Carrier

Turn to the experts

Product Data

WeatherMaker®
Single Packaged Rooftop
Gas Heat/Electric Cooling
Horizontal Air Flow Unit

15, 17.5, 20, 25 Nominal Tons

WeatherMaker®

Unit shown with economizer and power exhaust.

48TC 18, 21, 25, 29
with Puron® (R-410A) Refrigerant

Features/Benefits

Carrier's WeatherMaker® 15 to 25 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 easy to install, easy to maintain, easy to use and reliable.

Easy to install

These WeatherMaker units are designed for dedicated factory-supplied horizontal air flow duct configurations. No special field kits are required. This cabinet design also integrates a large control box that gives you room to work and room to mount Carrier accessory controls.

Easy to maintain

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

Easy to use

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

Reliable

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

Key features

- 2-stage cooling capability with independent circuits and control.
- High performance copper tube / aluminum plate fin (RTPF) condenser and evaporator coils with optional coating.
- Energy efficiency ratios (EERs) up to 10.8
- IEERs up to 11.0 with single speed indoor fan motor and 12.7 with 2-speed/VFD indoor fan motor
- Gas heating efficiencies up to 81% thermal efficiency.
- Dedicated horizontal air flow duct configuration models. No field kits required.
- Utility connections through the side or bottom. Bottom connections are also in an enclosed environment to help prevent water entry. Field supplied couplings are required.
- Standardized components and layout. Standardized components and controls make service and stocking parts easier.
- Scroll compressors on all units. This makes service, stocking parts, replacement, and troubleshooting easier.
- Precision sized thermostatic expansion valve (TXV) metering device on each refrigerant circuit.
- Easy-adjust, belt-drive motor available. Motor assembly also contains a fan belt break protection system on all models and reliable pillow block bearing system that allows lubrication 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 to 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 35°F/ 46°C to –2°C) standard on all models. Low ambient controller allows operation down to –20°F/–29°C.
- Redundant gas valve for 2-stage gas heating capacity control with induced-draft flue exhaust design to help ensure no flue gas can escape into the indoor air stream.
- Exclusive IGC solid-state gas controller for on board diagnostics with LED error code designation, burner control logic and energy saving indoor fan motor delay.
- 2-in. (51 mm) disposable filters on all units, with 4-in. (102 mm) filter track field-installed.
- Refrigerant filter-drier on each circuit.
- High and low pressure switches. Added reliability with high-pressure switch and low-pressure switch.
- Many factory-installed options ranging from air management economizers, 2-position dampers, manual outdoor air dampers, plus convenience outlets, disconnect switch and smoke detectors.
- Factory-installed Humidi-MiZer® adaptive dehumidification system.
- Standard Parts Warranty: 10-year aluminized heat exchanger, 5-year compressor, 1-year others.
- Staged air volume (SAV™) indoor fan motor speed between cooling stages. Available on 2-stage cooling models 18-29 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.

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Model number nomenclature

48TC UNITS MODEL NUMBER NOMENCLATURE (EXAMPLE)

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	5	A	5	A	5	-	0	A	0	A	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 Round Tube/Plate Fin Coils
E = Two stage cooling models with Humidi-MiZer® System

Cooling Tons (Horizontal Air Flow)
18 = 15 tons
21 = 17.5 tons
25 = 20 tons
29 = 25 tons

Sensor Options
A = None
B = RA Smoke Detector
C = SA Smoke Detector
D = RA + SA Smoke Detector
E = CO_2
F = RA Smoke Detector and CO_2
G = SA Smoke Detector and CO_2
H = RA + SA Smoke Detector and CO_2
J = Condensate Overflow Switch
K = Condensate Overflow Switch and RA Smoke Detectors
L = Condensate Overflow Switch and RA and SA Smoke Detectors

Indoor Fan Options & Air Flow Configuration
5 = Standard Static/Horizontal Supply, Return Air Flow (except 29 size models)
6 = Medium Static/Horizontal Supply, Return Air Flow (Standard on 29 size models)
7 = High Static/Horizontal Supply, Return Air Flow
F = Medium Static, High Efficiency Motor/Horizontal Supply, Return Air Flow
G = High Static, High Efficiency Motor/Horizontal Supply, Return Air Flow

NOTE:
Not all possible options are displayed. See the current 48TC Horizontal 15 to 25 Ton Price Pages for more details.

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) and Non-Fused Disconnect

Service Options
0 = None
1 = Unpowered Convenience Outlet
2 = Powered Convenience Outlet
3 = Hinged Panels
4 = Hinged Panels + Unpowered Convenience Outlet
5 = Hinged Panels + Powered Convenience Outlet

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/ Barometric Relief
W = Enthalpy Ultra Low Leak Economizer w/ Barometric Relief

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

Design Revision
- = Factory Design Revision

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

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

AHRI CERTIFIED™ www.ahridirectory.org
Unitary Large AC
AHRI Standard 340/360
Certification applies only when the complete system is listed with AHRI.

ASHRAE 90.1 COMPLIANT

C ETL LISTED US Intertek

Puron

AHRI capacity ratings

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
18	2	15.0	172.0	15.9	10.8	11.0	12.7
21	2	17.5	200.0	18.5	10.8	11.0	12.7
25	2	20.0	232.0	21.5	10.8	11.0	12.4
29	2	25.0	280.0	28.6	9.8	N/A*	11.0

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

* Model only available with 2-Speed Indoor Fan Motor.

NOTES:
1. Rated and certified under AHRI Standard 340/360, as appropriate.
2. Ratings are based on:
   Cooling Standard: 80°F (27°C) db, 67°F (19°C) wb indoor.
   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.
3. The 48TC rooftops meets the DOE-2018 (Department of Energy), ASHRAE 90.1-2016 and IECC[1]-2015 minimum efficiency requirements when equipped with the SAV™ (staged air volume) option.

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

HEATING RATING TABLE - NATURAL GAS AND PROPANE

48TC UNIT	HEAT SIZE	AL/SS HEAT EXCHANGER		TEMP RISE (°F)	THERMAL EFFICIENCY (%)
		INPUT / OUTPUT STAGE 2 (MBH)	INPUT / OUTPUT STAGE 1 (MBH)		
18	LOW	220 / 178	176 / 142	20 - 55	81%
	MED	310 / 251	248 / 200	30 - 60	81%
	HIGH	400 / 324	320 / 260	35 - 65	81%
21	LOW	220 / 178	176 / 142	15 - 55	81%
	MED	310 / 251	248 / 200	25 - 60	81%
	HIGH	400 / 324	320 / 260	30 - 65	81%
25	LOW	220 / 178	176 / 142	15 - 55	81%
	MED	310 / 251	248 / 200	20 - 60	81%
	HIGH	400 / 324	320 / 260	30 - 65	81%
29	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:
1. 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.
2. The input rating for altitudes above 2000 ft (610 m) must be derated by 4% for each 1000 ft (305 m) above sea level.

AHRI capacity ratings (cont)

SOUND PERFORMANCE

48TC MODEL SIZE	CLG STAGES	OUTDOOR SOUND (dB) AT 60 HZ									
		A-WGT	AHRI 370 RATING	63	125	250	500	1000	2000	4000	8000
18	2	84.1	84	92.2	83.9	80.4	81.8	78.7	76.5	72.2	65.4
21	2	84.1	84	92.2	83.9	80.4	81.8	78.7	76.5	72.2	65.4
25	2	86.5	87	95.6	87.5	84.2	84.2	81.7	77.9	73.2	66.3
29	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
18	LOW	4500	5070	3380	7500	3000	8250	3000	8250
	MED					3880	7750	3880	7750
	HIGH					4620	8570	4620	8570
21	LOW	5250	5915	3943	9000	3000	11000	3000	11000
	MED					3880	9300	3880	9300
	HIGH					4620	10000	4620	10000
25	LOW	6000	7500	5000	10000	3000	11000	3000	11000
	MED					3880	11630	3880	11630
	HIGH					4620	10000	4620	10000
29	LOW	7500	8450	5633	12500	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

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

		48TC*D18	48TC*E18	48TC*D21	48TC*E21
REFRIGERATION SYSTEM					
	# Circuits / # Comp. / Type	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 Scroll
	R-410A charge A/B (lbs)	17/16.4	24.5/25.7	17.5/16.8	25.5/25.5
	Metering device	TXV	TXV	TXV	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.RTPF	3/8-in.RTPF	3/8-in.RTPF	3/8-in.RTPF
	Rows / FPI	4 / 15	4 / 15	4 / 15	4 / 15
	Total face area (ft²)	22	22	22	22
	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.RTPF	—	3/8-in.RTPF
	Rows / FPI	—	1 / 17	—	1 / 17
	Total face area (ft²)	—	22	—	22
EVAP. FAN AND MOTOR HORIZONTAL					
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	1100
	Max Blower/Shaft RPM	1100	1100	1100	56
	Motor frame size	56	56	56	622-822
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11
MEDIUM STATIC	**Motor Qty / Belt Qty / Driver Type**	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	3.7	3.7	4.9	4.9
	RPM range	614-780	614-780	713-879	713-879
	Max Blower/Shaft RPM	1100	1100	1100	1100
	Motor frame size	56	56	56	56
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11
HIGH STATIC	**Motor Qty / Belt Qty / Driver Type**	1/1/Belt	1/1/Belt	—	—
	Max BHP	4.9	4.9	—	—
	RPM range	746-912	746-912	—	—
	Max Blower/Shaft RPM	1100	1100	—	—
	Motor frame size	56	56	—	—
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	—	—
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	—	—
HIGH STATIC HIGH EFFICIENCY	**Motor Qty / Belt Qty / Driver Type**	—	—	1/1/Belt	1/1/Belt
	Max BHP	—	—	6.5/ 6.9/ 7.0/ 8.3	6.5/ 6.9/ 7.0/ 8.3
	RPM range	—	—	835-1021	835-1021
	Max Blower/Shaft RPM	—	—	1100	1100
	Motor frame size	—	—	184T	184T
	Fan Qty. / Type	—	—	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	—	—	18 x 15/15 X 11	18 x 15/15 X 11

Physical data (cont)

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

		48TC*D25	48TC*E25	48TC*D29	48TC*E29
REFRIGERATION SYSTEM					
	# Circuits / # Comp. / Type	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 / Scroll	2 / 2 Scroll
	R-410A charge A/B (lbs)	23.8/23.1	30.0/30.7	24.9/27.7	35.1/35.4
	Metering device	TXV	TXV	TXV	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.RTPF	3/8-in.RTPF	3/8-in.RTPF	3/8-in.RTPF
	Rows / FPI	4 / 15	4 / 15	4 / 15	4 / 15
	Total face area (ft²)	26	26	26	26
	Condensate drain conn. size	3/4-in.	3/4-in.	3/4-in.	3/4-in.
HUMIDIMIZER COIL					
	Material	—	Cu / Al	—	Cu / Al
	Tube Diameter	—	3/8-in.RTPF	—	3/8-in.RTPF
	Rows / FPI	—	1 / 17	—	1 / 17
	Total face area (ft²)	—	26	—	26
EVAP. FAN AND MOTOR HORIZONTAL					
STANDARD STATIC	**Motor Qty / Belt Qty / Driver Type**	1/1/Belt	1/1/Belt	—	—
	Max BHP	4.9	4.9	—	—
	RPM range	690-863	690-863	—	—
	Max Blower/Shaft RPM	1100	1100	—	—
	Motor frame size	56	56	—	—
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	—	—
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	—	—
MEDIUM STATIC HIGH EFFICIENCY	**Motor Qty / Belt Qty / Driver Type**	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
	RPM range	835-1021	835-1021	755-923	755-923
	Max Blower/Shaft RPM	1100	1100	1100	1100
	Motor frame size	184T	184T	184T	184T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11
HIGH STATIC HIGH EFFICIENCY	**Motor Qty / Belt Qty / Driver Type**	1/1/Belt	1/1/Belt	1/1/Belt	1/1/Belt
	Max BHP	10.5/11.9/11.9/11	10.5/11.9/11.9/11	10.5/11.9/11.9/11	10.5/11.9/11.9/11
	RPM range	941-1100	941-1100	906-1100	906-1100
	Max Blower/Shaft RPM	1100	1100	1100	1100
	Motor frame size	213T	213T	213T	213T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11	18 x 15/15 X 11

Physical data (cont)

PHYSICAL DATA (COOLING), 15 - 25 TONS RTPF — ROUND TUBE/PLATE FIN COIL DESIGN

	48TC*D18	48TC*E18	48TC*D21	48TC*E21	48TC*D25	48TC*E25	48TC*D29	48TC*E29
COND. COIL (CIRCUIT A)								
Coil Type	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF
Coil length (in.)	70	70	72	72	82	82	95	95
Coil Height (in.)	44	44	44	44	52	52	52	52
Rows / FPI	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17
Total face area (ft^2)	21.4	21.4	22.0	22.0	29.6	29.6	34.3	34.3
COND. COIL (CIRCUIT B)								
Coil Type	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF	RTPF
Coil length (in.)	70	70	64	64	80	80	95	95
Coil Height (in.)	44	44	44	44	52	52	52	52
Rows / FPI	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17	2 / 17
Total face area (ft^2)	21.4	21.4	19.5	19.5	29.6	29.6	34.3	34.3
COND. fan / motor								
Qty / Motor drive type	3 / direct	3 / direct	4 / direct	4 / direct	4 / direct	4 / direct	6 / direct	6 / direct
Motor HP / RPM	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan diameter (in.)	22	22	22	22	22	22	22	22
FILTERS								
RA filter # / Size (in.)	6 / 20 x 25 x 2	6 / 20 x 25 x 2	6 / 20 x 25 x 2	6 / 20 x 25 x 2	9 / 16 x 25 x 2	9 / 16 x 25 x 2	9 / 16 x 25 x 2	9 / 16 x 25 x 2
OA inlet screen # / Size (in.)	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1	4 / 16 x 25 x 1

Physical data (cont)

PHYSICAL DATA (HEATING), 15 - 25 TONS

		48TC**18	48TC**21	48TC**25	48TC**29
GAS CONNECTION					
	# of Gas Valves	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
	LP supply line press (in. wg) / (PSIG)	11-13 / 0.40-0.47	11-13 / 0.40-0.47	11-13 / 0.40-0.47	11-13 / 0.40-0.47
	Heat Anticipator setting (Amps)	—	—	—	—
	First stage	0.14	0.14	0.14	0.14
	Second stage	0.14	0.14	0.14	0.14
NATURAL GAS HEAT					
LOW	**# of Stages / # of burners (total)**	2 / 5	2 / 5	2 / 5	2 / 5
	Connection size	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
	Temperature Rise (°F)	25-55	25-55	25-55	25-55
MED	**# of Stages / # of burners (total)**	2 / 7	2 / 7	2 / 7	2 / 7
	Connection size	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
	Temperature Rise (°F)	30-60	30-60	30-60	30-60
HIGH	**# of Stages / # of burners (total)**	2 / 10	2 / 10	2 / 10	2 / 10
	Connection size	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
	Temperature Rise (°F)	35-65	35-65	35-65	35-65
LIQUID PROPANE HEAT					
LOW	**# of Stages / # of burners (total)**	2 / 5	2 / 5	2 / 5	2 / 5
	Connection size	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
	Temperature Rise (°F)	25-55	25-55	25-55	25-55
MED	**# of Stages / # of burners (total)**	2 / 7	2 / 7	2 / 7	2 / 7
	Connection size	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
	Temperature Rise (°F)	30-60	30-60	30-60	30-60
HIGH	**# of Stages / # of burners (total)**	2 / 10	2 / 10	2 / 10	2 / 10
	Connection size	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
	Temperature Rise (°F)	35-65	35-65	35-65	35-65

OPERATING WEIGHTS

48TC	**UNIT LB (KG)**			
	18	**21**	**25**	**29**
Base Unit	1892 (858)	2102 (954)	2247 (1019)	2292 (1040)
Economizer	246 (112)	246 (112)	246 (112)	246 (112)
Powered Outlet	35 (16)	35 (16)	35 (16)	35 (16)
Humidi-MiZer® System	110 (50)	120 (54)	120 (54)	120 (54)
Curb	240 (109)	255 (116)	255 (116)	255 (116)
14-in./356 mm				
24-in./610 mm	340 (154)	355 (161)	355 (161)	355 (161)

Options and accessories

FACTORY-INSTALLED OPTIONS AND FIELD-INSTALLED ACCESSORIES

CATEGORY	ITEM	FACTORY INSTALLED OPTION	FIELD INSTALLED ACCESSORY
Cabinet	Hinged Access Panels	X	
Coil Options	Cu/Cu (indoor and outdoor) coils	X	
	E-coated (indoor and outdoor) coils	X	
	Pre-coated outdoor coils	X	
Humidity Control	Humidi-MiZer Adaptive Dehumidification System	X	
Condenser Protection	Condenser coil hail guard (louvered design)	X	X
Controls	Thermostats, temperature sensors, and subbases		X
	PremierLink™ DDC communicating controller [8]	X	X
	RTU Open protocol controller	X	
	Smoke detector (supply and/or return air)	X	X
	Horn/Strobe Annunciator [7]	X	X
	Time Guard II compressor delay control circuit		X
	Phase Monitor		X
	Condensate Overflow switch		X
Economizers & Outdoor Air Dampers	EconoMi$er IV for electro-mechanical controls Non FDD (Low Leak air damper models) [5]	X	X
	EconoMi$er2 for DDC controls, complies with FDD (Low Leak and Ultra Low Leak air damper models) [5, 6]	X	X
	Motorized 2 position outdoor-air damper [8]	X	X
	Manual outdoor-air damper (25%) [8]	X	X
	Barometric relief [1]	X	X
	Barometric hood (Horizontal economizer)		X
	Power exhaust–centrifugal blower		X
	Ultra-Low Leak EconoMi$er X for electro-mechanical controls, complies with FDD. (Low Leak and Ultra Low Leak air damper models) [5]	X	X
Economizer Sensors & IAQ Devices	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
	Unit mounted CO_2 sensor [2]	X	
	4-in Filter Track Assembly		X
Gas Heat	Propane conversion kit		X
	Stainless steel heat exchanger	X	
	High altitude conversion kit		X
	Flue Discharge Deflector		X
Indoor Motor & Drive	Multiple motor and drive packages	X	
	Staged Air Vol (SAV™) system w/VFD controller	X	
	Display Kit for SAV™ system with VFD		X
Low Ambient Control	Winter start kit [2]		X
	Motormaster® head pressure controller to –20°F (–29°C) [3]		X
Power Options	Convenience outlet (powered)	X	
	Convenience outlet (un-powered): 15 amp factory-installed, 20 amp field-installed	X	X
	Non-fused disconnect [4]	X	
Roof Curbs	Roof curb 14-in. (356 mm)		X
	Roof curb 24-in. (610 mm)		X

NOTES:
1. Included with economizer.
2. Sensors used to optimize economizer performance.
3. See application data for assistance.
4. 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.
5. FDD (Fault Detection and Diagnostic) capability per California Title 24 section 120.2.
6. Models with RTU Open DDC controls comply with California Title 24 Fault Detection and Diagnostic (FDD). PremierLink controller is non FDD.
7. Requires a field-supplied 24V transformer for each application. See price pages for details.
8. Not available with SAV.

Options and accessories (cont)

Factory-installed accessories

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 CO_2 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.

CO_2 sensor

The CO_2 sensor works with the economizer to intake only the correct amount of outside air for ventilation. As occupants fill your building, the CO_2 sensor detects their presence through increasing CO_2 levels, and opens the economizer appropriately.

When the occupants leave, the CO_2 levels decrease, and the sensor appropriately closes the economizer. This intelligent control of the ventilation air, called Demand Controlled Ventilation (DCV), reduces the overall load on the rooftop, saving money.

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 the disconnect 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 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. SAV is required on all units installed in the United States. PremierLink is not available with SAV.

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 (BACnet[1], Modbus[2], N2, and LonWorks[3]). Use this controller when you have an existing BAS.

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 available with Staged Air Volume (SAV) fan speed system.

Manual OA damper

Manual outdoor air dampers are an economical way to bring in ventilation air. The dampers are available in 25% versions. Not available with Staged Air Volume (SAV) fan speed system.

Optional Humidi-MiZer adaptive dehumidification system

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® 48TC18-29 rooftop coupled with the Humidi-MiZer system is capable of operating in normal design cooling mode, subcooling mode, and hot gas reheat mode. Normal design cooling mode is when the unit will operate under its normal sequence of operation by cycling compressors to maintain comfort conditions.

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

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1. BACnet is a trademark of ASHRAE.
2. Modbus is a registered trademark of Schneider Electric.
3. LonWorks is a registered trademark of Echelon Corporation.

Options and accessories (cont)

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.

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.

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.

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.

Barometric hood

For horizontal economizer applications where relief damper is installed in duct work, this kit provides the needed protection.

Hinged access panels

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

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

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.

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.

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

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.

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.

