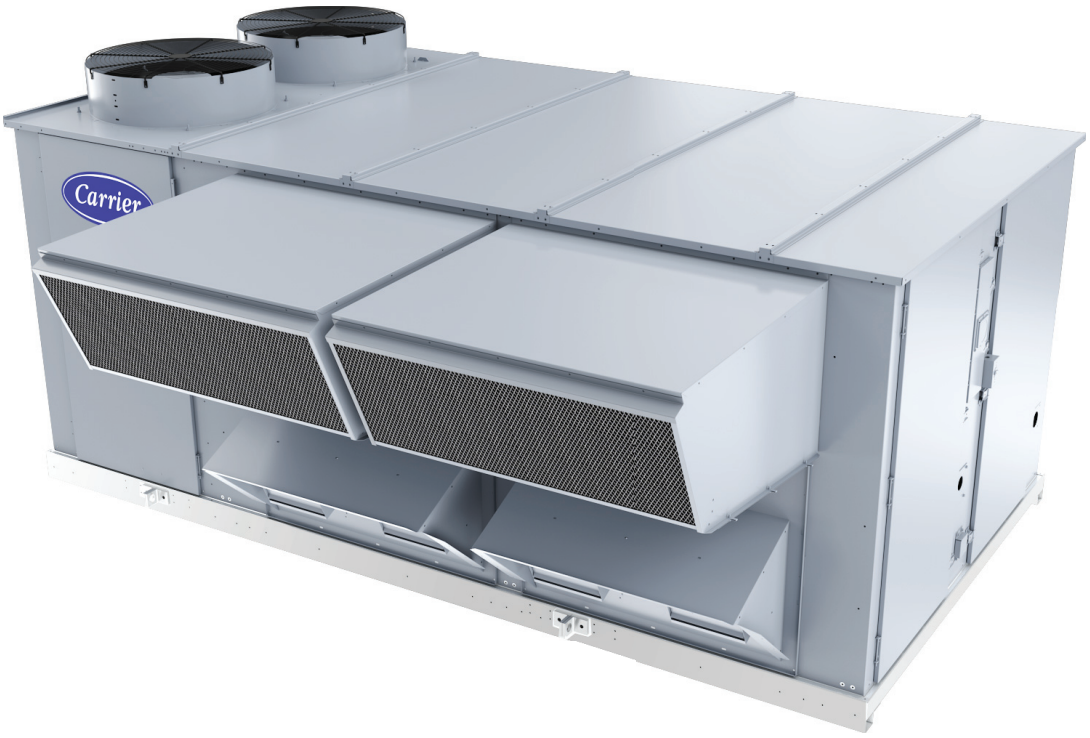
Product Data

WeatherMaker® Applied Rooftop Units

20 to 60 Nominal Tons



48K Single-Package Gas Heating/Electric Cooling Applied Rooftop Units
50K Single-Package Electric Cooling Applied Rooftop Units with Optional Electric Heat with Puron Advance™ Refrigerant

NOTE: This document is an advanced release product data. The information contained within is subject to change, deletion, or notation.

Overview

Carrier's 48/50K applied rooftop units offer design flexibility, quality, reliability, and adaptable Carrier SmartVu™ controls.

The WeatherMaker® 48/50K Series applied rooftop units are a cost effective solution for new construction or replacement applications that require more features, options, and performance than a traditional packaged rooftop unit.

Available in 20 to 60 tons, the 48/50K Series features a unique, compact design that allows the unit to fit into constrained spaces. The side by side duct layout allows the unit to straddle a structural beam, making structure design easy for new construction or retrofit applications.

The 48/50K Series also fits most Carrier 48/50E Series and 48/50A Series curbs with minimal changes in electrical and piping, making it ideal to replace legacy Carrier units without the need for expensive adapters or modification.

Standard features include commercial grade construction, reliable scroll compressors, electronic expansion valves (EXV), a robust belt drive fan system with variable frequency drive (VFD) controlled motor, and Carrier SmartVu™ controls.

All 48/50K units feature Puron Advance™ refrigerant (R-454B) with global warming potential (GWP) of 466 for compliance with the U.S. Environmental Protection Agency (EPA) phase down.

The new WeatherMaker® applied rooftop units are highly adaptable and are selectable with options that improve unit performance, efficiency, comfort, or indoor air quality (IAQ).

Factory-installed options include modulating digital compressor, multi-stage gas, or modulating electric heat for improved supply air temperature control, ultra-low leak economizer for ventilation and free cooling, Humidi-MiZer® modulating dehumidification system for better comfort, and high efficiency, low sound, low ambient packaged for improved cooling efficiency, reduced radiated sound, and low ambient mechanical cooling capability.

The Carrier SmartVu control provides flexibility while being user-friendly. Set-up and commissioning is simple with the included 7 in. touchscreen display and easy-to-navigate user interface. The SmartVu control can operate stand-alone, with Carrier i-Vu™ 8.0 web-based interfaces, or with other BACnet[1] building automation systems (BAS).

The SmartVu control includes multiple factory-programmed control methods for the indoor fan system, including modulation based on field-provided hardwired or network inputs.

Most cooling and heating operation is based on supply air temperature, with user-adjustable setpoints. The control is configurable for single-zone or multi-zone applications using space or return air temperature sensors, a two-stage heat/cool thermostat, or network inputs.

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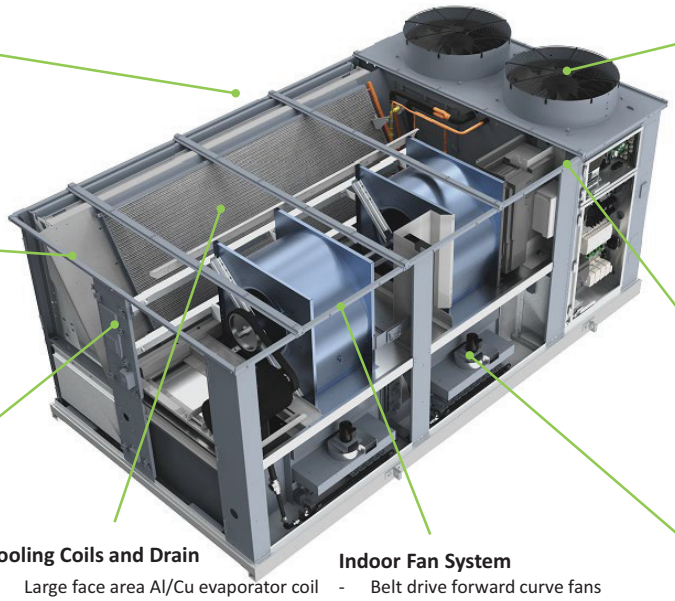


Construction

- Commercial grade construction
- Fits most Carrier A and E Series curbs
- Multiple supply and return options
- Optional double wall construction

Outdoor Air and Relief

- Available ultra-low leak economizer
- Optional barometric relief
- Optional multi-stage exhaust fan
- Accessory multi-stage or variable speed exhaust

Indoor Air Quality

- Standard 2" pre-evaporator filter rack with MERV 7 filter
- Available 4" filter rack with up to MERV 13 filter
- Available Agion® anti-microbial coating with double wall construction
- Selectable UV fixtures with accessory emitters

Cooling Coils and Drain

- Large face area Al/Cu evaporator coil
- Microchannel (MCHX) aluminum condenser coils
- Optional E-coated coils
- Available stainless drain pan

Indoor Fan System

- Belt drive forward curve fans
- Multiple motor sizes
- Standard VFD with optional bypass and shaft grounding rings
- Multiple control methods, including SAV™ or VAV

Refrigeration Circuit

- Puron Advance™ (R-454B) low–GWP refrigerant
- Optional lead digital compressor
- High efficiency, low sound, low ambient options
- Available Humidi-MiZer™ dehumidification system

Carrier SmartVu™ Controls

- 7" touchscreen display
- Flexible configuration
- Standalone, thermostat or networked operation
- Carrier i-Vu™ compatible
- Native BACnet communication

Heating Systems

- Natural gas heater with two-stage or (optional) multi-stage control
- Optional stainless steel heat exchanger
- Optional electric heat with two-stage or modulating control

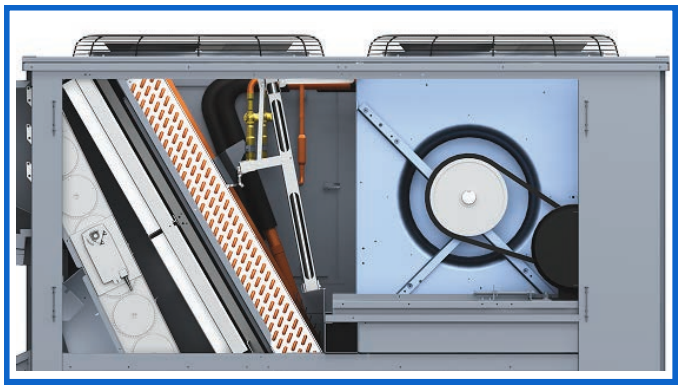
Features/Benefits

Reliable operation

Carrier conducts rigorous testing to ensure each unit will perform as designed. The 48/50K Series completed testing in Carrier and third-party psychometric labs to verify performance and efficiency.

The 48/50K Series use multiple, robust scroll compressors that are controlled by the SmartVu control to help prevent short cycling, reverse rotation, and out-of-envelope operation. Each compressor includes a crankcase heater to prevent refrigerant migration and oil dilution.

The use of electronic expansion valve (EXV) metering devices ensures reliable operation under a wide range of conditions. The all-aluminum microchannel heat exchanger (MCHX) condenser coils are used for their strength and resistance to galvanic corrosion. The standard condenser fan motors include staged control to allow mechanical cooling down to 65°F (8.3°C) at the lowest stage of capacity and lowest part-load airflow with 67°F/75°F (19.4°C/13.9°C) entering evaporator. Lower ambient operation may be allowable based on unit configuration air operating conditions.



All units include a robust, forward-curve indoor fan system with heavy-duty shaft. Positive-locking bearings reduce vibration of the indoor fan assembly and remain locked during the life of the bearing. The fan bearings are prelubricated from the factory and are designed with an operating life of 200,000 hours at design conditions.

48K Series units include an induced draft gas heat system with a steel gas heat exchanger with an aluminum silicon alloy coating to provide corrosion resistance and lengthen heat exchanger life.

After production, every unit must pass a run test and quality check before shipment. Vibration and transportation tests are performed on each model to ensure it withstands the rigors of shipping and installation.

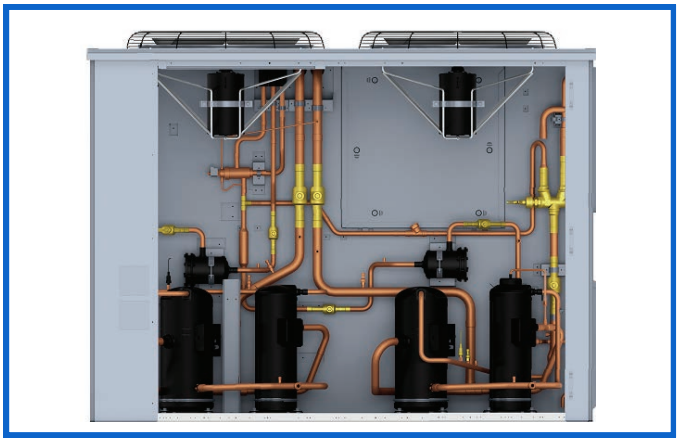
Efficient by design

Applied rooftop units spend most of their life operating at part-load cooling conditions, making part-load cooling efficiency important. The standard uneven tandem scroll compressors provides multiple stages of capacity control, which helps save energy at part-load cooling conditions. MCHX condenser coils and EXV metering devices also provide improved efficiency under a wide range of conditions. The standard VFD driven supply fan provides energy savings when less than full-load airflow is required.

The 27 to 35 ton units utilize a single circuit design that allows for a fully active evaporator and condenser coil during cooling operation, which further maximizes cooling efficiency and performance. The 40 to 60 ton units utilize dual refrigerant circuits with optimized circuit staging to maximize efficiency and performance. All 48/50K Series meet or exceed U.S. DOE 2023 efficiency requirements.

Under full-load conditions, microchannel condenser coils help reduce refrigerant system charge and improve full-load efficiency. The large face area aluminum fin, copper tube evaporator coils use both fin and tube enhancement for improved heat transfer. The forward curve indoor fans are designed for optimal efficiency at the typical full-load conditions of the 48/50K Series.

48K Series units include a factory-installed natural gas heater with a tubular, dimpled gas heat exchanger to optimize heat transfer for improved efficiency. The tubular design permits hot gases to make multiple passes across the path of the supply air. The dimpled design creates a turbulent gas flow to increase heating efficiency.



Flexible application

The 48/50K units are selectable between 20, 25, 30, 35, 40, 50, and 60 ton nominal cooling to meet project requirements. All models are available in 208/230v-3Ph-60Hz, 460v-3Ph-60Hz, and 575v-3Ph-60Hz with a short circuit current rating (SCCR) of 10kA.

The Puron Advance™ (R-454B) refrigerant used on all 48/50K Series units has a global warming potential (GWP) of 466 and is compliant with the U.S. EPA and other regulatory agency limits of 700. All units include A2L refrigerant leak detection on the indoor and outdoor sections with dissipation control for compliance with most building codes.

The 48/50K Series units can be installed on roof curbs, structure mounted, or pad mounted with supply and return duct connections selectable for vertical or horizontal units to meet a variety of applications.

All units include variable frequency drive (VFD) controlled indoor fan motors with multiple motor horsepower options to support a variety of application airflow and static pressure requirements. Units are standard with staged air volume (SAV) capacity indoor fan control for single zone applications, which provides up to 4 fan stages in cooling and 2 fan staged in heating. Units can be field configured for SAV demand, constant volume (CV), or third-party indoor fan speed control.

Features/Benefits (cont)

The 48K Series units include a factory-installed natural gas heater that is selectable for low or high capacity based on temperature rise requirements. The gas heaters can be field converted for elevations above 2000 ft or for propane fuel, using available accessory kits.

Easy to install

Units are easy to rig using the included lifting points in the unit base rail. The base rail design allows the unit to be installed on curbs, slabs, pads, beams, or sleeper rails. The unique footprint of the 48/50K unit allows for the unit to straddle a structural beam, which can reduce the need for a separate structural support for roof mounted applications.

All units feature single point electrical connections as standard with an easy to use terminal block. Connections can be made through the base of the unit (from the curb) or from the side of the unit. Gas and condensate connections are made at the side of the unit for easy access.

Field control wiring terminations are made at conveniently located and labeled terminal strips to simplify the installation of field wiring for sensors and communication wiring. Control wiring can pass through the base of the unit using the factory-installed couplings.

The SmartVu™ control is factory-installed and configured to match the unit order configuration for factory-installed sensors and options, which reduces setup time.

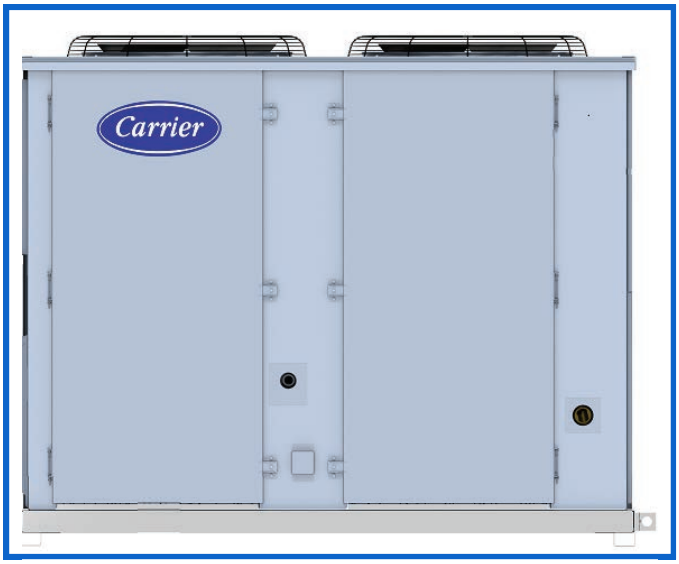
The 7 in. touch screen display provides a simple user interface for setup and commissioning. Navigation consists of a graphical menu with descriptive icons. Most setpoints and settings can be adjusted using the user-level password to simplify setup and configuration.

Plug and play compatibility with the Carrier i-Vu™ building automation system and other i-Vu interfaces reduces control setup time and complexity.

Simple to service

All 48/50K Series include hinged access doors with latches to access maintainable components, such as pre-filters, indoor fan motor, compressors, and controls. All units include a filter hook to facilitate easy filter changes.

Periodic maintenance can be performed entirely from the ends of the unit.



Less frequently accessed components, such as electronic expansion valves (EXVs), variable frequency drives (VFD), and heat systems are accessible through large access panels for service.

The MCHX condenser coils are easy to maintain and can be brushed or rinsed with low-pressure water. Side panels are easily removable to access the back side of the coils for cleaning.

The SmartVu control provides maintenance reminders and an alarm history for easier maintenance and troubleshooting.

Factory-installed condensing and suction pressure sensors allow service personnel to monitor the refrigerant circuit from the SmartVu control or building automation system, minimizing the need to connect refrigerant gauges for start-up and troubleshooting.

Features/Benefits (cont)

Quality indoor air

48/50K Series units were designed with indoor air quality in mind. Units are standard with a 2 in. pre-evaporator filter rack and ship with 2 in. MERV 5 filters. The standard access doors are double wall construction with a galvanized interior liner to facilitate easy cleaning.

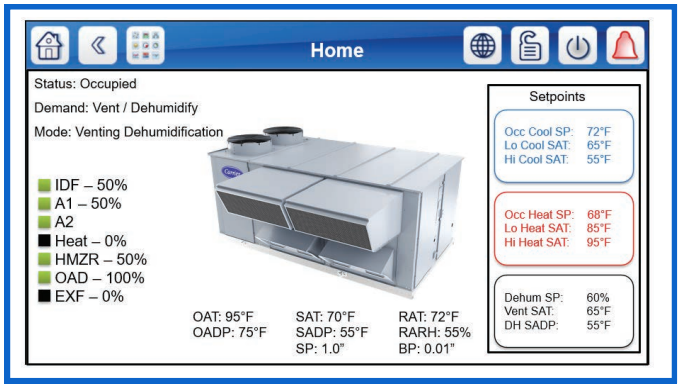
Base units include a factory-installed manual outdoor air damper. The pressure-activated damper (no actuator) opens when the indoor fan is on and closes when the indoor fan is off. The damper has multiple maximum position settings and can allow up to 25% outdoor air at the maximum position.

The included outdoor air hoods and screens filter large debris from the outdoor air and help prevent rain and snow ingress into the unit.

Adaptable controls

The SmartVu™ control allows for application and operation flexibility. The control is factory configured to meet the most common application types and is field configurable to meet project specific requirements.

Units selected for SAV are factory-configured for SAV capacity indoor fan control for single-zone applications and are field-configurable for constant volume (CV), SAV demand, or third-party modulation control.



Single-zone cooling and heating demands can be established based on an accessory space temperature (SPT) sensor or 2-stage heat/cool thermostat inputs (TSTAT).

Units selected for variable air volume (VAV) include a supply duct static pressure transducer for supply pressure control for multi-zone variable air volume (MZ-VAV) applications with air terminal units. Units are field configurable for single zone VAV (SZ-VAV), SAV, CV, or third-party modulation control.

Multi-zone or single-zone VAV cooling and heating demands can be established based on the included return temperature (RAT) sensor or the network thermostat inputs to meet application specific needs.

Cooling operation is based on user-adjustable supply air temperature (SAT) setpoints with available SAT resets based on a temperature sensor or third-party inputs. Heating operation is based on heat demand level for 2-stage heat, or supply air temperature for multi-stage or modulating heat.

In addition to normal cooling and heating modes, units can be configured for advanced modes of operation, including cool-tempered venting and heat-tempered venting (with modulating or multi-stage heat source). Appropriately equipped units can be configured for dehumidification and heat-tempered cooling operation.

Model number nomenclature

48/50K Model Number Nomenclature

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

Heat Type (1,2)
- 48 – Packaged Cooling/Gas Heat
- 50 – Packaged Cooling Only/Electric Heat

Model Series (3)
- K – WeatherMaker® Applied Rooftop Unit

Application, Supply and Return (4)
- 2 – Staged Air Volume (SAV), Vertical Supply and Return
- 3 – Variable Air Volume (VAV), Vertical Supply and Return
- 4 – SAV, Horizontal Supply and Return
- 5 – VAV, Horizontal Supply and Return

48K Heat (5)
- A – Low Gas Heat, 2-Stage
- B – High Gas Heat, 2-Stage
- C – Low Gas Heat, 2-Stage, Stainless Steel HX
- D – High Gas Heat, 2-Stage, Stainless Steel HX
- G – Low Gas Heat, Multi-Stage, Stainless Steel HX
- H – High Gas Heat, Multi-Stage, Stainless Steel HX

50K Heat
- A – No Heat
- B – Low Electric Heat, 2-Stage
- D – High Electric Heat, 2-Stage
- E – Low Electric Heat, Modulating
- G – High Electric Heat, Modulating

Direct Expansion System (6)
- - – Standard Efficiency
- A – Standard Efficiency, Low Sound
- B – Standard Efficiency, Low Ambient
- F – Standard Efficiency, Digital Compressor
- G – Standard Efficiency, Low Sound, Digital Compressor
- H – Standard Efficiency, Low Ambient, Digital Compressor
- J – Standard Efficiency, Humidi-MiZer
- K – Standard Efficiency, Low Sound, Humidi-MiZer
- L – Standard Efficiency, Low Ambient, Humidi-MiZer
- M – Standard Efficiency, Digital Compressor, Humidi-MiZer
- N – Standard Efficiency, Low Sound, Digital Compressor, Humidi-MiZer
- P – Standard Efficiency, Low Ambient, Digital Compressor, Humidi-MiZer
- S – High Efficiency, Low Sound, Low Ambient
- U – High Efficiency, Low Sound, Low Ambient, Digital Compressor
- V – High Efficiency, Low Sound, Low Ambient, Humidi-MiZer
- W – High Efficiency, Low Sound, Low Ambient, Digital Compressor, Humidi-MiZer

Size and Refrigerant (7,8)
- 20 – 20 Tons, R-454B
- 26 – 25 Tons, R-454B
- 30 – 30 Tons, R-454B
- 34 – 35 Tons, R-454B
- 40 – 40 Tons, R-454B
- 50 – 50 Tons, R-454B
- 60 – 60 Tons, R-454B

Construction (9)
- - – Single Wall
- A – Double Wall
- B – Agion® Double Wall
- C – Single Wall, Double Wall Bottom
- D – Double Wall, Double Wall Bottom
- E – Agion® Double Wall, Double Wall Bottom

Indoor Fan Options (10)
- 0 – 5 HP ODP Motor, Variable Frequencey Drive (VFD)
- 1 – 10 HP ODP Motor, VFD
- 2 – 15 HP ODP Motor, VFD
- 3 – 20 HP ODP Motor, VFD
- 4 – 25 HP ODP Motor, VFD
- 5 – 30 HP ODP Motor, VFD
- 6 – 40 HP ODP Motor, VFD
- 7 – 5 HP ODP Motor, VFD, Shaft Grounding Rings (SGR)
- 8 – 10 HP ODP Motor, VFD, SGR
- 9 – 15 HP ODP Motor, VFD, SGR
- A – 20 HP ODP Motor, VFD, SGR
- B – 25 HP ODP Motor, VFD, SGR
- C – 30 HP ODP Motor, VFD, SGR
- D – 40 HP ODP Motor, VFD, SGR
- E – 5 HP ODP Motor, VFD with Bypass, SGR
- F – 10 HP ODP Motor, VFD with Bypass, SGR
- G – 15 HP ODP Motor, VFD with Bypass, SGR
- H – 20 HP ODP Motor, VFD with Bypass, SGR
- J – 25 HP ODP Motor, VFD with Bypass, SGR
- K – 30 HP ODP Motor, VFD with Bypass, SGR
- L – 40 HP ODP Motor, VFD with Bypass, SGR
- M – 5 HP TEFC Motor, VFD with Bypass, SGR
- N – 10 HP TEFC Motor, VFD with Bypass, SGR
- P – 15 HP TEFC Motor, VFD with Bypass, SGR
- Q – 20 HP TEFC Motor, VFD with Bypass, SGR
- R – 25 HP TEFC Motor, VFD with Bypass, SGR
- S – 30 HP TEFC Motor, VFD with Bypass, SGR
- T – 40 HP TEFC Motor, VFD with Bypass, SGR

Drain Pan and Coils (11)
- - – Galvanized DP, Al/Cu Evap, MCHX Cond
- A – Galvanized DP, Al/Cu Evap, E-Coat MCHX Cond
- B – Stainless DP, Al/Cu Evap, MCHX Cond
- C – Stainless DP, Al/Cu Evap, E-Coat MCHX Cond
- D – Stainless DP, E-Coat Al/Cu Evap, E-Coat MCHX Cond

Voltage (12)
- 1 – 575V
- 5 – 208V/230V
- 6 – 460V

Design Series (13)
- A – Initial Release
- S – ETO

Controls (14)
- 0 – Standard [SmartVu, OAT, RAT, DX LAT Sensors]
- 1 – Humidity and Enthalpy Sensing (Humidity Sensors)
- 2 – RA CO_2
- 4 – Humidity Sensors, RA CO_2

Outdoor Air and Relief (15)
- A – Manual OA Damper
- B – Ultra Low Leak Economizer
- C – Ultra Low Leak Economizer, Barometric Relief
- D – Ultra Low Leak Economizer, Multi-Stage Power Exhaust (PE)
- F – Ultra Low Leak Economizer, Multi-Stage PE with Building Pressure (BP) Control
- P – Ultra Low Leak Economizer, Accessory Multi-Stage PE with BP Control
- Q – Ultra Low Leak Economizer, Accessory High-Capacity PE, Modulating BP Control

Electrical (16)
- 0 – Standard [Standard SCCR, Terminal Block]
- 1 – Powered Convenience Outlet (PCO)
- 2 – Unpowered Convenience Outlet (UCO)
- 3 – Non-Fused Disconnect (NFD)
- 4 – NFD + PCO
- 5 – NFD + UCO
- 6 – Phase Monitor (PM)
- 7 – PM + PCO
- 8 – PM + UCO
- 9 – PM + Non-Fused Disconnect (NFD)
- A – PM + NFD + PCO
- B – PM + NFD + UCO
- C – High SCCR [Terminal Block]
- D – Not Available
- E – High SCCR + UCO
- F – High SCCR + PM
- G – Not Available
- H – High SCCR + UCO + PM

Service and Safety (17)
- A – Standard [Hinged Doors, DX Pressure Sensors]
- B – Condensate Overflow Switch (COFS)
- C – Pre-Filter Status Switch + Access Door Retainer (FSS + ADR)
- D – Return Air Smoke Detector (RASD)
- E – Service Pack (Comp Isolation Valve, Replicable Core Filter Drier, Extended Lube Lines)
- F – COFS, FSS + ADR
- G – COFS, RASD
- H – COFS, Service Pack
- J – FSS + ADR, RASD
- K – FSS + ADR, Service Pack
- L – RASD, Service Pack
- M – COFS, FSS + ADR, RASD
- N – COFS, FSS + ADR, Service Pack
- P – COFS, RASD, Service Pack
- Q – RASD, FSS + ADR, Service Pack
- R – COFS, FSS + ADR, RASD, Service Pack
- S – Chicago Relief Valve (RRV), COFS, FSS + ADR, RASD, Service Pack

Indoor Air Quality (18)
- 0 – 2" Pre-Filter Rack with 2" M7 Filter
- 1 – 2" Pre-Filter Rack with 2" M8 Filter
- 2 – 2" Pre-Filter Rack with 2" M8 Filter, Ultraviolet Light (UV-C) Fixture
- 3 – 4" Pre-Filter Rack with 4" M8 Filter
- 4 – 4" Pre-Filter Rack with 4" M8 Filter, UV-C
- 5 – 4" Pre-Filter Rack with 4" M13 Filter
- 6 – 4" Pre-Filter Rack with 4" M13 Filter, UV-C

LEGEND

DP — Drain Pan
Al/Cu — Aluminum Fin/Copper Tube
MCHX — Microchannel
ETO — Engineered To Order
HX — Heat Exchanger
SCCR — Short Circuit Current Rating
ODP — Open Drip Proof
TEFC — Totally Enclosed Fan Cooled

Factory-installed options

Variable air volume (VAV)

Includes a factory-installed pressure transducer for indoor fan speed control based on duct supply pressure for multi-zone VAV systems with air terminal units. VAV units can also be configured for single-zone VAV for single-zone applications without air terminal units, or for SAV capacity, SAV demand, CV, or third-party indoor fan control.

VAV units require a digital compressor and are recommended with modulating or multi-stage heat.

Multi-stage gas heat

The 48K Series is available with multi-stage gas heat in low or high heat capacities. With turndowns of up to 5:1 (19% of full capacity) and up to 11 heat stages, multi-stage gas heat provides better low-load operation and supply air temperature control than two-stage gas heat. Multi-stage gas heaters are less prone to condensate generation at low loads than modulating heaters. Units with multi-stage gas heat include a stainless steel heat exchanger.

Two-stage electric heat

50K Series units are available with a factory-installed, 2-stage electric heater in low or high capacity. The electric heater is factory wired to the main power terminal block, eliminating the need for field power wiring or single-point kits.

Modulating electric heat

Factory-installed silicon rectifier controlled (SCR) modulating electric heat is available on 50K units in low or high capacities (except 208/230-v units). The modulated heat control provides improved supply air temperature control over two-stage heat.

Digital compressor

Units are selectable with a lead digital compressor that provide variable cooling capacity for improved supply air temperature control and reduced minimum cooling capacity. Units with a digital compressor comply with ASRHAE 90.1 code requirements for cooling stages and turn down for variable air volume (VAV) applications.

Low ambient

Low ambient includes variable frequency drive (VFD) controlled condenser fan motors and Greenspeed® intelligence to optimize performance based on operating conditions and allow mechanical cooling down to –10°F (–23.3°C) at the lowest stage of capacity and lowest part-load airflow with 67°F/75°F (19.4°C/13.9°C) entering evaporator. All units with low ambient include extended indoor fan lubrication lines.

Low-sound package

The low-sound package reduces unit radiated sound during cooling and dehumidification operation by replacing the standard condenser fans with shrouded, AeroAcoustic™ condenser fans and low rpm motors and adding compressor sound blankets to all compressors. NOTE: Unit size 34 is standard with low sound fans, which means the low sound package only includes the compressor sound blanket. Low sound package on unit size 34 includes low rpm motors and compressor sound blankets, as shrouded AeroAcoustic fan is standard on this size.

High efficiency, low ambient, low sound package

When equipped with both the low sound and low ambient options, the 48/50K Series is able to achieve higher efficiency during cooling and dehumidification operation, resulting in energy savings and a higher integrated energy efficiency ratio (IEER) for most units.

Humidi-MiZer® dehumidification

Carrier's patented Humidi-MiZer modulating dehumidification system provides unparalleled operation to meet varying environmental conditions.

The Humidi-MiZer system includes an e-coated reheat coil, a two-position reheat valve, and a modulating condenser bypass valve, which allows a variable mixture of hot gas and liquid refrigerant for modulated reheat operation during dehumidification mode.

A Humidi-Mizer system also includes a cooling coil temperature sensor (used to approximate supply air dewpoint) and requires the humidity and enthalpy sensor option (for return air relative humidity sensor).

The SmartVu™ control can monitor return air relative humidity, space relative humidity, or dehumidify input to determine if there is a dehumidify demand.

The Humidi-MiZer system is disabled when there is no dehumidify demand or if dehumidification is prevented (except at circuit start-up or reheat coil purge).

When there is a demand for both cooling and dehumidification, the Humidi-MiZer system operates in subcooling mode to provide cool, dehumidified air to the space. The subcooling operation increases the evaporator capacity, providing improved dehumidification compared to normal cooling mode.

When there is a demand for dehumidification and either ventilation or heating, the Humidi-MiZer system operates in hot gas reheat mode (HGRH) to provide neutral or warm, dehumidified air to the space.

Double-wall construction

This construction includes galvanized steel liners over the standard R4 fiberglass insulation on the top and side panels of the air handling section to provide fiber-free operation and wipe down capability. Access doors are double-wall construction and come standard.

Double-wall construction with Agion®

Includes Agion® anti-microbial coated galvanized steel liners on access doors and the top and side panels of the air handling section. Agion coating is also applied to the standard galvanized steel drain pan.

NOTE: Stainless steel drain pans are not coated with Agion.

Factory-installed options (cont)

Double-wall bottom

Includes a galvanized steel liner on the bottom of the unit to protect the base pan installation for slab or structure mounted installations. Double-wall bottom is available with horizontal return and supply.

E-coated evaporator and condenser coils

Units are selectable for e-coated condenser coils or e-coated condenser and evaporator coils. E-coat is a durable epoxy coating that completely and uniformly encapsulates the coil.

E-coat provides superior protection with unmatched edge coverage, metal adhesion, thermal performance, and corrosion resistance for mildly corrosive environments, such as coastal applications.

E-coated coils can withstand an 8,000-hour salt spray test per ASTM (American Society for Testing and Materials) Standard B-117.

Shaft grounding rings

Includes factory-installed grounding rings on the indoor fan motor shaft to protect against shaft voltage and bearing current from the variable frequency drive (VFD).

VFD bypass

Includes a bypass device to allow indoor fan motor operation in the event the VFD fails. Bypass operation must be field enabled. Recommended for critical applications.

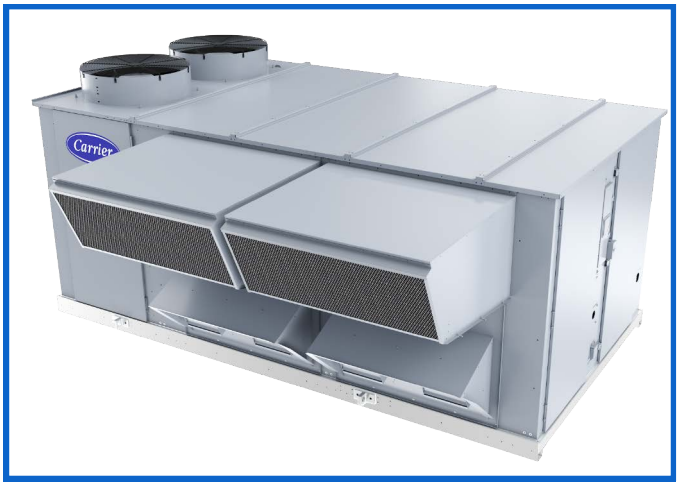
Totally enclosed fan-cooled (TEFC) motor

Replaces the open drip proof (ODP) indoor fan motor with a TEFC motor that protects the motor from the operating environment. Recommended for humid, corrosive, or dirty environments.

Humidity and enthalpy sensing

Units include factory-installed outdoor air and return air relative humidity sensors. These humidity sensors are used for dehumidification control with a Humidi-MiZer system or for free cooling control with enthalpy, differential enthalpy, or dewpoint limit operation.

The SmartVu control uses the outdoor or return air temperature and relative humidity readings to calculate enthalpy and dewpoint.



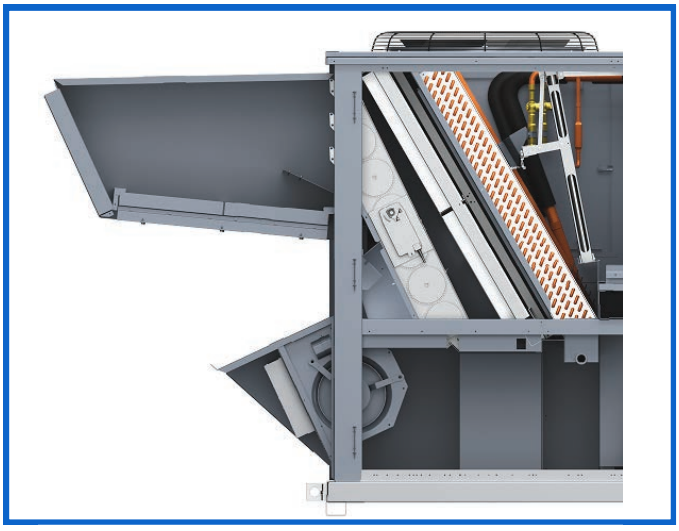
Ultra-low leak economizer

The factory-installed ultra-low leak economizer provides improved ventilation control over the manual outdoor air damper and enables free cooling operation with outdoor air.

The economizer assembly includes gear-driven return and outdoor air dampers with ultra-low leak blades and edge seals that restrict leakage to 3 cfm per sq ft at 1 in. water column when tested per AMCA (Air Movement and Control Association) Standard 500.

SmartVu™ controls the economizer and includes fault detection and diagnostic (FDD) functionality and ventilation control based on indoor fan speed, return or space CO_2 levels, or a third-party modulation signal.

Free cooling operation based on outdoor air dry bulb temperature or differential outdoor and return air dry bulb temperatures is standard. Free cooling based on outdoor air enthalpy, differential outdoor and return air enthalpy, or outdoor air dewpoint are available with the humidity and enthalpy sensing option.



Multi-stage exhaust fan

The factory-installed multi-stage power exhaust system is available on vertical return units and can be used for applications with low return duct static pressure (<6 in. wg) and low airflow to relieve excess building pressure.

The multi-stage exhaust system includes four (sizes 20 to 50) or six (size 60) direct drive exhaust fans with permanent split capacity (PSC) motors and exhaust hoods with barometric dampers. The exhaust assemblies ship tipped inside the unit and tipped out for final installation.

The multi-stage exhaust system can provide four stages of pressure relief based on outdoor air damper position or four (size 20 to 50) or six (size 60) stages of relief based on building pressure with the building pressure control option.

Factory-installed options (cont)

Power and control for accessory multi-stage power exhaust

For applications with horizontal return and low return duct static pressure and airflow, an accessory multi-stage power exhaust is available.

The multi-stage exhaust system includes four direct drive exhaust fans with permanent split capacity (PSC) motors and exhaust hoods with barometric dampers. The accessory exhaust assemblies are field-installed in the side of the return duct.

The base unit must be equipped with an options package with the power and control features to support the accessory multi-stage power exhaust, including a single point power terminal block, control contractors, building pressure transmitter, and updated nameplate.

Power and control for accessory high capacity power exhaust

For applications with low return duct static pressure (.63 in. wg) and high airflow, an accessory high capacity power exhaust is available.

Each accessory high capacity power exhaust module includes two belt-drive, forward curve fans with motors, a variable frequency drive (VFD), and barometric dampers with exhaust hoods. The exhaust module can connect to the side of units with vertical return or to the return ductwork with horizontal return. Field support is required for duct mounted installation.

The high capacity power exhaust system can be ordered in one, two, or three modules (size 60 only) to meet application airflow requirements.

The base unit must be equipped with the appropriate power and control features to support the accessory high capacity power exhaust, including a single point power terminal block, VFD control harness, building pressure transmitter, and updated nameplate.

Powered convenience outlet

A dual plug, grounded receptacle in the unit control panel provides up to 10A at 115-v for light-duty use; for charging devices or small power tools.

The transformer that powers the receptacle connects to the load side of the unit power feed. The outlet is not powered when the unit power is disconnected.

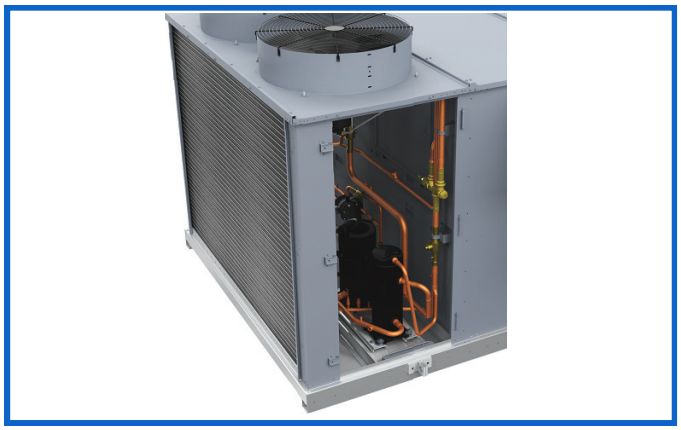
Unpowered convenience outlet

For applications that require a separate power supply or higher amperage operation, the field-wired convenience outlet includes a dual plug grounded receptacle that can handle up to 15A loads at 115-v with a field-supplied and installed power feed.

High short circuit current rating (SCCR)

Upgraded power and control components improve the SCCR rating of 208/230-v and 460-v units to 65kA and 575-v units for 25kA.

High SCCR includes a terminal block at the power connection point. Field-supplied J-type, current-limiting fuses must be installed before the terminal block in an external fuse box or fused disconnect.



Service pack

This service pack includes isolation valves for the tandem compressor assembly to allow removal of the compressors without recovering the entire refrigerant charge.

The service pack also includes a changeable core filter drier with isolation valves to allow easy changeout in the event of a compressor burnout or clogged filter drier.

48/50K Series units with the service pack also include extended lube lines for the far indoor fan shaft bearings to allow easier access for lubricating the bearings.

Chicago refrigerant relief valve

This valve provides a mechanical relief device installed on the high-pressure side of the refrigerant circuit to comply with building code requirements for refrigerant safety.

Pre-filters

Units can be configured with a 2 in. pre-filter rack with factory-installed MERV 8 filters, or a 4 in. pre-filter rack with factory-installed MERV 8 or 13 filters. Pre-filter racks are not field convertible.

Ultraviolet (UV-C) fixtures

Units with MERV 8 or MERV 13 filters and without Humidi-MiZer® are available with a factory-installed UV-C fixture on the downstream side of the evaporator coil.

The UV-C light requires a field-installed 115-v power feed (10A minimum) and field-installed UV-C emitters (bulbs). NOTE: Emitters are available as an accessory.

The UV-C fixtures include factory-installed fixtures with power wiring back to a shutoff switch for 115-v field-supplied power (10A minimum). The power wiring includes door interlock switches to disconnect the UV-C fixture power when the door is opened. A UV-C safe view port is installed in the access door to verify if the emitter is operational.

Other factory-installed options include:

- Barometric relief
- Return air CO_2 sensor
- Stainless steel condensate drain pan
- Non-fused disconnect
- Phase monitor
- Return air smoke detector
- Condensate overflow switch
- Pre-filter status switch with access door retainers
- Louvered hail guard

Field-installed accessories and warranty

Carrier non-communicating sensors

The SmartVu™ control supports a variety of field-provided communication (ZS series) and non-communicating (33ZC series) sensors and sensor functions, including:

- Space temperature
- Space relative humidity
- Space CO_2
- Occupancy override
- Space temperature adjustment
- Supply duct temperature
- Return air CO_2

NOTE: ZS Sensors cannot be used if the unit is configured for BACnet, MS/TP. ZS sensors also require their own power source.

Commercial thermostats

When the customer requires simple control over the unit, the SmartVu control supports two-stage heat/cool thermostats.

Carrier offers a variety of thermostats, including non-programmable, programmable, Wi-Fi, and BACnet. The SmartVu controls can accept a dehumidify input for dehumidification operation with Humidi-MiZer system.

Additional accessories include:

- Roof curbs
- Pleated filter kits
- Hail hoods
- Supply or return air smoke detector
- UV-C emitters
- Compressor sound blankets
- Flue vent extension
- High altitude gas heat kit
- Natural gas to propane heat conversion kit

Extended warranty protection and start-up service

All 48/50K units include Carrier's limited warranty coverage of five (5) year parts on ultra-low leak economizers, three (3) year parts on MCHX coils, ten (10) year parts on stainless steel heat exchangers (48K units only), and one (1) year parts on all other non-consumable parts. Available extended warranty protection includes:

- Up to 5 year coverage on all non-consumable parts
- Up to 20 year coverage on gas heat exchanger parts (48K units only)
- Up to 5 year labor coverage
- Cooling start-up by factory-trained personnel
- Heating start-up by factory-trained personnel

NOTE: Extended warranty protection does not require factory start-up. See the Carrier commercial rooftop equipment limited warranty statement for details.

Features, options, and accessories

DESCRIPTION	STANDARD	OPTION	ACCESSORY
APPLICATION AND CONFIGURATION			
SAV (SAV or Single-Zone VAV for Single-Zone Applications)	X		
VAV (Supply Pressure Control for Multi-Zone VAV Applications)		X	
Vertical Supply and Return	X		
Horizontal Supply and Return	X		
14 in. Knockout Roof Curbs (Full Perimeter)			X
NATURAL GAS HEAT (48K SERIES)			
Low or High Two-Stage Natural Gas Heat with Aluminized Steel Gas Heat Exchanger	X		
Low or High Two-Stage Natural Gas Heat with Stainless Steel Gas Heat Exchanger		X	
Low or High Multi-Stage Natural Gas Heat with Stainless Steel Gas Heat Exchanger		X	
High Elevation Kit (up to 7000 ft)			X
Propane (LP) Conversion and Propane High Elevation Kit			X
Flue Vent Extension Kit			X
OTHER HEAT (50K SERIES)			
No Heat	X		
Low or High Two-Stage Electric Heat		X	
Low or High Modulating Electric Heat (except 208/230-v units)		X	
COOLING			
Puron Advance™ (R-454B) Low Global Warning Potential (GWP) Refrigerant	X		
Refrigerant Leak Detection System with Leak Mitigation	X		
Electronic Expansion Valve (EXV) Metering Device	X		
Uneven Tandem Scroll Compressors on all Circuits	X		
Single Refrigerant Circuit	Size 20-34		
Dual Refrigerant Circuit	Size 40-60		
Mechanical Cooling Down to 65°F (18.3°C) Ambient at Lowest Stage and Low Load	X[a]		
Crankcase Heaters	X		
Lead Digital Scroll Compressor		X	
Low Ambient Mechanical Cooling Down to –10°F (–23.3°C)		X	
Shrouded, Aero-Acoustic™ Condenser Fans with Low RPM Motors (Low Sound)	X[a]	X	
Compressor Sound Blankets (Low Sound)		X	X
High Efficiency/Low Ambient/Low Sound Package		X	
Humidi-MiZer Modulating Dehumidification System		X	
CONSTRUCTION			
Single-Wall Panels with R4 Fiberglass Insulation	X		
Double-Wall Access Doors with R4 Fiberglass Insulation	X		
Double-Wall Construction on the Air Handling Section Panels (Top and Sides)		X	
Agion® Coated Double-wall Construction on the Air-handling Panels and Doors		X	
Single-wall Base Pan with R4 Fiberglass Insulation	X		
Double-wall Base Pan with R4 Fiberglass Insulation		X	
INDOOR FAN			
Forward Curve, Belt Drive Fan System	X		
Heavy Duty Fan Shaft	X		
Pre-lubricated Fan Bearings with 200,000 hr Life	X		
Variable Frequency Drive (VFD) Controlled Indoor Fan Motor	X		
Multiple Motor Horsepower (HP) Choices Per Unit Size	X		
Open Drip Proof (OPD) Motor	X		
Totally Enclosed (TEFC) Motor		X	
Shaft Grounding Rings (SGR)		X	
Variable Frequency Drive (VFD) Bypass		X	
DRAIN AND COIL			
Galvanized Steel Condensate Drain Pan	X		
Stainless Steel Condensate Drain Pan		X	
Al/Cu Evaporator Coil	X		
MCHX Condenser Coil	X		
E-coated Condenser Coil		X	
E-coated Condenser or Evaporator Coils		X	
Condenser Coil Hail Guards		X	X

Features, options, and accessories (cont)

DESCRIPTION	STANDARD	OPTION	ACCESSORY
OUTDOOR AIR AND RELIEF			
Outdoor Air Hoods with Mesh Screens	X		
Manual Outdoor Air Damper (Non-Actuated)	X		
Ultra Low-leak Economizer		X	
No Relief	X		
Barometric Relief for Vertical Return		X	
Barometric Relief for Horizontal Return			X
Multi-Stage Power Exhaust for Vertical Return		X	
Multi-Stage Power Exhaust for Horizontal Return			X
Base Unit Power and Control for Accessory Multi-Stage Power Exhaust		X	
Building Pressure Control of Multi-stage Power Exhaust		X	
High Capacity Power Exhaust with Modulating Building Pressure Control			X
Base Unit Power and Control for Accessory High Capacity Power Exhaust		X	
SENSOR AND CONTROL			
Carrier SmartVu™ Controls with 7 in. Touchscreen	X		
BACnet Communication (MS/TP or IP)	X		
Carrier Comfort Network (CCN) Communication	X		
Plug and Play with Carrier i-Vu Building Automation System	X		
Terminal Blocks for Field-Installed Control Devices	X		
Factory-Installed Outdoor, Return, and DX Leaving Air Temperature Sensors	X		
Supply Air Temperature Sensor		X[b]	X
DX Condensing and Suction Pressure Transducers (readable from SmartVu)	X		
Humidity and Enthalpy Sensors for Dehumidification or Enthalpy Free Cooling		X	
Return Air CO_2 Sensor		X	
Supply Duct or Building Pressure Sensors		X	
Non-Communicating Space Temperature, CO_2, and Relative Humidity Sensors			X
Communicating Space Temperature, CO_2, and Relative Humidity Sensors (Rnet)			X
Communicating Remote Equipment Touch Display (Rnet)			X
Two-Stage Heating and Cooling Thermostats			X
ELECTRICAL (V-Ph-Hz)			
208/230-3-60	X		
460-3-60	X		
575-3-60	X		
Thru-the-Base Power and Control Wiring Couplings	X		
Dedicated High and Low Voltage Sections	X		
Single Point Terminal Block Power Connection	X		
Non-Fused Disconnect		X[c]	
Powered Convenience Outlet		X[c]	
Un-Powered Convenience Outlet		X	
Standard SCCR (10kA)	X		
High SCCR (65kA for 208/230/460-v or 25kA for 575-v)		X	
Phase Monitor		X	
SERVICE AND SAFETY			
End Maintenance Access with Hinged Access Doors	X		
Removable Panels for Service Access	X		
Filter Removal Hook	X		
Condensate Overflow Switch		X	
Pre-Filter Status Switch		X	X
Access Door Retainers		X	
Return Air Smoke Detector		X	X
Supply Duct Smoke Detector			X
Compressor Isolation Valves		X	
Replaceable Core Filter Drier		X	
Extended Lube Lines For Indoor Shaft Motor Bearings		X	
Chicago Refrigerant Relief Valve (Pressure Relief Safety)		X	

Features, options, and accessories (cont)

DESCRIPTION	STANDARD	OPTION	ACCESSORY
IAQ OPTIONS			
2 in. Pre-Filter Rack with 2 in. MERV 5 Filters	X		
2 in. Pre-Filter Rack with 2 in. MERV 8 Filters		X	X
4 in. Pre-Filter Rack with 4 in. MERV 8 Filters		X	
4 in. Pre-Filter Rack with 4 in. MERV 13 Filters		X	
Replacement Filters			X
Ultraviolet (UV-C) Fixtures		X[d]	
Ultraviolet (UV-C) Emitters			X
WARRANTY AND START-UP			
Five (5) Year Low Leak Economizer Damper Parts Coverage	X		
Three (3) Year MCHX Coil Parts Coverage	X		
One (1) Year All Other Non-Consumable Parts Coverage	X		
Up To Five (5) Year Non-Consumable Parts Coverage		X	
Ten (10) Year Stainless Steel Gas Heat Exchanger Parts Coverage (48K Units)	X		
Up To Twenty (20) Year Stainless Steel Gas Heat Exchanger Parts Coverage (48K Units)		X	
Up To Five (5) Year Labor Coverage		X	
Cooling Start-Up Service By Factory Trained Personnel		X	
Heating Start-Up Service By Factory Trained Personnel		X	

NOTE(S):

a. Unit size 34 is standard with shrouded aeroacoustic condenser fans. All other sizes are standard with propeller fans.
b. Factory-supplied, field-installed with modulating or multi-stage heat (multi-stage gas or modulating electric).
c. Not available with high SCCR.
d. Not available with Humidi-MiZer or standard filters.

Capacities and ratings

48/50K AHRI Ratings[a,b]

UNIT SIZE 48/50K	UNIT MODE 48/50K	SUPPLY	APPLICATION SAV/VAV	EFFICIENCY	EER	IEER
20	48	Vertical	All	Standard	9.8	13.0
	50			Standard	10.0	13.2
26	48			Standard	9.8	13.2
	50			Standard	10.0	13.4
30	48			Standard	9.8	14.3
	50			Standard	10.0	14.5
34	48			Standard	9.8	13.4
	50			Standard	10.0	13.6
40	48			Standard	9.8	13.0
	50			Standard	10.0	13.2
50	48			Standard	9.8	13.0
	50			Standard	10.0	13.2
60	48			Standard	9.8	14.5
	50			Standard	10.0	14.6
20	48			High	10.3	15.8
	50			High	10.5	16.0
25	48			High	10.3	15.0
	50			High	10.5	15.2
30	48			High	10.6	16.0
	50			High	10.7	16.2
35	48			High	9.8	14.5
	50			High	10.0	14.6
40	48			High	10.3	15.1
	50			High	10.5	15.3
50	48			High	10.3	14.5
	50			High	10.5	14.6
60	48			High	9.8	15.0
	50			High	10.0	15.0

NOTE(S):

a. Ratings are in accordance with AHRI 340/360, as appropriate.
b. Refer to Carrier's electronic catalog website: http://ecat.Carrier.com for the full list of selections and ratings.

LEGEND

AHRI — Air Conditioning, Heating, and Refrigeration
EER — Energy Efficiency Ratio
IEER — Integrated Energy Efficiency Ratio
SAV — Staged Air Volume
VAV — Variable Air Volume

Capacities and ratings (cont)

Cooling Airflow Limits

UNIT SIZE 48/50K	COMPRESSOR TYPE	EVAPORATOR TYPE	MIN. PART-LOAD AIRFLOW (cfm)[a]	MIN. FULL-LOAD AIRFLOW (cfm)[b]	MAX. FULL-LOAD AIRFLOW (cfm)[b]
20	Fixed	Al (Standard)	3,000	4,000	10,000
		E-Coat Al			
	Digital	Al (Standard)	2,000		
		E-Coat Al			
26	Fixed	Al (Standard)	3,900	5,200	12.500
		E-Coat Al			
	Digital	Al (Standard)	2,600		
		E-Coat Al			
30	Fixed	Al (Standard)	4,500	6,000	15,000
		E-Coat Al			
	Digital	Al (Standard)	3,000		
		E-Coat Al			
34	Fixed	Al (Standard)	5,100	6,800	17,500
		E-Coat Al			15,000
	Digital	Al (Standard)	3,400		17,500
		E-Coat Al			15,000
40	Fixed	Al (Standard)	4,000	8,000	20,000
		E-Coat Al			15,000
	Digital	Al (Standard)	3,400		20,000
		E-Coat Al			15,000
50	Fixed	Al (Standard)	5,000	10,000	20,000
		E-Coat Al			15,000
	Digital	Al (Standard)	4,300		20,000
		E-Coat Al			15,000
60	Fixed	Al (Standard)	6,000	12,000	27,000
		E-Coat Al			22,500
	Digital	Al (Standard)	5,100		27,000
		E-Coat Al			22,500

NOTE(S):

a. Part-load cooling cfm is based on 67°F/57°F (19.4°C/13.9°C) entering evaporator, 67°F (19.4°C) ambient at lowest stage of capacity.
b. Full-load cooling cfm is based on 80°F/67°F (26.6°C/19.4°C) entering evaporator, 95°F (30°C) ambient at full capacity.

Cooling Capacity Staging — Sizes 20-34 with Fixed Compressor

COMPRESSOR	STAGE			
	0	1	2	3
	COMPRESSOR STATUS			
A1 (Fixed)	OFF	ON	OFF	ON
A2	OFF	OFF	ON	ON
UNIT	CAPACITY 48/50K			
20	0%	40%	60%	100%
26		33%	67%	
30		40%	60%	
34		46%	54%	

Capacities and ratings (cont)

Cooling Capacity Staging — Sizes 20-34 with Digital Compressor

COMPRESSOR	STAGE			
	0	1	2	3
	COMPRESSOR STATUS			
A1 (Digital)[a]	OFF	ON	OFF	ON
A2 (Fixed)	OFF	OFF	ON	ON
UNIT	CAPACITY 48/50K			
20	0%	20% to 39%	61%	69% to 100%
26		20% to 32%	68%	74% to 100%
30		20% to 39%	61%	69% to 100%
34		20% to 45%	55%	64% to 100%

NOTE(S):

a. On units with optional digital scroll compressor, compressor A1 modulates from minimum to maximum capacity to provide increased stages.

