

⚠ 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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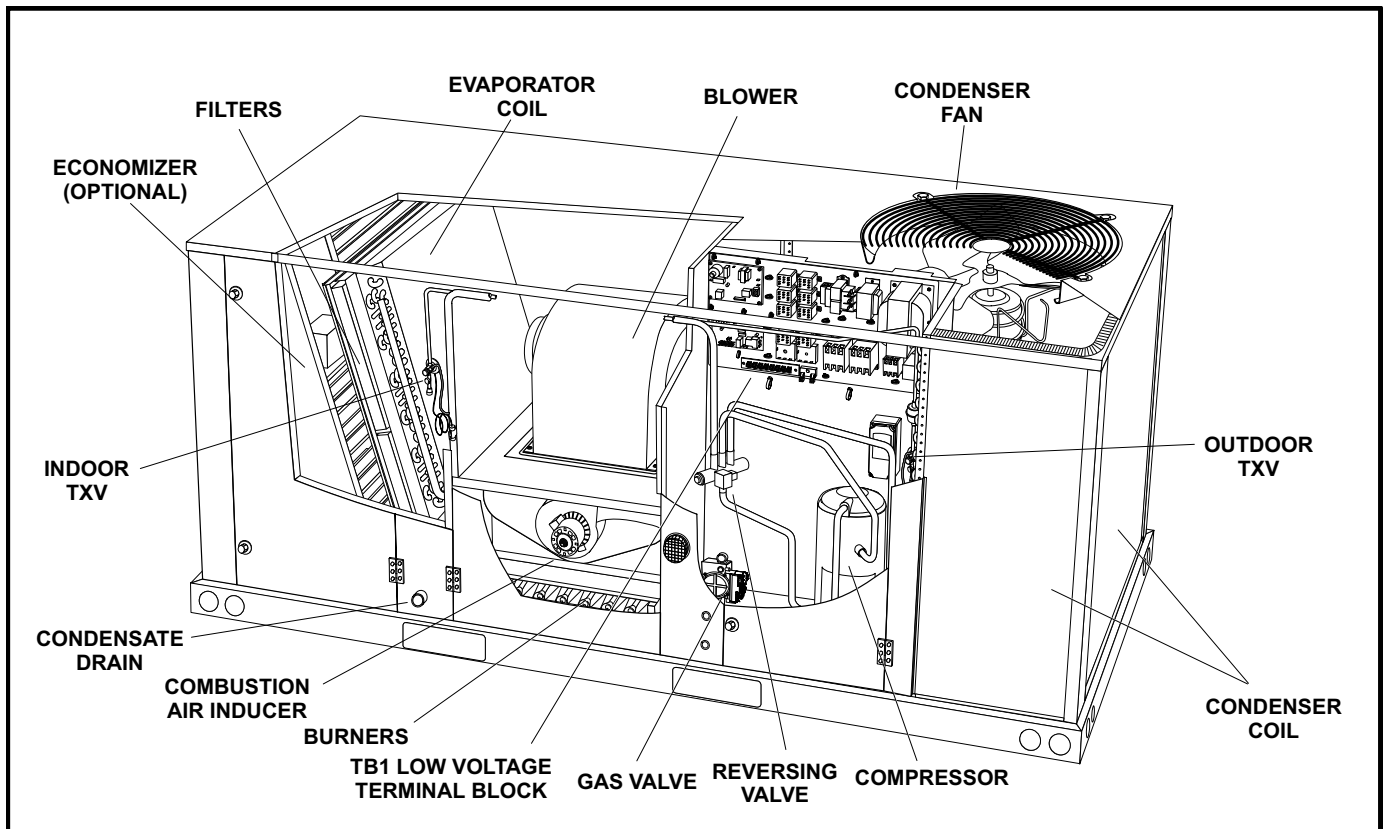
**INSTALLATION
INSTRUCTIONS****KDB024 (2 TON)****KDB036 (3 TON)****KDB048 (4 TON)****KDB060 (5 TON)****ROOFTOP PACKAGED UNITS**

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7/2019

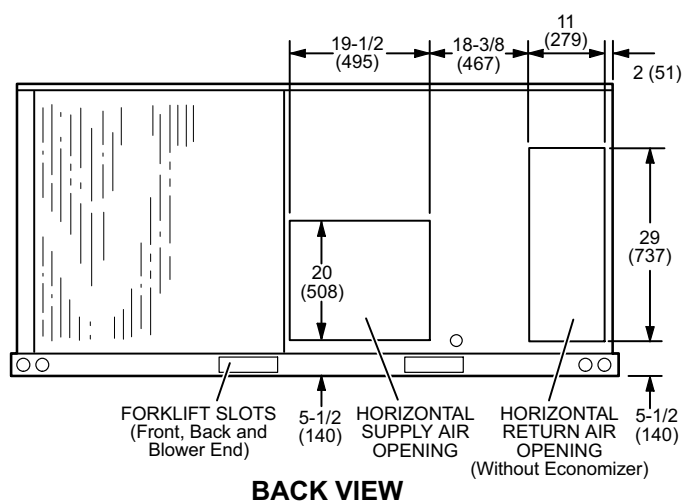
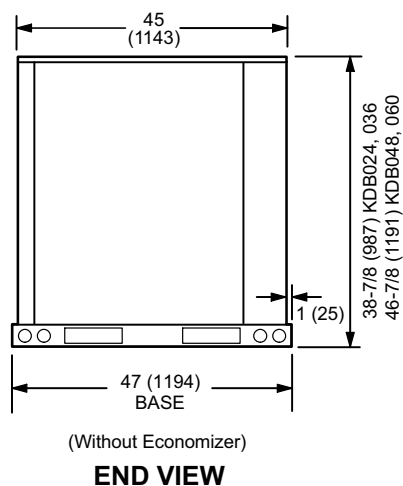
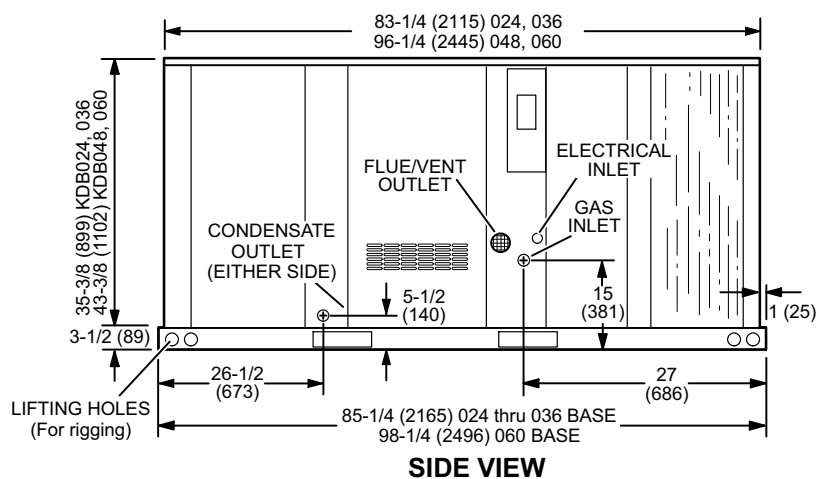
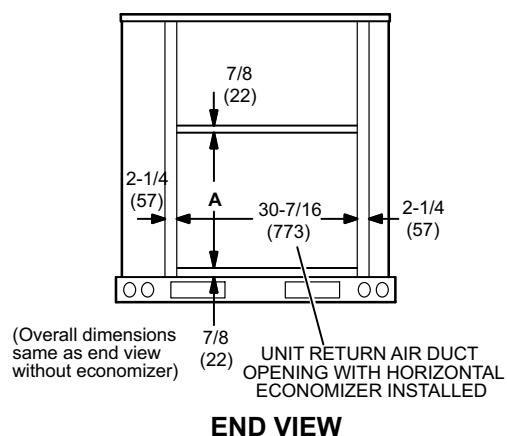
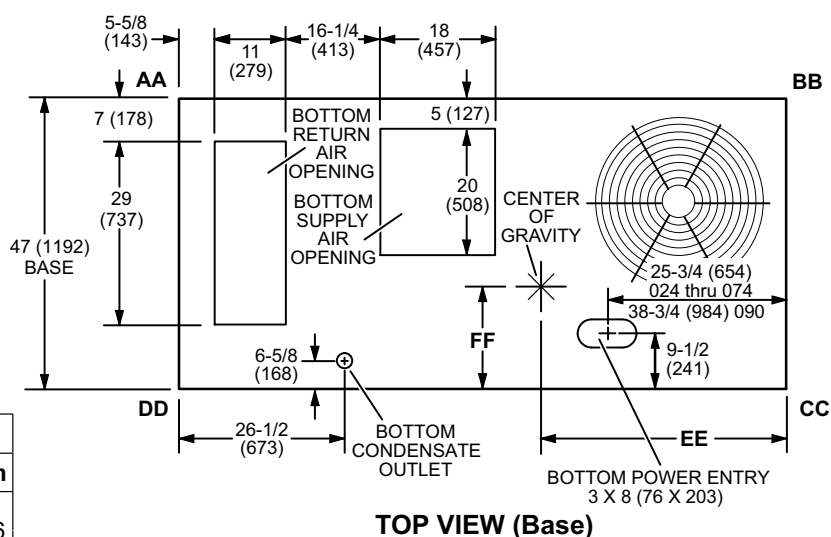
Supersedes 6/2019

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RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE**KDB024, 036, 048, 060 PARTS ARRANGEMENT**

KDB024, 030, 036, 048, 060 DIMENSIONS

Model No.	A	
	in.	mm
KDB024, 036	18-3/4	476
KDB048, 060	22-1/2	572



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 2, 3, 4, and 5-ton cooling capacities. Units are available in three gas heating inputs.

KDB036, 048, and 060 3-phase units are equipped with two-speed, belt or direct drive supply air blowers. KDB024, 036, 048 and 060 1-phase units are equipped with variable speed, 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 Blower Operation section.

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 dual fuel 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

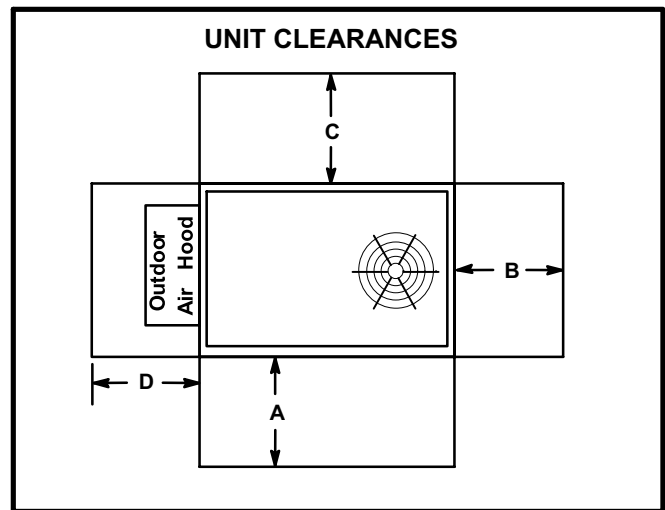


FIGURE 1

¹ Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	36 (914)	36 (914)	36 (914)	36 (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.

¹ **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.

WARNING



Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

The KDB unit is ETL/CSA certified as a dual fuel 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.

CAUTION

To reduce the likelihood of supply / return air bypass and promote a proper seal with the RTU, duct work / duct drops / diffuser assemblies must be supported independently to the building structure.

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:

- 1- The unit base is fully enclosed and insulated, so an enclosed frame is not required.
- 2- 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.
- 3- Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14" (356mm).
- 4- 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.
- 5- 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

- 1- Units which are equipped with an optional economizer and installed in horizontal airflow applications must use a horizontal conversion kit.
- 2- Specified installation clearances must be maintained when installing units. Refer to figure 1.

- 3- 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.
- 4- 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.)

Unit	Weight*	
	Lbs.	Kg.
All	894	406

*Maximum weight with all available installed accessories.

Lifting Point Should Be Directly Above Center Of Gravity.

CAUTION: DO NOT WALK ON UNIT.

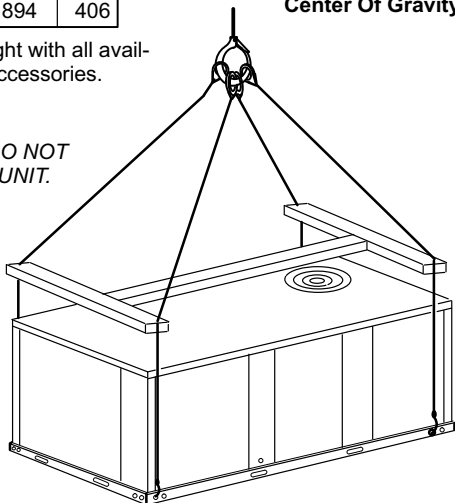


FIGURE 2

Horizontal Air Discharge

Unit is shipped with panels covering the horizontal supply and return air openings. Remove horizontal covers and place over downflow openings for horizontal air discharge. See figure 3. Secure in place with sheet metal screws.

Units Equipped With An Optional Economizer

- 1- Remove the horizontal supply air cover and position over the downflow supply air opening. Secure with sheet metal screws.
- 2- Leave the horizontal return air cover in place.
- 3- Locate the separately ordered horizontal air discharge kit. Place the kit panel over the downflow return air opening.
- 4- Remove and retain the barometric relief dampers and lower hood.
- 5- Install return air duct beneath outdoor air intake. See figure 4. Install barometric relief damper in lower hood and install in ductwork as shown in figure 4.

