

# INSTALLATION INSTRUCTIONS

## ⚠ 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.

**RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE**

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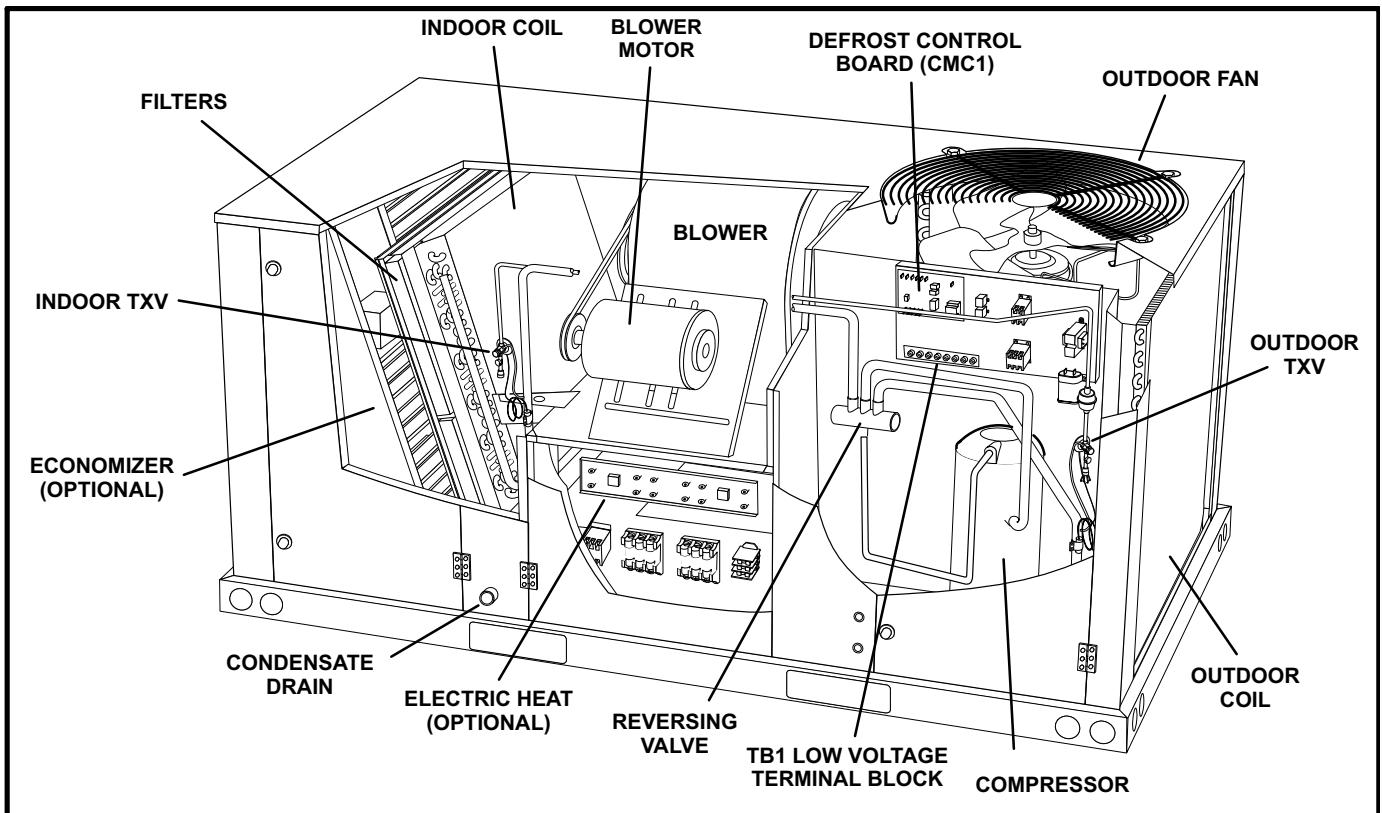
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- KHB024** (2-Ton)
- KHB030** (2-1/2-Ton)
- KHA036** (3-Ton)
- KHB036** (3-Ton)
- KHA048** (4-Ton)
- KHB048** (4-Ton)
- KHA060** (5-Ton)
- KHB060** (5-Ton)
- KHA072** (6-Ton)

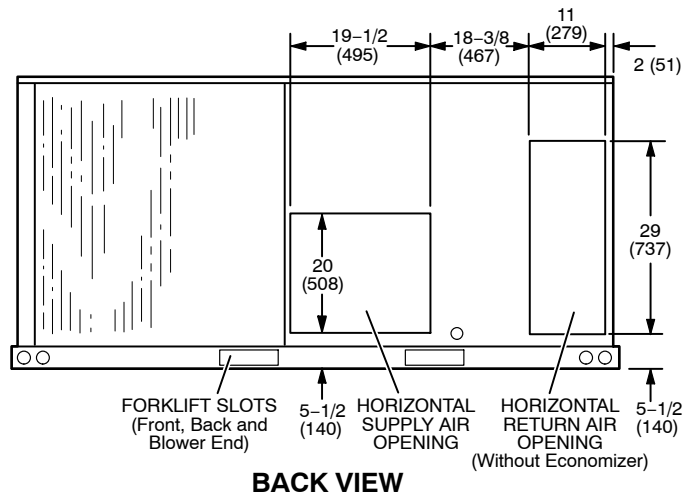
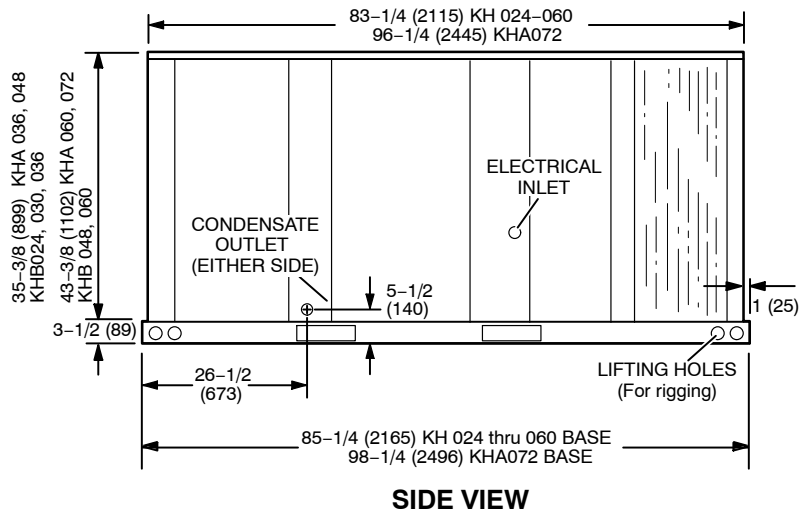
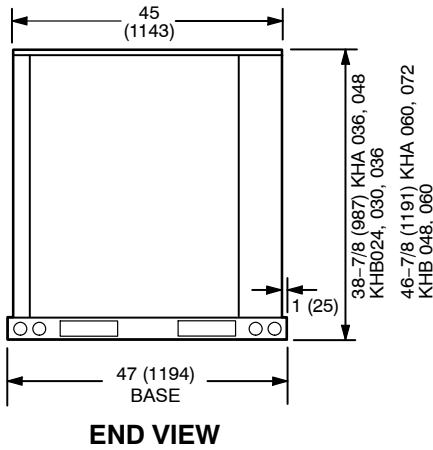
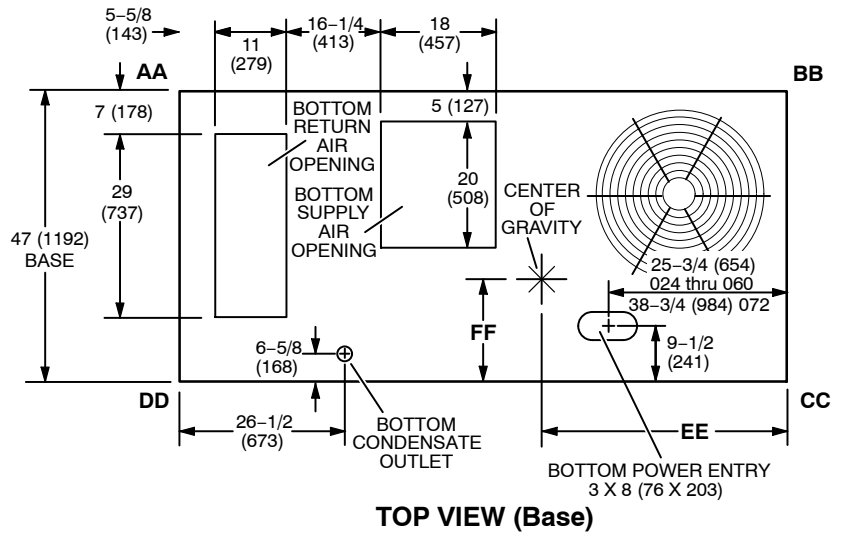
**HEAT PUMP PACKAGED UNITS**  
507349-01  
9/2014  
Supersedes 506002-01

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### KH 024, 030, 036, 048, 060, 072 PARTS ARRANGEMENT



**KH 024, 030, 036, 048, 060, 072 DIMENSIONS in (mm)**



## 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

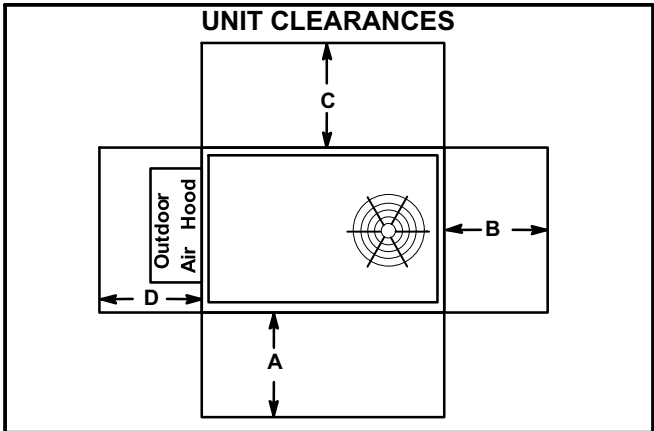
These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

Availability of units and options varies by brand.

## Requirements

The KH unit is ETL/CSA certified as a heat pump with cooling and with or without auxiliary electric heat for non-residential use only at the clearances to combustible materials as listed on the unit nameplate and in figure 1.

Installation of KH 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.



**FIGURE 1**

<sup>1</sup> 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)	Unob- structed
Minimum Opera- tion Clearance	36 (914)	36 (914)	36 (914)	36 (914)	Unob- structed

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

<sup>1</sup> **Service Clearance** - Required for removal of serviceable parts.  
**Minimum Operation Clearance** - Required clearance for proper unit operation.

## ⚠ 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

Installation of ETL/CSA certified units must also 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.

## ⚠ CAUTION

**Danger of sharp metallic edges. Can cause injury. Take care when servicing unit to avoid accidental contact with sharp edges.**

## ⚠ 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.*

KH 024, 030, 036, 048, 060 units are installed on T1CURB frames. KH 072 units are installed on K1CURB or T1CURB frames. K1CURB is a full-perimeter curb for KH 072 units; KH 072 will overhang T1CURB frame.

#### A - Downflow Discharge Application

##### Roof Mounting with T1CURB or K1CURB

- 1- The T1CURB/K1CURB roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.
- 2- The T1CURB/K1CURB 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 T1CURB/K1CURB 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- Remove all six base protection brackets before setting unit.
- 3- Connect rigging to the unit base using both holes in each corner. See figure 2.
- 4- All panels must be in place for rigging.
- 5- 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.)