Cooling Capacity Staging — Sizes 40,50, and 60 with Fixed Compressor

CIRCUIT	COMPRESSOR	STAGE								
		0	1	2	3	4	5	6	7	8
		COMPRESSOR STATUS								
A	A1 (Fixed)	OFF	ON	OFF	ON	ON	OFF	ON	ON	ON
	A2 (Fixed)	OFF	OFF	ON	OFF	OFF	ON	ON	ON	ON
B	B1 (Fixed)	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	ON
	B2 (Fixed)	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON
	UNIT	CAPACITY 48/50K								
	40	0%	21%	29%	43%	50%	57%	71%	79%	100%
	50		22%	28%	43%	50%	57%	72%	78%	100%
	60		20%	30%	40%	50%	60%	70%	80%	100%

Cooling Capacity Staging — Sizes 40,50, and 60 with Digital Compressor

CIRCUIT	COMPRESSOR	STAGE								
		0	1	2[a]	3	4	5[a]	6	7	8
		COMPRESSOR STATUS								
A	A1 (Digital)[b]	OFF	ON	N/A	ON	ON	N/A	ON	ON	ON
	A2 (Fixed)	OFF	OFF	N/A	OFF	OFF	N/A	ON	ON	ON
B	B1 (Fixed)	OFF	OFF	N/A	ON	OFF	N/A	ON	OFF	ON
	B2 (Fixed)	OFF	OFF	N/A	OFF	ON	N/A	OFF	ON	ON
	UNIT	CAPACITY 48/50K								
	40	0%	10%-20%	N/A	30%-42%	39%-49%	N/A	53-71%	62-78%	82-100%
	50		10%-21%	N/A	31%-42%	39%-49%	N/A	53-72%	62-78%	82-100%
	60		10%-19%	N/A	29%-39%	40%-49%	N/A	53-70%	64-80%	84-100%

NOTE(S):

a. In order to provide better control, the A1 digital compressor will always be on.

b. On units with optional digital scroll compressor, compressor A1 modulates from minimum to maximum capacity to provide increased stages.

Capacities and ratings (cont)

48K Two-Stage Gas Heating Capacities — Natural Gas On All Units and Liquid Propane Gas On Sizes 20-60 Low Heat/High Heat Units[a,b,c,d,e,f]

UNIT SIZE 48K	GAS INPUT (Btuh)		OUTPUT CAPACITY (Btuh)		EFFICIENCY (%)	TEMP RISE (°F)	AIRFLOW STAGE 1 (cfm)		AIRFLOW STAGE 2 (cfm)	
	Stage 1	Stage 2	Stage 1	Stage 2			Min	Max	Min	Max
20-30 Low Heat	262,500	350,000	212,625	283,500	81.0%	15-45	4,500	15,000	5,833	15,000
20-30 High Heat	394,000	525,000	319,140	425,250	81.0%	35-65	4,500	15,000	6,058	15,000
34 Low Heat	262,500	350,000	212,625	283,500	81.0%	15-45	4,500	17,500	5,833	17,500
34 High Heat	600,000	800,000	486,000	648,000	81.0%	30-60	7,500	17,500	10,000	17,500
40-50 Low Heat	300,000	400,000	243,000	324,000	81.0%	10-40	5,700	20,000	7,500	20,00
40-50 High Heat	600,000	800,000	486,000	648,000	81.0%	30-60	7,500	20,000	10,000	20,000
60 Low Heat	582,000	776,000	474,140	628,560	81.0%	10-40	11,100	27,000	14,550	27,000
60 High Heat VS	873,000	116,400	707,130	942,840	81.0%	30-60	11,100	27,000	14,550	27,000
60 High Heat HS	731,000	975,000	592,110	789,750	81.0%	30-60	9,500	24,375	12,188	24,375

NOTE(S):

a. Ratings are approved for altitudes to 2000 ft. At altitudes over 2000 ft, ratings are 4% less for each 1000 ft above sea level.
b. At altitudes up to 2000 ft, the following formula may be used to calculate air temperature rise:

$$\Delta t = \frac{\text{maximum output capacity}}{1.10 \times \text{air quantity}}$$

c. At altitudes above 2000 ft, the following formula may be used:

$$\Delta t = \frac{\text{maximum output capacity}}{(.24 \times \text{specific weight of air} \times 60) \times (\text{air quantity})}$$

d. Minimum allowable temperature of mixed air entering the heat exchanger during half-rate (first-stage) operation is 35°F. There is no minimum mixture temperature limitation during full-rate operation.
e. Temperature rise limits: see table.
f. On VAV (variable air volume) applications, set the zone terminals to provide minimum unit heating airflow as indicated in the table upon command from the Heat Interlock Relay (HIR) function.

LEGEND

Btuh — British Thermal Unit Per Hour
cfm — Cubic Feet Per Minute
HS — Horizontal Supply
LP — Liquid Propane
VS — Vertical Supply

48K Gas Heating Capacities — Multi-Staged Gas Option[a,b,c,d,e]

UNIT SIZE 48K2, K3, K4, K5	STAGES OF GAS CONTROL (% of Full Heat Option)	MIN. OUTPUT (Btuh)	MAX. OUTPUT (Btuh)	DESIGN RANGE	
				Min. cfm	Max. cfm[f]
20-30 Low Heat	37, 50, 75, 87, 100	107,730	283,500	4,500	15,000
20-30 High Heat	25, 33, 50, 67, 75, 83, 100	106,313	425,250	4,500	15,000
34 Low Heat	37, 50, 75, 87, 100	107,730	283,500	4,500	17,500
34 High Heat	37, 50, 75, 87, 100	246,240	648,000	7,500	17,500
40, 50 Low Heat	37, 50, 75, 87, 100	123,120	324,000	5,700	20,000
40, 50 High Heat	37, 50, 75, 87, 100	246,240	648,000	7,500	20,000
60 Low Heat	19, 25, 38, 44, 50, 56, 63, 75, 88, 94, 100	119,426	628,560	11,000	27,000
60 High Heat VS	25, 33, 50, 58, 67, 75, 83, 92, 100	235,710	942,840	11,000	27,000
60 High Heat HS	25, 33, 50, 58, 67, 75, 83, 92, 100	197,438	789,750	9,500	24,375

NOTE(S):

a. Ratings are approved for altitudes to 2000 ft. At altitudes over 2000 ft, ratings are 4% less for each 1000 ft above sea level.
b. At altitudes up to 2000 ft, the following formula may be used to calculate air temperature rise:

$$\Delta t = \frac{\text{maximum output capacity}}{1.10 \times \text{air quantity}}$$

c. At altitudes above 2000 ft, the following formula may be used:

$$\Delta t = \frac{\text{maximum output capacity}}{(.24 \times \text{specific weight of air} \times 60) \times (\text{air quantity})}$$

d. On standard gas heat with aluminized heat exchangers, the minimum allowable mixed air entering the heat exchanger during half-rate (first stage) operation is 50°F. There is no minimum limitation for full-rate operation.
e. Total unit design is listed by UL Testing Laboratories Inc.
f. In some cases, maximum cfm may be limited by maximum cooling airflow value.

LEGEND

Btuh — British Thermal Unit Per Hour
cfm — Cubic Feet Per Minute
HS — Horizontal Supply
VS — Vertical Supply

Capacities and ratings (cont)

Electric Heater Capacities and Staging

UNIT SIZE 50K	VOLTAGE	NO. STAGES	LOW HEAT		HIGH HEAT		LOW	HIGH	LOW and HIGH	
			LOW (kW)	CAPACITY PER STAGE (%)	HIGH (kW)	CAPACITY PER STAGE (%)	MIN. PART- LOAD AIRFLOW (cfm)	MAX. PART- LOAD AIRFLOW (cfm)	MIN. FULL- LOAD AIRFLOW (cfm)	MAX. FULL- LOAD AIRFLOW (cfm)
20-34	208	2-Stage or SCR	27	50,100	54	50,100	3,000	4,500	6,000	15,000
	230		36		72					
	460		36		72					
	575		36		72					
40-50	208		27		54		3,000	4,500	10,500	20,000
	230		36		72					
	460		36		72					
	575		36		72					
60	208		41		81		4,500	6,800	10,500	27,000
	230		54		108					
	460		54		108					
	575		54		108					

LEGEND

Btuh — British Thermal Unit Per Hour
cfm — Cubic Feet Per Meter
kW — Kilowatt
SCR — Silicon Rectifier Control

Physical data

48K2, K3, K4, K5 Unit Physical Data — Sizes 20, 26, 30

BASE UNIT SIZE 48K2, K3, K4, K5	20		26		30	
NOMINAL CAPACITY (TONS)	20		25		30	
OPERATING WEIGHT (lb)	See Unit Weights Table					
COMPRESSOR	Standard	Lead Digital (Option)	Standard	Lead Digital (Option)	Standard	Lead Digital (Option)
Refrigerant Circuits	1		1		1	
Circuit A, Type (A1/A2)	Fixed /Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1…YA91/ 1… YA137	1…YAD86/ 1…YA137	1…YA91/ 1… YA182	1…YAD86/ 1… YA182	1…YA122/ 1… YA182	1…YAD115/ 1…YA182
Circuit A Oil Charge (oz.) (A1/A2)	58/121	60/121	58/121	60/121	71/121	85/121
Circuit B, Type (B1/B2)	—	—	—	—	—	—
Circuit B, Qty…Model (B1/B2)	—	—	—	—	—	—
Circuit B Oil Charge (oz, B1/B2)	—	—	—	—	—	—
Capacity Steps (%)	0, 40, 60, 100%	0, 20-39, 61, 69-100%	0, 33, 67, 100	0, 20-32, 68, 74-100%	0, 40, 60, 100%	0, 20-39, 61, 69-100
REFRIGERANT	R-454B					
Circuit A Operating Charge -Standard (lb)	19.0		23.5		23.0	
Circuit A Operating Charge with Humidi-MiZer Option (lb)	27.3		32.0		31.0	
Circuit B Operating Charge -Standard (lb)	N/A		N/A		N/A	
High Pressure Switch Auto-Reset (psig)	500					
High Pressure Switch Cutout (psig)	650					
CONDENSER COIL	Novation (Al MCHX)					
Quantity	1					
Total Face Area (sq ft)	32.8					
CONDENSER FAN (STANDARD)	Metal Propeller		Metal Propeller		Metal Propeller	
Nominal cfm	19,500					
Quantity...Diameter (in.)	2...30					
Motor Hp...rpm	2.0-2.5...1140					
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™		Composite AeroAcoustic™		Composite AeroAcoustic™	
Nominal cfm	19,500					
Quantity...Diameter (in.)	2...30.5					
Motor Hp...rpm	1.5-1.75...850					
EVAPORATOR COIL	Al/Cu RTPF					
Circuiting	Fully Active		Fully Active		Fully Active	
Tube Size (in.)	3/8					
Total Face Area (sq ft)	31.7					
Rows...Fins (in.)	3…15		4…15		4…15	
Fin Enhancement	Double Wavy		Double Wavy		Double Wavy	
Tube Enhancement	Cross Hatched		Cross Hatched		Cross Hatched	
Condensate Drain Connection Qty...Size (in.)	1…1					
HUMIDI-MIZER COIL	Novation (Al MCHX)					
Coil Circuit	A					
Coil Quantity	1		1		1	
Coil Total Face Area (sq ft)	16					
Reheat Valve (Qty…Type)	1…On/Off Three-Way		1…On/Off Three-Way		1…On/Off Three-Way	
Bypass Valve (Qty…Type)	1…Modulating Three-Way		1…Modulating Three-Way		1…Modulating Three-Way	

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 20, 26, 30 (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	20		26		30	
NOMINAL CAPACITY (TONS)	**20**		**25**		**30**	
INDOOR FANS	DWDI Forward Curve		DWDI Forward Curve		DWDI Forward Curve	
Qty...Size (in.)	2... 20 x 15		2 ... 20 x 15		2 ... 20 x 15	
Drive Type	Belt		Belt		Belt	
Nominal cfm	8,000		10,000		12,000	
Peak Motor Efficiency	89.5/91.7	93	89.5/91.7	93/93.6	89.5/91.7	93/93.6
Motor Hp	5/10	15	5/10	15/20	5/10	15/20
Motor Frame Size (T)	184/215	254	184/215	254/256	184/215	254/256
Motor Bearing Type	Ball					
Maximum Allowable rpm	1200					
Motor Pulley Pitch Dia. (in.)	4.9/4.4	5.7	4.9/6.1	5.5/5.9	4.9/4.4	5.7/5.9
Nominal Motor Shaft Dia. (in.)	1.125/1.375	1.625	1.125/1.375	1.625	1.125/1.375	1.625
Fan Pulley Pitch Diameter (in.)	12.4/8.6	9.1	12.4/11.1	8.6	12.4/9.4	9.1/8.6
Nominal Fan Shaft Dia. (in.)	1-15/16					
Belt Quantity	1/1	2/2	1/1	2/2	1/2	2/2
Belt Type	BX56/BX50	5VX530	BX56/5VX570	5VX530	BX56/BX50	5VX530
Belt Length (in.)	59/53	53	59/57	53	59/53	53
Pulley Center Line Distance (in.)	15.5/16.2	14.8	15.5/14.8	15.4/15.1	15.5/15.5	14.8/15.1
Factory Speed Setting at 60 or Max Hz (rpm)	6997/903	1107	697/970	1131/1200	697/826	1107/1200
Grease Fitting Qty...Fitting Type (in.)	2...1/8 NPT					
PRE-EVAPORATOR FILTERS						
2 in. MERV 5 (Standard) Qty… Size (in.)	10… 20 x 24 x 2					
2 in. MERV 8 (Option) Qty… Size (in.)	10… 20 x 24 x 2					
4 in. MERV 8 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 4					
4 in. MERV 13 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 4					
OUTDOOR-AIR SCREENS						
Quantity...Size (in.)	4… 16 x 25 x 2 4… 20 x 25 x 2		4… 16 x 25 x 2 4… 20 x 25 x 2		4… 16 x 25 x 2 4… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)						
Motor Type	PSC					
Motor Quantity...Hp	4...1					
Fan Quantity	4					
Fan Diameter...width (in.)	11.9 x 10.7					
GAS HEAT (48K ONLY)						
Supply Line Pressure Range Liquid Gas	5.0 in. wg min./13.5 in. wg max.					
Rollout Switch Cutout Temp. (°F)[a]	225					
Efficiency (%)	81					
Number of Heat Exchangers	2					
Number of Gas Valves	2					
Gas Connection Qty… Size (in.)	1… 1 1/2 NPT					

NOTE(S):

a. The Rollout switch is manual reset.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 20, 26, 30 (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	20		26		30	
NOMINAL CAPACITY (TONS)	20		25		30	
TWO-STAGE GAS HEAT	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Heat Exchanger Material (Std/Option)	T1-40 Aluminized Steel / 409 Stainless Steel					
Input (mbh)	350,000	525,000	350,000	525,000	350,000	525,000
Output (mbh)	283,500	425,250	283,500	425,250	283,500	425,250
Burner Orifice Diameter (inches… drill no.)						
Natural Gas (Standard)	.111...34					
Liquid Propane (Alt)	.089...43					
Quantity	10	15	10	15	10	15
Stage 1/Stage 2 Manifold Pressure (in. wg)	2.0 / 3.5					
Firing Stages %	75 / 100					
MULTI-STAGE GAS HEAT (OPTIONAL)	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Heat Exchanger Material (Std)	409 Stainless Steel					
Input (mbh)	350,000	525,000	350,000	525,000	350,000	525,000
Output (mbh)	283,500	425,250	283,500	425,250	283,500	425,250
Burner Orifice Diameter (inches… drill no.)						
Natural Gas (Standard)	.111...34					
Liquid Propane (Alt)	.089...43					
Quantity	10	15	10	15	10	15
Low Fire/High Fire Manifold Pressure (in. wg)	2.0 / 3.5					
System Capacity Steps (%)	37, 50, 75, 87, 100	25, 33, 50, 67, 75, 83, 100	37, 50, 75, 87, 100	25, 33, 50, 67, 75, 83, 100	37, 50, 75, 87, 100	25, 33, 50, 67, 75, 83, 100
Temperature Rise Range	15-45°F	35-65°F	15-45°F	35-65°F	15-45°F	35-65°F

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 34 and 40

BASE UNIT SIZE 48K2, K3, K4, K5	34		40[a]	
NOMINAL CAPACITY (TONS)	35		40	
OPERATING WEIGHT (lb)	See Unit Weights Table			
COMPRESSOR	Standard	Lead Digital (Option)	Standard	Lead Digital (Option)
Refrigerant Circuits	1		2	
Circuit A, Type (A1/A2)	Fixed/Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1... YA154 / 1… YA182	1... YAD147 / 1… YA182	1… YA91 / 1… YA122	1… YAD86 / 1… YA122
Circuit A Oil Charge (oz) (A1/A2)	121/121	114/121	58/75	60/75
Circuit B, Type (B1/B2)	—	—	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit B, Qty…Model (B1/B2)	—	—	1… YA91 / 1… YA122	1… YA91 / 1… YA122
Circuit B Oil Charge (oz) (B1/B2)	—	—	58/75	58/75
Capacity Steps (%)	0%, 46%, 54%, 100%	0%, 20-45%, 55%, 64-100%	0%, 21%, 29%, 43%, 50%, 57%, 71%, 79%, 100%	0%, 10-20%, 30-42%, 39-49%, 53-71%, 62-78%, 82-100%
REFRIGERANT	R-454B			
Circuit A Operating Charge - Standard (lb)	24.0		19.0	
Circuit A Operating Charge with Humidi-MiZer Option (lb)	31.5		27.0	
Circuit B Operating Charge - Standard (lb)	N/A		19.3	
High Pressure Switch Auto-Reset (psig)	500			
High Pressure Switch Cutout (psig)	650			
CONDENSER COIL	Novation (Al MCHX)			
Quantity	1		2	
Total Face Area (sq ft)	32.8		65.6	
CONDENSER FAN (STANDARD)	Composite AeroAcoustic™		Metal Propeller	
Nominal cfm	19,500		32,000	
Qauntity...Diameter (in.)	2...30.5		4...30	
Motor Hp...rpm	2.0-2.5...1140			
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™		Composite AeroAcoustic™	
Nominal cfm	19,500		32,000	
Quantity...Diameter (in.)	2...30.5		4...30.5	
Motor Hp...rpm	1.5-1.75...850			
EVAPORATOR COIL	Al/Cu RTPF			
Circuiting	Fully Active		Intertwined	
Tube Size (in.)	3/8		1/2	
Total Face Area (sq ft)	31.7		31.3	
Rows...Fins (in.)	4…15		4…17	
Fin Enhancement	Double Wavy		Double Wavy	
Tube Enhancement	Cross Hatched		Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1			
HUMIDI-MIZER COIL	Novation (Al MCHX)			
Coil Circuit	A			
Coil Quantity	1		1	
Coil Total Face Area (sq ft)	16			
Reheat Valve Qty…Type	1…On/Off Three-Way		1…On/Off Three-Way	
Bypass Valve Qty…Type	1…Modulating Three-Way		1…Modulating Three-Way	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 34 and 40 (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	34		40[a]	
NOMINAL CAPACITY (TONS)	35		40	
INDOOR FANS	DWDI Forward Curve		DWDI Forward Curve	
Qty...Size (in.)	2... 20 x 15		2 ... 20 x 15	
Drive Type	Belt		Belt	
Nominal cfm	14,000		16,000	
Peak Motor Efficiency	91.7/93	93.6	91.7/93	93.6
Motor Hp	10/15	20/25	10/15	20/25
Motor Frame Size (T)	215/254	256/284	215/254	256/284
Motor Bearing Type	Ball			
Maximum Allowable rpm	1300			
Motor Pulley Pitch Dia. (in.)	4.4 / 5.1	537 / 6.2	4.4 / 5.3	5.7 / 7.5
Nominal Motor Shaft Dia. (in.)	1-3 / 81-5/8	1-5 / 81-7/8	1.375 / 1.625	1.625 / 1.874
Fan Pulley Pitch Diameter (in.)	9.4/8.6	8.6/8.6	9.4/9.4	9.4/11.1
Nominal Fan Shaft Dia. (in.)	1-15/16			
Belt Quantity	2		2	
Belt Type	BX50/5VX530	5VX530	BX50/5VX530	5VX550/BVX590
Belt Length (in.)	53		53/53	55/59
Pulley Center Line Distance (in.)	15.5/15.6	15.2/14.8	15.5/14.8	15.5/14.8
Factory Speed Setting at 60 or Max Hz (rpm)	826/1048	1170/1272	826/997	1070/1193
Grease Fitting Qty...Fitting Type (in.)	2...1/8 NPT			
PRE-EVAPORATOR FILTERS				
2 in. MERV 5 (Standard) Qty… Size (in.)	10… 20 x 24 x 2			
2 in. MERV 8 (Option) Qty… Size (in.)	10… 20 x 24 x 2			
4 in. MERV 8 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 4			
4 in. MERV 13 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 6			
OUTDOOR-AIR SCREENS				
Quantity...Size (in.)	4… 16 x 25 x 2 4… 20 x 25 x 2		8… 16 x 25 x 2 4… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)				
Motor Type	PSC			
Motor Quantity...Hp	4...1			
Fan Quantity	4			
Fan Diameter...width (in.)	11.9/10.7			
GAS HEAT (48K ONLY)				
Supply Line Pressure Range Liquid Gas	5.0 in. wg min./13.5 in. wg max.			
Rollout Switch Cutout Temp. (°F)[b]	225			
Efficiency (%)	81			
Number of Heat Exchangers	2			
Number of Gas Valves	2			
Gas Connection Qty… Size (in.)	1… 1-1/2 NPT			

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.
b. Rollout switch is manual reset.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 34 and 40 (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	34		40[a]	
NOMINAL CAPACITY (TONS)	35		40	
TWO-STAGE GAS HEAT	Low Heat	High Heat	Low Heat	High Heat
Heat Exchanger Material (Std/Option)	T1-40 Aluminized Steel / 409 Stainless Steel			
Input (mbh)	350,000	800,000	400,000	800,000
Output (mbh)	283,500	648,00	324,000	648,000
Burner Orifice Diameter (inches… drill no.)				
Natural Gas (Standard)	.111...34 (Low) /.120...31 (High)		.120...31	
Liquid Propane (Alt)	.089...43 (Low) /.0935 …42 (High)		.0935...42	
Quantity	10	20	10	20
Stage 1/Stage 2 Manifold Pressure (in. wg)	2.0/3.5		2.0/3.5	
Firing Stages %	75, 100		75,100	
MULTI-STAGE GAS HEAT (OPTIONAL)	Low Heat	High Heat	Low Heat	High Heat
Heat Exchanger Material (Std)	409 Stainless Steel		409 Stainless Steel	
Input (mbh)	350,000	800,000	400,000	800,000
Output (mbh)	283,500	648,00	324,000	648,000
Burner Orifice Diameter (in… drill no.)				
Natural Gas (Standard)	.111... 34 (Low) / .120...31 (High)		.120 ... 31	
Liquid Propane (Alt)	.089...43 (Low) / .0935 … 42 (High)		.0935 ... 42	
Quantity	10	20	10	20
Low Fire/High Fire Manifold Pressure (in. wg)	2.0/3.5		2.0/3.5	
System Capacity Steps (%)	37, 50, 75, 87, 100		37, 50, 75, 87, 100	
Temperature Rise Range	15-45°F	35-65°F	10-40°F	30-60°F

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 50 and 60 (Vertical)

BASE UNIT SIZE 48K2, K3, K4, K5	50[a]		60 (VERTICAL)[a]	
NOMINAL CAPACITY (TONS)	50		60	
OPERATING WEIGHT (lb)	See Unit Weights Table			
COMPRESSOR	Standard	Lead Digital (Option)	Standard	Lead Digital (Option)
Refrigerant Circuits	2		2	
Circuit A, Type (A1/A2)	Fixed/Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1… YA104 / 1… YA137	1… YAD98 / 1… YA137	1… YA122 / 1… YA182	1… YAD115 / 1… YA182
Circuit A Oil Charge (oz) (A1/A2)	75/121	85/121	75/121	85/121
Circuit B, Type (B1/B2)	Fixed/Fixed Speed	Fixed/Fixed Speed	Fixed/Fixed Speed	Fixed/Fixed Speed
Circuit B, Qty…Model B1/B2)	1… YA104 / 1… YA137	1… YA104 / 1… YA137	1… YA122 / 1… YA182	1… YA122 / 1… YA182
Circuit B Oil Charge (oz) (B1/B2)	75/121	75/121	75/121	75/121
Capacity Steps (%)	0, 22, 28, 43, 50, 57%, 72, 78, 100	0, 10-21, 31-42, 39-49, 53-71, 62-78, 82-100	0, 20, 30, 40, 50, 60, 70%, 80, 100	0, 10-19, 29-39, 40-49, 53-70, 64-80, 84-100
REFRIGERANT	R-454B			
Circuit A Operating Charge - Standard (lb)	23.5		28.0	
Circuit A Operating Charge with Humidi-MiZer Option (lb)	30.0		37.0	
Circuit B Operating Charge - Standard (lb)	22.5		27.5	
High Pressure Switch Auto-Reset (psig)	500			
High Pressure Switch Cutout (psig)	650			
CONDENSER COIL	Novation (Aluminum MCHX)			
Quantity	2			
Total Face Area (sq ft)	65.6			
CONDENSER FAN (STANDARD)	Metal Propeller		Metal Propeller	
Nominal cfm	35,500			
Quantity...Diameter (in.)	4...30			
Motor Hp...rpm	2.0-2.5...1140			
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™		Composite AeroAcoustic™	
Nominal cfm	135,500			
Quantity...Diameter (in.)	4...30.5			
Motor Hp...rpm	1.5-1.75...850			
EVAPORATOR COIL	Al/Cu RTPF			
Circuiting	Intertwined		Intertwined	
Tube Size (in.)	1/2			
Total Face Area (sq ft)	31.3		48.1	
Rows...Fins (in.)	6…16		4…17	
Fin Enhancement	Double Wavy		Double Wavy	
Tube Enhancement	Cross Hatched		Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1			
HUMIDI-MIZER COIL	Novation (Aluminum MCHX)			
Coil Circuit	A			
Coil Quantity	1		1	
Coil Total Face Area (sq ft)	16		24.3	
Reheat Valve Qty…Type	1…On/Off Three-Way		1…On/Off Three-Way	
Bypass Valve Qty…Type	1…Modulating Three-Way		1…Modulating Three-Way	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 50 and 60 Vertical (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	50[a]		60 (VERTICAL)[a]	
NOMINAL CAPACITY (TONS)	50		60	
INDOOR FANS	DWDI Forward Curve		DWDI Forward Curve	
Qty...Size (in.)	2... 20 x 15		3 ... 20 x 15	
Drive Type	Belt		Belt	
Nominal cfm	18,000		24,000	
Peak Motor Efficiency	93/93.6	93.6/94.1	93.6/93.6	94.1/94.1
Motor Hp	15/20	25/30	20/25	30/40
Motor Frame Size (T)	254/256	284/286	256/284	286/324
Motor Bearing Type	Ball			
Maximum Allowable rpm	1300		1200	
Motor Pulley Pitch Dia. (in.)	5.3/5.7	6.2/6.7	5.7/5.3	5.9/6.5
Nominal Motor Shaft Dia. (in.)	1.625/1.625	1.874/1.875	1.625/1.874	1.875/2.125
Fan Pulley Pitch Diameter (in.)	9.4/9.4	9.4/9.4	9.4/9.1	9.5/9.5
Nominal Fan Shaft Dia. (in.)	1-15/16			
Belt Quantity	2/2	2/2	2/3	3/3
Belt Type	5VX550/5VX550	5VX570/5VX570	5VX550/5VX530	5VX550/5VX570
Belt Length (in.)	53/55	57/57	55/53	55/57
Pulley Center Line Distance (in.)	14.8/15.5	16.2/15.8	15.5/15.1	15.3/15.9
Factory Speed Setting at 60 or Max Hz (rpm)	997/1070	1164/1269	1070/1028	1105/1200
Grease Fitting Qty...Fitting Type (in.)	2...1/8 NPT			
PRE-EVAPORATOR FILTERS				
2 in. MERV 5 (Standard) Qty… Size (in.)	10… 20 x 24 x 2			
2 in. MERV 8 (Option) Qty… Size (in.)	10… 20 x 24 x 2			
4 in. MERV 8 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 4			
4 in. MERV 13 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 6			
OUTDOOR-AIR SCREENS				
Quantity...Size (in.)	8… 16 x 25 x 2 4… 20 x 25 x 2		12… 16 x 25 x 2 6… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)				
Motor Type	PSC			
Motor Quantity...Hp	4...1		6...1	
Fan Quantity	4		6	
Fan Diameter...width (in.)	11.9x10.7		11.9x10.7	
GAS HEAT (48K ONLY)				
Supply Line Pressure Range Liquid Gas	5.0 in. wg min. / 13.5 in. wg max.		5.0 in. wg min. / 13.5 in. wg max.	
Rollout Switch Cutout Temp. (°F)[b]	225			
Efficiency (%)	81	81	81	81
Number of Heat Exchangers	2		3	
Number of Gas Valves	2		3	
Gas Connection Qty… Size (in.)	1… 1 1/2 NPT		1… 1 1/2 NPT	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.
b. Rollout switch is manual reset.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 50 and 60 Vertical (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	50[a]		60 (VERTICAL)[a]	
NOMINAL CAPACITY (TONS)	50		60	
TWO-STAGE GAS HEAT	Low Heat	High Heat	Low Heat	High Heat
Heat Exchanger Material (Std/Option)	T1-40 Aluminized Steel / 409 Stainless Steel		T1-40 Aluminized Steel / 409 Stainless Steel	
Input (mbh)	400,000	800,000	776,000	1,164,000
Output (mbh)	324,000	648,000	628,560	942,840
Burner Orifice Diameter (in… drill no.)				
Natural Gas (Standard)	.120...31		.120...31	
Liquid Propane (Alt)	.0935...42		.0935...42	
Quantity	10	20	20	30
Stage 1/Stage 2 Manifold Pressure (in. wg)	2.0/3.5		1.8/3.3	
Firing Stages %	75/100		75/100	
MULTI-STAGE GAS HEAT (OPTIONAL)	Low Heat	High Heat	Low Heat	High Heat
Heat Exchanger Material (Std)	409 Stainless Steel		409 Stainless Steel	
Input (mbh)	400,000	800,000	776,000	1,164,000
Output (mbh)	324,000	648,000	628,560	942,840
Burner Orifice Diameter (inches… drill no.)				
Natural Gas (Standard)	.120...31		.120...31	
Liquid Propane (Alt)	.0935...42		.0935...42	
Quantity	10	20	20	30
Low Fire/High Fire Manifold Pressure (in. wg)	2.0/3.5		1.8/3.3	
System Capacity Steps (%)	37, 50, 75, 87, 100	37, 50, 75, 87, 100	19, 25, 38, 44, 50, 56, 63, 75, 88, 94, 100	25, 33, 50, 58, 67, 75, 83, 92, 100
Temperature Rise Range	10-40°F	30-60°F	10-40°F	30-60°F

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 60 (Horizontal)

BASE UNIT SIZE 48K2, K3, K4, K5	60 HORIZONTAL[a]	
NOMINAL CAPACITY (TONS)	60	
OPERATING WEIGHT (lb)	See Unit Weights Table	
COMPRESSOR	Standard	Lead Digital (Option)
Refrigerant Circuits	2	
Circuit A, Type (A1/A2)	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1… YA122 / 1… YA182	1... YAD115 / 1… YA182
Circuit A Oil Charge (oz) (A1/A2)	75/121	85/121
Circuit B, Type (B1/B2)	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit B, Qty…Model B1/B2)	1… YA122 / 1… YA182	1… YA122 / 1… YA182
Circuit B Oil Charge (oz) (B1/B2)	75/121	75/121
Capacity Steps (%)	0, 20, 30, 40, 50, 60, 70, 80, 100	0, 10-19, 29-39, 40-49, 53-70, 64-80, 84-100
REFRIGERANT	R-454B	
Circuit A Operating Charge - Standard (lb)	28.8	
Circuit A Operating Charge with Humidi-MiZer Option (lb)	37.0	
Circuit B Operating Charge - Standard (lb)	27.5	
High Pressure Switch Auto-Reset (psig)	500	
High Pressure Switch Cutout (psig)	650	
CONDENSER COIL	Novation (Aluminum MCHX)	
Quantity	2	
Total Face Area (sq ft)	99.6	
CONDENSER FAN (STANDARD)	Metal Propeller	
Nominal cfm	48,000	
Quantity...Diameter (in.)	6...30	
Motor Hp...rpm	2.0-2.5...1140	
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™	
Nominal cfm	48,000	
Quantity...Diameter (in.)	6...30.5	
Motor Hp...rpm	1.5-1.75...850	
EVAPORATOR COIL	Al/Cu RTPF	
Circuiting	Intertwined	
Tube Size (in.)	1/2	
Total Face Area (sq ft)	48.1	
Rows...Fins (in.)	4...17	
Fin Enhancement	Double Wavy	
Tube Enhancement	Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1	
HUMIDI-MIZER COIL	Novation (Aluminum MCHX)	
Coil Circuit	A	
Coil Quantity	1	
Coil Total Face Area (sq ft)	24.3	
Reheat Valve Qty…Type	1…On/Off Three-Way	
Bypass Valve Qty…Type	1…Modulating Three-Way	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

48K2, K3, K4, K5 Physical Data — Sizes 60 (Horizontal) (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	60 HORIZONTAL[a]	
NOMINAL CAPACITY (TONS)	60	
INDOOR FANS	DWDI Forward Curve	
Qty...Size (in.)	3... 20 x15	
Drive Type	Belt	
Nominal cfm	24,000	
Peak Motor Efficiency	93.6/93.6	94.1/94.1
Motor Hp	20/25	30/40
Motor Frame Size (T)	256/284	286/324
Motor Bearing Type	Ball	
Maximum Allowable rpm	1200	
Motor Pulley Pitch Diameter (in.)	5.7/5.3	5.9/6.5
Nominal Motor Shaft Diameter (in.)	1.625/1.874	1.875/2.125
Fan Pulley Pitch Diameter (in.)	9.4/9.1	9.5/9.4
Nominal Fan Shaft Diameter (in.)	1-15/16	
Belt Quantity	2/3	3/3
Belt Type	5VX550/5VX530	5VX550/5VX570
Belt Length (in.)	55/53	55/57
Pulley Center Line Distance (in.)	15.5/15.1	15.3/15.9
Factory Speed Setting at 60 or Max Hz (rpm)	1070/1028	1105/1200
Grease Fitting Qty...Fitting Type (in.)	4… 1/8 in. NPT	
PRE-EVAPORATOR FILTERS		
2 in. MERV 5 (Standard) Qty… Size (In.)	16… 20 x 24 x 2	
2 in. MERV 8 (Option) Qty… Size (In.)	16… 20 x 24 x 2	
4 in. MERV 8 (Option) Qty… Size (In.)	8… 20 x 20 x 4, 8… 20 x 24 x 4	
4 in. MERV 13 (Option) Qty… Size (In.)	8… 20 x 20 x 4, 8… 20 x 24 x 4	
OUTDOOR-AIR SCREENS		
Quantity...Size (in.)	12… 16 x 25 x 2, 6… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)		
Motor Type	PSC	
Motor Quanitity...Hp	6...1	
Fan Quantity	6	
Fan Diameter...width (in.)	11.9 x 10.7	
GAS HEAT (48K ONLY)		
Supply Line Pressure Range Liquid Gas	5.0 in. wg min. / 13.5 in. wg max.	
Rollout Switch Cutout Temp (°F)[b]	225	
Efficiency (%)	81	81
Number of Heat Exchangers	3	
Number of Gas Valves	3	
Gas Connection Qty… Size (in.)	1… 1 1/2 NPT	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.
b. Rollout switch is manual reset.

Physical data (cont)

48K2, K3, K4, K5 Unit Physical Data — Sizes 60 (Horizontal) (cont)

BASE UNIT SIZE 48K2, K3, K4, K5	60 HORIZONTAL[a]	
NOMINAL CAPACITY (TONS)	60	
TWO-STAGE GAS HEAT	Low Heat	High Heat
Heat Exchanger Material (Std/Option)	T1-40 Aluminized Steel / 409 Stainless Steel	
Input (mbh)	776,000	975,000
Output (mbh)	628,560	789,750
Burner Orifice Diameter (in… drill no.)		
Natural Gas (Standard)	.120 ... 31 (low)/.1065 ... 36 (high)	
Liquid Propane (Alt)	.0935 ... 42 (Low)/.0860 ... 44 (High)	
Quantity	20	30
Stage 1/Stage 2 Manifold Pressure (in. wg)	1.8/3.3	
Firing Stages %	75/100	
MULTI-STAGE GAS HEAT (OPTIONAL)	Low Heat	High Heat
Heat Exchanger Material (Std)	409 Stainless Steel	
Input (mbh)	776,000	975,000
Output (mbh)	628,560	789,750
Burner Orifice Diameter (inches… drill no.)		
Natural Gas (Standard)	.120 ... 31 (Low) / .1065 ... 36 (High)	
Liquid Propane (Alt)	.0935 ... 42 (Low) / .0860 ... 44 (High)	
Quantity	20	30
Low Fire/High Fire Manifold Pressure (in. wg)	1.8/3.3	
System Capacity Steps (%)	19, 25, 38, 44, 50, 56, 63, 75, 88, 94, 100	25, 33, 50, 58, 67, 75, 83, 92, 100
Temperature Rise Range	10-40°F	30-60°F

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 20, 26, 30

BASE UNIT SIZE 50K2, K3, K4, K5	20		26		30	
NOMINAL CAPACITY (TONS)	20		25		30	
OPERATING WEIGHT (lb)	See Unit Weights Table					
COMPRESSOR	Standard	Lead Digital (Option)	Standard	Lead Digital (Option)	Standard	Lead Digital (Option)
Refrigerant Circuits	1		1		1	
Circuit A, Type (A1/A2)	Fixed /Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1… YA91 / 1… YA137	1… YAD86 / 1… YA137	1… YA91 / 1… YA182	1… YAD86 / 1… YA182	1… YA122 / 1… YA182	1… YAD115 / 1… YA182
Circuit A Oil Charge (oz) (A1/A2)	58/121	60/121	58/121	60/121	71/121	85/121
Circuit B, Type (B1/B2)	—	—	—	—	—	—
Circuit B, Qty…Model (B1/B2)	—	—	—	—	—	—
Circuit B Oil Charge (oz) (B1/B2)	—	—	—	—	—	—
Capacity Steps (%)	0, 40, 60, 100	0, 20-39, 61, 69-100	0, 33, 67, 100	0, 20-32, 68, 74-100	0, 40, 60, 100	0, 20-39, 61, 69-100
REFRIGERANT	R-454B					
Circuit A Operating Charge - Standard (lb)	19.0		23.5		23.0	
Circuit A Operating Charge with Humidi-MiZer Option (lb)	27.3		32.0		31.0	
Circuit B Operating Charge - Standard (lb)	N/A		N/A		N/A	
High Pressure Switch Auto-Reset (psig)	500					
High Pressure Switch Cutout (psig)	650					
CONDENSER COIL	Novation (Aluminum MCHX)					
Quantity	1					
Total Face Area (sq ft)	32.8					
CONDENSER FAN (STANDARD)	Metal Propeller		Metal Propeller		Metal Propeller	
Nominal cfm	19,500					
Quantity...Diameter (in.)	2...30					
Motor Hp...rpm	2.0-2.5...1140					
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™		Composite AeroAcoustic™		Composite AeroAcoustic™	
Nominal cfm	19,500					
Quantity...Diameter (in.)	2...30.5					
Motor Hp...rpm	1.5-1.75...850					
EVAPORATOR COIL	Al/Cu RTPF					
Circuiting	Fully Active		Fully Active		Fully Active	
Tube Size (in.)	3/8					
Total Face Area (sq ft)	31.7					
Rows...Fins (in.)	3…15		4…15		4…15	
Fin Enhancement	Double Wavy		Double Wavy		Double Wavy	
Tube Enhancement	Cross Hatched		Cross Hatched		Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1					
HUMIDI-MIZER COIL	Novation (Aluminum MCHX)					
Coil Circuit	A					
Coil Quantity	1					
Coil Total Face Area (sq ft)	16					
Reheat Valve (Qty…Type)	1…On/Off Three-Way		1…On/Off Three-Way		1…On/Off Three-Way	
Bypass Valve (Qty…Type)	1…Modulating Three-Way		1…Modulating Three-Way		1…Modulating Three-Way	

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 20, 26, 30 (cont)

BASE UNIT SIZE 50K2, K3, K4, K5	20		26		30	
NOMINAL CAPACITY (TONS)	**20**		**25**		**30**	
INDOOR FANS	DWDI Forward Curve		DWDI Forward Curve		DWDI Forward Curve	
Qty...Size (in.)	2... 20 x 15		2 ... 20 x 15		2 ... 20 x 15	
Drive Type	Belt		Belt		Belt	
Nominal cfm	8000		10,000		12,000	
Peak Motor Efficiency	89.5/91.7	93	89.5/91.7	93/93.6	89.5/91.7	93/93.6
Motor Hp	5/10	15	5/10	15/20	5/10	15/20
Motor Frame Size (T)	184/215	254	184/215	254/256	184/215	254/256
Motor Bearing Type	Ball					
Maximum Allowable rpm	1200					
Motor Pulley Pitch Diameter (in.)	4.9/4.4	5.7	4.9/6.1	5.5/5.9	4.9/4.4	5.7/5.9
Nominal Motor Shaft Diameter (in.)	1.125/1.375	1.625	1.125/1.375	1.625	1.125/1.375	1.625
Fan Pulley Pitch Diameter (in.)	12.4/8.6	9.1	12.4/11.1	8.6	12.4/9.4	9.1/8.6
Nominal Fan Shaft Diameter (in.)	1-15/16					
Belt Quantity	1/1	2/2	1/1	2/2	1/2	2/2
Belt Type	BX56/BX50	5VX530	BX56/5VX570	5VX530	BX56/BX50	5VX530
Belt Length (in.)	59/53	53	59/57	53	59/53	53
Pulley Center Line Distance (in.)	15.5/16.2	14.8	15.5/14.8	15.4/15.1	15.5/15.5	14.8/15.1
Factory Speed Setting at 60 or Max Hz (rpm)	6997/903	1107	697/970	1131/1200	697/826	1107/1200
Grease Fitting Qty...Fitting Type (in.)	2...1/8 NPT					
PRE-EVAPORATOR FILTERS						
2 in. MERV 5 (Standard) Qty… Size (in.)	10… 20 x 24 x 2					
2 in. MERV 8 (Option) Qty… Size (in.)	10… 20 x 24 x 2					
4 in. MERV 8 (Option) Qty… Size (in.)	5… 20 x 24 x 4/ 5… 20 x 20 x 4					
4 in. MERV 13 (Option) Qty… Size (in.)	5… 20 x 24 x 4/ 5… 20 x 20 x 4					
OUTDOOR-AIR SCREENS						
Quantity...Size (in.)	4… 16 x 25 x 2 4… 20 x 25 x 2		4… 16 x 25 x 2 4… 20 x 25 x 2		4… 16 x 25 x 2 4… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)						
Motor Type	PSC					
Motor Quantity...Hp	4...1					
Fan Quantity	4					
Fan Diameter...width (in.)	11.9 x 10.7					
ELECTRIC HEAT (50K ONLY OPTION)						
Heater Quantity	2					
Capacity Range	27-73KW					
Heater Auto Reset Temp Limit (°F)	Opens at 170°F, and Resets at 130°F					
Heater Manual Reset Temp Limit	Opens at 160°F					
Heater Air Proving Switch Limit	—		—		—	

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 34 and 40

BASE UNIT SIZE 50K2, K3, K4, K5	34		40[a]	
NOMINAL CAPACITY (TONS)	35		40	
OPERATING WEIGHT (lb)	See Unit Weights Table			
Refrigerant Circuits	1		2	
Circuit A, Type (A1/A2)	Fixed/Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1... YA154 / 1… YA182	1... YAD147 / 1… YA182	1… YA91 / 1… YA122	1… YAD86 / 1… YA122
Circuit A Oil Charge (oz) (A1/A2)	121/121	114/121	58/75	60/75
Circuit B, Type (B1/B2)	—	—	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit B, Qty…Model B1/B2)	—	—	1… YA91 / 1… YA122	1… YA91 / 1… YA122
Circuit B Oil Charge (oz) (B1/B2)	—	—	58/75	58/75
Capacity Steps (%)	0, 46, 54, 100	0, 20-45, 55, 64-100	0, 21, 29, 43, 50, 57, 71, 79, 100	0, 10-20, 30-42, 39-49, 53-71, 62-78, 82-100
REFRIGERANT	R-454B			
Circuit A Operating Charge - Standard (lb)	24.0		19.0	
Circuit A Operating Charge with Humidi-MiZer- Option (lb)	31.5		27.0	
Circuit B Operating Charge - Standard	N/A		19.3	
High Pressure Switch Auto-Reset (psig)	500			
High Pressure Switch Cutout (psig)	650			
CONDENSER COIL	Novation (Aluminum MCHX)			
Quantity	1		2	
Total Face Area (sq ft)	32.8		65.6	
CONDENSER FAN (STANDARD)	Composite AeroAcoustic™		Metal Propeller	
Nominal cfm	19,500		32,000	
Qauntity...Diameter (in.)	2...30.5		4...30	
Motor Hp...rpm	2.0-2.5...1140			
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™		Composite AeroAcoustic™	
Nominal cfm	19,500		32,000	
Quantity...Diameter (in.)	2...30.5		4...30.5	
Motor Hp...rpm	1.5-1.75...850			
EVAPORATOR COIL	Al/Cu RTPF			
Circuiting	Fully Active		Intertwined	
Tube Size (in.)	3/8		1/2	
Total Face Area (sq ft)	31.7		31.3	
Rows...Fins (in.)	4…15		4…17	
Fin Enhancement	Double Wavy		Double Wavy	
Tube Enhancement	Cross Hatched		Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1			
HUMIDI-MIZER COIL	Novation (Aluminum MCHX)			
Coil Circuit	A			
Coil Quantity	1		1	
Coil Total Face Area (sq ft)	16			
Reheat Valve Qty…Type	1…On/Off Three-Way		1…On/Off Three-Way	
Bypass Valve Qty…Type	1…Modulating Three-Way		1…Modulating Three-Way	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 34 and 40 (cont)

BASE UNIT SIZE 50K2, K3, K4, K5	34		40[a]	
NOMINAL CAPACITY (TONS)	35		40	
INDOOR FANS	DWDI Forward Curve		DWDI Forward Curve	
Qty...Size (in.)	2... 20 x 15		2 ... 20 x 15	
Drive Type	Belt		Belt	
Nominal cfm	14,000		16,000	
Peak Motor Efficiency	91.7/93	93.6	91.7/93	93.6
Motor Hp	10/15	20/25	10/15	20/25
Motor Frame Size (T)	215/254	256/284	215/254	256/284
Motor Bearing Type	Ball			
Maximum Allowable rpm	1300			
Motor Pulley Pitch Diameter (in.)	4.4/5.1	537/6.2	4.4/5.3	5.7/7.5
Nominal Motor Shaft Diameter (in.)	1-3/81-5/8	1-5/81-7/8	1.375/1.625	1.625/1.874
Fan Pulley Pitch Diameter (in.)	9.4/8.6	8.6/8.6	9.4/9.4	9.4/11.1
Nominal Fan Shaft Diameter (in.)	1-15/16			
Belt Quantity	2		2	
Belt Type	BX50/5VX530	5VX530	BX50/5VX530	5VX550/BVX590
Belt Length (in.)	53		53/53	55/59
Pulley Center Line Distance (in.)	15.5/15.6	15.2/14.8	15.5/14.8	15.5/14.8
Factory Speed Setting at 60 or Max Hz (rpm)	826/1048	1170/1272	826/997	1070/1193
Grease Fitting Qty...Fitting Type (in.)	2...1/8 NPT			
PRE-EVAPORATOR FILTERS				
2 in. MERV 5 (Standard) Qty… Size (in.)	10… 20 x 24 x 2			
2 in. MERV 8 (Option) Qty… Size (in.)	10… 20 x 24 x 2			
4 in. MERV 8 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 4			
4 in. MERV 13 (Option) Qty… Size (in.)	5… 20 x 24 x 4, 5… 20 x 20 x 6			
OUTDOOR-AIR SCREENS				
Quantity...Size (in.)	4… 16 x 25 x 2 4… 20 x 25 x 2		8… 16 x 25 x 2 4… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)				
Motor Type	PSC			
Motor Quantity...Hp	4...1			
Fan Quantity	4			
Fan Diameter...width (in.)	11.9/10.7			
ELECTRIC HEAT (50K ONLY OPTION)				
Heater Quantity	2		2	
Capacity Range	27-72 kW		27-72 kW	
Heater Auto Reset Temp Limit (°F)	Opens at 170°F, and Resets at 130°F		Opens at 170°F, and Resets at 130°F	
Heater Manual Reset Temp Limit (°F)	Opens at 160°F		Opens at 160°F	
Heater Air Proving Switch Limit	—		—	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 50 and 60 (Vertical)

BASE UNIT SIZE 50K2, K3, K4, K5	50[a]		60 (VERTICAL)[a]	
NOMINAL CAPACITY (TONS)	50		60	
OPERATING WEIGHT (lb)	See Unit Weights Table			
Refrigerant Circuits	2		2	
Circuit A, Type (A1/A2)	Fixed/Fixed Speed	Digital/Fixed Speed	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1… YA104 / 1… YA137	1… YAD98 / 1… YA137	1… YA122 / 1… YA182	1… YAD115 / 1… YA182
Circuit A Oil Charge (oz) (A1/A2)	75/121	85/121	75/121	85/121
Circuit B, Type (B1/B2)	Fixed/Fixed Speed	Fixed/Fixed Speed	Fixed/Fixed Speed	Fixed/Fixed Speed
Circuit B, Qty…Model (B1/B2)	1… YA104 / 1… YA137	1… YA104 / 1… YA137	1… YA122 / 1… YA182	1… YA122 / 1… YA182
Circuit B Oil Charge (oz) (B1/B2)	75/121	75/121	75/121	75/121
Capacity Steps (%)	0, 22, 28, 43, 50, 57, 72, 78, 100	0, 10-21, 31-42, 39-49, 53-71, 62-78, 82-100	0, 20, 30, 40, 50, 60, 70, 80, 100	0, 10-19, 29-39, 40-49, 53-70, 64-80, 84-100
REFRIGERANT	R-454B			
Circuit A Operating Charge - Standard	23.5		28.0	
Circuit A Operating Charge with Humidi-MiZer- Option (lb)	30.0		37.0	
Circuit B Operating Charge - Standard (lb)	22.5		27.5	
High Pressure Switch Auto-Reset (psig)	500			
High Pressure Switch Cutout (psig)	650			
CONDENSER COIL	Novation (Al MCHX)			
Quantity	2			
Total Face Area (sq ft)	65.6			
CONDENSER FAN (STANDARD)	Metal Propeller		Metal Propeller	
Nominal cfm	35,500			
Qauntity...Diameter (in.)	4...30			
Motor Hp...rpm	2.0-2.5...1140			
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™		Composite AeroAcoustic™	
Nominal cfm	135,500			
Quantity...Diameter (in.)	4...30.5			
Motor Hp...rpm	1.5-1.75...850			
EVAPORATOR COIL	Al/Cu RTPF			
Circuiting	Intertwined		Intertwined	
Tube Size (in.)	1/2			
Total Face Area (sq ft)	31.3		48.1	
Rows...Fins (in.)	6…16		4…17	
Fin Enhancement	Double Wavy		Double Wavy	
Tube Enhancement	Cross Hatched		Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1			
HUMIDI-MIZER COIL	Novation (Al MCHX)			
Coil Circuit	A			
Coil Quantity	1		1	
Coil Total Face Area (sq ft)	16		24.3	
Reheat Valve Qty…Type	1…On/Off Three-Way		1…On/Off Three-Way	
Bypass Valve Qty…Type	1…Modulating Three-Way		1…Modulating Three-Way	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 50 and 60 (Vertical) (cont)

BASE UNIT SIZE 50K2, K3, K4, K5	50[a]		60 (VERTICAL)[a]	
NOMINAL CAPACITY (TONS)	50		60	
INDOOR FANS	DWDI Forward Curve		DWDI Forward Curve	
Qty...Size (in.)	2... 20 x 15		3 ... 20 x 15	
Drive Type	Belt		Belt	
Nominal cfm	18,000		24,000	
Peak Motor Efficiency	93/93.6	93.6/94.1	93.6/93.6	94.1/94.1
Motor Hp	15/20	25/30	20/25	30/40
Motor Frame Size (T)	254/256	284/286	256/284	286/324
Motor Bearing Type	Ball			
Maximum Allowable rpm	1300		1200	
Motor Pulley Pitch Diameter (in.)	5.3/5.7	6.2/6.7	5.7/5.3	5.9/6.5
Nominal Motor Shaft Diameter (in.)	1.625//1.625	1.874/1.875	1.625/1.874	1.875/2.125
Fan Pulley Pitch Diameter (in.)	9.4/9.4	9.4/9.4	9.4/9.1	9.5/9.5
Nominal Fan Shaft Diameter (in.)	1-15/16			
Belt Quantity	2/2	2/2	2/3	3/3
Belt Type	5VX550/5VX550	5VX570/5VX570	5VX550/5VX530	5VX550/5VX570
Belt Length (in.)	53/55	57/57	55/53	55/57
Pulley Center Line Distance (in.)	14.8/15.5	16.2/15.8	15.5/15.1	15.3/15.9
Factory Speed Setting at 60 or Max Hz (rpm)	997/1070	1164/1269	1070/1028	1105/1200
Grease Fitting Qty...Fitting Type (in.)	2...1/8 NPT			
PRE-EVAPORATOR FILTERS				
2 in. MERV 5 (Standard) Qty… Size (In.)	10… 20 x 24 x 2			
2 in. MERV 8 (Option) Qty… Size (in.)	10… 20 x 24 x 2			
4 in. MERV 8 (Option) Qty… Size (In.)	5… 20 x 24 x 4, 5… 20 x 20 x 4			
4 in. MERV 13 (Option) Qty… Size (In.)	5… 20 x 24 x 4, 5… 20 x 20 x 6			
OUTDOOR-AIR SCREENS				
Quantity...Size (in.)	8… 16 x 25 x 2 4… 20 x 25 x 2		12… 16 x 25 x 2 6… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)				
Motor Type	PSC			
Motor Quantity...Hp	4...1		6...1	
Fan Quantity	4		6	
Fan Diameter...width (in.)	11.9x10.7		11.9x10.7	
ELECTRIC HEAT (50K ONLY OPTION)				
Heater Quantity	2		3	
Capacity Range	27-72kW		41-108kW	
Heater Auto Reset Temp Limit (°F)	Opens at 170°F, and Resets at 130°F		Opens at 170°F, and Resets at 130°F	
Heater Manual Reset Temp Limit (°F)	Opens at 160°F		Opens at 160°F	
Heater Air Proving Switch Limit	—		—	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 60 (Horizontal)

BASE UNIT SIZE 50K2, K3, K4, K5	60 HORIZONTAL[a]	
NOMINAL CAPACITY (TONS)	60	
OPERATING WEIGHT (lb)	See Unit Weights Table	
Refrigerant Circuits	2	
Circuit A, Type (A1/A2)	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit A, Qty…Model (A1/A2)	1… YA122 / 1… YA182	1... YAD115 / 1… YA182
Circuit A Oil Charge (oz) (A1/A2)	75/121	85/121
Circuit B, Type (B1/B2)	Fixed/Fixed Speed	Digital/Fixed Speed
Circuit B, Qty…Model (B1/B2)	1… YA122 / 1… YA182	1… YA122 / 1… YA182
Circuit B Oil Charge (oz) (B1/B2)	75/121	75/121
Capacity Steps (%)	0, 20, 30, 40, 50, 60, 70, 80, 100	0, 10-19, 29-39, 40-49, 53-70, 64-80, 84-100
REFRIGERANT	R-454B	
Circuit A Operating Charge - Standard (lb)	28.0	
Circuit A Operating Charge with Humidi-MiZer Option (lb)	37.0	
Circuit B Operating Charge - Standard (lb)	27.5	
High Pressure Switch Auto-Reset (psig)	500	
High Pressure Switch Cutout (psig)	650	
CONDENSER COIL	Novation (Al MCHX)	
Quantity	2	
Total Face Area (sq ft)	99.6	
CONDENSER FAN (STANDARD)	Metal Propeller	
Nominal cfm	48,000	
Quantity...Diameter (in.)	6...30	
Motor Hp...rpm	2.0-2.5...1140	
LOW SOUND CONDENSER FAN (OPTION)	Composite AeroAcoustic™	
Nominal cfm	48,000	
Quantity...Diameter (in.)	6..30.5	
Motor Hp...rpm	1.5-1.75...850	
EVAPORATOR COIL	Al/Cu RTPF	
Circuiting	Intertwined	
Tube Size (in.)	1/2	
Total Face Area (sq ft)	48.1	
Rows...Fins (in.)	4...17	
Fin Enhancement	Double Wavy	
Tube Enhancement	Cross Hatched	
Condensate Drain Connection Quantity...Size (in.)	1…1	
HUMIDI-MIZER COIL	Novation (Al MCHX)	
Coil Circuit	A	
Coil Quantity	1	
Coil Total Face Area (sq ft)	24.3	
Reheat Valve Qty…Type	1…On/Off Three-Way	
Bypass Valve Qty…Type	1…Modulating Three-Way	

NOTE(S):

a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

Physical data (cont)

50K2, K3, K4, K5 Unit Physical Data — Sizes 60 (Horizontal) (cont)

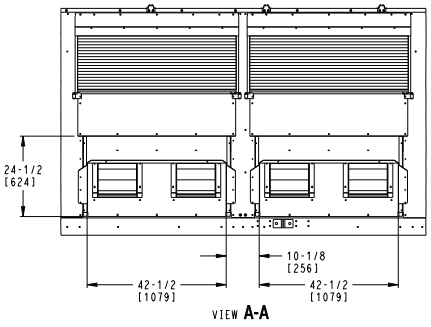
BASE UNIT SIZE 50K2, K3, K4, K5	60 HORIZONTAL[a]	
NOMINAL CAPACITY (TONS)	60	
INDOOR FANS	DWDI Forward Curve	
Qty...Size (in.)	3... 20 x 15	
Drive Type	Belt	
Nominal cfm	24,000	
Peak Motor Efficiency	93.6/93.6	94.1/94.1
Motor Hp	20/25	30/40
Motor Frame Size (T)	256/284	286/324
Motor Bearing Type	Ball	
Maximum Allowable rpm	1200	
Motor Pulley Pitch Diameter (in.)	5.7/5.3	5.9/6.5
Nominal Motor Shaft Diameter (in.)	1.625/1.874	1.875/2.125
Fan Pulley Pitch Diameter (in.)	9.4/9.1	9.5/9.4
Nominal Fan Shaft Diameter (in.)	1-15/16	
Belt Quantity	2/3	3/3
Belt Type	5VX550/5VX530	5VX550/5VX570
Belt Length (in.)	55/53	55/57
Pulley Center Line Distance (in.)	15.5/15.1	15.3/15.9
Factory Speed Setting at 60 or Max Hz (rpm)	1070/1028	1105/1200
Grease Fitting Qty...Fitting Type (in.)	4… 1/8 in. NPT	
PRE-EVAPORATOR FILTERS		
2 in. MERV 5 (Standard) Qty… Size (in.)	16… 20 x 24 x 2	
2 in. MERV 8 (Option) Qty… Size (in.)	16… 20 x 24 x 2	
4 in. MERV 8 (Option) Qty… Size (in.)	8… 20 x 20 x 4, 8… 20 x 24 x 4	
4 in. MERV 13 (Option) Qty… Size (in.)	8… 20 x 20 x 4, 8… 20 x 24 x 4	
OUTDOOR-AIR SCREENS		
Quantity...Size (in.)	12… 16 x 25 x 2 6… 20 x 25 x 2	
MUTLI-STAGE POWER EXHAUST (OPTION)		
Motor Type	PSC	
Motor Quanitity...Hp	6...1	
Fan Quantity	6	
Fan Diamtere...width (in.)	11.9 x 10.7	
ELECTRIC HEAT (50K ONLY OPTION)		
Heater Quantity	3	
Capacity Range	41-108 kW	
Heater Auto Reset Temp Limit (°F)	Opens at 170°F, and Resets at 130°F	
Heater Manual Reset Temp Limit (°F)	Opens at 160°F	
Heater Air Proving Switch Limit	—	—

NOTE(S):

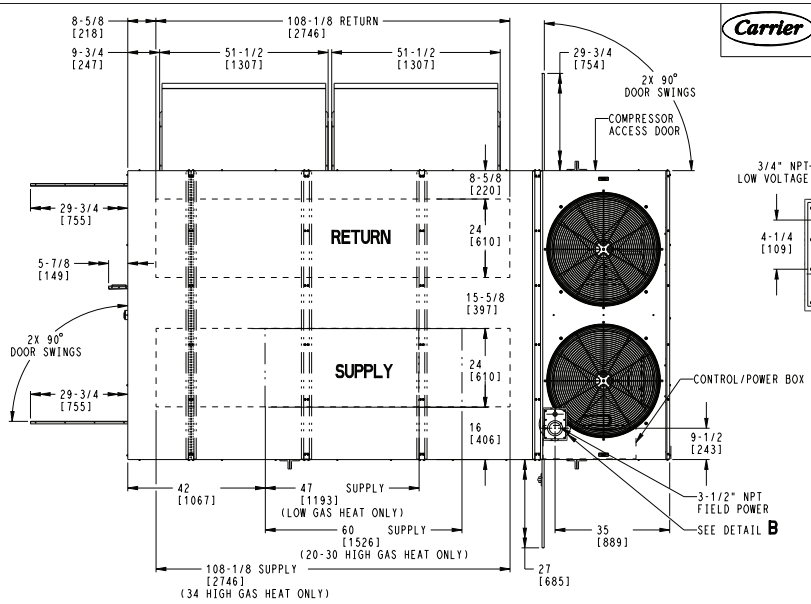
a. Sizes 40, 50 and 60: Circuit A uses the right condenser coil, Circuit B the left condenser coil.