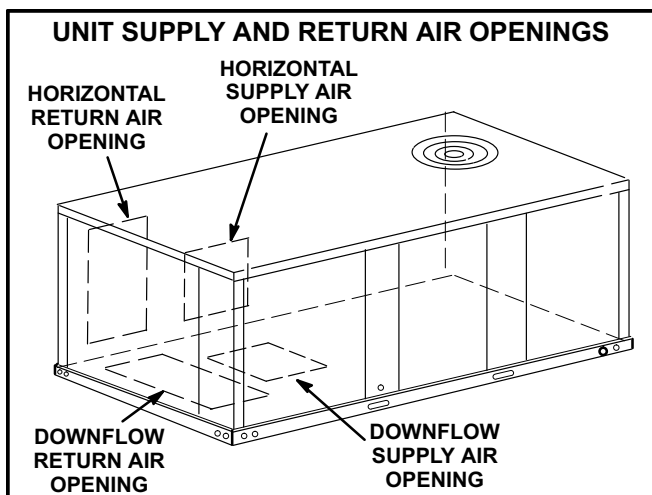


FIGURE 3

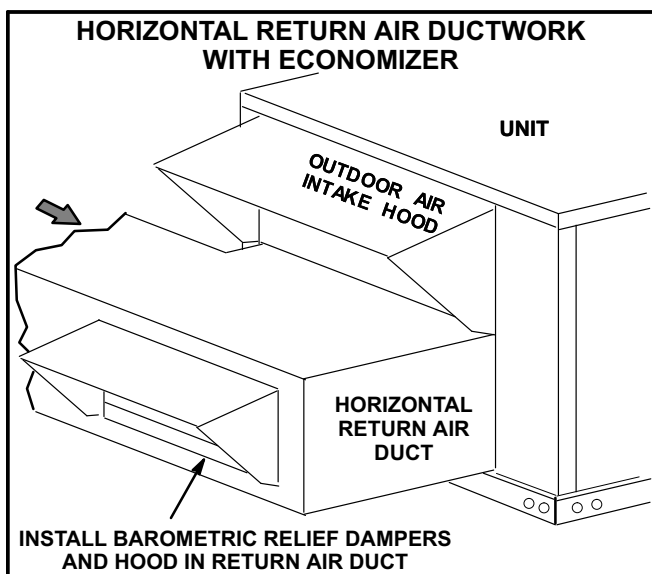


FIGURE 4

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 5 or 6. 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 for condensate drain location.

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

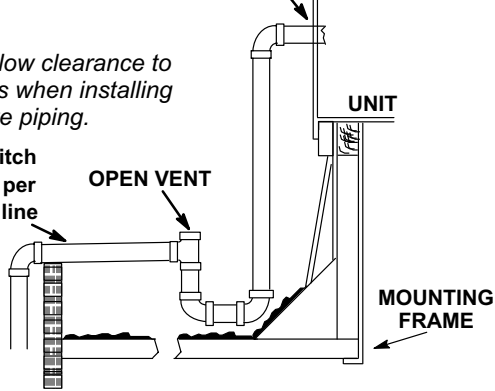


FIGURE 5

CONDENSATE BOTTOM DRAIN CONNECTION

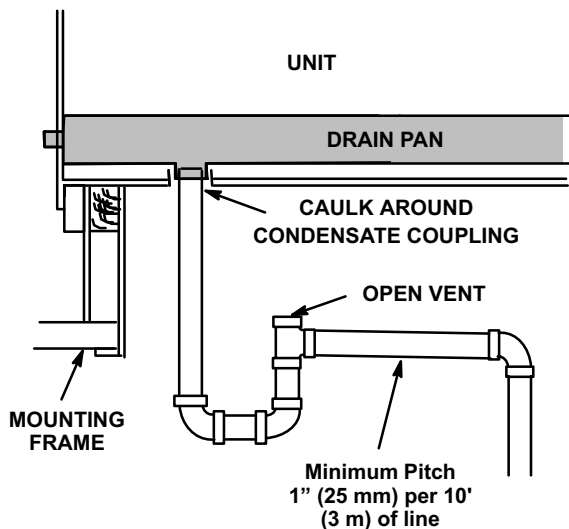


FIGURE 6

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 the condensate drain mullion. See figure 7.
Remove the two panels on each side of the mullion.

If the unit has hinged panels, two hinge screws must be removed in addition to the mullion screws. See figure 8.

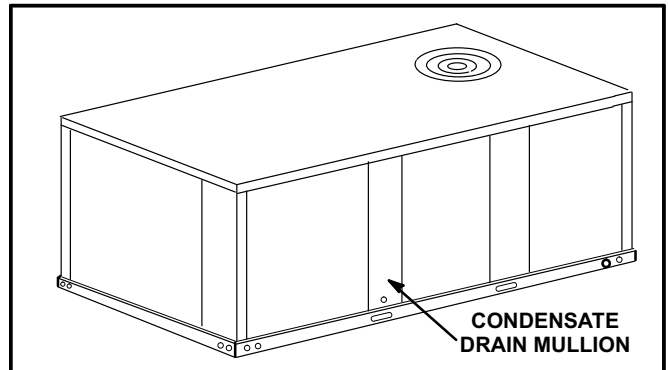


FIGURE 7

- 2- Lift the front edge of the drain pan and slide pan out of unit. See figure 9.

- 3- Make sure the cap over the unit bottom drain hole is secure.

UNITS WITH HINGED PANELS

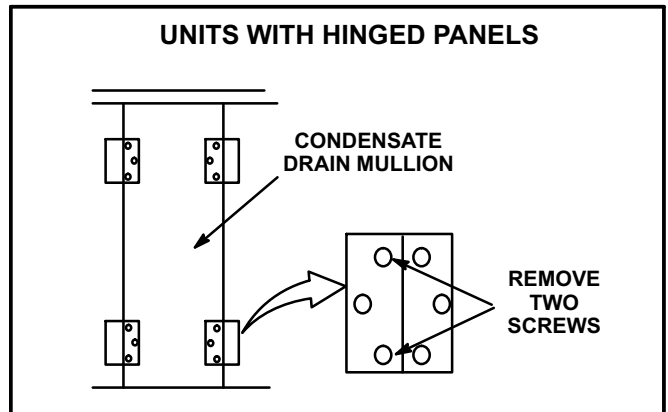


FIGURE 8

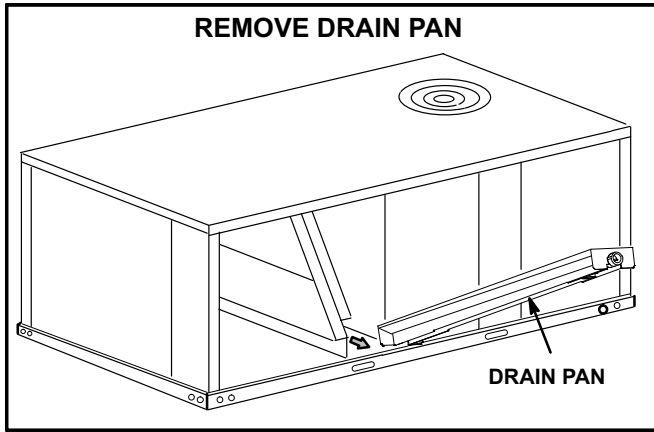


FIGURE 9

- 4- 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.
- 5- From the back side of the unit, pull the drain pan coupling through the rear condensate opening.
- 6- Replace the condensate drain mullion and reinstall screws.
- 7- Reinstall access doors.

Bottom Drain Connection

- 1- Remove the condensate drain mullion. See figure 7.
If the unit has hinged panels, two hinge screws must be removed in addition to the mullion screws. See figure 8.
- 2- Lift the front edge of the drain pan and slide pan out of unit. See figure 9.
- 3- 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 10.
- 4- From the inside of the pan, use a Vari-Bit® bit to enlarge the hole to 7/8". Do not damage coupling threads.
- 5- Remove the cap over the unit bottom drain hole.
- 6- Slide the drain pan back into the unit.
- 7- From the back side of the unit, pull the drain pan coupling through the rear condensate opening.
- 8- 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.

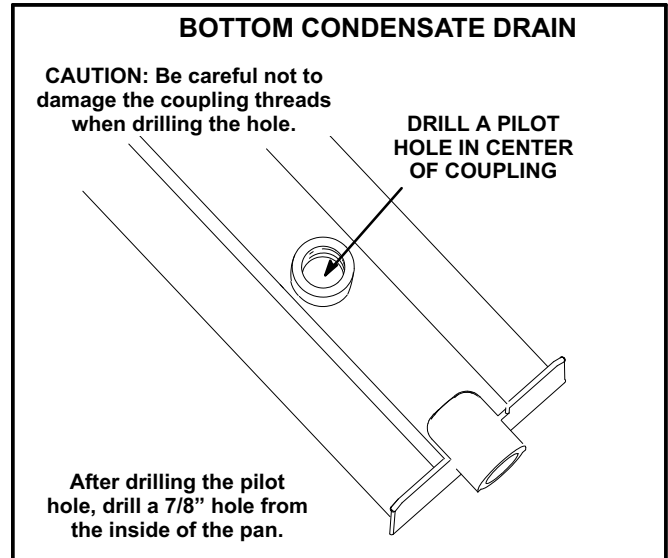


FIGURE 10

- 9- Use a field-provided 1" plug to seal side drain connection.
- 10- Replace the condensate drain mullion and reinstall screws.
- 11- 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 4.5" w.c. (1.12kPa) 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 11 for gas supply piping entering outside the unit. Figure 12 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.

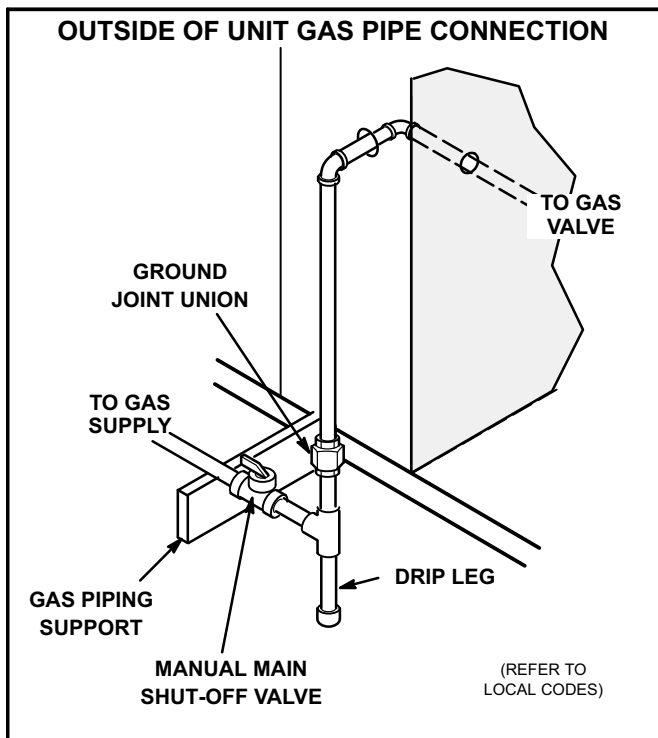


FIGURE 11

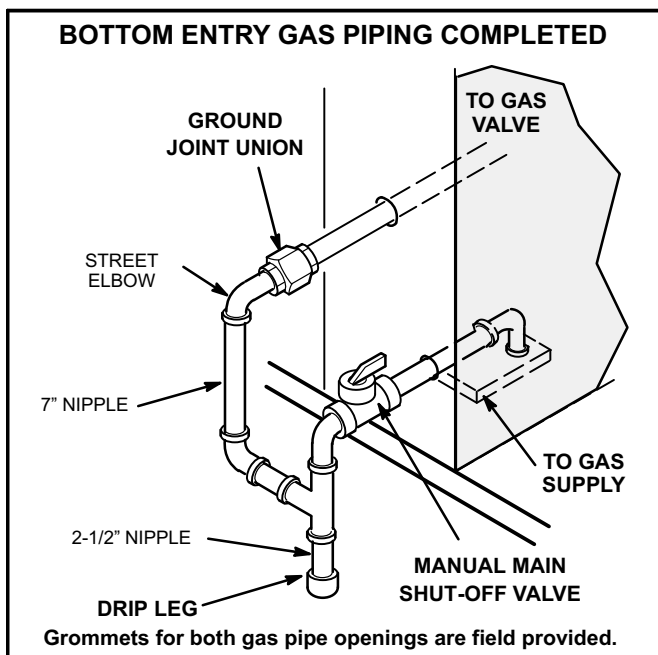


FIGURE 12

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 13.

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 othe 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.

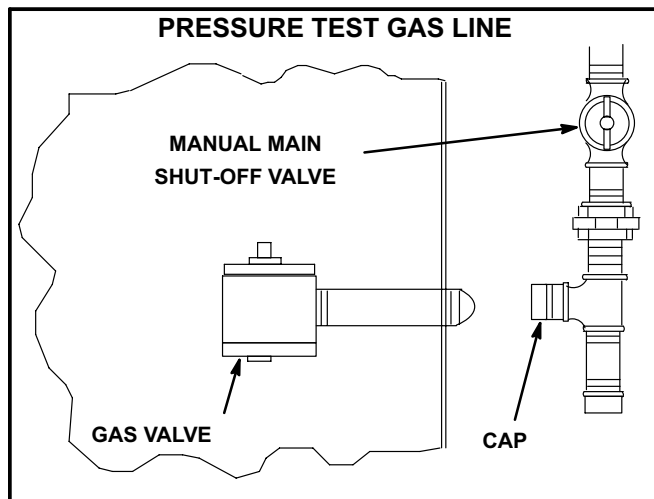


FIGURE 13

High Altitude Derate

Locate the high altitude conversion sticker in the unit literature bag. Fill out the conversion sticker and affix next to the unit nameplate.

Refer to table 1 for high altitude adjustments.

TABLE 1
HIGH ALTITUDE DERATE

Altitude Ft.*	Gas Manifold Pressure
2000-4500	See Unit Nameplate
4500 And Above	Derate 2% / 1000 Ft. Above Sea Level

*Units installed at 0-2000 feet do not need to be modified.

NOTE - This is the only permissible derate for these units.

