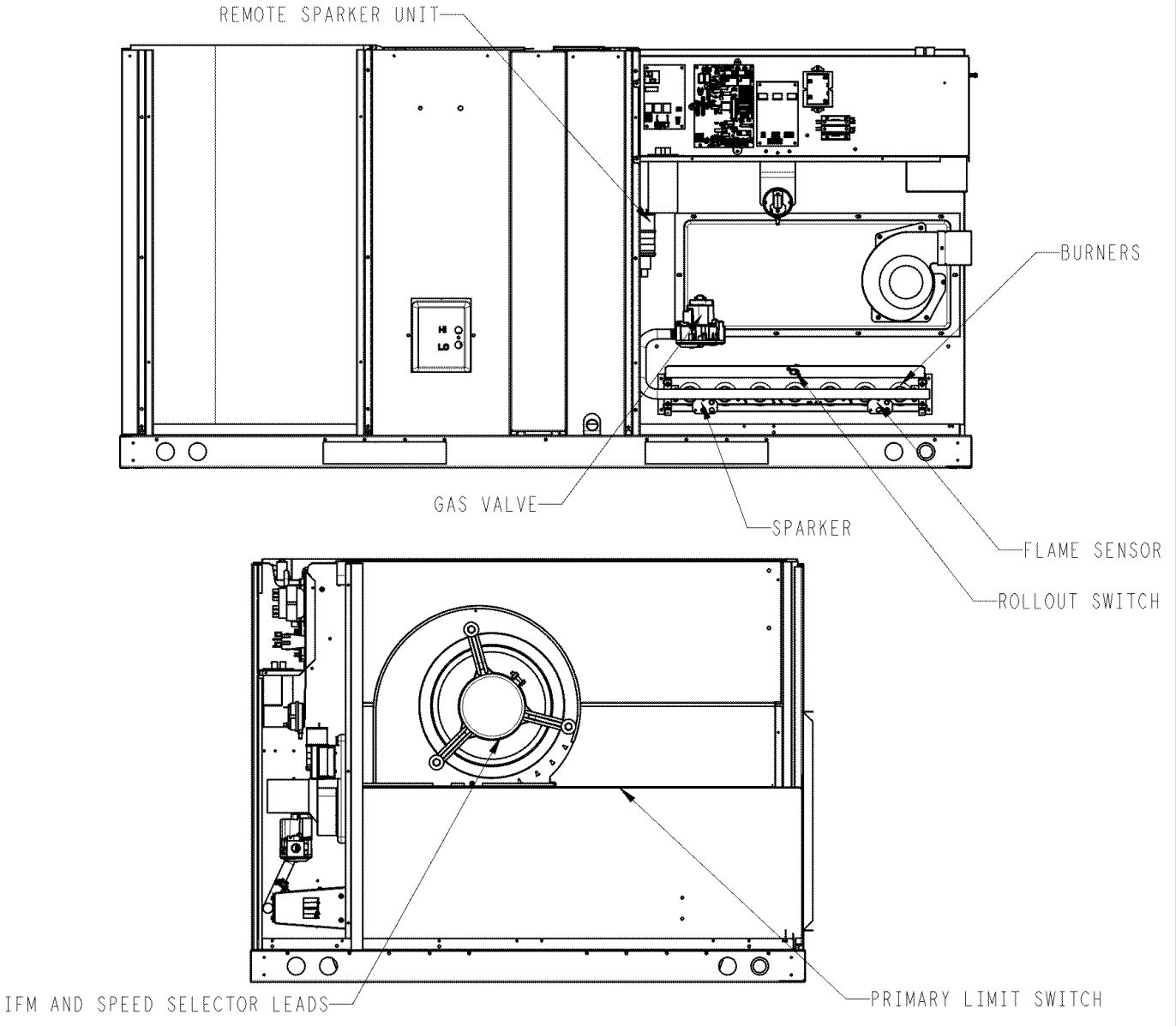
Failure to follow this warning could result in personal injury, death and/or property damage.

System under pressure. Relieve pressure and recover all refrigerant before system repair or final unit disposal. Use all service ports and open all flow control devices, including solenoid valves.

Federal regulations require that you do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal

If oil is detected or if low cooling performance is suspected, leak-test all refrigerant tubing using an electronic leak detector, halide torch, or liquid-soap solution.

