

ASHRAE 90.1 EFFICIENCY PACKAGE HEAT PUMP UNIT - 140 to 172 Mbtuh

REFRIGERATION CIRCUIT

- Single semi-hermetic compressor on all 13 ton units; Dual semi-hermetic compressors with independent refrigerant circuits on all 15 ton units.
- Two stage cooling.
- Refrigerant filter drier and evaporator freeze thermostat
- Thermostatic Expansion Valve (TXV) controls refrigerant flow.
- Suction line accumulator.
- High and Low pressure switches for excellent compressor protection.
- State of the art defrost system.
- Crankcase heaters standard on all models.



PHE156 - 180



BUILT TO LAST

- Pre-painted galvanized steel cabinet for long life and quality appearance.
- Commercial strength base rails with built-in rigging capability.
- Non-corrosive, sloped condensate drain pan, meets ASHRAE 62-89.

EASY TO INSTALL AND SERVICE

- Combination electric cooling and electric heat, self contained for year-round comfort. Unit shipped ready for downflow applications with conversion to horizontal airflow accomplished with accessory horizontal discharge roof curb
- Thru-the-base utility connections.
- Tool-less removal for filter access with two inch return air filters.

ELECTRIC HEAT

- Field installed accessory heaters are available in a wide range of capacities with single point wiring.

WARRANTY

- 5 year compressor limited warranty
- 1 year parts limited warranty

UNIT PERFORMANCE DATA (3 Phase - 60 Hz)

Model Number	COOLING		HEATING		Voltage/Phase/Hz	Unit Dimensions H x W x L	Ship Weight
	Net Capacity BTUH	E.E.R	High Temp. Capacity Btuh	Low Temp. Capacity Btuh			
PHE156H000A	140,000	9.8	136,000	72,000	208/230-3-60	45 X 86-1/8 X 83-1/2	1895
PHE156L000A	140,000	9.8	136,000	72,000	460-3-60	45 X 86-1/8 X 83-1/2	1895
PHE180H000A	172,000	9.3	172,000	90,000	208/230-3-60	45 X 86-1/8 X 83-1/2	2205
PHE180L000A	172,000	9.3	172,000	90,000	460-3-60	45 X 86-1/8 X 83-1/2	2205

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MODEL NUMBER IDENTIFICATION GUIDE							
MODEL NUMBER	P	H	E	180	H	000	A
PRODUCT FAMILY Package Units							Sales Code
TYPE H= Heat Pump G = Gas/Electric A = Air Conditioner							OPTIONS 000 = No Heat
							VOLTAGE / PHASE / HERTZ H = 208/230-3-60 L = 460-3-60
DESIGN SERIES S = Standard Efficiency E = ASHRAE 90.1 Efficiency							COOLING CAPACITY (NOMINAL BTUH) 156 = 13 Ton 180 = 15 Ton

UNIT SPECIFICATIONS - MODELS				
COOLING	PHE156H000A	PHE156L000A	PHE180H000A	PHE180L000A
ARI Rated Capacity Btuh (Net)	140,000		172,000	
Nominal Tons	13		15	
EER	9.8		9.3	
HEATING				
ARI Rated Capacity Btuh (Net)	136,000		172,000	
COP	3.2		3.3	
Standard CFM	4500		5200	
IPLV	12.4		9.7	
Sound Rating (decibals)	87		88	
Base Unit Operating Weights (lbs)	1615		1925	
ELECTRICAL				
Volts/ 3 Phase/ 60Hertz	208/230	460	208/230	460
Voltage Range Min/Max	187 / 253	414 / 508	187 / 253	414 / 508
Power Supply MCA	65	32	84	42
Power Supply MOCP*	100	50	110	50
COMPRESSOR				
Semi-Hermetic				
Quantity...Model	1...06D-328		2...06D-818	
Capacity Staging (%)	0,66,100		0,50,100	
RLA / LRA	Circuit #1	39.7 / 228	19.9 / 114	28.2 / 160
	Circuit #2	N/A		28.2 / 160
Oil (Oz.) per circuit	115		88 each	
REFRIGERATION TYPE				
R-22				
No. of Circuits	2		2	
Expansion Device	Fixed Orifice		Fixed Orifice	
Operating Charge (lb. oz.) **	26		CKT 1 = 16-1/2 CKT 2 = 16-1/2	
CONDENSER FAN				
Propeller Type				
Nominal CFM	9,000		9,000	
Quantity / Diameter (in.)	3 / 22		3 / 22	
Motor Hp / RPM (each)	1/2 / 1075		1/2 / 1075	
Watts Input (Total)	1090		1090	
FLA	1.7	0.8	1.7	0.8
CONDENSER COIL				
Cross Hatched 3/8 in. Copper Tubes, Aluminum Lanced				
Rows / Fin/In.	3 / 15		3 / 15	
Total Face Area (Sq. Ft.)	21.7		21.7	
EVAPORATOR COIL				
Cross Hatch 3/8 in. Copper Tubes, Aluminum Lanced, Face Split				
Rows / Fins/Inche	3 / 15		3 / 15	
Total Face Aea (sq. ft.)	17.5		17.5	
EVAPORATOR FAN				
Centrfugal Type				
Quantity / Size (in.)	2 / 10x10		2 / 12x12	
Type Drive	Belt		Belt	
Nominal CFM	5000		6000	
Motor Hp. / RPM / Max. Continuous Bhp	3.7 / 1725 / 4.25		5.0 / 1745 / 5.90	
FLA (Each)	10.5	4.8	15.8	7.9
Motor Frame Size	56H		184T	
Fan RPM Range	891 - 1179		817 - 1038	
Motor Bearing	Ball		Ball	
Maximum Allowable RPM	1550		1745	
Motor Pulley Pitch / Diameter Min/Max. (in.)	3.1 / 4.1		3.7 / 4.7	
Motor Shaft Diameter (in.)	7/8		7/8	
Fan Pulley Pitch Diam (in)	6.0		7.9	
Belt, Quantity...Type... Length (in.)	1...BX...42		1...BX...46	
Pulley Center Line Distance (in)	13.5 - 15.5		13.3 x 14.8	
Factory Speed Setting RPM	1035		934	
Fan Shaft Diam. at Pulley	1		1	

SEE LEGENDS AND NOTES ON FOLLOWING PAGES

UNIT SPECIFICATIONS (CONT)	MODELS	
	PHE156H/L	PHE180H/L
HIGH-PRESSURE SWITCH (psig)		
Internal Relief (Differential) Cutout	426	426
Reset (Auto.)	320	320
LOSS-OF-CHARGE SWITCH (psig) (LOW-PRESS.)		
Cutout	7	7
Reset (Auto.)	22	22
FREEZE PROTECTION THERMOSTAT (F)		
Opens	30 +/- 5	30 +/- 5
Closes	45 +/- 5	45 +/- 5
DEFROST THERMOSTAT (F) - 30 min (Adjustable to 50 or 90 min)		
Opens	65	65
Closes	28	28
RETURN-AIR FILTERS (THROWAWAY)		
Quantity...Size (in.)	4...20 x 20 x 2	4...20 x 20 x 2
	4...16 x 20 x 2	4...16 x 20 x 2

LEGENDS AND NOTES

LEGEND

- Bhp = Brake Horsepower
- Bels - Sound Levels
- EER - Energy Efficiency Ratio
- IPLV - Integrated Part Load Values
- MCA - Minimum Circuit Amps
- MOCP - Maximum Over-current Protection
- FLA - Full Load Amps
- LRA - Locked Rotor Amps
- RLA - Rated Load Amps
- * - Fuse or HACR circuit breaker
- ** - Circuit 1 uses the lower portion of the condenser coil and lower portion of the evaporator coils; and Circuit 2 uses the upper portion of both coils.

