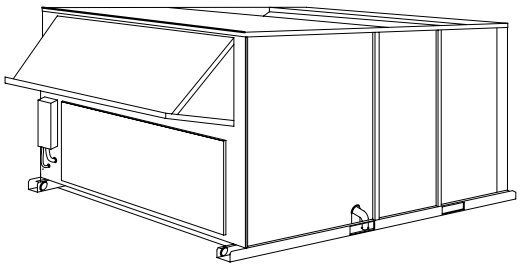
Installation Instructions

PAE Series – 3 Phase
15 to 25 Ton



PACKAGED ROOFTOP ELECTRIC COOLING/ELECTRIC HEATING UNITS

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CONTENTS

SAFETY CONSIDERATIONS

Installation and servicing of this equipment can be hazardous due to mechanical and electrical components. Only trained and qualified personnel should install, repair, or service this equipment.

Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on this equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the unit and other safety precautions that may apply.

Follow all safety codes. Installation must be in compliance with local and national building codes. Wear safety glasses, protective clothing, and work gloves. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit.

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

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

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

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Before installing or servicing system, always turn off power supply to unit and install lockout tag. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable.

INSTALLATION

IMPORTANT: Units have high ambient operating limits. If limits are exceeded, the unit will automatically lock the compressor out of operation. Manual reset will be required to restart the compressor.

PROVIDE UNIT SUPPORT

Roofcurb

Assemble or install accessory roof curb or horizontal adapter roof curb in accordance with instructions shipped with this accessory. Install insulation, cant strips, roofing, and counter flashing as shown. Ductwork can be installed to roof curb or horizontal adapter roof curb before unit is set in place. Curb or adapter roof curb should be level. This is necessary to permit unit drain to function properly. Unit leveling tolerance is $\pm\ ^1/_{16}$ in. per linear ft in any direction. Refer to Accessory Roof Curb or Horizontal Adapter Roof Curb Installation Instructions for additional information as required. When accessory roof curb or horizontal adapter roof curb is used, unit may be installed on class A, B, or C roof covering material.

IMPORTANT: The gasketing of the unit to the roof curb is critical for watertight seal. Install gasket supplied with the roof curb. Improperly applied gasket can result in air leaks and poor unit performance.

Alternate Unit Support

When the curb cannot be used, support unit with sleepers using unit curb support area. If sleepers cannot be used, support long sides of unit with a minimum of 3 equally spaced 4-in. x 4-in. pads on each side.

RIG AND PLACE UNIT

Inspect unit for transportation damage. File any claim with transportation agency. Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Rollers may be used to move unit across a roof. Level by using unit frame as a reference; leveling tolerance is $\pm\ ^1/_{16}$ in. per linear ft in any direction. See Fig. 2 for additional information. Unit operating weight is shown in Table 1.

Four lifting holes are provided in ends of unit base rails as shown in Fig. 2. Refer to rigging instructions on unit.

Positioning

Maintain clearance, per Fig. 3−5, around and above unit to provide minimum distance from combustible materials, proper airflow, and service access.

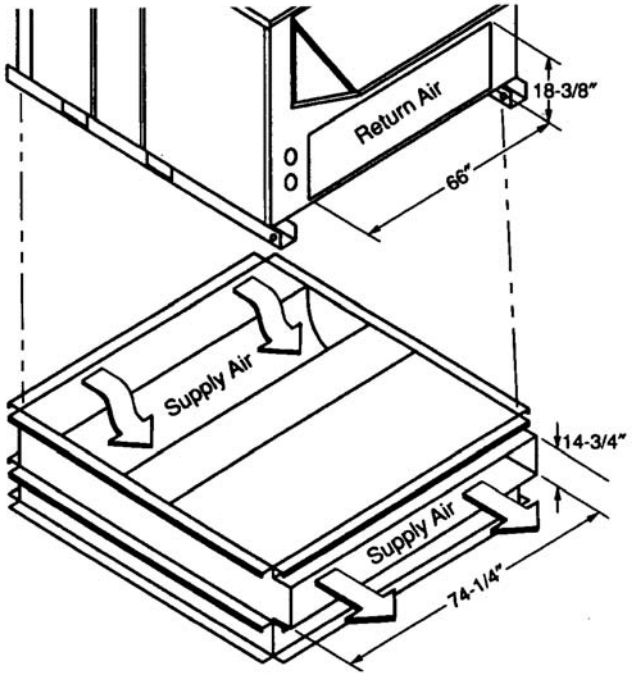
Do not install unit in an indoor location. Do not locate air inlets near exhaust vents or other sources of contaminated air.

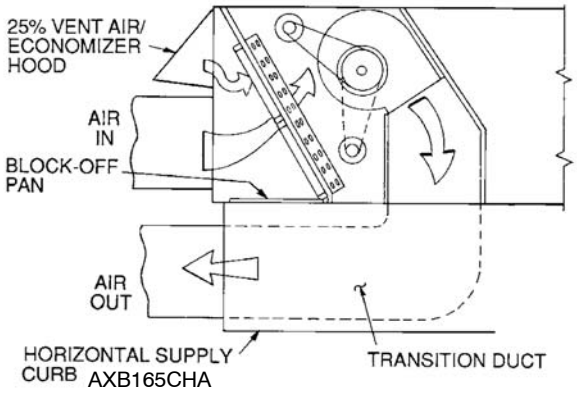
Although unit is weatherproof, guard against water from higher level runoff and overhangs.

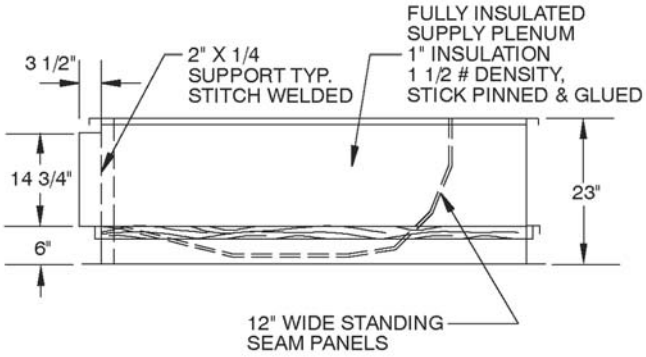
Roof Mount

Check building codes for weight distribution requirements. Unit operating weight is shown in Table 1.

FIGURE 1 | **Horizontal Supply/ Return Adapter Installation –– PAE180–240**



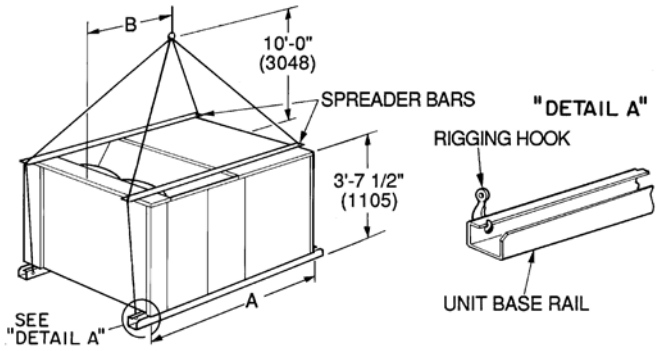




NOTE: AXB165CHA is a fully factory preassembled horizontal adapter and includes an insulated transition duct. The pressure drop through the adapter curb is negligible.
For horizontal return applications: The power exhaust and barometric relief dampers must be installed in the return air duct.

ACCESSORY PACKAGE NO.	CURB HEIGHT	DESCRIPTION
AXB165CHA	1′-11″ (584)	Pre-Assembled, Horizontal Adapter Roof Curb

FIGURE 2 | **Rigging Details**



NOTES:
1. Dimensions in ( ) are in millimeters.
2. Refer to fig. 4–6 for unit operating weights.
3. Remove boards at ends of unit and runners prior to rigging.
4. Rig by inserting hooks into unit base rails as shown. Use corner post from packaging to protect coil from damage. Use bumper boards for spreader bars.
5. Weights do not include optional economizer. See fig. 4–6 for economizer weight.
6. Weights given are for aluminum indoor coil plate fins and outdoor coil plate fins.

UNIT PAE	MAXIMUM SHIPPING WEIGHT		DIMENSIONS			
			A		B	
	lb	kg	ft-in.	mm	Ft-in.	mm
180	1725	782	6-11 1/2	2121	4- 0	1219
210	1785	810	6-11 1/2	2121	3-10	1168
240	1905	864	6-11 1/2	2121	3- 7	1092
300	2255	1023	6-11 1/2	2121	3- 5	1041

FIGURE 3 | **Base Unit Dimensions, PAE180, 210**

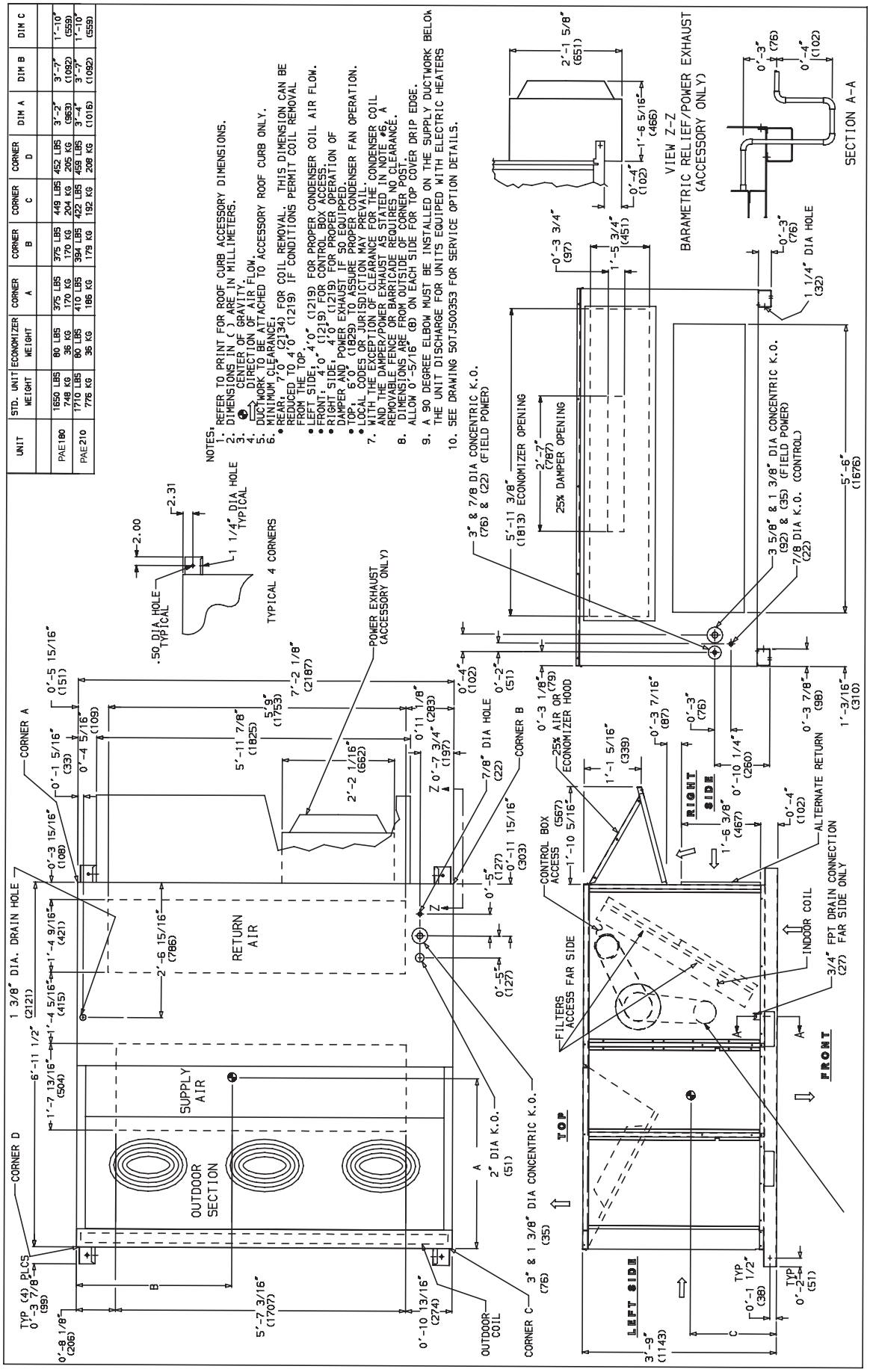


FIGURE 4

Base Unit Dimensions, PAE240

UNIT	STD. UNIT WEIGHT	ECONOMIZER WEIGHT	CORNER A	CORNER B	CORNER C	CORNER D	DIM A	DIM B	DIM C
240	1770 LBS 803 KG	80 LBS 36 KG	399 LBS 181 KG	405 LBS 184 KG	479 LBS 217 KG	487 LBS 221 KG	3'-3" (988)	3'-7" (1092)	1'-8" (508)

