INSTALLATION MANUAL

R-410A
XP SERIES
6-1/2 - 12-1/2 Ton
60 Hertz

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General

York® Predator® heat pumps are single package, reverse cycle air conditioners designed for outdoor installation on a rooftop or slab and for non-residential use. These units can be equipped with factory or field installed electric heaters for heating applications.

These units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power and duct connections. The electric heaters have nickel-chrome elements and utilize single-point power connection.

Safety Considerations

This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention the signal words **DANGER**, **WARNING** or **CAUTION**.

DANGER indicates an **imminently** hazardous situation, which, if not avoided, **will result in death or serious injury.**

WARNING indicates a **potentially** hazardous situation, which, if not avoided, **could result in death or serious injury.**

CAUTION indicates a potentially hazardous situation, which, if not avoided **may result in minor or moderate injury.** It is also used to alert against unsafe practices and hazards involving only property damage.

⚠WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer or service agency.

⚠ CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state and national codes including, but not limited to building, electrical, and mechanical codes.

⚠WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer or service agency.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gage sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer. Failure to use R-410A compatible servicing equipment may result in property damage or injury.

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes including National Electric Code, ANSI/NFPA No. 70 - latest edition U.S. A. and Canadian Electric Code, CSA C22.1 in Canada.

Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

Inspection

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

Reference

Additional information is available in the following reference forms:

- Technical Guide - ZH/XP078-150, 246824
- General Installation - XP078-150, 267233
- Pre-start & Post-start Check List
- Economizer Accessory -
  Downflow Factory Installed
  Downflow Field Installed
  Horizontal Field Installed
- Motorized Outdoor Air Damper
- Manual Outdoor Air Damper (0-100%)
- Manual Outdoor Air Damper (0-35%)
- Electric Heater Accessory 50” cabinet
- Electric Heater Accessory 42” cabinet

Renewal Parts

Contact your local York® parts distribution center for authorized replacement parts.

Approvals

Design certified by CSA as follows:

1. For use as a cooling only unit, cooling unit with supplemental electric heat or a forced air furnace.
2. For outdoor installation only.
3. For installation on combustible material and may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

⚠ WARNING

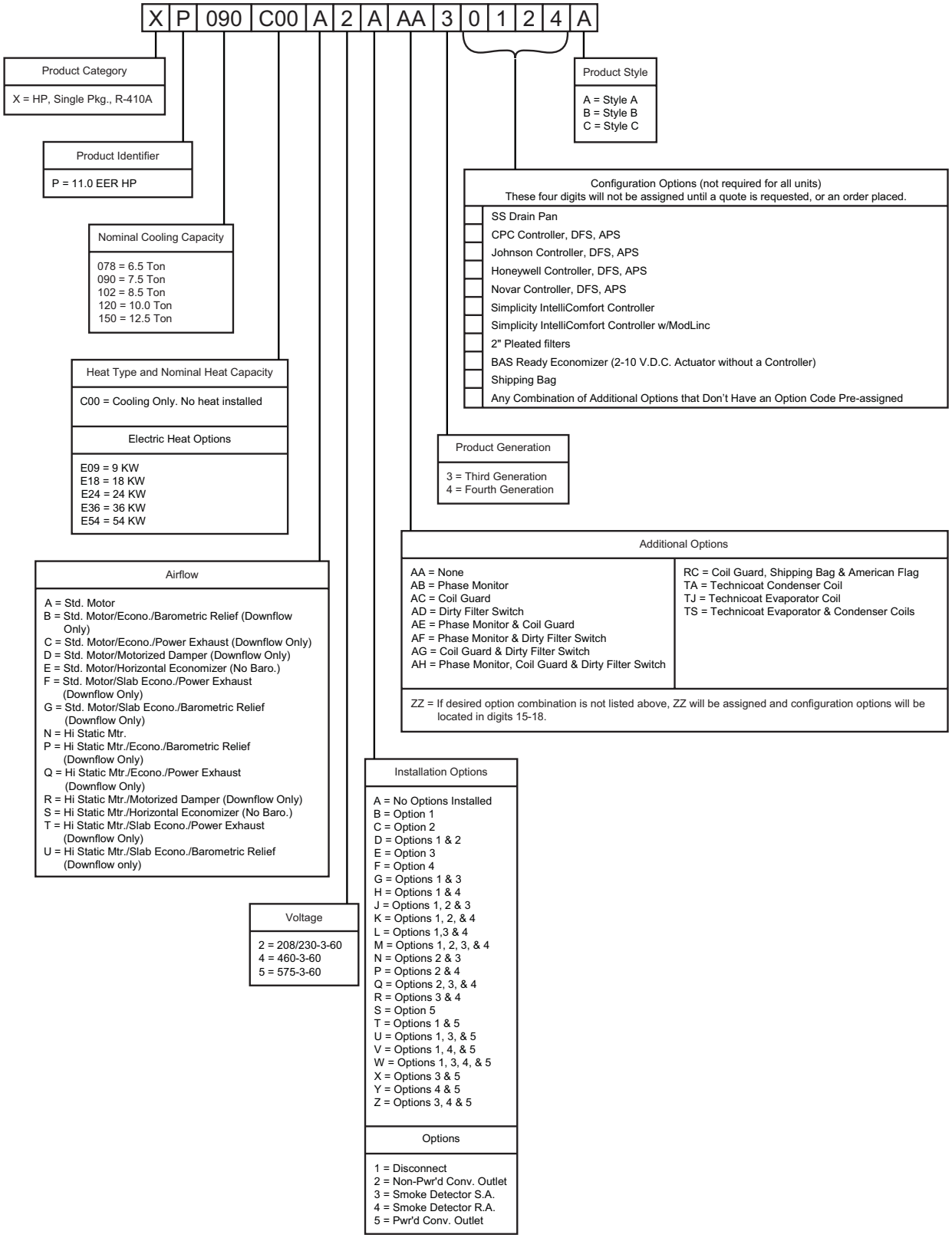
Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.

Nomenclature

6.5-12.5 Ton York® Model Number Nomenclature



Installation

Installation Safety Information

Read these instructions before continuing this appliance installation. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer and with instructions to retain them for future reference.

This equipment is not to be used for temporary heating of buildings or structures under construction.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

Preceding Installation

1. Remove the two screws holding the brackets in the front, rear and compressor side fork-lift slots.

Figure 1: Unit Shipping Bracket

2. Turn each bracket toward the ground and the protective plywood covering will drop to the ground.
3. Remove the condenser coil external protective covering prior to operation.
4. Remove the toolless doorknobs and instruction packet prior to installation.

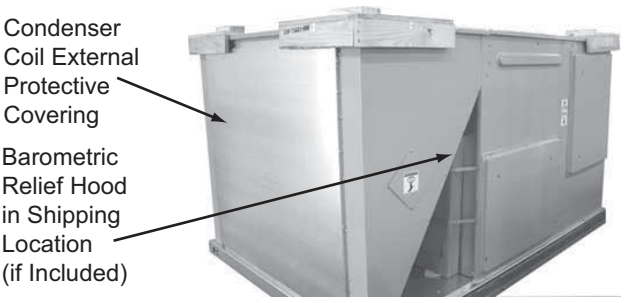


Figure 2: Condenser Covering

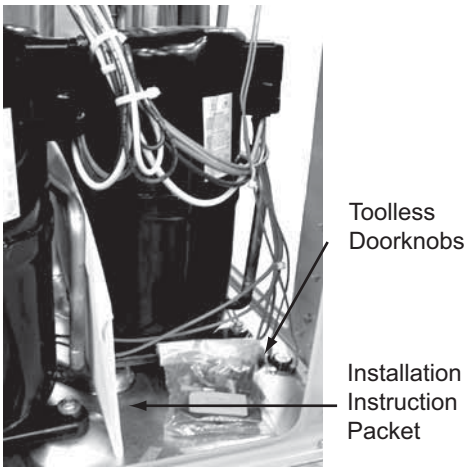


Figure 3: Compressor Section

Limitations

These units must be installed in accordance with the following:

In U.S.A.:

1. National Electrical Code, ANSI/NFPA No. 70 - Latest Edition
2. Local building codes, and
3. Local electric utility requirements

In Canada:

1. Canadian Electrical Code, CSA C22.1
2. Installation Codes, CSA - B149.1.
3. Local plumbing and waste water codes, and
4. Other applicable local codes.

Refer to unit application data found in this document.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculation made according to the methods of Air Conditioning Contractors of America (ACCA).

This furnace is not to be used for temporary heating of buildings or structures under construction.

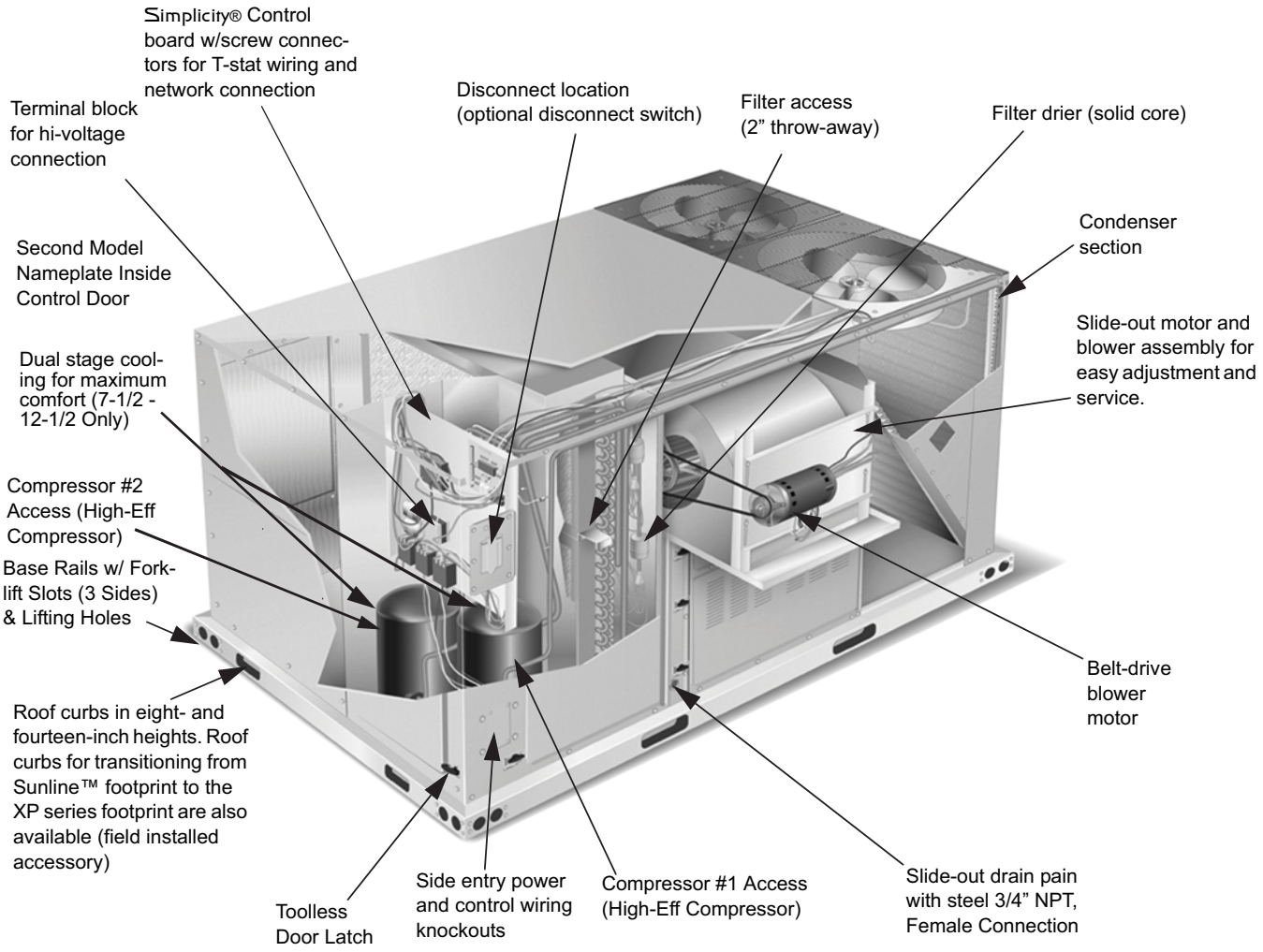


Figure 4: Predator® Component Location

Table 1: XP078-150 Unit Limitations

Size (Tons)	Model	Unit Voltage	Unit Limitations		
			Applied Voltage		Outdoor DB Temp
			Min	Max	Max (°F)
078 (6.5)	XP	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
090 (7.5)	XP	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
102 (8.5)	XP	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
120 (10)	XP	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
150 (12.5)	XP	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125

Location

Use the following guidelines to select a suitable location for these units:

1. Unit is designed for *outdoor installation only*.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for mounting on roof curb.
4. For ground level installation, use a level concrete slab with a minimum thickness of 4 inches. The length and width should be at least 6 inches greater than the unit base rails. Do not tie slab to the building foundation.
5. Roof structures must be able to support the weight of the unit and its options/accessories. Unit must be installed on a solid, level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/2” across the entire width and length of unit.

Clearances

All units require particular clearances for proper operation and service. Refer to Table 5 for clearances required for construction, servicing, and proper unit operation.

⚠WARNING

Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.

Rigging And Handling

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit.

⚠ CAUTION

If a unit is to be installed on a roof curb other than a York® roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

⚠ CAUTION

Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

LENGTH OF FORKS MUST BE A MINIMUM OF 60 INCHES.

⚠ CAUTION

All panels must be secured in place when the unit is lifted.

The condenser coils should be protected from rigging cable damage with plywood or other suitable material.

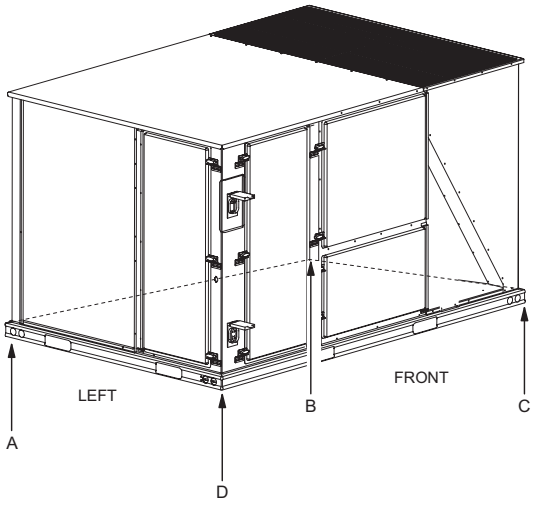


Figure 5: Unit 4 Point Load Weight

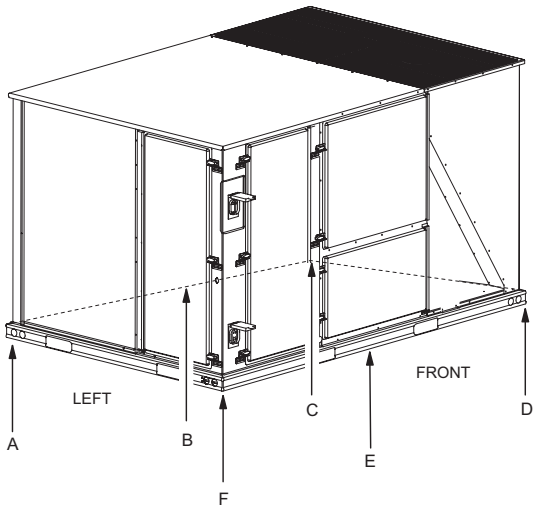


Figure 6: Unit 6 Point Load Weight

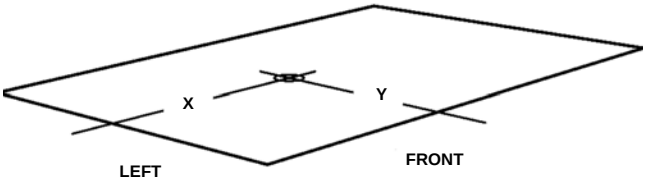


Figure 7: Center of Gravity

Table 2: Weights and Dimensions

Size (Tons)	Model	Weight (lbs.)		Center of Gravity		4 Point Load Location (lbs.)				6 Point Load Location (lbs.)					
		Shipping	Operating	X	Y	A	B	C	D	A	B	C	D	E	F
078 (6.5)	XP	925	920	38	23	206	153	240	322	144	117	97	152	184	225
090 (7.5)	XP	925	920	38	23	206	153	240	322	144	117	97	152	184	225
102 (8.5)	XP	1140	1135	38	25.5	281	209	275	369	197	160	133	175	211	259
120 (10)	XP	1140	1135	38	25.5	281	209	275	369	197	160	133	175	211	259
150 (12.5)	XP	1405	1400	51	25.5	258	347	456	339	164	198	243	319	260	216

Table 3: XP078-150 Unit Accessory Weights

Unit Accessory	Weight (lbs.)	
	Shipping	Operating
Economizer	90	85
Power Exhaust	155	150
Electric Heat[1]	80	80

1. Weight given is for the maximum heater size available (54KW).

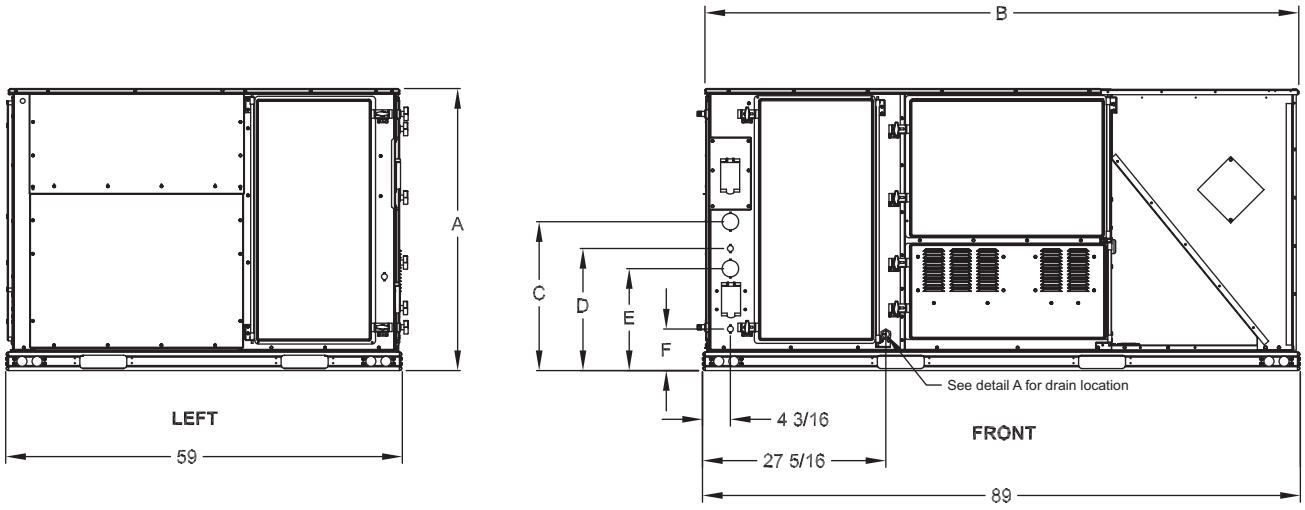


Figure 8: XP078-120 Physical Dimensions

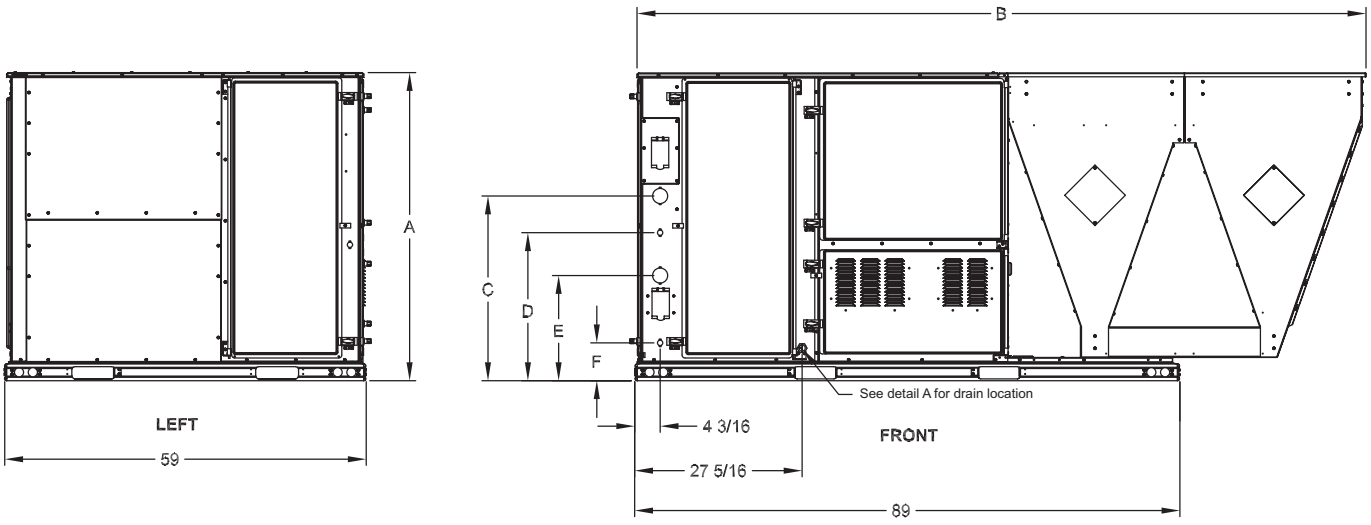


Figure 9: XP150 Physical Dimensions

Table 4: XP078-150 Unit Physical Dimensions

Unit Model Number	Dimension (in.)					
	A	B	C	D	E	F
XP078	42	89	22 1/8	18 3/16	15 3/16	6 3/16
XP090	42	89	22 1/8	18 3/16	15 3/16	6 3/16
XP102	50 3/4	89	30 3/16	24 3/16	17 3/16	6 3/16
XP120	50 3/4	89	30 3/16	24 3/16	17 3/16	6 3/16
XP150	50 3/4	119 1/2	30 3/16	24 3/16	17 3/16	6 3/16

Detail A

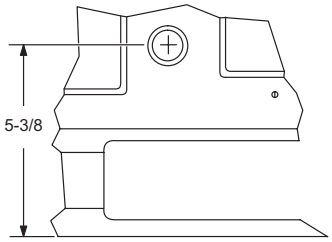


Table 5: XP078-150 Unit Clearances

Direction	Distance (in.)	Direction	Distance (in.)
Top[1]	72	Right	12
Front	36	Left	36
Rear	36	Bottom[2]	0

1. Units must be installed outdoors. Over hanging structure or shrubs should not obscure condenser air discharge outlet.
2. Units may be installed on combustable floors made from wood or class A, B or C roof covering materials.

