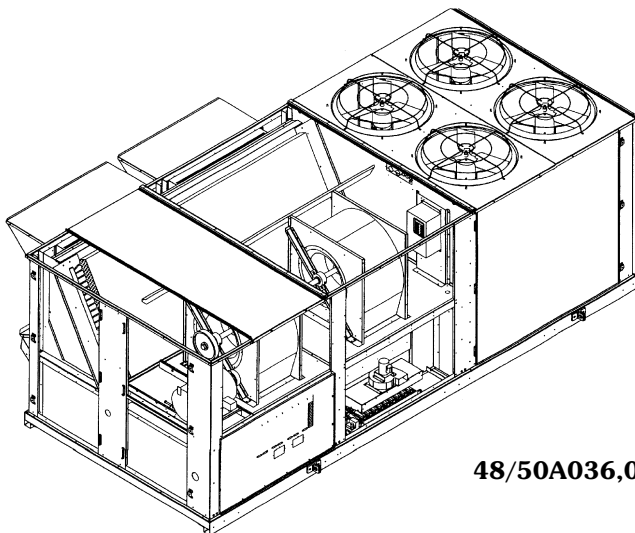




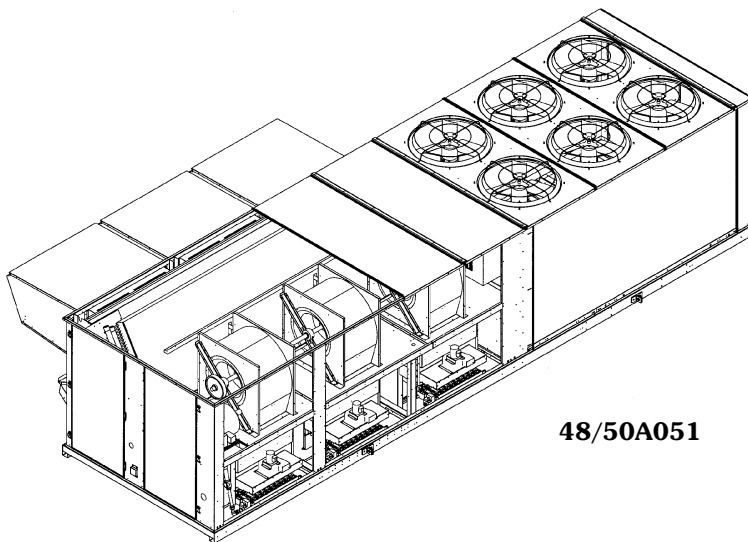
Advance Product Data

48/50AJ,AK,AW,AY Single-Package Gas Heating/Electric Cooling and Electric Heating/Electric Cooling Rooftop Units with **COMFORTLINK™** Controls

35 to 50 Nominal Tons



48/50A036,041



48/50A051

**ASHRAE
90.1
COMPLIANT**

Carrier's 48/50A Series commercial packaged rooftops offer:

- *ComfortLink* control's easy to use plain language display
- EERs meet ASHRAE Standard 90.1-2001
- Meets ASHRAE Standard 62
- Constant and variable volume communicating controls
- Accurately match building loads with up to 6 steps of capacity
- VFD (variable frequency drives) on all VAV (variable air volume) units
- Mechanical cooling operation at outdoor ambient temperatures as low as 32 F (-20 F with optional Motormaster® V fan speed control)

Features/Benefits

Carrier's 48/50A commercial packaged unit offers design flexibility, quality, reliability, and *ComfortLink* controls.

Design flexibility

Dedicated vertical supply/return units (AJ,AK) are ideal for new construction or retrofit to existing installations. The low unit profile is maintained when the unit is installed on the accessory roof curb.

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

Dedicated horizontal units (AW,AY) are ideal for replacement or applications such as through-the-wall where sound must be attenuated before the duct penetrates the roof. Ducts connect directly to the unit. Horizontal units may be curb or slab mounted.

Features/Benefits (cont)



ComfortLink™ control

The *ComfortLink* control is your link to a world of simple and easy to use rooftop units that offer outstanding performance and value. When used with a space temperature sensor, the *ComfortLink* control's intelligence maintains control over the economizer and condenser fans and optimizes the performance of the multiple refrigeration circuits as conditions change resulting in the following features:

- higher part load efficiency
- better control of temperature and humidity
- superior reliability
- automatic redundancy
- high ambient cooling operation at 115 F
- Low ambient cooling operation at 32 F as standard (optional Motormaster® V inverter fan speed control for operation down to -20 F)

The *ComfortLink* Scrolling Marquee display is very easy to use. Messages are displayed in easy to understand English, no decoding is required. A scrolling readout provides detailed explanations of control information. Only four, large, easy-to-use buttons are required to maneuver through the entire menu. The readout is designed to be visible even in the brightest sunlight. A hand-held Navigator™ accessory can be used for added service flexibility.

The *ComfortLink* control provides unparalleled service diagnostic information. Temperature and pressure can be read from the display with no need for separate gages. Other data, such as compressor cycles, unit run time hours, current alarms, can also be accessed. A history of alarms is also available for viewing.

Service run test can be very helpful when troubleshooting. The user can run test major components to determine the root cause of a problem. The unit can be run-tested before an installation is complete to ensure satisfactory start-up.

To ensure reliability, the *ComfortLink* control prevents reverse compressor rotation.

No laptop computers are required for start-up. Time schedules are built in and the Scrolling Marquee display provides easy access to set points.

The *ComfortLink* control accepts input from a CO₂ sensor and a smoke detector. Both are available as

factory-installed options or as field-installed accessories.

ComfortLink controls are fully communicating and are cable-ready for connection to the Carrier Comfort Network® (CCN) devices. The control communicates at 38.4 kilobaud. This provides high-speed communications for remote monitoring via the Internet. Multiple rooftop units can be daisy-chained together using a 3-wire communication bus at the rooftop level. *ComfortLink*/CCN system is a peer-to-peer system, rather than a polling system. This results in lower cost installations.

The units have a terminal strip on board, allowing them to operate with a standard thermostat. Expensive interface devices are not required.

Quality and reliability

Excellent full and part load efficiencies are achieved by using multiple scroll compressors and intertwined dual refrigerant circuits. The compressors are equipped with crankcase heaters and protected by electronic sensors and logic to control minimum on and off times and reverse rotation. The refrigerant circuits are both electrically and mechanically independent, to provide standby capability should one circuit require service.

Totally enclosed outdoor-fan motors ensure many years of trouble-free operation.

Positive-locking bearings for the indoor fan ensure vibration-free operation of the supply fan assembly and remain locked during the life of the bearing.

Variable frequency drive (VFD) and unit unloading

Variable air volume (VAV) units utilize state of the art Variable Frequency Drive (VFD) to control duct static pressure for optimum supply fan energy savings.

The VAV units have up to 6 stages of capacity control to match the load requirements of the conditioned space. Other VAV features include:

- provide cooling and heating (if equipped with heat) control in both occupied and unoccupied mode
- supports optional space temperature sensor
- control of modulating economizer to provide free cooling when outdoor conditions are suitable
- support of IAQ sensor
- support linkage to ComfortID™ VAV systems

Constant volume units come equipped with 2 stages of capacity. Optional configuration is available to increase this up to 6 stages of operation. Unit operation will closely match the load and maintain comfort in the most energy-efficient manner.



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Factory-installed economizer

An optional integrated economizer permits cooling utilizing an outdoor air sensor. The direct gear driven, low leakage blades eliminate conventional inter-blade linkages and the associated adjustments.

The economizer operates in conjunction with mechanical cooling when required and is factory-installed for either vertical or horizontal operation. The factory-supplied and field-installed rain hood/filter assembly prevents moisture or objects from entering the unit.

Exhaust air relief is available for all units:

- barometric relief (CV [constant volume] or VAV)
- power exhaust (2-stage CV)
- 100% modulating power exhaust (CV or VAV)

Field-adjustable set points on modulating power exhaust prevent space pressurization problems. Factory-installed relief options are unit mounted on downflow units. Accessories must be duct mounted for horizontal applications.

Gas heating units

Integrated gas unit controller (IGC) (gas heating units only) —

All ignition components are contained in the compact IGC which is easily accessible for servicing. The IGC control board, designed and manufactured exclusively for Carrier rooftop units, provides built-in diagnostic capability. An LED (light-emitting diode) simplifies troubleshooting by providing visual fault notification and system status confirmation.

The IGC also contains an anti-cycle protection for gas heat operation. After 4 continuous cycles on the unit high-temperature limit switch, the gas heat operation is disabled, and an error code is issued. This feature greatly improves reliability of the rooftop unit.

The IGC also contains burner control logic for accurate and dependable gas ignition. This LED fault-notification system reduces service person troubleshooting time and minimizes service costs. The IGC can also maximize heating efficiency by controlling evaporator fan on and off delays.

Efficient, dependable operation —

Tubular, dimpled gas heat exchangers optimize heat transfer for improved efficiency. The tubular design permits hot gases to make multiple passes across the path of the supply air. The dimpled design creates a turbulent gas

flow to maximize heating efficiency. The extra thick Alumagard™ heat exchanger coating provides corrosion resistance and ensures long life. An optional stainless steel heat exchanger is also available.

The unsightly appearance of flue stacks is eliminated and the effects of wind on heating operations are diminished by the induced draft combustion system. The inducer fan draws hot combustion gas through the heat exchanger at the optimum rate for the most effective heat transfer. Induced draft heating systems are safer than positive pressure, forced draft heating systems. With the induced draft heating system, the heat exchanger operates under negative pressure, preventing flue gas leakage into the indoor supply air.

During the Heating mode, the evaporator-fan relay automatically starts the evaporator fan after the heat exchanger warms up to a suitable temperature. The 30-second fan delay prevents cold air from entering the supply duct system when the conditioned space is calling for heat to maximize efficiency.

The direct-spark ignition system saves operating expense when compared to pilot ignition systems. No crossover tube is required, therefore no sooting or pilot fouling problems can occur.

All 48A standard units are designed for natural gas. An accessory LP (liquid propane) conversion kit is available.

Safety is built in — All 48A units have a flame rectification sensor to quickly sense the burner flame and ignite burners almost immediately. Fast shutdown is a certainty since the sensor reacts quickly to any flame outage or system failure. In the event of a shutdown, an error code is issued at the IGC board.

Safety is also assured due to the heating safety controls which will shut down the unit if there is a problem. If excessive temperatures develop, limit switches shut off the gas valve. After 4 continuous short cycles of the high-temperature limit switch, the IGC board locks out the gas heat cycle to prevent any further short cycles. This safety feature is provided exclusively on Carrier rooftop units. The rollout switch also deenergizes the gas valve in the event of a flame rollout.

Support of fire and smoke control included with optional *ComfortLink*™ control expansion board.

Staged gas unit heating

The staged gas control option adds the capability to control the rooftop unit's gas heating system to a specified supply air temperature set point for purposes of tempering a cool mixed-air condition. The gas heating system employs multiple heating sections. Each section is equipped with a two-stage gas valve. The gas valves are sequenced by a factory-installed staged gas controller (SGC) as required to maintain the user-specified supply air set point. Up to eleven stages of heating control are available, based on quantity and heating capacity sizes of the individual heat exchanger sections provided in the base unit. In addition to providing system control for tempering heat operation, the SGC also controls Demand Heat sequences for both First-Stage (W1) and Second-Stage (SW or full-fire) operation.

Tempering of supply air is desirable when rooftop units are operating in ventilation mode (economizer only operation) at low outdoor temperatures. At low outdoor temperatures, the mixed-air temperature (combination of return-from-space temperature and outdoor/ventilation air temperature) may become too low for the comfort of the occupants or for the terminal reheat systems. The tempering function adds incremental steps of heat capacity to raise the temperature of the mixed air up to levels suitable for direct admission into the occupied space or to levels consistent with reheat capabilities of the space terminals.

Installation/serviceability

Dedicated design (vertical or horizontal) requires no alteration time to convert in the field. Single point electrical connections are standard on all units. Electrical service access can be made through roof curb or side of unit.

All units are equipped with the *ComfortLink* control system as standard. The *ComfortLink* control system has a fully alpha-numeric display and keypad. The display has expandable text messages that eliminate the need to lookup coded display information. Unit also supports the use of the enhanced multiple line display that can be connected through a phone jack connection at either end of the unit. The standard microprocessor controls replace the need for field-installed anti-short cycle timers. The controls are compatible with either a room sensor or conventional thermostat with no need to install an accessory interface.



In addition, no special tools are required to run the unit through its operational steps. The unit can be run-tested before an installation is complete to ensure satisfactory start-up.

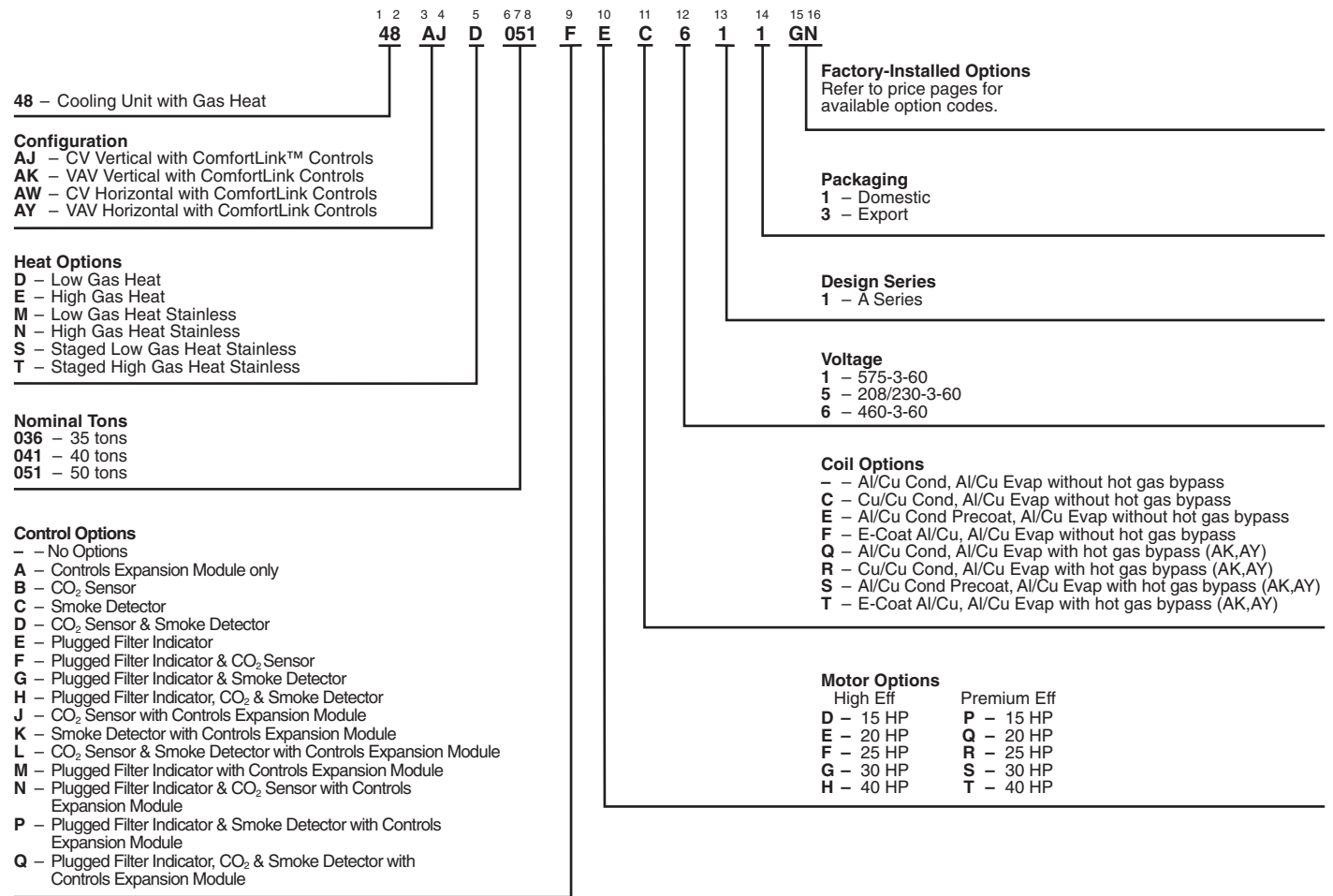
Hinged access panels are located for easy access to standard serviceable

components for maintenance. No fasteners need to be removed, which reduces servicing time and prevents roof leaks caused by discarded screws.

Color coded wiring permits easy tracing and diagnostics.

Model number nomenclature

48AJ,AK,AW,AY UNITS



LEGEND

- Al** — Aluminum
- Cu** — Copper
- CV** — Constant Volume
- VAV** — Variable Air Volume

NOTES:

1. VAV models (AK/AY) are equipped with variable frequency drives (VFD).
2. Premium-efficiency motors are not available in 575-3-60.
3. All indoor-fan motors meet the minimum efficiency requirements as established by Energy Policy Act (EPACT).

Quality Assurance

Certified to ISO 9001:2000

Model number nomenclature (cont)



50AJ,AK,AW,AY UNITS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
50 AJ E 051 F E C 6 1 1 GN

50 – Cooling Unit

Configuration

- AJ** – CV Vertical with ComfortLink™ Controls
- AK** – VAV Vertical with ComfortLink Controls
- AW** – CV Horizontal with ComfortLink Controls
- AY** – VAV Horizontal with ComfortLink Controls

Heat Options

- – No heat
- B** – 36/27 kW
- C** – 72/54 kW
- D** – 54/42 kW
- E** – 108/81 kW

Nominal Tons

- 036** – 35 tons
- 041** – 40 tons
- 051** – 50 tons

Control Options

- – No Options
- A** – Controls Expansion Module only
- B** – CO₂ Sensor
- C** – Smoke Detector
- D** – CO₂ Sensor & Smoke Detector
- E** – Plugged Filter Indicator
- F** – Plugged Filter Indicator & CO₂ Sensor
- G** – Plugged Filter Indicator & Smoke Detector
- H** – Plugged Filter Indicator, CO₂ & Smoke Detector
- J** – CO₂ Sensor with Controls Expansion Module
- K** – Smoke Detector with Controls Expansion Module
- L** – CO₂ Sensor & Smoke Detector with Controls Expansion Module
- M** – Plugged Filter Indicator with Controls Expansion Module
- N** – Plugged Filter Indicator & CO₂ Sensor with Controls Expansion Module
- P** – Plugged Filter Indicator & Smoke Detector with Controls Expansion Module
- Q** – Plugged Filter Indicator, CO₂ & Smoke Detector with Controls Expansion Module

Factory-Installed Options
 Refer to price pages for available option codes.

Packaging

- 1** – Domestic
- 3** – Export

Design Series

- 1** – A Series

Voltage

- 1** – 575-3-60
- 5** – 208/230-3-60
- 6** – 460-3-60

Coil Options

- – Al/Cu Cond, Al/Cu Evap without hot gas bypass
- C** – Cu/Cu Cond, Al/Cu Evap without hot gas bypass
- E** – Al/Cu Cond Precoat, Al/Cu Evap without hot gas bypass
- F** – E-Coat Al/Cu, Al/Cu Evap without hot gas bypass
- Q** – Al/Cu Cond, Al/Cu Evap with hot gas bypass (AK,AY)
- R** – Cu/Cu Cond, Al/Cu Evap with hot gas bypass (AK,AY)
- S** – Al/Cu Cond Precoat, Al/Cu Evap with hot gas bypass (AK,AY)
- T** – E-Coat Al/Cu, Al/Cu Evap with hot gas bypass (AK,AY)

Motor Options

- | | |
|------------------|------------------|
| High Eff | Premium Eff |
| D – 15 HP | P – 15 HP |
| E – 20 HP | Q – 20 HP |
| F – 25 HP | R – 25 HP |
| G – 30 HP | S – 30 HP |
| H – 40 HP | T – 40 HP |

LEGEND

- Al** — Aluminum
- Cu** — Copper
- CV** — Constant Volume
- VAV** — Variable Air Volume

NOTES:

1. VAV models (AK/AY) are equipped with variable frequency drives (VFD).
2. Premium-efficiency motors are not available in 575-3-60.
3. All indoor-fan motors meet the minimum efficiency requirements as established by Energy Policy Act (EPACT).

Quality Assurance

Certified to ISO 9001:2000

Ratings and capacities



ELECTRIC RESISTANCE HEATER DATA

UNIT 50AJ,AK,AW,AY	HEATER kW				HEATER STAGES	% HEAT PER STAGE	DESIGN RANGE	
	Unit Voltages						Min CFM	Max CFM
	208	230	460	575				
036,041 LO HEAT	27	36	36	36	1	100	10,500	20,000
036,041 HIGH HEAT	54	72	72	72	2	50/100	10,500	20,000
051 LO HEAT	41	54	54	54	1	100	15,000	27,000
051 HIGH HEAT	81	108	108	108	2	50/100	15,000	27,000

NOTE: Due to the open design of the electric heaters, the airside pressure drop is negligible.

COOLING CFM OPERATING RANGE

UNIT	MIN CFM	MAX CFM*
48/50AJ,AW036	10,500	17,500
48/50AK,AY036	7,000	17,500
48/50AJ,AW041	12,000	20,000
48/50AK,AY041	8,000	20,000
48/50AJ,AW051	15,000	25,000
48/50AK,AY051	10,000	25,000

*Operation at these levels may be limited by entering evaporator air wet bulb temperatures. See Cooling Capacities tables on pages 28-30 for further details.

GAS HEATING CAPACITIES AND EFFICIENCIES STANDARD UNITS

UNITS 48AJ,AK,AW,AY	INPUT (Btu/hr)		MAXIMUM OUTPUT (Btu/hr)	TEMPERATURE RISE (F)	STEADY-STATE EFFICIENCY (%)	DESIGN RANGE	
	Stage 1	Stage 2				Min Cfm	Max Cfm*
036,041 LO HEAT	303,500	400,000	328,000	10 to 40	82	7,600	22,500
036,041 HIGH HEAT	607,000	800,000	656,000	30 to 60	82	10,100	20,200
051 LO HEAT	582,000	776,000	636,300	10 to 40	82	11,000	27,000
051 HIGH HEAT	873,000	1,164,000	954,480	30 to 60	82	14,700	27,000

UNITS WITH STAGED GAS OPTION

UNITS 48AJ,AK,AW,AY	STAGES OF GAS CONTROL (% of Full Heat Output)	MIN. OUTPUT (Btuh)	MAX. OUTPUT (Btuh)	DESIGN RANGE	
				Min Cfm	Max Cfm*
036,041 LO HEAT	38, 50, 75, 88, 100	124,640	328,000	7,600	22,500
036,041 HIGH HEAT	38, 50, 75, 88, 100	249,280	656,000	10,100	20,200
051 LO HEAT	19, 25, 38, 44, 50, 56, 63, 75, 88, 94, 100	120,897	636,300	11,000	27,000
051 HIGH HEAT	25, 33, 50, 58, 67, 75, 83, 92, 100	238,620	954,480	14,700	27,000

*In some cases, maximum cfm may be limited by maximum cooling airflow value.

NOTES:

1. Ratings are approved for altitudes to 2000 feet. At altitudes over 2000 ft, ratings are 4% less for each 1000 ft greater than 2000 ft above sea level.
2. At altitudes up to 2000 ft, the following formula may be used to calculate air temperature rise:

$$\Delta t = \frac{\text{Output capacity}}{1.10 \times \text{air quantity}}$$

3. At altitudes above 2000 ft, the following formula may be used:

$$\Delta t = \frac{\text{Output capacity}}{(.24 \times \text{specific weight of air} \times 60) (\text{air quantity})}$$

4. On standard gas heat with aluminized heat exchangers, the minimum allowable mixed air entering the heat exchanger during half-rate (first stage) operation is 50 F. There is no minimum limitation for full-rate operation.

5. Total unit design is listed by ETL Testing Laboratories Inc.





CAPACITY CONTROL STAGING OPTIONS

APPLICATION	UNIT	DEMAND SOURCE	COOLING CONTROL METHOD	COMPRESSOR SEQUENCE	
VAV	48/50AK,AY	RAT	Multiple Stage EDT	Table B	Table C
	48/50AK,AY	SPT	Multiple Stage EDT	Table B	Table C
CV Sensor	48/50AJ,AW	SPT	2 Stage Demand	Table A	NA
	48/50AJ,AW	SPT	Multiple Stage EDT	Table B	Table C
CV, Mech Thermostat	48/50AJ,AW	Y1,Y2	2 Stage Demand	Table A	NA
	48/50AJ,AW	Y1,Y2	Multiple Adaptive Demand	Table B	Table C

LEGEND

- CV — Constant Volume
- EDT — Evaporator Discharge Temperature
- RAT — Return Air Temperature
- SPT — Space Temperature
- VAV — Variable Air Volume
- VVT — Variable Volume and Temperature

CAPACITY CONTROL STAGING OPTIONS TABLE A
CV 2-STAGE SEQUENCE

STAGE	SEQUENCE 1			SEQUENCE 2		
	0	1	2	0	1	2
	Thermostat Inputs			Thermostat Inputs		
Y1	OPEN	CLOSED	CLOSED	OPEN	CLOSED	CLOSED
Y2	OPEN	OPEN	CLOSED	OPEN	OPEN	CLOSED
COMP	Compressor Status			Compressor Status		
A1	OFF	ON	ON	OFF	OFF	ON
A2	OFF	ON*	ON	OFF	OFF	ON
B1	OFF	OFF	ON	OFF	ON	ON*
B2	OFF	OFF	ON*	OFF	ON	ON
UNIT	Capacity 48/50A			Capacity 48/50A		
036	0%	48%	100%	0%	52%	100%
041	0%	43%	100%	0%	57%	100%
051	0%	46%	100%	0%	54%	100%

*Compressor start is delay 10 seconds from other compressor.

ALTITUDE COMPENSATION

ELEVATION (ft)	NATURAL GAS ORIFICE DRILL BIT SIZE*	LIQUID PROPANE ORIFICE DRILL BIT SIZE*
0-2,000	31	41
2,001- 3,000	32	3/32"
3,001- 4,000	33	43
4,001- 5,000	33	43
5,001- 6,000	34	44
6,001- 7,000	36	44
7,001- 8,000	36	45
8,001- 9,000	37	45
9,001-10,000	38	45
10,001-11,000	39	47
11,001-12,000	40	5/64"
12,001-13,000	41	48
13,001-14,000	3/32"	49

*Orifices available through your local Carrier distributor.

CAPACITY CONTROL STAGING OPTIONS TABLE B
VAV AND ADAPTIVE CV STAGING SEQUENCE WITHOUT HOT GAS BYPASS

STAGE	SEQUENCE 1						SEQUENCE 2					
	0	1	2	3	4	5	0	1	2	3	4	5
COMP	Compressor Status						Compressor Status					
A1	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	ON	ON	ON
A2	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	OFF	ON	ON
B1	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Capacity 48/50A						Capacity 48/50A					
036	0%	22%	48%	52%	74%	100%	0%	26%	48%	48%	74%	100%
041	0%	21%	43%	50%	71%	100%	0%	21%	42%	50%	72%	100%
051	0%	23%	46%	45%	68%	100%	0%	23%	45%	45%	68%	100%

CAPACITY CONTROL STAGING OPTIONS TABLE C
VAV AND ADAPTIVE CV STAGING SEQUENCE WITH HOT GAS BYPASS STAGING SEQUENCE

STAGE	SEQUENCE 1						SEQUENCE 2						
	0	1	2	3	4	5	0	1	2	3	4	5	6
COMP	Compressor Status						Compressor Status						
A1	OFF	ON*	ON	ON	OFF	ON	OFF	OFF	OFF	ON	ON	ON	ON
A2	OFF	OFF	OFF	ON	ON	ON	OFF	ON*	ON	ON	OFF	ON	ON
B1	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON
B2	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
UNIT	Capacity 48/50A						Capacity 48/50A						
036	0%	12%	22%	48%	52%	74%	0%	16%	26%	48%	48%	74%	100%
041	0%	13%	21%	43%	50%	71%	0%	13%	21%	42%	50%	72%	100%
051	0%	16%	23%	46%	45%	68%	0%	16%	23%	45%	45%	68%	100%

*Hot gas bypass activated.

Physical data (gas heating units)



UNIT 48AJ,AK,AW,AY	036D/E			041D/E			051D/E			
NOMINAL CAPACITY (tons)	35			40			50			
BASE UNIT OPERATING WEIGHT (lb)	See Unit Weights Table									
COMPRESSOR	R-22									
Quantity...Type (Ckt 1, Ckt 2)	1...SR*812AT, 1...SR*942AT/ 2...SR*942AT			2...SR*942AT/2...SM125			2...SM125/2...SM125			
Number of Refrigerant Circuits	2			2			2			
Oil (oz) (Ckt 1, Ckt 2)	Precharged			Precharged			Precharged			
REFRIGERANT TYPE	R-22									
Operating Charge (lb-oz)	36-0			47-0			102-0			
Circuit 1	51-0			47-0			102-0			
Circuit 2										
CONDENSER COIL*	Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins									
Quantity	2			2			2			
Rows...Fins/in.	2...15/4...15			4...15/4...15			4...15			
Total Face Area (sq ft)	66.7			66.7			100			
CONDENSER FAN	Propeller Type									
Nominal Cfm	30,000			30,000			38,400			
Quantity...Diameter (in.)	4...30			4...30			6...30			
Motor Hp	1			1			1			
EVAPORATOR COIL	Cross-Hatched Copper Tubes, Aluminum Plate Fins									
Tube Size (in.)	1/2			1/2			1/2			
Rows...Fins/in.	4...17			4...17			4...17			
Total Face Area (sq ft)	31.3			31.3			48.1			
EVAPORATOR FAN	Centrifugal Type									
Quantity...Size (in.)	2...20 X 15			2...20 X 15			3...20 X 15			
Type Drive	Belt			Belt			Belt			
Nominal Cfm	14,400			16,000			20,400			
Motor Hp	15	20	25	15	20	25	20	25	30	40
Motor Frame Size	254T	256T	284T	254T	256T	284T	256T	284T	286T	324T
Motor Bearing Type	Ball			Ball			Ball			
Maximum Allowable Rpm	1300			1300			1200			
Motor Pulley Pitch Diameter	5.3	5.7	7.5	5.3	5.7	7.5	5.9	5.3	5.9	6.5
Nominal Motor Shaft Diameter (in.)	1 5/8	1 5/8	1 7/8	1 5/8	1 5/8	1 7/8	1 5/8	1 7/8	1 7/8	2 1/8
Fan Pulley Pitch Diameter (In.)	9.5	9.5	11.1	9.5	9.5	11.1	11.1	9.1	9.5	9.5
Nominal Fan Shaft Diameter (in.)	1 15/16			1 15/16			1 15/16			
Belt Quantity	2	2	2	2	2	2	2	3	3	3
Belt Type	5VX530	5VX550	5VX590	5VX530	5VX550	5VX590	5VX560	5VX530	5VX550	5VX570
Belt Length (in.)	53	55	59	53	55	59	56	53	55	57
Pulley Center Line Distance (in.)	15.0-17.9	15.0-17.9	14.6-17.6	15.0-17.9	15.0-17.9	14.6-17.6	15.0-17.9	15.2-17.5	14.7-17.2	14.2-17.0
Factory Speed Setting (rpm)	976	1050	1182	976	1050	1182	930	1019	1087	1197
FURNACE SECTION										
Rollout Switch Cutout Temp (F)†	225			225			225			
Burner Orifice Diameter (in. ...drill size)										
Natural Gas	.120...31			.120...31			.120...31			
Liquid Propane	.096...41			.096...41			.096...41			
Thermostat Heat Anticipator Setting										
Stage 1 (amps)	0.1			0.1			0.1			
Stage 2 (amps)	0.1			0.1			0.1			
Gas Input (Btuh) Stage 1	300,000/600,000			300,000/600,000			582,000/873,000			
Stage 2	400,000/800,000			400,000/800,000			776,000/1,164,000			
Efficiency (Steady State) (%)	82			82			82			
Temperature Rise Range	10-40/30-60			10-40/30-60			10-40/30-60			
Manifold Pressure (in. wg)										
Natural Gas Std	3.5			3.5			3.3			
Liquid Propane Alt	3.5			3.5			3.3			
Gas Valve Quantity	2			2			3			
HIGH-PRESSURE SWITCH (psig)										
Cutout	426			426			426			
Reset (Auto.)	320			320			320			
RETURN-AIR FILTERS										
Quantity...Size (in.)	10...20 x 24			10...20 x 24			16...20 x 24			

LEGEND

- Al — Aluminum
- Cu — Copper

*Circuit 1 uses the left condenser coil, Circuit 2 the right. All units have intertwined evaporator coils.
 †Rollout switch is manual reset.

Physical data (electric heating units)



UNIT 50AJ,AK,AW,AY	036	041	051
NOMINAL CAPACITY (tons)	35	40	50
BASE UNIT OPERATING WEIGHT (lb)	See Unit Weights Table		
COMPRESSOR	R-22		
Quantity...Type (Ckt 1, Ckt 2)	1...SR*812AT, 1...SR*942AT/ 2...SR*942AT	2...SR*942AT/2...SM125	2...SM125/2...SM125
Number of Refrigerant Circuits	2	2	2
Oil (oz) (Ckt 1, Ckt 2)	Precharged	Precharged	Precharged
REFRIGERANT TYPE	R-22		
Operating Charge (lb-oz)			
Circuit 1	36-0	47-0	102-0
Circuit 2	51-0	47-0	102-0
CONDENSER COIL*	Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins		
Quantity	2	2	2
Rows...Fins/in.	2...15/4...15	4...15/4...15	4...15
Total Face Area (sq ft)	66.7	66.7	100
CONDENSER FAN	Propeller Type		
Nominal Cfm	30,000	30,000	38,400
Quantity...Diameter (in.)	4...30	4...30	6...30
Motor Hp	1	1	1
EVAPORATOR COIL	Cross-Hatched Copper Tubes, Aluminum Plate Fins		
Tube Size (in.)	1/2	1/2	1/2
Rows...Fins/in.	4...17	4...17	4...17
Total Face Area (sq ft)	31.3	31.3	48.1
EVAPORATOR FAN	Centrifugal Type		
Quantity...Size (in.)	2...20 X 15	2...20 X 15	3...20 X 15
Type Drive	Belt	Belt	Belt
Nominal Cfm	14,400	16,000	20,400
Motor Hp	15 20 25	15 20 25	20 25 30 40
Motor Frame Size	254T 256T 284T	254T 256T 284T	256T 284T 286T 324T
Motor Bearing Type	Ball	Ball	Ball
Maximum Allowable Rpm	1300	1300	1200
Motor Pulley Pitch Diameter	5.3 5.7 7.5	5.3 5.7 7.5	5.9 5.3 5.9 6.5
Nominal Motor Shaft Diameter (in.)	1 5/8 1 5/8 1 7/8	1 5/8 1 5/8 1 7/8	1 5/8 1 7/8 1 7/8 2 1/8
Fan Pulley Pitch Diameter (in.)	9.5 9.5 11.1	9.5 9.5 11.1	11.1 9.1 9.5 9.5
Nominal Fan Shaft Diameter (in.)	2 2 2	2 2 2	2 3 3 3
Belt Quantity	2	2	1 15/16
Belt Type	5VX530 5VX550 5VX590	5VX530 5VX550 5VX590	5VX560 5VX530 5VX550 5VX570
Belt Length (in.)	53 55 59	53 55 59	56 53 55 57
Pulley Center Line Distance (in.)	15.0-17.9 15.0-17.9 14.6-17.6	15.0-17.9 15.0-17.9 14.6-17.6	15.0-17.9 15.2-17.5 14.7-17.2 14.2-17.0
Factory Speed Setting (rpm)	976 1050 1182	976 1050 1182	930 1019 1087 1197
HIGH-PRESSURE SWITCH (psig)	426		
Cutout	426	426	426
Reset (Auto.)	320	320	320
RETURN-AIR FILTERS	16...20 x 24		
Quantity...Size (in.)	10...20 x 24	10...20 x 24	16...20 x 24

LEGEND

Al — Aluminum
Cu — Copper

*Circuit 1 uses the left condenser coil, Circuit 2 the right. All units have intertwined evaporator coils.

Physical data (cont)



48/50A036-051 UNIT WEIGHTS

BASE UNIT WEIGHTS (Outdoor Air Hoods/Filters/Economizer Included, Indoor Fan Motor NOT Included)

UNIT	036	041	051
48AJD,AKD	4815	5091	7224
48AJE,AKE	4975	5251	7464
48AWD,AYD	4855	5131	7264
48AWE,AYE	5015	5291	7514
50AJ,AK	4500	4776	6984
50AW,AY	4693	4969	7199
OPTIONS/ACCESSORIES — WEIGHT ADDERS			
Barometric Relief	300	300	450
Non-Modulating Power Exhaust	450	450	675
Modulating Power Exhaust	500	500	725
Electric Heat	110	110	165
Cu. Tube/Cu. Fin Cond. Coil	380	380	651
Outdoor Air Hood Crate/Packaging (Less Hoods' Weight)	45	45	45
Outdoor Air Hoods/Filters	170	170	255
Hail Guards	146	146	219
Roof Curb	410	410	540

NOTES:

1. **Base unit weight** including outdoor air hoods (economizer or outdoor air damper) **does not** include an indoor fan motor. ADD indoor motor, FIOPs and accessories for TOTAL operating weight.
2. **VAV motor weights** include the indoor motor **and** the VFD, compressor electric unloaders, VFD transducer and associated wiring.

