



Product Data

WeatherMaker® Single Package Rooftop Gas Heat/Electric Cooling Vertical Air Flow Unit 15, 17.5, 20, 25, 27.5 Tons



Unit shown with
economizer and
power exhaust.

48TC 17, 20, 24, 28, 30
with Puron® (R-410A) Refrigerant

Carrier’s WeatherMaker® 15 to 27.5 ton rooftop unit (RTU) was designed by customers for customers. With “no-strip” screw collars, handled access panels, and more, we’ve made your unit reliable and easy to install, maintain, and use.

Easy to install:

These WeatherMaker® units are designed for dedicated factory-supplied vertical air flow duct configurations. 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 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:

- 2-stage cooling capability with independent circuits and control.
- Round tube/plate fin (RTPF) available on all sizes or Novation® all aluminum condenser (outdoor) coils available on 17-28 sizes only. Special coil-coating also available for coastal and industrial environments.
- Energy efficiency ratios (EERs) up to 10.8
- IEERs up to 12.0 with single speed indoor fan motor and up to 12.7 with 2-speed/VFD indoor fan motor.
- Gas heating efficiencies up to 81% thermal efficiency.
- Dedicated vertical air flow duct configuration models.
- 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 troubleshooting easier.
- Proven Acutrol™ refrigerant metering system.
- 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 through the 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 115°F to 30°F (46°C to -1°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, plus convenient outlets, disconnect switch and smoke detectors.

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- Factory-installed Humidi-MiZer® adaptive dehumidification system. Available on 17-28 sizes with RTPF condenser coil models only.
- Standard Parts Warranty: 10-year aluminized heat exchanger, 5-year compressor, 3-year Novation® condenser coil, 1-year others.
- Tool-less filter removal and installation.
- 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 17-30 with electro-mechanical controls or RTU Open Controller. Note that SAV is required on all units for installation in the United States as per Department of Energy (DOE) efficiency standard of 2018.



Model number nomenclature



48TC UNITS MODEL NUMBER NOMENCLATURE

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example:	4	8	T	C	D	D	2	4	A	1	A	5	-	0	A	3	G	0

Unit Heat Type

48 - Gas Heat Packaged Rooftop

Model Series - WeatherMaker®

TC - Standard 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 RTPF coils
 E = Two stage cooling models with Humidi-MiZer® (17-28 models with RTPF coils only)

Cooling Tons

17 = 15 tons 28 = 25 tons
 20 = 17.5 tons 30 = 27.5 tons
 24 = 20 tons

Sensor Options

A = None
 B = RA Smoke Detector
 C = SA Smoke Detector
 D = RA + SA Smoke Detector
 E = CO₂
 F = RA Smoke Detector and CO₂
 G = SA Smoke Detector and CO₂
 H = RA + SA Smoke Detector and CO₂
 J = Condensate Overflow Switch (electromechanical controls only)
 K = Condensate Overflow Switch and RA Smoke Detectors
 L = Condensate Overflow Switch and RA + 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 = Med Static High Efficiency Motor/Vertical Supply, Return Air Flow
 C = High Static High Efficiency Motor/Vertical 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

Coil Options – Novation (Outdoor – Indoor – Hail Guard)

G = Al/Al – Al/Cu
 H = Al/Al – Cu/Cu
 J = Al/Al – E-coat Al/Cu
 K = E-coat Al/Al – Al/Cu
 L = E-coat Al/Al – E-coat Al/Cu
 T = Al/Al – Al/Cu – Louvered Hail Guard
 U = Al/Al – Cu/Cu – Louvered Hail Guard
 V = Al/Al – E-coat Al/Cu – Louvered Hail Guard
 W = E-coat Al/Al – Al/Cu – Louvered Hail Guard
 X = E-coat Al/Al – E-coat Al/Cu – Louvered Hail Guard

Packaging

0 = Standard

Electrical Options

A = Non USA models - No (SAV) included
 C = Non-Fused Disconnect
 G = Standard USA models - (SAV) included
 J = 2 Speed Fan Controller (VFD) & Non-Fused Disconnect

Service Options

0 = None
 1 = Unpowered Convenience Outlet
 2 = Powered Convenience Outlet
 3 = Hinged Panels
 4 = Hinged Panels and Unpowered Convenience Outlet
 5 = Hinged Panels and Powered Convenience Outlet

Intake / Exhaust Options

A = None
 B = Temperature Economizer w/ Barometric Relief
 F = Enthalpy Economizer w/ Barometric Relief
 K = 2-Position Damper
 U = Temp Ultra Low Leak Economizer w/ Baro Relief
 V = Temp Ultra Low Leak Economizer w/ PE (cert) - Vertical Air Only
 W = Enthalpy Ultra Low Leak Economizer w/ Baro Relief
 X = Enthalpy Ultra Low Leak Economizer PE (cert) - Vertical Air Only

Base Unit Controls

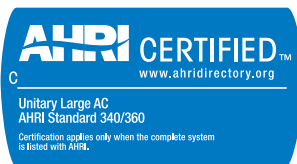
0 = Base Electro-mechanical Controls (can be used with W7212 EconoMi\$er IV)
 1 = PremierLink™ Controller (for 1-speed motors only)
 2 = RTU Open Multi-Protocol Controller
 6 = Electro-mechanical w/ 2-Speed Fan and W7220 Economizer Controller (can be used with W7220 EconoMi\$er X)

Design Revision

- = Factory Design Revision

Voltage

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



AHRI COOLING RATINGS

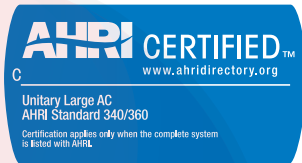
48TC UNIT	COOLING STAGES	NOM. CAPACITY (TONS)	NET COOLING CAPACITY (MBH)	TOTAL POWER (kW)	EER	IEER WITH SINGLE SPEED INDOOR FAN MOTOR	IEER WITH 2-SPEED INDOOR FAN MOTOR	RATED INDOOR AIRFLOW (CFM)
17	2	15.0	202.0	18.7	10.8	12.0	12.7	4,900
20	2	17.5	208.0	19.3	10.8	11.7	12.7	6,125
24	2	20.0	242.0	24.7	9.8	10.6	11.7	8,000
28	2	25.0	280.0	28.6	9.8	10.4	11.5	8,750
30*	2	27.5	330.0	32.4	10.2	10.4	11.5	9,750

LEGEND

- AHRI** — Air-Conditioning, Heating and Refrigeration Institute Test Standard
ASHRAE — American Society of Heating, Refrigerating and Air-Conditioning Engineers.
EER — Energy Efficiency Ratio
IEER — Integrated Energy Efficiency Ratio
IECC — International Energy Conservation Code
 *MCHX option is not available on size 30 units.

NOTES

- Rated and certified under AHRI Standard 340/360, as appropriate.
- Ratings are based on:
Cooling Standard: 80°F (27°C) db, 67°F (19°C) wb indoor air temp and 95°F (35°C) db outdoor air temp.
IEER Standard: A measure that expresses cooling part load EER efficiency for commercial unitary air conditioning and heat pump equipment on the basis of weighted operation at various load capacities.
- The 48TC rooftop units meet ASHRAE 90.1-2016, DOE-2018 and IECC¹-2015 minimum efficiency requirements when equipped with the SAV™ (staged air volume) option.
- 48TC units comply with US Energy Policy Act (2005). To evaluate code compliance requirements, refer to state and local codes or visit the following website: <http://bcap-energy.org> to determine if compliance with this standard pertains to your state, territory, or municipality.



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

HEATING RATING TABLE - NATURAL GAS AND PROPANE

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

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.
- The input rating for altitudes above 2000 ft (610 m) must be de-rated by 4% for each 1000 ft (305 m) above sea level.

AHRI capacity ratings (cont)



SOUND PERFORMANCE

48TC MODEL SIZE	COOLING STAGES	OUTDOOR SOUND (dB) AT 60 Hz									
		A-WEIGHTED	AHRI 370 RATING	63	125	250	500	1000	2000	4000	8000
17	2	84.1	84	92.2	83.9	80.4	81.8	78.7	76.5	72.2	65.4
20	2	84.1	84	92.2	83.9	80.4	81.8	78.7	76.5	72.2	65.4
24	2	86.5	87	95.6	87.5	84.2	84.2	81.7	77.9	73.2	66.3
28	2	85.9	86	97.1	88.3	84.4	83.3	80.7	77.4	73.4	67.3
30	2	85.9	86	97.1	88.3	84.4	83.3	80.7	77.4	73.4	67.3

LEGEND:

dB — Decibel

NOTES:

1. Outdoor sound data is measured in accordance with AHRI standard 370.
2. 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.

3. 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 standard 370.

MINIMUM - MAXIMUM AIRFLOW RATINGS - NATURAL GAS AND PROPANE

48TC MODEL SIZE	HEAT LEVEL	COOLING				AL HX HEATING		SS HX 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	4500	4500	3000	7500	3000	8250	3000	8250
	MED					3880	7750	3880	7750
	HIGH					4620	8570	4620	8570
20	LOW	5250	5250	3500	9000	3000	11000	3000	11000
	MED					3880	9300	3880	9300
	HIGH					4620	10000	4620	10000
24	LOW	6000	6000	4000	10000	3000	11000	3000	11000
	MED					3880	11630	3880	11630
	HIGH					4620	10000	4620	10000
28	LOW	7500	8450	5633	12500	3000	16500	3000	16500
	MED					3880	15500	3880	15500
	HIGH					4620	15000	4620	15000
30	LOW	8250	9450	6300	13750	3000	16500	3000	16500
	MED					3880	15500	3880	15500
	HIGH					4620	15000	4620	15000

LEGEND

AL HX — Aluminum Gas Heat Exchanger

SS HX — Stainless Steel Gas Heat Exchanger

PHYSICAL DATA (COOLING), 15 AND 17.5 TONS, RTPF — ROUND TUBE/PLATE FIN COIL DESIGN

		48TC*D17	48TC*E17	48TC*D20	48TC*E20
Refrigeration System		RTPF	RTPF	RTPF	RTPF
	# Circuits / # Comp. / Type	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 Scroll
	R-410A charge A/B (lbs)	16.3/17.5	24.9/25.7	16.3/17.5	25.9/25.7
	Metering device	Acutrol™	TXV	Acutrol™	TXV
	High-press. Trip / Reset (psig)	630 / 505	630 / 505	630 / 505	630 / 505
	Low-press. Trip / Reset (psig)	54 / 117	27 / 44	54 / 117	27 / 44
Evap. Coil					
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Tube Diameter	3/8-in.	3/8-in.	3/8-in.	3/8-in.
	Rows / FPI	4 / 15	4 / 15	4 / 15	4 / 15
	total face area (ft ²)	22.00	22.00	22.00	22.00
	Condensate drain conn. size	3/4-in.	3/4-in.	3/4-in.	3/4-in.
Humidi-MiZer® Coil					
	Material	—	Cu / Al	—	Cu / Al
	Tube Diameter	—	3/8-in.	—	3/8-in.
	Rows / FPI	—	1 / 17	—	1 / 17
	total face area (ft ²)	—	22.00	—	22.00
Evaporator Fan and Motor					
Standard Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	2.9	2.9	3.7	3.7
	RPM range	514-680	514-680	622-822	622-822
	Max Blower/Shaft RPM	1200	1200	1200	1200
	motor frame size	56	56	56	56
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	15 x 15	15 x 15	15 x 15	15 x 15
Medium Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	—	—
	Max BHP	3.7	3.7	—	—
	RPM range	679-863	679-963	—	—
	Max Blower/Shaft RPM	1200	1200	—	—
	motor frame size	56	56	—	—
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	—	—
	Fan Diameter (in.)	15 x 15	15 x 15	—	—
High Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	—	—
	Max BHP	4.9	4.9	—	—
	RPM range	826-1009	826-1009	—	—
	Max Blower/Shaft RPM	1200	1200	—	—
	motor frame size	56	56	—	—
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	—	—
	Fan Diameter (in.)	15 x 15	15 x 15	—	—
Medium Static - High Eff.	Motor Qty / Belt Qty / Driver Type	—	—	1/1/Belt	1/1/Belt
	Max BHP (208/230/460/575v)	—	—	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3
	RPM range	—	—	713-879	713-879
	Max Blower/Shaft RPM	—	—	1200	1200
	motor frame size	—	—	184T	184T
	Fan Qty / Type	—	—	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	—	—	15 x 15	15 x 15
High Static - High Eff.	Motor Qty / Belt Qty / Driver Type	—	—	1/1/Belt	1/1/Belt
	Max BHP (208/230/460/575v)	—	—	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3
	RPM range	—	—	882-1078	882-1078
	Max Blower/Shaft RPM	—	—	1200	1200
	motor frame size	—	—	184T	184T
	Fan Qty / Type	—	—	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	—	—	15 x 15	15 x 15

Physical data (cont)



PHYSICAL DATA (COOLING), 20, 25, and 27.5 TONS, RTPF — ROUND TUBE/PLATE FIN COIL DESIGN

	48TC*D24	48TC*E24	48TC*D28	48TC*E28	48TC*D30	
Refrigeration System	RTPF	RTPF	RTPF	RTPF	RTPF	
# Circuits / # Comp. / Type	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 Scroll	2 / 2 Scroll	
R-410A charge A/B (lbs)	20.6/14.7	27.9/20.5	19.8/20.4	27.9/28.9	27.0/28.5	
Metering device	Acutrol™	TXV	Acutrol™	TXV	Acutrol™	
High-press. Trip / Reset (psig)	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505	
Low-press. Trip / Reset (psig)	54 / 117	27 / 44	54 / 117	27 / 44	54 / 117	
Evap. Coil						
Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al	
Tube Diameter	3/8-in.	3/8-in.	3/8-in.	3/8-in.	3/8-in.	
Rows / FPI	4 / 15	4 / 15	4 / 15	4 / 15	4 / 15	
total face area (ft²)	22.00	22.00	23.11	23.11	26	
Condensate drain conn. size	3/4-in.	3/4-in.	3/4-in.	3/4-in.	3/4-in.	
Humidi-MiZer® Coil						
Material	—	Cu / Al	—	Cu / Al	—	
Tube Diameter	—	3/8-in.	—	3/8-in.	—	
Rows / FPI	—	1 / 17	—	1 / 17	—	
total face area (ft²)	—	22.00	—	23.11	—	
Evaporator Fan and Motor						
Standard Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt	—
	Max BHP	4.9	4.9	4.9	4.9	—
	RPM range	690-863	690-863	717-911	717-911	—
	Max Blower/Shaft RPM	1200	1200	1200	1200	—
	motor frame size	56	56	56	56	—
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	—
Fan Diameter (in.)	15 x 15	15 x 15	15 x 15	15 x 15	—	
Standard Static - High Eff.	Motor Qty / Belt Qty / Driver Type	—	—	—	—	1/1/Belt
	Max BHP	—	—	—	—	6.5/ 6.9/ 7.0/ 8.3
	RPM range	—	—	—	—	751-954
	Max Blower/Shaft RPM	—	—	—	—	1300
	motor frame size	—	—	—	—	56
	Fan Qty / Type	—	—	—	—	2 / Centrifugal
Fan Diameter (in.)	—	—	—	—	15 x 15	
Medium Static - High Eff.	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	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	10.5/11.9/11.9/11
	RPM range (208/230/460/575v)	835-1021	835-1021	913-1116	913-1116	920-1190
	Max Blower/Shaft RPM	1200	1200	1200	1200	1300
	motor frame size	184T	184T	184T	184T	184T
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
Fan Diameter (in.)	15 x 15	15 x 15	15 x 15	15 x 15	15 x 15	
High Static - High Eff.	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt	1/2/Belt
	Max BHP (208/230/460/575v)	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	11.9/12.9/12.9/14.1
	RPM range	941-1176	941-1176	941-1176	941-1176	1015-1299
	Max Blower/Shaft RPM	1200	1200	1200	1200	1300
	motor frame size	213T	213T	213T	213T	213T
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
Fan Diameter (in.)	15 x 15	15 x 15	15 x 15	15 x 15	15 x 15	

PHYSICAL DATA (COOLING), 15-27.5 TONS, RTPF — ROUND TUBE/PLATE FIN COIL DESIGN

	48TC*D17	48TC*E17	48TC*D20	48TC*E20	48TC*D24	48TC*E24	48TC*D28	48TC*E28	48TC*D30
Condenser Coil (Circuit A)									
Coil Type	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF
Coil length (in.)	70	70	70	70	82	82	75	75	95
Coil height (in.)	44	44	44	44	44	44	52	52	52
Rows / FPI	2/17	2/17	2/17	2/17	2/17	2/17	2/17	2/17	2/17
Total face area (ft ²)	21.4	21.4	21.4	21.4	25.1	25.1	27.1	27.1	34.3
Condenser Coil (Circuit B)									
Coil Type	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF
Coil length (in.)	70	70	70	70	57	57	75	75	95
Coil height (in.)	44	44	44	44	44	44	52	52	52
Rows / FPI	2/17	2/17	2/17	2/17	2/17	2/17	2/17	2/17	2/17
Total face area (ft ²)	21.4	21.4	21.4	21.4	17.4	17.4	27.1	27.1	34.3
Condenser Fan/Motor									
Qty/Motor drive type	3 / direct	3 / direct	3 / direct	3 / direct	4 / direct	4 / direct	4 / direct	4 / 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	1/4 / 1100
Fan diameter (in.)	22	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	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
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	4/ 16 x 25 x 1



Physical data (cont)

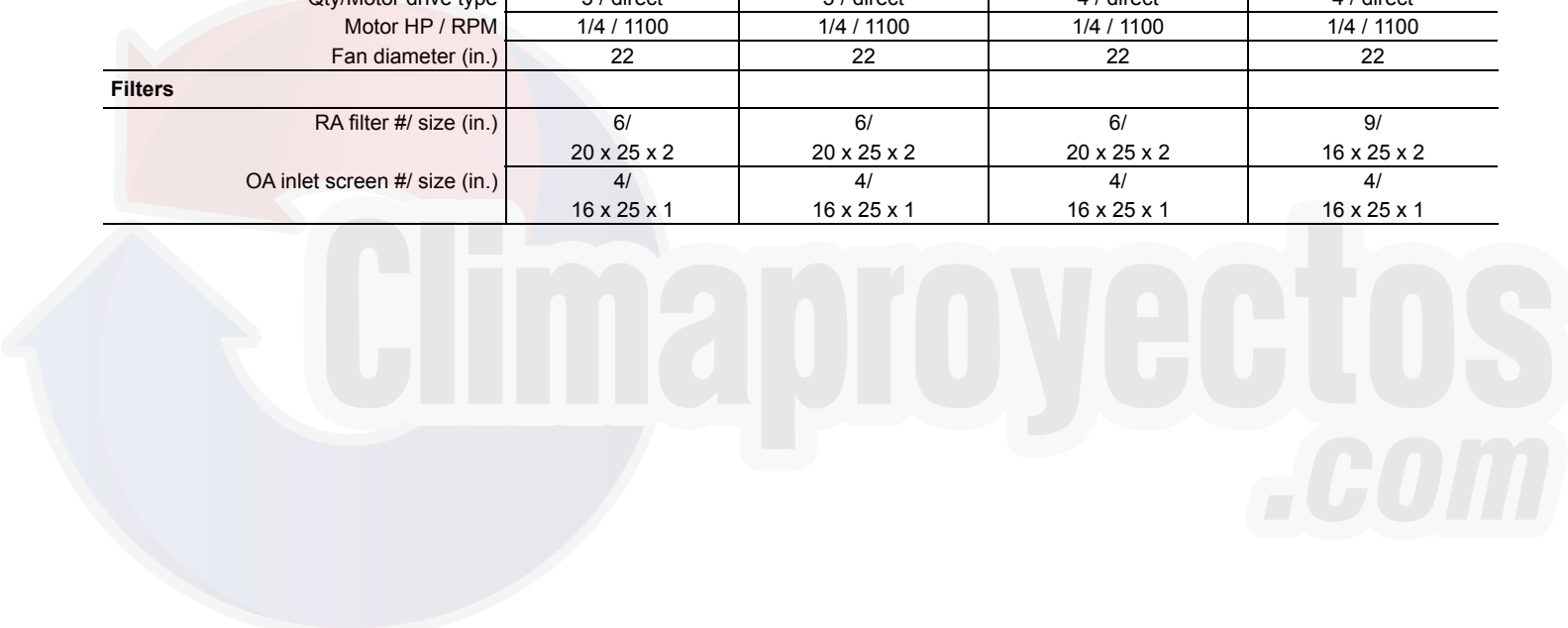


PHYSICAL DATA (COOLING), 15-27.5 TONS, NOVATION® — ALL ALUMINUM COIL DESIGN

		48TC*D17	48TC*D20	48TC*D24	48TC*D28
Refrigeration System		MCHX	MCHX	MCHX	MCHX
# Circuits / # Comp. / Type		2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll
R-410A charge A/B (lbs)		9.5/12.0	9.5/12.0	14.4/12.5	12.5/13.0
Metering device		Acutrol™	Acutrol™	Acutrol™	Acutrol™
High-press. Trip / Reset (psig)		630 / 505	630 / 505	630 / 505	630 / 505
Low-press. Trip / Reset (psig)		54 / 117	54 / 117	54 / 117	54 / 117
Evap. Coil					
Material		Cu / Al	Cu / Al	Cu / Al	Cu / Al
Tube Diameter		3/8-in.	3/8-in.	3/8-in.	3/8-in.
Rows / FPI		4 / 15	4 / 15	4 / 15	4 / 15
total face area (ft²)		19.56	19.56	22.00	23.11
Condensate drain conn. size		3/4-in.	3/4-in.	3/4-in.	3/4-in.
Evaporator Fan and Motor					
Standard Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	2.9	3.7	4.9	4.9
	RPM range	514-680	622-822	690-863	717-911
	Max Blower/Shaft RPM	1200	1200	1200	1200
	motor frame size	56	56	56	56
	Fan Qty / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	15 x 15	15 x 15	15 x 15	15 x 15
Medium Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	—	—	—
	Max BHP	3.7	—	—	—
	RPM range	679-863	—	—	—
	Max Blower/Shaft RPM	679-863	—	—	—
	motor frame size	56	—	—	—
	Fan Qty / Type	2 / Centrifugal	—	—	—
	Fan Diameter (in.)	15 x 15	—	—	—
High Static	Motor Qty / Belt Qty / Driver Type	1/1/Belt	—	—	—
	Max BHP	4.9	—	—	—
	RPM range	826-1009	—	—	—
	Max Blower/Shaft RPM	1200	—	—	—
	motor frame size	56	—	—	—
	Fan Qty / Type	2 / Centrifugal	—	—	—
	Fan Diameter (in.)	15 x 15	—	—	—
Medium Static - High Efficiency	Motor Qty / Belt Qty / Driver Type	—	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	—	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	—	713-879	835-1021	913-1116
	Max Blower/Shaft RPM	—	1200	1200	1200
	motor frame size	—	184T	184T	184T
	Fan Qty / Type	—	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	—	15 x 15	15 x 15	15 x 15
High Static - High Efficiency	Motor Qty / Belt Qty / Driver Type	—	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	—	6.5/6.9/7.0/8.3	10.5/11.9/11.9/11	10.5/11.9/11.9/11
	RPM range	—	882-1078	941-1176	941-1176
	Max Blower/Shaft RPM	—	1200	1200	1200
	motor frame size	—	184T	213T	213T
	Fan Qty / Type	—	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	—	15 x 15	15 x 15	15 x 15

PHYSICAL DATA (COOLING), 15-27.5 TONS, NOVIATION® — ALL ALUMINUM COIL DESIGN

	48TC*D17	48TC*D20	48TC*D24	48TC*D28
Condenser Coil (Circuit A)				
Coil Type	Novation®	Novation®	Novation®	Novation®
Coil length (in.)	70	70	82	75
Coil height (in.)	44	44	44	52
Rows / FPI	1 / 20.3	1 / 20.3	1 / 20.3	1 / 20.3
Total face area (ft²)	21.4	21.4	25.1	27.1
Condenser Coil (Circuit B)				
Coil Type	Novation®	Novation®	Novation®	Novation®
Coil length (in.)	70	70	57	75
Coil height (in.)	44	44	44	52
Rows / FPI	1 / 20.3	1 / 20.3	1 / 20.3	1 / 20.3
Total face area (ft²)	21.4	21.4	17.4	27.1
Condenser Fan/Motor				
Qty/Motor drive type	3 / direct	3 / direct	4 / direct	4 / direct
Motor HP / RPM	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan diameter (in.)	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	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



PHYSICAL DATA (HEATING), 15-27.5 TONS

	48TC*17	48TC*20	48TC*24	48TC*28	48TC*30
Gas Connection					
# of Gas Valves	1	1	1	1	1
Natural 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	5-13 / 0.18-0.47
LP supply line pressure (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	11-13 / 0.40-0.47
Heat Anticipator setting (Amps)					
First stage	0.14	0.14	0.14	0.14	0.14
Second stage	0.14	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	2 / 5
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise (F)	25-55	25-55	25-55	25-55	25-55
MED	# of stages / # of burners (total)	2 / 7	2 / 7	2 / 7	2 / 7	2 / 7
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise (F)	30-60	30-60	30-60	30-60	30-60
HIGH	# of stages / # of burners (total)	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise (F)	35-65	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	2 / 5
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise (F)	25-55	25-55	25-55	25-55	25-55
MED	# of stages / # of burners (total)	2 / 7	2 / 7	2 / 7	2 / 7	2 / 7
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (F)	195 / 115	196 / 115	197 / 115	198 / 115	198 / 115
	Temperature Rise (F)	30-60	30-60	30-60	30-60	30-60
HIGH	# of stages / # of burners (total)	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature Rise (F)	35-65	35-65	35-65	35-65	35-65

FACTORY-INSTALLED AND FIELD-INSTALLED ACCESSORIES

CATEGORY	ITEM	FACTORY INSTALLED OPTION	FIELD INSTALLED ACCESSORY
Cabinet	Hinged access panels	X	
	Cu/Cu outdoor & indoor coils	X	
Coil Options	E-coated outdoor & indoor coils	X	
	Pre-coated outdoor coils	X	
Humidity Control	Humidi-MiZer® Adaptive Dehumidification System (17-28 RTPF)	X	
Condenser Protection	Condenser coil hail guard (louvered design)	X	X
Controls	Thermostats, temperature sensors, and subbases		X
	PremierLink™ DDC communicating controller ⁹	X	X
	RTU Open protocol controller	X	
	Smoke detector (supply and/or return air)	X	X
	Horn/strobe annunciator ⁸		X
	Time Guard II compressor delay control circuit		X
Economizers & Outdoor Air Dampers	Phase monitor		X
	EconoMi\$er® IV for electro-mechanical controls Non FDD (Low air leak damper models) ^{6, 9}	X	X
	EconoMi\$er2 for DDC controls, complies with FDD (Low Leak and Ultra Low Leak air damper models) ^{6, 7}	X	X
	EconoMi\$er X for electro-mechanical controls, complies with FDD. (Low Leak and Ultra Low Leak air damper models) ⁶	X	X
	Motorized 2 position outdoor-air damper ⁹	X	X
	Manual outdoor-air damper (25%) ⁹	X	X
	Barometric relief ¹	X	X
Economizer Sensors & IAQ Devices	Power exhaust–centrifugal blower	X	X
	Single dry bulb temperature sensors ²	X	X
	Differential dry bulb temperature sensors ²		X
	Single enthalpy sensors ²	X	X
	Differential enthalpy sensors ²		X
	Wall or duct mounted CO ₂ sensor ²		X
Gas Heat	Unit mounted CO ₂ sensor ²	X	
	4-in filter track assembly		X
	Propane conversion kit		X
	Stainless steel heat exchanger	X	
Indoor Motor & Drive	High altitude conversion kit		X
	Flue discharge deflector		X
	Multiple motor and drive packages	X	
	Staged Air Vol (SAV™) system w/VFD controller (2-stage cool only with electrical mechanical and RTU Open controls)	X	
Low Ambient Control	Display Kit for SAV™ system with VFD		X
	Winter start kit ³		X
Power Options	Motormaster® head pressure controller to -20°F (-29°C) ³		X
	Convenience outlet (powered)	X	
	Convenience outlet (unpowered): 15 amp factory-installed, 20 amp field-installed	X	X
Roof Curbs	Non-fused disconnect ⁴	X	
	Roof curb 14-in. (356 mm)		X
	Roof curb 24-in. (610 mm)		X
	Adapter curb (Adapts to models: DP/DR/HJ/TM/TJ) ⁵		X

NOTES:

- Included with economizer.
- Sensors used to optimize economizer performance.
- See application data for assistance.
- Non-fused disconnect switch cannot be used when unit FLA rating exceeds 200 amps on 208/230 volt and 100 amps on 460/575 volt units. Carrier Packaged RTUBuilder selects this automatically.
- Not for 48TJE024-028 models using 48DP900041, 48DP900051 or 48DP900061 roof curbs.
- FDD (Fault Detection and Diagnostic) capability per California Title 24 Section 120.2i, ASHRAE 90.1-2016 and IECC-2015 Fault Detection and Diagnostic (FDD) requirements.
- Models with RTU Open DDC controls comply with California Title 24 Section 120.2i, ASHRAE 90.1-2016 and IECC-2015 Fault Detection and Diagnostic (FDD) requirements. PremierLink controller is non FDD.
- Requires a field-supplied 24V transformer for each application. See price pages for details.
- Not available on units with SAV.

Factory-installed options

Economizer (dry-bulb or enthalpy)

Economizers can reduce operating costs. They bring in fresh, outside air for ventilation; and provide cool outside air to cool your building. This also is the preferred method of low ambient cooling. When coupled to CO₂ sensors, economizers can limit the ventilation air to only that amount required.

Economizers are available, installed and tested by the factory, with either enthalpy or temperature dry-bulb inputs. There are also models for electro-mechanical, direct digital controllers and single speed fan or 2-speed indoor fan motors. Additional sensors are available as accessories to optimize the economizer.