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). Insulated terminal cover from the 208V terminal on the control transformer. Move the wire from the transformer 240V terminal to the 208V terminal. Place the insulated terminal cover on the unused 240V terminal.
- 2- Route power through the bottom power entry area and connect to the top of K1 compressor contactor or factory-installed disconnect or circuit breaker. Secure power wiring with factory-installed wire ties provided in control box. See unit wiring diagram.

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 14 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

24 VOLT FIELD WIRING WITH ELECTRONIC AND ELECTRO-MECHANICAL THERMOSTATS

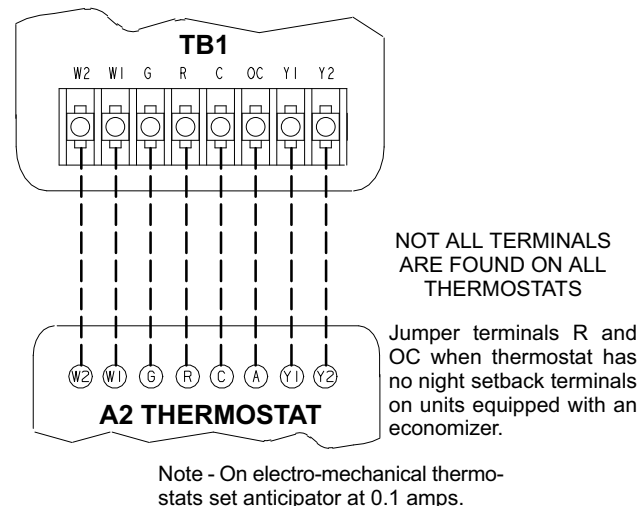


FIGURE 14

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 A19

A19 thermostat is an electronic temperature control. 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 15. See figure 16 for A19 location on 024-048 units and figure 17 for A19 location on 060 units.

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.

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.

Note - The setpoint is adjustable between 1-55°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.

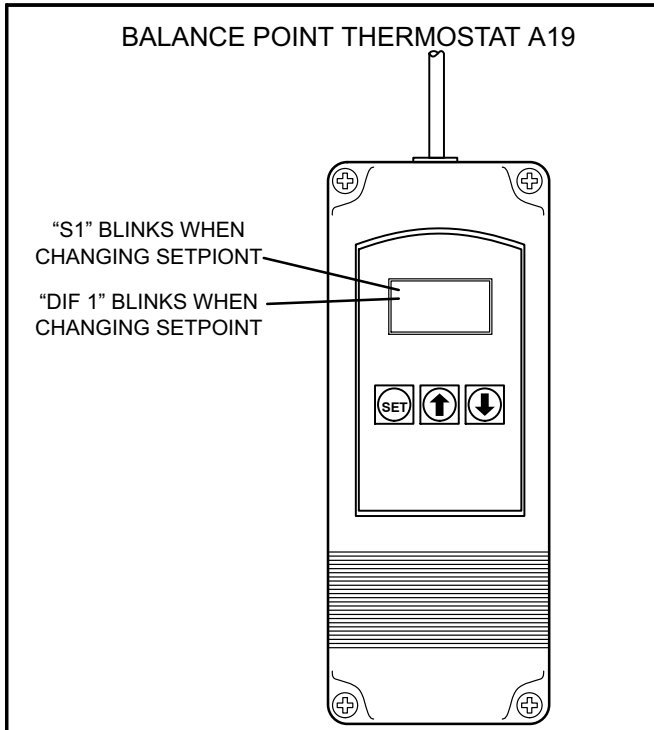


FIGURE 15

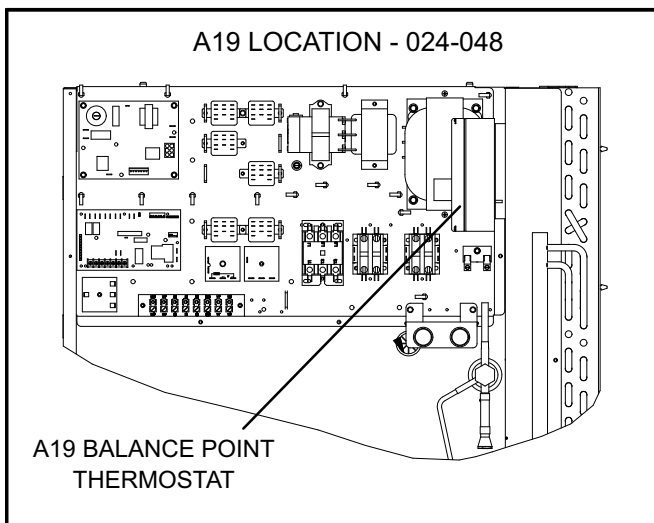


FIGURE 16

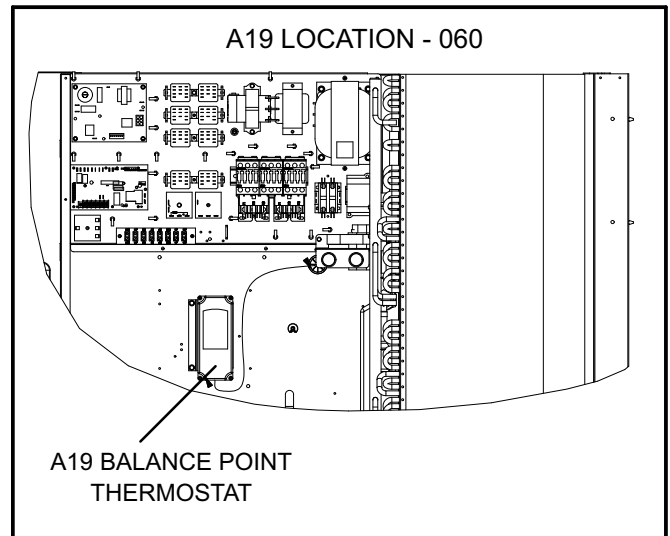


FIGURE 17

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.

Blower Operation and Adjustments

KD 024 units are equipped with multi-tap ECM, direct drive blowers only.

KD 036, 048 and 060 units are equipped with either multi-tap ECM, direct drive or two-stage belt drive blowers.

The blower will operate at high speed with Y2 thermostat demand and low speed with a Y1 thermostat demand. Low speed operation delivers approximately 2/3 of air volume of high speed. Two-speed blower operation results in lower energy consumption.

⚠ IMPORTANT

Three phase scroll compressors must be phased sequentially for correct compressor and blower rotation. Follow "COOLING START-UP" section of installation instructions to ensure proper compressor and blower operation.

A-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.

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.

B-Determining Unit CFM - Direct Drive Blowers

- 1- The following measurements must be made with air filters in place.
- 2- With all access panels in place, measure static pressure external to unit (from supply to return). Add any additional air resistance for options and accessories shown in accessory air resistance tables. Blower performance data is based on static pressure readings taken in locations shown in figure 18.

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

- 3- Use figure 19 to determine the factory-set blower speed.

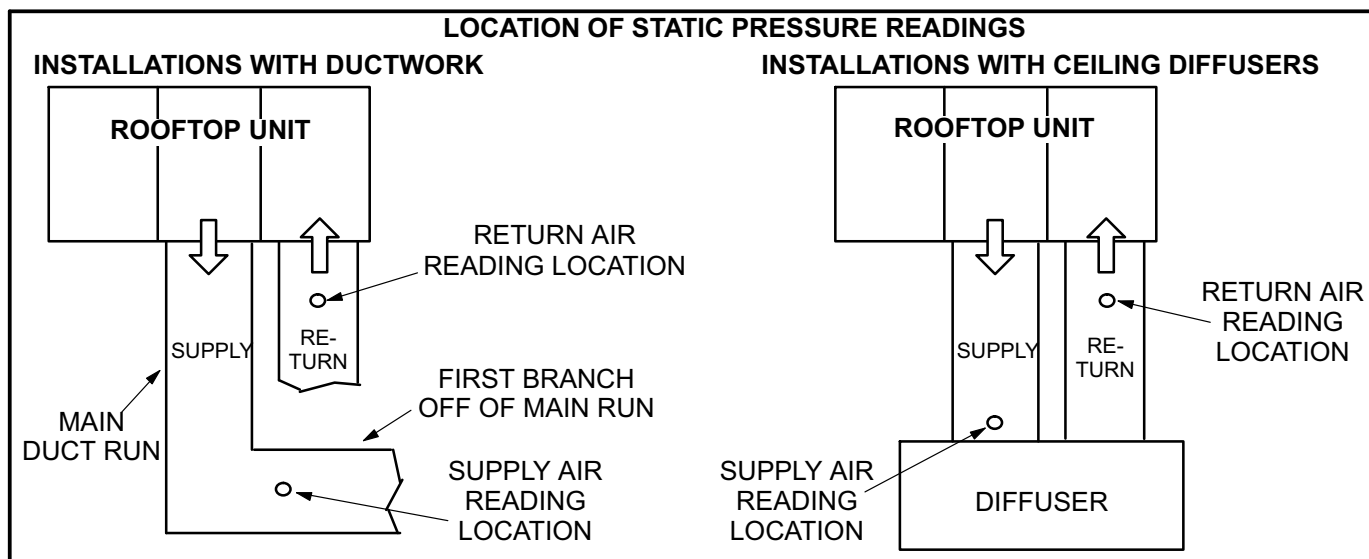


FIGURE 18

- 4- Use direct drive blower tables, the measured static pressure and the factory-set blower speed to determine CFM. If CFM is lower or higher than the design specified CFM, move the leads as shown in figure 19. See table 2 for single phase units.

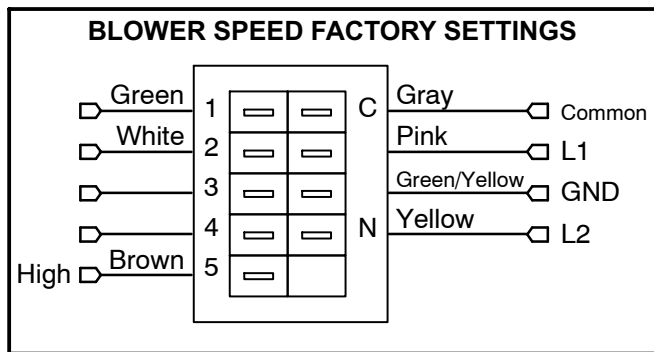


FIGURE 19

TABLE 2
SINGLE PHASE FER LIMITS*

Unit	Max Tap
KDB024	5
KDB036	4
KDB048	4
KDB060	3

*Note - Operation above the following speed selections in Heating mode may result in operation outside of this unit's FER rating.

C-Determining Unit CFM - Belt Drive Blowers

IMPORTANT - Direct drive multi-tap ECM blower unit CFM is determined by the blower motor speed tap. 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 18.

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

- 3- Referring to pages 18 to 23, use static pressure and RPM readings to determine unit CFM. Use page 24 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 21. Do not exceed minimum and maximum number of pulley turns as shown in table 3.

TABLE 3
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Minimum Turns Open	Maximum Turns Open
A Section	0	5

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

D-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 20.

- 1- Loosen four bolts securing motor base to mounting frame. See figure 21.

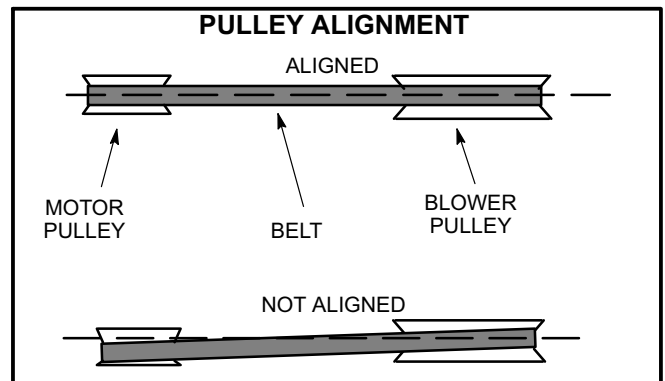


FIGURE 20

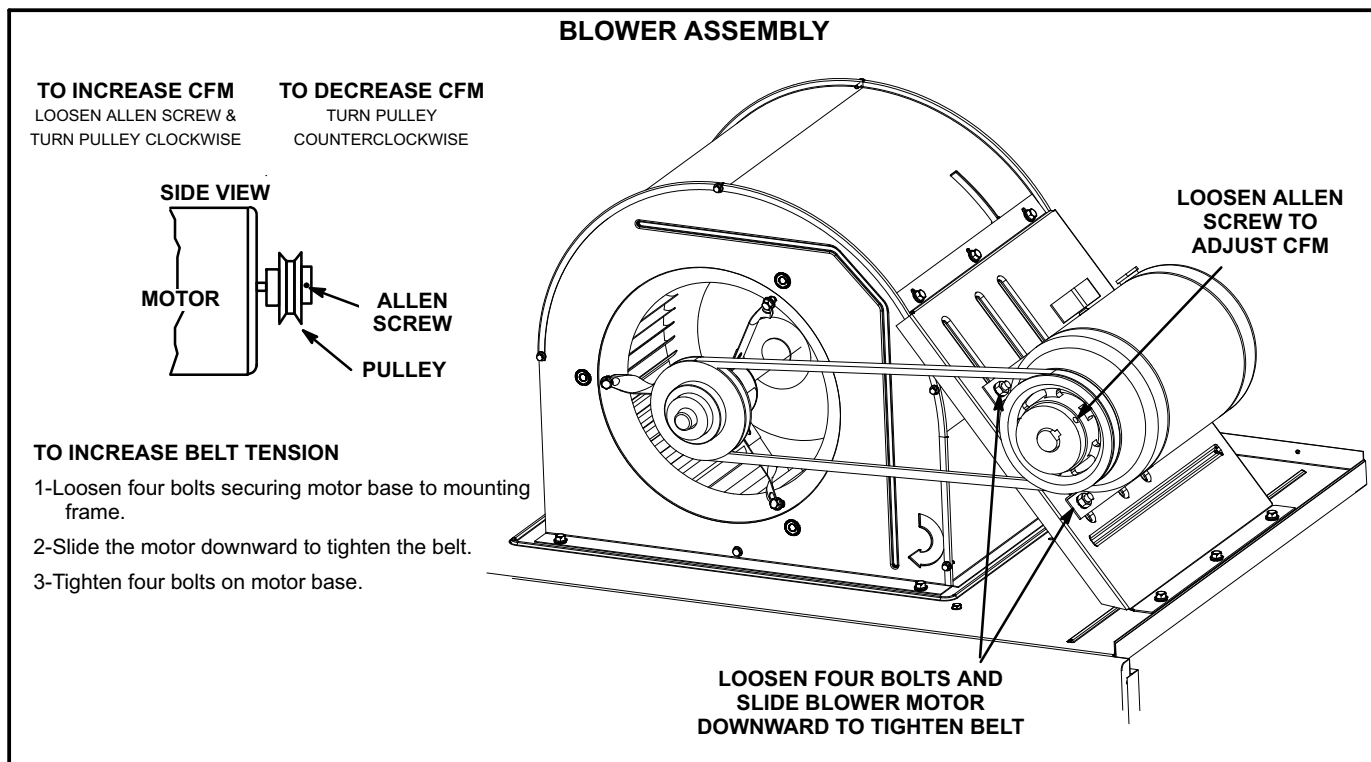


FIGURE 21

2- To increase belt tension -

Slide blower motor downward to tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -

Slide blower motor upward to loosen the belt. This decreases the distance between the blower motor and the blower housing.

