



Turn to the experts

Product Data

WeatherMaster® Gas Heat/Electric Cooling Packaged Rooftop Units

15 to 25 Nominal Tons



Unit shown with economizer and power exhaust.

48HC Sizes 17 to 28
Packaged Rooftop Units with Gas Heat, Optional EnergyX®
Energy Recovery Device, and ComfortLink Controls

The 15 to 25 Ton WeatherMaster® Carrier rooftop unit (RTU) was designed by customers for customers. With a newly designed cabinet that integrates “no-strip” screw collars, handled access panels, and more, we’ve made your unit easy to install, easy to maintain, easy to use and reliable.

Easy to install

These WeatherMaster units are designed for dedicated factory-supplied vertical or horizontal air flow duct configurations. No special field kits are required. Designed to fit on pre-installed curbs by another manufacturer, these units also fit on past designed Carrier installed curbs with a new certified and authorized adapter curb. This cabinet design also integrates a large control box that gives you room to work and room to mount Carrier accessory controls.

Easy to maintain

Easy access handles by Carrier provide quick and easy access to all normally serviced components. Our “no-strip” screw system has superior holding power and guides screws into position while preventing the screw from stripping the unit’s metal. Take accurate pressure readings by reading system pressures with panels in place as compressors are strategically located to eliminate any air bypass.

Easy to use

The newly designed, central terminal board by Carrier puts all your connections and troubleshooting points in one convenient place, standard. Most low voltage connections are made to the same board and make it easy to find what you’re looking for and easy to access it.

Reliable

Each unit comes with precision sized and tested scroll compressor that is internally protected from over temperature and pressures. In addition, each refrigerant circuit is further protected with a high-pressure and low-pressure switch as well as containing a liquid line filter drier. Each unit is factory tested prior to shipment to help ensure unit operation once properly installed.

Key features

- Two stage cooling capability with independent circuits and control.
- High performance copper tube / aluminum plate (RTPF) fin condenser and evaporator coils with optional coating.

- EERs up to 12.0
- IEEERs up to 13.2 with single speed indoor fan motor and 13.8 with SAV™ (Staged Air Volume) 2-speed/VFD indoor fan motor.
- Gas heating efficiencies up to 81% thermal efficiency.
- Dedicated vertical and horizontal air flow duct configuration models. No field kits required.
- Utility connections through the side or bottom. Bottom connections are also in an enclosed environment to help prevent water entry. Field supplied couplings are required.
- Standardized components and layout. Standardized components and controls make service and stocking parts easier.
- Scroll compressors on all units. This makes service, stocking parts, replacement, and trouble-shooting easier.
- Precision sized TXV metering device on each refrigerant circuit.
- Easy-adjust, belt-drive motor available. Motor assembly also contains a fan belt break protection system on all models and reliable pillow block bearing system that allows lubrication thru front of the unit.
- Single-point gas/electrical connection.
- Sloped, composite drain pan sheds water; and won’t rust.
- Standardized controls and control box layout. Standardized components and controls make stocking parts and service easier.
- Clean, large, easy to use control box.
- Color-coded wiring.
- Large, laminated wiring and power wiring drawings which are affixed to unit make troubleshooting easy.
- Single, central terminal board for test and wiring connections.
- Fast-access, handled, panels for easy access on normally accessed service panels.
- “No-strip” screw system guides screws into the panel and captures them tightly without stripping the screw, the panel, or the unit.
- Mechanical cooling (125°F to 35°F/ 52°C to –2°C) standard on all models. Low ambient controller allows operation down to –20°F/–29°C
- Redundant gas valve for 2-stage gas heating capacity control with induced-draft flue exhaust design to help ensure no flue gas can escape into the indoor air stream.
- Exclusive IGC solid state gas controller for on board diagnostics with LED error code designation, burner control logic and energy saving indoor fan motor delay.
- 2-in. (51 mm) disposable filters on all units, with 4-in. (102 mm) filter track field-installed.
- Refrigerant filter-drier on each circuit.
- High and low pressure switches. Added reliability with high-pressure switch and low-pressure switch.
- Many factory-installed options ranging from air management economizers, 2 position dampers, manual outdoor air dampers, plus convenience outlets, disconnect switch and smoke detectors.
- Factory-installed Humidi-MiZer® adaptive dehumidification system.
- Standard Parts Warranty: 10 year aluminized heat exchanger, 5 year compressor, 1 year others.
- Optional Staged Air Volume (SAV) system utilizes a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed between cooling stages. Available on 2-stage cooling models 17-28 with electro-mechanical controls or RTU Open.

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Model number nomenclature



48HC MODEL NUMBER NOMENCLATURE

48 HC D E 17 A 2 A 6 - 0 A 3 B 0

Unit Heat Type

48 = Gas Heat Packaged Rooftop

Model Series - WeatherMaster®

HC = High Efficiency

Heat Options

D = Low Gas Heat
E = Medium Gas Heat
F = High Gas Heat
S = Low Heat w/ Stainless Steel Exchanger
R = Medium Heat w/ Stainless Steel Exchanger
T = High Heat w/ Stainless Steel Exchanger

Refrig. Systems Options

D = Two stage cooling model with Round Tube/Plate Fin
E = Two stage cooling models with Humidi-MiZer® System
G = Two stage cooling models with Motormaster® Low Ambient controller

Cooling Tons

17 = 15 tons
20 = 17.5 tons
24 = 20 tons
28 = 25 tons

Sensor Options

A = None
B = RA Smoke Detector
C = SA Smoke Detector
D = RA + SA Smoke Detector
E = CO₂ Sensor
F = RA Smoke Detector and CO₂
G = SA Smoke Detector and CO₂
H = RA + SA Smoke Detector and CO₂
J = Condensate Overflow Switch
K = Condensate Overflow Switch and RA Smoke Detectors
L = Condensate Overflow Switch and RA and SA Smoke Detectors

Indoor Fan Options & Air Flow Configuration

1 = Standard Static/Vertical Supply, Return Air Flow
2 = Medium Static/Vertical Supply, Return Air Flow
3 = High Static/Vertical Supply, Return Air Flow
B = Medium Static, High Efficiency Motor/Vertical Supply, Return Air Flow
C = High Static, High Efficiency Motor/Vertical Supply, Return Air Flow
5 = Standard Static/Horizontal Supply, Return Air Flow
6 = Medium Static/Horizontal Supply, Return Air Flow
7 = High Static/Horizontal Supply, Return Air Flow
F = Medium Static, High Efficiency Motor/Horizontal Supply, Return Air Flow
G = High Static, High Efficiency Motor/Horizontal Supply, Return Air Flow

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
E = Cu/Cu - Al/Cu
F = Cu/Cu - Cu/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 Guard
R = Cu/Cu - Al/Cu — Louvered Hail Guard
S = Cu/Cu - Cu/Cu — Louvered Hail Guard

Packaging

0 = Standard
3 = California Seismic Complaint - OSHPD

Electrical Options

A = None
B = HACR Breaker
C = Non-Fused Disconnect
D = Through-the-base Connection
C = Non-Fused Disconnect and Through-the-base Connection
G = 2-Speed Indoor Fan (VFD) Controller
J = 2 Speed Fan Controller (VFD) and Non-Fused Disconnect

Service Options

0 = None
1 = Unpowered Convenience Outlet
2 = Powered Convenience Outlet
3 = Hinged Panels
4 = Hinged Panels & Unpowered Convenience Outlet
5 = Hinged Panels & Powered Convenience Outlet
C = Foil Faced Insulation

Intake / Exhaust Options

A = None
B = Temperature Economizer w/ Barometric Relief
F = Enthalpy Economizer w/ Barometric Relief
K = 2-Position Damper
P = Manual Outdoor Air Damper
Q = EnergyX® Only
R = EnergyX with Economizer Only
S = EnergyX with Frost Protection Only
T = EnergyX with Economizer and Frost Protection
U = Temp Ultra Low Leak Economizer w/ Barometric Relief
V = Temp Ultra Low Leak Economizer w/ Power Exhaust - Vertical Air Only
W = Enthalpy Ultra Low Leak Economizer w/ Barometric Relief
X = Enthalpy Ultra Low Leak Economizer w/ Power Exhaust - Vertical Air Only

Base Unit Controls

0 = Electro-mechanical Controls. Can be used with W7212 EconoMi\$er® IV (Non-Fault Detection and Diagnostic)
1 = PremierLink™ Controller
2 = RTU Open Multi-Protocol Controller
6 = Electro-mechanical w/ 2-Speed Fan and W7220 Economizer Controller. Can be used with W7220 EconoMi\$er X (with Fault Detection and Diagnostic)
D = ComfortLink Controls (Standard with EnergyX)

Design Revision

- = Factory Design Revision

Voltage

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

NOTE: Not all possible options are displayed. See the current 48HC and 48HCX 15 to 25 ton price page for more details.



AHRI RATINGS (2-STAGE COOLING)

48HC UNIT	CONFIGURATION	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (kW)	EER	IEER (Single Speed)	IEER (2-Speed)
17	Vertical	15.0	174	14.5	12.0	13.0	13.5
	Horizontal			15.1	11.5	12.2	13.0
20	Vertical	17.5	202	16.8	12.0	13.0	13.6
	Horizontal			17.9	11.3	11.5	13.2
24	Vertical	20.0	232	19.3	12.0	13.2	13.8
	Horizontal			20.4	11.4	12.0	13.0
28	Vertical	25.0	282	25.2	11.2	12.0	12.5
	Horizontal			26.9	10.5	N/A	12.2

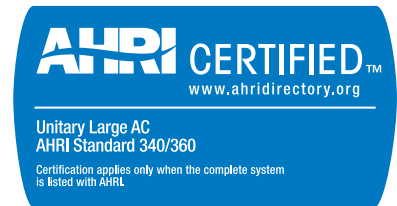
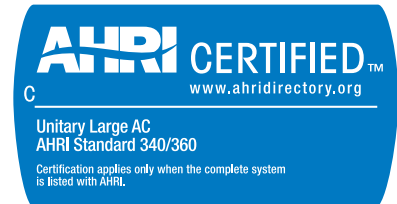
LEGEND

AHRI — Air-Conditioning, Heating and Refrigeration Institute

EER — Energy Efficiency Ratio

IEER — Integrated Energy Efficiency Ratio

NOTE: 48HC**28 horizontal units are only available with a 2-speed option.



SOUND RATINGS TABLE

48HC UNIT	COOLING STAGES	OUTDOOR SOUND (dB) AT 60 Hz											
		A-WEIGHTED	LINEAR	AHRI-370 RATING	31.5	63	125	250	500	1000	2000	4000	8000
17	2	84.1	96.2	84	92.6	92.0	84.0	80.0	82.0	78.7	76.5	72.2	65.4
20	2	84.1	96.2	84	92.6	92.0	84.0	80.0	82.0	78.7	76.5	72.2	65.4
24	2	86.5	99.6	87	96.2	95.6	87.5	84.2	84.2	81.7	77.9	73.2	66.3
28	2	85.9	103.0	86	101.0	97.0	88.0	84.0	83.0	80.7	77.4	73.4	67.3

LEGEND

dB — Decibel

NOTES:

- Outdoor sound data is measured in accordance with AHRI 370.
- 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.

- 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 370.

MINIMUM - MAXIMUM AIRFLOW RATINGS (CFM) — NATURAL GAS AND PROPANE

48HC UNIT	HEAT LEVEL	COOLING				ALUMINUM HEATING		STAINLESS STEEL HEATING	
		MINIMUM SINGLE SPEED FAN MOTOR	MINIMUM 2-SPEED FAN MOTOR (AT HIGH SPEED)	MINIMUM 2-SPEED FAN MOTOR (AT LOW SPEED)	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
17	LOW	4,500	5,070	3,380	7,500	3,000	8,250	3,000	8,250
	MED					3,880	7,750	3,880	7,750
	HIGH					4,620	8,570	4,620	8,570
20	LOW	5,250	5,915	3,943	9,000	3,000	11,000	3,000	11,000
	MED					3,880	9,300	3,880	9,300
	HIGH					4,620	10,000	4,620	10,000
24	LOW	6,000	7,500	5,000	10,000	3,000	11,000	3,000	11,000
	MED					3,880	11,630	3,880	11,630
	HIGH					4,620	10,000	4,620	10,000
28	LOW	7,500	8,450	5,633	12,500	3,000	16,500	3,000	16,500
	MED					3,880	15,500	3,880	15,500
	HIGH					4,620	15,000	4,620	15,000

HEAT RATING TABLE — NATURAL GAS AND PROPANE

48HC UNIT	GAS HEAT	AL/SS HEAT EXCHANGER		TEMPERATURE RISE (F)	THERMAL EFFICIENCY (%)
		INPUT/OUTPUT STAGE 1 (MBH)	INPUT/OUTPUT STAGE 2 (MBH)		
17	LOW	176/142	220/178	20-55	81%
	MED	248/200	310/251	30-60	
	HIGH	320/260	400/324	35-65	
20	LOW	176/142	220/178	15-55	81%
	MED	248/200	310/251	25-60	
	HIGH	320/260	400/324	30-65	
24	LOW	176/142	220/178	15-55	81%
	MED	248/200	310/251	20-60	
	HIGH	320/260	400/324	30-65	
28	LOW	176/142	220/178	10-55	81%
	MED	248/200	310/251	15-60	
	HIGH	320/260	400/324	20-65	

NOTES:

- Heat ratings are for natural gas heat exchangers operated at or below 2000 ft (610 m). For information on Propane or altitudes above 2000 ft (610 m), see the Application Data section of this book. Accessory Propane/High Altitude kits are also available.
- In the USA the input rating for altitudes above 2000 ft (610 m) must be derated by 4% for each 1000 ft (305 m) above sea level. In Canada, the input rating must be derated by 10% for altitudes of 2000 ft (610 m) to 4500 ft (1372 m) above sea level.

48HC 15 TO 25 TON PHYSICAL DATA

48HC UNIT		48HC*D17	48HC*E17	48HC*D20	48HC*E20	48HC*D24	48HC*E24	48HC*D28	48HC*E28
48HC BASE UNIT TONS		15	15	17.5	17.5	20	20	25	25
48HC BASE UNIT WEIGHT - lb (kg)		1892 (858)		2102 (953)		2247 (1019)		2292 (1040)	
REFRIGERATION SYSTEM									
# Circuits / # Comp. / Type		2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll
R-410A Charge A/B (lbs)		17/16.4	24.5/25.7	17.5/16.8	25.5/25.5	23.8/23.1	30.0/30.7	24.9/27.7	35.1/35.4
Metering device		TXV	TXV	TXV	TXV	TXV	TXV	TXV	TXV
High-Pressure Trip / Reset (psig)		630 / 505	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505
Low-Pressure Trip / Reset (psig)		54 / 117	27 / 44	54 / 117	27 / 44	54 / 117	27 / 44	54 / 117	27 / 44
EVAPORATOR COIL									
Material		Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
Tube Diameter (in.)		3⁄8 RTPF	3⁄8 RTPF	3⁄8 RTPF	3⁄8 RTPF	3⁄8 RTPF	3⁄8 RTPF	3⁄8 RTPF	3⁄8 RTPF
Rows / FPI		4 / 15	4 / 15	4 / 15	4 / 15	4 / 15	4 / 15	4 / 15	4 / 15
Total Face Area (ft²)		22	22	22	22	26	26	26	26
Condensate Drain Connection Size (in.)		3⁄4	3⁄4	3⁄4	3⁄4	3⁄4	3⁄4	3⁄4	3⁄4
HUMIDI-MIZER COIL									
Material			Cu / Al		Cu / Al		Cu / Al		Cu / Al
Tube Diameter		—	3⁄8 RTPF	—	3⁄8 RTPF	—	3⁄8 RTPF	—	3⁄8 RTPF
Rows / FPI			1 / 17		1 / 17		1 / 17		1 / 17
Total Face Area (ft²)			22		22		26		26
EVAPORATOR FAN AND MOTOR VERTICAL SUPPLY									
STANDARD STATIC	Motor Qty / Belt Qty / Driver Type	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt
	Nominal / Nameplate hp	2.9	2.9	3.7	3.7	N/A	N/A	5.25	5.25
	Max bhp	2.9	2.9	3.7	3.7	N/A	N/A	4.9	4.9
	Rpm Range	514-680	514-680	622-822	622-822	N/A	N/A	717-911	717-911
	Max Blower/Shaft rpm	1200	1200	1200	1200	N/A	N/A	1200	1200
	Motor Frame Size	56	56	56	56	N/A	N/A	56	56
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	N/A	N/A	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	15 X 15	15 X 15	15 X 15	15 X 15	N/A	N/A	15 X 15	15 X 15
MEDIUM STATIC	Motor Qty / Belt Qty / Driver Type	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A	N/A	N/A
	Nominal / Nameplate hp	3.7	3.7	5.25	5.25	N/A	N/A	N/A	N/A
	Max bhp	3.7	3.7	4.9	4.9	N/A	N/A	N/A	N/A
	Rpm Range	679-863	679-863	713-879	713-879	N/A	N/A	N/A	N/A
	Max Blower/Shaft rpm	1200	1200	1200	1200	N/A	N/A	N/A	N/A
	Motor Frame Size	56	56	56	56	N/A	N/A	N/A	N/A
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	N/A	N/A	N/A	N/A
	Fan Diameter (in.)	15 X 15	15 X 15	15 X 15	15 X 15	N/A	N/A	N/A	N/A
HIGH STATIC	Motor Qty / Belt Qty / Driver Type	1 / 1/ BELT	1 / 1/ BELT	N/A	N/A	N/A	N/A	N/A	N/A
	Nominal / Nameplate hp	5.25	5.25	N/A	N/A	N/A	N/A	N/A	N/A
	Max bhp	4.9	4.9	N/A	N/A	N/A	N/A	N/A	N/A
	Rpm Range	826-1009	826-1009	N/A	N/A	N/A	N/A	N/A	N/A
	Max Blower/Shaft rpm	1200	1200	N/A	N/A	N/A	N/A	N/A	N/A
	Motor Frame Size	56	56	N/A	N/A	N/A	N/A	N/A	N/A
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	N/A	N/A	N/A	N/A	N/A	N/A
	Fan Diameter (in.)	15 X 15	15 X 15	N/A	N/A	N/A	N/A	N/A	N/A

48HC 15 TO 25 TON PHYSICAL DATA (CONT)

48HC UNIT		48HC*D17	48HC*E17	48HC*D20	48HC*E20	48HC*D24	48HC*E24	48HC*D28	48HC*E28
EVAPORATOR FAN AND MOTOR VERTICAL SUPPLY (CONT)									
STANDARD STATIC - HIGH EFFCY	Motor Qty / Belt Qty / Driver Type	N/A	N/A	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A
	Nominal / Nameplate hp	N/A	N/A	N/A	N/A	5.0	5.0	N/A	N/A
	Max bhp	N/A	N/A	N/A	N/A	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	N/A	N/A
	Rpm Range	N/A	N/A	N/A	N/A	690-863	690-863	N/A	N/A
	Max Blower/Shaft rpm	N/A	N/A	N/A	N/A	1200	1200	N/A	N/A
	Motor Frame Size	N/A	N/A	N/A	N/A	184T	184T	N/A	N/A
	Fan Qty / Type	N/A	N/A	N/A	N/A	2 / Centrifugal	2 / Centrifugal	N/A	N/A
	Fan Diameter (in.)	N/A	N/A	N/A	N/A	15 X 15	15 X 15	N/A	N/A
MEDIUM STATIC - HIGH EFFICIENCY	Motor Qty / Belt Qty / Driver Type	N/A	N/A	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt
	Nominal / Nameplate hp	N/A	N/A	N/A	N/A	5.0	5.0	5.0	5.0
	Max bhp	N/A	N/A	N/A	N/A	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3
	Rpm Range	N/A	N/A	N/A	N/A	835-1021	835-1021	913-1116	913-1116
	Max Blower/Shaft rpm	N/A	N/A	N/A	N/A	1200	1200	1200	1200
	Motor Frame Size	N/A	N/A	N/A	N/A	184T	184T	184T	184T
	Fan Qty / Type	N/A	N/A	N/A	N/A	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	N/A	N/A	N/A	N/A	15 X 15	15 X 15	15 X 15	15 X 15
HIGH STATIC-HIGH EFFICIENCY	Motor Qty / Belt Qty / Driver Type	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt
	Nominal Nameplate H.p.	N/A	N/A	5.0	5.0	7.5	7.5	7.5	7.5
	Max Bhp (208/230/460/575v)	N/A	N/A	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	10.5/11.9/11.9/ 11	10.5/11.9/11.9/ 11	10.5/11.9/11.9/ 11	10.5/11.9/11.9/ 11
	Rpm Range	N/A	N/A	882-1078	882-1078	941-1176	941-1176	941-1176	941-1176
	Max Blower/shaft Rpm	N/A	N/A	1200	1200	1200	1200	1200	1200
	Motor Frame Size	N/A	N/A	184T	184T	213T	213T	213T	213T
	Fan Qty / Type	N/A	N/A	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (In)	N/A	N/A	15 X 15	15 X 15	15 X 15	15 X 15	15 X 15	15 X 15
EVAPORATOR FAN AND MOTOR HORIZONTAL SUPPLY									
STANDARD STATIC	Motor Qty / Belt Qty / Driver Type	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A	N/A	N/A
	Nominal / Nameplate hp	2.9	2.9	3.7	3.7	N/A	N/A	N/A	N/A
	Max bhp	2.9	2.9	3.7	3.7	N/A	N/A	N/A	N/A
	Rpm Range	514-680	514-680	622-822	622-822	N/A	N/A	N/A	N/A
	Max Blower/Shaft rpm	1100	1100	1100	1100	N/A	N/A	N/A	N/A
	Motor Frame Size	56	56	56	56	N/A	N/A	N/A	N/A
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	N/A	N/A	N/A	N/A
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	N/A	N/A	N/A	N/A
MEDIUM STATIC	Motor Qty / Belt Qty / Driver Type	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A	N/A	N/A
	Nominal / Nameplate hp	3.7	3.7	5.25	5.25	N/A	N/A	N/A	N/A
	Max bhp	3.7	3.7	4.9	4.9	N/A	N/A	N/A	N/A
	Rpm Range	614-780	614-780	713-879	713-879	N/A	N/A	N/A	N/A
	Max Blower/Shaft rpm	1100	1100	1100	1100	N/A	N/A	N/A	N/A
	Motor Frame Size	56	56	56	56	N/A	N/A	N/A	N/A
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	N/A	N/A	N/A	N/A
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	N/A	N/A	N/A	N/A

48HC 15 TO 25 TON PHYSICAL DATA (CONT)

48HC UNIT		48HC*D17	48HC*E17	48HC*D20	48HC*E20	48HC*D24	48HC*E24	48HC*D28	48HC*E28
HIGH STATIC	Motor Qty / Belt Qty / Driver Type	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A	N/A	N/A	N/A	N/A
	Nominal / Nameplate hp	4.9	4.9	N/A	N/A	N/A	N/A	N/A	N/A
	Max bhp	4.9	4.9	N/A	N/A	N/A	N/A	N/A	N/A
	Rpm Range	746-912	746-912	N/A	N/A	N/A	N/A	N/A	N/A
	Max Blower/Shaft rpm	1100	1100	N/A	N/A	N/A	N/A	N/A	N/A
	Motor Frame Size	56	56	N/A	N/A	N/A	N/A	N/A	N/A
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	N/A	N/A	N/A	N/A	N/A	N/A
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	N/A	N/A	N/A	N/A	N/A	N/A
STANDARD STATIC - HIGH EFFICIENCY	Motor Qty / Belt Qty / Driver Type	N/A	N/A	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt	N/A	N/A
	Nominal / Nameplate hp	N/A	N/A	N/A	N/A	5.0	5.0	N/A	N/A
	Max bhp	N/A	N/A	N/A	N/A	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	N/A	N/A
	Rpm Range	N/A	N/A	N/A	N/A	690-863	690-863	N/A	N/A
	Max Blower/Shaft rpm	N/A	N/A	N/A	N/A	1200	1200	N/A	N/A
	Motor Frame Size	N/A	N/A	N/A	N/A	184T	184T	N/A	N/A
	Fan Qty / Type	N/A	N/A	N/A	N/A	2 / Centrifugal	2 / Centrifugal	N/A	N/A
	Fan Diameter (in.)	N/A	N/A	N/A	N/A	18 x 15/15 X 11	18 x 15/15 X 11	N/A	N/A
MEDIUM STATIC - HIGH EFFICIENCY	Motor Qty / Belt Qty / Driver Type	N/A	N/A	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt
	Nominal / Nameplate hp	N/A	N/A	N/A	N/A	5.0	5.0	5.0	5.0
	Max bhp	N/A	N/A	N/A	N/A	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3
	Rpm Range	N/A	N/A	N/A	N/A	835-1021	835-1021	755-923	755-923
	Max Blower/Shaft rpm	N/A	N/A	N/A	N/A	1100	1100	1100	1100
	Motor Frame Size	N/A	N/A	N/A	N/A	184T	184T	184T	184T
	Fan Qty / Type	N/A	N/A	N/A	N/A	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	N/A	N/A	N/A	N/A	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11
HIGH STATIC - HIGH EFFICIENCY	Motor Qty / Belt Qty / Driver Type	N/A	N/A	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt	1 / 1 /Belt
	Nominal / Nameplate hp	N/A	N/A	5.0	5.0	7.5	7.5	7.5	7.5
	Max bhp	N/A	N/A	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3	10.5/11.9/11.9/ 11	10.5/11.9/11.9/ 11	10.5/11.9/11.9/ 11	10.5/11.9/11.9/ 11
	Rpm Range	N/A	N/A	835-1021	835-1021	941-1100	941-1100	906-1100	906-1100
	Max Blower/Shaft rpm	N/A	N/A	1100	1100	1100	1100	1100	1100
	Motor Frame Size	N/A	N/A	184T	184T	213T	213T	213T	213T
	Fan Qty / Type	N/A	N/A	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	N/A	N/A	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11
COND. COIL (CIRCUIT A)									
Coil Type		RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF
Coil Length (in.)		70	70	72	72	82	82	95	95
Coil Height (in.)		44	44	44	44	52	52	52	52
Rows / fpi		2 /17	2 /17	2 /17	2 /17	2 /17	2 /17	2 /17	2 /17
Total Face Area (Ft²)		21.4	21.4	22.0	22.0	29.6	29.6	34.3	34.3
COND. COIL (CIRCUIT B)									
Coil Type		RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF
Coil Type		70	70	64	64	80	80	95	95
Coil Length (in.)		44	44	44	44	52	52	52	52
Coil Height (in.)		2 /17	2 /17	2 /17	2 /17	2 /17	2 /17	2 /17	2 /17
Rows / fpi		21.4	21.4	19.5	19.5	29.6	29.6	34.3	34.3
COND. FAN / MOTOR									
Qty / Motor Drive Type		3 / direct	3 / direct	4 / direct	4 / direct	4/ direct	4/ direct	6 / direct	6 / direct
Motor Hp / Rpm		1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan Diameter (in.)		22	22	22	22	22	22	22	22
FILTERS									
RA Filter # / Size (in.)		6 / 20 x 25 x 2	6 / 20 x 25 x 2	6 / 20 x 25 x 2	6 / 20 x 25 x 2	9 / 16 x 25 x 2	9 / 16 x 25 x 2	9 / 16 x 25 x 2	9 / 16 x 25 x 2
OA Inlet Screen # / Size (in.)		4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1

48HC 15 TO 25 TON PHYSICAL DATA (CONT)

48HC UNIT		48HC*D17	48HC*E17	48HC*D20	48HC*E20	48HC*D24	48HC*E24	48HC*D28	48HC*E28
GAS CONNECTION									
Number of Gas Valves		1		1		1		1	
Nat. gas supply line press (in. wg) / (PSIG)		5 -13 / 0.18-0.47		5 -13 / 0.18-0.47		5 -13 / 0.18-0.47		5 -13 / 0.18-0.47	
LP supply line press (in. wg) / (PSIG)		11-13 / 0.40-0.47		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		0.14	
Second stage		0.14		0.14		0.14		0.14	
NATURAL GAS HEAT									
LOW	# of stages / # of burners (total)	2 / 5		2 / 5		2 / 5		2 / 5	
	Connection Size (in.)	3/4 NPT		3/4 NPT		3/4 NPT		3/4 NPT	
	Rollout switch opens / closes (F)	195 / 115		195 / 115		195 / 115		195 / 115	
	Temperature Rise (F)	25 - 55		25 - 55		25 - 55		25 - 55	
MED	# of stages / # of burners (total)	2 / 7		2 / 7		2 / 7		2 / 7	
	Connection Size (in.)	3/4 NPT		3/4 NPT		3/4 NPT		3/4 NPT	
	Rollout switch opens / closes (F)	195 / 115		195 / 115		195 / 115		195 / 115	
	Temperature Rise (F)	30 - 60		30 - 60		30 - 60		30 - 60	
HIGH	# of stages / # of burners (total)	2 / 10		2 / 10		2 / 10		2 / 10	
	Connection Size (in.)	3/4 NPT		3/4 NPT		3/4 NPT		3/4 NPT	
	Rollout switch opens / closes (F)	195 / 115		195 / 115		195 / 115		195 / 115	
	Temperature Rise (F)	35 - 65		35 - 65		35 - 65		35 - 65	
LIQUID PROPANE HEAT									
LOW	# of stages / # of burners (total)	2 / 5		2 / 5		2 / 5		2 / 5	
	Connection Size (in.)	3/4 NPT		3/4 NPT		3/4 NPT		3/4 NPT	
	Rollout switch opens / closes (F)	195 / 115		195 / 115		195 / 115		195 / 115	
	Temperature Rise (F)	25 - 55		25 - 55		25 - 55		25 - 55	
MED	# of stages / # of burners (total)	2 / 7		2 / 7		2 / 7		2 / 7	
	Connection Size (in.)	3/4 NPT		3/4 NPT		3/4 NPT		3/4 NPT	
	Rollout switch opens / closes (F)	195 / 115		196 / 115		197 / 115		198 / 115	
	Temperature Rise (F)	30 - 60		30 - 60		30 - 60		30 - 60	
HIGH	# of stages / # of burners (total)	2 / 10		2 / 10		2 / 10		2 / 10	
	Connection Size (in.)	3/4 NPT		3/4 NPT		3/4 NPT		3/4 NPT	
	Rollout switch opens / closes (F)	195 / 115		195 / 115		195 / 115		195 / 115	
	Temperature Rise (F)	35 - 65		35 - 65		35 - 65		35 - 65	

48HC 15 TO 25 TON PHYSICAL DATA (CONT)

48HC UNIT	48HC*D17	48HC*E17	48HC*D20	48HC*E20	48HC*D24	48HC*E24	48HC*D28	48HC*E28
ENERGYX® UNIT TYPE	Modulating Air Flow Capability / Electro-Mechanical Constant Speed				Modulating Air Flow Capability / Electro-Mechanical Constant Speed			
ENERGYX WHEEL OA (CFM)	1400-3675				2200-6000			
ENERGYX WHEEL EA (CFM)	1400-3675				2200-6000			
ENERGYX RECOVERY WHEEL	Enthalpy Lightweight Polymer with Silica Gel Desiccant Coating				Enthalpy Lightweight Polymer with Silica Gel Desiccant Coating			
Type	ERC-3628C				ERC-4646C			
Model (AirXchange)	36 x 3				46 x 3			
Size (Dia. x Depth) (in.)	0.1				1/6			
Nominal Drive Motor Hp								
ENERGYX SUPPLY FAN #1	1 - Backward Curved				1 - Backward Curved			
Qty - Type	Direct				Direct			
Drive Type	15.75" (400 mm)				17.7" (450 mm)			
Blower Size (Diameter)	1.2				3.7			
Nominal Motor Hp								
ENERGYX SUPPLY FAN #2	1 - Backward Curved				1 - Backward Curved			
Qty - Type	Direct				Direct			
Drive Type	15.75" (400 mm)				17.7" (450 mm)			
Blower Size	1.2				3.7			
Nominal Motor Hp								
ENERGYX EXHAUST FAN #1	1 - Backward Curved				1 - Backward Curved			
Qty - Type	Direct				Direct			
Drive Type	17.7" (450 mm)				17.7" (450 mm)			
Blower Size	3.7				3.7			
Nominal Motor Hp								
ENERGYX EXHAUST FAN #2*	1 - Backward Curved				1 - Backward Curved			
Qty - Type	Direct				Direct			
Drive Type	17.7" (450 mm)				17.7" (450 mm)			
Blower Size	3.7				3.7			
Nominal Motor Hp								
ENERGYX FILTERS	2-in. Pleated, 30% Efficiency				2-in. Pleated, 30% Efficiency			
Type	(2) 16 x 20 x 2				(2) 20 x 25 x 2			
Supply Air (Qty) - Size (in.)	(2) 16 x 20 x 2				(2) 20 x 25 x 2			
Exhaust Air (Qty) - Size (in.)	Aluminum Water Filter				Aluminum Water Filter			
Type	(2) 34.375 x 17.25 x 1				(2) 34.375 x 24.5 x 1			
Water Entrapment (Qty) - Size (in.)								

LEGEND

BHP — Brake Horsepower
EA — Entering Air
FPI — Fins Per Inch
OA — Outdoor Air

* Exhaust fan #2 data is not applicable to 15-17.5 ton high non-economizer models.

Options and accessories



ITEM	OPTION*	ACCESSORY†
CABINET		
Dedicated Vertical Air Flow Duct Configuration	X	
Dedicated Horizontal Air Flow Duct Configuration	X	
Hinged Access Panels	X	
Foil Faced Insulation Throughout Entire Cabinet	X	
Thru-the-Base Electrical or Gas-Line Connections	X	
COIL OPTIONS		
Cu/Cu (Indoor) Coils	X	
Premium, E-coated Outdoor Coils	X	
Pre-coated (outdoor and indoor) Coils	X	
HUMIDITY CONTROL		
Humidi-MiZer® Adaptive Dehumidification System	X	
CONDENSER PROTECTION		
Condenser Coil Louvered Hail Guard	X	X
CONTROLS		
PremierLink™ DDC Communicating Controller	X	X
ComfortLink Controller	X	
RTU Open Multi-Protocol Controller	X	
Thermostats, Temperature Sensors, and Subbase		X
Smoke Detector (Supply and/or Return Air)	X	X
Horn/Strobe Annunciator ¹		X
Time Guard II Compressor Delay Control Circuit		X
Phase Monitor		X
Condensate Overflow Switch	X	X
ECONOMIZERS AND OUTDOOR AIR DAMPERS		
EconoMiSer® IV for Electro-Mechanical Controls — Non-FDD (Standard Air Leak Damper Models) ²	X	X
EconoMiSer 2 for DDC controls (Standard and Ultra Low Leak Air Damper Models) ^{2,3}	X	X
EconoMiSer X For Electro-Mechanical Controls, Complies with FDD. (Standard and Ultra Low Leak air damper models) ²	X	X
Motorized 2 Position Outdoor-Air Damper ⁹	X	X
Manual Outdoor-Air Damper (25%) ⁹		X
Barometric Relief ⁴	X	X
Barometric Hood (Horizontal economizer)		X
Power Exhaust (Prop Design)	X	X
ECONOMIZER SENSORS AND IAQ DEVICES		
Single Dry Bulb Temperature Sensors ⁵	X	X
Differential Dry Bulb Temperature Sensors ⁵		X
Single Enthalpy Sensors ⁵	X	X
Differential Enthalpy Sensors ⁵		X
Wall or Duct Mounted CO ₂ Sensor ⁵		X
Unit Mounted CO ₂ Sensor ⁵	X	X
4-in. Filter Track Assembly		X

ITEM	OPTION*	ACCESSORY†
GAS HEAT		
Propane Conversion Kit		X
Stainless Steel Heat Exchanger	X	
High Altitude Conversion Kit		X
Flue Discharge Deflector		X
INDOOR MOTOR AND DRIVE		
Multiple Motor and Drive Packages	X	
Staged Air Volume (SAV™) System with VFD Controller (2-Stage Cooling Models Only)	X	
Display Kit or SAV System with VFD		X
LOW AMBIENT CONTROL		
Winter Start Kit ⁶		X
Motormaster® Head Pressure Controller to -20°F ⁶		X
POWER OPTIONS		
Cooling Low Ambient Controller to 0°F	X	
Powered Convenience Outlet	X	
Unpowered Convenience Outlet (125 amp Factory-Installed, 20 amp Field-Installed)	X	X
HACR Circuit Breaker ⁷	X	
Non-Fused Disconnect ⁸	X	
ROOF CURBS		
Roof Curb 14-in. (356 mm)		X
Roof Curb 24-in. (610 mm)		X
Horizontal Curb Adapter (Vertical to Horizontal Airflow)		X
EnergyX® SYSTEM		
EnergyX Energy Recovery	X	
EnergyX with Economizer	X	
EnergyX with Frost Protection	X	
EnergyX with Frost Protection and Economizer	X	
Filter Maintenance Sensor		X
Motor Status Sensor		X
California OSHPD Seismic Certification Label ¹⁰		

*Factory-installed option.

†Field-installed accessory.

NOTES:

- Requires a field-supplied 24V transformer for each application. See price page for details.
- FDD (Fault Detection and Diagnostics System) capability per ASHRAE 90.1-2016 and California Title 24-2015 Section 120.2.
- Models with RTU Open and ComfortLink DDC controls comply with ASHRAE 90.1-2016 section 6.4.3.1.b and California Title 24-2015 section 120.2.
- Included with economizer.
- Sensors used to optimize economizer performance.
- See application data for assistance.
- HACR circuit breaker cannot be used when rooftop MOCP electrical rating exceeds 200 amps at 208/230 volt, and 90 amps at 460 and 575 volt, 575 volt can only be used on Wye power supply. Delta power supply is prohibited. Carrier RTUBuilder selects this automatically.
- Non-fused disconnect switch cannot be used when MOCP electrical rating exceeds 70 amps at 460/575 volt and 150 amps at 208/230 volt. Carrier Packaged RTUBuilder selects this automatically.
- Not compatible with Staged Air Volume (SAV) system.
- OSHPD not available on units with Humidi-MiZer, HACR breaker, MCHX coil, low ambient controls, hail-guards, or EnergyX.

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 CO₂ 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 a powered exhaust system to help equalize building pressures.

Economizers include gravity controlled barometric relief that helps equalize building pressure and ambient air pressures. This can be a cost effective solution to prevent building pressurization. Economizers are available in Ultra Low Leak and standard low leak versions. Economizers can be factory-installed or easily field-installed.

Optional Humidi-MiZer® Adaptive Dehumidification System — Carrier's Humidi-MiZer adaptive dehumidification system is an all-inclusive factory-installed option that can be ordered with any WeatherMaster® 48HC17-28 rooftop unit.

This system expands the envelope of operation of Carrier's WeatherMaster rooftop products to provide unprecedented flexibility to meet year round comfort conditions.

The Humidi-MiZer adaptive dehumidification system has a unique dual operational mode setting. The Humidi-MiZer system includes two new modes of operation.

The WeatherMaster 48HC17-28 rooftop coupled with the Humidi-MiZer system is capable of operating in normal design cooling mode, subcooling mode, and hot gas reheat mode. Normal design cooling mode is when the unit will operate under its normal sequence of operation by cycling compressors to maintain comfort conditions.

Subcooling mode will operate to satisfy part load type conditions when the space requires combined sensible and a higher proportion of latent load control. Hot Gas Reheat mode will operate when outdoor temperatures diminish and the need for latent capacity is required for sole humidity control. Hot Gas Reheat mode will provide neutral air for maximum dehumidification operation.

Thru-the-Base Connections — Thru-the-base provisions/connection points are available as standard with every unit. When bottom connections are required, field furnished couplings are required.

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

Cu/Cu (Indoor) Coils (3-Phase Models Only) — 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 potential for galvanic corrosion between coil and pan.

E-coated (Outdoor and Indoor) Coils — A flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation of tubes, fins and headers.

Pre-Coated Outdoor Coils — A durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments. The coating minimizes galvanic action between dissimilar metals. 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 — 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.

Smoke Detectors — Trust the experts. 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.

