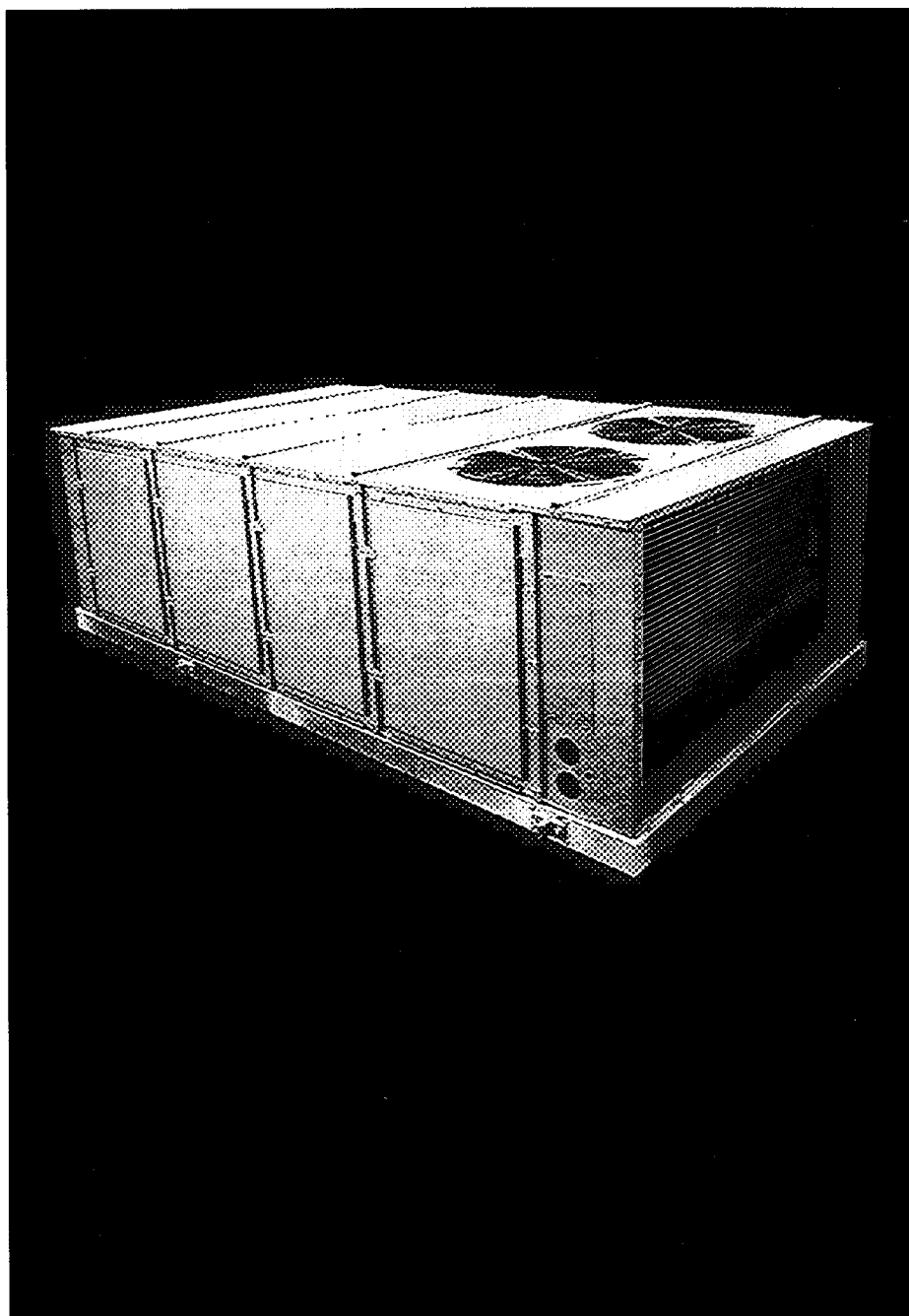




Product Data

50NB,NP Weathermaker® II Rooftop Units Cooling With Product Integrated Controls and Optional Electric Heat

20 to 27 Nominal Tons



Single-package rooftop products with communicating controls designed to meet commercial and industrial application requirements

- constant volume (for use when unit operation is to be based on the occupied space temperature)
- variable-air volume (for use when unit operation is to be based on discharge-air temperature)
- optional digital air volume (all units) provides occupied space control of unit for more efficient heating and cooling
- optional factory-installed control option module for increased capabilities and functions
- factory-built vertical supply/return units (50NP)
- factory-built horizontal supply/return units (50NB)

Features/Benefits

Factory-installed product integrated controls (PIC) provide free-standing or communicating system operation as part of the Carrier Comfort Network (CCN). System operation requires units be connected by a twisted, 3-wire communications bus. Units share information, and can be monitored either on site or remotely (via a telephone modem). Unit PIC controls also interface directly with Carrier PIC controls on 35 and 45 Series units and 37 Series Moduline® terminals to form a digital-air volume (DAV) system for optimum efficiency and tenant comfort.

Standard PIC control functions include:

- up to 6 stages of capacity control

- lead-lag compressor control to equalize the operating hours between the 2 serviceable, semi-hermetic compressors (not recommended with optional hot gas bypass)
- adaptive optimal start/morning warm-up (VAV only)
- adaptive optimal stop (CV only)
- head-pressure control to -20 F ambient outdoor-air temperature
- solid-state enthalpy economizer control (with optional economizer)
- supply-fan control based on occupancy schedule
- adjustment of space set point at the space on CV applications using accessory T56 space temperature sensor
- 365-day electronic time-clock with battery back-up
- occupancy control with 8 programmable occupancy periods and additional holiday period
- 2-stage control for optional medium and high electric heat control
- inlet guide vane control (VAV with optional inlet guide vanes)
- support linkage function for interface with 35 or 45 Series units and 37 Series Moduline® units to create a DAV system
- control of a field-supplied supply fan motor inverter
- space temperature reset (DAV and VAV applications)
- economizer and supply-air fan control
- local or remote unit alarm and alert monitoring
- filter maintenance alert
- building purge
- self-monitoring diagnostics
- demand limiting

Unique design

The 50NB,NP units are uniquely designed in that the unit control will perform both the constant volume (CV) and the variable-air volume (VAV) control functions. The physical factors that determine whether a unit will be CV or VAV are the factory-installed options which are chosen for the unit.

Digital-air volume (DAV) system

The 50NB,NP024-030 units have as standard a support linkage function which provides the ability to interface with the 35, 37, and 45 Series VAV terminals with PIC controls to create a true DAV system. A DAV system's "zone-directed control" allows dynamic

equipment response to changing space conditions, which maximizes system efficiencies and reduces overall operating costs. For maximum benefit, temperature reset function must be used. The feedback from the conditioned space enables each piece of equipment to automatically adjust its operation to effectively match the building load and act as a part of a synergistic HVAC system.

When using a DAV system, the conditioned space is divided into zones. Each zone has its own temperature sensor that is connected to an air terminal unit. Each zone's status (occupied or unoccupied) and space temperature requirements are directly communicated to the air terminals and rooftop unit through the system linkage software. Operation of the VAV air terminals and the 50NB,NP rooftop unit is determined by the zone's heating and cooling requirements.

System functions like adaptive optimal start (including morning warm-up), nighttime free cooling, building pressurization and evacuation, and occupied heating and cooling can all be integrated into the system control strategy.

Design flexibility

Carrier Weathermaker® II rooftop units with PIC are designed to meet all customer requirements for new construction, replacement jobs, or special applications. Choose from: constant or variable-air volume applications (the base units are the same regardless of application; the options chosen are the only physical differences between the two), 3 sizes of electric heaters, 2 fan motor sizes (standard or high efficiency), and aluminum or copper condenser coils. Add optional integrated economizer with low-leak dampers, barometric relief, or power exhaust.

Dedicated vertical supply/return unit (Model 50NP) is ideal for new construction. The low unit profile is maintained when the unit is installed on the accessory roof curb, which is approved by the National Roofing Contractors Association (NRCA). The roof curb is made watertight by the roofer.

The ducts are attached directly to the roof curb to allow all ductwork to be completed before the unit is positioned.

Dedicated horizontal unit (Model 50NB) is ideal for replacement or special applications such as thru-the-wall jobs or jobs where sound must be attenuated before the duct penetrates the roof. Ducts connect directly to unit, using factory-supplied flanges. Horizontal units may be curb mounted or slab mounted.

Indoor-air quality (IAQ)

There is currently a great deal of concern over indoor-air quality in commercial establishments. Contaminants can get into the conditioned space from various sources. For example, people produce carbon dioxide and other contaminants which can affect the quality of the conditioned space.

In order to deal with possible indoor-air contaminants, ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) has created a standard (ASHRAE 62) for indoor-air quality (IAQ). The standard requires that on the average, 20 cfm per person or 0.20 cfm per square ft (depending on the application) of outdoor air must be used for ventilation of the conditioned space.

Meeting this requirement can be expensive and wasteful in many situations. Because of this, ASHRAE has also determined that it is acceptable to monitor indoor-air quality using an IAQ sensor and provide ventilation as necessary to maintain acceptable levels of contaminants.

The 50NB,NP units have been designed to provide control over indoor-air quality in an efficient manner. With the factory-installed control option module, an analog input is supplied to accept a zero to 10-v input from a field-supplied IAQ sensor. When the sensor indicates poor IAQ, the optional economizer steps open to increase ventilation air until the sensor registers satisfactory IAQ. (See Control Option Module section on page 4 for more information on integrated economizer operation and control.) This optional function eliminates the need to meet the ASHRAE requirements of cfm per person (or per square ft), and is especially useful in retail applications and in situations where mixed-air temperatures would be extreme.

With additional Carrier data collection software, IAQ data can be recorded and printed in user-designed reports.

The 50NB,NP units also provide the following IAQ features:

1. Building purge flushes the conditioned space. This is especially important when a temporary situation occurs in a conditioned space, such as painting, new carpeting, or carpet cleaning fumes. The unit can be set to purge the space with outdoor air for 5 to 60 minutes. The purge function starts 2 hours prior to the occupied mode to ensure maximum occupant comfort.

2. On VAV applications, maintaining a constant volume of outdoor air regardless of supply-air volume can be difficult. The accessory outdoor airflow sensor, in conjunction with the factory-installed control option module, solves this problem by maintaining an inputted cfm $\pm 5\%$.
3. Space temperature reset (DAV and VAV applications). Space temperature reset maintains adequate ventilation airflow during low load operation (single or multiple sensors can be used). Resetting the discharge-air temperature allows more air to circulate, reducing the possibility of "sick building syndrome."

Unit efficiency

Electric unloaders on dual serviceable, semi-hermetic compressors, used with intertwined circuits on evaporator coils ensure optimum unloading capabilities, as well as excellent full and part load efficiency with EERs (Energy Efficiency Ratios) to 9.7. Dual refrigerant circuits provide stand-by capability should one circuit require service. Reliable Carlyle compressors are proven performers.

All units have a minimum of 5 stages of unloading. Optional hot gas bypass valve provides enhanced low-load operation.

The low rpm single-supply fan design reduces noise and vibration.

The refrigerant circuits on all units are equipped with low ambient head pressure control as standard, and are designed to operate efficiently at outdoor-air temperatures down to -20°F . It is recommended that wind baffles be installed to achieve this unit's full low-ambient capabilities. Consult Service Engineering Manual SMB90-80 for baffle dimensions, mounting, and winter start requirements.

The optional factory-installed integrated economizer supports free cooling using outdoor air to maintain the occupied set point when outdoor air is satisfactory. The integrated economizer also provides the nighttime free cooling feature to maintain the conditioned space at the occupied set point (when outdoor air is satisfactory) between 3 and 7 a.m. If the outdoor air is not sufficient to keep the space cooled to the occupied set point, the adaptive optimal start will turn on the compressors at the appropriate time to ensure the building will be cooled to the occupied set point in time for the occupied period to begin. Thus, the integrated economizer uses free outdoor air to cool the conditioned space whenever possible, and supplements with mechanical cooling only when necessary to ensure comfort.

Low-leak dampers to regulate the outdoor air and the outdoor-air enthalpy sensor are standard with the economizer option. Accessory field-installed differential enthalpy sensor is available for even greater savings. The differential enthalpy sensor allows unit control to compare the enthalpy of return air and outdoor air to determine which is more economical to use for enhanced energy savings.

Field-installed rainhood/filter assembly prevents moisture or objects from entering the unit. Units without economizer can be fitted with an accessory field-installed manual outdoor-air damper that allows intake of up to 25% of nominal cfm.

Exhaust/air relief is also available for economizer units:

- barometric relief
- 100% modulating power exhaust

Using field-adjustable set points, the modulating power exhaust relieves up to 100% of nominal cfm and prevents space pressurization problems.

Optional factory-installed inlet guide vanes are available on units for fan modulation. All associated controls are factory installed. In addition, field-supplied and installed inverters may be used if desired. The PIC controls will accommodate and control either inlet guide vanes or inverters through a 4-20 mA signal.

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HINGED ACCESS DOORS

Features/Benefits (cont)



Installation/Serviceability

Small footprint requires less roof area and makes unit easier to rig. Low unit profile allows units to be mounted closer to edge of building while remaining out of public view. Up to 60% smaller volume than comparable units.

Single-point electric connections are standard on all units, regardless of voltage or optional heater size. Electrical service access can be made through roof curb or side of unit.

On horizontal units, the ducts attach directly to the unit using factory-supplied flanges. Horizontal units can be curb or slab mounted.

Hinged access panels are located so as to make it easy to reach standard serviceable components for maintenance. No fasteners need to be removed, which reduces servicing time and prevents roof leaks caused by discarded screws puncturing the roof.

The compressors are equipped with discharge service valves and liquid line valves for easy service.

To ensure a successful start-up, every rooftop unit is factory run tested.

When the accessory HSIO (keypad interface) or building supervisor feature is installed, serviceability becomes even easier, including:

- Local or remote alarm and alert monitoring
- Self-diagnostic run testing to confirm control and component operation
- Expedited troubleshooting and unit repair through self-diagnostic display of unit troubleshooting code to immediately identify reason for unit outage
- Filter maintenance alert
- Monitoring of supply-air fan run time, permitting easy service schedule planning

Serviceability is further facilitated with the field installation of the accessory suction and discharge pressure transducers. With this accessory, there is no need to open or modify the refrigerant circuit to check the pressures. Suction and discharge pressures can be monitored remotely, and have alarm fault capability. With the factory-installed control option module, refrigerant superheat can also be monitored remotely.

Unit controls

A self-diagnostic microprocessor controls the leaving-air temperature. The microprocessor also controls stages of cooling, heating, morning warm-up cycle, and unit safety controls. At start-up, the self-diagnostic "quick" test verifies component operation and calibration. Fault codes reduce service troubleshooting time and difficulty.

Space temperature reset uses the standard T55 space temperature sensor. Space temperature reset prevents overcooling the space and maintains higher airflow to ensure adequate ventilation air to the space. It automatically resets the supply-air temperature set point when space temperature reaches the field-adjustable set point. Supply-air temperature set point resets up by a user-defined amount for every degree below set point in the space.

Unit design is ETL (Electrical Testing Laboratory) and CSA (Canadian Standards Association) certified.

When installed with the modulating power exhaust option, the economizer option, the optional control option module, and a field-supplied interface with a fire and smoke control panel, units can be set to run in the building pressurization or smoke purge mode. In the event of a fire or smoke condition, a zone can be pressurized to prevent smoke from entering the zone, or smoke can be exhausted from a zone. Refer to Building Pressurization, Evacuation, and Smoke Purge Control section on page 31 for more information.

Control option module

The control option module is a package of factory-installed controls which provide control of the following:

1. Suction and discharge pressure transducers and suction temperature thermistors. These allow suction pressure, discharge pressure, and suction superheat to be monitored remotely with alarm capability. These transducers and thermistors also control condenser head pressure to maintain the minimum differential pressure required across the thermal expansion valve (TXV) for proper operation, which reduces energy consumption.

2. Indoor-air quality (IAQ) functions to interface with economizer control. The functions included are.

- A constant amount of outdoor-air intake on VAV applications. This maintains inputted cfm of outdoor air as indoor-air cfm varies due to load changes (accessory field installed outdoor airflow sensor and transducer required).
- Input channel to accept a 0 to 10-v analog input from a field-supplied IAQ sensor. When the sensor indicates poor IAQ, the economizer steps open to increase ventilation air until the sensor clears.
- Maintains a minimum set point when enthalpy is not suitable for free cooling.

NOTE: The economizer still provides integrated operation with mechanical cooling when required for optimum unit efficiency.

3. Building pressurization, evacuation, smoke purge control, and unit shutdown functions are all available through software. Terminals are provided to interface with a field-supplied smoke/fire panel.

NOTE. Economizer and/or modulating power exhaust options are required.

4. Control for a field-supplied humidifier (accessory field-supplied humidity sensor located in the space or the return-air duct required).
5. A 4-20 mA output located on the PSIO2 optional processor module to control a field-supplied hot water valve and heating coil.
6. A discrete output with time schedule to control items such as parking lot lights.