- 3- Tighten four bolts securing motor base to the mounting frame.

E-Check Belt Tension

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

- 1- Measure span length X. See figure 22.
- 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.

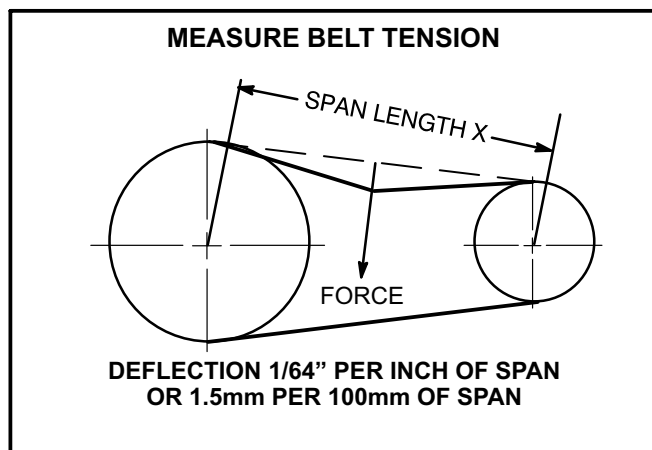


FIGURE 22

F-Field-Furnished Blower Drives

For field-furnished blower drives, use pages 18-23 to determine BHP and RPM required. Reference page 24 to determine the drive number. Reference table 4 for drive component manufacturer's numbers.

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 24.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 24.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					KDB024H4E
0.0	635	825	918	1121	1336
0.1	547	763	861	1071	1290
0.2	433	699	806	1031	1253
0.3	371	636	749	986	1212
0.4	280	559	677	927	1166
0.5	217	481	605	868	1120
0.6	---	---	548	819	1071
0.7	---	---	491	773	1029
0.8	---	---	442	714	983
0.9	---	---	393	653	929
1.0	---	---	---	604	879
HORIZONTAL					KDB024H4E
0.0	602	815	908	1096	1302
0.1	509	750	852	1057	1263
0.2	413	689	793	1007	1227
0.3	340	625	736	964	1189
0.4	266	561	679	918	1142
0.5	220	501	620	864	1100
0.6	---	---	560	809	1061
0.7	---	---	500	752	1015
0.8	---	---	444	706	964
0.9	---	---	390	661	913
1.0	---	---	352	612	872

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 24.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 24.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					KDB036H4E
0.0	893	1035	1375	1600	1840
0.1	838	965	1330	1574	1780
0.2	768	895	1277	1543	1748
0.3	705	800	1253	1505	1712
0.4	645	750	1200	1473	1677
0.5	575	690	1150	1435	1638
0.6	---	---	1095	1390	1608
0.7	---	---	1052	1345	1577
0.8	---	---	1004	1302	1528
0.9	---	---	950	1260	1491
1.0	---	---	900	1218	1455
HORIZONTAL					KDB036H4E
0.0	900	1045	1379	1599	1810
0.1	828	970	1305	1549	1749
0.2	777	900	1264	1504	1718
0.3	702	800	1216	1479	1677
0.4	635	750	1173	1434	1649
0.5	553	685	1131	1399	1622
0.6	---	---	1078	1359	1577
0.7	---	---	1038	1315	1544
0.8	---	---	986	1280	1509
0.9	---	---	933	1236	1471
1.0	---	---	885	1196	1438

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 24.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 24.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					KDB048H4E
0.0	1225	1310	1561	2015	2168
0.1	1167	1254	1514	1995	2143
0.2	1112	1203	1473	1977	2126
0.3	1052	1145	1424	1942	2097
0.4	1000	1098	1387	1917	2078
0.5	939	1040	1343	1888	2049
0.6	894	996	1300	1854	2020
0.7	840	941	1250	1819	1991
0.8	780	883	1201	1787	1952
0.9	734	839	1159	1749	1914
1.0	681	784	1115	1704	1856
HORIZONTAL					KDB048H4E
0.0	1185	1265	1504	1983	2120
0.1	1130	1213	1467	1957	2098
0.2	1085	1171	1432	1932	2077
0.3	1035	1125	1395	1906	2054
0.4	978	1069	1347	1870	2023
0.5	929	1023	1304	1841	1992
0.6	880	977	1267	1811	1962
0.7	822	920	1224	1776	1931
0.8	764	863	1175	1740	1900
0.9	718	820	1133	1710	1869
1.0	549	712	1096	1652	1772

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (economizer, wet coil, etc.) See page 24.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 24.

External Static Pressure in. w.g.	Air Volume at Specific Blower Taps (cfm)				
	Tap 1	Tap 2	Tap 3	Tap 4	Tap 5
DOWNFLOW					KDB060H4E
0.0	1351	1405	1801	1982	2339
0.1	1303	1359	1769	1956	2310
0.2	1254	1314	1736	1928	2281
0.3	1206	1268	1703	1900	2253
0.4	1158	1222	1669	1870	2224
0.5	1109	1177	1634	1838	2195
0.6	1061	1131	1598	1806	2166
0.7	1012	1085	1561	1772	2137
0.8	964	1040	1524	1736	2108
0.9	915	994	1486	1700	2080
1.0	867	949	1446	1662	2051
HORIZONTAL					KDB60H4E
0.0	1329	1353	1728	1886	2206
0.1	1284	1320	1708	1872	2189
0.2	1239	1285	1685	1859	2174
0.3	1193	1258	1661	1832	2157
0.4	1147	1218	1636	1814	2135
0.5	1100	1178	1608	1796	2118
0.6	1052	1125	1579	1770	2102
0.7	1004	1085	1548	1743	2080
0.8	955	1044	1516	1716	2058
0.9	906	991	1481	1689	2036
1.0	856	938	1445	1654	2020

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 24 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW**KDB036H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	447	0.09	517	0.12	589	0.15	663	0.17	739	0.19	815	0.20	883	0.23	938	0.25
800	465	0.10	534	0.14	605	0.17	678	0.19	753	0.21	825	0.23	890	0.25	946	0.27
900	486	0.12	554	0.16	623	0.20	695	0.22	767	0.23	836	0.25	897	0.28	953	0.30
1000	508	0.15	576	0.19	643	0.22	713	0.24	783	0.26	848	0.28	907	0.30	961	0.33
1100	533	0.18	599	0.22	665	0.25	733	0.27	800	0.28	863	0.31	919	0.34	971	0.36
1200	560	0.21	625	0.25	689	0.28	755	0.30	820	0.32	879	0.34	932	0.37	983	0.40
1300	591	0.24	654	0.28	716	0.31	779	0.33	841	0.35	897	0.38	948	0.41	996	0.44
1400	631	0.26	690	0.30	748	0.34	807	0.36	864	0.39	916	0.42	964	0.46	1011	0.49
1500	676	0.28	729	0.33	782	0.36	835	0.40	887	0.43	935	0.47	981	0.50	1028	0.54
Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	988	0.27	1039	0.29	1088	0.31	---	---	---	---	---	---	---	---	---	---
800	996	0.30	1047	0.32	1098	0.34	1144	0.36	1185	0.39	1224	0.42	---	---	---	---
900	1004	0.33	1055	0.35	1106	0.37	1152	0.40	1193	0.43	1232	0.46	1269	0.49	1305	0.52
1000	1011	0.36	1062	0.38	1111	0.41	1157	0.43	1199	0.47	1238	0.50	1276	0.53	1311	0.56
1100	1020	0.39	1070	0.41	1118	0.44	1163	0.47	1206	0.51	1245	0.54	1282	0.58	1318	0.61
1200	1031	0.43	1079	0.45	1127	0.48	1171	0.52	1213	0.55	1252	0.59	1289	0.62	1324	0.66
1300	1044	0.47	1091	0.49	1137	0.53	1181	0.56	1221	0.60	1259	0.64	1296	0.68	1330	0.71
1400	1058	0.51	1105	0.54	1150	0.57	1191	0.61	1231	0.65	1268	0.69	1303	0.73	1337	0.77
1500	1074	0.56	1120	0.59	1163	0.63	1203	0.67	1241	0.71	1277	0.75	1312	0.79	1345	0.82

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 24 for blower motors and drives and wet coil and options/accessory air resistance data.

HORIZONTAL**KDB036H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	445	0.08	516	0.11	591	0.13	670	0.15	753	0.16	820	0.19	870	0.22	918	0.24
800	463	0.09	534	0.12	608	0.14	685	0.16	766	0.18	830	0.21	878	0.24	926	0.27
900	485	0.11	554	0.14	627	0.16	703	0.18	780	0.21	841	0.23	888	0.27	935	0.30
1000	509	0.13	578	0.16	649	0.19	722	0.21	796	0.23	854	0.26	900	0.29	947	0.33
1100	537	0.16	605	0.19	674	0.21	744	0.24	813	0.26	868	0.29	913	0.33	959	0.36
1200	567	0.19	633	0.22	700	0.24	768	0.27	833	0.30	884	0.33	928	0.37	974	0.40
1300	599	0.22	664	0.25	729	0.28	793	0.30	853	0.33	902	0.37	945	0.41	990	0.44
1400	634	0.26	697	0.29	758	0.31	819	0.34	875	0.38	921	0.42	964	0.46	1008	0.49
1500	669	0.30	730	0.33	789	0.36	846	0.39	897	0.42	941	0.47	983	0.51	1028	0.54
Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
700	969	0.27	1021	0.29	1071	0.32	---	---	---	---	---	---	---	---	---	---
800	977	0.29	1030	0.32	1082	0.34	1128	0.37	1169	0.40	1205	0.42	---	---	---	---
900	986	0.32	1039	0.35	1090	0.37	1137	0.40	1177	0.43	1214	0.46	1248	0.49	1280	0.51
1000	997	0.35	1048	0.38	1098	0.41	114	0.44	1184	0.47	1221	0.50	1255	0.53	1287	0.56
1100	1008	0.39	1059	0.41	1107	0.44	1150	0.47	1191	0.51	1228	0.54	1263	0.57	1295	0.60
1200	1022	0.43	1071	0.45	1117	0.48	1160	0.52	1200	0.55	1237	0.59	1271	0.62	1303	0.66
1300	1037	0.47	1058	0.50	1130	0.53	1171	0.57	1210	0.60	1246	0.64	1280	0.68	1312	0.71
1400	1054	0.52	1100	0.54	1144	0.58	1183	0.62	1221	0.66	1256	0.70	1290	0.73	1321	0.77
1500	1073	0.57	1117	0.60	1159	0.64	1197	0.67	1234	0.71	1268	0.75	1301	0.79	1332	0.83

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 24 for blower motors and drives and page 30 for wet coil and options/accessory air resistance data.

DOWNFLOW

KDB048H4T

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	466	0.10	525	0.14	586	0.17	646	0.20	729	0.20	821	0.19	899	0.20	953	0.23
1000	484	0.12	543	0.16	603	0.19	664	0.22	745	0.23	834	0.23	908	0.24	959	0.26
1100	505	0.15	563	0.18	622	0.22	682	0.25	762	0.26	847	0.26	917	0.27	966	0.30
1200	527	0.18	584	0.21	643	0.25	702	0.28	779	0.30	860	0.30	927	0.31	973	0.34
1300	550	0.21	607	0.25	664	0.29	722	0.32	797	0.33	875	0.34	937	0.35	981	0.38
1400	574	0.25	630	0.29	687	0.32	744	0.35	817	0.37	890	0.38	949	0.39	991	0.42
1500	603	0.28	659	0.32	714	0.36	770	0.39	839	0.41	907	0.42	962	0.44	1002	0.47
1600	651	0.29	703	0.33	754	0.37	806	0.41	867	0.43	927	0.45	976	0.48	1014	0.51
1700	708	0.30	754	0.34	800	0.38	846	0.42	898	0.46	949	0.49	992	0.53	1028	0.57
1800	764	0.31	804	0.36	844	0.40	884	0.45	927	0.49	970	0.54	1008	0.58	1044	0.63
1900	812	0.34	847	0.39	881	0.44	916	0.49	953	0.54	990	0.59	1025	0.64	1061	0.69
2000	857	0.42	889	0.47	920	0.52	952	0.57	986	0.62	1020	0.68	1055	0.73	1091	0.77
Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1000	996	0.31	1034	0.35	---	---	---	---	---	---	---	---	---	---	---	---
1100	1001	0.34	1040	0.38	1083	0.42	1128	0.46	1176	0.49	---	---	---	---	---	---
1200	1008	0.38	1047	0.42	1089	0.46	1133	0.49	1180	0.53	1224	0.56	1261	0.60	---	---
1300	1017	0.42	1055	0.46	1097	0.50	1139	0.53	1184	0.57	1228	0.60	1264	0.63	1295	0.67
1400	1026	0.46	1065	0.50	1106	0.54	1147	0.57	1191	0.61	1233	0.64	1269	0.68	1300	0.71
1500	1038	0.51	1076	0.55	1117	0.59	1157	0.62	1199	0.65	1240	0.69	1275	0.72	1305	0.76
1600	1050	0.56	1089	0.60	1129	0.64	1168	0.67	1209	0.71	1249	0.74	1282	0.78	1312	0.82
1700	1065	0.61	1103	0.65	1142	0.69	1181	0.73	1221	0.76	1259	0.80	1292	0.83	1320	0.88
1800	1081	0.67	1118	0.71	1156	0.75	1194	0.79	1234	0.82	1271	0.86	1302	0.90	1330	0.94
1900	1098	0.73	1135	0.77	1172	0.81	1209	0.85	1248	0.88	1284	0.92	1314	0.97	1341	1.01
2000	1128	0.82	1164	0.86	1201	0.89	1239	0.93	1276	0.97	1310	1.01	1336	1.06	1362	1.10

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 24 for blower motors and drives and wet coil and options/accessory air resistance data.

