Product Data

WeatherMaster® Hybrid Heat Single Packaged Rooftop

15 to 25 Nominal Tons

ecoblue™ technology

Puron ADVANCE™

4QE**17, 24, 28
Single-Package Rooftop Heat Pump with Gas Heat with Puron Advance™ Refrigerant (R-454B) and EcoBlue™ Technology

Form 48QE-17-28-01PD Rev A

Features/Benefits

Introducing Carrier's WeatherMaster® Hybrid Heat Single Packaged Rooftop units (RTUs) with Puron Advance™ and EcoBlue™ Fan Technology.

The WeatherMaster line has always stood for cooling solutions that are innovative, high quality, and easy to use. Carrier's new 48QE hybrid heat pump rooftop units continue that legacy with Puron Advance, our low global warming potential refrigerant. With competitive efficiencies, EcoBlue fan technology, hybrid heat technology, and direct fit footprints, new installations and replacements are easier than ever.

Major design features include:

- Puron Advance (R-454B) refrigerant, which delivers a 75% reduction in global warming potential (GWP) compared to the original Puron (R-410A). Puron Advance's GWP of 466 easily exceeds the EPA (Environmental Protection Agency) requirement of <700 GWP.
- New Hybrid Heat technology which pairs a high efficiency heat pump with the reliability and occupant comfort of gas heat.
- A patented, industry-first vane axial indoor fan system with an electronically commutated motor for simplicity and efficiency. When compared to traditional belt-driven forward curve fans, our reliable system has:
  - 75% fewer moving parts
  - Up to 40% greater efficiency
  - No fan belts, pulleys, shaft, or shaft bearings
  - Better sound and comfort due to slow ramp-up capability
  - Internal protection from phase reversal and phase loss situations
  - High external static capability
  - Slide-out blower assembly design
- Reliable and highly protected 2-stage cooling with tandem scroll compressors technology and fully active evaporator coil
- Reliable copper tube/aluminum fin condenser coil with 5/16 in. tubing to help reduce refrigerant charge and weight versus prior designs

WeatherMaster® 48QE units up to 25 tons are specifically designed for dedicated factory-supplied vertical air flow or horizontal air flow. No special field kits are required. Designed to fit on pre-installed curbs by other manufacturer, these units can also fit on some of Carrier's past installed roof curbs.

Two-speed staged air volume (SAV) Vane Axial indoor fan speed control helps deliver IEERs up to 17.0 and COP up to 3.5.

With "no-strip" screw collars, handled access panels, and more, the unit is easy to install, easy to maintain, and easy to use. Your new 15 to 25 ton Carrier WeatherMaster rooftop unit (RTU) provides optimum comfort and control from a packaged rooftop.

Value-added features include:

- SystemVu™ intuitive intelligent controller (standard) that provides:
  - Large, full text, multi-line display
  - USB flash port for data transfer
  - Built-in i-Vu®, CCN, and BACnet®[1]
  - Easy to read refrigerant pressures shown via the display — no checking gauges
  - Quick LED Status for Run, Alert, and Fault
  - Conventional thermostat or sensor capabilities
  - Historical component runtime and starts
  - Supply air tempering
  - Network Service Tool compatible
- Single point gas and electrical connections
- TXV refrigerant metering devices on all models
- Scroll compressors with internal line-break overload protection
- Easy-to-access tool-less filter door, filter tracks that tilt out for filter removal and replacement, and filter size consistency across units

Installation ease

Lighter units make for easy replacement and aid in the structural approval process. All units have SystemVu controls standard for easy, tool free commissioning. Clearly labeled connection points reduce installation time, and a large control box provides room to work and mount Carrier accessories.

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Features/Benefits (cont)

Easy to maintain

With the EcoBlue vane axial fan system and a direct drive ECM motor, belts and pulleys are a thing of the past. This frees up maintenance, installation and commissioning time. Should an adjustment be necessary, it can easily be made via the SystemVu controller. For regular service activities, our easy-access handles provide a quick solution to all commonly accessed service panels, and our sloped, corrosion-resistant composite drain pan sheds water and will not rust. Service gauge connections are included on compressor suction/discharge lines and before and after the filter drier to monitor system operation during maintenance. The SystemVu controller provides readable LEDs and fault information should an error occur.

Hybrid Heat flexibility

48QE models offer the best of both worlds. All units have onboard mechanical heating standard and are rigorously tested to ensure reliable reverse cycle heating operation. The result is a more sustainable heat source to keep occupants comfortable year-round. When the temperature dips and mechanical heating starts to diminish, 48QE models kick on gas heat to supplement the heat pump, in place of the electric strip heaters a traditional heat pump would use. This ensures occupants are comfortable with a proven reliable heat source that doesn't require upsized wires. On the coldest days of the year all 48QE models are automatically designed to read the outdoor air temperature and exclusively use gas heating to ensure occupants are comfortable and defrost cycles are minimized. All Hybrid Heat models allow building owners to adjust this change over temperature to provide maximum flexibility for a space's unique needs. The result is a powerful Hybrid Heat unit that makes electrification possible in cold environments.

Puron Advance™ Features

In 2018, Carrier announced Puron Advance (R-454B) as our next generation refrigerant for light commercial rooftops. With a GWP of 466 and similar working pressure and performance to R-410A, Puron Advance easily exceeds the EPA's new, stringent <700 GWP refrigerant requirement while minimizing unit redesign. Like other next generation refrigerants (R-32, etc.), R-454B is classified as an "A2L" refrigerant by ASHRAE®[1] (American Society of Heating, Refrigerating, and Air-Conditioning Engineers). This designation means that R-454B is "mildly flammable" under certain conditions. While this is a change from legacy "A1 — No Flame Propagation" refrigerants like Puron (R-410A), A2Ls are still very low on the flammability scale and quite safe for use. A2L refrigerants are difficult to ignite and have an extremely low flame speed — much less so than natural gas, propane, or even rubbing alcohol. At Carrier, we are committed to safety. As such, all of our Puron Advance rooftop units include a factory-installed dissipation control board and leak sensor designed to last the lifetime of the unit. This system is certified to UL 60335-2-40 and designed to work right away, without any field configuration or wiring. In the event of a leak, these systems are designed to automatically identify and resolve the issue by dissipating the refrigerant to minimize risk to equipment, buildings, or occupants.

EcoBlue™ Technology

Our direct drive EcoBlue indoor fan system uses vane axial fan and electronically commutated motor. The benefit is clear: when compared to legacy belt drive systems, this vane axial design has 75% fewer moving parts, uses up to 40% less energy, and has no belts, blower bearings, or shaft. The full fan and motor assembly also slides out for easier maintenance and service.

Streamlined control and integration

The 48QE's standard SystemVu controls make connecting these units into existing building automation systems easy.

Operating efficiency and flexibility

The 48QE rooftops meet the DOE 2023 efficiency standard, as well as ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) 90.1 and IECC®[1] (International Energy Conservation Code) requirements.

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Features/Benefits (cont)

WeatherMaster®
with ecoblue™ technology
48QE 15 – 25 Ton Models

Vane Axial Indoor Fan
– Direct drive ECM
– Slow ramp up
– Phase loss protection
– No belts or pulleys
– Slide out design

Unit Controls
– SystemVu™ control

Air Management
– Factory - Field economizers
– Upgraded MERV-13 filters
– Tool-less Filter Access door

Efficient Coils
– Round tube/plate fin
– Copper/Aluminum
– Special coating available
– New 5/16 in. condenser tube
– TXV metering device

Heating
– Gas Heating
Induced draft heat exchanger
Multiple sizes available
Efficient dimpled gas design

High Efficiency Outdoor Fan
– Quite operation
– Balanced blades
– Efficient airflow collar

Compression
– Fully hermetic scroll
– Internally protected
– Multi stage design
– Safety switch protected

Cabinet Design
– Heavy gauge base rails
– Large handled access panels
– Embossed strengthened base pan

Model number nomenclature

48QE Model Number Nomenclature

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example:	4	8	Q	E	S	M	2	4	A	2	A	6	-	3	A	0	A	0

Unit Heat Type
48 = Gas Heat Packaged Rooftop

Model Series - WeatherMaster®
QE = Mid Tier Hybrid Heat with Puron Advance™

Heat Type
S = Low Gas Heat, Stainless Steel (SS) Heat Exchanger
R = Medium Gas Heat, SS Heat Exchanger
T = High Gas Heat, SS Heat Exchanger

Refrigerant Options
M = Two Stage Cooling/Single Circuit

Cooling Tons
17 = 15.0 tons
24 = 20.0 tons
28 = 25.0 tons

Sensor Options
A = None
B = Return Air Smoke Detector (RA)
C = Supply Air Smoke Detector (SA)
D = RA + SA Smoke Detector
J = Condensate Overflow Switch (COFS)
K = Condensate Overflow Switch + RA Smoke Detector
L = Condensate Overflow Switch + RA and SA Smoke Detectors
M = Condensate Overflow Switch + SA Smoke Detector

Indoor Fan Options - Vane Axial EcoBlue Fan System
2 = Standard/Medium Static Motor
3 = High Static Motor
5 = Standard/Medium Static Motor, Filter Status Switch
6 = High Static Motor - Vertical Supply and Filter Status Switch
J = High Static Motor - Horizontal Supply
L = High Static Motor - Horizontal Supply and Filter Status Switch

Coil Options – RTPF (Outdoor – Indoor – Hail Guard)
A = Al/Cu – Al/Cu
B = Precoat Al/Cu – Al/Cu
C = E-coat Al/Cu – Al/Cu
D = E-coat Al/Cu – E-coat Al/Cu
M = Al/Cu – Al/Cu – Louvered Hail Guard
N = Precoat Al/Cu – Al/Cu – Louvered Hail Guard
P = E-coat Al/Cu – Al/Cu – Louvered Hail Guard
Q = E-coat Al/Cu – E-coat Al/Cu – Louvered Hail Guards
R = Cu/Cu – Al/Cu – Louvered Hail Guard
S = Cu/Cu – Cu/Cu – Louvered Hail Guard

Voltage
1 = 575-3-60
5 = 208/230-3-60
6 = 460-3-60

Design Revision
- = Factory Design Revision

Packaging Compliance
0 = Standard

Electrical Options
A = None
B = HACR Breaker
C = Non-Fused Disconnect (NFDC)
N = Phase Monitor/Protection (PMR)
P = PMR + HACR
Q = PMR + NFDC
1 = HSCCR[a] (High Short Circuit Current Rating) Protection

Service Options
0 = None
1 = Unpowered Convenience Outlet (NPCO)
2 = Powered Convenience Outlet (PCO)
3 = Hinged Panels (HP)
4 = Hinged Panels + NPCO
5 = Hinged Access Panels + PCO
6 = MERV-13 Filters (M13)
7 = NPCO + MERV-13 Filters
8 = PCO + MERV-13 Filters
9 = Hinged Panels + MERV-13 Filters
A = HP + NPCO + MERV-13 Filters
B = HP + PCO + MERV-13 Filters
C = Foil Faced Insulation (FF)
D = FF + NPCO
E = FF + PCO
F = FF + HP
G = FF + HP + NPCO
H = FF + HP + PCO
J = FF + MERV-13 Filters
K = FF + NPCO + MERV-13 Filters
L = FF + PCO + MERV-13 Filters
M = FF + HP + MERV-13 Filters
N = FF + HP + NPCO + MERV-13 Filters
P = FF + HP + PCO + MERV-13 Filters

Intake / Exhaust Options
A = None
B = Temperature Economizer with Barometric Relief
F = Enthalpy Economizer with Barometric Relief
L = ULL (Ultra Low Leak) Temperature Economizer with Barometric Relief and CO_2 Sensor
M = ULL Enthalpy Economizer with Barometric Relief and CO_2 Sensor
N = ULL Temperature Economizer with Power Exhaust and CO_2 Sensor, Vertical Only
P = ULL Enthalpy Economizer with Power Exhaust and CO_2 Sensor, Vertical Only
U = ULL Temperature Economizer with Barometric Relief
V = ULL Temperature Economizer with Power Exhaust, Vertical Only
W = ULL Enthalpy Economizer with Barometric Relief
X = ULL Enthalpy Economizer with Power Exhaust, Vertical Only

Base Unit Controls
3 = SystemVu™ Controller

NOTE(S):
a Not available on the following models/options: 575V, Head Pressure Control, Phase Loss Monitor, Non-Fused Disconnect, HACR Breaker, Powered Convenience Outlet.

Capacity ratings

48QE AHRI Ratings[a,b,c,d]

UNIT	COOLING STAGES	NOMINAL CAPACITY (TONS)	NET COOLING CAPACITY (BTU/HR)	TOTAL POWER (kW)	EER	IEER WITH 2-SPEED INDOOR FAN MOTOR	AHRI RATING CFM	AHRI PART LOAD CFM
Vertical Units								
48QE17**	2	15	175,000	15.9	11.40	17.0	6,000	3,600
48QE24**	2	20	230,000	22.1	10.40	16.2	8,000	4,800
48QE28**	2	25	290,000	29.4	9.85	15.3	9,500	6,000
Horizontal Units								
48QE17**	2	15	175,000	15.9	11.40	17.0	6,000	3,600
48QE24**	2	20	228,000	21.9	10.40	15.7	8,000	4,800
48QE28**	2	25	286,000	29.6	9.65	14.7	9,500	6,000

NOTE(S):

a. Rated in accordance with AHRI Standards 340/360.
b. Rating are based on:
Cooling Standard: 80°F (27°C) db, 67°F (19°C) wb indoor air temperature and 95°F (35°C) db outdoor air temperature.
IEER Standard: A measure that expresses cooling part-load EER efficiency for commercial unitary air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities.
c. All 48QE units comply with ASHRAE 90.1-2019 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) and DOE-2023 (Department of Energy) Energy Standard for minimum IEER requirements.
d. 48QE units comply with US Energy Policy Act (2005). To evaluate code compliance requirements, refer to state and local codes.

LEGEND

AHRI — Air-Conditioning, Heating and Refrigeration Institute
EER — Energy Efficiency Ratio
IEER — Integrated Energy Efficiency Ratio

48QE Vertical and Horizontal Units AHRI Ratings, Heating Mode[a,b,c]

UNIT	HEATING, LOW 17°F (–8°C) AMBIENT		HEATING, HIGH 47°F (8°C) AMBIENT		AHRI RATING CFM
	Net Capacity (BTU/HR)	COP	Net Capacity (Btuh)	COP	
48QE17**	96,000	2.30	166,000	3.50	6,000
48QE24**	134,000	2.25	232,000	3.40	8,000
48QE28**	172,000	2.20	300,000	3.40	9,500

NOTE(S):

a. Rated in accordance with AHRI Standards 340/360.
b. Rating are based on:
Cooling Standard: 80°F (27°C) db, 67°F (19°C) wb indoor air temperature and 95°F (35°C) db outdoor air temperature.
IEER Standard: A measure that expresses cooling part-load EER efficiency for commercial unitary air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities.
c. All 48QE units comply with ASHRAE 90.1-2019 (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) and DOE-2023 (Department of Energy) Energy Standard for minimum IEER requirements.

LEGEND

AHRI — Air-Conditioning, Heating and Refrigeration Institute
COP — Coefficient of Performance

Sound Ratings Table[a,b,c]

48QE UNIT	COOLING STAGES	OUTDOOR SOUND (dB) at 60 Hz								
		A-WEIGHTED	63	125	250	500	1000	2000	4000	8000
17	2	84.1	92.2	83.9	80.4	81.8	78.7	76.5	72.2	65.4
24	2	85.9	97.1	88.3	84.4	83.3	80.7	77.4	73.4	67.3
28	2	85.9	97.1	88.3	84.4	83.3	80.7	77.4	73.4	67.3

NOTE(S):

a. Outdoor sound data is measured in accordance with AHRI.
b. Measurements are expressed in terms of sound power. Do not compare these values to sound pressure values because sound pressure depends on specific environmental factors which normally do not match individual applications. Sound power values are independent of the environment and therefore more accurate.
c. A-weighted sound ratings filter out very high and very low frequencies, to better approximate the response of “average” human ear. A-weighted measurements for Carrier units are taken in accordance with AHRI.

LEGEND

dB — Decibel

Capacity ratings (cont)

Minimum - Maximum Airflow Ratings (cfm) — Natural Gas and Propane

UNIT	HEAT LEVEL	COOLING			SS HX HEATING[a]	
		MINIMUM 2-SPEED AIRFLOW (LOW SPEED)	MINIMUM 2-SPEED AIRFLOW (HIGH SPEED)	MAXIMUM AIRFLOW CFM	MINIMUM AIRFLOW CFM	MAXIMUM AIRFLOW CFM
48QE17**	LOW	2,700	4,500	7,500	3,000	11,000
	MED				3,880	9,300
	HIGH				4,620	10,000
48QE24**	LOW	3,000	6,000	10,000	3,000	16,500
	MED				3,880	15,500
	HIGH				4,620	15,000
48QE28**	LOW	3,750	7,500	12,500	3,000	16,500
	MED				3,880	15,500
	HIGH				4,620	15,000

NOTE(S):

a. Stainless steel heat exchangers.

Heat Rating Table — Natural Gas and Propane

UNIT	GAS HEAT	AL/SS HEAT EXCHANGER		TEMPERATURE RISE (°F)	THERMAL EFFICIENCY (%)
		INPUT/OUTPUT STAGE 1 (MBH)	INPUT/OUTPUT STAGE 2 (MBH)		
48QE17**	LOW	176 / 142	220 / 178	20-45	81
	MED	248 / 200	310 / 251	30-55	81
	HIGH	320 / 260	400 / 324	35-60	81
48QE24**	LOW	176 / 142	220 / 178	15-45	81
	MED	248 / 200	310 / 251	20-55	81
	HIGH	320 / 260	400 / 324	30-60	81
48QE28**	LOW	176 / 142	220 / 178	10-45	81
	MED	248 / 200	310 / 251	15-55	81
	HIGH	320 / 260	400 / 324	20-60	81

LEGEND

MBH — Btuh in thousands

Physical data

48QE 17 to 28 Physical Data

48QE UNIT	48QE**17	48QE**24	48QE**28
NOMINAL TONS	15	20	25
BASE UNIT OPERATING WT (lb)[a]	1990	2382	2445
REFRIGERATION SYSTEM			
No. Circuits/No. Compressors/Type	1/2/Scroll	1/2/Scroll	1/2/Scroll
Puron Advance™ (R-454B) Charge (lb-oz)	31-0	45-0	47-0
Metering Device	TXV	TXV	TXV
High-Pressure Trip/Reset (psig)	630/505	630/505	630/505
Loss of Charge Trip/Reset (psig)	27/44	27/44	27/44
EVAPORATOR COIL			
Material (Tube/Fin)	Cu/Al	Cu/Al	Cu/Al
Coil Type	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF
Rows/FPI	3/17	4/17	4/17
Total Face Area (ft^2)	22	26	26
Condensate Drain Connection Size	3/4 in.	3/4 in.	3/4 in.
CONDENSER COIL			
Material (Tube/Fin)	Cu/Al	Cu/Al	Cu/Al
Coil Type	5/16 in. RTPF	5/16 in. RTPF	5/16 in. RTPF
Rows/FPI	2/18	2/18	2/18
Total Face Area (ft^2)	50.1	70.8	70.8
EVAPORATOR FAN AND MOTOR			
Vertical Standard Static 3 Phase			
Motor Qty / Drive Type	2 / Direct	2 / Direct	2 / Direct
Maximum Cont bhp (per motor)	2.4	2.4	3
Range (rpm)	250-2000	250-2000	250-2200
Fan Qty / Type	2 / Vane Axial	2 / Vane Axial	2 / Vane Axial
Fan Diameter (in.)	22	22	22
Vertical High Static 3 Phase			
Motor Qty / Drive Type	2 / Direct	2 / Direct	2 / Direct
Maximum Cont bhp (per motor)	3	5	5
Range (rpm)	250-2200	250-2200	250-2200
Fan Qty / Type	2 / Vane Axial	2 / Vane Axial	2 / Vane Axial
Fan Diameter (in.)	22	22	22
Horizontal High Static 3 Phase			
Motor Qty / Drive Type	2 / Direct	2 / Direct	2 / Direct
Maximum Cont bhp (per motor)	5	5	5
Range (rpm)	250-2200	250-2200	250-2200
Fan Qty / Type	2 / Vane Axial	2 / Vane Axial	2 / Vane Axial
Fan Diameter (in.)	22	22	22
CONDENSER FAN AND MOTOR			
Qty / Motor Drive Type	4 / Direct	6 / Direct	6 / Direct
Motor hp / rpm	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan Diameter (in.)	22	22	22
FILTERS			
RA Filter Qty / Size (in.)	6 / 20x25x2	9 / 20x25x2	9 / 20x25x2
OA Inlet Screen Qty / Size (in.)	4 / 16x25x1	4 / 16x25x1	4 / 16x25x1

NOTE(S):

a. Base unit operating weight does not include weight of options.

LEGEND

bhp — Brake Horsepower
FPI — Fins Per Inch
OA — Outdoor Air
RA — Return Air

Physical data (cont)

48QE 17 to 28 Gas Heat Data

48QE UNIT	48QE**17	48QE**24	48QE**28
NOMINAL TONS	15.0	20.0	25.0
GAS CONNECTION			
No. of Gas Valves	1	1	1
Natural Gas Supply Line Pressure (in. wg)/(psig)	5-13 / 0.18-0.47	5-13 / 0.18-0.47	5-13 / 0.18-0.47
Liquid Propane Supply Line Pressure (in. wg)/(psig)	11-13 / 0.40-0.47	11-13 / 0.40-0.47	11-13 / 0.40-0.47
HEAT ANTICIPATOR SETTING (AMPS)			
First Stage	0.14	0.14	0.14
Second Stage	0.14	0.14	0.14
NATURAL GAS HEAT			
LOW			
No. of Stages / No. of Burners (total)	2 / 5	2 / 5	2 / 5
Connection Size	3/4 in. NPT	3/4 in. NPT	3/4 in. NPT
Rollout Switch Opens / Closes (°F)	195 / 115	195 / 115	195 / 115
Temperature Rise (°F)	20-45	15-45	10-45
MEDIUM			
No. of Stages / No. of Burners (total)	2 / 7	2 / 7	2 / 7
Connection Size	3/4 in. NPT	3/4 in. NPT	3/4 in. NPT
Rollout Switch Opens / Closes (°F)	195 / 115	195 / 115	195 / 115
Temperature Rise (°F)	30-55	20-55	15-55
HIGH			
No. of Stages / No. of Burners (total)	2 / 9	2 / 9	2 / 9
Connection Size	3/4 in. NPT	3/4 in. NPT	3/4 in. NPT
Rollout Switch Opens / Closes (°F)	195 / 115	195 / 115	195 / 115
Temperature Rise (°F)	35-60	30-60	20-60
LIQUID PROPANE HEAT			
LOW			
No. of Stages / No. of Burners (total)	2 / 5	2 / 5	2 / 5
Connection Size	3/4 in. NPT	3/4 in. NPT	3/4 in. NPT
Rollout Switch Opens / Closes (°F)	195 / 115	195 / 115	195 / 115
Temperature Rise (°F)	20-45	15-45	10-45
MEDIUM			
No. of Stages / No. of Burners (total)	2 / 7	2 / 7	2 / 7
Connection Size	3/4 in. NPT	3/4 in. NPT	3/4 in. NPT
Rollout Switch Opens / Closes (°F)	195 / 115	195 / 115	195 / 115
Temperature Rise (°F)	30-55	20-55	15-55
HIGH			
No. of Stages / No. of Burners (total)	2 / 9	2 / 9	2 / 9
Connection Size	3/4 in. NPT	3/4 in. NPT	3/4 in. NPT
Rollout Switch Opens / Closes (°F)	195 / 115	195 / 115	195 / 115
Temperature Rise (°F)	35-60	30-60	20-60

Options and accessories

ITEM	FACTORY-INSTALLED OPTION	FIELD-INSTALLED ACCESSORY
GAS HEAT		
Low, Medium or High Gas Heat — Stainless Steel Heat Exchanger	X	
Propane Conversion Kit		X
High Altitude Conversion Kit		X
Flue Discharge Deflector		X
CABINET		
Hinged Access Panels	X	
MERV-13, 4 in. Filters	X	
MERV-13, 2 in. Filters		X
MERV-8, 2 in. Filters		X
4 in. Filter Rack (filters not included)		X
COIL OPTIONS		
Cu/Cu Indoor and/or Outdoor Coils[a]	X	
Pre-Coated Outdoor Coils	X	
Premium, E-Coated Outdoor Coils	X	
CONDENSER PROTECTION		
Condenser Coil Hail Guard (louvered design)	X	X
CONTROLS		
Thermostats, Temperature Sensors, and Subbases		X
Smoke Detector (supply and/or return air)	X	X
Horn Strobe Annunciator[b]		X
Phase Monitor	X	X
ECONOMIZERS AND OUTDOOR AIR DAMPERS		
EconoMi$er® 2 for DDC Controls (Low and Ultra Low Leak air damper models)[c]	X	X
Motorized Two-Position Outdoor-Air Damper		X
Manual Outdoor-Air Damper (25% and 50%)		X
Barometric Relief[d]	X	X
Power Exhaust — centrifugal design	X	X
Condensate Overflow Switch	X	X

ITEM	FACTORY-INSTALLED OPTION	FIELD-INSTALLED ACCESSORY
ECONOMIZER SENSORS AND IAQ DEVICES		
Single Dry Bulb Temperature Sensors[e]	X	X
Differential Dry Bulb Temperature Sensors[e]		X
Differential Enthalpy Sensors[e]		X
CO_2 Sensor (wall, duct, or unit mounted)[e]	X	X
INDOOR FAN MOTOR		
Optional Indoor Fan Motors	X	
Fan Filter Status Switch	X	X
LOW AMBIENT CONTROLS		
Low Ambient Controller to 0°F (–18°C)[f]		X
POWER OPTIONS		
Convenience Outlet (powered)	X	
Convenience Outlet (unpowered)	X	
Convenience Outlet, 20 amp (unpowered)		X
HACR Circuit Breaker[g]	X	
Non-Fused Disconnect[h]	X	
High SCCR Protection[i]	X	
ROOF CURBS		
Roof Curb 14 in. (356 mm)		X
Roof Curb 24 in. (610 mm)		X

NOTE(S):

a. Cu/Cu coils are only available with louvered hail guards.
b. Requires a field-supplied 24V transformer for each application. See price pages for details.
c. 48QE units are equipped with SystemVu controls (standard) which complies with California Title 24 Fault Detection and Diagnostic (FDD).
d. Included with economizer.
e. Sensors used to optimize economizer performance.
f. See application data for assistance.
g. HACR circuit breaker cannot be used when unit MOCP electrical rating exceeds:
   17-24 sizes -
   208V/230V = 150 amps
   460V = 70 amps
   575V = 50 amps
   28 size -
   208V/230V = 200 amps
   460V = 90 amps
   575V = 70 amps
   HACR circuit breaker on 575 volt can only be used on Wye power supply. Delta power supply is prohibited.
   Carrier RTUBuilder automatically selects the amps limitations.
h. Non-fused disconnect switch cannot be used when unit FLA electrical rating exceeds:
   208V/230V = 200 amps
   460V/575V = 100 amps
i. High SCCR (Short Circuit Current Rating) is not available on the following: units with phase loss monitor, non-fused disconnect, HACR breaker, powered convenience outlet, and 575V models

Options and accessories (cont)

Factory-installed options

Economizer (dry-bulb or enthalpy)

Economizers save money. They bring in fresh, outside air for ventilation; and provide cool, outside air to cool your building. This is the preferred method of low-ambient cooling. When coupled to CO_2 sensors, economizers can provide even more savings by coupling the ventilation air to only that amount required.

Economizers are available, installed and tested by the factory, with either enthalpy or dry-bulb temperature inputs. Additional sensors are available as accessories to optimize the economizers. Economizers include barometric relief system to help equalize building pressures.

Economizers can be factory-installed or easily field-installed.

Unit mounted CO_2 sensor

The CO_2 sensor works with the economizer to intake only the correct amount of outside air for ventilation. As occupants fill your building, the CO_2 sensor detects their presence through increasing CO_2 levels, and opens the economizer appropriately. When the occupants leave, the CO_2 levels decrease, and the sensor appropriately closes the economizer. This intelligent control of the ventilation air, called demand controlled ventilation (DCV), reduces the overall load on the rooftop, saving money. It is also available as a field-installed accessory.

Smoke detector (supply and/or return air)

Our smoke detectors make your application safer and your job easier. Carrier smoke detectors immediately shut down the rooftop unit when smoke is detected. They are available, installed by the factory, for supply air, return air, or both.

Hinged access panels

Allows access to unit's major components with specifically designed hinged access panels. Panels are filter, control box access indoor fan motor access.

Cu/Cu (indoor) coils

Copper fins and copper tubes are mechanically bonded to copper tubes and copper tube sheets. A polymer strip prevents coil assembly from contacting the sheet metal coil pan to minimize the potential for galvanic corrosion between coil and pan. Only available with louvered hail guards.

E-coated (outdoor and indoor) coils

These coils feature a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. The coating process ensures complete coil encapsulation of tubes, fins, and headers.

Pre-coated outdoor coils

These coils feature a durable epoxy-phenolic coating that provides protection in mildly corrosive coastal environments. The coating minimizes galvanic action between dissimilar metals. The coating is applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.

Condenser coil hail guard

These sleek, louvered panels protect the condenser coil from hail damage, foreign objects, and incidental contact. This can be purchased as a factory-installed option or as a field-installed accessory.

Convenience outlet (powered or un-powered)

Reduce service and/or installation costs by including a convenience outlet in your specification. Carrier will install this service feature at our factory. Provides a convenient, 15 amp, 115v GFCI receptacle with "Wet in Use" cover. The "powered" option allows the installer to power the outlet from the line side of the disconnect or load side as required by code. The "unpowered" option is to be powered from a separate 115/120v power source.

The unpowered convenience outlet is available as a 15 amp factory-installed option or a 20 amp field-installed accessory.

Non-fused disconnect

This OSHA-compliant, factory-installed, safety switch allows a service technician to locally secure power to the rooftop. When selecting a factory-installed non-fused disconnect, note they are sized for the unit as ordered from the factory. The sizing of these do not accommodate field-installed items such as power exhaust devices, etc. If field installing electric heat with factory-installed non-fused disconnect switch, a single point kit may or may not be required.

HACR Breaker

These manual reset devices provide overload and short circuit protection for the unit. Breakers are factory wired and mounted on the units, with an access cover to provide protection from the environment.

Condensate overflow switch

This sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:

- Indicator light — solid red (more than 10 seconds on water contact — compressors disabled), blinking red (sensor disconnected)
- 10-second delay to break — eliminates nuisance trips from splashing or waves in pan (sensor needs 10 seconds of constant water contact before tripping)
- Disables the compressors operation when condensate plug is detected, but still allows fans to run for economizer.

Power exhaust with barometric relief

Superior internal building pressure control. This field-installed accessory may eliminate the need for costly, external pressure control fans.

MERV-13 4 in. return air filters

This factory option upgrades the return air filters from standard unit filters to high efficiency MERV-13 filters. Non-woven MERV-13 filter media with high strength, moisture-resistant frame. Filter media is securely fasted inside the filter frame on all 4 sides.