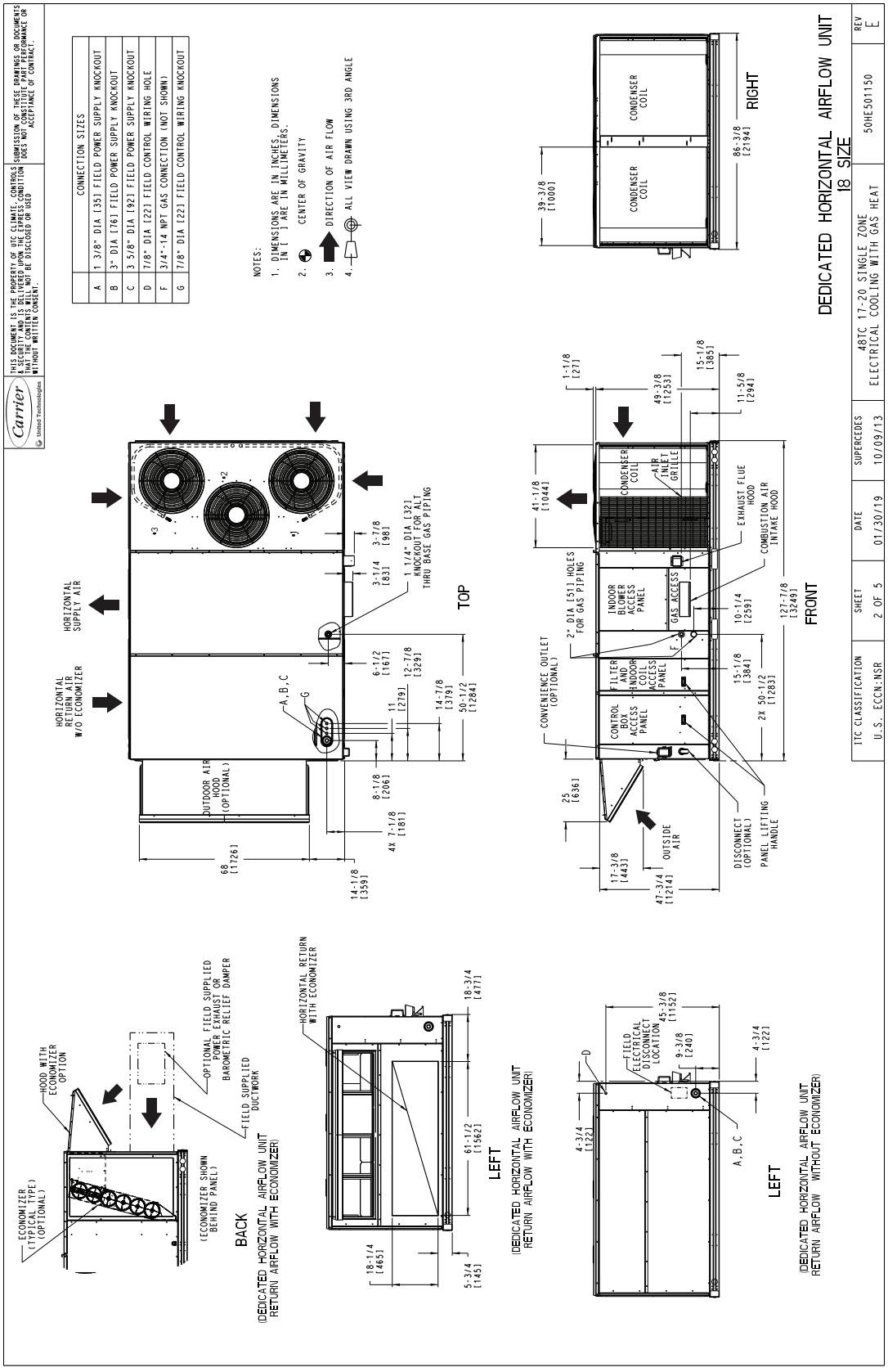
OPTIONS AND ACCESSORIES — WEIGHT ADDERS

BASE UNIT WITH OPTIONS AND ACCESSORIES (WEIGHT ADDERS)	MAX WEIGHT ADDER							
	48TC**18		48TC**21		48TC**25		48TC**29	
	lb	kg	lb	kg	lb	kg	lb	kg
Humidi-MiZer® System*	110	50	120	55	120	55	120	55
Base Unit Operating Weight	1892	858	2102	953	2247	1019	2292	1040
Power Exhaust	125	57	125	57	125	57	125	57
EconoMi$er® (IV, X, or 2)	246	112	246	112	246	112	246	112
Copper Tube/Fin Evaporator Coil	53	24	58	26	64	29	64	29
Low Gas Heat	85	39	85	39	85	39	85	39
Medium Gas Heat	90	41	90	41	90	41	90	41
High Gas Heat	113	51	113	51	113	51	113	51
Flue Discharge Deflector	7	3	7	3	7	3	7	3
Roof Curb 14-in. (356 mm)	240	109	255	116	255	116	255	116
Roof Curb 24-in. (610 mm)	340	154	355	161	355	161	355	161
Louvered Hail Guard	60	27	60	27	120	54	150	68
CO_2 sensor	5	2	5	2	5	2	5	2
Return Smoke Detector	5	2	5	2	5	2	5	2
Supply Smoke Detector	5	2	5	2	5	2	5	2
Fan/Filter Status Switch	2	1	2	1	2	1	2	1
Non-Fused Disconnect	15	7	15	7	15	7	15	7
Powered Convenience Outlet	35	16	35	16	35	16	35	16
Non-Powered Convenience Outlet	5	2	5	2	5	2	5	2
Enthalpy Sensor	2	1	2	1	2	1	2	1
Differential Enthalpy Sensor	3	1	3	1	3	1	3	1
Two Position Motorized Damper	50	23	50	23	65	29	65	29
Manual Damper	35	16	35	16	35	16	40	18
Field Filter Track 4-in. (102 mm)	12	5	12	5	12	5	12	5
Motormaster® Controller	39	18	39	18	39	18	39	18
Standard Static Motor/Drive	0	0	0	0	0	0	0	0
Medium Static Motor/Drive	5	2	6	3	6	3	6	3
High Static Motor/Drive	11	5	12	5	16	7	16	7
Barometric Relief Hood (Horizontal)	25	11	25	11	25	11	25	11
SAV™ System with VFD	20	9	20	9	20	9	20	9

* For Humidi-MiZer® system, add Motormaster® controller.

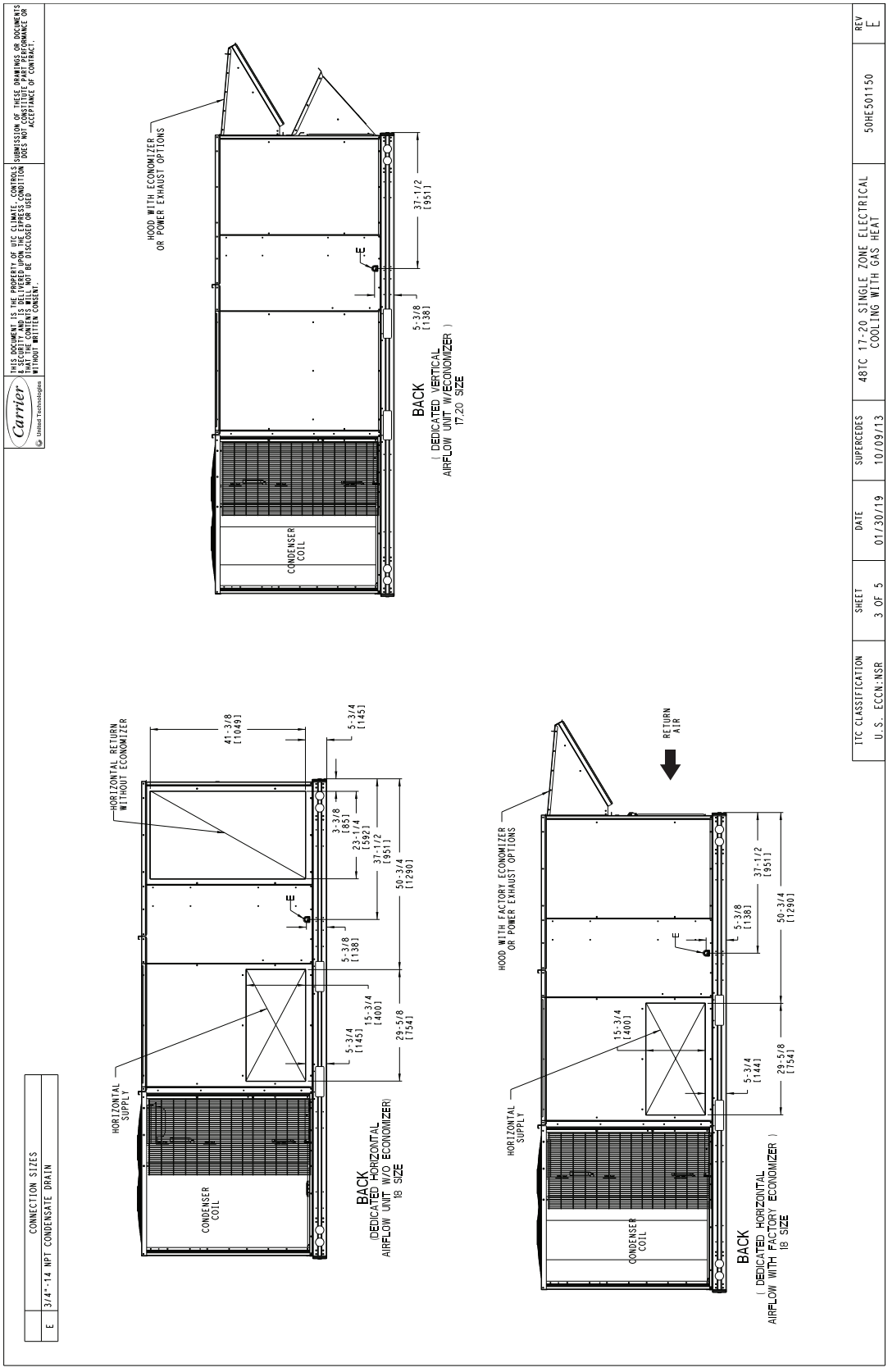
Dimensions

48TC**18 HORIZONTAL AIRFLOW



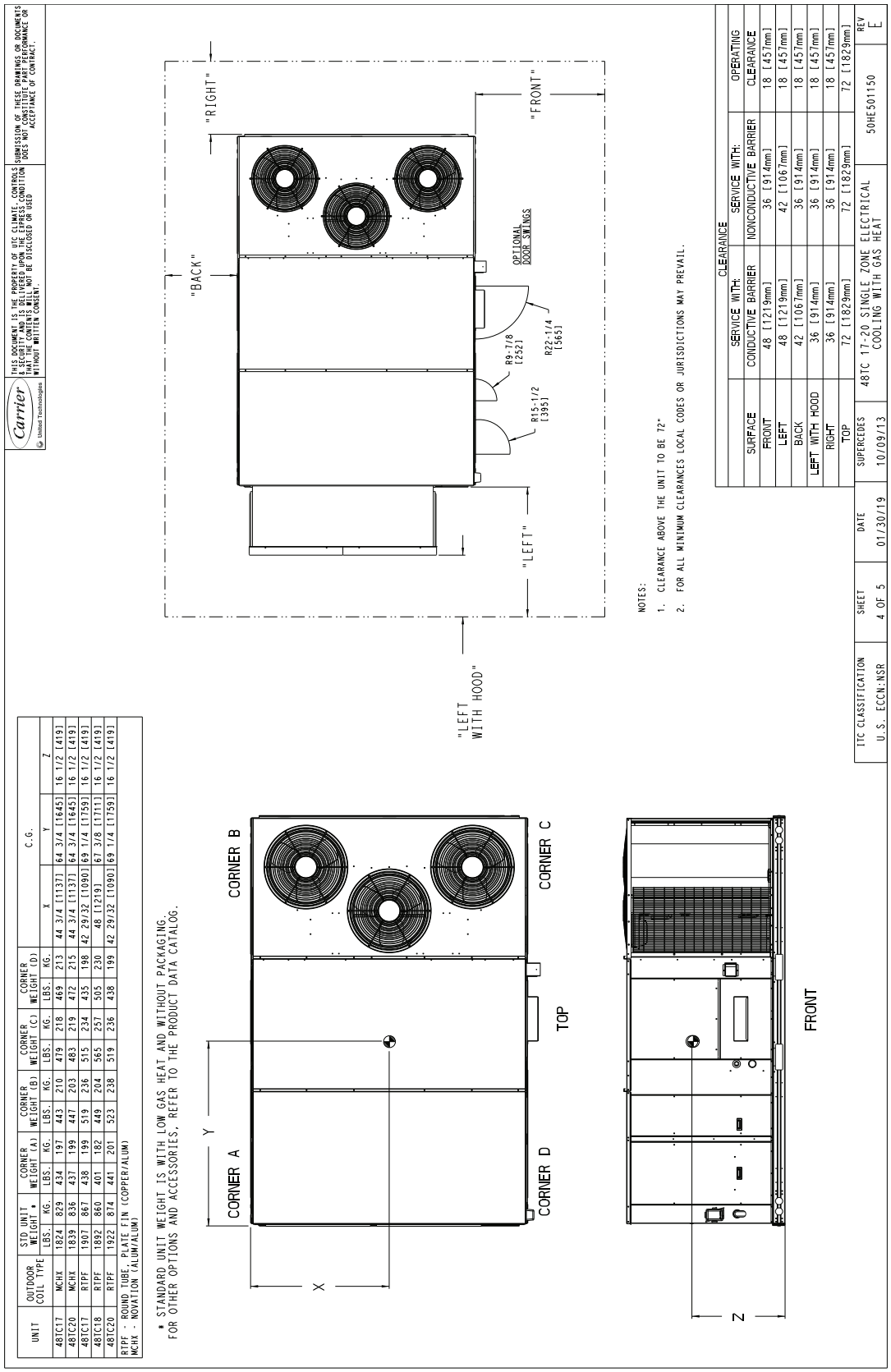
Dimensions (cont)

48TC**18 BACK VIEW AND CONDENSATE DRAIN LOCATION



Dimensions (cont)

48TC**18 CORNER WEIGHTS AND CLEARANCES



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

RTPF - ROUND TUBE, PLATE FIN (COPPER/ALUM)
MCHX - NOVATION (ALUM/ALUM)

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

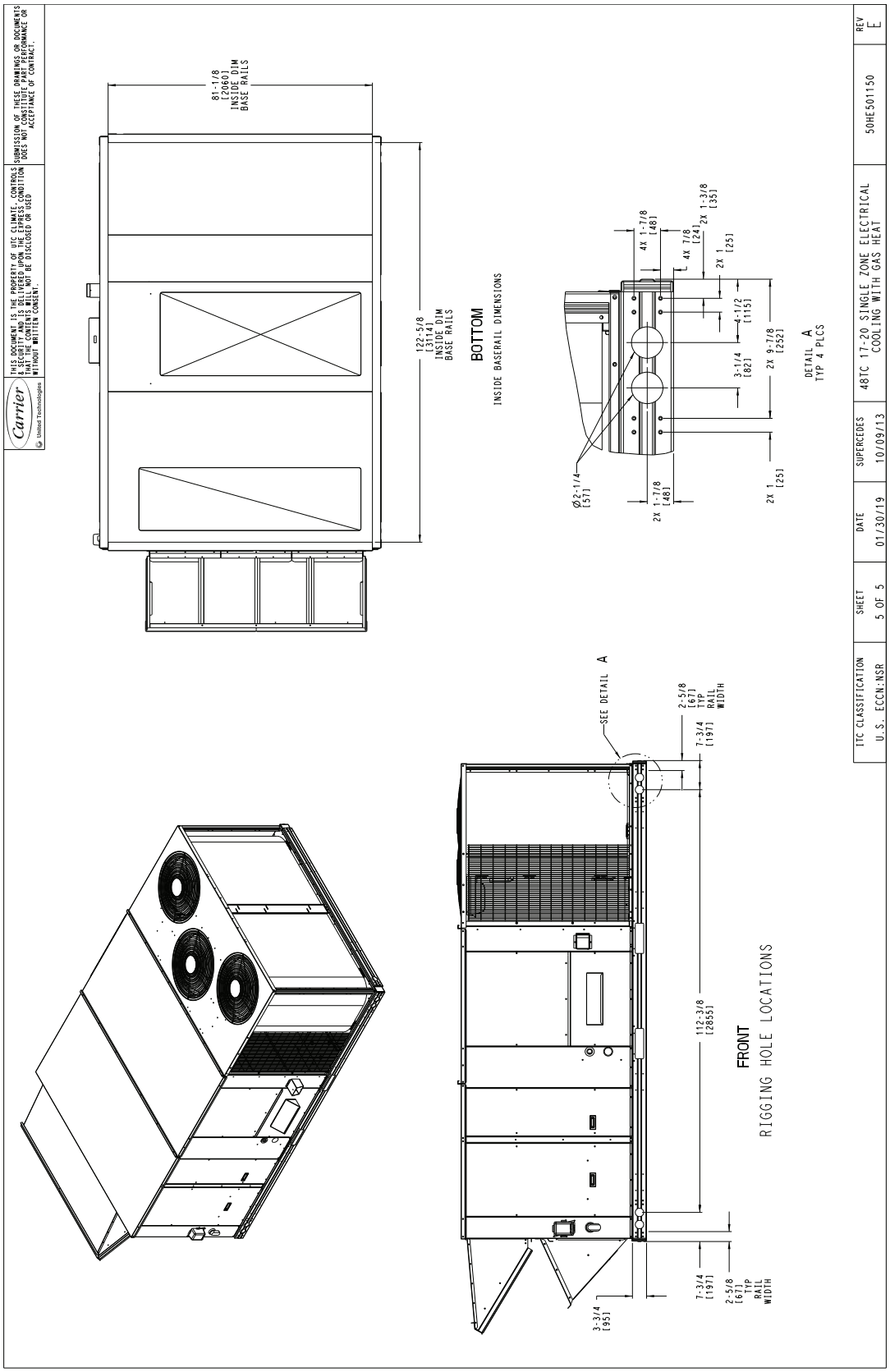
NOTES:
1. CLEARANCE ABOVE THE UNIT TO BE 72"
2. FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

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

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48TC 17-20 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	50HE501150	REV
U.S. ECCN:NSR	4 OF 5	01/30/19	10/09/13			E

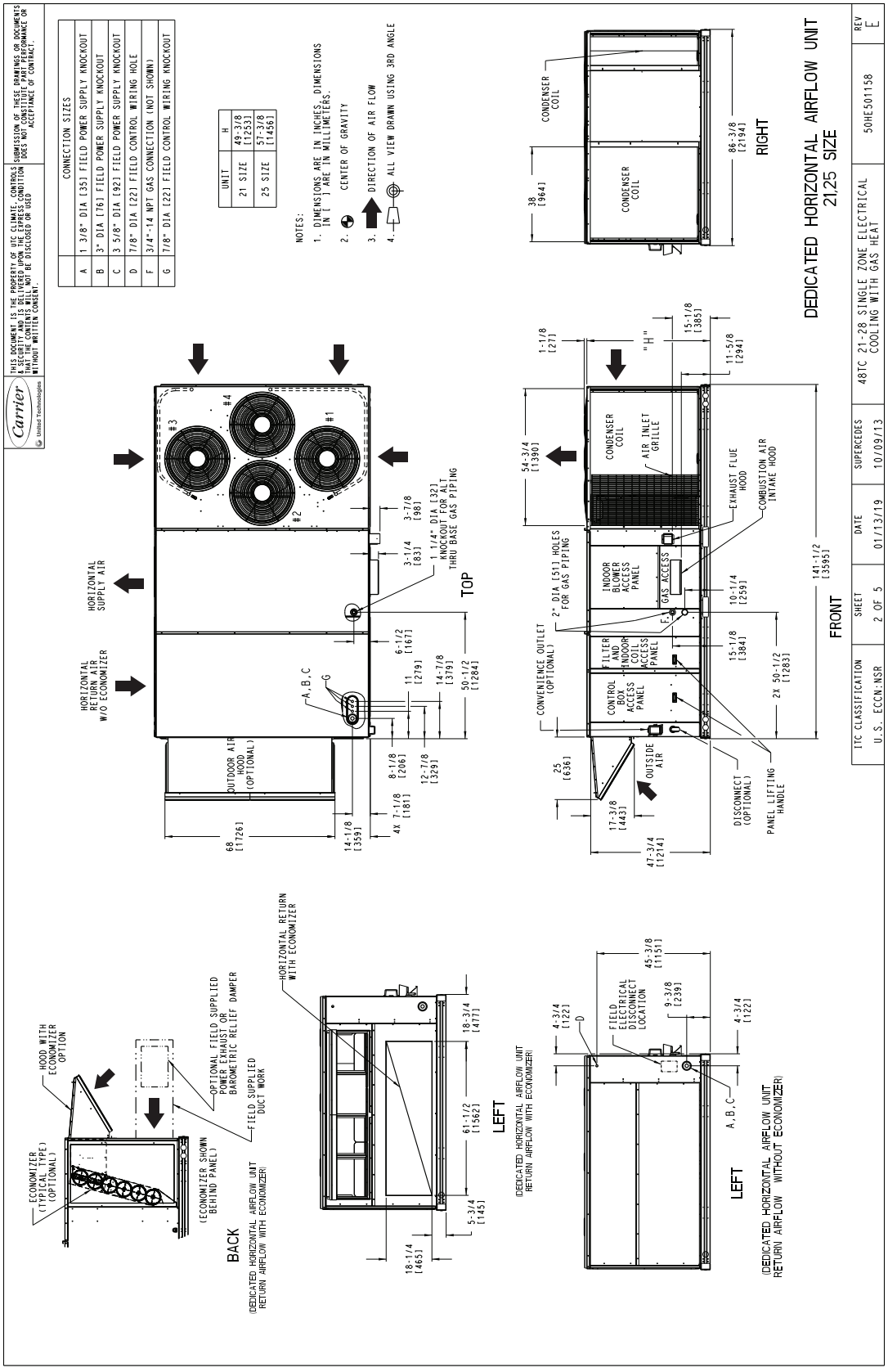
Dimensions (cont)

48TC**18 BOTTOM VIEW



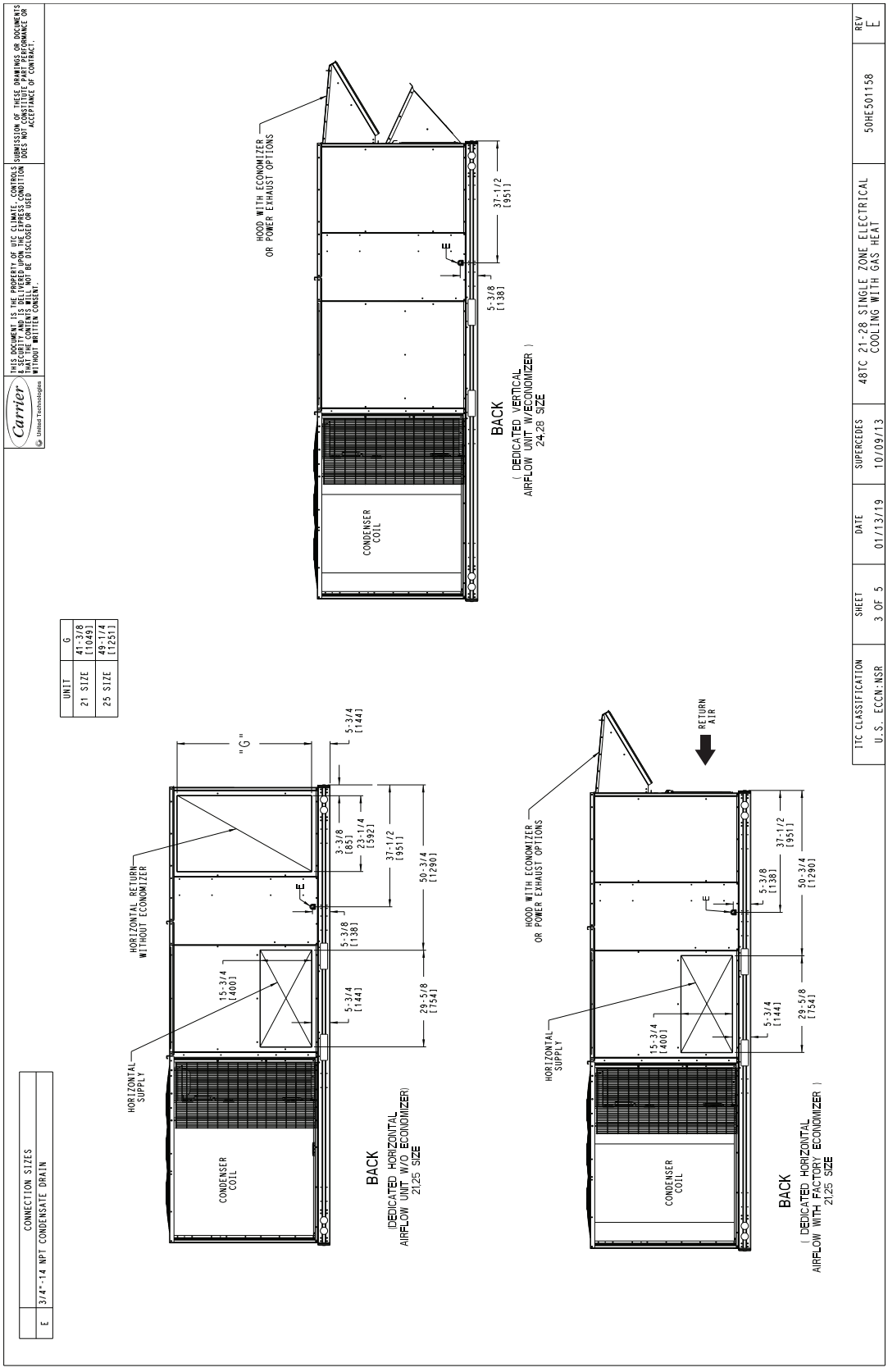
Dimensions (cont)