NOTE: The PHE156 and 180 units have a low -pressure switch (standard) located on the suction side.

NOTE: Minimum allowable temperature of mixed-air entering the heat exchanger during first-stage heating is 45F. There is no minimum mixed-air temperature limitation during second-stage heating. For entering-air temperatures below 45F both stages of heat must be energized together to minimize condensation issues and ensure proper unit operation.

NOTES: 1. Rated in accordance with ARI Standards 360-89 and 270-89.

2. The PHE is beyond the scope of the ARI Certification Program.

3. ARI ratings are net values, reflecting the effects of circulating fan heat.

4. Ratings are based on:

Cooling Standard: 80F db, 67F wb indoor entering air temperature and 95F db air entering outdoor unit.

IPLV Standard: 80F db, 67F wb indoor entering air temperature and 80F db entering air temperature.

NOTES:

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the over-current protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.

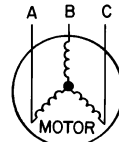
2. Unbalanced 3-Phase Supply Voltage

Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percent voltage imbalance.

% Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

EXAMPLE: Supply voltage is 460-3-60.



$$\begin{aligned} \text{AB} &= 452 \text{ v} & \text{Average Voltage} &= \frac{452 + 464 + 455}{3} \\ \text{BC} &= 464 \text{ v} & &= \frac{1371}{3} \\ \text{AC} &= 455 \text{ v} & &= 457 \end{aligned}$$

Determine maximum deviation from average voltage.

$$(\text{AB}) 457 - 452 = 5 \text{ V}$$

$$(\text{BC}) 464 - 457 = 7 \text{ V}$$

$$(\text{AC}) 457 - 455 = 2 \text{ V}$$

Maximum deviation is 7 v.

Determine percent voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457} = 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

IMPORTANT: If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

EXPANDED PERFORMANCE DATA (COOLING) PHE156 (GROSS CAPACITY)

Temp (F) Air Ent Outdoor Coil (Edb)	Indoor Entering Air - Cfm/BF															
	3750/0.04			4500/0.03			5000/0.05			5625/0.06			6250/0.07			
	Indoor Entering Air - Ewb (F)															
	72	67	62	72	67	62	72	67	62	72	67	62	72	67	62	
75	TC	167.0	154.0	140.0	171.0	158.0	144.0	173.0	159.0	146.0	171.0	162.0	148.0	173.0	161.0	151.0
	SHC	79.6	100.0	120.0	85.0	108.0	131.0	87.5	114.0	138.0	94.5	120.0	146.0	97.7	127.0	150.0
	kW	10.00	9.77	9.50	10.10	9.87	9.61	10.20	9.93	9.68	10.20	10.00	9.74	10.20	10.00	9.80
85	TC	160.0	148.0	133.0	164.0	151.0	137.0	167.0	154.0	140.0	168.0	155.0	143.0	166.0	157.0	146.0
	SHC	77.6	98.9	118.0	82.0	107.0	129.0	86.1	113.0	136.0	89.6	118.0	142.0	95.3	125.0	146.0
	kW	11.10	10.80	10.40	11.20	10.90	10.60	11.30	11.0	10.70	11.30	11.0	10.80	11.30	11.10	10.80
95	TC	155.0	141.0	127.0	157.0	144.0	131.0	160.0	146.0	133.0	161.0	149.0	137.0	163.0	149.0	140.0
	SHC	76.1	96.3	115.0	80.3	105.0	126.0	84.4	110.0	132.0	86.5	117.0	137.0	91.7	121.0	140.0
	kW	12.20	11.80	11.40	12.20	11.90	11.50	12.40	12.00	11.60	12.40	12.10	11.80	12.50	12.10	11.90
105	TC	147.0	133.0	120.0	150.0	137.0	124.0	152.0	138.0	127.0	153.0	140.0	131.0	154.0	141.0	134.0
	SHC	73.6	93.3	112.0	78.5	102.0	123.0	81.6	108.0	127.0	85.1	114.0	131.0	88.6	120.0	134.0
	kW	13.20	12.70	12.30	13.30	12.90	12.50	13.40	13.0	12.60	13.50	13.10	12.80	13.50	13.10	12.90
115	TC	140.0	126.0	112.0	141.0	129.0	118.0	144.0	130.0	121.0	144.0	131.0	125.0	146.0	133.0	128.0
	SHC	71.4	90.3	109.0	75.1	99.1	117.0	78.9	104.0	121.0	81.9	110.0	125.0	87.0	117.0	128.0
	kW	14.20	13.70	13.20	14.30	13.90	13.50	14.40	14.0	13.70	14.50	14.0	13.90	14.60	14.10	14.0
125	TC	131.0	118.0	105.0	134.0	120.0	111.0	135.0	122.0	115.0	137.0	123.0	118.0	136.0	124.0	121.0
	SHC	68.1	87.6	105.0	73.5	96.4	111.0	75.7	102.0	115.0	80.7	108.0	118.0	93.4	113.0	121.0
	kW	15.20	14.70	14.10	15.40	14.90	14.50	15.40	14.90	14.70	15.60	15.00	14.90	15.60	15.10	15.0

EXPANDED PERFORMANCE DATA (COOLING) PHE180 (GROSS CAPACITY)

Temp (F) Air Ent Outdoor Coil (Edb)	Indoor Entering Air - Cfm/BF															
	4500/0.06			5250/0.08			6000/0.10			6750/0.10			7500/0.12			
	Indoor Entering Air - Ewb (F)															
	72	67	62	72	67	62	72	67	62	72	67	62	72	67	62	
75	TC	210.0	192.0	173.4	216.0	196.6	178.4	220.0	202.0	182.2	222.0	204.0	185.6	224.0	206.0	190.2
	SHC	100.6	125.2	148.2	106.0	134.0	160.6	110.6	143.0	172.2	115.0	151.2	183.2	120.2	158.2	190.0
	kW	13.58	13.12	12.66	13.76	13.28	12.84	13.88	13.44	12.98	13.96	13.52	13.10	14.02	13.60	13.26
85	TC	202.0	183.0	164.4	208.0	187.8	169.0	212.0	191.4	172.8	212.0	194.0	177.2	214.0	195.8	182.2
	SHC	98.0	121.8	144.2	103.8	131.2	156.4	109.0	140.0	168.6	112.0	148.0	177.0	116.2	155.6	182.2
	kW	14.86	14.32	13.78	15.08	14.52	13.98	15.22	14.66	14.14	15.26	14.78	14.30	15.34	14.86	14.50
95	TC	192.4	173.2	155.0	196.2	177.8	159.2	200.0	180.8	163.4	202.0	183.4	169.0	204.0	185.4	174.2
	SHC	94.8	118.0	140.0	100.2	127.4	152.6	105.6	136.4	163.4	110.6	144.8	169.0	114.2	153.2	173.8
	kW	16.16	15.52	14.88	16.32	15.72	15.10	16.48	15.88	15.30	16.62	16.00	15.54	16.64	16.12	15.76
105	TC	182.0	163.0	145.0	186.4	167.0	149.4	188.6	170.0	155.4	191.0	172.2	160.8	193.0	173.8	165.2
	SHC	91.0	114.2	135.2	96.8	123.6	147.6	101.8	132.6	155.2	107.2	141.2	160.6	112.2	149.6	165.2
	kW	17.36	16.64	15.92	17.58	16.86	16.16	17.70	17.04	16.48	17.84	17.18	16.74	17.94	17.28	16.96
115	TC	171.2	152.4	134.8	175.0	156.2	140.6	177.8	158.8	146.8	179.4	160.8	152.2	179.6	162.2	156.4
	SHC	87.4	110.2	130.8	92.6	119.4	140.6	98.8	128.2	146.8	103.6	136.8	151.8	107.2	144.6	156.2
	kW	18.54	17.72	16.90	18.76	17.94	17.24	18.94	18.12	17.60	19.02	18.28	17.90	19.04	18.38	18.16
125	TC	159.4	141.2	125.0	162.8	143.8	132.0	165.6	147.0	137.8	166.6	148.8	143.0	168.2	150.0	146.8
	SHC	83.6	105.8	125.0	89.0	115.0	131.8	94.4	123.6	137.8	99.8	132.2	142.8	105.0	139.6	146.6
	kW	19.64	18.74	17.88	19.86	19.00	18.34	20.00	19.12	18.72	20.20	19.28	19.00	20.20	19.40	19.28