High Short Circuit Current Rating (SCCR) protection

This factory-installed option provides high short circuit current protection to each compressor, plus all indoor and outdoor fan motors of 60 kA (for 208/230-3-60 units) and 65 kA (for 460-3-60 units) against high potential fault current situations.

Standard unit comes with 5 kA rating.

This option is not available with factory installed non-fused disconnect, HACR breaker, phase loss monitor/protection, powered convenience outlet, and 575 volt models.

Options and accessories (cont)

Field-installed accessories

Filter maintenance indicator

When the optional factory-installed filter maintenance indicator is used, a factory-installed differential pressure switch measures pressure drop across the outside air filter and activates a field-supplied dry contact indicator when the pressure differential exceeds the adjustable switch setpoint.

Condenser coil hail guard

Sleek, louvered panels protect the condenser coil from hail damage, foreign objects, and incidental contact. This can be purchased as a factory-installed option or as a field-installed accessory.

Differential enthalpy sensor

The differential enthalpy sensor is comprised of an outdoor and return air enthalpy sensors to provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.

Wall or duct mounted CO_2 sensor

The IAQ sensor shall be available in duct or wall mount. The sensor provides demand ventilation indoor air quality (IAQ) control.

Propane conversion kit

Convert your gas heat rooftop from standard natural gas operation to Propane using this field-installed kit.

High altitude conversion kit

High altitudes have less oxygen, which affects the fuel/air mixture in heat exchangers. In order to maintain a proper fuel/air mixture, heat exchangers operating in altitudes above 2000 ft (610 m) require different orifices. To select the correct burner orifices or determine the heat capacity for a high altitude application, use either the selection software, or the unit's service manual. High altitudes have less oxygen, which means heat exchangers need less fuel. The new gas orifices in this field-installed kit make the necessary adjustment for high altitude applications. They restore the optimal fuel to air mixture and maintain healthy combustion on altitudes above 2000 ft (610 m).

NOTE: Typical natural gas heating value ranges from 975 to 1050 Btu/ft^3 at sea level nationally. The heating value goes down approximately 1.7% per every thousand feet elevation. Standard factory orifices can typically be used up to 2000 ft (610 m) elevation without any operational issues.

4 in. filter rack kit

The 4 in. filter rack accessory kit is designed to hold 4 in. MERV-8 or MERV-13 filters. Filters not included in kit.

MERV-13 2 in. return air filters

This kit includes MERV-13 2 in. filters (qty 4) to accommodate unit filter rack size.

MERV-8 2 in. return air filters

This kit includes MERV-8 2 in. filters (qty 4) to accommodate unit filter rack size.

Phase monitor protection

The Phase Monitor Control will monitor the sequence of 3-phase electrical system to provide a phase reversal protection; and monitor the 3-phase voltage inputs to provide a phase loss protection for the 3-phase device. It will work on either a Delta or Wye power connection.

Low ambient controller

The low ambient controller is a head pressure controller kit that is designed to maintain the unit's condenser head pressure during periods of low ambient cooling operation. This device should be used as an alternative to economizer free cooling when economizer usage is either not appropriate or desired. The low ambient controller will either cycle the outdoor fan motors or operate them at reduced speed to maintain the unit operation, depending on the model. This controller allows cooling operation down to –20°F (–28°C) ambient conditions.

Roof curb (14 in./356 mm or 24 in./610 mm)

Full perimeter roof curb with exhaust capability provides separate air streams for energy recovery from the exhaust air without supply air contamination.

Filter status indicator accessory

Monitors static pressure across supply and exhaust filters and provides indication when filters become clogged.

Power exhaust

Superior internal building pressure control. This field-installed accessory may eliminate the need for costly, external pressure control fans.

Manual OA damper

Manual outdoor air dampers are an economical way to bring in ventilation air. The dampers are available in 25% and 50% versions.

Motorized Two-Position damper

The Carrier two-position, motorized outdoor air damper admits up to 100% outside air. Using reliable, gear-driven technology, the two-position damper opens to allow ventilation air and closes when the rooftop stops, stopping unwanted infiltration.

Options and accessories (cont)

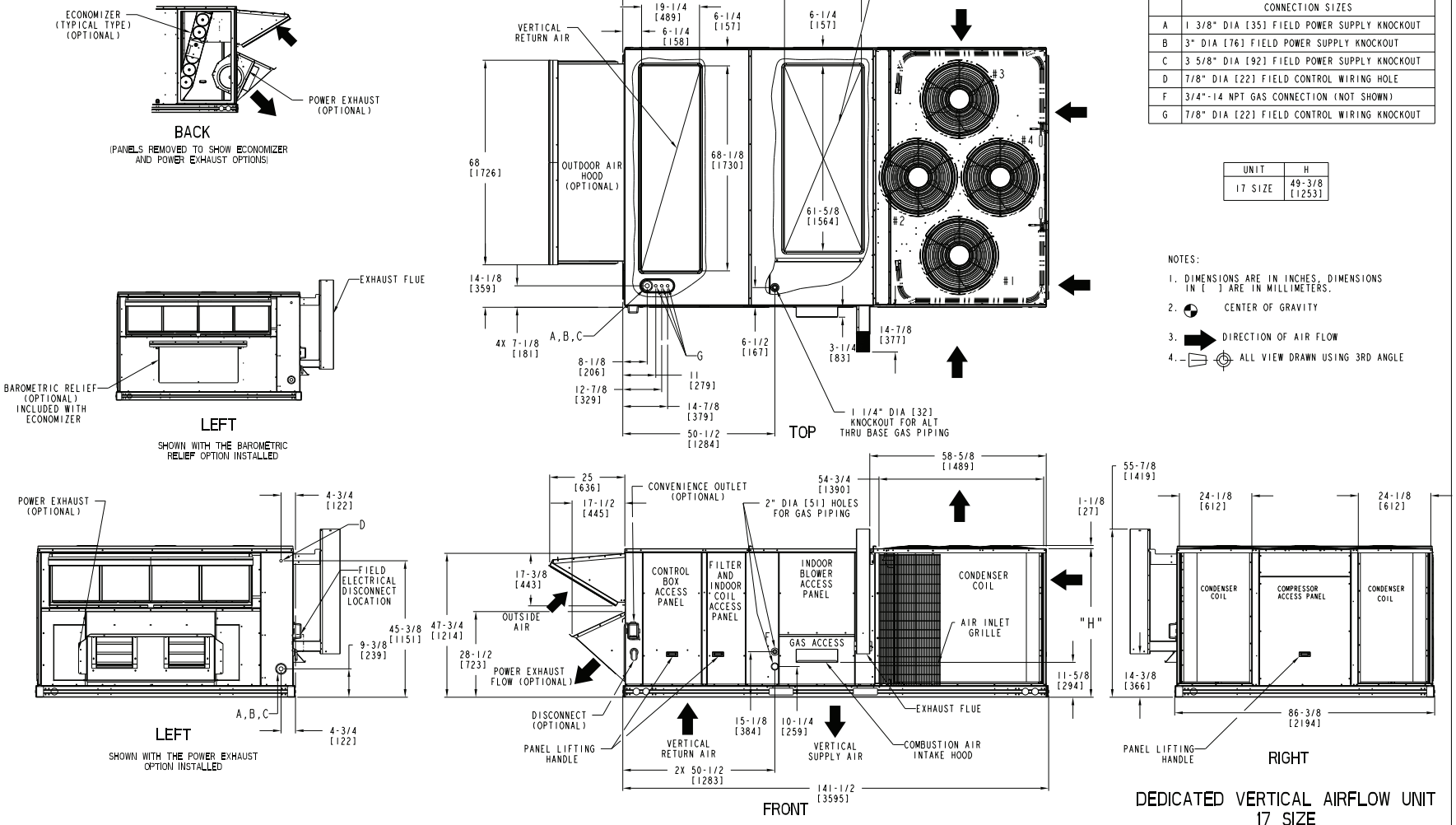
Options and Accessory Weights[a]

OPTION / ACCESSORY NAME	48QE UNIT WEIGHT					
	17		24		28	
	lb	kg	lb	kg	lb	kg
Power Exhaust	198	90	198	90	198	90
Economizer	245	111	245	111	245	111
Hail Guard (louvered)	90	41	100	46	100	46
Cu/Cu Condenser Coil	331	150	448	203	448	203
Cu/Cu Evaporator Coil	331	150	448	203	448	203
Roof Curb (14 in. curb)	240	109	255	116	255	116
Roof Curb (24 in. curb)	340	154	355	161	355	161
CO_2 Sensor	5	3	5	3	5	3
Optional Indoor Motor[b]	30	14	0	0	0	0
Low Ambient Controller	9	4	9	4	9	4
Return Air Smoke Detector	7	3	7	3	7	3
Supply Air Smoke Detector	7	3	7	3	7	3
Fan Filter Switch	2	1	2	1	2	1
Non-Fused Disconnect	15	7	15	7	15	7
Powered Convenience Outlet[c]	36	16	36	16	36	16
Unpowered Convenience Outlet	4	2	4	2	4	2
Enthalpy Sensor	2	1	2	1	2	1
Differential Enthalpy Sensor	3	1	3	1	3	1

NOTE(S):

a. Where multiple variations are available, the heaviest combination is listed.
b. Add the Optional Indoor Motor weight to the weight of the base unit.
c. Weight includes convenience outlet and convenience outlet transformer.

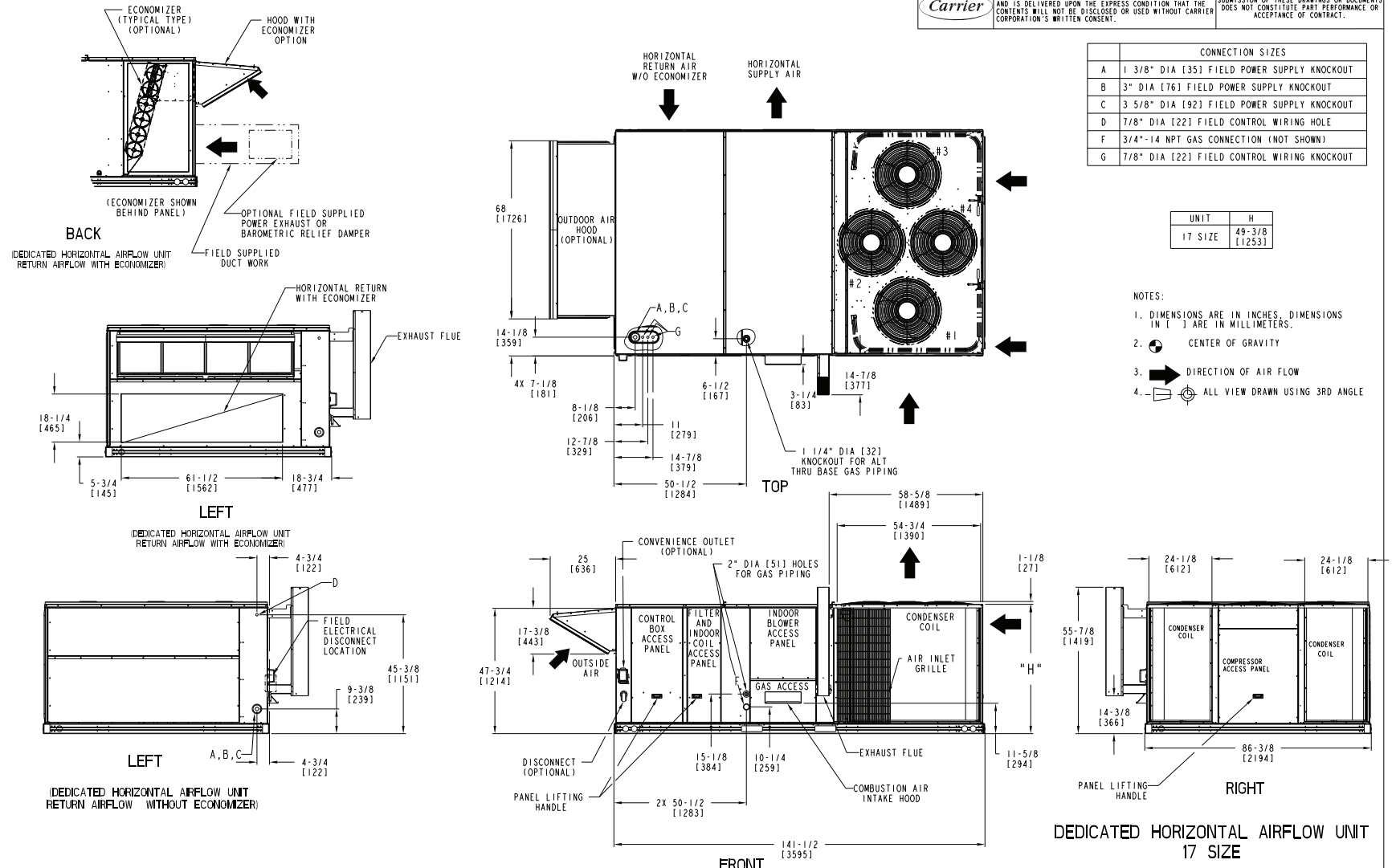
48QE**17 Base Unit Dimensions



DEDICATED VERTICAL AIRFLOW UNIT
17 SIZE

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	1 OF 5	09/20/24	-	48QE 17 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008200	-

48QE**17 Base Unit Dimensions (cont)



	CONNECTION SIZES
A	1 3/8" DIA [35] FIELD POWER SUPPLY KNOCKOUT
B	3" DIA [76] FIELD POWER SUPPLY KNOCKOUT
C	3 5/8" DIA [92] FIELD POWER SUPPLY KNOCKOUT
D	7/8" DIA [22] FIELD CONTROL WIRING HOLE
F	3/4"-14 NPT GAS CONNECTION (NOT SHOWN)
G	7/8" DIA [22] FIELD CONTROL WIRING KNOCKOUT

UNIT	H
17 SIZE	49-3/8 [1253]

NOTES:
1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. CENTER OF GRAVITY
3. DIRECTION OF AIR FLOW
4. ALL VIEW DRAWN USING 3RD ANGLE

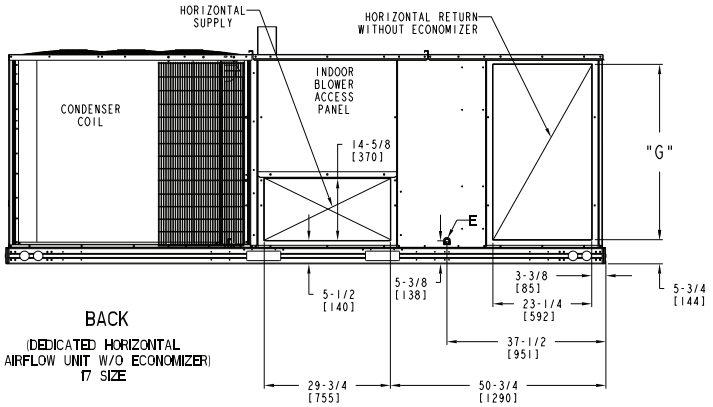
DEDICATED HORIZONTAL AIRFLOW UNIT
17 SIZE

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	2 OF 5	09/20/24	-	48QE 17 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008200	-

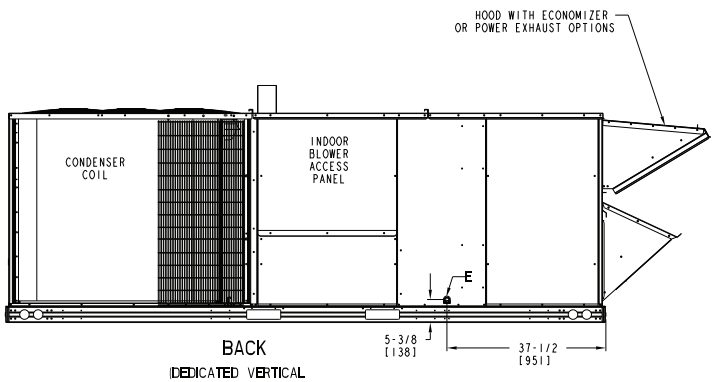
48QE**17 Base Unit Dimensions (cont)

	CONNECTION SIZES
E	3/4"-14 NPT CONDENSATE DRAIN

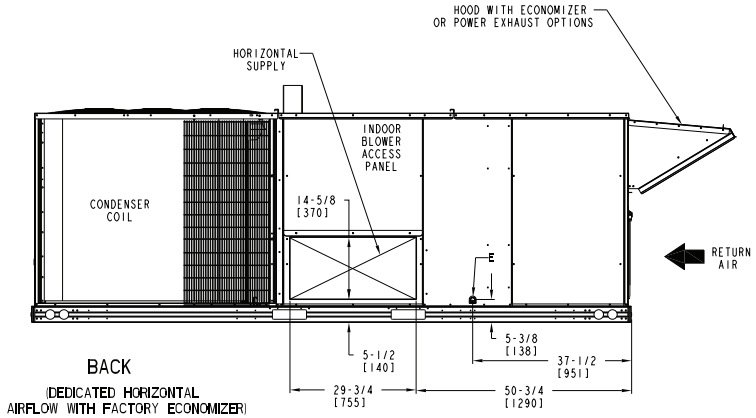
UNIT	G
17 SIZE	41-3/8 [1049]



BACK
(DEDICATED HORIZONTAL AIRFLOW UNIT W/O ECONOMIZER)
17 SIZE



BACK
(DEDICATED VERTICAL AIRFLOW UNIT W/ECONOMIZER)
17 SIZE



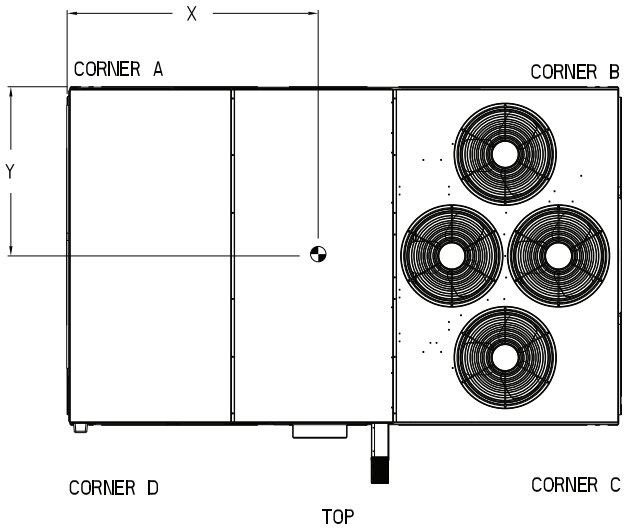
BACK
(DEDICATED HORIZONTAL AIRFLOW WITH FACTORY ECONOMIZER)
17 SIZE

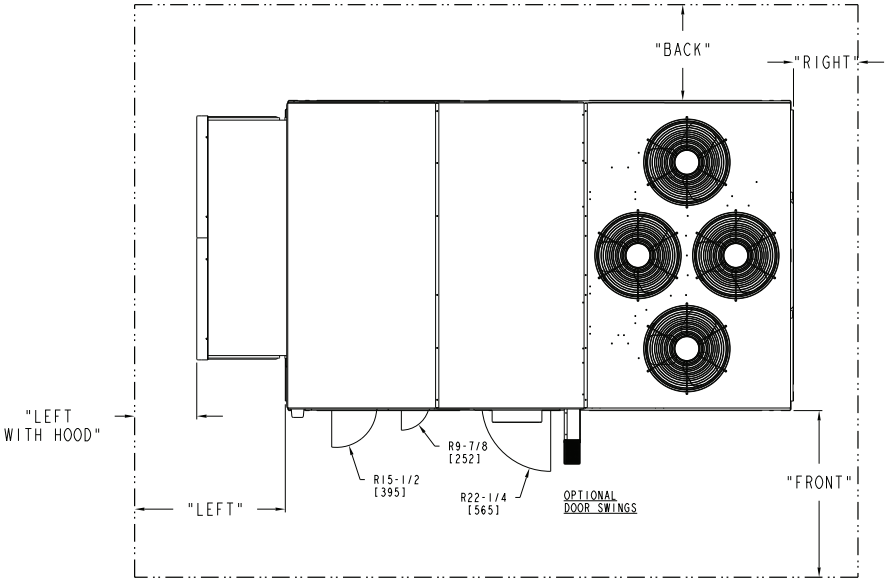
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	3 OF 5	09/20/23	-	48QE SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008200	-

48QE**17 Base Unit Dimensions (cont)

UNIT	STD UNIT WEIGHT *		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
48QE17	1990	903	445	202	531	241	552	250	462	210	77 [1956]	44 [1118]	16 1/2 [419]

* STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.



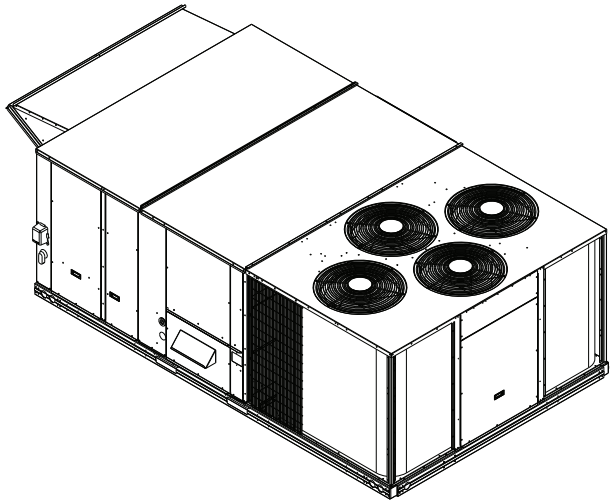


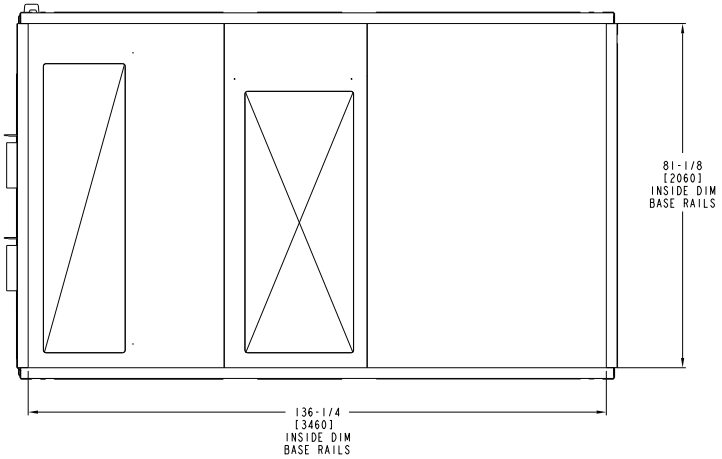
NOTES:

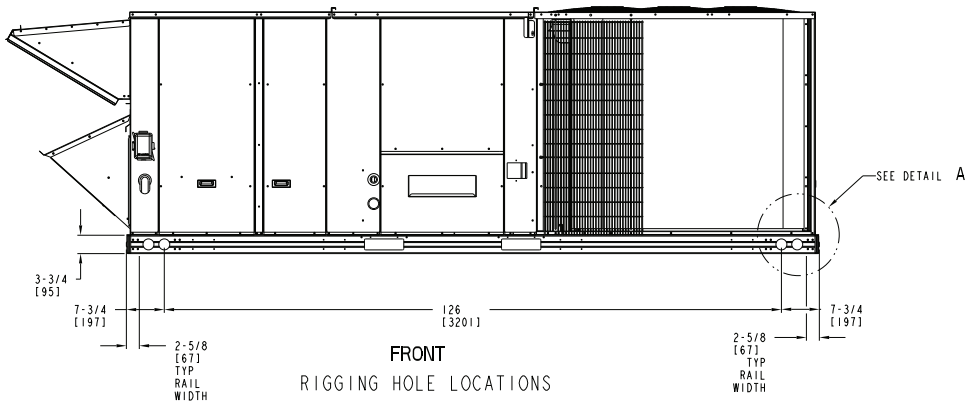
1. CLEARANCE ABOVE THE UNIT TO BE 72"
2. FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

	CLEARANCE		
	SERVICE WITH:	SERVICE WITH:	OPERATING
SURFACE	CONDUCTIVE BARRIER	NONCONDUCTIVE BARRIER	CLEARANCE
FRONT	48 [1219mm]	36 [914mm]	18 [457mm]
LEFT	48 [1219mm]	42 [1067mm]	18 [457mm]
BACK	42 [1067mm]	36 [914mm]	18 [457mm]
LEFT WITH HOOD	36 [914mm]	36 [914mm]	18 [457mm]
RIGHT	36 [914mm]	36 [914mm]	18 [457mm]
TOP	72 [1829mm]	72 [1829mm]	72 [1829mm]

48QE**17 Base Unit Dimensions (cont)





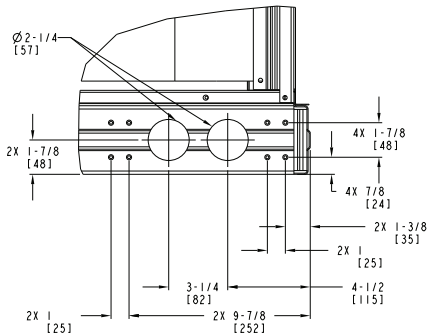


FRONT

RIGGING HOLE LOCATIONS

BOTTOM

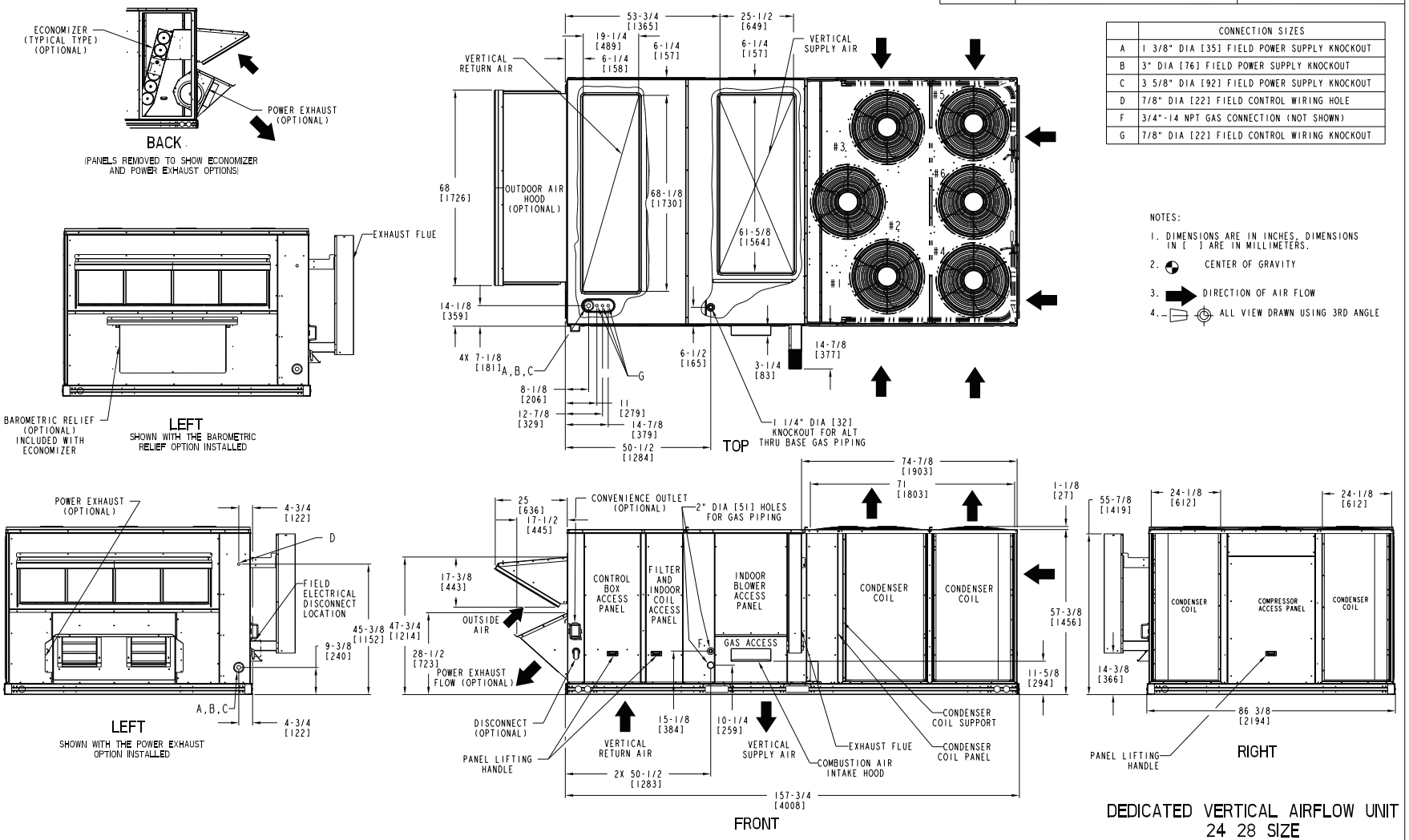
INSIDE BASERAIL DIMENSIONS



DETAIL A
TYP 4 PLCS

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	5 OF 5	09/20/24	-	48QE 17 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008200	-

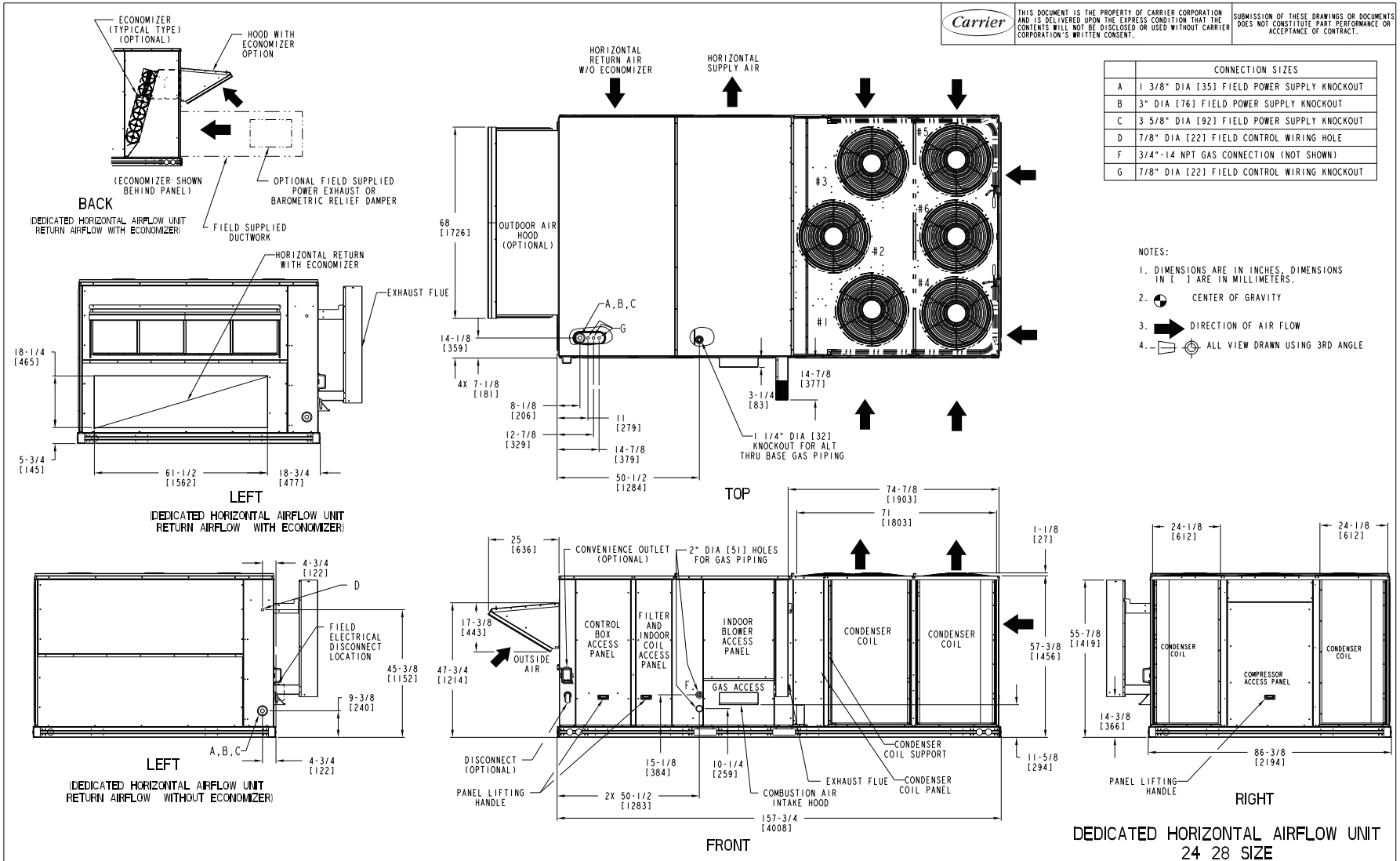
48QE**24-28 Base Unit Dimensions



DEDICATED VERTICAL AIRFLOW UNIT
24 28 SIZE

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	1 OF 5	09/20/24	-	48QE 24 28 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008201	-