48TC**21-25 HORIZONTAL AIRFLOW



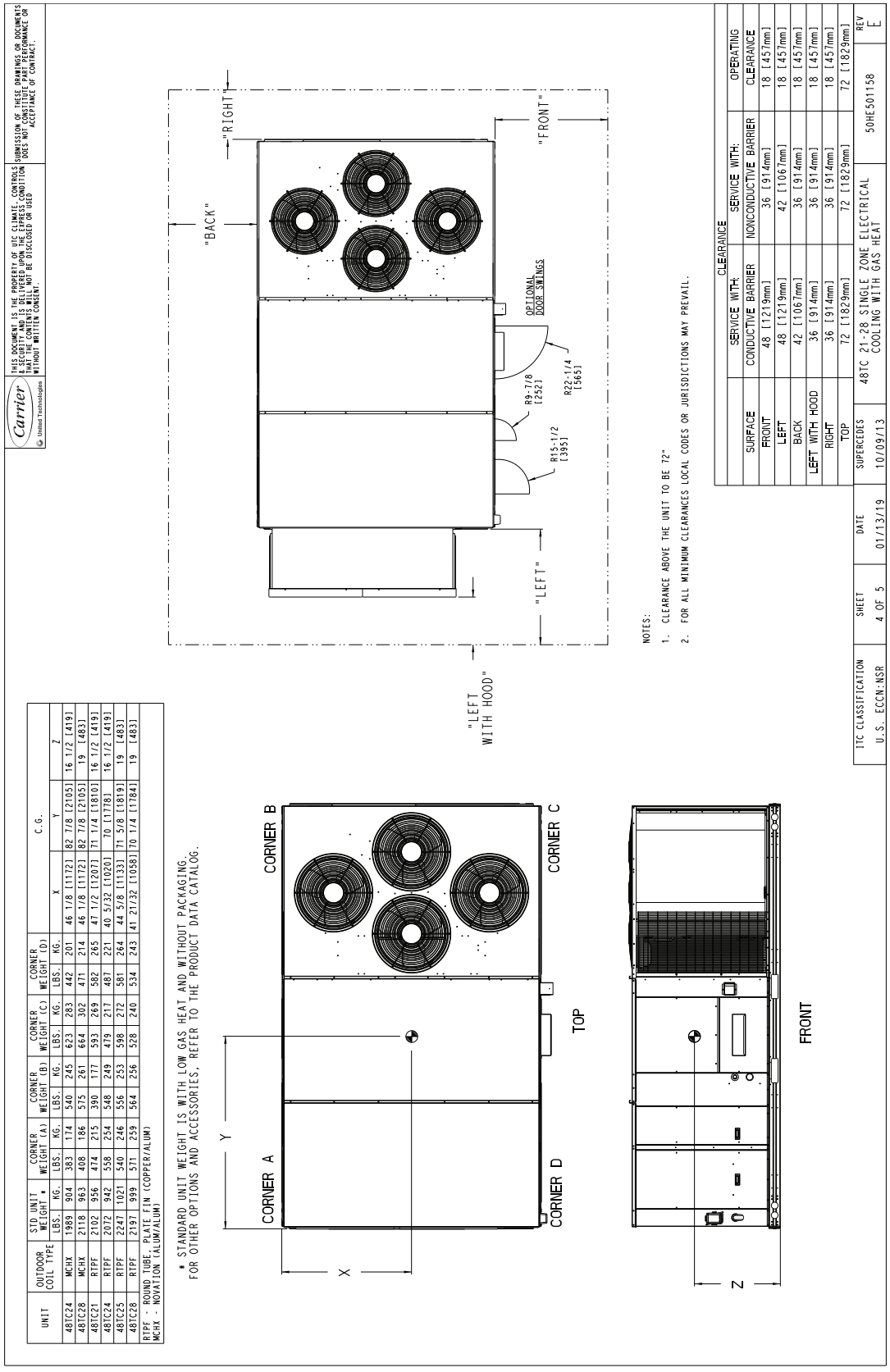
Dimensions (cont)

48TC**21-25 BACK VIEW AND CONDENSATE DRAIN LOCATION



Dimensions (cont)

48TC**21-25 CORNER WEIGHTS AND CLEARANCES



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.	LBS.	KG.	X	Y	Z
48TC24	MCHX	1989	904	383	174	540	245	623	283	442	201	46 1/8 [1172]	82 7/8 [2105]	16 1/2 [419]
48TC28	MCHX	2118	963	408	186	575	261	664	302	471	214	46 1/8 [1172]	82 7/8 [2105]	19 [483]
48TC21	RTPF	2102	956	474	215	390	177	593	269	582	265	47 1/2 [1207]	71 1/4 [1810]	16 1/2 [419]
48TC24	RTPF	2072	942	558	254	548	249	479	217	487	221	40 5/32 [1020]	70 [1778]	16 1/2 [419]
48TC25	RTPF	2247	1021	540	246	556	253	598	272	581	264	44 5/8 [1133]	71 5/8 [1819]	19 [483]
48TC28	RTPF	2197	999	571	259	564	256	528	240	534	243	41 21/32 [1058]	70 1/4 [1784]	19 [483]

RTPF - ROUND TUBE, PLATE FIN (COPPER/ALUM)
MCHX - NOVATION (ALUM/ALUM)

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

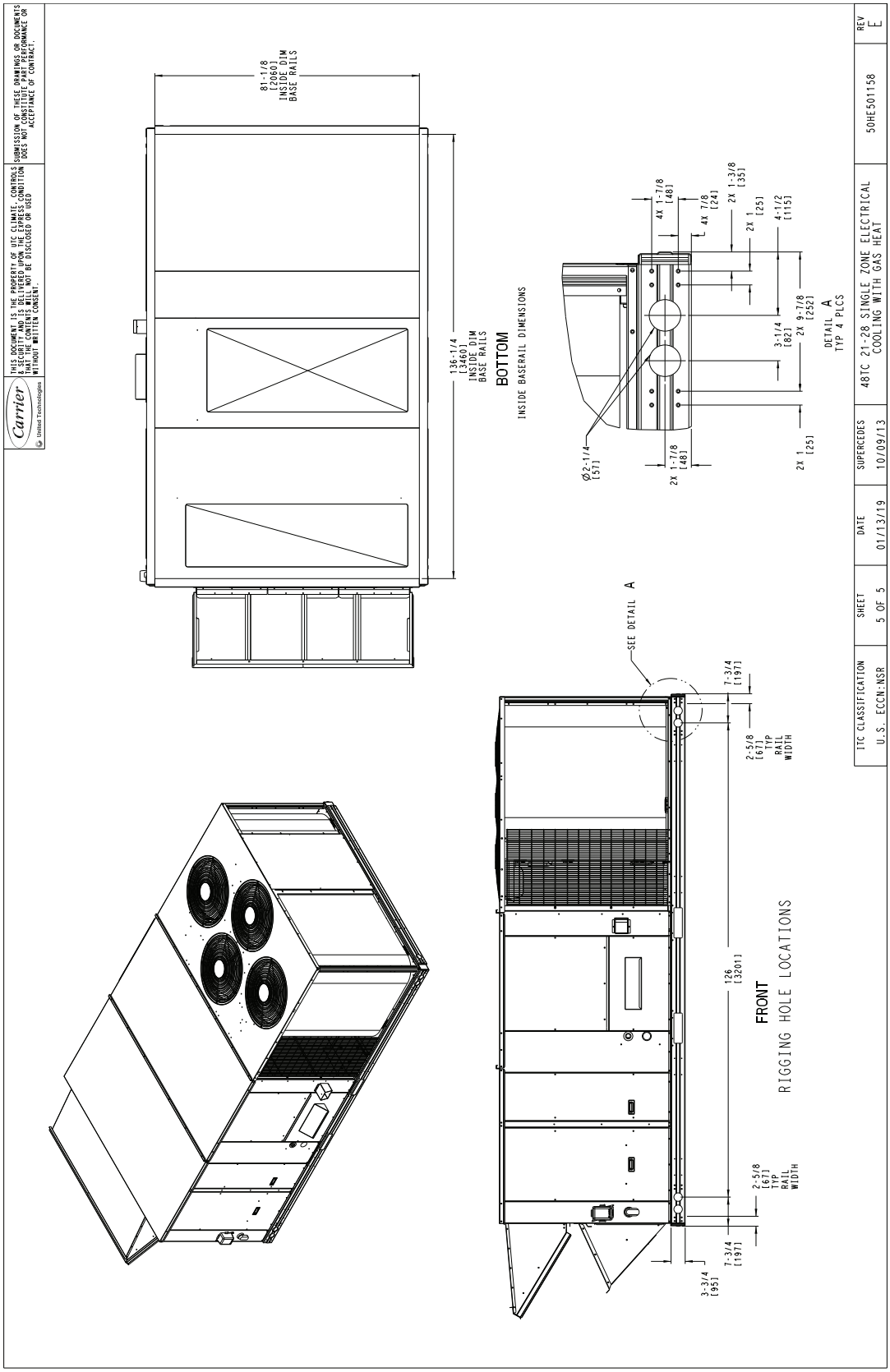
NOTES:
1. CLEARANCE ABOVE THE UNIT TO BE 72"
2. FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

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

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

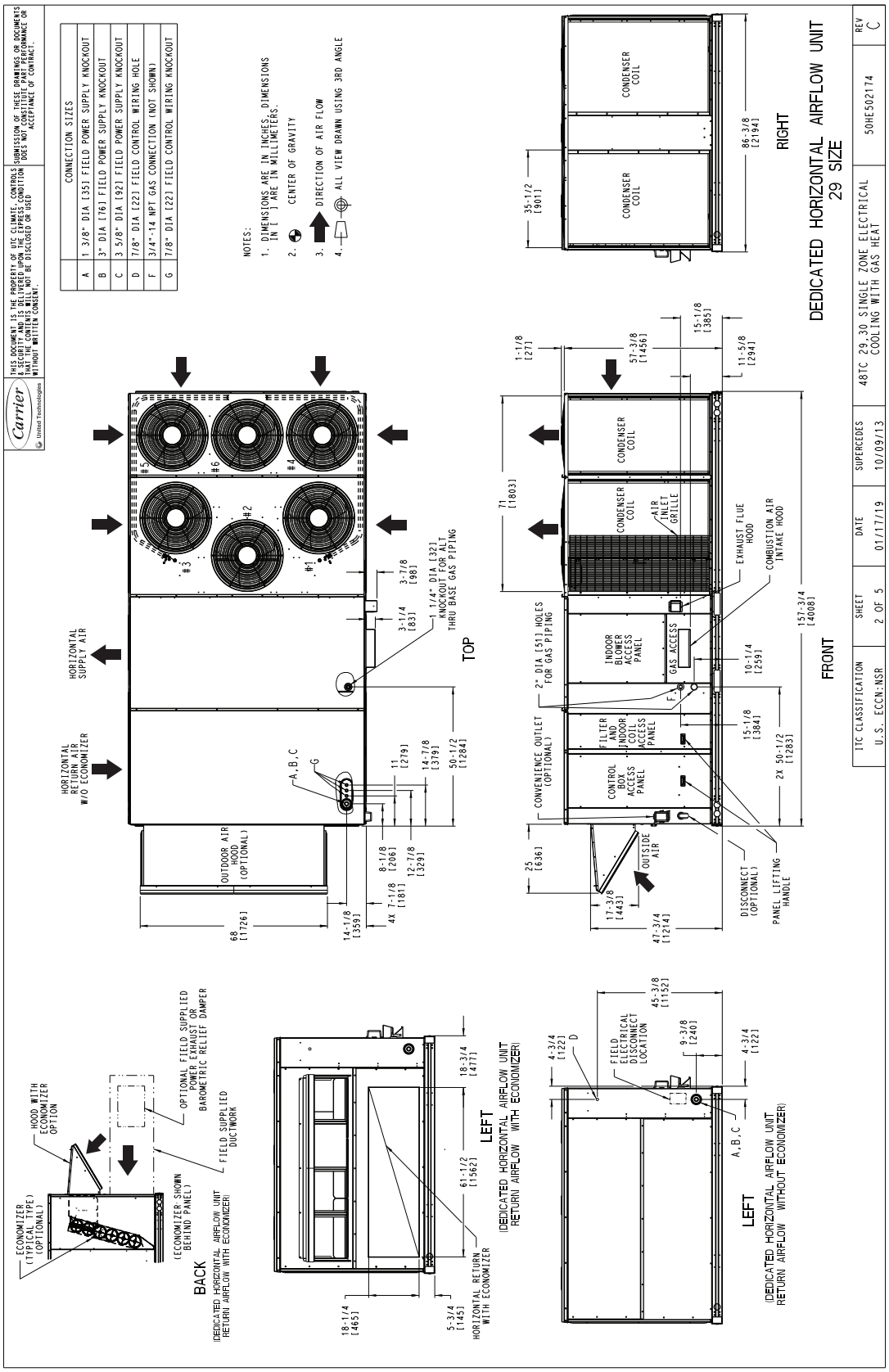
Dimensions (cont)

48TC**21-25 BOTTOM VIEW



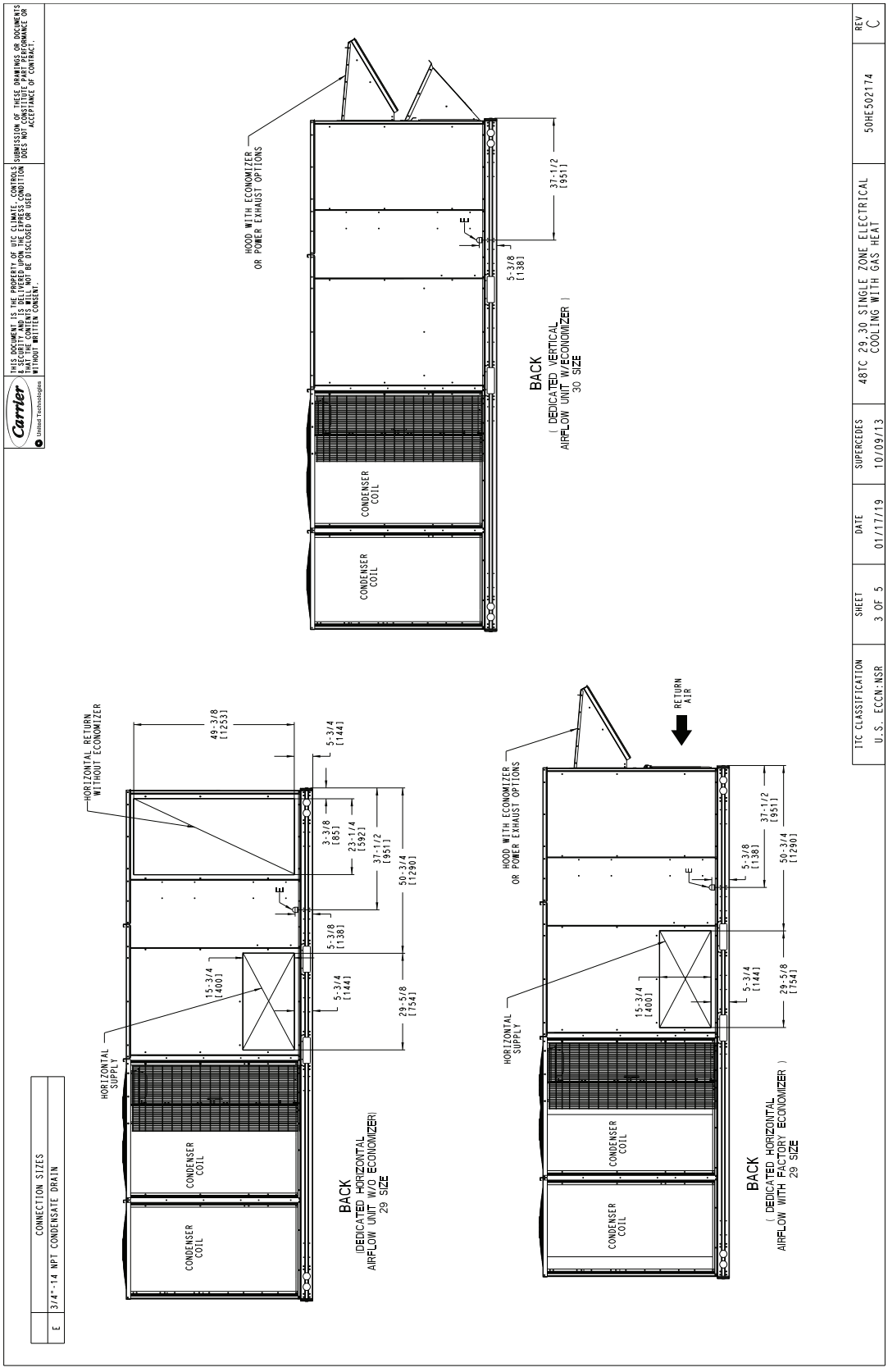
Dimensions (cont)

48TC**29 HORIZONTAL AIRFLOW



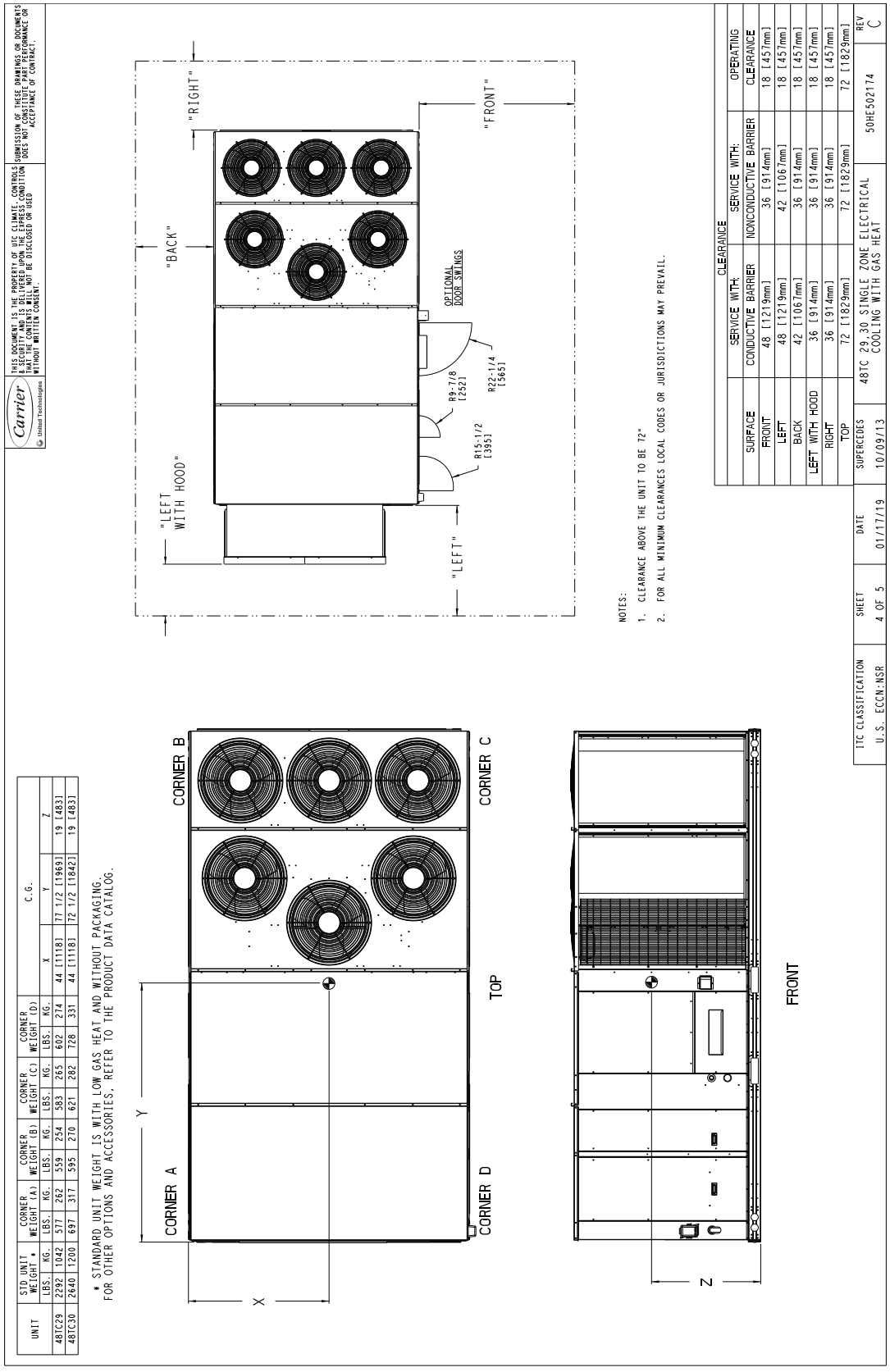
Dimensions (cont)

48TC**29 BACK VIEW AND CONDENSATE DRAIN LOCATION



Dimensions (cont)

48TC**29 CORNER WEIGHTS AND CLEARANCES



UNIT	STD UNIT WEIGHT *		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
48TC29	2292	1042	577	262	559	254	583	265	602	274	44 [1118]	77 1/2 [1969]	19 [483]
48TC30	2640	1200	697	317	595	270	621	282	728	331	44 [1118]	72 1/2 [1842]	19 [483]

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

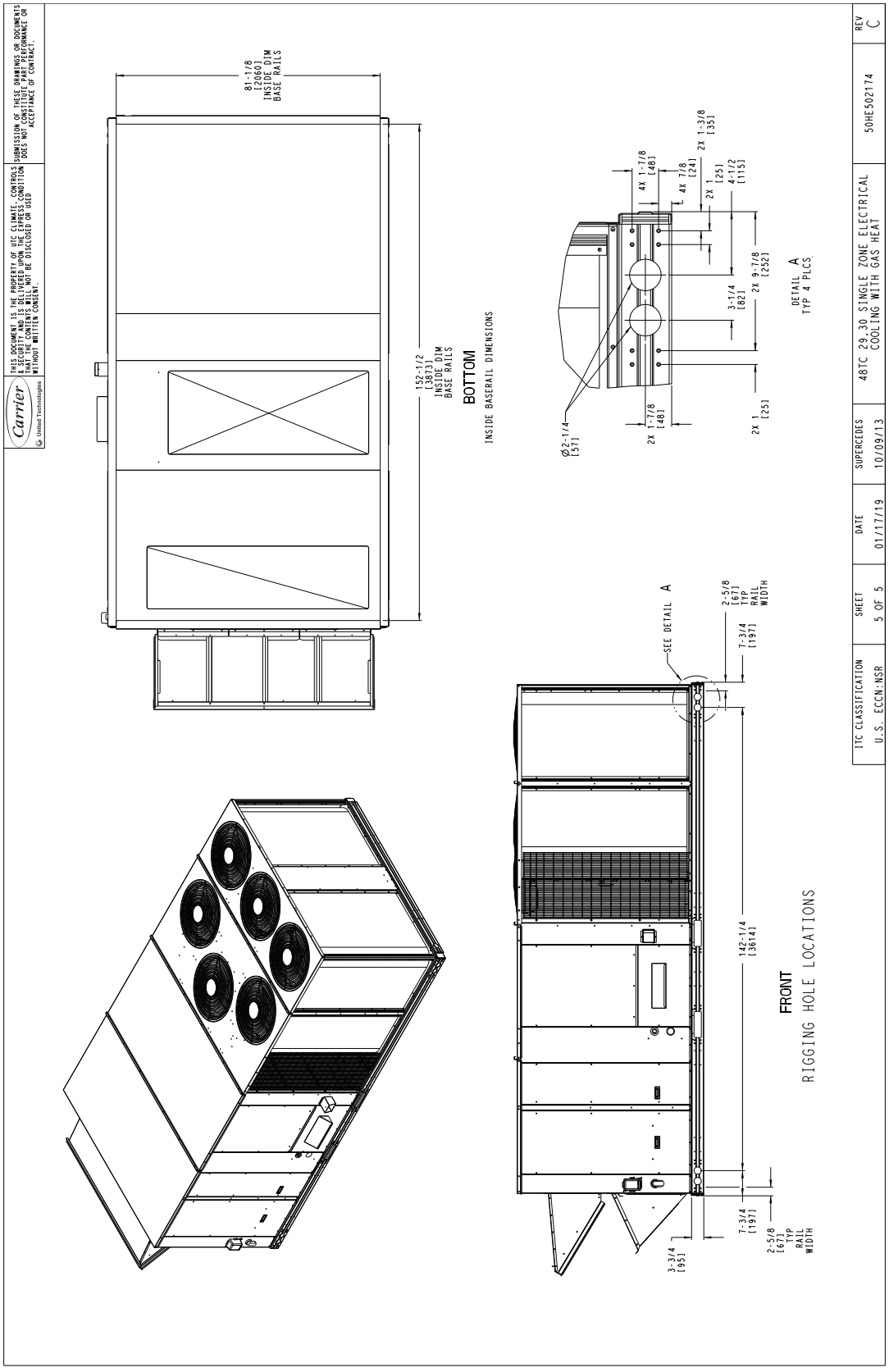
NOTES:
1. CLEARANCE ABOVE THE UNIT TO BE 72"
2. FOR ALL MINIMUM CLEARANCES LOCAL CODES OR JURISDICTIONS MAY PREVAIL.