LEGEND

- BF — Bypass Factor
- Edb — Entering Dry Bulb
- Ewb — Entering Wet Bulb
- kW — Compressor Motor Power Input, Total
- Ldb — Leaving Dry Bulb
- Lwb — Leaving Wet Bulb
- SHC — Sensible Heat Capacity, Gross (1000 Btuh)
- TC — Total Capacity, Gross (1000 Btuh)

3. Formulas:

$$t_{ldb} = t_{edb} - \frac{\text{sensible heat capacity (Btuh)}}{1.1 \times \text{cfm}}$$

$$t_{lwb} = \text{wet-bulb temperature corresponding to enthalpy of air leaving indoor coil (} h_{lwb} \text{)}$$

$$h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{cfm}}$$

where h_{ewb} = enthalpy of air entering indoor coil

4. Capacities are based on 25 actual ft (40 equivalent ft) of interconnecting piping sized to the outdoor unit field connections. (Equivalent length is equal to the actual length plus a 50% allowance for fitting losses.) For other equivalent lengths, refer to the Carrier System Design Manual, Part 3, for line losses.

NOTES:

1. Direct interpolation is permissible. Do not extrapolate.
2. SHC is based on 80 F db air entering indoor coil.
Below 80 F db, subtract (Corr Factor x Cfm) from SHC.
Above 80 F db, add (Corr Factor x Cfm) to SHC.

BYPASS FACTOR	ENTERING-AIR DRY-BULB TEMP (F)						
	79	78	77	76	75	under 75	
	81	82	83	84	85	over 85	
	Correction Factor						
0.03	1.07	2.13	3.20	4.27	5.34	Use formula given.	
0.06	1.03	2.07	3.10	4.14	5.17		
0.09	1.00	2.00	3.00	4.00	5.01		
0.12	0.97	1.94	2.90	3.87	4.84		
0.15	0.94	1.87	2.81	3.74	4.68		

Interpolation is permissible.
Correction Factor = $1.10 \times (1 - BF) \times (db - 80)$

PHE156 INTEGRATED HEATING CAPACITIES

CFM	Return Air Temp F (db)	Temp Air Entering Outdoor Coil (°F db at 75% RH)																			
		- 10		0		10		17		20		30		40		47		50		60	
		Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW
3750	55	40.4	7.81	53.0	8.35	65.6	8.89	74.5	9.27	78.5	9.47	91.9	10.1	120	11.0	140	11.5	147	11.8	168	12.6
	70	37.7	8.19	49.8	8.85	61.9	9.51	70.3	9.97	74.1	10.2	86.8	11.0	114	11.9	133	12.5	139	12.9	161	13.9
	80	35.4	8.41	47.1	9.15	58.8	9.89	67.0	10.4	70.8	10.7	83.4	11.5	109	12.5	128	13.2	134	13.6	156	14.7
4500	55	40.3	7.98	53.9	8.49	67.5	9.0	77.0	9.35	80.9	9.54	93.8	10.1	123	10.9	144	11.4	149	11.6	167	12.3
	70	36.7	8.38	49.8	9.00	62.9	9.62	72.0	10.0	75.9	10.3	88.6	11.0	116	11.8	136	12.5	142	12.7	163	13.6
	80	33.2	8.64	46.4	9.32	59.6	10.0	68.7	10.5	72.6	10.7	85.2	11.5	112	12.5	131	13.1	137	13.4	159	14.5
5000	55	41.0	8.11	54.7	8.60	68.4	9.09	78.0	9.43	81.9	9.6	95.0	10.2	124	10.9	144	11.4	149	11.6	165	12.1
	70	44.7	8.45	55.2	9.07	65.7	9.69	73.1	10.1	76.9	10.3	89.7	11.0	118	11.9	138	12.5	143	12.7	163	13.5
	80	33.6	8.76	47.0	9.43	60.4	10.1	69.8	10.6	73.6	10.8	86.3	11.6	113	12.5	132	13.1	139	13.4	160	14.4
5625	55	42.0	8.27	55.7	8.74	69.4	9.21	79.0	9.54	83.0	9.71	96.2	10.3	124	10.9	144	11.4	148	11.5	164	12.1
	70	42.7	8.66	54.3	9.24	65.9	9.82	74.1	10.2	77.9	10.4	90.9	11.1	120	11.9	140	12.5	145	12.7	163	13.4
	80	34.5	8.94	48.0	9.57	61.5	10.2	70.9	10.7	74.7	10.9	87.4	11.6	115	12.5	134	13.1	140	13.4	160	14.3
6250	55	44.0	8.43	57.3	8.89	70.6	9.35	79.9	9.67	83.9	9.83	97.3	10.4	124	11.0	143	11.4	147	11.5	160	12.0
	70	45.7	8.79	56.8	9.37	67.9	9.95	75.6	10.4	79.4	10.5	91.9	11.2	120	12.0	140	12.5	145	12.7	161	13.3
	80	35.2	9.04	48.8	9.72	62.4	10.4	71.9	10.8	75.7	11.0	88.4	11.7	117	12.6	136	13.2	142	13.4	159	14.2