48QE**24-28 Base Unit Dimensions (cont)



	CONNECTION SIZES
A	1 3/8" DIA [35] FIELD POWER SUPPLY KNOCKOUT
B	3" DIA [76] FIELD POWER SUPPLY KNOCKOUT
C	3 5/8" DIA [92] FIELD POWER SUPPLY KNOCKOUT
D	7/8" DIA [22] FIELD CONTROL WIRING HOLE
F	3/4"-14 NPT GAS CONNECTION (NOT SHOWN)
G	7/8" DIA [22] FIELD CONTROL WIRING KNOCKOUT

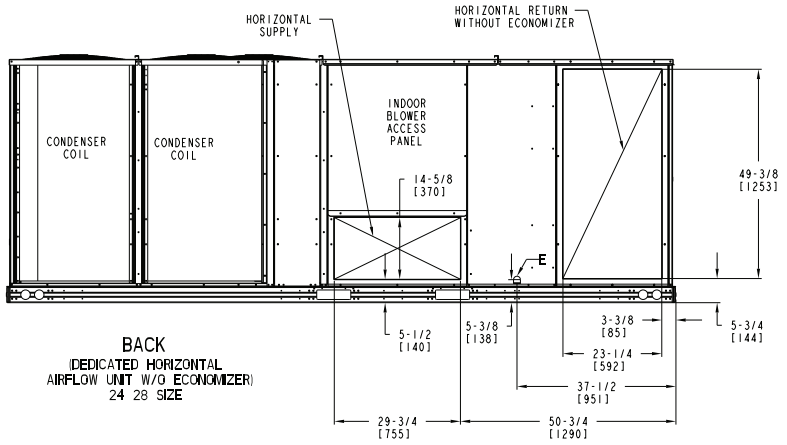
NOTES:
1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. CENTER OF GRAVITY
3. DIRECTION OF AIR FLOW
4. ALL VIEW DRAWN USING 3RD ANGLE

DEDICATED HORIZONTAL AIRFLOW UNIT
24 28 SIZE

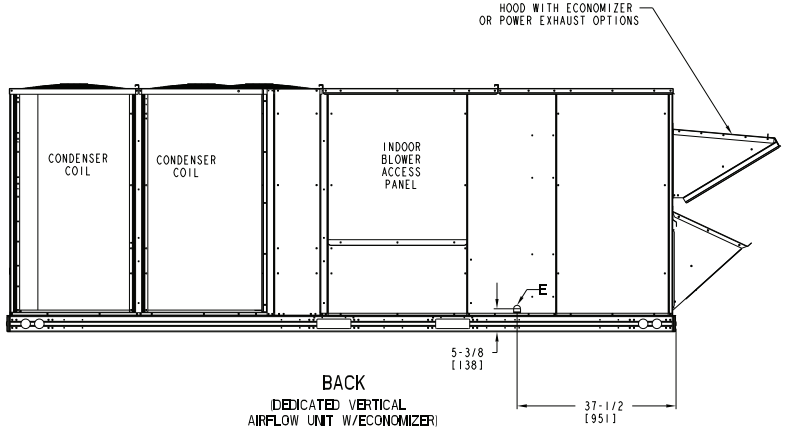
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	2 OF 5	09/20/24	-	48QE 24 28 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008201	-

48QE**24-28 Base Unit Dimensions (cont)

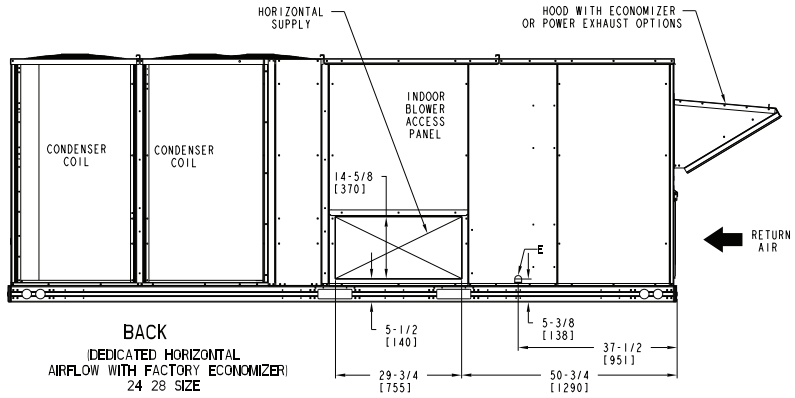
	CONNECTION SIZES
E	3/4"-14 NPT CONDENSATE DRAIN



BACK
(DEDICATED HORIZONTAL AIRFLOW UNIT W/O ECONOMIZER)
24 28 SIZE



BACK
(DEDICATED VERTICAL AIRFLOW UNIT W/ECONOMIZER)
24 28 SIZE



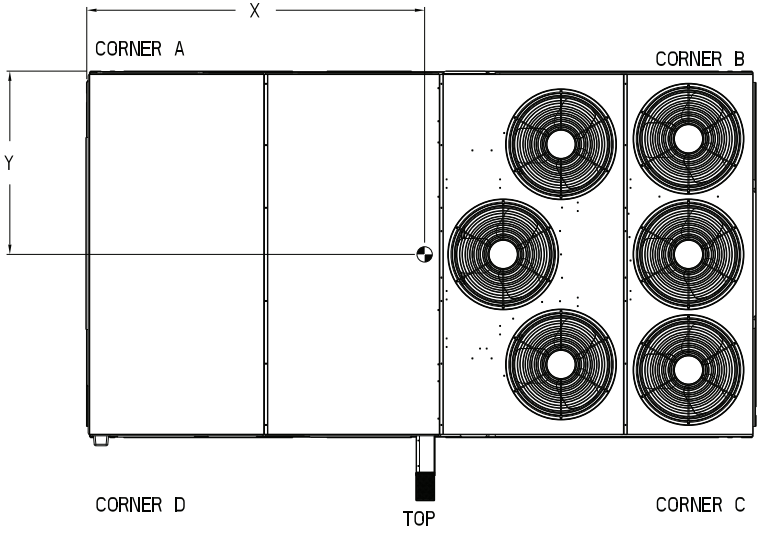
BACK
(DEDICATED HORIZONTAL AIRFLOW WITH FACTORY ECONOMIZER)
24 28 SIZE

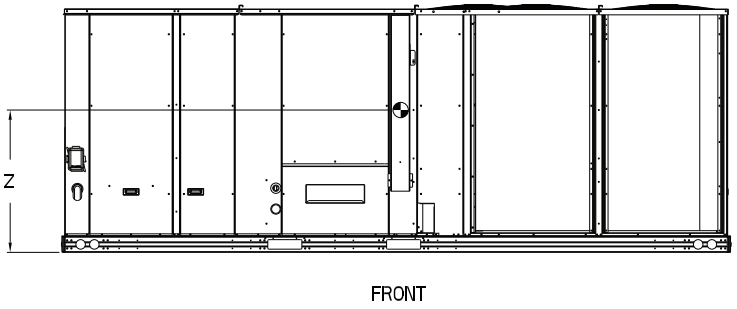
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	3 OF 5	09/20/24	-	48QE 24 28 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008201	-

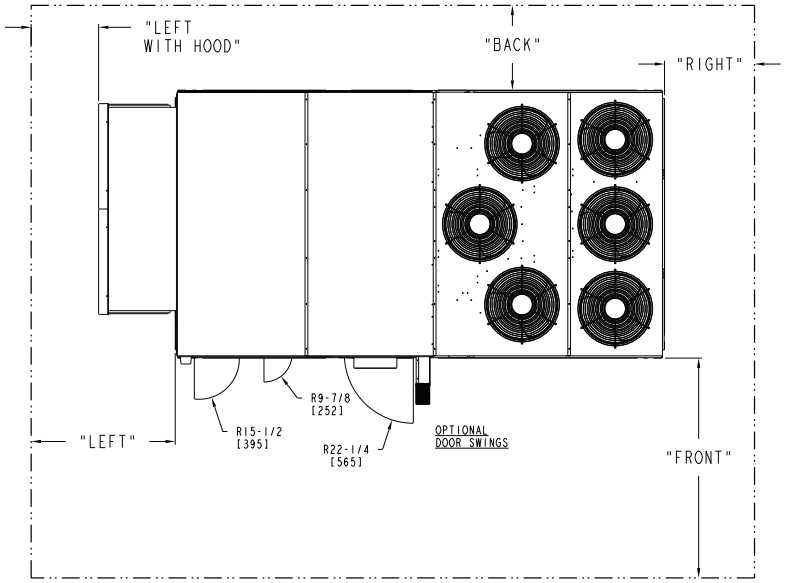
48QE**24-28 Base Unit Dimensions (cont)

UNIT	STD UNIT WEIGHT *		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
48QE24	2382	1081	495	225	605	274	705	320	577	262	86 3/4 [2203]	46 1/2 [1181]	19 [483]
48QE28	2445	1109	503	228	626	284	730	331	586	266	87 1/2 [2223]	46 1/2 [1181]	19 [483]

* STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.







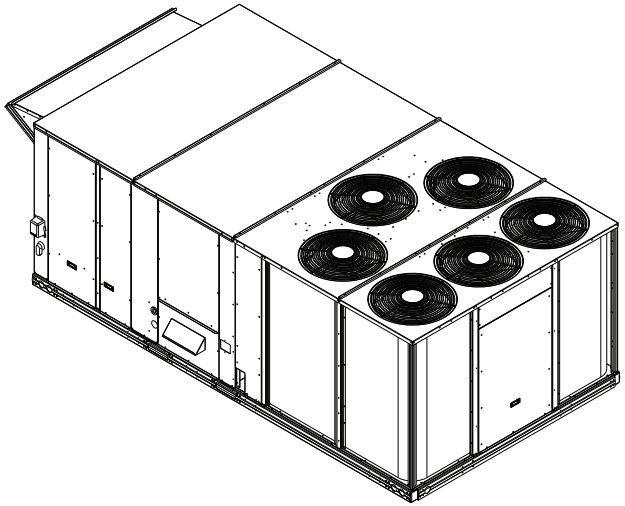
NOTES:

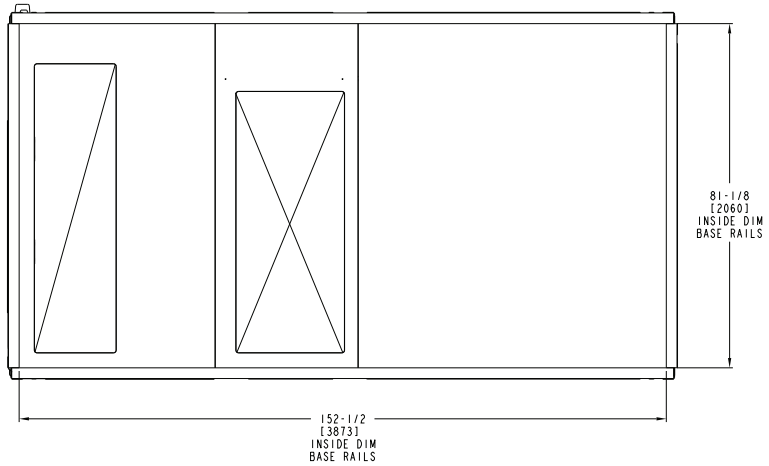
1. CLEARANCE ABOVE THE UNIT TO BE 72"
2. FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

	CLEARANCE		
	SERVICE WITH:	SERVICE WITH:	OPERATING
SURFACE	CONDUCTIVE BARRIER	NONCONDUCTIVE BARRIER	CLEARANCE
FRONT	48 [1219mm]	36 [914mm]	18 [457mm]
LEFT	48 [1219mm]	42 [1067mm]	18 [457mm]
BACK	42 [1067mm]	36 [914mm]	18 [457mm]
LEFT WITH HOOD	36 [914mm]	36 [914mm]	18 [457mm]
RIGHT	36 [914mm]	36 [914mm]	18 [457mm]
TOP	72 [1829mm]	72 [1829mm]	72 [1829mm]

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:NSR	4 OF 5	09/20/24	-	48QE 24 28 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008201	-

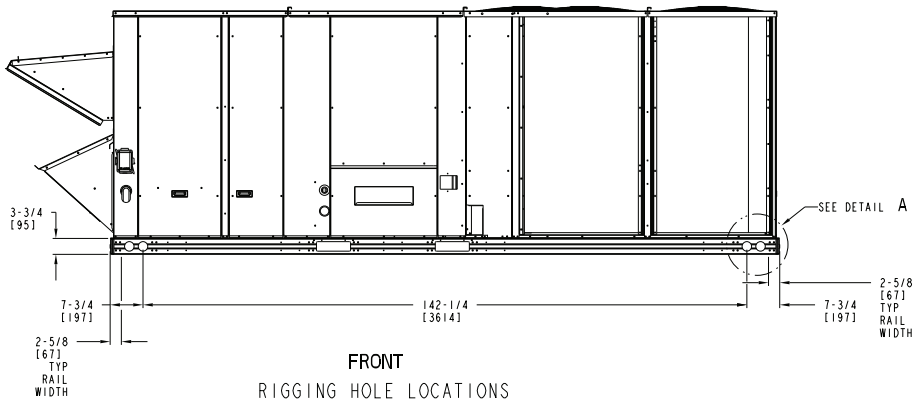
48QE**24-28 Base Unit Dimensions (cont)





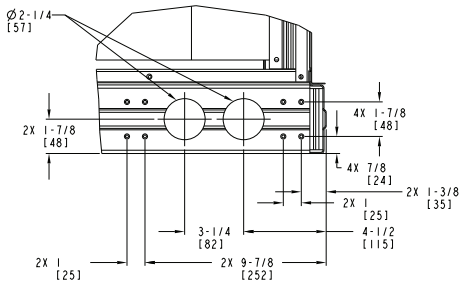
BOTTOM

INSIDE BASERAIL DIMENSIONS



FRONT

RIGGING HOLE LOCATIONS



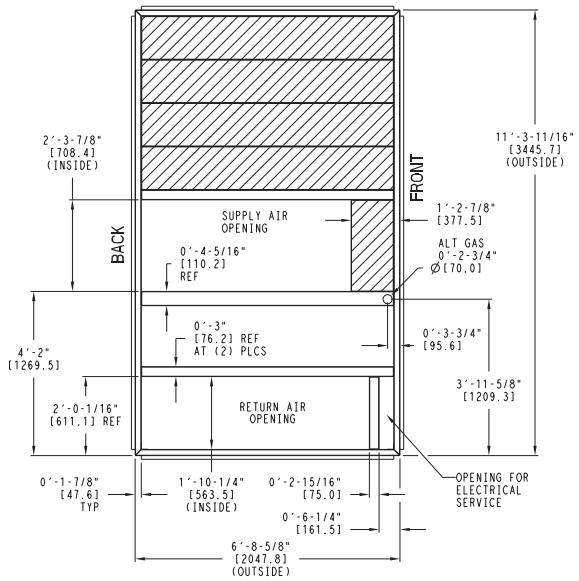
DETAIL A
TYP 4 PLCS

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES		
U.S. ECCN:NSR	5 OF 5	09/20/24	-	48QE 24 28 SINGLE ZONE ELECTRICAL HEAT PUMP WITH GAS HEAT	50HE008201	REV -

Accessory dimensions

Roof Curb Dimensions — 48QE 17

"A"	ROOF CURB ACCESSORY
1′-2" [356.0]	CRRFCURB047A00
2′-0" [610.0]	CRRFCURB048A00



NOTES:

1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.

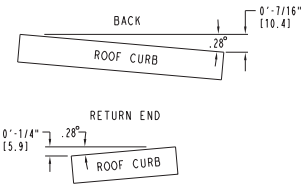
2 DIMENSIONS IN [ ] ARE IN MILLIMETERS.

3 ROOF CURB GALVANIZED STEEL.

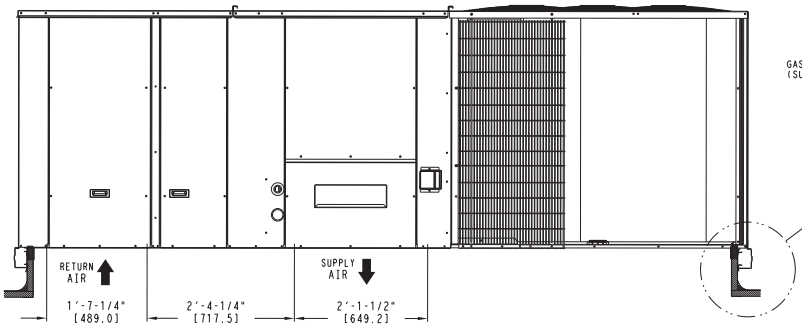
4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)

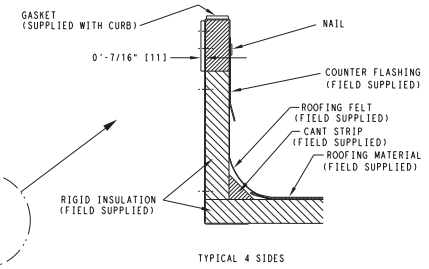
5 SERVICE CLEARANCE 4 ft ON EACH SIDE

DIRECTION OF AIR FLOW

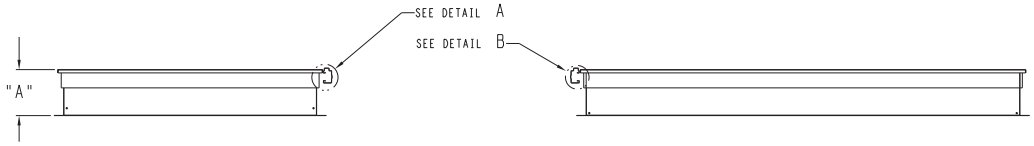


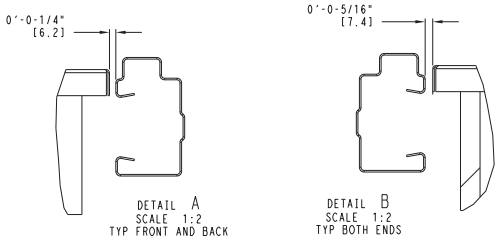
MAX CURB LEVELING TOLERANCES

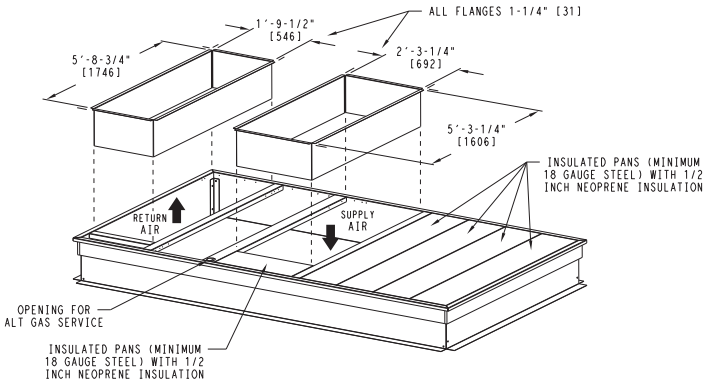




TYPICAL 4 SIDES



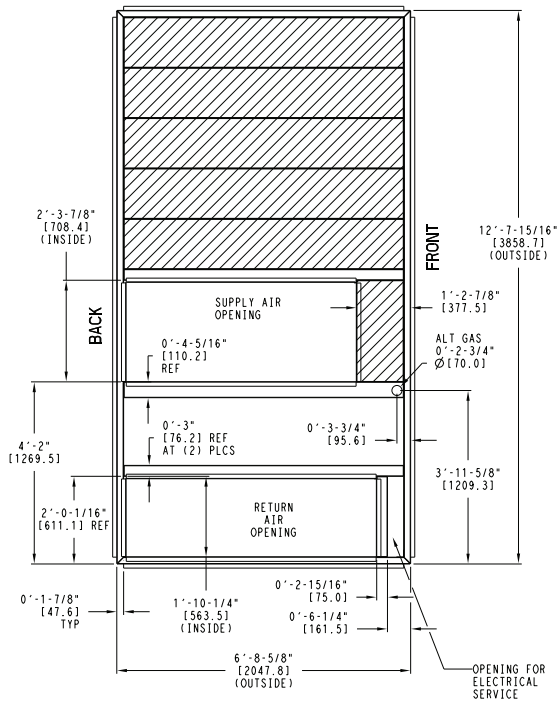




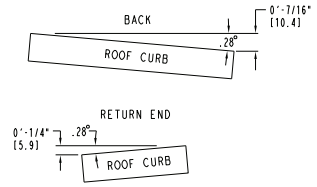
Accessory dimensions (cont)

Roof Curb Dimensions — 48QE 24-28

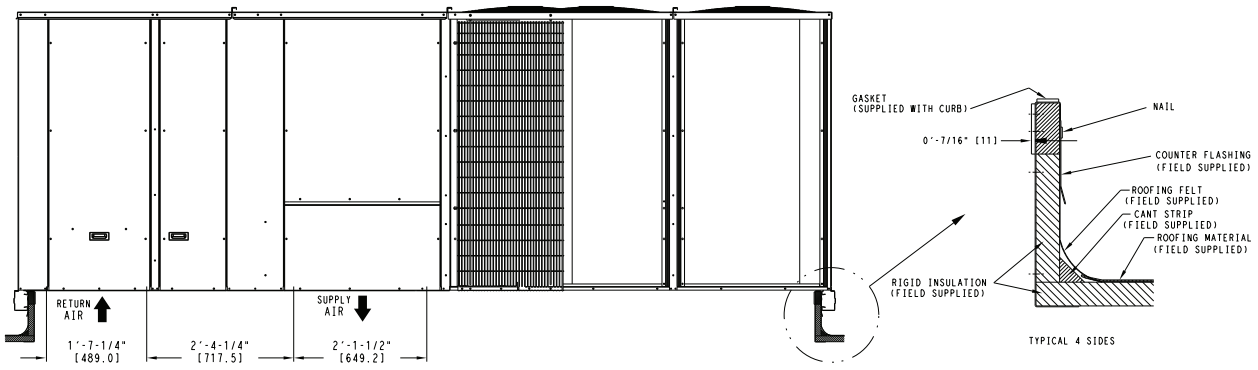
"A"	ROOF CURB ACCESSORY
1′-2" [356.0]	CRRFCURB049A00
2′-0" [610.0]	CRRFCURB050A00

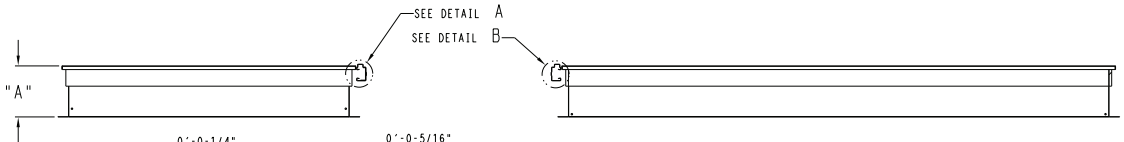


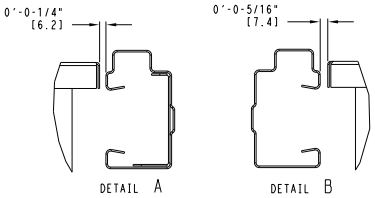
NOTES:
1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.
2 BOLT HEADS TO BE ON INSIDE OF FLANGE. CLEARANCE IS [11] 0-0-7/16" TYP ALL CORNERS.
3 DIMENSIONS IN [ ] ARE IN MILLIMETERS.
4 ROOF CURB GALVANIZED STEEL.
5 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)
6 SERVICE CLEARANCE 4 ft ON EACH SIDE
➡ DIRECTION OF AIR FLOW

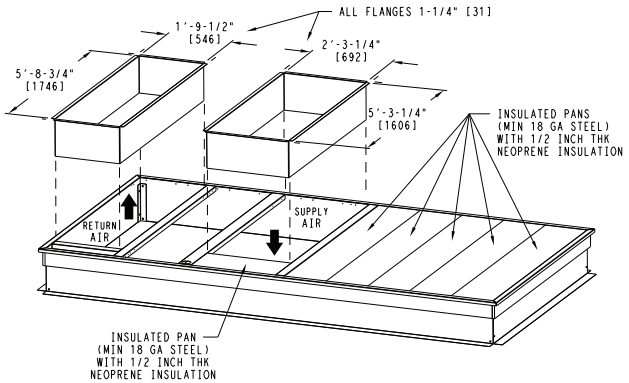


MAX CURB LEVELING TOLERANCES









Performance data

48QE**17 Two Stage Cooling Capacities

48QE**17				AMBIENT TEMPERATURE (°F)															
				85			95			105			115			125		
				EA (db)			EA (db)			EA (db)			EA (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
4500 cfm	EA (wb)	58	TC	162.6	162.6	184.5	154.8	154.8	176.0	146.6	146.6	167.1	137.9	137.9	157.5	128.7	128.7	147.4
			SHC	140.7	162.6	184.5	133.6	154.8	176.0	126.2	146.6	167.1	118.3	137.9	157.5	110.0	128.7	147.4
		62	TC	172.2	172.2	173.9	162.8	162.8	168.1	152.7	152.7	162.2	142.1	142.1	156.0	131.0	131.0	149.5
			SHC	126.2	150.0	173.9	120.5	144.3	168.1	114.6	138.4	162.2	108.4	132.2	156.0	102.0	125.8	149.5
		67	TC	190.6	190.6	190.6	180.4	180.4	180.4	169.7	169.7	169.7	158.3	158.3	158.3	146.3	146.3	146.3
			SHC	103.5	127.5	151.4	97.8	121.7	145.6	91.9	115.8	139.7	85.8	109.7	133.6	79.5	103.3	127.2
		72	TC	210.7	210.7	210.7	199.6	199.6	199.6	188.1	188.1	188.1	175.9	175.9	175.9	163.0	163.0	163.0
			SHC	80.4	104.3	128.1	74.6	98.5	122.4	68.7	92.6	116.5	62.7	86.5	110.4	56.4	80.2	104.0
		76	TC	—	227.8	227.8	—	216.1	216.1	—	203.9	203.9	—	191.0	191.0	—	177.3	177.3
			SHC	—	85.2	108.2	—	79.5	102.6	—	73.6	96.8	—	67.6	90.8	—	61.3	84.6
5250 cfm	EA (wb)	58	TC	172.5	172.5	195.6	164.5	164.5	186.8	155.8	155.8	177.3	146.5	146.5	167.1	136.7	136.7	156.4
			SHC	149.5	172.5	195.6	142.2	164.5	186.8	134.3	155.8	177.3	125.9	146.5	167.1	117.1	136.7	156.4
		62	TC	178.4	178.4	192.3	168.5	168.5	186.3	158.1	158.1	180.0	147.4	147.4	173.2	138.7	138.7	158.6
			SHC	137.2	164.8	192.3	131.3	158.8	186.3	125.2	152.6	180.0	118.8	146.0	173.2	108.6	133.6	158.6
		67	TC	196.3	196.3	196.3	186.1	186.1	186.1	174.9	174.9	174.9	163.0	163.0	163.0	150.5	150.5	150.5
			SHC	110.5	138.2	165.9	104.8	132.5	160.1	98.8	126.5	154.1	92.6	120.2	147.9	86.2	113.8	141.4
		72	TC	216.9	216.9	216.9	205.3	205.3	205.3	193.3	193.3	193.3	180.6	180.6	180.6	167.3	167.3	167.3
			SHC	83.4	111.0	138.7	77.6	105.3	132.9	71.6	99.3	126.9	65.5	93.1	120.7	59.1	86.7	114.3
		76	TC	—	234.2	234.2	—	222.0	222.0	—	209.3	209.3	—	195.8	195.8	—	181.6	181.6
			SHC	—	88.8	115.6	—	83	109.9	—	77.0	103.9	—	70.9	97.8	—	64.5	91.4
6000 cfm	EA (wb)	58	TC	181.4	181.4	205.5	172.6	172.6	195.9	163.4	163.4	185.8	153.7	153.7	175.1	143.3	143.3	163.7
			SHC	157.3	181.4	205.5	149.3	172.6	195.9	141	163.4	185.8	132.3	153.7	175.1	122.9	143.3	163.7
		62	TC	183.6	183.6	209.3	175.6	175.6	196.7	166.4	166.4	185.7	156.5	156.5	175.1	143.5	143.5	170.8
			SHC	147.4	178.4	209.3	138.5	167.6	196.7	130.2	158.0	185.7	121.9	148.5	175.1	116.3	143.5	170.8
		67	TC	201.5	201.5	201.5	190.5	190.5	190.5	178.9	178.9	178.9	166.7	166.7	166.7	153.8	153.8	155.0
			SHC	117.3	148.6	180.0	111.4	142.7	174.1	105.3	136.6	167.9	99.1	130.3	161.6	92.6	123.8	155.0
		72	TC	221.8	221.8	221.8	209.9	209.9	209.9	197.5	197.5	197.5	184.3	184.3	184.3	170.5	170.5	170.5
			SHC	86.1	117.4	148.7	80.3	111.6	142.9	74.2	105.5	136.8	68.0	99.2	130.5	61.5	92.8	124.0
		76	TC	—	239.1	239.1	—	226.6	226.6	—	213.4	213.4	—	199.4	199.4	—	184.9	184.9
			SHC	—	91.9	122.3	—	86.1	116.5	—	80.0	110.5	—	73.8	104.3	—	67.3	97.8
6750 cfm	EA (wb)	58	TC	188.6	188.6	213.5	179.5	179.5	203.5	169.9	169.9	193.1	159.7	159.7	181.9	148.9	148.9	169.9
			SHC	163.7	188.6	213.5	155.4	179.5	203.5	146.8	169.9	193.1	137.6	159.7	181.9	127.8	148.9	169.9
		62	TC	190.1	190.1	219.0	182.4	182.4	203.6	170.1	170.1	201.0	159.9	159.9	189.5	149.0	149	177.1
			SHC	154.1	186.6	219.0	143.7	173.7	203.6	139.2	170.1	201.0	130.3	159.9	189.5	120.9	149	177.1
		67	TC	205.4	205.4	205.4	193.9	193.9	193.9	182.1	182.1	182.1	169.6	169.6	174.8	156.4	156.4	168.2
			SHC	123.6	158.5	193.4	117.7	152.6	187.5	111.6	146.4	181.3	105.3	140.0	174.8	98.7	133.5	168.2
		72	TC	225.5	225.5	225.5	213.4	213.4	213.4	200.6	200.6	200.6	187.2	187.2	187.2	173.1	173.1	173.1
			SHC	88.5	123.3	158.2	82.6	117.5	152.3	76.5	111.4	146.2	70.2	105.0	139.9	63.8	98.5	133.3
		76	TC	—	242.9	242.9	—	230.1	230.1	—	216.5	216.5	—	202.3	202.3	—	187.4	187.4
			SHC	—	94.7	128.6	—	88.7	122.7	—	82.6	116.6	—	76.3	110.3	—	69.8	103.8
7500 cfm	EA (wb)	58	TC	194.8	194.8	220.4	185.4	185.4	210.2	175.4	175.4	199.2	164.8	164.8	187.5	153.6	153.6	175.2
			SHC	169.1	194.8	220.4	160.6	185.4	210.2	151.7	175.4	199.2	142.1	164.8	187.5	132.0	153.6	175.2
		62	TC	195.1	195.1	229.3	185.7	185.7	218.7	175.6	175.6	207.4	165.0	165.0	195.4	153.8	153.8	182.6
			SHC	160.8	195.1	229.3	152.6	185.7	218.7	143.9	175.6	207.4	134.7	165.0	195.4	124.9	153.8	182.6
		67	TC	208.4	208.4	208.4	196.8	196.8	200.5	184.7	184.7	194.2	172.0	172.0	187.7	158.6	158.6	181.0
			SHC	129.6	168.0	206.4	123.7	162.1	200.5	117.6	155.9	194.2	111.3	149.5	187.7	104.7	142.8	181.0
		72	TC	228.6	228.6	228.6	216.2	216.2	216.2	203.2	203.2	203.2	189.5	189.5	189.5	175.1	175.1	175.1
			SHC	90.6	129.0	167.3	84.7	123.1	161.5	78.6	116.9	155.3	72.3	110.6	148.9	65.8	104.0	142.3
		76	TC	—	245.9	245.9	—	232.8	232.8	—	219.0	219.0	—	204.5	204.5	—	189.3	189.3
			SHC	—	97.1	134.5	—	91.1	128.5	—	84.9	122.4	—	78.6	116.0	—	72.1	109.4

LEGEND

— — Do Not Operate
cfm — Cubic Feet Per Minute (Supply Air)
EA (db) — Entering Air Temperature (dry bulb)
EA (wb) — Entering Air Temperature (wet bulb)
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTE: See minimum-maximum airflow ratings on page 7.

