

## ⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent or service agency.

## ⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

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# INSTALLATION INSTRUCTIONS

**KDB092 (7-1/2 TON)**

**KDB102 (8-1/2 TON)**

**KDB122 (10 TON)**

#### ROOFTOP PACKAGED UNITS

507630-01

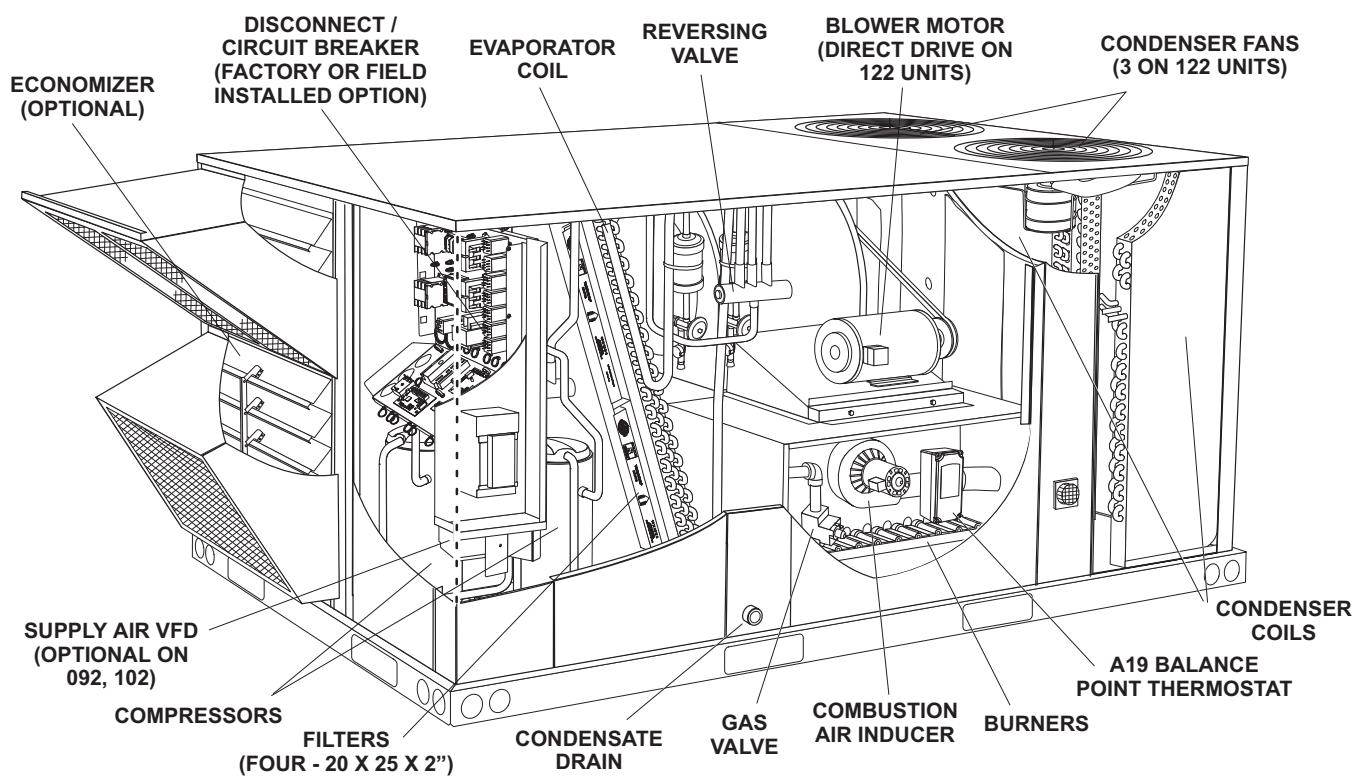
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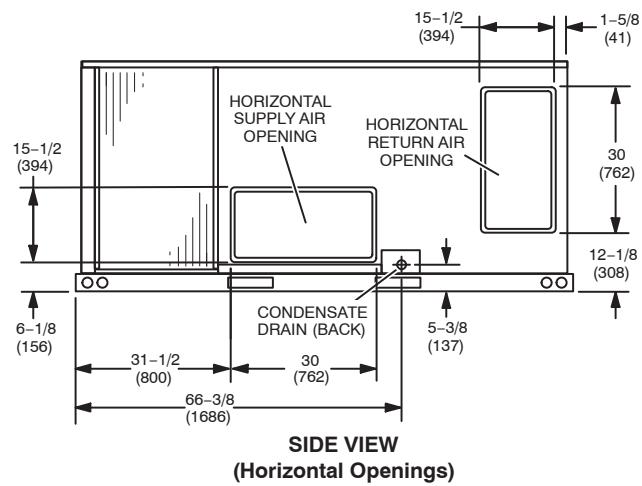
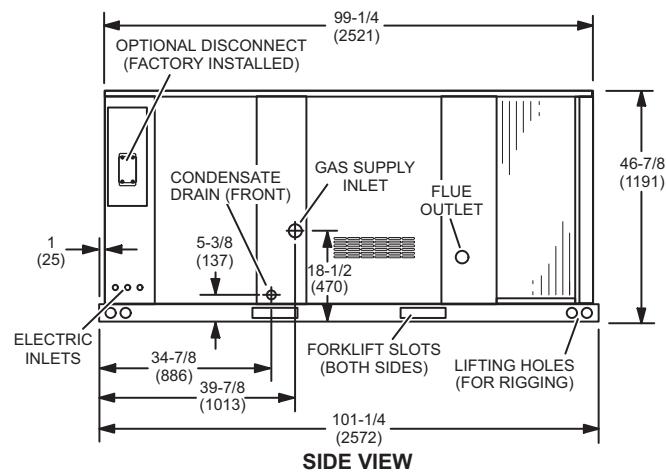
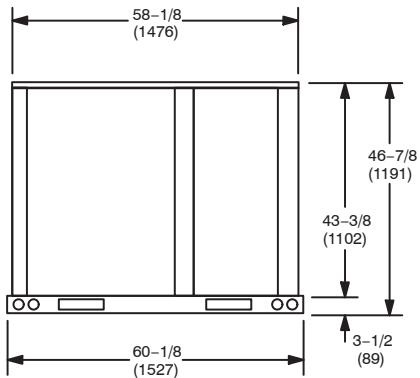
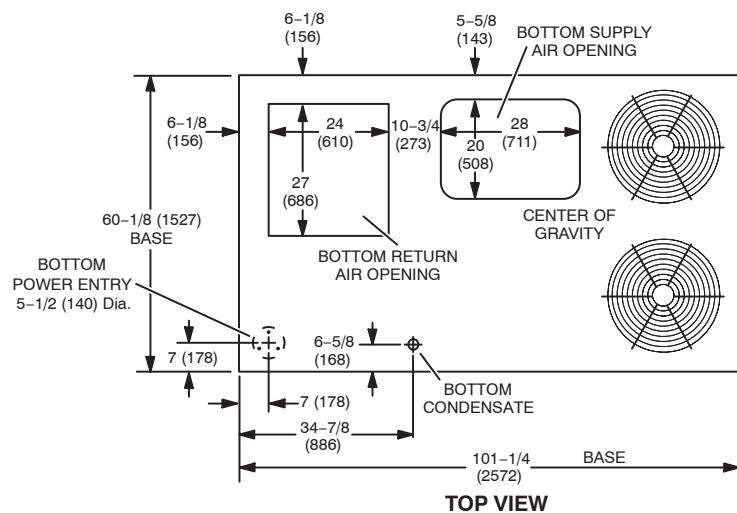
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### RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

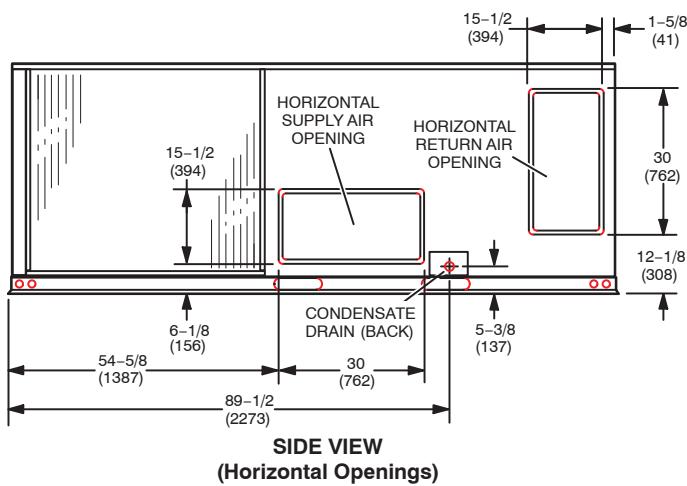
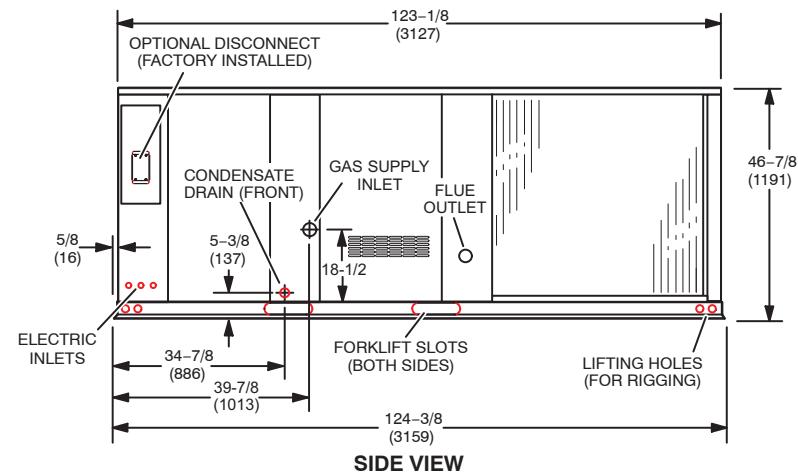
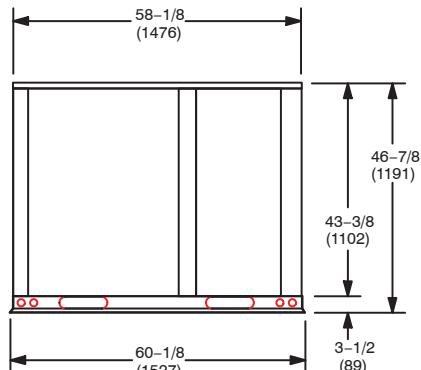
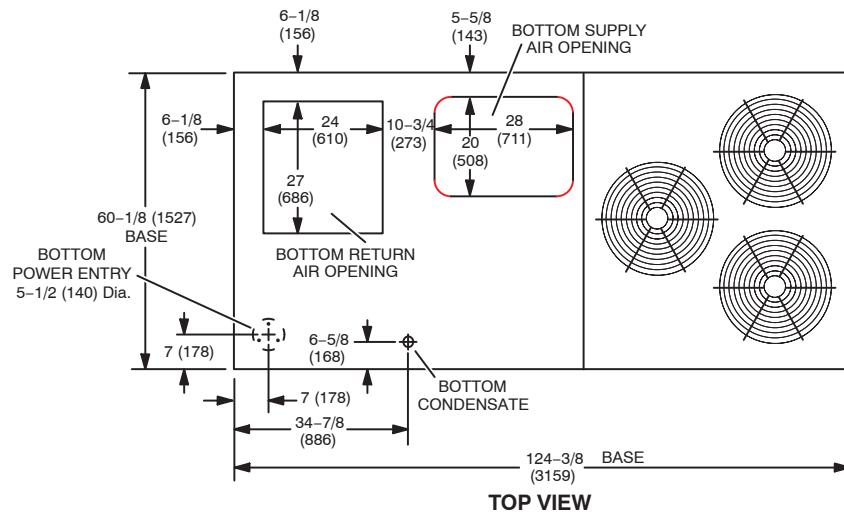
### KDB092, 102, 122 PARTS ARRANGEMENT



## KDB092, 102 DIMENSIONS



## KDB122 DIMENSIONS



## Shipping and Packing List

### Package 1 of 1 contains:

#### 1- Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

## General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

KDB units have 7-1/2, 8-1/2, and 10-ton cooling capacities. Units are available in three gas heating inputs.

KDB092 and 102 units are equipped with constant volume, belt-drive supply air blowers.

KDB092 and 102 units are available equipped with an optional supply air inverter. KDB122 units are equipped with variable-volume, direct drive blowers. These units will provide supply air at lower speeds when cooling demand is low and increase to higher speeds when cooling demand is high. Refer to Supply Air Start-Up sections.

Availability of units and options varies by brand.

## Requirements

The KDB unit is ETL/CSA certified for outdoor installations only at the clearances to combustible materials listed on unit nameplate and in figure 1.

Installation of KDB heat pumps must conform with standards in National Fire Protection Association (NFPA) "Standard for Installation of Air Conditioning and Ventilating Systems NFPA No. 90A," "Standard for Installation of Residence Type Warm Air Heating and Air conditioning Systems NFPA No. 90B," local municipal building codes and manufacturer's installation instructions.

## ! NOTICE

### Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

The National Electric Code (ANSI/NFPA No. 70-1984) is available from:

National Fire Protection Association  
1 Batterymarch Park  
PO Box 9101  
Quincy, MA 02269-9101

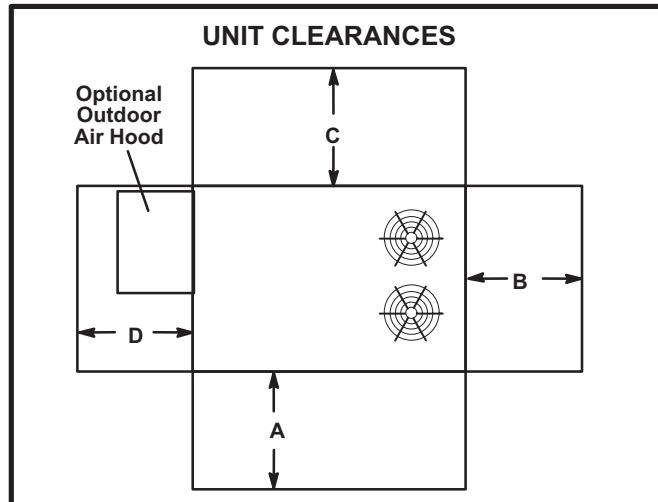


FIGURE 1

1 Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	60 (1524)	36 (914)	36 (914)	60 (914)	Unobstructed
Clearance to Combustibles	36 (914)	1 (25)	1 (25)	1 (25)	Unobstructed
Minimum Operation Clearance	36 (914)	36 (914)	36 (914)	36 (914)	Unobstructed

Note - Entire perimeter of unit base requires support when elevated above mounting surface.