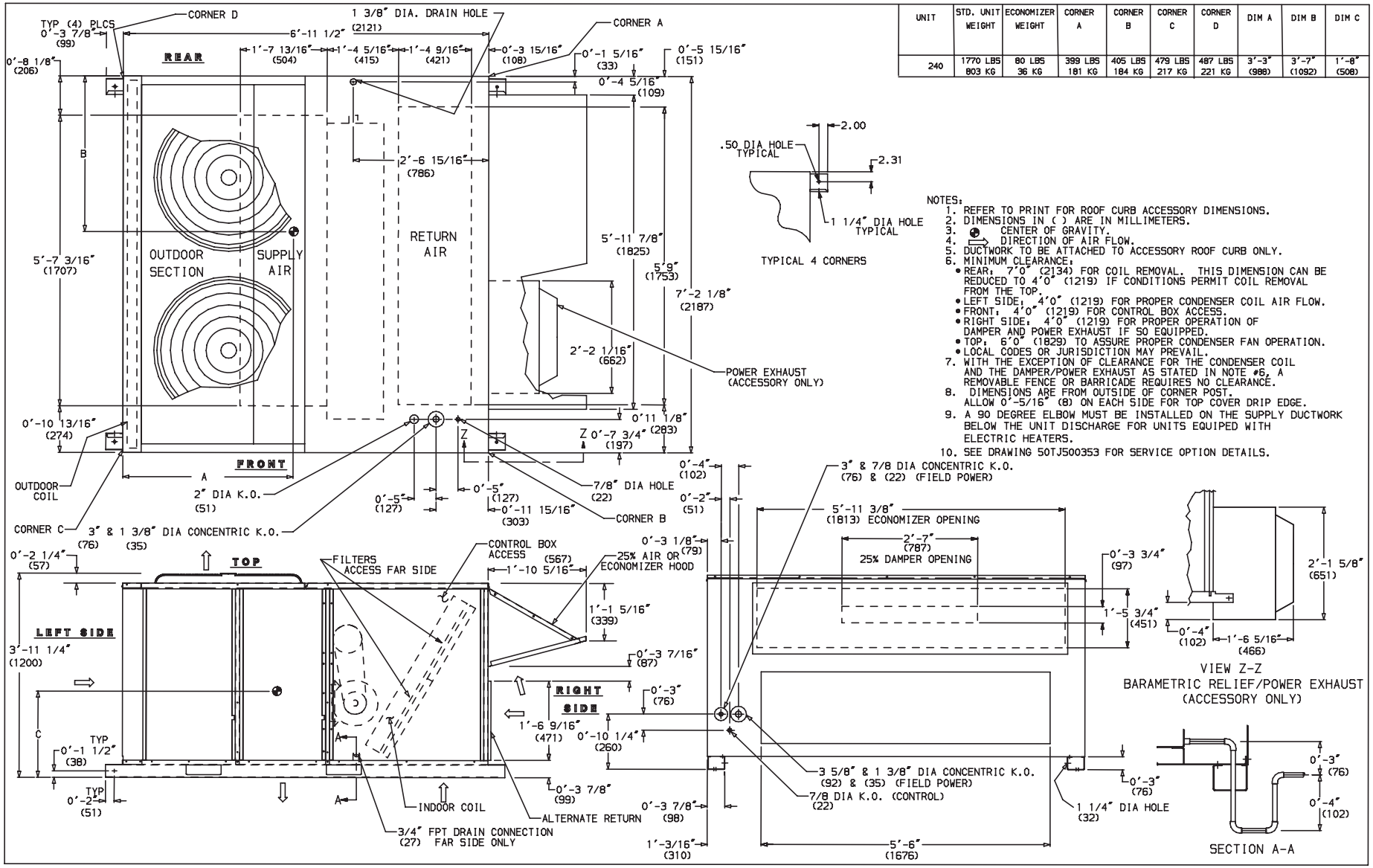


FIGURE 5 | **Base Unit Dimensions, PAE300**

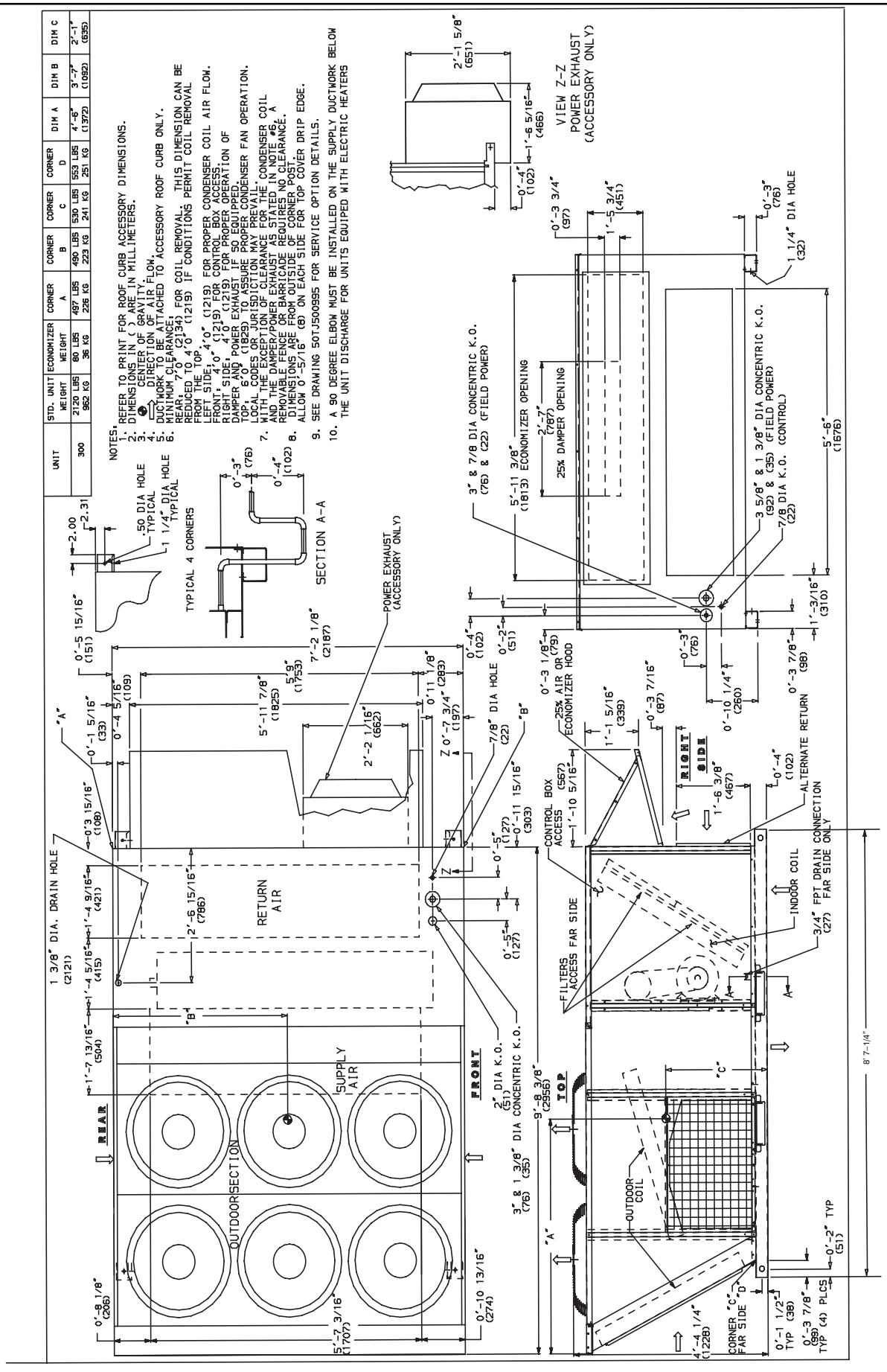


Table 1 – Physical Data – PAE180–300

UNIT PAE		180	210	240	300
NOMINAL CAPACITY (tons)		15	18	20	25
OPERATING WEIGHT		For Operating Weights, See Fig. 4–6			
COMPRESSOR/MANUFACTURER		Scroll, Copeland			
Quantity...Model (Ckt 1, Ckt 2)		1...ZR94KC, 1...ZR72KC	1...ZR108KC, 1...ZR94KC	1...ZR125KC, 1...ZR108KC	1...ZRU140KC,* 1...ZR144KC
Capacity Stages (%)		60, 40	55, 45	55, 45	50, 50
Number of Refrigerant Circuits		2	2	2	2
Oil (oz) (Ckt 1, Ckt 2)		85, 60	106, 81	106,106	136, 106
REFRIGERANT TYPE		R-22			
Expansion Device		TXV			
Operating Charge (lb–oz) Circuit 1†		19-8	19-8	19-11	26-13
Circuit 2		13-8	19-2	13-14	25-10
CONDENSER COIL		Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced			
Rows...Fins/in.		4...15	4...15	4...15	3...15 (2 coils)
Total Face Area (sq ft)		21.7	21.7	21.7	43.4
CONDENSER FAN		Propeller Type			
Nominal Cfm		10,500	10,500	14,200	21,000
Quantity...Diameter (in.)		3...22	3...22	2...30	6...22
Motor Hp...Rpm		1/2...1050	1/2...1050	1...1075	1/2...1050
Watts Input (Total)		1100	1100	3400	2200
EVAPORATOR COIL		Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced or			
Rows...Fins/in.		4...15	4...15	4...15	4...15
Total Face Area (sq ft)		17.5	17.5	17.5	17.5
EVAPORATOR FAN		Centrifugal Type			
Quantity...Size (in.)		2...12 x 12	2...12 x 12	2...12 x 12	2...12 x 12
Type Drive		Belt	Belt	Belt	Belt
Nominal Cfm		6000	7200	8000	10,000
Motor Hp		5	5	7.5	10
Motor Nominal Rpm		1745	1745	1745	1740
Maximum Continuous Bhp		6.13	5.90	8.7 [208/230 v] 9.5 [460 v]	10.2 [208/230 v] 11.8 [460 v]
Motor Frame Size		184T	184T	213T	215T
Fan Rpm Range	Low-Medium Static	873-1021	910-1095	1002-1151	1066-1283
	High Static	1025-1200	1069-1287	1193-1369	1332-1550
Motor Bearing Type		Ball	Ball	Ball	Ball
Maximum Allowable Rpm		1550	1550	1550	1550
Motor Pulley Pitch Diameter	Low-Medium Static	4.9/5.9	4.9/5.9	5.4/6.6	4.9/5.9
Min/Max (in.)	High Static	4.9/5.9	4.9/5.9	5.4/6.6	4.9/5.9
Nominal Motor Shaft Diameter (in.)		1 1/8	1 1/8	1 3/8	1 3/8
Fan Pulley Pitch Diameter (in.)	Low-Medium Static	9.4	9.4	9.4	8.0
	High Static	8.0	8.0	7.9	6.4
Nominal Fan Shaft Diameter (in.)		1 7/16	1 7/16	1 7/16	1 7/16
Belt, Quantity...Type...Length (in.)	Low-Medium Static	1...BX...50	1...BX...50	1...BX...53	2...BX...50
	High Static	1...BX...48	1...BX...48	1...BX...50	2...BX...47
Pulley Center Line Distance (in.)		13.3-14.8	13.3-14.8	14.6-15.4	14.6-15.4
Speed Change per Full Turn of Movable Pulley Flange (rpm)	Low-Medium Static	37	37	37	36
	High Static	44	34	44	45
Movable Pulley Maximum Full Turns From Closed Position		6**	6††	6**	6††
Factory Pulley Setting		3.5	3.5	3.5	3.5
Factory Speed Setting (rpm)	Low-Medium Static	965	1002	1120	1182
	High Static	1134	1178	1328	1470
Fan Shaft Diameter at Pulley (in.)		1 7/16	1 7/16	1 7/16	1 7/16

Table 1 – Physical Data – PAE180–300

UNIT PAE	180	210	240	300

HIGH-PRESSURE SWITCH (psig)	
Cutout	426
Reset (Auto)	320
LOW-PRESSURE SWITCH (psig)	
Cutout	27
Reset (Auto)	44
FREEZE PROTECTION THERMOSTAT (F)	
Opens	30 ± 5
Closes	45 ± 5
OUTDOOR-AIR INLET SCREENS	Cleanable
Quantity...Size (in.)	2...20 x 25 x 1 1...20 x 20 x 1
RETURN-AIR FILTERS	Throwaway¶
Quantity...Size (in.)	4...20 x 20 x 2 4...16 x 20 x 2
POWER EXHAUST	$^1/_2$ Hp, 208/230-460 v Motor Direct Drive, Propeller-Fan (Factory-Wired for 460 v)

LEGEND

Bhp — Brake Horsepower

TXV — Thermostatic Expansion Valve

*The ZRU140KC compressor is a tandem compressor, consisting of a ZR72KC (25% total capacity) and a ZR68KC (24% total capacity).
†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.
**Pulley has 6 turns. Due to belt and pulley size, movable pulley cannot be set to 0 to $1^1/_2$ turns open.
††Pulley has 6 turns. Due to belt and pulley size, movable pulley cannot be set to 0 to $^1/_2$ turns open.
***Rollout switch is manual reset.
†††A Liquid Propane kit is available as an accessory.
¶The PAE300 unit requires 2-in. industrial-grade filters capable of handling face velocities up to 625 ft/min (such as American Air Filter no. 5700 or equivalent).

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

FIELD FABRICATE DUCTWORK

Secure all ducts to building structure. Use flexible duct connectors between unit and ducts as required. Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier.

The PAE units with electric heat require a 1-in. clearance for the first 24 in. of ductwork.

Outlet grilles must not lie directly below unit discharge.

NOTE: A 90-degree elbow must be provided in the ductwork to comply with UL (Underwriters Laboratories) codes for use with electric heat.

⚠ WARNING

PERSONAL INJURY OR DEATH HAZARD

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

For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install a 90-degree turn in the return ductwork between the unit and the conditioned space. If a 90-degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Due to electric heater, supply duct will require 90-degree elbow.

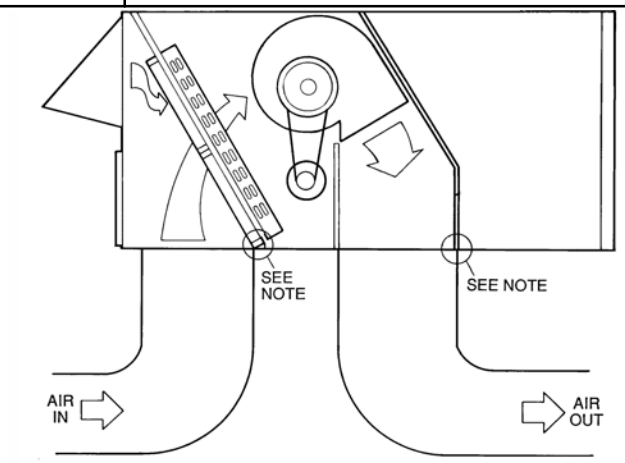
MAKE UNIT DUCT CONNECTIONS

Unit is shipped for thru-the-bottom duct connections. Ductwork openings are shown in Fig. 3-5. Duct connections are shown in Fig. 6. Field-fabricated concentric ductwork may be connected as shown in Fig. 7 and 8. Attach all ductwork to roof curb and roof curb basepans.

TRAP CONDENSATE DRAIN

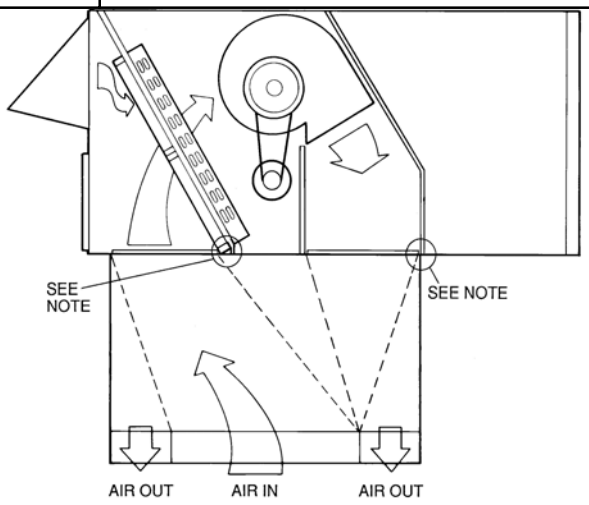
See Fig. 4-6 and 10 for drain location. Plug is provided in drain hole and must be removed when unit is operating. One $^3/_4$-in. half-coupling is provided inside unit evaporator section for condensate drain connection. An $8^1/_2$ in. x $^3/_4$-in. diameter nipple and a 2-in. x $^3/_4$-in. diameter pipe nipple are coupled to standard $^3/_4$-in. diameter elbows to provide a straight path down through holes in unit base rails (see Fig. 10). A trap at least 4-in. deep must be used.

FIGURE 6 Air Distribution , Thru–the–Bottom



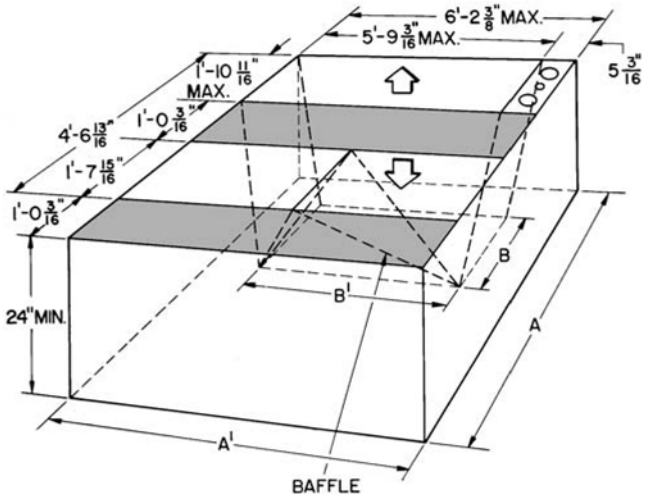
NOTE: Do not drill in this area; damage to basepan may result in water leak.

FIGURE 7 Concentric Duct Air Distribution



NOTE: Do not drill in this area; damage to basepan may result in water leak.

FIGURE 8 Concentric Duct Details



Shaded area indicates block-off panels.

NOTE: Dimensions A, A′ and B, B′ are obtained from field-supplied ceiling diffuser.

FIGURE 9 Condensate Drain Details

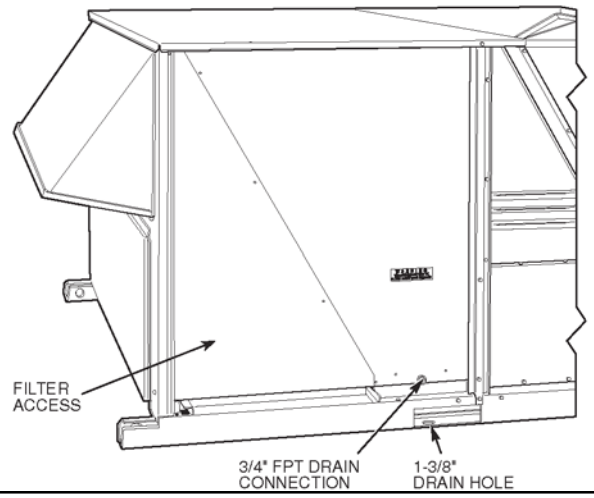


FIGURE 10 Condensate Drain Piping Details

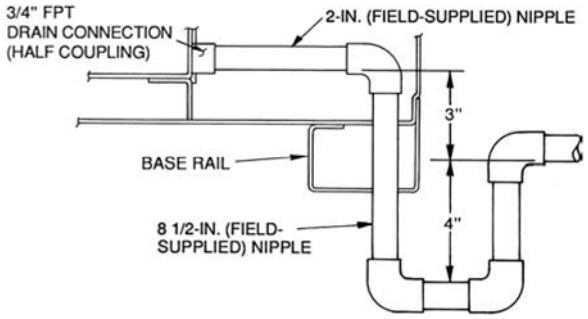
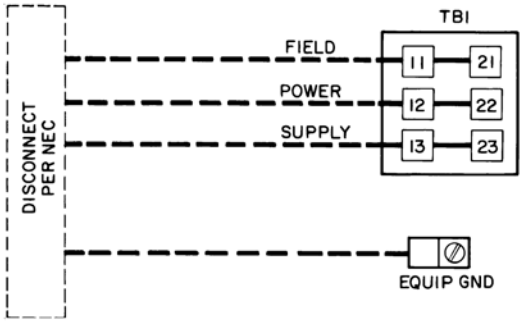


FIGURE 11 Field Power Wiring Connections



TB1 MAXIMUM WIRE SIZE

UNIT 558F	VOLTAGE	
	208/230	460
All	350 kcmil	2/0

LEGEND

EQUIP — Equipment
GND — Ground
kcmil — Thousand Circular Mils
NEC — National Electrical Code
TB — Terminal Block

Make Electrical Connections

Field Power Supply

Unit is factory wired for voltage shown on nameplate.

When installing units, provide a disconnect of adequate size per NEC (National Electrical Code) requirements (Table 2).

All field wiring must comply with NEC and local requirements.

Route power lines through control box access panel or unit basepan (Fig. 3 to 5) to connections as shown on unit wiring diagram and Fig. 11.