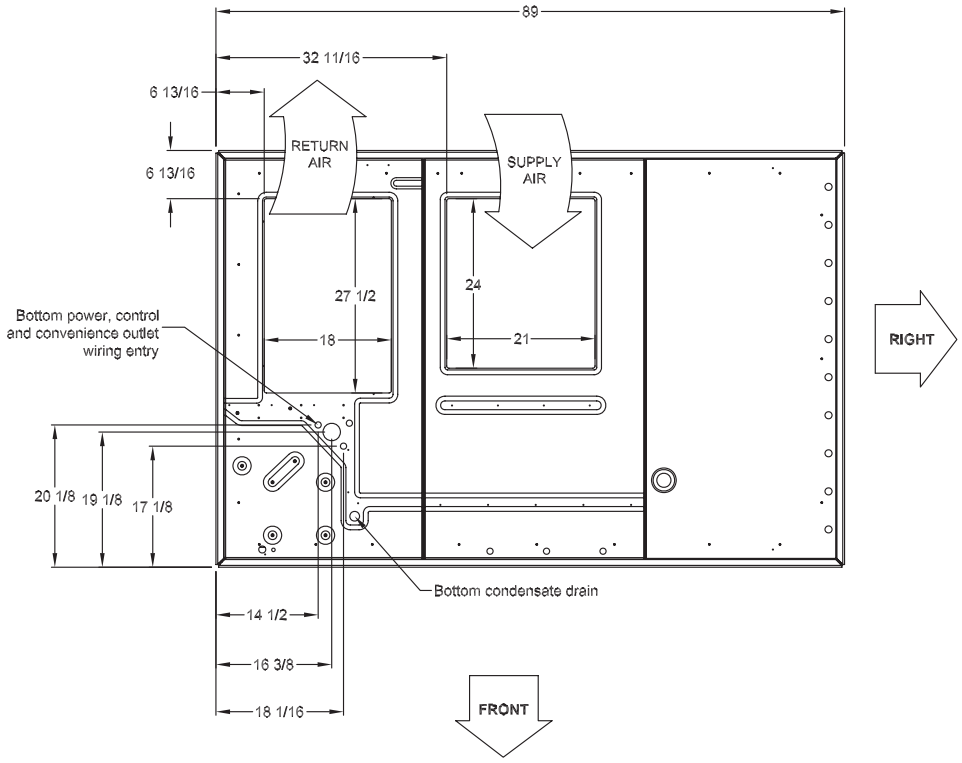


Figure 10: XP078-150 Unit Bottom Duct Openings

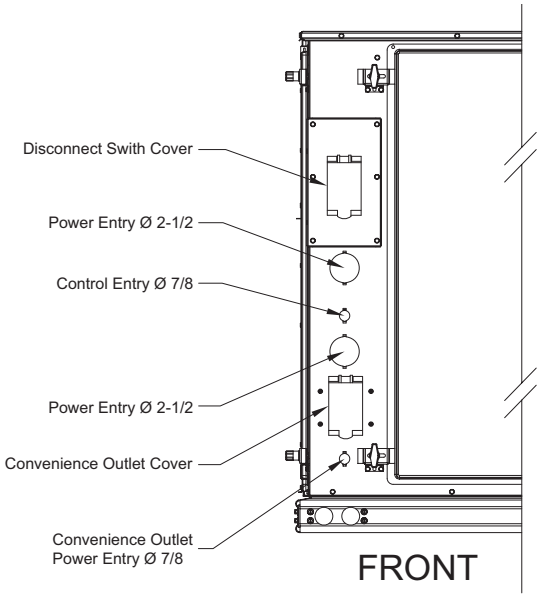


Figure 11: XP078-150 Unit Electrical Entry

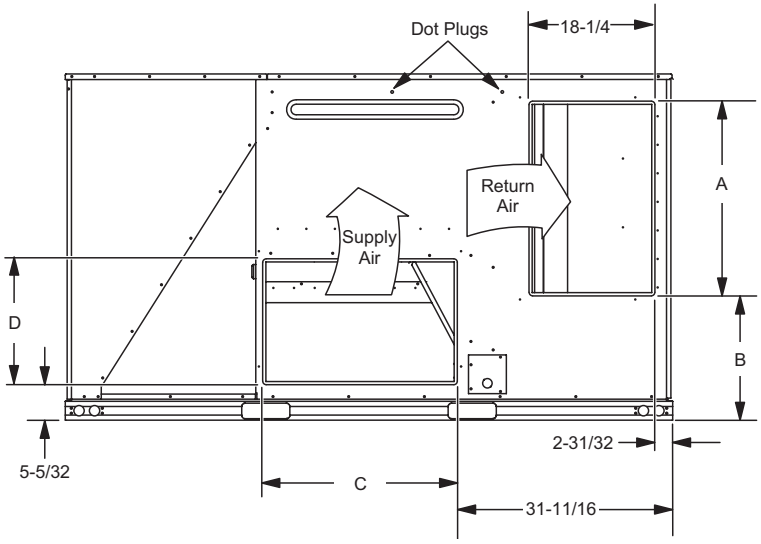


Figure 12: XP078-120 Unit Side Duct Openings

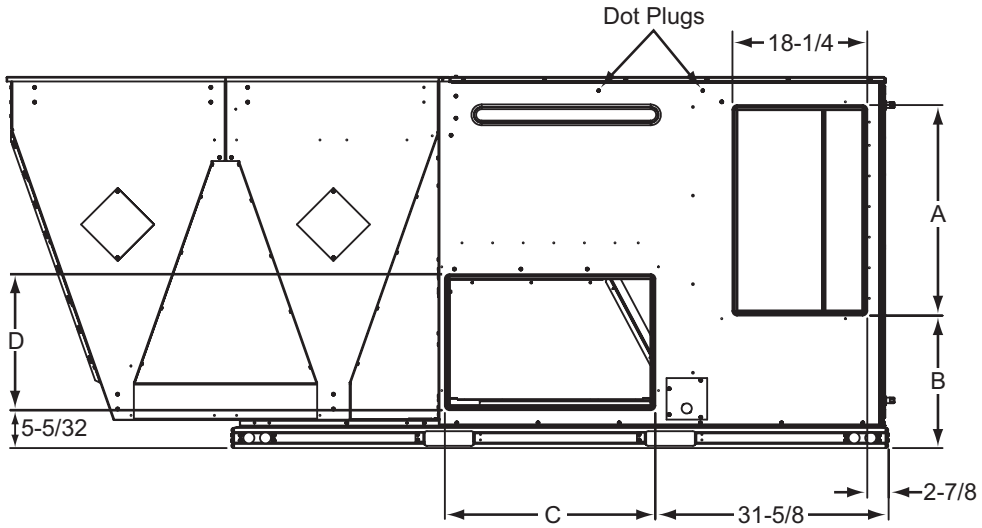


Figure 13: XP150 Unit Side Duct Openings

Table 6: Side Duct Dimensions

Unit Model Number	Dimension (in.)			
	A	B	C	D
XP078	27 3/4	12 1/16	27 1/2	16
XP090	27 3/4	12 1/16	27 1/2	16
XP102	28 1/4	18 1/16	28 1/4	18 1/4
XP120	28 1/4	18 1/16	28 1/4	18 1/4
XP150	28 1/4	18 1/16	28 1/4	18 1/4

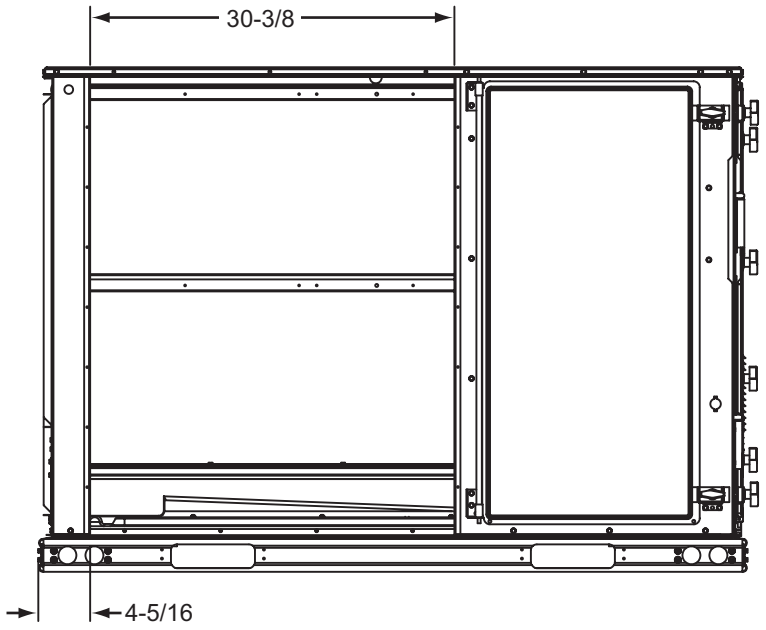


Figure 14: XP078-150 Unit Left Duct Opening

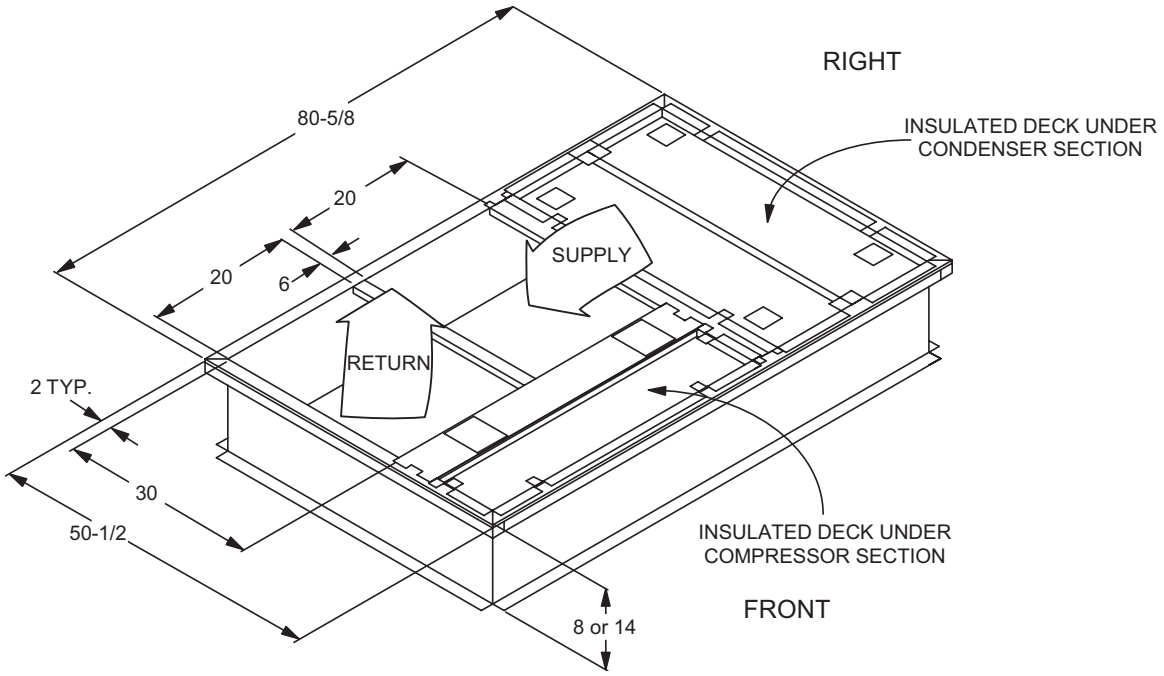


Figure 15: XP078-150 Roof Curb

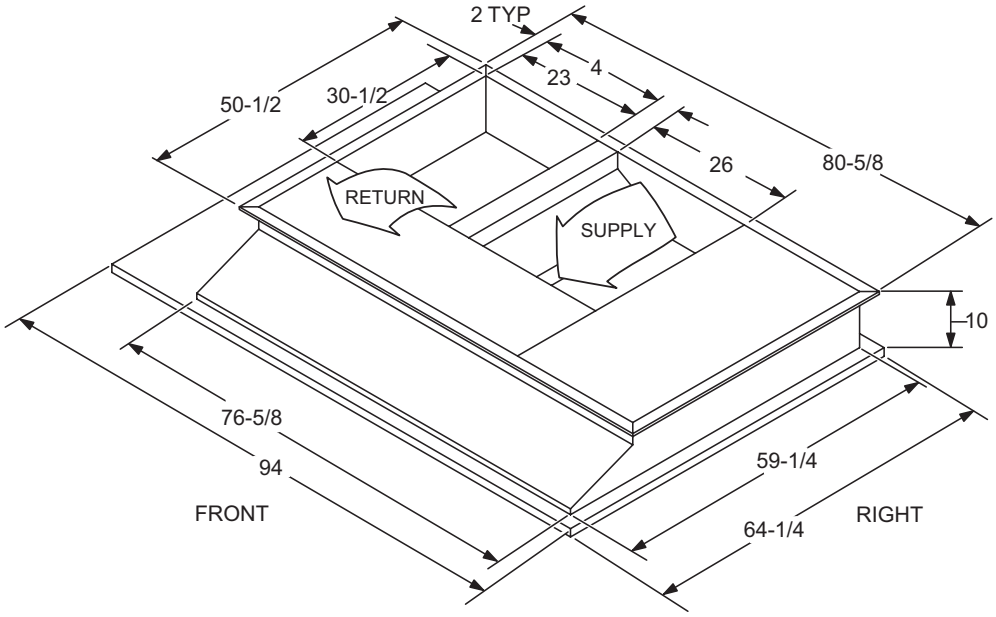


Figure 16: XP078-150 Transition Roof Curb

Ductwork

Ductwork should be designed and sized according to the methods in Manual D of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA.

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

Refer to Figure 10 for bottom air duct openings. Refer to Figures 12, 13 and Table 6 for side air duct openings.

Duct Covers

Units are shipped with the side duct openings covered and a covering over the bottom of the unit. For bottom duct application, no duct cover changes are necessary. For side duct application, remove the side duct covers and install over the bottom duct openings. The panels removed from the side duct connections are designed to be reused by securing each panel to its respective downflow opening. But keep in mind that the supply panel is installed with the painted surface UP, facing the heat exchanger, while the return panel is installed with the painted surface DOWN, facing the downflow duct opening. The supply panel is secured with the bracket (already in place from the factory) and two screws. It's a snug fit for the panel when sliding it between the heat exchanger and unit bottom, but there is room. The return panel is secured with four screws.

⚠ CAUTION

When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and water-proofed.

Figure 17: Side Panels With Hole Plugs

NOTE: Orientation. Panel is "insulation" side up.

Figure 18: Return Downflow Plenum With Panel

Figure 19: Discharge Panel In Place

Condensate Drain

The side condensate drain is reversible and maybe re-oriented to the rear of the cabinet to facilitate condensate piping. A condensate drain connection is available through the base pan for piping inside the roof curb. Trap the connection per Figure 20. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain line from the 3/4 inch NPT female connection on the unit to an open drain.

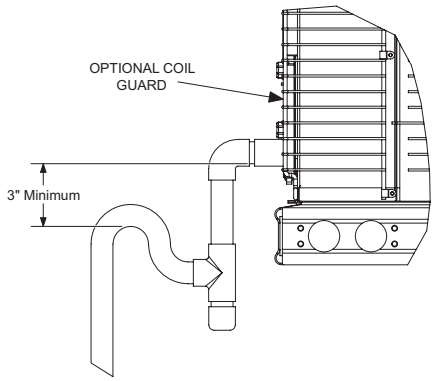


Figure 20: Condensate Drain

Compressors

The scroll compressor used in this product is specifically designed to operate with R-410A Refrigerant and cannot be interchanged.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.

The compressor also uses a polyolester (POE oil), Mobil 3MA POE. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oil can absorb 15 times as much water as other oils

designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

⚠ CAUTION

Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the **POE oil** in the system. This type of oil is highly susceptible to moisture absorption

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials.

⚠ CAUTION

Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take precautions to protect roofing.

Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device or coil.

Units are shipped with compressor mountings which are factory-adjusted and ready for operation.

⚠ CAUTION

Do not loosen compressor mounting bolts.

Filters

Two-inch filters are supplied with each unit. One-inch filters may be used with no modification to the filter racks. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. Refer to physical data tables, for the number and size of filters needed for the unit. The unit should not be operated without filters properly installed.

⚠ CAUTION

Make sure that panel latches are properly positioned on the unit to maintain an airtight seal.

Power And Control Wiring

Field wiring to the unit, fuses, and disconnects must conform to provisions of National Electrical Code (NEC), ANSI/NFPA No. 70 – Latest Edition (in U.S.A.), current Canadian Electrical Code C221, and/or local ordinances. The unit must be electrically grounded in accordance with NEC and CEC as specified above and/or local codes.

Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

A disconnect must be utilized for these units. Factory installed disconnects are available. If installing a disconnect (field supplied or York International® supplied accessory), refer to Figure 4 for the recommended mounting location.

⚠ CAUTION

Avoid damage to internal components if drilling holes for disconnect mounting.

NOTE: Since not all local codes allow the mounting of a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical line must be sized properly to carry the load. USE COPPER CONDUCTORS ONLY. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

Refer to Figures 21, 22 and 23 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

⚠ CAUTION

When connecting electrical power and control wiring to the unit, water-proof connectors must be used so that water or moisture cannot be drawn into the unit during normal operation. The above water-proofing conditions will also apply when installing a field supplied disconnect switch.

Power Wiring Detail

Units are factory wired for the voltage shown on the unit nameplate. Refer to Electrical Data Table 8 to size power wiring, fuses, and disconnect switch.

Power wiring is brought into the unit through the side of the unit or the basepan inside the curb.