HORIZONTAL**KDB048H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	464	0.10	514	0.13	576	0.15	644	0.17	728	0.18	817	0.19	893	0.21	951	0.24
1000	482	0.12	533	0.15	595	0.17	662	0.19	744	0.21	829	0.22	902	0.24	957	0.27
1100	504	0.14	556	0.17	617	0.20	683	0.22	762	0.24	843	0.25	912	0.28	965	0.31
1200	528	0.17	581	0.20	641	0.23	706	0.25	782	0.27	859	0.29	924	0.31	974	0.34
1300	556	0.21	609	0.24	669	0.26	731	0.29	804	0.31	877	0.33	938	0.35	985	0.38
1400	592	0.24	645	0.27	702	0.30	763	0.32	830	0.35	898	0.37	953	0.39	997	0.43
1500	641	0.26	692	0.29	746	0.33	801	0.36	862	0.38	921	0.41	970	0.44	1011	0.48
1600	696	0.28	743	0.32	792	0.35	842	0.39	894	0.42	945	0.45	988	0.49	1027	0.53
1700	750	0.31	792	0.35	836	0.39	880	0.43	924	0.47	968	0.51	1007	0.55	1043	0.59
1800	799	0.35	837	0.39	875	0.43	913	0.48	952	0.52	990	0.56	1026	0.61	1061	0.65
1900	840	0.40	873	0.45	907	0.49	941	0.54	976	0.58	1011	0.63	1045	0.67	1080	0.72
2000	883	0.48	913	0.53	944	0.57	976	0.62	1009	0.67	1043	0.71	1078	0.76	1112	0.8
Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
900	995	0.28	1034	0.31	1077	0.35	1121	0.38	---	---	---	---	---	---	---	---
1000	999	0.31	1038	0.34	1081	0.38	1124	0.41	1168	0.44	1211	0.47	---	---	---	---
1100	1006	0.34	1044	0.38	1086	0.41	1129	0.44	1171	0.47	1213	0.50	1253	0.53	1293	0.56
1200	1014	0.38	1052	0.42	1093	0.45	1135	0.48	1176	0.51	1217	0.54	1257	0.58	1296	0.61
1300	1023	0.42	1061	0.46	1102	0.50	1143	0.53	1184	0.56	1224	0.59	1263	0.62	1302	0.66
1400	1035	0.47	1073	0.51	1112	0.54	1153	0.57	1193	0.61	1232	0.64	1271	0.67	1309	0.71
1500	1048	0.52	1086	0.56	1125	0.59	1164	0.63	1204	0.66	1243	0.69	1280	0.73	1317	0.77
1600	1063	0.57	1100	0.61	1139	0.65	1178	0.68	1216	0.71	1254	0.75	1291	0.79	1326	0.83
1700	1079	0.63	1116	0.67	1154	0.71	1192	0.74	1230	0.78	1267	0.81	1302	0.85	1337	0.89
1800	1097	0.69	1133	0.73	1171	0.77	1209	0.80	1246	0.84	1281	0.88	1315	0.92	1349	0.96
1900	1116	0.76	1152	0.80	1189	0.84	1226	0.87	1262	0.91	1296	0.95	1329	0.99	1361	1.03
2000	1148	0.84	1183	0.88	1220	0.92	1257	0.96	1291	1.00	1323	1.04	1354	1.08	1385	1.12

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 24 for blower motors and drives and wet coil and options/accessory air resistance data.

DOWNFLOW**KDB060H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	512	0.15	571	0.19	630	0.23	690	0.26	770	0.26	854	0.26	922	0.27	970	0.30
1200	535	0.18	593	0.22	651	0.26	710	0.30	788	0.30	868	0.30	933	0.31	978	0.34
1300	559	0.22	616	0.26	674	0.29	732	0.34	807	0.34	883	0.34	944	0.35	987	0.38
1400	584	0.26	641	0.29	698	0.33	755	0.37	827	0.37	899	0.38	956	0.40	997	0.43
1500	615	0.29	671	0.33	726	0.36	782	0.41	850	0.41	917	0.42	970	0.44	1009	0.47
1600	665	0.30	716	0.34	768	0.38	819	0.44	879	0.44	937	0.46	985	0.49	1022	0.52
1700	723	0.31	768	0.35	814	0.39	860	0.47	910	0.47	959	0.50	1001	0.54	1037	0.58
1800	779	0.32	818	0.37	857	0.41	897	0.50	939	0.50	980	0.55	1018	0.59	1054	0.64
1900	826	0.36	859	0.41	894	0.45	928	0.56	964	0.56	1000	0.61	1036	0.66	1072	0.70
2000	857	0.42	889	0.47	920	0.52	952	0.62	986	0.62	1020	0.68	1055	0.73	1091	0.77
2100	878	0.49	909	0.54	940	0.59	973	0.70	1006	0.70	1041	0.75	1076	0.80	1112	0.85
2200	897	0.55	929	0.61	961	0.66	994	0.78	1028	0.78	1063	0.83	1099	0.89	1134	0.93
2300	918	0.62	950	0.68	983	0.74	1017	0.86	1052	0.86	1087	0.92	1122	0.97	1157	1.02
2400	941	0.70	974	0.77	1008	0.83	1042	0.96	1077	0.96	1111	1.01	1146	1.06	1181	1.11

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	1006	0.35	1045	0.39	1089	0.43	1134	0.46	---	---	---	---	---	---	---	---
1200	1013	0.38	1053	0.42	1095	0.46	1139	0.50	1186	0.53	1230	0.57	1266	0.60	---	---
1300	1022	0.42	1062	0.46	1104	0.50	1146	0.54	1192	0.57	1234	0.60	1269	0.64	1301	0.68
1400	1033	0.47	1072	0.51	1114	0.55	1155	0.58	1199	0.61	1240	0.65	1275	0.68	1305	0.72
1500	1045	0.52	1085	0.56	1125	0.60	1165	0.63	1208	0.66	1248	0.69	1281	0.73	1311	0.77
1600	1059	0.57	1098	0.61	1138	0.65	1177	0.68	1218	0.71	1257	0.75	1290	0.79	1319	0.83
1700	1074	0.62	1113	0.66	1152	0.70	1190	0.74	1231	0.77	1268	0.80	1299	0.84	1328	0.89
1800	1091	0.68	1129	0.72	1167	0.76	1205	0.80	1244	0.83	1280	0.87	1310	0.91	1338	0.95
1900	1109	0.75	1146	0.79	1183	0.82	1221	0.86	1260	0.90	1294	0.94	1323	0.98	1349	1.02
2000	1128	0.82	1164	0.86	1201	0.89	1239	0.93	1276	0.97	1310	1.01	1336	1.06	1362	1.10
2100	1148	0.89	1185	0.93	1221	0.97	1258	1.01	1294	1.05	1325	1.09	1351	1.14	1376	1.19
2200	1170	0.97	1206	1.01	1242	1.05	1277	1.09	1311	1.14	1341	1.18	1365	1.23	1390	1.28
2300	1193	1.06	1228	1.09	1262	1.14	1295	1.19	1327	1.24	1355	1.29	1380	1.33	1406	1.37
2400	1216	1.15	1250	1.19	1282	1.24	1313	1.30	1343	1.36	1371	1.40	1396	1.44	1423	1.48

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE.

FOR ALL UNITS ADD:

1 - Any factory installed options air resistance (larger gas heat section, economizer, wet coil, etc.).

2 - Any field installed accessories air resistance (duct resistance, diffuser, etc.).

See page 24 for blower motors and drives and wet coil and options/accessory air resistance data.

HORIZONTAL**KDB060H4T**

Air Volume cfm	External Static - in. w.g.															
	0.10		0.20		0.30		0.40		0.50		0.60		0.70		0.80	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	509	0.15	562	0.18	624	0.20	691	0.22	771	0.24	852	0.25	919	0.28	970	0.31
1200	535	0.18	589	0.21	650	0.23	715	0.25	792	0.27	869	0.29	932	0.32	980	0.35
1300	564	0.21	618	0.24	678	0.27	741	0.29	815	0.31	887	0.33	946	0.36	991	0.39
1400	604	0.24	657	0.27	715	0.30	775	0.33	842	0.35	908	0.37	962	0.40	1004	0.43
1500	656	0.26	706	0.30	760	0.33	814	0.36	874	0.39	931	0.41	979	0.45	1019	0.48
1600	712	0.29	758	0.32	807	0.36	855	0.39	906	0.43	955	0.46	997	0.50	1035	0.54
1700	766	0.32	808	0.36	850	0.40	892	0.44	936	0.47	978	0.51	1016	0.56	1052	0.60
1800	814	0.36	851	0.40	888	0.44	925	0.49	963	0.53	1000	0.57	1035	0.62	1071	0.66
1900	853	0.41	886	0.46	919	0.50	952	0.55	986	0.60	1021	0.64	1056	0.69	1091	0.73
2000	883	0.48	913	0.53	944	0.57	976	0.62	1009	0.67	1043	0.71	1078	0.76	1112	0.80
2100	906	0.56	936	0.60	967	0.65	999	0.70	1033	0.75	1067	0.79	1101	0.84	1135	0.88
2200	930	0.64	960	0.68	991	0.73	1024	0.78	1058	0.83	1092	0.88	1126	0.92	1160	0.96
2300	954	0.72	985	0.77	1017	0.82	1051	0.87	1085	0.92	1119	0.96	1152	1.00	1186	1.04
2400	981	0.81	1013	0.86	1046	0.91	1079	0.96	1113	1.00	1180	1.05	1180	1.09	1213	1.13

Air Volume cfm	External Static - in. w.g.															
	0.90		1.00		1.10		1.20		1.30		1.40		1.50		1.60	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1100	1010	35.00	1049	0.38	1091	0.42	1134	0.45	1176	0.78	1218	0.51	1258	0.54	1297	0.57
1200	1019	0.38	1058	0.42	1099	0.46	1141	0.49	1182	0.52	1223	0.55	1263	0.58	1302	0.61
1300	1030	0.43	1068	0.47	1108	0.50	1149	0.53	1190	0.56	1230	0.59	1270	0.63	1308	0.66
1400	1042	0.47	1080	0.51	1120	0.55	1160	0.58	1200	0.61	1240	0.65	1278	0.68	1315	0.72
1500	1056	0.53	1094	0.57	1133	0.60	1172	0.63	1212	0.67	1250	0.70	1288	0.74	1324	0.77
1600	1071	0.58	1109	0.62	1147	0.66	1186	0.69	1225	0.72	1263	0.76	1299	0.80	1334	0.83
1700	1088	0.64	1126	0.68	1164	0.72	1202	0.75	1240	0.78	1276	0.82	1311	0.86	1345	0.90
1800	1107	0.70	1143	0.74	1181	0.78	1219	0.81	1256	0.85	1290	0.89	1324	0.93	1357	0.97
1900	1126	0.77	1163	0.81	1200	0.85	1237	0.88	1273	0.92	1306	0.96	1339	1.00	1371	1.04
2000	1148	0.84	1183	0.88	1220	0.92	1257	0.96	1291	1.00	1323	1.04	1354	1.08	1385	1.12
2100	1170	0.92	1206	0.96	1242	1.00	1277	1.04	1310	1.08	1340	1.13	1370	1.17	1401	1.21
2200	1195	1.00	1230	1.04	1265	1.08	1299	1.13	1330	1.18	1359	1.23	1388	1.27	1418	1.31
2300	1220	1.08	1254	1.13	1288	1.17	1320	1.23	1350	1.28	1378	1.34	1406	1.38	1435	1.42
2400	1245	1.18	1278	1.22	1311	1.28	1341	1.33	1370	1.40	1397	1.45	1425	1.50	1454	1.54

BLOWER DATA

BELT DRIVE KIT SPECIFICATIONS

Model No.	Motor HP		No. of Speeds	Drive Kits and RPM Range					
	Nominal	Maximum		A01	A02	A03	A05	A06	A07
036	0.75	0.86	2	low 449-673 high 673-1010	---	---	---	---	---
	1	1.15	2	---	---	---	low 598-897 high 897-1346	---	---
048	0.75	0.86	2	---	low 497-673 high 745-1117	---	---	---	---
	2	2.3	2	---	---	---	---	low 714-953 high 1071-1429	---
060	1	1.15	2			low 555-833 high 833-1250			
	2	2.3	2						low 808-1032 high 1212-1548

NOTE - Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor hp required. Maximum usable hp of motors furnished are shown. In Canada, nominal motor hp is also maximum usable motor hp. If motors of comparable hp are used, be sure to keep within the service factor limitations outlined on the motor nameplate.

OPTIONS / ACCESSORIES AIR RESISTANCE - in. w.g.