CV MOTOR WEIGHTS (lb)

MOTOR HP	UNIT VOLTAGE	STANDARD EFFICIENCY IFM	HIGH EFFICIENCY IFM
15 HP	230/380/460	150	217
	575	150	220
20 HP	230/380/460	212	250
	575	212	258
25 HP	230/380/460	240	309
	575	240	319
30 HP	230/380/460	283	355
	575	283	359
40 HP	230/380/460	372	415
	575	372	410

VAV MOTOR WEIGHTS (lb)

MOTOR HP	UNIT VOLTAGE	STANDARD EFFICIENCY IFM	HIGH EFFICIENCY IFM
15 HP	230/380/460	238	305
	575	240	310
20 HP	230/380/460	348	386
	575	304	350
25 HP	230/380/460	377	446
	575	375	454
30 HP	230/380/460	480	552
	575	418	494
40 HP	230/380/460	637	680
	575	587	625

**48/50AJ,AW CONSTANT VOLUME UNITS
RIGGING WEIGHTS, CENTER OF GRAVITY AND CORNER WEIGHTS**

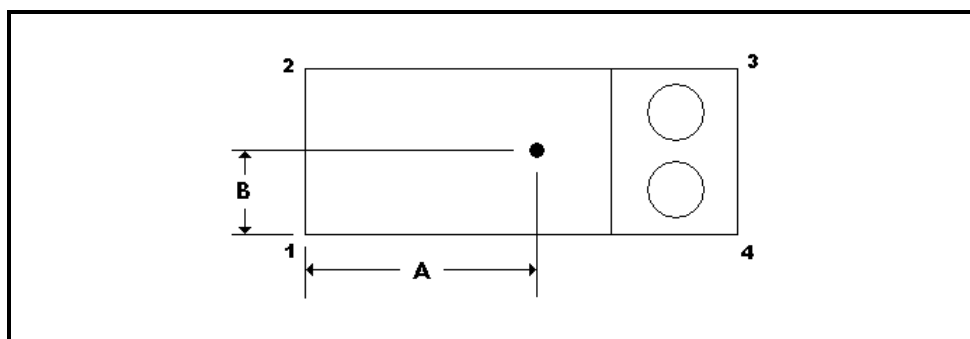
UNIT	UNIT WEIGHT (lb)	CENTER OF GRAVITY (in.)		CORNER WEIGHT (lb)			
		A	B	1	2	3	4
50AJ036	5474	121.6	42.7	1225	1152	1501	1596
48AJD036	5679	120.2	42.2	1304	1201	1522	1652
48AJE036	5459	118.7	41.9	1282	1163	1434	1580
50AW036	5167	121.7	42.6	1156	1086	1416	1508
48AWD036	5219	120.2	42.2	1198	1104	1399	1519
48AWE036	5379	118.7	41.9	1263	1146	1413	1557
50AJ041	5750	126.0	42.4	1233	1147	1624	1745
48AJD041	5955	124.5	42.0	1311	1197	1645	1802
48AJE041	6115	122.9	41.7	1378	1240	1656	1841
50AW041	5443	125.9	42.4	1169	1086	1536	1652
48AWD041	5495	124.4	42.0	1210	1104	1518	1663
48AWE041	5655	122.9	41.7	1275	1147	1531	1702
50AJ051	8334	185.3	43.4	1710	1663	2446	2515
48AJD051	8409	178.1	41.4	1907	1690	2261	2551
48AJE051	8649	171.1	39.3	2155	1741	2123	2629
50AW051	7824	185.4	43.4	1604	1560	2297	2362
48AWD051	7724	178.1	41.4	1751	1553	2077	2343
48AWE051	7974	171.1	39.3	1987	1605	1958	2424

NOTE: The weight distribution and center of gravity information are representative of a standard unit and include the impact of factory-installed economizer, largest IFM motor, modulating power exhaust (on 48/50AJ only) and electric heat (on 50A only).

**48/50AK,AY VARIABLE AIR VOLUME UNITS
RIGGING WEIGHTS, CENTER OF GRAVITY AND CORNER WEIGHTS**

UNIT	UNIT WEIGHT (lb)	CENTER OF GRAVITY (in.)		CORNER WEIGHT (lb)			
		A	B	1	2	3	4
50AK036	5609	121.6	42.7	1256	1181	1538	1635
48AKD036	5814	120.2	42.2	1335	1230	1558	1691
48AKE036	5974	118.7	41.9	1403	1273	1569	1729
50AY036	5302	121.7	42.6	1187	1114	1453	1548
48AYD036	5354	120.2	42.2	1229	1132	1435	1558
48AYE036	5514	118.7	41.9	1295	1175	1448	1596
50AK041	5885	126.0	42.4	1262	1174	1662	1786
48AKD041	6090	124.5	42.0	1341	1224	1682	1843
48AKE041	6250	122.9	41.7	1409	1267	1693	1881
50AY041	5578	125.9	42.4	1198	1113	1574	1693
48AYD041	5630	124.4	42.0	1240	1131	1555	1704
48AYE041	5790	122.9	41.7	1305	1174	1568	1743
50AK051	8599	185.3	43.4	1764	1716	2524	2595
48AKD051	8674	178.1	41.4	1967	1744	2332	2631
48AKE051	8914	171.1	39.3	2222	1794	2188	2710
50AY051	8089	185.4	43.4	1659	1613	2375	2442
48AYD051	7989	178.1	41.4	1812	1606	2148	2423
48AYE051	8239	171.1	39.3	2053	1658	2023	2505

NOTE: The weight distribution and center of gravity information are representative of a standard unit and include the impact of factory-installed economizer, largest IFM motor and VFD, modulating power exhaust (on 48/50AK only) and electric heat (on 50A only).



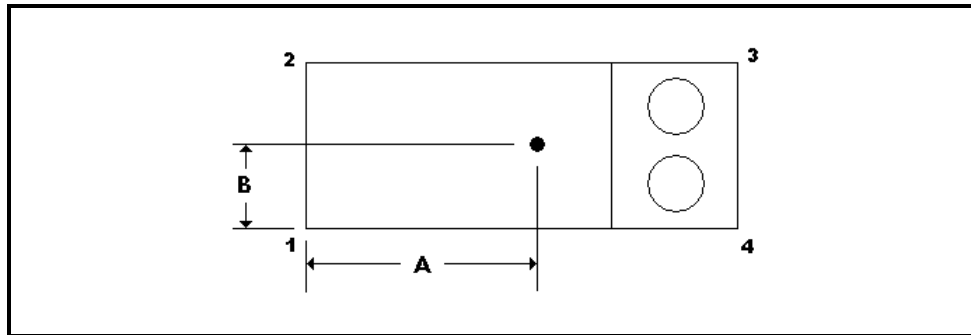
Physical data (cont)



FIOP AND ACCESSORY CORNER WEIGHT ADJUSTMENTS

UNIT	WEIGHT (lb)	INCHES		LB			
		A	B	1	2	3	4
48/50A036,041							
Barometric Relief	300	62.0	87.0	2	211	86	1
Non-Mod. Power Exhaust	450	62.0	87.0	4	317	128	1
Mod. Power Exhaust	500	62.0	87.0	4	352	143	2
Electric Heat	110	62.0	13.0	67	12	5	27
CU/CU Cond. Coil	380	169.0	44.0	41	41	149	149
Hail Guards	146	214.0	44.0	0	0	73	73
48/50A051							
Barometric Relief	450	88.0	87.0	4	319	126	1
Non-Mod. Power Exhaust	675	88.0	87.0	6	479	189	2
Mod. Power Exhaust	725	88.0	87.0	6	514	203	2
Electric Heat	165	88.0	13.0	101	17	7	40
CU/CU Cond.Coil	651	245.0	44.0	69	69	256	256
Hail Guards	219	310.0	44.0	0	0	109	109

NOTE: See the notes below the base unit tables to determine what FIOPs have been included in the base weights, then add or subtract above weights as necessary.



Options and accessories



ITEM	FACTORY-INSTALLED OPTIONS				FIELD-INSTALLED ACCESSORIES			
	AJ	AK	AW	AY	AJ	AK	AW	AY
GAS HEAT OPTIONS (48A Only)								
Low Gas Heat - Aluminized	X	X	X	X				
High Gas Heat - Aluminized	X	X	X	X				
Low Gas Heat - Stainless Steel	X	X	X	X				
High Gas Heat - Stainless Steel	X	X	X	X				
Staged Gas Heat - Low - Stainless Steel	X	X	X	X				
Staged Gas Heat - High - Stainless Steel	X	X	X	X				
LP Conversion Kit					X	X	X	X
ELECTRIC HEAT (50A Only)								
Low Electric Heat	X	X	X	X				
High Electric heat	X	X	X	X				
INDOOR AIR QUALITY								
2-inch Filters	X	X	X	X				
4-inch Filters	X	X	X	X				
Return Air CO ₂ Sensor	X	X	X	X	X	X	X	X
CO ₂ Space Sensor					X	X	X	X
CO ₂ Aspirator Box					X	X	X	X
ECONOMIZER								
Manual Outside Air Self-Closing Damper	X	X	X	X				
Modulating Economizer 3-Position Damper	X	X	X	X				
Outdoor or Return Humidity Sensor (Enthalpy)					X	X	X	X
EXHAUST AIR CONTROL								
Barometric Relief	X	X			X	X	X	X
Non-Modulating Power Exhaust	X				X	X	X	X
Modulating Power Exhaust and Static Sensor	X	X			X	X	X	X
Supply and Building Pressure Control Board (ECB2)					X	X	X	X
Build Pressure Control Sensor					X	X	X	X
CONDENSER AND EVAPORATOR COIL OPTIONS								
Al/Cu Cond and Evap	X	X	X	X				
Al/Cu Pre-Coat Cond and Al/Cu Evap (E option)	X	X	X	X				
Al/Cu E-Coat Cond and Al/Cu Evap (F option)	X	X	X	X				
Cu/Cu Cond and Al/Cu Evap (C option)	X	X	X	X				
Hot Gas Bypass - Circuit A (requires ECB2)	X	X	X	X				
Condenser Coil Hail Guard Assembly					X	X	X	X
Galvanized Drain Pan	X	X	X	X				
Stainless Drain Pan	X	X	X	X				
CONTROLS								
Controls Option Board	X	X	X	X	X	X	X	X
Enhanced Display					X	X	X	X
Navigator™ Display					X	X	X	X
Return Air CO ₂ Sensor	X	X	X	X	X	X	X	X
Return Air Smoke Detector	X	X	X	X				
Supply Smoke Detector					X	X	X	X
Filter Switch	X	X	X	X	X	X	X	X
Fan Status Switch (requires options board)					X	X	X	X
T55 Thermostat					X	X	X	X
T56 Thermostat					X	X	X	X
T58 Sensor					X	X	X	X
Space Temperature Sensor with CO ₂ Override					X	X	X	X
Space Temperature Sensor Setpoint and CO ₂ Override					X	X	X	X
Remote Enhanced Display					X	X	X	X
Thermostats (Temp System)					X		X	
Thermostats (Debonair®)					X		X	
Thermostats (Slimline)					X		X	
Thermostats (Corporate)					X		X	
Dataport™ Control Panel Assembly (one-way ready interface)					X	X	X	X
Datalink™ Control Panel Assembly (two-way read write interface)					X	X	X	X
BACnet™/MODBUS Carrier Translator					X	X	X	X
LONWORKS® Carrier Translator					X	X	X	X
POWER CIRCUIT								
GFI Convenience Outlet (powered)	X	X	X	X				
GFI Convenience Outlet (not powered)	X	X	X	X				
Power Terminal Block	X	X	X	X				
Non-Fused Disconnect	X	X	X	X				
INDOOR MOTOR OPTIONS								
Low HP, Std Eff	X	X	X	X				
Medium HP, Std Eff	X	X	X	X				
High HP, Std Eff	X	X	X	X				
Low HP, High Eff	X	X	X	X				
Medium HP, High Eff	X	X	X	X				
High HP, High Eff	X	X	X	X				
PACKAGING								
Domestic	X	X	X	X				
Export	X	X	X	X				
MISCELLANEOUS OPTIONS								
Roof Curb Adapter Kit					X	X	X	X
14-inch Roof Curb					X	X	X	X
Motormaster® V Control					X	X	X	X

LEGEND

- Al — Aluminum
- Cu — Copper
- GFI — Ground Fault Circuit Interrupter
- LP — Liquid Propane
- VFD — Variable Frequency Drive

Base unit dimensions — 48AJ,AK036,041



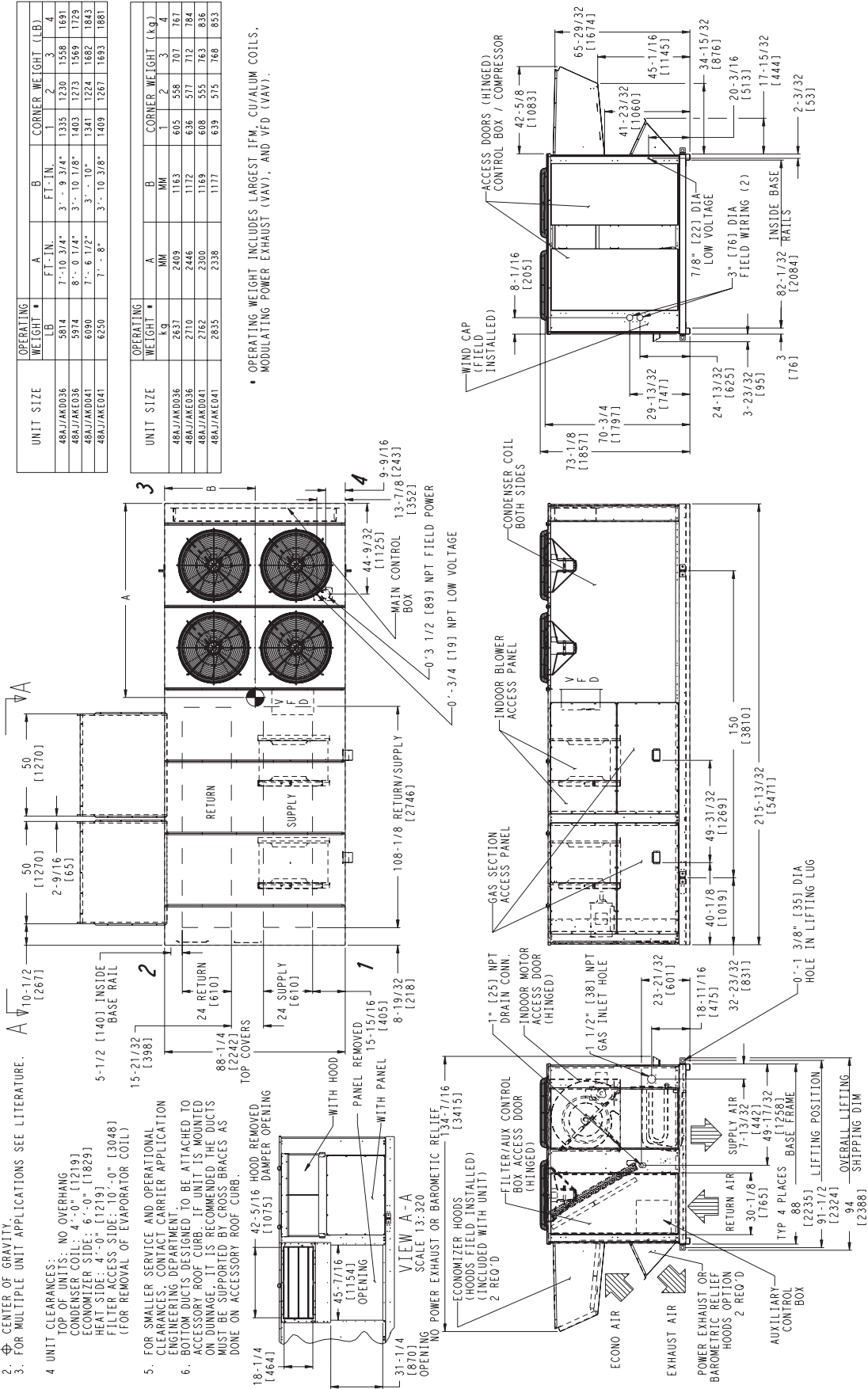
- NOTES:
- WEIGHTS INCLUDE ECONOMIZER.
 - CENTER OF GRAVITY.
 - FOR MULTIPLE UNIT APPLICATIONS SEE LITERATURE.
 - UNIT CLEARANCES:

- TOP OF UNITS: NO OVERHANG
 - CONDENSER COIL: 4'-0" [1219]
 - ECONOMIZER SIDE: 6'-0" [1829]
 - HEAT SIDE: 4'-0" [1219]
 - FILTER ACCESS SIDE: 10'-0" [3048] (FOR REMOVAL OF EVAPORATOR COIL)
- 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 MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.

UNIT SIZE	OPERATING WEIGHT *		CORNER WEIGHT (LB)	
	LB	KG	1	2
48AJ/AK036	5814	2637	1335	1558
48AJ/AK036	5974	2710	1403	1569
48AJ/AK041	6090	2762	1341	1682
48AJ/AK041	6250	2835	1409	1693

UNIT SIZE	OPERATING WEIGHT *		CORNER WEIGHT (kg)	
	MM	KG	MM	KG
48AJ/AK036	2409	2637	605	707
48AJ/AK036	2446	2710	636	712
48AJ/AK041	2300	2762	608	763
48AJ/AK041	2338	2835	639	768

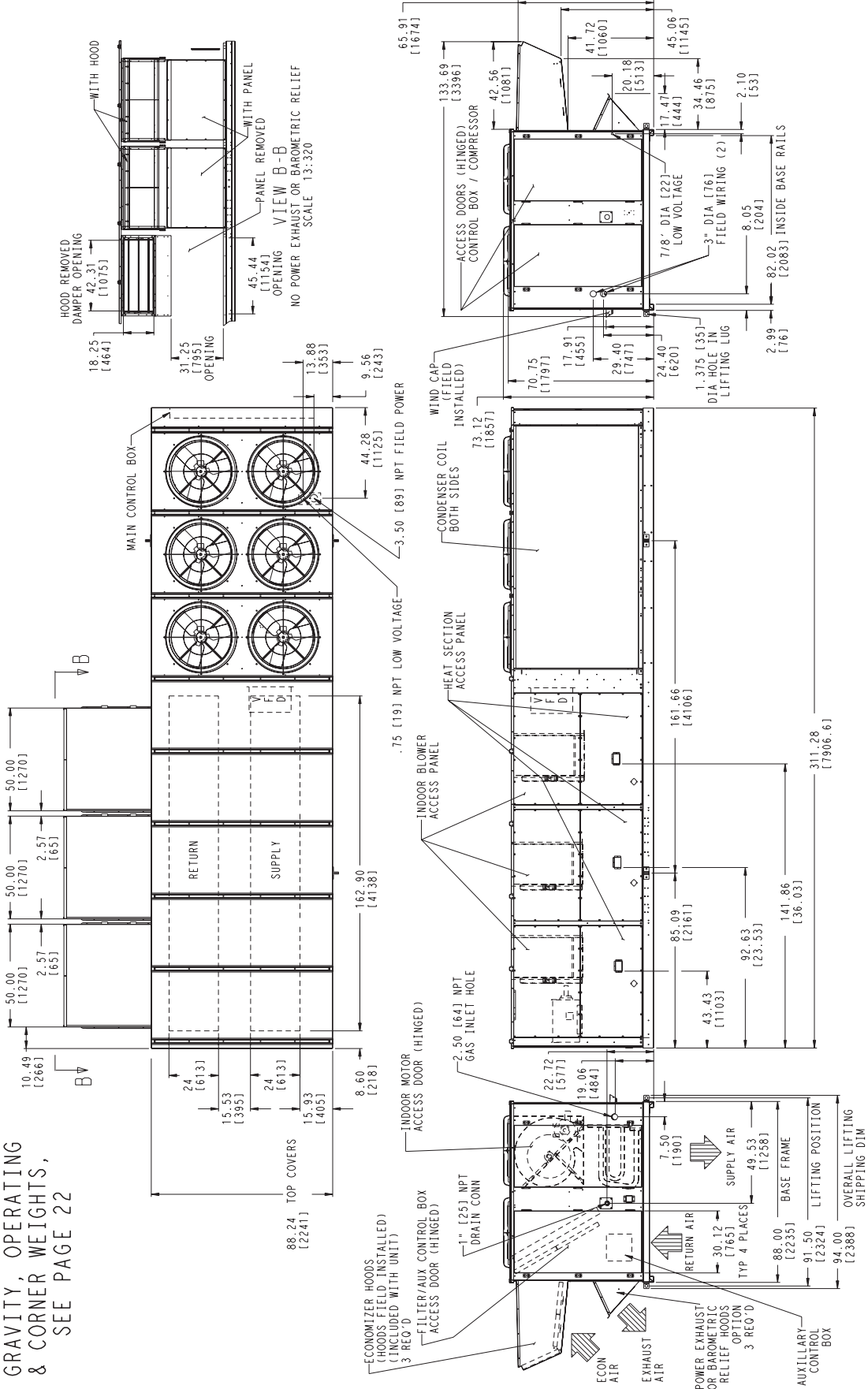
* OPERATING WEIGHT INCLUDES LARGEST IFM, CU/ALUM COILS, MODULATING POWER EXHAUST (VAV), AND VFD (VAV).



Base unit dimensions — 48AJ,AK051



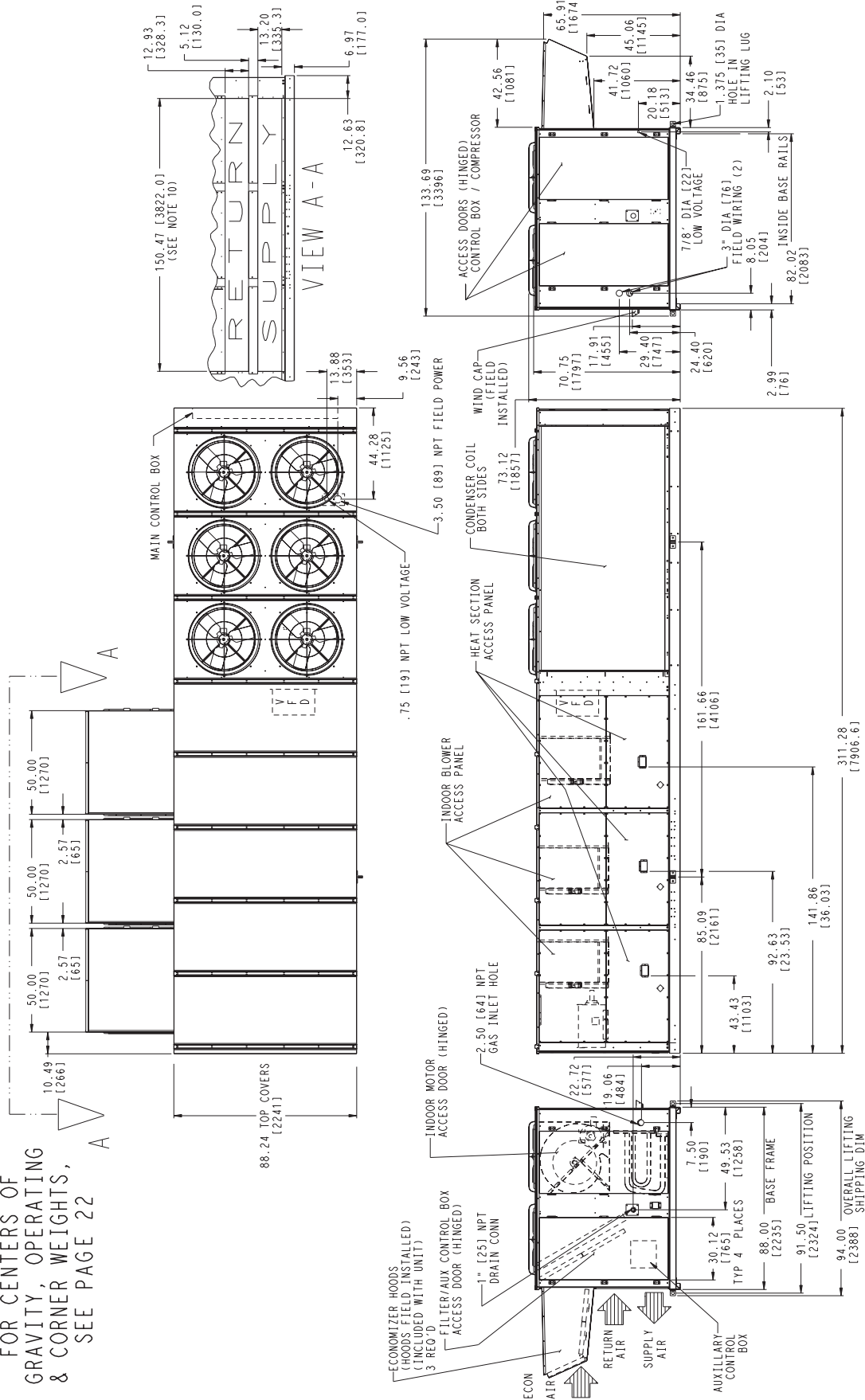
FOR CENTERS OF GRAVITY, OPERATING & CORNER WEIGHTS, SEE PAGE 22



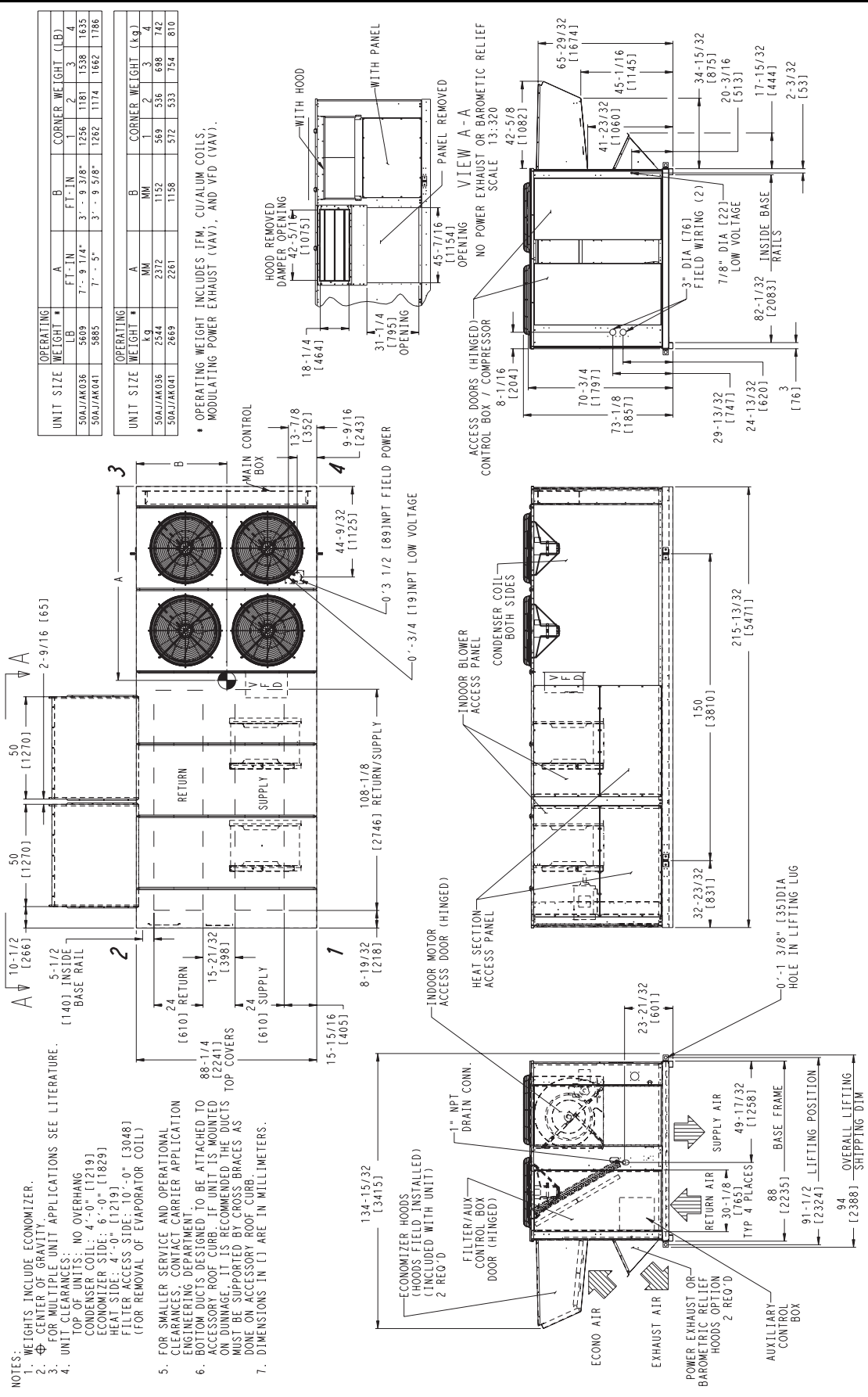
Base unit dimensions — 48AW,AY051



FOR CENTERS OF GRAVITY, OPERATING & CORNER WEIGHTS, SEE PAGE 22

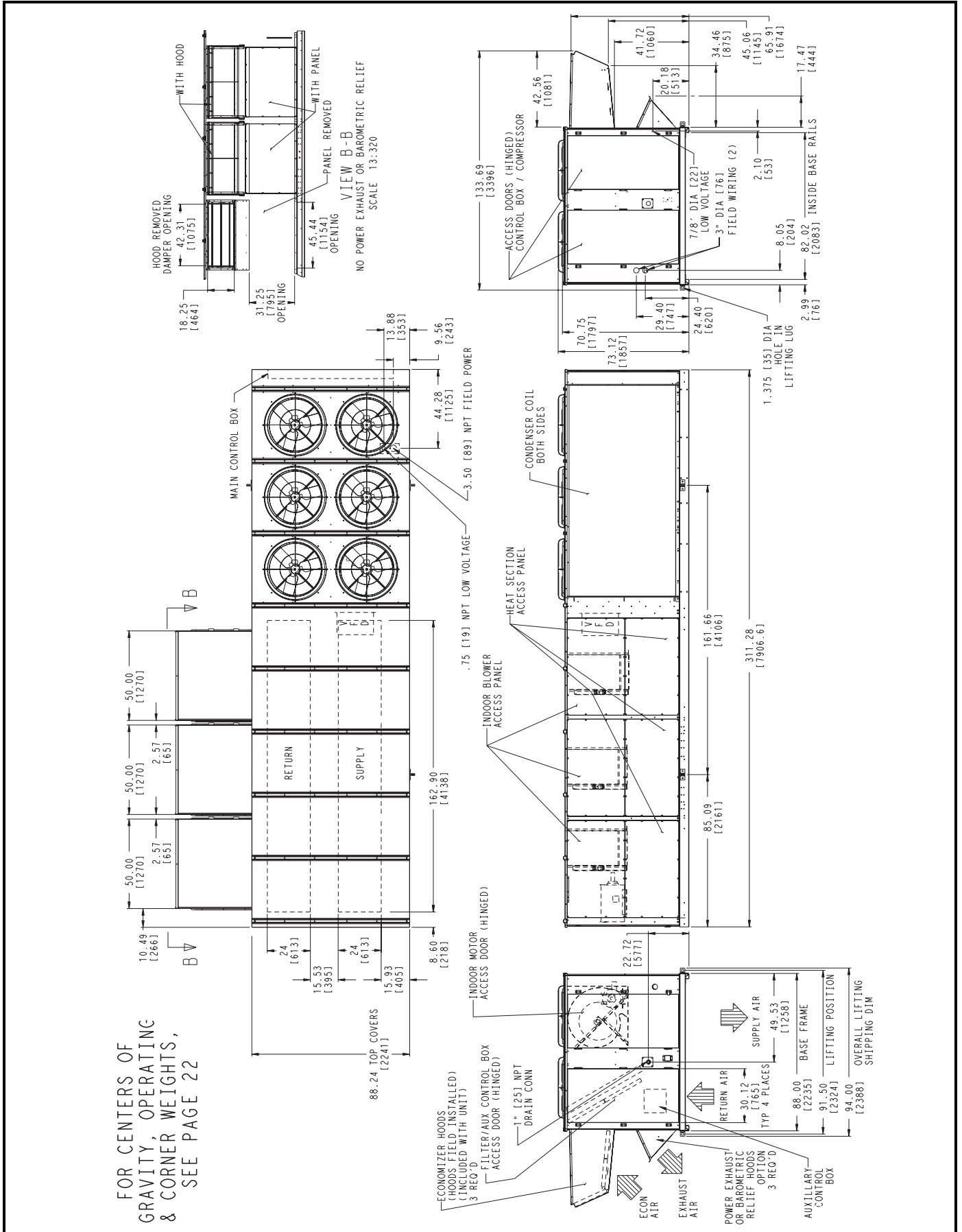


Base unit dimensions — 50AJ,AK036,041



- NOTES:**
- WEIGHTS INCLUDE ECONOMIZER.
 - CENTER OF GRAVITY.
 - FOR MULTIPLE UNIT APPLICATIONS SEE LITERATURE.
 - UNIT CLEARANCES:
TOP OF UNITS: NO OVERHANG
CONDENSER COIL: 4'-0" [1219]
ECONOMIZER SIDE: 6'-0" [1829]
HEAT SIDE: 4'-0" [1219]
FILTER ACCESS SIDE: 10'-0" [3048]
(FOR REMOVAL OF EVAPORATOR COIL)
 - 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 TOP COVERS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
 - DIMENSIONS IN [] ARE IN MILLIMETERS.

Base unit dimensions — 50AJ,AK051



Base unit dimensions — 50AW,AY036,041

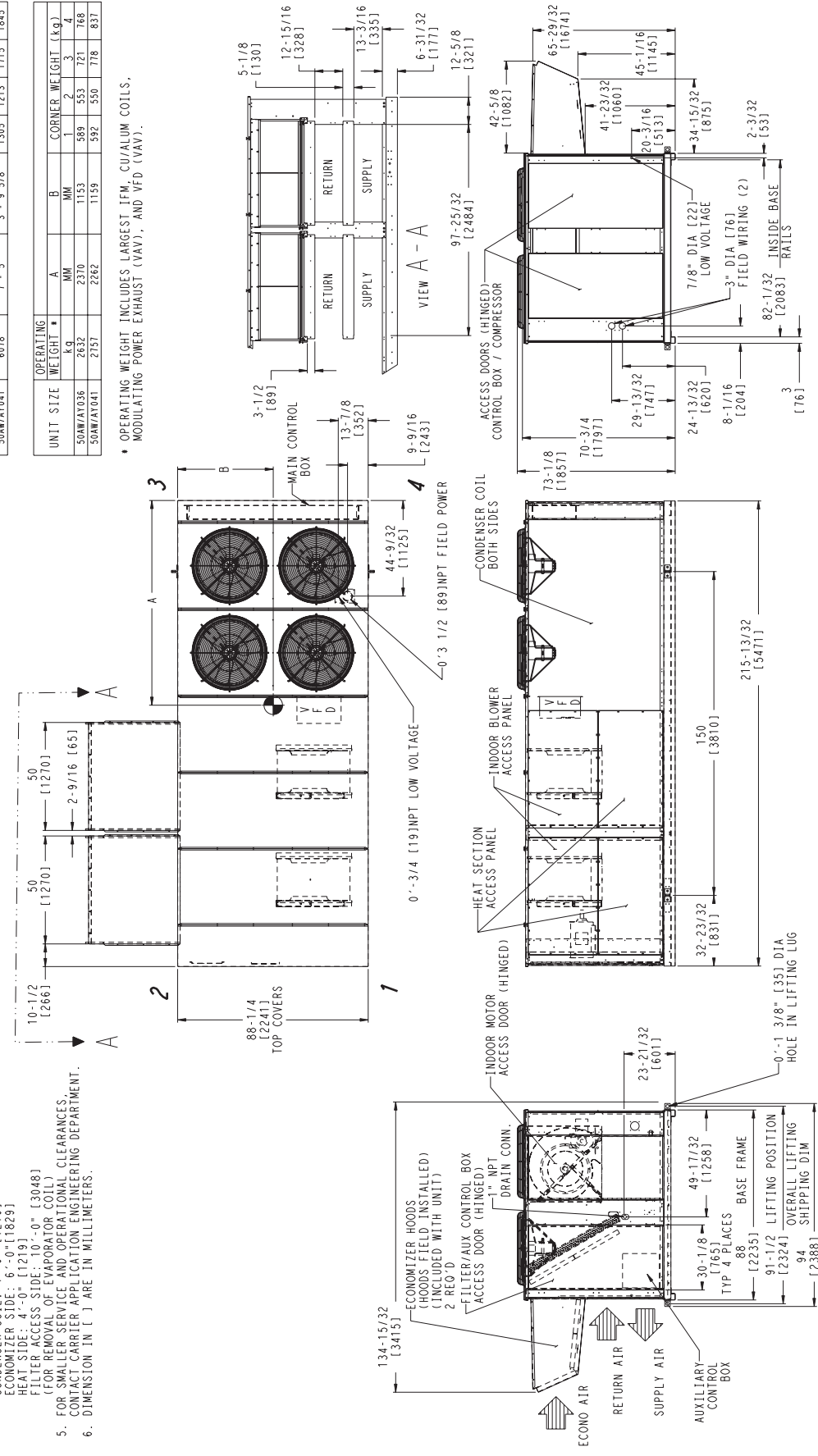


- NOTES:
- WEIGHTS INCLUDE ECONOMIZER.
 - ⊕ CENTER OF GRAVITY.
 - FOR MULTIPLE UNIT APPLICATION SEE LITERATURE.
 - UNIT CLEARANCES:
TOP OF UNITS: NO OVERHANG
ECONOMIZER COIL: 4'-0" (1219)
CONDENSER COIL: 4'-0" (1219)
HEAT SECTION: 6'-0" (1829)
HEAT SIDE: 0" (1219)
FILTER ACCESS SIDE: 0" (1219)
FILTER ACCESS SIDE: 0" (1219)
(FOR REMOVAL OF EVAPORATOR COIL)
 - FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
 - DIMENSION IN [] ARE IN MILLIMETERS.