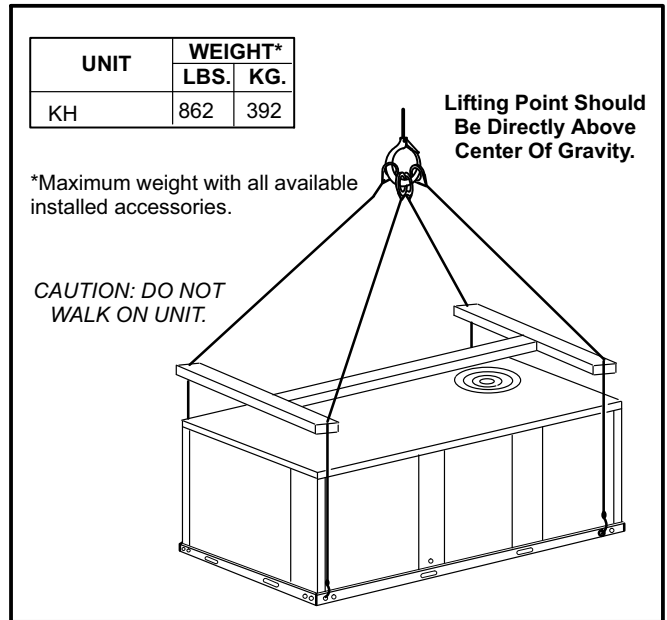


FIGURE 2

## 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.

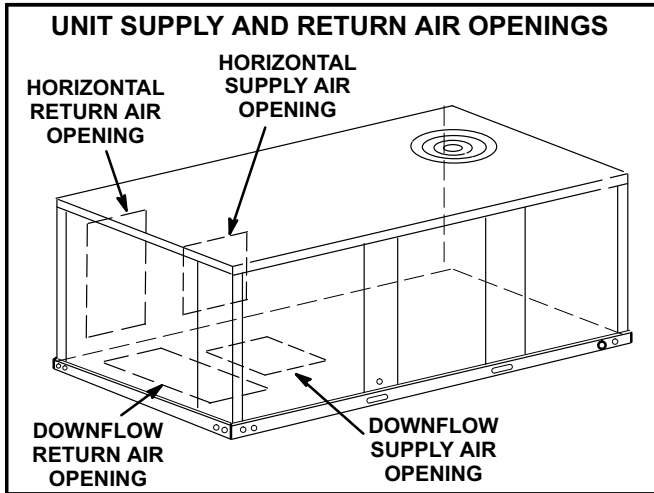


FIGURE 3

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 duct as shown in figure 4.

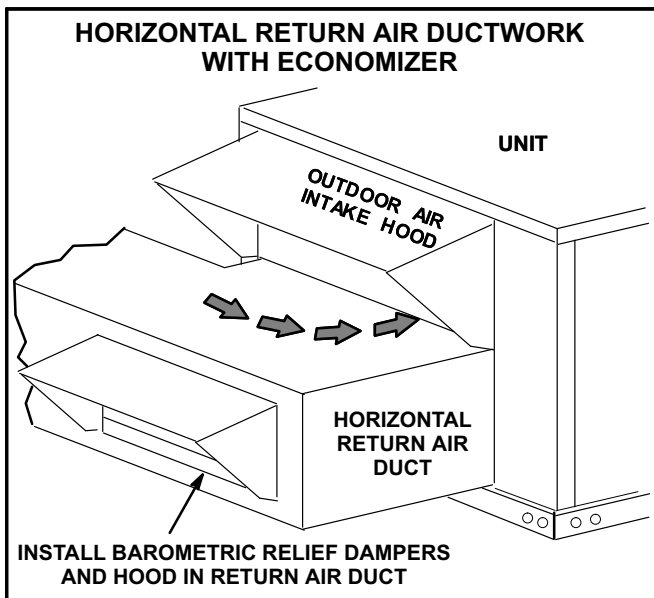


FIGURE 4

## 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 1 and 2 for condensate drain location.

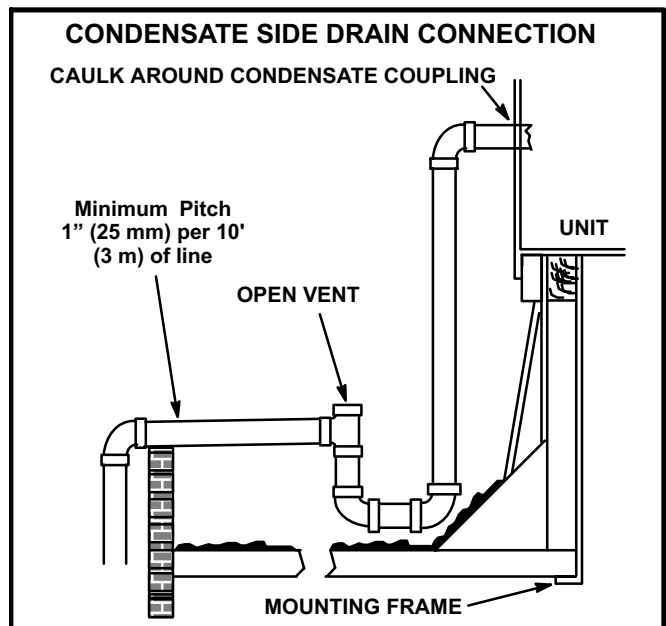


FIGURE 5

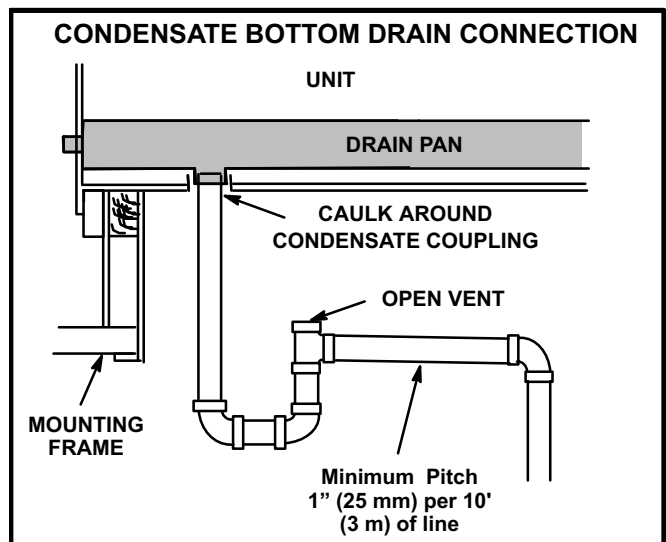
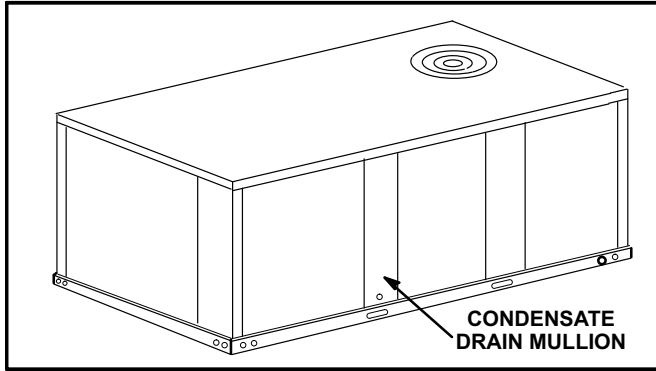


FIGURE 6

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.

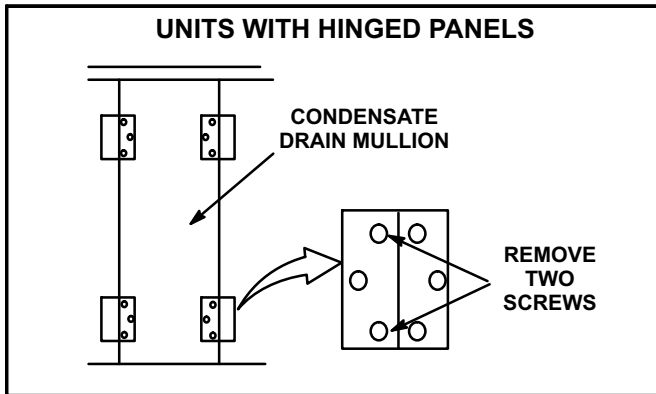
**Rear Drain Connection**

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



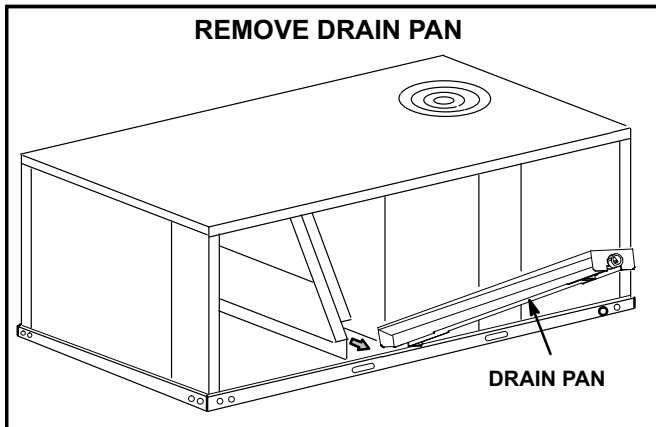
**FIGURE 7**

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



**FIGURE 8**

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

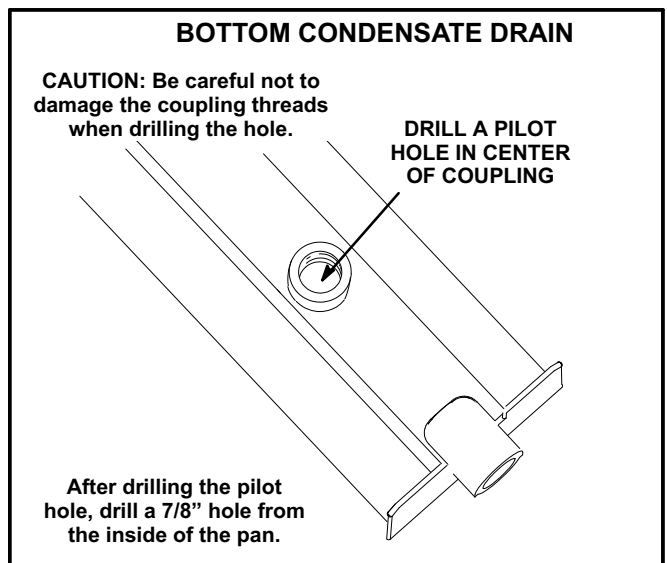


**FIGURE 9**

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

**Bottom Drain Connection**

- 1- Remove the condensate drain mullion. See figure 7.
- 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.
- 9- Use a field-provided 1" plug to seal side drain connection.
- 10- Replace the condensate drain mullion.



**FIGURE 10**

## Electrical Connections

### POWER SUPPLY

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram. Figure 12 shows a typical unit wiring diagram.

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

- 1- Units are factory-wired for 230,460,575 volt supply. **For 208V supply**, remove the 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 TB2. 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. Use wire ties located near the lower left corner of the controls hat section to secure thermostat cable.

#### B - Control Wiring

- 1- Route thermostat cable or wires from subbase to control area above compressor (refer to unit dimensions to locate bottom and side power entry). 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 control board on the lower side of the controls hat section. Wire as shown in figure 11 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