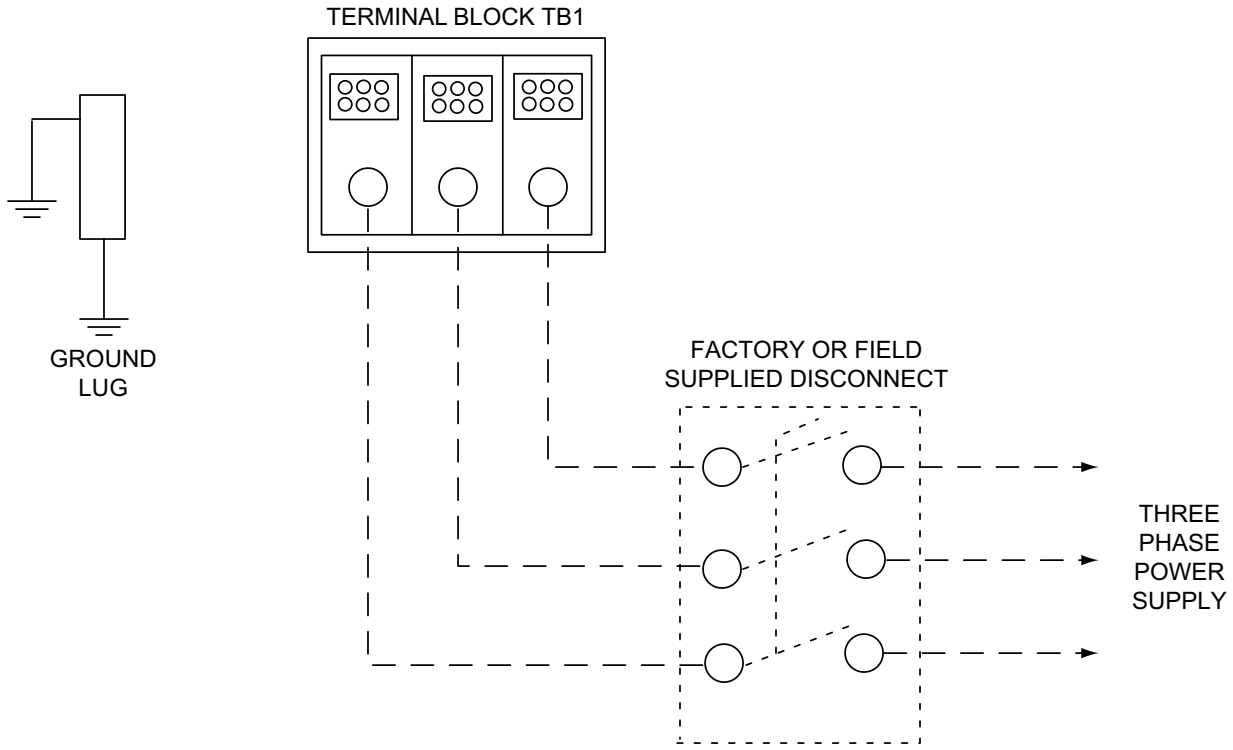


Figure 21: Field Wiring Disconnect - Cooling Unit With/Without Electric Heat

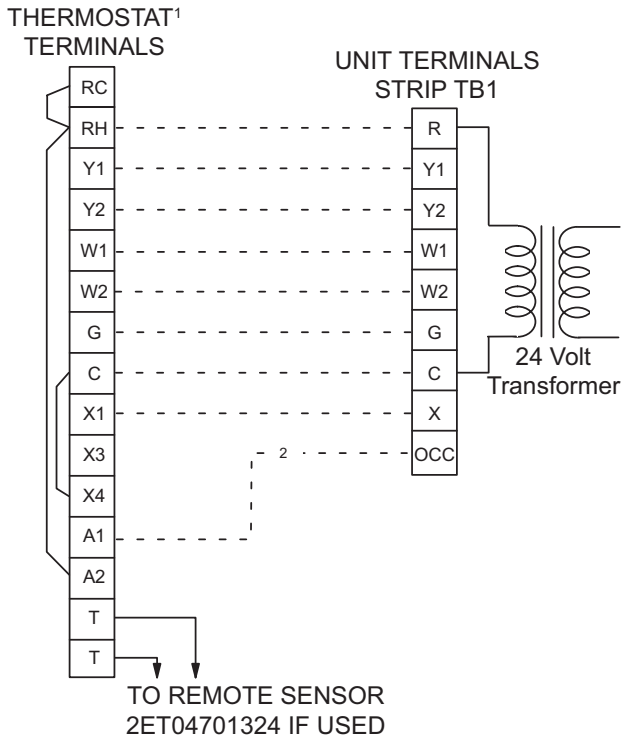
Thermostat Wiring

The thermostat should be located on an inside wall approximately 56 inch above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with thermostat for general installation procedure. Seven (7) color-coded, insulated wires should be used to connect the thermostat to the unit. Refer to Table 7 for control wire sizing and maximum length.

Table 7: Control Wire Sizes

Wire Size	Maximum Length[1]
18 AWG	150 Feet

1. From the unit to the thermostat and back to the unit.



[1] Electronic programmable Thermostat 2ET0770010024 (includes subbase).
[2] Terminals A1 and A2 provide a relay output to close the outdoor economizer dampers when the thermostat switches to the set-back position.

Figure 22: Electronic Thermostat Field Wiring

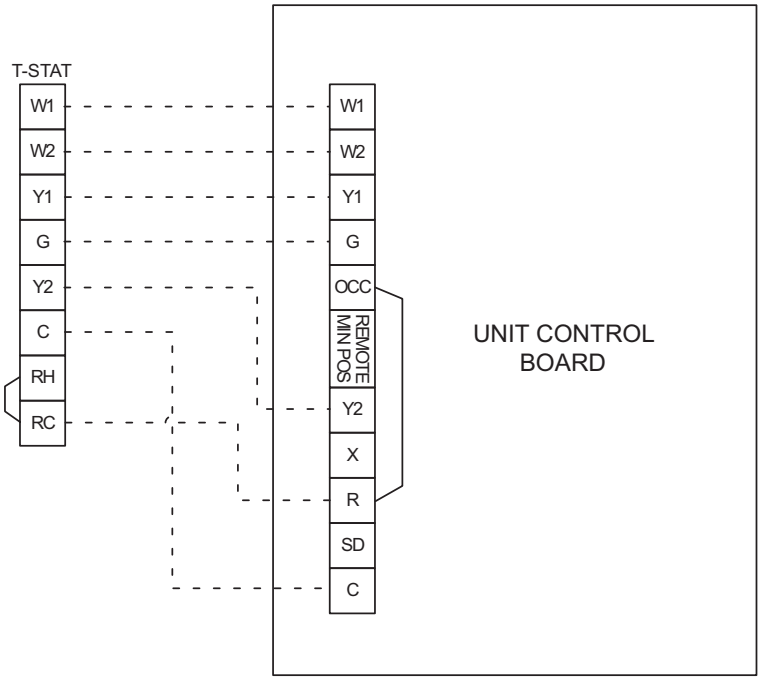


Figure 23: Field Wiring 24 Volt Thermostat

Table 8: Electrical Data

XP078-150 Standard Motor - Without Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
078 (6.5)	208	14.1	95.0	22.0	1.5	6.2	5.5	0.0	None	-	-	-	40.9	46.4	50	60
									E09	6.8	1	18.9	64.5	70.0	70	70
									E18	13.5	2	37.5	87.8	93.3	90	100
									E24	18.0	2	50.0	103.4	108.9	110	110
									E36	25.5	2	70.8	129.4	134.9	150	150
	230	14.1	95.0	22.0	1.5	6.2	5.5	0.0	None	-	-	-	40.9	46.4	50	60
									E09	9.0	1	22.6	68.0	73.5	70	80
									E18	18.0	2	45.2	95.1	100.6	100	110
									E24	24.0	2	60.2	113.1	118.6	125	125
									E36	34.0	2	85.3	143.2	148.7	150	150
	460	6.4	45.0	10.0	0.8	3.1	2.2	0.0	None	-	-	-	19.1	21.3	25	25
									E09	9.0	1	11.3	32.6	34.8	35	35
									E18	18.0	2	22.6	46.2	48.4	50	50
									E24	24.0	2	30.1	55.2	57.4	60	60
									E36	34.0	2	42.7	70.2	72.4	80	80
	575	5.4	38.0	8.5	0.6	2.4	1.8	0.0	None	-	-	-	15.8	17.6	20	20
									E09	9.0	1	9.0	26.6	28.4	30	30
									E18	18.0	2	18.1	37.4	39.2	40	40
									E24	24.0	2	24.1	44.6	46.4	45	50
									E36	34.0	2	34.1	56.6	58.4	60	60
090 (7.5)	208	15.6	83.1	21.4	1.5	6.2	5.5	0.0	None	-	-	-	44.3	49.8	50	60
									E09	6.8	1	18.9	67.9	73.4	70	80
									E18	13.5	2	37.5	91.1	96.6	100	100
									E24	18.0	2	50.0	106.8	112.3	110	125
									E36	25.5	2	70.8	132.8	138.3	150	150
	230	15.6	83.1	21.4	1.5	6.2	5.5	0.0	None	-	-	-	44.3	49.8	50	60
									E09	9.0	1	22.6	71.4	76.9	80	80
									E18	18.0	2	45.2	98.4	103.9	100	110
									E24	24.0	2	60.2	116.5	122.0	125	125
									E36	34.0	2	85.3	146.5	152.0	150	175
	460	6.9	41.0	9.7	0.8	3.1	2.2	0.0	None	-	-	-	20.2	22.4	25	25
									E09	9.0	1	11.3	33.8	36.0	35	40
									E18	18.0	2	22.6	47.3	49.5	50	50
									E24	24.0	2	30.1	56.3	58.5	60	60
									E36	34.0	2	42.7	71.3	73.5	80	80
	575	5.4	33.0	7.5	0.6	2.4	1.8	0.0	None	-	-	-	15.8	17.6	20	20
									E09	9.0	1	9.0	26.6	28.4	30	30
									E18	18.0	2	18.1	37.4	39.2	40	40
									E24	24.0	2	24.1	44.6	46.4	45	50
									E36	34.0	2	34.1	56.6	58.4	60	60
102 (8.5)	208	16.7	120.0	26.0	1.5	8.2	5.5	0.0	None	-	-	-	48.8	54.3	60	70
									E09	6.8	1	18.9	72.4	77.9	80	80
									E18	13.5	2	37.5	95.6	101.1	100	110
									E24	18.0	2	50.0	111.2	116.7	125	125
									E36	25.5	2	70.8	137.3	142.8	150	150
	230	16.7	120.0	26.0	1.5	8.2	5.5	0.0	None	-	-	-	48.8	54.3	60	70
									E09	9.0	1	22.6	75.8	81.3	80	90
									E18	18.0	2	45.2	102.9	108.4	110	110
									E24	24.0	2	60.2	120.9	126.4	125	150
									E36	34.0	2	85.3	151.0	156.5	175	175
	460	8.7	60.0	13.5	0.8	4.1	2.2	0.0	None	-	-	-	25.3	27.5	30	35
									E09	9.0	1	11.3	38.8	41.0	40	45
									E18	18.0	2	22.6	52.3	54.5	60	60
									E24	24.0	2	30.1	61.4	63.6	70	70
									E36	34.0	2	42.7	76.4	78.6	80	80
	575	6.7	42.0	10.5	0.6	3.6	1.8	0.0	None	-	-	-	19.9	21.7	25	25
									E09	9.0	1	9.0	30.7	32.5	35	35
									E18	18.0	2	18.1	41.5	43.3	45	45
									E24	24.0	2	24.1	48.7	50.5	50	60
									E36	34.0	2	34.1	60.8	62.6	70	70

XP078-150 Standard Motor - Without Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
120 (10)	208	17.9	120.0	28.0	1.5	8.2	5.5	0.0	None	-	-	-	51.5	57.0	60	70
									E18	13.5	2	37.5	98.3	103.8	100	110
									E24	18.0	2	50.0	113.9	119.4	125	125
									E36	25.5	2	70.8	140.0	145.5	150	150
									E54	40.6	2	112.7	151.1	158.0	175	175
	230	17.9	120.0	28.0	1.5	8.2	5.5	0.0	None	-	-	-	51.5	57.0	60	70
									E18	18.0	2	45.2	105.6	111.1	110	125
									E24	24.0	2	60.2	123.6	129.1	125	150
									E36	34.0	2	85.3	153.7	159.2	175	175
									E54	54.0	2	135.6	153.7	159.2	175	175
	460	9.6	70.0	15.0	0.8	4.1	2.2	0.0	None	-	-	-	27.3	29.5	35	35
									E18	18.0	2	22.6	54.4	56.6	60	60
									E24	24.0	2	30.1	63.4	65.6	70	70
									E36	34.0	2	42.7	78.4	80.6	80	90
									E54	54.0	2	67.8	78.4	80.6	80	90
	575	7.4	53.0	11.5	0.6	3.6	1.8	0.0	None	-	-	-	21.5	23.3	25	30
									E18	18.0	2	18.1	43.1	44.9	45	45
									E24	24.0	2	24.1	50.3	52.1	60	60
									E36	34.0	2	34.1	62.3	64.1	70	70
									E54	54.0	2	54.2	62.3	64.1	70	70
150 (12.5)	208	23.1	160.0	36.0	1.5	10.9	5.5	0.0	None	-	-	-	68.9	74.4	90	90
									E18	13.5	2	37.5	115.7	121.2	125	125
									E24	18.0	2	50.0	131.3	136.8	150	150
									E36	25.5	2	70.8	157.4	162.9	175	175
									E54	40.6	2	112.7	157.4	162.9	175	175
	230	23.1	160.0	36.0	1.5	10.9	5.5	0.0	None	-	-	-	68.9	74.4	90	90
									E18	18.0	2	45.2	123.0	128.5	125	150
									E24	24.0	2	60.2	141.0	146.5	150	150
									E36	34.0	2	85.3	171.1	176.6	175	200
									E54	54.0	2	135.6	171.1	176.6	175	200
	460	12.2	87.0	19.0	0.8	5.3	2.2	0.0	None	-	-	-	36.0	38.2	45	50
									E18	18.0	2	22.6	63.0	65.2	70	70
									E24	24.0	2	30.1	72.0	74.2	80	80
									E36	34.0	2	42.7	87.1	89.3	90	90
									E54	54.0	2	67.8	87.1	89.3	90	90
	575	8.7	62.0	13.5	0.6	4.1	1.8	0.0	None	-	-	-	26.1	27.9	30	35
									E18	18.0	2	18.1	47.7	49.5	50	50
									E24	24.0	2	24.1	54.9	56.7	60	60
									E36	34.0	2	34.1	67.0	68.8	70	70
									E54	54.0	2	54.2	67.0	68.8	70	70

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

XP078-150 Hi Static Motor - Without Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
078 (6.5)	208	14.1	95.0	22.0	1.5	8.2	5.5	0.0	None	-	-	-	42.9	48.4	50	60
									E09	6.8	1	18.9	66.5	72.0	70	80
									E18	13.5	2	37.5	89.8	95.3	90	100
									E24	18.0	2	50.0	105.4	110.9	110	125
									E36	25.5	2	70.8	131.4	136.9	150	150
	230	14.1	95.0	22.0	1.5	8.2	5.5	0.0	None	-	-	-	42.9	48.4	50	60
									E09	9.0	1	22.6	70.0	75.5	70	80
									E18	18.0	2	45.2	97.1	102.6	100	110
									E24	24.0	2	60.2	115.1	120.6	125	125
									E36	34.0	2	85.3	145.2	150.7	150	175
	460	6.4	45.0	10.0	0.8	4.1	2.2	0.0	None	-	-	-	20.1	22.3	25	25
									E09	9.0	1	11.3	33.6	35.8	35	40
									E18	18.0	2	22.6	47.2	49.4	50	50
									E24	24.0	2	30.1	56.2	58.4	60	60
									E36	34.0	2	42.7	71.2	73.4	80	80
	575	5.4	38.0	8.5	0.6	3.6	1.8	0.0	None	-	-	-	17.0	18.8	20	20
									E09	9.0	1	9.0	27.8	29.6	30	30
									E18	18.0	2	18.1	38.6	40.4	40	45
									E24	24.0	2	24.1	45.8	47.6	50	50
									E36	34.0	2	34.1	57.8	59.6	60	60
090 (7.5)	208	15.6	83.1	21.4	1.5	10.9	5.5	0.0	None	-	-	-	49.0	54.5	60	70
									E09	6.8	1	18.9	72.6	78.1	80	80
									E18	13.5	2	37.5	95.8	101.3	100	110
									E24	18.0	2	50.0	111.5	117.0	125	125
									E36	25.5	2	70.8	137.5	143.0	150	150
	230	15.6	83.1	21.4	1.5	10.9	5.5	0.0	None	-	-	-	49.0	54.5	60	70
									E09	9.0	1	22.6	76.1	81.6	80	90
									E18	18.0	2	45.2	103.1	108.6	110	110
									E24	24.0	2	60.2	121.2	126.7	125	150
									E36	34.0	2	85.3	151.2	156.7	175	175
	460	6.9	41.0	9.7	0.8	5.3	2.2	0.0	None	-	-	-	22.4	24.6	25	30
									E09	9.0	1	11.3	36.0	38.2	40	40
									E18	18.0	2	22.6	49.5	51.7	50	60
									E24	24.0	2	30.1	58.5	60.7	60	70
									E36	34.0	2	42.7	73.5	75.7	80	80
	575	5.4	33.0	7.5	0.6	4.1	1.8	0.0	None	-	-	-	17.5	19.3	20	20
									E09	9.0	1	9.0	28.3	30.1	30	35
									E18	18.0	2	18.1	39.1	40.9	40	45
									E24	24.0	2	24.1	46.3	48.1	50	50
									E36	34.0	2	34.1	58.3	60.1	60	70
102 (8.5)	208	16.7	120.0	26.0	1.5	10.9	5.5	0.0	None	-	-	-	51.5	57.0	60	70
									E09	6.8	1	18.9	75.1	80.6	80	90
									E18	13.5	2	37.5	98.3	103.8	100	110
									E24	18.0	2	50.0	113.9	119.4	125	125
									E36	25.5	2	70.8	140.0	145.5	150	150
	230	16.7	120.0	26.0	1.5	10.9	5.5	0.0	None	-	-	-	51.5	57.0	60	70
									E09	9.0	1	22.6	78.5	84.0	80	90
									E18	18.0	2	45.2	105.6	111.1	110	125
									E24	24.0	2	60.2	123.6	129.1	125	150
									E36	34.0	2	85.3	153.7	159.2	175	175
	460	8.7	60.0	13.5	0.8	5.3	2.2	0.0	None	-	-	-	26.5	28.7	35	35
									E09	9.0	1	11.3	40.0	42.2	45	45
									E18	18.0	2	22.6	53.5	55.7	60	60
									E24	24.0	2	30.1	62.6	64.8	70	70
									E36	34.0	2	42.7	77.6	79.8	80	80
	575	6.7	42.0	10.5	0.6	4.1	1.8	0.0	None	-	-	-	20.4	22.2	25	25
									E09	9.0	1	9.0	31.2	33.0	35	35
									E18	18.0	2	18.1	42.0	43.8	45	45
									E24	24.0	2	24.1	49.2	51.0	50	60
									E36	34.0	2	34.1	61.3	63.1	70	70