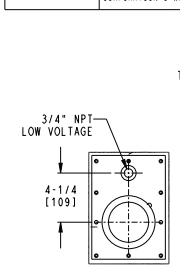
48K, Sizes 20-34 Vertical Supply and Return

NOTES:
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END - 4'-0" [1219]
   ECONOMIZER SIDE - 6'-0" [1829]
   HEAT SIDE - 4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END - 10'-0" [3048]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CANNOT ATTACH TO UNIT BASEPAN. DUCTWORK MUST CONNECT TO ROOFCURB OR STEEL DUNNAGE
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. EXHAUST/RELIEF HOODS SHIP TIPPED IN AND TIP OUT FOR OPERATING LOCATION
7. SEE ACESSORY GUIDE FOR HIGH CAPACITY POWER EXHAUST DIMENSIONS

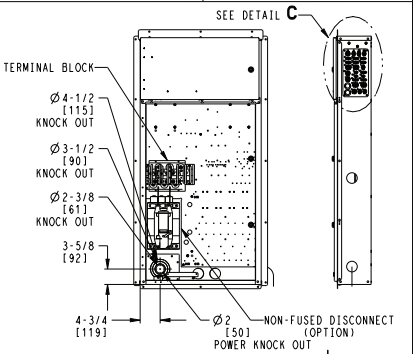


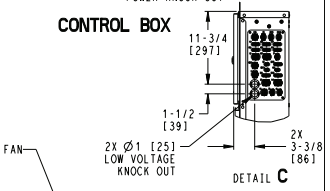
VIEW A-A



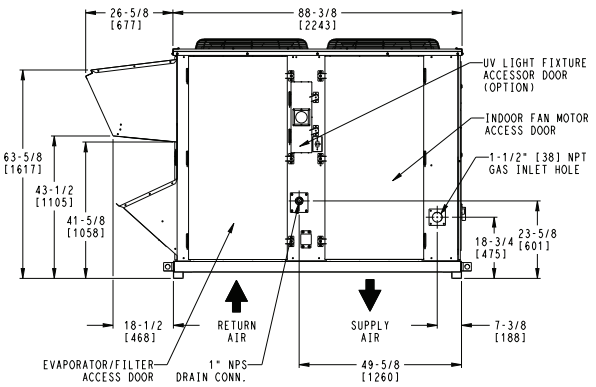


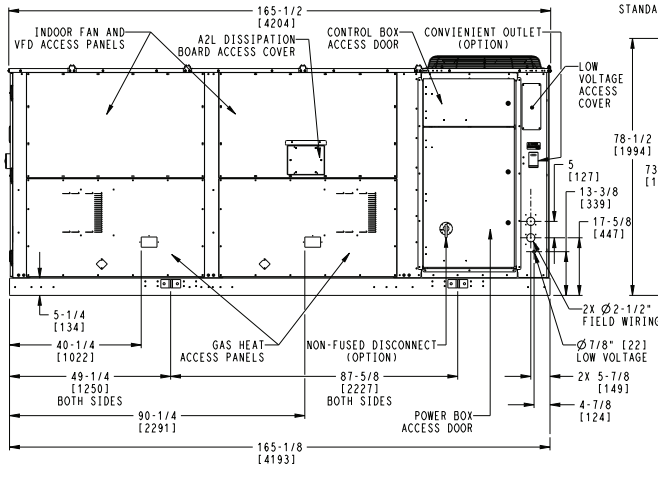
DETAIL B

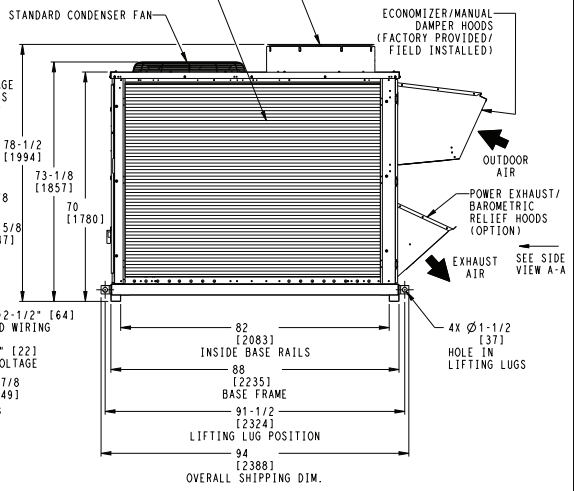




DETAIL C





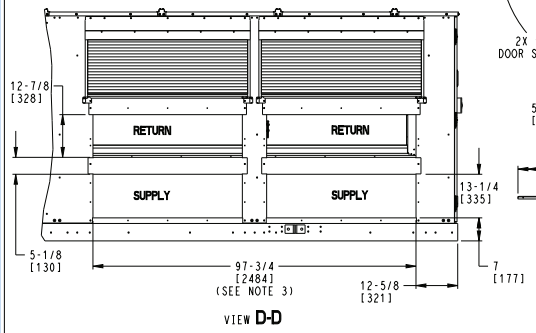


VERTICAL SUPPLY & RETURN

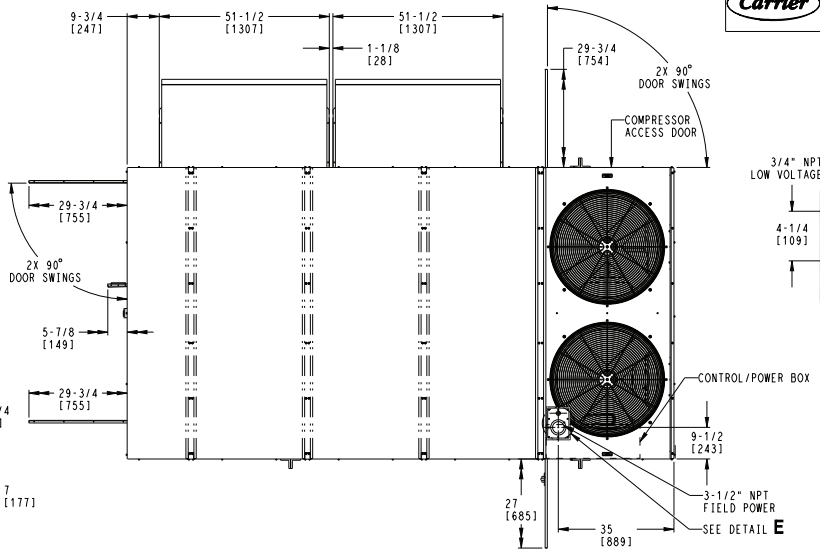
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48K SIZE 20-34	48VA006060	REV
U.S. ECCN: EAR99	1 OF 2	07/28/23	-			-

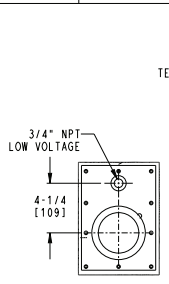
48K, Sizes 20-34 Horizontal Supply and Return (cont)

NOTES:
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONDENSER END - 4'-0" [1219]
   ECONOMIZER SIDE - 6'-0" [1829]
   HEAT SIDE - 4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END - 10'-0" [3048]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CONNECTS TO SIDE OF UNIT. CONNECT ALL SUPPLY OPENINGS WITH A SINGLE DUCT. CONNECT ALL RETURN OPENINGS WITH A SINGLE DUCT.
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. ACCESSORY EXHAUST/RELIEF SYSTEMS MUST BE DUCT MOUNTED WITH HORIZONTAL RETURN
7. CONSIDER CONDENSATE DRAINAGE WHEN UNIT IS SLAB MOUNTED

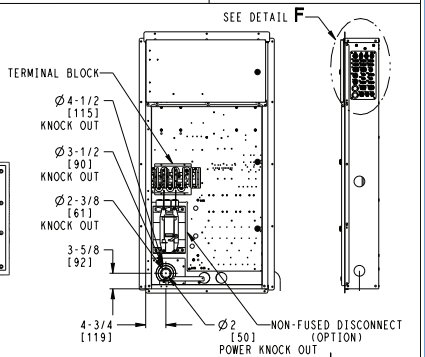


VIEW D-D

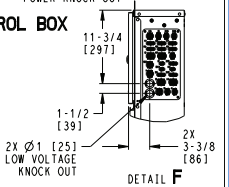




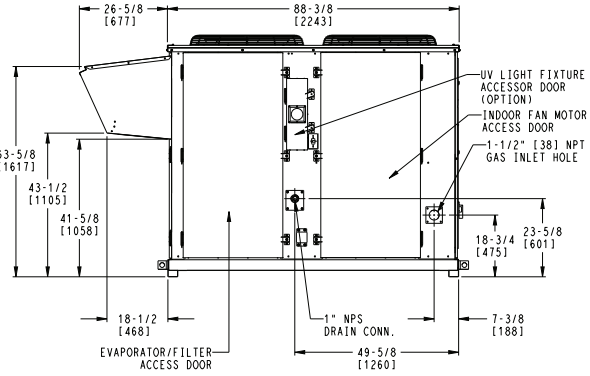
DETAIL E

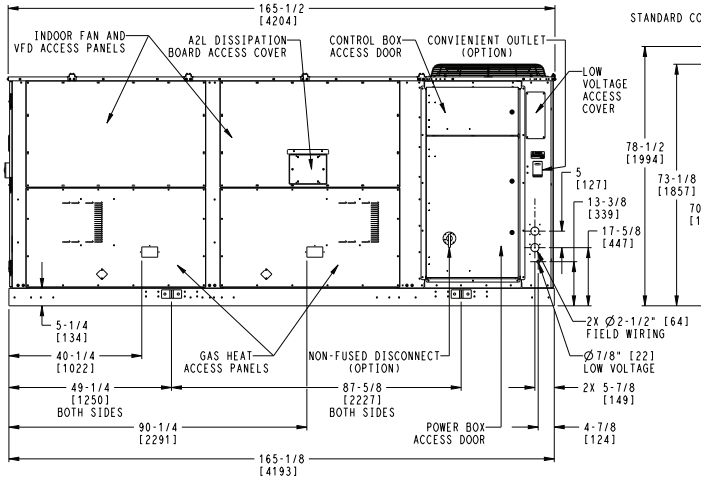


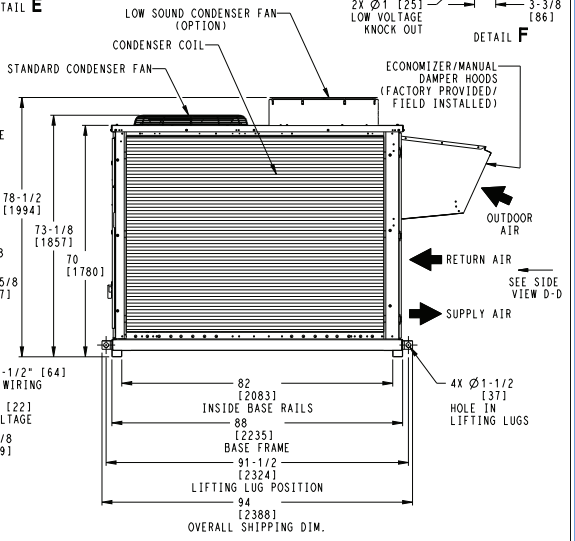
CONTROL BOX



DETAIL F





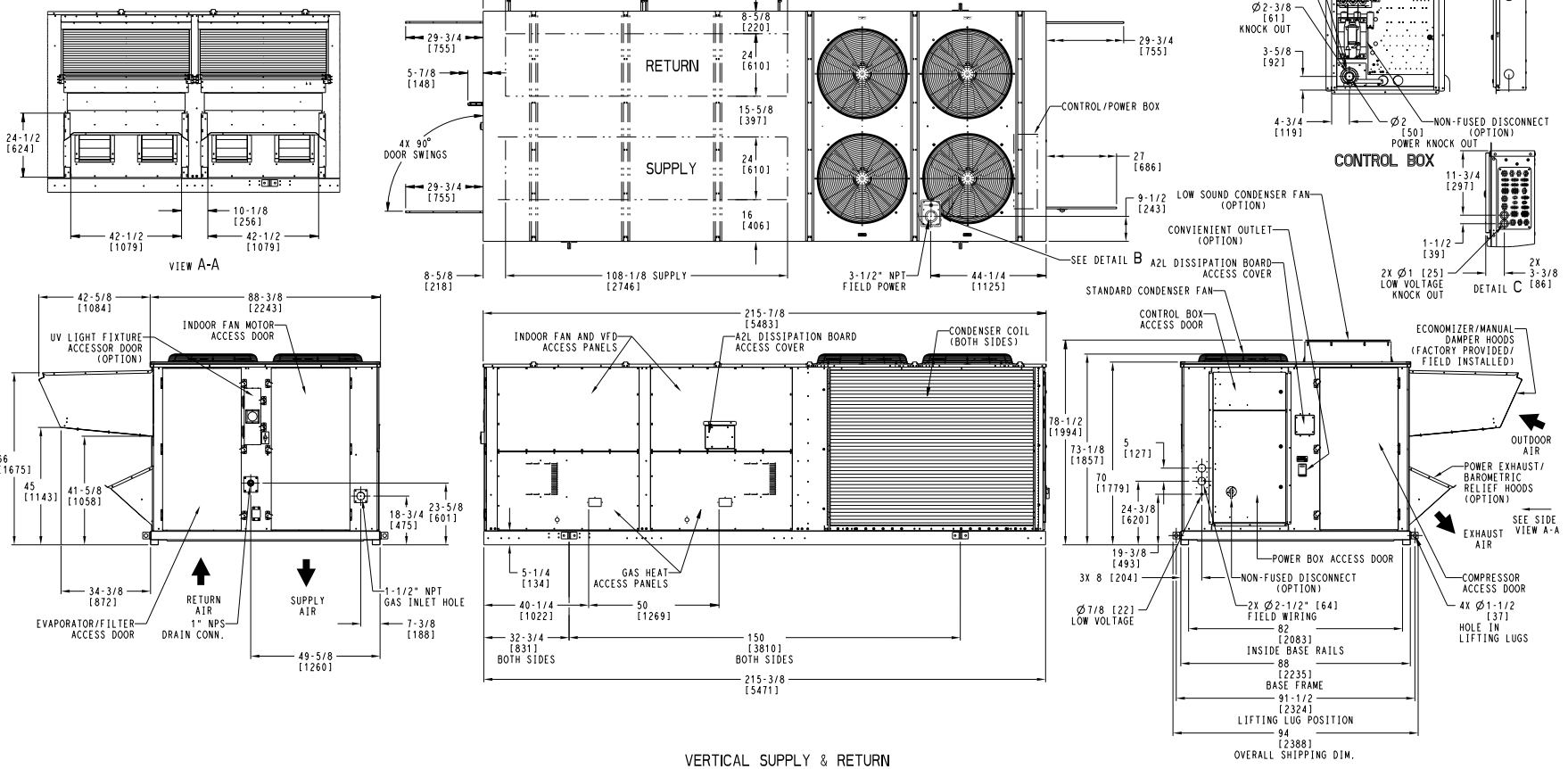


HORIZONTAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48K SIZE 20-34	48VA006060	REV
U.S. ECCN: EAR99	2 OF 2	07/28/23	-			-

48K, Sizes 40-50 Vertical Supply and Return

NOTES:
1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END - 4'-0" [1219]
   ECONOMIZER SIDE - 6'-0" [1829]
   HEAT SIDE - 4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END - 10'-0" [3048]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CANNOT ATTACH TO UNIT BASEPAN. DUCTWORK MUST CONNECT TO ROOFCURB OR STEEL DUNNAGE
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. EXHAUST/RELIEF HOODS SHIP TIPPED IN AND TIP OUT FOR OPERATING LOCATION
7. SEE ACESSORY GUIDE FOR HIGH CAPACITY POWER EXHAUST DIMENSIONS

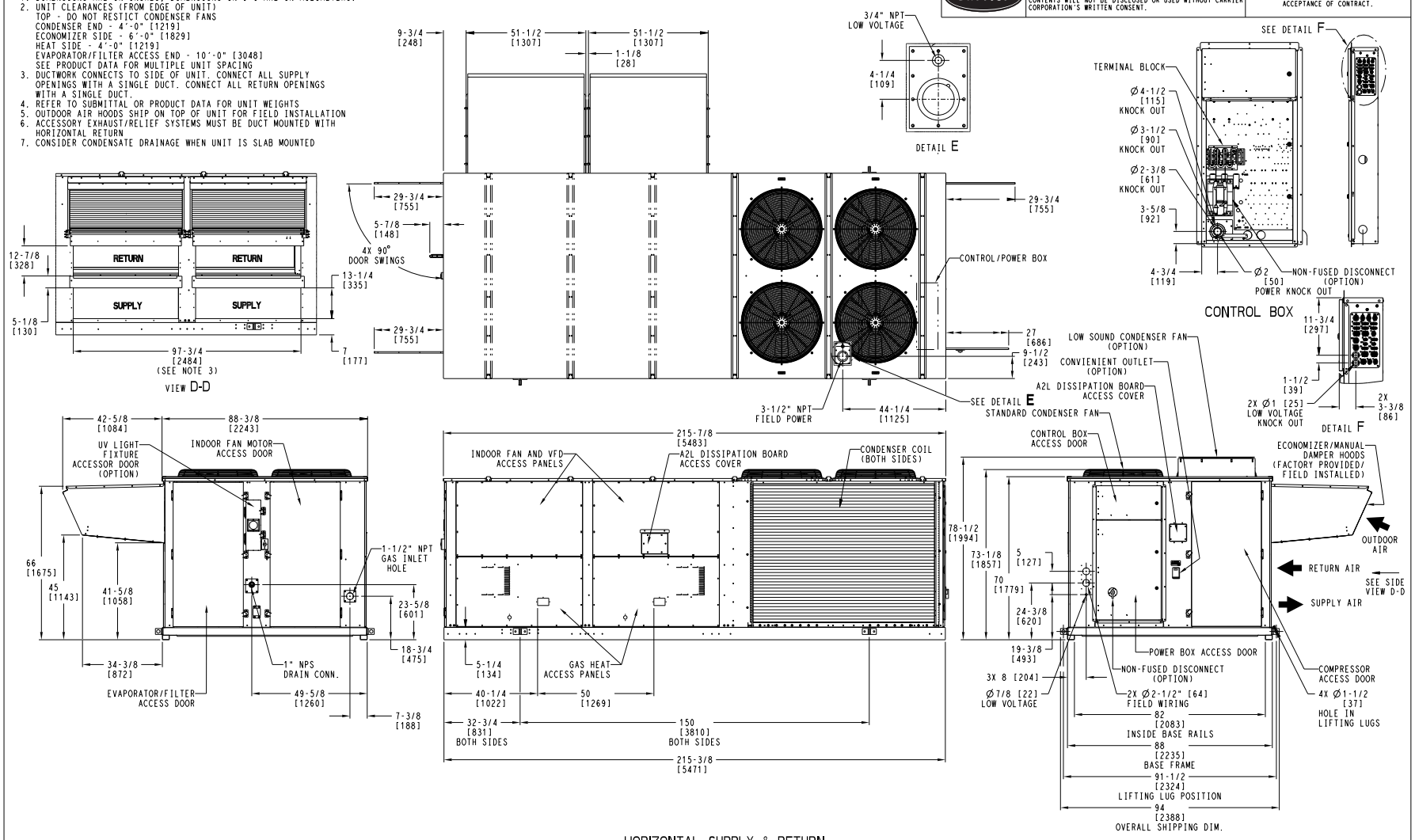


VERTICAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN: EAR99	1 OF 2	08/03/23	-	48K SIZE 40-50	48VA006062	-

48K, Sizes 40-50 Horizontal Supply and Return (cont)

NOTES:
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END - 4'-0" [1219]
   ECONOMIZER SIDE - 6'-0" [1829]
   HEAT SIDE - 4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END - 10'-0" [3048]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CONNECTS TO SIDE OF UNIT. CONNECT ALL SUPPLY OPENINGS WITH A SINGLE DUCT. CONNECT ALL RETURN OPENINGS WITH A SINGLE DUCT.
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. ACCESSORY EXHAUST/RELIEF SYSTEMS MUST BE DUCT MOUNTED WITH HORIZONTAL RETURN
7. CONSIDER CONDENSATE DRAINAGE WHEN UNIT IS SLAB MOUNTED

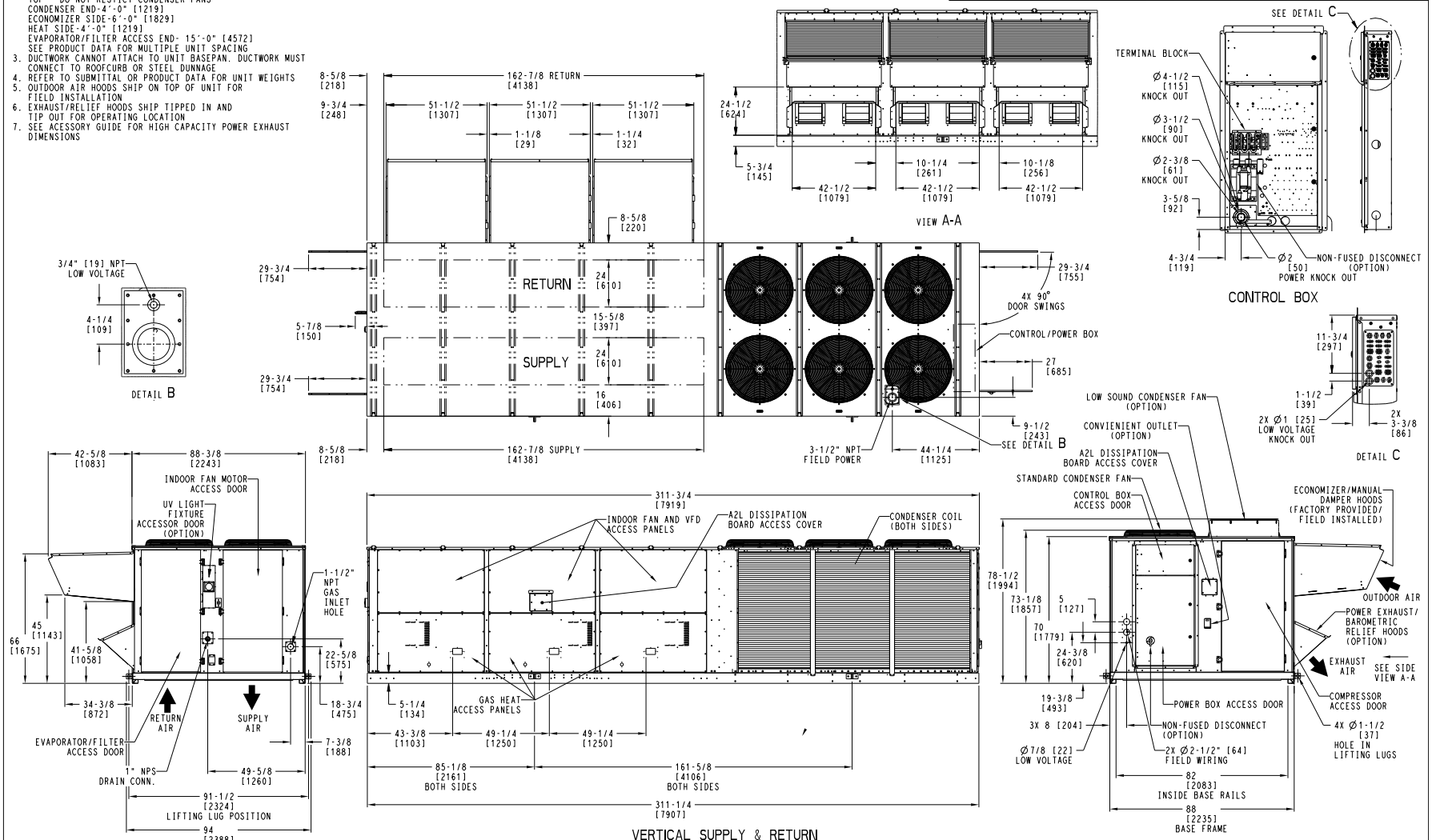


HORIZONTAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN: EAR99	2 OF 2	08/03/23	-	48K SIZE 40-50	48VA006062	-

48K, Size 60 Vertical Supply and Return

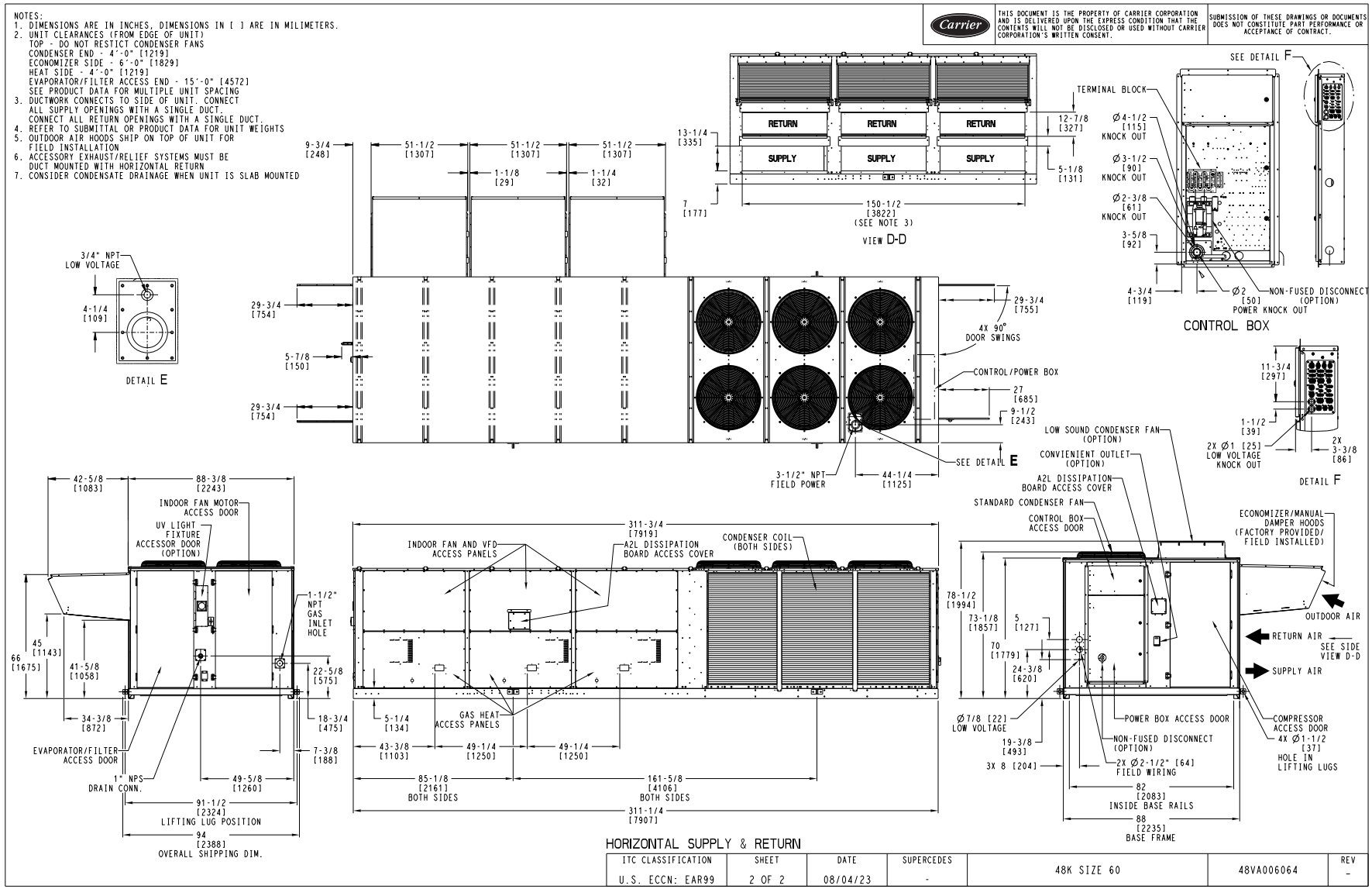
NOTES:
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END-4'-0" [1219]
   ECONOMIZER SIDE-6'-0" [1829]
   HEAT SIDE-4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END- 15'-0" [4572]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CANNOT ATTACH TO UNIT BASEPAN. DUCTWORK MUST CONNECT TO ROOFCURB OR STEEL DUNNAGE
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. EXHAUST/RELIEF HOODS SHIP TIPPED IN AND TIP OUT FOR OPERATING LOCATION
7. SEE ACESSORY GUIDE FOR HIGH CAPACITY POWER EXHAUST DIMENSIONS



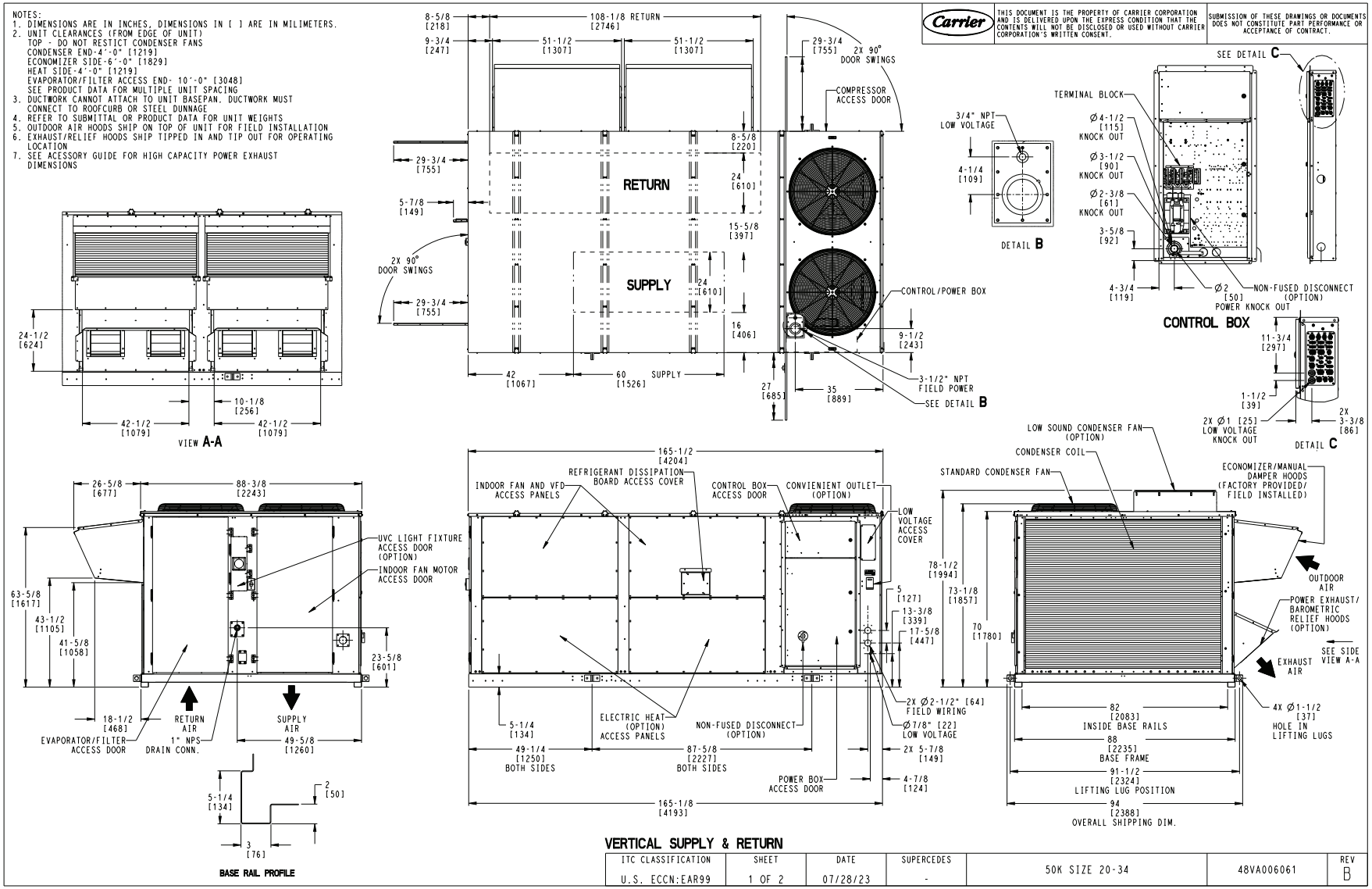
VERTICAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48K SIZE 60	48VA006064	REV
U.S. ECCN: EAR99	1 OF 2	08/04/23	-			-

48K, Size 60 Horizontal Supply and Return (cont)



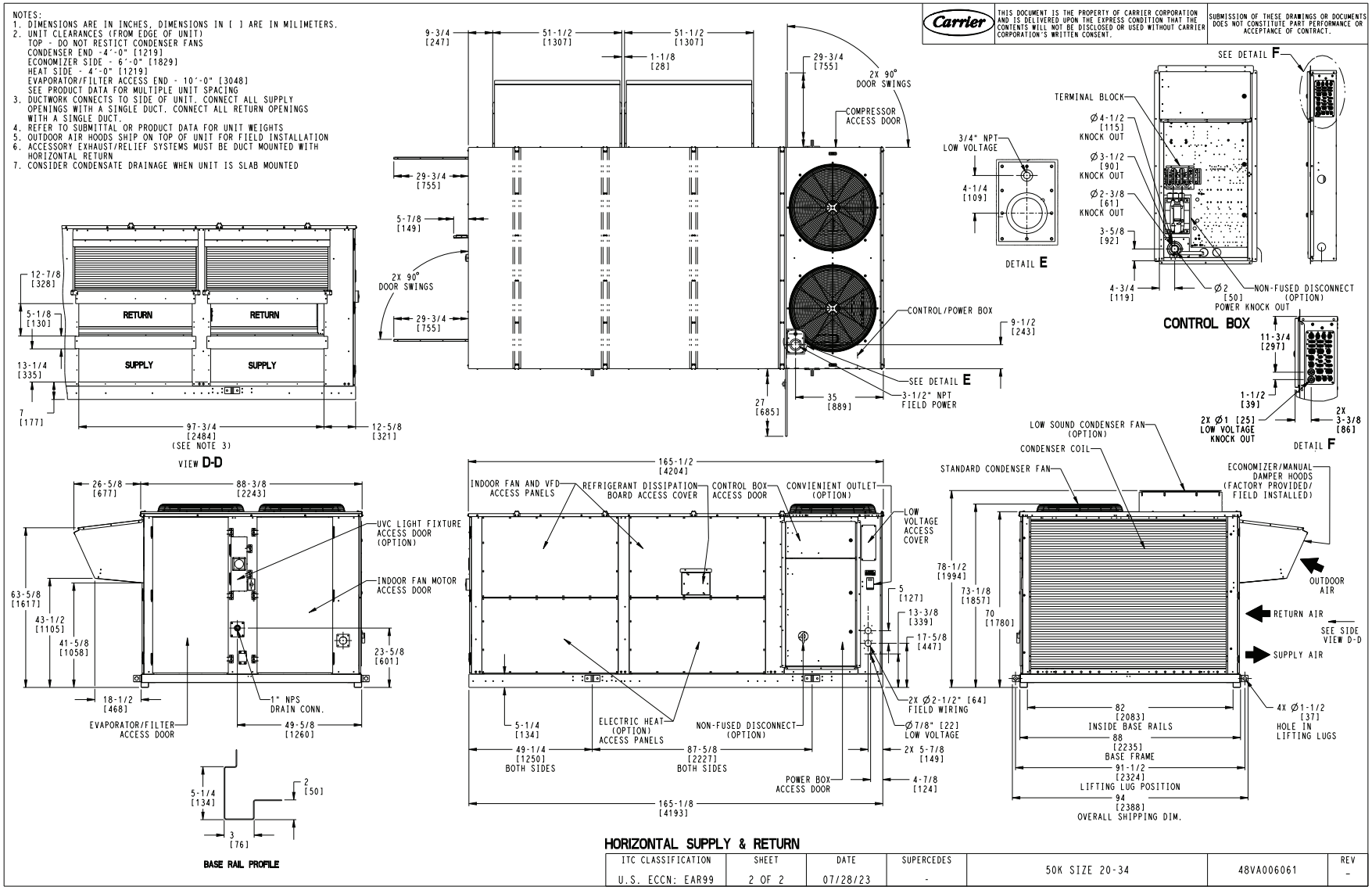
50K, Sizes 20-34 Vertical Supply and Return



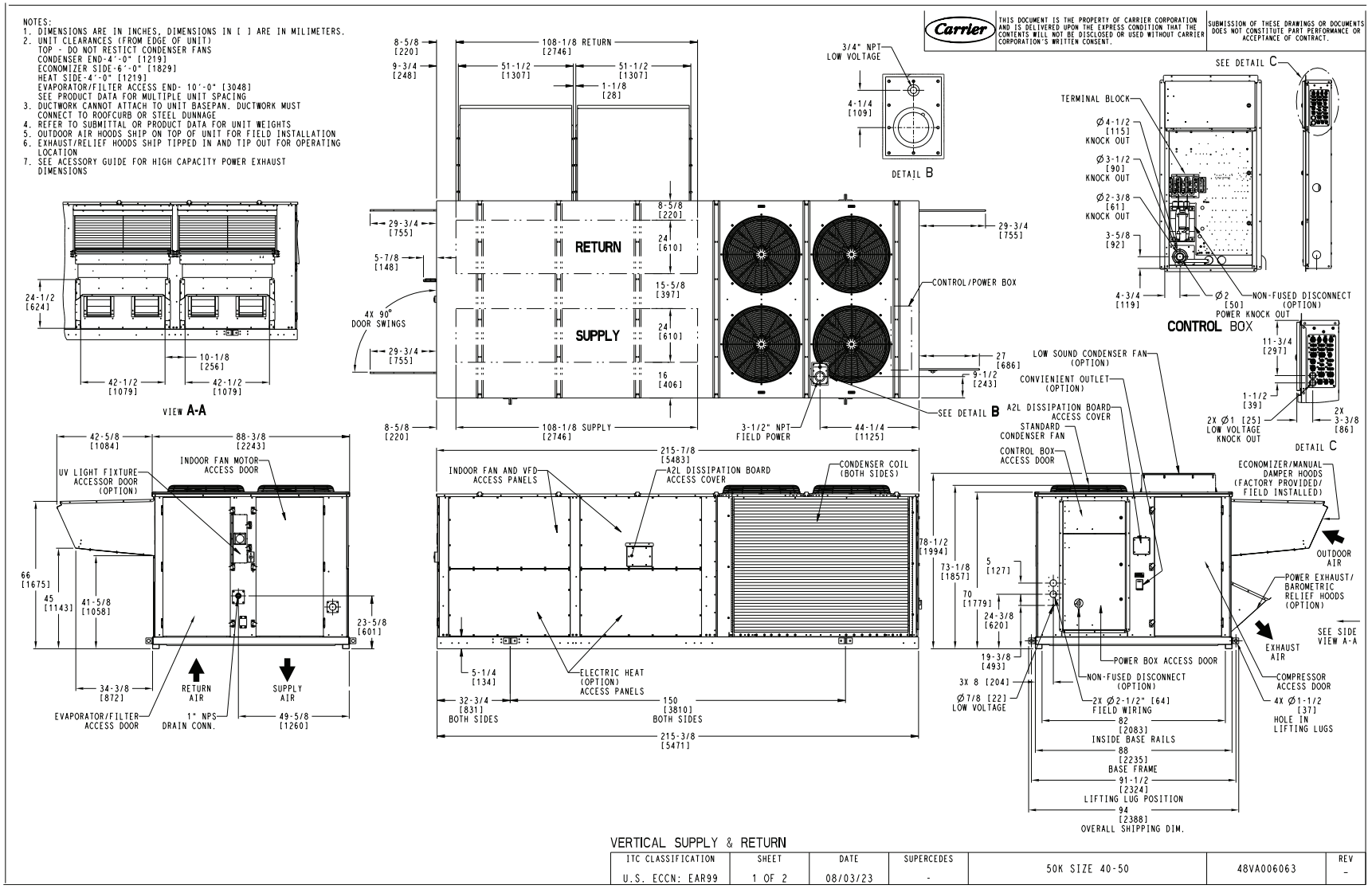
VERTICAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN:EAR99	1 OF 2	07/28/23	-	50K SIZE 20-34	48VA006061	B

50K, Sizes 20-34 Horizontal Supply and Return (cont)

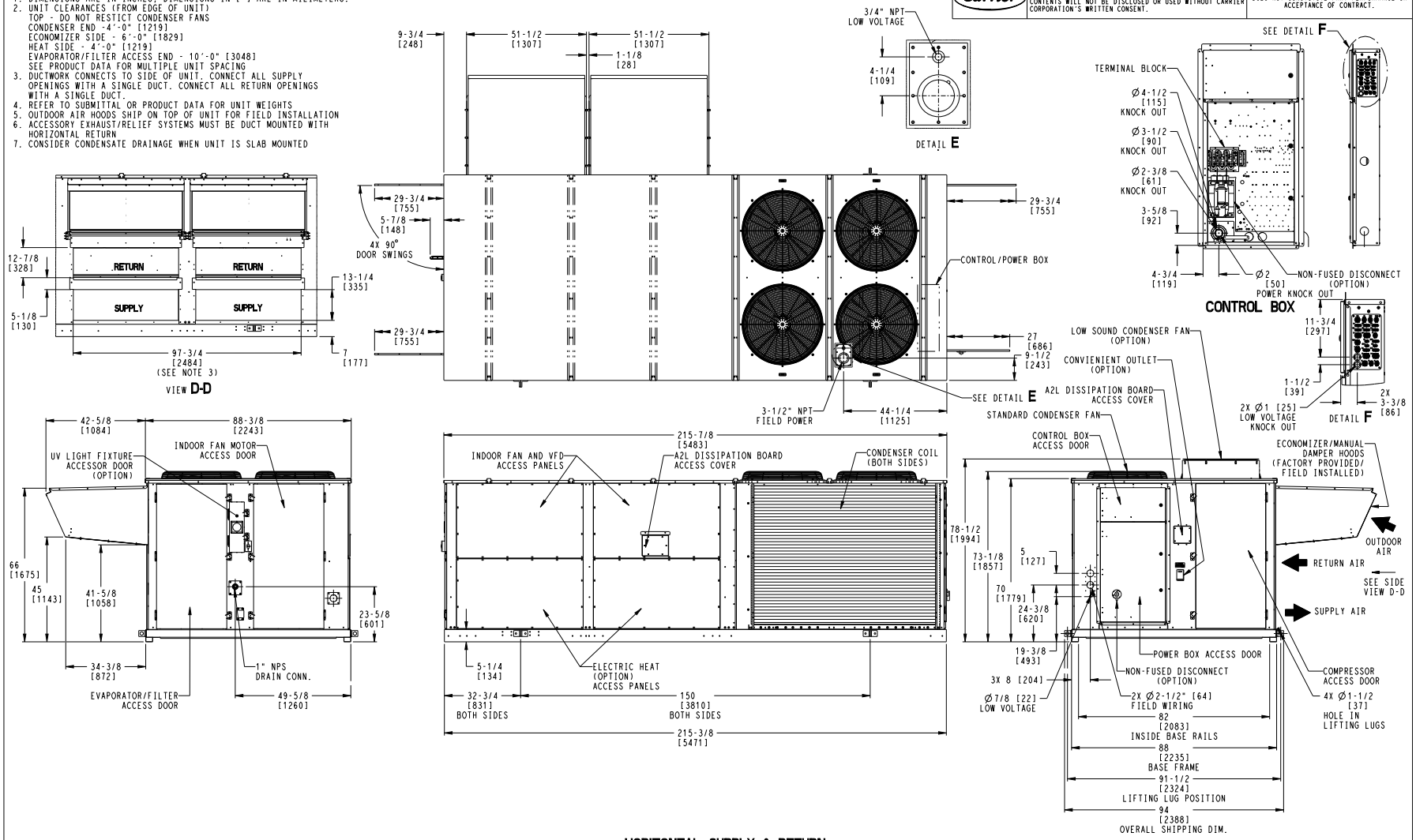


50K, Sizes 40-50 Vertical Supply and Return



50K, Sizes 40-50 Horizontal Supply and Return (cont)

NOTES:
1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END -4'-0" [1219]
   ECONOMIZER SIDE - 6'-0" [1829]
   HEAT SIDE - 4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END - 10'-0" [3048]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CONNECTS TO SIDE OF UNIT. CONNECT ALL SUPPLY OPENINGS WITH A SINGLE DUCT. CONNECT ALL RETURN OPENINGS WITH A SINGLE DUCT.
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS.
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. ACCESSORY EXHAUST/RELIEF SYSTEMS MUST BE DUCT MOUNTED WITH HORIZONTAL RETURN
7. CONSIDER CONDENSATE DRAINAGE WHEN UNIT IS SLAB MOUNTED

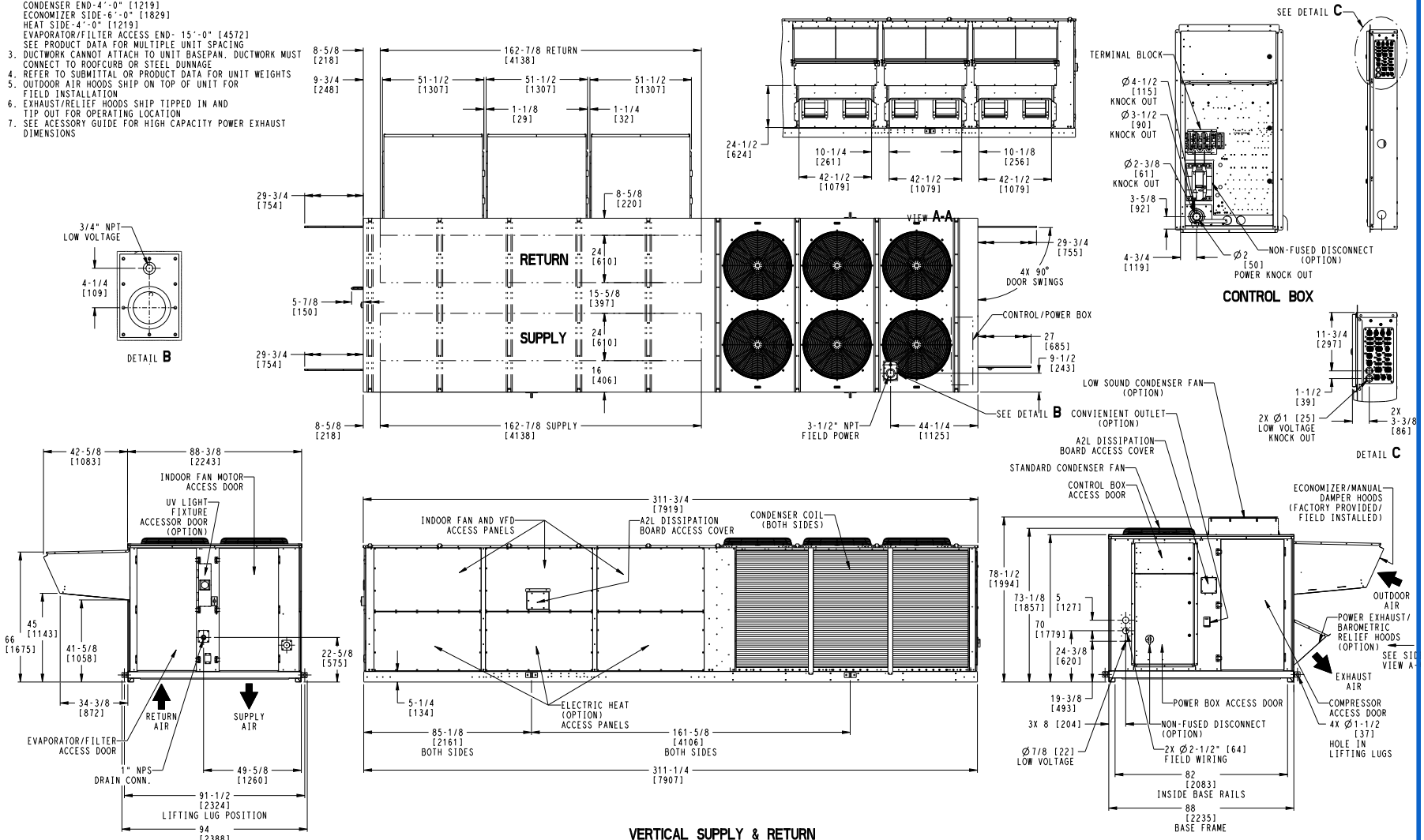


HORIZONTAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	50K SIZE 40-50	48VA006063	REV
U.S. ECCN: EAR99	2 OF 2	08/03/23	-			-

50K, Size 60 Vertical Supply and Return

NOTES:
1. DIMENSIONS ARE IN INCHES. DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END-4'-0" [1219]
   ECONOMIZER SIDE-6'-0" [1829]
   HEAT SIDE-4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END- 15'-0" [4572]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CANNOT ATTACH TO UNIT BASEPAN. DUCTWORK MUST CONNECT TO ROOFCURB OR STEEL DUNNAGE
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. EXHAUST/RELIEF HOODS SHIP TIPPED IN AND TIP OUT FOR OPERATING LOCATION
7. SEE ACESSORY GUIDE FOR HIGH CAPACITY POWER EXHAUST DIMENSIONS

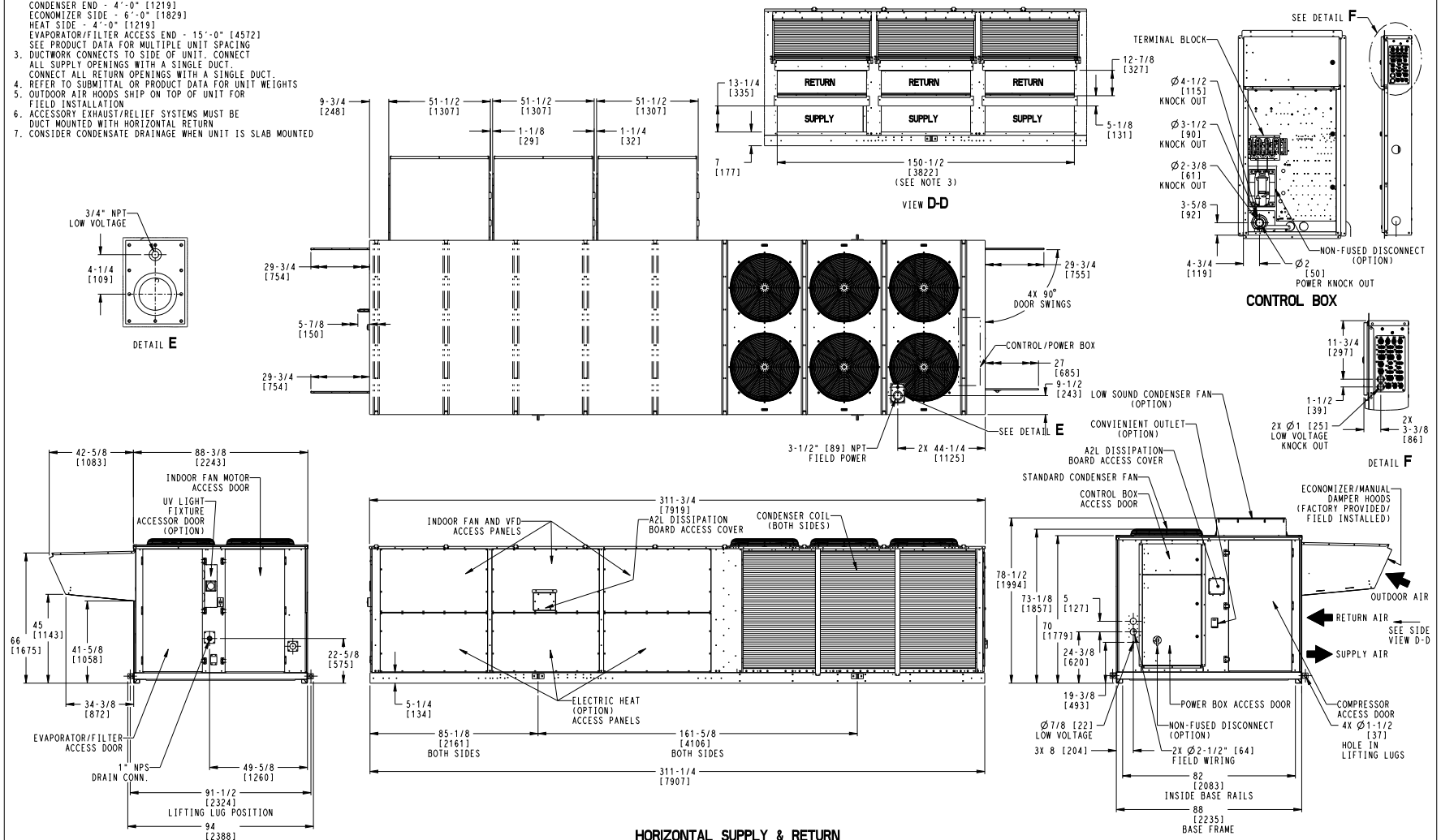


VERTICAL SUPPLY & RETURN

ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN: EAR99	1 OF 2	08/04/23	-	50K SIZE 60	48VA006065	-

50K, Size 60 Horizontal Supply and Return (cont)

NOTES:
1. DIMENSIONS ARE IN INCHES, DIMENSIONS IN [ ] ARE IN MILIMETERS.
2. UNIT CLEARANCES (FROM EDGE OF UNIT)
   TOP - DO NOT RESTICT CONDENSER FANS
   CONDENSER END - 4'-0" [1219]
   ECONOMIZER SIDE - 6'-0" [1829]
   HEAT SIDE - 4'-0" [1219]
   EVAPORATOR/FILTER ACCESS END - 15'-0" [4572]
   SEE PRODUCT DATA FOR MULTIPLE UNIT SPACING
3. DUCTWORK CONNECTS TO SIDE OF UNIT. CONNECT ALL SUPPLY OPENINGS WITH A SINGLE DUCT. CONNECT ALL RETURN OPENINGS WITH A SINGLE DUCT.
4. REFER TO SUBMITTAL OR PRODUCT DATA FOR UNIT WEIGHTS
5. OUTDOOR AIR HOODS SHIP ON TOP OF UNIT FOR FIELD INSTALLATION
6. ACCESSORY EXHAUST/RELIEF SYSTEMS MUST BE DUCT MOUNTED WITH HORIZONTAL RETURN
7. CONSIDER CONDENSATE DRAINAGE WHEN UNIT IS SLAB MOUNTED



HORIZONTAL SUPPLY & RETURN

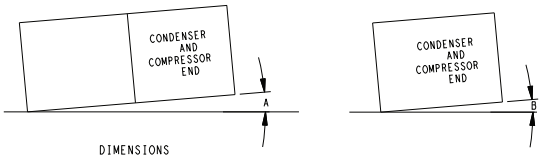
ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			
U.S. ECCN: EAR99	2 OF 2	08/04/23	-	50K SIZE 60	48VA006065	REV -

Roof Curb — 48/50K, Sizes 20-34

NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL DIM ARE TO OUTSIDE OF PART.
2. ROOFCURB ACCESSORY CRRFCURB005A00 IS SHIPPED DISASSEMBLED.
3. ALL ROOFCURB PARTS ARE TO BE 14 GA GALVANIZED STL.
4. UNITS WITH ELECTRIC HEAT MUST BE INSTALLED WITH 90° ELBOW ON THE SUPPLY DUCT PRIOR TO ANY SUPPLY TAKE OFFS OR BRANCHES.
5. DIMENSIONS IN [ ] ARE MILLIMETERS.