Model number nomenclature



50 NP C 024 EA - 6 0 1 F D

50 — Cooling Only
Electric Heat Option

NP — Vertical Supply and Return
NB — Horizontal Supply and Return

Heat Option

- — No Heat Option
A — Low Electric Heat (CV and VAV applications)*
B — Med Electric Heat (CV and VAV applications)*
C — High Electric Heat (CV applications only)*
F — Low Electric Heat †
G — Medium Electric Heat †

Nominal Tons

024 — 20
028 — 25
030 — 27

Filter and Control Option Module

- — Standard 2-in. Throwaway
EA — Option Module with Standard 2-in. Throwaway

Condenser Coil Material/Hot Gas Bypass

- — Al/Cu, without hot gas bypass
A — Al/Cu, with hot gas bypass
C — Cu/Cu, without hot gas bypass
D — Cu/Cu, with hot gas bypass

Outdoor Air Option

- — Standard Unit
A — Economizer Only
C — Economizer with Barometric Relief
D — Economizer with Modulating Power Exhaust

Inlet Guide Vane/Motor Option

- — Standard Motor, without IGV
A — Alternate Motor, without IGV
F — High Efficiency, Std Motor, without IGV
G — High Efficiency Alt Motor, without IGV
L — Standard Motor, with IGV
M — Alternate Motor, with IGV
S — High Efficiency, Std Motor, with IGV
T — High Efficiency, Alt Motor, with IGV

Packaging

1 — Domestic

Design Series

0 — Initial

Voltage

1 — 575-3-60
5 — 208/230-3-60
6 — 460-3-60

LEGEND

Al — Aluminum
Cu — Copper
CV — Constant Volume
IGV — Inlet Guide Vanes
VAV — Variable Air Volume

*Without inlet guide vanes

†With inlet guide vanes

Physical data



BASE UNIT 50	NP024	NB024	NP028	NB028	NP030	NB030
NOMINAL CAPACITY (tons)	20	20	25	25	27	27
OPERATING WEIGHT (lb)*	2440	2650	2900	3100	2930	3140
COMPRESSORS (2 each unit) Capacity Steps (%)	Semi-Hermetic. 06D Type, 1750 Rpm 21, 42, 62, 80, 10020, 40, 60, 73, 86, 10019, 38, 57, 71, 86, 100					
REFRIGERANT Operating Charge (lb), Sys 1/Sys2 Without Optional Hot Gas Bypass With Optional Hot Gas Bypass	R-22, Controlled by Thermostatic Expansion Valve 23.1/18.122.6/16.322.3/18.3 25 2/18 124.6/16.324.3/18.3					
CONDENSER COILS Face Area (sq ft) Fins Per In. (Aluminum) (Copper)	3-Row, 3/8-in. Tube Diameter 24.7519 019.0 15.717 517 5					
EVAPORATOR COILS Face Area (sq ft) Fins Per In.	4-Row, 1/2-in. Tube Diameter 20 123.423.4 151515					
CONDENSER FANS (2 each unit) Nominal Cfm Nominal Hp Watts Input (Total)	Propeller Type, 30-in. Diameter, 1140 Rpm 10,00013,00015,000 3/4 (208/230, 460 v); 1 (575 v)11 170024002900					
EVAPORATOR FAN (1 each unit)† Nominal Cfm Maximum Allowable Cfm Maximum Allowable Rpm	Centrifugal Type, 18 x 15-in. 8,00010,00010,800 10,00012,50012,500 1,2001,2001,200					
Standard Motor and Drive Motor Hp Full Load Efficiency (%) Standard High Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Pulley A Pulley B Resulting Fan Rpm Pulley A Pulley B Belts Quantity Length (in.)	1 438-in. Fan Pulley Bore, Service Factor 1 15 57 1/210 84 384.887 4 86.588 589.5 184T213T215T 10 68 08 0 4.754 124.50 5.304 505 00 780900980 8759801090 2233 568547854785					
Optional Motor and Drive Motor Hp Full Load Efficiency (%) Standard High Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Pulley A Pulley B Resulting Fan Rpm Pulley A Pulley B Belts Quantity Length (in.)	1 438-in. Fan Pulley Bore, Service Factor 1 15 7 1/21015 84 887 485 7 88.589 590 0 213T215T254T 8 08 08.0 4 124 505.00 4 505 005.30 9009801090 98010901160 233 4747855085					
Optional Power Exhaust** Motors...Hp Fans...Diameter (in.)	Propeller Type, 1140 Rpm 1 . 11 . 1 1...241.. 30NA1 . 1 1 . 30NA1 . 30NA					
Filters (Quantity...L x W x D) 20% Standard Efficiency Throwaway	2...18 x 24 x 22.. 18 x 24 x 22 . 18 x 24 x 2 4 ..24 x 24 x 26...20 x 24 x 26 20 x 24 x 2					

*Weights do not include economizer. See page 7 for weights of options and accessories.

†Standard fan motor is supplied with standard fan drive, pulleys, and belts. Optional fan motor is supplied with optional fan drive, pulleys, and belts. Other combinations are field supplied. Pulley A is installed in base unit. Pulley B is shipped with base unit.

**Optional unit-mounted power exhaust not available (NA) on Model 50NB. Accessory modulating power exhaust may be duct mounted on 50NB installations.

Physical data (cont)



WEIGHT DISTRIBUTION AND CENTER OF GRAVITY						
UNIT	WEIGHT OF CORNER (lb)				DIM (ft.-in.)	
	1	2	3	4	A	B
50NP	024	749	491	531	809	4-1 3-8
	028	883	579	625	953	4-5 3-8
	030	891	585	632	962	4-5 3-8
50NB	024	791	520	586	893	5-1 3-7
	028	910	613	691	1026	5-6 3-7
	030	921	620	700	1039	5-6 3-7

NOTE: Weights include economizer, but not economizer rain hood. See Operating Weights of Options and Accessories table, at right.

OPERATING WEIGHTS OF OPTIONS AND ACCESSORIES

OPTION OR ACCESSORY	WEIGHT (lb)
ROOF CURB	
Vertical Supply/Return (50NP)	250
Horizontal Supply/Return (50NB)	280
ECONOMIZER	140
ECONOMIZER RAIN HOOD	140
25% OUTDOOR AIR HOOD	40
POWER EXHAUST	70
HOOD FOR POWER EXHAUST OR BAROMETRIC RELIEF	110
HAIL GUARD	40
ELECTRIC HEAT (kW)	
18	75
36	85
72	110
90	110
108	110
ALTERNATE MOTOR AND DRIVE	
Size 024	45
028	25
030	45
COPPER CONDENSER	
Size 024	104
028,030	143
INLET GUIDE VANES	100

EER and IPLV ratings

UNIT 50	EER*	IPLV*
NP024	9.7	10.0
NB024	9.6	9.8
NP028	9.0	8.9
NB028	8.8	8.4
NP030	8.6	8.4
NB030	8.5	8.0

EER — Energy Efficiency Ratio
IPLV — Integrated Part-Load Values

The integrated part load value (IPLV) is a calculated value to compare unit part load operation. Refer to ARI 360-D1 (Air Conditioning and Refrigeration Institute) for additional information.



024 units only.

Part load operation

For efficient part load operation, the Weathermaker® II units utilize 2 semi-hermetic compressors, each on its own refrigerant circuit. Additional capacity steps allow the unit to match the cooling load without cycling compressors or artificially loading the unit with hot gas bypass. In addition, the PIC controls provide lead/lag operation to prolong the life of both compressors.

Units have 5 to 6 stages of cooling capacity as standard. Electric unloaders are factory installed on both compressors. Capacity reduction is handled by both the lead and lag compressors.

To provide the maximum capacity steps available, units are supplied with electric unloaders as standard.

See Physical Data table for capacity steps per unit

Options and accessories



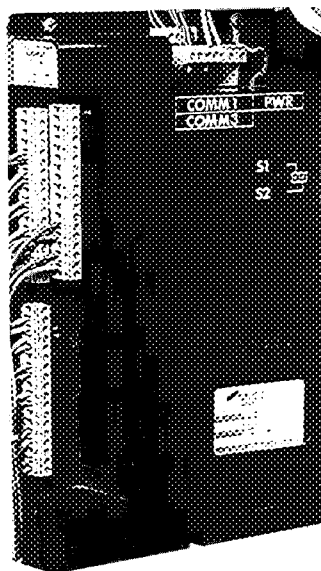
ITEM	OPTION*	ACCESSORY†
Integrated Economizer	X	
Inlet Guide Vanes	X	
Copper/Copper Condenser Coil	X	
High-Efficiency Evaporator-Fan Motor**	X	
Control Option Module	X	
Hot Gas Bypass	X	
Barometric Relief††	X	X
100% Modulating Power Exhaust††	X	X
Electric Heat	X	X
Roof Curb		X
Condenser Hail Guard		X
Differential Enthalpy Sensor		X
HSIO (Keyboard and Display Module)		X
PSIO2 (Processor Module)		X
Refrigerant Pressure Transducers		X
Space Temperature Sensor (T56)		X
Humidity Control Sensors		X
Outdoor Air Cfm Kit		X
25% Manual Outdoor-Air Kit		X

*Factory installed

†Field installed

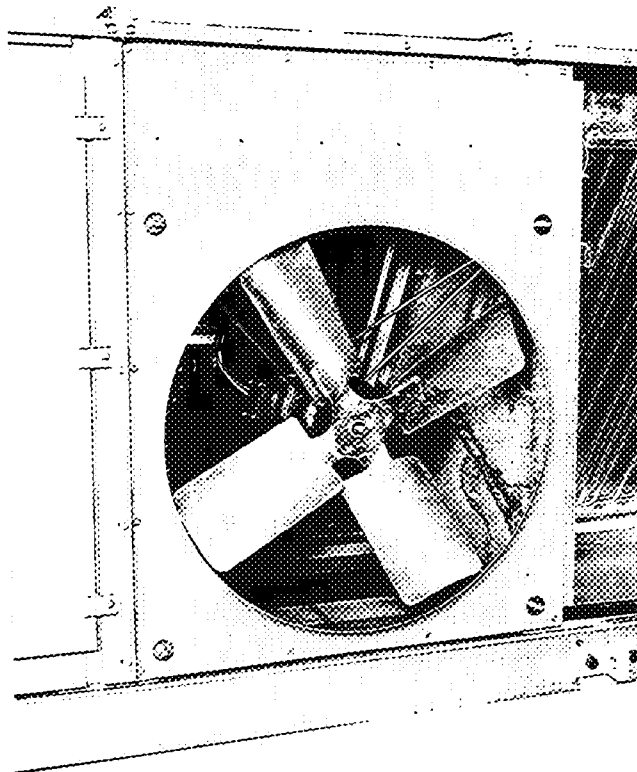
**Not available on 575-v units

††Unit mounted on vertical discharge applications; duct mounted on horizontal discharge applications



PSIO NO. 2

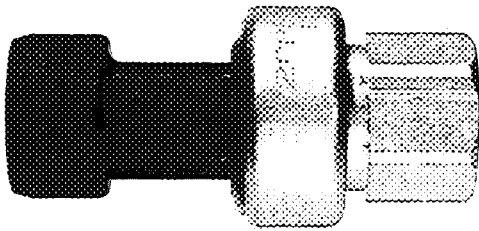
The accessory field-installed (factory-installed when included as part of the control option module) processor module no. 2 supports the sensors used for humidity control, outdoor-air cfm, IAQ, expanded economizer control, building pressurization and smoke purge control, hydronic coil protection, and super-heat monitoring. In addition, the PSIO no. 2 supplies the outputs for humidity and hydronic heating coil control, and the discrete output with timed clock control.



POWER EXHAUST

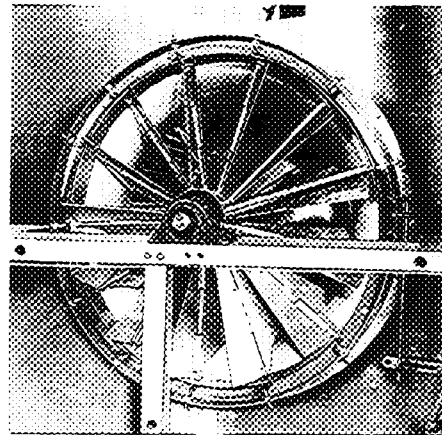
When combined with the economizer, the 100% modulating power exhaust can be used to exhaust up to 100% of the return air and eliminate overpressurization of the building. The power exhaust utilizes 1 propeller-type fan driven by its own motor. A 1/4-in OD plastic tube to sense building pressure is field installed.

The 100% modulating power exhaust energizes the motor according to interior space pressure. The fan has discharge modulation dampers.



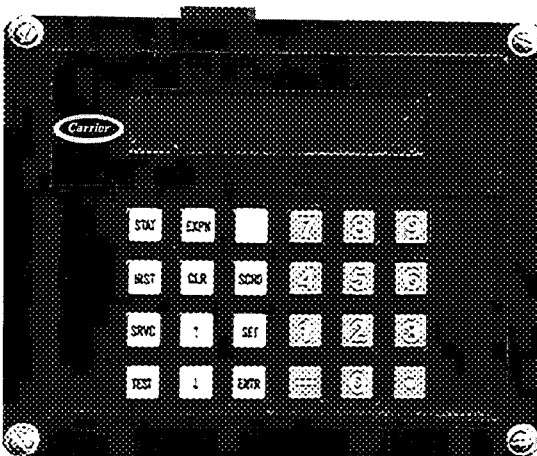
TRANSDUCERS

The transducers can be purchased as a field-installed accessory or as a factory-installed part of the control option module. The transducers monitor the refrigerant pressures, permitting improved control of head pressure and refrigerant pressures. This information can be monitored either locally or from a remote location.



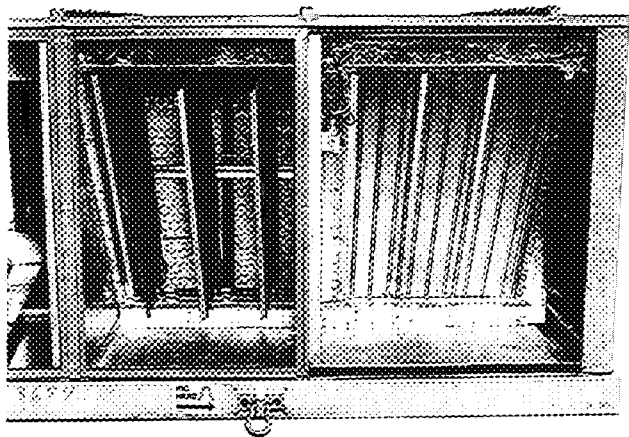
INLET GUIDE VANES

Inlet guide vanes provide fan modulation. All controls are factory installed. A 1/4-in. OD plastic tube to sense supply duct pressure is field installed.



HSIO

The keypad and display module is a local interface device that is purchased as an accessory and field installed. The HSIO provides unit function information at the unit, and is easily installed. The module is portable, and one module can be moved from unit to unit for ease in routine maintenance. The HSIO is required to change the unit from standby to run mode and back. Therefore, an accessory HSIO is required for initial start-up and for most service and diagnostic routines.



ECONOMIZER

Optional integrated economizer saves energy by using low temperature outdoor air to provide cooling. A solid state enthalpy control adjusts the economizer. The electronic control logic located in the processor module (PSIO1) integrates economizer cooling with mechanical cooling. If the conditioned space requires more cooling, mechanical cooling will be brought on to satisfy the cooling need. Spring return damper motor automatically closes the outdoor-air dampers in the event of a power failure.

Low-leakage design includes sealing strip along edge of damper blades and venetian blind type seal along end of damper blade.

Base unit dimensions — 50NP



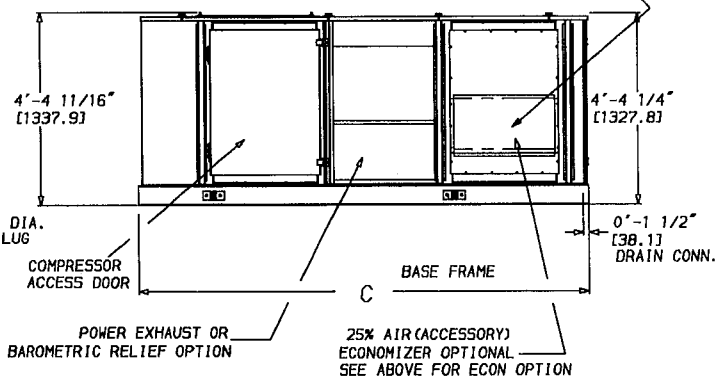
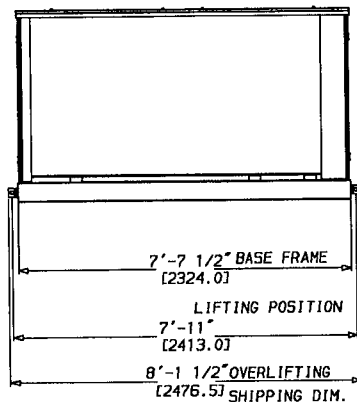
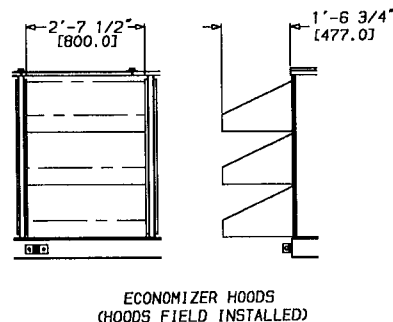
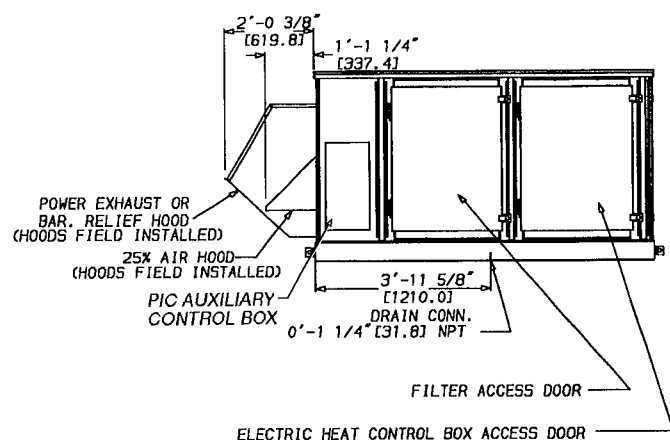
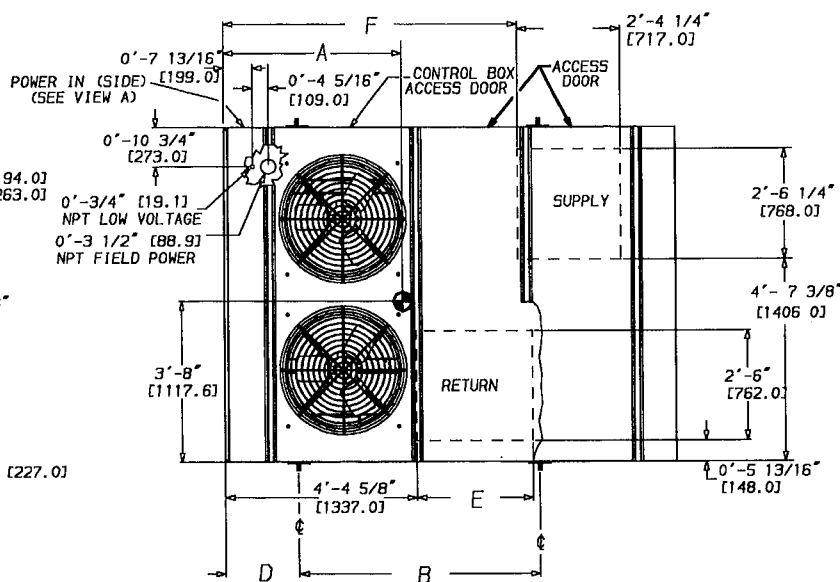
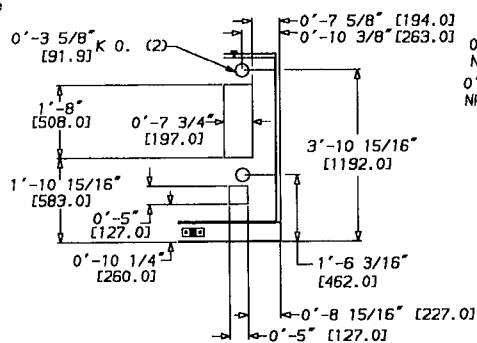
CONN — Connection
DIM — Dimension
PIC — Product Integrated Controls