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 low leak versions.

CO₂ sensor

The CO₂ sensor works with the economizer to intake only the correct amount of outside air for ventilation. As occupants fill your building, the CO₂ sensor detects their presence through increasing CO₂ levels, and opens the economizer appropriately.

When the occupants leave, the CO₂ levels decrease, and the sensor appropriately closes the economizer. This intelligent control of the ventilation air, called Demand Controlled Ventilation (DCV), reduces the overall load on the rooftop, saving money.

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.

Louvered hail guards

Sleek, louvered panels protect the condenser coil from hail damage, foreign objects, and incidental contact.

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 “un-powered” option is to be powered from a separate (non-unit) 115/120v power source. The unpowered convenience outlet is available as a 15 amp factory-installed option or a 20 amp field-installed accessory.

The 20 amp unpowered convenience outlet kit provides a flexible installation method which allows code compliance for height requirements of the GFCI outlet from the finished roof surface as well as the capability to relocate the outlet to a more convenient location, if necessary.

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.

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.

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, but it is not available with SAV. Since SAV is required for units installed in the USA, PremierLink is not applicable.

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.

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™ controller, RTU Open controller, or authorized commercial thermostats.

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 WeatherMaker® 48TC17-28 rooftop unit equipped with Round Tube-Plate Fin (RTPF) coils.

This system expands the envelope of operation of Carrier's WeatherMaker 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 WeatherMaker 48TC17-28 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.

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.

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.

Motorized 2-position damper

The new Carrier 2-position, motorized outdoor air damper admits up to 100% outside air. Using reliable, gear-driven technology, the 2-position damper opens to allow ventilation air and closes when the rooftop stops, stopping unwanted infiltration. Not for use with SAV models.

Manual OA damper

Manual outdoor air dampers are an economical way to bring in ventilation air. The dampers are available in 25% versions. Not for use with SAV models.

Staged air volume (SAV™) indoor fan speed system with a variable frequency drive (VFD)

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 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 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.

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 preprogrammed 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.

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 will either cycle the outdoor-fan motors or operate them at reduced speed to maintain the unit operation, depending on the model.

Optional stainless steel heat exchanger

The stainless steel heat exchanger option provides the tubular heat exchanger be made out of a minimum 20 gage 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.

Hinged access panels

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

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.

Thru-the-bottom connections

Provisions for thru-the-bottom power connections are standard.

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.

Options and accessories (cont)



Field-installed accessories

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 allows cooling operation down to -20°F (-29°C) ambient conditions.

Propane heating

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 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 at altitudes above 2000 ft (610 m). Kits may not be required in all areas.

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.

OPTIONS AND ACCESSORIES — WEIGHT ADDERS

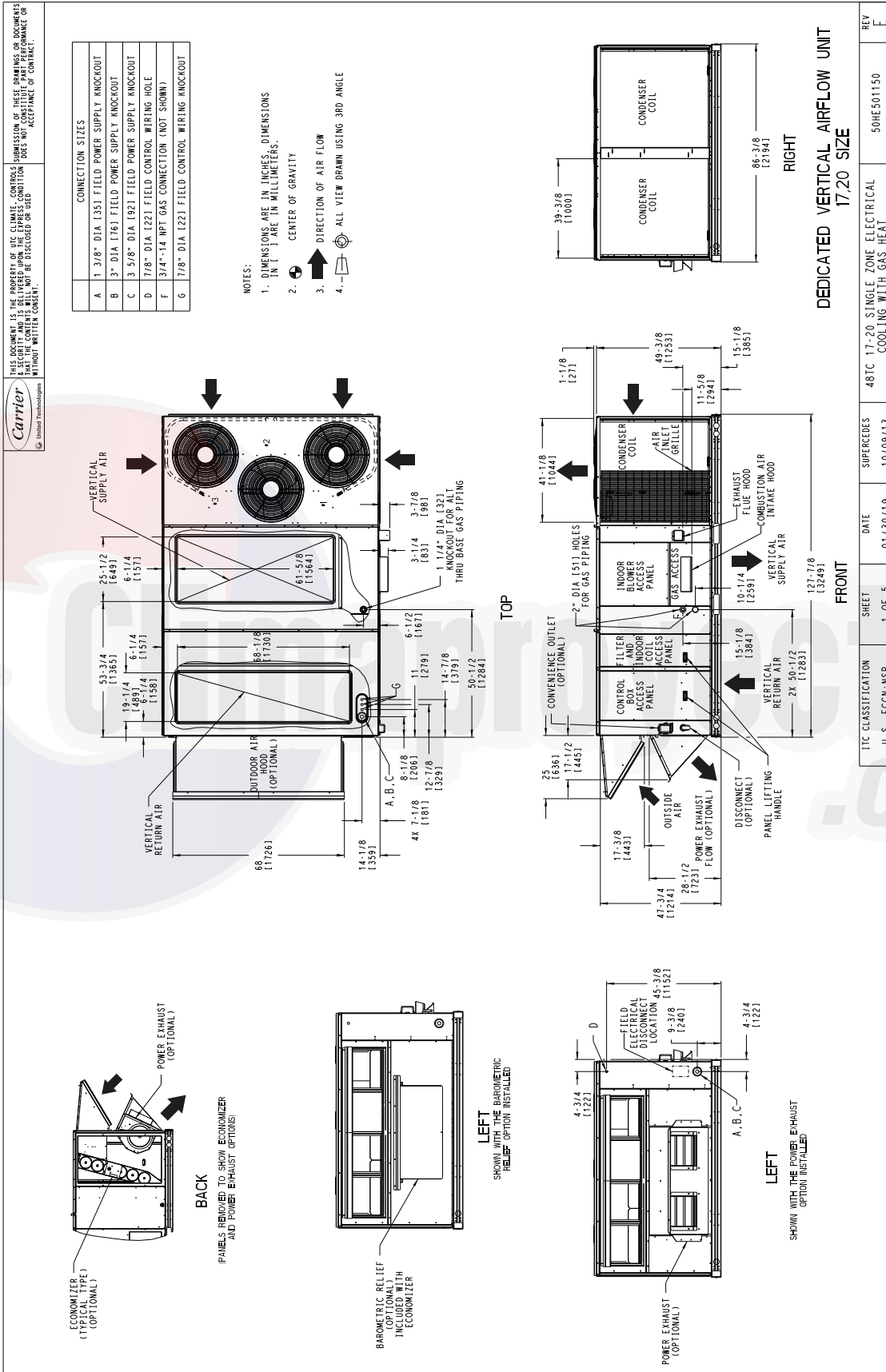
BASE UNIT WITH OPTIONS AND ACCESSORIES (Weight Adders)	MAX WEIGHT ADDER									
	48TC**17		48TC**20		48TC**24		48TC**28		48TC**30	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
Humidi-MiZer® System ¹	110	50	120	55	120	55	120	55	—	—
Power Exhaust	125	57	125	57	125	57	125	57	125	57
EconoMiSer® (IV, X, or 2)	246	112	246	112	246	112	246	112	246	112
Cu/Cu Condenser Coil ²	28	13	28	13	30	14	34	15	34	15
Cu/Cu Condenser and Evaporator Coils ²	53	24	53	24	58	26	64	29	64	29
Medium Gas Heat	90	41	90	41	90	41	90	41	90	41
High Gas Heat	113	51	113	51	113	51	113	51	113	51
Flue Discharge Deflector	7	3	7	3	7	3	7	3	7	3
Roof Curb 14-in. (356 mm)	240	109	240	109	255	116	255	116	255	116
Roof Curb 24-in. (610 mm)	340	154	340	154	355	161	355	161	355	161
Louvered Hail Guard	60	27	60	27	120	54	150	68	150	68
CO ₂ Sensor	5	2	5	2	5	2	5	2	5	2
Return Smoke Detector	5	2	5	2	5	2	5	2	5	2
Supply Smoke Detector	5	2	5	2	5	2	5	2	5	2
Fan/Filter Status Switch	2	1	2	1	2	1	2	1	2	1
Non-Fused Disconnect	15	7	15	7	15	7	15	7	15	7
Powered Convenience Outlet	35	16	35	16	35	16	35	16	35	16
Non-Powered Convenience Outlet	5	2	5	2	5	2	5	2	5	2
Enthalpy Sensor	2	1	2	1	2	1	2	1	2	1
Differential Enthalpy Sensor	3	1	3	1	3	1	3	1	3	1
Two Position Motorized Damper	50	23	50	23	50	23	65	29	65	29
Manual Damper	35	16	35	16	35	16	—	—	—	—
Field Filter Track 4-in. (102 mm)	22	10	22	10	22	10	22	10	22	10
Motormaster® Controller	35	16	35	16	35	16	35	16	35	16
Medium Static Motor/Drive	5	2	6	3	6	3	6	3	10	5
High Static Motor/Drive	11	5	12	5	16	7	16	7	20	9
SAV™ System with VFD	20	9	20	9	20	9	20	9	20	9

¹ For Humidi-MiZer® System add Motormaster Controller.

— Not available

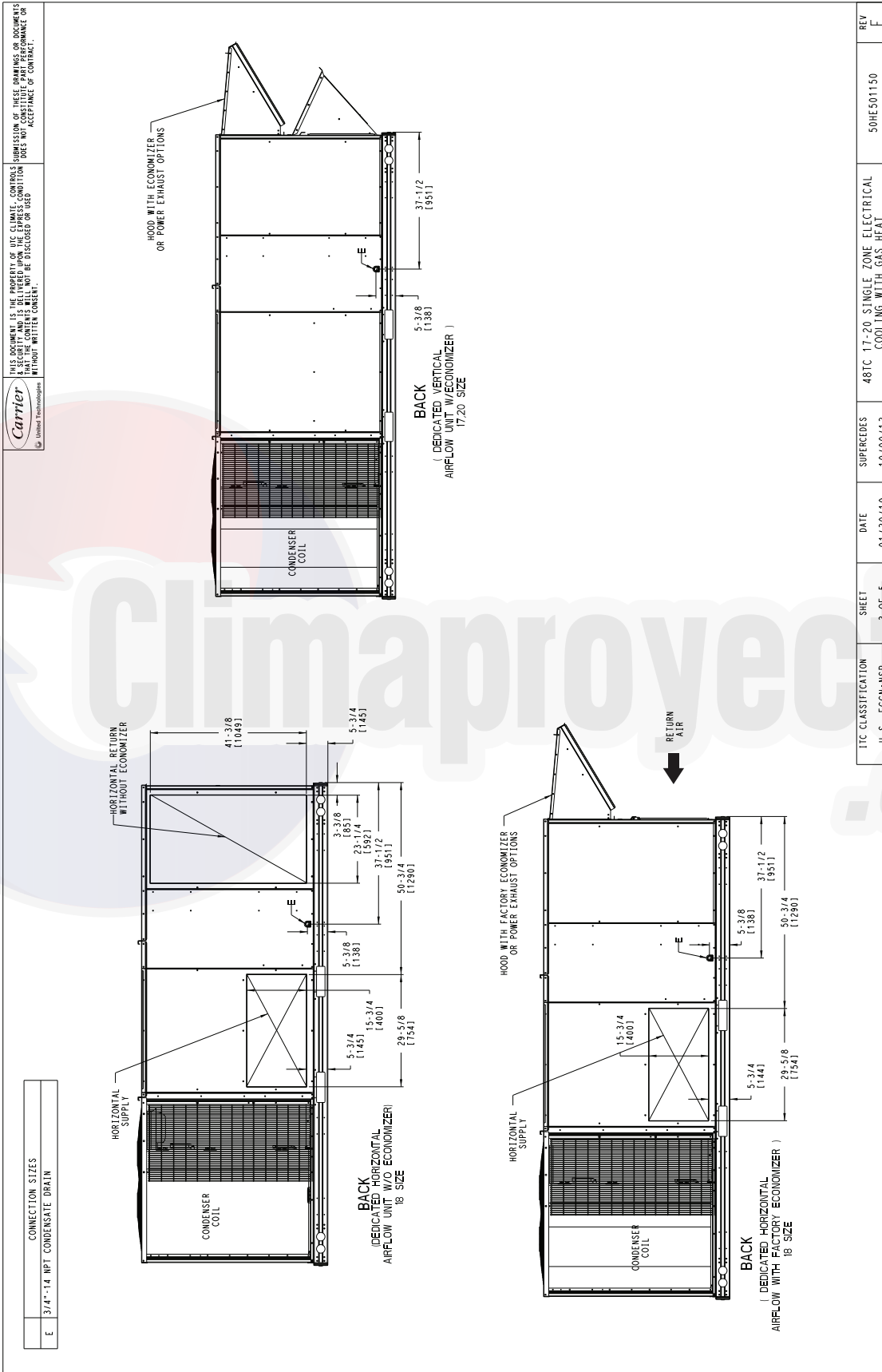
² Where available.

48TC**17-20 VERTICAL AIRFLOW



TIC CLASSIFICATION	SHEET	DATE	DATE	DATE	REV
U.S. - ECCN:NSR	1 OF 5	01/30/19	10/09/13	48TC SUPERGEDES	E
				48TC 17-20 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	50HE501150

48TC**17-20 BACK VIEW AND CONDENSATE DRAIN LOCATION



REV	DESCRIPTION	DATE	SUPERCEDES	SHEET	ITC CLASSIFICATION
E	50HES01150	01/30/19	10/09/13	3 OF 5	U.S. - ECON:MSR
E	48TC 17-20 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT				

48TC**17-20 CORNER WEIGHTS AND CLEARANCES

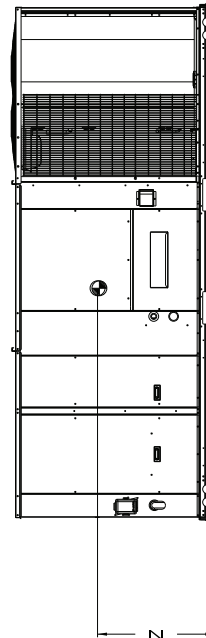
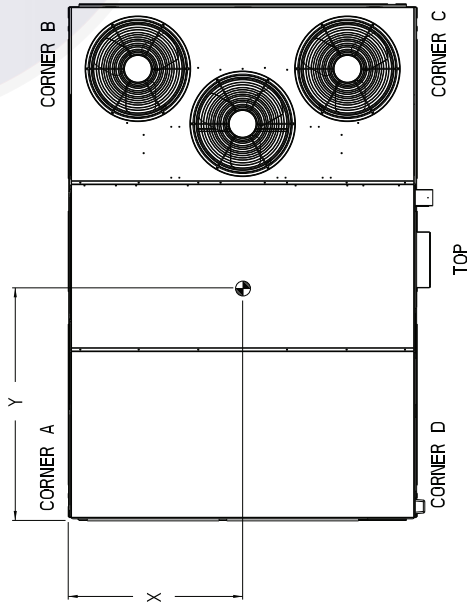
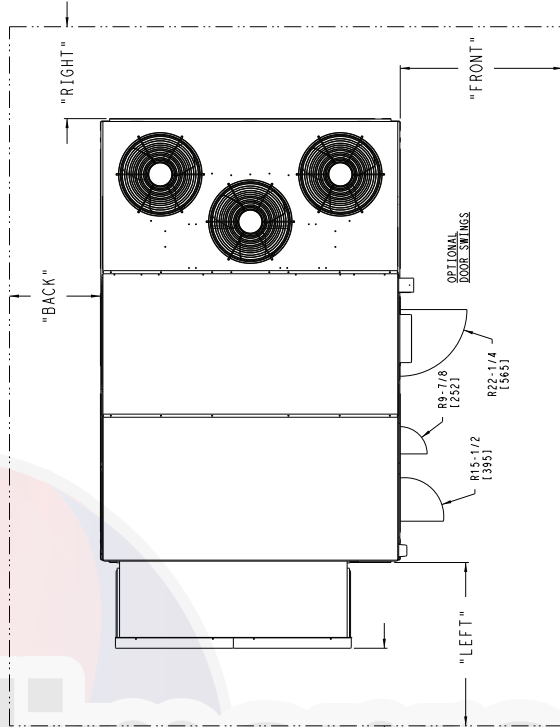
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UNIT	OUTDOOR COIL TYPE	STD UNIT WEIGHT	CORNER WEIGHT (A)	CORNER WEIGHT (B)	CORNER WEIGHT (C)	CORNER WEIGHT (D)	C.G.										
		LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z					
48TC17	MCHX	1824	829	434	197	443	210	479	218	469	213	44	3 1/4 [1137]	64	3 1/4 [1645]	16	1/2 [419]
48TC20	MCHX	1839	836	437	199	447	203	483	219	472	215	44	3 1/4 [1137]	64	3 1/4 [1645]	16	1/2 [419]
48TC17	R1PF	1907	867	438	199	519	236	515	234	435	198	42	29/32 [1090]	69	1/4 [1759]	16	1/2 [419]
48TC18	R1PF	1892	860	401	182	449	204	565	257	505	230	48	[1219]	67	3/8 [1711]	16	1/2 [419]
48TC20	R1PF	1922	874	441	201	523	238	519	236	438	199	42	29/32 [1090]	69	1/4 [1759]	16	1/2 [419]

R1PF - ROUND TUBE PLATE FIN (COPPER/ALUM)
MCHX - NOVIATION (ALUM/ALUM)

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



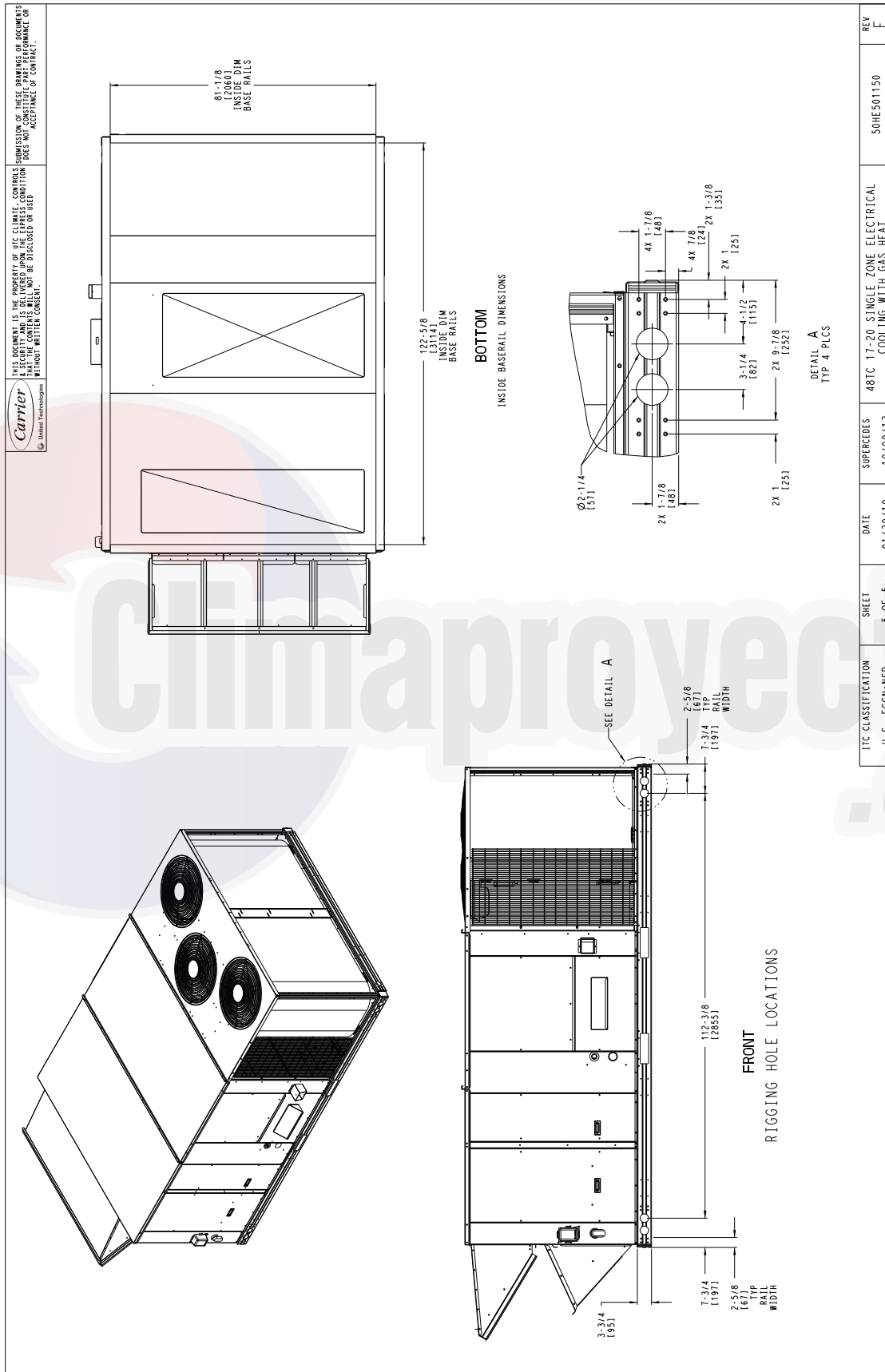
NOTES:

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

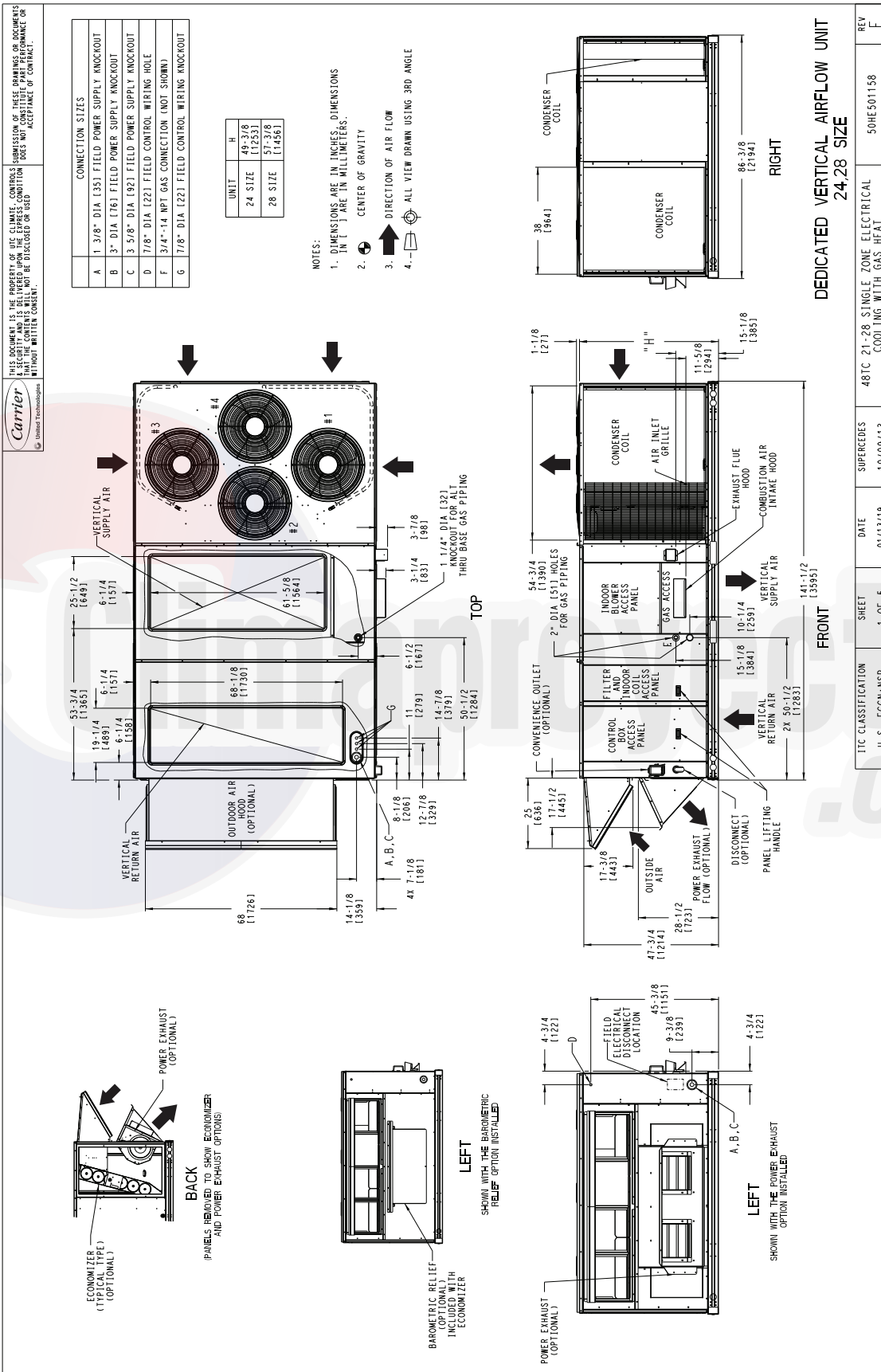
SURFACE	CLEARANCE			OPERATING CLEARANCE
	SERVICE WITH CONDUCTIVE BARRIER	SERVICE WITH NONCONDUCTIVE BARRIER	OPERATING CLEARANCE	
FRONT	48 [1219mm]	36 [914mm]	18 [457mm]	18 [457mm]
LEFT	48 [1219mm]	42 [1067mm]	18 [457mm]	18 [457mm]
BACK	42 [1067mm]	36 [914mm]	18 [457mm]	18 [457mm]
LEFT WITH HOOD	36 [914mm]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

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	REV
U.S. - ECCN:NSR	4 OF 5	01/30/19	48TC 17-20 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	E

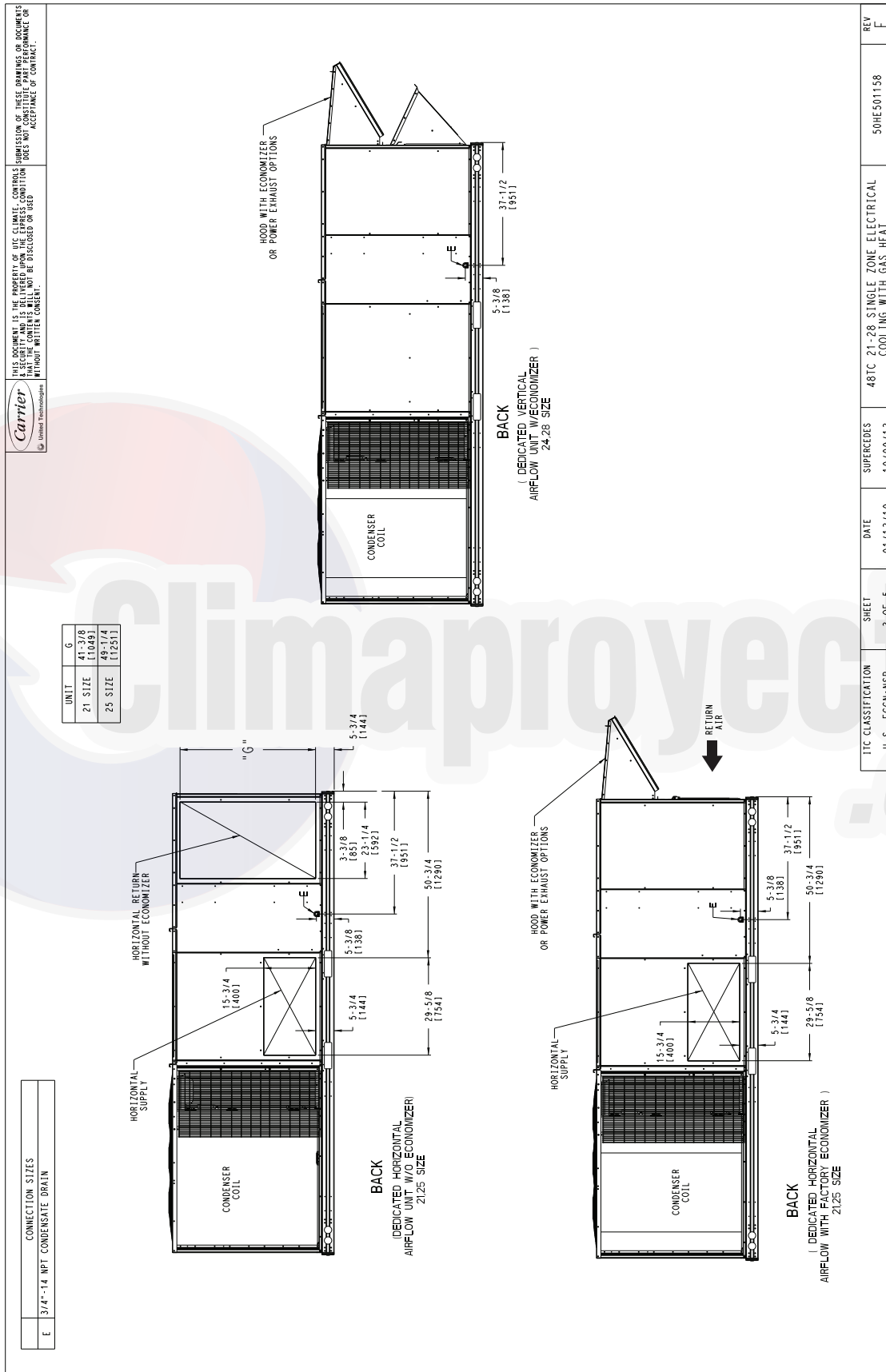
48TC**17-20 BOTTOM VIEW



48TC**24-28 VERTICAL AIRFLOW



48TC**24-28 BACK VIEW AND CONDENSATE DRAIN LOCATION



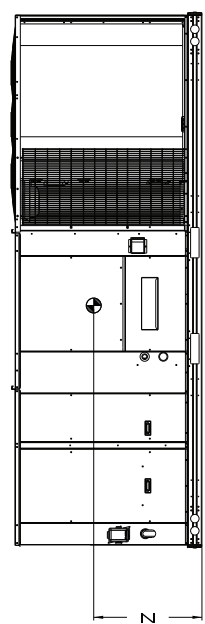
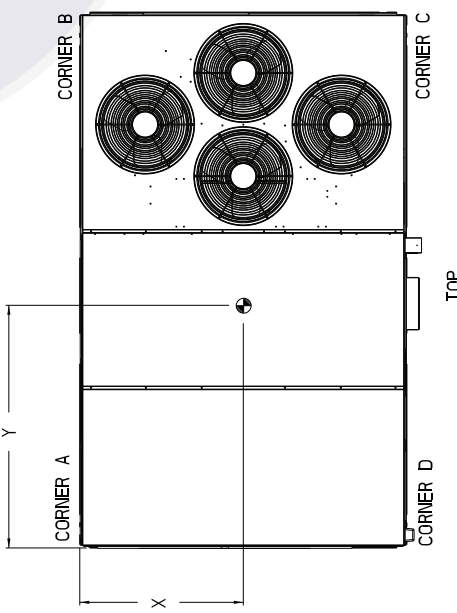
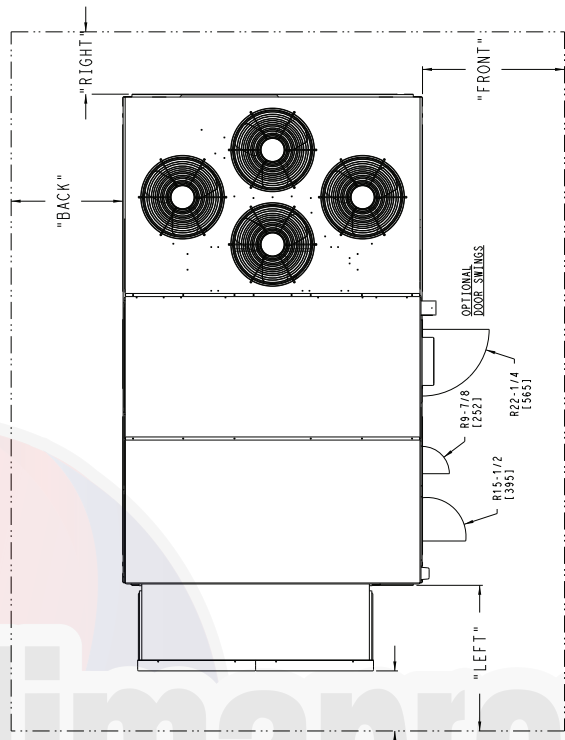
48TC**24-28 CORNER WEIGHTS AND CLEARANCES