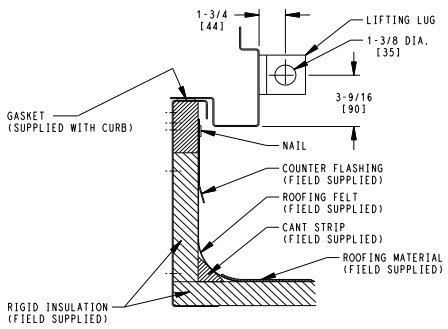
NOTE:
TO PREVENT STANDING WATER IN THE DRAIN PAN OF THE INDOOR SECTION, AND THE HEAT EXCHANGERS
UNIT CAN ONLY BE PITCHED AS SHOWN.

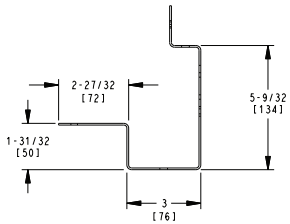


DIMENSIONS
(DEGREES AND INCHES)

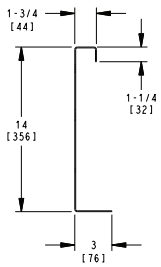
A			B		
DEG.	IN.	mm	DEG.	IN.	mm
1.0	2.9	73	.50	.75	19

UNIT LEVELING TOLERANCES
*FROM EDGE OF UNIT TO HORIZONTAL

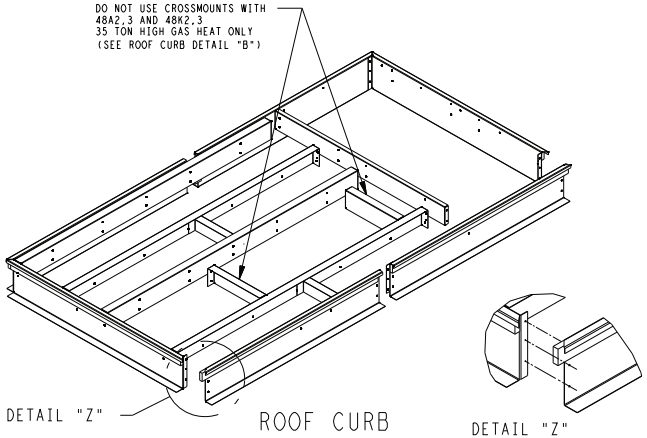




BASE RAIL CROSS SECTION
TYP 2 SIDES

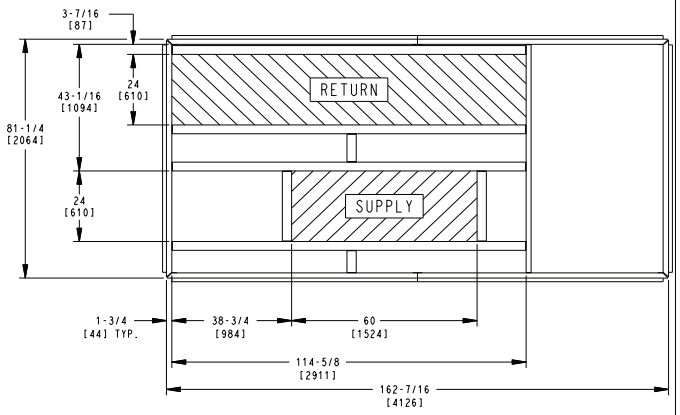


ROOF CURB CROSS SECTION
TYP 4 SIDES

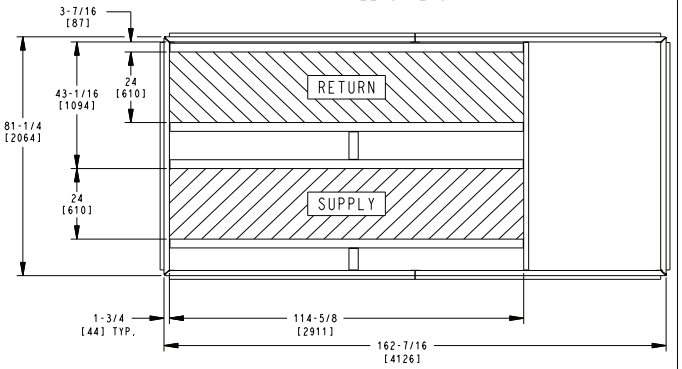


ROOF CURB
SCALE 1:16

DETAIL "Z"
SCALE 1:8
TYP 4 CORNERS



ROOF CURB DETAIL 'A"
(ALL OTHERS)



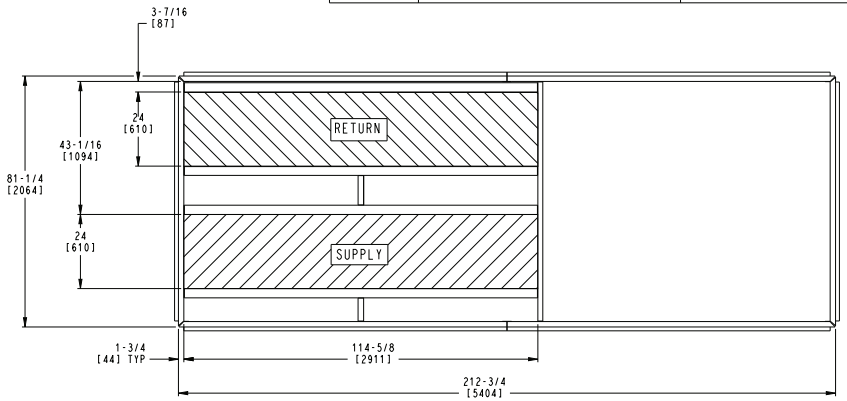
ROOF CURB DETAIL "B"
(48A2,3 AND 48K2,3
35 TON HIGH GAS HEAT ONLY)

DATE	SUPERCEDES	48/50A2-9 AND 48/50K2-5 20-35 TON	48EJ500067	REV
4/18/24	-			H

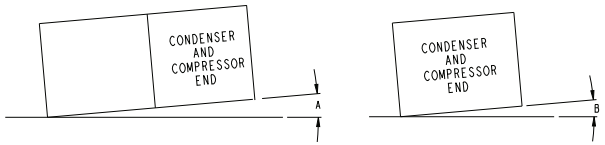
Roof Curb — 48/50K, Sizes 40-50

NOTE:

1. UNLESS OTHERWISE SPECIFED ALL DIM ARE TO OUTSIDE OF PART.
2. ROOFCURB ACCESSORY CRRFCURB006A00 IS SHIPPED DISASSEMBLED.
3. ALL ROOFCURB PARTS: 14 GA GALVANIZED STL.
4. UNITS WITH ELECTRIC HEAT MUST BE INSTALLED WITH 90° ELBOW ON THE SUPPLY DUCT PRIOR TO ANY SUPPLY TAKE OFFS OR BRANCHES.
5. DIMENSIONS IN [ ] ARE MILLIMETERS.



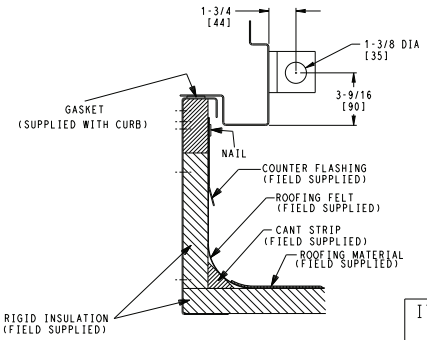
NOTE:
TO PREVENT STANDING WATER IN THE DRAIN PAN OF THE INDOOR SECTION, AND THE HEAT EXCHANGERS
UNIT CAN ONLY BE PITCHED AS SHOWN.

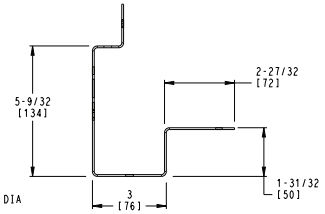


DIMENSIONS
(DEGREES AND INCHES)

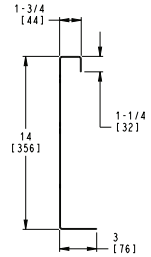
A			B		
DEG.	IN.	mm	DEG.	IN.	mm
1.0	2.9	73	.50	.75	19

UNIT LEVELING TOLERANCES
*FROM EDGE OF UNIT TO HORIZONTAL

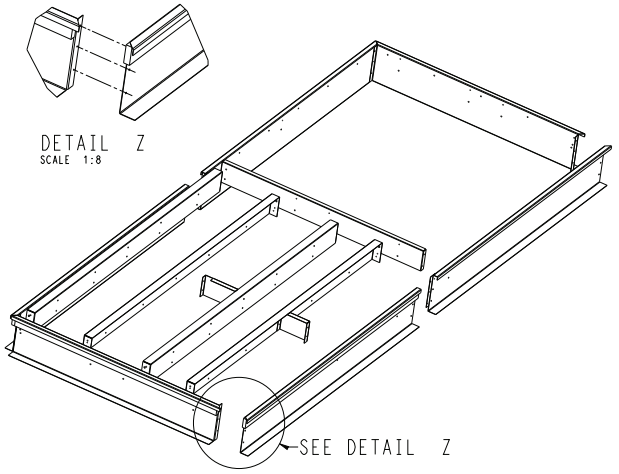




BASE RAIL CROSS SECTION
TYP (2) SIDES



ROOF CURB CROSS SECTION
TYP 4 SIDES

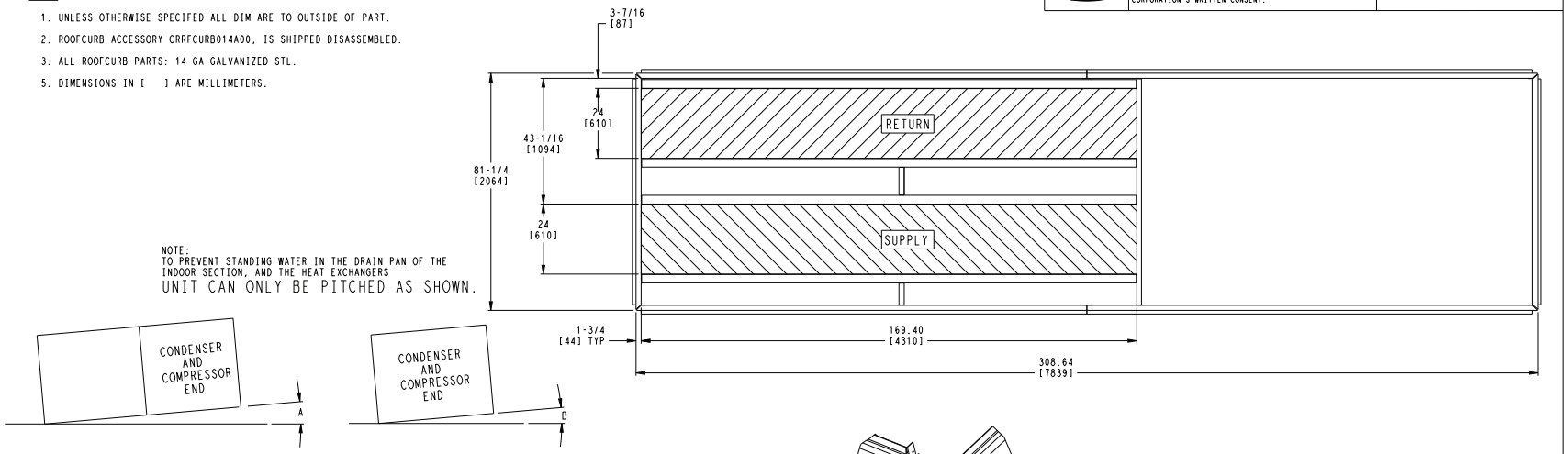


ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES	48/50A2-9 AND 48/50K2-5 40-50 TON	48EJ503213	REV
U.S. ECCN: EAR99	1 OF 1	4/19/24	-			C

Roof Curb — 48/50K, Unit Size 60 (Without Heat)

NOTE:

1. UNLESS OTHERWISE SPECIFED ALL DIM ARE TO OUTSIDE OF PART.
2. ROOFCURB ACCESSORY CRRFCURB014A00, IS SHIPPED DISASSEMBLED.
3. ALL ROOFCURB PARTS: 14 GA GALVANIZED STL.
5. DIMENSIONS IN [ ] ARE MILLIMETERS.

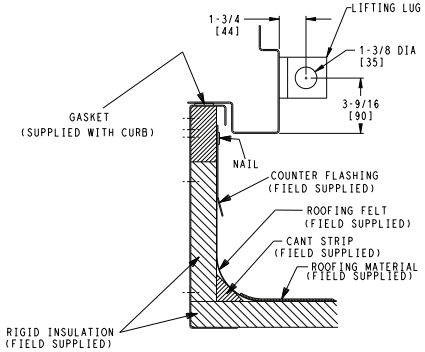


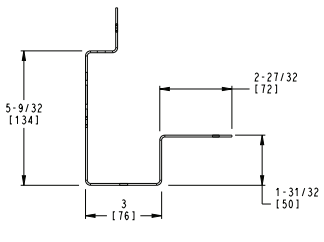
NOTE:
TO PREVENT STANDING WATER IN THE DRAIN PAN OF THE INDOOR SECTION, AND THE HEAT EXCHANGERS
UNIT CAN ONLY BE PITCHED AS SHOWN.

DIMENSIONS
(DEGREES AND INCHES)

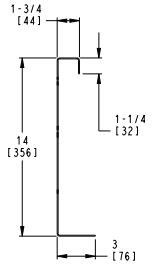
A			B		
DEG.	IN.	mm	DEG.	IN.	mm
1.0	5.43	138	.50	.75	19

UNIT LEVELING TOLERANCES
*FROM EDGE OF UNIT TO HORIZONTAL

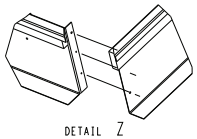




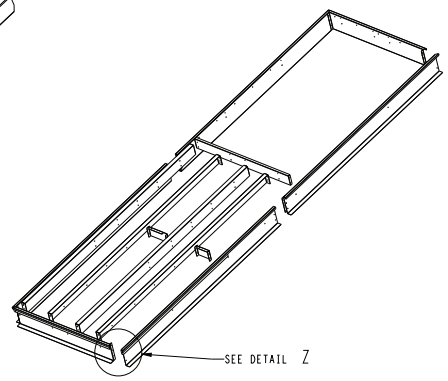
BASE RAIL CROSS SECTION
TYP (2) SIDES



ROOF CURB CROSS SECTION
TYP 4 SIDES



DETAIL Z
SCALE 1:8

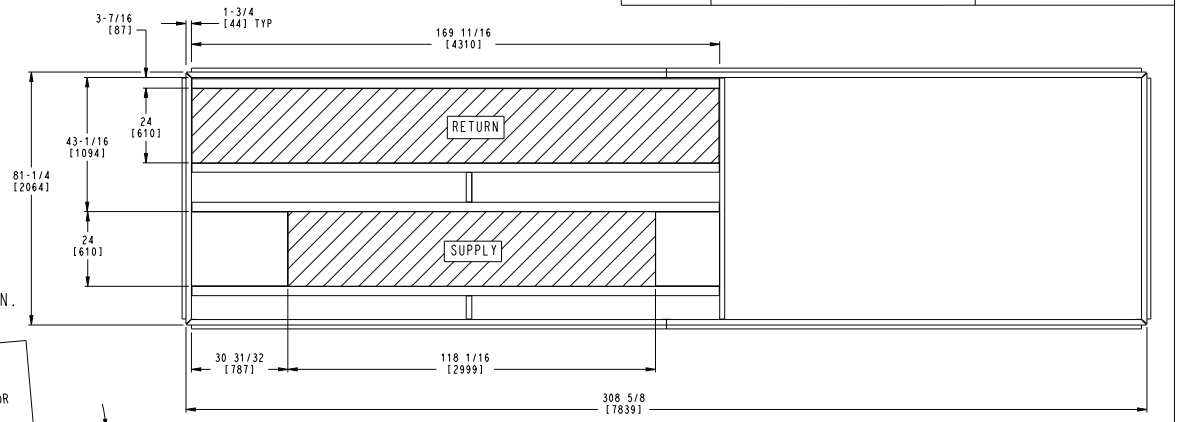


ITC CLASSIFICATION	DATE	SUPERCEDES			REV
U.S. ECCN: EAR99	4/19/24	-	48A2-9/50A4,5,8,9 AND 48K2-5/50K4,5 60 TON	48EJ503214	C

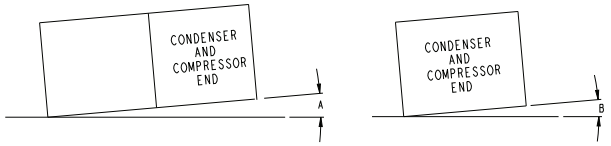
Roof Curb — 50K Units, Size 60 (with Electric Heat)

NOTE:

1. UNLESS OTHERWISE SPECIFED ALL DIM ARE TO OUTSIDE OF PART.
2. ROOFCURB ACCESSORY CRRFCURB009A00 IS SHIPPED DISASSEMBLED.
3. ALL ROOFCURB PARTS: 14 GA GALVANIZED STL.
4. UNITS WITH ELECTRIC HEAT MUST BE INSTALLED WITH 90° ELBOW ON THE SUPPLY DUCT PRIOR TO ANY SUPPLY TAKE OFFS OR BRANCHES.
5. DIMENSIONS IN [ ] ARE MILLIMETERS.



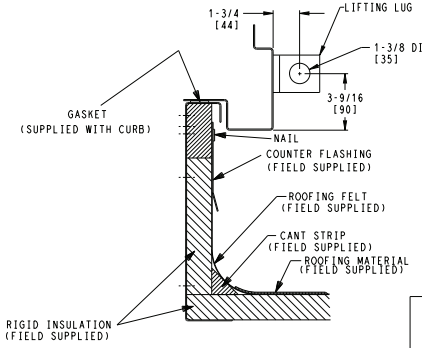
NOTE:
TO PREVENT STANDING WATER IN THE DRAIN PAN OF THE INDOOR SECTION, AND THE HEAT EXCHANGERS
UNIT CAN ONLY BE PITCHED AS SHOWN.

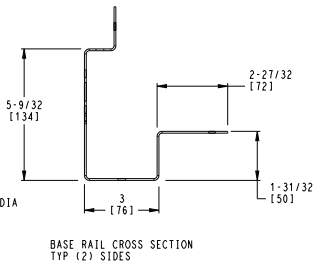


DIMENSIONS
(DEGREES AND INCHES)

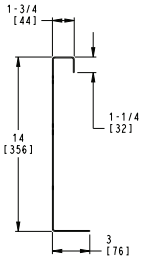
A			B		
DEG.	IN.	mm	DEG.	IN.	mm
1.0	5.43	138	.50	.75	19

UNIT LEVELING TOLERANCES
*FROM EDGE OF UNIT TO HORIZONTAL

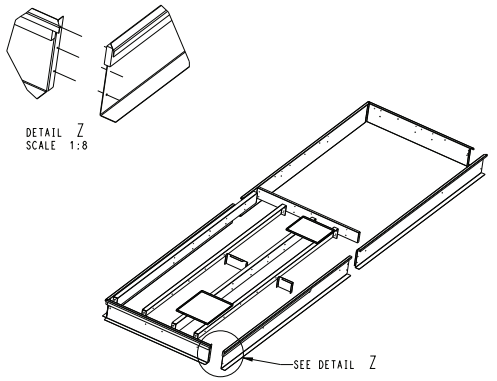




BASE RAIL CROSS SECTION
TYP (2) SIDES



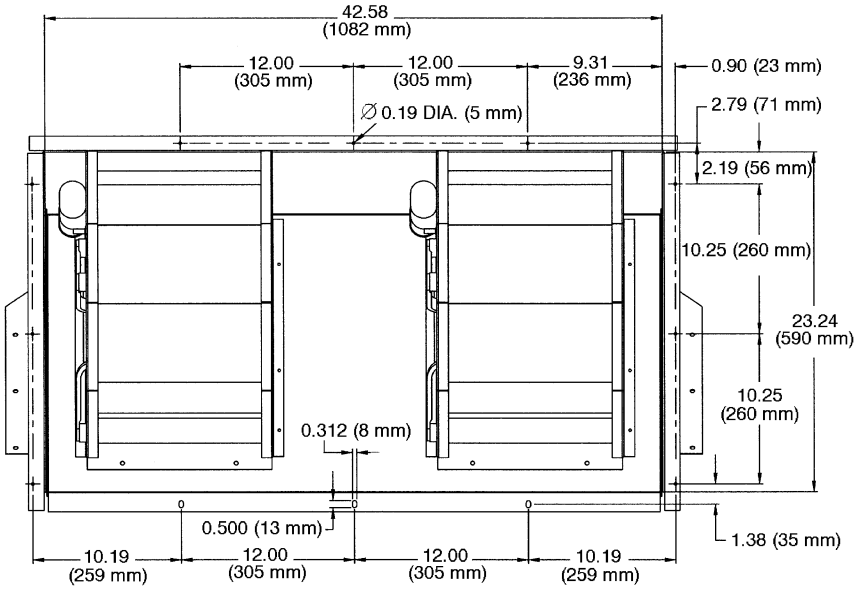
ROOF CURB CROSS SECTION
TYP 4 SIDES

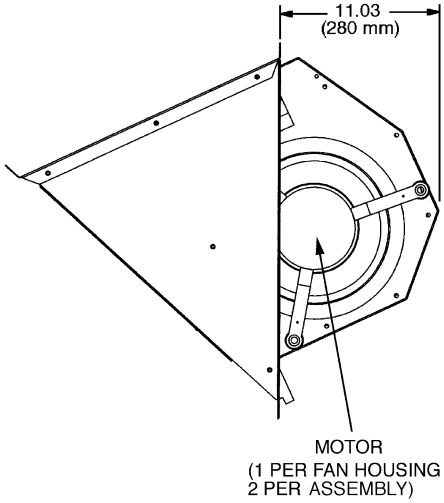


ITC CLASSIFICATION	SHEET	DATE	SUPERCEDES			REV
U.S. ECCN: EAR99	1 OF 1	4/19/24	-	50A2,3,6,7 AND 50K2,3 60 TON	48EJ503211	C

Dimensions and weights (cont)

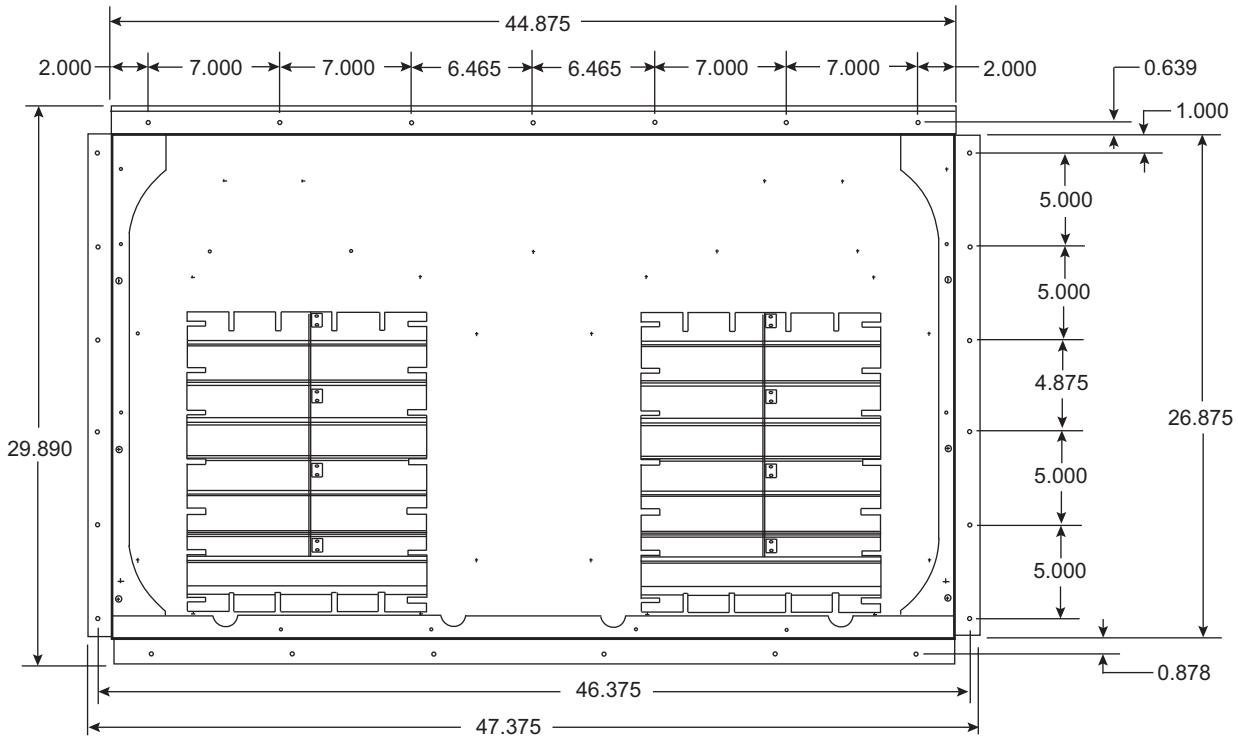
Multi-Stage Power Exhaust and Barometric Relief Option and Accessory





LEGEND
∅ — Diameter
NOTES:
1. Unless otherwise specified, all dimensions are to outside of part.
2. Dimensions are in inches.
3. Unit sizes 20 to 50 have 2 fan assemblies. Unit size 60 has 3 fan assemblies.
4. For horizontal return units, the accessory power exhaust or barometric relief must be mounted in the field-supplied return ductwork.

High Capacity Power Exhaust Accessory



NOTE: Dimensions are in inches.

Dimensions and weights (cont)

Refer to Carrier's electronic catalog website at http://ecat.Carrier.com for actual weights by unit configuration and corner weights.

Base Unit Weights[a]

MODEL**SIZE	SUPPLY/ RETURN	TON	BASE UNIT WEIGHT	
			lbs	kg
48/50K (2,3)20**	Vertical	20	3169	1437.4
48/50K (4,5)20**	Horizontal	20	3143	1425.6
48/50K (2,3)26**	Vertical	25	3199	1451.0
48/50K (4,5)26**	Horizontal	25	3173	1439.2
48/50K (2,3)30**	Vertical	30	3199	1451.0
48/50K (4,5)30**	Horizontal	30	3173	1439.2
48/50K (2,3)34**	Vertical	35	3199	1451.0
48/50K (4,5)34**	Horizontal	35	3173	1439.2
48/50K (2,3)40**	Vertical	40	3143	1425.6
48/50K (4,5)40**	Horizontal	40	4290	1945.9
48/50K (2,3)50**	Vertical	50	4272	1937.7
48/50K (4,5)50**	Horizontal	50	4290	1945.9
48/50K (2,3)60**	Vertical	60	5793	2627.7
48/50K (4,5)60**	Horizontal	60	5798	2629.9

NOTE(S):

a. Base unit weights do not include heat source, indoor fan motor or VFD, intake/relief, filters, or option weights

Option Mode Weights

MODE TYPE	OPTION	OPTION WEIGHTS					
		48/50K SIZES 20-34		48/50K SIZES 40-50		48/50K SIZE 60	
		lbs	kkg	lbs	kg	lbs	kg
HEATING	Low Gas Heat	375	170	375	170	563	255
	High Gas Heat	458	208	458	208	687	312
	Electric Heat	217	98	217	98	325	147
	Mod Electric Heat	232	105	232	105	340	154
DX OPTIONS	Low Sound (Size 20-30)	8	4	30	14	45	20
	Low Ambient	15	7	15	7	30	14
	Humidi-MiZer	130	59	130	59	180	82
CONSTRUCTION	Double Wall	36	16	36	16	53	24
	Agion® Double Wall	36	16	36	16	53	24
	Double Wall Bottom	68	31	87	39	123	56
COIL	E-Coat Evaporator Coil	20	9	32	14	35	16
	E-Coat Condenser Coil	15	7	30	14	45	20
INTAKE/RELIEF	Manual Damper	33	15	33	15	51	23
	Economizer	150	68	150	68	225	102
	Barometric Pressure Relief	61	28	61	28	92	42
	Multi-Stage Power Exhaust (PE)	500	227	500	227	725	329
	High Capacity Power Exhaust (PE)	750	340	750	340	1000	454
FILTERS	2 in. Filter	27	12	27	12	36	16
	4 in. Filter	44	20	44	20	71	32
	Ultraviolet Light (UV-C) Fixture	44	20	44	20	74	34

Dimensions and weights (cont)

Indoor Fan Motor (IFM) Weights

IFM HP	VOLTAGE	IFM TYPE	DRIVE TYPE	IFM WEIGHTS	
				lb	kg
5	208/230/460	ODP	VFD	109	50
	575	ODP	VFD	114	52
	208/230/460	ODP	VFD + Bypass	169	76
	575	ODP	VFD + Bypass	169	76
	208/230/460	TEFC	VFD + Bypass	169	76
	575	TEFC	VFD + Bypass	169	76
10	208/230/460	ODP	VFD	180	81
	575	ODP	VFD	163	74
	208/230/460	ODP	VFD + Bypass	235	106
	575	ODP	VFD + Bypass	218	99
	208/230/460	TEFC	VFD + Bypass	235	106
	575	TEFC	VFD + Bypass	218	99
15	208/230/460	ODP	VFD	297	135
	575	ODP	VFD	286	130
	208/230/460	ODP	VFD + Bypass	352	160
	575	ODP	VFD + Bypass	341	155
	208/230/460	TEFC	VFD + Bypass	352	160
	575	TEFC	VFD + Bypass	341	155
20	208/230/460	ODP	VFD	357	162
	575	ODP	VFD	361	164
	208/230/460	ODP	VFD + Bypass	396	180
	575	ODP	VFD + Bypass	416	189
	208/230/460	TEFC	VFD + Bypass	396	180
	575	TEFC	VFD + Bypass	416	189
25	208/230/460	ODP	VFD	441	200
	575	ODP	VFD	421	191
	208/230/460	ODP	VFD + Bypass	483	219
	575	ODP	VFD + Bypass	479	217
	208/230/460	TEFC	VFD + Bypass	483	219
	575	TEFC	VFD + Bypass	479	217
30	208/230/460	ODP	VFD	424	193
	575	ODP	VFD	558	253
	208/230/460	ODP	VFD + Bypass	486	221
	575	ODP	VFD + Bypass	620	281
	208/230/460	TEFC	VFD + Bypass	561	255
	575	TEFC	VFD + Bypass	620	281
40	208/230/460	ODP	VFD	563	256
	575	ODP	VFD	622	282
	208/230/460	ODP	VFD + Bypass	625	284
	575	ODP	VFD + Bypass	684	310
	208/230/460	TEFC	VFD + Bypass	748	339
	575	TEFC	VFD + Bypass	684	310

LEGEND

ODP — Open Drive Proof Motor
TEFC — Totally Enclosed Fan Cooled Motor
IFM HP — Indoor Fan Motor Horse Power
VFD — Variable Frequency Drive

Performance data

NOTE: Refer to Carrier's electronic catalog website at http://ecat.Carrier.com for full selection of performance data and option and accessory pressure drops.

48K2,K3**20 (20 Ton) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	328	0.62	406	0.84	472	1.07	529	1.30	580	1.54	626	1.78	668	2.02
5,000	369	0.97	439	1.19	500	1.43	554	1.69	604	1.95	650	2.21	692	2.47
6,000	415	1.43	477	1.65	533	1.90	584	2.17	631	2.45	676	2.73	717	3.01
7,000	463	2.01	519	2.25	570	2.5	618	2.78	662	3.06	704	3.36	744	3.65
8,000	513	2.74	564	2.98	611	3.24	655	3.52	697	3.81	737	4.11	775	4.42
9,000	564	3.61	612	3.87	655	4.13	696	4.42	735	4.71	772	5.02	808	5.33
10,000	616	4.64	661	4.91	701	5.18	739	5.47	776	5.77	811	6.08	845	6.40
Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	708	2.27	745	2.51	780	2.76	814	3.01	845	3.26	876	3.51	905	3.76
5,000	731	2.74	769	3.01	804	3.28	837	3.55	869	3.82	900	4.10	929	4.37
6,000	756	3.30	793	3.59	828	3.88	861	4.17	893	4.46	923	4.76	953	5.05
7,000	782	3.96	818	4.27	852	4.57	885	4.89	917	5.20	947	5.51	977	5.83
8,000	811	4.74	846	5.06	879	5.38	912	5.71	943	6.04	973	6.37	1002	6.70
9,000	843	5.65	876	5.98	909	6.32	940	6.66	970	7.00	999	7.35	1028	7.69
10,000	878	6.72	909	7.06	940	7.40	971	7.75	1000	8.10	1028	8.46	1056	8.82
Airflow (cfm)	Available External Static Pressure (in. wg)													
	3.0		3.2		3.4		3.6		3.8		4.0			
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp		
4,000	934	4.02	961	4.28	987	4.54	1013	4.80	1038	5.06	1062	5.32		
5,000	958	4.64	985	4.92	1012	5.20	1038	5.48	1063	5.76	1087	6.04		
6,000	981	5.35	1009	5.65	1036	5.94	1061	6.24	1087	6.54	1111	6.84		
7,000	1005	6.14	1033	6.46	1059	6.78	1085	7.09	1110	7.41	1135	7.73		
8,000	1030	7.04	1057	7.37	1083	7.71	1109	8.04	1134	8.38	1159	8.72		
9,000	1055	8.04	1082	8.39	1109	8.75	1134	9.10	1159	9.45	1183	9.81		
10,000	1083	9.18	1109	9.54	1135	9.91	1160	10.28	1185	10.65	—	—		

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K2, K3***26, 30 (25-30 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	374	0.98	443	1.20	503	1.45	558	1.70	607	1.96	653	2.23	695	2.49
6,000	421	1.45	482	1.68	538	1.93	589	2.20	636	2.47	680	2.75	721	3.04
7,000	471	2.04	526	2.28	576	2.54	623	2.81	668	3.10	710	3.39	749	3.69
8,000	522	2.78	572	3.03	619	3.29	662	3.57	704	3.86	743	4.16	781	4.47
9,000	574	3.66	621	3.92	664	4.19	704	4.47	743	4.77	780	5.08	815	5.40
10,000	628	4.71	671	4.97	711	5.25	748	5.54	784	5.84	819	6.15	853	6.47
11,000	682	5.91	722	6.19	759	6.48	795	6.77	828	7.08	861	7.40	893	7.72
12,000	736	7.30	774	7.59	809	7.88	842	8.18	874	8.49	905	8.82	935	9.15
13,000	791	8.86	827	9.16	860	9.46	891	9.77	922	10.09	951	10.42	979	10.75
14,000	846	10.61	880	10.93	912	11.24	941	11.56	970	11.88	998	12.21	1025	12.56
15,000	902	12.56	934	12.89	964	13.21	992	13.54	1020	13.87	1046	14.21	1072	14.55

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	734	2.76	771	3.03	806	3.3	839	3.57	871	3.84	902	4.11	931	4.39
6,000	759	3.33	796	3.62	831	3.91	864	4.20	896	4.49	926	4.79	956	5.08
7,000	787	4.00	823	4.31	857	4.62	890	4.93	921	5.24	951	5.55	980	5.87
8,000	817	4.79	851	5.11	885	5.44	917	5.76	948	6.09	977	6.42	1006	6.76
9,000	850	5.72	883	6.05	915	6.39	946	6.73	976	7.07	1005	7.42	1033	7.76
10,000	885	6.81	917	7.14	948	7.49	978	7.84	1007	8.19	1035	8.55	1063	8.91
11,000	924	8.06	954	8.40	983	8.75	1012	9.10	1040	9.47	1067	9.83	1094	10.20
12,000	965	9.48	993	9.83	1021	10.19	1048	10.54	1075	10.91	1102	11.28	1127	11.66
13,000	1007	11.10	1034	11.45	1061	11.8	1087	12.17	1113	12.54	1138	12.91	1163	13.30
14,000	1052	12.90	1078	13.26	1103	13.62	1128	13.98	1153	14.36	1177	14.74	—	—
15,000	1098	14.91	1122	15.26	1147	15.63	1171	16.00	1194	16.38	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	960	4.66	987	4.94	1014	5.22	1039	5.50	1064	5.78	1089	6.06
6,000	984	5.38	1012	5.68	1038	5.97	1064	6.27	1089	6.57	1113	6.87
7,000	1009	6.18	1036	6.50	1063	6.82	1088	7.14	1113	7.45	1138	7.77
8,000	1034	7.09	1061	7.43	1088	7.76	1113	8.10	1138	8.43	1163	8.77
9,000	1061	8.11	1088	8.46	1114	8.82	1139	9.17	1164	9.52	1188	9.88
10,000	1089	9.27	1116	9.63	1141	10.00	1166	10.37	1191	10.74	—	—
11,000	1120	10.57	1145	10.95	1170	11.33	1195	11.71	—	—	—	—
12,000	1152	12.04	1177	12.42	—	—	—	—	—	—	—	—
13,000	1187	13.68	—	—	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—
15,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K2, K3***34 (35 tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	471	2.05	526	2.41	576	2.74	623	3.08	668	3.42	710	3.76	750	4.11
8,000	522	2.74	573	3.14	618	3.50	662	3.86	703	4.22	743	4.58	781	4.95
9,000	574	3.55	621	4.00	664	4.39	704	4.78	742	5.16	779	5.54	815	5.92
10,000	628	4.50	671	4.99	711	5.43	748	5.84	784	6.24	819	6.65	852	7.05
11,000	682	5.60	722	6.13	760	6.61	795	7.05	828	7.48	861	7.90	893	8.32
12,000	736	6.84	774	7.42	809	7.93	843	8.41	874	8.87	905	9.32	935	9.76
13,000	791	8.24	827	8.86	860	9.42	892	9.93	922	10.42	951	10.90	979	11.36
14,000	846	9.80	880	10.47	912	11.07	942	11.62	971	12.14	998	12.65	1025	13.14
15,000	902	11.54	934	12.25	964	12.88	993	13.47	1020	14.03	1047	14.57	1073	15.08
16,000	957	13.45	988	14.20	1017	14.88	1044	15.50	1071	16.10	1096	16.66	1121	17.21
17,000	1013	15.54	1042	16.33	1070	17.05	1096	17.71	1122	18.34	1146	18.94	1170	19.52
17,500	1041	16.66	1070	17.47	1097	18.20	1123	18.89	1147	19.53	1171	20.15	1195	20.74

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	788	4.45	824	4.78	858	5.11	891	5.44	922	5.77	952	6.08	980	6.40
8,000	817	5.31	852	5.68	886	6.05	918	6.41	949	6.76	979	7.12	1007	7.47
9,000	849	6.31	883	6.70	915	7.09	946	7.47	977	7.86	1006	8.25	1035	8.63
10,000	885	7.45	917	7.86	947	8.26	978	8.67	1007	9.08	1035	9.49	1063	9.90
11,000	923	8.74	953	9.17	983	9.59	1011	10.01	1039	10.44	1067	10.87	1094	11.30
12,000	964	10.20	993	10.64	1020	11.08	1048	11.52	1074	11.96	1101	12.41	1127	12.85
13,000	1007	11.82	1034	12.28	1061	12.74	1087	13.20	1112	13.65	1137	14.12	1162	14.58
14,000	1052	13.62	1078	14.10	1103	14.57	1128	15.05	1152	15.52	1176	16.00	1200	16.47
15,000	1098	15.59	1122	16.09	1147	16.59	1170	17.08	1194	17.57	1217	18.06	1239	18.56
16,000	1145	17.74	1169	18.27	1192	18.79	1214	19.30	1237	19.81	1259	20.32	1281	20.83
17,000	1193	20.08	1216	20.63	1238	21.17	1260	21.71	1281	22.24	—	—	—	—
17,500	1217	21.32	1240	21.88	1262	22.44	1283	22.98	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	1008	6.71	1035	7.02	1061	7.32	1086	7.62	1110	7.92	1134	8.22
8,000	1035	7.82	1062	8.16	1088	8.50	1113	8.84	1138	9.17	1162	9.50
9,000	1062	9.01	1089	9.39	1115	9.76	1140	10.13	1165	10.50	1189	10.87
10,000	1090	10.31	1117	10.71	1142	11.12	1167	11.52	1192	11.92	1216	12.31
11,000	1120	11.73	1146	12.16	1171	12.59	1196	13.02	1220	13.44	1243	13.87
12,000	1152	13.30	1177	13.75	1201	14.2	1225	14.65	1249	15.10	1272	15.54
13,000	1186	15.04	1210	15.50	1234	15.97	1257	16.43	1280	16.90	—	—
14,000	1223	16.95	1246	17.43	1269	17.91	1291	18.39	—	—	—	—
15,000	1262	19.05	1284	19.54	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—	—	—
17,500	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K2, K3***40 (40 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	502	2.90	550	3.30	596	3.71	639	4.12	680	4.54	720	4.97	759	5.40
9,000	552	3.81	595	4.24	637	4.67	677	5.11	715	5.55	752	6.00	788	6.45
10,000	602	4.89	642	5.34	680	5.80	717	6.26	752	6.73	787	7.20	821	7.67
11,000	653	6.15	689	6.62	725	7.11	759	7.59	792	8.08	825	8.58	856	9.07
12,000	704	7.60	738	8.09	771	8.60	803	9.11	834	9.63	865	10.14	895	10.66
13,000	756	9.24	788	9.76	818	10.29	848	10.83	878	11.36	906	11.90	935	12.44
14,000	808	11.10	838	11.64	867	12.19	895	12.74	922	13.30	950	13.87	976	14.43
15,000	861	13.18	888	13.74	915	14.31	942	14.88	968	15.46	994	16.05	1019	16.63
16,000	914	15.49	940	16.06	965	16.65	990	17.24	1015	17.85	1039	18.45	1063	19.06
17,000	967	18.03	991	18.62	1015	19.23	1039	19.85	1062	20.47	1086	21.09	1109	21.72
18,000	1020	20.82	1043	21.43	1066	22.06	1088	22.69	1111	23.33	1133	23.97	1155	24.62
19,000	1073	23.87	1095	24.50	1117	25.14	1138	25.79	1159	26.44	1180	27.11	—	—
20,000	1127	27.18	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	796	5.85	832	6.31	867	6.77	901	7.24	933	7.72	965	8.20	995	8.69
9,000	823	6.92	857	7.39	890	7.87	923	8.35	954	8.85	985	9.35	1014	9.86
10,000	854	8.16	886	8.64	917	9.14	948	9.64	978	10.15	1007	10.66	1036	11.19
11,000	887	9.57	918	10.08	947	10.59	976	11.11	1005	11.63	1033	12.16	1060	12.70
12,000	924	11.18	952	11.71	980	12.24	1008	12.77	1035	13.31	1062	13.86	1088	14.41
13,000	962	12.99	989	13.53	1016	14.08	1042	14.64	1068	15.19	1093	15.76	1118	16.32
14,000	1002	15.00	1028	15.57	1053	16.14	1078	16.71	1103	17.28	1127	17.86	1151	18.45
15,000	1044	17.22	1068	17.81	1092	18.40	1116	19.00	1140	19.59	1163	20.19	1186	20.79
16,000	1087	19.67	1110	20.28	1133	20.89	1156	21.51	1178	22.12	1200	22.74	1222	23.36
17,000	1131	22.35	1153	22.98	1175	23.61	1197	24.25	1218	24.89	1240	25.52	1261	26.17
18,000	1176	25.27	1197	25.92	1219	26.58	1239	27.24	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	1024	9.19	1053	9.69	1081	10.19	1108	10.70	1134	11.21	1159	11.73
9,000	1043	10.37	1072	10.89	1099	11.41	1126	11.94	1152	12.47	1177	13.00
10,000	1064	11.71	1092	12.25	1118	12.78	1145	13.33	1171	13.88	1196	14.43
11,000	1088	13.24	1114	13.79	1140	14.34	1166	14.90	1191	15.46	1216	16.03
12,000	1114	14.97	1139	15.53	1164	16.09	1189	16.67	1213	17.24	1237	17.83
13,000	1143	16.89	1167	17.47	1191	18.05	1215	18.64	1238	19.23	1262	19.82
14,000	1174	19.03	1198	19.63	1221	20.22	1244	20.82	1266	21.43	1288	22.04
15,000	1208	21.40	1230	22.00	1252	22.62	1274	23.23	1296	23.85	—	—
16,000	1244	23.98	1265	24.61	1286	25.24	—	—	—	—	—	—
17,000	1281	26.81	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K2, K3***50 (50 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	611	5.00	651	5.45	689	5.91	725	6.37	761	6.84	795	7.31	829	7.79
11,000	662	6.27	699	6.75	734	7.23	768	7.72	801	8.21	833	8.71	865	9.20
12,000	714	7.74	748	8.24	780	8.75	812	9.26	843	9.77	873	10.29	903	10.81
13,000	766	9.41	798	9.93	828	10.46	858	11.00	887	11.54	916	12.08	944	12.62
14,000	819	11.29	848	11.84	877	12.39	905	12.95	932	13.51	959	14.07	986	14.63
15,000	872	13.40	899	13.96	926	14.54	953	15.11	979	15.70	1004	16.28	1029	16.87
16,000	925	15.74	951	16.32	976	16.91	1001	17.51	1026	18.12	1050	18.72	1074	19.33
17,000	979	18.32	1003	18.92	1027	19.53	1051	20.15	1074	20.77	1097	21.40	1120	22.03
18,000	1032	21.15	1055	21.77	1078	22.4	1100	23.04	1123	23.68	1145	24.33	1166	24.98
19,000	1086	24.24	1108	24.88	1129	25.52	1151	26.18	1172	26.84	1193	27.51	1214	28.18
20,000	1140	27.60	1161	28.25	1181	28.92	1202	29.59	1222	30.27	1242	30.95	1262	31.64

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	861	8.27	893	8.76	925	9.26	955	9.76	985	10.27	1014	10.79	1043	11.31
11,000	895	9.71	925	10.21	955	10.73	984	11.25	1012	11.77	1040	12.30	1068	12.84
12,000	932	11.33	960	11.86	988	12.39	1016	12.93	1043	13.47	1069	14.02	1095	14.57
13,000	971	13.16	998	13.71	1024	14.26	1050	14.82	1076	15.38	1101	15.94	1126	16.51
14,000	1012	15.20	1037	15.77	1062	16.34	1087	16.92	1111	17.49	1135	18.07	1159	18.66
15,000	1054	17.46	1078	18.05	1102	18.64	1126	19.23	1149	19.83	1172	20.43	1195	21.03
16,000	1097	19.94	1120	20.55	1143	21.17	1166	21.78	1188	22.40	1210	23.01	1232	23.64
17,000	1142	22.66	1164	23.29	1186	23.93	1208	24.56	1229	25.20	1250	25.84	1271	26.48
18,000	1188	25.63	1209	26.28	1230	26.93	1250	27.59	1271	28.25	1291	28.91	—	—
19,000	1234	28.85	1254	29.52	1274	30.19	1294	30.87	—	—	—	—	—	—
20,000	1281	32.33	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	1071	11.84	1098	12.37	1125	12.91	1151	13.46	1177	14.01	1202	14.56
11,000	1094	13.38	1121	13.93	1147	14.49	1172	15.05	1197	15.61	1222	16.18
12,000	1121	15.13	1147	15.69	1172	16.26	1196	16.83	1220	17.41	1244	18.00
13,000	1151	17.08	1175	17.66	1199	18.24	1223	18.83	1246	19.42	1269	20.02
14,000	1183	19.25	1206	19.84	1229	20.44	1252	21.04	1274	21.64	1296	22.25
15,000	1217	21.64	1239	22.25	1261	22.86	1283	23.48	—	—	—	—
16,000	1253	24.26	1275	24.89	1296	25.52	—	—	—	—	—	—
17,000	1291	27.12	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K2, K3***60 (60 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	476	4.33	534	5.04	585	5.78	632	6.56	674	7.39	714	8.24	751	9.12
13,000	506	5.21	561	5.94	610	6.70	655	7.50	697	8.34	735	9.22	772	10.11
14,000	536	6.18	588	6.96	636	7.74	680	8.56	720	9.41	758	10.30	793	11.21
15,000	566	7.28	617	8.09	662	8.90	704	9.73	744	10.59	781	11.50	816	12.43
16,000	597	8.48	645	9.34	689	10.17	730	11.02	768	11.90	804	12.82	839	13.76
17,000	628	9.80	674	10.71	717	11.58	756	12.45	793	13.34	829	14.27	862	15.23
18,000	659	11.25	704	12.21	745	13.11	783	14.00	819	14.91	853	15.85	886	16.82
19,000	691	12.82	734	13.84	773	14.77	810	15.69	845	16.62	879	17.58	911	18.56
20,000	723	14.53	764	15.60	802	16.57	838	17.52	872	18.47	905	19.44	936	20.44
21,000	755	16.37	794	17.49	831	18.51	866	19.49	899	20.47	931	21.46	961	22.47
22,000	787	18.35	825	19.53	861	20.59	894	21.60	927	22.61	958	23.62	987	24.64
23,000	819	20.48	856	21.71	890	22.81	923	23.87	954	24.90	985	25.93	1014	26.97
24,000	851	22.75	887	24.04	920	25.19	952	26.28	983	27.34	1012	28.40	1041	29.46
25,000	883	25.17	918	26.52	951	27.72	982	28.84	1011	29.94	1040	31.02	1068	32.11
26,000	916	27.76	950	29.15	981	30.40	1011	31.57	1040	32.70	1068	33.81	1095	34.92
27,000	948	30.49	981	31.95	1012	33.24	1041	34.46	1070	35.62	1097	36.76	1123	37.90