Performance data (cont)

48QE**17 Single Stage Cooling Capacities

48QE**17				AMBIENT TEMPERATURE (°F)															
				85			95			105			115			125		
				EA (db)			EA (db)			EA (db)			EA (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
2700 cfm	EA (wb)	58	TC	102.7	102.7	116.9	97.4	97.4	111.1	91.8	91.8	105.0	85.9	85.9	98.6	79.6	79.6	91.7
			SHC	88.6	102.7	116.9	83.7	97.4	111.1	78.5	91.8	105.0	73.2	85.9	98.6	67.5	79.6	91.7
		62	TC	111.3	111.3	111.3	104.7	104.7	104.7	97.8	97.8	99.1	90.6	90.6	94.6	82.9	82.9	90.0
			SHC	78.6	93.1	107.6	74.4	88.9	103.4	70.1	84.6	99.1	65.7	80.1	94.6	61.1	75.5	90.0
		67	TC	123.9	123.9	123.9	117.0	117.0	117.0	109.6	109.6	109.6	101.9	101.9	101.9	93.6	93.6	93.6
			SHC	65.4	79.9	94.4	61.2	75.7	90.2	57.0	71.4	85.9	52.5	67.0	81.5	48.0	62.4	76.9
		72	TC	137.9	137.9	137.9	130.4	130.4	130.4	122.6	122.6	122.6	114.3	114.3	114.3	105.5	105.5	105.5
			SHC	51.9	66.4	80.9	47.8	62.3	76.8	43.5	58.0	72.5	39.1	53.6	68.1	34.6	49.0	63.5
		76	TC	—	149.7	149.7	—	142.1	142.1	—	133.8	133.8	—	125.1	125.1	—	115.9	115.9
			SHC	—	55.3	68.5	—	51.3	65.1	—	47.0	61.0	—	42.6	56.7	—	38.1	52.3
3150 cfm	EA (wb)	58	TC	110.0	110.0	125.0	104.3	104.3	118.8	98.3	98.3	112.3	92.0	92.0	105.4	85.4	85.4	98.2
			SHC	95.0	110.0	125.0	89.8	104.3	118.8	84.4	98.3	112.3	78.6	92.0	105.4	72.6	85.4	98.2
		62	TC	115.9	115.9	119.2	109.0	109.0	114.9	101.8	101.8	110.5	94.2	94.2	105.8	86.3	86.3	100.9
			SHC	85.7	102.5	119.2	81.4	98.2	114.9	77.0	93.7	110.5	72.4	89.1	105.8	67.7	84.3	100.9
		67	TC	128.7	128.7	128.7	121.4	121.4	121.4	113.7	113.7	113.7	105.5	105.5	105.5	96.9	96.9	96.9
			SHC	70.1	86.9	103.7	65.9	82.7	99.5	61.5	78.3	95.1	57.0	73.8	90.5	52.3	69.1	85.8
		72	TC	142.8	142.8	142.8	134.9	134.9	134.9	126.8	126.8	126.8	118.1	118.1	118.1	109.0	109.0	109.0
			SHC	54.2	71.0	87.8	50.0	66.8	83.6	45.7	62.4	79.2	41.2	58.0	74.7	36.6	53.3	70.1
		76	TC	—	155.0	155.0	—	146.8	146.8	—	138.2	138.2	—	129.1	129.1	—	119.4	119.4
			SHC	—	58.0	74.2	—	53.8	70.1	—	49.5	65.9	—	45.1	61.5	—	40.5	56.9
3600 cfm	EA (wb)	58	TC	116.2	116.2	131.9	110.2	110.2	125.4	103.9	103.9	118.5	97.3	97.3	111.3	90.2	90.2	103.6
			SHC	100.5	116.2	131.9	95.0	110.2	125.4	89.3	103.9	118.5	83.2	97.3	111.3	76.9	90.2	103.6
		62	TC	119.6	119.6	130.3	112.5	112.5	125.8	105.1	105.1	121.1	97.4	97.4	116.2	90.3	90.3	108.2
			SHC	92.4	111.4	130.3	88.0	106.9	125.8	83.4	102.3	121.1	78.7	97.4	116.2	72.5	90.3	108.2
		67	TC	132.4	132.4	132.4	124.8	124.8	124.8	116.8	116.8	116.8	108.4	108.4	108.4	99.5	99.5	99.5
			SHC	74.5	93.6	112.6	70.2	89.3	108.3	65.7	84.8	103.8	61.2	80.2	99.2	56.4	75.4	94.5
		72	TC	146.4	146.4	146.4	138.5	138.5	138.5	130.0	130.0	130.0	121.1	121.1	121.1	111.6	111.6	111.6
			SHC	56.2	75.2	94.3	52.0	71.0	90.0	47.6	66.6	85.6	43.0	62.1	81.1	38.4	57.4	76.4
		76	TC	—	158.9	158.9	—	150.5	150.5	—	141.5	141.5	—	132.1	132.1	—	122.1	122.1
			SHC	—	60.4	78.9	—	56.2	74.7	—	51.8	70.4	—	47.3	65.9	—	42.6	61.2
4050 cfm	EA (wb)	58	TC	121.5	121.5	137.8	115.2	115.2	130.9	108.6	108.6	123.8	101.7	101.7	116.2	94.3	94.3	108.2
			SHC	105.1	121.5	137.8	99.4	115.2	130.9	93.5	108.6	123.8	87.2	101.7	116.2	80.5	94.3	108.2
		62	TC	122.7	122.7	140.7	115.7	115.7	135.7	108.8	108.8	129.1	101.8	101.8	121.2	94.4	94.4	112.9
			SHC	98.6	119.6	140.7	94.0	114.8	135.7	88.5	108.8	129.1	82.4	101.8	121.2	76.0	94.4	112.9
		67	TC	135.4	135.4	135.4	127.5	127.5	127.5	119.3	119.3	119.3	110.7	110.7	110.7	101.6	101.6	102.8
			SHC	78.6	99.9	121.2	74.3	95.6	116.8	69.8	91.0	112.3	65.2	86.4	107.6	60.4	81.6	102.8
		72	TC	149.6	149.6	149.6	141.3	141.3	141.3	132.6	132.6	132.6	123.4	123.4	123.4	113.7	113.7	113.7
			SHC	58.0	79.3	100.7	53.7	75.0	96.3	49.3	70.6	91.8	44.7	66.0	87.2	40.0	61.2	82.5
		76	TC	—	162.0	162.0	—	153.4	153.4	—	144.2	144.2	—	134.5	134.5	—	124.3	124.3
			SHC	—	62.5	83.2	—	58.2	79.0	—	53.8	74.6	—	49.2	70.1	—	44.5	65.4
4500 cfm	EA (wb)	58	TC	126.0	126.0	142.9	119.6	119.6	135.8	112.7	112.7	128.3	105.5	105.5	120.4	97.9	97.9	112.1
			SHC	109.2	126.0	142.9	103.3	119.6	135.8	97.1	112.7	128.3	90.5	105.5	120.4	83.6	97.9	112.1
		62	TC	128.1	128.1	142.5	119.7	119.7	141.4	112.9	112.9	133.7	105.6	105.6	125.6	98.0	98.0	117
			SHC	100.8	121.6	142.5	98.0	119.7	141.4	92.0	112.9	133.7	85.6	105.6	125.6	79.0	98.0	117
		67	TC	137.8	137.8	137.8	129.8	129.8	129.8	121.4	121.4	121.4	112.6	112.6	115.8	103.3	103.3	111
			SHC	82.6	106.1	129.6	78.2	101.7	125.1	73.7	97.1	120.6	69.0	92.4	115.8	64.2	87.6	111
		72	TC	152.0	152.0	152.0	143.6	143.6	143.6	134.6	134.6	134.6	125.3	125.3	125.3	115.4	115.4	115.4
			SHC	59.6	83.1	106.6	55.3	78.8	102.3	50.8	74.3	97.8	46.2	69.7	93.1	41.5	64.9	88.4
		76	TC	—	164.7	164.7	—	155.7	155.7	—	146.3	146.3	—	136.4	136.4	—	126.0	126.0
			SHC	—	64.5	87.4	—	60.1	83.1	—	55.7	78.7	—	51.1	74.1	—	46.3	69.3

LEGEND

— — Do Not Operate
cfm — Cubic Feet Per Minute (Supply Air)
EA (db) — Entering Air Temperature (dry bulb)
EA (wb) — Entering Air Temperature (wet bulb)
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTE: See minimum-maximum airflow ratings on page 7.

Performance data (cont)

48QE**24 Two Stage Cooling Capacities

48QE**24				AMBIENT TEMPERATURE (°F)															
				85			95			105			115			125		
				EA (db)			EA (db)			EA (db)			EA (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
6000 cfm	EA (wb)	58	TC	201.2	201.2	214.9	187.2	187.2	213.2	174.8	174.8	199.7	162.0	162.0	185.7	148.0	148.0	170.3
			SHC	166.1	190.5	214.9	161.2	187.2	213.2	150.0	174.8	199.7	138.4	162.0	185.7	125.7	148.0	170.3
		62	TC	214.8	214.8	214.8	202.2	202.2	202.2	188.2	188.2	188.2	172.7	172.7	176.4	155.7	155.7	166.0
			SHC	150.1	176.7	203.3	141.9	168.5	195.0	133.2	159.6	186.1	123.7	150.1	176.4	113.7	139.8	166.0
		67	TC	236.7	236.7	236.7	223.6	223.6	223.6	208.8	208.8	208.8	192.8	192.8	192.8	175.1	175.1	175.1
			SHC	124.2	151.0	177.8	116.3	143.1	169.9	107.8	134.5	161.3	98.8	125.5	152.2	89.2	115.9	142.5
		72	TC	261.6	261.6	261.6	247.6	247.6	247.6	232.4	232.4	232.4	215.5	215.5	215.5	196.9	196.9	196.9
			SHC	98.1	124.7	151.3	90.2	116.8	143.4	81.9	108.5	135.1	73.1	99.7	126.3	63.7	90.3	116.9
		76	TC	—	283.1	283.1	—	268.4	268.4	—	252.4	252.4	—	234.9	234.9	—	215.7	215.7
			SHC	—	103.2	136.2	—	95.3	128.3	—	87.1	111.1	—	78.4	103.4	—	69.2	94.6
7000 cfm	EA (wb)	58	TC	208.7	208.7	236.8	197.7	197.7	224.9	185.5	185.5	211.6	172.1	172.1	196.9	157.5	157.5	180.9
			SHC	180.6	208.7	236.8	170.5	197.7	224.9	159.4	185.5	211.6	147.3	172.1	196.9	134.1	157.5	180.9
		62	TC	222.6	222.6	222.6	209.6	209.6	213.0	195.2	195.2	203.8	179.3	179.3	193.9	161.7	161.7	183.0
			SHC	161.2	191.4	221.5	153.0	183.0	213.0	144.1	174.0	203.8	134.5	164.2	193.9	124.1	153.5	183.0
		67	TC	244.9	244.9	244.9	231.3	231.3	231.3	216.0	216.0	216.0	199.2	199.2	199.2	180.9	180.9	180.9
			SHC	131.8	162.2	192.7	123.7	154.2	184.7	115.1	145.5	175.9	105.9	136.3	166.6	96.2	126.5	156.8
		72	TC	270.2	270.2	270.2	255.6	255.6	255.6	239.7	239.7	239.7	222.2	222.2	222.2	203.0	203.0	203.0
			SHC	101.5	131.8	162.1	93.6	123.8	154.1	85.1	115.4	145.7	76.1	106.4	136.7	66.7	97.0	127.3
		76	TC	—	292.0	292.0	—	276.6	276.6	—	260.0	260.0	—	241.7	241.7	—	221.9	221.9
			SHC	—	107.0	134.2	—	99.0	127.1	—	90.7	119.3	—	81.8	110.8	—	72.5	101.7
8000 cfm	EA (wb)	58	TC	218.5	218.5	247.8	207.0	207.0	235.2	194.5	194.5	221.6	180.7	180.7	206.4	165.6	165.6	189.8
			SHC	189.3	218.5	247.8	178.8	207.0	235.2	167.4	194.5	221.6	154.9	180.7	206.4	141.3	165.6	189.8
		62	TC	229.1	229.1	238.5	215.7	215.7	230.0	201.1	201.1	220.5	184.6	184.6	210.0	166.3	166.3	198.9
			SHC	171.6	205.0	238.5	163.3	196.6	230.0	154.2	187.3	220.5	144.3	177.2	210.0	133.8	166.3	198.9
		67	TC	251.2	251.2	251.2	237.1	237.1	237.1	221.5	221.5	221.5	204.3	204.3	204.3	185.5	185.5	185.5
			SHC	138.5	172.4	206.3	130.3	164.3	198.2	121.7	155.6	189.4	112.4	146.2	180.0	102.7	136.3	170.0
		72	TC	276.8	276.8	276.8	261.7	261.7	261.7	245.3	245.3	245.3	227.2	227.2	227.2	207.6	207.6	207.6
			SHC	104.4	138.2	172.0	96.3	130.1	164.0	87.8	121.6	155.4	78.7	112.6	146.4	69.2	103.0	136.8
		76	TC	—	298.9	298.9	—	283.0	283.0	—	265.8	265.8	—	247.0.	247.0	—	226.7	226.7
			SHC	—	110.1	141.8	—	102.1	134.1	—	93.6	126.0	—	84.7	117.3	—	75.3	108.1
9000 cfm	EA (wb)	58	TC	227.0	227.0	257.2	215.1	215.1	244.2	202.2	202.2	230.2	188.0	188.0	214.6	172.2	172.2	197.3
			SHC	196.8	227.0	257.2	185.9	215.1	244.2	174.2	202.2	230.2	161.4	188.0	214.6	147.2	172.2	197.3
		62	TC	234.5	234.5	254.4	220.7	220.7	245.4	207.2	207.2	226.3	188.9	188.9	224.6	172.4	172.4	205.8
			SHC	181.3	217.8	254.4	172.7	209.1	245.4	158.8	192.5	226.3	153.3	188.9	224.6	138.9	172.4	205.8
		67	TC	256.5	256.5	256.5	242.0	242.0	242.0	226.0	226.0	226.0	208.4	208.4	208.4	189.3	189.3	189.3
			SHC	144.7	182.0	219.3	136.6	173.8	211.0	127.8	165.0	202.1	118.5	155.6	192.6	108.7	145.6	182.4
		72	TC	282.2	282.2	282.2	266.7	266.7	266.7	249.8	249.8	249.8	231.2	231.2	231.2	211.3	211.3	211.3
			SHC	106.9	144.1	181.3	98.7	136.0	173.2	90.1	127.4	164.6	81.0	118.2	155.4	71.4	108.5	145.7
		76	TC	—	304.4	304.4	—	288.1	288.1	—	270.5	270.5	—	251.2	251.2	—	230.5	230.5
			SHC	—	112.9	148.2	—	104.7	140.3	—	96.2	132.0	—	87.2	123.2	—	77.8	113.9
10000 cfm	EA (wb)	58	TC	234.0	234.0	265.0	222.0	222.0	251.9	208.8	208.8	237.5	194.2	194.2	221.5	178.0	178.0	203.7
			SHC	203.0	234.0	265.0	192.0	222.0	251.9	180.1	208.8	237.5	166.9	194.2	221.5	152.3	178.0	203.7
		62	TC	238.7	238.7	268.7	223.9	223.9	264.2	209.6	209.6	248.1	194.3	194.3	230.8	178.2	178.2	212.5
			SHC	190.0	229.4	268.7	183.6	223.9	264.2	171.2	209.6	248.1	157.9	194.3	230.8	143.8	178.2	212.5
		67	TC	260.9	260.9	260.9	246.0	246.0	246.0	229.8	229.8	229.8	211.9	211.9	211.9	192.4	192.4	194.2
			SHC	150.6	191.1	231.6	142.4	182.8	223.2	133.6	173.9	214.3	124.2	164.4	204.6	114.3	154.3	194.2
		72	TC	286.6	286.6	286.6	270.6	270.6	270.6	253.4	253.4	253.4	234.7	234.7	234.7	214.4	214.4	214.4
			SHC	109.0	149.6	190.2	100.8	141.3	181.9	92.1	132.7	173.2	83.0	123.4	163.9	73.4	113.8	154.2
		76	TC	—	309.0	309.0	—	292.3	292.3	—	274.4	274.4	—	254.7	254.7	—	233.7	233.7
			SHC	—	115.2	154.0	—	107.1	146.0	—	98.5	137.6	—	89.4	128.7	—	79.9	119.4

LEGEND

— — Do Not Operate
cfm — Cubic Feet Per Minute (Supply Air)
EA (db) — Entering Air Temperature (dry bulb)
EA (wb) — Entering Air Temperature (wet bulb)
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTE: See minimum-maximum airflow ratings on page 7.

Performance data (cont)

48QE**24 Single Stage Cooling Capacities

48Q**24				AMBIENT TEMPERATURE (°F)															
				85			95			105			115			125		
				EA (db)			EA (db)			EA (db)			EA (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
3600 cfm	EA (wb)	58	TC	140.0	140.0	157.8	135.5	135.5	152.7	130.6	130.6	147.2	124.3	124.3	140.2	117.3	117.3	132.3
			SHC	122.2	140.0	157.8	118.2	135.5	152.7	113.9	130.6	147.2	108.5	124.3	140.2	102.4	117.3	132.3
		62	TC	150.0	150.0	150.0	144.4	144.4	144.4	137.9	137.9	138.2	130.3	130.3	134.5	121.2	121.2	130.0
			SHC	108.3	126.4	144.4	105.5	123.5	141.5	102.3	120.3	138.2	98.6	116.6	134.5	94.2	112.1	130.0
		67	TC	163.8	163.8	163.8	157.7	157.7	157.7	150.4	150.4	150.4	142.1	142.1	142.1	132.9	132.9	132.9
			SHC	90.2	108.3	126.3	87.4	105.5	123.5	84.2	102.2	120.2	80.5	98.6	116.6	76.6	94.6	112.6
		72	TC	178.6	178.6	178.6	171.6	171.6	171.6	164.2	164.2	164.2	155.6	155.6	155.6	145.7	145.7	145.7
			SHC	71.5	89.5	107.5	68.6	86.6	104.5	65.6	83.6	101.6	62.2	80.2	98.2	58.4	76.3	94.3
		76	TC	—	190.9	190.9	—	183.4	183.4	—	176.0	176.0	—	166.9	166.9	—	156.7	156.7
			SHC	—	73.9	93.7	—	71.1	86.8	—	68.3	85.0	—	65.0	82.0	—	61.3	78.5
4200 cfm	EA (wb)	58	TC	147.4	147.4	166.1	142.6	142.6	160.8	137.5	137.5	155.0	130.8	130.8	147.4	123.5	123.5	139.3
			SHC	128.6	147.4	166.1	124.4	142.6	160.8	120.0	137.5	155.0	114.1	130.8	147.4	107.8	123.5	139.3
		62	TC	154.5	154.5	157.3	148.6	148.6	154.3	142.0	142.0	151.0	134.0	134.0	146.9	125.0	125.0	142.0
			SHC	115.9	136.6	157.3	113.0	133.7	154.3	109.8	130.4	151.0	105.9	126.4	146.9	101.4	121.7	142.0
		67	TC	168.2	168.2	168.2	162.1	162.1	162.1	154.5	154.5	154.5	146.1	146.1	146.1	136.4	136.4	136.4
			SHC	94.8	115.6	136.3	92.2	112.9	133.7	88.9	109.6	130.4	85.3	106.0	126.7	81.3	101.9	122.6
		72	TC	184.1	184.1	184.1	176.4	176.4	176.4	168.1	168.1	168.1	159.3	159.3	159.3	149.1	149.1	149.1
			SHC	73.7	94.4	115.1	70.7	91.4	112.1	67.4	88.1	108.8	64.1	84.7	105.4	60.2	80.9	101.5
		76	TC	—	197.4	197.4	—	188.4	188.4	—	180.2	180.2	—	170.8	170.8	—	160.2	160.2
			SHC	—	76.8	96.1	—	73.5	93.0	—	70.5	90.3	—	67.2	87.1	—	63.5	83.5
4800 cfm	EA (wb)	58	TC	154.1	154.1	173.7	149.0	149.0	168.0	142.6	142.6	160.7	136.4	136.4	153.8	128.4	128.4	144.7
			SHC	134.5	154.1	173.7	130.0	149.0	168.0	124.4	142.6	160.7	119.0	136.4	153.8	112.0	128.4	144.7
		62	TC	158.4	158.4	169.6	152.4	152.4	166.3	145.4	145.4	162.6	137.5	137.5	157.5	128.6	128.6	150.5
			SHC	123.2	146.4	169.6	120.1	143.2	166.3	116.7	139.6	162.6	112.3	134.9	157.5	106.7	128.6	150.5
		67	TC	172.6	172.6	172.6	165.3	165.3	165.3	157.5	157.5	157.5	148.9	148.9	148.9	138.8	138.8	138.8
			SHC	99.7	123.1	146.4	96.6	119.9	143.2	93.3	116.5	139.8	89.8	113.0	136.3	85.6	108.8	132.0
		72	TC	187.8	187.8	187.8	179.8	179.8	179.8	171.3	171.3	171.3	162.2	162.2	162.2	151.8	151.8	151.8
			SHC	75.5	98.8	122.0	72.4	95.7	119.0	69.2	92.4	115.7	65.8	89.0	112.3	62.0	85.2	108.4
		76	TC	—	200.4	200.4	—	191.6	191.6	—	183.6	183.6	—	173.8	173.8	—	162.8	162.8
			SHC	—	78.6	100.8	—	75.5	97.8	—	72.7	95.1	—	69.3	91.8	—	65.6	88.2
5400 cfm	EA (wb)	58	TC	158.9	158.9	179.1	154.0	154.0	173.6	147.5	147.5	166.3	140.9	140.9	158.8	132.4	132.4	149.3
			SHC	138.7	158.9	179.1	134.4	154.0	173.6	128.7	147.5	166.3	122.9	140.9	158.8	115.5	132.4	149.3
		62	TC	161.8	161.8	180.8	155.7	155.7	177.2	148.0	148.0	173.1	141.0	141.0	165.0	132.8	132.8	155.4
			SHC	129.8	155.3	180.8	126.6	151.9	177.2	122.8	148.0	173.1	117.0	141.0	165.0	110.2	132.8	155.4
		67	TC	175.2	175.2	175.2	168.2	168.2	168.2	159.9	159.9	159.9	151.2	151.2	151.2	141.0	141.0	141.2
			SHC	103.8	129.7	155.6	101.0	126.9	152.7	97.5	123.3	149.1	94.0	119.7	145.5	89.9	115.5	141.2
		72	TC	190.8	190.8	190.8	182.2	182.2	182.2	174.1	174.1	174.1	164.4	164.4	164.4	153.6	153.6	153.6
			SHC	77.1	102.9	128.8	73.9	99.7	125.5	70.9	96.7	122.5	67.3	93.2	119.0	63.5	89.3	115.1
		76	TC	—	204.5	204.5	—	195.4	195.4	—	186.2	186.2	—	176.2	176.2	—	164.9	164.9
			SHC	—	81.2	106.7	—	77.8	102.7	—	74.6	99.6	—	71.3	96.3	—	67.5	92.7
6000 cfm	EA (wb)	58	TC	164.2	164.2	185.1	158.1	158.1	178.2	151.7	151.7	171.0	144.6	144.6	163.1	136.2	136.2	153.6
			SHC	143.4	164.2	185.1	138.0	158.1	178.2	132.4	151.7	171.0	126.2	144.6	163.1	118.8	136.2	153.6
		62	TC	165.7	165.7	187.8	158.6	158.6	185.6	152.1	152.1	177.9	144.7	144.7	169.3	136.0	136.0	159.1
			SHC	134.3	161.1	187.8	131.7	158.6	185.6	126.2	152.1	177.9	120.1	144.7	169.3	112.8	136.0	159.1
		67	TC	177.1	177.1	177.1	170.2	170.2	170.2	162.3	162.3	162.3	153.1	153.1	154.4	142.8	142.8	150.0
			SHC	107.8	136.2	164.5	105.0	133.3	161.6	101.7	130.0	158.2	98.0	126.2	154.4	93.9	121.9	150.0
		72	TC	193.6	193.6	193.6	184.3	184.3	184.3	176.0	176.0	176.0	166.1	166.1	166.1	155.4	155.4	155.4
			SHC	78.7	107.1	135.5	75.3	103.7	132.0	72.3	100.7	129.0	68.8	97.1	125.4	65.0	93.3	121.5
		76	TC	—	206.1	206.1	—	197.9	197.9	—	188.3	188.3	—	178.0	178.0	—	166.6	166.6
			SHC	—	82.5	109.8	—	79.7	107.1	—	76.5	104.0	—	73.1	100.7	—	69.4	97.1

LEGEND

— — Do Not Operate
cfm — Cubic Feet Per Minute (Supply Air)
EA (db) — Entering Air Temperature (dry bulb)
EA (wb) — Entering Air Temperature (wet bulb)
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTE: See minimum-maximum airflow ratings on page 7.