PHE180 INTEGRATED HEATING CAPACITIES

CFM	Return Air temp F (db)	Temp Air Entering Outdoor Coil (F dbat 75% RH)																			
		- 10		0		10		17		20		30		40		47		50		60	
		Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW	Cap.	kW
3750	55	46.4	9.80	60.8	10.60	75.6	11.34	85.8	11.84	91.4	12.10	110.0	12.96	150.2	14.00	178.2	14.72	189.4	15.08	228.0	16.32
	70	39.6	10.04	54.4	10.96	69.8	11.86	80.4	12.48	85.8	12.78	103.4	13.82	141.6	15.02	168.4	15.84	179.0	16.26	214.0	17.64
	80	35.0	10.20	50.2	11.20	65.8	12.20	76.8	12.90	81.8	13.24	99.2	14.38	136.0	15.70	161.8	16.60	172.0	17.04	206.0	18.52
4500	55	47.8	10.02	62.0	10.78	77.0	11.48	87.6	11.96	93.2	12.20	112.0	12.98	153.2	13.92	182.2	14.58	193.4	14.90	230.0	15.94
	70	40.6	10.26	55.8	11.16	71.2	12.00	82.0	12.60	87.4	12.90	105.4	13.86	144.6	14.98	172.0	15.74	182.8	16.12	220.0	17.36
	80	36.0	10.44	51.6	11.40	67.4	12.36	78.4	13.04	83.6	13.36	101.0	14.44	138.8	15.68	165.2	16.52	175.8	16.94	212.0	18.30
5000	55	48.6	10.26	63.0	10.98	78.4	11.64	89.2	12.10	94.8	12.32	113.6	13.06	155.2	13.94	184.4	14.56	195.8	14.86	234.0	15.80
	70	41.8	10.50	56.8	11.36	72.6	12.18	83.6	12.76	89.0	13.04	107.2	13.96	147.0	15.00	174.8	15.74	185.8	16.08	222.0	17.24
	80	37.2	10.66	52.8	11.62	68.6	12.54	79.8	13.20	85.0	13.50	103.0	14.56	141.4	15.72	168.2	16.52	179.0	16.90	216.0	18.18
5625	55	49.2	10.50	63.8	11.18	79.4	11.82	90.2	12.26	96.0	12.46	115.2	13.18	158.0	14.02	187.8	14.60	198.4	14.84	234.0	15.64
	70	42.6	10.72	58.0	11.58	73.6	12.38	84.6	12.92	90.2	13.20	108.6	14.08	149.2	15.08	177.6	15.78	188.4	16.10	224.0	17.14
	80	38.2	10.88	54.0	11.84	69.8	12.74	81.0	13.38	86.4	13.68	104.4	14.68	143.4	15.80	170.8	16.58	181.6	16.94	218.0	18.14
6250	55	50.0	10.72	64.6	11.40	80.2	12.00	91.0	12.42	97.0	12.64	116.6	13.30	159.8	14.14	190.0	14.70	200.0	14.92	234.0	15.58
	70	43.4	10.96	58.8	11.80	74.6	12.58	85.6	13.12	91.2	13.36	110.0	14.22	151.0	15.20	179.6	15.88	190.2	16.16	226.0	17.12
	80	39.0	11.12	54.8	12.06	70.8	12.94	82.0	13.56	87.6	13.86	105.6	14.84	145.0	15.92	172.6	16.66	183.6	17.00	220.0	18.16

Cap. - Capacity (1000 Btuh)
Edb - Entering Air Dry-Bulb Temperature (F)
Ldb - Leaving Air Dry-Bulb Temperature (F)
kW - Compressor and Outdoor-Fan Power Input
RH - Relative Humidity

NOTES:

1. Integrated heating capacity ratings shown are not adjusted for the effects of the indoor-fan motor power and heat. A deduction has been made for defrosting the outdoor coils at temperatures below 40 F.
2. Direct interpolation is permissible. Do not extrapolate.
3. When using auxiliary and/or supplementary heating, the maximum allowable leaving-air temperature is 140 F.

$$Ldb\ F = \frac{Edb\ F + \text{Total heating cap. (Btuh)}}{1.10 \times \text{airflow cfm}}$$

4. For supplementary glycol coil:

$$\text{Fluid flow Gpm} = \frac{\text{fluid capacity (Btuh)}}{500 \times \text{fluid temperature drop (F)}}$$

CIRCULATING BLOWER PERFORMANCE - PHE156 UNITS (STANDARD MOTOR)

CFM	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
3750	724	481	838	685	937	889	1028	1097	1111	1309	1190	1526	1265	1746	1337	1972	1405	2199	1471	2431
4000	754	613	865	824	962	1034	1050	1247	1131	1463	1208	1684	1281	1908	1351	2136	1418	2368	1483	2603
4250	786	757	893	975	987	1191	1073	1408	1152	1629	1227	1853	1299	2082	1367	2313	1433	2548	1496	2787
4500	818	914	922	1138	1013	1360	1097	1583	1174	1808	1247	2036	1317	2268	1384	2503	1448	2742	1510	2983
4750	850	1084	951	1313	1040	1541	1122	1770	1197	2000	1269	2232	1337	2468	1403	2707	1465	2948	1526	3194
5000	883	1267	980	1501	1068	1736	1147	1969	1221	2204	1291	2441	1358	2680	1422	2923	1484	3168	1544	3418
5250	917	1464	1011	1703	1096	1943	1174	2183	1246	2423	1315	2664	1380	2907	1443	3154	1503	3403	1562	3655
5500	950	1675	1041	1918	1124	2165	1201	2409	1272	2655	1339	2900	1403	3148	1464	3398	1524	3651	-	-
5750	985	1901	1072	2147	1153	2400	1228	2650	1298	2901	1364	3151	1426	3403	1486	3657	1545	3914	-	-
6000	1020	2142	1103	2391	1183	2649	1256	2905	1324	3160	1389	3416	1450	3672	-	-	-	-	-	-
6250	1055	2398	1135	2650	1213	2912	1284	3175	1352	3435	1415	3695	-	-	-	-	-	-	-	-

LEGEND

Bhp = Brake Horsepower Input to Fan
Watts = Input Watts to Motor

Standard drive range is 891 to 1179 rpm.

NOTES:

- 1) Maximum continuous bhp is 4.25 and maximum continuous watts are 3775. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.
- 2) Fan performance is identical for horizontal discharge applications using horizontal adapter curb.

CIRCULATING BLOWER PERFORMANCE - PHE180 UNITS (STANDARD MOTOR)

CFM	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN - DRY COIL WITH FILTER																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts	RPM	Watts
4500	584	717	695	952	798	1205	893	1483	984	1786	1070	2113	1151	2459	1229	2819	1302	3194	-	-
4800	609	839	717	1085	815	1346	907	1630	994	1938	1078	2269	1157	2620	1233	2990	1306	3374	-	-
5100	634	971	738	1229	833	1500	921	1791	1006	2104	1086	2439	1164	2795	1238	3170	-	-	-	-
5400	660	1118	760	1389	852	1669	937	1968	1019	2286	1097	2626	1172	2986	1245	3366	-	-	-	-
5700	687	1284	783	1566	873	1858	956	2165	1034	2490	1110	2835	1183	3200	1253	3584	-	-	-	-
6000	712	1458	805	1752	892	2055	973	2371	1049	2703	1122	3053	1193	3422	1262	3810	-	-	-	-
6300	736	1644	826	1952	911	2265	990	2591	1064	2930	1135	3286	1204	3660	1271	4052	-	-	-	-
6600	763	185	851	2176	933	2502	1010	2837	1082	2186	1151	3549	1218	3928	1283	4325	-	-	-	-
6900	788	2078	873	2410	954	2747	1029	3093	1099	3451	1167	3821	1232	4207	1295	4608	-	-	-	-
7200	813	2316	896	2662	975	3011	1048	3367	1117	3734	1183	4113	1246	4505	-	-	-	-	-	-
7500	841	2584	921	2943	998	3304	1070	3672	1137	4049	1202	4437	1264	4837	-	-	-	-	-	-

LEGEND

Bhp = Brake Horsepower Input to Fan
Watts = Input Watts to Motor

Standard drive range is 817 to 1038 rpm

NOTES:

- 1) Maximum continuous bhp is 5.90 and maximum continuous watts are 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.
- 2) Fan performance is identical for horizontal discharge applications using horizontal adapter curb.

GENERAL NOTES FOR FAN PERFORMANCE TABLES

1. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the wattage ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. Values include losses for filters, unit casing, and wet coils.
3. Use of a field-supplied motor may affect wire sizing. Contact your distributor for details.
4. Interpolation is permissible. Do not extrapolate.

PERFORMANCE DATA (CONT.)

