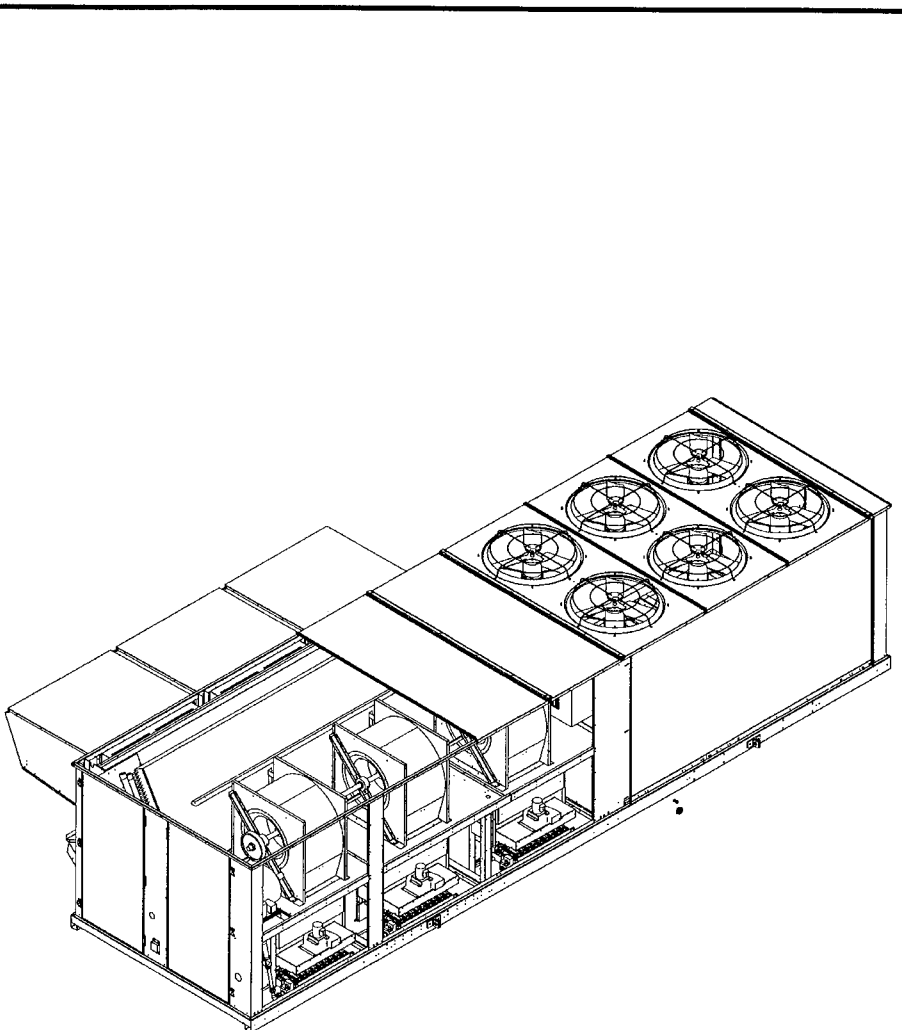




Advance Product Data

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
- indoor air quality (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)

- digital air volume (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.

The VAV units have up to 6 steps of unloading for low load operation. Constant volume (CV) 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 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 (dual in-line package) 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.

Table of contents

	Page
Features/Benefits	1-3
Model Number Nomenclature	4,5
Physical Data	6-10
Options and Accessories	11,12
Base Unit Dimensions	13-17
Accessory Dimensions	18,19
Selection Procedure	19
Performance Data	20-28
Electrical Data	29-34
Controls	35-42
Control Wiring	43-45
Typical Wiring Schematics	46-51
Application Data	52
Guide Specifications	53-61

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) are equipped with Variable Frequency Drive (VFD). High efficiency motors are 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

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) are
equipped with Variable Frequency Drive (VFD)
High efficiency motors are 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



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
NOMINAL CAPACITY (tons)	50	55
OPERATING WEIGHT (lb)		
Unit		
Al/Al*	6915/7155	7165/7405
Al/Cu*	7186/7426	7572/7812
Roof Curb†	585	585
COMPRESSOR		
Quantity...Type (Ckt 1, Ckt 2)	1 06EA265, 1 ..06EA250	1 .06EA275, 1 .06EA250
Number of Refrigerant Circuits	2	2
Oil (oz) (Ckt 1, Ckt 2)	304, 224	304, 224
REFRIGERANT TYPE	R-22	
Operating Charge (lb-oz)		
Circuit 1**	50-0	57-0
Circuit 2	40-0	48-6
CONDENSER COIL	Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins	
Quantity	1	1
Rows...Fins/in.	3 15	3.. 15
Total Face Area (sq ft)	66.6	100.0
CONDENSER FAN	Propeller Type	
Nominal Cfm	30,000	43,900
Quantity...Diameter (in.)	4 .30	6 .30
Motor Hp (1075 Rpm)	1	1
EVAPORATOR COIL	Cross-Hatched 1/2-in. Copper Tubes, Aluminum Plate Fins, Intertwined Circuits	
Rows...Fins/in.	4. 17	4...17
Total Face Area (sq ft)	45.0	45.0
EVAPORATOR FAN	Centrifugal Type	
Quantity...Size (in.)	3. 20 x 15	3 20 x 15
Type Drive	Belt	Belt
Nominal Cfm	20,000	22,000
Motor Hp	15	20
Motor Frame Size	S254T	S256T
Motor Bearing Type	20††	25††
Maximum Allowable Rpm	1200	1200
Motor Pulley Pitch Diameter	6 1	6 7
Nominal Motor Shaft Diameter (in.)	1.625	1.875
Fan Pulley Pitch Diameter (in.)	11 1	11 1
Nominal Fan Shaft Diameter (in.)	1 15/16	1 15/16
Belt, Quantity...Type	2. 5VX570	2.. 5VX570
Length (in.)	57	57
Pulley Center Line Distance (in.)	15 2-17.5	14 7-17.2
Factory Speed Setting (rpm)	741	930
FURNACE SECTION		
Rollout Switch Cutout Temp (F) ‖	225	225
Burner Orifice Diameter (in. drill size)		
Natural Gas Std	.120. 31	.120 .31
Liquid Propane Alt	096 41	096. 41
Thermostat Heat Anticipator Setting (amps)		
Stage 1	0 1	0 1
Stage 2	0 1	0.1
Gas Input (Btuh) Stage 1	582,000/ 873,000	582,000/ 873,000
Stage 2	776,000/1,164,000	776,000/1,164,000
Efficiency (Steady State) (%)	81	81
Temperature Rise Range	10-40/30-60	10-40/30-60
Manifold Pressure (in. wg)		
Natural Gas Std	3.3	3.3
Liquid Propane Alt	3.3	3.9
Gas Valve Quantity	3.	3
Field Gas Connection Size (in. - FPT)	2.5	2.5
HIGH-PRESSURE SWITCH (psig)		
Cutout	426	426
Reset (Auto.)	320	320
LOW-PRESSURE SWITCH (psig)		
Cutout	7	7
Reset (Auto.)	22	22
RETURN-AIR FILTERS		
Quantity...Size (in.)	16...24 x 20 x 2	16...24 x 20 x 2
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)	675	

LEGEND

Al — Aluminum
Cu — Copper

*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

††Motor and drive shown will deliver approximately 2.5 in. wg net external static pressure

‖ Rollout switch is manual reset.

NOTE: Weights do not include Variable Frequency Drive (VFD). Add in weight of VFD for VAV (variable air volume) units from table on right.

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	118	178
40	240	140	180

UNIT 48EJ,EK,EW,EY	064D/E	068D/E
NOMINAL CAPACITY (tons)	60	65
OPERATING WEIGHT (lb) Unit Al/Al* Al/Cu* Roof Curb†	7415/7655 7904/8144 585	7590/7830 8241/8481 585
COMPRESSOR Quantity...Type (Ckt 1, Ckt 2) Number of Refrigerant Circuits Oil (oz) (Ckt 1, Ckt 2)	1 06EA275, 1. 06EA265 2 304, 304	2...06EA275 2 304, 304
REFRIGERANT TYPE Operating Charge (lb-oz) Circuit 1** Circuit 2	R-22	
CONDENSER COIL Quantity Rows...Fins/in. Total Face Area (sq ft)	Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins 2 3...15 100	2 4...15 100
CONDENSER FAN Nominal Cfm Quantity...Diameter (in.) Motor Hp (1075 Rpm)	Propeller Type	
	43,900 6 .30 1	43,900 6 .30 1
EVAPORATOR COIL Rows...Fins/in. Total Face Area (sq ft)	Cross-Hatched 1/2-in. Copper Tubes, Aluminum Plate Fins, Intertwined Circuits	
	4..17 48 1	4..17 48 1
EVAPORATOR FAN Quantity...Size (in.) Type Drive Nominal Cfm Motor Hp Motor Frame Size Motor Bearing Type Maximum Allowable Rpm Motor Pulley Pitch Diameter Nominal Motor Shaft Diameter (in.) Fan Pulley Pitch Diameter (in.) Nominal Fan Shaft Diameter (in.) Belt, Quantity...Type Length (in.) Pulley Center Line Distance (in.) Factory Speed Setting (rpm)	Centrifugal Type	
	3...20 x 15 Belt 24,000 30†† 40 S284T S286T S324T Ball 1200 5 3 8 1 9 4 1.875 1.875 2.125 9.1 12.5 13.6 11 1/16 3...5VX530 2...5VX630 2 5VX650 53 63 65 14 7-17 2 14 7-17 2 14 2-17.0 1019 1134 1214	3..20 x 15 Belt 26,000 30 40 S284T S286T S324T Ball 1200 5.9 9 4 1.875 1.875 2 125 12.5 9 5 13 6 11 1/16 3. 5VX550 2 5VX650 55 65 14 7-17 2 14 7-17 2 14.3-17.0 1087 1214
FURNACE SECTION Rollout Switch Cutout Temp (F) Burner Orifice Diameter (in. ...drill size) Natural Gas Std Liquid Propane Alt Thermostat Heat Anticipator Setting (amps) Stage 1 Stage 2 Gas Input (Btuh) Stage 1 Stage 2 Efficiency (Steady State) (%) Temperature Rise Range Manifold Pressure (in. wg) Natural Gas Std Liquid Propane Alt Gas Valve Quantity Field Gas Connection Size (in. - FPT)	225 120 31 .096 41 0.1 0.1 582,000/ 873,000 776,000/1,164,000 81 10-40/30-60 3 3 3.3 3 2 5	
	225 120 31 .096. 41 0.1 0 1 582,000/ 873,000 776,000/1,164,000 81 10-40/30-60 3 3 3.3 3 2.5	
HIGH-PRESSURE SWITCH (psig) Cutout Reset (Auto.)	426 320	
LOW-PRESSURE SWITCH (psig) Cutout Reset (Auto.)	7 22	
RETURN-AIR FILTERS Quantity...Size (in.)	16...24 x 20 x 2	
POWER EXHAUST Motor, Quantity...Hp Fan, Diameter...Width (in.) Weight (lb)	Direct Drive, 3-Speed, Single-Phase Motor (Factory-Wired for High Speed) and Forward Curved Fan 6 1 11 10 675	

LEGEND

Al — Aluminum
Cu — Copper

*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.

††Motor and drive shown will deliver approximately 2.5 in. wg net external static pressure.

|| Rollout switch is manual reset

NOTE: Weights do not include Variable Frequency Drive (VFD). Add in weight of VFD for VAV (variable air volume) units from table on right.

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	118	178
40	240	140	180

Physical data (electric heating units)

UNIT 50EJ,EK,EW,EY	054	058
NOMINAL CAPACITY (tons)	50	55
OPERATING WEIGHT (lb)		
Unit		
Al/Al*	6675	6925
Al/Cu*	6946	7332
Roof Curb†	585	585
COMPRESSOR		
Quantity...Type (Ckt 1, Ckt 2)	1 . 06EA265, 1 . 06EA250	1.. 06EA275, 1 . 06EA250
Number of Refrigerant Circuits	2	2
Oil (oz) (Ckt 1, Ckt 2)	304, 224	304, 224
REFRIGERANT TYPE	R-22	
Operating Charge (lb-oz)		
Circuit 1**	50-0	57-0
Circuit 2	48-0	48-6
CONDENSER COIL	Cross-Hatched 3/8-in Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins	
Quantity	1	1
Rows...Fins/in.	3.. 15	3 15 2. 15
Total Face Area (sq ft)	66.6	100
CONDENSER FAN	Propeller Type	
Nominal Cfm	30,000	43,900
Quantity...Diameter (in.)	4...30	6 30
Motor Hp (1075 Rpm)	1	1
EVAPORATOR COIL	Cross-Hatched 1/2-in. Copper Tubes, Aluminum Plate Fins, Intertwined Circuits	
Rows...Fins/in.	4 17	4...17
Total Face Area (sq ft)	45 0	45 0
EVAPORATOR FAN	Centrifugal Type	
Quantity...Size (in.)	3. 20 x 15	3 20 x 15
Type Drive	Belt	Belt
Nominal Cfm	20,000	22,000
Motor Hp	15	20
Motor Frame Size	S254T	S256T
Motor Bearing Type	20††	25††
Maximum Allowable Rpm	Ball	Ball
Motor Pulley Pitch Diameter	1200	1200
Nominal Motor Shaft Diameter (in.)	4 7	6 7
Fan Pulley Pitch Diameter (in.)	1 625	1 625
Nominal Fan Shaft Diameter (in.)	11 1	11.1
Belt, Quantity...Type	1 15/16	1 15/16
Length (in.)	2.. 5VX570	2 5VX570
Pulley Center Line Distance (in.)	57	57
Factory Speed Setting (rpm)	15 2-17 5	14 7-17 2
	741	962
HIGH-PRESSURE SWITCH (psig)		
Cutout	426	426
Reset (Auto.)	320	320
LOW-PRESSURE SWITCH (psig)		
Cutout	7	7
Reset (Auto.)	22	22
RETURN-AIR FILTERS		
Quantity...Size (in.)	16. .24 x 20 x 2	16 24 x 20 x 2
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)	675	

LEGEND

Al — Aluminum
Cu — Copper

*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.

††Motor and drive shown will deliver approximately 2.5 in. wg net external static pressure.

NOTE: Weights do not include Variable Frequency Drive (VFD). Add in weight of VFD for VAV (variable air volume) units from table on right

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	118	178
40	240	140	180

UNIT 50EJ,EK,EW,EY	064	068
NOMINAL CAPACITY (tons)	60	65
OPERATING WEIGHT (lb) Unit Al/Al* Al/Cu* Roof Curb†	7175 7663 585	7350 8001 585
COMPRESSOR Quantity...Type (Ckt 1, Ckt 2) Number of Refrigerant Circuits Oil (oz) (Ckt 1, Ckt 2)	1 ..06EA275, 1.. 06EA265 2 304, 304	2...06EA275 2 304, 304
REFRIGERANT TYPE Operating Charge (lb-oz) Circuit 1** Circuit 2	R-22	
	68-0 68-0	75-0 75-0
CONDENSER COIL Quantity Rows...Fins/in. Total Face Area (sq ft)	Cross-Hatched 3/8-in. Copper Tubes, Aluminum Lanced, Aluminum Pre-Coated, or Copper Plate Fins	
	2 3..15 100	2 4..15 100
CONDENSER FAN Nominal Cfm Quantity...Diameter (in.) Motor Hp (1075 Rpm)	Propeller Type	
	43,900 6...30 1	43,900 6..30 1
EVAPORATOR COIL Rows...Fins/in. Total Face Area (sq ft)	Cross-Hatched 1/2-in. Copper Tubes, Aluminum Plate Fins, Intertwined Circuits	
	4...17 48.1	4..17 48.1
EVAPORATOR FAN Quantity...Size (in.) Type Drive Nominal Cfm Motor Hp Motor Frame Size Motor Bearing Type Maximum Allowable Rpm Motor Pulley Pitch Diameter Nominal Motor Shaft Diameter (in.) Fan Pulley Pitch Diameter (in.) Nominal Fan Shaft Diameter (in.) Belt, Quantity...Type Length (in.) Pulley Center Line Distance (in.) Factory Speed Setting (rpm)	Centrifugal Type	
	3...20 x 15 Belt 24,000 25 S284T 30†† 40 S286T S324T Ball 1200 5 3 1.875 1.875 9 4 9 1 12.5 13.6 1 15/16 3 .5VX530 2...5VX630 2...5VX650 53 63 65 15.2-17.5 14.7-17.2 14.2-17.0 930 1134 1214	3.. 20 x 15 Belt 26,000 25 S284T 30†† 40 S286T S324T Ball 1200 6 7 1.875 1.875 9.4 12.5 9.5 13.6 1 15/16 3 .5VX550 2 .5VX650 55 65 14.7-17.2 14.7-17.2 14.3-17.0 1087 1214
HIGH-PRESSURE SWITCH (psig) Cutout Reset (Auto.)	426 320	426 320
LOW-PRESSURE SWITCH (psig) Cutout Reset (Auto.)	7 22	7 22
RETURN-AIR FILTERS Quantity...Size (in.)	16...24 x 20 2	16...24 x 20 x 2
POWER EXHAUST Motor, Quantity...Hp Fan, Diameter...Width (in.) Weight (lb)	Direct Drive, 3-Speed, Single-Phase Motor (Factory-Wired for High Speed) and Forward Curved Fan 6 1 11 10 675	

LEGEND

Al — Aluminum
Cu — Copper

*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.