Performance data (cont)

48QE**28 Two Stage Cooling Capacities

48QE**28				AMBIENT TEMPERATURE (°F)															
				85			95			105			115			125		
				EA (db)			EA (db)			EA (db)			EA (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
7500 cfm	EA (wb)	58	TC	259.0	259.0	294.6	243.8	243.8	278.1	227.4	227.4	260.4	209.5	209.5	240.8	190.1	190.1	219.5
			SHC	223.3	259.0	294.6	209.4	243.8	278.1	194.5	227.4	260.4	178.2	209.5	240.8	160.7	190.1	219.5
		62	TC	279.8	279.8	279.8	262.0	262.0	262.0	242.3	242.3	246.8	220.6	220.6	233.5	197.0	197.0	219.3
			SHC	197.4	234.1	270.7	186.0	222.6	259.1	173.8	210.3	246.8	160.8	197.1	233.5	146.9	183.1	219.3
		67	TC	309.6	309.6	309.6	290.9	290.9	290.9	270.3	270.3	270.3	247.6	247.6	247.6	222.9	222.9	222.9
			SHC	162.3	199.1	235.9	151.0	187.8	224.6	139.1	175.8	212.6	126.4	163.1	199.8	113.0	149.7	186.3
		72	TC	342.5	342.5	342.5	322.7	322.7	322.7	301.0	301.0	301.0	277.2	277.2	277.2	251.6	251.6	251.6
			SHC	126.5	163.0	199.6	115.2	151.8	188.4	103.4	140.0	176.6	90.9	127.5	164.1	77.9	114.5	151.1
		76	TC	—	370.5	370.5	—	349.6	349.6	—	327.0	327.0	—	302.3	302.3	—	275.9	275.9
			SHC	—	133.6	174.8	—	122.4	156.1	—	110.7	145.3	—	98.4	133.4	—	85.6	120.9
8750 cfm	EA (wb)	58	TC	275.0	275.0	312.4	259.5	259.5	295.7	242.4	242.4	277.0	223.6	223.6	256.4	203.2	203.2	234.1
			SHC	237.5	275.0	312.4	223.4	259.5	295.7	207.8	242.4	277.0	190.7	223.6	256.4	172.3	203.2	234.1
		62	TC	290.3	290.3	297.4	271.9	271.9	285.6	251.6	251.6	272.8	229.3	229.3	258.6	206.7	206.7	237.3
			SHC	213.8	255.6	297.4	202.1	243.9	285.6	189.7	231.2	272.8	176.2	217.4	258.6	158.9	198.1	237.3
		67	TC	320.1	320.1	320.1	300.7	300.7	300.7	279.3	279.3	279.3	255.7	255.7	255.7	230.3	230.3	230.3
			SHC	172.8	214.9	257.1	161.4	203.5	245.6	149.3	191.4	233.4	136.4	178.4	220.4	123.0	164.8	206.7
		72	TC	353.2	353.2	353.2	332.6	332.6	332.6	310.0	310.0	310.0	285.3	285.3	285.3	259.0	259.0	259.0
			SHC	131.0	172.9	214.8	119.6	161.5	203.4	107.7	149.6	191.5	95.0	136.9	178.8	81.9	123.8	165.7
		76	TC	—	381.5	381.5	—	359.7	359.7	—	336.2	336.2	—	310.5	310.5	—	283.4	283.4
			SHC	—	138.6	178.0	—	127.2	167.1	—	115.4	155.6	—	102.9	143.4	—	90.0	130.6
10000 cfm	EA (wb)	58	TC	288.6	288.6	327.6	272.5	272.5	310.1	254.7	254.7	290.7	235.1	235.1	269.3	214.0	214.0	246.1
			SHC	249.6	288.6	327.6	234.9	272.5	310.1	218.7	254.7	290.7	201.0	235.1	269.3	181.9	214.0	246.1
		62	TC	298.7	298.7	322.4	279.8	279.8	309.9	258.9	258.9	296.0	239.8	239.8	267.6	219.1	219.1	240.1
			SHC	229.0	275.7	322.4	217.0	263.5	309.9	203.9	249.9	296.0	183.5	225.6	267.6	163.2	201.7	240.1
		67	TC	328.4	328.4	328.4	308.3	308.3	308.3	286.3	286.3	286.3	262.0	262.0	262.0	236.0	236.0	236.0
			SHC	182.5	229.8	277.1	171.0	218.2	265.5	158.8	206.0	253.1	145.8	192.9	240.0	132.3	179.2	226.2
		72	TC	361.6	361.6	361.6	340.2	340.2	340.2	317.0	317.0	317.0	291.5	291.5	291.5	264.7	264.7	264.7
			SHC	134.8	181.9	229.0	123.3	170.4	217.5	111.2	158.3	205.4	98.5	145.6	192.7	85.3	132.3	179.3
		76	TC	—	390.0	390.0	—	367.5	367.5	—	343.3	343.3	—	317.0	317.0	—	289.2	289.2
			SHC	—	142.8	187.8	—	131.3	176.6	—	119.4	164.8	—	106.8	152.4	—	93.7	139.5
11250 cfm	EA (wb)	58	TC	300.0	300.0	340.3	283.3	283.3	322.1	264.9	264.9	302.0	244.8	244.8	280.0	223.0	223.0	256.1
			SHC	259.8	300.0	340.3	244.5	283.3	322.1	227.8	264.9	302.0	209.5	244.8	280.0	189.9	223.0	256.1
		62	TC	305.6	305.6	344.9	288.1	288.1	323.7	265.6	265.6	315.3	245.0	245.0	292.1	223.1	223.1	267.3
			SHC	242.6	293.8	344.9	226.3	275.0	323.7	215.9	265.6	315.3	197.9	245.0	292.1	178.9	223.1	267.3
		67	TC	335.0	335.0	335.0	314.4	314.4	314.4	291.9	291.9	291.9	267.1	267.1	267.1	240.7	240.7	244.5
			SHC	191.6	243.8	296.1	180.0	232.2	284.3	167.7	219.8	271.9	154.7	206.6	258.6	141.1	192.8	244.5
		72	TC	368.2	368.2	368.2	346.1	346.1	346.1	322.5	322.5	322.5	296.6	296.6	296.6	269.2	269.2	269.2
			SHC	138.1	190.2	242.4	126.5	178.7	231.0	114.4	166.5	218.5	101.6	153.6	205.7	88.3	140.3	192.3
		76	TC	—	396.8	396.8	—	373.7	373.7	—	349.0	349.0	—	322.1	322.1	—	293.8	293.8
			SHC	—	146.4	196.6	—	134.9	185.2	—	122.8	173.3	—	110.1	160.7	—	97.0	147.8
12500 cfm	EA (wb)	58	TC	309.9	309.9	351.3	292.6	292.6	332.5	273.7	273.7	311.9	253.0	253.0	289.1	230.7	230.7	264.6
			SHC	268.5	309.9	351.3	252.8	292.6	332.5	235.6	273.7	311.9	216.8	253.0	289.1	196.7	230.7	264.6
		62	TC	311.2	311.2	366.6	293.0	293.0	346.3	274.0	274.0	324.9	253.2	253.2	301.5	230.9	230.9	276.2
			SHC	255.8	311.2	366.6	239.8	293.0	346.3	223.1	274.0	324.9	204.9	253.2	301.5	185.5	230.9	276.2
		67	TC	340.5	340.5	340.5	319.4	319.4	319.4	296.4	296.4	296.4	271.3	271.3	276.3	244.6	244.6	262.1
			SHC	200.2	257.3	314.3	188.6	245.5	302.4	176.2	233.0	289.8	163.1	219.7	276.3	149.5	205.8	262.1
		72	TC	373.6	373.6	373.6	351.2	351.2	351.2	327.0	327.0	327.0	300.8	300.8	300.8	273.0	273.0	273.0
			SHC	141.0	198.0	255.1	129.3	186.3	243.3	117.1	174.1	231.0	104.3	161.2	218.1	91.0	147.9	204.7
		76	TC	—	402.4	402.4	—	378.8	378.8	—	353.6	353.6	—	326.3	326.3	—	297.6	297.6
			SHC	—	149.6	204.7	—	137.9	193.2	—	125.7	181.2	—	112.9	168.5	—	99.7	155.5

LEGEND

— — Do Not Operate
cfm — Cubic Feet Per Minute (Supply Air)
EA (db) — Entering Air Temperature (dry bulb)
EA (wb) — Entering Air Temperature (wet bulb)
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTE: See minimum-maximum airflow ratings on page 7.

Performance data (cont)

48QE**28 Single Stage Cooling Capacities

48QE**28				AMBIENT TEMPERATURE (°F)															
				85			95			105			115			125		
				EA (db)			EA (db)			EA (db)			EA (db)			EA (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
4500 cfm	EA (wb)	58	TC	158.4	158.4	180.5	149.4	149.4	170.8	139.8	139.8	160.3	129.3	129.3	149.0	118.0	118.0	136.7
			SHC	136.3	158.4	180.5	128.0	149.4	170.8	119.2	139.8	160.3	109.6	129.3	149.0	99.4	118.0	136.7
		62	TC	168.9	168.9	169.6	158.1	158.1	162.5	146.5	146.5	155.1	134.1	134.1	147.3	120.5	120.5	138.8
			SHC	121.9	145.7	169.6	114.8	138.7	162.5	107.5	131.3	155.1	99.8	123.5	147.3	91.5	115.1	138.8
		67	TC	187.9	187.9	187.9	176.4	176.4	176.4	164.2	164.2	164.2	151.0	151.0	151.0	136.6	136.6	136.6
			SHC	99.9	123.8	147.7	92.9	116.8	140.7	85.6	109.5	133.4	78.0	101.8	125.7	69.9	93.8	117.6
		72	TC	208.6	208.6	208.6	196.4	196.4	196.4	183.4	183.4	183.4	169.4	169.4	169.4	154.3	154.3	154.3
			SHC	77.5	101.3	125.2	70.5	94.3	118.2	63.2	87.1	110.9	55.7	79.5	103.4	47.8	71.6	95.4
		76	TC	—	226.7	226.7	—	213.8	213.8	—	200.2	200.2	—	185.6	185.6	—	169.7	169.7
			SHC	—	83.1	105.9	—	76.1	99.1	—	68.9	92.0	—	61.4	84.6	—	53.5	76.8
5250 cfm	EA (wb)	58	TC	169.1	169.1	192.3	159.5	159.5	182.0	149.3	149.3	171.0	138.4	138.4	159.1	126.4	126.4	146.0
			SHC	145.8	169.1	192.3	137.0	159.5	182.0	127.7	149.3	171.0	117.7	138.4	159.1	106.8	126.4	146.0
		62	TC	175.3	175.3	188.1	164.1	164.1	180.7	152.2	152.2	173.0	142.1	142.1	156.7	128.7	128.7	146.9
			SHC	133.1	160.6	188.1	125.9	153.3	180.7	118.3	145.7	173.0	106.7	131.7	156.7	97.8	122.4	146.9
		67	TC	194.4	194.4	194.4	182.4	182.4	182.4	169.6	169.6	169.6	155.9	155.9	155.9	140.9	140.9	140.9
			SHC	107.3	134.9	162.6	100.1	127.8	155.4	92.7	120.3	148.0	85.0	112.6	140.2	76.8	104.4	131.9
		72	TC	215.2	215.2	215.2	202.5	202.5	202.5	189.0	189.0	189.0	174.5	174.5	174.5	158.8	158.8	158.8
			SHC	80.9	108.5	136.1	73.8	101.4	129.0	66.5	94.1	121.7	58.8	86.4	114.0	50.8	78.3	105.9
		76	TC	—	233.7	233.7	—	220.2	220.2	—	206.0	206.0	—	190.7	190.7	—	174.2	174.2
			SHC	—	87.1	113.9	—	80.0	106.8	—	72.6	99.6	—	65.0	92.0	—	57.0	84.1
6000 cfm	EA (wb)	58	TC	177.9	177.9	202.2	167.9	167.9	191.4	157.4	157.4	179.9	145.9	145.9	167.4	133.4	133.4	153.7
			SHC	153.6	177.9	202.2	144.5	167.9	191.4	134.8	157.4	179.9	124.3	145.9	167.4	113.0	133.4	153.7
		62	TC	180.6	180.6	205.2	171.5	171.5	189.9	157.6	157.6	187.7	146.1	146.1	174.8	133.5	133.5	160.7
			SHC	143.5	174.3	205.2	132.5	161.2	189.9	127.5	157.6	187.7	117.3	146.1	174.8	106.3	133.5	160.7
		67	TC	199.3	199.3	199.3	186.9	186.9	186.9	173.8	173.8	173.8	159.6	159.6	159.6	144.4	144.4	145.8
			SHC	114.2	145.5	176.8	106.9	138.2	169.5	99.4	130.7	162.0	91.6	122.8	154.0	83.4	114.6	145.8
		72	TC	220.4	220.4	220.4	207.1	207.1	207.1	193.2	193.2	193.2	178.3	178.3	178.3	162.1	162.1	162.1
			SHC	84.0	115.3	146.6	76.7	108.1	139.4	69.3	100.6	131.9	61.6	92.9	124.2	53.4	84.7	116.0
		76	TC	—	239.1	239.1	—	225.0	225.0	—	210.4	210.4	—	194.7	194.7	—	177.7	177.7
			SHC	—	90.7	121.2	—	83.5	114.0	—	76.0	106.7	—	68.3	99.0	—	60.3	91.1
6750 cfm	EA (wb)	58	TC	185.5	185.5	210.6	175.2	175.2	199.4	164.1	164.1	187.4	152.1	152.1	174.4	139.1	139.1	160.1
			SHC	160.4	185.5	210.6	150.9	175.2	199.4	140.8	164.1	187.4	129.9	152.1	174.4	118.1	139.1	160.1
		62	TC	185.7	185.7	219.3	175.4	175.4	207.8	164.3	164.3	195.4	152.4	152.4	182.1	139.3	139.3	167.4
			SHC	152.2	185.7	219.3	143.0	175.4	207.8	133.2	164.3	195.4	122.7	152.4	182.1	111.2	139.3	167.4
		67	TC	203.2	203.2	203.2	190.5	190.5	190.5	177.2	177.2	177.2	162.7	162.7	167.4	147.1	147.1	159.1
			SHC	120.7	155.6	190.6	113.4	148.3	183.1	105.9	140.7	175.6	97.9	132.6	167.4	89.6	124.4	159.1
		72	TC	224.4	224.4	224.4	210.9	210.9	210.9	196.6	196.6	196.6	181.3	181.3	181.3	164.8	164.8	164.8
			SHC	86.7	121.7	156.7	79.4	114.4	149.4	71.9	106.9	141.8	64.1	99.1	134.0	55.9	90.9	125.8
		76	TC	—	243.3	243.3	—	228.9	228.9	—	213.8	213.8	—	197.7	197.7	—	180.4	180.4
			SHC	—	94.0	128.2	—	86.7	120.9	—	79.2	113.5	—	71.4	105.8	—	63.3	97.7
7500 cfm	EA (wb)	58	TC	192.0	192.0	217.9	181.2	181.2	206.2	169.8	169.8	193.7	157.5	157.5	180.3	144.1	144.1	165.6
			SHC	166.2	192.0	217.9	156.3	181.2	206.2	145.9	169.8	193.7	134.6	157.5	180.3	122.5	144.1	165.6
		62	TC	192.3	192.3	226.8	181.4	181.4	214.7	170.0	170.0	201.9	157.6	157.6	188.1	144.2	144.2	173.0
			SHC	157.7	192.3	226.8	148.1	181.4	214.7	138.0	170.0	201.9	127.2	157.6	188.1	115.4	144.2	173.0
		67	TC	206.5	206.5	206.5	193.6	193.6	196.4	179.9	179.9	188.7	165.2	165.2	180.6	149.3	149.3	171.7
			SHC	127.0	165.5	203.9	119.6	158.0	196.4	112.1	150.4	188.7	104.1	142.3	180.6	95.6	133.7	171.7
		72	TC	227.7	227.7	227.7	213.8	213.8	213.8	199.3	199.3	199.3	183.8	183.8	183.8	166.9	166.9	166.9
			SHC	89.3	127.8	166.3	81.9	120.4	158.9	74.3	112.8	151.3	66.5	105.0	143.5	58.3	96.8	135.2
		76	TC	—	246.7	246.7	—	231.9	231.9	—	216.5	216.5	—	200.2	200.2	—	182.6	182.6
			SHC	—	97.0	134.7	—	89.6	127.4	—	82.0	119.9	—	74.2	112.2	—	66.1	104.1

LEGEND

— — Do Not Operate
cfm — Cubic Feet Per Minute (Supply Air)
EA (db) — Entering Air Temperature (dry bulb)
EA (wb) — Entering Air Temperature (wet bulb)
SHC — Sensible Heat Capacity (1000 Btuh) Gross
TC — Total Capacity (1000 Btuh) Gross

NOTE: See minimum-maximum airflow ratings on page 7.

Performance data (cont)

48QE**17 Heating Capacities

48QE**17 (15 Tons)											
Return Air (°F db)	CFM (Standard Air)		Temperature Air Entering Outdoor Coil (°F db at 70% rh)								
			–10	0	10	17	30	40	47	50	60
55	4500	Capacity	59.9	68.4	89.6	104.4	131.3	154.0	171.3	177.5	202.7
		Int. Cap.	55.4	62.9	82.2	95.2	115.1	154.0	171.3	177.5	202.7
	6000	Capacity	50.3	70.2	92.3	106.3	135.6	159.6	177.9	184.5	211.7
		Int. Cap.	46.5	64.6	84.7	96.9	118.8	159.6	177.9	184.5	211.7
	7500	Capacity	52.6	72.5	95.2	110.2	139.3	164.0	183.1	189.8	218.3
		Int. Cap.	48.7	66.7	87.4	100.5	122.0	164.0	183.1	189.8	218.3
70	4500	Capacity	46.2	64.9	84.7	99.1	124.7	146.5	162.8	168.8	192.5
		Int. Cap.	42.7	59.7	77.7	90.3	109.3	146.5	162.8	168.8	192.5
	6000	Capacity	47.7	66.7	86.9	102.2	129.0	152.0	169.4	175.8	201.5
		Int. Cap.	44.1	61.4	79.8	93.2	113.0	152.0	169.4	175.8	201.5
	7500	Capacity	50.0	69.1	89.7	105.1	132.8	156.4	174.7	181.3	208.3
		Int. Cap.	46.2	63.5	82.3	95.9	116.4	156.4	174.7	181.3	208.3
80	4500	Capacity	54.6	62.8	81.9	95.8	120.5	141.7	157.2	163.1	185.8
		Int. Cap.	50.5	57.8	75.2	87.3	105.6	141.7	157.2	163.1	185.8
	6000	Capacity	46.2	64.6	84.2	98.8	124.7	147.0	163.8	169.9	194.6
		Int. Cap.	42.7	59.4	77.3	90.1	109.3	147.0	163.8	169.9	194.6
	7500	Capacity	48.5	67.0	86.9	101.9	128.5	151.6	169.1	175.5	201.4
		Int. Cap.	44.9	61.6	79.7	92.9	112.6	151.6	169.1	175.5	201.4

LEGEND

— — Do Not Operate
Capacity — Instantaneous Capacity (1000 Btuh) — includes indoor fan motor heat at AHRI static conditions
Int. Cap. — Integrated Capacity = instantaneous capacity minus the effects of frost on the OD coil and the heat required to defrost it
rh — Relative Humidity
db — Dry Bulb

48QE**24 Heating Capacities

48QE**24 (20 Tons)											
Return Air (°F db)	CFM (Standard Air)		Temperature Air Entering Outdoor Coil (°F db at 70% rh)								
			–10	0	10	17	30	40	47	50	60
55	6000	Capacity	77.5	100.2	134.5	151.9	189.0	221.3	244.0	251.2	285.3
		Int. Cap.	71.7	92.2	123.5	138.5	165.6	221.3	244.0	251.2	285.3
	8000	Capacity	79.8	100.1	136.1	153.5	190.7	223.4	246.7	254.2	289.9
		Int. Cap.	73.8	92.1	124.9	140.0	167.1	223.4	246.7	254.2	289.9
	10000	Capacity	82.9	105.5	138.4	155.2	193.0	225.7	249.3	256.9	293.7
		Int. Cap.	76.7	97.1	127.0	141.5	169.1	225.7	249.3	256.9	293.7
70	6000	Capacity	70.4	93.8	129.9	147.5	183.8	216.0	238.4	245.2	277.6
		Int. Cap.	65.1	86.3	119.2	134.5	161.1	216.0	238.4	245.2	277.6
	8000	Capacity	73.9	97.1	132.6	147.2	186.7	219.2	242.3	249.3	283.6
		Int. Cap.	68.3	89.3	121.7	134.2	163.6	219.2	242.3	249.3	283.6
	10000	Capacity	77.3	100.4	135.6	153.4	189.7	222.1	245.5	252.9	288.0
		Int. Cap.	71.5	92.4	124.5	139.9	166.2	222.1	245.5	252.9	288.0
80	6000	Capacity	64.1	89.0	125.7	141.9	178.6	211.1	233.4	240.2	271.8
		Int. Cap.	59.3	81.9	115.4	129.4	156.5	211.1	233.4	240.2	271.8
	8000	Capacity	67.8	91.5	129.4	146.6	182.6	215.4	238.1	245.1	278.4
		Int. Cap.	62.7	84.2	118.8	133.7	160.0	215.4	238.1	245.1	278.4
	10000	Capacity	71.5	95.5	132.6	150.2	186.3	218.9	242.0	248.9	283.5
		Int. Cap.	66.1	87.9	121.7	136.9	163.2	218.9	242.0	248.9	283.5

LEGEND

— — Do Not Operate
Capacity — Instantaneous Capacity (1000 Btuh) — includes indoor fan motor heat at AHRI static conditions
Int. Cap. — Integrated Capacity = instantaneous capacity minus the effects of frost on the OD coil and the heat required to defrost it
rh — Relative Humidity
db — Dry Bulb

Performance data (cont)

48QE**28 Heating Capacities

48QE**28 (25 Tons)											
Return Air (°F db)	CFM (Standard Air)		Temperature Air Entering Outdoor Coil (°F db at 70% rh)								
			–10	0	10	17	30	40	47	50	60
55	7500	Capacity	107.5	135.5	174.5	196.7	243.5	285.8	311.5	323.1	363.4
		Int. Cap.	99.5	124.7	160.1	179.3	213.4	285.8	311.5	323.1	363.4
	10000	Capacity	111.8	139.7	177.9	200.2	247.4	289.9	316.0	325.2	370.3
		Int. Cap.	103.4	128.6	163.3	182.5	216.8	289.9	316.0	325.2	370.3
	12500	Capacity	116.9	144.6	182.3	204.5	251.5	293.7	320.5	329.9	376.1
		Int. Cap.	108.1	133.1	167.3	186.4	220.4	293.7	320.5	329.9	376.1
70	7500	Capacity	97.4	126.1	167.9	189.8	235.6	277.8	304.1	314.9	355.7
		Int. Cap.	90.1	116.0	154.1	173.1	206.4	277.8	304.1	314.9	355.7
	10000	Capacity	102.4	131.0	172.6	194.5	241.0	283.6	310.5	322.5	362.6
		Int. Cap.	94.7	120.5	158.4	177.3	211.2	283.6	310.5	322.5	362.6
	12500	Capacity	108.0	136.5	177.3	199.3	246.2	289.5	315.9	328.7	369.5
		Int. Cap.	99.9	125.6	162.7	181.7	215.7	289.5	315.9	328.7	369.5
80	7500	Capacity	—	117.9	161.0	183.4	228.6	270.8	299.4	307.7	347.7
		Int. Cap.	—	108.5	147.8	167.3	200.3	270.8	299.4	307.7	347.7
	10000	Capacity	—	123.9	166.4	189.0	234.7	278.1	307.6	316.0	358.6
		Int. Cap.	—	114.0	152.8	172.3	205.7	278.1	307.6	316.0	358.6
	12500	Capacity	—	129.2	172.4	194.7	240.7	283.9	311.6	323.1	367.5
		Int. Cap.	—	118.9	158.3	177.5	210.9	283.9	311.6	323.1	367.5

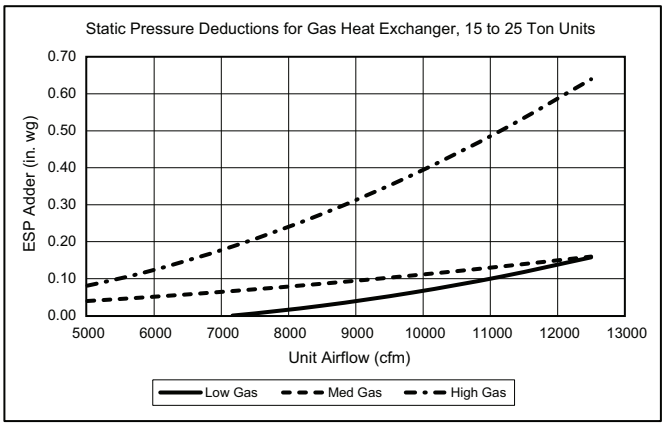
LEGEND

— — Do Not Operate
Capacity — Instantaneous Capacity (1000 Btuh) — includes indoor fan motor heat at AHRI static conditions
Int. Cap. — Integrated Capacity = instantaneous capacity minus the effects of frost on the OD coil and the heat required to defrost it
rh — Relative Humidity
db — Dry Bulb

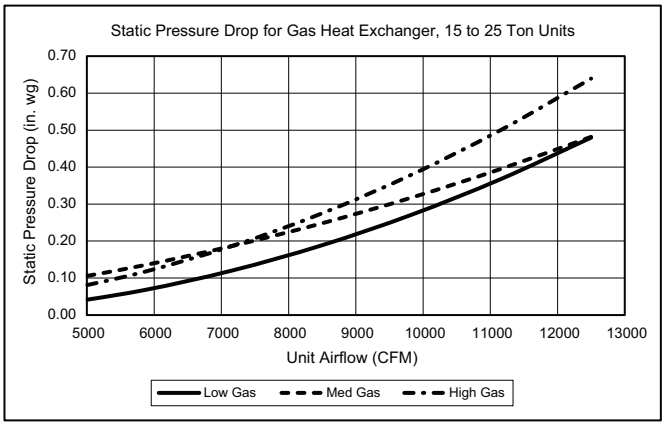
Performance data (cont)

Pressure Drop — Heating

Static Pressure Deduction, 15 to 25 Ton Gas Heat Units



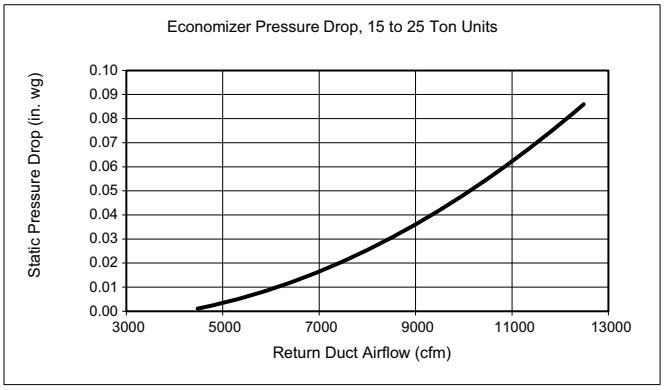
Static Pressure Drop, 15 to 25 Ton Units



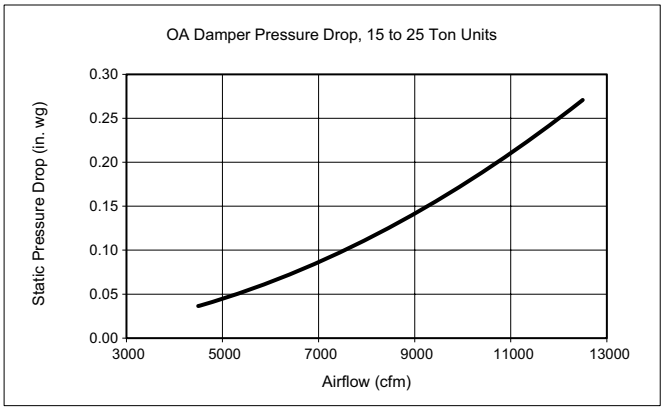
Performance data (cont)

Pressure Drops for Options and Accessories

Economizer Pressure Drop, 15 to 25 Ton Units



Outside Air Damper Pressure Drop, 15 to 25 Ton Units



Gas Heat Static Pressure Deductions (in. wg)

CFM	4,500	5,835	7,165	8,500	9,835	11,165	12,500
Medium Gas Heat	0.03	0.05	0.07	0.09	0.11	0.13	0.16
Low Gas Heat	0.06	0.12	0.19	0.28	0.38	0.50	0.64

Pressure Drop for Gas Heat Exchangers

CFM	4,500	5,835	7,165	8,500	9,835	11,165	12,500
Low Gas Heat	0.03	0.07	0.12	0.19	0.27	0.37	0.48
Medium Gas Heat	0.09	0.13	0.19	0.25	0.32	0.40	0.48
High Gas Heat	0.06	0.12	0.19	0.28	0.38	0.50	0.64

General Fan Performance Notes

1. Interpolation is permissible. Do not extrapolate.
2. External static pressure is the static pressure difference between the return duct and the supply duct plus the static pressure caused by any FIOPs or accessories.
3. Tabular data accounts for pressure loss due to clean filters, unit casing, wet coils, and highest gas heat exchanger (when gas heat unit).
4. Factory options and accessories may effect static pressure losses. Gas heat unit fan tables assume highest gas heat models; for fan selections with low or medium heat models, the user must deduct low and medium heat static pressures. Selection software is available, through your salesperson, to help you select the best motor/drive combination for your application.
5. The fan performance tables offer motor recommendations. In cases when 2 motors would work, the lower horsepower option is recommended.
6. Fan tables include highest gas heat. Utilize static pressure deduction table on page 35 for lower gas heat capacities.
7. For information on the electrical properties of the fan motors, please see the Electrical information section of this book.
8. For more information on the performance limits of the fan motors, see the application data section of this book.
9. The EPACT (Energy Policy Act of 1992) regulates energy requirements for specific types of indoor fan motors. Motors regulated by EPACT include any general purpose, T-frame (3-digit, 143 and larger), single-speed, foot mounted, polyphase, squirrel cage induction motors of NEMA (National Electrical Manufacturers Association) design A and B, manufactured for use in the United States. Ranging from 1 to 200 Hp, these continuous-duty motors operate on 230 and 460 volt, 60 Hz power. If a motor does not fit into these specifications, the motor does not have to be replaced by an EPACT compliant energy-efficient motor. Variable-speed motors are exempt from EPACT compliance requirements.