XP078-150 Hi Static Motor - Without Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
120 (10)	208	17.9	120.0	28.0	1.5	10.9	5.5	0.0	None	-	-	-	54.2	59.7	70	70
									E18	13.5	2	37.5	101.0	106.5	110	110
									E24	18.0	2	50.0	116.6	122.1	125	125
									E36	25.5	2	70.8	142.7	148.2	150	150
									E54	40.6	2	112.7	154.5	161.4	175	175
	230	17.9	120.0	28.0	1.5	10.9	5.5	0.0	None	-	-	-	54.2	59.7	70	70
									E18	18.0	2	45.2	108.3	113.8	110	125
									E24	24.0	2	60.2	126.3	131.8	150	150
									E36	34.0	2	85.3	156.4	161.9	175	175
									E54	54.0	2	135.6	156.4	161.9	175	175
	460	9.6	70.0	15.0	0.8	5.3	2.2	0.0	None	-	-	-	28.5	30.7	35	40
									E18	18.0	2	22.6	55.6	57.8	60	60
									E24	24.0	2	30.1	64.6	66.8	70	70
									E36	34.0	2	42.7	79.6	81.8	80	90
									E54	54.0	2	67.8	79.6	81.8	80	90
	575	7.4	53.0	11.5	0.6	4.1	1.8	0.0	None	-	-	-	22.0	23.8	25	30
									E18	18.0	2	18.1	43.6	45.4	45	50
									E24	24.0	2	24.1	50.8	52.6	60	60
									E36	34.0	2	34.1	62.8	64.6	70	70
									E54	54.0	2	54.2	62.8	64.6	70	70
150 (12.5)	208	23.1	160.0	36.0	1.5	16.1	5.5	0.0	None	-	-	-	74.1	79.6	90	100
									E18	13.5	2	37.5	120.9	126.4	125	150
									E24	18.0	2	50.0	136.5	142.0	150	150
									E36	25.5	2	70.8	162.6	168.1	175	175
									E54	40.6	2	112.7	162.6	168.1	175	175
	230	23.1	160.0	36.0	1.5	16.1	5.5	0.0	None	-	-	-	74.1	79.6	90	100
									E18	18.0	2	45.2	128.2	133.7	150	150
									E24	24.0	2	60.2	146.2	151.7	150	175
									E36	34.0	2	85.3	176.3	181.8	200	200
									E54	54.0	2	135.6	176.3	181.8	200	200
	460	12.2	87.0	19.0	0.8	8.1	2.2	0.0	None	-	-	-	38.8	41.0	50	50
									E18	18.0	2	22.6	65.8	68.0	70	70
									E24	24.0	2	30.1	74.8	77.0	80	80
									E36	34.0	2	42.7	89.9	92.1	90	100
									E54	54.0	2	67.8	89.9	92.1	90	100
	575	8.7	62.0	13.5	0.6	6.0	1.8	0.0	None	-	-	-	28.0	29.8	35	35
									E18	18.0	2	18.1	49.6	51.4	50	60
									E24	24.0	2	24.1	56.8	58.6	60	60
									E36	34.0	2	34.1	68.9	70.7	70	80
									E54	54.0	2	54.2	68.9	70.7	70	80

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

XP078-150 Standard Motor - With Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
078 (6.5)	208	14.1	95.0	22.0	1.5	6.2	5.5	10.0	None	–	–	–	50.9	56.4	60	70
									E09	6.8	1	18.9	74.5	80.0	80	80
									E18	13.5	2	37.5	97.8	103.3	100	110
									E24	18.0	2	50.0	113.4	118.9	125	125
									E36	25.5	2	70.8	139.4	144.9	150	150
	230	14.1	95.0	22.0	1.5	6.2	5.5	10.0	None	–	–	–	50.9	56.4	60	70
									E09	9.0	1	22.6	78.0	83.5	80	90
									E18	18.0	2	45.2	105.1	110.6	110	125
									E24	24.0	2	60.2	123.1	128.6	125	150
									E36	34.0	2	85.3	153.2	158.7	175	175
	460	6.4	45.0	10.0	0.8	3.1	2.2	5.0	None	–	–	–	24.1	26.3	30	30
									E09	9.0	1	11.3	37.6	39.8	40	40
									E18	18.0	2	22.6	51.2	53.4	60	60
									E24	24.0	2	30.1	60.2	62.4	70	70
									E36	34.0	2	42.7	75.2	77.4	80	80
	575	5.4	38.0	8.5	0.6	2.4	1.8	4.0	None	–	–	–	19.8	21.6	25	25
									E09	9.0	1	9.0	30.6	32.4	35	35
									E18	18.0	2	18.1	41.4	43.2	45	45
									E24	24.0	2	24.1	48.6	50.4	50	60
									E36	34.0	2	34.1	60.6	62.4	70	70
090 (7.5)	208	15.6	83.1	21.4	1.5	6.2	5.5	10.0	None	-	-	-	54.3	59.8	60	70
									E09	6.8	1	18.9	77.9	83.4	80	90
									E18	13.5	2	37.5	101.1	106.6	110	110
									E24	18.0	2	50.0	116.8	122.3	125	125
									E36	25.5	2	70.8	142.8	148.3	150	150
	230	15.6	83.1	21.4	1.5	6.2	5.5	10.0	None	-	-	-	54.3	59.8	60	70
									E09	9.0	1	22.6	81.4	86.9	90	90
									E18	18.0	2	45.2	108.4	113.9	110	125
									E24	24.0	2	60.2	126.5	132.0	150	150
									E36	34.0	2	85.3	156.5	162.0	175	175
	460	6.9	41.0	9.7	0.8	3.1	2.2	5.0	None	-	-	-	25.2	27.4	30	30
									E09	9.0	1	11.3	38.8	41.0	40	45
									E18	18.0	2	22.6	52.3	54.5	60	60
									E24	24.0	2	30.1	61.3	63.5	70	70
									E36	34.0	2	42.7	76.3	78.5	80	80
	575	5.4	33.0	7.5	0.6	2.4	1.8	4.0	None	-	-	-	19.8	21.6	25	25
									E09	9.0	1	9.0	30.6	32.4	35	35
									E18	18.0	2	18.1	41.4	43.2	45	45
									E24	24.0	2	24.1	48.6	50.4	50	60
									E36	34.0	2	34.1	60.6	62.4	70	70
102 (8.5)	208	16.7	120.0	26.0	1.5	8.2	5.5	10.0	None	–	–	–	58.8	64.3	70	80
									E09	6.8	1	18.9	82.4	87.9	90	90
									E18	13.5	2	37.5	105.6	111.1	110	125
									E24	18.0	2	50.0	121.2	126.7	125	150
									E36	25.5	2	70.8	147.3	152.8	150	175
	230	16.7	120.0	26.0	1.5	8.2	5.5	10.0	None	–	–	–	58.8	64.3	70	80
									E09	9.0	1	22.6	85.8	91.3	90	100
									E18	18.0	2	45.2	112.9	118.4	125	125
									E24	24.0	2	60.2	130.9	136.4	150	150
									E36	34.0	2	85.3	161.0	166.5	175	175
	460	8.7	60.0	13.5	0.8	4.1	2.2	5.0	None	–	–	–	30.3	32.5	35	40
									E09	9.0	1	11.3	43.8	46.0	45	50
									E18	18.0	2	22.6	57.3	59.5	60	60
									E24	24.0	2	30.1	66.4	68.6	70	70
									E36	34.0	2	42.7	81.4	83.6	90	90
	575	6.7	42.0	10.5	0.6	3.6	1.8	4.0	None	–	–	–	23.9	25.7	30	30
									E09	9.0	1	9.0	34.7	36.5	35	40
									E18	18.0	2	18.1	45.5	47.3	50	50
									E24	24.0	2	24.1	52.7	54.5	60	60
									E36	34.0	2	34.1	64.8	66.6	70	70

XP078-150 Standard Motor - With Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
120 (10)	208	17.9	120.0	28.0	1.5	8.2	5.5	10.0	None	–	–	–	61.5	67.0	70	80
									E18	13.5	2	37.5	108.3	113.8	110	125
									E24	18.0	2	50.0	123.9	129.4	125	150
									E36	25.5	2	70.8	150.0	155.5	150	175
									E54	40.6	2	112.7	163.6	170.5	175	175
	230	17.9	120.0	28.0	1.5	8.2	5.5	10.0	None	–	–	–	61.5	67.0	70	80
									E18	18.0	2	45.2	115.6	121.1	125	125
									E24	24.0	2	60.2	133.6	139.1	150	150
									E36	34.0	2	85.3	163.7	169.2	175	175
									E54	54.0	2	135.6	163.7	169.2	175	175
	460	9.6	70.0	15.0	0.8	4.1	2.2	5.0	None	–	–	–	32.3	34.5	40	40
									E18	18.0	2	22.6	59.4	61.6	60	70
									E24	24.0	2	30.1	68.4	70.6	70	80
									E36	34.0	2	42.7	83.4	85.6	90	90
									E54	54.0	2	67.8	83.4	85.6	90	90
	575	7.4	53.0	11.5	0.6	3.6	1.8	4.0	None	–	–	–	25.5	27.3	30	30
									E18	18.0	2	18.1	47.1	48.9	50	50
									E24	24.0	2	24.1	54.3	56.1	60	60
									E36	34.0	2	34.1	66.3	68.1	70	70
									E54	54.0	2	54.2	66.3	68.1	70	70
150 (12.5)	208	23.1	160.0	36.0	1.5	10.9	5.5	10.0	None	–	–	–	78.9	84.4	100	100
									E18	13.5	2	37.5	125.7	131.2	150	150
									E24	18.0	2	50.0	141.3	146.8	150	150
									E36	25.5	2	70.8	167.4	172.9	175	175
									E54	40.6	2	112.7	167.4	173.9	175	175
	230	23.1	160.0	36.0	1.5	10.9	5.5	10.0	None	–	–	–	78.9	84.4	100	100
									E18	18.0	2	45.2	133.0	138.5	150	150
									E24	24.0	2	60.2	151.0	156.5	175	175
									E36	34.0	2	85.3	181.1	186.6	200	200
									E54	54.0	2	135.6	181.1	186.6	200	200
	460	12.2	87.0	19.0	0.8	5.3	2.2	5.0	None	–	–	–	41.0	43.2	50	50
									E18	18.0	2	22.6	68.0	70.2	70	80
									E24	24.0	2	30.1	77.0	79.2	80	80
									E36	34.0	2	42.7	92.1	94.3	100	100
									E54	54.0	2	67.8	92.1	94.3	100	100
	575	8.7	62.0	13.5	0.6	4.1	1.8	4.0	None	–	–	–	30.1	31.9	35	40
									E18	18.0	2	18.1	51.7	53.5	60	60
									E24	24.0	2	24.1	58.9	60.7	60	70
									E36	34.0	2	34.1	71.0	72.8	80	80
									E54	54.0	2	54.2	71.0	72.8	80	80

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

XP078-150 Hi Static Motor - With Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
078 (6.5)	208	14.1	95.0	22.0	1.5	8.2	5.5	10.0	None	–	–	–	52.9	58.4	60	70
									E09	6.8	1	18.9	76.5	82.0	80	90
									E18	13.5	2	37.5	99.8	105.3	100	110
									E24	18.0	2	50.0	115.4	120.9	125	125
									E36	25.5	2	70.8	141.4	146.9	150	150
	230	14.1	95.0	22.0	1.5	8.2	5.5	10.0	None	–	–	–	52.9	58.4	60	70
									E09	9.0	1	22.6	80.0	85.5	80	90
									E18	18.0	2	45.2	107.1	112.6	110	125
									E24	24.0	2	60.2	125.1	130.6	150	150
									E36	34.0	2	85.3	155.2	160.7	175	175
	460	6.4	45.0	10.0	0.8	4.1	2.2	5.0	None	–	–	–	25.1	27.3	30	30
									E09	9.0	1	11.3	38.6	40.8	40	45
									E18	18.0	2	22.6	52.2	54.4	60	60
									E24	24.0	2	30.1	61.2	63.4	70	70
									E36	34.0	2	42.7	76.2	78.4	80	80
	575	5.4	38.0	8.5	0.6	3.6	1.8	4.0	None	–	–	–	21.0	22.8	25	25
									E09	9.0	1	9.0	31.8	33.6	35	35
									E18	18.0	2	18.1	42.6	44.4	45	45
									E24	24.0	2	24.1	49.8	51.6	50	60
									E36	34.0	2	34.1	61.8	63.6	70	70
090 (7.5)	208	15.6	83.1	21.4	1.5	10.9	5.5	10.0	None	–	–	–	59.0	64.5	70	80
									E09	6.8	1	18.9	82.6	88.1	90	90
									E18	13.5	2	37.5	105.8	111.3	110	125
									E24	18.0	2	50.0	121.5	127.0	125	150
									E36	25.5	2	70.8	147.5	153.0	150	175
	230	15.6	83.1	21.4	1.5	10.9	5.5	10.0	None	–	–	–	59.0	64.5	70	80
									E09	9.0	1	22.6	86.1	91.6	90	100
									E18	18.0	2	45.2	113.1	118.6	125	125
									E24	24.0	2	60.2	131.2	136.7	150	150
									E36	34.0	2	85.3	161.2	166.7	175	175
	460	6.9	41.0	9.7	0.8	5.3	2.2	5.0	None	–	–	–	27.4	29.6	30	35
									E09	9.0	1	11.3	41.0	43.2	45	45
									E18	18.0	2	22.6	54.5	56.7	60	60
									E24	24.0	2	30.1	63.5	65.7	70	70
									E36	34.0	2	42.7	78.5	80.7	80	90
	575	5.4	33.0	7.5	0.6	4.1	1.8	4.0	None	–	–	–	21.5	23.3	25	25
									E09	9.0	1	9.0	32.3	34.1	35	35
									E18	18.0	2	18.1	43.1	44.9	45	45
									E24	24.0	2	24.1	50.3	52.1	60	60
									E36	34.0	2	34.1	62.3	64.1	70	70
102 (8.5)	208	16.7	120.0	26.0	1.5	10.9	5.5	10.0	None	–	–	–	61.5	67.0	70	80
									E09	6.8	1	18.9	85.1	90.6	90	100
									E18	13.5	2	37.5	108.3	113.8	110	125
									E24	18.0	2	50.0	123.9	129.4	125	150
									E36	25.5	2	70.8	150.0	155.5	150	175
	230	16.7	120.0	26.0	1.5	10.9	5.5	10.0	None	–	–	–	61.5	67.0	70	80
									E09	9.0	1	22.6	88.5	94.0	90	100
									E18	18.0	2	45.2	115.6	121.1	125	125
									E24	24.0	2	60.2	133.6	139.1	150	150
									E36	34.0	2	85.3	163.7	169.2	175	175
	460	8.7	60.0	13.5	0.8	5.3	2.2	5.0	None	–	–	–	31.5	33.7	40	40
									E09	9.0	1	11.3	45.0	47.2	50	50
									E18	18.0	2	22.6	58.5	60.7	60	70
									E24	24.0	2	30.1	67.6	69.8	70	70
									E36	34.0	2	42.7	82.6	84.8	90	90
	575	6.7	42.0	10.5	0.6	4.1	1.8	4.0	None	–	–	–	24.4	26.2	30	30
									E09	9.0	1	9.0	35.2	37.0	40	40
									E18	18.0	2	18.1	46.0	47.8	50	50
									E24	24.0	2	24.1	53.2	55.0	60	60
									E36	34.0	2	34.1	65.3	67.1	70	70

XP078-150 Hi Static Motor - With Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
120 (10)	208	17.9	120.0	28.0	1.5	10.9	5.5	10.0	None	–	–	–	64.2	69.7	80	80
									E18	13.5	2	37.5	111.0	116.5	125	125
									E24	18.0	2	50.0	126.6	132.1	150	150
									E36	25.5	2	70.8	152.7	158.2	175	175
									E54	40.6	2	112.7	167.0	173.9	175	175
	230	17.9	120.0	28.0	1.5	10.9	5.5	10.0	None	–	–	–	64.2	69.7	80	80
									E18	18.0	2	45.2	118.3	123.8	125	125
									E24	24.0	2	60.2	136.3	141.8	150	150
									E36	34.0	2	85.3	166.4	171.9	175	175
									E54	54.0	2	135.6	166.4	171.9	175	175
	460	9.6	70.0	15.0	0.8	5.3	2.2	5.0	None	–	–	–	33.5	35.7	40	45
									E18	18.0	2	22.6	60.6	62.8	70	70
									E24	24.0	2	30.1	69.6	71.8	70	80
									E36	34.0	2	42.7	84.6	86.8	90	90
									E54	54.0	2	67.8	84.6	86.8	90	90
	575	7.4	53.0	11.5	0.6	4.1	1.8	4.0	None	–	–	–	26.0	27.8	30	35
									E18	18.0	2	18.1	47.6	49.4	50	50
									E24	24.0	2	24.1	54.8	56.6	60	60
									E36	34.0	2	34.1	66.8	68.6	70	70
									E54	54.0	2	54.2	66.8	68.6	70	70
150 (12.5)	208	23.1	160.0	36.0	1.5	16.1	5.5	10.0	None	–	–	–	84.1	89.6	100	110
									E18	13.5	2	37.5	130.9	136.4	150	150
									E24	18.0	2	50.0	146.5	152.0	150	175
									E36	25.5	2	70.8	172.6	178.1	175	200
									E54	40.6	2	112.7	173.5	180.4	175	200
	230	23.1	160.0	36.0	1.5	16.1	5.5	10.0	None	–	–	–	84.1	89.6	100	110
									E18	18.0	2	45.2	138.2	143.7	150	150
									E24	24.0	2	60.2	156.2	161.7	175	175
									E36	34.0	2	85.3	186.3	191.8	200	200
									E54	54.0	2	135.6	186.3	191.8	200	200
	460	12.2	87.0	19.0	0.8	8.1	2.2	5.0	None	–	–	–	43.8	46.0	50	50
									E18	18.0	2	22.6	70.8	73.0	80	80
									E24	24.0	2	30.1	79.8	82.0	80	90
									E36	34.0	2	42.7	94.9	97.1	100	100
									E54	54.0	2	67.8	94.9	97.1	100	100
	575	8.7	62.0	13.5	0.6	6.0	1.8	4.0	None	–	–	–	32.0	33.8	40	40
									E18	18.0	2	18.1	53.6	55.4	60	60
									E24	24.0	2	24.1	60.8	62.6	70	70
									E36	34.0	2	34.1	72.9	74.7	80	80
									E54	54.0	2	54.2	72.9	74.7	80	80

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

XP078-150 Physical Data

Component	Models				
	XP078	XP090	XP102	XP120	XP150
Nominal Tonnage	**6.5**	**7.5**	**8.5**	**10**	**12.5**
ARI COOLING PERFORMANCE					
Gross Capacity @ ARI A point (Btu)	80000	95000	104000	122000	156000
ARI net capacity (Btu)	78000	92000	100000	118000	150000
EER	11.0	11.0	11.0	11.0	11.0
SEER	-	-	-	-	-
IPLV	12.4	12.4	12.4	12.4	11.9
Nominal CFM	2600	3000	3400	4000	5000
System power (KW)	7.10	8.35	9.10	10.70	13.60
Refrigerant type	R-410a	R-410a	R-410a	R-410a	R-410a
Refrigerant charge (lb-oz)					
System 1	9-0	9-8	13-8	14-0	16-0
System 2	9-4	9-0	13-0	14-0	16-0
ARI HEATING PERFORMANCE					
47°F capacity rating (MBH)	78.0	92.0	94.0	110.0	144.0
System power (KW) / COP	6.5 / 3.50	7.6 / 3.50	7.8 / 3.50	9.2 / 3.50	13.2 / 3.20
17°F capacity rating (MBH	48.0	55.0	57.0	66.0	90.0
System power (KW) / COP	6.2 / 2.30	7.0 / 2.30	7.3 / 2.30	8.3 / 2.30	11.9 / 2.20
HSPF (Btu/Watts-hr)	-	-	-	-	-
DIMENSIONS (inches)					
Length	89	89	89	89	119-7/16
Width	59	59	59	59	59
Height	42	42	50-3/4	50-3/4	50-3/4
OPERATING WT. (lbs.)	920	920	1135	1135	1400
COMPRESSORS					
Type	Scroll	Scroll	Scroll	Scroll	Scroll
Quantity	2	2	2	2	2
Unit Capacity Steps (%)	50 / 100	50 / 100	50 / 100	50 / 100	50 / 100
CONDENSER COIL DATA					
Face area (Sq. Ft.)	23.8	23.8	29.0	29.0	47.5
Rows	2	2	2	2	2
Fins per inch	20	20	20	20	15
Tube diameter (in.)	3/8	3/8	3/8	3/8	3/8
Circuitry Type	Split-face	Split-face	Split-face	Split-face	Split-face
EVAPORATOR COIL DATA					
Face area (Sq. Ft.)	10.6	10.6	13.2	13.2	13.2
Rows	3	3	4	4	4
Fins per inch	15	15	15	15	15
Tube diameter	3/8	3/8	3/8	3/8	3/8
Circuitry Type	Split-face	Split-face	Split-face	Split-face	Split-face
Refrigerant control	TXV	TXV	TXV	TXV	TXV

XP078-150 Physical Data (Continued)

Component	Models									
	XP078		XP090		XP102		XP120		XP150	
Nominal Tonnage	6.5		7.5		8.5		10		12.5	
CONDENSER FAN DATA										
Quantity	2		2		2		2		4	
Fan diameter (Inch)	24		24		24		24		24	
Type	Prop		Prop		Prop		Prop		Prop	
Drive type	Direct		Direct		Direct		Direct		Direct	
No. speeds	1		1		1		1		1	
Number of motors	2		2		2		2		4	
Motor HP each	1/3		1/3		1/3		1/3		1/3	
RPM	850		850		850		850		850	
Nominal total CFM	6800		6800		6800		6800		14000	
BELT DRIVE EVAP FAN DATA										
Quantity	1		1		1		1		1	
Fan Size (Inch)	12 x 12		12 x 12		15 x 15		15 x 15		15 x 15	
Type	Centrifugal		Centrifugal		Centrifugal		Centrifugal		Centrifugal	
Motor Sheave	1VM50	1VM50	1VM50	1VM50	1VM50	1VM50	1VM50	1VM50	1VM50	1VP56
Blower Sheave	AK74	AK64	AK74	AK61	AK89	AK74	AK84	AK74	AK74	BK77
Belt	A49	A49	A49	A49	A56	A54	A56	A54	A54	BX55
Motor HP each	1-1/2	2	1-1/2	3	2	3	2	3	3	5
RPM	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
Frame size	56	56	56	56	56	56	56	56	56	184T
FILTERS										
Quantity - Size	4 - 25 x 16 x 2		4 - 25 x 16 x 2		4 - 25 x 20 x 2		4 - 25 x 20 x 2		4 - 25 x 20 x 2	

Optional Electric Heat

The factory-installed heaters are wired for single point power supply. Power supply need only be brought into the single point terminal block.