Operating voltage to compressor must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2% and the current must be balanced within 10%.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

Field Control Wiring

Install an approved accessory thermostat assembly according to the installation instructions included with accessory. Locate thermostat assembly on a solid interior wall in the conditioned space to sense average temperature.

Route thermostat cable or equivalent single leads of colored wire from subbase terminals through conduit in unit to low-voltage connections as shown on unit label wiring diagram and in Fig. 12.

NOTE: For wire runs up to 50 ft, use no. 18 AWG (American Wire Gage) insulated wire (35 C minimum). For 50 to 75 ft, use no. 16 AWG insulated wire (35 C minimum). For over 75 ft, use no. 14 AWG insulated wire (35 C minimum). All wire larger than no. 18 AWG cannot be directly connected at the thermostat and will require a junction box and splice at the thermostat.

Set heat anticipator settings as indicated in Table 3. Settings may be changed slightly to provide a greater degree of comfort for a particular installation.

Optional Non-Fused Disconnect

On units with the optional non-fused disconnect, incoming power will be wired into the disconnect switch. Refer to Fig. 13 for wiring for 100 and 200 amp disconnect switches. Units with an MOCP (maximum overcurrent protection) under 100 will use the 100 amp disconnect switch. Units with an MOCP over 100 will use the 200 amp disconnect switch. Refer to the applicable disconnect wiring diagram.

To prevent breakage during shipping, the disconnect handle and shaft are shipped and packaged inside the unit control box. Install the disconnect handle before unit operation. To install the handle and shaft, perform the following procedure:

1. Open the control box door and remove the handle and shaft from shipping location.
2. Loosen the Allen bolt located on the disconnect switch. The bolt is located on the square hole and is used to hold the shaft in place. The shaft cannot be inserted until the Allen bolt is moved.
3. Insert the disconnect shaft into the square hole on the disconnect switch. The end of the shaft is specially cut and the shaft can only be inserted in the correct orientation.
4. Tighten the Allen bolt to lock the shaft into position.
5. Close the control box door.
6. Attach the handle to the external access door with the two screws provided. When the handle is in the ON position, the handle will be vertical. When the

handle is in the OFF position, the handle will be horizontal.

7. Turn the handle to the OFF position and close the door. The handle should fit over the end of the shaft when the door is closed.
8. The handle must be in the OFF position to open the control box door.

Optional Convenience Outlet

On units with optional convenience outlet, a 115-v GFI (ground fault interrupt) convenience outlet receptacle is provided for field wiring. Field wiring should be run through the $^{7}/_{8}$-in. knockout provided in the basepan near the return air opening.

FIGURE 12 **Field Control Thermostat Wiring**

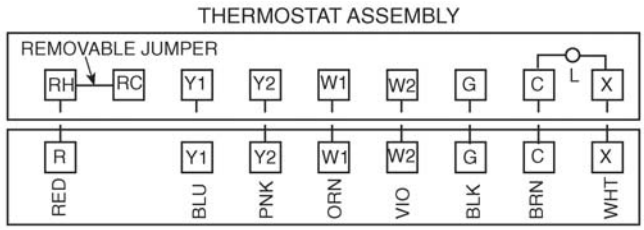
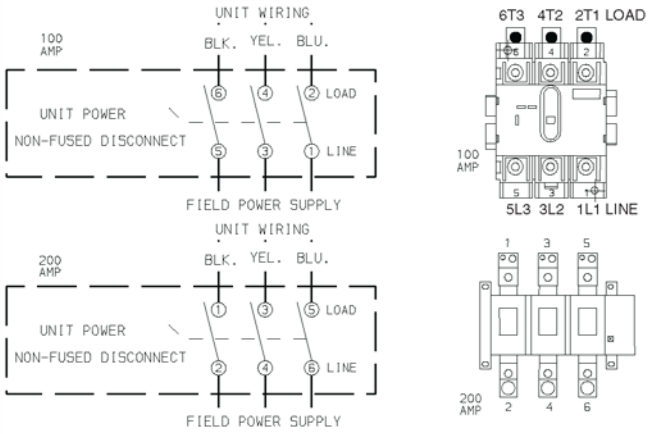


FIGURE 13 **Optional Non–Fused Disconnect Wiring**



NOTE: The disconnect takes the place of TB-1 as shown on the unit wiring diagram label and the component arrangement label.

Table 2 — Electrical Data

UNIT PAE	NOMINAL VOLTAGE (3 Ph, 60 Hz)	VOLTAGE RANGE		COMPRESSOR						OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
				No. 1		No. 1A		No. 2												
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCP†
180	208/230	187	253	32.1	195	—	—	20.7	156	3	0.5	1.7	5.0	15.8/15.8	—	—	—	—	82/82	110/110
															4.6	18.8	—	—	86/86	110/110
															—	—	26/34	71/82	109/122	110/125
															4.6	18.8	26/34	71/82	114/128	125/150
															—	—	42/56	117/135	166/155	175/175
															4.6	18.8	42/56	117/135	172/161	175/175
															—	—	56/75**	156/180	176/200	200/225
															4.6	18.8	56/75**	156/180	182/206	200/225
	460	414	508	16.4	95	—	—	10	70	3	0.5	0.8	5.0	7.9	—	—	—	—	41	50
															2.3	6.0	—	—	43	50
															—	—	32	39	59	60
															2.3	6.0	32	39	62	70
															—	—	55	66	76	90
															2.3	6.0	55	66	79	90
															—	—	80**	96	106	125
															2.3	6.0	80**	96	109	125
210	208/230	187	253	30.1	225	—	—	28.8	195	3	0.5	1.7	5.0	15.8/15.8	—	—	—	—	87/87	110/110
															4.6	18.8	—	—	92/92	110/110
															—	—	26/34	71/82	109/122	110/125
															4.6	18.8	26/34	71/82	114/128	125/150
															—	—	42/56	117/135	166/155	175/175
															4.6	18.8	42/56	117/135	172/161	175/175
															—	—	56/75	156/180	176/200	200/225
															4.6	18.8	56/75	156/180	182/206	200/225
	460	414	508	15.5	114	—	—	14.7	95	3	0.5	0.8	5.0	7.9	—	—	—	—	44	50
															2.3	6.0	—	—	47	60
															—	—	32	39	59	60
															2.3	6.0	32	39	61	70
															—	—	55	66	76	90
															2.3	6.0	55	66	79	90
															—	—	80	96	106	125
															2.3	6.0	80	96	109	125
240	208/230	187	253	42	239	—	—	33.6	225	2	1	6.6	7.5	25.0/25.0	—	—	—	—	124/124	150/150
															4.6	18.8	—	—	129/129	150/150
															—	—	26/34	71/82	124/134	150/150
															4.6	18.8	26/34	71/82	129/140	150/150
															—	—	42/56	117/135	178/166	200/175
															4.6	18.8	42/56	117/135	183/172	200/175
															—	—	56/75	156/180	187/211	200/225
															4.6	18.8	56/75	156/180	193/217	200/225
	460	414	508	19.2	125	—	—	17.3	114	2	1	3.3	7.5	13.0	—	—	—	—	61	80
															2.3	6	—	—	63	80
															—	—	32	39	65	80
															2.3	6	32	39	68	80
															—	—	55	66	82	90
															2.3	6	55	66	85	90
															—	—	80	96	112	125
															2.3	6	80	96	115	125

Table 2 — Electrical Data

UNIT PAE	NOMINAL VOLTAGE (3 Ph, 60 Hz)	VOLTAGE RANGE		COMPRESSOR No. 1		COMPRESSOR No. 1A		COMPRESSOR No. 2		OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCP†
300	208/230	187	253	20.7	156	20.7	156	47.1	245	6	0.5	1.7	10.0	28.0/28.0	—	—	—	—	138/138	175/175
															4.6	18.8	—	—	143/143	175/175
															—	—	26/34	71/82	138/138	175/175
															4.6	18.8	26/34	71/82	143/143	175/175
															—	—	42/56	117/135	181/170	200/175
															4.6	18.8	42/56	117/135	187/176	200/200
															—	—	56/75	156/180	191/215	200/225
															4.6	18.8	56/75	156/180	197/221	200/225
	460	414	508	10.0	75	10.0	75	19.6	125	6	0.5	0.8	10.0	14.6	—	—	—	—	64	80
															2.3	6	—	—	66	80
															—	—	32	39	67	80
															2.3	6	32	39	70	80
															—	—	55	66	84	90
															2.3	6	55	66	87	100
															—	—	80	96	114	125
															2.3	6	80	96	117	125

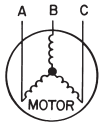
LEGEND
FLA – Full Load Amps
HACR – Heating, Air Conditioning and Refrigeration
IFM – Indoor–Fan Motor
LRA – Locked Rotor Amps
MCA – Minimum Circuit Amps
MOCP – Maximum Overcurrent Protection
NEC – National Electrical Code
OFM – Outdoor–Fan Motor
RLA – Rated Load Amps

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent 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



AB = 452 v
BC = 464 v
AC = 455 v

$$\text{Average Voltage} = \frac{452 + 464 + 455}{3} = \frac{1371}{3} = 457$$

Determine maximum deviation from average voltage.
(AB) 457 – 452 = 5 v
(BC) 464 – 457 = 7 v
(AC) 457 – 455 = 2 v

Maximum deviation is 7 v.

Determine percent of 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.

3. MCA calculation for PAE units with electric heaters over 50 kW = (1.25 x IFM amps) + (1.00 x heater FLA).
4. Use the following table to determine heater capacity at actual voltage.

HEATER RATING VOLTAGE	ACTUAL HEATER VOLTAGE							
	200	208	230	240	380	440	460	480
240	0.694	0.751	0.918	1.000	—	—	—	—
480	—	—	—	—	0.626	0.840	0.918	1.000

EXAMPLE: 34 kW (at 230 v) heater on 208 v
= 34.0 (.751 mult factor)
= 25.5 kW capacity at 208 v.

Table 3 — Heat Anticipator Settings

UNIT PAE	UNIT VOLTAGES	kW*	STAGE 1	STAGE 2
180–300	208/230-3-60	26/34	.40	.66
		42/56	.66	.40
		56/75	.66	.66
	460-3-60	32	.40	.40
		55	.40	.66
		80	.66	.66

*Heater kW is based on heater voltage of 208 v, 240 v, or 480 v.

MAKE OUTDOOR-AIR INLET ADJUSTMENTS

Manual Outdoor-Air Damper

All units (except those equipped with a factory-installed economizer) have a manual outdoor-air damper to provide ventilation air. Damper can be preset to admit up to 25% outdoor air into return-air compartment. To adjust, loosen securing screws and move damper to desired setting. Then retighten screws to secure damper (Fig. 14).

INSTALL OUTDOOR-AIR HOOD

The outdoor-air hood is common to 25% air ventilation and economizer. If economizer is factory installed, all electrical connections have been made and adjusted at the factory. Assemble and install hood in the field.

IMPORTANT:If the unit is equipped with the optional economizer component, move the outdoor-air temperature sensor prior to installing the outdoor-air hood. See the Optional economizer section for more information.

NOTE: The hood top panel, upper and lower filter retainers, hood drain pan, baffle (300) and filter support bracket are secured opposite the outdoor coil end of the unit. The screens, hood side panels, remaining section of filter support bracket, seal strip, and all other hardware are in a package located inside the return-air filter access panel (Fig. 15).

1. Attach seal strip to upper filter retainer. See Fig. 16.
2. Assemble hood top panel, side panels, upper filter retainer, and drain pan (see Fig. 17).
3. Secure lower filter retainer and support bracket to unit. See Fig. 18. Leave screws loose on size 300 units.
4. Slide baffle (size 300) behind lower filter retainer and tighten screws.
5. Loosen sheet metal screws for top panel of base unit located above outdoor-air inlet opening, and remove screws for hood side panels located on the sides of the outdoor-air inlet opening.
6. Match notches in hood top panel to unit top panel screws. Insert hood flange between top panel flange and unit. Tighten screws.
7. Hold hood side panel flanges flat against unit, and install screws removed in Step 5.
8. Insert outdoor-air inlet screens and spacer in channel created by lower filter retainer and support bracket.
9. Attach remaining section of filter support bracket.

FIGURE 14 25% Outdoor Air Section Details

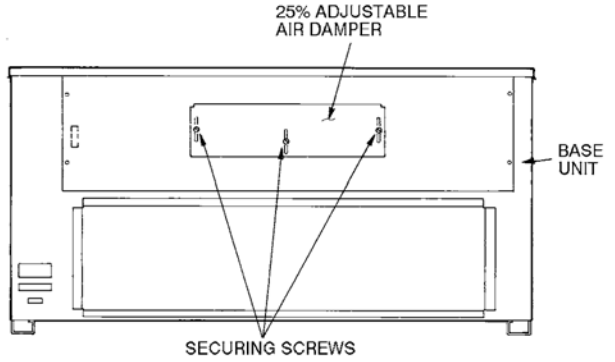


FIGURE 15 Outdoor Air Hood Component Location

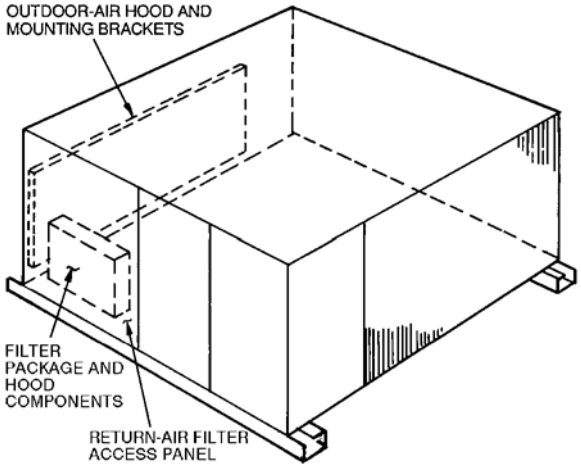
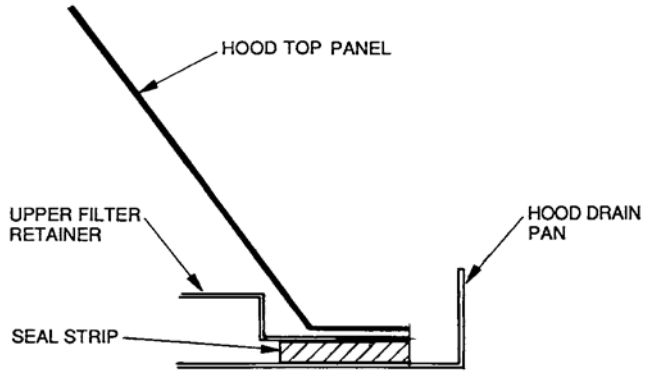


FIGURE 16 Seal Strip Location

Air Hood Cross–Sectional View



INSTALL ALL ACCESSORIES

After all the factory-installed options have been adjusted, install all field-installed accessories. Refer to the accessory installation instructions included with each accessory.

Adjust Factory-Installed Options

Optional Economizer

See Figs. 18 and 19 for economizer component locations.

NOTE:These instructions are for installing the optional economizer only. Refer to the accessory economizer installation instructions when field installing an economizer accessory.

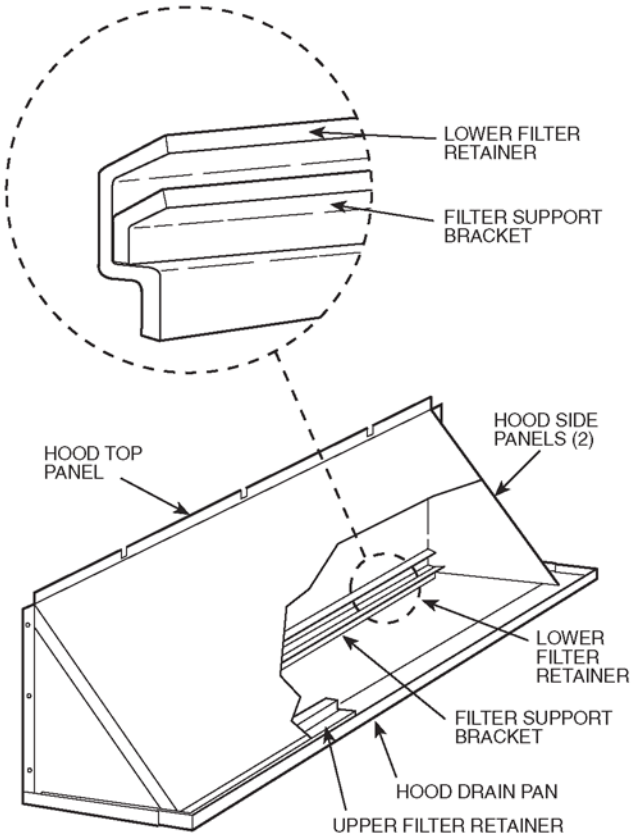
To complete installation of the optional economizer, perform the following procedure.

1. Remove the economizer hood. Refer to Step 8 — Install Outdoor-Air Hood on page 14 for information on removing and installing the outdoor-air hood.
2. Relocate outdoor air temperature sensor from shipping position to operation position on economizer. See Fig. 18.
3. Re-install economizer hood.
4. Install all economizer accessories. Economizer wiring is shown in Fig. 20.