Optional Stainless Steel Heat Exchanger — The stainless steel heat exchanger option 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). Stainless steel may be specified on applications where the presence of airborne contaminants require its use (applications such as paper mills) or in area with very high outdoor humidity that may result in severe condensation in the heat exchanger during cooling operation.

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 side as required by code. The "unpowered" option is to be powered from a separate 115/120v power source.

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 unit as ordered from the factory. The sizing of these does not accommodate any power exhaust devices, etc.

HACR Breaker — 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 environment protection.

On 575V applications, HACR breaker can only be used with WYE power distribution systems. Use on Delta power distribution systems is prohibited.

Foil Faced Insulated Cabinet — Cabinet is fully insulated with non-fibrous, foil faced cleanable insulation that is secured and encapsulated in unit design.

PremierLink™ DDC Controller — This CCN controller regulates your rooftop's performance to tighter tolerances and expanded limits, as well as facilitates zoning systems and digital accessories. It also unites your Carrier HVAC equipment together on one, coherent CCN network. The PremierLink Controller can be factory-installed, or easily field-installed.

ComfortLink Controls — Models with the optional Carrier ComfortLink Controls allow added unit diagnostics and operation setup capabilities, as well as controlling logic for single zone Variable Air Volume (VAV) applications.

The ComfortLink control is your link to a world of simple and easy to use rooftop units that offer outstanding performance and value. It optimizes the performance of the refrigeration circuits as conditions change, resulting in the following features:

- Better control of temperature and humidity
- Superior reliability
- Automatic redundancy
- Low ambient cooling operation to 0°F (–18°C)
- More accurate diagnostics, at unit or remote

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

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

The service run test can be very helpful when troubleshooting. The user can run test major components to determine the root cause of a problem. The unit can be run-tested before an installation is complete to ensure satisfactory start-up. To ensure reliability, the ComfortLink control prevents reverse compressor rotation. No laptop computers are required for start-up.

Time schedules are built in and the Scrolling Marquee display provides easy access to setpoints. The ComfortLink control accepts input from a CO₂ sensor and a smoke detector. Both are available as factory-installed options or as field-installed accessories.

RTU Open Protocol Controller — Connect the rooftop to an existing BAS without needing complicated translators or adapter modules using the RTU Open controller. This new controller speaks the 4 most common building automation system languages (BACnet¹, Modbus², N2, and LonWorks³). Use this controller when you have an existing BAS.

Condensate Overflow Switch (Factory-Installed Option) — 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 compressor(s) 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 or factory-installed option may eliminate the need for costly, external pressure control fans.

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 not 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 0°F (–18°C) ambient conditions.

Manual OA Damper — Manual outdoor air dampers are an economical way to bring in ventilation air. The dampers are available in 25% versions.

Staged Air Volume (SAV™) Indoor Fan Speed System — Carrier's Staged Air Volume (SAV) system saves energy and installation time by utilizing a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the units cooling operation. Per ASHRAE 90.1-2016 standard, during the first stage of cooling operation the VFD will adjust the fan motor to provide 66% of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm for the unit established (100%). During the heating mode the VFD will allow total design cfm (100%) operation and during the ventilation mode the VFD will allow operation to 66% of total cfm. Compared to single speed indoor fan motor systems, Carrier's SAV system can save substantial energy, 25%+, versus single speed indoor fan motor systems.

1. BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).
 2. Modbus is a registered trademark of Schneider Electric.
 3. LonWorks is a registered trademark of Echelon Corporation.

IMPORTANT: Data based on 0.10 (\$/kWh) in an office application utilizing Carrier's HAP 4.6 simulation software program.

The VFD used in Carrier's SAV™ system has soft start capabilities to slowly ramp up the speeds, thus eliminating any high inrush air volume during initial start-up. It also has internal over current protection for the fan motor and a field-installed display kit that allows adjustment and in depth diagnostics of the VFD.

This SAV system is available on models with 2-stage cooling operation with electrical mechanical or RTU Open, Multi Protocol controls. Both space sensor and conventional thermostats controls can be used to provide accurate control in any application.

The SAV system is very flexible for initial fan performance set up and adjustment. The standard factory shipped VFD is pre-programmed to automatically stage the fan speed between the first and second stage of cooling. The unit fan performance static pressure and cfm can be easily adjusted using the traditional means of pulley adjustments. The other means to adjust the unit static and cfm performance is to utilize the field-installed Display Kit and adjust the frequency and voltage in the VFD to required performance requirements. In either case, once set up, the VFD will automatically adjust the speed between the cooling stage operations.

Alternate Motors and Drives — 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 and pulleys (drives) are available, factory-installed, to handle nearly any application.

Barometric Hood — For Horizontal Economizer applications where relief damper is installed in duct work. This kit provides the needed protection.

EnergyX® Energy Recovery Ventilator (ERV) — EnergyX System is a factory installed Energy Recovery Ventilator (ERV) module on a Carrier packaged rooftop unit. It is integrated with the base rooftop unit structurally, electrically and with regard to controls operation.

EnergyX with Economizer (3-phase Models Only) — Allows true modulating economizer capability when OA is suitable for free cooling.

- operates as a true wheel bypass
- uses stop/jog operation for wheel required when using CO₂ sensor for DCV operation
- economizer integrated into EnergyX unit

EnergyX with Economizer (3-phase Models Only) — Senses pressure differential across the energy recovery cassette. Uses exhaust air to defrost the wheel when necessary.

California OSHPD Seismic Certification Label —

Units meet the seismic requirements of the International Code Council Evaluation Service (ICC-ES) document AC156 (Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems) and per International Building Code (IBC 2009) at an SDS (g) value of 2.00 $z/h=1.0$, $I_p=1.5$ and certified by independent structural engineers. A certification label is applied to the unit that meets the CA OSHPD Special Seismic Certification pre-approval labeling requirements on the external chassis of the unit.

OSHPD not available on units with factory installed Humidi-MiZer, HACR breaker, MCHX coils, low ambient controls, hailguards, or EnergyX.

Field-Installed Accessories

Differential Enthalpy Sensor — The differential enthalpy sensor is comprised of an outdoor and return air enthalpy sensors to provide differential.

Wall or duct mounted CO₂ Sensor — The IAQ sensor shall be available in duct or wall mount. The sensor provides demand ventilation indoor air quality (IAQ) control.

Time Guard II Control Circuit — This accessory protects your compressor by preventing short-cycling in the event of some other failure, prevents the compressor from restarting for 30 seconds after stopping. Not required with PremierLink, RTU Open, or authorized commercial thermostats.

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

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/ft³ 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.

Flue Discharge Deflector — The flue discharge deflector is a useful accessory when flue gas recirculation is a concern. By venting the flue discharge upwards, the deflector minimizes the chance for a neighboring unit to intake the flue exhaust.

Winter Start Kit — The winter start kit by Carrier extends the low ambient limit of your rooftop to 25°F (–4°C). The kit bypasses the low pressure switch, preventing nuisance tripping of the low pressure switch. Other low ambient precautions may still be prudent.

Motormaster® Head Pressure Controller — The Motormaster motor controller is a low ambient, 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 Motormaster controller will either cycle the outdoor-fan motors or operate them at reduced speed to maintain the unit operation, depending on the model.

Motormaster controller allows cooling operation down to –20°F (–29°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.

Horizontal Roof Curb Adapter (Vertical to Horizontal Airflow) — Horizontal Roof Curb Adapters —

Used when horizontal supply and/or return is desired. Motor Status Indicator Accessory – monitors wheel, supply and exhaust motors and provides indication if not operating. Filter status indicator accessory – monitors static pressure across supply and exhaust filters and provides indication when filters become clogged.

EnergyX Filter Maintenance Sensor — 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. The EnergyX® wheel operation is not interrupted.

EnergyX Motor Status Sensor — Monitors the EnergyX wheel/motor and supply and exhaust fan motors to provide indication of operation.

EnergyX Motorized Exhaust Damper Accessory — Replaces the standard barometric exhaust damper blades with motorized (open/shut) damper.

OPTIONS AND ACCESSORY WEIGHTS

OPTION / ACCESSORY NAME	48HC UNIT WEIGHT							
	17		20		24		28	
	lb	kg	lb	kg	lb	kg	lb	kg
EnergyX® Energy Recovery Ventilator	1466	665	1466	665	1676	760	1676	760
Barometric Relief Damper	50	23	50	23	50	23	50	23
Humidi-MiZer® System*	110	50	120	55	120	55	120	55
Economizer	498	226	498	226	505	229	505	229
Power Exhaust	125	57	125	57	125	57	125	57
EconoMiSer® (IV, X, or 2)	170	77	170	77	170	77	195	88
Copper Tube/Fin Condenser Coil	28	13	30	14	34	15	34	15
Copper Tube/Fin Evaporator Coil	110	50	110	50	135	61	16	73
Copper Tube/Fin Condenser and Evaporator Coil	—	—	—	—	—	—	—	—
Low Gas Heat	85	39	85	39	85	39	85	39
Medium Gas Heat	90	41	90	41	90	41	90	41
High Gas Heat	113	51	113	51	113	51	113	51
Flue Discharge Deflector	7	3	7	3	7	3	7	3
Roof Curb 14-in. (356 mm)	240	109	240	109	240	109	255	116
Roof Curb 24-in. (610 mm)	340	154	340	154	340	154	355	161
Louvered Hail Guard	60	27	60	27	120	54	150	68
CO ₂ Sensor	5	2	5	2	5	2	5	2
Return Smoke Detector	5	2	5	2	5	2	5	2
Supply Smoke Detector	5	2	5	2	5	2	5	2
Fan/Filter Status Switch	2	1	2	1	2	1	2	1
Non-Fused Disconnect	15	7	15	7	15	7	15	7
HACR Circuit Breaker	2	1	2	1	2	1	2	1
Powered Convenience Outlet	35	16	35	16	35	16	35	16
Powered Exhaust	125	57	125	57	125	57	125	57
Non-Powered Convenience Outlet	5	2	5	2	5	2	5	2
Enthalpy Sensor	2	1	2	1	2	1	2	1
Differential Enthalpy Sensor	3	1	3	1	3	1	3	1
Two Position Motorized Damper	50	23	50	23	50	23	65	29
Manual Damper	35	16	35	16	35	16	40	18
Field Filter Track 4-in. (102mm)	12	5	12	5	12	5	12	5
Motormaster® Controller	35	16	35	16	35	16	35	16
Medium Static Motor/Drive	5	2	6	3	6	3	6	3
High Static Motor/Drive	11	5	12	5	16	7	16	7
Barometric Relief Hood (Horizontal)	25	11	25	11	25	11	25	11
SAV™ System with VFD	20	9	20	9	20	9	20	9

LEGEND

— Not Available

* For Humidi-MiZer system add Motormaster® controller.

NOTE: Where multiple variations are available, the heaviest combination is listed.

Carrier United Technologies

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CONNECTION SIZES

	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:

- DIMENSIONS ARE IN INCHES. DIMENSIONS IN [] ARE IN MILLIMETERS.
- CENTER OF GRAVITY
- DIRECTION OF AIR FLOW
- ALL VIEW DRAWN USING 3RD ANGLE

TOP

VERTICAL SUPPLY AIR
VERTICAL RETURN AIR
OUTDOOR AIR HOOD (OPTIONAL)
68 [1726]
53-3/4 [1385]
19-1/4 [489]
6-1/4 [157]
6-1/4 [157]
25-1/2 [649]
6-1/4 [157]
68-1/8 [1730]
51-5/8 [1584]
3-1/4 [83]
3-7/8 [98]
1 1/4" DIA [32] KNOCKOUT FOR ALT THRU GAS PIPING
14-1/8 [359]
4X 7-1/8 [181]
6-1/8 [206]
11 [279]
14-7/8 [379]
50-1/2 [1284]
6-1/2 [167]
3-1/4 [83]

FRONT

1-1/8 [27]
40-1/4 [1022]
15-1/8 [385]
11-5/8 [294]
48-3/8 [1253]
15-1/8 [385]
10-1/4 [259]
15-1/8 [384]
2X 50-1/2 [1283]
121-7/8 [3249]
17-3/8 [443]
17-1/2 [445]
25 [636]
CONVENIENCE OUTLET (OPTIONAL)
2" DIA [51] HOLES FOR GAS PIPING
INDOOR ACCESS PANEL
FILTER INDOOR ACCESS PANEL
CONTROL ACCESS PANEL
GAS ACCESS
F.A.
CONDENSER COIL
AIR INLET GRILLE
EXHAUST FLUE HOOD
COMBUSTION AIR INTAKE HOOD
VERTICAL SUPPLY AIR
VERTICAL RETURN AIR
DISCONNECT (OPTIONAL)
PANEL LIFT HANDLES
OUTSIDE AIR
POWER EXHAUST FLOW (OPTIONAL)
28-1/2 [723]
47-3/4 [1214]

LEFT

SHOWN WITH THE BAROMETRIC RELIEF OPTION INSTALLED

POWER EXHAUST (OPTIONAL)
4-3/4 [122]
45-3/8 [1151]
9-3/8 [239]
4-3/4 [122]
A, B, C

BACK

SHOWN WITH THE BAROMETRIC RELIEF OPTION INSTALLED

ECONOMIZER (TYPICAL TYPE) (OPTIONAL)
PANELS REMOVED TO SHOW ECONOMIZER AND POWER EXHAUST OPTIONS
BAROMETRIC RELIEF (OPTIONAL) INCLUDED WITH ECONOMIZER
POWER EXHAUST (OPTIONAL)

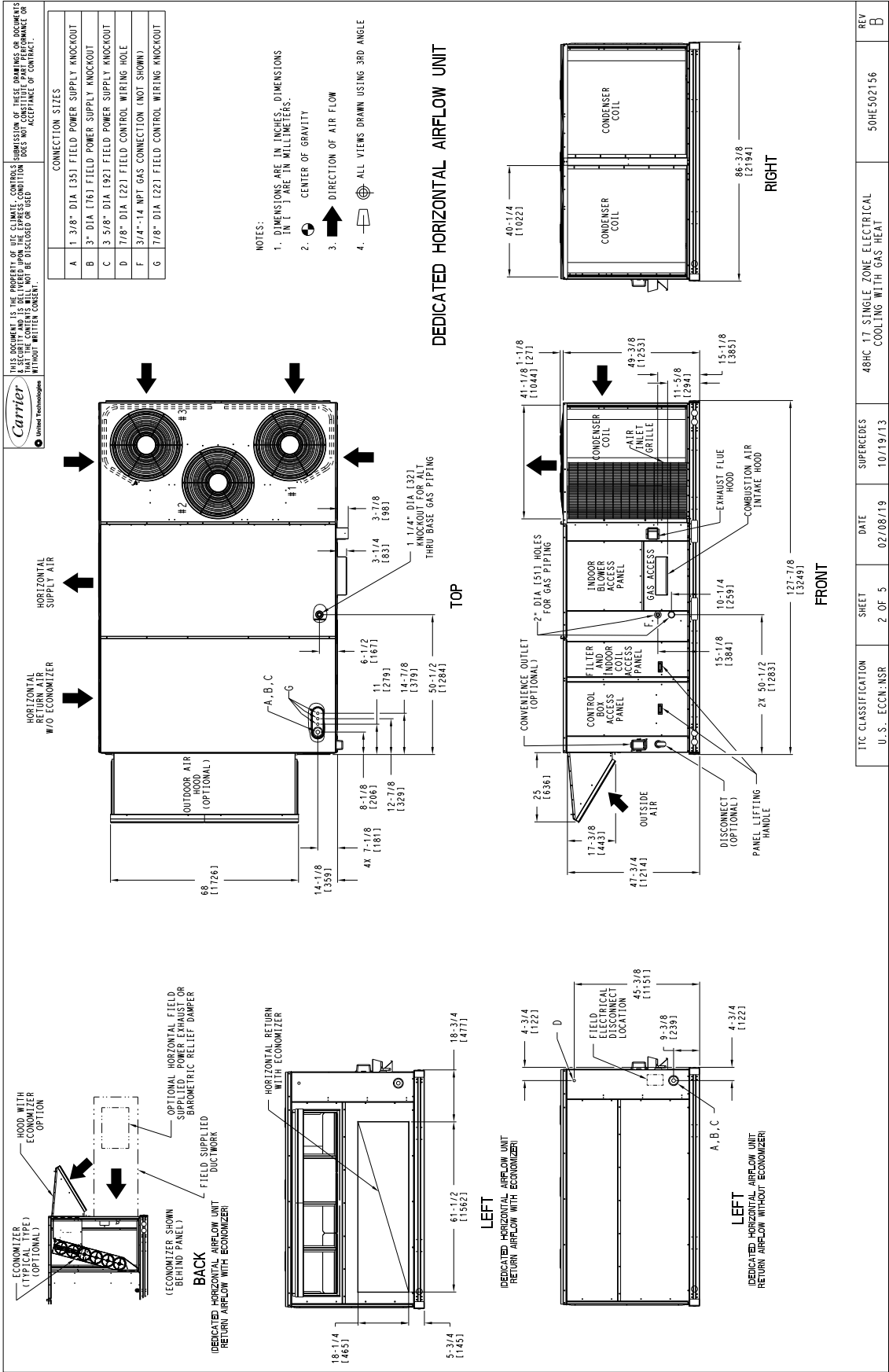
DEDICATED VERTICAL AIRFLOW UNIT

48HC 17 SINGLE ZONE ELECTRICAL DEDICATED VERTICAL AIRFLOW UNIT

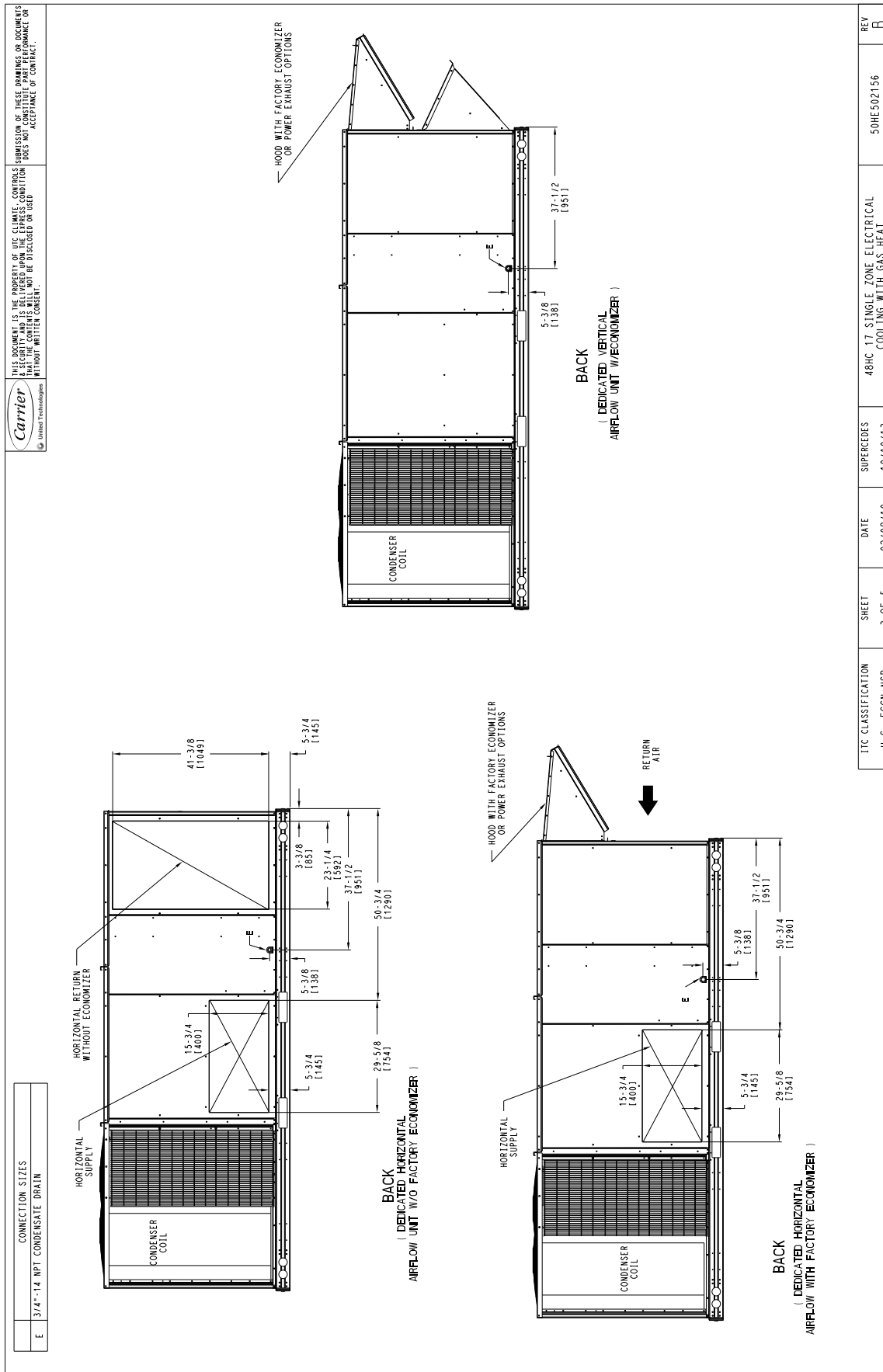
ITC CLASSIFICATION SHEET DATE SUPERCEDS

REV B 50HE502156

48HC**17 HORIZONTAL AIRFLOW



48HC**17 BACK VIEW AND CONDENSATE DRAIN LOCATION



ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48HC 17 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	REV
U.S. ECCN-NSR	3 OF 5	02/08/19	10/19/13	50HES02156	B

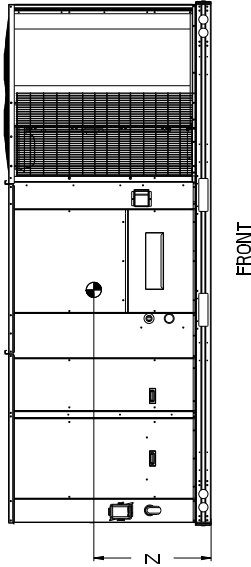
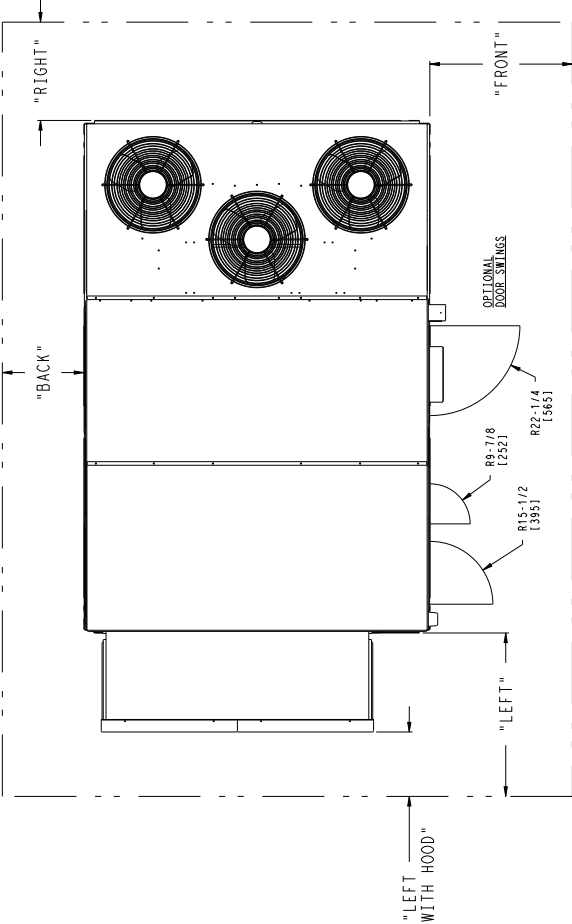
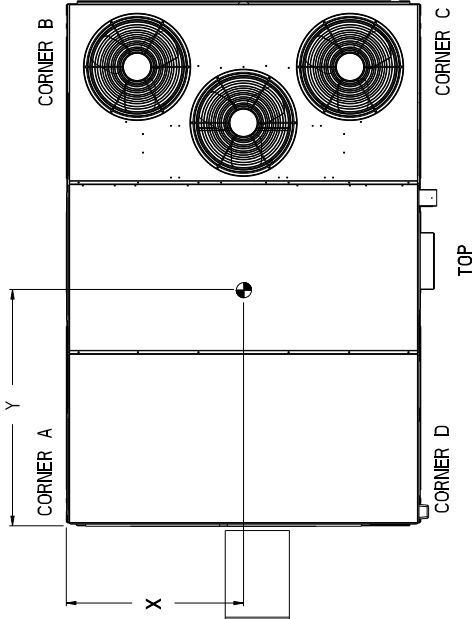


48HC**17 CORNER WEIGHTS AND CLEARANCES

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WITHOUT WRITTEN CONSENT.

UNIT	CORNER A		CORNER B		CORNER C		CORNER D		C. G.	
	WEIGHT (A)	WEIGHT (B)	WEIGHT (C)	WEIGHT (D)	WEIGHT (A)	WEIGHT (B)	WEIGHT (C)	WEIGHT (D)	X	Y
48HC17	1892	860	401	182	449	204	565	257	505	230
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.

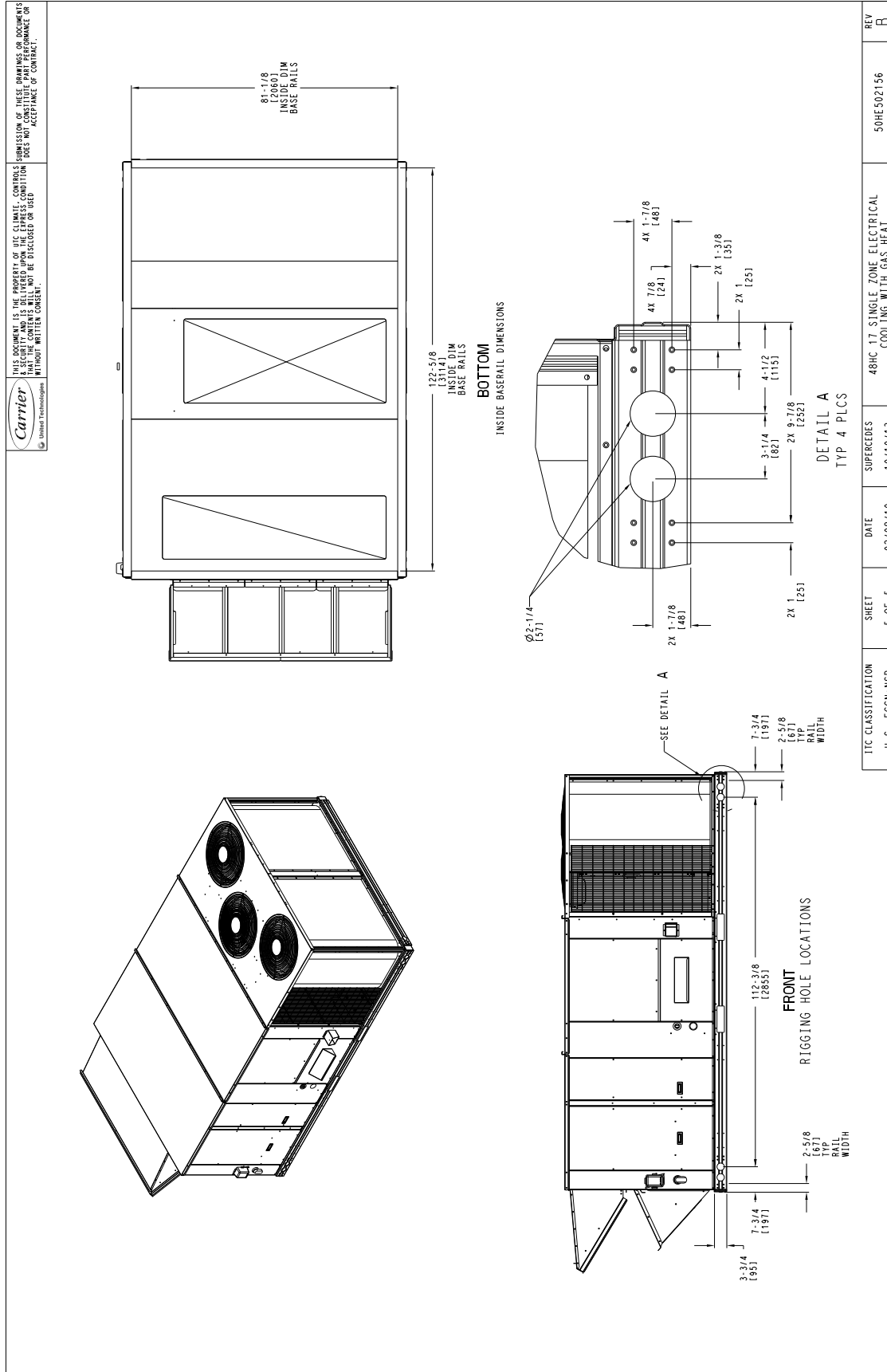
* STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.



- NOTES:
- CLEARANCE ABOVE THE UNIT TO BE 72"
 - FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

CLEARANCE		SERVICE WITH		NON-CONDUCTIVE BARRIER		OPERATING	
SURFACE	FRONT	CONDUCTIVE BARRIER	FRONT	CONDUCTIVE BARRIER	FRONT	CONDUCTIVE BARRIER	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]	
48HC 17 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT		50HE502156		REV		B	
I/T CLASSIFICATION		SHEET		DATE		REV	
U.S. ECCN: NSR		4 OF 5		02/08/19		50HE502156	
				10/19/13			

48HC[®] 17 BOTTOM VIEW



ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	REV
U.S. ECCN: NSR	5 OF 5	02/08/19	10/19/13	B
48HC 17 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT				50H502156

DEDICATED VERTICAL AIRFLOW UNIT

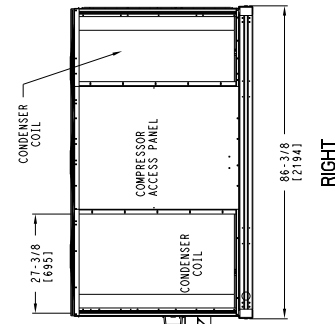
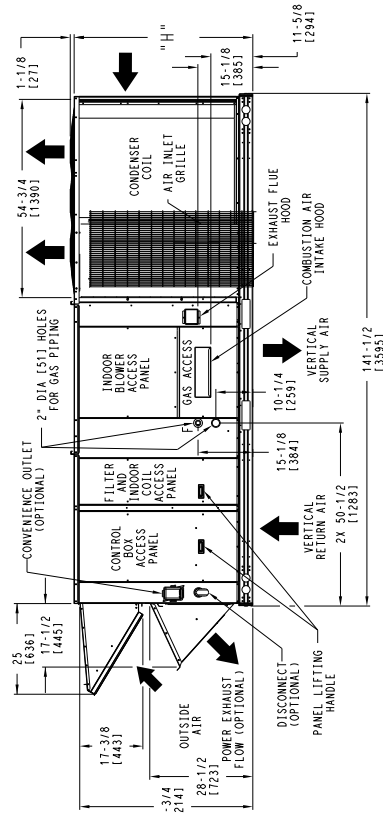
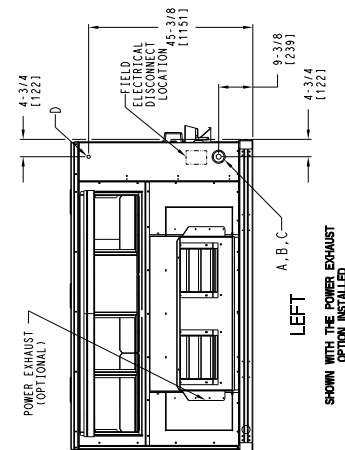
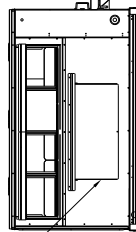
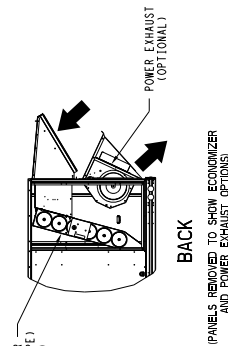
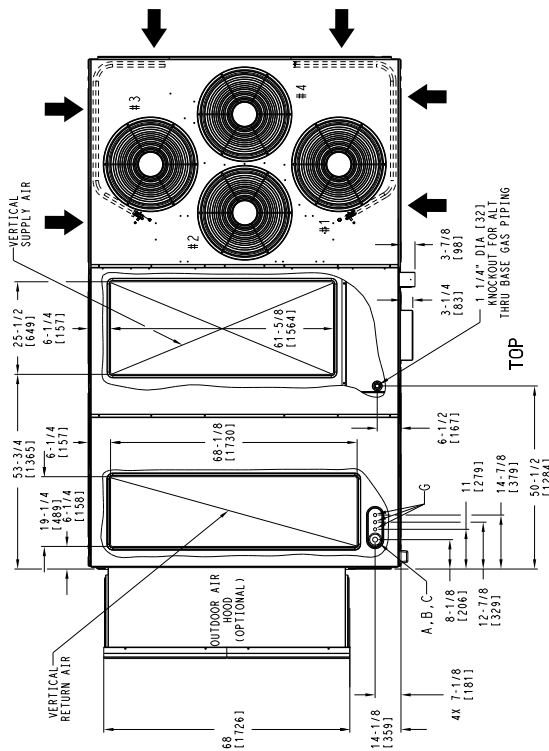
Carrier
United Technologies

	CONNECTION SIZES
A	1 3/8" DIA 1351 FIELD POWER SUPPLY KNOCKOUT
B	3" DIA 1761 FIELD POWER SUPPLY KNOCKOUT
C	3 5/8" DIA 1921 FIELD POWER SUPPLY KNOCKOUT
D	7/8" DIA 1221 FIELD CONTROL WIRING HOLE
F	3/4"-14 NPT GAS CONNECTION (NOT SHOWN)
G	7/8" DIA 1221 FIELD CONTROL WIRING KNOCKOUT

UNIT	H
20 SIZE	49-3/8 [1253]
24 SIZE	57-3/8 [1456]

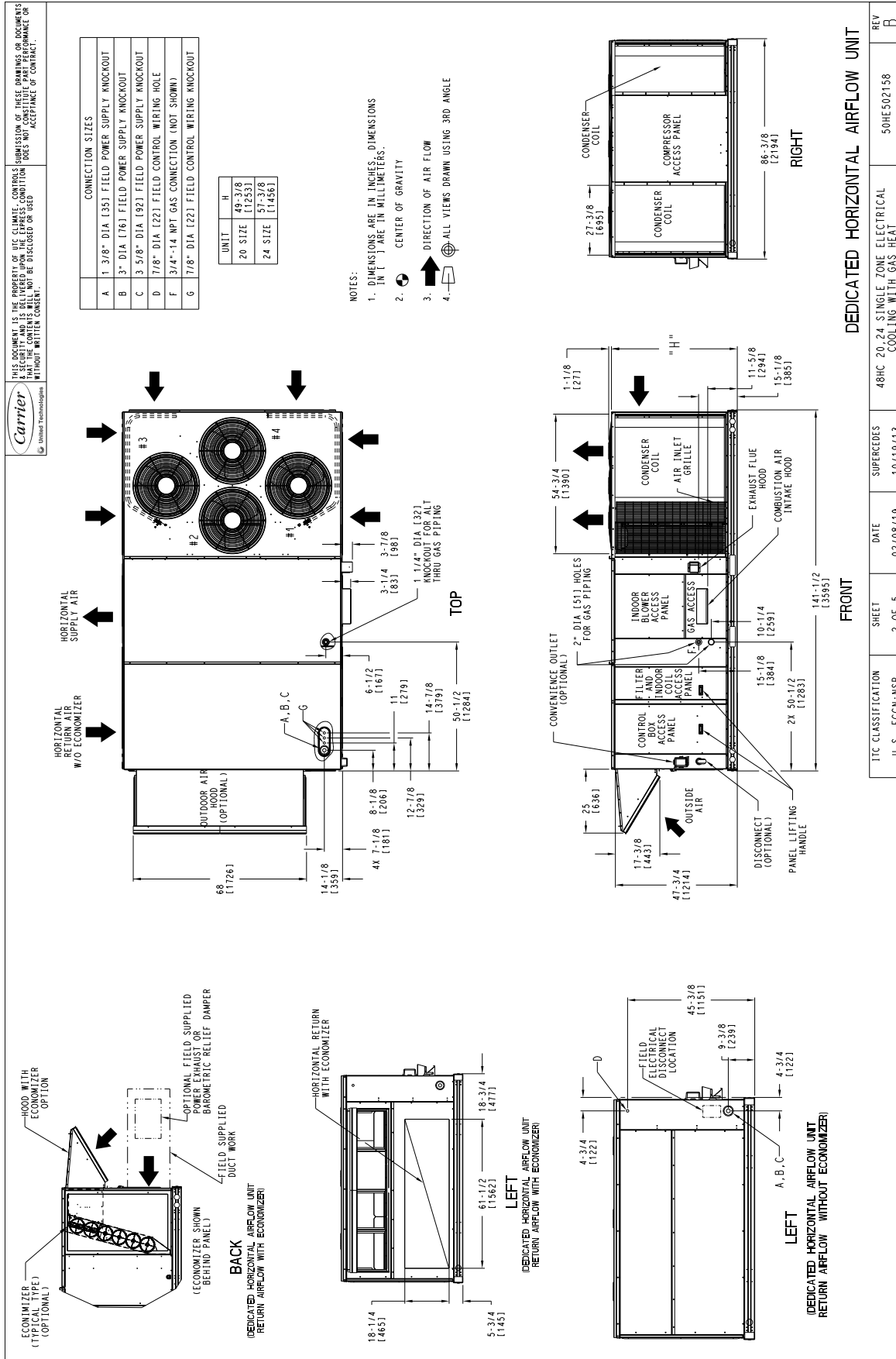
NOTES:

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



ITC CLASSIFICATION	SHEET	DATE	SUPERSEDES	REV
II S EFCM-USD	1 OF 5	02/08/19	48HC 20, 24 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	50HE502158

48HC**20-24 HORIZONTAL AIRFLOW



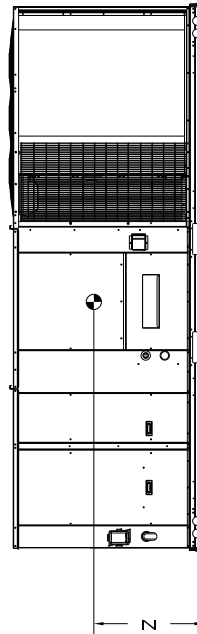
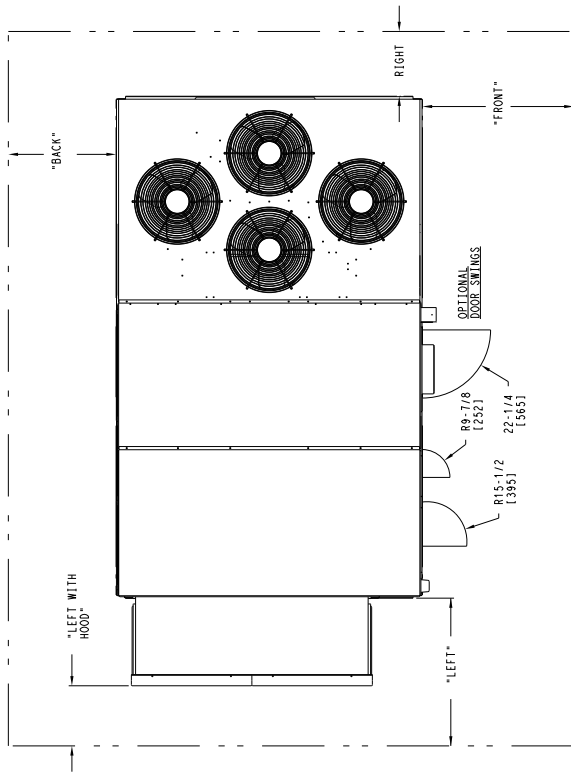
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48HC**20-24 CORNER WEIGHTS AND CLEARANCES

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UNIT	STD. UNIT		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						
48HC20	2102	956	474	215	390	177	593	269	582	265	47	1/2	[1207]	71	1/4	[1810]	16	1/2	[419]
48HC24	2247	1021	540	246	556	253	598	272	581	264	44	5/8	[1133]	71	5/8	[1819]	19		[483]