††Motor and drive shown will deliver approximately 2.5 in. wg net external static pressure

NOTE: Weights do not include Variable Frequency Drive (VFD). Add in weight of VFD for VAV (variable air volume) units from table right.

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	118	178
40	240	140	180

Physical data (cont)

HEATING CAPACITIES AND EFFICIENCIES

UNIT 48EJ,EK,EW,EY	HEATING INPUT (Btuh) Stage 2/Stage 1	OUTPUT CAPACITY (Btuh)	TEMPERATURE RISE (F)	STEADY STATE EFFICIENCY (%)	MINIMUM HEATING CFM
D054	776,000/582,000	628,560	10-40	81	17,477
E054	1,164,000/873,000	942,840	30-60	81	16,713
D058	776,000/582,000	628,560	10-40	81	17,477
E058	1,164,000/873,000	942,840	30-60	81	16,713
D064	776,000/582,000	628,560	10-40	81	18,000
E064	1,164,000/873,000	942,840	30-60	81	18,000
D068	776,000/582,000	628,560	10-40	81	19,500
E068	1,164,000/873,000	942,840	30-60	81	19,500

ELECTRIC HEATING MINIMUM AIRFLOW

UNIT 50EJ,EK,EW,EY	MINIMUM HEATING AIRFLOW (cfm)
054	15,000
058	16,500
064	18,000
068	19,500

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
Electronic Programmable Thermostat		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

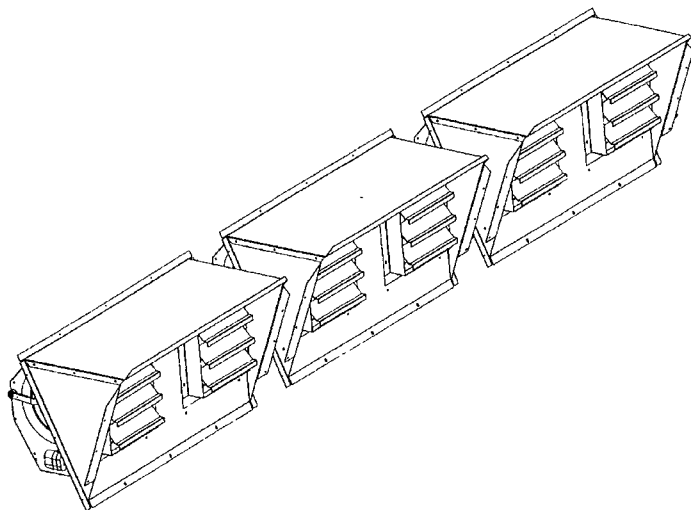
CV — Constant Volume
 IAQ — Indoor Air Quality
 VAV — Variable Air Volume

*Factory installed

†Field Installed

**Accessory must be installed in ductwork on horizontal supply/return units. Not available as a factory-installed option on horizontal supply/return units

POWER EXHAUST FANS



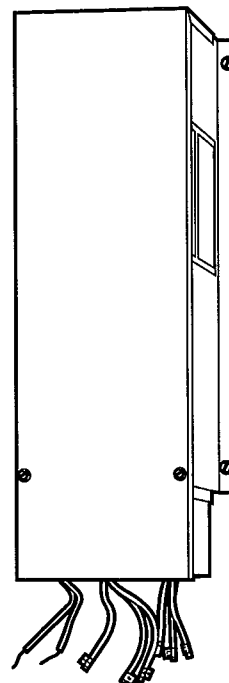
When combined with the economizer, the power exhaust can be used to exhaust the return air and eliminate over-pressurization of the building. The power exhaust utilizes multiple forward-curved fans, each driven by its own motor.

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.

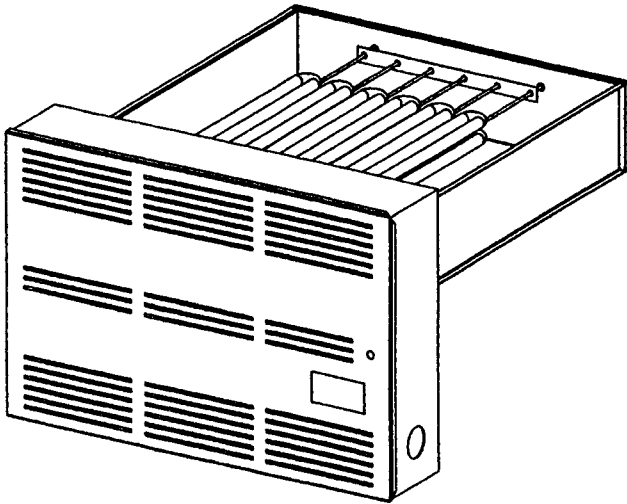
HEAD PRESSURE CONTROL



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.

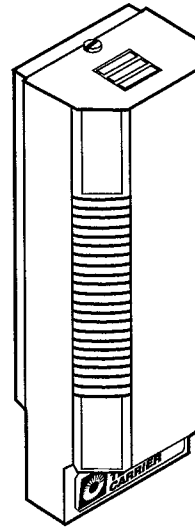
Options and accessories (cont)

ELECTRIC HEATER



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

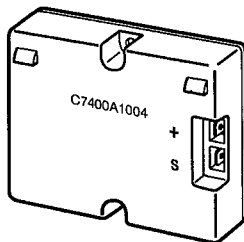
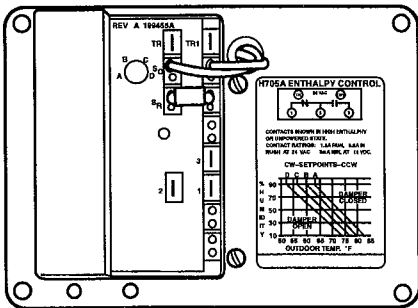
CO₂ SENSOR



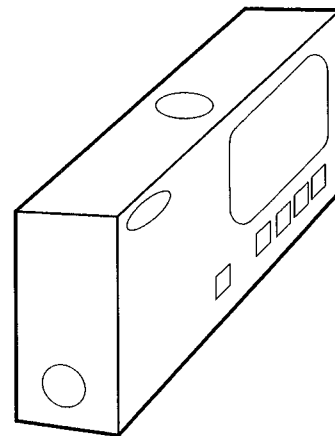
This sensor monitors building interior or return air carbon dioxide levels and automatically activates the outdoor fan and opens the economizer for rapid dilution of CO₂ levels above an adjustable set point.

LID-2B FIELD-INSTALLED INTERFACE DEVICE

ENTHALPY CONTROL FOR INTEGRATED ECONOMIZER

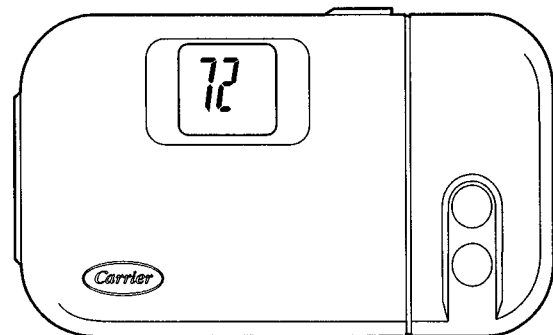


Enthalpy economizer controls help provide efficient, economical economizer operation. Solid-state enthalpy control includes the logic and one sensor to calculate both dry and wet bulb of the outdoor air to provide an accurate enthalpy reading. It then decides when to energize the economizer based on 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).



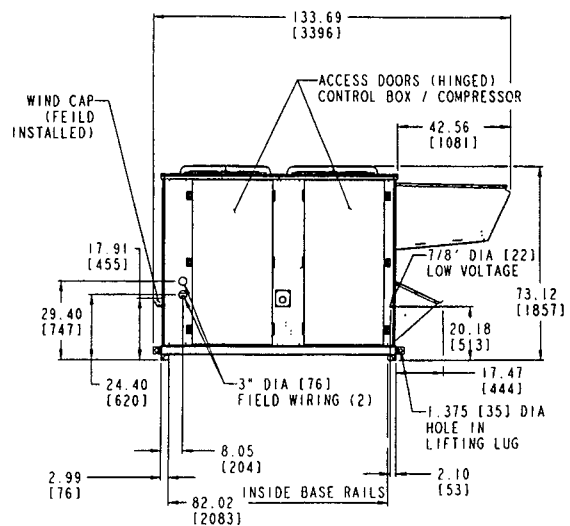
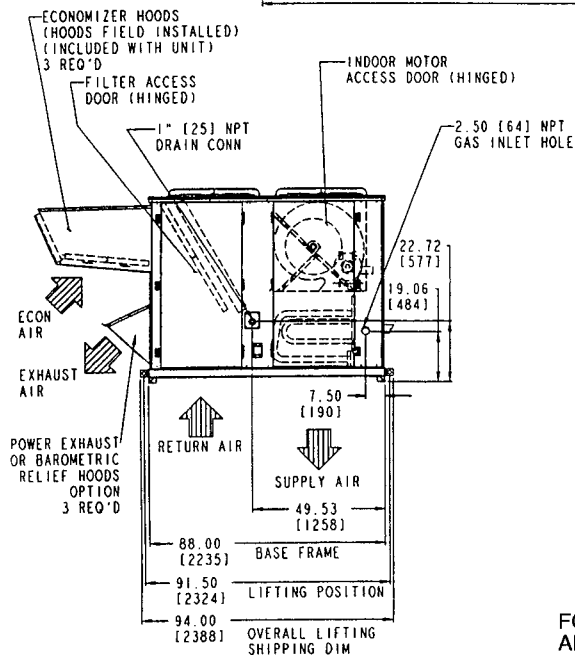
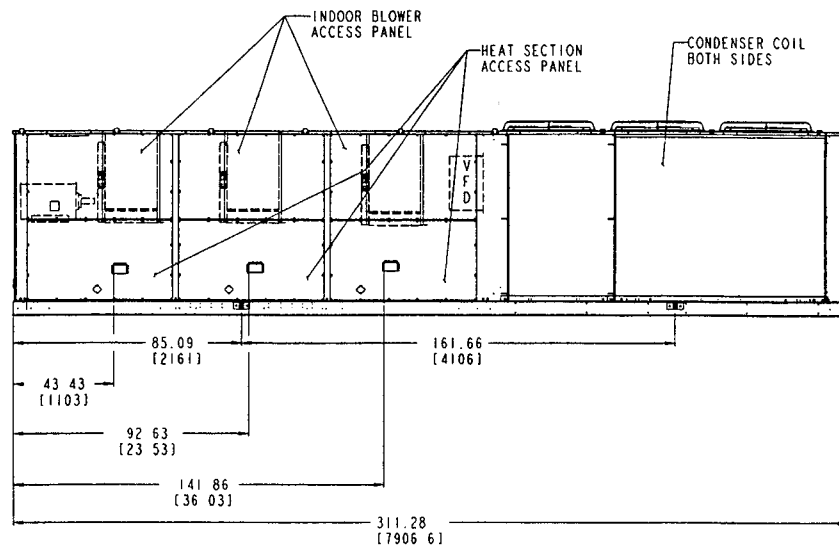
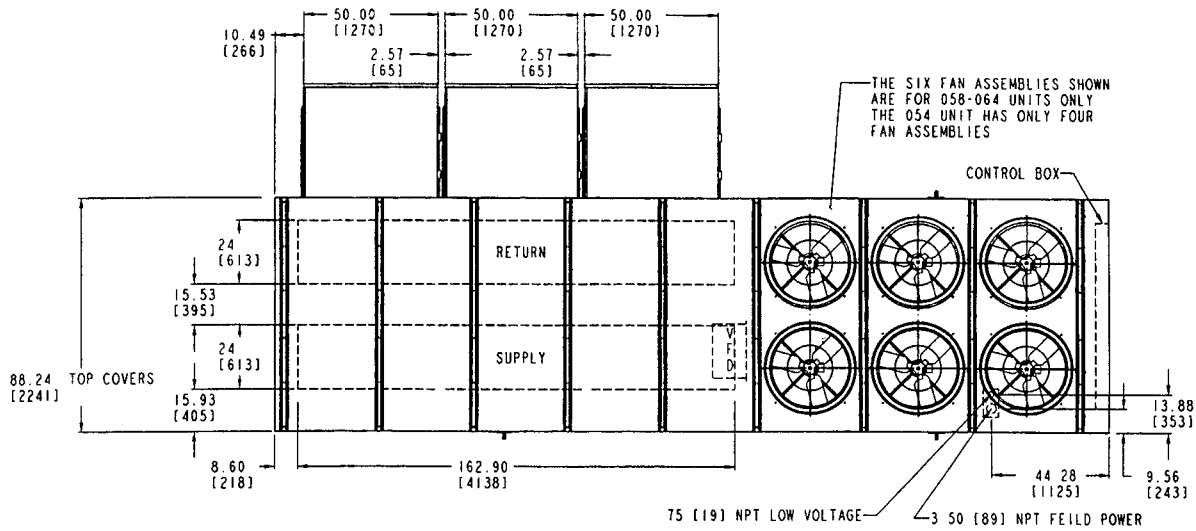
The LID-2B (30HX900007) enhanced display provides access to the unit software for specific application time schedules and control configurations. The LID-2B requires a separate dedicated 24-v power source.

ELECTRONIC PROGRAMMABLE THERMOSTAT



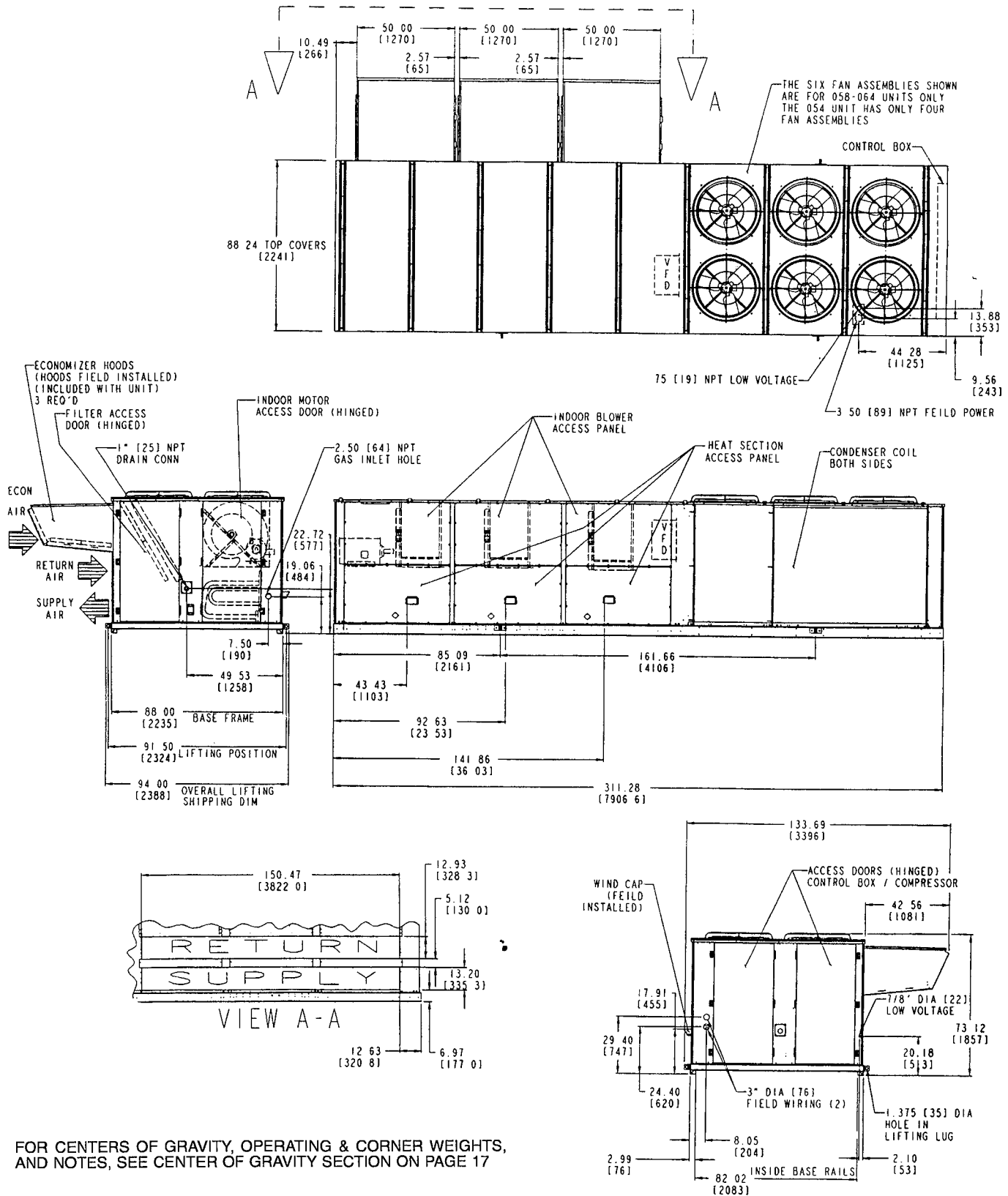
Carrier's electronic programmable thermostat provides efficient temperature control by allowing programming of heating and cooling setbacks and set ups with provisions for weekends and holidays.