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UNIT	OUTDOOR COIL TYPE	STD UNIT WEIGHT *				CORNER WEIGHT (A)				CORNER WEIGHT (B)				CORNER WEIGHT (C)				CORNER WEIGHT (D)				C.6.			
		LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z	
48TC24	MCHX	1989	904	383	174	540	245	623	283	442	201	46	178	1172	82	178	2105	16	172	1419					
48TC28	MCHX	2118	963	408	186	575	261	664	302	471	214	46	178	1172	82	178	2105	19	1483						
48TC21	R1PF	2102	956	474	215	390	177	593	269	582	265	47	172	1207	71	174	1181	16	172	1419					
48TC24	R1PF	2072	942	558	254	548	249	479	217	487	221	40	532	1020	70	1178									
48TC25	R1PF	2247	1021	540	246	556	253	598	272	581	264	44	578	1133	71	578	1181	19	1483						
48TC28	R1PF	2197	999	571	259	564	256	528	240	534	243	41	217	1058	70	174	1178	19	1483						

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

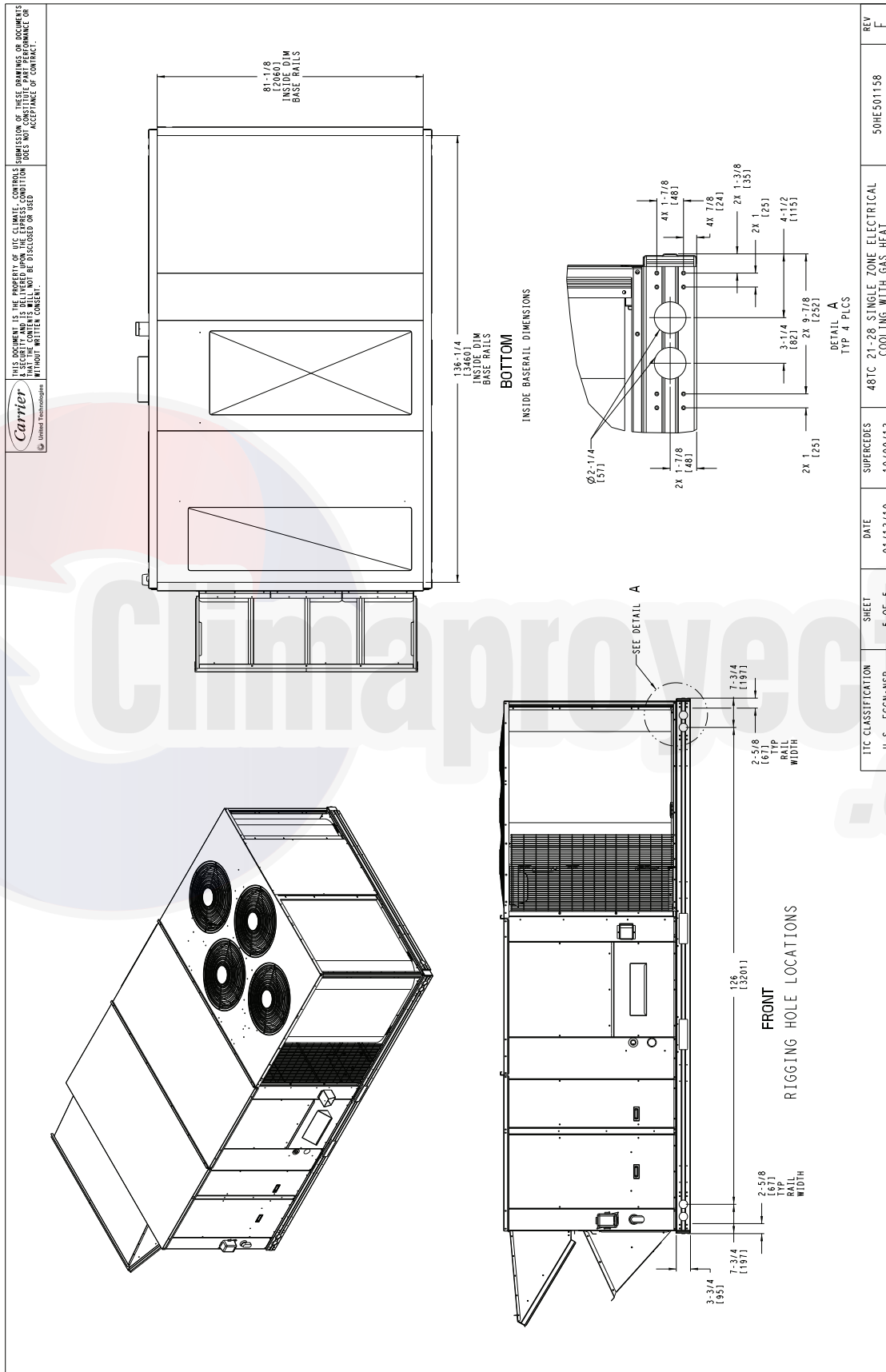


- NOTES:
- CLEARANCE ABOVE THE UNIT TO BE 72"
 - FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

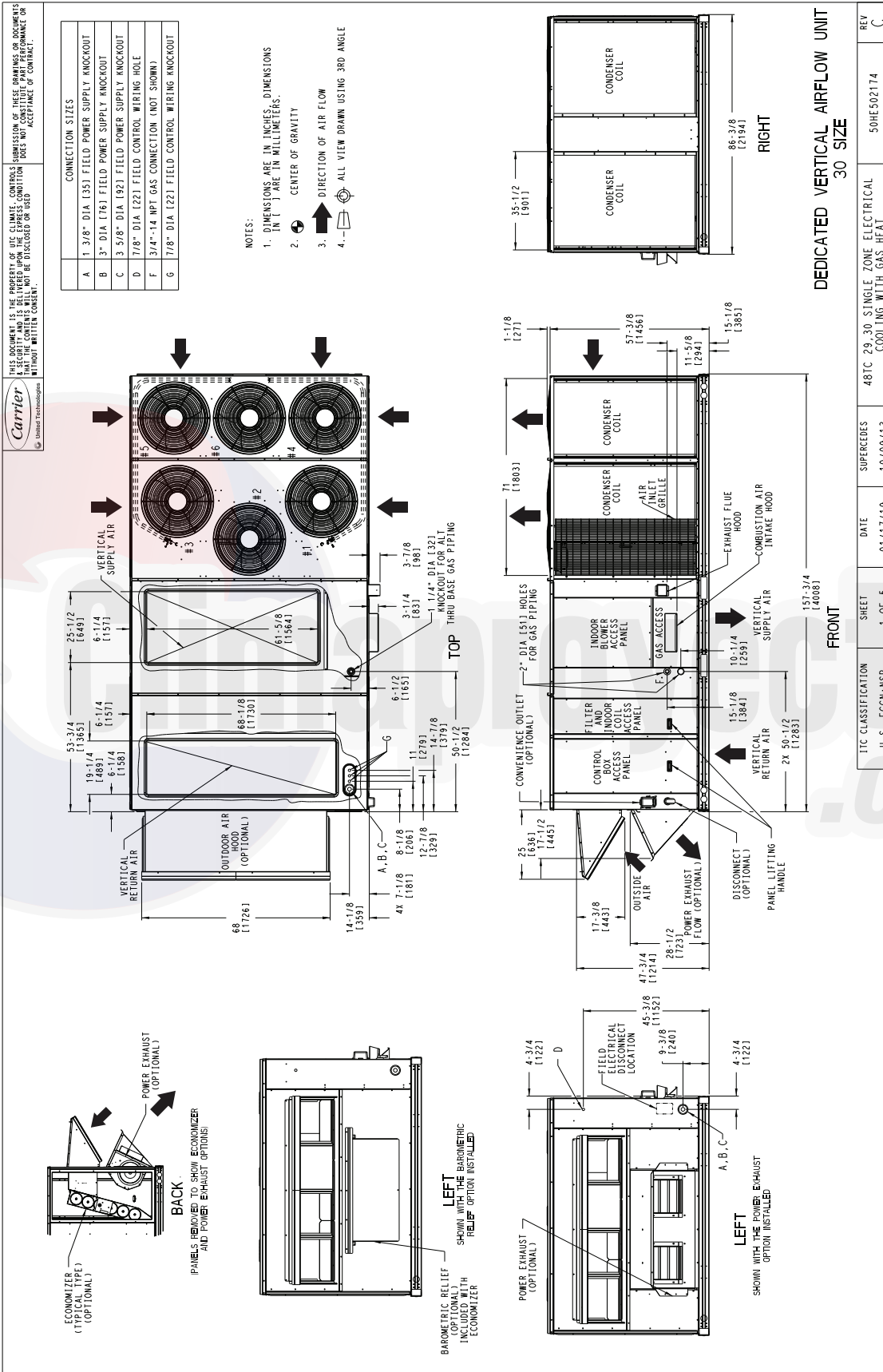
SURFACE	CLEARANCE		OPERATING CLEARANCE		REV
	SERVICE WITH CONDUCTIVE BARRIER	SERVICE WITH NONCONDUCTIVE BARRIER	SERVICE WITH CONDUCTIVE BARRIER	SERVICE WITH NONCONDUCTIVE BARRIER	
FRONT	48 [1219mm]	36 [914mm]	36 [914mm]	18 [457mm]	E
LEFT	48 [1219mm]	42 [1067mm]	42 [1067mm]	18 [457mm]	
BACK	42 [1067mm]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

U.S. ECCN: NSR	SHEET 4 OF 5	DATE 01/13/19	DATE 10/09/13	REV 50HE501158
IITC CLASSIFICATION		48TC 21-28 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT		

48TC**24-28 BOTTOM VIEW



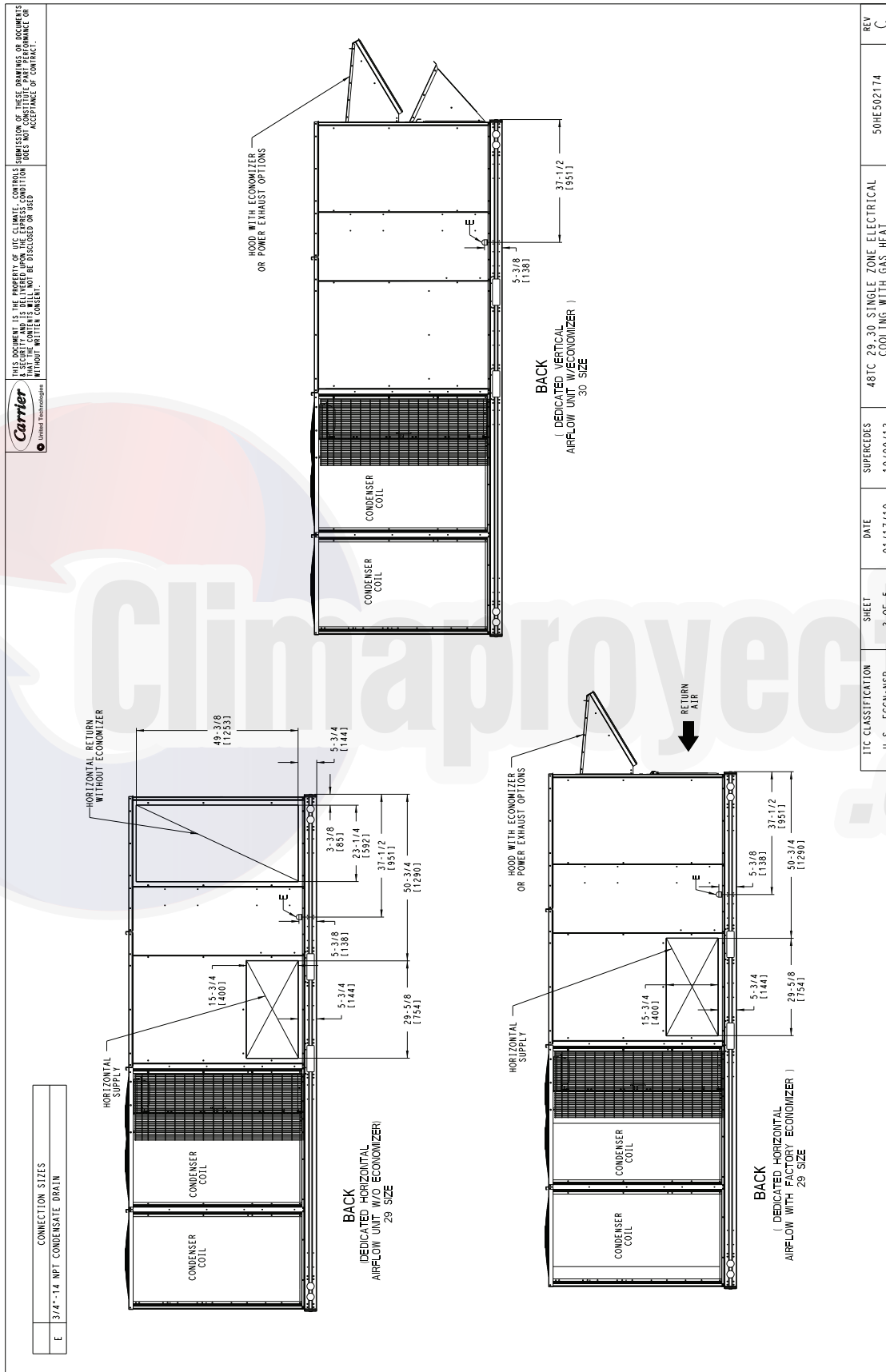
48TC**30 VERTICAL AIRFLOW



DEDICATED VERTICAL AIRFLOW UNIT
30 SIZE

REV	DESCRIPTION	DATE	BY	CHKD
C	50HE502174	10/09/13		
B	48TC 29 30 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	01/17/19		
A	48TC 29 30 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	01/17/19		

48TC**30 BACK VIEW AND CONDENSATE DRAIN LOCATION



REV	C	50HE502174
ITC CLASSIFICATION	U. S. - ECCN: NSR	3 OF 5
DATE	01/17/17/19	10/09/13
SUPERCEDES	48TC 29 30 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	

48TC**30 CORNER WEIGHTS AND CLEARANCES

Carrier
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The drawing includes a top view showing four fans and dimensions X and Y. A side view shows the unit with labels for 'LEFT WITH HOOD', 'LEFT', 'RIGHT', and 'FRONT'. A front view shows the unit's profile with height dimension Z. Labels include 'CORNER A', 'CORNER B', 'CORNER C', 'CORNER D', 'TOP', and 'FRONT'. Specific dimensions for fan clearances are noted: R9-7/8 (252), R15-1/2 (385), R22-1/4 (565), and R22-1/4 (565).

REVISIONS

REV	DESCRIPTION
C	50HE502174

UNIT	STD UNIT WEIGHT * LBS.	CORNER WEIGHT (A) LBS.	CORNER WEIGHT (B) LBS.	CORNER WEIGHT (C) LBS.	CORNER WEIGHT (D) LBS.	C.G.											
	KG.	KG.	KG.	KG.	KG.	X	Y	Z									
48TC29	2292	1042	577	282	559	254	583	265	602	274	44	111183	77	11/2	11969	19	14831
48TC30	2640	1200	697	317	595	270	621	282	728	331	44	111183	72	11/2	11842	19	14831

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

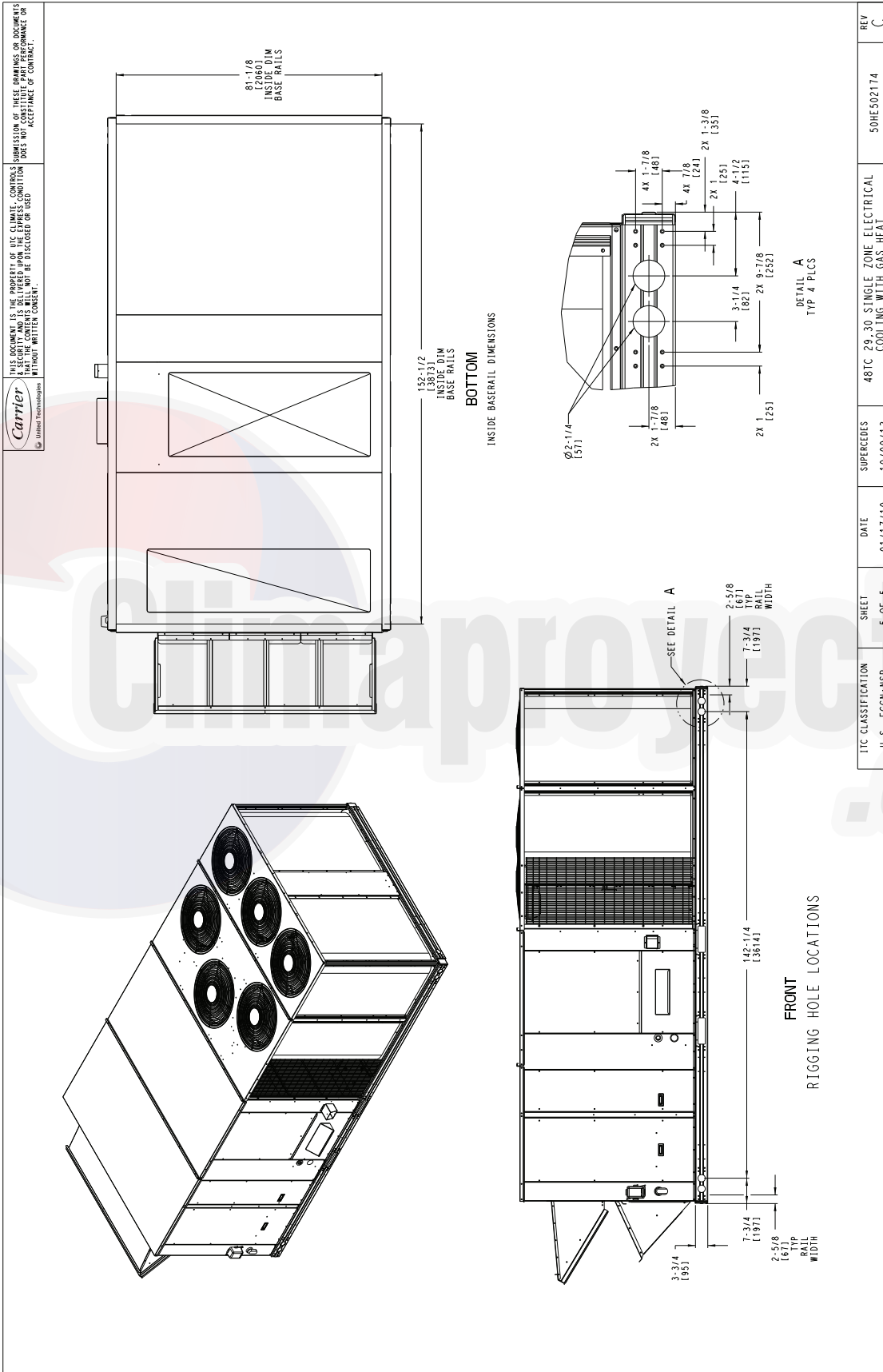
NOTES:

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

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

ITC CLASSIFICATION	SHEET	DATE	REV
U.S. ECCN: NSR	4 OF 5	01/17/19	50HE502174

48TC**30 BOTTOM VIEW



OPERATING WEIGHTS

48TC	UNIT LB (KG)				
	17	20	24	28	30
Base Unit					
Novation® Coil	1824 (829)	1839 (836)	1989 (904)	2118 (963)	n/a
RTPF Coil	1907 (867)	1922 (874)	2072 (942)	2197 (999)	2640 (1200)
Economizer	246 (112)	246 (112)	246 (112)	246 (112)	246 (112)
Powered Outlet	35 (16)	35 (16)	35 (16)	35 (16)	35 (16)
Humidi-MiZer® System	110 (50)	110 (50)	120 (54)	120 (54)	n/a
Curb					
14-in./356 mm	240 (109)	240 (109)	255 (116)	255 (116)	255 (116)
24-in./610 mm	340 (154)	340 (154)	355 (161)	355 (161)	355 (161)



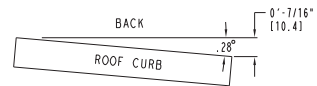
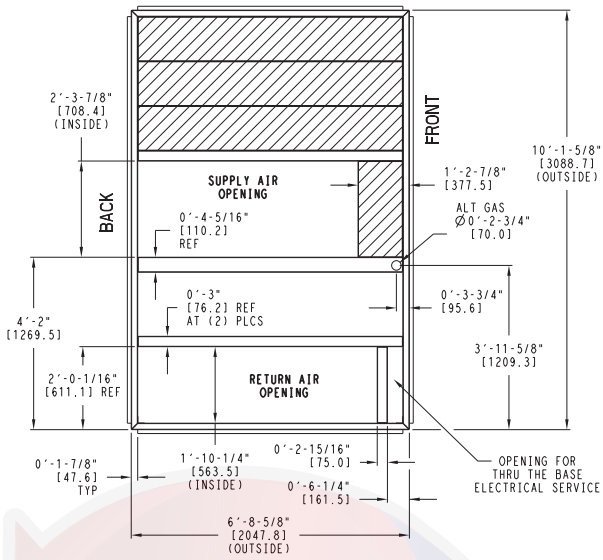
ROOF CURB DETAILS - UNIT SIZES 17 AND 20

UNIT SIZE	"A"	ROOF CURB ACCESSORY
17,20	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB045A00 CRRFCURB046A00

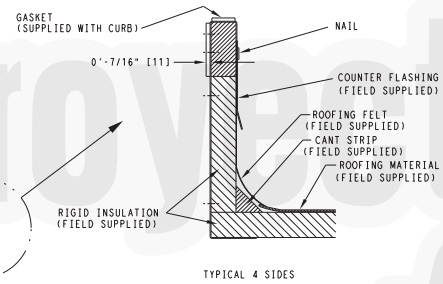
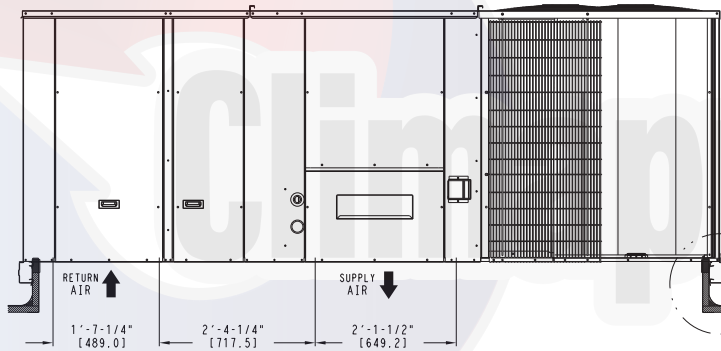
NOTES:

- 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

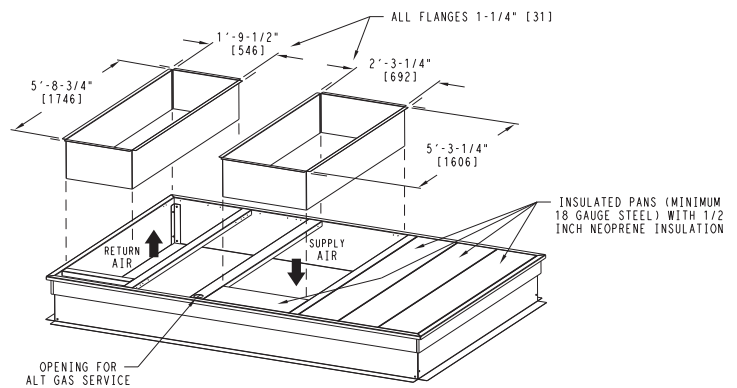
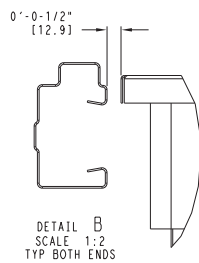
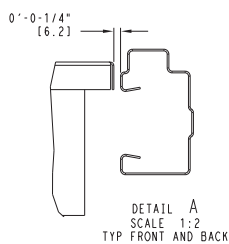
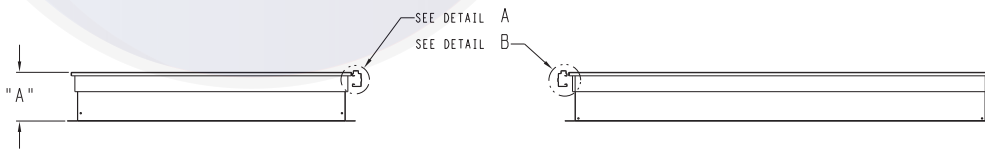
➔ DIRECTION OF AIR FLOW



MAX CURB LEVELING TOLERANCES



TYPICAL 4 SIDES

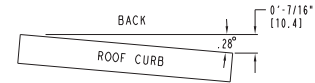
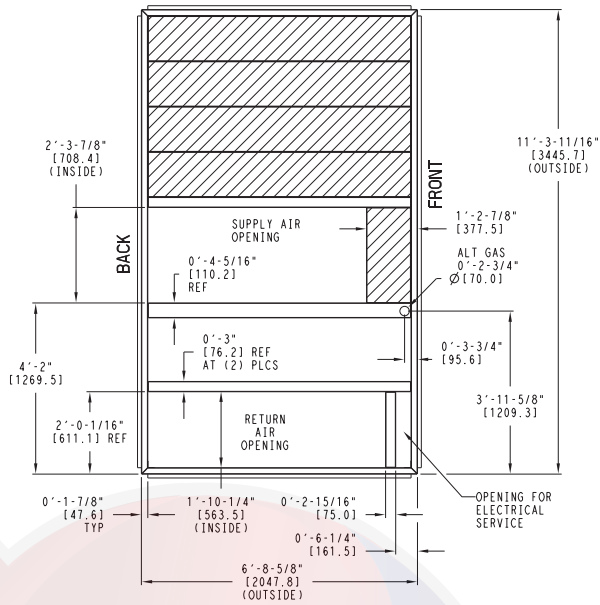