<sup>1</sup> Service Clearance - Required for removal of serviceable parts.

Clearance to Combustibles - Required clearance to combustible material.

Minimum Operation Clearance - Required clearance for proper unit operation.

The KDB unit is ETL/CSA certified as a heat pump with cooling and auxiliary gas heat for non-residential use only at the clearances to combustible materials as listed on the unit nameplate and in figure 1.

Installation of ETL/CSA certified units must conform with current standard C273.5 "Installation Requirements for Heat Pumps" and applicable local codes. Authorities having jurisdiction should be consulted before installation.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.

- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filter must be removed upon construction completion.
- The unit components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, and heating operation) must be verified according to these installation instructions.

## ⚠️ WARNING



**Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off electrical power to unit before performing any maintenance or servicing operations on the unit.**

## ⚠️ IMPORTANT

**The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.**

### Unit Support

*NOTE - Securely fasten roof frame to roof per local codes.*

#### A-Downflow Discharge Application

##### Roof Mounting with C1CURB

- 1- The C1CURB roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2- The C1CURB roof mounting frame should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 3- Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

### Installer's Roof Mounting Frame

Many types of roof frames can be used to install the unit, depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

- 4- The unit base is fully enclosed and insulated, so an enclosed frame is not required.
- 5- The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16" per linear foot (5mm per linear meter) in any direction.
- 6- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).
- 7- Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.
- 8- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

*NOTE-When installing unit on a combustible surface for downflow discharge applications, the C1CURB roof mounting frame is required.*

#### B-Horizontal Discharge Applications

- 9- Units installed in horizontal airflow applications must use a horizontal conversion kit (K1HECK00).
- 10- Specified installation clearances must be maintained when installing units. Refer to figure 1.
- 11- Top of support slab should be at least 4" (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.
- 12- Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

### Duct Connection

All exterior ducts, joints, and openings in roof or building walls must be insulated and weatherproofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

## ⚠️ CAUTION

**In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.**

## Rigging Unit For Lifting

- 1- Detach wooden base protection before rigging.
- 2- Connect rigging to the unit base using both holes in each corner. See figure 2.
- 3- All panels must be in place for rigging.
- 4- Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)

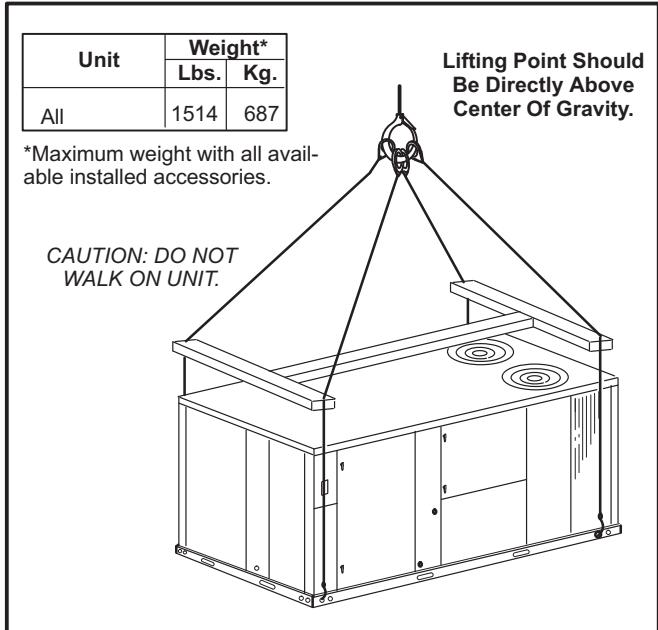


FIGURE 2

## Condensate Drains

Make drain connection to the 1" N.P.T. drain coupling provided on unit.

*Note - The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.*

A trap must be installed between drain connection and an open vent for proper condensate removal. See figure 3 or 4. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to pages 2 and 3 for condensate drain location.

Units are shipped with the drain coupling facing the front of the unit. Condensate can be drained from the back or bottom of the unit with the following modifications. The unit can be installed in either downflow or horizontal air discharge regardless of condensate drain location.

### Rear Drain Connection

- 1- Remove heat access door. See figure 5.
- 2- Remove filter access door. Refer to figure 5.
- 3- Remove eight screws holding condensate drain mullion and remove mullion.

### CONDENSATE SIDE DRAIN CONNECTION

#### CAULK AROUND CONDENSATE COUPLING

NOTE - Allow clearance to open doors when installing condensate piping.

Minimum Pitch  
1" (25 mm) per  
10' (3 m) of line

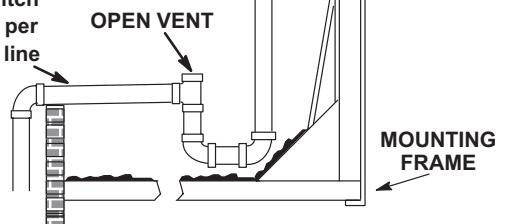


FIGURE 3

### CONDENSATE BOTTOM DRAIN CONNECTION

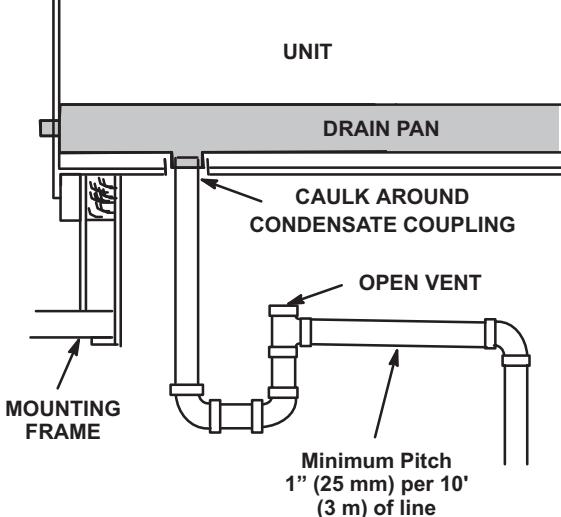


FIGURE 4

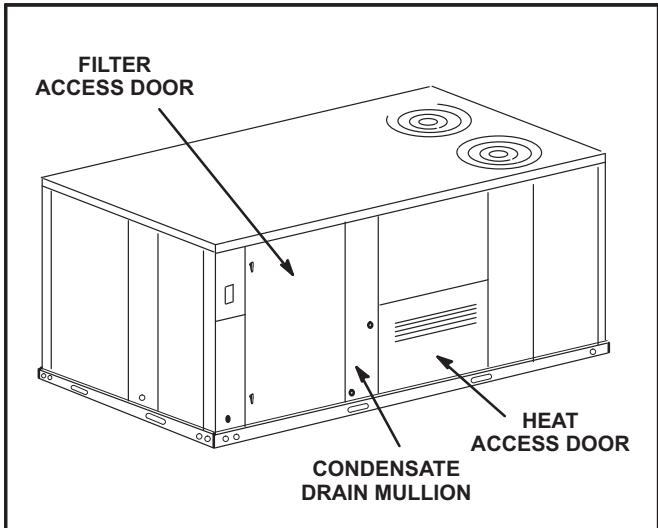


FIGURE 5

- 4- Lift front edge of the drain pan (to clear bottom drain plug) and slide drain pan out of unit. See figure 6.

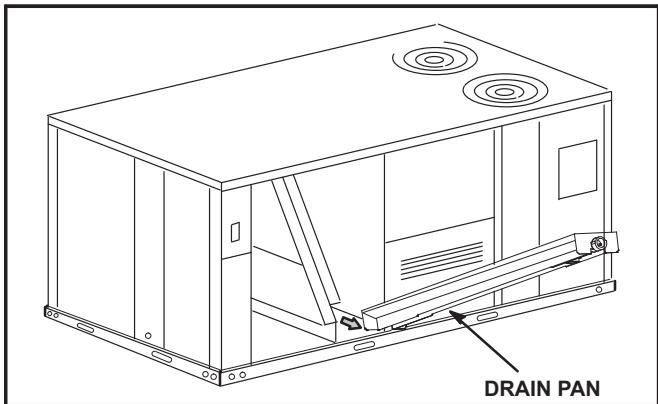


FIGURE 6

- 5- Make sure the cap over the unit bottom drain hole is secure.
- 6- Rotate the drain pan until the downward slope is toward the back of the unit. Slide the drain pan back into the unit. Be careful not to dislodge the cap over the bottom drain hole.
- 7- From the back side of the unit, pull the drain pan coupling through the rear condensate opening.
- 8- Replace the condensate drain mullion and reinstall eight screws.
- 9- Reinstall access doors.

## Bottom Drain Connection

- 1- Remove heat access door. See figure 5.
- 2- Remove filter access door. Refer to figure 5.
- 3- Remove eight screws holding condensate drain mullion and remove mullion.
- 4- Lift front edge of the drain pan (to clear bottom drain plug) and slide drain pan out of unit. See figure 6.
- 5- Turn the drain pan upside down and drill a pilot hole through the bottom of the drain pan in the center of the coupling. See figure 7.

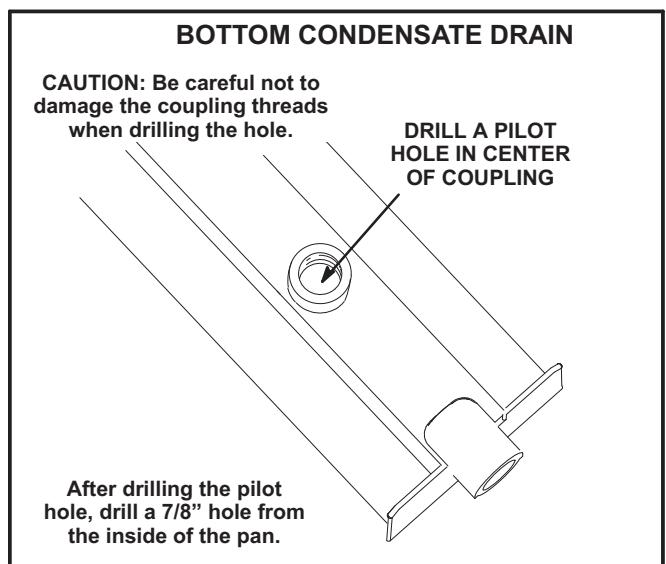


FIGURE 7

- 6- From the inside of the pan, use a Vari-Bit® bit to enlarge the hole to 7/8". Do not damage coupling threads.
- 7- Remove the cap over the unit bottom drain hole.
- 8- Slide the drain pan back into the unit.
- 9- From the back side of the unit, pull the drain pan coupling through the rear condensate opening.
- 10- From the front side of the unit, move the drain pan until the bottom coupling settles into the unit bottom drain opening. Once in place, check to make sure the coupling is still positioned through the rear condensate drain hole.
- 11- Use a field-provided 1" plug to seal side drain connection.
- 12- Replace the condensate drain mullion and reinstall eight screws.
- 13- Reinstall access doors.

## Connect Gas Piping

Before connecting field-provided piping, check with gas company or authorities having jurisdiction for local code requirements. When installing gas supply piping, length of run from gas meter must be considered in determining pipe size for 0.5" w.c. (.12kPa) maximum pressure drop. Do not use supply pipe smaller than unit gas connection. For natural gas units, operating pressure at the unit gas connection must be a minimum of 4.7" w.c. (1.19kPa) and a maximum of 10.5" (2.60kPa) w.c. For LP/propane gas units, operating pressure at the unit gas connection must be a minimum of 11" w.c. (2.74kPa) and a maximum of 13.0" w.c. (3.23kPa).

When making piping connections a drip leg should be installed on vertical pipe runs to serve as a trap for sediment or condensate. A 1/8" N.P.T. plugged tap is located on gas valve for test gauge connection. Refer to Heating Start-Up section for tap location. Install a ground joint union between the gas control manifold and the main manual shut-off valve. See figure 8 for gas supply piping entering outside the unit. Figure 9 shows bottom gas entry piping through the curb. Figure 10 shows bottom gas entry piping through the unit.

Compounds used on threaded joints of gas piping shall be resistant to the action of liquified petroleum gases.