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

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48TC 29,30 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	50HE502174	REV
U.S. ECCN:NSR	4 OF 5	01/17/19	10/09/13			C

Dimensions (cont)

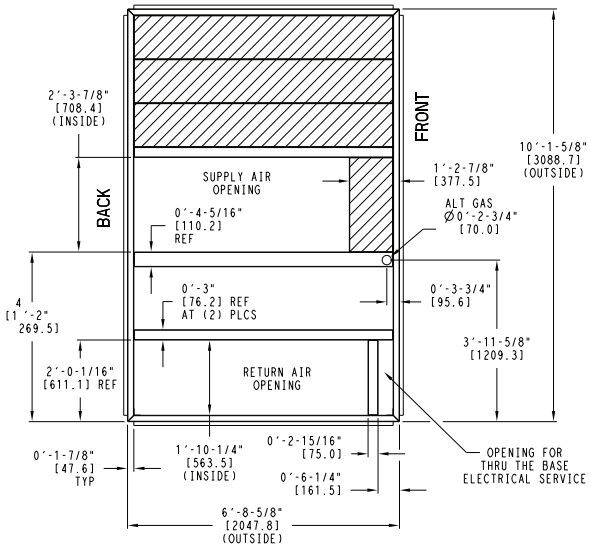
48TC**29 BOTTOM VIEW



Dimensions (cont)

ROOF CURB DETAILS - 18 SIZE UNIT

UNIT SIZE	"A"	ROOF CURB ACCESSORY
18	1′-2" [356.0] 2′-0" [610.0]	CRRFCURB045A00 CRRFCURB046A00



NOTES:

1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.

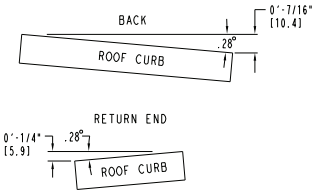
2 DIMENSIONS IN [ ] ARE IN MILLIMETERS.

3 ROOF CURB GALVANIZED STEEL.

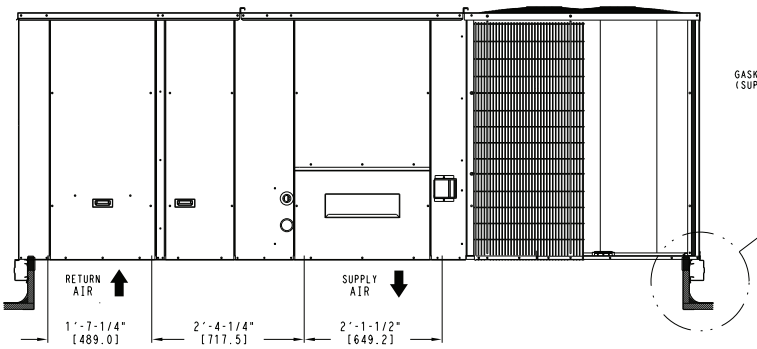
4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)

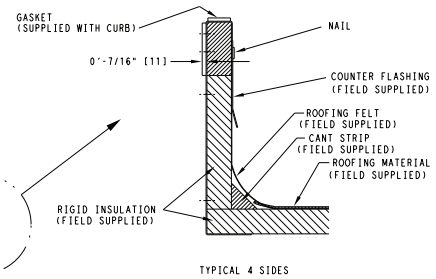
5 SERVICE CLEARANCE 4 ft ON EACH SIDE

➡ DIRECTION OF AIR FLOW

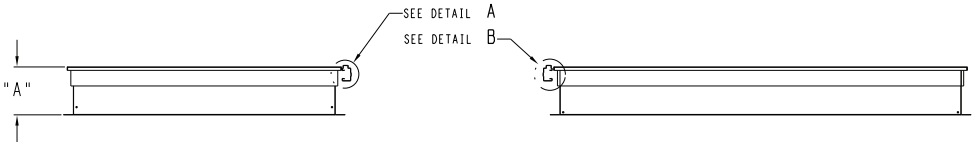


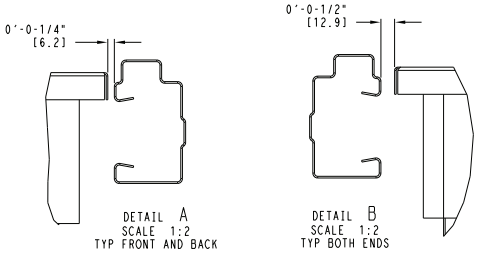
MAX CURB LEVELING TOLERANCES

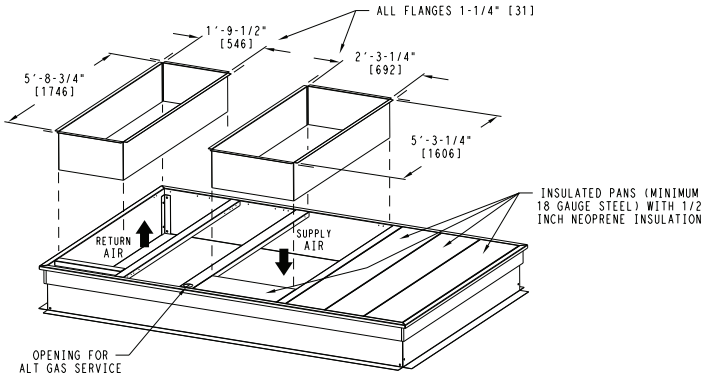




TYPICAL 4 SIDES



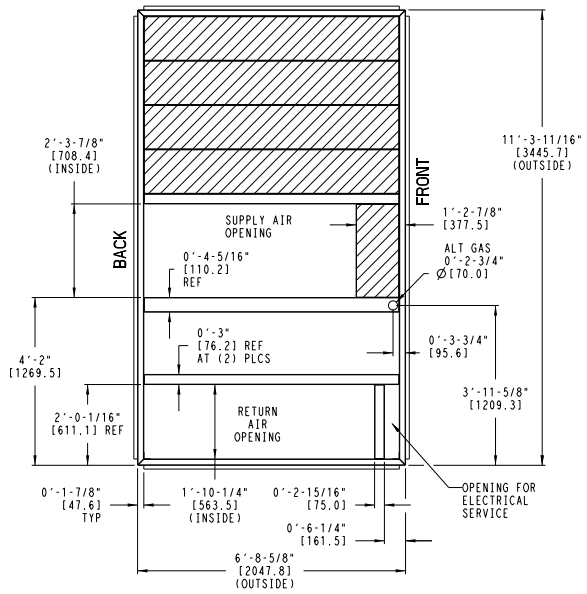




Dimensions (cont)

ROOF CURB DETAILS - 21 AND 25 SIZE UNITS

UNIT SIZE	"A"	ROOF CURB ACCESSORY
21, 25	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB047A00 CRRFCURB048A00



NOTES:

1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.

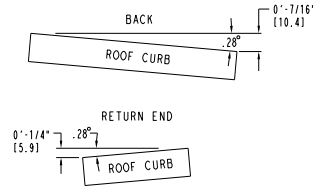
2 DIMENSIONS IN [ ] ARE IN MILLIMETERS.

3 ROOF CURB GALVANIZED STEEL.

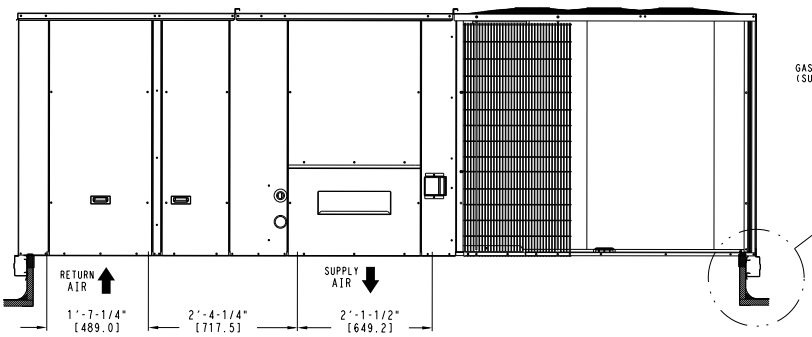
4 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)

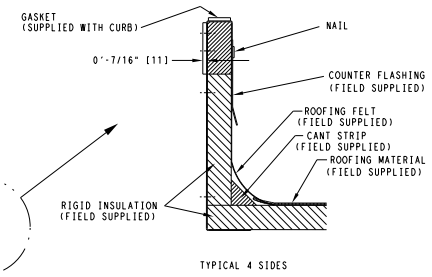
5 SERVICE CLEARANCE 4 ft ON EACH SIDE

➡ DIRECTION OF AIR FLOW

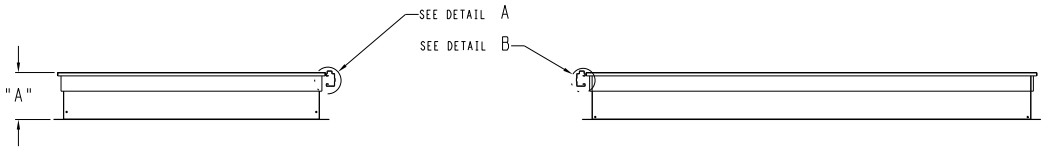


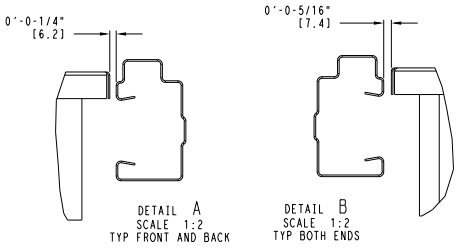
MAX CURB LEVELING TOLERANCES

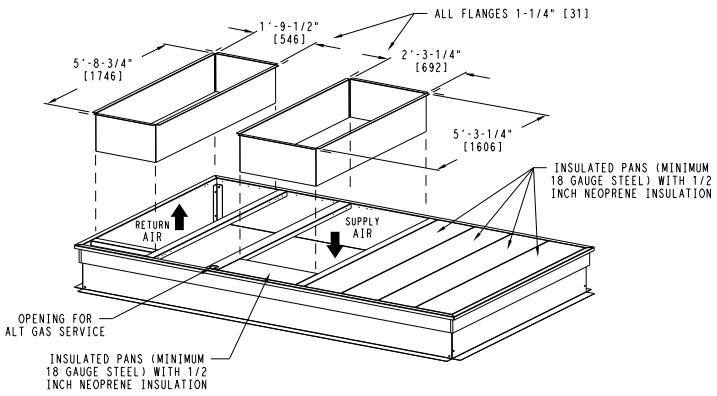




TYPICAL 4 SIDES



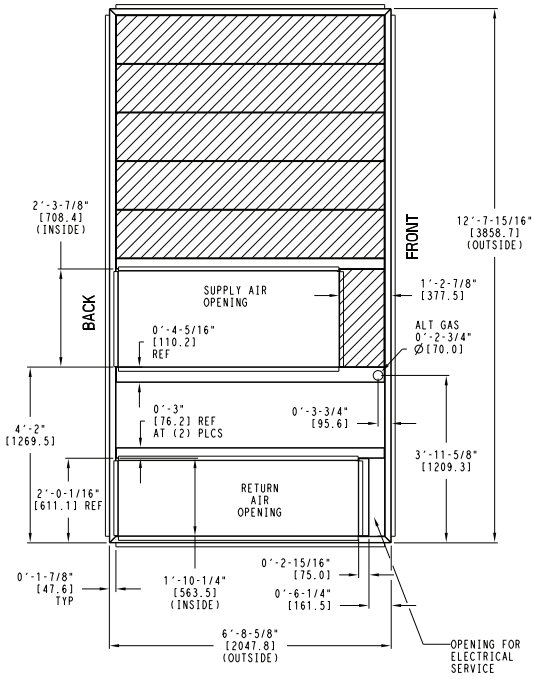




Dimensions (cont)

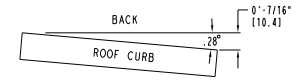
ROOF CURB DETAILS - 29 SIZE UNIT

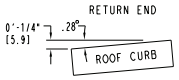
UNIT SIZE	"A"	ROOF CURB ACCESSORY
29	1'-2" [356.0] 2'-0" [610.0]	CRRFCURB049A00 CRRFCURB050A00



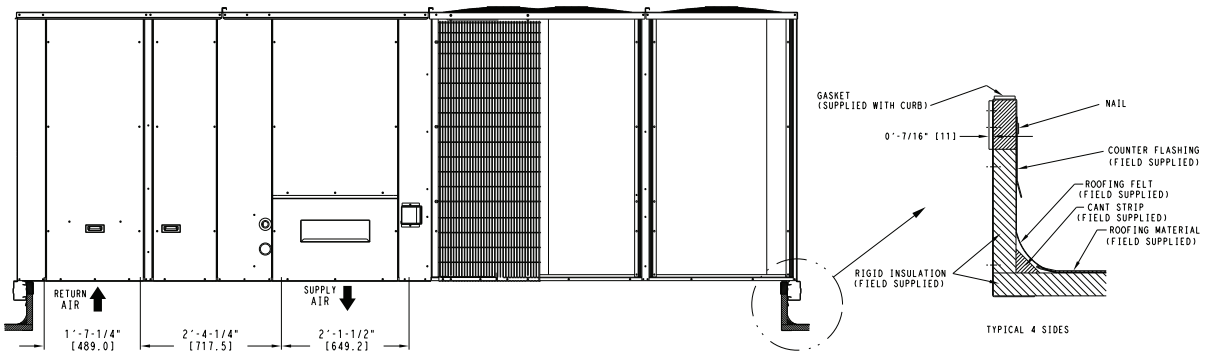
NOTES:
1 ROOF CURB ACCESSORY IS SHIPPED UNASSEMBLED.
2 BOLT HEADS TO BE ON INSIDE OF FLANGE. CLEARANCE IS [11] 0-0-7/16" TYP ALL CORNERS.
3 DIMENSIONS IN [ ] ARE IN MILLIMETERS.
4 ROOF CURB GALVANIZED STEEL.
5 ATTACH DUCTWORK TO CURB (FLANGES ON DUCT REST ON CURB)
6 SERVICE CLEARANCE 4 ft ON EACH SIDE
7 GAS SERVICE PLATE IS PART OF A SEPARATELY SHIPPED ACCESSORY PACKAGE.
8 GAS SERVICE PLATE CAN BE USED WITH EITHER ACCESSORY ROOFCURB.

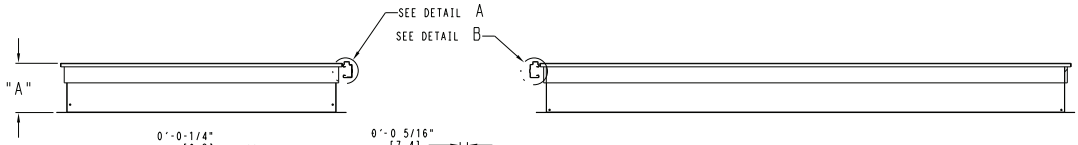
DIRECTION OF AIR FLOW

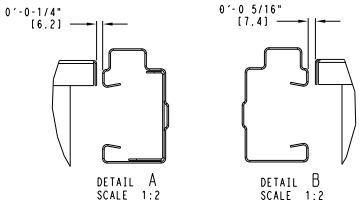


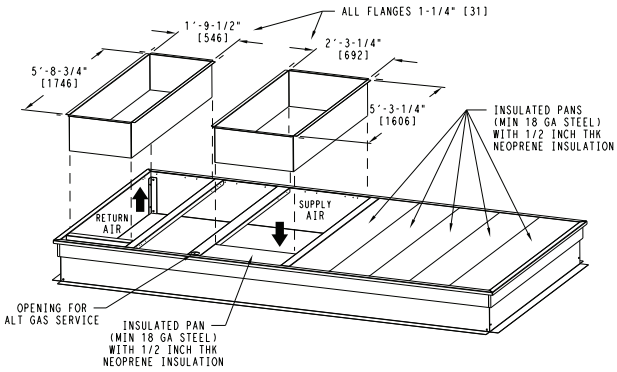


MAX CURB LEVELING TOLERANCES









Performance data

COOLING CAPACITIES — 2-STAGE COOLING, 15 TONS

48TC*D18				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	TC	158.3	158.3	179.2	152.6	152.6	172.9	146.6	146.6	166.1	140.2	140.2	158.8
			SHC	137.3	158.3	179.2	132.4	152.6	172.9	127.2	146.6	166.1	121.6	140.2	158.8
		62	TC	166.8	166.8	169.0	159.5	159.5	165.6	151.8	151.8	161.9	143.6	143.6	157.9
			SHC	123.1	146.1	169.0	119.7	142.6	165.6	116.1	139.0	161.9	112.3	135.1	157.9
		67	TC	182.9	182.9	182.9	174.9	174.9	174.9	166.3	166.3	166.3	157.2	157.2	157.2
			SHC	100.0	123.1	146.1	96.7	119.8	142.8	93.2	116.3	139.4	89.7	112.7	135.7
		72	TC	200.5	200.5	200.5	191.6	191.6	191.6	182.2	182.2	182.2	172.2	172.2	172.2
			SHC	76.1	99.5	122.8	72.9	96.2	119.5	69.5	92.8	116.1	66.0	89.3	112.5
		76	TC	—	215.4	215.4	—	205.8	205.8	—	195.6	195.6	—	184.8	184.8
			SHC	—	80.2	105.0	—	77.1	101.7	—	73.7	98.2	—	70.2	94.5
5250 CFM	EAT (wb)	58	TC	166.7	166.7	188.8	160.6	160.6	181.9	154.0	154.0	174.4	147.0	147.0	166.5
			SHC	144.6	166.7	188.8	139.3	160.6	181.9	133.6	154.0	174.4	127.6	147.0	166.5
		62	TC	172.0	172.0	185.1	164.3	164.3	181.2	156.3	156.3	177.0	147.8	147.8	172.4
			SHC	132.5	158.8	185.1	128.9	155.1	181.2	125.0	151.0	177.0	120.9	146.6	172.4
		67	TC	188.3	188.3	188.3	179.7	179.7	179.7	170.7	170.7	170.7	161.0	161.0	161.0
			SHC	106.1	132.7	159.3	102.8	129.3	155.9	99.3	125.8	152.4	95.6	122.1	148.6
		72	TC	206.1	206.1	206.1	196.7	196.7	196.7	186.7	186.7	186.7	176.2	176.2	176.2
			SHC	78.8	105.6	132.5	75.5	102.3	129.1	72.1	98.8	125.6	68.5	95.2	121.9
		76	TC	—	221.2	221.2	—	211.0	211.0	—	200.3	200.3	—	189.0	189.0
			SHC	—	83.6	111.7	—	80.3	108.2	—	76.9	104.6	—	73.3	100.9
6000 CFM	EAT (wb)	58	TC	173.8	173.8	196.8	167.2	167.2	189.4	160.2	160.2	181.4	152.7	152.7	173.0
			SHC	150.8	173.8	196.8	145.1	167.2	189.4	139.0	160.2	181.4	132.5	152.7	173.0
		62	TC	176.3	176.3	199.5	168.5	168.5	194.9	160.5	160.5	188.9	152.9	152.9	179.9
			SHC	140.9	170.2	199.5	136.9	165.9	194.9	132.1	160.5	188.9	125.8	152.9	179.9
		67	TC	192.3	192.3	192.3	183.4	183.4	183.4	173.9	173.9	173.9	164.0	164.0	164.0
			SHC	112.0	142.0	172.0	108.5	138.5	168.5	104.9	134.9	164.8	101.2	131.1	161.0
		72	TC	210.4	210.4	210.4	200.6	200.6	200.6	190.2	190.2	190.2	179.3	179.3	179.3
			SHC	81.2	111.4	141.7	77.9	108.0	138.2	74.4	104.5	134.6	70.7	100.8	130.8
		76	TC	—	225.6	225.6	—	215.0	215.0	—	203.8	203.8	—	192.1	192.1
			SHC	—	86.7	117.9	—	83.3	114.5	—	79.9	110.8	—	76.3	107.1
6750 CFM	EAT (wb)	58	TC	179.8	179.8	203.7	172.9	172.9	195.8	165.5	165.5	187.4	157.5	157.5	178.4
			SHC	156.0	179.8	203.7	150.0	172.9	195.8	143.5	165.5	187.4	136.7	157.5	178.4
		62	TC	180.5	180.5	210.7	173.0	173.0	203.6	165.6	165.6	194.9	157.7	157.7	185.5
			SHC	147.6	179.2	210.7	142.4	173.0	203.6	136.3	165.6	194.9	129.8	157.7	185.5
		67	TC	195.6	195.6	195.6	186.2	186.2	186.2	176.5	176.5	176.8	166.2	166.2	172.7
			SHC	117.5	150.8	184.1	114.0	147.3	180.5	110.4	143.6	176.8	106.5	139.6	172.7
		72	TC	213.8	213.8	213.8	203.6	203.6	203.6	192.9	192.9	192.9	181.6	181.6	181.6
			SHC	83.5	117.0	150.5	80.1	113.5	147.0	76.5	109.9	143.3	72.8	106.1	139.4
		76	TC	—	229.1	229.1	—	218.1	218.1	—	206.6	206.6	—	194.6	194.6
			SHC	—	89.6	124.0	—	86.2	120.5	—	82.7	116.8	—	79.0	113.0
7500 CFM	EAT (wb)	58	TC	185.1	185.1	209.6	177.7	177.7	201.3	170.0	170.0	192.5	161.6	161.6	183.0
			SHC	160.6	185.1	209.6	154.2	177.7	201.3	147.5	170.0	192.5	140.2	161.6	183.0
		62	TC	185.2	185.2	218.0	177.9	177.9	209.3	170.1	170.1	200.2	161.8	161.8	190.4
			SHC	152.5	185.2	218.0	146.4	177.9	209.3	140.0	170.1	200.2	133.2	161.8	190.4
		67	TC	198.1	198.1	198.1	188.6	188.6	192.1	178.6	178.6	188.1	168.1	168.1	183.8
			SHC	122.8	159.3	195.9	119.2	155.7	192.1	115.5	151.8	188.1	111.5	147.7	183.8
		72	TC	216.6	216.6	216.6	206.1	206.1	206.1	195.1	195.1	195.1	183.5	183.5	183.5
			SHC	85.6	122.3	159.0	82.2	118.8	155.5	78.6	115.2	151.7	74.9	111.3	147.8
		76	TC	—	231.9	231.9	—	220.7	220.7	—	208.9	208.9	—	196.5	196.5
			SHC	—	92.4	129.9	—	88.9	126.3	—	85.4	122.6	—	81.6	118.7

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 5. Do not operate outside these limits.