NOTES:

- Dimensions in [] are in millimeters
- Center of gravity
- Allow 12'-0" (3658) at top and 6'-0" (1829) on sides for service and operational clearance
- On multiunit applications, allow 12'-0" (3658) between adjacent condensers and economizers
- For smaller service and operational clearances, contact Carrier Application Engineering Department
- Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on the accessory roof curb
- Always line up condenser end of unit tight against the roof curb
- Units with bottom return and power exhaust require a 90 degree elbow in return air duct
- Units with bottom supply and electric heat require a 90 degree elbow in supply air duct
- When unit is slab mounted, locate the condensate drain as low as possible on vertical face of base rail at the same location as the standard condensate drain using factory supplied fitting. Plug factory drilled condensate hole

UNIT SIZE	WEIGHT*		A		B		C		D		E		F	
	Lb	Kg	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.	mm	Ft.-In.
50NP024	2580	1172.7	1244.6	4-1	1680.0	5-6 1/8	3141.0	10-3 1/16	525.5	1-8 1/16	807.0	2-7 3/4	2048.0	6- 8 3/4
50NP028	3040	1381.8	1346.2	4-5	1956.0	6-5	3397.0	11-1 3/4	382.5	1-3 1/16	935.0	3-0 13/16	2131.0	6-11 7/8
50NP030	3070	1395.5												

*Weights include economizer, but not rainhood



Base unit dimensions — 50NB



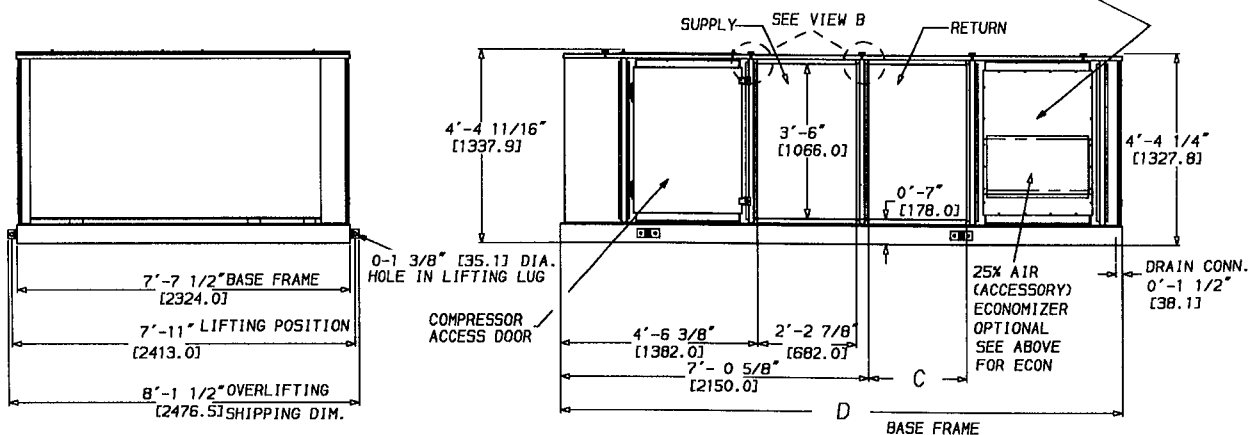
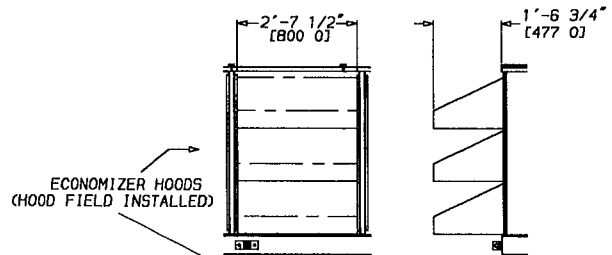
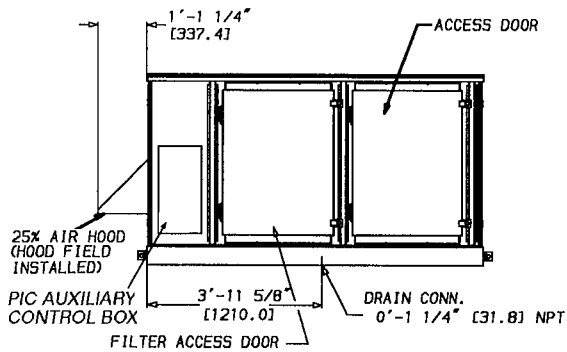
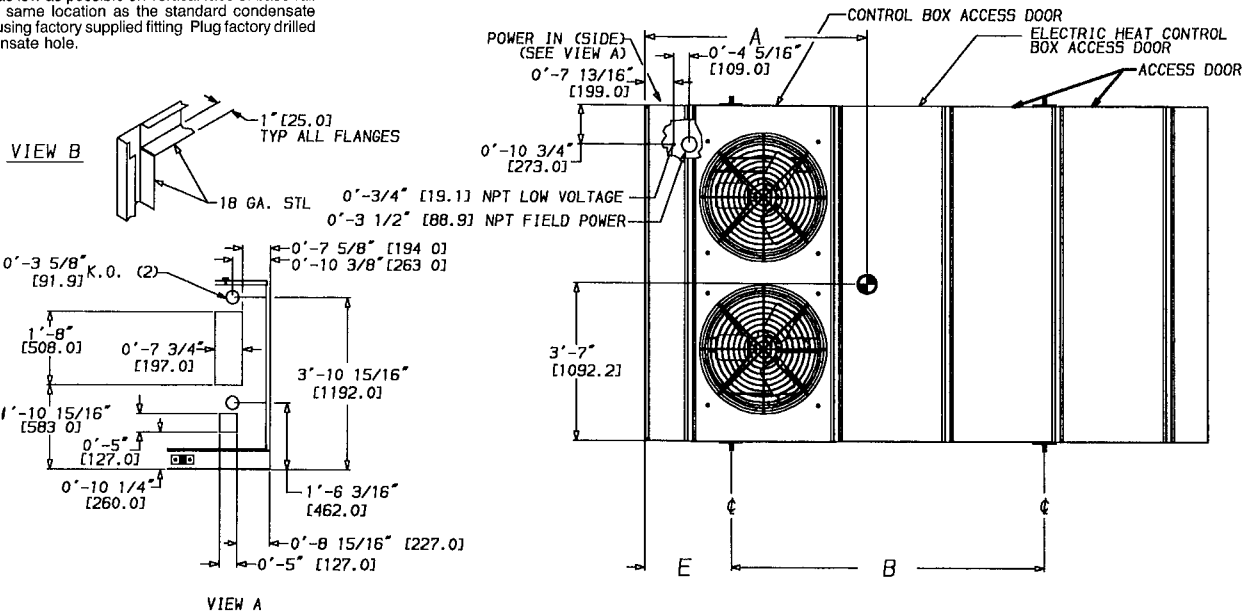
CONN — Connections
DIM — Dimensions
PIC — Product Integrated Controls

NOTES:

- 1 Dimensions in [] are in millimeters
- 2 Center of gravity
- 3 Allow 12'-0" (3658) at top and 6'-0" (1829) on sides for service and operational clearance.
- 4 On multiunit applications, allow 12'-0" (3658) between adjacent condensers and economizers
- 5 For smaller service and operational clearances, contact Carrier Application Engineering Department
- 6 Always line up condenser end of unit tight against the roof curb
- 7 When unit is slab mounted, locate the condensate drain as low as possible on vertical face of base rail at the same location as the standard condensate drain using factory supplied fitting. Plug factory drilled condensate hole.

UNIT SIZE	WEIGHT*		A		B		C		D		E	
	Lb	Kg	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.
50NB024	2790	1268.2	1549.4	5-1	2182.0	7-1 1/4	682.0	2-2 7/8	3909.0	12-9 1/4	533.5	1-9
50NB028	3240	1472.7										
50NB030	3280	1490.9	1676.4	5-6	2470.0	8-1 1/4	810.0	2-7 7/8	4165.0	13-8	379.5	1-2 15/16

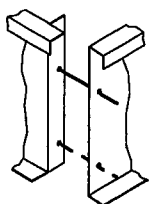
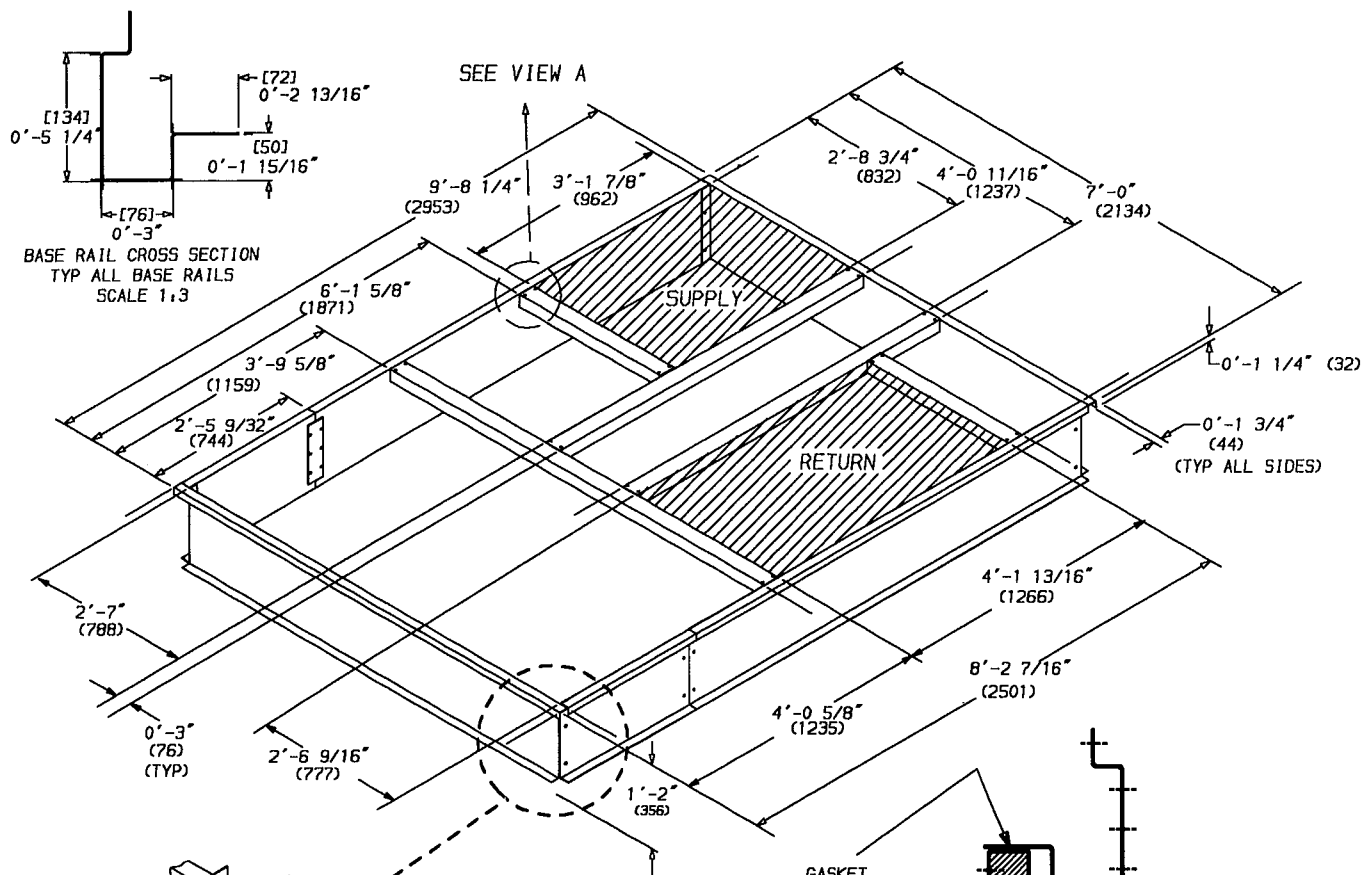
*Weight includes economizer, but not rainhood



Accessory dimensions — 50NP

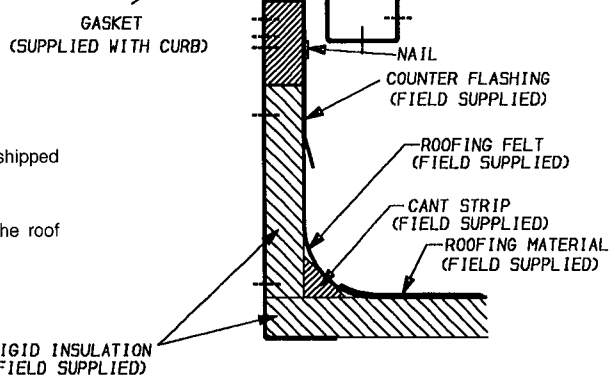


ROOF CURB



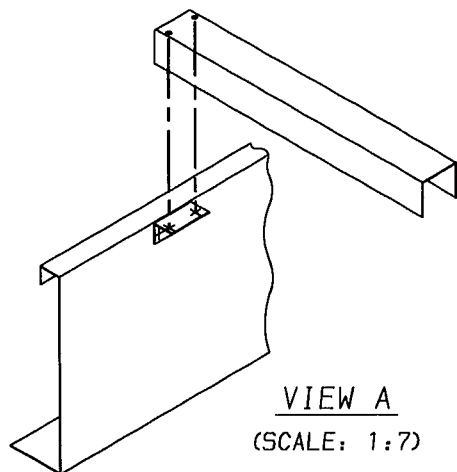
VIEW B
(TYP. ALL CORNERS)

- NOTES:**
- 1 Roof curb accessory 50DJ900401 is shipped unassembled
 - 2 Dimensions in () are millimeters
 - 3 Roof curb: 16 gage (VA03-56) steel
 - 4 The 028 and 030 units overhang the roof curbs on the return air end

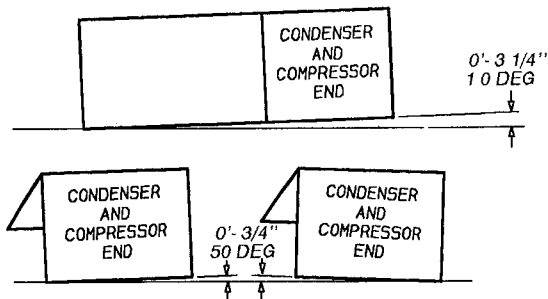


UNIT LEVELING TOLERANCES

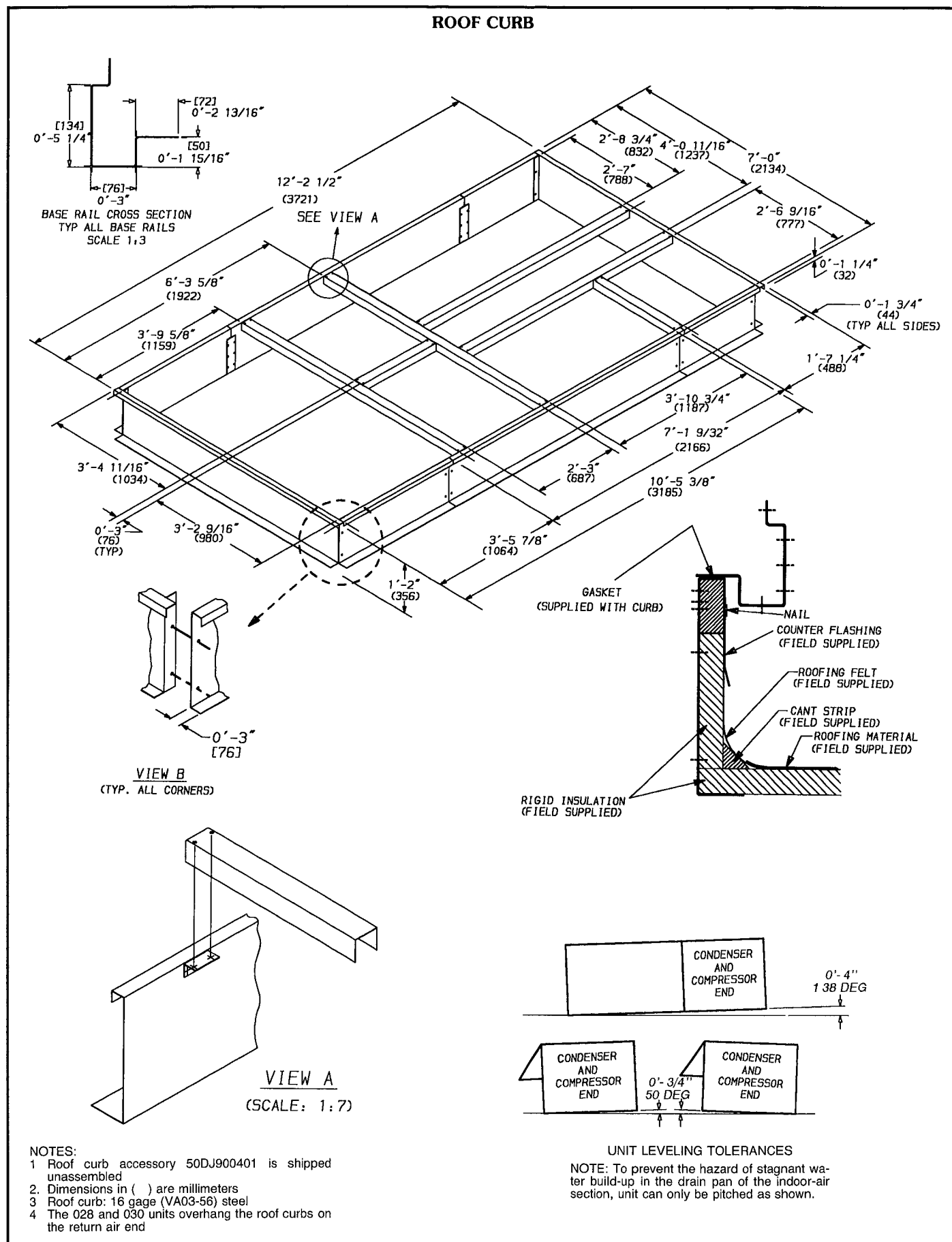
NOTE: To prevent the hazard of stagnant water build-up in the drain pan of the indoor-air section, unit can only be pitched as shown



VIEW A
(SCALE: 1:7)



Accessory dimensions — 50NB



Selection procedure (with 50NP024 example)



I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) . . . 230,000 Btuh
Sensible Heat Capacity (SHC) 170,000 Btuh
Required Heating Capacity 60,000 Btuh
Condenser Entering-Air Temperature 95 F
Indoor Air Temperature 80 F edb, 67 F ewb
Evaporator Air Quantity 7,000 cfm
External Static Pressure 1.50 in. wg
Electrical Characteristics (V-Ph-Hz) 460-3-60
Integrated Economizer Required.
Ewb — Entering Wet Bulb
Edb — Entering Dry Bulb

II Select unit based on required cooling capacity.