### BOTTOM ENTRY GAS PIPING THROUGH THE CURB

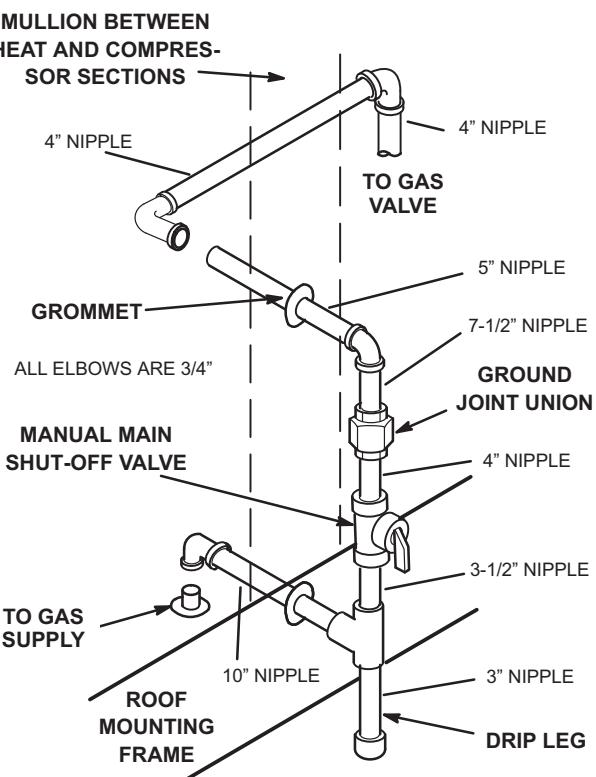


FIGURE 9

### OUTSIDE OF UNIT GAS PIPE CONNECTION

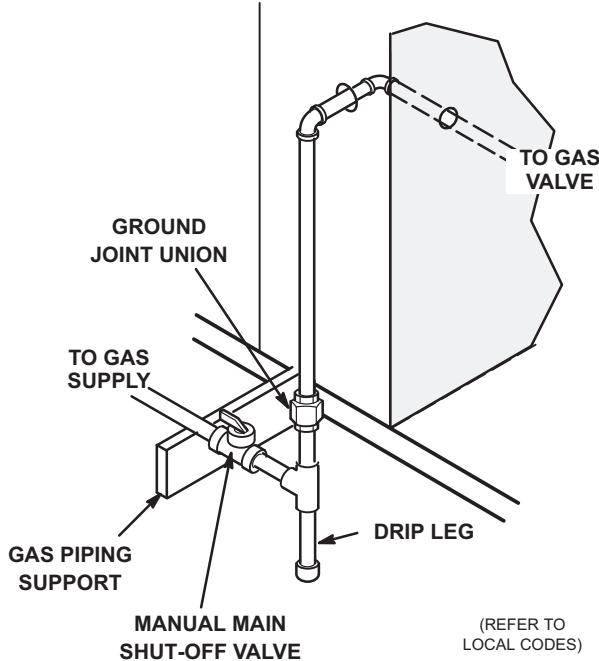


FIGURE 8

### BOTTOM GAS ENTRY THROUGH THE UNIT

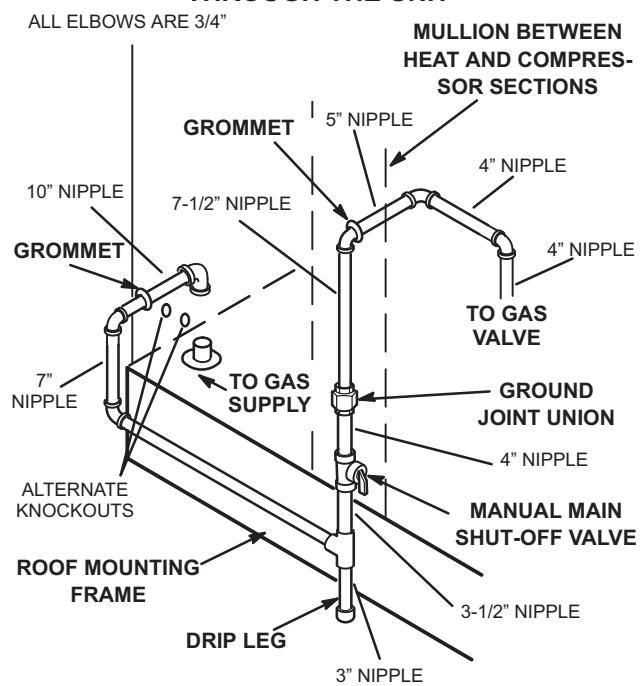


FIGURE 10

## Pressure Test Gas Piping

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (3.48kPa). See figure 11.

*NOTE-Codes may require that manual main shut-off valve and union (furnished by installer) be installed in gas line external to unit. Union must be of the ground joint type.*

After all connections have been made, check all piping connections for gas leaks. Also check existing unit gas connections up to the gas valve; loosening may occur during installation. Use a leak detection solution or other preferred means. Do not use matches candles or other sources of ignition to check for gas leaks.

### ⚠ CAUTION

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.

### ⚠ WARNING



Danger of explosion. Can cause injury or product or property damage. Do not use matches, candles, flame or other sources of ignition to check for leaks.

*NOTE-In case emergency shut down is required, turn off the main manual shut-off valve and disconnect main power to unit. These devices should be properly labeled by the installer.*

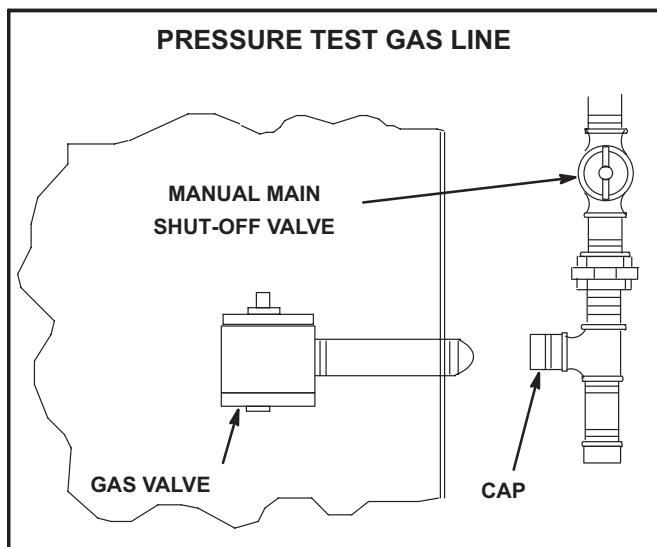


FIGURE 11

## Electrical Connections

### POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

- 1- 230,460,575 volt units are factory wired. **For 208V supply**, disconnect the pink wire (230V) at all control power transformer(s). Reconnect the pink wire to terminal marked 208 on power transformer(s). Tape the exposed end of the 230V pink wire.
- 2- Route power through the bottom power entry area and connect to TB2. Route power to S48 disconnect switch when the option is factory-installed. See unit wiring diagram.
- 3- Connect separate 120v wiring to optional GFCI outlet pigtails.

### CONTROL WIRING

#### A-Thermostat Location

Room thermostat mounts vertically on a standard 2" X 4" handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524 mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

*IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring.*

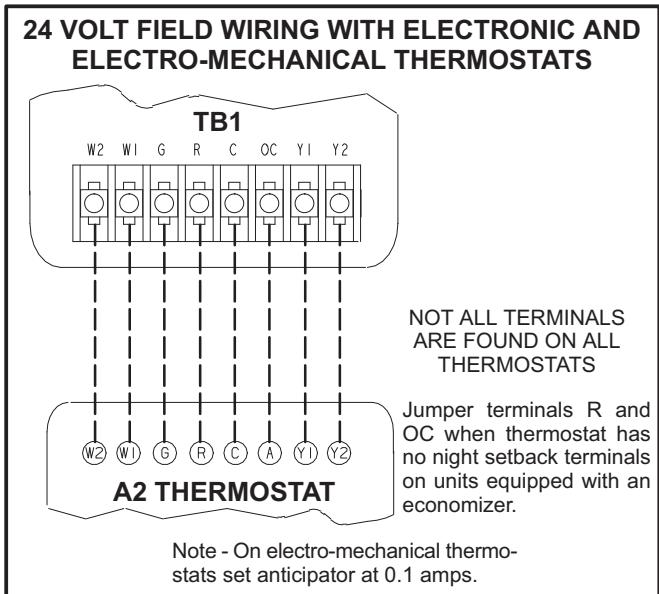
#### B-Control Wiring

- 1- Route thermostat cable or wires from subbase to unit control box (refer to unit dimensions to locate bottom and side power entry).

*IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring. Use wire ties located near the front of the control section to secure thermostat cable.*

Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

- 2- Install thermostat assembly in accordance with instructions provided with thermostat.
- 3- Connect thermostat wiring to TB1 terminal board on the lower side of the controls hat section. Wire as shown in figure 12 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.



**FIGURE 12**

**IMPORTANT**-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

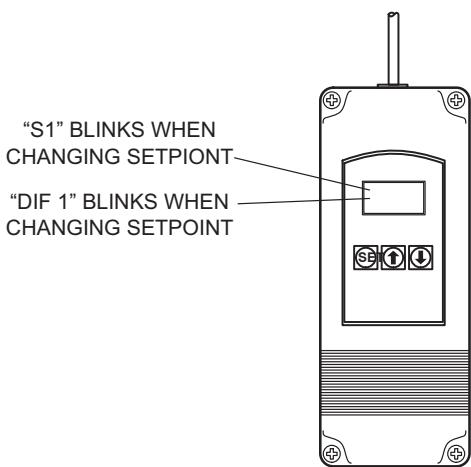
### Balance Point Thermostat

When outdoor air temperature is above setpoint (35°F+5°F default), the unit will operate in heat pump mode. When outdoor air temperature falls below setpoint, the unit will operate in gas heat mode. See figure 13. The thermostat is located in the heat section next to the combustion air inducer.

**Note** - Only stage one is used; stage 2 is not used.

Although the recommended balance point setpoint is 35°F, the setpoint can be adjusted. Weigh the comfort / cost benefit when increasing the setpoint.

**BALANCE POINT THERMOSTAT A19**



**FIGURE 13**

Use the thermostat LCD display and SET and arrow buttons to adjust balance point thermostat as follows:

- 1- F/C - Press SET button and use arrow keys to select C (Celsius) or F (Fahrenheit). Press SET to confirm.
- 2- S1 - Push SET button to adjust the changeover setpoint. "S1" will blink on the display. Use arrow keys to change setpoint. Press SET to confirm. Factory default is 35°F.
- 3- DIF 1 - Push SET button to adjust the differential range. "DIF 1" will blink on the display. Use arrow keys to change the differential range. Press SET to confirm. Factory default is 5°F.
- 4- C1/H1 - Push SET button and arrow keys to select Cooling (C1) mode. C1 will apply the setpoint differential above the setpoint. Press SET to confirm.

### Unit Power-Up

#### A-General

- 1- Make sure that unit is installed in accordance with the installation instructions and applicable codes.
- 2- Inspect all electrical wiring, both field and factory installed, for loose connections. Tighten as required.
- 3- Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.
- 4- Check voltage at main unit power connection. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.
- 5- Make sure filters are in place before start-up.
- 6- Make sure there is no heating, cooling, or blower demand from thermostat. Apply power to unit.
- 7- Verify the FCB (A191) fan control board DIP switch settings are correct. Use the model number on the unit nameplate and figure 14. The FCB is in the control section above the compressors.

### Blower Operation and Adjustments

#### A-Three Phase Scroll Compressor Voltage Phasing

Three phase scroll compressors must be phased sequentially to ensure correct compressor and blower rotation and operation. Compressor and blower are wired in phase at the factory. Power wires are color-coded as follows: line 1-red, line 2-yellow, line 3-blue.

- 1- Observe suction and discharge pressures and blower rotation on unit start-up.

If pressure differential is not observed or blower rotation is not correct:

- 2- Suction pressure must drop, discharge pressure must rise, and blower rotation must match rotation marking.

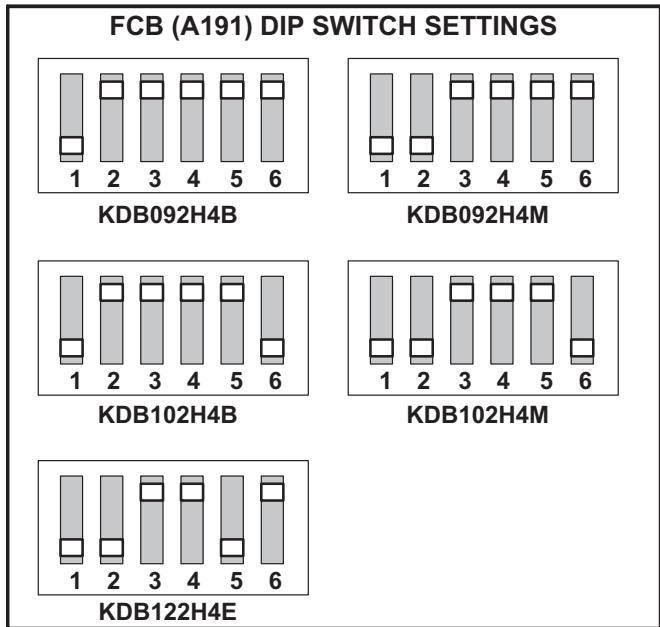


FIGURE 14

- 5- Disconnect all remote electrical power supplies.
- 6- Reverse any two field-installed wires connected to the line side of K3, TB2 or F4. Do not reverse wires at blower contactor or compressors.
- 7- Make sure the connections are tight.

Discharge and suction pressures should operate at their normal start-up ranges.

**Belt-Driven Supply Air Inverter Units** - Units are equipped with a phase monitor located in the control compartment. The phase monitor will detect the phasing of incoming power. If the incoming power is out of phase or if any of the three phases are lost, the indicating LED on the phase monitor will turn red and the unit will not start. In normal operation with correct incoming power phasing, the LED will be green.

## B-Blower Operation

Initiate blower demand at thermostat according to instructions provided with thermostat. Unit will cycle on thermostat demand. The following steps apply to applications using a typical electro-mechanical thermostat.

- 1- Blower operation is manually set at the thermostat subbase fan switch. With fan switch in **ON** position, blowers will operate continuously.
- 2- With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

## C-Blower Access

The blower assembly is secured to a sliding frame which allows the blower motor to be pulled out of the unit. See figure 15 and 16.

### *Belt Drive Blowers*

- 1- Loosen the reusable wire tie which secures the blower wiring to the blower motor mounting plate.
- 2- Remove and retain screws on either side of sliding frame. Pull frame toward outside of unit.
- 3- Slide frame back into original position when finished servicing. Reattach the blower wiring in the previous location on the blower motor base using the wire tie.
- 4- Replace retained screws on either side of the sliding frame.