Performance data (cont)

COOLING CAPACITIES — 2-STAGE COOLING, 15 TONS, WITH HUMIDI-MIZER IN SUBCOOLING MODE

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

COOLING CAPACITIES — 2-STAGE COOLING, 15 TONS, WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE

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

LEGEND

Edb — Entering Dry-Bulb
Ewb — Entering Wet-Bulb
kW — 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:

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

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

Performance data (cont)

COOLING CAPACITIES — 2-STAGE COOLING, 17.5 TONS

48TC*D21				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	TC	185.1	185.1	209.2	178.7	178.7	201.9	171.8	171.8	194.1	164.5	164.5	185.8
			SHC	161.1	185.1	209.2	155.4	178.7	201.9	149.4	171.8	194.1	143.1	164.5	185.8
		62	TC	193.8	193.8	199.5	185.6	185.6	195.4	176.9	176.9	191.1	167.7	167.7	186.4
			SHC	145.6	172.6	199.5	141.7	168.6	195.4	137.6	164.4	191.1	133.2	159.8	186.4
		67	TC	212.2	212.2	212.2	203.3	203.3	203.3	193.8	193.8	193.8	183.8	183.8	183.8
			SHC	119.0	146.0	173.1	115.3	142.3	169.4	111.4	138.4	165.4	107.3	134.3	161.3
		72	TC	232.3	232.3	232.3	222.7	222.7	222.7	212.4	212.4	212.4	201.6	201.6	201.6
			SHC	91.5	118.8	146.2	87.9	115.2	142.5	84.1	111.4	138.7	80.2	107.4	134.6
		76	TC	—	249.5	249.5	—	239.2	239.2	—	228.2	228.2	—	216.6	216.6
			SHC	—	96.7	125.3	—	93.2	121.7	—	89.5	117.9	—	85.6	113.8
6125 CFM	EAT (wb)	58	TC	194.7	194.7	220.0	187.8	187.8	212.2	180.4	180.4	203.8	172.5	172.5	194.9
			SHC	169.4	194.7	220.0	163.3	187.8	212.2	156.9	180.4	203.8	150.1	172.5	194.9
		62	TC	199.6	199.6	218.0	191.1	191.1	213.5	182.1	182.1	208.4	173.0	173.0	201.2
			SHC	156.5	187.2	218.0	152.3	182.9	213.5	147.7	178.0	208.4	141.8	171.5	201.2
		67	TC	218.0	218.0	218.0	208.7	208.7	208.7	198.7	198.7	198.7	188.2	188.2	188.2
			SHC	126.2	157.4	188.6	122.4	153.6	184.7	118.4	149.6	180.7	114.3	145.4	176.5
		72	TC	238.5	238.5	238.5	228.4	228.4	228.4	217.7	217.7	217.7	206.3	206.3	206.3
			SHC	94.7	126.1	157.5	91.0	122.4	153.8	87.2	118.5	149.8	83.1	114.4	145.7
		76	TC	—	255.9	255.9	—	245.1	245.1	—	233.6	233.6	—	221.4	221.4
			SHC	—	100.7	133.3	—	97.1	129.6	—	93.3	125.6	—	89.3	121.5
7000 CFM	EAT (wb)	58	TC	202.7	202.7	229.1	195.4	195.4	220.8	187.5	187.5	211.9	179.2	179.2	202.5
			SHC	176.4	202.7	229.1	170.0	195.4	220.8	163.1	187.5	211.9	155.9	179.2	202.5
		62	TC	204.6	204.6	234.4	196.0	196.0	228.0	187.7	187.7	220.3	179.3	179.3	210.5
			SHC	166.0	200.2	234.4	160.8	194.4	228.0	155.1	187.7	220.3	148.2	179.3	210.5
		67	TC	222.5	222.5	222.5	212.8	212.8	212.8	202.4	202.4	202.4	191.5	191.5	191.5
			SHC	133.0	168.2	203.4	129.2	164.3	199.5	125.1	160.3	195.4	120.9	156.0	191.0
		72	TC	243.3	243.3	243.3	232.7	232.7	232.7	221.6	221.6	221.6	209.9	209.9	209.9
			SHC	97.5	132.9	168.3	93.8	129.2	164.5	89.9	125.2	160.5	85.8	121.1	156.3
		76	TC	—	260.8	260.8	—	249.6	249.6	—	237.7	237.7	—	225.1	225.1
			SHC	—	104.4	140.8	—	100.7	137.0	—	96.9	133.0	—	92.8	128.8
7875 CFM	EAT (wb)	58	TC	209.6	209.6	236.8	201.8	201.8	228.1	193.6	193.6	218.8	184.8	184.8	208.9
			SHC	182.3	209.6	236.8	175.6	201.8	228.1	168.4	193.6	218.8	160.8	184.8	208.9
		62	TC	209.8	209.8	246.2	202.0	202.0	237.1	193.8	193.8	227.4	185.0	185.0	217.1
			SHC	173.4	209.8	246.2	167.0	202.0	237.1	160.1	193.8	227.4	152.9	185.0	217.1
		67	TC	226.1	226.1	226.1	216.0	216.0	216.0	205.4	205.4	209.4	194.2	194.2	204.8
			SHC	139.6	178.6	217.7	135.6	174.7	213.7	131.5	170.5	209.4	127.1	166.0	204.8
		72	TC	247.0	247.0	247.0	236.2	236.2	236.2	224.7	224.7	224.7	212.7	212.7	212.7
			SHC	100.2	139.5	178.8	96.5	135.7	174.9	92.5	131.7	170.9	88.4	127.5	166.6
		76	TC	—	264.7	264.7	—	253.1	253.1	—	240.9	240.9	—	227.9	227.9
			SHC	—	107.9	148.1	—	104.2	144.3	—	100.2	140.2	—	96.1	135.9
8750 CFM	EAT (wb)	58	TC	215.4	215.4	243.4	207.3	207.3	234.3	198.7	198.7	224.6	189.6	189.6	214.2
			SHC	187.4	215.4	243.4	180.3	207.3	234.3	172.9	198.7	224.6	164.9	189.6	214.2
		62	TC	215.5	215.5	253.0	207.5	207.5	243.5	198.9	198.9	233.4	189.7	189.7	222.7
			SHC	178.1	215.5	253.0	171.5	207.5	243.5	164.4	198.9	233.4	156.8	189.7	222.7
		67	TC	228.9	228.9	231.5	218.7	218.7	227.3	207.8	207.8	222.8	196.4	196.4	217.9
			SHC	145.8	188.6	231.5	141.8	184.5	227.3	137.5	180.1	222.8	133.0	175.5	217.9
		72	TC	250.1	250.1	250.1	239.0	239.0	239.0	227.3	227.3	227.3	214.9	214.9	214.9
			SHC	102.8	145.8	188.9	99.0	142.0	185.0	95.0	137.9	180.9	90.8	133.7	176.5
		76	TC	—	267.8	267.8	—	256.0	256.0	—	243.5	243.5	—	230.2	230.2
			SHC	—	111.2	155.2	—	107.4	151.3	—	103.5	147.1	—	99.3	142.8

LEGEND

— — Do not operate
Cfm — Cubic feet per minute (supply air)
EAT (db) — Entering Air Temperature (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 5. Do not operate outside these limits.

Performance data (cont)

COOLING CAPACITIES — 2-STAGE COOLING, 17.5 TONS, WITH HUMIDI-MIZER IN SUBCOOLING MODE

TEMP (°F) AIR ENTERING CONDENSER (Edb)		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	232.00	211.30	190.60	242.40	221.00	199.70	250.70	228.90	207.00
	SHC	110.90	133.70	156.40	127.60	150.30	173.00	141.10	163.70	186.40
	kW	12.45	12.16	11.81	12.74	12.41	12.02	12.93	12.51	12.18
85	TC	215.90	195.70	175.50	226.00	205.20	184.40	234.20	212.80	191.50
	SHC	90.60	118.80	147.00	108.40	136.60	164.90	122.70	151.00	179.20
	kW	13.48	13.20	12.88	13.77	13.47	13.07	13.96	13.58	13.23
95	TC	199.70	180.00	160.30	209.70	189.40	169.10	217.60	196.80	176.10
	SHC	70.30	104.00	137.70	89.20	123.00	156.70	104.40	138.20	172.10
	kW	14.60	14.25	13.94	14.89	14.51	14.15	15.08	14.63	14.31
105	TC	183.60	164.50	145.20	193.30	173.50	153.80	201.00	180.80	160.60
	SHC	50.00	89.10	128.30	70.00	109.30	148.60	86.00	125.50	158.60
	kW	15.64	15.36	15.01	15.93	15.60	15.21	16.12	15.72	15.37
115	TC	167.50	148.80	130.10	176.90	157.70	138.50	184.50	164.80	145.10
	SHC	29.70	74.30	118.90	50.70	95.60	138.10	67.70	112.70	145.10
	kW	16.70	16.38	15.82	16.98	16.63	16.03	17.17	16.75	16.19

COOLING CAPACITIES — 2-STAGE COOLING, 17.5 TONS, WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE

TEMP (°F) AIR ENTERING CONDENSER (Edb)		AIR ENTERING EVAPORATOR (°F)								
		75 DRY BULB 62.5 WET BULB (50% RELATIVE)			75 DRY BULB 64 WET BULB (56% RELATIVE)			75 DRY BULB 65.3 WET BULB (60% RELATIVE)		
		AIR ENTERING EVAPORATOR - Cfm								
		5,250	7,000	8,750	5,250	7,000	8,750	5,250	7,000	8,750
80	TC	67.80	71.30	74.10	70.50	74.50	79.80	73.30	78.20	82.40
	SHC	9.00	26.50	41.70	2.20	13.70	26.90	-5.20	2.90	13.80
	kW	11.65	11.75	11.87	11.82	10.40	11.98	11.93	12.10	12.19
75	TC	72.50	76.00	78.80	75.00	79.20	84.30	78.00	83.00	86.90
	SHC	13.40	30.90	46.10	6.50	18.00	31.30	-2.10	7.20	17.90
	kW	11.44	11.54	11.66	11.61	11.68	11.75	11.70	11.86	11.95
70	TC	77.10	80.60	83.40	79.50	83.90	88.90	82.40	87.30	91.10
	SHC	17.60	34.70	49.90	10.80	22.20	35.10	3.20	11.50	22.20
	kW	11.22	11.33	11.45	11.40	11.46	11.54	11.49	11.64	11.75
60	TC	86.30	89.90	92.70	88.80	93.20	98.20	91.70	96.60	100.50
	SHC	26.20	43.20	58.40	19.40	30.80	43.60	11.60	20.10	30.70
	kW	10.76	10.86	10.98	10.93	11.00	11.07	11.03	11.18	11.28
50	TC	95.50	99.10	101.90	98.00	102.40	107.40	101.00	106.00	109.80
	SHC	34.80	51.80	67.00	28.00	39.40	52.20	20.10	28.70	39.40
	kW	10.33	10.43	10.55	10.50	10.52	10.63	10.59	10.74	10.85
40	TC	104.80	99.10	111.20	107.30	111.70	116.60	110.30	115.30	119.10
	SHC	43.40	51.80	75.60	36.60	48.00	60.80	28.80	37.30	47.90
	kW	9.87	10.43	10.09	10.04	10.11	10.18	10.14	10.28	10.40

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:

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

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

Performance data (cont)

COOLING CAPACITIES — 2-STAGE COOLING, 20 TONS

48TC*D25				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	TC	214.4	214.4	242.5	207.0	207.0	234.2	199.0	199.0	225.1	190.2	190.2	215.2
			SHC	186.3	214.4	242.5	179.9	207.0	234.2	173.0	199.0	225.1	165.3	190.2	215.2
		62	TC	226.8	226.8	227.7	217.3	217.3	223.0	206.9	206.9	218.0	195.8	195.8	212.5
			SHC	167.0	197.3	227.7	162.4	192.7	223.0	157.6	187.8	218.0	152.3	182.4	212.5
		67	TC	248.4	248.4	248.4	237.9	237.9	237.9	226.6	226.6	226.6	214.3	214.3	214.3
			SHC	136.5	167.1	197.6	132.2	162.7	193.2	127.5	158.0	188.4	122.5	152.9	183.4
		72	TC	271.9	271.9	271.9	260.3	260.3	260.3	247.9	247.9	247.9	234.5	234.5	234.5
			SHC	105.1	136.0	167.0	100.8	131.7	162.5	96.3	127.1	157.9	91.4	122.1	152.9
		76	TC	—	291.7	291.7	—	279.2	279.2	—	265.7	265.7	—	251.3	251.3
			SHC	—	110.7	143.7	—	106.5	139.5	—	102.0	134.7	—	97.2	129.7
7000 CFM	EAT (wb)	58	TC	225.8	225.8	255.3	217.8	217.8	246.3	209.1	209.1	236.5	199.6	199.6	225.7
			SHC	196.2	225.8	255.3	189.3	217.8	246.3	181.7	209.1	236.5	173.4	199.6	225.7
		62	TC	233.9	233.9	248.8	223.8	223.8	243.8	213.1	213.1	238.2	201.4	201.4	231.8
			SHC	179.4	214.1	248.8	174.6	209.2	243.8	169.4	203.8	238.2	163.7	197.8	231.8
		67	TC	255.7	255.7	255.7	244.6	244.6	244.6	232.6	232.6	232.6	219.6	219.6	219.6
			SHC	144.7	179.7	214.8	140.2	175.2	210.2	135.4	170.4	205.4	130.3	165.2	200.2
		72	TC	279.4	279.4	279.4	267.3	267.3	267.3	254.1	254.1	254.1	240.1	240.1	240.1
			SHC	108.7	144.1	179.6	104.3	139.7	175.1	99.6	135.0	170.3	94.7	129.9	165.1
		76	TC	—	299.4	299.4	—	286.2	286.2	—	272.1	272.1	—	256.9	256.9
			SHC	—	115.3	152.9	—	110.9	148.2	—	106.3	143.3	—	101.3	138.0
8000 CFM	EAT (wb)	58	TC	235.3	235.3	266.2	226.8	226.8	256.5	217.5	217.5	246.0	207.4	207.4	234.5
			SHC	204.5	235.3	266.2	197.1	226.8	256.5	189.0	217.5	246.0	180.2	207.4	234.5
		62	TC	239.7	239.7	268.1	229.4	229.4	262.0	219.0	219.0	253.3	208.3	208.3	241.9
			SHC	190.7	229.4	268.1	185.4	223.7	262.0	178.6	215.9	253.3	170.4	206.2	241.9
		67	TC	261.3	261.3	261.3	249.6	249.6	249.6	237.1	237.1	237.1	223.6	223.6	223.6
			SHC	152.3	191.8	231.2	147.7	187.1	226.6	142.9	182.2	221.6	137.7	177.0	216.3
		72	TC	285.3	285.3	285.3	272.5	272.5	272.5	258.9	258.9	258.9	244.2	244.2	244.2
			SHC	111.9	151.7	191.5	107.5	147.2	186.9	102.7	142.4	182.0	97.7	137.2	176.7
		76	TC	—	305.4	305.4	—	291.6	291.6	—	276.8	276.8	—	261.2	261.2
			SHC	—	119.4	161.0	—	114.9	156.2	—	110.1	151.2	—	105.1	146.0
9000 CFM	EAT (wb)	58	TC	243.5	243.5	275.4	234.5	234.5	265.2	224.6	224.6	254.0	213.9	213.9	241.9
			SHC	211.6	243.5	275.4	203.8	234.5	265.2	195.2	224.6	254.0	185.9	213.9	241.9
		62	TC	245.4	245.4	282.9	235.4	235.4	274.6	225.0	225.0	264.3	214.4	214.4	251.7
			SHC	199.7	241.3	282.9	193.2	233.9	274.6	185.6	224.9	264.3	176.8	214.3	251.7
		67	TC	265.6	265.6	265.6	253.6	253.6	253.6	240.7	240.7	240.7	226.8	226.8	231.8
			SHC	159.6	203.3	247.1	154.9	198.6	242.3	150.0	193.6	237.3	144.7	188.3	231.8
		72	TC	289.9	289.9	289.9	276.7	276.7	276.7	262.6	262.6	262.6	247.5	247.5	247.5
			SHC	114.9	159.0	203.0	110.4	154.4	198.3	105.6	149.5	193.3	100.5	144.2	188.0
		76	TC	—	310.1	310.1	—	295.8	295.8	—	280.6	280.6	—	264.4	264.4
			SHC	—	123.2	168.9	—	118.6	164.1	—	113.8	159.0	—	108.7	153.6
10,000 CFM	EAT (wb)	58	TC	250.4	250.4	283.2	240.9	240.9	272.5	230.7	230.7	260.9	219.5	219.5	248.2
			SHC	217.7	250.4	283.2	209.4	240.9	272.5	200.5	230.7	260.9	190.7	219.5	248.2
		62	TC	250.8	250.8	294.6	241.1	241.1	283.3	231.1	231.1	271.4	219.6	219.6	258.0
			SHC	207.0	250.8	294.6	199.0	241.1	283.3	190.7	231.1	271.4	181.2	219.6	258.0
		67	TC	269.2	269.2	269.2	256.8	256.8	257.6	243.5	243.5	252.3	229.4	229.4	246.4
			SHC	166.6	214.5	262.5	161.9	209.7	257.6	156.8	204.5	252.3	151.3	198.9	246.4
		72	TC	293.7	293.7	293.7	280.1	280.1	280.1	265.6	265.6	265.6	250.2	250.2	250.2
			SHC	117.8	166.0	214.2	113.2	161.3	209.3	108.3	156.3	204.3	103.2	151.0	198.8
		76	TC	—	313.9	313.9	—	299.3	299.3	—	283.7	283.7	—	267.1	267.1
			SHC	—	126.8	176.5	—	122.2	171.6	—	117.3	166.5	—	112.1	161.0

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 5. Do not operate outside these limits.

Performance data (cont)

COOLING CAPACITIES — 2-STAGE COOLING, 20 TONS, WITH HUMIDI-MIZER IN SUBCOOLING MODE

TEMP (°F) AIR ENTERING CONDENSER (Edb)		AIR ENTERING EVAPORATOR - Cfm								
		6,000			8,000			10,000		
		AIR ENTERING EVAPORATOR - Ewb (°F)								
		72	67	62	72	67	62	72	67	62
75	TC	281.6	256.5	231.3	293.1	267.0	240.9	302.3	275.4	248.6
	SHC	114.7	141.0	167.4	140.6	166.6	192.6	161.6	187.3	212.9
	kW	13.52	13.25	12.95	13.82	13.46	13.21	13.97	13.60	13.31
85	TC	261.3	236.9	212.4	272.1	247.7	221.3	280.7	254.6	228.5
	SHC	90.9	123.5	156.1	118.8	151.1	183.3	141.4	173.4	205.4
	kW	14.95	14.68	14.48	15.25	14.89	14.64	15.40	15.03	14.74
95	TC	241.1	217.2	193.4	251.1	226.4	201.7	259.2	233.8	208.4
	SHC	67.2	106.0	144.8	97.1	120.1	174.1	121.2	159.5	197.8
	kW	16.52	16.25	15.95	16.82	16.46	16.21	16.97	16.60	16.31
105	TC	220.8	197.5	174.4	230.2	206.2	182.2	237.7	213.0	188.4
	SHC	43.4	88.4	133.5	75.3	120.1	164.9	101.0	145.7	178.9
	kW	18.09	17.82	17.52	18.39	18.03	17.78	18.54	18.17	17.88
115	TC	200.5	178.0	155.5	209.2	185.9	162.6	216.2	192.2	168.7
	SHC	19.7	70.9	122.2	53.5	104.6	155.7	80.9	131.8	161.2
	kW	19.65	19.38	19.08	19.95	19.59	19.34	20.10	19.73	19.44

COOLING CAPACITIES — 2-STAGE COOLING, 20 TONS, WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE

TEMP (°F) AIR ENTERING CONDENSER (EDB)		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	115.20	123.30	130.60	120.40	129.30	138.20	122.80	135.00	143.70
	SHC	40.80	58.30	76.10	32.30	45.50	60.40	20.10	34.30	48.00
	kW	13.24	13.32	13.39	13.43	13.57	13.65	13.49	13.68	13.74
75	TC	119.80	128.60	135.90	125.50	135.30	143.20	128.00	139.50	148.40
	SHC	45.60	62.80	82.10	37.00	49.80	65.20	24.30	38.70	52.60
	kW	13.05	13.10	13.17	13.21	13.35	13.43	13.27	13.46	13.52
70	TC	122.50	133.10	140.20	129.80	140.70	147.60	132.40	144.40	153.20
	SHC	49.80	76.00	86.10	41.10	54.30	69.20	28.80	41.40	56.80
	kW	12.80	12.87	12.94	12.98	13.12	13.20	13.04	13.23	13.29
60	TC	133.80	142.50	149.60	139.30	150.40	157.40	141.50	154.20	163.00
	SHC	58.60	76.00	95.00	50.20	63.50	78.10	37.80	52.10	65.90
	kW	12.34	12.42	12.49	12.53	12.67	12.75	12.59	12.78	12.84
50	TC	143.50	151.80	159.30	149.00	160.00	167.00	151.30	163.60	172.50
	SHC	67.70	84.80	103.80	59.10	72.40	87.00	46.70	61.00	74.90
	kW	11.88	11.95	12.30	12.07	12.21	12.29	12.13	12.32	12.38
40	TC	153.20	161.30	168.70	158.60	169.20	176.60	160.80	173.10	182.00
	SHC	76.50	93.60	111.60	68.00	81.50	95.80	55.80	69.80	84.00
	kW	11.42	11.49	11.56	11.60	11.74	11.82	11.66	11.85	11.91

LEGEND

Edb — Entering Dry-Bulb
Ewb — Entering Wet-Bulb
kW — 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:

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

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

Performance data (cont)

COOLING CAPACITIES — 2-STAGE COOLING, 25 TONS

48TC*E29				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	TC	264.4	264.4	298.9	254.6	254.6	287.9	244.1	244.1	276.0	232.7	232.7	263.1
			SHC	229.9	264.4	298.9	221.4	254.6	287.9	212.2	244.1	276.0	202.3	232.7	263.1
		62	TC	278.7	278.7	282.4	266.3	266.3	276.4	252.8	252.8	269.8	238.5	238.5	262.4
			SHC	206.8	244.6	282.4	200.9	238.7	276.4	194.6	232.2	269.8	187.7	225.0	262.4
		67	TC	305.3	305.3	305.3	291.9	291.9	291.9	277.3	277.3	277.3	261.5	261.5	261.5
			SHC	169.0	207.0	245.0	163.4	201.4	239.4	157.4	195.3	233.3	151.0	188.9	226.8
		72	TC	334.0	334.0	334.0	319.4	319.4	319.4	303.6	303.6	303.6	286.5	286.5	286.5
			SHC	129.9	168.5	207.1	124.5	163.0	201.5	118.7	157.1	195.5	112.5	150.8	189.2
		76	TC	—	358.2	358.2	—	342.4	342.4	—	325.4	325.4	—	307.1	307.1
			SHC	—	137.0	178.2	—	131.7	172.9	—	126.0	166.9	—	119.9	160.4
8,750 CFM	EAT (wb)	58	TC	278.2	278.2	314.5	267.8	267.8	302.8	256.5	256.5	289.9	244.2	244.2	276.1
			SHC	241.9	278.2	314.5	232.8	267.8	302.8	223.0	256.5	289.9	212.3	244.2	276.1
		62	TC	287.2	287.2	308.3	274.3	274.3	301.5	260.8	260.8	291.7	247.0	247.0	280.9
			SHC	222.1	265.2	308.3	215.7	258.6	301.5	207.7	249.7	291.7	199.0	240.0	280.9
		67	TC	314.0	314.0	314.0	299.8	299.8	299.8	284.4	284.4	284.4	267.8	267.8	267.8
			SHC	179.1	222.7	266.4	173.3	216.9	260.6	167.2	210.8	254.3	160.7	204.2	247.7
		72	TC	343.0	343.0	343.0	327.7	327.7	327.7	311.1	311.1	311.1	293.1	293.1	293.1
			SHC	134.3	178.5	222.6	128.8	172.9	216.9	122.9	166.9	210.8	116.6	160.4	204.3
		76	TC	—	367.3	367.3	—	350.8	350.8	—	333.0	333.0	—	313.8	313.8
			SHC	—	142.6	189.4	—	137.1	183.5	—	131.2	177.3	—	125.0	170.7
10,000 CFM	EAT (wb)	58	TC	289.7	289.7	327.5	278.7	278.7	315.0	266.6	266.6	301.4	253.6	253.6	286.7
			SHC	251.9	289.7	327.5	242.3	278.7	315.0	231.8	266.6	301.4	220.5	253.6	286.7
		62	TC	294.6	294.6	329.6	282.2	282.2	319.7	268.7	268.7	309.1	254.1	254.1	298.4
			SHC	234.7	282.1	329.6	226.8	273.3	319.7	218.4	263.7	309.1	209.7	254.1	298.4
		67	TC	320.6	320.6	320.6	305.9	305.9	305.9	289.9	289.9	289.9	272.7	272.7	272.7
			SHC	188.6	237.7	286.8	182.7	231.8	280.9	176.5	225.5	274.5	169.8	218.8	267.7
		72	TC	350.0	350.0	350.0	334.0	334.0	334.0	316.8	316.8	316.8	298.2	298.2	298.2
			SHC	138.4	187.9	237.5	132.8	182.2	231.7	126.8	176.1	225.5	120.4	169.6	218.8
		76	TC	—	374.4	374.4	—	357.3	357.3	—	338.7	338.7	—	318.9	318.9
			SHC	—	147.7	199.5	—	142.1	193.7	—	136.1	187.4	—	129.7	180.6
11,250 CFM	EAT (wb)	58	TC	299.4	299.4	338.4	287.8	287.8	325.4	275.2	275.2	311.1	261.4	261.4	295.6
			SHC	260.3	299.4	338.4	250.2	287.8	325.4	239.2	275.2	311.1	227.3	261.4	295.6
		62	TC	302.2	302.2	346.0	289.3	289.3	335.7	275.5	275.5	323.5	262.1	262.1	307.7
			SHC	244.8	295.4	346.0	236.7	286.2	335.7	227.5	275.5	323.5	216.4	262.1	307.7
		67	TC	325.9	325.9	325.9	310.7	310.7	310.7	294.2	294.2	294.2	276.6	276.6	286.7
			SHC	197.6	252.1	306.5	191.7	246.1	300.4	185.3	239.6	293.9	178.5	232.6	286.7
		72	TC	355.5	355.5	355.5	339.1	339.1	339.1	321.3	321.3	321.3	302.2	302.2	302.2
			SHC	142.1	197.0	251.8	136.4	191.2	245.9	130.4	185.0	239.6	123.9	178.3	232.8
		76	TC	—	380.0	380.0	—	362.4	362.4	—	343.3	343.3	—	322.8	322.8
			SHC	—	152.4	209.4	—	146.8	203.4	—	140.7	197.0	—	134.2	190.2
12,500 CFM	EAT (wb)	58	TC	307.7	307.7	347.9	295.7	295.7	334.2	282.5	282.5	319.3	268.2	268.2	303.2
			SHC	267.6	307.7	347.9	257.1	295.7	334.2	245.6	282.5	319.3	233.2	268.2	303.2
		62	TC	308.4	308.4	362.2	295.9	295.9	347.4	283.1	283.1	332.4	268.4	268.4	315.2
			SHC	254.6	308.4	362.2	244.4	295.9	347.4	233.8	283.1	332.4	221.7	268.4	315.2
		67	TC	330.2	330.2	330.2	314.6	314.6	319.2	297.8	297.8	312.3	279.8	279.8	304.7
			SHC	206.3	265.9	325.5	200.3	259.7	319.2	193.8	253.1	312.3	186.7	245.7	304.7
		72	TC	360.1	360.1	360.1	343.2	343.2	343.2	325.0	325.0	325.0	305.4	305.4	305.4
			SHC	145.7	205.7	265.7	139.9	199.8	259.7	133.8	193.5	253.3	127.3	186.8	246.3
		76	TC	—	384.6	384.6	—	366.5	366.5	—	346.9	346.9	—	325.9	325.9
			SHC	—	157.0	218.9	—	151.2	212.9	—	145.1	206.3	—	138.5	199.3

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 5. Do not operate outside these limits.