These CSA approved heaters are located within the central compartment of the unit with the heater elements extending in to the supply air chamber.

Fuses are supplied, where required, by the factory. Some kW sizes require fuses and others do not. refer to Table 9 for minimum CFM limitations and to Table 8 for electrical data.

Table 9: Electric Heat Minimum Supply Air

Size (Tons)	Model	Voltage	Minimum Supply Air (CFM)				
			Heater kW				
			9	18	24	36	54
078 (6.5)	XP	208/230-3-60	1950	1950	1950	1950	-
		460-3-60	1950	1950	1950	1950	-
		600-3-60	1950	1950	1950	1950	-
090 (7.5)	XP	208/230-3-60	2250	2250	2250	2250	-
		460-3-60	2250	2250	2250	2250	-
		600-3-60	2250	2250	2250	2250	-
102 (8.5)	XP	208/230-3-60	2550	2550	2550	2550	-
		460-3-60	2550	2550	2550	2550	-
		600-3-60	2550	2550	2550	2550	-
120 (10)	XP	208/230-3-60	-	3000	3000	3000	3500
		460-3-60	-	3000	3000	3000	3000
		600-3-60	-	3000	3000	3000	3500
150 (12.5)	XP	208/230-3-60	-	3750	3750	3750	4000
		460-3-60	-	3750	3750	3750	3750
		600-3-60	-	3750	3750	3750	3750

Options/Accessories

Electric Heat

Electric heaters are available as factory-installed options or field-installed accessories. Refer to electric heat instructions for installation. These heaters mount in the heat compartment with the heating elements extending into the supply air chamber. All electric heaters are fused and intended for use with single point power supply.

Motorized Outdoor Damper

The Motorized Outdoor Damper can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Motorized Outdoor Damper accessories include complete instructions for installation.

Economizer

The Economizer can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Economizer accessories include complete instructions for installation.

There are two Economizer options:

1. Down Flow application with barometric relief hood standard.
2. Horizontal Flow application that requires the purchase of a barometric relief hood.

Power Exhaust

The Power Exhaust can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Power Exhaust accessories include complete instructions for installation.

The Power Exhaust factory installed option is for Down Flow application only.

There are two field installed Power Exhaust accessories:

1. Down Flow application.
2. Horizontal Flow application that requires the purchase of a barometric relief hood.

Rain Hood

All of the hood components, including the filters, the gasketing and the hardware for assembling, are packaged and located between the condenser coil section and the main unit cabinet, if the unit has factory installed options. If field installed accessories are being installed all parts necessary for the installation comes in the accessory.

Economizer And Power Exhaust Set Point Adjustments

Remove the top rear access panel from the unit. Locate the economizer control module, where the following adjustments will be made.

⚠ CAUTION

Extreme care must be exercised in turning all set point, maximum and minimum damper positioning adjustment screws to prevent twisting them off.

Minimum Position Adjustment

- Check that the damper blades move smoothly without binding; carefully turn the Minimum Position Adjust screw (found on the damper control module) fully clockwise and then set the thermostat indoor fan switch to the ON position and then OFF or energize and de-energize terminals “R” to “G”.
- With the thermostat set to the indoor fan ON position or terminals “R” to “G” energized, turn the Minimum Position Adjusting screw (located on the damper control module) counterclockwise until the desired minimum damper position has been attained.

Enthalpy Set Point Adjustment

- The enthalpy set point may now be set by selecting the desired set point shown in the Enthalpy Set Point Adjustment Figure 24. Adjust as follows:
- For a single enthalpy operation carefully turn the set point adjusting screw (found on the damper control module) to the "A", "B", "C" or "D" setting corresponding to the lettered curve of the Enthalpy Set Point Adjustment Figure 25.
- For a dual enthalpy operation, carefully turn the set point adjusting screw fully clockwise past the "D" setting.

Power Exhaust Damper Set Point (With Or Without Power Exhaust)

- With no power exhaust option, adjust the Exhaust Air Adjustment Screw fully clockwise. This will allow 2nd stage cooling to operate.
- With power exhaust option, each building pressurization requirement will be different. The point at which the power exhaust comes on is determined by the economizer damper position (Percent Open). The Exhaust Air Adjustment Screw should be set at the Percent Open of the economizer damper at which the power exhaust is needed. It can be set from 0 to 100% damper open.

Indoor Air Quality AQ

Indoor Air Quality (indoor sensor input): Terminal AQ accepts a +2 to +10 Vdc signal with respect to the (AQ1) terminal. When the signal is below it's set point, the actuator is allowed to modulate normally in accordance with the enthalpy and mixed air sensor inputs. When the AQ signal exceeds it's set point setting and there is no call for free cooling, the actuator is proportionately modulated from the 2 to 10 Vdc signal, with 2 Vdc corresponding to full closed and 10 Vdc corresponding to full open. When there is no call for free cooling, the damper position is limited by the IAQ Max damper position setting.

When the signal exceeds it's set point (Demand Control Ventilation Set Point) setting and there is a call for free cooling, the actuator modulates from the minimum position to the full open position based on the highest call from either the mixed air sensor input or the AQ voltage input.

- Optional CO_2 Space Sensor Kit Part # 2AQ04700324
- Optional CO_2 Sensor Kit Part # 2AQ04700424

Replace the top rear access panel on the unit.

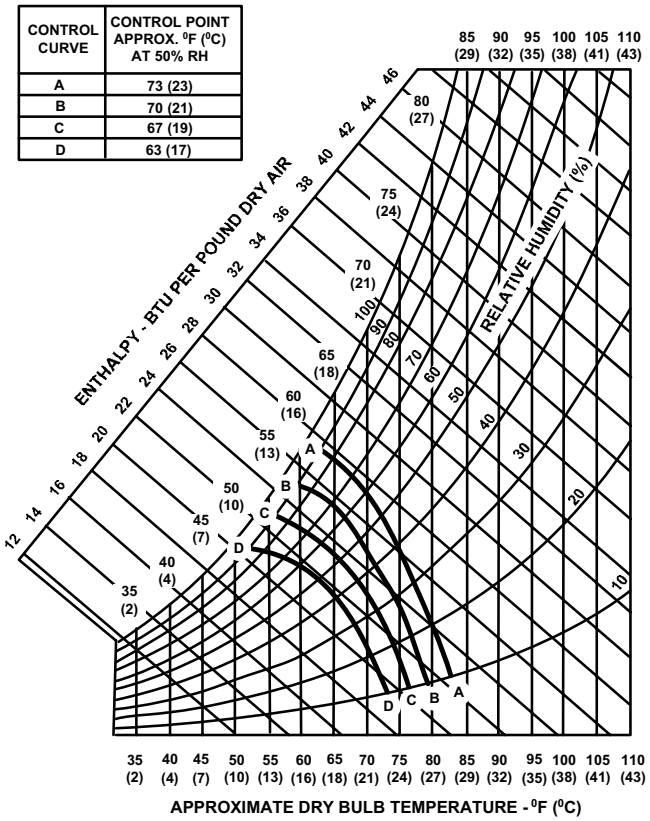


Figure 24: Enthalpy Set Point Chart

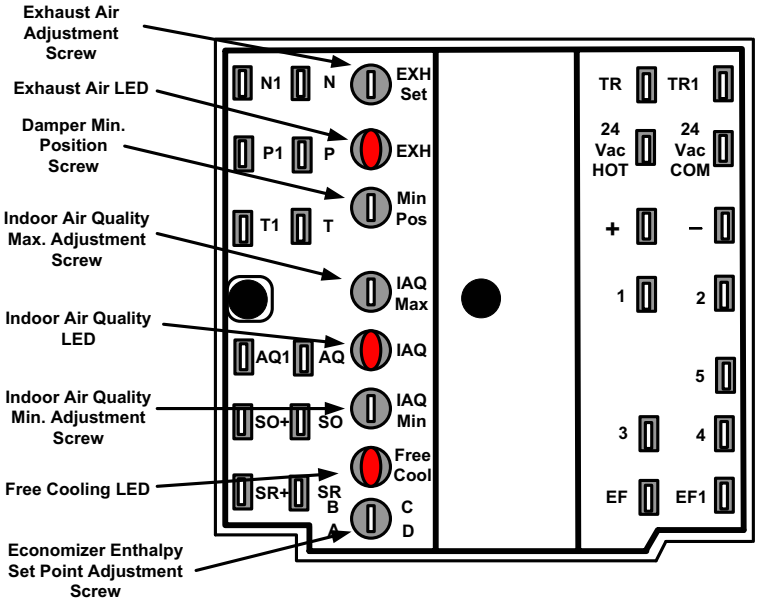


Figure 25: Honeywell Economizer Control W7212

Phasing

Predator® units are properly phased at the factory. Check for proper compressor rotation. If the blower or compressors rotate in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the phasing of the **Field Line Connection at the factory or field supplied disconnect** to obtain proper rotation. (Scroll compressors operate in only one direction. If the scroll is drawing low amperage, has similar suction and discharge pressures, or producing a high noise level, the scroll is misphased.)

⚠ CAUTION

Scroll compressors require proper rotation to operate correctly. Units are properly phased at the factory. Do not change the internal wiring to make the blower condenser fans, or compressor rotate correctly.

Blower Rotation

Check for proper supply air blower rotation. If the blower is rotating backwards, the line voltage at the unit point of power connection is misphased (See 'PHASING').

Table 10: Supply Air Limitations

Unit Size (Ton)	Minimum	Maximum
078 (6.5)	1950	3250
090 (7.5)	2250	3750
102 (8.5)	2550	4250
120 (10)	3000	5000
150 (12.5)	3750	6250

Belt Tension

The tension on the belt should be adjusted as shown in Figure 26.

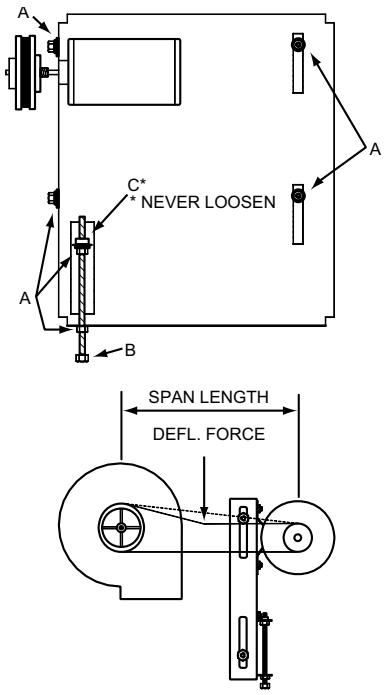


Figure 26: Belt Adjustment

⚠ CAUTION

Procedure for adjusting belt tension:

1. Loosen six nuts (top and bottom) A.
2. Adjust by turning (B).
3. Never loosen nuts (C).
4. Use belt tension checker to apply a perpendicular force to one belt at the midpoint of the span as shown. Deflection distance of 4mm (5/32") is obtained.

To determine the deflection distance from normal position, use a straight edge from sheave to sheave as reference line. The recommended deflection force is as follows:

Tension new belts at the max. deflection force recommended for the belt section. Check the belt tension at least two times during the first 24 hours of operation. Any retensioning should fall between the min. and max. deflection force values.

5. After adjusting retighten nuts (A).

CFM Static Pressure and Power-Altitude and Temperature Corrections

The information below should be used to assist in application of product when being applied at altitudes at or exceeding 1000 feet above sea level.

The air flow rates listed in the standard blower performance tables are based on standard air at sea level. As the altitude or temperature increases, the density of air decreases. In order to use the indoor blower tables for high altitude applications, certain corrections are necessary.

A centrifugal fan is a "constant volume" device. This means that, if the rpm remains constant, the CFM delivered is the same regardless of the density of the air. However, since the air at high altitude is less dense, less static pressure will be generated and less power will be required than a similar application at sea level. Air density correction factors are shown in Table 11 and Figure 27.

Table 11: Altitude/Temperature Correction Factors

Air Temp.	Altitude (Ft.)										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
40	1.060	1.022	0.986	0.950	0.916	0.882	0.849	0.818	0.788	0.758	0.729
50	1.039	1.002	0.966	0.931	0.898	0.864	0.832	0.802	0.772	0.743	0.715
60	1.019	0.982	0.948	0.913	0.880	0.848	0.816	0.787	0.757	0.729	0.701
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.715	0.688
80	0.982	0.947	0.913	0.880	0.848	0.817	0.787	0.758	0.730	0.702	0.676
90	0.964	0.929	0.897	0.864	0.833	0.802	0.772	0.744	0.716	0.689	0.663
100	0.946	0.912	0.880	0.848	0.817	0.787	0.758	0.730	0.703	0.676	0.651

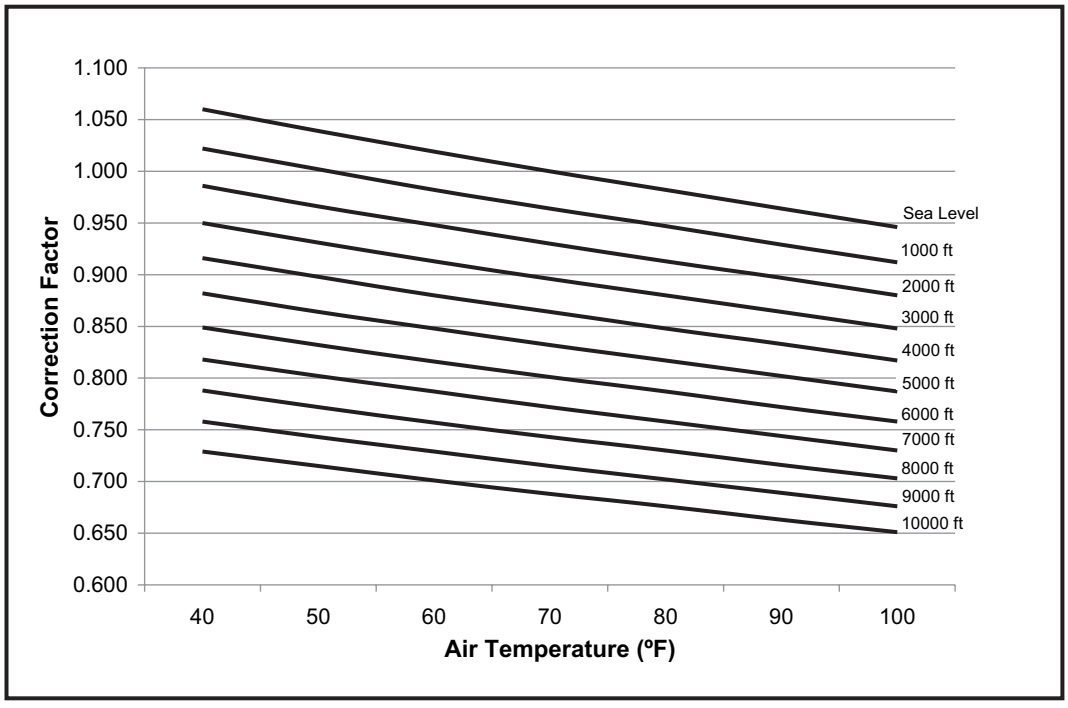


Figure 27: Altitude/Temperature Correction Factors

The examples below will assist in determining the airflow performance of the product at altitude.

Example 1: What are the corrected CFM, static pressure, and BHP at an elevation of 5,000 ft. if the blower performance data is 6,000 CFM, 1.5 IWC and 4.0 BHP?

Solution: At an elevation of 5,000 ft. the indoor blower will still deliver 6,000 CFM if the rpm is unchanged. However, Table 10 must be used to determine the static pressure and BHP. Since no temperature data is given, we will assume an air temperature of 70°F. Table 12 shows the correction factor to be 0.832.

Corrected static pressure = 1.5 x 0.832 = 1.248 IWC

Corrected BHP = 4.0 x 0.832 = 3.328

Example 2: A system, located at 5,000 feet of elevation, is to deliver 6,000 CFM at a static pressure of 1.5". Use the unit blower tables to select the blower speed and the BHP requirement.

Solution: As in the example above, no temperature information is given so 70°F is assumed.

The 1.5" static pressure given is at an elevation of 5,000 ft. The first step is to convert this static pressure to equivalent sea level conditions.

Sea level static pressure = 1.5 / .832 = 1.80"

Enter the blower table at 6000 sCFM and static pressure of 1.8". The rpm listed will be the same rpm needed at 5,000 ft.

Suppose that the corresponding BHP listed in the table is 3.2. This value must be corrected for elevation.

BHP at 5,000 ft. = 3.2 x .832 = 2.66

Drive Selection

1. Determine desired airflow.
2. Calculate or measure the amount of external static pressure.
3. Using the operating point determined from steps 1 & 2, locate this point on the appropriate supply air blower performance table. (Linear interpolation may be necessary.)
4. Noting the RPM and BHP from step 3, locate the appropriate model and drive on the RPM selection table.
5. Review the BHP compared to the motor options available. Select the appropriate motor.
6. Review the RPM range for the motor options available. Select the appropriate drive if multiple drives are available for the chosen motor.
7. Determine turns open to obtain the desired operation point.

Example

1. 19000 CFM
2. 5.4 iwg
3. Using the supply air blower performance table below, the following data point was located: 1150 RPM & 36 BHP.
4. Using the RPM selection table below, Size X and Model Y is found.
5. 36 BHP exceeds the maximum continuous BHP rating of the 30 HP motor. The 40 HP motor is required.
6. 1150 RPM is within the range of the 30 & 40 HP drives, but step 5 requires the 40 HP motor.
7. Using the 40 HP motor and drive, 5.5 turns open will achieve 1150 RPM.