### *Direct Drive Blowers*

- 1- Loosen the reusable wire tie which secures the controls and high voltage blower wiring to the blower housing.
- 2- Remove and retain screws in front and on either side of blower housing. Pull frame toward outside of unit.
- 3- Slide frame back into original position when finished servicing. Reattach the blower wiring in the previous location on the blower motor base using the wire tie.
- 4- Replace retained screws in front and on either side of the blower housing.

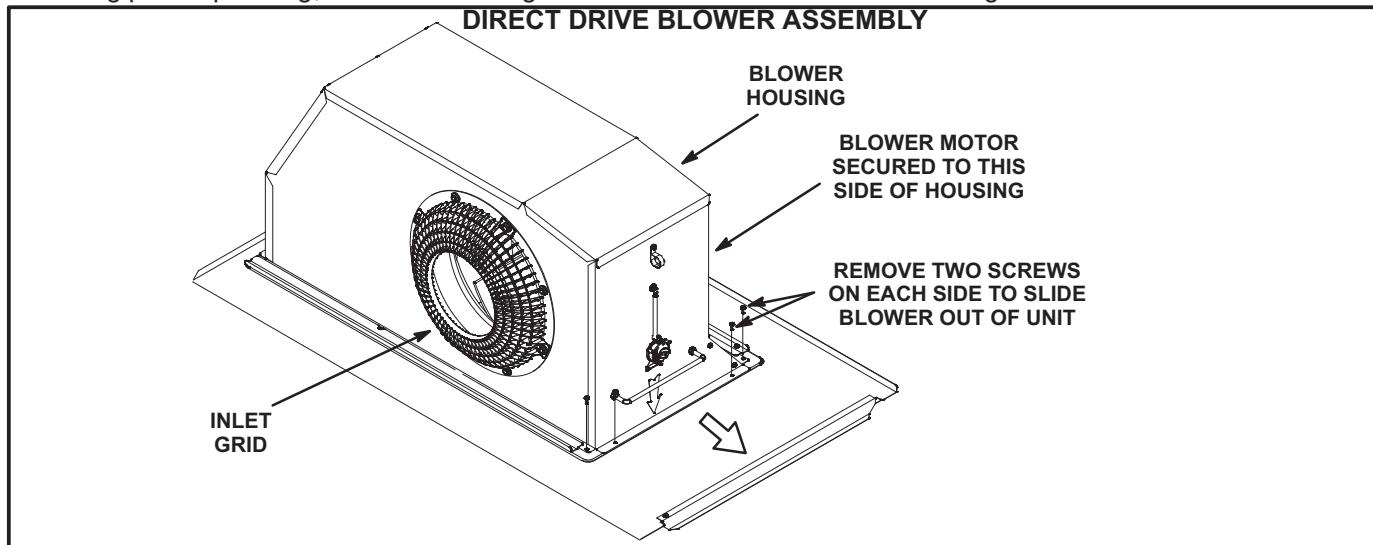


FIGURE 15

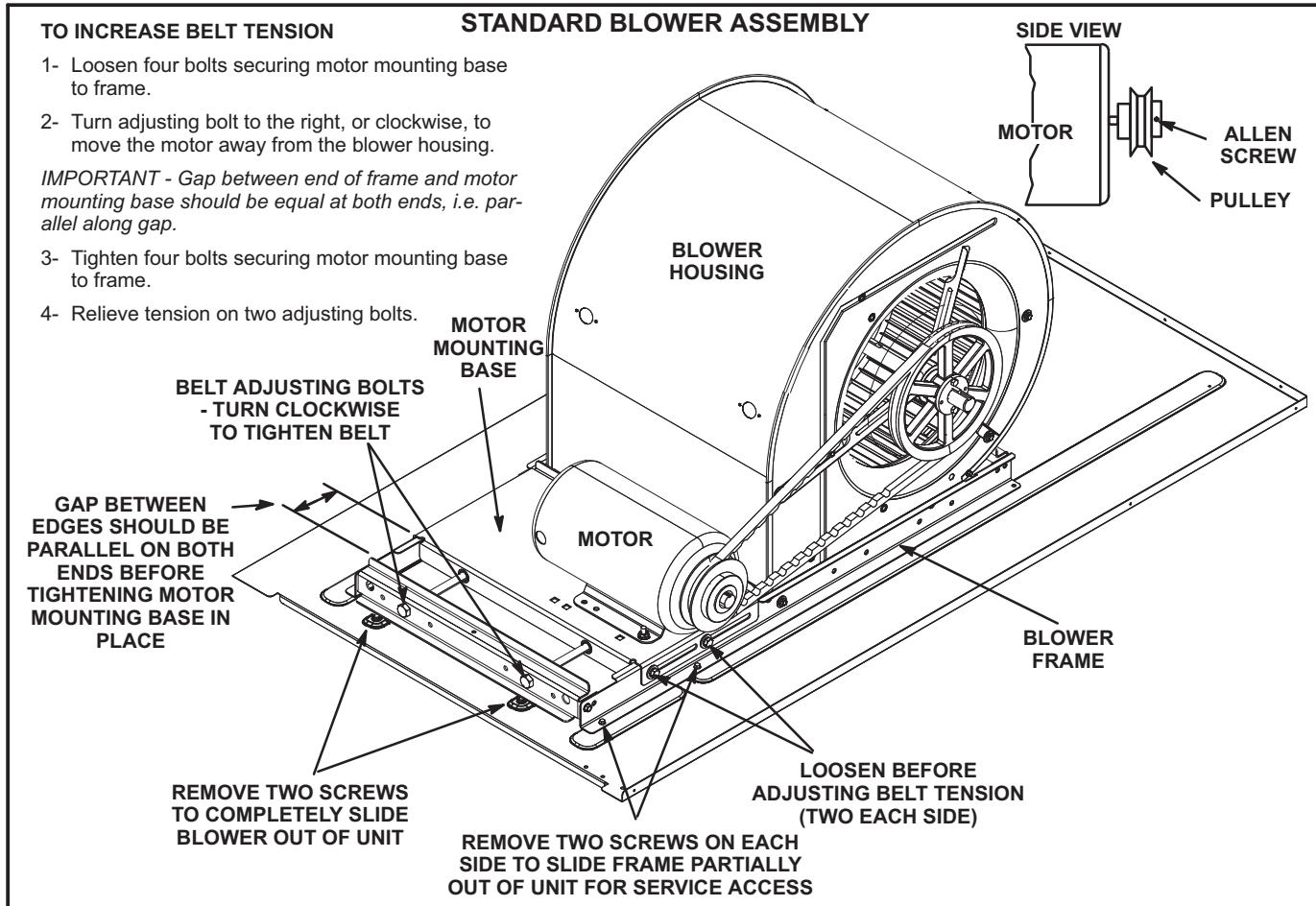


FIGURE 16

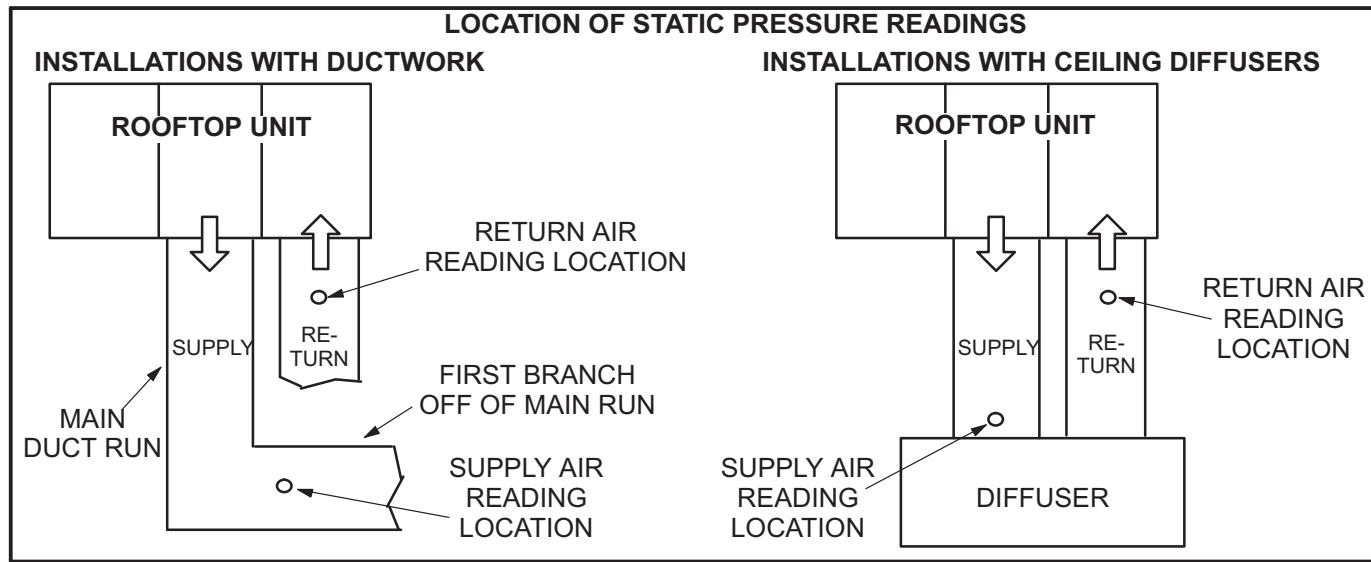


FIGURE 17

#### D-Determining Unit CFM

*IMPORTANT - Belt-driven supply air inverter units are factory-set to run the blower at full speed when there is a blower (G) demand without a heating or cooling demand. Use the following procedure to adjust motor pulley to deliver the full load cooling or heating CFM. See Belt-Driven Supply Air Inverter Start-Up section to set blower CFM for all modes once the motor pulley is set.*

*IMPORTANT - Direct drive variable blower unit CFM is determined by the Fan Control board. Refer to the Direct Drive Variable Speed Start-Up section.*

- 1- The following measurements must be made with a dry indoor coil. Run blower without a cooling demand. Measure the indoor blower shaft RPM. Air filters must be in place when measurements are taken.

2- With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in figure 17.

*Note - Static pressure readings can vary if not taken where shown.*

3- Referring to pages 14 or 15, use static pressure and RPM readings to determine unit CFM. Use page 16 when installing units with any of the optional accessories listed.

4- The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See figure 16. Do not exceed minimum and maximum number of pulley turns as shown in table 1.

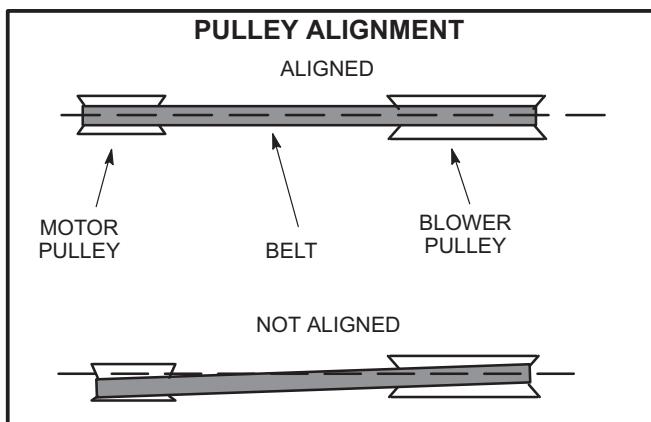
**TABLE 1  
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Minimum Turns Open	Maximum Turns Open
A Section	0	5
B Section	1*	6

\*No minimum number of turns open when B belt is used on pulleys 6" O.D. or larger.

#### E-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat in the pulley grooves. Make sure blower and motor pulleys are aligned as shown in figure 18.



**FIGURE 18**

1- Loosen four bolts securing motor base to mounting frame. See figure 16.

2- *To increase belt tension -*  
Turn both adjusting bolts to the right, or clockwise, to move the motor outward and tighten the belt. This

increases the distance between the blower motor and the blower housing.

*To loosen belt tension -*

Turn the adjusting bolts to the left, or counterclockwise to loosen belt tension.

**IMPORTANT - Align top edges of blower motor base and mounting frame base parallel before tightening four bolts on the side of base. Motor shaft and blower shaft must be parallel.**

3- Tighten two bolts on each side of the motor mounting base. This secures the mounting base to the frame.

4- Relieve tension adjusting bolts.

#### F-Check Belt Tension

Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

1- Measure span length X. See figure 19.

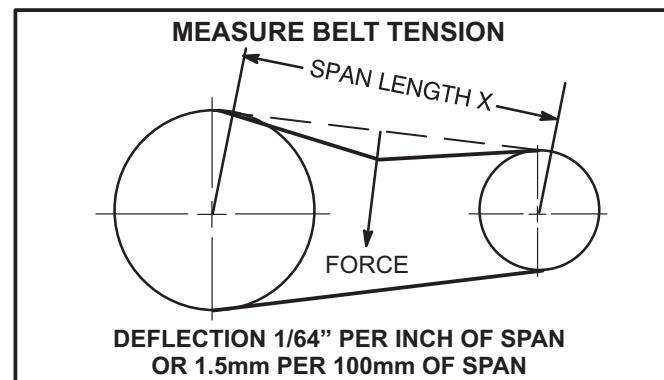
2- Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length.

Example: Deflection distance of a 40" span would be 40/64" or 5/8".

Example: Deflection distance of a 400mm span would be 6mm.

3- Measure belt deflection force. For a new 2 and 3hp belt, the deflection force should be 5.0-7.0 lbs. (35-48kPa). For a new 5hp belt, the deflection force should be 7-10lbs. (48-69kPa).

A force below these values indicates an undertensioned belt. A force above these values indicates an overtensioned belt.



**FIGURE 19**

#### G-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 14 or 15 to determine BHP and RPM required. Reference page 16 to determine the drive number. Reference table 2 for drive component manufacturer's numbers.

## BLOWER DATA

### 092, 102 BELT DRIVE BLOWER – BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY (NO HEAT SECTION) WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE. FOR ALL UNITS ADD:

1 – Wet indoor coil air resistance of selected unit.