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



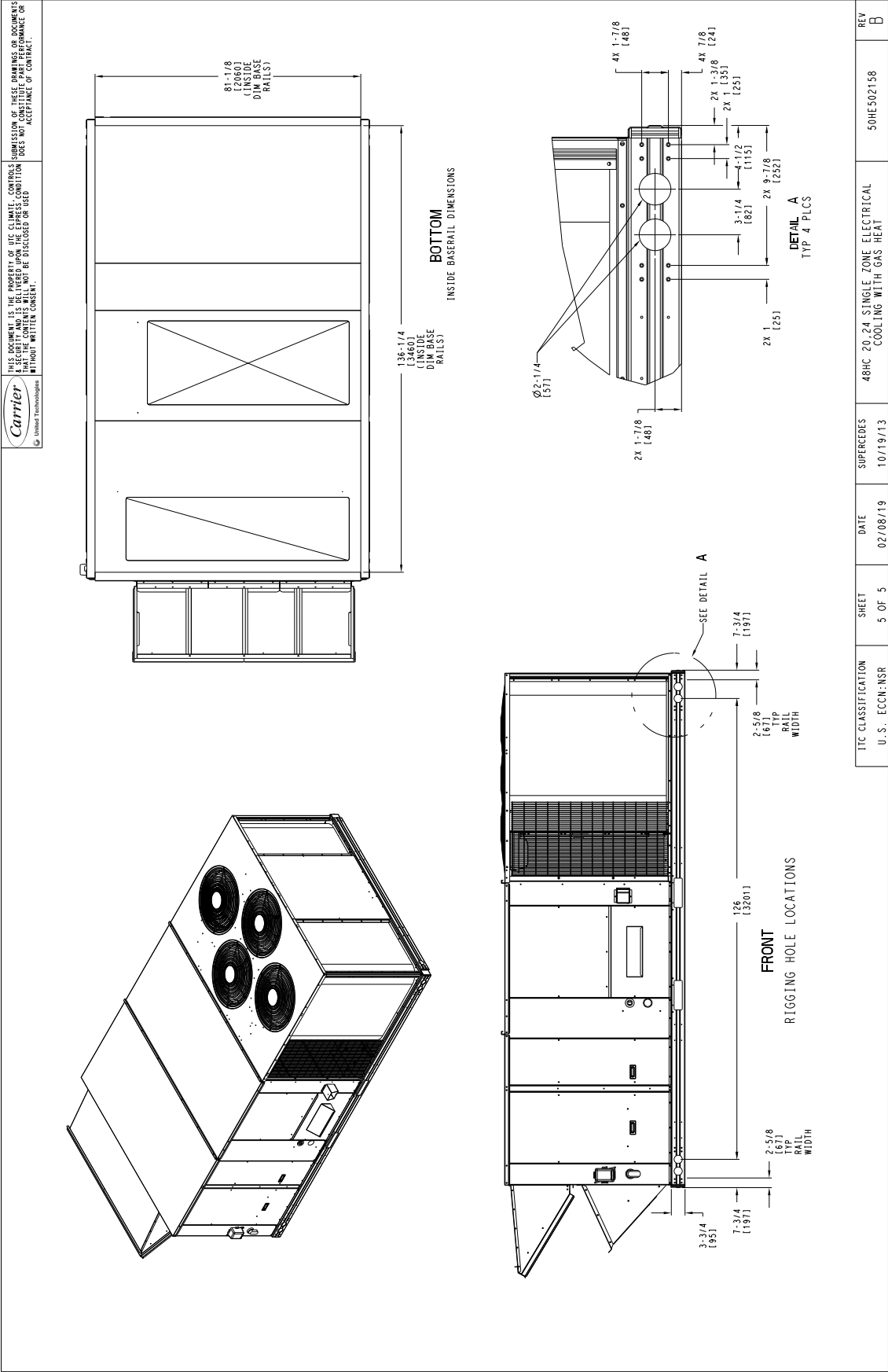
- NOTES:
1. CLEARANCE ABOVE THE UNIT TO BE 72"
 2. FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

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]	
SUPERCEDES		48HC 20, 24 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT		50HE502158		REV B	
ITC CLASSIFICATION		U.S. ECCN: NSR		SHEET 4 OF 5		DATE 02/08/19	

Base unit dimensions (cont)



48HC**20-24 BOTTOM VIEW

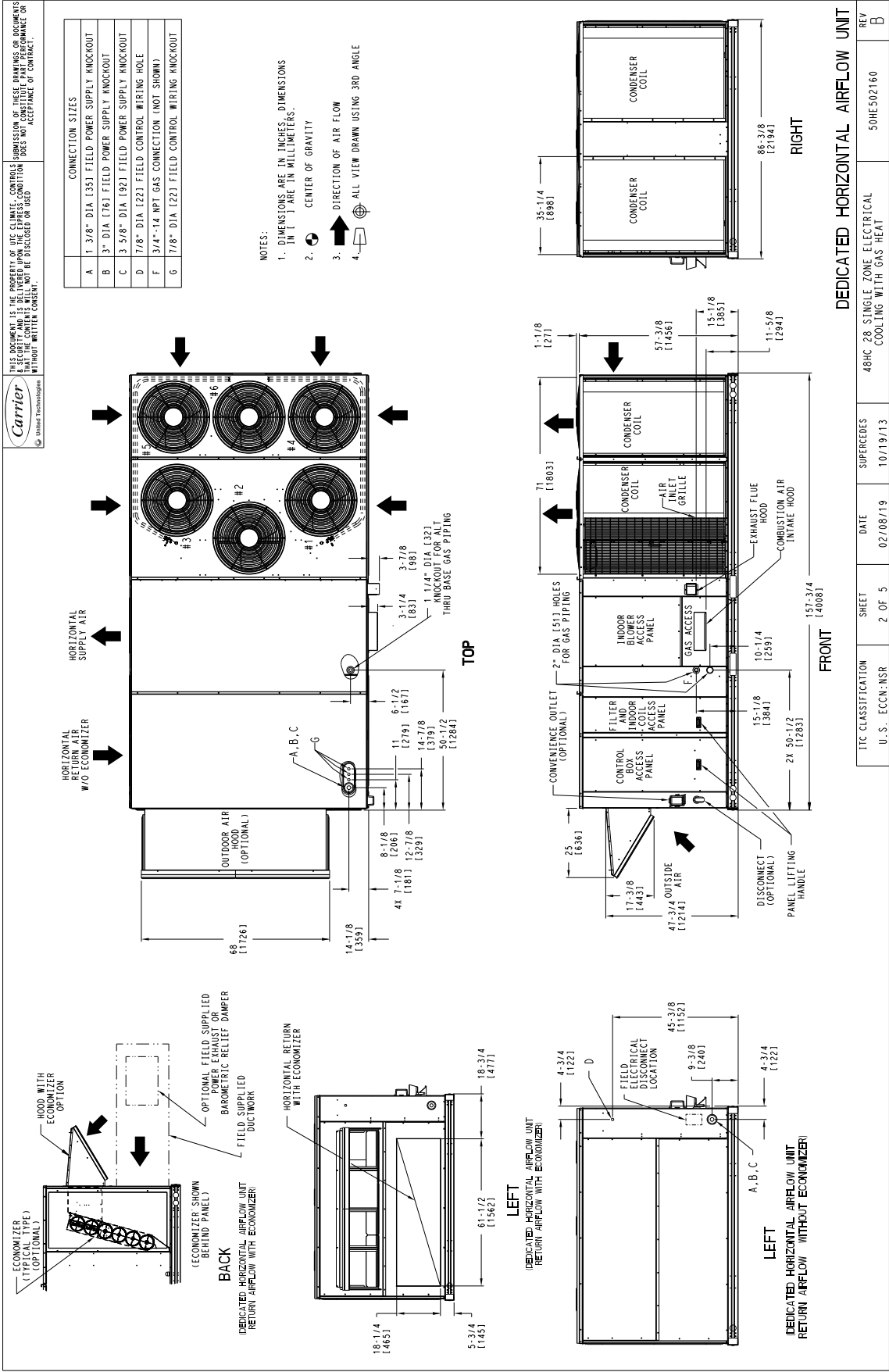


TIC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48HC 20-24 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	REV
U.S. ECCN-NSR	5 OF 5	02/08/19	10/19/13	50HE502158	B

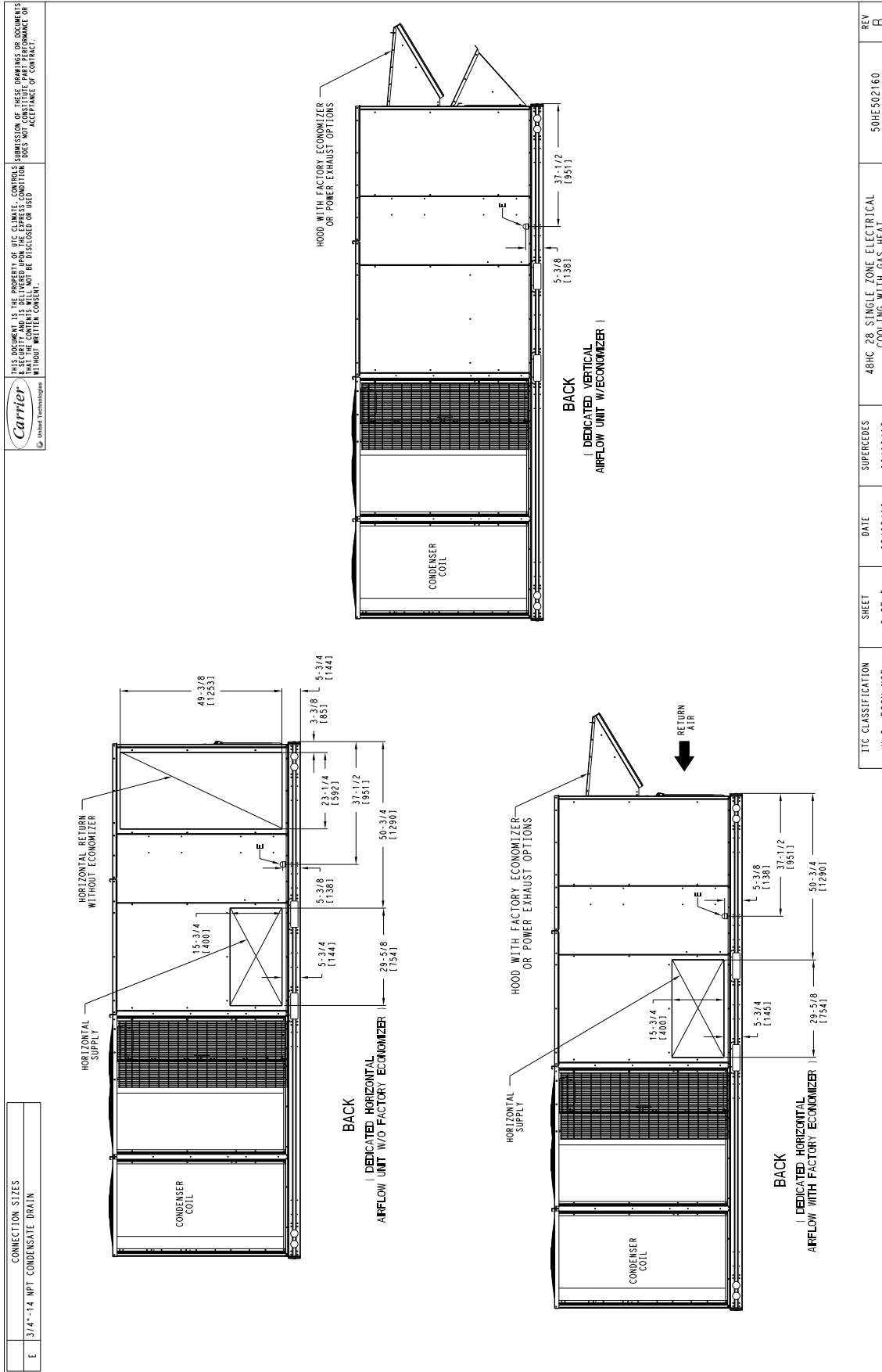




48HC**28 HORIZONTAL AIRFLOW



48HC**28 BACK VIEW AND CONDENSATE DRAIN LOCATION



ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48HC 28 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	REV
U.S. ECCN: NSR	3 OF 5	02/08/19	10/19/13	50HE502160	B

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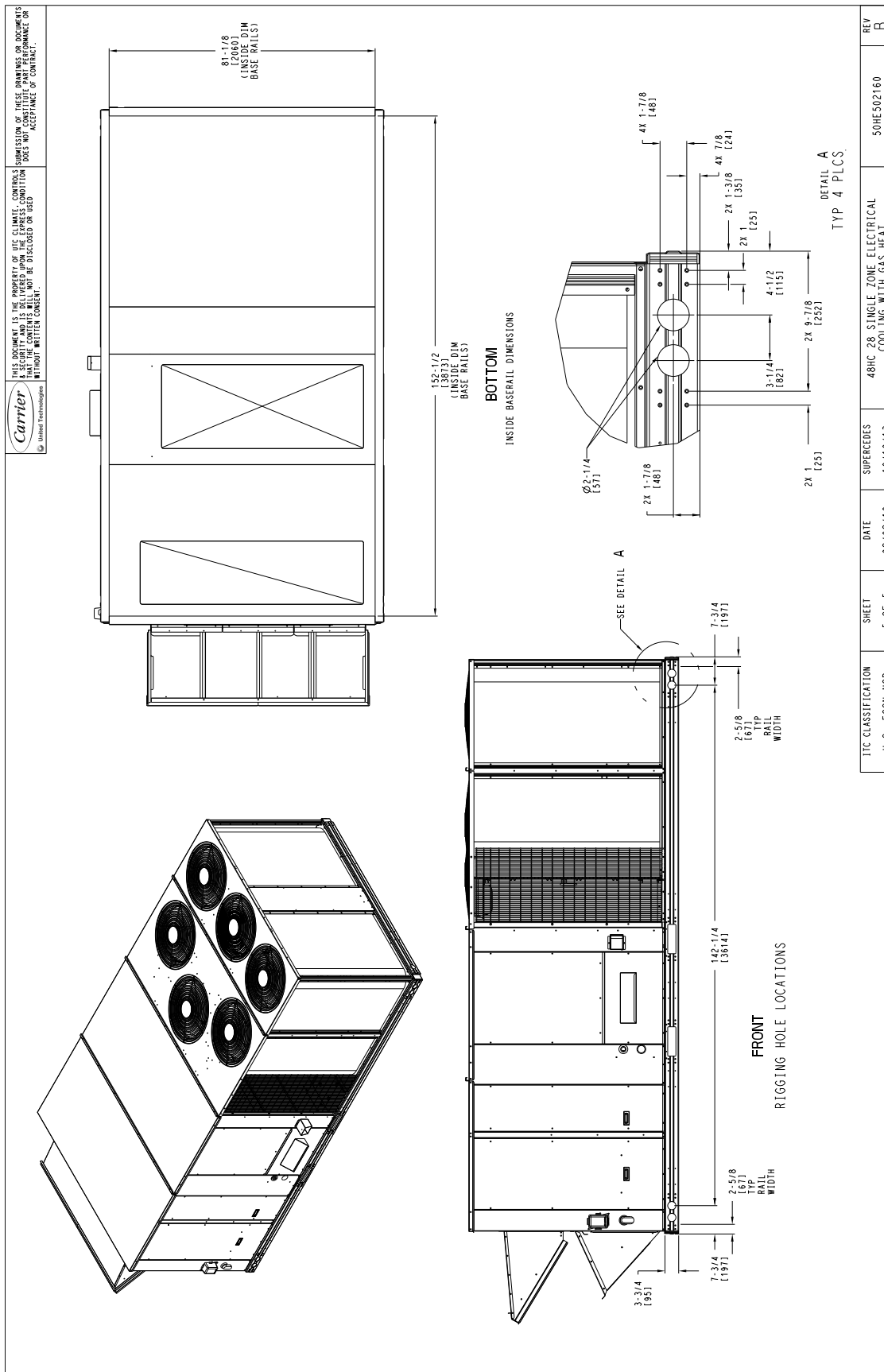
* STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.



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

FRONT

48HC**28 BOTTOM VIEW



ITC CLASSIFICATION	SHEET	DATE	SUPERCEDS	48HC 28 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	REV
U.S. ECCN: NSR	5 OF 5	02/09/19	10/19/13	50HE502160	B

48HC**17 WITH EnergyX SYSTEM CORNER WEIGHTS

UNITED STATES OF AMERICA
 P.O. BOX 4806
 HUNTSVILLE, AL 35894-0006
 CARRIER

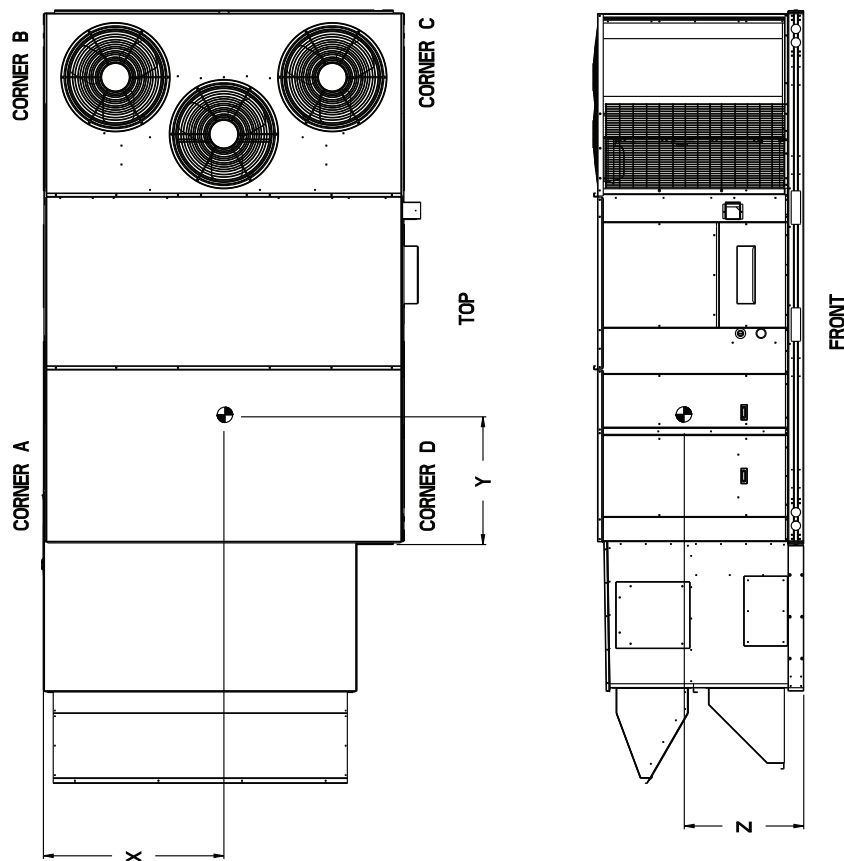
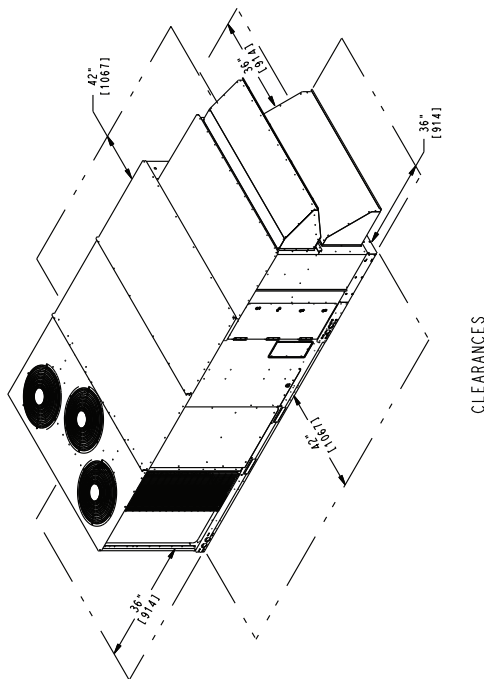
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 DOES NOT CONSTITUTE AN ACCEPTANCE OF CONTRACT.

UNIT	STD UNIT	ERV **	CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C. G.			
			LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z	
48HC17	HIGH CFM	3330	1514	1168	531	225	496	226	1171	532	43 1/8 [1095]	38 [965]	16 1/2 [419]	
48HC17	LOW CFM	2919	1324	954	433	551	250	518	235	896	406	41 7/8 [1063]	47 [1190]	19 1/8 [486]

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

** FOR COMFORT LINK UNITS, ONLY HIGH CFM ERV IS AVAILABLE.

NOTE:
 UNIT IS NOT DESIGNED TO HAVE OVERHEAD OBSTRUCTION. CONTACT
 APPLICATION ENGINEERING FOR GUIDANCE ON ANY APPLICATION
 PLANNING OVERHEAD OBSTRUCTION OF FOR VERTICAL CLEARANCES.

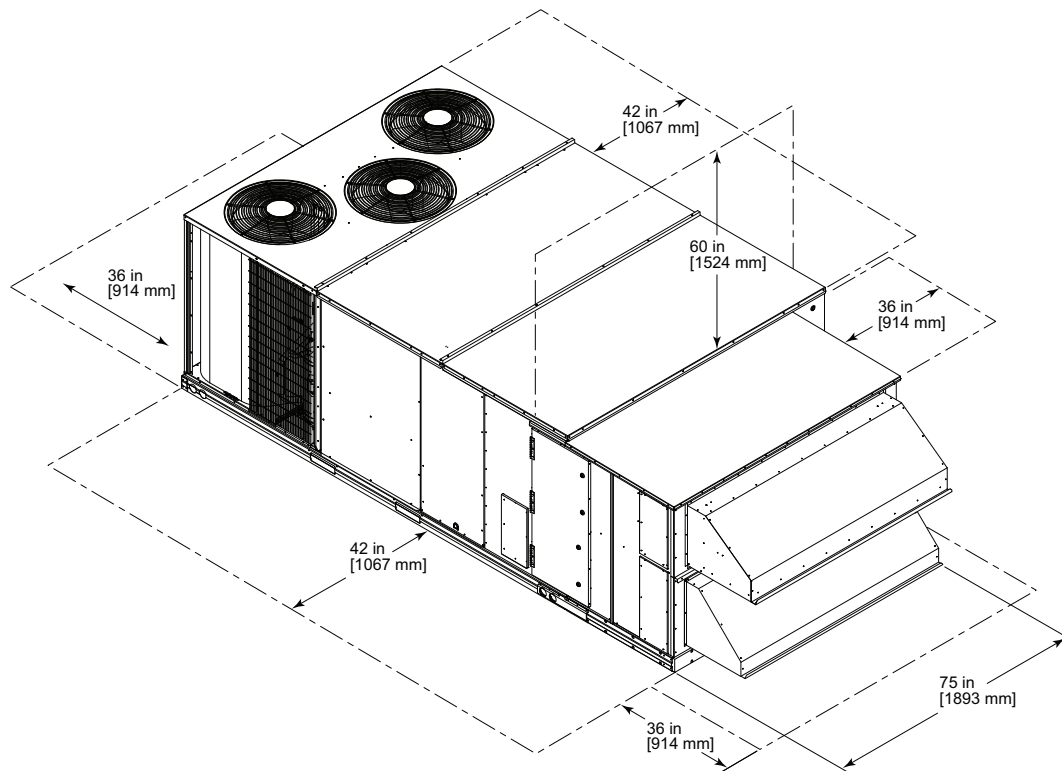


WARNING:
 DO NOT LIFT UNIT THROUGH FORK LIFT OPENINGS IN
 UNIT BASERAIL. PER RIGGING LABEL INSTRUCTIONS,
 UNIT MUST BE LIFTED BY AN OVERHEAD LIFTING DEVICE

SHEET	DATE	SUPERSEDES	REV
2 OF 2	09/30/14	10/19/12	E

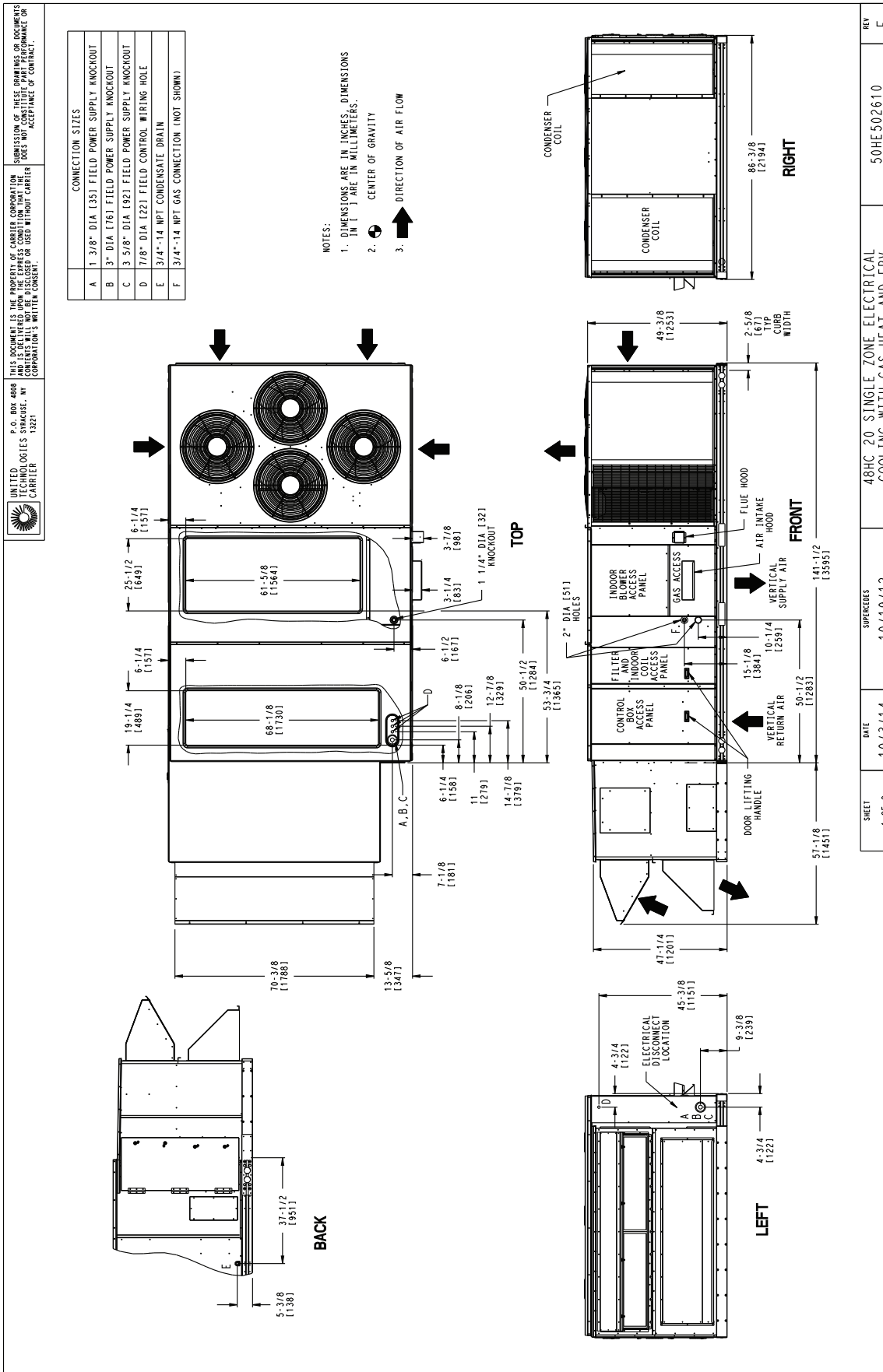
48HC 17 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT AND ERV	50HE502608
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48HC**17 WITH EnergyX SYSTEM SERVICE CLEARANCES



NOTE: Unit is not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

48HC**20 WITH EnergyX SYSTEM DIMENSIONS



SHEET	DATE	SUPERSEDES	REV
1 OF 2	10/3/14	10/19/12	E

48HC 20 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT AND ERV

50HES02610

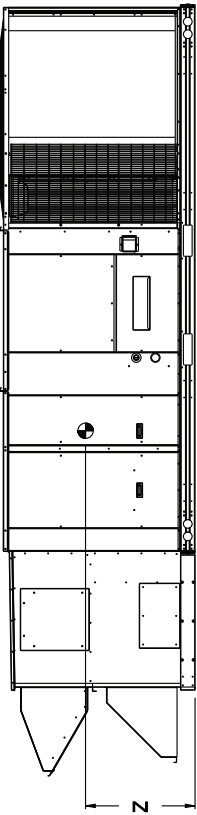
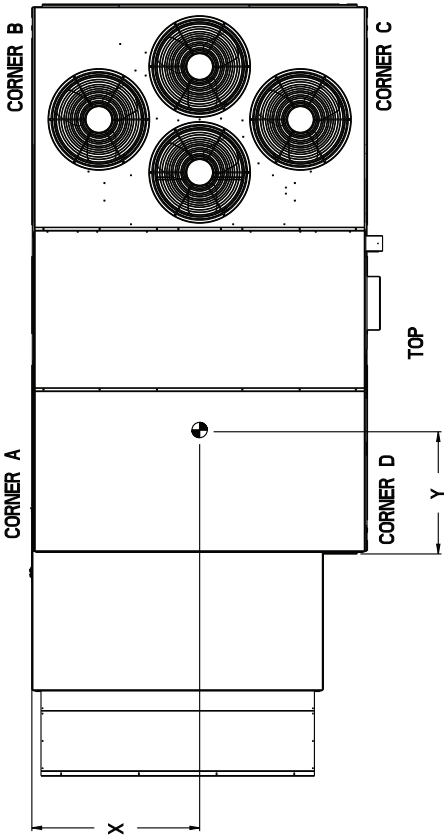


48HC**20 WITH EnergyX SYSTEM CORNER WEIGHTS

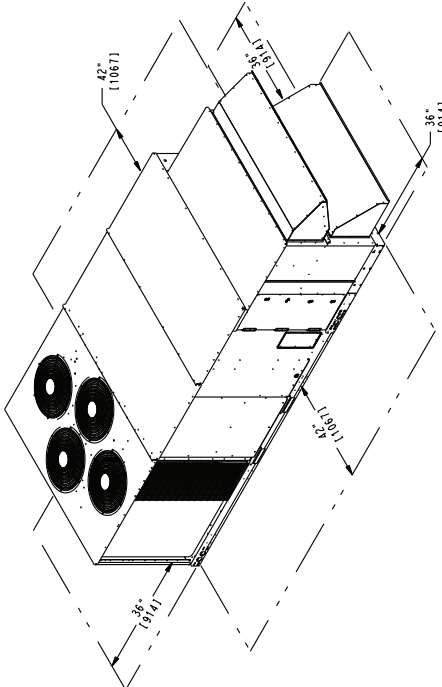
UNITED TECHNOLOGIES STRAUSSE, NY 13271
P.O. BOX 4808
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UNIT	ERV **	STD. UNIT WEIGHT (A) LBS. KG.	CORNER WEIGHT (B) LBS. KG.	CORNER WEIGHT (C) LBS. KG.	CORNER WEIGHT (D) LBS. KG.	C.G.													
48HC20	HIGH CFM	3540	1689	1161	528	449	204	613	279	1146	321	42	3/4	11087	49	[1251]	16	1/2	[1419]
48HC20	LOW CFM	3129	1419	1032	468	318	262	345	247	913	441	41	7/8	11065	50	7/8	11291	19	[482]

• STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
• FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.
• FOR COMFORT LINK UNITS, ONLY HIGH CFM ERV IS AVAILABLE.



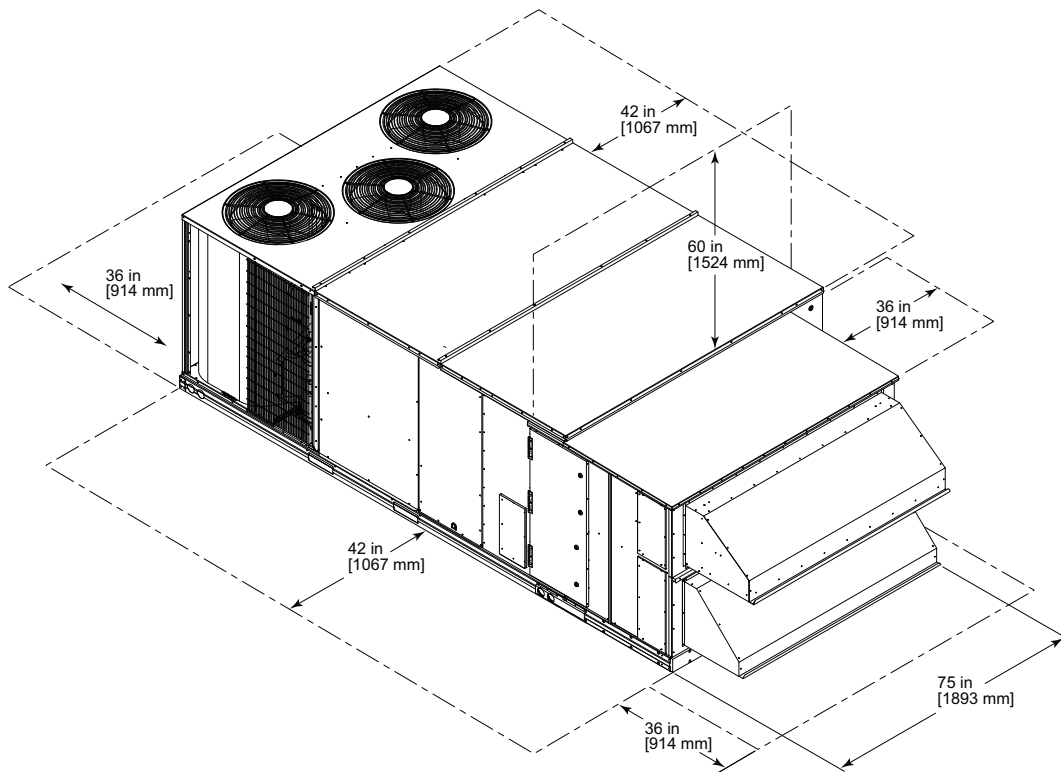
NOTE:
UNIT IS NOT DESIGNED TO HAVE OVERHEAD OBSTRUCTION. CONTACT APPLICATION ENGINEERING FOR GUIDANCE ON ANY APPLICATION PLANNING OVERHEAD OBSTRUCTION OF FOR VERTICAL CLEARANCES.



WARNING:
DO NOT LIFT UNIT THROUGH FORK LIFT OPENINGS IN UNIT BASERAIL PER RIGGING LABEL INSTRUCTIONS. UNIT MUST BE LIFTED BY AN OVERHEAD LIFTING DEVICE

SHEET	DATE	SUPPLIES	48HC 20 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT AND ERV	REV
2 OF 2	10/3/14	10/19/12	50HE502610	E

48HC**20 WITH EnergyX SYSTEM SERVICE CLEARANCES

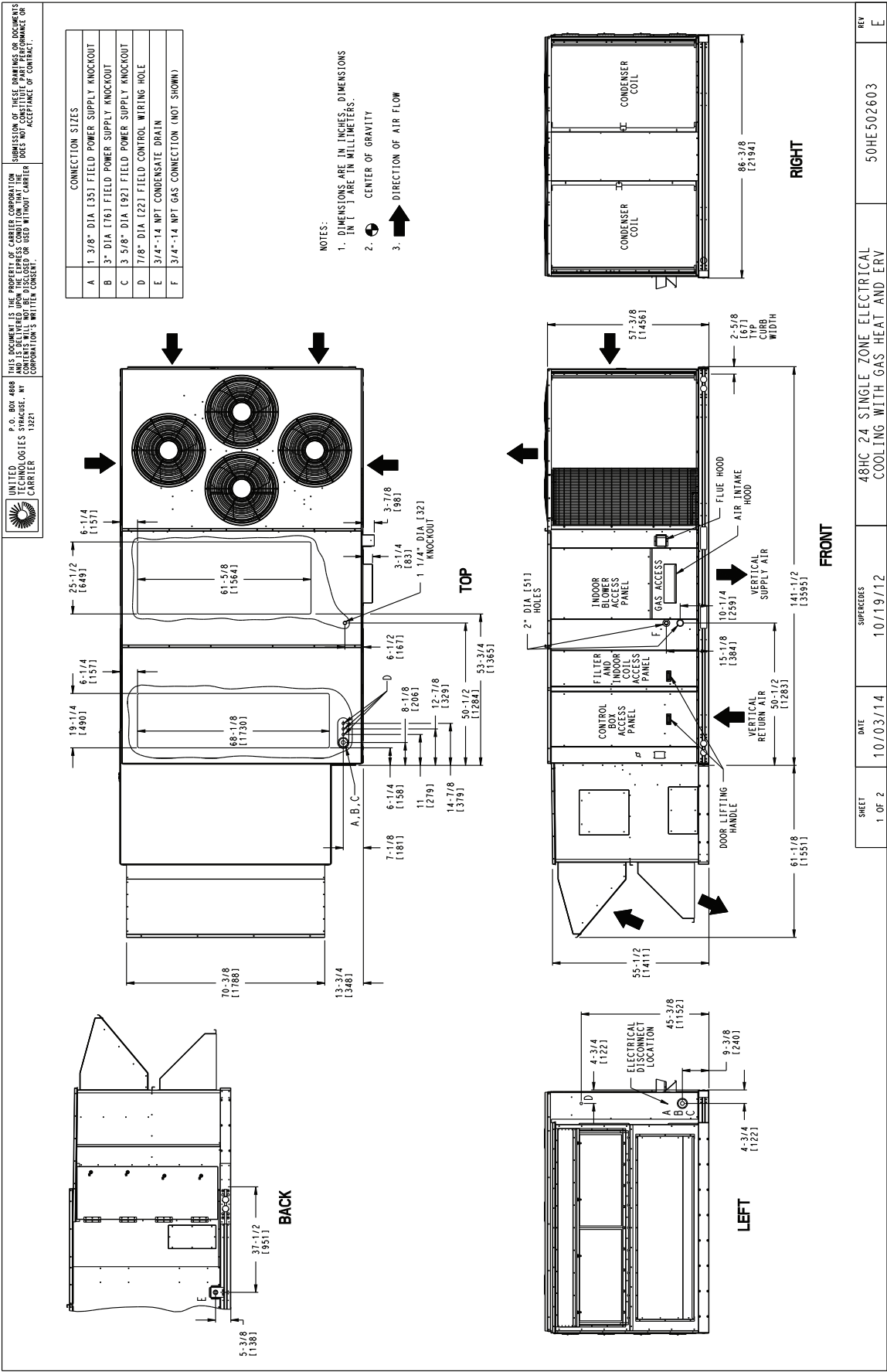


NOTE: Unit is not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

Base unit dimensions (cont)



48HC**24 WITH EnergyX SYSTEM DIMENSIONS



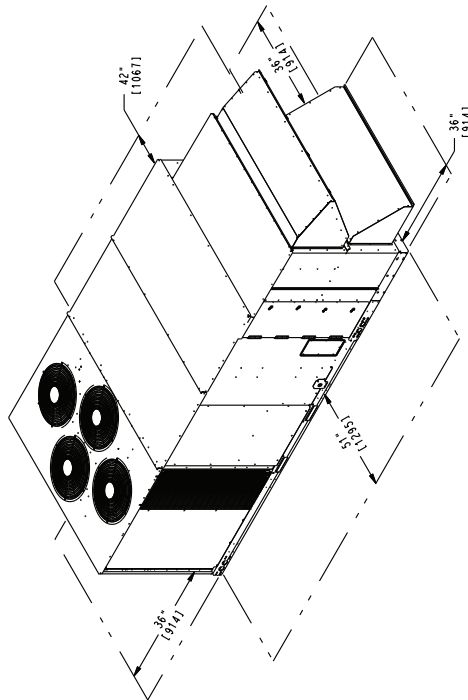
48HC**24 WITH EnergyX SYSTEM CORNER WEIGHTS

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P.O. BOX 4808
13271
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UNIT	ERV **	STD. UNIT LBS.	CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.			
			KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	X	Y	Z	
48HC24	HIGH CFM	3895	1770	1358	617	582	264	586	267	1389	622	43 1/4 [1099]	42 3/8 [1076]	19 [483]
48HC24	LOW CFM	3542	1607	1189	539	633	287	587	266	1103	500	41 5/8 [1056]	49 1/8 [1249]	20 3/4 [529]

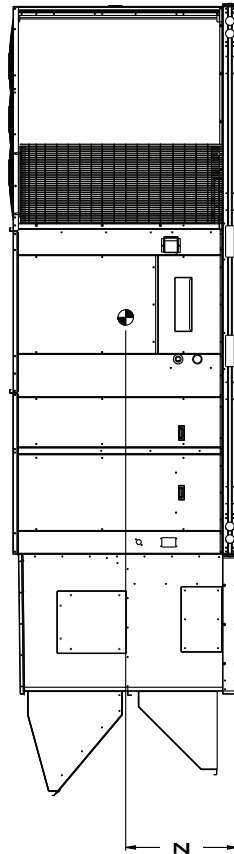
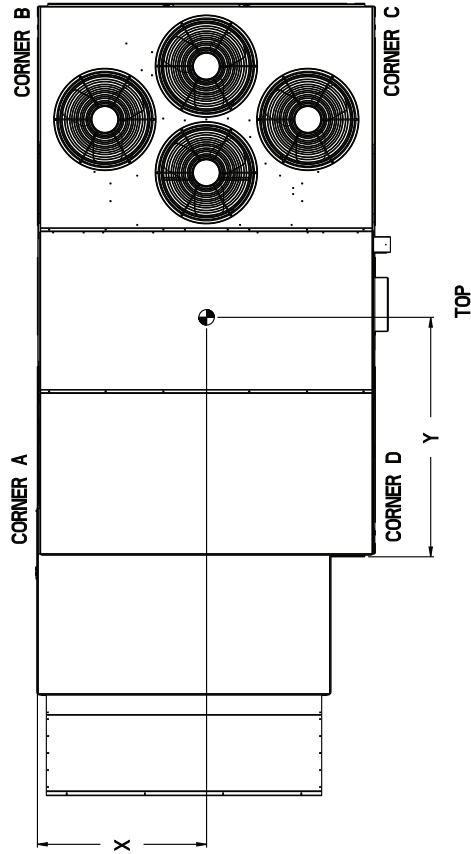
* STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.
** FOR COMFORT LINK UNITS, ONLY HIGH CFM ERV IS AVAILABLE.

NOTE :
UNIT IS NOT DESIGNED TO HAVE OVERHEAD OBSTRUCTION. CONTACT APPLICATION ENGINEERING FOR GUIDANCE ON ANY APPLICATION PLANNING OVERHEAD OBSTRUCTION OF FOR VERTICAL CLEARANCES.



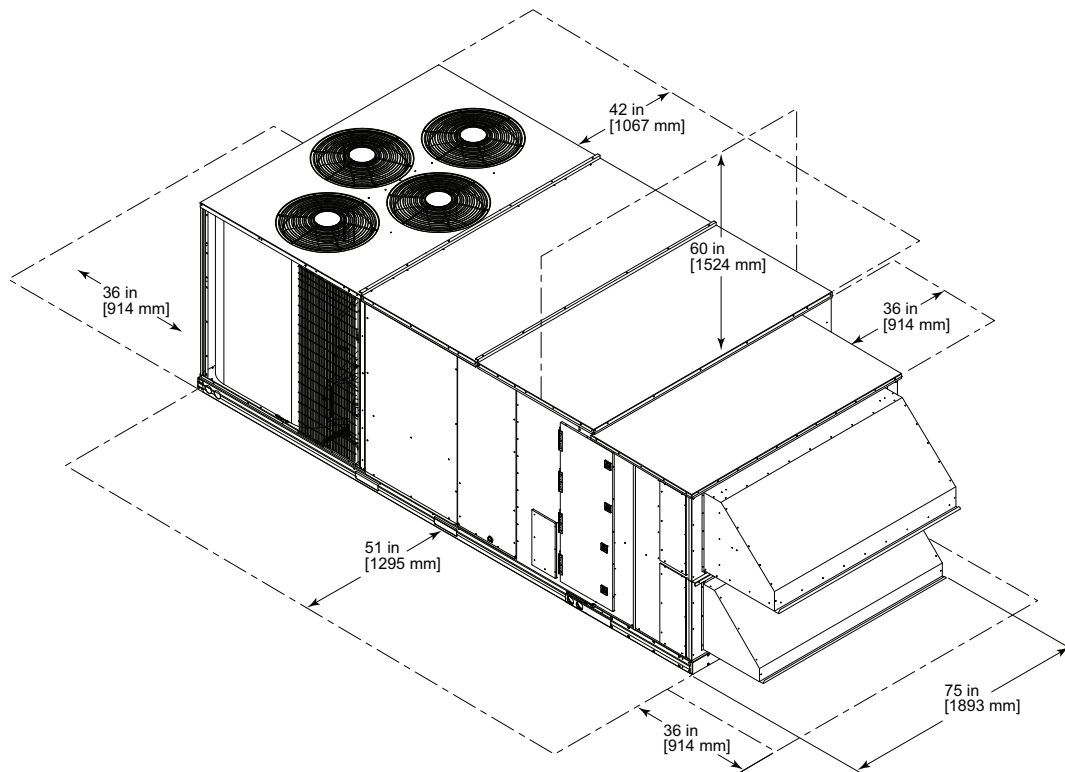
CLEARANCES

WARNING:
DO NOT LIFT UNIT THROUGH FORK LIFT OPENINGS IN UNIT BASERAIL. PER RIGGING LABEL INSTRUCTIONS, UNIT MUST BE LIFTED BY AN OVERHEAD LIFTING DEVICE



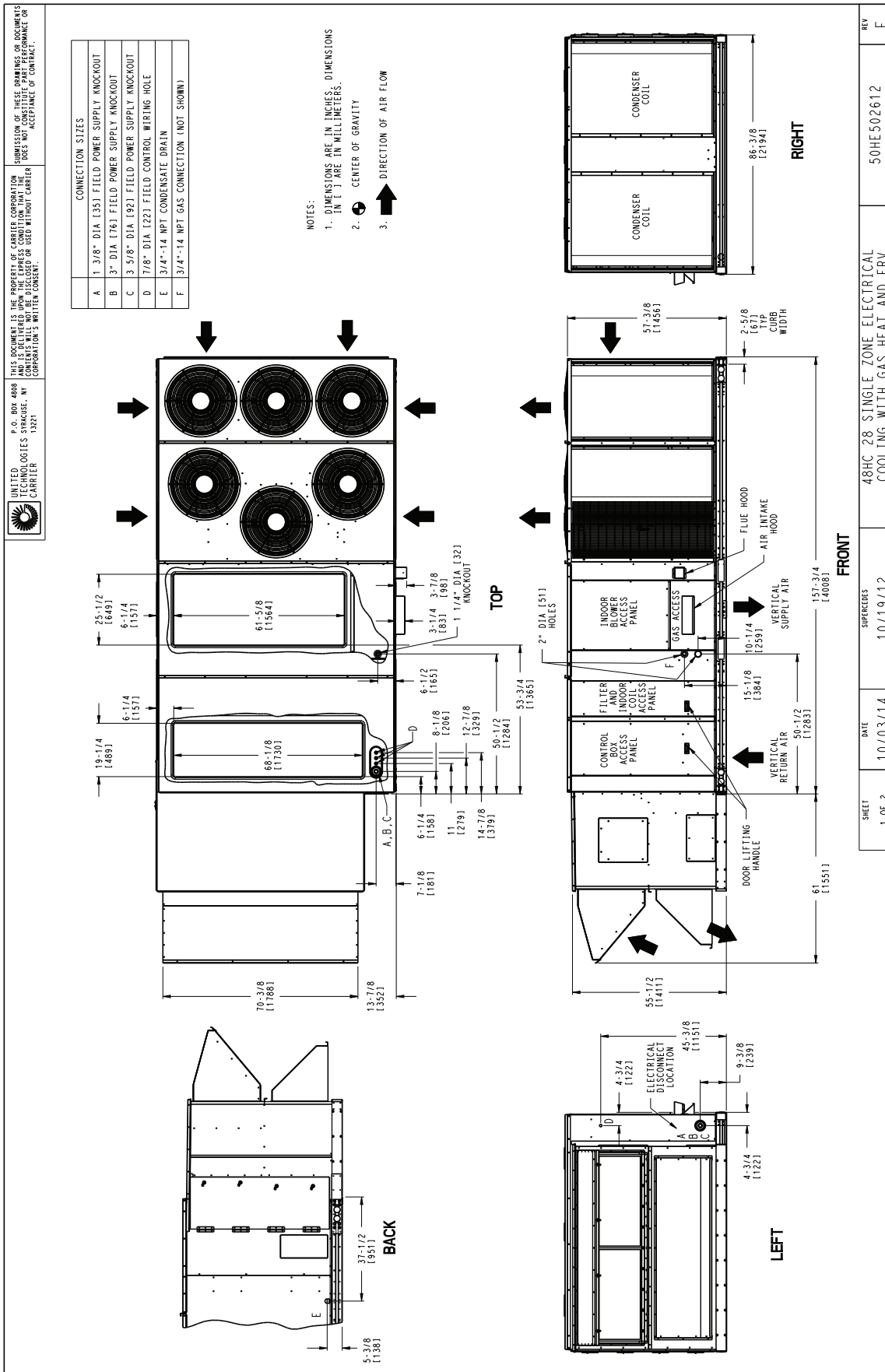
SHEET	DATE	SUPERSEDES	48HC 24 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT AND ERV	REV
2 OF 2	10/03/14	10/19/12	50HE502603	E

48HC**24 WITH EnergyX SYSTEM SERVICE CLEARANCES



NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

48HC**28 WITH EnergyX SYSTEM DIMENSIONS



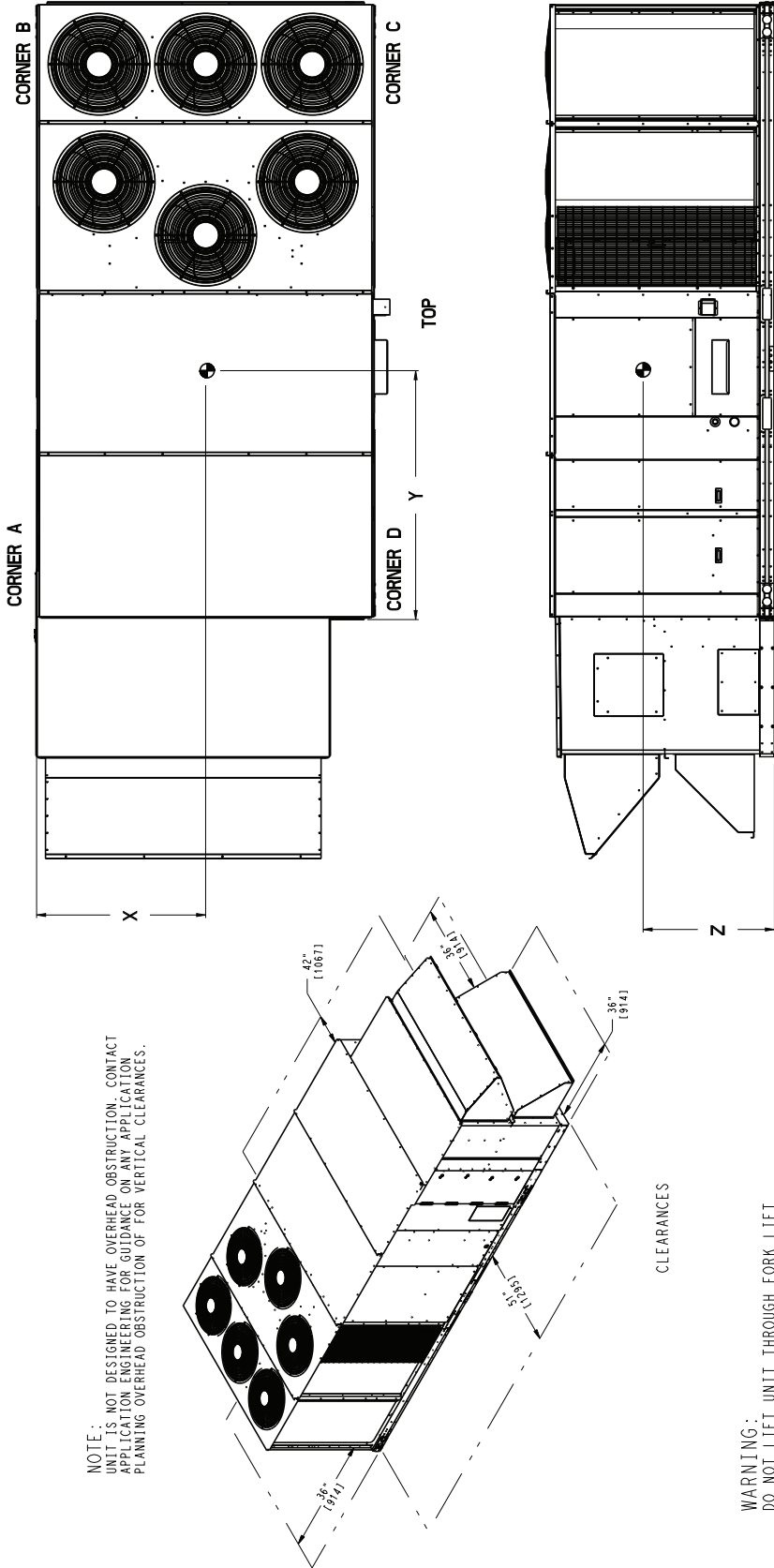


48HC**28 WITH EnergyX SYSTEM CORNER WEIGHTS

UNITED TECHNOLOGIES SPRINGFIELD, MA
P.O. BOX 4808
13221
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SUBMISSION OF THESE PRINTS OR DOCUMENTS CONSTITUTES ACCEPTANCE OF THE TERMS AND CONDITIONS OF CONTRACT.

UNIT	ERV **	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
48HC28	HIGH CFM	3940	1791	1423	647	720	327	603	274	1194	543	39 1/4 [998]	52 7/8 [1344]	19 [483]
48HC28	LOW CFM	3488	1582	1272	577	633	287	526	238	1057	479	39 1/4 [995]	52 3/8 [1331]	22 3/8 [569]

* STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT AND WITHOUT PACKAGING.
FOR OTHER OPTIONS AND ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.
** FOR COMFORT LINK UNITS, ONLY HIGH CFM ERV IS AVAILABLE.

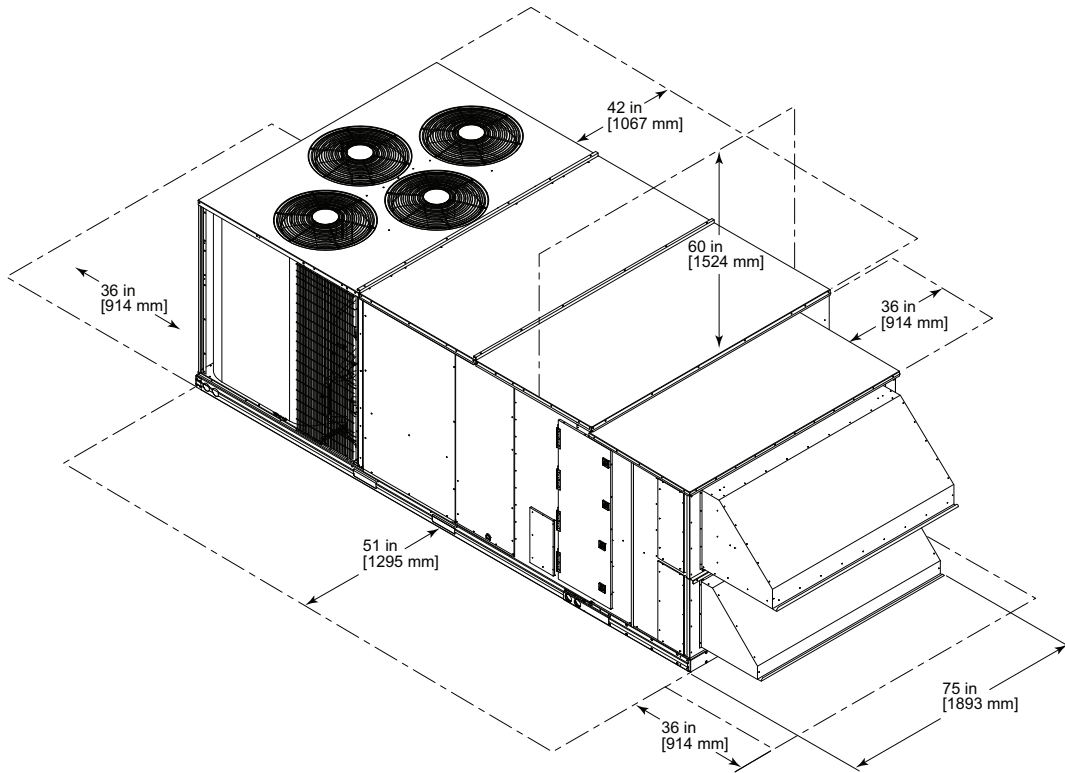


WARNING:
DO NOT LIFT UNIT THROUGH FORK LIFT
OPENINGS IN UNIT BASE RAIL. PER RIGGING
LABEL INSTRUCTIONS, UNIT MUST BE
LIFTED BY AN OVERHEAD LIFTING DEVICE

SHEET	DATE	SUPP/REV	REV
2 OF 2	10/03/14	10/19/12	F

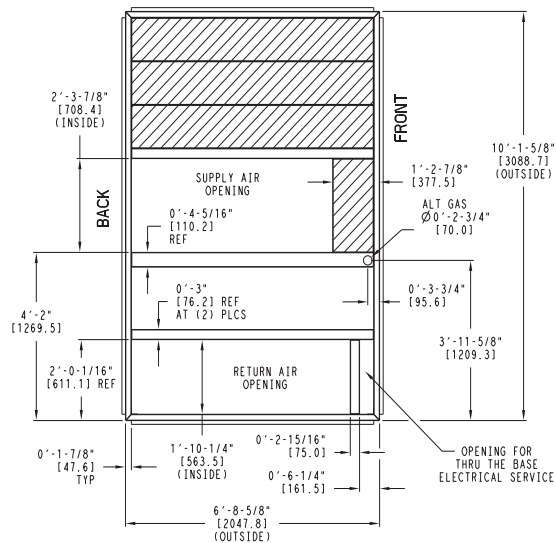
48HC 28 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT AND ERV	50HE502612
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48HC**28 WITH EnergyX SYSTEM SERVICE CLEARANCES



NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

48HC**17 — ROOF CURB DIMENSIONS

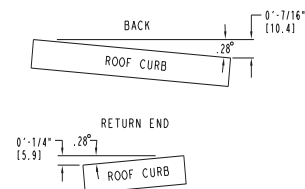


UNIT SIZE	"A"	ROOF CURB ACCESSORY
17	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB045A00 CRRFCURB046A00

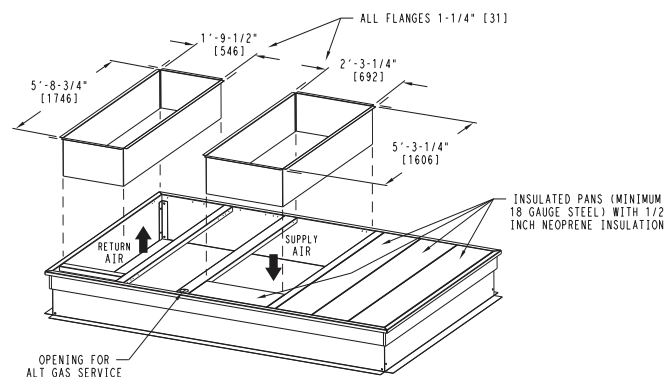
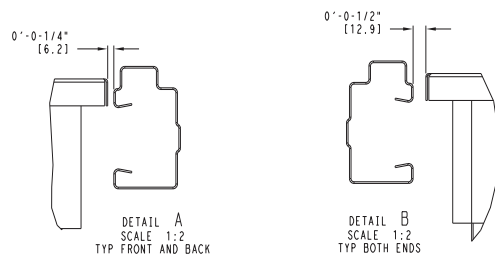
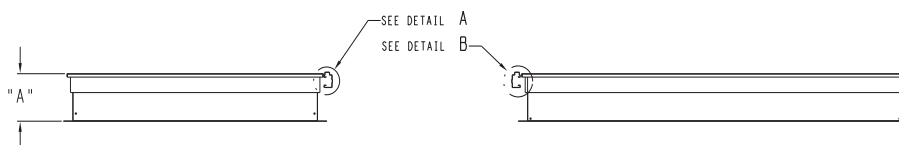
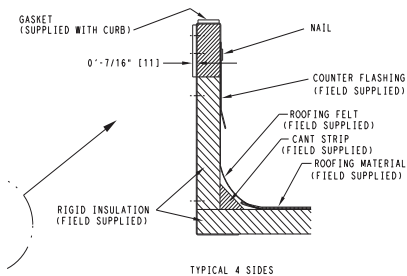
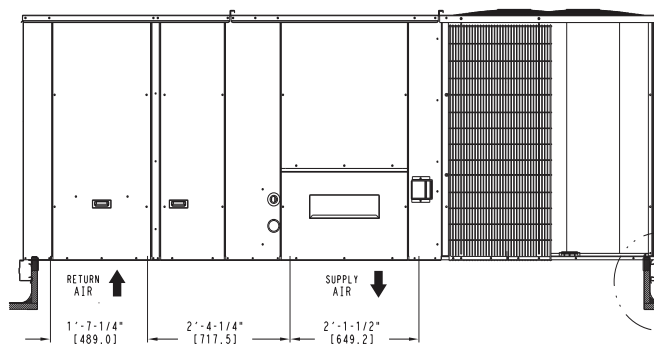
NOTES:

- 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

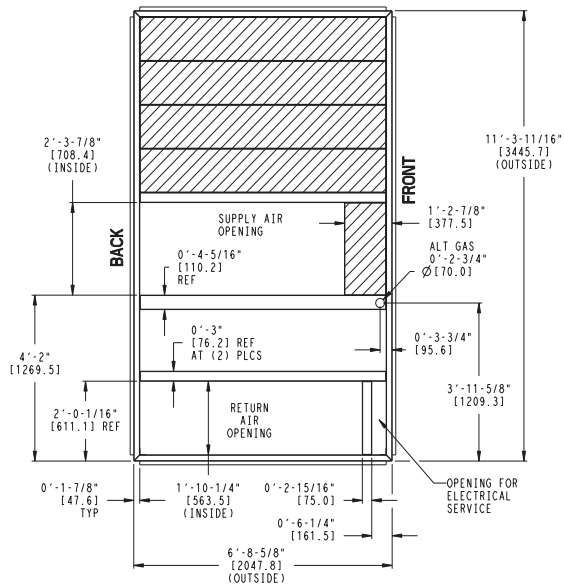
➔ DIRECTION OF AIR FLOW



MAX CURB LEVELING TOLERANCES



48HC**20, 24 — ROOF CURB DIMENSIONS

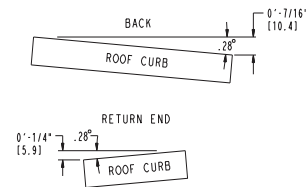


UNIT SIZE	"A"	ROOF CURB ACCESSORY
20, 24	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB047A00 CRRFCURB048A00

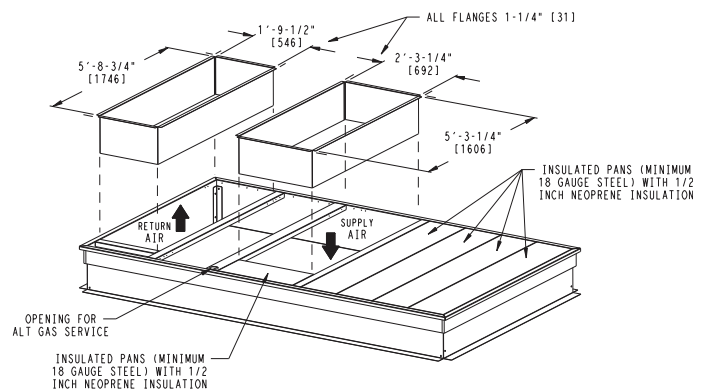
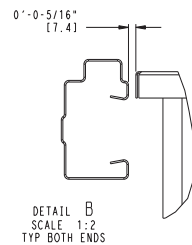
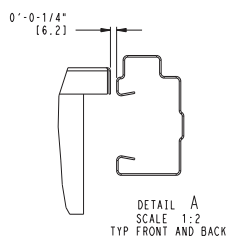
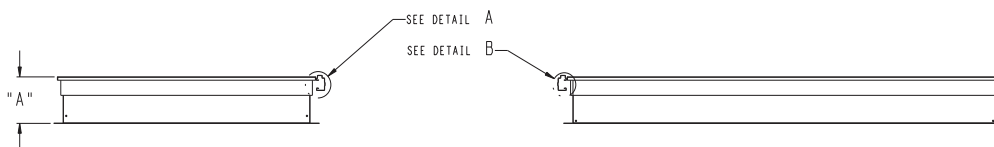
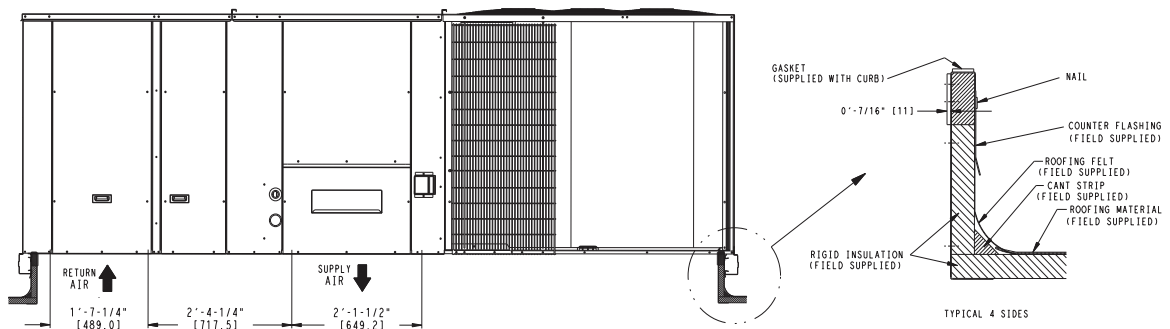
NOTES:

- 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



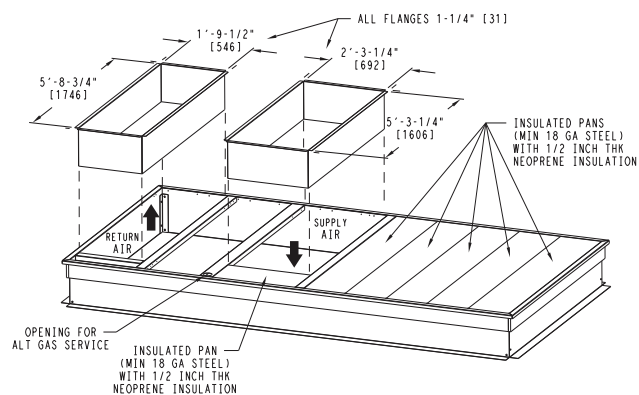
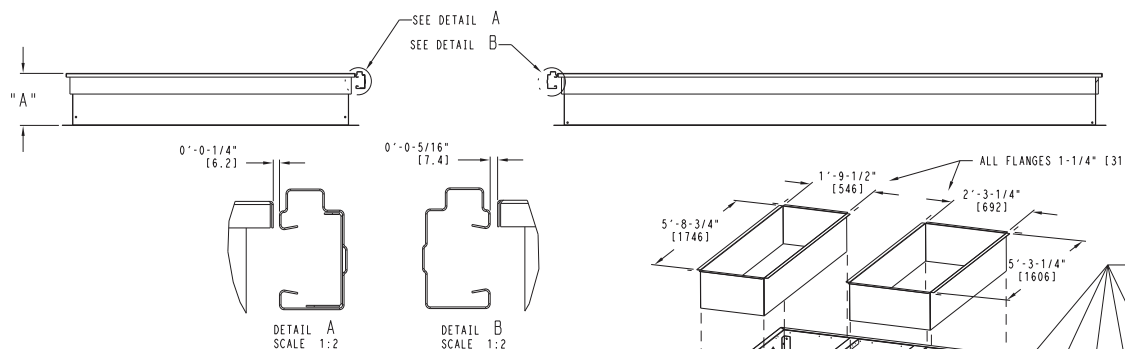
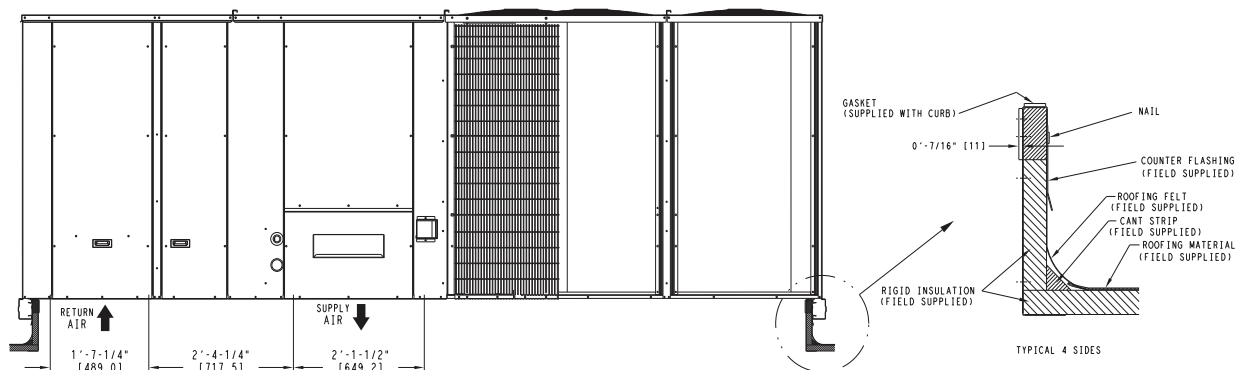
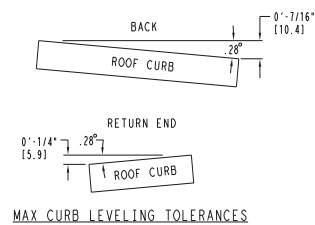
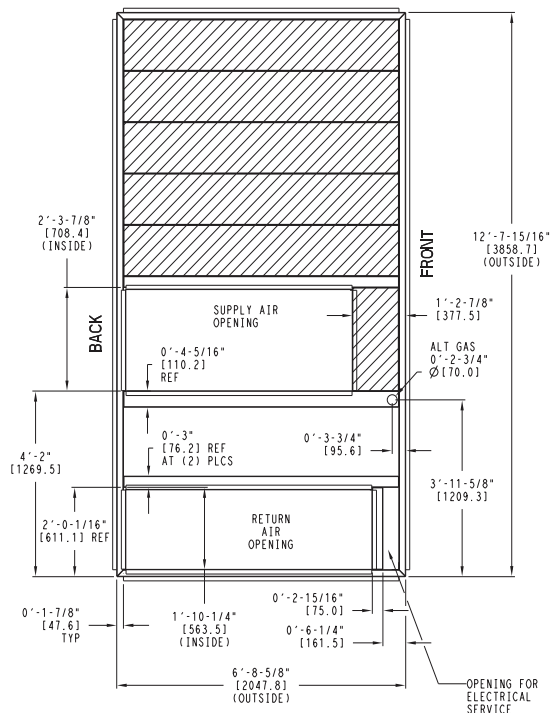
MAX CURB LEVELING TOLERANCES



48HC**28 — ROOF CURB DIMENSIONS

UNIT SIZE	"A"	ROOF CURB ACCESSORY
28	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB049A00 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
 - 7 GAS SERVICE PLATE IS PART OF A SEPARATELY SHIPPED ACCESSORY PACKAGE.
 - 8 GAS SERVICE PLATE CAN BE USED WITH EITHER ACCESSORY ROOF CURB.
- ➔ DIRECTION OF AIR FLOW



48HC*D17 — 15 TON — COOLING CAPACITIES

48HC17				AMBIENT TEMPERATURE (F)														
				85					95					105				
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
4500 Cfm	EAT (wb)	58	THC	158.3	158.3	179.2	152.6	152.6	172.9	146.6	146.6	166.1	140.2	140.2	158.8	133.2	133.2	150.8
			SHC	137.3	158.3	179.2	132.4	152.6	172.9	127.2	146.6	166.1	121.6	140.2	158.8	115.5	133.2	150.8
		62	THC	166.8	166.8	169.0	159.5	159.5	165.6	151.8	151.8	161.9	143.6	143.6	157.9	134.9	134.9	153.4
			SHC	123.1	146.1	169.0	119.7	142.6	165.6	116.1	139.0	161.9	112.3	135.1	157.9	108.2	130.8	153.4
		67	THC	182.9	182.9	182.9	174.9	174.9	174.9	166.3	166.3	166.3	157.2	157.2	157.2	147.6	147.6	147.6
			SHC	100.0	123.1	146.1	96.7	119.8	142.8	93.2	116.3	139.4	89.7	112.7	135.7	85.9	108.9	131.9
		72	THC	200.5	200.5	200.5	191.6	191.6	191.6	182.2	182.2	182.2	172.2	172.2	172.2	161.7	161.7	161.7
			SHC	76.1	99.5	122.8	72.9	96.2	119.5	69.5	92.8	116.1	66.0	89.3	112.5	62.4	85.6	108.8
		76	THC	—	215.4	215.4	—	205.8	205.8	—	195.6	195.6	—	184.8	184.8	—	173.6	173.6
			SHC	—	80.2	105.0	—	77.1	101.7	—	73.7	98.2	—	70.2	94.5	—	66.7	90.7
5250 Cfm	EAT (wb)	58	THC	166.7	166.7	188.8	160.6	160.6	181.9	154.0	154.0	174.4	147.0	147.0	166.5	139.5	139.5	157.9
			SHC	144.6	166.7	188.8	139.3	160.6	181.9	133.6	154.0	174.4	127.6	147.0	166.5	121.0	139.5	157.9
		62	THC	172.0	172.0	185.1	164.3	164.3	181.2	156.3	156.3	177.0	147.8	147.8	172.4	139.6	139.6	164.3
			SHC	132.5	158.8	185.1	128.9	155.1	181.2	125.0	151.0	177.0	120.9	146.6	172.4	114.9	139.6	164.3
		67	THC	188.3	188.3	188.3	179.7	179.7	179.7	170.7	170.7	170.7	161.0	161.0	161.0	150.9	150.9	150.9
			SHC	106.1	132.7	159.3	102.8	129.3	155.9	99.3	125.8	152.4	95.6	122.1	148.6	91.7	118.2	144.7
		72	THC	206.1	206.1	206.1	196.7	196.7	196.7	186.7	186.7	186.7	176.2	176.2	176.2	165.3	165.3	165.3
			SHC	78.8	105.6	132.5	75.5	102.3	129.1	72.1	98.8	125.6	68.5	95.2	121.9	64.8	91.4	118.0
		76	THC	—	221.2	221.2	—	211.0	211.0	—	200.3	200.3	—	189.0	189.0	—	177.2	177.2
			SHC	—	83.6	111.7	—	80.3	108.2	—	76.9	104.6	—	73.3	100.9	—	69.7	97.1
6000 Cfm	EAT (wb)	58	THC	173.8	173.8	196.8	167.2	167.2	189.4	160.2	160.2	181.4	152.7	152.7	173.0	144.7	144.7	163.8
			SHC	150.8	173.8	196.8	145.1	167.2	189.4	139.0	160.2	181.4	132.5	152.7	173.0	125.5	144.7	163.8
		62	THC	176.3	176.3	199.5	168.5	168.5	194.9	160.5	160.5	188.9	152.9	152.9	179.9	144.8	144.8	170.4
			SHC	140.9	170.2	199.5	136.9	165.9	194.9	132.1	160.5	188.9	125.8	152.9	179.9	119.2	144.8	170.4
		67	THC	192.3	192.3	192.3	183.4	183.4	183.4	173.9	173.9	173.9	164.0	164.0	164.0	153.4	153.4	156.9
			SHC	112.0	142.0	172.0	108.5	138.5	168.5	104.9	134.9	164.8	101.2	131.1	161.0	97.2	127.1	156.9
		72	THC	210.4	210.4	210.4	200.6	200.6	200.6	190.2	190.2	190.2	179.3	179.3	179.3	167.9	167.9	167.9
			SHC	81.2	111.4	141.7	77.9	108.0	138.2	74.4	104.5	134.6	70.7	100.8	130.8	67.0	96.9	126.9
		76	THC	—	225.6	225.6	—	215.0	215.0	—	203.8	203.8	—	192.1	192.1	—	180.0	180.0
			SHC	—	86.7	117.9	—	83.3	114.5	—	79.9	110.8	—	76.3	107.1	—	72.6	103.2
6750 Cfm	EAT (wb)	58	THC	179.8	179.8	203.7	172.9	172.9	195.8	165.5	165.5	187.4	157.5	157.5	178.4	149.0	149.0	168.8
			SHC	156.0	179.8	203.7	150.0	172.9	195.8	143.5	165.5	187.4	136.7	157.5	178.4	129.3	149.0	168.8
		62	THC	180.5	180.5	210.7	173.0	173.0	203.6	165.6	165.6	194.9	157.7	157.7	185.5	149.1	149.1	175.5
			SHC	147.6	179.2	210.7	142.4	173.0	203.6	136.3	165.6	194.9	129.8	157.7	185.5	122.8	149.1	175.5
		67	THC	195.6	195.6	195.6	186.2	186.2	186.2	176.5	176.5	176.8	166.2	166.2	172.7	155.4	155.4	168.4
			SHC	117.5	150.8	184.1	114.0	147.3	180.5	110.4	143.6	176.8	106.5	139.6	172.7	102.4	135.4	168.4
		72	THC	213.8	213.8	213.8	203.6	203.6	203.6	192.9	192.9	192.9	181.6	181.6	181.6	169.9	169.9	169.9
			SHC	83.5	117.0	150.5	80.1	113.5	147.0	76.5	109.9	143.3	72.8	106.1	139.4	69.1	102.3	135.5
		76	THC	—	229.1	229.1	—	218.1	218.1	—	206.6	206.6	—	194.6	194.6	—	182.1	182.1
			SHC	—	89.6	124.0	—	86.2	120.5	—	82.7	116.8	—	79.0	113.0	—	75.2	109.0
7500 Cfm	EAT (wb)	58	THC	185.1	185.1	209.6	177.7	177.7	201.3	170.0	170.0	192.5	161.6	161.6	183.0	152.8	152.8	173.0
			SHC	160.6	185.1	209.6	154.2	177.7	201.3	147.5	170.0	192.5	140.2	161.6	183.0	132.5	152.8	173.0
		62	THC	185.2	185.2	218.0	177.9	177.9	209.3	170.1	170.1	200.2	161.8	161.8	190.4	152.9	152.9	179.9
			SHC	152.5	185.2	218.0	146.4	177.9	209.3	140.0	170.1	200.2	133.2	161.8	190.4	125.8	152.9	179.9
		67	THC	198.1	198.1	198.1	188.6	188.6	192.1	178.6	178.6	188.1	168.1	168.1	183.8	157.2	157.2	179.1
			SHC	122.8	159.3	195.9	119.2	155.7	192.1	115.5	151.8	188.1	111.5	147.7	183.8	107.3	143.2	179.1
		72	THC	216.6	216.6	216.6	206.1	206.1	206.1	195.1	195.1	195.1	183.5	183.5	183.5	171.6	171.6	171.6
			SHC	85.6	122.3	159.0	82.2	118.8	155.5	78.6	115.2	151.7	74.9	111.3	147.8	71.1	107.4	143.8
		76	THC	—	231.9	231.9	—	220.7	220.7	—	208.9	208.9	—	196.5	196.5	—	183.8	183.8
			SHC	—	92.4	129.9	—	88.9	126.3	—	85.4	122.6	—	81.6	118.7	—	77.8	114.6

LEGEND

—	Do Not Operate
Cfm	Cubic Feet Per Minute (Supply Air)
EAT (db)	Entering Air Temperature (Wet Bulb)
EAT (wb)	Entering Air Temperature (Wet Bulb)
SHC	Sensible Heat Capacity (1000 Btuh) Gross
THC	Total Heat Capacity (1000 Btuh) Gross

48HC*D20 — 17.5 TON — COOLING CAPACITIES

48HC20				AMBIENT TEMPERATURE (F)														
				85			95			105			115			125		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
5250 Cfm	EAT (wb)	58	THC	185.1	185.1	209.2	178.7	178.7	201.9	171.8	171.8	194.1	164.5	164.5	185.8	156.7	156.7	177.0
			SHC	161.1	185.1	209.2	155.4	178.7	201.9	149.4	171.8	194.1	143.1	164.5	185.8	136.3	156.7	177.0
		62	THC	193.8	193.8	199.5	185.6	185.6	195.4	176.9	176.9	191.1	167.7	167.7	186.4	158.2	158.2	181.1
			SHC	145.6	172.6	199.5	141.7	168.6	195.4	137.6	164.4	191.1	133.2	159.8	186.4	128.3	154.7	181.1
		67	THC	212.2	212.2	212.2	203.3	203.3	203.3	193.8	193.8	193.8	183.8	183.8	183.8	173.1	173.1	173.1
			SHC	119.0	146.0	173.1	115.3	142.3	169.4	111.4	138.4	165.4	107.3	134.3	161.3	103.0	130.0	157.0
		72	THC	232.3	232.3	232.3	222.7	222.7	222.7	212.4	212.4	212.4	201.6	201.6	201.6	190.1	190.1	190.1
			SHC	91.5	118.8	146.2	87.9	115.2	142.5	84.1	111.4	138.7	80.2	107.4	134.6	76.0	103.2	130.4
		76	THC	—	249.5	249.5	—	239.2	239.2	—	228.2	228.2	—	216.6	216.6	—	204.3	204.3
			SHC	—	96.7	125.3	—	93.2	121.7	—	89.5	117.9	—	85.6	113.8	—	81.5	109.5
6125 Cfm	EAT (wb)	58	THC	194.7	194.7	220.0	187.8	187.8	212.2	180.4	180.4	203.8	172.5	172.5	194.9	164.1	164.1	185.5
			SHC	169.4	194.7	220.0	163.3	187.8	212.2	156.9	180.4	203.8	150.1	172.5	194.9	142.8	164.1	185.5
		62	THC	199.6	199.6	218.0	191.1	191.1	213.5	182.1	182.1	208.4	173.0	173.0	201.2	164.3	164.3	192.8
			SHC	156.5	187.2	218.0	152.3	182.9	213.5	147.7	178.0	208.4	141.8	171.5	201.2	135.8	164.3	192.8
		67	THC	218.0	218.0	218.0	208.7	208.7	208.7	198.7	198.7	198.7	188.2	188.2	188.2	177.1	177.1	177.1
			SHC	126.2	157.4	188.6	122.4	153.6	184.7	118.4	149.6	180.7	114.3	145.4	176.5	109.9	141.0	172.1
		72	THC	238.5	238.5	238.5	228.4	228.4	228.4	217.7	217.7	217.7	206.3	206.3	206.3	194.3	194.3	194.3
			SHC	94.7	126.1	157.5	91.0	122.4	153.8	87.2	118.5	149.8	83.1	114.4	145.7	78.9	110.1	141.4
		76	THC	—	255.9	255.9	—	245.1	245.1	—	233.6	233.6	—	221.4	221.4	—	208.5	208.5
			SHC	—	100.7	133.3	—	97.1	129.6	—	93.3	125.6	—	89.3	121.5	—	85.1	117.1
7000 Cfm	EAT (wb)	58	THC	202.7	202.7	229.1	195.4	195.4	220.8	187.5	187.5	211.9	179.2	179.2	202.5	170.3	170.3	192.4
			SHC	176.4	202.7	229.1	170.0	195.4	220.8	163.1	187.5	211.9	155.9	179.2	202.5	148.1	170.3	192.4
		62	THC	204.6	204.6	234.4	196.0	196.0	228.0	187.7	187.7	220.3	179.3	179.3	210.5	170.4	170.4	200.0
			SHC	166.0	200.2	234.4	160.8	194.4	228.0	155.1	187.7	220.3	148.2	179.3	210.5	140.8	170.4	200.0
		67	THC	222.5	222.5	222.5	212.8	212.8	212.8	202.4	202.4	202.4	191.5	191.5	191.5	180.0	180.0	186.4
			SHC	133.0	168.2	203.4	129.2	164.3	199.5	125.1	160.3	195.4	120.9	156.0	191.0	116.4	151.4	186.4
		72	THC	243.3	243.3	243.3	232.7	232.7	232.7	221.6	221.6	221.6	209.9	209.9	209.9	197.4	197.4	197.4
			SHC	97.5	132.9	168.3	93.8	129.2	164.5	89.9	125.2	160.5	85.8	121.1	156.3	81.6	116.7	151.9
		76	THC	—	260.8	260.8	—	249.6	249.6	—	237.7	237.7	—	225.1	225.1	—	211.7	211.7
			SHC	—	104.4	140.8	—	100.7	137.0	—	96.9	133.0	—	92.8	128.8	—	88.5	124.4
7875 Cfm	EAT (wb)	58	THC	209.6	209.6	236.8	201.8	201.8	228.1	193.6	193.6	218.8	184.8	184.8	208.9	175.5	175.5	198.3
			SHC	182.3	209.6	236.8	175.6	201.8	228.1	168.4	193.6	218.8	160.8	184.8	208.9	152.7	175.5	198.3
		62	THC	209.8	209.8	246.2	202.0	202.0	237.1	193.8	193.8	227.4	185.0	185.0	217.1	175.6	175.6	206.1
			SHC	173.4	209.8	246.2	167.0	202.0	237.1	160.1	193.8	227.4	152.9	185.0	217.1	145.1	175.6	206.1
		67	THC	226.1	226.1	226.1	216.0	216.0	216.0	205.4	205.4	209.4	194.2	194.2	204.8	182.4	182.4	199.9
			SHC	139.6	178.6	217.7	135.6	174.7	213.7	131.5	170.5	209.4	127.1	166.0	204.8	122.5	161.2	199.9
		72	THC	247.0	247.0	247.0	236.2	236.2	236.2	224.7	224.7	224.7	212.7	212.7	212.7	199.9	199.9	199.9
			SHC	100.2	139.5	178.8	96.5	135.7	174.9	92.5	131.7	170.9	88.4	127.5	166.6	84.1	123.1	162.1
		76	THC	—	264.7	264.7	—	253.1	253.1	—	240.9	240.9	—	227.9	227.9	—	—	—
			SHC	—	107.9	148.1	—	104.2	144.3	—	100.2	140.2	—	96.1	135.9	—	—	—
8750 Cfm	EAT (wb)	58	THC	215.4	215.4	243.4	207.3	207.3	234.3	198.7	198.7	224.6	189.6	189.6	214.2	179.9	179.9	203.2
			SHC	187.4	215.4	243.4	180.3	207.3	234.3	172.9	198.7	224.6	164.9	189.6	214.2	156.5	179.9	203.2
		62	THC	215.5	215.5	253.0	207.5	207.5	243.5	198.9	198.9	233.4	189.7	189.7	222.7	180.0	180.0	211.2
			SHC	178.1	215.5	253.0	171.5	207.5	243.5	164.4	198.9	233.4	156.8	189.7	222.7	148.8	180.0	211.2
		67	THC	228.9	228.9	231.5	218.7	218.7	227.3	207.8	207.8	222.8	196.4	196.4	217.9	184.5	184.5	212.6
			SHC	145.8	188.6	231.5	141.8	184.5	227.3	137.5	180.1	222.8	133.0	175.5	217.9	128.2	170.4	212.6
		72	THC	250.1	250.1	250.1	239.0	239.0	239.0	227.3	227.3	227.3	214.9	214.9	214.9	201.8	201.8	201.8
			SHC	102.8	145.8	188.9	99.0	142.0	185.0	95.0	137.9	180.9	90.8	133.7	176.5	86.4	129.2	172.0
		76	THC	—	267.8	267.8	—	256.0	256.0	—	243.5	243.5	—	230.2	230.2	—	—	—
			SHC	—	111.2	155.2	—	107.4	151.3	—	103.5	147.1	—	99.3	142.8	—	—	—

LEGEND

—	Do Not Operate
Cfm	Cubic Feet Per Minute (Supply Air)
EAT (db)	Entering Air Temperature (Wet Bulb)
EAT (wb)	Entering Air Temperature (Wet Bulb)
SHC	Sensible Heat Capacity (1000 Btuh) Gross
THC	Total Heat Capacity (1000 Btuh) Gross

48HC*D24 — 20 TON — COOLING CAPACITIES

48HC24				AMBIENT TEMPERATURE (F)														
				85			95			105			115			125		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
6000 Cfm	EAT (wb)	58	THC	214.4	214.4	242.5	207.0	207.0	234.2	199.0	199.0	225.1	190.2	190.2	215.2	180.6	180.6	204.3
			SHC	186.3	214.4	242.5	179.9	207.0	234.2	173.0	199.0	225.1	165.3	190.2	215.2	157.0	180.6	204.3
		62	THC	226.8	226.8	227.7	217.3	217.3	223.0	206.9	206.9	218.0	195.8	195.8	212.5	183.7	183.7	206.4
			SHC	167.0	197.3	227.7	162.4	192.7	223.0	157.6	187.8	218.0	152.3	182.4	212.5	146.6	176.5	206.4
		67	THC	248.4	248.4	248.4	237.9	237.9	237.9	226.6	226.6	226.6	214.3	214.3	214.3	201.0	201.0	201.0
			SHC	136.5	167.1	197.6	132.2	162.7	193.2	127.5	158.0	188.4	122.5	152.9	183.4	117.2	147.6	178.0
		72	THC	271.9	271.9	271.9	260.3	260.3	260.3	247.9	247.9	247.9	234.5	234.5	234.5	220.1	220.1	220.1
			SHC	105.1	136.0	167.0	100.8	131.7	162.5	96.3	127.1	157.9	91.4	122.1	152.9	86.3	116.9	147.6
		76	THC	—	291.7	291.7	—	279.2	279.2	—	265.7	265.7	—	251.3	251.3	—	235.8	235.8
			SHC	—	110.7	143.7	—	106.5	139.5	—	102.0	134.7	—	97.2	129.7	—	92.1	124.3
7000 Cfm	EAT (wb)	58	THC	225.8	225.8	255.3	217.8	217.8	246.3	209.1	209.1	236.5	199.6	199.6	225.7	189.2	189.2	214.0
			SHC	196.2	225.8	255.3	189.3	217.8	246.3	181.7	209.1	236.5	173.4	199.6	225.7	164.4	189.2	214.0
		62	THC	233.9	233.9	248.8	223.8	223.8	243.8	213.1	213.1	238.2	201.4	201.4	231.8	190.0	190.0	221.5
			SHC	179.4	214.1	248.8	174.6	209.2	243.8	169.4	203.8	238.2	163.7	197.8	231.8	155.9	188.7	221.5
		67	THC	255.7	255.7	255.7	244.6	244.6	244.6	232.6	232.6	232.6	219.6	219.6	219.6	205.7	205.7	205.7
			SHC	144.7	179.7	214.8	140.2	175.2	210.2	135.4	170.4	205.4	130.3	165.2	200.2	124.9	159.8	194.7
		72	THC	279.4	279.4	279.4	267.3	267.3	267.3	254.1	254.1	254.1	240.1	240.1	240.1	224.9	224.9	224.9
			SHC	108.7	144.1	179.6	104.3	139.7	175.1	99.6	135.0	170.3	94.7	129.9	165.1	89.5	124.6	159.7
		76	THC	—	299.4	299.4	—	286.2	286.2	—	272.1	272.1	—	256.9	256.9	—	240.7	240.7
			SHC	—	115.3	152.9	—	110.9	148.2	—	106.3	143.3	—	101.3	138.0	—	96.1	132.6
8000 Cfm	EAT (wb)	58	THC	235.3	235.3	266.2	226.8	226.8	256.5	217.5	217.5	246.0	207.4	207.4	234.5	196.3	196.3	222.0
			SHC	204.5	235.3	266.2	197.1	226.8	256.5	189.0	217.5	246.0	180.2	207.4	234.5	170.6	196.3	222.0
		62	THC	239.7	239.7	268.1	229.4	229.4	262.0	219.0	219.0	253.3	208.3	208.3	241.9	196.7	196.7	231.0
			SHC	190.7	229.4	268.1	185.4	223.7	262.0	178.6	215.9	253.3	170.4	206.2	241.9	162.3	196.7	231.0
		67	THC	261.3	261.3	261.3	249.6	249.6	249.6	237.1	237.1	237.1	223.6	223.6	223.6	209.2	209.2	210.6
			SHC	152.3	191.8	231.2	147.7	187.1	226.6	142.9	182.2	221.6	137.7	177.0	216.3	132.2	171.4	210.6
		72	THC	285.3	285.3	285.3	272.5	272.5	272.5	258.9	258.9	258.9	244.2	244.2	244.2	228.6	228.6	228.6
			SHC	111.9	151.7	191.5	107.5	147.2	186.9	102.7	142.4	182.0	97.7	137.2	176.7	92.4	131.8	171.2
		76	THC	—	305.4	305.4	—	291.6	291.6	—	276.8	276.8	—	261.2	261.2	—	244.4	244.4
			SHC	—	119.4	161.0	—	114.9	156.2	—	110.1	151.2	—	105.1	146.0	—	99.8	140.4
9000 Cfm	EAT (wb)	58	THC	243.5	243.5	275.4	234.5	234.5	265.2	224.6	224.6	254.0	213.9	213.9	241.9	202.3	202.3	228.8
			SHC	211.6	243.5	275.4	203.8	234.5	265.2	195.2	224.6	254.0	185.9	213.9	241.9	175.8	202.3	228.8
		62	THC	245.4	245.4	282.9	235.4	235.4	274.6	225.0	225.0	264.3	214.4	214.4	251.7	202.5	202.5	237.8
			SHC	199.7	241.3	282.9	193.2	233.9	274.6	185.6	224.9	264.3	176.8	214.3	251.7	167.1	202.5	237.8
		67	THC	265.6	265.6	265.6	253.6	253.6	253.6	240.7	240.7	240.7	226.8	226.8	231.8	212.0	212.0	225.8
			SHC	159.6	203.3	247.1	154.9	198.6	242.3	150.0	193.6	237.3	144.7	188.3	231.8	139.0	182.4	225.8
		72	THC	289.9	289.9	289.9	276.7	276.7	276.7	262.6	262.6	262.6	247.5	247.5	247.5	231.4	231.4	231.4
			SHC	114.9	159.0	203.0	110.4	154.4	198.3	105.6	149.5	193.3	100.5	144.2	188.0	95.2	138.7	182.3
		76	THC	—	310.1	310.1	—	295.8	295.8	—	280.6	280.6	—	264.4	264.4	—	247.3	247.3
			SHC	—	123.2	168.9	—	118.6	164.1	—	113.8	159.0	—	108.7	153.6	—	103.4	147.9
10000 Cfm	EAT (wb)	58	THC	250.4	250.4	283.2	240.9	240.9	272.5	230.7	230.7	260.9	219.5	219.5	248.2	207.3	207.3	234.5
			SHC	217.7	250.4	283.2	209.4	240.9	272.5	200.5	230.7	260.9	190.7	219.5	248.2	180.2	207.3	234.5
		62	THC	250.8	250.8	294.6	241.1	241.1	283.3	231.1	231.1	271.4	219.6	219.6	258.0	207.5	207.5	243.7
			SHC	207.0	250.8	294.6	199.0	241.1	283.3	190.7	231.1	271.4	181.2	219.6	258.0	171.2	207.5	243.7
		67	THC	269.2	269.2	269.2	256.8	256.8	257.6	243.5	243.5	252.3	229.4	229.4	246.4	214.3	214.3	240.0
			SHC	166.6	214.5	262.5	161.9	209.7	257.6	156.8	204.5	252.3	151.3	198.9	246.4	145.5	192.8	240.0
		72	THC	293.7	293.7	293.7	280.1	280.1	280.1	265.6	265.6	265.6	250.2	250.2	250.2	233.7	233.7	233.7
			SHC	117.8	166.0	214.2	113.2	161.3	209.3	108.3	156.3	204.3	103.2	151.0	198.8	97.8	145.4	193.1
		76	THC	—	313.9	313.9	—	299.3	299.3	—	283.7	283.7	—	267.1	267.1	—	249.6	249.6
			SHC	—	126.8	176.5	—	122.2	171.6	—	117.3	166.5	—	112.1	161.0	—	106.7	155.1

LEGEND

—	Do Not Operate
Cfm	Cubic Feet Per Minute (Supply Air)
EAT (db)	Entering Air Temperature (Wet Bulb)
EAT (wb)	Entering Air Temperature (Wet Bulb)
SHC	Sensible Heat Capacity (1000 Btuh) Gross
THC	Total Heat Capacity (1000 Btuh) Gross

48HC*D28 — 25 TON — COOLING CAPACITIES

48HC28				AMBIENT TEMPERATURE (F)														
				85			95			105			115			125		
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			EAT (db)		
				75	80	85	75	80	85	75	80	85	75	80	85	75	80	85
7500 Cfm	EAT (wb)	58	THC	264.4	264.4	298.9	254.6	254.6	287.9	244.1	244.1	276.0	232.7	232.7	263.1	220.3	220.3	249.1
			SHC	229.9	264.4	298.9	221.4	254.6	287.9	212.2	244.1	276.0	202.3	232.7	263.1	191.5	220.3	249.1
		62	THC	278.7	278.7	282.4	266.3	266.3	276.4	252.8	252.8	269.8	238.5	238.5	262.4	223.9	223.9	251.3
			SHC	206.8	244.6	282.4	200.9	238.7	276.4	194.6	232.2	269.8	187.7	225.0	262.4	178.7	215.0	251.3
		67	THC	305.3	305.3	305.3	291.9	291.9	291.9	277.3	277.3	277.3	261.5	261.5	261.5	244.5	244.5	244.5
			SHC	169.0	207.0	245.0	163.4	201.4	239.4	157.4	195.3	233.3	151.0	188.9	226.8	144.2	182.1	219.9
		72	THC	334.0	334.0	334.0	319.4	319.4	319.4	303.6	303.6	303.6	286.5	286.5	286.5	268.1	268.1	268.1
			SHC	129.9	168.5	207.1	124.5	163.0	201.5	118.7	157.1	195.5	112.5	150.8	189.2	106.0	144.2	182.3
		76	THC	—	358.2	358.2	—	342.4	342.4	—	325.4	325.4	—	307.1	307.1	—	287.4	287.4
			SHC	—	137.0	178.2	—	131.7	172.9	—	126.0	166.9	—	119.9	160.4	—	113.4	153.4
8750 Cfm	EAT (wb)	58	THC	278.2	278.2	314.5	267.8	267.8	302.8	256.5	256.5	289.9	244.2	244.2	276.1	230.8	230.8	261.0
			SHC	241.9	278.2	314.5	232.8	267.8	302.8	223.0	256.5	289.9	212.3	244.2	276.1	200.7	230.8	261.0
		62	THC	287.2	287.2	308.3	274.3	274.3	301.5	260.8	260.8	291.7	247.0	247.0	280.9	232.0	232.0	269.1
			SHC	222.1	265.2	308.3	215.7	258.6	301.5	207.7	249.7	291.7	199.0	240.0	280.9	189.7	229.4	269.1
		67	THC	314.0	314.0	314.0	299.8	299.8	299.8	284.4	284.4	284.4	267.8	267.8	267.8	250.0	250.0	250.0
			SHC	179.1	222.7	266.4	173.3	216.9	260.6	167.2	210.8	254.3	160.7	204.2	247.7	153.7	197.2	240.6
		72	THC	343.0	343.0	343.0	327.7	327.7	327.7	311.1	311.1	311.1	293.1	293.1	293.1	273.8	273.8	273.8
			SHC	134.3	178.5	222.6	128.8	172.9	216.9	122.9	166.9	210.8	116.6	160.4	204.3	109.9	153.6	197.3
		76	THC	—	367.3	367.3	—	350.8	350.8	—	333.0	333.0	—	313.8	313.8	—	293.2	293.2
			SHC	—	142.6	189.4	—	137.1	183.5	—	131.2	177.3	—	125.0	170.7	—	118.4	163.7
10000 Cfm	EAT (wb)	58	THC	289.7	289.7	327.5	278.7	278.7	315.0	266.6	266.6	301.4	253.6	253.6	286.7	239.4	239.4	270.7
			SHC	251.9	289.7	327.5	242.3	278.7	315.0	231.8	266.6	301.4	220.5	253.6	286.7	208.2	239.4	270.7
		62	THC	294.6	294.6	329.6	282.2	282.2	319.7	268.7	268.7	309.1	254.1	254.1	298.4	239.7	239.7	281.4
			SHC	234.7	282.1	329.6	226.8	273.3	319.7	218.4	263.7	309.1	209.7	254.1	298.4	197.9	239.7	281.4
		67	THC	320.6	320.6	320.6	305.9	305.9	305.9	289.9	289.9	289.9	272.7	272.7	272.7	254.3	254.3	260.3
			SHC	188.6	237.7	286.8	182.7	231.8	280.9	176.5	225.5	274.5	169.8	218.8	267.7	162.8	211.5	260.3
		72	THC	350.0	350.0	350.0	334.0	334.0	334.0	316.8	316.8	316.8	298.2	298.2	298.2	278.3	278.3	278.3
			SHC	138.4	187.9	237.5	132.8	182.2	231.7	126.8	176.1	225.5	120.4	169.6	218.8	113.6	162.6	211.7
		76	THC	—	374.4	374.4	—	357.3	357.3	—	338.7	338.7	—	318.9	318.9	—	297.5	297.5
			SHC	—	147.7	199.5	—	142.1	193.7	—	136.1	187.4	—	129.7	180.6	—	123.0	173.5
11250 Cfm	EAT (wb)	58	THC	299.4	299.4	338.4	287.8	287.8	325.4	275.2	275.2	311.1	261.4	261.4	295.6	246.6	246.6	278.8
			SHC	260.3	299.4	338.4	250.2	287.8	325.4	239.2	275.2	311.1	227.3	261.4	295.6	214.4	246.6	278.8
		62	THC	302.2	302.2	346.0	289.3	289.3	335.7	275.5	275.5	323.5	262.1	262.1	307.7	246.8	246.8	289.8
			SHC	244.8	295.4	346.0	236.7	286.2	335.7	227.5	275.5	323.5	216.4	262.1	307.7	203.8	246.8	289.8
		67	THC	325.9	325.9	325.9	310.7	310.7	310.7	294.2	294.2	294.2	276.6	276.6	286.7	257.7	257.7	278.9
			SHC	197.6	252.1	306.5	191.7	246.1	300.4	185.3	239.6	293.9	178.5	232.6	286.7	171.2	225.1	278.9
		72	THC	355.5	355.5	355.5	339.1	339.1	339.1	321.3	321.3	321.3	302.2	302.2	302.2	281.8	281.8	281.8
			SHC	142.1	197.0	251.8	136.4	191.2	245.9	130.4	185.0	239.6	123.9	178.3	232.8	117.1	171.3	225.5
		76	THC	—	380.0	380.0	—	362.4	362.4	—	343.3	343.3	—	322.8	322.8	—	300.9	300.9
			SHC	—	152.4	209.4	—	146.8	203.4	—	140.7	197.0	—	134.2	190.2	—	127.3	182.8
12500 Cfm	EAT (wb)	58	THC	307.7	307.7	347.9	295.7	295.7	334.2	282.5	282.5	319.3	268.2	268.2	303.2	252.7	252.7	285.7
			SHC	267.6	307.7	347.9	257.1	295.7	334.2	245.6	282.5	319.3	233.2	268.2	303.2	219.7	252.7	285.7
		62	THC	308.4	308.4	362.2	295.9	295.9	347.4	283.1	283.1	332.4	268.4	268.4	315.2	252.8	252.8	296.9
			SHC	254.6	308.4	362.2	244.4	295.9	347.4	233.8	283.1	332.4	221.7	268.4	315.2	208.8	252.8	296.9
		67	THC	330.2	330.2	330.2	314.6	314.6	319.2	297.8	297.8	312.3	279.8	279.8	304.7	260.6	260.6	295.9
			SHC	206.3	265.9	325.5	200.3	259.7	319.2	193.8	253.1	312.3	186.7	245.7	304.7	179.0	237.4	295.9
		72	THC	360.1	360.1	360.1	343.2	343.2	343.2	325.0	325.0	325.0	305.4	305.4	305.4	284.6	284.6	284.6
			SHC	145.7	205.7	265.7	139.9	199.8	259.7	133.8	193.5	253.3	127.3	186.8	246.3	120.4	179.7	238.9
		76	THC	—	384.6	384.6	—	366.5	366.5	—	346.9	346.9	—	325.9	325.9	—	303.5	303.5
			SHC	—	157.0	218.9	—	151.2	212.9	—	145.1	206.3	—	138.5	199.3	—	131.5	191.7

LEGEND

—	Do Not Operate
Cfm	Cubic Feet Per Minute (Supply Air)
EAT (db)	Entering Air Temperature (Wet Bulb)
EAT (wb)	Entering Air Temperature (Wet Bulb)
SHC	Sensible Heat Capacity (1000 Btuh) Gross
THC	Total Heat Capacity (1000 Btuh) Gross

48HC*E17 COOLING CAPACITIES, SUBCOOLING MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - CFM								
		4,500			6,000			7,500		
		Air Entering Evaporator - Ewb (F)								
		72	67	62	72	67	62	72	67	62
75	TC	202.90	184.60	166.20	213.70	194.60	175.40	222.30	202.50	182.70
	SHC	91.90	112.40	132.90	106.10	126.40	146.80	117.50	137.70	158.00
	kW	10.19	10.12	9.78	10.51	10.19	9.95	10.61	10.36	10.12
85	TC	189.80	171.80	153.80	201.00	182.20	163.30	209.90	190.40	170.80
	SHC	75.90	101.00	126.20	91.20	116.30	141.30	103.40	128.40	153.50
	kW	11.57	11.49	11.15	11.88	11.56	11.32	11.98	11.73	11.49
95	TC	176.70	159.10	141.40	188.30	169.70	151.20	197.50	178.20	159.00
	SHC	59.80	89.70	119.60	76.20	106.10	135.90	89.40	119.20	149.00
	kW	12.87	12.81	12.47	13.20	12.88	12.64	13.30	13.05	12.81
105	TC	163.60	146.30	129.00	175.60	157.30	139.10	185.10	166.10	147.10
	SHC	43.80	78.40	112.90	61.30	95.90	130.40	75.30	109.90	144.40
	kW	14.05	14.00	13.65	14.39	14.07	13.82	14.40	14.24	14.00
115	TC	150.50	133.50	116.50	162.90	144.90	127.00	172.70	154.00	135.30
	SHC	27.70	67.00	106.30	46.40	85.70	125.00	61.30	100.60	133.40
	kW	15.44	15.36	15.02	15.75	15.43	15.19	15.85	15.60	15.36
125	TC	137.40	120.80	104.10	150.20	132.50	114.90	160.30	141.90	123.50
	SHC	11.70	55.70	99.60	31.40	75.50	112.90	47.30	91.30	123.00
	kW	16.77	16.71	16.37	17.10	16.78	16.54	17.20	16.95	16.71

48HC*E17 COOLING CAPACITIES, HOT GAS REHEAT MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - Ewb (F)								
		75 Dry Bulb 62.5 Wet Bulb (50% Relative)			75 Dry Bulb 64 Wet Bulb (56% Relative)			75 Dry Bulb 65.3 Wet Bulb (60% Relative)		
		Air Entering Evaporator - Cfm								
		4,500	6,000	7,500	4,500	6,000	7,500	4,500	6,000	7,500
80	TC	64.50	71.00	73.30	68.40	74.50	77.30	71.20	79.70	80.60
	SHC	12.60	24.90	36.80	6.80	13.70	23.90	-0.80	5.50	13.80
	kW	10.10	10.26	10.42	10.18	10.40	10.56	10.33	10.47	10.67
75	TC	66.60	73.10	75.60	70.50	76.60	79.50	73.20	80.80	82.90
	SHC	14.30	26.70	38.50	8.10	14.90	25.70	0.70	7.00	15.00
	kW	10.05	10.22	10.36	10.14	10.36	10.52	10.28	10.43	10.62
70	TC	68.70	75.10	77.40	72.50	78.60	81.40	75.20	82.80	84.90
	SHC	15.40	27.80	40.00	9.50	16.20	26.80	2.10	8.40	16.30
	kW	10.00	10.18	10.33	10.10	10.31	10.47	10.23	10.40	10.58
60	TC	72.80	79.30	81.60	76.70	82.80	85.70	79.40	86.90	88.80
	SHC	19.00	31.10	43.20	12.70	19.90	30.10	5.30	11.60	20.00
	kW	9.92	10.09	10.24	10.01	10.22	10.37	10.14	10.31	10.49
50	TC	76.80	83.40	85.70	80.80	86.90	89.70	83.50	90.90	92.80
	SHC	21.70	34.20	46.20	15.80	22.70	33.20	8.40	14.70	22.80
	kW	9.83	10.00	10.15	9.92	10.13	10.29	10.05	10.21	10.39
40	TC	80.90	87.30	89.60	84.90	90.80	93.60	87.40	94.80	96.70
	SHC	24.90	37.10	49.30	19.00	26.00	36.10	11.60	17.90	26.20
	kW	9.74	9.91	10.06	9.83	10.04	10.20	9.96	10.12	10.30

LEGEND

Edb	—	Entering Dry Bulb
Ewb	—	Entering Wet Bulb
kW	—	Kilowatts
SHC	—	Sensible Heat Capacity
TC	—	Total Capacity

48HC*E20 COOLING CAPACITIES, SUBCOOLING MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - CFM								
		5250			7000			8750		
		Air Entering Evaporator - Ewb (F)								
		72	67	62	72	67	62	72	67	62
75	TC	232.00	211.30	190.60	242.40	221.00	199.70	250.70	228.90	207.00
	SHC	110.90	133.70	156.40	127.60	150.30	173.00	141.10	163.70	186.40
	kW	12.45	12.16	11.81	12.74	12.41	12.02	12.93	12.51	12.18
85	TC	215.90	195.70	175.50	226.00	205.20	184.40	234.20	212.80	191.50
	SHC	90.60	118.80	147.00	108.40	136.60	164.90	122.70	151.00	179.20
	kW	13.48	13.20	12.88	13.77	13.47	13.07	13.96	13.58	13.23
95	TC	199.70	180.00	160.30	209.70	189.40	169.10	217.60	196.80	176.10
	SHC	70.30	104.00	137.70	89.20	123.00	156.70	104.40	138.20	172.10
	kW	14.60	14.25	13.94	14.89	14.51	14.15	15.08	14.63	14.31
105	TC	183.60	164.50	145.20	193.30	173.50	153.80	201.00	180.80	160.60
	SHC	50.00	89.10	128.30	70.00	109.30	148.60	86.00	125.50	158.60
	kW	15.64	15.36	15.01	15.93	15.60	15.21	16.12	15.72	15.37
115	TC	167.50	148.80	130.10	176.90	157.70	138.50	184.50	164.80	145.10
	SHC	29.70	74.30	118.90	50.70	95.60	138.10	67.70	112.70	145.10
	kW	16.70	16.38	15.82	16.98	16.63	16.03	17.17	16.75	16.19
125	TC	151.40	133.20	115.00	160.60	141.90	123.10	167.90	148.80	129.70
	SHC	9.40	59.50	109.60	31.50	81.90	123.00	49.30	100.00	129.70
	kW	17.71	17.39	17.09	18.01	17.65	17.30	18.20	17.76	17.46

48HC*E20 COOLING CAPACITIES, HOT GAS REHEAT MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - Ewb (F)								
		75 Dry Bulb 62.5 Wet Bulb (50% Relative)			75 Dry Bulb 64 Wet Bulb (56% Relative)			75 Dry Bulb 65.3 Wet Bulb (60% Relative)		
		Air Entering Evaporator - Cfm								
		5,250	7,000	8,750	5,250	7,000	8,750	5,250	7,000	8,750
80	TC	67.80	71.30	74.10	70.50	74.80	79.80	73.30	78.20	82.40
	SHC	9.00	26.50	41.70	2.20	13.20	26.90	-5.20	2.90	13.80
	kW	11.65	11.75	11.87	11.82	11.90	11.98	11.93	12.10	12.19
75	TC	72.50	76.00	78.80	75.00	79.20	84.30	78.00	83.00	86.90
	SHC	13.40	30.90	46.10	6.50	18.00	31.30	-2.10	7.20	17.90
	kW	11.44	11.54	11.66	11.61	11.68	11.75	11.70	11.86	11.95
70	TC	77.10	80.60	83.40	79.50	83.90	88.90	82.40	87.30	91.10
	SHC	17.60	34.70	49.90	10.80	22.20	35.10	3.20	11.50	22.20
	kW	11.22	11.33	11.45	11.40	11.46	11.54	11.49	11.64	11.75
60	TC	86.30	89.90	92.70	88.80	93.20	98.20	91.70	96.60	100.50
	SHC	26.20	43.20	58.40	19.40	30.80	43.60	11.60	20.10	30.70
	kW	10.76	10.86	10.98	10.93	11.00	11.07	11.03	11.18	11.28
50	TC	95.50	99.10	101.90	98.00	102.40	107.40	101.00	106.00	109.80
	SHC	34.80	51.80	67.00	28.00	39.40	52.20	20.10	28.70	39.40
	kW	10.33	10.43	10.55	10.50	10.52	10.63	10.59	10.74	10.85
40	TC	104.80	108.40	111.20	107.30	111.70	116.60	110.30	115.30	119.10
	SHC	43.40	60.40	75.60	36.60	48.00	60.80	28.80	37.30	47.90
	kW	9.87	9.97	10.09	10.04	10.11	10.18	10.14	10.28	10.40

LEGEND

Edb	—	Entering Dry Bulb
Ewb	—	Entering Wet Bulb
kW	—	Kilowatts
SHC	—	Sensible Heat Capacity
TC	—	Total Capacity

48HC*E24 COOLING CAPACITIES, SUBCOOLING MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - CFM								
		6,000			8,000			10,000		
		Air Entering Evaporator - Ewb (F)								
		72	67	62	72	67	62	72	67	62
75	TC	281.60	256.50	231.30	293.10	267.00	240.90	302.30	275.40	248.60
	SHC	114.70	141.00	167.40	140.60	166.60	192.60	161.60	187.30	212.90
	kW	13.52	13.25	12.95	13.82	13.46	13.21	13.97	13.60	13.31
85	TC	261.30	236.90	212.40	272.10	247.70	221.30	280.70	254.60	228.50
	SHC	90.90	123.50	156.10	118.80	151.10	183.30	141.40	173.40	205.40
	kW	14.95	14.68	14.48	15.25	14.89	14.64	15.40	15.03	14.74
95	TC	241.10	217.20	193.40	251.10	226.40	201.70	259.20	233.80	208.40
	SHC	67.20	106.00	144.80	97.10	120.10	174.10	121.20	159.50	197.80
	kW	16.52	16.25	15.95	16.82	16.46	16.21	16.97	16.60	16.31
105	TC	220.80	197.50	174.40	230.20	206.20	182.20	237.70	213.00	188.40
	SHC	43.40	88.40	133.50	75.30	120.10	164.90	101.00	145.70	178.90
	kW	18.09	17.82	17.52	18.39	18.03	17.78	18.54	18.17	17.88
115	TC	200.50	178.00	155.50	209.20	185.90	162.60	216.20	192.20	168.70
	SHC	19.70	70.90	122.20	53.50	104.60	155.70	80.90	131.80	161.20
	kW	19.65	19.38	19.08	19.95	19.59	19.34	20.10	19.73	19.44
125	TC	180.20	158.40	136.50	188.20	165.60	143.00	194.70	171.40	148.20
	SHC	-4.10	53.40	110.80	31.70	89.10	142.20	60.70	118.00	145.10
	kW	20.59	20.32	20.02	20.89	20.53	20.28	21.04	20.67	20.38

48HC*E24 COOLING CAPACITIES, HOT GAS REHEAT MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - Ewb (F)								
		75 Dry Bulb 62.5 Wet Bulb (50% Relative)			75 Dry Bulb 64 Wet Bulb (56% Relative)			75 Dry Bulb 65.3 Wet Bulb (60% Relative)		
		Air Entering Evaporator - Cfm								
		6,000	8,000	10,000	6,000	8,000	10,000	6,000	8,000	10,000
80	TC	115.20	123.30	130.60	120.40	129.30	138.20	122.80	135.00	143.70
	SHC	40.80	58.30	76.10	32.30	45.50	60.40	20.10	34.30	48.00
	kW	13.24	13.32	13.39	13.43	13.57	13.65	13.49	13.68	13.74
75	TC	119.80	128.60	135.90	125.50	135.30	143.20	128.00	139.50	148.40
	SHC	45.60	62.80	82.10	37.00	49.80	65.20	24.30	38.70	52.60
	kW	13.05	13.10	13.17	13.21	13.35	13.43	13.27	13.46	13.52
70	TC	122.50	133.10	140.20	129.80	140.70	147.60	132.40	144.40	153.20
	SHC	49.80	76.00	86.10	41.10	54.30	69.20	28.80	41.40	56.80
	kW	12.80	12.87	12.94	12.98	13.12	13.20	13.04	13.23	13.29
60	TC	133.80	142.50	149.60	139.30	150.40	157.40	141.50	154.20	163.00
	SHC	58.60	76.00	95.00	50.20	63.50	78.10	37.80	52.10	65.90
	kW	12.34	12.42	12.49	12.53	12.67	12.75	12.59	12.78	12.84
50	TC	143.50	151.80	159.30	149.00	160.00	167.00	151.30	163.60	172.50
	SHC	67.70	84.80	103.80	59.10	72.40	87.00	46.70	61.00	74.90
	kW	11.88	11.95	12.03	12.07	12.21	12.29	12.13	12.32	12.38
40	TC	153.20	161.30	168.70	158.60	169.20	176.60	160.80	173.10	182.00
	SHC	76.50	93.60	111.60	68.00	81.50	95.80	55.80	69.80	84.00
	kW	11.42	11.49	11.56	11.60	11.74	11.82	11.66	11.85	11.91

LEGEND

Edb	—	Entering Dry Bulb
Ewb	—	Entering Wet Bulb
kW	—	Kilowatts
SHC	—	Sensible Heat Capacity
TC	—	Total Capacity

48HC*E28 COOLING CAPACITIES, SUBCOOLING MODE

TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - CFM								
		7,500			10,000			12,500		
		Air Entering Evaporator - Ewb (F)								
		72	67	62	72	67	62	72	67	62
75	TC	351.30	319.50	287.80	370.40	337.30	304.10	385.80	351.50	317.20
	SHC	166.50	199.40	232.30	191.20	245.60	258.50	211.40	245.60	279.90
	kW	16.75	16.55	15.20	17.30	16.75	15.85	17.80	17.50	16.50
85	TC	327.50	296.40	265.30	346.10	313.60	281.20	361.10	327.50	294.00
	SHC	137.40	178.20	219.00	162.60	204.50	246.40	183.30	226.00	268.70
	kW	18.65	18.45	17.25	19.20	18.65	17.80	19.45	19.15	18.15
95	TC	303.70	273.30	242.90	321.80	290.00	258.30	336.40	303.50	270.70
	SHC	108.20	157.00	205.80	134.00	184.10	234.30	155.10	206.40	257.60
	kW	20.60	20.40	19.34	21.15	20.60	19.95	21.60	21.30	20.30
105	TC	279.90	250.20	220.40	297.50	266.40	235.30	311.70	279.50	247.40
	SHC	79.00	135.80	192.50	105.40	163.80	222.20	127.10	186.70	246.40
	kW	22.85	22.65	21.45	23.40	22.85	22.05	23.70	23.40	22.40
115	TC	256.20	227.10	198.00	273.20	242.80	212.40	287.00	255.50	224.10
	SHC	49.90	114.50	179.20	76.80	143.40	210.10	98.90	167.10	223.80
	kW	25.05	24.85	23.65	25.60	25.05	24.25	25.90	25.60	24.60
125	TC	232.40	203.90	175.50	248.90	219.20	189.50	262.30	231.50	200.80
	SHC	20.70	93.30	166.00	48.20	123.10	188.90	70.80	147.40	200.80
	kW	27.25	27.05	25.80	27.80	27.25	26.50	28.15	27.85	26.85

48HC*E28 COOLING CAPACITIES, HOT GAS REHEAT MODE

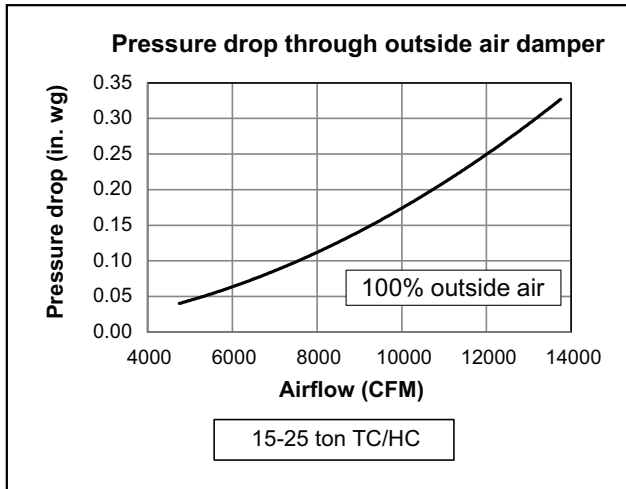
TEMP (F) AIR ENT CONDENSER (Edb)		AIR ENTERING EVAPORATOR - Ewb (F)								
		75 Dry Bulb 62.5 Wet Bulb (50% Relative)			75 Dry Bulb 64 Wet Bulb (56% Relative)			75 Dry Bulb 65.3 Wet Bulb (60% Relative)		
		Air Entering Evaporator - Cfm								
		7,500	10,000	12,500	7,500	10,000	12,500	7,500	10,000	12,500
80	TC	124.40	133.90	139.00	132.00	142.10	145.10	135.60	149.10	151.50
	SHC	37.60	60.70	82.20	27.80	45.40	65.80	17.50	34.20	50.10
	kW	15.83	15.90	16.00	15.97	16.13	16.16	16.11	16.31	16.38
75	TC	129.00	138.50	144.60	136.60	147.60	150.10	140.60	154.00	156.30
	SHC	47.10	70.60	92.10	37.30	55.30	75.70	27.00	43.70	60.00
	kW	15.77	15.83	15.94	15.91	16.07	16.10	16.05	16.25	16.32
70	TC	133.60	143.10	149.20	141.20	152.30	154.80	145.30	158.80	161.10
	SHC	57.30	80.70	102.20	47.50	65.40	85.80	37.20	53.90	70.10
	kW	15.68	15.75	15.86	15.83	16.00	16.04	15.88	16.08	16.15
60	TC	142.80	158.40	158.40	150.40	161.40	163.90	153.90	167.40	169.70
	SHC	76.50	121.40	121.40	66.70	84.60	105.00	56.40	73.10	89.30
	kW	15.54	15.60	15.71	15.68	15.84	15.87	15.82	16.02	16.09
50	TC	151.80	161.30	167.40	159.40	170.50	173.20	162.80	176.20	178.80
	SHC	94.10	117.50	139.00	84.30	102.20	122.60	74.00	90.70	106.90
	kW	15.40	15.47	15.58	15.54	15.68	15.71	15.66	15.86	15.93
40	TC	161.20	170.70	176.80	168.80	179.80	182.50	172.20	185.70	188.20
	SHC	114.10	137.60	159.10	104.30	122.30	142.70	94.00	110.70	127.00
	kW	15.24	15.31	15.42	15.39	15.55	15.58	15.53	15.73	15.80

LEGEND

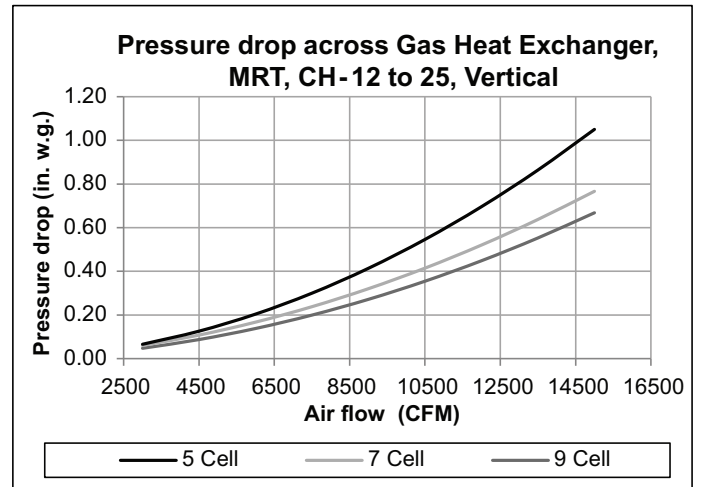
Edb	—	Entering Dry Bulb
Ewb	—	Entering Wet Bulb
kW	—	Kilowatts
SHC	—	Sensible Heat Capacity
TC	—	Total Capacity

ACCESSORY PRESSURE DROPS, BAROMETRIC RELIEF AND POWER EXHAUST PERFORMANCE (EXCLUDES EnergyX® SYSTEMS)

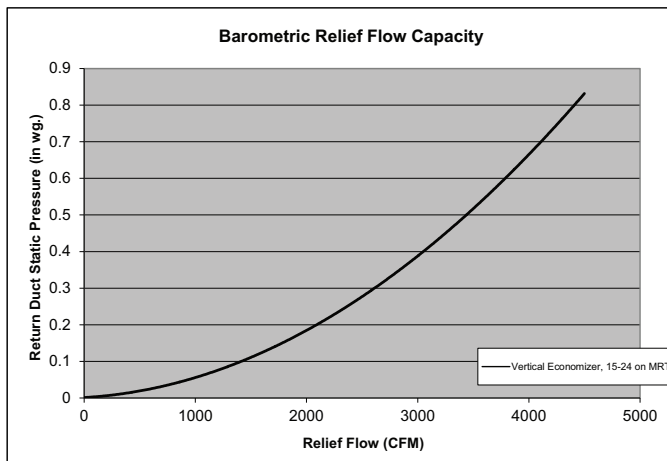
OUTSIDE AIR PRESSURE DROP



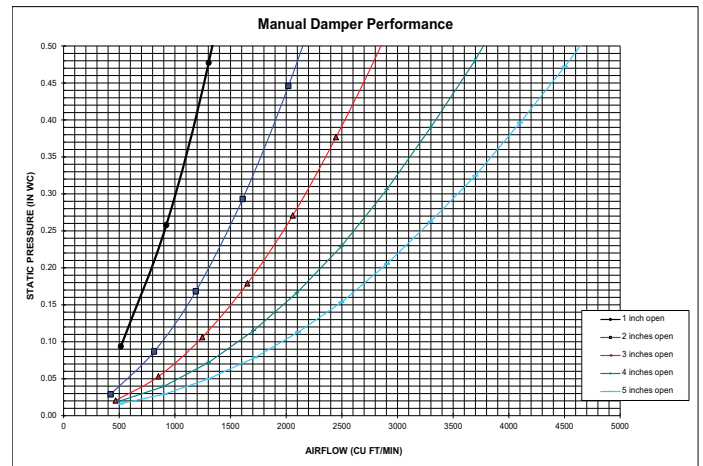
GAS HEAT EXCHANGER, CH-12 TO 25, VERTICAL SUPPLY PRESSURE DROP



BAROMETRIC RELIEF FLOW CAPACITY

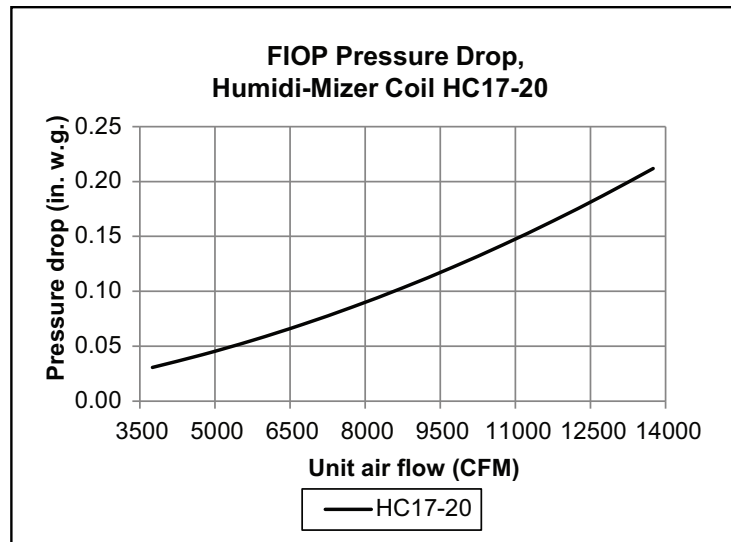


MANUAL DAMPER PERFORMANCE



ACCESSORY PRESSURE DROPS, BAROMETRIC RELIEF AND POWER EXHAUST PERFORMANCE (EXCLUDES EnergyX® SYSTEMS) (cont)

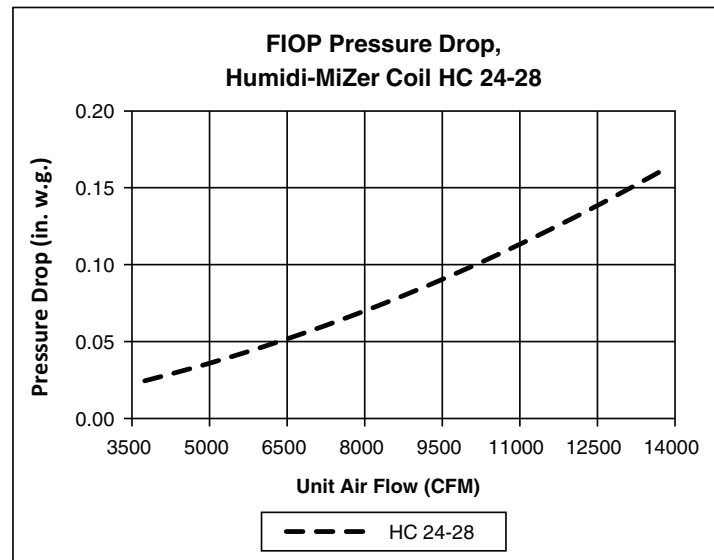
PRESSURE DROP FOR HUMIDI-MIZER® COIL, SIZES 17, 20



15, 17.5 TONS

CFM	3750	4750	5750	6750	7750	8750	9750	10750	11750	12750	13750
PRESSURE DROP (in. wg)	0.03	0.04	0.06	0.07	0.08	0.10	0.12	0.14	0.16	0.19	0.21

PRESSURE DROP FOR HUMIDI-MIZER COIL, SIZES 24, 28

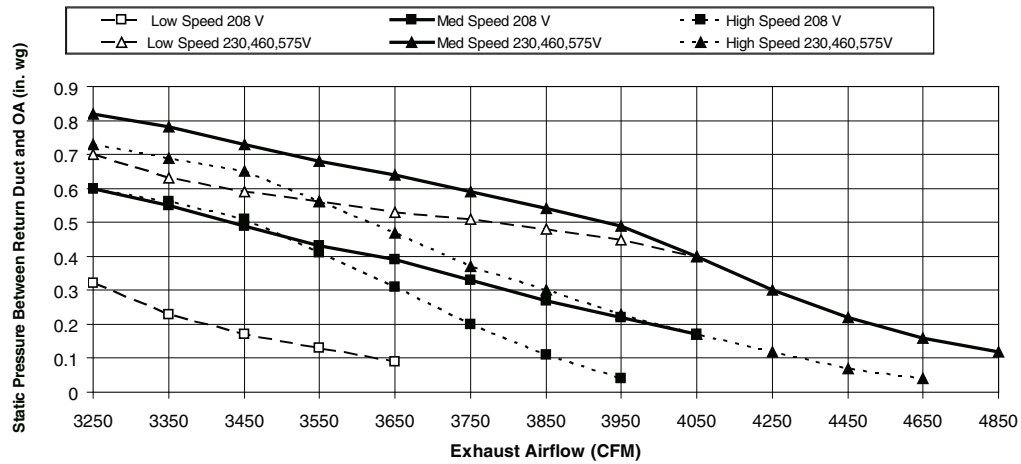


20, 25 TONS

CFM	3750	4750	5750	6750	7750	8750	9750	10750	11750	12750	13750
PRESSURE DROP (in. wg)	0.02	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.13	0.14	0.16

ACCESSORY PRESSURE DROPS, BAROMETRIC RELIEF AND POWER EXHAUST PERFORMANCE (EXCLUDES EnergyX SYSTEMS) (cont)

POWER EXHAUST FAN PERFORMANCE



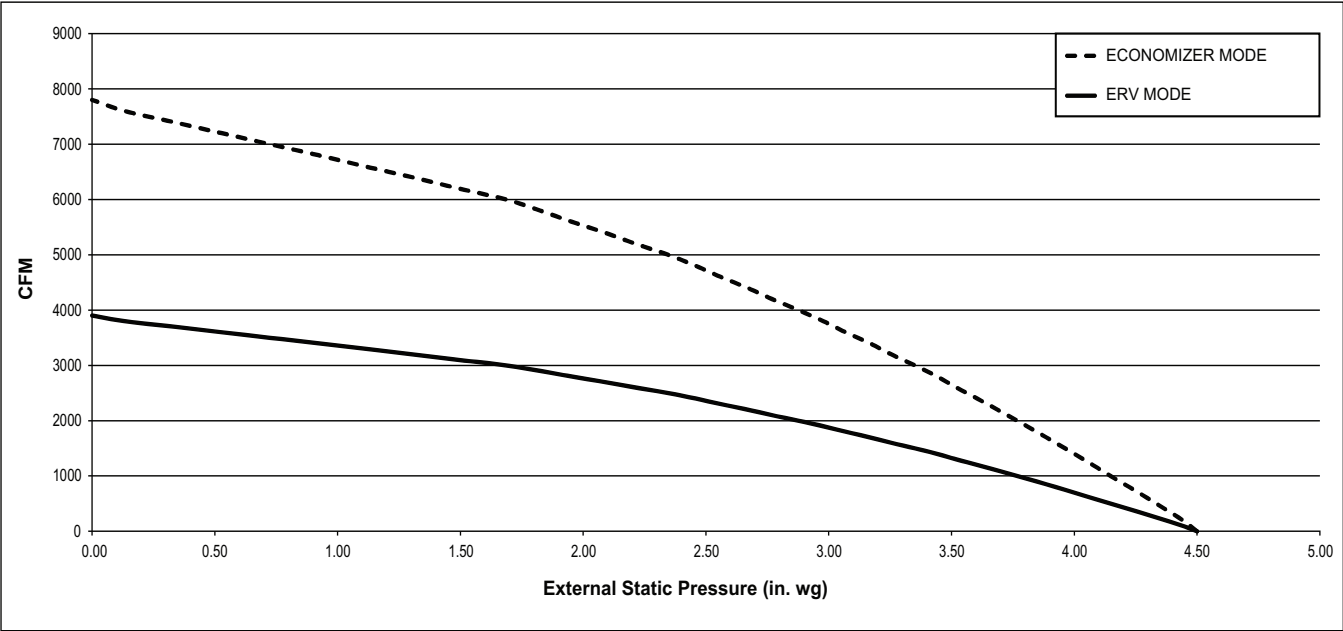
FAN PERFORMANCE — POWER EXHAUST

AIRFLOW	208V		230V/460V/575V	
	ESP	BHP	ESP	BHP
3,850	0.600	1.845	0.730	1.99
3,950	0.560	1.870	0.690	2.01
4,050	0.510	1.890	0.650	2.04
4,250	0.410	1.915	0.560	2.06
4,450	0.310	1.965	0.470	2.12
4,650	0.200	2.035	0.370	2.19
4,850	0.110	2.085	0.300	2.24
5,050	0.040	2.125	0.230	2.28
5,250	—	—	0.170	2.33
5,450	—	—	0.120	2.38
5,650	—	—	0.070	2.40
5,850	—	—	0.040	2.42

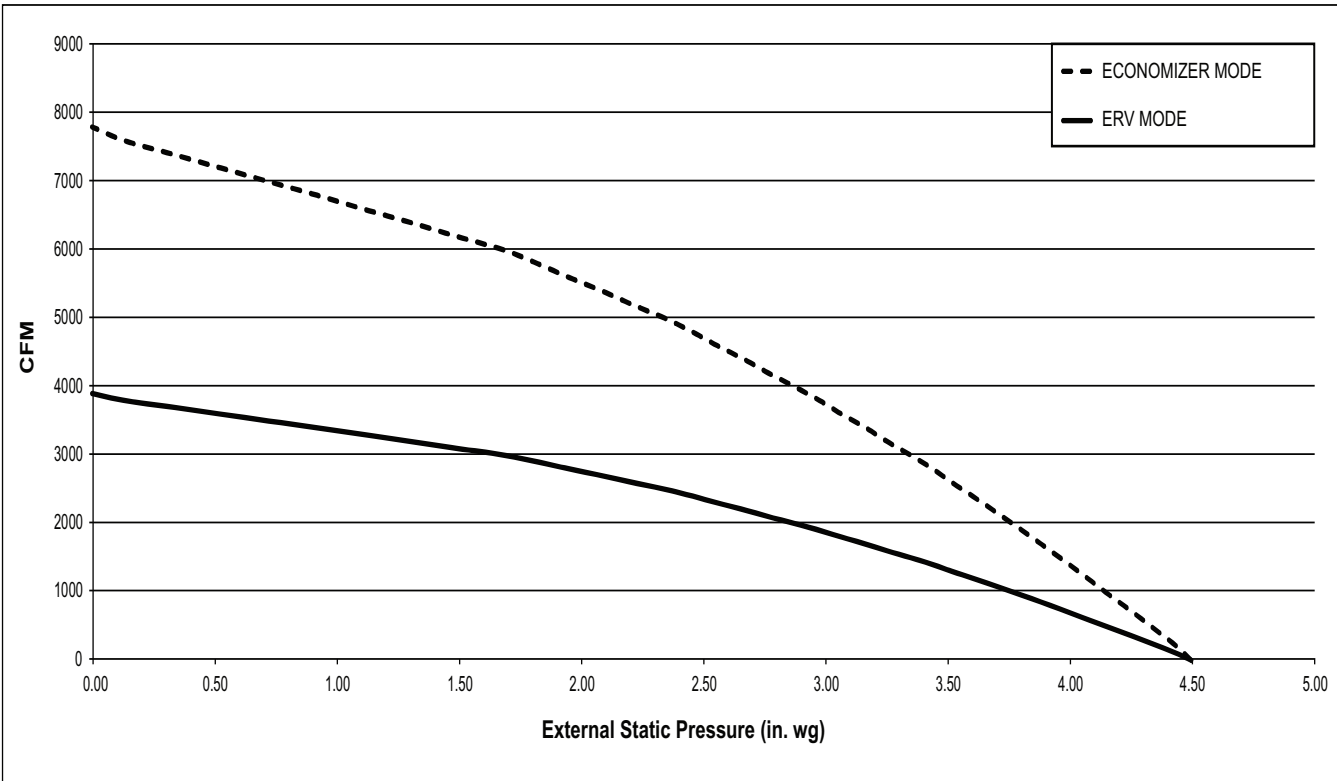


48HC UNITS WITH EnergyX SYSTEM — POWER EXHAUST PERFORMANCE

48HC**17 SUPPLY AND EXHAUST FAN PERFORMANCE CURVES

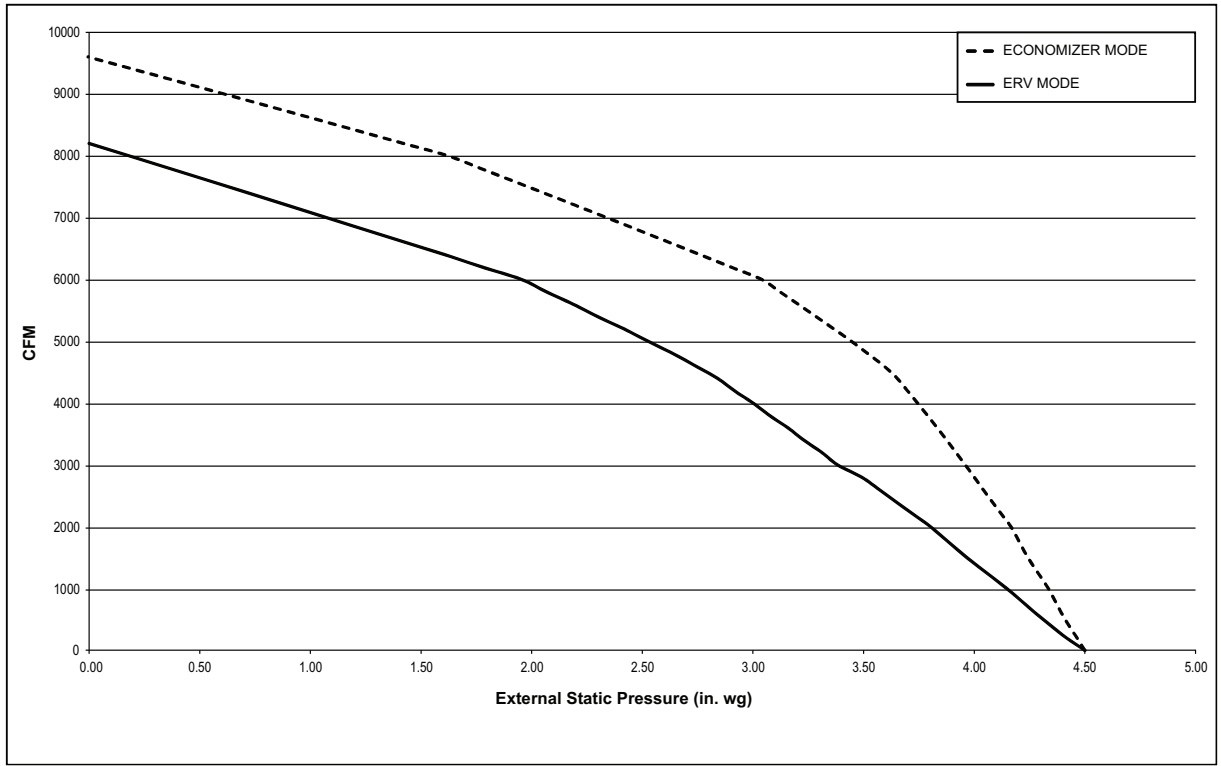


48HC**20 SUPPLY AND EXHAUST FAN PERFORMANCE CURVES

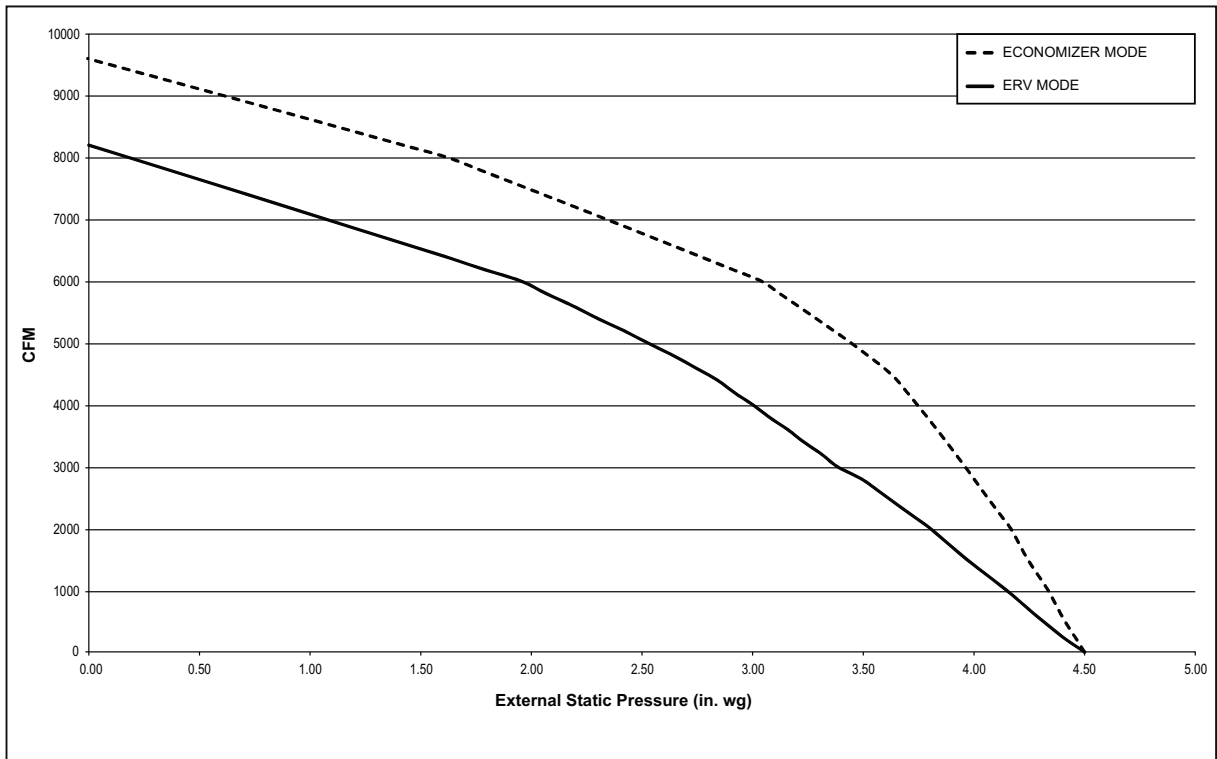


48HC UNITS WITH EnergyX SYSTEM — POWER EXHAUST PERFORMANCE (cont)

48HC**24 SUPPLY AND EXHAUST FAN PERFORMANCE CURVES



48HC**28 Supply and exhaust fan performance curves



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, and wet coils. Factory options and accessories may add static pressure losses. Selection software is available, through your salesperson, to help you select the best motor/drive combination for your application.
4. The Fan Performance tables offer motor/drive recommendations. In cases when two motor/drive combinations would work, Carrier recommended the lower horsepower option.
5. For information on the electrical properties of Carrier motors, please see the Electrical information section of this book.
6. For more information on the performance limits of Carrier motors, see the application data section of this book.
7. 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 (three-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.

48HC**17, 15 TON, VERTICAL SUPPLY/RETURN WITHOUT EnergyX® — FAN PERFORMANCE

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	494	0.77	583	1.09	662	1.43	732	1.80	796	2.19
4900	522	0.93	605	1.27	681	1.64	750	2.03	813	2.44
5250	547	1.10	626	1.45	700	1.84	766	2.24	828	2.67
5650	577	1.32	651	1.68	721	2.09	786	2.51	846	2.96
6000	603	1.53	674	1.91	741	2.33	804	2.78	863	3.24
6400	634	1.81	701	2.20	765	2.64	826	3.10	883	3.59
6750	662	2.07	725	2.49	787	2.94	846	3.42	902	3.92
7150	694	2.42	754	2.85	813	3.31	869	3.81	923	4.33
7500	722	2.74	779	3.19	836	3.67	890	4.19	943	4.72

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	856	2.60	911	3.02	963	3.46	1012	3.92	1059	4.39
4900	871	2.86	926	3.30	977	3.76	1026	4.23	1072	4.72
5250	885	3.11	939	3.57	990	4.05	1038	4.54	—	—
5650	903	3.43	956	3.91	1006	4.40	—	—	—	—
6000	918	3.72	971	4.22	1020	4.73	—	—	—	—
6400	937	4.09	988	4.61	—	—	—	—	—	—
6750	954	4.44	—	—	—	—	—	—	—	—
7150	975	4.87	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. *Italics* requires high static drive package with different motor pulley.

	Standard static 514-680 RPM, 2.9 BHP, max
	Medium static 679-863 RPM, 3.7 BHP max
	High static 826-1009 RPM, 4.9 BHP max

48HC**17, 15 TON, HORIZONTAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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	508	1.25	582	1.76	647	2.31	705	2.89	758	3.51
4900	540	1.51	610	2.05	672	2.64	729	3.26	781	3.91
5250	568	1.78	635	2.35	695	2.96	750	3.61	801	4.29
5650	600	2.13	664	2.73	723	3.37	776	4.05	825	4.76
6000	629	2.47	691	3.10	747	3.77	799	4.48	—	—
6400	663	2.91	721	3.57	776	4.28	—	—	—	—
6750	693	3.34	749	4.03	801	4.76	—	—	—	—
7150	727	3.88	781	4.61	—	—	—	—	—	—
7500	757	4.40	—	—	—	—	—	—	—	—

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	807	4.16	852	4.83	—	—	—	—	—	—
4900	829	4.58	—	—	—	—	—	—	—	—
5250	—	—	—	—	—	—	—	—	—	—
5650	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—
6400	—	—	—	—	—	—	—	—	—	—
6750	—	—	—	—	—	—	—	—	—	—
7150	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. *Italics* requires high static drive package with different motor pulley.

	Standard static 514-680 RPM, 2.9 BHP, max
	Medium static 614-780 RPM, 3.7 BHP max
	High static 746-912 RPM, 4.9 BHP max

48HC**20, 17.5 TON, VERTICAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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
5250	547	1.10	626	1.45	700	1.84	766	2.24	828	2.67
5700	581	1.35	655	1.72	724	2.12	789	2.55	849	3.00
6150	615	1.63	684	2.02	750	2.44	812	2.90	871	3.37
6550	646	1.92	711	2.32	774	2.77	834	3.24	891	3.73
7000	682	2.28	743	2.71	803	3.17	860	3.66	915	4.17
7450	718	2.70	775	3.14	832	3.62	887	4.13	940	4.67
7900	755	3.16	809	3.62	863	4.12	915	4.65	966	5.21
8300	787	3.62	839	4.09	891	4.61	941	5.16	990	5.73
8750	825	4.18	874	4.68	923	5.22	971	5.78	1018	6.38

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
5250	885	3.11	939	3.57	990	4.05	1038	4.54	1084	5.04
5700	905	3.47	958	3.95	1008	4.45	1055	4.96	1100	5.48
6150	925	3.86	977	4.36	1026	4.88	1073	5.42	1118	5.96
6550	945	4.24	995	4.76	1043	5.30	1090	5.86	1134	6.42
7000	967	4.71	1017	5.26	1064	5.82	1109	6.39	—	—
7450	991	5.22	1039	5.79	1085	6.38	—	—	—	—
7900	1015	5.78	1062	6.38	—	—	—	—	—	—
8300	1038	6.33	—	—	—	—	—	—	—	—
8750	—	—	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

Standard static 622-822 RPM, 3.7 BHP, max
Medium static 713-879 RPM, 4.9 BHP max
High static 882-1078 RPM, 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575V (8.3 Max BHP)
Operation point covered by high static drive. Confirm Max BHP coverage based on unit voltage selected.

48HC**20, 17.5 TON, HORIZONTAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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
5250	568	1.78	635	2.35	695	2.96	750	3.61	801	4.29
5700	604	2.17	668	2.78	726	3.43	779	4.11	829	4.82
6150	642	2.63	702	3.27	758	3.95	809	4.67	857	5.42
6550	676	3.09	733	3.76	786	4.48	836	5.23	883	6.01
7000	714	3.67	769	4.38	820	5.14	868	5.92	913	6.74
7450	753	4.33	805	5.08	854	5.87	900	6.69	944	7.54
7900	792	5.06	841	5.85	888	6.68	933	7.54	—	—
8300	827	5.78	874	6.61	920	7.47	—	—	—	—
8750	867	6.69	912	7.55	—	—	—	—	—	—

CFM	Available External Static PressuAVAILABLE EXTERNAL STATIC PRESSURE (in. wg)re (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5250	848	4.99	893	5.72	934	6.47	974	7.25	1012	8.05
5700	875	5.56	918	6.33	959	7.12	998	7.93	—	—
6150	902	6.20	944	7.00	985	7.83	—	—	—	—
6550	927	6.82	968	7.65	—	—	—	—	—	—
7000	955	7.58	—	—	—	—	—	—	—	—
7450	—	—	—	—	—	—	—	—	—	—
7900	—	—	—	—	—	—	—	—	—	—
8300	—	—	—	—	—	—	—	—	—	—
8750	—	—	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

Standard static 622-822 RPM, 3.7 BHP, max
Medium static 713-879 RPM, 4.9 BHP max
High static 835-1021 RPM, 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575V (8.3 Max BHP)
Operation point covered by high static drive. Confirm Max BHP coverage based on unit voltage selected.

48HC**24, 20 TON, VERTICAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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	615	1.25	690	1.56	757	1.89	819	2.22	875	2.57
6,500	653	1.52	725	1.87	789	2.21	848	2.57	903	2.94
7,000	692	1.85	760	2.21	822	2.58	879	2.96	932	3.35
7,500	731	2.21	796	2.60	856	3.00	911	3.40	963	3.81
8,000	771	2.63	833	3.04	890	3.47	944	3.89	994	4.33
8,500	812	3.10	871	3.54	926	3.98	977	4.43	1026	4.89
9,000	852	3.62	909	4.09	961	4.55	1011	5.03	1059	5.51
9,500	893	4.20	947	4.69	998	5.19	1046	5.69	1092	6.19
10,000	934	4.85	986	5.36	1035	5.88	1082	6.40	1126	6.93

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	928	2.92	978	3.28	1025	3.65	1071	4.03	1114	4.42
6,500	955	3.31	1003	3.69	1050	4.09	1094	4.49	1137	4.89
7,000	983	3.75	1030	4.15	1075	4.56	1119	4.98	1161	5.41
7,500	1011	4.23	1058	4.66	1102	5.09	1145	5.53	1186	5.98
8,000	1041	4.77	1087	5.21	1130	5.67	1171	6.13	—	—
8,500	1072	5.35	1116	5.82	1158	6.30	—	—	—	—
9,000	1104	6.00	1147	6.49	1188	6.99	—	—	—	—
9,500	1136	6.70	1178	7.22	—	—	—	—	—	—
10,000	1169	7.47	—	—	—	—	—	—	—	—

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. *Italics* requires high static drive package with different motor pulley.

Standard static 690-863 RPM; 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575 V (8.3 Max BHP)
Medium static 835-1021 RPM; 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575 V (8.3 Max BHP)
High static 941-1176 RPM; 208V (10.5 Max BHP) / 230V (11.9 Max BHP) / 460V (11.9 Max BHP) / 575 V (11.0 Max BHP)

48HC**24, 20 TON, HORIZONTAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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	633	1.92	700	2.44	759	2.98	812	3.53	861	4.10
6,500	674	2.34	738	2.90	795	3.48	847	4.07	894	4.67
7,000	715	2.83	776	3.43	831	4.05	882	4.67	928	5.31
7,500	757	3.39	816	4.03	869	4.68	917	5.35	963	6.03
8,000	800	4.02	856	4.70	907	5.39	954	6.10	998	6.81
8,500	843	4.73	896	5.45	945	6.18	991	6.93	1034	7.68
9,000	886	5.52	937	6.28	984	7.06	1029	7.84	1071	8.63
9,500	929	6.40	978	7.21	1024	8.02	1067	8.84	—	—
10,000	973	7.38	1020	8.22	1064	9.08	—	—	—	—

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	907	4.68	949	5.27	990	5.88	1028	6.50	1064	7.13
6,500	939	5.29	981	5.92	1020	6.56	1058	7.21	1094	7.88
7,000	972	5.97	1013	6.63	1052	7.31	1089	8.00	—	—
7,500	1005	6.72	1046	7.42	1084	8.13	—	—	—	—
8,000	1040	7.54	1079	8.28	—	—	—	—	—	—
8,500	1075	8.45	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

NOTES:

1. **Boldface** indicates field-supplied drive is required.
2. **UNDERSCORE**: Operation point covered by mid static drive; Confirm Max BHP coverage based on the unit voltage selected.

Standard static 690-863 RPM; 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575 V (8.3 Max BHP)
Medium static 835-1021 RPM; 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575 V (8.3 Max BHP)
High static 941-1100 RPM; 208V (10.5 Max BHP) / 230V (11.9 Max BHP) / 460V (11.9 Max BHP) / 575 V (11.0 Max BHP)

48HC**28, 25 TON, VERTICAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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	731	2.21	796	2.60	856	3.00	911	3.40	963	3.81
8,150	783	2.76	844	3.19	901	3.61	954	4.05	1003	4.49
8,750	832	3.35	890	3.80	943	4.26	994	4.73	1042	5.19
9,400	885	4.08	940	4.57	991	5.06	1039	5.55	1085	6.05
10,000	934	4.85	986	5.36	1035	5.88	1082	6.40	1126	6.93
10,650	988	5.78	1038	6.33	1084	6.88	1129	7.44	1172	8.00
11,250	<u>1038</u>	<u>6.74</u>	<u>1086</u>	<u>7.32</u>	1130	7.91	1173	8.49	—	—
11,900	<u>1093</u>	<u>7.91</u>	1138	8.52	1181	9.14	—	—	—	—
12,500	1144	9.10	1187	9.74	—	—	—	—	—	—

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	1011	4.23	1058	4.66	1102	5.09	1145	5.53	1186	5.98
8,150	1050	4.94	1095	5.39	1138	5.85	1180	6.32	—	—
8,750	1088	5.67	1131	6.15	1173	6.64	—	—	—	—
9,400	1129	6.56	1172	7.07	—	—	—	—	—	—
10,000	1169	7.47	—	—	—	—	—	—	—	—
10,650	—	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—	—
11,900	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

NOTES:

1. *Italics* requires high static drive package with different motor pulley.
2. **UNDERSCORE**: Operation point covered by mid static drive; Confirm Max BHP coverage based on the unit voltage selected.

Standard static 717-911 RPM, 4.9 BHP, max
Medium static 913-1116 RPM, 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575 V (8.3 Max BHP)
High static 941-1176 RPM, 208V (10.5 Max BHP) / 230V (11.9 Max BHP) / 460V (11.9 Max BHP) / 575 V (11.0 Max BHP)

48HC**28, 25 TON, HORIZONTAL SUPPLY/RETURN WITHOUT EnergyX — FAN PERFORMANCE

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	757	3.39	816	4.03	869	4.68	917	5.35	963	6.03
8,000	800	4.02	856	4.70	907	5.39	954	6.10	998	6.81
8,500	843	4.73	896	5.45	945	6.18	991	6.93	1034	7.68
9,000	886	5.52	937	6.28	984	7.06	1029	7.84	1071	8.63
9,500	929	6.40	978	7.21	1024	8.02	1067	8.84	—	—
10,000	973	7.38	1020	8.22	1064	9.08	—	—	—	—
10,500	1017	8.45	1062	9.33	—	—	—	—	—	—
11,000	1061	9.63	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—

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	1005	6.72	1046	7.42	1084	8.13	—	—	—	—
8,000	1040	7.54	1079	8.28	—	—	—	—	—	—
8,500	1075	8.45	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—
10,500	—	—	—	—	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

Standard static 717-911 RPM, 4.9 BHP, max
Medium static 913-1116 RPM, 208V (6.5 Max BHP) / 230V (6.9 Max BHP) / 460V (7.0 Max BHP) / 575 V (8.3 Max BHP)
High static 941-1176 RPM, 208V (10.5 Max BHP) / 230V (11.9 Max BHP) / 460V (11.9 Max BHP) / 575 V (11.0 Max BHP)

48HC*D17, 15 TON WITH EnergyX, VERTICAL SUPPLY/RETURN — FAN PERFORMANCE

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	490	0.76	575	1.07	653	1.41	724	1.79	791	2.19
4900	517	0.92	597	1.24	671	1.60	740	1.99	804	2.41
5250	541	1.08	618	1.42	688	1.79	754	2.19	817	2.62
5600	566	1.26	639	1.61	707	2.00	770	2.42	831	2.86
6000	595	1.49	664	1.86	729	2.27	790	2.70	848	3.15
6400	624	1.75	690	2.14	751	2.56	810	3.01	866	3.48
6750	650	2.00	713	2.41	772	2.84	829	3.30	883	3.79
7100	676	2.27	736	2.70	793	3.15	848	3.63	901	4.13
7500	706	2.62	763	3.06	819	3.54	871	4.03	922	4.55

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	854	2.63	913	3.09	970	3.57	1024	4.09	1077	4.62
4900	865	2.86	923	3.33	978	3.83	1031	4.35	1082	4.89
5250	876	3.08	932	3.56	986	4.07	1038	4.60	—	—
5600	888	3.33	943	3.82	995	4.34	1046	4.88	—	—
6000	903	3.64	956	4.14	1008	4.67	—	—	—	—
6400	920	3.98	971	4.50	—	—	—	—	—	—
6750	935	4.30	986	4.83	—	—	—	—	—	—
7100	952	4.65	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

	Standard static 514 — 680 RPM, 2.2 Max BHP
	Medium static 679 — 863 RPM, 3.3 Max BHP
	High static 826 — 1009 RPM, 4.9 Max BHP

48HCF*20, 17.5 TON WITH EnergyX, VERTICAL SUPPLY/RETURN — FAN PERFORMANCE

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
5250	541	1.08	618	1.42	688	1.79	754	2.19	817	2.62
5700	573	1.31	645	1.67	712	2.06	775	2.48	835	2.93
6100	602	1.55	670	1.93	734	2.34	795	2.77	852	3.23
6500	631	1.81	696	2.21	757	2.64	815	3.09	871	3.57
7000	668	2.19	729	2.61	787	3.06	843	3.53	896	4.03
7500	706	2.62	763	3.06	819	3.54	871	4.03	922	4.55
7900	736	3.00	791	3.47	844	3.96	895	4.47	944	5.00
8300	767	3.42	819	3.90	870	4.41	919	4.94	967	5.49
8750	801	3.94	852	4.44	900	4.97	948	5.52	993	6.09

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
5250	876	3.08	932	3.56	986	4.07	1038	4.60	1088	5.15
5700	892	3.40	946	3.90	998	4.42	1049	4.96	1097	5.52
6100	907	3.72	960	4.23	1011	4.76	1060	5.31	1107	5.89
6500	924	4.07	975	4.59	1025	5.13	1072	5.70	1119	6.28
7000	947	4.55	996	5.09	1044	5.65	1090	6.23	—	—
7500	971	5.08	1019	5.64	1064	6.22	—	—	—	—
7900	992	5.55	1038	6.13	—	—	—	—	—	—
8300	1013	6.06	—	—	—	—	—	—	—	—
8750	—	—	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

	Standard static 622 — 822 RPM, 3.3 Max BHP
	Medium static 713 — 879 RPM, 4.9 Max BHP
	High static 882 — 1078 RPM, 6.5 Max BHP

48HC*D24, 20 TON WITH EnergyX, VERTICAL SUPPLY/RETURN — FAN PERFORMANCE

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	605	1.48	674	1.77	738	2.08	798	2.41	854	2.74
6,500	644	1.82	709	2.14	770	2.47	827	2.81	881	3.17
7,000	683	2.22	744	2.56	802	2.91	857	3.28	908	3.65
7,500	722	2.68	781	3.04	836	3.41	888	3.80	938	4.19
8,000	762	3.20	818	3.58	870	3.97	920	4.38	968	4.79
8,500	803	3.78	855	4.19	905	4.60	953	5.02	999	5.46
9,000	843	4.43	893	4.86	941	5.30	987	5.74	1032	6.19
9,500	884	5.15	932	5.61	978	6.06	1022	6.53	1065	7.01
10,000	925	5.95	970	6.43	1015	6.91	1057	7.40	1098	7.89

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	907	3.10	958	3.46	1006	3.84	1052	4.23	1097	4.63
6,500	932	3.54	981	3.92	1027	4.31	1073	4.72	1116	5.14
7,000	958	4.04	1005	4.43	1051	4.84	1094	5.27	1137	5.70
7,500	985	4.59	1031	5.01	1075	5.44	1118	5.87	1159	6.32
8,000	1014	5.21	1058	5.65	1101	6.09	1142	6.55	—	—
8,500	1044	5.90	1087	6.35	1128	6.82	1168	7.29	—	—
9,000	1075	6.66	1116	7.13	1156	7.61	—	—	—	—
9,500	1106	7.49	1146	7.98	—	—	—	—	—	—
10,000	1139	8.40	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

Standard static 690 — 863 RPM, 4.9 Max BHP
Medium static 835 — 1021 RPM, 6.5 Max BHP
High static 941 — 1176 RPM, 8.7 Max BHP

48HC*D28 25 TON, WITH EnergyX, VERTICAL SUPPLY/RETURN — FAN PERFORMANCE

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	713	2.25	778	2.61	838	2.97	894	3.36	946	3.76
8,000	752	2.68	814	3.06	871	3.44	925	3.85	976	4.26
8,500	791	3.17	850	3.56	905	3.97	957	4.39	1006	4.83
9,000	831	3.71	887	4.12	939	4.55	989	4.99	1037	5.45
9,500	870	4.31	924	4.75	974	5.19	1023	5.66	1069	6.13
10,000	910	4.83	961	5.43	1010	5.90	1057	6.38	1102	6.87
10,500	950	5.70	999	6.18	1046	6.67	1091	7.17	1135	7.69
11,000	990	6.50	1037	7.01	1083	7.52	1126	8.04	1168	8.57
11,500	1030	7.38	1076	7.90	1119	8.43	—	—	—	—
12,000	1070	8.33	—	—	—	—	—	—	—	—
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	996	4.17	1044	4.60	1089	5.05	1133	5.51	1175	5.98
8,000	1024	4.70	1071	5.14	1115	5.60	1158	6.07	—	—
8,500	1053	5.27	1098	5.74	1141	6.21	—	—	—	—
9,000	1083	5.91	1127	6.39	1169	6.88	—	—	—	—
9,500	1113	6.61	1156	7.11	—	—	—	—	—	—
10,000	1145	7.38	—	—	—	—	—	—	—	—
10,500	—	—	—	—	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—
12,500	—	—	—	—	—	—	—	—	—	—

NOTE: **Boldface** indicates field-supplied drive is required.

Standard static 717 — 911 RPM, 4.9 Max BHP 2.2
Medium static 913 — 1116 RPM, 6.5 Max BHP
High static 941 — 1176 RPM, 8.7 Max BHP

PULLEY ADJUSTMENT, VERTICAL

48HC UNIT		MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN										
			0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
17	3 phase	Standard Static	680	663	647	630	614	597	580	564	547	531	514
		Medium Static	863	845	826	808	789	771	753	734	716	697	679
		High Static	1009	991	972	954	936	918	899	881	863	844	826
20	3 phase	Standard Static	822	802	782	762	742	722	702	682	662	642	622
		Medium Static	879	862	846	829	813	796	779	763	746	730	713
		High Static	1078	1058	1039	1019	1000	980	960	941	921	902	882
24	3 phase	Standard Static	863	846	828	811	794	777	759	742	725	707	690
		Medium Static	1021	1002	984	965	947	928	909	891	872	854	835
		High Static	1176	1153	1129	1106	1082	1059	1035	1012	988	965	941
28	3 phase	Standard Static	911	892	872	853	833	814	795	775	756	736	717
		Medium Static	1116	1096	1075	1055	1035	1015	994	974	954	933	913
		High Static	1176	1153	1129	1106	1082	1059	1035	1012	988	965	941

Factory setting

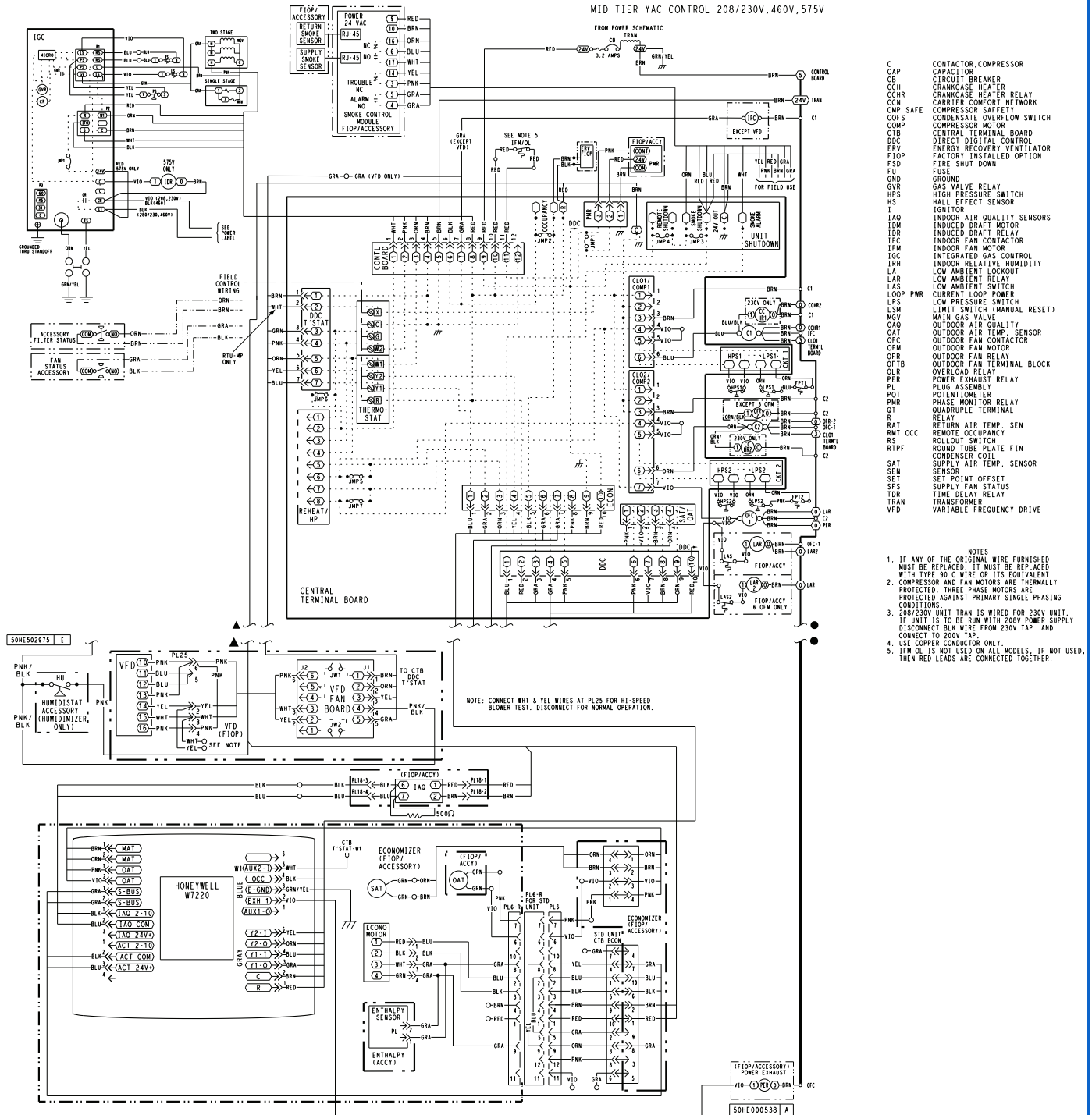
PULLEY ADJUSTMENT, HORIZONTAL

48HC UNIT		MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN										
			0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
17	3 phase	Standard Static	680	663	647	630	614	597	580	564	547	531	514
		Medium Static	780	763	747	730	714	697	680	664	647	631	614
		High Static	912	895	879	862	846	829	812	796	779	763	746
20	3 phase	Standard Static	822	802	782	762	742	722	702	682	662	642	622
		Medium Static	879	862	846	829	813	796	779	763	746	730	713
		High Static	1021	1002	984	965	947	928	909	891	872	854	835
24	3 phase	Standard Static	863	846	828	811	794	777	759	742	725	707	690
		Medium Static	1021	1002	984	965	947	928	909	891	872	854	835
		High Static	1176	1153	1129	1106	1082	1059	1035	1012	988	965	941
28	3 phase	*Standard Static	791	777	762	748	733	719	705	690	676	661	647
		Medium Static	923	906	889	873	856	839	822	805	789	772	755
		High Static	1107	1087	1067	1047	1027	1007	986	966	946	926	906

* Standard Static drive is only for 50 series, for 48 series use a field-supplied drive.

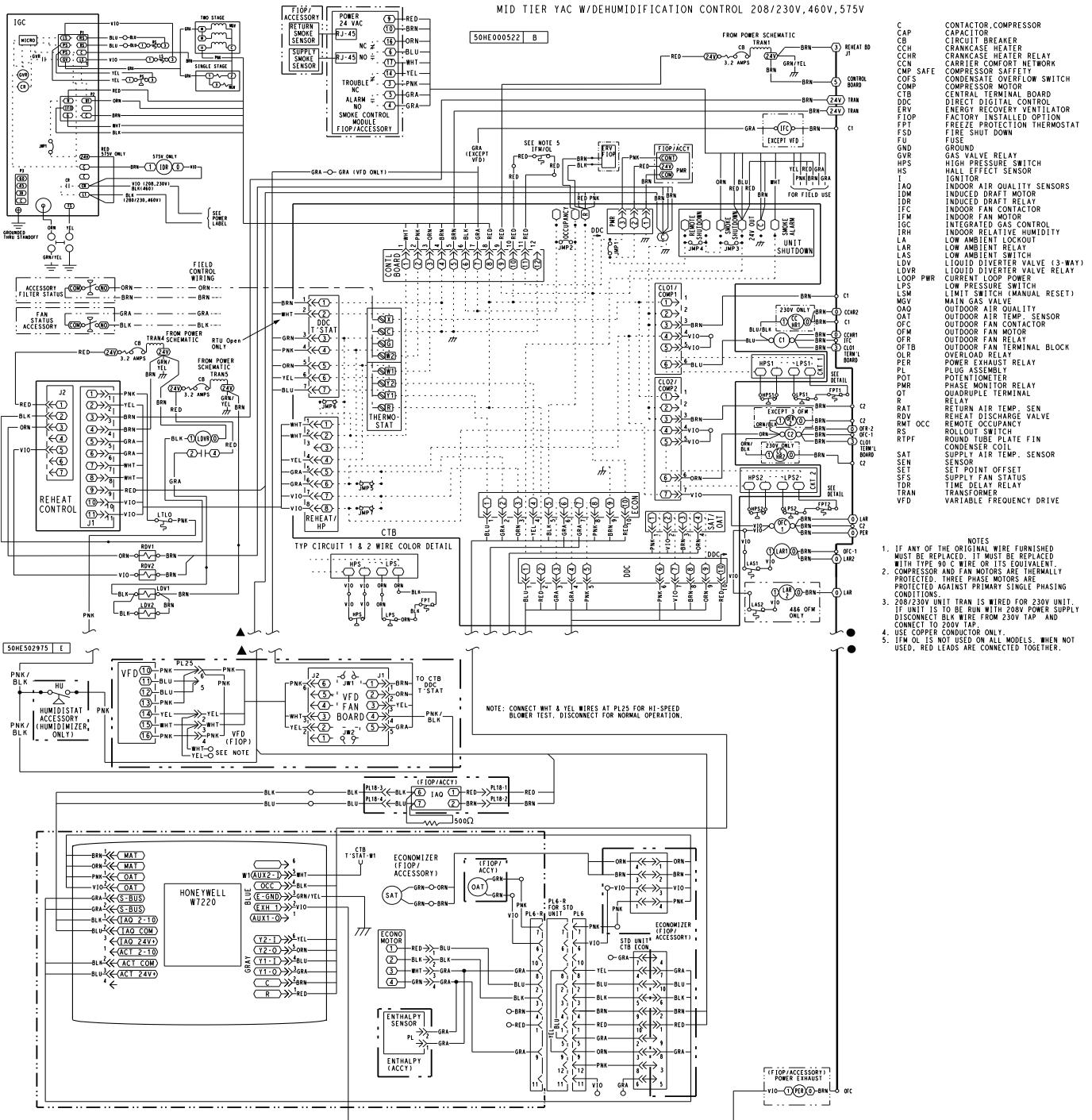
Factory setting

MID TIER YAC CONTROL 208/230V,460V,575V



48HC 17-24 ELECTRO-MECHANICAL CONTROL WIRING DIAGRAM WITH OPTIONAL HUMIDI-MIZER® SYSTEM

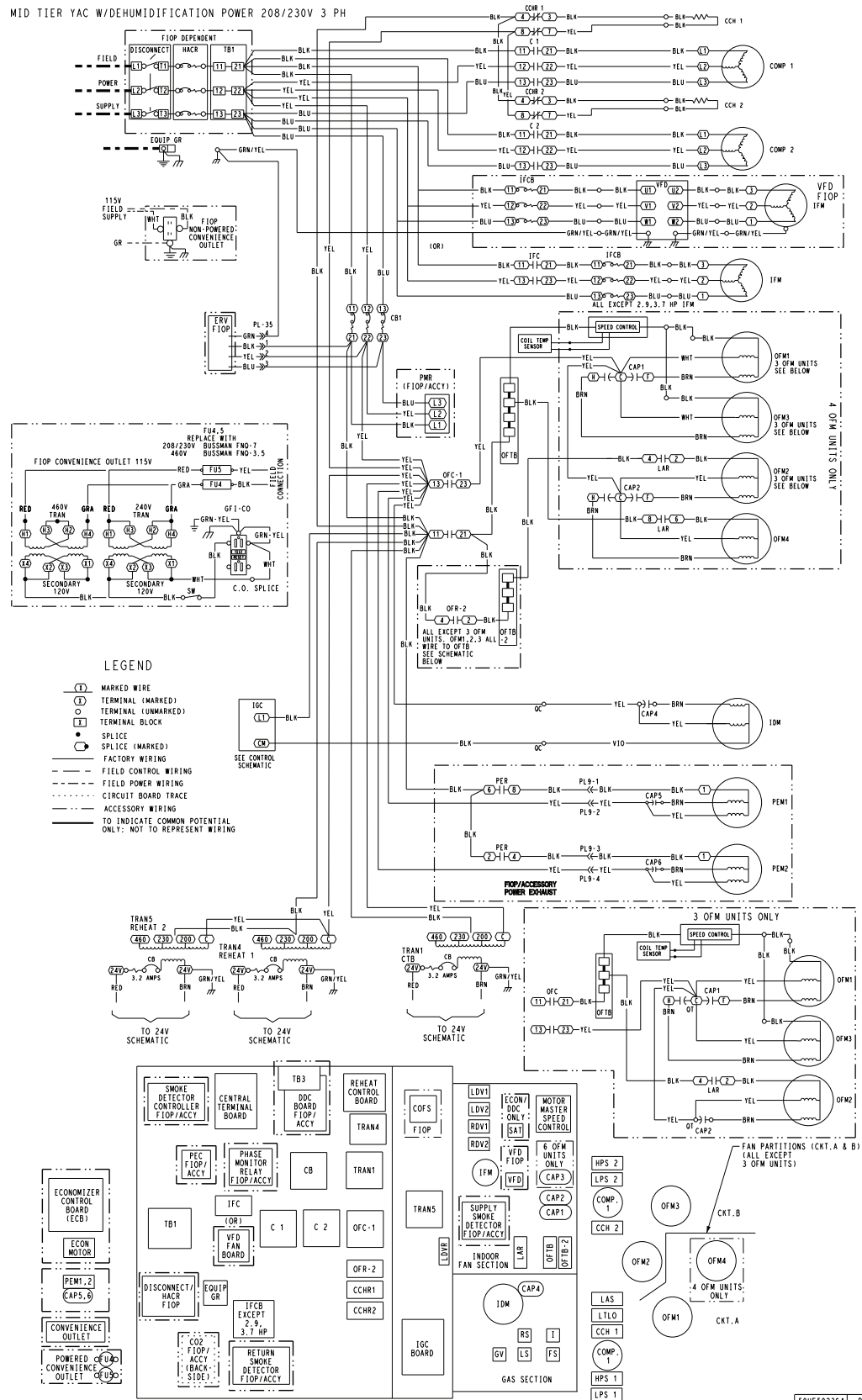
MID TIER YAC W/DEHUMIDIFICATION CONTROL 208/230V, 460V, 575V



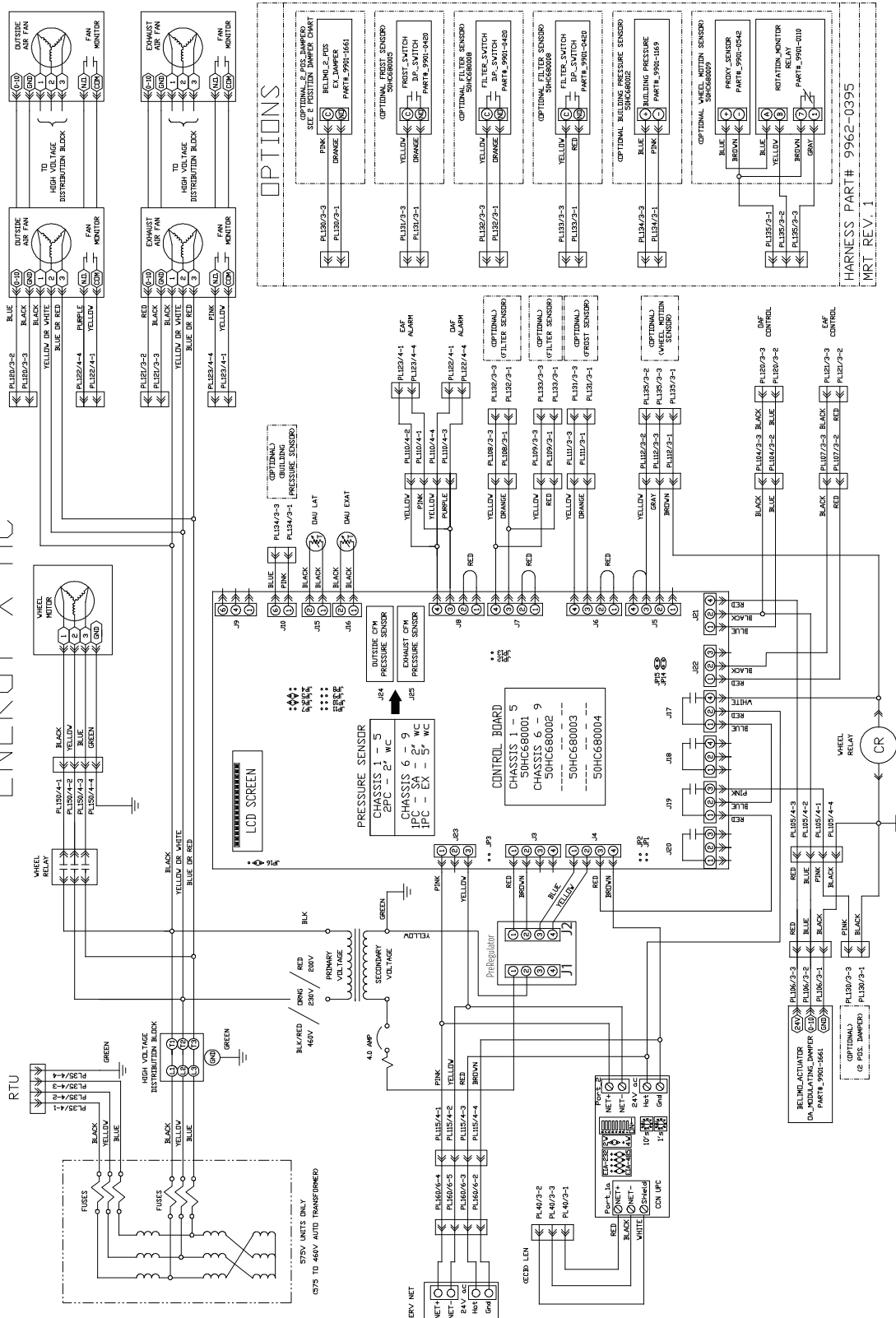
MID TIER YAC POWER 208/230V 3 PH



**48HC 17-24 TYPICAL POWER WIRING DIAGRAM WITH OPTIONAL HUMIDI-MIZER® SYSTEM,
208/230V SHOWN**



HCX ENERGY



48HC**17-28 COOLING ELECTRICAL DATA — WITHOUT EnergyX® ERV

48HC UNIT SIZE	V-Ph-Hz	VOLTAGE		COMP 1		COMP 2		OFM (EA)		IFM			COMBUSTION FAN MOTOR	POWER EXHAUST	
		RANGE		RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFFCY AT FULL LOAD	FLA	FLA	KIT QTY	FLA (EA KIT)
		MIN	MAX												
17	208-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	81.3%	7.5	0.52	2	5.9
										MED	87.0%	10.6			
										HIGH	82.9%	13.6			
	230-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	81.3%	7.5	0.52	2	5.9
										MED	87.0%	10.6			
										HIGH	82.9%	12.7			
	460-3-60	414	506	12.8	100	12.8	100	277	0.9	STD	81.3%	3.4	0.3	2	3.1
										MED	87.0%	5.3			
										HIGH	82.9%	6.4			
	575-3-60	518	633	9.6	78	9.6	48	397	0.6	STD	81.1%	2.8	0.24	2	2.4
										MED	81.1%	2.8			
										HIGH	83.6%	5.6			
20	208-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	83.8%	10.2	0.52	2	5.9
										MED	82.9%	13.6			
										HIGH-HE	89.5%	17.1			
	230-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	83.8%	10.2	0.52	2	5.9
										MED	82.9%	12.7			
										HIGH-HE	89.5%	17.1			
	460-3-60	414	506	12.8	100	12.2	100	277	0.9	STD	83.8%	4.8	0.3	2	3.1
										MED	82.9%	6.4			
										HIGH-HE	89.5%	8.6			
	575-3-60	518	633	9.6	78	9.0	78	397	0.6	STD	81.1%	2.8	0.24	2	2.4
										MED	83.6%	5.6			
										HIGH-HE	89.5%	7.6			
24	208-3-60	187	253	28.2	239	28.2	239	350	1.5	STD	89.5%	17.1	0.52	2	5.9
										MED-HE	89.5%	17.1			
										HIGH-HE	91.7%	28.5			
	230-3-60	187	253	28.2	239	28.2	239	350	1.5	STD	89.5%	17.1	0.52	2	5.9
										MED-HE	89.5%	17.1			
										HIGH-HE	91.7%	28.5			
	460-3-60	414	506	14.7	130	14.7	130	277	0.9	STD	89.5%	8.6	0.3	2	3.1
										MED-HE	89.5%	8.6			
										HIGH-HE	91.7%	14.3			
	575-3-60	518	633	11.3	94	11.3	94	397	0.6	STD	83.6%	5.6	0.24	2	2.4
										MED-HE	89.5%	7.6			
										HIGH-HE	91.7%	9.5			
28	208-3-60	187	253	48.1	245	33.9	240	350	1.5	STD	82.9%	13.6	0.52	2	5.9
										MED-HE	89.5%	17.1			
										HIGH-HE	91.7%	28.5			
	230-3-60	187	253	48.1	245	33.9	240	350	1.5	STD	82.9%	12.7	0.52	2	5.9
										MED-HE	89.5%	17.1			
										HIGH-HE	91.7%	28.5			
	460-3-60	414	506	18.6	125	16.0	140	277	0.9	STD	82.9%	6.4	0.3	2	3.1
										MED-HE	89.5%	8.6			
										HIGH-HE	91.7%	14.3			
	575-3-60	518	633	14.7	100	12.9	108	397	0.6	STD	83.6%	5.6	0.24	2	2.4
										MED-HE	89.5%	7.6			
										HIGH-HE	91.7%	9.5			

LEGEND

EA	— Each
FLA	— Full Load Amps
HIGH-HE	— High-High Efficiency
IFM	— Indoor (Evaporator) Fan Motor
LRA	— Locked Rotor Amps
MED-HE	— Medium-High Efficiency
OFM	— Outdoor Fan Motor
RLA	— Rated Load Amps

NOTE: Refer to Packaged Rooftop Builder (Selection Software) for additional electrical data specific to EnergyX units.

48HC**17-28 WITH TWO-SPEED BLOWER COOLING ELECTRICAL DATA — WITHOUT EnergyX® ERV

48HC UNIT SIZE	V-Ph-Hz	VOLTAGE		COMP 1		COMP 2		OFM (EA)		IFM			COMBUSTION FAN MOTOR	POWER EXHAUST	
		RANGE		RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFFCY AT FULL LOAD	FLA	FLA	KIT QTY	FLA (EA KIT)
		MIN	MAX												
17	208-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	85.0%	8.6	0.52	2	5.9
										MED	81.5%	10.8			
										HIGH	83.6%	13.6			
	230-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	85.0%	7.8	0.52	2	5.9
										MED	81.5%	9.8			
										HIGH	83.6%	12.7			
	460-3-60	414	506	12.8	100	12.8	100	277	0.9	STD	85.0%	3.8	0.3	2	3.1
										MED	81.5%	4.9			
										HIGH	83.6%	6.4			
	575-3-60	518	633	9.6	78	9.6	78	397	0.6	STD	81.1%	4.5	0.24	2	2.4
										MED	81.1%	4.5			
										HIGH	83.6%	6.2			
20	208-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	81.5%	10.8	0.52	2	5.9
										MED	83.6%	13.6			
										HIGH	89.5%	17.1			
	230-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	81.5%	9.8	0.52	2	5.9
										MED	83.6%	12.7			
										HIGH	89.5%	17.1			
	460-3-60	414	506	12.8	100	12.2	100	277	0.9	STD	81.5%	4.9	0.3	2	3.1
										MED	83.6%	6.4			
										HIGH	89.5%	8.6			
	575-3-60	518	633	9.6	78	9.0	78	397	0.6	STD	81.1%	4.5	0.24	2	2.4
										MED	83.6%	6.2			
										HIGH	89.5%	7.6			
24	208-3-60	187	253	28.2	239	28.2	239	350	1.5	STD	83.6%	13.6	0.52	2	5.9
										MED	89.5%	17.1			
										HIGH	91.7%	28.5			
	230-3-60	187	253	28.2	239	28.2	239	350	1.5	STD	83.6%	12.7	0.52	2	5.9
										MED	89.5%	17.1			
										HIGH	91.7%	28.5			
	460-3-60	414	506	14.7	130	14.7	130	277	0.9	STD	83.6%	6.4	0.3	2	3.1
										MED	89.5%	8.6			
										HIGH	91.7%	14.3			
	575-3-60	518	633	11.3	94	11.3	94	397	0.6	STD	83.6%	6.2	0.24	2	2.4
										MED	89.5%	7.6			
										HIGH	91.7%	9.5			
28	208-3-60	187	253	48.1	245	33.9	240	350	1.5	STD	83.6%	13.6	0.52	2	5.9
										MED	89.5%	17.1			
										HIGH	91.7%	28.5			
	230-3-60	187	253	48.1	245	33.9	240	350	1.5	STD	83.6%	12.7	0.52	2	5.9
										MED	89.5%	17.1			
										HIGH	91.7%	28.5			
	460-3-60	414	506	18.6	125	16.0	140	277	0.9	STD	83.6%	6.4	0.3	2	3.1
										MED	89.5%	8.6			
										HIGH	91.7%	14.3			
	575-3-60	518	633	14.7	100	12.9	108	397	0.6	STD	83.6%	6.2	0.24	2	2.4
										MED	89.5%	7.6			
										HIGH	91.7%	9.5			

LEGEND

EA	—	Each
FLA	—	Full Load Amps
HIGH-HE	—	High-High Efficiency
IFM	—	Indoor (Evaporator) Fan Motor
LRA	—	Locked Rotor Amps
MED-HE	—	Medium-High Efficiency
OFM	—	Outdoor Fan Motor
RLA	—	Rated Load Amps

NOTE: Refer to Packaged Rooftop Builder (Selection Software) for additional electrical data specific to EnergyX units.

48HC**17-28 MCA MOCP ELECTRICAL DATA — WITHOUT EnergyX ERV

48HC UNIT TYPE	NOM. V-Ph-Hz	IFM TYPE	NO CONVENIENCE OUTLET OR UNPOWERED CONVENIENCE OUTLET								WITH POWERED CONVENIENCE OUTLET							
			NO POWERED EXHAUST				WITH POWERED EXHAUST (POWERED FROM UNIT)				NO POWERED EXHAUST				WITH POWERED EXHAUST (POWERED FROM UNIT)			
			MCA	HACR BRKR	DISC. SIZE		MCA	HACR BRKR	DISC. SIZE		MCA	HACR BRKR	DISC. SIZE		MCA	HACR BRKR	DISC. SIZE	
					FLA	LRA			FLA	LRA			FLA	LRA			FLA	LRA
17	208/230-3-60	STD	68.3	90	71	393	80.1	100	85	413	73.1	90	77	398	84.9	100	90	68.3
		MED	71.4	90	75	423	83.2	100	88	443	76.2	100	80	428	88.0	100	94	71.4
		HIGH	74.4	90	78/77	425	86.2	100	92/91	445	79.2	100	84/83	430	91.0	100	97/96	74.4
	460-3-60	STD	34.9	45	36	234	41.1	50	44	246	37.1	45	39	236	43.3	50	46	34.9
		MED	36.8	45	39	249	43.0	50	46	261	39.0	50	41	251	45.2	50	48	36.8
		HIGH	37.9	50	40	250	44.1	50	47	262	40.1	50	42	252	46.3	50	50	37.9
	575-3-60	STD	26.2	30	27	184	31.0	40	33	192	27.9	35	29	186	32.7	40	35	26.2
		MED	26.2	30	27	184	31.0	40	33	192	27.9	35	29	186	32.7	40	35	26.2
		HIGH	29.0	35	31	198	33.8	40	36	206	30.7	40	33	200	35.5	45	38	29.0
20	208/230-3-60	STD	75.7	100	79	440	87.5	100	93	460	80.5	100	85	445	92.3	100	98	75.7
		MED	79.1	100	83/82	455	90.9	100	97/96	475	83.9	100	89/88	460	95.7	110	102/101	79.1
		HIGH-HE	82.6	100	87	451	94.4	110	101	471	87.4	100	93	456	99.2	125	106	82.6
	460-3-60	STD	36.6	45	38	245	42.8	50	46	257	38.8	50	41	247	45.0	50	48	36.6
		MED	38.2	50	40	252	44.4	50	47	264	40.4	50	43	254	46.6	50	50	38.2
		HIGH-HE	40.4	50	43	250	46.6	50	50	262	42.6	50	45	252	48.8	60	52	40.4
	575-3-60	STD	26.2	30	27	186	31.0	40	33	194	27.9	35	29	188	32.7	40	35	26.2
		MED	29.0	35	31	200	33.8	40	36	208	30.7	40	33	202	35.5	45	38	29.0
		HIGH-HE	31.0	40	33	198	35.8	45	38	206	32.7	40	35	200	37.5	45	40	31.0
24	208/230-3-60	STD	86.6	100	91	574	98.4	125	105	594	91.4	100	97	579	103.2	125	111	86.6
		MED-HE	86.6	100	91	574	98.4	125	105	594	91.4	100	97	579	103.2	125	111	86.6
		HIGH-HE	98.0	125	105	653	109.8	125	118	673	102.8	125	110	658	114.6	125	124	98.0
	460-3-60	STD	45.3	50	48	310	51.5	60	55	322	47.5	60	50	312	53.7	60	58	45.3
		MED-HE	45.3	50	48	310	51.5	60	55	322	47.5	60	50	312	53.7	60	58	45.3
		HIGH-HE	51.0	60	54	350	57.2	70	62	362	53.2	60	57	352	59.4	70	64	51.0
	575-3-60	STD	33.4	40	35	232	38.2	45	41	240	35.1	45	37	234	39.9	50	43	33.4
		MED-HE	35.4	45	37	230	40.2	50	43	238	37.1	45	39	232	41.9	50	45	35.4
		HIGH-HE	37.3	45	40	257	42.1	50	45	265	39.0	50	42	259	43.8	50	47	37.3
28	208/230-3-60	STD	116.6	150	120/119	591	128.4	175/175	134/133	611	121.4	150/150	126/125	596	133.2	175/175	139/138	116.6
		MED-HE	120.1	150	124	587	131.9	175	138	607	124.9	150	130	592	136.7	175	143	120.1
		HIGH-HE	131.5	175	137	666	143.3	175	151	686	136.3	175	143	671	148.1	175	157	131.5
	460-3-60	STD	51.1	60	53	321	57.3	70	60	333	53.3	60	56	323	59.5	70	63	51.1
		MED-HE	53.3	60	56	319	59.5	70	63	331	55.5	70	58	321	61.7	80	66	53.3
		HIGH-HE	59.0	70	62	359	65.2	80	70	371	61.2	70	65	361	67.4	80	72	59.0
	575-3-60	STD	40.5	50	42	256	45.3	50	48	264	42.2	50	44	258	47.0	60	50	40.5
		MED-HE	42.5	50	45	254	47.3	60	50	262	44.2	50	47	256	49.0	60	52	42.5
		HIGH-HE	44.4	50	47	281	49.2	60	52	289	46.1	60	49	283	50.9	60	54	44.4

LEGEND

BRKR	— Circuit Breaker
DISC	— Disconnect
FLA	— Full Load Amps
HACR	— Heating Air-conditioning And Refrigeration
IFM	— Indoor Fan Motor
LRA	— Locked Rotor Amps
MCA	— Minimum Circuit Amps
RLA	— Rated Load Amps

NOTES:

1. Refer to Packaged Rooftop Builder (Selection Software) for additional electrical data specific to EnergyX units.
2. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the over-current protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
3. For 208/230 v units, where one value is shown it is the same for either 208 or 230 volts.
4. 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.

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

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.

General — The sequence below describes the sequence of operation for an electro-mechanical unit with and without a factory-installed EconoMi\$er® IV and X (called “economizer” in this sequence). For information regarding a direct digital controller, see the start-up, operations, and troubleshooting manual for the applicable controller.

Electro-Mechanical Units with No Economizer Cooling (Single Speed Indoor Fan Motor) — When the thermostat calls for cooling, terminals G and Y1 are energized. As a result, the indoor-fan contactor (IFC) and the compressor contactor (C1) are energized, causing the indoor-fan motor (IFM), compressor #1, and outdoor fan to start. If the unit has 2 stages of cooling, the thermostat will additionally energize Y2. The Y2 signal will energize compressor contactor #2 (C2), causing compressor #2 to start. Regardless of the number of stages, the outdoor-fan motor runs continuously while unit is cooling.

Cooling (2-speed indoor fan motor) — Per ASHRAE 90.1-2016 standards during the first stage of cooling operation the VFD will adjust the fan motor to provide 66% of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm established for the unit (100%).

Heating

NOTE: WeatherMaster® units have either 1 or 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. On units with 2 stages of heat, 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 call for W1 lasted less than 1 minute,

the heating cycle will not terminate until 1 minute after W1 became active. If the unit is controlled through a room thermostat set for fan auto, the indoor-fan motor will continue to operate for an additional 45 seconds then stop. If the over-temperature limit opens after the indoor motor is stopped, but within 10 minutes of W1 becoming inactive, on the next cycle the time will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified, the fan off delay will not change back to 45 seconds unless power is reset to the control. An LED indicator is provided on the IGC to monitor operation.

Electro-Mechanical Units with Factory-Installed EconoMi\$er Cooling (Single Speed Indoor Fan Motor, Non-EnergyX units)

Cooling — When free cooling is not available, the compressors will be controlled by the zone thermostat. When free cooling is available, the outdoor-air damper is modulated by the EconoMi\$er IV and X control to provide a 50°F (10°C) to 55°F (13°C) mixed-air temperature into the zone. As the mixed air temperature fluctuates above 55°F (13°C) or below 50°F (10°C) dampers will be modulated (open or close) to bring the mixed-air temperature back within control. If mechanical cooling is utilized with free cooling, the outdoor-air damper will maintain its current position at the time the compressor is started. If the increase in cooling capacity causes the mixed-air temperature to drop below 45°F (7°C), then the outdoor-air damper position will be decreased to the minimum position. If the mixed-air temperature continues to fall, the outdoor-air damper will close. Control returns to normal once the mixed-air temperature rises above 48°F (9°C). The power exhaust fans will be energized and de-energized, if installed, as the outdoor-air damper opens and closes.

If field-installed accessory CO₂ sensors are connected to the EconoMi\$er IV and X control, a demand controlled ventilation strategy will begin to operate. As the CO₂ level in the zone increases above the CO₂ set-point, the minimum position of the damper will be increased proportionally. As the CO₂ level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. For EconoMi\$er IV and X operation, there must be a thermostat call for the fan (G). If the unit is occupied and the fan is on, the damper will operate at minimum position. Otherwise, the damper will be closed.