Base unit dimensions — 48EJ,EK054-068 units

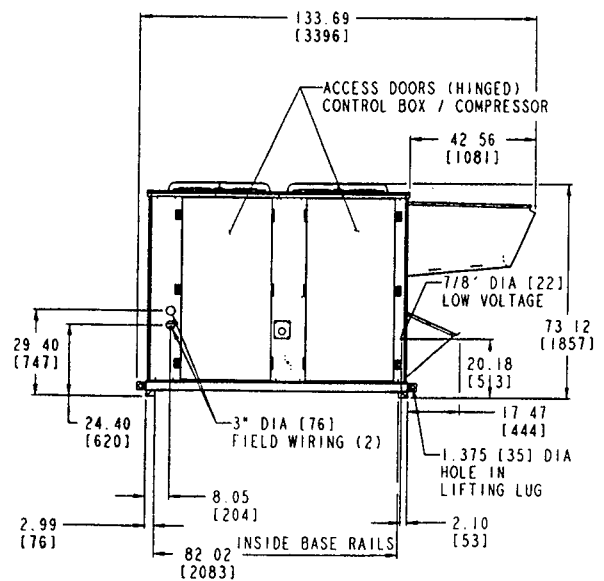
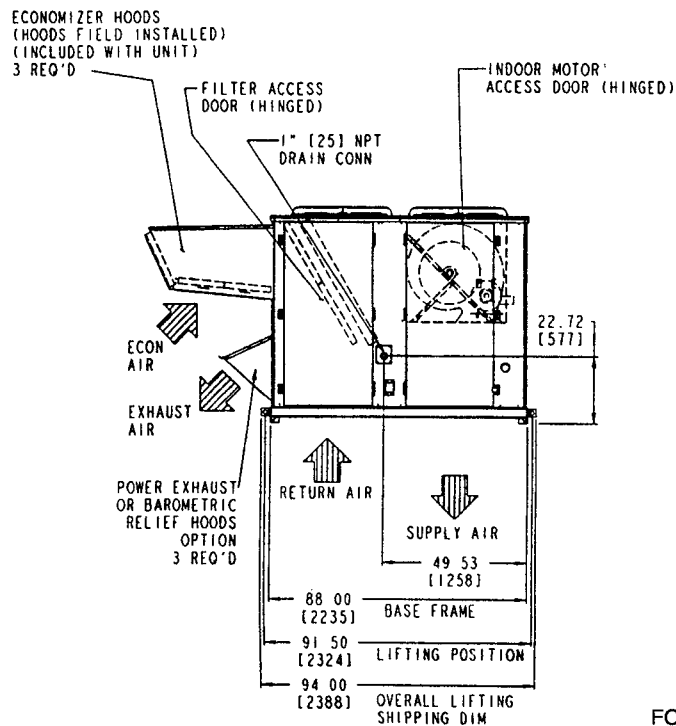
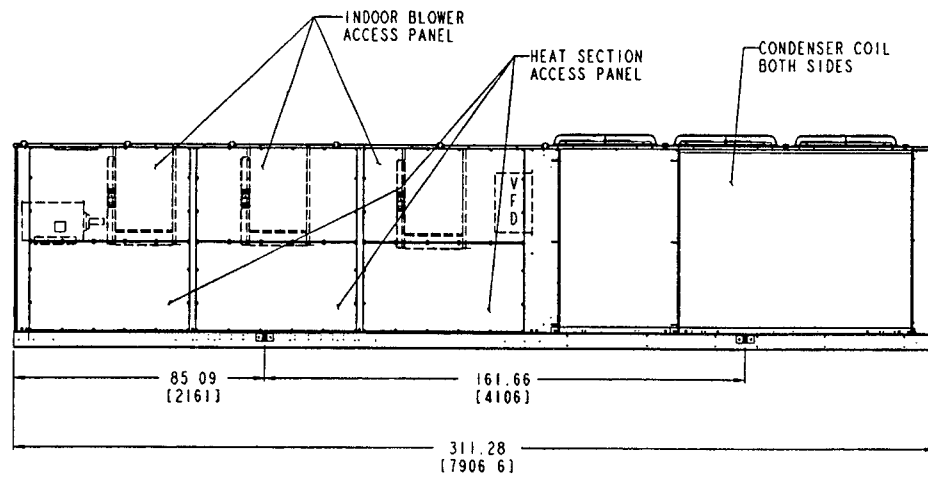
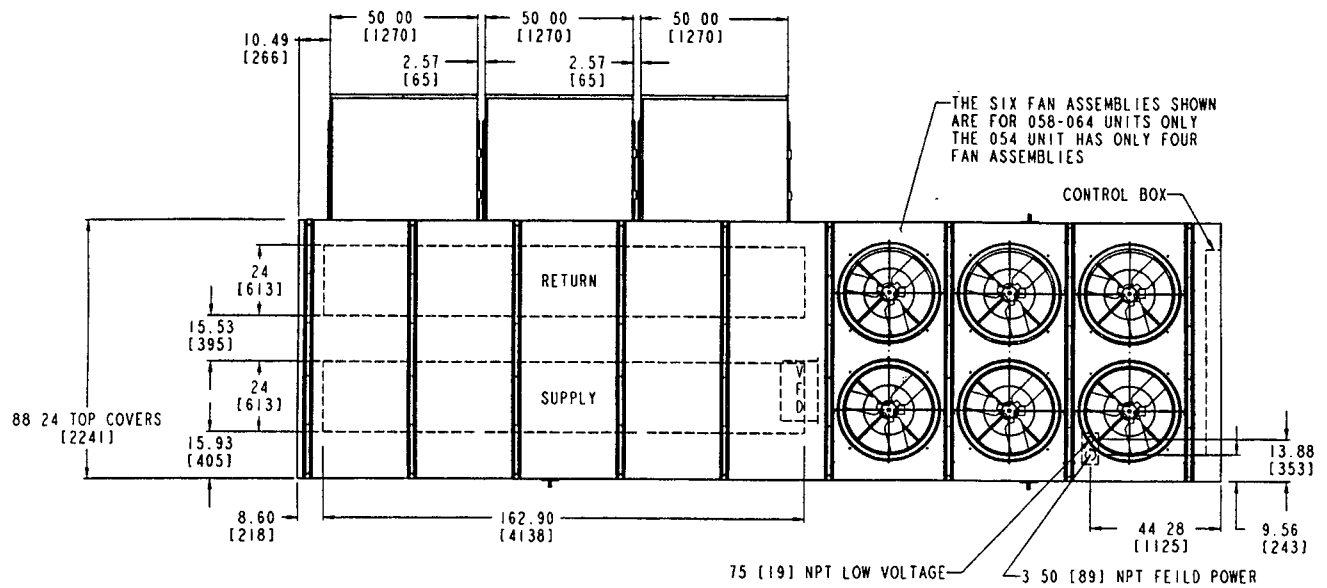


FOR CENTERS OF GRAVITY, OPERATING & CORNER WEIGHTS, AND NOTES, SEE CENTER OF GRAVITY SECTION ON PAGE 17.

Base unit dimensions — 48EW,EY054-068 units



Base unit dimensions — 50EJ,EK054-068 units



FOR CENTERS OF GRAVITY, OPERATING & CORNER WEIGHTS, AND NOTES, SEE CENTER OF GRAVITY SECTION ON PAGE 17

10.49 [266] 50.00 [1270] 50.00 [1270] 50.00 [1270] 2.57 [65] 2.57 [65] 2.57 [65] 88 24 TOP COVERS [2241] 13.88 [353] 44.28 [1125] 9.56 [243] 75 [19] NPT LOW VOLTAGE 3 50 [89] NPT FIELD POWER

THE SIX FAN ASSEMBLIES SHOWN ARE FOR 058-064 UNITS ONLY THE 054 UNIT HAS ONLY FOUR FAN ASSEMBLIES

CONTROL BOX

ECONOMIZER HOODS (HOODS FIELD INSTALLED) (INCLUDED WITH UNIT) 3 REQ'D

FILTER ACCESS DOOR (HINGED)

1" [25] NPT DRAIN CONN

ECON AIR

RETURN AIR

SUPPLY AIR

INDOOR MOTOR ACCESS DOOR (HINGED)

INDOOR BLOWER ACCESS PANEL

HEAT SECTION ACCESS PANEL

CONDENSER COIL BOTH SIDES

22.72 [577] 49.53 [1258] 88.00 [2235] 91.50 [2324] 94.00 [2388] OVERALL LIFTING SHIPPING DIM

85.09 [2161] 161.66 [4106] 311.28 [7906.6]

133.69 [3396] 42.56 [1081] 73.12 [1857] 20.18 [513] 1.375 [35] DIA HOLE IN LIFTING LUG 2.10 [53] 82.02 [2083] 8.05 [204] 2.99 [76] 24.40 [620] 29.40 [747] 7/8" DIA [22] LOW VOLTAGE

ACCESS DOORS (HINGED) CONTROL BOX / COMPRESSOR

3" DIA [76] FIELD WIRING (2)

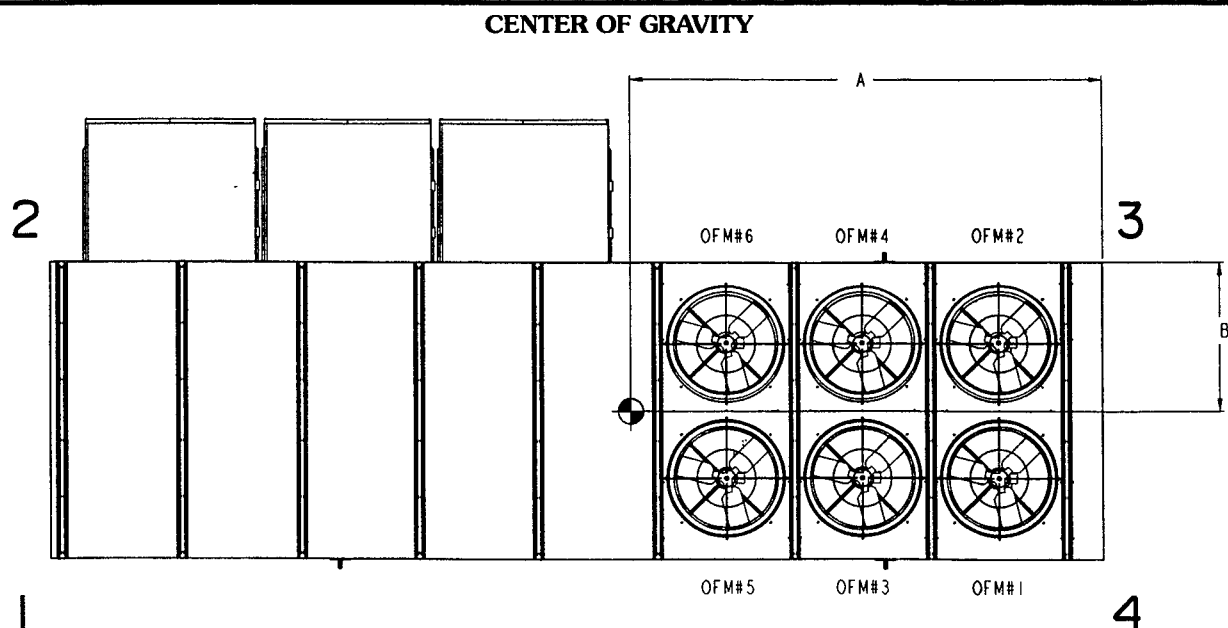
INSIDE BASE RAILS

VIEW A-A

150.47 [3822.0] 12.93 [328.3] 5.12 [130.0] 13.20 [335.3] 12.63 [320.8] 6.97 [177.0]

FOR CENTERS OF GRAVITY, OPERATING & CORNER WEIGHTS, AND NOTES, SEE CENTER OF GRAVITY SECTION ON PAGE 17

Base unit dimensions (cont)

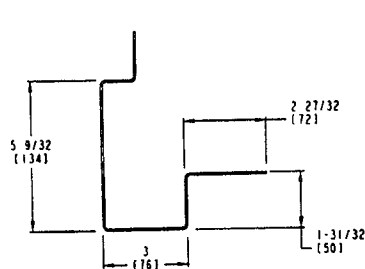
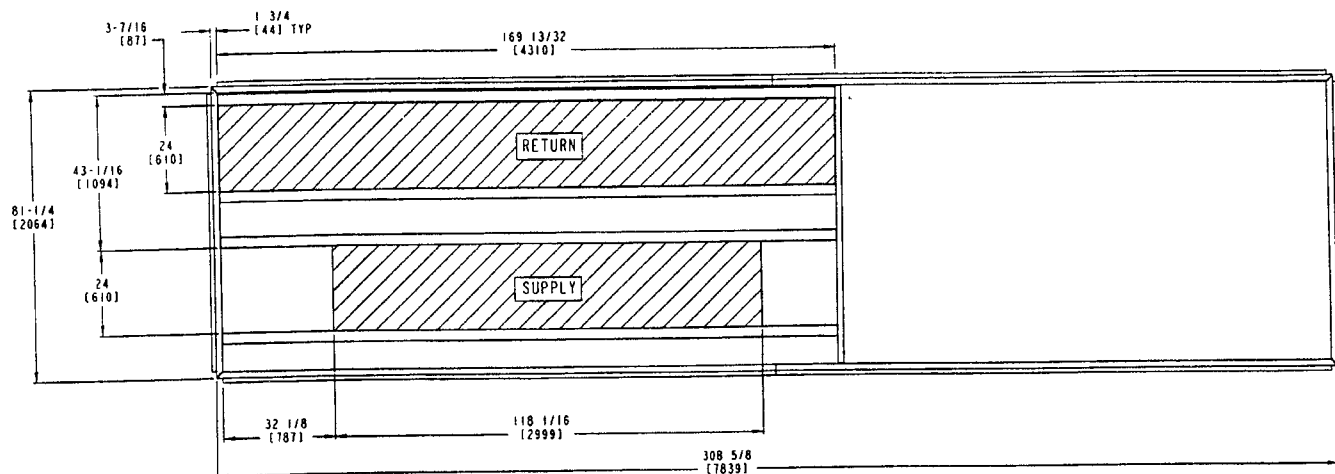


UNIT SIZE	OPERATING WEIGHT		CENTER OF GRAVITY				CORNER WEIGHTS							
			in.		mm		lb				kg			
	lb	kg	A	B	A	B	1	2	3	4	1	2	3	4
48EJD,EKD,EWD,EYD054	6915	3137	130.9	46.9	3325	1192	1551	1357	1870	2138	704	615	848	970
48EJE,EKE,EWE,EYE054	7155	3245	133.8	47.4	3397	1204	1656	1418	1882	2199	751	643	854	997
48EJD,EKD,EWD,EYD058	7165	3250	132.1	47.5	3354	1207	1641	1399	1899	2227	744	634	861	1010
48EJE,EKE,EWE,EYE058	7405	3359	139.5	49.6	3544	1260	1872	1448	1782	2304	849	657	808	1045
48EJD,EKD,EWD,EYD064	7415	3363	125.3	45.2	3181	1149	1533	1450	2154	2277	695	658	977	1033
48EJE,EKE,EWE,EYE064	7655	3472	132.2	47.2	3359	1199	1744	1508	2042	2361	791	684	926	1071
48EJD,EKD,EWD,EYD068	7590	3443	127.7	46.6	3242	1184	1649	1464	2106	2372	748	664	955	1076
48EJE,EKE,EWE,EYE068	7830	3552	134.7	48.6	3422	1235	1871	1517	1988	2453	849	688	902	1113
50EJ,EK,EW,EY054	6675	3028	128.1	46.1	3254	1171	1439	1308	1870	2058	653	593	848	933
50EJ,EK,EW,EY058	6925	3141	124.6	45.4	3164	1153	1429	1342	2011	2142	648	609	912	972
50EJ,EK,EW,EY064	7175	3255	122.2	44.7	3104	1135	1431	1386	2145	2213	649	629	973	1004
50EJ,EK,EW,EY068	7350	3334	120.6	44.6	3063	1133	1444	1404	2219	2283	655	637	1007	1036

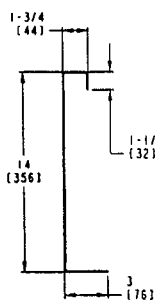
NOTES:

- Weights include economizer (STD).
-  Center of gravity.
- Do not locate adjacent units with flue discharge facing economizer inlet. Minimum clearances to be:
 Adjacent Units: 15'-0" [4572]
 Top of Units: No overhang
 Condenser Coil: 4'-0" [1219]
 Economizer Side: 6'-0" [1829]
 Heat Side: 4'-0" [1219]
 Filter Access Side: 15'-0" [4572] (For Removal of Evaporator Coil)
- For smaller service and operational clearances, contact Carrier Application Engineering department.
- Bottom ducts designed to be attached to accessory roof curb. It is recommended the ducts must be supported by cross braces as done on accessory roof curb.
- Dimensions in [] are in millimeters
- Dimensions are in inches

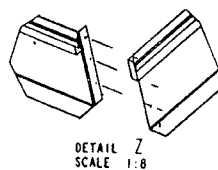
Accessory dimensions



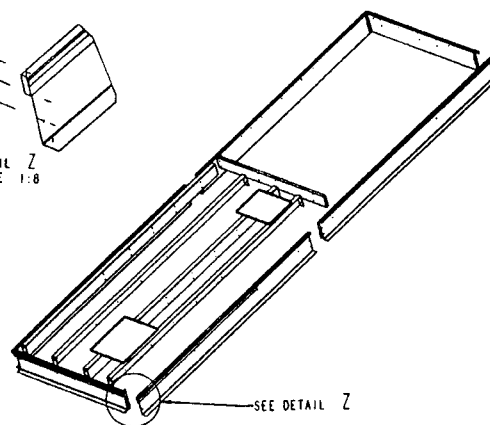
BASE RAIL CROSS SECTION
TYP (2) SIDES



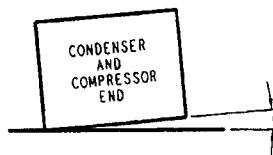
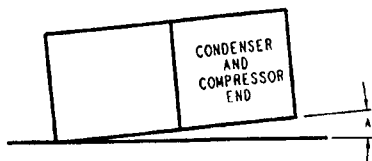
ROOF CURB CROSS SECTION
TYP 4 SIDES



DETAIL Z
SCALE 1:8



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



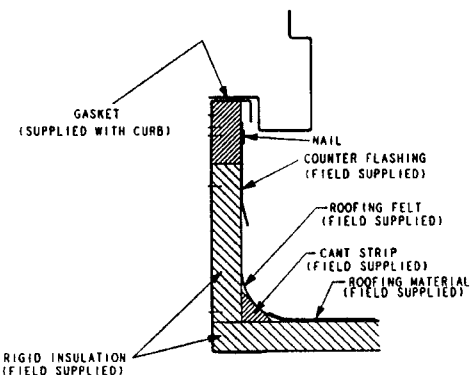
NOTES

- 1 Unless otherwise specified all dimensions are to outside of part
2. Roof curb accessory CRRFCURB009A00 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.