ROOF CURB DETAILS - UNIT SIZES 24 AND 28

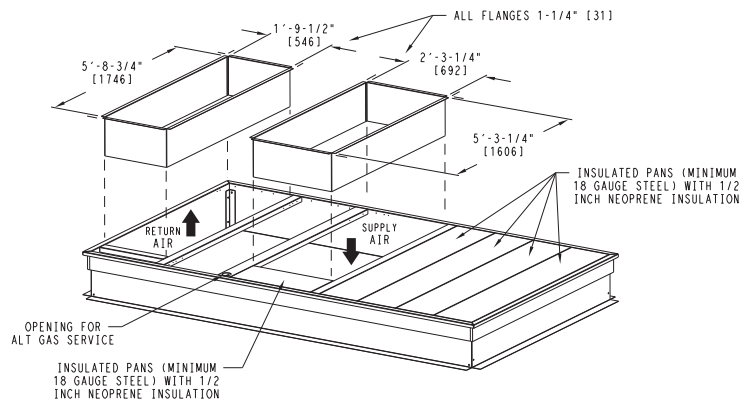
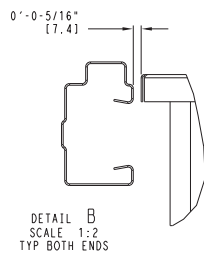
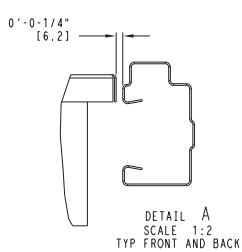
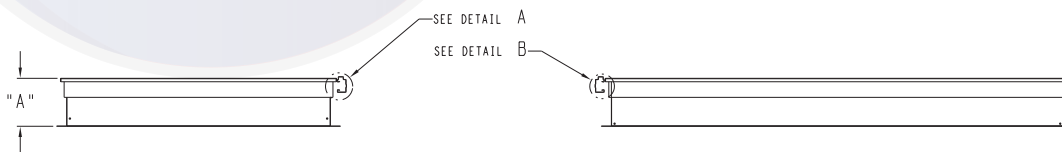
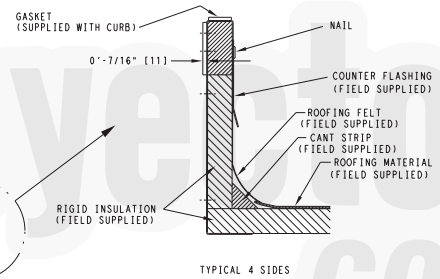
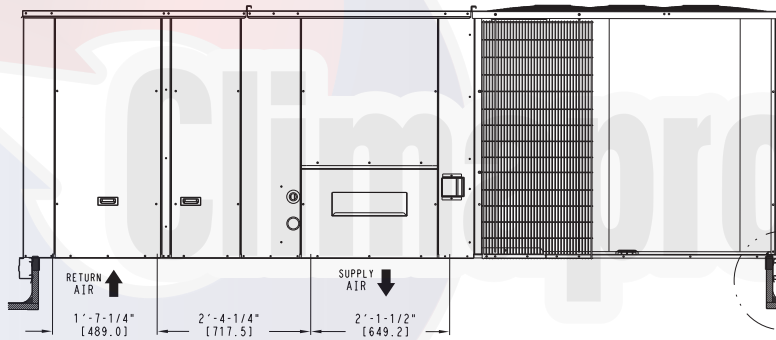
UNIT SIZE	"A"	ROOF CURB ACCESSORY
24,28	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB04TA00 CRRFCURB048A00

- 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

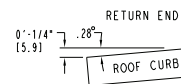
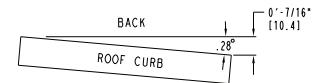
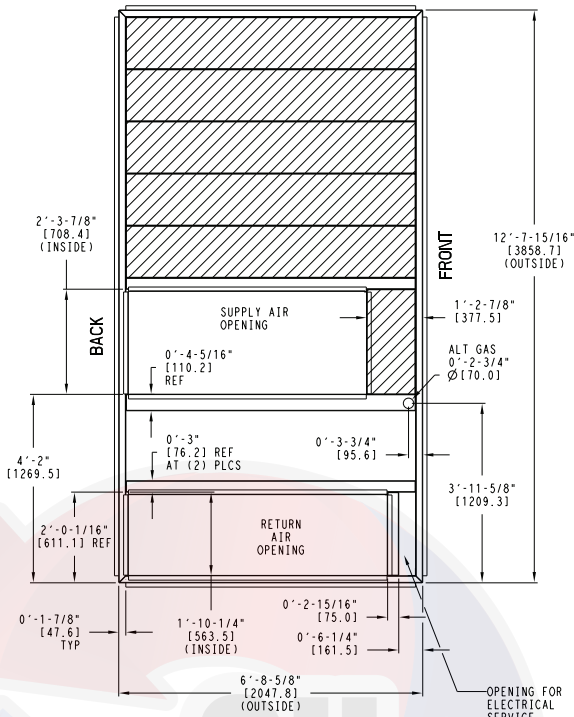


ROOF CURB DETAILS - UNIT SIZE 30

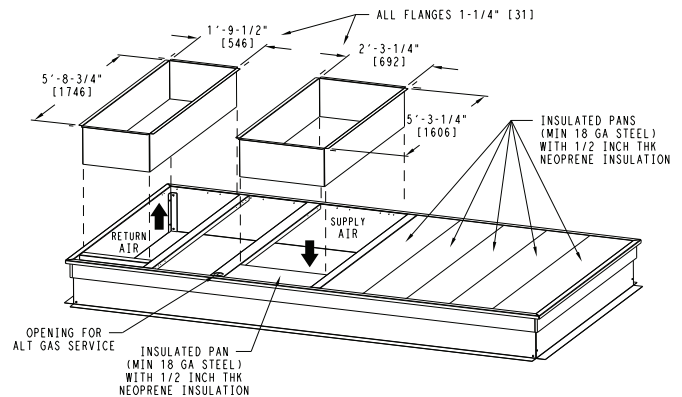
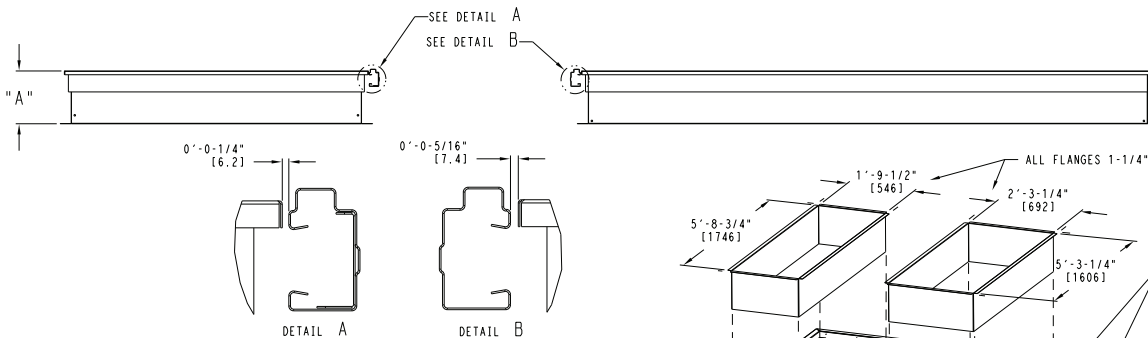
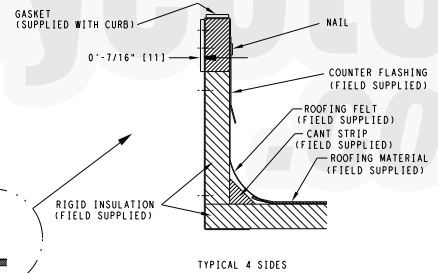
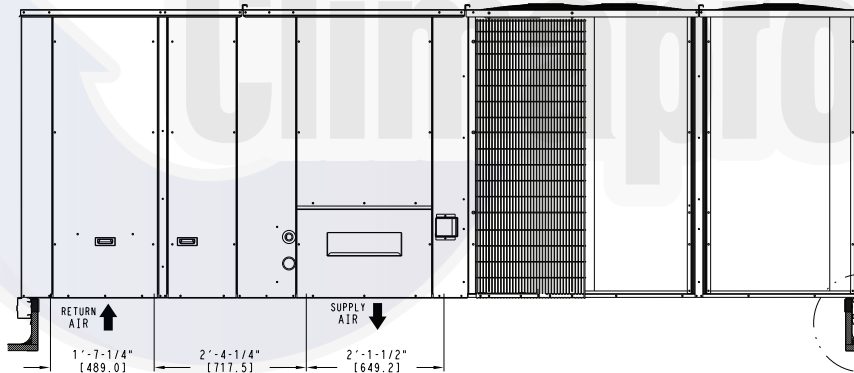
UNIT SIZE	"A"	ROOF CURB ACCESSORY
30	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB049A00 CRRFCURB050A00

- 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 ROOFCURB.

➔ DIRECTION OF AIR FLOW



MAX CURB LEVELING TOLERANCES



COOLING CAPACITIES 2-STAGE COOLING, SIZE 17, 15 TONS

48TC*D17			AMBIENT TEMPERATURE (F)													
			85			95			105			115				
			EAT (db)			EAT (db)			EAT (db)			EAT (db)				
			75	80	85	75	80	85	75	80	85	75	80	85		
4500 Cfm	EAT (wb)	58	THC	159.6	159.1	163.4	148.7	148.4	155.2	136.1	137.1	146.0	122.4	127.2	136.2	
			SHC	132.6	149.6	163.4	127.0	143.9	155.2	120.7	137.1	146.0	113.9	127.2	136.2	
		62	THC	173.9	173.6	173.3	163.1	162.6	162.2	150.5	150.2	149.9	136.8	136.2	136.9	
			SHC	119.4	136.8	153.9	114.1	131.5	148.6	108.2	125.7	142.6	101.9	119.2	135.8	
		67	THC	193.4	193.0	192.5	182.5	182.1	181.7	169.9	169.5	169.1	156.0	155.5	155.2	
			SHC	102.3	119.7	137.0	97.3	114.8	132.3	91.7	109.4	126.9	85.7	103.5	121.1	
	72	THC	213.7	213.2	212.6	203.5	203.0	202.5	191.0	190.5	189.9	177.1	176.6	176.1		
		SHC	84.0	101.7	119.2	79.7	97.4	115.0	74.6	92.4	109.9	69.1	86.9	104.6		
	76	THC	—	227.8	228.5	—	219.6	219.1	—	207.9	207.4	—	194.1	193.5		
		SHC	—	89.9	103.7	—	82.5	100.2	—	78.1	95.8	—	73.0	97.2		
	5250 Cfm	EAT (wb)	58	THC	168.7	168.5	176.4	157.0	158.2	167.7	143.9	148.2	158.0	129.5	137.5	147.4
				SHC	161.3	163.9	176.4	138.9	157.2	167.7	132.4	148.2	158.0	125.4	137.5	147.4
62			THC	184.2	183.8	183.2	172.3	171.8	171.5	159.1	158.5	159.3	144.4	143.8	147.8	
			SHC	129.4	149.6	168.9	123.9	144.0	163.5	117.9	137.9	156.4	111.4	131.3	147.8	
67			THC	204.7	204.0	203.5	193.1	192.6	192.2	179.7	179.2	178.7	164.8	164.3	163.6	
			SHC	109.3	129.5	149.6	104.3	124.7	144.9	98.6	119.1	139.4	92.5	113.1	133.3	
72		THC	224.6	224.1	223.6	214.4	213.7	213.1	202.0	201.4	200.7	187.0	186.4	185.8		
		SHC	87.5	107.9	128.2	83.4	103.9	124.3	78.6	99.2	119.6	72.9	93.6	114.1		
76		THC	—	239.1	239.6	—	230.6	230.1	—	218.4	217.7	—	204.4	203.7		
		SHC	—	92.6	110.2	—	86.4	107.0	—	82.0	102.6	—	77.1	97.8		
6000 Cfm		EAT (wb)	58	THC	176.9	178.5	188.9	164.3	168.9	179.6	150.3	158.4	169.1	136.1	146.9	157.7
				SHC	157.4	178.5	188.9	151.1	168.9	179.6	144.3	158.4	169.1	136.1	146.9	157.7
	62		THC	193.2	192.7	192.2	180.4	179.7	180.7	166.2	165.6	170.1	150.5	150.0	158.1	
			SHC	140.2	162.8	184.2	134.4	156.9	177.8	128.1	150.6	168.9	121.3	143.5	158.1	
	67		THC	214.4	213.7	213.0	202.1	201.6	201.0	187.7	187.1	186.4	171.8	171.1	170.4	
			SHC	117.3	140.3	163.0	112.1	135.3	158.2	106.2	129.4	152.2	99.8	123.1	145.9	
	72	THC	234.9	234.6	234.2	224.0	223.3	222.5	210.9	210.1	209.3	194.9	194.1	193.4		
		SHC	92.7	115.9	139.1	88.4	111.8	134.8	83.4	106.8	130.0	77.5	101.0	124.3		
	76	THC	—	250.7	250.9	—	240.9	240.1	—	227.5	226.7	—	212.7	211.8		
		SHC	—	95.7	118.9	—	92.1	115.3	—	87.4	110.8	—	82.4	105.8		
	6750 Cfm	EAT (wb)	58	THC	182.5	187.4	198.5	169.3	177.4	188.7	156.0	166.4	177.8	142.9	154.4	165.9
				SHC	167.5	187.4	198.5	161.2	177.4	188.7	153.0	166.4	177.8	142.9	154.4	165.9
62			THC	199.3	198.7	199.6	186.0	185.2	188.9	171.2	170.5	208.4	154.7	155.5	166.2	
			SHC	148.6	173.7	196.6	142.8	167.6	188.9	136.4	161.1	208.4	115.2	152.6	166.2	
67			THC	220.4	219.6	218.8	208.2	207.4	206.6	193.2	192.5	191.7	176.8	176.1	175.2	
			SHC	122.6	148.2	173.6	117.6	143.4	168.7	111.6	137.6	162.9	97.2	131.3	156.3	
72		THC	241.2	240.5	240.2	229.8	228.9	228.1	216.3	215.4	214.6	200.2	199.4	198.6		
		SHC	95.1	120.9	146.6	90.8	116.8	142.6	85.8	111.9	137.8	80.0	106.2	118.0		
76		THC	—	257.2	256.7	—	246.6	245.9	—	233.0	232.1	—	217.6	216.7		
		SHC	—	98.4	124.2	—	94.8	120.7	—	90.2	116.3	—	85.1	111.3		
7500 Cfm		EAT (wb)	58	THC	187.3	195.3	206.8	174.4	184.9	196.8	161.5	173.5	185.5	148.9	161.1	173.2
				SHC	177.5	195.3	206.8	169.9	184.9	196.8	161.5	173.5	185.5	148.9	161.1	173.2
	62		THC	204.3	203.5	207.1	190.6	189.9	197.1	175.1	175.4	185.7	158.4	161.2	173.5	
			SHC	156.5	183.9	207.1	150.7	177.9	197.1	144.1	170.2	185.7	137.1	161.2	173.5	
	67		THC	225.2	224.4	223.4	213.1	212.2	211.3	197.8	197.0	196.2	180.8	179.9	179.1	
			SHC	127.5	155.8	183.5	122.8	151.2	178.9	116.8	145.5	173.1	110.3	139.0	166.3	
	72	THC	246.1	245.5	244.9	234.5	233.6	232.8	220.6	219.7	218.6	204.7	203.7	202.7		
		SHC	97.1	125.6	153.8	92.9	121.6	150.1	87.9	116.8	145.3	82.3	111.2	139.9		
	76	THC	—	262.3	261.6	—	251.3	250.5	—	237.3	236.3	—	221.6	220.6		
		SHC	—	100.9	129.2	—	97.3	125.8	—	92.8	121.5	—	87.7	116.6		

LEGEND

- Do not operate
- Cfm** — Cubic feet per minute (supply air)
- EAT (db)** — Entering Air Temperature (dry bulb)
- EAT (wb)** — Entering Air Temperature (wet bulb)
- SHC** — Sensible Heat Capacity (1000 Btuh) Gross
- TC** — Total Capacity (1000 Btuh) Gross

NOTE: See Minimum-Maximum Airflow - Natural Gas and Propane Ratings on page 6. Do not operate outside these limits.

Performance data (cont)



COOLING CAPACITIES, 2-STAGE COOLING, SIZE 17, 15 TONS (cont)

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC-E17 (15 TONS) UNIT WITH HUMIDI-MIZER IN SUBCOOLING MODE								
		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	208.50	190.60	172.60	229.20	208.60	188.10	247.80	224.90	202.00
	SHC	94.00	114.50	135.00	104.50	125.20	145.90	113.00	133.80	154.60
	kW	13.42	13.05	12.70	13.60	13.21	12.80	13.82	13.36	13.15
85	TC	198.30	180.70	163.00	214.90	194.80	174.60	229.80	207.40	185.10
	SHC	74.10	99.60	125.10	85.20	110.90	136.70	94.10	120.00	145.90
	kW	14.79	14.42	14.10	14.97	14.58	14.20	15.19	14.73	14.51
95	TC	188.20	170.80	153.40	200.60	180.90	161.10	211.90	190.00	168.10
	SHC	54.40	84.80	115.30	65.90	96.70	127.50	75.10	106.20	137.20
	kW	16.23	15.86	15.50	16.41	16.02	15.60	16.63	16.17	15.95
105	TC	178.10	160.90	143.80	186.40	167.00	147.70	193.90	172.50	151.20
	SHC	34.60	70.00	105.40	46.50	82.40	118.20	56.10	92.30	128.50
	kW	17.47	17.10	16.80	17.65	17.26	16.90	17.87	17.41	17.25
115	TC	167.90	151.10	134.20	172.10	153.20	134.20	175.90	155.10	134.50
	SHC	14.80	55.20	95.60	27.20	68.10	109.00	37.10	78.50	119.80
	kW	18.87	18.50	18.20	19.05	18.66	18.30	19.27	18.81	18.55

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC-E17 (15 TONS) WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE								
		Air Entering Evaporator (F)								
		75 Dry Bulb			75 Dry Bulb			75 Dry Bulb		
		62.5 Wet Bulb			64 Wet Bulb			65.3 Wet Bulb		
		(50% Relative)			(56% Relative)			(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	80.10	85.50	91.30	82.70	90.90	97.10	86.00	95.40	100.50
	SHC	12.70	22.30	34.20	5.10	12.10	21.20	-2.10	4.20	10.50
	kW	12.44	12.67	12.78	12.55	12.88	13.10	12.65	13.02	13.12
75	TC	82.30	87.60	93.40	84.70	93.00	99.20	88.10	97.30	102.50
	SHC	14.30	24.20	36.00	6.70	13.70	23.10	-0.50	5.80	12.60
	kW	12.38	12.62	12.73	12.50	12.83	13.05	12.62	12.98	13.07
70	TC	84.40	89.60	94.70	87.00	95.10	101.30	90.30	99.50	104.60
	SHC	16.10	25.70	37.30	8.20	15.80	24.50	1.10	7.50	13.70
	kW	12.34	12.58	12.69	12.47	12.78	13.03	12.59	12.93	13.02
60	TC	88.50	93.90	99.80	91.20	99.40	105.50	94.40	103.70	108.90
	SHC	19.40	29.20	40.70	11.50	18.60	27.80	4.60	10.50	16.90
	kW	12.28	12.52	12.63	12.41	12.73	12.97	12.53	12.84	12.94
50	TC	92.80	98.10	104.80	95.40	103.60	110.50	98.80	108.00	113.90
	SHC	22.70	32.20	43.80	14.80	22.10	31.30	7.70	13.90	20.50
	kW	12.21	12.45	12.56	12.34	12.68	12.91	12.46	12.75	12.85
40	TC	97.10	102.50	108.50	99.60	108.00	114.30	103.00	112.40	117.70
	SHC	26.00	35.40	46.90	17.90	25.30	34.40	10.80	17.10	23.80
	kW	12.14	12.38	12.49	12.27	12.60	12.84	12.40	12.70	12.80

LEGEND

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

NOTES:

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

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

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

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

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

COOLING CAPACITIES, 2-STAGE COOLING, SIZE 20, 17.5 TONS

48TC*D20				AMBIENT TEMPERATURE (F)												
				85			95			105			115			
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			
				75	80	85	75	80	85	75	80	85	75	80	85	
5250 Cfm	EAT (wb)	58	THC	180.4	185.6	196.3	167.7	176.1	186.9	154.7	165.3	176.6	142.2	153.6	164.9	
			SHC	166.5	185.6	196.3	160.6	176.1	186.9	152.7	165.3	176.6	142.2	153.6	164.9	
		62	THC	196.2	195.5	196.9	183.6	182.9	187.2	169.3	168.7	176.9	153.4	154.1	165.2	
			SHC	146.8	172.1	194.7	141.4	166.6	187.2	135.4	160.5	176.9	128.6	152.5	165.2	
		67	THC	216.7	215.9	215.2	204.9	204.1	203.1	190.6	189.7	189.0	174.8	174.0	173.3	
			SHC	120.0	146.1	171.8	115.4	141.5	167.1	109.8	136.1	161.7	103.8	130.2	155.6	
	72	THC	237.4	236.8	236.0	226.0	225.1	224.2	212.8	211.9	211.0	197.3	196.4	195.5		
		SHC	92.0	118.3	144.3	87.8	114.3	140.4	83.0	109.6	135.8	77.6	104.2	130.6		
	76	THC	—	252.9	253.0	—	242.5	241.6	—	229.1	228.2	—	214.1	213.1		
		SHC	—	95.1	121.4	—	91.7	118.0	—	87.3	113.8	—	82.5	107.1		
	6125 Cfm	EAT (wb)	58	THC	188.8	198.5	209.3	176.5	188.2	200.2	164.5	176.7	189.0	151.9	164.2	176.7
				SHC	180.4	198.5	209.3	174.4	188.2	200.2	164.5	176.7	189.0	151.9	164.2	176.7
62			THC	205.2	204.6	209.6	191.8	191.5	200.4	176.6	177.6	189.2	159.9	164.2	176.9	
			SHC	159.9	188.7	209.6	154.2	183.0	200.4	147.9	174.8	189.2	141.0	164.2	176.9	
67			THC	225.5	224.5	223.5	213.5	212.5	211.7	199.1	198.3	197.4	182.3	181.4	180.9	
			SHC	128.3	158.4	187.8	123.8	154.1	183.5	118.4	148.9	178.1	112.2	142.7	171.6	
72		THC	245.6	245.3	244.6	234.7	233.6	232.6	220.9	219.9	218.8	205.5	204.4	203.4		
		SHC	95.4	125.9	155.7	91.7	122.2	152.4	86.9	117.7	148.1	81.7	112.5	143.1		
76		THC	—	262.0	261.2	—	250.7	250.1	—	237.3	236.2	—	221.6	220.6		
		SHC	—	99.5	129.4	—	95.9	126.2	—	91.8	122.4	—	87.0	117.8		
7000 Cfm		EAT (wb)	58	THC	197.4	209.8	221.3	186.1	199.1	211.7	173.8	186.9	200.1	160.3	173.5	186.9
				SHC	196.8	209.8	221.3	186.1	199.1	211.7	173.8	186.9	200.1	160.3	173.5	186.9
	62		THC	212.7	212.4	221.5	198.4	199.8	212.0	182.3	186.9	200.3	164.7	173.8	187.1	
			SHC	173.4	205.1	221.5	167.4	197.4	212.0	160.8	186.8	200.3	153.4	173.8	187.1	
	67		THC	233.7	232.5	231.4	220.8	219.8	218.9	205.6	204.5	204.1	187.8	186.8	188.0	
			SHC	138.0	172.0	205.0	133.4	167.6	200.4	127.8	162.0	194.4	121.3	155.6	185.6	
	72	THC	254.3	253.3	252.8	242.7	241.5	240.3	228.0	226.8	225.7	211.8	210.6	209.3		
		SHC	101.3	135.4	169.2	97.3	131.8	165.9	92.3	127.2	161.5	86.9	121.8	156.3		
	76	THC	—	270.7	269.9	—	259.0	258.1	—	245.0	243.6	—	228.5	227.1		
		SHC	—	106.1	140.0	—	102.4	136.5	—	98.2	132.7	—	93.2	127.9		
	7875 Cfm	EAT (wb)	58	THC	205.0	217.2	229.1	193.4	206.9	219.3	180.6	194.3	207.9	166.6	180.5	194.5
				SHC	205.0	217.2	229.1	193.4	206.9	219.3	180.6	194.3	207.9	166.6	180.5	194.5
62			THC	216.7	217.4	229.4	202.5	207.1	219.6	185.9	194.5	208.4	168.4	180.7	194.7	
			SHC	183.9	217.4	229.4	178.2	207.1	219.6	171.5	194.5	208.4	141.2	180.7	194.7	
67			THC	237.8	236.7	235.7	224.7	223.5	223.0	209.5	208.3	209.2	191.5	190.3	195.0	
			SHC	144.6	182.4	219.3	140.3	178.2	213.7	134.9	172.7	205.9	113.6	166.2	195.0	
72		THC	258.6	257.5	256.5	246.8	245.7	244.3	231.8	230.5	229.2	215.3	213.9	212.5		
		SHC	103.9	141.8	179.2	100.0	138.3	176.1	95.1	133.9	172.1	89.7	128.6	142.0		
76		THC	—	275.4	274.2	—	262.7	261.8	—	248.7	247.6	—	231.9	230.5		
		SHC	—	109.5	147.0	—	105.7	143.6	—	101.5	139.9	—	96.6	135.4		
8750 Cfm		EAT (wb)	58	THC	211.3	223.6	235.9	199.7	213.4	225.7	186.4	200.7	214.3	172.1	186.5	200.9
				SHC	211.3	223.6	235.9	199.7	213.4	225.7	186.4	200.7	214.3	172.1	186.5	200.9
	62		THC	220.0	223.7	236.3	206.0	213.6	226.1	189.3	200.9	214.5	172.2	186.7	201.2	
			SHC	194.0	223.7	236.3	188.5	213.6	226.1	181.3	200.9	214.5	172.2	186.7	201.2	
	67		THC	241.1	240.1	239.7	227.9	226.6	226.9	212.7	211.4	214.9	194.4	193.0	201.4	
			SHC	151.0	192.1	230.2	146.9	188.3	225.2	141.6	182.9	214.8	135.3	176.3	201.4	
	72	THC	262.2	261.0	259.7	250.0	248.8	247.7	235.0	233.5	232.1	218.1	216.6	215.2		
		SHC	106.5	148.1	189.0	102.5	144.5	186.0	97.8	140.4	182.1	92.4	135.3	177.1		
	76	THC	—	278.9	277.4	—	266.0	264.8	—	251.5	250.6	—	234.7	233.0		
		SHC	—	112.7	153.7	—	108.9	150.4	—	104.7	146.7	—	100.0	142.4		

LEGEND

- Do not operate
- Cfm — Cubic feet per minute (supply air)
- EAT (db) — Entering Air Temperature (dry bulb)
- EAT (wb) — Entering Air Temperature (wet bulb)
- SHC — Sensible Heat Capacity (1000 Btuh) Gross
- TC — Total Capacity (1000 Btuh) Gross

NOTE: See Minimum-Maximum Airflow - Natural Gas and Propane Ratings on page 6. Do not operate outside these limits.