Example Supply Air Blower Performance

Air Flow (CFM)	Available External Static Pressure - IWG																			
	3.0		3.4		3.8		4.2		4.6		5.0		5.4		5.8		6.2		6.6	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	30 HP & Field Supplied Drive								Standard 30 HP & Drive						Alternate 40 HP & Drive					
18000	800	10.00	850	14.00	900	18.00	950	22.00	1000	26.00	1050	30.00	1100	34.00	1150	38.00	1200	42.00	1250	46.00
19000	850	12.00	900	16.00	950	20.00	1000	24.00	1050	28.00	1100	32.00	1150	36.00	1200	40.00	1250	44.00	1300	48.00
20000	900	14.00	950	18.00	1000	22.00	1050	26.00	1100	30.00	1150	34.00	1200	38.00	1250	42.00	1300	46.00	1350	50.00
21000	950	16.00	1000	20.00	1050	24.00	1100	28.00	1150	32.00	1200	36.00	1250	40.00	1300	44.00	1350	48.00	1400	52.00

Table X: RPM Selection

Size (Tons)	Model	HP	Max BHP	Motor Sheave	Blower Sheave	6 Turns Open	5 Turns Open	4 Turns Open	3 Turns Open	2 Turns Open	1 Turn Open	Fully Closed
X	Y	30	34.50	1VL51	BK99	1000	1025	1045	1060	1110	1150	N/A
		40	46.00	1VL63	BK67	1125	1175	1250	1325	1400	1475	N/A

Table 12: Airflow Performance - Side Duct Application

XP078 (6.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	1.5 HP & Field Supplied Drive						Standard 1.5 HP & Drive								Hi Static 2 HP & Drive					
1800	754	0.24	814	0.44	872	0.63	929	0.79	985	0.93	1039	1.07	1094	1.20	1150	1.33	1207	1.45	1266	1.59
2000	779	0.37	840	0.58	898	0.76	955	0.92	1010	1.07	1065	1.21	1120	1.34	1176	1.46	1233	1.59	1292	1.72
2200	809	0.52	870	0.73	928	0.91	985	1.07	1040	1.22	1095	1.36	1150	1.48	1206	1.61	1263	1.74	1321	1.87
2400	842	0.69	903	0.90	961	1.08	1018	1.24	1073	1.39	1128	1.52	1183	1.65	1239	1.78	1296	1.91	1355	2.04
2600	879	0.87	939	1.08	998	1.26	1054	1.42	1110	1.57	1165	1.71	1220	1.84	1275	1.96	1332	2.09	1391	2.22
2800	918	1.08	979	1.28	1037	1.46	1093	1.63	1149	1.77	1204	1.91	1259	2.04	1315	2.16	1371	2.29	-	-
3000	960	1.30	1020	1.50	1079	1.68	1135	1.85	1191	1.99	1246	2.13	1301	2.26	-	-	-	-	-	-
3200	1004	1.54	1065	1.74	1123	1.92	1179	2.09	1235	2.23	-	-	-	-	-	-	-	-	-	-
3400	1050	1.79	1111	2.00	1169	2.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
															2 HP & Field Supplied Drive					

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP090 (7.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	1.5 HP & Field Supplied Drive						Standard 1.5 HP & Drive								Hi Static 3 HP & Drive					
2000	779	0.37	840	0.58	898	0.76	955	0.92	1010	1.07	1065	1.21	1120	1.34	1176	1.46	1233	1.59	1292	1.72
2200	809	0.52	870	0.73	928	0.91	985	1.07	1040	1.22	1095	1.36	1150	1.48	1206	1.61	1263	1.74	1321	1.87
2400	842	0.69	903	0.90	961	1.08	1018	1.24	1073	1.39	1128	1.52	1183	1.65	1239	1.78	1296	1.91	1355	2.04
2600	879	0.87	939	1.08	998	1.26	1054	1.42	1110	1.57	1165	1.71	1220	1.84	1275	1.96	1332	2.09	1391	2.22
2800	918	1.08	979	1.28	1037	1.46	1093	1.63	1149	1.77	1204	1.91	1259	2.04	1315	2.16	1371	2.29	1430	2.43
3000	960	1.30	1020	1.50	1079	1.68	1135	1.85	1191	1.99	1246	2.13	1301	2.26	1356	2.39	1413	2.51	1472	2.65
3200	1004	1.54	1065	1.74	1123	1.92	1179	2.09	1235	2.23	1290	2.37	1345	2.50	1400	2.62	1457	2.75	1516	2.89
3400	1050	1.79	1111	2.00	1169	2.18	1226	2.34	1281	2.49	1336	2.63	1391	2.75	1447	2.88	1504	3.01	1562	3.14
3600	1099	2.07	1159	2.27	1218	2.45	1274	2.62	1330	2.76	1385	2.90	1440	3.03	1495	3.15	1552	3.28	1611	3.42
3800	1149	2.36	1209	2.56	1268	2.74	1324	2.91	1380	3.05	1435	3.19	1490	3.32	1545	3.44	-	-	-	-
															3 HP & Field Supplied Drive					

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP102 (8.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	2 HP & Field Supplied Drive						Standard 2 HP & Drive								Hi Static 3 HP & Drive					
2200	632	0.23	684	0.44	734	0.65	783	0.84	830	1.03	876	1.21	921	1.39	966	1.56	1009	1.74	1051	1.91
2400	639	0.32	691	0.53	741	0.74	790	0.93	837	1.12	883	1.30	928	1.48	972	1.65	1015	1.83	1058	2.00
2600	646	0.41	698	0.62	748	0.82	797	1.02	844	1.21	890	1.39	936	1.57	980	1.74	1023	1.92	1065	2.09
2800	654	0.50	706	0.71	756	0.92	805	1.11	852	1.30	898	1.48	943	1.66	987	1.83	1031	2.01	1073	2.18
3000	663	0.60	714	0.81	765	1.02	813	1.21	861	1.40	907	1.58	952	1.76	996	1.93	1039	2.11	1082	2.28
3200	673	0.71	724	0.93	774	1.13	823	1.32	871	1.51	917	1.69	962	1.87	1006	2.05	1049	2.22	1091	2.39
3400	684	0.84	735	1.05	785	1.25	834	1.45	882	1.63	928	1.82	973	2.00	1017	2.17	1060	2.34	1102	2.52
3600	696	0.98	747	1.19	798	1.39	846	1.59	894	1.78	940	1.96	985	2.14	1029	2.31	1072	2.48	1115	2.66
3800	709	1.14	761	1.35	811	1.55	860	1.75	907	1.93	953	2.12	999	2.29	1043	2.47	1086	2.64	1128	2.81
4000	724	1.31	776	1.52	826	1.72	874	1.92	922	2.11	968	2.29	1013	2.47	1057	2.64	1100	2.82	1143	2.99
4200	740	1.50	792	1.71	842	1.92	890	2.11	938	2.30	984	2.48	1029	2.66	1073	2.83	1116	3.01	1159	3.18
																	3 HP & Field Supplied Drive			

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP120 (10 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	2 HP & Field Supplied Drive						Standard 2 HP & Drive										Hi Static 3 HP & Drive			
2600	646	0.41	698	0.62	748	0.82	797	1.02	844	1.21	890	1.39	936	1.57	980	1.74	1023	1.92	1065	2.09
2800	654	0.50	706	0.71	756	0.92	805	1.11	852	1.30	898	1.48	943	1.66	987	1.83	1031	2.01	1073	2.18
3000	663	0.60	714	0.81	765	1.02	813	1.21	861	1.40	907	1.58	952	1.76	996	1.93	1039	2.11	1082	2.28
3200	673	0.71	724	0.93	774	1.13	823	1.32	871	1.51	917	1.69	962	1.87	1006	2.05	1049	2.22	1091	2.39
3400	684	0.84	735	1.05	785	1.25	834	1.45	882	1.63	928	1.82	973	2.00	1017	2.17	1060	2.34	1102	2.52
3600	696	0.98	747	1.19	798	1.39	846	1.59	894	1.78	940	1.96	985	2.14	1029	2.31	1072	2.48	1115	2.66
3800	709	1.14	761	1.35	811	1.55	860	1.75	907	1.93	953	2.12	999	2.29	1043	2.47	1086	2.64	1128	2.81
4000	724	1.31	776	1.52	826	1.72	874	1.92	922	2.11	968	2.29	1013	2.47	1057	2.64	1100	2.82	1143	2.99
4200	740	1.50	792	1.71	842	1.92	890	2.11	938	2.30	984	2.48	1029	2.66	1073	2.83	1116	3.01	1159	3.18
4400	757	1.71	809	1.92	859	2.13	908	2.32	955	2.51	1001	2.69	1046	2.87	1091	3.04	1134	3.22	1176	3.39
4600	776	1.94	827	2.15	877	2.35	926	2.55	974	2.74	1020	2.92	1065	3.10	1109	3.27	1152	3.45	-	-
4800	795	2.19	847	2.40	897	2.60	946	2.79	993	2.98	1040	3.16	1085	3.34	-	-	-	-	-	-
5000	816	2.45	868	2.66	918	2.86	967	3.06	1014	3.25	1061	3.43	-	-	-	-	-	-	-	-
																	3 HP & Field Supplied Drive			

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP150 (12.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	3 HP & Field Supplied Drive										Standard 3 HP & Drive									
3200	673	0.71	724	0.93	774	1.13	823	1.32	871	1.51	917	1.69	962	1.87	1006	2.05	1049	2.22	1091	2.39
3400	684	0.84	735	1.05	785	1.25	834	1.45	882	1.63	928	1.82	973	2.00	1017	2.17	1060	2.34	1102	2.52
3600	696	0.98	747	1.19	798	1.39	846	1.59	894	1.78	940	1.96	985	2.14	1029	2.31	1072	2.48	1115	2.66
3800	709	1.14	761	1.35	811	1.55	860	1.75	907	1.93	953	2.12	999	2.29	1043	2.47	1086	2.64	1128	2.81
4000	724	1.31	776	1.52	826	1.72	874	1.92	922	2.11	968	2.29	1013	2.47	1057	2.64	1100	2.82	1143	2.99
4200	740	1.50	792	1.71	842	1.92	890	2.11	938	2.30	984	2.48	1029	2.66	1073	2.83	1116	3.01	1159	3.18
4400	757	1.71	809	1.92	859	2.13	908	2.32	955	2.51	1001	2.69	1046	2.87	1091	3.04	1134	3.22	1176	3.39
4600	776	1.94	827	2.15	877	2.35	926	2.55	974	2.74	1020	2.92	1065	3.10	1109	3.27	1152	3.45	1194	3.62
4800	795	2.19	847	2.40	897	2.60	946	2.79	993	2.98	1040	3.16	1085	3.34	1129	3.52	1172	3.69	1214	3.86
5000	816	2.45	868	2.66	918	2.86	967	3.06	1014	3.25	1061	3.43	1106	3.61	1150	3.78	1193	3.95	1235	4.13
5200	839	2.73	890	2.94	940	3.14	989	3.34	1037	3.53	1083	3.71	1128	3.89	1172	4.06	1215	4.23	1257	4.41
5400	862	3.03	914	3.24	964	3.44	1012	3.64	1060	3.82	1106	4.01	1151	4.18	1195	4.36	1238	4.53	1281	4.70
5600	886	3.34	938	3.55	988	3.76	1037	3.95	1084	4.14	1131	4.32	1176	4.50	1220	4.67	1263	4.85	1305	5.02
5800	912	3.67	964	3.89	1014	4.09	1063	4.28	1110	4.47	1156	4.65	1201	4.83	1246	5.01	1289	5.18	1331	5.35
6000	939	4.02	990	4.23	1041	4.44	1089	4.63	1137	4.82	1183	5.00	1228	5.18	1272	5.35	1315	5.53	1358	5.70
6200	967	4.39	1018	4.60	1068	4.80	1117	4.99	1165	5.18	1211	5.36	1256	5.54	1300	5.72	-	-	-	-
	Hi Static 5 HP & Drive														5 HP & Field Supplied Drive					

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

Table 13: Airflow Performance - Bottom Duct Application

XP078 (6.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	1.5 HP & Field Supplied Drive				Standard 1.5 HP & Drive						Hi Static 2 HP & Drive									
1800	775	0.32	849	0.54	923	0.72	997	0.89	1071	1.05	1147	1.20	1224	1.35	1303	1.51	1385	1.68	1469	1.88
2000	805	0.46	879	0.68	953	0.86	1027	1.03	1101	1.19	1177	1.34	1254	1.49	1333	1.65	1414	1.82	1499	2.02
2200	842	0.62	916	0.84	990	1.02	1064	1.19	1138	1.35	1214	1.50	1291	1.65	1370	1.81	1451	1.98	1536	2.18
2400	885	0.81	959	1.02	1033	1.21	1107	1.38	1181	1.53	1257	1.68	1334	1.83	1413	1.99	1495	2.17	-	-
2600	933	1.01	1007	1.23	1081	1.41	1155	1.58	1229	1.74	1305	1.89	1382	2.04	1461	2.20	-	-	-	-
2800	985	1.24	1059	1.46	1132	1.64	1206	1.81	1281	1.97	1356	2.12	1433	2.27	-	-	-	-	-	-
3000	1040	1.49	1114	1.71	1187	1.90	1261	2.06	1336	2.22	-	-	-	-	-	-	-	-	-	-
3200	1097	1.77	1171	1.98	1245	2.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3400	1157	2.06	1231	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
									2 HP & Field Supplied Drive											

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP090 (7.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	1.5 HP & Field Supplied Drive				Standard 1.5 HP & Drive						Hi Static 3 HP & Drive									
2000	805	0.46	879	0.68	953	0.86	1027	1.03	1101	1.19	1177	1.34	1254	1.49	1333	1.65	1414	1.82	1499	2.02
2200	842	0.62	916	0.84	990	1.02	1064	1.19	1138	1.35	1214	1.50	1291	1.65	1370	1.81	1451	1.98	1536	2.18
2400	885	0.81	959	1.02	1033	1.21	1107	1.38	1181	1.53	1257	1.68	1334	1.83	1413	1.99	1495	2.17	1579	2.36
2600	933	1.01	1007	1.23	1081	1.41	1155	1.58	1229	1.74	1305	1.89	1382	2.04	1461	2.20	1542	2.37	1627	2.57
2800	985	1.24	1059	1.46	1132	1.64	1206	1.81	1281	1.97	1356	2.12	1433	2.27	1512	2.43	1594	2.60	1679	2.80
3000	1040	1.49	1114	1.71	1187	1.90	1261	2.06	1336	2.22	1411	2.37	1488	2.52	1567	2.68	1649	2.85	1734	3.05
3200	1097	1.77	1171	1.98	1245	2.17	1319	2.34	1393	2.49	1469	2.64	1546	2.80	1625	2.96	1706	3.13	1791	3.33
3400	1157	2.06	1231	2.28	1305	2.47	1379	2.63	1453	2.79	1529	2.94	1606	3.09	1685	3.25	1766	3.43	-	-
3600	1219	2.38	1293	2.60	1367	2.78	1440	2.95	1515	3.11	1590	3.26	1667	3.41	-	-	-	-	-	-
3800	1282	2.72	1356	2.93	1430	3.12	1504	3.29	1578	3.45	-	-	-	-	-	-	-	-	-	-
											3 HP & Field Supplied Drive									

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP102 (8.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	2 HP & Field Supplied Drive				Standard 2 HP & Drive								Hi Static 3 HP & Drive							
2200	662	0.53	717	0.68	770	0.83	821	0.96	870	1.09	918	1.22	965	1.35	1010	1.47	1055	1.59	1098	1.71
2400	677	0.63	732	0.78	784	0.93	835	1.06	885	1.19	933	1.32	979	1.44	1025	1.57	1069	1.69	1112	1.81
2600	693	0.75	748	0.90	801	1.04	852	1.18	901	1.31	949	1.44	996	1.56	1041	1.68	1085	1.80	1129	1.92
2800	712	0.88	767	1.03	819	1.17	871	1.31	920	1.44	968	1.57	1014	1.69	1060	1.81	1104	1.94	1148	2.06
3000	733	1.03	788	1.18	841	1.33	892	1.46	941	1.59	989	1.72	1036	1.84	1081	1.97	1125	2.09	1169	2.21
3200	757	1.20	811	1.36	864	1.50	915	1.64	964	1.77	1012	1.89	1059	2.02	1104	2.14	1149	2.26	1192	2.38
3400	782	1.40	837	1.55	890	1.69	941	1.83	990	1.96	1038	2.09	1085	2.21	1130	2.33	1174	2.45	1218	2.58
3600	810	1.61	865	1.76	918	1.91	969	2.04	1018	2.18	1066	2.30	1113	2.43	1158	2.55	1203	2.67	1246	2.79
3800	841	1.85	896	2.00	948	2.14	999	2.28	1049	2.41	1097	2.54	1143	2.66	1189	2.78	1233	2.91	1276	3.03
4000	874	2.11	928	2.26	981	2.40	1032	2.54	1082	2.67	1130	2.80	1176	2.92	1222	3.04	1266	3.16	1309	3.28
4200	909	2.38	963	2.53	1016	2.68	1067	2.81	1117	2.95	1164	3.07	1211	3.20	1256	3.32	1301	3.44	-	-
													3 HP & Field Supplied Drive							

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP120 (10 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	2 HP & Field Supplied Drive				Standard 2 HP & Drive								Hi Static 3 HP & Drive							
2600	693	0.75	748	0.90	801	1.04	852	1.18	901	1.31	949	1.44	996	1.56	1041	1.68	1085	1.80	1129	1.92
2800	712	0.88	767	1.03	819	1.17	871	1.31	920	1.44	968	1.57	1014	1.69	1060	1.81	1104	1.94	1148	2.06
3000	733	1.03	788	1.18	841	1.33	892	1.46	941	1.59	989	1.72	1036	1.84	1081	1.97	1125	2.09	1169	2.21
3200	757	1.20	811	1.36	864	1.50	915	1.64	964	1.77	1012	1.89	1059	2.02	1104	2.14	1149	2.26	1192	2.38
3400	782	1.40	837	1.55	890	1.69	941	1.83	990	1.96	1038	2.09	1085	2.21	1130	2.33	1174	2.45	1218	2.58
3600	810	1.61	865	1.76	918	1.91	969	2.04	1018	2.18	1066	2.30	1113	2.43	1158	2.55	1203	2.67	1246	2.79
3800	841	1.85	896	2.00	948	2.14	999	2.28	1049	2.41	1097	2.54	1143	2.66	1189	2.78	1233	2.91	1276	3.03
4000	874	2.11	928	2.26	981	2.40	1032	2.54	1082	2.67	1130	2.80	1176	2.92	1222	3.04	1266	3.16	1309	3.28
4200	909	2.38	963	2.53	1016	2.68	1067	2.81	1117	2.95	1164	3.07	1211	3.20	1256	3.32	1301	3.44	-	-
4400	946	2.68	1000	2.83	1053	2.98	1104	3.11	1154	3.24	1202	3.37	-	-	-	-	-	-	-	-
4600	985	3.00	1040	3.15	1092	3.29	1143	3.43	-	-	-	-	-	-	-	-	-	-	-	-
4800	1026	3.33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3 HP & Field Supplied Drive																			

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

XP150 (12.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	3 HP & Field Supplied Drive						Standard 3 HP & Drive										Hi Static 5 HP & Drive			
3200	757	1.20	811	1.36	864	1.50	915	1.64	964	1.77	1012	1.89	1059	2.02	1104	2.14	1149	2.26	1192	2.38
3400	782	1.40	837	1.55	890	1.69	941	1.83	990	1.96	1038	2.09	1085	2.21	1130	2.33	1174	2.45	1218	2.58
3600	810	1.61	865	1.76	918	1.91	969	2.04	1018	2.18	1066	2.30	1113	2.43	1158	2.55	1203	2.67	1246	2.79
3800	841	1.85	896	2.00	948	2.14	999	2.28	1049	2.41	1097	2.54	1143	2.66	1189	2.78	1233	2.91	1276	3.03
4000	874	2.11	928	2.26	981	2.40	1032	2.54	1082	2.67	1130	2.80	1176	2.92	1222	3.04	1266	3.16	1309	3.28
4200	909	2.38	963	2.53	1016	2.68	1067	2.81	1117	2.95	1164	3.07	1211	3.20	1256	3.32	1301	3.44	1344	3.56
4400	946	2.68	1000	2.83	1053	2.98	1104	3.11	1154	3.24	1202	3.37	1248	3.49	1294	3.62	1338	3.74	1381	3.86
4600	985	3.00	1040	3.15	1092	3.29	1143	3.43	1193	3.56	1241	3.69	1287	3.81	1333	3.93	1377	4.05	1420	4.18
4800	1026	3.33	1081	3.48	1133	3.63	1184	3.76	1234	3.90	1282	4.02	1328	4.15	1374	4.27	1418	4.39	1461	4.51
5000	1069	3.69	1124	3.84	1177	3.98	1228	4.12	1277	4.25	1325	4.38	1372	4.50	1417	4.62	1461	4.74	1505	4.87
5200	1114	4.06	1169	4.21	1222	4.35	1273	4.49	1322	4.62	1370	4.75	1417	4.87	1462	5.00	1506	5.12	1550	5.24
5400	1161	4.45	1216	4.60	1268	4.74	1319	4.88	1369	5.01	1417	5.14	1463	5.26	1509	5.38	1553	5.51	1596	5.63
5600	1210	4.86	1264	5.01	1317	5.15	1368	5.29	1418	5.42	1465	5.55	1512	5.67	-	-	-	-	-	-
5800	1260	5.28	1315	5.43	1367	5.57	1418	5.71	-	-	-	-	-	-	-	-	-	-	-	-
	5 HP & Field Supplied Drive																			