UNIT SIZE	OPERATING WEIGHT *		CORNER WEIGHT (LB.)	
	LB.	KG.	FT.-IN.	MM.
50AWAY036	5802	2632	7'-9 3/8"	2370
50AWAY041	6018	2757	7'-9 5/8"	2382

UNIT SIZE	OPERATING WEIGHT *		CORNER WEIGHT (kg.)	
	kg.	MM.	MM.	MM.
50AWAY036	2632	2370	1153	589
50AWAY041	2757	2382	1159	592

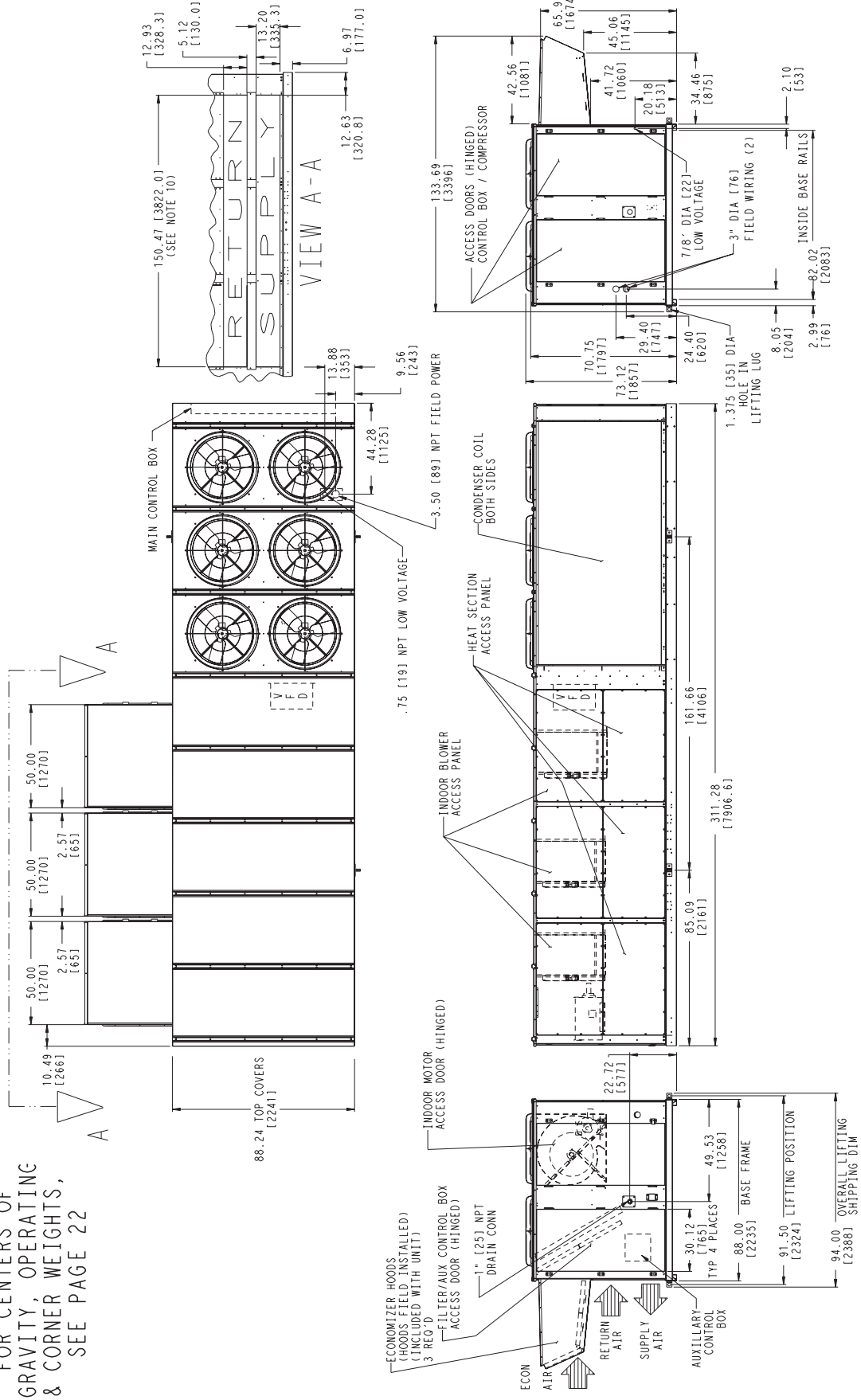
* OPERATING WEIGHT INCLUDES LARGEST I/FW, CU/ALUM COILS, MODULATING POWER EXHAUST (VAV), AND VFD (VAV).



Base unit dimensions — 50AW,AY051



FOR CENTERS OF GRAVITY, OPERATING & CORNER WEIGHTS, SEE PAGE 22



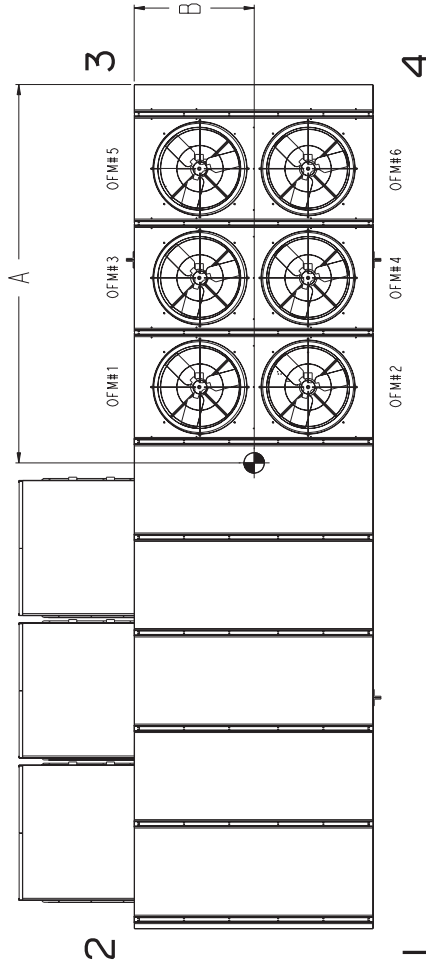
Base unit dimensions — 48/50AJ,AK,AW,AY051



- NOTES:
- WEIGHTS INCLUDE ECONOMIZER OR OUTDOOR AIR DAMPER.
 - ☉ CENTER OF GRAVITY.
 - FOR MULTIPLE UNIT APPLICATIONS SEE LITERATURE.
 - UNIT CLEARANCES:
TOP OF UNITS: NO OVERHANG
CONDENSER COIL: 4'-0" [1219]
ECONOMIZER SIDE: 6'-0" [1829]
HEAT SIDE: 4'-0" [1219]
FILTER ACCESS SIDE: 15'-0" [4572]
(FOR REMOVAL OF EVAPORATOR COIL)
 - 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 MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
 - BASE UNIT WEIGHTS INCLUDE OUTDOOR AIR HOODS, AND FILTERS (INDOOR FAN MOTOR IS NOT INCLUDED). ADD INDOOR MOTOR, FLOPS AND ACCESSORIES FOR TOTAL OPERATING WEIGHT.
 - VFD TRANSUCER AND ASSOCIATED WIRING.
 - FOR SIDE-SUPPLY/RETURN APPLICATIONS, A SINGLE RETURN AND SUPPLY DUCTWORK CONNECTION IS RECOMMENDED FOR COVERING ALL THREE RETURN AND ALL THREE SUPPLY OPENINGS. THE ENTIRE AREA AROUND THE DUCT OPENINGS IS AVAILABLE FOR A 1.5" DUCT FLANGE ATTACHMENT.

BASE UNIT WEIGHTS (SEE NOTE 7)	
LB (kg)	051
48AJD/AKD	7224 (3277)
48AJE/AKE	7464 (3386)
48AWD/AYD	7264 (3295)
48AWE/AYE	7514 (3408)
50AJ/AK	6984 (3168)
50AW/AY	7199 (3265)
OPTIONS / ACCESSORIES (SEE NOTE 7)	
BAROMETRIC RELIEF	450 (204)
NON MOD. POWER EXHAUST	675 (306)
MOD. POWER EXHAUST	725 (329)
ELECTRIC HEAT	165 (75)
CU.FIN COND COIL	651 (295)

UNIT SIZE	CENTER OF GRAVITY		% OF TOTAL WEIGHT AT EACH CORNER					
	FT.-IN.		MILLIMETERS		1	2	3	4
	A	B	A	B				
48AJD/AKD 051 48AWD/AYD 051	11'- 1 1/4"	3'- 10 5/8"	3383	1185	22.7	20.1	26.9	30.3
48AJE/AKE 051 48AWE/AYE 051	11'- 8 1/4"	4'- 0 5/8"	3562	1237	24.9	20.1	24.6	30.4
50AJ/AK 051 50AW/AY 051	10'- 6"	3'- 8 5/8"	3200	1133	20.5	19.9	29.4	30.2



	CV MOTOR WEIGHTS LB. (kg)	PREMIUM EFFC-Y IFM		HIGH EFFC-Y IFM		PREMIUM EFFC-Y IFM		
		240 (109)	309 (140)	319 (145)	377 (171)	375 (170)	448 (202)	454 (206)
25 HP (18.65 kW)	230/460 575	240 (109)	309 (140)	319 (145)	377 (171)	375 (170)	448 (202)	454 (206)
30 HP (22.38 kW)	230/460 575	283 (128)	355 (161)	359 (163)	418 (190)	418 (190)	552 (250)	552 (250)
40 HP (29.84 kW)	230/460 575	372 (169)	415 (188)	415 (188)	637 (289)	637 (289)	680 (308)	680 (308)
20 HP (14.92 kW)	230/460 575	212 (96)	250 (113)	250 (113)	348 (158)	348 (158)	386 (175)	386 (175)
		212 (96)	258 (117)	258 (117)	304 (138)	304 (138)	350 (159)	350 (159)

Accessory dimensions

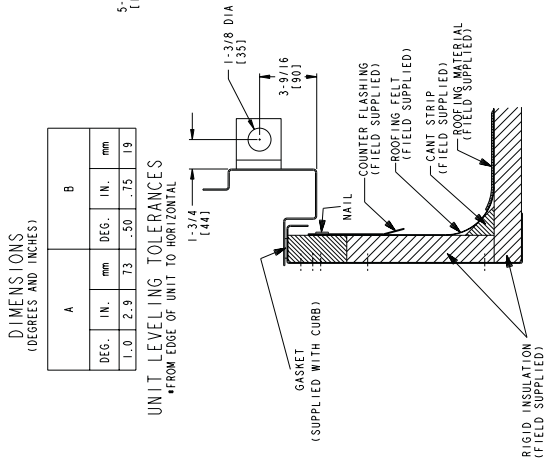
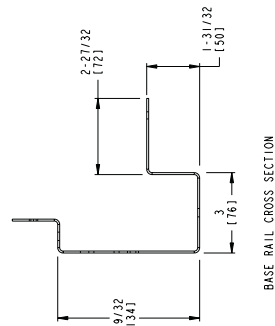
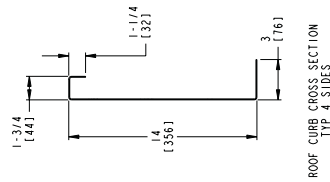
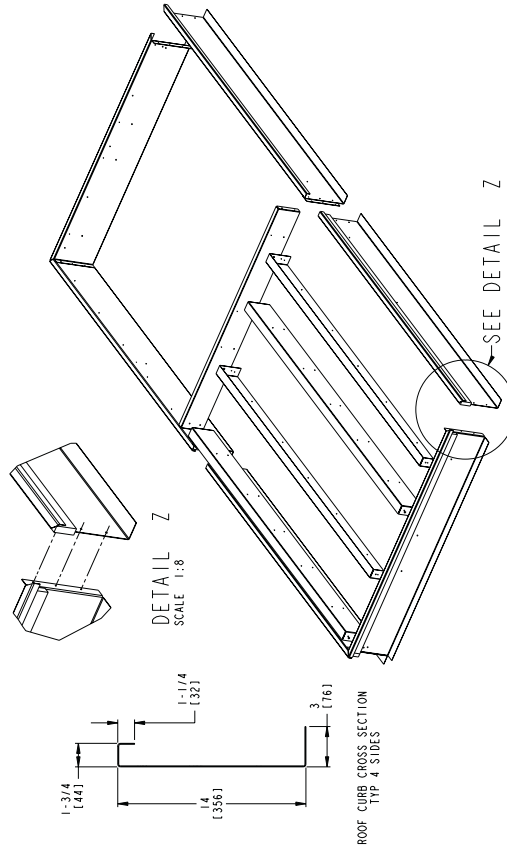
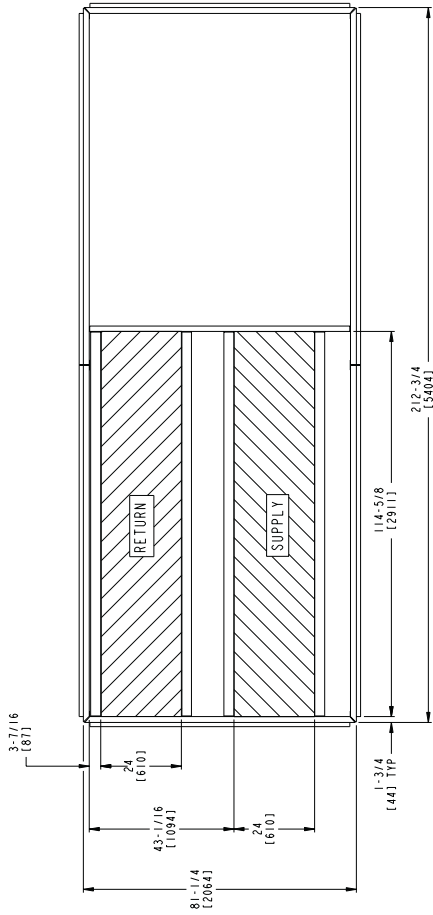
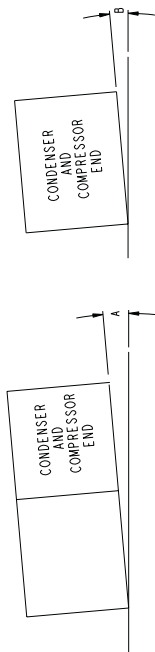


ROOF CURB SIZES 036,041

NOTE:

1. UNLESS OTHERWISE SPECIFIED ALL DIM ARE TO OUTSIDE OF PART.
2. ROOFCURB ACCESSORY CRRCURB006A00 IS SHIPPED DISASSEMBLED.
3. ALL ROOFCURB PARTS: 14 GA GALVANIZED STL.
4. UNITS WITH ELECTRIC HEAT MUST BE INSTALLED WITH 90° ELBOW ON THE SUPPLY DUCT PRIOR TO ANY SUPPLY TAKE OFFS OR BRANCHES.
5. DIMENSIONS IN () ARE MILLIMETERS.

NOTE:
TO PREVENT STANDING WATER IN THE DRAIN PAN OF THE ROOF CURB SECTION THE EXCESSIVE CONDENSATE UNIT CAN ONLY BE PITCHED AS SHOWN.



DIMENSIONS (DEGREES AND INCHES)		A		B	
DEG.	IN.	mm	DEG.	IN.	mm
1.0	2.9	73	.50	.75	19

Accessory dimensions (cont)

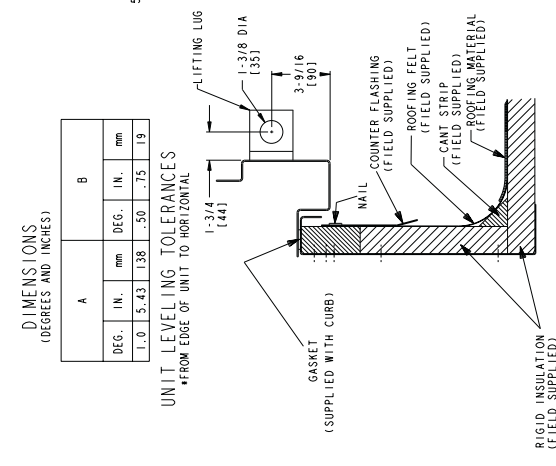
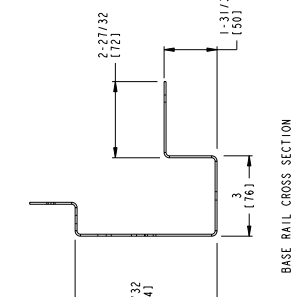
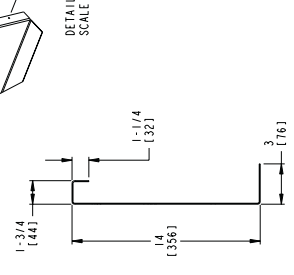
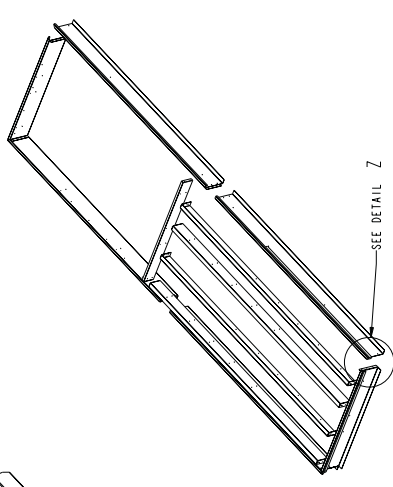
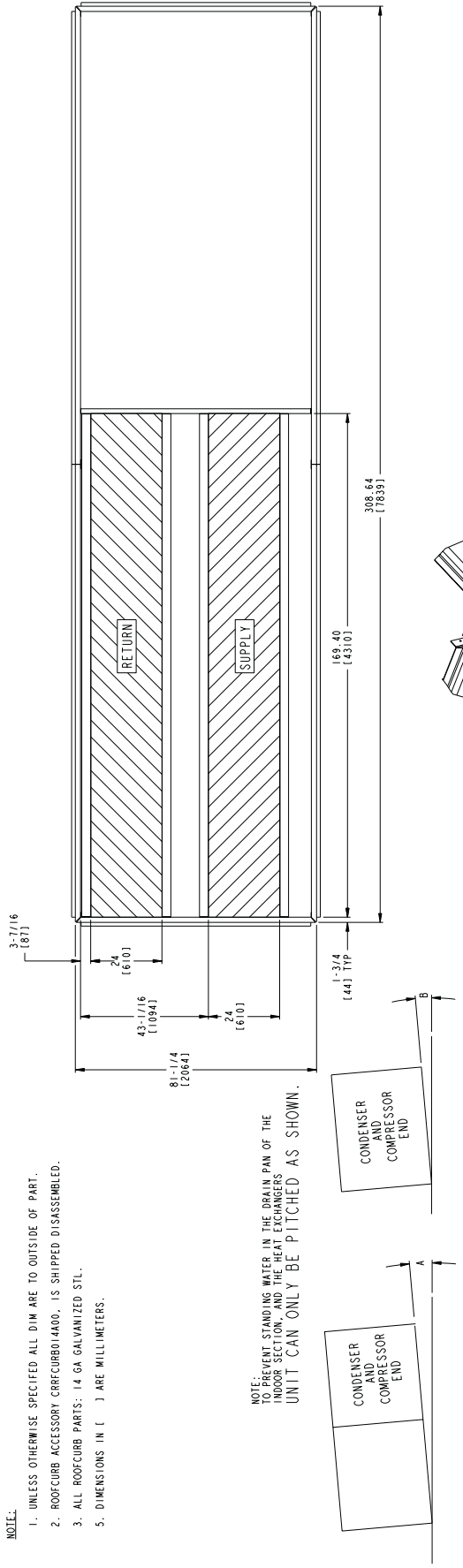


ROOF CURB 48AJ, AK051/UNIT SUPPORT 48/50AW, AY051

NOTE:

1. UNLESS OTHERWISE SPECIFIED ALL DIM ARE TO OUTSIDE OF PART.
2. ROOFCURB ACCESSORY CRFCURB014400, IS SHIPPED DISASSEMBLED.
3. ALL ROOFCURB PARTS: 14 GA GALVANIZED STL.
5. DIMENSIONS IN () ARE MILLIMETERS.

NOTE: PREVENT STANDING WATER IN THE DRAIN PAN OF THE INDOOR SECTION, AND THE HEAT EXCHANGERS UNIT CAN ONLY BE PITCHED AS SHOWN.



DIMENSIONS (DEGREES AND INCHES)

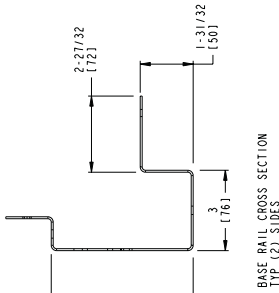
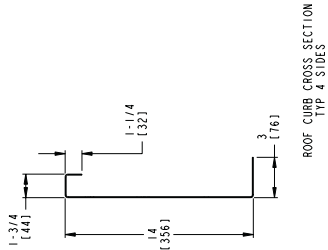
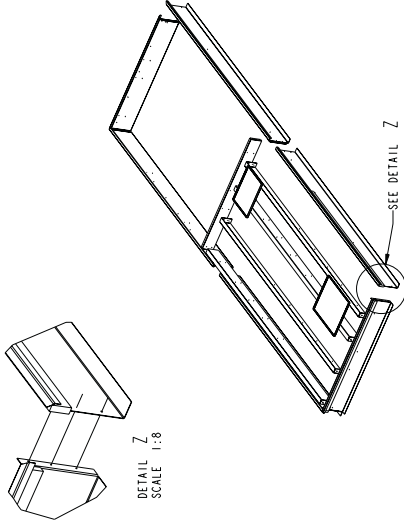
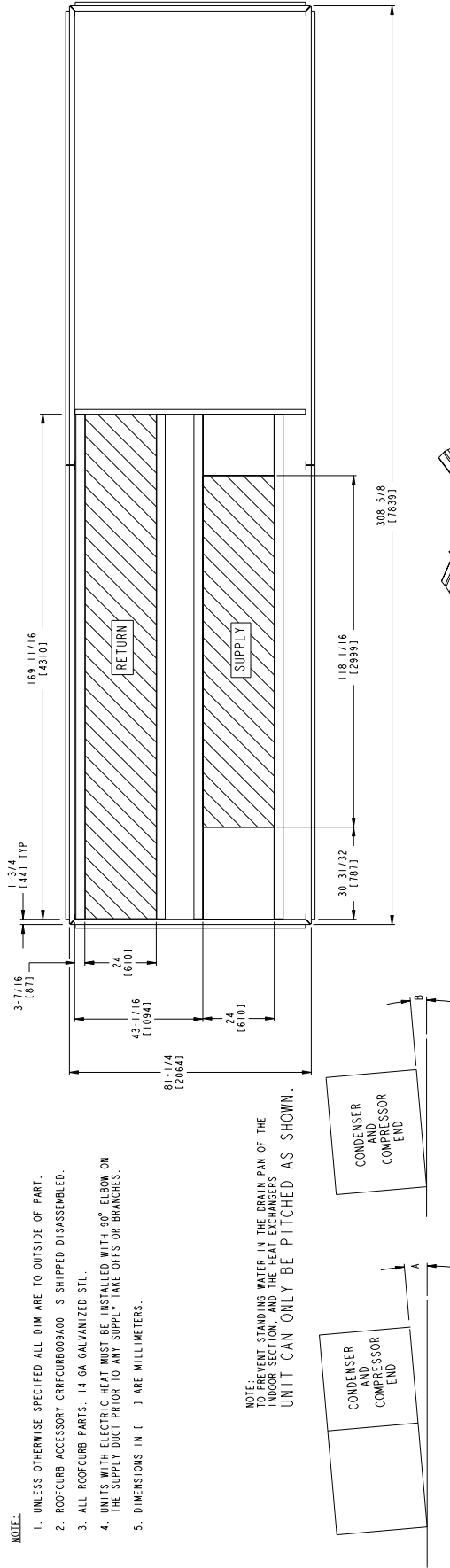
A		B	
DEG.	IN.	DEG.	IN.
1.0	5.43	1.38	.50
			.75
			.19

ROOF CURB 50AJ, AK051

NOTE:

- UNLESS OTHERWISE SPECIFIED ALL DIM ARE TO OUTSIDE OF PART.
- ROOFCURB ACCESSORY CRFCURB090A00 IS SHIPPED DISASSEMBLED.
- ALL ROOFCURB PARTS: 14 GA GALVANIZED STL.
- UNITS WITH ELECTRIC HEAT MUST BE INSTALLED WITH 90° ELBOW ON THE SUPPLY DUCT PRIOR TO ANY SUPPLY TAKE OFFS OR BRANCHES.
- DIMENSIONS IN [] ARE MILLIMETERS.

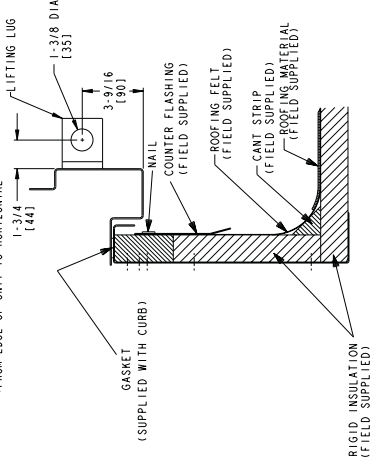
NOTE:
TO PREVENT STANDING WATER IN THE DRAIN PAN OF THE INDOOR SECTION, AND THE HEAT EXCHANGERS UNIT CAN ONLY BE PITCHED AS SHOWN.



DIMENSIONS (DEGREES AND INCHES)

A		B	
DEG.	IN.	DEG.	IN.
1.0	5.43	1.38	.50
			.75
			.19

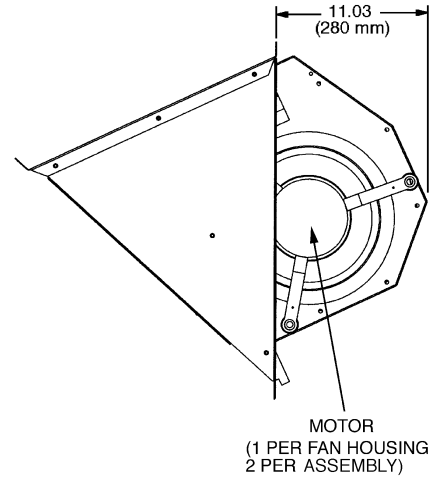
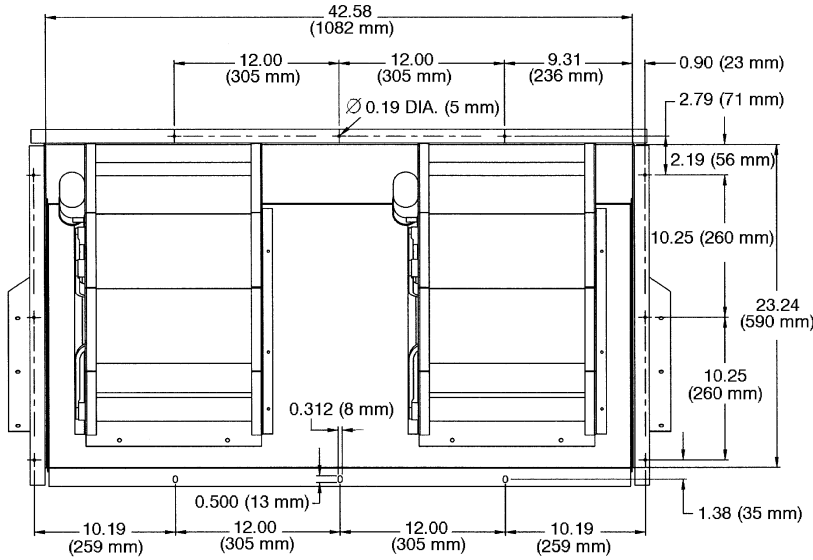
UNIT LEVELING TOLERANCES
*FROM EDGE OF UNIT TO HORIZONTAL



Accessory dimensions (cont)



POWER EXHAUST AND BAROMETRIC RELIEF



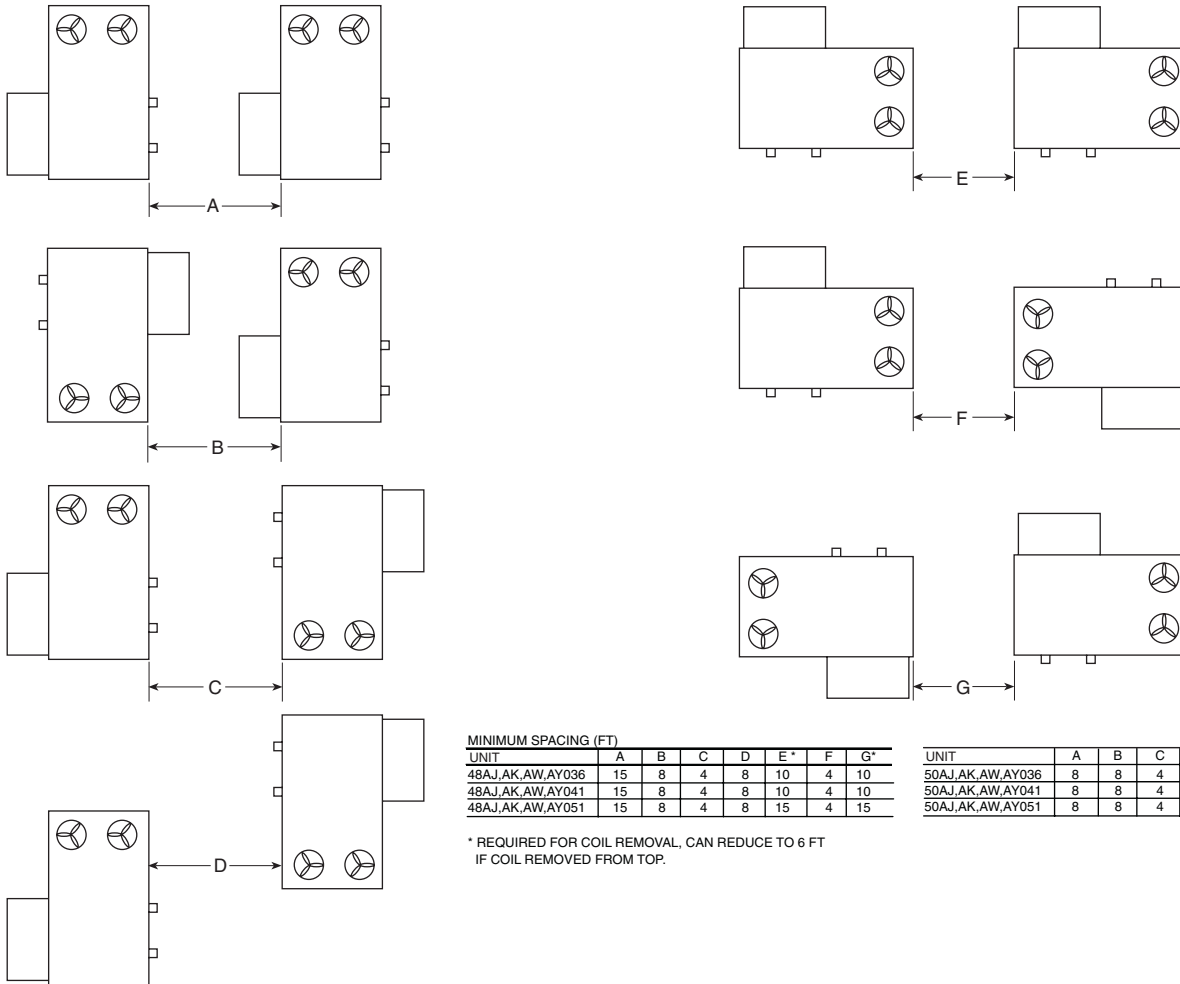
LEGEND

∅ — Diameter

NOTES:

1. Unless otherwise specified, all dimensions are to outside of part.
2. Dimensions are in inches.
3. Unit sizes 036 and 041 have 2 fan assemblies. Unit size 051 has 3 fan assemblies.
4. For 48/50AW,AY units, the accessory power exhaust or barometric relief must be mounted in the field-supplied return ductwork.

MULTIPLE UNIT APPLICATION SPACING



MINIMUM SPACING (FT)

UNIT	A	B	C	D	E*	F	G*
48AJ,AK,AW,AY036	15	8	4	8	10	4	10
48AJ,AK,AW,AY041	15	8	4	8	10	4	10
48AJ,AK,AW,AY051	15	8	4	8	15	4	15

UNIT	A	B	C	D	E*	F	G*
50AJ,AK,AW,AY036	8	8	4	8	10	4	10
50AJ,AK,AW,AY041	8	8	4	8	10	4	10
50AJ,AK,AW,AY051	8	8	4	8	15	4	15

* REQUIRED FOR COIL REMOVAL. CAN REDUCE TO 6 FT IF COIL REMOVED FROM TOP.

Selection procedure (with example)



I Determine cooling and heat requirements at design conditions.

Given:

Type Application VAV
Required Cooling Capacity (TC) 470,000 Btuh
Sensible Heat Capacity (SHC) 338,000 Btuh
Required Heating Capacity 300,000 Btuh
Design Outdoor Air db Temperature 95 F
Design Outdoor Air wb Temperature 67 F
Climate Type (as per ASHRAE 90.1 Table D) . . Dry
Indoor-Air Temperature 80 F edb, 67 F ewb
Evaporator Air Quantity 16,000 cfm
External Static Pressure 1.4 in. wg
Electrical Characteristics (V-Ph-Hz) 460-3-60
Unit Type Gas Heating Vertical Discharge

II Select the unit based on required cooling capacity.

Entering Cooling Capacity table at air condenser entering temperature of 95 F. Unit 48AKD041 at 16,000 cfm and 67 F ewb will provide the total capacity of 475,000 Btuh and a SHC of 375,000 Btuh. Calculate SHC correction, if required, using notes under cooling capacity table.

III Select heat capacity of unit to provide design condition requirements.

In the Gas Heating Capacities and Efficiencies table note that unit 48AKD041 will provide 328,000 Btuh with an input of 400,000 Btuh.

IV Select supply fan to provide design condition requirements.

Tabulated fan performance includes 2-in. throw-away filters, wet evaporator coil, economizer, cabinet losses, and roof curb. Find fan rpm and bhp at 1.4 in. wg and 16,000 cfm on 48AKD041 Fan Performance table for vertical applications. Find that the fan speed is 1063 rpm and the power required is 19.06 bhp. Refer to the Motor Limitations table which shows the 20 hp motor is required.

V Select unit that corresponds to the power source available.

The electrical data table shows that a 460-3-60 unit is available.

VI Select the options and accessories.

As per the ASHRAE 90.1 requirements this unit is located in a dry climate and therefore is required to have an economizer. As this is a dry climate either differential dry bulb changeover, outdoor air changeover or differential enthalpy should be used. Outside air enthalpy can not be used.

Select the options and model number using the options summary and model number charts in the price pages.

Note as an alternative a computerized selection program, *RTUBuilder*, is available for use in selecting and optimizing the unit for your application.

Performance data



COOLING CAPACITIES

Temp (F) Air Entering Condenser (Edb)		48/50AJ,AK,AW,AY036 (35 Tons)															
		Evaporator Air Quantity — Cfm / BF															
		7000/0.069				8750/0.071				10,500/0.076				12,250/0.100			
		Evaporator Air — Ewb (F)															
		60	62	67	72	60	62	67	72	60	62	67	72	60	62	67	72
75	TC	338	351	386	426	357	371	407	447	372	384	421	462	388	394	432	474
	SHC	291	277	243	205	329	313	270	224	361	346	295	241	381	375	319	256
	kW	22	22	22	23	22	22	23	23	22	22	23	24	22	23	23	24
85	TC	328	341	375	413	346	359	395	434	361	372	408	448	376	382	418	459
	SHC	286	272	237	201	323	306	264	219	353	340	289	235	376	369	313	251
	kW	24	24	25	26	24	25	25	26	25	25	26	26	25	25	26	26
95	TC	317	330	363	400	334	347	382	420	350	359	394	433	365	370	404	443
	SHC	280	267	232	196	317	301	258	214	345	333	284	230	365	359	307	245
	kW	27	27	28	28	27	27	28	29	27	28	28	29	28	28	28	29
105	TC	306	318	351	386	322	334	368	404	338	345	379	417	353	357	388	426
	SHC	294	283	252	221	332	318	280	240	358	350	306	257	377	374	330	274
	kW	30	30	31	31	30	30	31	32	30	31	31	32	31	31	31	32
115	TC	294	306	337	372	310	321	353	388	326	331	364	400	341	343	372	409
	SHC	268	255	221	185	301	289	246	202	326	319	271	218	341	340	295	233
	kW	33	33	34	35	33	34	34	35	34	34	35	35	34	34	35	36

48/50AJ,AK,AW,AY036 (35 Tons) (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm / BF											
		14,000/0.131				15,750/0.163				17,500/0.194			
		Evaporator Air — Ewb (F)											
		60	62	67	72	60	62	67	72	60	62	67	72
75	TC	401	406	440	483	415	416	446	489	426	426	452	495
	SHC	401	397	342	272	415	416	365	286	426	426	386	301
	kW	23	23	23	24	23	23	23	24	23	23	24	24
85	TC	391	393	426	467	403	404	432	474	414	414	437	479
	SHC	391	388	336	266	403	404	358	281	414	414	380	295
	kW	25	25	26	27	25	26	26	27	26	26	26	27
95	TC	379	380	410	451	391	392	416	457	402	402	421	462
	SHC	379	379	330	260	391	392	352	275	402	402	374	289
	kW	28	28	29	29	28	28	29	30	28	28	29	30
105	TC	367	368	394	433	379	379	400	439	388	389	403	443
	SHC	391	393	353	289	404	405	376	304	414	415	397	318
	kW	31	31	32	32	31	31	32	33	32	32	32	33
115	TC	354	355	378	415	365	365	383	420	374	375	385	424
	SHC	354	355	317	248	365	365	339	262	374	375	359	276
	kW	34	34	35	36	35	35	35	36	35	35	35	36

LEGEND

- BF** — Bypass Factor
- Edb** — Entering Dry Bulb
- Ewb** — Entering Wet Bulb
- kW** — Compressor Motor Power Input
- SHC** — Sensible Heat Capacity (1000 Btuh)
- TC** — Total Capacity (1000 Btuh) Gross
- VAV** — Variable Air Volume

Boldface — VAV Units Only

NOTES:

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

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

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

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

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

3. The 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	4.18	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 indoor fan motor heat.
5. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



COOLING CAPACITIES (cont)

48/50AJ,AK,AW,AY041 (40 Tons)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm / BF															
		8000/0.080				10,000/0.077				12,000/0.081				14,000/0.107			
		Evaporator Air — Ewb (F)															
		60	62	67	72	60	62	67	72	60	62	67	72	60	62	67	72
75	TC	392	407	447	492	412	428	469	515	428	442	486	533	442	455	498	546
	SHC	331	316	276	235	373	356	307	255	412	395	335	273	442	426	361	291
	kW	25.2	25	26	27	26	26	27	27	26	26	27	28	26	26	27	28
85	TC	381	395	434	478	400	415	456	501	415	429	471	517	430	440	483	530
	SHC	325	310	271	230	367	349	301	249	405	386	329	268	430	420	355	285
	kW	28.2	28	29	30	29	29	30	30	29	29	30	31	29	29	30	31
95	TC	369	383	421	464	387	402	442	485	401	415	456	500	418	425	466	512
	SHC	319	304	265	224	361	343	294	243	398	379	322	262	418	412	349	279
	kW	31.6	32	33	33	32	32	33	34	32	33	33	34	33	33	34	34
105	TC	357	370	407	448	374	387	426	468	388	400	439	483	405	410	449	493
	SHC	313	298	259	218	354	336	288	237	388	372	316	255	405	404	342	272
	kW	35.2	36	36	37	36	36	37	38	36	36	37	38	36	36	37	38
115	TC	523	356	392	431	359	372	410	450	375	385	422	464	392	394	431	473
	SHC	306	291	252	212	347	329	282	231	375	365	309	249	392	394	335	266
	kW	39.1	39	40	41	40	40	41	42	40	40	41	42	40	40	41	42
120	TC	336	349	384	422	352	364	401	441	368	376	413	454	385	387	422	463
	SHC	302	288	249	208	343	325	278	227	368	361	306	245	385	387	332	262
	kW	41.2	42	42	43	42	42	43	44	42	42	43	44	43	43	43	44

48/50AJ,AK,AW,AY041 (40 Tons) (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm / BF											
		16,000/0.141				18,000/0.177				20,000/0.208			
		Evaporator Air — Ewb (F)											
		60	62	67	72	60	62	67	72	60	62	67	72
75	TC	458	463	507	556	473	474	515	565	486	486	521	571
	SHC	458	457	388	308	473	474	412	324	486	486	436	340
	kW	26	26	27	28	27	27	27	28	27	27	28	28
85	TC	446	449	491	539	460	461	499	547	473	473	504	553
	SHC	446	448	381	302	460	461	406	318	473	473	429	334
	kW	29	30	30	31	30	30	31	31	30	30	31	32
95	TC	434	436	475	521	447	448	481	528	459	460	486	534
	SHC	434	436	375	296	447	448	399	312	459	460	422	328
	kW	33	33	34	35	33	33	34	35	33	33	34	35
105	TC	421	422	457	502	434	434	463	508	445	445	467	514
	SHC	421	422	368	289	434	434	392	305	445	445	415	321
	kW	37	37	37	38	37	37	38	39	37	37	38	39
115	TC	407	407	438	481	419	419	443	484	430	430	448	490
	SHC	407	407	361	282	419	419	384	297	430	430	408	313
	kW	41	41	42	43	41	41	42	43	41	41	42	43
120	TC	399	400	428	470	411	412	433	477	422	422	438	481
	SHC	399	400	357	279	411	412	381	295	422	422	404	310
	kW	43	43	44	45	43	43	44	45	44	44	44	45

LEGEND

- BF** — Bypass Factor
- Edb** — Entering Dry Bulb
- Ewb** — Entering Wet Bulb
- kW** — Compressor Motor Power Input
- SHC** — Sensible Heat Capacity (1000 Btuh)
- TC** — Total Capacity (1000 Btuh) Gross
- VAV** — Variable Air Volume

Boldface — VAV Units Only

NOTES:

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

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

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

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

- Where: h_{ewb} = Enthalpy of air entering evaporator coil.
3. The 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	4.18	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.
Correction Factor = $1.10 \times (1 - BF) \times (edb - 80)$.