Outdoor air leakage is shown in Table 4. Return air pressure drop is shown in Table 5.

IMPORTANT:Failure to relocate the sensor will result in the economizer not operating properly.

FIGURE 17 **Outdoor Air Hood Details**



Note: The outdoor air hood comes with a baffle which is used on
size 300 units only, discard baffle for 180—240 units.

Table 4 – Outdoor Air Damper Leakage

	DAMPER STATIC PRESSURE (in. wg)					
	0.2	0.4	0.6	0.8	1.0	1.2
LEAKAGE (cfm)	35	53	65	75	90	102

Table 5 – Return Air Pressure Drop

CFM					
4500	5000	5400	6000	7200	7500
0.040	0.050	0.060	0.070	0.090	0.100

FIGURE 18 **Economizer Component Locations (End View)**

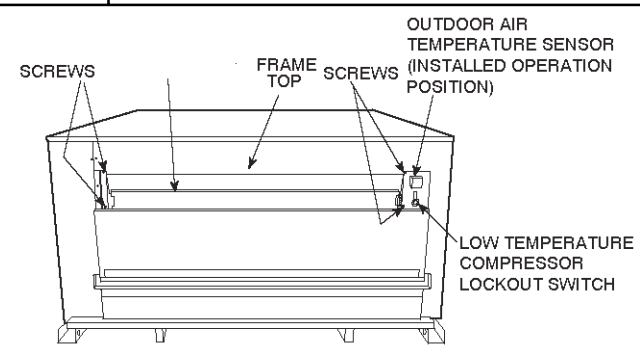
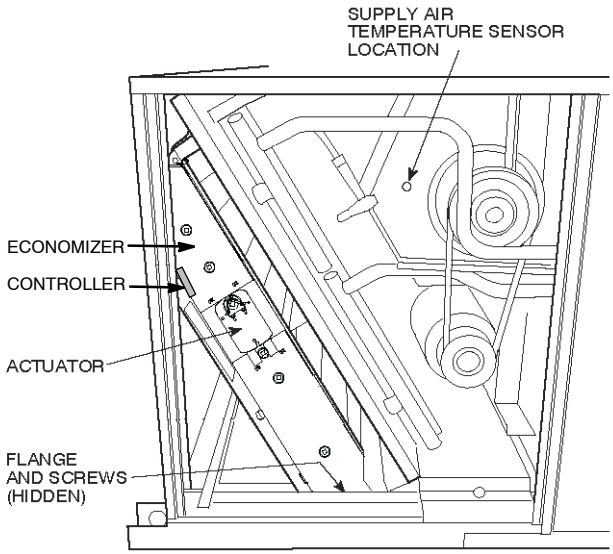


FIGURE 19 **Economizer Component Locations (Side View)**



Economizer Standard Sensors

Outdoor Air Temperature (OAT) Sensor

The outdoor air temperature sensor (HH57AC074) is a 10 to 20 mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the economizer can be used for free cooling. The sensor must be field-relocated. See Fig. 18. The operating range of temperature measurement is 40 to 100 F.

Supply Air Temperature (SAT) Sensor

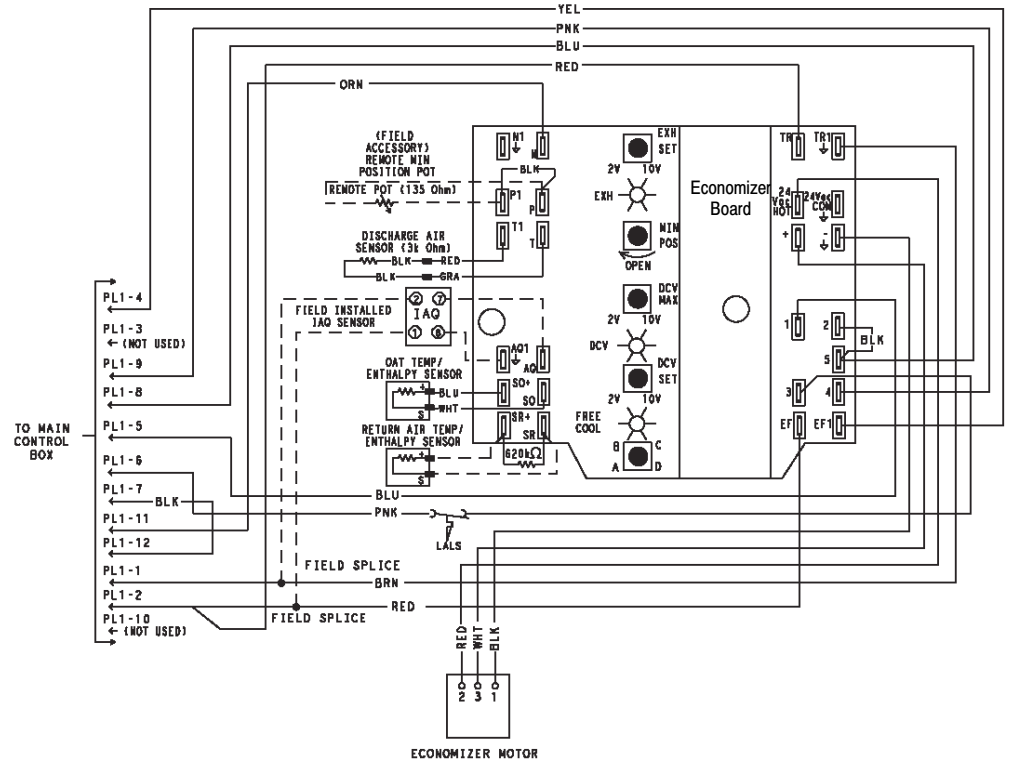
The supply air temperature sensor is a 3 K thermistor located at the inlet of the indoor fan. See Fig. 19. This sensor is factory installed. The operating range of temperature measurement is 0° to 158 F. See Table 6 for sensor temperature/resistance values.

The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the “crimp end” and is sealed from moisture.

Low Temperature Compressor Lockout Sensor

The economizer is equipped with an ambient temperature lockout switch located in the outdoor air stream which is used to lockout the compressors below a 42 F ambient temperature. See Fig. 18.

FIGURE 20 | **Economizer Wiring**



LEGEND

DCV — Demand Controlled Ventilation
IAQ — Indoor Air Quality
LALS — Low Temperature Compressor Lockout Switch
OAT — Outdoor-Air Temperature
POT — Potentiometer

Potentiometer Default Settings:

Power Exhaust	Middle
Minimum Pos.	Fully Closed
DCV Max.	Middle
DCV Set	Middle
Enthalpy	C Setting

NOTES:

1. 620 ohm, 1 watt 5% resistor should be removed only when using differential enthalpy or dry bulb.
2. If a separate field-supplied 24 v transformer is used for the IAQ sensor power supply, it cannot have the secondary of the transformer grounded.
3. For field-installed remote minimum position POT, remove black wire jumper between P and P1 and set control minimum position POT to the minimum position.

Table 6 – Supply Air Temperature/ Resistance Values

TEMPERATURE (F)	RESISTANCE (ohms)
–58	200,250
–40	100,680
–22	53,010
–4	29,091
14	16,590
32	9,795
50	5,970
68	3,747
77	3,000
86	2,416
104	1,597
122	1,080
140	746
158	525
176	376
185	321
194	274
212	203
230	153
248	116
257	102
266	89
284	70
302	55

Economizer Control Modes

Determine the economizer control mode before set up of the control. Some modes of operation may require different sensors. Refer to Table 7. The economizer is supplied from the factory with a supply–air temperature sensor and an outdoor– air temperature sensor. This allows for operation of the economizer with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the economizer and unit.

Outdoor Dry Bulb Changeover

The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. The outdoor air and supply air temperature sensors are included as standard. For this control mode, the outdoor temperature is compared to an adjustable set point selected on the control. If the outdoor-air temperature is above the set point, the economizer will adjust the outdoor-air dampers to minimum position. If the outdoor-air temperature is below the set point, the position of the outdoor-air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the LED next to the free cooling set point potentiometer will be on. The changeover temperature set point is controlled by the free cooling set point potentiometer located on the control. See Fig. 21. The scale on the potentiometer is A, B, C, and D. See Fig. 22 for the corresponding temperature changeover values.

Table 7 – ECONOMIZER SENSOR USAGE

APPLICATION	ECONOMIZER WITH OUTDOOR AIR DRY BULB SENSOR	ECONOMIZER WITH SINGLE ENTHALPY SENSOR
	Accessories Required	Accessories Required
Outdoor Air Dry Bulb	None. The outdoor air dry bulb sensor is factory installed.	DNTEMPSN002A00*
Differential Dry Bulb	DNTEMPSN002A00*	(2) DNTEMPSN002A00*
Single Enthalpy	HH57AC078	None. The single enthalpy sensor is factory installed.
Differential Enthalpy	HH57AC078 and DNENTDIF004A00*	DNENTDIF004A00*

*DNENTDIF004A00 and DNTEMPSN002A00 accessories are used on many different base units. As such, these kits may contain parts that will not be needed for installation.

†33ZCSENCO2 is an accessory CO_2 sensor.

**33ZCASPCO2 is an accessory aspirator box required for duct−mounted applications.

Differential Dry Bulb Control

For differential dry bulb control the standard outdoor dry bulb sensor is used in conjunction with an additional accessory return air sensor (part number DNTEMPSN002A00). The accessory sensor must be mounted in the return airstream. See Fig. 23.

In this mode of operation, the outdoor-air temperature is compared to the return-air temperature and the lower temperature airstream is used for cooling. When using this mode of changeover control, turn the free cooling/enthalpy set point potentiometer fully clockwise to the D setting. See Fig. 21.

Outdoor Enthalpy Changeover

For enthalpy control, accessory enthalpy sensor (part number HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 18. When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the economizer controller. The set points are A, B, C, and D. See Fig. 24. The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on the economizer controller. See Fig. 20 and 25.

FIGURE 21 Economizer Controller Potentiometer and LED Locations

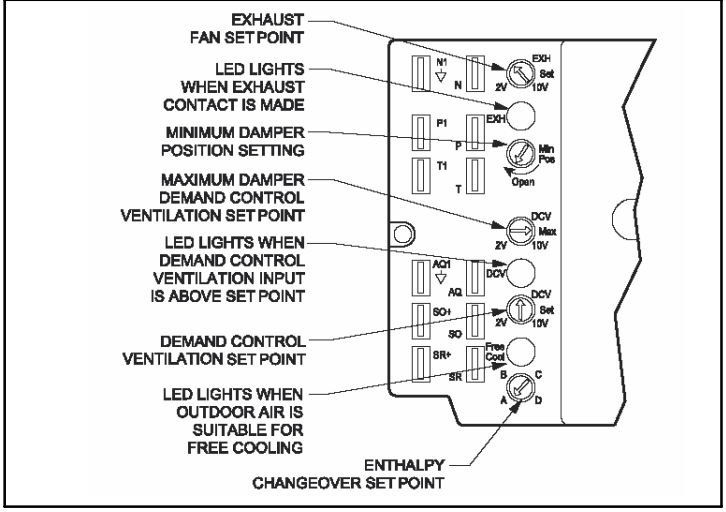


FIGURE 22 Outdoor Air Temperature Changeover Set Points

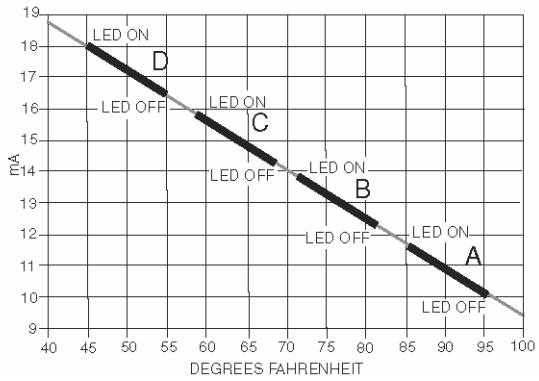
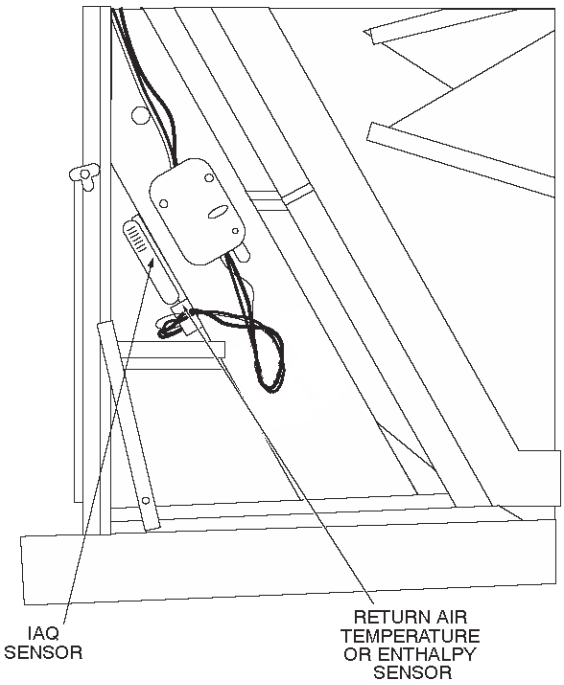


FIGURE 23 Return Air Temperature or Enthalpy Sensor Mounting Location



Differential Enthalpy Control

For differential enthalpy control, the economizer controller uses two enthalpy sensors (HH57AC078 and CRENTDIF004A00), one in the outside air and one in the return airstream on the economizer frame. The economizer controller compares the outdoor air enthalpy to the return air enthalpy to determine economizer use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air and is below the set point, the economizer opens to bring in outdoor air for free cooling.

Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 18. Mount the return air enthalpy sensor in the return airstream. See Fig. 23. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the economizer controller. When using this mode of changeover control, turn the enthalpy set point potentiometer fully clockwise to the D setting.

NOTE: Remove 620-ohm resistor if differential enthalpy sensor is installed.

Indoor Air Quality (IAQ) Sensor Input

The IAQ input can be used for demand control ventilation control based on the level of CO_2 measured in the space or return air duct.

Mount the accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user-determined set point. See Fig. 26.

If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the economizer control board will be damaged.

Exhaust Set Point Adjustment

The exhaust set point will determine when the exhaust fan runs based on damper position (if accessory power exhaust is installed). The set point is modified with the Exhaust Fan Set Point (EXH SET) potentiometer. See Fig. 21. The set point represents the damper position above which the exhaust fan will be turned on. When there is a call for exhaust, the economizer controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

Minimum Position Control

There is a minimum damper position potentiometer on the economizer controller. See Fig. 21. The minimum damper position maintains the minimum airflow into the building during the occupied period.

When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compound) ventilation requirements. The maximum demand ventilation position is used for fully occupied ventilation.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise.

Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10° F temperature difference between the outdoor and return-air temperatures.