Enter Cooling Capacities table below at condenser entering temperature of 95 F. Unit 50NP024 at 7,000 cfm and 67 F ewb will provide a total capacity of 233,000 Btuh and a SHC of 174,000 Btuh. Calculate SHC correction, if required, using notes under cooling capacities tables.

III Select unit that corresponds to power source available.

The Electrical Data table on page 21 shows that a 460-3-60 unit is available

IV Select heating capacity of unit to provide design condition requirement.

Using the formula found in the notes following the Heating Capacities table on page 17, calculate unit heating capacity. Unit 50NP024 with 18 kW will provide 61,434 Btuh (18 kW x 3413 Btuh/kW).

V Determine fan speed and power requirements at design conditions.

Tabulated fan performance includes 2-in. throwaway filters and wet evaporator coil. Refer to Component Pressure Drops table on page 20 for economizer pressure drop (.2 in. wg) and 18 kW heater pressure drop (.11 in. wg) Add these pressure drops to the specified external static pressure of 1.5 in. wg.

$$1.50 + .20 + .11 = 1.81 \text{ in. wg}$$

Find fan rpm and bhp at 1.8 in. wg and 7,000 cfm on Fan Performance table on page 17. Note that the fan speed is 930 rpm and the power required is 5.2 bhp
The standard 5.0 hp motor is required.

Performance data

COOLING CAPACITIES

50NB,NP024													
Temp (F) Air Entering Air Condenser		Air Entering Evaporator — Cfm/BF											
		4000/0.02			5000/0.03			6000/0.04			7000/0.04		
		Air Entering Evaporator — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	225	230	209	247	228	210	255	237	218	263	245	227
	SHC	144	138	151	122	152	129	131	165	197	139	179	214
	kW	17.1	16.5	15.8	17.4	15.8	16.2	17.6	17.1	16.5	17.9	17.4	16.8
95	TC	225	240	192	225	216	200	243	225	208	250	233	216
	SHC	140	134	155	118	147	123	126	160	191	134	174	209
	kW	16.5	17.8	17.6	16.3	16.1	14.4	19.1	18.4	17.7	19.4	18.7	18.1
100	TC	223	205	183	230	212	186	237	219	203	244	227	211
	SHC	138	131	154	116	145	121	124	158	188	132	171	205
	kW	16.2	16.4	17.6	14.5	16.7	15.3	19.8	19.0	18.4	20.1	19.4	18.7
105	TC	217	200	183	224	207	191	231	214	199	238	220	206
	SHC	146	128	151	134	142	125	122	156	185	130	169	202
	kW	16.9	16.1	18.2	16.2	16.4	14.6	20.5	19.7	19.0	20.8	20.0	19.3
115	TC	207	190	174	210	196	181	218	202	189	224	209	195
	SHC	141	125	147	119	138	123	117	151	178	125	164	194
	kW	20.0	20.3	19.5	21.5	20.7	19.2	21.9	21.0	20.3	22.2	21.4	20.6
120	TC	201	185	170	207	191	176	213	197	184	218	202	190
	SHC	90	123	145	107	125	130	115	148	175	123	161	190
	kW	20.3	21.0	20.0	22.2	21.3	20.4	22.6	21.6	20.9	22.9	22.0	21.3

50NB,NP024										
Temp (F) Air Entering Condenser		Air Entering Evaporator — Cfm/BF								
		8000/0.05			9000/0.06			10,000/0.06		
		Air Entering Evaporator — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	266	249	232	269	252	238	271	255	244
	SHC	146	191	230	153	202	237	160	213	244
	kW	18.1	17.5	16.9	18.2	17.6	17.1	18.3	17.7	17.4
95	TC	254	237	222	256	239	228	259	242	233
	SHC	142	186	221	148	197	227	155	208	233
	kW	19.5	18.9	18.2	19.7	19.0	18.5	19.7	19.0	18.7
100	TC	247	230	217	249	233	222	252	236	228
	SHC	139	183	216	146	194	222	153	205	228
	kW	20.3	19.5	19.0	20.3	19.7	19.2	20.5	19.8	19.5
105	TC	241	224	212	243	227	217	245	230	223
	SHC	137	181	212	144	192	217	150	202	223
	kW	21.0	20.2	19.6	21.1	20.3	19.8	21.2	20.5	20.1
115	TC	227	212	202	229	215	206	231	216	211
	SHC	132	175	202	139	185	206	145	196	211
	kW	22.4	21.6	20.9	22.5	21.6	21.2	22.6	21.8	21.5
120	TC	221	205	197	222	208	201	224	210	206
	SHC	130	172	197	136	183	201	143	193	206
	kW	23.0	22.2	21.7	23.2	22.4	21.9	23.3	22.5	22.2

COOLING CAPACITIES (cont)

50NB,NP028													
Temp (F) Air Entering Condenser		Air Entering Evaporator — Cfm/BF											
		5000/0.02			6250/0.02			7500/0.03			8750/0.04		
		Air Entering Evaporator — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	314	290	266	304	280	256	335	311	288	345	322	299
	SHC	159	150	208	160	137	231	170	214	255	180	231	277
	kW	25.7	24.7	23.0	25.6	24.6	23.5	26.0	25.0	24.0	26.5	25.5	24.5
95	TC	300	277	254	290	267	245	319	296	275	328	306	285
	SHC	144	134	202	154	131	225	164	207	247	174	225	271
	kW	23.7	22.3	20.7	23.6	22.4	21.2	28.0	26.9	25.7	28.5	27.4	26.2
100	TC	293	270	248	282	259	238	311	289	268	319	298	278
	SHC	141	131	199	151	128	222	161	204	244	172	221	266
	kW	23.0	21.7	20.5	25.5	24.3	23.0	29.0	27.8	26.7	29.5	28.3	27.2
105	TC	286	265	242	274	253	232	303	282	262	311	290	272
	SHC	133	123	197	148	125	218	158	202	241	169	218	263
	kW	22.3	21.7	20.3	24.5	23.2	22.0	30.0	28.7	27.5	30.5	29.3	28.1
115	TC	272	252	231	273	250	230	287	268	249	294	275	258
	SHC	132	122	191	143	120	212	152	195	233	162	212	254
	kW	20.9	20.4	20.0	23.4	22.9	22.7	31.8	30.6	29.3	32.4	31.1	29.9
120	TC	266	245	226	272	253	234	279	260	242	286	268	252
	SHC	130	120	189	140	119	209	149	192	229	159	208	249
	kW	21.3	20.4	20.0	32.3	30.9	29.5	32.8	31.5	30.1	33.4	32.0	30.8

50NB,NP028										
Temp (F) Air Entering Condenser		Air Entering Evaporator — Cfm/BF								
		10,000/0.04			11,250/0.05			12,500/0.06		
		Air Entering Evaporator — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	350	328	306	353	331	312	356	335	318
	SHC	190	247	298	199	261	309	208	276	318
	kW	26.8	25.8	24.7	26.9	25.9	25.0	27.0	26.1	25.3
95	TC	333	311	291	336	315	299	339	318	305
	SHC	183	240	287	193	255	296	201	269	305
	kW	28.8	27.6	26.6	28.9	27.8	27.0	29.0	28.0	27.4
100	TC	324	303	285	327	306	291	331	310	299
	SHC	181	237	282	189	250	290	199	265	299
	kW	29.8	28.6	27.6	29.9	28.8	27.9	30.0	29.0	28.3
105	TC	316	295	278	319	298	285	322	302	291
	SHC	178	234	277	186	247	284	195	261	291
	kW	30.7	29.5	28.4	30.9	29.7	28.9	31.0	30.0	29.3
115	TC	298	279	265	301	283	271	303	286	278
	SHC	172	227	264	180	240	271	189	254	278
	kW	32.7	31.3	30.4	32.9	31.6	30.8	33.0	31.8	31.3
120	TC	289	271	258	291	274	265	294	278	271
	SHC	168	224	258	176	237	265	185	251	271
	kW	33.7	32.3	31.4	33.7	32.5	31.8	33.9	32.8	32.3

VAV Applications Only

BF — Bypass Factor
Ewb — Entering Wet-Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap (1000 Btu/h)
TC — Total Cap (1000 Btu/h) Gross

NOTES:

- Direct interpolation is permissible. Do not extrapolate.
- The following formulas may be used:

$$t_{ldb} = t_{edb} - \frac{\text{sensible capacity (Btu/h)}}{1.10 \times \text{cfm}}$$

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

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

Where: h_{ewb} = Enthalpy of air entering evaporator coil

- SHC is based on 80 F edb temperature of air entering evaporator coil. Below 80 F edb, subtract (corr factor x cfm) from SHC. Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	82	83	84	85	over 85
	Correction Factor					
.05	1.04	2.07	3.11	4.14	5.18	Use formula shown below
.10	.98	1.96	2.94	3.92	4.91	
.20	.87	1.74	2.62	3.49	4.36	

Interpolation is permissible.

$$\text{Correction Factor} = 1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$$

- Cooling capacities are gross and do not include deduction for evaporator-fan motor heat.

Performance data (cont)



COOLING CAPACITIES (cont)

50NB,NP030													
Temp (F) Air Entering Condenser		Air Entering Evaporator — Cfm/BF											
		5400/0.05			8750/0.04			8100/0.04			9450/0.05		
		Air Entering Evaporator — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	324	340	353	352	345	339	363	337	312	372	346	321
	SHC	161	190	223	170	202	230	184	230	275	194	247	297
	kW	28.6	33.5	39.2	27.3	35.1	40.9	27.8	26.6	25.6	28.2	27.1	26.0
95	TC	323	337	350	348	342	336	348	323	298	355	330	307
	SHC	163	187	216	167	205	234	178	224	268	188	241	290
	kW	28.7	27.8	38.3	29.5	36.2	41.3	30.0	28.7	27.5	30.3	29.0	27.9
100	TC	316	334	347	351	345	339	339	314	291	347	323	299
	SHC	157	184	214	164	200	229	175	221	264	185	238	285
	kW	28.0	28.4	37.1	30.8	35.2	40.9	31.1	29.7	28.4	31.5	30.2	28.8
105	TC	316	334	347	351	345	339	332	307	284	338	313	292
	SHC	149	180	211	161	200	229	171	218	260	182	235	282
	kW	26.8	28.4	37.3	31.6	35.1	40.9	32.1	30.6	29.4	32.5	31.1	29.9
115	TC	314	332	346	350	344	338	314	292	270	320	297	277
	SHC	145	175	206	154	194	223	165	211	253	175	228	272
	kW	26.0	31.2	36.7	27.6	34.1	39.5	34.1	32.6	31.2	34.6	33.0	31.7

50NB,NP030							
Temp (F) Air Entering Condenser		Air Entering Evaporator — Cfm/BF					
		10,800/0.05			12,150/0.06		
		Air Entering Evaporator — Ewb (F)					
		72	67	62	72	67	62
85	TC	378	353	328	382	357	335
	SHC	204	264	316	214	280	331
	kW	28.4	27.4	26.3	28.6	27.5	26.6
95	TC	360	335	314	364	340	320
	SHC	198	257	307	207	273	320
	kW	30.6	29.3	28.2	30.8	29.6	28.6
100	TC	352	327	306	356	331	314
	SHC	195	254	303	204	269	314
	kW	31.7	30.4	29.2	31.9	30.6	29.7
105	TC	342	319	299	346	324	306
	SHC	192	250	297	201	267	306
	kW	32.8	31.4	30.3	33.0	31.7	30.6
115	TC	325	302	285	330	307	293
	SHC	185	243	285	195	259	243
	kW	34.9	33.4	32.2	35.2	33.7	32.8

▨ VAV Applications Only

BF — Bypass Factor
Ewb — Entering Wet-Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap (1000 Btuh)
TC — Total Cap (1000 Btuh) Gross

NOTES:

- 1 Direct interpolation is permissible. Do not extrapolate.
- 2 The following formulas may be used:

$$t_{db} = t_{edb} - \frac{\text{sensible capacity (Btuh)}}{1.10 \times \text{cfm}}$$

t_{lwb} = Wet-bulb temperature corresponding to enthalpy of air leaving evaporator coil (h_{lwb}).

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

Where: h_{ewb} = Enthalpy of air entering evaporator coil

- 3 SHC is based on 80 F edb temperature of air entering evaporator coil. Below 80 F edb, subtract (corr factor x cfm) from SHC. Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	82	83	84	85	over 85
	Correction Factor					
.05	1.04	2.07	3.11	4.14	5.18	Use formula shown below
.10	.98	1.96	2.94	3.92	4.91	
.20	87	1.74	2.62	3.49	4.36	

Interpolation is permissible

$$\text{Correction Factor} = 1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$$

- 4 Cooling capacities are gross and do not include deduction for evaporator-fan motor heat

ELECTRIC HEATER CAPACITIES

UNIT 50	VOLTAGE	LOW (kW) Single Stage	MED (kW) Two Stages		HIGH (kW) Two Stages	
			1st	1st and 2nd	1st	1st and 2nd
NP024,028,030	208	15	15	29	29	59
	230	18	18	36	36	72
	460	18	18	36	54	90
	575	N/A	18	36	54	72
NB024	208	15	15	29	45	74
	230	18	18	36	54	90
	460	18	18	36	54	90
	575	N/A	18	36	54	90
NB028,030	208	15	15	29	45	74
	230	18	18	36	54	90
	460	18	18	36	72	108
	575	N/A	18	36	72	108

N/A — Not applicable

NOTE: Btuh = kW x 3413 Btuh/kW

FAN PERFORMANCE — 50NP UNITS WITHOUT INLET GUIDE VANES

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024	6,000	570	1.8	620	2.2	660	2.4	690	2.6	730	2.9	770	3.3	820	3.6	850	3.8
	7,000	630	2.7	670	2.9	710	3.3	750	3.5	790	3.8	830	4.2	860	4.5	890	4.7
	8,000	690	3.8	730	4.2	770	4.5	800	4.7	830	5.0	860	5.5	900	5.7	930	6.2
	9,000	760	5.2	800	5.4	830	5.8	860	6.2	890	6.5	930	7.0	960	7.6	990	8.1
	10,000	830	6.7	860	7.2	890	7.6	920	8.0	950	8.6	980	9.1	1010	9.6	1040	10.1

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024 (cont)	6,000	950	4.7	980	5.2	1020	5.7	1050	5.9	1080	6.2	1110	6.7	1130	7.0	1150	7.3
	7,000	990	6.2	1030	6.6	1060	6.9	1080	7.2	1110	7.6	1140	8.0	1160	8.4	1180	8.8
	8,000	1030	7.6	1060	8.0	1080	8.3	1120	8.7	1140	9.0	1170	9.5	1190	10.0	—	—
	9,000	1070	9.4	1100	9.7	1130	10.2	1160	10.6	1180	10.9	1200	11.3	—	—	—	—
	10,000	1120	11.1	1150	11.6	1170	12.0	1190	12.4	—	—	—	—	—	—	—	—

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030	7,000	550	2.3	590	2.5	630	2.8	670	3.0	710	3.3	750	3.5	800	3.9	830	4.3
	8,000	590	3.1	630	3.5	670	3.8	720	4.1	760	4.5	800	4.7	830	5.0	860	5.3
	9,000	640	4.4	690	4.6	730	4.9	770	5.2	810	5.6	840	5.9	870	6.2	900	6.6
	10,000	710	5.7	750	5.9	800	6.3	830	6.8	860	7.2	900	7.7	940	8.4	980	9.2
	11,000	770	7.0	820	7.5	850	8.0	880	8.6	910	9.0	940	9.6	970	10.0	1000	10.6
	12,000	850	9.2	870	9.5	910	10.4	940	10.9	960	11.2	990	11.7	1020	12.2	1050	12.7
	12,500	870	10.0	910	11.0	940	11.5	960	11.9	980	12.3	1010	12.7	1040	13.2	1070	13.7

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030 (cont)	7,000	930	5.2	970	5.7	1000	6.3	1030	6.7	1060	6.9	1080	7.2	1110	7.5	1140	7.9
	8,000	960	6.6	1000	7.2	1030	7.6	1060	8.0	1080	8.3	1110	8.6	1140	9.0	1170	9.5
	9,000	1000	8.4	1030	8.7	1060	9.2	1090	9.5	1120	10.0	1140	10.3	1170	10.7	1190	11.1
	10,000	1060	10.2	1090	10.8	1120	11.1	1140	11.4	1170	11.9	1190	12.4	—	—	—	—
	11,000	1080	12.0	1110	12.5	1130	12.8	1160	13.1	1180	13.6	1200	14.0	—	—	—	—
	12,000	1130	14.3	1160	14.8	1180	15.3	1200	15.6	—	—	—	—	—	—	—	—
	12,500	1150	15.4	1170	15.8	1200	16.5	—	—	—	—	—	—	—	—	—	—

Bhp — Brake Horsepower

Boldface — Special order motor required

NOTES:

- Fan performance is based on wet coils, clean 2-in. filters and roof curb
- See Component Pressure Drops table, page 20, before using fan performance tables

3 Conversion — Bhp to Watts

$$\text{Watts} = \frac{\text{Bhp} \times 746}{\text{motor efficiency}}$$

See Physical Data table, page 6, for motor efficiencies

- Minimum airflow shown is minimum recommended design cfm. Minimum airflow shown is minimum heating cfm for units equipped with electric heater
- VAV applications can operate down to 70 cfm/nominal ton in cooling mode

Performance data (cont)