Figure 19 Component Locations



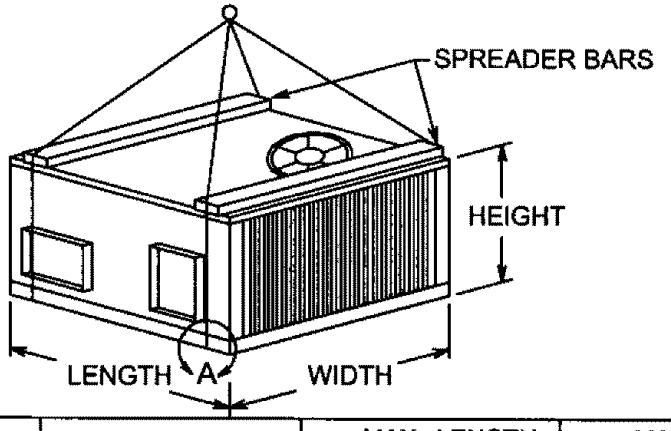
RIGGING INSTRUCTIONS

1096286-A

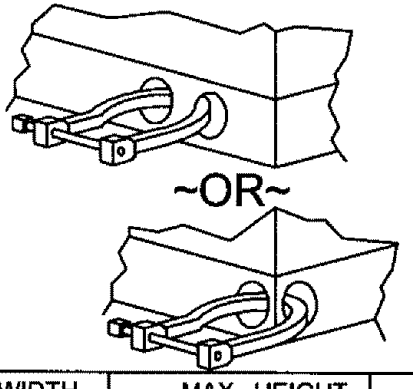
⚠ WARNING

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

- 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.

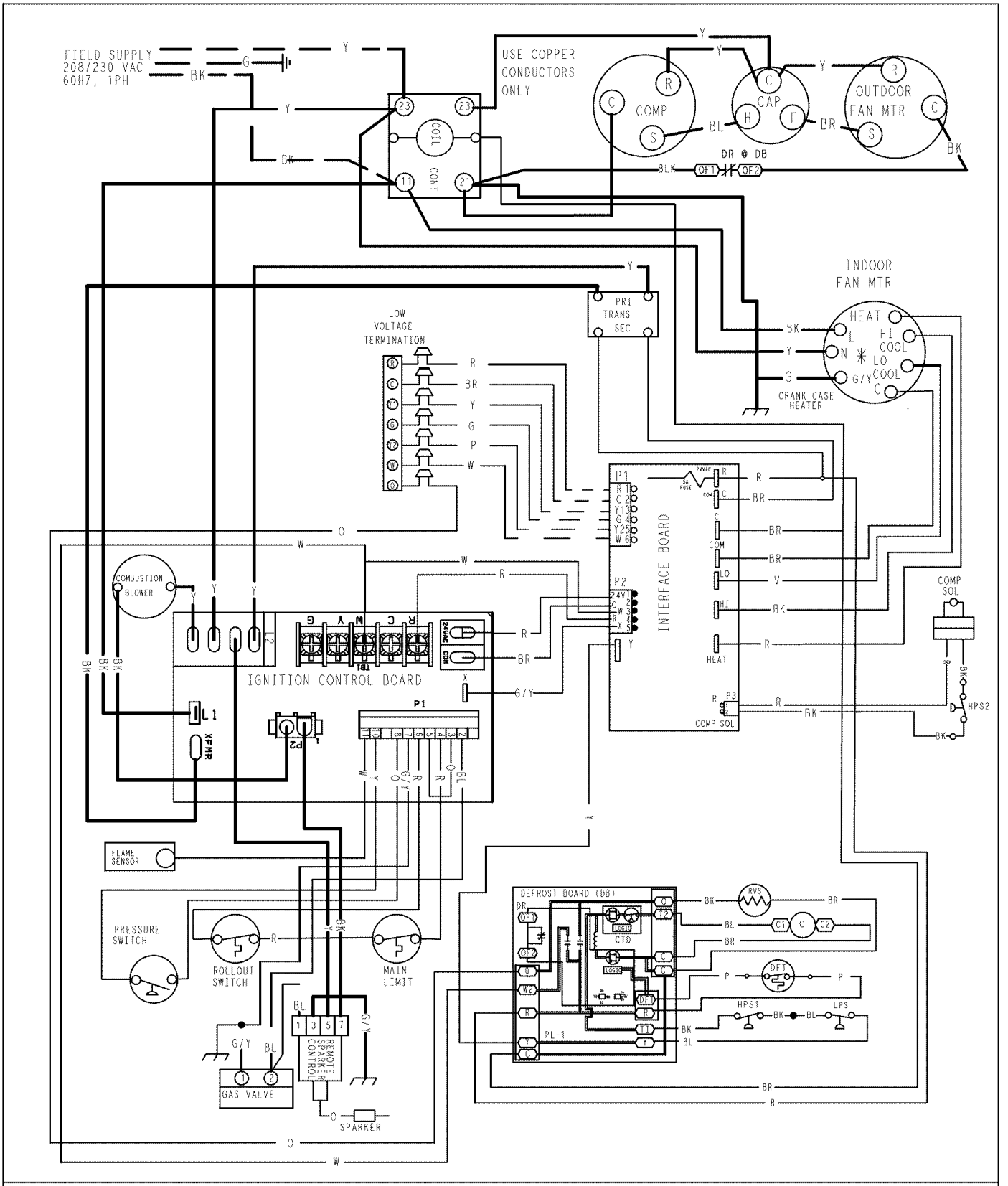


DETAIL-A



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

CONNECTION WIRING DIAGRAM - ALL MODELS



IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE AWM-105°C OR ITS EQUIVALENT.