FIGURE 24 **Enthalpy Changeover Settings**

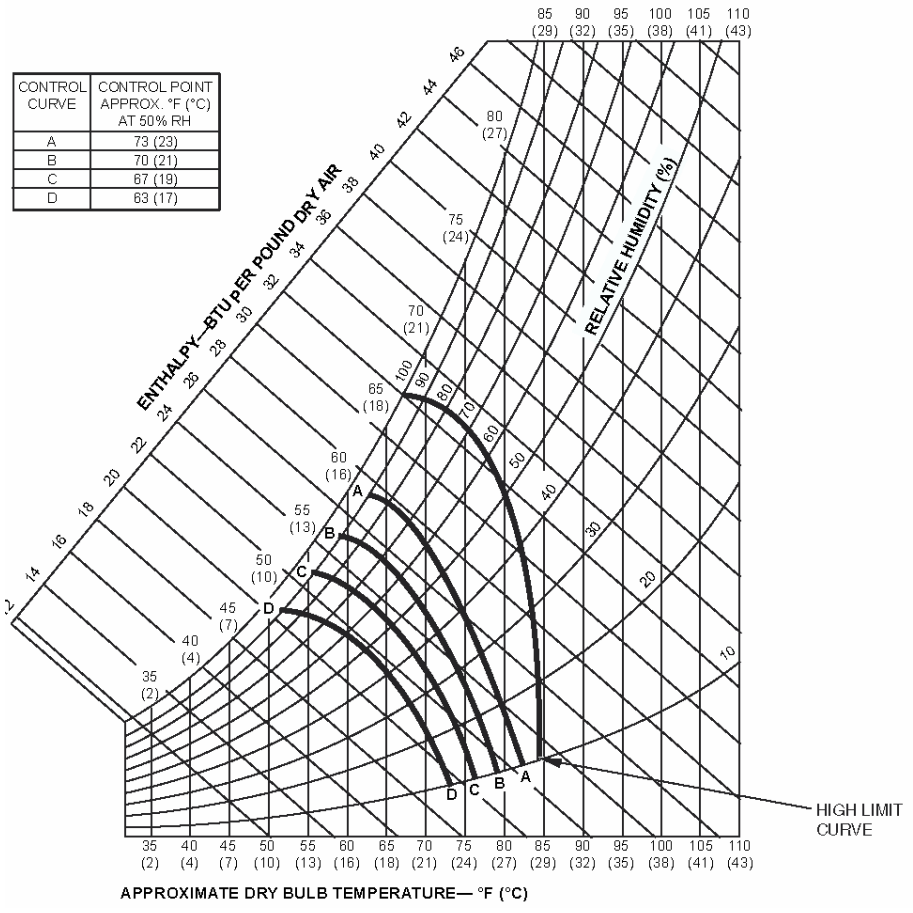


FIGURE 25 **Economizer Control**

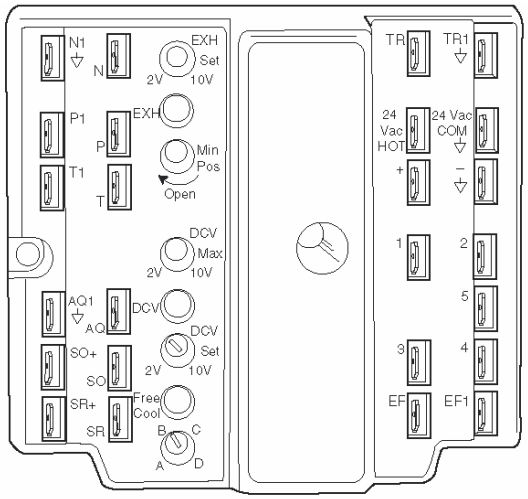
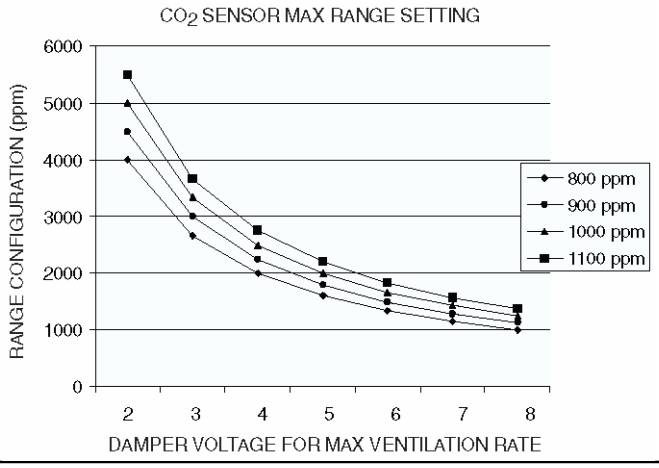


FIGURE 26 **CO_2 Sensor Maximum Range Setting**



To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed-air temperature using the following formula:

$$(T_O \times \frac{OA}{100}) + (TR \times \frac{RA}{100}) = T_M$$

T_O = Outdoor-Air Temperature
OA = Percent of Outdoor Air
T_R = Return-Air Temperature
RA = Percent of Return Air
T_M = Mixed-Air Temperature

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60 F, and return-air temperature is 75 F.

(60 x .10) + (75 x .90) = 73.5 F

2. Disconnect the supply-air sensor from terminals T and T1.
3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 20 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured mixed-air temperature matches the calculated value.
6. Reconnect the supply-air sensor to terminals T and T1.

Remote control of the economizer damper is desirable when requiring additional temporary ventilation. If a field-supplied remote potentiometer (Honeywell part number S963B1128) is wired to the economizer controller, the minimum position of the damper can be controlled from a remote location.

To control the minimum damper position remotely, remove the factory-installed jumper on the P and P1 terminals on the economizer controller. Wire the field-supplied potentiometer to the P and P1 terminals on the economizer controller. See Fig. 25.

Damper Movement

Damper movement from full open to full closed (or vice versa) takes $2^1/_2$ minutes.

Thermostats

The economizer control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The economizer control does not support space temperature sensors. Connections are made at the thermostat terminal connection board located in the main control box.

Occupancy Control

The factory default configuration for economizer control is occupied mode. This is implemented by the RED jumper at TB2-9 to TB2-10. When unoccupied mode is desired, remove the RED jumper and install a field-supplied timeclock function between TB2-9 and TB2-10. When the timeclock contacts are closed, the economizer control will be in occupied mode. When the timeclock contacts are open (removing the 24-v signal from terminal N), the economizer will be in unoccupied mode.

Demand Controlled Ventilation (DCV)

When using the economizer for demand controlled ventilation, there are some equipment selection criteria which should be considered. When selecting the heat capacity and cool capacity of the equipment, the maximum ventilation rate must be evaluated for design conditions. The maximum damper position must be calculated to provide the desired fresh air.

Typically the maximum ventilation rate will be about 5 to 10% more than the typical cfm required per person, using normal outside air design criteria.

A proportional anticipatory strategy should be taken with the following conditions: a zone with a large area, varied occupancy, and equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy. A proportional-anticipatory strategy will cause the fresh air supplied to increase as the room CO_2 level increases even though the CO_2 set point has not been reached. By the time the CO_2 level reaches the set point, the damper will be at maximum ventilation and should maintain the set point.

In order to have the CO_2 sensor control the economizer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The following equation may be used to determine the percent of outside-air entering the building for a given damper position. For best results there should be at least a 10 degree difference in outside and return-air temperatures.

$$(T_O \times \frac{OA}{100}) + (TR \times \frac{RA}{100}) = T_M$$

T_O = Outdoor-Air Temperature
OA = Percent of Outdoor Air
T_R = Return-Air Temperature
RA = Percent of Return Air
T_M = Mixed-Air Temperature

Once base ventilation has been determined, set the minimum damper position potentiometer to the correct position.

The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 cfm per person). Use Fig. 26 to determine the maximum setting of the CO_2 sensor. For example, a 1100 ppm set point relates to a 15 cfm per person design. Use the 1100 ppm curve on Fig. 26 to find the point when the CO_2 sensor output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the CO_2 sensor should be 1800 ppm. The economizer controller will output the 6.7 volts from the CO_2 sensor to the actuator when the CO_2 concentration in the space is at 1100 ppm. The DCV set point may be left at 2 volts since the CO_2 sensor voltage will be ignored by the economizer controller until it rises above the 3.6 volt setting of the minimum position potentiometer.

Once the fully occupied damper position has been determined, set the maximum damper demand control ventilation potentiometer to this position. Do not set to the maximum position as this can result in over-ventilation to the space and potential high-humidity levels.

CO $_2$ Sensor Configuration

The CO_2 sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. See Table 8.

Use setting 1 or 2 for equipment. See Table 8.

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. See Table 8.
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

The custom settings of the CO_2 sensor can be changed anytime after the sensor is energized. Follow the steps below to change the non-standard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to toggle to the NONSTD menu and press Enter.
4. Use the Up/Down button to toggle through each of the nine variables, starting with Altitude, until the desired setting is reached.
5. Press Mode to move through the variables.
6. Press Enter to lock in the selection, then press Mode to continue to the next variable.

Dehumidification of Fresh Air with DCV Control

Information from ASHRAE indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, a field-supplied energy recovery unit can be added to reduce the moisture content of the fresh air being brought into the building when the enthalpy is high. In most cases, the normal heating and cooling processes are more than adequate to remove the humidity loads for most commercial applications.

If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.

Table 8 – CO_2 Sensor Standard Settings

Setting	Equipment	Output	Ventilation Rate (cfm/Person)	Analog Output	CO_2 Control Range (ppm)	Optional Relay Setpoint (ppm)	Relay Hysteresis (ppm)
1	Interface w/Standard Building Control System	Proportional	Any	0–10V 4–20 mA	0–2000	1000	50
2		Proportional	Any	2–10V 7–20 mA	0–2000	1000	50
3		Exponential	Any	0–10V 4–20 mA	0–2000	1100	50
4	Economizer	Proportional	15	0–10V 4–20 mA	0–1100	1100	50
5		Proportional	20	0–10V 4–20 mA	0–900	900	50
6		Exponential	15	0–10V 4–20 mA	0–1100	1100	50
7		Exponential	20	0–10V 4–20 mA	0–900	900	50
8	Health & Safety	Proportional	—	0–10V 4–20 mA	0–9999	5000	500
9	Parking/Air Intakes/ Loading Docks	Proportional	—	0–10V 4–20 mA	0–2000	700	50

START-UP

Use the following information and Start-Up Checklist on last page to check out unit PRIOR to start-up.

UNIT PREPARATION

Check that unit has been installed in accordance with these installation instructions and all applicable codes.

INTERNAL WIRING

Check all electrical connections in unit control boxes; tighten as required.

CRANKCASE HEATER

Crankcase heater(s) is energized as long as there is power to the unit and the compressor is not operating.

IMPORTANT: Unit power must be on for 24 hours prior to start-up. Otherwise, damage to compressor may result.

COMPRESSOR MOUNTING

Compressors are internally spring mounted. Do not loosen or remove compressor holddown bolts.

REFRIGERANT SERVICE PORTS

Each refrigerant system has a total of 3 Schrader-type service gage ports. One port is located on the suction line, one on the compressor discharge line, and one on the liquid line. In addition, Schrader-type valves are located underneath the low-pressure switches. Be sure that caps on the ports are tight.

COMPRESSOR ROTATION

It is important to be certain the compressors are rotating in the proper direction. To determine whether or not compressors are rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Note that the evaporator fan is probably also rotating in the wrong direction.
2. Turn off power to the unit.
3. Reverse any two of the incoming power leads.
4. Turn on power to the compressor.

The suction and discharge pressure levels should now move to their normal start-up levels.

NOTE: When compressors are rotating in the wrong direction, the unit will have increased noise levels and will not provide heating and cooling.

After a few minutes of reverse operation, the scroll compressor internal overload protection will open, which will activate the unit's lockout and requires a manual reset. Reset is accomplished by turning the thermostat on and off.

EVAPORATOR FAN

Fan belt and variable pulleys are factory installed. Remove tape from the fan pulley. See Table 9 for air quantity limits. See Tables 10-13 for fan performance data. Be sure that fans rotate in the proper direction. See Table 14 for static pressure information for accessories and options. See Table 15 for fan rpm at various fan motor pulley settings. For evaporator fan motor performance, see Tables 16 and 17. To alter fan performance, see Evaporator-Fan Performance Adjustment section.

NOTE: A $3^1/_2$-in. bolt and threaded plate are included in the installer's packet. They can be added to the motor support channel below the motor mounting plate to aid in raising the fan motor.

CONDENSER-FANS AND MOTORS

Condenser fans and motors are factory set. Refer to Condenser-Fan Adjustment section as required. Be sure that fans rotate in the proper direction.

RETURN-AIR FILTERS

Check that correct filters are installed in filter tracks (see Table 1). Do not operate unit without return-air filters.

OUTDOOR-AIR INLET SCREENS

Outdoor-air inlet screens must be in place before operating unit.

Table 9 — Air Quantity Limits

UNIT PAE	MINIMUM AIRFLOW (cfm)	MAXIMUM AIRFLOW (cfm)
180	4500	7,500
210	5400	9,000
240	6000	10,000
300	7000	11,250

Table 10 — Fan Performance — PAE180*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2			0.4			0.6			0.8			1.0			1.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
4500	753	1.53	1307	753	1.53	1307	784	1.64	1397	859	1.92	1635	928	2.20	1880	993	2.50	2133
4800	747	1.62	1384	747	1.62	1384	806	1.83	1563	878	2.12	1808	946	2.42	2060	1009	2.72	2319
5100	741	1.72	1465	752	1.76	1500	828	2.05	1745	898	2.34	1996	964	2.65	2255	1026	2.96	2521
5700	735	1.95	1659	805	2.22	1895	876	2.53	2156	942	2.84	2423	1004	3.16	2696	1064	3.49	2975
6000	759	2.18	1854	832	2.48	2118	901	2.80	2388	965	3.12	2663	1026	3.45	2943	1083	3.79	3228
6300	790	2.45	2088	860	2.77	2360	926	3.09	2638	988	3.43	2920	1048	3.76	3208	1104	4.11	3501
6600	821	2.74	2340	888	3.07	2621	952	3.41	2906	1013	3.75	3196	1070	4.10	3491	1125	4.45	3791
6900	852	3.06	2611	917	3.40	2900	979	3.75	3194	1038	4.10	3492	1094	4.45	3794	1147	4.81	4101
7200	883	3.40	2903	946	3.75	3200	1006	4.11	3501	1063	4.47	3807	1118	4.83	4117	1170	5.20	4431
7500	914	3.77	3215	975	4.13	3521	1033	4.49	3830	1089	4.86	4143	1142	5.23	4461	1193	5.61	4781

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	1.4			1.6			1.8			2.0			2.2			2.4		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
4500	1055	2.81	2394	1114	3.12	2662	1170	3.45	2938	1224	3.78	3220	1276	4.12	3509	1326	4.46	3805
4800	1070	3.03	2585	1127	3.35	2859	1183	3.68	3139	1236	4.02	3427	1287	4.36	3721	1336	4.72	4020
5100	1086	3.28	2794	1142	3.60	3073	1196	3.94	3359	1248	4.28	3650	1299	4.63	3949	1347	4.99	4253
5700	1120	3.82	3260	1174	4.17	3551	1226	4.51	3848	1277	4.87	4151	1325	5.23	4458	1373	5.60	4772
6000	1139	4.13	3520	1192	4.48	3817	1243	4.83	4119	1292	5.19	4427	1340	5.56	4741	1387	5.93	5060
6300	1158	4.46	3799	1210	4.81	4102	1260	5.17	4410	1309	5.54	4724	1356	5.91	5043	—	—	—
6600	1178	4.80	4095	1229	5.17	4405	1278	5.54	4720	1326	5.91	5039	—	—	—	—	—	—
6900	1199	5.18	4412	1249	5.55	4728	1297	5.92	5050	—	—	—	—	—	—	—	—	—
7200	1221	5.57	4749	1270	5.95	5072	—	—	—	—	—	—	—	—	—	—	—	—
7500	1243	5.99	5107	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)											
	2.6			2.8			3.0			3.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
4500	1375	4.82	4107	1421	5.18	4414	1467	5.55	4728	1511	5.92	5047
4800	1384	5.07	4326	1430	5.44	4638	1475	5.81	4955	—	—	—
5100	1395	5.35	4563	1440	5.72	4879	—	—	—	—	—	—
5700	1418	5.97	5091	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—	—	—
6300	—	—	—	—	—	—	—	—	—	—	—	—
6600	—	—	—	—	—	—	—	—	—	—	—	—
6900	—	—	—	—	—	—	—	—	—	—	—	—
7200	—	—	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Watts — Input Watts to Motor

*Standard low-medium static drive range is 873 to 1021 rpm. Alternate high-static drive range is 1025 to 1200. Other rpms require a field-supplied drive.

Refer to general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 6.13. The maximum continuous watts is 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.

Table 11 — Fan Performance — PAE210*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																	
	0.2			0.4			0.6			0.8			1.0			1.2		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
5,500	682	1.99	1675	760	2.29	1922	832	2.59	2177	901	2.90	2441	965	3.22	2712	1027	3.56	2990
6,000	730	2.38	2005	802	2.68	2257	871	2.99	2516	935	3.31	2783	997	3.63	3057	1056	3.97	3337
6,500	778	2.82	2373	846	3.13	2630	911	3.44	2893	972	3.76	3164	1031	4.09	3440	1087	4.43	3722
7,000	828	3.31	2780	892	3.62	3042	953	3.94	3310	1011	4.26	3583	1067	4.59	3863	1121	4.93	4148
7,500	878	3.84	3227	938	4.15	3494	996	4.48	3766	1051	4.81	4043	1105	5.14	4326	1156	5.49	4613
8,000	928	4.42	3715	985	4.74	3986	1040	5.07	4263	1093	5.40	4544	1144	5.74	4830	1194	6.09	5120
8,500	979	5.05	4245	1033	5.38	4521	1085	5.71	4801	1136	6.05	5086	1185	6.39	5375	1232	6.74	5669
9,000	1030	5.73	4817	1082	6.06	5098	1131	6.40	5382	1180	6.74	5671	1227	7.09	5964	1272	7.44	6260
9,500	1082	6.46	5433	1131	6.80	5718	1178	7.14	6007	1225	7.49	6299	1270	7.84	6595	1313	8.20	6895
10,000	1134	7.25	6093	1180	7.59	6382	1226	7.94	6675	1270	8.29	6971	1313	8.65	7271	1356	9.01	7574

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.4			1.6			1.8			1.9			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
5,500	1086	3.89	3275	1142	4.24	3567	1197	4.59	3864	1223	4.77	4015	1249	4.96	4167
6,000	1112	4.31	3623	1167	4.66	3915	1219	5.01	4213	1245	5.19	4364	1270	5.37	4516
6,500	1142	4.77	4010	1194	5.12	4304	1245	5.47	4602	1270	5.65	4754	1294	5.83	4906
7,000	1173	5.28	4438	1224	5.63	4733	1273	5.98	5033	1296	6.17	5184	1320	6.35	5337
7,500	1207	5.83	4906	1255	6.19	5203	1302	6.55	5504	1326	6.73	5657	1348	6.91	5810
8,000	1242	6.44	5415	1289	6.80	5714	1334	7.16	6018	1357	7.34	6171	1379	7.52	6325
8,500	1279	7.10	5966	1324	7.45	6268	1368	7.82	6573	1389	8.00	6728	1411	8.18	6883
9,000	1317	7.80	6561	1360	8.16	6865	1403	8.53	7173	1424	8.71	7328	1445	8.90	7484
9,500	1356	8.56	7198	1398	8.93	7505	1440	9.29	7815	1460	9.48	7972	1480	9.67	8129
10,000	1397	9.37	7881	1438	9.74	8190	1477	10.11	8503	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Watts — Input Watts to Motor

*Standard low-medium static drive range is 910 to 1095 rpm. Alternate high-static drive range is 1069 to 1287. Other rpms require a field-supplied drive.