FAN PERFORMANCE — 50NB UNITS WITHOUT INLET GUIDE VANES

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024	6,000	570	1.9	620	2.1	670	2.5	710	2.8	760	3.1	790	3.3	830	3.6	870	3.9	910	4.3	940	4.6
	7,000	650	2.9	690	3.1	730	3.5	770	3.8	810	4.1	840	4.4	870	4.7	920	5.1	950	5.5	980	6.0
	8,000	720	4.1	760	4.4	790	4.7	830	5.0	860	5.3	900	5.7	930	6.1	960	6.5	990	7.0	1020	7.4
	9,000	800	5.4	830	5.8	870	6.2	900	6.7	930	7.2	960	7.6	990	8.1	1020	8.5	1050	8.9	1080	9.4
	10,000	870	7.2	900	7.7	930	8.3	960	8.7	990	9.3	1020	9.7	1050	10.1	1080	10.5	1100	10.9	1130	11.4

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024 (cont)	6,000	970	5.0	1010	5.5	1040	5.9	1070	6.2	1100	6.5	1130	7.0	1160	7.5	1190	7.9
	7,000	1020	6.5	1050	6.8	1080	7.2	1110	7.5	1140	8.0	1160	8.3	1190	8.8	—	—
	8,000	1060	7.9	1090	8.2	1120	8.7	1150	9.2	1170	9.6	1200	10.1	—	—	—	—
	9,000	1110	9.8	1140	10.4	1170	10.7	1190	11.1	—	—	—	—	—	—	—	—
	10,000	1160	11.8	1180	12.1	1200	12.5	—	—	—	—	—	—	—	—	—	—

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030	7,000	630	2.7	680	3.0	720	3.3	760	3.6	800	3.9	830	4.3	860	4.6	900	4.9	930	5.3	970	5.8
	8,000	670	3.7	720	4.0	760	4.3	790	4.6	820	4.9	860	5.3	900	5.7	930	6.2	960	6.7	1000	7.2
	9,000	740	5.0	780	5.2	810	5.5	840	6.0	880	6.4	920	6.9	950	7.5	980	8.1	1020	8.5	1040	8.9
	10,000	810	6.4	840	6.9	870	7.4	910	7.9	950	8.5	980	9.1	1010	9.6	1040	10.0	1070	10.5	1090	10.8
	11,000	870	8.4	910	9.1	940	9.5	970	10.0	1010	10.7	1040	11.2	1070	11.6	1090	12.0	1120	12.4	1150	13.0
	12,000	950	11.0	980	11.6	1010	12.1	1040	12.6	1070	13.2	1090	13.6	1120	14.0	1150	14.6	1170	15.0	1200	15.5
	12,500	980	12.2	1020	12.9	1040	13.3	1070	13.9	1090	14.4	1120	14.8	1140	15.2	1170	15.7	1190	16.2	—	—

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030 (cont)	7,000	1000	6.3	1030	6.7	1060	7.0	1090	7.3	1120	7.6	1140	8.0	1170	8.4	1190	8.8
	8,000	1030	7.7	1060	8.1	1090	8.4	1120	8.7	1140	9.1	1160	9.5	1190	10.0	—	—
	9,000	1070	9.3	1100	9.6	1130	10.2	1160	10.6	1180	11.0	1200	11.3	—	—	—	—
	10,000	1120	11.1	1150	11.5	1170	12.0	1200	12.5	—	—	—	—	—	—	—	—
	11,000	1170	13.3	1200	13.9	—	—	—	—	—	—	—	—	—	—	—	—
	12,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	12,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

FAN PERFORMANCE — 50NP UNITS WITH INLET GUIDE VANES

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024	6,000	640	2.6	680	2.9	730	3.3	770	3.7	810	4.1	840	4.4	870	4.7	910	5.0	940	5.3	970	5.6
	7,000	710	3.8	750	4.1	790	4.5	820	4.8	860	5.1	890	5.4	930	5.9	960	6.4	990	6.9	1020	7.3
	8,000	770	5.0	810	5.5	840	5.8	870	6.1	910	6.6	940	7.0	970	7.5	1000	8.0	1030	8.5	1060	8.9
	9,000	850	6.7	880	7.0	910	7.5	940	8.0	970	8.5	1000	9.0	1030	9.5	1060	9.9	1090	10.3	1120	10.7
	10,000	920	8.7	960	9.4	990	10.1	1020	10.6	1040	11.0	1070	11.4	1090	11.7	1120	12.1	1140	12.5	1170	13.0

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRSSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024 (cont)	6,000	1010	6.0	1040	6.5	1070	7.0	1090	7.3	1120	7.6	1150	8.1	1170	8.4	1200	8.8
	7,000	1050	7.6	1080	8.0	1110	8.5	1140	9.0	1160	9.4	1190	9.8	—	—	—	—
	8,000	1090	9.3	1120	9.7	1150	10.1	1170	10.6	1200	11.1	—	—	—	—	—	—
	9,000	1150	11.2	1170	11.7	1200	12.3	—	—	—	—	—	—	—	—	—	—
	10,000	1200	13.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—

FAN PERFORMANCE — 50NP UNITS WITH INLET GUIDE VANES (cont)

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030	7,000	630	3.2	660	3.4	700	3.6	740	4.0	780	4.4	830	4.8	860	5.2	890	5.5	920	5.8	960	6.4
	8,000	690	4.3	730	4.7	770	5.0	810	5.5	850	5.9	880	6.3	920	6.7	950	7.2	980	7.9	1010	8.3
	9,000	750	5.7	790	6.0	830	6.4	860	6.8	900	7.3	930	7.9	960	8.3	990	8.8	1020	9.3	1050	9.7
	10,000	830	7.3	860	7.8	890	8.3	920	8.8	950	9.3	980	9.9	1010	10.5	1040	10.9	1070	11.3	1100	11.7
	11,000	900	9.7	930	10.2	960	10.8	990	11.4	1010	11.8	1040	12.3	1070	12.8	1100	13.3	1120	13.7	1150	14.2
	12,000	960	12.1	990	12.7	1020	13.3	1050	14.0	1080	14.6	1100	15.0	1130	15.5	1160	16.0	1180	16.6	1200	17.0
	12,500	990	13.4	1020	13.9	1050	14.6	1070	15.2	1100	15.7	1130	16.2	1160	16.9	—	—	—	—	—	—

UNIT 50NP	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030 (cont)	7,000	990	6.9	1020	7.3	1050	7.6	1080	8.0	1100	8.3	1130	8.7	1160	9.2	1190	9.7
	8,000	1040	8.6	1070	9.0	1100	9.4	1120	9.7	1140	10.0	1160	10.3	1190	10.9	—	—
	9,000	1070	10.0	1100	10.4	1130	10.9	1150	11.3	1180	11.9	1200	12.3	—	—	—	—
	10,000	1130	12.3	1160	12.8	1180	13.4	1200	13.7	—	—	—	—	—	—	—	—
	11,000	1170	14.8	1200	15.3	—	—	—	—	—	—	—	—	—	—	—	—
	12,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	12,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

FAN PERFORMANCE — 50NB UNITS WITH INLET GUIDE VANES

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
024	6,000	620	2.5	670	2.9	710	3.2	750	3.5	790	3.8	830	4.2	870	4.6	900	4.9	940	5.3	970	5.7
	7,000	700	3.7	740	4.0	780	4.4	810	4.8	850	5.1	890	5.4	920	5.7	950	6.2	990	6.7	1020	7.2
	8,000	780	5.2	810	5.6	850	5.9	880	6.3	910	6.6	950	7.1	980	7.7	1010	8.2	1040	8.5	1070	8.9
	9,000	860	6.7	900	7.3	930	7.9	960	8.3	990	8.8	1020	9.3	1050	9.7	1080	10.2	1110	10.6	1130	11.0
	10,000	940	9.2	970	9.6	1000	10.2	1030	10.8	1060	11.2	1090	11.6	1120	12.2	1140	12.6	1160	13.0	1190	13.4

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4			
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp		
024 (cont)	6,000	1010	6.2	1040	6.6	1070	7.0	1000	7.4	1130	7.8	1160	8.3	1190	8.8		
	7,000	1050	7.6	1080	8.0	1110	8.5	1140	8.9	1170	9.5	1200	10.0	—	—		
	8,000	1100	9.3	1130	9.8	1160	10.2	1190	10.8	—	—	—	—	—	—		
	9,000	1160	11.5	1190	12.0	—	—	—	—	—	—	—	—	—	—		
	10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—		

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
028,030	7,000	660	3.5	700	3.8	740	4.1	780	4.4	810	4.7	840	5.0	880	5.3	910	5.7	940	6.1	970	6.6
	8,000	740	4.7	780	5.2	820	5.6	860	5.9	890	6.3	920	6.7	950	7.2	980	7.7	1010	8.2	1040	8.6
	9,000	820	6.3	850	6.7	880	7.1	910	7.5	940	8.0	980	8.6	1010	9.2	1040	9.6	1070	10.0	1100	10.4
	10,000	900	8.5	930	9.0	960	9.5	990	10.1	1020	10.6	1050	11.0	1180	11.5	1110	12.0	1130	12.4	1160	12.8
	11,000	970	11.1	1000	11.6	1030	12.0	1060	12.5	1090	13.1	1120	13.6	1140	14.2	1170	14.7	1200	15.3	—	—
	12,000	1050	13.9	1080	14.5	1100	14.9	1130	15.6	1160	16.1	1180	16.5	1200	17.0	—	—	—	—	—	—
	12,500	1070	14.8	1100	15.7	1130	16.5	1160	16.9	—	—	—	—	—	—	—	—	—	—	—	—

UNIT 50NB	AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
		2.2		2.4		2.6		2.8		3.0		3.2		3.4			
		Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp		
028,030 (cont)	7,000	1000	7.0	1030	7.4	1060	7.8	1100	8.3	1130	8.8	1160	9.3	1190	9.8		
	8,000	1070	8.9	1100	9.3	1130	9.8	1160	10.2	1180	10.7	1200	11.2	—	—		
	9,000	1130	11.0	1150	11.4	1170	11.8	1200	12.3	—	—	—	—	—	—		
	10,000	1190	13.5	—	—	—	—	—	—	—	—	—	—	—	—		
	11,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	12,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
	12,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—		

Bhp — Brake Horsepower

Boldface — Special order motor required

NOTES:

- 1 Fan performance is based on wet coils, clean 2-in. filters and roof curb.
- 2 See Component Pressure Drops table, page 20, before using fan performance tables
- 3 Conversion — Bhp to Watts

$$\text{Watts} = \frac{\text{Bhp} \times 746}{\text{motor efficiency}}$$

See Physical Data table, page 6, for motor efficiencies

- 4 Minimum airflow shown is minimum recommended design cfm. Minimum airflow shown is minimum heating cfm for units equipped with electric heater
- 5 VAV applications can operate down to 70 cfm/nominal ton in cooling mode

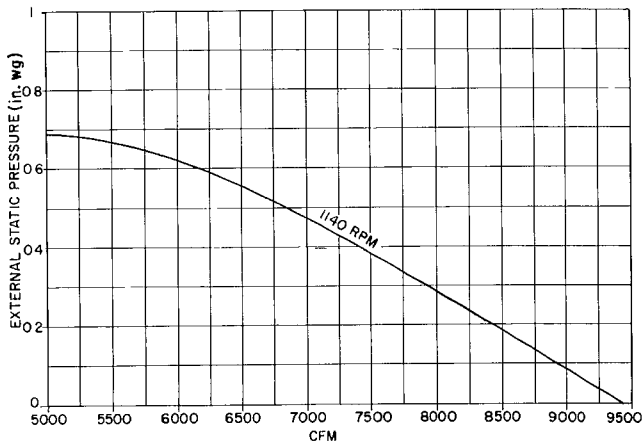
Performance data (cont)



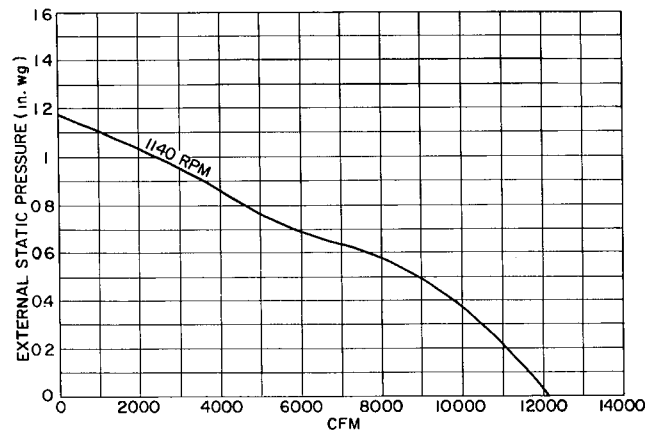
COMPONENT PRESSURE DROPS (in. wg)

COMPONENT	CFM						
	6000	7000	8000	9000	10,000	11,000	12,000
ECONOMIZER All Units	0.18	0.20	0.25	0.28	0.32	0.36	0.40
LOW ELECTRIC HEAT 208/230 and 460 V 50NP 50NB	0.03 0.03	0.11 0.10	0.15 0.14	0.16 0.14	0.18 0.15	0.18 0.17	0.19 0.20
MED ELECTRIC HEAT 208/230, 460 and 575 V 50NP 50NB	0.20 0.09	0.24 0.13	0.29 0.14	0.35 0.16	0.41 0.21	0.48 0.25	0.56 0.30
HIGH ELECTRIC HEAT 208/230 V 50NP 50NB	0.28 0.12	0.33 0.16	0.39 0.18	0.47 0.20	0.58 0.23	0.68 0.30	0.80 0.32
460 and 575 V 50NP 50NB024 50NB028,030	0.26 0.11 0.11	0.33 0.16 0.16	0.41 0.19 0.19	0.49 0.21 0.24	0.58 0.23 0.26	0.68 0.30 0.35	0.80 0.32 0.40

**50NB,NP024
POWER EXHAUST FAN PERFORMANCE**



**50NB,NP028,030
POWER EXHAUST FAN PERFORMANCE**



Electrical data



UNIT 50NB,NP024

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	kW	FLA	MCA	MOCF Fuse Only
208/230-3-60	187	254	43.3	228	31.5	160	6.4	5.0*	15.2	—	—	—	108.5/108.5	150/150
										6.6/6.0	—	—	115.1/114.5	150/150
										—	15/18	40.9/ 45.2	108.5/108.5	150/150
										6.6/6.0	15/18	40.9/ 45.2	115.1/114.5	150/150
										—	29/36	81.8/ 90.4	121.2/132.0	150/150
										6.6/6.0	29/36	81.8/ 90.4	121.2/132.0	150/150
										—	59/72**	163.6/181.0	223.5/245.2	225/250
										6.6/6.0	59/72**	163.6/181.0	223.5/245.2	225/250
										—	74/90††	204.5/225.9	274.6/301.4	300/350
								7.5*	22.0	—	—	—	115.3/115.3	150/150
										6.6/6.0	—	—	121.9/121.3	150/150
										—	15/18	40.9/ 45.2	115.3/115.3	150/150
										6.6/6.0	15/18	40.9/ 45.2	121.9/121.3	150/150
										—	29/36	81.8/ 90.4	129.8/140.5	150/175
										6.6/6.0	29/36	81.8/ 90.4	129.8/140.5	150/175
										—	59/72**	163.6/181.0	232.0/253.8	250/300
										6.6/6.0	59/72**	163.6/181.0	283.1/309.9	300/350
										—	74/90††	204.5/225.9	232.0/253.8	250/300
	187	254	43.3	228	31.5	160	6.4	5.0†	12.4	—	—	—	105.7/105.7	125/125
										6.6/6.0	—	—	112.3/111.7	150/150
										—	15/18	40.9/ 45.2	125/125	125/125
										6.6/6.0	15/18	40.9/ 45.2	112.3/111.7	150/150
										—	29/36	81.8/ 90.4	117.7/128.5	125/125
										6.6/6.0	29/36	81.8/ 90.4	117.7/128.5	150/150
										—	59/72**	163.6/181.0	220.0/241.7	225/250
										6.6/6.0	59/72**	163.6/181.0	220.0/241.7	225/250
								7.5†	19.6	—	—	—	112.9/112.9	150/150
										6.6/6.0	—	—	119.5/118.9	150/150
										—	15/18	40.9/ 45.2	112.9/112.9	150/150
										6.6/6.0	15/18	40.9/ 45.2	119.5/118.9	150/150
										—	29/36	81.8/ 90.4	126.7/137.5	150/150
										6.6/6.0	29/36	81.8/ 90.4	126.7/137.5	150/150
										—	59/72**	163.6/181.0	229.0/250.7	250/300
										6.6/6.0	59/72**	163.6/181.0	229.0/250.7	250/300
										—	74/90††	204.5/225.9	280.1/306.9	300/350
460-3-60	414	508	22.1	114	15.7	80	3.2	5.0*	7.2	—	—	—	53.7	70
										3.0	—	—	56.7	70
										—	18	22.6	53.7	70
										3.0	18	22.6	56.7	70
										—	36	45.2	65.5	70
										3.0	36	45.2	65.5	70
										—	90	113.0	150.2	175
										3.0	90	113.0	150.2	175
	414	508	22.1	114	15.7	80	3.2	7.5*	10.5	—	—	—	57.0	70
										3.0	—	—	60.0	80
										—	18	22.6	57.0	70
										3.0	18	22.6	60.0	80
										—	36	45.2	69.6	80
										3.0	36	45.2	69.6	80
										—	90	113.0	154.4	175
										3.0	90	113.0	154.4	175
	414	508	22.1	114	15.7	80	3.2	5.0†	6.2	—	—	—	52.7	70
										3.0	—	—	55.7	70
										—	18	22.6	52.7	70
										3.0	18	22.6	55.7	70
										—	36	45.2	64.2	70
										3.0	36	45.2	64.2	70
										—	90	113.0	149.0	150
										3.0	90	113.0	149.0	150
	414	508	22.1	114	15.7	80	3.2	7.5†	9.8	—	—	—	56.3	70
										3.0	—	—	59.3	80
										—	18	22.6	56.3	70
										3.0	18	22.6	59.3	80
										—	36	45.2	68.7	80
										3.0	36	45.2	68.7	80
										—	90	113.0	153.5	175
										3.0	90	113.0	153.5	175
575-3-60	518	632	17.9	91	12.6	64	4.8	5.0*	5.6	—	—	—	45.4	60
										2.4	—	—	47.8	60
										—	36	36.1	52.1	60
										2.4	36	36.1	52.1	60
										—	72**	72.3	97.4	125
										2.4	72**	72.3	97.4	125
										—	90††	90.4	120.0	125
	518	632	17.9	91	12.6	64	4.8	7.5*	8.6	—	—	—	48.4	60
										2.4	—	—	50.8	60
										—	36	36.1	55.9	70
										2.4	36	36.1	55.9	70
										—	72**	72.3	101.1	125
										2.4	72**	72.3	101.1	125
										—	90††	90.4	123.7	125