Performance data (cont)

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

COOLING CAPACITIES — 2-STAGE COOLING, 25 TONS, WITH HUMIDI-MIZER IN SUBCOOLING MODE

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

COOLING CAPACITIES — 2-STAGE COOLING, 25 TONS, WITH HUMIDI-MIZER IN HOT GAS REHEAT MODE

TEMP (°F) AIR ENTERING CONDENSER (EDB)		AIR ENTERING EVAPORATOR (°F)								
		75 DRY BULB 62.5 WET BULB (50% RELATIVE)			75 DRY BULB 64 WET BULB (56% RELATIVE)			75 DRY BULB 65.3 WET BULB (60% RELATIVE)		
		AIR ENTERING EVAPORATOR - Cfm								
		6,000	8,000	10,000	6,000	8,000	10,000	6,000	8,000	10,000
80	TC	124.40	133.90	139.00	132.00	142.10	145.10	135.60	149.10	151.50
	SHC	37.60	60.70	82.20	27.80	45.40	65.80	17.50	34.20	50.10
	kW	15.83	15.90	16.00	15.97	16.13	16.16	16.11	16.31	16.38
75	TC	129.00	138.50	144.60	136.60	147.60	150.10	140.60	154.00	156.30
	SHC	47.10	70.60	92.10	37.30	55.30	75.70	27.00	43.70	60.00
	kW	15.77	15.83	15.94	15.91	16.07	16.10	16.05	16.25	16.32
70	TC	133.60	143.10	149.20	141.20	152.30	154.80	145.30	158.80	161.10
	SHC	57.30	80.70	102.20	47.50	65.40	85.80	37.20	53.90	70.10
	kW	15.68	15.75	15.86	15.83	16.00	16.04	15.88	16.08	16.15
60	TC	142.80	158.40	158.40	150.40	161.40	163.90	153.90	167.40	169.70
	SHC	76.50	121.40	121.40	66.70	84.60	105.00	56.40	73.10	89.30
	kW	15.54	15.60	15.71	15.68	15.84	15.87	15.82	16.02	16.09
50	TC	151.80	161.30	167.40	159.40	170.50	173.20	162.80	176.20	178.80
	SHC	94.10	117.50	139.00	84.30	102.20	122.60	74.00	90.70	106.90
	kW	15.40	15.47	15.58	15.54	15.68	15.71	15.66	15.86	15.93
40	TC	161.20	170.70	176.80	168.80	179.80	182.50	172.20	185.70	188.20
	SHC	114.10	137.60	159.10	104.30	122.30	142.70	94.00	110.70	127.00
	kW	15.24	15.31	15.42	15.39	15.55	15.58	15.53	15.73	15.80

LEGEND

Edb — Entering Dry-Bulb
Ewb — Entering Wet-Bulb
kW — 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:

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

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

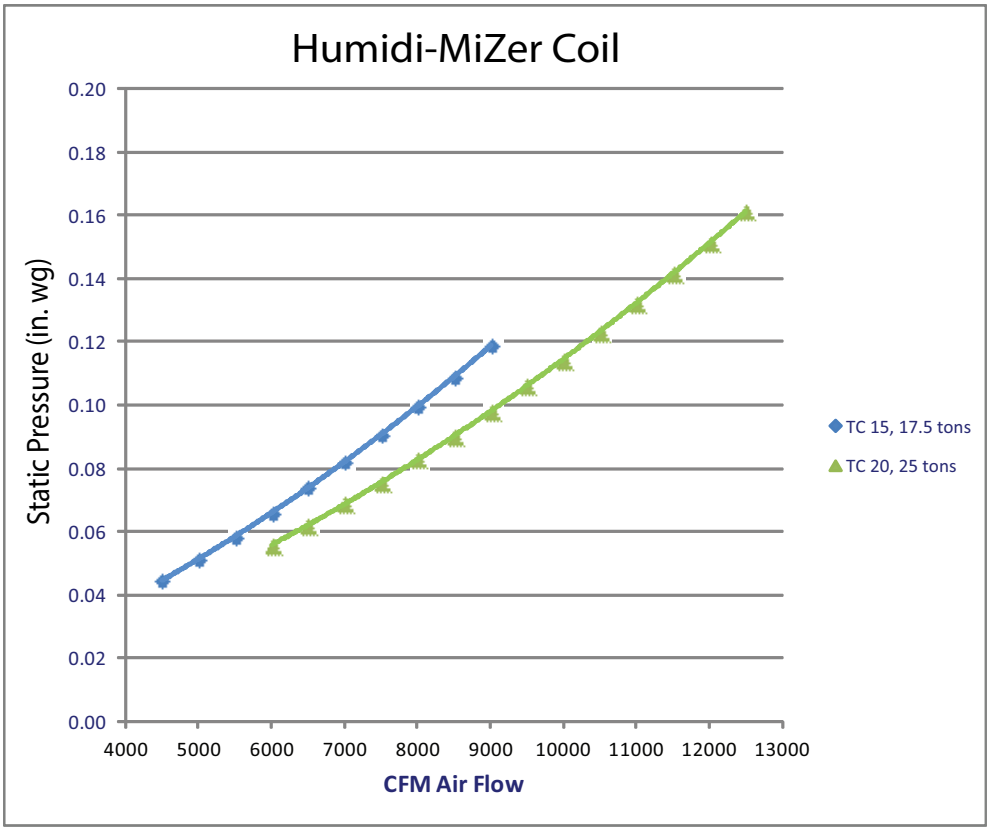
$$h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{cfm}}$$

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

Performance data (cont)

STATIC PRESSURE ADDERS (IN. WG)

HUMIDI-MIZER® SYSTEM



HORIZONTAL DUCT CONFIGURATION

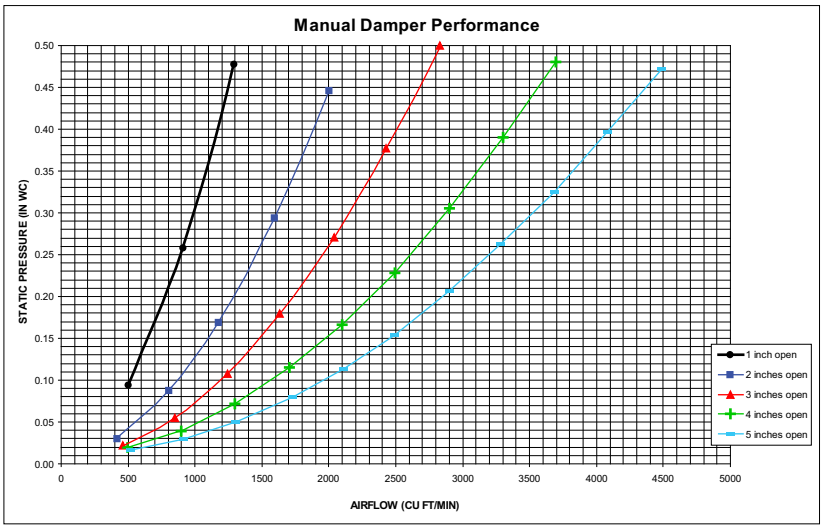
MODEL SIZES 18-29								
CFM	**4500**	**5000**	**5500**	**6000**	**6500**	**7000**	**7500**	**8000**
STATIC PRESSURE ADDER (in. wg)	0.002	0.004	0.006	0.009	0.013	0.017	0.021	0.026

MODEL SIZES 18-29									
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

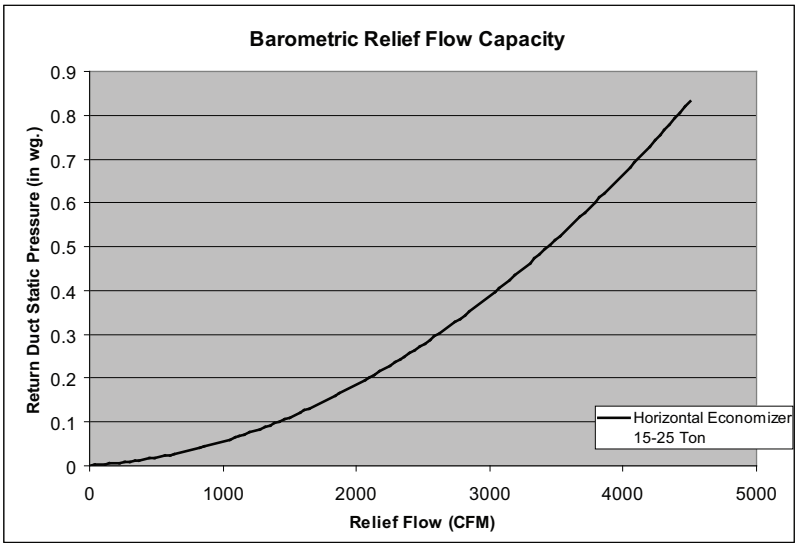
Performance data (cont)

DAMPER, BAROMETRIC RELIEF AND PE PERFORMANCE

MANUAL DAMPER PERFORMANCE

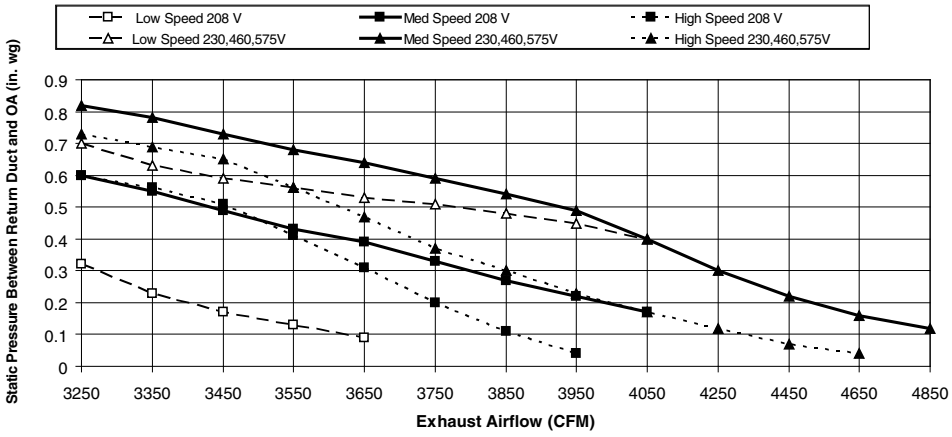


BAROMETRIC RELIEF FLOW CAPACITY



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.
6. For more information on the performance limits of Carrier motors, see the application data section of this book.

48TC**18 — 15 TON HORIZONTAL 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	508	1.25	582	1.76	647	2.31	705	2.89	758	3.51
4900	540	1.51	610	2.05	672	2.64	729	3.26	781	3.91
5250	568	1.78	635	2.35	695	2.96	750	3.61	801	4.29
5650	600	2.13	664	2.73	723	3.37	776	4.05	825	4.76
6000	629	2.47	691	3.10	747	3.77	799	4.48	—	—
6400	663	2.91	721	3.57	776	4.28	—	—	—	—
6750	693	3.34	749	4.03	801	4.76	—	—	—	—
7150	727	3.88	781	4.61	—	—	—	—	—	—
7500	757	4.40	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4500	807	4.16	852	4.83	—	—	—	—	—	—
4900	829	4.58	—	—	—	—	—	—	—	—
5250	—	—	—	—	—	—	—	—	—	—
5650	—	—	—	—	—	—	—	—	—	—
6000	—	—	—	—	—	—	—	—	—	—
6400	—	—	—	—	—	—	—	—	—	—
6750	—	—	—	—	—	—	—	—	—	—
7150	—	—	—	—	—	—	—	—	—	—
7500	—	—	—	—	—	—	—	—	—	—

LEGEND

STD Static - 514-680 RPM, 2.9 Max BHP
MED Static - 614-780 RPM, 3.7 Max BHP
HIGH Static - 746-912 RPM, 4.9 Max BHP

Fan data (cont)

48TC**21 — 17.5 TON HORIZONTAL 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	568	1.78	635	2.35	695	2.96	750	3.61	801	4.29
5700	604	2.17	668	2.78	726	3.43	779	4.11	829	4.82
6150	642	2.63	702	3.27	758	3.95	809	4.67	857	5.42
6550	676	3.09	733	3.76	786	4.48	836	5.23	883	6.01
7000	714	3.67	769	4.38	820	5.14	868	5.92	913	7.64
7450	753	4.33	805	5.08	854	5.87	900	6.69	944	7.54
7900	792	5.06	841	5.85	888	6.68	933	7.54	—	—
8300	827	5.78	874	6.61	920	7.47	—	—	—	—
8750	867	6.69	912	7.55	—	—	—	—	—	—

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

LEGEND

- STD Static - 622-822 RPM, 3.7 Max BHP
- MED Static - 713-879 RPM, 4.9 Max BHP
- HIGH Static - 835-1021 RPM, Voltage: 208V / 230V / 460V / 575V Max BHP: 6.5 / 6.9 / 7.0 /8.3
- Operation point covered by high static drive; Confirm Max BHP based on unit voltage selected.

Fan data (cont)

48TC**25 — 20 TON HORIZONTAL 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
6,000	**633**	**1.92**	700	2.44	759	2.98	812	3.53	861	4.10
6,500	**674**	**2.34**	738	2.90	795	3.48	847	4.07	894	4.67
7,000	715	2.83	776	3.43	831	4.05	882	4.67	928	5.31
7,500	757	3.39	816	4.03	869	4.68	917	5.35	963	6.03
8,000	800	4.02	856	4.70	907	5.39	954	6.10	998	6.81
8,500	843	4.73	896	5.45	945	6.18	991	6.93	1034	7.68
9,000	886	5.52	937	6.28	984	7.06	1029	7.84	1071	8.63
9,500	929	6.40	978	7.21	1024	8.02	1067	8.84	—	—
10,000	973	7.38	1020	8.22	1064	9.08	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,000	907	4.68	949	5.27	990	5.88	1028	6.50	1064	7.13
6,500	939	5.29	981	5.92	1020	6.56	1058	7.21	1094	7.88
7,000	972	5.97	1013	6.63	1052	7.31	1089	8.00	—	—
7,500	1005	6.72	1046	7.42	1084	8.13	—	—	—	—
8,000	1040	7.54	1079	8.28	—	—	—	—	—	—
8,500	1075	8.45	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

LEGEND

	STD Static - 690-863 RPM, 4.9 Max BHP
	MED Static - 835-1021, Voltage: 208V / 230V / 460V / 575V Max BHP: 6.5 / 6.9 / 7.0 / 8.3
	HIGH Static - 941-1100 RPM, Voltage: 208V / 230V / 460V / 575V Max BHP: 10.5 / 11.9 / 11.9 / 11.0
BOLD	Requires alternate standard static drive package
Underscore	Operation point covered by medium static drive. Confirm Max BHP coverage based on unit voltage selected.

Fan data (cont)

48TC**29 — 25 TON HORIZONTAL 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
7,500	**757**	**3.39**	816	4.03	869	4.68	917	5.35	963	6.03
8,000	800	4.02	856	4.70	907	5.39	954	6.10	998	6.81
8,500	843	4.73	896	5.45	945	6.18	991	6.93	1034	7.68
9,000	886	5.52	937	6.28	984	7.06	1029	7.84	1071	8.63
9,500	929	6.40	978	7.21	1024	8.02	1067	8.84	—	—
10,000	973	7.38	1020	8.22	1064	9.08	—	—	—	—
10,500	1017	8.45	1062	9.33	—	—	—	—	—	—
11,000	1061	9.63	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
7,500	1005	6.72	1046	7.42	1084	8.13	—	—	—	—
8,000	1040	7.54	1079	8.28	—	—	—	—	—	—
8,500	1075	8.45	—	—	—	—	—	—	—	—
9,000	—	—	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—
10,500	—	—	—	—	—	—	—	—	—	—
11,000	—	—	—	—	—	—	—	—	—	—
11,500	—	—	—	—	—	—	—	—	—	—

LEGEND

MED Static - 755-923 RPM, Voltage: 208V / 230V / 460V / 575V Max BHP: 6.5 / 6.9 / 7.0 / 8.3

HIGH Static - 906-1100 RPM, Voltage: 208V / 230V / 460V / 575V Max BHP: 10.5 / 11.9 / 11.9 / 11.0

BOLD Requires alternate standard static drive package

PULLEY ADJUSTMENT — HORIZONTAL

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
18	Standard Static	680	663	647	630	614	597	580	564	547	531	514
	Medium Static	780	763	747	730	714	697	680	664	647	631	614
	High Static	912	895	879	862	846	829	812	796	779	763	746
21	Standard Static	822	802	782	762	742	722	702	682	662	642	622
	Medium Static	879	862	846	829	813	796	779	763	746	730	713
	High Static	1021	1002	984	965	947	928	909	891	872	854	835
25	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
29	Standard Static	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Medium Static	923	906	889	873	856	839	822	805	789	772	755
	High Static	1107	1087	1067	1047	1027	1007	986	966	946	926	906

LEGEND

Factory settings

N/A Not available

NOTE: Do not adjust pulley further than 5 turns open

2-STAGE COOLING WITH SINGLE SPEED INDOOR FAN MOTOR, 15 - 25 TONS

UNIT	V-Ph-Hz	VOLTAGE RANGE		COMP 1		COMP 2		OFM (EA)		IFM		
		MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFF. AT FULL LOAD	FLA
48TC**18	208-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	88.6%	8.4
										MED	87.0%	10.6
										HIGH	82.9%	13.6
	230-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	88.6%	8.3
										MED	87.0%	10.6
										HIGH	82.9%	12.7
	460-3-60	414	506	12.8	100	12.8	100	277	0.9	STD	88.6%	4.2
										MED	87.0%	5.3
										HIGH	82.9%	6.4
	575-3-60	518	633	9.6	78	9.6	78	397	0.6	STD	81.1%	2.8
										MED	81.1%	2.8
										HIGH	83.6%	5.6
48TC**21	208-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	87.0%	10.6
										MED	82.9%	13.6
										HIGH-High Eff.	89.5%	17.1
	230-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	87.0%	10.6
										MED	82.9%	12.7
										HIGH-High Eff.	89.5%	17.1
	460-3-60	414	506	12.8	100	12.2	100	277	0.9	STD	87.0%	5.3
										MED	82.9%	6.4
										HIGH-High Eff.	89.5%	8.6
	575-3-60	518	633	9.6	78	9.0	78	397	0.6	STD	81.1%	2.8
										MED	83.6%	5.6
										HIGH-High Eff.	89.5%	7.6
48TC**25	208-3-60	187	253	28.2	239	28.2	239	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	28.2	239	28.2	239	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	14.7	130	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	11.3	94	11.3	94	397	0.6	STD	83.6%	5.6
										MED-High Eff.	89.5%	7.6
										HIGH-High Eff.	91.7%	9.5

See Legend and Notes on page 50.

Size 29 unit is not available with single speed indoor fan motor.

Electrical data (cont)

2-STAGE COOLING WITH 2-SPEED INDOOR FAN MOTOR, 15 - 25 TONS

UNIT	V-Ph-Hz	VOLTAGE RANGE		COMP 1		COMP 2		OFM (EA)		IFM		
		MIN	MAX	RLA	LRA	RLA	LRA	WATTS	FLA	TYPE	EFF AT FULL LOAD	FLA
48TC**18	208-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	85.0%	8.6
										MED	81.5%	10.8
										HIGH	83.6%	13.6
	230-3-60	187	253	25.0	164	25.0	164	350	1.5	STD	85.0%	7.8
										MED	81.5%	9.8
										HIGH	83.6%	12.7
	460-3-60	414	506	12.8	100	12.8	100	277	0.9	STD	85.0%	3.8
										MED	81.5%	4.9
										HIGH	83.6%	6.4
	575-3-60	518	633	9.6	78	9.6	78	397	0.6	STD	81.1%	4.5
										MED	81.1%	4.5
										HIGH	83.6%	6.2
48TC**21	208-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	81.5%	10.8
										MED	83.6%	13.6
										HIGH	89.5%	17.1
	230-3-60	187	253	27.6	191	25.0	164	350	1.5	STD	81.5%	9.8
										MED	83.6%	12.7
										HIGH	89.5%	17.1
	460-3-60	414	506	12.8	100	12.2	100	277	0.9	STD	81.5%	4.9
										MED	83.6%	6.4
										HIGH	89.5%	8.6
	575-3-60	518	633	9.6	78	9.0	78	397	0.6	STD	81.1%	4.5
										MED	83.6%	6.2
										HIGH	89.5%	7.6
48TC**25	208-3-60	187	253	28.2	239	28.2	239	350	1.5	STD	83.6%	13.6
										MED	89.5%	17.1
										HIGH	91.7%	28.5
	230-3-60	187	253	28.2	239	28.2	239	350	1.5	STD	83.6%	12.7
										MED	89.5%	17.1
										HIGH	91.7%	28.5
	460-3-60	414	506	14.7	130	14.7	130	277	0.9	STD	83.6%	6.4
										MED	89.5%	8.6
										HIGH	91.7%	14.3
	575-3-60	518	633	11.3	94	11.3	94	397	0.6	STD	83.6%	6.2
										MED	89.5%	7.6
										HIGH	91.7%	9.5
48TC**29	208-3-60	187	253	48.1	245	33.3	239	350	1.5	MED	89.5%	17.1
										HIGH	91.7%	28.5
	230-3-60	187	253	48.1	245	33.3	239	350	1.5	MED	89.5%	17.1
										HIGH	91.7%	28.5
	460-3-60	414	506	18.6	125	17.9	125	277	0.9	MED	89.5%	8.6
										HIGH	91.7%	14.3
	575-3-60	518	633	14.7	100	12.8	80	397	0.6	MED	89.5%	7.6
										HIGH	91.7%	9.5

See Legend and Notes on page 50.