**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.

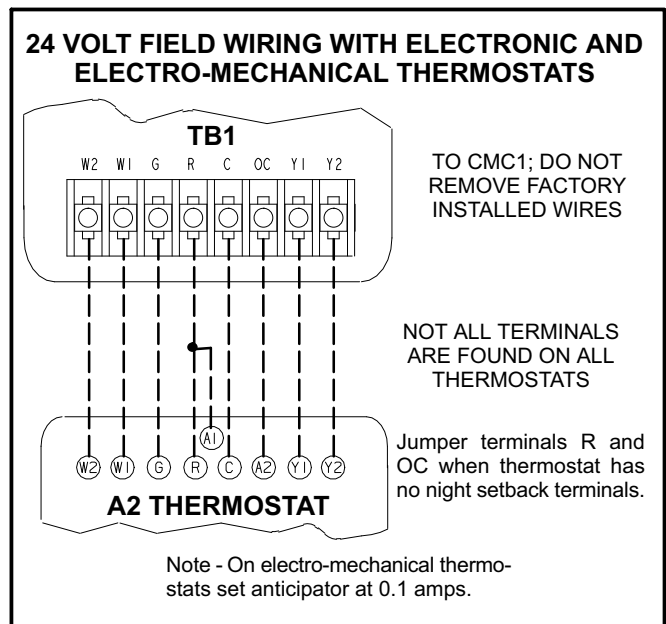
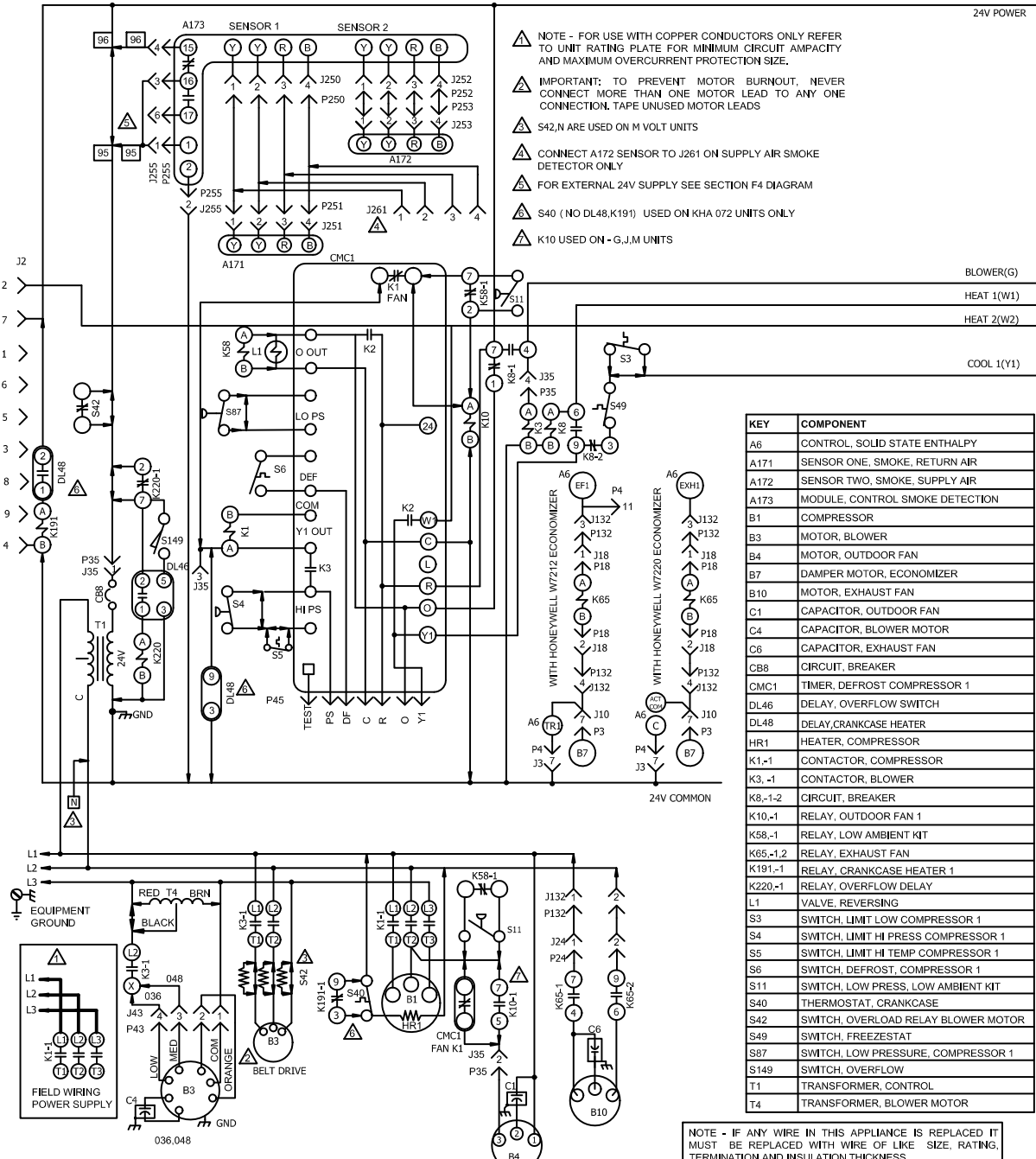


FIGURE 11

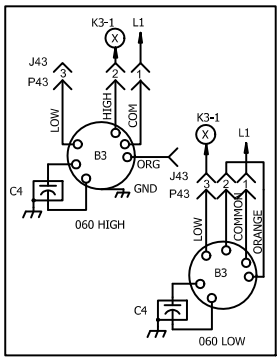
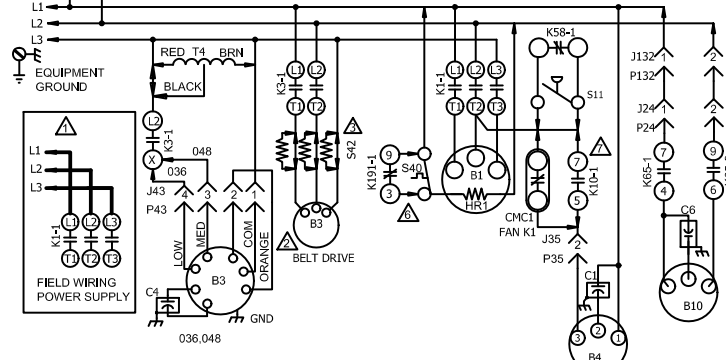


# TYPICAL KH UNIT WIRING SCHEMATIC



- ⚠ NOTE - FOR USE WITH COPPER CONDUCTORS ONLY REFER TO UNIT RATING PLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION SIZE.
- ⚠ IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION. TAPE UNUSED MOTOR LEADS
- ⚠ S42,N ARE USED ON M VOLT UNITS
- ⚠ CONNECT A172 SENSOR TO J261 ON SUPPLY AIR SMOKE DETECTOR ONLY
- ⚠ FOR EXTERNAL 24V SUPPLY SEE SECTION F4 DIAGRAM
- ⚠ S40 (NO DL48,K191) USED ON KHA 072 UNITS ONLY
- ⚠ K10 USED ON -G,J,M UNITS

KEY	COMPONENT
A6	CONTROL, SOLID STATE ENTHALPY
A171	SENSOR ONE, SMOKE, RETURN AIR
A172	SENSOR TWO, SMOKE, SUPPLY AIR
A173	MODULE, CONTROL SMOKE DETECTION
B1	COMPRESSOR
B3	MOTOR, BLOWER
B4	MOTOR, OUTDOOR FAN
B7	DAMPER MOTOR, ECONOMIZER
B10	MOTOR, EXHAUST FAN
C1	CAPACITOR, OUTDOOR FAN
C4	CAPACITOR, BLOWER MOTOR
C6	CAPACITOR, EXHAUST FAN
CB8	CIRCUIT, BREAKER
CMC1	TIMER, DEFROST COMPRESSOR 1
DL46	DELAY, OVERFLOW SWITCH
DL48	DELAY, CRANKCASE HEATER
HR1	HEATER, COMPRESSOR
K1-1	CONTACTOR, COMPRESSOR
K3-1	CONTACTOR, BLOWER
K8-1,2	CIRCUIT, BREAKER
K10-1	RELAY, OUTDOOR FAN 1
K58-1	RELAY, LOW AMBIENT KIT
K65-1,2	RELAY, EXHAUST FAN
K191-1	RELAY, CRANKCASE HEATER 1
K220-1	RELAY, OVERFLOW DELAY
L1	VALVE, REVERSING
S3	SWITCH, LIMIT LOW COMPRESSOR 1
S4	SWITCH, LIMIT HI PRESS COMPRESSOR 1
S5	SWITCH, LIMIT HI TEMP COMPRESSOR 1
S6	SWITCH, DEFROST, COMPRESSOR 1
S11	SWITCH, LOW PRESS, LOW AMBIENT KIT
S40	THERMOSTAT, CRANKCASE
S42	SWITCH, OVERLOAD RELAY BLOWER MOTOR
S49	SWITCH, FREEZESTAT
S87	SWITCH, LOW PRESSURE, COMPRESSOR 1
S149	SWITCH, OVERFLOW
T1	TRANSFORMER, CONTROL
T4	TRANSFORMER, BLOWER MOTOR



J / P	JACK / PLUG DESCRIPTION
2	HEAT
3	UNIT ECONOMIZER
10	ECONOMIZER
18	EXHAUST FAN
24	EXHAUST FAN
35	TEST
43	BLOWER MOTOR
45	INPUT
132	BLOWER, EXHAUST FAN MOTOR
250	SMOKE ONE
251	SENSOR ONE
252	SMOKE TWO
253	SENSOR TWO
255	MODULE, CONTROL SMOKE DETECTION
261	SMOKE DETECTOR JUMPER

NOTE - IF ANY WIRE IN THIS APPLIANCE IS REPLACED IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, TERMINATION AND INSULATION THICKNESS. WARNING - ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES. DISCONNECT ALL POWER BEFORE SERVICING.

— DENOTES OPTIONAL COMPONENTS  
 — LINE VOLTAGE FIELD INSTALLED


10/14		<b>WIRING DIAGRAM</b> 537779-01	10/14
	<b>COOLING</b> KHA,B - 036, 048, 060, 072 - G, J,M,Y		
SECTION B		REV 0	
Supersedes 537633-01		New Form No. 537779-01	

FIGURE 12

## Blower Operation and Adjustments

Units are equipped with direct or belt drive blowers; available drive varies by model.

### ⚠️ 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

- 1- Set thermostat or temperature control device fan switch to **AUTO** or **ON**. With fan switch in **ON** position, blower will operate continuously. With fan switch in **AUTO** position, the blower will cycle with demand.
- 2- Blower and entire unit will be off when thermostat or temperature control device system switch is in **OFF** position.

#### 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 on page 20.
- 3- Use figure 13 to determine the factory set blower speed.

BLOWER SPEED FACTORY SETTINGS		
036 Units	024, 030, 048 Units	060 Units
<input type="checkbox"/> 1 Com	<input type="checkbox"/> 1 Com	<input type="checkbox"/> 1 Com
<input type="checkbox"/> 2 Hi	<input type="checkbox"/> 2 Hi	<input type="checkbox"/> 2 Hi
<input type="checkbox"/> 3 Med	<input type="checkbox"/> 3 <b>Med*</b>	<input type="checkbox"/> 3 <b>Low*</b>
<input type="checkbox"/> 4 <b>Low*</b>	<input type="checkbox"/> 4 Low	<input type="checkbox"/> 4 Unused

\*Factory Setting

FIGURE 13

- 4- Use page 13 or 14, the measured static pressure, and the factory-set blower speed to determine CFM. If CFM is lower than the design specified CFM, move the lead from speed tap 3 or 4 to speed tap 2. See figure 14. Refer to table 1 for minimum airflow when electric heat is installed.

For 460/575V units, remove the isolation lead from speed tap 2 before moving the wire to speed tap 2. Tape the exposed end of the isolation lead and secure away from other components.

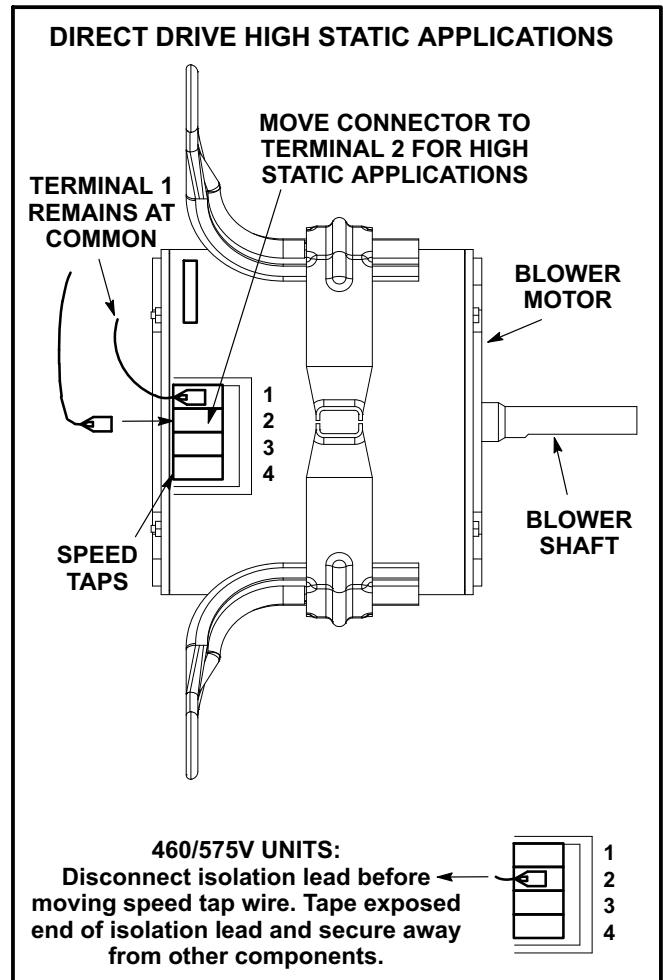


FIGURE 14

TABLE 1  
MINIMUM AIRFLOW  
KH(BELT DRIVE) UNITS WITH ELECTRIC HEAT

kW	CFM	
	Downflow	Horizontal
30	2250	2050
22.5	1750	1800
15	1250	1350
7.5	1050	1200

Direct drive units with electric heat (5.0-22.5kW) can operate on low speed up to 0.6" w.g. maximum static pressure.