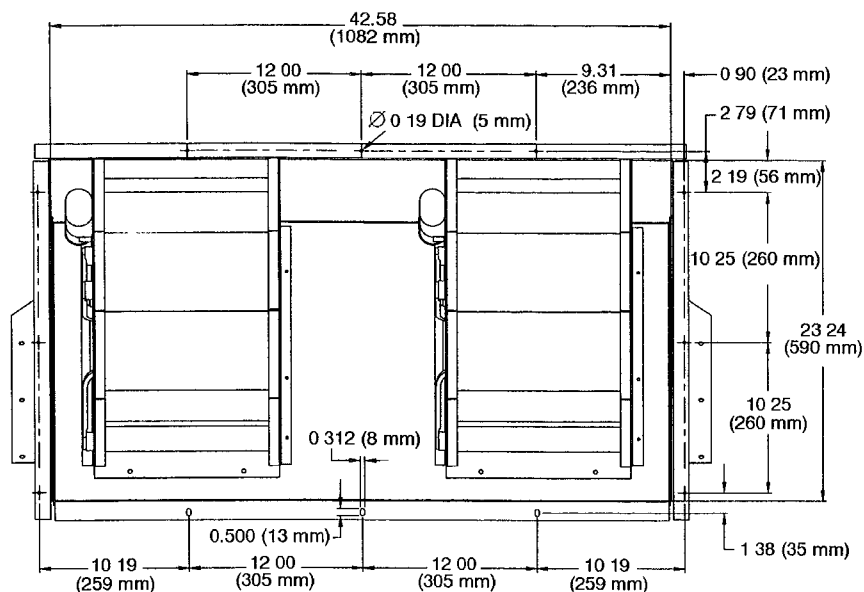
UNIT LEVELING TOLERANCES

DIMENSIONS					
A			B		
Deg.	in.	mm	Deg.	in.	mm
1.0	5 43	138	50	75	10

From edge of unit to horizontal



POWER EXHAUST AND BAROMETRIC RELIEF



LEGEND

Ø — Diameter

NOTES.

1. Unless otherwise specified, all dimensions are to outside of part
2. Dimensions are in inches
3. There are 3 assemblies per unit.

Selection procedure (with example)

I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 700,000 Btuh
 Sensible Heat Capacity (SHC) 425,000 Btuh
 Required Heating Capacity 600,000 Btuh
 Condenser Entering Air Temperature 95 F
 Indoor Air Temperature 80 F ewb, 67 F ewb
 Evaporator Air Quantity 21,000 cfm
 External Static Pressure 1.4 in. wg
 Electrical Characteristics (V-Ph-Hz) 460-3-60
 Constant volume, vertical supply/return, gas unit is specified.

II Select unit based on required cooling capacity.

Enter Cooling Capacities table at condenser entering temperature of 95 F. Unit 48EJ064 at 21,000 cfm and 67 ewb will provide a total capacity of 731,000 Btuh and a SHC of 545,000 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 Heat Capacities and Efficiencies table, note that unit 48EJD064 will provide 628,560 Btuh with an input of 776,000 Btuh. Calculation is 776,000 Btuh x 81% efficiency = 628,560 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 21,000 cfm. Find that the fan speed is 968 rpm and the power required is 22.81 bhp. In the Evaporator-Fan Motor Performance table, note that the 25 hp 460 v motor will deliver 28.9 bhp. The standard efficiency 25 hp motor is acceptable.

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		
		Evaporator Air — Ewb (F)					
		62	67	72	62	67	72
75	TC	631	677	736	646	687	—
	SHC	625	537	415	646	568	—
	kW	42.5	44.1	46.0	43.0	44.4	—
85	TC	605	647	703	621	655	—
	SHC	604	524	404	621	556	—
	kW	46.1	47.7	49.9	46.8	48.2	—
95	TC	578	616	671	596	623	—
	SHC	578	513	393	594	543	—
	kW	49.7	51.4	53.7	50.4	51.8	—
100	TC	551	586	636	570	591	—
	SHC	550	499	382	569	529	—
	kW	53.2	55.1	57.5	54.1	55.4	—
115	TC	523	554	603	544	559	—
	SHC	522	487	367	542	515	—
	kW	56.7	58.5	61.2	57.8	58.9	—

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:

- Direct interpolation is permissible. Do not extrapolate.
- 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

- 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.

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

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

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	—	699	744	—
	SHC	676	581	—	699	615	—
	kW	42.2	43.7	—	42.7	44.0	—
85	TC	655	700	—	672	709	—
	SHC	654	567	—	672	602	—
	kW	45.7	47.3	—	46.4	47.8	—
95	TC	626	667	—	645	674	—
	SHC	626	555	—	643	588	—
	kW	49.3	51.0	—	50.0	51.4	—
105	TC	596	634	—	617	640	—
	SHC	595	540	—	616	573	—
	kW	52.8	54.7	—	53.7	55.0	—
115	TC	566	600	—	589	605	—
	SHC	565	527	—	587	557	—
	kW	56.2	58.0	—	57.3	58.4	—

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

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

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

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

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

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

- 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.

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

- Cooling capacities are gross and do not include deduction for indoor fan motor heat.
- 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,EY 064 (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			27,000/0.06		
		Evaporator Air — Ewb (F)														
		62	67	72	62	67	72	62	67	72	62	67	72	62	67	72
75	TC	687	752	821	717	778	849	736	800	872	756	—	—	773	—	—
	SHC	573	488	409	631	537	433	685	573	454	727	—	—	759	—	—
	KW	48.5	50.7	53.0	49.5	51.7	54.0	50.2	52.5	54.7	50.9	—	—	51.5	—	—
85	TC	659	720	788	685	746	813	703	766	834	724	—	—	741	793	—
	SHC	558	475	388	617	517	414	666	560	435	704	—	—	733	636	—
	KW	52.4	54.9	57.6	53.5	56.0	58.6	54.4	56.9	59.3	55.2	—	—	55.9	57.8	—
95	TC	630	686	752	652	712	774	673	731	795	691	—	—	708	755	—
	SHC	544	459	374	600	500	396	645	545	427	680	—	—	702	623	—
	KW	56.4	59.2	62.0	57.6	60.3	63.0	58.4	61.1	63.9	59.4	—	—	60.3	62.3	—
105	TC	599	653	717	619	679	735	640	695	757	659	704	—	675	718	—
	SHC	529	446	361	583	481	390	623	532	408	653	571	—	668	606	—
	KW	60.3	63.3	66.4	61.5	64.6	67.4	62.6	65.5	68.5	63.5	66.1	—	64.5	66.8	—
115	TC	570	619	679	589	646	696	609	659	718	626	668	—	641	679	—
	SHC	513	432	352	563	462	378	601	517	399	620	556	—	634	591	—
	KW	64.0	67.3	70.7	65.5	68.7	71.7	66.7	69.7	73.0	67.8	70.3	—	68.7	70.9	—

48/50EJ,EK,EW,EY 068 (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			27,000/0.06		
		Evaporator Air — Ewb (F)														
		62	67	72	62	67	72	62	67	72	62	67	72	62	67	72
75	TC	716	783	855	746	810	884	767	833	908	787	—	—	793	—	—
	SHC	584	498	417	644	547	442	698	584	463	741	—	—	751	—	—
	kW	47.8	50.0	52.2	48.8	50.9	53.2	49.5	51.8	53.9	50.2	—	—	50.4	—	—
85	TC	686	750	820	713	777	847	732	797	869	754	—	—	760	—	—
	SHC	569	484	396	629	527	422	680	571	443	718	—	—	727	—	—
	kW	51.6	54.1	56.8	52.7	55.2	57.7	53.7	56.1	58.4	54.4	—	—	54.6	—	—
95	TC	656	715	783	679	741	806	700	762	828	720	—	—	725	—	—
	SHC	555	468	381	612	510	404	657	556	436	693	—	—	700	—	—
	kW	55.6	58.3	61.1	56.8	59.4	62.1	57.6	60.2	63.0	58.6	—	—	58.8	—	—
105	TC	624	680	746	644	707	766	666	723	789	686	734	—	692	738	—
	SHC	540	454	368	594	490	397	635	542	416	666	582	—	671	593	—
	kW	59.4	62.4	65.5	60.6	63.7	66.5	61.7	64.5	67.5	62.6	65.1	—	62.9	65.4	—
115	TC	593	644	707	614	672	725	634	686	748	652	695	—	657	699	—
	SHC	524	441	359	574	472	385	613	527	407	633	567	—	637	578	—
	kW	63.1	66.3	69.7	64.5	67.8	70.6	65.7	68.7	71.9	66.8	69.3	—	67.1	69.5	—

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.

FAN PERFORMANCE — VERTICAL DISCHARGE UNITS

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		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	420	2.89	486	3.60	539	4.27	584	4.93	624	5.59	660	6.25	694	6.91	725	7.57
12,000	473	4.27	537	5.10	589	5.87	633	6.62	673	7.36	709	8.10	742	8.83	773	9.56
15,000	556	7.05	616	8.06	666	8.99	709	9.89	748	10.76	783	11.62	816	12.47	846	13.31
16,000	584	8.18	643	9.25	692	10.24	735	11.19	773	12.11	808	13.01	841	13.90	871	14.78
17,000	612	9.42	670	10.56	718	11.60	760	12.60	799	13.56	833	14.51	866	15.44	896	16.36
18,000	640	10.78	697	11.98	745	13.08	786	14.12	824	15.13	859	16.12	891	17.10	921	18.06
19,000	669	12.26	724	13.51	771	14.67	813	15.77	850	16.83	884	17.86	916	18.87	946	19.88
20,000	698	13.86	752	15.17	798	16.38	839	17.53	876	18.64	910	19.72	942	20.78	972	21.82
21,000	726	15.58	780	16.96	825	18.22	866	19.42	902	20.58	936	21.71	968	22.81	997	23.89
22,000	756	17.44	808	18.87	853	20.19	892	21.45	929	22.65	962	23.82	993	24.97	1023	26.10
23,000	785	19.43	836	20.92	880	22.30	919	23.60	955	24.86	988	26.08	1019	27.27	1049	28.44
24,000	814	21.56	864	23.11	907	24.54	946	25.90	982	27.20	1015	28.47	1045	29.70	1074	30.91
25,000	843	23.83	892	25.44	935	26.92	973	28.33	1008	29.68	1041	31.00	1072	32.28	1100	33.53
26,000	873	26.25	921	27.91	963	29.45	1001	30.91	1035	32.31	1068	33.67	1098	35.00	1127	36.29
27,000	903	28.82	950	30.53	991	32.12	1028	33.63	1062	35.09	1094	36.49	1124	37.86	1153	39.21

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

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	755	8.24	783	8.92	809	9.60	835	10.29	859	10.98	883	11.68	905	12.39	927	13.10
12,000	802	10.30	830	11.04	857	11.78	882	12.52	906	13.27	930	14.03	953	14.79	974	15.55
15,000	875	14.15	903	14.99	929	15.83	954	16.67	978	17.51	1002	18.35	1024	19.19	1046	20.04
16,000	900	15.65	927	16.53	954	17.40	979	18.27	1003	19.14	1026	20.01	1048	20.89	1070	21.76
17,000	925	17.27	952	18.18	978	19.09	1003	19.99	1027	20.90	1050	21.80	1072	22.70	1094	23.61
18,000	950	19.01	977	19.95	1003	20.90	1028	21.84	1051	22.77	1075	23.71	1097	24.64	1118	25.58
19,000	975	20.87	1002	21.85	1028	22.83	1052	23.80	1076	24.77	1099	25.74	1121	26.71	1143	27.67
20,000	1000	22.85	1027	23.87	1052	24.89	1077	25.90	1101	26.90	1124	27.90	1146	28.90	1167	29.90
21,000	1025	24.96	1052	26.02	1077	27.07	1102	28.12	1126	29.16	1148	30.19	1170	31.23	1192	32.26
22,000	1051	27.21	1077	28.31	1103	29.40	1127	30.48	1151	31.55	1173	32.62	1195	33.69	—	—
23,000	1076	29.59	1103	30.73	1128	31.85	1152	32.97	1176	34.08	1198	35.19	—	—	—	—
24,000	1102	32.11	1128	33.28	1153	34.45	1178	35.61	1201	36.75	—	—	—	—	—	—
25,000	1128	34.77	1154	35.99	1179	37.19	—	—	—	—	—	—	—	—	—	—
26,000	1154	37.57	1180	38.83	—	—	—	—	—	—	—	—	—	—	—	—
27,000	1180	40.53	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	949	13.81	970	14.54	990	15.26
12,000	996	16.31	1016	17.09	1037	17.86
15,000	1067	20.88	1088	21.73	1108	22.59
16,000	1091	22.64	1112	23.52	1131	24.40
17,000	1115	24.51	1136	25.42	1156	26.33
18,000	1139	26.51	1160	27.45	1180	28.39
19,000	1164	28.64	1184	29.60	—	—
20,000	1188	30.90	—	—	—	—
21,000	—	—	—	—	—	—
22,000	—	—	—	—	—	—
23,000	—	—	—	—	—	—
24,000	—	—	—	—	—	—
25,000	—	—	—	—	—	—
26,000	—	—	—	—	—	—
27,000	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES

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

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

3. Variable air volume units will operate down to 70 cfm/ton in the cooling mode. 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)

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		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	397	2.68	463	3.34	516	3.97	560	4.58	600	5.18	635	5.79	668	6.40	699	7.02
12,000	446	3.96	510	4.73	562	5.46	606	6.15	645	6.84	680	7.52	713	8.19	744	8.87
15,000	520	6.51	582	7.47	632	8.35	675	9.19	714	10.00	749	10.79	781	11.58	812	12.36
16,000	545	7.55	606	8.58	656	9.51	699	10.39	737	11.25	772	12.08	804	12.91	834	13.72
17,000	571	8.69	631	9.78	680	10.77	722	11.70	760	12.60	795	13.48	827	14.34	857	15.19
18,000	596	9.94	655	11.09	704	12.13	746	13.11	784	14.06	818	14.98	850	15.88	880	16.77
19,000	622	11.29	680	12.50	728	13.60	770	14.63	808	15.62	842	16.59	874	17.53	904	18.46
20,000	648	12.75	705	14.03	752	15.18	794	16.27	831	17.31	865	18.31	897	19.30	927	20.27
21,000	674	14.33	730	15.67	777	16.88	818	18.02	855	19.10	889	20.16	921	21.18	950	22.19
22,000	700	16.03	755	17.43	802	18.70	842	19.89	879	21.02	913	22.12	944	23.19	974	24.24
23,000	726	17.85	780	19.31	826	20.64	867	21.88	903	23.06	937	24.20	968	25.32	997	26.41
24,000	752	19.79	806	21.32	851	22.70	891	23.99	927	25.22	961	26.41	992	27.57	1021	28.71
25,000	779	21.87	831	23.45	876	24.89	916	26.24	952	27.52	985	28.75	1015	29.96	1044	31.13
26,000	805	24.07	857	25.72	901	27.21	940	28.61	976	29.94	1009	31.23	1039	32.47	1068	33.69
27,000	832	26.41	883	28.12	926	29.67	965	31.12	1000	32.50	1033	33.83	1063	35.13	1092	36.39

