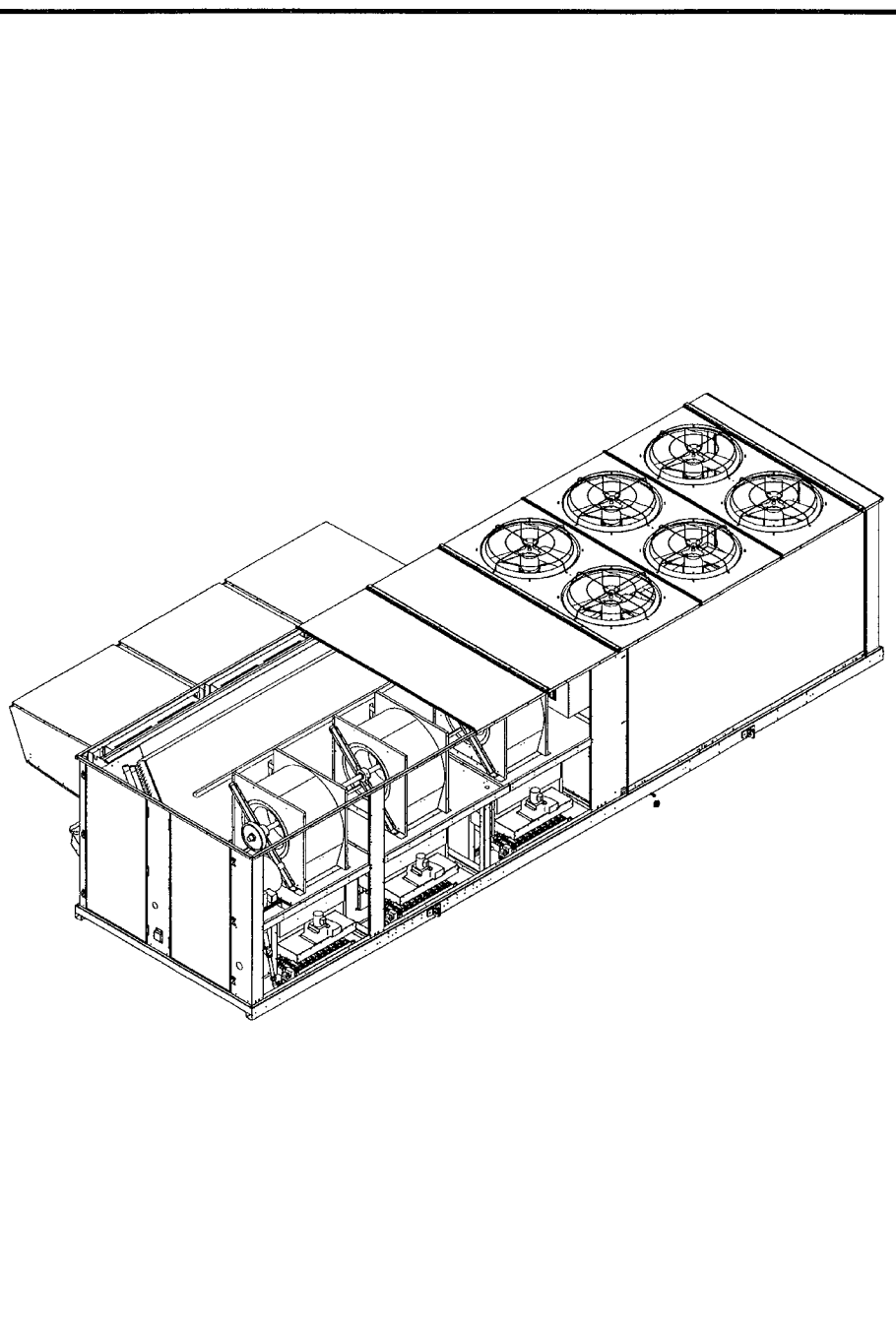




Advance Product Data

48/50EJ,EK,EW,EY Single-Package Rooftop Gas Heating/Electric Cooling and Electric Cooling Units With Optional Electric Heat

50 to 65 Nominal Tons



Single-Package Rooftop Units with:

- dedicated vertical and horizontal discharge configurations.
- constant and variable volume controls
- ASHRAE Standard 62 certification
- standard cooling operation at outdoor ambient temperatures as low as 35 F
- aluminized steel, sloped condensate pan
- sheet metal lined or anti-microbial insulation on all internal surfaces
- two-inch return air filters
- single power entry to unit
- Commercial duty, totally enclosed, 3-phase condenser motors with permanently lubricated bearings
- Alumagard™ heat exchanger coating
- induced-draft fan for gas combustion
- tubular heat exchangers
- pre-painted, galvanized steel cabinet
- commercial strength base rails (full perimeter, 14 gage)
- communicating DDC (Direct Digital Controls) unit controllers
- semi-hermetic compressors with service valves as standard
- dual independent refrigerant circuits with intertwined evaporator coils
- hinged access panels
- short cycle protection
- service diagnostics
- integrated economizer utilizing direct-drive actuators and opposed blade dampers
- IAQ options
- VFD (variable frequency drives) on all VAV units

Features/Benefits

Design flexibility

Dedicated vertical supply/return units (EJ,EK) 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, which is approved by the National Roofing Contractors Association (NRCA). The roof curb is made watertight by the roofer.

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

Dedicated horizontal units (EW,EY) are ideal for replacement or applications such as through-the-wall jobs or jobs 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.

Direct Digital Controls (DDC) — standard

Unit features (48/50EJ,EK,EY,EW units)

- heating/cooling operation
- fan cycling head pressure control
- integrated economizer
- remote start/stop for non-thermostat applications
- provide a power exhaust output
- LED diagnostic capability
- field test checkout
- timed override from accessory remote sensor
- space temperature averaging from using accessory remote sensor
- unoccupied heating or cooling from using accessory remote sensor

Unit features (48/50EJ,EW units only)

- heating/cooling via thermostat
- heating/cooling during unoccupied periods using accessory remote sensor
- support supply air offset using accessory remote sensor (T-56)
- control of two stages of power exhaust
- control of modulating power exhaust with field installed accessory
- two-steps of capacity control (up to 4 steps with accessory suction pressure unloader packages)

Unit features (48/50EK,EY units only)

- 6 steps of capacity control
- supply air pressure via variable frequency drive
- control of heat interlock relay
- occupied heat
- nighttime heating/cooling
- morning warm-up

Additional features are available with accessory expansion board

- indoor air quality control
- inputs for fan status, filter status and field applied status
- demand limit input and function
- external alarm light function
- smoke control modes
- control of power exhaust under fire outputs

The Direct Digital Controls also have pre-loaded software that is available through the use of a computer and the associated software. The computer used to access the DDC may be permanent or used only during set-up and commissioning of the unit.

Unit features with computer access (48/50EJ,EK,EY,EW units)

- CCN (Carrier Comfort Network) protocol
- compatible with Building Supervisor, Service Tool, ComfortWorks™, software and LID-2B accessory
- perform demand limit functions
- alarm monitoring
- timeclock with back-up
- daylight savings time function
- occupancy control
- holiday table
- temperature compensated start
- Configuration, Maintenance, Service and Set Point data table display

Unit features with computer access (48/50EK,EW units only)

- DAV interface linkage
- support supply air temperature reset
- occupied heat

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

The IGC also contains burner control logic for accurate and dependable gas ignition. The light-emitting diode (LED) fault notification system

reduces service person troubleshooting time and minimizes service costs. The IGC also maximizes heating efficiency by controlling evaporator fan on and off delays.

The IGC control board provides built-in diagnostic capability. An LED simplifies troubleshooting by providing visual fault notification and system status confirmation.

The IGC also contains exclusive anticycle 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.

Quality and reliability

Dual serviceable, semi-hermetic compressors on intertwined evaporator coil ensures excellent full and part load efficiency. Dual refrigerant circuits, both electrically and mechanically independent, provide standby capability should one circuit require service. Reliable Carlyle 06D/E compressors are proven performers.

Solid core dessicant filter driers are sized at 30 cubic in. to assure longer compressor life. Solid core filters prevent erosion and dispersion of dessicant.

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 airflow.

VAV units have up to 6 steps of unloading for low load operation. Constant volume units come equipped with 2 stages of capacity. Field installed accessory unloaders are available to increase this to up to 6 stages of operation. The unit operation will closely match the load and maintain comfort in the most energy-efficient manner.

Factory-installed economizer (standard)

All units come equipped with an integrated economizer which 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 (CV)
- 100% modulating power exhaust (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.

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.

High static capability of standard units minimize the need to convert to higher static, oversized motors. The unit is less sensitive to distribution ductwork design.

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. It's as simple as throwing a DIP switch to activate the automatic test mode. After the test cycle, the unit automatically returns to normal operation.

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.

The thermal insulation contains an EPA (Environmental Protection Agency) registered immobilized antimicrobial agent to inhibit the growth of bacteria and fungi.

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Model number nomenclature

48 EJ D 054 -- -- 6 0 1 E C

48 — Cooling Unit with Natural Gas Heat

EJ — CV Vertical
EK — VAV Vertical
EW — CV Horizontal
EY — VAV Horizontal

Heat Options (kW)

D — Low Gas Heat
E — High Gas Heat (EJ/EW Only)

Nominal Tons

054 — 50
058 — 55 (Not Available for 575-volt Units)
064 — 60
068 — 65 (Not Available for 575-volt Units)

Filter Option

-- — Std 2-in. Throwaway

Coil Material

-- — Al/Cu Condenser and Evaporator
C — Cu/Cu Condenser, Al/Cu Evaporator (w/o Lances)
E — Al/Cu Condenser with Precoated Fins (w/o Lances)

Economizer/Relief Options

A — Economizer Only (all)
B — Economizer with Non-Modulating Power Exhaust (EJ Only)
C — Economizer with Barometric Relief (EJ/EK Only)
D — Economizer with Modulating Power Exhaust (EK Only)

Motor Options

STD	HI-EFF	HP	054	058	064	068
D-	P-	15	X			
E-	Q-	20	X	X		
F-	R-	25	X	X	X	X
G-	S-	30		X	X	X
H-	T-	40			X	X

NOTE: Variable Air Volume Units (EK and EY) Equipped with Variable Frequency Drive (VFD) High Efficiency Motors Not Available in 575-3-60

Packaging

1 — Domestic
3 — Export Crate

Design Series

0 — Original
1 — 1st Design Change

Voltage

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

LEGEND

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

Quality Assurance



Certificate No FM 21837

Approvals:

ISO 9002
EN 29002
BS5750 PART 2
ANSI/ASQC Q92

50 EJ D 054 -- -- 6 0 1 E C

50 — Cooling Unit with
Optional Electric Heat

EJ — CV Vertical
EK — VAV Vertical
EW — CV Horizontal
EY — VAV Horizontal

Heat Options (kW)

	D		E*
	0 kW	54 kW	108 kW
054	O	O	X
058	O	O	X
064	O	O	X
068	O	O	X

X = Available CV Only (EJ/EW)
O = Available CV and VAV Models

Nominal Tons

054 — 50
058 — 55 (Not Available for 575-volt Units)
064 — 60
068 — 65 (Not Available for 575-volt Units)

Filter Option

-- — Std 2-in. Throwaway

Coil Material

-- — Al/Cu Condenser and Evaporator
C — Cu/Cu Condenser, Al/Cu Evaporator
E — Al/Cu Condenser with Precoated Fins

*NOT available in 208/230 volt

Economizer/Relief Options

A — Economizer Only (all)
B — Economizer with Non-Modulating
Power Exhaust (EJ Only)
C — Economizer with Barometric
Relief (EJ/EK Only)
D — Economizer with Modulating
Power Exhaust (EK Only)

Motor Options

STD	HI-EFF	HP	054	058	064	068
D-	P-	15	X			
E-	Q-	20	X	X		
F-	R-	25	X	X	X	X
G-	S-	30		X	X	X
H-	T-	40			X	X

NOTE: Variable Air Volume Units (EK and EY)
Equipped with Variable Frequency Drive (VFD)

Packaging

1 — Domestic
3 — Export Crate

Design Series

0 — Original
1 — 1st Design Change

Voltage

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

LEGEND

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

Quality Assurance



Approvals:

ISO 9002
EN 29002
BS5750 PART 2
ANSI/ASQC Q92

Physical data (gas heating units)

UNIT 48EJ,EK,EW,EY	054D/E	058D/E	064D/E	068D/E
NOMINAL CAPACITY (tons)	50	55	60	65
OPERATING WEIGHT (lb)				
Unit				
AI/AI*	6915/7155	7165/7405	7415/7655	7590/7830
AI/Cu*	N/A	N/A	N/A	N/A
Roof Curb†	N/A	N/A	N/A	N/A
COMPRESSOR				
Quantity...Type (Ckt 1, Ckt 2)	1 06EA265, 1 .06EA250	1. 06EA275, 1...06EA250	2 06EA275	2 06EA275
Number of Refrigerant Circuits	2	2	2	2
Oil (oz) (Ckt 1, Ckt 2)	N/A	N/A	N/A	N/A
REFRIGERANT TYPE	R-22			
Operating Charge (lb-oz)				
Circuit 1**	N/A	N/A	N/A	N/A
Circuit 2	N/A	N/A	N/A	N/A
CONDENSER COIL	Cross-Hatched 3/8-in Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins			
Quantity	1	1	2	2
Rows...Fins/in.	3...15	3 15	3 15	4...15
Total Face Area (sq ft)	66.6	100	100	100
CONDENSER FAN	Propeller Type			
Nominal Cfm	30,000	43,900	43,900	43,900
Quantity...Diameter (in.)	4...30	6 30	6...30	6 30
Motor Hp (1075 Rpm)	1	1	1	1
EVAPORATOR COIL	Cross-Hatched 1/2-in Copper Tubes, Aluminum Plate Fins, Intertwined Circuits			
Rows...Fins/in.	4...17	4...17	4 17	4...17
Total Face Area (sq ft)	45 0	45 0	48 1	48.1
EVAPORATOR FAN	Centrifugal Type			
Quantity...Size (in.)	3 .20 x 15	3 20 x 15	3 20 x 15	3 20 x 15
Type Drive	Belt	Belt	Belt	Belt
Nominal Cfm	20,000	22,000	24,000	26,000
Motor Hp††	15 20 25	20 25 30	25 30 40	25 30 40
Motor Frame Size	S254T S256T S284T	S256T S284T S286T	S284T S286T S324T	S284T S286T S324T
Motor Bearing Type	Ball	Ball	Ball	Ball
Maximum Allowable Rpm	1200	1200	1200	1200
Motor Pulley Pitch Diameter	N/A	N/A	N/A	N/A
Nominal Motor Shaft Diameter (in.)	N/A	N/A	N/A	N/A
Fan Pulley Pitch Diameter (in.)	N/A	N/A	N/A	N/A
Nominal Fan Shaft Diameter (in.)	N/A	N/A	N/A	N/A
Belt, Quantity...Type...Length (in.)	N/A	N/A	N/A	N/A
Pulley Center Line Distance (in.)	N/A	N/A	N/A	N/A
Factory Speed Setting (rpm)	N/A	N/A	N/A	N/A
FURNACE SECTION				
Rollout Switch Cutout Temp (F)††	225	225	225	225
Burner Orifice Diameter (in. ...drill size)				
Natural Gas Std	120 31	120 31	120 31	120 31
Liquid Propane Alt	096 41	096 41	096 41	096 41
Thermostat Heat Anticipator Setting (amps)				
Stage 1	0 1	0 1	0 1	0.1
Stage 2	0 1	0.1	0 1	0 1
Gas Input (Btuh) Stage 1	600,000/ 900,000	600,000/ 900,000	600,000/ 900,000	600,000/ 900,000
Stage 2	800,000/1,200,000	800,000/1,200,000	800,000/1,200,000	800,000/1,200,000
Efficiency (Steady State) (%)	81	81	81	81
Temperature Rise Range	N/A	N/A	N/A	N/A
Manifold Pressure (in. wg)				
Natural Gas Std	3.5	3 5	3 5	3 5
Liquid Propane Alt	3.5	3 5	3 5	3.5
Gas Valve Quantity	3	3	3	3
Field Gas Connection Size (in. - FPT)	N/A	N/A	N/A	N/A
HIGH-PRESSURE SWITCH (psig)				
Cutout	426	426	426	426
Reset (Auto.)	320	320	320	320
LOW-PRESSURE SWITCH (psig)				
Cutout	27	27	27	27
Reset (Auto.)	67	67	67	67
RETURN-AIR FILTERS				
Quantity...Size (in.)	N/A	N/A	N/A	N/A
POWER EXHAUST	Direct Drive, 3-Speed, Single-Phase Motor (Factory-Wired for High Speed) and Forward Curved Fan			
Motor, Quantity...Hp		6 1		
Fan, Diameter...Width (in.)		11 10		
Weight (lb)		450		

LEGEND

AI — Aluminum
Cu — Copper
N/A — Data not available at this time

*Evaporator coil fin material/condenser coil fin material

†Weight of 14-in roof curb.

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

††Rollout switch is manual reset

NOTE: Weights do not include Variable Frequency Drive (VFD) Add in weight of VFD for VAV units.