FLA — Full Load Amps
Hp — Nominal Horsepower
IFM — Indoor Fan Motor
LRA — Locked Rotor Amps

MCA — Minimum Circuit Amps (for wire sizing)
MOCF — Maximum Overcurrent Protection
OFM — Outdoor Fan Motor
RLA — Rated Load Amps

*Standard efficiency
†High efficiency
**NP units only
††NB units only



NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	kW	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	63.6	266	39.7	198	10.8	7.5*	22.0	—	—	—	152.0/152.0	200/200
										6.6/6.0	—	—	158.6/158.0	200/200
										6.6/6.0	15/18	40.9/ 45.2	152.0/152.0	200/200
										—	29/36	81.8/ 90.4	158.6/158.0	200/200
										6.6/6.0	29/36	81.8/ 90.4	152.0/152.0	200/200
										—	59/72**	163.6/181.0	158.6/158.0	200/200
								10.0*	26.4	6.6/6.0	59/72**	163.6/181.0	232.0/253.8	250/300
										—	59/72**	163.6/181.0	232.0/253.8	250/300
										—	74/90††	204.5/225.9	283.1/309.9	300/350
										6.6/6.0*	—	—	156.4/156.4	200/200
										6.6/6.0*	15/18	40.9/ 45.2	163.0/162.4	225/225
										—	29/36	81.8/ 90.4	156.4/156.4	200/200
7.5†	19.6	6.6/6.0*	29/36	81.8/ 90.4	163.0/162.4	225/225								
		—	59/72**	163.6/181.0	237.5/259.2	250/300								
		6.6/6.0*	59/72**	163.6/181.0	237.5/259.2	250/300								
		—	74/90††	204.5/225.9	288.6/315.4	300/350								
		6.6/6.0*	—	—	149.6/149.6	200/200								
		—	15/18	40.9/ 45.2	156.2/155.6	200/200								
10.0†	24.2	6.6/6.0*	29/36	81.8/ 90.4	149.6/149.6	200/200								
		—	59/72**	163.6/181.0	229.0/250.7	250/300								
		6.6/6.0*	59/72**	163.6/181.0	229.0/250.7	250/300								
		—	74/90††	204.5/225.9	280.1/306.9	300/350								
		6.6/6.0*	—	—	154.2/154.2	200/200								
		—	15/18	40.9/ 45.2	160.8/160.2	200/200								
460-3-60	414	508	28.6	120	19.9	99	5.4	7.5*	10.5	—	—	—	71.5	100
										3.0	18	22.6	74.5	100
										—	18	22.6	71.5	100
										3.0	36	45.2	74.5	100
										—	36	45.2	71.5	100
										—	90**	113.0	154.4	175
								10.0*	12.5	3.0	90**	113.0	154.4	175
										—	108††	135.6	182.6	200
										3.0	—	—	73.5	100
										—	18	22.6	76.5	100
										3.0	18	22.6	73.5	100
										—	36	45.2	76.5	100
7.5†	9.8	3.0	36	45.2	73.5	100								
		—	36	45.2	76.5	100								
		3.0	90**	113.0	156.9	175								
		—	90**	113.0	156.9	175								
		3.0	90**	113.0	156.9	175								
		—	108††	135.6	185.1	200								
10.0†	12.2	3.0	—	—	70.8	90								
		—	18	22.6	73.8	100								
		3.0	18	22.6	70.8	90								
		—	36	45.2	73.8	100								
		3.0	36	45.2	70.8	90								
		—	90**	113.0	153.5	175								
575-3-60	518	632	22.9	96	15.9	79	4.8	7.5*	8.6	—	—	—	57.9	80
										2.4	—	—	60.3	80
										—	36	36.1	57.9	80
										2.4	36	36.1	60.3	80
										—	72**	72.3	101.1	125
										—	72**	72.3	101.1	125
								10.0*	11.6	2.4	108††	108.4	146.2	150
										—	—	—	60.9	80
										2.4	—	—	63.3	80
										—	36	36.1	60.9	80
										2.4	36	36.1	63.3	80
										—	72**	72.3	104.9	150
10.0†	11.6	2.4	72**	72.3	104.9	150								
		—	108††	108.4	150.0	150								
		—	—	—	60.9	80								
		2.4	—	—	63.3	80								



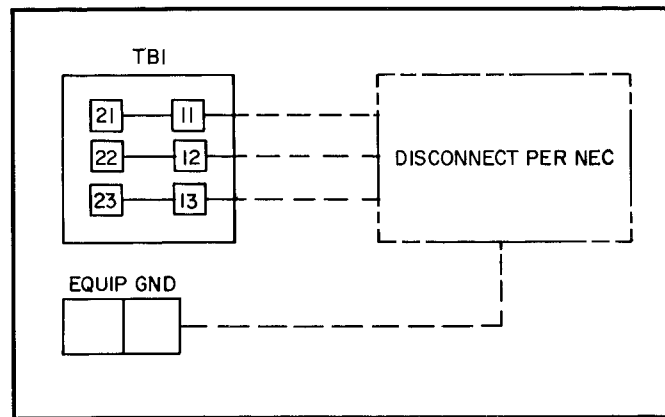
UNIT 50NB,NP030

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	kW	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	63.6	266	44.3	228	10.8	10 0*	26.4	6 6/6 0	—	—	161 0/161 0	200/200
										—	—	—	167 6/167 0	225/225
										6 6/6 0	15/18	40 9/ 45.2	161 0/161.0	200/200
										—	15/18	40 9/ 45.2	167 6/167 0	225/225
										—	29/36	81 8/ 90 4	161 0/161 0	200/200
										6.6/6 0	29/36	81 8/ 90 4	167 6/167 0	225/225
										—	59/72**	163 6/181 0	237 5/259 2	250/300
										6.6/6 0	59/72**	163 6/181 0	237 5/259 2	250/300
										—	74/90††	204.5/225.9	288.6/315.4	300/350
								15 0*	42.0	6 6/6 0	—	—	176 6/176 6	225/225
										—	—	—	183 2/182 6	225/225
										6 6/6.0	15/18	40 9/ 45 2	176 6/176 6	225/225
										—	15/18	40 9/ 45 2	183 2/182 6	225/225
										—	29/36	81.8/ 90 4	176 6/176 6	225/250
										6.6/6.0	29/36	81 8/ 90 4	183 2/182 6	225/250
										—	59/72**	163.6/181 0	257 0/278 8	300/300
										6 6/6 0	59/72**	163 6/181 0	257 0/278 8	300/300
										—	74/90††	204.5/225.9	308.1/334.9	350/350
								10 0†	24.2	6 6/6 0	—	—	158 8/158 8	200/200
										—	—	—	165 4/164 8	225/225
										6 6/6 0	15/18	40 9/ 45 2	158 8/158 8	200/200
										—	15/18	40 9/ 45 2	165 4/164 8	225/225
										—	29/36	81 8/ 90 4	158 8/158 8	200/200
										6 6/6 0	29/36	81 8/ 90 4	165 4/164 8	225/225
—	59/72**	163 6/181 0	234 7/256 5	250/300										
6 6/6 0	59/72**	163 6/181 0	234 7/256 5	250/300										
—	74/90††	204.5/225.9	285.9/312.6	300/350										
15 0†	36.6	6 6/6 0	—	—	171 2/171.2	225/225								
		—	—	—	177 8/177.2	225/225								
		6 6/6 0	15/18	40 9/ 45.2	171 2/171.2	225/225								
		—	15/18	40 9/ 45.2	177 8/177.2	225/225								
		—	29/36	81 8/ 90.4	171 2/171.2	225/225								
		6 6/6 0	29/36	81 8/ 90 4	177 8/177.2	225/225								
		—	59/72**	163 6/181 0	250 2/272 0	300/300								
		6 6/6 0	59/72**	163 6/181 0	250 2/272 0	300/300								
		—	74/90††	204.5/225.9	301.4/328.1	350/350								
460-3-60	414	508	30.0	120	22.1	114	5.4	10 0*	12.5	—	—	—	77.5	100
										3.0	—	—	80.5	110
										—	18	22.6	77.5	100
										3.0	18	22.6	80.5	110
										—	36	45.2	77.5	100
										3.0	36	45.2	80.5	110
										—	90**	113.0	156.9	175
										3.0	90**	113.0	156.9	175
										—	108††	135.6	185.1	200
								15 0*	20.0	—	—	—	85.0	110
										3.0	—	—	88.0	110
										—	18	22.6	85.0	110
										3.0	18	22.6	88.0	110
										—	36	45.2	85.0	125
										3.0	36	45.2	88.0	125
										—	90**	113.0	166.2	175
										3.0	90**	113.0	166.2	175
										—	108††	135.6	194.5	200
								10 0†	12.2	—	—	—	77.2	100
										3.0	—	—	80.2	110
										—	18	22.6	77.2	100
										3.0	18	22.6	80.2	110
										—	36	45.2	77.2	100
										3.0	36	45.2	80.2	110
										—	90**	113.0	156.5	175
										3.0	90**	113.0	156.5	175
										—	108††	135.6	184.7	200
								15 0†	18.3	—	—	—	83.3	110
										3.0	—	—	86.3	110
										—	18	22.6	83.3	110
										3.0	18	22.6	86.3	110
										—	36	45.2	83.3	110
										3.0	36	45.2	86.3	110
										—	90**	113.0	164.1	175
										3.0	90**	113.0	164.1	175
										—	108††	135.6	192.4	200
575-3-60	518	632	22.9	96	17.9	91	4.8	10*	11.6	—	—	—	62.9	80
										2.4	—	—	65.3	80
										—	36	36.1	62.9	80
										2.4	36	36.1	65.3	80
										—	72**	72.3	104.9	150
										2.4	72**	72.3	104.9	150
										—	108††	108.4	150.0	150
								15*	15.4	—	—	—	66.7	80
										2.4	—	—	69.1	90
										—	36	36.1	66.7	90
										2.4	36	36.1	69.1	90
										—	72**	72.3	109.6	125
										2.4	72**	72.3	109.6	125
—	108††	108.4	154.7	175										

Typical wiring schematics



FIELD POWER WIRING CONNECTIONS

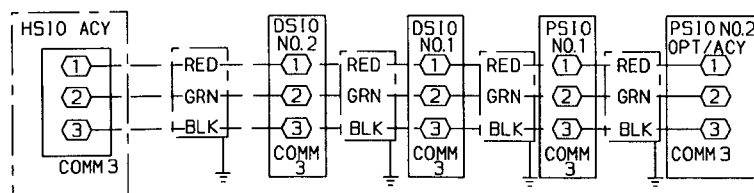
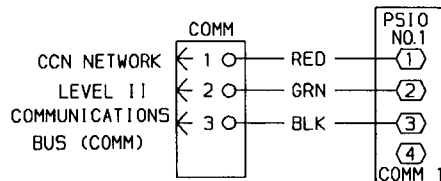
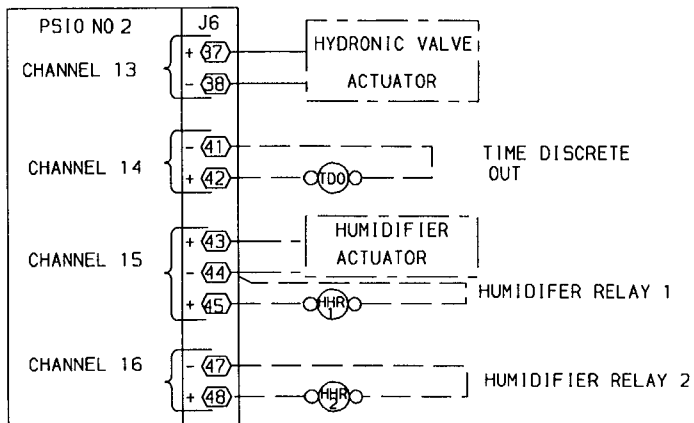
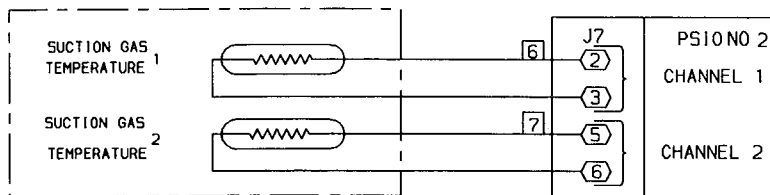
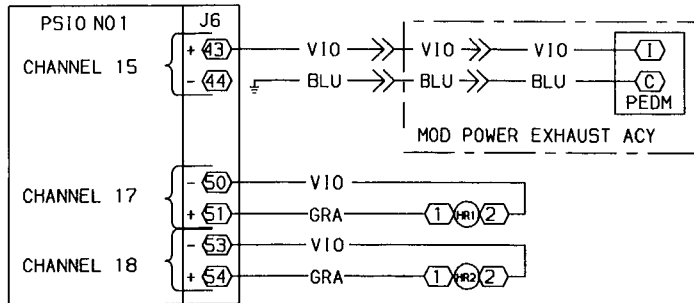
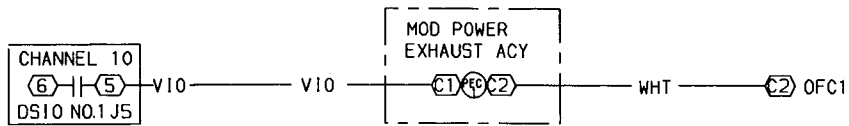


LEGEND FOR TYPICAL WIRING SCHEMATICS

C — Contactor
COM — Common Motor
COMM — Communication Plug
DSIO — High-Voltage Relay Module
DU — Dummy Terminal
EQUIP — Equipment
GND — Ground
HHR — Hydronic Humidifier Relay
HIR — Heat Interlock Relay
HR — Heater Relay
IFC — Indoor (Evaporator) Fan Contactor
IGV — Inlet Guide Vanes
MOD — Modulating
MPER — Modulating Power Exhaust Relay
NC — Normally Closed

NEC — National Electrical Code
NO — Normally Open
OFC — Outdoor (Condenser) Fan Contactor
PEC — Power Exhaust Contactor
PEDM — Power Exhaust Damper Motor
PER — Power Exhaust Relay
PSIO NO. 1 — Standard Processor Module
PSIO NO. 2 — Accessory/Optional Processor Module
SW — Switch
TB — Terminal Block
TDO — Timed Discrete Output
TRAN — Transformer
 - - - - - Field Wiring
 - - - - - Factory Wiring
 - - - - - Field Supplied

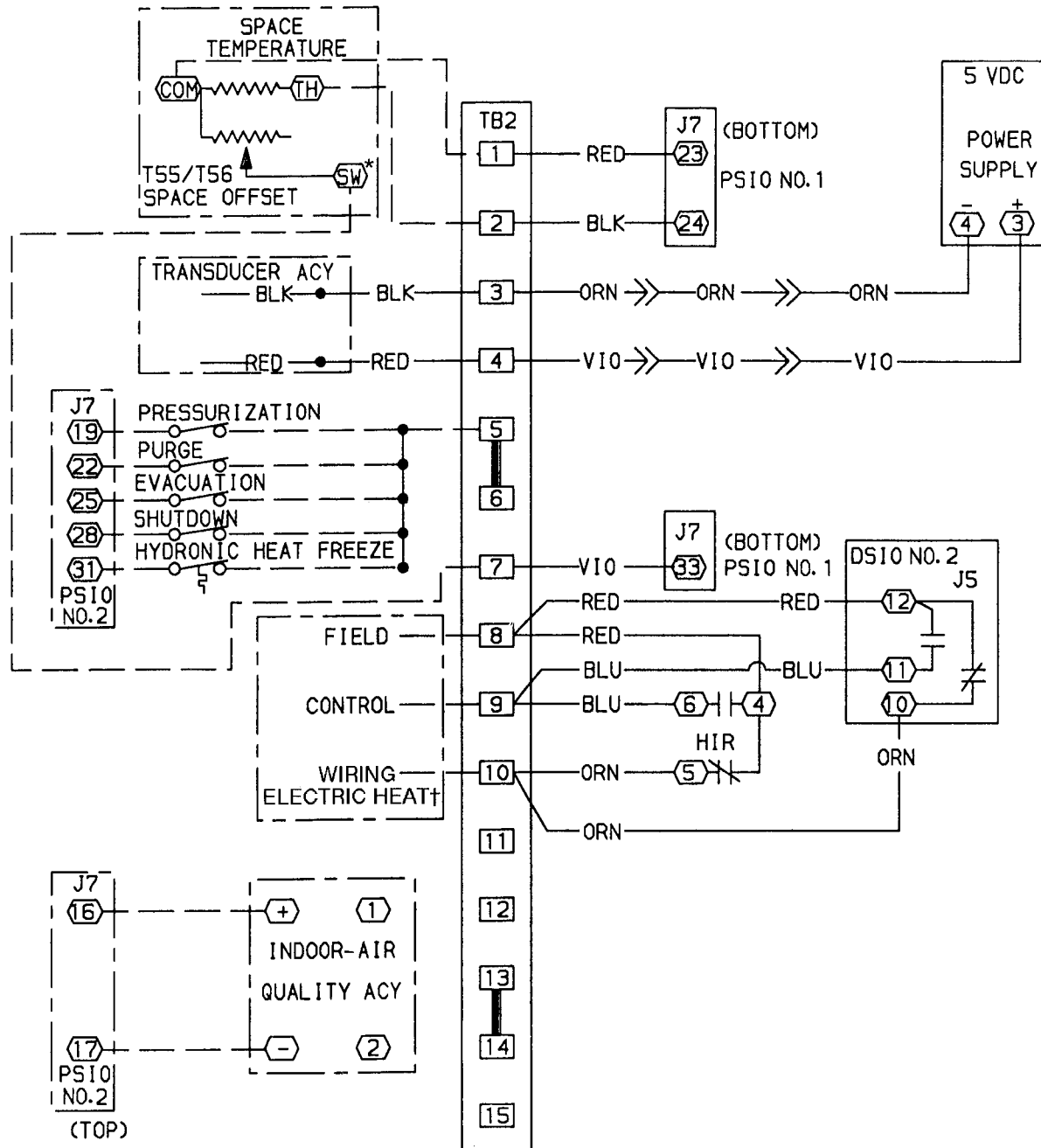
FIELD CONTROL WIRING, MAIN CONTROL BOX



Typical wiring schematics (cont)