Refer to general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 5.9. The maximum continuous watts is 5180. Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.

Table 12 — Fan Performance — PAE240*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
6,000	753	2.83	2385	816	3.06	2579	884	3.33	2807	949	3.61	3040	1010	3.89	3277
6,500	793	3.25	2738	861	3.51	2959	925	3.78	3186	987	4.05	3418	1045	4.33	3653
7,000	844	3.74	3151	908	4.00	3372	968	4.27	3598	1026	4.54	3828	1082	4.82	4062
7,500	895	4.27	3596	955	4.53	3817	1013	4.80	4042	1068	5.07	4271	1121	5.34	4504
8,000	947	4.83	4073	1004	5.09	4294	1058	5.36	4518	1111	5.63	4747	1162	5.91	4978
8,500	999	5.44	4583	1053	5.70	4803	1105	5.96	5027	1155	6.23	5255	1204	6.51	5485
9,000	1052	6.08	5125	1103	6.34	5345	1152	6.61	5569	1200	6.88	5796	1247	7.15	6025
9,500	1105	6.76	5699	1153	7.02	5919	1200	7.29	6142	1246	7.56	6369	1291	7.83	6598
10,000	1158	7.48	6306	1204	7.74	6526	1249	8.01	6750	1293	8.27	6975	1336	8.55	7203

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	1.2			1.4			1.6			1.8			2.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
6,000	1069	4.17	3517	1125	4.46	3761	1180	4.75	4006	1232	5.05	4255	1283	5.35	4506
6,500	1102	4.62	3891	1156	4.90	4132	1208	5.19	4377	1259	5.48	4623	1308	5.78	4871
7,000	1136	5.10	4299	1188	5.38	4538	1239	5.67	4780	1288	5.96	5025	1335	6.25	5271
7,500	1173	5.62	4739	1223	5.90	4977	1272	6.19	5217	1319	6.48	5460	1365	6.77	5705
8,000	1211	6.18	5212	1259	6.46	5449	1306	6.75	5688	1352	7.03	5929	1396	7.32	6172
8,500	1251	6.78	5718	1297	7.06	5954	1342	7.35	6192	1386	7.63	6431	1429	7.92	6673
9,000	1292	7.42	6257	1337	7.70	6492	1380	7.98	6729	1423	8.27	6967	1464	8.55	7207
9,500	1335	8.10	6830	1377	8.38	7063	1419	8.66	7299	1460	8.94	7536	1501	9.22	7776
10,000	1378	8.82	7434	1419	9.10	7667	1460	9.37	7902	1499	9.65	8138	1538	9.94	8377

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	2.2			2.4			2.6			2.8			3.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
6,000	1332	5.65	4750	1380	5.95	5015	1427	6.25	5272	1472	6.56	5531	1517	6.87	5793
6,500	1356	6.08	5122	1402	6.38	5375	1447	6.68	5630	1492	6.98	5886	1535	7.29	6144
7,000	1381	6.55	5519	1427	6.84	5770	1471	7.14	6022	1514	7.45	6276	—	—	—
7,500	1409	7.06	5951	1453	7.35	6199	1496	7.65	6449	1538	7.95	6701	—	—	—
8,000	1440	7.61	6417	1482	7.90	6663	1523	8.20	6911	—	—	—	—	—	—
8,500	1471	8.20	6916	1513	8.49	7161	—	—	—	—	—	—	—	—	—
9,000	1505	8.84	7449	1545	9.13	7693	—	—	—	—	—	—	—	—	—
9,500	1540	9.51	8016	—	—	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Watts — Input Watts to Motor

*Standard low-medium static drive range is 1002 to 1151 rpm. Alternate high-static drive range is 1193 to 1369. Other rpms require a field-supplied drive.

Refer to general Fan Performance Data notes.

NOTE: Maximum continuous bhp for the standard motor is 8.7 (for 208/230-v units) and 9.5 (for 460-v units). The maximum continuous watts is 7915 (for 208/230-v units) and 8640 (for 460-v units). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm. See Table 24 for additional information.

Table 13 — Fan Performance — PAE300*

Airflow (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)														
	0.2			0.4			0.6			0.8			1.0		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
7,000	845	3.26	2693	909	3.60	2979	969	3.96	3272	1028	4.32	3574	1083	4.70	3883
7,500	896	3.82	3156	956	4.17	3450	1014	4.54	3752	1069	4.91	4060	1123	5.29	4375
8,000	948	4.43	3667	1005	4.80	3969	1060	5.17	4278	1112	5.56	4593	1163	5.94	4915
8,500	1001	5.11	4226	1054	5.49	4537	1106	5.87	4853	1156	6.26	5175	1205	6.66	5504
9,000	1053	5.85	4836	1104	6.23	5155	1154	6.63	5478	1202	7.02	5808	1248	7.43	6142
9,500	1106	6.65	5498	1155	7.04	5824	1202	7.44	6155	1248	7.85	6492	1293	8.26	6833
10,000	1159	7.52	6214	1206	7.92	6547	1251	8.33	6886	1295	8.74	7229	1338	9.16	7577
10,500	1213	8.45	6984	1257	8.86	7325	1300	9.28	7671	1342	9.70	8020	1384	10.13	8375
11,000	1266	9.45	7810	1309	9.87	8159	1350	10.29	8511	1391	10.73	8868	1431	11.16	9229
11,250	1293	9.97	8245	1334	10.40	8597	1375	10.83	8953	1415	11.26	9313	1454	11.70	9677

Airflow (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)											
	1.2			1.4			1.6			1.8		
	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts	Rpm	Bhp	Watts
7,000	1137	5.08	4,200	1189	5.47	4,524	1239	5.87	4,854	1288	4.91	5191
7,500	1174	5.68	4,698	1224	6.08	5,026	1272	6.48	5,362	1320	5.56	5703
8,000	1213	6.34	5,243	1261	6.75	5,577	1307	7.16	5,917	1353	6.26	6263
8,500	1253	7.06	5,838	1299	7.47	6,177	1344	7.89	6,523	1388	7.02	6873
9,000	1294	7.84	6,483	1338	8.26	6,828	1382	8.68	7,179	1424	7.85	7534
9,500	1336	8.68	7,179	1379	9.11	7,530	1421	9.54	7,887	1462	8.74	8247
10,000	1380	9.59	7,929	1421	10.02	8,286	1461	10.46	8,648	1501	9.70	9014
10,500	1424	10.56	8,733	1464	11.00	9,096	1503	11.45	9,464	1541	10.73	9835
11,000	1470	11.60	9,594	1508	12.05	9,963	1546	12.50	10,336	—	—	—
11,250	1493	12.15	10,045	1530	12.60	10,417	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

Watts — Input Watts to Motor

***Standard low-medium static drive range is 1066 to 1283 rpm. Alternate high-static drive range is 1332 to 1550. Other rpms require a field-supplied drive.

Refer to general Fan Performance Data notes.

NOTE: Maximum continuous bhp is 10.20 (208/230 v) or 11.80 (460 v) and the maximum continuous watts are 9510 (208/230 v) or 11,000 (460 v). Do not adjust motor rpm such that motor maximum bhp and/or watts is exceeded at the maximum operating cfm.

GENERAL NOTES FOR FAN PERFORMANCE DATA TABLES

1. Static pressure losses (i.e., economizer) must be added to external static pressure before entering Fan Performance table.
2. Interpolation is permissible. Do not extrapolate.
3. Fan performance is based on wet coils, clean filters, and casing losses. See Table 14 for Accessory/FIOP Static Pressure information.
4. Extensive motor and drive testing on these units ensures that the full horsepower and watts range of the motor can be utilized with confidence. Using fan motors up to the watts or bhp rating shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Use of a field-supplied motor may affect wire size.

Table 14 — Accessory/FIOP Static Pressure (in. wg) — PAE180-300

COMPONENT		CFM					
		5400	6000	7200	9000	10,000	11,250
Economizer		0.06	0.07	0.09	0.11	0.12	0.14
Electric Heat (kW)	26/34	0.08	0.09	0.11	0.15	0.17	0.20
	32	0.08	0.09	0.11	0.15	0.17	0.20
	42/56	0.11	0.12	0.15	0.19	0.21	0.24
	55	0.11	0.12	0.15	0.19	0.21	0.24
	56/75	0.14	0.15	0.20	0.24	0.26	0.29
	80	0.14	0.15	0.20	0.24	0.26	0.29

LEGEND

FIOP — Factory-Installed Option

NOTES: The static pressure must be added to external static pressure. The sum and the evaporator entering-air cfm should then be used in conjunction with the Fan Performance table to determine blower rpm, bhp, and watts.

Table 15 — Fan Rpm at Motor Pulley Settings*

UNIT PAE	MOTOR PULLEY TURNS OPEN												
	0	1/2	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
180†	††	††	††	††	1021	1002	984	965	947	928	910	891	873
180**	††	††	††	††	1200	1178	1156	1134	1112	1091	1069	1047	1025
210†	††	††	1095	1077	1058	1040	1021	1002	984	965	947	928	910
210**	††	††	1287	1265	1243	1222	1200	1178	1156	1134	1112	1091	1069
240†	††	††	††	††	1151	1132	1114	1095	1077	1058	1040	1021	1002
240**	††	††	††	††	1369	1347	1325	1303	1281	1259	1237	1215	1193
300†	††	††	1283	1269	1247	1225	1203	1182	1160	1138	1116	1095	1066
300**	††	††	††	††	1551	1524	1497	1470	1443	1415	1388	1361	1332

*Approximate fan rpm shown
†Indicates standard drive package.
**Indicates alternate drive package.
††Due to belt and pulley size, pulley cannot be set to this number of turns open.

Table 16— Evaporator-Fan Motor Data

UNIT PAE	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP	MAXIMUM ACCEPTABLE CONTINUOUS BkW*	MAXIMUM ACCEPTABLE OPERATING WATTS	MAXIMUM AMP DRAW
180	208/230	6.13	4.57	5,180	15.8
	460				7.9
210	208/230	5.90	4.40	5,180	15.8
	460				7.9
240	208/230	8.70	6.59	7,915	22.0
	460	9.50	7.08	8,640	13.0
300	208/230	10.20	7.61	9,510	28.0
	460	11.80	8.80	11,000	14.6

LEGEND

BHP — Brake Horsepower

BkW — Brake Kilowatts

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

NOTE: All indoor-fan motors 5 hp and larger meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT) effective October 24, 1997.

Table 17 — Evaporator-Fan Motor Efficiency

UNIT PAE	MOTOR EFFICIENCY (%)
5 Hp	87.5
7.5 Hp	88.5
10 Hp	89.5

OPERATING SEQUENCE

Cooling, Units Without Economizer

When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC), outdoor fan contactor (OFC), and compressor contactor no. 1 (C1) are energized and evaporator-fan motor, condenser fans and compressor no. 1 start. The condenser-fan motors run continuously while unit is cooling. If 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 (If Optional or Accessory Heater is Installed)

Upon a call for heating through terminal W1, IFC and heater contactor no. 1 (HC1) are energized. On units equipped for 2 stages of heat, when additional heat is needed HC2 is energized through W2.

Cooling, Units With Economizer

When free cooling is not available, the compressors will be controlled by the zone thermostat. When free cooling is available, the outdoor-air damper is modulated by the Economizer control to provide a 50 to 55 F supply-air temperature into the zone. As the supply-air temperature fluctuates above 55 or below 50 F, the dampers will be modulated (open or close) to bring the supply-air temperature back within set point limits.

For Economizer operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position during the occupied mode.

Above 50 F supply-air temperature, the dampers will modulate from 100% open to the minimum open position. From 50 F to 45 F supply-air temperature, the dampers will maintain at the minimum open position. Below 45 F the dampers will be completely shut. As the supply-air temperature rises, the dampers will come back open to the minimum open position once the supply-air temperature rises to 48 F.

If optional power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized.

If field-installed accessory CO_2 sensors are connected to the Economizer control, a demand controlled ventilation strategy will begin to operate. As the CO_2 level in the zone increases above the CO_2 set point, the minimum position of the damper will be increased proportionally. As the CO_2 level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. Damper position will follow the higher demand condition from DCV mode or free cooling mode.

Damper movement from full closed to full open (or vice versa) will take between $1^1/_2$ and $2^1/_2$ minutes.

If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the control to modulate the dampers open to maintain the supply air temperature set point at 50 to 55 F.

As the supply-air temperature drops below the set point range of 50 to 55 F, the control will modulate the outdoor-air dampers closed to maintain the proper supply-air temperature.

Heating, Units With Economizer

When the room thermostat calls for heat, the heating controls are energized as described in the Heating, Units Without Economizer section. When the indoor fan is energized, the economizer damper moves to the minimum position. When the indoor fan is off, the economizer damper is fully closed.

SERVICE

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Before installing or servicing system, always turn off power supply to unit and install lockout tag. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable.

CLEANING

Inspect unit interior at beginning of each heating and cooling season and as operating conditions require. Remove unit top panel and/or side panels for access to unit interior.

Evaporator Coil

Clean as required with commercial coil cleaner.

NOTE:The PAE300 unit has a mist eliminator screen attached to the evaporator coil to prevent condensate runoff at high wet-bulb conditions. Check periodically and clean as necessary.

Condenser Coil

Clean condenser coil annually and as required by location and outdoor-air conditions. Inspect coil monthly — clean as required.

Condensate Drain

Check and clean each year at start of cooling season. In winter, keep drains and traps dry.

Filters

Clean or replace at start of each heating and cooling season, or more often if operating conditions require. Refer to Table 1 for type and size.

The PAE300 unit requires industrial grade throwaway filters capable of withstanding face velocities up to 625 fpm. Ensure that replacement filters for the PAE300 units are rated for 625 fpm.

Outdoor-Air Inlet Screens

Clean screens with steam or hot water and a mild detergent. Do not use throwaway filters in place of screens.

LUBRICATION

Compressors

Each compressor is charged with the correct amount of oil at the factory. Conventional white oil (Sontex 200LT) is used. White oil is compatible with 3GS oil, and 3GS oil may be used if the addition of oil is required. See compressor nameplate for original oil charge. A complete recharge should be four ounces less than the original oil charge. When a compressor is exchanged in the field it is possible that a major portion of the oil from the replaced compressor may still be in the system. While this will not affect the reliability of the replacement compressor, the extra oil will add rotor drag and increase power usage. To remove this excess oil, an access valve may be added to the lower portion of the suction line at the inlet of the compressor. The compressor should then be run for 10 minutes, shut down and the access valve opened until no oil flows. This should be repeated twice to make sure the proper oil level has been achieved.

Fan Shaft Bearings

Lubricate bearings at least every 6 months with suitable bearing grease. Extended grease line is provided for far side fan bearing (opposite drive side). Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Mobil	Mobilplex EP No. 1
Sunoco	Prestige 42
Texaco	Multifak 2

*Preferred lubricant because it contains rust and oxidation inhibitors.

Condenser and Evaporator-Fan Motor Bearings

The condenser and evaporator-fan motors have permanently sealed bearings, so no field lubrication is necessary.

EVAPORATOR FAN PERFORMANCE ADJUSTMENT (Fig. 27 and 28)

Fan motor pulleys are factory set for speed shown in Table 1.

To change fan speeds:

1. Shut off unit power supply.
2. Loosen nuts on the 2 carriage bolts in the motor mounting base. Install jacking bolt and plate under motor base (bolt and plate are shipped in installer's packet). Using bolt and plate, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
3. Loosen movable-pulley flange setscrew (see Fig. 28).
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified in Table 1.

   See Table 9 for air quantity limits.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew. (See Table 1 for speed change for each full turn of pulley flange.)
6. Replace and tighten belts. See Belt Tension Adjustment section below.

To align fan and motor pulleys:

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft.
3. Make angular alignment by loosening motor from mounting plate.

EVAPORATOR FAN SERVICE AND REPLACEMENT

The PAE units use a fan motor mounting system that features a slide-out motor mounting plate. See Fig. 28. To replace or service the motor, slide out the bracket.

1. Remove the evaporator-fan access panel and the heating control access panel.
2. Remove the center post (located between the evaporator fan and heating control access panels) and all screws securing it.
3. Loosen nuts on the 2 carriage bolts in the motor mounting base.
4. Using jacking bolt under motor base, raise motor to top of slide and remove belt. Secure motor in this position by tightening the nuts on the carriage bolts.
5. Remove the belt drive.
6. Remove jacking bolt and tapped jacking bolt plate.
7. Remove the 2 screws that secure the motor mounting plate to the motor support channel.
8. Remove the 3 screws from the end of the motor support channel that interfere with the motor slide path.
9. Slide out the motor and motor mounting plate.
10. Disconnect wiring connections and remove the 4 mounting bolts.