Air Volume cfm	Wet Indoor Coil		Gas Heat		Economizer	Filters	
	024 036, 048	060	Medium Input	High Input		MERV 8	MERV 13
800	0.01	0.01	0.02	0.02	0.04	0.04	0.05
1000	0.02	0.01	0.02	0.02	0.04	0.04	0.07
1200	0.02	0.01	0.02	0.02	0.04	0.04	0.07
1400	0.03	0.02	0.02	0.03	0.04	0.04	0.07
1600	0.04	0.03	0.03	0.04	0.04	0.04	0.07
1800	0.05	0.04	0.03	0.05	0.05	0.05	0.07
2000	0.06	0.05	0.04	0.06	0.05	0.05	0.08
2200	0.08	0.06	0.04	0.07	0.05	0.05	0.08
2400	0.09	0.07	0.05	0.08	0.05	0.05	0.08
2600	0.10	0.08	0.05	0.09	0.06	0.05	0.08
2800	0.11	0.09	0.06	0.10	0.06	0.05	0.08
3000	0.13	0.10	0.07	0.11	0.06	0.05	0.08

CEILING DIFFUSERS AIR RESISTANCE (in. w.g.)

Air Volume cfm	RTD9-65S Step-Down Diffuser			FD9-65S Flush Diffuser
	2 Ends Open	1 Side & 2 Ends Open	All Ends & Sides Open	
800	0.15	0.13	0.11	0.11
1000	0.19	0.16	0.14	0.14
1200	0.25	0.20	0.17	0.17
1400	0.33	0.26	0.20	0.20
1600	0.43	0.32	0.20	0.24
1800	0.56	0.40	0.30	0.30
2000	0.73	0.50	0.36	0.36
2200	0.95	0.63	0.44	0.44

**TABLE 4
MANUFACTURER'S NUMBERS**

Drive No.	DRIVE COMPONENTS					
	MOTOR PULLEY		BLOWER PULLEY		BELTS	
	Browning No.	OEM Part No.	Browning No.	OEM Part No.	Browning No.	OEM Part No.
A01	1VP34 X 7/8	31K6901	AK54 X 1	100244-19	A40	100245-17
A02	1VP34 X 7/8	31K6901	AK49 X 1	100244-18	A39	100245-16
A03	1VP34 X 7/8	31K6901	AK44X 1	100244-16	A39	100245-16
A04	1VP40 X 7/8	79J0301	AK49 X 1	100244-18	A41	100245-18
A05	1VP34 X 7/8	31K6901	AK41 X 1	100244-15	A39	100245-16
A06	1VP44 X 7/8	P-8-1488	AK51 X 1	18L2201	A41	100245-18
A07	1VP50 X 7/8	P-8-2187	AK54 X 1	100244-19	AX43	73K8201
A08	1VP44 X 7/8	P-8-1488	AK46 X 1	100244-17	A40	100245-17

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

Heating

Note - L1 reversing valve is 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 compressor **heat pump heating**, the outdoor fan, and the blower.

A second-stage heating demand (W2) will de-energize compressor heat pump heating through K27. **High gas heat** will be energized.

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

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

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

Cooling

- 1- Initiate first and second stage cooling demands according to instructions provided with thermostat. See table 5 for operation.

- 2- Units contain one refrigerant circuit.

Note - Units are equipped with two-stage compressors.

- 3- Unit is charged with R-410A refrigerant. See unit rating plate for correct amount of charge.
- 4- Refer to Refrigerant Charge and Check section for proper method to check refrigerant charge.

**TABLE 5
COOLING OPERATION**

T'Stat Demand	Energized	
No Economizer or Outdoor Air Unsuitable		
Y1	Compressor Low Speed*	OD Fan Low Sp.
Y2	Compressor High Speed**	OD Fan High Sp.
Unit Equipped With An Economizer		
Y1	Economizer	na
Y2	Economizer + Compressor Low Speed*	OD Fan Low Sp.

*67% of full capacity

**100% of full capacity

Note - The reversing valve is energized at the same time as the compressor.

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

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

- 3- Disconnect all remote electrical power supplies.
- 4- Reverse any two field-installed wires connected to the line side of K1 contactor. Do not reverse wires at blower contactor.

Make sure the connections are tight.

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

C-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:

IMPORTANT - Charge unit in standard cooling mode.

- 1- Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.
- 2- Compare the normal operating pressures (see table 6 through 9) to the pressures obtained from the gauges. Check unit components if there are significant differences.
- 3- Measure the outdoor ambient temperature and the suction pressure. Refer to the appropriate circuit charging curve to determine a target liquid temperature.

Note - Pressures are listed for sea level applications.

- 4- Use the same thermometer to accurately measure the liquid temperature (in the outdoor section).
 - If measured liquid temperature is higher than the target liquid temperature, add refrigerant to the system.
 - If measured liquid temperature is lower than the target liquid temperature, recover some refrigerant from the system.
- 5- Add or remove charge in increments. Allow the system to stabilize each time refrigerant is added or removed.
- 6- Continue the process until measured liquid temperature agrees with the target liquid temperature. Do not go below the target liquid temperature when adjusting charge. Note that suction pressure can change as charge is adjusted.
- 7- Example KDB024: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 102°F. For a measured liquid temperature of 112°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

TABLE 6

KDB024H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
113	217	114	254	117	295	119	342	121	395	124	455
120	222	125	259	123	304	128	349	130	401	133	459
141	226	143	262	142	303	145	353	148	404	154	465
154	233	162	270	167	312	170	358	171	410	175	466

TABLE 7

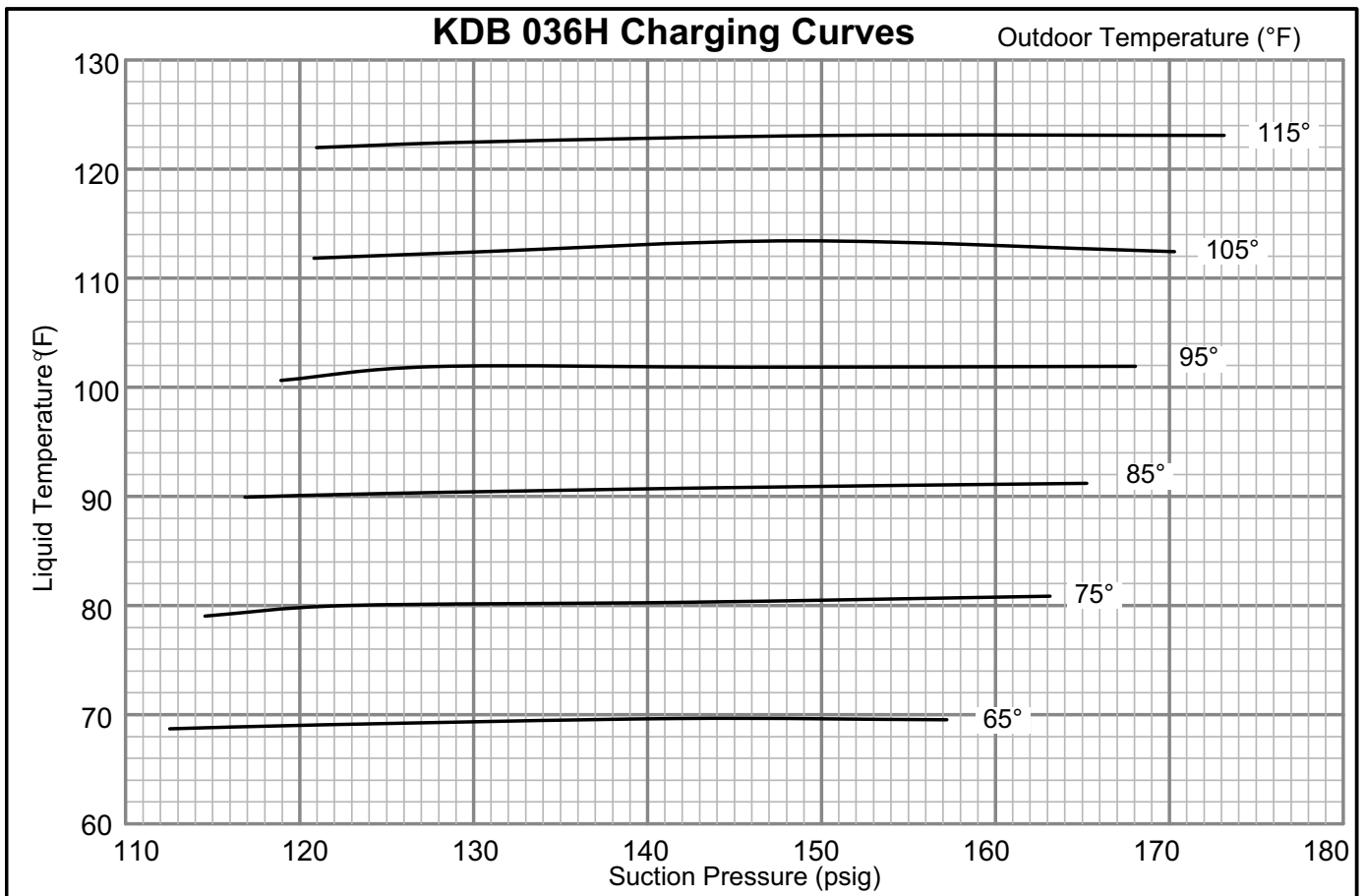
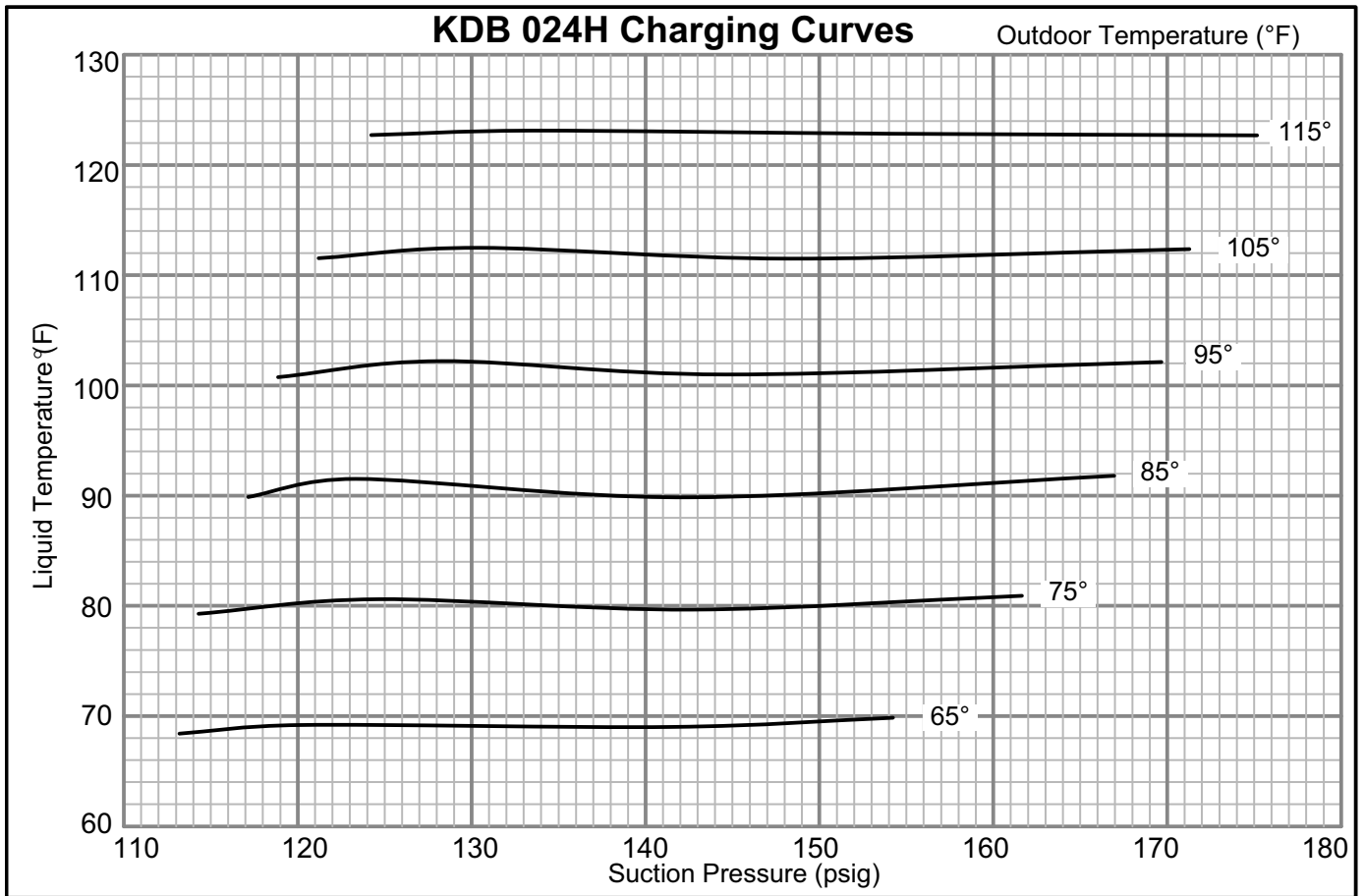
KDB036H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
113	230	115	268	117	310	119	358	121	412	121	471
121	233	123	273	125	314	128	364	130	417	130	476
142	240	142	278	144	321	146	370	149	425	151	483
157	247	163	286	165	330	168	378	170	431	173	491