VFD WEIGHTS (lb)

Hp	208/230 v	460 v	575 v
15	61	63	105
20	63	111	107
25	105	112	110
30	172	148	178
40	240	140	180

Physical data (electric heating units)

UNIT 50EJ,EK,EW,EY	054	058	064	068
NOMINAL CAPACITY (tons)	50	55	60	65
OPERATING WEIGHT (lb)				
Unit				
Al/Al*	6675	6925	7175	7350
Al/Cu*	N/A	N/A	N/A	N/A
Roof Curb†	N/A	N/A	N/A	N/A
COMPRESSOR				
Quantity...Type (Ckt 1, Ckt 2)	1 .06EA265, 1 .06EA250	1..06EA275, 1 .06EA250	2. .06EA275	2 .06EA275
Number of Refrigerant Circuits	2	2	2	2
Oil (oz) (Ckt 1, Ckt 2)	N/A	N/A	N/A	N/A
REFRIGERANT TYPE	R-22			
Operating Charge (lb-oz)				
Circuit 1**	N/A	N/A	N/A	N/A
Circuit 2	N/A	N/A	N/A	N/A
CONDENSER COIL	Cross-Hatched 3/8-in Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins			
Quantity	1	1	2	2
Rows...Fins/in.	3 15 2.. 15	3 15 2. 15	3 15	4.. 15
Total Face Area (sq ft)	66.6	100	100	100
CONDENSER FAN	Propeller Type			
Nominal Cfm	30,000	43,900	43,900	43,900
Quantity...Diameter (in.)	4 . 30	6 . 30	6...30	6 . 30
Motor Hp (1075 Rpm)	1	1	1	1
EVAPORATOR COIL	Cross-Hatched 1/2-in Copper Tubes, Aluminum Plate Fins, Intertwined Circuits			
Rows...Fins/in.	4.. 17	4...17	4 . 17	4...17
Total Face Area (sq ft)	45 0	45.0	48 1	48.1
EVAPORATOR FAN	Centrifugal Type			
Quantity...Size (in.)	3 . 20 x 15	3 20 x 15	3 . 20 x 15	3 20 x 15
Type Drive	Belt	Belt	Belt	Belt
Nominal Cfm	20,000	22,000	24,000	26,000
Motor Hp	15 20 25	20 25 30	25 30 40	25 30 40
Motor Frame Size	S254T S256T S284T	S256T S284T S286T	S284T S286T S324T	S284T S286T S324T
Motor Bearing Type	Ball	Ball	Ball	Ball
Maximum Allowable Rpm	1200	1200	1200	1200
Motor Pulley Pitch Diameter	N/A	N/A	N/A	N/A
Nominal Motor Shaft Diameter (in.)	N/A	N/A	N/A	N/A
Fan Pulley Pitch Diameter (in.)	N/A	N/A	N/A	N/A
Nominal Fan Shaft Diameter (in.)	N/A	N/A	N/A	N/A
Belt, Quantity...Type...Length (in.)	N/A 1 15/16	N/A 1 15/16	N/A 1 15/16	N/A 1 15/16
Pulley Center Line Distance (in.)	N/A	N/A	N/A	N/A
Factory Speed Setting (rpm)	N/A	N/A	N/A	N/A
HIGH-PRESSURE SWITCH (psig)				
Cutout	426	426	426	426
Reset (Auto.)	320	320	320	320
LOW-PRESSURE SWITCH (psig)				
Cutout	27	27	27	27
Reset (Auto.)	67	67	67	67
RETURN-AIR FILTERS				
Quantity...Size (in.)	N/A	N/A	N/A	N/A
POWER EXHAUST	Direct Drive, 3-Speed, Single-Phase Motor (Factory-Wired for High Speed) and Forward Curved Fan			
Motor, Quantity...Hp	6 . 1			
Fan, Diameter...Width (in.)	11 10			
Weight (lb)	450			

LEGEND

Al — Aluminum
Cu — Copper
N/A — Data not available at this time

*Evaporator coil fin material/condenser coil fin material

†Weight of 14-in roof curb

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

NOTE: Weights do not include Variable Frequency Drive (VFD) Add in weight of VFD for VAV units

VFD WEIGHTS (lb)

Hp	208/230 v	460 v	575 v
15	61	63	105
20	63	111	107
25	105	112	110
30	172	148	178
40	240	140	180

Options and accessories

ITEM	OPTION*	ACCESSORY†
Barometric Relief	X	X
Copper/Copper Condenser Coil	X	
Pre-Coated Aluminum Fin Condenser Coil	X	
Modulating Power Exhaust (VAV Only)	X	
Non-Modulating Power Exhaust (CV Only)	X	X
Power Exhaust Conversion, Non-Modulating to Modulating (48/50EW Only)		X
Electric Heat (50EJ,EK,EW,EY Units Only)	X	X
Roof Curb		X
Motormaster® III Head Pressure Control		X
LP (Liquid Propane) Conversion Kit (48EJ,EK,EW,EY Units Only)		X
Condenser Coil Hail Guard Assembly		X
Thermostat and Subbase		X
Space Temperature Sensor (T-55)		X
Space Temperature Sensor with Offset (T-56) (CV Only)		X
IAQ (CO ₂) Sensor		X
Enthalpy Control for Integrated Economizer		X
Differential Enthalpy Sensor		X
Compressor Unloaders (CV Only)		X
Expansion Electronic Board (IAQ, Smoke Control, Demand Limit)		X
Roof Curb Retrofit Kit		X
LID-2B Interface Device		X

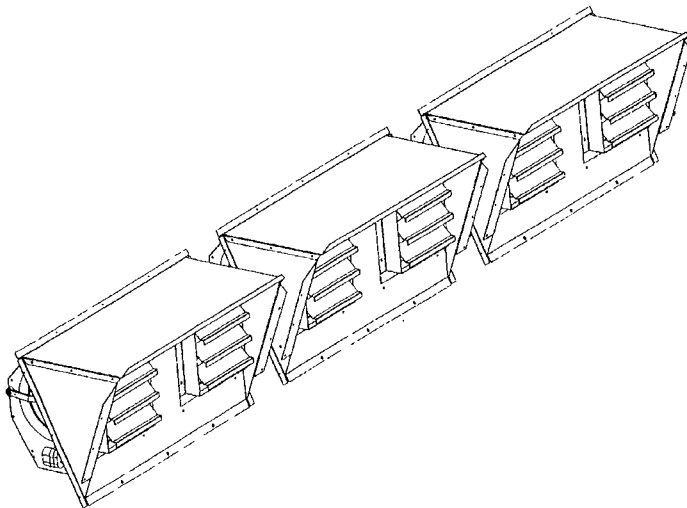
LEGEND

CV — Constant Volume
IAQ — Indoor Air Quality
VAV — Variable Air Volume

*Factory installed

†Field Installed

POWER EXHAUST FANS



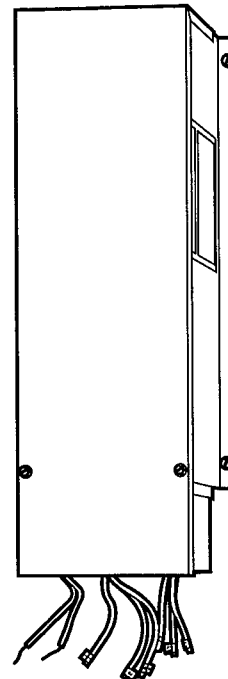
When combined with the economizer, the power exhaust can be used to exhaust the return air and eliminate over-pressurization of the building. The power exhaust utilizes multiple forward-curved fans, each driven by its own motor.

The constant volume power exhaust stages the motors according to economizer position to control the building pressure.

The modulating power exhaust stages the motors according to interior space pressure.

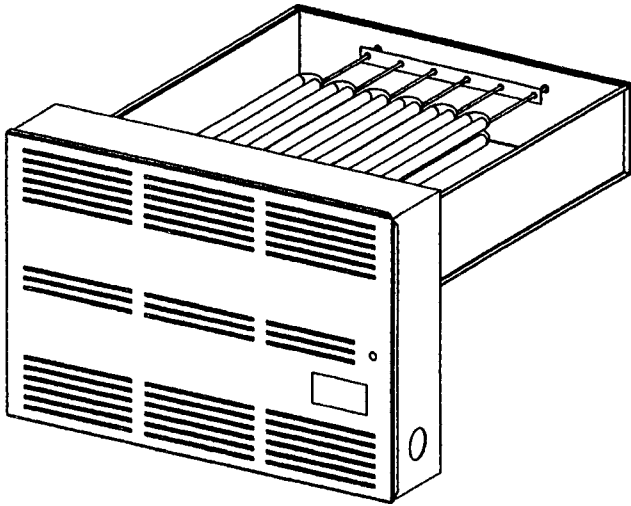
NOTE: The factory mounted power exhaust/barometric relief is shipped tilted into the unit cabinet. Power exhaust/barometric relief is fully assembled and only needs to be rotated into operating position for start-up.

HEAD PRESSURE CONTROL



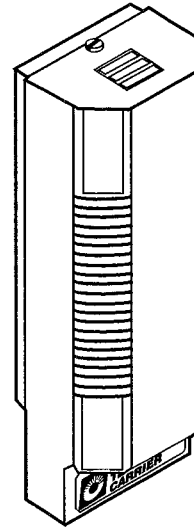
The standard units are designed to operate in cooling at outdoor temperatures down to 35 F. With accessory Motormaster III control (condenser fan speed modulation) units can operate at outdoor temperatures down to -20 F. The head pressure controls, which mount in the condenser section, control the condenser-fan motor to maintain correct condensing temperature. Refer to price pages or contact your local Carrier representative for appropriate accessory combinations for desired outdoor ambient temperature operation.

ELECTRIC HEATER



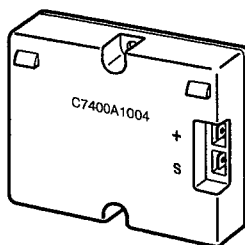
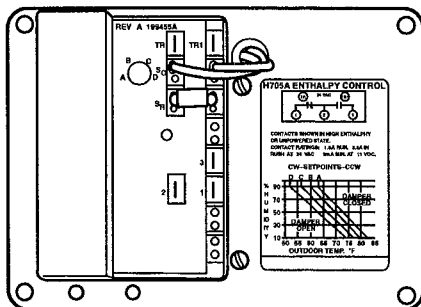
Electric heaters are available in a wide range of capacities for factory or field installation.

CO₂ SENSOR



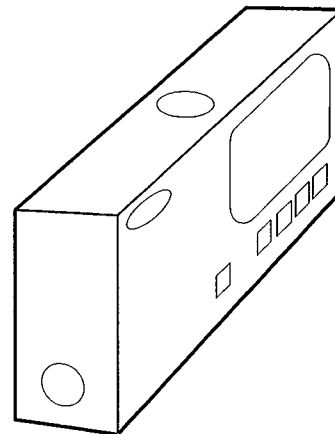
This sensor monitors building interior or return air carbon dioxide levels and automatically activates the outdoor fan and opens the economizer for rapid dilution of CO₂ levels above an adjustable set point.

ENTHALPY CONTROL FOR INTEGRATED ECONOMIZER



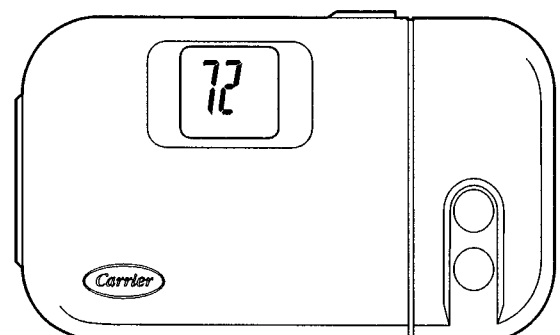
Enthalpy economizer controls help provide efficient, economical economizer operation. Solid-state enthalpy control includes the logic and one sensor to calculate both dry and wet bulb of the outdoor air to provide an accurate enthalpy reading. It then decides when to energize the economizer based on this reading. A second sensor provides information for comparison of outdoor temperature and humidity to return-air temperature and humidity and determines the most economical mixture of air (purchased in addition to first solid-state enthalpy sensor for differential enthalpy sensing).

LID-2B FIELD-INSTALLED INTERFACE DEVICE



The LID-2B (30HX900007) enhanced display provides access to the unit software for specific application time schedules and control configurations. The LID-2B requires a separate dedicated 24-v power source.

ELECTRONIC PROGRAMMABLE THERMOSTAT



Carrier's electronic programmable thermostat provides efficient temperature control by allowing programming of heating and cooling setbacks and set ups with provisions for weekends and holidays.

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1. **NOTES.**
2. 1. Weights include economizer (std).
3. 2.  Center of Gravity.
4. 3. Do not locate adjacent units with minimum clearances to be:
 - Adjacent Units: 15'-0" [4572]
 - Top of Units: No Overhang
 - Condenser Coil: 4'-0" [1219]
 - Economizer Slide: 6'-0" [1829]
 - Heat Side: 4'-0" [1219]
 - Filter Access Side: 15'-0" [4572]

LEGEND

VFD — Variable Frequency Drive

4. For smaller service and operational clearances, contact Carrier Application Engineering Department.
5. Bottom ducts designed to be attached to accessory roof curb. If unit is mounted on downpipe, it is recommended the ducts must be supported by cross braces as done on accessory roof curb.
6. Dimensions in [] are in millimeters.

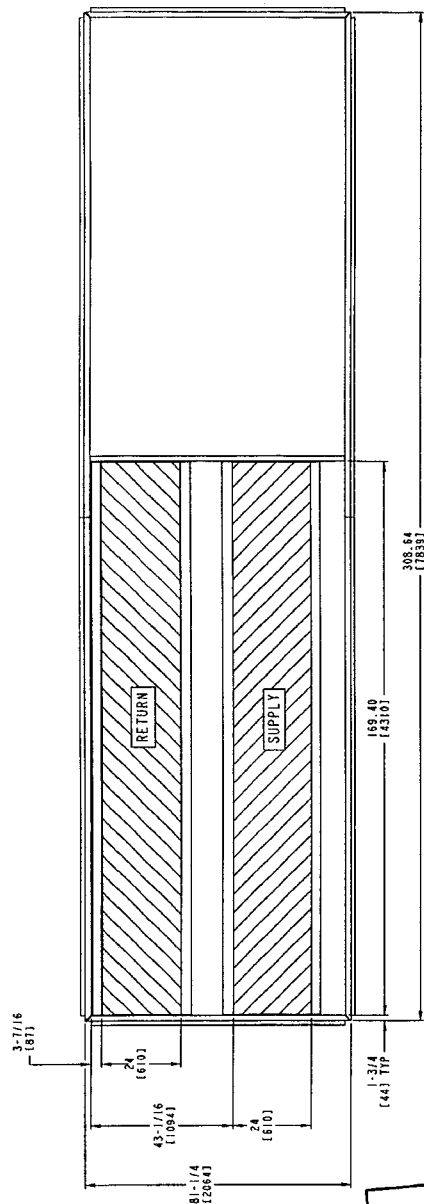
48/50EW.EY DUCT DIMENSIONS

Accessory dimensions

NOTES:

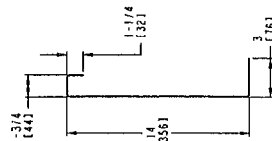
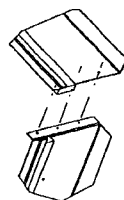
1. Unless otherwise specified all dimensions are to outside of part.
2. Roof curb accessory is shipped disassembled.
3. All roof curb parts: 14 ga galvanized stl.
4. Units with electric heat must be installed with 90° elbow on the supply duct prior to any supply take offs or branches.
5. Dimensions in [] are millimeters.
6. Dimensions are in inches.

NOTE: To prevent standing water in the drain pan of the indoor section and the heat exchangers:
UNIT CAN ONLY BE PITCHED AS SHOWN.