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.
5. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be

Performance data (cont)



COOLING CAPACITIES (cont)

48/50AJ,AK,AW,AY051 (50 Tons)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm / BF															
		10,000/0.119				12,500/0.143				15,000/0.157				17,500/0.179			
		Evaporator Air — Ewb (F)															
		60	62	67	72	60	62	67	72	60	62	67	72	60	62	67	72
75	TC	482	501	548	600	511	529	578	631	537	550	599	653	566	567	615	669
	SHC	405	387	338	289	454	432	373	312	492	474	405	333	511	512	435	354
	kW	29.3	30	30	31	30	30	31	32	30	31	31	32	31	31	32	33
85	TC	469	487	533	584	496	513	561	613	524	533	581	633	533	550	596	648
	SHC	398	380	331	282	447	424	365	305	479	466	397	325	533	502	428	345
	kW	32.9	33	34	35	33	34	35	36	34	34	35	36	34	34	35	36
95	TC	454	471	516	566	480	497	543	592	510	516	562	612	518	534	576	626
	SHC	391	372	324	275	439	417	358	297	465	459	389	318	518	487	420	338
	kW	37.0	37	38	39	37	38	39	40	38	38	39	40	38	39	39	40
105	TC	439	455	499	547	464	479	524	572	496	497	542	590	502	518	554	603
	SHC	384	364	316	267	428	409	350	289	454	450	381	310	502	471	411	329
	kW	41.5	42	43	44	42	42	43	44	42	43	44	45	43	43	44	45
115	TC	523	437	481	527	450	461	504	550	463	479	520	567	485	503	531	579
	SHC	376	356	308	259	415	401	341	281	463	438	373	301	485	453	402	321
	kW	46.4	47	48	49	47	47	48	49	47	48	49	50	48	48	49	50
120	TC	413	429	471	517	443	451	494	539	455	470	509	555	477	493	519	567
	SHC	371	352	304	255	406	396	337	277	455	430	368	297	477	445	397	317
	kW	49.1	49	50	51	50	50	51	52	50	50	51	52	51	51	52	53

48/50AJ,AK,AW,AY051 (50 Tons) (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm / BF											
		20,000/0.202				22,500/0.225				25,000/0.250			
		Evaporator Air — Ewb (F)											
		60	62	67	72	60	62	67	72	60	62	67	72
75	TC	569	589	626	681	588	607	635	690	604	604	643	698
	SHC	569	529	464	373	588	544	492	392	604	604	520	410
	kW	31	31	32	33	31	32	32	33	32	32	32	33
85	TC	554	573	605	660	572	572	615	669	587	588	622	676
	SHC	554	515	456	365	572	572	485	384	587	588	511	402
	kW	35	35	36	37	35	35	36	37	35	35	36	37
95	TC	538	556	585	637	555	556	594	646	570	570	600	652
	SHC	538	499	448	357	555	556	476	376	570	570	502	394
	kW	39	39	40	41	39	39	40	41	39	39	40	41
105	TC	521	522	563	613	538	538	571	621	552	552	577	627
	SHC	521	522	440	349	538	538	467	367	552	552	494	385
	kW	43	43	44	45	44	44	44	45	44	44	44	45
115	TC	504	504	541	589	519	519	548	596	532	532	554	602
	SHC	504	504	431	340	519	519	457	359	532	532	484	377
	kW	48	48	49	50	49	49	49	50	49	49	49	50
120	TC	494	495	529	576	509	510	535	583	522	523	542	588
	SHC	494	495	426	336	509	510	452	354	522	523	478	372
	kW	51	51	52	53	51	51	52	53	52	52	52	53

LEGEND

- BF** — Bypass Factor
- Edb** — Entering Dry Bulb
- Ewb** — Entering Wet Bulb
- kW** — Compressor Motor Power Input
- SHC** — Sensible Heat Capacity (1000 Btuh)
- TC** — Total Capacity (1000 Btuh) Gross
- VAV** — Variable Air Volume

Boldface — VAV Units Only

NOTES:

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

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

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

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

- Where: h_{ewb} = Enthalpy of air entering evaporator coil.
3. The 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	4.18	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.
Correction Factor = $1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$.

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.
5. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS

48AJ,AK036 (35 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	454	2.15	508	2.52	557	2.90	605	3.29	650	3.69
8,000	502	2.90	550	3.30	596	3.71	639	4.12	680	4.54
9,000	552	3.81	595	4.24	637	4.67	677	5.11	715	5.55
10,000	602	4.89	642	5.34	680	5.80	717	6.26	752	6.73
11,000	653	6.15	689	6.62	725	7.11	759	7.59	792	8.08
12,000	704	7.60	738	8.09	771	8.60	803	9.11	834	9.63
13,000	756	9.24	788	9.76	818	10.29	848	10.83	878	11.36
14,000	808	11.10	838	11.64	867	12.19	895	12.74	922	13.30
15,000	861	13.18	888	13.74	915	14.31	942	14.88	968	15.46
16,000	914	15.49	940	16.06	965	16.65	990	17.24	1015	17.85
17,000	967	18.03	991	18.62	1015	19.23	1039	19.85	1062	20.47
17,500	993	19.40	1017	20.00	1040	20.61	1064	21.24	1086	21.87

48AJ,AK036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	693	4.09	734	4.52	773	4.95	811	5.39	847	5.83
8,000	720	4.97	759	5.40	796	5.85	832	6.31	867	6.77
9,000	752	6.00	788	6.45	823	6.92	857	7.39	890	7.87
10,000	787	7.20	821	7.67	854	8.16	886	8.64	917	9.14
11,000	825	8.58	856	9.07	887	9.57	918	10.08	947	10.59
12,000	865	10.14	895	10.66	924	11.18	952	11.71	980	12.24
13,000	906	11.90	935	12.44	962	12.99	989	13.53	1016	14.08
14,000	950	13.87	976	14.43	1002	15.00	1028	15.57	1053	16.14
15,000	994	16.05	1019	16.63	1044	17.22	1068	17.81	1093	18.40
16,000	1039	18.45	1063	19.06	1087	19.67	1110	20.28	1133	20.89
17,000	1086	21.09	1109	21.72	1131	22.35	1153	22.98	1175	23.61
17,500	1109	22.50	1131	23.14	1154	23.78	1175	24.42	1197	25.07

48AJ,AK036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	881	6.29	914	6.74	946	7.21	977	7.68	1006	8.15
8,000	901	7.24	933	7.72	965	8.20	995	8.69	1024	9.19
9,000	923	8.35	954	8.85	985	9.35	1014	9.86	1043	10.37
10,000	948	9.64	978	10.15	1007	10.66	1036	11.19	1064	11.71
11,000	976	11.11	1005	11.63	1033	12.16	1061	12.70	1088	13.24
12,000	1008	12.77	1035	13.31	1062	13.86	1088	14.41	1114	14.97
13,000	1042	14.64	1068	15.19	1093	15.76	1118	16.32	1143	16.89
14,000	1078	16.71	1103	17.28	1127	17.86	1151	18.45	1174	19.03
15,000	1116	19.00	1140	19.59	1163	20.19	1186	20.79	1208	21.40
16,000	1156	21.51	1178	22.12	1200	22.74	1222	23.36	1244	23.98
17,000	1197	24.25	1218	24.89	1240	25.52	1261	26.17	1281	26.81
17,500	1218	25.71	1239	26.36	1260	27.00	1280	27.66	—	—

48AJ,AK036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	1035	8.63	1062	9.11	1089	9.60	1115	10.09	1140	10.58
8,000	1053	9.69	1081	10.19	1108	10.70	1134	11.21	1159	11.73
9,000	1072	10.89	1099	11.41	1126	11.94	1152	12.47	1177	13.00
10,000	1092	12.25	1119	12.78	1145	13.33	1171	13.88	1196	14.43
11,000	1114	13.79	1140	14.34	1166	14.90	1191	15.46	1216	16.03
12,000	1139	15.53	1164	16.09	1189	16.67	1213	17.24	1237	17.83
13,000	1167	17.47	1191	18.05	1215	18.64	1238	19.23	1262	19.82
14,000	1198	19.63	1221	20.22	1244	20.82	1266	21.43	1288	22.04
15,000	1230	22.00	1253	22.62	1274	23.23	1296	23.85	—	—
16,000	1265	24.61	1286	25.24	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—
17,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (cont)

48AJ,AK041 (40 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	502	2.90	550	3.30	596	3.71	639	4.12	680	4.54
9,000	552	3.81	595	4.24	637	4.67	677	5.11	715	5.55
10,000	602	4.89	642	5.34	680	5.80	717	6.26	752	6.73
11,000	653	6.15	689	6.62	725	7.11	759	7.59	792	8.08
12,000	704	7.60	738	8.09	771	8.60	803	9.11	834	9.63
13,000	756	9.24	788	9.76	818	10.29	848	10.83	878	11.36
14,000	808	11.10	838	11.64	867	12.19	895	12.74	922	13.30
15,000	861	13.18	888	13.74	915	14.31	942	14.88	968	15.46
16,000	914	15.49	940	16.06	965	16.65	990	17.24	1015	17.85
17,000	967	18.03	991	18.62	1015	19.23	1039	19.85	1062	20.47
18,000	1020	20.82	1043	21.43	1066	22.06	1088	22.69	1111	23.33
19,000	1073	23.87	1095	24.50	1117	25.14	1138	25.79	1159	26.44
20,000	1127	27.18	1147	27.82	1168	28.48	1188	29.15	—	—

48AJ,AK041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	720	4.97	759	5.40	796	5.85	832	6.31	867	6.77
9,000	752	6.00	788	6.45	823	6.92	857	7.39	890	7.87
10,000	787	7.20	821	7.67	854	8.16	886	8.64	917	9.14
11,000	825	8.58	856	9.07	887	9.57	918	10.08	947	10.59
12,000	865	10.14	895	10.66	924	11.18	952	11.71	980	12.24
13,000	906	11.90	935	12.44	962	12.99	989	13.53	1016	14.08
14,000	950	13.87	976	14.43	1002	15.00	1028	15.57	1053	16.14
15,000	994	16.05	1019	16.63	1044	17.22	1068	17.81	1093	18.40
16,000	1039	18.45	1063	19.06	1087	19.67	1110	20.28	1133	20.89
17,000	1086	21.09	1109	21.72	1131	22.35	1153	22.98	1175	23.61
18,000	1133	23.97	1155	24.62	1176	25.27	1197	25.92	1219	26.58
19,000	1180	27.11	1201	27.77	1222	28.45	1242	29.12	—	—
20,000	—	—	—	—	—	—	—	—	—	—

48AJ,AK041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	901	7.24	933	7.72	965	8.20	995	8.69	1024	9.19
9,000	923	8.35	954	8.85	985	9.35	1014	9.86	1043	10.37
10,000	948	9.64	978	10.15	1007	10.66	1036	11.19	1064	11.71
11,000	976	11.11	1005	11.63	1033	12.16	1061	12.70	1088	13.24
12,000	1008	12.77	1035	13.31	1062	13.86	1088	14.41	1114	14.97
13,000	1042	14.64	1068	15.19	1093	15.76	1118	16.32	1143	16.89
14,000	1078	16.71	1103	17.28	1127	17.86	1151	18.45	1174	19.03
15,000	1116	19.00	1140	19.59	1163	20.19	1186	20.79	1208	21.40
16,000	1156	21.51	1178	22.12	1200	22.74	1222	23.36	1244	23.98
17,000	1197	24.25	1218	24.89	1240	25.52	1261	26.17	1281	26.81
18,000	1239	27.24	1260	27.89	1280	28.55	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

48AJ,AK041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	1053	9.69	1081	10.19	1108	10.70	1134	11.21	1159	11.73
9,000	1072	10.89	1099	11.41	1126	11.94	1152	12.47	1177	13.00
10,000	1092	12.25	1119	12.78	1145	13.33	1171	13.88	1196	14.43
11,000	1114	13.79	1140	14.34	1166	14.90	1191	15.46	1216	16.03
12,000	1139	15.53	1164	16.09	1189	16.67	1213	17.24	1237	17.83
13,000	1167	17.47	1191	18.05	1215	18.64	1238	19.23	1262	19.82
14,000	1198	19.63	1221	20.22	1244	20.82	1266	21.43	1288	22.04
15,000	1230	22.00	1253	22.62	1274	23.23	1296	23.85	—	—
16,000	1265	24.61	1286	25.24	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (cont)

48AJ,AK051 (50 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	419	2.89	483	3.54	538	4.25	587	5.00	632	5.79
12,000	476	4.33	534	5.04	585	5.78	632	6.56	674	7.39
13,000	506	5.21	561	5.94	610	6.70	655	7.50	697	8.34
14,000	536	6.18	588	6.96	636	7.74	680	8.56	720	9.41
15,000	566	7.28	617	8.09	662	8.90	704	9.73	744	10.59
16,000	597	8.48	645	9.34	689	10.17	730	11.02	768	11.90
17,000	628	9.80	674	10.71	717	11.58	756	12.45	793	13.34
18,000	659	11.25	704	12.21	745	13.11	783	14.00	819	14.91
19,000	691	12.82	734	13.84	773	14.77	810	15.69	845	16.62
20,000	723	14.53	764	15.60	802	16.57	838	17.52	872	18.47
21,000	755	16.37	794	17.49	831	18.51	866	19.49	899	20.47
22,000	787	18.35	825	19.53	861	20.59	894	21.60	927	22.61
23,000	819	20.48	856	21.71	890	22.81	923	23.87	954	24.90
24,000	851	22.75	887	24.04	920	25.19	952	26.28	983	27.34
25,000	883	25.17	918	26.52	951	27.72	982	28.84	1011	29.94

48AJ,AK051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	673	6.60	711	7.42	747	8.26	782	9.10	815	9.96
12,000	714	8.24	751	9.12	786	10.02	819	10.92	851	11.85
13,000	735	9.22	772	10.11	806	11.03	839	11.97	870	12.92
14,000	758	10.30	793	11.21	827	12.15	859	13.11	890	14.08
15,000	781	11.50	816	12.43	849	13.38	881	14.35	911	15.35
16,000	804	12.82	839	13.76	871	14.73	902	15.72	932	16.73
17,000	829	14.27	862	15.23	894	16.21	925	17.21	954	18.24
18,000	853	15.85	886	16.82	918	17.82	948	18.84	977	19.88
19,000	879	17.58	911	18.56	942	19.57	971	20.60	1000	21.65
20,000	905	19.44	936	20.44	966	21.45	995	22.50	1023	23.57
21,000	931	21.46	961	22.47	991	23.50	1019	24.55	1047	25.63
22,000	958	23.62	987	24.64	1016	25.69	1044	26.76	1071	27.84
23,000	985	25.93	1014	26.97	1042	28.03	1069	29.11	1096	30.21
24,000	1012	28.40	1041	29.46	1068	30.54	1095	31.63	1121	32.74
25,000	1040	31.02	1068	32.11	1095	33.21	1121	34.31	1147	35.44

48AJ,AK051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	846	10.82	876	11.69	906	12.56	934	13.44	961	14.32
12,000	881	12.78	911	13.72	939	14.67	967	15.62	993	16.58
13,000	900	13.88	929	14.85	957	15.82	984	16.81	1011	17.80
14,000	920	15.06	948	16.06	976	17.07	1003	18.08	1029	19.11
15,000	940	16.36	968	17.38	996	18.41	1022	19.45	1048	20.50
16,000	961	17.76	989	18.80	1016	19.86	1042	20.92	1067	22.00
17,000	983	19.28	1010	20.34	1036	21.42	1062	22.51	1087	23.60
18,000	1005	20.94	1032	22.01	1058	23.11	1083	24.21	1108	25.33
19,000	1027	22.72	1054	23.81	1080	24.92	1105	26.04	1129	27.18
20,000	1050	24.65	1076	25.76	1102	26.88	1126	28.01	1151	29.17
21,000	1073	26.73	1099	27.84	1124	28.97	1149	30.13	1173	31.29
22,000	1097	28.95	1123	30.08	1147	31.22	1172	32.39	1195	33.56
23,000	1122	31.33	1147	32.47	1171	33.63	1195	34.80	—	—
24,000	1146	33.87	1171	35.02	1195	36.19	—	—	—	—
25,000	1171	36.58	1196	37.74	—	—	—	—	—	—

48AJ,AK051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	988	15.21	1014	16.09	1039	16.98	1063	17.88	1087	18.77
12,000	1019	17.54	1045	18.51	1069	19.48	1093	20.45	1117	21.43
13,000	1036	18.80	1061	19.80	1086	20.81	1109	21.82	1133	22.84
14,000	1054	20.13	1079	21.17	1103	22.21	1126	23.26	1149	24.31
15,000	1073	21.56	1097	22.63	1121	23.70	1144	24.78	1167	25.86
16,000	1092	23.08	1116	24.17	1140	25.28	1162	26.38	1185	27.49
17,000	1112	24.71	1135	25.83	1159	26.95	1181	28.09	—	—
18,000	1132	26.46	1156	27.60	1178	28.74	—	—	—	—
19,000	1153	28.33	1176	29.48	1199	30.65	—	—	—	—
20,000	1174	30.33	1197	31.50	—	—	—	—	—	—
21,000	1196	32.47	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (cont)

50AJ,AK036 (35 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	431	1.99	484	2.35	534	2.72	580	3.08	625	3.46
8,000	475	2.69	523	3.08	569	3.47	612	3.86	653	4.26
9,000	521	3.53	565	3.94	606	4.36	646	4.78	684	5.20
10,000	568	4.52	608	4.96	646	5.40	683	5.84	719	6.29
11,000	615	5.68	652	6.14	687	6.60	722	7.07	755	7.55
12,000	663	7.01	697	7.49	730	7.98	762	8.47	794	8.97
13,000	712	8.53	743	9.03	774	9.54	804	10.05	834	10.57
14,000	760	10.24	790	10.76	819	11.29	847	11.82	875	12.36
15,000	809	12.15	837	12.69	864	13.24	891	13.79	917	14.35
16,000	859	14.27	885	14.83	910	15.40	936	15.97	960	16.55
17,000	908	16.61	933	17.19	957	17.77	981	18.36	1004	18.96
17,500	933	17.87	957	18.45	981	19.04	1004	19.64	1027	20.25

50AJ,AK036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	667	3.85	707	4.24	746	4.65	783	5.07	819	5.49
8,000	692	4.66	730	5.07	767	5.49	802	5.92	836	6.36
9,000	721	5.63	757	6.06	791	6.49	825	6.94	857	7.39
10,000	753	6.74	787	7.20	819	7.65	851	8.11	882	8.58
11,000	788	8.02	819	8.50	850	8.97	880	9.46	909	9.94
12,000	824	9.47	854	9.96	883	10.47	912	10.97	939	11.48
13,000	862	11.09	891	11.61	918	12.13	945	12.66	972	13.19
14,000	902	12.90	929	13.45	955	13.99	981	14.54	1006	15.09
15,000	943	14.91	968	15.48	993	16.04	1018	16.62	1042	17.18
16,000	985	17.13	1009	17.71	1033	18.30	1056	18.89	1079	19.48
17,000	1028	19.56	1051	20.16	1073	20.77	1096	21.38	1118	21.99
17,500	1049	20.86	1072	21.47	1094	22.09	1116	22.71	1137	23.33

50AJ,AK036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	854	5.93	887	6.37	919	6.82	950	7.28	980	7.74
8,000	870	6.81	902	7.26	933	7.73	964	8.20	993	8.67
9,000	889	7.85	920	8.31	950	8.79	979	9.27	1008	9.75
10,000	912	9.05	941	9.53	970	10.02	998	10.51	1026	11.00
11,000	938	10.43	966	10.92	993	11.42	1020	11.93	1047	12.44
12,000	967	11.98	993	12.49	1020	13.01	1046	13.53	1071	14.05
13,000	998	13.72	1023	14.25	1049	14.78	1073	15.32	1098	15.86
14,000	1031	15.64	1055	16.19	1079	16.75	1103	17.30	1126	17.86
15,000	1066	17.76	1089	18.33	1112	18.90	1135	19.48	1157	20.06
16,000	1102	20.08	1124	20.67	1147	21.26	1168	21.86	1190	22.46
17,000	1140	22.61	1161	23.22	1182	23.84	1203	24.45	1224	25.07
17,500	1159	23.95	1180	24.58	1201	25.21	1221	25.83	1242	26.46

50AJ,AK036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	1009	8.21	1037	8.69	1064	9.17	1091	9.65	1116	10.14
8,000	1022	9.16	1050	9.65	1077	10.14	1104	10.64	1129	11.15
9,000	1036	10.25	1064	10.75	1090	11.26	1117	11.77	1142	12.29
10,000	1053	11.51	1080	12.02	1106	12.54	1131	13.06	1157	13.59
11,000	1073	12.95	1099	13.47	1124	14.00	1149	14.53	1173	15.07
12,000	1096	14.58	1121	15.11	1145	15.65	1169	16.19	1192	16.74
13,000	1121	16.40	1145	16.95	1168	17.50	1191	18.06	1214	18.62
14,000	1149	18.42	1172	18.98	1195	19.55	1217	20.12	1239	20.69
15,000	1179	20.63	1201	21.21	1223	21.80	1244	22.38	1265	22.97
16,000	1211	23.06	1232	23.66	1253	24.26	1274	24.86	1294	25.46
17,000	1245	25.69	1265	26.31	1285	26.93	—	—	—	—
17,500	1262	27.09	1282	27.71	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (cont)

50AJ,AK041 (40 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	475	2.69	523	3.08	569	3.47	612	3.86	653	4.26
9,000	521	3.53	565	3.94	606	4.36	646	4.78	684	5.20
10,000	568	4.52	608	4.96	646	5.40	683	5.84	719	6.29
11,000	615	5.68	652	6.14	687	6.60	722	7.07	755	7.55
12,000	663	7.01	697	7.49	730	7.98	762	8.47	794	8.97
13,000	712	8.53	743	9.03	774	9.54	804	10.05	834	10.57
14,000	760	10.24	790	10.76	819	11.29	847	11.82	875	12.36
15,000	809	12.15	837	12.69	864	13.24	891	13.79	917	14.35
16,000	859	14.27	885	14.83	910	15.40	936	15.97	960	16.55
17,000	908	16.61	933	17.19	957	17.77	981	18.36	1004	18.96
18,000	958	19.18	981	19.77	1004	20.37	1027	20.98	1049	21.60
19,000	1007	21.98	1030	22.59	1052	23.21	1073	23.84	1095	24.47
20,000	1057	25.02	1079	25.65	1099	26.29	1120	26.93	1140	27.58

50AJ,AK041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	692	4.66	730	5.07	767	5.49	802	5.92	836	6.36
9,000	721	5.63	757	6.06	791	6.49	825	6.94	857	7.39
10,000	753	6.74	787	7.20	819	7.65	851	8.11	882	8.58
11,000	788	8.02	819	8.50	850	8.97	880	9.46	909	9.94
12,000	824	9.47	854	9.96	883	10.47	912	10.97	939	11.48
13,000	862	11.09	891	11.61	918	12.13	945	12.66	972	13.19
14,000	902	12.90	929	13.45	955	13.99	981	14.54	1006	15.09
15,000	943	14.91	968	15.48	993	16.04	1018	16.62	1042	17.18
16,000	985	17.13	1009	17.71	1033	18.30	1056	18.89	1079	19.48
17,000	1028	19.56	1051	20.16	1073	20.77	1096	21.38	1118	21.99
18,000	1071	22.22	1093	22.84	1115	23.46	1136	24.09	1157	24.72
19,000	1116	25.10	1137	25.74	1157	26.39	1178	27.04	1198	27.68
20,000	1161	28.23	1181	28.89	—	—	—	—	—	—

50AJ,AK041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	870	6.81	902	7.26	933	7.73	964	8.20	993	8.67
9,000	889	7.85	920	8.31	950	8.79	979	9.27	1008	9.75
10,000	912	9.05	941	9.53	970	10.02	998	10.51	1026	11.00
11,000	938	10.43	966	10.92	993	11.42	1020	11.93	1047	12.44
12,000	967	11.98	993	12.49	1020	13.01	1046	13.53	1071	14.05
13,000	998	13.72	1023	14.25	1049	14.78	1073	15.32	1098	15.86
14,000	1031	15.64	1055	16.19	1079	16.75	1103	17.30	1126	17.86
15,000	1066	17.76	1089	18.33	1112	18.90	1135	19.48	1157	20.06
16,000	1102	20.08	1124	20.67	1147	21.26	1168	21.86	1190	22.46
17,000	1140	22.61	1161	23.22	1182	23.84	1203	24.45	1224	25.07
18,000	1178	25.36	1199	25.99	1219	26.63	1240	27.26	1260	27.90
19,000	1218	28.34	1238	28.99	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

50AJ,AK041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	1022	9.16	1050	9.65	1077	10.14	1104	10.64	1129	11.15
9,000	1036	10.25	1064	10.75	1090	11.26	1117	11.77	1142	12.29
10,000	1053	11.51	1080	12.02	1106	12.54	1131	13.06	1157	13.59
11,000	1073	12.95	1099	13.47	1124	14.00	1149	14.53	1173	15.07
12,000	1096	14.58	1121	15.11	1145	15.65	1169	16.19	1192	16.74
13,000	1121	16.40	1145	16.95	1168	17.50	1191	18.06	1214	18.62
14,000	1149	18.42	1172	18.98	1195	19.55	1217	20.12	1239	20.69
15,000	1179	20.63	1201	21.21	1223	21.80	1244	22.38	1265	22.97
16,000	1211	23.06	1232	23.66	1253	24.26	1274	24.86	1294	25.46
17,000	1245	25.69	1265	26.31	1285	26.93	—	—	—	—
18,000	1279	28.54	1299	29.18	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (cont)

50AJ,AK051 (50 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	397	2.69	461	3.31	516	3.96	564	4.63	608	5.33
12,000	450	4.03	509	4.71	560	5.41	605	6.12	647	6.86
13,000	477	4.83	533	5.55	582	6.27	627	7.01	668	7.77
14,000	505	5.74	558	6.49	606	7.24	649	8.01	689	8.79
15,000	533	6.75	584	7.53	630	8.32	672	9.11	711	9.91
16,000	561	7.88	610	8.68	655	9.50	696	10.32	734	11.14
17,000	590	9.12	637	9.95	680	10.79	720	11.64	757	12.49
18,000	619	10.48	664	11.33	706	12.20	744	13.07	781	13.96
19,000	648	11.96	692	12.84	732	13.74	769	14.64	805	15.54
20,000	678	13.57	719	14.47	758	15.40	795	16.32	829	17.25
21,000	707	15.30	748	16.24	785	17.19	821	18.14	854	19.09
22,000	737	17.18	776	18.14	812	19.11	847	20.09	879	21.07
23,000	767	19.20	804	20.18	840	21.17	873	22.17	905	23.18
24,000	797	21.35	833	22.36	867	23.38	900	24.40	931	25.43
25,000	827	23.66	862	24.68	895	25.72	927	26.78	957	27.83

50AJ,AK051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	649	6.06	686	6.82	722	7.60	755	8.40	787	9.23
12,000	686	7.62	723	8.40	757	9.21	790	10.04	821	10.89
13,000	706	8.55	742	9.35	776	10.17	808	11.01	839	11.87
14,000	727	9.59	762	10.40	795	11.24	827	12.09	857	12.96
15,000	748	10.73	782	11.56	815	12.41	846	13.28	876	14.17
16,000	770	11.98	803	12.84	836	13.71	866	14.59	896	15.49
17,000	792	13.35	825	14.23	857	15.12	887	16.02	916	16.94
18,000	815	14.84	847	15.74	878	16.65	908	17.57	937	18.50
19,000	838	16.45	870	17.37	900	18.30	930	19.24	958	20.19
20,000	862	18.19	893	19.13	923	20.08	952	21.04	979	22.01
21,000	886	20.05	917	21.02	946	22.00	974	22.98	1001	23.97
22,000	911	22.06	940	23.05	969	24.04	997	25.05	1024	26.06
23,000	935	24.19	965	25.21	993	26.23	1020	27.25	1046	28.28
24,000	961	26.47	989	27.51	1017	28.55	1044	29.60	1070	30.65
25,000	986	28.89	1014	29.95	1041	31.02	1068	32.09	1093	33.17

50AJ,AK051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	818	10.06	847	10.92	875	11.80	902	12.68	929	13.59
12,000	851	11.75	880	12.63	907	13.53	934	14.45	960	15.38
13,000	868	12.75	897	13.64	924	14.55	951	15.48	976	16.42
14,000	886	13.85	915	14.76	942	15.68	968	16.62	993	17.57
15,000	905	15.07	933	15.99	960	16.92	986	17.87	1011	18.83
16,000	924	16.41	952	17.34	978	18.28	1004	19.25	1029	20.22
17,000	944	17.86	971	18.81	997	19.77	1023	20.74	1047	21.73
18,000	964	19.45	991	20.41	1017	21.38	1042	22.36	1066	23.36
19,000	985	21.15	1011	22.13	1037	23.12	1061	24.11	1085	25.13
20,000	1006	22.99	1032	23.98	1057	24.99	1081	26.00	1105	27.03
21,000	1028	24.97	1053	25.97	1078	26.99	1102	28.02	1126	29.06
22,000	1050	27.08	1075	28.10	1099	29.14	1123	30.18	1146	31.24
23,000	1072	29.32	1097	30.37	1121	31.42	1144	32.48	1167	33.55
24,000	1095	31.71	1119	32.78	1143	33.85	1166	34.93	1189	36.02
25,000	1118	34.25	1142	35.33	1165	36.42	1188	37.52	—	—

50AJ,AK051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	954	14.50	979	15.42	1003	16.36	1027	17.30	1050	18.26
12,000	985	16.32	1010	17.28	1033	18.24	1057	19.22	1079	20.22
13,000	1001	17.38	1026	18.35	1049	19.32	1072	20.32	1095	21.32
14,000	1018	18.54	1042	19.52	1066	20.51	1088	21.52	1111	22.53
15,000	1035	19.81	1059	20.81	1082	21.81	1105	22.82	1127	23.85
16,000	1053	21.21	1077	22.21	1100	23.22	1122	24.25	1144	25.29
17,000	1071	22.73	1095	23.74	1117	24.76	1140	25.80	1161	26.85
18,000	1090	24.37	1113	25.40	1136	26.43	1158	27.48	1179	28.54
19,000	1109	26.15	1132	27.19	1154	28.24	1176	29.29	1197	30.36
20,000	1128	28.06	1151	29.11	1173	30.17	1195	31.24	—	—
21,000	1148	30.11	1171	31.17	1193	32.25	—	—	—	—
22,000	1169	32.30	1191	33.38	—	—	—	—	—	—
23,000	1190	34.64	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS

48AW,AY036 (35 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	475	2.29	527	2.66	576	3.05	622	3.44	666	3.84
8,000	526	3.10	573	3.50	617	3.91	660	4.33	700	4.75
9,000	579	4.08	621	4.51	662	4.95	701	5.39	738	5.83
10,000	633	5.24	671	5.70	709	6.16	744	6.62	779	7.09
11,000	687	6.59	723	7.07	757	7.56	790	8.05	823	8.54
12,000	742	8.15	775	8.65	807	9.17	838	9.68	868	10.20
13,000	797	9.92	827	10.45	857	10.98	887	11.52	915	12.07
14,000	852	11.92	881	12.47	909	13.03	936	13.59	963	14.15
15,000	908	14.15	935	14.72	961	15.31	987	15.89	1013	16.48
16,000	964	16.63	989	17.23	1014	17.83	1039	18.43	1063	19.04
17,000	1021	19.37	1044	19.98	1068	20.60	1091	21.23	1114	21.86
17,500	1049	20.84	1072	21.46	1095	22.09	1117	22.73	1139	23.36

48AW,AY036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	709	4.25	749	4.68	788	5.11	825	5.55	860	6.00
8,000	740	5.18	778	5.62	814	6.07	850	6.53	884	7.00
9,000	775	6.28	810	6.74	845	7.21	878	7.69	911	8.17
10,000	813	7.57	846	8.05	879	8.53	910	9.03	941	9.53
11,000	854	9.04	885	9.54	916	10.05	945	10.56	974	11.08
12,000	898	10.72	927	11.24	955	11.77	983	12.30	1011	12.84
13,000	943	12.61	970	13.15	997	13.70	1024	14.25	1050	14.81
14,000	990	14.72	1016	15.29	1041	15.86	1066	16.43	1091	17.01
15,000	1038	17.06	1062	17.65	1086	18.25	1110	18.84	1134	19.44
16,000	1086	19.65	1110	20.26	1133	20.88	1156	21.49	1178	22.11
17,000	1136	22.49	1158	23.12	1180	23.76	1202	24.39	1223	25.03
17,500	1161	24.01	1183	24.65	1205	25.30	1226	25.94	1247	26.59

48AW,AY036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	894	6.46	927	6.92	958	7.38	988	7.85	1017	8.33
8,000	917	7.48	949	7.96	980	8.44	1010	8.93	1039	9.43
9,000	942	8.66	973	9.16	1003	9.66	1033	10.17	1061	10.69
10,000	971	10.03	1001	10.55	1030	11.06	1058	11.59	1086	12.12
11,000	1003	11.60	1031	12.13	1059	12.67	1086	13.21	1112	13.75
12,000	1038	13.38	1065	13.92	1091	14.47	1117	15.03	1142	15.59
13,000	1075	15.37	1101	15.93	1126	16.50	1150	17.07	1175	17.65
14,000	1115	17.59	1139	18.17	1163	18.75	1186	19.34	1210	19.94
15,000	1157	20.04	1180	20.64	1202	21.24	1225	21.85	1247	22.46
16,000	1200	22.73	1222	23.35	1243	23.97	1265	24.60	1286	25.23
17,000	1245	25.67	1266	26.32	1286	26.96	—	—	—	—
17,500	1267	27.24	1288	27.89	—	—	—	—	—	—

48AW,AY036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	1046	8.81	1073	9.29	1099	9.78	1125	10.27	1150	10.76
8,000	1067	9.93	1094	10.44	1121	10.95	1147	11.46	1172	11.98
9,000	1089	11.21	1116	11.73	1142	12.26	1168	12.80	1193	13.33
10,000	1113	12.66	1139	13.20	1165	13.75	1190	14.30	1215	14.86
11,000	1139	14.31	1164	14.86	1189	15.43	1214	15.99	1238	16.56
12,000	1167	16.16	1192	16.73	1216	17.31	1240	17.89	1264	18.48
13,000	1199	18.23	1222	18.82	1246	19.41	1269	20.00	1291	20.61
14,000	1232	20.53	1255	21.14	1277	21.74	1300	22.35	—	—
15,000	1269	23.07	1290	23.69	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—
17,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (cont)

48AW,AY041 (40 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	526	3.10	573	3.50	617	3.91	660	4.33	700	4.75
9,000	579	4.08	621	4.51	662	4.95	701	5.39	738	5.83
10,000	633	5.24	671	5.70	709	6.16	744	6.62	779	7.09
11,000	687	6.59	723	7.07	757	7.56	790	8.05	823	8.54
12,000	742	8.15	775	8.65	807	9.17	838	9.68	868	10.20
13,000	797	9.92	827	10.45	857	10.98	887	11.52	915	12.07
14,000	852	11.92	881	12.47	909	13.03	936	13.59	963	14.15
15,000	908	14.15	935	14.72	961	15.31	987	15.89	1013	16.48
16,000	964	16.63	989	17.23	1014	17.83	1039	18.43	1063	19.04
17,000	1021	19.37	1044	19.98	1068	20.60	1091	21.23	1114	21.86
18,000	1077	22.37	1099	23.01	1122	23.64	1144	24.29	1165	24.94
19,000	1133	25.65	1155	26.30	1176	26.96	1197	27.62	1217	28.29
20,000	1190	29.21	—	—	—	—	—	—	—	—