Performance data (cont)



COOLING CAPACITIES, 2-STAGE COOLING, SIZE 20, 17.5 TONS (cont)

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC*E20(17.5 TONS)-UNIT WITH HUMIDI-MIZER IN SUBCOOLING MODE								
		Air Entering Evaporator - CFM								
		5,250			7,000			8,750		
		Air Entering Evaporator - Ewb (F)								
		72	67	62	72	67	62	72	67	62
75	TC	218.70	199.60	180.50	241.40	219.40	197.40	261.70	237.20	212.70
	SHC	99.90	123.90	147.80	112.70	136.90	161.10	122.90	147.30	171.70
	kW	11.81	11.56	11.20	13.81	13.48	13.16	14.82	14.58	14.16
85	TC	206.60	187.90	169.10	224.90	203.40	181.90	241.30	217.30	193.40
	SHC	78.90	108.40	137.90	92.20	122.10	152.00	103.00	133.10	163.30
	kW	13.18	12.53	12.53	15.18	14.85	14.52	16.21	15.85	15.54
95	TC	194.70	176.20	157.80	208.40	187.40	166.40	220.80	197.40	174.10
	SHC	57.80	92.90	128.00	71.70	107.30	142.90	83.00	118.90	154.90
	kW	14.56	14.21	13.88	16.56	16.21	15.87	17.56	17.22	16.01
105	TC	182.70	164.50	146.40	191.90	171.40	150.80	200.30	177.60	154.80
	SHC	36.80	77.40	118.10	51.30	92.50	133.80	63.00	104.70	146.40
	kW	15.93	15.58	15.20	17.94	17.58	17.22	18.95	18.59	18.24
115	TC	170.60	152.80	135.00	175.40	155.40	135.30	179.80	157.70	135.50
	SHC	15.70	62.00	108.20	30.80	77.80	124.70	43.00	90.50	128.00
	kW	17.31	16.95	16.58	19.32	18.95	18.58	20.32	19.96	19.59

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC*E20(17.5 TONS)-UNIT WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE								
		Air Entering Evaporator (F)								
		75 Dry Bulb			75 Dry Bulb			75 Dry Bulb		
		62.5 Wet Bulb			64 Wet Bulb			65.3 Wet Bulb		
		(50% Relative)			(56% Relative)			(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	82.20	90.50	92.40	86.70	96.40	97.80	91.60	99.80	101.20
	SHC	18.20	29.40	41.60	8.60	17.20	27.50	0.50	9.30	13.20
	kW	12.64	12.73	12.88	12.78	13.06	13.15	12.96	13.07	13.22
75	TC	84.40	92.70	94.40	88.80	98.60	99.70	93.70	102.00	103.40
	SHC	19.70	31.30	43.50	10.10	18.80	29.20	12.10	10.80	15.30
	kW	12.60	12.71	12.85	12.75	13.02	13.12	12.93	13.03	13.19
70	TC	86.70	94.90	96.60	91.00	100.70	102.00	95.90	104.10	105.40
	SHC	21.30	32.80	44.80	11.60	20.40	30.70	3.80	12.30	16.50
	kW	12.56	12.66	12.82	12.70	12.99	13.08	12.89	13.00	13.14
60	TC	90.90	99.10	100.80	95.20	105.00	106.30	100.20	108.30	109.70
	SHC	24.80	36.00	48.20	14.90	23.90	35.90	7.20	15.60	19.60
	kW	12.49	12.60	12.75	12.64	12.92	13.02	12.83	12.93	13.09
50	TC	95.00	103.40	105.10	99.50	109.40	110.50	104.40	112.50	113.90
	SHC	28.10	39.30	51.30	18.20	27.20	37.40	10.30	18.90	23.20
	kW	12.43	12.53	12.67	12.57	12.86	12.95	12.76	12.87	13.02
40	TC	99.20	107.70	109.30	103.70	113.70	114.70	108.60	116.70	118.10
	SHC	31.40	42.50	54.40	21.30	30.40	40.50	13.40	22.00	26.50
	kW	12.35	12.45	12.61	12.50	12.79	12.87	12.68	12.80	12.94

LEGEND

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

NOTES:

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

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

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

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

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

COOLING CAPACITIES, 2-STAGE COOLING, SIZE 24, 20 TONS

48TC*D24				AMBIENT TEMPERATURE (F)												
				85			95			105			115			
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			
				75	80	85	75	80	85	75	80	85	75	80	85	
6000 Cfm	EAT (wb)	58	THC	213.1	217.2	228.7	199.9	207.5	219.4	184.8	195.8	208.4	169.6	182.6	195.6	
			SHC	194.3	217.2	228.7	188.0	207.5	219.4	179.0	195.8	208.4	169.6	182.6	195.6	
		62	THC	230.0	229.4	230.4	217.5	217.0	219.7	202.5	201.9	208.8	184.9	184.9	195.9	
			SHC	170.0	199.9	225.9	164.6	194.5	219.7	158.3	187.8	208.8	150.9	178.7	195.9	
		67	THC	251.5	251.1	250.6	239.4	238.7	238.1	225.4	224.7	224.0	208.8	208.2	207.4	
			SHC	137.5	168.1	198.4	132.9	163.4	193.7	127.5	158.1	188.2	121.1	151.9	181.9	
	72	THC	274.0	273.8	273.5	262.3	261.7	261.0	248.2	247.4	246.6	232.2	231.3	230.5		
		SHC	104.3	135.1	165.6	100.1	130.9	161.4	95.1	125.9	156.6	89.6	120.5	151.3		
	76	THC	—	292.9	292.2	—	280.5	279.9	—	266.3	265.6	—	250.6	249.8		
		SHC	—	108.1	138.6	—	104.1	134.9	—	99.6	130.4	—	94.6	125.5		
	7000 Cfm	EAT (wb)	58	THC	220.8	229.7	241.7	208.4	219.7	232.2	194.3	208.1	221.0	180.1	194.2	207.9
				SHC	211.0	229.7	241.7	203.1	219.7	232.2	194.3	208.1	221.0	180.1	194.2	207.9
62			THC	237.8	237.3	241.9	225.1	224.6	232.3	209.6	210.2	221.3	191.3	196.0	208.2	
			SHC	183.3	217.8	241.9	178.2	212.1	232.3	171.8	203.8	221.3	164.3	196.0	208.2	
67			THC	260.0	259.2	258.5	247.2	246.4	245.7	232.7	231.9	231.7	215.8	215.0	214.3	
			SHC	146.0	181.0	215.7	141.3	176.5	211.2	136.0	171.3	206.3	129.8	165.3	199.4	
72		THC	283.3	282.5	281.8	270.6	269.8	268.9	255.9	255.0	254.1	240.0	238.9	238.0		
		SHC	107.9	143.2	178.1	103.6	139.0	174.1	98.6	134.2	169.5	93.2	129.0	164.4		
76		THC	—	302.3	301.6	—	289.1	288.4	—	274.4	273.6	—	257.9	256.8		
		SHC	—	112.3	147.5	—	108.3	143.7	—	103.9	139.4	—	98.9	134.5		
8000 Cfm		EAT (wb)	58	THC	232.1	243.6	256.1	219.8	233.4	246.0	206.9	221.3	234.5	192.1	206.8	221.2
				SHC	227.5	243.6	256.1	219.8	233.4	246.0	206.9	221.3	234.5	192.1	206.8	221.2
	62		THC	247.8	247.1	256.4	234.7	235.5	246.2	218.7	221.1	234.7	199.5	207.0	221.4	
			SHC	199.5	236.7	256.4	194.3	229.1	246.2	187.8	221.1	234.7	179.9	207.0	221.4	
	67		THC	270.2	269.3	268.3	257.0	256.1	255.2	242.1	241.0	240.3	224.5	223.5	223.1	
			SHC	157.6	197.1	235.6	152.7	192.6	231.0	147.3	187.2	225.3	141.0	181.0	215.6	
	72	THC	294.1	293.1	292.2	280.7	279.7	278.4	265.9	264.7	263.8	248.9	247.6	246.6		
		SHC	114.8	154.6	193.9	110.3	150.4	190.0	105.4	145.6	185.5	99.7	140.1	180.2		
	76	THC	—	313.1	312.3	—	299.3	298.2	—	283.8	282.8	—	266.7	265.4		
		SHC	—	120.2	159.6	—	116.0	155.9	—	111.4	151.5	—	106.2	146.6		
	9000 Cfm	EAT (wb)	58	THC	238.5	252.5	266.0	226.8	241.6	255.6	213.1	228.2	243.0	197.5	213.0	229.2
				SHC	238.5	252.5	266.0	226.8	241.6	255.6	213.1	228.2	243.0	197.5	213.0	229.2
62			THC	253.0	254.1	266.3	238.6	241.6	255.7	221.0	228.4	243.3	201.1	213.2	229.4	
			SHC	211.9	249.1	266.3	206.2	241.6	255.7	199.2	228.4	243.3	164.2	213.2	229.4	
67			THC	276.9	275.8	274.8	263.0	261.8	261.0	246.5	245.2	246.6	228.2	225.9	229.6	
			SHC	165.6	209.9	252.2	160.7	205.1	247.0	154.9	199.3	238.5	132.3	192.7	229.6	
72		THC	302.2	301.0	299.7	287.9	286.6	285.4	272.3	270.9	269.6	254.3	252.9	251.6		
		SHC	118.2	162.8	206.8	113.5	158.4	202.9	108.5	153.4	198.0	102.7	147.8	165.1		
76		THC	—	322.0	320.8	—	307.7	306.1	—	291.4	289.9	—	275.1	272.5		
		SHC	—	124.5	168.7	—	120.4	164.9	—	115.6	160.5	—	110.9	155.3		
10,000 Cfm		EAT (wb)	58	THC	245.7	259.8	273.9	233.8	248.7	263.2	219.8	235.3	250.5	203.7	219.8	236.5
				SHC	245.7	259.8	273.9	233.8	248.7	263.2	219.8	235.3	250.5	203.7	219.8	236.5
	62		THC	256.8	260.7	274.2	242.2	249.0	263.3	224.6	235.6	250.6	205.6	220.0	236.8	
			SHC	223.8	258.4	274.2	218.1	249.0	263.3	211.0	235.6	250.6	199.3	220.0	236.8	
	67		THC	280.8	279.6	266.3	266.6	265.4	265.8	249.9	248.6	251.0	231.4	229.8	237.3	
			SHC	173.2	221.8	266.3	168.3	217.0	258.7	162.6	211.4	250.7	156.4	204.7	237.3	
	72	THC	306.4	305.0	274.8	292.1	290.6	289.3	276.0	274.3	273.0	257.5	256.0	254.6		
		SHC	121.2	170.1	252.2	116.6	165.9	214.8	111.5	161.0	210.0	105.7	155.4	204.5		
	76	THC	—	326.2	299.7	—	311.4	310.0	—	295.2	293.2	—	277.0	275.3		
		SHC	—	128.2	206.8	—	124.0	172.9	—	119.5	168.9	—	114.3	163.8		

LEGEND

- Do not operate
- Cfm — Cubic feet per minute (supply air)
- EAT (db) — Entering Air Temperature (dry bulb)
- EAT (wb) — Entering Air Temperature (wet bulb)
- SHC — Sensible Heat Capacity (1000 Btuh) Gross
- TC — Total Capacity (1000 Btuh) Gross

NOTE: See Minimum-Maximum Airflow - Natural Gas and Propane Ratings on page 6. Do not operate outside these limits.

Performance data (cont)



COOLING CAPACITIES, 2-STAGE COOLING, SIZE 24, 20 TONS (cont)

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC*E24 (20TONS) -UNITWITHHUMIDI-MIZERINSUBCOOLING MODE								
		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	263.00	240.40	217.70	301.00	274.00	246.90	336.90	305.60	274.40
	SHC	125.30	151.60	178.00	144.40	171.10	198.00	160.00	186.90	213.90
	kW	15.63	15.20	14.65	15.91	15.62	14.98	16.26	15.92	15.21
85	TC	248.20	226.10	204.00	279.20	252.90	226.60	308.40	278.20	248.00
	SHC	98.90	131.70	164.50	118.60	152.00	185.30	134.60	168.40	202.20
	kW	17.50	17.04	16.50	17.74	17.51	16.75	18.08	17.73	17.03
95	TC	233.40	211.80	190.20	257.30	231.80	206.40	279.80	250.70	221.50
	SHC	72.40	111.80	151.10	92.70	132.80	172.90	109.30	149.90	190.60
	kW	19.36	18.96	18.35	19.61	19.37	18.67	20.02	19.62	18.97
105	TC	218.60	197.50	176.50	235.40	210.70	186.10	251.30	223.20	195.10
	SHC	46.00	91.80	137.70	66.90	113.60	160.40	83.90	131.40	178.90
	kW	21.23	20.76	20.18	21.53	21.22	20.52	21.91	21.52	20.77
115	TC	203.70	183.30	162.80	213.50	189.70	165.80	222.70	195.70	168.70
	SHC	19.50	71.90	124.20	41.00	94.40	147.90	58.50	112.90	157.20
	kW	23.02	22.58	22.02	23.42	23.02	22.38	23.73	23.41	22.57

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC*E24 (20 TONS) -UNITWITHHUMIDI-MIZERIN HOT GAS REHEAT MODE								
		Air Entering Evaporator (F)								
		75 Dry Bulb			75 Dry Bulb			75 Dry Bulb		
		62.5 Wet Bulb			64 Wet Bulb			65.3 Wet Bulb		
		(50% Relative)			(56% Relative)			(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	91.50	100.80	109.50	95.80	105.70	112.40	102.30	110.80	118.60
	SHC	12.30	31.20	44.50	0.90	15.10	25.70	-6.50	3.60	13.90
	kW	14.82	15.01	15.24	15.35	15.45	15.52	15.56	15.65	15.73
75	TC	94.00	103.40	112.00	98.70	108.10	115.10	104.70	113.10	121.10
	SHC	13.60	32.40	45.70	2.00	16.00	26.60	-5.60	4.70	15.10
	kW	14.90	15.07	15.33	15.43	15.56	15.64	15.69	15.77	15.85
70	TC	96.50	106.00	114.30	100.90	110.60	117.20	107.20	115.80	123.50
	SHC	14.50	33.20	45.70	3.30	17.30	28.00	-4.00	5.90	16.20
	kW	14.97	15.17	15.41	15.50	15.66	15.75	15.80	15.87	15.94
60	TC	101.80	111.30	119.30	106.20	115.60	122.20	112.60	119.40	128.00
	SHC	16.70	35.50	48.60	5.60	19.40	30.30	-1.80	8.20	18.50
	kW	15.14	15.32	15.58	15.66	15.88	15.97	16.05	16.10	16.19
50	TC	107.20	116.40	124.30	111.50	120.70	127.30	117.70	125.20	132.90
	SHC	18.60	37.60	50.70	8.00	22.00	32.70	0.50	10.50	21.00
	kW	15.27	15.46	15.76	15.81	16.10	16.23	16.27	16.34	16.41
40	TC	112.20	121.80	129.20	116.60	125.70	132.00	123.20	130.00	138.00
	SHC	21.80	39.50	52.90	10.20	24.40	35.20	2.90	13.00	23.40
	kW	15.42	15.63	15.93	15.96	16.32	16.44	16.52	16.57	16.65

LEGEND

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

NOTES:

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

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

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

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

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

COOLING CAPACITIES, 2-STAGE COOLING, SIZE 28, 25 TONS

48TC*E28			AMBIENT TEMPERATURE (F)												
			85			95			105			115			
			EAT (db)			EAT (db)			EAT (db)			EAT (db)			
			75	80	85	75	80	85	75	80	85	75	80	85	
7,500 Cfm	EAT (wb)	58	THC	257.3	266.5	279.6	247.5	255.4	269.0	231.5	243.3	257.2	214.3	229.2	243.7
		SHC	247.5	266.5	279.6	231.1	255.4	269.0	223.5	243.3	257.2	213.2	229.2	243.7	
	62	THC	281.4	280.5	280.6	267.5	267.0	269.3	251.3	251.0	257.6	232.7	232.5	244.1	
		SHC	208.2	244.0	278.0	202.3	238.4	269.3	195.8	231.5	257.6	188.1	223.4	244.1	
	67	THC	307.4	306.4	305.7	293.0	292.2	291.4	276.9	276.2	275.4	259.7	259.2	258.8	
		SHC	168.7	205.7	242.3	163.2	200.3	236.9	157.1	194.4	230.7	150.6	188.4	224.8	
	72	THC	333.9	333.2	332.5	320.1	319.3	318.6	304.5	303.7	302.7	287.2	285.3	284.5	
		SHC	128.1	165.4	202.3	123.1	160.6	197.8	117.6	155.1	192.5	111.5	149.0	186.6	
	76	THC	—	356.0	355.2	—	342.0	341.2	—	326.0	325.2	—	308.0	307.4	
		SHC	—	132.7	169.9	—	128.1	165.6	—	123.0	160.7	—	117.3	154.5	
8,750 Cfm	EAT (wb)	58	THC	269.8	280.2	294.4	255.3	268.9	283.2	241.1	256.1	270.7	225.5	241.3	257.3
		SHC	257.9	280.2	294.4	250.4	268.9	283.2	241.1	256.1	270.7	225.5	241.3	257.3	
	62	THC	289.9	289.3	294.6	275.3	274.9	283.6	258.7	258.2	271.0	238.8	241.6	257.6	
		SHC	224.2	265.0	294.6	218.6	258.6	283.6	212.0	251.7	271.0	203.9	241.6	257.6	
	67	THC	316.2	315.7	314.5	301.7	300.8	299.8	285.1	284.2	283.4	266.7	266.0	265.2	
		SHC	179.0	221.6	263.1	173.5	216.4	257.9	167.5	210.5	251.9	161.0	204.5	245.1	
	72	THC	343.7	342.7	341.6	315.3	327.9	327.0	313.1	311.4	310.4	294.3	293.2	292.2	
		SHC	132.4	175.4	217.7	127.6	170.7	213.3	122.0	165.3	208.3	115.6	159.2	202.5	
	76	THC	—	366.0	364.9	—	351.2	350.1	—	334.2	333.2	—	315.4	314.3	
		SHC	—	138.0	180.7	—	133.4	176.5	—	128.2	171.6	—	122.5	166.1	
10,000 Cfm	EAT (wb)	58	THC	277.1	291.8	306.8	264.9	280.2	295.3	251.2	267.0	282.3	235.1	252.2	268.1
		SHC	275.3	291.8	306.8	264.9	280.2	295.3	251.2	267.0	282.3	235.1	252.2	268.1	
	62	THC	296.8	296.0	307.2	281.8	281.8	295.6	264.7	267.1	282.6	244.9	252.4	268.4	
		SHC	239.8	283.9	307.2	234.0	276.8	295.6	227.5	267.1	282.6	219.4	252.4	268.4	
	67	THC	323.5	322.6	321.4	308.5	307.4	306.5	291.3	290.2	289.3	272.5	271.5	270.8	
		SHC	188.8	236.9	282.9	183.5	231.9	277.4	177.5	226.1	271.2	171.2	219.7	264.3	
	72	THC	351.8	350.5	349.2	336.6	335.4	334.1	319.7	318.3	317.1	300.2	298.9	297.8	
		SHC	136.6	185.1	232.8	131.6	180.4	228.6	126.0	175.1	223.7	119.7	169.1	217.9	
	76	THC	—	374.2	372.8	—	358.6	357.3	—	340.9	339.7	—	321.3	320.1	
		SHC	—	143.1	191.2	—	138.5	187.1	—	133.3	182.3	—	127.6	176.8	
11,250 Cfm	EAT (wb)	58	THC	285.8	301.5	317.0	273.8	289.0	305.1	259.8	276.1	291.7	244.0	260.9	277.4
		SHC	285.8	301.5	317.0	273.8	289.0	305.1	259.8	276.1	291.7	244.0	260.9	277.4	
	62	THC	302.2	302.3	317.4	286.3	289.5	305.4	269.6	276.4	208.4	249.3	261.1	277.6	
		SHC	254.3	300.2	317.4	245.8	289.5	305.4	242.1	276.4	208.4	201.5	261.1	277.6	
	67	THC	328.7	327.7	326.7	313.5	312.2	311.1	296.0	294.8	294.3	277.5	275.7	277.9	
		SHC	197.9	251.1	301.0	192.8	246.4	295.4	187.0	240.4	288.0	160.9	234.6	277.9	
	72	THC	357.4	355.9	354.4	341.8	340.3	339.0	324.4	322.8	321.6	304.8	303.2	302.0	
		SHC	140.2	193.9	246.7	135.2	189.4	242.8	129.7	184.3	238.2	123.5	178.4	198.1	
	76	THC	—	379.7	378.2	—	363.9	362.3	—	345.7	344.2	—	327.5	324.0	
		SHC	—	147.6	200.8	—	143.1	196.9	—	138.0	192.3	—	132.9	187.1	
12,500 Cfm	EAT (wb)	58	THC	293.7	309.8	325.6	280.3	297.3	313.5	267.0	283.5	299.8	250.8	268.3	284.8
		SHC	293.7	309.8	325.6	280.3	297.3	313.5	267.0	283.5	299.8	250.8	268.3	284.8	
	62	THC	310.5	310.2	326.1	290.7	297.6	313.9	273.7	283.7	300.1	253.1	268.5	285.0	
		SHC	264.9	310.1	326.1	262.1	297.6	313.9	255.7	283.7	300.1	246.9	268.5	285.0	
	67	THC	333.1	331.7	330.9	317.5	316.2	315.9	299.8	298.7	300.3	280.7	279.6	285.5	
		SHC	206.6	264.7	317.6	201.9	260.2	311.0	196.2	254.9	300.3	190.0	248.1	285.5	
	72	THC	362.1	360.3	358.7	346.0	344.3	343.0	328.2	326.6	325.1	308.4	306.6	305.3	
		SHC	143.6	202.4	260.2	138.7	198.1	256.5	133.2	193.2	252.1	127.1	187.5	246.5	
	76	THC	—	384.3	382.5	—	368.1	366.3	—	349.5	347.8	—	331.0	328.7	
		SHC	—	151.9	210.1	—	147.5	206.4	—	142.5	201.9	—	137.4	195.2	

LEGEND

- Do not operate
- Cfm — Cubic feet per minute (supply air)
- EAT (db) — Entering Air Temperature (dry bulb)
- EAT (wb) — Entering Air Temperature (wet bulb)
- SHC — Sensible Heat Capacity (1000 Btuh) Gross
- TC — Total Capacity (1000 Btuh) Gross

NOTE: See Minimum-Maximum Airflow - Natural Gas and Propane Ratings on page 6. Do not operate outside these limits.

Performance data (cont)



COOLING CAPACITIES, 2-STAGE COOLING, SIZE 28, 25 TONS (cont)

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC*E28 (25TONS) - UNIT WITH HUMIDI-MIZER IN SUBCOOLING MODE								
		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	335.30	305.50	275.80	368.30	334.40	300.50	398.10	360.50	322.90
	SHC	149.60	181.70	213.70	172.80	205.50	238.20	191.70	224.90	258.20
	kW	19.50	18.70	17.70	19.50	18.70	17.70	19.70	18.80	17.90
85	TC	316.30	287.00	257.70	341.50	308.40	275.30	364.30	327.80	291.20
	SHC	120.80	160.50	200.20	144.60	185.20	225.80	164.00	205.40	246.70
	kW	21.90	21.30	20.10	22.30	21.30	20.30	22.50	21.70	20.60
95	TC	297.30	268.50	239.60	314.70	282.40	250.10	330.50	295.00	259.50
	SHC	92.10	139.40	186.70	116.40	164.90	213.50	136.30	185.80	235.30
	kW	24.30	23.50	22.50	24.40	23.50	22.60	24.40	23.60	22.50
105	TC	278.20	249.90	221.60	287.90	256.40	224.90	296.70	262.30	227.80
	SHC	63.30	118.20	173.20	88.30	144.70	201.10	108.70	166.30	223.90
	kW	26.70	26.00	25.00	27.30	26.00	25.00	27.30	26.10	25.10
115	TC	259.20	231.40	203.50	261.10	230.40	199.70	262.90	229.50	196.10
	SHC	34.50	97.10	159.70	60.10	124.40	188.70	81.00	146.70	191.20
	kW	28.70	28.00	27.10	29.30	28.10	26.90	29.10	27.90	27.20

TEMP (F) AIR ENTERING CONDENSER (Edb)		48TC*E28 (25TONS) - UNIT WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE								
		Air Entering Evaporator (F)								
		75 Dry Bulb			75 Dry Bulb			75 Dry Bulb		
		62.5 Wet Bulb			64 Wet Bulb			65.3 Wet Bulb		
		(50% Relative)			(56% Relative)			(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	132.40	136.80	148.40	138.20	142.40	154.60	144.30	146.40	162.50
	SHC	37.80	61.50	85.50	21.80	44.40	52.40	16.10	32.10	48.90
	kW	17.90	18.15	18.21	18.05	18.33	18.43	18.26	18.55	18.62
75	TC	138.00	142.20	154.10	143.50	148.00	160.30	148.90	151.00	167.10
	SHC	44.20	68.00	91.80	28.10	51.50	58.80	22.70	38.20	56.00
	kW	17.77	18.00	18.07	17.92	18.19	18.29	18.14	18.40	18.48
70	TC	143.80	148.10	160.00	149.30	154.00	165.90	155.50	157.60	173.80
	SHC	50.50	73.80	98.10	34.20	56.50	65.30	28.30	44.00	62.30
	kW	17.63	17.86	17.93	17.78	18.04	18.14	18.03	18.26	18.34
60	TC	154.80	159.50	171.10	160.20	165.20	177.20	166.70	168.80	185.10
	SHC	63.10	84.50	110.10	46.50	69.50	75.70	41.40	56.50	74.30
	kW	17.35	17.58	17.65	17.50	17.76	17.85	17.70	17.97	18.04
50	TC	166.30	170.50	181.20	171.30	176.40	188.40	178.00	180.00	196.40
	SHC	75.80	96.50	122.20	58.30	79.80	87.80	53.70	69.10	85.90
	kW	17.06	17.30	17.37	17.22	17.46	17.56	17.42	17.69	17.76
40	TC	177.50	181.70	192.30	182.40	187.60	199.70	189.30	191.20	207.70
	SHC	85.70	109.80	134.30	71.50	92.30	100.50	66.10	79.50	97.90
	kW	16.76	17.01	17.09	16.93	17.18	17.28	17.14	17.41	17.47

LEGEND

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

NOTES:

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

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

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

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

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

COOLING CAPACITIES, 2-STAGE COOLING, SIZE 30, 27.5 TONS

48TC*E30				AMBIENT TEMPERATURE (F)												
				85			95			105			115			
				EAT (db)			EAT (db)			EAT (db)			EAT (db)			
				75	80	85	75	80	85	75	80	85	75	80	85	
7,500 Cfm	EAT (wb)	58	THC	298.0	298.0	336.8	285.3	285.3	322.4	270.1	270.1	305.3	253.5	253.5	286.5	
			SHC	259.2	298.0	336.8	248.2	285.3	322.4	235.0	270.1	305.3	220.5	253.5	286.5	
		62	THC	318.3	318.3	318.3	301.9	301.9	309.0	282.4	282.4	299.5	260.5	260.5	288.5	
			SHC	233.5	275.2	316.9	225.8	267.4	309.0	216.6	258.1	299.5	206.1	247.3	288.5	
		67	THC	352.3	352.3	352.3	335.9	335.9	335.9	317.1	317.1	317.1	294.0	294.0	294.0	
			SHC	193.3	235.0	276.8	186.4	228.3	270.1	178.7	220.5	262.4	169.3	211.1	252.9	
	72	THC	383.6	383.6	383.6	368.5	368.5	368.5	350.7	350.7	350.7	329.6	329.6	329.6		
		SHC	149.7	191.9	234.2	144.0	186.2	228.4	137.3	179.5	221.7	129.6	171.7	213.8		
	76	THC	—	404.0	404.0	—	390.3	390.3	—	373.1	373.1	—	353.4	353.4		
		SHC	—	154.8	200.2	—	150.2	195.6	—	144.5	189.9	—	138.0	183.2		
	8,750 Cfm	EAT (wb)	58	THC	315.7	315.7	356.8	302.4	302.4	341.8	286.8	286.8	324.1	269.2	269.2	304.3
				SHC	274.6	315.7	356.8	263.0	302.4	341.8	249.4	286.8	324.1	234.2	269.2	304.3
62			THC	329.7	329.7	346.7	312.7	312.7	338.3	293.0	293.0	328.0	271.1	271.1	314.6	
			SHC	251.3	299.0	346.7	243.3	290.8	338.3	233.7	280.9	328.0	222.0	268.3	314.6	
67			THC	363.1	363.1	363.1	346.4	346.4	346.4	327.1	327.1	327.1	303.7	303.7	303.7	
			SHC	204.4	252.2	299.9	197.8	245.7	293.6	190.2	238.3	286.3	181.0	229.1	277.2	
72		THC	392.4	392.4	392.4	377.4	377.4	377.4	359.5	359.5	359.5	338.6	338.6	338.6		
		SHC	153.8	201.6	249.3	148.4	196.3	244.3	141.9	190.0	238.0	134.5	182.7	230.8		
76		THC	—	410.9	410.9	—	397.4	397.4	—	380.0	380.0	—	359.9	359.9		
		SHC	—	160.7	213.6	—	156.2	208.9	—	150.1	201.8	—	143.2	194.1		
10,000 Cfm		EAT (wb)	58	THC	330.4	330.4	373.4	316.6	316.6	357.8	300.7	300.7	339.9	282.3	282.3	319.0
				SHC	287.4	330.4	373.4	275.4	316.6	357.8	261.6	300.7	339.9	245.6	282.3	319.0
	62		THC	338.9	338.9	373.5	321.8	321.8	364.5	301.9	301.9	354.3	282.6	282.6	331.6	
			SHC	267.2	320.3	373.5	258.9	311.7	364.5	249.5	301.9	354.3	233.5	282.6	331.6	
	67		THC	371.1	371.1	371.1	354.3	354.3	354.3	334.7	334.7	334.7	310.9	310.9	310.9	
			SHC	214.5	267.9	321.3	208.2	262.0	315.7	200.9	254.9	308.9	191.9	246.0	300.1	
	72	THC	398.6	398.6	398.6	383.8	383.8	383.8	365.7	365.7	365.7	344.9	344.9	344.9		
		SHC	157.3	210.1	262.8	152.2	205.4	258.7	145.8	199.4	252.9	138.7	192.5	246.3		
	76	THC	—	415.7	415.7	—	402.3	402.3	—	384.9	384.9	—	364.5	364.5		
		SHC	—	165.2	223.6	—	160.5	218.0	—	154.6	211.3	—	147.8	203.9		
	11,250 Cfm	EAT (wb)	58	THC	342.7	342.7	387.3	328.7	328.7	371.4	312.7	312.7	353.3	293.5	293.5	331.7
				SHC	298.1	342.7	387.3	285.9	328.7	371.4	272.0	312.7	353.3	255.3	293.5	331.7
62			THC	346.8	346.8	396.7	329.7	329.7	387.0	313.0	313.0	367.3	293.8	293.8	344.8	
			SHC	281.1	338.9	396.7	272.5	329.7	387.0	258.6	313.0	367.3	242.8	293.8	344.8	
67			THC	377.2	377.2	377.2	360.4	360.4	360.4	340.7	340.7	340.7	316.6	316.6	321.8	
			SHC	223.7	282.5	341.2	217.9	277.2	336.5	210.8	270.5	330.2	202.1	261.9	321.8	
72		THC	403.1	403.1	403.1	388.6	388.6	388.6	370.3	370.3	370.3	349.5	349.5	349.5		
		SHC	160.3	217.7	275.1	155.5	213.7	271.9	149.3	208.0	266.7	142.4	201.4	260.5		
76		THC	—	419.3	419.3	—	406.0	406.0	—	388.5	388.5	—	367.8	367.8		
		SHC	—	168.8	231.3	—	164.4	226.3	—	158.6	220.0	—	151.9	212.8		
12,500 Cfm		EAT (wb)	58	THC	353.0	353.0	398.9	338.8	338.8	382.9	322.5	322.5	364.5	303.1	303.1	342.5
				SHC	307.1	353.0	398.9	294.7	338.8	382.9	280.6	322.5	364.5	263.7	303.1	342.5
	62		THC	353.9	353.9	415.3	339.1	339.1	397.9	322.8	322.8	378.9	303.4	303.4	356.0	
			SHC	292.4	353.9	415.3	280.2	339.1	397.9	266.8	322.8	378.9	250.7	303.4	356.0	
	67		THC	381.9	381.9	381.9	365.2	365.2	365.2	345.3	345.3	350.4	321.3	321.3	342.2	
			SHC	232.3	296.1	360.0	227.0	291.6	356.3	220.1	285.2	350.4	211.5	276.8	342.2	
	72	THC	406.6	406.6	406.6	392.2	392.2	392.2	373.9	373.9	373.9	352.9	352.9	352.9		
		SHC	163.1	224.8	286.6	158.5	221.4	284.3	152.5	216.1	279.6	145.7	209.8	273.9		
	76	THC	—	422.1	422.1	—	408.9	408.9	—	391.2	391.2	—	370.3	370.3		
		SHC	—	172.2	238.5	—	167.9	234.0	—	162.3	228.1	—	155.7	221.2		

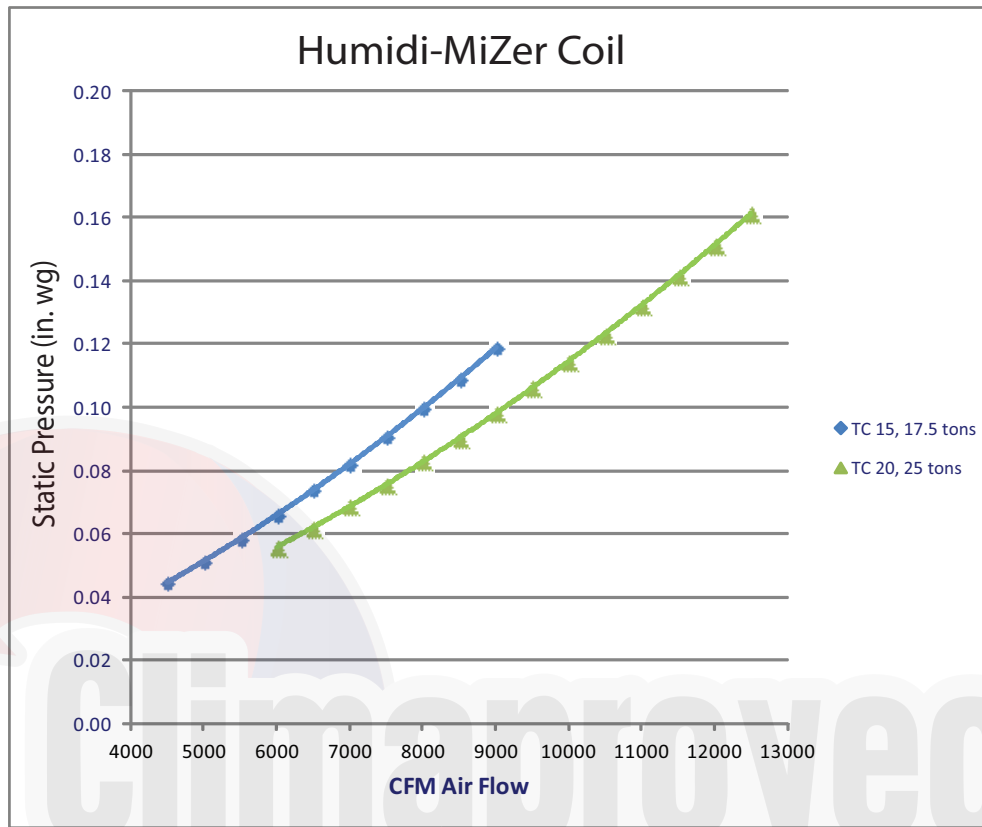
LEGEND

- Do not operate
- Cfm — Cubic feet per minute (supply air)
- EAT (db) — Entering Air Temperature (dry bulb)
- EAT (wb) — Entering Air Temperature (wet bulb)
- SHC — Sensible Heat Capacity (1000 Btu/h) Gross
- TC — Total Capacity (1000 Btu/h) Gross

NOTES:

1. See Minimum-Maximum Airflow - Natural Gas and Propane Ratings on page 6. Do not operate outside these limits.
2. Humidi-MiZer system available for 17-28 sizes only.