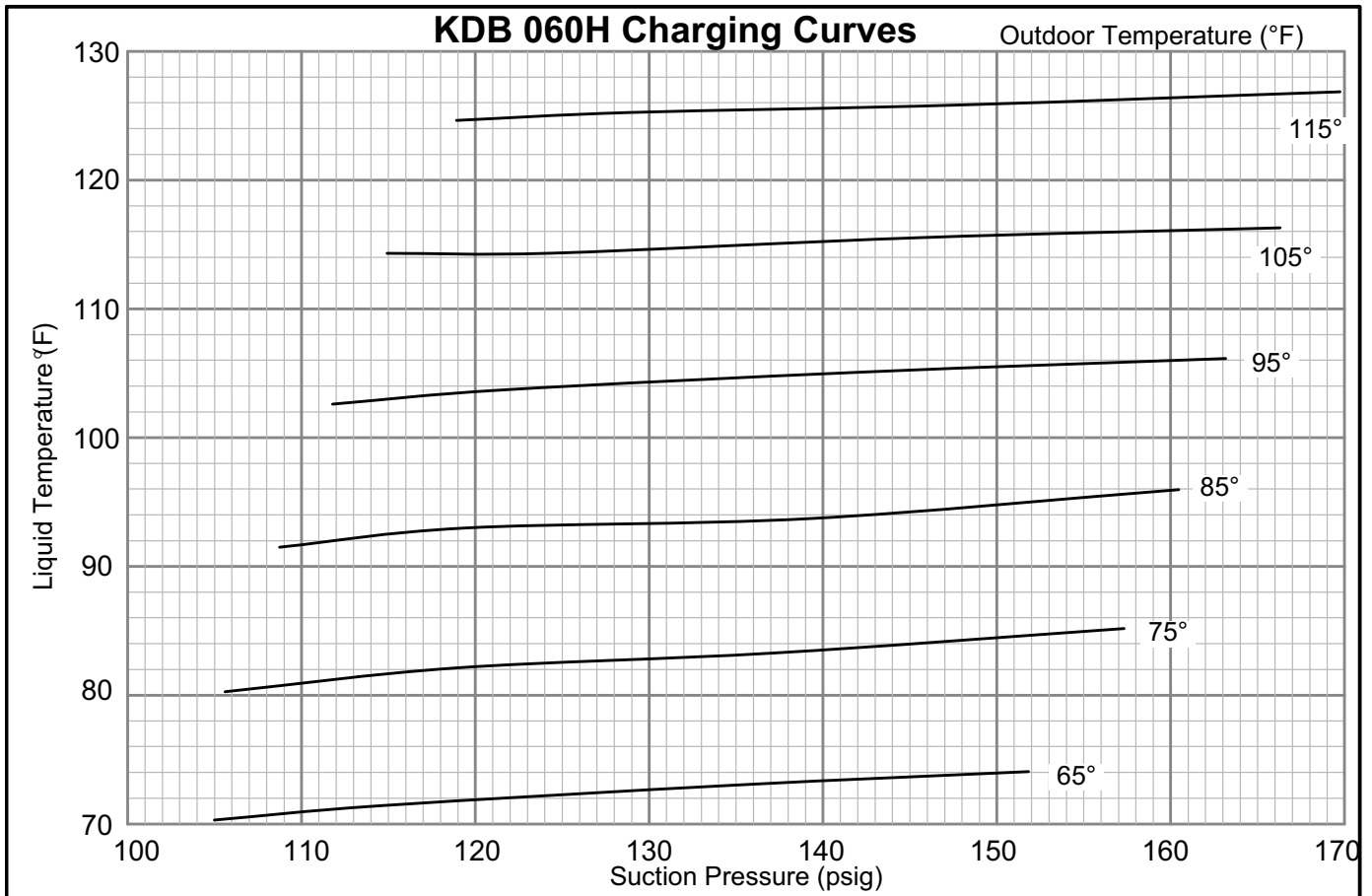
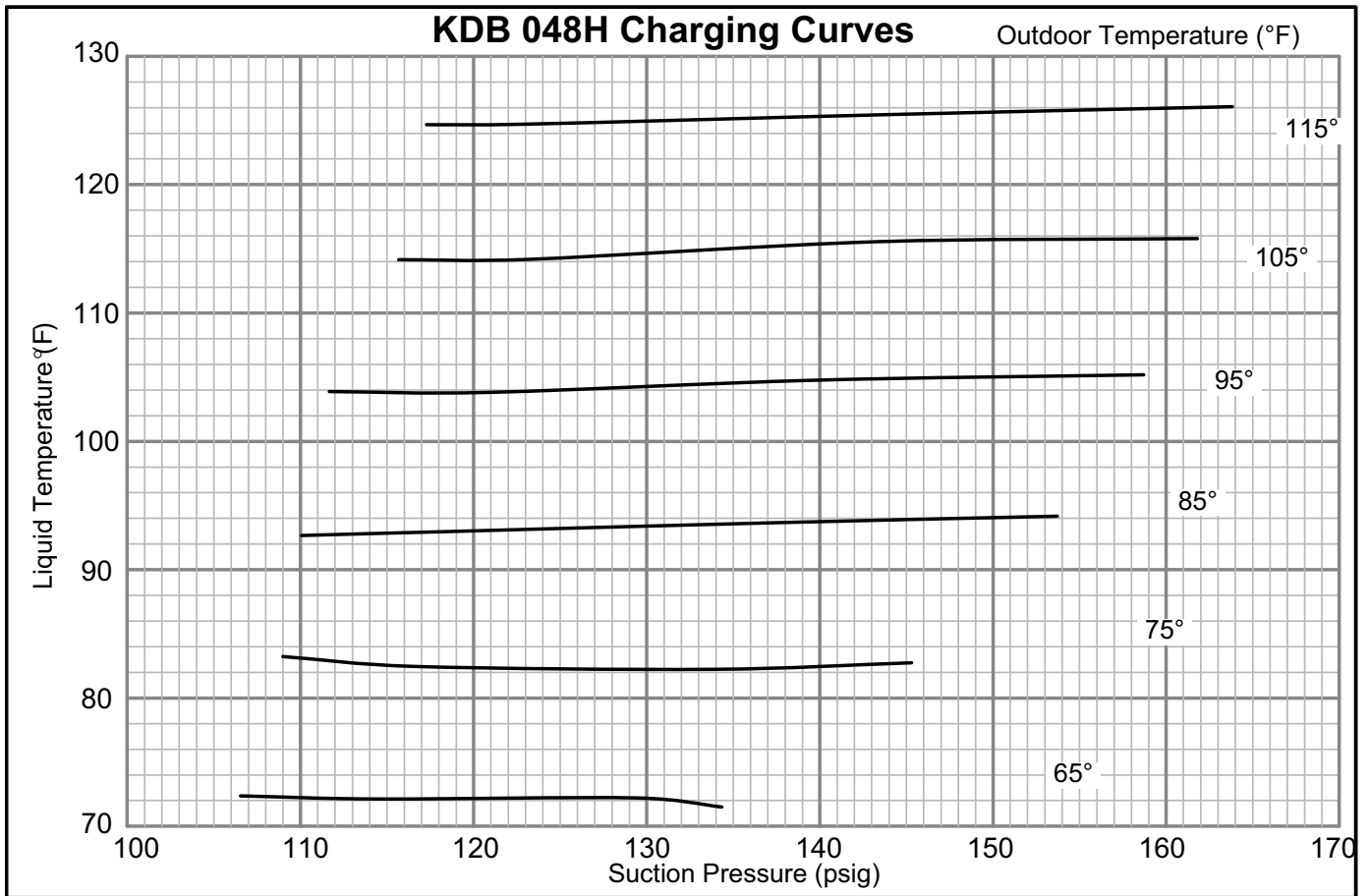
TABLE 8

KDB048H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
107	234	109	272	110	314	112	363	116	409	117	462
115	242	117	279	119	321	121	366	123	415	123	470
129	247	134	284	137	328	140	375	143	425	144	480
134	251	145	292	154	335	159	382	162	432	164	489

TABLE 9

KDB060H Normal Operating Pressures											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
105	236	106	274	109	317	112	365	115	419	119	474
115	243	119	280	119	324	122	372	124	422	129	480
135	251	137	289	139	332	142	381	146	432	148	489
152	261	157	300	160	344	163	392	166	443	170	500





D - Compressor Controls

See unit wiring diagram to determine which controls are used in each unit. Optional controls are identified on wiring diagrams by arrows at junction points.

1- Freezestat (S49)

Switch de-energizes compressor when indoor coil temperature falls below 29°F (-2°C) to prevent coil freeze-up. Switch resets when indoor coil temperature reaches 58°F (15°C).

2- High Pressure Switch (S4)

Auto-reset switch is located on the discharge line. Switch opens at 640 psig and closes at 475 psig. Switch is wired directly into the defrost control (CMC1), which provides a 5 strike lockout feature.

3- Defrost Switch (S6)

100269 Series Only

Defrost switch closes to initiate defrost when liquid line temperature falls to 42°F (5.6°C). Defrost switch opens when liquid line temperature reaches 70°F (21°C) to terminate defrost. If the liquid line temperature does not rise above 70°F (21°C), the CMC1 will terminate defrost after 14 minutes. The defrost switch is located on the liquid line between the outdoor expansion valve and the distributor

4- Ambient and Coil Temperature Sensors (RT13, RT21)

100135 Series Only

Both sensors provide input to the defrost control which cycles defrost. The ambient sensor is located on the inside of the corner mullion on the back of the outdoor coil section. The coil sensor is located on a return bend on the front of the outdoor coil.

5- Defrost Controls (CMC1)

Gas heat is energized during defrost to maintain discharge air temperature.

100269 Series Time/Temperature

When the liquid line temperature drops below 42°F (5.6°C), the defrost switch closes and signals the defrost control that a defrost cycle is needed. If the defrost switch is still closed after 90 minutes (default),

a defrost cycle begins and operates for 14 minutes. The defrost switch can terminate the defrost cycle before the 14 minutes elapses if liquid line temperature reaches 70°F (21°C).

Note - The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 90 minutes (default) on 100269 series boards. The run time interval can be changed by moving the jumper on the CMC board timing pins. See figure 23. The defrost interval can be adjusted to 30, 60, or 90 minutes. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval.

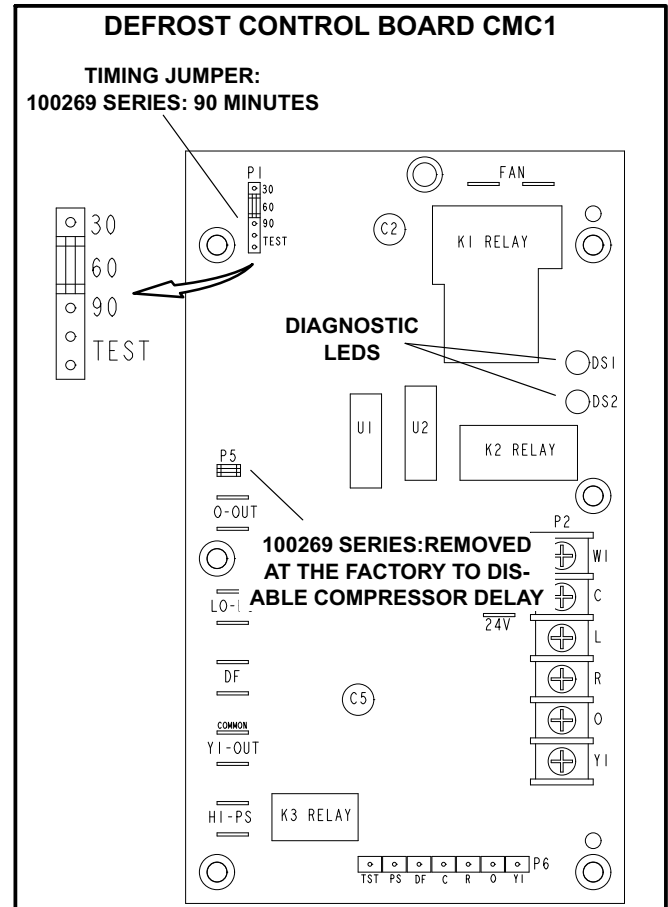


FIGURE 23

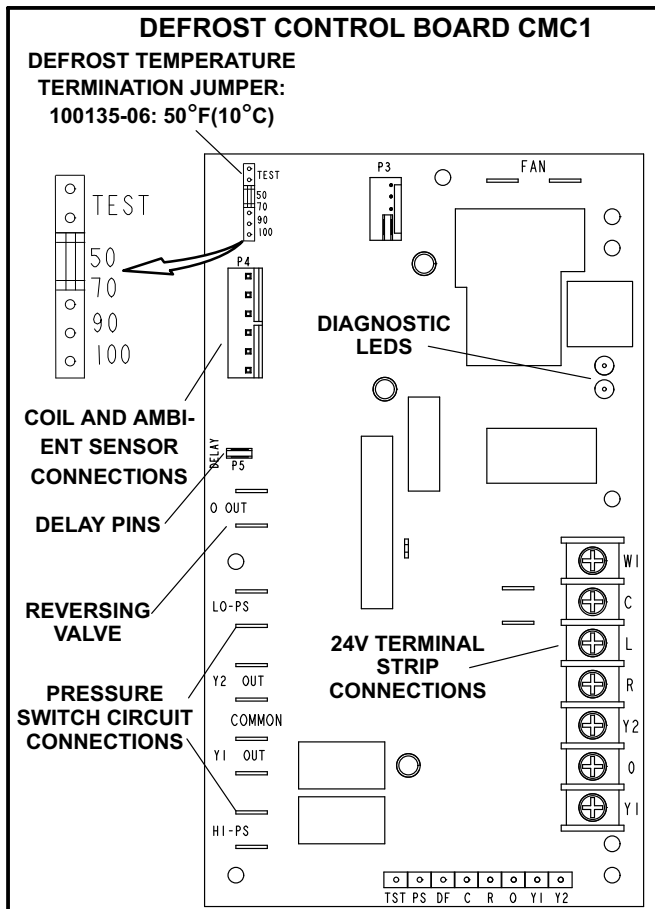


FIGURE 24

5- Defrost Controls (CMC1) - Continued

100135 Series Demand Defrost Control

After 34 minutes of heating mode operation, if the difference between the ambient temperature (RT13) and the coil temperature (RT21) is higher than the maximum difference allowed by the control, the defrost control will initiate defrost. The defrost control will also initiate defrost after 6 hours of heating mode operation when coil temperatures remain below 35°F (2°C). The defrost cycle ends when the coil temperature is higher than the termination temperature (50°F default) or after 14 minutes of operation. If the defrost is terminated by the 14-minute timer, another defrost cycle will be initiated after 34 minutes of run time.