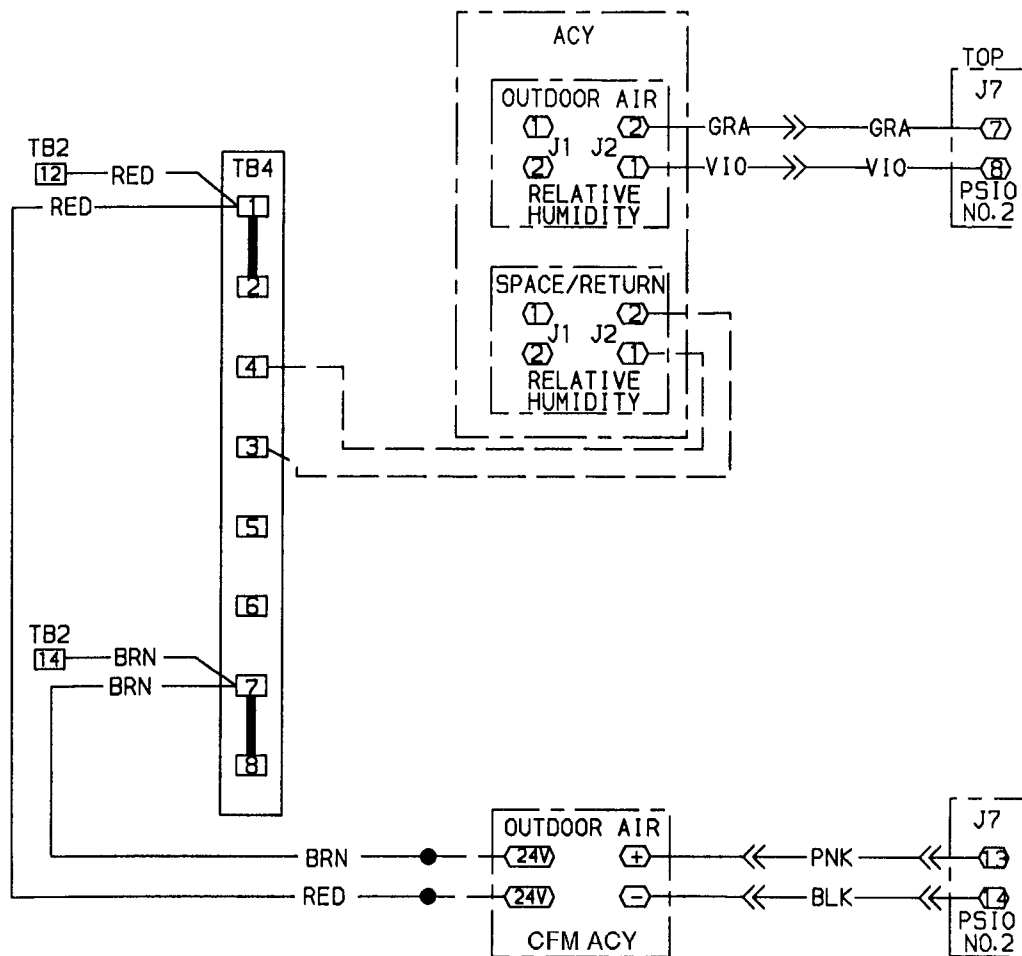
FIELD CONTROL TERMINAL BLOCK WIRING — MAIN CONTROL BOX



*Only applies to accessory T56 wiring.

†Only applies to units with factory-installed electric heat

FIELD CONTROL TERMINAL BLOCK WIRING – AUXILIARY CONTROL BOX



Operating sequence

Cooling

NOTE: The cooling algorithms (software) used in the 50NB,NP units will only run when the supply fan is on.

Units with economizer — The economizer will modulate to satisfy the leaving-air set point if the outdoor-air enthalpy is suitable. If the economizer cannot satisfy the leaving-air set point, the economizer will remain at 100% open, and mechanical cooling will be initiated. If the outdoor-air enthalpy is not suitable, economizer will remain at minimum position during mechanical cooling.

CV operation — The controls will compare the occupied space temperature to the occupied cooling set point. If the occupied space temperature is above the set point, the unit will commence cooling. The supply-air temperature that has been determined by the PIC software is compared to the actual supply-air temperature to determine when to add or remove stages of capacity to satisfy the load

VAV operation — The controls will compare the supply-air temperature to the modified supply-air set point. The supply-air temperature that has been determined by the PIC software is compared to the actual supply-air temperature to determine when to add or remove stages of capacity to satisfy the load

All units — The PIC software controls capacity by maintaining the supply-air temperature at the value specified by the supply-air temperature set point through cycling the compressors and unloader(s). Both the supply- and return-air temperature sensors are used to adjust the cycling deadband to match the actual load. The control system provides cooling capacity control of up to 6 stages, using 2 compressors and up to 4 unloaders to maintain supply-air temperature (VAV applications) or occupied space temperature (CV applications) to the occupied or unoccupied set point. Automatic lead-lag circuit switching occurs to equalize run times per compressor for improved compressor reliability

NOTE: The lead/lag function should be disabled when unit is equipped with hot gas bypass.

If unit is equipped with a humidity sensor, the controls will determine if dehumidification is required. If humidity is above the high humidity limit, a cooling demand is initiated to counteract the humidity. Stages of capacity control will be added as necessary to lower the humidity below the high humidity limit.

Units with power exhaust — On units configured with modulating power exhaust fans, the power exhaust fan will be energized when the building pressure set point is exceeded, and the dampers will modulate to maintain the building pressure set point.

Heating

NOTE: The heating algorithms on the 50NP units will only run when the supply-air fan is on.

When the unit is in the heating mode, room terminals must be fully open. The room terminals are controlled by the heat interlock relay (HIR).

During heating, the economizer dampers (if so equipped) will be at the minimum damper position during occupied heating, and will be fully closed during unoccupied heating.

CV operation — The heater is staged to prevent the occupied space temperature from falling below the desired set point. The control reads the space temperature and computes the supply-air temperature necessary to heat the space to the heating set point. The 50NB,NP PIC controls will compare the calculated supply-air temperature set point to the actual supply-air temperature to compute the number of stages required to satisfy the conditions.

VAV operation — Heating is primarily used for morning warm-up or occupied space heating with the heater being staged to maintain desired return-air temperature. If the unit is in morning warm-up, the return-air temperature is read and compared to the heating set point. If the return-air temperature is below the heating set point, the unit will commence heating at the biased start time calculated by the morning warm-up (AOS) routine. The supply-air temperature that has been determined by the PIC software is compared to the actual temperature to determine when to add or remove stages of capacity to satisfy the load. Once morning warm-up is completed, heat will not be activated again in the occupied mode unless the occupied heating mode has been selected

DAV operation — Heating using a DAV system is more controlled than in a standard system because the terminals have a minimum heating cfm instead of operating fully open. Contact your sales representative for more information on DAV systems.

Morning warm-up (VAV only) — Morning warm-up occurs when the adaptive optimal start (AOS) algorithms calculate a biased occupied start time, and the unit has a call for heat. The occupied and unoccupied heating set points are variable inputs, and the user-configurable reset option can vary from the set point by the inputted value

The warm-up will continue into the occupied period as long as there is a need for heat, even if occupied heating is disabled. When the heating demand is satisfied, the warm-up condition will terminate. The unit may reenter this mode if there is another call for heat before the start of the occupied period.

NOTE: On units equipped with optional economizer, the dampers will be fully closed during morning warm-up, except when morning warm-up continues into the occupied period. If morning warm-up continues into the occupied period, the dampers will open to the minimum position to provide ventilation air.

Room terminals should go to the fully open position when the unit enters the heating mode. This is controlled by the heating interlock relay (HIR), located in the unit control box. When the unit goes into heating mode, the HIR is energized and opens the room terminals.

General

The 50NB,NP PIC units are designed with state-of-the-art features and benefits. Some of them are a function of the base unit, and some are a function of the PIC controls. Many of these features and benefits are standard, and additional applications and functions can be achieved through the purchase of numerous options and/or accessories. The appropriate applications will be described in this section

Base unit applications

Integrated economizer — The factory-installed integrated economizer option provides ventilation of the conditioned space with outdoor air, as well as economical cooling through the use of outdoor air instead of mechanical cooling whenever possible. When the outdoor air enthalpy is appropriate for cooling, but cannot provide enough cooling for the space, outdoor air will be used as the first stage of cooling, with mechanical cooling stages added as needed (there are 5 to 6 stages available per unit).

When the factory-installed control option module is purchased, 2 additional types of economizer control are added, providing increased economies, comfort, and indoor-air quality (IAQ) monitoring. See Control Option Module section on page 31 for more information

Inlet guide vanes — The factory-installed inlet-guide vane option provides fan modulation of the supply-air fan.

This is desirable on most VAV applications to maintain a constant static pressure in the duct which helps avoid unacceptable noise levels. In addition, the evaporator fan is more efficient with inlet guide vanes because less operating horsepower is necessary to run the fan. When the static pressure is kept low, the fan can run at a lower brake horsepower; making it more efficient.

In some cases, field supplied and installed inverters may be used instead of inlet guide vanes to provide evaporator fan modulation. The PIC controls will output a 4-20 mA signal to control the inverters. A field-supplied pressure transducer is required, and must be the same transducer as is used for the factory-installed inlet guide vanes

Copper/copper condenser coil — This factory-installed option should be used whenever there is an environment which may be detrimental to the aluminum fins (standard). Examples of applications which would require copper/copper condenser coils include: coastal applications or applications where corrosive or airborne contaminants which adversely affect aluminum are present

High-efficiency evaporator-fan motor — The high-efficiency fan motor reduces electric consumption because it consumes less electrical power, while delivering the same horsepower. Further, the high-efficiency fan motor may qualify for rebates from the local utility company.

Barometric relief — The barometric relief package (factory-installed option) prevents overpressurization of the conditioned space

NOTE: The optional factory-installed economizer is required with this option/accessory

100% modulating power exhaust — The power exhaust option is available on all unit sizes and is used for relief of excess pressure in the occupied space. The power exhaust can remove larger amounts of air from the conditioned space than the barometric relief damper. The power exhaust is energized when the building pressure exceeds the set point.

NOTE: The optional factory-installed economizer is required with this option/accessory.

Roof curb — The rooftop units are designed to be set on a roof curb, and the accessory roof curb packages are specifically designed for the units they support. Use of a roof curb permits the ductwork to be connected to the curb (before the unit is delivered to the jobsite, if desired). The accessory roof curb packages include seal strips to ensure a leakfree transition between the unit and the curb. In addition, on multi-unit applications, having the roof curbs in place in advance permits quick and easy rigging of the units. Units can simply be lifted and set onto their curbs. Also, rigging expenses can be reduced because the curbs can be set up in advance, meaning there is no delay in rigging while curbs are set in place. All electrical connections can be made through the curb, if desired.

Hot gas bypass — The factory-installed hot gas bypass option prevents short cycling of the compressor at low load conditions. Each of the 50NB,NP units has as standard the maximum number of stages of unloading possible controlled electronically. In applications where there is the potential for loads which might be beneath the minimum unloading capability of the unit, the compressor would need to be cycled often to meet the low load. The hot gas bypass option prevents this from happening by providing additional unloading capability for the unit.

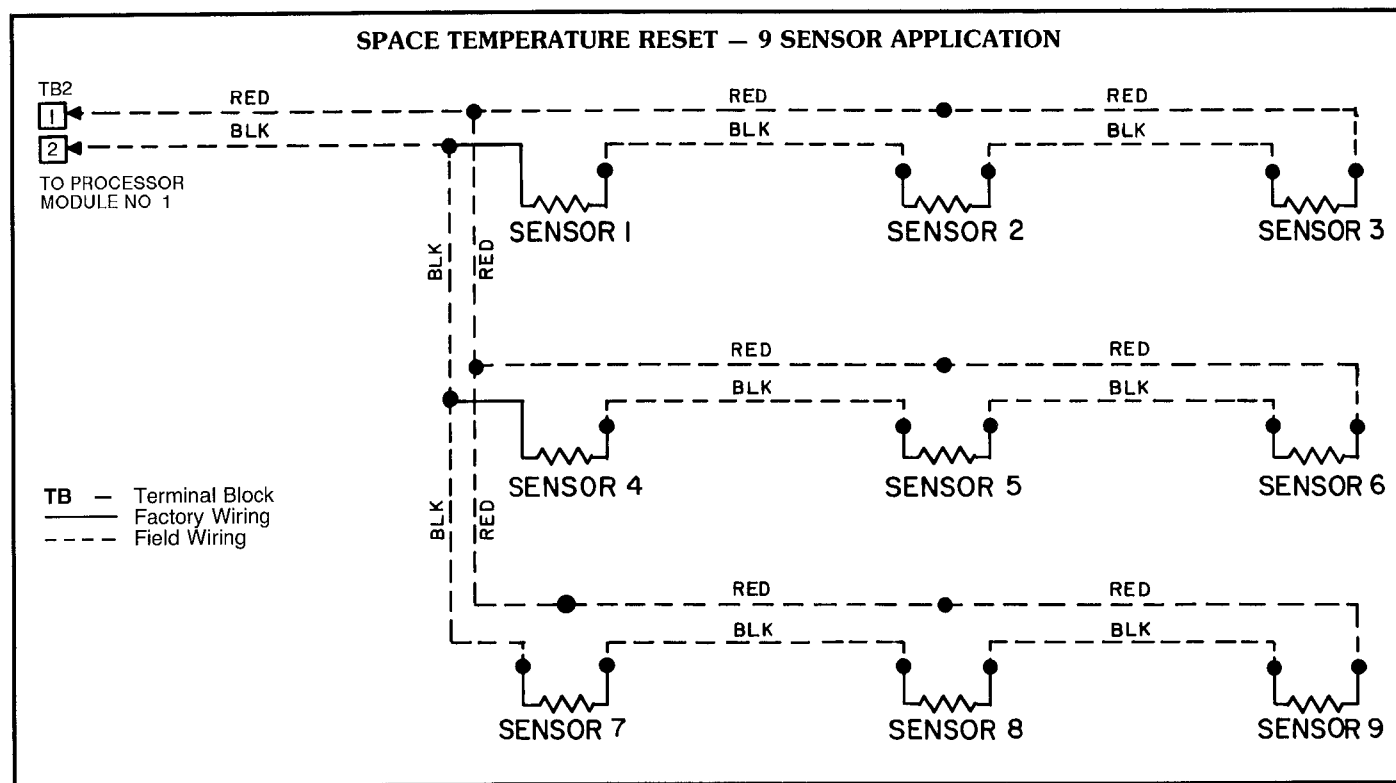
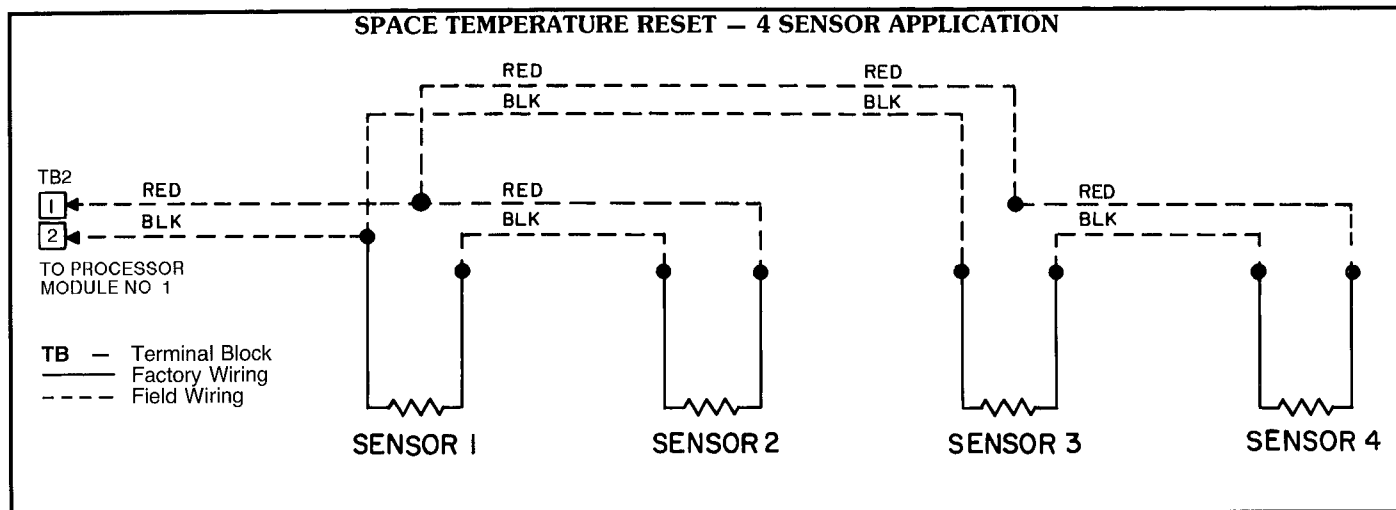
NOTE: When hot gas bypass is used, the lead/lag compressor feature should be disabled

Differential enthalpy control — The differential enthalpy control accessory is a sensor that is used in conjunction with the standard solid-state enthalpy control sensor. Using the two sensors together provides the ability to compare heat content (temperature and humidity) of outdoor and return air. When outdoor air has a lower enthalpy or heat content than the return-air, then the economizer will be used for free cooling of the space. This comparison of outdoor versus return air permits the optional economizer cut-in point to be at the most economical level possible.

Space temperature reset — Variable air volume applications that require averaging multiple space temperature sensors to determine when to modify the discharge-air temperature can be satisfied using either 4 or 9 sensors as shown on page 30. However, space temperature reset can be accomplished with only 1 sensor (provided standard with unit). Single space temperature reset wiring is shown in Field Control Terminal Block Wiring on page 26

NOTE: Only Carrier sensors may be used (part no. HH51BX001 for standard T55, and HH51BX004 for accessory T56). Sensors must be used in multiples of 1, 4, and 9 only, with total sensor wiring not to exceed 1000 ft.

Application data (cont)



PIC controls

Keypad and display module (HSIO) — The keypad and display module (local interface device) is a field-installed accessory, and provides unit function information at the unit. The HSIO keypad and display module is easily installed via connection of the power and communication plugs and can

be easily moved from one unit to another. Due to this flexibility, only one HSIO needs to be ordered for several units. The HSIO is the only means of switching between run and standby modes, and is required for initial start-up and most service and diagnostic functions.