48AW,AY041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	740	5.18	778	5.62	814	6.07	850	6.53	884	7.00
9,000	775	6.28	810	6.74	845	7.21	878	7.69	911	8.17
10,000	813	7.57	846	8.05	879	8.53	910	9.03	941	9.53
11,000	854	9.04	885	9.54	916	10.05	945	10.56	974	11.08
12,000	898	10.72	927	11.24	955	11.77	983	12.30	1011	12.84
13,000	943	12.61	970	13.15	997	13.70	1024	14.25	1050	14.81
14,000	990	14.72	1016	15.29	1041	15.86	1066	16.43	1091	17.01
15,000	1038	17.06	1062	17.65	1086	18.25	1110	18.84	1134	19.44
16,000	1086	19.65	1110	20.26	1133	20.88	1156	21.49	1178	22.11
17,000	1136	22.49	1158	23.12	1180	23.76	1202	24.39	1223	25.03
18,000	1187	25.59	1208	26.25	1229	26.90	1250	27.56	1270	28.22
19,000	1238	28.96	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

48AW,AY041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	917	7.48	949	7.96	980	8.44	1010	8.94	1039	9.43
9,000	942	8.66	973	9.16	1003	9.66	1033	10.17	1061	10.69
10,000	971	10.03	1001	10.55	1030	11.06	1058	11.59	1086	12.12
11,000	1003	11.60	1031	12.13	1059	12.67	1086	13.21	1112	13.75
12,000	1038	13.38	1065	13.92	1091	14.47	1117	15.03	1142	15.59
13,000	1075	15.37	1101	15.93	1126	16.50	1150	17.07	1175	17.65
14,000	1115	17.59	1139	18.17	1163	18.75	1186	19.34	1210	19.94
15,000	1157	20.04	1180	20.64	1202	21.24	1225	21.85	1247	22.46
16,000	1200	22.73	1222	23.35	1243	23.97	1265	24.60	1286	25.23
17,000	1245	25.67	1266	26.32	1286	26.96	—	—	—	—
18,000	1290	28.88	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

48AW,AY041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	1067	9.93	1094	10.44	1121	10.95	1147	11.46	1172	11.98
9,000	1089	11.21	1116	11.73	1142	12.26	1168	12.80	1193	13.33
10,000	1113	12.66	1139	13.20	1165	13.75	1190	14.30	1215	14.86
11,000	1139	14.31	1164	14.86	1189	15.43	1214	15.99	1238	16.56
12,000	1167	16.16	1192	16.73	1216	17.31	1240	17.89	1264	18.48
13,000	1199	18.23	1222	18.82	1246	19.41	1269	20.00	1291	20.61
14,000	1232	20.53	1255	21.14	1277	21.74	1300	22.35	—	—
15,000	1269	23.07	1290	23.69	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (cont)

48AW,AY051 (50 TONS)

Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	450	3.19	509	3.86	561	4.58	608	5.34	651	6.14
12,000	516	4.81	569	5.54	617	6.30	660	7.10	701	7.93
13,000	550	5.80	600	6.56	646	7.34	688	8.15	727	9.00
14,000	584	6.90	632	7.69	676	8.50	716	9.33	754	10.20
15,000	619	8.13	664	8.96	706	9.79	745	10.65	782	11.53
16,000	654	9.49	697	10.36	737	11.22	775	12.10	811	13.00
17,000	689	10.99	730	11.90	769	12.79	806	13.69	840	14.61
18,000	725	12.64	764	13.58	801	14.51	837	15.43	870	16.38
19,000	760	14.43	798	15.41	834	16.37	868	17.32	900	18.29
20,000	796	16.37	833	17.39	867	18.39	900	19.37	931	20.36
21,000	832	18.47	867	19.54	901	20.56	932	21.57	963	22.59
22,000	869	20.74	902	21.84	934	22.90	965	23.94	995	24.98
23,000	905	23.17	937	24.31	968	25.40	998	26.48	1027	27.55
24,000	942	25.78	973	26.95	1003	28.08	1032	29.18	1059	30.28
25,000	978	28.56	1008	29.77	1037	30.93	1065	32.07	1092	33.20

48AW,AY051 (50 TONS) (cont)

Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	691	6.96	728	7.80	764	8.66	797	9.53	829	10.42
12,000	739	8.79	774	9.68	808	10.59	841	11.52	872	12.46
13,000	764	9.88	799	10.79	832	11.72	864	12.67	894	13.64
14,000	790	11.10	824	12.02	857	12.97	888	13.94	917	14.92
15,000	817	12.44	850	13.38	882	14.35	912	15.33	941	16.34
16,000	845	13.93	877	14.88	908	15.86	938	16.86	966	17.88
17,000	873	15.56	904	16.53	935	17.52	964	18.54	992	19.58
18,000	902	17.34	933	18.32	962	19.33	990	20.36	1018	21.41
19,000	932	19.27	961	20.27	990	21.29	1018	22.34	1045	23.40
20,000	962	21.36	991	22.38	1019	23.42	1046	24.48	1072	25.56
21,000	992	23.61	1020	24.65	1048	25.71	1074	26.78	1100	27.87
22,000	1023	26.03	1051	27.09	1077	28.17	1103	29.26	1129	30.36
23,000	1055	28.62	1081	29.70	1107	30.79	1133	31.90	1157	33.02
24,000	1086	31.38	1113	32.48	1138	33.59	1163	34.72	1187	35.86
25,000	1119	34.32	1144	35.44	1169	36.58	1193	37.72	—	—

48AW,AY051 (50 TONS) (cont)

Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	860	11.31	890	12.21	918	13.11	946	14.02	973	14.94
12,000	901	13.42	930	14.38	958	15.36	985	16.34	1011	17.33
13,000	923	14.62	952	15.61	979	16.61	1006	17.62	1031	18.64
14,000	946	15.92	974	16.94	1001	17.97	1027	19.01	1052	20.06
15,000	970	17.36	997	18.40	1024	19.45	1049	20.51	1074	21.58
16,000	994	18.93	1021	19.98	1047	21.05	1072	22.14	1097	23.23
17,000	1019	20.63	1045	21.70	1071	22.79	1096	23.89	1120	25.01
18,000	1045	22.48	1070	23.57	1096	24.67	1120	25.79	1144	26.93
19,000	1071	24.49	1096	25.59	1121	26.71	1145	27.84	1169	28.99
20,000	1098	26.66	1123	27.77	1147	28.90	1171	30.05	1194	31.21
21,000	1125	28.99	1150	30.12	1173	31.26	1197	32.42	—	—
22,000	1153	31.49	1177	32.63	—	—	—	—	—	—
23,000	1181	34.16	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—

48AW,AY051 (50 TONS) (cont)

Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	998	15.86	1024	16.79	1048	17.72	1072	18.66	1096	19.60
12,000	1036	18.33	1061	19.33	1085	20.34	1108	21.35	1131	22.36
13,000	1056	19.67	1081	20.71	1104	21.75	1128	22.80	1150	23.85
14,000	1077	21.12	1101	22.18	1125	23.25	1148	24.33	1170	25.42
15,000	1099	22.67	1122	23.76	1146	24.86	1168	25.97	1191	27.08
16,000	1121	24.34	1144	25.45	1167	26.58	1190	27.71	—	—
17,000	1144	26.13	1167	27.27	1190	28.42	—	—	—	—
18,000	1167	28.07	1190	29.23	—	—	—	—	—	—
19,000	1192	30.16	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—
21,000	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (cont)

50AW,AY036 (35 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	451	2.13	503	2.49	552	2.86	597	3.23	641	3.60
8,000	499	2.88	546	3.27	590	3.66	632	4.06	672	4.46
9,000	548	3.78	591	4.20	631	4.62	670	5.04	708	5.47
10,000	599	4.86	637	5.30	675	5.74	711	6.19	746	6.64
11,000	649	6.11	685	6.57	720	7.04	753	7.51	786	7.99
12,000	701	7.54	734	8.03	766	8.52	797	9.02	828	9.52
13,000	753	9.18	783	9.69	813	10.21	842	10.72	871	11.25
14,000	805	11.03	833	11.56	861	12.09	889	12.63	916	13.18
15,000	857	13.09	884	13.64	910	14.20	936	14.76	962	15.32
16,000	910	15.38	935	15.95	960	16.53	984	17.11	1008	17.69
17,000	963	17.91	986	18.50	1010	19.09	1033	19.69	1056	20.30
17,500	989	19.26	1012	19.86	1035	20.47	1058	21.08	1080	21.69

50AW,AY036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	682	3.99	722	4.39	760	4.80	797	5.22	832	5.65
8,000	711	4.87	748	5.28	784	5.70	819	6.14	853	6.58
9,000	744	5.90	778	6.33	812	6.77	845	7.22	877	7.67
10,000	779	7.09	812	7.55	844	8.01	875	8.47	905	8.94
11,000	817	8.47	848	8.94	878	9.43	907	9.91	936	10.40
12,000	857	10.02	886	10.52	915	11.03	943	11.53	970	12.04
13,000	899	11.77	927	12.30	953	12.82	980	13.35	1006	13.88
14,000	942	13.73	968	14.27	994	14.82	1019	15.37	1044	15.92
15,000	987	15.89	1011	16.46	1036	17.03	1060	17.61	1083	18.18
16,000	1032	18.28	1056	18.87	1079	19.47	1101	20.06	1124	20.66
17,000	1078	20.91	1101	21.52	1123	22.13	1145	22.75	1166	23.36
17,500	1102	22.31	1124	22.93	1145	23.55	1166	24.18	1187	24.80

50AW,AY036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	866	6.09	899	6.54	931	6.99	961	7.45	991	7.91
8,000	885	7.03	917	7.48	948	7.95	978	8.42	1007	8.90
9,000	908	8.13	939	8.60	968	9.08	997	9.56	1026	10.05
10,000	934	9.42	963	9.90	992	10.39	1020	10.89	1047	11.39
11,000	964	10.89	992	11.39	1019	11.89	1045	12.40	1071	12.91
12,000	996	12.55	1023	13.07	1048	13.59	1074	14.11	1099	14.64
13,000	1031	14.41	1056	14.95	1081	15.48	1105	16.03	1129	16.57
14,000	1068	16.48	1092	17.03	1115	17.59	1138	18.15	1161	18.71
15,000	1106	18.75	1129	19.33	1151	19.91	1174	20.48	1196	21.07
16,000	1146	21.25	1168	21.85	1189	22.45	1211	23.04	1232	23.64
17,000	1187	23.98	1208	24.60	1229	25.21	1249	25.83	1270	26.46
17,500	1208	25.43	1229	26.06	1249	26.69	1269	27.32	1289	27.95

50AW,AY036 (35 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	1020	8.39	1047	8.86	1074	9.34	1101	9.83	1126	10.32
8,000	1036	9.39	1063	9.88	1090	10.38	1116	10.88	1142	11.39
9,000	1053	10.55	1080	11.05	1107	11.56	1133	12.08	1158	12.60
10,000	1073	11.89	1100	12.41	1125	12.93	1151	13.45	1175	13.99
11,000	1097	13.43	1122	13.96	1147	14.49	1171	15.02	1195	15.56
12,000	1123	15.17	1147	15.71	1171	16.25	1195	16.80	1218	17.35
13,000	1152	17.12	1175	17.67	1198	18.22	1221	18.78	1243	19.35
14,000	1184	19.27	1206	19.84	1228	20.41	1250	20.99	1271	21.56
15,000	1217	21.65	1239	22.23	1260	22.82	1280	23.41	—	—
16,000	1253	24.25	1273	24.85	1293	25.45	—	—	—	—
17,000	1289	27.07	—	—	—	—	—	—	—	—
17,500	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (cont)

50AW,AY041 (40 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	499	2.88	546	3.27	590	3.66	632	4.06	672	4.46
9,000	548	3.78	591	4.20	631	4.62	670	5.04	708	5.47
10,000	599	4.86	637	5.30	675	5.74	711	6.19	746	6.64
11,000	649	6.11	685	6.57	720	7.04	753	7.51	786	7.99
12,000	701	7.54	734	8.03	766	8.52	797	9.02	828	9.52
13,000	753	9.18	783	9.69	813	10.21	842	10.72	871	11.25
14,000	805	11.03	833	11.56	861	12.09	889	12.63	916	13.18
15,000	857	13.09	884	13.64	910	14.20	936	14.76	962	15.32
16,000	910	15.38	935	15.95	960	16.53	984	17.11	1008	17.69
17,000	963	17.91	986	18.50	1010	19.09	1033	19.69	1056	20.30
18,000	1016	20.68	1038	21.29	1060	21.90	1082	22.52	1104	23.15
19,000	1069	23.71	1090	24.33	1111	24.96	1132	25.60	1153	26.25
20,000	1122	26.99	1142	27.64	1162	28.29	1182	28.95	—	—

50AW,AY041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	711	4.87	748	5.28	784	5.70	819	6.14	853	6.58
9,000	744	5.90	778	6.33	812	6.77	845	7.22	877	7.67
10,000	779	7.09	812	7.55	844	8.01	875	8.47	905	8.94
11,000	817	8.47	848	8.94	878	9.43	907	9.91	936	10.40
12,000	857	10.02	886	10.52	915	11.03	943	11.53	970	12.04
13,000	899	11.77	927	12.30	953	12.82	980	13.35	1006	13.88
14,000	942	13.73	968	14.27	994	14.82	1019	15.37	1044	15.92
15,000	987	15.89	1011	16.46	1036	17.03	1060	17.61	1083	18.18
16,000	1032	18.28	1056	18.87	1079	19.47	1101	20.06	1124	20.66
17,000	1078	20.91	1101	21.52	1123	22.13	1145	22.75	1166	23.36
18,000	1126	23.77	1147	24.41	1168	25.04	1189	25.67	1209	26.31
19,000	1173	26.89	1194	27.54	1214	28.19	1234	28.85	—	—
20,000	—	—	—	—	—	—	—	—	—	—

50AW,AY041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	885	7.03	917	7.48	948	7.95	978	8.42	1007	8.90
9,000	908	8.13	939	8.60	968	9.08	997	9.56	1026	10.05
10,000	934	9.42	963	9.90	992	10.39	1020	10.89	1047	11.39
11,000	964	10.89	992	11.39	1019	11.89	1045	12.40	1071	12.91
12,000	996	12.55	1023	13.07	1048	13.59	1074	14.11	1099	14.64
13,000	1031	14.41	1056	14.95	1081	15.48	1105	16.03	1129	16.57
14,000	1068	16.48	1092	17.03	1115	17.59	1138	18.15	1161	18.71
15,000	1106	18.75	1129	19.33	1151	19.91	1174	20.48	1196	21.07
16,000	1146	21.25	1168	21.85	1189	22.45	1211	23.04	1232	23.64
17,000	1187	23.98	1208	24.60	1229	25.21	1249	25.83	1270	26.46
18,000	1230	26.95	1250	27.58	1269	28.22	1289	28.86	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

50AW,AY041 (40 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	1036	9.39	1063	9.88	1090	10.38	1116	10.88	1142	11.39
9,000	1053	10.55	1080	11.05	1107	11.56	1133	12.08	1158	12.60
10,000	1073	11.89	1100	12.41	1125	12.93	1151	13.45	1175	13.99
11,000	1097	13.43	1122	13.96	1147	14.49	1171	15.02	1195	15.56
12,000	1123	15.17	1147	15.71	1171	16.25	1195	16.80	1218	17.35
13,000	1152	17.12	1175	17.67	1198	18.22	1221	18.78	1243	19.35
14,000	1184	19.27	1206	19.84	1228	20.41	1250	20.99	1271	21.56
15,000	1217	21.65	1239	22.23	1260	22.82	1280	23.41	—	—
16,000	1253	24.25	1273	24.85	1293	25.45	—	—	—	—
17,000	1289	27.07	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (cont)

50AW,AY051 (50 TONS)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	429	2.98	488	3.61	539	4.26	585	4.95	627	5.66
12,000	490	4.48	543	5.17	591	5.88	634	6.61	673	7.36
13,000	522	5.39	572	6.11	618	6.85	659	7.61	698	8.38
14,000	554	6.41	602	7.17	645	7.94	686	8.72	723	9.51
15,000	586	7.56	632	8.34	674	9.14	713	9.94	749	10.77
16,000	619	8.83	663	9.64	703	10.46	741	11.30	776	12.14
17,000	652	10.23	694	11.07	733	11.92	769	12.78	803	13.65
18,000	685	11.76	725	12.63	763	13.51	798	14.39	831	15.29
19,000	719	13.44	757	14.33	793	15.23	827	16.14	860	17.07
20,000	753	15.26	789	16.18	824	17.10	857	18.04	888	18.99
21,000	787	17.23	822	18.17	855	19.12	887	20.08	918	21.05
22,000	821	19.35	855	20.32	887	21.29	918	22.28	947	23.28
23,000	855	21.63	888	22.62	919	23.62	949	24.63	977	25.65
24,000	889	24.07	921	25.08	951	26.11	980	27.14	1008	28.19
25,000	924	26.67	954	27.71	983	28.76	1011	29.82	1038	30.89

50AW,AY051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	666	6.41	703	7.17	737	7.96	770	8.78	801	9.61
12,000	711	8.14	746	8.94	779	9.76	811	10.60	841	11.45
13,000	734	9.18	769	9.99	801	10.82	832	11.68	862	12.55
14,000	759	10.33	792	11.16	824	12.01	855	12.88	884	13.76
15,000	784	11.60	816	12.45	848	13.32	878	14.21	906	15.11
16,000	810	13.00	841	13.87	872	14.76	901	15.66	929	16.58
17,000	836	14.53	867	15.42	897	16.33	926	17.25	953	18.19
18,000	863	16.20	893	17.11	922	18.04	950	18.98	978	19.93
19,000	890	18.00	920	18.94	949	19.88	976	20.84	1003	21.81
20,000	918	19.94	947	20.90	975	21.87	1002	22.85	1028	23.84
21,000	947	22.03	975	23.02	1002	24.01	1029	25.01	1054	26.02
22,000	976	24.28	1003	25.28	1030	26.30	1056	27.32	1081	28.35
23,000	1005	26.68	1032	27.71	1058	28.75	1083	29.79	1108	30.85
24,000	1035	29.24	1061	30.29	1086	31.35	1111	32.42	1135	33.49
25,000	1065	31.96	1090	33.04	1115	34.12	1139	35.21	1163	36.31

50AW,AY051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	831	10.46	860	11.33	888	12.21	915	13.11	941	14.02
12,000	870	12.33	898	13.22	925	14.13	951	15.06	977	16.00
13,000	891	13.44	918	14.35	945	15.27	971	16.20	996	17.16
14,000	912	14.67	939	15.59	965	16.52	991	17.47	1016	18.44
15,000	934	16.02	961	16.96	987	17.90	1012	18.87	1036	19.84
16,000	957	17.51	983	18.46	1008	19.42	1033	20.39	1057	21.38
17,000	980	19.13	1006	20.10	1031	21.07	1055	22.06	1079	23.06
18,000	1004	20.89	1029	21.87	1054	22.86	1078	23.86	1101	24.88
19,000	1028	22.80	1053	23.79	1078	24.80	1101	25.81	1124	26.84
20,000	1053	24.85	1078	25.86	1102	26.88	1125	27.91	1148	28.96
21,000	1079	27.04	1103	28.07	1126	29.11	1149	30.16	1172	31.22
22,000	1105	29.39	1129	30.44	1152	31.50	1174	32.57	1196	33.65
23,000	1131	31.90	1155	32.97	1177	34.05	1199	35.13	—	—
24,000	1158	34.57	1181	35.66	—	—	—	—	—	—
25,000	1186	37.41	—	—	—	—	—	—	—	—

50AW,AY051 (50 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	966	14.94	991	15.88	1014	16.83	1038	17.79	1060	18.76
12,000	1002	16.96	1026	17.92	1049	18.90	1072	19.89	1094	20.89
13,000	1020	18.13	1044	19.11	1067	20.10	1090	21.10	1112	22.12
14,000	1040	19.42	1063	20.41	1086	21.41	1109	22.43	1131	23.46
15,000	1060	20.83	1083	21.84	1106	22.85	1128	23.88	1150	24.92
16,000	1081	22.39	1104	23.40	1126	24.43	1148	25.47	1170	26.52
17,000	1102	24.07	1125	25.10	1147	26.14	1169	27.19	1190	28.26
18,000	1124	25.91	1147	26.94	1169	28.00	1190	29.06	—	—
19,000	1147	27.89	1169	28.94	1190	30.00	—	—	—	—
20,000	1170	30.01	1192	31.08	—	—	—	—	—	—
21,000	1194	32.30	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—

LEGEND
Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters.

2. Conversion — Bhp to watts:

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

3. Variable air volume units will operate down to 70 cfm/ton. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.



FAN PERFORMANCE — POWER EXHAUST

48/50AJ,AK,AW,AY036,041 (35 and 40 Tons)

Airflow (Cfm)	208 V			230, 460, 575 V		
	ESP	Bhp	Watts	ESP	Bhp	Watts
7,700	0.60	3.69	4140	0.73	3.98	4460
7,900	0.56	3.74	4190	0.69	4.02	4510
8,100	0.51	3.78	4240	0.65	4.07	4560
8,500	0.41	3.83	4290	0.56	4.12	4620
8,900	0.31	3.93	4410	0.47	4.23	4740
9,300	0.20	4.07	4560	0.37	4.37	4900
9,700	0.11	4.17	4670	0.30	4.47	5010
10,100	0.04	4.25	4770	0.23	4.56	5110
10,500	—	—	—	0.17	4.66	5220
10,900	—	—	—	0.12	4.75	5330
11,300	—	—	—	0.07	4.80	5380
11,700	—	—	—	0.04	4.83	5420

LEGEND

Bhp — Brake Horsepower
ESP — External Static Pressure (in. wg)
Watts — Input Watts to Motor

48/50AJ,AK,AW,AY051 (50 Tons)

Airflow (Cfm)	208 V			230, 460, 575 V		
	ESP	Bhp	Watts	ESP	Bhp	Watts
11,550	0.60	5.54	6210	0.73	5.97	6690
11,850	0.56	5.61	6285	0.69	6.03	6765
12,150	0.51	5.67	6360	0.65	6.10	6840
12,750	0.41	5.74	6435	0.56	6.18	6930
13,350	0.31	5.90	6615	0.47	6.34	7110
13,950	0.20	6.10	6840	0.37	6.56	7350
14,550	0.11	6.25	7005	0.30	6.70	7515
15,150	0.04	6.38	7155	0.23	6.84	7665
15,750	—	—	—	0.17	6.98	7830
16,350	—	—	—	0.12	7.13	7995
16,950	—	—	—	0.07	7.20	8070
17,550	—	—	—	0.04	7.25	8130

LEGEND

Bhp — Brake Horsepower
ESP — External Static Pressure (in. wg)
Watts — Input Watts to Motor

MOTOR LIMITATIONS

HIGH-EFFICIENCY MOTORS

Nominal		Maximum		Maximum Amps			Maximum Efficiency
Bhp	BkW	Bhp	BkW	230 v	460 v	575 v	
15	11.19	15.3	11.41	43.8	—	—	91.0
		18.0	13.43	—	21.9	19.0	91.0
20	14.92	22.4	16.71	62.0	—	—	91.0
		23.4	17.46	—	28.7	23.0	91.0
25	18.65	28.9	21.56	72.0	—	—	91.7
		29.4	21.93	—	37.4	31.0	91.7
30	22.38	35.6	26.56	95.0	—	—	92.4
		34.7	25.89	—	43.8	36.3	92.4
40	29.84	42.0	31.33	110.0	55.0	43.8	93.0

PREMIUM-EFFICIENCY MOTORS

Nominal		Maximum		Maximum Amps		Maximum Efficiency
Bhp	BkW	Bhp	BkW	230 v	460 v	
15	11.19	15.3	11.41	43.8	—	93.0
		18.0	13.43	—	21.9	93.0
20	14.92	22.4	16.71	58.2	—	93.6
		23.4	17.46	—	28.7	93.6
25	18.65	28.9	21.56	73.0	—	93.6
		29.4	21.93	—	36.3	93.6
30	22.38	35.6	26.56	82.6	—	93.6
		34.7	25.89	—	41.7	93.6
40	29.84	42.0	31.33	110.0	55.0	94.5

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts

NOTES:

- Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using the fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

Electrical data



48AJ,AK,AW,AY UNITS WITHOUT OPTIONAL CONVENIENCE OUTLET

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	POWER SUPPLY	
				Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	MCA	Fuse or HACR Brkr*
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA							
036	208	187	229	21.8	184	25.6	190	25.6	190	25.6	190	4	6.5 (ea)	15	46.2	— 23.6	182.4 206.0	225 250
														20	59.4	— 23.6	198.9 222.5	250 250
														25	74.8	— 23.6	218.1 241.7	250 300
	230	207	253	21.8	184	25.6	190	25.6	190	25.6	190	4	6.6 (ea)	15	42.0	— 23.6	177.5 201.1	200 225
														20	54.0	— 23.6	192.5 216.1	225 250
														25	68.0	— 23.6	210.0 233.6	250 300
	460	414	508	11	90	13.5	95	13.5	95	13.5	95	4	3.3 (ea)	15	21.0	— 12.6	91.0 103.6	110 110
														20	27.0	— 12.6	98.5 111.1	125 125
														25	34.0	— 12.6	107.2 119.8	125 150
	575	518	632	9	73	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	15	17.0	— 9.6	71.3 80.9	80 90
														20	22.0	— 9.6	77.5 87.1	90 100
														25	27.0	— 9.6	83.8 93.4	110 110
041	208	187	229	25.6	190	25.6	190	34.3	265	34.3	265	4	6.5 (ea)	15	46.2	— 23.6	203.6 227.2	225 250
														20	59.4	— 23.6	220.1 243.7	250 300
														25	74.8	— 23.6	239.3 262.9	300 300
	230	207	253	25.6	190	25.6	190	34.3	265	34.3	265	4	6.6 (ea)	15	42.0	— 23.6	198.7 222.3	225 250
														20	54.0	— 23.6	213.7 237.3	250 250
														25	68.0	— 23.6	231.2 254.8	250 300
	460	414	508	13.5	95	13.5	95	16	120	16	120	4	3.3 (ea)	15	21.0	— 12.6	98.5 111.1	110 125
														20	27.0	— 12.6	106.0 118.6	125 125
														25	34.0	— 12.6	114.7 127.3	125 150
	575	518	632	10.2	75	10.2	75	12.9	80	12.9	80	4	2.6 (ea)	15	17.0	— 9.6	77.9 87.5	90 100
														20	22.0	— 9.6	84.1 93.7	100 110
														25	27.0	— 9.6	90.4 100.0	110 125
051	208	187	229	34.3	265	34.3	265	34.3	265	34.3	265	6	6.5 (ea)	20	59.4	— 35.4	250.5 285.9	300 300
														25	74.8	— 35.4	269.7 305.1	300 350
														30	88	— 35.4	286.2 321.6	350 400
														40	114	— 35.4	318.7 354.1	400 450
	230	207	253	34.3	265	34.3	265	34.3	265	34.3	265	6	6.6 (ea)	20	54	— 35.4	244.3 279.7	250 300
														25	68	— 35.4	261.8 297.2	300 350
														30	80	— 35.4	276.8 312.2	350 350
														40	104	— 35.4	306.8 342.2	400 400
	460	414	508	16	120	16	120	16	120	16	120	6	3.3 (ea)	20	27	— 18.9	117.6 136.5	125 150
														25	34	— 18.9	126.3 145.2	150 175
														30	40	— 18.9	133.8 152.7	150 175
														40	52	— 18.9	148.8 167.7	200 200
575	518	632	12.9	80	12.9	80	12.9	80	12.9	80	6	2.6 (ea)	20	22	— 14.4	94.7 109.1	110 125	
													25	27	— 14.4	101.0 115.4	125 125	
													30	32	— 14.4	107.2 121.6	125 150	
													40	41	— 14.4	118.5 132.9	150 150	



48AJ,AK,AW,AY UNITS WITH OPTIONAL CONVENIENCE OUTLET

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	CONVENIENCE OUTLET			POWER SUPPLY	
				Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2											
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	Qty	FLA	Hp	FLA	FLA (total)	FLA	LRA	MCA	Fuse or HACR Brkr*	
036	208	187	229	21.8	184	25.6	190	25.6	190	25.6	190	4	6.5 (ea)	15	46.2	—	7.0	—	189.4	225	
														20	59.4	23.6	7.0	—	205.9	250	
														25	74.8	23.6	7.0	—	225.1	250	
	230	207	253	21.8	184	25.6	190	25.6	190	25.6	190	4	6.6 (ea)	15	42.0	—	7.0	—	184.5	225	
														20	54.0	23.6	7.0	—	199.5	250	
														25	68.0	23.6	7.0	—	217.0	250	
	460	414	508	11	90	13.5	95	13.5	95	13.5	95	4	3.3 (ea)	15	21.0	12.6	3.5	—	94.5	110	
														20	27.0	12.6	3.5	—	102.0	125	
														25	34.0	12.6	3.5	—	110.7	125	
	575	518	632	9	73	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	15	17.0	9.6	2.5	—	73.8	90	
														20	22.0	9.6	2.5	—	80.0	100	
														25	27.0	9.6	2.5	—	86.3	110	
041	208	187	229	25.6	190	25.6	190	34.3	265	34.3	265	4	6.5 (ea)	15	46.2	—	7.0	—	210.6	250	
														20	59.4	23.6	7.0	—	227.1	250	
														25	74.8	23.6	7.0	—	246.3	300	
	230	207	253	25.6	190	25.6	190	34.3	265	34.3	265	4	6.6 (ea)	15	42.0	—	7.0	—	205.7	225	
														20	54.0	23.6	7.0	—	220.7	250	
														25	68.0	23.6	7.0	—	238.2	300	
	460	414	508	13.5	95	13.5	95	16	120	16	120	4	3.3 (ea)	15	21.0	12.6	3.5	—	102.0	110	
														20	27.0	12.6	3.5	—	109.5	125	
														25	34.0	12.6	3.5	—	118.2	150	
	575	518	632	10.2	75	10.2	75	12.9	80	12.9	80	4	2.6 (ea)	15	17.0	9.6	2.5	—	80.4	90	
														20	22.0	9.6	2.5	—	86.6	100	
														25	27.0	9.6	2.5	—	92.9	110	
051	208	187	229	34.3	265	34.3	265	34.3	265	34.3	265	6	6.5 (ea)	20	59.4	—	7.0	—	257.5	300	
														25	74.8	35.4	7.0	—	276.7	350	
														30	88	35.4	7.0	—	293.2	350	
														40	114	35.4	7.0	—	325.7	400	
	230	207	253	34.3	265	34.3	265	34.3	265	34.3	265	6	6.6 (ea)	20	54	35.4	7.0	—	251.3	300	
														25	68	35.4	7.0	—	268.8	300	
														30	80	35.4	7.0	—	283.8	350	
														40	104	35.4	7.0	—	313.8	400	
	460	414	508	16	120	16	120	16	120	16	120	6	3.3 (ea)	20	27	18.9	3.5	—	121.1	125	
														25	34	18.9	3.5	—	129.8	150	
														30	40	18.9	3.5	—	137.3	175	
														40	52	18.9	3.5	—	152.3	200	
575	518	632	12.9	80	12.9	80	12.9	80	12.9	80	6	2.6 (ea)	20	22	14.4	2.5	—	97.2	110		
													25	27	14.4	2.5	—	103.5	125		
													30	32	14.4	2.5	—	109.7	125		
													40	41	14.4	2.5	—	121.0	150		

Electrical data (cont)



50AJ,AK,AW,AY UNITS WITHOUT OPTIONAL CONVENIENCE OUTLET

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	OPTIONAL ELECTRIC HEAT		POWER SUPPLY	
		Min	Max	Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	kW	MCA	Fuse or HACR Brkr*
				RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA									
036	208	187	229	21.8	184	25.6	190	25.6	190	25.6	190	4	6.5 (ea)	15	46.2	—	75.1	27	182.4	225
																—	150.1	54	182.4	225
																23.6	75.1	27	206.0	250
																—	150.1	54	207.9	250
																—	75.1	27	198.9	250
																—	150.1	54	198.9	250
	230	207	253	21.8	184	25.6	190	25.6	190	25.6	190	4	6.6 (ea)	15	42.0	—	86.6	36	177.5	200
																—	173.2	72	177.5	200
																23.6	86.6	36	201.1	225
																—	173.2	72	201.1	225
																—	86.6	36	192.5	225
																—	173.2	72	192.5	225
460	414	508	11	90	13.5	95	13.5	95	13.5	95	4	3.3 (ea)	15	21.0	—	43.3	36	91.0	110	
															—	86.6	72	91.0	110	
															12.6	43.3	36	103.6	110	
															—	86.6	72	103.6	110	
															—	43.3	36	98.5	125	
															—	86.6	72	98.5	125	
575	518	632	9	73	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	15	17.0	—	34.6	36	71.3	80	
															—	69.3	72	71.3	80	
															9.6	34.6	36	80.9	90	
															—	69.3	72	80.9	90	
															—	34.6	36	77.5	90	
															—	69.3	72	77.5	90	
575	518	632	9	73	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	20	22.0	—	34.6	36	87.1	100	
															—	69.3	72	87.1	100	
															9.6	34.6	36	87.1	100	
															—	69.3	72	87.1	100	
															—	34.6	36	77.5	90	
															—	69.3	72	77.5	90	
575	518	632	9	73	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	25	27.0	—	34.6	36	83.8	110	
															—	69.3	72	83.8	110	
															9.6	34.6	36	83.8	110	
															—	69.3	72	83.8	110	
															—	34.6	36	93.4	110	
															—	69.3	72	93.4	110	



50AJ,AK,AW,AY UNITS WITHOUT OPTIONAL CONVENIENCE OUTLET (cont)

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	OPTIONAL ELECTRIC HEAT		POWER SUPPLY	
		Min	Max	Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	kW	MCA	Fuse or HACR Brkr*
				RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA									
041	208	187	229	25.6	190	25.6	190	34.3	265	34.3	265	4	6.5 (ea)	15	46.2	—	75.1	27	203.6	225
																—	150.1	54	203.6	225
																23.6	75.1	27	227.2	250
																—	150.1	54	227.2	250
																—	75.1	27	222.1	250
																—	150.1	54	224.4	250
	20	59.4	—	75.1	27	243.7	300													
			—	150.1	54	243.7	300													
			23.6	75.1	27	243.7	300													
			—	150.1	54	253.9	300													
			—	75.1	27	239.3	300													
			—	150.1	54	239.3	300													
25	74.8	—	75.1	27	262.9	300														
		—	150.1	54	262.9	300														
		23.6	75.1	27	262.9	300														
		—	150.1	54	273.1	300														
		—	75.1	27	198.7	225														
		—	150.1	54	198.7	225														
041	230	207	253	25.6	190	25.6	190	34.3	265	34.3	265	4	6.6 (ea)	15	42.0	—	86.6	36	198.7	225
																—	173.2	72	225.7	250
																23.6	86.6	36	222.3	250
																—	173.2	72	222.3	250
																—	86.6	36	213.7	250
																—	173.2	72	213.7	250
	20	54.0	—	86.6	36	237.3	250													
			—	173.2	72	237.3	250													
			23.6	86.6	36	237.3	250													
			—	173.2	72	270.2	300													
			—	86.6	36	231.2	250													
			—	173.2	72	231.2	250													
25	68.0	—	86.6	36	254.8	300														
		—	173.2	72	254.8	300														
		23.6	86.6	36	254.8	300														
		—	173.2	72	287.7	300														
		—	43.3	36	98.5	110														
		—	86.6	72	98.5	110														
041	460	414	508	13.5	95	13.5	95	16	120	16	120	4	3.3 (ea)	15	21.0	—	43.3	36	112.9	125
																—	86.6	72	112.9	125
																12.6	43.3	36	111.1	125
																—	86.6	72	111.1	125
																—	43.3	36	106.0	125
																—	86.6	72	106.0	125
	20	27.0	—	43.3	36	118.6	125													
			—	86.6	72	118.6	125													
			12.6	43.3	36	118.6	125													
			—	86.6	72	136.1	150													
			—	43.3	36	114.7	125													
			—	86.6	72	114.7	125													
25	34.0	—	43.3	36	129.1	150														
		—	86.6	72	129.1	150														
		12.6	43.3	36	127.3	150														
		—	86.6	72	127.3	150														
		—	43.3	36	144.9	175														
		—	86.6	72	144.9	175														
041	575	518	632	10.2	75	10.2	75	12.9	80	12.9	80	4	2.6 (ea)	15	17.0	—	34.6	36	77.9	90
																—	69.3	72	77.9	90
																9.6	34.6	36	87.5	100
																—	69.3	72	87.5	100
																—	34.6	36	84.1	100
																—	69.3	72	84.1	100
	20	22.0	—	34.6	36	93.7	110													
			—	69.3	72	93.7	110													
			9.6	34.6	36	93.7	110													
			—	69.3	72	108.8	125													
			—	34.6	36	90.4	110													
			—	69.3	72	90.4	110													
25	27.0	—	34.6	36	103.1	125														
		—	69.3	72	103.1	125														
		9.6	34.6	36	100.0	125														
		—	69.3	72	100.0	125														
		—	34.6	36	115.1	125														
		—	69.3	72	115.1	125														

Electrical data (cont)



50AJ,AK,AW,AY UNITS WITHOUT OPTIONAL CONVENIENCE OUTLET (cont)