Fan data (cont)

48QETM17 — 15 Ton Vertical Supply (rpm - bhp)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4500	977	0.70	1102	1.00	1213	1.34	1314	1.70	1408	2.09
4875	1037	0.84	1155	1.15	1263	1.51	1360	1.88	1451	2.29
5250	1099	1.00	1210	1.33	1313	1.70	1408	2.10	1496	2.51
5625	1162	1.18	1267	1.53	1366	1.92	1457	2.33	1543	2.76
6000	1225	1.38	1325	1.75	1419	2.15	1508	2.58	1591	3.03
6375	1290	1.61	1384	1.99	1474	2.41	1560	2.85	1641	3.32
6750	1355	1.86	1443	2.25	1530	2.68	1613	3.14	1692	3.62
7125	1421	2.13	1504	2.52	1588	2.97	1668	3.44	1744	3.94
7500	1488	2.42	1567	2.82	1646	3.27	1723	3.75	1797	4.26

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4500	1496	2.51	1579	2.95	1658	3.41	1732	3.89	1803	4.39
4875	1537	2.72	1618	3.17	1695	3.65	1768	4.14	1838	4.65
5250	1579	2.96	1658	3.42	1733	3.91	1805	4.42	1875	4.95
5625	1623	3.22	1700	3.70	1774	4.20	1844	4.72	1912	5.26
6000	1670	3.51	1745	4.00	1816	4.51	1885	5.04	1952	5.60
6375	1717	3.80	1790	4.31	1860	4.83	1928	5.38	1993	5.95
6750	1766	4.12	1837	4.64	1906	5.18	1972	5.74	2035	6.30
7125	1817	4.45	1886	4.98	1953	5.53	2017	6.09	—	—
7500	1868	4.78	1936	5.33	2001	5.88	—	—	—	—

Std/Med Static 977-2000 rpm, 4.8 maximum bhp (2.4 maximum bhp per fan motor)

High Static 977-2200 rpm, 6.0 maximum bhp (3.0 maximum bhp per fan motor)

48QETM17 — Standard/Medium Static — 15 Ton Vertical Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
4500	977	4.7	1102	5.4	1213	6.0	1314	6.5	1408	7.0
4875	1037	5.0	1155	5.7	1263	6.2	1360	6.7	1451	7.2
5250	1099	5.4	1210	5.9	1313	6.5	1408	7.0	1496	7.4
5625	1162	5.7	1267	6.2	1366	6.7	1457	7.2	1543	7.6
6000	1225	6.0	1325	6.5	1419	7.0	1508	7.5	1591	7.9
6375	1290	6.3	1384	6.8	1474	7.3	1560	7.7	1641	8.2
6750	1355	6.7	1443	7.1	1530	7.6	1613	8.0	1692	8.4
7125	1421	7.0	1504	7.4	1588	7.9	1668	8.3	1744	8.7
7500	1488	7.4	1567	7.8	1646	8.2	1723	8.6	1797	9.0

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
4500	1496	7.4	1579	7.8	1658	8.2	1732	8.6	1803	9.0
4875	1537	7.6	1618	8.0	1695	8.4	1768	8.8	1838	9.2
5250	1579	7.8	1658	8.2	1733	8.6	1805	9.0	1875	9.4
5625	1623	8.1	1700	8.5	1774	8.8	1844	9.2	—	—
6000	1670	8.3	1745	8.7	1816	9.1	1885	9.4	—	—
6375	1717	8.5	1790	8.9	1860	9.3	—	—	—	—
6750	1766	8.8	1837	9.2	—	—	—	—	—	—
7125	1817	9.1	1886	9.4	—	—	—	—	—	—
7500	1868	9.3	—	—	—	—	—	—	—	—

Std/Med Static 977-2000 rpm

Fan data (cont)

48QETM17 — High Static — 15 Ton Vertical Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
4500	977	4.4	1102	4.9	1213	5.4	1314	5.9	1408	6.3
4875	1037	4.6	1155	5.2	1263	5.7	1360	6.1	1451	6.5
5250	1099	4.9	1210	5.4	1313	5.9	1408	6.3	1496	6.8
5625	1162	5.2	1267	5.7	1366	6.2	1457	6.6	1543	7.0
6000	1225	5.5	1325	6.0	1419	6.4	1508	6.8	1591	7.2
6375	1290	5.8	1384	6.2	1474	6.6	1560	7.0	1641	7.4
6750	1355	6.1	1443	6.5	1530	6.9	1613	7.3	1692	7.7
7125	1421	6.4	1504	6.8	1588	7.2	1668	7.5	1744	7.9
7500	1488	6.7	1567	7.1	1646	7.4	1723	7.8	1797	8.1

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
4500	1496	6.8	1579	7.1	1658	7.5	1732	7.8	1803	8.2
4875	1537	6.9	1618	7.3	1695	7.7	1768	8.0	1838	8.3
5250	1579	7.1	1658	7.5	1733	7.8	1805	8.2	1875	8.5
5625	1623	7.3	1700	7.7	1774	8.0	1844	8.4	1912	8.7
6000	1670	7.6	1745	7.9	1816	8.2	1885	8.5	1952	8.9
6375	1717	7.8	1790	8.1	1860	8.4	1928	8.7	1993	9.0
6750	1766	8.0	1837	8.3	1906	8.6	1972	8.9	2035	9.2
7125	1817	8.2	1886	8.6	1953	8.9	2017	9.2	—	—
7500	1868	8.5	1936	8.8	2001	9.1	—	—	—	—

High Static 977-2200 rpm

Fan data (cont)

48QETM24 — 20 Ton Vertical Supply (rpm - bhp)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
6,000	1107	1.02	1212	1.34	1313	1.70	1411	2.11	1504	2.56
6,500	1182	1.24	1280	1.57	1374	1.95	1467	2.37	1556	2.83
7,000	1258	1.48	1350	1.83	1438	2.21	1525	2.64	1610	3.11
7,500	1335	1.75	1421	2.11	1504	2.50	1586	2.93	1667	3.40
8,000	1412	2.03	1494	2.40	1573	2.80	1650	3.23	1726	3.70
8,500	1490	2.32	1568	2.70	1643	3.11	1716	3.54	1788	4.00
9,000	1569	2.62	1643	3.01	1714	3.41	1783	3.84	1852	4.31
9,500	1647	2.92	1719	3.32	1786	3.72	1852	4.15	1918	4.61
10,000	1726	3.23	1795	3.64	1860	4.05	1923	4.47	1985	4.92

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
6,000	1592	3.04	1674	3.53	1750	4.03	1821	4.54	1888	5.06
6,500	1641	3.32	1721	3.83	1797	4.35	1869	4.90	1936	5.45
7,000	1692	3.61	1770	4.13	1845	4.68	1916	5.24	1984	5.81
7,500	1745	3.90	1821	4.43	1894	4.99	1964	5.56	2032	6.16
8,000	1801	4.20	1874	4.73	1945	5.29	2014	5.88	2080	6.47
8,500	1859	4.50	1929	5.03	1998	5.59	2065	6.17	2129	6.76
9,000	1920	4.80	1987	5.32	2053	5.87	2117	6.43	2180	7.03
9,500	1982	5.09	2046	5.60	2110	6.14	2172	6.70	—	—
10,000	2047	5.40	2108	5.89	2169	6.42	—	—	—	—

Std/Med Static 1107-2000 rpm, 4.8 maximum bhp (2.4 maximum bhp per fan motor)

High Static 1107-2200 rpm, 10.0 maximum bhp (5.0 maximum bhp per fan motor)

48QETM24 — Standard/Medium Static — 20 Ton Vertical Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
6,000	1107	5.4	1212	5.9	1313	6.5	1411	7.0	1504	7.4
6,500	1182	5.8	1280	6.3	1374	6.8	1467	7.3	1556	7.7
7,000	1258	6.2	1350	6.7	1438	7.1	1525	7.6	1610	8.0
7,500	1335	6.6	1421	7.0	1504	7.4	1586	7.9	1667	8.3
8,000	1412	7.0	1494	7.4	1573	7.8	1650	8.2	1726	8.6
8,500	1490	7.4	1568	7.8	1643	8.2	1716	8.5	1788	8.9
9,000	1569	7.8	1643	8.2	1714	8.5	1783	8.9	1852	9.2
9,500	1647	8.2	1719	8.6	1786	8.9	1852	9.2	1918	9.6
10,000	1726	8.6	1795	8.9	1860	9.3	1923	9.6	1985	9.9

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
6,000	1592	7.9	1674	8.3	1750	8.7	1821	9.1	1888	9.4
6,500	1641	8.2	1721	8.6	1797	9.0	1869	9.3	—	—
7,000	1692	8.4	1770	8.8	1845	9.2	—	—	—	—
7,500	1745	8.7	1821	9.1	1894	9.5	—	—	—	—
8,000	1801	9.0	1874	9.4	—	—	—	—	—	—
8,500	1859	9.3	1929	9.6	—	—	—	—	—	—
9,000	1920	9.6	—	—	—	—	—	—	—	—
9,500	1982	9.9	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

Std/Med Static 1107-2000 rpm

Fan data (cont)

48QETM24 — High Static — 20 Ton Vertical Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
6,000	1107	5.0	1212	5.4	1313	5.9	1411	6.4	1504	6.8
6,500	1182	5.3	1280	5.8	1374	6.2	1467	6.6	1556	7.0
7,000	1258	5.7	1350	6.1	1438	6.5	1525	6.9	1610	7.3
7,500	1335	6.0	1421	6.4	1504	6.8	1586	7.2	1667	7.5
8,000	1412	6.4	1494	6.7	1573	7.1	1650	7.5	1726	7.8
8,500	1490	6.7	1568	7.1	1643	7.4	1716	7.8	1788	8.1
9,000	1569	7.1	1643	7.4	1714	7.8	1783	8.1	1852	8.4
9,500	1647	7.4	1719	7.8	1786	8.1	1852	8.4	1918	8.7
10,000	1726	7.8	1795	8.1	1860	8.4	1923	8.7	1985	9.0

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
6,000	1592	7.2	1674	7.6	1750	7.9	1821	8.3	1888	8.6
6,500	1641	7.4	1721	7.8	1797	8.1	1869	8.5	1936	8.8
7,000	1692	7.7	1770	8.0	1845	8.4	1916	8.7	1984	9.0
7,500	1745	7.9	1821	8.3	1894	8.6	1964	8.9	2032	9.2
8,000	1801	8.2	1874	8.5	1945	8.8	2014	9.1	2080	9.4
8,500	1859	8.4	1929	8.7	1998	9.1	2065	9.4	2129	9.7
9,000	1920	8.7	1987	9.0	2053	9.3	2117	9.6	2180	9.9
9,500	1982	9.0	2046	9.3	2110	9.6	2172	9.9	—	—
10,000	2047	9.3	2108	9.6	2169	9.9	—	—	—	—

High Static 1107-2200 rpm

Fan data (cont)

48QETM28 — 25 Ton Vertical Supply (rpm - bhp)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,500	1177	1.57	1260	1.92	1347	2.35	1437	2.85	1524	3.40
8,125	1263	1.95	1337	2.31	1417	2.75	1499	3.26	1581	3.82
8,750	1349	2.38	1418	2.77	1490	3.21	1565	3.72	1642	4.30
9,375	1437	2.88	1500	3.27	1566	3.72	1635	4.24	1706	4.82
10,000	1525	3.41	1583	3.81	1644	4.27	1708	4.79	1774	5.37
11,700	1613	3.97	1668	4.39	1724	4.85	1784	5.37	1845	5.94
11,250	1702	4.57	1753	4.99	1806	5.46	1861	5.97	1918	6.54
11,875	1791	5.22	1839	5.66	1889	6.13	1941	6.65	1994	7.21
12,500	1880	6.00	1926	6.46	1973	6.94	2021	7.46	2071	8.03

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,500	1607	3.98	1686	4.60	1760	5.23	1830	5.88	1897	6.55
8,125	1661	4.43	1738	5.07	1811	5.74	1880	6.42	1947	7.13
8,750	1718	4.92	1792	5.59	1863	6.28	1932	7.00	1997	7.73
9,375	1778	5.45	1849	6.13	1918	6.84	1984	7.57	2049	8.34
10,000	1841	6.00	1908	6.68	1974	7.40	2039	8.15	2102	8.93
11,700	1907	6.56	1970	7.23	2033	7.95	2096	8.71	2157	9.50
11,250	1976	7.15	2036	7.82	2095	8.52	2155	9.28	—	—
11,875	2048	7.81	2104	8.47	2160	9.17	—	—	—	—
12,500	2122	8.63	2175	9.30	—	—	—	—	—	—

Std/Med Static 1177-2200 rpm, 6.0 maximum bhp (3.0 maximum bhp per fan motor)

High Static 1177-2200 rpm, 10.0 maximum bhp (5 maximum bhp per fan motor)

48QETM28 — Standard/Medium Static — 25 Ton Vertical Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
7,500	1177	5.3	1260	5.7	1347	6.1	1437	6.5	1524	6.9
8,125	1263	5.7	1337	6.0	1417	6.4	1499	6.8	1581	7.1
8,750	1349	6.1	1418	6.4	1490	6.7	1565	7.1	1642	7.4
9,375	1437	6.5	1500	6.8	1566	7.1	1635	7.4	1706	7.7
10,000	1525	6.9	1583	7.2	1644	7.4	1708	7.7	1774	8.0
11,700	1613	7.3	1668	7.5	1724	7.8	1784	8.1	1845	8.4
11,250	1702	7.7	1753	7.9	1806	8.2	1861	8.4	—	—
11,875	1791	8.1	1839	8.3	1889	8.6	—	—	—	—
12,500	1880	8.5	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
7,500	1607	7.3	1686	7.6	1760	8.0	1830	8.3	—	—
8,125	1661	7.5	1738	7.9	1811	8.2	—	—	—	—
8,750	1718	7.8	1792	8.1	1863	8.4	—	—	—	—
9,375	1778	8.1	1849	8.4	—	—	—	—	—	—
10,000	1841	8.3	—	—	—	—	—	—	—	—
11,700	—	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—	—
11,875	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

Std/Med Static 1177-2200 rpm

Fan data (cont)

48QETM28 — High Static — 25 Ton Vertical Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
7,500	1177	5.3	1260	5.7	1347	6.1	1437	6.5	1524	6.9
8,125	1263	5.7	1337	6.0	1417	6.4	1499	6.8	1581	7.1
8,750	1349	6.1	1418	6.4	1490	6.7	1565	7.1	1642	7.4
9,375	1437	6.5	1500	6.8	1566	7.1	1635	7.4	1706	7.7
10,000	1525	6.9	1583	7.2	1644	7.4	1708	7.7	1774	8.0
11,700	1613	7.3	1668	7.5	1724	7.8	1784	8.1	1845	8.4
11,250	1702	7.7	1753	7.9	1806	8.2	1861	8.4	1918	8.7
11,875	1791	8.1	1839	8.3	1889	8.6	1941	8.8	1994	9.0
12,500	1880	8.5	1926	8.7	1973	9.0	2021	9.2	2071	9.4

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
7,500	1607	7.3	1686	7.6	1760	8.0	1830	8.3	1897	8.6
8,125	1661	7.5	1738	7.9	1811	8.2	1880	8.5	1947	8.8
8,750	1718	7.8	1792	8.1	1863	8.4	1932	8.8	1997	9.1
9,375	1778	8.1	1849	8.4	1918	8.7	1984	9.0	2049	9.3
10,000	1841	8.3	1908	8.7	1974	9.0	2039	9.3	2102	9.5
11,700	1907	8.6	1970	8.9	2033	9.2	2096	9.5	2157	9.8
11,250	1976	9.0	2036	9.2	2095	9.5	2155	9.8	—	—
11,875	2048	9.3	2104	9.6	2160	9.8	—	—	—	—
12,500	2122	9.6	2175	9.9	—	—	—	—	—	—

High Static 1177-2200 rpm

Fan data (cont)

48QETM17 — 15 Ton Horizontal Supply (rpm - bhp)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4500	1092	0.79	1205	1.06	1311	1.36	1409	1.69	1500	2.04
4875	1164	0.95	1270	1.23	1370	1.55	1464	1.89	1552	2.25
5250	1237	1.14	1337	1.43	1432	1.76	1522	2.11	1607	2.49
5625	1311	1.34	1405	1.65	1496	2.00	1582	2.36	1664	2.75
6000	1386	1.58	1475	1.90	1561	2.25	1643	2.62	1722	3.02
6375	1461	1.83	1546	2.16	1627	2.52	1706	2.91	1782	3.31
6750	1538	2.10	1618	2.45	1696	2.82	1771	3.21	1844	3.62
7125	1614	2.39	1691	2.75	1765	3.13	1837	3.53	1907	3.94
7500	1691	2.71	1764	3.07	1835	3.46	1904	3.86	1972	4.29

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4500	1585	2.40	1667	2.79	1744	3.20	1819	3.88	1892	4.37
4875	1635	2.63	1714	3.03	1790	3.45	1862	3.88	1932	4.65
5250	1688	2.88	1764	3.29	1837	3.72	1908	4.17	1976	4.98
5625	1742	3.15	1816	3.57	1888	4.01	1956	4.46	2023	5.34
6000	1798	3.44	1870	3.87	1940	4.32	2007	4.78	2072	5.74
6375	1855	3.74	1926	4.18	1994	4.64	2059	5.11	2122	6.16
6750	1915	4.06	1983	4.50	2049	4.97	2113	5.45	2175	6.64
7125	1976	4.39	2042	4.84	2106	5.31	2168	5.80	—	—
7500	2038	4.74	2102	5.20	2164	5.67	—	—	—	—

High Static 1092-2200 rpm, 10.0 maximum bhp (5.0 maximum bhp per fan motor)

48QETM17 — High Static — 15 ton Horizontal Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
4500	1092	4.9	1205	5.4	1311	5.9	1409	6.3	1500	6.8
4875	1164	5.2	1270	5.7	1370	6.2	1464	6.6	1552	7.0
5250	1237	5.6	1337	6.0	1432	6.5	1522	6.9	1607	7.3
5625	1311	5.9	1405	6.3	1496	6.8	1582	7.1	1664	7.5
6000	1386	6.2	1475	6.7	1561	7.1	1643	7.4	1722	7.8
6375	1461	6.6	1546	7.0	1627	7.4	1706	7.7	1782	8.1
6750	1538	6.9	1618	7.3	1696	7.7	1771	8.0	1844	8.4
7125	1614	7.3	1691	7.7	1765	8.0	1837	8.3	1907	8.6
7500	1691	7.7	1764	8.0	1835	8.3	1904	8.6	1972	8.9

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
4500	1585	7.2	1667	7.5	1744	7.9	1819	8.2	1892	8.6
4875	1635	7.4	1714	7.8	1790	8.1	1862	8.4	1932	8.8
5250	1688	7.6	1764	8.0	1837	8.3	1908	8.7	1976	9.0
5625	1742	7.9	1816	8.2	1888	8.6	1956	8.9	2023	9.2
6000	1798	8.1	1870	8.5	1940	8.8	2007	9.1	2072	9.4
6375	1855	8.4	1926	8.7	1994	9.0	2059	9.3	2122	9.6
6750	1915	8.7	1983	9.0	2049	9.3	2113	9.6	2175	9.9
7125	1976	9.0	2042	9.3	2106	9.6	2168	9.9	—	—
7500	2038	9.3	2102	9.5	2164	9.8	—	—	—	—

High Static 1092-2200 rpm

Fan data (cont)

48QETM24 — 20 Ton Horizontal Supply (rpm - bhp)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
6,000	1326	1.38	1417	1.68	1505	2.01	1589	2.37	1670	2.75
6,500	1421	1.67	1506	1.99	1589	2.34	1668	2.70	1745	3.09
7,000	1518	2.00	1597	2.33	1674	2.68	1750	3.06	1823	3.46
7,500	1615	2.36	1689	2.70	1762	3.06	1833	3.45	1903	3.86
8,000	1713	2.75	1783	3.10	1852	3.48	1919	3.87	1985	4.28
8,500	1811	3.17	1877	3.53	1943	3.92	2007	4.32	2069	4.73
9,000	1910	3.63	1973	4.00	2035	4.39	2095	4.79	2155	5.21
9,500	2010	4.12	2069	4.50	2128	4.89	2186	5.30	—	—
10,000	2109	4.64	2166	5.03	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
6,000	1748	3.16	1823	3.58	1894	4.02	1963	4.47	2030	4.94
6,500	1819	3.50	1891	3.94	1960	4.38	2027	4.85	2092	5.33
7,000	1893	3.88	1962	4.32	2029	4.78	2093	5.24	2156	5.73
7,500	1970	4.28	2036	4.73	2100	5.19	2162	5.66	—	—
8,000	2049	4.71	2112	5.16	2174	5.62	—	—	—	—
8,500	2131	5.17	2191	5.62	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

High Static 1326-2200 rpm, 10.0 maximum bhp (5.0 maximum bhp per fan motor)

48QETM24 — High Static — 20 Ton Horizontal Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
6,000	1326	6.0	1417	6.4	1505	6.8	1589	7.2	1670	7.6
6,500	1421	6.4	1506	6.8	1589	7.2	1668	7.5	1745	7.9
7,000	1518	6.9	1597	7.2	1674	7.6	1750	7.9	1823	8.3
7,500	1615	7.3	1689	7.6	1762	8.0	1833	8.3	1903	8.6
8,000	1713	7.8	1783	8.1	1852	8.4	1919	8.7	1985	9.0
8,500	1811	8.2	1877	8.5	1943	8.8	2007	9.1	2069	9.4
9,000	1910	8.7	1973	9.0	2035	9.2	2095	9.5	2155	9.8
9,500	2010	9.1	2069	9.4	2128	9.7	2186	9.9	—	—
10,000	2109	9.6	2166	9.8	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
6,000	1748	7.9	1823	8.3	1894	8.6	1963	8.9	2030	9.2
6,500	1819	8.2	1891	8.6	1960	8.9	2027	9.2	2092	9.5
7,000	1893	8.6	1962	8.9	2029	9.2	2093	9.5	2156	9.8
7,500	1970	8.9	2036	9.2	2100	9.5	2162	9.8	—	—
8,000	2049	9.3	2112	9.6	2174	9.9	—	—	—	—
8,500	2131	9.7	2191	10.0	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

High Static 1326-2200 rpm

Fan data (cont)

48QETM28 — 25 Ton Horizontal Supply (rpm - bhp)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,500	1486	2.49	1562	2.89	1639	3.34	1714	3.82	1786	4.32
8,125	1597	3.08	1668	3.51	1739	3.98	1809	4.48	1877	5.00
8,750	1709	3.75	1775	4.20	1841	4.69	1907	5.21	1971	5.75
9,375	1822	4.50	1884	4.97	1945	5.47	2007	6.01	2067	6.56
10,000	1936	5.31	1994	5.81	2051	6.32	2109	6.87	2166	7.44
10,625	2050	6.19	2104	6.69	2159	7.23	—	—	—	—
11,250	2164	7.09	—	—	—	—	—	—	—	—
11.875	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,500	1856	4.85	1923	5.39	1988	5.96	2050	6.53	2110	7.12
8,125	1944	5.55	2008	6.12	2071	6.71	2131	7.32	2189	7.93
8,750	2034	6.32	2096	6.92	2156	7.53	—	—	—	—
9,375	2127	7.15	2186	7.76	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—
10,625	—	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—	—
11.875	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

High Static 1486-2200 rpm, 10.0 maximum bhp (maximum bhp 5.0 per fan motor)

48QETM28 — High Static — 25 Ton Horizontal Supply (rpm - vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
7,500	1486	6.7	1562	7.1	1639	7.4	1714	7.8	1786	8.1
8,125	1597	7.2	1668	7.5	1739	7.9	1809	8.2	1877	8.5
8,750	1709	7.7	1775	8.0	1841	8.3	1907	8.6	1971	8.9
9,375	1822	8.3	1884	8.5	1945	8.8	2007	9.1	2067	9.4
10,000	1936	8.8	1994	9.0	2051	9.3	2109	9.6	2166	9.8
10,625	2050	9.3	2104	9.6	2159	9.8	—	—	—	—
11,250	2164	9.8	—	—	—	—	—	—	—	—
11.875	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc	rpm	vdc
7,500	1856	8.4	1923	8.7	1988	9.0	2050	9.3	2110	9.6
8,125	1944	8.8	2008	9.1	2071	9.4	2131	9.7	2189	9.9
8,750	2034	9.2	2096	9.5	2156	9.8	—	—	—	—
9,375	2127	9.7	2186	9.9	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—
10,625	—	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—	—
11.875	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

High Static 1486-2200 rpm

Electrical data

Legend and Notes

Applicable for Electrical Data Tables on pages 47 to 51

LEGEND

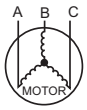
BRKR	—	Circuit Breaker
C.O.	—	Convenience Outlet
FLA	—	Full Load Amps
IFM	—	Indoor Fan Motor
LRA	—	Locked Rotor Amps
MCA	—	Minimum Circuit Amps
P.E.	—	Power Exhaust
PWRD C.O.	—	Powered Convenience Outlet
RLA	—	Rated Load Amps
SCCR	—	Short Circuit Current Rating
UNPWR C.O.	—	Unpowered Convenience Outlet

NOTES:

1. In compliance with NEC requirements for multi-motor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
2. For 208/230 v units, where one value is shown it is the same for either 208 or 230 volts.
3. **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 percentage of voltage imbalance.

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

Example: Supply voltage is 230-3-60



AB = 224-v
BC = 231-v
AC = 226-v

$$\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227$$

Determine maximum deviation from average voltage.
(AB) 227-224 = 3-v
(BC) 231-227 = 4-v
(AC) 227-226 = 1-v
Maximum deviation is 4-v.
Determine percent of voltage imbalance.

$$\text{\% Voltage Imbalance} = 100x \frac{4}{227} = 1.78\%$$

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

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

Electrical data (cont)

48QE**17-28 Cooling Electrical Data

48QE UNIT SIZE	V-Ph-Hz	UNIT VOLTAGE Range		STD SCCR kA	HIGH SCCR kA[a]	COMP 1		COMP 2		OFM (EA)		IFM			COMBUSTION FAN MOTOR	POWER EXHAUST	
		Min	Max			RLA	LRA	RLA	LRA	WATTS	FLA	Type	Effcy at Full Load	FLA	FLA	Motor Qty	FLA (Each motor)
17 Vertical	208-3-60	187	253	5	60	31.8	255	23.6	157	350	1.5	STD/MED	90%	6.4	0.52	2	5.9
												HIGH	90%	7.5			
	230-3-60	187	253	5	60	31.8	255	23.6	157	350	1.5	STD/MED	90%	6.4	0.52	2	5.9
												HIGH	90%	7.5			
	460-3-60	414	506	5	65	15.0	123	10.1	75	277	0.9	STD/MED	90%	3.0	0.3	2	3.1
												HIGH	90%	3.5			
	575-3-60	518	633	5	—	11.9	94	8.6	48	397	0.6	STD/MED	90%	2.5	0.24	2	2.4
												HIGH	90%	3.0			
24 Vertical	208-3-60	187	253	5	60	45.4	270	31.9	208	397	1.9	STD/MED	90%	6.4	0.52	2	5.9
												HIGH	90%	12.6			
	230-3-60	187	253	5	60	45.4	270	31.9	208	397	1.9	STD/MED	90%	6.4	0.52	2	5.9
												HIGH	90%	12.6			
	460-3-60	414	506	5	65	21.6	147	13.9	100	397	0.9	STD/MED	90%	3.0	0.3	2	3.1
												HIGH	90%	5.6			
	575-3-60	518	633	5	—	15.3	109	10.0	78	397	0.7	STD/MED	90%	2.5	0.24	2	2.4
												HIGH	90%	4.6			
28 Vertical	208-3-60	187	253	5	60	51.3	300	45.4	270	397	1.9	STD/MED	90%	7.5	0.52	2	5.9
												HIGH	90%	12.6			
	230-3-60	187	253	5	60	51.3	300	45.4	270	397	1.9	STD/MED	90%	7.5	0.52	2	5.9
												HIGH	90%	12.6			
	460-3-60	414	506	5	65	22.4	150	21.6	147	397	0.9	STD/MED	90%	3.5	0.3	2	3.1
												HIGH	90%	5.6			
	575-3-60	518	633	5	—	19.9	109	15.3	109	397	0.7	STD/MED	90%	3.0	0.24	2	2.4
												HIGH	90%	4.6			
17 Horizontal	208-3-60	187	253	5	60	31.8	255	23.6	157	350	1.5	HIGH	90%	12.6	0.52	—	—
	230-3-60	187	253	5	60	31.8	255	23.6	157	350	1.5	HIGH	90%	12.6	0.52	—	—
	460-3-60	414	506	5	65	15.0	123	10.1	75	277	0.9	HIGH	90%	5.6	0.3	—	—
	575-3-60	518	633	5	—	11.9	94	8.6	48	397	0.6	HIGH	90%	4.6	0.24	—	—
24 Horizontal	208-3-60	187	253	5	60	45.4	270	31.9	208	397	1.9	HIGH	90%	12.6	0.52	—	—
	230-3-60	187	253	5	60	45.4	270	31.9	208	397	1.9	HIGH	90%	12.6	0.52	—	—
	460-3-60	414	506	5	65	21.6	147	13.9	100	397	0.9	HIGH	90%	5.6	0.3	—	—
	575-3-60	518	633	5	—	15.3	109	10.0	78	397	0.7	HIGH	90%	4.6	0.24	—	—
28 Horizontal	208-3-60	187	253	5	60	51.3	300	45.4	270	397	1.9	HIGH	90%	12.6	0.52	—	—
	230-3-60	187	253	5	60	51.3	300	45.4	270	397	1.9	HIGH	90%	12.6	0.52	—	—
	460-3-60	414	506	5	65	22.4	150	21.6	147	397	0.9	HIGH	90%	5.6	0.3	—	—
	575-3-60	518	633	5	—	19.9	109	15.3	109	397	0.7	HIGH	90%	4.6	0.24	—	—

NOTE(S):

a. High SCCR (Short Circuit Current Rating) is not available on the following: units with phase loss monitor, non-fused disconnect, HACR circuit breaker, powered convenience outlet, and 575V models.

Electrical data (cont)

48QE**17-28 Unit Wire/Fuse Sizing Electrical Data

48QE UNIT SIZE	NOM. V-Ph-Hz	IFM TYPE	STD SCCR kA	HIGH SCCR kA[a]	NO CONVENIENCE OUTLET OR UNPOWERED CONVENIENCE OUTLET							
					No Power Exhaust				With Power Exhaust (powered from unit)			
					MCA	Fuse or HACR Breaker	Disconnect Size		MCA	Fuse or HACR Breaker	Disconnect Size	
							FLA	LRA			FLA	LRA
48QE**17 Vertical	208/230-3-60	STD/MED	5	60	83	100	86	444	94	125	99	464
		HIGH			85	100	88	448	97	125	102	468
	460-3-60	STD/MED	5	65	39	50	40	215	45	50	47	227
		HIGH			40	50	41	217	46	60	49	229
	575-3-60	STD/MED	5	—	31	40	32	159	36	45	38	167
		HIGH			32	40	34	159	37	45	39	167
48QE**24 Vertical	208/230-3-60	STD/MED	5	60	113	150	117	516	125	150	131	536
		HIGH			126	150	132	534	138	175	145	554
	460-3-60	STD/MED	5	65	53	60	54	268	59	80	61	280
		HIGH			58	70	60	276	64	80	67	288
	575-3-60	STD/MED	5	—	39	50	40	208	43	50	45	216
		HIGH			43	50	45	212	48	60	50	220
48QE**28 Vertical	208/230-3-60	STD/MED	5	60	136	175	142	612	148	175	156	632
		HIGH			147	175	154	626	158	200	167	646
	460-3-60	STD/MED	5	65	62	80	65	320	68	90	72	332
		HIGH			66	80	70	326	73	90	77	338
	575-3-60	STD/MED	5	—	51	60	52	239	55	70	58	247
		HIGH			54	60	56	243	59	70	62	251
48QE**17 Horizontal	208/230-3-60	HIGH	5	60	95	125	100	462	107	125	114	482
	460-3-60	HIGH	5	65	44	50	46	223	50	60	53	235
	575-3-60	HIGH	5	—	35	45	37	163	40	50	43	171
48QE**24 Horizontal	208/230-3-60	HIGH	5	60	126	150	132	534	138	175	145	554
	460-3-60	HIGH	5	65	58	70	60	276	64	80	67	288
	575-3-60	HIGH	5	—	43	50	45	212	48	60	50	220
48QE**28 Horizontal	208/230-3-60	HIGH	5	60	147	175	154	626	158	200	167	646
	460-3-60	HIGH	5	65	66	80	70	326	73	90	77	338
	575-3-60	HIGH	5	—	54	60	56	243	59	70	62	251

NOTE(S):

a. High SCCR (Short Circuit Current Rating) is not available on the following: units with phase loss monitor, non-fused disconnect, HACR circuit breaker, and 575V models.