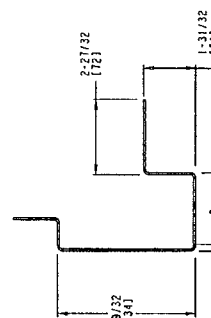


CONDENSER AND COMPRESSOR END

CONDENSER AND COMPRESSOR END



ROOF CURB CROSS SECTION
TYP 4 SIDES

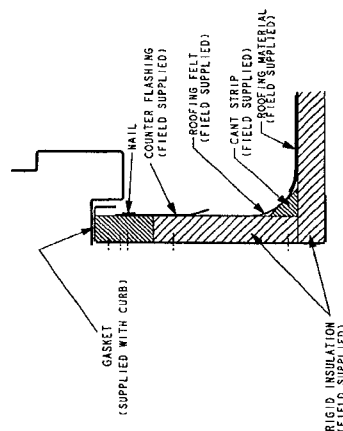


BASE RAIL CROSS SECTION
TYP (2) SIDES

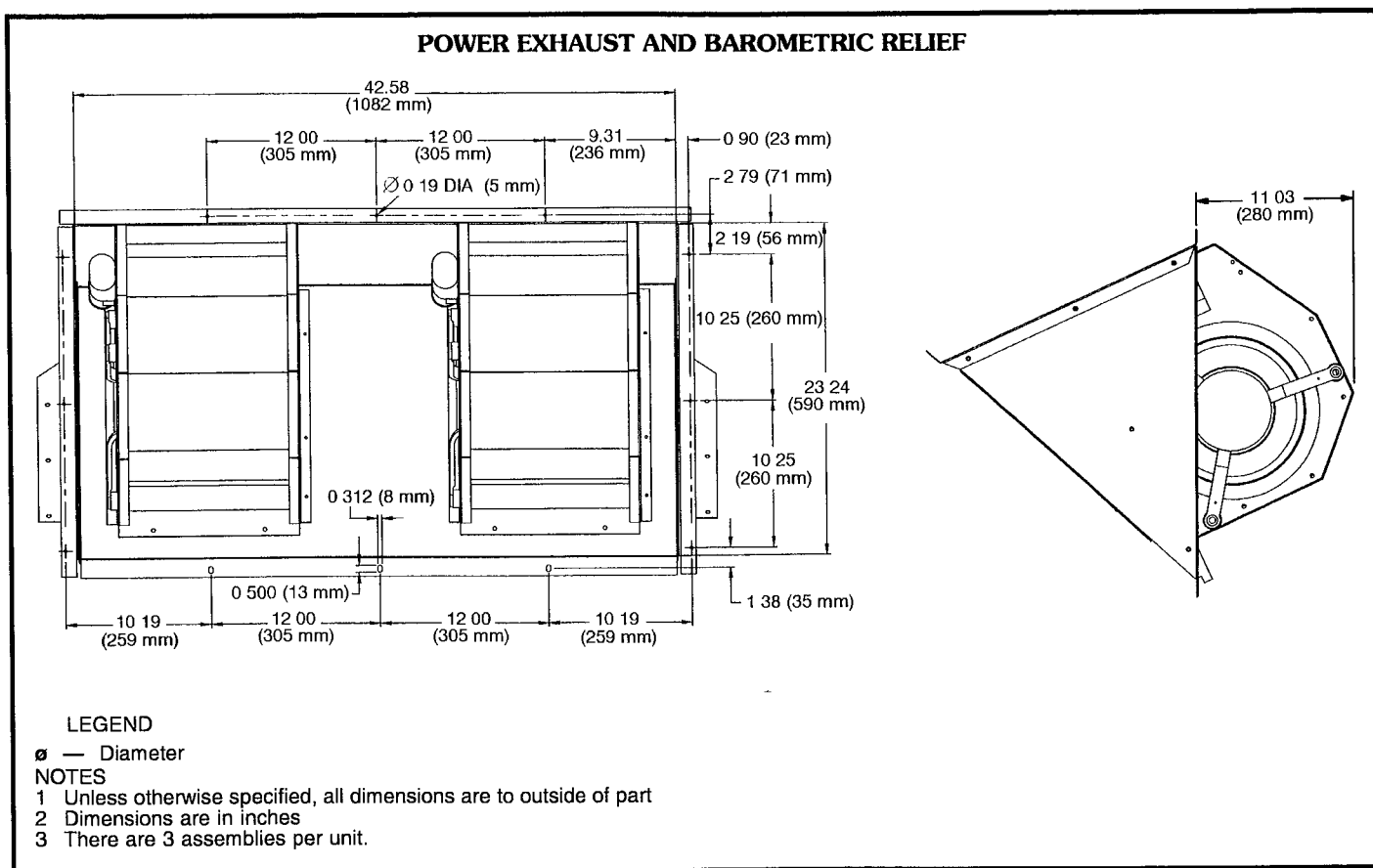
DIMENSIONS (DEGREES AND INCHES)

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)



Selection procedure (with example)

I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 735,000 Btuh
 Sensible Heat Capacity (SHC) 425,000 Btuh
 Required Heating Capacity 640,000 Btuh
 Condenser Entering Air Temperature 95 F
 Indoor Air Temperature 80 F ewb, 67 F ewb
 Evaporator Air Quantity 24,000 cfm
 External Static Pressure 1.4 in. wg
 Electrical Characteristics (V-Ph-Hz) 460-3-60

II Select unit based on required cooling capacity.

Enter Cooling Capacities table at condenser entering temperature of 95 F. Unit 48EJ064 at 24,000 cfm and 67 ewb will provide a total capacity of 743,000 Btuh and a SHC of 473,000 Btuh. Calculate SHC correction, if required, using notes under cooling capacities tables.

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

In the Physical data table, note that unit 48EJD064 will provide 648,000 Btuh with an input of 800,000 Btuh. Calculation is 800,000 Btuh x 81% efficiency = 648,000 Btuh.

IV Determine fan speed and power requirements at design conditions.

Tabulated fan performance includes 2-in. throwaway filters, wet evaporator coil, economizer, cabinet losses, and roof curb. Enter 48EJ,EK054-068 Fan Performance table for vertical applications. Find fan rpm and bhp at 1.4 in. wg and 24,000 cfm. Find that the fan speed is 1143 rpm and the power required is 32.48 bhp. In the Evaporator-Fan Motor Performance table, note that the 30 hp 460 v motor will deliver 34.7 bhp. The 30 hp motor is required.

V Select unit that corresponds to power source available.

The Electrical Data table shows that a 460-3-60 unit is available.

Performance data

COOLING CAPACITIES

48/50EJ,EK,EW,EY054 (50 TONS)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		12,500/0.03			15,000/0.03			17,500/0.04			20,000/0.05		
		Evaporator Air — Ewb (F)											
		62	67	72	62	67	72	62	67	72	62	67	72
75	TC	561	614	670	585	635	693	601	653	712	617	667	726
	SHC	472	402	337	520	442	357	564	472	374	599	505	395
	kW	40.0	41.8	43.7	40.8	42.6	44.5	41.4	43.3	45.0	42.0	43.7	45.6
85	TC	538	588	643	559	609	664	574	625	681	591	637	694
	SHC	460	391	320	508	426	341	549	461	358	580	494	384
	kW	43.2	45.3	47.5	44.1	46.2	48.3	44.9	46.9	48.9	45.5	47.4	49.5
95	TC	514	560	614	532	581	632	549	597	649	564	606	663
	SHC	448	378	308	494	412	326	531	449	352	560	482	373
	kW	46.5	48.8	51.1	47.5	49.7	52.0	48.2	50.4	52.7	49.0	51.0	53.3
105	TC	489	533	585	505	554	600	522	567	618	538	575	631
	SHC	436	367	297	480	396	321	513	438	336	538	470	362
	kW	49.7	52.2	54.8	50.7	53.3	55.6	51.6	54.0	56.5	52.4	54.5	57.2
115	TC	465	505	554	481	527	568	497	538	586	511	545	599
	SHC	423	356	290	464	381	311	495	426	329	511	458	350
	kW	52.8	55.5	58.3	54.0	56.7	59.1	55.0	57.5	60.2	55.9	58.0	60.9

48/50EJ,EK,EW,EY054 (50 TONS) (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF					
		22,500/0.06			25,000/0.06		
		Condenser Evaporator Air — Ewb (F)					
		62	67	72	62	67	72
75	TC	631	677	736	646	687	744
	SHC	625	537	415	646	568	435
	kW	42.5	44.1	46.0	43.0	44.4	46.3
85	TC	605	647	703	621	655	711
	SHC	604	524	404	621	556	424
	kW	46.1	47.7	49.9	46.8	48.2	50.2
95	TC	578	616	671	596	623	676
	SHC	578	513	393	594	543	413
	kW	49.7	51.4	53.7	50.4	51.8	54.1
100	TC	551	586	636	570	591	643
	SHC	550	499	382	569	529	397
	kW	53.2	55.1	57.5	54.1	55.4	57.9
115	TC	523	554	603	544	559	609
	SHC	522	487	367	542	515	387
	kW	56.7	58.5	61.2	57.8	58.9	61.7

LEGEND

BF — Bypass Factor
Edb — Entering Dry-Bulb
Ewb — Entering Wet-Bulb
kW — Compressor Motor Power Input
ldb — leaving Dry Bulb
lwb — leaving Wet Bulb
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTES:

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

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

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

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

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

- 3 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					
0.05	1.04	2.07	3.11	4.14	5.18	use formula shown below
0.1	0.98	1.96	2.94	3.92	4.91	
0.2	0.87	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 VAV units will operate as low as 70 cfm/ton unloaded. Performance at 70 cfm/ton is limited to unloaded operation and may be additionally limited by edb and ewb conditions.

Performance data (cont)

COOLING CAPACITIES (cont)

48/50EJ,EK,EW,EY058 (55 TONS)													
Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		13,750/0.03			16,500/0.03			19250/0.04			22,000/0.05		
		Evaporator Air — Ewb (F)											
		62	67	72	62	67	72	62	67	72	62	67	72
75	TC	607	665	725	633	687	750	650	707	771	668	722	786
	SHC	511	435	365	563	478	386	610	511	405	648	547	427
	kW	39.7	41.5	43.3	40.5	42.3	44.1	41.1	43.0	355.1	41.7	43.3	45.2
85	TC	582	636	696	605	659	719	621	676	737	640	689	751
	SHC	498	423	346	550	461	369	594	499	387	628	535	416
	kW	42.9	44.9	47.1	43.7	45.8	47.9	44.5	46.5	48.5	45.1	47.0	49.1
95	TC	556	606	665	576	629	684	594	646	702	610	656	718
	SHC	485	409	333	535	446	353	575	486	381	606	522	404
	kW	46.1	48.4	50.7	47.1	49.3	51.6	47.8	50.0	52.3	48.6	50.6	52.9
105	TC	529	577	633	547	600	649	565	614	669	582	622	683
	SHC	472	397	321	519	429	347	555	474	364	582	509	392
	kW	49.3	51.8	54.4	50.3	52.9	55.2	51.2	53.6	56.0	52.0	54.1	56.7
115	TC	503	547	600	521	570	615	538	582	634	553	590	648
	SHC	458	385	314	502	412	337	536	461	356	553	496	379
	kW	52.4	55.1	57.8	53.6	56.2	58.6	54.6	57.0	59.7	55.5	57.5	60.4

48/50EJ,EK,EW,EY058 (55 TONS) (cont)							
Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF					
		24,750/0.06			27,500/0.06		
		Evaporator Air — Ewb (F)					
		62	67	72	62	67	72
75	TC	683	733	797	699	744	805
	SHC	676	581	449	699	615	471
	kW	42.2	43.7	45.6	42.7	44.0	45.9
85	TC	655	700	761	672	709	769
	SHC	654	567	437	672	602	459
	kW	45.7	47.3	49.5	46.4	47.8	49.8
95	TC	626	667	726	645	674	732
	SHC	626	555	425	643	588	447
	kW	49.3	51.0	53.3	50.0	51.4	53.7
105	TC	596	634	688	617	640	696
	SHC	595	540	413	616	573	430
	kW	52.8	54.7	57.0	53.7	55.0	57.4
115	TC	566	600	653	589	605	659
	SHC	565	527	397	587	557	419
	kW	56.2	58.0	60.7	57.3	58.4	61.2

See Legend on page 13.

COOLING CAPACITIES (cont)

48/50EJ,EK,EW,EY064 (60 TONS)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		15,000/0.03			18,000/0.03			21,000/0.04			24,000/0.05		
		Condenser Evaporator Air — Ewb (F)											
		62	67	72	62	67	72	62	67	72	62	67	72
75	TC	688	753	822	718	779	850	737	801	873	757	818	891
	SHC	463	395	331	510	434	350	554	463	367	588	496	388
	kW	48.3	50.5	52.8	49.3	51.5	53.8	50.0	52.3	432.6	50.8	52.8	55.1
85	TC	660	721	789	686	747	814	704	767	835	725	781	851
	SHC	451	384	314	499	418	335	539	452	351	569	485	377
	kW	52.2	54.7	57.4	53.3	55.8	58.4	54.3	56.7	59.1	55.0	57.3	59.8
95	TC	630	687	753	653	713	775	673	732	796	692	743	813
	SHC	440	371	302	485	404	320	521	441	345	550	473	366
	kW	56.2	59.0	61.8	57.4	60.1	62.8	58.3	60.9	63.7	59.2	61.6	64.4
105	TC	600	654	718	619	680	736	640	696	758	660	705	774
	SHC	428	360	291	471	389	315	503	430	330	528	461	355
	kW	60.1	63.1	66.2	61.3	64.4	67.2	62.4	65.3	68.3	63.3	65.9	69.1
115	TC	570	619	680	590	646	697	610	660	719	627	669	735
	SHC	415	349	285	455	374	305	486	418	323	502	449	343
	kW	63.8	67.1	70.5	65.3	68.5	71.4	66.5	69.5	72.8	67.6	70.1	73.6

48/50EJ,EK,EW,EY064 (60 TONS) (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF		
		27,000/0.06		
		Condenser Evaporator Air — Ewb (F)		
		62	67	72
75	TC	774	830	903
	SHC	613	527	407
	kW	51.4	53.3	55.6
85	TC	742	794	862
	SHC	593	514	396
	kW	55.7	57.6	60.3
95	TC	709	756	823
	SHC	567	503	386
	kW	60.1	62.1	64.9
105	TC	676	719	780
	SHC	540	490	375
	kW	64.3	66.6	69.5
115	TC	642	680	740
	SHC	512	478	360
	kW	68.5	70.7	74.0

See Legend on page 13

Performance data (cont)

COOLING CAPACITIES (cont)

48/50EJ,EK,EW,EY068 (65 TONS)													
Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		16,250/0.03			19,500 /0.03			22,750/0.04			26,000/0.05		
		Evaporator Air — Ewb (F)											
		62	67	72	62	67	72	62	67	72	62	67	72
75	TC	718	786	857	749	812	887	769	836	911	789	853	929
	SHC	453	386	324	499	424	343	542	453	359	575	485	379
	kW	47.6	49.7	51.9	48.5	50.6	52.9	49.2	51.5	425.6	49.9	51.9	54.2
85	TC	688	752	823	715	779	850	734	800	871	756	815	888
	SHC	442	375	307	488	409	327	527	443	344	557	474	369
	kW	51.4	53.9	56.5	52.4	54.9	57.4	53.4	55.8	58.1	54.1	56.3	58.8
95	TC	658	717	786	681	743	809	702	764	830	722	775	848
	SHC	430	363	296	474	396	313	510	431	338	538	463	358
	kW	55.3	58.0	60.7	56.5	59.1	61.8	57.3	59.9	62.6	58.3	60.6	63.4
105	TC	626	682	749	646	709	768	668	725	791	688	736	807
	SHC	419	352	285	461	380	308	493	421	323	517	451	348
	kW	59.1	62.1	65.1	60.3	63.4	66.1	61.3	64.2	67.2	62.3	64.8	68.0
115	TC	595	646	709	615	674	727	636	688	750	654	697	766
	SHC	406	342	278	446	366	299	475	409	316	491	440	336
	kW	62.8	66.0	69.3	64.2	67.4	70.3	65.4	68.4	71.6	66.5	68.9	72.4

48/50EJ,EK,EW,EY068 (65 TONS) (cont)				
Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF		
		27,000/0.06		
		Condenser Evaporator Air — Ewb (F)		
		62	67	72
75	TC	795	857	933
	SHC	583	494	385
	kW	50.1	52.1	54.4
85	TC	762	819	892
	SHC	564	483	375
	kW	54.3	56.5	59.0
95	TC	727	779	851
	SHC	543	472	364
	kW	58.5	60.8	63.5
105	TC	694	740	809
	SHC	520	460	354
	kW	62.6	65.0	68.1
115	TC	659	701	768
	SHC	494	448	341
	kW	66.7	69.1	72.5

See Legend on page 13

FAN PERFORMANCE — VERTICAL DISCHARGE UNITS

For EW/EY units, reduce net available external static pressure by 0.5 in. wg.

48EJ054-068 AND 48EK054-068 (50 THRU 65 TONS)

Airflow (Cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	461	2.60	526	3.34	583	4.20	633	5.17	678	6.24	720	7.40	759	8.65
12,000	526	4.02	586	4.81	638	5.70	685	6.69	728	7.77	769	8.93	806	10.17
15,000	628	7.06	680	7.94	726	8.89	769	9.93	809	11.05	847	12.24	883	13.50
16,000	663	8.35	712	9.26	757	10.24	799	11.30	838	12.43	875	13.63	909	14.90
17,000	698	9.79	745	10.73	788	11.74	829	12.82	867	13.97	903	15.19	937	16.47
18,000	733	11.39	778	12.36	820	13.40	860	14.50	896	15.68	931	16.91	965	18.21
19,000	768	13.15	812	14.16	853	15.22	891	16.35	927	17.55	961	18.80	993	20.12
20,000	804	15.09	846	16.13	885	17.22	922	18.38	957	19.60	990	20.87	1022	22.20
21,000	840	17.21	880	18.28	918	19.41	954	20.59	988	21.83	1021	23.13	1052	24.48
22,000	876	19.52	915	20.62	952	21.78	986	22.99	1020	24.26	1051	25.57	1082	26.94
23,000	912	22.02	950	23.16	985	24.35	1019	25.59	1051	26.88	1082	28.22	1112	29.61
24,000	949	24.73	985	25.90	1019	27.12	1052	28.39	1084	29.70	1114	31.07	1143	32.48
25,000	985	27.64	1020	28.85	1054	30.10	1085	31.40	1116	32.74	1146	34.13	1174	35.57
26,000	1022	30.78	1056	32.02	1088	33.30	1119	34.63	1149	36.00	1178	37.42	—	—
27,000	1059	34.13	1091	35.41	1123	36.72	1153	38.08	1182	39.48	—	—	—	—

48EJ054-068 AND 48EK054-068 (50 THRU 64 TONS) (cont)

Airflow (Cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	796	9.98	831	11.38	865	12.86	897	14.41	927	16.02	957	17.70	985	19.43
12,000	842	11.49	876	12.88	909	14.34	940	15.87	970	17.45	999	19.10	1027	20.81
15,000	917	14.82	949	16.22	980	17.67	1010	19.18	1039	20.75	1066	22.38	1094	24.06
16,000	943	16.24	974	17.64	1005	19.09	1034	20.61	1063	22.18	1090	23.81	1117	25.49
17,000	969	17.82	1001	19.22	1031	20.68	1060	22.20	1088	23.78	1115	25.40	1141	27.08
18,000	997	19.56	1027	20.98	1057	22.45	1085	23.97	1113	25.55	1140	27.18	1166	28.86
19,000	1025	21.49	1055	22.91	1084	24.39	1112	25.92	1139	27.51	1165	29.14	1191	30.83
20,000	1053	23.59	1082	25.03	1111	26.52	1139	28.06	1165	29.65	1191	31.29	—	—
21,000	1082	25.88	1111	27.33	1139	28.84	1166	30.39	1192	31.99	—	—	—	—
22,000	1111	28.36	1140	29.83	1167	31.35	1194	32.92	—	—	—	—	—	—
23,000	1141	31.05	1169	32.54	1196	34.07	—	—	—	—	—	—	—	—
24,000	1171	33.94	1198	35.45	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

48EJ054-068 AND 48EK054-068 (50 THRU 65 TONS) (cont)

Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.0		3.2		3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	1013	21.22	1040	23.08	1066	24.98	1091	26.94	1115	28.95
12,000	1054	22.57	1080	24.39	1106	26.26	1130	28.18	1155	30.15
15,000	1120	25.80	1145	27.58	1170	29.42	1194	31.30	—	—
16,000	1143	27.22	1168	29.00	1193	30.83	—	—	—	—
17,000	1167	28.81	1192	30.59	—	—	—	—	—	—
18,000	1191	30.59	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—
21,000	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
edb — entering dry bulb (F)
ewb — entering wet bulb (F)
VAV — Variable Air Volume

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 VAV 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)

For EW/EY units, reduce net available external static pressure by 0.5 in. wg.