1. Blower performance includes 2" filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

Table 14: RPM Selection

Size (Tons)	Model	HP	Max BHP	Motor Sheave	Blower Sheave	6 Turns Open	5 Turns Open	4 Turns Open	3 Turns Open	2 Turns Open	1 Turn Open	Fully Closed
078	XP	1.5	1.73	1VM50	AK74	N/A	897	945	991	1035	1079	1126
(6.5)		2	2.30	1VM50	AK64	N/A	1039	1094	1150	1207	1256	1308
090	XP	1.5	1.73	1VM50	AK74	N/A	897	945	991	1035	1079	1126
(7.5)		3	3.45	1VM50	AK61	N/A	1088	1147	1205	1265	1312	1365
102	XP	2	2.30	1VM50	AK89	N/A	735	775	815	851	889	930
(8.5)		3	3.45	1VM50	AK74	N/A	880	928	972	1016	1067	1110
120	XP	2	2.30	1VM50	AK84	N/A	785	821	858	901	940	980
(10)		3	3.45	1VM50	AK74	N/A	880	928	972	1016	1067	1110
150	XP	3	3.45	1VM50	AK74	N/A	880	928	972	1016	1067	1110
(12.5)		5	5.75	1VP56	BK77	1052	1095	1136	1175	1216	1272	N/A

Table 15: Indoor Blower Specifications

Size (Tons)	Model	Motor					Motor Sheave			Blower Sheave			Belt
		HP	RPM	Eff.	SF	Frame	Datum Dia. (in.)	Bore (in.)	Model	Datum Dia. (in.)	Bore (in.)	Model	
078 (6.5)	XP	1-1/2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A49
		2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	6.2	1	AK64	A49
090 (7.5)	XP	1-1/2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	6.5	1	AK74	A49
		3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	6.0	1	AK61	A49
102 (8.5)	XP	2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	8.5	1	AK89	A56
		3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
120 (10)	XP	2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	8.0	1	AK84	A56
		3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
150 (12.5)	XP	3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
		5	1725	0.87	1.15	184T	4.3 - 5.3	1-1/8	1VP56	6.7	1	BK77	BX55

Table 16: Power Exhaust Specifications

Model	Voltage	Motor			Motor			Fuse Size	CFM @ 0.1 ESP
		HP	RPM[1]	QTY	LRA	FLA	MCA		
2PE04703225	208/230-1-60	3/4	1075	1	7.8	5	6.3	10	3800
2PE04703246	460-1-60	3/4	1075	1	3.4	2.2	2.8	5	3800
2PE04703258	575-1-60	3/4	1050	1	2.9	1.5	1.9	4	3800

1. Motors are multi-tapped and factory wired for high speed.

Air Balance

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

Checking Air Quantity

Method One

1. Remove the dot plugs from the duct panel (for location of the dot plugs see Figures 12 and 13).
2. Insert eight-inches of 1/4 inch metal tubing into the airflow on both sides of the indoor coil.

NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

3. Use an Inclined Manometer or Magnehelic to determine the pressure drop across a dry evaporator coil. Since the moisture on an evaporator coil can vary greatly, measuring the pressure drop across a wet coil under field conditions could be inaccurate. To assure a dry coil, the compressors should be de-activated while the test is being run.

NOTE: De-energize the compressors before taking any test measurements to assure a dry evaporator coil.

4. The CFM through the unit can be determined from the pressure drop indicated by the manometer by referring to Figure 28. In order to obtain an accurate measurement, be certain that the air filters are clean.
5. To adjust Measured CFM to Required CFM, see SUPPLY AIR DRIVE ADJUSTMENT.
6. After readings have been obtained, remove the tubes and replace the dot plugs.

⚠WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

Method Two

1. Drill two 5/16 inch holes, one in the return air duct as close to the inlet of the unit as possible, and another in the supply air duct as close to the outlet of the unit as possible.
2. Using the whole drilled in step 1, insert eight inches of 1/4 inch metal tubing into the airflow of the return and supply air ducts of the unit.

NOTE: The tubes must be inserted and held in position perpendicular to the airflow so that velocity pressure will not affect the static pressure readings.

3. Use an Inclined Manometer or Magnehelic to determine the pressure drop across the unit. This is the External Static Pressure (ESP). In order to obtain an accurate measurement, be certain that the air filters are clean.
4. Determine the number of turns the variable motor sheave is open.
5. Select the correct blower performance table for the unit from Tables 12 and 13. Tables are presented for side and downflow configuration.
6. Determine the unit Measured CFM from the Blower Performance Table, External Static Pressure and the number of turns the variable motor sheave is open.
7. To adjust Measured CFM to Required CFM, see SUPPLY AIR DRIVE ADJUSTMENT.
8. After reading has been obtained, remove the tubes and seal holes.

NOTE: With the addition of field installed accessories repeat this procedure.

⚠WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

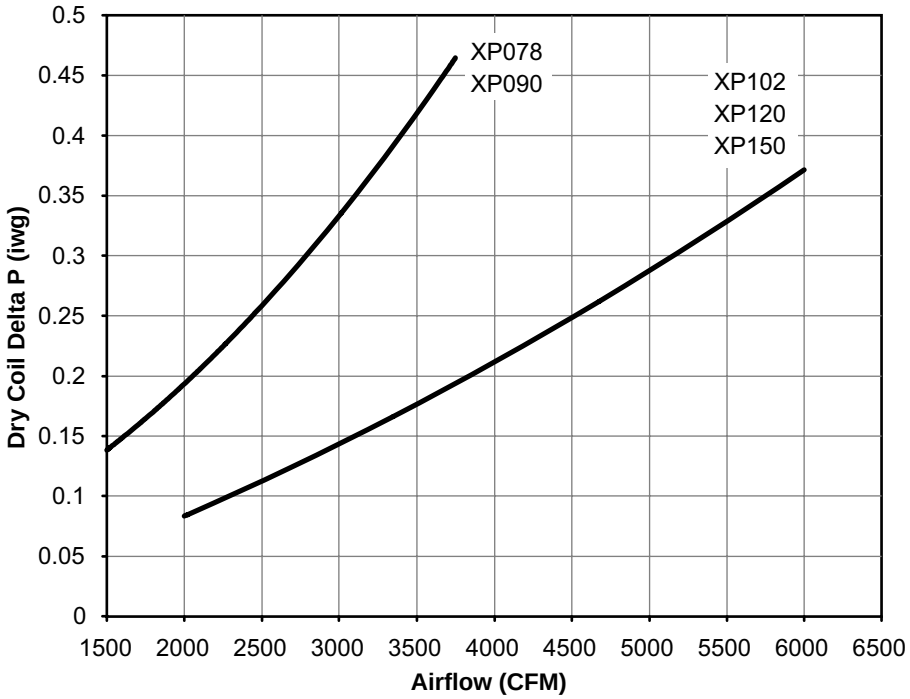


Figure 28: Dry Coil Delta P

Supply Air Drive Adjustment

⚠ CAUTION

Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of airflow.

Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP and AMP draw of the blower motor will increase by the cube of the blower speed. Static pressure will increase by the square of the blower speed. Only qualified personnel should make blower speed changes, strictly adhering to the fan laws.

At unit start-up, the measured CFM may be higher or lower than the required CFM. To achieve the required CFM, the speed of the drive may have adjusted by changing the datum diameter (DD) of the variable pitch motor sheave as described below:

$$\left(\frac{4{,}000\ \text{CFM}}{3{,}800\ \text{CFM}}\right) \bullet 4.0\ \text{in.} = 4.21\ \text{in.}$$

Use the following tables and the DD calculated per the above equation to adjust the motor variable pitch sheave.

EXAMPLE

A 12.5 ton unit was selected to deliver 4,000 CFM with a 3 HP motor, but the unit is delivering 3,800 CFM. The variable pitch motor sheave is set at 2 turns open.

Use the equation to determine the required DD for the new motor sheave,

$$\left(\frac{\text{Required CFM}}{\text{Measured CFM}}\right) \bullet \text{Existing DD} = \text{New DD}$$

Use Table 17 to locate the DD nearest to 4.21 in. Close the sheave to 1 turn open.

New BHP

= (Speed increase)^3 • BHP at 3,800 CFM

= (Speed increase)^3 • Original BHP

= New BHP

New motor Amps

= (Speed increase)^3 • Amps at 3,800 CFM

= (Speed increase)^3 • Original Amps

= New Amps

Table 17: Motor Sheave Datum Diameters

1VM50x7/8 (1-1/2, 2 & 3 HP Motor)		1VP56x1-1/8 (5 HP Motor)	
Turns Open	**Datum Diameter**	**Turns Open**	**Datum Diameter**
0	4.4	1	5.3
1/2	4.3	1-1/2	5.2
1	4.2	2	5.1
1-1/2	4.1	2-1/2	5.0
2	4.0	3	4.9
2-1/2	3.9	3-1/2	4.8
3	3.8	4	4.7
3-1/2	3.7	4-1/2	4.6
4	3.6	5	4.5
4-1/2	3.5	5-1/2	4.4
5	3.4	6	4.3

Table 18: Additional Static Resistance

Size (Tons)	Model	CFM	Cooling Only[1]	Economizer[2 3]	Electric Heat kW[2]				
					95	18	24	36	54
078 (6.5) 090 (7.5)	XP	1900	0.00	0.07	0.05	0.06	0.07	0.08	0.10
		2100	-0.01	0.09	0.06	0.07	0.08	0.09	0.11
		2300	-0.01	0.11	0.07	0.08	0.09	0.10	0.13
		2500	-0.02	0.13	0.08	0.09	0.10	0.11	0.14
		2700	-0.03	0.16	0.09	0.10	0.12	0.13	0.16
		2900	-0.04	0.18	0.10	0.11	0.13	0.14	0.18
		3100	-0.05	0.20	0.12	0.13	0.15	0.16	0.20
		3300	-0.06	0.22	0.13	0.14	0.17	0.18	0.22
		3500	-0.07	0.24	0.15	0.16	0.19	0.20	0.24
		3700	-0.08	0.27	0.17	0.18	0.21	0.22	0.26
		3900	-0.09	0.29	0.19	0.20	0.23	0.24	0.28
		4100	-0.09	0.31	0.21	0.22	0.25	0.26	0.31
		4300	-0.10	0.30	0.23	0.24	0.28	0.29	0.34
		4500	-0.11	0.35	0.25	0.26	0.30	0.31	0.37
102 (8.5) 120 (10) 150 (12.5)	XP	1900	0.06	0.02	0.05	0.06	0.07	0.08	0.10
		2100	0.07	0.02	0.06	0.07	0.08	0.09	0.11
		2300	0.08	0.02	0.07	0.08	0.09	0.10	0.13
		2500	0.09	0.02	0.08	0.09	0.10	0.11	0.14
		2700	0.11	0.03	0.09	0.10	0.12	0.13	0.16
		2900	0.12	0.03	0.10	0.11	0.13	0.14	0.18
		3100	0.14	0.03	0.12	0.13	0.15	0.16	0.20
		3300	0.16	0.03	0.13	0.14	0.17	0.18	0.22
		3500	0.18	0.04	0.15	0.16	0.19	0.20	0.24
		3700	0.20	0.04	0.17	0.18	0.21	0.22	0.26
		3900	0.23	0.04	0.19	0.20	0.23	0.24	0.28
		4100	0.25	0.04	0.21	0.22	0.25	0.26	0.31
		4300	0.28	0.05	0.23	0.24	0.28	0.29	0.34
		4500	0.30	0.05	0.25	0.26	0.30	0.31	0.37
		4700	0.33	0.05	0.28	0.29	0.33	0.34	0.40
		4900	0.36	0.05	0.30	0.31	0.35	0.37	0.43
		5100	0.39	0.06	0.33	0.34	0.38	0.40	0.46
		5300	0.42	0.06	0.35	0.37	0.41	0.43	0.49
		5500	0.45	0.06	0.38	0.40	0.44	0.46	0.53
		5700	0.48	0.06	0.41	0.43	0.47	0.49	0.56
		5900	0.52	0.07	0.44	0.46	0.50	0.53	0.59
		6100	0.56	0.07	0.47	0.49	0.53	0.56	0.62
		6300	0.60	0.07	0.50	0.53	0.56	0.59	0.65

1. Add these values to the available static resistance in the respective Blower Performance Tables.
2. Deduct these values from the available external static pressure shown in the respective Blower Performance Tables.
3. The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

Operation

Cooling Sequence Of Operation

For the XP series of units, the thermostat makes a circuit between "R" and "Y1" for the first stage of cooling.

The call is passed to the **Unit Control Board (UCB),** which then determines whether the requested operation is available and, if so, which components to energize.

For heating, the thermostat makes a circuit between “R” and “W1” for the first stage heating. The UCB energizes the compressors #1 and #2 and their condenser fans. The “W1” call also energizes a separate relay (RY1), de-energizing the reversing valve allowing the unit to run in the heating mode. A time/temperature control operates the defrost cycle.

The thermostat makes a circuit between “R” and “W2” for the second stage of heating. The UCB passes the “W2” signal on to the electric heaters if available. In both cases, when the “W1” call is sensed, the indoor blower is energized.

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

Continuous Blower

By setting the room thermostat fan switch to "ON," the supply air blower will operate continuously.

Intermittent Blower

With the room thermostat fan switch set to "AUTO" and the system switch set to either the "AUTO" or "HEAT" settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds between operations.

No Outdoor Air Options

When the thermostat calls for the first stage of cooling, the low-voltage control circuit from “R” to “Y1” and “G” is completed. The UCB energizes the economizer (if installed and free cooling is available) or the first available compressor* and the condenser fans. For first stage cooling, compressor #1 is energized. If compressor #1 is unavailable, compressor #2 is energized. After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

When the thermostat calls for the second stage of cooling, the low-voltage control circuit from “R” to “Y2” is completed. The control board energizes the first available compressor. If free cooling is being used for the first stage of cooling, compressor #1 is energized. If compressor #1 is active for first stage cooling or the first compressor is locked-out, compressor #2 is energized. In free-cooling mode, if the call for the second stage of cooling continues for 20 minutes, compressor #2 is energized, provided it has not been locked-out.

If there is an initial call for both stages of cooling, the UCB will delay energizing compressor #2 by 30 seconds in order to avoid a power rush.

Once the thermostat has been satisfied, it will de-energize Y1 and Y2. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling.

* To be available, a compressor must not be locked-out due to a high or low-pressure switch or freezestat trip and the **Anti-Short Cycle Delay (ASCD)** must have elapsed.

Economizer With Single Enthalpy Sensor

When the room thermostat calls for "first-stage" cooling, the low voltage control circuit from "R" to "G" and "Y1" is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the "AUTO" position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the set point of the enthalpy controller (previously determined), "Y1" energizes the economizer. The dampers will modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the set point, "Y1" energizes compressor #1.

When the thermostat calls for "second-stage" cooling, the low voltage control circuit from "R" to "Y2" is completed. The UCB energizes the first available compressor. If the enthalpy of the outdoor air is below the set point of the enthalpy controller (i.e. first stage has energized the economizer), "Y2" will energize compressor #1. If the outdoor air is above the set point, "Y2" will energize compressor #2.

Once the thermostat has been satisfied, it will de-energize “Y1” and “Y2”. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continues fan operation, the economizer damper goes to the minimum position.

Economizer With Dual Enthalpy Sensors

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

Economizer With Power Exhaust

A unit equipped with an economizer (single or dual enthalpy) and a power exhaust operates as specified above with one addition. The power exhaust motor is energized 45 seconds after the actuator position exceeds the exhaust fan set point on the economizer control. When the power exhaust is operating, the second stage of mechanical cooling will not operate. As always, the "R" to "G" connection provides minimum position but does not provide power exhaust operation.

Motorized Outdoor Air Dampers

This system operation is the same as the units with no outdoor air options with one exception. When the "R" to "G" circuit is complete, the motorized damper drives open to a position set by the thumbwheel on the damper motor. When the "R" to "G" circuit is opened, the damper spring returns fully closed.

Cooling Operation Errors

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

High-Pressure Limit Switch

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the associated compressor, initiate the ASCD (Anti-short cycle delay), and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the associated compressor and flash a code (see Table 22). If the other compressor is inactive, the condenser fans will be de-energized.

Low-Pressure Limit Switch

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system's operation. For the following 30 seconds, the UCB will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30-second monitoring phase, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the associated compressor and flash a code (Table 22). If the other compressor is inactive, the condenser fans will be de-energized.

Freezestat

During cooling operation, if a freezestat opens, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a freezestat open three times within two hours of operation, the UCB will lock-out the associated compressor and flash a code (Table 22). If the other compressor is inactive, the condenser fans will be de-energized.

Low Ambient Cooling

To determine when to operate in low ambient mode, the UCB has a pair of terminals connected to a temperature-activated switch set at 45ºF. When the low ambient switch is closed and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The defrost cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, the UCB will not lockout the compressors due to a freezestat trip. However, a freezestat trip will de-energize the associated compressor. If the call for cooling is still present at the end of the ASCD and the freezestat has closed, the unit will resume operation.

Safety Controls

The unit control board monitors the following inputs for each cooling system:

1. A suction line freezestat to protect against low evaporator temperatures due to a low airflow or a low return air temperature, (opens at 26 ± 5 °F and resets at 38 ± 5°F).
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 625 ± 25 psig).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 22 ± 5 psig).

The above pressure switches are hard-soldered to the unit. The refrigeration systems are independently monitored and controlled. On any fault, only the associated system will be affected by any safety/preventive action. The other refrigerant system will continue in operation unless it is affected by the fault as well.

The unit control board monitors the temperature limit switch of units with electric heat.

Compressor Protection

In addition to the external pressure switches, the compressors also have inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector will open to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An **Anti-Short Cycle Delay (ASCD)** is utilized to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

Flash Codes

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 22.

Reset

Remove the call for cooling, by raising thermostat setting higher than the conditioned space temperature. This resets any pressure or freezestat flash codes.

Heating Sequence of Operation

When the thermostat calls for the first stage of heating, the low voltage control circuit is completed between “R” and “W1”. This 24vac signal is passed through the UCB to the RY1 Relay. Contacts RY1-1 open, assuring the reversing valve cannot be energized, except during defrost. Contacts RY1-2 close, completing the circuit to Y on the defrost control (DC). After its five minute ASCD timer is satisfied, the DC closes it’s internal compressor relay contacts, sending a 24vac signal to the MV terminal on the UCB. If its ASCD timer is satisfied the UCB will energize compressor #1 relay. After a two second delay, it then energizes compressor #2 relay (if applicable). Therefore, on a call for heat from W1, both compressors are always energized, unless one or the other is locked out by the UCB. Also on the call for heat, the DC energizes the M4 contactor which brings on both condenser fans.

A second stage call from the thermostat completes the circuit between R and W2. This 24vac signal is passed through the UCB to the defrost control board. If the unit is equipped with an optional electric heater it would be energized through a set of normally closed contacts on the defrost board. Take note that the MV terminal on the UCB is constantly monitored while there is a demand for heat. If the UCB does not see 24vac at terminal MV after six minutes, it initiates a fault code 9, indicating a heating problem.

As mentioned earlier, the defrost control (DC) utilizes a time/ temperature defrost scheme. The following two conditions must be met before the DC will enter a defrost mode:

1. The DC must first satisfy its accumulated minimum run time. This is factory set at 60 minutes, but is field adjustable to 30, 60 or 90 minutes.
2. Either of the two defrost thermostats (DF1 or DF2) must be closed. These normally open thermostats are mounted on the respective liquid lines and are set to close at 31 degrees (+/-3).

If neither defrost thermostat is closed at the completion of it’s minimum accumulated run time cycle, the DC initiates another run time cycle, which it must complete before it looks at the position of the defrost thermostats. This action is repeated until, at the completion of a run time cycle, one of the defrost thermostats is found to be closed and the DC enters defrost mode.