**C - Determining Unit CFM - Belt 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). 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- Measure the indoor blower wheel RPM.
- 4- Referring to page 16 through 21, use static pressure and RPM readings to determine unit CFM. Use page 22 when installing units with any of the options or accessories listed. Refer to table 1 for minimum airflow when electric heat is installed.
- 5- 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 2.

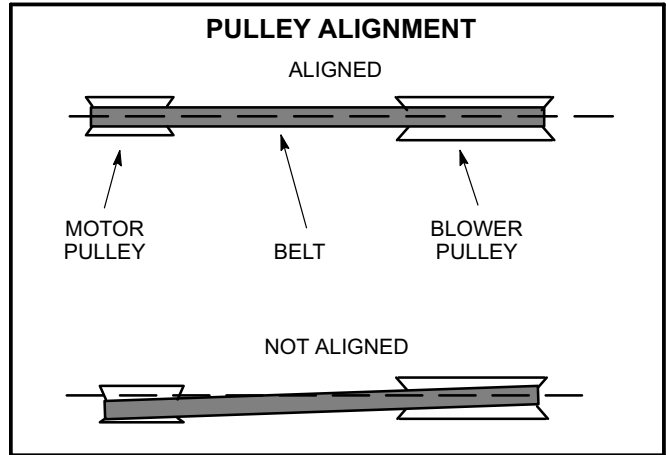
**TABLE 2  
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT**

Belt	Min. Turns Open	Maxi. Turns Open
A Section	No minimum	5

**D - Blower Belt Adjustment**

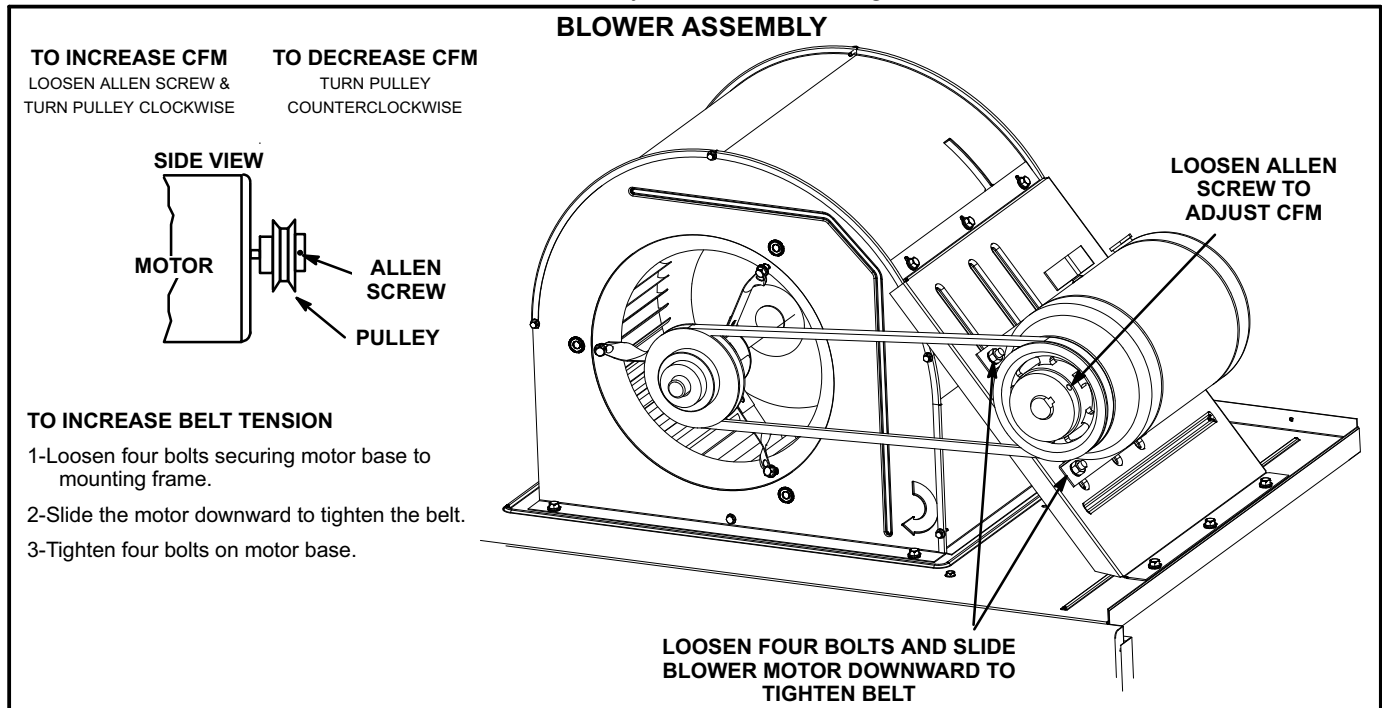
Maximum life and wear can be obtained from belts only if

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 grooves. Make sure blower and motor pulley are aligned as shown in figure 15.

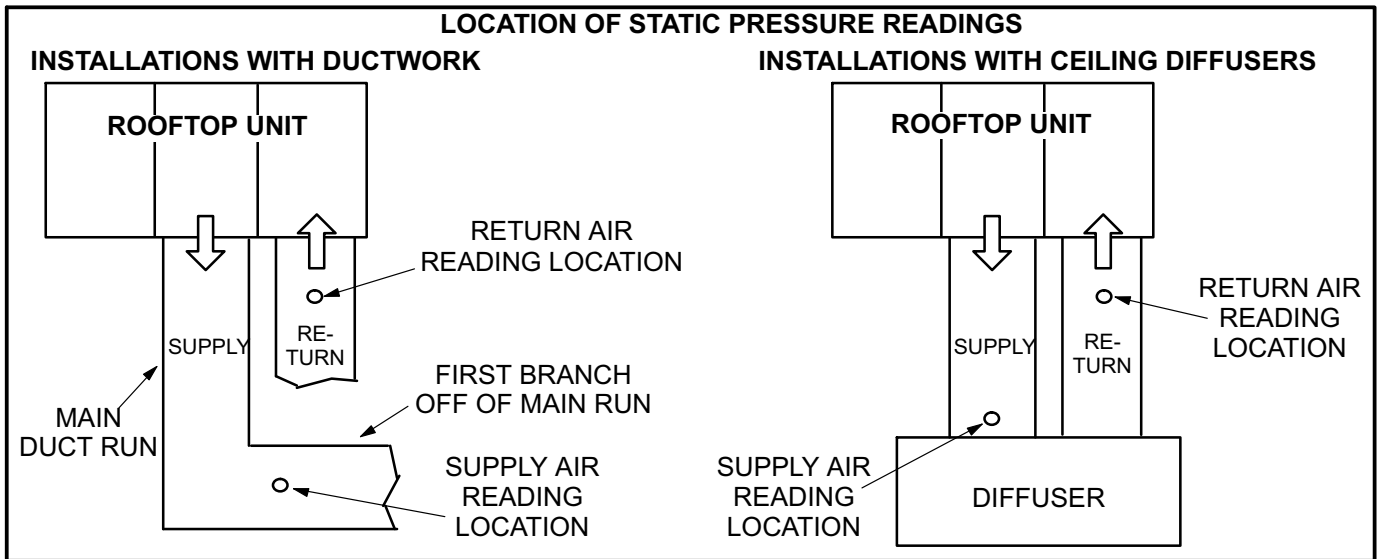


**FIGURE 15**

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



**FIGURE 16**



**FIGURE 17**

**E - Check Belt Tension**

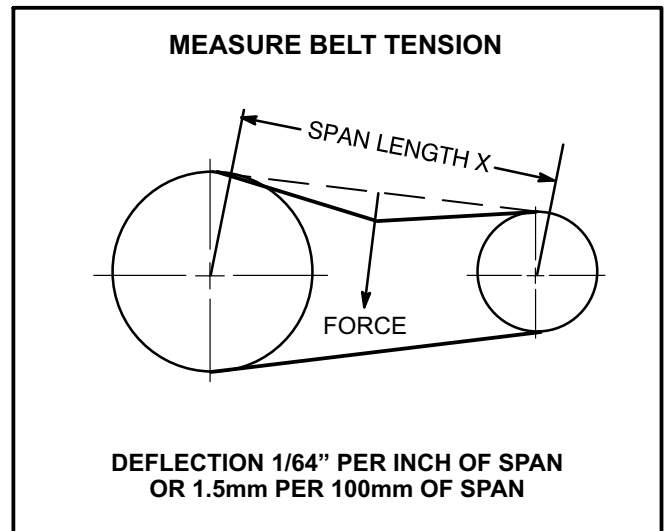
Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

- 1- Measure span length X. See figure 18.
- 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 used belt, the deflection force should be 5 lbs. (35kPa). A new belt deflection force should be 7 lbs. (48kPa).

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

**F - Field-Furnished Blower Drives**

For field-furnished blower drives, use page 15 through 19 to determine BHP and RPM required. Reference table 3 to determine the drive kit number and table 4 for drive kit specifications.



**FIGURE 18**

## BLOWER DATA - DIRECT DRIVE - KHB024-030

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 22.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 22.

External Static Pressure (in. w.g.)	Air Volume (cfm) at Various Blower Speeds					
	208 VOLTS			230 VOLTS		
	High	Medium	Low	High	Medium	Low
<b>2 and 2.5 Ton Standard Efficiency (Downflow)</b>			<b>KHB024S and KHB030S</b>			
0.0	1199	928	838	1379	1085	877
0.1	1229	926	813	1409	1086	872
0.2	1206	928	782	1367	1094	850
0.3	1183	881	742	1350	1047	820
0.4	1159	843	686	1321	1009	783
0.5	1136	812	643	1282	981	762
0.6	1103	766	569	1242	921	705
0.7	1046	728	496	1195	888	625
0.8	953	648	432	1134	792	583
0.9	909	584	335	1037	738	492
1.0	783	465	247	926	592	411
<b>2 and 2.5 Ton Standard Efficiency (Horizontal)</b>			<b>KHB024S and KHB030S</b>			
0.0	1152	909	801	1325	1063	838
0.1	1152	893	770	1321	1048	826
0.2	1136	866	734	1288	1021	798
0.3	1104	826	697	1260	982	771
0.4	1072	787	643	1222	942	734
0.5	1041	747	589	1175	903	698
0.6	1009	707	534	1137	850	662
0.7	946	654	467	1081	797	588
0.8	861	588	396	1024	718	535
0.9	798	508	319	911	642	468
1.0	715	443	237	846	564	394

## BLOWER DATA - DIRECT DRIVE - KHA/KHB036, KHA048

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 22.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 22.

External Static Pressure (in. w.g.)	Air Volume (cfm) at Various Blower Speeds								
	208 VOLTS			230 VOLTS			460/575 VOLTS		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
<b>3 and 4 Ton Standard Efficiency (Downflow)</b>					<b>KHA/KHB036S and KHA048S</b>				
0.0	1938	1552	1119	2167	1772	1317	2136	1716	1212
0.1	1992	1586	1128	2167	1780	1315	2104	1728	1208
0.2	1915	1592	1137	2100	1792	1307	2052	1684	1197
0.3	1865	1536	1083	2043	1735	1266	1994	1647	1172
0.4	1813	1495	1033	1986	1678	1204	1918	1597	1134
0.5	1762	1444	976	1909	1621	1164	1861	1534	1096
0.6	1694	1391	899	1814	1535	1082	1765	1485	1059
0.7	1609	1331	817	1718	1478	1000	1689	1410	996
0.8	1471	1220	730	1603	1364	918	1613	1335	920
0.9	1368	1066	522	1488	1250	755	1498	1235	848
1.0	1108	869	402	1259	1021	640	1345	1036	763
<b>3 and 4 Ton Standard Efficiency (Horizontal)</b>					<b>KHA/KHB036S and KHA048S</b>				
0.0	1862	1520	1070	2082	1736	1259	2085	1745	1247
0.1	1867	1530	1069	2031	1717	1246	2070	1744	1257
0.2	1804	1485	1067	1978	1672	1227	2016	1690	1225
0.3	1741	1440	1018	1907	1627	1190	1944	1643	1192
0.4	1677	1396	968	1837	1567	1128	1890	1596	1160
0.5	1614	1329	894	1749	1492	1066	1800	1533	1111
0.6	1550	1284	844	1660	1417	1016	1727	1455	1062
0.7	1455	1195	769	1554	1327	941	1655	1377	996
0.8	1329	1106	670	1448	1237	842	1511	1283	865
0.9	1202	927	496	1307	1087	718	1403	1190	784
1.0	1012	828	385	1150	973	613	1222	1002	670

## BLOWER DATA - DIRECT DRIVE - KHB048

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 22.