50EJ054-068 AND 50EK054-068 (50 THRU 65 TONS)														
Airflow (Cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	438	2.36	500	2.97	551	3.64	595	4.38	635	5.17	672	6.02	706	6.92
12,000	498	3.68	556	4.34	605	5.07	648	5.84	687	6.68	723	7.56	756	8.48
15,000	592	6.49	645	7.26	690	8.07	731	8.92	768	9.82	802	10.76	834	11.74
16,000	624	7.69	675	8.49	719	9.33	759	10.21	795	11.13	829	12.10	861	13.10
17,000	657	9.02	706	9.86	749	10.73	788	11.64	823	12.59	857	13.58	888	14.60
18,000	689	10.50	737	11.38	779	12.28	817	13.22	852	14.20	885	15.21	915	16.26
19,000	722	12.14	768	13.05	809	13.99	846	14.96	880	15.96	913	17.00	943	18.07
20,000	755	13.94	799	14.89	839	15.86	876	16.86	909	17.89	941	18.96	971	20.05
21,000	788	15.91	831	16.89	870	17.90	906	18.93	939	19.99	970	21.08	999	22.20
22,000	821	18.05	863	19.07	901	20.11	936	21.18	968	22.27	999	23.39	1028	24.53
23,000	855	20.38	895	21.44	932	22.51	966	23.61	998	24.73	1028	25.88	1057	27.05
24,000	888	22.90	927	23.99	963	25.10	997	26.23	1028	27.38	1058	28.56	1086	29.76
25,000	922	25.61	960	26.74	995	27.88	1028	29.05	1058	30.23	1087	31.44	1115	32.67
26,000	956	28.53	993	29.69	1027	30.87	1059	32.07	1089	33.28	1117	34.52	1145	35.78
27,000	990	31.66	1025	32.86	1059	34.07	1090	35.30	1120	36.55	1148	37.82	1175	39.10

50EJ054-068 AND 50EK054-068 (50 THRU 65 TONS) (cont)														
Airflow (Cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	737	7.87	767	8.86	796	9.89	823	10.96	849	12.07	874	13.22	898	14.41
12,000	787	9.45	816	10.47	844	11.52	871	12.61	897	13.74	922	14.90	945	16.10
15,000	864	12.76	893	13.82	920	14.91	946	16.04	971	17.20	996	18.40	1019	19.63
16,000	891	14.14	919	15.21	946	16.32	972	17.47	997	18.64	1021	19.85	1044	21.09
17,000	917	15.66	945	16.75	972	17.88	998	19.04	1023	20.23	1047	21.46	1070	22.71
18,000	944	17.34	972	18.45	999	19.60	1024	20.77	1049	21.98	1072	23.22	1095	24.49
19,000	972	19.17	999	20.31	1025	21.47	1051	22.67	1075	23.90	1098	25.15	1121	26.44
20,000	999	21.18	1027	22.33	1053	23.52	1078	24.74	1102	25.98	1125	27.25	1147	28.56
21,000	1027	23.35	1054	24.53	1080	25.74	1105	26.98	1128	28.24	1151	29.53	1174	30.85
22,000	1056	25.71	1082	26.91	1107	28.14	1132	29.40	1155	30.69	1178	32.00	1200	33.34
23,000	1084	28.25	1110	29.48	1135	30.73	1159	32.01	1183	33.32	—	—	—	—
24,000	1113	30.99	1139	32.24	1163	33.52	1187	34.82	—	—	—	—	—	—
25,000	1142	33.92	1167	35.20	1192	36.50	—	—	—	—	—	—	—	—
26,000	1171	37.06	1196	38.37	—	—	—	—	—	—	—	—	—	—
27,000	1200	40.41	—	—	—	—	—	—	—	—	—	—	—	—

50EJ054-068 AND 50EK054-068 (50 THRU 65 TONS) (cont)										
Airflow (Cfm)	Available External Static Pressure (in. wg)									
	3.0		3.2		3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	921	15.62	944	16.87	965	18.16	987	19.47	1007	20.81
12,000	968	17.33	991	18.59	1013	19.88	1034	21.20	1054	22.55
15,000	1042	20.88	1064	22.17	1085	23.49	1106	24.84	1126	26.21
16,000	1067	22.36	1089	23.66	1110	24.99	1130	26.34	1151	27.73
17,000	1092	23.99	1114	25.31	1135	26.64	1155	28.01	1175	29.41
18,000	1117	25.79	1139	27.11	1160	28.46	1180	29.84	1200	31.25
19,000	1143	27.75	1165	29.09	1185	30.45	—	—	—	—
20,000	1169	29.88	1190	31.24	—	—	—	—	—	—
21,000	1195	32.20	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower
edb — entering dry bulb (F)
ewb — entering wet bulb (F)
VAV — Variable Air Volume

NOTES:

- Fan performance is based on wet coils, economizer, roof curb, cabinet losses, and clean 2-in. filters
- Conversion — Bhp to watts.

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

- VAV 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

EVAPORATOR-FAN MOTOR PERFORMANCE

STANDARD EFFICIENCY

NAMEPLATE HP	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*
15	208	15.3
	230	15.3
	460	18.0
	575	18.0
20	208	22.4
	230	22.4
	460	23.4
	575	23.4
25	208	28.9
	230	28.9
	460	29.4
	575	29.4
30	208	35.6
	230	35.6
	460	34.7
	575	34.7
40	208	41.5
	230	41.5
	460	41.5
	575	41.5

HIGH EFFICIENCY

NAMEPLATE HP	UNIT VOLTAGE	MAXIMUM ACCEPTABLE CONTINUOUS BHP*
15	208	15.3
	230	15.3
	460	18.0
	575	18.0
20	208	22.4
	230	22.4
	460	23.4
	575	23.4
25	208	28.9
	230	28.9
	460	29.4
	575	29.4
30	208	35.6
	230	35.6
	460	34.7
	575	34.7
40	208	41.5
	230	41.5
	460	41.5
	575	41.5

LEGEND

Bhp — Brake Horsepower

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

USER DEFINED SET POINTS

SET POINT	FORMAT	DESCRIPTION	LIMITS	DEFAULT
OHSP	xx.xF	Occupied Heat Set Point	55 to 80 F	68 F
OCSP	xx.xF	Occupied Cool Set Point	55 to 80 F	78 F
UHSP	xx.xF	Unoccupied Heat Set Point	40 to 80 F	55 F
UCSP	xx.xF	Unoccupied Cool Set Point	75 to 95 F	90 F
SASP	xx.xF	Supply Air Set Point	45 to 70 F	55 F
OATL	xx.xF	Hi OAT Lockout Temperature	55 to 75 F	65 F
NTLO	xx.xF	Unoccupied OAT Lockout Temperature	40 to 70 F	50 F
RTIO	xx.x	Reset Ratio	0 to 10	3
LIMIT	xx.x°F	Reset Limit	0 to 20 F	10 F
MDP	xxx%	Minimum Damper Position	0 to 100%	20%
IAQS	xxxx	IAQ Set Point	1 to 5000 PPM	650 PPM
UHDB	xx.x°F	Unoccupied Heating Deadband	0 to 10 F	1 F
UCDB	xx.x°F	Unoccupied Cooling Deadband	0 to 10 F	1 F
LTMP	xx.xF	Low Temp. Min. Position	0 to 100 F	10 F
HTMP	xx.xF	High Temp. Min. Position	0 to 100 F	35 F
PES1	xxx%	CV Power Exhaust Stage 1 Point	0 to 100%	25%
PES2	xxx%	CV Power Exhaust Stage 2 Point	0 to 100%	75%

LEGEND

CV — Constant Volume
IAQ — Indoor Air Quality
OAT — Outdoor Air Temperature

NOTE: Computer access may be required to reconfigure set points.

Electrical data — 48EJ,EK,EW,EY054-068

UNIT 48EJ,EK, EW,EY	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY	
				NO. 1		NO. 2											
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	FLA	MCA	MOCP*
054	208/230	187	254	82.1	446	69.2	345	4	1	5.3	15	46.2/ 42.0	—	—	1.44	239.2/235.0	300
												35.4	62.4	1.44	274.6/270.4	300	
											20	59.4/ 54.0	—	—	1.44	252.4/247.0	300
												35.4	62.4	1.44	287.8/282.4	300	
											25	74.8/ 68.0	—	—	1.44	267.8/261.0	300
												35.4	62.4	1.44	303.2/296.4	350	
	460	414	508	43.6	223	28.8	173	4	1	2.7	15	21.0	—	—	0.75	115.1	150
												18.9	35.4	0.75	134.0	175	
											20	27.0	—	—	0.75	121.1	150
												18.9	35.4	0.75	140.0	175	
											25	34.0	—	—	0.75	128.1	150
												18.9	35.4	0.75	147.0	175	
	575	518	632	34.6	164	26.9	120	4	1	2.4	15	17.0	—	—	0.75	96.8	125
												18.9	35.4	0.75	115.7	150	
											20	22.0	—	—	0.75	101.8	125
												18.9	35.4	0.75	120.7	150	
											25	27.0	—	—	0.75	106.8	125
												18.9	35.4	0.75	125.7	150	
058	208/230	187	254	106.4	506	69.2	345	6	1	5.3	20	59.4/ 54.0	—	—	1.44	293.4/288.0	300
												35.4	62.4	1.44	328.8/323.4	350	
											25	74.6/ 68.0	—	—	1.44	308.6/302.0	350
												35.4	62.4	1.44	344.0/337.4	350	
											30	88.0/ 80.0	—	—	1.44	322.0/314.0	350
												35.4	62.4	1.44	357.4/349.4	350	
	460	414	508	52.6	253	28.8	173	6	1	2.7	20	27.0	—	—	0.75	137.8	175
												18.9	35.4	0.75	156.7	200	
											25	34.0	—	—	0.75	144.8	175
												18.9	35.4	0.75	163.7	200	
											30	40.0	—	—	0.75	150.8	200
												18.9	35.4	0.75	169.7	200	

UNIT 48EJ,EK, EW,EY	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		COMBUSTION FAN MOTOR	POWER SUPPLY	
		Min	Max	RLA	LRA	RLA	LRA						FLA	LRA		FLA	MCA
064	208/230	187	254	106.4	506	106.4	506	6	1	5.3	25	74.6/ 68.0	—	—	1.44	345.8/339.2	350
												35.4	62.4	1.44	381.2/374.6	350	
											30	88.0/ 80.0	—	—	1.44	359.2/351.2	350
												35.4	62.4	1.44	394.6/386.6	350	
	40	114.0/ 104.0	—	—	1.44	385.2/375.2	350										
		35.4	62.4	1.44	420.6/410.6	350											
	460	414	508	52.6	253	52.6	253	6	1	2.7	25	34.0	—	—	0.75	168.5	200
												18.9	35.4	0.75	187.4	225	
											30	40.0	—	—	0.75	174.5	225
												18.9	35.4	0.75	193.4	225	
	40	52.0	—	—	0.75	186.5	225										
		18.9	35.4	0.75	205.4	250											
575	518	632	40.4	176	40.4	176	6	1	2.4	25	27.0	—	—	0.75	132.3	150	
											18.9	35.4	0.75	151.2	175		
										30	32.0	—	—	0.75	137.3	175	
											18.9	35.4	0.75	156.2	175		
40	41.0	—	—	0.75	146.3	175											
	18.9	35.4	0.75	165.2	200												
068	208/230	187	254	106.4	506	106.4	506	6	1	5.3	25	74.6/ 68.0	—	—	1.44	345.8/339.2	350
												35.4	62.4	1.44	381.2/374.6	350	
											30	88.0/ 80.0	—	—	1.44	359.2/351.2	350
												35.4	62.4	1.44	394.6/386.6	350	
	40	114.0/ 104.0	—	—	1.44	385.2/375.2	350										
		35.4	62.4	1.44	420.6/410.6	350											
	460	414	508	52.6	253	52.6	253	6	1	2.7	25	34.0	—	—	0.75	168.5	200
												18.9	35.4	0.75	187.4	225	
											30	40.0	—	—	0.75	174.5	225
												18.9	35.4	0.75	193.4	225	
	40	52.0	—	—	0.75	186.5	225										
		18.9	35.4	0.75	205.4	250											

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
IFM — Indoor (Evaporator) Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
MOCPS — Maximum Overcurrent Protection
NEC — National Electrical Code
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Fuse of HACR circuit breaker

NOTES

- 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. The Canadian units may be fuse or circuit breaker.

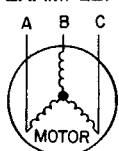
2 Unbalanced 3-Phase Supply Voltage

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

% voltage Imbalance

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

EXAMPLE: Supply voltage is 460-3-60



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

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

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 of 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

Electrical data — 50EJ,EK,EW,EY054-068

UNIT 50EJ,EK, EW,EY	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
				No. 1		No. 2												
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCPT
054	208/230	187	254	82.1	446	69.2	345	4	1	5.3	15	46.2/ 42.0	—	—	—	—	235.0/239.2	300
													35.4	62.4	—	—	270.4/274.6	350
													—	—	41/54	112.6/129.9	235.0/239.2	300
													35.4	62.4	41/54	112.6/129.9	270.4/274.6	350
											20	59.4/ 54.0	—	—	—	—	247.0/252.4	300
													35.4	62.4	—	—	282.4/287.8	350
													—	—	41/54	112.6/129.9	247.0/252.4	300
													35.4	62.4	41/54	112.6/129.9	282.4/287.8	350
											25	74.8/ 68.0	—	—	—	—	261.0/267.8	300
													35.4	62.4	—	—	296.4/303.0	350
													—	—	41/54	112.6/129.9	261.0/267.8	300
													35.4	62.4	41/54	112.6/129.9	296.4/303.0	350
	460	414	508	43.6	223	28.8	173	4	1	2.7	15	21.0	—	—	—	—	115.1	150
													18.9	35.4	—	—	134.0	175
													—	—	54	65.0	115.1	150
													18.9	35.4	54	65.0	134.0	175
													—	—	108	129.9	156.2	175
													18.9	35.4	108	129.9	179.8	200
											20	27.0	—	—	—	—	121.1	150
													18.9	35.4	—	—	140.0	175
													—	—	54	65.0	121.1	150
													18.9	35.4	54	65.0	140.0	175
													—	—	108	129.9	163.7	175
													18.9	35.4	108	129.9	187.3	200
											25	34.0	—	—	—	—	128.1	150
													18.9	35.4	—	—	147.0	175
													—	—	54	65.0	128.1	150
													18.9	35.4	54	65.0	147.0	175
													—	—	108	129.9	172.4	200
													18.9	35.4	108	129.9	196.0	225
	575	518	632	34.6	164.0	26.9	120	4	1	2.4	15	17.0	—	—	—	—	96.8	125
													18.9	35.4	—	—	115.7	150
													—	—	54	52.0	96.8	125
													18.9	35.4	54	52.0	115.7	150
													—	—	108	103.9	125.2	150
													18.9	35.4	108	103.9	148.8	150
											20	22.0	—	—	—	—	101.8	125
													18.9	35.4	—	—	120.7	150
													—	—	54	52.0	104.8	125
													18.9	35.4	54	52.0	120.7	150
													—	—	108	103.9	131.4	150
													18.9	35.4	108	103.9	155.0	175
											25	27.0	—	—	—	—	106.8	125
													18.9	35.4	—	—	125.7	150
													—	—	54	52.0	106.8	125
													18.9	35.4	54	52.0	125.7	150
													—	—	108	103.9	137.7	150
													18.9	35.4	108	103.9	161.3	175

UNIT 50EJ,EK, EW,EY	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
				No. 1		No.2												
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCP†
058	208/230	187	254	106.4	506	69.2	345	6	1	5.3	20	59.4/ 54.0	—	—	—	—	288.0/293.4	350
													35.4	62.4	—	—	323.4/326.8	400
													—	—	41/54	112.6/129.9	288.0/293.4	350
													35.4	62.4	41/54	112.6/129.9	323.4/328.8	400
											25	74.6/ 68.0	—	—	—	—	302.0/308.6	400
													35.4	62.4	—	—	337.4/344.0	450
													—	—	41/54	112.6/129.9	302.0/308.6	400
													35.4	62.4	41/54	112.6/129.9	337.4/344.0	450
											30	88.0/ 80.0	—	—	—	—	314.0/322.0	400
													35.4	62.4	—	—	349.4/357.4	450
													—	—	41/54	112.6/129.9	314.0/322.0	400
													35.4	62.4	41/54	112.6/129.9	349.4/357.4	450
	460	414	508	52.6	253	28.8	173	6	1	2.7	20	27.0	—	—	—	—	137.8	175
													18.9	35.4	—	—	156.7	200
													—	—	54	65.0	137.8	175
													18.9	35.4	54	65.0	156.7	200
													—	—	108	129.9	163.7	175
													18.9	35.4	108	129.9	187.3	200
											25	34.0	—	—	—	—	144.8	175
													18.9	35.4	—	—	163.7	200
													—	—	54	65.0	144.8	175
													18.9	35.4	54	65.0	163.7	200
													—	—	108	129.9	172.4	200
													18.9	35.4	108	129.9	196.0	225
											30	40.0	—	—	—	—	150.8	200
													18.9	35.4	—	—	169.7	200
													—	—	54	65.0	150.8	200
													18.9	35.4	54	65.0	169.7	200
													—	—	108	129.9	179.9	200
													18.9	35.4	108	129.9	203.5	225

LEGEND

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

*Heater capacity (kW) is based on heater voltage of 208, 240, 480, and 575 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.