2 – Any factory installed options air resistance (heat section, economizer, etc.)

3 – Any field installed accessories air resistance (duct resistance, diffuser, etc.)

Then determine from blower table blower motor output required.

See page 16 for blower motors and drives.

See page 16 for wet coil and option/accessory air resistance data.

**MAXIMUM STATIC PRESSURE WITH GAS HEAT - 2.0 in.w.g.**

Total Air Volume cfm	Total Static Pressure – in. w.g.																										
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2		2.2		2.4		2.6		
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	
1750	480	0.19	548	0.39	618	0.57	689	0.70	758	0.81	824	0.92	885	1.07	941	1.23	992	1.40	1039	1.55	1084	1.70	1128	1.85	1156	2.08	
2000	492	0.27	560	0.47	629	0.64	700	0.77	768	0.88	832	1.00	892	1.16	946	1.32	995	1.48	1041	1.65	1085	1.81	1127	1.97	1160	2.13	
2250	505	0.35	573	0.55	643	0.72	713	0.85	780	0.97	842	1.10	900	1.25	952	1.42	999	1.59	1044	1.76	1087	1.93	1127	2.10	1164	2.27	
2500	520	0.45	588	0.64	658	0.81	727	0.94	793	1.07	853	1.21	909	1.37	959	1.54	1005	1.71	1048	1.89	1089	2.07	1127	2.25	1166	2.42	
2750	536	0.55	604	0.74	674	0.91	743	1.05	806	1.19	865	1.34	919	1.50	968	1.67	1012	1.86	1053	2.04	1092	2.23	1129	2.41	1167	2.60	
3000	553	0.66	622	0.85	692	1.02	760	1.17	821	1.32	878	1.48	930	1.64	977	1.83	1020	2.02	1059	2.21	1096	2.41	1133	2.60	1170	2.79	
3250	572	0.77	641	0.98	712	1.15	778	1.32	837	1.48	892	1.64	942	1.81	988	2.00	1028	2.20	1066	2.41	1102	2.61	1138	2.81	1174	3.01	
3500	592	0.90	663	1.12	733	1.31	798	1.48	854	1.65	907	1.82	955	1.99	999	2.19	1038	2.41	1074	2.63	1109	2.84	1144	3.04	1180	3.24	
3750	614	1.04	687	1.28	756	1.48	818	1.66	872	1.83	922	2.01	969	2.19	1010	2.41	1048	2.64	1084	2.87	1118	3.09	1152	3.29	1188	3.50	
4000	639	1.22	712	1.47	780	1.67	838	1.85	890	2.03	939	2.22	983	2.42	1023	2.65	1060	2.90	1095	3.14	1128	3.36	1162	3.57	1198	3.77	
4250	666	1.42	740	1.68	804	1.88	859	2.06	909	2.25	956	2.45	998	2.67	1036	2.92	1072	3.18	1106	3.42	1139	3.65	1172	3.86	1208	4.07	
4500	697	1.65	769	1.91	829	2.10	881	2.28	929	2.48	973	2.71	1013	2.95	1050	3.22	1085	3.48	1118	3.73	1151	3.96	1184	4.17	1221	4.39	
4750	729	1.91	798	2.15	854	2.34	903	2.53	948	2.75	991	3.00	1030	3.27	1065	3.55	1099	3.81	1132	4.06	1164	4.29	1198	4.51	1235	4.74	
5000	763	2.18	826	2.41	878	2.60	925	2.81	968	3.05	1009	3.33	1046	3.61	1081	3.90	1114	4.17	1146	4.42	1178	4.65	1212	4.87	1250	5.09	
5250	797	2.47	854	2.69	903	2.90	947	3.12	989	3.39	1028	3.69	1064	3.99	1098	4.28	1130	4.55	1162	4.80	1194	5.02	1228	5.24	1266	5.47	
5500	830	2.78	882	3.00	927	3.22	969	3.48	1010	3.77	1047	4.09	1083	4.40	1116	4.69	1147	4.96	1179	5.20	1211	5.42	1246	5.63	---	---	
5750	861	3.11	908	3.34	951	3.58	992	3.87	1031	4.19	1068	4.52	1102	4.84	1134	5.12	1165	5.38	1196	5.61	---	---	---	---	---	---	
6000	890	3.45	935	3.71	976	3.98	1016	4.31	1053	4.65	1089	4.99	1122	5.30	1153	5.58	---	---	---	---	---	---	---	---	---	---	---
6250	918	3.84	961	4.12	1001	4.43	1040	4.79	1076	5.14	1110	5.48	---	---	---	---	---	---	---	---	---	---	---	---	---	---	

## BLOWER DATA

### 122 DIRECT DRIVE BLOWER ALL MODELS – BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY (NO HEAT SECTION) WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

- 1 – Wet indoor coil air resistance of selected unit.
- 2 – Any factory installed options air resistance (heat section, economizer, etc.)
- 3 – Any field installed accessories air resistance (duct resistance, diffuser, etc.)

See page 16 for wet coil and option/accessory air resistance data.

#### MAXIMUM STATIC PRESSURE WITH GAS HEAT - 2.0 in. w.g.

Total Air Volume cfm	Total Static Pressure - in. w.g.													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
1750	711	188	771	279	836	366	905	453	975	544	1044	640	1109	737
2000	752	242	812	332	876	420	944	510	1011	606	1075	709	1138	812
2250	799	300	860	389	923	479	988	575	1052	678	1113	787	1171	896
2500	853	362	914	453	976	548	1038	650	1097	761	1154	877	1209	990
2750	914	434	974	529	1033	629	1091	739	1146	858	1199	979	1250	1098
3000	980	513	1037	614	1092	720	1146	837	1198	961	1247	1088	1295	1215
3250	1048	598	1101	705	1153	819	1203	941	1251	1071	1298	1206	1343	1343
3500	1116	693	1166	809	1214	931	1261	1060	1307	1198	1351	1341	1395	1489
3750	1185	806	1232	931	1277	1063	1322	1201	1365	1348	1407	1499	1448	1657
4000	1254	937	1299	1072	1341	1214	1383	1363	1424	1518	1464	1679	1503	1844
4250	1324	1089	1366	1234	1406	1386	1445	1545	1484	1708	1522	1876	1559	2046
4500	1395	1262	1433	1417	1471	1579	1508	1745	1544	1913	1581	2084	1616	2256
4750	1465	1455	1501	1619	1536	1787	1571	1957	1606	2128	1641	2299	1675	2470
5000	1534	1666	1568	1834	1602	2004	1635	2174	1668	2345	1701	2514	1735	2682
5250	1603	1887	1635	2055	1667	2224	1699	2392	1731	2559	1763	2724	---	---
5500	1671	2110	1702	2275	1733	2441	1764	2605	---	---	---	---	---	---
5750	1738	2325	1768	2488	---	---	---	---	---	---	---	---	---	---

Total Air Volume cfm	Total Static Pressure - in. w.g.											
	1.6		1.8		2.0		2.2		2.4		2.6	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
1750	1172	833	1231	932	1287	1039	1340	1156	1391	1283	1442	1426
2000	1197	913	1253	1019	1306	1135	1357	1261	1407	1398	1457	1547
2250	1227	1003	1280	1117	1330	1242	1379	1378	1428	1525	1477	1680
2500	1261	1103	1311	1226	1360	1361	1407	1507	1454	1663	1501	1826
2750	1299	1219	1347	1350	1394	1494	1440	1649	1485	1813	1530	1982
3000	1342	1346	1388	1487	1432	1640	1476	1803	1520	1973	1563	2146
3250	1388	1485	1432	1638	1475	1800	1517	1969	1558	2143	1600	2319
3500	1437	1643	1479	1805	1519	1975	1560	2148	1600	2325	1640	2502
3750	1489	1821	1528	1990	1567	2164	1605	2340	1645	2517	1685	2693
4000	1541	2014	1579	2187	1616	2364	1654	2540	1693	2715	1732	2887
4250	1596	2218	1632	2393	1668	2569	1705	2742	1743	2913	---	---
4500	1652	2429	1687	2603	1722	2775	1759	2944	---	---	---	---
4750	1709	2641	1743	2811	1778	2979	---	---	---	---	---	---
5000	1768	2850	---	---	---	---	---	---	---	---	---	---
5250	---	---	---	---	---	---	---	---	---	---	---	---
5500	---	---	---	---	---	---	---	---	---	---	---	---
5750	---	---	---	---	---	---	---	---	---	---	---	---

## BLOWER DATA

### FACTORY INSTALLED BELT DRIVE KIT SPECIFICATIONS

Nominal hp	Maximum hp	Drive Kit Number	RPM Range
2	2.3	1	590 - 890
2	2.3	2	800 - 1105
2	2.3	3	795 - 1195
3	3.45	4	730 - 970
3	3.45	5	940 - 1200
3	3.45	6	1015 - 1300
5	5.75	10	900 - 1135
5	5.75	11	1040 - 1315
5	5.75	12	1125 - 1425

### POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure		Air Volume Exhausted	
in. w.g.		cfm	
	0		3175
	0.05		2955
	0.10		2685
	0.15		2410
	0.20		2165
	0.25		1920
	0.30		1420
	0.35		1200

### FACTORY INSTALLED OPTIONS/FIELD INSTALLED ACCESSORY AIR RESISTANCE - in. w.g.

Air Volume cfm	Wet Indoor Coil 092, 102, 122	Gas Heat Exchanger			Economizer	Filters		Return Air Adaptor Plate
		Standard Heat	Medium Heat	High Heat		MERV 8	MERV 13	
1750	0.09	0.06	0.02	0.02	0.05	0.01	0.03	0.00
2000	0.11	0.07	0.05	0.06	0.06	0.01	0.03	0.00
2250	0.13	0.07	0.07	0.08	0.08	0.01	0.04	0.00
2500	0.15	0.09	0.10	0.11	0.11	0.01	0.05	0.00
2750	0.17	0.09	0.11	0.12	0.12	0.02	0.05	0.00
3000	0.19	0.11	0.12	0.13	0.13	0.02	0.06	0.02
3250	0.23	0.12	0.15	0.16	0.15	0.02	0.06	0.02
3500	0.26	0.12	0.16	0.17	0.15	0.03	0.07	0.04
3750	0.29	0.14	0.19	0.20	0.15	0.03	0.08	0.07
4000	0.31	0.14	0.21	0.22	0.19	0.04	0.08	0.09
4250	0.34	0.14	0.24	0.28	0.19	0.04	0.09	0.11
4500	0.37	0.15	0.26	0.32	0.22	0.04	0.09	0.12
4750	0.40	0.16	0.29	0.37	0.25	0.05	0.10	0.16
5000	0.43	0.16	0.34	0.43	0.29	0.06	0.10	0.18
5250	0.46	0.16	0.37	0.47	0.32	0.06	0.11	0.19
5500	0.50	0.18	0.44	0.54	0.34	0.07	0.12	0.22
5750	0.56	0.19	0.49	0.59	0.45	0.07	0.12	0.25
6000	0.59	0.20	0.54	0.64	0.52	0.08	0.13	0.27

**TABLE 2**  
**MANUFACTURER'S NUMBERS**

DRIVE NO.	DRIVE COMPONENTS					
	ADJUSTABLE SHEAVE		FIXED SHEAVE		BELT	
BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.	
1	1VP34x7/8	31K6901	AK61x1	100244-20	AX54	100245-25
2	1VP40x7/8	79J0301	AK59x1	31K6801	AX55	100245-26
3	1VP34x7/8	31K6901	AK46x1	100244-17	AX52	100245-33
4	1VP44x7/8	53J9601	AK74x1	100244-21	AX58	100245-34
5	1VP50x7/8	98J0001	AK69x1	37L4701	AX58	100245-34
6	1VP50x7/8	98J0001	AK64x1	12L2501	AX57	100245-28
10	1VP50x1-1/8	P-8-1977	BK77x1	49K4001	BX59	59A5001
11	1VP50x1-1/8	P-8-1977	BK67x1	100244-24	BX57	78L5301
12	1VP50x1-1/8	P-8-1977	BK62x1	100244-23	BX56	100245-11

### Heating Start-Up

*Note - The balance point thermostat must be set below the outdoor ambient temperature to enable heat pump mode. The thermostat is located in the gas heat section.*

*Note - L1 and L2 reversing valves are de-energized in the heating mode.*

- 1- Set thermostat or temperature control device to initiate a first-stage heating demand.
- 2- Outdoor Temperature **ABOVE** A19 Balance Point Thermostat (35°F default):

A first-stage heating demand (W1) will energize **compressors 1 and 2**. Both outdoor fans are energized with a W1 demand.

An increased heating demand (W2) will energize **high gas heat** and de-energize heat pump compressor operation (via K27).

- 3- Outdoor Temperature **BELOW** A19 Balance Point Thermostat (35°F default):

A first-stage heating demand (W1) will energize **low gas heat**.

*Note - Low gas heat is also energized during the defrost mode.*

A second-stage heating demand (W2) will energize **high gas heat**.

### Cooling Start-Up

### **!IMPORTANT**

**If unit is equipped with a crankcase heater. Make sure heater is energized 24 hours before unit start-up to prevent compressor damage as a result of slugging.**

#### A-Start-Up

*Staged Supply Air Units - Refer to the Supply Air Blower or Inverter Start-Up section.*

- 1- Set thermostat or temperature control device fan switch to **AUTO** or **ON**. Set thermostat or temperature control device to initiate a first-stage cooling demand.

A first-stage Y1 cooling demand will energize L1 reversing valve solenoid and compressor 1. An increased cooling demand Y2 will initiate L2 reversing valve solenoid and compressor 2.

#### *Units With Optional Economizer -*

The optional economizer will start on a first stage (Y1) cooling demand when outdoor air enthalpy is suitable. An increased cooling demand (Y2) will energize compressors 1.