Evaporator-Fan Motor Efficiency

Unit Size	Motor Efficiency (%)
PHE156	85.8
PHE180	87.5

Outdoor Sound Power

Unit Size	Sound Rating (60 Hz)	A- Weighted	Octave Bands							
			63	125	250	500	1000	2000	4000	8000
PHE156	9.4 Bels	94.1	98.7	92.3	93.8	90.9	89.6	85.9	80.3	74.3
PHE180	9.4 Bels	94.1	98.7	92.3	93.8	90.9	89.6	85.9	80.3	74.3

Bels = Sound Levels (1 bel = 10 decibels)

MOTOR PULLEY

Unit Size	1	1-1/2	2	2-1/2	3**	3-1/2	4	4-1/2	5	5-1/2	6
PHE156	1179	1150	1121	1093	1064	1035	1006	978	949	920	891

MOTOR PULLEY

Unit Size	1	1-1/2	2	2-1/2	3**	3-1/2	4	4-1/2	5	5-1/2	6
PHE180	1038	1023	1001	979	956	934	912	890	868	846	817

* Approximate fan rpm shown.

** Factory setting

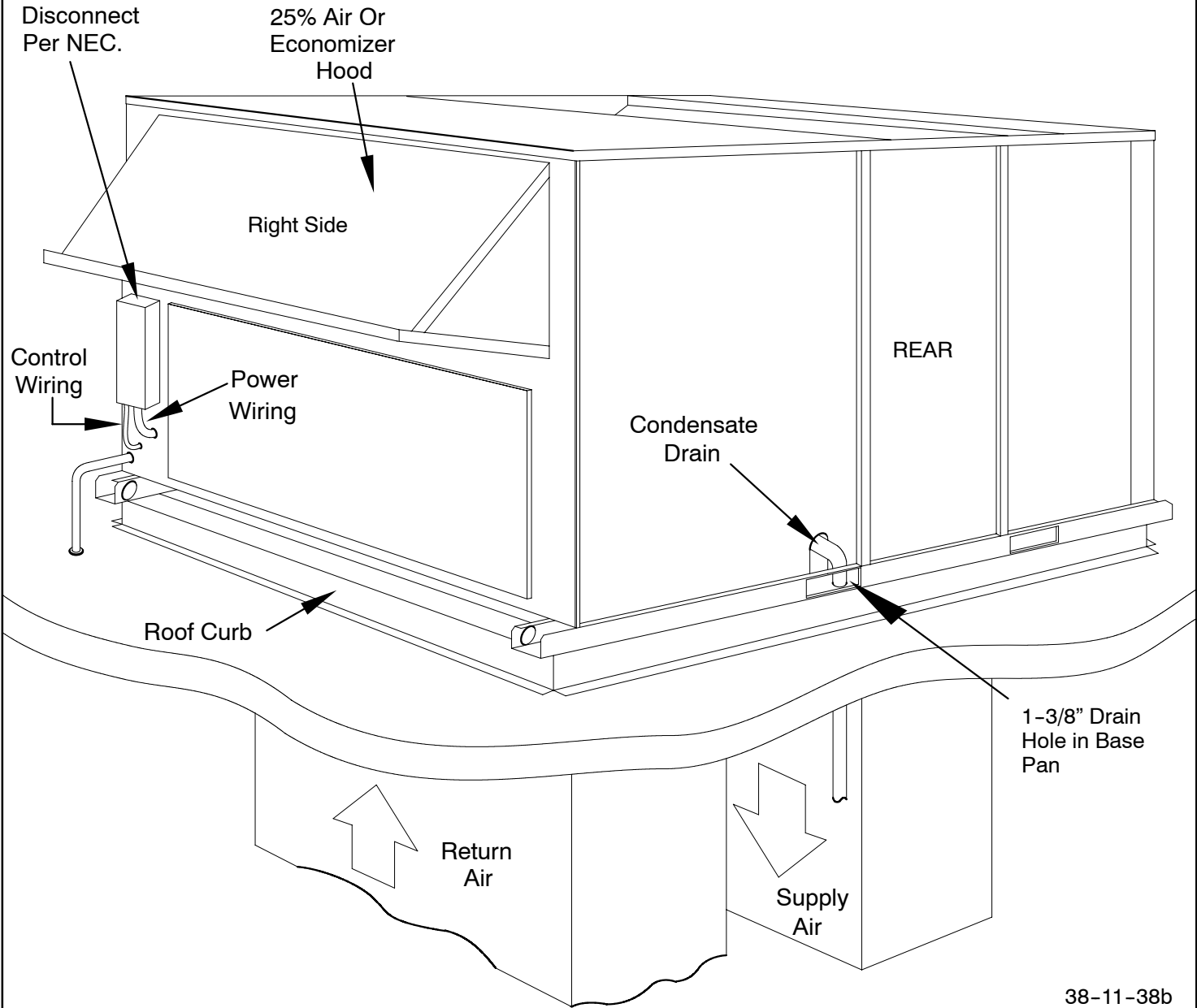
Evaporator Fan Motor Performance

Unit Size	Unit Voltage	Max. Acceptable Continuous BHP*	Max. Acceptable Operating Watts	Max. AMP Draw
PHE156	208/230	4.25	3775	10.5
	460	4.25	3775	4.9
PHE180	208/230	5.90	5180	15.8
	460	5.90	5180	7.9

Bhp - Brake Horsepower.

* Extensive motor and electrical testing on these units ensures that the full horsepower range of the motors can be utilized with confidence. Using your fan motors up to the horsepower ratings shown in this table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