†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. The Canadian units may be fuse or circuit breaker.

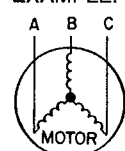
2. Unbalanced 3-Phase Supply Voltage

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

% voltage Imbalance

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

EXAMPLE: Supply voltage is 460-3-60.



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

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

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 of 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.

3. MCA calculation for units with electric heaters over 50 kW = (1.25 x IFM amps) + (1.00 x heater FLA)

4. 108 kW heaters are for constant volume applications only

Electrical data — 50EJ,EK,EW,EY054-068 (cont)

UNIT 50EJ,EK, EW,EY	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
				No. 1		No.2												
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCP†
064	208/230	187	254	106.4	506	106.4	506	6	1	5.3	25	74.6/ 68.0	—	—	—	—	339.2/345.8	450
													35.4	62.4	—	—	374.6/381.2	450
													—	—	41/54	112.6/129.9	339.2/345.8	450
													35.4	62.4	41/54	112.6/129.9	374.6/381.2	450
											30	88.0/ 80.0	—	—	—	—	351.2/359.2	450
													35.4	62.4	—	—	386.6/394.6	500
													—	—	41/54	112.6/129.9	351.2/359.2	450
													35.4	62.4	41/54	112.6/129.9	386.6/394.6	500
											40	114.0/ 104.0	—	—	—	—	375.2/385.2	450
													35.4	62.4	—	—	410.6/420.6	500
													—	—	41/54	112.6/129.9	375.2/385.2	450
													35.4	62.4	41/54	112.6/129.9	410.6/420.6	500
	460	414	508	52.6	253	52.6	253	6	1	2.7	25	34.0	—	—	—	—	168.5	200
													18.9	35.4	—	—	187.4	225
													—	—	54	65.0	168.5	200
													18.9	35.4	54	65.0	187.4	225
													—	—	108	129.9	172.4	200
													18.9	35.4	108	129.9	196.0	225
											30	40.0	—	—	—	—	174.6	225
													18.9	35.4	—	—	193.4	225
													—	—	54	65.0	174.5	225
													18.9	35.4	54	65.0	193.4	225
													—	—	108	129.9	179.9	225
													18.9	35.4	108	129.9	203.5	225
											40	52.0	—	—	—	—	186.5	225
													18.9	35.4	—	—	205.4	250
													—	—	54	65.0	186.5	225
													18.9	35.4	54	65.0	205.4	250
													—	—	108	129.9	194.9	225
													18.9	35.4	108	129.9	218.5	250
	575	518	632	40.4	176	40.4	176	6	1	2.4	25	27.0	—	—	—	—	132.3	150
													18.9	35.4	—	—	151.2	175
													—	—	54	52.0	132.3	150
													18.9	35.4	54	52.0	151.2	175
													—	—	108	103.9	163.7	175
													18.9	35.4	108	103.9	187.3	200
											30	32.0	—	—	—	—	137.3	175
													18.9	35.4	—	—	156.2	175
													—	—	54	52.0	137.3	175
													18.9	35.4	54	52.0	156.2	175
													—	—	108	103.9	169.9	200
													18.9	35.4	108	103.9	193.5	200
											40	41.0	—	—	—	—	146.3	175
													18.9	35.4	—	—	165.2	200
													—	—	54	52.0	146.3	175
													18.9	35.4	54	52.0	165.2	200
													—	—	108	103.9	181.2	200
													18.9	35.4	108	103.9	204.8	225

UNIT 50EJ,EK, EW,EY	NOMINAL VOLTAGE (3 Ph 60 Hz)	VOLTAGE RANGE		COMPRESSOR				OFM			IFM		POWER EXHAUST		ELECTRIC HEAT*		POWER SUPPLY	
				No. 1		No.2												
		Min	Max	RLA	LRA	RLA	LRA	Qty	Hp	FLA (ea)	Hp	FLA	FLA	LRA	kW	FLA	MCA	MOCPT†
068	208/230	187	254	106.4	506	106.4	506	6	1	5.3	25	74.6/ 68.0	—	—	—	—	339.2/345.8	450
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													—	—	108	129.9	179.9	225
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											40	52.0	—	—	—	—	186.5	225
													18.9	35.4	—	—	205.4	250
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													18.9	35.4	54	65.0	205.4	250
													—	—	108	129.9	194.9	225
													18.9	35.4	108	129.9	218.5	250

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
IFM — Indoor (Evaporator) Fan Motor
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MCA — Minimum Circuit Amps
MOCPT — Maximum Overcurrent Protection
NEC — National Electrical Code
OFM — Outdoor (Condenser) Fan Motor
RLA — Rated Load Amps

*Heater capacity (kW) is based on heater voltage of 208, 240, 480, and 575 v. If power distribution voltage to unit varies from rated heater voltage, heater kW will vary accordingly.

†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. The Canadian units may be fuse or circuit breaker.

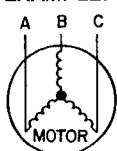
2 Unbalanced 3-Phase Supply Voltage

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

% voltage Imbalance

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

EXAMPLE. Supply voltage is 460-3-60



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

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

$$= \frac{1371}{3}$$

$$= 457$$

Determine maximum deviation from average voltage

(AB) 457 - 452 = 5 v

(BC) 464 - 457 = 7 v

(AC) 457 - 455 = 2 v

Maximum deviation is 7 v

Determine percent of voltage imbalance.

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

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.

3 MCA calculation for units with electric heaters over 50 kW = (1.25 x IFM amps) + (1.00 x heater FLA)

4 108 kW heaters are for constant volume applications only

Controls

Controls options

The control options that the units can provide are based on the following parameters: CV (constant volume) or VAV (variable air volume) operation; stand-alone unit with field-supplied sensors installed (CV or VAV); as a system via the Carrier Comfort System (TEMP or VVT® [Variable Volume and Temperature]); optional electronic expansion board installed (CV or VAV); linked to the Carrier Comfort Network; and availability of a computer and software (Comfort Works™, Building Supervisor, and Service Tool software or accessory LID-2B) to access the base control board.

NOTE: Access to the base control board allows unit occupancy schedules, unit timeclock, and various set points to be changed from their factory-defined default settings.

Constant volume applications — The units, as shipped, are operable as stand-alone units, using either a standard (mechanical or electronic) 2-stage heat, 2-stage cool thermostat, or with an electronic room 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 senses 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.

Features with Thermostat Control of Unit

- two-stage heating (if installed)
- two-stage cooling
- control of unit using Y1, Y2, W1, W2, and G thermostat inputs
- control of the indoor fan
- outdoor air temperature/supply air temperature monitoring
- control of an outdoor air condenser fan based on outdoor air temperature
- control of modulating economizer damper to provide free cooling when outdoor conditions are suitable, using supply-air temperature as a control point
- control of the economizer damper and indoor fan to obtain unoccupied free cooling
- provide power exhaust output to an external power exhaust controller
- support a field test for field checkout
- control of 2 stages of CV power exhaust
- compressor Time Guard® override (power up and minimum off and on times)
- compressor lockout during low supply air temperature

Additional features are provided by accessing the stand-alone unit control board via software with a computer. These features are:

- electronic expansion board features (if installed)
- control board diagnostics

- ability to change supply air set point (economizer control)
- ability to change high outdoor air temperature lockout set point (economizer control)
- ability to change power exhaust set points

NOTE: A CV unit without a thermostat requires a field-supplied sensor for operation.

Features with Sensor Control of Unit (Stand-Alone Applications) — Unit control is limited to CV unoccupied default set points, 90 F for cooling, 55 F for heating. There are 2 sensor options available:

- T-55 sensor will monitor room temperature and provide unoccupied override capability (1 hour)
- T-56 sensor will monitor room temperature, provide unoccupied override capability (1 hour), and provide a temperature offset of 5° F.

Standard features are:

- support of remote occupied/unoccupied input to start and stop the unit
- cooling capacity control of 3 stages using economizer and 2 compressors to maintain space temperature to an 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 $\pm 5^\circ\text{F}$ when using a T-56 sensor

Features with sensor control of unit are:

- 365-day timeclock with backup (supports minute, hour, day of week, date, month, and year)
- 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 T-55 or T-56 sensors (1 to 4 hours, 1 hour default)
- ability to use multiple space temperature sensors to average the space temperature
- temperature compensated start to calculate early start times before occupancy
- access to the Display, Maintenance, Configuration, Service, and Set Point data table through network software

When the unit is equipped with a field-supplied space temperature sensor and a remote contact closure (remote start/stop) on the base control board, the occupied default set points will monitor unit operation. The occupied default set points are 78 F cooling and 68 F heating (if heat is used).

NOTE: For units (with a field-supplied space temperature sensor) which have not had the base unit control board accessed via software to set an occupancy schedule, the remote start/stop closure will allow the unit to operate in the pre-configured occupied default set points (based on space temperature) of 78 F cooling and 68 F heating. Without this feature, the unit will control to the unoccupied default set points of 90 F cooling and 55 F heating (if heat is equipped).

CONTROLS OPTIONS AND CONFIGURATIONS (NON-THERMOSTAT APPLICATIONS)

UNIT CONFIGURATION	DEFAULT COOLING	DEFAULT HEATING
CV or VAV Unit with SPT Sensor	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — NA	Unoccupied Heating — 55 F (SPT) Occupied Heating — NA
CV Unit with SPT Sensor and Remote Start/Stop Switch	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — 78 F (SPT)	Unoccupied Heating — 55 F (SPT) Occupied Heating — 68 F (SPT)
VAV Unit Remote Start/Stop Switch Only	Unoccupied Cooling — 90 F (RAT) Occupied Cooling — 55 F (SAT)	Unoccupied Heating — 55 F (RAT) Occupied Heating — 68 F (RAT)*
VAV Unit with SPT Sensor and Remote Start/Stop Switch	Unoccupied Cooling — 90 F (SPT) Occupied Cooling — 55 F (SAT)	Unoccupied Heating — 55 F (SPT) Occupied Heating — 68 F (RAT)*

LEGEND

CV — Constant Volume
NA — Not Available
RAT — Return-Air Temperature
SAT — Supply-Air Temperature
SPT — Space Temperature
VAV — Variable Air Volume

*With DIP (dual-in-line package) Switch No. 5 configured to OPEN (Occupied Heat Enabled)

NOTE: Space temperature sensor and remote stop/switch are field supplied

An electronic expansion board may be field-installed to provide the following features:

- control of modulating economizer damper to maintain indoor air quality (IAQ) when outdoor conditions are suitable
- provide discrete inputs for fan status, filter status, field-applied status, and demand limit
- provide an output for the external alarm light indicator
- provides power exhaust fire outputs for direct control of modulated power exhaust stages during fire or smoke modes
- smoke control modes including evacuation, smoke purge, pressurization, and fire shutdown (modulating power exhaust required)

When the unit is connected to the CCN (Carrier Comfort Network), the following expansion board features can be utilized.

- perform Demand Limit functions based on CCN load-shed commands or the state of the discrete input
- alarm monitoring of all key parameters
- CCN protocol
- provides CCN IAQ participation

See Carrier TEMP or VVT® literature for complete TEMP (single zone) or VVT (multi-zone) application information.

Features with Sensor Control of Unit (Network Applications) — The base control board provides, as standard, a connection for use with a Carrier VVT system and can also be integrated into a Carrier Comfort Network.

When the unit is accessed via a PC equipped with ComfortWorks™, Building Supervisor, or Service Tool software or accessory LID-2B, the following features can be accessed:

- on-board timeclock can be programmed
- occupancy schedules can be programmed
- unit set points can be changed
- alarms can be monitored

This access is available on the base control board via a RJ-11 phone jack or a 3-wire connection to the communication bus. The internal timeclock has a 10-hour minimum back-uptime to provide for unit power off for servicing unit or during unexpected power outages. For complete Carrier

Comfort System (CCS) and Carrier Comfort Network (CCN) features and benefits, refer to the product literature.

Variable air volume (VAV) applications

Features with Stand-Alone Applications — The units, as shipped, are operable as stand-alone units with the addition of a field-supplied timeclock to establish unit start and stop times.

Heating (if equipped with heat) and cooling in both on and off modes are controlled to default values by the base unit control. Set points may be changed with appropriate input devices.

The control has an on-board occupancy schedule which can be set using an input device and eliminates the need for an external timeclock.

During both the on and off periods, cooling operation is controlled to the supply air setting and heating is controlled to the return air setting (or to the optional space temperature sensor). During the on period, the supply fan runs continuously. During the off period, the supply fan will be activated if the return air sensor is outside of the set points and will run long enough to accurately sample the space temperature. The supply fan will then continue to run until any heating or cooling load is satisfied, at which point it will turn off.

The use of a space sensor will allow for supply air reset to conserve energy and maintain comfort. If equipped with an override feature, the sensor will allow operation during the off period for a fixed length of time.

Base unit control supports a Heat Interlock Relay (field supplied) to fully open the VAV terminal devices during heating operation.

Standard features of a VAV unit with a remote start/stop switch are:

- control board diagnostics
- control of an outdoor condenser fan based upon outdoor-air temperature
- control of modulating economizer to provide free cooling when outdoor conditions are suitable, using supply-air temperature as a set point
- support of remote occupied/unoccupied input to start or stop the unit

Controls (cont)

- provide power exhaust output to an external power exhaust controller
- support supply air temperature reset to offset supply air set point
- support a field test for field check out
- support linkage to DAV (digital air volume) systems
- cooling capacity control of up to 6 stages plus economizer with compressors and unloaders to maintain supply-air temperature set point during occupied periods
- control of one stage of heat to maintain air temperature
- provide a variable frequency drive (VFD) relay output to enable VFD
- control of heat interlock relay
- compressor Time Guard® override (power up, minimum off and on times)

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.

Occupied heating is enabled or disabled by the position of DIP (dual in-line package) switch no. 5.

Additional features may be provided with electronic access to unit control board. These features are:

- additional control board diagnostics
- electronic expansion board features (if installed)
- control of the economizer damper and indoor fan to option unoccupied free cooling
- 365-day timeclock with backup (supports minute, hour, day, month, and year)
- holiday table containing up to 18 holiday schedules
- occupancy control with 8 periods for unit operation
- support a set of display, maintenance, configuration, service, and set point data tables for interface with Building Supervisor, ComfortWorks™, or Service Tool software

When a VAV unit with a space temperature sensor is accessed via a computer, the following additional features are available:

- ability to initiate timed override from T-55 sensors
- temperature compensated start to calculate early start time before occupancy
- provide space temperature reset to reset the supply air set point upward when the temperature falls below the occupied cooling set point

An electronic expansion board may be field-installed to provide the following features:

- fan status
- filter status
- field-applied status
- demand limiting
- IAQ (indoor air quality) sensor
- OAQ (outdoor air quality) sensor
- alarm light
- fire unit shutdown
- fire pressurization
- fire evacuation
- fire smoke purge

When the unit is connected to the CCN (Carrier Comfort Network), the following expansion board features can be utilized:

- CCN IAQ participation
- CCN OAQ participation
- CCN demand limit participation
- ability to use multiple space temperature sensors (multiples of 4 or 9) to average space temperature (DAV only)

A field-supplied space temperature sensor can be added to allow an accessory T-55 sensor to monitor room temperature and provide unoccupied override capability (1 hour).

When the unit is equipped with a field-supplied space temperature sensor and a remote contact closure (remote start/stop), the occupied default set points will monitor unit operation. The occupied default set points are 55 F (supply air) cooling and 68 F (return air temperature) heating (if heat is installed).

NOTE: For units without a space temperature sensor and which have not had the base unit control board accessed via software to set an occupancy schedule, the remote start/stop closure will allow the unit to operate in the pre-configured occupied default set points of 55 F (supply-air temperature) cooling and 68 F (return-air temperature) heating. Without an occupancy schedule, the unit will control to the unoccupied default set points of 90 F (return air) cooling and 55 F (return air) heating (if heat is installed).