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	OPTIONAL ELECTRIC HEAT		POWER SUPPLY		
				Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	kW	MCA	Fuse or HACR Brkr*	
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA										
051	208	187	229	34.3	265	34.3	265	34.3	265	34.3	265	6	6.5 (ea)	20	59.4	—	—	—	—	250.5	300.0
																—	112.6	41	—	250.5	300.0
																225.2	81	—	250.5	350.0	
																35.4	—	—	285.9	300.0	
																—	112.6	41	285.9	300.0	
																225.2	81	343.7	350.0		
														25	74.8	—	—	—	269.7	300.0	
																—	112.6	41	269.7	300.0	
																225.2	81	318.7	350.0		
																35.4	—	—	305.1	350.0	
																—	112.6	41	305.1	350.0	
																225.2	81	363.0	400.0		
30	88	—	—	—	286.2	350.0															
		—	112.6	41	286.2	350.0															
		225.2	81	335.2	400.0																
		35.4	—	—	321.6	400.0															
		—	112.6	41	321.6	400.0															
		225.2	81	379.5	450.0																
40	114	—	—	—	318.7	400.0															
		—	112.6	41	318.7	400.0															
		225.2	81	367.7	450.0																
		35.4	—	—	354.1	450.0															
		—	112.6	41	354.1	450.0															
		225.2	81	412.0	500.0																
230	207	253	34.3	265	34.3	265	34.3	265	34.3	265	6	6.6 (ea)	20	54	—	—	—	—	244.3	250.0	
															—	129.9	54	—	244.3	250.0	
															259.8	108	—	327.3	350.0		
															35.4	—	—	279.7	300.0		
															—	129.9	54	279.7	300.0		
															259.8	108	371.6	400.0			
													25	68	—	—	—	261.8	300.0		
															—	129.9	54	261.8	300.0		
															259.8	108	344.8	400.0			
															35.4	—	—	297.2	350.0		
															—	129.9	54	297.2	350.0		
															259.8	108	389.1	400.0			
30	80	—	—	—	276.8	350.0															
		—	129.9	54	276.8	350.0															
		259.8	108	359.8	400.0																
		35.4	—	—	312.2	350.0															
		—	129.9	54	312.2	350.0															
		259.8	108	404.1	450.0																
40	104	—	—	—	306.8	400.0															
		—	129.9	54	306.8	400.0															
		259.8	108	389.8	450.0																
		35.4	—	—	342.2	400.0															
		—	129.9	54	342.2	400.0															
		259.8	108	434.1	500.0																



50AJ,AK,AW,AY UNITS WITHOUT OPTIONAL CONVENIENCE OUTLET (cont)

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	OPTIONAL ELECTRIC HEAT		POWER SUPPLY	
		Min	Max	Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	kW	MCA	Fuse or HACR Brkr*
				RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA									
051 (cont)	460	414	508	16	120	16	120	16	120	16	120	6	3.3 (ea)	20	27	—	—	—	117.6	125.0
																65.0	54	117.6	125.0	
																129.9	108	163.7	175.0	
																18.9	—	—	136.5	150.0
																65.0	54	136.5	150.0	
																129.9	108	187.3	200.0	
														25	34	—	—	—	126.3	150.0
																65.0	54	126.3	150.0	
																129.9	108	172.4	200.0	
																18.9	—	—	145.2	175.0
																65.0	54	145.2	175.0	
																129.9	108	196.0	225.0	
30	40	—	—	—	133.8	150.0														
		65.0	54	133.8	150.0															
		129.9	108	179.9	200.0															
		18.9	—	—	152.7	175.0														
		65.0	54	152.7	175.0															
		129.9	108	203.5	225.0															
40	52	—	—	—	148.8	200.0														
		65.0	54	148.8	200.0															
		129.9	108	194.9	225.0															
		18.9	—	—	167.7	200.0														
		65.0	54	167.7	200.0															
		129.9	108	218.5	250.0															
575	518	632	12.9	80	12.9	80	12.9	80	12.9	80	12.9	80	2.6 (ea)	20	22	—	—	—	94.7	110.0
																65.0	54	94.7	110.0	
																129.9	108	157.4	175.0	
																14.4	—	—	109.1	125.0
																65.0	54	110.5	125.0	
																129.9	108	175.4	200.0	
														25	27	—	—	—	101.0	125.0
																65.0	54	101.0	125.0	
																129.9	108	163.7	175.0	
																14.4	—	—	115.4	125.0
																65.0	54	116.8	125.0	
																129.9	108	181.7	200.0	
30	32	—	—	—	107.2	125.0														
		65.0	54	107.2	125.0															
		129.9	108	169.9	200.0															
		14.4	—	—	121.6	150.0														
		65.0	54	123.0	150.0															
		129.9	108	187.9	200.0															
40	41	—	—	—	118.5	150.0														
		65.0	54	118.5	150.0															
		129.9	108	181.2	200.0															
		14.4	—	—	132.9	150.0														
		65.0	54	134.3	150.0															
		129.9	108	199.2	225.0															



50AJ,AK,AW,AY UNITS WITH OPTIONAL CONVENIENCE OUTLET

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	CONVENIENCE OUTLET			OPTIONAL ELECTRIC HEAT		POWER SUPPLY		
		Min	Max	Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	LRA	FLA	kW	MCA	Fuse or HACR Brkr*		
		RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA													
036	208	187	229	21.8	184	25.6	190	25.6	190	25.6	190	4	6.5 (ea)	15	46.2	—	7.0	—	—	—	189.4	225		
																—	7.0	—	75.1	27	189.4	225		
																—	7.0	—	150.1	54	216.6	250		
																23.6	7.0	—	—	—	213.0	250		
																23.6	7.0	—	75.1	27	213.0	250		
																23.6	7.0	—	150.1	54	246.1	250		
	230	207	253	21.8	184	25.6	190	25.6	190	25.6	190	25.6	190	4	6.6 (ea)	15	42.0	—	7.0	—	—	—	184.5	225
																		—	7.0	—	86.6	36	184.5	225
																		—	7.0	—	173.2	72	234.5	250
																		23.6	7.0	—	—	—	208.1	250
																		23.6	7.0	—	86.6	36	208.1	250
																		23.6	7.0	—	173.2	72	264.0	300
460	414	508	11	90	13.5	95	13.5	95	13.5	95	13.5	95	4	3.3 (ea)	15	21.0	—	3.5	—	—	—	94.5	110	
																	—	3.5	—	43.3	36	94.5	110	
																	—	3.5	—	86.6	72	117.2	125	
																	12.6	3.5	—	—	—	107.1	125	
																	12.6	3.5	—	43.3	36	107.1	125	
																	12.6	3.5	—	86.6	72	133.0	150	
575	518	632	9	73	10.2	75	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	15	17.0	—	2.5	—	—	—	73.8	90	
																	—	2.5	—	34.6	36	73.8	90	
																	—	2.5	—	69.3	72	93.7	110	
																	9.6	2.5	—	—	—	83.4	100	
																	9.6	2.5	—	34.6	36	83.4	100	
																	9.6	2.5	—	69.3	72	105.7	110	
575	518	632	9	73	10.2	75	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	20	22.0	—	2.5	—	—	—	80.0	100	
																	—	2.5	—	34.6	36	80.0	100	
																	—	2.5	—	69.3	72	99.9	110	
																	9.6	2.5	—	—	—	89.6	110	
																	9.6	2.5	—	34.6	36	89.6	110	
																	9.6	2.5	—	69.3	72	111.9	125	
575	518	632	9	73	10.2	75	10.2	75	10.2	75	10.2	75	4	2.6 (ea)	25	27.0	—	2.5	—	—	—	86.3	110	
																	—	2.5	—	34.6	36	86.3	110	
																	—	2.5	—	69.3	72	106.2	125	
																	9.6	2.5	—	—	—	95.9	110	
																	9.6	2.5	—	34.6	36	95.9	110	
																	9.6	2.5	—	69.3	72	118.2	125	



50AJ,AK,AW,AY UNITS WITH OPTIONAL CONVENIENCE OUTLET (cont)

UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	CONVENIENCE OUTLET		OPTIONAL ELECTRIC HEAT		POWER SUPPLY	
		Min	Max	Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	LRA	FLA	kW	MCA	Fuse or HACR Brkr*
		RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA											
041	208	187	229	25.6	190	25.6	190	34.3	265	34.3	265	4	6.5 (ea)	15	46.2	—	7.0	—	—	—	210.6	250
																—	7.0	—	75.1	27	210.6	250
																—	7.0	—	150.1	54	216.6	250
																23.6	7.0	—	—	—	234.2	250
																23.6	7.0	—	75.1	27	234.2	250
																23.6	7.0	—	150.1	54	246.1	250
	230	207	253	25.6	190	25.6	190	34.3	265	34.3	265	4	6.6 (ea)	15	42.0	—	7.0	—	—	—	205.7	225
																—	7.0	—	86.6	36	205.7	225
																—	7.0	—	173.2	72	234.5	250
																23.6	7.0	—	—	—	229.3	250
																23.6	7.0	—	86.6	36	229.3	250
																23.6	7.0	—	173.2	72	264.0	300
460	414	508	13.5	95	13.5	95	16	120	16	120	4	3.3 (ea)	15	21.0	—	3.5	—	—	—	102.0	110	
															—	3.5	—	43.3	36	102.0	110	
															—	3.5	—	86.6	72	117.2	125	
															12.6	3.5	—	—	—	114.6	125	
															12.6	3.5	—	43.3	36	114.6	125	
															12.6	3.5	—	86.6	72	133.0	150	
575	518	632	10.2	75	10.2	75	12.9	80	12.9	80	4	2.6 (ea)	15	17.0	—	2.5	—	—	—	80.4	90	
															—	2.5	—	34.6	36	80.4	90	
															—	2.5	—	69.3	72	93.7	110	
															9.6	2.5	—	—	—	90.0	100	
															9.6	2.5	—	34.6	36	90.0	100	
															9.6	2.5	—	69.3	72	105.7	110	
575	518	632	10.2	75	10.2	75	12.9	80	12.9	80	4	2.6 (ea)	20	22.0	—	2.5	—	—	—	86.6	100	
															—	2.5	—	34.6	36	86.6	100	
															—	2.5	—	69.3	72	99.9	110	
															9.6	2.5	—	—	—	96.2	110	
															9.6	2.5	—	34.6	36	96.2	110	
															9.6	2.5	—	69.3	72	111.9	125	
575	518	632	10.2	75	10.2	75	12.9	80	12.9	80	4	2.6 (ea)	25	27.0	—	2.5	—	—	—	92.9	110	
															—	2.5	—	34.6	36	92.9	110	
															—	2.5	—	69.3	72	106.2	125	
															9.6	2.5	—	—	—	102.5	125	
															9.6	2.5	—	34.6	36	102.5	125	
															9.6	2.5	—	69.3	72	118.2	125	

Electrical data (cont)



50AJ,AK,AW,AY UNITS WITH OPTIONAL CONVENIENCE OUTLET (cont)

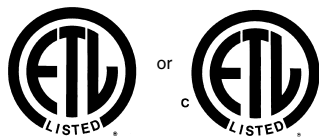
UNIT SIZE	VOLTAGE 3 PH, 60 Hz	VOLTAGE RANGE		COMPRESSOR								CONDENSER FAN MOTOR		EVAPORATOR FAN MOTOR		POWER EXHAUST	CONVENIENCE OUTLET		OPTIONAL ELECTRIC HEAT		POWER SUPPLY	
		Min	Max	Cir A, No. 1		Cir A, No. 2		Cir B, No. 1		Cir B, No. 2		Qty	FLA	Hp	FLA	FLA (total)	FLA	LRA	FLA	kW	MCA	Fuse or HACR Brkr*
		RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA											
208	187	229	34.3	265	34.3	265	34.3	265	34.3	265	6	6.5 (ea)	20	59.4	—	7.0	—	—	—	257.5	300.0	
															—	7.0	—	112.6	41	257.5	300.0	
															—	7.0	—	225.2	81	308.2	350.0	
															35.4	7.0	—	—	—	292.9	350.0	
															35.4	7.0	—	112.6	41	292.9	350.0	
															35.4	7.0	—	225.2	81	352.5	400.0	
													25	74.8	—	7.0	—	—	—	276.7	350.0	
															—	7.0	—	112.6	41	276.7	350.0	
															—	7.0	—	225.2	81	327.5	400.0	
															35.4	7.0	—	—	—	312.1	350.0	
															35.4	7.0	—	112.6	41	312.1	350.0	
															35.4	7.0	—	225.2	81	371.7	400.0	
30	88	—	7.0	—	—	—	293.2	350.0														
		—	7.0	—	112.6	41	293.2	350.0														
		—	7.0	—	225.2	81	344.0	400.0														
		35.4	7.0	—	—	—	328.6	400.0														
		35.4	7.0	—	112.6	41	328.6	400.0														
		35.4	7.0	—	225.2	81	388.2	450.0														
40	114	—	7.0	—	—	—	325.7	400.0														
		—	7.0	—	112.6	41	325.7	400.0														
		—	7.0	—	225.2	81	376.5	450.0														
		35.4	7.0	—	—	—	361.1	450.0														
		35.4	7.0	—	112.6	41	361.1	450.0														
		35.4	7.0	—	225.2	81	420.7	500.0														
230	207	253	34.3	265	34.3	265	34.3	265	34.3	265	6	6.6 (ea)	20	54	—	7.0	—	—	251.3	300.0		
															—	7.0	—	129.9	54	251.3	300.0	
															—	7.0	—	259.8	108	336.1	350.0	
															35.4	7.0	—	—	—	286.7	300.0	
															35.4	7.0	—	129.9	54	286.7	300.0	
															35.4	7.0	—	259.8	108	380.3	400.0	
													25	68	—	7.0	—	—	—	268.8	300.0	
															—	7.0	—	129.9	54	268.8	300.0	
															—	7.0	—	259.8	108	353.6	400.0	
															35.4	7.0	—	—	—	304.2	350.0	
															35.4	7.0	—	129.9	54	304.2	350.0	
															35.4	7.0	—	259.8	108	397.8	450.0	
30	80	—	7.0	—	—	—	283.8	350.0														
		—	7.0	—	129.9	54	283.8	350.0														
		—	7.0	—	259.8	108	368.6	400.0														
		35.4	7.0	—	—	—	319.2	350.0														
		35.4	7.0	—	129.9	54	319.2	350.0														
		35.4	7.0	—	259.8	108	412.8	450.0														
40	104	—	7.0	—	—	—	313.8	400.0														
		—	7.0	—	129.9	54	313.8	400.0														
		—	7.0	—	259.8	108	398.6	500.0														
		35.4	7.0	—	—	—	349.2	450.0														
		35.4	7.0	—	129.9	54	349.2	450.0														
		35.4	7.0	—	259.8	108	442.8	500.0														
460	414	508	16	120	16	120	16	120	16	120	6	3.3 (ea)	20	27	—	3.5	—	—	121.1	125.0		
															—	3.5	—	65.0	54	121.1	125.0	
															—	3.5	—	129.9	108	168.0	175.0	
															18.9	3.5	—	—	—	140.0	150.0	
															18.9	3.5	—	65.0	54	140.0	150.0	
															18.9	3.5	—	129.9	108	191.7	200.0	
													25	34	—	3.5	—	—	—	129.8	150.0	
															—	3.5	—	65.0	54	129.8	150.0	
															—	3.5	—	129.9	108	176.8	200.0	
															18.9	3.5	—	—	—	148.7	175.0	
															18.9	3.5	—	65.0	54	148.7	175.0	
															18.9	3.5	—	129.9	108	200.4	225.0	
30	40	—	3.5	—	—	—	137.3	175.0														
		—	3.5	—	65.0	54	137.3	175.0														
		—	3.5	—	129.9	108	184.3	200.0														
		18.9	3.5	—	—	—	156.2	175.0														
		18.9	3.5	—	65.0	54	156.2	175.0														
		18.9	3.5	—	129.9	108	207.9	225.0														
40	52	—	3.5	—	—	—	152.3	200.0														
		—	3.5	—	65.0	54	152.3	200.0														
		—	3.5	—	129.9	108	199.3	250.0														
		18.9	3.5	—	—	—	171.2	200.0														
		18.9	3.5	—	65.0	54	171.2	200.0														
		18.9	3.5	—	129.9	108	222.9	250.0														
575	518	632	12.9	80	12.9	80	12.9	80	12.9	80	6	2.6 (ea)	20	22	—	2.5	—	—	97.2	110.0		
															—	2.5	—	65.0	54	97.2	110.0	
															—	2.5	—	129.9	108	160.5	175.0	
															14.4	2.5	—	—	—	111.6	125.0	
															14.4	2.5	—	65.0	54	113.6	125.0	
															14.4	2.5	—	129.9	108	178.5	200.0	
													25	27	—	2.5	—	—	—	103.5	125.0	
															—	2.5	—	65.0	54	103.5	125.0	
															—	2.5	—	129.9	108	166.8	175.0	
															14.4	2.5	—	—	—	117.9	125.0	
															14.4	2.5	—	65.0	54	119.9	125.0	
															14.4	2.5	—	129.9	108	184.8	200.0	
30	32	—	2.5	—	—	—	109.7	125.0														
		—	2.5	—	65.0	54	109.7	125.0														
		—	2.5	—	129.9	108	173.0	200.0														
		14.4	2.5	—	—	—	124.1	150.0														
		14.4	2.5	—	65.0	54	126.1	150.0														
		14.4	2.5	—	129.9	108	191.0	200.0														
40	41	—	2.5	—	—	—	121.0	150.0														
		—	2.5	—	65.0	54	121.0	150.0														
		—	2.5	—	129.9	108	184.3	200.0														
		14.4	2.5	—	—	—	135.4	175.0														
		14.4	2.5	—	65.0	54	137.4	175.0														
		14.4	2.5	—	129.9	108	202.3	225.0														

LEGEND AND NOTES FOR ELECTRICAL DATA TABLES

LEGEND

FLA	— Full Load Amps
HACR	— Heating, Air Conditioning and Refrigeration
LRA	— Locked Rotor Amps
MCA	— Minimum Circuit Amps
NEC	— National Electrical Code
RLA	— Rated Load Amps

*Fuse or HACR circuit breaker.



NOTES:

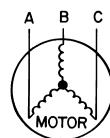
1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker.

2. Unbalanced 3-Phase Supply Voltage

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

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

EXAMPLE: Supply voltage is 460-3-60.



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

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

Determine maximum deviation from average voltage.

(AB) 457 - 452 = 5 v

(BC) 464 - 457 = 7 v

(AC) 457 - 455 = 2 v

Maximum deviation is 7 v.

Determine percent voltage imbalance.

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{7}{457} \\ &= 1.53\% \end{aligned}$$

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

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

Controls

Control components

The 48/50A series rooftops use the *ComfortLink™* control system that has been developed for use in all types of Carrier Commercial equipment. The control system monitors all operating conditions in the rooftop unit as well as controlling the compressors, economizers, fans, heat and other devices. It also has the capability of communicating with the Carrier Comfort Network® devices using the CCN protocol.

The system uses a microprocessor and a series of boards, each with inputs and outputs. A local network communications bus (LEN) ties all the boards together into a system and enables the boards to communicate.

For the 48/50A series, the control consists of the following key components:

Main base board (MBB) — The MBB is the center of the *ComfortLink* control system. It contains the major portion of the operating software and controls the operation of the unit. The MBB continuously monitors inputs and outputs as well as data about from the LEN and CCN communications channels. The MBB also controls 11 output relays. A complete list of the MBB and system I/O are contained in the following table. The board is located in the main control box.

Economizer control board (ECB1) — The ECB controls the economizer actuator. The ECB controls the economizer motor using a digital communications signal that also provides operation and diagnostic data on the economizer motor. The ECB also controls the operation of the power exhaust motors and provides up to 6 stages of digitally sequenced power exhaust. Exhaust sequencing can be based on either the economizer motor position or the building pressure. On the A series unit, the ECB board is located in an auxiliary box located at the end of the unit near the economizer motor. The board also contains a second LEN port than can be used with the handheld Navigator™ display.

Supply and building pressure control board (ECB2) — The board, which is the same hardware as the ECB1, is used to control the supply fan inverter on the VAV units. It

sends a 4 to 20 mA signal to the inverter based on a supply duct pressure sensor connected to the board. The board also accepts a signal from another pressure sensor that monitors building pressure and controls the operation of the optional modulating power exhaust system. This board is located in the auxiliary control box.

CV staged gas heat board (SCB) — When the optional staged gas heat is used, the SCB board will be installed and control the operation of the gas valves. It also provides additional sensors for monitoring of the supply air temperature. This board is located in the gas heat section of the unit.

Integrated gas controller (IGC) — One IGC is provided with each bank of gas heat exchangers. It controls the direct spark ignition system and monitors the rollout switch, limit switches, and induced-draft motor Hall Effect sensor. It is equipped with an LED for diagnostics.

Controls Expansion Module (CEM) — The optional expansion module is used to provide inputs for demand limiting, remote set point and other optional inputs. It is located in the main control box.

Compressor protection Cycle-LOC™ board (CS) — This board monitors the status of the compressor by sensing the current flow to the compressors and then provides digital status signal to the MBB.

Scrolling Marquee display — This device is the keypad interface used to access the control information, read sensor values, test the unit, and monitor alarm status. The marquee display is a 4-key, 4-character, 16-segment LED (light-emitting diode) display. The display is very easy to operate using 4 buttons and a group of 11 LED's that indicate the following menu structures:

- Run Status
- Service Test
- Temperatures
- Pressures
- Set Points
- Inputs
- Outputs
- Configuration
- Timeclock
- Operating Modes
- Alarms

Controls (cont)



Through the display, inputs and outputs can be checked for their value or status. Because the unit is equipped with suction pressure transducers and discharge saturation temperature sensors it can also display pressures typically obtained from gages. The control includes a full alarm

history which can be accessed from the display. Through the display, a built-in test routine can be used at start-up commission and during maintenance inspections to diagnose operational problems with the unit.

MAIN BASE BOARD (MBB) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	INPUT/OUTPUT TYPE	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
GASFAN	YAC Indoor Fan Relay (fan request from YAC)	Switch Input	DI1	J6, 3-4
FSD	Fire Shutdown Switch Input	Switch Input	DI2	J6, 5-6
G	Thermostat 'G' Input /Remote Occupied	Switch Input	DI3	J7, 1-2
W2	Thermostat 'W2' Input	Switch Input	DI4	J7, 3-4
W1	Thermostat 'W1' Input	Switch Input	DI5	J7, 5-6
Y2	Thermostat 'Y2' Input	Switch Input	DI6	J7, 7-8
Y1	Thermostat 'Y1' Input	Switch Input	DI7	J7, 9-10
CSB_A1	Compressor A1 Current Sensor	Digital Input	DIG1	J9, 10-12
CSB_A2	Compressor A2 Current Sensor	Digital Input	DIG2	J9, 7-9
CSB_B1	Compressor B1 Current Sensor	Digital Input	DIG3	J9, 4-6
CSB_B2	Compressor B2 Current Sensor	Digital Input	DIG4	J9, 1-3
DP_A / SCTA	Circuit A Saturated Condensing Temperature	5 K Thermistor	AN1	J8, 21-23
DP_B / SCTB	Circuit B Saturated Condensing Temperature	5 K Thermistor	AN2	J8, 24-26
SP_A / SSTA	Circuit A Saturated Suction Pressure	Pressure Transducer	AN3	J8, 15-17
SP_B / SSTB	Circuit B Saturated Suction Pressure	Pressure Transducer	AN4	J8, 18-20
RAT	Return Air Temperature	10 K Thermistor	AN5	J8, 9-10
EDT	Evaporator Discharge Air Temperature	10 K Thermistor	AN6	J8, 11-12
OAT	Outdoor Air Temperature	10 K Thermistor	AN7	J8, 13-14
SPT	Space Temperature (T55/56)	10 K Thermistor	AN8	J8, 1-2
SPTO	Space Temperature Offset (T56)	10 K Thermistor	AN9	J8, 3-4
IAQ, IAQMINOV	IAQ Analog Input	4-20 mA	AN10	J8, 5-6
FLTS	Filter Status	Switch Input	AN11	J8, 7-8
OUTPUTS				
CMPB2	Compressor B2	Relay	RLY1	J10, 20-21
CMPB1	Compressor B1	Relay	RLY2	J10, 22-23
CMPA2	Compressor A2	Relay	RLY3	J10, 24-25
CMPA1	Compressor A1	Relay	RLY4	J10, 26-27
CONDFANB	Condenser Fan B	Relay	RLY5	J10, 10-11
CONDFANA	Condenser Fan A	Relay	RLY6	J10, 12-13
HS2	Heat Stage 2	Relay	RLY7	J10, 14-16
HS1	Heat Stage 1	Relay	RLY8	J10, 17-19
HIR	Heat Interlock Relay	Relay	RLY9	J10, 4-6
SF	Supply Fan	Relay	RLY10	J10, 7-9
ALRM	Alarm Output Relay	Relay	RLY11	J10, 1-3

LEGEND

IAQ — Indoor-Air Quality
YAC — Gas Heat Unit

ECONOMIZER CONTROL BOARD (ECB1) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	INPUT/OUTPUT TYPE	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
RMTIN	Remote Occupancy	Switch	DI1	J4, 1-2
ENTH	Economizer Enable	Switch	DI2	J4, 3-4
RARH	Return Air Relative Humidity	4-20 mA	AN1	J5, 1-3
OARH	Outdoor Air Relative Humidity	4-20 mA	AN2	J5, 4-6
OUTPUTS				
ECONOCMD	Economizer Actuator (Analog Control)	4-20 mA	AO1	J9, 1-2
ECONOCMD	Economizer Actuator (Digital Control)	Digital	PP/MP	J7, 1-3
PE_A	Power Exhaust Stage A	Relay	RLY1	J8, 1-3
PE_B	Power Exhaust Stage B	Relay	RLY2	J8, 4-6
PE_C	Power Exhaust Stage C	Relay	RLY3	J8, 7-9
ECON_PWR	Economizer Power	Relay	RLY6	J8, 16-18



VAV CONTROL BOARD (ECB2) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	INPUT/OUTPUT TYPE	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
	Not Used		DI1	J4, 1-2
	Not Used		DI2	J4, 3-4
BP	Building Static Pressure	4-20 mA	AN1	J5, 1-3
SP	Supply Duct Static Pressure	4-20 mA	AN2	J5, 4-6
OUTPUTS				
SFAN_VFD	Supply Fan Inverter Speed	4-20 mA	AO1	J9, 1-2
	Not Used		PP/MP	J7, 1-3
	Not Used		RLY1	J8, 1-3
	Not Used		RLY2	J8, 4-6
	Not Used		RLY3	J8, 7-9
HGBP	Hot Gas Bypass Valve	Relay	RLY6	J8, 16-18

STAGED GAS HEAT BOARD (SCB) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	INPUT/OUTPUT TYPE	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
	Not Used		AN1	J5, 1-3
	Not Used		AN2	J5, 4-6
SAT1	Supply Air Temperature 1	10 K Thermistor	AN3	J5, 7-9
SAT2	Supply Air Temperature 2	10 K Thermistor	AN4	J5, 10-12
SAT3	Supply Air Temperature 3	10 K Thermistor	AN5	J5, 13-15
	Not Used		AN6	J6, 1-3
	Not Used		AN7	J6, 4-6
	Not Used		AN8	J6, 7-9
	Not Used		AN9	J7, 1-2
	Not Used		AN10	J7, 3-4
OUTPUTS				
	Not Used		AO1	J8, 1-2
	Not Used		AO2	J8, 3-4
HS3	Heat Stage 3	Relay	RLY1	J9, 1-3
HS4	Heat Stage 4	Relay	RLY2	J9, 4-6
HS5	Heat Stage 5	Relay	RLY3	J9, 7-9
HS6	Heat Stage 6	Relay	RLY4	J9, 10-12
	Not Used		RLY5	J9, 13-15

CONTROLS EXPANSION MODULE (CEM) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	INPUT/OUTPUT TYPE	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
SFS	Supply Fan Status Switch	Switch	DI1	J7, 1-2
DMD_SW1	Demand Limit — Redline	Switch	DI2	J7, 3-4
DMD_SW2	Demand Limit — Load Shed	Switch	DI3	J7, 5-6
PRES	Fire Pressurization	Switch	DI4	J7, 7-8
EVAC	Fire Evacuation	Switch	DI5	J7, 9-10
PURG	Smoke Purge	Switch	DI6	J7, 11-12
IAQIN	Indoor Air Quality Override Switch	Switch	DI7	J7, 13-14
OACFM	Outside Air CFM	4-20 mA	AN7	J6, 1-3
DMDLMTMA	4-20 mA Demand Limit	4-20 mA	AN8	J6, 4-6
SATRESMA	4-20 mA Supply Air Set Point	4-20 mA	AN9	J6, 7-9
OAQ	Outside Air CO ₂ Sensor	4-20 mA	AN10	J6, 10-12
	Not Used		AN1	J5, 1-2
	Not Used		AN2	J5, 3-4
	Not Used		AN3	J5, 5-6
	Not Used		AN4	J5, 7-8
	Not Used		AN5	J5, 9-10
	Not Used		AN6	J5, 11-12

Controls (cont)



Cooling control options

When mechanical cooling is required, the A Series *ComfortLink*™ control has the capability to control the staging of the four scroll compressors in several different sequences. In addition, the *ComfortLink* control supports the use of an optional minimum load hot gas bypass valve (MLV) with the Multiple Adaptive Demand and VAV control sequences. The MLV is directly controlled by the *ComfortLink* control and provides an additional stage of capacity as well as low load coil freeze protection. The control also integrates the use of an economizer with the use of mechanical cooling to allow for the greatest use of free cooling. When both mechanical cooling and the economizer are being used, the control will use the economizer to provide better temperature control and limit the cycling of the compressors. The control also checks on various other operation parameters in the units to make sure that safety limits are not exceeded and the compressors are reliably operated.

The A Series *ComfortLink* control offers two basic control approaches to mechanical cooling: constant volume with 2 stages of cooling and VAV with multiple stages of cooling. In addition to these traditional methods of control, the A Series *ComfortLink* control offers the ability to run multiple stages of cooling in constant volume operation by controlling the unit to either a low or high cool supply air set point based on either a space temperature sensor or 2-stage thermostat input.

CONTROL TYPE			COOLING CONTROL METHOD
Unit	Application	Demand Source	
AK,AY	VAV	RAT or SPT	Multiple Stage EDT
AJ,AW	CV	SPT or T-STAT	Multiple Adaptive Demand or 2-Stage Demand

Control type — The control type determines the selection of the type of cooling control as well as the technique for selecting a cooling mode. The control types are:

VAV-RAT and VAV-SPT — Both of these configurations refer to standard VAV operation. If the control is occupied, the supply fan is run continuously and return-air temperature will be used in the determination of the selection of the cooling mode. VAV-SPT differs from VAV-RAT only in that during the unoccupied period, space temperature will be used instead of return-air temperature to start the fan for ten minutes before the return-air temperature is allowed to call out any mode.

CV TSTAT-Multiple Stage — This configuration will force the control to monitor the thermostat inputs (Y1,Y2) to make a determination of mode. Unlike traditional 2-stage thermostat control, the unit is allowed to use multiple stages of cooling control and perform VAV-style capacity control.

CV TSTAT-2 Stage — This configuration will force the control to monitor the thermostat inputs (Y1,Y2) to make a determination of mode.

CV SPT-Multiple Stage — This configuration will force the control to monitor a space temperature sensor to make a determination of mode. The unit is allowed to use multiple

stages of cooling control and perform VAV-style capacity control.

CV SPT-2 Stage — This configuration will force the control to monitor the space temperature sensor to make a determination of mode and allow two stages of cooling.

Cooling control method — Three different cooling control methods are used to step through the available stages of capacity. Depending on the unit size, cooling control method and presence of an MLV, this may range from 2 up to 6 stages of capacity control. These methods are:

Multiple Stage Evaporator Discharge Temperature (EDT) — The capacity of the economizer and compressors are controlled based on the evaporator air discharge temperature and supply air temperature set point. This control method uses an adaptive PID algorithm to calculate the estimated change in supply air temperature before engaging or disengaging the next stage of cooling. The algorithm compensates for varying conditions, including changing flow rates across the evaporator coil, to provide better overall control of compressor staging.

Multiple Adaptive Demand — This control method will base the capacity of the economizer and compressors on the evaporator air discharge temperature and one of two supply air temperature set points. The control will be able to call out a LOW COOL or a HIGH COOL mode and maintain a low or high cool supply air set point. The unit will use either the input from a conventional thermostat to turn the Y1, Y2 signals into a high and low demand signal, or with a space temperature sensor use a differential from set point to determine the mode. Once the mode has been established the control uses the same algorithm as with VAV control.

Two-Stage Demand — The unit will operate with integrated economizer and 2 stages of compressor capacity control.

Integrated economizer — For each of the above modes of operation all mechanical cooling will first be delayed while the unit attempts to use the economizer for free cooling. Once the economizer is at full capacity, the control will then supplement the free cooling with as much mechanical cooling as required. To prevent any rapid changes in cooling, the control will also use the economizer to trim the cooling supplied.

Heating control options

When heating is required the A Series units can be provided with 2-Stage Electric Heat, 2-Stage Gas Heat or Multiple-Stage Gas Heat. Depending on unit size and heating capacity the Multiple-Stage option may have between 5 and 11 stages of heating capacity control. The A Series *ComfortLink*™ control has the capability to control the heating capacity based on input from a 2-stage mechanical thermostat, a space temperature sensor, or on VAV units by the return air temperature sensor. With CV units the heating mode (off, low or high) will be enabled based on W1 and W2 thermostat inputs, or when using a space temperature sensor the differential from heating set-point will be used. Heating with VAV units will be enabled based on the return-air temperature or the space temperature, but once enabled control will be based on the return-air

temperature. Variable air volume terminals will be commanded open to the heating cfm through linkage or the heat interlock relay. The A Series *ComfortLink*[™] control will use one of the following control methods:

Two-stage control — The unit will operate in LOW HEAT or HIGH HEAT mode as determined by the demand inputs. In the LOW HEAT mode if the temperature sensed by the evaporator discharge temperature sensor is below 50 F, the unit will automatically go into a HIGH HEAT mode.

Multiple-stage control — When the unit is in a LOW HEAT mode the algorithm calculates the desired heat capacity based on set-point and supply-air temperature. The staged gas control logic will stage the heating capacity to match the calculated demand. When the unit is in a HIGH HEAT mode all stages of heat will be activated. Staged Gas Heat can also be used in a TEMPERING mode. This mode is enabled during a VENTILATION, LOW COOL or HIGH COOL mode when the economizer dampers are at their minimum ventilation position and the mixed-air temperature is below the supply air set-point. Tempering can also be used during a preoccupancy purge to prevent low temperature air from being delivered to the space.

Economizer and IAQ options

The controls have been designed to support the requirements of indoor air quality control through the use of outside air. Units can either be equipped with an outside air adjustable, self-closing economizer or a fully modulating, gear driven economizer with no linkages. The economizer can be configured for a full modulation mode or 3-position mode of operation. The control includes logic for a minimum ventilation position and different set points for occupied and unoccupied minimum position set points. This control also has logic built in to calibrate the economizer position to the actual percentage of outside air introduced. During periods when the compressors are not being used the control will use the RAT, SAT and OAT to calibrate the economizer. This will allow for setting the outside air actual percentage and not just the percent damper position.

The use of the economizer will depend on the mode of change selected. This control integrates the changeover directly into the control. Five types of changeover are available:

- Outdoor air dry bulb
- Differential dry bulb
- Outdoor air enthalpy
- Differential enthalpy
- Outdoor air dew point

The units are provided with an outdoor air and return air temperature sensor so the first two changeover methods are available as standard. To use the enthalpy changeover options the control supports the addition of highly reliable, electronic humidity sensors. The humidity sensor input is then used with the dry bulb sensors to calculate the enthalpy. For outdoor enthalpy changeover the control also has the ASHRAE 90.1 A, B, C, D economizer changeover curves built into the software.

When operating with outside air economizers, large amounts of air can be introduced into the building and a means must be provided for building pressure relief. The 48/50A series control supports the following three types of building pressure control:

- Relief Dampers — Can be used on low return duct static applications
- Non-Modulating Two-Stage Power Exhaust — The unit can be equipped with multiple power exhaust fans, 4 on the sizes 036 and 041 and 6 on the size 051 units. The software controls the power exhaust stages based on the economizer position (percent open).
- Modulating Power Exhaust — Both the VAV and CV units can be equipped with power exhaust fans that are controlled by a building pressure sensor that is connected to the *ComfortLink* controls. The fans are in groups which allow for 4 stages on sizes 036 and 041 units and 6 stages on size 051 unit.

The units are capable of using either 2-in. or optional 4-in. pleated filters and can have an optional filter pressure drop switch to warn of dirty filter conditions.

The indoor air quality (IAQ) function provides a demand-based control for ventilation air quantity, by providing a modulating outside air damper position that is proportional to the space CO₂ level. The ventilation damper position is varied between a minimum ventilation level (based on internal sources of contaminants and CO₂ levels other than the effect of people) and the maximum design ventilation level (determined at maximum populated status in the building). During a less-than-fully populated space period, the CO₂ level will be lower than that at full-load design condition and will require less ventilation air. Reduced quantities of ventilation air will result in reduced operating costs. Space CO₂ levels are monitored and compared to user-configured set points. Accessory CO₂ sensor for space (or return duct mounting) is required. The IAQ routine can be enhanced by also installing a sensor for outdoor air quality.

During the occupied period, in the absence of a demand for cooling using outside air, if CO₂ levels are below the set point for the minimum ventilation level, the outside-air damper will open to the minimum ventilation level damper position set point. The minimum damper position will be maintained as long as the CO₂ level remains below the set point.

When the space CO₂ level exceeds set point for the minimum ventilation level condition, the *ComfortLink* control will begin to open the outside air damper position to admit more ventilation air and remove the additional contaminants. As the space CO₂ level approaches the set point for maximum design ventilation level condition, the outside air damper position will reach the maximum ventilation level damper position set point limit. Damper position will be modulated in a directly proportional relationship between these two CO₂ set point limits and their corresponding damper position limits.

In most applications a fixed reference value can be set for the outdoor air quality level, but the control also supports the addition of an outdoor air quality sensor that will be compared to the indoor or return IAQ sensor. If an OAQ sensor is connected, the demand set point levels will be

Controls (cont)



adjusted automatically as the outdoor CO₂ levels vary. Also, if the outdoor CO₂ level exceeds a user-configured maximum limit value, then outside air damper position will be limited to the minimum ventilation damper set point value. The control can also receive these signals through the CCN.

The IAQ and OAQ measurement levels are displayed by the *ComfortLink*[™] control in parts per million (ppm).