When the EconoMi\$er IV and X control is in the occupied mode and a call for cooling exists (Y1 on the thermostat), the control will first check for indoor fan operation. If the fan is not on, then cooling will not be activated. If the fan is on, then the control will open the EconoMi\$er IV and X damper to the minimum position.

On the initial power to the EconoMi\$er IV and X control, it will take the damper up to 2 1/2 minutes before it begins to position itself. After the initial power-up, further changes in damper position can take up to 30 seconds to initiate. Damper movement from full closed to full open (or vice versa) will take between 1 1/2 and 2 1/2 minutes. If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to maintain the

mixed-air temperature set-point at 50°F (10°C) to 55°F (13°C). If there is a further demand for cooling (cooling second stage - Y2 is energized), then the control will bring on compressor stage 1 to maintain the mixed-air temperature set-point. The EconoMi\$er IV and X damper will be open at maximum position.

2-Speed Note: When operating in ventilation mode only, the indoor fan motor will automatically adjust to 66% of the total cfm established.

Heating — The sequence of operation for the heating is the same as an electro-mechanical unit with no economizer. The only difference is how the economizer acts. The economizer will stay at the Economizer Minimum Position while the evaporator fan is operating. The outdoor-air damper is closed when the indoor fan is not operating. Refer to Service and Maintenance Manual for further details.

Optional Humidi-MiZer® Dehumidification System —

Units with the factory equipped Humidi-MiZer system option are capable of providing multiple modes of improved dehumidification as a variation of the normal cooling cycle. The Humidi-MiZer system option includes additional valves in the liquid line and discharge line of each refrigerant circuit, a small reheat condenser coil downstream of the evaporator, and Motormaster® variable-speed control of some or all outdoor fans. Operation of the revised refrigerant circuit for each mode is described below.

The Humidi-MiZer system provides three sub-modes of operation: Cool, Reheat1, and Reheat2.

Cool mode — Provides a normal ratio of Sensible and Latent Cooling effect from the evaporator coil.

Reheat1 — Provides increased Latent Cooling while slightly reducing the Sensible Cooling effect.

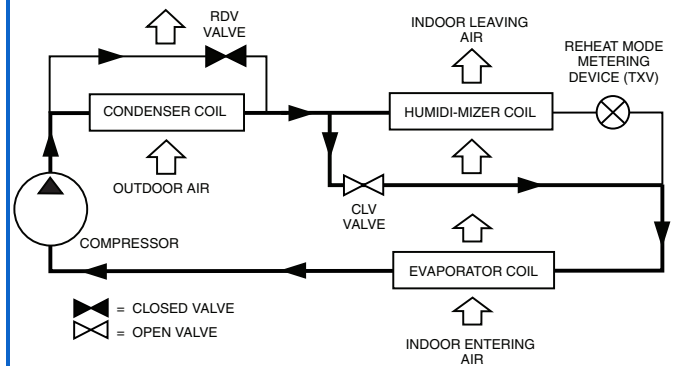
Reheat2 — Provides normal Latent Cooling but with null or minimum Sensible Cooling effect delivered to the space.

The Reheat1 and Reheat2 modes are available when the unit is not in a Heating mode and when the Low Ambient Lockout switch is closed.

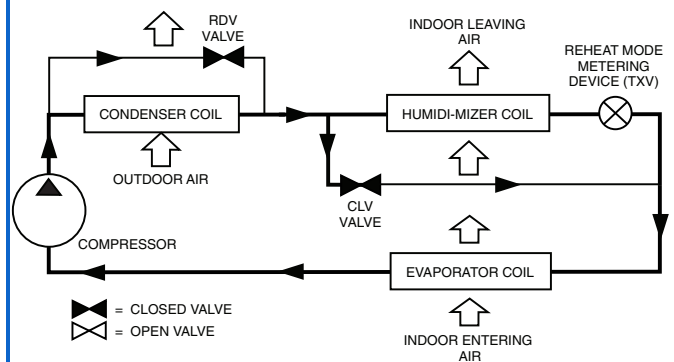
The figures on this page depict piping for single stage cooling units.

RTU Open Controller (Factory Option) — For details on operating 48HC units equipped with the factory-installed RTU Open controller option refer to Factory Installed RTU Open Multi-Protocol Controller Controls, Start-Up, Operation and Troubleshooting manual.

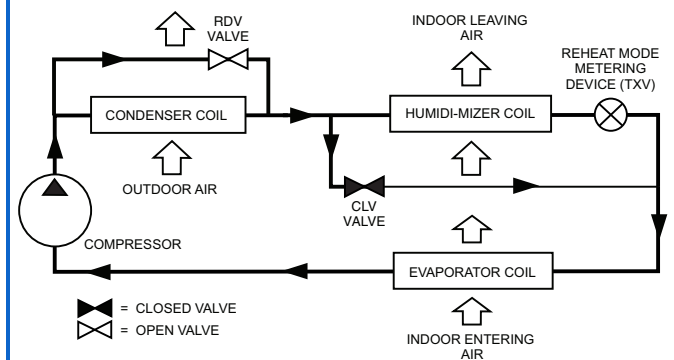
NORMAL COOLING MODE — HUMIDI-MIZER SYSTEM WITH SINGLE STAGE COOLING



SUBCOOLING MODE (REHEAT 1) — HUMIDI-MIZER SYSTEM WITH SINGLE STAGE COOLING



HOT GAS REHEAT MODE (REHEAT2) — HUMIDI-MIZER SYSTEM WITH SINGLE STAGE COOLING



Minimum Operating Ambient Temperature (Cooling) — In mechanical cooling mode, your Carrier rooftop unit can safely operate down to an outdoor ambient temperature of 35°F (2°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.

Minimum Mixed Air Temperature (Heating) — 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 table below.

MINIMUM MIXED AIR TEMPERATURE

ALUMINIZED	STAINLESS STEEL
50°F (10°C) Continuous	40°F (4°C) Continuous
45°F (7°C) Intermittent	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 max may cause blow-off, undesired airflow noise, or airflow related problems with the rooftop unit. Operating below the min may cause problems with coil freeze-up and unsafe heating operation. Heating and cooling limitations differ when evaluating operating CFM, the minimum value is the HIGHER of the cooling and heating minimum CFM values published on page 5 and the maximum value is the LOWER of the cooling and heating minimum values published on page 5.

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-through 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 control methods and their benefits, as well as sensors required to accomplish your application goals. Please contact your local Carrier representative for assistance.

Motor Limits, Break 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/ft³ 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.

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 (-29°C) using the recommended accessory Motormaster® low ambient controller.

Sizing a Rooftop — Bigger isn't necessarily better. While an air conditioner needs to have enough capacity to meet the design loads, it doesn't 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.

Rather than oversizing an air conditioner, engineers should “right-size” or even slightly undersize 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 (-29°C) using the recommended accessory Motormaster® low ambient controller.

Staged Air Volume (SAV™) System with VFD Controller (2-Stage Cooling Models Only)

Carrier’s staged air volume (SAV) system saves energy and installation time by utilizing a variable frequency drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the units cooling operation. Per ASHRAE 90.1-2016 and IECC-2015, during the first stage of cooling operation the VFD will adjust the fan motor to provide two-thirds of the total cfm established for the unit. When a call for the second stage of cooling is required, the VFD will allow the total cfm for the unit established (100%). During the heating mode the VFD will allow total design cfm (100%) operation and during the ventilation mode the VFD will allow operation to two-thirds of total cfm.

Compared to single speed indoor fan motor systems, Carrier’s SAV system can save substantial energy, 25%+, versus single speed indoor fan motor systems.

IMPORTANT: Data based on .10 (\$/kWh) in an office application utilizing Carrier’s HAP 4.6 simulation software program.

The VFD used in Carrier’s SAV system has soft start capabilities to slowly ramp up the speeds, thus eliminating any high inrush air volume during initial start-up. It also has internal over current protection for the fan motor and a field installed display kit that allows adjustment and in depth diagnostics of the VFD.

This SAV system is available on models with 2-stage cooling operation. The SAV system is very flexible for initial fan performance set up and adjustment. The standard factory shipped VFD is pre-programmed to automatically stage the fan speed between the first and second stage of cooling. The unit fan performance static pressure and cfm can be easily adjusted using the traditional means of pulley adjustments. The other means to adjust the unit static and cfm performance is to utilize the field-installed display kit and adjust the frequency and voltage in the VFD to required performance requirements. In either case, once set up, the VFD will automatically adjust the speed between the cooling stage operations.

48HC STAGED AIR VOLUME (SAV) — VARIABLE FREQUENCY DRIVE (VFD) HP RATING

UNIT SIZE	STATIC OPTION	VOLTAGE	VFD HP
17	STD	208/230	3.0
		460	3.0
		575	5.0
	MED	208/230	3.0
		460	5.0
		575	5.0
	HIGH	208/230	7.5
		460	
		575	
20	STD	208/230	3.0
		460	5.0
		575	5.0
	MED	208/230	7.5
		460	
		575	
	HIGH	208/230	7.5
		460	
		575	
24	STD	208/230/460/575	7.5
	MED	208/230/460/575	7.5
	HIGH	208/230/460/575	7.5
28	STD	208/230/460/575	7.5
	MED	208/230/460/575	7.5
	HIGH	208/230/460/575	7.5

Optional EnergyX® Energy Recovery Ventilator (ERV) Application Data

When selecting the WeatherMaster® Series Unit and EnergyX system to use on a given application, it is strongly recommended that the Carrier Packaged RTU Builder (PRB) Selection Software be used. This is because there are a number of variables which become complex when manual calculations are performed, but can easily be accounted for in a computer operation. Most specifically, the AHRI certified ratings use Standard CFM values, but due to real world operation, variances in altitude and air density are very important. The Carrier PRB software uses altitude corrected airflows (ACFM).

See Carrier’s Packaged Rooftop Builder selection software for automated calculation of unit selection and Combined Efficiency Factor (CEF) values.

Typical Energy Recovery unit selection involves the following steps:

1. Determine the zone cooling and heating requirements at the design conditions.
2. Select Energy Recovery unit based on desired outdoor airflow rate.

NOTE: It is recommended that the outdoor airflow and exhaust airflow rates be designed at the same or close to the same value. If the difference between the two airflows becomes large enough, the energy recovery unit’s cooling capacity, heating capacity and overall efficiency will be negatively impacted.

3. Calculate the Energy Recovery unit’s leaving air conditions and unit capacities based on the outside airflow rate, temperature (db and wb) and exhaust

airflow rate and temperatures (db and wb) at the design temperatures and maximum ventilation rate.

4. Subtract the Energy Recovery unit's cooling and heating capacities from the design zone requirements. The value that remains is the necessary design size of the rooftop unit.
5. Use the Energy Recovery unit's leaving air temperatures (db and wb) as the ventilation air temperatures entering the rooftop unit to be mixed with the return air before passing through the rooftop unit's evaporator.
6. After selecting the desired Energy Recovery unit and rooftop unit, use AHRI's Guideline V to calculate the Combine Efficiency Factor (system EER). Additional information on Energy Recovery capacity calculations and leaving air temperature calculations can be found in the two AHRI documents below:

AHRI Guideline V — Calculating the efficiency of energy recovery ventilation and its effect on efficiency and sizing of building HVAC systems

AHRI Standard 1060 — Performance rating of air-to-air heat exchangers for energy recovery ventilation equipment

AirXchange¹ Energy Recovery Cassette — UL certified, AHRI listed, silica gel enthalpy desiccant, wheels greater than 25-in. diameter are segmented for easy cleaning, washable with detergent and water, 5 year standard limited warranty.

EnergyX Operation — Energy recovery wheels rotate between the incoming outdoor airstream and the building exhaust airstream. As the wheel rotates, it transfers heat and moisture from one airstream to the other. Result = outdoor air is pre-conditioned, significantly reducing the capacity and energy needed from the mechanical HVAC system.

EnergyX Factory Installed Accessories

Economizer option — Allows true modulating economizer capability when OA is suitable for free cooling

- operates as a true wheel bypass damper
- uses stop/jog operation for wheel
- required when using CO₂ sensor for DCV operation

Frost control option — Uses exhaust air to defrost the wheel when necessary.

EnergyX System ComfortLink V5 integrated controls — All ERV configuration, setup and troubleshooting is done via *ComfortLink* controls.

- Modulating OA ventilation damper
- New "Outside Air Unit" points table
- New control functions for accessory devices:
 - Cold air tempering kit
 - Exhaust fan building pressure control
 - 2-position exhaust damper

EnergyX Field-Installed Accessories

Horizontal Roofcurb Adapters — Used when horizontal supply and/or return is desired.

Motor Status Indicator Accessory — Monitors wheel, supply and exhaust motors and provides indication if not operating.

Filter Status Indicator Accessory — Monitors static pressure across supply and exhaust filters and provides indication when filters become clogged.

Motorized Exhaust Damper Accessory — Replaces the standard barometric exhaust damper blades with motorized (open/shut) damper.

Application/Selection Option — Selection software by Carrier saves time by performing many of the steps above. Contact your Carrier sales representative for assistance.

1. AirXchange is a registered trademark of AirXchange, Inc.

"Masterformat" as published by the Construction Specification Institute. Please feel free to copy this specification directly into your building spec.



WeatherMaster® Gas Heat/Electric Cooling Packaged Rooftop

HVAC guide specifications

Size range: **15 to 25 Nominal Tons**

Carrier Model Number: **48HC*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.
 3. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.
- 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 2 different stages of cooling, and 2 different stages of heating.
 - c. 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.) PremierLink™ controller
 1. Shall be ASHRAE 62 compliant.
 2. Shall accept 18-32 VAC input power.
 3. Shall have an operating temperature range from -40°F (-40°C) to 158°F (70°C), 10% to 95% RH (non-condensing).
 4. Shall include an integrated economizer controller to support an economizer with 4 to 20 mA actuator input and no microprocessor controller.
 5. Controller shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock-out, fire shutdown, enthalpy, fan status, remote time clock/door switch.
 6. Shall accept a CO₂ sensor in the conditioned space, and be Demand Controlled Ventilation (DCV) ready.
 7. Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/exhaust/ reversing valve/ dehumidify/ occupied.
 8. Unit shall provide surge protection for the controller through a circuit breaker.
 9. Shall be Internet capable, and communicate at a Baud rate of 38.4K or faster.
 10. Shall have an LED display independently showing the status of activity on the communication bus, and processor operation.
 11. Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool, an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks¹ plug-in communications card.
 12. Shall have built-in Carrier Comfort Network® (CCN) protocol, and be compatible with other CCN devices, including ComfortLink and ComfortVIEW™ controllers.
 13. Shall have built-in support for Carrier technician tool.
 14. Software upgrades will be accomplished by local download. Software upgrades through chip replacements are not allowed.
 15. Shall be shock resistant in all planes to 5G peak, 11ms during operation, and 100G peak, 11ms during storage.
 16. Shall be vibration resistant in all planes to 1.5G at 20-300 Hz.

1. LonWorks is a registered trademark of Echelon Corporation.

17. Shall support a bus length of 4000 ft (1219 m) max, 60 devices per 1000 ft (305 m) section, and 1 RS-485 repeater per 1000 ft (305 m) sections.
- B. (23 09 23.13.B.) RTU Open protocol, direct digital controller:
 1. Shall be ASHRAE 62 compliant.
 2. Shall accept 18-30VAC, 50-60Hz, and consume 15VA or less power.
 3. Shall have an operating temperature range from -40°F (-40°C) to 130°F (54°C), 10% to 90% RH (non-condensing).
 4. Shall include built-in protocol for BACnet¹ (MS/TP and PTP modes), Modbus² (RTU and ASCII), Johnson N2 and LonWorks. LonWorks Echelon processor required for all Lon applications shall be contained in separate communication board.
 5. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers.
 6. Baud rate Controller shall be selectable using a dip switch.
 7. Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.
 8. Shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, compressor lock-out, fire shutdown, enthalpy switch, and fan status / filter status / humidity / remote occupancy.
 9. Shall provide the following outputs: economizer, variable frequency drive, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, exhaust reversing valve/high fan speed.
 10. Shall have built-in surge protection circuitry through solid-state polyswitches. Polyswitches shall be used on incoming power and network connections. Polyswitches will return to normal when the "trip" condition clears.
 11. Shall have a battery backup capable of a minimum of 10,000 hours of data and time clock retention during power outages.
 12. Shall have built-in support for Carrier technician tool.
 13. Shall include an RS-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool, an RS-485 port for network communication to intelligent space sensors and displays, and

a port to connect an optional LonWorks communications card.

14. Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.
- C. (23 09 23.13.C.) *ComfortLink* Unit Controls shall contain:
 1. Four button detailed English scrolling marquee display.
 2. CCN (Carrier Comfort Network®) capable.
 3. Unit control with standard suction pressure transducers and condensing temperature thermistors.
 4. Shall provide a 5°F (2°C) temperature difference between cooling and heating set points to meet ASHRAE 90.1-2016 Energy Standard.
 5. Shall provide and display a current alarm list and an alarm history list.
 6. Service run test capability.
 7. Shall accept input from a CO₂ sensor (both indoor and outdoor).
 8. Configurable alarm light shall be provided which activates when certain types of alarms occur.
 9. Compressor minimum run time (3 minutes) and minimum off time (5 minutes) are provided.
 10. Service diagnostic mode.
 11. Economizer control (optional).
 12. Control multiple capacity stages.
 13. Unit shall be complete with self-contained low voltage control circuit.
 14. Unit shall have 0°F low ambient cooling operation.

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 75VA capability.
 2. Shall utilize color-coded wiring.
 3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, economizer, thermostat, DDC control options, loss of charge, freeze switch, 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.

1. BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).

2. Modbus is a registered trademark of Schneider Electric.

B. (23 09 33.13.B) Safeties:

1. Compressor over-temperature, over-current.
2. Low-pressure switch.
 - a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 loss of charge switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
 - b. Loss of charge 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.
 - a. Units with 2 compressors shall have different sized connectors for the circuit 1 and circuit 2 high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
 - b. 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.

Part 6 — (23 09 93) Sequence of operations for HVAC controls

6.01 (23 09 93.13) Decentralized, Rooftop Units:

(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, throwaway 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 a dedicated, weather tight access panel.
4. 4-in. filter capabilities shall be capable with pre-engineered and approved Carrier filter track field-installed accessory. This kit requires field furnished filters.

Part 8 — (23 81 19) Self-contained air conditioners

8.01 (23 81 19.13) Medium-Capacity Self-Contained Air Conditioners (48HC17-28)**

A. (23 81 19.13.A) General

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing 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® R-410A 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 ASHRAE 90.1-2016 and IECC¹-2015 minimum efficiency requirements.
2. Units are ENERGY STAR² certified where sizes are required.
3. Unit shall be rated in accordance with AHRI Standard 340/360.
4. Unit shall be designed to conform to ASHRAE 15.
5. Unit shall be ETL-tested and certified in accordance with ANSI Z21.47 Standards and ETL-listed and certified under Canadian standards as a total package for safety requirements.
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
7. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.
8. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
9. Roof curb shall be designed to conform to NRCA Standards.
10. 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.

1. IECC is a registered trademark of the International Code Council, Inc.

2. Energy Star is registered trademark of the United States Department of Energy.

11. Unit shall be designed in accordance with UL Standard 1995, ETL listed including tested to withstand rain.
 12. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
 13. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
 14. High-Efficiency Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).
- 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
- 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 $\pm 10\%$ voltage.
 2. Compressor with standard controls shall be capable of operation from 35°F (2°C), ambient outdoor temperatures. Accessory kits are necessary if mechanically cooling at ambient temperatures below 35°F (2°C).
 3. Unit shall discharge supply air vertically as shown on contract drawings.
 4. Unit shall be factory configured and ordered for vertical supply and return configurations.
 5. Unit shall be factory furnished for either vertical or horizontal configuration without the use of special conversion kits. No field conversion is possible.
- F. (23 81 19.13.F) Electrical Requirements
- 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 pre-painted 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): 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. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.
 5. Base of unit shall have a minimum of four locations for factory thru-the-base gas and electrical connections (factory-installed or field-installed) standard. Connections shall be internal to the cabinet to protect from environmental issues.
 6. 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.
 7. Condensate pan and connections:
 - a. Shall be a sloped condensate drain pan made of a non-corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 3/4-in. 14 NPT drain connection at the end of the drain pan. Connection shall be made per manufacturer's recommendations.
 8. Top panel:

Shall be a multi-piece top panel linked with water tight flanges and interlocking systems.
 9. 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 a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
 - 2) Optional, factory-approved, water-tight connection method must be used for thru-the-base gas connections.
 - 3) No basepan penetration, other than those authorized by the manufacturer, is permitted.

10. Electrical Connections:

- a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.
- b. Thru-the-base capability
 - 1) Thru-the-base provisions/connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.
 - 2) No basepan penetration, other than those authorized by the manufacturer, is permitted.

11. Component Access Panels (standard):

- a. Cabinet panels shall be easily removable for servicing.
- b. Unit shall have one factory installed, tool-less, removable, filter access panel.
- c. Panels covering control box and filters shall have molded composite handles while the blower access door shall have an integrated flange for easy removal.
- d. Handles shall be UV modified, composite, 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.

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. IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high temperature limit switch.
- c. 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. Standard Heat Exchanger Construction:

- a. Heat exchanger shall be of the tubular-section type constructed of a minimum of

20-gauge steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance.

- b. Burners shall be of the in-shot type constructed of aluminum-coated steel.
- c. Burners shall incorporate orifices for rated heat output up to 2000 ft (610 m) elevation. Additional accessory kits may be required for applications above 2000 ft (610 m) elevation, depending on local gas supply conditions.
- d. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.

4. Optional 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 optional 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.

5. 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 1995 burst test at 1775 psig.
- c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 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 B117-90.
 - 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 D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93.
 - f. Impact resistance shall be up to 160 in.-lb (ASTM D2794-93).
 - g. Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D224-92 and ASTM D870-92).
 - h. Corrosion durability shall be confirmed through testing to be no less than 6000 hours salt spray per ASTM B117-90.
5. Optional E-coated aluminum-fin, aluminum tube condenser coils:
 - a. Shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers.
 - b. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.
 - c. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
 - d. Shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02.
 - e. Shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2.
- 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.
 - c. Service gauge connections on suction and discharge lines.
 - d. Pressure gauge access through a specially designed access screen on the side of the unit.
 2. Compressors:
 - a. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
 - b. Models shall be available with 2 compressor/2-stage cooling.
 - 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-ampereage 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 provided by the factory.

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 preformed slide out 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.
- 6. 4-in. filter capability is possible with a field-installed pre-engineered slide out filter track accessory. 4-in. filters are field furnished.

L. (23 81 19.13.L) Evaporator fan and motor

- 1. Evaporator fan motor:
 - a. Shall have inherent automatic-reset thermal overload protection or circuit breaker.
 - b. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.
- 2. Belt-driven evaporator fan:
 - a. Belt drive shall include an adjustable-pitch motor pulley and belt break protection system.
 - b. Shall use rigid pillow block bearing system with lubricate fittings at are accessible or lubrication line.
 - c. Blower fan shall be double-inlet type with forward-curved blades.
 - d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

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 aluminum blades riveted to corrosion resistant steel spiders and shall be dynamically balanced.

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

1. EnergyX® and Economizer

a. System Description:

- 1) One-piece EnergyX (Energy Recovery Ventilation) unit is an electrically controlled ventilation air pre-conditioner utilizing an AHRI 1060 certified Energy Recovery Cassette to reduce the cooling and heating loads placed on the primary HVAC unit by untreated outdoor air. Building exhaust air shall be introduced to the EnergyX unit through ductwork. Unit shall be designed as a factory-installed option to be used with WeatherMaster® 48HC units for use in vertical return applications only.

2) Quality Assurance:

- a) Unit shall be designed in accordance with UL Standard 1995.
- b) Energy Recovery unit shall be ETL tested and certified.
- c) Rooftop unit and Energy Recovery unit shall be ETL certified as one single system.
- d) Roof curb or curb extension shall be designed to conform to NRCA Standards.
- e) Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- f) Unit casing shall be capable of withstanding ASTM No. 141 (Method 6061) 500-hour salt spray test.
- g) Unit shall contain AHRI 1060 certified Energy Recovery Cassette.
- h) Unit shall leakage rates shall be capable of meeting ASHRAE Standard 62.1 requirements for use of class-2 exhaust with class-1 ventilation air.

b. Products:

Equipment (Standard): The EnergyX unit shall be a factory assembled, single piece unit. Contained within the unit enclosure shall be all factory wiring with a single, pre-determined point of power input and a single point of 24-volt control wiring.

c. Unit Cabinet:

- 1) Unit cabinet shall be constructed of galvanized steel coated with a pre-painted baked enamel finish.
- 2) All models shall have hoods installed over outside air intake and exhaust openings. Outside air hood shall have aluminum water entrainment filters.
- 3) All models have 1-in., 2 pound density fiberglass insulation.
- 4) Hinged access doors with compression latches shall be provided on all units for access to fans and filters. Hinged doors

shall be provided with at least one handle capable of being locked.

- 5) Exhaust air stream shall have back-draft dampers to prevent air penetration during off cycles.
- 6) Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging.

d. Blowers:

- 1) Blowers shall be direct drive with variable speed motors.
- 2) Blower wheel shall be made of steel with a corrosion resistant finish. It shall be dynamically balanced, double-inlet type with backward-curved blades.
- 3) Blower shall be mounted on neoprene vibration isolation pads.
- 4) Motor shall be high efficiency and have thermal overload protection.

e. Filter Section:

Standard filter section shall accept commercially available, 2-in. pleated filter(s).

f. Controls and Safeties:

The EnergyX® unit shall operate in conjunction with rooftop unit fan.

g. Electrical Requirements:

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

h. Energy Recovery Cassette:

- 1) The energy recovery media shall have a minimum of 70% effectiveness at nominal unit airflow.
- 2) Energy wheel performance shall be AHRI Standard 1060 Certified and bear the AHRI Certified Product Seal.
- 3) The energy recovery cassette shall be an UL Recognized component for electrical and fire safety.
- 4) The wheel shall be coated with silica gel desiccant, permanently bonded without the use of binders or adhesives.
- 5) Coated wheels shall be washable with detergent or alkaline coil cleaner and water.
- 6) The silica gel shall not dissolve or deliquesce in the presence of water or high humidity.
- 7) The substrate shall be made of a lightweight polymer and shall not degrade or require additional coatings for application in coastal environments.
- 8) The wheel polymer layers shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop.
- 9) The polymer layers shall be captured in a stainless steel wheel frame or aluminum and stainless steel segment frames

that provide a rigid and self-supporting matrix.

- 10) Energy recovery wheels greater than 19 inches in diameter shall be provided with removable wheel segments.
- 11) Wheel frame shall be a welded hub, spoke and rim assembly of stainless, plated, and or coated steel and shall be self supporting without the wheel segments in place.
- 12) Wheel segments shall be removable without the use of tools to facilitate maintenance and cleaning.
- 13) Wheel rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.
- 14) Wheel bearings shall provide an L-10 life of 400,000 hours.
- 15) Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

i. Supply and Exhaust Air Frost Control Option:

- 1) Factory-installed frost protection module shall sense pressure differential across the energy recovery cassette.
- 2) Supply blower shall be shut-off if the pressure differential across the energy recovery cassette exceeds an adjustable set point. Blower shall remain off for an adjustable time period.
- 3) Exhaust blower and wheel shall remain in operation in order to remove any frost build-up on the wheel.

j. EnergyX Maintenance Indicator Package:

A factory-installed switch shall monitor EnergyX blowers and wheel motor amp draw and send a signal to field-supplied 24-v indicator upon amperage surge that maintenance required.

k. Filter Maintenance Indicator:

A factory-installed differential pressure switch shall measure pressure drop across the outside air filter and activate a field-supplied 24-v indicator when airflow is restricted. It shall not interrupt EnergyX operation. Switch set point shall be adjustable.

l. EnergyX Free Cooling with Enthalpy and Stop/Jog Control:

- 1) An enthalpy sensor shall prevent the wheel from rotating if the outside air conditions are acceptable for free cooling. Both exhaust and supply blowers will remain on.
- 2) Stop-Jog-Control shall energize the wheel periodically during the free cooling operation of the EnergyX® to prevent dirt build-up on the wheel.

- m. Economizer Option:
 - 1) The economizer shall be integrated in the energy recovery module and shall allow air to bypass the energy recovery wheel for free cooling and fail safe operation. Tilting wheel mechanisms shall not be allowed.
 - 2) The economizer damper shall be motorized with factory installed, 24-volt Belimo actuator.
 - 3) The EnergyX unit shall be capable of using the economizer in a free cooling operation.
 - 4) The economizer shall utilize enthalpy sensor controls when in the economizer mode.
- n. CO₂ Sensor:
 - 1) The modulating airflow energy recovery unit shall be capable of incorporating a CO₂ sensor for use with Demand Controlled Ventilation.
 - 2) The CO₂ sensor shall connect to the base rooftop unit's digital controller.
 - 3) The modulating airflow energy recovery unit shall use at a minimum, a high and low CFM airflow set point when a CO₂ sensor is used.
- o. Roof Curb Extension Accessory For Use with EnergyX Units:
 - 1) The energy recovery module shall use the standard rooftop unit rooftop curb.
 - 2) Rooftop extensions, support rails or other devices that come in contact with the roof surface to support the energy recovery module shall not be allowed.
 - 3) A horizontal adapter curb shall be used to convert vertical return air applications into horizontal return air applications. The supply airflow shall be convertible via the base rooftop unit operation and restrictions.
- 2. Staged Air Volume System (SAV™) for 2-stage cooling models only:
 - a. Evaporator Fan Motor:
 - 1) Shall have permanently lubricated bearings.
 - 2) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
 - 3) Shall be Variable Frequency duty and 2-speed control.
 - 4) Shall contain motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.
 - 3. Variable Frequency Drive (VFD). Only available on 2-speed indoor fan motor option (SAV):
 - a. Factory-supplied VFDs qualify, through ABB for a 12-month warranty from date of commissioning or 18 months from date of sale, whichever occurs first.
 - b. Shall be installed inside the unit cabinet, mounted, wired and tested.
 - c. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - d. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
 - e. Self diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.
 - f. RS485 capability standard.
 - g. Electronic thermal overload protection.
 - h. 5% swinging chokes for harmonic reduction and improved power factor.
 - i. All printed circuit boards shall be conformal coated.
 - 4. Integrated EconoMi\$er® IV, EconoMi\$er 2, and EconoMi\$er X low leak rate models. (Factory-installed on 3-phase models only. Field installed on all 3 and 1-phase models):
 - a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory-installed option.
 - c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
 - e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - f. Low leak rate models shall be equipped with dampers not to exceed 2% leakage at 1 in. wg pressure differential.
 - g. Economizer controller on EconoMi\$er IV models shall be Honeywell W7212 that provides:
 - 1) Combined minimum and DCV maximum damper position potentiometers with compressor staging relay.
 - 2) Functions with solid state analog enthalpy or dry bulb changeover control sensing.
 - 3) LED indicators for: when free cooling is available, when module is in DCV mode, when exhaust fan contact is closed.

- h. Economizer controller on EconoMi\$er® X models shall be the Honeywell W7220 that provides:
 - 1) 2-line LCD interface screen for setup, configuration and troubleshooting.
 - 2) On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.
 - 3) Sensor failure loss of communication identification.
 - 4) Automatic sensor detection.
 - 5) Capabilities for use with multiple-speed indoor fan systems.
 - 6) Utilize digital sensors: Dry bulb and Enthalpy.
- i. Economizer controller on EconoMi\$er 2 models with PremierLink™ controller shall be 4-20mA design and controlled by the PremierLink controller. PremierLink does not comply with California Title 24 Fault Detection and Diagnostic (FDD) requirements.
- j. Economizer controller on EconoMi\$er 2 models with RTU Open controller shall be a 4-20mA design controlled directly by the RTU Open controller. RTU Open controller meets California Title 24 Fault Detection and Diagnostic (FDD) requirements.
- k. Shall be capable of introducing up to 100% outdoor air.
- l. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1-2016 and IECC-2015 requirements.
- m. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
- n. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100°F (4 to 38°C). Additional sensor options shall be available as accessories.
- o. 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%.
- p. The economizer shall maintain minimum air-flow into the building during occupied period and provide design ventilation rate for full occupancy.
- q. Dampers shall be completely closed when the unit is in the unoccupied mode.
- r. Economizer controller shall accept a 2-10 Vdc CO₂ sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
- s. Compressor lockout temperature on W7220 is adjustable from -45°F to 80°F, set at a factory default of 32°F. Others shall open at 35°F (2°C) and close at 50°F (10°C).
- t. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
- u. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
- 5. Integrated EconoMi\$er2, and EconoMi\$er X Ultra Low Leak rate models. (Factory-installed on 3-phase models only. Field-installed on all 3 and 1-phase models):
 - a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory-installed option.
 - c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
 - e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - f. Ultra Low Leak design meets California Title 24 section 140.4 and, ASHRAE 90.1-2016 and IECC-2015 requirements for 4 cfm per sq. ft. on the outside air dampers and 10 cfm per sq. ft. on the return dampers.
 - g. Economizer controller on EconoMi\$er X models shall be the Honeywell W7220 that provides:
 - 1) 2-line LCD interface screen for setup, configuration and troubleshooting.
 - 2) On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.
 - 3) Sensor failure loss of communication identification.
 - 4) Automatic sensor detection.
 - 5) Capabilities for use with multiple-speed indoor fan systems.
 - 6) Utilize digital sensors: Dry bulb and Enthalpy.
 - h. Economizer controller on EconoMi\$er® 2 models with RTU Open controller shall be a 4-20mA design controlled directly by the RTU Open controller. RTU Open controller

- meets California Title 24 Fault Detection and Diagnostic (FDD) requirements.
- i. Shall be capable of introducing up to 100% outdoor air.
 - j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1-2016 and IECC-2015 requirements.
 - k. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
 - l. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100°F (4 to 38°C). Additional sensor options shall be available as accessories.
 - m. 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%.
 - n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
 - o. Dampers shall be completely closed when the unit is in the unoccupied mode.
 - p. Economizer controller shall accept a 2-10 Vdc CO₂ sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
 - q. Compressor lockout temperature on W7220 is adjustable from -45°F to 80°F, set at a factory default of 32°F. Others shall open at 35°F (2°C) and closes at 50°F (10°C).
 - r. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
 - s. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
6. Two-Position Damper:
- a. Damper shall be a Two-Position Damper. Damper travel shall be from the full closed position to the field adjustable %-open setpoint.
 - 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.
 - i. Not available with Staged Air Volume (SAV™) models.
7. Manual Damper:
- a. Manual damper package shall consist of damper, air inlet screen, and rain hood which can be preset to admit up to 25% outdoor air for year round ventilation.
 - b. Not available with Staged Air Volume (SAV) models.
8. Humidi-MiZer® Adaptive Dehumidification System:
- a. The Humidi-MiZer Adaptive Dehumidification System shall be factory-installed and shall provide greater dehumidification of the occupied space by two modes of dehumidification operations in addition to its normal design cooling mode:
 - 1) Subcooling mode further sub cools the hot liquid refrigerant leaving the condenser coil when both temperature and humidity in the space are not satisfied.
 - 2) Hot gas reheat mode shall mix a portion of the hot gas from the discharge of the compressor with the hot liquid refrigerant leaving the condenser coil to create a two-phase heat transfer in the system, resulting in a neutral leaving air temperature when only humidity in the space is not satisfied.
 - 3) Includes head pressure controller.
9. Head Pressure Control Package (Motormaster®):
- 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 at outdoor ambient temperatures between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to 0°F (-18°C).
10. Low Ambient Controller (Factory-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 0°F (-18°C).

11. Propane Conversion Kit:

Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane. Kits shall be available for elevations from 0 up to 14,000 ft (4,276 m).

12. Condenser Coil Hail Guard Assembly:

- a. Shall protect against damage from hail.
- b. Shall be of louvered style.

13. Unit-Mounted, Non-Fused Disconnect Switch:

- a. Switch shall be factory-installed, internally mounted.
- b. National Electric Code (NEC) and UL or ETL approved non-fused switch shall provide unit power shutoff.
- c. Shall be accessible from outside the unit.
- d. Shall provide local shutdown and lockout capability.
- e. Sized only for the unit as ordered from the factory. Does not accommodate field-installed devices.

14. 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.

15. Convenience Outlet:

- a. Powered convenience outlet. (Not available on single phase models):
 - 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. 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.
- 5) Outlet shall be accessible from outside the unit.
- 6) Outlet shall include a field-installed "Wet in Use" cover.

16. 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.

17. Fan/Filter Status Switch:

- a. Switch shall provide status of indoor evaporator fan (ON/OFF) or filter (CLEAN/DIRTY).
- b. Status shall be displayed either over communication bus (when used with direct digital controls) or with an indicator light at the thermostat.

18. Centrifugal Propeller Power Exhaust:

- a. Power exhaust shall be used in conjunction with an integrated economizer.
- b. Independent modules for vertical or horizontal return configurations shall be available.
- c. Horizontal power exhaust is 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 0-100% adjustable setpoint on the economizer control.

19. 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.

20. Adapter Curb (Vertical):

- a. Full perimeter – fully assembled and welded 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 of new 48HC 17-28 models to past Carrier design curb models: DP, DR, HJ, TM, and TJ. (Not for 48TJE024-028 models.) Check with Carrier sales expert of further details and information.
21. High Altitude Gas Conversion Kit:
Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit to operate from 3,000 to 10,000 ft (914 to 3048 m) elevation and 10,001 to 14,000 ft (3049 to 4267 m) elevation.
22. 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.
23. 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.
24. Indoor Air Quality (CO₂) 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.
25. Smoke Detectors:
- a. Shall be a Four-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 two individual detector modules.
 - 5) Can be wired to up to 14 other duct smoke detectors for multiple fan shut-down applications
26. 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 (51 mm) x 4-in (102 mm).
 - d. Shall have a clear colored lens.
27. Winter Start Kit:
- a. Shall contain a bypass device around the low pressure switch.
 - b. Shall be required when mechanical cooling is required down to 25°F (-4°C).
 - c. Shall not be required to operate on an economizer when below an outdoor ambient of 40°F (4°C).
28. Time Guard:
- a. Shall prevent compressor short cycling by providing a 5-minute delay (±2 minutes) before restarting a compressor after shut-down for any reason.
 - b. One device shall be required per compressor.
29. Barometric Hood (Horizontal Economizer Applications):
Shall be required when a horizontal economizer and barometric relief are required. Barometric relief damper must be installed in the return air (horizontal) duct work. This hood provides weather protection.
30. Display Kit for Variable Frequency Drive:
- a. Kit allows the ability to access the VFD controller programs to provide special setup capabilities and diagnostics.
 - b. Kit contains display module and communication cable.
 - c. Display Kit can be permanently installed in the unit or used on any SAV™ system VFD controller as needed.
31. Condensate Overflow Switch:
- a. This sensor and related controller monitors the condensate level in the drain pan and shuts down compression operation when overflow conditions occur. It includes:
 - 1) Indicator light - solid red (more than 10 seconds on water contact - compressors disabled), blinking red (sensor disconnected).
 - 2) 10 second delay to break - eliminates nuisance trips from splashing or waves

in pan (sensor needs 10 seconds of constant water contact before tripping).

- 3) Disables the compressor(s) operation when condensate plug is detected, but still allows fans to run for Economizer.

32. 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.

33. Foil Faced Insulation:

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

34. California OSHPD Seismic Certification Label:

- a. Units meet the seismic capacity requirements of the International Code Council Evaluation

Service (ICC-ES) document AC156 (Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems) and per International Building Code (IBC 2009) at an SDS (g) value of 2.00 $z/h=1.0$, $I_p=1.5$ and certified by independent structural engineers.

- b. Units shall include a certification label that meets the CA OSHPD Special Seismic Certification pre-approval labeling requirements on the external chassis of the unit.
- c. OSHPD not available on units with factory installed Humidi-MiZer, HACR breaker, MCHX coils, low ambient controls, hail-guards, or EnergyX.