Note - The defrost termination temperature can be adjusted to 50, 70, 90 or 100 °F. The jumper termination pin is factory-set at 50 °F (10 °C). If the temperature jumper is not installed, the default termination temperature is 90 °F (32 °C). See figure 24.

Defrost Control Board

The defrost control ensures that the heat pump outdoor coil does not ice excessively during the heating mode. The defrost control uses input from a defrost switch on 100269 series defrost control boards. The defrost control uses input from a coil and an ambient temperature sensor on 100135 series defrost control boards.

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 10

Defrost Control Board Diagnostic LED		
Mode	Green LED (DS2)	Red LED (DS1)
No power to control	OFF	OFF
Normal operation / power to control	Simultaneous Slow FLASH	
Anti-short cycle lockout	Alternating Slow FLASH	
Low pressure switch, freezestat fault	OFF	Slow FLASH
Low pressure switch, freezestat lockout	OFF	ON
High pressure switch fault	Slow FLASH	OFF
High pressure switch lockout	ON	OFF
*Ambient sensor fault	Simultaneous FAST flash	
*Coil sensor fault	Alternating FAST flash	

*100135-06 board only

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 or switch. Never use tools. If the switch will not move, or 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 VR8215S or White Rodgers 36J54 (figure 25 and 26)

- 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 control section access panel.
- 6- Move gas valve switch to **OFF**. See figure 25 or 26.
- 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- Move gas valve switch to **ON**. See figure 25 or 26.
- 9- Close or replace the control section access panel.
- 10- Turn on all electrical power to appliance.
- 11- Set thermostat to desired setting.

NOTE - When unit is initially started, steps 1 through 9 may need to be repeated to purge air from gas line.

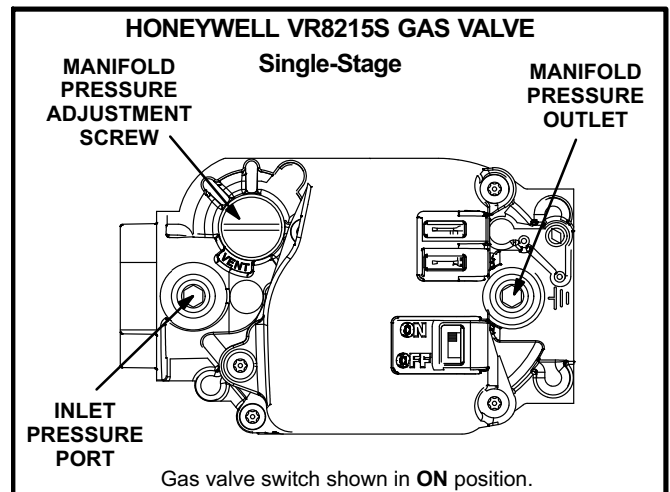


FIGURE 25

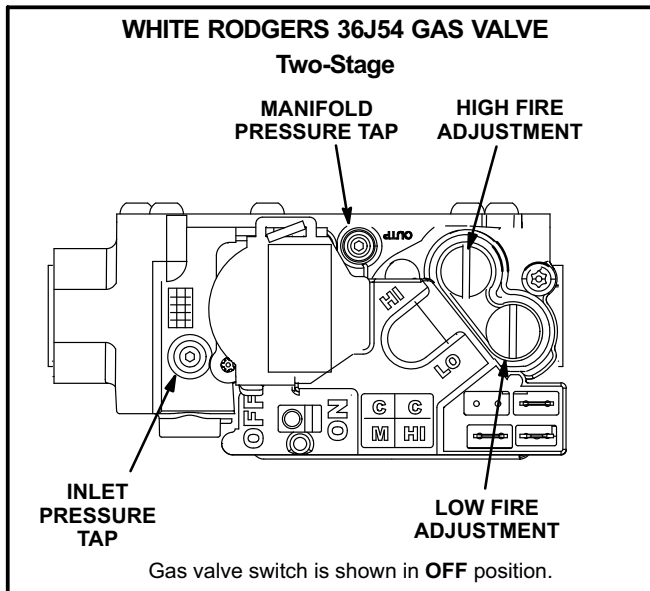


FIGURE 26

- 6- The ignition sequence will start.
- 7- 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.
- 8- If lockout occurs, repeat steps 1 through 10.
- 9- 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 control section access panel.
- 4- Move gas valve switch to **OFF**.
- 5- Close or replace the control 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.

- 12- Spark ignitor energizes and gas valve solenoid opens.
- 13- Spark ignites gas, ignition sensor proves the flame and combustion continues.
- 14- 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.
- 15- 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 11
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 to the right of the combustion air inducer. See figure 31.

If the primary limit trips three times in the same heating cycle, heating operation will de-energize. Heating will automatically restart after one hour if a heating demand is present. To initiate heating during the one hour timed-off interval, reset the thermostat.

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 - 2.0" w.c.
- Natural Gas Units - High Fire - 3.5" w.c.
- LP Gas Units - Low Fire - 5.9" w.c.
- 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 filters. See table 12. 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 27.

**TABLE 12
UNIT FILTERS**

Unit	Qty	Filter Size - in. (mm)
KDB024, 036	4	16 X 20 X 2 (406 X 508 X 51)
KDB048, 060	4	20 X 20 X 2 (508 X 508 X 51)

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.

D-Filter Drier

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

REMOVE FILTERS

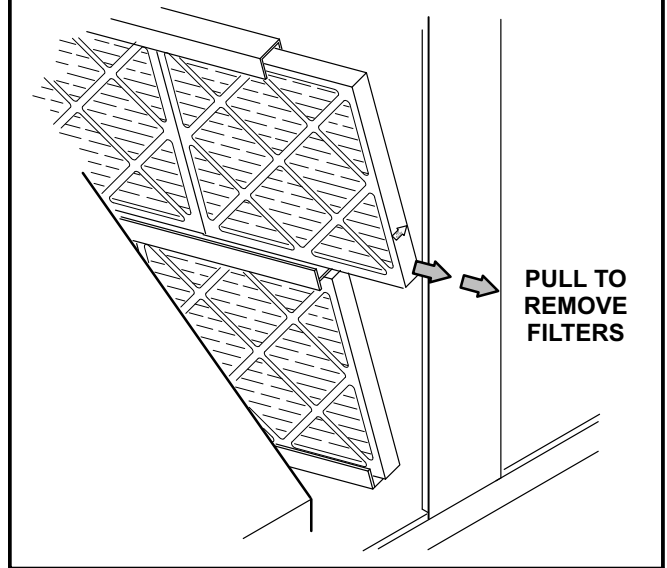


FIGURE 27

E-Indoor Coil

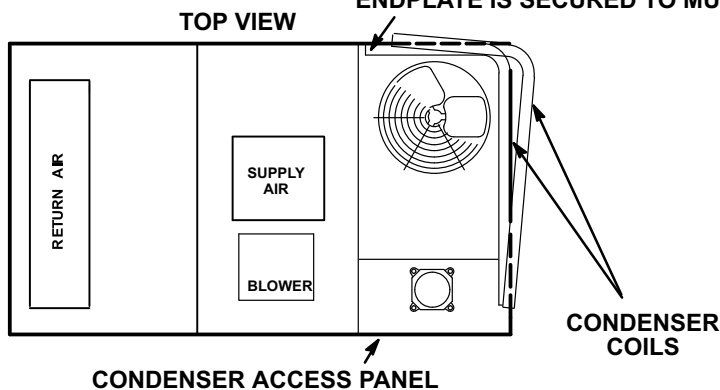
Inspect and clean coil at beginning of each cooling and heating season. Clean using mild detergent or commercial coil cleanser. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

F-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 28. Flush coils with water following cleaning.

CLEAN FIN/TUBE CONDENSER COIL ENDPLATE IS SECURED TO MULLION



- 1- Remove unit top panel and condenser section access panel.
- 2- Remove screws securing coil end plate to mullion.
- 3- Remove wire ties connecting coil slabs and separate slabs 3-4" (76-102mm).
- 4- Clean coils with detergent or commercial coil cleaner.
- 5- Rinse thoroughly with water and reassemble.
- 6- Secure coil slabs together using field-provided wire ties.

FIGURE 28

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 blower access panel.
- 3- Remove top burner box panel and screws securing burners to burner support and lift the individual burners or the entire burner assembly from the orifices. See figure 29. Clean as necessary.
- 4- Locate the ignitor under the right burners. Check ignitor spark gap with appropriately sized twist drills or feeler gauges. See figure 30.
- 5- Replace burners and screws securing burner. See figure 29.
- 6- Replace access panel.

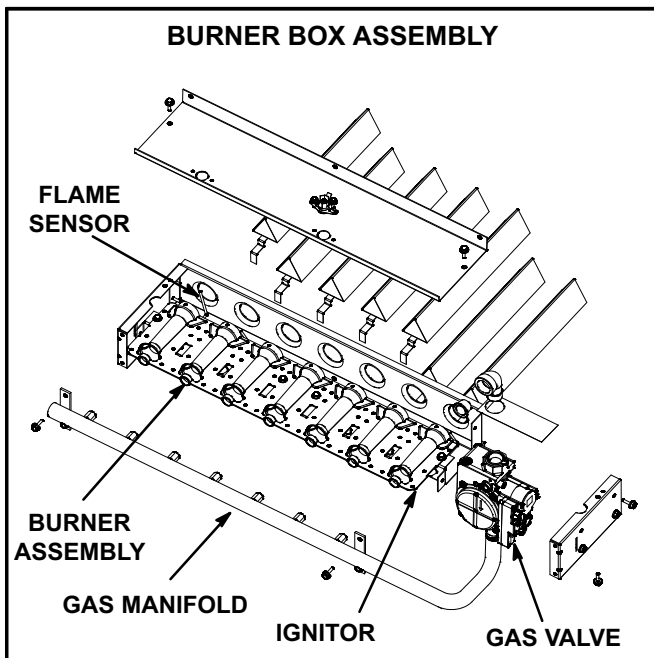


FIGURE 29

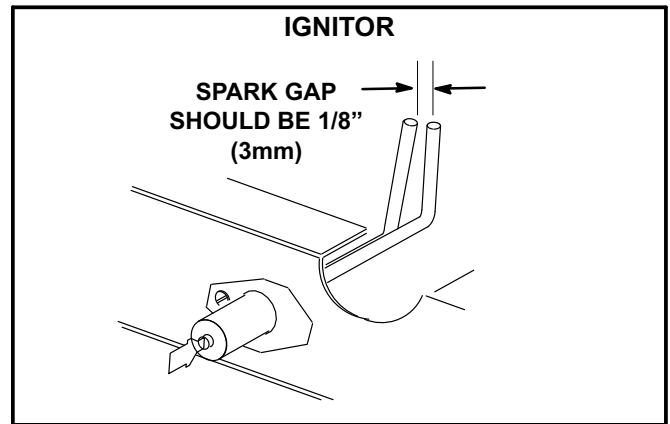


FIGURE 30

⚠ WARNING



Danger of explosion. Can cause injury or death. Do not overtighten main burner mounting screws. Snug tighten only.

- 7- Restore electrical power and gas supply. Follow lighting instructions attached to unit and use inspection port in access panel to check flame.

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.

Clean combustion air inducer as follows:

- 1- Shut off power supply and gas to unit.
- 2- Disconnect pressure switch air tubing from combustion air inducer port.
- 3- Remove the mullion on the right side of the heat section.
- 4- Remove and retain screws securing combustion air inducer to flue box. Remove vent connector. See figure 31.
- 5- Clean inducer wheel blades with a small brush and wipe off any dust from housing. Clean accumulated dust from front of flue box cover.
- 6- Replace the mullion on the right side of the heat section.

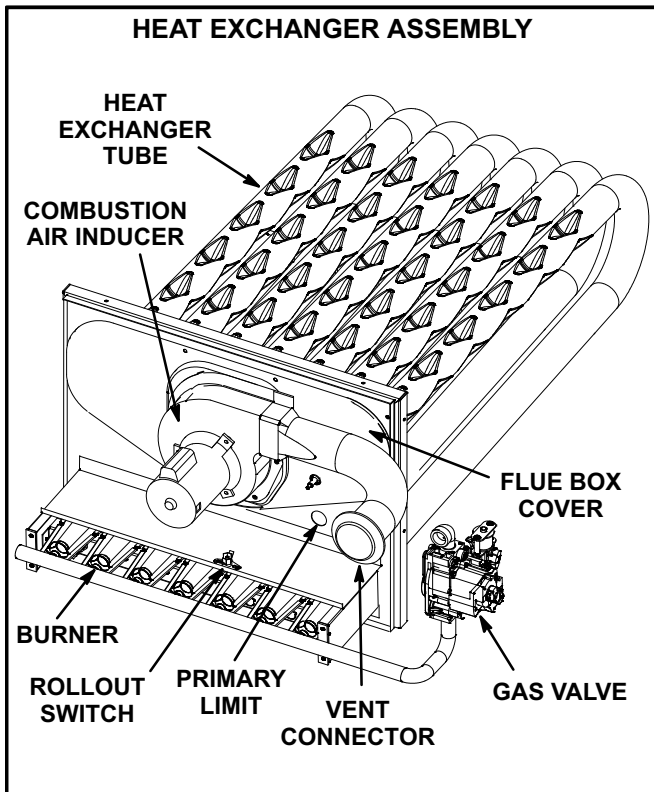


FIGURE 31

16- 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.

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

18- Replace mullion.

J-Flue Passageway and Flue Box

1- Remove combustion air inducer assembly as described in section J.

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

3- Clean tubes with a wire brush.

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