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

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	728	7.64	755	8.26	781	8.89	806	9.53	830	10.17	853	10.82	876	11.47	897	12.13
12,000	773	9.55	800	10.23	826	10.92	851	11.61	875	12.30	898	12.99	920	13.70	941	14.40
15,000	840	13.14	867	13.91	893	14.69	918	15.46	941	16.24	964	17.01	986	17.79	1008	18.57
16,000	863	14.53	890	15.34	916	16.15	940	16.95	964	17.76	987	18.56	1009	19.37	1030	20.18
17,000	886	16.04	913	16.88	938	17.72	963	18.56	987	19.39	1009	20.23	1031	21.06	1053	21.90
18,000	909	17.65	936	18.53	961	19.40	986	20.27	1009	21.14	1032	22.00	1054	22.87	1075	23.73
19,000	932	19.38	958	20.29	984	21.20	1008	22.10	1032	23.00	1055	23.89	1076	24.79	1098	25.68
20,000	955	21.23	982	22.17	1007	23.11	1031	24.05	1055	24.98	1077	25.90	1099	26.83	1120	27.75
21,000	978	23.19	1005	24.17	1030	25.15	1054	26.12	1078	27.08	1100	28.04	1122	28.99	1143	29.95
22,000	1001	25.27	1028	26.29	1053	27.31	1077	28.31	1101	29.31	1123	30.30	1145	31.28	1166	32.27
23,000	1025	27.48	1051	28.54	1076	29.59	1100	30.63	1124	31.66	1146	32.68	1168	33.70	1189	34.72
24,000	1048	29.82	1074	30.92	1100	32.00	1124	33.08	1147	34.14	1169	35.20	1191	36.25	—	—
25,000	1072	32.29	1098	33.42	1123	34.55	1147	35.66	1170	36.76	1192	37.85	—	—	—	—
26,000	1095	34.89	1121	36.06	1146	37.22	1170	38.37	1193	39.51	—	—	—	—	—	—
27,000	1119	37.62	1145	38.84	1170	40.04	1194	41.22	—	—	—	—	—	—	—	—

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

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	918	12.79	938	13.46	958	14.13
12,000	962	15.11	982	15.82	1002	16.54
15,000	1028	19.36	1049	20.14	1068	20.93
16,000	1051	20.99	1071	21.80	1090	22.61
17,000	1073	22.73	1093	23.57	1113	24.41
18,000	1096	24.59	1116	25.46	1135	26.32
19,000	1118	26.57	1138	27.47	1158	28.36
20,000	1141	28.67	1161	29.59	1180	30.51
21,000	1163	30.90	1183	31.85	—	—
22,000	1186	33.25	—	—	—	—
23,000	—	—	—	—	—	—
24,000	—	—	—	—	—	—
25,000	—	—	—	—	—	—
26,000	—	—	—	—	—	—
27,000	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES

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

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

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

FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS

48EW054-068 AND 48EY054-068 (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		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	447	2.9	508	3.6	558	4.2	601	4.8	640	5.4	675	6.0	707	6.6	738	7.3
12,000	509	4.4	567	5.1	615	5.8	657	6.5	695	7.2	729	7.9	761	8.6	791	9.3
15,000	606	7.3	659	8.2	704	9.0	744	9.9	780	10.7	813	11.5	844	12.2	874	13.0
16,000	639	8.5	690	9.4	734	10.3	773	11.2	809	12.0	842	12.9	873	13.7	902	14.5
17,000	672	9.8	721	10.8	765	11.7	803	12.6	838	13.5	871	14.4	901	15.3	930	16.1
18,000	705	11.2	753	12.3	795	13.3	833	14.2	868	15.1	900	16.1	930	17.0	959	17.8
19,000	738	12.8	785	13.9	826	14.9	864	15.9	898	16.9	929	17.8	959	18.8	987	19.7
20,000	772	14.5	817	15.6	858	16.7	894	17.7	928	18.8	959	19.7	989	20.7	1016	21.7
21,000	806	16.3	850	17.5	889	18.6	925	19.7	958	20.8	989	21.8	1018	22.8	1046	23.8
22,000	840	18.3	883	19.5	921	20.7	956	21.8	989	22.9	1019	24.0	1048	25.0	1075	26.1
23,000	874	20.4	915	21.7	953	22.9	987	24.1	1019	25.2	1049	26.3	1078	27.4	1105	28.5
24,000	908	22.7	948	24.0	985	25.3	1019	26.5	1050	27.6	1080	28.8	1108	29.9	1135	31.0
25,000	942	25.1	982	26.5	1018	27.8	1051	29.0	1082	30.2	1111	31.4	1138	32.6	1165	33.7
26,000	976	27.7	1015	29.1	1050	30.4	1083	31.7	1113	33.0	1142	34.2	1169	35.4	1195	36.6
27,000	1011	30.4	1048	31.9	1083	33.2	1115	34.6	1145	35.9	1173	37.1	1200	38.4	—	—

48EW054-068 AND 48EY054-068 (50 THRU 65 TONS) (cont)

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	766	7.9	794	8.50	820	9.13	844	9.76	868	10.40	891	11.04	914	11.69	935	12.34
12,000	820	9.9	847	10.62	872	11.30	897	11.99	921	12.68	943	13.37	965	14.07	987	14.77
15,000	901	13.8	928	14.59	953	15.36	977	16.14	1001	16.92	1023	17.69	1045	18.47	1066	19.26
16,000	929	15.3	955	16.14	981	16.95	1005	17.75	1028	18.56	1050	19.37	1072	20.18	1093	20.98
17,000	957	17.0	983	17.81	1008	18.65	1032	19.49	1055	20.33	1077	21.16	1099	22.00	1120	22.84
18,000	986	18.7	1011	19.60	1036	20.48	1060	21.35	1083	22.22	1105	23.08	1126	23.95	1147	24.82
19,000	1014	20.6	1040	21.53	1064	22.43	1088	23.34	1110	24.24	1132	25.14	1154	26.03	1174	26.93
20,000	1043	22.6	1068	23.58	1092	24.52	1116	25.46	1138	26.39	1160	27.32	1181	28.25	—	—
21,000	1072	24.8	1097	25.78	1121	26.75	1144	27.72	1167	28.68	1188	29.64	—	—	—	—
22,000	1101	27.1	1126	28.11	1150	29.12	1173	30.12	1195	31.11	—	—	—	—	—	—
23,000	1130	29.5	1155	30.58	1179	31.62	—	—	—	—	—	—	—	—	—	—
24,000	1160	32.1	1184	33.20	—	—	—	—	—	—	—	—	—	—	—	—
25,000	1190	34.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

48EW054-068 AND 48EY054-068 (50 THRU 65 TONS) (cont)

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	956	12.99	976	13.66	996	14.32
12,000	1008	15.48	1028	16.19	1047	16.90
15,000	1087	20.04	1106	20.82	1126	21.61
16,000	1113	21.80	1133	22.61	1152	23.42
17,000	1140	23.68	1160	24.52	1179	25.36
18,000	1167	25.68	1187	26.55	—	—
19,000	1195	27.82	—	—	—	—
20,000	—	—	—	—	—	—
21,000	—	—	—	—	—	—
22,000	—	—	—	—	—	—
23,000	—	—	—	—	—	—
24,000	—	—	—	—	—	—
25,000	—	—	—	—	—	—
26,000	—	—	—	—	—	—
27,000	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

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

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

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

Performance data (cont)

FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (cont)

50EW054-068 AND 50EY054-068 (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		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	424	2.7	485	3.3	535	3.9	577	4.5	615	5.0	650	5.6	682	6.2	712	6.7
12,000	481	4.0	540	4.7	588	5.4	629	6.1	666	6.7	700	7.3	732	8.0	762	8.6
15,000	570	6.7	624	7.6	669	8.4	709	9.1	745	9.9	779	10.6	809	11.4	838	12.1
16,000	600	7.8	653	8.7	697	9.6	737	10.4	772	11.2	805	11.9	836	12.7	864	13.5
17,000	631	9.0	682	10.0	725	10.9	764	11.7	799	12.6	832	13.4	862	14.2	891	15.0
18,000	661	10.4	711	11.4	754	12.3	792	13.2	827	14.0	859	14.9	889	15.7	917	16.6
19,000	692	11.8	740	12.8	782	13.8	820	14.8	854	15.7	886	16.5	916	17.4	944	18.3
20,000	723	13.4	770	14.4	811	15.5	848	16.4	882	17.4	913	18.3	943	19.2	970	20.1
21,000	754	15.0	800	16.2	840	17.2	877	18.3	910	19.2	941	20.2	970	21.2	997	22.1
22,000	785	16.9	830	18.0	869	19.1	905	20.2	938	21.2	969	22.2	997	23.2	1025	24.2
23,000	817	18.8	860	20.0	899	21.2	934	22.3	966	23.3	997	24.4	1025	25.4	1052	26.4
24,000	848	20.9	891	22.2	928	23.3	963	24.5	995	25.6	1025	26.7	1053	27.7	1080	28.8
25,000	880	23.1	921	24.4	958	25.7	992	26.8	1024	28.0	1053	29.1	1081	30.2	1107	31.3
26,000	912	25.5	952	26.8	988	28.1	1021	29.3	1052	30.5	1082	31.7	1109	32.8	1135	33.9
27,000	943	28.0	983	29.4	1018	30.7	1051	32.0	1082	33.2	1110	34.4	1137	35.5	1163	36.7

50EW054-068 AND 50EY054-068 (50 THRU 65 TONS) (cont)

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	740	7.3	766	7.88	792	8.46	816	9.04	840	9.63	862	10.23	884	10.83	905	11.43
12,000	789	9.2	816	9.84	841	10.47	865	11.11	889	11.75	911	12.39	933	13.04	953	13.69
15,000	866	12.8	892	13.53	917	14.25	940	14.97	963	15.68	985	16.41	1007	17.13	1028	17.85
16,000	891	14.2	917	14.97	942	15.72	966	16.46	989	17.21	1011	17.96	1032	18.71	1053	19.46
17,000	918	15.7	943	16.52	968	17.30	991	18.08	1014	18.85	1036	19.63	1057	20.40	1078	21.18
18,000	944	17.4	969	18.19	994	19.00	1017	19.80	1040	20.61	1061	21.41	1083	22.21	1103	23.02
19,000	970	19.1	995	19.97	1020	20.81	1043	21.65	1065	22.48	1087	23.32	1108	24.15	1129	24.98
20,000	997	21.0	1022	21.88	1046	22.75	1069	23.62	1091	24.48	1113	25.35	1134	26.20	1154	27.06
21,000	1024	23.0	1049	23.91	1072	24.82	1095	25.72	1118	26.61	1139	27.50	1160	28.39	1180	29.27
22,000	1051	25.1	1075	26.08	1099	27.01	1122	27.94	1144	28.87	1165	29.79	1186	30.70	—	—
23,000	1078	27.4	1102	28.37	1126	29.34	1148	30.30	1170	31.26	1192	32.21	—	—	—	—
24,000	1105	29.8	1129	30.80	1153	31.80	1175	32.79	1197	33.78	—	—	—	—	—	—
25,000	1132	32.3	1157	33.37	1180	34.40	—	—	—	—	—	—	—	—	—	—
26,000	1160	35.0	1184	36.08	—	—	—	—	—	—	—	—	—	—	—	—
27,000	1188	37.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—

50EW054-068 AND 50EY054-068 (50 THRU 65 TONS) (cont)

AIRFLOW (cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)					
	3.4		3.6		3.8	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	925	12.04	945	12.65	965	13.27
12,000	974	14.34	994	15.00	1013	15.66
15,000	1048	18.57	1067	19.30	1086	20.03
16,000	1073	20.21	1092	20.96	1111	21.71
17,000	1098	21.95	1117	22.73	1136	23.51
18,000	1123	23.82	1142	24.62	1161	25.42
19,000	1148	25.80	1168	26.63	1186	27.46
20,000	1174	27.92	1193	28.77	—	—
21,000	1200	30.16	—	—	—	—
22,000	—	—	—	—	—	—
23,000	—	—	—	—	—	—
24,000	—	—	—	—	—	—
25,000	—	—	—	—	—	—
26,000	—	—	—	—	—	—
27,000	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

NOTES:

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

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

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

POWER EXHAUST

48/50EJ,EK,EW,EY054-068 (50 THRU 65 TONS)

AIRFLOW (cfm)	Low Speed						Medium Speed						High Speed					
	208 v			230, 460, 575 v			208 v			230, 460, 575 v			208 v			230, 460, 575 v		
	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts	ESP	Bhp	Watts
9,750	0.32	4.23	4740	0.70	4.47	5010	—	—	—	—	—	—	—	—	—	—	—	—
10,050	0.23	4.31	4830	0.63	4.55	5100	0.60	4.52	5070	0.82	4.84	5430	—	—	—	—	—	—
10,350	0.17	4.37	4905	0.59	4.63	5190	0.55	4.60	5160	0.78	4.92	5520	—	—	—	—	—	—
10,650	0.13	4.40	4935	0.56	4.67	5235	0.49	4.68	5250	0.73	5.00	5610	—	—	—	—	—	—
10,950	0.09	4.46	4995	0.53	4.72	5295	0.43	4.76	5340	0.68	5.08	5700	—	—	—	—	—	—
11,250	—	—	—	0.51	4.79	5370	0.39	4.86	5445	0.64	5.16	5790	—	—	—	—	—	—
11,550	—	—	—	0.48	4.84	5430	0.33	4.91	5505	0.59	5.22	5850	0.60	5.54	6210	0.73	5.97	6690
11,850	—	—	—	0.45	4.91	5505	0.27	4.98	5580	0.54	5.28	5925	0.56	5.61	6285	0.69	6.03	6765
12,150	—	—	—	0.40	4.99	5595	0.22	5.04	5655	0.49	5.35	6000	0.51	5.67	6360	0.65	6.10	6840
12,750	—	—	—	—	—	—	0.17	5.20	5835	0.40	5.51	6180	0.41	5.74	6435	0.56	6.18	6930
13,350	—	—	—	—	—	—	0.00	5.36	6015	0.30	5.66	6345	0.31	5.90	6615	0.47	6.34	7110
13,950	—	—	—	—	—	—	—	—	—	0.22	5.81	6510	0.20	6.10	6840	0.37	6.56	7350
14,550	—	—	—	—	—	—	—	—	—	0.16	5.93	6645	0.11	6.25	7005	0.30	6.70	7515
15,150	—	—	—	—	—	—	—	—	—	0.12	6.05	6780	0.04	6.38	7155	0.23	6.84	7665
15,750	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.17	6.98	7830
16,350	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.12	7.13	7995
16,950	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.07	7.20	8070
17,550	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04	7.25	8130

LEGEND

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

NOTE: On 50DL retrofit applications, the power exhaust fan performance will be reduced due to smaller return duct opening

EVAPORATOR FAN MOTOR PERFORMANCE

STANDARD EFFICIENCY MOTORS						
Nominal Hp	Maximum Bhp	Maximum Amps			Maximum Watts	Motor Efficiency
		230	460	575		
15	15.3	43.8	—	—	12,543	91.0
	18.0	—	21.9	19.0	14,756	91.0
20	22.4	62.0	—	—	18,363	91.0
	23.4	—	28.7	23.0	19,183	91.0
25	28.9	72.0	—	—	23,511	91.7
	29.4	—	37.4	31.0	23,918	91.7
30	35.6	95.0	—	—	28,742	92.4
	34.7	—	48.0	47.0	28,015	92.4
40	42.0	110.0	55.0	48.8	33,690	93.0

HIGH EFFICIENCY MOTORS					
Nominal Hp	Maximum Bhp	Maximum Amps		Maximum Watts	Motor Efficiency
		230	460		
15	15.3	43.8	—	12,273	93.0
	18.0	—	21.9	14,439	93.0
20	22.4	58.2	—	17,853	93.6
	23.4	—	28.7	18,650	93.6
25	28.9	73.0	—	23,034	93.6
	29.4	—	36.3	23,432	93.6
30	35.6	82.6	—	28,374	93.6
	34.7	—	41.7	27,656	93.6
40	42.0	110.0	55.0	33,156	94.5

Bhp — Brake Horsepower

NOTE: Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the horsepower ratings shown on the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.