- 2- A first-stage Y1 cooling demand will energize all fans in low speed. An increased cooling demand Y2 will energize all fans in high speed.
- 3- Refrigerant circuits are factory charged with HCFC-410A refrigerant. See unit rating plate for correct amount of charge.
- 4- Units contain two refrigerant circuits or systems. See figure 20 or 21.

## REFRIGERANT STAGES - 092, 102

(BOTH FANS ARE ENERGIZED IN LOW SPEED WITH A Y1 DEMAND AND HIGH SPEED WITH A Y2 DEMAND)

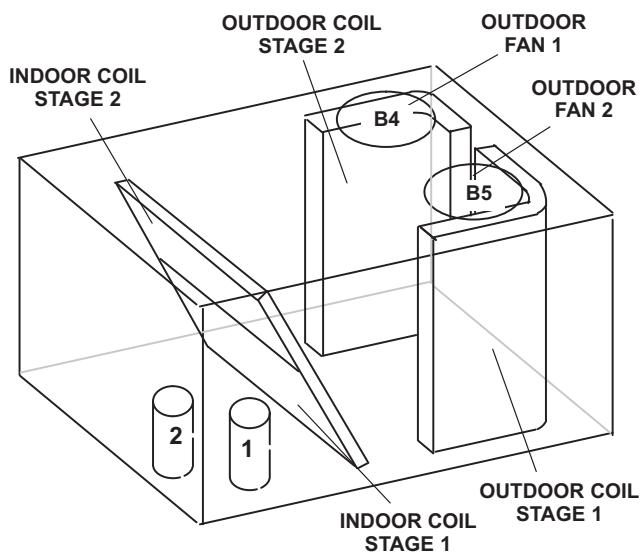


FIGURE 20

## REFRIGERANT STAGES - 122

(ALL FANS ARE ENERGIZED IN LOW SPEED WITH A Y1 DEMAND AND HIGH SPEED WITH A Y2 DEMAND)

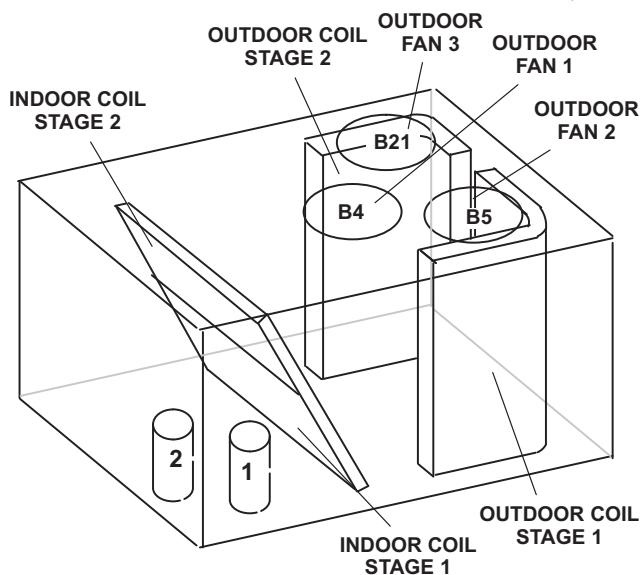


FIGURE 21

## B-Refrigerant Charge and Check

**WARNING**-Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, **reclaim the charge, evacuate the system, and add required nameplate charge**.

**NOTE** - System charging is not recommended below 60°F (15°C). In temperatures below 60°F (15°C), the charge **must** be weighed into the system.

If weighing facilities are not available, or to check the charge, use the following procedure:

- 1- Attach gauge manifolds and operate unit in cooling mode with economizer disabled until system stabilizes (approximately five minutes).
- 2- Check each system separately with all stages operating.
- 3- Use a thermometer to accurately measure the outdoor ambient temperature.
- 4- Apply the outdoor temperature to tables 3 through 5 to determine normal operating pressures. Pressures are listed for sea level applications at 80°F dry bulb and 67°F wet bulb return air.
- 5- Compare the normal operating pressures to the pressures obtained from the gauges. Minor variations in these pressures may be expected due to differences in installations. Significant differences could mean that the system is not properly charged or that a problem exists with some component in the system. **Correct any system problems before proceeding.**

**TABLE 3  
KDB092H NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis- charge ±10 psig	Suction ±5 psig	Dis- charge ±10 psig	Suction ±5 psig
65° F	250	140	257	142
75° F	287	143	295	145
85° F	329	146	336	147
95° F	371	148	382	150
105° F	423	151	435	153
115° F	472	154	486	156

**TABLE 4  
KDB102H NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis- charge ±10 psig	Suction ±5 psig	Dis- charge ±10 psig	Suction ±5 psig
65° F	257	136	261	139
75° F	296	139	298	142
85° F	335	141	339	144
95° F	384	144	390	147
105° F	431	147	441	149
115° F	485	150	495	152

**TABLE 5  
KDB122H NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	CIRCUIT 1		CIRCUIT 2	
	Dis- charge ±10 psig	Suction ±5 psig	Dis- charge ±10 psig	Suction ±5 psig
65° F	248	131	251	134
75° F	284	134	287	136
85° F	322	136	329	139
95° F	371	139	381	142
105° F	416	142	429	144
115° F	470	145	488	148

- If discharge pressure is high, remove refrigerant from the system. If discharge pressure is low, add refrigerant to the system.
  - Add or remove charge in increments.
  - Allow the system to stabilize each time refrigerant is added or removed.
- Use the following approach method along with the normal operating pressures to confirm readings.

#### C-Charge Verification - Approach Method - AHRI Testing

- Using the same thermometer, compare liquid temperature to outdoor ambient temperature.  
Approach Temperature = Liquid temperature (at condenser outlet) minus ambient temperature.
- Approach temperature should match values in table 6. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.

10- The approach method is not valid for grossly over or undercharged systems. Use tables 3 through 5 as a guide for typical operating pressures.

**TABLE 6  
APPROACH TEMPERATURE**

Unit	Liquid Temp. Minus Ambient Temp.	
	1st Stage	2nd Stage
092H, 102H	8°F ± 1 (4.4°C ± 0.5)	9°F ± 1 (5.0°C ± 0.5)
122H	6°F ± 1 (3.3°C ± 0.5)	6°F ± 1 (3.3°C ± 0.5)

#### D-Compressor Controls

- High Pressure Switches (S4, S7)  
Compressor circuits are protected by a high pressure switch which cuts out at 640 psig ± 10 psig (4413 kPa ± 70 kPa).
- Freezestats (S49, S50)  
Switches de-energize compressors when indoor coil temperature falls below 29°F (-2°C) to prevent coil freeze-up. Switches reset when indoor coil temperature reaches 58°F (15°C).
- Crankcase Heater (HR1, HR2)  
Compressors have belly band compressor oil heaters which must be on 24 hours before running compressors. Energize by setting thermostat so that there is no cooling demand, to prevent compressor from cycling, and apply power to unit.
- Defrost Switches (S6, S9)  
Defrost switches close to initiate defrost when liquid line temperature falls to 35°F (1.7°C). The defrost switch is located on the liquid line between the outdoor expansion valve and the distributor
- Defrost Termination Switches (S46, S104)  
Defrost pressure switches open to terminate defrost when vapor (discharge pressure during cooling and defrost) pressure reaches 450 psig (3103 kPa).
- Defrost Controls (CMC1)  
Defrost is liquid line temperature initiated and operates for 14 minutes unless terminated by vapor line pressure drop.  
When the liquid line temperature drops below 35°F, the defrost switch closes and signals the **defrost control** that a defrost cycle is needed. If the defrost switch is still closed after 60 minutes (default), a defrost cycle begins and operates for 14 minutes. The defrost pressure switch can terminate the defrost cycle before the 14 minutes elapses if vapor pressure reaches 450 ± 10 psi.  
Gas heat is energized during defrost to maintain discharge air temperature.

## Defrost Control Board

The defrost thermostat, defrost pressure switch and the defrost control work together to ensure that the heat pump outdoor coil does not ice excessively during the heating mode.

### Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 60 minutes (default) on 100269-02 boards; 90 minutes (default) on 100269-04 boards. The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 22.

The defrost interval can be adjusted to 30, 60, or 90 minutes. The defrost timing jumper is factory-installed to provide a 60-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval.

Low gas heat is energized by CMC1 W1 24VAC contacts during defrost.

### Defrost Test Option

A TEST option is provided for troubleshooting. The TEST mode may be started any time the unit is in the heating

mode and the defrost thermostat is closed or jumpered. If the timing jumper is in the TEST position at power-up, the defrost control will ignore the test pins. When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost pressure switch opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

### Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a sequence according to the condition.

TABLE 7

Defrost Control Board Diagnostic LED		
Indicates	LED 1	LED 2
Normal operation / power to board	Synchronized Flash with LED 2	Synchronized Flash with LED 1
Board failure / no power	Off	Off
Board failure	On	On
Pressure switch open	Flash	On

DEFROST CONTROL BOARD CMC1

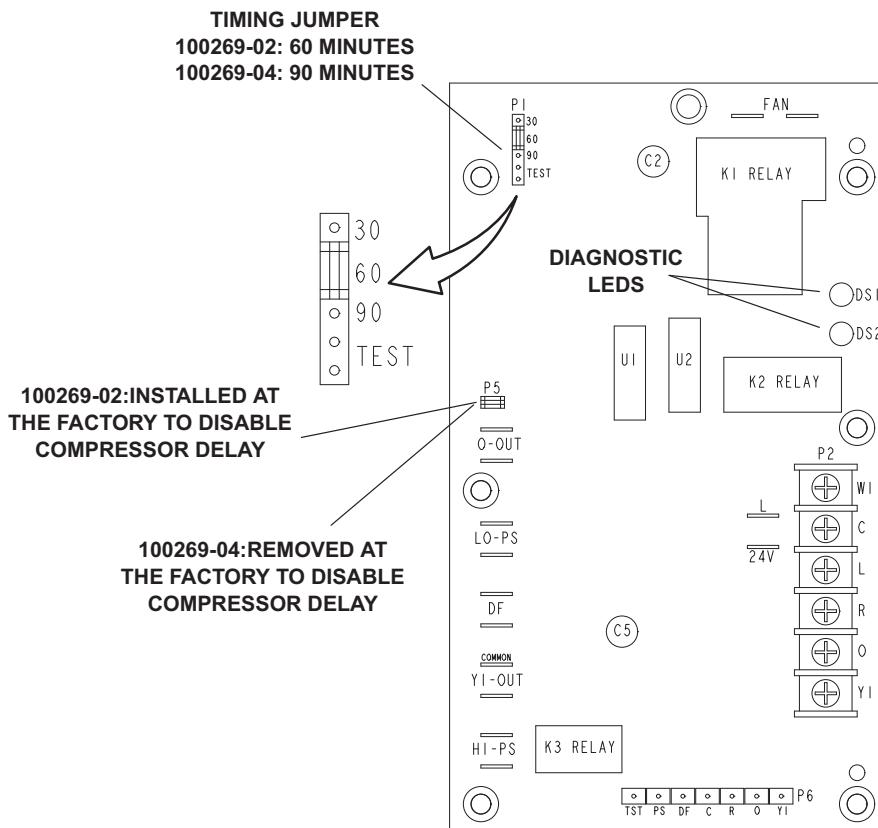


FIGURE 22

## Belt Drive Supply Air Inverter Start-Up

### A-General

Units are available with an optional inverter which provides two blower speeds. The blower will operate at lower speeds when cooling demand is low and higher speeds when cooling demand is high. This results in lower energy consumption.

Units will operate at high speed during ventilation (blower "G" only signal) but can be adjusted to operate at low speed.

Low speed is approximately 2/3 of the full speed RPM.

### B-Set Maximum Blower CFM

- 1- Initiate a blower (G) only signal from the room thermostat or control system.
- 2- Adjust the blower pulley to deliver the full (high speed) CFM in the typical manner. See *Determining Unit CFM* in the Blower Operation and Adjustment section.

### C-Set Blower Speed During Ventilation

To save energy during ventilation, the blower speed can be set to low. This is accomplished by changing the ventilation speed switch on the FCB control board to "LO". See figure 23.

*Note - On units equipped with an economizer, set damper minimum position as shown in the next section. After adjusting the low speed minimum position, the ventilation speed switch will be in the "LO" position.*

### D-Set Damper Minimum Position (Units W/ Economizer)

To maintain required minimum ventilation air volumes when the unit is in the occupied mode, two minimum damper positions must be set. A high and a low speed potentiometer are provided on the FCB control board to adjust minimum damper position. See figure 23.

#### Set High Speed Minimum Position

- 1- Initiate a blower (G) only AND occupied demand from the room thermostat or control system.
- 2- Set the ventilation speed switch on the FCB control board to "HI".
- 3- Rotate the high speed potentiometer on the FCB control board to set the high speed minimum damper position.

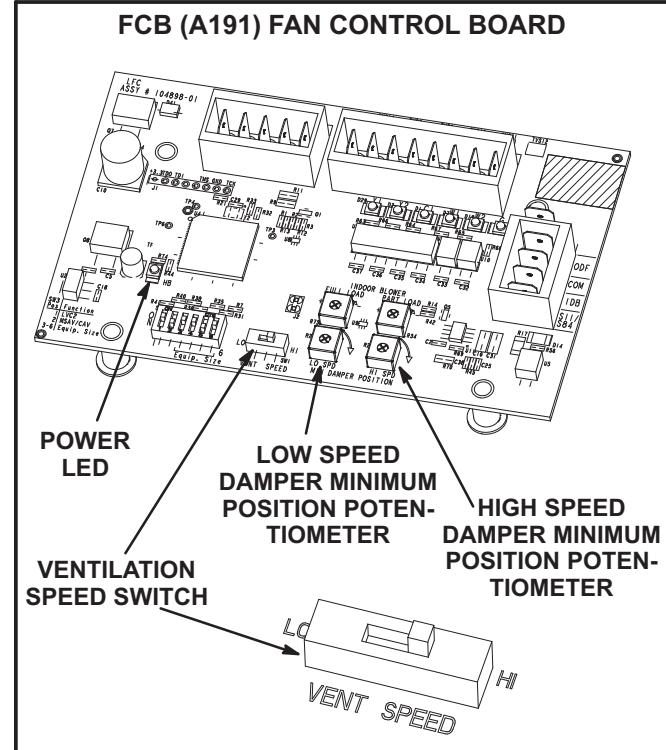


FIGURE 23

- 4- Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the potentiometer to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

*Note - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.*

#### Set Low Speed Minimum Position

- 1- Initiate a blower (G) only AND occupied demand from the room thermostat or control system.
- 2- Set the ventilation speed switch on the FCB control board to "LO".
- 3- Rotate the low speed potentiometer on the FCB control board to set the low speed minimum damper position.
- 4- Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the potentiometer to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

*Note - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.*

## Direct Drive Supply Air Blower Start-Up

### A-General

Units are available with an optional direct drive blower which can be set at high and low speed. The blower will operate at lower speeds when demand is low and higher speeds when demand is high. This results in lower energy consumption.