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	786	10.02	819	10.93	851	11.85	881	12.78	911	13.72	939	14.67	967	15.62
13,000	806	11.03	839	11.97	870	12.92	900	13.88	929	14.85	957	15.82	984	16.81
14,000	827	12.15	859	13.11	890	14.08	920	15.06	948	16.06	976	17.07	1003	18.08
15,000	849	13.38	881	14.35	911	15.35	940	16.36	968	17.38	996	18.41	1022	19.45
16,000	871	14.73	902	15.72	932	16.73	961	17.76	989	18.80	1016	19.86	1042	20.92
17,000	894	16.21	925	17.21	954	18.24	983	19.28	1010	20.34	1036	21.42	1062	22.51
18,000	918	17.82	948	18.84	977	19.88	1005	20.94	1032	22.01	1058	23.11	1083	24.21
19,000	942	19.57	971	20.60	1000	21.65	1027	22.72	1054	23.81	1080	24.92	1105	26.04
20,000	966	21.45	995	22.50	1023	23.57	1050	24.65	1076	25.76	1102	26.88	1126	28.01
21,000	991	23.50	1019	24.55	1047	25.63	1073	26.73	1099	27.84	1124	28.97	1149	30.13
22,000	1016	25.69	1044	26.76	1071	27.84	1097	28.95	1123	30.08	1147	31.22	1172	32.39
23,000	1042	28.03	1069	29.11	1096	30.21	1122	31.33	1147	32.47	1171	33.63	1195	34.80
24,000	1068	30.54	1095	31.63	1121	32.74	1146	33.87	1171	35.02	1195	36.19	—	—
25,000	1095	33.21	1121	34.31	1147	35.44	1171	36.58	1196	37.74	—	—	—	—
26,000	1122	36.04	1147	37.16	1172	38.30	1197	39.46	—	—	—	—	—	—
27,000	1149	39.04	1174	40.18	1199	41.34	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	993	16.58	1019	17.54	1044	18.51	1069	19.48	1093	20.45	1117	21.43
13,000	1011	17.80	1036	18.80	1061	19.80	1086	20.81	1109	21.82	1133	22.84
14,000	1029	19.11	1054	20.13	1079	21.17	1103	22.21	1126	23.26	1149	24.31
15,000	1048	20.50	1073	21.56	1097	22.63	1121	23.70	1144	24.78	1167	25.86
16,000	1067	22.00	1092	23.08	1116	24.17	1139	25.28	1162	26.38	1185	27.49
17,000	1087	23.60	1112	24.71	1135	25.83	1159	26.95	1181	28.09	—	—
18,000	1108	25.33	1132	26.46	1156	27.60	1178	28.74	—	—	—	—
19,000	1129	27.18	1153	28.33	1176	29.48	1199	30.65	—	—	—	—
20,000	1151	29.17	1174	30.33	1197	31.50	—	—	—	—	—	—
21,000	1173	31.29	1196	32.47	—	—	—	—	—	—	—	—
22,000	1195	33.56	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K2, K3***20 (20 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	311	0.54	390	0.71	457	0.88	515	1.05	567	1.21	613	1.38	656	1.55
5,000	347	0.84	417	1.02	480	1.21	536	1.40	587	1.59	633	1.78	676	1.97
6,000	387	1.25	450	1.43	507	1.63	560	1.84	609	2.05	654	2.26	696	2.47
7,000	430	1.77	488	1.96	540	2.17	588	2.38	634	2.61	677	2.83	718	3.06
8,000	474	2.41	528	2.61	576	2.82	620	3.04	663	3.28	704	3.52	743	3.76
9,000	519	3.19	570	3.39	614	3.60	656	3.83	696	4.07	734	4.32	771	4.57
10,000	565	4.10	613	4.31	655	4.53	694	4.76	731	5.00	767	5.26	802	5.51

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	696	1.71	733	1.88	768	2.04	802	2.21	833	2.38	864	2.55	893	2.71
5,000	716	2.16	753	2.34	788	2.52	822	2.71	854	2.89	885	3.08	914	3.26
6,000	735	2.68	773	2.88	808	3.09	842	3.29	874	3.50	905	3.70	934	3.90
7,000	756	3.29	793	3.51	828	3.74	862	3.96	894	4.19	924	4.41	954	4.63
8,000	780	4.00	816	4.24	850	4.48	883	4.73	914	4.97	945	5.21	974	5.45
9,000	806	4.82	840	5.08	873	5.34	905	5.60	936	5.85	966	6.11	995	6.37
10,000	835	5.78	868	6.04	900	6.31	931	6.58	961	6.85	990	7.13	1018	7.40

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	921	2.88	949	3.06	975	3.23	1001	3.40	1026	3.58	1050	3.75
5,000	943	3.45	970	3.64	997	3.82	1023	4.01	1048	4.20	1072	4.39
6,000	963	4.10	991	4.31	1017	4.51	1043	4.71	1069	4.91	1093	5.12
7,000	983	4.85	1010	5.07	1037	5.29	1063	5.51	1089	5.72	1113	5.94
8,000	1003	5.68	1030	5.92	1057	6.16	1083	6.39	1108	6.63	1133	6.86
9,000	1023	6.62	1051	6.88	1077	7.13	1103	7.38	1128	7.64	1153	7.89
10,000	1046	7.67	1072	7.94	1099	8.21	1124	8.48	1149	8.75	1174	9.02

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K2, K3***26, 30 (25-30 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	352	0.85	422	1.03	484	1.22	540	1.42	590	1.61	636	1.79	678	1.98
6,000	394	1.26	456	1.45	513	1.65	565	1.86	613	2.07	658	2.28	700	2.49
7,000	438	1.79	495	1.98	546	2.19	594	2.41	640	2.64	682	2.86	723	3.09
8,000	483	2.44	536	2.64	583	2.85	628	3.08	670	3.32	710	3.55	749	3.80
9,000	530	3.23	579	3.43	623	3.65	664	3.88	704	4.12	741	4.37	778	4.62
10,000	577	4.15	624	4.36	665	4.58	703	4.82	740	5.06	776	5.32	810	5.58
11,000	625	5.22	669	5.44	708	5.67	744	5.91	779	6.16	813	6.41	845	6.68
12,000	674	6.45	715	6.67	753	6.90	787	7.15	820	7.40	851	7.66	882	7.93
13,000	722	7.85	762	8.07	798	8.30	831	8.55	862	8.81	892	9.08	921	9.35
14,000	771	9.41	810	9.64	844	9.88	875	10.13	905	10.39	934	10.66	962	10.94
15,000	821	11.15	857	11.38	890	11.62	921	11.88	949	12.14	977	12.42	1004	12.70

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	718	2.17	755	2.35	791	2.54	824	2.72	856	2.91	887	3.09	916	3.28
6,000	739	2.70	776	2.90	811	3.11	845	3.31	877	3.51	908	3.72	937	3.92
7,000	761	3.32	798	3.54	833	3.77	866	3.99	898	4.21	928	4.43	958	4.66
8,000	786	4.04	821	4.28	855	4.52	888	4.77	919	5.01	950	5.25	979	5.49
9,000	813	4.88	847	5.13	880	5.39	912	5.65	942	5.90	972	6.16	1001	6.42
10,000	843	5.84	876	6.11	907	6.38	938	6.65	968	6.92	997	7.19	1025	7.46
11,000	877	6.95	907	7.22	937	7.50	967	7.78	995	8.07	1023	8.35	1051	8.63
12,000	912	8.21	941	8.49	970	8.78	998	9.06	1025	9.35	1052	9.65	1078	9.94
13,000	950	9.63	977	9.92	1005	10.21	1031	10.50	1058	10.80	1083	11.10	1109	11.40
14,000	989	11.22	1015	11.51	1041	11.81	1067	12.10	1092	12.41	1117	12.71	1141	13.02
15,000	1030	12.99	1055	13.28	1080	13.58	1104	13.88	1128	14.19	1152	14.50	1175	14.81

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	945	3.46	972	3.65	999	3.83	1024	4.02	1049	4.21	1074	4.40
6,000	966	4.12	993	4.32	1020	4.53	1046	4.73	1071	4.93	1095	5.14
7,000	986	4.88	1014	5.10	1041	5.31	1067	5.53	1092	5.75	1116	5.97
8,000	1007	5.72	1035	5.96	1061	6.20	1087	6.43	1112	6.67	1137	6.90
9,000	1029	6.67	1056	6.93	1083	7.18	1108	7.43	1134	7.69	1158	7.94
10,000	1052	7.73	1079	8.00	1105	8.27	1130	8.54	1155	8.81	1179	9.08
11,000	1077	8.92	1103	9.20	1129	9.49	1154	9.77	1178	10.06	—	—
12,000	1104	10.24	1130	10.54	1154	10.83	1179	11.13	—	—	—	—
13,000	1133	11.71	1158	12.01	1182	12.32	—	—	—	—	—	—
14,000	1165	13.33	1188	13.65	—	—	—	—	—	—	—	—
15,000	1198	15.13	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K2, K3***34 (35 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	438	1.66	494	1.92	546	2.18	594	2.43	639	2.68	683	2.93	723	3.18
8,000	484	2.23	536	2.51	583	2.79	627	3.06	669	3.33	710	3.60	749	3.87
9,000	531	2.91	579	3.21	623	3.51	664	3.80	703	4.09	741	4.38	778	4.67
10,000	579	3.71	624	4.03	665	4.35	703	4.66	740	4.97	775	5.27	810	5.58
11,000	628	4.63	670	4.98	708	5.31	744	5.64	779	5.97	812	6.29	845	6.61
12,000	678	5.69	717	6.05	753	6.40	787	6.75	820	7.10	851	7.44	882	7.77
13,000	728	6.88	764	7.26	798	7.63	831	8.00	862	8.36	892	8.72	921	9.07
14,000	778	8.22	812	8.61	845	9.00	876	9.38	905	9.76	934	10.14	962	10.51
15,000	829	9.71	861	10.11	892	10.52	921	10.92	950	11.31	977	11.70	1004	12.09
16,000	879	11.35	910	11.77	940	12.19	968	12.60	995	13.01	1021	13.42	1047	13.82
17,000	931	13.15	960	13.58	988	14.01	1015	14.44	1041	14.87	1066	15.29	1090	15.71
17,500	956	14.11	985	14.55	1012	14.99	1038	15.42	1064	15.86	1089	16.29	1113	16.71

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	762	3.42	799	3.66	834	3.90	867	4.13	899	4.36	929	4.59	958	4.81
8,000	786	4.14	822	4.40	856	4.66	889	4.92	921	5.18	951	5.43	980	5.68
9,000	813	4.95	847	5.23	880	5.52	912	5.80	943	6.08	973	6.35	1002	6.63
10,000	843	5.88	875	6.18	907	6.48	938	6.78	968	7.08	997	7.37	1025	7.67
11,000	876	6.93	907	7.24	937	7.56	966	7.87	995	8.19	1023	8.50	1050	8.82
12,000	912	8.11	941	8.44	969	8.77	997	9.10	1025	9.43	1052	9.76	1078	10.09
13,000	949	9.42	977	9.77	1004	10.11	1031	10.46	1057	10.80	1083	11.15	1108	11.49
14,000	989	10.87	1015	11.24	1041	11.60	1066	11.96	1091	12.32	1116	12.67	1140	13.03
15,000	1030	12.47	1055	12.85	1080	13.23	1104	13.60	1128	13.98	1151	14.35	1175	14.72
16,000	1071	14.22	1096	14.61	1119	15.01	1143	15.40	1166	15.78	1188	16.17	1211	16.56
17,000	1114	16.12	1138	16.53	1161	16.94	1183	17.34	1205	17.75	1227	18.15	1248	18.55
17,500	1136	17.13	1159	17.55	1181	17.97	1204	18.38	1225	18.79	1247	19.20	1268	19.60

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	986	5.02	1013	5.24	1039	5.45	1064	5.65	1089	5.86	1112	6.06
8,000	1008	5.93	1036	6.17	1062	6.41	1088	6.65	1112	6.88	1136	7.11
9,000	1030	6.90	1058	7.17	1084	7.44	1110	7.70	1135	7.96	1159	8.22
10,000	1053	7.96	1080	8.26	1106	8.55	1132	8.83	1157	9.12	1181	9.40
11,000	1077	9.13	1104	9.44	1129	9.75	1155	10.06	1179	10.37	1203	10.67
12,000	1104	10.42	1129	10.74	1154	11.07	1179	11.40	1203	11.72	1227	12.05
13,000	1133	11.83	1157	12.17	1181	12.52	1205	12.86	1229	13.2	1252	13.54
14,000	1164	13.39	1188	13.74	1211	14.10	1234	14.46	1256	14.81	1279	15.16
15,000	1197	15.09	1220	15.46	1242	15.83	1264	16.20	1286	16.56	—	—
16,000	1233	16.94	1254	17.32	1276	17.70	1297	18.09	—	—	—	—
17,000	1270	18.95	1290	19.34	—	—	—	—	—	—	—	—
17,500	1288	20.01	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K2, K3***40 (40 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	475	2.69	523	3.08	569	3.47	612	3.86	653	4.26	692	4.66	730	5.07
9,000	521	3.53	565	3.94	606	4.36	646	4.78	684	5.20	721	5.63	757	6.06
10,000	568	4.52	608	4.96	646	5.40	683	5.84	719	6.29	753	6.74	787	7.20
11,000	615	5.68	652	6.14	687	6.60	722	7.07	755	7.55	788	8.02	819	8.50
12,000	663	7.01	697	7.49	730	7.98	762	8.47	794	8.97	824	9.47	854	9.96
13,000	712	8.53	743	9.03	774	9.54	804	10.05	834	10.57	862	11.09	891	11.61
14,000	760	10.24	790	10.76	819	11.29	847	11.82	875	12.36	902	12.90	929	13.45
15,000	809	12.15	837	12.69	864	13.24	891	13.79	917	14.35	943	14.91	968	15.48
16,000	859	14.27	885	14.83	910	15.40	936	15.97	960	16.55	985	17.13	1009	17.71
17,000	908	16.61	933	17.19	957	17.77	981	18.36	1004	18.96	1028	19.56	1051	20.16
18,000	958	19.18	981	19.77	1004	20.37	1027	20.98	1049	21.60	1071	22.22	1093	22.84
19,000	1007	21.98	1030	22.59	1052	23.21	1073	23.84	1095	24.47	1116	25.10	1137	25.74
20,000	1057	25.02	1079	25.65	1099	26.29	1120	26.93	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	767	5.49	802	5.92	836	6.36	870	6.81	902	7.26	933	7.73	964	8.20
9,000	791	6.49	825	6.94	857	7.39	889	7.85	920	8.31	950	8.79	979	9.27
10,000	819	7.65	851	8.11	882	8.58	912	9.05	941	9.53	970	10.02	998	10.51
11,000	850	8.97	880	9.46	909	9.94	938	10.43	966	10.92	993	11.42	1020	11.93
12,000	883	10.47	912	10.97	939	11.48	967	11.98	993	12.49	1020	13.01	1046	13.53
13,000	918	12.13	945	12.66	972	13.19	998	13.72	1023	14.25	1049	14.78	1073	15.32
14,000	955	13.99	981	14.54	1006	15.09	1031	15.64	1055	16.19	1079	16.75	1103	17.30
15,000	993	16.04	1018	16.62	1042	17.18	1066	17.76	1089	18.33	1112	18.90	1135	19.48
16,000	1033	18.30	1056	18.89	1079	19.48	1102	20.08	1124	20.67	1147	21.26	1168	21.86
17,000	1073	20.77	1096	21.38	1118	21.99	1140	22.61	1161	23.22	1182	23.84	1203	24.45
18,000	1115	23.46	1136	24.09	1157	24.72	1178	25.36	1199	25.99	1219	26.63	1240	27.26
19,000	1157	26.39	1178	27.04	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	993	8.67	1022	9.16	1050	9.65	1077	10.14	1104	10.64	1129	11.15
9,000	1008	9.75	1036	10.25	1064	10.75	1090	11.26	1117	11.77	1142	12.29
10,000	1026	11.00	1053	11.51	1080	12.02	1106	12.54	1131	13.06	1156	13.59
11,000	1047	12.44	1073	12.95	1099	13.47	1124	14.00	1149	14.53	1173	15.07
12,000	1071	14.05	1096	14.58	1121	15.11	1145	15.65	1169	16.19	1192	16.74
13,000	1097	15.86	1121	16.40	1145	16.95	1168	17.50	1191	18.06	1214	18.62
14,000	1126	17.86	1149	18.42	1172	18.98	1195	19.55	1217	20.12	1239	20.69
15,000	1157	20.06	1179	20.63	1201	21.21	1223	21.8	1244	22.38	1265	22.97
16,000	1190	22.46	1211	23.06	1232	23.66	1253	24.26	1274	24.86	1294	25.46
17,000	1224	25.07	1245	25.69	1265	26.31	1285	26.93	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K2, K3***50 (50 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	577	4.62	617	5.06	655	5.50	692	5.95	727	6.40	761	6.85	794	7.30
11,000	625	5.80	661	6.26	697	6.73	731	7.20	764	7.67	796	8.14	827	8.62
12,000	673	7.15	707	7.63	740	8.12	772	8.62	803	9.11	833	9.61	863	10.11
13,000	722	8.69	753	9.19	784	9.70	814	10.22	843	10.74	872	11.26	900	11.78
14,000	771	10.43	800	10.95	829	11.48	857	12.01	885	12.55	912	13.10	938	13.64
15,000	821	12.37	848	12.91	875	13.46	901	14.01	928	14.57	953	15.14	978	15.70
16,000	870	14.52	896	15.08	922	15.65	947	16.22	971	16.80	996	17.39	1020	17.97
17,000	920	16.89	945	17.48	969	18.06	993	18.65	1016	19.25	1039	19.86	1062	20.46
18,000	971	19.50	994	20.10	1017	20.71	1039	21.32	1061	21.93	1083	22.55	1105	23.18
19,000	1021	22.35	1043	22.96	1065	23.59	1086	24.21	1107	24.85	1128	25.49	1149	26.13
20,000	1071	25.43	1092	26.07	1113	26.71	1133	27.36	1154	28.01	1174	28.66	1194	29.33

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	827	7.76	858	8.22	889	8.69	919	9.17	948	9.64	977	10.13	1005	10.62
11,000	858	9.10	888	9.58	917	10.07	945	10.56	973	11.05	1001	11.55	1027	12.06
12,000	891	10.61	920	11.12	947	11.62	975	12.13	1001	12.64	1027	13.16	1053	13.68
13,000	927	12.31	954	12.83	980	13.36	1006	13.89	1031	14.42	1056	14.96	1081	15.49
14,000	964	14.19	990	14.74	1015	15.29	1040	15.84	1064	16.39	1088	16.94	1111	17.50
15,000	1003	16.27	1028	16.84	1052	17.41	1075	17.99	1098	18.56	1121	19.13	1144	19.71
16,000	1043	18.56	1066	19.15	1089	19.75	1112	20.34	1134	20.93	1156	21.53	1178	22.12
17,000	1084	21.07	1107	21.68	1129	22.30	1150	22.91	1172	23.52	1193	24.14	1214	24.76
18,000	1126	23.80	1148	24.44	1169	25.07	1190	25.7	1210	26.34	1230	26.97	1250	27.61
19,000	1170	26.78	1190	27.42	1210	28.08	1230	28.73	1250	29.38	1269	30.04	1289	30.70
20,000	1213	29.99	1233	30.65	1252	31.33	1271	31.99	1290	32.67	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	1032	11.12	1059	11.63	1086	12.14	1112	12.66	1137	13.18	1162	13.71
11,000	1054	12.57	1080	13.09	1105	13.61	1130	14.14	1155	14.67	1179	15.21
12,000	1078	14.21	1103	14.74	1128	15.27	1152	15.81	1176	16.35	1199	16.90
13,000	1105	16.03	1129	16.58	1153	17.12	1176	17.68	1199	18.23	1221	18.80
14,000	1135	18.06	1158	18.62	1180	19.18	1203	19.75	1225	20.32	1246	20.90
15,000	1166	20.29	1188	20.86	1210	21.45	1231	22.03	1253	22.62	1274	23.21
16,000	1199	22.72	1221	23.32	1241	23.92	1262	24.52	1283	25.13	—	—
17,000	1234	25.37	1255	25.99	1275	26.61	1295	27.23	—	—	—	—
18,000	1270	28.25	1290	28.89	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K2, K3***60 (60 Tons) Vertical Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	450	4.02	509	4.71	560	5.41	605	6.12	647	6.86	686	7.62	723	8.40
13,000	477	4.83	533	5.55	582	6.27	627	7.01	668	7.77	706	8.55	742	9.35
14,000	505	5.74	558	6.49	606	7.24	649	8.01	689	8.79	727	9.59	762	10.40
15,000	533	6.75	584	7.53	630	8.32	672	9.11	711	9.91	748	10.73	782	11.56
16,000	561	7.88	610	8.68	655	9.5	696	10.32	734	11.14	770	11.98	803	12.84
17,000	590	9.12	637	9.95	680	10.79	720	11.64	757	12.49	792	13.35	825	14.23
18,000	619	10.48	664	11.33	706	12.2	744	13.07	781	13.96	815	14.84	847	15.74
19,000	648	11.96	692	12.84	732	13.74	769	14.64	805	15.54	838	16.45	870	17.37
20,000	678	13.57	719	14.47	758	15.4	795	16.32	829	17.25	862	18.19	893	19.13
21,000	707	15.3	748	16.24	785	17.19	821	18.14	854	19.09	886	20.05	917	21.02
22,000	737	17.18	776	18.14	812	19.11	847	20.09	879	21.07	911	22.06	940	23.05
23,000	767	19.20	804	20.18	840	21.17	873	22.17	905	23.18	935	24.19	965	25.21
24,000	797	21.35	833	22.36	867	23.38	900	24.40	931	25.43	961	26.47	989	27.51
25,000	827	23.66	862	24.68	895	25.72	927	26.78	957	27.83	986	28.89	1014	29.95
26,000	857	26.11	891	27.16	923	28.23	954	29.30	984	30.38	1012	31.46	1040	32.55
27,000	888	28.72	920	29.79	952	30.88	982	31.97	1011	33.08	1038	34.19	1065	35.29

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	757	9.21	790	10.04	821	10.89	851	11.75	880	12.63	907	13.53	934	14.45
13,000	776	10.17	808	11.01	839	11.87	868	12.75	897	13.64	924	14.55	951	15.48
14,000	795	11.24	827	12.09	857	12.96	886	13.85	915	14.76	942	15.68	968	16.62
15,000	815	12.41	846	13.28	876	14.17	905	15.07	933	15.99	960	16.92	986	17.87
16,000	836	13.71	866	14.59	896	15.49	924	16.41	952	17.34	978	18.28	1004	19.25
17,000	857	15.12	887	16.02	916	16.94	944	17.86	971	18.81	997	19.77	1023	20.74
18,000	878	16.65	908	17.57	937	18.50	964	19.45	991	20.41	1017	21.38	1042	22.36
19,000	900	18.30	930	19.24	958	20.19	985	21.15	1011	22.13	1037	23.12	1061	24.11
20,000	923	20.08	952	21.04	979	22.01	1006	22.99	1032	23.98	1057	24.99	1081	26.00
21,000	946	22.00	974	22.98	1001	23.97	1028	24.97	1053	25.97	1078	26.99	1102	28.02
22,000	969	24.04	997	25.05	1024	26.06	1050	27.08	1075	28.1	1099	29.14	1123	30.18
23,000	993	26.23	1020	27.25	1046	28.28	1072	29.32	1097	30.37	1121	31.42	1144	32.48
24,000	1017	28.55	1044	29.60	1070	30.65	1095	31.71	1119	32.78	1143	33.85	1166	34.93
25,000	1041	31.02	1068	32.09	1093	33.17	1118	34.25	1142	35.33	1165	36.42	1188	37.52
26,000	1066	33.64	1092	34.73	1117	35.83	1141	36.93	1165	38.04	1188	39.15	—	—
27,000	1091	36.40	1117	37.52	1141	38.64	1165	39.76	1188	40.89	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	960	15.38	985	16.32	1010	17.28	1033	18.24	1057	19.22	1079	20.22
13,000	976	16.42	1001	17.38	1026	18.35	1049	19.32	1072	20.32	1095	21.32
14,000	993	17.57	1018	18.54	1042	19.52	1065	20.51	1088	21.52	1111	22.53
15,000	1011	18.83	1035	19.81	1059	20.81	1082	21.81	1105	22.82	1127	23.85
16,000	1029	20.22	1053	21.21	1077	22.21	1100	23.22	1122	24.25	1144	25.29
17,000	1047	21.73	1071	22.73	1095	23.74	1117	24.76	1140	25.80	1161	26.85
18,000	1066	23.36	1090	24.37	1113	25.40	1136	26.43	1158	27.48	1179	28.54
19,000	1085	25.13	1109	26.15	1132	27.19	1154	28.24	1176	29.29	1197	30.36
20,000	1105	27.03	1128	28.06	1151	29.11	1173	30.17	1195	31.24	—	—
21,000	1126	29.06	1148	30.11	1171	31.17	1193	32.25	—	—	—	—
22,000	1146	31.24	1169	32.30	1191	33.38	—	—	—	—	—	—
23,000	1167	33.55	1190	34.64	—	—	—	—	—	—	—	—
24,000	1189	36.02	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K4, K5**20 (20 Ton) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	339	0.71	414	0.97	478	1.25	534	1.54	585	1.84	631	2.14	674	2.44
5,000	384	1.10	452	1.37	510	1.66	563	1.96	611	2.28	656	2.60	698	2.93
6,000	433	1.61	494	1.89	548	2.19	597	2.51	643	2.84	686	3.18	726	3.52
7,000	484	2.27	540	2.56	590	2.87	636	3.19	679	3.53	719	3.88	757	4.24
8,000	538	3.09	588	3.38	634	3.70	678	4.03	718	4.38	756	4.74	793	5.11
9,000	593	4.07	639	4.37	682	4.69	722	5.03	760	5.39	796	5.76	831	6.13
10,000	649	5.23	691	5.54	731	5.87	769	6.21	805	6.58	839	6.95	872	7.33

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	714	2.75	751	3.06	787	3.37	820	3.68	852	3.99	883	4.30	912	4.62
5,000	738	3.27	775	3.60	811	3.94	844	4.28	877	4.63	907	4.97	937	5.31
6,000	764	3.88	800	4.23	835	4.60	869	4.96	901	5.33	931	5.70	961	6.07
7,000	794	4.61	829	4.98	863	5.36	895	5.74	926	6.13	956	6.52	986	6.91
8,000	827	5.49	861	5.87	893	6.26	925	6.66	955	7.06	984	7.46	1013	7.87
9,000	864	6.52	896	6.91	927	7.32	957	7.72	986	8.13	1015	8.55	1042	8.97
10,000	904	7.73	934	8.13	964	8.54	993	8.96	1021	9.38	1048	9.80	1075	10.23

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	940	4.93	967	5.25	993	5.57	1019	5.89	1043	6.21	1067	6.53
5,000	966	5.66	993	6.01	1020	6.35	1046	6.70	1071	7.05	1095	7.40
6,000	990	6.44	1017	6.81	1044	7.19	1070	7.56	1096	7.94	1120	8.32
7,000	1014	7.30	1042	7.70	1068	8.10	1094	8.50	1120	8.90	1145	9.30
8,000	1040	8.28	1067	8.69	1094	9.11	1119	9.53	1144	9.95	1169	10.37
9,000	1069	9.39	1096	9.82	1121	10.25	1146	10.69	1171	11.12	1195	11.56
10,000	1101	10.67	1126	11.11	1151	11.55	1176	12.00	1200	12.44	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K4, K5**26, 30 (25-30 Ton) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	389	1.11	456	1.38	514	1.68	566	1.98	614	2.3	659	2.62	701	2.95
6,000	439	1.64	499	1.92	553	2.22	602	2.54	647	2.87	689	3.21	730	3.56
7,000	492	2.31	546	2.60	596	2.91	641	3.24	684	3.58	724	3.93	762	4.29
8,000	546	3.14	596	3.43	642	3.75	684	4.09	724	4.44	762	4.80	798	5.17
9,000	602	4.13	647	4.43	690	4.76	730	5.10	768	5.46	803	5.83	838	6.21
10,000	659	5.31	701	5.62	740	5.95	777	6.30	813	6.67	847	7.04	880	7.43
11,000	717	6.67	755	6.99	792	7.33	827	7.68	860	8.06	893	8.44	924	8.83
12,000	775	8.23	811	8.56	845	8.90	878	9.27	909	9.64	940	10.03	970	10.43
13,000	834	9.99	867	10.33	899	10.68	930	11.05	960	11.44	989	11.83	1017	12.24
14,000	893	11.97	924	12.32	954	12.68	983	13.06	1012	13.44	1039	13.85	1066	14.26
15,000	953	14.17	982	14.53	1010	14.90	1037	15.28	1064	15.68	1091	16.08	1116	16.50

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	740	3.29	777	3.62	813	3.96	846	4.3	879	4.65	909	4.99	939	5.34
6,000	768	3.91	804	4.27	838	4.63	872	5.00	903	5.36	934	5.73	964	6.10
7,000	798	4.66	833	5.03	867	5.41	899	5.79	930	6.18	960	6.57	989	6.96
8,000	833	5.55	866	5.93	898	6.32	930	6.72	960	7.12	989	7.53	1017	7.94
9,000	871	6.60	903	7.00	933	7.40	963	7.80	992	8.22	1020	8.63	1048	9.06
10,000	911	7.83	942	8.23	971	8.64	1000	9.06	1028	9.48	1055	9.91	1081	10.34
11,000	954	9.24	983	9.65	1011	10.07	1039	10.49	1066	10.92	1092	11.36	1117	11.80
12,000	999	10.84	1026	11.26	1054	11.69	1080	12.12	1106	12.56	1131	13.00	1156	13.45
13,000	1045	12.65	1072	13.08	1098	13.51	1123	13.95	1148	14.39	1172	14.84	1196	15.30
14,000	1093	14.68	1118	15.11	1143	15.54	1168	15.99	1192	16.44	—	—	—	—
15,000	1142	16.93	1166	17.36	1190	17.8	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	968	5.68	995	6.03	1022	6.38	1047	6.73	1073	7.08	1097	7.43
6,000	992	6.48	1020	6.85	1047	7.22	1073	7.60	1098	7.98	1123	8.36
7,000	1018	7.36	1045	7.75	1072	8.15	1098	8.55	1123	8.95	1148	9.35
8,000	1045	8.35	1072	8.76	1098	9.18	1123	9.60	1148	10.02	1173	10.44
9,000	1075	9.48	1101	9.91	1126	10.34	1151	10.78	1176	11.21	1200	11.65
10,000	1107	10.77	1133	11.22	1157	11.66	1182	12.11	—	—	—	—
11,000	1142	12.24	1167	12.69	1191	13.15	—	—	—	—	—	—
12,000	1180	13.90	—	—	—	—	—	—	—	—	—	—
13,000	—	—	—	—	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—
15,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K4, K5***34 (35 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	492	2.19	545	2.54	594	2.87	641	3.21	684	3.55	725	3.90	764	4.24
8,000	547	2.94	595	3.32	640	3.68	683	4.04	723	4.40	762	4.77	799	5.13
9,000	603	3.83	647	4.24	689	4.63	728	5.02	766	5.40	802	5.78	837	6.17
10,000	661	4.88	701	5.32	739	5.74	776	6.15	811	6.55	845	6.95	878	7.36
11,000	719	6.08	756	6.57	792	7.02	826	7.45	859	7.87	890	8.29	922	8.72
12,000	777	7.46	812	7.98	845	8.46	877	8.92	908	9.36	938	9.81	967	10.25
13,000	836	9.01	869	9.56	900	10.07	930	10.56	959	11.04	988	11.50	1015	11.96
14,000	895	10.75	926	11.33	955	11.87	984	12.39	1011	12.89	1038	13.38	1065	13.86
15,000	955	12.68	984	13.29	1011	13.86	1038	14.41	1065	14.94	1090	15.45	1115	15.95
16,000	1015	14.81	1042	15.45	1068	16.05	1094	16.62	1119	17.18	1143	17.72	1167	18.24
17,000	1075	17.15	1101	17.81	1126	18.44	1150	19.04	1174	19.62	1197	20.19	1220	20.74
17,500	1105	18.39	1130	19.07	1154	19.71	1178	20.33	1201	20.92	1224	21.50	1246	22.07

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	801	4.58	837	4.91	870	5.24	902	5.57	933	5.89	962	6.21	990	6.52
8,000	835	5.5	869	5.87	902	6.23	933	6.59	963	6.95	993	7.30	1021	7.65
9,000	871	6.55	904	6.94	935	7.33	966	7.72	995	8.11	1024	8.49	1052	8.87
10,000	910	7.76	941	8.17	971	8.58	1001	8.99	1029	9.40	1057	9.81	1084	10.22
11,000	952	9.14	981	9.56	1010	9.99	1038	10.42	1066	10.85	1093	11.28	1119	11.71
12,000	996	10.69	1024	11.13	1051	11.57	1078	12.01	1104	12.46	1130	12.91	1156	13.36
13,000	1042	12.42	1069	12.88	1095	13.34	1120	13.80	1146	14.26	1170	14.72	1194	15.18
14,000	1090	14.34	1116	14.82	1140	15.29	1165	15.77	1189	16.24	1212	16.72	1236	17.20
15,000	1140	16.45	1164	16.95	1187	17.44	1211	17.93	1234	18.42	1256	18.92	1279	19.41
16,000	1190	18.77	1213	19.28	1236	19.79	1258	20.3	1280	20.81	—	—	—	—
17,000	1242	21.28	1264	21.82	1286	22.35	—	—	—	—	—	—	—	—
17,500	1268	22.62	1290	23.17	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	1018	6.83	1044	7.13	1069	7.43	1094	7.73	1118	8.03	1142	8.32
8,000	1048	7.99	1074	8.33	1100	8.67	1125	9.01	1149	9.34	1172	9.66
9,000	1079	9.25	1105	9.63	1130	10.00	1155	10.37	1179	10.74	1203	11.10
10,000	1111	10.63	1137	11.03	1162	11.43	1186	11.84	1210	12.23	1234	12.63
11,000	1144	12.14	1170	12.57	1194	13.00	1218	13.42	1242	13.85	1265	14.27
12,000	1180	13.80	1205	14.25	1229	14.7	1252	15.15	1275	15.60	1298	16.05
13,000	1218	15.65	1242	16.11	1265	16.58	1288	17.05	—	—	—	—
14,000	1258	17.68	1281	18.16	—	—	—	—	—	—	—	—
15,000	—	—	—	—	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—	—	—
17,500	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K4, K5***40 (40 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	526	3.10	573	3.50	617	3.91	660	4.33	700	4.75	740	5.18	778	5.62
9,000	579	4.08	621	4.51	662	4.95	701	5.39	738	5.83	775	6.28	810	6.74
10,000	633	5.24	671	5.70	709	6.16	744	6.62	779	7.09	813	7.57	846	8.05
11,000	687	6.59	723	7.07	757	7.56	790	8.05	823	8.54	854	9.04	885	9.54
12,000	742	8.15	775	8.65	807	9.17	838	9.68	868	10.20	898	10.72	927	11.24
13,000	797	9.92	827	10.45	857	10.98	887	11.52	915	12.07	943	12.61	970	13.15
14,000	852	11.92	881	12.47	909	13.03	936	13.59	963	14.15	990	14.72	1016	15.29
15,000	908	14.15	935	14.72	961	15.31	987	15.89	1013	16.48	1038	17.06	1062	17.65
16,000	964	16.63	989	17.23	1014	17.83	1039	18.43	1063	19.04	1086	19.65	1110	20.26
17,000	1021	19.37	1044	19.98	1068	20.60	1091	21.23	1114	21.86	1136	22.49	1158	23.12
18,000	1077	22.37	1099	23.01	1122	23.64	1144	24.29	1165	24.94	1187	25.59	1208	26.25
19,000	1133	25.65	1155	26.3	1176	26.96	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	814	6.07	850	6.53	884	7.00	917	7.48	949	7.96	980	8.44	1010	8.94
9,000	845	7.21	878	7.69	911	8.17	942	8.66	973	9.16	1003	9.66	1033	10.17
10,000	879	8.53	910	9.03	941	9.53	971	10.03	1001	10.55	1030	11.06	1058	11.59
11,000	916	10.05	945	10.56	974	11.08	1003	11.60	1031	12.13	1059	12.67	1086	13.21
12,000	955	11.77	983	12.30	1011	12.84	1038	13.38	1065	13.92	1091	14.47	1117	15.03
13,000	997	13.70	1024	14.25	1050	14.81	1075	15.37	1101	15.93	1126	16.50	1150	17.07
14,000	1041	15.86	1066	16.43	1091	17.01	1115	17.59	1139	18.17	1163	18.75	1186	19.34
15,000	1086	18.25	1110	18.84	1134	19.44	1157	20.04	1180	20.64	1202	21.24	1225	21.85
16,000	1133	20.88	1156	21.49	1178	22.11	1200	22.73	1222	23.35	1243	23.97	1265	24.60
17,000	1180	23.76	1202	24.39	1223	25.03	1245	25.67	1266	26.32	1286	26.96	—	—
18,000	1229	26.90	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	1039	9.43	1067	9.93	1094	10.44	1121	10.95	1147	11.46	1172	11.98
9,000	1061	10.69	1089	11.21	1116	11.73	1142	12.26	1168	12.8	1193	13.33
10,000	1085	12.12	1112	12.66	1139	13.20	1165	13.75	1190	14.3	1215	14.86
11,000	1112	13.75	1139	14.31	1164	14.86	1189	15.43	1214	15.99	1238	16.56
12,000	1142	15.59	1167	16.16	1192	16.73	1216	17.31	1240	17.89	1264	18.48
13,000	1175	17.65	1199	18.23	1222	18.82	1246	19.41	1269	20.00	1291	20.61
14,000	1210	19.94	1232	20.53	1255	21.14	1277	21.74	1300	22.35	—	—
15,000	1247	22.46	1269	23.07	1290	23.69	—	—	—	—	—	—
16,000	1286	25.23	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K4, K5***50 (50 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	642	5.35	680	5.80	717	6.27	753	6.73	787	7.20	821	7.68	854	8.16
11,000	696	6.72	732	7.20	766	7.69	799	8.18	831	8.67	863	9.17	893	9.68
12,000	751	8.29	784	8.80	816	9.32	847	9.83	877	10.35	906	10.87	935	11.40
13,000	807	10.09	837	10.62	867	11.16	896	11.70	924	12.24	952	12.78	979	13.33
14,000	863	12.12	891	12.67	919	13.23	946	13.79	973	14.36	999	14.92	1025	15.49
15,000	919	14.38	946	14.96	972	15.54	997	16.12	1023	16.71	1047	17.30	1072	17.89
16,000	975	16.90	1000	17.49	1025	18.09	1049	18.70	1073	19.31	1097	19.92	1120	20.53
17,000	1032	19.67	1056	20.29	1079	20.91	1102	21.54	1125	22.17	1147	22.80	1169	23.44
18,000	1089	22.71	1111	23.35	1134	23.99	1155	24.64	1177	25.29	1198	25.95	1219	26.60
19,000	1146	26.04	1167	26.69	1188	27.35	1209	28.02	1230	28.69	1250	29.37	1270	30.04
20,000	1203	29.65	1223	30.32	1243	31.00	1263	31.69	1283	32.38	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	886	8.65	917	9.14	948	9.65	978	10.15	1008	10.67	1036	11.19	1064	11.72
11,000	923	10.18	953	10.70	982	11.21	1010	11.74	1038	12.27	1066	12.81	1093	13.35
12,000	964	11.92	991	12.46	1019	12.99	1046	13.53	1072	14.08	1098	14.63	1124	15.19
13,000	1006	13.88	1032	14.43	1058	14.99	1084	15.55	1109	16.11	1134	16.68	1158	17.26
14,000	1050	16.06	1075	16.64	1100	17.21	1124	17.79	1148	18.38	1171	18.97	1195	19.55
15,000	1096	18.48	1120	19.08	1143	19.68	1166	20.27	1189	20.88	1211	21.49	1234	22.09
16,000	1143	21.15	1165	21.76	1188	22.38	1210	23.00	1231	23.62	1253	24.25	1274	24.88
17,000	1191	24.07	1213	24.71	1234	25.35	1255	25.99	1276	26.63	1296	27.27	—	—
18,000	1240	27.26	1261	27.92	1281	28.58	—	—	—	—	—	—	—	—
19,000	1290	30.72	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	1092	12.25	1119	12.79	1145	13.33	1171	13.88	1196	14.43	1221	14.99
11,000	1119	13.90	1145	14.45	1171	15.01	1196	15.57	1220	16.14	1245	16.72
12,000	1149	15.76	1174	16.32	1199	16.90	1223	17.48	1247	18.06	1270	18.65
13,000	1182	17.84	1206	18.42	1230	19.01	1253	19.60	1276	20.20	1299	20.80
14,000	1218	20.15	1241	20.75	1263	21.35	1285	21.96	—	—	—	—
15,000	1256	22.71	1277	23.32	1299	23.94	—	—	—	—	—	—
16,000	1295	25.51	—	—	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

48K4, K5***60 (60 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	516	4.81	569	5.54	617	6.30	660	7.10	701	7.93	739	8.79	774	9.68
13,000	550	5.80	600	6.56	646	7.34	688	8.15	727	9.00	764	9.88	799	10.79
14,000	584	6.90	632	7.69	676	8.50	716	9.33	754	10.20	790	11.10	824	12.02
15,000	619	8.13	664	8.96	706	9.79	745	10.65	782	11.53	817	12.44	850	13.38
16,000	654	9.49	697	10.36	737	11.22	775	12.10	811	13.00	845	13.93	877	14.88
17,000	689	10.99	730	11.90	769	12.79	806	13.69	840	14.61	873	15.56	904	16.53
18,000	725	12.64	764	13.58	801	14.51	837	15.43	870	16.38	902	17.34	933	18.32
19,000	760	14.43	798	15.41	834	16.37	868	17.32	900	18.29	932	19.27	961	20.27
20,000	796	16.37	833	17.39	867	18.39	900	19.37	931	20.36	962	21.36	991	22.38
21,000	832	18.47	867	19.54	901	20.56	932	21.57	963	22.59	992	23.61	1020	24.65
22,000	869	20.74	902	21.84	934	22.90	965	23.94	995	24.98	1023	26.03	1051	27.09
23,000	905	23.17	937	24.31	968	25.40	998	26.48	1027	27.55	1055	28.62	1081	29.70
24,000	942	25.78	973	26.95	1003	28.08	1032	29.18	1059	30.28	1086	31.38	1113	32.48
25,000	978	28.56	1008	29.77	1037	30.93	1065	32.07	1092	33.20	1119	34.32	1144	35.44
26,000	1015	31.52	1044	32.76	1072	33.96	1099	35.13	1125	36.29	1151	37.44	1176	38.59
27,000	1052	34.66	1080	35.94	1107	37.18	1133	38.38	1159	39.57	1184	40.75	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	808	10.59	841	11.52	872	12.46	901	13.42	930	14.38	958	15.36	985	16.34
13,000	832	11.72	864	12.67	894	13.64	923	14.62	952	15.61	979	16.61	1006	17.62
14,000	857	12.97	888	13.94	917	14.92	946	15.92	974	16.94	1001	17.97	1027	19.01
15,000	882	14.35	912	15.33	941	16.34	970	17.36	997	18.40	1024	19.45	1049	20.51
16,000	908	15.86	938	16.86	966	17.88	994	18.93	1021	19.98	1047	21.05	1072	22.14
17,000	935	17.52	964	18.54	992	19.58	1019	20.63	1045	21.70	1071	22.79	1096	23.89
18,000	962	19.33	990	20.36	1018	21.41	1045	22.48	1070	23.57	1096	24.67	1120	25.79
19,000	990	21.29	1018	22.34	1045	23.40	1071	24.49	1096	25.59	1121	26.71	1145	27.84
20,000	1019	23.42	1046	24.48	1072	25.56	1098	26.66	1123	27.77	1147	28.90	1171	30.05
21,000	1048	25.71	1074	26.78	1100	27.87	1125	28.99	1150	30.12	1173	31.26	1197	32.42
22,000	1077	28.17	1103	29.26	1129	30.36	1153	31.49	1177	32.63	—	—	—	—
23,000	1107	30.79	1133	31.9	1157	33.02	1181	34.16	—	—	—	—	—	—
24,000	1138	33.59	1163	34.72	1187	35.86	—	—	—	—	—	—	—	—
25,000	1169	36.58	1193	37.72	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	1011	17.33	1036	18.33	1061	19.33	1085	20.34	1108	21.35	1131	22.36
13,000	1031	18.64	1056	19.67	1081	20.71	1104	21.75	1128	22.80	1150	23.85
14,000	1052	20.06	1077	21.12	1101	22.18	1125	23.25	1148	24.33	1170	25.42
15,000	1074	21.58	1099	22.67	1122	23.76	1146	24.86	1168	25.97	1191	27.08
16,000	1097	23.23	1121	24.34	1144	25.45	1167	26.58	1190	27.71	—	—
17,000	1120	25.01	1144	26.13	1167	27.27	1190	28.42	—	—	—	—
18,000	1144	26.93	1167	28.07	1190	29.23	—	—	—	—	—	—
19,000	1169	28.99	1192	30.16	—	—	—	—	—	—	—	—
20,000	1194	31.21	—	—	—	—	—	—	—	—	—	—
21,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K4, K5**20 (20 Ton) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	322	0.62	399	0.82	464	1.04	521	1.26	572	1.48	619	1.71	662	1.93
5,000	361	0.95	431	1.17	491	1.41	545	1.65	594	1.89	640	2.14	682	2.39
6,000	405	1.41	467	1.64	524	1.88	574	2.14	621	2.4	664	2.67	705	2.93
7,000	451	2.00	508	2.22	559	2.48	607	2.75	651	3.02	693	3.3	732	3.58
8,000	500	2.72	551	2.95	598	3.21	643	3.48	685	3.77	724	4.06	762	4.36
9,000	550	3.6	596	3.83	640	4.08	682	4.36	721	4.66	759	4.96	795	5.27
10,000	601	4.63	644	4.86	684	5.12	723	5.40	760	5.70	796	6.01	830	6.33
Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
4,000	702	2.16	739	2.38	774	2.61	808	2.84	840	3.06	870	3.29	900	3.52
5,000	722	2.64	759	2.89	795	3.14	829	3.39	861	3.64	892	3.89	922	4.14
6,000	744	3.20	780	3.47	816	3.75	849	4.02	881	4.29	912	4.57	942	4.84
7,000	769	3.87	804	4.16	839	4.45	871	4.74	903	5.03	933	5.33	963	5.62
8,000	797	4.66	832	4.96	864	5.27	896	5.58	927	5.89	957	6.20	985	6.51
9,000	829	5.58	862	5.90	893	6.22	924	6.54	954	6.86	983	7.19	1011	7.51
10,000	863	6.65	894	6.98	925	7.31	954	7.64	983	7.98	1011	8.31	1038	8.65
Airflow (cfm)	Available External Static Pressure (in. wg)													
	3.0		3.2		3.4		3.6		3.8		4.0			
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp		
4,000	928	3.75	955	3.98	981	4.21	1007	4.44	1031	4.67	1055	4.91		
5,000	950	4.40	978	4.65	1005	4.90	1031	5.16	1056	5.41	1080	5.67		
6,000	971	5.12	999	5.39	1026	5.67	1052	5.94	1077	6.22	1102	6.49		
7,000	991	5.92	1019	6.21	1046	6.51	1072	6.80	1098	7.10	1122	7.40		
8,000	1014	6.82	1041	7.13	1067	7.45	1093	7.76	1118	8.08	1143	8.39		
9,000	1038	7.84	1064	8.17	1090	8.50	1116	8.83	1141	9.16	1165	9.49		
10,000	1065	8.99	1091	9.34	1116	9.68	1141	10.02	1165	10.37	1189	10.72		

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K4, K5**26, 30 (25-30 Ton) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	366	0.97	435	1.19	495	1.42	548	1.67	597	1.91	642	2.16	685	2.41
6,000	411	1.43	473	1.66	529	1.91	579	2.16	625	2.43	668	2.69	709	2.96
7,000	459	2.02	515	2.25	566	2.51	613	2.78	657	3.06	698	3.34	737	3.62
8,000	508	2.76	559	2.99	606	3.25	650	3.53	691	3.82	731	4.11	768	4.41
9,000	560	3.64	605	3.88	649	4.14	690	4.42	729	4.72	766	5.02	802	5.33
10,000	612	4.68	654	4.92	694	5.19	732	5.47	769	5.77	804	6.09	838	6.40
11,000	665	5.89	703	6.14	740	6.41	776	6.69	811	7.00	844	7.31	876	7.64
12,000	718	7.28	754	7.53	788	7.80	822	8.09	854	8.39	886	8.71	916	9.04
13,000	772	8.85	806	9.11	838	9.38	869	9.67	899	9.98	929	10.30	958	10.63
14,000	826	10.61	858	10.87	888	11.15	917	11.44	946	11.75	974	12.07	1002	12.41
15,000	881	12.57	910	12.84	939	13.12	967	13.41	994	13.72	1021	14.05	1047	14.38

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	724	2.65	762	2.90	797	3.16	831	3.41	863	3.66	894	3.91	924	4.16
6,000	747	3.23	784	3.50	819	3.77	852	4.04	884	4.32	915	4.59	945	4.87
7,000	774	3.91	809	4.20	843	4.49	875	4.78	907	5.07	937	5.37	967	5.66
8,000	803	4.71	837	5.01	870	5.32	901	5.63	932	5.94	961	6.25	990	6.56
9,000	835	5.64	868	5.96	900	6.28	930	6.60	960	6.93	988	7.25	1016	7.58
10,000	870	6.73	902	7.06	932	7.39	961	7.72	990	8.06	1018	8.40	1045	8.74
11,000	907	7.97	937	8.31	967	8.65	995	8.99	1022	9.34	1049	9.69	1075	10.04
12,000	946	9.38	975	9.72	1003	10.07	1030	10.43	1057	10.78	1083	11.14	1108	11.51
13,000	987	10.97	1014	11.32	1041	11.68	1068	12.04	1093	12.40	1119	12.77	1143	13.14
14,000	1029	12.75	1055	13.10	1081	13.46	1107	13.83	1131	14.20	1156	14.58	1179	14.96
15,000	1073	14.73	1098	15.08	1123	15.45	1147	15.82	1171	16.19	1194	16.58	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
5,000	952	4.41	980	4.67	1007	4.92	1032	5.17	1057	5.43	1082	5.68
6,000	974	5.14	1001	5.42	1028	5.69	1054	5.97	1080	6.24	1104	6.52
7,000	995	5.95	1023	6.25	1049	6.55	1075	6.84	1101	7.14	1126	7.44
8,000	1018	6.87	1045	7.18	1072	7.50	1097	7.81	1122	8.13	1147	8.44
9,000	1043	7.91	1070	8.23	1096	8.57	1121	8.90	1146	9.23	1170	9.56
10,000	1071	9.08	1097	9.42	1122	9.76	1147	10.11	1171	10.46	1194	10.80
11,000	1101	10.39	1126	10.75	1151	11.11	1175	11.47	1198	11.82	—	—
12,000	1133	11.87	1157	12.24	1181	12.61	—	—	—	—	—	—
13,000	1167	13.52	1191	13.89	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—
15,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K4, K5***34 (35 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	459	1.75	514	2.02	565	2.28	613	2.53	657	2.78	699	3.03	738	3.27
8,000	509	2.36	558	2.64	605	2.93	650	3.20	691	3.48	731	3.74	768	4.01
9,000	561	3.09	605	3.39	648	3.69	689	3.99	728	4.28	766	4.57	802	4.86
10,000	613	3.95	654	4.27	693	4.58	731	4.89	768	5.21	803	5.52	837	5.83
11,000	667	4.95	704	5.28	740	5.60	775	5.93	809	6.26	843	6.59	875	6.92
12,000	720	6.08	755	6.43	788	6.77	821	7.11	853	7.46	885	7.80	915	8.15
13,000	775	7.37	807	7.73	838	8.08	869	8.44	899	8.80	928	9.16	957	9.52
14,000	829	8.81	860	9.18	889	9.55	918	9.92	946	10.29	973	10.66	1001	11.04
15,000	884	10.40	913	10.80	941	11.18	967	11.56	994	11.94	1020	12.33	1046	12.71
16,000	939	12.17	966	12.58	993	12.98	1018	13.37	1043	13.76	1068	14.16	1092	14.56
17,000	994	14.10	1020	14.53	1045	14.94	1069	15.35	1093	15.76	1116	16.16	1140	16.57
17,500	1021	15.13	1047	15.57	1072	15.99	1095	16.40	1118	16.82	1141	17.23	1164	17.64

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	775	3.51	810	3.74	844	3.97	876	4.20	907	4.43	937	4.65	966	4.87
8,000	804	4.27	838	4.53	871	4.78	903	5.03	933	5.28	963	5.53	991	5.78
9,000	836	5.14	869	5.42	901	5.70	931	5.97	961	6.24	990	6.51	1018	6.78
10,000	870	6.13	902	6.43	933	6.73	962	7.02	991	7.31	1019	7.60	1046	7.89
11,000	907	7.24	937	7.56	967	7.88	995	8.19	1023	8.50	1050	8.81	1076	9.12
12,000	945	8.49	974	8.83	1003	9.16	1030	9.50	1057	9.83	1083	10.15	1109	10.48
13,000	985	9.87	1013	10.23	1040	10.59	1067	10.94	1093	11.29	1118	11.63	1143	11.98
14,000	1028	11.41	1054	11.78	1080	12.15	1105	12.52	1130	12.89	1155	13.25	1179	13.61
15,000	1071	13.10	1096	13.49	1121	13.87	1146	14.26	1170	14.64	1193	15.02	1216	15.40
16,000	1116	14.95	1140	15.35	1164	15.75	1187	16.15	1210	16.55	1233	16.94	1255	17.34
17,000	1163	16.98	1185	17.39	1208	17.8	1230	18.21	1252	18.62	1274	19.03	1296	19.44
17,500	1186	18.06	1208	18.47	1230	18.89	1252	19.30	1274	19.72	1295	20.14	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
7,000	994	5.09	1021	5.30	1047	5.51	1072	5.72	1097	5.93	1121	6.13
8,000	1019	6.02	1045	6.26	1071	6.50	1097	6.73	1121	6.96	1145	7.20
9,000	1045	7.04	1071	7.31	1097	7.57	1122	7.83	1146	8.08	1170	8.34
10,000	1073	8.17	1098	8.46	1124	8.74	1148	9.02	1172	9.30	1196	9.58
11,000	1102	9.42	1127	9.73	1152	10.03	1176	10.33	1200	10.63	1223	10.92
12,000	1134	10.80	1159	11.12	1183	11.44	1206	11.76	1229	12.08	1252	12.39
13,000	1167	12.32	1191	12.66	1214	12.99	1238	13.33	1260	13.66	1282	14.00
14,000	1203	13.97	1226	14.33	1248	14.68	1271	15.04	1293	15.39	—	—
15,000	1239	15.77	1262	16.15	1284	16.52	—	—	—	—	—	—
16,000	1277	17.73	1299	18.12	—	—	—	—	—	—	—	—
17,000	—	—	—	—	—	—	—	—	—	—	—	—
17,500	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K4, K5***40 (40 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	499	2.88	546	3.27	590	3.66	632	4.06	672	4.46	711	4.87	748	5.28
9,000	548	3.78	591	4.20	631	4.62	670	5.04	708	5.47	744	5.90	778	6.33
10,000	599	4.86	637	5.30	675	5.74	711	6.19	746	6.64	779	7.09	812	7.55
11,000	649	6.11	685	6.57	720	7.04	753	7.51	786	7.99	817	8.47	848	8.94
12,000	701	7.54	734	8.03	766	8.52	797	9.02	828	9.52	857	10.02	886	10.52
13,000	753	9.18	783	9.69	813	10.21	842	10.72	871	11.25	899	11.77	927	12.30
14,000	805	11.03	833	11.56	861	12.09	889	12.63	916	13.18	942	13.73	968	14.27
15,000	857	13.09	884	13.64	910	14.20	936	14.76	962	15.32	987	15.89	1011	16.46
16,000	910	15.38	935	15.95	960	16.53	984	17.11	1008	17.69	1032	18.28	1056	18.87
17,000	963	17.91	986	18.50	1010	19.09	1033	19.69	1056	20.30	1078	20.91	1101	21.52
18,000	1016	20.68	1038	21.29	1060	21.9	1082	22.52	1104	23.15	1126	23.77	1147	24.41
19,000	1069	23.71	1090	24.33	1111	24.96	1132	25.6	1153	26.25	1173	26.89	—	—
20,000	1122	26.99	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	784	5.70	819	6.14	853	6.58	885	7.03	917	7.48	948	7.95	978	8.42
9,000	812	6.77	845	7.22	877	7.67	908	8.13	939	8.60	968	9.08	997	9.56
10,000	844	8.01	875	8.47	905	8.94	934	9.42	963	9.90	992	10.39	1020	10.89
11,000	878	9.43	907	9.91	936	10.40	964	10.89	992	11.39	1019	11.89	1045	12.40
12,000	915	11.03	943	11.53	970	12.04	996	12.55	1023	13.07	1048	13.59	1074	14.11
13,000	953	12.82	980	13.35	1006	13.88	1031	14.41	1056	14.95	1081	15.48	1105	16.03
14,000	994	14.82	1019	15.37	1044	15.92	1068	16.48	1092	17.03	1115	17.59	1138	18.15
15,000	1036	17.03	1059	17.61	1083	18.18	1106	18.75	1129	19.33	1151	19.91	1174	20.48
16,000	1079	19.47	1101	20.06	1124	20.66	1146	21.25	1168	21.85	1189	22.45	1211	23.04
17,000	1123	22.13	1145	22.75	1166	23.36	1187	23.98	1208	24.60	1229	25.21	1249	25.83
18,000	1168	25.04	1189	25.67	1209	26.31	1230	26.95	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
8,000	1007	8.90	1036	9.39	1063	9.88	1090	10.38	1116	10.88	1142	11.39
9,000	1026	10.05	1053	10.55	1080	11.05	1107	11.56	1132	12.08	1158	12.60
10,000	1047	11.39	1073	11.89	1100	12.41	1125	12.93	1150	13.45	1175	13.99
11,000	1071	12.91	1097	13.43	1122	13.96	1147	14.49	1171	15.02	1195	15.56
12,000	1098	14.64	1123	15.17	1147	15.71	1171	16.25	1195	16.80	1218	17.35
13,000	1129	16.57	1152	17.12	1175	17.67	1198	18.22	1221	18.78	1243	19.35
14,000	1161	18.71	1184	19.27	1206	19.84	1228	20.41	1250	20.99	1271	21.56
15,000	1196	21.07	1217	21.65	1239	22.23	1260	22.82	1280	23.41	—	—
16,000	1232	23.64	1253	24.25	1273	24.85	1293	25.45	—	—	—	—
17,000	1270	26.46	1289	27.07	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K4, K5***50 (50 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	608	4.96	646	5.40	683	5.85	719	6.30	754	6.75	787	7.20	819	7.66
11,000	659	6.23	694	6.69	728	7.16	762	7.64	794	8.11	825	8.59	856	9.07
12,000	710	7.68	743	8.17	775	8.67	806	9.17	836	9.67	866	10.17	895	10.67
13,000	763	9.35	793	9.86	823	10.37	852	10.89	880	11.42	908	11.94	935	12.47
14,000	815	11.22	843	11.75	871	12.29	899	12.83	925	13.38	952	13.92	978	14.47
15,000	868	13.31	895	13.86	921	14.42	946	14.98	972	15.55	997	16.12	1021	16.69
16,000	921	15.64	946	16.21	971	16.78	995	17.37	1019	17.96	1042	18.54	1066	19.14
17,000	974	18.20	998	18.79	1021	19.39	1044	19.99	1067	20.60	1089	21.21	1112	21.82
18,000	1028	21.01	1050	21.62	1072	22.24	1094	22.86	1116	23.49	1137	24.12	1158	24.75
19,000	1081	24.08	1103	24.71	1124	25.35	1145	25.99	1165	26.63	1185	27.28	1206	27.93
20,000	1135	27.42	1155	28.06	1175	28.72	1195	29.38	1215	30.04	1234	30.71	1254	31.38