Performance data (cont)

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	300/300	
													35.4	62.4	1.44	274.6/270.0	350/350	
											20	59.4/ 54.0	—	—	1.44	252.4/247.0	300/300	
													35.4	62.4	1.44	287.8/282.0	350/350	
											25	74.8/ 68.0	—	—	1.44	267.8/261.0	300/300	
													35.4	62.4	1.44	303.2/296.0	350/350	
	460	414	508	43.6	223	30.8	173	4	1	2.7	15	21.0	—	—	0.75	117.1	150	
													18.9	35.4	0.75	136.0	175	
											20	27.0	—	—	0.75	123.1	150	
													18.9	35.4	0.75	142.0	175	
											25	34.0	—	—	0.75	130.1	150	
													18.9	35.4	0.75	149.0	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	350/350	
													35.4	62.4	1.44	328.8/323.0	400/400	
											25	74.6/ 68.0	—	—	1.44	308.6/302.0	400/400	
													35.4	62.4	1.44	344.0/337.0	450/400	
											30	88.0/ 80.0	—	—	1.44	322.0/314.0	400/400	
													35.4	62.4	1.44	357.4/349.0	450/450	
	460	414	508	52.6	253	30.8	173	6	1	2.7	20	27.0	—	—	0.75	139.7	175	
													18.9	35.4	0.75	158.6	200	
											25	34.0	—	—	0.75	146.7	175	
													18.9	35.4	0.75	165.6	200	
											30	40.0	—	—	0.75	152.7	200	
													18.9	35.4	0.75	171.6	200	
064	208/230	187	254	106.4	506	82.1	446	6	1	5.3	25	74.6/ 68.0	—	—	1.44	321.5/315.0	400/400	
													35.4	62.4	1.44	356.9/350.0	450/450	
											30	88.0/ 80.0	—	—	1.44	334.9/327.0	400/400	
													35.4	62.4	1.44	370.3/362.0	450/450	
											40	114.0/104.0	—	—	1.44	360.9/351.0	450/450	
													35.4	62.4	1.44	396.3/386.0	500/450	
	460	414	508	52.6	253	43.6	223	6	1	2.7	25	34.0	—	—	0.75	159.6	200	
													18.9	35.4	0.75	178.4	225	
											30	40.0	—	—	0.75	165.5	200	
													18.9	35.4	0.75	184.4	225	
											40	52.0	—	—	0.75	177.5	225	
													18.9	35.4	0.75	196.4	225	
	575	518	632	40.4	176	34.6	164	6	1	2.4	25	27.0	—	—	0.75	126.5	150	
													18.9	35.4	0.75	145.4	175	
											30	32.0	—	—	0.75	131.5	150	
													18.9	35.4	0.75	150.4	175	
											40	41.0	—	—	0.75	140.5	175	
													18.9	35.4	0.75	159.4	175	
068	208/230	187	254	106.4	506	106.4	506	6	1	5.3	25	74.6/ 68.0	—	—	1.44	345.8/339.0	450/400	
													35.4	62.4	1.44	381.2/375.0	450/450	
											30	88.0/ 80.0	—	—	1.44	359.2/351.0	450/450	
													35.4	62.4	1.44	394.6/387.0	500/450	
											40	114.0/104.0	—	—	1.44	385.2/375.0	450/450	
													35.4	62.4	1.44	420.6/411.0	500/500	
	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	

See Legend and Notes on page 30

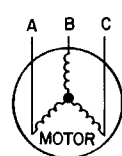
Electrical data — 48EJ,EK,EW,EY054-068 (cont)

LEGEND AND NOTES

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



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

$$(AB) 457 - 452 = 5 \text{ v}$$

$$(BC) 464 - 457 = 7 \text{ v}$$

$$(AC) 457 - 455 = 2 \text{ v}$$

Maximum deviation is 7 v

Determine percent of voltage imbalance

% Voltage Imbalance

$$= 100 \times \frac{7}{457}$$

$$= 1.53\%$$

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

*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

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

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	MOCP†
054	208/230	187	254	82.1	446	69.2	345	4	1	5.3	15	46.2/42.0	—	—	—	—	239.1/235.0	300/300
													35.4	62.4	—	—	274.6/270.4	350/350
													—	—	41/ 54	112.6/129.9	239.2/235.0	300/300
													35.4	62.4	41/ 54	112.6/129.9	274.6/270.4	350/350
													—	—	81/108	225.2/259.8	282.9/312.3	300/300
													35.4	62.4	81/108	225.2/259.8	327.2/356.6	350/400
											20	59.4/54.0	—	—	—	—	252.4/247.0	300/300
													35.4	62.4	—	—	287.8/282.4	350/350
													—	—	41/ 54	112.6/129.9	252.4/247.0	300/300
													35.4	62.4	41/ 54	112.6/129.9	287.8/282.4	350/350
													—	—	81/108	225.2/259.8	299.4/327.3	350/350
													35.4	62.4	81/108	225.2/259.8	343.7/371.6	350/400
											25	74.8/68.0	—	—	—	—	267.8/261.0	300/300
													35.4	62.4	—	—	303.2/296.4	350/350
													—	—	41/ 54	112.6/129.9	267.8/261.0	300/300
													35.4	62.4	41/ 54	112.6/129.9	303.2/296.0	350/350
													—	—	81/108	225.2/259.8	318.7/344.8	350/400
													35.4	62.4	81/108	225.2/259.8	371.6/362.9	400/400
	460	414	508	43.6	223	30.8	173	4	1	2.7	15	21.0	—	—	—	—	117.1	150
													18.9	35.4	—	—	136.0	175
													—	—	54	65.0	117.1	150
													18.9	35.4	54	65.0	136.0	175
													—	—	108	129.9	156.2	175
													18.9	35.4	108	129.9	179.8	200
											20	27.0	—	—	—	—	123.1	150
													18.9	35.4	—	—	142.0	175
													—	—	54	65.0	123.1	150
													18.9	35.4	54	65.0	142.0	175
													—	—	108	129.9	163.7	175
													18.9	35.4	108	129.9	187.3	200
											25	34.0	—	—	—	—	130.1	150
													18.9	35.4	—	—	149.0	175
													—	—	54	65.0	130.1	150
													18.9	35.4	54	65.0	149.0	175
													—	—	108	129.9	172.4	200
													18.9	35.4	108	129.9	196.0	225
	575	518	632	34.6	164	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	101.8	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

See Legend and Notes on page 32.

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†
058	208/230	187	254	106.4	506	69.2	345	6	1	5.3	20	59.4/54.0	—	—	—	—	293.4/288.0	350/350
													35.4	62.4	—	—	328.8/323.4	400/400
													—	—	41/ 54	112.6/129.9	293.4/288.0	350/350
													35.4	62.4	41/ 54	112.6/129.9	328.8/323.4	400/400
													—	—	81/108	225.2/259.8	299.4/327.3	350/350
													35.4	62.4	81/108	225.2/259.8	343.7/371.6	400/400
											25	74.8/68.0	—	—	—	—	308.8/302.0	400/400
													35.4	62.4	—	—	344.2/337.4	450/400
													—	—	41/ 54	112.6/129.9	308.8/302.0	400/400
													35.4	62.4	41/ 54	112.6/129.9	344.2/337.4	450/400
													—	—	81/108	225.2/259.8	318.7/344.8	400/400
													35.4	62.4	81/108	225.2/259.8	362.9/389.1	450/400
											30	88.0/80.0	—	—	—	—	322.0/314.0	400/400
													35.4	62.4	—	—	357.4/349.4	450/450
													—	—	41/ 54	112.6/139.9	322.0/314.0	400/400
													35.4	62.4	41/ 54	112.6/139.9	357.4/349.4	450/450
													—	—	81/108	225.2/259.8	335.2/359.8	400/400
													35.4	62.4	81/108	225.2/259.8	379.4/404.1	450/450
	460	414	508	52.6	253	30.8	173	6	1	2.7	20	27.0	—	—	—	—	139.7	175
													18.9	35.4	—	—	158.6	200
													—	—	54	65.0	139.7	175
													18.9	35.4	54	65.0	158.6	200
													—	—	108	129.9	163.7	175
													18.9	35.4	108	129.9	187.3	200
											25	34.0	—	—	—	—	146.7	175
													18.9	35.4	—	—	165.6	200
													—	—	54	65.0	146.7	175
													18.9	35.4	54	65.0	165.6	200
													—	—	108	129.9	172.4	200
													18.9	35.4	108	129.9	196.0	225
											30	40.0	—	—	—	—	152.7	200
													18.9	35.4	—	—	171.6	200
													—	—	54	65.0	152.7	200
													18.9	35.4	54	65.0	171.6	200
													—	—	108	129.9	179.9	200
													18.9	35.4	108	129.9	203.5	225

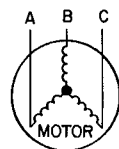
LEGEND AND NOTES

- 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



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

% Voltage Imbalance

$$= 100 \times \frac{7}{457} = 1.53\%$$

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

*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

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

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

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	82.1	446	6	1	5.3	25	74.8/ 68.0	—	—	—	—	321.7/314.9	400/400		
													35.4	62.4	—	—	357.1/350.3	450/450		
													—	—	41/ 54	112.6/129.9	321.7/314.9	400/400		
													35.4	62.4	41/ 54	112.6/129.9	357.1/350.3	450/450		
													—	—	81/108	225.2/259.8	321.7/344.8	400/400		
													35.4	62.4	81/108	225.2/259.8	362.9/389.1	450/450		
											30	88.0/ 80.0	—	—	—	—	—	—	334.9/326.9	400/400
													35.4	62.4	—	—	370.3/362.3	450/450		
													—	—	41/ 54	112.6/129.9	334.4/226.9	400/400		
													35.4	62.4	41/ 54	112.6/129.9	370.3/362.3	450/450		
													—	—	81/108	225.2/259.8	335.2/359.8	400/400		
													35.4	62.4	81/108	225.2/259.8	379.4/404.1	450/450		
											40	114.0/104.0	—	—	—	—	—	—	360.9/350.9	450/450
													35.4	62.4	—	—	396.3/386.3	500/450		
													—	—	41/ 54	112.6/129.9	360.9/350.9	450/450		
													35.4	62.4	41/ 54	112.6/129.9	396.3/386.3	500/450		
													—	—	81/108	225.2/259.8	367.7/389.8	450/450		
													35.4	62.4	81/108	225.2/259.8	411.9/434.1	500/500		
	460	414	508	52.6	253	43.6	253	6	1	2.7	25	34.0	—	—	—	—	159.5	200		
													18.9	35.4	—	—	178.4	225		
													—	—	54	65.0	159.5	200		
													18.9	35.4	54	65.0	178.4	225		
													—	—	108	129.9	172.4	200		
													18.9	35.4	108	129.9	196.0	225		
											30	40.0	—	—	—	—	165.5	200		
													18.9	35.4	—	—	184.4	225		
													—	—	54	65.0	165.5	200		
													18.9	35.4	54	65.0	184.4	225		
													—	—	108	129.9	179.9	200		
													18.9	35.4	108	129.9	203.5	225		
											40	52.0	—	—	—	—	177.5	225		
													18.9	35.4	—	—	196.4	225		
													—	—	54	65.0	177.5	225		
													18.9	35.4	54	65.0	196.4	225		
													—	—	108	129.9	194.9	225		
													18.9	35.4	108	129.9	218.5	250		
	575	518	632	40.4	176	34.6	164	6	1	2.4	25	27.0	—	—	—	—	126.5	150		
													18.9	35.4	—	—	145.4	175		
													—	—	54	52.0	126.5	150		
													18.9	35.4	54	52.0	145.4	175		
													—	—	108	103.9	163.7	175		
													18.9	35.4	108	103.9	187.3	200		
											30	32.0	—	—	—	—	131.5	150		
													18.9	35.4	—	—	150.4	175		
													—	—	54	52.0	131.5	150		
													18.9	35.4	54	52.0	150.4	175		
													—	—	108	103.9	169.9	200		
													18.9	35.4	108	103.9	193.5	200		
											40	41.0	—	—	—	—	140.5	175		
													18.9	35.4	—	—	159.4	175		
													—	—	54	52.0	140.5	175		
													18.9	35.4	54	52.0	159.4	175		
													—	—	108	103.9	181.2	200		
													18.9	35.4	108	103.9	204.8	225		

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	MOCPT
068	208/230	187	254	106.4	506	106.4	506	6	1	5.3	25	74.8/ 68.0	—	—	—	—	346.0/339.2	450/450
													35.4	62.4	—	—	381.4/374.6	450/450
													—	—	41/ 54	112.6/129.9	346.0/339.2	450/450
													35.4	62.4	41/ 54	112.6/129.9	381.4/374.6	450/450
													—	—	81/108	225.2/259.8	346.0/344.8	450/400
													35.4	62.4	81/108	225.2/259.8	381.4/389.1	450/450
											30	88.0/ 80.0	—	—	—	—	359.2/351.2	450/450
													35.4	62.4	—	—	394.6/386.6	500/450
													—	—	41/ 54	112.6/129.9	359.2/351.2	450/450
													35.4	62.4	41/ 54	112.6/129.9	394.6/386.6	500/450
													—	—	81/108	225.2/259.8	359.2/359.8	450/450
													35.4	62.4	81/108	225.2/259.8	394.6/404.1	500/450
											40	114.0/104.0	—	—	—	—	385.2/375.2	450/450
													35.4	62.4	—	—	420.6/410.6	500/500
													—	—	41/ 54	112.6/129.9	385.2/375.2	450/450
													35.4	62.4	41/ 54	112.6/129.9	402.6/410.6	500/500
													—	—	81/108	225.2/259.8	385.2/389.8	450/450
													35.4	62.4	81/108	225.2/259.8	420.6/434.1	500/500
	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	—	—	—	—	174.5	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

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.

Every unit is equipped with a supply-air thermistor (SAT) located in the supply fan discharge and an outdoor-air thermistor (OAT) located in the outdoor air hood. Variable air volume units are supplied with a return-air thermistor (RAT) located in the return air damper.

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 standard 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 $\pm 5^\circ$ 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 (cont)

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

NOTE: The IAQ sensor must be set for current output (4 to 20 mA). This requires removing the sensor cover and moving a jumper on the sensor.

- 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-up time 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

- 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 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.

Controls (cont)

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 28.

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 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 supply-air temperature at the defined set point. (The default is 55 F.) When supply-air temperature is above the set point, the economizer will be 100% open. When supply-air temperature 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 supply-air temperature 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 supply-air 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 micro-processor 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.

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.

Controls (cont)

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. The supply-air temperature reset option does not need to be enabled.

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 software 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.

Smoke detector — A smoke detector can be used to initiate fire shutdown. This can be accomplished by a set of normally closed pilot relay contacts which will interrupt power from the 24-v transformer, secondary "B" terminal to the control circuit breaker (CB4). The wire that connects these two points is white and labeled "W78."

NOTE: On standard gas models, the indoor fan will continue to run 45 seconds after the call for heat has been terminated. If fire shutdown is initiated the fan will stop immediately. No 45-second delay will occur.

The smoke detector may be mounted in the return-air duct or the supply duct. Carrier does not make recommendations as to specific smoke detector location due to liability considerations.

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.

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

Controls (cont)

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	—

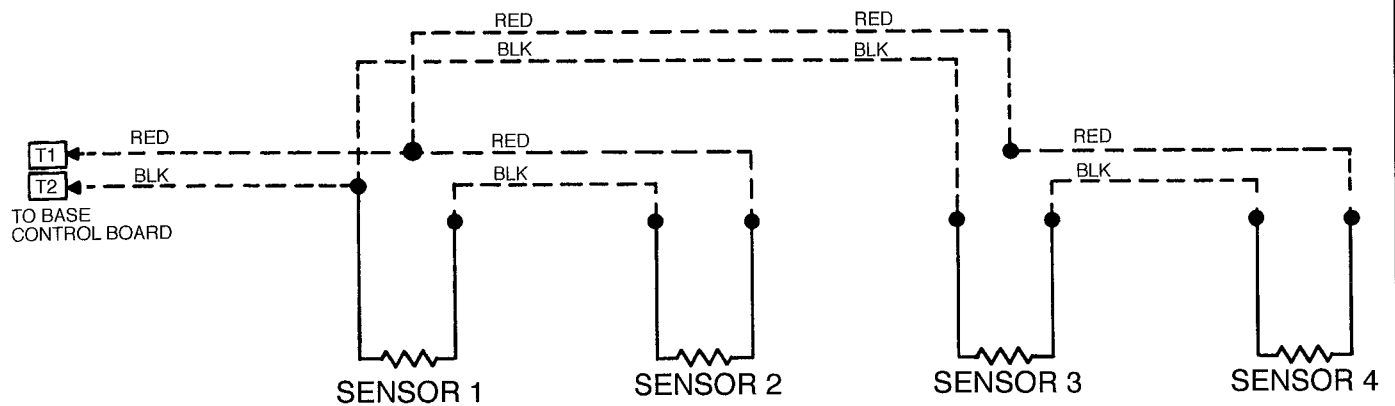
LEGEND

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

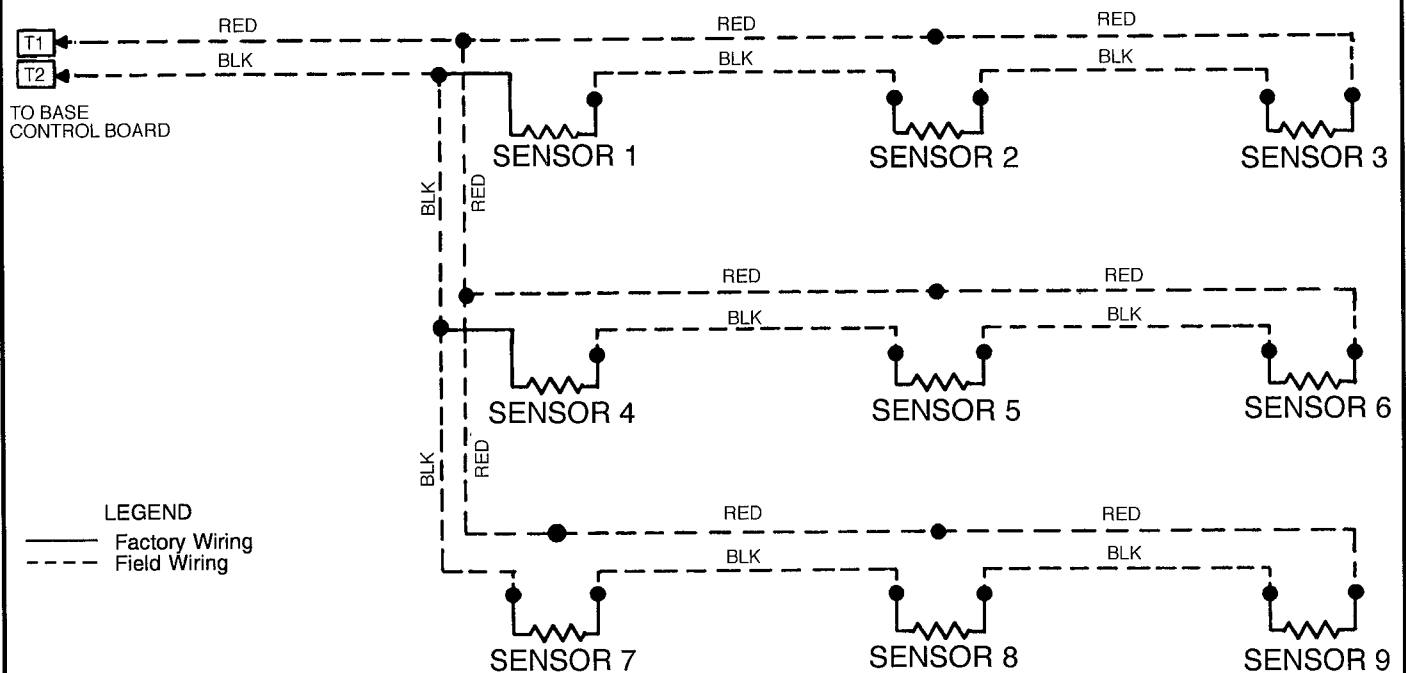
NOTE: All even numbered terminals are negative (–) polarity and all odd numbered terminals are positive (+) polarity.