FIGURE 27 | **Evaporator Fan Pulley Adjustment**

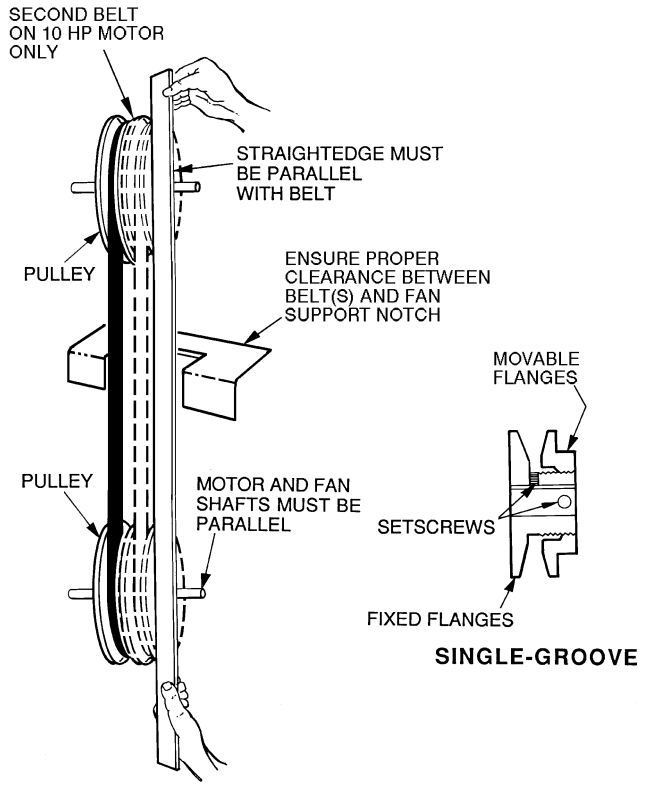
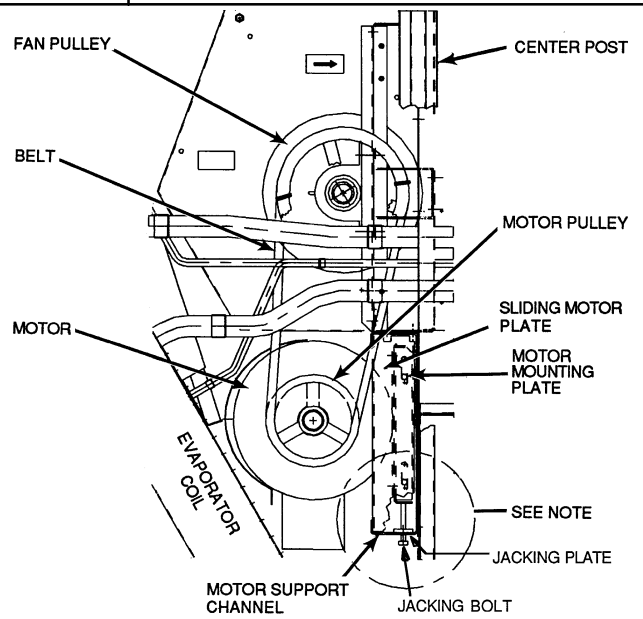


FIGURE 28 | **PAE180–300 Evaporator Fan Motor Section**



NOTE: A $3^1/_2$-in. bolt and threaded plate are included in the installer's packet. They should be added to the motor support channel below the motor mounting plate to aid in raising the motor. The plate part number is 50DP503842. The adjustment bolt is $^3/_8$-16 x $1^3/_4$-in. LG.

11. Remove the motor.
12. To install the new motor, reverse Steps 1-11.

BELT TENSION ADJUSTMENT

To adjust belt tension:

1. Loosen fan motor bolts.
2. Turn motor jacking bolt to move motor mounting plate up or down for proper belt tension ($^3/_8$ in. deflection at midspan with one finger [9 lb force]).
3. Tighten nuts.
4. Adjust bolts and nut on mounting plate to secure motor in fixed position.

CONDENSER-FAN ADJUSTMENT

PAE180, 210, 300 UNITS (Fig. 29)

1. Shut off unit power supply.
2. Remove access panel(s) closest to the fan to be adjusted.
3. Loosen fan hub setscrews.
4. Adjust fan height on shaft using a straightedge placed across the fan orifice.
5. Tighten setscrews and replace panel(s).
6. Turn on unit power.

PAE240 Units (Fig. 30)

1. Shut off unit power supply.
2. Remove fan top-grille assembly and loosen fan hub screws.
3. Adjust fan height on unit, using a straightedge placed across the fan orifice.
4. Tighten setscrews and replace rubber hubcap to prevent hub from rusting to motor shaft.
5. Fill hub recess with permagum if rubber hubcap is missing.

POWER FAILURE

Dampers have a spring return. In event of power failure, dampers will return to fully closed position until power is restored. *Do not manually operate economizer motor.*

REFRIGERANT CHARGE

Amount of refrigerant charge is listed on unit nameplate and in Table 1. Refer to GTAC II; Module 5; Charging, Recovery, Recycling, and Reclamation section for charging methods and procedures. Unit panels must be in place when unit is operating during charging procedure.

NOTE: Do not use recycled refrigerant as it may contain contaminants.

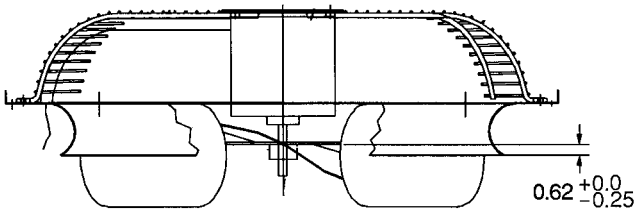
No Charge

Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant (refer to Table 1).

Low Charge Cooling

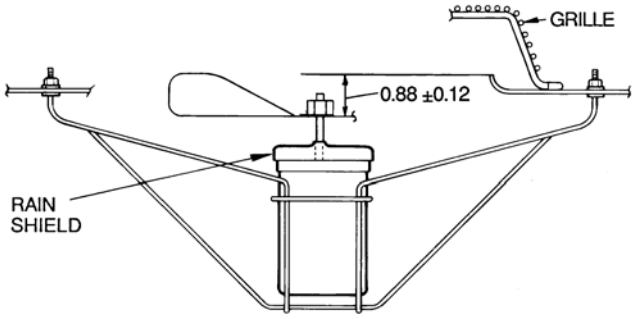
Using cooling charging chart (see Fig. 31), add or remove refrigerant until conditions of the chart are met. Note that charging chart is different from those normally used. An accurate pressure gage and temperature-sensing device is required. Charging is accomplished by ensuring the proper amount of liquid subcooling. Measure liquid line pressure at the liquid line service valve using pressure gage. Connect temperature sensing device to the liquid line near the liquid line service valve and insulate it so that outdoor ambient temperature does not affect reading.

FIGURE 29 | **Outdoor Fan Adjustment – PAE180, 210, 300**



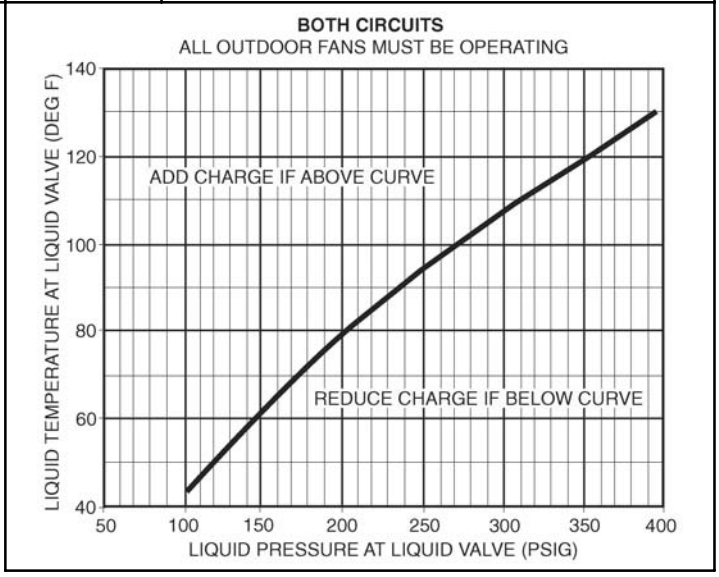
NOTE: Dimensions are in inches.

FIGURE 30 | **Outdoor Fan Adjustment – PAE240**



NOTE: Dimensions are in inches.

FIGURE 31 **Cooling Charging Chart**



To Use the Cooling Charging Chart

Use the above temperature and pressure readings, and find the intersection point on the cooling charging chart. If intersection point on chart is above line, add refrigerant. If intersection point on chart is below line, carefully recover some of the charge. Recheck suction pressure as charge is adjusted.

NOTE: Indoor-air cfm must be within normal operating range of unit. All outdoor fans must be operating.

The TXV (thermostatic expansion valve) is set to maintain between 15 and 20 degrees of superheat at the compressors. The valves are factory set and should not require re-adjustment.

FILTER DRIER

Replace whenever refrigerant system is exposed to atmosphere.

PROTECTIVE DEVICES

Compressor Protection

Overcurrent

Each compressor has internal line break motor protection.

Crankcase Heater

All units are equipped with a 70-watt crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. The crankcase heater is energized whenever there is main power to the unit and the compressor is not energized.

IMPORTANT: After prolonged shutdown or servicing, energize the crankcase heaters for 24 hours before starting the compressors.

Compressor Lockout

If any of the safeties (high-pressure, low-pressure, freeze protection thermostat, compressor internal thermostat) trip, or if there is loss of power to the compressors, the cooling lockout (CLO) will lock the compressors off. To reset, manually move the thermostat setting.

Evaporator Fan Motor Protection

A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

Condenser-Fan Motor Protection

Each condenser-fan motor is internally protected against overtemperature.

High and Low-Pressure Switches

If either switch trips, or if the compressor overtemperature switch activates, that refrigerant circuit will be automatically locked out by the CLO. To reset, manually move the thermostat setting.

Freeze Protection Thermostat (FPT)

An FPT is located on the top and bottom of the evaporator coil. They detect frost build-up and turn off the compressor, allowing the coil to clear. Once the frost has melted, the compressor can be reenergized by resetting the compressor lockout.

RELIEF DEVICES

All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side.

CONTROL CIRCUIT, 24-V

This control circuit is protected against overcurrent by a 3.2 amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting. See Fig. 33 for typical wiring diagram.

REPLACEMENT PARTS

A complete list of replacement parts may be obtained from your distributor upon request.

OPTIONAL HINGED ACCESS DOORS

When the optional hinged access doors option is ordered, the unit will be provided with external and internal hinged access doors to facilitate service.

Four external hinged access doors are provided on size 180-240 units. Two external hinged doors are provided on size 300 units. All external doors are provided with 2 large $^1/_4$ turn latches with folding bail-type handles. (Compressor access doors have one latch.) A single door is provided for filter and drive access. One door is provided for control box access. The control box access door is interlocked with the non-fused disconnect which must be in the OFF position to open the door. Two doors are provided on PAE180-240 units for access to the compressor compartment.

Two internal access doors are provided inside the filter/drive access door. The filter access door (on the left) is secured by 2 small $^1/_4$ turn latches with folding bail-type handles. This door must be opened prior to opening the drive access door. The drive access door is shipped with 2 sheet metal screws holding the door closed. Upon initial opening of the door, these screws may be removed and discarded. The door is then held shut by the filter access door, which closes over it.

FIGURE 32 | **Typical Wiring Schematic, PAE240 – 208/230v Shown**

SCHEMATIC

208/230–3–60

ELECTRIC HEAT		
	208/240V AMPS	200/230V KW
A	71.3/82.3	25.7/34.2
B	117/135	42.2/56.1
C	156/180	56.2/74.8

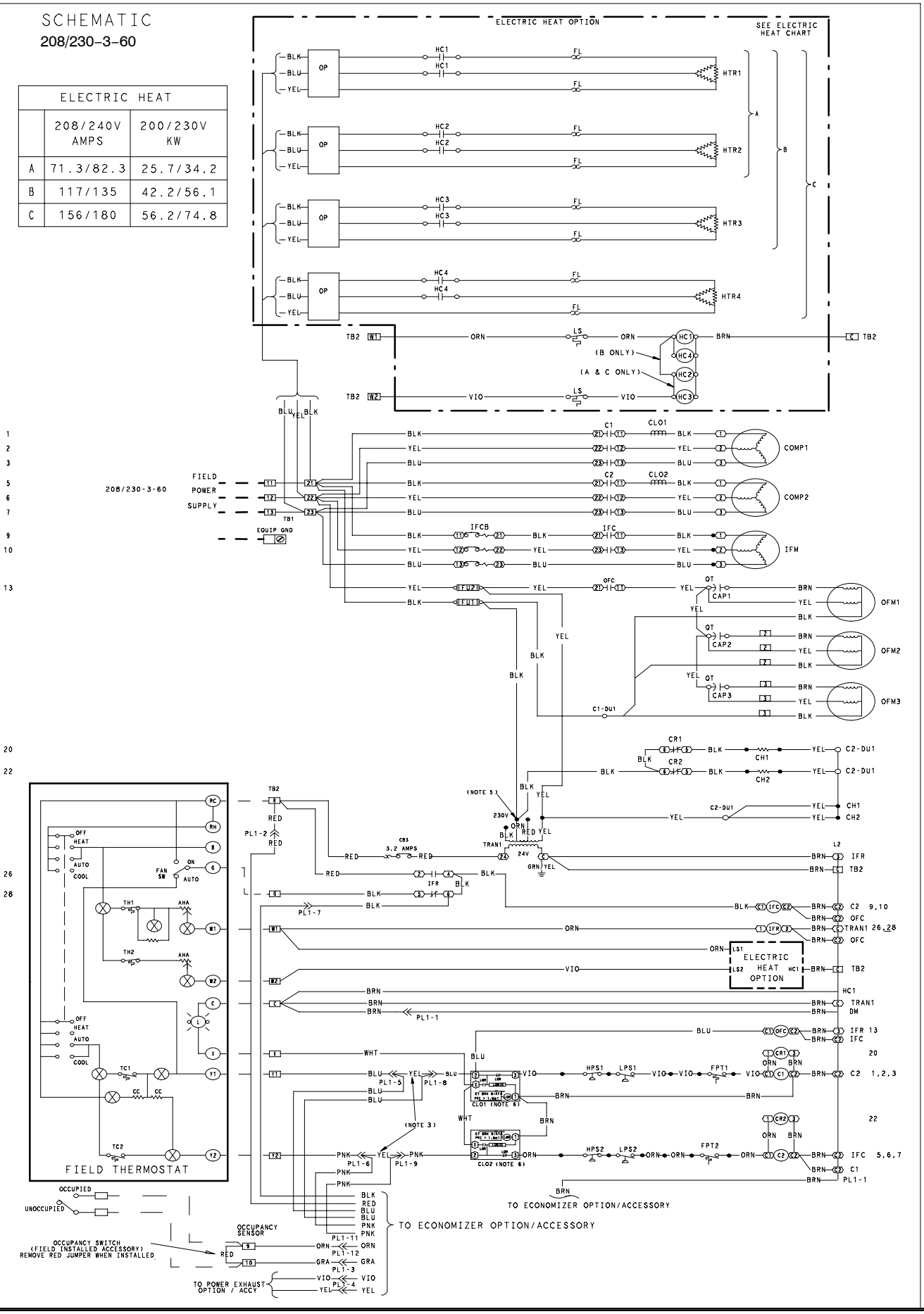
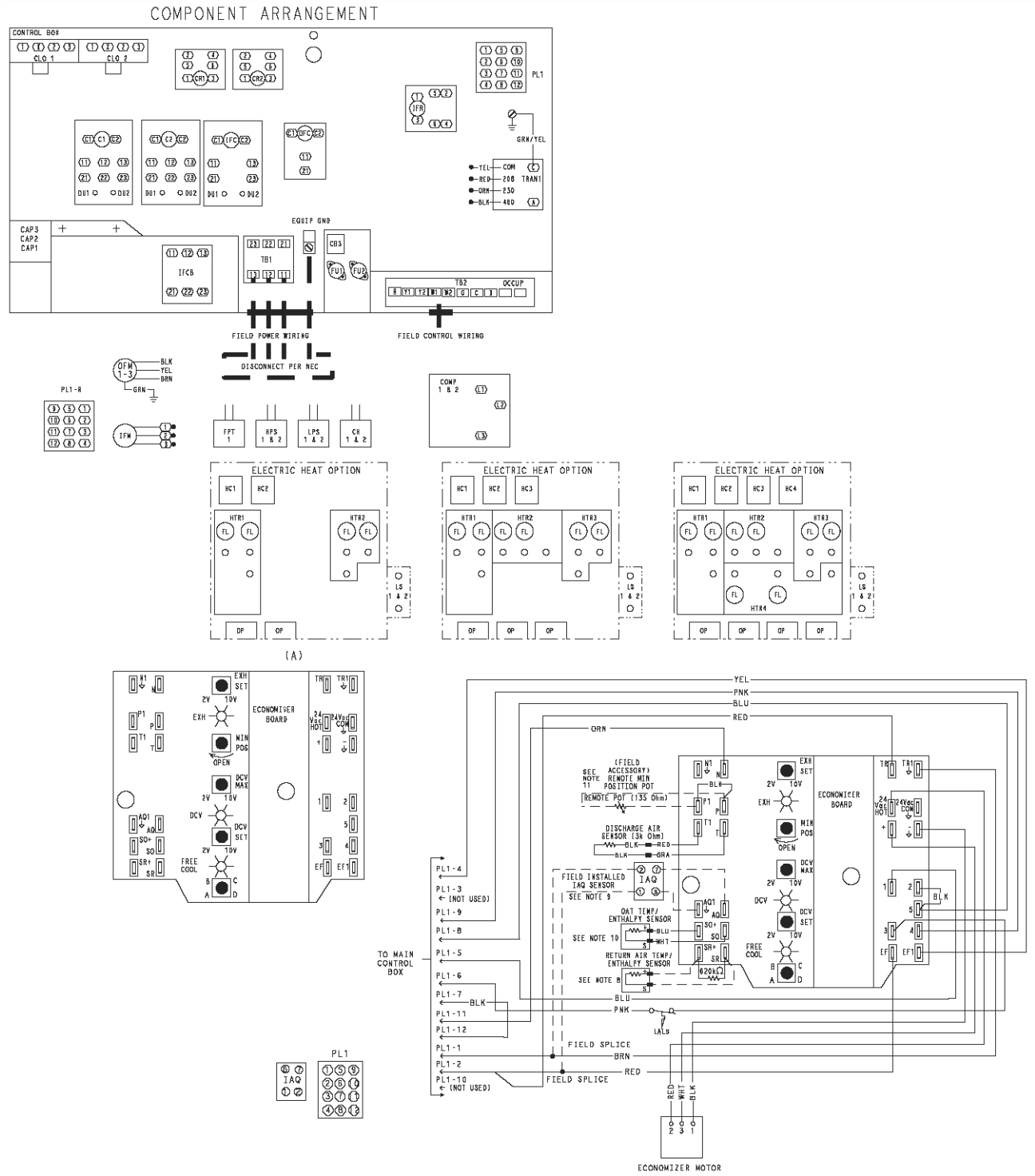