Processor modules (PSIO) — There are two types of processor modules: standard and optional. All units come with the standard PSIO no. 1 module, which contains the operational software and controls the operation of the unit. The standard PSIO no. 1 module monitors and processes the following inputs, outputs and system information

INPUTS:

- transducers
- thermistors
- switches

OUTPUTS:

- compressors
- condenser-fan head pressure control
- optional integrated economizer
- optional inlet guide vanes
- optional modulating power exhaust dampers
- heat stages 1 and 2 operation (if applicable)

SYSTEM INFORMATION:

- generates alert and alarm information (via transducer, thermistor and sensor inputs)
- supports level II communications
- supports DAV interface

NOTE. The optional PSIO no. 2 can be purchased on its own (as a field-installed accessory) or as part of the factory-installed control option module. When purchased as a stand-alone accessory, superheat monitoring is not available without accessory pressure transducers and thermistors. The accessory PSIO no. 2 module supports the inputs used for:

- superheat monitoring
- humidity control
- IAQ
- smoke control
- hydronic coil freeze protection

In addition, the accessory/optional PSIO no. 2 supplies the outputs for humidity and hydronic heating coil control and the discrete output with timed clock control.

Refrigerant pressure transducers — The transducers can also be purchased either as an accessory or as a part of the control option module. Refer to the Control Option Module section below for more information on transducers as part of the factory-installed control option package. When purchased as an accessory, the transducer package comes with 4 transducers and 2 suction thermistors. The transducers permit improved head pressure control capability through monitoring of the refrigerant pressure. This can be done locally or remotely.

Control option module — The control option module is factory installed and incorporates some of the accessories available as stand-alone pieces, as well as additional functions not available outside the module. The components of the control option module are

- PSIO no. 2 (in addition to the standard PSIO no. 1)
- 4 refrigerant pressure transducers
- 2 suction thermistors

The primary purpose of the control option module is to increase capabilities and functions of the PIC controls. Through the use of the optional factory-installed control option module, additional monitoring and control of the occupied space become possible.

PSIO — The processor module is the heart of the entire control option module system, and supports the inputs which are used for humidity and smoke control, as well as outdoor-air cfm, superheat, and IAQ monitoring. The PSIO also supplies the outputs for humidity and hydronic heating coil control, a discrete output for timed clock control, and increased optional economizer control.

Humidity — The accessory humidity sensor provides information on the current humidity levels. When used in conjunction with a field-installed humidifier, the conditioned space can be kept within a preset comfort range.

Building pressurization, evacuation, and smoke purge control — It is common practice to use the rooftop unit for building pressurization, evacuation, and smoke purge functions in the event of a building fire. These functions are enhanced when multiple rooftop units are used to zone a building.

The intent of building pressurization is to keep smoke out of a zone. This is accomplished by:

- opening the optional economizer
- running the evaporator fan (optional inlet guide vanes open)
- closing the modulating power exhaust dampers if installed (option)
- shutting off the power exhaust fan (if installed)

This allows the space to be overpressurized and smoke will not enter the space.

The smoke purge and evacuation functions allow the rooftop unit to remove smoke from the space. Required unit functions for smoke purge and evacuation are:

- economizer open (smoke purge)
- economizer closed (evacuation)
- exhaust fan running
- exhaust dampers are open
- evaporator fan is not running (evacuation)

Note that the optional economizer and modulating power exhaust are required for both functions.

It is possible to remotely energize the power exhaust fan using the power exhaust contacts. This would allow smoke removal to occur without a fireman having to climb onto the roof before structural integrity can be verified.

Application data (cont)



Superheat — The capability to monitor superheat values is critical to both the comfort of building occupants and improving the longevity of the compressors. A major benefit of the superheat function is that the superheat can be monitored remotely. When the person monitoring the system has access to the superheat information, the problem can be fixed as soon as the system goes into the alarm lockout state (high or low superheat). This prevents long periods of down time for the HVAC system because the service person can troubleshoot and solve the problem before the compressors need to be replaced. Repeated superheat situations and the stress they put on the compressors can be avoided, thus increasing the life of the unit.

IAQ monitoring — Indoor-air quality is critical. As mentioned in the Features/Benefits section, many retail establishments will have to spend far more money than necessary to meet the generic outdoor-air cfm per square ft required by the ASHRAE 62 Standard if they are not able to monitor the contaminant levels (like CO₂) in the conditioned space. Being able to monitor the indoor-air quality permits compliance with the ASHRAE Standard while saving money, since only the amount of outdoor ventilation air that is required to meet the Standard is used. In addition, accessory software provides data collection and report generation capabilities.

Hydronic heating coil control — The heating coil control is used to control the field-supplied and installed heating coil and steam or hot water valve. The valve is modulated to prevent the space temperature from falling below the desired set point. The desired set point can be programmed into the PIC software, and the valve modulation will be controlled based on temperature sensed in the heating coil.

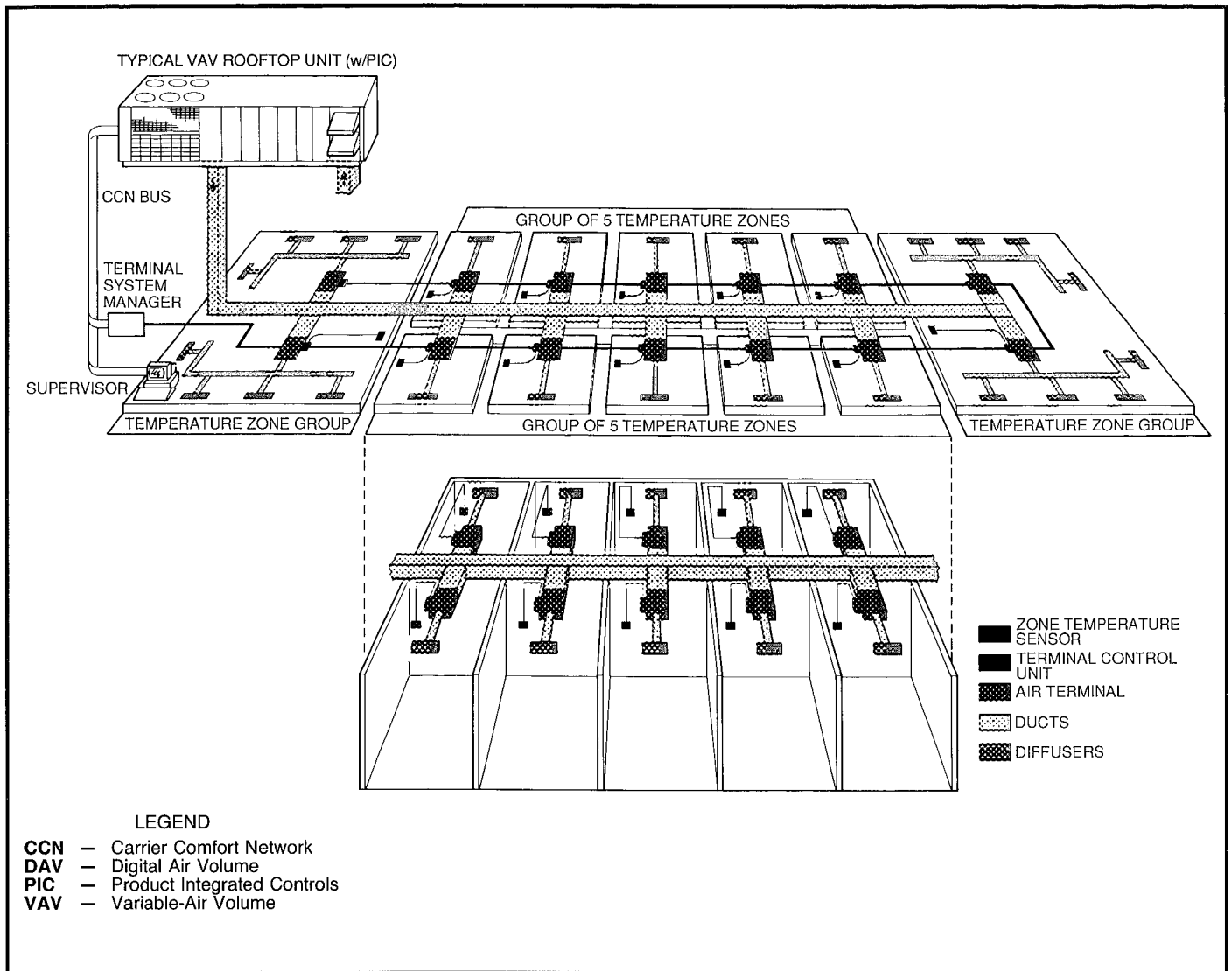
Discrete output controlled by the timed clock — Another benefit gained from the purchase of the factory-installed control option module is the ability to control an additional timed output. A single output terminal is provided for a field-supplied relay. The timed output can be used for such functions as parking lot or other outdoor light control, and this discrete timed output control is only available with the option module.

Economizer controls — The control option module also permits greatly enhanced control of the economizer. The basic integrated economizer will provide free cooling with outdoor air whenever the enthalpy is favorable. The control option module provides 2 additional types of minimum position economizer control, and can be configured to review all 3 inputs and control the dominant parameter.

1. Maintains a minimum set point when enthalpy is not suitable for free cooling (standard with optional economizer)
2. Maintains a constant cfm of outdoor air on VAV applications independent of unit cfm (using control option module and accessory outdoor airflow sensor).
3. Maintains a minimum set point based on a 0 to 10 v input from a field-supplied IAQ sensor (such as a CO₂ sensor) (using control option module).

NOTE: The economizer still provides integrated operation with mechanical cooling when required for optimum unit efficiency

Typical piping and wiring (DAV application shown)



Guide specifications

Packaged Rooftop Cooling Unit With Gas Heat and PIC Controls

HVAC Guide Specifications

Size Range. **20 to 27 Tons, Nominal**

Carrier Model Number: **50NB,NP**

NOTE: Items throughout the specification which apply only to "With Electric Heat" are indicated by single brackets [i e].

Part 1 — General

1 01 SYSTEM DESCRIPTION

- A Outdoor, roof-curb mounted, electronically controlled [heating and] cooling unit utilizing semi-hermetic reciprocating type compressors for cooling duty [and utilizing electric resistance coils for heating duty]. Units shall discharge supply air downward (50NP) or horizontally (50NB) as shown on the contract drawings.

1 02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 360 and 270.
- B. Unit shall be designed to conform to ASHRAE 15, latest revision, UL Standard 465, and NEC.
- C. Unit shall be certified by ETL and CSA as a total package
- D. Roof curb shall be designed to conform to NRCA standards.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be stored and handled per manufacturer's recommendations.

Part 2 — Products

1.01 EQUIPMENT

A. Factory-assembled, single-piece [heating and] cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B Unit Cabinet:

1. Constructed of galvanized steel, bonderized and coated with a baked enamel finish.
2. Unit casing shall be capable of withstanding Federal test method Standard No 141 (Method 6061) 500-hour salt spray test
3. Sides shall have insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing
4. Indoor blower compartment interior cabinet surfaces shall be insulated with flexible fiberglass insulation, coated on the air side
5. Unit shall be equipped with factory-supplied condensate drain connection for evaporator coil.
6. Units shall be equipped with lifting lugs to facilitate overhead rigging.

C. Fans

1. Evaporator Fan:

- a. Double-width, double-inlet, centrifugal belt driven forward-curve type with single outlet discharge
- b. Fixed-pitch pulley drive with factory-supplied alternate motor pulley bolted to the fan sled.
- c. Fan shaft bearing shall be of the ball bearing type with lubrication provisions.
- d. Statically and dynamically balanced.
- e. Evaporator-fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15
- f. Solid fan shaft construction.

2. Condenser Fans:

- a. Direct-driven propeller type only
- b. Discharge air vertically upward.
- c. Protected by PVC-coated steel wire safety guards.
- d. Statically and dynamically balanced.
- e. Three-phase, totally enclosed motors

D Compressors:

1. Reciprocating, semi-hermetic type only and shall be located for easy servicing
2. Equipped with a suction-cutoff type electrically controlled unloader(s)

3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.

4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor, and discharge service valves.

5. Maximum operating speed of 1800 rpm.

E Coils.

1. Evaporator Coil

- a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes with all joints brazed.
- b. Full-face active type during full and part load conditions.
- c. Coils shall be leak tested at 150 psig and pressure tested at 450 psig.

2. Condenser Coils:

- a. Constructed of aluminum fins mechanically bonded to seamless copper tubes with all joints brazed.
- b. Air-cooled condenser coils shall be leak tested at 150 psig and pressure tested at 450 psig.
- c. All coils shall be same manufacturer as unit.

F. [Heating Section:] Optional

Electric resistance heaters shall be factory installed, open wire nichrome element type, insulated with ceramic bushings, and shall include operating and safety controls.

G. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits, each containing:

1. Liquid line service valve.
2. Discharge service valves
3. Filter drier
4. Moisture indicating sight glass.
5. Thermostatic expansion valve.
6. Fusible plug

H Filter Section:

Filter section shall consist of low velocity, 2-in. thick, throwaway fiberglass filters of commercially available sizes.

I. Controls, Safeties, and Diagnostics.

1 Controls:

- a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:

- 1) Evaporator leaving-air temperature.
- 2) Return-air temperature.
- 3) Saturated condensing temperature.

- 4) Economizer position.
 - 5) Minimum economizer set point
 - 6) Morning warm-up set point.
 - 7) Room temperature (unoccupied [heat and] cool function).
 - 8) Supply-air fan status.
 - 9) Outdoor-air temperature.
 - b. Controls shall be capable of performing the following functions.
 - 1) Capacity control based on discharge-air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of electric unloaders and compressor staging
 - 2) Perform a quick test to check the status of all input and operation of all output signals to the control system using diagnostic display module.
 - 3) Control of integrated economizer operation
 - 4) Two-step demand limit control (when used in conjunction with the Carrier Comfort Network).
 - 5) Condenser-fan cycling to maintain correct head pressure down to -20 F.
 - 6) Adaptive optimal start (morning warm-up) determines the time unit will commence cooling [or heating] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode
 - 7) Adaptive optimal stop turns off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV applications only).
2. Safeties:
- Unit components shall be equipped with the following protections:
- a. Compressors:
 - 1) Overtemperature (shuts down individual compressor).
 - 2) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
 - 3) Crankcase heaters
 - 4) High-pressure switch (shuts down individual compressor, automatic reset type)
 - 5) Low-pressure switch (shuts down individual compressor, automatic reset type).
 - 6) Check filter switch.
 - b. [Heating Section:]
 - 1) Automatic reset high-temperature limit switches.
 - 2) Heat limiters (fusible links).
 - 3) Overcurrent protection manual reset circuit breakers
 - 4) Branch circuit protection.
3. Diagnostics
- a. Diagnostic display module shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.
 - b. Diagnostic display module shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.
 - c. Diagnostic module must also be capable of displaying outputs of microprocessor-controlled "quick test" to verify operation of every thermostat, actuator motor, fan, and compressor before unit is started
- J. Operating Characteristics:
1. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 360.
 2. Unit shall be capable of mechanical cooling operation down to -20 F ambient outdoor temperature.
 3. Provides multi-stage cooling capability.
 4. [Provides a minimum of 2 stages of heating capability on units with medium or high heat.]
- K. Motors:
1. Compressor motors shall be cooled by suction gas passing over motor windings.
 2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection
 3. Indoor blower motor shall be of the 3-phase ball bearing type.
- L. Electrical Requirements:
- All unit power wiring shall enter unit cabinet at a single location.
- M. Special Features.
- Certain standard features are not applicable when the features designated * are specified. For assistance in amending the specifications, your local Carrier Sales Office should be contacted.
- * 1. Integrated Economizer:
- Enthalpy controlled integrated type consisting of dampers, motors, and linkages, in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary
- a. Dampers shall be a low-leakage type, not to exceed 1% leakage and 1 in. wg pressure differential when fully closed.
 - b. Motors shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown

Guide specifications (cont)



- c. Equipped with a solid-state enthalpy control that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level.
- * 2. Optional Condenser Coil Materials:
Unit shall be factory equipped with a condenser coil made from copper tubes and copper fins.
- * 3. Roof Curb.
Formed 16-gage galvanized steel with wood nailer.
- * 4. 100% Modulating Power Exhaust:
Package shall include 1 direct-driven propeller-type fan with modulating dampers at the fan discharge to maintain a field adjustable interior space pressure set point.
Fan shall be statically and dynamically balanced.
- 5. Hot Gas Bypass Option:
Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.
- * 6. Differential Enthalpy Sensor
 - a. For use with economizer only.
 - b. Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.
- 7 Barometric Relief Package:
 - a. Package shall relieve excess internal pressure and consist of damper assembly, hoods, damper screen, seal strip, and required hardware
 - b. Damper assembly shall close due to gravity upon unit shutoff.
 - c. Unit mounted on vertical applications, and duct mounted on horizontal applications
- 8. Condenser Coil Hail Guard:
Expanded metal grille complete with support retainers and fasteners shall be provided for protection of condensing coil.
- 9. Optional high-efficiency evaporator-fan motor shall be factory supplied to reduce electric consumption.
- 10. Keypad/Display Module (HSIO):
Module shall provide hardware necessary for human interface with the PIC controls. Module shall contain a keypad and display for interactive communication.

NOTE: The HSIO is required to move the unit back and forth between standby and run modes, and is necessary for initial start-up and for most service and diagnostic routines.
- 11. Optional Processor Module no 2 (PSIO2):
Module shall support sensors used for humidity control, outdoor-air cfm, indoor-air quality, smoke control, and superheat monitoring. The optional processor module also supplies the outputs for humidity and hydronic heating coil control, as well as the discrete output for timed clock control.
- 12. Suction Thermistors and Refrigerant Pressure Transducers:
These accessories must be ordered together, and depending on placement, will determine suction superheat or control the condenser fans
NOTE: For suction superheat monitoring, the PSIO2 must also be ordered.
- 13 Space Temperature Sensor (T56).
This space temperature sensor shall determine the temperature required to satisfy the conditions. In addition, this accessory device shall provide a space temperature offset of $\pm 5^{\circ}\text{F}$ (CV applications only).
- 14 Humidity Control Sensors:
Package shall contain either duct- or wall-mounted sensors to measure the relative humidity of the air within the occupied space.
- 15. Control Option Module.
Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:
 - Humidity monitoring
 - Building pressurization, evacuation, and smoke purge
 - Superheat monitoring
 - IAQ monitoring
 - Hydronic heating coil control
 - Timed discrete output
 - Economizer controls
- * 16. Optional Inlet Guide Vanes shall be factory-installed, and shall contain all hardware necessary for fan modulation of the evaporator fan
- * 17. Outdoor Airflow Sensor:
Kit includes one transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer is required with this accessory