TYPICAL INSTALLATIONS

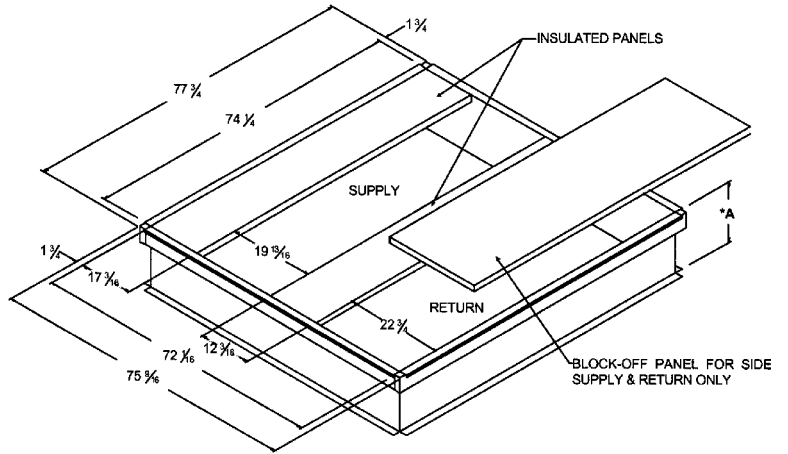


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ACCESSORIES

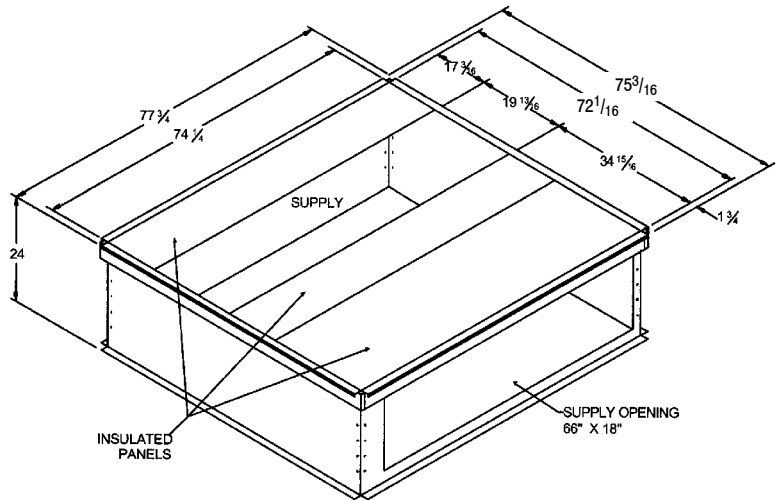
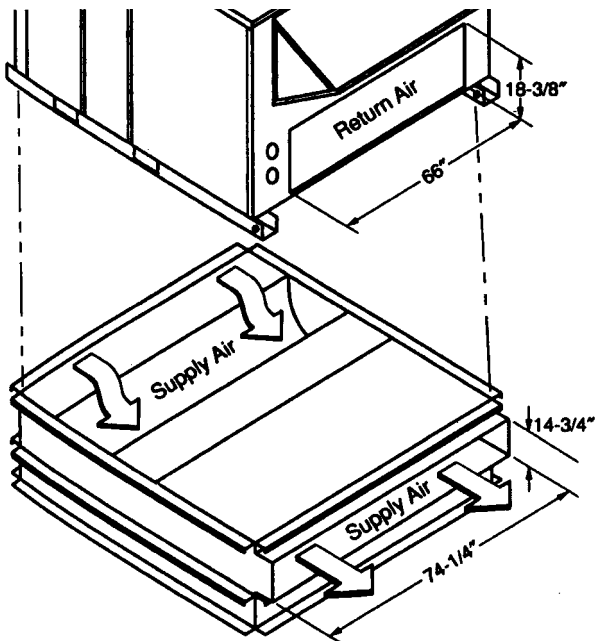
VERTICAL DISCHARGE ROOF CURBS

Description	Model Number	Where Used
14" High	AXB060CMA	13 & 15 ton
24" High	AXB060CHA	13 & 15 Ton



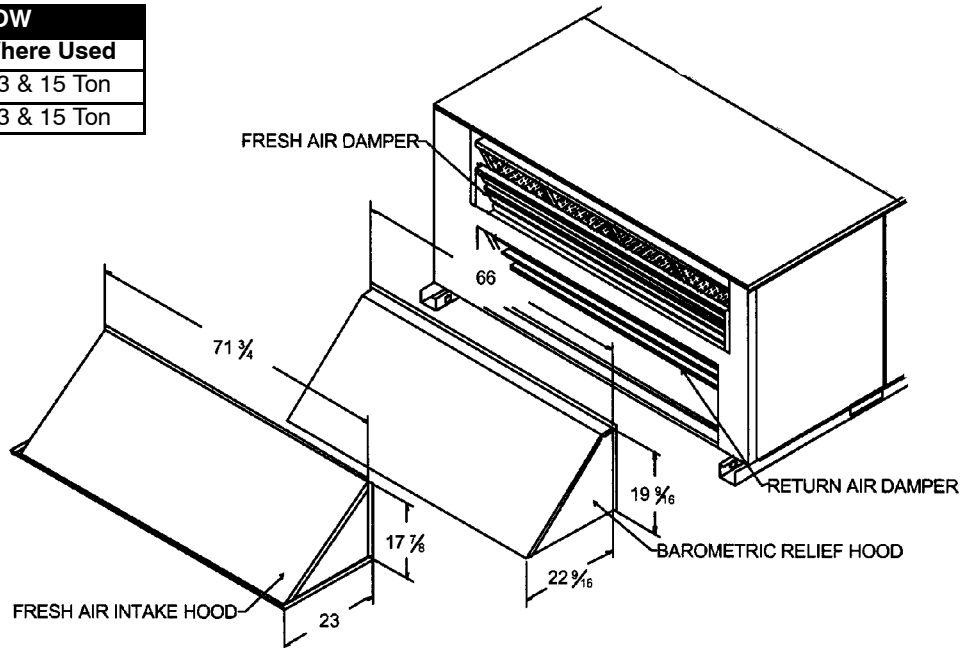
HORIZONTAL DISCHARGE ROOF CURBS

Description	Model Number	Where Used
24" High	AXB065CHA	13 & 15 Ton
24" High w/ Duct	AXB165CHA	13 & 15 Ton



ECONOMIZER - HORIZONTAL / DOWNFLOW

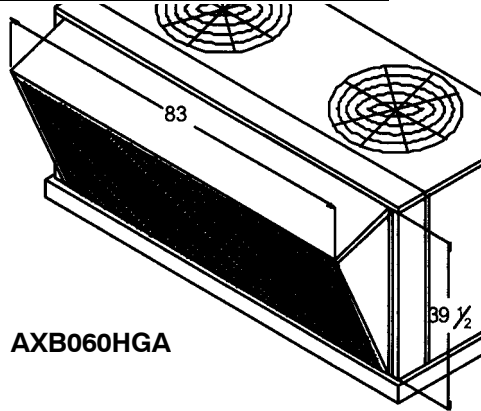
Description	Model Number	Where Used
Fully Modulating	AXB060EMA	13 & 15 Ton
Three Position	AXB060EPA	13 & 15 Ton



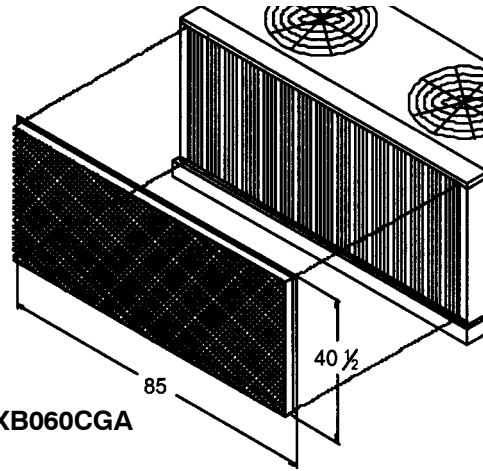
ACCESSORIES (CONT.)

COIL PROTECTION

Description	Model Number	Where Used
Coil Guard	AXB060CGA	13 & 15 Ton
Hail Guard	AXB060HGA	13 & 15 Ton