### B-Set Blower CFM

See figure 24.

- 1- Initiate a blower (G) only signal from the room thermostat or control system. The blower will operate in high speed.
- 2- Measure the blower RPM and static pressure and use appropriate blower table to calculate supply air CFM. See *Determining Unit CFM* in the Blower Operation and Adjustment section.
- 3- If the resulting CFM is lower than the desired CFM, rotate the fan control board high speed potentiometer clockwise (or counterclockwise if CFM is too high).
- 4- Calculate the CFM and adjust potentiometer as needed to meet desired CFM.
- 5- Initiate a blower (G) AND first-stage (Y1) cooling signal from the room thermostat or control system. The blower will operate in low speed.
- 6- Calculate the low speed CFM in the same manner as the high speed CFM.
- 7- Adjust low speed potentiometer as needed to meet desired CFM.

### C-Set Blower Speed During Ventilation

To save energy during ventilation, the blower speed can be set to low. This is accomplished by changing the ventilation speed switch on the FCB control board to "LO". See figure 24.

*Note - On units equipped with an economizer, set damper minimum position as shown in the next section. After adjusting the low speed minimum position, the ventilation speed switch will be in the "LO" position.*

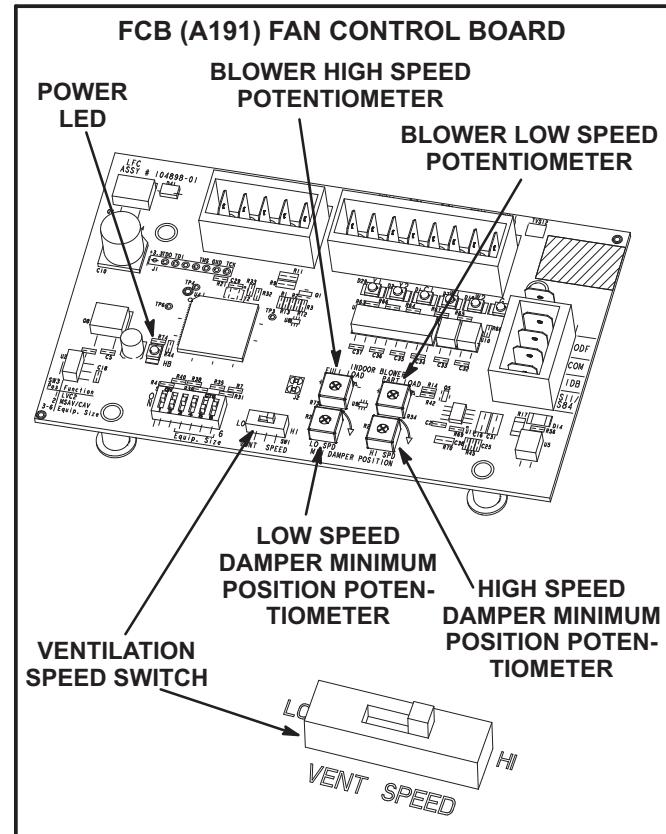


FIGURE 24

### D-Set Damper Minimum Position (Units W/ Economizer)

To maintain required minimum ventilation air volumes when the unit is in the occupied mode, two minimum damper positions must be set. A high and a low speed potentiometer are provided on the FCB control board to adjust minimum damper position. See figure 24.

#### Set High Speed Minimum Position

- 1- Initiate a blower (G) only AND occupied demand from the room thermostat or control system.
- 2- Set the ventilation speed switch on the FCB control board to "HI".
- 3- Rotate the high speed potentiometer on the FCB control board to set the high speed minimum damper position.
- 4- Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the potentiometer to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

*Note - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.*

### Set Low Speed Minimum Position

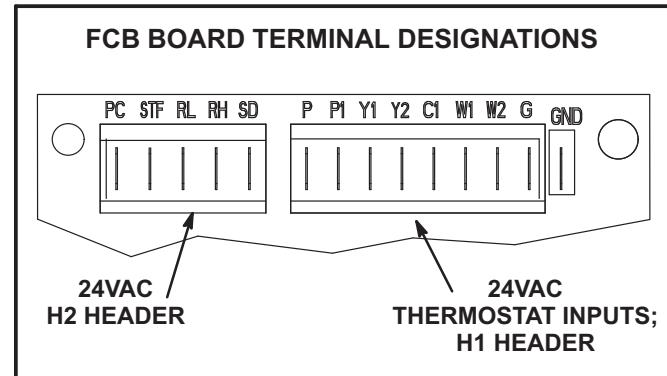
- 1- Initiate a blower (G) only AND occupied demand from the room thermostat or control system.
- 2- Set the ventilation speed switch on the FCB control board to "LO".
- 3- Rotate the low speed potentiometer on the FCB control board to set the low speed minimum damper position.
- 4- Measure the intake air CFM. If the CFM is lower than the design specified CFM for ventilation air, use the potentiometer to increase the damper percent open. If the CFM is higher than specified, decrease the damper percent open.

*Note - Intake air CFM can also be determined using the outdoor air temperature, return air temperature and mixed air temperature. Refer to the economizer or outdoor air damper installation instructions.*

### Troubleshoot FCB Board (A191)

Refer to wiring diagram sections B (unit), C (control) and D (economizer) located on inside of unit panels.

- 1- Inspect the board for damaged components. Replace the board if damaged components are found.
- 2- Check all wire connections to board; secure if loose.
- 3- Check for 24VAC signal at the thermostat blower input (G to GND terminal). See figure 25.



**FIGURE 25**

- 4- If there is no thermostat signal, troubleshoot back toward the thermostat.
- 5- Check the power LED on the board. See figure 24.
- 6- The LED should be blinking at a 1-second rate when operating normally. If the LED is dim and not blinking, this indicates power is provided but a problem exists with the board.
- 7- If the power LED is not on, check voltage between FCB terminals PC (H2-1) and SD (H2-5). Voltage should read 24VAC.
- 8- If voltage does not read 24VAC, disconnect the H2 header from the FCB VFD inputs terminal block (to make sure the FCB is not shorting 24VAC supply from the inverter). Measure the voltage between the end terminals on the H2 header. If 24VAC is present, replace the FCB board. If no voltage is read, troubleshoot the VFD.

## Gas Heat Start-Up

FOR YOUR SAFETY READ BEFORE LIGHTING

### ⚠ WARNING



**Electric shock hazard. Can cause injury or death. Do not use this unit if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control which has been under water.**

### ⚠ WARNING



**Danger of explosion. Can cause injury or product or property damage. If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.**

### ⚠ WARNING



**Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.**

### ⚠ WARNING

#### SMOKE POTENTIAL

The heat exchanger in this unit could be a source of smoke on initial firing. Take precautions with respect to building occupants and property. Vent initial supply air outside when possible.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

### ⚠ WARNING



**Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.**

This unit is equipped with an automatic spark ignition system. There is no pilot. In case of a safety shutdown, move thermostat switch to **OFF** and return the thermostat switch to **HEAT** to reset ignition control.

#### A-Placing Unit In Operation

### ⚠ WARNING



**Danger of explosion and fire. Can cause injury or product or property damage. You must follow these instructions exactly.**

**Gas Valve Operation for Honeywell VR8205Q/VR8305Q and White Rodgers 36H54 (figure 26 and 27)**

- 1- Set balance point thermostat setpoint above the outdoor ambient temperature to disable heat pump operation.
- 2- Set thermostat to lowest setting.
- 3- Turn off all electrical power to appliance.
- 4- This appliance is equipped with an ignition device which automatically lights the burner. Do **not** try to light the burner by hand.
- 5- Open or remove the heat section access panel.

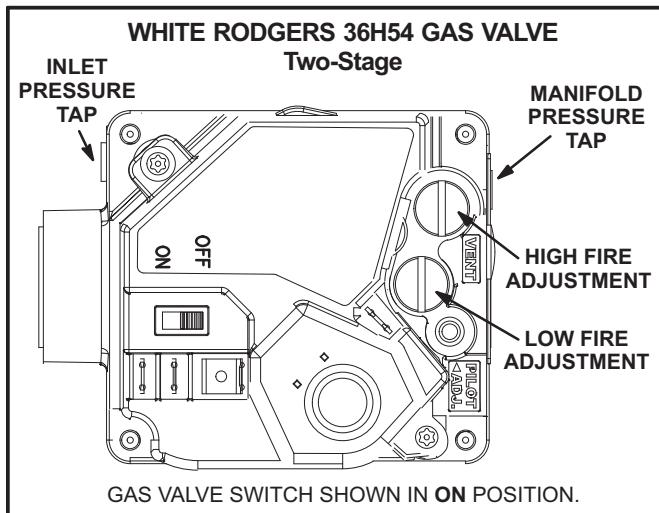


FIGURE 26

**HONEYWELL VR8205Q/VR8305Q SERIES GAS VALVE**

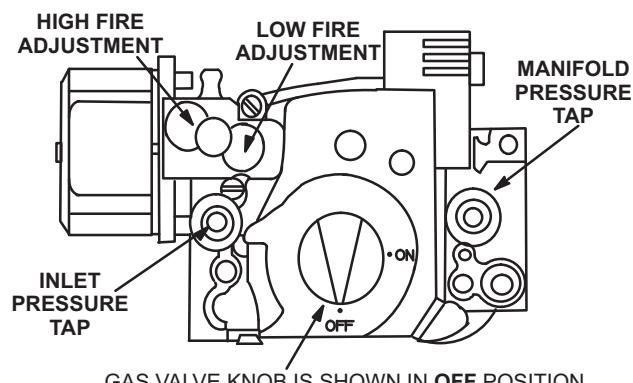


FIGURE 27

- 6- Turn gas valve switch to **OFF**. See figure 26. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise  to “**OFF**”. Do not force. See figure 27.
- 7- Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas, go to the next step.
- 8- Turn gas valve switch to **ON**. See figure 26. On Honeywell VR8305Q gas valves, turn the knob on the gas valve counterclockwise  to “**ON**”. Do not force. See figure 27.
- 9- Close or replace the heat section access panel.
- 10- Turn on all electrical power to appliance.
- 11- Set thermostat to desired setting.
- 12- The ignition sequence will start.
- 13- If the appliance does not light the first time (gas line not fully purged), it will attempt up to two more ignitions before locking out.
- 14- If lockout occurs, repeat steps 1 through 10.
- 15- If the appliance will not operate, follow the instructions “Turning Off Gas to Appliance” and call your service technician or gas supplier.

#### Turning Off Gas to Unit

- 1- If using an electromechanical thermostat, set to the lowest setting.
- 2- Before performing any service, turn off all electrical power to the appliance.
- 3- Open or remove the heat section access panel.
- 4- Turn gas valve switch to **OFF**. On Honeywell VR8305Q gas valves, turn the knob on the gas valve clockwise  to “**OFF**”. Do not force.
- 5- Close or replace the heat section access panel.

## **WARNING**



**Danger of explosion. Can cause injury or death. Do not attempt to light manually. Unit has a direct spark ignition system.**

## **Heating Operation and Adjustments**

#### A-Heating Sequence of Operation

- 1- Set balance point thermostat setpoint above the outdoor ambient temperature to disable heat pump operation.
- 2- On a heating demand the combustion air inducer starts immediately.
- 3- Combustion air pressure switch proves inducer operation. After a 30-second pre-purge, power is

allowed to ignition control. Switch is factory set and requires no adjustment.

- 4- Spark ignitor energizes and gas valve solenoid opens.
- 5- Spark ignites gas, ignition sensor proves the flame and combustion continues.
- 6- If flame is not detected after first ignition trial, ignition control will repeat steps 3 and 4 two more times before locking out the gas valve.
- 7- For troubleshooting purposes, an ignition attempt after lock out may be re-established manually. Move thermostat to “**OFF**” and return thermostat switch to “**HEAT**” position.

#### B-Ignition Control Diagnostic LED's

**TABLE 8**  
**IGNITION CONTROL HEARTBEAT LED STATUS**

LED Flashes	Indicates
Slow	Normal operation. No call for heat.
Fast	Normal operation. Call for heat.
Steady Off	Internal control fault OR no power to control OR Gas Valve Relay Fault.
Steady On	Control internal failure.
2	Lockout. Failed to detect or sustain flame.
3	Prove switch open or closed or rollout switch open.
4	Limit switch is open and/or limit has opened three times.
5	Flame sensed but gas valve solenoid not energized.

#### C-Limit Controls

Limit controls are factory-set and are not adjustable. The primary limit is located on the blower deck to the right of blower assembly.

#### D-Heating Adjustment

Main burners are factory-set and do not require adjustment.

The following manifold pressures are listed on the gas valve.

Natural Gas Units - Low Fire - 1.6" w.c. (not adjustable)  
 Natural Gas Units - High Fire - 3.7" w.c.  
 LP Gas Units - Low Fire - 5.5" w.c. (not adjustable)  
 LP Gas Units - High Fire - 10.5" w.c.