FIGURE 33 | **Typical Component Arrangement, PAE240 Shown**



LEGENDS AND NOTES FOR FIGS. 32 and 33.

LEGEND

AHA	—	Adjustable, Heat Anticipator
BRK W/AT	—	Breaks with Amp Turns
C	—	Contactor, Compressor
CAP	—	Capacitor
CB	—	Circuit Breaker
CC	—	Cooling Compensator
CH	—	Crankcase Heater
CLO	—	Compressor Lockout
COMP	—	Compressor Motor
CTD	—	Compressor Time Delay
DB	—	Defrost Board
DFT	—	Defrost Thermostat
DM	—	Damper Motor
DR	—	Defrost Relay
DU	—	Dummy Terminal
EQUIP	—	Equipment
FL	—	Fuse Link
FPT	—	Freeze Protection Thermostat
FU	—	Fuse
GND	—	Ground
HC	—	Heater Contactor
HPS	—	High-Pressure Switch
HR	—	Heat Relay
HTR	—	Heater
IAQ	—	Indoor Air Quality Sensor
IFC	—	Indoor-Fan Contactor
IFCB	—	Indoor-Fan Circuit Breaker
IFM	—	Indoor-Fan Motor
IP	—	Internal Protector
L	—	Light
LALS	—	Low Temperature Compressor Lockout Switch
LPS	—	Low-Pressure Switch
LS	—	Limit Switch
NEC	—	National Electric Code
OAT	—	Outdoor Air Temperature Sensor
OCCUP	—	Occupancy Sensor
OFC	—	Outdoor Fan Contactor
OFM	—	Outdoor Fan Motor
OP	—	Overcurrent Protector
PL	—	Plug Assembly
QT	—	Quadruple Terminal
RVR	—	Reversing Valve Relay
RVS	—	Reversing Valve Solenoid
TB	—	Terminal Block
TC	—	Thermostat Cooling
TH	—	Thermostat Heating
TRAN	—	Transformer


Terminal (Marked)


Terminal (Unmarked)


Terminal Block


Splice

Factory Wiring

Field Wiring

Option/Accessory Wiring

To indicate common potential only; not to represent wiring.


Economizer Motor

Remote POT Field Accessory


OAT Sensor


Disch Air Sensor


RAT Accessory Sensor


Low Ambient Lockout Switch

NOTES:

1. Compressor and/or fan motor(s) thermally protected three-phase motors protected against primary single phasing conditions.
2. If any of the original wire furnished must be replaced, it must be replaced with Type 90° C or its equivalent.
3. TRAN1 is wired for 230-v operation. If unit is 208-v, disconnect the black wires from the ORN TRAN wire and reconnect to the RED TRAN wire, apply wirenuts to wires.
4. CB1,2 must trip amps are equal to or less than 156% FLA, IFCB 140%.
5. The CLO locks out the compressor to prevent short cycling on compressor overload and safety devices; before replacing CLO, check these devices.
6. Jumpers are omitted when unit is equipped with economizer.
7. Number(s) indicates the line location of used contacts. A bracket over (2) numbers signifies a single pole, double throw contact. An underlined number signifies a normally closed contact. Plain (no line) number signifies a normally open contact.
8. Remove jumper between RC & RN.
9. 620 Ohm, 1 watt, 5% resistor should be removed only when using differential enthalpy or dry bulb.
10. If a separate field-supplied 24-v transformer is used for the IAQ sensor power supply, it cannot have the secondary of the transformer grounded.
11. OAT sensor is shipped inside unit and must be relocated in the field for proper operation.
12. For field-installed remote minimum position POT, remove black wire jumper between P and P1 and set control minimum position POT to the minimum position.

TROUBLESHOOTING

Unit Troubleshooting

Refer to Table 18 and fig. 32 for unit troubleshooting information.

Economizer Troubleshooting

See Table 19 for economizer logic.

A functional view of the economizer is shown in Fig. 46. Typical settings, sensor ranges, and jumper positions are also shown.

Preparation

This procedure is used to prepare the economizer for troubleshooting. No troubleshooting or testing is done by performing the following procedure.

NOTE:This procedure requires a 9-v battery, 1.2 kilo-ohm resistor, and a 5.6 kilo-ohm resistor which are not supplied with the economizer.

IMPORTANT:Be sure to record the positions of all potentiometers before starting troubleshooting.

1. Disconnect power at TR and TR1. All LEDs should be off. Exhaust fan contacts should be open.
2. Disconnect device at P and P1.
3. Jumper P to P1.
4. Disconnect wires at T and T1. Place 5.6 kilo-ohm resistor across T and T1.
5. Jumper TR to 1.
6. Jumper TR to N.
7. If connected, remove sensor from terminals S_O and +. Connect 1.2 kilo-ohm 4074EJM checkout resistor across terminals S_O and +.
8. Put 620-ohm resistor across terminals S_R and +.
9. Set minimum position, DCV set point, and exhaust potentiometers fully CCW (counterclockwise).
10. Set DCV maximum position potentiometer fully CW (clockwise).
11. Set enthalpy potentiometer to D.
12. Apply power (24 vac) to terminals TR and TR1.

Differential Enthalpy

To check differential enthalpy:

1. Make sure economizer preparation procedure has been performed.
2. Set the enthalpy potentiometer to A (fully CCW). The Free Cool LED should be lit.
3. Set the enthalpy potentiometer to D (fully CW). The Free Cool LED should turn off.
4. Remove 620-ohm resistor across S_O and +. The Free Cool LED should turn off.
5. Return economizer settings and wiring to normal after completing troubleshooting.

Single Enthalpy

To check single enthalpy:

1. Make sure economizer preparation procedure has been performed.
2. Set the enthalpy potentiometer to A (fully CCW). The Free Cool LED should be lit.
3. Set the enthalpy potentiometer to D (fully CW). The Free Cool LED should turn off.
4. Return economizer settings and wiring to normal after completing troubleshooting.

DCV (Demand Controlled Ventilation) and Power Exhaust

To check DCV and Power Exhaust:

1. Make sure economizer preparation procedure has been performed.
2. Ensure terminals AQ and AQ1 are open. The LED for both DCV and Exhaust should be off. The actuator should be fully closed.
3. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The LED for both DCV and Exhaust should turn on. The actuator should drive to between 90 and 95% open.
4. Turn the Exhaust potentiometer CW until the Exhaust LED turns off. The LED should turn off when the potentiometer is approximately 90%. The actuator should remain in position.
5. Turn the DCV set point potentiometer CW until the DCV LED turns off. The DCV LED should turn off when the potentiometer is approximately 9 v. The actuator should drive fully closed.
6. Turn the DCV and Exhaust potentiometers CCW until the Exhaust LED turns on. The exhaust contacts will close 30 to 120 seconds after the Exhaust LED turns on.
7. Return economizer settings and wiring to normal after completing troubleshooting.

DCV Minimum and Maximum Position

To check the DCV minimum and maximum position:

1. Make sure economizer preparation procedure has been performed.
2. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The DCV LED should turn on. The actuator should drive to between 90 and 95% open.
3. Turn the DCV Maximum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
4. Turn the DCV Maximum Position potentiometer to fully CCW. The actuator should drive fully closed.
5. Turn the Minimum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
6. Turn the Minimum Position Potentiometer fully CW. The actuator should drive fully open.
7. Remove the jumper from TR and N. The actuator should drive fully closed.
8. Return economizer settings and wiring to normal after completing troubleshooting.

Supply–air Input

To check supply-air input:

1. Make sure economizer preparation procedure has been performed.
2. Set the Enthalpy potentiometer to A. The Free Cool LED turns on. The actuator should drive to between 20 and 80% open.
3. Remove the 5.6 kilo-ohm resistor and jumper T to T1. The actuator should drive fully open.
4. Remove the jumper across T and T1. The actuator should drive fully closed.
5. Return economizer settings and wiring to normal after completing troubleshooting.

Economizer Troubleshooting Completion

This procedure is used to return the economizer to operation. No troubleshooting or testing is done by performing the following procedure.

1. Disconnect power at TR and TR1.
2. Set enthalpy potentiometer to previous setting.
3. Set DCV maximum position potentiometer to previous setting.
4. Set minimum position, DCV set point, and exhaust potentiometers to previous settings.
5. Remove 620-ohm resistor from terminals S_R and +.
6. Remove 1.2 kilo-ohm checkout resistor from terminals S_O and +. If used, reconnect sensor from terminals S_O and +.
7. Remove jumper from TR to N.
8. Remove jumper from TR to 1.
9. Remove 5.6 kilo-ohm resistor from T and T1. Reconnect wires at T and T1.
10. Remove jumper from P to P1. Reconnect device at P and P1.
11. Apply power (24 vac) to terminals TR and TR1.

Table 18 — Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and Condenser Fan Will Not Start.	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer, or control relay.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
Compressor Will Not Start but Condenser Fan Runs.	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective overload.	Determine cause and replace.
	Compressor locked out	Determine cause for safety trip and reset lockout.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
Compressor Cycles (other than normally satisfying thermostat).	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor.	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective overload.	Determine cause and replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor Operates continuously.	Dirty air filter.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak, repair, and recharge.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser coil dirty or restricted.	Clean coil or remove restriction.
Excessive Head Pressure.	Dirty air filter.	Replace filter.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharged.	Recover excess refrigerant.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
Head Pressure Too Low.	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Restriction in liquid tube.	Remove restriction.
Excessive Suction Pressure.	High heat load.	Check for source and eliminate.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction Pressure Too Low.	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks, repair, and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Faulty TXV.	1. Check TXV bulb mounting and secure tightly to suction line. 2. Replace TXV if stuck open or closed.
	Insufficient evaporator airflow.	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Field-installed filter drier restricted.	Replace.

LEGEND

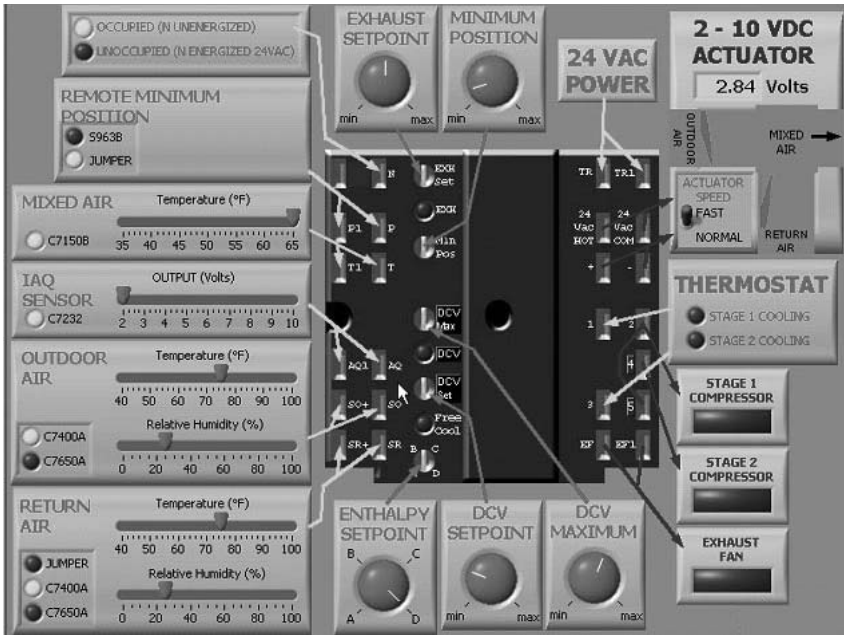
TXV — Thermostatic Expansion Valve

TABLE 19 — ECONOMIZER INPUT/OUTPUT LOGIC

INPUTS					OUTPUTS			
Demand Control Ventilation (DCV)	Enthalpy*		Y1	Y2	Compressor		N Terminal†	
	Outdoor	Return			Stage 1	Stage 2	Occupied	Unoccupied
							Damper	
Below set (DCV LED Off)	High (Free Cooling LED Off)	Low	On	On	On	On	Minimum position	Closed
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating** (between min. position and full-open)	Modulating** (between closed and full-open)
			On	Off	Off	Off		
			Off	Off	Off	Off	Minimum position	Closed
Above set (DCV LED On)	High (Free Cooling LED Off)	Low	On	On	On	On	Modulating†† (between min. position and DCV maximum)	Modulating†† (between closed and DCV maximum)
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating***	Modulating†††
			On	Off	Off	Off		
			Off	Off	Off	Off		

*For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.
† Power at N terminal determines Occupied/Unoccupied setting: 24 vac (Occupied), no power (Unoccupied).
** Modulation is based on the supply-air sensor signal.
†† Modulation is based on the DCV signal.
***Modulation is based on the greater of DCV and supply-air sensor signals, between minimum position and either maximum position (DCV) or fully open (supply-air signal).
††† Modulation is based on the greater of DCV and mixed air sensor signals, between closed and either maximum position (DCV) or fully open (supply-air signal).

FIGURE 34 **Economizer Functional View**



START-UP CHECKLIST
(Remove and Store in Job File)

MODEL NO.: _____ DATE: _____

SERIAL NO.: _____ TECHNICIAN: _____

I. PRE-START-UP

- ☐ VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ VERIFY PROPER ADJUSTMENT OF INDOOR FAN MOTOR ADJUSTMENT BOLT
- ☐ VERIFY INSTALLATION OF OUTDOOR–AIR HOOD
- ☐ VERIFY INSTALLATION OF FLUE HOOD AND WIND BAFFLE
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ CHECK THAT AIR INLET FILTERS ARE CLEAN AND IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ CHECK FAN WHEEL AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE, AND VERIFY SET SCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ VERIFY THAT SCROLL COMPRESSOR IS ROTATING IN THE CORRECT DIRECTION
- ☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR AL LEAST 24 HOURS

II. START-UP

ELECTRICAL

SUPPLY VOLTAGE L1–L2 _____ L2–L3 _____ L3–L1 _____

COMPRESSOR AMPS – COMPRESSOR NO. 1 L1 _____ L2 _____ L3 _____

INDOOR–FAN AMPS – COMPRESSOR NO. 2 L1 _____ L2 _____ L3 _____

SUPPLY FAN AMPS _____ EXHAUST FAN AMPS _____

TEMPERATURES

OUTDOOR–AIR TEMPERATURE _____ F DB (Dry–Bulb)

RETURN–AIR TEMPERATURE _____ F DB _____ F WB (Wet–Bulb)

COOLING SUPPLY AIR _____ F

PRESSURES (COOLING MODE)

REFRIGERANT SUCTION CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

REFRIGERANT DISCHARGE CIRCUIT NO. 1 _____ PSIG CIRCUIT NO. 2 _____ PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS

GENERAL

- ☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS