INSTALLATION MANUAL

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NOTES, CAUTIONS AND WARNINGS

The installer should pay particular attention to the words: *NOTE*, *CAUTION*, and *WARNING*. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

CAUTION: READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

PREDATOR®

SINGLE PACKAGE HEAT PUMP

HIGH EFFICIENCY

BP078, 090, 102, 120 AND 150

(6-1/2 TO 12-1/2 TON)

Tested in accordance with:

ARI Standard 340/360
Commercial and Industrial Unitary
Air Conditioning Equipment

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GENERAL

YORK® Predator® Heat Pump units 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

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.

⚠WARNING

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

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, service agency or the gas supplier.

REFERENCE

Additional information is available in the following reference forms:

- Technical Guide - 259337
- General Installation - 127421
- 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 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.

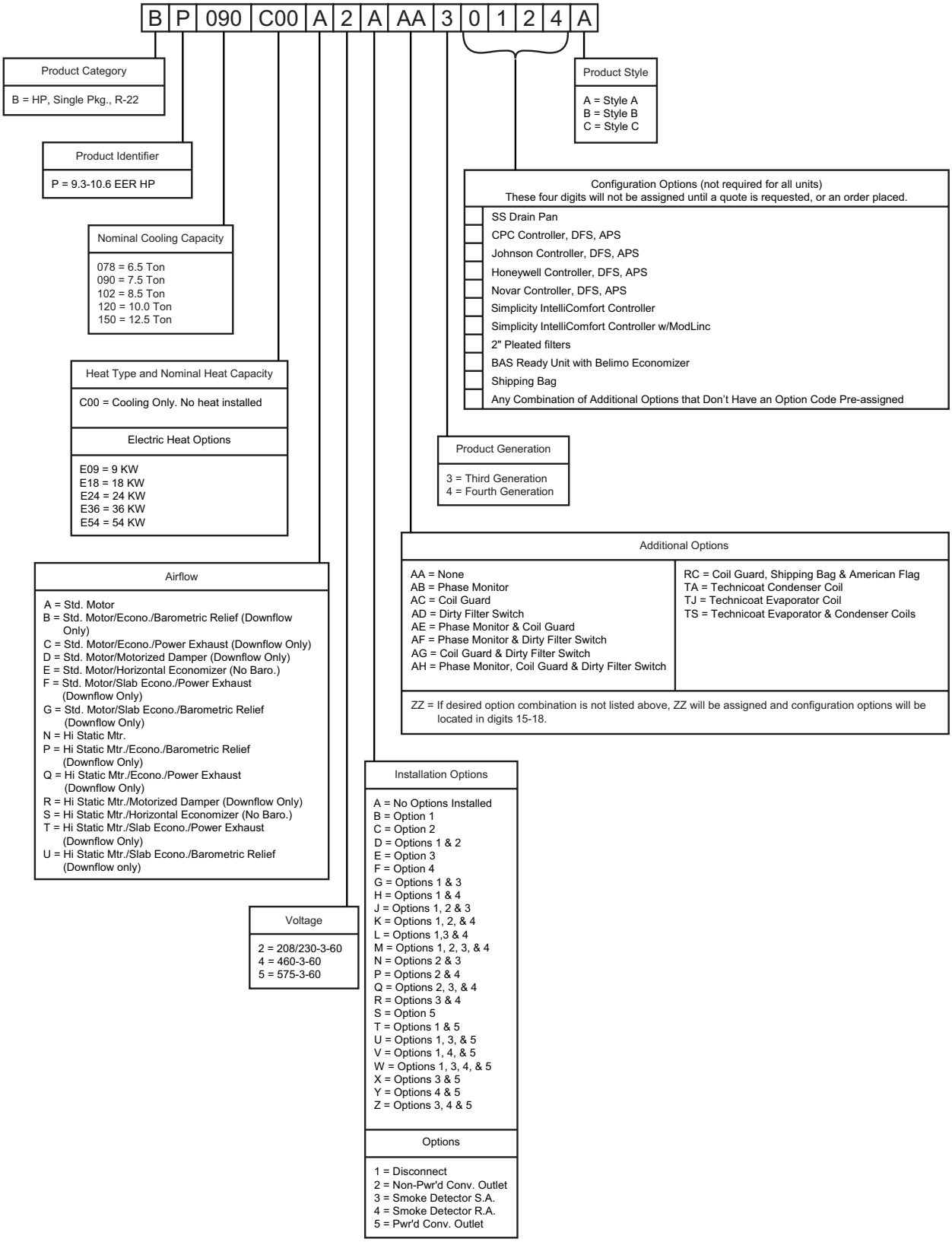
⚠WARNING

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

The installer should pay particular attention to the words: NOTE, CAUTION, and WARNING. NOTES are intended to clarify or make the installation easier. CAUTIONS are given to prevent equipment damage. WARNINGS are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

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.

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

PRECEDING INSTALLATION

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

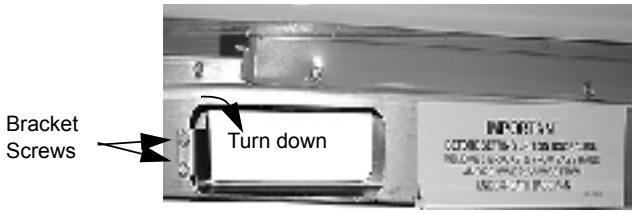


FIGURE 1 - UNIT SHIPPING BRACKET

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.

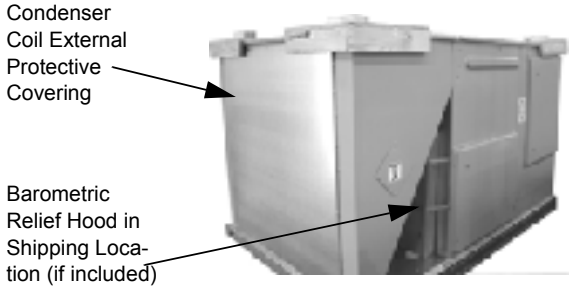


FIGURE 2 - CONDENSER COIL COVERING

⚠ 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.

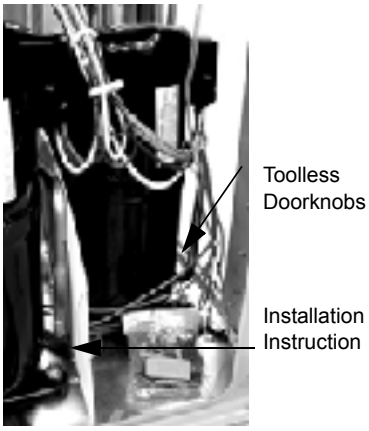


FIGURE 3 - COMPRESSOR SECTION

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
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 Tables 1 & 2 for unit application data.

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.

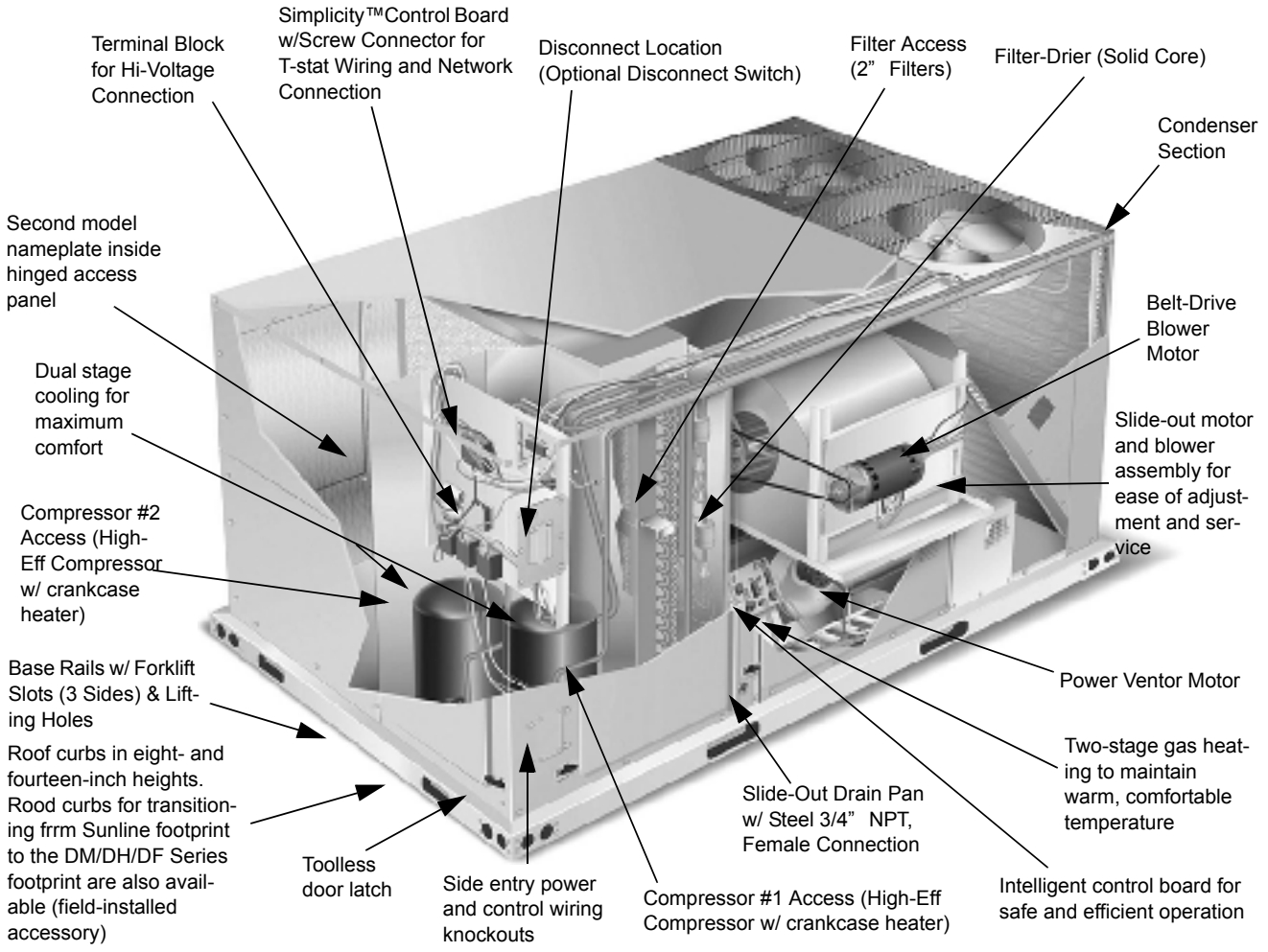


FIGURE 4 - PREDATOR® COMPONENT LOCATION

TABLE 1: UNIT VOLTAGE LIMITATIONS

Power Rating*	Minimum	Maximum
208/230-3-60	187	252
460-3-60	432	504
575-3-60	540	630
380/415-3-50	342	456

*. Utilization range " A" in accordance with ARI Standard 110.

TABLE 2: UNIT TEMPERATURE LIMITATIONS

Temperature	Min.	Max.
Wet Bulb Temperature (°F) of Air on Evaporator Coil	57	72
Dry Bulb Temperature (°F) of Air on Condenser Coil	0*	125

*. A low ambient accessory is available for operation down to -20°F.

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.

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.

TABLE 3: UNIT WEIGHTS

Model	Shipping Weight (lb.)	Operating Weight (lb.)
BP078	1104	1099
BP090	895	890
BP102	1178	1173
BP120	1212	1207
BP150	1202	1197
Econ.	85	84
w/ PE	150	148
Elec. Heat*	49	49

*. 54kW heater.

TABLE 4: 4 POINT LOAD WEIGHT

Model	Location (lbs.)			
	A	B	C	D
BP078	241	206	300	352
BP090	199	148	232	311
BP102	257	220	321	375
BP120	265	226	330	386
BP150	263	224	327	383

TABLE 5: 6 POINT LOAD WEIGHT

Model	Location (lbs.)					
	A	B	C	D	E	F
BP078	165	148	134	195	216	241
BP090	139	113	94	147	128	218
BP102	176	158	143	208	231	257
BP120	181	163	147	214	237	264
BP150	180	161	146	213	235	262

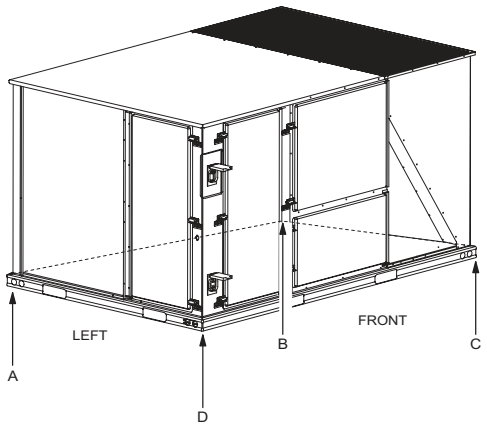


FIGURE 5 - UNIT 4 POINT LOAD

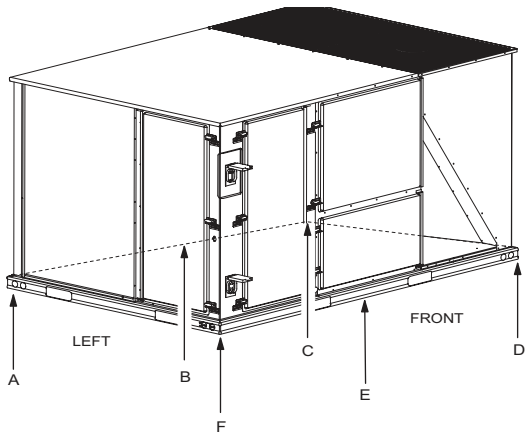
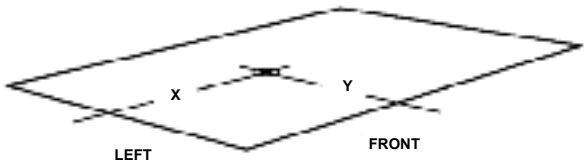


FIGURE 6 - UNIT 6 POINT LOAD



Unit Model Number	X	Y
BP078	47 1/2	25 1/2
BP090	38	23
BP102	47 1/2	25 1/2
BP120	47 1/2	25 1/2
BP150	47 1/2	25 1/2

CLEARANCES

All units require particular clearances for proper operation and service. Refer to Table 7 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.

FIGURE 7 - UNIT CENTER OF GRAVITY

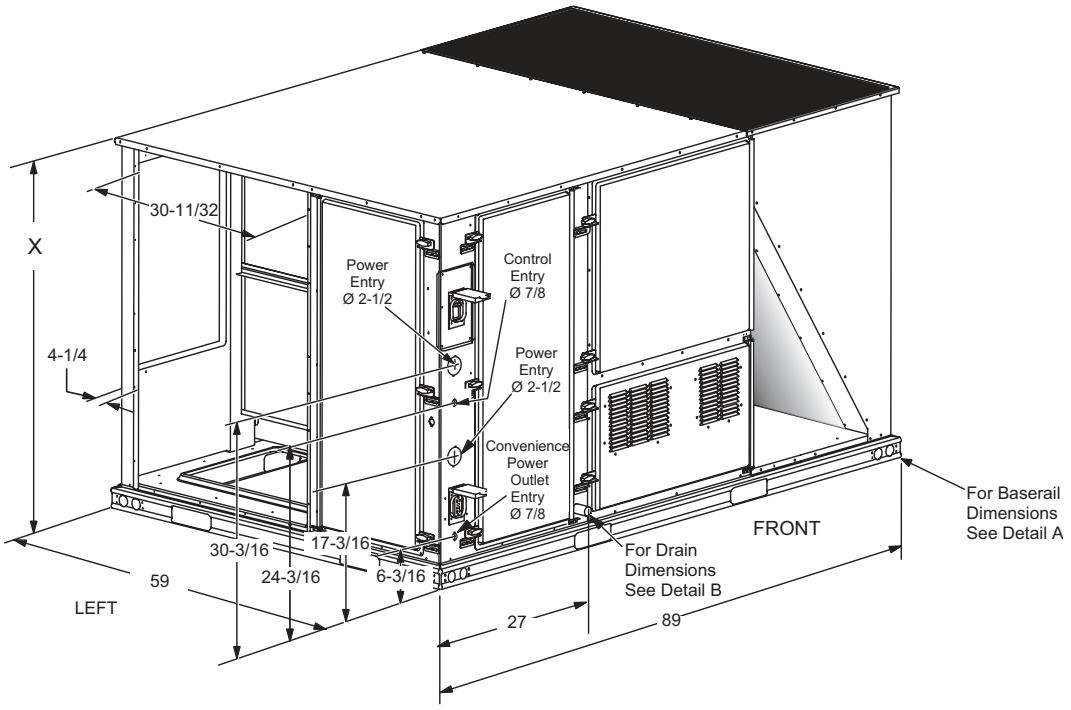


FIGURE 8 - UNIT DIMENSIONS

TABLE 6: UNIT HEIGHT

Unit Model Number	X
BP078	50 3/4
BP090	42
BP102	50 3/4
BP120	50 3/4
BP150	50 3/4

TABLE 7: UNIT CLEARANCES

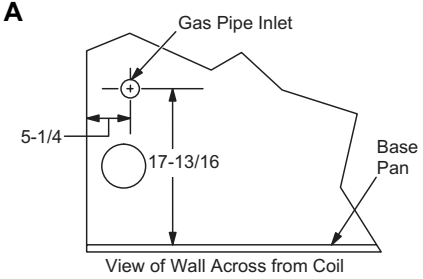
Top*	72”	**Right**	12”
Front	36”	**Left**	36”
Rear†	36”	**Bottom‡**	0”

*. Units must be installed outdoors. Overhanging structure or shrubs should not obstruct condenser air discharge outlet.

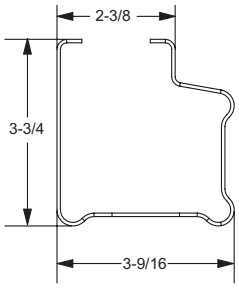
†. To remove the slide-out drain pan, a rear clearance of sixty inches is required. If space is unavailable, the drain pan can be removed through the front by separating the corner wall.

‡. Units may be installed on combustible floors made from wood or class A, B or C roof covering materials.

DETAIL A

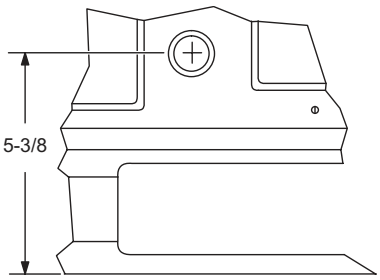


DETAIL B



NOTE: A one-inch clearance must be provided between any combustible material and the supply ductwork for a distance of 3 feet from the unit.

DETAIL C



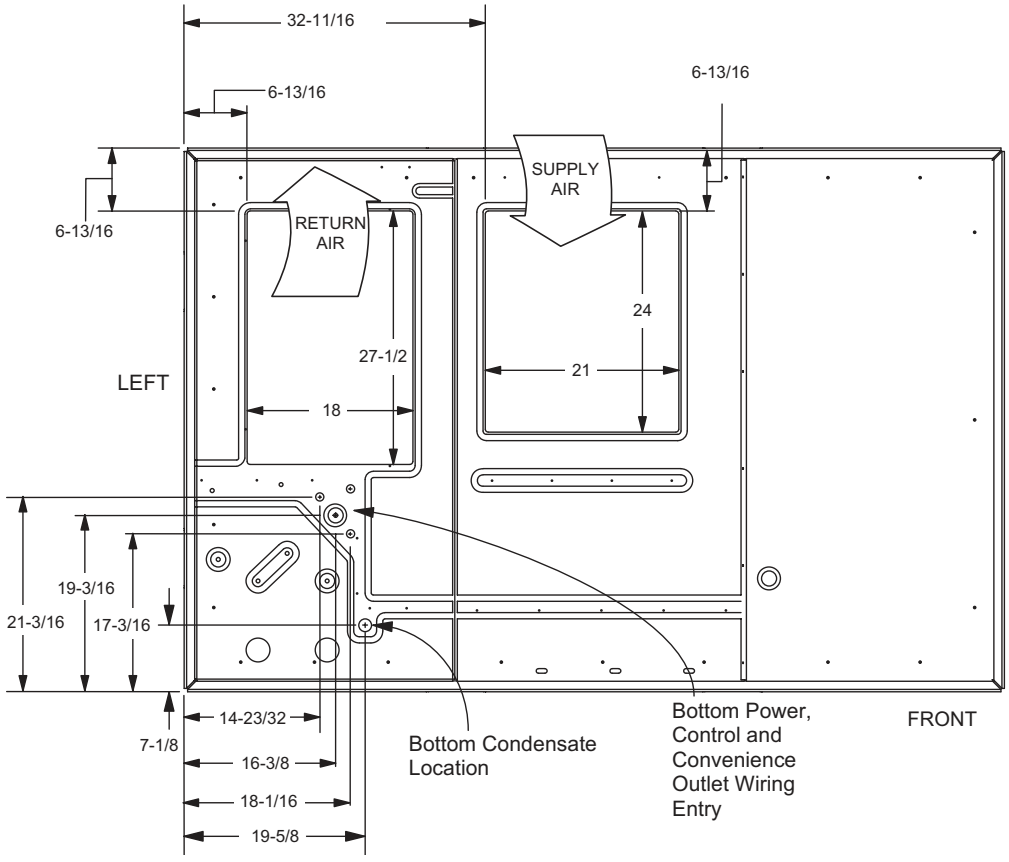


FIGURE 9 - BOTTOM DUCT OPENINGS (FROM ABOVE)

REAR DUCT DIMENSIONS

CABINET SIZE	DIMENSION		
	" A"	" B"	" C"
50 3/4"	28 1/4	18 1/16	28 1/4
42"	27 3/4	12 1/16	27 1/2

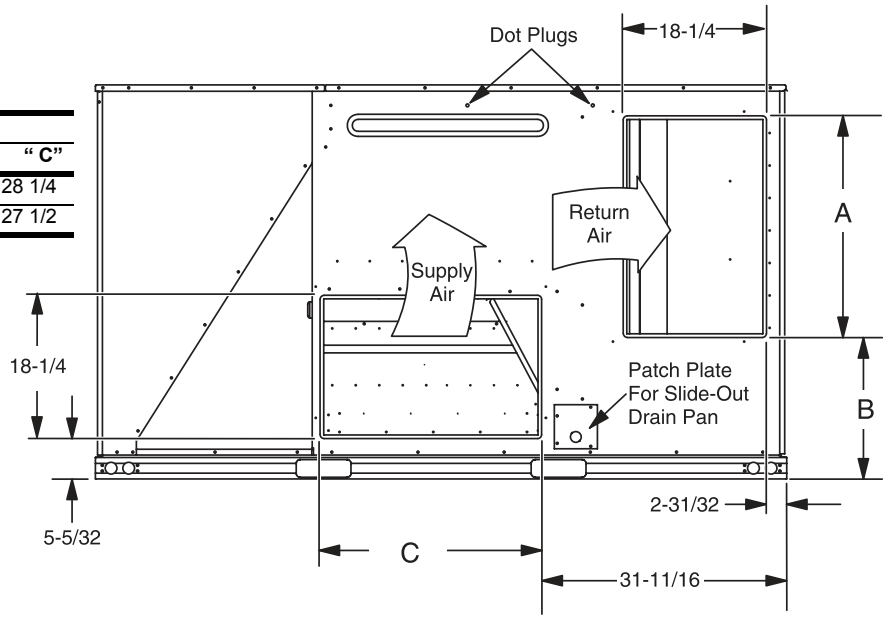


FIGURE 10 - REAR DUCT DIMENSIONS

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 9 for bottom air duct openings. Refer to Figure 10 for rear 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.

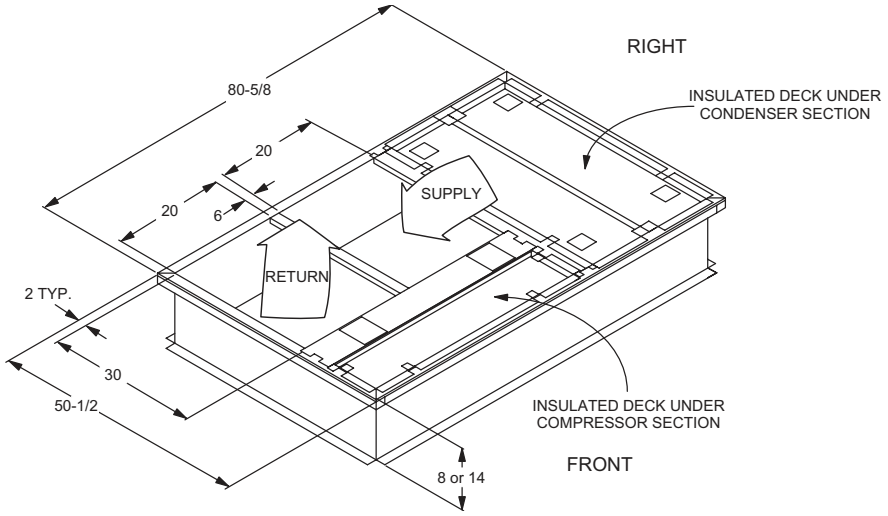


FIGURE 11 - PREDATOR® ROOF CURB DIMENSIONS

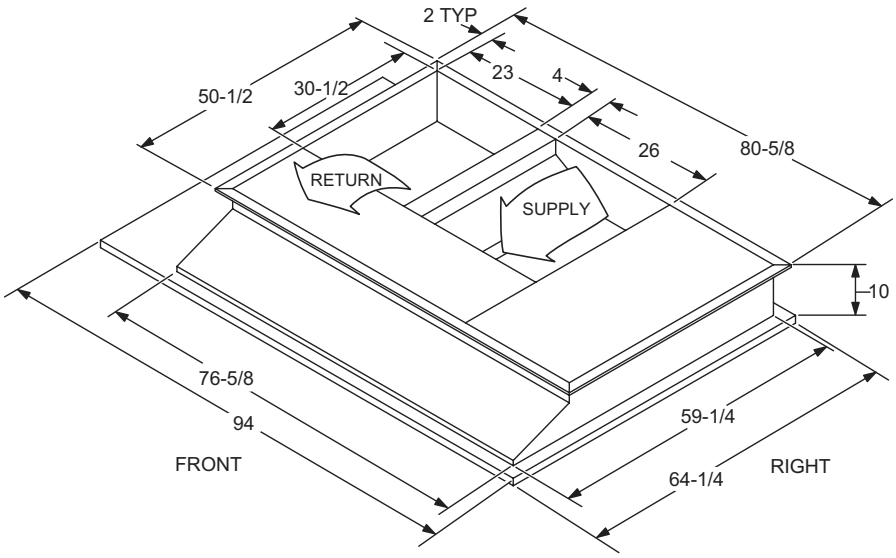


FIGURE 12 - SUNLINE™TO PREDATOR ® TRANSITION ROOF CURBS

⚠ CAUTION

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

FIGURE 13 - SIDE PANELS WITH HOLE PLUGS

Note orientation. Panel is " insulation" side up.

FIGURE 14 - RETURN DOWNFLOW PLENUM WITH PANEL

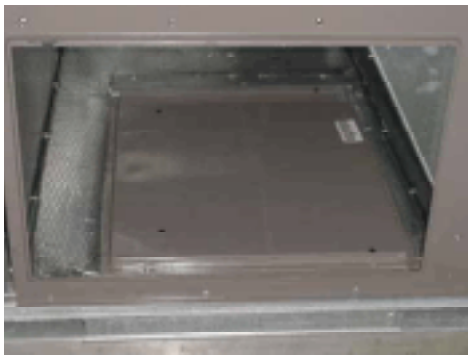


FIGURE 15 - DISCHARGE PANEL IN PLACE

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 16. 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.

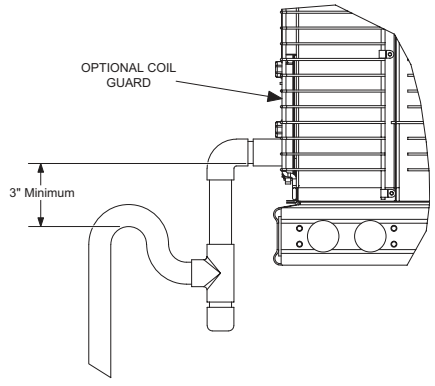


FIGURE 16 - CONDENSATE DRAIN

COMPRESSORS

The compressors are mounted on elastomer insulators. The mounting bolts have been fully tightened for shipping.

⚠ CAUTION

Do not loosen the 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. All units use four filters. Refer to Physical Data table 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.

THERMOSTAT WIRING

The thermostat should be located on an inside wall approximately 56 inches 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 8 for control wire sizing and maximum length.

TABLE 8: CONTROL WIRE SIZES

Wire Size	Maximum Length*
18 AWG	150 Feet

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

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 CSA C22.1, 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 3 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.

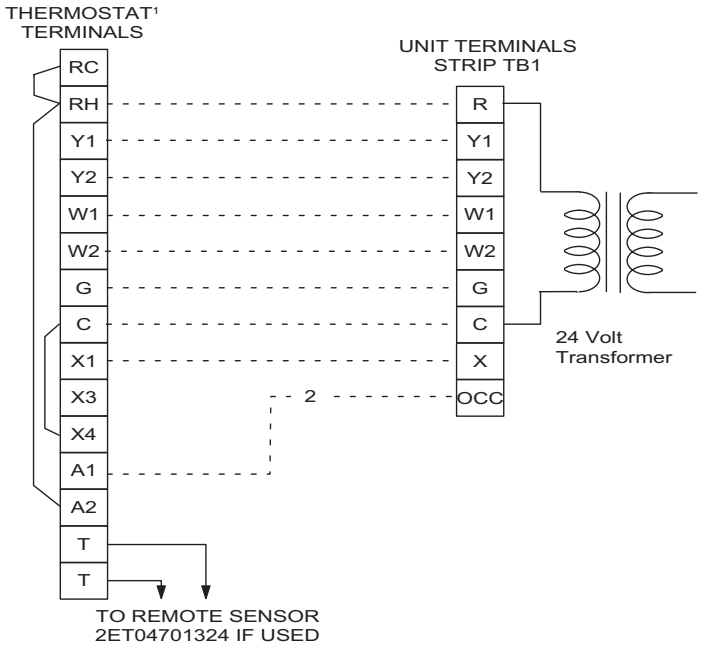
Refer to Figures 17, 18 and 19 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

⚠ 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 Tables 9 through 18 size power wiring, fuses, and disconnect switch.



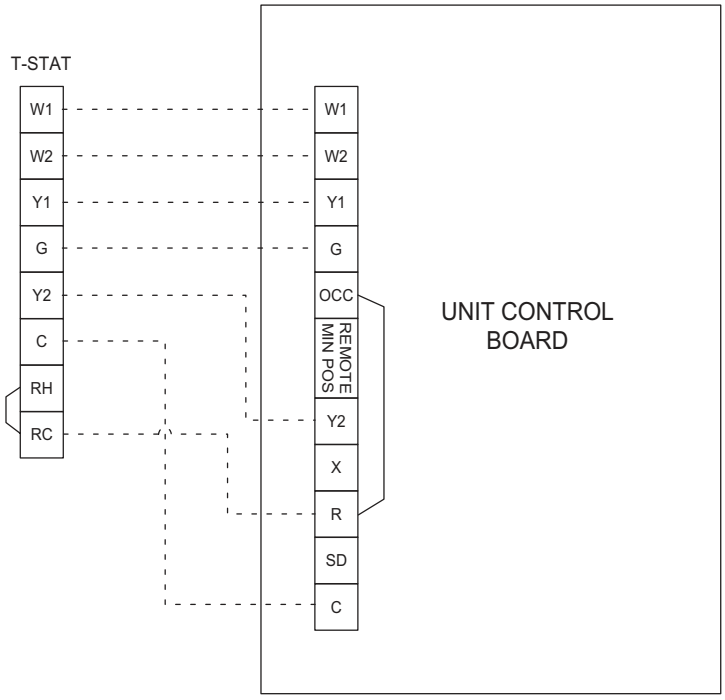
[1] Electronic programmable Thermostat 2ET0770010024 (includes subbase).
[2] Terminals A1 and A2 provide a relay output to close the outdoor economizer dampers when the thermostat switches to the set-back position.

FIGURE 17 - ELECTRONIC THERMOSTAT FIELD WIRING

⚠ CAUTION

The thermostat must provide a " G" signal when there is a call for " W1." The unit control board will energize the indoor blower when the compressors are energized; however, if the thermostat calls for " W2" during the anti-short-cycle delay, the electric heat (when installed) will be energized immediately upon the call for " W2."

NOTE: This unit does not require a heat pump thermostat. It is designed to work with a standard two-stage cool, two-stage heat thermostat; however, the thermostat must provide a " G" signal when there is a call for " W1" .



⚠ CAUTION

The thermostat must provide a " G" signal when there is a call for " W1." The unit control board will energize the indoor blower when the compressors are energized; however, if the thermostat calls for " W2" during the anti-short-cycle delay, the electric heat (when installed) will be energized immediately upon the call for " W2."

FIGURE 18 - FIELD WIRING 24 VOLT THERMOSTAT

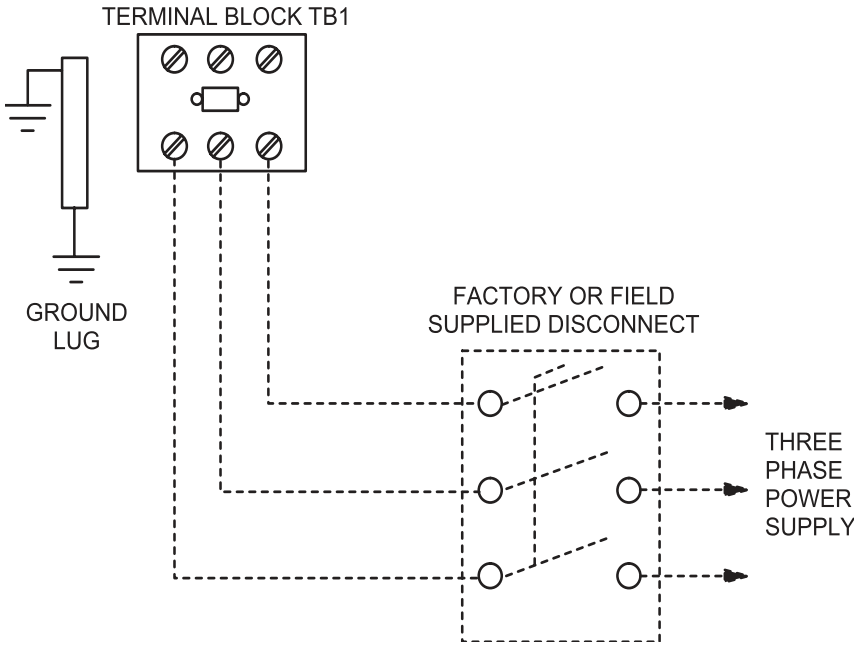


FIGURE 19 - FIELD WIRING DISCONNECT

TABLE 9: ELECTRICAL DATA BP078 (6-1/2 TON) HP W/O PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	1.5 HP	2 HP	FLA	FLA				1.5 HP	2 HP	1.5 HP	2 HP	1.5 HP	2 HP	1.5 HP	2 HP
208	18.9	146.0	1.6	6.2	8.2	5.5	0.0	None	--	--	33.0	35.0	38.5	40.5	45	45	50	50
								2TP04520925	6.8	18.9	56.6	58.6	62.1	64.1	70	70	70	70
								2TP04521825	13.5	37.5	79.9	81.9	85.4	87.4	80	90	90	90
								2TP04522425	18.0	50.0	95.5	97.5	101.0	103.0	100	100	110	110
								2TP04523625	25.5	70.8	121.5	123.5	127.0	129.0	125	125	150	150
230	18.9	146.0	1.6	6.2	8.2	5.5	0.0	None	--	--	33.0	35.0	38.5	40.5	45	45	50	50
								2TP04520925	9.0	21.7	60.1	62.1	65.6	67.6	70	70	70	80
								2TP04521825	18.0	43.3	87.2	89.2	92.7	94.7	90	90	100	100
								2TP04522425	24.0	57.7	105.2	107.2	110.7	112.7	110	110	125	125
								2TP04523625	34.0	81.8	135.3	137.3	140.8	142.8	150	150	150	150
460	9.5	73.0	0.8	3.1	4.1	2.2	0.0	None	--	--	16.6	17.6	18.8	19.8	25	25	25	25
								2TP04520946	9	11.3	30.1	31.1	32.3	33.3	35	35	35	40
								2TP04521846	18	22.6	43.6	44.6	45.8	46.8	45	45	50	50
								2TP04522446	24	30.1	52.7	53.7	54.9	55.9	60	60	60	60
								2TP04523646	34	42.7	67.7	68.7	69.9	70.9	70	70	70	80
575	7.6	58.4	0.6	2.4	3.6	1.8	0.0	None	--	--	13.1	14.3	14.9	16.1	20	20	20	20
								2TP04520958	9	9.0	23.9	25.1	25.7	26.9	25	30	30	30
								2TP04521858	18	18.1	34.8	36	36.6	37.8	35	40	40	40
								2TP04522458	24	24.1	42	43.2	43.8	45	45	45	45	45
								2TP04523658	34	34.1	54	55.2	55.8	57	60	60	60	60

* Maximum HACR breaker of the same AMP size is applicable.

TABLE 10: ELECTRICAL DATA BP078 (6-1/2 TON) HP WITH PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	1.5 HP	2 HP	FLA	FLA				1.5 HP	2 HP	1.5 HP	2 HP	1.5 HP	2 HP	1.5 HP	2 HP
208	18.9	146.0	1.6	6.2	8.2	5.5	10.0	None	--	--	43.0	45.0	48.5	50.5	60	60	60	60
								2TP04520925	6.8	18.9	66.6	68.6	72.1	74.1	80	80	80	80
								2TP04521825	13.5	37.5	89.9	91.9	95.4	97.4	90	100	100	100
								2TP04522425	18.0	50.0	105.5	107.5	111.0	113.0	110	110	125	125
								2TP04523625	25.5	70.8	131.5	133.5	137.0	139.0	150	150	150	150
230	18.9	146.0	1.6	6.2	8.2	5.5	10.0	None	--	--	43.0	45.0	48.5	50.5	60	60	60	60
								2TP04520925	9.0	21.7	70.1	72.1	75.6	77.6	80	80	80	90
								2TP04521825	18.0	43.3	97.2	99.2	102.7	104.7	100	100	110	110
								2TP04522425	24.0	57.7	115.2	117.2	120.7	122.7	125	125	125	125
								2TP04523625	34.0	81.8	145.3	147.3	150.8	152.8	150	150	175	175
460	9.5	73.0	0.8	3.1	4.1	2.2	5.0	None	--	--	21.6	22.6	23.8	24.8	30	30	30	30
								2TP04520946	9	11.3	35.1	36.1	37.3	38.3	40	40	40	45
								2TP04521846	18	22.6	48.6	49.6	50.8	51.8	50	50	60	60
								2TP04522446	24	30.1	57.7	58.7	59.9	60.9	60	60	60	70
								2TP04523646	34	42.7	72.7	73.7	74.9	75.9	80	80	80	80
575	7.6	58.4	0.6	2.4	3.6	1.8	4.0	None	--	--	17.1	18.3	18.9	20.1	20	25	25	25
								2TP04520958	9	9.0	27.9	29.1	29.7	30.9	30	30	35	35
								2TP04521858	18	18.1	38.8	40	40.6	41.8	40	40	45	45
								2TP04522458	24	24.1	46	47.2	47.8	49	50	50	50	50
								2TP04523658	34	34.1	58	59.2	59.8	61	60	60	60	70

* Maximum HACR breaker of the same AMP size is applicable.

TABLE 11: ELECTRICAL DATA BP090 (7-1/2 TON) HP W/O PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse Size w/Power Exhaust	
	RLA ea.	LRA ea.	FLA ea.	2 HP	3 HP	FLA	FLA				2 HP	3 HP	2 HP	3 HP	2 HP	3 HP	2 HP	3 HP
208	11.5	84.0	1.5	8.2	10.9	5.5	0.0	None	--	--	37.1	39.8	42.6	45.3	45	50	50	50
								2TP04540925	6.8	18.9	60.7	63.4	66.2	68.9	70	70	70	70
								2TP04541825	13.5	37.5	83.9	86.6	89.4	92.1	90	90	90	100
								2TP04542425	18	50.0	99.5	102.2	105.0	107.7	100	110	110	110
								2TP04543625	25.5	70.8	125.6	128.3	131.1	133.8	150	150	150	150
230	11.5	84.0	1.5	8.2	10.9	5.5	0.0	None	--	--	37.1	39.8	42.6	45.3	45	50	50	50
								2TP04540925	9	21.7	64.1	66.8	69.6	72.3	70	70	70	80
								2TP04541825	18	43.3	91.2	93.9	96.7	99.4	100	100	100	100
								2TP04542425	24	57.7	109.2	111.9	114.7	117.4	110	125	125	125
								2TP04543625	34	81.8	139.3	142.0	144.8	147.5	150	150	150	150
460	6.4	42.0	0.8	4.1	5.3	2.2	0.0	None	--	--	20.1	21.3	22.3	23.5	25	25	25	25
								2TP04540946	9	11.3	33.6	34.8	35.8	37	35	35	40	40
								2TP04541846	18	22.6	47.2	48.4	49.4	50.6	50	50	50	60
								2TP04542446	24	30.1	56.2	57.4	58.4	59.6	60	60	60	60
								2TP04543646	34	42.7	71.2	72.4	73.4	74.6	80	80	80	80
575	5.1	34.0	0.6	3.6	4.1	1.8	0.0	None	--	--	16.3	16.8	18.1	18.6	20	20	20	20
								2TP04540958	9	9.0	27.1	27.6	28.9	29.4	30	30	30	30
								2TP04541858	18	18.1	37.9	38.4	39.7	40.2	40	40	40	45
								2TP04542458	24	24.1	45.1	45.6	46.9	47.4	50	50	50	50
								2TP04543658	34	34.1	57.2	57.7	59	59.5	60	60	60	60

TABLE 12: ELECTRICAL DATA BP090 (7-1/2 TON) HP WITH PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse Size w/Power Exhaust	
	RLA ea.	LRA ea.	FLA ea.	2 HP	3 HP	FLA	FLA				2 HP	3 HP	2 HP	3 HP	2 HP	3 HP	2 HP	3 HP
208	11.5	84.0	1.5	8.2	10.9	5.5	10.0	None	--	--	47.1	49.8	52.6	55.3	50	60	60	60
								2TP04540925	6.8	18.9	70.7	73.4	76.2	78.9	80	80	80	80
								2TP04541825	13.5	37.5	93.9	96.6	99.4	102.1	100	100	100	110
								2TP04542425	18	50.0	109.5	112.2	115.0	117.7	110	125	125	125
								2TP04543625	25.5	70.8	135.6	138.3	141.1	143.8	150	150	150	150
230	11.5	84.0	1.5	8.2	10.9	5.5	10.0	None	--	--	47.1	49.8	52.6	55.3	50	60	60	60
								2TP04540925	9	21.7	74.1	76.8	79.6	82.3	80	80	80	90
								2TP04541825	18	43.3	101.2	103.9	106.7	109.4	110	110	110	110
								2TP04542425	24	57.7	119.2	121.9	124.7	127.4	125	125	125	150
								2TP04543625	34	81.8	149.3	152.0	154.8	157.5	150	175	175	175
460	6.4	42.0	0.8	4.1	5.3	2.2	5.0	None	--	--	25.1	26.3	27.3	28.5	30	30	30	30
								2TP04540946	9	11.3	38.6	39.8	40.8	42	40	40	45	45
								2TP04541846	18	22.6	52.2	53.4	54.4	55.6	60	60	60	60
								2TP04542446	24	30.1	61.2	62.4	63.4	64.6	70	70	70	70
								2TP04543646	34	42.7	76.2	77.4	78.4	79.6	80	80	80	80
575	5.1	34.0	0.6	3.6	4.1	1.8	4.0	None	--	--	20.3	20.8	22.1	22.6	25	25	25	25
								2TP04540958	9	9.0	31.1	31.6	32.9	33.4	35	35	35	35
								2TP04541858	18	18.1	41.9	42.4	43.7	44.2	45	45	45	45
								2TP04542458	24	24.1	49.1	49.6	50.9	51.4	50	50	60	60
								2TP04543658	34	34.1	61.2	61.7	63	63.5	70	70	70	70

TABLE 13: ELECTRICAL DATA BP102 (8-1/2 TON) HP W/O PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	2 HP	3 HP	FLA	FLA				2 HP	3 HP	2 HP	3 HP	2 HP	3 HP	2 HP	3 HP
208	14.7	130.0	3.5	8.2	10.9	5.5	0.0	None	--	--	48.3	51.0	53.8	56.5	60	60	60	70
								2TP04520925	6.8	18.9	71.9	74.6	77.4	80.1	80	80	80	90
								2TP04521825	13.5	37.5	95.1	97.8	100.6	103.3	100	100	110	110
								2TP04522425	18.0	50.0	110.7	113.4	116.2	118.9	125	125	125	125
								2TP04523625	25.5	70.8	136.8	139.5	142.3	145.0	150	150	150	150
230	14.7	130.0	3.5	8.2	10.9	5.5	0.0	None	--	--	48.3	51.0	53.8	56.5	60	60	60	70
								2TP04520925	9.0	21.7	75.3	78.0	80.8	83.5	80	80	90	90
								2TP04521825	18.0	43.3	102.4	105.1	107.9	110.6	110	110	110	125
								2TP04522425	24.0	57.7	120.4	123.1	125.9	128.6	125	125	150	150
								2TP04523625	34.0	81.8	150.5	153.2	156.0	158.7	175	175	175	175
460	7.7	64.0	1.6	4.1	5.3	2.2	0.0	None	--	--	24.6	25.8	26.8	28	30	30	30	35
								2TP04520946	9	11.3	38.2	39.4	40.4	41.6	40	40	45	45
								2TP04521846	18	22.6	51.7	52.9	53.9	55.1	60	60	60	60
								2TP04522446	24	30.1	60.7	61.9	62.9	64.1	70	70	70	70
								2TP04523646	34	42.7	75.7	76.9	77.9	79.1	80	80	80	80
575	6.4	52.0	1.3	3.6	4.1	1.8	0.0	None	--	--	20.6	21.1	22.4	22.9	25	25	25	25
								2TP04520958	9	9.0	31.4	31.9	33.2	33.7	35	35	35	35
								2TP04521858	18	18.1	42.3	42.8	44.1	44.6	45	45	45	45
								2TP04522458	24	24.1	49.5	50	51.3	51.8	50	50	60	60
								2TP04523658	34	34.1	61.5	62	63.3	63.8	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

TABLE 14: ELECTRICAL DATA BP102 (8-1/2 TON) HP WITH PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	2 HP	3 HP	FLA	FLA				2 HP	3 HP	2 HP	3 HP	2 HP	3 HP	2 HP	3 HP
208	14.7	130.0	3.5	8.2	10.9	5.5	10.0	None	--	--	58.3	61.0	63.8	66.5	70	70	70	80
								2TP04520925	6.8	18.9	81.9	84.6	87.4	90.1	90	90	90	100
								2TP04521825	13.5	37.5	105.1	107.8	110.6	113.3	110	110	125	125
								2TP04522425	18.0	50.0	120.7	123.4	126.2	128.9	125	125	150	150
								2TP04523625	25.5	70.8	146.8	149.5	152.3	155.0	150	150	175	175
230	14.7	130.0	3.5	8.2	10.9	5.5	10.0	None	--	--	58.3	61.0	63.8	66.5	70	70	70	80
								2TP04520925	9.0	21.7	85.3	88.0	90.8	93.5	90	90	100	100
								2TP04521825	18.0	43.3	112.4	115.1	117.9	120.6	125	125	125	125
								2TP04522425	24.0	57.7	130.4	133.1	135.9	138.6	150	150	150	150
								2TP04523625	34.0	81.8	160.5	163.2	166.0	168.7	175	175	175	175
460	7.7	64.0	1.6	4.1	5.3	2.2	5.0	None	--	--	29.6	30.8	31.8	33	35	35	35	40
								2TP04520946	9	11.3	43.2	44.4	45.4	46.6	45	45	50	50
								2TP04521846	18	22.6	56.7	57.9	58.9	60.1	60	60	60	70
								2TP04522446	24	30.1	65.7	66.9	67.9	69.1	70	70	70	70
								2TP04523646	34	42.7	80.7	81.9	82.9	84.1	90	90	90	90
575	6.4	52.0	1.3	3.6	4.1	1.8	4.0	None	--	--	24.6	25.1	26.4	26.9	30	30	30	30
								2TP04520958	9	9.0	35.4	35.9	37.2	37.7	40	40	40	40
								2TP04521858	18	18.1	46.3	46.8	48.1	48.6	50	50	50	50
								2TP04522458	24	24.1	53.5	54	55.3	55.8	60	60	60	60
								2TP04523658	34	34.1	65.5	66	67.3	67.8	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

TABLE 15: ELECTRICAL DATA BP120 (10 TON) HP W/O PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse Size* w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	2 HP	3 HP	FLA	FLA				2 HP	3 HP	2 HP	3 HP	2 HP	3 HP	2 HP	3 HP
208	16.0	150.0	3.5	8.2	10.9	5.5	0.0	None	--	--	51.2	53.9	56.7	59.4	60	60	70	70
								2TP04521825	13.5	37.5	98.0	100.7	103.5	106.2	100	110	110	110
								2TP04522425	18.0	50.0	113.7	116.4	119.2	121.9	125	125	125	125
								2TP04523625	25.5	70.8	139.7	142.4	145.2	147.9	150	150	150	150
								2HP04525425**	40.6	112.7	151.1	154.5	158.0	161.4	175	175	175	175
230	16.0	150.0	3.5	8.2	10.9	5.5	0.0	None	--	--	51.2	53.9	56.7	59.4	60	60	70	70
								2TP04521825	18.0	43.3	105.3	108.0	110.8	113.5	110	110	125	125
								2TP04522425	24.0	57.7	123.4	126.1	128.9	131.6	125	150	150	150
								2TP04523625	34.0	81.8	153.4	156.1	158.9	161.6	175	175	175	175
								2HP04525425**	54.0	129.9	153.4	156.1	158.9	161.6	175	175	175	175
460	9.9	75.0	1.6	4.1	5.3	2.2	0.0	None	--	--	29.6	30.8	31.8	33	35	40	40	40
								2TP04521846	18	22.6	56.6	57.8	58.8	60	60	60	60	60
								2TP04522446	24	30.1	65.7	66.9	67.9	69.1	70	70	70	70
								2TP04523646	34	42.7	80.7	81.9	82.9	84.1	90	90	90	90
								2HP04535446**	54	67.8	80.7	81.9	82.9	84.1	90	90	90	90
575	6.4	62.0	1.3	3.6	4.1	1.8	0.0	None	--	--	20.6	21.1	22.4	22.9	25	25	25	25
								2TP04521858	18	18.1	42.3	42.8	44.1	44.6	45	45	45	45
								2TP04522458	24	24.1	49.5	50	51.3	51.8	50	50	60	60
								2TP04523658	34	34.1	61.5	62	63.3	63.8	70	70	70	70
								2HP04535458**	54	54.2	61.5	62	63.3	63.8	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

** Only 34 kW of Electric heat can be simultaneously energized with the mechanical heating. The full 54 kW operates only if both compressors are locked-out.

TABLE 16: ELECTRICAL DATA BP120 (10 TON) HP WITH PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	2 HP	3 HP	FLA	FLA				2 HP	3 HP	2 HP	3 HP	2 HP	3 HP	2 HP	3 HP
208	16.0	150.0	3.5	8.2	10.9	5.5	10.0	None	--	--	61.2	63.9	66.7	69.4	70	70	80	80
								2TP04521825	13.5	37.5	108.0	110.7	113.5	116.2	110	125	125	125
								2TP04522425	18.0	50.0	123.7	126.4	129.2	131.9	125	150	150	150
								2TP04523625	25.5	70.8	149.7	152.4	155.2	157.9	150	175	175	175
								2HP04525425**	40.6	112.7	163.6	167.0	170.5	173.9	175	175	175	175
230	16.0	150.0	3.5	8.2	10.9	5.5	10.0	None	--	--	61.2	63.9	66.7	69.4	70	70	80	80
								2TP04521825	18.0	43.3	115.3	118.0	120.8	123.5	125	125	125	125
								2TP04522425	24.0	57.7	133.4	136.1	138.9	141.6	150	150	150	150
								2TP04523625	34.0	81.8	163.4	166.1	168.9	171.6	175	175	175	175
								2HP04525425**	54.0	129.9	163.4	166.1	168.9	171.6	175	175	175	175
460	9.9	75.0	1.6	4.1	5.3	2.2	5.0	None	--	--	34.6	35.8	36.8	38	40	45	45	45
								2TP04521846	18	22.6	61.6	62.8	63.8	65	70	70	70	70
								2TP04522446	24	30.1	70.7	71.9	72.9	74.1	80	80	80	80
								2TP04523646	34	42.7	85.7	86.9	87.9	89.1	90	90	90	90
								2HP04535446**	54	67.8	85.7	86.9	87.9	89.1	90	90	90	90
575	6.4	62.0	1.3	3.6	4.1	1.8	4.0	None	--	--	24.6	25.1	26.4	26.9	30	30	30	30
								2TP04521858	18	18.1	46.3	46.8	48.1	48.6	50	50	50	50
								2TP04522458	24	24.1	53.5	54	55.3	55.8	60	60	60	60
								2TP04523658	34	34.1	65.5	66	67.3	67.8	70	70	70	70
								2HP04535458**	54	54.2	65.5	66	67.3	67.8	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

** Only 34 kW of Electric heat can be simultaneously energized with the mechanical heating. The full 54 kW operates only if both compressors are locked-out.

TABLE 17: ELECTRICAL DATA BP150 (12-1/2 TON) HP W/O PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	3 HP	5 HP	FLA	FLA				3 HP	5 HP	3 HP	5 HP	3 HP	5 HP	3 HP	5 HP
208	18.9	146.0	3.5	10.9	16.1	5.5	0.0	None	--	--	60.4	65.6	65.9	71.1	70	80	80	90
								2TP04521825	13.5	37.5	107.3	112.5	112.8	118.0	110	125	125	125
								2TP04522425	18.0	50.0	122.9	128.1	128.4	133.6	125	150	150	150
								2TP04523625	25.5	70.8	148.9	154.1	154.4	159.6	150	175	175	175
								2HP04535425**	40.6	112.7	154.5	161.0	161.4	167.9	175	175	175	175
230	18.9	146.0	3.5	10.9	16.1	5.5	0.0	None	--	--	60.4	65.6	65.9	71.1	70	80	80	90
								2TP04521825	18.0	43.3	114.6	119.8	120.1	125.3	125	125	125	150
								2TP04522425	24.0	57.7	132.6	137.8	138.1	143.3	150	150	150	150
								2TP04523625	34.0	81.8	162.7	167.9	168.2	173.4	175	175	175	175
								2HP04535425**	54.0	129.9	162.7	167.9	168.2	173.4	175	175	175	175
460	9.5	73.0	1.6	5.3	8.1	2.2	0.0	None	--	--	29.9	32.7	32.1	34.9	35	40	40	40
								2TP04521846	18	22.6	56.9	59.7	59.1	61.9	60	60	60	70
								2TP04522446	24	30.1	66	68.8	68.2	71	70	70	70	80
								2TP04523646	34	42.7	81	83.8	83.2	86	90	90	90	90
								2HP04535446**	54	67.8	81	83.8	83.2	86	90	90	90	90
575	7.6	58.4	1.3	4.1	6.0	1.8	0.0	None	--	--	23.8	25.7	25.6	27.5	30	30	30	35
								2TP04521858	18	18.1	45.5	47.4	47.3	49.2	50	50	50	50
								2TP04522458	24	24.1	52.7	54.6	54.5	56.4	60	60	60	60
								2TP04523658	34	34.1	64.7	66.6	66.5	68.4	70	70	70	70
								2HP04535458**	54	54.2	64.7	66.6	66.5	68.4	70	70	70	70

* Maximum HACR breaker of the same AMP size is applicable.

** Only 34 kW of Electric heat can be simultaneously energized with the mechanical heating. The full 54 kW operates only if both compressors are locked-out.

TABLE 18: ELECTRICAL DATA BP150 (12-1/2 TON) HP W/PWRD CONVENIENCE OUTLET

Voltage	Compressors		OD Fan Motors	Supply Blower Motor FLA		Pwr Exh Motor	Pwr Conv Outlet	Electric Heater Model No.	Actual KW	Heater Amps	Min. Circuit Ampacity (Amps)		MCA w/Power Exhaust (Amps)		Max Fuse* Size (Amps)		Max Fuse* Size w/Power Exhaust (Amps)	
	RLA ea.	LRA ea.	FLA ea.	3 HP	5 HP	FLA	FLA				3 HP	5 HP	3 HP	5 HP	3 HP	5 HP	3 HP	5 HP
208	18.9	146.0	3.5	10.9	16.1	5.5	10.0	None	--	--	70.4	75.6	75.9	81.1	80	90	90	100
								2TP04521825	13.5	37.5	117.3	122.5	122.8	128.0	125	125	125	150
								2TP04522425	18.0	50.0	132.9	138.1	138.4	143.6	150	150	150	150
								2TP04523625	25.5	70.8	158.9	164.1	164.4	169.6	175	175	175	175
								2HP04535425**	40.6	112.7	167.0	173.5	173.9	180.4	175	175	175	200
230	18.9	146.0	3.5	10.9	16.1	5.5	10.0	None	--	--	70.4	75.6	75.9	81.1	80	90	90	100
								2TP04521825	18.0	43.3	124.6	129.8	130.1	135.3	125	150	150	150
								2TP04522425	24.0	57.7	142.6	147.8	148.1	153.3	150	150	150	175
								2TP04523625	34.0	81.8	172.7	177.9	178.2	183.4	175	200	200	200
								2HP04535425**	54.0	129.9	172.7	177.9	178.2	183.4	175	200	200	200
460	9.5	73.0	1.6	5.3	8.1	2.2	5.0	None	--	--	34.9	37.7	37.1	39.9	40	45	45	45
								2TP04521846	18	22.6	61.9	64.7	64.1	66.9	70	70	70	70
								2TP04522446	24	30.1	71	73.8	73.2	76	80	80	80	80
								2TP04523646	34	42.7	86	88.8	88.2	91	90	90	90	100
								2HP04535446**	54	67.8	86	88.8	88.2	91	90	90	90	100
575	7.6	58.4	1.3	4.1	6.0	1.8	4.0	None	--	--	27.8	29.7	29.6	31.5	35	35	35	35
								2TP04521858	18	18.1	49.5	51.4	51.3	53.2	50	60	60	60
								2TP04522458	24	24.1	56.7	58.6	58.5	60.4	60	60	60	70
								2TP04523658	34	34.1	68.7	70.6	70.5	72.4	70	80	80	80
								2HP04535458**	54	54.2	68.7	70.6	70.5	72.4	70	80	80	80

* Maximum HACR breaker of the same AMP size is applicable.

** Only 34 kW of Electric heat can be simultaneously energized with the mechanical heating. The full 54 kW operates only if both compressors are locked-out.

TABLE 19: PHYSICAL DATA

Component		Model				
		078	090	102	120	150
Evaporator Blower	Blower, Centrifugal (Dia. X Wd. in.)	15x15	12 x 12	15x15	15 x 15	15 x 15
	Motor, Standard (HP)	1-1/2	2	2	2	3
	Motor, Optional (HP)	2	3	3	3	5
Evaporator Coil	Rows	3	3	3	4	4
	Fins per Inch	15	15	15	15	15
	Height (in.)	40	32	40	40	40
	Face Area ($ft.^2$ each)	13.2	10.6	13.2	13.2	13.2
Condenser Fan (2 per Unit)	Propeller Dia. (in., each)	24	24	24	24	24
	Motor (HP, each)	1/3	1/3	3/4	3/4	3/4
	CFM, Nominal (each)	1700	1700	2200	2200	2200
Condenser Coil (2 per unit)	Rows (each)	1	2	2	2	2
	Fins per Inch	20	20	20	20	20
	Height (in., each)	44	36	44	44	44
	Face Area ($ft.^2$ each)	14.5	11.9	14.5	14.5	14.5
Refrigerant Charge	System 1 (lb./oz.)	18/0	12/0	13/8	15/4	12/12
	System 2 (lb./oz.)	N/A	12/0	13/8	15/4	12/12
Compressors	Quantity	1	2	2	2	2
	Type	Scroll	Recip	Recip	Recip	Scroll
Air Filters	Size (Wd. x Ht. x Thickness in.)	25x20x2	25x16x2	25x20x2	25x20x2	25x20x2
	Number Per Unit	4	4	4	4	4

FACTORY INSTALLED OPTIONS/ FIELD INSTALLED ACCESSORIES

ELECTRIC HEAT ACCESSORY

Electric heaters are available as 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.

ELECTRIC HEAT OPTION

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 into the supply air chamber.

Fuses are supplied, where required, by the factory. Some kW sizes require fuses and other do not. Refer to Table 20 for minimum CFM limitations and to Tables 9 through 18 for electrical data.

TABLE 20: ELECTRIC HEAT MINIMUM SUPPLY AIR

HEATER		UNIT MODEL SIZE, NOMINAL TONS				
kW	VOLTAGE	6.5	7.5	8.5	10	12.5
		MINIMUM SUPPLY AIR CFM				
9	208/230	1950	2250	2550	N/A	N/A
18		1950	2250	2550	3000	3750
24		1950	2250	2550	3000	3750
36		1950	2250	2550	3000	3750
54		N/A	N/A	N/A	3500	4000
9	480	1950	2250	2550	N/A	N/A
18		1950	2250	2550	3000	3750
24		1950	2250	2550	3000	3750
36		1950	2250	2550	3000	3750
54		N/A	N/A	N/A	3000	3750
9	600	1950	2250	2550	N/A	N/A
18		1950	2250	2550	3000	3750
24		1950	2250	2550	3000	3750
36		1950	2250	2550	3000	3750
54		N/A	N/A	N/A	3500	3750

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 AND INFORMATION

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 20. 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 20.
- 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.

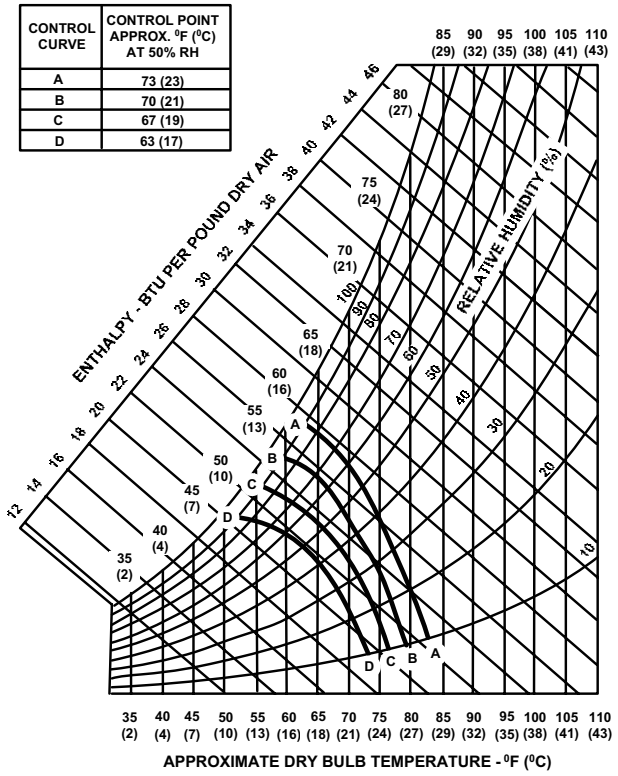


FIGURE 20 - ENTHALPY SET POINT CHART

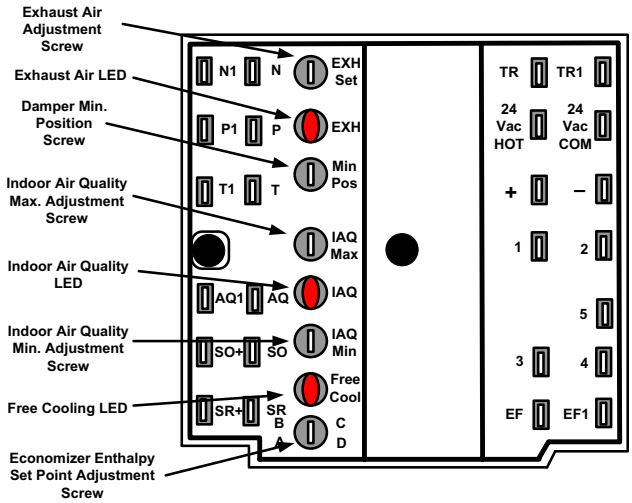


FIGURE 21: HONEYWELL ECONOMIZER CONTROL W7212

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). Units with scroll compressors have a phase monitor as standard equipment. This phase monitor will prevent unit operation under misphased conditions by breaking the 24 volt power.

⚠ 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 21: SUPPLY AIR LIMITATIONS

Unit Size	Minimum	Maximum
078	1950	3250
090	2250	3750
102	2250	4250
120	3000	5000
150	3750	6250

BELT TENSION

The tension on the belt should be adjusted as shown in Figure 22.

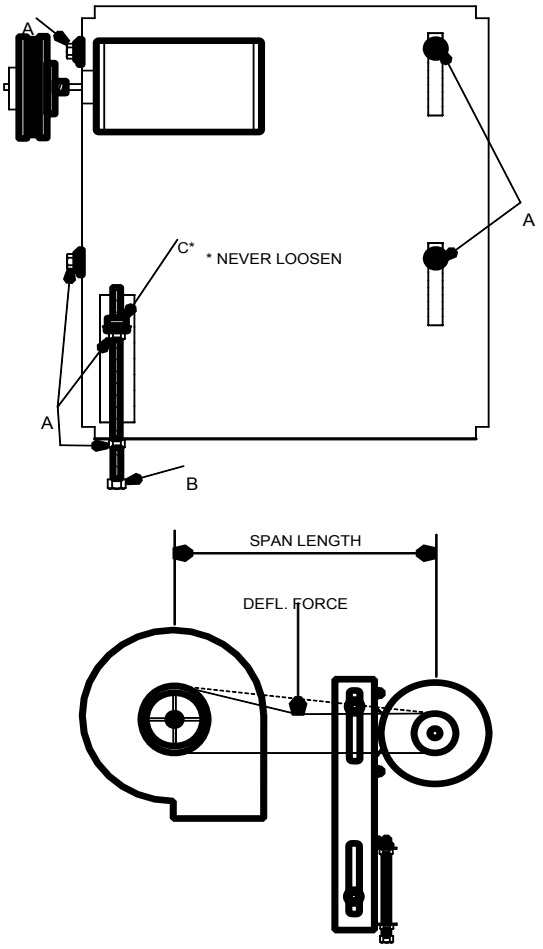


FIGURE 22 - BELT ADJUSTMENT

⚠ 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).

TABLE 22: 6-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.2	-	-	-	-	-	-	3291	1191	1.28	3096	1059	1.14	2963	948	1.02	2757	831	0.89
0.4	-	-	-	3168	1225	1.31	2969	1085	1.16	2658	939	1.01	2535	834	0.89	2255	718	0.77
0.6	3223	1273	1.37	2732	1084	1.16	2500	947	1.02	2110	803	0.86	1923	699	0.75	1608	596	0.64
0.8	2541	1091	1.17	2168	925	0.99	1882	793	0.85	-	-	-	-	-	-	-	-	-
1.0	1859	908	0.97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 23: 6-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3489	1553	1.67
0.6	-	-	-	-	-	-	-	-	-	-	-	-	3394	1641	1.76	3101	1407	1.51
0.8	-	-	-	-	-	-	3623	2009	2.15	3323	1742	1.87	2971	1477	1.58	2607	1241	1.33
1.0	-	-	-	3643	2150	2.31	3224	1820	1.95	2889	1569	1.68	2466	1306	1.40	2009	1071	1.15
1.2	3613	2238	2.40	3143	1917	2.06	2748	1621	1.74	2369	1385	1.49	1879	1141	1.22	-	-	-
1.4	3099	2039	2.19	2636	1711	1.83	2195	1424	1.53	-	-	-	-	-	-	-	-	-
1.6	2586	1833	1.97	2124	1532	1.64	-	-	-	-	-	-	-	-	-	-	-	-
1.8	2073	1621	1.74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 24: 7-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE[1]

ESP[2]	TURNS OPEN[3]																							
	0 Turns				1 Turn				2 Turns				3 Turns				4 Turns				5 Turns			
	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP
0.2	3619	1203	2148	2.3	3452	1156	1913	2.1	3272	1110	1696	1.8	3085	1063	1503	1.6	2932	1013	1299	1.4	2742	963	1123	1.2
0.4	3343	1204	1988	2.1	3189	1159	1781	1.9	2995	1113	1547	1.7	2798	1065	1360	1.5	2640	1014	1190	1.3	2421	965	1024	1.1
0.6	3100	1205	1857	2.0	2944	1162	1676	1.8	2746	1116	1440	1.5	2512	1068	1246	1.3	2340	1017	1067	1.1	2084	967	918	1.0
0.8	2846	1205	1712	1.8	2675	1166	1534	1.6	2448	1118	1326	1.4	2162	1071	1098	1.2	1956	1020	934	1.0	1606	969	781	0.8
1	2559	1207	1574	1.7	2335	1169	1364	1.5	2084	1119	1174	1.3	1712	1074	941	1.0	-	-	-	-	-	-	-	-
1.2	2219	1209	1435	1.5	1935	1174	1039	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1. Blower performance includes two-inch throwaway filters.
2. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
3. “Turns Open” refers to the setting of the variable pitch motor sheave, where “0 Turns Open” is fully closed.
4. W = Watts

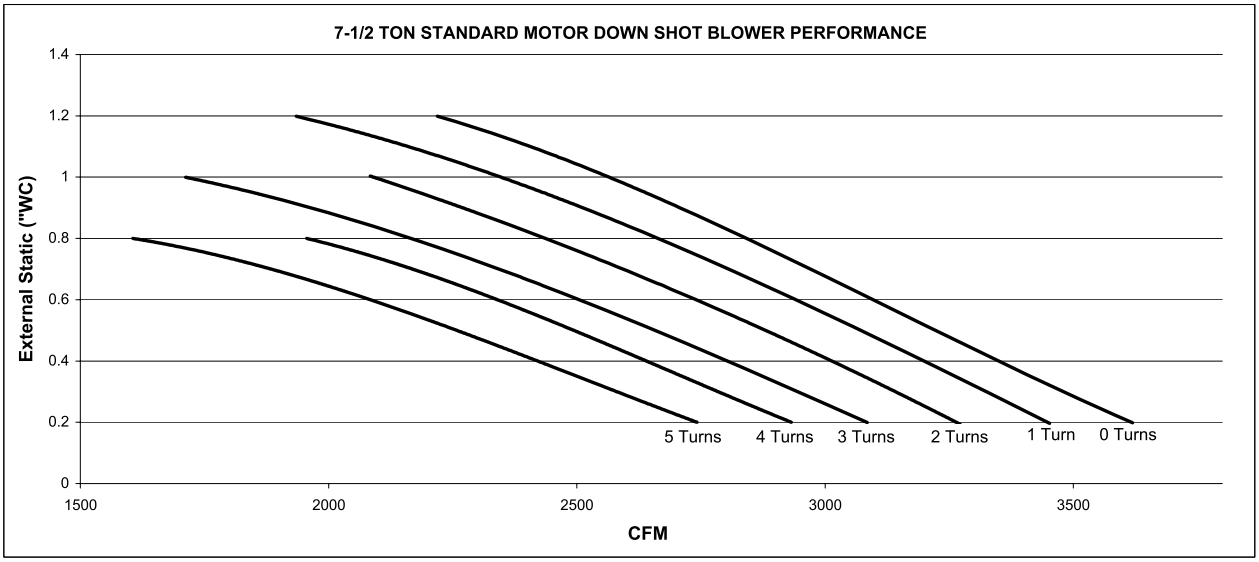


TABLE 25: 7-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE[1]

ESP[2]	TURNS OPEN[3]																							
	0 Turns				1 Turn				2 Turns				3 Turns				4 Turns				5 Turns			
	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP
0.2	3995	1299	2790	3.0	3765	1249	2420	2.6	3619	1198	2147	2.3	3399	1144	1849	2.0	3223	1092	1630	1.7	3002	1038	1421	1.5
0.4	3718	1303	2580	2.8	3508	1252	2290	2.5	3353	1201	2010	2.2	3131	1147	1715	1.8	2945	1094	1525	1.6	2715	1039	1328	1.4
0.6	3506	1305	2440	2.6	3288	1255	2117	2.3	3107	1203	1862	2.0	2876	1149	1603	1.7	2666	1096	1368	1.5	2418	1042	1206	1.3
0.8	3290	1308	2290	2.5	3053	1258	1982	2.1	2858	1206	1712	1.8	2594	1152	1487	1.6	2334	1099	1248	1.3	2049	1044	1037	1.1
1	3065	1312	2167	2.3	2795	1261	1844	2.0	2558	1209	1602	1.7	2259	1155	1318	1.4	1954	1101	1095	1.2	-	-	-	-
1.2	2799	1315	1977	2.1	2458	1264	1675	1.8	2223	1212	1408	1.5	1780	1159	1084	1.2	-	-	-	-	-	-	-	-
1.4	2401	1320	1775	1.9	2098	1269	1487	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.6	1940	1325	1514	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1. Blower performance includes two-inch throwaway filters.
2. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
3. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.
4. W = Watts

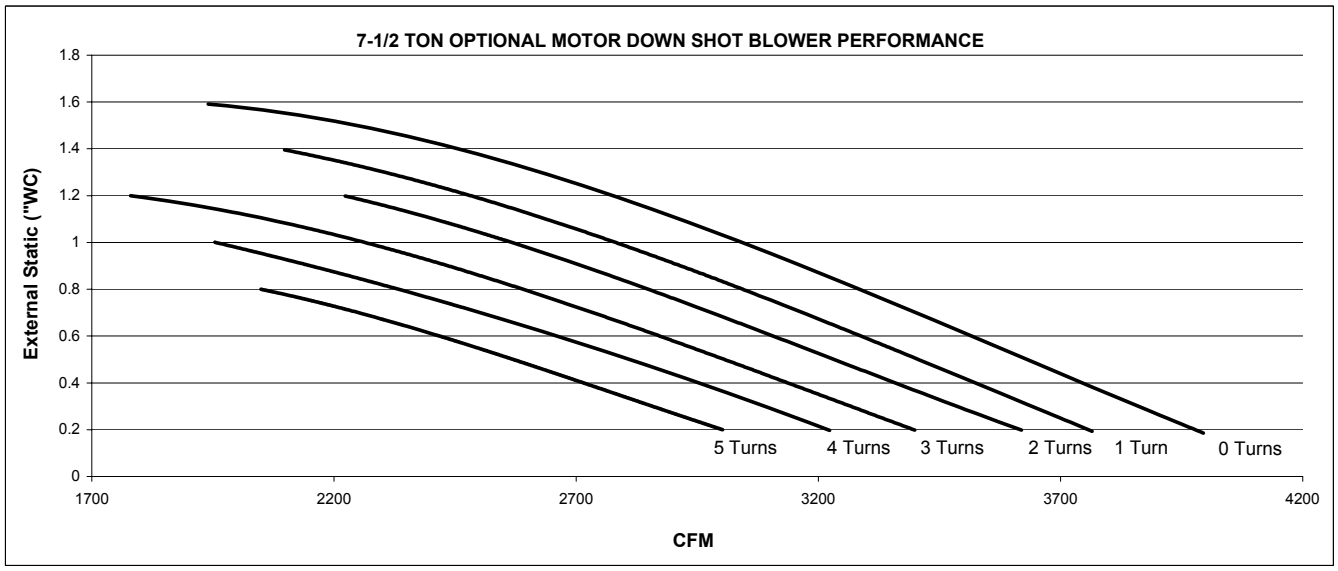


TABLE 26: 8-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.2	-	-	-	4090	1816	1.95	3872	1613	1.73	3681	1448	1.55	3420	1271	1.36	3217	1125	1.21
0.4	3783	1778	1.91	3782	1685	1.81	3548	1489	1.60	3334	1325	1.42	3026	1149	1.23	2796	1010	1.08
0.6	3648	1720	1.84	3387	1529	1.64	3123	1340	1.44	2874	1176	1.26	2495	1002	1.08	-	-	-
0.8	3317	1583	1.70	2903	1354	1.45	2599	1175	1.26	-	-	-	-	-	-	-	-	-
1.0	2788	1385	1.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.
†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.
**. W = Watts

TABLE 27: 8-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	-	-	-	-	-	-	-	-	-	4257	2325	2.49	4117	2079	2.23	3878	1816	1.95
0.6	-	-	-	-	-	-	4363	2596	2.78	4114	2248	2.41	3876	1961	2.10	3556	1676	1.80
0.8	-	-	-	4323	2776	2.98	4107	2446	2.62	3838	2104	2.26	3499	1788	1.92	3166	1520	1.63
1.0	4317	2968	3.18	4175	2677	2.87	3803	2276	2.44	3427	1905	2.04	2987	1577	1.69	2710	1355	1.45
1.2	4243	2918	3.13	3869	2486	2.67	3451	2089	2.24	2882	1669	1.79	-	-	-	-	-	-
1.4	3977	2743	2.94	3408	2225	2.39	3051	1888	2.03	-	-	-	-	-	-	-	-	-
1.6	3518	2467	2.65	2790	1927	2.07	2604	1679	1.80	-	-	-	-	-	-	-	-	-
1.8	2868	2125	2.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.
†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.
**. W = Watts

TABLE 28: 10 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.2	-	-	-	-	-	-	-	-	-	3896	1639	1.76	3688	1453	1.56	3447	1268	1.36
0.4	4040	2076	2.23	4005	1934	2.07	3790	1698	1.82	3569	1508	1.62	3333	1330	1.43	3057	1147	1.23
0.6	3890	2006	2.15	3697	1790	1.92	3427	1550	1.66	3152	1356	1.45	-	-	-	-	-	-
0.8	3620	1882	2.02	3324	1629	1.75	2972	1380	1.48	-	-	-	-	-	-	-	-	-
1.0	3227	1708	1.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.
†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.
**. W = Watts

TABLE 29: 10 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	4965	3485	3.74	4875	3150	3.38	4613	2739	2.94	4322	2374	2.55	4156	2106	2.26	3907	1860	1.99
0.6	4876	3416	3.66	4651	2997	3.21	4359	2582	2.77	4038	2220	2.38	3860	1966	2.11	3590	1724	1.85
0.8	4713	3291	3.53	4387	2823	3.03	4077	2417	2.59	3719	2059	2.21	3541	1827	1.96	3242	1584	1.70
1.0	4476	3116	3.34	4084	2632	2.82	3768	2245	2.41	3365	1892	2.03	3197	1691	1.81	-	-	-
1.2	4165	2898	3.11	3741	2427	2.60	3432	2070	2.22	-	-	-	-	-	-	-	-	-
1.4	3779	2646	2.84	3359	2212	2.37	3069	1895	2.03	-	-	-	-	-	-	-	-	-
1.6	3319	2372	2.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 30: 12-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	5078	3630	3.89	4809	3103	3.33	4594	3053	3.27	4360	2478	2.66	4090	2093	2.24	3812	1798	1.93
0.6	4865	3456	3.71	4584	2961	3.17	4349	2912	3.12	4106	2318	2.49	3814	1964	2.11	-	-	-
0.8	4642	3284	3.52	4356	2828	3.03	4089	2776	2.98	3840	2137	2.29	-	-	-	-	-	-
1.0	4408	3114	3.34	4124	2705	2.90	3815	2647	2.84	-	-	-	-	-	-	-	-	-
1.2	4164	2947	3.16	3889	2592	2.78	-	-	-	-	-	-	-	-	-	-	-	-
1.4	3910	2787	2.99	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 31: 12-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	5994	5400	5.79	5565	4369	4.69	5488	4169	4.47	5264	3599	3.86	4990	3085	3.31	4738	2812	3.02
0.6	5824	5216	5.59	5368	4186	4.49	5289	3991	4.28	5049	3437	3.69	4763	2937	3.15	4491	2655	2.85
0.8	5641	5022	5.39	5170	4012	4.30	5076	3807	4.08	4822	3272	3.51	4528	2790	2.99	4235	2497	2.68
1.0	5444	4819	5.17	4971	3846	4.12	4847	3618	3.88	4584	3103	3.33	4286	2644	2.83	3969	2340	2.51
1.2	5233	4609	4.94	4771	3687	3.95	4604	3426	3.67	4335	2933	3.15	4035	2499	2.68	-	-	-
1.4	5009	4394	4.71	4571	3537	3.79	4346	3233	3.47	4074	2762	2.96	3777	2356	2.53	-	-	-
1.6	4771	4174	4.48	4370	3395	3.64	4074	3040	3.26	3802	2590	2.78	-	-	-	-	-	-
1.8	4520	3951	4.24	4169	3262	3.50	3786	2850	3.06	-	-	-	-	-	-	-	-	-
2.0	4255	3728	4.00	3966	3137	3.36	-	-	-	-	-	-	-	-	-	-	-	-
2.2	3976	3505	3.76	3763	3020	3.24	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 32: 6-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	-	-	-	-	-	-	3367	1216	1.30	3133	1067	1.14	2954	944	1.01	2701	819	0.88
0.6	-	-	-	3208	1239	1.33	2913	1068	1.15	2466	913	0.98	2350	789	0.85	1750	621	0.67
0.8	-	-	-	2651	1058	1.13	2317	894	0.96	1656	700	0.75	-	-	-	-	-	-
1.0	2186	998	1.07	1774	830	0.89	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 33: 6-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3597	1598	1.71
0.8	-	-	-	-	-	-	-	-	-	-	-	-	3503	1689	1.81	3172	1430	1.53
1.0	-	-	-	-	-	-				3406	1778	1.91	3032	1497	1.61	2248	1143	1.23
1.2	-	-	-	-	-	-	3327	1866	2.00	2926	1578	1.69	2160	1217	1.31	-	-	-
1.4	-	-	-	3270	1971	2.11	2537	1544	1.66	2043	1296	1.39	-	-	-	-	-	-
1.6	3196	2077	2.23	2460	1651	1.77	1858	1318	1.41	-	-	-	-	-	-	-	-	-
1.8	2426	1768	1.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 34: 7-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE[1]

ESP[2]	TURNS OPEN[3]																							
	0 Turns				1 Turn				2 Turns				3 Turns				4 Turns				5 Turns			
	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP
0.2	-	-	-	-	-	-	-	-	3721	1108	1951	2.1	3495	1053	1684	1.8	3377	1006	1520	1.6	3124	957	1309	1.4
0.4	-	-	-	-	-	-	-	-	3446	1104	1831	2.0	3239	1055	1408	1.5	3058	1008	1388	1.5	2825	959	1182	1.3
0.6	-	-	-	-	3439	1152	1996	2.1	3198	1106	1697	1.8	2964	1057	1456	1.6	2772	1010	1268	1.4	2523	960	1090	1.2
0.8	3309	1202	2058	2.2	3178	1156	1847	2.0	2922	1109	1591	1.7	2688	1060	1336	1.4	2469	1012	1177	1.3	2177	963	975	1.0
1	3058	1206	1899	2.0	2918	1159	1714	1.8	2649	1111	1453	1.6	2385	1063	1241	1.3	2108	1015	1035	1.1	1746	965	851	0.9
1.2	2809	1209	1793	1.9	2645	1162	1595	1.7	2333	1115	1325	1.4	2002	1066	1114	1.2	1624	1017	886.2	1.0	-	-	-	-
1.4	2580	1212	1701	1.8	2340	1165	1455	1.6	1951	1118	1176	1.3	-	-	-	-	-	-	-	-	-	-	-	-

1. Blower performance includes two-inch throwaway filters.
2. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
3. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.
4. W = Watts

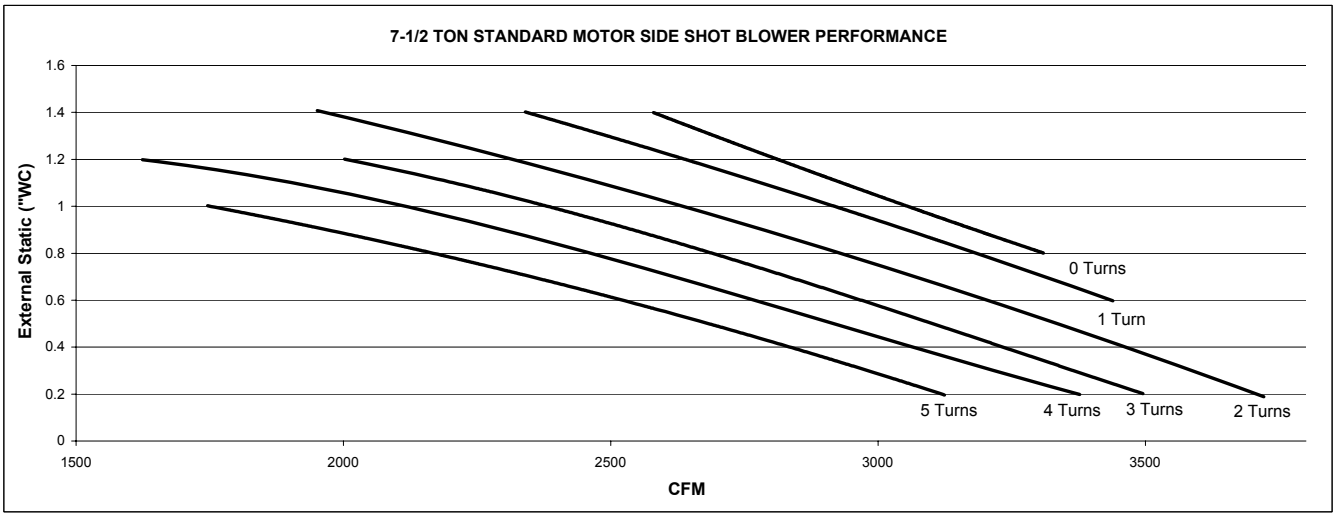


TABLE 35: 7-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE[1]

ESP[2]	TURNS OPEN[3]																							
	0 Turns				1 Turn				2 Turns				3 Turns				4 Turns				5 Turns			
	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP	CFM	RPM	W[4]	BHP
0.2	4467	1295	3131	3.4	4316	1246	2800	3.0	4139	1195	2476	2.7	3886	1146	2178	2.3	3622	1092	1894	2.0	3413	1037	1644	1.8
0.4	4216	1299	3018	3.2	4058	1248	2708	2.9	3882	1199	2391	2.6	3612	1147	2048	2.2	3351	1095	1775	1.9	3139	1039	1550	1.7
0.6	4001	1301	2861	3.1	3825	1252	2534	2.7	3664	1201	2290	2.5	3369	1149	1915	2.1	3100	1097	1643	1.8	2869	1041	1408	1.5
0.8	3804	1304	2729	2.9	3652	1254	2426	2.6	3436	1204	2097	2.3	3118	1151	1816	1.9	2827	1099	1552	1.7	2583	1042	1307	1.4
1	3603	1308	2598	2.8	3442	1256	2306	2.5	3153	1207	2000	2.1	2840	1153	1644	1.8	2539	1100	1398	1.5	2259	1045	1173	1.3
1.2	3370	1310	2435	2.6	3225	1259	2173	2.3	2898	1209	1858	2.0	2560	1155	1554	1.7	2215	1103	1294	1.4	1828	1047	1027	1.1
1.4	3185	1312	2327	2.5	2970	1262	2049	2.2	2617	1212	1719	1.8	2216	1158	1417	1.5	1758	1105	1116	1.2	-	-	-	-
1.6	2928	1315	2173	2.3	2742	1266	1944	2.1	2251	1214	1555	1.7	-	-	-	-	-	-	-	-	-	-	-	-
1.8	2678	1319	2055	2.2	2294	1268	1687	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2326	1354	1844	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1. Blower performance includes two-inch throwaway filters.
2. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.
3. “Turns Open” refers to the setting of the variable pitch motor sheave, where “0 Turns Open” is fully closed.
4. W = Watts

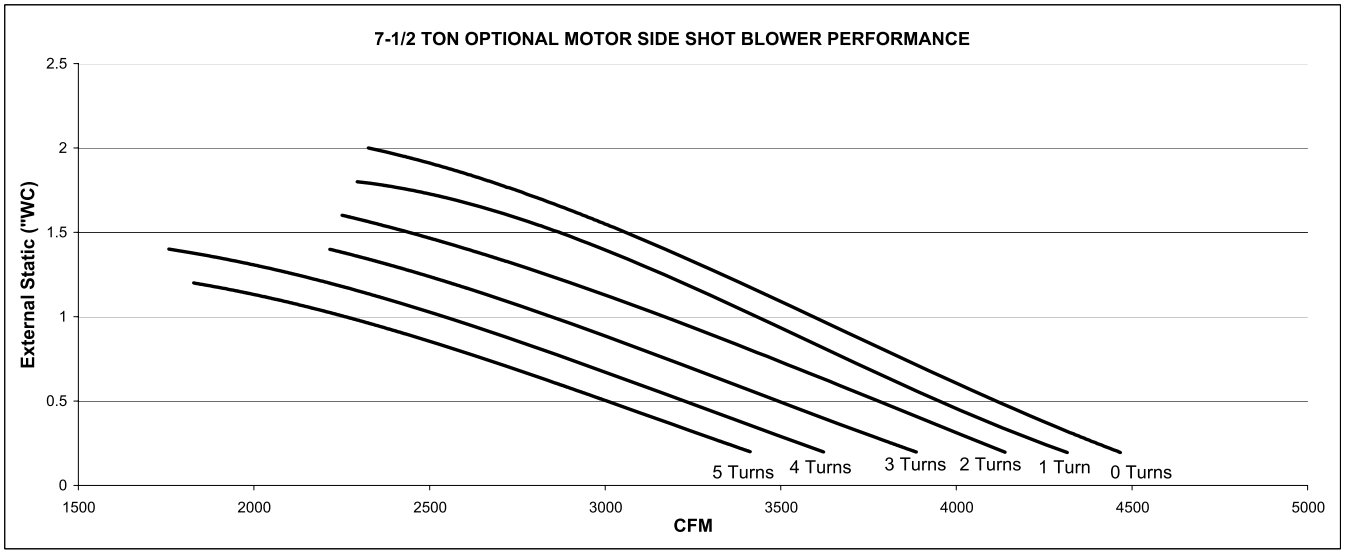


TABLE 36: 8-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	-	-	-	4220	1873	2.01	3991	1659	1.78	3745	1468	1.57	3470	1283	1.38	3209	1120	1.20
0.6	-	-	-	3887	1729	1.85	3612	1514	1.62	3357	1330	1.43	3013	1146	1.23	2719	992	1.06
0.8	-	-	-	3516	1584	1.70	3219	1372	1.47	2903	2903	3.11	2343	966	1.04	-	-	-
1.0	3383	1614	1.73	3023	1391	1.49	2557	1161	1.25	-	-	-	-	-	-	-	-	-
1.2	2674	1341	1.44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 37: 8-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4068	1902	2.04
0.8	-	-	-	-	-	-	-	-	-	4306	2348	2.52	4036	2050	2.20	3692	1742	1.87
1.0	-	-	-	-	-	-	4323	2579	2.77	3967	2172	2.33	3632	1848	1.98	3270	1552	1.66
1.2	-	-	-	-	-	-	4002	2389	2.56	3613	1996	2.14	3080	1613	1.73	2564	1307	1.40
1.4	-	-	-	4097	2632	2.82	3691	2210	2.37	2980	1706	1.83	-	-	-	-	-	-
1.6	4211	2896	3.11	3571	2313	2.48	3003	1869	2.00	-	-	-	-	-	-	-	-	-
1.8	3776	2623	2.81	2591	1849	1.98	-	-	-	-	-	-	-	-	-	-	-	-
2.0	2674	2038	2.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 38: 10 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE

ESP*	TURNS OPEN†																	
	0			1			2			3			4			5		
	CFM	W‡	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.2	-	-	-	-	-	-	-	-	-	4368	1843	1.98	4132	1624	1.74	3870	1423	1.53
0.4	-	-	-	4515	2192	2.35	4213	1885	2.02	4020	1692	1.81	3791	1491	1.60	3499	1283	1.38
0.6	-	-	-	4192	2027	2.17	3905	1741	1.87	3657	1537	1.65	3383	1345	1.44	3062	1149	1.23
0.8	-	-	-	3838	1858	1.99	3534	1591	1.71	3236	1386	1.49	2934	1202	1.29	-	-	-
1.0	3755	1942	2.08	3489	1695	1.82	3081	1425	1.53	-	-	-	-	-	-	-	-	-
1.2	3337	1757	1.88	2918	1475	1.58	-	-	-	-	-	-	-	-	-	-	-	-

*. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

†. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

‡. W = Watts

TABLE 39: 10 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE*

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.2	-	-	-	-	-	-	-	-	-	-	-	-	5067	2614	2.80	4809	2290	2.46
0.4	-	-	-	-	-	-	5179	3112	3.34	4884	2703	2.90	4729	2401	2.57	4459	2113	2.27
0.6	-	-	-	-	-	-	4925	2943	3.16	4585	2521	2.70	4429	2244	2.41	4137	1964	2.11
0.8	-	-	-	4974	3220	3.45	4607	2727	2.92	4267	2342	2.51	4099	2080	2.23	3783	1809	1.94
1.0	4975	3453	3.70	4657	2995	3.21	4305	2550	2.73	3941	2171	2.33	3751	1919	2.06	3371	1630	1.75
1.2	4679	3423	3.67	4366	2808	3.01	4022	2373	2.54	3545	1978	2.12	3305	1741	1.87	-	-	-
1.4	4429	3065	3.29	4040	2607	2.80	3669	2673	2.87	2918	1700	1.82	-	-	-	-	-	-
1.6	4107	2845	3.05	3620	2357	2.53	2931	1830	1.96	-	-	-	-	-	-	-	-	-
1.8	3553	2500	2.68	2756	1899	2.04	-	-	-	-	-	-	-	-	-	-	-	-
2.0	2439	1939	2.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 40: 12-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE *

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	-	-	-	-	-	-	5201	3162	3.39	4966	2796	3.00	4681	2405	2.58	4355	2054	2.20
0.6	-	-	-	5220	3395	3.64	4942	2980	3.20	4657	2608	2.80	4358	2230	2.39	4007	1890	2.03
0.8	-	-	-	4944	3194	3.43	4661	2806	3.01	4378	2572	2.76	4016	2057	2.21	-	-	-
1.0	5003	3490	3.74	4647	2988	3.20	4380	2636	2.83	4030	2257	2.42	-	-	-	-	-	-
1.2	4724	3290	3.53	4363	2875	3.08	4012	2505	2.69	-	-	-	-	-	-	-	-	-
1.4	4428	3040	3.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 41: 12-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE*

ESP†	TURNS OPEN‡																	
	0			1			2			3			4			5		
	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP	CFM	W**	BHP
0.4	-	-	-	6447	5315	5.70	6207	4760	5.1046	5966	4205	4.51	5717	3716	3.98	5470	3307	3.55
0.6	-	-	-	6110	4917	5.27	5965	4464	4.79	5740	4023	4.31	5430	3501	3.75	5126	3054	3.28
0.8	-	-	-	5772	4519	4.85	5741	4274	4.58	5503	3821	4.10	5162	3294	3.53	4849	2870	3.08
1.0	6235	5521	5.92	5628	4407	4.73	5474	4048	4.34	5244	3611	3.87	4882	3101	3.33	4530	2667	2.86
1.2	5881	5137	5.51	5384	4205	4.51	5248	3854	4.13	4941	3387	3.63	4589	2906	3.12	4225	2502	2.68
1.4	5695	4950	5.31	5123	3996	4.29	5014	3670	3.94	4651	3178	3.41	4284	2716	2.91	3858	2280	2.45
1.6	5471	4728	5.07	4919	3828	4.11	4732	3460	3.71	4365	2983	3.20	3951	2516	2.70	3491	2058	2.21
1.8	5242	4514	4.84	4656	3611	3.87	4438	3240	3.47	3998	2740	2.94	3618	2316	2.48	-	-	-
2.0	4954	4231	4.54	4339	3380	3.62	3905	2861	3.07	3631	2497	2.68	-	-	-	-	-	-
2.2	4585	3934	4.22	4022	3149	3.38	-	-	-	-	-	-	-	-	-	-	-	-
2.4	4217	3637	3.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.6	3848	3340	3.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*. Blower performance includes two-inch throwaway filters.

†. ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡. " Turns Open" refers to the setting of the variable pitch motor sheave, where " 0 Turns Open" is fully closed.

**. W = Watts

TABLE 42: INDOOR BLOWER SPECIFICATIONS

MODEL	MOTOR					MOTOR SHEAVE			BLOWER SHEAVE			BELT
	HP	RPM	Eff.	SF	Frame	Datum Dia. (in.)	Bore (in.)	Model	Datum Dia. (in.)	Bore (in.)	Model	
BP078	1-1/2	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	9.5	1	AK99	A58
	2	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	7.5	1	AK79	A55
BP090	2	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	6.5	1	AK69	A49
	3	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	6.0	1	AK64	A49
BP102	2	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	9.0	1	AK94	A56
	3	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
BP120	2	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	8.5	1	AK89	A56
	3	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
BP150	3	1725	80%	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
	5	1725	87%	1.15	184T	4.3 - 5.3	1 1/8	1VP56	6.7	1	BK77	BX56

TABLE 43: POWER EXHAUST SPECIFICATIONS

POWER EXHAUST MODEL	VOLT	PHASE	MOTOR			ELECTRICAL			FUSE SIZE	CFM@ 0.1 ESP
			HP	RPM*	QTY	LRA	FLA	MCA		
2PE0473225	208/230	1	0.75	1075	1	24.9	5.0	6.3	10	3,800
2PE0473246	460	1				N/A	2.2	2.8	5	
2PE0473258	575	1		1050			1.5	1.9	4	

*. 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 Figure 10).
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 23. 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 holes drilled in step one, insert eight inches of 1/4 inch metal tubing into the airflow of both 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 22 - 41. Tables are presented for horizontal and downflow configurations.
6. Determine the unit Measured CFM from the Blower Performance Table by utilizing the measured 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 readings have 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.

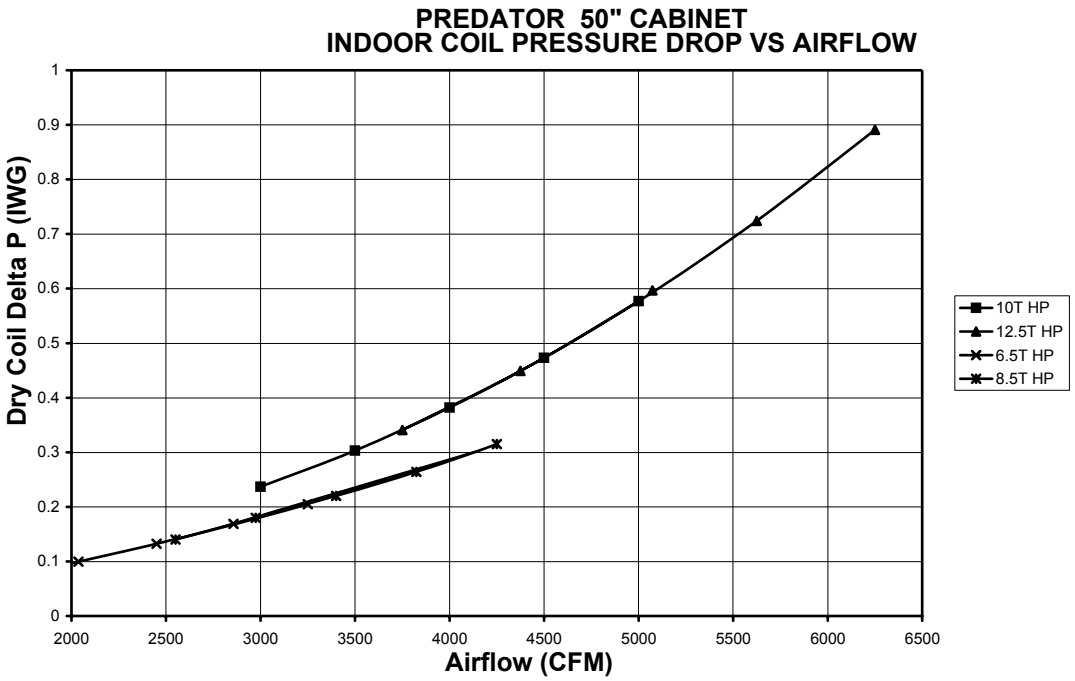


FIGURE 23 - DRY COIL DELTA P 50" CABINET

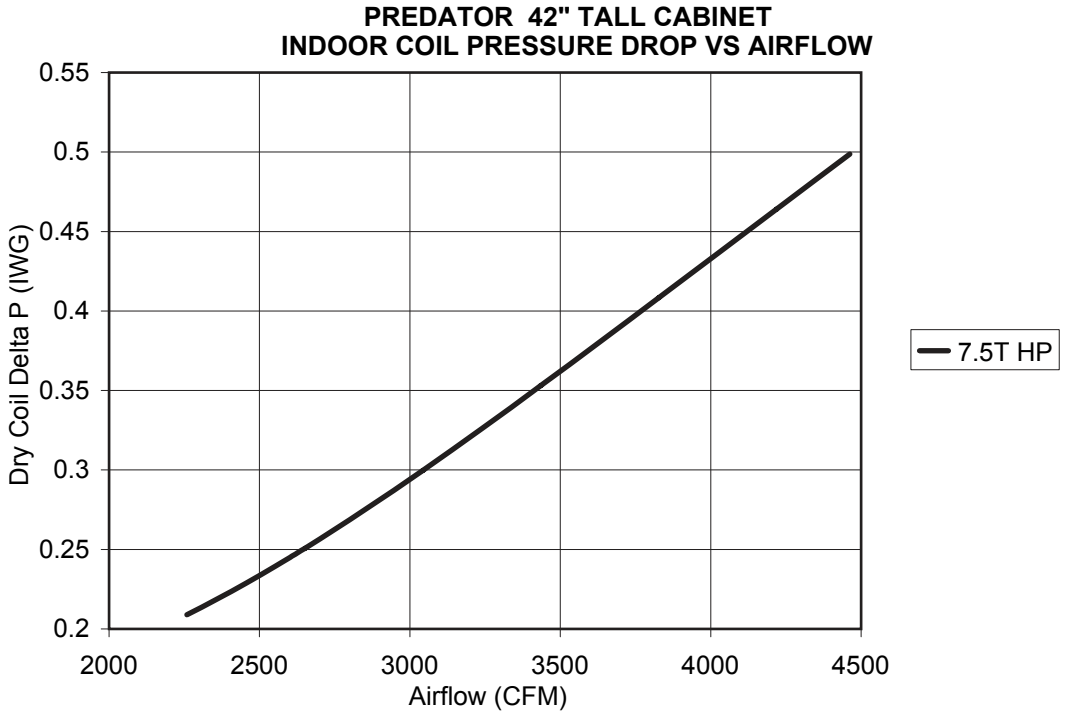


FIGURE 24 - DRY COIL DELTA P 42" CABINET

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:

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

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,

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

Use Table 46 to locate the DD nearest to 4.21 in. Close the sheave to 1 turn open.

New BHP

$= (\text{Speed increase})^3 \bullet$ BHP at 3,800 CFM

$= (\text{Speed increase})^3 \bullet$ Original BHP

= New BHP

New motor Amps

$= (\text{Speed increase})^3 \bullet$ Amps at 3,800 CFM

$= (\text{Speed increase})^3 \bullet$ Original Amps

= New Amps

TABLE 44: ADDITIONAL STATIC RESISTANCE 50" CABINET

CFM	Cooling Only*	Economizer† ‡	Electric Heat KW†				
			9	18	24	36	54
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

*. Add these resistance values to the available static resistance in the respective Blower Performance Tables.

†. Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.

‡. 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 system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

TABLE 45: ADDITIONAL STATIC RESISTANCE 42" CABINET

CFM	Cooling Only*	Economizer† ‡	Electric Heat KW†				
			9	18	24	36	54
1900	-0.004	0.07	0.05	0.06	0.07	0.08	0.1
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	0.1	0.13
2500	0.02	0.13	0.08	0.09	0.1	0.11	0.14
2700	0.03	0.16	0.09	0.1	0.12	0.13	0.16
2900	0.04	0.18	0.1	0.11	0.13	0.14	0.18
3100	0.05	0.20	0.12	0.13	0.15	0.16	0.2
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	0.2	0.24
3700	0.08	0.27	0.17	0.18	0.21	0.22	0.26
3900	0.09	0.29	0.19	0.2	0.23	0.24	0.28
4100	0.09	0.31	0.21	0.22	0.25	0.26	0.31
4300	0.10	0.33	0.23	0.24	0.28	0.29	0.34

*. Add these resistance values to the available static resistance in the respective Blower Performance Tables.

†. Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.

‡. 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 system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

TABLE 46: 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

OPERATION

SEQUENCE OF OPERATIONS OVERVIEW

For the Predator® Magnum 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.

COOLING SEQUENCE OF OPERATION

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 min. 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 (SINGLE OR DUAL) WITH POWER EXHAUST -

This system 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 55). 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 55). 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 55). 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 405 ± 10 psig or 440 ± 10 psig, depending on model).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 7 ± 3 psig and resets 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 electric heat units and the temperature limit switch and the gas valve of gas furnace units.

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 55.

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.

NOTE: The 6-1/2 ton unit has only one compressor.

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.

a. the heating requirements of the conditioned space.

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 55).

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. 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 47: ELECTRIC HEAT LIMIT SETTING 50" CABINET

UNIT (TONS)	VOLTAGE	HEATER kW	LIMIT SWITCH OPENS °F
BP 078, 102 (6.5, 8.5)	208/230	9	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		18	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		24	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		34	150
BP 120 (10)		54	140
BP 150 (12.5)		54	135
BP 078, 102 (6.5, 8.5)	480	9	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		18	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		24	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		34	150
BP 120, 150 (10, 12.5)		54	150
BP 078, 102 (6.5, 8.5)	600	9	140
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		18	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		24	150
BP 078, 102, 120, 150 (6.5, 8.5, 10, 12.5)		34	150
BP 120, 150 (10, 12.5)		54	150

TABLE 48: ELECTRIC HEAT LIMIT SETTING 42" CABINET

UNIT (TONS)	VOLTAGE	HEATER kW	LIMIT SWITCH OPENS °F
BP 090 (7.5)	208/230	9	135
		18	150
		24	165
		34	190
BP 090 (7.5)	480	9	135
		18	150
		24	165
		34	185
BP 090 (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 55.

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 49 for the required electric heat anticipator setting.

TABLE 49: ELECTRIC HEAT ANTICIPATOR SETPOINTS

SETTING, AMPS	
W1	W2
0.13	0.1

START-UP

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 initial operation, the crankcase heaters must be energized at least 8 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.

SUPERHEAT CHARGING METHOD

(Use this method if the unit is equipped with an orifice-type metering device). To determine if the system is properly charged, connect a gauge set to the high and low service ports in the compressor compartment. A temperature probe should be attached to the suction line near the compressor so that suction superheat can be calculated. The probe must be insulated so the higher surrounding temperatures will not affect the reading. A measurement of the outdoor ambient and the indoor wet bulb temperature is also required. (When using a digital temperature probe it is not necessary to insulate the probe because only the probe " tip" is used for sensing.)

Operate system until temperatures and pressures stabilize (minimum of 15 minutes). Then measure and record indoor wet bulb (WB) temperature at the indoor coil. Insert a thermometer with a " wet sock" attached to it into the coil section. Record the outdoor dry bulb (DB) temperature using a thermometer.

Measure and record the suction pressure at the suction service port. Using the Superheat table, note the superheat value corresponding to the intersection of the indoor wet bulb and the outdoor dry bulb. With the superheat value obtained from the table and the suction pressure value previously recorded, find the intersection of the values in Suction Tube Temperature Table. This is the required suction tube temperature at the suction service valve.

To bring the tube temperature in line with the required value, add refrigerant to the service port to cause the tube temperature to fall and reclaim refrigerant to cause the temperature to rise.

TABLE 50: SUPERHEAT CHARGING

SUCTION PRESSURE PSIG (Service Port)	SUCTION TUBE TEMPERATURE																	
	0*	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34
61.5	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69
64.2	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71
67.1	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73
70	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75
73	43	45	47	49	51	53	55	57	59	61	63	63	67	69	71	73	75	77
76	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79
79.2	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81
82.4	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83
84.1	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
92.6	55	57	59	71	73	65	67	69	71	73	75	77	79	81	83	85	87	89

*: From TMP chart.

TABLE 51: COOLING SUPERHEAT 6-1/2 TON HEAT PUMP

OUTDOOR TEMP °F	SUCTION SUPERHEAT °F										
	INDOOR WB TEMP °F										
	55	57	59	61	63	65	67	69	71	73	75
65	34.5	34.8	35.1	35.4	35.6	35.9	36.2	37.0	37.7	38.5	39.2
70	32.5	32.9	33.3	33.7	34.1	34.5	34.9	35.8	36.7	37.5	38.4
75	30.4	31.0	31.5	32.0	32.5	33.0	33.6	34.6	35.6	36.6	37.6
80	28.4	29.0	29.7	30.3	30.9	31.6	32.2	33.4	34.5	35.7	36.8
85	26.3	27.1	27.9	28.6	29.4	30.1	30.9	32.2	33.5	34.7	36.0
90	22.0	23.0	23.9	24.9	25.8	26.8	27.8	29.5	31.2	33.0	34.7
95	17.7	18.9	20.0	21.2	22.3	23.5	24.6	26.8	29.0	31.2	33.4
100	13.9	14.9	15.9	17.0	18.0	19.0	20.1	22.5	24.9	27.3	29.8
105	10.0	10.9	11.8	12.8	13.7	14.6	15.5	18.2	20.8	23.5	26.1
110	6.2	7.0	7.8	8.6	9.4	10.2	11.0	13.8	16.7	19.6	22.5
115	-	-	-	-	5.0	5.7	6.4	9.5	12.6	15.8	18.9

TABLE 52: COOLING SUPERHEAT 7-1/2 TON HEAT PUMP

OUTDOOR TEMP °F	SUCTION SUPERHEAT °F										
	INDOOR WB TEMP °F										
	55	57	59	61	63	65	67	69	71	73	75
65	29.2	31.9	34.6	37.3	40.1	42.8	45.5	46.5	47.6	48.6	49.7
70	27.1	29.7	32.2	34.8	37.3	39.9	42.4	43.5	44.5	45.6	46.7
75	25.0	27.4	29.8	32.2	34.5	36.9	39.3	40.4	41.5	42.6	43.7
80	22.9	25.2	27.4	29.6	31.8	34.0	36.2	37.3	38.5	39.6	40.7
85	20.9	22.9	24.9	27.0	29.0	31.1	33.1	34.3	35.4	36.6	37.7
90	14.8	17.4	19.9	22.4	24.9	27.5	30.0	31.7	33.4	35.2	36.9
95	8.8	11.8	14.8	17.8	20.9	23.9	26.9	29.2	31.5	33.7	36.0
100	7.8	10.1	12.4	14.7	16.9	19.2	21.5	24.6	27.8	30.9	34.1
105	6.9	8.4	9.9	11.5	13.0	14.5	16.1	20.1	24.1	28.1	32.1
110	5.9	6.7	7.5	8.3	9.1	9.8	10.6	15.5	20.4	25.3	30.2
115			5.0	5.1	5.1	5.2	5.2	11.0	16.7	22.5	28.2

TABLE 53: COOLING SUPERHEAT 8-1/2 & 10 TON HEAT PUMP

OUTDOOR TEMP °F	SUCTION SUPERHEAT °F										
	INDOOR WB TEMP °F										
	55	57	59	61	63	65	67	69	71	73	75
65	29.9	31.5	33.1	34.7	36.3	37.9	39.5	39.5	39.5	39.5	39.5
70	25.5	27.1	28.7	30.4	32.0	33.6	35.2	35.8	36.3	36.9	37.5
75	21.1	22.8	24.4	26.0	27.7	29.3	31.0	32.1	33.2	34.3	35.4
80	16.7	18.4	20.0	21.7	23.4	25.1	26.7	28.4	30.0	31.7	33.4
85	12.3	14.0	15.7	17.4	19.1	20.8	22.5	24.7	26.9	29.1	31.3
90	12.0	13.4	14.8	16.2	17.6	19.0	20.4	22.4	24.4	26.4	28.4
95	11.6	12.8	13.9	15.0	16.1	17.2	18.3	20.1	21.9	23.6	25.4
100	8.9	9.7	10.6	11.4	12.2	13.0	13.9	15.5	17.1	18.7	20.3
105	6.2	6.7	7.3	7.8	8.3	8.9	9.4	10.9	12.3	13.8	15.3
110	-	-	-	-	-	-	-	6.3	7.6	8.9	10.2
115	-	-	-	-	-	-	-	-	-	-	5.1

TABLE 54: COOLING SUPERHEAT 12.5 TON HEAT PUMP

OUTDOOR TEMP °F	SUCTION SUPERHEAT °F										
	INDOOR WB TEMP °F										
	55	57	59	61	63	65	67	69	71	73	75
65	10.2	12.3	14.4	16.4	18.5	20.5	22.6	24.9	27.2	29.4	31.7
70	9.6	11.5	13.3	15.2	17.1	18.9	20.8	23.3	25.8	28.3	30.8
75	9.0	10.7	12.3	14.0	15.7	17.4	19.0	21.7	24.4	27.2	29.9
80	8.3	9.8	11.3	12.8	14.3	15.8	17.3	20.2	23.1	26.0	28.9
85	7.7	9.0	10.3	11.6	12.9	14.2	15.5	18.6	21.7	24.9	28.0
90	7.3	8.3	9.2	10.1	11.0	11.9	12.8	15.9	19.0	22.0	25.1
95	7.0	7.5	8.0	8.6	9.1	9.6	10.2	13.2	16.2	19.2	22.2
100	6.3	6.8	7.2	7.7	8.1	8.6	9.0	11.7	14.3	16.9	19.5
105	5.6	6.0	6.4	6.8	7.2	7.5	7.9	10.1	12.3	14.6	16.8
110	-	5.3	5.6	5.9	6.2	6.5	6.8	8.6	10.4	12.2	14.0
115	-	-	-	-	5.2	5.5	5.7	7.1	8.5	9.9	11.3

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 25. 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 55.

TABLE 55: 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*	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*	Flashing	On	Off	On	Off
11 Flashes	Compressors locked out because the Economizer is using free Cooling*	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*	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

*. Non-alarm condition.

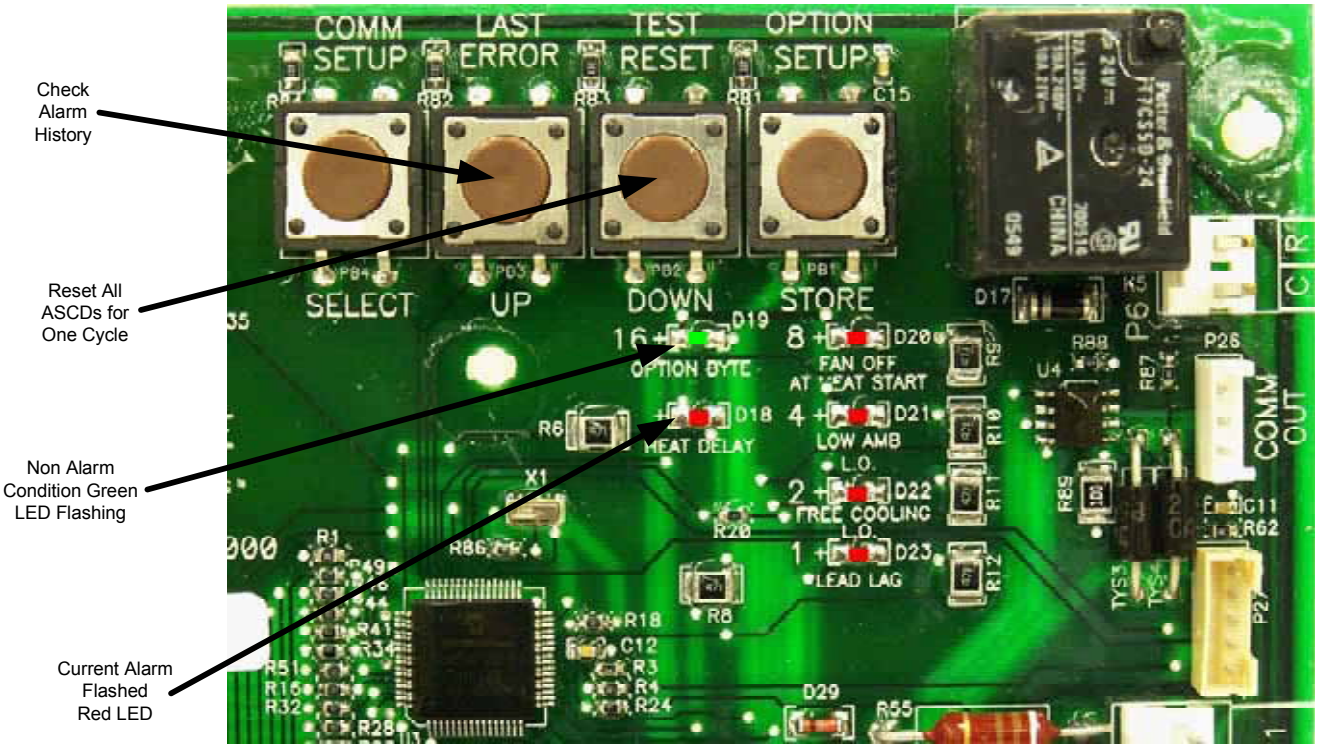


FIGURE 25: UNIT CONTROL BOARD

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.

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.

127421-YIM-C-0606
Supersedes: 127421-YIM-B-0206

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