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	851	8.12	882	8.58	912	9.06	941	9.53	970	10.02	998	10.51	1026	11.00
11,000	886	9.55	915	10.04	943	10.53	971	11.02	999	11.52	1026	12.02	1052	12.53
12,000	923	11.17	950	11.68	978	12.19	1004	12.70	1030	13.22	1056	13.74	1081	14.26
13,000	962	12.99	988	13.52	1014	14.05	1039	14.59	1064	15.12	1088	15.66	1112	16.20
14,000	1003	15.02	1028	15.57	1052	16.12	1076	16.68	1100	17.23	1123	17.79	1146	18.35
15,000	1045	17.26	1069	17.83	1092	18.41	1115	18.98	1138	19.56	1160	20.14	1182	20.72
16,000	1089	19.73	1111	20.32	1134	20.92	1156	21.52	1177	22.11	1199	22.71	1220	23.31
17,000	1134	22.43	1155	23.05	1176	23.66	1198	24.28	1218	24.90	1239	25.52	1259	26.14
18,000	1179	25.38	1200	26.02	1220	26.65	1240	27.29	1260	27.93	1280	28.57	1300	29.21
19,000	1226	28.58	1245	29.24	1265	29.9	1284	30.55	—	—	—	—	—	—
20,000	1273	32.05	1292	32.72	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
10,000	1053	11.51	1080	12.01	1106	12.53	1131	13.05	1156	13.58	1181	14.11
11,000	1078	13.05	1103	13.57	1128	14.09	1153	14.63	1177	15.16	1201	15.71
12,000	1106	14.79	1130	15.33	1154	15.86	1178	16.41	1201	16.96	1224	17.51
13,000	1136	16.74	1160	17.29	1183	17.85	1206	18.40	1228	18.96	1250	19.53
14,000	1169	18.91	1192	19.48	1214	20.04	1236	20.62	1257	21.19	1279	21.77
15,000	1204	21.30	1226	21.88	1247	22.47	1268	23.05	1289	23.65	—	—
16,000	1241	23.91	1262	24.51	1282	25.12	—	—	—	—	—	—
17,000	1279	26.76	1299	27.38	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
19,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

50K4, K5***60 (60 Tons) Horizontal Discharge Units[a]

Airflow (cfm)	Available External Static Pressure (in. wg)													
	0.2		0.4		0.6		0.8		1.0		1.2		1.4	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	490	4.48	543	5.17	591	5.88	634	6.61	674	7.37	711	8.14	746	8.94
13,000	522	5.39	572	6.11	618	6.85	659	7.61	698	8.38	734	9.18	769	9.99
14,000	554	6.41	602	7.17	645	7.94	686	8.72	723	9.51	759	10.33	792	11.16
15,000	586	7.56	632	8.34	674	9.14	713	9.94	749	10.77	784	11.60	816	12.45
16,000	619	8.83	663	9.64	703	10.46	741	11.30	776	12.14	810	13.00	841	13.87
17,000	652	10.23	694	11.07	733	11.92	769	12.78	803	13.65	836	14.53	867	15.42
18,000	685	11.76	725	12.63	763	13.51	798	14.39	831	15.29	863	16.20	893	17.11
19,000	719	13.44	757	14.33	793	15.23	827	16.14	860	17.07	890	18.00	920	18.94
20,000	753	15.26	789	16.18	824	17.10	857	18.04	888	18.99	918	19.94	947	20.90
21,000	787	17.23	822	18.17	855	19.12	887	20.08	918	21.05	947	22.03	975	23.02
22,000	821	19.35	855	20.32	887	21.29	918	22.28	947	23.28	976	24.28	1003	25.28
23,000	855	21.63	888	22.62	919	23.62	949	24.63	977	25.65	1005	26.68	1032	27.71
24,000	889	24.07	921	25.08	951	26.11	980	27.14	1008	28.19	1035	29.24	1061	30.29
25,000	924	26.67	954	27.71	983	28.76	1011	29.82	1038	30.89	1065	31.96	1090	33.04
26,000	958	29.45	987	30.51	1016	31.59	1043	32.67	1069	33.76	1095	34.85	1120	35.95
27,000	993	32.40	1021	33.49	1048	34.58	1075	35.69	1101	36.80	1126	37.92	1150	39.04

Airflow (cfm)	Available External Static Pressure (in. wg)													
	1.6		1.8		2.0		2.2		2.4		2.6		2.8	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	779	9.76	811	10.60	841	11.45	870	12.33	898	13.22	925	14.13	951	15.06
13,000	801	10.82	832	11.68	862	12.55	891	13.44	918	14.35	945	15.27	971	16.20
14,000	824	12.01	855	12.88	884	13.76	912	14.67	939	15.59	965	16.52	991	17.47
15,000	848	13.32	878	14.21	906	15.11	934	16.02	961	16.96	987	17.90	1012	18.87
16,000	872	14.76	901	15.66	929	16.58	957	17.51	983	18.46	1008	19.42	1033	20.39
17,000	897	16.33	926	17.25	953	18.19	980	19.13	1006	20.10	1031	21.07	1055	22.06
18,000	922	18.04	950	18.98	978	19.93	1004	20.89	1029	21.87	1054	22.86	1078	23.86
19,000	949	19.88	976	20.84	1003	21.81	1028	22.80	1053	23.79	1078	24.80	1101	25.81
20,000	975	21.87	1002	22.85	1028	23.84	1053	24.85	1078	25.86	1102	26.88	1125	27.91
21,000	1002	24.01	1029	25.01	1054	26.02	1079	27.04	1103	28.07	1126	29.11	1149	30.16
22,000	1030	26.30	1056	27.32	1081	28.35	1105	29.39	1129	30.44	1152	31.50	1174	32.57
23,000	1058	28.75	1083	29.79	1108	30.85	1131	31.9	1155	32.97	1177	34.05	1199	35.13
24,000	1086	31.35	1111	32.42	1135	33.49	1158	34.57	1181	35.66	—	—	—	—
25,000	1115	34.12	1139	35.21	1163	36.31	1186	37.41	—	—	—	—	—	—
26,000	1144	37.06	1168	38.17	1191	39.29	—	—	—	—	—	—	—	—
27,000	1174	40.17	1197	41.30	—	—	—	—	—	—	—	—	—	—

Airflow (cfm)	Available External Static Pressure (in. wg)											
	3.0		3.2		3.4		3.6		3.8		4.0	
	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp	rpm	bhp
12,000	977	16.00	1002	16.96	1026	17.92	1049	18.9	1072	19.89	1094	20.89
13,000	996	17.16	1020	18.13	1044	19.11	1067	20.1	1090	21.10	1112	22.12
14,000	1016	18.44	1040	19.42	1063	20.41	1086	21.41	1109	22.43	1131	23.46
15,000	1036	19.84	1060	20.83	1083	21.84	1106	22.85	1128	23.88	1150	24.92
16,000	1057	21.38	1081	22.39	1104	23.40	1126	24.43	1148	25.47	1170	26.52
17,000	1079	23.06	1102	24.07	1125	25.1	1147	26.14	1169	27.19	1190	28.26
18,000	1101	24.88	1124	25.91	1147	26.94	1169	28.00	1190	29.06	—	—
19,000	1124	26.84	1147	27.89	1169	28.94	1190	30.00	—	—	—	—
20,000	1148	28.96	1170	30.01	1192	31.08	—	—	—	—	—	—
21,000	1172	31.22	1194	32.30	—	—	—	—	—	—	—	—
22,000	1196	33.65	—	—	—	—	—	—	—	—	—	—
23,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
25,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
27,000	—	—	—	—	—	—	—	—	—	—	—	—

NOTE(S):

a. Fan performance is based on wet coils, economizer, roof curb, cabinet losses, clean 2 in. filters, and high gas heat.

Performance data (cont)

Exhaust Fan Performance — Multi-Stage Power Exhaust[a]

48/50K2,K3,K4,K5**20-50 (20 to 50 Tons)						
Airflow (cfm)	208-v			230/460/ 575-v		
	ESP	Bhp	Watts	ESP	Bhp	Watts
7,700	0.60	3.69	4140	0.73	3.98	4460
7,900	0.56	3.74	4190	0.69	4.02	4510
8,100	0.51	3.78	4240	0.65	4.07	4560
8,500	0.41	3.83	4290	0.56	4.12	4620
8,900	0.31	3.93	4410	0.47	4.23	4740
9,300	0.20	4.07	4560	0.37	4.37	4900
9,700	0.11	4.17	4670	0.30	4.47	5010
10,100	0.04	4.25	4770	0.23	4.56	5110
10,500	—	—	—	0.17	4.66	5220
10,900	—	—	—	0.12	4.75	5330
11,300	—	—	—	0.07	4.80	5380
11,700	—	—	—	0.04	4.83	5420
48/50K2,K3,K4,K5**60 (60 Tons)						
Airflow (cfm)	208-v			230/460/575-v		
	ESP	Bhp	Watts	ESP	Bhp	Watts
11,550	0.60	5.54	6210	0.73	5.97	6690
11,850	0.56	5.61	6285	0.69	6.03	6765
12,150	0.51	5.67	6360	0.65	6.10	6840
12,750	0.41	5.74	6435	0.56	6.18	6930
13,350	0.31	5.90	6615	0.47	6.34	7110
13,950	0.20	6.10	6840	0.37	6.56	7350
14,550	0.11	6.25	7005	0.30	6.70	7515
15,150	0.04	6.38	7155	0.23	6.84	7665
15,750	—	—	—	0.17	6.98	7830
16,350	—	—	—	0.12	7.13	7995
16,950	—	—	—	0.07	7.20	8070
17,550	—	—	—	0.04	7.25	8130

NOTE(S):

a. Conversion — 1 watt = 0.00134102 bhp

LEGEND

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

Exhaust Fan Performance — High Capacity Power Exhaust[a]

PART NO.	VOLTAGE (v-Ph)	CFM PERFORMANCE VS. STATIC PRESSURE				TOTAL AMPS	NOISE (dB)	
		1/4 in.	3/8 in.	1/2 in.	5/8 in.		at 1 foot	at 10 feet
Single Module								
CRPWREXH071A01	230-3	9,817	9,631	9,591	8,964	12.8	88	77
CRPWREXH072A01	460-3					6.4		
CRPWREXH073A01	575-3					4.8		
Two Module								
CRPWREXH074A01	230-3	19,634	19,262	19,182	17,928	25.6	88	77
CRPWREXH075A01	460-3					12.8		
CRPWREXH076A01	575-3					9.6		
Three Module								
CRPWREXH077A01	230-3	29,451	28,893	28,773	26,892	38.4	88	77
CRPWREXH078A01	460-3					19.2		
CRPWREXH079A01	575-3					14.4		

NOTE(S):

a. Conversion — 1 watt = 0.00134102 bhp

LEGEND

dB — Decibel
cfm — Cubit Feet Per Minute

Application guidance

General

Overview

Consider the following guidance on unit installation and application.

Transportation

Units with A2L refrigerant require special consideration for transportation and handling. Review code requirements for transporting units with A2L refrigerant.

Carrier applied rooftop units contain more than 26.5 lb (12 kg) of A2L refrigerant and should only be transported on a flatbed.

For applications where the unit is required to ship via boat or in an enclosed container, a special order is available to charge the unit with nitrogen, instead of A2L refrigerant.

Storage

Project schedules may require equipment to be stored for extended periods of time. Most modern HVAC equipment contains electronic components that have specific storage requirements. Units that have been in storage for extended periods of time or have been exposed to conditions outside of storage requirement require special attention when starting equipment. Refer to the unit installation instructions for storage and start-up.

Units with A2L refrigerant require special consideration for storage. Leak detection may be required during storage. Indoor storage may require ventilation. Storage must comply with all code requirements.

For applications where the unit will be in extended storage, a special order is available to charge the unit with nitrogen, instead of A2L refrigerant.

Climate

Verify the geographic location of the installation. The location's climate determines the outdoor air and entering condenser air conditions for sizing and selecting the equipment.

The location can impact the type of operation the unit will need to perform. Warm climates may only require cooling, while mild climates may require both cooling and heating. Humid climates may require dehumidification.

Environment

Consider the areas around the installation site that can impact the unit. Forests, gardens, and fields generate pollen and seeds that can clog condenser coils, outdoor air intake screens, and filters.

Air conditioning units installed near coastlines or in highly polluted areas require special consideration for protecting coils and other metal surfaces from corrosion.

Elevation and altitude

Verify the jobsite elevation as it can impact selection conditions. Air is less dense as elevation increases and affects selection conditions, airflow performance, and gas heat performance.

High altitude units may be subject to high winds and require special attention. The condenser coils may require wind baffles for mechanical cooling during high winds. Gas heat units exposed to high winds may require flue vent extensions.

Units exposed to very high winds require mechanical attachment to the curb or mounting structure with curb clips or anchor bolts.

Codes

Municipalities can have code requirements for packaged air conditioning and heating equipment. Examples include:

- California Title 24 energy code has specific requirements for HVAC units, including economizer operation, demand control ventilation, and demand shedding.
- Chicago Construction Code mandates there be refrigerant relief valves on any circuit with more than four pounds of refrigerant.
- Florida Building Code has requirements for wind load and full perimeter roof curbs.

NOTE: Review local codes before configuring and installing packaged air conditioning equipment.

Unit location

Overview

Review plans or site notes for obstructions that impede the installation, service access, or airflow. Be sure to take note of unit utility connection points and sources, including power and control wiring, condensate disposal, gas connections (48K units), and hot water connections (50K units with special order hot water coil). Review local code requirements for clearances before finalizing the unit location. Ensure equipment is not accessible by the general public.

Installation clearances

Verify access is available for the rigging and installation of equipment. Review the equipment path for rigging and obstructions that may be present. Avoid rigging equipment over power lines or occupied areas.

Consider access requirements for installing accessories, condensate pipe connections, and power and control wiring connections. Verify clearance for gas piping connections and flue vents for gas heat units. Verify coil piping connection clearances for units with hot water coil.

Service clearances

Refer to the certified drawings for service clearance requirements. Clearances are from the end or side of the unit. The provided dimensions allow for the removal of the largest component in each unit section.

Consider additional service clearances for equipment, such as cranes, gantries, or hoists required to support equipment service.

Control and power box service clearance may be higher if the control box is adjacent to a conductive surface. Review local code requirements for clearance requirements with conductive surfaces.

Condenser airflow clearances

Consider airflow clearance for the condenser. Airflow may be required on the sides and the end of the condenser. Overhead obstructions (within 20 ft) of the condenser fans are not permitted. Side or end obstructions may be permitted if they allow air to pass or do not obstruct more than 25% of the condenser surface.

Do not locate condenser coils near exhaust or scrubber outlets, as the contaminants from the exhaust system can clog or damage the condenser coils.

Application guidance (cont)

Keep the condenser coils away from corrosive sources. Use e-coated coils where the environment is mildly corrosive, such as coastal locations.

Outdoor air intake clearances

Do not locate outdoor air intakes within 10 ft of exhaust air sources, flue vent outlets, or other sources of contaminated air. If possible, locate the outdoor air intake away from prevailing winds.

Gas heat clearances

For units with gas heat, clearance is required for the combustion air inlet and flue exhaust. Do not locate combustion inlets near combustible or highly contaminated exhaust air sources.

Do not locate flue gas outlets near the outdoor air intakes of other air conditioning units or ventilation devices.

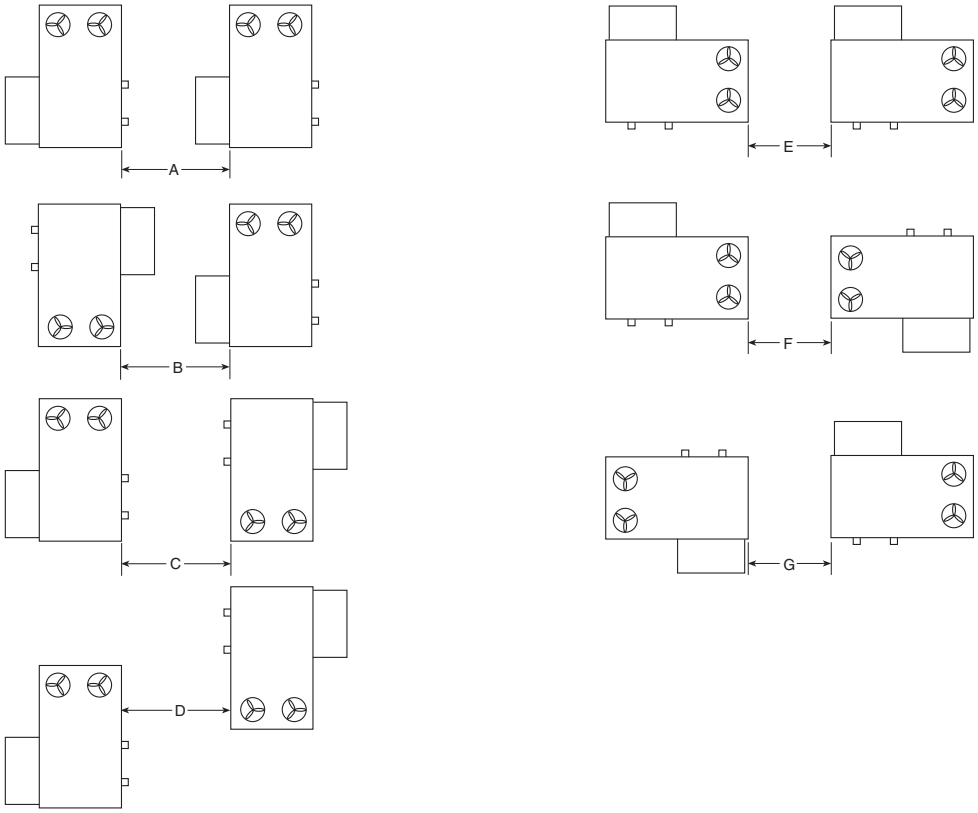
Exhaust outlet clearance

For units with factory-installed exhaust fans, do not locate the exhaust air outlets near the outdoor air intake of other air conditioning units or ventilation devices. Do not locate exhaust outlets of heavily contaminated air near condenser coils or combustion gas inlets.

Multi-unit spacing

For applications with multiple units installed side-by-side or end-by-end, see figure below for minimum unit separation distances. When units have different clearance requirements, use the higher spacing requirement.

48/50K — Multiple Unit Spacing



Minimum Unit Spacing (ft)

UNIT	A	B	C	D	E[a]	F	G[a]
48K2,K3,K4,K5**20	15	8	4	4	10	8	10
48K2,K3,K4,K5**26							
48K2,K3,K4,K5**30							
48K2,K3,K4,K5**34							
48K2,K3,K4,K5**40							
48K2,K3,K4,K5**50							
48K2,K3,K4,K5**60							

NOTE(S):

a. Required for coil removal. Spacing can be reduced to 6 ft if coil removed from top.

Minimum Unit Spacing (ft)

UNIT	A	B	C	D	E[a]	F	G
50K2,K3,K4,K5**20	15	8	4	4	10	8	10
50K2,K3,K4,K5**26							
50K2,K3,K4,K5**30							
50K2,K3,K4,K5**34							
50K2,K3,K4,K5**40							
50K2,K3,K4,K5**50							
50K2,K3,K4,K5**60							

NOTE(S):

a. Required for coil removal. Spacing can be reduced to 6 ft if coil removed from top.

Application guidance (cont)

Utility sources

Verify the distance and location of the unit compared to utility sources. Power wire length may be limited by the unit minimum circuit ampacity, available wire size, and the factory terminal block or disconnect lug size. Control wiring distances can be limited based on wiring size and type. Long wire-length installations may require repeaters.

NOTE: For gas heat units, verify the distance between the unit and the main gas line and the gas shut-off.

NOTE: For units with a hot water coil, verify the distance between the hot water coil and the nearest pipe connection. Verify the pump is sized for the flow and pressure drop of the hot water coil and piping.

Unit support

Consider how the unit will be mounted. Direct ground installation is not recommended. Verify structure weight, service clearances and clearances for ducting, power and control wiring, and condensate draining for all support types. Use the following recommended unit support methods: roof curb, support structure, or slab mount.

Roof curb

Units can be installed on an accessory or field-provided roof curb. The roof curb support rails must support the unit base pan, not the unit base rail. For field-provided roof curbs, the location and size of curb rails should be no less than the Carrier installed roof curbs (accessory).

Verify sufficient structure is available to support the roof curb and unit weight, as well as any additional loads from wind or heavy snow.

For units with vertical supply or return duct connections, the ductwork must connect to the roof curb, not the unit base pan.

The air handling section of the unit must use a full perimeter roof curb. The end of the condenser section can rest on a sleeper rail.

For applications that require mechanical attachment of the unit to the roof curb, use field-provided curb clips. The curb clips must connect to the side of the unit base rail.

Consider power and control wire routing when using roof curbs. All units include couplings for thru-the-base power and control wiring.

Support structure

Units can be installed on a field-provided support structure. The structure can support the unit base pan or the base rails.

For a base pan support structure, the structure must provide the same support as a Carrier roof curb accessory. Support must be provided along the entire perimeter edge of the unit base pan and around the supply and return duct openings.

For a base rail support structure, the support structure must provide support along the entire length of the side base rails. Additional support under the two base pan ends is recommended.

For units with a support structure and vertical supply or return duct connections, the ductwork must connect to the support structure, not the unit base pan or base rails.

Verify that the support structure and other supporting members can support the unit weight and additional loads from wind or heavy snow. Verify that the structure height provides sufficient clearance for condensate drainage.

For applications that require mechanical attachment of the unit to the support structure, use field-provided curb clips or anchor bolts. The curb clips or anchor bolts must connect to the side of the unit base rail.

For installations where the unit bottom is exposed to the elements, protection is required for the base pan insulation using the double-wall bottom construction option.

Consider power and control wire routing when using support structures. All units include couplings for thru-the-base power and control wiring.

Slab mount

Units can be installed on a field-provided slab. The slab must provide adequate height for condensate drainage.

The slab should be a minimum of 8 in. thick and at least 4 in. above grade. Extend the slab 6 in. beyond the cabinet edge to ensure sufficient space for unit placement.

Carrier recommends using a minimum of four, semi-equally spaced vibration pads on each side base rail to reduce vibration and sound transmission. The end vibration pads should be within 12 in. of the end of the unit.

Do not locate the slab near roads, exhaust systems, or foliage, where dirt, debris, and pollen can clog the condenser coil, outdoor air screens, and filters. Use a gravel apron near the outdoor air intake, condenser, and gas heat inlet (if equipped) to inhibit the growth of foliage next to the unit.

For installations where the unit bottom is exposed to the elements, protection is required for the base pan insulation using the double-wall bottom construction option.

Screening

For installation where screening is required, Carrier does not recommend supporting the screen from the unit or curb. The screen should have a separate support system.

For solid panel screens, maintain airflow clearances for the condenser, outdoor air intake, exhaust (if equipped), and gas heat (if equipped) systems.

For perforated or screened panels that allow airflow to pass, airflow clearances may be reduced depending on the panel airflow resistance and air entrapment.

In applications where the screening system is not removable, service clearances must be maintained.

In applications where the screens are removable, the screen can be installed closer to the unit if service clearances can be maintained when the screens are removed.

Ductwork

Review project plans or site reports for supply and return duct orientations and connection locations.

For units with vertical supply or return, the ductwork must connect to the roof curb or support structure. Do not attach the ductwork to the base pan or base rails.

For units with horizontal supply or return, a factory-provided flange is included for ductwork connections.

Use a single supply duct to connect all supply openings and a single return duct to connect all return openings. Do not use multiple ducts for each opening.

NOTE: Vertical and horizontal supply and horizontal return duct connection orientations are not field convertible. Units with vertical return can be converted to horizontal return. See the unit installation instructions for details.

Application guidance (cont)

Condensate drainage

All units require a field-connected condensate drain. The unit must be installed with allowed tolerances to promote drainage. Roof curb, support structures, or slabs should provide adequate clearance to install a condensate drain.

A drain trap is recommended to prevent unfiltered air from entering the unit The drain trap size must be sized for a draw-thru application based on the installed static pressure. Consider waterless traps or trap shutoffs for indoor air quantity-conscious applications.

NOTE: The unit does not have any secondary drain connections in the unit base rails.

Power wiring and protection

For new construction installations, review project documentation for voltage, minimum circuit ampacity (MCA), maximum overcurrent protection (MOCP), and short circuit current rating (SCCR).

For retrofit or replacement installations, review the existing unit information for voltage, minimum circuit ampacity, maximum overcurrent protection, and short circuit current rating. Also review the existing power feed information (if re-used) for voltage, wire size, breaker size, fuse size, disconnect size, and maximum short circuit fault current.

The unit voltage must match the power feed voltage. The units are not field convertible for alternate voltages. For applications with high voltage fluctuations (>10% of nominal), a phase monitor or isolation transformer may be required.

Review the unit minimum circuit ampacity (MCA). This information is used to size the power conductors feeding the unit. The conductors must be rated to handle no less than the MCA value based on the installation length, rated temperature, and wiring arrangement.

Review the unit maximum overcurrent protection (MOCP). This value is used to size the breaker or fuses for the unit power feed. The installed overcurrent protection device cannot be rated higher than the unit MOCP.

It may be acceptable to install an overcurrent protection device that is rated lower than the nameplate MOCP if it has a protection rating no lower than the unit MCA. Using an overcurrent protection device that is rated lower than the MOCP can lead to nuisance trips.

The field-provided power wiring enters the power box through the back panel on the bottom left side (when looking at the front of the power box). Power conductors must be copper. Aluminum conductors are not allowed.

Power wiring connections are made in the dedicated high voltage power box at the terminal block or non-fused disconnect.

For units without a factory-installed non-fused disconnect, a field-provided disconnect is required.

Verify the required short circuit current rating (SCCR) for the unit as specified in the National Electric Code (NEC).

For units with the high short circuit current rating option, a field-provided disconnect or fuse block with J-type current-limiting fuses must be installed and wired upstream of the unit terminal block.

All units have factory-installed couplings for thru-the-base power and control wiring. The couplings must be sealed-up in the field during installation.

Controls

Review project documentation or jobsite reports on control requirements. Review application details for control methodology and required sensors and control inputs.

NOTE: For job sites with a building automation system (BAS), verify communication type (BACnet, CCN, Modbus, etc.) and method (MS/TP, IP, etc.)

Most field control wiring connections are made at the terminal blocks in the front of the dedicated low voltage control box. The control wiring enters the control box through the top of the right-side panel (when looking at the front of the control box).

Acoustics

To minimize sound transmitted to the space or areas around the unit, consider the following recommendations:

Location

Avoid locating the unit above sound-sensitive areas. Locate the unit above restrooms, storage areas, corridors, or other noise-tolerant areas. Locate the units at least 25 ft away from critical areas. If this is not possible, the ductwork and ceiling structure should be acoustically treated. Consider the use of vibration isolators or an acoustic curb.

Avoid locating the unit next to exterior walls or windows of sound-sensitive areas. If unavoidable, locate the condenser away from the occupied space. Use the low-sound condenser fans and compressor sound blankets to reduce radiated sound levels. Use sound barriers as necessary.

Avoid mounting the unit in the middle of large roof expanses between vertical supports. This will minimize the phenomenon known as roof bounce. Install the units close to vertical roof supports (columns or load-bearing walls).

Ductwork

Use flexible connectors between the unit and the supply and return ducts. Supply and return air main trunk ducts should be located over hallways and/or public areas. Provide trailing edge turning vanes in ductwork elbows and tees to reduce air turbulence. Make the ductwork as stiff as possible. Use round duct wherever possible because it is less noisy.

Seal all penetrations around ductwork entering the space. Make sure that ceiling and wall contractors do not attach hangers or supports to ductwork. Provide as smooth and gradual transition as possible when connecting the rooftop unit discharge to the supply duct.

If a ceiling plenum return is used, provide a return elbow or tee to eliminate line-of-sight noise to the space. Face the entrance of the return duct away from other adjacent units.

Acoustic insulation

Provide acoustic interior lining for the first 20 ft of supply and return duct or until the first elbow is encountered. The elbow prevents line-of-sight transmission in the supply and return ducts.

Install a double layer of 2 in. acoustical pads with mass-loaded vinyl facing on top of the roof deck before building insulation and roofing installation occur. Place the material inside the curb and for 4 to 8 ft beyond the unit perimeter.

Openings in the pad should only be large enough for the supply and return ducts. An alternate approach is to use two layers of gypsum board with staggered seams in addition to the acoustical pad.

Application guidance (cont)

Indoor fan control

Consider using an indoor fan control method that allows for incremental levels of speed modulation, such as single or multi-zone variable air volume (VAV) control. The incremental fan speed changes are less noticeable to occupants than discrete fan speed changes.

Application type

General

Consider how the unit is being applied, as the application type can dictate required operation and factory-installed options.

Single-zone

For most single-zone comfort cooling applications or in applications where the cooling capacity is staged based on the space temperature, precise supply air temperature isn't required. In these applications, it may be acceptable to use SAV™ or CV indoor fan control with staged cooling and heating systems, such as staged compressor and two-stage heat.

If precise supply air temperature control is required or the cooling or heating airflow is modulated based on the space temperature (SZ-VAV), then variable-capacity cooling and heating systems, such as variable-capacity digital compressor and modulating or multi-stage heat, are required. Variable-capacity cooling and heating systems should also be used for third-party modulated indoor fan operation.

Consider using a dehumidification system, like Humidi-MiZer, in applications in humid climates or with high latent loads. Having a dedicated dehumidification mode will allow the unit to dehumidify the space without overcooling. A variable-capacity compressor is recommended with dehumidification operation.

Multi-zone variable air volume (VAV)

Multi-zone VAV applications with air terminal units require VAV indoor fan control based on duct supply pressure. The wide airflow range of multi-zone VAV systems requires variable capacity cooling and heating systems (such as variable-capacity digital compressor and modulating heat).

Multi-zone VAV systems do not typically require dedicated dehumidification operation, as the unit typically provides constant cool, dehumidified air whenever there isn't a ventilate or heating demand.

Advanced applications

Contact your local Carrier applied sales representative for guidance on advanced applications, including:

- Process applications
- Mission or condition critical
- Two or more units on a common duct system, "twinned"
- 100% outdoor air or high mixed air (>90°F/32.2°C) operation
- Applications above 115°F (46.1°C) ambient

Application conditions

Consider both full and part-load operating conditions, including airflows, static pressures, and temperatures to ensure the unit is appropriately sized and configured for the application.

For new construction or major retrofit applications, the operating conditions are often subject to the project plans and mechanical schedules.

For replacement applications, operating conditions can be difficult to determine and "like-for-like" replacement isn't always the best option. Information on operating conditions can be obtained from original plans and mechanical schedules, air balance documentation, and BAS trends. If application direct data isn't available, compare existing unit operating parameters (fan speeds, sheave settings, DX temperatures and pressures, etc.) to product data. Also consider changes to the climate and to building loads since the original equipment was installed.

Mechanical cooling and dehumidification airflow

This ensures the application full-load airflow for cooling and dehumidification is within the minimum and maximum full load airflows for the unit. Ensure the part-load airflow for cooling, cool-tempered venting, and part-load dehumidification is at or above the minimum part-load airflow. See "Capacities and ratings (cont)" on page 16 for airflow limits.

Mechanical cooling and dehumidification temperatures

- Minimum entering evaporator air temperature: 67°F (19.4°C)
- Maximum entering evaporator air temperature: 90°F (32.2°C)
- Minimum entering condenser air temperature: –20°F (–28.8°C)
- Maximum entering condenser air temperature: 115°F (46.1°C)

Heating airflow

Heating airflow ensures the application full-load airflow for heating is within the minimum and maximum full-load airflows for the heat type. Ensure the part-load airflow for heating, heat-tempered venting, or heat-tempered cooling is above the minimum airflow for heat stage 1, multi-stage, modulating heat. See "Capacities and ratings (cont)" on page 16 for airflow limits by heat type.

Alternate minimum or maximum temperatures may be allowable based on application airflow or unit configuration. Contact your local Carrier applied sales representative for guidance.

Heating temperatures

- Minimum gas heat entering air temperature with standard heat exchanger: 50°F (10°C)
- Minimum gas heat entering air temperature with stainless steel heat exchanger: 20°F (–6.7°C)
- Maximum gas heat entering air temperature: 75°F (23.8°C)
- Minimum electric heat entering air temperature: 50°F (10°C)
- Maximum electric heat entering air temperature: 75°F (23.8°C)

Alternate minimum or maximum temperatures may be allowable based on application airflow or unit configuration. Contact your local Carrier applied sales representative for guidance.

Application guidance (cont)

Temporary Operation for an Under-Construction Building

This product is not designed to operate in a construction environment. Extensive equipment damage can be caused by operating this equipment while construction, renovation, or remodeling is occurring in the space or near the equipment. Carrier recommends using equipment designed for specific construction duty or specialized application duty based on the construction or application needs.

Temporary Operation for a Completed Building

Carrier does not recommend operating this product without proper configuration and startup being performance, and prior to the building being completed and occupied. Operating the equipment prior to configuration and startup or without sufficient system loads can lead to equipment damage.

If temporary operation of equipment is required, contact your local Carrier applied sales representative for guidelines. Please note that equipment must be operated and maintained in accordance to manufacturer's recommendations. Damage caused by improper operation or lack of maintenance is not covered by standard or extended warranties.

Factory-installed option guidance

General

Consider the following guidance on when to use factory-installed options based on application or customer requirements.

NOTE: Factory-installed options cannot be field-installed unless they are available as an accessory.

Application type

Staged air volume (SAV™)

Units are intended for use in single-zone applications without air terminal units for space temperature or thermostat input control.

SAV units default to SAV capacity indoor fan control and are field configurable for SAV demand, CV, or third-party input control.

SAV units can be field converted to supply duct static pressure control for true constant volume operation by adding the appropriate duct static pressure sensor and required pneumatic tubing and wiring.

Variable air volume (VAV)

Units are intended for VAV indoor fan based on supply duct static pressure for MZ-VAV applications with air terminal units and return air temperature control. It can also be used for single-zone VAV (SZ-VAV) applications.

VAV units default to MZ-VAV supply duct static pressure control. Units can be field configured for third-party modulating control, SAV (demand or capacity), SZ-VAV, or CV.

A digital compressor is required for VAV applications. A mutli-stage or modulating heat source (multi-stage gas, modulating electric, or hot water coil) or no heat is recommended for VAV applications.

Direct expansion options

Low ambient

The low ambient option includes variable speed condenser fans with Greenspeed® intelligence control to modulate the condenser fan speed to maintain condensing pressure. Allows mechanical cooling down to –10F (–23.3C) and reduces condenser fan energy consumption and radiated sound levels during part-load cooling and dehumidification operation. Recommended for applications where economizer free cooling can't be performed or for applications where mechanical cooling is required as a backup to free cooling. Also recommended for sound or energy conscious applications.

Low sound package

The low sound package replaces the standard condenser fans with low sound, AeroAcoustic™ condenser fans with fan shrouds and low speed motors (except size 34, which is standard with the shrouded, AeroAcoustic). Also includes sound blankets on all compressors. Reduces radiated sound during cooling and dehumidification operation. Recommended for sound-sensitive applications. Note that the lower condenser fan speed can increase condensing temperature, so use caution when applying this option in high ambient applications or where condenser airflow is restricted (installation, recirculation, debris, etc.).

High efficiency, low ambient, low sound package

The combination of variable speed condenser fan with Greenspeed® intelligence in the low ambient package and the efficient, AeroAcoustic™ condenser fans with low rpm motors in the low sound package results in part-load energy savings during cooling and dehumidification and an improved part-load cooling integrated energy efficiency ratio (IEER) on most units. Select units also receive a higher full-load energy efficiency ratio (EER). Recommended for applications where both low ambient and low sound are required, for energy conscious applications, or to achieve a higher EER or IEER rating for code compliance, which combine to reduce radiated sound output during cooling and dehumidification operation.

This package is also recommended for sound-sensitive applications. When combined with variable speed control with Greenspeed intelligence, the lower condenser fan speed and efficient AeroAcoustic fan reduce condenser fan energy consumption during cooling and dehumidification operation.

Applications with high mechanical cooling hours to reduce energy consumption or high electricity costs is also recommended to reduce operating costs. Applications where higher EER or IEER ratings are required for code or utility rebates can also be used and is recommended.

The lower condenser fan speed can increase condensing temperatures at peak conditions, so use caution when applying this option in high ambient applications or where condenser airflow is restricted (installation, recirculation, debris, etc.).

Humidi-MiZer® adaptive dehumidification

Adaptive dehumidification provides a reheat source that allows the unit to dehumidify without overcooling the space. Humid-MiZer can also improve system performance during simultaneous cooling and dehumidification.

It is recommended for applications where dedicated dehumidification operation is required, such as humid climates, spaces with high humidity loads (gymnasiums, conference areas), or applications with high quantities of outdoor air.

Construction options

Double-wall construction

This option provides galvanized steel liners over the top and side panels in the air handling section of the unit. Recommended for indoor air quality (IAQ) conscious applications or applications in dirty environments to provide wipe down capability for easy cleaning.

Agion® double-wall construction

Provides Agion® coated galvanized steel liners over the access doors and the top and side panels in the air handling section of the unit. Recommended for indoor air quality (IAQ) conscious applications to provide wipe down capability and help resist microbial growth.

Double-wall bottom

Double-wall bottom provides a galvanized liner over the base pan insulation to protect the insulation against the elements. NOTE: It is required for slab or structure mounted applications with horizontal supply and return to protect the insulation.

Factory-installed option guidance (cont)

Drain pan and coil

Stainless steel drain pan

This drain pan is required for applications with mildly corrosive indoor environments or with mildly corrosive outdoor environments and operation with outdoor air.

E-coated MCHX condenser coil

Provides condenser coil protection, which can help maintain unit efficiency and performance.

NOTE: It is required for applications in mildly corrosive environments.

It is recommended in rainy climates or applications with frequent condenser coil cleaning to help prevent moisture entrapment in the coil, which can cause head pressure issues or reduces efficiency.

E-coated (Al/Cu) evaporator coil

Provides evaporator coil protection, which can help maintain unit efficiency and performance. E-coated evaporator coils are more susceptible to moisture carry-over than non-coated coils, so the allowable maximum cooling airflow may be limited.

It is required for applications with mildly corrosive indoor environments or with mildly corrosive outdoor environments and operation with outdoor air.

E-coat coils have a lower water carry-over threshold and limits the maximum application cooling airflow.

Sensors and controls

Humidity and enthalpy sensors

These sensors provide SmartVu controls with the ability to read return air and outdoor air relative humidity, which are also used to calculate outdoor and return air enthalpy.

They are required for applications with Humidi-MiZer system or dehumidification with a field-provided reheat source. They are also required for applications with ultra-leak economizer and free cooling based on outdoor air enthalpy or differential outdoor air and return air enthalpy.

Return air CO_2

Allows SmartVu controls to read return air CO_2 levels to approximate indoor air quality or occupancy for units with an ultra-low leak economizer.

Return air CO_2 is Recommended for multi-zone applications where demand-controlled ventilation (DCV) operation is required.

Outdoor air intake and relief options

Ultra-low leak economizer

Provides a modulating outdoor and return air damper for improved ventilation and free cooling.

Required in applications that need constant ventilation rates at varying indoor fan speeds, modulated ventilation rates based on space occupancy, or free cooling using outdoor air. Frequently required by code.

Consider the building pressure control that will be used in conjunction with the ultra-low leak economizer. Configure the unit without building pressure relief or with:

Barometric relief

Allows the relief excess building pressure to be relieved when the outdoor air damper is almost fully opened, and the return air section is mostly fully closed, which commonly occurs during free cooling operation.

Barometric relief should only be used to relieve building pressure during free cooling economizer operation in applications with very low return duct static pressure drops (<0.1 in. wg). An exhaust fan should be used to control building pressure during normal ventilation operation or in applications with more than 0.5 in. wg return duct static pressure drops.

Multi-stage power exhaust

Enables four-stage, mechanical building pressure relief based on outdoor air damper position.

It is recommended to relieve building pressure during free cooling for buildings with low return duct static pressure drops (0.7 in. wg) and vertical return where the unit isn't required to maintain a specific building pressure.

Multi-stage power exhaust with building pressure control

Provides four (size 20-50) or six (size 60) stages mechanical building pressure relief based on a building pressure reading.

Recommended to relieve building pressure during ventilation or free cooling operation for buildings with low return duct static pressure drops (<0.7 in. wg) and vertical return.

Power and control for accessory multi-stage power exhaust

Configures the unit to support the accessory multi-stage power exhaust, including single point power, control contractors, and building pressure transducer.
NOTE: Required for applications with accessory multi-stage power exhaust.

Accessory multi-stage power exhaust enables mechanical building pressure relief based on outdoor air damper position or building pressure and is recommended for buildings with low return duct static pressure drops (<.7 in.wg) and horizontal return.

Power and control for accessory high capacity power exhaust

Configures the unit to support the accessory high capacity power exhaust, including single point power, VFD control output, and building pressure transducer. NOTE: Required for applications with accessory high capacity power exhaust.

Accessory high capacity power exhaust enables mechanical building pressure relief based on outdoor air damper position or building pressure and is recommended for buildings with low return duct static pressure drops (<.6 in. wg).

Factory-installed option guidance (cont)

Electrical

High short circuit current rating (SCCR)

Provides an upgraded power box with terminal block. Required for applications that require SCCR ratings over 10kA. Field-provided, J-type current-limiting fuses must be installed before the unit terminal block a in field-supplied fuse box or disconnect. This option is not available for units with powered convenience outlet.

Non-fused disconnect

Non-fused disconnect provides the ability to disconnect and lock out electrical service to the unit.

Recommended for most applications to comply with local disconnecting requirements and to reduce installation time.

Powered convenience outlet

Includes a 115-v, 10A duplex power outlet that is powered by the main unit power feed using a transformer.

Recommended for most applications to provide power for charging mobile devices or battery-powered tools to facilitate equipment maintenance. Not available with high SCCR.

Unpowered convenience outlet

Provides a 115-v duplex power outlet for a field-provided power feed.

Recommended for applications where the outlet is used to support high-power draw devices, such as air compressors or vacuum pumps or where the outlet needs to remain energized when the unit power feed is de-energized (NEC compliance).

Phase monitor

Protects against phase loss, voltage imbalance, and reversed phases.

Recommended for applications with poor power quality to help protect the unit against damage.

Service and safety options

Condensate overflow switch

Protects against drain pan overflow caused by clogged drains.

Recommended for humid climates or where the unit is installed over the occupied space.

Pre-filter status switch and access door retainers

Improves serviceability and can help promote equipment maintenance.

Recommended for ease of service and applications concerned with energy savings or high indoor air quality.

Return air smoke detector

Allows SmartVu controller to shut down the unit when smoke is detected in the return air stream. NOTE: May be required by code. Recommended for applications for reduced installation time compared to a field-provided smoked detector.

Service package

Provides provisions to isolate the compressors from the refrigerant circuit to allow compressor removal without recovering the entire refrigerant charge. Also includes a replaceable core filter drier for easy refrigerant circuit clean-up in the event of refrigerant charge contamination and extended lube lines to allow the indoor fan shaft bearings to be lubricated from the indoor fan motor access door.

Recommended for applications that require minimum downtime, ease of service, or have high annual compressor or indoor fan run hours.

Chicago refrigerant relief valve

Includes a mechanical refrigerant circuit pressure relief device installed on all unit refrigerant circuits.

NOTE: Required by select building codes (Chicago) for systems with more than 4 pounds of refrigerant.

Indoor air quality

2 in. MERV 8 pleated pre-filters

Effective at filtering contaminants 3 to 10 microns in size, such as pollen, mold, and some types of dust.

Recommended for most commercial applications with basic indoor air quantity requirements.

4 in. MERV 8 pleated pre-filters

Effective at filtering contaminants 3 to 10 microns in size, such as pollen, mold, and some types of dust.

Recommended for most commercial applications with basic indoor air quantity requirements. Provides a lower airside pressure drop than 2 in. filters.

4 in. MERV 13 pleated pre-filters

Effective at filtering contaminants 1 to 3 microns in size, such as bacteria, smoke, and most types of dust.

Recommended for applications with high indoor air quantity requirements.

Ultraviolet wavelength C fixtures (UV-C)

The field-installed UV-C emitters can help inhibit microbial growth on the evaporator coil and in the condensate drain pan.

Recommended for applications that are concerned with indoor air quality or indoor air coil cleanliness. Not available for units with Humidi-MiZer.

All 48/50K units feature the factory-installed Carrier SmartVu™ control which is factory-configured to match factory-installed options and can be configured for accessories or field-use devices.

Control interface

The SmartVu touchscreen display is the primary method of interfacing with the controls for setup and equipment start-up. The touchscreen is a resistive-type, 7 in. LCD that can be activated with a finger, touch-compatible gloves, or stylus. The display is in the dedicated low voltage control box.


Touchscreen Display

The SmartVu control can also be accessed remotely by a web browser using the built-in ethernet port. The web browser interface matches the touchscreen display for ease of use.

The control navigation is user-friendly with icon-based navigation and descriptive point and properties names. Menus and settings are protected by multiple levels of user access control, with basic user level access allowing basic equipment setup and start-up capability. Service level access for advanced setup and troubleshooting is available using the Carrier® SMART Service mobile application.

NOTE: This iteration of SmartVu control is not compatible with System Touch.

Sensors

The SmartVu control system for the 48/50K Series includes a wide array of standard and optional factory-installed sensors. SmartVu control provides the ability to expand functionality by adding an accessory or field-provided sensors using the easy-to-access terminal strip connection.

Sensors

SENSOR TYPE	INSTALLED
Supply Air Temperature	Standard
Return Air Temperature	Standard
Outdoor Air Temperature	Standard
Space Temperature	Accessory
DX Leaving Air Temperature	Standard
Cooling Coil Air Temperature	Option (HZMR)
Supply Air Temperature	Option or Accessory
Space Relative Humidity	Accessory
Return Air Relative Humidity	Option
Outdoor Air Relative Humidity	Option
DX Leaving Refrigerant Temperature	Field
Condensing Pressure	Standard
Suction Pressure	Standard
Supply Duct Pressure	Option
Building Pressure	Option
Return Air Co_2	Option or Accessory
Space Co_2	Accessory

LEGEND

HZMR — Humidi-MiZer

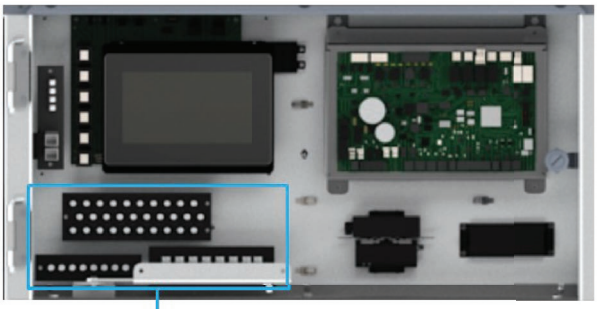
Field-use control inputs

The SmartVu control system supports a range of field-use control inputs for field-supplied sensors or control inputs to adapt unit operation to project-specific needs.

Field-Use Inputs

INPUT TYPE	AVAILABLE
Space Temperature Adjustment	Standard
Space Temperature	Standard
Thermostat Style Inputs (Y1, Y2, W1, W2, G)	Standard
Dehumidify Input	Standard
Demand Limit Switch (x2)	Standard
Demand Limit or Third-party Supply Air Temperature Reset	Standard
Pre-filter Status	Standard
Third-party IDF Modulation or Supply Static Pressure Reset	Standard
Remote Shutdown or Occupancy Switch	Standard
Emergency Shutdown or Phase Monitor	Standard
Smoke Detector/fire Shutdown Input	Standard
Smoke Purge	Standard
Fire Pressurization	Standard
Fire Evacuation	Standard
Indoor Air Quality Switch	Standard

Most connections for accessory sensor or field-use control inputs are made at conveniently located terminal blocks in the control panel. See figure below for terminal block locations.


Field-Use Terminal Blocks

Communication

The SmartVu™ control supports native Carrier Comfort Network® (CCN) and BACnet MS/TP and IP communication. The control is plug-and-play with Carrier i-Vu™ 8.0+ systems and supports auto-discovery, built-in unit graphics, and organized point and properties pages.

Modbus®[1] and LonWorks[1] communication are available with accessory translator devices with support for a limited amount of network points.

Sequence of operation

The 48/50K operating sequence will vary based on the unit and control configurations. SmartVu controls all aspects of the unit operation; the cooling system, Humidi-MiZer® system, heating system, indoor fan, exhaust fan, and the economizer. See the 48/50K controls, service, and troubleshooting manual for details.

1. Third-party trademarks and logos are the property of their respective owners.

Below is a summary of control configurations and the resulting operating sequence:

Occupancy sources

The occupancy source determines if the unit is in the occupied or unoccupied period and affects active setpoints and available modes. The occupied period provides optimal comfort control for occupants, and the unoccupied period provides reduced or no comfort control for energy savings.

Occupancy Sources

NAME	DESCRIPTION
Occupancy Switch	An input switch status determines occupancy.
BAS Occupancy	A network input determines occupancy.
Unit Schedule	The local unit schedule (in SmartVu) determines occupancy.

Simultaneous use of multiple occupancy sources is allowed. The SmartVu controller uses the higher priority occupancy source when sources conflict. The level of priority (highest first) and description of the source types are as follows:

Occupancy switch

A hardwired, normally open occupancy switch controls occupancy. The unit is unoccupied when the occupancy switch is open, and the unit is occupied when the switch is closed. A field-provided relay and control signal is required to operate the occupancy switch.

BAS occupancy

The unit will monitor the network occupancy command point to determine occupancy. A field-provided and installed BAS system is required.

Local schedule

SmartVu controls determine occupancy based on user-configured schedules. Eight standard schedules are available with optional holiday and override schedules. Each schedule allows a single occupancy start time and stop time, selectable in hour/minute increments and for each day of the week.

Indoor fan operation

The indoor fan operation configurations determine when the indoor fan operates based on the occupancy period. The indoor fan control type can limit indoor fan operation.

Occupied Indoor Fan Operation

NAME	DESCRIPTION
Continuous	The indoor fan operates continuously during the occupied period.
Demand	The indoor fan operates only when there is a cool, heat, ventilate, or dehumidify demand during the occupied period.

The sequence of operation is as follows:

Continuous

The indoor fan is on when the unit is in the occupied period. Continuous indoor fan is the recommended configuration for most applications where the unit is the primary source of ventilation.

Demand

The indoor fan will only operate when there is an occupied cool, heat, ventilate, or dehumidify demand. The indoor fan is off when there isn't an active demand.

Demand operation is not available when the indoor fan control is configured for supply duct pressure. Do not use occupied demand indoor fan control in applications where the unit is the primary source of ventilation.

Unoccupied Indoor Fan Operation

NAME	DESCRIPTION
Demand	The indoor fan operates only when there is a cool, heat, ventilate, or dehumidify demand during the unoccupied period.
Disabled	The indoor fan is off during the unoccupied period.

The sequence of operation is as follows:

Demand

The indoor fan will only operate when there is an unoccupied cool, heat, ventilate, or dehumidify demand. The indoor fan is off when there isn't an active demand.

Disabled

The indoor fan is off during the unoccupied period. This configuration prevents the selection of cooling, heating, or dehumidification modes during the unoccupied period.

Indoor fan control

The indoor fan control configuration determines how the indoor fan operates when it's on. This control configuration may be limited based on the cooling and heating demand determination configuration.

Indoor Fan Control Methods

NAME	DESCRIPTIONS
Constant Volume (CV)	Indoor fan operates at a constant speed for cool or heat demands.
Staged Air Volume (SAV)	Indoor fan stages between discrete speeds based on demand levels or cooling capacity.
Multi-Zone VAV (MZ-VAV)	Indoor fan modulates based on supply duct static pressure.
Single-Zone VAV (SZ-VAV)	Indoor fan modulates based on space temperature.
Third-party Control	Indoor fan modulates based on a third-party signal.

The sequence of operation is as follows:

Constant volume (CV)

The indoor fan operates at the high cool indoor fan speed with a vent, cool, or dehumidify demand. The indoor fan operates at the high heat indoor fan speed with a heat demand.

CV control is intended for single-zone space air conditioning or multi-zone variable volume and temperature (VVT) applications with a bypass damper. Consult local code requirements before using CV control in single-zone space air conditioning applications.

Staged air volume (SAV)

SAV is configurable for two types of operation, SAV Demand or SAV Capacity.

When the indoor fan is configured for SAV demand, the indoor fan will operate at the indoor fan minimum speed with a vent demand, the IDF low cool speed with a low cool demand, the IDF high cool speed with a high cool, VAV cool, or dehumidify demand, the IDF low heat speed with a low heat demand, or the IDF high heat speed with a high heat demand.