STATIC PRESSURE ADDERS (in. wg) HUMIDI-MIZER® SYSTEM



STATIC PRESSURE ADDERS (in. wg) — FACTORY OPTIONS AND/OR ACCESSORIES VERTICAL DUCT CONFIGURATION

Humidi-MiZer® Coil

MODEL SIZES 17 - 28								
CFM	4500	5000	5500	6000	6500	7000	7500	8000
Static Pressure Adder (in. wg)	0.039	0.045	0.052	0.059	0.066	0.074	0.082	0.090

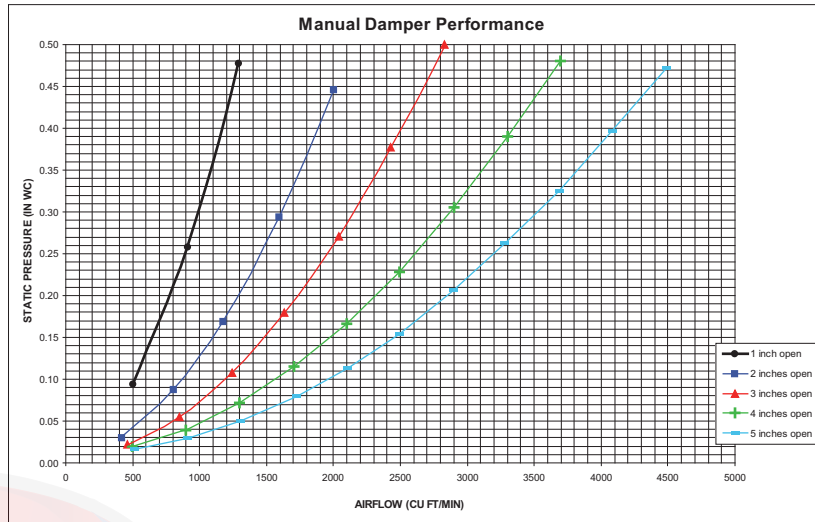
MODEL SIZES 17 - 28									
CFM	8500	9000	9500	10000	10500	11000	11500	12000	12500
Static Pressure Adder (in. wg)	0.099	0.108	0.117	0.127	0.137	0.148	0.158	0.170	0.181

Economizer-Vertical Duct Configuration

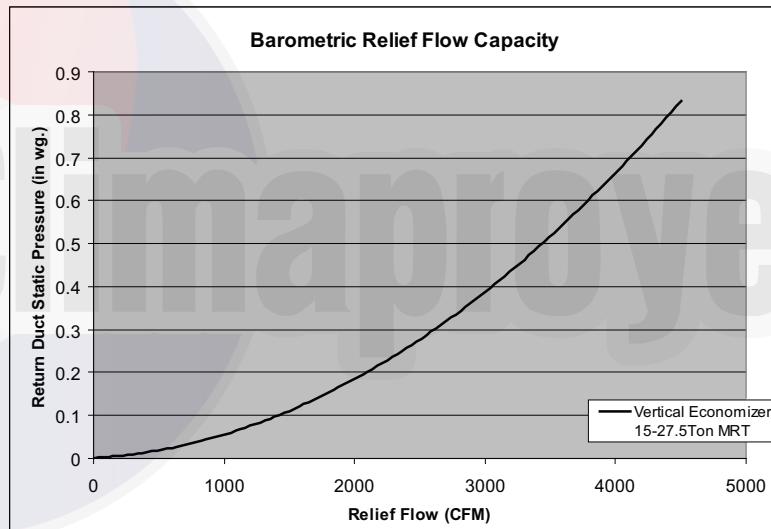
MODEL SIZES 17 - 28								
CFM	4500	5000	5500	6000	6500	7000	7500	8000
Static Pressure Adder (in. wg)	0.002	0.004	0.006	0.009	0.013	0.017	0.021	0.026

MODEL SIZES 17 - 30									
CFM	8500	9000	9500	10000	10500	11000	11500	12000	12500
Static Pressure Adder (in. wg)	0.031	0.026	0.042	0.048	0.055	0.062	0.070	0.078	0.086

DAMPER, BAROMETRIC RELIEF AND PE PERFORMANCE MANUAL DAMPER PERFORMANCE

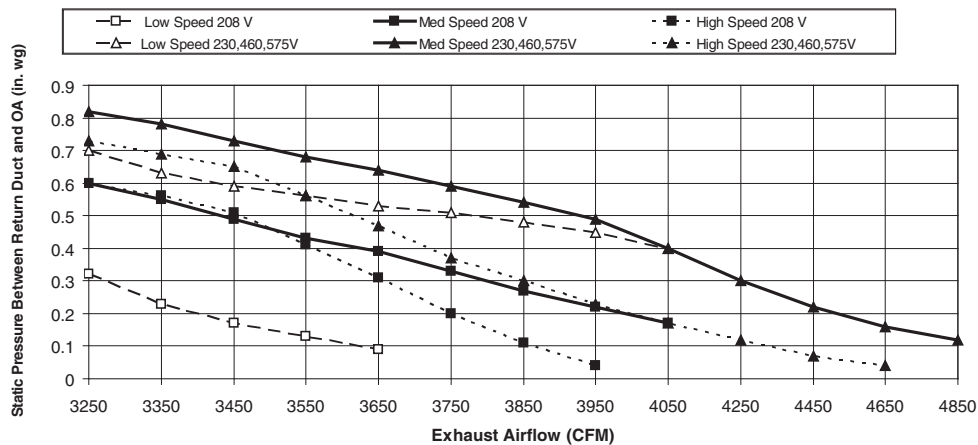


BAROMETRIC RELIEF FLOW CAPACITY



POWER EXHAUST FAN PERFORMANCE

Power Exhaust Fan Performance



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 factory-installed options (FIOPs) or accessories.
3. Tabular data accounts for pressure loss due to clean filters, high gas heat, 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 recommends the lower horsepower option.
5. For information on the electrical properties of Carrier motors, please see the Electrical information section of this book. For more information on the performance limits of Carrier motors, see the application data section of this book.

48TC**17 — 15 TON VERTICAL SUPPLY

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	—	—	—	—	—	—	—	—	—	—

LEGEND

STD — STD Static - 514-680 RPM, 2.9 Max BHP

MED — MED Static - 679-863 RPM, 3.7 Max BHP

HIGH — HIGH Static - 826-1009 RPM, 4.9 Max BHP

BOLD — Requires alternate standard static drive package

Italics — Requires high static drive package with different motor pulley.

48TC**20 — 17.5 TON VERTICAL SUPPLY

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	<i>1084</i>	<i>5.04</i>
5700	905	3.47	958	3.95	1008	4.45	1055	4.96	<i>1100</i>	<i>5.48</i>
6150	925	3.86	977	4.36	1026	4.88	1073	5.42	<i>1118</i>	<i>5.96</i>
6550	945	4.24	995	4.76	1043	5.30	1090	5.86	<i>1134</i>	<i>6.42</i>
7000	967	4.71	1017	5.26	1064	5.82	1109	6.39	<i>1153</i>	<i>6.98</i>
7450	991	5.22	1039	5.79	<i>1085</i>	<i>6.38</i>	1130	6.98	<i>1172</i>	<i>7.59</i>
7900	1015	5.78	1062	6.38	1107	6.99	1151	7.61	—	—
8300	1038	6.33	1084	6.94	1128	7.57	1171	8.21	—	—
8750	<i>1064</i>	<i>6.99</i>	1109	7.63	1152	8.28	—	—	—	—

LEGEND

- STD Static - 622-822 RPM, 3.7 Max BHP
- MED Static - 713-879 RPM, Voltage 208V/230V/460V/575V, Max BHP 6.5/6.9/7.0/8.3
- HIGH Static - 882-1078 RPM, Voltage 208V/230V/460V/575V, Max BHP 6.5/6.9/7.0/8.3
- Requires high static drive package with different motor pulley. Confirm Max BHP based on unit voltage selected.
- BOLD** — Requires alternate standard static drive package
- Italics* — Requires high static drive package with different motor pulley. All voltages.
- Underscore — Operation point covered by factory package. Confirm Max BHP based on unit voltage selected.

Fan data (cont)



48TC**24 — 20 TON VERTICAL SUPPLY

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
6000	620	1.53	689	1.84	752	2.16	810	2.49	865	2.83
6500	660	1.88	725	2.22	785	2.56	841	2.92	894	3.28
7000	701	2.29	762	2.65	819	3.02	873	3.40	923	3.78
7500	742	2.76	800	3.15	855	3.54	906	3.94	955	4.34
8000	784	3.30	839	3.71	891	4.12	940	4.55	987	4.97
8500	826	3.90	879	4.33	928	4.78	975	5.22	1021	5.67
9000	869	4.57	919	5.03	966	5.50	1011	5.97	1055	6.44
9500	911	5.32	959	5.81	1005	6.30	1048	6.79	1090	7.29
10000	954	6.15	1000	6.66	1044	7.18	1086	7.70	1126	8.22

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
6000	917	3.18	967	3.54	1015	3.91	1061	4.30	1105	4.69
6500	944	3.65	992	4.03	1038	4.42	1083	4.82	1126	5.23
7000	972	4.17	1018	4.57	1063	4.98	1106	5.40	1148	5.83
7500	1001	4.76	1046	5.18	1090	5.61	1131	6.05	1172	6.49
8000	1032	5.41	1076	5.85	1117	6.30	1158	6.76	—	—
8500	1064	6.13	1106	6.59	1147	7.07	<i>1186</i>	<i>7.54</i>	—	—
9000	1097	6.92	1138	7.41	1177	7.90	—	—	—	—
9500	1131	7.79	1170	8.30	—	—	—	—	—	—
10000	1166	8.75	—	—	—	—	—	—	—	—

LEGEND

- STD Static - 690-863 RPM, 4.9 Max BHP
- MED Static - 835-1021 RPM, Voltage 208V/230V/460V/575V, Max BHP 6.5/6.9/7.0/8.3
- HIGH Static - 941-1176 RPM, Voltage 208V/230V/460V/575V, Max BHP 10.5/11.9/11.9/11.0

- BOLD** — Requires alternate standard static drive package
- Italics* — Requires high static drive package with different motor pulley.

48TC**28 — 25 TON VERTICAL SUPPLY

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
7500	731	2.21	796	2.60	856	3.00	911	3.40	963	3.81
8150	783	2.76	844	3.19	901	3.61	954	4.05	1003	4.49
8750	832	3.35	890	3.80	943	4.26	994	4.73	1042	5.19
9400	885	4.08	940	4.57	991	5.06	1039	5.55	1085	6.05
10000	934	4.85	986	5.36	1035	5.88	1082	6.40	1126	6.93
10650	988	5.78	1038	6.33	<u>1084</u>	<u>6.88</u>	1129	7.44	1172	8.00
11250	<u>1038</u>	<u>6.74</u>	<u>1086</u>	<u>7.32</u>	1130	7.91	1173	8.49	—	—
11900	<u>1093</u>	<u>7.91</u>	1138	8.52	1181	9.14	—	—	—	—
12500	1144	9.10	1186	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
7500	1011	4.23	1058	4.66	1102	5.09	<i>1145</i>	<i>5.53</i>	<i>1186</i>	<i>5.98</i>
8150	1050	4.94	1095	5.39	1138	5.85	<i>1180</i>	6.32	—	—
8750	1088	5.67	1131	6.15	1173	6.64	—	—	—	—
9400	1129	6.56	1171	7.07	—	—	—	—	—	—
10000	1169	7.47	—	—	—	—	—	—	—	—
10650	—	—	—	—	—	—	—	—	—	—
11250	—	—	—	—	—	—	—	—	—	—
11900	—	—	—	—	—	—	—	—	—	—
12500	—	—	—	—	—	—	—	—	—	—

LEGEND

- STD Static - 717-911 RPM, 4.9 Max BHP
- MED Static - 913-1116 RPM, Voltage 208V/230V/460V/575V, Max BHP 6.5/6.9/7.0/8.3
- HIGH Static - 941-1176 RPM, Voltage 208V/230V/460V/575V, Max BHP 10.5/11.9/11.9/11.0
- Italics* — Requires high static drive package with different motor pulley.
- Underscore — Operation point covered by factory package. Confirm Max BHP based on unit voltage selected.

48TC**30 — 27.5 TON VERTICAL SUPPLY

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
8250	791	2.86	852	3.28	908	3.72	960	4.16	1010	4.60
8950	848	3.57	905	4.03	958	4.50	1008	4.97	1055	5.45
9650	906	4.39	959	4.89	1009	5.39	1057	5.89	1102	6.41
10300	959	5.26	1010	5.79	1058	6.33	1104	6.87	1147	7.41
11000	1018	6.33	1066	6.90	1111	7.47	1155	8.04	1197	8.62
11700	1076	7.54	1122	8.14	1165	8.74	1207	9.35	1247	9.96
12400	1135	8.90	1178	9.53	1220	10.17	1260	10.82	1299	11.46
13050	1190	10.30	1231	10.97	1271	11.64	—	—	—	—
13750	1249	11.97	1289	12.67	—	—	—	—	—	—

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
8250	1056	5.05	1101	5.51	1144	5.98	1185	6.45	1225	6.93
8950	1100	5.93	1144	6.42	1185	6.92	1225	7.42	1264	7.93
9650	1146	6.92	1187	7.45	1228	7.98	1266	8.51	—	—
10300	1189	7.96	1229	8.51	1268	9.07	—	—	—	—
11000	1237	9.20	1276	9.79	—	—	—	—	—	—
11700	1286	10.58	—	—	—	—	—	—	—	—
12400	—	—	—	—	—	—	—	—	—	—
13050	—	—	—	—	—	—	—	—	—	—
13750	—	—	—	—	—	—	—	—	—	—

LEGEND

- STD Static - 751-954 RPM, 6.5 Max BHP
- MED Static - 973-1175 RPM, Voltage 208V/230V/460V/575V, Max BHP 10.5/11.9/11.9/11.0
- HIGH Static - 1015-1300 RPM, Voltage 208V/230V/460V/575V, Max BHP 11.9/12.9/12.9/14.1
- Requires high static drive package with different motor pulley. Confirm Max BHP based on unit voltage selected.

PULLEY ADJUSTMENT — VERTICAL

48TC UNIT	MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN (RPM)										
		0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
17	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	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	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	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
30	Standard Static	954	934	913	893	873	853	832	812	792	771	751
	Medium Static	1175	1155	1135	1114	1094	1074	1054	1034	1013	993	973
	High Static	1299	1271	1242	1214	1185	1157	1129	1100	1072	1043	1015

NOTE: Do not adjust pulley further than 5 turns open.

- Factory settings

LEGEND AND NOTES

Applicable for Electrical Data Tables on pages 50-57

LEGEND

BRKR	— Circuit breaker
C.O.	— Convenience outlet
DISC	— Disconnect
EFF	— Efficiency
FLA	— Full load amps
LRA	— Locked rotor amps
MCA	— Minimum circuit amps
P.E.	— Power exhaust
Pwr'd fr/unit	— Powered from unit
PWRD C.O.	— Powered convenience outlet
RLA	— Rated load amps
UNPWR C.O.	— Un-powered convenience outlet

NOTES

1. In compliance with NEC requirements for multi-motor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
2. For 208/230 v units, where one value is shown it is the same for either 208 or 230 volts.
3. **Unbalanced 3-Phase Supply Voltage**
Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

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

Example: Supply voltage is 230-3-60



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

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

Determine maximum deviation from average voltage.

$$(AB) 227 - 224 = 3 \text{ v}$$

$$(BC) 231 - 227 = 4 \text{ v}$$

$$(AC) 227 - 226 = 1 \text{ v}$$

Maximum deviation is 4 v.

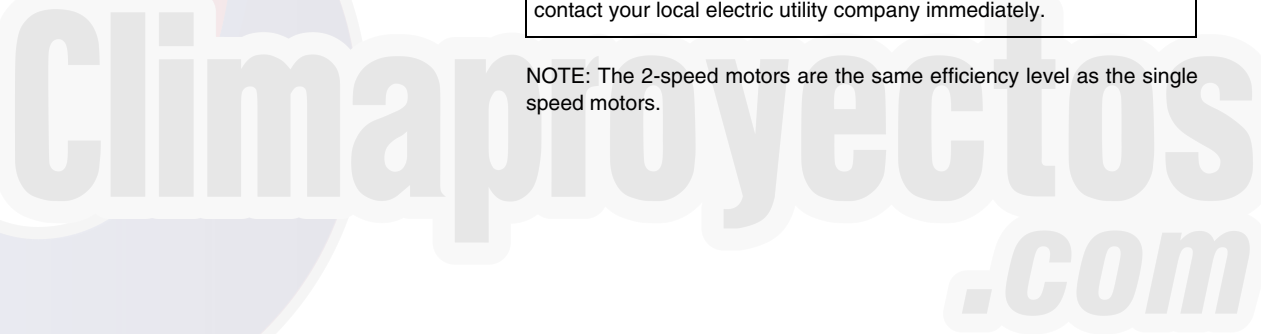
Determine percent of voltage imbalance.

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

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.

NOTE: The 2-speed motors are the same efficiency level as the single speed motors.



Electrical data (cont)



2-STAGE COOLING WITH SINGLE SPEED INDOOR FAN MOTOR, SIZES 17-30, 15-27.5 TONS

UNIT	V-PH-HZ	VOLTAGE RANGE		COMP 1		COMP 2		OFM (EA)		IFM		
		MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	EFFICIENCY TYPE	EFF AT FULL LOAD	FLA
48TC**17	208-3-60	187	253	29.5	195	28.2	329	350	1.5	STD	88.6%	8.4
										MED	87.0%	10.6
										HIGH	82.9%	13.6
	230-3-60	187	253	29.5	195	28.2	164	350	1.5	STD	88.6%	8.3
										MED	87.0%	10.6
										HIGH	82.9%	12.7
	460-3-60	414	506	14.7	95	14.7	130	277	0.9	STD	88.6%	4.2
										MED	87.0%	5.3
										HIGH	82.9%	6.4
	575-3-60	518	633	12.2	80	11.3	94	397	0.6	STD	81.1%	2.8
										MED	81.1%	2.8
										HIGH	83.6%	5.6
48TC**20	208-3-60	187	253	29.5	195	28.2	329	350	1.5	STD	87.0%	10.6
										MED-High Eff.	89.5%	17.1
										HIGH-High Eff.	89.5%	17.1
	230-3-60	187	253	29.5	195	28.2	164	350	1.5	STD	87.0%	10.6
										MED-High Eff.	89.5%	17.1
										HIGH-High Eff.	89.5%	17.1
	460-3-60	414	506	14.7	95	14.7	130	277	0.9	STD	87.0%	5.3
										MED-High Eff.	89.5%	8.6
										HIGH	89.5%	8.6
	575-3-60	518	633	12.2	80	11.3	94	397	0.6	STD	81.1%	2.8
										MED-High Eff.	83.6%	5.6
										HIGH-High Eff.	89.5%	7.6
48TC**24	208-3-60	187	253	48.2	245	29.5	329	350	1.5	STD	82.9%	13.6
										MED-High Eff.	89.5%	17.1
										HIGH-High Eff.	91.7%	28.5
	230-3-60	187	253	48.1	245	29.5	164	350	1.5	STD	82.9%	12.7
										MED-High Eff.	89.5%	17.1
										HIGH-High Eff.	91.7%	28.5
	460-3-60	414	506	18.6	125	14.7	130	277	0.9	STD	82.9%	6.4
										MED-High Eff.	89.5%	8.6
										HIGH-High Eff.	91.7%	14.3
	575-3-60	518	633	14.7	100	12.2	94	397	0.6	STD	83.6%	5.6
										MED-High Eff.	89.5%	7.6
										HIGH-High Eff.	91.7%	9.5
48TC**28	208-3-60	187	253	48.1	245	48.1	245	350	1.5	STD	82.9%	13.6
										MED-HIGH	89.5%	17.1
										HIGH-HIGH	91.7%	28.5
	230-3-60	187	253	48.1	245	48.1	245	350	1.5	STD	82.9%	12.7
										MED-HIGH	89.5%	17.1
										HIGH-HIGH	91.7%	28.5
	460-3-60	414	506	18.6	100	18.6	125	277	0.9	STD	82.9%	6.4
										MED-HIGH	89.5%	8.6
										HIGH-HIGH	91.7%	14.3
	575-3-60	518	633	14.7	300	14.7	100	397	0.6	STD	83.6%	5.6
										MED-HIGH	89.5%	7.6
										HIGH-HIGH	91.7%	9.5
48TC**30	208-3-60	187	253	51.3	300	51.3	300	350	1.5	STD	83.6%	13.6
										MED-HIGH	89.5%	17.1
										HIGH-HIGH	91.7%	28.5
	230-3-60	187	253	23.1	239	51.3	300	350	1.5	STD	89.5%	17.1
										MED-HIGH	91.7%	28.5
										HIGH-HIGH	91.7%	30.4
	460-3-60	414	506	14.7	150	23.1	150	277	0.9	STD	89.5%	8.6
										MED-HIGH	91.7%	14.3
										HIGH-HIGH	91.7%	15.2
	575-3-60	518	633	19.9	109	19.9	109	397	0.6	STD	89.5%	7.6
										MED-HIGH	91.7%	9.6
										HIGH-HIGH	91.7%	12.4

See Legend and Notes on page 49.

2-STAGE COOLING WITH SINGLE 2-SPEED INDOOR FAN MOTOR, SIZES 17-30, 15-27.5 TONS

UNIT	V-Ph-Hz	VOLTAGE RANGE		COMP 1		COMP 2		OFM (ea)		IFM		
		Min	Max	RLA	LRA	RLA	LRA	Watts	FLA	Efficiency Type	Eff at Full Load	FLA
48TC**17	208-3-60	187	253	29.5	195	28.2	329	350	1.5	STD	88.6%	8.4
										MED	87.0%	10.6
										HIGH	82.9%	13.6
	230-3-60	187	253	29.5	195	28.2	164	350	1.5	STD	88.6%	8.3
										MED	87.0%	10.6
										HIGH	82.9%	12.7
	460-3-60	414	506	14.7	95	14.7	130	277	0.9	STD	88.6%	4.2
										MED	87.0%	5.3
										HIGH	82.9%	6.4
	575-3-60	518	633	12.2	80	11.3	94	397	0.6	STD	81.1%	2.8
										MED	81.1%	2.8
										HIGH	83.6%	5.6
48TC**20	208-3-60	187	253	29.5	195	28.2	329	350	1.5	STD	87.0%	10.6
										MED	89.5%	17.1
										HIGH	89.5%	17.1
	230-3-60	187	253	29.5	195	28.2	164	350	1.5	STD	87.0%	10.6
										MED	89.5%	17.1
										HIGH	89.5%	17.1
	460-3-60	414	506	14.7	95	14.7	130	277	0.9	STD	87.0%	5.3
										MED	89.5%	8.6
										HIGH	89.5%	8.6
	575-3-60	518	633	12.2	80	11.3	94	397	0.6	STD	81.1%	2.8
										MED	83.6%	5.6
										HIGH	89.5%	7.6
48TC**24	208-3-60	187	253	48.1	245	29.5	195	350	1.5	STD	83.6%	13.6
										MED	89.5%	17.1
										HIGH	91.7%	28.5
	230-3-60	187	253	48.1	245	29.5	195	350	1.5	STD	83.6%	12.7
										MED	89.5%	17.1
										HIGH	91.7%	28.5
	460-3-60	414	506	18.6	125	14.7	95	277	0.9	STD	83.6%	6.4
										MED	89.5%	8.6
										HIGH	91.7%	14.3
	575-3-60	518	633	14.7	100	12.2	80	397	0.6	STD	83.6%	6.2
										MED	89.5%	7.6
										HIGH	91.7%	9.5
48TC**28	208-3-60	187	253	48.1	245	48.1	245	350	1.5	STD	83.6%	13.6
										MED	89.5%	17.1
										HIGH	91.7%	28.5
	230-3-60	187	253	48.1	245	48.1	245	350	1.5	STD	83.6%	12.7
										MED	89.5%	17.1
										HIGH	91.7%	28.5
	460-3-60	414	506	18.6	125	18.6	125	277	0.9	STD	83.6%	6.4
										MED	89.5%	8.6
										HIGH	91.7%	14.3
	575-3-60	518	633	14.7	100	14.7	100	397	0.6	STD	83.6%	6.2
										MED	89.5%	7.6
										HIGH	91.7%	9.5
48TC**30	208-3-60	187	253	51.3	300	51.3	300	350	1.5	STD	89.5%	17.1
										MED	91.7%	28.5
										HIGH	91.7%	30.4
	230-3-60	187	253	51.3	300	51.3	300	350	1.5	STD	89.5%	17.1
										MED	91.7%	28.5
										HIGH	91.7%	30.4
	460-3-60	414	506	23.1	150	23.1	150	277	0.9	STD	89.5%	8.6
										MED	91.7%	14.3
										HIGH	91.7%	15.2
	575-3-60	518	633	19.9	109	19.9	109	397	0.6	STD	89.5%	7.6
										MED	91.7%	9.5
										HIGH	91.7%	12.4

See Legend and Notes on page 49.

Electrical data (cont)



UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA - SINGLE-SPEED INDOOR FAN MOTOR, SIZES 17-30

UNIT	OM. V-PH-HZ	IFM TYPE	NO C.O. OR UNPWR C.O.							
			NO P.E.				W/ P.E. (PWRD FR/ UNIT)			
			MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		MCA	MAX FUSE OR HACR BRKR	DISC. SIZE	
FLA	LRA	FLA			LRA					
48TC**17	208/230-3-60	STD	78.0/77.9	100/100	81/81	515	89.8/89.7	100/100	95/95	535
		MED	80.2	100	84	529	92.0	100	97	549
		HIGH	83.2/82.3	100/100	87/86	531	95.0/94.1	110/110	101/100	551
	460-3-60	STD	40.0	50	42	267	46.2	60	49	279
		MED	41.1	50	43	274	47.3	60	50	286
		HIGH	42.2	50	44	275	48.4	61	51	287
	575-3-60	STD	31.2	40	32	202	36.0	45	38	210
		MED	31.2	40	32	202	36.0	45	38	210
		HIGH	34	45	36	216	38.8	50	41	244
48TC**20	208/230-3-60	STD	80.2	100	84	529	92.0	100	97	549
		MED	86.7	100	91	527	89.5	125	105	547
		HIGH-High Efficiency	86.7	100	91	527	98.5	125	105	547
	460-3-60	STD	41.1	50	43	274	47.3	60	50	286
		MED	44.4	50	47	273	50.6	60	54	285
		HIGH-High Efficiency	44.4	50	47	273	50.6	60	54	285
	575-3-60	STD	31.2	40	32	202	36.0	45	38	210
		MED	34.0	45	36	216	36.8	50	41	224
		HIGH-High Efficiency	36.0	45	38	214	40.8	50	43	222
48TC**24	208/230-3-60	STD	109.2/108.3	150/150	112/111	540	121.0/120.1	150/150	125/124	560
		MED-High Efficiency	112.7	150	116	536	124.5	150	129	556
		HIGH-High Efficiency	124.1	150	129	615	135.9	175	142	635
	460-3-60	STD	48.0	60	50	272	54.2	60	57	284
		MED-High Efficiency	50.2	60	52	270	56.4	70	59	282
		HIGH-High Efficiency	55.9	70	59	310	62.1	80	66	322
	575-3-60	STD	38.6	50	40	224	43.4	50	46	232
		MED-High Efficiency	40.6	50	42	222	45.4	60	48	230
		HIGH-High Efficiency	42.5	50	45	249	47.3	60	50	257
48TC**28	208/230-3-60	STD	127.8/126.9	175/175	133/132	590	139.6/138.7	175/175	147/146	610
		MED-High Efficiency	131.3	175	137	586	143.1	175	151	606
		HIGH-High Efficiency	142.7	175	150	665	154.5	200	164	685
	460-3-60	STD	51.9	60	54	302	58.1	70	61	314
		MED-High Efficiency	54.1	60	57	300	60.3	70	64	312
		HIGH-High Efficiency	59.8	70	63	340	66.0	80	70	352
	575-3-60	STD	41.1	50	43	244	45.9	60	49	252
		MED-High Efficiency	43.1	50	45	242	47.9	60	51	250
		HIGH-High Efficiency	45.0	50	47	269	49.8	60	53	277

See Legend and Notes on page 49.

UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA - SINGLE-SPEED INDOOR FAN MOTOR, SIZES 17-30 (cont)

UNIT	NOM. V-PH-HZ	IFM TYPE	NO C.O. OR UNPWR C.O.							
			NO P.E.				W/ P.E. (PWRD FR/ UNIT)			
			MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		MCA	MAX FUSE OR HACR BRKR	DISC. SIZE	
FLA	LRA	FLA			LRA					
48TC**30	208/230-3-60	STD	141.5	175	148	702	153.3	200	162	722
		MED-High Efficiency	152.9	200	161	781	164.7	200	175	801
		HIGH-High Efficiency	154.8	200	163	812	166.5	200	177	832
	460-3-60	STD	66.0	80	69	354	72.2	90	76	366
		MED-High Efficiency	71.1	90	76	394	77.9	100	83	406
		HIGH-High Efficiency	72.6	90	77	409	78.8	100	84	421
	575-3-60	STD	56.0	70	59	264	60.8	80	64	272
		MED-High Efficiency	57.9	70	61	291	62.7	80	66	299
		HIGH-High Efficiency	60.8	80	64	302	65.6	80	70	310

See Legend and Notes on page 49.



Electrical data (cont)



UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA - SINGLE-SPEED INDOOR FAN MOTOR, SIZES 17-30

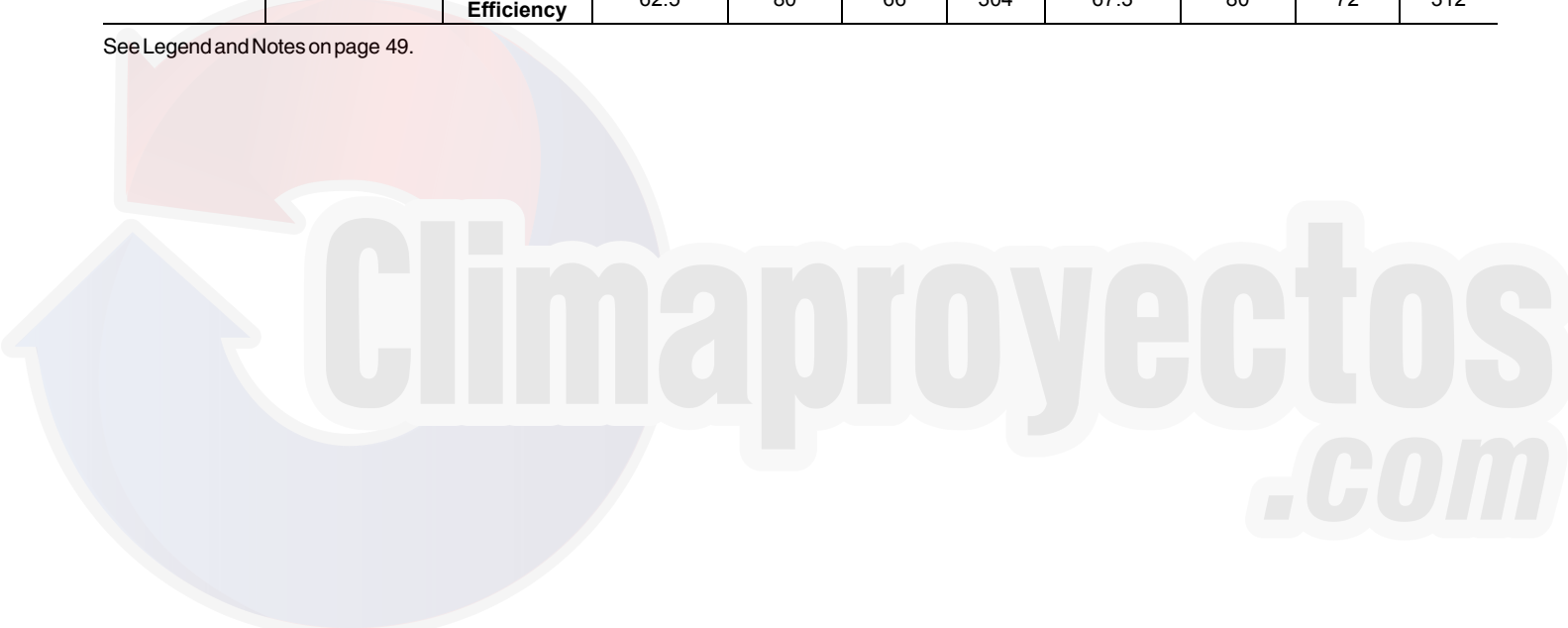
UNIT	NOM. V-PH-HZ	IFM TYPE	W/ PWRD C.O.								
			NO P.E.				W/ P.E. (PWRD FR/ UNIT)				
			MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		
					FLA	LRA			FLA	LRA	
48TC**17	208/230-3-60	STD	82.8/82.7	100/100	87/87	520	94.6/94.5	110/110	100/100	540	
		MED	85.0	100	89	534	96.8	125	103	554	
		HIGH	88.0/87.1	100/100	93/92	536	99.8/98.9	125/125	106/105	556	
	460-3-60	STD	42.2	50	44	269	48.4	60	51	281	
		MED	43.3	50	46	276	49.5	60	53	288	
		HIGH	44.4	50	47	277	50.6	60	54	289	
	575-3-60	STD	32.9	45	34	204	37.7	45	40	212	
		MED	32.9	45	34	204	37.7	45	40	212	
		HIGH	35.7	45	37	218	40.5	50	43	226	
48TC**20	208/230-3-60	STD	85.0	100	89	534	96.8	125	103	554	
		MED	91.5	100	97	532	103.3	125	110	552	
		HIGH-High Efficiency	91.5	100	697	532	103.3	125	110	552	
	690460-3-60	STD	43.3	50	46	276	49.5	60	53	288	
		MED	46.6	60	49	275	52.8	60	56	287	
		HIGH-High Efficiency	46.5	60	49	275	52.8	60	56	287	
	575-3-60	STD	32.9	45	34	204	37.7	45	40	212	
		MED	35.7	45	37	218	40.5	50	43	226	
		HIGH-High Efficiency	37.7	45	40	216	42.5	50	45	224	
	48TC**24	208/230-3-60	STD	114.0/113.1	150/150	117/116	545	125.8/124.9	150/150	131/130	565
			MED-High Efficiency	117.5	150	121	541	129.3	175	135	561
			HIGH-High Efficiency	128.9	175	134	620	140.7	175	148	640
460-3-60		STD	50.2	60	52	274	56.4	70	59	286	
		MED-High Efficiency	52.4	60	55	272	58.6	70	62	284	
		HIGH-High Efficiency	58.1	70	61	312	64.3	80	69	324	
575-3-60		STD	40.3	50	42	226	45.1	50	48	234	
		MED-High Efficiency	42.3	50	44	224	47.1	60	50	232	
		HIGH-High Efficiency	44.2	50	47	251	49.3	60	52	259	
48TC**28	208/230-3-60	STD	132.3/131.7	175/175	139/138	595	144.4/143.5	175/175	152/151	615	
		MED-High Efficiency	136.1	175	143	591	147.9	175	156	611	
		HIGH-High Efficiency	147.5	175	156	670	159.3	200	169	690	
	460-3-60	STD	54.1	60	57	304	60.3	70	64	316	
		MED-High Efficiency	56.3	70	59	302	62.5	80	66	314	
		HIGH-High Efficiency	62.0	80	66	342	68.2	80	73	354	
	575-3-60	STD	42.8	50	45	246	47.8	60	50	254	
		MED-High Efficiency	44.8	50	47	244	49.6	60	53	252	
		HIGH-High Efficiency	46.7	60	49	271	51.5	60	55	279	

See Legend and Notes on page 49.

UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA - SINGLE-SPEED INDOOR FAN MOTOR, SIZES 17-30 (cont)

UNIT	NOM. V-PH-HZ	IFM TYPE	W/ PWRD C.O.							
			NO P.E.				W/ P.E. (PWRD FR/ UNIT)			
			MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		MCA	MAX FUSE OR HACR BRKR	DISC. SIZE	
					FLA	LRA			FLA	LRA
48TC**30	208/230-3-60	STD	146.3	175	154	707	158.1	200	167	727
		MED-High Efficiency	157.7	200	167	786	169.5	200	180	806
		HIGH-High Efficiency	159.6	200	169	817	171.4	200	182	837
	460-3-60	STD	68.2	90	72	356	74.4	90	79	368
		MED-High Efficiency	73.9	90	78	396	80.1	100	85	408
		HIGH-High Efficiency	74.8	90	79	411	81.0	100	86	423
	575-3-60	STD	57.7	70	61	266	62.5	80	66	274
		MED-High Efficiency	59.6	70	63	293	64.4	80	68	301
		HIGH-High Efficiency	62.5	80	66	304	67.3	80	72	312

See Legend and Notes on page 49.



**UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA
WITH FACTORY-INSTALLED 2-SPEED INDOOR FAN OPTION, SIZES 17-30**

UNIT	NOM. V-PH-HZ	IFM TYPE	NO C.O. OR UNPWR C.O.							
			NO P.E.				W/ P.E. (PWRD FR/ UNIT)			
			MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		MCA	MAX FUSE OR HACR BRKR	DISC. SIZE	
					FLA	LRA			FLA	LRA
48TC**17	208/230-3-60	STD	78.2/77.4	100/100	81/81	496	90.0/89.2	100/100	95/94	516
		MED	80.4/79.4	100/100	84/83	520	92.2/91.2	100/100	98/96	540
		HIGH	83.2/82.3	100/100	87/86	531	96.0/94.1	110/110	101/100	551
	460-3-60	STD	39.6	50	41	258	45.8	60	48	270
		MED	40.7	50	43	270	46.9	60	50	282
		HIGH	42.2	50	44	275	48.4	60	51	287
	575-3-60	STD	32.9	45	34	202	37.7	45	40	210
		MED	32.9	45	34	202	37.7	45	40	210
		HIGH	34.6	45	36	216	39.4	50	42	224
48TC**20	208/230-3-60	STD	80.4/79.4	100/100	84/83	520	92.2/91.2	100/100	96/96	540
		MED	83.2/82.3	100/100	87/86	531	95.0/94.1	110/110	101/100	551
		HIGH	86.7	100	91	527	98.5	125	105	547
	460-3-60	STD	40.4	50	43	270	46.9	60	50	282
		MED	42.2	50	44	275	48.4	60	51	287
		HIGH	44.4	50	47	273	50.6	60	54	285
	575-3-60	STD	32.9	45	34	202	37.7	45	40	210
		MED	34.6	45	36	216	39.4	50	42	224
		HIGH	36.0	45	38	214	40.8	50	43	222
48TC**24	208/230-3-60	STD	109.2/108.3	150/150	112/111	540	121.0/120.1	150/150	125/124	560
		MED	112.7	150	116	536	124.5	150	129	556
		HIGH	124.1	150	129	615	135.9	175	142	63.5
	460-3-60	STD	48.0	60	50	272	54.2	60	57	284
		MED	50.2	60	52	270	56.4	70	59	282
		HIGH	55.9	70	59	310	62.1	80	66	322
	575-3-60	STD	39.2	50	41	224	44.0	50	46	232
		MED	40.8	50	42	222	45.4	60	48	230
		HIGH	42.5	50	45	249	47.3	60	50	257
48TC**28	208/230-3-60	STD	127.8/126.9	175/175	133/132	590	139.6/138.7	175/175	147/146	610
		MED	131.3	175	137	586	143.1	175	151	606
		HIGH	142.7	175	150	665	154.5	200	164	685
	460-3-60	STD	51.9	60	54	302	58.1	70	61	314
		MED	54.1	60	57	300	60.3	70	64	312
		HIGH	59.8	70	63	340	66.0	80	70	352
	575-3-60	STD	41.7	50	44	244	46.5	60	49	252
		MED	43.1	50	45	242	47.9	60	51	250
		HIGH	45.0	50	47	269	49.8	60	53	277
48TC**30	208/230-3-60	STD	141.50	175	148	702	153.3	200	162	722
		MED	152.9	200	161	781	164.7	200	175	801
		HIGH	154.8	200	163	812	166.6	200	177	832
	460-3-60	STD	66.0	80	69	354	72.2	90	76	366
		MED	71.7	90	76	394	77.9	100	83	406
		HIGH	72.6	90	77	409	78.8	100	84	421
	575-3-60	STD	56.0	70	59	264	60.8	80	64	272
		MED	57.9	70	61	291	62.7	80	66	1299
		HIGH	60.8	80	64	302	66.5	80	70	310

See Legend and Notes on page 49.

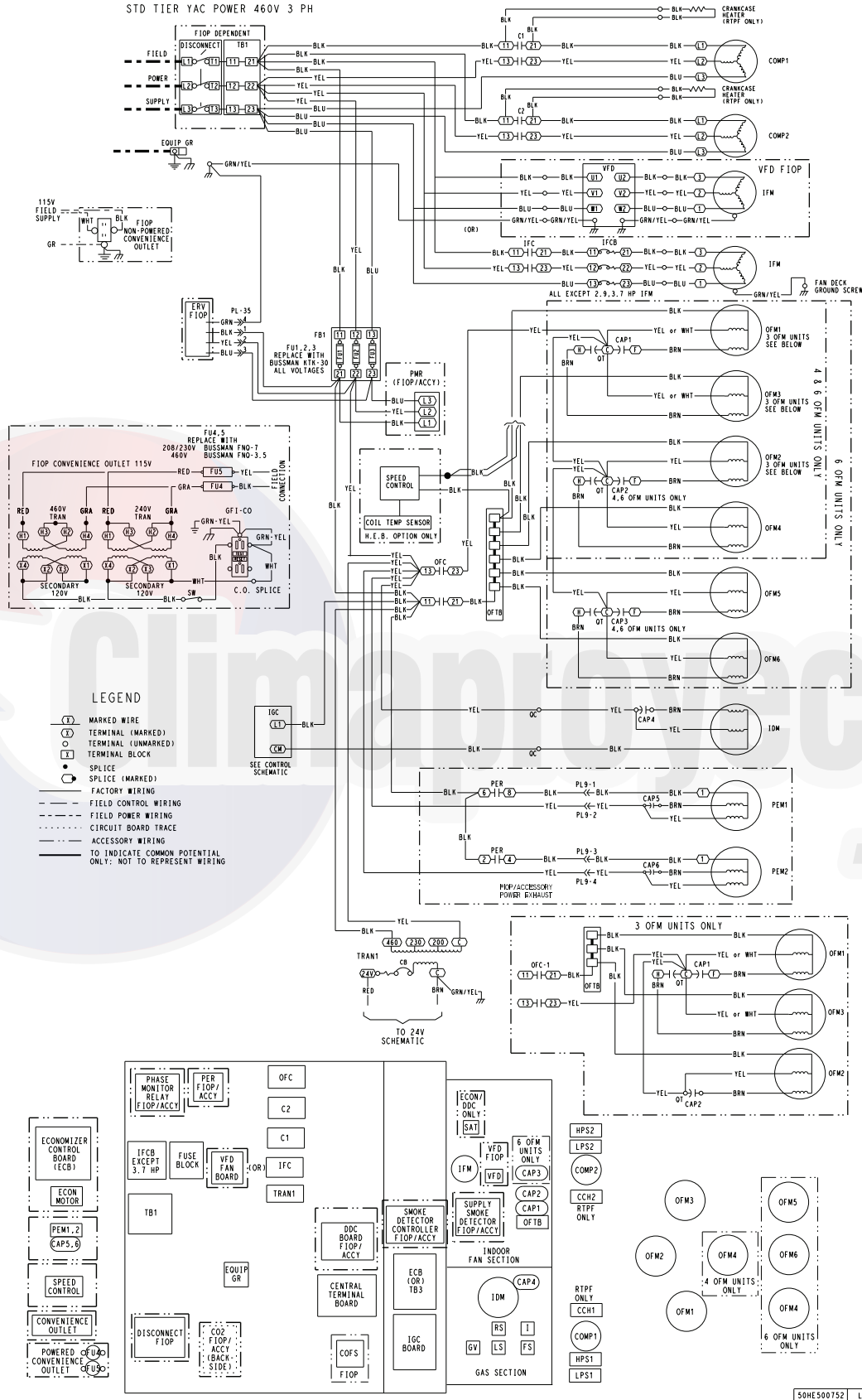
**UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA
WITH FACTORY-INSTALLED 2-SPEED INDOOR FAN OPTION, SIZES 17-30 (cont)**

UNIT	NOM. V-PH-HZ	IFM TYPE	W/ PWRD C.O.							
			NO P.E.				W/ P.E. (PWRD FR/ UNIT)			
			MCA	MAX FUSE OR HACR BRKR	DISC. SIZE		MCA	MAX FUSE OR HACR BRKR	DISC. SIZE	
					FLA	LRA			FLA	LRA
48TC**17	208/230-3-60	STD	83.0/82.2	100/100	87/86	501	94.8/94.0	110/110	101/100	521
		MED	85.2/84.2	100/100	89/88	525	97.0/96.0	125/125	103/102	545
		HIGH	88.0/87.1	100/100	93/92	536	99.8/98.9	125/125	106/105	556
	460-3-60	STD	41.8	50	44	260	48.0	60	51	272
		MED	42.9	50	45	272	49.1	60	52	284
		HIGH	44.4	50	47	277	50.6	60	54	289
	575-3-60	STD	34.6	45	36	204	39.4	50	42	212
		MED	34.6	45	36	204	39.4	50	42	212
		HIGH	36.3	45	38	218	41.1	50	44	226
48TC**20	208/230-3-60	STD	85.2/84.2	100/100	89/88	525	97.0/96.0	125/125	103/102	545
		MED	88.0/87.1	100/100	93/92	536	99.8/98.9	125/125	106/105	556
		HIGH	91.5	100	97	532	103.3	125	110	552
	460-3-60	STD	42.9	50	45	272	49.1	60	52	284
		MED	44.4	50	47	277	50.6	60	54	289
		HIGH	46.6	60	49	275	52.8	60	56	287
	575-3-60	STD	34.6	45	36	204	39.4	50	42	212
		MED	36.3	45	38	218	41.1	50	44	226
		HIGH	37.7	45	40	216	42.5	50	45	224
48TC**24	208/230-3-60	STD	114.0/113.1	150/150	117/116	545	125.8/124.9	105/150	131/130	565
		MED	117.5	150	121	541	129.3	175	135	561
		HIGH	128.9	175	134	620	140.7	175	148	640
	460-3-60	STD	50.2	60	52	274	56.4	70	59	286
		MED	52.4	60	55	272	58.6	70	62	284
		HIGH	58.1	70	61	312	64.3	80	69	324
	575-3-60	STD	40.9	50	43	226	45.7	60	48	234
		MED	42.3	50	44	224	47.1	60	50	232
		HIGH	44.2	50	47	251	49.0	60	52	259
48TC**28	208/230-3-60	STD	132.6/131.7	175/175	139/138	595	144.4/143.5	175/175	152/151	615
		MED	136.1	175	143	591	147.9	175	156	611
		HIGH	147.5	175	156	670	159.3	200	169	690
	460-3-60	STD	54.1	60	57	304	60.3	70	64	316
		MED	56.3	70	59	302	62.5	80	66	314
		HIGH	62.0	80	66	342	68.2	80	73	354
	575-3-60	STD	43.4	50	46	246	48.2	60	51	254
		MED	44.8	50	47	244	49.6	60	53	252
		HIGH	46.7	60	49	271	51.5	60	55	279
48TC**30	208/230-3-60	STD	146.3	175	154	707	158.1	200	167	727
		MED	157.7	200	167	786	169.5	200	180	806
		HIGH	159.6	200	169	817	171.4	200	182	837
	460-3-60	STD	68.2	90	72	358	74.4	90	79	368
		MED	73.9	90	78	396	80.1	100	85	408
		HIGH	74.8	90	79	411	81.0	100	86	423
	575-3-60	STD	57.7	70	61	266	62.5	80	66	274
		MED	59.6	70	63	293	64.4	80	68	301
		HIGH	62.5	80	66	304	67.3	80	72	312

See Legend and Notes on page 49.

TYPICAL POWER WIRING DIAGRAM, 48TC 17-30 460V SHOWN

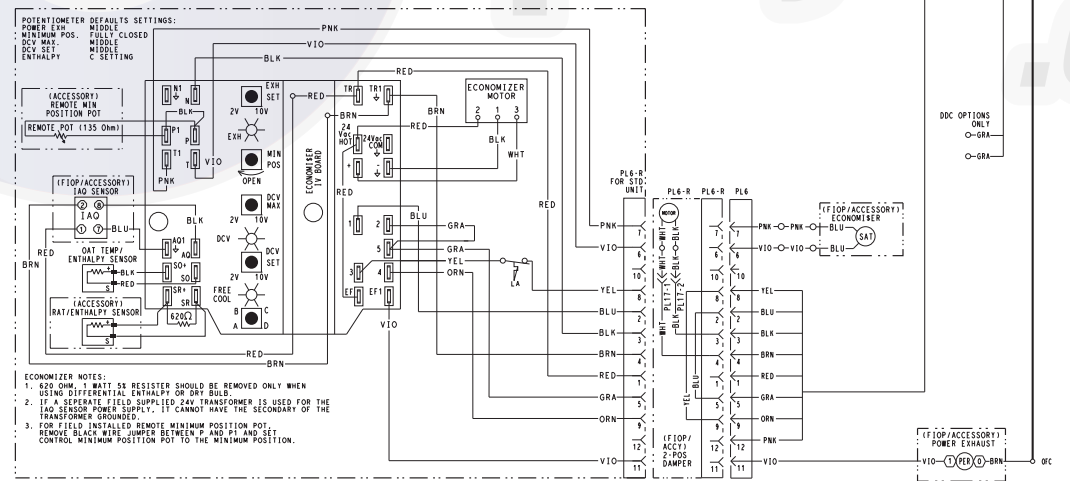
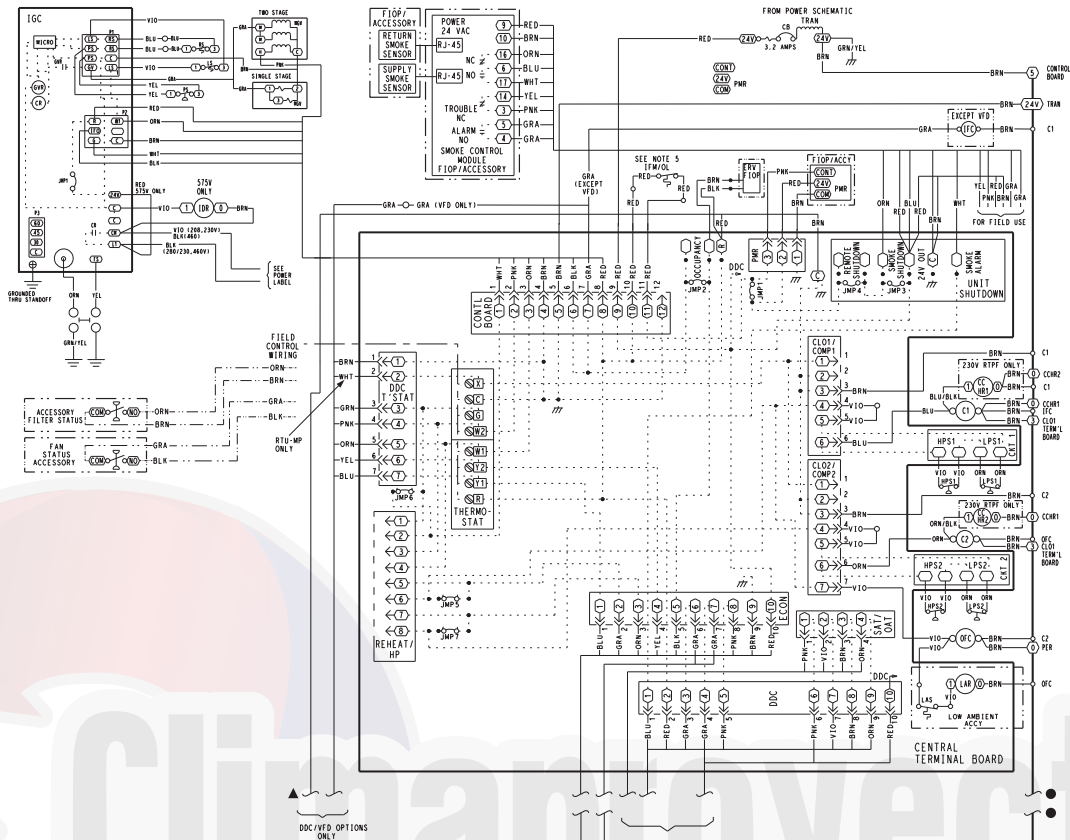
STD TIER YAC POWER 460V 3 PH



50HE500752 L

ELECTRO-MECHANICAL CONTROL WIRING DIAGRAM 48TC 17-30

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

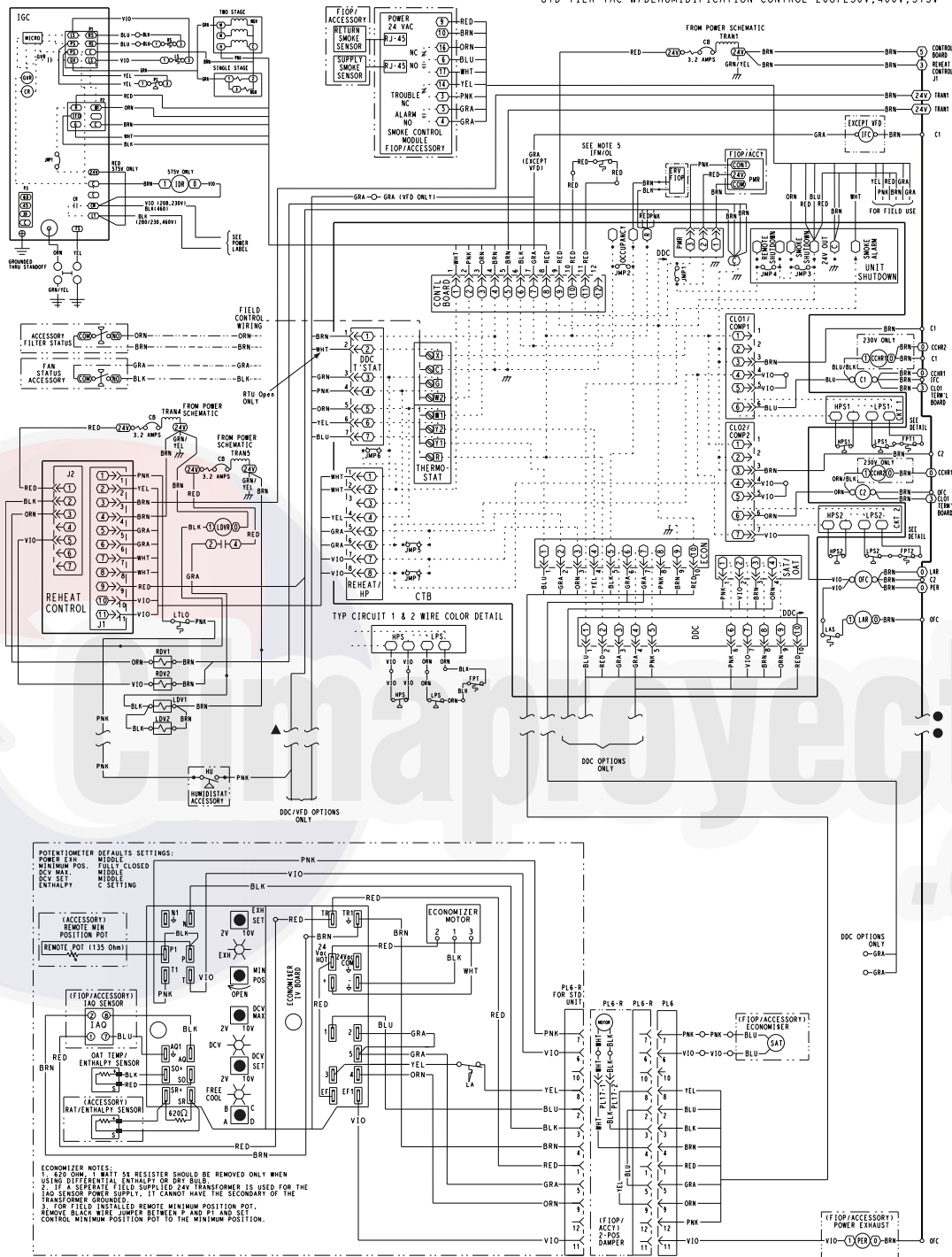


- NOTES**
- IF ANY OF THE ORIGINAL WIRE FURNISHED MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE 90 C WIRE OR ITS EQUIVALENT.
 - COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED. THREE PHASE MOTORS ARE PROTECTED AGAINST PRIMARY SINGLE PHASING CONDITIONS.
 - 208/230V UNIT TRN IS WIRED FOR 230V UNIT. IF UNIT IS TO BE RUN WITH 208V POWER SUPPLY DISCONNECT BLK WIRE FROM 230V TAP AND CONNECT TO 208V TAP.
 - USE COPPER CONDUCTOR ONLY.
 - IF W O/L IS NOT USED ON ALL MODELS, WHEN NOT USED, RED LEADS ARE CONNECTED TOGETHER.
- | | | | | | |
|----------|----------------------------|----------|-----------------------------|---------|--------------------------|
| C | CONTACTOR, COMPRESSOR | IFC | INDOOR FAN CONTACTOR | PWR | PHASE MONITOR RELAY |
| CAP | CAPACITOR | IFM | INDOOR FAN MOTOR | QT | QUADRUPLE TERMINAL |
| CB | CIRCUIT BREAKER | IGC | INTEGRATED GAS CONTROL | R | RELAY |
| CCH | CRANKCASE HEATER | IRH | INDOOR RELATIVE HUMIDITY | RAT | RETURN AIR TEMP. SEN |
| CCHR | CRANKCASE HEATER RELAY | LA | LOW AMBIENT LOCKOUT | RMT OCC | REMOTE OCCUPANCY |
| CCN | CARRIER COMFORT NETWORK | LAR | LOW AMBIENT RELAY | RS | ROLLOUT SWITCH |
| CCN SAFE | COMPRESSOR SAFETY | LAS | LOW AMBIENT SWITCH | RFTF | ROUND TUBE PLATE FIN |
| COFS | CONDENSATE OVERFLOW SWITCH | LOOP PWR | CURRENT LOOP POWER | SEN | SENSOR |
| COMP | COMPRESSOR MOTOR | LPS | LOW PRESSURE SWITCH | SAT | SUPPLY AIR TEMP. SENSOR |
| CTB | CENTRAL TERMINAL BOARD | LST | LIMIT SWITCH (MANUAL RESET) | SEN | SENSOR |
| DC | DIRECT DIGITAL CONTROL | LSM | LOW SWITCH (MANUAL RESET) | SET | SET POINT OFFSET |
| DCV | DIRECT DIGITAL CONTROL | MGV | MAIN GAS VALVE | SFS | SUPPLY FAN STATUS |
| DCV SET | DIRECT DIGITAL CONTROL | OAO | OUTDOOR AIR QUALITY | TDR | TIME DELAY RELAY |
| ERV | ENERGY RECOVERY VENTILATOR | OAT | OUTDOOR AIR TEMP. SEN | TRN | TRANSFORMER |
| F | FUSE | OFC | OUTDOOR FAN CONTACTOR | VFD | VARIABLE FREQUENCY DRIVE |
| FSD | FIRE SHUT DOWN | OFM | OUTDOOR FAN MOTOR | | |
| FU | FUSE | OFTB | OUTDOOR FAN TERMINAL BLOCK | | |
| GND | GROUND | OLR | OVERLOAD RELAY | | |
| GVR | GAS VALVE RELAY | PER | POWER EXHAUST RELAY | | |
| HPS | HIGH PRESSURE SWITCH | PL | PLUG ASSEMBLY | | |
| HS | HALL EFFECT SENSOR | POT | POTENTIOMETER | | |
| I | IGNITOR | | | | |
| IAO | INDOOR AIR QUALITY SENSORS | | | | |
| IDM | INDUCED DRAFT MOTOR | | | | |
| IDR | INDUCED DRAFT RELAY | | | | |

50HE00534

ELECTRO-MECHANICAL CONTROL WIRING DIAGRAM 48TC 17-30 WITH OPTIONAL HUMIDIFIER SYSTEM

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



ECONOMIZER NOTES:
 1. 50 OHM 1/2 WATT RESISTOR SHOULD BE REMOVED ONLY WHEN USING DIFFERENTIAL ENTHALPY OR DRY BULB.
 2. IF A SEPARATE FIELD SUPPLIED 24V TRANSFORMER IS USED FOR THE IAD SENSOR POWER SUPPLY, IT CANNOT HAVE THE SECONDARY OF THE TRANSFORMER GROUND.
 3. FOR FIELD INSTALLED REMOTE MINIMUM POSITION POT, REMOVE BLACK WIRE JUMPER BETWEEN P1 AND P1 AND SET CONTROL MINIMUM POSITION POT TO THE MINIMUM POSITION.
 4. USE COPPER CONDUCTOR ONLY.
 5. IFM OIL IS NOT USED ON ALL MODELS. WHEN NOT USED, RED LEADS ARE CONNECTED TOGETHER.