Electrical data (cont)

48QE**17-28 Unit Wire/Fuse Sizing Electrical Data (cont)

48QE UNIT SIZE	NOM. V-Ph-Hz	IFM TYPE	STD SCCR kA	WITH POWERED CONVENIENCE OUTLET							
				No Power Exhaust				With Power Exhaust (powered from unit)			
				MCA	Fuse or HACR Breaker	Disconnect Size		MCA	Fuse or HACR Breaker	Disconnect Size	
						FLA	LRA			FLA	LRA
48QE**17 Vertical	208/230-3-60	STD/MED	5	88	100	91	449	99	125	105	469
		HIGH		90	100	94	453	102	125	108	473
	460-3-60	STD/MED	5	41	50	43	217	47	60	50	229
		HIGH		42	50	44	219	48	60	51	231
	575-3-60	STD/MED	5	33	40	34	161	38	45	40	169
		HIGH		34	45	35	161	39	50	41	169
48QE**24 Vertical	208/230-3-60	STD/MED	5	118	150	123	521	130	175	136	541
		HIGH		131	175	137	539	142	175	151	559
	460-3-60	STD/MED	5	55	70	57	270	61	80	64	282
		HIGH		60	80	63	278	66	80	70	290
	575-3-60	STD/MED	5	40	50	42	210	45	60	47	218
		HIGH		44	50	47	214	49	60	52	222
48QE**28 Vertical	208/230-3-60	STD/MED	5	141	175	148	617	153	200	161	637
		HIGH		151	200	159	631	163	200	173	651
	460-3-60	STD/MED	5	64	80	68	322	71	90	75	334
		HIGH		69	90	73	328	75	90	80	340
	575-3-60	STD/MED	5	52	60	54	241	57	70	60	249
		HIGH		56	70	58	245	60	80	64	253
48QE**17 Horizontal	208/230-3-60	HIGH	5	100	125	106	467	112	125	119	487
	460-3-60	HIGH	5	46	60	49	225	52	60	56	237
	575-3-60	HIGH	5	37	45	39	165	42	50	45	173
48QE**24 Horizontal	208/230-3-60	HIGH	5	131	175	137	539	142	175	151	559
	460-3-60	HIGH	5	60	80	63	278	66	80	70	290
	575-3-60	HIGH	5	44	50	47	214	49	60	52	222
48QE**28 Horizontal	208/230-3-60	HIGH	5	151	200	159	631	163	200	173	651
	460-3-60	HIGH	5	69	90	73	328	75	90	80	340
	575-3-60	HIGH	5	56	70	58	245	60	80	64	253

Electrical data (cont)

48QE**17-28 Unit HACR Sizing Electrical Data

48QE UNIT SIZE	NOM. V-Ph-Hz	IFM TYPE	STD SCCR kA	NO CONVENIENCE OUTLET OR UNPOWERED CONVENIENCE OUTLET							
				No Power Exhaust				With Power Exhaust (powered from unit)			
				MCA	HACR Breaker	Disconnect Size		MCA	HACR Breaker	Disconnect Size	
						FLA	LRA			FLA	LRA
48QE**17 Vertical	208/230-3-60	STD/MED	5	83	100	86	444	94	125	99	464
		HIGH		85	100	88	448	97	125	102	468
	460-3-60	STD/MED	5	39	50	40	215	45	50	47	227
		HIGH		40	50	41	217	46	60	49	229
	575-3-60	STD/MED	5	31	40	32	159	36	45	38	167
		HIGH		32	40	34	159	37	45	39	167
48QE**24 Vertical	208/230-3-60	STD/MED	5	113	150	117	516	125	150	131	536
		HIGH		126	150	132	534	138	175	145	554
	460-3-60	STD/MED	5	53	60	54	268	59	80	61	280
		HIGH		58	70	60	276	64	80	67	288
	575-3-60	STD/MED	5	39	50	40	208	43	50	45	216
		HIGH		43	50	45	212	48	60	50	220
48QE**28 Vertical	208/230-3-60	STD/MED	5	136	175	142	612	148	175	156	632
		HIGH		147	175	154	626	158	200	167	646
	460-3-60	STD/MED	5	62	80	65	320	68	90	72	332
		HIGH		66	80	70	326	73	90	77	338
	575-3-60	STD/MED	5	51	60	52	239	55	70	58	247
		HIGH		54	60	56	243	59	70	62	251
48QE**17 Horizontal	208/230-3-60	HIGH	5	95	125	100	462	107	125	114	482
	460-3-60	HIGH	5	44	50	46	223	50	60	53	235
	575-3-60	HIGH	5	35	45	37	163	40	50	43	171
48QE**24 Horizontal	208/230-3-60	HIGH	5	126	150	132	534	138	175	145	554
	460-3-60	HIGH	5	58	70	60	276	64	80	67	288
	575-3-60	HIGH	5	43	50	45	212	48	60	50	220
48QE**28 Horizontal	208/230-3-60	HIGH	5	147	175	154	626	158	200	167	646
	460-3-60	HIGH	5	66	80	70	326	73	90	77	338
	575-3-60	HIGH	5	54	60	56	243	59	70	62	251

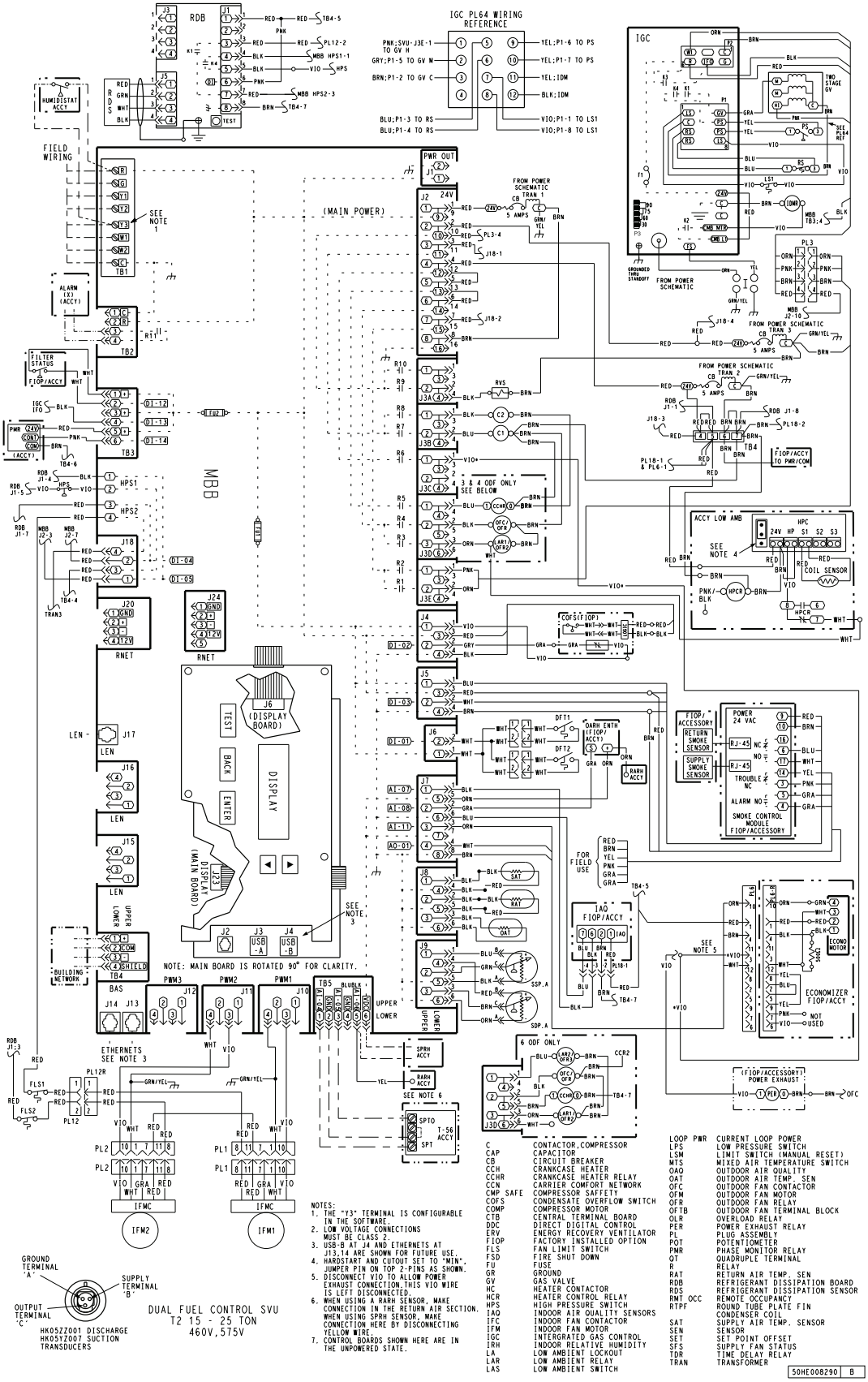
Electrical data (cont)

48QE**17-28 Unit HACR Sizing Electrical Data (cont)

48QE UNIT SIZE	NOM. V-Ph-Hz	IFM TYPE	STD SCCR kA	WITH POWERED CONVENIENCE OUTLET							
				No Power Exhaust				With Power Exhaust (powered from unit)			
				MCA	HACR Breaker	Disconnect Size		MCA	HACR Breaker	Disconnect Size	
						FLA	LRA			FLA	LRA
48QE**17 Vertical	208/230-3-60	STD/MED	5	88	100	91	449	99	125	105	469
		HIGH		90	100	94	453	102	125	108	473
	460-3-60	STD/MED	5	41	50	43	217	47	60	50	229
		HIGH		42	50	44	219	48	60	51	231
	575-3-60	STD/MED	5	33	40	34	161	38	45	40	169
		HIGH		34	45	35	161	39	50	41	169
48QE**24 Vertical	208/230-3-60	STD/MED	5	118	150	123	521	130	175	136	541
		HIGH		131	175	137	539	142	175	151	559
	460-3-60	STD/MED	5	55	70	57	270	61	80	64	282
		HIGH		60	80	63	278	66	80	70	290
	575-3-60	STD/MED	5	40	50	42	210	45	60	47	218
		HIGH		44	50	47	214	49	60	52	222
48QE**28 Vertical	208/230-3-60	STD/MED	5	141	175	148	617	153	200	161	637
		HIGH		151	200	159	631	163	200	173	651
	460-3-60	STD/MED	5	64	80	68	322	71	90	75	334
		HIGH		69	90	73	328	75	90	80	340
	575-3-60	STD/MED	5	52	60	54	241	57	70	60	249
		HIGH		56	70	58	245	60	80	64	253
48QE**17 Horizontal	208/230-3-60	HIGH	5	100	125	106	467	112	125	119	487
	460-3-60	HIGH	5	46	60	49	225	52	60	56	237
	575-3-60	HIGH	5	37	45	39	165	42	50	45	173
48QE**24 Horizontal	208/230-3-60	HIGH	5	131	175	137	539	142	175	151	559
	460-3-60	HIGH	5	60	80	63	278	66	80	70	290
	575-3-60	HIGH	5	44	50	47	214	49	60	52	222
48QE**28 Horizontal	208/230-3-60	HIGH	5	151	200	159	631	163	200	173	651
	460-3-60	HIGH	5	69	90	73	328	75	90	80	340
	575-3-60	HIGH	5	56	70	58	245	60	80	64	253

Typical wiring diagrams

48QE**17-28 Control Wiring Diagram, SystemVu Controller, 460/575-3-60 Unit Shown



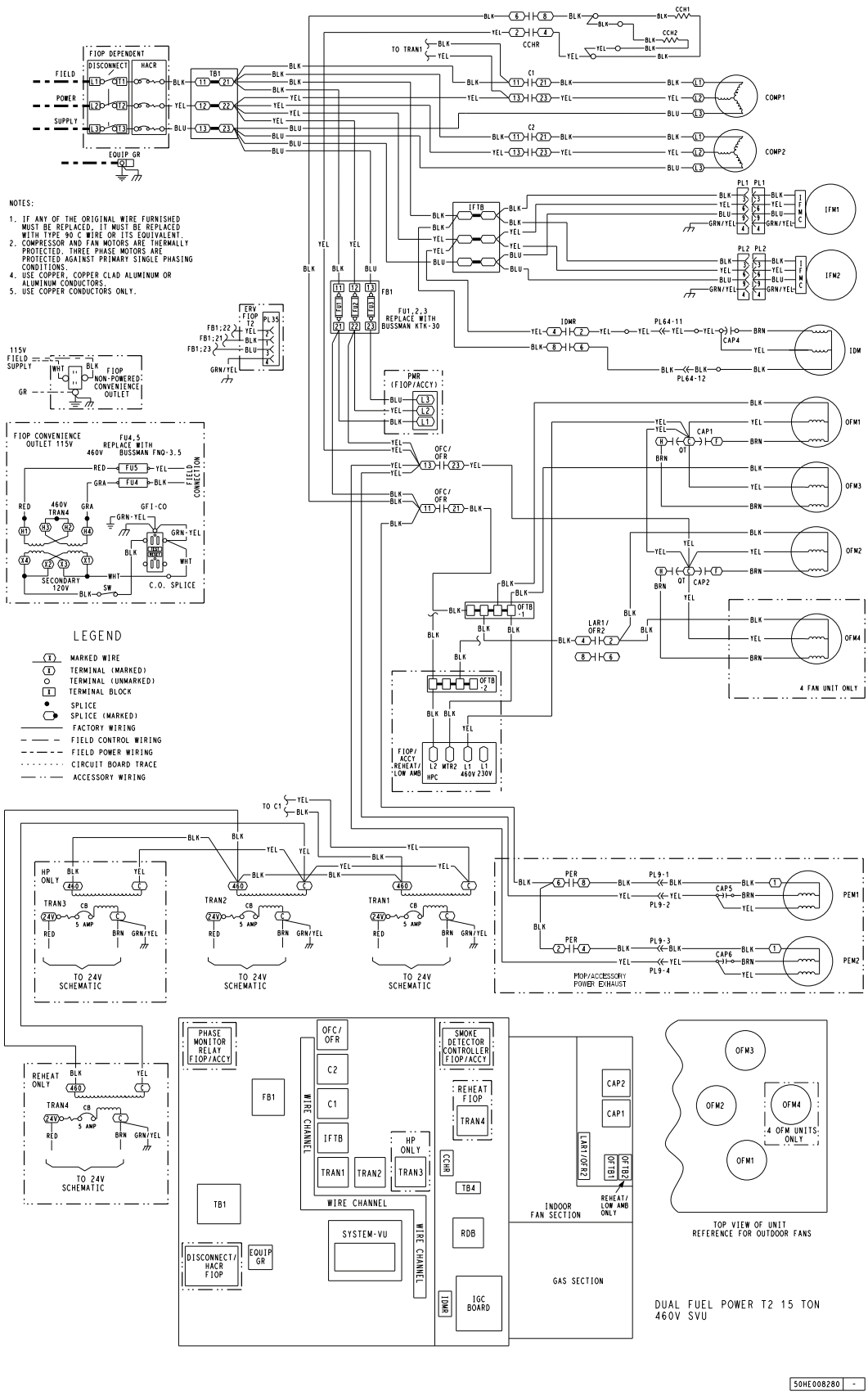
C	CONTACTOR,COMPRESSOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CCH	CRANKCASE HEATER
CCHR	CRANKCASE HEATER RELAY
CCN	CARRIER COMFORT NETWORK
CMP SAFE	COMPRESSOR SAFFETY
COFS	CONDENSATE OVERFLOW SWITCH
COMP	COMPRESSOR MOTOR
CTB	CENTRAL TERMINAL BOARD
DDC	DIRECT DIGITAL CONTROL
ERV	ENERGY RECOVERY VENTILATOR
FIOP	FACTORY INSTALLED OPTION
FLS	FAN LIMIT SWITCH
FSD	FIRE SHUT DOWN
FU	FUSE
GR	GROUND
GV	GAS VALVE
HC	HEATER CONTACTOR
HCR	HEATER CONTROL RELAY
HPS	HIGH PRESSURE SWITCH
IAQ	INDOOR AIR QUALITY SENSORS
IFC	INDOOR FAN CONTACTOR
IFM	INDOOR FAN MOTOR
IGC	INTERGRATED GAS CONTROL
IRH	INDOOR RELATIVE HUMIDITY
LA	LOW AMBIENT LOCKOUT
LAR	LOW AMBIENT RELAY
LAS	LOW AMBIENT SWITCH
LOOP PWR	CURRENT LOOP POWER
LPS	LOW PRESSURE SWITCH
LSM	LIMIT SWITCH (MANUAL RESET)
MTS	MIXED AIR TEMPERATURE SWITCH
OAQ	OUTDOOR AIR QUALITY
OAT	OUTDOOR AIR TEMP. SEN
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
OFR	OUTDOOR FAN RELAY
OFTB	OUTDOOR FAN TERMINAL BLOCK
OLR	OVERLOAD RELAY
PER	POWER EXHAUST RELAY
PL	PLUG ASSEMBLY
POT	POTENTIOMETER
PMR	PHASE MONITOR RELAY
QT	QUADRUPLE TERMINAL
R	RELAY
RAT	RETURN AIR TEMP. SEN
RDB	REFRIGERANT DISSIPATION BOARD
RDS	REFRIGERANT DISSIPATION SENSOR
RMT OCC	REMOTE OCCUPANCY
RTPF	ROUND TUBE PLATE FIN
	CONDENSER COIL
SAT	SUPPLY AIR TEMP. SENSOR
SEN	SENSOR
SET	SET POINT OFFSET
SFS	SUPPLY FAN STATUS
TDR	TIME DELAY RELAY
TRAN	TRANSFORMER

NOTES:
1. THE "Y3" TERMINAL IS CONFIGURABLE IN THE SOFTWARE.
2. LOW VOLTAGE CONNECTIONS MUST BE CLASS 2.
3. USB-B AT J4 AND ETHERNETS AT J13,14 ARE SHOWN FOR FUTURE USE.
4. HARDSTART AND CUTOUT SET TO "MIN". JUMPER PIN ON TOP 2-PINS AS SHOWN.
5. DISCONNECT V1O TO ALLOW POWER EXHAUST CONNECTION.THIS V1O WIRE IS LEFT DISCONNECTED.
6. WHEN USING A RARH SENSOR, MAKE CONNECTION IN THE RETURN AIR SECTION. WHEN USING SPRH SENSOR, MAKE CONNECTION HERE BY DISCONNECTING YELLOW WIRE.
7. CONTROL BOARDS SHOWN HERE ARE IN THE UNPOWERED STATE.

50HE008290 B

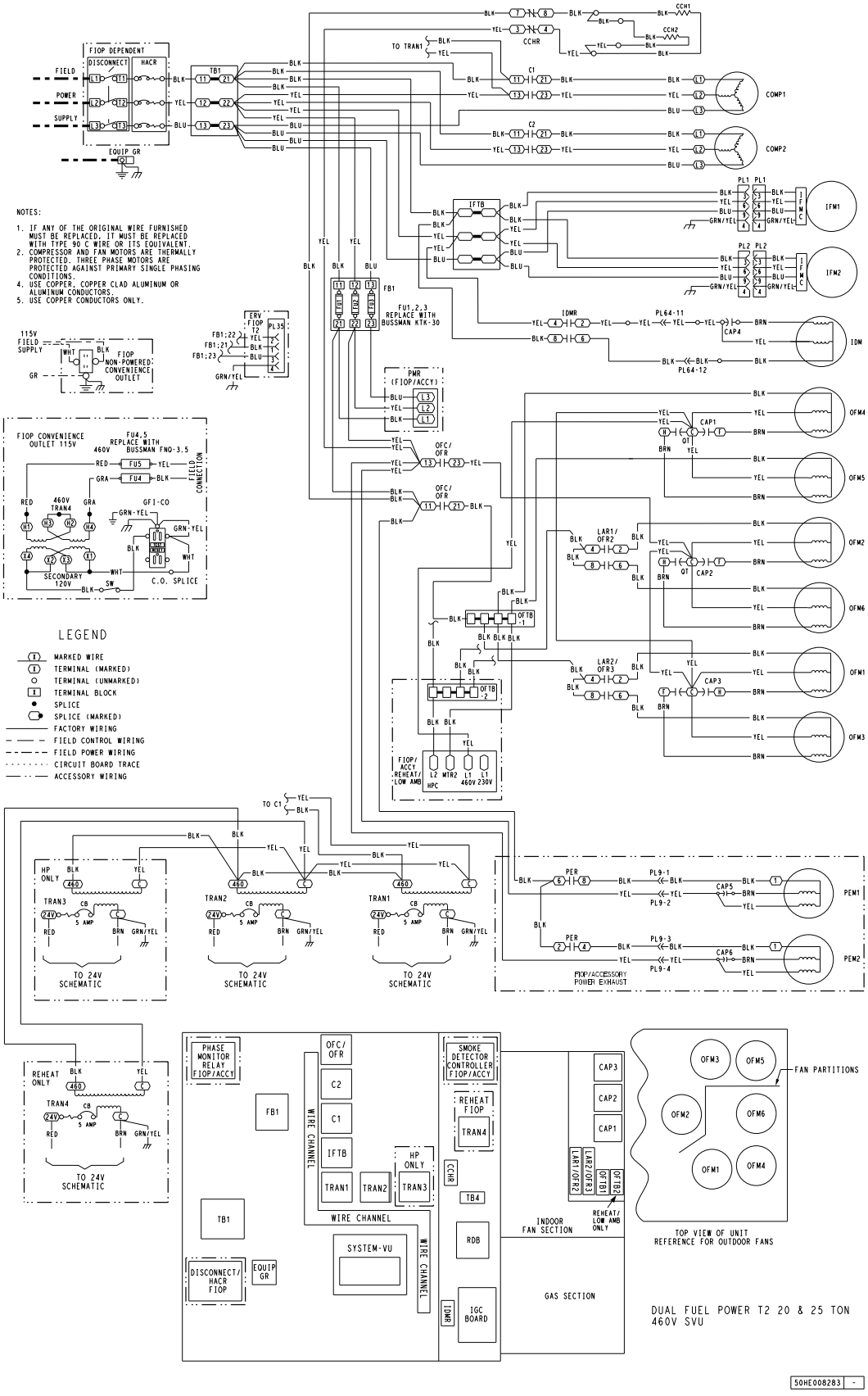
Typical wiring diagrams (cont)

Typical 48QE17 Power Wiring Diagram, SystemVu Controller, 460-3-60 Unit Shown**



Typical wiring diagrams (cont)

Typical 48QE**24-*28 Power Wiring Diagram, SystemVu Controller, 460-3-60 Unit Shown



Sequence of operation

General

The SystemVu controller is standard on all 48QE units. The sequence below describes the sequence of operation for 48QE units with and without a factory-installed economizer. For more information regarding the SystemVu controller, see the FEQ/GEQ/QE Series Single Package Rooftop Heat Pump and Hybrid Heat Units with SystemVu Controller Controls, Start-Up, Operation and Troubleshooting manual.

Dissipation

When the factory-installed dissipation system detects a level of refrigerant leak in the unit, a safety dissipation mode will be activated. During this dissipation mode, the thermostat will be disabled and the indoor fan will run at 66% of the maximum speed of the motor. When the refrigerant leak levels are normal for 5 minutes, the unit will return to normal operation.

Cooling without economizer

When the thermostat calls for cooling, terminals G and Y1 are energized. The indoor fan will run at the low fan speed and the C1 compressor contactor (CC) is energized causing the compressor and outdoor fan to run. The low indoor fan speed is 60% of the user set fan speed.

If additional cooling is needed, the thermostat will add the call for Y2. This will increase the indoor fan speed to the user set fan speed and energize the C2 contactor and second compressor for full compressor capacity. The outdoor fan runs at different speeds for Y1 and Y2 depending on unit size.

When the thermostat removes the call for Y2 but leaves the Y1, the indoor fan will slow to the reduced percentage of the user set fan speed, the C2 contactor will de-energize, the second compressor will turn off, and the outdoor fan will remain on. When the thermostat removes the call for Y1 the compressor contactor will de-energize shutting down the compressor and the outdoor fan. When the thermostat removes the call for G, the indoor fan will turn off after the specific unit fan off delay.

NOTE: Per ASHRAE 90.1-2019 and IECC-2018 standards, during the first stage cooling operation the SystemVu controller will adjust the fan motor speed to provide 60% of the total cfm established for the unit.

Cooling with economizer

For detailed information on free cooling operation for 48QE units with factory-installed economizer see the FEQ/GEQ/QE Series Single Package Rooftop Heat Pump and Hybrid Heat Units with SystemVu Controller Controls, Start-Up, Operation and Troubleshooting manual.

Defrost

When the temperature of the outdoor coil drops below 28°F (–2°C) as sensed by the defrost switch and the defrost timer is at the end of a timed period (adjustable between 30 and 120 minutes), the reversing valve solenoid (RVS) is energized and the outdoor fan is de-energized. This switches the position of the reversing valve and shuts off the outdoor fan. Gas heating will be energized.

Heating, unit with economizer

Upon a request for heating from the space thermostat terminal, W1 will be energized with 24V. The indoor fan will run at high speed, outdoor fan, C1 and C2 will be energized in heating. The indoor fan, outdoor fans, and the compressor are energized. The reversing valve is de-energized and switch positions. The economizer is set to minimum position (ventilation position). If the space temperature continues to fall with W1 energized, W2 will bring on gas heat. As the space temperature rises the W2 will de-energize and the compressors will continue to operate, until the thermostat set point is achieved de-energizing W1. If the thermostat is set to Auto, the indoor fan will de-energize and the economizer will close. If the indoor fan is set to On, the indoor fan will continue to operate and the economizer will remain at minimum position (vent position). On units equipped for 2 stages of heat, when additional heat is needed, second stage of gas heat energized through W2. The economizer damper moves to the minimum position. When the thermostat is satisfied, the damper moves to the fully closed position.

Heating, unit without economizer

Upon a request for heating from the space thermostat, terminal W1 will be energized with 24V. The indoor fan, outdoor fan, C1, and C2 will be energized. The indoor fan, outdoor fans, and compressor 1, and compressor 2 are energized and reversing valves are deenergized and switch position. If the space temperature continues to fall while W1 is energized, W2 will be energized with 24V, and gas heat will be energized. When the space thermostat is satisfied, W2 will be de-energized first, and gas heating will be de-energized. Upon a further rise in space temperature, W1 will be de-energized.

Gas heating

NOTE: WeatherMaster® units have 2 stages of gas heat.

When the thermostat calls for heating, power is sent to W on the Integrated Gas Controller (IGC) board. An LED (light-emitting diode) on the IGC board turns on and remains on during normal operation. A check is made to ensure that the roll-out switch and limit switch are closed. If the check was successful, the induced-draft motor is energized, and when its speed is satisfactory, as proven by the flue gas pressure switch, the ignition activation period begins. The burners will ignite within 5 seconds. If the burners do not light, there is a 22 second delay before another 5 second attempt. This sequence is repeated for 15 minutes or until the burners light. If, after the 15 minutes, the burners still have not lit, heating is locked out. To reset the control, break 24-v power to the thermostat.

When ignition occurs, the IGC board will continue to monitor the condition of the roll-out switch, the limit switches, the flue gas pressure switch, as well as the flame sensor. 45 seconds after ignition occurs, assuming the unit is controlled through a room thermostat set for fan auto, the indoor-fan motor will energize (and the outdoor-air dampers will open to their minimum position). If, for some reason, the over-temperature limit opens prior to the start of the indoor fan blower, the unit will shorten the 45 second delay 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 the fan-on delay has been modified, it will not change back to 45 seconds until power is reset to the control. When additional heat is required, W2 closes and initiates power to the second stage of the main gas valve. When the thermostat is satisfied, W1 and W2 open and the gas valve closes, interrupting the flow of gas to the main burners. 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. An LED indicator is provided on the IGC to monitor operation.

Sequence of operation (cont)

Hybrid heating

48QE units can run mechanical heating and gas heating simultaneously. When the thermostat calls for heating, terminals G and W1 are energized. The indoor fan will run at the user set fan speed. The C1 and C2 compressor contactors (CC) are energized causing the compressors and outdoor fans to run. The W1 call runs mechanical heating only.

If additional heating is needed, the thermostat will add the call for W2. This enables the unit to run both mechanical heating and adds one stage of gas heating. The first stage of gas heating energizes depending on the supply air temperature of the unit. The second stage of gas heating is enabled when the first stage of gas heating has been running for 30 minutes and the outdoor air temperature is lower than the 3 stage maximum temperature.

If the supply air temperature is below the Maximum SAT Lower Level (***LOWER MAX SET***), the unit will run the first stage of gas heating on top of mechanical heating. Both mechanical and the first stage of gas heat run simultaneously until the supply air temperature reaches the Maximum SAT Upper Level (***UPPER MAX SAT***). When the upper max supply air temperature is reached, one stage of gas heating is removed. Gas heat cycles on and off within the range of the lower max supply air temperature and upper max supply air temperature.

When the thermostat removes the call for W2 but leaves the W1, gas heat staging will be removed and the unit runs mechanical heating only. When the thermostat removes the call for W1, the compressor contactors will de-energize shutting down the compressors and the outdoor fans. When the thermostat removes the call for G, the indoor fan will turn off after the specific fan off delay.

If the outside air temperature is below the mechanical heat lockout temperature [30°F (–1°C) as a default from the factory, but adjustable between –20°F and 40°F (–29°C and –5°C)], the unit will follow the same heat sequencing as outlined in the gas heating section. The mechanical heat lockout temperature is adjustable to ensure building owners can customize operation to their building's needs.

NOTE: Temperatures specified are for default configuration.

SystemVu controller manual

For detailed information on operating the 48QE unit's SystemVu controller and free cool operation, refer to FEQ/GEQ/QE Series Single Package Rooftop Heat Pump and Hybrid Heat Units with SystemVu Controller Controls, Start-Up, Operation and Troubleshooting manual.

Application data

Minimum operating ambient temperature (cooling)

In mechanical cooling mode, your Carrier rooftop unit can safely operate down to an outdoor ambient temperature of 40°F (4°C). It is possible to provide cooling at lower outdoor ambient temperatures by using less outside air, economizers, and/or accessory low ambient kits.

Maximum operating ambient temperature (cooling)

The maximum operating ambient temperature for cooling mode is 125°F (52°C). While cooling operation above 125°F (52°C) may be possible, it could cause either a reduction in performance, reliability, or a protective action by the unit's internal safety devices.

Multiple motor and drive packages

Some applications need larger horsepower motors, some need more airflow, and some need both. Regardless of the case, your Carrier expert has a factory installed combination to meet your application. A wide selection of motors are available, factory installed, to handle nearly any application.

Stainless steel heat exchanger

The stainless steel heat exchanger provides the tubular heat exchanger be made out of a minimum 20 gauge type 409 stainless steel for applications where the mixed air to the heat exchanger is expected to drop below 45°F (7°C). The stainless steel heat exchanger is standard on all 48QE units.

Minimum mixed air temperature

Using the factory settings, the minimum temperatures for the mixed air (the combined temperature of the warm return air and the cold outdoor air) entering the dimpled, gas heat exchangers are shown in the following table.

Minimum Temperature for Mixed Air Temperature

STAINLESS STEEL HEAT EXCHANGER
40°F (4°C) Continuous
35°F (2°C) Intermittent

Operating at lower mixed-air temperatures may be possible, if a field-supplied, outdoor air thermostat initiates both heat stages when the temperature is less than the minimum temperatures listed above. Please contact your local Carrier representative for assistance.

Minimum and maximum airflow (heating and cooling)

To maintain safe and reliable operation of your rooftop, operate within the heating airflow limits during heating mode and cooling airflow limits during cooling mode. Operating above the maximum may cause blow-off, undesired airflow noise, or airflow related problems with the rooftop unit. Operating below the minimum may cause problems with coil freeze-up and unsafe heating operation. Heating and cooling limitations differ when evaluating operating cfm, minimum value is the HIGHER of the cooling and heating minimum cfm values published on page 7 and the maximum value is the LOWER of the cooling and heating minimum values published on page 7.

Heating-to-cooling changeover

Your unit will automatically change from heating to cooling mode when using a thermostat with an auto-changeover feature.

Airflow

All units are draw-though in cooling mode and blow-through in heating mode.

Outdoor air application strategies

Economizers reduce operating expenses and compressor run time by providing a free source of cooling and a means of ventilation to match application changing needs. In fact, they should be considered for most applications. Also, consider the various economizer sensors required to accomplish your application goals. Please contact your local Carrier representative for assistance.

Motor limits, brake horsepower (bhp)

Due to internal design of Carrier units, the air path, and specially designed motors, the full horsepower (maximum continuous bhp) band, as listed in the Fan Performance tables, can be used with the utmost confidence. There is no need for extra safety factors, as Carrier motors are designed and rigorously tested to use the entire, listed bhp range without either nuisance tripping or premature motor failure.

Propane heating

Propane has different physical qualities than natural gas. As a result, propane requires different fuel to air mixture. To optimize the fuel/air mixture for propane, Carrier sells different burner orifices in an easy to install accessory kit. To select the correct burner orifices or determine the heat capacity for a propane application, use either the selection software, or the unit's service manual.

High altitude heating

High altitudes have less oxygen, which affects the fuel/air mixture in heat exchangers. In order to maintain a proper fuel/air mixture, heat exchangers operating in altitudes above 2000 ft (610 m) require different orifices. To select the correct burner orifices or determine the heat capacity for a high altitude application, use either the selection software, or the unit's service manual.

High altitudes have less oxygen, which means heat exchangers need less fuel. The new gas orifices in this field-installed kit make the necessary adjustment for high altitude applications. They restore the optimal fuel to air mixture and maintain healthy combustion on altitudes above 2000 ft (610 m).

NOTE: Typical natural gas heating value ranges from 975 to 1050 Btu/ft^3 at sea level nationally. The heating value goes down approximately 1.7% per every thousand feet elevation. Standard factory orifices can typically be used up to 2000 ft (610 m) elevation without any operational issues.

Sizing a rooftop

Bigger is not necessarily better. While an air conditioner needs to have enough capacity to meet the design loads, it does not need excess capacity. In fact, excess capacity typically results in very poor part load performance and humidity control.

Using higher design temperatures than ASHRAE recommends for your location, adding "safety factors" to the calculated load, are all signs of oversizing air conditioners. Oversizing the air conditioner leads to poor humidity control, reduced efficiency, higher utility bills, larger indoor temperature swings, excessive noise, and increased wear and tear on the air conditioner.

Application data (cont)

Rather than oversizing an air conditioner, engineers should "right-size" or even slightly "under-size" air conditioners. Correctly sizing an air conditioner controls humidity better; promotes efficiency; reduces utility bills; extends equipment life, and maintains even, comfortable temperatures. Please contact your local Carrier representative for assistance.

Low ambient applications

The optional Carrier economizer can adequately cool your space by bringing in fresh, cool outside air. In fact, when so equipped, accessory low-ambient kit may not be necessary. In low ambient conditions, unless the outdoor air is excessively humid or contaminated, economizer-based "free cooling" is the preferred less costly and energy conscious method. In low ambient applications where outside air might not be desired (such as contaminated or excessively humid outdoor environments), your Carrier rooftop can operate to ambient temperatures down to –20°F (–28°C) using the recommended accessory low ambient controller.

Guide specifications

Note about this specification:
This specification is in the "Masterformat" as published by the Construction Specification Institute. Please feel free to copy this specification directly into your building spec.

Puron ADVANCE™

Hybrid Heat Packaged Rooftop

HVAC Guide Specifications

Size Range: **15 to 25 Nominal Tons**
Carrier Model Number: **48QE*17-28**

Part 1 — (23 06 80) Schedules for Decentralized HVAC Equipment

1.01 (23 06 80.13) Decentralized Unitary HVAC Equipment Schedule

A. (23 06 80.13.A.) Rooftop Unit (RTU) Schedule:

Schedule is per the project specification requirements.

Part 2 — (23 07 16) HVAC Equipment Insulation

2.01 (23 07 16.13) Decentralized, Rooftop Units:

A. (23 07 16.13.A.) Evaporator Fan Compartment:

1. Interior cabinet surfaces shall be insulated with a minimum 1/2 in. thick, minimum 1-1/2 lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

B. (23 07 16.13.B.) Gas Heat Compartment:

1. Aluminum foil-faced fiberglass insulation shall be used.
2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

Part 3 — (23 09 13) Instrumentation and Control Devices for HVAC

3.01 (23 09 13.23) Sensors and Transmitters

A. (23 09 13.23.A.) Thermostats:

1. Thermostat must:
   a. energize both "W" and "G" when calling for heat.
   b. have capability to energize 1 or 2 stages of cooling, and 2 different stages of heating.
   c. be heat pump design and include capability for occupancy scheduling.

Part 4 — (23 09 23) Direct Digital Control system for HVAC

4.01 (23 09 23.13) Decentralized, Rooftop Units:

A. (23 09 23.13.A.) SystemVu™ intelligent integrated Direct Digital Control (DDC) shall provide:

1. Integrated unit operation for comfort cooling, heating ventilation as well as all monitoring, recording and reporting capabilities. Controller shall also provide diagnostics and alarms of abnormal unit operation through the controller. Controller shall have an intuitive user display and be able to be used in a standalone operation or via building automation system (BAS).
2. Quick Unit Status LEDs of: RUN — meaning all systems are go, ALERT — that indicates there is currently a non-critical issue with the unit, like filters need to be replaced and FAULT — that indicates the unit has a critical issue and will possibly shut down.
3. Six large navigation keys for easy access. Navigation keys shall consist of: TEST, BACK, ENTER, and MENU along with UP and DOWN arrows.
4. Full back lit user display with 4 line by 30 character text capabilities. Display menu shall be designed to provide guided major menus and sub menus main menus provided below:
   a. Shutdown Unit
   b. Run Status
   c. Settings
   d. Alerts/Faults
   e. Service
   f. Inputs
   g. Outputs
   h. USB
5. The capability for standalone operation with conventional thermostat/sensor or use with building automation systems (BAS) of Carrier i-Vu®, BACnet®[1] and Carrier Comfort Network® (CCN) systems. No special modules or boards are required for these capabilities. Has the capability to work with Equipment Touch™ and System Touch™ devices and ZS Sensors.
6. The ability to read refrigerant pressures at display or via BAS network of Discharge Pressure and Suction Pressure. The need for traditional refrigerant gauges is not required.
7. USB Data Port for flash drive interaction. This will allow the transfer of data for uploads, downloads, perform software upgrades, back-up and restore data and file transfer data such as component number of starts and run hours.
8. Reverse Rotation Protection of compressors if field 3-phase wiring is misapplied.
9. Provide service capabilities of:
   a. Auto run test
   b. Manual run test
   c. Component run hours and starts
   d. Commissioning reports
   e. Data logging
   f. Alarm history

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10. Economizer control and diagnostics. Set up economizer operation, receive feedback from actuator. Also meets the most recent California Title 24, ASHRAE®[1] 90.1 and IECC®[1] Fault Detection and Diagnostic (FDD) requirements.
11. Unit cooling operation down to 40°F (4°C).
12. Controller shall have easy access connections around the controller perimeter area and consist of Mate-N-Lok®[1], terminal block and RJ style modular jack connections.
13. 365 day real time clock, 20 holiday schedules along with occupied and unoccupied scheduling.
14. Auto-Recognition for easy installation and commissioning of devices like economizers, space sensors etc.
15. A 5°F (3°C) temperature difference between cooling and heating setpoints to meet the latest ASHRAE 90.1 Energy Standard.
16. Contains return air sensor, supply air sensor and outdoor air sensor to help monitor and provide data for the unit comfort operation, diagnostic and alarms.
17. Use of Carrier's field accessory Equipment Touch and System Touch devices.
18. Supply Air Tempering control operates the gas or electric heat to maintain a minimum supply air temperature during conditions where very cold outdoor air causes the supply air temperature to fall below the configured Supply Air Tempering Setpoint. This occurs during periods where DCV is active and increasing the amount of outdoor air or in cases where the system is operating at very low airflow and the calculated economizer position has increased to maintain a constant ventilation rate.
19. Demand limiting in units with SystemVu controller is achieved through setpoint expansion. The systems heating and cooling setpoints are expanded in steps or levels. The degree to which the setpoints may be expanded is defined by the 6 demand level offsets and the 2 commanded demand limit levels.
20. 3-year limited part warranty.

Part 5 — (23 09 33) Electric and Electronic Control System for HVAC

5.01 (23 09 33.13) Decentralized, Rooftop Units:

A. (23 09 33.13.A.) General:

1. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75 VA capability.
2. Shall utilize color-coded wiring.
3. Shall include a unit control board (SystemVu controller main base board) to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.
5. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.
6. Shall include integrated defrost system to prevent excessive frost accumulation during heating duty, and shall be controlled as follows:
   a. Defrost shall be initiated on the basis of time and coil temperature.
   b. A 30 to 120 minute timer shall activate the defrost cycle only if the coil temperature is low enough to indicate a heavy frost condition.
   c. Defrost cycle shall terminate when defrost thermostat is satisfied and shall have a positive termination time of 10 minutes.

B. (23 09 33.13.B.) Safeties:

1. Compressor over-temperature, over-current. High internal pressure differential.
2. Low Pressure Switch.

   Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. High Pressure Switch.

   High pressure switch shall use different color wire than the low pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
4. Automatic Reset, Motor Thermal Overload Protector.
5. Heating section shall be provided with the following minimum protections:
   a. High temperature limit switches.
   b. Induced draft motor speed sensor.
   c. Flame rollout switch.
   d. Flame proving controls.
6. A2L Refrigerant Leak Dissipation System:
   a. Leak dissipation system shall consist of control board and A2L sensor certified to UL 60335-2-40, integrated with SystemVu controller.
   b. System shall be designed for the life of the unit.

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c. Dissipation system shall be automatic, ship pre-wired, and require no additional field connections to function.

d. Refrigerant leak sensor shall be installed in UL certified location and orientation. Sensor shall be self-correcting and resettable. Single use refrigerant leak sensor shall not be permitted.

e. Factory installed dissipation system shall use onboard microprocessor and include:

1) Automatic leak detection and dissipation algorithm

2) Automatic reset after a dissipation event has occurred

3) Onboard LED with flash code to indicate current unit status and hardware failures

4) Depressible "Test" button to allow for a system test and recall/reset of leak detection history

5) 24V dry contact alarm terminal on dissipation control board to allow for external notification of leak detection

6) Ability to notify BAS system of dissipation event via readable alarm point through SystemVu

7) Recallable dissipation alarm history on SystemVu controller

f. Dissipation control board shall be accessible via normal maintenance locations and LED shall be visible.

g. Dissipation system shall "Fail Safe" per UL requirements.

h. Dissipation shall allow smoke and building fire systems to override in case of event.

Part 6 — (23 09 93) Sequence of Operation for HVAC Controls

6.01 (23 09 93.13) Decentralized, Rooftop Units:

A. (23 09 93.13.A.) INSERT SEQUENCE OF OPERATION

Part 7 — (23 40 13) Panel Air Filters

7.01 (23 40 13.13) Decentralized, Rooftop Units:

A. (23 40 13.13.A.) Standard Filter Section:

1. Shall consist of factory installed, low velocity, disposable 2 in. thick fiberglass filters of commercially available sizes.
2. Unit shall use only one filter size. Multiple sizes are not acceptable.
3. Filters shall be accessible through an access panel with "no-tool" removal as described in the unit cabinet section of this specification (23 81 19.13.G).

Part 8 — (23 81 19) Self-Contained Air Conditioners

8.01 (23 81 19.13) Small-Capacity Self-Contained Air Conditioners:

A. (23 81 19.13.A.) General:

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
2. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.
3. Unit shall use Puron Advance™ (R-454B) refrigerant.
4. Unit shall be installed in accordance with the manufacturer's instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. (23 81 19.13.B.) Quality Assurance:

1. Unit meets DOE and ASHRAE 90.1 minimum efficiency requirements.
2. Unit shall be rated in accordance with AHRI Standards 340/360.
3. Unit shall be designed to conform to ASHRAE 15.
4. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 500 hour salt spray exposure per ASTM B117 (scribed specimen).
7. Unit shall be designed in accordance with ISO 9001, and shall be manufactured in a facility registered by ISO 9001:2015.
8. Roof curb shall be designed to conform to NRCA Standards.
9. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
10. Unit shall be designed in accordance with UL Standard 600335-1 and 60335-2-40,to withstand rain. Unit shall be IPX4 rated.
11. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
12. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.

C. (23 81 19.13.C.) Delivery, Storage, and Handling:

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

2. Lifted by crane requires either shipping top panel or spreader bars.
3. Unit shall only be stored or positioned in the upright position.

D. (23 81 19.13.D.) Project Conditions:
1. As specified in the contract.

E. (23 81 19.13.E.) Operating Characteristics:
1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature meeting maximum load criteria of AHRI Standard 340/360 at ±10% voltage.
2. Compressor with standard controls shall be capable of operation down to 40°F (4°C) ambient outdoor temperatures.
3. Compressor with standard controls shall be capable of operation down to –10°F (–23°C) ambient outdoor temperatures or lower in heat pump heating mode.
4. Unit shall discharge supply air vertically or horizontally as shown on contract drawings.
5. Unit shall be factory configured for either vertical or horizontal supply and return configurations. Unit shall not require field conversion.

F. (23 81 19.13.F.) Electrical Requirements:
1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

G. (23 81 19.13.G.) Unit Cabinet:
1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F/16°C): 60, Hardness: H-2H Pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2 in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.
4. Base of unit shall have a minimum of 4 locations for thru-the-base gas and electrical connections (factory-installed or field-installed) standard.
5. Base Rail:
   a. Unit shall have base rails on a minimum of 2 sides.
   b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
   c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
   d. Base rail shall be a minimum of 16 gauge thickness.
6. Condensate Pan and Connections:
   a. Shall be a sloped condensate drain pan made of a corrosion resistant material.
   b. Shall comply with ASHRAE Standard 62.
   c. Shall use a 3/4 in. 14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.
7. Top Panel:
   a. Shall be a multi-top panel linked with water-tight flanges and locking systems.
8. Gas Connections:
   a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
   b. Thru-the-base capability.
      1) Standard unit shall have thru-the-base gas-line location using a raised, embossed portion of the unit basepan standard.
      2) No basepan penetration, other than those authorized by the manufacturer, is permitted.
9. Electrical Connections:
   a. All unit power wiring shall enter unit cabinet at a single, factory prepared, knockout location.
   b. Thru-the-base capability.
      1) Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.
      2) Factory approved, water-tight connection method is included on all units standard and must be used for thru-the-base electrical connections.
      3) No basepan penetration, other than those authorized by the manufacturer, is permitted.
10. Component Access Panels (standard):
   a. Cabinet panels shall be easily removable for servicing.
   b. Unit shall have one factory installed, tool-less, filter access panel.
   c. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.
   d. Handles shall be UV modified, composite. They shall be permanently attached, and recessed into the panel.
   e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.

f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

H. (23 81 19.13.H.) Gas Heat:

1. General:
   a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
   b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
   c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
   d. Mechanical heating cutoff temperature (i.e. the outdoor air temperature the unit disables mechanical compression heating and enables exclusive gas heating) shall be adjustable through SystemVu controller.
2. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.
   a. IGC board shall notify users of fault using an LED (light-emitting diode).
   b. The LED shall be visible without removing the control box access panel.
   c. IGC board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.
   d. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.
3. Stainless Steel Heat Exchanger Construction:
   a. Use energy saving, direct-spark ignition system.
   b. Use a redundant main gas valve.
   c. Burners shall be of the in-shot type constructed of aluminum-coated steel.
   d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).
   e. The stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20 gauge type 409 stainless steel.
   f. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
   g. Complete stainless steel heat exchanger allows for greater application flexibility.
4. Induced Draft Combustion Motor and Blower
   a. Shall be a direct-drive, single inlet, forward-curved centrifugal type.
   b. Shall be made from steel with a corrosion resistant finish.
   c. Shall have permanently lubricated sealed bearings.
   d. Shall have inherent thermal overload protection.
   e. Shall have an automatic reset feature.

I. (23 81 19.13.I.) Coils:

1. Standard Aluminum Fin-Copper Tube Coils:
   a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
   b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 60335-2-40 burst test at 1775 psig.
   c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 60335-2-40 burst test at 1980 psig.
2. Optional Pre-coated Aluminum-Fin Condenser Coils:
   a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.
   b. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.
   c. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.
   d. Corrosion durability of fin stock shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117.
   e. Corrosion durability of fin stock shall be confirmed through testing to have no visible corrosion after 48 hour immersion in a room temperature solution of 5% salt, 1% acetic acid.
   f. Fin stock coating shall pass 2000 hours of the following: one week exposure in the prohesion chamber followed by one week of accelerated ultraviolet light testing. Prohesion chamber: the solution shall contain 3.5% sodium chloride and 0.35% ammonium sulfate. The exposure cycle is one hour of salt fog application at ambient followed by one hour drying at 95°F (35°C).
3. Optional Copper-fin Evaporator and Condenser Coils:
   a. Shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets.
   b. Galvanized steel tube sheets shall not be acceptable.
   c. A polymer strip shall prevent coil assembly from contacting the sheet metal coil pan to minimize potential for galvanic corrosion between coil and pan.

4. Optional E-coated Aluminum-Fin Evaporator and Condenser Coils:
   a. Shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins.
   b. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.
   c. Color shall be high gloss black with gloss per ASTM D523-89.
   d. Uniform dry film thickness from 0.8 to 1.2 mil on all surface areas including fin edges.
   e. Superior hardness characteristics of 2H per ASTM D3363- and cross-hatch adhesion of 4B-5B per ASTM D3359.
   f. Impact resistance shall be up to 160 in. lb (ASTM D2794).
   g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247 and ASTM D870).
   h. Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117.

J. (23 81 19.13.J.) Refrigerant Components:
   1. Refrigerant circuit shall include the following control, safety, and maintenance features:
      a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
      b. Refrigerant filter drier — Solid core design with pre and post filter service gauge connections for filter diagnostics and maintenance.
      c. Service gauge connections on suction and discharge lines.
      d. Pressure gauge access through a specially designed access port in the unit.
   2. There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.
      a. The plug shall be easy to remove and replace.
      b. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines.
      c. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.
      d. The plug shall be made of leak proof, UV-resistant, composite material.
   3. Compressors:
      a. Unit shall use tandem scroll compressor assembly on single independent refrigeration circuit with two stages of cooling for efficient comfort cooling operation.
      b. Evaporator coils shall be a full active design to help better control comfort latent removal and minimize unconditioned bypass air.
      c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
      d. Compressors shall be internally protected from high discharge temperature conditions.
      e. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
      f. Compressor shall be factory-mounted on rubber grommets.
      g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
      h. Crankcase heaters shall not be required for normal operating range, unless required by the manufacturer due to refrigerant charge limits.

K. (23 81 19.13.K.) Filter Section:
   1. Filters access is specified in the unit cabinet section of this specification.
   2. Filters shall be held in place by a pivoting filter tray, facilitating easy removal and installation.
   3. Shall consist of factory installed, low velocity, throw-away 2 in. thick fiberglass filters.
   4. Filters shall be standard, commercially available sizes.
   5. Only one size filter per unit is allowed.

L. (23 81 19.13.L.) Evaporator Fan and Motor with EcoBlue™ Technology:
   1. Direct Drive Evaporator Fan Motor:
      a. Shall be a ECM motor design.
      b. Shall be direct drive design for all static options.
      c. Shall have permanently lubricated bearings.
      d. Shall have inherent automatic-reset thermal overload protection.
      e. Shall have slow ramp up to speed capabilities.
      f. Shall require no fan/motor belts for operation, adjustments and or initial fan speed set up.
      g. Fan set up via SystemVu shall eliminate the need of removal of blower access door, required on conventional belt drive systems.
      h. Shall be internally protected from electrical phase reversal.
   2. Evaporator Fan:
      a. Shall be easily set through SystemVu controller.
      b. Shall provide 2 stage cooling capacity control, the indoor fan speed is automatically controlled to meet the code-compliant

<66% low fan speed and 100% at full fan speed operation.

c. Blower fans shall be a Vane Axial fan design with fan assembly secured directly to ECM motor. Additional shafts, belts, pulleys/sheaves, and bearing blocks to drive fan shall not be permitted or necessary.

d. Additional variable frequency drive to control fan motor speed shall not be permitted or necessary. All speed control electronics must be onboard fan motor assembly.

e. Shall be constructed of a high impact composite material stator, rotor and air inlet casing.

f. Shall be a patented / pending design with a corrosion resistant material.

g. Fan assembly design shall be integrated to fan deck, dynamically balanced, and require no additional vibration isolation for normal operation.

h. Shall have slow ramp up to speed capabilities to help reduce sound and comfort issues typically associated with single speed belt drive systems.

i. Units shall contain 2 separate vane axial fan assemblies designed to meet factory configured airflow orientation.

j. Shall be a slide out design with removal of a few support brackets.

3. Shall include an easily accessible SystemVu main base board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.

M. (23 81 19.13.M.) Condenser Fans and Motors:

1. Condenser Fan Motors:

a. Shall be a totally enclosed motor.

b. Shall use permanently lubricated bearings.

c. Shall have inherent thermal overload protection with an automatic reset feature.

d. Shall use a shaft-down design on all sizes.

2. Condenser Fans:

a. Shall be a direct-driven propeller type fan.

b. Shall have galvalum blades riveted to steel spider that have corrosion-resistant properties and shall be dynamically balanced.

N. (23 81 19.13.N.) Special Features Options and Accessories:

1. Integrated EconoMi$er® 2 Low Leak Rate Models.

a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.

b. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.

c. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.

d. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.

e. Low leak rate shall be equipped with dampers not to exceed 2% leakage at 1 in. wg pressure differential.

f. Economizer controller on EconoMi$er 2 models with SystemVu controllers shall be a 4-20mA design controlled directly by the controller. SystemVu controllers meets California Title 24, ASHRAE 90.1 and IECC Fault Detection and Diagnostic (FDD) requirements.

g. Shall be capable of introducing up to 100% outdoor air.

h. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.

i. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.

j. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed economizers only. Outdoor air sensor setpoint shall be adjustable and shall range from 40°F to 100°F (4°C to 38°C). Additional sensor options shall be available as accessories.

k. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.

l. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.

m. Dampers shall be completely closed when the unit is in the unoccupied mode.

n. Economizer controller shall accept a 0 to 10 vdc CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

o. Compressor lockout temperature control is adjustable from –45°F to 80°F (–43°C to 26°C), set at a factory default of 32°F (0°C).

p. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.

Guide specifications (cont)

2. Integrated EconoMi$er 2 Ultra Low Leak Rate Models.
   a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
   b. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
   c. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
   d. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
   e. Ultra Low Leak design meets California Title 24 section 140.4 and ASHRAE 90.1 requirements for 4 cfm per sq. ft on the outside air dampers and 10 cfm per sq. ft on the return dampers.
   f. Economizer controller on EconoMi$er 2 models with SystemVu controls shall be a 4-20mA design controlled directly by the controller. SystemVu controller meets California Title 24, ASHRAE 90.1 and IECC Fault Detection and Diagnostic (FDD) requirements.
   g. Shall be capable of introducing up to 100% outdoor air.
   h. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.
   i. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
   j. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed economizers only. Outdoor air sensor setpoint shall be adjustable and shall range from 40°F to 100°F (4°C to 38°C). Additional sensor options shall be available as accessories.
   k. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
   l. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
   m. Dampers shall be completely closed when the unit is in the unoccupied mode.
   n. Economizer controller shall accept a 0 to 10 vdc CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
   o. Compressor lockout temperature on POL224 control is adjustable from –45°F to 80°F (–43°C to 26°C), set at a factory default of 32°F (0°C).
   p. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
3. Two-Position Damper (field-installed only):
   a. Damper shall be a Two-Position Damper. Damper travel shall be from the full closed position to the field adjustable %-open set point.
   b. Damper shall include adjustable damper travel from 25% to 100% (full open).
   c. Damper shall include single or dual blade, gear driven dampers and actuator motor.
   d. Actuator shall be direct coupled to damper gear. No linkage arms or control rods shall be acceptable.
   e. Damper will admit up to 100% outdoor air for applicable rooftop units.
   f. Damper shall close upon indoor (evaporator) fan shutoff and/or loss of power.
   g. The damper actuator shall plug into the rooftop unit's wiring harness plug. No hard wiring shall be required.
   h. Outside air hood shall include aluminum water entrainment filter.
4. Manual Damper (field-installed only):
   Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 25 or 50% outdoor air for year round ventilation.
5. Low Ambient Control Package (field-installed only):
   a. Controller shall control coil head pressure by condenser fan speed modulation or condenser fan cycling and wind baffles.
   b. Shall consist of solid-state control and condenser coil temperature sensor to maintain condensing temperature between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to –20°F (–29°C).
6. Propane Gas Conversion Kit:
   a. Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane, up to 2000 ft (610 m) elevation.
   b. Additional accessory kits may be required for applications above 2000 ft (610 m) elevation.
7. Condenser Coil Hail Guard Assembly (factory or field installed):
   a. Shall protect against hail and additional coil damage.
   b. Shall be louvered type.

8. Unit-Mounted, Non-Fused Disconnect Switch:
   a. Available on units with FLA of 100 amps or less (460/575V) or 200 amps or less (208/230V).
   b. Switch shall be factory installed, internally mounted.
   c. National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff.
   d. Shall be accessible from outside the unit.
   e. Shall provide local shutdown and lockout capability.
   f. Sized **only** for the unit as ordered from the factory. Does not accommodate field-installed devices.
9. HACR Breaker:
   a. These manual reset devices provide overload and short circuit protection for the unit. Factory wired and mounted with the units, with access cover to help provide environmental protection. On 575V applications, HACR breaker can only be used with WYE power distribution systems. Use on Delta power distribution systems is prohibited.
   b. Sized **only** for the unit as ordered from the factory. Does not accommodate field-installed devices.
10. Convenience Outlet:
   a. Factory-Installed Powered Convenience Outlet.
      1) Outlet shall be powered from main line power to the rooftop unit.
      2) Outlet shall be powered from line side or load side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be UL certified and rated for additional outlet amperage.
      3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
      4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
      5) Voltage required to operate convenience outlet shall be provided by a factory installed step-down transformer.
      6) Outlet shall be accessible from outside the unit.
      7) Outlet shall include a field installed “Wet in Use” cover.
   b. Factory-Installed Non-Powered Convenience Outlet.
      1) Outlet shall be powered from a separate 115/120v power source.
      2) A transformer shall not be included.
      3) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
      4) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
      5) Outlet shall be accessible from outside the unit.
      6) Outlet shall include a field installed “Wet in Use” cover.
   c. Field-Installed Non-Powered Convenience Outlet.
      1) Outlet shall be powered from a separate 115/120v power source.
      2) A transformer shall not be included.
      3) Outlet shall be field-installed and internally mounted with easily accessible 115-v female receptacle.
      4) Outlet shall include 20 amp GFI receptacles. This kit provides a flexible installation method which allows code compliance for height requirements of the GFCI outlet from the finished roof surface as well as the capability to relocate the outlet to a more convenient location.
      5) Outlet shall be accessible from outside the unit.
      6) Outlet shall include a field installed “Wet in Use” cover.
11. Flue Discharge Deflector:
   a. Flue discharge deflector shall direct unit exhaust vertically instead of horizontally.
   b. Deflector shall be defined as a “natural draft” device by the National Fuel and Gas (NFG) code.
12. Thru-the-Base Connectors (included standard):
   a. Shall provide connectors to permit gas and electrical connections to be brought to the unit through the unit basepan.
   b. Minimum of 4 connection locations per unit.
13. Centrifugal Fan Power Exhaust:
   a. Power exhaust shall be used in conjunction with an integrated economizer.
   b. Power exhaust to be of centrifugal fan type.
   c. Horizontal power exhaust shall be mounted in return ductwork.
   d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0 to 100% adjustable setpoint on the economizer control.
14. Roof Curbs (Vertical):
   a. Full perimeter roof curb with exhaust capability providing separate air streams for energy recovery from the exhaust air without supply air contamination.

b. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
c. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

15. High Altitude Gas Conversion Kit:

Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit to operate from 2000 to 7000 ft (610 to 2134 m) elevation with natural gas or from 0 to 7000 ft (0 to 2134 m) elevation with liquefied propane.

16. Outdoor Air Enthalpy Sensor:

The outdoor air enthalpy sensor shall be used to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the unit will provide differential enthalpy control. The sensor allows the unit to determine if outside air is suitable for free cooling.

17. Return Air Enthalpy Sensor:

The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.

18. Indoor Air Quality (CO_2) Sensor:
    a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.
    b. The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The setpoint shall have adjustment capability.
19. Smoke Detectors:
    a. Shall be a 4-Wire Controller and Detector.
    b. Shall be environmental compensated with differential sensing for reliable, stable, and drift-free sensitivity.
    c. Shall use magnet-activated test/reset sensor switches.
    d. Shall have tool-less connection terminal access.
    e. Shall have a recessed momentary switch for testing and resetting the detector.
    f. Controller shall include:
        1) One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.
        2) Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.
        3) One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.
        4) Capable of direct connection to 2 individual detector modules.
        5) Can be wired to up to 14 other duct smoke detectors for multiple fan shutdown applications.
20. Hinged Access Panels:
    a. Shall provide easy access through integrated quarter turn latches.
    b. Shall be on major panels of: filter, control box, fan motor, and compressor.
21. Condensate Overflow Switch:

The sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:

    a. Indicator light — solid red (more than 10 seconds on water contact — compressors disabled), blinking red (sensor disconnected).
    b. 10 second delay to break — eliminates nuisance trips from splashing or eaves in pan (sensor needs 10 seconds of constant water contact before tripping).
    c. Disables the compressor(s) operation when condensate plug is detected, but still allows fans to run for Economizer.
22. Foil Faced Insulation:

Throughout unit cabinet air stream, non-fibrous and cleanable foil faced insulation is used.

23. 4 in. MERV-13 Return Air Filters (factory installed only):
    a. Factory option to upgrade standard unit filters to 4 in. MERV-13 filters.
    b. Upgrade option shall include factory installed 4 in. Filter Rack kit.
24. 4 in. Return Air Rack (field installed only);
    a. Accessory kit is designed to hold 4 in. MERV-8 or MERV-13 filters. Filters not included in kit.
25. 2 in. MERV-13 Return Air Filters:
    a. Accessory kit to field upgrade standard unit filters to 2 in. MERV-13 filters.
    b. Correct size and quantity of filters shall ship in a single box.
26. 2 in. MERV-8 Return Air filters:
    a. Accessory kit to field upgrade standard unit filters to 2 in. MERV-8 filters.
    b. Correct size and quantity of filters shall ship in a single box.
27. Phase Monitor Control:
    a. Shall monitor the sequence of 3-phase electrical system to provide a phase reversal protection.
    b. Shall monitor the 3-phase voltage inputs to provide a phase loss protection for the 3-phase device.
    c. Will work on either a Delta or Wye power connection.

Guide specifications (cont)

28. Horn/Strobe Annunciator:
    a. Provides an audible/visual signaling device for use with factory-installed option or field installed accessory smoke detectors.
    b. Requires installation of a field-supplied 24-v transformer suitable for 4.2 VA (AC) or 3.0 VA (DC) per horn/strobe accessory.
    c. Requires field-supplied electrical box, North American 1-gang box, 2 in. x 4 in. (51 mm x 102 mm).
    d. Shall have a clear colored lens.

29. High Short Circuit Current Rating (SCCR) Protection:
    a. Factory-installed option shall provide high short circuit current protection to compressor and all indoor and outdoor fan motors rated at 208/230V = 60kA, 460V = 65kA against high potential fault current situations. (Standard unit comes with 5 kA rating.)
    b. This option is not available with factory installed powered convenience outlet, non-fused disconnect, HACR breaker, phase loss monitor/protection and 575-v models.

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