Features with Network Applications — The base control board provides, as standard, a connection for use with a Carrier Comfort System and can also be integrated into a Carrier Comfort Network. When the unit is accessed via a PC equipped with ComfortWorks, Building Supervisor, or Service Tool software or accessory LID-2B, the following features can be accessed:

- on-board timeclock can be programmed
- occupancy schedules can be programmed
- unit set points can be changed
- alarms can be monitored

This access is available on the base control board via a RJ-11 phone jack or a 3-wire connection to the communication bus. The internal timeclock has a 10-hour minimum back-up time to provide for unit power off for servicing unit or during unexpected power outages. For complete Carrier Comfort System (CCS) or Carrier Comfort Network (CCN) features and benefits, refer to the product literature.

Sequence of operation

NOTE: Unit is shipped with default values that can be changed through Service Tool, CCN software, or using an accessory LID-2B.

Cooling, constant volume (CV) units — On power up, the control module will activate the initialization software. The initialization software reads each DIP switch to determine the unit configuration. The initialization sequence: clears all alarms and alerts; re-maps the input/output database for CV operation; sets maximum heat stages to 2; and sets maximum cool stages to 3. The control module reads DIP switch no. 3 and determines if the unit will use expansion mode operation.

The TSTAT function performs a thermostat based control by monitoring Y1, Y2, W1, W2, and G inputs. These functions control stages: cool1, cool2, heat1, heat2, and the indoor fan, respectively. If the TSTAT function is not selected, the control module determines the occupancy state based on the system time schedules with a field-supplied sensor installed, or with remote occupied/unoccupied input. If Temperature Compensated Start is active, the unit will be controlled as in the Occupied mode. User defined set points are shown on page 19.

Occupied or unoccupied comfort set points must be selected. The control module will set appropriate operating mode and fan control. The control module will turn on indoor fan if in Occupied mode or if the unit is in Unoccupied mode and the space temperature is outside of the unoccupied comfort set points (Unoccupied Heat or Unoccupied Cool). The control module will then monitor space temperature against comfort set points and control heating or cooling stages as required. If the system is in the Occupied mode, the economizer will operate as required. If the system is in Unoccupied mode, the system will perform nighttime free cool and IAQ (indoor air quality) pre-occupancy purge as required (when functions are enabled via software). Whenever the DX (direct expansion) cooling is requested, the outdoor fan will operate.

The control module will operate economizer, run diagnostics to monitor alarms/alerts at all times, and respond to CCN communications to perform any configured network POC (product outboard control) functions such as time/outdoor-air temperature broadcast and global occupancy broadcast. When the optional expansion I/O board is employed, it will: perform a periodic scan and maintain a database of expanded I/O points; perform Fire/Smoke control (power exhaust required); if in Occupied mode, perform IAQ control and monitor the fan, filter, demand limit, and field-applied status (with accessories).

If thermostats are used to energize the G input, the control module will turn on the indoor fan without delay and open the economizer dampers to minimum position. If thermostats are used to deenergize the G input, the control module will turn off the indoor fan without delay and close the economizer dampers.

When cooling, G must be energized before cooling can operate. The control module determines if outdoor conditions are suitable for economizer cooling using the standard outdoor air thermistor. For the economizer to function for outside air cooling: the enthalpy must be below the enthalpy set point; the outdoor-air temperature must be equal to or less than the High Outdoor Air Temperature Lock-out (default is 65 F); the SAT (supply-air temperature) thermistor must not be in alarm; and the outdoor air reading is available. When these conditions are satisfied, the control module will use economizer as the first stage of cooling.

When Y1 input is energized, the economizer will be modulated to maintain SAT at the defined set point. (The default is 55 F.) When SAT is above the set point, the economizer will be 100% open. When SAT is below the set point, the economizer will modulate between minimum and 100% open position. When Y2 is energized, the control module will turn on compressor no. 1 and continue to modulate the economizer as described above. If the Y2 remains energized and the SAT reading remains above the set point for 15 minutes, compressor no. 2 will turn on. If Y2 is deenergized at any time, only the last stage of compression that

was energized will be turned off. If outdoor conditions are not suitable for economizer cooling, the economizer will go to minimum position and cycle compressors no. 1 and 2 based on demand from Y1 and Y2 respectively. The compressors will be locked out when the SAT temperature is too low (less than 40 F for compressor no. 1 and less than 45 F for compressor no. 2). After a compressor is locked out, it can restart after normal time-guard period.

The Time Guard® function maintains a minimum off time of 5 minutes, a minimum on time of 10 seconds, and a minimum delay before starting the second compressor of 10 seconds.

When heating, the heat stages respond to the demand from W1 and W2 of the thermostat input. Heating and cooling will be mutually locked out on demand on a first call basis. The heating and the cooling functions cannot operate simultaneously.

Cooling, variable volume units — On power up, the control module will activate the initialization software. The initialization software reads each DIP switch to determine the unit configuration. The initialization sequence: clears all alarms and alerts; re-maps the input/output database for VAV operation; sets maximum heat stages to 1; and sets maximum cool stages to 6. The control module reads DIP switch no. 3 and determines if the unit will use expansion mode operation. Power up takes a random time of 1 to 63 seconds plus 5 minutes the first time power is sent to the control board after a power outage.

The control module will determine if an interface (linkage) is active and if the unit will operate in a DAV mode. In a DAV system, the room terminals are equipped with microprocessor controls that give commands to the base unit module. If a linkage is active, the control module will replace local comfort set points, space and return air temperatures, and occupancy status with the linkage data supplied.

The control module will determine occupancy status from Time Schedules (if programmed), Remote Occupied/Unoccupied input, global occupancy schedules, or DAV. If temperature compensated start is active, the unit will be controlled as in the Occupied mode.

NOTE: The temperature compensated start is a period of time calculated to bring the unit on while in Unoccupied mode to reach the occupied set point when occupancy occurs.

The control module will set the appropriate operating mode and fan control. The control module will turn on the VFD if Occupied mode is evident. If in Unoccupied mode and a valid return-air temperature reading is available (either from a sensor or DAV), the control module will monitor return-air temperature against unoccupied heat and cool set points. The control module will start the VFD whenever return-air temperature is outside of the set points (Unoccupied Heat or Unoccupied Cool). The VFD may also be started by nighttime thermostat via remote Occupied/Unoccupied input or by a temperature compensated start algorithm. When the VFD is running in a normal mode, the control module will start heating or cooling as required to maintain supply-air temperature at the supply air set point plus the reset (when enabled). The reset value is determined by SAT (supply-air temperature) reset and/or space temperature reset algorithms. The reset is only available when enabled through software.

Controls (cont)

When cooling, the control module will energize the power exhaust enable output to the external power exhaust controller (when power exhaust is used).

The control module will run continuous diagnostics for alarms/alerts; respond to CCN (Carrier Comfort Network) communications; perform any configured network POC (Product Outboard Control) functions such as time/outdoor air temperature broadcast and global broadcast; and perform Fire/Smoke control.

Heating, constant volume (CV) units

48 series units — The gas heat units incorporate 2 separate systems to provide gas heat. Each system incorporates its own induced-draft motor, Integrated Gas Control (IGC) board, 2 stage gas valve, manifold, etc. 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.

All of the gas heating control is performed through the IGC boards (located in the heating section). The base module board serves only to initiate and terminate heating operation.

The base module board is powered by 24 vac. When the thermostat or room sensor calls for heating, power is sent from the base module board 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. The induced-draft motors are then energized, and when 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, as well as 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 for some reason the overtemperature 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 IAQ position (generally closed in the Unoccupied mode). If IAQ is not enabled, dampers will move to the minimum position.

When additional heat is required, W2 closes and initiates power to the second stage of the main gas valves. When the thermostat is satisfied, W1 and W2 open and the gas valves close interrupting the flow of gas to the main burners. If the call for W1 lasted less than 1 minute, the heating cycle will not terminate until 1 minute after W1 became active. If the unit is controlled through a room thermostat set for fan auto., the indoor-fan motor will continue to operate for an additional 45 seconds then stop and the outdoor-air

dampers will close. If the overtemperature 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. If the unit is controlled through a room sensor, the indoor fan will be operating in the Occupied mode and turned off after 45 seconds in the Unoccupied mode.

50 series units — The control module is powered by 24 vac. If the unit is controlled with a room sensor, the fan will run continuously in the Occupied mode, with the outside-air damper in the minimum position. If the unit is controlled through a room thermostat (with FAN set to AUTO), upon a call for heat the first stage of heat is energized, the indoor-fan motor will turn on, and the outdoor-air damper will move to the minimum position. Upon a call for additional heat (if the unit is equipped with a two-stage heater), the second stage of heat is energized. When the call for heat is satisfied, the heaters will deenergize. The indoor-fan motor will also deenergize (unless controlled by a room sensor) and the outdoor-air damper will move to the closed position.

If the unit is controlled with a room sensor the fan will not run in the Unoccupied mode. Upon a call for heat, the first stage of heat is energized, the indoor-fan motor will turn on, and the outdoor air damper will move to the Unoccupied IAQ position (generally set to zero in the Unoccupied mode). The IAQ feature is enabled through system software. Upon a call for additional heat (if the unit is equipped with a two-stage heater), the second stage of heat is energized. When the call for heat is satisfied, the heaters and indoor-fan motor will deenergize and the outdoor-air damper will move to the closed position (if open).

Heating, variable air volume (VAV) units

48 series units — All of the gas heating control is performed through the integrated gas control (IGC) board. The base module board serves only to initiate and terminate heating operation.

NOTE: The unit is factory-configured for disabled occupied heating. Dual In-line Package (DIP) switch 5 is used to enable occupied heating (DIP switch 5 set to OPEN).

The base module board is powered by 24 vac. When there is a call for heating (either Morning Warm-Up, Unoccupied, or Occupied modes), power is sent from the base module board to W on each of the IGC boards and W2 of the main gas valve. A field-supplied heat interlock relay signals for the air terminals to open fully. In the Occupied mode the indoor-fan motor will be operating and the outdoor-air dampers will be in the minimum position. In the Unoccupied mode the indoor-fan motor will be off, but will energize 45 seconds after the call for heat and the outdoor-air dampers will move to the IAQ Unoccupied position (generally set to closed in the Unoccupied mode). The duct pressure sensor will signal to the variable frequency drive to operate at full speed since all terminals have been driven open. 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. The induced-draft motors are then energized and when 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 call for heat lasted less than 1 minute, the heating cycle will not terminate until 1 minute after heat became active. When heating is satisfied, the power will be interrupted to the IGC board and W1 and W2 of the main gas valve. If the unit is controlled through a room sensor, the indoor fan will be operating in the Occupied mode and turned off after 45 seconds in the Unoccupied mode.

50 series units — The control board is powered by 24 vac. When there is a call for heating (from Morning Warm-Up, Unoccupied, or Occupied modes), power is sent from the control module to energize the first stage of electric heat. A field-supplied heat interlock relay signals for the air terminals to fully open. In the Occupied mode, the indoor-fan motor will operate continuously and the outdoor-air dampers will be in the minimum position. In the Unoccupied mode, the indoor-fan motor will be off, but will energize upon the call for heat. The outdoor-air dampers will move to the IAQ unoccupied position (generally set to zero in the Unoccupied mode). The duct pressure sensor will signal to the variable frequency drive to operate at full speed. When the call for heat is satisfied, the heaters will deenergize.

NOTE: The HIR is not needed in a DAV system.

If the unit is in the Unoccupied mode, the indoor-fan motor will deenergize and the outdoor-air damper will move to the closed position (if open).

Morning warm-up (VAV only with PC accessed/CCN operation) — Morning warm-up occurs when the control module has been programmed to turn on heat, prior to the Occupied mode, to be ready for the occupancy. Morning warm-up is a condition in VAV systems that occurs when the Temperature Compensated Start algorithm calculates a biased occupied start time and the unit has a demand for heating. The warm-up will continue into the occupied period as long as there is a need for heat. During warm-up, the unit can continue heating into the occupied period, even if occupied heating is disabled. When the heating demand is satisfied, the warm-up condition will terminate. To increase or decrease the heating demand, use the network access software to change the occupied heating set point.

NOTE: To utilize morning warm-up mode, the unit occupancy schedule must be accessed via Service Tool, ComfortWorks™, or Building Supervisor software.

Morning warm-up (VAV only with stand-alone operation) — When a unit operates in stand-alone mode, morning warm-up occurs when the unit is energized in Occupied mode and return-air temperature (RAT) is below 68 F. Warm-up will not terminate until the RAT reaches 68 F. The heat interlock relay output is energized during morning warm-up. (A field-installed 24-vdc heat interlock relay is required.) The output will be energized until the morning warm-up cycle is complete.

Space temperature reset (VAV only) — An accessory space temperature sensor (T-55 or T-56 without offset) is required. Space temperature reset is used to reset the supply-air temperature set point of a VAV system higher, as the space temperature falls below the Occupied Cool set point. As the space temperature falls below the cool set point, the supply-air temperature will be reset upward as a function of the reset ratio. Reset ratio is expressed in degrees change

in supply-air temperature per degree of space temperature change. A reset limit will exist which will limit the maximum number of degrees the supply-air temperature may be raised. Both the reset ratio and the reset limit are user definable. The sequence of operation is as follows:

1. The on/off status of the unit supply fan is determined.
2. If the fan is on, the sequence will check if the system is in Occupied mode.
3. If the system is in Occupied mode, the sequence will determine if the reset option is enabled.
4. If the reset option is enabled, the sequence will read the space temperature and compare it to the Occupied Cool set point. If the temperature is below the Occupied Cool set point, the algorithm will compute the reset value and compare this value against the reset limit. If it is greater than the reset limit, the sequence will use the reset limit as the reset value.

NOTE: A computer equipped with Carrier network access software (ComfortWorks, Building Supervisor or Service Tool) or an accessory LID-2B is required to enable this function.

Supply-air temperature reset (VAV only) — A field-supplied 4 to 20 mA input signal enables the supply-air temperature to be reset 0 to 20° F.

Power exhaust operation — The optional power exhaust packages are factory- or field-installed with vertical units and optionally installed in the return air ductwork for horizontal applications. The standard (only offered with constant volume units) and modulating power exhaust (offered on VAV units and CV units with non-modulating to modulating accessory conversion kit) are the 2 packages available. The modulating power exhaust package is equipped with a field-adjustable static pressure controller which will control up to 6 power exhaust stages to maintain a building static pressure. The blue sequencer located in the control box below the control board can be adjusted by removing the covers and adjusting the set point dial to the desired building pressure. The standard power exhaust package controls up to 2 stages of power exhaust to maintain building pressure. These power exhaust stages are staged according to a percentage of the economizer damper position. The default values are 25% for Stage 1 and 75% for Stage 2. This package has set points that are adjustable through software (such as Service Tool, Building Supervisor, or ComfortWorks or accessory LID-2B).

Smoke control modes — The 48/50EJ,EK,EW,EY units with an optional expansion board perform fire and smoke control modes. The expansion board provides 4 modes which can be used to control smoke within the conditioned area. The modes of operation are fire shutdown, pressurization, evacuation, and smoke purge.

IAQ control — The accessory expansion board and accessory IAQ sensor are required for IAQ control. The Carrier sensors operate with a 4 to 20 mA signal. The 4 to 20 mA signal is connected to T11 (+) and T12 (–) for the IAQ sensor, and T13 (+) and T14 (–) for the OAQ sensor. The sensor is field-mounted and wired to the expansion board installed in the unit main control box. The IAQ sensor must be powered by a field-supplied 24-v power supply (ungrounded). Do not use the unit 24-v power supply to power the sensor.

Controls (cont)

Once installed, the sensor must be enabled. The sensor is configured with default values which may be changed through network access software. To work properly, the IAQ sensor high and low reference points for the sensor that is used must match the configured values. The expansion board reacts to a 4 to 20 mA signal from the IAQ sensor. The low reference (4 mA output) must be configured to the minimum IAQ sensor reading. The high reference (20 mA output) must be configured to the maximum IAQ sensor reading.

The IAQ sensor can be configured to either low or high priority. The priority value can be changed by the user. The default is low.

Low priority — When the priority is set to low, the initial control is to the IAQ set point, but the outside air damper

position will change to its minimum position when the following conditions occur:

- CV units with sensor — when the space temperature is greater than the occupied cooling set point plus 2° F or when the space temperature is less than the occupied heating set point minus 2° F.
- VAV units and CV units with thermostat — when the supply air temperature is less than the supply air temperature set point minus 8° F or when the supply air temperature is greater than the supply air temperature set point plus 5° F for 4 minutes.
- When the outdoor air quality is greater than the outdoor air quality set point (ppm)

High priority — When the priority is set to high, the IAQ set point controls the outside air damper exclusively, with no regard to comfort conditioning.