2 - Any field installed accessories air resistance (electric heat, duct resistance, diffuser, etc.) See page 22.

External Static Pressure (in. w.g.)	Air Volume (cfm) at Various Blower Speeds								
	208 VOLTS			230 VOLTS			460/575 VOLTS		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
<b>3 and 4 Ton Standard Efficiency (Downflow)</b>									<b>KHB048S</b>
0.0	1951	1542	1098	2139	1542	1271	2139	1542	1271
0.1	1918	1526	1081	2105	1526	1261	2105	1526	1261
0.2	1877	1508	1062	2054	1508	1238	2054	1508	1238
0.3	1814	1448	1026	1986	1448	1196	1986	1448	1196
0.4	1752	1407	990	1918	1407	1154	1918	1407	1154
0.5	1689	1347	936	1826	1347	1099	1826	1347	1099
0.6	1605	1286	864	1735	1286	1043	1735	1286	1043
0.7	1500	1206	774	1644	1206	932	1644	1206	932
0.8	1375	1085	---	1461	1085	---	1461	1085	---
0.9	1202	---	---	---	---	---	---	---	---
1.0	---	---	---	---	---	---	---	---	---
<b>3 and 4 Ton Standard Efficiency (Horizontal)</b>									<b>KHB048S</b>
0.0	1901	1506	1079	2072	1718	1249	2072	1718	1249
0.1	1855	1478	1069	2026	1686	1238	2026	1686	1238
0.2	1800	1458	1049	1969	1644	1206	1969	1644	1206
0.3	1744	1396	1012	1908	1601	1161	1908	1601	1161
0.4	1687	1346	936	1847	1530	1115	1847	1530	1115
0.5	1630	1296	886	1755	1460	1047	1755	1460	1047
0.6	1546	1222	811	1663	1403	1002	1663	1403	1002
0.7	1461	1147	735	1572	1290	910	1572	1290	910
0.8	1347	1073	660	1419	1205	820	1419	1205	820
0.9	1178	874	560	1296	1006	683	1296	1006	683
1.0	954	624	358	1129	---	496	1129	---	496

## BLOWER DATA - BELT DRIVE - KHA/KHB036

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.).

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

See page 21 for blower motors and drives and page 22 for wet coil and options/accessory air resistance data.

### DOWNFLOW

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
	Field Furnished						Kit A01									
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
	Kit A01		Kit A05													
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

### HORIZONTAL

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
	Field Furnished						Kit A01									
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
	Kit A01		Kit A05													
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	1143	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	1085	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 DATA - BELT DRIVE - KHA048

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.).

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

See page 21 for blower motors and drives and page 22 for wet coil and options/accessory air resistance data.

### DOWNFLOW

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
	Field Furnished						Kit A02									
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	675	0.28	729	0.33	782	0.36	835	0.40	887	0.43	935	0.47	981	0.50	1028	0.54
1600	718	0.31	766	0.35	814	0.40	862	0.44	910	0.48	955	0.52	1000	0.55	1046	0.59
1700	756	0.34	799	0.39	843	0.44	887	0.49	932	0.53	976	0.57	1020	0.61	1066	0.64
1800	787	0.40	828	0.45	870	0.50	912	0.55	955	0.59	999	0.63	1043	0.67	1089	0.70
1900	815	0.46	855	0.51	897	0.57	939	0.62	981	0.66	1024	0.69	1068	0.73	1113	0.76
2000	843	0.53	884	0.59	925	0.64	968	0.68	1009	0.72	1052	0.76	1095	0.79	1138	0.83

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
	Kit A02				Kit A06											
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
1600	1092	0.61	1137	0.65	1178	0.68	1216	0.72	1253	0.76	1288	0.80	1321	0.84	1354	0.88
1700	1112	0.67	1155	0.70	1193	0.75	1230	0.79	1265	0.83	1299	0.87	1332	0.91	1364	0.95
1800	1133	0.73	1174	0.77	1209	0.81	1244	0.85	1278	0.90	1311	0.94	1343	0.98	1375	1.02
1900	1156	0.80	1193	0.84	1226	0.89	1260	0.93	1293	0.97	1325	1.01	1356	1.06	1388	1.10
2000	1178	0.87	1213	0.92	1243	0.97	1275	1.02	1307	1.06	1339	1.10	1370	1.14	1402	1.18

### HORIZONTAL

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
	Field Furnished						Kit A02									
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
1600	705	0.34	763	0.37	819	0.40	873	0.43	921	0.48	963	0.52	1004	0.56	1048	0.59
1700	741	0.38	796	0.41	850	0.45	900	0.49	945	0.53	985	0.58	1026	0.62	1070	0.65
1800	776	0.43	829	0.46	880	0.51	927	0.55	970	0.60	1009	0.64	1050	0.68	1093	0.71
1900	812	0.48	862	0.52	910	0.57	955	0.62	996	0.66	1035	0.71	1076	0.74	1118	0.78
2000	847	0.54	895	0.59	941	0.64	984	0.69	1023	0.74	1062	0.78	1103	0.81	1144	0.85

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
	Kit A02				Kit A06											
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	1085	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
1600	1093	0.62	1136	0.66	1175	0.70	1212	0.74	1247	0.78	1281	0.82	1313	0.86	1344	0.90
1700	1114	0.68	1155	0.72	1192	0.76	1227	0.80	1262	0.85	1295	0.89	1327	0.93	1358	0.97
1800	1136	0.75	1175	0.79	1210	0.83	1245	0.88	1278	0.92	1311	0.97	1342	1.01	1373	1.05
1900	1159	0.82	1197	0.86	1229	0.92	1263	0.97	1296	1.01	1328	1.06	1359	1.10	1390	1.14
2000	1183	0.90	1218	0.95	1249	1.01	1282	1.06	1314	1.11	1346	1.15	1377	1.20	1408	1.24

## BLOWER DATA - BELT DRIVE - KHB048

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.).

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

See page 21 for blower motors and drives and page 22 for wet coil and options/accessory air resistance data.

### DOWNFLOW

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
	Field Furnished								Kit A02							
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	847	0.40	878	0.45	909	0.50	942	0.55	975	0.60	1009	0.66	1044	0.71	1079	0.76

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
	Kit A02								Kit A06							
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	0.5	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	1116	0.80	1152	0.84	1189	0.88	1226	0.92	1264	0.96	1299	1.00	1327	1.04	1353	1.09

### HORIZONTAL

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
	Field Furnished								Kit A02							
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	873	0.47	903	0.51	934	0.56	966	0.60	998	0.65	1032	0.70	1066	0.75	1101	0.79

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
	Kit A02								Kit A06							
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	1136	0.83	1172	0.87	1208	0.91	1245	0.94	1280	0.99	1313	1.03	1344	1.07	1375	1.11

## BLOWER DATA - BELT DRIVE - KHA/KHB060

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.).

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

See page 21 for blower motors and drives and page 22 for wet coil and options/accessory air resistance data.

### DOWNFLOW

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
	Field Furnished								Kit A03							
1600	665	0.30	716	0.34	768	0.38	819	0.41	879	0.44	937	0.46	985	0.49	1022	0.52
1700	723	0.31	768	0.35	814	0.39	860	0.43	910	0.47	959	0.50	1001	0.54	1037	0.58
1800	779	0.32	818	0.37	857	0.41	897	0.46	939	0.50	980	0.55	1018	0.59	1054	0.64
1900	826	0.36	859	0.41	894	0.45	928	0.50	964	0.56	1000	0.61	1036	0.66	1072	0.70
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
2100	878	0.49	909	0.54	940	0.59	973	0.64	1006	0.70	1041	0.75	1076	0.80	1112	0.85
2200	897	0.55	929	0.61	961	0.66	994	0.72	1028	0.78	1063	0.83	1099	0.89	1134	0.93
2300	918	0.62	950	0.68	983	0.74	1017	0.80	1052	0.86	1087	0.92	1122	0.97	1157	1.02
2400	941	0.70	974	0.77	1008	0.83	1042	0.90	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
	Kit A03						Kit A07									
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

### HORIZONTAL

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
	Field Furnished								Kit A03							
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	1146	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
	Kit A03						Kit A07									
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	1291	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	1371	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 - DOWNFLOW - KHA072

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.).

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

See page 21 for blower motors and drives and page 22 for wet coil and options/accessory air resistance data.

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
	Field Furnished										Kit A04					
1900	826	0.36	859	0.41	894	0.45	928	0.50	964	0.56	1000	0.61	1036	0.66	1072	0.70
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
2100	878	0.49	909	0.54	940	0.59	973	0.64	1006	0.70	1041	0.75	1076	0.80	1112	0.85
2200	897	0.55	929	0.61	961	0.66	994	0.72	1028	0.78	1063	0.83	1099	0.89	1134	0.93
2300	918	0.62	950	0.68	983	0.74	1017	0.80	1052	0.86	1087	0.92	1122	0.97	1157	1.02
2400	941	0.70	974	0.77	1008	0.83	1042	0.90	1077	0.96	1111	1.01	1146	1.06	1181	1.11
2500	966	0.79	1000	0.86	1034	0.93	1068	1.00	1103	1.06	1137	1.11	1171	1.16	1205	1.20
2600	994	0.90	1028	0.97	1062	1.04	1096	1.10	1130	1.16	1164	1.21	1197	1.26	1231	1.30
2700	1023	1.01	1057	1.08	1091	1.15	1125	1.22	1159	1.27	1192	1.32	1225	1.37	1258	1.41
2800	1053	1.13	1088	1.21	1122	1.27	1155	1.33	1188	1.39	1221	1.43	1253	1.48	1286	1.53
2900	1085	1.26	1119	1.33	1153	1.40	1186	1.45	1218	1.51	1250	1.55	1281	1.61	1313	1.66

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
	Kit A04										Kit A08					
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
2500	1240	1.24	1273	1.29	1302	1.36	1331	1.42	1360	1.48	1388	1.52	1414	1.55	1441	1.58
2600	1265	1.34	1296	1.40	1324	1.47	1352	1.54	1381	1.60	1408	1.64	1434	1.67	1460	1.70
2700	1291	1.46	1321	1.52	1347	1.60	1374	1.67	1403	1.72	1429	1.76	1455	1.79	1481	1.82
2800	1317	1.58	1346	1.66	1372	1.74	1399	1.80	1426	1.85	1451	1.89	1477	1.92	1503	1.95
2900	1343	1.72	1371	1.80	1397	1.88	1424	1.95	1450	1.99	1475	2.02	1500	2.05	1526	2.08

## BLOWER DATA - BELT DRIVE - HORIZONTAL - KHA072

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.).

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

See below for blower motors and drives and page 22 for wet coil and options/accessory air resistance data.