When the indoor fan is configured for SAV capacity, the indoor fan will operate at the indoor fan minimum speed with a vent demand, the IDF low cool speed when the cooling capacity is at or below the low cool capacity threshold, the IDF med cool speed when the cooling capacity between the low cool and high cool capacity thresholds, the high cool IDF speed when the system capacity is at or above the high cool capacity threshold or there is a dehumidify demand, the IDF low heat speed when the heating capacity is at or below 75%, and the IDF high heat speed when the heating capacity is above 75%.

SAV control is intended for single-zone space air conditioning applications to provide energy savings, quieter operation, and better dehumidification at part-load conditions compared to CV operation.

Single-zone variable air volume (SZ-VAV)

When the indoor fan is configured for SZ-VAV and there is only a cooling demand, the indoor fan will modulate linearly between the low and high cool IDF speeds based on the deviation between the space temperature and the cooling space temperature setpoint. The further away the space temperature is from the setpoint, the higher the indoor fan speed will be.

For units equipped with modulating or multi-stage heat and only a heating demand, the indoor fan will modulate linearly between the low and high heat IDF speeds based on the deviation between the space temperature and the heating space temperature setpoint. For units equipped with two-stage heat, the IDF will operate between the low or high heat IDF speeds based on the demand level.

The IDF will be at the minimum indoor fan speed with a vent demand or the high cool IDF with a dehumidify demand.

SZ-VAV is recommended for sound sensitive applications or applications with higher sensible loads than latent loads. SZ-VAV requires SPT demand source.

Multi-zone variable air volume (MZ-VAV)

When the indoor fan is enabled during a cooling, venting, dehumidifying, or heating mode with modulating heat, the fan will modulate between the minimum and maximum indoor fan speeds to maintain the supply duct static pressure at the static pressure setpoint.

For units equipped with a two-stage heat source, the duct pressure control signal is ignored when heat mode is activated. The indoor fan will operate at the low heat fan speed when the first stage of heat is activated, and the high heat fan speed when the second stage of heat is activated.

MZ-VAV duct static pressure control requires the VAV factory-installed option (supply duct pressure transducer) or a field-provided supply duct pressure transducer.

Supply duct static pressure control is intended for multi-zone variable air volume (VAV) or variable volume and temperature (VVT) applications with pressure-independent air terminal units. Supply duct static pressure control can be used for single-zone space air conditioning applications for true constant volume operation to account for filter loading.

Third-party control

A field-provided binary or network input is required to enable the indoor fan. When enabled, the indoor fan speed modulates between the minimum and maximum fan speeds based on the third-party input signal. For units equipped with a two-stage heat source, the third-party signal is ignored when heat mode is activated. The indoor fan will operate at the low heat fan speed when the first stage of heat is activated, and the high heat fan speed when the second stage of heat is activated.

Third-party indoor fan control is for applications with field-provided direct digital control or building automation system control where a specific method of indoor fan operation is required.

Supply duct static pressure reset

For applications that require reduced operating static at part-load for reduced sound, energy savings, or code compliance. Static pressure reset can only be used with MZ-VAV control and should not be used in applications with pressure dependent air terminal units.

Supply Duct Static Pressure Reset

NAME	DESCRIPTION
None	No reset.
Space Temperature (SPT)	Reset is based on the cooling space temperature.
Return Air Temperature (RAT)	Reset is based on the cooling return air temperature.
Third-Party Reset	Reset is based on a third-party input.

The sequence of operation is as follows:

None

Supply pressure reset is not performed. The indoor fan will operate to a constant static pressure setpoint. This configuration is recommended for CV, SAV, SZ-VAV, or third-party indoor fan control application.

Space temperature (SPT)

When the unit is configured for MZ-VAV, is in a cooling or vent mode, and the space temperature is below the occupied cooling setpoint, the duct static pressure control point is reduced. The static pressure reset is disabled when there is a heat or dehumidify demand.

Space temperature static pressure reset is recommended for multi-zone VAV applications with a large central zone.

Return air temperature (RAT)

When the unit is configured for MZ-VAV, is in a cooling or vent mode, and the return air temperature is below the occupied cooling setpoint, the duct static pressure control point is reduced. The static pressure reset is disabled when there is a heat or dehumidify demand.

Return air temperature static pressure reset is recommended for multi-zone VAV applications without a dominant central zone.

Third-party reset

When the unit is configured for VAV, is in a cooling or vent mode, and a third-party input is present, the duct static pressure control point is reduced. The static pressure reset is disabled when there is a heat or dehumidify demand.

Third-party static pressure reset is recommended for applications as an alternate to third-party indoor fan control.

Exhaust fan control

The exhaust fan control configuration determines how the exhaust fans are enabled and how they operate.
NOTE: Requires the factory-installed or accessory power exhaust.

Exhaust Fan Control

NAME	DESCRIPTION
None	No exhaust fans.
2-stage or 4-stage Exhaust	Exhaust fans operate at a discrete speed or stage based on outdoor air damper position.
Building Pressure Control	Exhaust fans modulate based on building pressure (high capacity PE only).
Multi-Stage Building Pressure Control	Exhaust fans stage based on building pressure. Multi-stage PE only.

The sequence of operation is as follows:

Two-stage or four-stage exhaust

For units with high capacity power exhaust, fans are enabled and will operate at low fan speed when the outdoor air damper position is at or above the first damper position configuration. The exhaust fans will operate at high fan speed when the outdoor air damper position is at or above the second adjustable damper position configuration.

For units with multi-stage power exhaust, the exhaust fans will operate at one of four user-adjustable exhaust fan stages based on four user-adjustable outdoor air damper positions.

For units with high capacity power exhaust, the exhaust fans will operate at one of two user-adjustable fan speeds based on two user-adjustable outdoor air damper positions.

The exhaust fans are off when the outdoor air damper position is below the first adjustable outdoor air damper position, or the outdoor air damper is closed.

Two-stage or four-stage exhaust control is intended for single-zone space air conditioning applications.

Building static pressure control

When the outdoor air damper is open and the building static pressure is above the building static pressure setpoint, the exhaust fans turn on and simultaneously modulate between the minimum and maximum speeds to maintain the building static pressure at the building static pressure setpoint.

When the building static pressure drops below the building static pressure setpoint or the outdoor air damper closes, the exhaust fans turn off.

Building pressure control is only available with the accessory High Capacity Power Exhaust and is recommended for multi-zone applications or in applications where building pressure is regulated by code (accessibility).

Building pressure control is recommended for multi-zone applications or in applications where building pressure is regulated by code (accessibility).

Multi-stage building static pressure control

When the outdoor air damper is open and the building static pressure is above the building static pressure setpoint, the exhaust system stages up until the building pressure is at the building pressure setpoint. When the building pressure drops below static pressure setpoint, the exhaust fan stages down. The exhaust fan will turn off if the outdoor air damper closes or the exhaust fan is at the lowest stage and the building pressure is below the building pressure setpoint.

Multi-stage building pressure control requires the factory-installed multi-stage power exhaust with building pressure control or the accessory multi-stage power exhaust.

Outdoor air damper ventilation control

Requires a factory-installed economizer. This configuration determines how the economizer outdoor air damper provides building ventilation during the occupied period.

Outdoor Air Ventilation Control

NAME	DESCRIPTION
Indoor Fan Mapping	Outdoor air damper stages based on the indoor fan speed.
IAQ Control	Outdoor air damper modulates based on CO_2.
Third-party Minimum Position Control	Outdoor air damper modulates the minimum position based on a third-party input.
Third-party Full Control	Outdoor air damper modulates based on a third-party input.

The sequence of operation is as follows:

Indoor fan mapping

When the indoor fan is on during the occupied period, the economizer outdoor air damper opens and modulates between the minimum and maximum positions to maintain a constant ventilation rate at varying indoor fan speeds. The damper position is based on a field configurable four-point damper position curve at four different indoor fan speeds.

Ventilation is not normally performed during the unoccupied period or when the indoor fan is off during the occupied period (demand-based operation).

Indoor fan mapping is intended for use in applications with modulating indoor fan control, including SAV, and supply duct pressure control, or third-party control.

IAQ control

Requires factory-installed return air CO_2 sensor option or field-provided and installed return air or space CO_2 sensor. When the indoor fan is on during the occupied period, the outdoor air damper opens and modulates between the minimum and maximum positions to maintain return air or space CO_2 levels at the indoor air quality (IAQ) level setpoint.

Ventilation is not normally performed during the unoccupied period or when the indoor fan is off during the occupied period (demand-based operation).

IAQ control is intended for use in applications with variable space occupancy levels, such as gymnasiums, conference areas, and cafeterias.

Third-party minimum position control

When the indoor fan is on during the occupied period, the outdoor air damper modulates between the closed and maximum position based on the third-party analog or network signal. Free cooling operation or IAQ reset overrides the third-party commanded damper position.

Ventilation is not normally performed during the unoccupied period or when the indoor fan is off during the occupied period (demand-based operation).

Third-party control is intended for use in applications that require operations that differ from the factory ventilation control methodology but still want SmartVu controls to perform free cooling or IAQ override.

Third-party full control

When the indoor fan is on during the occupied period, the economizer outdoor air damper modulates between the minimum and maximum position based on the third-party analog or network signal. Free cooling operation or IAQ reset are not allowed to override the third-party commanded outdoor air damper position.

Ventilation is not normally performed during the unoccupied period or when the indoor fan is off during the occupied period (demand-based operation).

Third-party control is intended for use in applications that require operations that differ from the factory ventilation control methodology and do not require SmartVu controls to provide free cooling or IAQ overrides.

Cool and heat demand source

The cool and heat demand source configuration determines which inputs control monitors to establish a cool or heat demand. The demand source configuration also affects how the unit operates and must match the intended application type.

Cool and Heat Demand Sources

NAME	DESCRIPTION
Space Temperature (SPT)	Cool and heat demands are based on space temperature (intended for single-zone applications).
Return Air Temperature (RAT)	Cool and heat demands are based on return air temperature (intended for multi-zone applications).
Third-party Input (TSTAT)	Cool and heat demands are based on thermostat-style hardwired or network inputs (Y1, Y2, W1, W2).

For temperature-based demand sources (SPT and RAT), the control compares the demand source temperature sensor reading to the occupied or unoccupied cooling and heating setpoints.

The control will use the occupied setpoints during the occupied period. If the indoor fan is configured for unoccupied demand operation, the control will use the unoccupied setpoint during the unoccupied periods. If the indoor fan is configured for disabled during the unoccupied period, unoccupied demands are ignored.

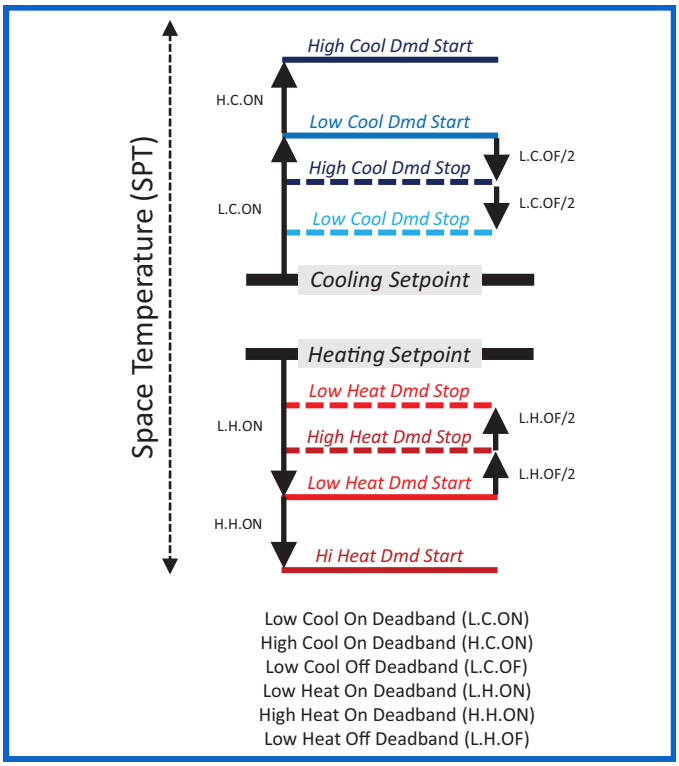
For the input-based cool and heat demand source (TSTAT), the control will monitor the hardwired or networked control inputs to determine if there is a cooling or heating demand.

Once a cool or heat demand is established, the control sets the demand supply air temperature to the supply air temperature setpoint associated with the active demand level.

The following is a summary of each configuration and demand determination:

Space temperature (SPT)

SPT is intended for single-zone space air conditioning applications. Requires a field-installed space temperature sensor.



A cool demand is established when the space temperature is above the space temperature setpoint plus the applicable deadband. A heat demand is established when the space temperature is below the space temperature setpoint minus the applicable deadband. Below is a summary of available demands, demand determination, and supply air temperature setpoints for the SPT demand source:

Low cool (occupied or unoccupied)

If the space temperature is above the occupied or unoccupied cooling setpoint plus the low cool on deadband, the demand is set to low cool. The control sets the demand supply air temperature to the low cool supply air temperature setpoint.

When the space temperature drops below the occupied or unoccupied cooling temperature, plus the low cool on deadband, minus the low cool off deadband, the low cool demand stops.

High cool (occupied or unoccupied)

If the space temperature rises above the occupied or unoccupied cooling setpoint, plus the low cool on deadband, plus the high cool on deadband, the demand is set to high cool. The control sets the demand supply air temperature to the high cool supply air temperature setpoint.

When the space temperature drops below the occupied or unoccupied cooling setpoint, plus the low cool on deadband, and minus one-half of the low cool off deadband, the high cool demand stops.

Low heat (occupied or unoccupied)

If the space temperature is below the occupied or unoccupied heating setpoint minus the low heat on deadband, the demand is set to low heat. For units with a modulating or multi-stage heat source, the control sets the demand supply air temperature to the low heat supply air temperature setpoint.

Controls (cont)

When the space temperature rises above the occupied or unoccupied heating setpoint, minus the low heat on deadband, plus the low heat off deadband, the low heat demand stops.

High heat (occupied or unoccupied)

If the space temperature drops below the occupied or unoccupied heating setpoint, minus the low heat on deadband, minus the high heat on deadband, the demand is set to high heat. For units with a modulating or multi-stage heat source, the control sets the demand supply air temperature to the high heat supply air temperature setpoint.

When the space temperature rises above the occupied or unoccupied heating setpoint, minus the low heat on deadband, plus one-half of the low heat off deadband, the high heat demand stops.

Ventilate (occupied or unoccupied)

When there is no cool or heat demand and the indoor fan is on, demand is set to ventilate. The supply air temperature control point is set to the vent supply air temperature setpoint.

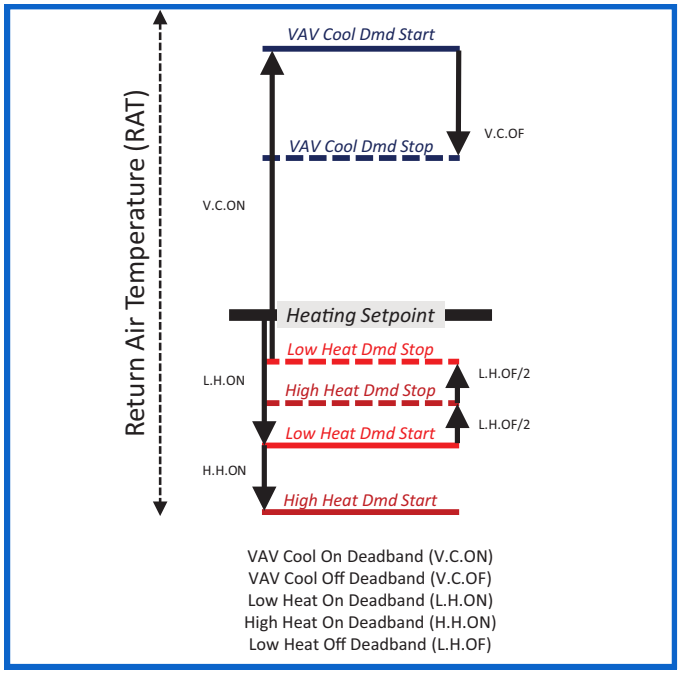
None (occupied or unoccupied)

When there is no cool or heat demand and the indoor fan is off, demand is set to none.

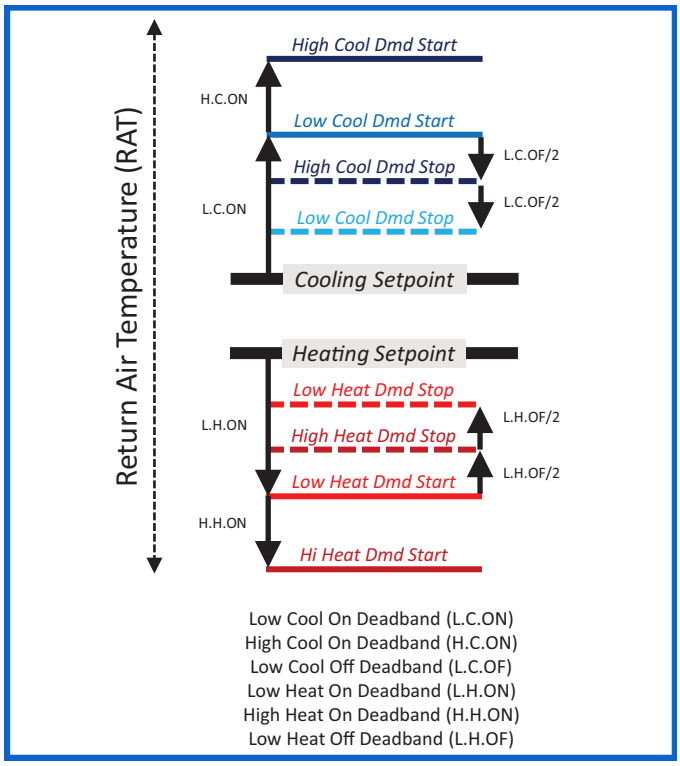
Return air temperature (RAT)

RAT is intended for multi-zone space air conditioning applications with air terminal units. RAT may be used in other applications without air terminal units. The return air temperature sensor used for RAT control is standard on all units.

The figure below illustrates RAT Occupied Demand Levels.



The following figure illustrates RAT Unoccupied Demand Levels.



During the occupied period, the control compares the return air temperature to the occupied heating setpoint and applicable deadbands to establish a VAV cool demand. During the unoccupied period, the control compares the return air temperature to the unoccupied cooling setpoint plus applicable deadbands to establish a low or high cool demand.

A heat demand is established when the return air temperature is below the occupied or unoccupied heating setpoint minus the applicable deadband. Below is a summary of available demands, demand determination, and supply air temperature setpoints for the RAT demand source.

VAV cool (occupied only)

If the return air temperature is above the occupied heating setpoint, minus the low heat on deadband, plus the low heat off deadband, plus the VAV cool on deadband, the demand is set to VAV cool. The control sets the demand supply air temperature to the VAV cool supply air temperature setpoint.

When the return air temperature drops below the occupied heating setpoint, minus the low heat on deadband, plus the low heat off deadband, plus the VAV cool on deadband, minus the VAV cool off deadband, the VAV cool demand stops.

Low cool (unoccupied only)

If the return air temperature is above the unoccupied cooling setpoint plus the low cool on deadband, the demand is set to low cool. The control sets the demand supply air temperature to the low cool supply air temperature setpoint.

When the return air temperature drops below the unoccupied cooling temperature, plus the low cool on deadband, minus the low cool off deadband, the low cool demand stops.

High cool (unoccupied only)

If the return air temperature is above the unoccupied cooling setpoint, plus the low cool on deadband, plus the high cool on deadband, the demand is set to high cool. The control sets the demand supply air temperature to the high cool supply air temperature setpoint.

When the return air temperature drops below the unoccupied cooling setpoint, plus the low cool on deadband, and minus one-half of the low cool off deadband, the high cool demand stops.

Low heat (occupied or unoccupied)

If the return air temperature is below the occupied or unoccupied heating setpoint minus the low heat on deadband, the demand is set to low heat. For units with a modulating or multi-stage heat source, the control sets the demand supply air temperature to the low heat supply air temperature setpoint.

When the return air temperature rises above the occupied or unoccupied heating setpoint, minus the low heat on deadband, plus the low heat off deadband, the low heat demand stops.

High heat (occupied or unoccupied)

If the return air temperature is below the occupied or unoccupied heating setpoint, minus the low heat on deadband, minus the high heat on deadband, the demand is set to high heat. For units with a modulating or multi-stage heat source, the controls set the demand supply air temperature to the high heat supply air temperature setpoint.

When the return air temperature rises above occupied or unoccupied heating setpoint, minus the low heat on deadband, plus one-half of the low heat off deadband, the high heat demand stops.

Ventilate (occupied only)

When there is no cool or heat demand and the indoor fan is on, demand is set to ventilate. The supply air temperature control point is set to the vent supply air temperature setpoint.

None (occupied or unoccupied)

When there is no cool or heat demand and the indoor fan is off, demand is set to none.

Thermostat/third-party input (TSTAT)

TSTAT is intended for single-zone space air conditioning applications with a field-installed, two-stage heat/cool thermostat or single or multi-zone applications with a field-provided digital control system. The cool and heat demand inputs can be enabled using hardwired inputs or network inputs.

A cool demand is established when the Y1 or Y2 inputs are activated. A heat demand is established when the W1 or W2 inputs are activated. An alert is triggered if both a Y and W input are active at the same time. Below is a summary of available demands, demand determination, and supply air temperatures setpoints for the TSTAT demand source:

Low cool (occupied or unoccupied)

When the Y1 input is activated, the demand is set to low cool. The control sets the demand supply air temperature to the low cool supply air temperature setpoint.

When the Y1 input is deactivated, the low cool demand stops.

High cool (occupied or unoccupied)

When the Y1 and Y2 inputs are activated, the demand is set to high cool. The control sets the demand supply air temperature to the high cool supply air temperature setpoint.

If the Y2 input is activated without the Y1 input being activated, the control issues an alarm but the demand is still set to high cool.

Low heat (occupied or unoccupied)

When the W1 input is activated, the demand is set to low heat. For units with a modulating or multi-stage heat source, the controls set the demand supply air temperature to the low heat supply air temperature setpoint.

When the W1 input is deactivated, the low heat demand stops.

High heat (occupied or unoccupied)

When the W1 and W2 inputs are activated, the demand is set to high heat. For units with a modulating or multi-stage heat source, the control sets the demand supply air temperature to the high heat supply air temperature setpoint.

If the W2 input is activated without the W1 input being activated, the control issues an alarm but the demand is still set to high heat.

When the W2 input is deactivated, the high heat demand stops.

Ventilate (occupied or unoccupied)

When there is no cool or heat demand and the indoor fan is on, demand is set to ventilate. The supply air temperature control point is set to the vent supply air temperature setpoint.

None (occupied or unoccupied)

When there is no cool or heat demand and the indoor fan is off, demand is set to none.

Free cooling control

The free cooling control configurations determine if free cooling with outdoor air is allowed during the occupied and unoccupied periods. Requires a factory-installed economizer option.

Occupied Free Cooling

NAME	DESCRIPTION
Disabled	Free cooling is not allowed during the occupied period.
Enabled	Free cooling is available during the occupied period.

The sequence of operation is as follows:

Disabled

Free cooling is disabled during the occupied period. Intended for applications without factory-installed economizers or where code does not require free cooling.

Enabled

Free cooling using outdoor air is available during the occupied period. Intended for applications for energy savings or where required by code.

Unoccupied Free Cooling

NAME	DESCRIPTION
Disabled	Free cooling is not allowed during the unoccupied period.
Enabled	Free cooling is available during the unoccupied period.

The sequence of operation is as follows:

Disabled

Free cooling is disabled during the unoccupied period. Intended for applications without factory-installed economizers or where code does not require unoccupied free cooling.

Enabled

Free cooling using outdoor air is available during the unoccupied period. Intended for applications for energy savings or where required by code.

Free cooling checks

When free cooling is allowed, the control will try to satisfy a cooling demand using free cooling before enabling mechanical cooling. The free cooling checks configurations determine what sensors and setpoints the control checks to prevent free cooling mode.

Free cooling requires the factory-installed economizer and for free cooling operation to be enabled during either the occupied or unoccupied periods. Where allowed, multiple free cooling checks can be used simultaneously.

Outdoor Air Dry Bulb Limit

NAME	DESCRIPTION
Disabled	Outdoor air dry bulb temperature is not checked to prevent free cooling.
Enabled	Outdoor air dry bulb temperature is checked to prevent free cooling.

A factory-installed outdoor air temperature sensor is standard on all units and can be used for dry bulb limit control. Dry bulb limit is recommended for most applications. The sequence of operation is as follows:

Disabled

The outdoor air dry bulb temperature is not checked to prevent free cooling.

Enabled

When free cooling is allowed and there is a demand for cooling, the control compares the outdoor air dry bulb temperature to the dry-bulb temperature. If the outdoor air temperature is at or above the dry bulb limit setpoint, free cooling mode is prevented.

If the outdoor air temperature is below the dry bulb limit setpoint and other free checks prevent free cooling, free cooling mode is prevented.

If the outdoor air temperature is below the dry bulb limit setpoint and no other checks prevent free cooling, free cooling mode is enabled.

Outdoor Air Dewpoint Limit

NAME	DESCRIPTION
Disabled	Outdoor air dewpoint is not checked to prevent free cooling.
Enabled	Outdoor air dewpoint is checked to prevent free cooling.

The outdoor air dewpoint limit requires the factory-installed humidity and enthalpy sensor option (OARH and RARH sensors). The control calculates the dewpoint from outdoor air temperature and relative humidity. The dewpoint limit is recommended for humid climates. The sequence of operation is as follows:

Disabled

The outdoor air dewpoint is not checked to prevent free cooling.

Enabled

When free cooling is available and there is a demand for cooling, the control compares the outdoor air dewpoint to the dewpoint limit. If the outdoor air dewpoint is at or above the dewpoint limit setpoint, free cooling mode is prevented.

If the outdoor air dewpoint is below the dewpoint limit setpoint and other checks prevent free cooling, free cooling mode is prevented.

If the outdoor air dewpoint is below the dewpoint limit setpoint and no other checks prevent free cooling, free cooling mode is enabled.

Free Cooling Changeover

NAME	DESCRIPTION
None	Differential outdoor and return air dry bulb, outdoor air enthalpy, and differential outdoor and return air enthalpy are not checked to prevent free cooling.
Differential Dry Bulb	The differential between outdoor air and return air dry bulb temperatures is checked to prevent free cooling.
Outdoor Enthalpy	Outdoor air enthalpy is checked to prevent free cooling.
Differential Enthalpy	The differential between outdoor air and return air enthalpy is checked to prevent free cooling.

A factory-installed return air temperature sensor is standard on all units and can be used for differential dry bulb changeover. Dewpoint limit is recommended in addition to differential dry bulb changeover.

Enthalpy or differential enthalpy control requires factory-installed humidity and enthalpy sensor option (OARH and RARH). The control calculates enthalpy from outdoor and return air temperature and relative humidity. The dry bulb limit is recommended with enthalpy or differential enthalpy changeover. The sequence of operation is as follows:

None

Differential enthalpy, outdoor air enthalpy, or differential outdoor and return air enthalpy are not checked to prevent free cooling.

Differential dry bulb

Requires the humidity and enthalpy sensing option (OARH and RARH). When free cooling is available and there is a demand for cooling, the control calculates the temperature differential between the outdoor air temperature and return air temperature and compares it to the differential dry bulb threshold.

If the temperature differential is at or above the differential dry bulb limit setpoint, free cooling mode is prevented.

If the temperature differential is below the differential dry bulb limit setpoint and other checks are enabled and prevent free cooling, free cooling mode is prevented.

If the temperature differential is below the differential dry bulb limit setpoint and no other checks are enabled or no other checks prevent free cooling, free cooling mode is enabled.

Enthalpy

Requires the humidity and enthalpy sensing option (OARH and RARH). When free cooling is available and there is a demand for cooling, the control calculates the outdoor air enthalpy.

If the outdoor air enthalpy is at or above 28 Btu/lb, free cooling mode is prevented.

If the outdoor air enthalpy is below 28 Btu/lb and other checks are enabled and prevent free cooling, free cooling mode is prevented.

If the outdoor air enthalpy is below 28 Btu/lb and no other checks are enabled or no other checks prevent free cooling, free cooling mode is enabled.

Differential enthalpy

When free cooling is available and there is a demand for cooling, the control calculates the outdoor air and return air enthalpy levels.

If the outdoor air enthalpy is at or above the return air enthalpy, free cooling mode is prevented.

If the outdoor air enthalpy is below the return air enthalpy and other checks are enabled and prevent free cooling, free cooling mode is prevented.

If the outdoor air enthalpy is below the return air enthalpy and no other checks are enabled or no other checks prevent free cooling, free cooling mode is enabled.

Occupied heating control (morning warm-up)

For units equipped with a heat source and configured for RAT control, the control is configurable to allow morning warm-up only or heating operation anytime during the occupied period.

Occupied Heating

NAME	DESCRIPTION
Disabled	Heating is only allowed at the start of the occupied period.
Enabled	Heating is allowed anytime during the occupied period.

The sequence of operation is as follows:

Disabled (morning warm-up only)

Heating modes are only allowed at the start of the occupied period before a cooling mode starts. The heating mode can start and stop multiple times, up until a cooling mode is enabled. After the cooling mode is enabled, the heating mode is disabled until the start of the next occupied period (or if unoccupied heating is enabled).

Enabled

Heating modes are allowed anytime during the occupied period.

Supply air temperature reset

SAT reset is intended for applications with constant cooling supply air temperatures (VAV) to provide energy savings at part-load conditions.

When the system is cooling and the SAT reset input indicates that the system is at part-load conditions, the supply air temerature control point is increased to save compressor energy. SAT reset is prevented when a dehumidify demand is present.

Supply Air Temperature Reset

NAME	DESCRIPTION
None	No SAT reset.
Space Temperature (SPT)	Space temperature is used as the SAT reset source.
Return Air Temperature (RAT)	Return air temperature is used as the SAT reset.
Third-Party Input	A third-party analog input is used as the SAT reset source.

The sequence of operation is as follows:

None

SAT reset is not performed. Recommended for single-zone applications or multi-zone applications in humid climates.

Space temperature (SPT)

When the unit is configured for RAT, is in a cooling mode, and the space temperature is below the occupied cooling setpoint, the SAT control point is increased based on the SAT reset ratio. The SAT reset is disabled when there is a vent, heat, or dehumidify demand.

Space temperature SAT reset is recommended for multi-zone VAV applications with a large central zone.

Return air temperature (RAT)

When the unit is configured for RAT, is in a cooling mode, and the return air temperature is below the occupied cooling setpoint, the SAT control point is increased based on the SAT reset ratio. The SAT reset is disabled when there is a vent, heat, or dehumidify demand.

Return air temperature SAT reset is recommended for multi-zone VAV applications without a dominant central zone.

Third-party input (TSTAT)

When the unit is configured for RAT, is in a cooling mode, and a third-party input is present, the SAT control point is increased based on a scale of the input signal between 0°F and 3°F (default). The SAT reset is disabled when there is a vent, heat, or dehumidify demand.

Third-party static pressure reset is recommended for applications as an alternate to third-party input control.

Cooling and heating modes

When there is a cool or heat demand during the occupied period and a cooling or heating source is available, a cooling and heating mode is selected to satisfy the demand. Except for units with a two-stage heat source, heating and cooling operation is based on the supply air temperature control point, which is determined from the demand supply air temperature and any applicable resets (SAT control point = demand SAT ± SAT reset). For units with a 2-stage heat source, operation is based on the demand level.

When there is a cool or heat demand during the unoccupied period, the indoor fan is configured for demand operation during the unoccupied demand, and a cooling or heating source is available, a cooling and heating mode is selected to satisfy the demand.

If the indoor fan is configured for disabled during the unoccupied period, the unit is off during the unoccupied period and will not initiate a cooling or heating mode if there is a cool or heat demand.

The cooling or heating mode that is selected will depend on the supply air temperature control point, the unit and control configuration, and the mixed air temperature. Below is a summary of available cooling and heating modes:

Mechanical cooling

When there is a cool demand, free cooling is disabled or not available, compressors are available, and the mixed air temperature is above the active supply air temperature control point, the mechanical cooling mode is enabled. The compressors turn on and operate to maintain the unit supply air temperature at the supply air temperature control point.

Free cooling (requires economizer)

When there is a cool demand and free cooling is available, and the mixed air temperature is above the supply air temperature control point, free cooling mode is enabled. The outdoor air damper opens and modulates between the ventilation position and maximum position to maintain the unit supply air temperature at the supply air temperature control point.

Integrated cooling (requires economizer)

When there is a cool demand, free cool and compressors are available, and the outdoor air temperature is above the supply air temperature control point, integrated cooling mode is enabled. The outdoor air damper opens to its maximum position and the lowest stage of compression is enabled. Additional stages of compression can be added to maintain the supply air temperature at the supply air temperature control point.

Heat-tempered cooling (requires modulating or multi-stage heat)

When there is a cool demand, and the mixed air temperature is below the supply air temperature control point by the heat tempered cool deadband, the heat-tempered cooling mode is enabled. The heat source turns on and operates to maintain the unit supply air temperature at the supply air temperature control point.

Two-stage heating (requires 2-stage gas or 2-stage electric heat)

When there is a heat demand and the heat source is available, the two-stage heating mode is enabled. Heat stage 1 turns on with a low heat demand, and heat stage 2 turns on with a high heat demand.

Modulated heating (requires modulating gas, modulating electric, or hot water heat)

When there is a heat demand and the heat source is available, modulated heating mode is enabled. The heat source turns on and modulates to maintain the unit supply air temperature at the supply air temperature control point. Multi-stage heating (requires multi-stage gas heat) When there is a heat demand and the heat source is available, multi-stage heating mode is enabled. The heat source turns on and stages to maintain the unit supply air temperature at the supply air temperature control point.

Fan-only venting

When there is a demand for ventilate and the mixed air temperature is within the vent supply air temperature setpoint by the vent deadbands, fan-only venting mode is enabled. The indoor fan is on, the outdoor air damper operates at the ventilation control point, and the heating and cooling sources are off.

Cool-tempered venting

When there is a demand for ventilate and the mixed air temperature is above the vent supply air temperature setpoint plus the vent deadband, cool-tempered venting mode is enabled. The compressors turn on and operate to maintain the unit supply air temperature at the vent supply air temperature setpoint.

When the mixed air temperature drops below the vent supply air temperature setpoint, plus the vent deadband, minus one-half of the vent deadband, cool-tempered venting stops.

Heat-tempered venting (requires modulating or multi-stage heat)

When there is a demand for ventilate and the mixed air temperature is below the vent supply air temperature setpoint minus the vent deadband, heat-tempered venting mode is enabled. For units with a modulating or multi-stage heat source, the heat source turns on and operates to maintain the unit supply air temperature at the vent supply air temperature setpoint. For units with a two-stage heat source, heat stage 1 is enabled.

When the mixed air temperature rises above the vent supply air temperature setpoint, minus the vent deadband, plus one-half of the vent deadband, heat-tempered venting stops.

Standby

When there is no cool, heat, or ventilate demand, standby mode is enabled. All components are off.

Oil recovery

If the refrigerant circuit is operating at low capacity for an extended period of time, oil recovery mode will be initiated. The refrigerant circuit capacity will be temporarily increased to promote oil recovery from the refrigerant circuit.

Electronic expansion valve (EXV) recalibration

If the refrigerant circuit has been operating continuously for an extended period of time, the refrigerant circuit is shut down to allow recalibration of the EXVs.

Dehumidify demand source

The dehumidify demand source configuration determines which input is monitored to establish a dehumidify demand. Dehumidify demands are only established if the unit is configured for dehumidification with a reheat source, such as Humidi-MiZer system.

Dehumidify Demand Sources

NAME	DESCRIPTION
Space Relative Humidity (SPRH)	Dehumidify demand is based on space relative humidity(intended for single-zone applications).
Return Air Relative Humidity (RARH)	Dehumidify demand is based on return air relative humidity (intended for multi-zone applications).
Dehumidify Input (HSTAT)	Dehumidify demand is based on dehumidify input.

For relative humidity-based demand sources (SPRH or RARH), the control compares the demand source relative humidity sensor reading to the dehumidify relative humidity setpoint.

For the input based dehumidify demand source (TSTAT), the control will monitor the hardwired or networked control inputs to determine if there is a dehumidify demand.

Once a dehumidify demand is established, the control sets the cooling coil temperature control point to the dehumidify cooling coil temperature setpoint. The cooling coil temperature is an approximate for the supply air dewpoint temperature.

A dehumidify demand can co-exist with a cool, heat, or ventilate demand. If the current demand is none and a dehumidify demand starts, the demand is changed to ventilate. Below is a summary of each configuration and demand determination:

Space relative humidity (SPRH)

Requires a field-provided and installed space relative humidity sensor. SPRH is intended for single-zone space air conditioning applications. The figure on page 103 illustrates SPRH Demand Levels.

When the space relative humidity is above the dehumidify relative humidity setpoint, plus the dehumidify deadband, a dehumidify demand starts. The control set the cooling coil temperature control point to the dehumidify cooling coil temperature setpoint.

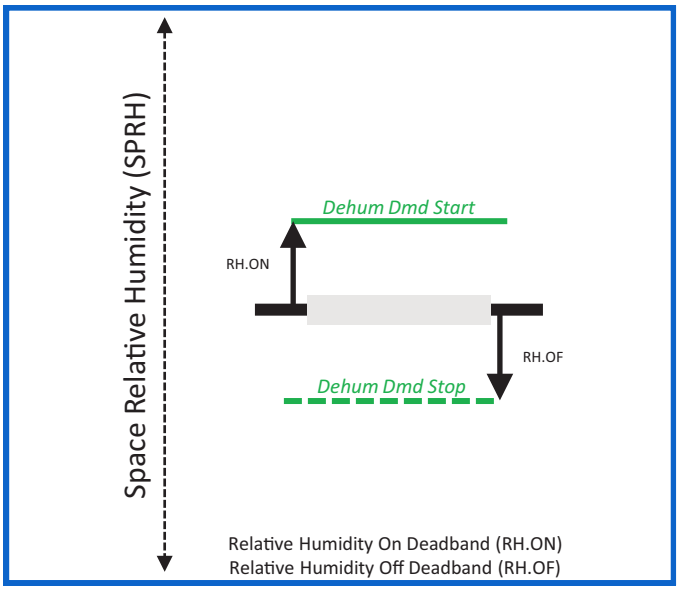
When the space relative humidity drops below the dehumidify relative humidity setpoint, minus the dehumidify off deadband, the dehumidify demand stops.

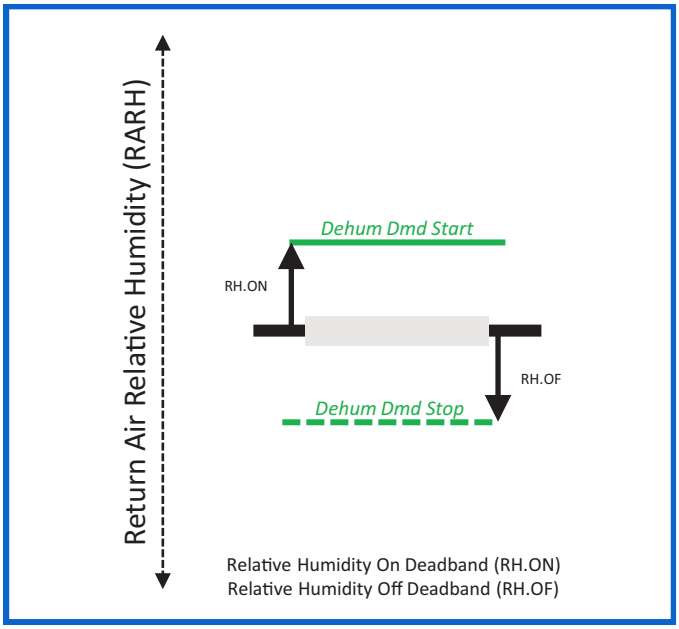
Return air relative humidity (RARH)

Requires the humidity and enthalpy sensor option (OARH and RARH sensors). RARH is intended for multi-zone space air conditioning applications but can also be used for single-zone applications.

When the return air relative humidity is above the dehumidify relative humidity setpoint, plus the dehumidify deadband, a dehumidify demand starts. The control set the cooling coil temperature control point to the dehumidify cooling coil temperature setpoint.

When the return air relative humidity drops below the dehumidify relative humidity setpoint, minus the dehumidify off deadband, the dehumidify demand stops.





Dehumidify input (HSTAT)

HSTAT requires a field-provided humidistat or thermostat with dehumidification output for single-zone space air conditioning applications. A digital control with hardwired or network dehumidification output can be used for single or multi-zone applications.

When the dehumidify input is active, a dehumidify demand starts. The control set the cooling coil temperature control point to the dehumidify cooling coil temperature setpoint. When the dehumidify input is deactivated, the dehumidify demand stops.

Dehumidify co-demands

The dehumidify co-demand configuration determines when the system is allowed to satisfy a dehumidification demand based on the existence of a cooling, heating, or ventilate demand.

The control can be configured to ignore a dehumidify demand when there is a cooling demand (low, high, or VAV cool) or a heating demand (low or high heat) for applications where temperature control is paramount. A dehumidify demand is always allowed with a ventilate demand.

For single-zone comfort cooling applications, the recommended configuration is to allow dehumidification with a low cool or ventilate demand. For multi-zone applications with constant cooling supply air temperatures, the recommended configuration is dehumidification only with a ventilate demand.

Dehumidification modes

If the unit is equipped with a reheat source, such as Humidi-MiZer® system, the compressors are available and a dehumidify demand isn't prevented, The SmartVu controller can enable a dehumidification mode to satisfy a dehumidify demand. When a dehumidification mode is activated, the compressors are controlled to maintain the cooling coil (evaporator) leaving air temperature at the dehumidify cooling coil temperature (CCT) setpoint. The reheat system is controlled to maintain the supply air temperature at the demand supply air temperature. Since SAT reset is disabled during dehumidification mode, the supply air temperature control point is the demand supply air temperature.

Dehumidification modes are available during the occupied period and are only available during the unoccupied period when the indoor fan is configured for demand unoccupied operation.

Below is a summary of available dehumidification modes and with the modulating Humidi-MiZer adaptive dehumidification system. The dehumidification operation will be similar for other reheat types.

Venting dehumidification

When there is a dehumidify demand, but no cool or heat demand, venting dehumidification mode is enabled.

The compressors are enabled and will operate to maintain the cooling coil leaving air temperature at the dehumidify CCT setpoint.

The Humidi-MiZer system is enabled, and mostly hot refrigerant gas is directed to the Humidi-MiZer coil. The mix of hot gas and warm liquid refrigerant entering the Humidi-Mizer coil modulates to maintain the unit supply air temperature at the ventilate demand supply air temperature.

Cooling dehumidification

When cooling dehumidification mode is available, and there is both a dehumidify and a cool demand, cooling dehumidification mode is enabled.

The compressors are enabled, and will operate to maintain the cooling coil leaving air temperature at the dehumidify CCT setpoint.

The Humidi-MiZer system is enabled mostly warm refrigerant liquid is directed to the Humidi-MiZer coil to sub-cool the refrigerant and increase the evaporator capacity, which improves dehumidification performance. The mix of hot gas and warm liquid refrigerant entering the Humidi-Mizer coil modulates to maintain the unit supply air temperature at the active cool demand supply air temperature. Under some conditions, the Humidi-MiZer leaving air temperature may be higher than the cool demand air temperature.

Heating dehumidification

When heating dehumidification mode is available, and there is both a dehumidify and a heat demand, heating dehumidification mode is enabled.

The compressors are enabled and will operate to maintain the cooling coil leaving air temperature at the dehumidify CCT setpoint.

The Humidi-MiZer system is enabled, and mostly hot refrigerant gas is directed to the Humidi-MiZer coil. The mix of hot gas and warm liquid refrigerant entering the Humidi-Mizer coil modulates to maintain the unit supply air temperature at the heat demand supply air temperature.

Humidi-MiZer recharge

At the first start-up of a cooling circuit with Humidi-MiZer (for cooling or dehumidification) and periodically during extended Humidi-MiZer operation, a Humidi-MiZer recharge is initialed to recharge the Humidi-MiZer coil with liquid refrigerant.

Humidi-MiZer purge

When the Humidi-MiZer system is operating for extended periods with the bypass valve mostly open, a Humidi-MiZer purge is initiated to recovery any oil that may be trapped in the condenser coils.

Controls (cont)

Special operating modes

SmartVu™ controls are available with special operating modes to override normal unit operation to meet unique conditions.

Special Operating Modes

NAME	DESCRIPTION
Service Test	Normal operation is disabled to allow component or system testing.
Service Run	Normal unit operation is enabled and unit components and systems can be manipulated for testing.
Pre-occupancy Purge	The outdoor air damper is open, and the indoor fan is on to ventilate the building before occupancy.
Temperature Compensated Start	The indoor fan and cooling or heating systems are on to pre-cool or pre-heat the building before occupancy.
Emergency Shutdown	The unit operation is disabled due to: – Indoor fan door switch – Phase monitor shutdown – Active emergency shutdown input – Emergency shutdown from the user interface
Fire Shutdown	The unit operation is disabled due to an active fire or smoke shutdown input.
Fire Pressurization	The indoor fans are on at the max speed and the outdoor air damper is open to its max position to pressurize the building. The exhaust fans are off.
Fire Evacuation	The indoor fans are off, and the outdoor air damper is closed. The exhaust fans are on at the max speed to de-pressurize the building.
Smoke Purge	The indoor fans and exhaust fans are on at max speed and the outdoor air damper is open to max position to purge smoke from the building.

Advanced control functions

SmartVu™ controls are available with additional advance control functions to meet application or operational requirements.

Advanced Control Functions

NAME	DESCRIPTION
Cool Demand Limit	Increases the effective occupied cooling setpoint based on a setpoint, limit switches, or analog input.
Heat Demand Limit	Decreases the effective occupied heating setpoint based on a setpoint, limit switches, or analog input.
Cool Capacity Limit	Restricts the maximum cooling capacity (%) based on a setpoint, limit switches, or analog input.
Heat Capacity Limit	Restricts the maximum heating capacity (%) based on a setpoint, limit switches, or analog input.
Economizer FDD	Provides economizer fault detection and diagnostics.
IAQ Reset	Resets the damper ventilation position based on IAQ switch or sensor.

Electrical data

NOTE: Refer to Carrier's website at http://ecat.Carrier.com for selection performance data.

48/50K Electrical Data

48/50K UNIT SIZE	VOLTAGE (V-Ph-Hz)	VOLTAGE RANGE		COMPRESSOR A1		COMPRESSOR A2		COMPRESSOR B1		COMPRESSOR B2		STANDARD OFM		LOW SOUND OFM		CONTROLS
		Min	Max	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	Qty	FLA (ea)	Qty	FLA (ea)	FLA
20	208-3-60	187	253	28.7	207.5	40.8	270	—	—	—	—	2	6.8	2	5.8	4.8
	230-3-60	187	253	28.7	207.5	40.8	270	—	—	—	—	2	6.8	2	5.8	4.8
	460-3-60	414	506	12.8	100.2	19.4	147	—	—	—	—	2	3.4	2	2.8	2.4
	575-3-60	518	633	10.9	78	13.7	109	—	—	—	—	2	3.3	2	2.4	2
26	208-3-60	187	253	28.7	207.5	49	386.3	—	—	—	—	2	6.8	2	5.8	4.8
	230-3-60	187	253	28.7	207.5	49	386.3	—	—	—	—	2	6.8	2	5.8	4.8
	460-3-60	414	506	12.8	100.2	24	182	—	—	—	—	2	3.4	2	2.8	2.4
	575-3-60	518	633	10.9	78	19.2	131	—	—	—	—	2	3.3	2	2.4	2
30	208-3-60	187	253	33.3	255	49	386.3	—	—	—	—	2	6.8	2	5.8	4.8
	230-3-60	187	253	33.3	255	49	386.3	—	—	—	—	2	6.8	2	5.8	4.8
	460-3-60	414	506	16	140	24	182	—	—	—	—	2	3.4	2	2.8	2.4
	575-3-60	518	633	12.9	107.6	19.2	131	—	—	—	—	2	3.3	2	2.4	2
34	208-3-60	187	253	45.9	335.5	49	396.3	—	—	—	—	2	6.8	2	5.8	4.8
	230-3-60	187	253	45.9	335.5	49	396.3	—	—	—	—	2	6.8	2	5.8	4.8
	460-3-60	414	506	22.2	150	24	182	—	—	—	—	2	3.4	2	2.8	2.4
	575-3-60	518	633	17.3	109	19.2	131	—	—	—	—	2	3.3	2	2.4	2
40	208-3-60	187	253	28.7	207.5	33.3	255	28.7	207.5	33.3	255	4	6.8	4	5.8	4.8
	230-3-60	187	253	28.7	207.5	33.3	255	28.7	207.5	33.3	255	4	6.8	4	5.8	4.8
	460-3-60	414	506	12.8	100.2	16	140	12.8	100.2	16	140	4	3.4	4	2.8	2.4
	575-3-60	518	633	10.9	78	12.9	107.6	10.9	78	12.9	107.6	4	3.3	4	2.4	2
50	208-3-60	187	253	29.8	255	40.8	270	29.8	255	40.8	270	4	6.8	4	5.8	4.8
	230-3-60	187	253	29.8	255	40.8	270	29.8	255	40.8	270	4	6.8	4	5.8	4.8
	460-3-60	414	506	13.5	130	19.4	147	13.5	130	19.4	147	4	3.4	4	2.8	2.4
	575-3-60	518	633	11.2	93.7	13.7	109	11.2	93.7	13.7	109	4	3.3	4	2.4	2
60	208-3-60	187	253	3.3	255	49	386.3	3.3	255	49	386.3	6	6.8	6	5.8	4.8
	230-3-60	187	253	3.3	255	49	386.3	3.3	255	49	386.3	6	6.8	6	5.8	4.8
	460-3-60	414	506	16	140	24	182	16	140	24	182	6	3.4	6	2.8	2.4
	575-3-60	518	633	12.9	107.6	19.2	131	12.9	107.6	19.2	131	6	3.3	6	2.4	2

LEGEND

C/O — Convenience Outlet
FLA — Full-Load Amp
IFM — Indoor Fan Motor
LRA — Locked Rotor Amp
OFM — Outdoor Fan Motor
RLA — Rated Load Amp

Electrical data (cont)

NOTE: Refer to Carrier's website at http://ecat.Carrier.com for selection performance data.