Fire and smoke controls interface — The unit can be equipped with an optional return air smoke detector. The smoke detector is wired to stop the unit and send a message to a remote alarm system if a fault condition is detected. If the controls options board is added, the control will support smoke control modes including evacuation, smoke purge, and pressurization.

Demand limiting — The control supports demand limiting using Redline and Load Limiting logic. On CCN systems this can be done through the network or for non-CCN network jobs this can be done by adding the Controls Expansion Board.

Diagnostics

The *ComfortLink* control has fully integrated all controls and sensors into a common control system. The control monitors these inputs as well as many of the routines to provide advanced diagnostic and prognostics. These include adaptive logic to allow the unit to continue to operate in a reduced output mode and automatic resets where applicable. The last 10 alarms and alerts are stored in memory and can be accessed through the display. The alarms can also be monitored through the Carrier Comfort Network[®] connection. The unit also supports the use of the hand held Navigator[™] display which can be plugged in at the main control box and auxiliary control box at the opposite end of the unit.

Some of the diagnostics that are included are;

- Monitoring of all sensors
- Suction pressure transducers to provide compressor protection and coil freeze protection
- Monitoring of the economizer motor using a digitally controlled motor
- Monitoring of compressor status using compressor protection boards
- Adaptive logic for low supply-air temperatures
- Compressor lockout at low ambient conditions
- Storage of compressor run hours and starts
- Low refrigerant charge protection
- Compressor reverse rotation protection

Control interface

The *ComfortLink* control can interface with the Carrier Comfort Network devices through the 485 communications port. This will allow for the use of all system control programs. These programs include:

- Network service tool
- ComfortID[™] system

Contact Carrier Controls Marketing for more information.

The control can also provide interface with non-Carrier Energy Management systems with the addition of either

the BACnet/MODBUS Carrier translator or the LonWorks Carrier translator.

Several contact connection points have been provided in the main control box for interface to external controls and systems. These are summarized in the Interface Connection table.

INTERFACE CONNECTIONS

TB-3 — CCN COMMUNICATIONS (HY84HA096)	
TB3	1 LEN +
	2 LEN C
	3 LEN -
	4 24 VAC
	5 CCN +
	6 CCN c
	7 CCN -
	8 Grd
TB-4 — THERMOSTAT CONNECTIONS (HY84HA090)	
TB4	1 Thermostat R
	2 Thermostat Y1
	3 Thermostat Y2
	4 Thermostat W1
	5 Thermostat W2
	6 Thermostat G
	7 Thermostat C
	8 Thermostat X
TB-5 — FIELD CONNECTIONS (HY84HA101)	
TB5	1 VAV Heater Interlock Relay, Ground
	2 VAV Heater Interlock Relay, 24 VAC
	3 T56 Sensor
	4 T56/T58 Ground
	5 T58 Set Point
	6 Indoor Air IAQ Remote Sensor/Remote Pot/Remote 4-20 mA
	7 Indoor Air IAQ Remote Sensor/Remote Pot/Remote 4-20 mA
	8 Smoke Detector Remote Alarm
	9 Smoke Detector Remote Alarm
	10 Fire Shutdown
	11 Fire Shutdown
	12 Fire Control Common
	13 Fire Pressurization
	14 Fire Evacuation
	15 Fire Smoke Purge
	16 Not Used
TB-6 — FIELD CONNECTIONS (HY84HA101)	
TB6	1 Remote Occupied/Economizer Enable 24 VAV
	2 Remote Occupied Contact
	3 Remote Economizer Contact
	4 Demand Limit Contacts Common
	5 Demand Limit Redline
	6 Demand Limit Loadshed
	7 Demand Limit 4-20 mA
	8 Demand Limit 4-20 mA
	9 Remote Supply Air Set Point 4-20 mA
	10 Remote Supply Air Set Point 4-20 mA
	11 Outdoor Air IAQ 4-20 mA
	12 Outdoor Air IAQ 4-20 mA
	13 IAQ Remote Switch
	14 IAQ Remote Switch
	15 Not Used
	16 Not Used

External controls use the following interface points:

- Start/Stop (On/Off) — Start/Stop is accomplished with a contact closure between terminals 1 and 3 on TB6.
- Remote Economizer Enable — Enabling and disabling of the economizer can be done by connecting a contact closure to terminals 1 and 2 on TB6. The economizer can be configured for a switch closure changeover for 3-position operation.
- VAV Heating Interlock — Interface with non-linkage terminals can be done through TB5 terminal 1 and 2.
- Remote IAQ Inputs — External IAQ demand inputs can be connected through terminals 6 and 7 on TB5.
- Smoke Detectors Alarm Output — Remote detector alarm outputs can be connected through terminals 8 and 9 on TB5.
- Fire Shutdown — A remote fire shutdown signal can be connected to 10 and 11 on TB5. The software can be configured to shut the unit down on an open or closed signal.
- Fire Pressurization — For a remote control of pressurization a contact closer can be connected to terminals 12 and 13 on TB5. In this mode the economizer damper will be fully opened and the supply fan turned on to pressurize the space.
- Fire Evacuation — For this mode a remote contact closure can be connected to terminal 12 and 14 on TB5. For remote evacuation of a space the outside-air dampers will be opened and the power exhaust fans turned on to evacuate the space of smoke.
- Fire Purge — For this mode external contacts can be connected to terminals 12 and 15 on TB5. In this mode the supply fan and return fans will be turned on with the economizer at a full open position.
- Demand Limiting — For demand limiting the Controls Option board must be used. Connections are provided on TB6 for switch input demand limiting and for 4 to 20 mA demand limit signals.
- Remote Supply Air Set Point — A remote supply air temperature set point can be supported when the Controls Options board is used. It can be connected to terminals 11 and 12 on TB6.
- Outdoor Air IAQ Signal — If an external outdoor air signal is being used then it can be connected to terminals 9 and 10 on TB6.
- IAQ Switch Input — If an external control will be controlling IAQ then it can be connected as a contact closure through terminals 13 and 14 on TB6.

Carrier can also support electronic interface to other systems using the following;

- BacLink support (read/write)
- BACnet/MODBUS Carrier translator (read/write, provides CCN to BACnet master-slave/twisted-pair [MS/TP] or MODBUS remote terminal unit (RTU) protocol conversion)
- LonWorks Carrier translator (read/write, provides CCN to LON FT-10A ANSI/EIA-709.1 protocol conversion)

Contact Carrier Controls Marketing for pricing and availability information regarding these devices.

Constant volume applications

The units are shipped as operable, stand-alone units using either a standard (mechanical or electronic) 2-stage heat, 2-stage cool thermostat, or with an electronic room temperature sensor and a timeclock to establish unit start and stop times. With a standard thermostat (programmable is optional), heating and cooling operation is set by space temperature. With a space sensor and field-supplied timeclock, the machine will operate at default values unless they are changed using appropriate input devices. The space sensor monitors space temperature and may be equipped with a timed override feature, which allows unit operation during unoccupied periods. The space sensors may be used in multiples of 4 or 9 to achieve space temperature averaging. The use of a space sensor also allows the unit to be turned on and off from a remote signal or it can be programmed to use the time of day scheduling that is built into the control.

Features with thermostat control of unit

- Two-stage heating (if installed)
- Multiple stage gas heating if unit is equipped with the staged gas heat option
- Two-stage demand with fully proportional economizers and integrated compressor capacity
- Two-stage cooling or adaptive multiple stage cooling which can provide up to 6 stages of capacity
- Control of unit using Y1, Y2, W1, W2, and G thermostat or T55, T56, or T58 space sensors
- Control of the indoor fan
- Outdoor-air temperature/supply-air temperature monitoring with logic to lock the compressors out at low ambient temperatures down to 0° F
- Control of a condenser fan based on outdoor-air and condensing pressures
- Control of modulating economizer to provide free cooling when outdoor conditions are suitable
- Control allows for use of the economizer and the compressors to maximize the use of outside air cooling to reduce part load operating costs
- Control of the power exhaust fans based on configurable damper positions or outside air intake valves or directly from the optional building pressure sensor
- Compressor Time Guard override (power up and minimum on and off timers) to assure air return in low load conditions
- Support of IAQ sensor

Features with sensor control of unit

There are 3 sensor options available:

- T55 sensor will monitor room temperature and provide unoccupied override capability (1-4 hours).
- T56 sensor will monitor room temperature, provide unoccupied override capability (1-4 hours), and provide a temperature offset of 5 F maximum.
- T58 is a CCN communicating sensor that will provide the set point and space temperature values.

Controls (cont)



Standard features are:

- Support of remote occupied/unoccupied input to start and stop the unit
- Two-stage economizer demand with fully proportional economizers and integrated compressor capacity
- Cooling capacity control of 2 levels cooling with either 2-stage control or adaptive control with up to 6 stages of mechanical refrigeration capacity
- Occupied or unoccupied set point
- Enable heating (if installed) or cooling during unoccupied periods as required to maintain space temperature within the unoccupied set points
- Adjustment of space temperature set points of $\pm 5^{\circ}$ F when using a T56 sensor
- Support of IAQ sensor
- 365-day timeclock with backup (supports minute, hour, and day of week, date, month, and year access). The timeclock includes the following features:
 - Daylight savings time function
 - Occupancy control with 8 periods for unit operation
 - Holiday table containing up to 18 holiday schedules
 - Ability to initiate timed override from T55 or T56 sensors (for a timed period of 1 to 4 hours)
 - Temperature compensated start to calculate early start times before occupancy
 - For units connected into a CCN network the timeclock can be integrated into the overall building Energy management system and be updated remotely
- For units connected to the CCN network the user can also display all the unit information including I/O values Maintenance, Configuration, Service, and Set Point data tables
- Indoor air quality (IAQ)

Variable air volume (VAV) applications

The 48/50AK,AY units are designed to operate in VAV applications. As standard they include a supply fan inverter (VFD) to control the supply fan speed and duct pressure. They are designed to control the leaving-air temperature in cooling to a configurable set point. The changes in mode of operation from Heating, to Vent mode to Cooling mode can be controlled either from the return air temperature sensor or from an accessory space temperature sensor. Some of the features for VAV units in a stand-alone application are:

- The units are shipped as operable, stand-alone units with the addition of a field-supplied timeclock to establish unit start and stop times or they can use *ComfortLink*[™] time of day scheduling routine
- Provide cooling and heating control (if equipped with heat) in both occupied and unoccupied modes
- Supports an optional space temperature sensor for mode control and supply air temperature reset
- If space sensor is equipped with an override feature, the sensor will allow operation during the unoccupied period for a fixed length of time
- Base unit control supports a Heat Interlock Relay (field supplied) to signal the VAV terminal devices to fully open during heating operation

- Control board diagnostics
- Control of an outdoor-condenser fan based upon outdoor-air temperature and saturated condensing temperature
- Control of modulating economizer to provide free cooling when outdoor conditions are suitable.
- Control also allows for use of the economizer and the compressors to maximize the use of outside air cooling to reduce part load operating costs.
- Support of remote occupied/unoccupied input to start
- Controls the operation of the supply fan inverter to maintain a configurable supply duct static pressure set point. Inverter is configured and controlled directly by *ComfortLink* control.
- Support of IAQ sensor
- Support a field test for field check out
- Support linkage to *ComfortID*[™] systems
- Cooling capacity control of up to 6 stages plus economizer
- Control of two stages of heat to maintain return-air temperature
- Multiple stage gas heating if unit is equipped with the staged gas heat option
- Control of heat interlock relay
- Compressor time delays to prevent rapid cycling of compressors
- Automatic lead-lag control of compressors to reduce the number of compressor cycles
- With the addition of a remote start/stop switch heating or cooling is enabled during unoccupied periods as required to maintain space temperature to within unoccupied set points
- With the addition of the Controls Expansion Board, the *ComfortLink* controls will also support demand limiting and remote set point control

When the unit is connected to CCN (Carrier Comfort Network®) additional features can be used:

- Interface of the unit clock with the CCN network clock and allow for remote configuration of the schedules
- CCN demand limit participation
- Interface with *ComfortID* control systems through linkage

Sequence of operation

Cooling, constant volume (CV) units — On power up, the control module will activate the initialization software. The initialization software will determine the unit configuration and also initialize any controls loops and input/output devices. All alarms and configurations are saved in memory and maintained during power outages. All alarms will be maintained in memory and must be cleared through the display.

Constant volume conventional thermostat control — If the unit is equipped with a conventional thermostat with Y1, Y2, W1, W2 and G connections then the control will perform the following sequence.

When G is closed the indoor fan will turn on. G must be closed for heating or cooling to occur. If Y1 is closed then the control will first check the ability to use the economizer. If the economizer can be used the control will modulate the damper open to maintain the low load economizer leaving

air temperature set point. If Y2 closes then the control will lower the leaving air temperature set point to the configured set point. If the economizer can not satisfy the load then compressors will be sequenced on to maintain either the low or high load temperature set points. If the economizer can not be used or the enable control disables the economizer, then the control will sequence the compressors based on the Y1 and Y2 signals. If two-stage control has been selected then the control will map the compressors to the Y1 and Y2 inputs as defined in the loading sequence. If Adaptive mode has been selected then the control will add and remove compressor stages to maintain the low and high demand set points. If Y1 is closed at least one compressor stage will be turned on.

If W1 closes then it will indicate that the units should be in the Heating mode. The economizer will be closed to the minimum position and if the unit is equipped with gas or electric heat then the first stage of heat will be energized. If W2 closes then the control will turn on the second stage of heat. If the unit is equipped with a staged gas heat control option then the W1 and W2 signal will be used to control the gas heat to the configurable low and high heat load leaving air temperature set points. If the unit is equipped with gas heat then the IGC board will control the operation of the gas heat. See the 48 Series Gas Heat units section on the IGC board sequence of operation.

Constant volume space temperature sensor control — If the space temperature operation has been selected using a T55, T56, or T58 sensor then the following logic will be used to control the operation of the unit. If a space temperature is used then a wire jumper must be added between R, W1, and W2. If a remote occupancy control method has been selected then the input must first be closed for the unit to go into Heat, Vent or Cooling mode. If the internal timeclock is used, the control module determines the occupancy state based on the system time schedules. If Temperature Compensated Start is active, the unit will be controlled as in the occupied mode and will start a time as determined by prior operation to have the space at set point by the occupied time. If the unit has been configured for a preoccupancy purge then the control will start the unit in Vent mode prior to the occupancy time to vent the space. If an IAQ sensor is being used and the low IAQ set point is satisfied then the occupancy purge mode will be terminated. The set points for heat and cooling are configurable through the display. If a T56 sensor is being used then the set point can be shifted by as much as 5 degrees. If the space temperature goes above the cooling set point then the unit will go into Cooling mode. If the economizer can be used, the control will first try to control to the leaving air temperature set point. The set point will depend on the space temperature. If the temperature is above the low demand set point then the low economizer load discharge air temperature set point will be used. If the temperature is above the high load space temperature set point then the high load leaving air temperature set point will be used. If the economizer can not satisfy the load then compressors will be sequenced on to maintain either the low or high load temperature set points. If the economizer can not be used or the enable control disables the economizer then the control will

sequence the compressors based on the low and high load space temperature variables. If two-stage control has been selected then the control will map the compressors to the low and high loads as defined in the loading sequence. If Adaptive mode has been selected then the control will add and remove compressor stages to maintain the high and low demand leaving air set points.

If the space temperature goes below the heating space temperature set points then it will indicate that the units should be in the Heating mode. The economizer will be closed to the minimum position and if the unit is equipped with gas or electric heat then the first stage of heat will be energized. If the space temperature goes below the high load space temperature set point then the control will turn on the second stage of heat. If the unit is equipped with a staged gas heat control option then the low load and high load demand signal will control the leaving air temperature set point and will turn on heating stages to maintain the leaving air temperature set points.

If the units is configured for unoccupied free cooling, mechanical cooling or heating and the temperature goes beyond the unoccupied configuration set points then the control will turn on free cooling, mechanical cooling or heat as needed to get within the unoccupied set points. When in this mode, the economizer dampers will be maintained fully closed or to the minimum unoccupied ventilation set point.

Variable air volume control — On power up, the control module will activate the initialization software. The initialization software will determine the unit configuration and also initialize any controls loops and input/output devices. All alarms and configurations are saved in memory and maintained during power outages. All alarms will be maintained in memory and must be cleared through the display.

The unit will first determine the mode of operation. If the unit has been configured for space temperature demand then the control will determine, based on the configurable set points, if the unit should be in the heat mode, vent mode or cooling mode. If the unit is configured for return air temperature control then it will start the fan and monitor the return air temperature vs. the configurable set point to determine if the unit should be in cooling, vent or heating mode.

If the control is connected to a ComfortID™ system, the room terminals are equipped with microprocessor controls that give commands to the base module. If linkage is active, the control module will replace local *ComfortLink*™ set points and occupancy data with linkage supplied data.

If temperature compensated start is active then advance pre-cool or heat of the space is enabled. If the unit is configured to use a pre-purge cycle then the *ComfortLink* control will start the unit in Vent mode based on a pre-start time interval. If an IAQ sensor is being used and the low IAQ control point is satisfied, then the mode will be terminated.

If Cooling mode is required, then the controlling set point will be the leaving air temperature set point. If an economizer is present and the changeover control allows the economizer to be used, then it will first attempt to

Controls (cont)



control the leaving-air temperature using free cooling. If this can not satisfy the load, then additional compressor stages will be turned on to maintain the leaving-air temperature. When both compressors and economizers are being used, the control will use the economizer dampers to maintain better control of the leaving-air and to prevent high compressor cycling. If the economizer can not be used then it will be set to the minimum vent position. When using compressors, the leaving-air temperature will sequence to compressors on and off using a PID control loop. If the unit is equipped with an optional hot gas bypass valve the control will use the hot gas as an additional stage of capacity. When the first stage of cooling is required the control will turn on a circuit "A" compressor and the hot gas bypass valve. When additional cooling is called for it will turn off the hot gas bypass valve. The valve will also be used for additional freeze protection of the coils when low evaporator refrigerant temperatures are detected using the suction pressure transducers.

When operating in cooling the control will also monitor the supply duct pressure and send a 4 to 20 mA signal to the factory-supplied inverter to control the speed of the fan and the delivered cfm. If on a Linkage system the control also support static pressure reset based on the needs of the zones.

If the unit has been enabled for occupied heat and the space temperature sensor (SPT), return air temperature sensor (RAT) or Linkage demand calls for heat, the control will energize the electric heat or gas heat (if present) to warm the space. In this mode the control will energize the heat interlock relay which will signal the terminals to open to the heating position. Note that for the linkage systems the interlock relay connection is not required. Once the heat mode is enabled, the heat capacity will be controlled by the return air temperature set point. Heating will continue until the return temperature set point is satisfied. If the unit is configured for morning warm-up and the heating demand is below the set point during the first 10 minutes of operation, the control will energize full heating capacity until the return air temperature set point is satisfied.

If the space temperature sensor (SPT), return air temperature sensor (RAT) or Linkage demand requires that the unit be in heating then the control will energize the electric heat or gas heat (if present) to warm the space. In this mode the control will energize the heat interlock relay which should be connected to the terminals to indicate that they should open to the heating position. The interlock relay connection is not required for the Linkage systems. Heating will continue until the mode selection sensor is satisfied.

48 series gas heat units

The gas heat units incorporate 2 (3 on size 051) separate systems to provide gas heat. Each system incorporates its own induced-draft motor, Integrated Gas Control (IGC) board, 2-stage gas valve, manifold, and safeties. For 2-stage heat control the systems are operated in parallel. For example, when there is a call for first stage heat, both

induced-draft motors operate, both gas valves are energized, and both IGC boards initiate spark. With the Staged Gas Control, the systems are operated independently to allow for a greater range of capacity control. All of the gas heating control is performed through the IGC boards (located in the heating section). The MBB module board serves only to initiate and terminate heating operation and monitor the status of the requirements for indoor fan operation. The fan will be controlled directly by the MBB board. The base module board is powered by 24 vac. When the thermostat or room sensor calls for heating the MBB board will close heating relays and send power to W on each of the IGC boards. An LED on the IGC board will be on during normal operation. A check is made to ensure that the rollout switches and limit switches are closed and the induced-draft motors are not running. After the induced-draft motors are energized and speed is proven with the Hall Effect sensor on the motor, the ignition activation period begins. The burners will ignite within 5 seconds. When ignition occurs the IGC board will continue to monitor the condition of the rollout and limit switches, the Hall Effect sensor and the flame sensor. If the unit is controlled through a room thermostat set for fan auto., 45 seconds after ignition occurs the indoor-fan motor will be energized and the outdoor-air dampers will open to their minimum position. If the over temperature limit opens prior to the start of the indoor fan blower, on the next attempt the 45-second delay will be shortened to 5 seconds less than the time from initiation of heat to when the limit tripped. Gas will not be interrupted to the burners and heating will continue. Once modified, the fan on delay will not change back to 45 seconds unless power is reset to the control. If the unit is controlled through a room sensor, the indoor fan will be operating in the occupied mode and the outdoor-air dampers will be in the minimum position. If the unit is controlled with a room sensor in the unoccupied mode, the indoor fan will be energized through the IGC board with a 45-second delay and the outside-air dampers will move to the minimum unoccupied set point. When additional heat is required, the second stage MBB output relay closes and initiates power to the second stage of all main gas valves in all sections. When the demand is satisfied, MBB heat output relays will open and the gas valves close interrupting the flow of gas to the main burners. If the call for stage 1 heat lasts less than 1 minute, the heating cycle will not terminate until 1 minute after W1 became active. If the unit is configured for intermittent fan then the indoor-fan motor will continue to operate for an additional 45 seconds then stop and the outdoor-air dampers will close. If the over temperature limit opens after the indoor motor is stopped within 10 minutes of W1 becoming inactive, on the next cycle the time will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified, the fan off delay will not change back to 45 seconds unless power is reset to the control.

Application data



Ductwork — Secure vertical discharge ductwork to roof curb. Interior installation may proceed before unit is set in place on roof. For horizontal discharge applications, attach ductwork to unit, or field-supplied flanges can be attached to horizontal discharge openings and all ductwork attached to flanges. Units equipped with electric heat require a 90-degree elbow below the unit supply duct connection.

Thru-the-curb service connections — Roof curb connections allow field power wires and control wires to enter through the roof curb opening.

Thermostat (CV only) — Use of a thermistor-type room sensor is recommended on all CCN installations. A thermistor-type room sensor or a 2-stage heating/cooling thermostat may be used for all other units.

Heating-to-cooling changeover — All units are automatic changeover from heating to cooling when automatic changeover thermostat and subbase or a thermistor-type room sensor are used.

Airflow — Units are draw-thru on cooling and blow-thru on heating.

Maximum airflow — To minimize the possibility of condensate blow-off from evaporator, airflow through units should not exceed values shown in Cooling Cfm Operating Range table and Cooling Capacities tables.

Minimum airflow — The minimum airflow for cooling is 300 cfm/ton for constant volume units and 70 cfm/ton for VAV (variable air volume) units. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by entering-air temperatures. Refer to Gas Heating Capacities and Efficiencies table on page 6 for minimum airflow cfm for heating.

Minimum ambient cooling operation temperature — All units are equipped with factory economizers to allow free cooling at any outdoor ambient. If mechanical cooling is required, the units are designed to operate at outdoor

temperatures down to 32 F. With accessory Motormaster® V control units can operate at outdoor temperatures down to -20 F. Outdoor-fan motor no. 1 change out is required for Motormaster V applications.

Carrier recommends the installation of field-fabricated wind baffles on all vertically oriented condenser coil surfaces when operating in environments with prevailing winds of more than 5 mph and where temperatures drop below 32 F.

Maximum operating outdoor-air temperature — The maximum operating outdoor-air temperature is 115 F. Some models will operate up to 125 F depending on model and operating conditions.

High altitude (gas heat units only) — A change to the gas orifice may be required at high altitudes. Refer to Altitude Compensation table on page 7.

Minimum temperature — Minimum allowable temperature of mixed air entering the heat exchanger during half rate (first stage) operation is 50 F. There is no minimum mixture temperature during full-rate operation. Comfort conditioning may be compromised at temperatures below 50 F. Below 50 F entering-air temperature (EAT) both stages of heat are engaged.

Internal unit design — Due to Carrier's internal unit design (draw-thru over the motor), air path, and specially designed motors, the full horsepower listed in the Physical Data table and Motor Limitations table can be utilized with extreme confidence. Using Carrier motors with the values listed in the Physical Data and Motor Limitations tables will not result in nuisance tripping or premature motor failure. The unit warranty will not be affected.

Electric heat — A field-supplied 90-degree elbow must be installed in the supply ductwork below the unit discharge.

POWER SCHEMATIC 48/50AJ,AK,AW,AY041

TABLE C

208-230V/480V TRANSFORMER	CONNECT	HI	LS	COM
PRIMARY VOLTAGE: 480V	H1 (BLK)	H1	LS1	COM1
288V	H3 (BLK)	H2	LS2	COM2
288V	H4 (YEL)	H3	LS3	COM3
SECONDARY VOLTAGE 24V	X1 (BLK)	H4	LS4	COM4
	X2 (YEL)	H5	LS5	COM5

575V TRANSFORMER	CONNECT	HI	LS	COM
PRIMARY VOLTAGE: 575V	H1 (BLK)	H1	LS1	COM1
387V	H3 (BLK)	H2	LS2	COM2
387V	H4 (YEL)	H3	LS3	COM3
SECONDARY VOLTAGE 24V	X1 (BLK)	H4	LS4	COM4
	X2 (YEL)	H5	LS5	COM5

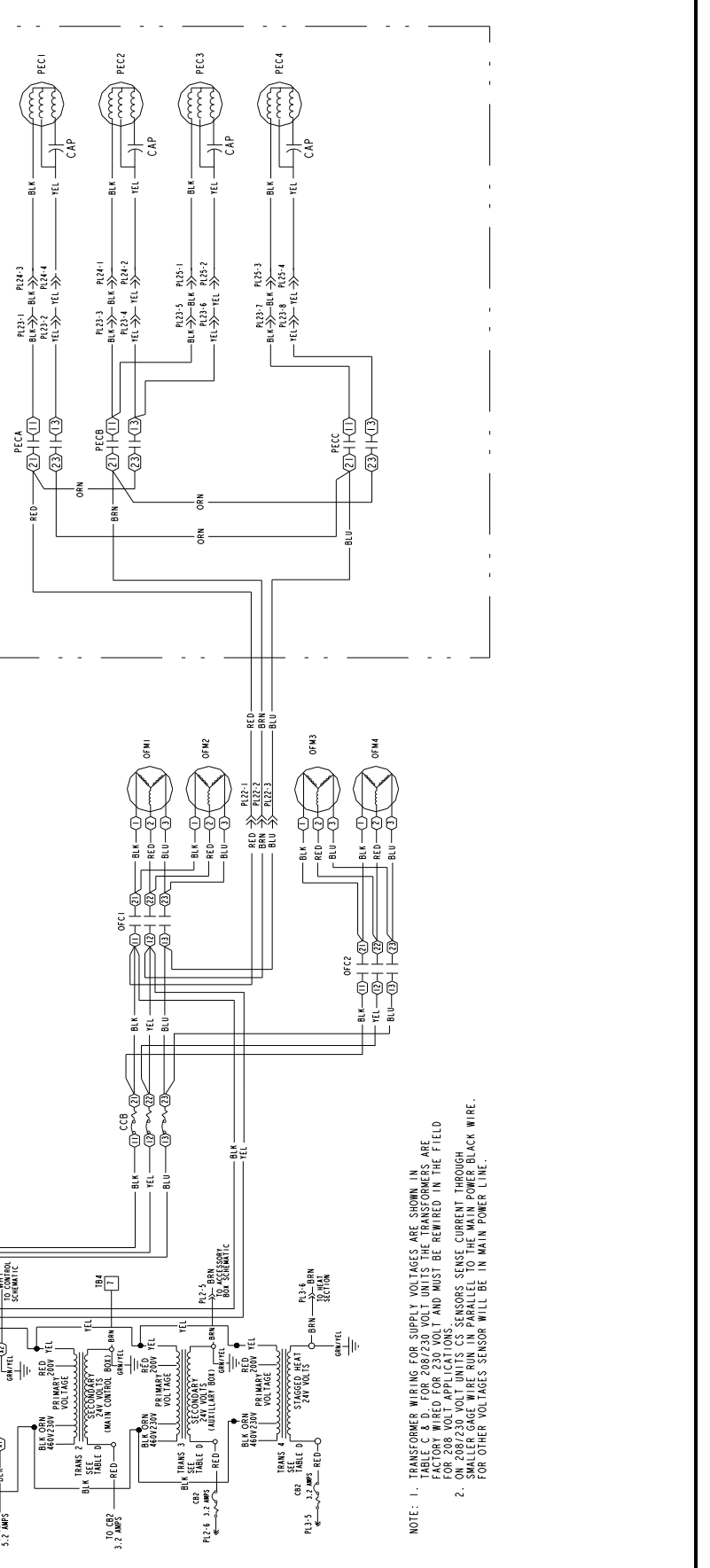
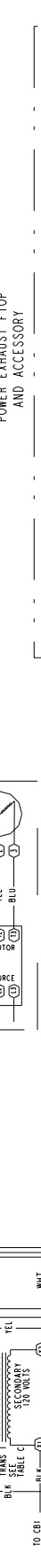
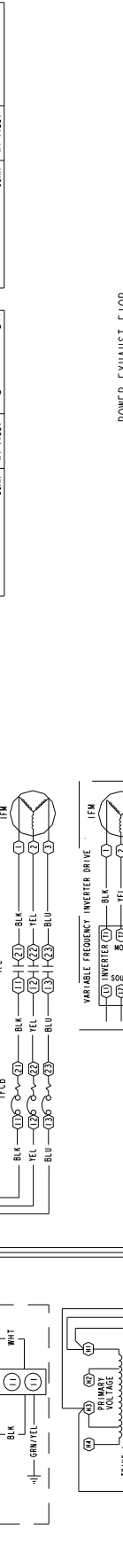
480V TRANSFORMER	CONNECT	HI	LS	COM
PRIMARY VOLTAGE: 480V	H1 (BLK)	H1	LS1	COM1
380V	H3 (BLK)	H2	LS2	COM2
380V	H4 (YEL)	H3	LS3	COM3
SECONDARY VOLTAGE 24V	X1 (BLK)	H4	LS4	COM4
	X2 (YEL)	H5	LS5	COM5

TABLE D

208-230V/480V TRANSFORMER	CONNECT	HI	LS	COM
PRIMARY VOLTAGE: 480V	H1 (BLK)	H1	LS1	COM1
288V	H3 (BLK)	H2	LS2	COM2
288V	H4 (YEL)	H3	LS3	COM3
SECONDARY VOLTAGE 24V	X1 (BLK)	H4	LS4	COM4
	X2 (YEL)	H5	LS5	COM5

575V TRANSFORMER	CONNECT	HI	LS	COM
PRIMARY VOLTAGE: 575V	H1 (BLK)	H1	LS1	COM1
387V	H3 (BLK)	H2	LS2	COM2
387V	H4 (YEL)	H3	LS3	COM3
SECONDARY VOLTAGE 24V	X1 (BLK)	H4	LS4	COM4
	X2 (YEL)	H5	LS5	COM5

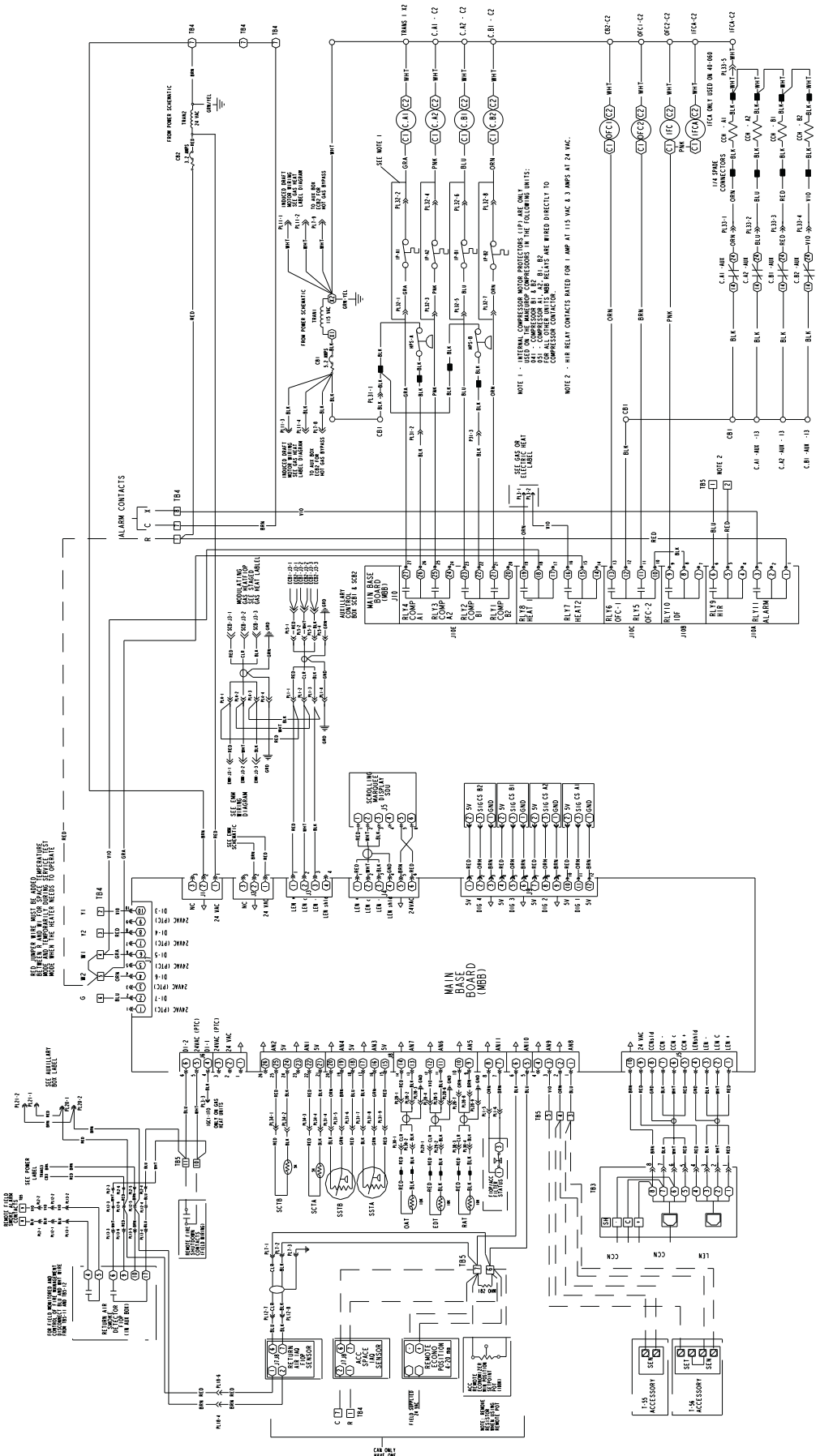
480V TRANSFORMER	CONNECT	HI	LS	COM
PRIMARY VOLTAGE: 480V	H1 (BLK)	H1	LS1	COM1
380V	H3 (BLK)	H2	LS2	COM2
380V	H4 (YEL)	H3	LS3	COM3
SECONDARY VOLTAGE 24V	X1 (BLK)	H4	LS4	COM4
	X2 (YEL)	H5	LS5	COM5



NOTE: 1. TRANSFORMER WIRING FOR SUPPLY VOLTAGES ARE SHOWN IN TABLE C & D. FOR 208/230 VOLT UNITS THE TRANSFORMERS ARE FACTORY WIRED FOR 230 VOLT AND MUST BE REWIRED IN THE FIELD FOR 208 VOLT APPLICATIONS.

2. ON 208/230 VOLT UNITS CS SENSORS SENSE CURRENT THROUGH THE BLACK WIRE. FOR OTHER VOLTAGES SENSOR WILL BE IN MAIN POWER LINE.