Electrical data (cont)

UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA - SINGLE-SPEED INDOOR FAN MOTOR

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**18	208/230-3-60	STD	69.2/69.1	90/90	72/72	409	81.0/80.9	100/100	86/86	429
		MED	71.4	90	75	423	83.2	100	88	443
		HIGH	74.4/73.5	90/90	78/77	425	86.2/85.3	100/100	92/91	445
	460-3-60	STD	35.7	45	37	242	41.9	50	45	254
		MED	36.8	45	39	249	43.0	50	46	261
		HIGH	37.9	50	40	250	44.1	50	47	262
	575-3-60	STD	26.2	30	27	184	31.0	40	33	192
		MED	26.2	30	27	184	31.0	40	33	192
		HIGH	29.0	35	31	198	33.8	40	36	206
48TC**21	208/230-3-60	STD	76.1	100	80	453	87.9	100	93	473
		MED	79.1/78.2	100/100	83/82	455	90.9/90.0	100/100	97/96	475
		HIGH-High Efficiency	82.6	100	87	451	94.4	110	101	471
	460-3-60	STD	37.1	45	39	251	43.3	50	46	263
		MED	38.2	50	40	252	44.4	50	47	264
		HIGH-High Efficiency	40.4	50	43	250	46.6	50	50	262
	575-3-60	STD	26.2	30	27	186	31.0	40	33	194
		MED	29.0	35	31	200	33.8	40	36	208
		HIGH-High Efficiency	31.0	40	33	198	35.8	45	38	206
48TC**25	208/230-3-60	STD	83.1/82.2	100/100	87/86	578	94.9/94.0	110/110	101/100	598
		MED-High Efficiency	86.6	100	91	574	98.4	125	105	594
		HIGH-High Efficiency	98.0	125	105	653	109.8	125	118	673
	460-3-60	STD	43.1	50	45	312	49.3	60	52	324
		MED-High Efficiency	45.3	50	48	310	51.5	60	55	322
		HIGH-High Efficiency	51.0	60	54	350	57.2	70	62	362
	575-3-60	STD	33.4	40	35	232	38.2	45	41	240
		MED-High Efficiency	35.4	45	37	230	40.2	50	43	238
		HIGH-High Efficiency	37.3	45	40	257	42.1	50	45	265

See Legend and Notes on page 50.

Electrical data (cont)

UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA - SINGLE-SPEED INDOOR FAN MOTOR (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**18	208/230-3-60	STD	74.0/73.9	90/90	78/78	414	85.8/85.7	100/100	91/91	434
		MED	76.2	100	80	428	88.0	100	94	448
		HIGH	79.2/78.3	100/100	84/83	430	91.0/90.1	100/100	97/96	450
	460-3-60	STD	37.9	50	40	244	44.1	50	47	256
		MED	39.0	50	41	251	45.2	50	48	263
		HIGH	40.1	50	42	252	46.3	50	50	264
	575-3-60	STD	27.9	35	29	186	32.7	40	35	194
		MED	27.9	35	29	186	32.7	40	35	194
		HIGH	30.7	40	33	200	35.5	45	38	208
48TC**21	208/230-3-60	STD	80.9	100	85	458	92.7	100	99	478
		MED	83.9/83.0	100/100	89/88	460	95.7/94.8	110/110	102/101	480
		HIGH-High Efficiency	87.4	100	93	456	99.2	125	106	476
	460-3-60	STD	39.3	50	42	253	45.5	50	49	265
		MED	40.4	50	43	254	46.6	50	50	266
		HIGH-High Efficiency	42.6	50	45	252	48.8	60	52	264
	575-3-60	STD	27.9	35	29	188	32.7	40	35	196
		MED	30.7	40	33	202	35.5	45	38	210
		HIGH-High Efficiency	32.7	40	35	200	37.5	45	40	208
48TC**25	208/230-3-60	STD	87.9/87.0	100/100	93/92	583	99.7/98.8	125/125	106/105	603
		MED-High Efficiency	91.4	100	97	579	103.2	125	111	599
		HIGH-High Efficiency	102.8	125	110	658	114.6	125	124	678
	460-3-60	STD	45.3	50	48	314	51.5	60	55	326
		MED-High Efficiency	47.5	60	50	312	53.7	60	58	324
		HIGH-High Efficiency	53.2	60	57	352	59.4	70	64	364
	575-3-60	STD	35.1	45	37	234	39.9	50	43	242
		MED-High Efficiency	37.1	45	39	232	41.9	50	45	240
		HIGH-High Efficiency	39.0	50	42	259	43.8	50	47	267

See Legend and Notes on page 50.

Electrical data (cont)

UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA WITH FACTORY-INSTALLED 2-SPEED INDOOR FAN OPTION

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**18	208/230-3-60	STD	69.4/68.6	90/90	73/72	390	81.2/80.4	100/100	86/85	410
		MED	71.6/70.6	90/90	75/74	414	83.4/82.4	100/100	89/88	434
		HIGH	74.4/73.5	90/90	78/77	425	86.2/85.3	100/100	92/91	445
	460-3-60	STD	35.3	45	37	233	41.5	50	44	245
		MED	36.4	45	38	245	42.6	50	45	257
		HIGH	37.9	50	40	250	44.1	50	47	262
	575-3-60	STD	27.9	35	29	184	32.7	40	35	192
		MED	27.9	35	29	184	32.7	40	35	192
		HIGH	29.6	35	31	198	34.4	40	37	206
48TC**21	208/230-3-60	STD	76.3/75.3	100/100	80/79	444	88.1/87.1	100/100	93/92	464
		MED	79.1/78.2	100/100	83/82	455	90.9/90.0	100/100	97/96	475
		HIGH	82.6	100	87	451	94.4	110	101	471
	460-3-60	STD	36.7	45	39	247	42.9	50	46	259
		MED	38.2	50	40	252	44.4	50	47	264
		HIGH	40.4	50	43	250	46.6	50	50	262
	575-3-60	STD	27.9	35	29	186	32.7	40	35	194
		MED	29.6	35	31	200	34.4	40	37	208
		HIGH	31.0	40	33	198	35.8	45	38	206
48TC**25	208/230-3-60	STD	83.1/82.2	100/100	87/86	578	94.9/94.0	110/110	101/100	598
		MED	86.6	100	91	574	98.4	125	105	594
		HIGH	98.0	125	105	653	109.8	125	118	673
	460-3-60	STD	43.1	50	45	312	49.3	60	52	324
		MED	45.3	50	48	310	51.5	60	55	322
		HIGH	51.0	60	54	350	57.2	70	62	362
	575-3-60	STD	34.0	45	36	232	38.8	50	41	240
		MED	35.4	45	37	230	40.2	50	43	238
		HIGH	37.3	45	40	257	42.1	50	45	265
48TC**29	208/230-3-60	MED	120.1	150	124	587	131.9	175	138	607
		HIGH	131.5	175	137	666	143.3	175	151	686
	460-3-60	MED	53.3	60	56	319	59.5	70	63	331
		HIGH	59.0	70	62	359	65.2	80	70	371
	575-3-60	MED	42.5	50	45	254	47.3	60	50	262
		HIGH	44.4	50	47	281	49.2	60	52	289

See Legend and Notes on page 50.

Electrical data (cont)

UNIT WIRE/FUSE OR HACR BREAKER SIZING DATA WITH FACTORY-INSTALLED 2-SPEED INDOOR FAN OPTION (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**18	208/230-3-60	STD	74.2/73.4	90/90	78/77	395	86.0/85.2	100/100	92/91	415
		MED	76.4/75.4	100/100	81/79	419	88.2/87.2	100/100	94/93	439
		HIGH	79.2/78.3	100/100	84/83	430	91.0/90.1	100/100	97/96	450
	460-3-60	STD	37.5	50	39	235	43.7	50	47	247
		MED	38.6	50	41	247	44.8	50	48	259
		HIGH	40.1	50	42	252	46.3	50	50	264
	575-3-60	STD	29.6	35	31	186	34.4	40	37	194
		MED	29.6	35	31	186	34.4	40	37	194
		HIGH	31.3	40	33	200	36.1	45	39	208
48TC**21	208/230-3-60	STD	81.1/80.1	100/100	85/84	449	92.9/91.9	100/100	99/98	469
		MED	83.9/83.0	100/100	89/88	460	95.7/94.8	110/110	102/101	480
		HIGH	87.4	100	93	456	99.2	125	106	476
	460-3-60	STD	38.9	50	41	249	45.1	50	48	261
		MED	40.4	50	43	254	46.6	50	50	266
		HIGH	42.6	50	45	252	48.8	60	52	264
	575-3-60	STD	29.6	35	31	188	34.4	40	37	196
		MED	31.3	40	33	202	36.1	45	39	210
		HIGH	32.7	40	35	200	37.5	45	40	208
48TC**25	208/230-3-60	STD	87.9/87.0	100/100	93/92	583	99.7/98.8	125/125	106/105	603
		MED	91.4	100	97	579	103.2	125	111	599
		HIGH	102.8	125	110	658	114.6	125	124	678
	460-3-60	STD	45.3	50	48	314	51.5	60	55	326
		MED	47.5	60	50	312	53.7	60	58	324
		HIGH	53.2	60	57	352	59.4	70	64	364
	575-3-60	STD	35.7	45	38	234	40.5	50	43	242
		MED	37.1	45	39	232	41.9	50	45	240
		HIGH	39.0	50	42	259	43.8	50	47	267
48TC**29	208/230-3-60	MED	124.9	150	130	592	136.7	175	143	612
		HIGH	136.3	175	143	671	148.1	175	157	691
	460-3-60	MED	55.5	70	58	321	61.7	80	66	333
		HIGH	61.2	70	65	361	67.4	80	72	373
	575-3-60	MED	44.2	50	47	256	49.0	60	52	264
		HIGH	46.1	60	49	283	50.9	60	54	291

See Legend and Notes on page 50.

Electrical data (cont)

2-STAGE COOLING WITH TWO-SPEED INDOOR FAN MOTOR, 2-STAGE COOLING WITH TWO-SPEED INDOOR FAN MOTOR, SIZES 18-29 (15-25 TONS) — HIGH SCCR

48TC** UNIT	V-Ph-Hz	VOLTAGE RANGE		HIGH SCCR kA	COMP 1		COMP 2		OFM (ea)		IFM		
		MIN	MAX		RLA	LRA	RLA	LRA	WATTS	FLA	TYPE *	EFF AT FULL LOAD	FLA
18	208-3-60	253	187	60	25.0	164	25.0	164	350	1.5	STD	85.0%	8.6
											MED	81.5%	10.8
											HIGH	83.6%	13.6
	230-3-60	253	187	60	25.0	164	25.0	164	350	1.5	STD	85.0%	7.8
											MED	81.5%	9.8
											HIGH	83.6%	12.7
	460-3-60	506	414	65	12.8	100	12.8	100	277	0.9	STD	85.0%	3.8
											MED	81.5%	4.9
											HIGH	83.6%	6.4
21	208-3-60	253	187	60	27.6	191	25.0	164	350	1.5	STD	81.5%	10.8
											MED	83.6%	13.6
											HIGH	89.5%	17.1
	230-3-60	253	187	60	27.6	191	25.0	164	350	1.5	STD	81.5%	9.8
											MED	83.6%	12.7
											HIGH	89.5%	17.1
	460-3-60	506	414	65	12.8	100	12.2	100	277	0.9	STD	81.5%	4.9
											MED	83.6%	6.4
											HIGH	89.5%	8.6
25	208-3-60	253	187	60	28.2	239	28.2	239	350	1.5	STD	83.6%	13.6
											MED	89.5%	17.1
											HIGH	91.7%	28.5
	230-3-60	253	187	60	28.2	239	28.2	239	350	1.5	STD	83.6%	12.7
											MED	89.5%	17.1
											HIGH	91.7%	28.5
	460-3-60	506	414	65	14.7	130	14.7	130	277	0.9	STD	83.6%	6.4
											MED	89.5%	8.6
											HIGH	91.7%	14.3
29	208-3-60	253	187	60	48.1	245	33.9	240	350	1.5	STD	83.6%	13.6
											MED	89.5%	17.1
											HIGH	91.7%	28.5
	230-3-60	253	187	60	48.1	245	33.9	240	350	1.5	STD	83.6%	12.7
											MED	89.5%	17.1
											HIGH	91.7%	28.5
	460-3-60	506	414	65	18.6	125	16.0	140	277	0.9	STD	83.6%	6.4
											MED	89.5%	8.6
											HIGH	91.7%	14.3

* The 2 speed motors are the same efficiency level as the single speed motors.

See Legend and Notes on page 50.

NOTE: High SCCR is not available for units with 575v.

Electrical data (cont)

LEGEND AND NOTES

Applicable for Electrical Data Tables on pages 43-49

LEGEND

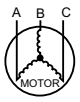
BRKR	—	Circuit Breaker
C.O.	—	Convenience Outlet
DISC	—	Disconnect
EFF	—	Efficiency
FLA	—	Full Load Amps
HACR	—	Heating, Air Conditioning, and Refrigeration
LRA	—	Locked Rotor Amps
MCA	—	Minimum Circuit Amps
PE	—	Power Exhaust
Pwrd fr/unit	—	Powered from Unit
PWRD C.O.	—	Powered Convenience Outlet
RLA	—	Rated Load Amps
SCCR	—	Short Circuit Current Rating
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 v

(BC) 231-227 = 4 v

(AC) 227-226 = 1 v

Maximum deviation is 4 v.

Determine percent of voltage imbalance.

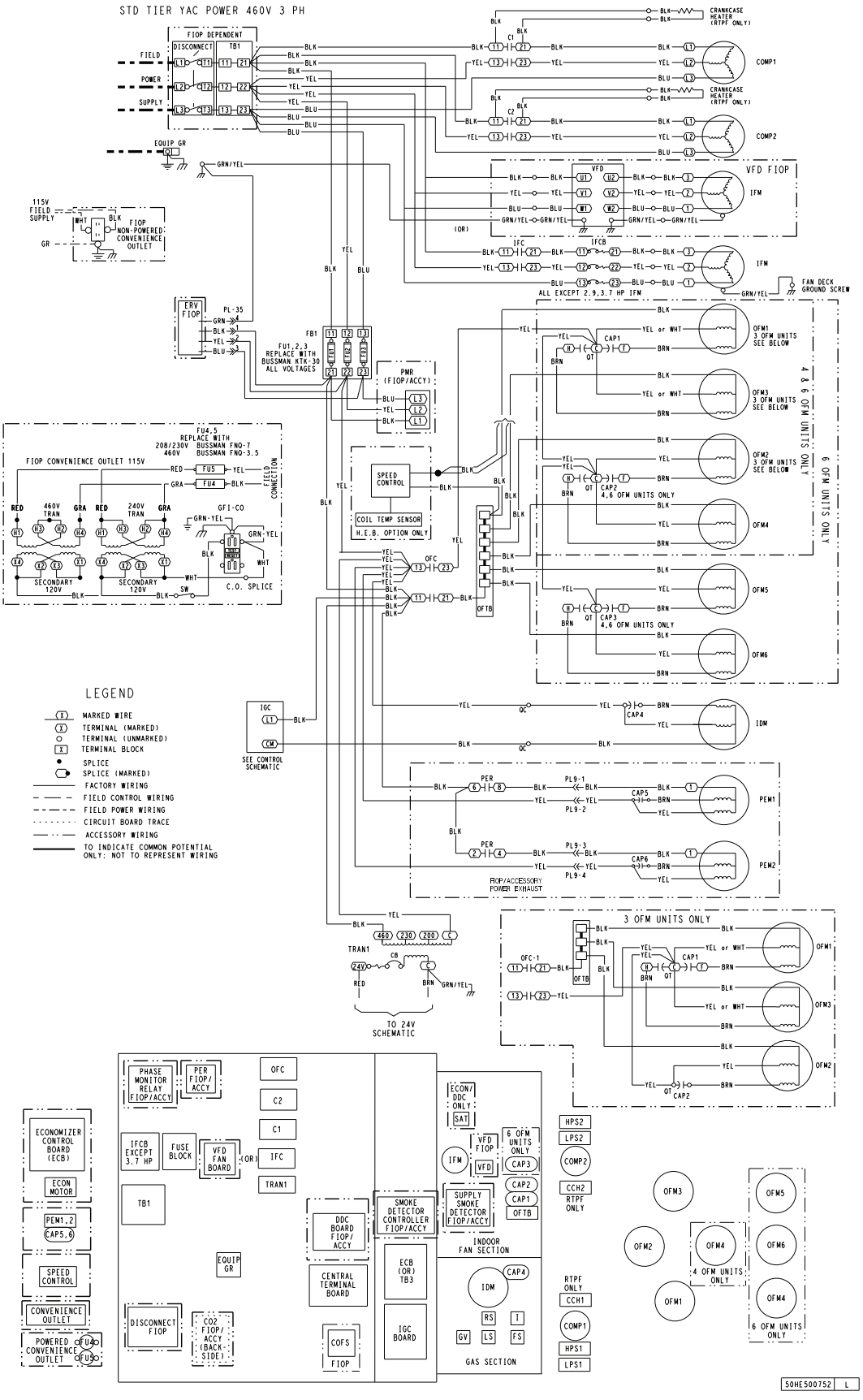
$$\text{\% Voltage Imbalance} = 100x \frac{4}{227} = 1.78\%$$

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

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

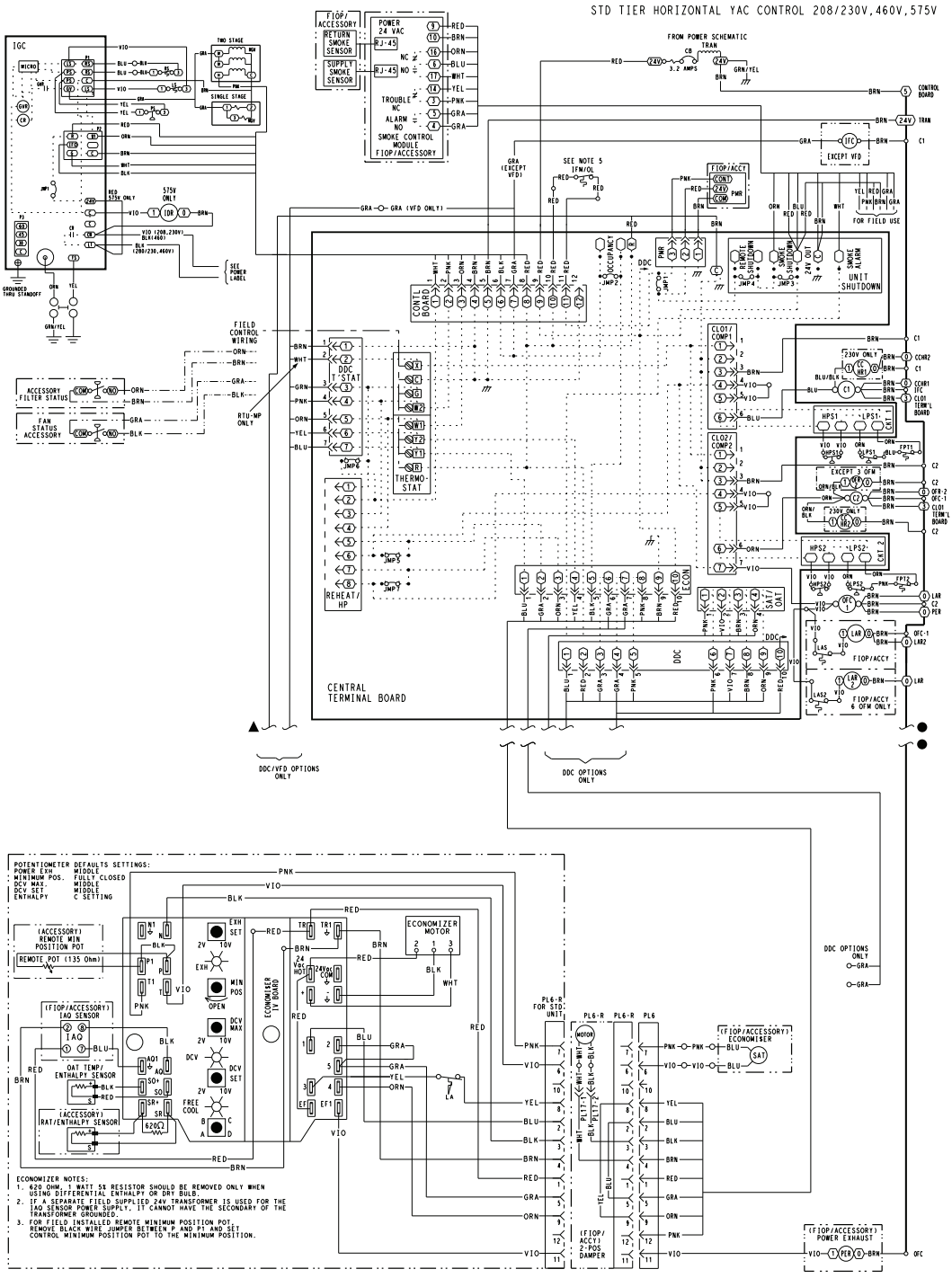
Typical wiring diagrams

TYPICAL POWER WIRING DIAGRAM, 48TC 18-29 460V SHOWN



Typical wiring diagrams (cont)

ELECTRO-MECHANICAL CONTROL WIRING DIAGRAM 48TC 18-29



NOTES
1. IF ANY OF THE ORIGINAL 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 TRAN IS WIRED FOR 230V UNIT. IF UNIT IS TO BE RUN WITH 208V POWER SUPPLY DISCONNECT BLK WIRE FROM 230V TAP AND CONNECT TO 200V TAP.
4. USE COPPER CONDUCTOR ONLY.
5. IFM OL IS NOT USED ON ALL MODELS, IF NOT USED, THEN RED LEADS ARE CONNECTED TOGETHER.