When the DC enters the defrost mode, it’s on-board defrost relay is powered. This energizes both reversing valves, de-energizes both condenser fan motors and energizes the unit’s optional electric heater. The DC remains in defrost mode until either of the following two conditions is met:

1. Both of the liquid line thermostats are open. Each is set to open at 55 degrees (+/- 3).
2. The maximum defrost run time of 10 minutes is met.

The DC also contains a set of test pins. Placing a jumper across these pins will result in the following actions:

- If the ASCD timer is active, it is now by-passed, allowing the compressor to run.
- If the DC is in a lockout condition, the lockout is reset.
- If the compressor is running, the DC is forced into defrost mode. The control will remain in defrost mode for as long as the jumper is in place. When the jumper is removed, the control will terminate the defrost mode in the normal manner as described above.

NOTE: The DC has two flashing codes which are only initiated if the two pressure switch terminals are open. As used in the Predator® there is a jumper across the pressure switch terminals. Therefore the field should never experience a DC lockout mode unless that jumper is removed or broken.

Electric Heat Operation Errors

Temperature Limit

If the UCB senses zero volts from the high temperature limit, the indoor blower motor is immediately energized.

This limit is monitored regardless of unit operation status, i.e. the limit is monitored at all times.

If the temperature limit opens three times within one hour, it will lock-on the indoor blower motor and a flash code is initiated (See Table 22).

Safety Controls

The UCB monitors the temperature limit switch of electric heat units.

The control circuit includes the following safety controls:

Limit Switch (Ls)

This control is located inside the heater compartment and is set to open at the temperature indicated in the Electric Heat Limit Setting Tables 19 and 20. It resets automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

Table 19: Electric Heat Limit Setting 50” Cabinet

UNIT (TONS)	VOLTAGE	HEATER kW	LIMIT SWITCH OPENS °F
XP102, 120, 150 (8.5, 10, 12.5)	208/230	18	150
		24	150
		34	150
		54	130
XP102, 120, 150 (8.5, 10, 12.5)	480	18	150
		24	150
		34	150
		54	130
XP102, 120, 150 (8.5, 10, 12.5)	600	18	150
		24	150
		34	150
		54	130

Table 20: Electric Heat Limit Setting 42” Cabinet

UNIT (TONS)	VOLTAGE	HEATER kW	LIMIT SWITCH OPENS °F
XP078, 090 (6.5, 7.5)	208/230	9	135
		18	150
		24	165
		34	190
XP078, 090 (6.5, 7.5)	480	9	135
		18	150
		24	165
		34	185
XP078, 090 (6.5, 7.5)	600	9	135
		18	150
		24	150
		34	185

Flash Codes

The UCB will initiate a flash code associated with errors within the system. Refer to UNIT CONTROL BOARD FLASH CODES Table 22.

Reset

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature.This resets any flash codes.

Electric Heat Anticipator Setpoints

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint will give shorter “ON” cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 21 for the required electric heat anticipator setting.

Table 21: Electric Heat Anticipator Setpoints

SETTING, AMPS	
W1	W2
0.13	0.1

Start-Up (Cooling)

Prestart Check List

After installation has been completed:

1. Check the electrical supply voltage being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn unit electrical power on.
4. Set the room thermostat fan switch to on.
5. Check indoor blower rotation.
   - If blower rotation is in the wrong direction. Refer to Phasing Section in general information section.

   Check blower drive belt tension.
6. Check the unit supply air (CFM).
7. Measure evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn unit electrical power off.

Operating Instructions

1. Turn unit electrical power on.

NOTE: Prior to each cooling season, the crankcase heaters must be energized at least 10 hours before the system is put into operation.

2. Set the room thermostat setting to lower than the room temperature.
3. First stage compressors will energize after the built-in time delay (five minutes).
4. The second stage of the thermostat will energize second stage compressor if needed.

Post Start Check List

1. Verify proper system pressures for both circuits.
2. Measure the temperature drop across the evaporator coil.

Charging The Unit

All XP units use Thermal Expansion Devices. Charge the unit to 10° subcooling.

Troubleshooting

⚠WARNING

Troubleshooting of components may require opening the electrical control box with the power connected to the unit. **Use extreme care when working with live circuits!** Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals.

When not necessary, shut off all electric power to the unit prior to any of the following maintenance procedures so as to prevent personal injury.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation which could cause injury to person and/or damage unit components. Verify proper operation after servicing.

Predator® Flash Codes

Various flash codes are utilized by the unit control board (UCB) to aid in troubleshooting. Flash codes are distinguished by the short on and off cycle used (approximately 200ms on and 200ms off). To show normal operation, the control board flashes a 1 second on, 1 second off "heartbeat" during normal operation. This is to verify that the UCB is functioning correctly. Do not confuse this with an error flash code. To prevent confusion, a 1-flash, flash code is not used.

Alarm condition codes are flashed on the UCB lower left Red LED, See Figure 29. While the alarm code is being flashed, it will also be shown by the other LEDs: lit continuously while the alarm is being flashed. The total of the continuously lit LEDs equates to the number of flashes, and is shown in the table. Pressing and releasing the LAST ERROR button on the UCB can check the alarm history. The UCB will cycle through the last five (5) alarms, most recent to oldest, separating each alarm flash code by approximately 2 seconds. In all cases, a flashing Green LED will be used to indicate non-alarm condition.

In some cases, it may be necessary to "zero" the ASCD for the compressors in order to perform troubleshooting. To reset all ASCDs for one cycle, press and release the UCB TEST/ RESET button once.

Flash codes that do and do not represent alarms are listed in Table 22.

Table 22: Unit Control Board Flash Codes

Flash Code	Description	Green LED 16	Red LED 8	Red LED 4	Red LED 2	Red LED 1
On Steady	This is a Control Failure	-	-	-	-	-
1 Flash	Not Applicable	-	-	-	-	-
2 Flashes	Control waiting ASCD[1]	Flashing	Off	Off	On	Off
3 Flashes	HPS1 Compressor Lockout	Off	Off	Off	On	On
4 Flashes	HPS2 Compressor Lockout	Off	Off	On	Off	Off
5 Flashes	LPS1 Compressor Lockout	Off	Off	On	Off	On
6 Flashes	LPS2 Compressor Lockout	Off	Off	On	On	Off
7 Flashes	FS1 Compressor Lockout	Off	Off	On	On	On
8 Flashes	FS2 Compressor Lockout	Off	On	Off	Off	Off
9 Flashes	Ignition Control Locked Out / Ignition Control Failure	Off	On	Off	Off	On
10 Flashes	Compressors Locked Out on Low Outdoor Air Temperature[1]	Flashing	On	Off	On	Off
11 Flashes	Compressors locked out because the Economizer is using free Cooling[1]	Flashing	On	Off	On	On
12 Flashes	Unit Locked Out due to Fan Overload Switch Failure	Off	On	On	Off	Off
13 Flashes	Compressor Held Off due to Low Voltage[1]	Flashing	On	On	Off	On
14 Flashes	EEPROM Storage Failure	Off	On	On	On	Off
OFF	No Power or Control Failure	Off	Off	Off	Off	Off

1. Non-alarm condition.

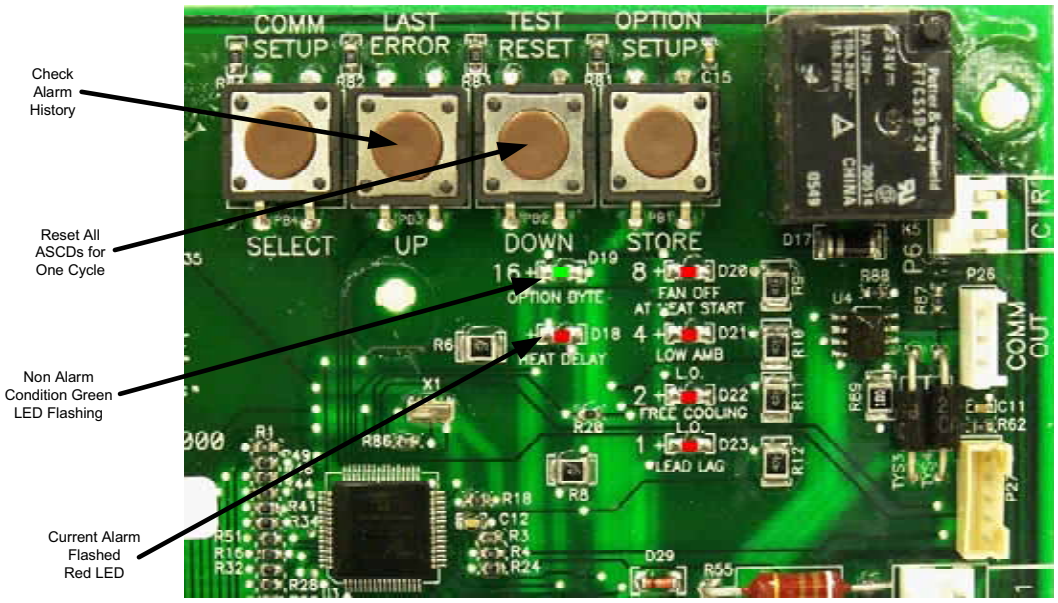


Figure 29: Unit Control Board

Unit Control Board Option Setup

Option Byte Setup

- Enter the Option Setup mode by pushing the OPTION SETUP / STORE button, and holding it for at least 2 seconds.
- The green status LED (Option Byte) will be turned on and the red status LED (Heat Delay) is turned off.
- The 8, 4, 2 and 1 LEDs will then show the status of the 4 labeled options (**(8) Fan Off at Heat Start**, **(4) Low Ambient Lockout**, **(2) Free Cooling Lockout**, and **(1) Lead / Lag)**.
- Press the UP or Down button to change the LED status to correspond to the desired Option Setup.
- To save the current displayed value, push the OPTION SETUP / STORE button and hold it for at least 2 seconds. When the value is saved, the green LED will flash a few times and then normal display will resume.

NOTE: While in either Setup mode, if no buttons are pushed for 60 seconds, the display will revert to its normal display, exiting the Option Setup mode. **When saving, the control board only saves the parameters for the currently displayed mode (Option Byte or Heat Delay).**

Heat Delay Setup

- Enter the Option Setup mode by pushing the OPTION SETUP / STORE button, and holding it for at least 2 seconds.
- The green status LED (Option Byte) will be turned on and the red status LED (Heat Delay) is turned off.
- Press the COMM SETUP / SELECT button to toggle into the Heat Delay Setup, the green LED will turn off and the red LED for Heat Delay will turn on.
- The 8, 4, 2 and 1 LEDs will then show the status of the Heat Delay, (See Table 23). Press the UP or Down button to change the LED status to correspond to the desired Heat Delay Value.
- To save the current displayed value, push the OPTION SETUP / STORE button and hold it for at least 2 seconds. When the value is saved, the red LED will flash a few times and then normal display will resume.

NOTE: While in either Setup mode, if no buttons are pushed for 60 seconds, the display will revert to its normal display, exiting the Option Setup mode. **When saving, the control board only saves the parameters for the currently displayed mode (Option Byte or Heat Delay).**

Table 23: Heat Delay

Heat Fan On Delay	Heat Fan Off Delay	Red LED 8	Red LED 4	Red LED 2	Red LED 1
60	180	On	On	On	On
60	90	On	On	On	Off
60	60	On	On	Off	On
60	30	On	On	Off	Off
45	180	On	Off	On	On
45	90	On	Off	On	Off
45	60	On	Off	Off	On
45	30	On	Off	Off	Off
30	180	Off	On	On	On
30	90	Off	On	On	Off
30	60	Off	On	Off	On
30	30	Off	On	Off	Off
0	60	Off	Off	On	On
0	30	Off	Off	On	Off
0	10	Off	Off	Off	On
Non-std	Non-std	Off	Off	Off	Off

Cooling Troubleshooting Guide

On calls for cooling, if the compressors are operating but the supply air blower motor does not energize after a short delay (the room thermostat fan switch is in the “AUTO” position):

1. Turn the thermostat fan switch to the ON position. If the supply air blower motor does not energize, go to Step 3.
2. If the blower motor runs with the fan switch in the ON position but will not run after the first compressor has energized when the fan switch is in the AUTO position, check the room thermostat for contact between R and G in the AUTO position during calls for cooling.
3. If the supply air blower motor does not energize when the fan switch is set to ON, check that line voltage is being supplied to the contacts of the M3, contactor, and that the contactor is pulled in. Check for loose wiring between the contactor and the supply air blower motor.
4. If M3 is pulled in and voltage is supplied to M3, lightly touch the supply air blower motor housing. If it is hot, the motor may be off on internal protection. Cancel any thermostat calls and set the fan switch to AUTO. Wait for the internal overload to reset. Test again when cool.
5. If M3 is not pulled in, check for 24 volts at the M3 coil. If 24 volts are present at M3 but M3 is not pulled in, replace the contactor.
6. Failing the above, if there is line voltage supplied at M3, M3 is pulled in, and the supply air blower motor still does not operate, replace the motor.
7. If 24 volts is not present at M3, check that 24 volts is present at the UCB supply air blower motor terminal, “FAN”. If 24 volts is present at the FAN, check for loose wiring between the UCB and M3.
8. If 24 volts is not present at the “FAN” terminal, check for 24 volts from the room thermostat. If 24 volts are not present from the room thermostat, check for the following:
   a. Proper operation of the room thermostat (contact between R and G with the fan switch in the ON position and in the AUTO position during operation calls).
   b. Proper wiring between the room thermostat and the UCB, and
   c. Loose wiring from the room thermostat to the UCB
9. If 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat G terminal is connected to the G terminal of the UCB, and for loose wiring.
10. If the thermostat and UCB are properly wired, replace the UCB.

On calls for cooling, the supply air blower motor is operating but compressor #1 is not (the room thermostat fan switch is in the “AUTO” position):

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling and the compressors will not immediately operate. If both stages of cooling are requested simultaneously and the economizer provides free cooling, following a short delay compressor #1 will be energized unless it is locked out. If compressor #1 is locked out, compressor #2 is energized. Compressor #2 is always energized in place of compressor #1 when compressor #1 is requested but locked out.
2. If no economizer is installed or the economizer is not opening to provide free cooling and compressor #1 does not energize on a call for cooling, check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts are present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts is not present from the room thermostat, check for the following:
   a. 24 volts at the thermostat Y1 terminal
   b. Proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2, and
   c. Loose wiring from the room thermostat to the UCB
8. If 24 volts is present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.
9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing an alarm code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, cancel any call for cooling. This will reset any compressor lock outs.

NOTE: While the above step will reset any lockouts, compressor #1 may be held off for the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked

out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.

11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 “OUT” terminal of the UCB. If 24 volts is present, trace the wiring from Y1 “OUT” for incorrect wiring. If 24 volts is not present at the Y1 “OUT” terminal, the UCB must be replaced.
12. *For units without economizers*: If 24 volts is present at the Y1 OUT terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 “ECON” terminal.
13. *For units with economizers*: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 “ECON” terminal. If nothing is found, the economizer control may have faulted and is failing to return the 24-volt “call” to the Y1 “ECON” terminal even though the economizer is not providing free cooling. To test, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB’s Mate-N-Lock plug. If compressor #1 energizes, there is a fault in the economizer wiring or the economizer control.
14. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local distributors can test the UCB for this programming.

    For units with factory installed economizers, the UCB is programmed to lock out compressor operation when the LAS set point is reached.

    For units without factory installed or with field installed economizers, the UCB allows compressor operation all the time. This programming can be checked or changed by the local distributor.
15. If none of the above corrected the error, test the integrity of the UCB. Disconnect the C1 terminal wire and jumper it to the Y1 terminal. DO NOT jump the Y1 to C1 terminals. If the compressor engages, the UCB has faulted.
16. If none of the above correct the error, replace the UCB.

On calls for the second stage of cooling, the supply air blower motor and compressor #1 are operating but compressor #2 is not (the room thermostat fan switch is in the “AUTO” position):

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling. If the second stage of cooling is requested, following a short delay, compressor #1 will be energized unless it is locked out. Typically, compressor #2 is energized only during free cooling if the call for the second stage of cooling persists for 20 minutes.
2. Compressor #2 will not energize simultaneously with compressor #1 if a call for both stages of cooling is received. The UCB delays compressor #2 by 30 seconds to prevent a power surge. If after the delay compressor #2 does not energize on a second stage call for cooling, check for line voltage at the compressor contactor, M2, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M2 is pulled in and voltage is supplied at M2, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M2 is not pulled in, check for 24 volts at the M2 coil. If 24 volts is present and M2 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M2, M2 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M2, check for 24 volts at the UCB terminal, C2. If 24 volts are present, check for loose wiring between C2 and the compressor contactor.
7. If 24 volts is not present at the C2 terminal, check for 24 volts from the room thermostat at the UCB Y2 terminal. If 24 volts is not present from the room thermostat, check for the following:
    a. 24 volts at the thermostat Y2 terminal
    b. Proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2, and
    c. Loose wiring from the room thermostat to the UCB
8. If 24 volts is present at the UCB Y2 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS2, LPS2, and FS2 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS2 has opened, there will be 24 volts of potential between the LPS2 terminals.
9. If 24 volts is present at the UCB Y2 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing a code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out,

    remove any call for cooling at the thermostat or by disconnecting the thermostat wiring at the Y2 UCB terminal. This will reset any compressor lock outs.

NOTE: While the above step will reset any lock outs, compressor #1 will be held off for the ASCD, and compressor #2 may be held off for a portion of the ASCD. See the next step.

10. If 24 volts is present at the UCB Y2 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.
11. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local distributors can test the UCB for this programming.

    For units with factory installed economizers, the UCB is programmed to lock out compressor operation when the LAS set point is reached.

    For units without factory installed or with field installed economizers, the UCB allows compressor operation all the time. This programming can be checked or changed by the local distributor.
12. If none of the above corrected the error, test the integrity of the UCB. Disconnect the C2 terminal wire and jumper it to the Y2 terminal. DO NOT jump the Y2 to C2 terminals. If the compressor engages, the UCB has faulted.
13. If none of the above correct the error, replace the UCB.

On a call for cooling, the supply air blower motor and compressor #2 are operating but compressor #1 is not (the room thermostat fan switch is in the “AUTO” position):

1. Compressor #2 is energized in place of compressor #1 when compressor #1 is unavailable for cooling calls. Check the UCB for alarms indicating that compressor #1 is locked out. Press and release the ALARMS button if the LED is not flashing an alarm.
2. Check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts is present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts are not present at the UCB Y1 terminal, the UCB may have faulted. Check for 24 volts at the Y1 ECON terminal. If 24 volts is not present at Y1 “ECON”, the UCB has faulted. The UCB should de-energize all compressors on a loss of call for the first stage of cooling, i.e. a loss if 24 volts at the Y1 terminal.
8. If 24 volts are present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.
9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing a code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, remove any call for cooling. This will reset any compressor lock outs.

NOTE: While the above step will reset any lock outs, compressor #2 will be held off for the ASCD, and compressor #1 may be held off for a portion of the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within 5 minutes. Press and release the TEST button to reset all ASCDs.
11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 “OUT” terminal of the UCB. If 24 volts is present, trace the wiring from Y1 “OUT” for incorrect wiring. If 24 volts is not present at the Y1 “OUT” terminal, the UCB must be replaced.
12. *For units without economizers:* If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 “ECON” terminal.

    For units with economizers: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 “ECON” terminal. The economizer control may have faulted and is not returning the 24 volts to the Y1 “ECON” terminal even though the economizer is not providing free cooling. To test the economizer control, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB’s Mate-N-Lock plug.
13. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient

conditions. These options are not enabled by default. They can be checked by local distributors.

For units with factory installed economizers, the UCB is programmed to lock out compressor operation when the LAS set point is reached.

For units without factory installed or with field installed economizers, the UCB allows compressor operation all the time. This programming can be checked or changed by the local distributor.

14. If none of the above corrected the error, test the integrity of the UCB. Disconnect the C1 terminal wire and jumper it to the Y1 terminal. DO NOT jump the Y1 to C1 terminals. If the compressor engages, the UCB has faulted.
15. If none of the above correct the error, replace the UCB.

267233-YIM-B-0507
Supersedes: 267233-YIM-A-0806

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