Control wiring

SPACE TEMPERATURE AVERAGING WIRING



SPACE TEMPERATURE AVERAGING — 4 SENSOR APPLICATION



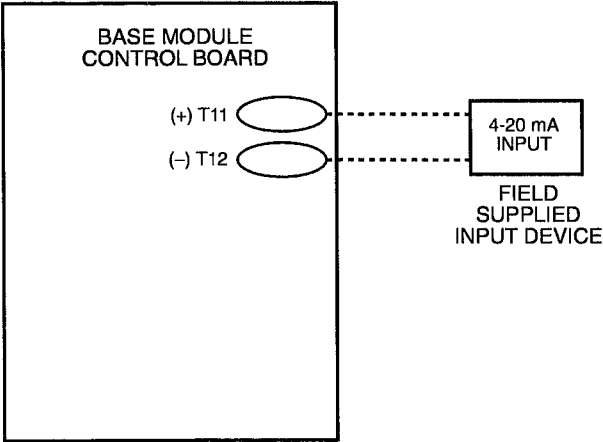
LEGEND

- Factory Wiring
- - - Field Wiring

SPACE TEMPERATURE AVERAGING — 9 SENSOR APPLICATION

Control wiring (cont)

SUPPLY TEMPERATURE RESET WIRING



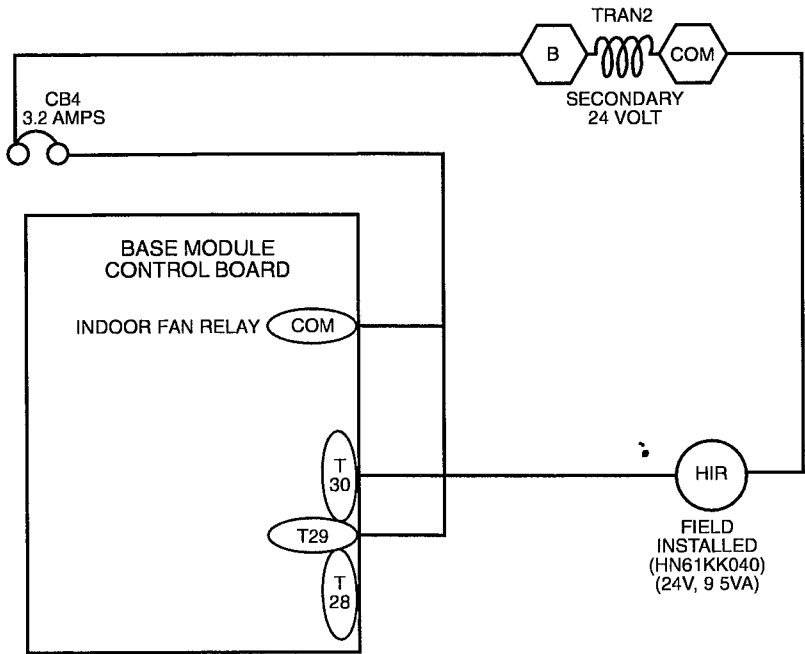
mA INPUT	DEG. F RESET
4	0.00
5	1.25
6	2.50
7	3.75
8	5.00
9	6.25
10	7.50
11	8.75
12	10.00
13	11.25
14	12.50
15	13.75
16	15.00
17	16.25
18	17.50
19	18.75
20	20.00

LEGEND

T — Terminal

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

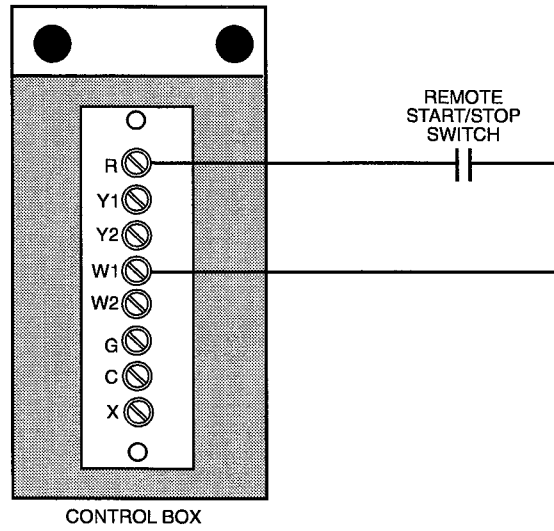
HEAT INTERLOCK RELAY WIRING



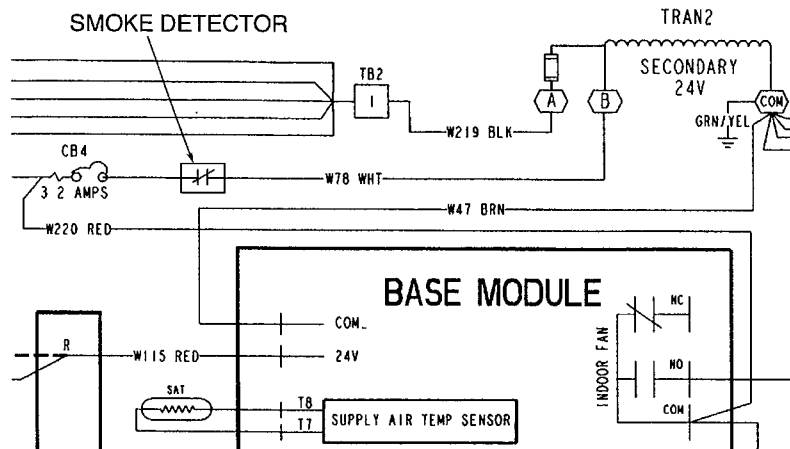
LEGEND

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

FIELD CONTROL REMOTE START/STOP WIRING

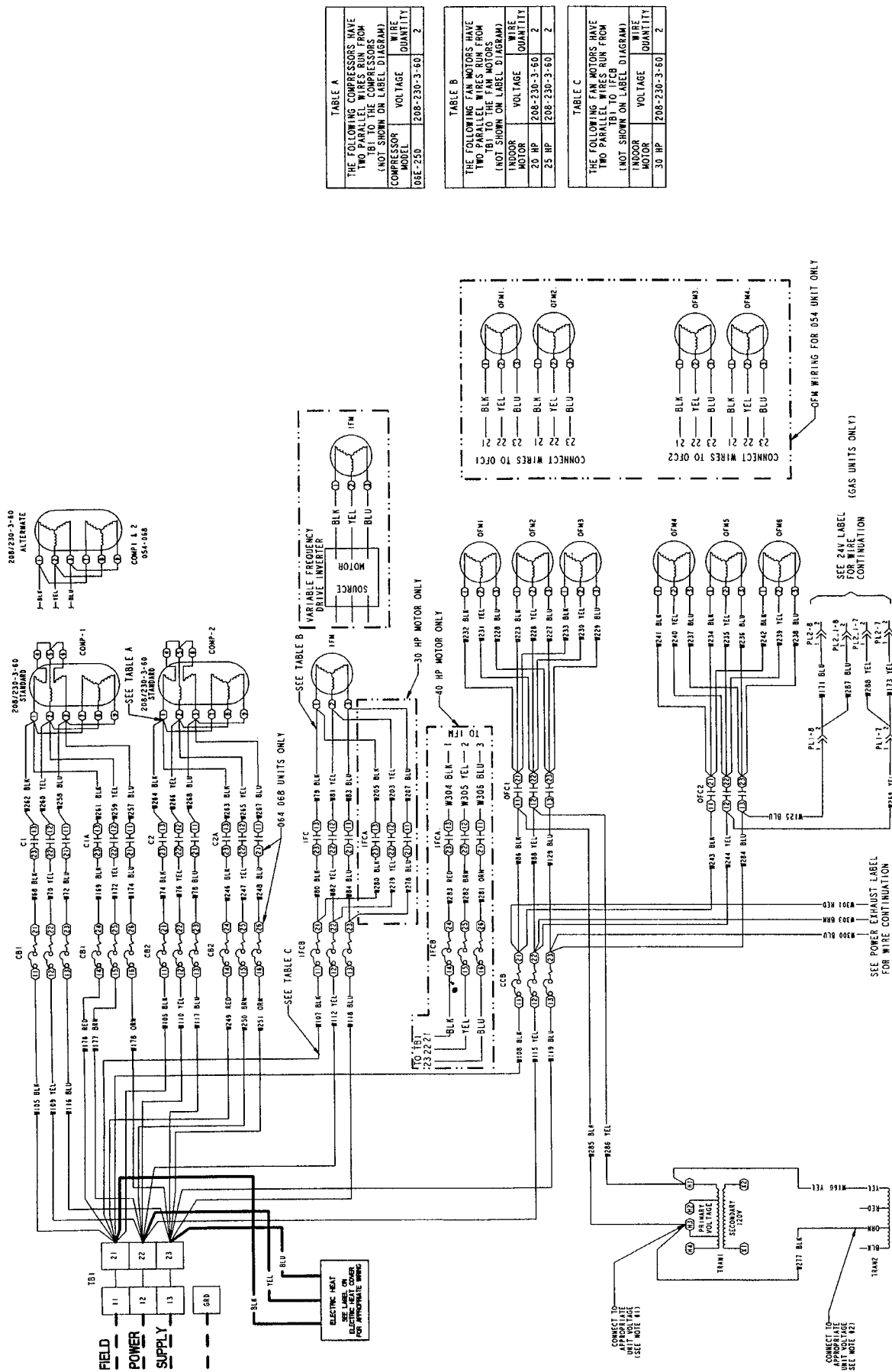


SMOKE DETECTOR WIRING

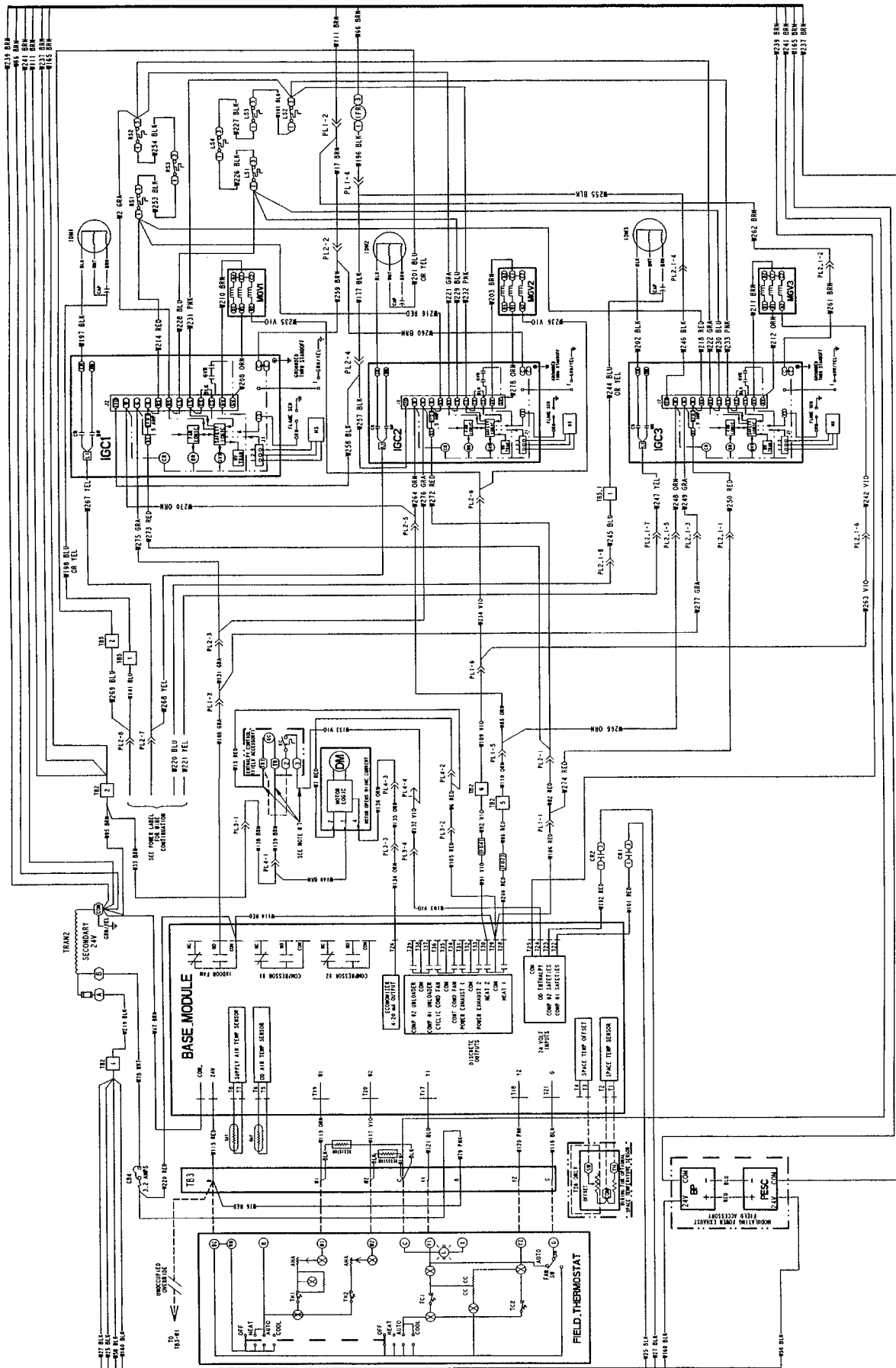


Typical wiring schematics

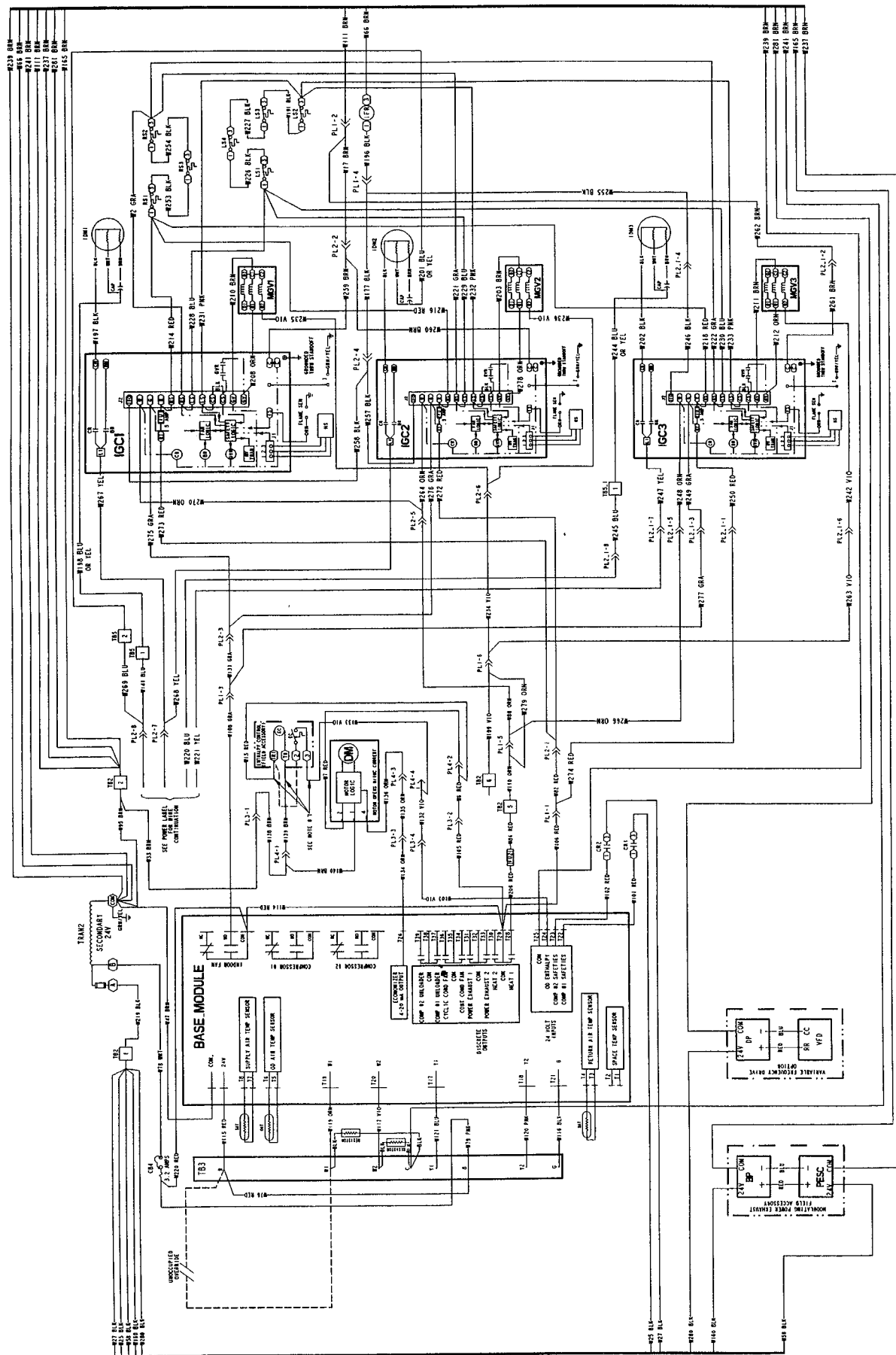
TYPICAL POWER WIRING SCHEMATIC



TYPICAL 24-V CONTROL SCHEMATIC (CONSTANT VOLUME UNITS)