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
	Field Furnished								Kit A04							
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	1146	1.05	1180	1.09	1213	1.13
2500	1010	0.91	1042	0.96	1075	1.00	1109	1.05	1142	1.09	1175	1.14	1207	1.18	1239	1.23
2600	1040	1.01	1073	1.05	1106	1.10	1139	1.14	1171	1.19	1203	1.23	1235	1.28	1266	1.33
2700	1072	1.10	1104	1.15	1137	1.20	1169	1.24	1201	1.29	1232	1.34	1263	1.40	1293	1.46
2800	1105	1.21	1137	1.25	1168	1.30	1200	1.35	1231	1.40	1261	1.46	1291	1.52	1321	1.59
2900	1138	1.32	1169	1.37	1200	1.42	1231	1.47	1261	1.53	1291	1.60	1321	1.66	1350	1.73

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
	Kit A04														Kit A08	
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	1371	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
2500	1271	1.28	1303	1.33	1334	1.39	1363	1.45	1391	1.52	1418	1.57	1446	1.62	1474	1.66
2600	1297	1.39	1328	1.45	1357	1.52	1385	1.58	1412	1.64	1439	1.70	1467	1.74	1495	1.78
2700	1323	1.52	1353	1.58	1382	1.65	1409	1.72	1435	1.77	1462	1.82	1490	1.86	1517	1.90
2800	1351	1.65	1380	1.72	1407	1.78	1434	1.85	1460	1.90	1486	1.95	1513	1.99	1541	2.02
2900	1379	1.79	1407	1.86	1434	1.92	1460	1.98	1485	2.04	1511	2.08	1538	2.12	1565	2.15

### BELT DRIVE KIT SPECIFICATIONS

Model No.	Blower Motor Choice (HP)								Drive Kit No.	RPM Range
	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum		
036	0.75	0.86	1	1.15	1.5	1.7	2	2.3	A01	673 - 1010 rpm
									A05	897 - 1346 rpm
048	0.75	0.86	1	1.15	1.5	1.7	2	2.3	A02	745 - 1117 rpm
									A06	1071 - 1429 rpm
060	0.75	0.86	1	1.15	1.5	1.7	2	2.3	A03	833 - 1250 rpm
									A07	1212 - 1548 rpm
072	---	---	1	1.15	---	---	2	2.3	A04	968 - 1340 rpm
									A08	1193 - 1591 rpm

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.

## BLOWER DATA

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

Air Volume cfm	Wet Indoor Coil		Economizer	Electric Heat	Filters	
	KHA/KHB036, KHA048	KHB048, KHA/ KHB060, KHA072			MERV 8	MERV 13
800	0.01	0.01	0.04	0.01	0.04	0.05
1000	0.02	0.01	0.04	0.03	0.04	0.07
1200	0.02	0.01	0.04	0.06	0.04	0.07
1400	0.03	0.02	0.04	0.09	0.04	0.07
1600	0.04	0.03	0.04	0.12	0.04	0.07
1800	0.05	0.04	0.05	0.15	0.05	0.07
2000	0.06	0.05	0.05	0.18	0.05	0.08
2200	0.08	0.06	0.05	0.20	0.05	0.08
2400	0.09	0.07	0.05	0.22	0.05	0.08
2600	0.10	0.08	0.06	0.24	0.05	0.08
2800	0.11	0.09	0.06	0.26	0.05	0.08
3000	0.13	0.10	0.06	0.28	0.05	0.08

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

Air Volume cfm	RTD9-65 Step-Down Diffuser			FD9-65 Flush Diffuser	RTD11-95 Step-Down Diffuser			FD11-95 Flush Diffuser
	2 Ends Open	1 Side & 2 Ends Open	All Ends & Sides Open		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	0.13	0.11	0.09	0.09
2000	0.73	0.50	0.36	0.36	0.15	0.13	0.11	0.10
2200	0.95	0.63	0.44	0.44	0.18	0.15	0.12	0.12
2400	---	----	---	---	0.21	0.18	0.15	0.14
2600	---	----	---	---	0.24	0.21	0.18	0.17
2800	---	----	---	---	0.27	0.24	0.21	0.20
3000	---	----	---	---	0.32	0.29	0.25	0.25

### CEILING DIFFUSER AIR THROW DATA

Air Volume - cfm Model No.	1 Effective Throw - ft.	
	RTD9-65	FD9-65
800	10 - 17	14 - 18
1000	10 - 17	15 - 20
1200	11 - 18	16 - 22
1400	12 - 19	17 - 24
1600	12 - 20	18 - 25
1800	13 - 21	20 - 28
2000	14 - 23	21 - 29
2200	16 - 25	22 - 30
Model No.	RTD11-95	FD11-95
2600	24 - 29	19 - 24
2800	25 - 30	20 - 28
3000	27 - 33	21 - 29

<sup>1</sup> Effective throw based on terminal velocities of 75 ft. per minute.

### POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure - in. w.g.	Air Volume Exhausted cfm
0.00	2000
0.05	1990
0.10	1924
0.15	1810
0.20	1664
0.25	1507
0.30	1350
0.35	1210

**TABLE 3  
DRIVE COMPONENT 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 3/8	31K6901	AK54 X 1	100244-19	A40	100245-17
A02	1VP34 X 3/8	31K6901	AK49 X 1	100244-18	A39	100245-16
A03	1VP34 X 3/8	31K6901	AK44X 1	100244-16	A39	100245-16
A04	1VP40 X 3/8	79J0301	AK49 X 1	100244-18	A41	100245-18
A05	1VP34 X 3/8	31K6901	AK41 X 1	100244-15	A38	100245-15
A06	1VP44 X 3/8	P-8-1488	AK51 X 1	18L2201	A41	100245-18
A07	1VP50 X 3/8	53J1501	AK54 X 1	100244-19	AX43	73K8201
A08	1VP44 X 3/8	P-8-1488	AK46 X 1	100244-17	A40	100245-17

**TABLE 4  
DRIVE KIT SPECIFICATIONS**

Motor hp		RPM Range							
Nominal	Maximum	Drive A01	Drive A02	Drive A03	Drive A04	Drive A05	Drive A06	Drive A07	Drive A08
1.5	1.72	673 - 1010	745 - 1117	833 - 1250	968 - 1340	897 - 1346	1071 - 1429	1212 - 1548	1193 - 1591
2	2.3								

\*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 by Lennox 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.

**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**

- 1- Set thermostat or temperature control device to initiate a first-stage heating demand.
- 2- A first-stage heating demand (W1) will energize compressors 1 and the outdoor fan.

*Note - L1 reversing valve is de-energized in the heating mode.*

*KH Units With Optional Electric Heat -*

An increased heating demand (W2) will energize electric heat. Electric heat is also energized during the defrost cycle (W1) to maintain discharge air temperature.

**Cooling**

- 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.

*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 compressor 1.

- 2- Refrigerant circuits are factory charged with R-410A refrigerant. See unit rating plate for correct amount of charge.

**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 - KHA036-072

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

This unit is factory charged and should require no further adjustment. If the system requires charge, **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 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 5 through 8 to determine normal operating pressures.
- 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 5  
KHA036 NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	247	140
75°F	289	143
85°F	331	145
95°F	381	148
105°F	434	151
115°F	492	154

**TABLE 6  
KHA048S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	272	139
75°F	313	142
85°F	359	145
95°F	410	148
105°F	465	150
115°F	529	152

**TABLE 7  
KHA060S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	265	136
75°F	304	139
85°F	348	141
95°F	397	144
105°F	447	147
115°F	507	149

**TABLE 8  
KHA072S NORMAL OPERATING PRESSURES**

Outdoor Coil Entering Air Temp	Dis. ± 10 psig	Suct. ±5 psig
65°F	257	134
75°F	297	138
85°F	340	142
95°F	387	146
105°F	438	149
115°F	493	153

- 6- 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.
- 7- Use the following approach method along with the normal operating pressures to confirm readings.

### D - Charge Verification - Approach Method - KHA036-072

- 1- Using the same thermometer, compare liquid temperature to outdoor ambient temperature.  
Approach Temperature = Liquid temperature minus ambient temperature.
- 2- Approach temperature should match values in table 9. An approach temperature greater than value shown indicates an undercharge. An approach temperature less than value shown indicates an overcharge.
- 3- Do not use the approach method if system pressures do not match pressures in tables 5 through 8. The approach method is not valid for grossly over or undercharged systems.

**TABLE 9  
APPROACH TEMPERATURE**

Unit	Liquid Temp. Minus Ambient Temp.
KHA036	9°F ± 1 (5.0°C ± 0.5)
KHA048, 060	11°F ± 1 (6.1°C ± 0.5)
KHA072	8°F ± 1 (4.4°C ± 0.5)



**E-Refrigerant Charge and Check - KHB024-060**

**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 10 through 14) 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.*

1. 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.
2. Add or remove charge in increments. Allow the system to stabilize each time refrigerant is added or removed.
3. 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.
4. Example KHB024: At 95°F outdoor ambient and a measured suction pressure of 130psig, the target liquid temperature is 101°F. For a measured liquid temperature of 112°F, add charge in increments until measured liquid temperature agrees with the target liquid temperature.

**TABLE 10**

<b>KHB024 Normal Operating Pressures</b>											
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)
117	220	119	255	121	297	122	343	123	394	125	449
125	221	127	256	129	297	131	343	132	394	135	451
138	226	145	261	148	302	151	352	155	401	156	459
153	231	164	268	171	311	174	357	177	409	180	465

**TABLE 11**

<b>KHB030 Normal Operating Pressures</b>											
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)
116	227	118	262	120	303	123	347	125	395	127	449
125	229	127	267	129	308	132	349	133	398	136	452
139	235	143	271	146	313	150	360	153	409	155	463
147	239	153	277	159	321	164	366	168	416	174	472