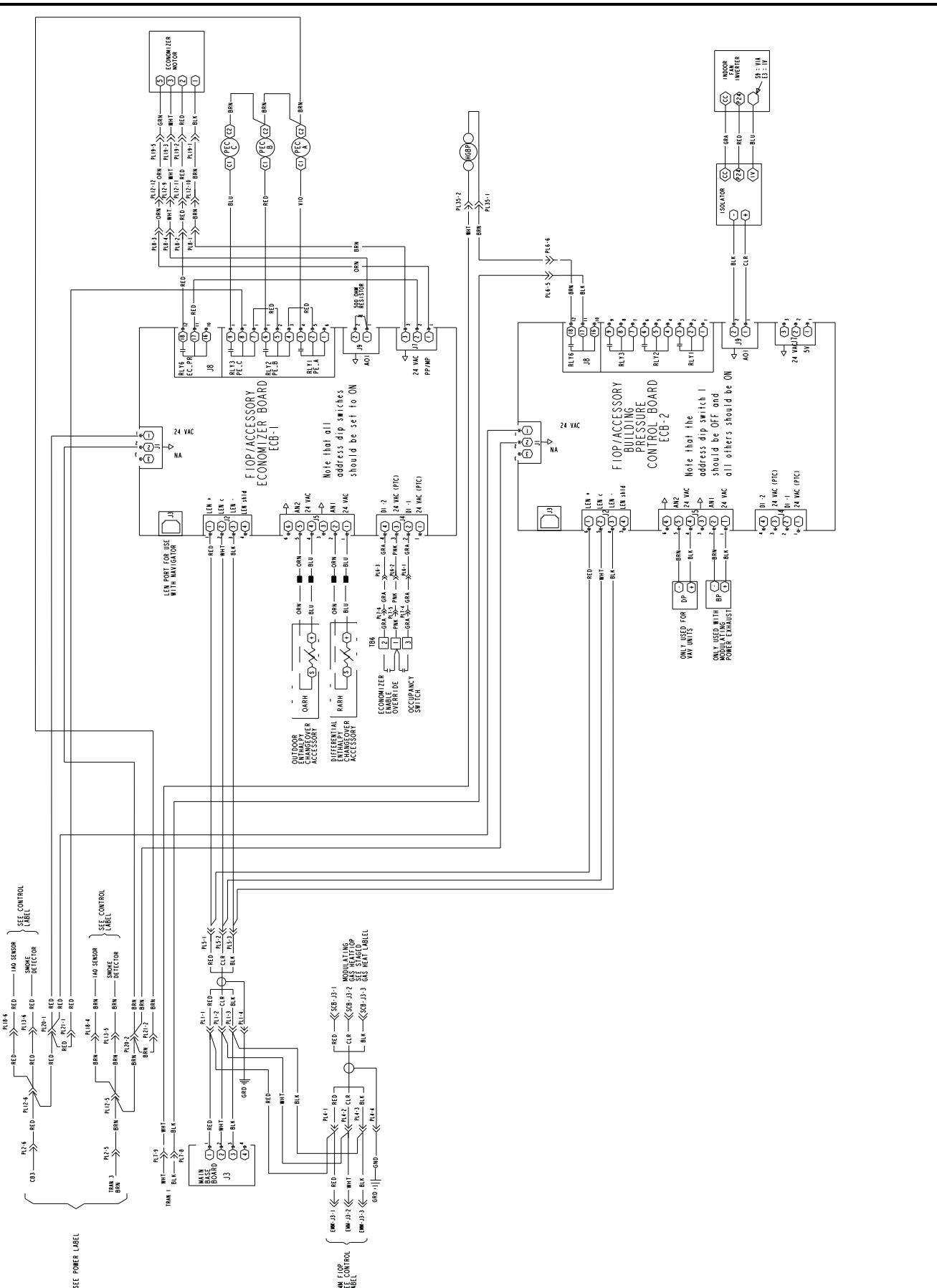
MAIN BOX CONTROL SCHEMATIC 48/50AJ.AK.AW.AY036-051



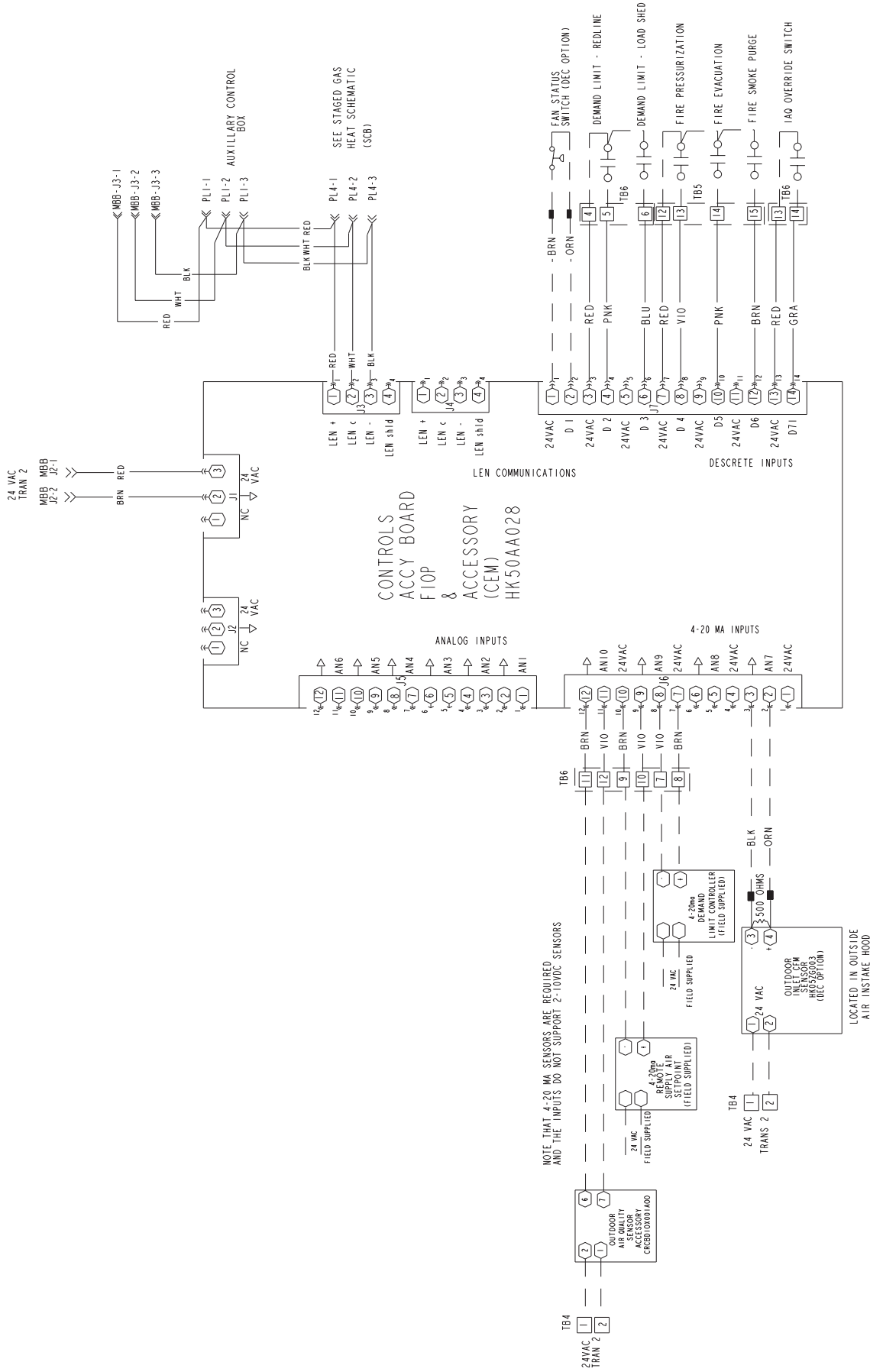
Typical wiring schematics (cont)



AUXILIARY CONTROL BOX SCHEMATIC 48/50AJ,AK,AW,AY036-051



ACCESSORY BOARD WIRING SCHEMATIC 48/50AJ,AK,AW,AY036-051



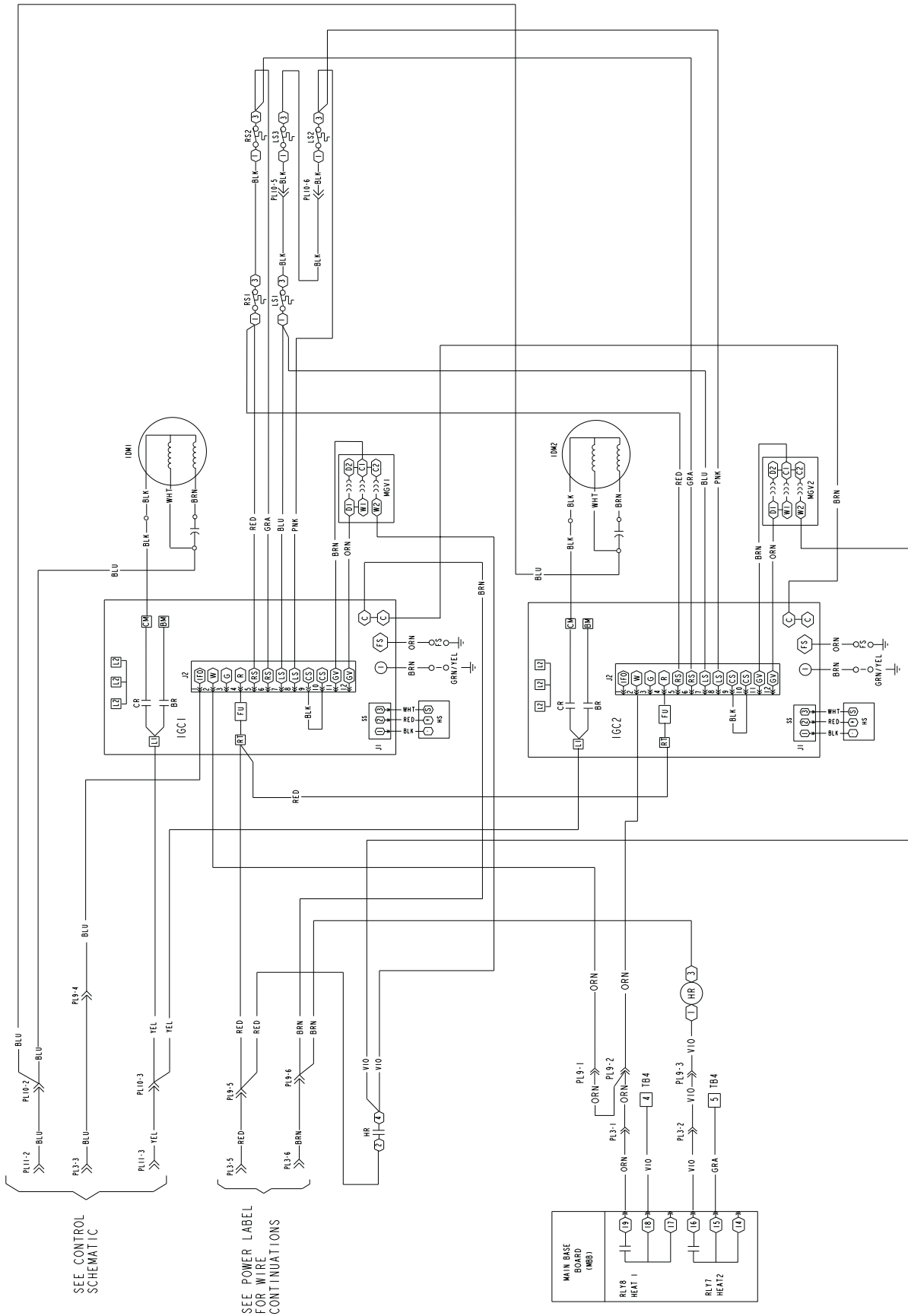
NOTE THAT 4-20 MA SENSORS ARE REQUIRED AND THE INPUTS DO NOT SUPPORT 2-10VDC SENSORS

LOCATED IN OUTSIDE AIR INSTAKE HOOD

Typical wiring schematics (cont)



GAS HEAT CONTROL SCHEMATIC 48/50AJ,AK036-051





LEGEND AND NOTES FOR TYPICAL WIRING SCHEMATIC

LEGEND

A — Circuit A
AUX — Auxiliary Contact
BP — Building Pressure Transducer
C — Compressor Contactor
CAP — Capacitor
CB — Circuit Breaker
CCB — Control Circuit Breaker
CCH — Crankcase Heater
CCN — Carrier Comfort Network®
CEM — Controls Expansion Module
COMP — Compressor
CS — Compressor Current Sensor Board
DP — Discharge Pressure Transducer
ECB1 — Economizer Control Board
ECB2 — VAV Control Board
EDT — Evaporator Discharge Temperature
EMM — Energy Management Module
FIOP — Factory-Installed Option
FS — Flame Sensor
FU — Fuse
GND — Ground
HGBP — Hot Gas Bypass
HPS — High-Pressure Switch
HR — Heat Relay
HS — Hall Effect Induced Draft Motor Switch
IAQ — Indoor Air Quality
IARH — Return Air Relative Humidity

IDM — Induced-Draft Motor
IFC — Indoor-Fan Contactor
IFCB — Indoor-Fan Circuit Breaker
IFM — Indoor-Fan Motor
IGC — Integrated Gas Control Board
IP — Internal Compressor Protector
LEN — Local Equipment Network
LS — Limit Switch
MBB — Main Base Board
MGV — Main Gas Valve
OARH — Outdoor Air Relative Humidity
OAT — Outdoor Air Temperature Sensor
OFC — Outdoor-Fan Contactor
OFM — Outdoor-Fan Motor
PEC — Power Exhaust Contactor
PL — Plug
RARH — Return Air Relative Humidity
RAT — Return Air Temperature Sensor
RS — Rollout Switch
SCB — Staged Gas Heat Control Board
SCT — Saturated Condensing Temperature Sensor
SDU — Scrolling Marquee Display
SST — Saturated Suction Temperature Sensor
T-55 — Room Temperature Sensor
T-56 — Room Temperature Sensor with Set Point
TB — Terminal Block
TRANS — Transformer

THERMOSTAT MARKINGS

BM — Blower Motor
C — Common
CM — Inducer Motor
CS — Centrifugal Switch
G — Fan
IFO — Indoor Fan On
L1 — Line 1
R — Thermostat Power
RT — Power Supply
SS — Speed Sensor
W1 — Thermostat Heat Stage 1
W2 — Thermostat Heat Stage 2
X — Alarm Output
Y1 — Thermostat Cooling Stage 1
Y2 — Thermostat Cooling Stage 2



Terminal (Marked)



Terminal (Unmarked)



Terminal Block



Splice



Factory Wiring



Field Wiring



To indicate common potential only, not to represent wiring.

Guide specifications (constant volume application)



Packaged Rooftop Cooling Unit and Packaged Rooftop Cooling Unit With Gas Heat — Constant Volume Application

HVAC Guide Specifications — Section 48/50AJ,AW

Size Range: **35 to 50 Tons, Nominal (Cooling)**

Carrier Model Number: **48AJ, 48AW, 50AJ, 50AW**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor roof curb or slab mounted, electronically controlled heating and cooling unit utilizing hermetic scroll compressors with crankcase heaters for cooling duty and with optional gas heat or electric heat. Units shall discharge supply and return air vertically or horizontally as shown on contract drawings. EER shall meet requirements of ASHRAE Standard 90.1-1999.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 340/360.
- B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest edition), ASHRAE 62, UL Standard 1995 and National Electrical Code.
- C. Unit shall be listed by ETL and ETL, Canada as a total package.
- D. 48AJ,AW units shall be designed to conform with ANSI Standard Z21.47 (U.S.A.) / CSA Standard 2.3 (Canada), Gas-Fired Central Furnaces.
- E. Roof curb shall be designed to NRCA criteria per Bulletin B-1986.
- F. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- G. Unit shall be manufactured in a facility registered to the ISO 9001:2000 manufacturing quality standard.

1.03 DELIVERY, STORAGE AND HANDLING

Unit shall be stored and handled per manufacturer's recommendations. All exposed coils shall have protective shipping covers.

Part 2 — Products

2.01 EQUIPMENT

A. General:

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, micro-processor 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 precoated with a baked enamel finish.

- a. Top cover shall be 18-gage sheet metal with 0.75-in. thick, 1.5-lb density, fiberglass insulation.
 - b. Access panels and doors shall be 20-gage sheet metal with 0.5-in. thick, 1.5-lb density, fiberglass insulation.
 - c. Corner and center posts shall be 16-gage galvanized steel.
 - d. Basepans in the heating and return air sections shall be 16-gage galvanized steel.
 - e. Basepans in the condenser section shall be 12-gage galvanized steel.
 - f. Compressor rail shall be 12-gage galvanized steel.
 - g. Condensate pan shall be 16-gage aluminized steel.
 - h. Air baffles shall be 18-gage galvanized steel with 0.5-in. thick, 1.5-lb density, fiberglass insulation.
 - i. Base rail shall be 14-gage galvanized steel.
 - j. Fan deck (indoor and outdoor section) shall be 16-gage galvanized steel.
2. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
 3. Sides shall have person-sized 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 be equipped to permit ease and safety during servicing.
 4. Interior cabinet surfaces shall be sheet metal lined or insulated with flexible fire-retardant material, coated on the air side.
 5. Unit shall have a factory-installed sloped condensate drain connection made from an aluminized steel or optional stainless steel.
 6. Equipped with lifting lugs to facilitate overhead rigging.
 7. Filters shall be accessible through a hinged access panel without requiring any special tools.

C. Fans:

1. Indoor Evaporator Fans:

- a. Double-width/double-inlet, centrifugal, belt driven, forward-curved type with single outlet discharge.
- b. Fan shaft bearings shall be of the pillow-block type with positive locking collar and lubrication provisions.
- c. Statically and dynamically balanced.
- d. Evaporator fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.



e. Solid fan shaft construction for size 036 and 041 units and two-piece solid fan shaft construction on the size 051 unit.

2. Condenser Fans:

a. Direct-driven propeller type only, with corrosion-resistant blades riveted to corrosion resistant steel supports.

b. Discharge air vertically upward and protected by PVC coated steel wire safety guards.

c. Statically and dynamically balanced.

D. Compressors:

1. Fully hermetic, scroll type compressors with overload protection and short cycle protection with minimum on and off timers.

2. Factory rubber-in-shear mounted and internally spring mounted for vibration isolation.

3. Reverse rotation protection capability.

4. Crankcase heaters shall only be activated during compressor off mode.

E. Coils:

1. Standard evaporator and condenser coils shall have copper or aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

2. Coils shall be leak tested at 150 psig and pressure tested at 450 psig.

3. Optional pre-coated aluminum-fin coils shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

4. Copper-fin coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan. All copper construction shall provide protection in moderate coastal environments.

5. E-Coated aluminum-fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93. Impact resistance shall be up to

160 in./lb (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

F. Heating Section:

Electric Heat:

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

Gas Heat:

1. Induced-draft combustion type with energy saving direct spark ignition systems and redundant main gas valves.

2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance. Optional stainless steel heat exchangers shall be available.

3. Burners shall be of the in-shot type constructed of aluminum coated steel.

4. All gas piping shall enter the unit cabinet at a single location.

5. Induced Draft Fans:

a. Direct-driven, single inlet, forward-curved centrifugal type.

b. Statically and dynamically balanced.

c. Made from steel with a corrosion-resistant finish.

6. High-corrosion areas such as flue gas collection and exhaust areas shall be lined with corrosion resistant material.

G. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits each containing:

1. Solid core filter drier.

2. Thermostatic expansion valve.

3. Fusible plug.

H. Filter Section:

Standard filter section shall consist of either factory installed 2-in. thick throwaway fiberglass filters or 30% pleated filters of commercially available sizes.

Optional 4-in. filter track shall be supplied with 30% pleated fiberglass filters.

I. Controls and Safeties:

1. Unit *ComfortLink*™ Controls:

a. Scrolling Marquee display.

b. CCN (Carrier Comfort Network®) capable.

Guide specifications (constant volume application (cont))



- c. Unit control with standard suction pressure transducers and condensing temperature thermistors.
 - d. Shall provide a minimum 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1, energy standard.
 - e. Shall provide and display a current alarm list and an alarm history list.
 - f. Automatic compressor lead/lag control.
 - g. Service run test capability.
 - h. Shall accept input from a CO₂ sensor (both indoor and outdoor).
 - i. Configurable alarm light shall be provided which activates when certain types of alarms occur.
 - j. Compressor minimum run time (3 minutes) and minimum off time (3 minutes) are provided.
 - k. Service diagnostic mode.
 - l. Optional integrated economizer control or two-position self-closing adjustable outside air damper.
 - m. Minimum of 4 capacity stages of mechanical capacity control (excluding HGBP) controlled by one of the following user selectable methods:
 - 1) A control algorithm to maintain either high-cool or low-cool supply air temperature set-point. cooling mode (off, low or high) to be determined from space temperature sensor or standard 2-stage mechanical thermostat input.
 - 2) Two-stage control.
 - n. Optional minimum load valve for additional capacity stage.
 - o. Unit shall be complete with self-contained low voltage control circuit.
 - p. Control of evaporator leaving air temperature through compressor and economizer control.
2. Safeties:
- a. Unit shall incorporate a solid-state compressor lockout which provides optional reset capability at the space thermostat should any of the following safety devices trip and shut off compressor:
 - 1) Compressor lockout protection provided for either internal or external overload.
 - 2) Low-pressure protection.
 - 3) Freeze protection (evaporator coil).
 - 4) High-pressure protection (high pressure switch or internal).
 - 5) Compressor reverse rotation protection.
 - 6) Loss-of-charge protection.
 - b. Supply-air sensor shall be located in the unit and should be used for economizer control and compressor stage control.
 - c. Induced draft heating section (48 Series) shall be provided with the following minimum protections:
 - 1) High-temperature limit switch.
 - 2) Induced-draft motor speed sensor.
 - 3) Flame rollout switch.
 - 4) Flame proving controls.
 - 5) Redundant gas valve.
- 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 340/360.
 - 2. Unit with standard controls will operate in cooling down to an outdoor ambient temperature of 32 F.
 - 3. Unit shall be provided with fan time delay to prevent cold air delivery.
- K. Electrical Requirements:
- All unit power wiring shall enter unit cabinet at a single location.
- L. Motors:
- 1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.
 - 2. All condenser-fan motors shall be totally enclosed 3-phase type with permanently lubricated ball bearings, class F insulation and internal, automatic-reset thermal overloads thermal overload protection or manual reset calibrated circuit breakers.
 - 3. All indoor-fan motors 5 hp and larger shall meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT), effective October 24, 1997.
- M. Special Features:
- Certain features are not applicable when the features designated * are specified. For assistance in amending the specifications, contact your local Carrier Sales Office.
- 1. Full Perimeter Roof Curbs (Horizontal and Vertical):

Formed of 14-gage galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
 - * 2. Integrated Economizer:
 - a. Economizer shall be furnished and installed complete with recirculated air dampers, outside-air dampers, and controls.



- b. Low-leakage dampers ride in UL approved gears.
 - c. Capable of introducing up to 100% outdoor air for minimum ventilation as well as freecooling.
 - d. Damper actuator shall be gear driven, 24-v fully modulating design.
 - e. Economizer outdoor hood shall be pre-painted.
- * 3. Barometric Relief Damper Package:
- a. Package shall include damper, seals, hardware, and hoods to relieve excess internal pressure.
 - b. Damper shall close due to gravity upon unit shutdown.
- * 4. Power Exhaust:
- Package shall include a multiple exhaust fan (centrifugal style) fan, 1 Hp 208-230, 460 v direct-drive motor, and damper for vertical flow units with economizer to control over-pressurization of building. Control shall be through *ComfortLink™* based on damper position or through an optional building pressure sensor. On size 036 and 041 units 4 stages of control shall be available and 6 stages on the size 051 unit.
- * 5. Thermostats and Subbases:
- To provide staged heating and cooling in addition to automatic (or manual) changeover and fan control.
- * 6. Electronic Programmable Thermostat:
- Capable of using deluxe full-featured electronic thermostat.
- * 7. Liquefied Propane Conversion Kit (48 Series):
- Kit shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane gas.
- * 8. Convenience Outlet:
- Shall be factory-installed and internally mounted with an externally accessible 115-v, 15 amp. GFI, female receptacle with hinged cover. A step-down transformer and overload protection shall be included so no additional wiring is necessary unless the field-wired outlet has been requested. When applied with a unit-mounted disconnect the outlet shall be wired to the line side of the disconnect, but shall include a means to shut off the outlet.
- * 9. Non-Fused Disconnect Switch:
- Shall be factory-installed, internally mounted, and UL approved. Non-fused switch shall provide unit power shutoff. Shall be accessible from outside the unit and shall provide power off lockout capability.
- *10. Electric Heater Package (50 Series Units Only):
- a. Fully assembled for installation. The packages are designed in accordance with UL safety standards 1995 and listed by ETL. Heater construction approved by UL 5306.
 - b. Heater element open coil resistance wire, nickel-chrome alloy, 0.29 inches inside diameter, strung through ceramic insulators mounted on metal frame. Coil ends are staked and welded to terminal screw slots.
 - c. Heater assemblies are provided with integral fusing for protection of internal heater circuits not exceeding 48 amps each.
 - d. Auto reset thermo limit controls, magnetic heater contactors (24 v coil) and terminal block all mounted in electric heater control box (minimum 18-gage Galvanized steel) attached to end of heater assembly.
- *11. Hail Guard, Condenser Coil Grille:
- Shall protect the condenser coil from hail, flying debris, and damage by large objects without increasing unit clearances.
- *12. CO₂ Sensor:
- The CO₂ sensor shall have the ability to monitor CO₂ levels and relay information to the controller. The controller will use CO₂ level information to modulate the economizer and provide demand control ventilation. The sensor shall be available as field installed or factory-installed return air sensor or a remote space sensor.
- *13. Return Air Smoke Detector:
- The smoke detector shall send input to the controller to shut down the unit in case smoke is detected. The smoke detector shall be factory installed in the return air section or shall be available as a field-installed accessory.
- *14. Filter Status:
- The filter status switch shall be a pressure differential switch and will indicate a dirty filter. The switch shall be available as field or factory installed.
- *15. Return Air Dry Bulb Sensors:
- Return air dry bulb sensors are used to provide differential dry bulb changeover for the economizer.
- *16. Humidity Sensor:
- A humidity sensor will allow for outside air enthalpy changeover control using the standard outside air dry bulb sensor and the option accessory humidity sensor. When both an outside and return air humidity sensor is used then differential enthalpy changeover can be supported.

Guide specifications (constant volume application) (cont)



***17. Two-Position Damper:**

A two-position damper shall admit up to 25% outdoor air during fan operation and shall close when the fan is off. The damper position shall be mechanically adjustable.

***18. 4-Inch Filters:**

A factory-installed option shall be available for 4-inch, high-efficiency filters.

***19. Control Expansion Module (CEM):**

Shall provide the following additional optional features:

- a. Remote set point
- b. Demand limit control
- c. Remote economizer position
- d. Fire and smoke control override control
- e. Remote sensor monitoring
- f. Fan status switch monitoring

***20. Staged Gas Heat (48AJ,AW):**

The control shall have the option for control of the gas heat to a discharge air temperature by sequencing on the gas cells to provide up to 11 stages of capacity. The control shall be integrated directly into the main unit controls and shall include leaving air temperature sensors to ensure that high temperatures do not occur during the operation of the staged gas heat.

21. BACnet/MODBUS Protocol Translator:

A controller-based module shall provide CCN to BACnet Master-Slave/Twisted-Pair (MS/TP) and MODBUS Remote Terminal Unit (RTU) protocol conversion.

22. LonWorks Protocol Translator:

A controller-based module shall provide CCN to LON FT-10A ANSI/EIA-709.1 protocol conversion.

Guide specifications (variable air volume application)



Packaged Rooftop Cooling Unit and Packaged Rooftop Cooling Unit With Gas Heat — Variable Air Volume Application

HVAC Guide Specifications — Section 48/50AK,AY

Size Range: **35 to 50 Tons, Nominal (Cooling)**

Carrier Model Number: **48AK, 48AY, 50AK, 50AY**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor roof curb or slab mounted, electronically controlled heating and cooling unit utilizing hermetic scroll compressors with crankcase heaters for cooling duty and gas combustion or electric heating duty. Units shall discharge supply and return air vertically or horizontally as shown on contract drawings. EER shall meet requirements of ASHRAE Standard 90.1-1999.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 340/360.
- B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest edition), ASHRAE 62, UL Standard 1995 and National Electrical Code.
- C. Unit shall be listed by ETL and ETL, Canada as a total package.
- D. 48AK,AY units shall be designed to conform with ANSI Standard Z21.47 (U.S.A.) / CSA Standard 2.3 (Canada), Gas-Fired Central Furnaces.
- E. Roof curb shall be designed to NRCA criteria per Bulletin B-1986.
- F. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- G. Unit shall be manufactured in a facility registered to the ISO 9001:2000 manufacturing quality standard.

1.03 DELIVERY, STORAGE AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. General:

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, micro-processor 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 precoated with a baked enamel finish.

- a. Top cover shall be 18-gage sheet metal with 0.75-in. thick, 1.5-lb density, fiberglass insulation.
 - b. Access panels and doors shall be 20-gage sheet metal with 0.5-in. thick, 1.5-lb density, fiberglass insulation.
 - c. Corner and center posts shall be 16-gage galvanized steel.
 - d. Basepans in the heating and return air sections shall be 16-gage galvanized steel.
 - e. Basepans in the condenser section shall be 12-gage galvanized steel.
 - f. Compressor rail shall be 12-gage galvanized steel.
 - g. Condensate pan shall be 16-gage aluminized steel.
 - h. Air baffles shall be 18-gage galvanized steel with 0.5-in. thick, 1.5-lb density, fiberglass insulation.
 - i. Base rail shall be 14-gage galvanized steel.
 - j. Fan deck (indoor and outdoor section) shall be 16-gage galvanized steel.
2. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
 3. Sides shall have person-sized 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 be equipped to permit ease and safety during servicing.
 4. Interior cabinet surfaces shall be sheet metal lined or insulated with flexible fire-retardant material, coated on the air side.
 5. Unit shall have a factory-installed sloped condensate drain connection made from an aluminized steel or optional stainless steel.
 6. Equipped with lifting lugs to facilitate overhead rigging.
 7. Filters shall be accessible through a hinged access panel without requiring any special tools.

C. Fans:

1. Indoor Evaporator Fans:

- a. Double-width/double-inlet, centrifugal, belt driven, forward-curved type with single outlet discharge.
- b. Fan shaft bearings shall be of the pillow-block type with positive locking collar and lubrication provisions.
- c. Statically and dynamically balanced.
- d. Evaporator fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

Guide specifications (variable air volume application) (cont)



e. Solid fan shaft construction for size 036 and 041 units and two-piece solid fan shaft construction on the size 051 unit.

2. Condenser Fans:

a. Direct-driven propeller type only, with corrosion-resistant blades riveted to corrosion resistant steel supports.

b. Discharge air vertically upward and protected by PVC coated steel wire safety guards.

c. Statically and dynamically balanced.

3. Supply Fan Drive:

Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, wired and tested. The VFD shall control motor speed to maintain set point static pressure at the sensor tube location of the supply duct pressure transducer (transducer is factory-provided and installed; sensor tube must be field-routed). The VFD may be field-adjusted to maintain supply duct static pressure set points from 0 in. wg to 3.5 in. wg.

The variable speed drive shall include the following features:

a. Full digital control with direct control from the unit *ComfortLink™* controls.

b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.

c. Inverters capable of operation at a frequency of 8 kHz, so no acoustic noise shall be produced by the motor.

d. NEMA 1 enclosure.

e. Self diagnostics.

f. Personal lockout code for additional security.

g. Critical frequency avoidance.

h. RS232C/RS485 capability (accessory card source required).

i. Electronic thermal overload protection.

j. DC link feature for harmonic reduction and improved power factor (460 v units, 20 Hp and larger only).

D. Compressors:

1. Fully hermetic, scroll type compressors with overload protection and short cycle protection with minimum on and off timers.

2. Factory rubber-in-shear mounted and internally spring mounted for vibration isolation.

3. Reverse rotation protection capability.

4. Crankcase heaters shall only be activated during compressor off mode.

E. Coils:

1. Standard evaporator and condenser coils shall have copper or aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

2. Coils shall be leak tested at 150 psig and pressure tested at 450 psig.

3. Optional pre-coated aluminum-fin coils shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

4. Copper-fin coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan. All copper construction shall provide protection in moderate coastal environments.

5. E-Coated aluminum-fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

F. Heating Section:

Electric Heat:

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

Gas Heat:

1. Induced-draft combustion type with energy saving direct spark ignition systems and redundant main gas valves.



2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance. Optional stainless steel heat exchangers shall be available.
 3. Burners shall be of the in-shot type constructed of aluminum coated steel.
 4. All gas piping shall enter the unit cabinet at a single location.
 5. Induced Draft Fans:
 - a. Direct-driven, single inlet, forward-curved centrifugal type.
 - b. Statically and dynamically balanced.
 - c. Made from steel with a corrosion-resistant finish.
 6. High-corrosion areas such as flue gas collection and exhaust areas shall be lined with corrosion resistant material.
- G. Refrigerant Components:
Unit shall be equipped with dual refrigerant circuits each containing:
1. Solid core filter drier.
 2. Thermostatic expansion valve.
 3. Fusible plug.
- H. Filter Section:
Standard filter section shall consist of either factory installed 2-in. thick throwaway fiberglass filters or 30% pleated filters of commercially available sizes.
Optional 4-in. filter track shall be supplied with 30% pleated fiberglass filters.
- I. Controls and Safeties:
1. Unit *ComfortLink*[™] Controls:
 - a. Scrolling Marquee display.
 - b. CCN (Carrier Comfort Network[®]) capable.
 - c. Unit control with standard suction pressure transducers and condensing temperature thermistors.
 - d. Shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1, energy standard.
 - e. Shall provide and display a current alarm list and an alarm history list.
 - f. Automatic compressor redundancy.
 - g. Service run test capability.
 - h. Shall accept input from a CO₂ sensor (both indoor and outdoor).
 - i. Configurable alarm light shall be provided which activates when certain types of alarms occur.
 - j. Compressor minimum run time (3 minutes) and minimum off time (3 minutes) are provided.
 - k. Service diagnostic mode.
 - l. Optional integrated economizer control or two-position self-closing adjustable outside-air damper.
 - m. Minimum of 4 capacity stages of mechanical capacity control (excluding HGBP) controlled with logic to maintain supply air temperature set-point.
 - n. Optional minimum load valve for additional capacity stage.
 - o. Unit shall be complete with self-contained low voltage control circuit.
2. Safeties:
 - a. Unit shall incorporate a solid-state compressor lockout which provides optional reset capability at the space thermostat should any of the following safety devices trip and shut off compressor:
 - 1) Compressor lockout protection provided for either internal or external overload.
 - 2) Low-pressure protection.
 - 3) Freeze protection (evaporator coil).
 - 4) High-pressure protection (high pressure switch or internal).
 - 5) Compressor reverse rotation protection.
 - 6) Loss of charge protection.
 - b. Supply-air sensor shall be located in the unit and should be used for economizer control and compressor stage control.
 - c. Induced draft heating section (48 Series) shall be provided with the following minimum protections:
 - 1) High-temperature limit switch.
 - 2) Induced-draft motor speed sensor.
 - 3) Flame rollout switch.
 - 4) Flame proving controls.
 - 5) Redundant gas valve.
- 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 340/360.
 2. Unit with standard controls will operate in cooling down to an outdoor ambient temperature of 32 F.
 3. Unit shall be provided with fan time delay to prevent cold air delivery.
- K. Electrical Requirements:
All unit power wiring shall enter unit cabinet at a single location.
- L. Motors:
1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.
 2. All condenser-fan motors shall be totally enclosed 3-phase type with permanently

Guide specifications (variable air volume application) (cont)



lubricated ball bearings, class F insulation and internal, automatic-reset thermal overloads thermal overload protection or manual reset calibrated circuit breakers.

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

M. Special Features:

Certain features are not applicable when the features designated * are specified. For assistance in amending the specifications, contact your local Carrier Sales Office.

1. Full Perimeter Roof Curbs (Horizontal and Vertical):
Formed of 14-gage galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
- * 2. Integrated Economizer:
 - a. Economizer shall be furnished and installed complete with recirculated air dampers, outside air dampers, and controls.
 - b. Low-leakage dampers ride in UL-approved gears.
 - c. Capable of introducing up to 100% outdoor air for minimum ventilation as well as free cooling.
 - d. Damper actuator shall be gear driven, 24-v fully modulating design.
 - e. Economizer outdoor hood shall be pre-painted.
- * 3. Barometric Relief Damper Package:
 - a. Package shall include damper, seals, hardware, and hoods to relieve excess internal pressure.
 - b. Damper shall close due to gravity upon unit shutdown.
- * 4. Power Exhaust:
Package shall include a multiple exhaust fan (centrifugal style) fan, 1 Hp 208-230, 460 v direct-drive motor, and damper for vertical flow units with economizer to control over-pressurization of building. Control shall be through *ComfortLink™* based on optional building pressure sensor. On size 036 and 041 units 4 stages of control shall be available and 6 stages on the size 051 unit.
- * 5. Liquefied Propane Conversion Kit (48 Series):
Kit shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane gas.
- * 6. Convenience Outlet:
Shall be factory-installed and internally mounted with an externally accessible 115-v, 15 amp GFI, female receptacle with hinged

cover. A step-down transformer and overload protection shall be included so no additional wiring is necessary unless the field wired outlet has been requested. When applied with a unit-mounted disconnect the outlet shall be wired to the load side of the disconnect, and shall include a means to shut off the outlet.

- * 7. Non-Fused Disconnect Switch:
Shall be factory-installed, internally mounted, and UL approved. Non-fused switch shall provide unit power shutoff. Shall be accessible from outside the unit and shall provide power off lockout capability.
- * 8. Electric Heater Package (50 Series Units Only):
 - a. Fully assembled for installation. The packages are designed in accordance with UL safety standards 1995 and listed by ETL. Heater construction approved by UL 5306.
 - b. Heater element open coil resistance wire, nickel-chrome alloy, 0.29 inches inside diameter, strung through ceramic insulators mounted on metal frame. Coil ends are staked and welded to terminal screw slots.
 - c. Heater assemblies are provided with integral fusing for protection of internal heater circuits not exceeding 48 amps each.
 - d. Auto reset thermo limit controls, magnetic heater contactors (24 v coil) and terminal block all mounted in electric heater control box (minimum 18-gage Galvanized steel) attached to end of heater assembly.
- * 9. Hail Guard, Condenser Coil Grille:
Shall protect the condenser coil from hail, flying debris, and damage by large objects without increasing unit clearances.
- *10. CO₂ Sensor:
The CO₂ sensor shall have the ability to monitor CO₂ levels and relay information to the controller. The controller will use CO₂ level information to modulate the economizer and provide demand control ventilation. The sensor shall be available as field installed or factory-installed return air sensor or a remote space sensor.
- *11. Return Air Smoke Detector:
The smoke detector shall send input to the controller to shut down the unit in case smoke is detected. The smoke detector shall be factory installed in the return air section or shall be available as a field-installed accessory.
- *12. Filter Status:
The filter status switch shall be a pressure differential switch and will indicate a dirty filter. The switch shall be available as field or factory installed.



- *13. Return Air Dry Bulb Sensors:
An option return air dry bulb sensor can be used to provide differential dry bulb changeover for the economizer.
- *14. Humidity Sensor:
A humidity sensor will allow for outside air enthalpy changeover control using the standard outside air dry bulb sensor and the option accessory humidity sensor. When both an outside and return air humidity sensor are used then differential enthalpy changeover can be supported.
- *15. Two-Position Damper:
A two-position damper shall admit up to 25% outdoor air during fan operation and shall close when the fan is off. The damper position shall be mechanically adjustable.
- *16. 4-Inch Filters:
A factory-installed option shall be available for 4-inch, high-efficiency filters.
- *17. Control Expansion Module (CEM):
Shall provide the following additional optional features:
 - a. Remote set point.
 - b. Demand limit control.
 - c. Remote economizer position.
 - d. Fire and smoke control override control.
 - e. Remote sensor monitoring.
 - f. Fan status switch monitoring.
- 18. BACnet/MODBUS Protocol Translator:
A controller-based module shall provide CCN to BACnet Master-Slave/Twisted-Pair (MS/TP) and MODBUS Remote Terminal Unit (RTU) protocol conversion.
- 19. LonWorks Protocol Translator:
A controller-based module shall provide CCN to LON FT-10A ANSI/EIA-709.1 protocol conversion.



Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.