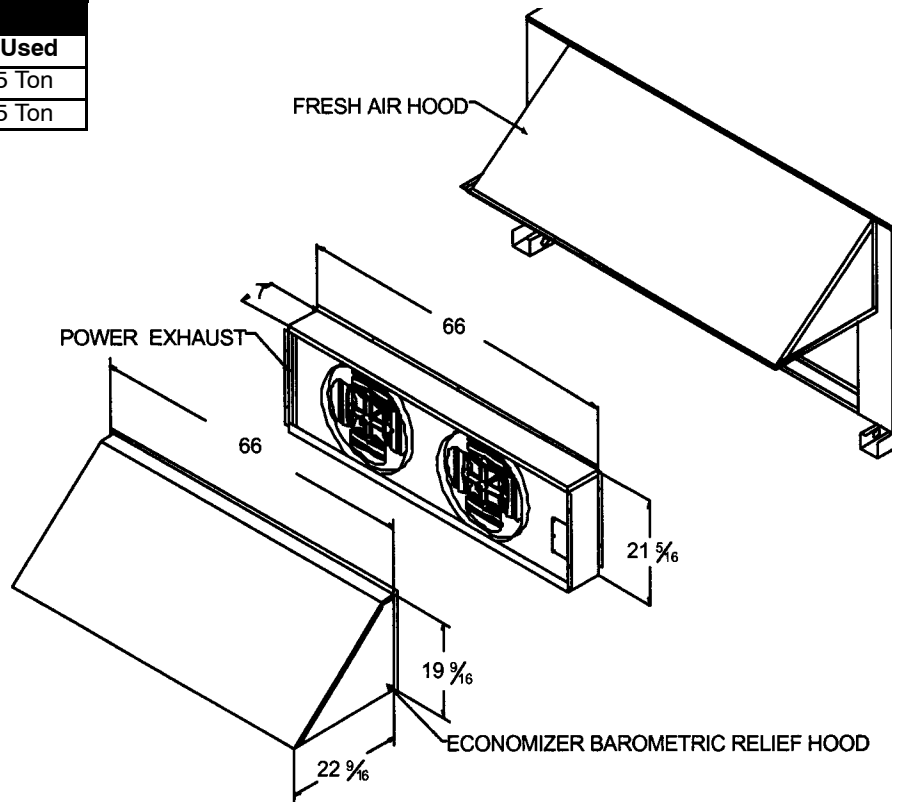
AXB060HGA



AXB060CGA

POWER EXHAUST

Description	Model Number	Where Used
208/230 Volt	AXB060PEH	13 & 15 Ton
460 Volt	AXB060PEL	13 & 15 Ton



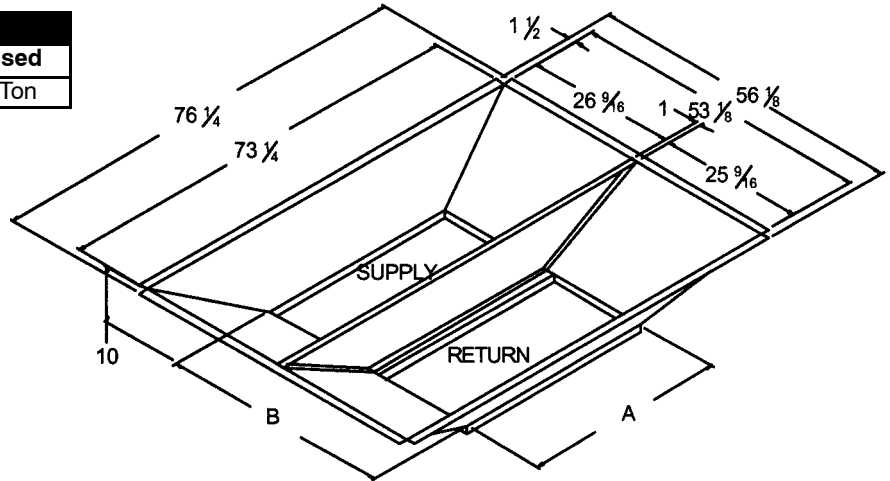
POWER EXHAUST PERFORMANCE DATA

Model	Volt/Phase/ Hertz	Motor			Unit					
		Qty	HP	RPM	Cir. Qty	LRA	FLA	MCA	Fuse Size	@0.1 CFM
AXB060PEH	208-230/3/60	2	3/4	1075	1	24.9	10.0	12.6	15	9,600
AXB060PEL	460/3/60	2	3/4	1075	1	N/A	4.4	5.6	8	9,600

ACCESSORIES (CONT.)

CONCENTRIC DUCT KIT

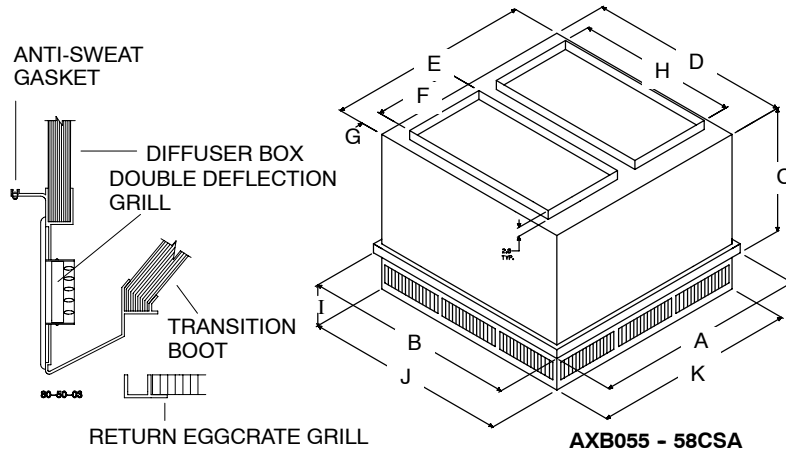
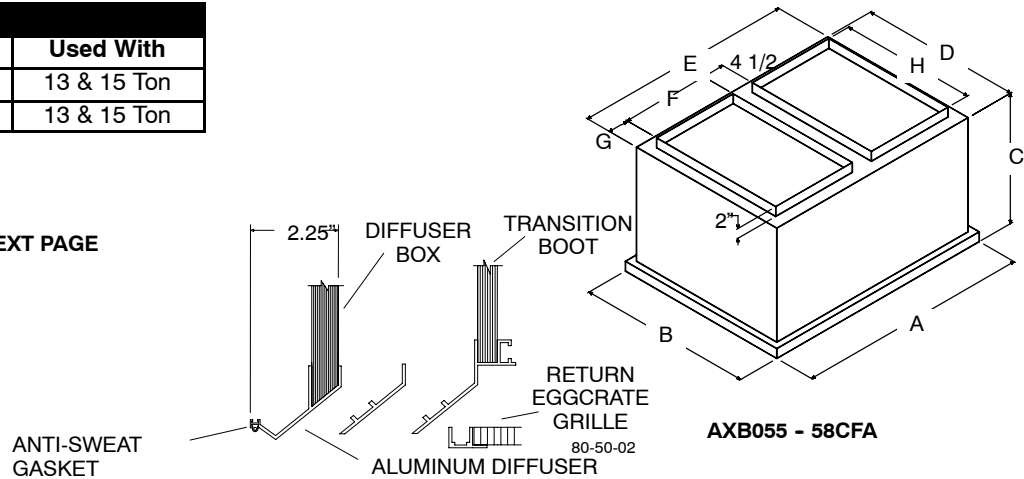
Description	Model Number	Where Used
24" x 48"	AXB260CTA	13 & 15 Ton



CONCENTRIC DIFFUSER

Description	Model Number	Used With
Flush Mount	AXB058CFA	13 & 15 Ton
Step Down	AXB058CSA	13 & 15 Ton

SEE PERFORMANCE DATA ON NEXT PAGE



DIMENSIONS

Model Number	A	B	C	D	E	F	G	H	I	J	K	Duct Size
AXB055CFA	47-5/8	47-5/8	29-1/4	45	45	18	2-1/4	38	N/A	N/A	N/A	18 x 36
AXB058CFA	59-5/8	59-5/8	35-1/4	57	57	24	2-1/4	48	N/A	N/A	N/A	24 x 48
AXB055CSA	47-5/8	47-5/8	24-5/8	45	45	18	2-1/2	36	10-1/8	45-1/2	45-1/2	18 x 36
AXB058CSA	59-5/8	59-5/8	30-5/8	57-1/2	57-1/2	24	2-1/2	48	11-1/8	57-1/2	57-1/2	24 x 48

ACCESSORIES (CONT.)