**TABLE 12**

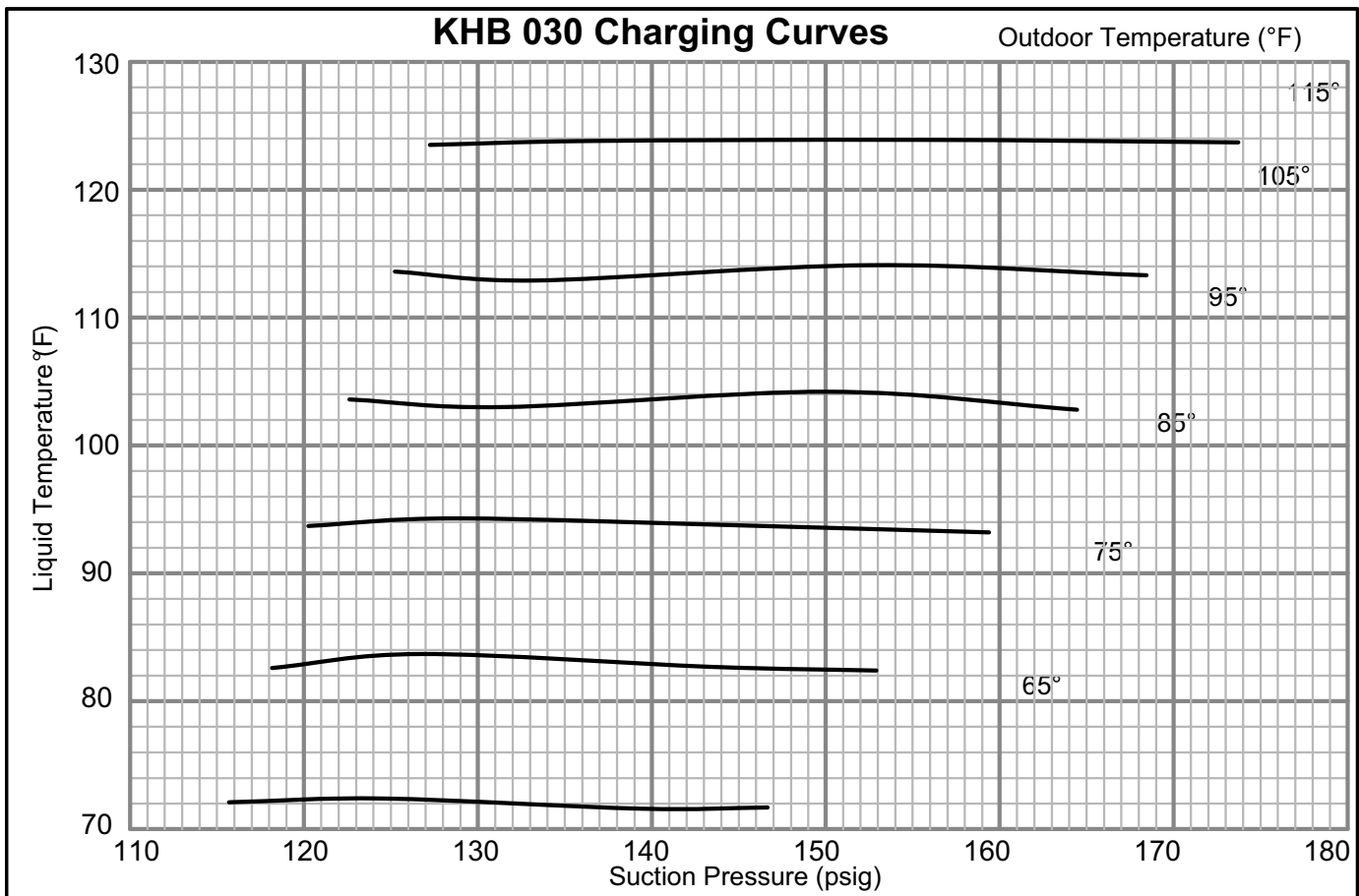
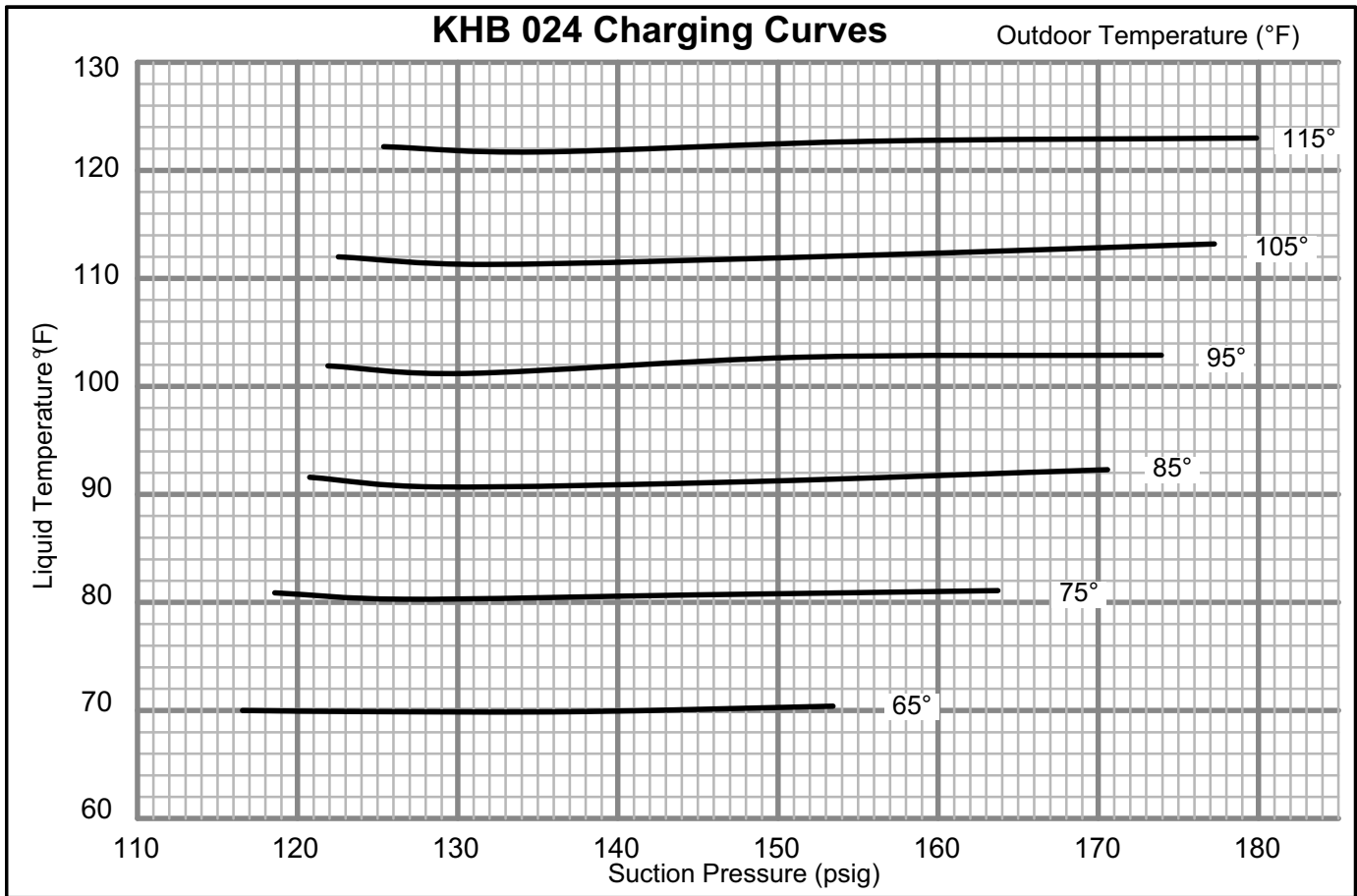
<b>KHB036 Normal Operating Pressures</b>											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
110	234	110	272	118	317	122	366	125	422	124	475
123	238	122	277	126	320	129	367	131	419	134	478
142	248	144	286	146	329	150	378	150	429	155	491
154	253	163	295	168	336	171	393	173	439	177	500

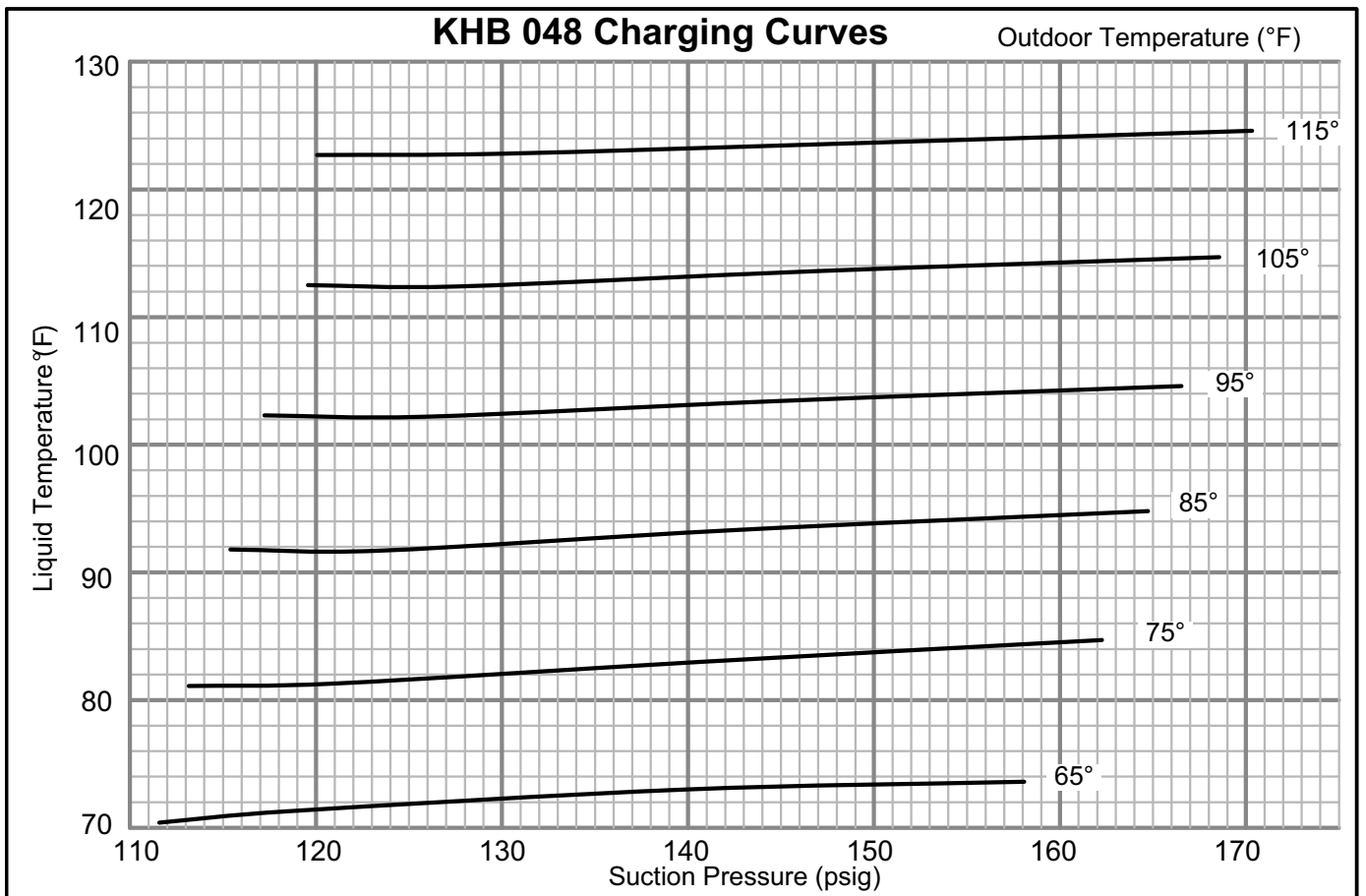
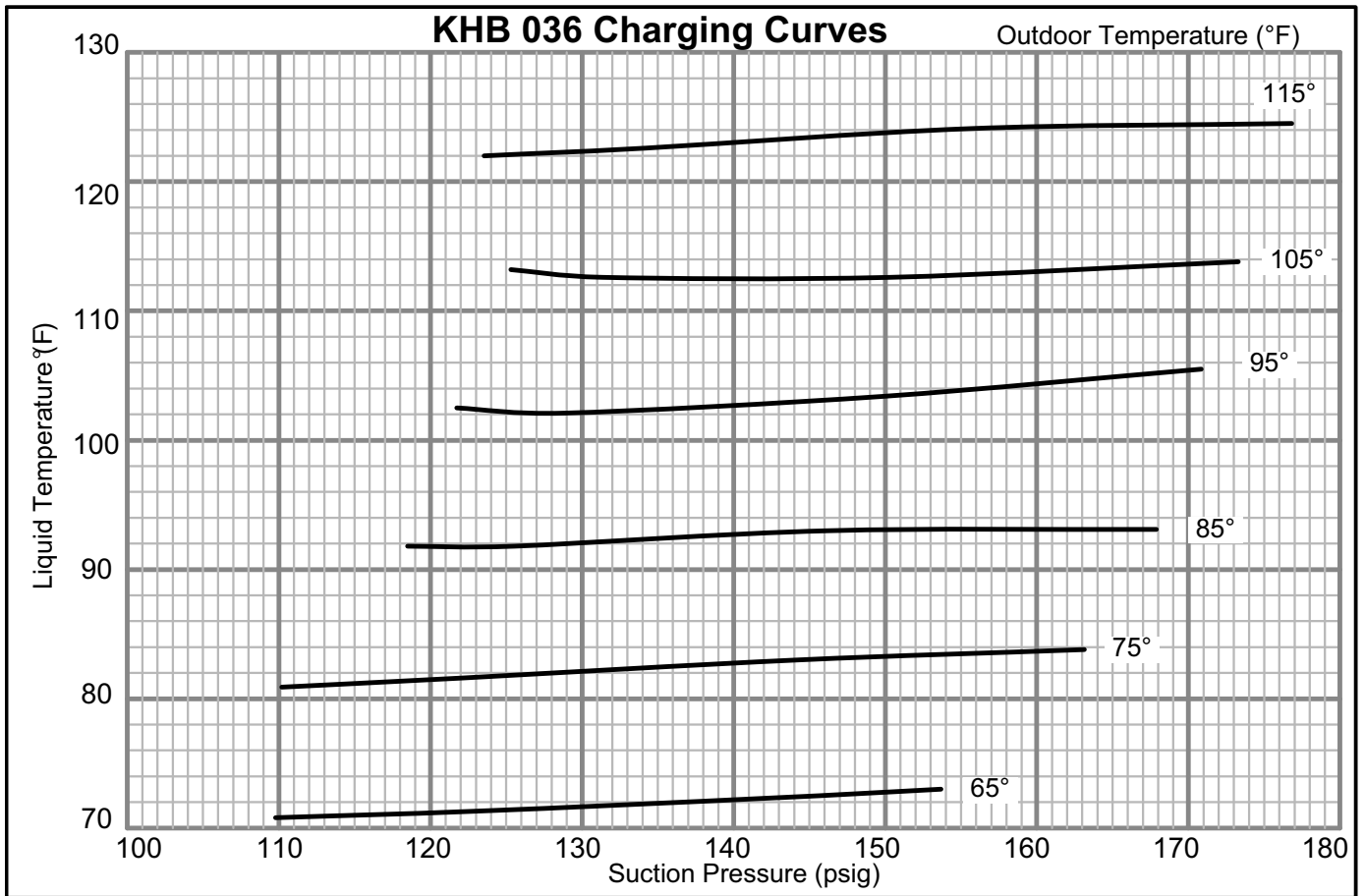
**TABLE 13**