C	CONTACTOR,COMPRESSOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CCH	CRANKCASE HEATER
CCHR	CRANKCASE HEATER RELAY
CCN	CARRIER COMFORT NETWORK
CMP SAFE	COMPRESSOR SAFFETY
COFS	CONDENSATE OVERFLOW SWITCH
COMP	COMPRESSOR MOTOR
CTB	CENTRAL TERMINAL BOARD
DDC	DIRECT DIGITAL CONTROL
FIOP	FACTORY INSTALLED OPTION
FSD	FIRE SHUT DOWN
FU	FUSE
GND	GROUND
GVR	GAS VALVE RELAY
HPS	HIGH PRESSURE SWITCH
HS	HALL EFFECT SENSOR
I	IGNITOR
IAQ	INDOOR AIR QUALITY SENSORS
IDM	INDUCED DRAFT MOTOR
IDR	INDUCED DRAFT RELAY
IFC	INDOOR FAN CONTACTOR
IFM	INDOOR FAN MOTOR
IGC	INTEGRATED GAS CONTROL
IRH	INDOOR RELATIVE HUMIDITY
LA	LOW AMBIENT LOCKOUT
LAR	LOW AMBIENT RELAY
LAS	LOW AMBIENT SWITCH
LOOP PWR	CURRENT LOOP POWER
LPS	LOW PRESSURE SWITCH
LSM	LIMIT SWITCH (MANUAL RESET)
MGV	MAIN GAS VALVE
OAQ	OUTDOOR AIR QUALITY
OAT	OUTDOOR AIR TEMP. SENSOR
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
OFR	OUTDOOR FAN RELAY
OFTB	OUTDOOR FAN TERMINAL BLOCK
OLR	OVERLOAD RELAY
PER	POWER EXHAUST RELAY
PL	PLUG ASSEMBLY
POT	POTENTIOMETER
PMR	PHASE MONITOR RELAY
QT	QUADRUPLE TERMINAL
R	RELAY
RAT	RETURN AIR TEMP. SEN
RMT OCC	REMOTE OCCUPANCY
RS	ROLLOUT SWITCH
RTPF	ROUND TUBE PLATE FIN
	CONDENSER COIL
SAT	SUPPLY AIR TEMP. SENSOR
SEN	SENSOR
SET	SET POINT OFFSET
SFS	SUPPLY FAN STATUS
TDR	TIME DELAY RELAY
TRAN	TRANSFORMER
VFD	VARIABLE FREQUENCY DRIVE

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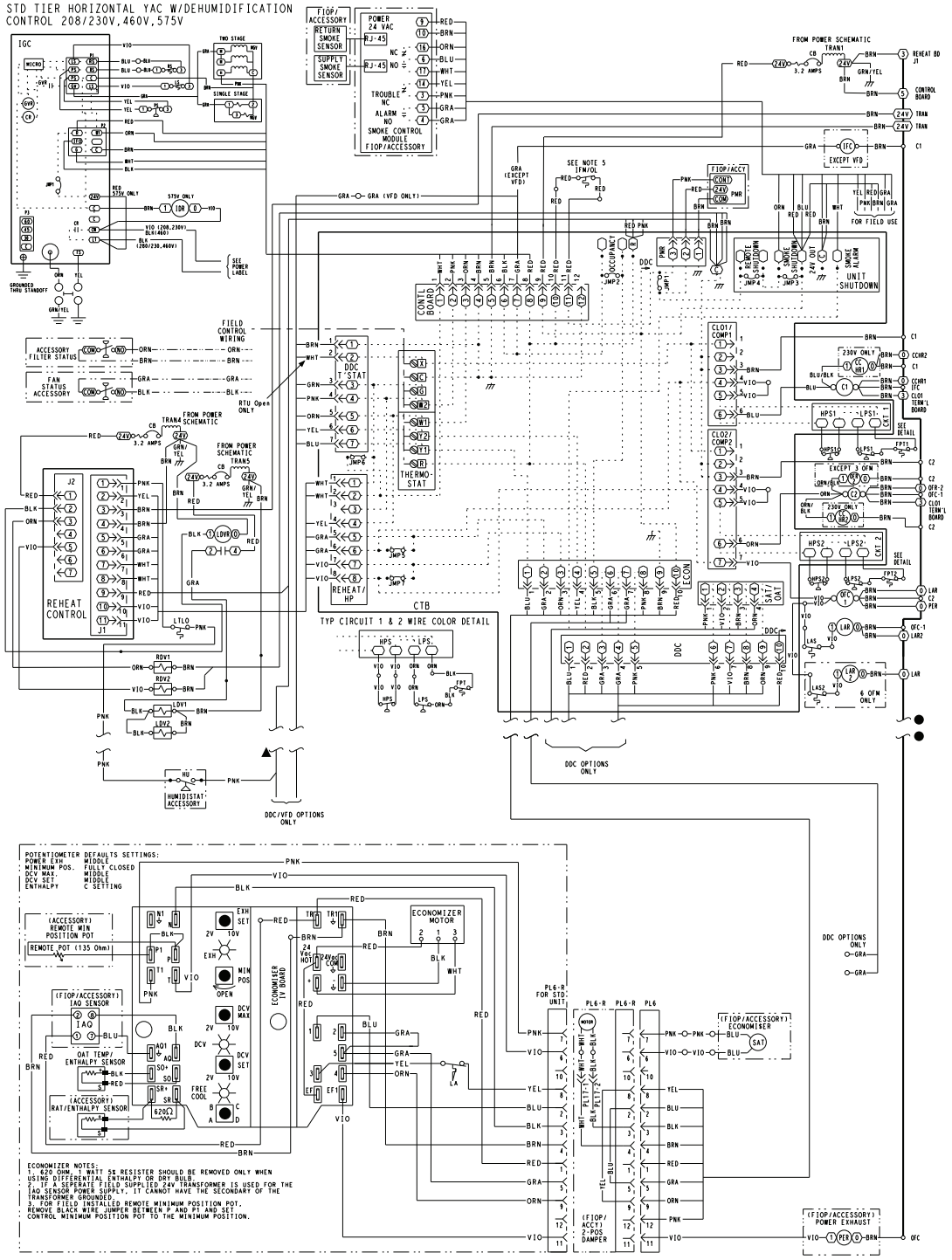
Typical wiring diagrams (cont)

ELECTRO-MECHANICAL CONTROL WIRING DIAGRAM 48TC 18-29 WITH OPTIONAL HUMIDI-MIZER SYSTEM



NOTES
1. IF ANY OF THE ORIGINAL 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 TRAN IS WIRED FOR 230V UNIT. IF UNIT IS TO BE RUN WITH 208V POWER SUPPLY DISCONNECT BLK WIRE FROM 230V TAP AND CONNECT TO 200V TAP.
4. USE COPPER CONDUCTOR ONLY.
5. IFM OL IS NOT USED ON ALL MODELS. WHEN NOT USED, RED LEADS ARE CONNECTED TOGETHER.

C	CONTACTOR,COMPRESSOR
CAP	CAPACITOR
CB	CIRCUIT BREAKER
CCH	CRANKCASE HEATER
CCHR	CRANKCASE HEATER RELAY
CCN	CARRIER COMFORT NETWORK
CCR	COMPRESSOR CONTACTOR RELAY
CMP SAFE	COMPRESSOR SAFFETY
COFS	CONDENSATE OVERFLOW SWITCH
COMP	COMPRESSOR MOTOR
CTB	CENTRAL TERMINAL BOARD
DDC	DIRECT DIGITAL CONTROL
FIOP	FACTORY INSTALLED OPTION
FPT	FREEZE PROTECTION THERMOSTAT
FSD	FIRE SHUT DOWN
FU	FUSE
GND	GROUND
GVR	GAS VALVE RELAY
HPS	HIGH PRESSURE SWITCH
HS	HALL EFFECT SENSOR
I	IGNITOR
IAQ	INDOOR AIR QUALITY SENSORS
IDM	INDUCED DRAFT MOTOR
IDR	INDUCED DRAFT RELAY
IFC	INDOOR FAN CONTACTOR
IFM	INDOOR FAN MOTOR
IGC	INTEGRATED GAS CONTROL
IRH	INDOOR RELATIVE HUMIDITY
LA	LOW AMBIENT LOCKOUT
LAR	LOW AMBIENT RELAY
LAS	LOW AMBIENT SWITCH
LDV	LIQUID DIVERTER VALVE (3-WAY)
LDVR	LIQUID DIVERTER VALVE RELAY
LOOP PWR	CURRENT LOOP POWER
LPS	LOW PRESSURE SWITCH
LSM	LIMIT SWITCH (MANUAL RESET)
MGV	MAIN GAS VALVE
OAQ	OUTDOOR AIR QUALITY
OAT	OUTDOOR AIR TEMP. SENSOR
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
OFR	OUTDOOR FAN RELAY
OFTB	OUTDOOR FAN TERMINAL BLOCK
OLR	OVERLOAD RELAY
PER	POWER EXHAUST RELAY
PL	PLUG ASSEMBLY
POT	POTENTIOMETER
PMR	PHASE MONITOR RELAY
QT	QUADRUPLE TERMINAL
R	RELAY
RAT	RETURN AIR TEMP. SEN
RDV	REHEAT DISCHARGE VALVE
RMT OCC	REMOTE OCCUPANCY
RS	ROLLOUT SWITCH
RTPF	ROUND TUBE PLATE FIN CONDENSER COIL
SAT	SUPPLY AIR TEMP. SENSOR
SEN	SENSOR
SET	SET POINT OFFSET
SFS	SUPPLY FAN STATUS
TDR	TIME DELAY RELAY
TRAN	TRANSFORMER
VFD	VARIABLE FREQUENCY DRIVE

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Sequence of operation

General

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

Electro-mechanical units with no economizer

Cooling (Single speed indoor fan motor)

When the thermostat calls for cooling, terminals G and Y1 are energized. As a result, the indoor-fan contactor (IFC) and the compressor contactor (C1) are energized, causing the indoor-fan motor (IFM), compressor #1, and outdoor fan to start. If the unit has 2 stages of cooling, the thermostat will additionally energize Y2. The Y2 signal will energize compressor contactor #2 (C2), causing compressor #2 to start. Regardless of the number of stages, the outdoor-fan motor runs continuously while unit is cooling.

Cooling (2-speed indoor fan motor)

Per ASHRAE 90.1-2016 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%).

Heating

NOTE: 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 rollout 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 CO_2 sensors are connected to the EconoMi$er IV and X control, a demand controlled ventilation strategy will begin to operate. As the CO_2 level in the zone increases above the CO_2 setpoint, the minimum position of the damper will be increased proportionally. As the CO_2 level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. For EconoMi$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$er IV and X control, it will take the damper up to 2-1/2 minutes before it begins to position itself. After the initial power-up, further changes in damper position can take up to 30 seconds to initiate. Damper movement from full closed to full open (or vice versa) will take between 1-1/2 and 2-1/2 minutes. If free cooling can be used as determined from the appropriate changeover command (switch, dry bulb, enthalpy curve, differential dry bulb, or differential enthalpy), then the control will modulate the dampers open to maintain the mixed-air temperature setpoint at 50°F (10°C) to 55°F (13°C). If there is a further demand for cooling, then cooling second stage - Y2 is energized, and then the control will bring on compressor stage 1 to maintain the mixed-air temperature setpoint. The EconoMi$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.

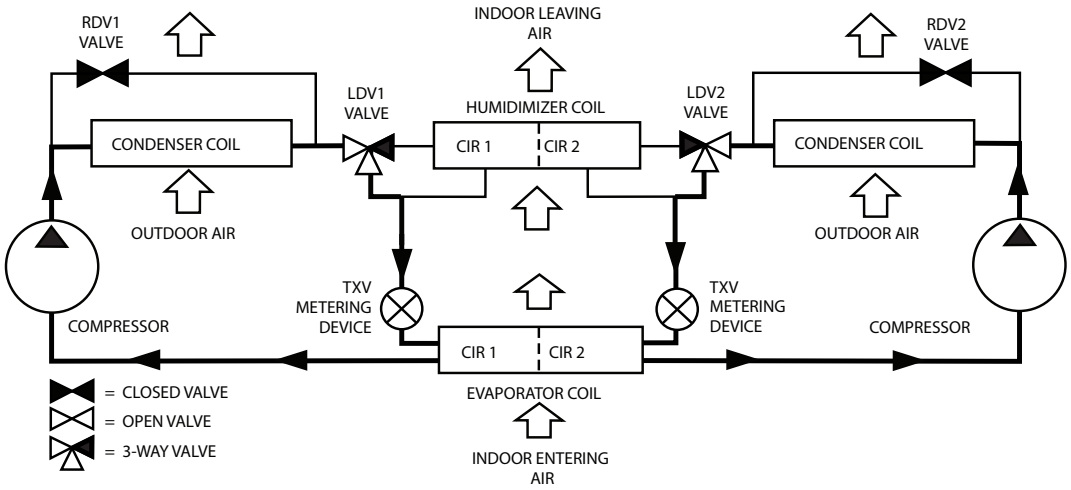
The Reheat1 and Reheat2 modes are a variable when the unit is not in a Heating mode and when the Low Ambient Lockout switch is closed.

RTU Open Controller (factory option)

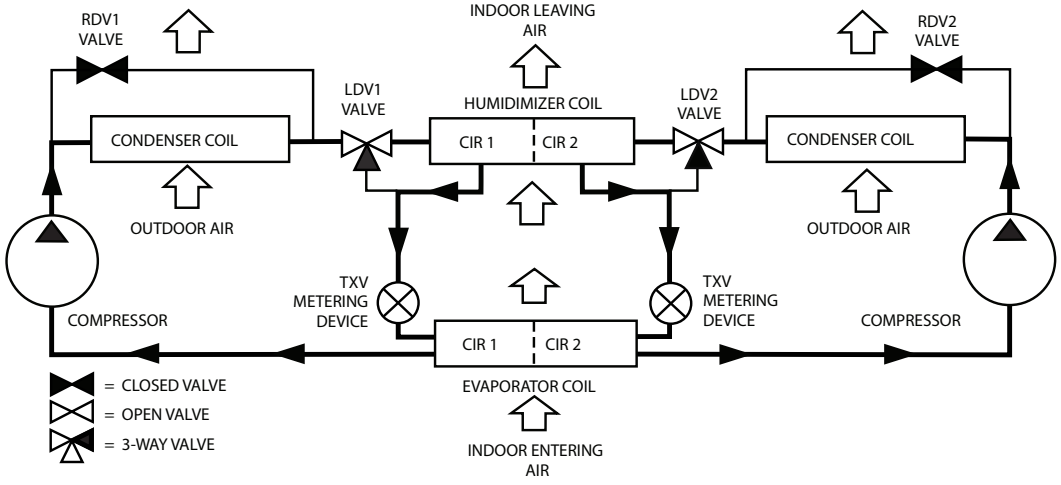
For details on operating 48TC units equipped with the factory-installed RTU Open option refer to Factory Installed Option RTU Open Multi-Protocol Controller Controls, Start-Up, Operation, and Troubleshooting.

Sequence of operation (cont)

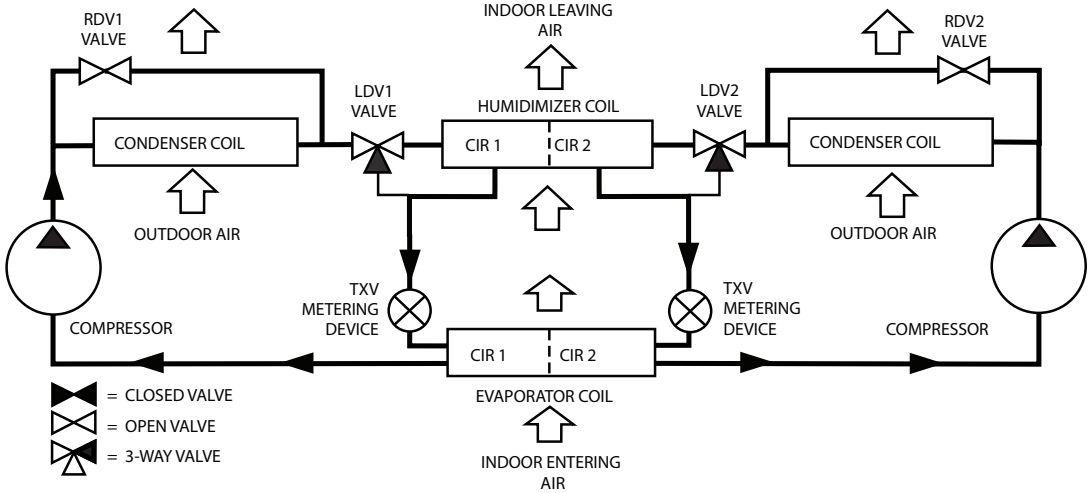
NORMAL COOLING MODE — HUMIDI-MIZER SYSTEM



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 35°F (2°C). It is possible to provide cooling at lower outdoor ambient temperatures by using less outside air, economizers, and/or accessory low ambient kits.

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 5.

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 the physical data cooling table, 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/ft^3 at sea level nationally. The heating value goes down approximately 1.7% per every thousand feet elevation. Standard factory orifices can typically be used up to 2000 ft (610 m) elevation without any operational issues.

Sizing a rooftop

Bigger 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.

Application/selection option

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

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 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.

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.

Guide specifications

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 to 25 Nominal Tons**

Carrier Model Number: **48TC**

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 13.23) Sensors and Transmitters

A. (23 09 13.23.A.) Thermostats

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

Part 4 — (23 09 23) Direct-digital control system for HVAC

4.01 (23 09 23.13) Decentralized, Rooftop Units:

A. (23 09 23.13.A.) PremierLink™ controller

1. Shall be ASHRAE 62 compliant.
2. Shall accept 18-32 VAC input power.
3. Shall have an operating temperature range from –40°F (–40°C) to 158°F (70°C), 10% to 95% RH (non-condensing).
4. Shall include an integrated economizer controller to support an economizer with 4 to 20 mA actuator input and no microprocessor controller.
5. Controller shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock-out, fire shutdown, enthalpy, fan status, remote time clock/door switch.
6. Shall accept a CO_2 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 LonWorks[1] 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.
17. Shall support a bus length of 4000 ft (1219 m) max, 60 devices per 1000 ft (305 m) section, and 1 RS-485 repeater per 1000 ft (305 m) sections.

B. (23 09 23.13.B.) RTU Open protocol, direct digital controller:

1. Shall be ASHRAE 62 compliant.

1. LonWorks is a registered trademark of Echelon Corporation.

2. Shall accept 18-30VAC, 50-60Hz, and consume 15VA or less power.
3. Shall have an operating temperature range from –40°F (–40°C) to 130°F (54°C), 10% to 90% RH (non-condensing).
4. Shall include built-in protocol for BACnet[1] (MS/TP and PTP modes), Modbus[2] (RTU and ASCII), Johnson N2 and LonWorks. LonWorks Echelon processor required for all Lon applications shall be contained in separate communication board.
5. Shall allow access of up to 62 network variables (SNVT). Shall be compatible with all open controllers
6. Baud rate controller shall be selectable using a dip switch.
7. Shall have an LED display independently showing the status of serial communication, running, errors, power, all digital outputs, and all analog inputs.
8. Shall accept the following inputs: space temperature, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, compressor lock-out, fire shutdown, enthalpy switch, and fan status/filter status/humidity/remote occupancy.
9. Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/exhaust/reversing valve.
10. Shall have built-in surge protection circuitry through solid-state polyswitches. Polyswitches shall be used on incoming power and network connections. Polyswitches will return to normal when the "trip" condition clears.
11. Shall have a battery backup capable of a minimum of 10,000 hours of data and time clock retention during power outages.
12. Shall have built-in support for Carrier technician tool.
13. Shall include an 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 LonWorks communications card.
14. Software upgrades will be accomplished by either local or remote download. No software upgrades through chip replacements are allowed.

1. BACnet is a trademark of ASHRAE.
2. Modbus is a registered trademark of Schneider Electric.

Part 5 — (23 09 33) Electric and electronic control systems 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 rollout switch.
   d. Flame proving controls.

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

6.01 (23 09 93.13) Decentralized, Rooftop Units:

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**18-29)

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 ASHRAE 90.1-2016 and IECC[1]-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 35°F (2°C), ambient outdoor temperatures. Accessory winter start kit is necessary if mechanically cooling at ambient temperatures below 35°F (2°C).
3. Unit shall discharge supply air horizontally as shown on contract drawings.
4. Unit shall be factory configured and ordered for horizontal supply and return configurations.
5. Unit shall be factory furnished for horizontal 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.

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

Guide specifications (cont)

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 (horizontal plane).
   b. Thru-the-base capability:
      1) Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
      2) 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 in-shot type constructed of aluminum-coated steel.

c. Burners shall incorporate orifices for rated heat output up to 2000 ft (610 m) elevation. Additional accessory kits may be required for applications above 2000 ft (610 m) elevation, depending on local gas supply conditions.

d. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.

4. Optional stainless steel heat exchanger construction:

a. Use energy saving, direct-spark ignition system.

b. Use a redundant main gas valve.

c. Burners shall be of the in-shot type constructed of aluminum-coated steel.

d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).

e. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-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.I.) Coils

1. Standard aluminum fin/copper tube coils:

a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.

c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

2. Optional pre-coated aluminum-fin condenser coils:

a. Shall have a durable epoxy-phenolic coating to provide protection in mildly corrosive coastal environments.

b. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube.

c. Epoxy-phenolic barrier shall minimize galvanic action between dissimilar metals.

d. Corrosion durability of fin stock shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90.

e. Corrosion durability of fin stock shall be confirmed through testing to have no visible corrosion after 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, 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, including all exposed fin edges.
   c. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
   d. Shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02.
   e. Shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2.

J. (23 81 19.13.J.) Refrigerant components
   1. Refrigerant circuit shall include the following control, safety, and maintenance features:
      a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
      b. Refrigerant filter drier - Solid core design.
      c. Service gage connections on suction and discharge lines.
      d. 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-amperage conditions by an internal, motor overload device.
      f. Compressor shall be factory mounted on rubber grommets.
      g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.
      h. Crankcase heaters shall not be required for normal operating range, unless 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.
      e. Standard on all 18-29 size Humidi-MiZer® models.

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.

Guide specifications (cont)

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 24-month warranty from date of commissioning or 30 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$er X low leak rate models. (Factory or field-installed):
   a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.
   b. Independent modules for horizontal return configuration shall be available.
   c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
   d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
   e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
   f. Low leak rate models shall be equipped with dampers not to exceed 2% leakage at 1 in. wg pressure differential.
   g. Economizer controller on EconoMi$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$er X models shall be the Honeywell W7220 that provides:
      1) 2-line LCD interface screen for setup, configuration and troubleshooting.
      2) On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.
      3) Sensor failure loss of communication identification.
      4) Automatic sensor detection.
      5) Capabilities for use with multiple-speed indoor fan systems.
      6) Utilize digital sensors: Dry bulb and Enthalpy.
   i. Economizer controller on EconoMi$er 2 models with PremierLink™ controller shall be 4 to 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 CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

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 horizontal 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.
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 CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

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 available 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 available with Staged Air Volume (SAV) models.
7. Humidi-MiZer® adaptive dehumidification system:
   a. The Humidi-MiZer Adaptive Dehumidification System shall be factory-installed and shall provide greater dehumidification of the occupied space by two modes of dehumidification operations in addition to its normal design cooling mode:
      1) Subcooling mode further sub cools the hot liquid refrigerant leaving the condenser coil when both temperature and humidity in the space are not satisfied.
      2) Hot gas reheat mode shall mix a portion of the hot gas from the discharge of the compressor with the hot liquid refrigerant leaving the condenser coil to create a two-phase heat transfer in the system, resulting in a neutral leaving air temperature when only humidity in the space is not satisfied.
      3) Includes head pressure controller.
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 with independent fuse protection.
   5) Outlet shall be accessible from outside the unit.
   6) Outlet shall include a field-installed "Wet in Use" cover.

c. Field-installed non-powered convenience outlet.
   1) Outlet shall be powered from a separate 115-120v power source.
   2) A transformer shall not be included.
   3) Outlet shall be 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 horizontally instead of vertically.
    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 horizontal return configurations shall be available.
    c. Horizontal power exhaust shall be mounted in return ductwork.
    d. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0 to 100% adjustable setpoint on the economizer control.
15. 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.
16. 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.
17. 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.
18. Indoor air quality (CO_2) sensor:
    a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.
    b. The IAQ sensor shall be available in duct mount, wall mount, or wall mount with LED display. The setpoint shall have adjustment capability.
19. Smoke detectors:
    a. Shall be a 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 shutdown applications.
20. 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.

21. 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).
22. Time guard:
    a. Shall prevent compressor short cycling by providing a 5-minute delay (±2 minutes) before restarting a compressor after shutdown for any reason.
    b. One device shall be required per compressor.
23. Barometric hood (horizontal economizer applications)
    a. Shall be required when a horizontal economizer and barometric relief are required. Barometric relief damper must be installed in the return air (horizontal) duct work. This hood provides weather protection.
24. 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.
25. Condensate overflow switch (for units with electro-mechanical controls or RTU Open controller only):
    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.
26. 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.
27. High Short Circuit Current Rating (SCCR):
    a. An optional SCCR of 65kA shall be provided for 460 volt and 60kA for 208/230 volt units.

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