SMOKE CONTROL MODES

DEVICE	PRESSURIZATION	SMOKE PURGE	EVACUATION	FIRE SHUTDOWN
Economizer	100%	100%	100%	0%
Indoor Fan/VFD	ON	ON	OFF	OFF
Power Exhaust (all outputs)	OFF	ON	ON	OFF
Heat Stages	OFF	OFF	OFF	OFF
HIR	ON	ON	OFF	OFF

LEGEND

HIR — Heat Interlock Relay
VFD — Variable Frequency Drive

I/O CHANNEL DESIGNATIONS BASE MODULE — CV

TERMINAL NO.	ASSIGNMENT	TERMINAL NO.	ASSIGNMENT
T1-2	SPT (CCN) — 10K Ω Thermistor	T23-25	Compressor 2 Safety — DI (24 vac)
T3-4	STO (CCN) — 10K Ω Thermistor	T24-25	Outside Air Enthalpy — DI (24 vac)
T5-6	OAT — 5K Ω Thermistor	T26-27	Economizer Pos — AO (4-20 mA)
T7-8	SAT — 5K Ω Thermistor	T28-29	Heat 1 Relay — DO (24 vac)
T9-10	—	T30-29	Heat 2 Relay — DO (24 vac)
T11-12	SAT Reset — AI (4 to 20 mA)	T31-32	CV Power Exhaust 1/Modulating Power Exhaust — DO (115 vac)
T13-14	—	T33-32	CV Power Exhaust 2 — DO (115 vac)
T15-16	—	T34-35	Condenser Fan — DO (115 vac)
T17-25	Y1 or Remote Start/Stop — DI (24 vac)	T36-35	OFC2 — DO (115 vac)
T18-25	Y2 — DI (24 vac)	T37-38	—
T19-25	W1 — DI (24 vac)	T39-38	—
T20-25	W2 — DI (24 vac)	K1	Indoor Fan Relay — DO (LV)
T21-25	G — DI (24 vac)	K2	Compr 1 — DO (HV)
T22-25	Compressor 1 Safety — DI (24 vac)	K3	Compr. 2 — DO (HV)

I/O CHANNEL DESIGNATIONS BASE MODULE — VAV

TERMINAL NO.	ASSIGNMENT	TERMINAL NO.	ASSIGNMENT
T1-2	SPT (CCN) — 10K Ω Thermistor	T23-25	Compressor 2 Safety — DI (24 vac)
T3-4	RAT — 5K Ω Thermistor	T24-25	Outside Air Enthalpy — DI (24 vac)
T5-6	OAT — 5K Ω Thermistor	T26-27	Economizer Pos. — AO (4-20 mA)
T7-8	SAT — 5K Ω Thermistor	T28-29	Heat 1 Relay — DO (115 vac)
T9-10	—	T30-29	Heat Interlock Relay — DO (115 vac)
T11-12	SAT Reset — AI (4 to 20 mA)	T31-32	Modulated Power Exhaust — DO (24 vac)
T13-14	—	T33-32	—
T15-16	—	T34-35	Condenser Fan — DO (115 vac)
T17-25	Remote Start/Stop — DI (24 vac)	T36-35	OFC2 — DO (115 vac)
T18-25	—	T37-38	Unloader 1 — DO (115 vac)
T19-25	—	T39-38	Unloader 2 — DO (115 vac)
T20-25	—	K1	Indoor Fan Relay — DO (LV)
T21-25	—	K2	Compr. 1 — DO (HV)
T22-25	Compressor 1 Safety — DI (24 vac)	K3	Compr 2 — DO (HV)

I/O CHANNEL DESIGNATIONS EXPANSION MODULE (Field-Installed) — CV AND VAV

TERMINAL NO.	ASSIGNMENT	TERMINAL NO.	ASSIGNMENT
T1-2	—	T23-25	Fire — Evacuation — DI (24 vac)
T3-4	—	T24-25	Fire — Smoke Purge — DI (24 vac)
T5-6	—	T26-27	—
T7-8	—	T28-29	—
T9-10	—	T30-29	Alarm Light Indicator — DO (24 vac)
T11-12	IAQ Indoor — AI (4 to 20 mA)	T31-32	Power Exhaust Fire No. 1 — DO (115 vac)
T13-14	IAQ Outdoor — AI (4 to 20 mA)	T33-32	Power Exhaust Fire No. 2 — DO (115 vac)
T15-16	—	T34-35	Power Exhaust Fire No. 3 — DO (115 vac)
T17-25	Fan Status — DI (24 vac)	T36-35	Power Exhaust Fire No. 4 — DO (115 vac)
T18-25	Filter Status — DI (24 vac)	T37-38	—
T19-25	Field Applied Status — DI (24 vac)	T39-38	—
T20-25	Demand Limit — DI (24 vac)	K1	—
T21-25	Fire — Unit Shutdown — DI (24 vac)	K2	—
T22-25	Fire — Pressurization — DI (24 vac)	K3	—

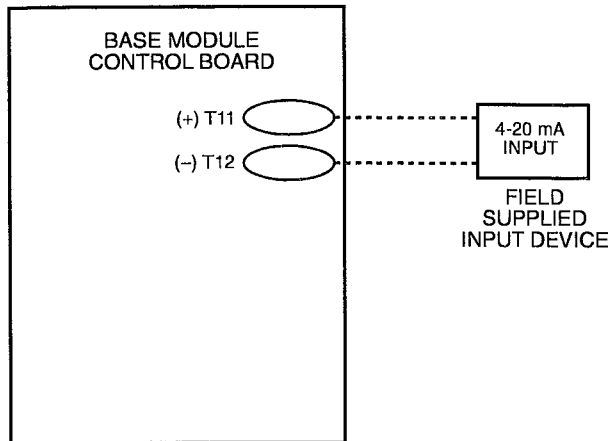
LEGEND

AI — Analog Input	LV — Low Voltage
AO — Analog Output	OAT — Outdoor-Air Temperature
CCN — Carrier Comfort Network	OFC — Outdoor Fan Contactor
CV — Constant Volume	RAT — Return-Air Temperature
DI — Direct Input	SAT — Supply-Air Temperature
DO — Direct Output	SPT — Space Temperature
HV — High Voltage	STO — Space Temperature Offset
IAQ — Indoor Air Quality	T — Terminal
K Ω — Kilo-Ohms	VAV — Variable Air Volume

NOTE: All even numbered terminals are negative (–) polarity and all odd numbered terminals are positive (+) polarity

[illegible]

SUPPLY TEMPERATURE RESET WIRING



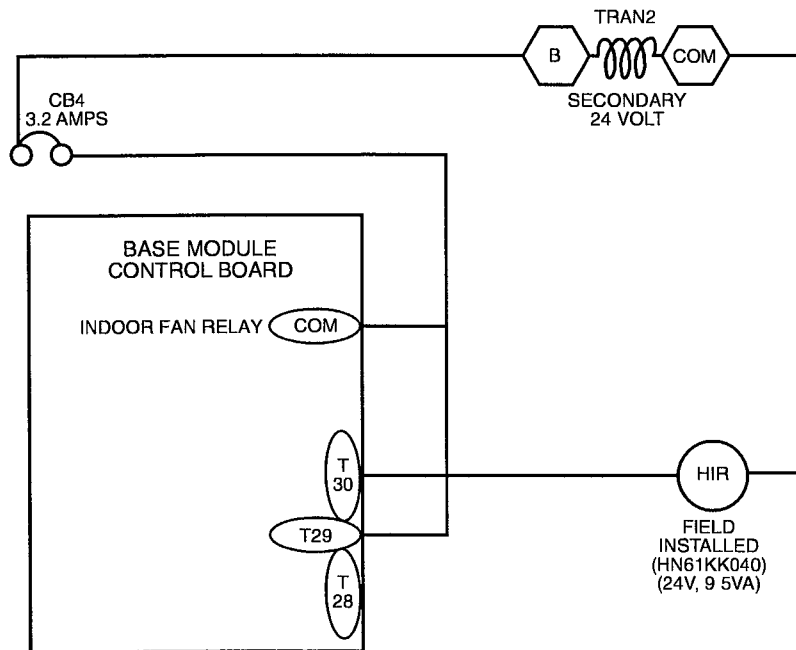
mA INPUT	DEG. F RESET
4	0.00
5	1.25
6	2.50
7	3.75
8	5.00
9	6.25
10	7.50
11	8.75
12	10.00
13	11.25
14	12.50
15	13.75
16	15.00
17	16.25
18	17.50
19	18.75
20	20.00

LEGEND

T — Terminal

NOTE The 4 to 20 mA input is a field-supplied non-Carrier EMS (Energy Management System) device

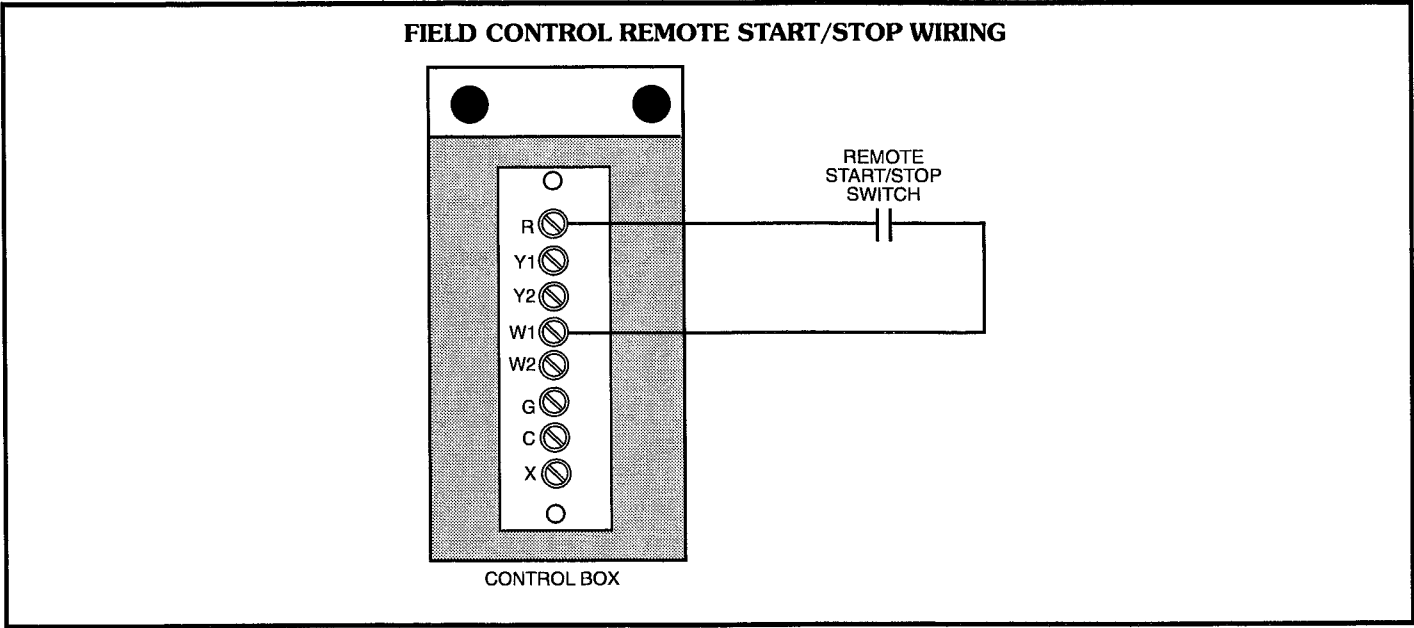
HEAT INTERLOCK RELAY WIRING



LEGEND

CB — Circuit Breaker
 COM — Common
 HIR — Heat Interlock Relay
 T — Terminal
 TRAN — Transformer

Control wiring (cont)



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.

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 500 cfm/ton.

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 the entering-air temperature.

Minimum ambient cooling operation temperature — All units 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 35 F. With accessory Motormaster® III control units can operate at outdoor temperatures down to -20 F. Outdoor-fan motor no. 1 changeout is required for Motormaster III applications.

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 — A change to the gas orifice may be required at high altitudes.

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.

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° elbow must be installed in the supply ductwork below the unit discharge connection.

Existing roof curbs — The 48/50E units will install on existing vertical supply and return roof curb applications. This minimizes installation expenses due to the use of the existing curb. No additional roof penetrations or transition curbs are required.

The existing building ductwork on units is **connected to the unit** (not the roof curb). The ductwork must be disconnected from the existing unit prior to its removal. The ductwork must then be cut back below the roof curb to allow for installation of field-supplied ductwork. The field-supplied ductwork will transition from the existing building ductwork to the newly installed accessory roof curb adapter package. The accessory roof curb adapter package provides sheet metal duct connections to be installed in the existing roof curb. No connections exist in the original roof curb since the ductwork is connected to the unit, not the curb.

NOTE: Each installation should be evaluated to determine if the application will accommodate the accessory roof curb adapter package. Call Carrier Application Engineering for more information concerning individual applications.

Guide specifications — 48/50EJ,EW constant volume units

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

HVAC Guide Specifications — Section 48/50EJ,EW

Size Range: **50 to 65 Tons, Nominal**

Carrier Model Number: **48EJ, 48EW, 50EJ, 50EW**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor roof curb or slab mounted, electronically controlled heating and cooling unit utilizing semi-hermetic reciprocating type compressors for cooling duty and gas or electric heat for heating duty. Units shall discharge supply air vertically or horizontally as shown on contract drawings.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 360 and designed in accordance with UL Standard 1995.
- B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest edition) and NEC.
- C. Unit shall be tested and certified by ETL in accordance with ANSI Z21.47 Standards as a total package.
- D. Roof curb shall be NRCA approved.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- F. Unit shall be manufactured in a facility registered to the ISO 9002 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. 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.
 2. Unit casing shall be capable of withstanding Federal test method Standard No. 141 (Method 6061) 500-hour salt spray test.
 3. Sides shall have 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 and containing an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards G21 and 22.
5. Unit shall have a factory-installed condensate drain connection and an aluminized steel, sloped condensate drain pan to prevent standing water from accumulating.
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.

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. Reciprocating, semi-hermetic type only and located for easy servicing.
2. Mounted on spring vibration isolators with an isolation efficiency of no less than 95%.
3. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor, and suction and discharge service valves.
4. Maximum operating speed of 1800 rpm (30 rps).
5. Each on independent refrigerant and electrical circuits.

E. Coils:

1. Evaporator Coil:

- a. Intertwined circuited, constructed of lanced aluminum fins mechanically bonded to seamless, internally enhanced copper tubes.
- b. Full face active type during full load and part load conditions.

- c. Coils shall be leak tested at 150 psig and pressure tested at 450 psig.
- 2. Condenser Coil:
 - a. Constructed of aluminum fins mechanically bonded to seamless, internally grooved, copper tubes.
 - b. Air-cooled condenser coils shall be leak tested at 150 psig and pressure tested at 450 psig.
- 3. All coils shall be same manufacturer as unit.
- 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.
 - 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 and dynamically balanced.
 - 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. Liquid line service valve.
 - 2. Solid core filter drier.
 - 3. Thermostatic expansion valve.
 - 4. Fusible plug.
- H. Filter Section:

Filter section shall consist of 2-in. thick, disposable fiberglass filters or commercially available sizes.
- I. Controls and Safeties:
 - 1. Controls:
 - a. Unit shall be complete with self-contained, demand-oriented microprocessor based, solid-state control system.
 - b. Unit shall be compatible with either a remote start/stop switch and a room sensor, room thermostat, or on a TEMP system or CCN (Carrier Comfort Network) with no accessory interface required.
 - c. Unit staging shall be minimum 2-cool, 2-heat.
 - d. Unit shall perform in response to a variable space temperature signal. Control system shall determine control sequences through monitoring the following operational variables:
 - 1) Evaporator leaving-air temperature.
 - 2) Economizer position.
 - 3) Minimum economizer set point.
 - 4) Morning warm-up set point.
 - 5) Outdoor-air temperature.
 - e. In the event of a power failure, unit control system shall sequence the unit to re-start beginning with the first stage of cooling or heating.
 - f. Thermostats shall be of the dual set point type for heating and cooling.
 - g. Set points must have adjustable deadband between heat and cool.
 - h. Unit shall be capable of performing nighttime free cooling.
 - i. Control boards shall be equipped with flashing LED(s) (light-emitting diode) for diagnostics.
 - j. With gas heat, upon flame failure a new ignition sequence must start (rather than locking out heat).
 - k. Minimum heat on-time of 1 minute.
- 2. Safeties:

Unit components shall be equipped with the following protections:

 - a. Compressors:
 - 1) Overtemperature (shuts down individual compressor).
 - 2) Overcurrent (shuts down individual compressor).
 - 3) Crankcase heaters.
 - 4) High-pressure switch (shuts down individual compressor, automatic reset type).
 - 5) Loss-of-charge switch (shuts down individual compressor, automatic reset type).
 - 6) Compressor shall be prevented from restarting for a minimum of 5 minutes after shutdown. Compressor shall run a minimum of 10 seconds after starting.
 - 7) Freeze protection thermostat (FPT) shall shut down unit operation based on coil temperature.
 - b. Heating Section:
 - Gas Heat:
 - 1) High-temperature limit switch.
 - 2) Redundant dual-stage gas valve.
 - 3) Flame rollout switches.
 - 4) Flame proving controls.
 - 5) Speed sensor on each induced draft fan motor.
 - Electric Heat:
 - 1) Automatic reset high-temperature limit switches.
 - 2) Heat limiters (fusible links).
 - 3) Overcurrent protection short-circuit fuses.
 - 4) Branch circuit protection.

Guide specifications — 48/50EJ,EW

constant volume units (cont)

J. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 360.
2. Unit shall be capable of mechanical cooling operation down to 35 F ambient outdoor temperature.
3. Provides multi-stage mechanical cooling capability.
4. Unit provided with fan time delay to prevent cold starts.

K. Motors:

1. Compressor motors shall be cooled by suction gas passing over motor windings and shall have line break thermal and current overload protection.
2. Condenser-fan motors shall be totally enclosed, 3-phase type with permanently lubricated ball bearings and internal, automatic-reset thermal overload protection.
3. Indoor blower motor shall be of the 3-phase ball bearing type.
4. Induced-draft motor shall be of the permanently lubricated sealed bearing type with inherent automatic reset thermal overload protection.

L. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single location.

M. Integrated Economizer:

Consists of gear driven dampers, direct-drive motor in conjunction with microprocessor control system to provide primary cooling using outdoor air, temperature permitting, supplemented with mechanical cooling when necessary.

1. Dampers shall be low leakage type, not to exceed 20 cfm per sq ft leakage at 1 in. wg pressure differential when fully closed.
2. Motor shall have a spring return feature which shuts dampers upon a power interruption or unit shutdown.
3. Equipped with solid-state control that sets the economizer cut-in point at an economical level.
4. Capable of introducing up to 100% outdoor air.
5. Motor shall be controlled by 4 to 20 mA input.
6. Minimum position set point shall be adjustable by the control module DIP (Dual In-Line Package) switches in 10% increments.

N. Space Temperature Control:

1. Two-Stage Thermostat with Integral Sensor:
 - a. Thermostat shall be capable of automatic heating and cooling changeover without system switches.
 - b. Each thermostat or transmitter shall provide the following features:
 - 1) Separate locking heating and cooling set point adjustments concealed under a locking cover.
 - 2) An adjustable (3 to 30 F) deadband between heating and cooling set points.

- 3) Two LEDs concealed under locking cover to provide remote checkout of control system.

- 4) Load reactive time delays to ensure stable system performance.

2. Thermistor Type Room Sensor

- a. Sensor shall be capable of setback override.
- b. Set point adjustment may be made at sensor.
- c. Allows access to CCN (Carrier Comfort Network) (computer access required).

O. Special Features:

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

* 1. Optional Condenser Coil Materials:

- a. Unit shall be factory equipped with a condenser coil made from copper tubes and copper fins.
- b. Unit shall be factory equipped with a condenser coil made from corrosion resistant pre-coated aluminum fins.

* 2. Roof Curb:

Formed 14-gage galvanized steel with wood nailer strip. Supports full perimeter of unit.

* 3. Constant Volume Power Exhaust:

Package shall include 6 double-width, double inlet direct drives, forward-curved power exhaust fans with non-modulating dampers at the discharge. Motors (6) shall be 1 hp, 3-speed, single-phase design.

- a. Fans shall be statically and dynamically balanced.
- b. Exhaust hood and eliminators shall prevent objects from entering unit through the relief dampers.

* 4. Non-Modulating to Modulating Power Exhaust Conversion Package:

Package shall include modulating devices to maintain a field adjustable interior space pressure set point.

5. Barometric Relief Damper Package:

- a. Package shall relieve excess internal pressure and consist of damper assembly, hoods, damper screen, seal strip, and required hardware.
- b. Damper assembly shall close due to gravity upon unit shutoff.
- c. Unit mounted on vertical supply/return units only; can be duct mounted on horizontal applications.
- d. Each damper (6 total) shall consist of six 26-gage aluminum blades with a total area of 1,085 ft² each and a maximum velocity of 2600 ft/m.

6. Modulating Head Pressure Control:
Package shall consist of an accessory outdoor-air package and a solid-state control with condenser coil temperature sensor capable of modulating outdoor fan speed to maintain condensing temperature between 90 F and 100 F at outdoor ambient temperature down to -20 F.
7. Condenser Coil Hail Guard:
Hood with welded wire grille complete with support retainers and fasteners shall be provided for protection of condensing coil(s).
8. LP Gas Conversion Package:
ETL and ETL, Canada approved package allows unit to be field converted for use with LP (liquid propane) gas.
9. Electric Heat Package:
Shall be fully assembled for installation. The 208/230-v, 460-v, and 575-v units are designed in accordance with UL standards and all units feature a single point connection.
- * 10. Space Temperature Sensor (T-55):
This space temperature sensor shall determine the actual temperature in the conditioned space. Sensor shall be equipped with an override button for timed override. Override shall be configurable at 1 to 4 hours with a default of 1 hour.
- * 11. Space Temperature Sensor with Offset (T-56):
This space temperature sensor shall determine the actual temperature in the conditioned space. In addition, this accessory device shall provide a space temperature offset $\pm 5^{\circ}$ F.
- * 12. Enthalpy Control:
Shall provide efficient economizer control based on outdoor air enthalpy. Shall include logic and one sensor to calculate both dry and wet bulb of the outdoor air.
- * 13. Enthalpy Sensor:
 - a. For use with economizer only and enthalpy control.
 - b. Capable of measuring temperature of return air to provide economizer control with a comparison of outdoor temperature and humidity and return air temperature and humidity.
- * 14. Thermostat and Subbase Assembly:
To provide staged heating and cooling in addition to automatic (or manual) changeover and fan control.
15. Indoor Air Quality (CO₂) Sensor (Accessory Electronic Expansion Board Required):
 - a. Shall have the ability to provide demand ventilation IAQ control through the economizer with an indoor air quality sensor.
 - b. The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO₂ in parts per million. The set point shall have adjustment capability.
 - c. IAQ sensor must be powered by a separate field-supplied 24-v transformer.
 - d. IAQ sensor shall provide a 4 to 20 mA signal to the expansion board.
16. Electronic Expansion Board:
Shall provide the following:
 - a. Control of modulating economizer damper to maintain indoor air quality when outdoor conditions are suitable.
 - b. Discrete inputs for fan status, filter status, field-applied status, and demand limit.
 - c. Shall perform demand limit functions based on the state of the discrete input.
 - d. An output for the external alarm light indicator.
 - e. Smoke control modes including evacuation, smoke purge, pressurization, and shutdown.
 - f. Pre-occupancy purge shall be available.
 - g. Power to expansion board shall be provided by a separate 24-v power source.
 - h. All even numbered terminals shall have negative (-) potential. All odd numbered terminals shall have positive (+) potential.
17. Pressure Operated Unloader:
Additional steps for unloading can be obtained by the addition of accessory pressure-actuated suction cutoff unloaders to the lead compressor.
18. Roof Curb Retrofit Kit:
Shall provide duct support hardware to retrofit unit to an existing roof curb.
NOTE: Duct transition from new unit duct configuration to existing ductwork design will be required below the existing roof curb.
19. Field-Installed Interface Device (LID-2B):
Shall be field-mounted to provide a remote 40-character per line, 16-line display panel. Device is not qualified for outdoor installation. The interface device is for use with temporary installation during service of unit.

Guide specifications — 48/50EK,EY variable air volume units

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

HVAC Guide Specifications — Section 48/50EK,EY

Size Range: **50 to 65 Tons, Nominal**

Carrier Model Number: **48EK, 48EY, 50EK, 50EY**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor roof curb or slab mounted, electronically controlled heating and cooling unit utilizing semi-hermetic reciprocating type compressors for cooling duty and gas combustion or electric heaters for heating duty. Units shall discharge supply air horizontally or vertically as shown on contract drawings.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standard 360 and designed in accordance with UL Standard 1995.
- B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest edition) and NEC.
- C. Unit shall be tested and certified by ETL in accordance with ANSI Z21.47 Standards as a total package.
- D. Roof curb shall be NRCA approved.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation. Insulation shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards G21 and 22.
- F. Unit shall be manufactured in a facility registered to the ISO 9002 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. 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.
 2. Unit casing shall be capable of withstanding Federal test method Standard No. 141 (Method 6061) 500-hour salt spray test.

3. Sides shall have 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.
4. Interior cabinet surfaces shall be sheet metal lined or insulated with flexible fire-retardant material, coated on the air side and containing an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards G21 and 22.
5. Unit shall have a factory-installed condensate drain connection and an aluminized steel, sloped condensate drain pan to prevent standing water from accumulating.
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.
 - f. Statically and dynamically balanced.
 - g. Evaporator fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.
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.
- 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 metal enclosure for reduction of RFI (radio frequency interference).
- e. Self diagnostics.
- f. Personal lockout code for additional security.
- g. Critical frequency avoidance.
- h. PID set point control.
- i. RS232C/RS485 capability.
- j. Electronic thermal overload protection.

D. Compressors:

1. Reciprocating, semi-hermetic type only and shall be located for easy servicing.
2. Equipped with suction-cutoff type unloader(s).
3. Mounted on spring vibration isolators with an isolation efficiency of no less than 95%.
4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor, and suction and discharge service valves.
5. Maximum operating speed of 1800 rpm (30 rps).
6. Each on independent refrigerant and electrical circuits.

E. Coils:

1. Evaporator Coil:
 - a. Intertwined circuited, constructed of lanced aluminum fins mechanically bonded to seamless, internally enhanced copper tubes.
 - b. Full-face active type during full load and part load conditions.
 - c. Coils shall be leak tested at 150 psig and pressure tested at 450 psig.
2. Condenser Coil:
 - a. Constructed of aluminum fins mechanically bonded to seamless, internally grooved copper tubes.
 - b. Air-cooled condenser coils shall be leak tested at 150 psig and pressure tested at 450 psig.
3. All coils shall be same manufacturer as unit.

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.
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 and dynamically balanced.
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. Liquid line service valve.
2. Solid core filter drier.
3. Thermostatic expansion valve.
4. Fusible plug.

H. Filter Section:

Filter section shall consist of 2-in. thick (maximum), disposable fiberglass filters of commercially available sizes.

I. Controls, Safeties and Diagnostics:

1. Controls:

- a. Control shall be accomplished through the use of a factory-installed, microprocessor based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:
 - 1) Evaporator leaving-air temperature.
 - 2) Evaporator entering-air temperature.
 - 3) Economizer position.
 - 4) Minimum economizer set point.
 - 5) Morning warm-up set point.
 - 6) Outdoor-air temperature.

NOTE: A field-supplied remote start/stop switch contact closure is required for stand-alone applications to run unit during occupied time period.

Guide specifications — 48/50EK,EY variable air volume units (cont)

b. Controls shall be capable of performing the following functions:

- 1) Capacity control based on discharge air temperature and compensated by rate of change of return air temperature. Capacity control shall be accomplished through the use of an unloading device and compressor staging.
- 2) Perform a quick test to check the status of all input and output signals to the control system.
- 3) Control of integrated economizer operation.
- 4) Capable of single-step demand limit control.
- 5) Condenser fan cycling to maintain correct head pressure.
- 6) Morning warm-up.
- 7) Remote monitoring and set point adjustments.
- 8) In the event of a power failure, unit control system shall sequence the unit to restart beginning with the first stage of cooling or heating.
- 9) Nighttime free cooling.
- 10) Control boards shall be equipped with flashing LED(s) for diagnostics.
- 11) With gas heat, upon flame failure a new ignition sequence must start (rather than locking out heat)
- 12) Minimum heat on-time of 1 minute.

2. Safeties:

Unit components shall be equipped with the following protections:

a. Compressors:

- 1) Overtemperature (shuts down individual compressor).
- 2) Overcurrent (shuts down individual compressor).
- 3) Crankcase heaters.
- 4) High-pressure switch (shuts down individual compressor, automatic reset type).
- 5) Loss-of-charge switch (shuts down individual compressor, automatic reset type).
- 6) Compressor shall be prevented from restarting for a minimum of 5 minutes after shut-down. Compressor must run for at least 10 seconds after start-up.
- 7) Freeze protection thermostat (FPT) shall shut down unit operation based on coil temperature.

b. Heating Section:

Gas Heat:

- 1) High-temperature limit switch.
- 2) Redundant dual-stage gas valve.
- 3) Flame rollout switches.
- 4) Flame proving controls.
- 5) Speed sensor on each induced draft fan motor.

Electric Heat:

- 1) Automatic reset high-temperature limit switches.
- 2) Heat limiters (fusible links).
- 3) Overcurrent protection short-circuit fuses.
- 4) Branch circuit protection.

3. Diagnostics:

- a. Diagnostic display via the Carrier Comfort Network (CCN) shall be capable of indicating a safety lockout condition.
- b. Diagnostics must also be capable of displaying outputs of microprocessor controlled run test to verify operation of every thermistor, potentiometer, fan and compressor before unit is started.

J. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 360.
2. Unit shall be capable of mechanical cooling operation down to 35 F ambient outdoor temperature.
3. Provides multi-stage mechanical cooling capability and single-stage morning warm-up heating.
4. Unit provided with fan time delay to prevent cold starts.

K. Motors:

1. Compressor motors shall be cooled by suction gas passing over motor windings and shall have line break thermal and current overload protection.
2. Condenser-fan motors shall be totally enclosed, 3-phase type with permanently lubricated ball bearings and internal, automatic-reset thermal overload protection.
3. Indoor blower motor shall be of the 3-phase ball bearing type.
4. Induced-draft motor shall be of the permanently lubricated sealed bearing type with inherent automatic reset thermal overload protection.

L. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single location.

M. Integrated Economizer:

Consists of gear driven dampers, direct-drive motor in conjunction with microprocessor control system to provide primary cooling using outdoor air, temperature permitting, supplemented with mechanical cooling when necessary.

1. Dampers shall be low leakage type, not to exceed 20 cfm per sq ft leakage at 1 in. wg pressure differential when fully closed.
2. Motor shall have a spring return feature which shuts dampers upon a power interruption or unit shutdown.
3. Equipped with solid-state control that sets the economizer cut-in point at an economical level.
4. Capable of introducing up to 100% outdoor air.
5. Economizer motor shall be controlled by a 4 to 20 mA input.
6. Minimum damper position set point shall be adjustable by control module DIP (Dual In-Line Package) switches in 10% increments.

N. Special Features:

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

- * 1. Optional Condenser Coil Materials:
 - a. Unit shall be factory equipped with a condenser coil made from copper tubes and copper fins.
 - b. Unit shall be factory equipped with a condenser coil made from corrosion resistant pre-coated aluminum fins.
- * 2. Roof Curb:

Formed 14-gage galvanized steel with wood nailer strip. Supports full perimeter of unit.
- * 3. 100% Modulating Power Exhaust:

Package shall include 6 double-width, double inlet direct drives, forward-curved power exhaust fans staged independently to maintain a field adjustable interior space pressure set point.

 - a. Fans shall be statically and dynamically balanced.
 - b. Exhaust hood and eliminators shall prevent objects from entering unit through the relief dampers.
- 4. Barometric Relief Damper Package:
 - a. Package shall relieve excess internal pressure and consist of damper assembly, hoods, damper screen, seal strip, and required hardware.
 - b. Damper assembly shall close due to gravity upon unit shutoff.
 - c. Unit mounted on vertical supply/return units only; can be duct mounted on horizontal applications.
 - d. Each damper (6 total) shall consist of six 26-gage, aluminum blades with a total area of 1.085 ft² each and a maximum velocity of 2600 ft/m.

5. Modulating Head Pressure Control:

Package shall consist of an accessory outdoor-air package and a solid-state control with condenser coil temperature sensor capable of modulating outdoor fan speed to maintain condensing temperature between 90 F and 100 F at outdoor ambient temperature down to -20 F.

6. Condenser Coil Hail Guard:

Hood with welded wire grille complete with support retainers and fasteners shall be provided for protection of condensing coil.

7. LP Gas Conversion Package:

ETL and ETL, Canada, approved package allows unit to be field converted for use with LP (liquid propane) gas.

8. Electric Heat Package:

Shall be fully-assembled for installation. The 208/230-v, 460-v, and 575-v units are designed in accordance with UL standards and all units feature a single point connection.

* 9. Space Temperature Sensor (T-55):

This space temperature sensor shall determine the actual temperature in the conditioned space. Sensor shall be equipped with an override button for timed override of 1 to 4 hours, field-configurable, with a default of one hour.

* 10. Enthalpy Control:

Shall provide efficient economizer control based on outdoor air enthalpy. Shall include logic and one sensor to calculate both dry and wet bulb of the outdoor air.

* 11. Enthalpy Sensor:

- a. For use with economizer only and enthalpy control.
- b. Capable of measuring temperature of return air to provide economizer control with a comparison of outdoor temperature and humidity and return air temperature and humidity.

* 12. Thermostat and Subbase Assembly:

To provide staged heating and cooling in addition to automatic (or manual) changeover and fan control.

13. Indoor Air Quality (CO₂) Sensor (Accessory Electronic Expansion Board Required):

- a. Shall have the ability to provide demand ventilation IAQ control through the economizer with an indoor air quality sensor.
- b. The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO₂ in parts per million. The set point shall have adjustment capability.
- c. The IAQ sensor must be powered by a separate field-supplied 24-v transformer.
- d. The IAQ sensor shall provide a 4 to 20 mA signal to the accessory expansion board.

Guide specifications — 48/50EK,EY variable air volume units (cont)

14. Electronic Expansion Board:

Shall provide the following:

- a. Control of modulating economizer damper to maintain indoor air quality when outdoor conditions are suitable.
- b. Discrete inputs for fan status, filter status, field-applied status, and demand limit.
- c. Shall perform demand limit functions based on the state of the discrete input.
- d. An output for the external alarm light indicator.
- e. Smoke control modes including evacuation, smoke purge, pressurization, and shutdown.
- f. Pre-occupancy purge shall be available.

15. Roof Curb Retrofit Kit:

Shall provide duct support hardware to retrofit unit to an existing roof curb.

NOTE: Duct transition from new unit duct configuration to existing ductwork design will be required below the existing roof curb.

16. Field-Installed Interface Device (LID-2B):

Shall be field-mounted to provide a remote 40-character per line, 16-line display panel. Device is not qualified for outdoor installation. The interface device is for use with temporary installation during service of unit.