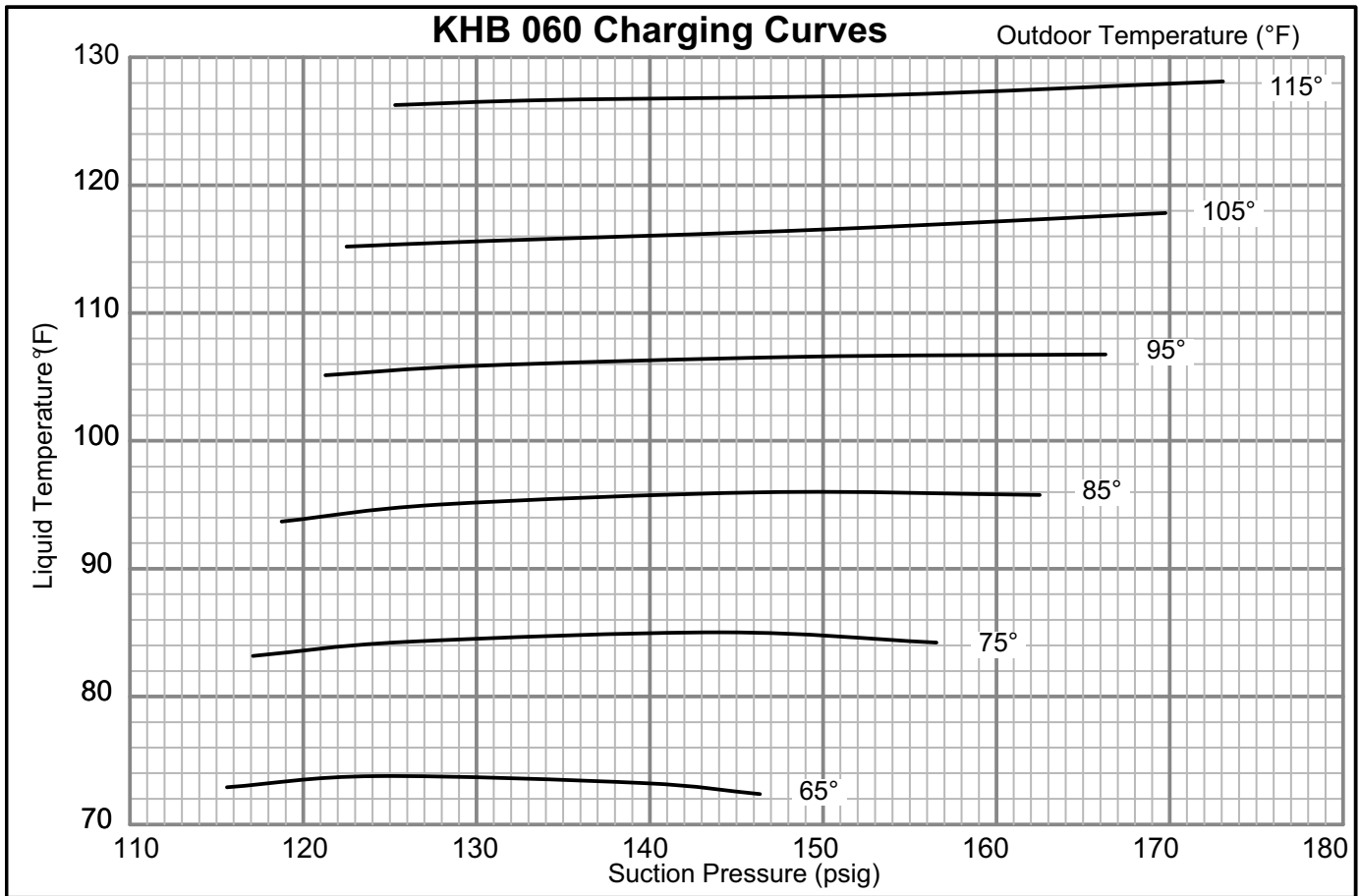
<b>KHB048 Normal Operating Pressures</b>											
Outdoor Coil Entering Air Temperature											
65 °F		75 °F		85 °F		95 °F		105 °F		115 °F	
Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)	Suct (psig)	Disc (psig)
112	239	113	277	115	319	117	363	120	411	120	464
119	244	121	282	123	323	126	368	128	416	130	471
140	253	141	291	142	333	144	377	147	426	149	481
158	264	162	301	165	343	167	389	169	439	170	493

**TABLE 14**

<b>KHB060 Normal Operating Pressures</b>											
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)
115	246	116	284	118	326	120	372	122	423	124	478
123	250	125	288	127	331	129	377	130	428	133	484
139	259	143	299	146	342	147	388	149	440	153	495
149	266	159	308	163	352	167	400	170	452	173	509







## F - 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)

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- Defrost Control (CMC1)

Defrost is liquid line temperature initiated and operates for 14 minutes unless terminated by liquid line 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 60 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)

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

## Defrost Control Board

The defrost thermostat 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 19.

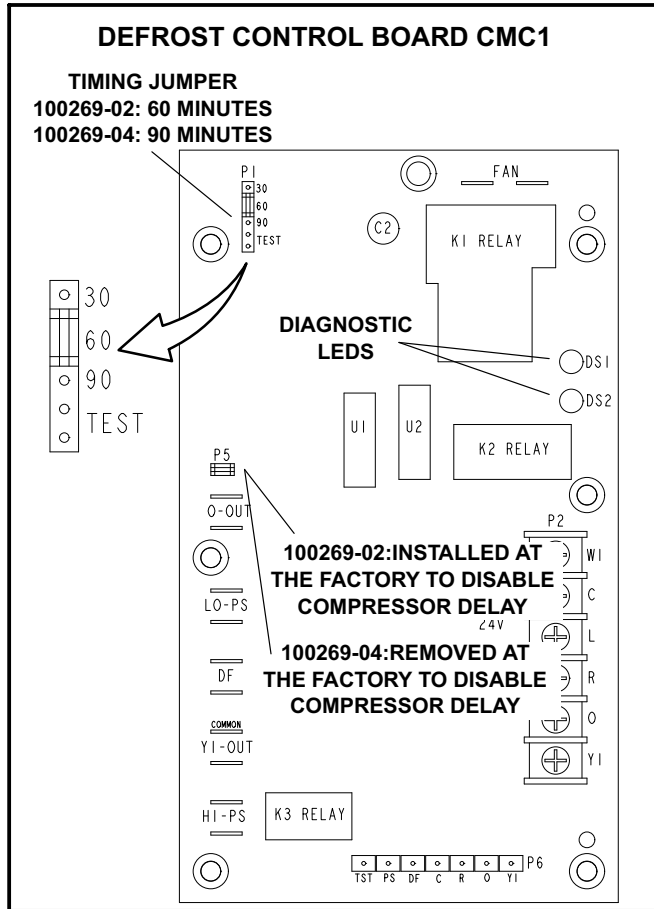


FIGURE 19

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.

### 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 15

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

### Service

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

## ⚠ WARNING

The State of California has determined that this product may contain or produce a chemical or chemicals, in very low doses, which may cause serious illness or death. It may also cause cancer, birth defects, or reproductive harm.

## ⚠ 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-Compressor**

If Interlink compressor replacement is necessary, call 1-800-4-LENNOX (1-800-453-6669).

**⚠ IMPORTANT**

**Some scroll compressors have an internal vacuum protector that will unload scrolls when suction pressure goes below 20 psig. A hissing sound will be heard when the compressor is running unloaded. Protector will reset when low pressure in system rises above 40 psig. DO NOT REPLACE COMPRESSOR.**

**C - Filters**

Units are equipped with temporary filters which need to be replaced before the building is occupied. See table 16 for correct filter size. Refer to local codes or appropriate jurisdiction for approved filters.

Approved filters should be checked monthly and replaced when necessary. Take note of air flow direction marking on filter frame when reinstalling filters. See figure 20.

**⚠ WARNING**

**Units are shipped from the factory with temporary filters. Replace filters before building is occupied. Damage to unit could result if filters are not replaced with approved filters. Refer to appropriate codes.**

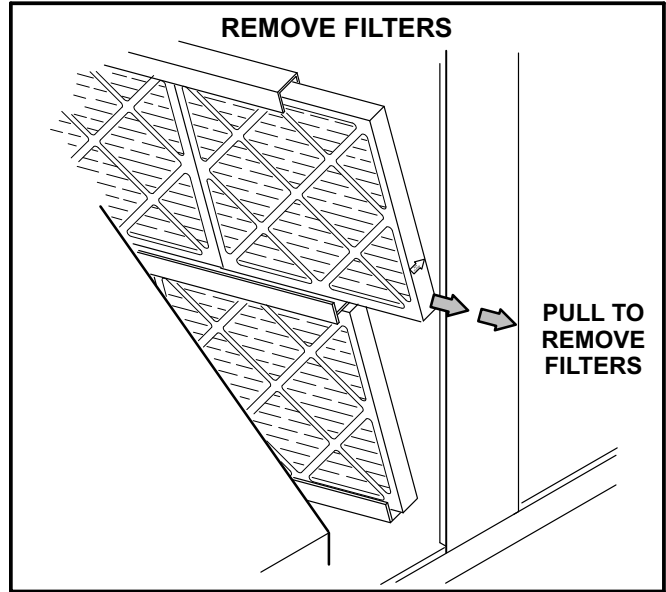
**TABLE 16  
UNIT FILTERS**

Unit	Qty	Filter Size - inches (mm)
KHA036, 048 KHB024, 030, 036	4	16 X 20 X 2 (406 X 508 X 51)
KHA060, 072 KHB048, 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.*

**D - 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 20**

**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 - Filter Drier**

The unit is equipped with a biflow filter drier. if replacement is necessary, order another of like design.

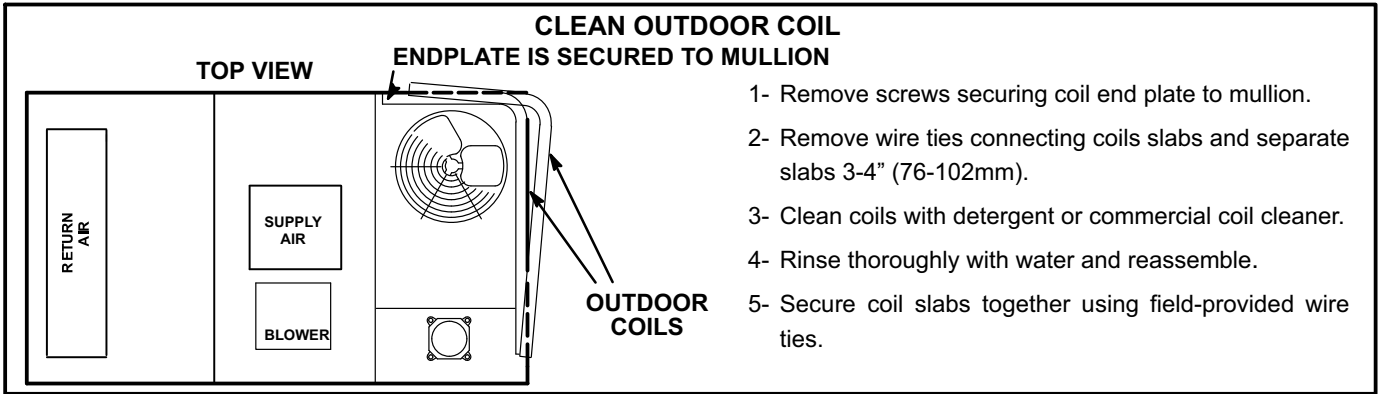
### G - Outdoor Coil

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

Outdoor coils are made of single and two formed slabs.

On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See figure 21. Flush coils with water following cleaning.

*Note - Remove all screws and gaskets prior to cleaning procedure and replace upon completion.*



**FIGURE 21**