TYPICAL 24-V CONTROL SCHEMATIC (VARIABLE AIR VOLUME UNITS)

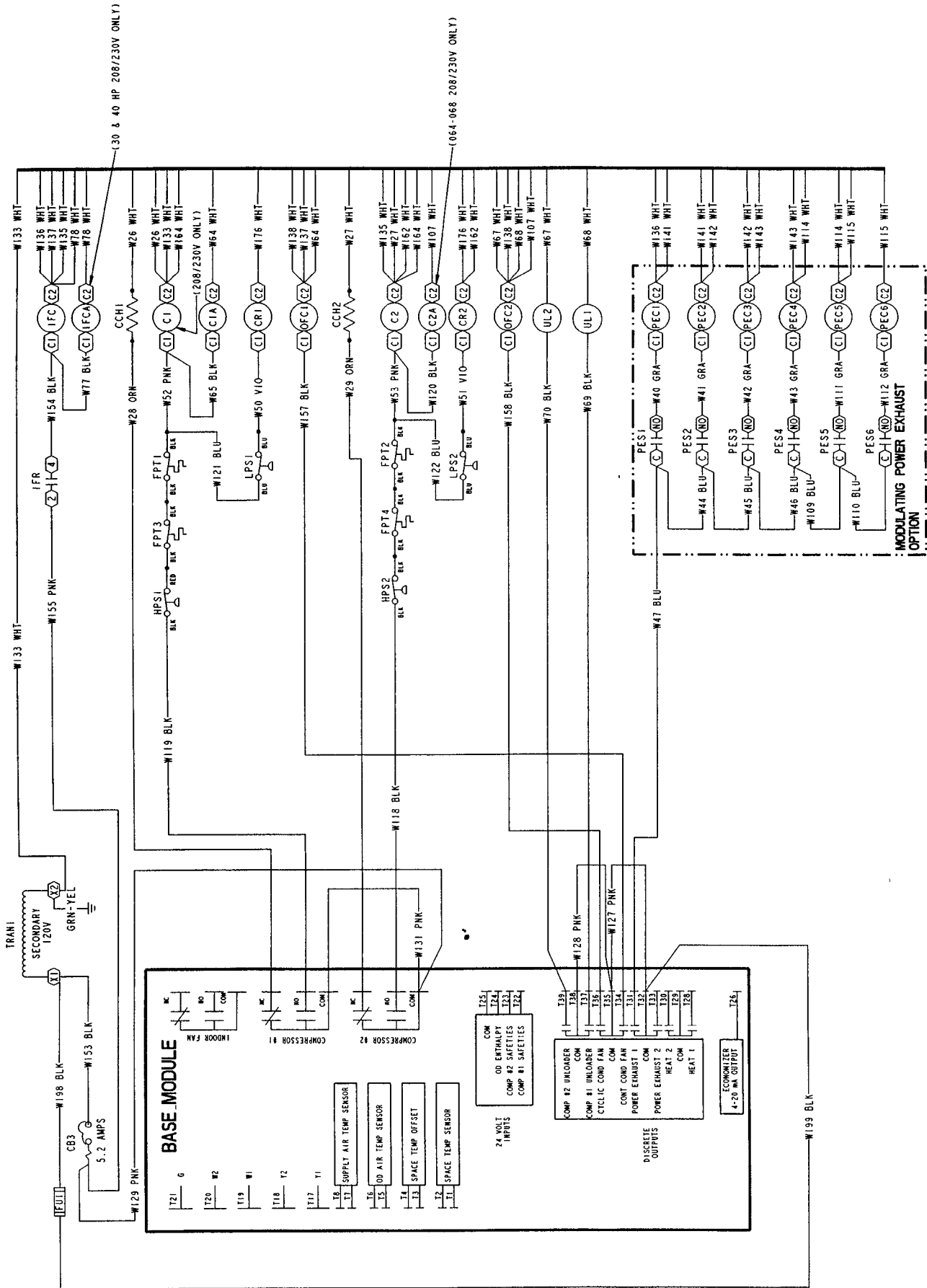


The diagram illustrates the electrical connections for a Carrier HVAC system. Key components and their connections include:

- Base Module:** Contains terminals for 24 VOLT INPUTS (T21-T24), DISCRETE OUTPUTS (T25-T28), and a COMMUNIZER (T29). It also includes a terminal block for 5.2 AMP FUSE and a secondary 120V power source.
- Modulating Power Exhaust Field Accessory:** Includes a 4-20 mA output (T29) and a 5.2 AMP FUSE.
- CV Power Exhaust Option:** Includes a 4-20 mA output (T29) and a 5.2 AMP FUSE.
- Wiring Labels:** Wires are labeled with alphanumeric codes such as W129, W130, W131, W132, W133, W134, W135, W136, W137, W138, W139, W140, W141, W142, W143, W144, W145, W146, W147, W148, W149, W150, W151, W152, W153, W154, W155, W156, W157, W158, W159, W160, W161, W162, W163, W164, W165, W166, W167, W168, W169, W170, W171, W172, W173, W174, W175, W176, W177, W178, W179, W180, W181, W182, W183, W184, W185, W186, W187, W188, W189, W190, W191, W192, W193, W194, W195, W196, W197, W198, W199, W200, W201, W202, W203, W204, W205, W206, W207, W208, W209, W210, W211, W212, W213, W214, W215, W216, W217, W218, W219, W220, W221, W222, W223, W224, W225, W226, W227, W228, W229, W230, W231, W232, W233, W234, W235, W236, W237, W238, W239, W240, W241, W242, W243, W244, W245, W246, W247, W248, W249, W250, W251, W252, W253, W254, W255, W256, W257, W258, W259, W260, W261, W262, W263, W264, W265, W266, W267, W268, W269, W270, W271, W272, W273, W274, W275, W276, W277, W278, W279, W280, W281, W282, W283, W284, W285, W286, W287, W288, W289, W290, W291, W292, W293, W294, W295, W296, W297, W298, W299, W300, W301, W302, W303, W304, W305, W306, W307, W308, W309, W310, W311, W312, W313, W314, W315, W316, W317, W318, W319, W320, W321, W322, W323, W324, W325, W326, W327, W328, W329, W330, W331, W332, W333, W334, W335, W336, W337, W338, W339, W340, W341, W342, W343, W344, W345, W346, W347, W348, W349, W350, W351, W352, W353, W354, W355, W356, W357, W358, W359, W360, W361, W362, W363, W364, W365, W366, W367, W368, W369, W370, W371, W372, W373, W374, W375, W376, W377, W378, W379, W380, W381, W382, W383, W384, W385, W386, W387, W388, W389, W390, W391, W392, W393, W394, W395, W396, W397, W398, W399, W400, W401, W402, W403, W404, W405, W406, W407, W408, W409, W410, W411, W412, W413, W414, W415, W416, W417, W418, W419, W420, W421, W422, W423, W424, W425, W426, W427, W428, W429, W430, W431, W432, W433, W434, W435, W436, W437, W438, W439, W440, W441, W442, W443, W444, W445, W446, W447, W448, W449, W450, W451, W452, W453, W454, W455, W456, W457, W458, W459, W460, W461, W462, W463, W464, W465, W466, W467, W468, W469, W470, W471, W472, W473, W474, W475, W476, W477, W478, W479, W480, W481, W482, W483, W484, W485, W486, W487, W488, W489, W490, W491, W492, W493, W494, W495, W496, W497, W498, W499, W500, W501, W502, W503, W504, W505, W506, W507, W508, W509, W510, W511, W512, W513, W514, W515, W516, W517, W518, W519, W520, W521, W522, W523, W524, W525, W526, W527, W528, W529, W530, W531, W532, W533, W534, W535, W536, W537, W538, W539, W540, W541, W542, W543, W544, W545, W546, W547, W548, W549, W550, W551, W552, W553, W554, W555, W556, W557, W558, W559, W560, W561, W562, W563, W564, W565, W566, W567, W568, W569, W570, W571, W572, W573, W574, W575, W576, W577, W578, W579, W580, W581, W582, W583, W584, W585, W586, W587, W588, W589, W590, W591, W592, W593, W594, W595, W596, W597, W598, W599, W600, W601, W602, W603, W604, W605, W606, W607, W608, W609, W610, W611, W612, W613, W614, W615, W616, W617, W618, W619, W620, W621, W622, W623, W624, W625, W626, W627, W628, W629, W630, W631, W632, W633, W634, W635, W636, W637, W638, W639, W640, W641, W642, W643, W644, W645, W646, W647, W648, W649, W650, W651, W652, W653, W654, W655, W656, W657, W658, W659, W660, W661, W662, W663, W664, W665, W666, W667, W668, W669, W670, W671, W672, W673, W674, W675, W676, W677, W678, W679, W680, W681, W682, W683, W684, W685, W686, W687, W688, W689, W690, W691, W692, W693, W694, W695, W696, W697, W698, W699, W700, W701, W702, W703, W704, W705, W706, W707, W708, W709, W710, W711, W712, W713, W714, W715, W716, W717, W718, W719, W720, W721, W722, W723, W724, W725, W726, W727, W728, W729, W730, W731, W732, W733, W734, W735, W736, W737, W738, W739, W740, W741, W742, W743, W744, W745, W746, W747, W748, W749, W750, W751, W752, W753, W754, W755, W756, W757, W758, W759, W760, W761, W762, W763, W764, W765, W766, W767, W768, W769, W770, W771, W772, W773, W774, W775, W776, W777, W778, W779, W780, W781, W782, W783, W784, W785, W786, W787, W788, W789, W790, W791, W792, W793, W794, W795, W796, W797, W798, W799, W800, W801, W802, W803, W804, W805, W806, W807, W808, W809, W810, W811, W812, W813, W814, W815, W816, W817, W818, W819, W820, W821, W822, W823, W824, W825, W826, W827, W828, W829, W830, W831, W832, W833, W834, W835, W836, W837, W838, W839, W840, W841, W842, W843, W844, W845, W846, W847, W848, W849, W850, W851, W852, W853, W854, W855, W856, W857, W858, W859, W860, W861, W862, W863, W864, W865, W866, W867, W868, W869, W870, W871, W872, W873, W874, W875, W876, W877, W878, W879, W880, W881, W882, W883, W884, W885,

Typical wiring schematics (cont)

TYPICAL 115-V CONTROL SCHEMATIC (VARIABLE AIR VOLUME UNITS)



LEGEND AND NOTES FOR TYPICAL WIRING SCHEMATICS

LEGEND

AHA — Adjustable Heat Anticipator
BP — Building Pressure
BR — Burner Relay
C — Contactor, Compressor
CAP — Capacitor
CB — Circuit Breaker
CC — Cooling Compensator
CCB — Controller Circuit Breaker
CCH — Crankcase Heater
COM — Communication
COMP — Compressor Motor
CR — Control Relay
DM — Damper Motor
DP — Duct Pressure
EC — Enthalpy Control
FLA — Full Load Amps
FPT — Freeze Protection Thermostat
FU — Fuse
GRD — Ground
GVR — Gas Valve Relay
HPS — High-Pressure Switch
HS — Hall Effect Sensor
HV — High Voltage

IDM — Induced-Draft Motor
IFC — Indoor Fan Contactor
IFCB — Indoor Fan Circuit Breaker
IFM — Indoor-Fan Motor
IFR — Indoor-Fan Relay
IGC — Integrated Gas Unit Controller
L — Light
LPS — Low-Pressure Switch
MGV — Main Gas Valve
NC — Normally Closed
NO — Normally Open
OAT — Outdoor-Air Thermistor
OFC — Outdoor-Fan Contactor
OFM — Outdoor-Fan Motor
PEC — Power Exhaust Contactor
PES — Power Exhaust Sequencer
PESC — Power Exhaust Sequencer Controller
PL — Plug Assembly
RAT — Return-Air Thermistor
RS — Rollout Switch
SAT — Supply-Air Thermistor
TB — Terminal Block

TC — Thermostat Cooling
TH — Thermostat Heating
TRAN — Transformer
UL — Compressor Unloader
VFD — Variable Frequency Drive

 Terminal (Marked)
 Terminal (Unmarked)
 Terminal Block
 Splice
 Factory Wiring
 Field Wiring
 To Indicate Common Potential Only, Not To Represent Wiring

NOTES.

1. Connect TRAN1 to H4 for 460 v units. Connect to H3 for 230 v. If 208/230 v units are run with a 208 v power supply connect to H2.
2. Connect TRAN2 to black lead for 460 v units. Connect to orange lead for 230 v units. If 208/230 v units are run with a 208 v power supply connect to red lead.
3. Circuit breaker must trip amps are equal to or less than 156% FLA for CB1 and CB2. All others are 140%.
4. If any of the original wire furnished must be replaced, it must be replaced with type 90 C wire or its equivalent.
5. Compressors and/or fan motors are thermally protected.
6. Three phase motors are protected against primary single phasing conditions.
7. Red wire and violet wire are spliced together at the factory. The brown wire has a wire nut added at the factory.

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 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.

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 Evaporator Fan Motor Performance table can be utilized with extreme confidence.

Using Carrier motors with the values listed in the Physical Data and Motor Limitations tables *will not* result in nuisance tripping or premature motor failure. The unit warranty will not be affected.

Electric heat — A field-supplied 90 degree elbow must be installed in the supply ductwork below the unit discharge 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 and 62 (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, microprocessor based control system and associated hardware, and all special features required prior to field start-up.
 - B. Unit Cabinet:
 1. Constructed of galvanized steel, bonderized and precoated with a baked enamel finish.
 - a. Top cover shall be 18-gage sheet metal, 0.75-in. thick.
 - b. Access panels and doors shall be 20-gage sheet metal, 0.5-in. thick.
 - c. Corner and center posts shall be 16-gage galvanized steel.
 - d. Base pans in the heating and return air sections shall be 16-gage galvanized steel.
 - e. Base pans in the condenser section shall be 14-gage galvanized steel.
 - f. Compressor rail shall be 12-gage galvanized steel.
 - g. Condensate pan shall be 16-gage aluminized steel.
 - h. Air baffles shall be 18-gage galvanized steel, 0.5-in. thick.
 - i. Base rail shall be 14-gage galvanized steel.
 - j. Fan deck (indoor and outdoor section) shall be 16-gage galvanized steel.
 2. Unit casing shall be capable of withstanding 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. Two-piece 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%.

Guide specifications — 48/50EJ,EW

constant volume units

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 shut-down. 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.

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.

Guide specifications — 48/50EJ,EW

constant volume units

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.

NOTE: A jumper is provided on the sensor to change the IAQ output to 4 to 20 mA from the factory setting of 0 to 10 VDC.

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.

* 20. Electronic Programmable Thermostat:

Capable of using deluxe full-featured electronic thermostat. Shall use built-in compressor cycle delay control for both heating and cooling duty. Capable of working with Carrier direct digital controls.

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 and 62 (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.
 - a. Top cover shall be 18-gage sheet metal, 0.75-in. thick.
 - b. Access panels and doors shall be 20-gage sheet metal, 0.5-in. thick.
 - c. Corner and center posts shall be 16-gage galvanized steel.
 - d. Base pans in the heating and return air sections shall be 16-gage galvanized steel.
 - e. Base pans in the condenser section shall be 14-gage galvanized steel.
 - f. Compressor rail shall be 12-gage galvanized steel.
 - g. Condensate pan shall be 16-gage aluminized steel.
 - h. Air baffles shall be 18-gage galvanized steel, 0.5-in. thick.
 - i. Base rail shall be 14-gage galvanized steel.
 - j. Fan deck (indoor and outdoor section) shall be 16-gage galvanized steel.
- 2. Unit casing shall be capable of withstanding 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. Two-piece 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.

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

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

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.

- 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.

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

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.

NOTE: A jumper is provided on the sensor to change the IAQ output to 4 to 20 mA from the factory setting of 0 to 10 VDC.

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.

* 17. Electronic Programmable Thermostat:

Capable of using deluxe full-featured electronic thermostat. Shall use built-in compressor cycle delay control for both heating and cooling duty. Capable of working with Carrier direct digital controls.