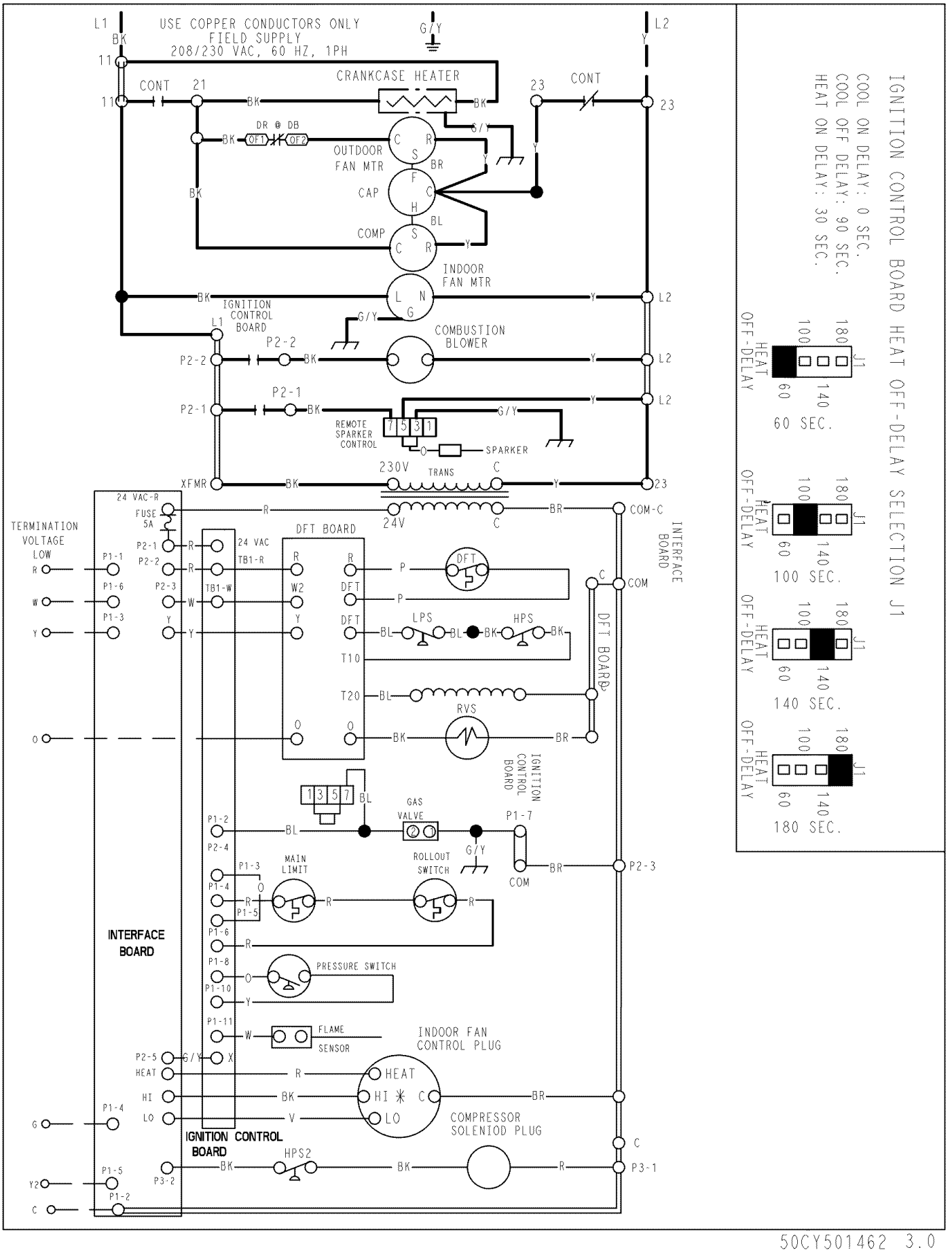
* SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS- "Do Not Disconnect Under Load"

LINE VOLTAGE FACTORY
LOW VOLTAGE FIELD
LOW VOLTAGE FACTORY
LINE VOLTAGE FIELD
INTERNAL CIRCUIT BOARD WIRING

COLOR CODE :

BLACK	BK	GREEN	G	WHITE	W
BLUE	BL	ORANGE	O	YELLOW	Y
BROWN	BR	RED	R		
GRAY	GY	VIOLET	V		
PINK	P				

LADDER WIRING DIAGRAM - ALL MODELS



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