- NOTES:**
 1. IF ANY OF THE OPTIONAL WIRE FURNISHED MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE 90 C WIRE OR ITS EQUIVALENT.
 2. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED. THREE PHASE MOTORS ARE PROTECTED AGAINST PRIMARY SINGLE PHASING CONDITIONS.
 3. 208/230V UNIT TRAIL IS WIRED FOR 230V UNIT. IF UNIT IS TO BE RUN WITH 230V POWER SUPPLY DISCONNECT BLK WIRE FROM 230V TAP AND CONNECT TO 230V TAP.
 4. USE COPPER CONDUCTOR ONLY.
 5. IFM OIL IS NOT USED ON ALL MODELS. WHEN NOT USED, RED LEADS ARE CONNECTED TOGETHER.

C	CONTACTOR, COMPRESSOR	IFC	INDOOR FAN CONTACTOR	PMR	PHASE MONITOR RELAY
CB	CAPACITOR	IFM	INDOOR FAN MOTOR	QT	QUADRUPLATE TERMINAL
CCH	CIRCUIT BREAKER	IGC	INTEGRATED GAS CONTROL	R	RELAY
CCRH	CRANKCASE HEATER RELAY	IRH	INDOOR RELATIVE HUMIDITY	RAT	RETURN AIR TEMP. SEN
CCN	CARRIER COMFORT NETWORK	LA	LOW AMBIENT LOCKOUT	RDW	REHEAT DISCHARGE VALVE
CMP SAFE	COMPRESSOR SAFETY	LAR	LOW AMBIENT RELAY	RMT OCC	REMOTE OCCUPANCY
COFS	CONDENSATE OVERFLOW SWITCH	LAS	LOW AMBIENT SWITCH	RS	ROLLOUT SWITCH
COMP	COMPRESSOR MOTOR	LAV	LIQUID DIVERTER VALVE (3-WAY)	RTPF	ROUND TUBE PLATE FIN
CTB	CENTRAL TERMINAL BOARD	LDDV	LIQUID DIVERTER VALVE RELAY	RAT	CONDENSER COIL
CTD	DIRECT DIGITAL CONTROL	LDP	LOW PRESSURE SWITCH	SAT	SENSOR
CTB	FREZEZ PROTECTION THERMOSTAT	LSM	LIMIT SWITCH (MANUAL RESET)	SEN	SET POINT OFFSET
FOP	FACTORY INSTALLED OPTION	LSP	LOW PRESSURE SWITCH	SFS	SUPPLY FAN STATUS
FPT	FUSE	LTV	LOW TEMPERATURE LOCK OUT	TDR	TIME DELAY RELAY
FSD	FIRE SHUT DOWN	MGV	MAIN GAS VALVE	TRN	TRANSFORMER
FU	FUSE	OAO	OUTDOOR AIR QUALITY	VFD	VARIABLE FREQUENCY DRIVE
GND	GROUND	OAT	OUTDOOR AIR TEMP. SEN		
GVR	GAS VALVE RELAY	OFC	OUTDOOR FAN CONTACTOR		
HPS	HALL EFFECT SENSOR	OFM	OUTDOOR FAN MOTOR		
HS	HALL EFFECT SENSOR	OFTB	OUTDOOR FAN TERMINAL BLOCK		
HU	HUMIDISTAT	OLR	OVERLOAD RELAY		
I	IGNITOR	PER	POWER EXHAUST RELAY		
IAD	INDOOR AIR QUALITY SENSORS	PL	POTENTIOMETER		
IDM	INDUCED DRAFT MOTOR	POT	POTENTIOMETER		
IDR	INDUCED DRAFT RELAY				

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Sequence of operation



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-air 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, and IECC-2015 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 for the unit established (100%). This is standard on all models installed in the U.S. to meet U.S. Department of Energy - 2018 IEER efficiency rating.

Heating

WeatherMaker® (48TC) units have 2 stages of gas heat. When the thermostat calls for heating, power is sent to W on the Integrated Gas Controller (IGC) board. An LED (light-emitting diode) on the IGC board turns on and remains on during normal operation. A check is made to ensure that the roll-out switch and limit switch are closed. If the check was successful, the induced-draft motor is energized, and when its speed is satisfactory, as proven by the flue gas pressure switch, the ignition activation period begins. The burners will ignite within 5 seconds. If the burners do not light, there is a 22 second delay before another 5 second attempt. This sequence is repeated for 15 minutes or until the burners light. If, after the 15 minutes, the burners still have not lit, heating is locked out. To reset the control, break 24-v power to the thermostat.

When ignition occurs, the IGC board will continue to monitor the condition of the roll-out switch, the limit switches, the flue gas pressure switch, as well as the flame sensor. Forty-five 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. A LED indicator is provided on the IGC to monitor operation.

Electro-mechanical units with an economizer

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 setpoint, 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 damper to the minimum position.

On the initial power to the EconoMi\$er IV and X control, it will take the damper up to 2¹/₂ 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 1¹/₂ and 2¹/₂ minutes. If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve,

Sequence of operation (cont)



differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to maintain the mixed-air temperature setpoint at 50°F (10°C) to 55°F (13°C).

If there is a further demand for cooling, then cooling second stage - Y2 is energized, and then the control will bring on compressor stage 1 to maintain the mixed-air temperature setpoint. The EconoMi\$er® IV and X damper will be open at maximum position. EconoMi\$er IV and X operation is limited to a single compressor.

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® option are capable of providing multiple modes of improved dehumidification as a variation of the normal cooling cycle. The

Humidi-MiZer 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.

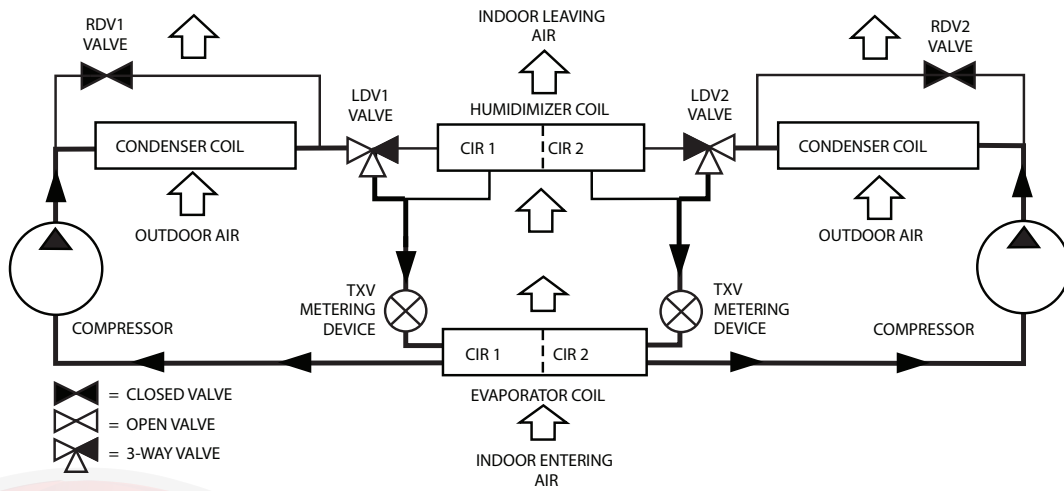
The Reheat1 and Reheat2 modes are a variable when the unit is not in a Heating mode and when the Low Ambient Lockout switch is closed.

RTU Open controller (factory option)

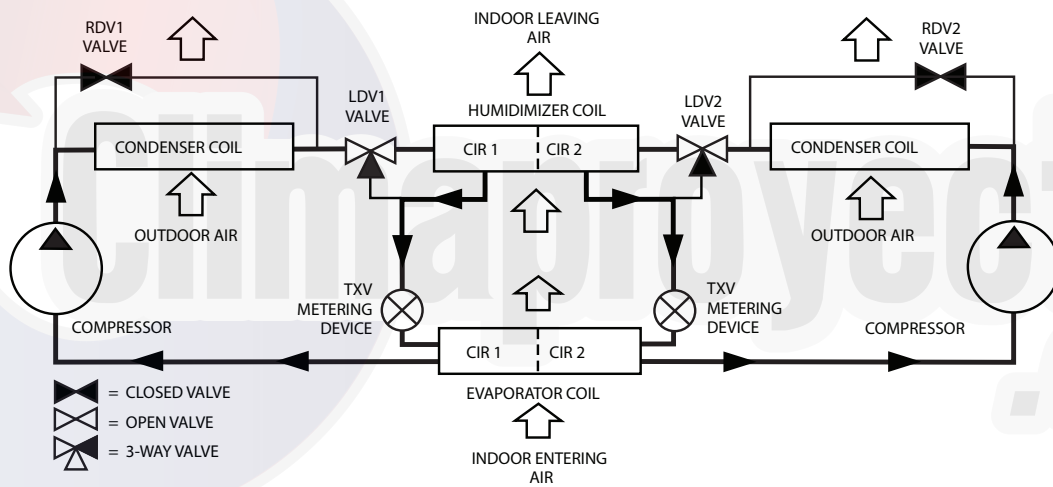
For details on operating 48TC units equipped with the factory-installed RTU Open option, refer to Factory Installed Option RTU Open Multi-Protocol Controller Controls, Start-Up, Operation and Troubleshooting.



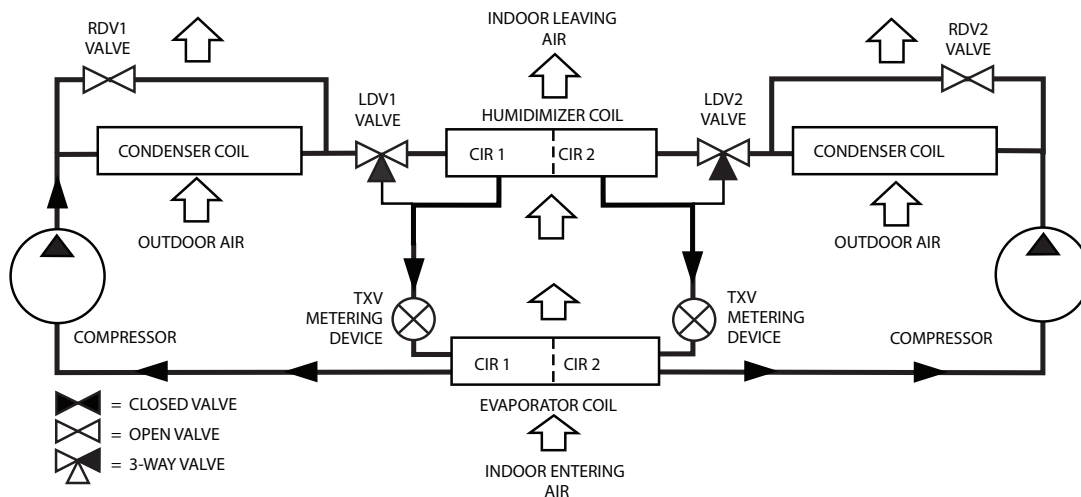
NORMAL COOLING MODE — HUMIDI-MIZER® SYSTEM



SUBCOOLING MODE (REHEAT 1) — HUMIDI-MIZER® SYSTEM



SUBCOOLING MODE (REHEAT 2) — HUMIDI-MIZER® SYSTEM



Min operating ambient temp (cooling)

In mechanical cooling mode, your Carrier rooftop unit can safely operate down to an outdoor ambient temperature of 30°F (-1°C). It is possible to provide cooling at lower outdoor ambient temperatures by using less outside air, economizers, and/or accessory low ambient kits.

Max operating ambient temp (cooling)

The maximum operating ambient temperature for cooling mode is 115°F (46°C). While cooling operation above 115°F (46°C) may be possible, it could cause either a reduction in performance, reliability, or a protective action by the unit's internal safety devices.

Min mixed air temp (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:

Aluminized

50°F (10°C) continuous

45°F (7°C) intermittent

Stainless Steel

40°F (4°C) continuous

35°F (2°C) intermittent

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

Min and max 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. For proper minimum and maximum CFM values see Minimum - Maximum Airflow Ratings - Natural Gas and Propane table on page 6.

Heating-to-cooling changeover

Your unit will automatically change from heating to cooling mode when using a thermostat with an auto-change-over 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 Physical Data Table Cooling, 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 significantly improve 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.

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 or down to 25°F (-4°C) with the field-installed Winter Start Package.

Staged air volume (SAV™) with variable frequency drive (VFD)

Carrier’s Staged Air Volume (SAV™) system utilizes 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.

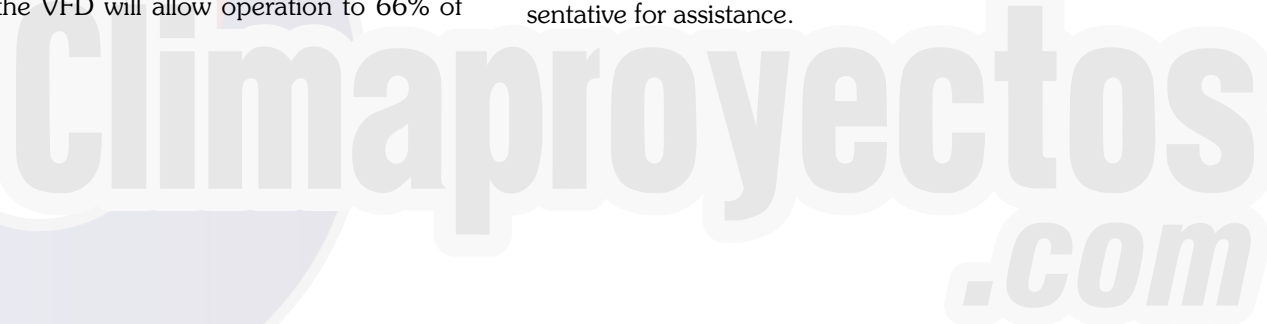
The VFD used in Carrier’s SAV system has soft start capabilities to slowly ramp up the speeds, thus eliminating any high inrush air volume during initial start-up. It also has internal over current protection for the fan motor and a field-installed display kit that allows adjustment and in depth diagnostics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

This SAV system is available on models with 2-stage cooling operation with electro-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 module 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 operation.

Application/selection option

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

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

WeatherMaker® Gas heat/electric cooling packaged rooftop

HVAC guide specifications

Size range: **15, 17.5, 20, 25, 27.5 Nominal Tons**

Carrier Model Number: **48TC-17-30**

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

1. 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 23) Instrumentation and control devices for HVAC

3.01 (23 09 12.13) Sensors and Transmitters

A. (23 09 12.13.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 (not compatible with SAV models):

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 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 multi-protocol, direct digital controller:
 1. Shall be ASHRAE 62 compliant.
 2. RTU Open controls meets California Title 24 Section 120.2i, ASHRAE 90.1-2016 and IECC¹-2015 Fault Detection and Diagnostic (FDD) requirements.
 3. Shall accept 18-30VAC, 50-60 Hz, and consume 15VA or less power.
 4. Shall have an operating temperature range from -40°F (-40°C) to 130°F (54°C), 10% to 90% RH (non-condensing).
 5. Shall include built-in protocol for BACnet² (MS/TP and PTP modes), Modbus³ (RTU and ASCII), Johnson N2 and LonWorks. LonWorks Echelon processor required for all Lon applications shall be contained in separate communication board.
 6. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers.
 7. Baud rate controller shall be selectable using a dip switch.
 8. Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.
 9. 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.
 10. 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.
 11. 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.
 12. Shall have a battery backup capable of a minimum of 10,000 hours of data and time clock retention during power outages.
 13. Shall have built-in support for Carrier technician tool.
 14. Shall include an EIA-485 protocol communication port, an access port for connection of either a computer or a Carrier technician tool,

1. IECC is a registered trademark of International Code Council, Inc.
 2. BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).
 3. Modbus is a registered trademark of Schneider Electric.

an EIA-485 port for network communication to intelligent space sensors and displays, and a port to connect an optional LonWorks communications card.

15. Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.

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, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.
5. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.

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

1. Compressor over-temperature, over-current. High internal pressure differential.
2. Low-pressure switch:
 - a. Units shall have different sized connectors for the circuit 1 and circuit 2 low and high pressure switches. They shall physically prevent the cross-wiring of the safety switches between circuits 1 and 2.
 - b. Low-pressure switch shall use different color wire than the high-pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. High-pressure switch:
 - a. Units shall have different sized connectors for the circuit 1 and circuit 2 low and 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 roll-out 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:

- A. (23 09 93 13.A.) INSERT SEQUENCE OF OPERATION

Part 7 — (23 40 13) Panel air filters

7.01 (23 40 13.13) Decentralized rooftop units:

- A. (23 40.13.13.A.) Standard filter section:
 1. Shall consist of factory-installed, low velocity, disposable 2-in. thick fiberglass filters of commercially available sizes.
 2. Unit shall use only one filter size. Multiple sizes are not acceptable.
 3. Filters shall be accessible through 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 (48TC**17-30)

- A. (23 81 19.13.A.) General:
 1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
 2. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.
 3. Unit shall use Puron® 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 Department of Energy-2018, ASHRAE 90.1-2016 and IECC-2015 minimum efficiency requirements.
 2. Unit shall be rated in accordance with AHRI Standard 340/360.
 3. Unit shall be designed to conform to ASHRAE 15.
 4. 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.

5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. 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.
7. Unit casing shall be capable of withstanding 500 hour salt spray exposure per ASTM B117 (scribed specimen).
8. Roof curb shall be designed to conform to NRCA Standards.
9. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
10. Unit shall be designed in accordance with UL Standard 1995, ETL listed including tested to withstand rain.
11. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
12. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
13. 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:
 1. As specified in the contract.
- E. (23 81 19.13.E.) Operating characteristics:
 1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 340/360 at ± 10% voltage.
 2. Compressor with standard controls shall be capable of operation down to 30°F (-1°C), ambient outdoor temperatures. Accessory winter start kit is necessary if mechanically cooling at ambient temperatures below 30°F (-1°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 vertical configuration. No field conversion is required.
- F. (23 81 19.13.F.) Electrical Requirements:
 1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
- G. (23 81 19.13.G.) Unit cabinet:
 1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a 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 / 16°C): 60, Hardness: H to 2H Pencil hardness.
 3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standard 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 gas 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 thru-the-base gas and electrical connections standard. Both gas and electric 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-gage 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, through the side of the drain pan. Connection shall be made per manufacturer’s recommendations.
 8. Top panel:
 - a. Shall be a multi-piece top panel linked with water tight flanges and locking 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 (vertical 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.) Thru-the-base provisions / connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.
 - 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, removable, filter access panel.
 - c. Panels covering control box and filter 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. They shall be permanently attached, and recessed into the panel.
 - e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
 - f. Collars shall be removable and easily replaceable using manufacturer recommended parts.
- H. (23 81 19.13.H.) Gas heat:
 1. General:
 - a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
 - b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
 - c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.

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 roll-out 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-gage steel coated with a nominal 1.2 mil aluminum-silicone alloy to aid with corrosion resistance.
 - b. Burners shall be of the inshot 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 inshot type constructed of aluminum-coated steel.
 - d. All gas piping shall enter the unit cabinet at a single location on side of unit (vertical plane).
 - e. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gage 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 19.13.1.) 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 a 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 shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 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. Standard ALL Aluminum Novation® Coils:
- a. Standard condenser coils shall have all aluminum Novation Heat Exchanger Technology design consisting of aluminum multi-port flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
 - b. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
6. 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.
 - b. Coating process shall ensure complete coil encapsulation of tubes, fins, and headers.
 - 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. Fixed orifice metering system (on non-Humidi-MiZer® units) provides correct distribution of two-phase refrigerant by including multiple fixed orifice devices in each refrigeration circuit. Each orifice is to be optimized to the coil circuit it serves.
 - b. 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.
 - c. Refrigerant filter drier - Solid core design.
 - d. Service gage connections on suction and discharge lines.
 - e. Pressure gage 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 lubricant fittings at accessible bearing or lubrication line.
 - c. Blower fan shall be double-inlet type with forward-curved blades.
 - d. Shall be constructed from steel with a finish that aids with corrosion resistance and that is 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.
 2. Condenser fans:
 - a. Shall be a direct-driven propeller type fan.
 - b. Shall have aluminum blades riveted to steel spiders that have corrosion resistant properties and shall be dynamically balanced.
- N. (23 81 19.13.N.) Special features options and accessories:
 1. 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.
 2. 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.
3. Integrated EconoMi\$er® IV, EconoMi\$er 2, and EconoMi\$er X low leak rate models. (Factory or field-installed):
 - a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical return configuration shall be available.
 - 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.) Contain LED indicates 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 multi-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 models shall be 4-20mA design controlled directly by the RTU Open controller. RTU Open 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 for factory-installed economizers only. Outdoor air sensor setpoint shall be adjustable and shall range from 40°F to 100°F (4°C to 38°C.) Additional sensor options shall be available as accessories.
 - 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 airflow 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 to 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 (43°C to 27°C), set at a factory default of 32°F (0°C). Others shall open at 35°F (2°C) and closes 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.
4. Integrated EconoMi\$er® 2, and EconoMi\$er X Ultra Low Leak rate models. (Factory or field-installed):
- a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Independent modules for vertical return configuration shall be available.
 - 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 of 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 Fault Detection and Diagnostic (FDD) requirements.
 - 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 models shall be 4 to 20mA design controlled directly by the RTU Open controller. RTU Open 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 for factory-installed economizers only. Outdoor air sensor setpoint shall be adjustable and shall range from 40°F to 100°F (4°C to 38°C). Additional sensor options shall be available as accessories.
 - 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 to 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 (43°C to 27°C), set at a factory default of 32°F (0°C). 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.
5. Two-Position Motorized Damper:
 - a. Damper shall be a 2-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 for use with Staged Air Volume (SAV™) models.
 6. 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 for use with Staged Air Volume (SAV) models.
 7. Humidi-MiZer® adaptive dehumidification system (not available on 30 size models):
 - a. The Humidi-MiZer Adaptive Dehumidification System shall be factory-installed in 48TC17-28 models with RTPF (round tube plate-fin) condenser coils, and shall provide greater dehumidification of the occupied space by two modes of dehumidification operations besides 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.
 8. 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 between 90°F (32°C) and 110°F (43°C) at outdoor ambient temperatures down to -20°F (-29°C).
 9. Propane conversion kit:
 - a. 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 (4,267m).
 10. Condenser coil hail guard assembly:
 - a. Shall protect against damage from hail.
 - b. Shall be louvered style design.
 11. Unit-mounted, non-fused disconnect switch:
 - a. Switch shall be factory-installed, internally mounted.
 - b. National Electric Code (NEC) and UL 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.
12. Convenience outlet:
 - a. Powered convenience outlet:
 - 1.) Outlet shall be powered from main line power to the rooftop unit.
 - 2.) Outlet shall be powered from line side of disconnect by installing contractor, as required by code. If outlet is powered from load side of disconnect, unit electrical ratings shall be ETL certified and rated for additional outlet amperage.
 - 3.) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
 - 4.) Outlet shall include 15 amp GFI receptacles with independent fuse protection.
 - 5.) Voltage required to operate convenience outlet shall be provided by a factory-installed step-down transformer.
 - 6.) Outlet shall be accessible from outside the unit.
 - 7.) Outlet shall include a field-installed "Wet in Use" cover.
 - b. Factory-installed non-powered convenience outlet:
 - 1.) Outlet shall be powered from a separate 115-120v power source.
 - 2.) A transformer shall not be included.
 - 3.) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
 - 4.) Outlet shall include 15 amp GFI receptacles.
 - 5.) Outlet shall be accessible from outside the unit.
 - 6.) Outlet shall include a field-installed "Wet in Use" cover.
 - c. Field-installed non-powered convenience outlet:
 - 1.) Outlet shall be powered from a separate 115-120v power source.
 - 2.) A transformer shall not be included.
 - 3.) Outlet shall be factory-installed and internally mounted with easily accessible 115-v female receptacle.
 - 4.) Outlet shall include 20 amp GFI receptacles. This kit provides a flexible installation method which allows code compliance for height requirements of the GFCI outlet from the finished roof surface as well as the capability to relocate the outlet to a more convenient location.
 - 5.) Outlet shall be accessible from outside the unit.
 - 6.) Outlet shall include a field-installed "Wet in Use" cover.
 13. 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.
 14. Centrifugal propeller power exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.
 - b. Independent modules for vertical return configurations shall be available.
 - c. 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.
 15. 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.
 16. 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 48TC17-28 models to past Carrier design curb models: DP, DR, HJ, TM, and TJ. (Not for 48TJE024-28 models.) Check with Carrier sales expert for further details and information.
 17. High altitude gas conversion kit:
 - a. 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.
 18. Outdoor air enthalpy sensor:
 - a. 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.

Guide specifications (cont)

19. Return air enthalpy sensor:
 - a. The return air enthalpy sensor shall be used in conjunction with an outdoor air enthalpy sensor to provide differential enthalpy control.
20. 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.
21. 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.
22. Horn/strobe annunciator:
 - a. Provides an audible/visual signaling device for use with factory-installed option or field-installed accessory smoke detectors.
 - 1.) Requires installation of a field-supplied 24-v transformer suitable for 4.2 VA (AC) or 3.0 VA (DC) per horn/strobe accessory.
 - 2.) Requires field-supplied electrical box, North American 1-gang box, 2-in. (51 mm) x 4-in. (102 mm).
 - 3.) Shall have a clear colored lens.
23. 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).
24. 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.
25. Display kit for variable frequency drive (VFD):
 - 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.
26. 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.
27. Hinged access panels:
 - a. Shall provide easy access through hinged access doors with vinyl coated door retainers.
 - b. Shall be on major panels of – filter, control box, and fan motor.