## Service

The unit should be inspected once a year by a qualified service technician.

## ⚠ CAUTION

**Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.**

### A-Lubrication

All motors are lubricated at the factory. No further lubrication is required.

### B-Filters

Units are equipped with four 20 X 25 X 2" filters. Filters should be checked monthly and replaced when necessary with filters of like kind and size. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 28.

*NOTE-Filters must be U.L.C. certified or equivalent for use in Canada.*

### C-Supply Air Blower Wheel

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.

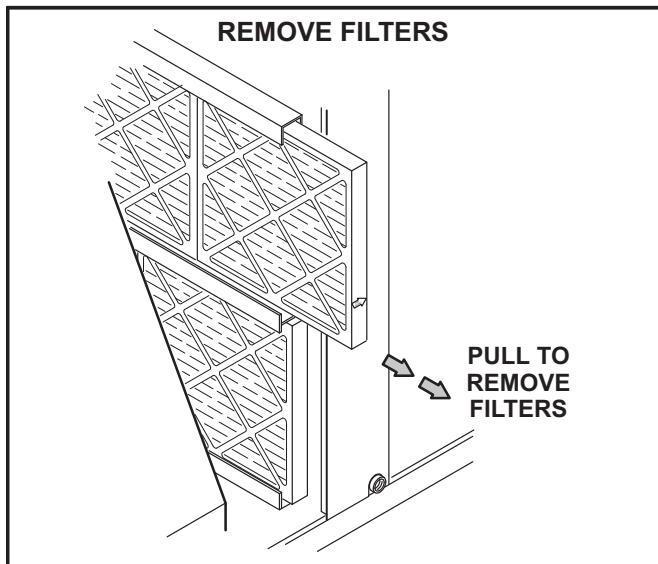


FIGURE 28

### D-Indoor Coil

Inspect and clean coil at beginning of each cooling and heating season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

### E-Outdoor Coil

Clean condenser coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season.

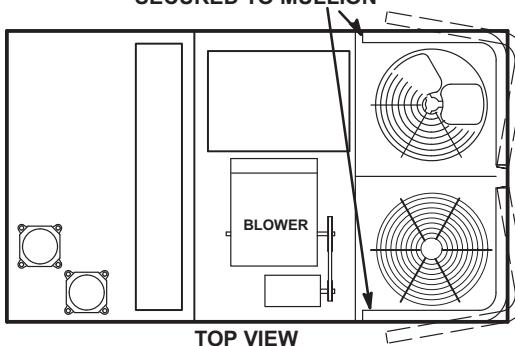
Condenser coils are made of two formed slabs. Dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 29. Flush coils with water following cleaning.

### F-Filter Drier

The unit is equipped with a bi-flow filter drier. If replacement is necessary, order another of like design.

### CLEAN CONDENSER COIL (092-102 SHOWN)

ENDPLATE IS  
SECURED TO MULLION



TOP VIEW

- 1- Remove screws securing coil end plate to mullion.
- 2- Remove clips connecting coils slabs and separate slabs 3-4" (76-102mm).
- 3- Clean coils with detergent or commercial coil cleaner.
- 4- Rinse thoroughly with water and reassemble.

FIGURE 29

## G-Burners

Periodically examine burner flames for proper appearance during the heating season. Before each heating season examine the burners for any deposits or blockage which may have occurred.

Clean burners as follows:

- 1- Turn off both electrical power and gas supply to unit.
- 2- Remove burner compartment access panel.
- 3- Remove screws securing burners to burner support and lift the individual burners or the entire burner assembly from the orifices. See figure 30. Clean as necessary.
- 4- Locate the ignitor under the left burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 31.
- 5- Check the alignment of the ignitor and the sensor as shown in figure 32 and table 9.
- 6- Replace burners and screws securing burner.
- 7- Replace access panel.
- 8- Restore electrical power and gas supply. Follow lighting instructions attached to unit and use inspection port in access panel to check flame.

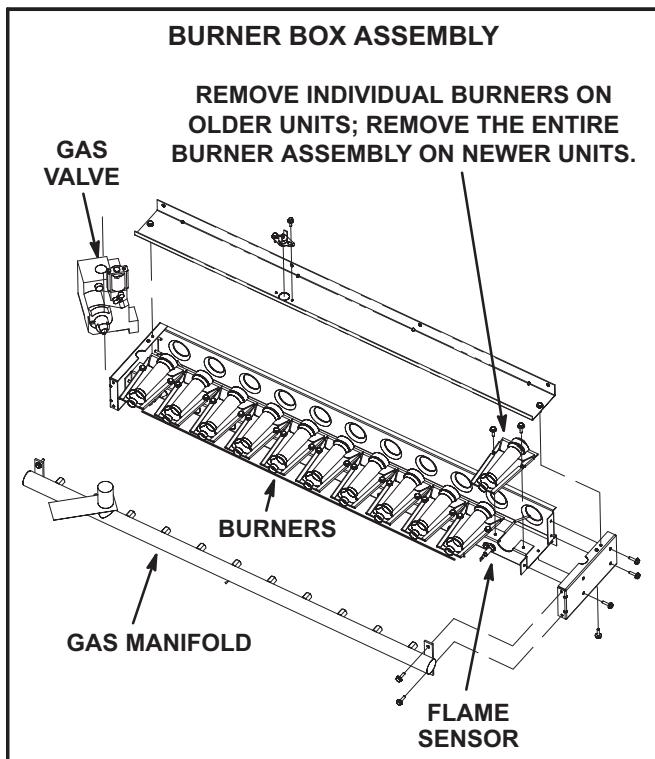


FIGURE 30

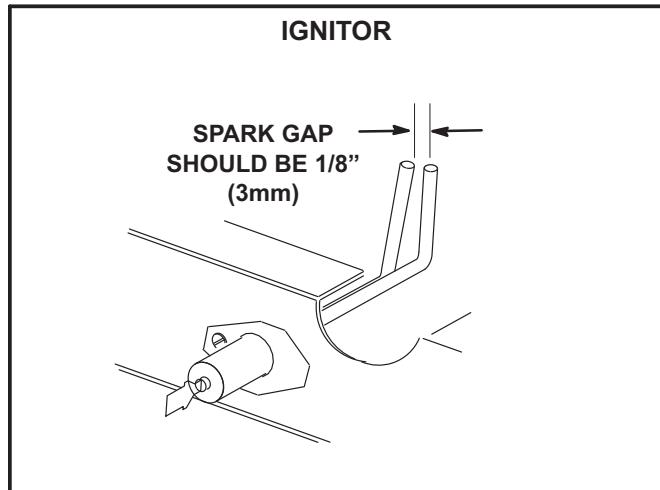


FIGURE 31

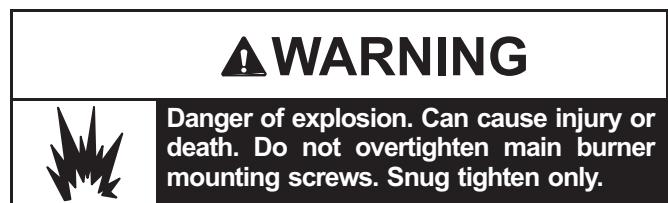


TABLE 9

Dimension	Unit Btuh Input	Length - in. (mm)	
		Ignitor	Sensor
A	130K	7-3/4 (197)	11 (279)
B	180K	5 (127)	5-1/2 (140)
C	240K	2-1/4 (57)	2-3/4 (70)

## H-Combustion Air Inducer

A combustion air proving switch checks combustion air inducer operation before allowing power to the gas controller. Gas controller will not operate if inducer is obstructed.

Under normal operating conditions, the combustion air inducer wheel should be checked and cleaned prior to the heating season. However, it should be examined periodically during the heating season to establish an ideal cleaning schedule. With power supply disconnected, the condition of the inducer wheel can be determined by looking through the vent opening.

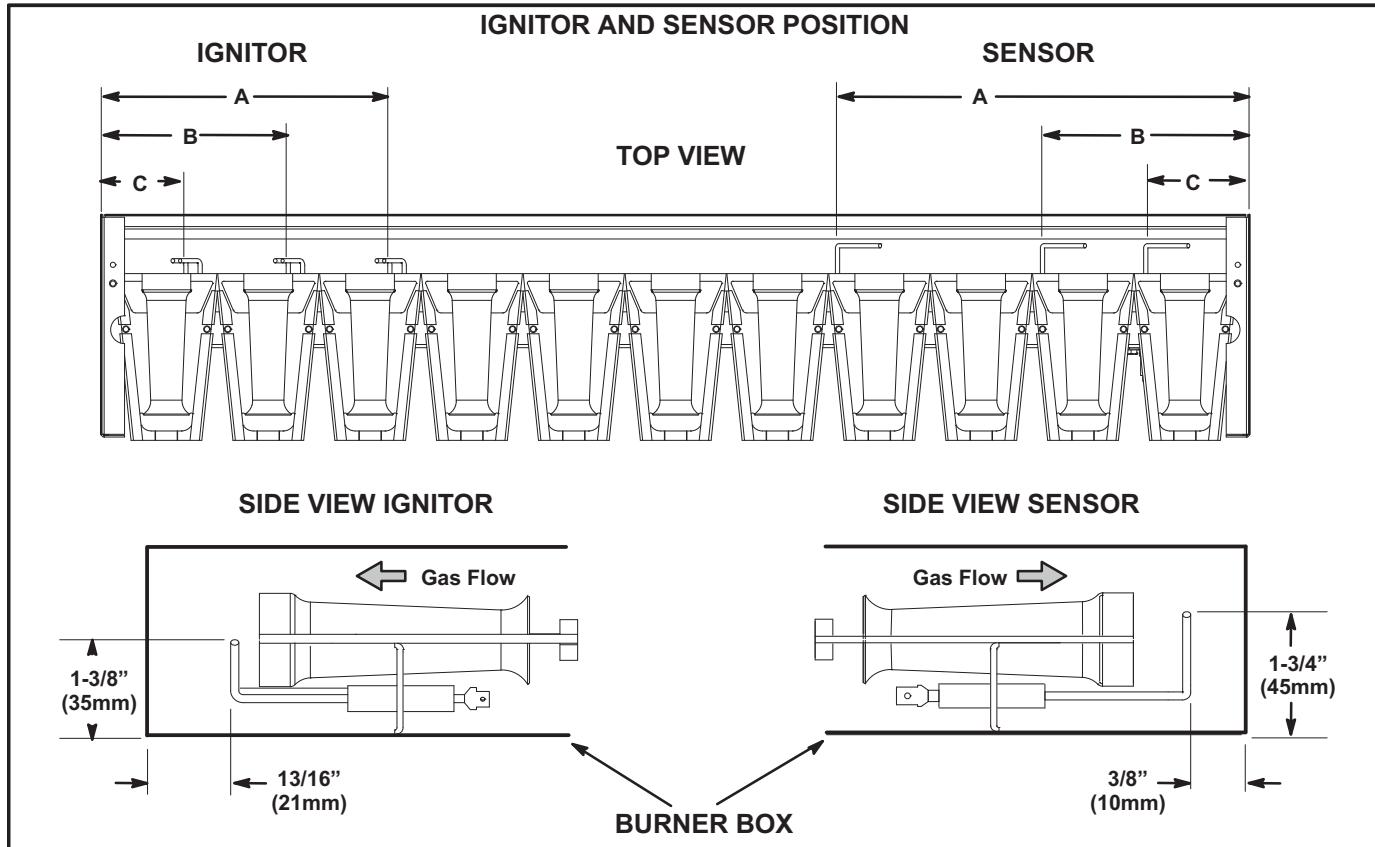


FIGURE 32

Clean combustion air inducer as follows:

- 9- Shut off power supply and gas to unit.
- 10- Disconnect pressure switch air tubing from combustion air inducer port.
- 11- Remove and retain screws securing combustion air inducer to flue box. Remove vent connector. See figure 33.

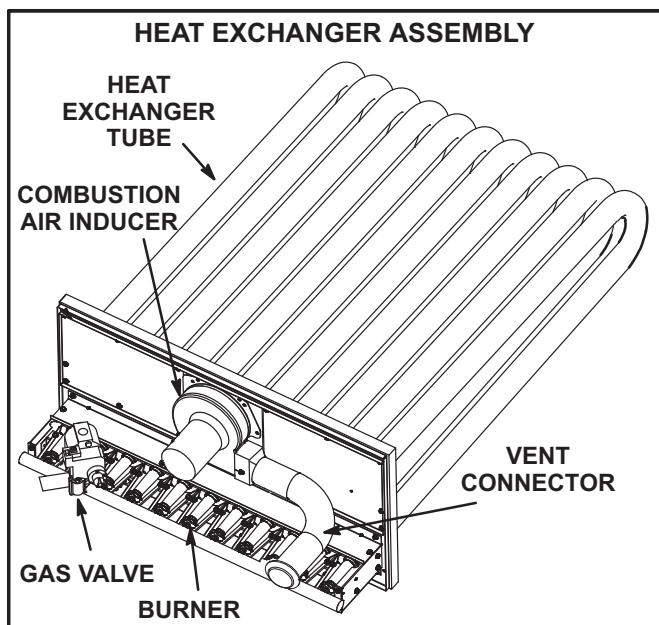


FIGURE 33

12- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Clean accumulated dust from front of flue box cover.

13- Return combustion air inducer motor and vent connector to original location and secure with retained screws. It is recommended that the combustion air inducer gasket be replaced during reassembly.

14- Clean combustion air inlet louvers on heat access panel using a small brush.

#### J-Flue Passageway and Flue Box

15- Remove combustion air inducer assembly as described in section D.

16- Remove flue box cover. Clean with a wire brush as required.

17- Clean tubes with a wire brush.

18- Reassemble the unit. The flue box cover gasket and combustion air inducer gasket should also be replaced during reassembly.