CFA SERIES PERFORMANCE DATA						
Part No. AXB	CFM	Static Pressure In. WC	Throw Feet	Neck Velocity FPM	Jet Velocity FPM	db Sound Level
058CFA	7200	.39	26-35	996	2093	45
	7400	.41	28-37	1024	2151	45
	7600	.43	29-38	1051	2209	45
	7800	.47	40-50	1079	2276	45
	8000	.50	42-51	1107	2326	50
	8200	.53	43-52	1134	2384	50

CSA SERIES PERFORMANCE DATA					
Part No. AXB	CFM	Static Pressure In. WC	Throw Feet	Neck / Jet Velocity FPM	db Sound Levels
058CSA	7200	.39	33-38	827	25
	7400	.41	35-40	850	25
	7600	.43	36-41	873	25
	7800	.47	38-43	896	30
	8000	.50	39-44	918	30
	8200	.53	41-46	941	30

CSA/CFA NOTES:

1. All data is based on the Air Diffusion Council guidelines.
2. Throw data is based on Terminal Velocities of 75 FPM using isothermal air.
3. Throw is based on diffuser blades being directed in a straight pattern.
4. Actual sound levels are less than those shown.
5. Minimum height 9' above floor.

FRESH AIR DAMPERS		
Description	Model Number	Used With
35% Motorized	AXB060FMA	13 & 15 Ton

LOW AMBIENT KIT	
Model Number	Used With
AXB260LAA	13 & 15 Ton

ELECTRIC HEAT ACCESSORY								
Unit Voltage	Qty	Model Number	Evap. Fan Motor		Electric Heater *		Power Supply	
			HP	FLA	kW	FLA	MCA	MOCP **
PHE156 208-3-60	1	AES034EHA	3.7	10.5	26	72	155	175
	1	AES056EHA			42	117	211	225
PHE156 240-3-60	1	AES034EHA		10.5	34	82	168	175
	1	AES056EHA			56	135	200	225
PHE156 480-3-60	1	AES132ELA		4.8	32	39	81	90
	1	AES055ELA			55	66	98	110
PHE180 208-3-60	1	AES034EHA	5.0	15.8	26	72	174	175
	1	AES056EHA			42	117	231	250
PHE180 240-3-60	1	AES034EHA		15.8	34	82	187	200
	1	AES056EHA			56	135	219	225
PHE180 480-3-60	1	AES132ELA		7.9	32	39	91	100
	1	AES055ELA			55	66	108	110

* Heater capacity (kW) is based on heater voltage of 208 v, 240 v, 480 v, and 600 v. Heaters are rated at 240 v, 480 v, or 600 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly. To determine heater capacity at actual unit voltage, multiply 240v, 480v, and 600v capacity by multipliers found at bottom of page.

** Fuse or HACR circuit breaker.

OPERATING SEQUENCE

COOLING, UNITS WITHOUT ECONOMIZER: When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized, and evaporator-fan motor (IFM), compressor no. 1, and condenser fan(s) start. The condenser fan motor(s) runs continuously while unit is cooling. When the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

HEATING, UNITS WITHOUT ECONOMIZER: When thermostat calls for heating through terminal W1. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized, and evaporator-fan motor (IFM), compressor no. 1, and condenser fan(s) start. The condenser-fan motor(s) runs continuously while unit is heating. When the thermostat calls for a second stage of heating by energizing W2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

DEFROST CYCLE: When the temperature of the outdoor coil drops below 28 F as sensed by the defrost thermostat (DFT1 or DFT2), the defrost timer starts. At the end of a timed period (field set at 30, 50, or 90 minutes), the defrost cycle will begin. The defrost board energizes terminals O and W2, energizes the defrost relay (RVR), deenergizes the reversing valve solenoids (RVS1 and RVS2), and energizes the electric heat(Accessory). The outdoor-fan motor will stop.

The unit continues to defrost either until the coil temperature as measured by DFT1 or DFT2 reaches 65 F, or until unit completes a 10-minute defrost cycle. During the defrost mode, when a circuit defrosts, RVS will oscillate between heating and cooling modes until defrost mode is complete. This will prevent the head pressure from getting too high.

At the end of the defrost cycle, the electric heaters (if applicable) will be deenergized, the reversing valve solenoids will be energized, and the outdoor fans will start.

APPLICATION DATA

- 1. DUCTWORK:** Ductwork should be attached to the curb on all units. Interior installation may proceed before unit is set in place on roof. If ductwork will be attached to the unit, do not drill in condensate drain pan area — leaks may result. See figures below for information on field-installed concentric ductwork when applicable.
- 2. THRU-THE-CURB SERVICE CONNECTIONS:** Roof curb connections allow field power wires, control wires, and gas supply to enter through the roof curb opening.
- 3. THERMOSTAT:** Use of 2-stage cooling thermostat is recommended for all units. A 2-stage cooling thermostat is required on units with accessory economizer to provide integrated cooling.
- 4. HEATING-TO-COOLING CHANGEOVER:** All units are automatic changeover from heating to cooling when automatic changeover thermostat and subbase are used.
- 5. AIRFLOW:** Units are draw-thru on cooling and blow-thru on heating.
- 6. MAXIMUM AIRFLOW:** To minimize the possibility of condensate blow-off from evaporator, airflow through units should not exceed 500 cfm/nominal ton on size 156-180 units.

7. MINIMUM AIRFLOW: The minimum airflow for cooling is 300 cfm/nominal ton on size 156-180 units.

8. MINIMUM AMBIENT COOLING OPERATION TEMPERATURE: Units are designed to operate at outdoor temperatures down to 40 F. To operate at lower outdoor-air temperatures, see Trade Prices or contact your local representative for appropriate accessory combinations for specific applications.

9. MAXIMUM OPERATING OUTDOOR-AIR TEMPERATURE: For cooling, this temperature is 120 F for 156-180 units. Refer to Cooling Capacities tables.

10. MINIMUM AMBIENT HEATING OPERATION TEMPERATURE: Units are designed to operate at outdoor temperatures down to -20 F.

11. INTERNAL UNIT DESIGN: Due to the internal unit design (draw-thru over the motor), air path, and specially designed motors, the full horsepower (maximum continuous bhp) listed in the Physical Data table and the notes following each Fan Performance table can be utilized with extreme confidence. Using motors with the values listed in the Physical and Fan Performance Data tables will not result in nuisance tripping or premature motor failure. The unit warranty will not be affected.

GUIDE SPECIFICATIONS

CABINET: The cabinet shall be made of sturdy baked enamel coated galvanized steel. Base rails shall be 16 gauge steel and have fork lift slots and holes provided for lifting shackles. Unit shall be designed with convertible airflow and shipped ready for downflow applications with conversion to horizontal air flow accomplished by relocating two panels.

Return air compartments shall be insulated with not less than 1/2" of water resistant coated glass fiber and not less than 1/2" of aluminum foil faced glass fiber in the furnace/supply compartments.

COOLING SECTION: Units shall be factory charged and operationally ready. Each refrigeration circuit shall have a compressor, with internal overload protection, high and low pressure switches, filter drier and copper tube/aluminum fin evaporator and condenser coils.

COILS: The evaporator and condenser coils shall be fabricated with aluminum fins mechanically bonded to copper tubing. Both coils shall be pressure tested prior to assembly into the unit and electronically leak tested after assembly onto the unit. The evaporator coil shall be protected from dust and debris on the return air side by factory installed 2" air filters.

CONDENSER FAN: The unit shall have a single direct drive propeller fan/motor assembly mounted directly to a vertical-discharge grille panel that is easily removable. Motors shall have permanently lubricated sleeve bearings and inherent overload protection.

EVAPORATOR BLOWER: The units shall have a single belt driven evaporator blower. The motor shall have permanently lubricated ball bearings and internal overload protection. An adjustable motor drive sheave for matching air flow requirements shall be standard. Additionally high static accessory kits shall be available for air flows above the standard requirement.