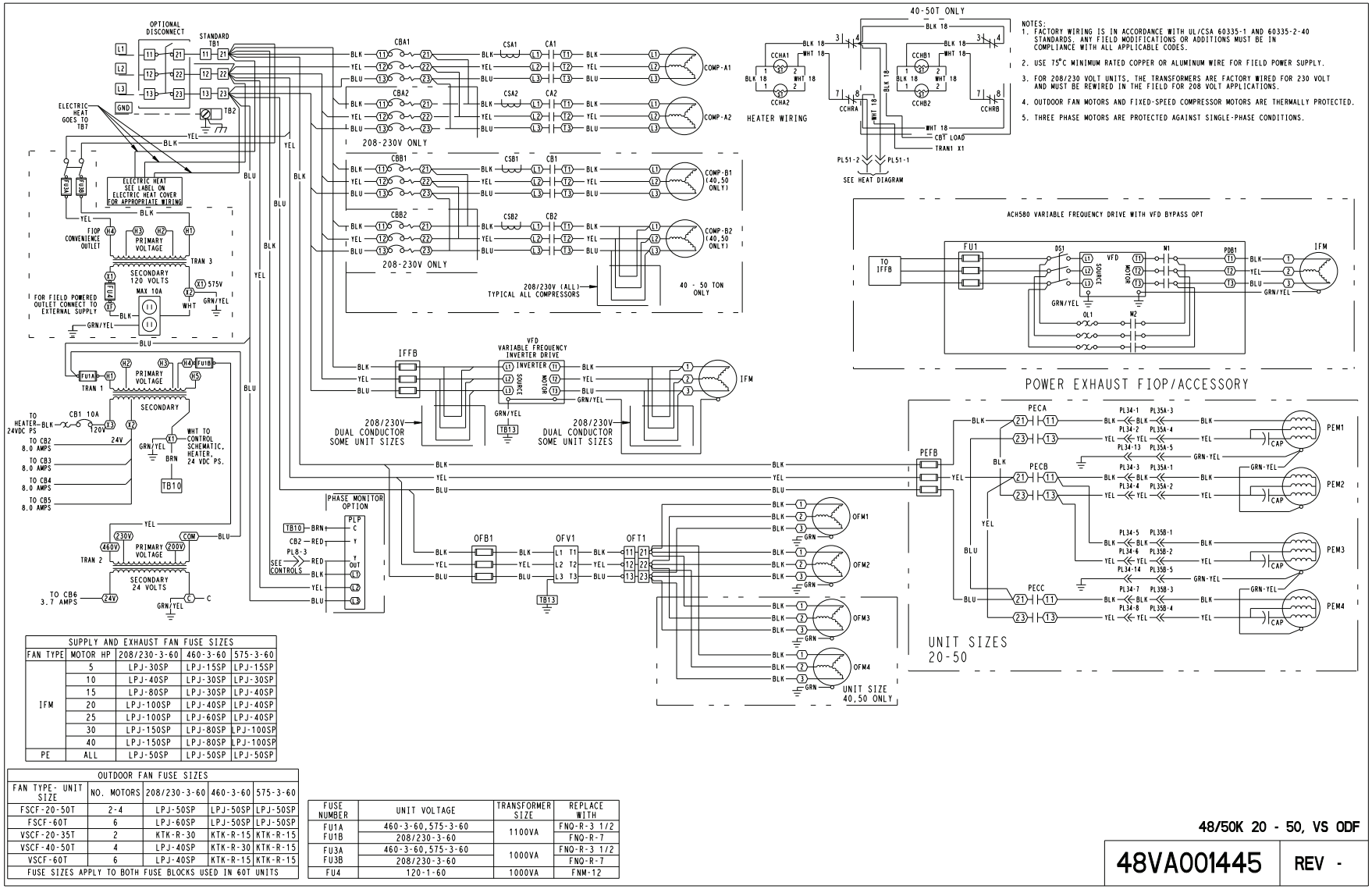
48/50K Electrical Data (cont)

48/50K UNIT SIZE	IFM								ELECTRIC HEAT				POWER EXHAUST				POWERED C/O
									LOW		HIGH		MULTI-STAGE		HIGH CAPACITY		
	HP	FLA (ea)	HP	FLA (ea)	HP	FLA (ea)	HP	FLA (ea)	kW	FLA	kW	FLA	Qty	FLA (ea)	Qty	FLA (ea)	FLA
20	5	15.4	10	30.5	15	44.6	—	—	27	75.1	54.1	150.1	4	5.9	4	6.4	5.3
		14.5		27.9		41.3		—	36	86.6	72	173.2	4	5.9	4	6.4	4.8
		7.3		14		20.7		—	36	43.3	72	86.6	4	3.1	4	3.2	2.2
		5.8		11.6		16.6		—	36	34.6	72	69.3	4	2.4	4	2.4	1.7
26	5	15.4	10	30.5	15	44.6	20	58.3	27	75.1	54.1	150.1	4	5.9	4	6.4	5.3
		14.5		27.9		41.3		53.4	36	86.6	72	173.2	4	5.9	4	6.4	4.8
		7.3		14		20.7		26.7	36	43.3	72	86.6	4	3.1	4	3.2	2.2
		5.8		11.6		16.6		21.6	36	34.6	72	69.3	4	2.4	4	2.4	1.7
30	5	15.4	10	30.5	15	44.6	20	58.3	27	75.1	54.1	150.1	4	5.9	4	6.4	5.3
		14.5		27.9		41.3		53.4	36	86.6	72	173.2	4	5.9	4	6.4	4.8
		7.3		14		20.7		26.7	36	43.3	72	86.6	4	3.1	4	3.2	2.2
		5.8		11.6		16.6		21.6	36	34.6	72	69.3	4	2.4	4	2.4	1.7
34	10	30.5	15	44.6	20	58.3	25	72.6	27	75.1	54.1	150.1	4	5.9	4	6.4	5.3
		27.9		41.3		53.4		68.8	36	86.6	72	173.2	4	5.9	4	6.4	4.8
		14		20.7		26.7		34.1	36	43.3	72	86.6	4	3.1	4	3.2	2.2
		11.6		16.6		21.6		27	36	34.6	72	69.3	4	2.4	4	2.4	1.7
40	10	30.5	15	44.6	20	58.3	25	72.6	27	75.1	54.1	150.1	4	5.9	4	6.4	5.3
		27.9		41.3		53.4		68.8	36	86.6	72	173.2	4	5.9	4	6.4	4.8
		14		20.7		26.7		34.1	36	43.3	72	86.6	4	3.1	4	3.2	2.2
		11.6		16.6		21.6		27	36	34.6	72	69.3	4	2.4	4	2.4	1.7
50	15	44.6	20	58.3	25	72.6	30	85.8	27	75.1	54.1	150.1	4	5.9	4	6.4	5.3
		41.3		53.4		68.8		80.3	36	86.6	72	173.2	4	5.9	4	6.4	4.8
		20.7		26.7		34.1		40.2	36	43.3	72	86.6	4	3.1	4	3.2	2.2
		16.6		21.6		27		31.2	36	34.6	72	69.3	4	2.4	4	2.4	1.7
60	20	58.3	25	72.6	30	85.8	40	113.3	40.6	112.6	81.1	225.2	6	5.9	6	6.4	5.3
		53.4		68.8		80.3		105.1	54	129.9	108	259.8	6	5.9	6	6.4	4.8
		26.7		34.1		40.2		52.3	54	65	108	129.9	6	3.1	6	3.2	2.2
		21.6		27		31.2		42.2	54	52	108	103.9	6	2.4	6	2.4	1.7

LEGEND

C/O — Convenience Outlet
FLA — Full-Load Amp
HP — Horsepower
IFM — Indoor Fan Motor
kW — Kilowatt
OFM — Outdoor Fan Motor

48/50K VS ODF Power Schematic (Sizes 20-50)



SUPPLY AND EXHAUST FAN FUSE SIZES				
FAN TYPE	MOTOR HP	208/230-3-60	460-3-60	575-3-60
IFM	5	LPJ-30SP	LPJ-15SP	LPJ-15SP
	10	LPJ-40SP	LPJ-30SP	LPJ-30SP
	15	LPJ-80SP	LPJ-30SP	LPJ-40SP
	20	LPJ-100SP	LPJ-40SP	LPJ-40SP
	25	LPJ-100SP	LPJ-60SP	LPJ-40SP
	30	LPJ-150SP	LPJ-80SP	LPJ-100SP
	40	LPJ-150SP	LPJ-80SP	LPJ-100SP
PE	ALL	LPJ-50SP	LPJ-50SP	LPJ-50SP

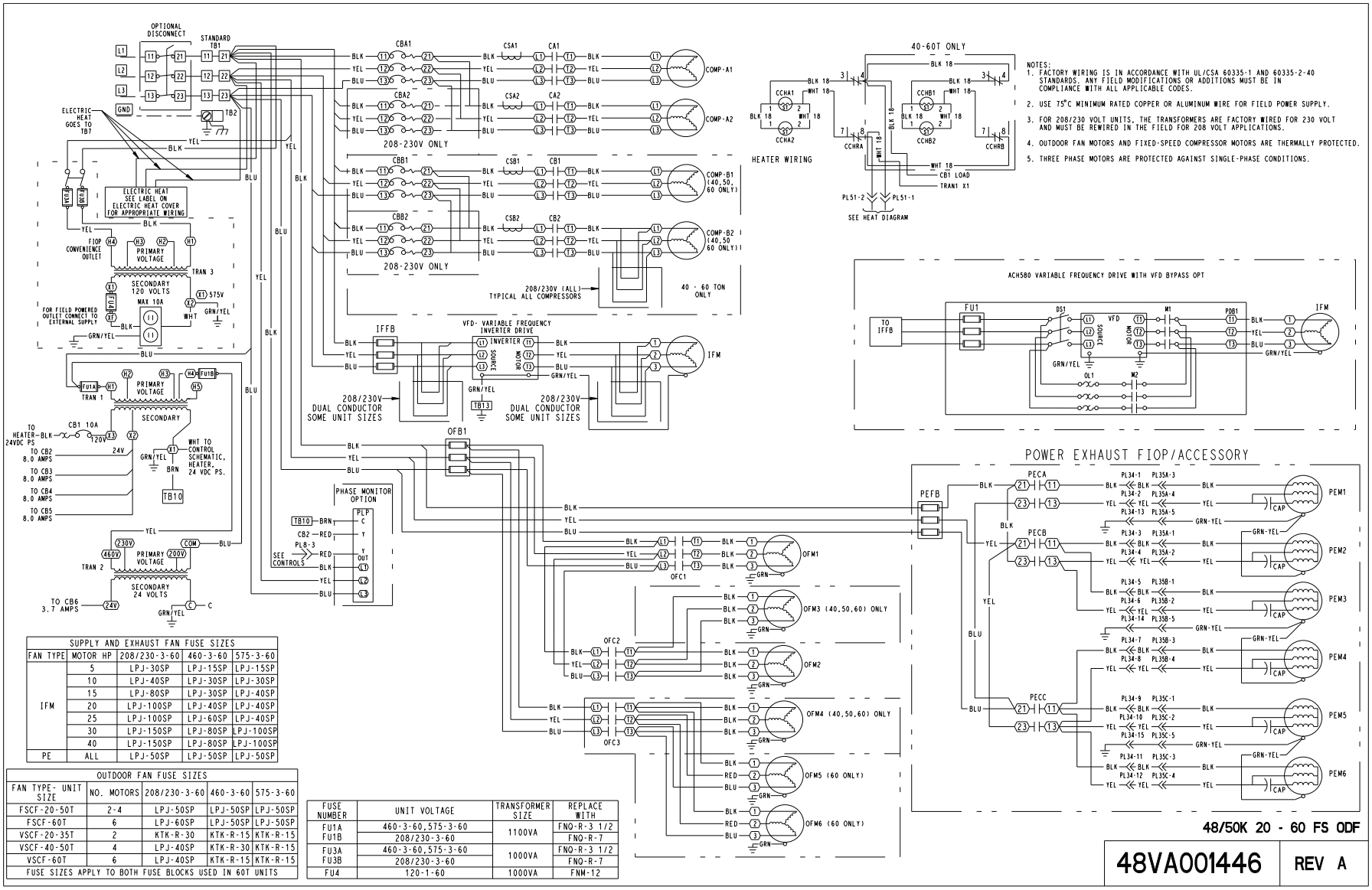
OUTDOOR FAN FUSE SIZES				
FAN TYPE- UNIT SIZE	NO. MOTORS	208/230-3-60	460-3-60	575-3-60
FSCF-20-50T	2-4	LPJ-50SP	LPJ-50SP	LPJ-50SP
FSCF-60T	6	LPJ-60SP	LPJ-50SP	LPJ-50SP
VSCF-20-35T	2	KTK-R-30	KTK-R-15	KTK-R-15
VSCF-40-50T	4	LPJ-40SP	KTK-R-30	KTK-R-15
VSCF-60T	6	LPJ-40SP	KTK-R-15	KTK-R-15
FUSE SIZES APPLY TO BOTH FUSE BLOCKS USED IN 60T UNITS				

FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1A	460-3-60,575-3-60	1100VA	FNQ-R-3 1/2
FU1B	208/230-3-60		FNQ-R-7
FU3A	460-3-60,575-3-60	1000VA	FNQ-R-3 1/2
FU3B	208/230-3-60		FNQ-R-7
FU4	120-1-60	1000VA	FNM-12

48/50K 20 - 50, VS ODF

48VA001445 | REV -

48/50K FS ODF Power Schematic Sizes (20-60)

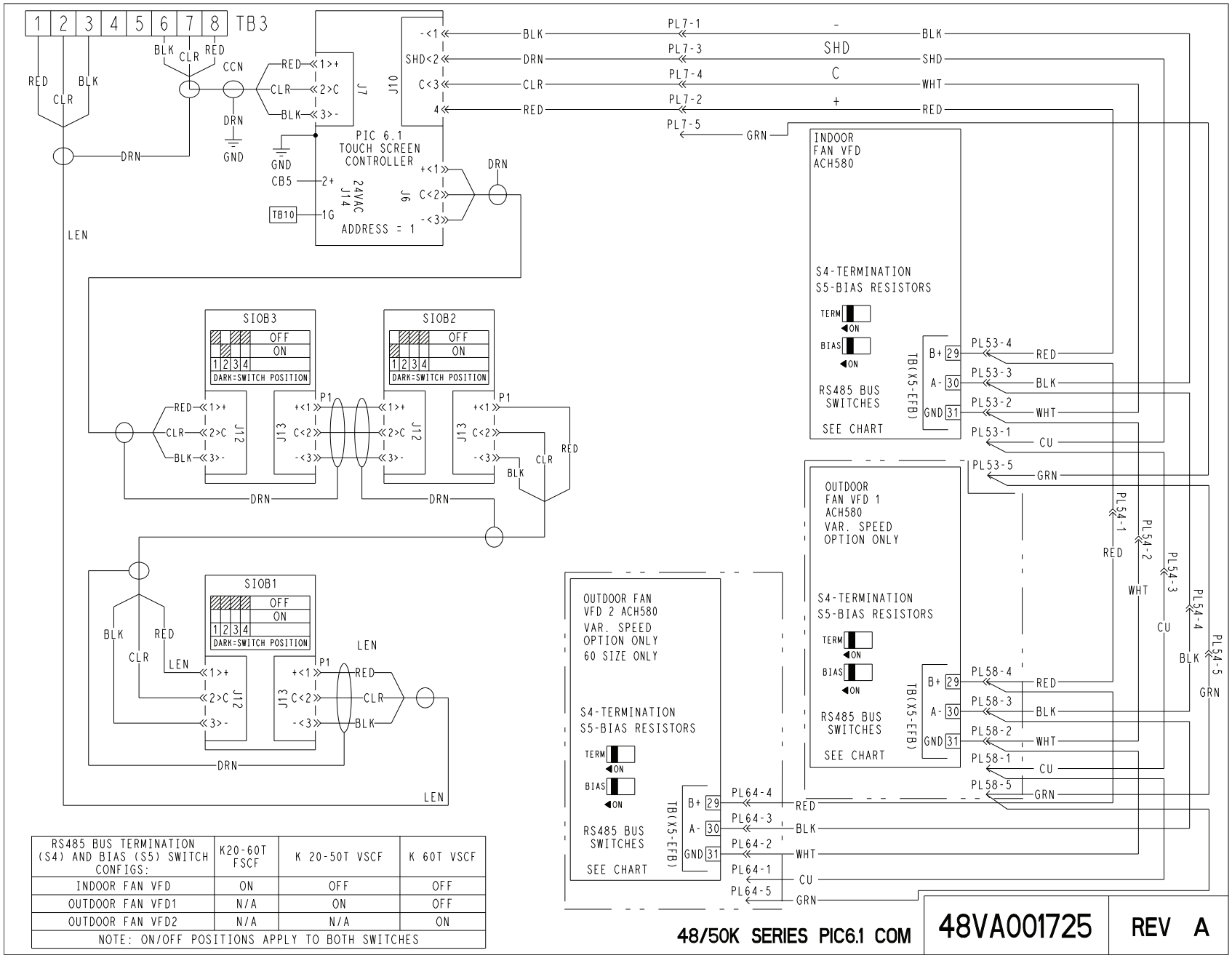


SUPPLY AND EXHAUST FAN FUSE SIZES				
FAN TYPE	MOTOR HP	208/230-3-60	460-3-60	575-3-60
IFM	5	LPJ-30SP	LPJ-15SP	LPJ-15SP
	10	LPJ-40SP	LPJ-30SP	LPJ-30SP
	15	LPJ-80SP	LPJ-30SP	LPJ-40SP
	20	LPJ-100SP	LPJ-40SP	LPJ-40SP
	25	LPJ-100SP	LPJ-60SP	LPJ-40SP
	30	LPJ-150SP	LPJ-80SP	LPJ-100SP
	40	LPJ-150SP	LPJ-80SP	LPJ-100SP
PE	ALL	LPJ-50SP	LPJ-50SP	LPJ-50SP

OUTDOOR FAN FUSE SIZES				
FAN TYPE- UNIT SIZE	NO. MOTORS	208/230-3-60	460-3-60	575-3-60
FSCF-20-50T	2-4	LPJ-50SP	LPJ-50SP	LPJ-50SP
FSCF-60T	6	LPJ-60SP	LPJ-50SP	LPJ-50SP
VSCF-20-35T	2	KTK-R-30	KTK-R-15	KTK-R-15
VSCF-40-50T	4	LPJ-40SP	KTK-R-30	KTK-R-15
VSCF-60T	6	LPJ-40SP	KTK-R-15	KTK-R-15
FUSE SIZES APPLY TO BOTH FUSE BLOCKS USED IN 60T UNITS				

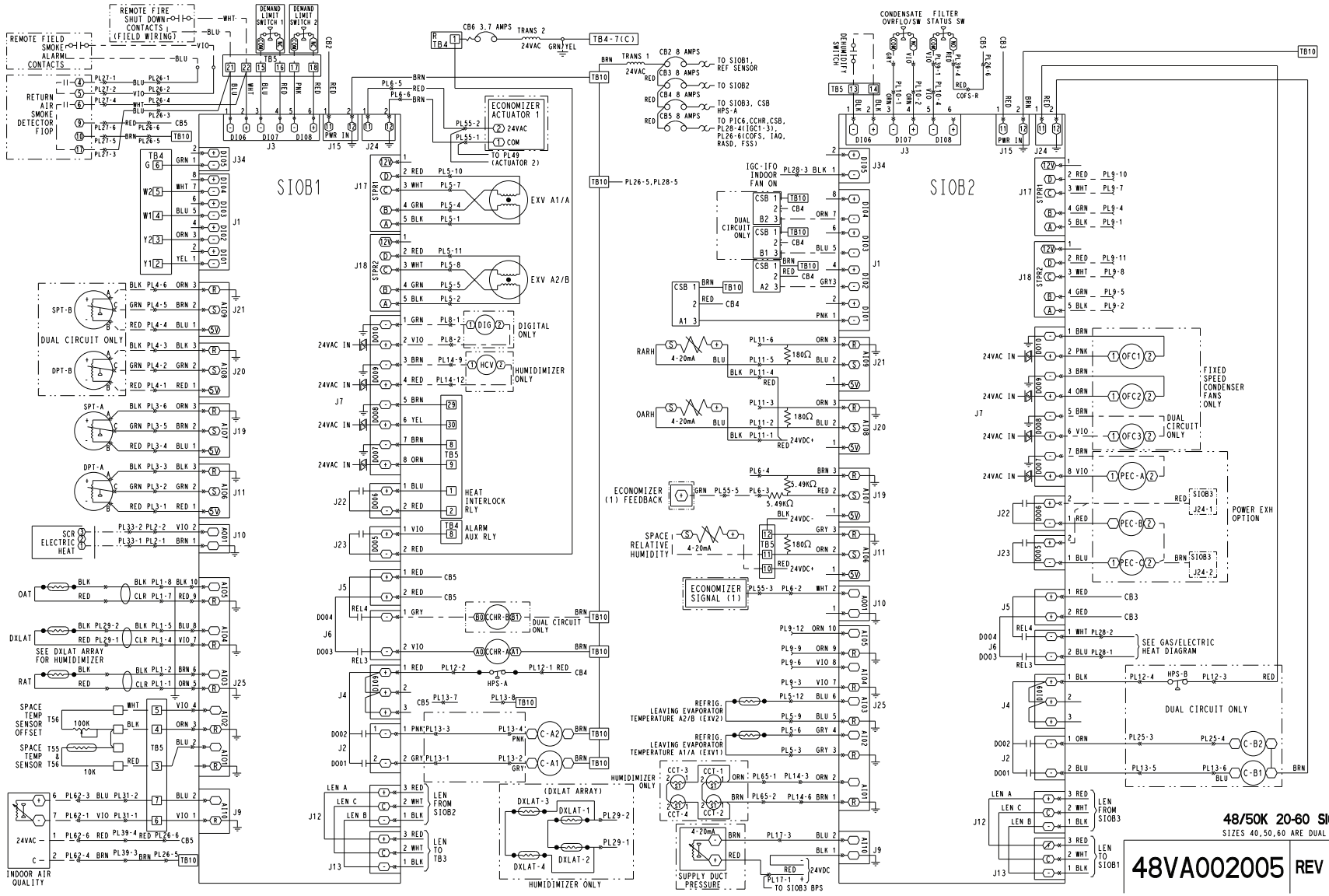
FUSE NUMBER	UNIT VOLTAGE	TRANSFORMER SIZE	REPLACE WITH
FU1A FU1B	460-3-60,575-3-60	1100VA	FNQ-R-3 1/2
	208/230-3-60		FNQ-R-7
FU3A FU3B	460-3-60,575-3-60	1000VA	FNQ-R-3 1/2
	208/230-3-60		FNQ-R-7
FU4	120-1-60	1000VA	FNM-12

48/50K PIC6 Communication Schematic

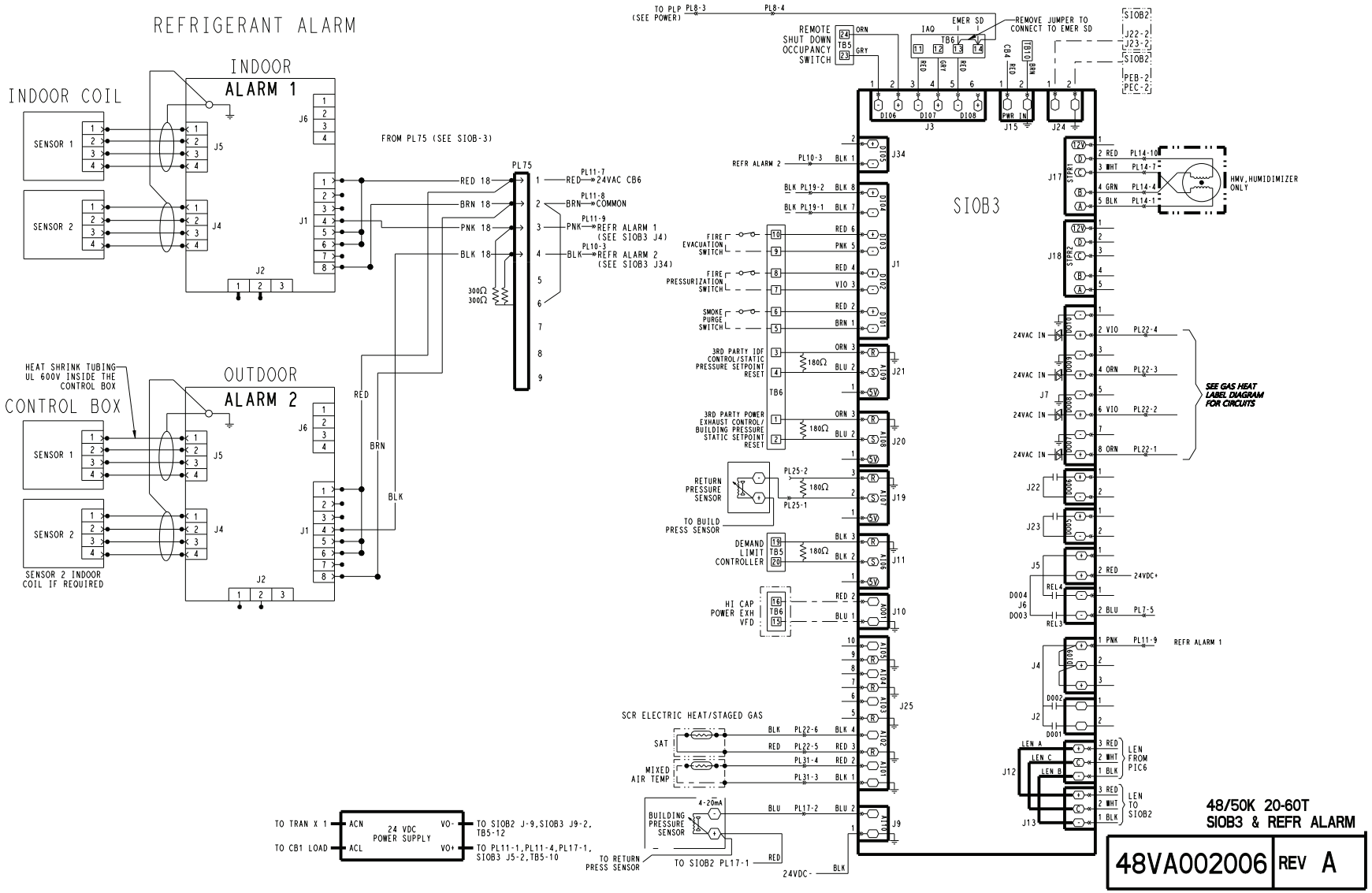


RS485 BUS TERMINATION (S4) AND BIAS (S5) SWITCH CONFIGS:	K20-60T FSCF	K 20-50T VSCF	K 60T VSCF
INDOOR FAN VFD	ON	OFF	OFF
OUTDOOR FAN VFD1	N/A	ON	OFF
OUTDOOR FAN VFD2	N/A	N/A	ON
NOTE: ON/OFF POSITIONS APPLY TO BOTH SWITCHES			

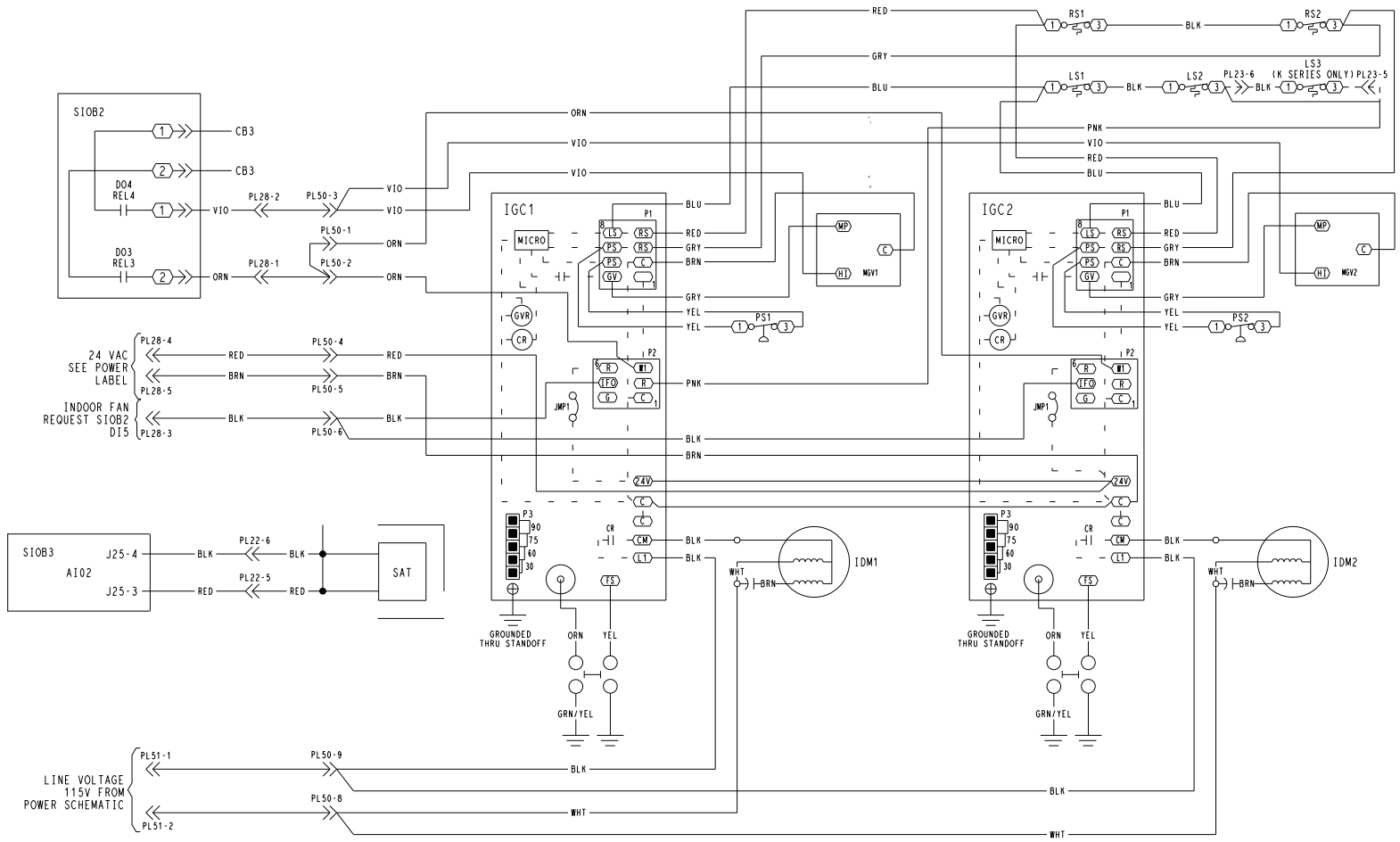
48/50K SIOB 1/2 (Sizes 20-60)



48/50K SIOB3 and Refrigerant Alarm (Sizes 20-60)



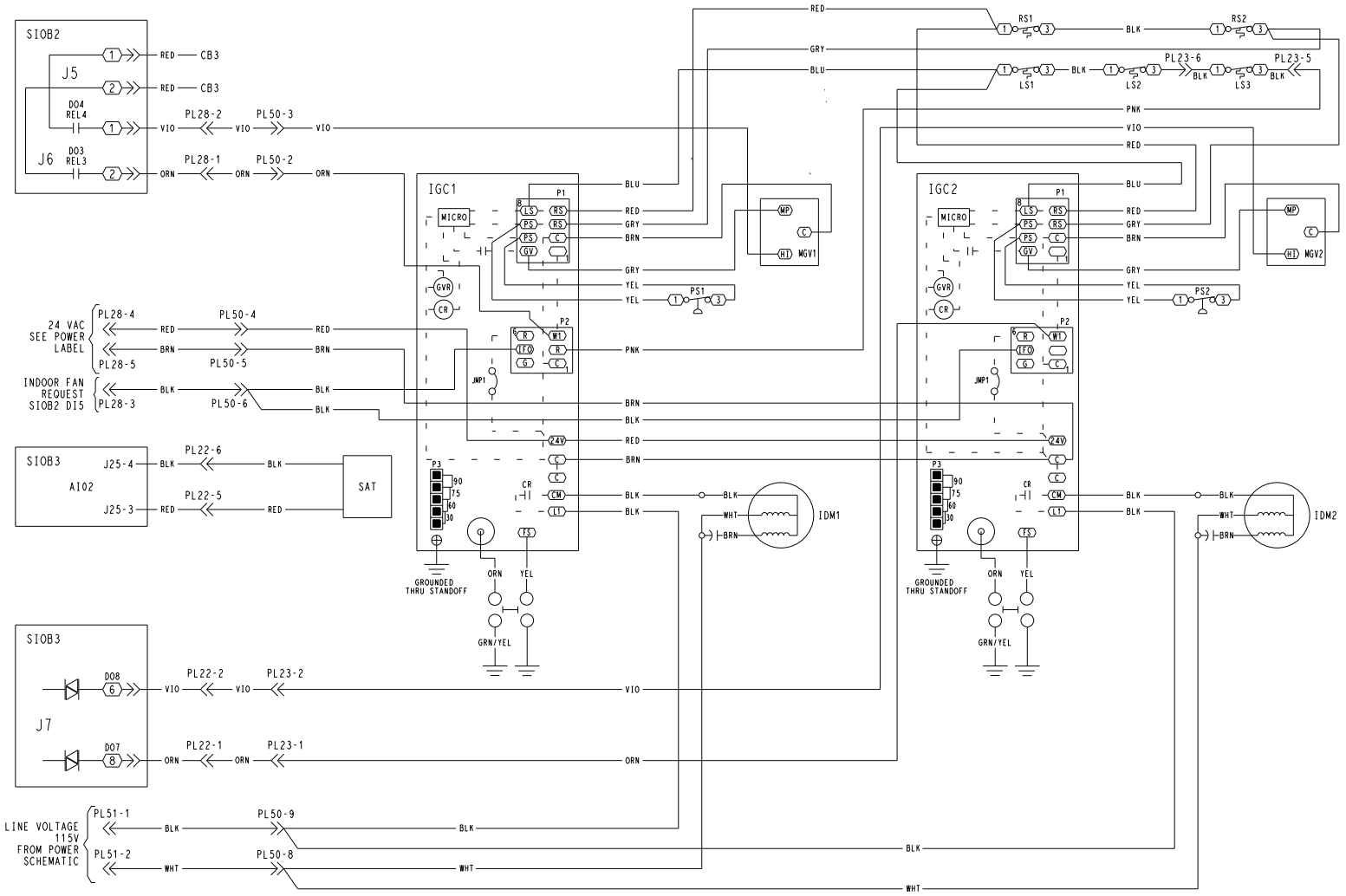
48/50K High 2-Stage Gas Heat Control Circuit (Sizes 20-50)



50V 27-50 HIGH 2 STG GH
K 20-50 2 STG GH

48VV000811	REV C

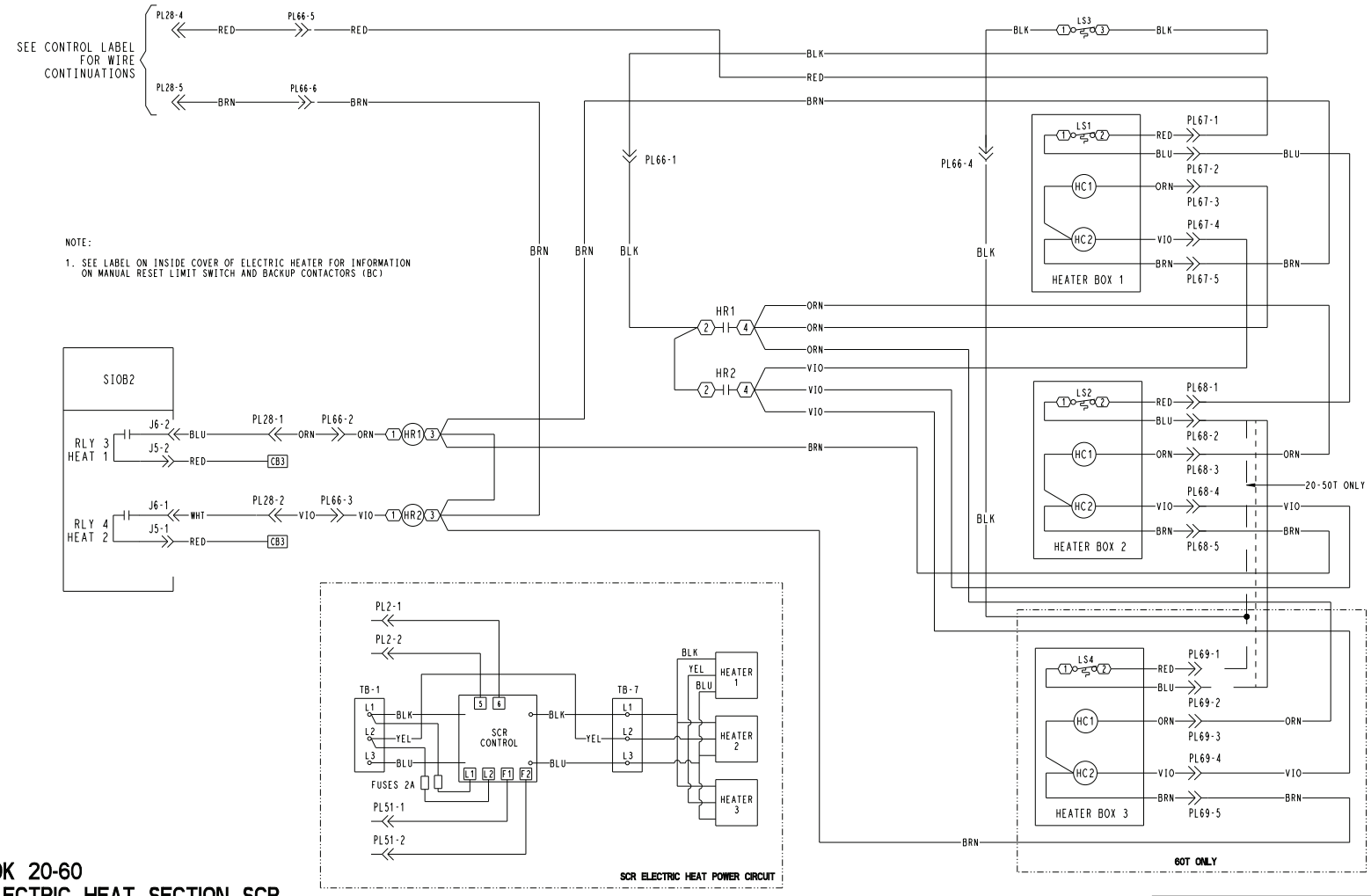
48/50K Multi-Stage Gas Heat Control Circuit (Sizes 20-50)



48K 20T - 50T MULTI STG GH

48VA001544	-

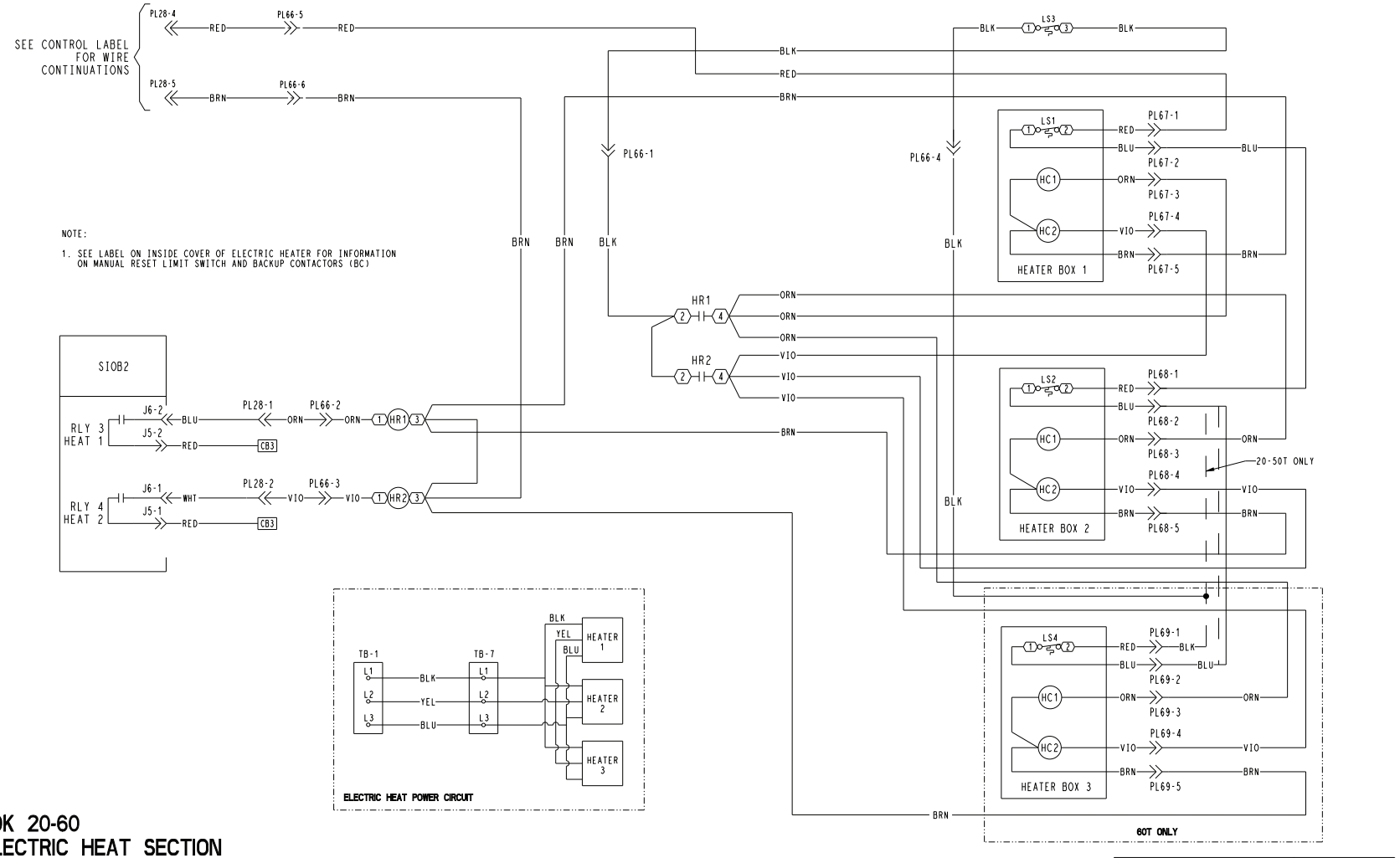
50K Electric Heat Section SCR Control Circuit (Sizes 20-60)



50K 20-60
ELECTRIC HEAT SECTION SCR CONTROL CIRCUIT

48VA503394 | REV -

50K Electric Heat Section Control Circuit (Sizes 20-60)



50K 20-60
ELECTRIC HEAT SECTION
CONTROL CIRCUIT

48VA503393	REV -

48/50K Component Arrangement (Size 60 Horizontal and Vertical)

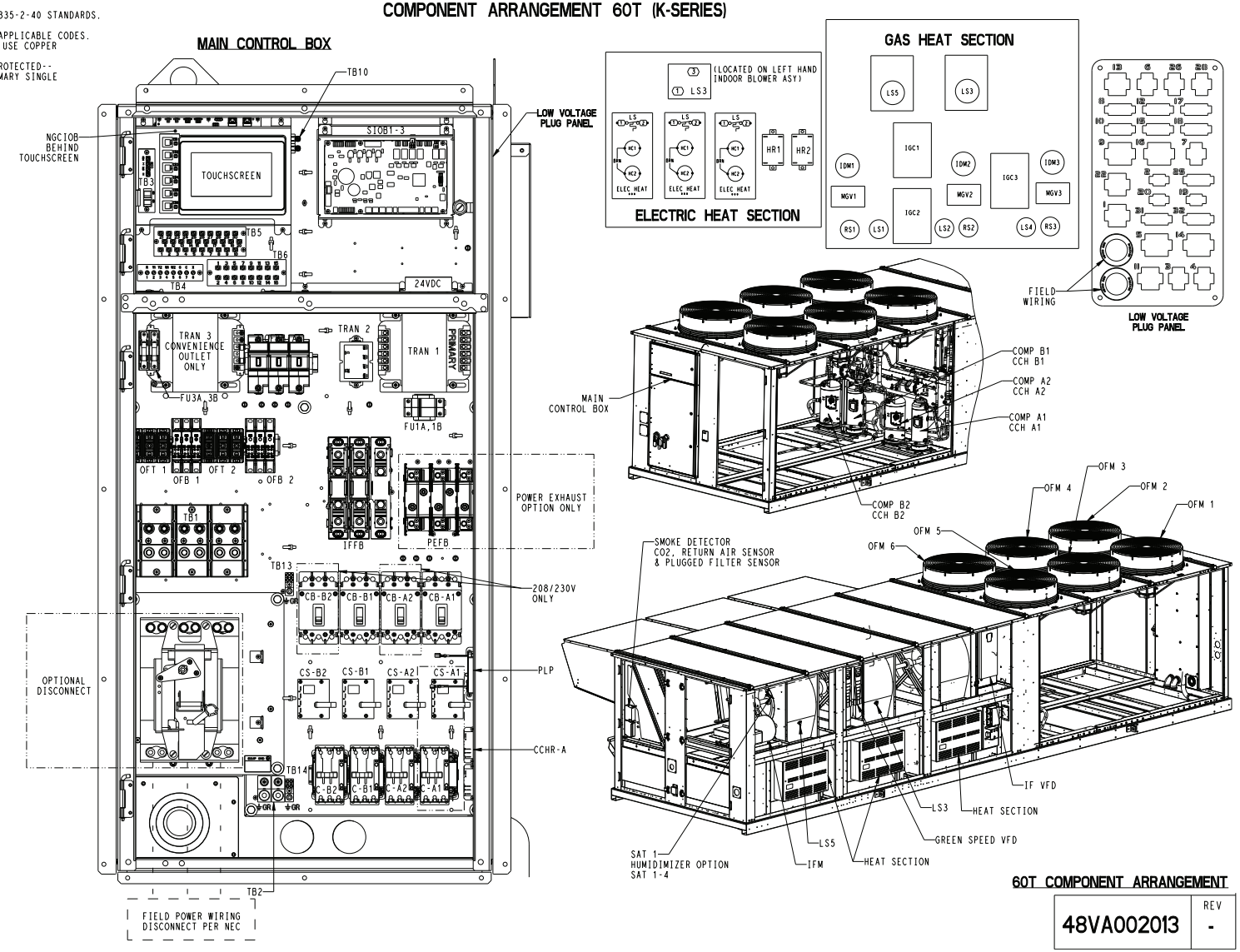
NOTES:
1. FACTORY WIRING IS IN ACCORDANCE WITH UL60335-2-40 STANDARDS. ANY FIELD MODIFICATIONS OR ADDITIONS MUST BE IN COMPLIANCE WITH ALL APPLICABLE CODES.
2. USE 75°C MIN WIRE FOR FIELD POWER SUPPLY. USE COPPER WIRES FOR ALL UNITS.
3. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED-- THREE PHASE MOTORS, PROTECTED AGAINST PRIMARY SINGLE PHASE CONDITIONS.

LEGEND

X	TERMINAL BLOCK
○	TERMINAL (UNMARKED)
(X)	TERMINAL (MARKED
•	SPLICE
———	FACTORY WIRING
– – –	FIELD WIRING
———	TO INDICATE COMMON POTENTIAL ONLY, NOT TO REPRESENT WIRING
—·—·—	TO INDICATE FIOP OR ACCESSORY

ACCSY	ACCESSORY
AN	ANALOG
APS	AIR PRESSURE SWITCH
C	COMPRESSOR CONTACTOR
CAP	CAPACITY
CB	CIRCUIT BREAKER
CBT	CIRCUIT BREAKER, TRANSFORMER
CCB	CONTROL CIRCUIT BREAKER
CCN	CARRIER COMFORT NETWORK
CCT	COOLING COIL THERMISTOR
CCH	CRANKCASE HEATER
CM	COMBUSTION MOTOR
CMR	COMPRESSOR MODULATION RELAY
COFS	CONDENSATE OVERFLOW SWITCH
COMP	COMPRESSOR
COND	CONDENSER
CO2	CARBON DIOXIDE
CR	CONTROL RELAY
CS	CURRENT SENSOR BOARD
DGS	DIGITAL SCROLL
DI	DIGITAL INPUT
DPT	DISCHARGE PRESSURE TRANSDUCER
DTT	DISCHARGE TEMPERATURE THERMISTOR
DUS	DIGITAL UNLOADER SOLENOID
ECM	ELECTRICALLY COMMUTATED MOTOR
ECON	ECONOMIZER
EH	ELECTRIC HEAT
EQUIP	EQUIPMENT
EVAP	EVAPORATOR
EXH	EXHAUST
EXV	ELECTRONIC EXPANSION VALVE
FU	FUSE
GND	GROUND
GVR	GAS VALVE RELAY
HC	HEATER CONTACTOR
HIR	HEAT INTERLOCK RELAY
HMV	HUMIDIMIZER MODULATING VALVE
HPS	HIGH PRESSURE SWITCH
HV	HIGH VOLTAGE
HVS	HUMIDIMIZER VALVE SOLENOID
I	IGNITOR
IAQ	INDOOR AIR QUALITY
IDM	INDUCED DRAFT MOTOR
IFFB	INDOOR FAN FUSE BLOCK
IGC	INTEGRATED GAS CONTROLLER
LEN	LOCAL EQUIPMENT NETWORK
LLS	LIQUID LINE SOLENOID
LS	LIMIT SWITCH
MGC	MODULATING GAS CONTROLLER
MGV	MAIN GAS VALVE
MOD PE	MODULATING POWER EXHAUST
OAQ	OUTDOOR AIR QUALITY
OAT	OUTDOOR AIR THERMISTOR
OFB	OUTDOOR FAN FUSE BLOCK
OFC	OUTDOOR FAN CONTACTOR
OFM	OUTDOOR FAN MOTOR
OFT	OUTDOOR FAN TERMINAL BLOCK
OFV	OUTDOOR FAN VFD
OPT	OPTION
PEFB	POWER EXHAUST FUSE BLOCK
PL	PLUG ASSEMBLY
PLP	PHASE LOSS PROTECTION
PS	PRESSURE SWITCH
RA	RETURN AIR
RAT	RETURN AIR THERMISTOR
RET	RETURN
RF	RETURN FAN
RS	ROLLOUT SWITCH
SAT	SUPPLY AIR THERMISTOR
SC	SIGNAL CONDITIONER
SCR	SILICON CONTROLLED RECIFIER
SEN	SENSOR
SIOB	STARTFIRE IO BOARD
SPT	SUCTION PRESSURE TRANSDUCER
TB	TERMINAL BLOCK
TRAN	TRANSFORMER
T'STAT	THERMOSTAT
VAC	VOLTS ALTERNATING CURRENT
VAV	VARIABLE AIR VOLUME
VDC	VOLTS DIRECT CURRENT
VFD	VARIABLE FREQUENCY DRIVE

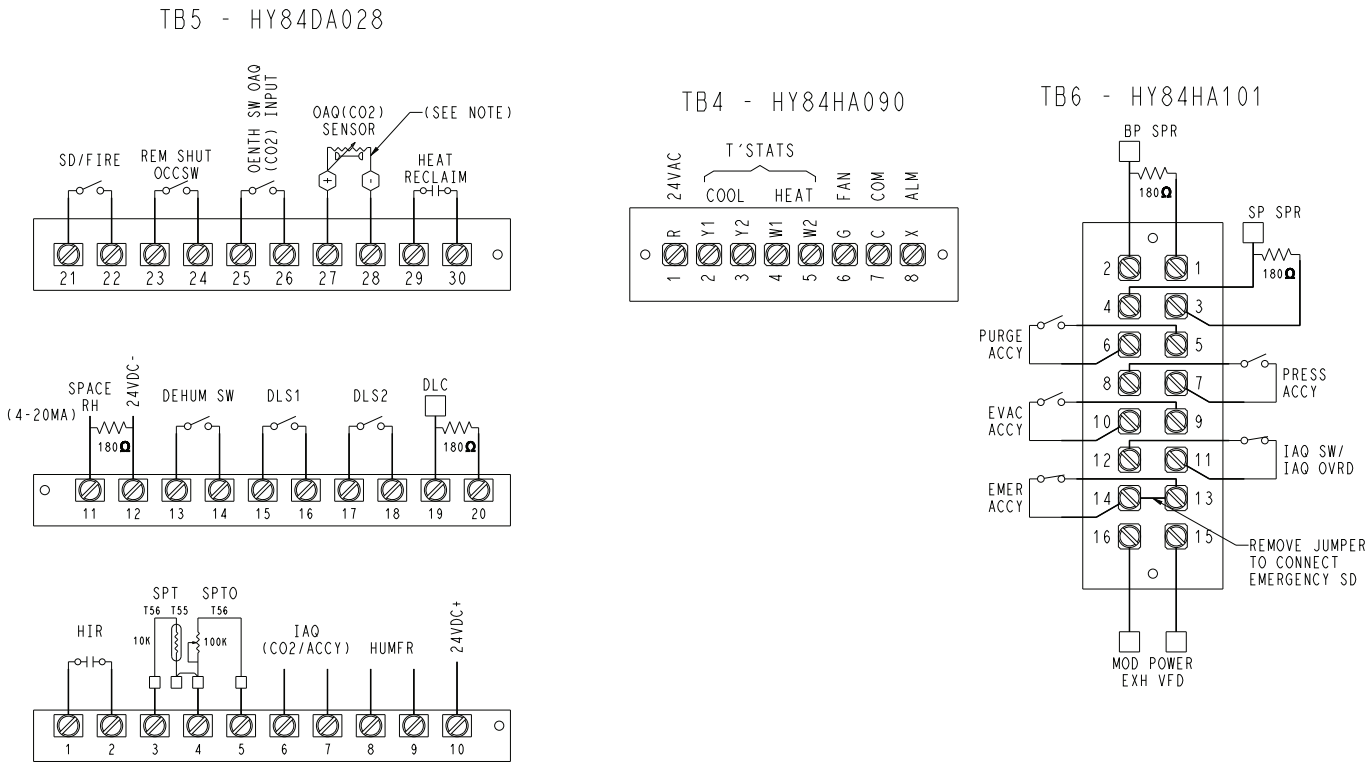
COMPONENT ARRANGEMENT 60T (K-SERIES)



60T COMPONENT ARRANGEMENT

48VA002013	REV -

48/50K Field Wiring Terminal Board Layout



NOTE: OAQ(CO2)SENSOR INPUT ONLY AVAILABLE WHEN EQUIPPED WITH NGCIOB

TERMINAL BD LAYOUT

48VV004617	REV -

NOTE: this specification is in the "Masterformat" as published by the Construction Specification Institute for use in a mechanical specification.

Electric Cooling/Gas Heat Packaged Applied Rooftop Unit

HVAC Guide Specifications

Size Range: **20 to 60 Nominal Tons**

Carrier Model Number: **48K**

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.) Air handling compartment (standard construction):

1. Interior cabinet panels shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiberglass insulation.
2. Access doors shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiberglass insulation covered with galvanized steel liner on the air side (double wall).
3. The gas heat compartment shall be insulated with a minimum 1/2 in. thick, neoprene insulation.
4. The bottom of the base pan (exterior) shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiberglass insulation.
5. Air touching doors and panels shall have a minimum nominal thermal efficiency rating of R4.
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

Part 3 — (23 09 13) Instrumentation and control devices for HVAC

3.01 (23 09 13.23) Sensors and Transmitters:

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

1. Thermostat shall:
   a. Energize both "W" and "G" when calling for heat.
   b. Have capability to energize up to two-stages of cooling, and two-stages of heating.
   c. Include capability for occupancy scheduling.

B. (23 09 13.23.B.) Sensors:

1. Standard sensors shall have outdoor air temperature, return air temperature, evaporator/DX reheat coil leaving air temperature, suction pressure (all circuits), condensing pressure (all circuits), and leaving evaporator refrigerant temperature (all circuits).

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.) Carrier SmartVu™ intelligent integrated unit controller with Direct Digital Control (DDC) shall:

1. Provide integrated unit operation for cooling, heating, and ventilation as well as monitoring, recording, and reporting capabilities. Controller shall also provide diagnostics and alarms of abnormal unit operation through the user interface.
2. Operate standalone, with a two-stage cooling, two-stage heating thermostat, or via building automation system (BAS) without the need for additional control modules, licenses, or adapters.
3. Have plug-and-play compatibility with Carrier i-Vu® Open building automation system, including communication, points and properties pages, and graphics.
4. Shall include a 7 in. color touch screen user interface with intuitive icon based navigation as the primary user interface. Keypad or rotary interfaces or touchscreens less than 7 in. are not acceptable.
5. Allow control access via web browser using a secure, direct ethernet connection between the control and PC, without the need for special licenses or proprietary interface adapters or programs. The web browser interface shall match the local control interface.
6. Provide a minimum of four control interface access levels, including basic access (no password), user access (static password), service access (app authenticated password), and factory access (controlled password).
7. Provide the ability to read refrigerant pressures at local display, web browser, or via BAS network without the use of external refrigerant gauges.
8. Shall include a USB data port to allow for software upgrades without the need for special tools or programs.
9. Provide service capabilities of:
   a. Manual component test.
   b. Service run mode.
   c. Track component run hours and starts.
   d. Data trending.
   e. Alarm history.
10. Allow the use of multiple occupancy sources, including BAS, remote input, local schedules with 365 day real time clock, 8 occupancy schedules and 16 holiday schedules.

11. Shall include field use control inputs, including space temperature, space temperature offset, space relative humidity, supply air temperature, mixed air temperature, two-stage cool/heat thermostat (Y1, Y2, W1, W2, G), dehumidify switch, two demand/capacity limit switches, analog demand limit/third-party supply air temperature reset, pre-filter status switch, indoor air quality (IAQ)/third-party outdoor air damper control, IAQ switch, third-party supply static pressure reset/third-party indoor fan control, remote shutdown/occupancy switch, smoke detector/fire shutdown, emergency shut-down, smoke purge, fire pressurization, and fire evacuation as standard.
12. Shall include field use control outputs, including field provided modulating heat, field provided heat enable, alarm/auxiliary relay, and damper override relay as standard.
13. Provide cooling and heating demand source configurations for space temperature sensor, two-stage cool/heat thermostat or network inputs, or return air temperature.
14. Provide supply air temperature based operation for cooling and modulating or multi-stage heat with user adjustable supply air temperature setpoints for low cool, high cool, VAV cool, low heat, high heat, and vent demands.
15. Shall include occupied cooling, unoccupied cooling, occupied heating, and unoccupied heating setpoints and maintain a 5°F temperature difference between cooling and heating set points to meet the latest ASHRAE 90.1 Energy Standard. Single setpoint configurations are not allowed.
16. Provide the ability to perform cool-tempered venting and heat-tempered venting operation to prevent hot or cold discharge air during vent mode.
17. Allow mechanical cooling operation down to 65°F (18.3°C) entering condenser coil through the staging of condenser fan speeds as standard.
18. Provide user-adjustable compressor lockouts based on outdoor air temperature and mixed air temperature, and user-adjustable heating lockouts based on outdoor air temperature.

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

5.01 (23 09 33.13) Decentralized, Rooftop Units:

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

1. Shall be complete with self-contained low-voltage control circuit.
2. Shall utilize color-coded wiring.
3. Shall have wiring diagrams affixed to the interior door panels of each section.

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

1. Compressors:
   a. Over-temperature.
   b. Over-current.
   c. High refrigerant circuit pressure switch.
2. Refrigeration System:
   a. Outdoor refrigerant leak detection.
   b. Indoor refrigerant leak detection.
3. Heating section shall be provided with the following minimum protections:
   a. Indoor fan switch.
   b. Inducer fan speed sensor.
   c. High temperature limit switches.
   d. Flame rollout switch.
   e. 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 Pre-filter Section

1. Shall consist of factory-installed, disposable 2 in. pleated filters of commercially available sizes, with a minimum rating of MERV 5 unless optional filters are selected.

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

8.01 (23 81 19.16) Large-Capacity Self-Contained Air Conditioners:

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

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
2. Factory-assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge, operating oil charge, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.
3. Unit shall use Puron Advance™ (R-454B) refrigerant and include a factory refrigerant charge. The unit exterior must be marked as using R-454B and the nameplate must contain the refrigerant change weight.
4. Unit shall ship as a single piece and 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 and exceeds ASHRAE 90.1 (latest edition) minimum efficiency requirements.
   2. Unit performance shall be certified in accordance with AHRI Standard 340/360 (latest edition).
   3. Unit shall be designed to conform to ASHRAE 15 (latest editions).
   4. Gas heater shall be designed to conform with in accordance with ANSI Standard Z21.47 (U.S.A.)-20212021/CSA Standard 2.3 (Canada).
   5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
   6. Unit casing shall be capable of withstanding a minimum 500-hour salt spray exposure per ASTM B117 (scribed specimen).
   7. Unit shall be manufactured in a facility registered by ISO 9001:2015.
   8. Roof curb shall be designed to conform to National Roofing Contractors Association (NRCA) criteria per Guideline B-1986.
   9. Unit shall pass an automated factory run test, including validation of refrigerant circuit performance, verification of operation of key components. A run test certificate shall ship with the unit.
   10. Unit shall be designed in accordance with UL Standard 1995 or 60335-2-40, including tested to withstand rain. Compliance shall be listed with UL and UL Canada.

C. (23 81 19.13.C.) Delivery, Storage, and Handling:
   1. Unit shall be stored and handled per manufacturer's recommendations.
   2. Lifting by crane requires 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 in mechanical cooling from 65°F (8.3°C) to 115°F (46.1°C) entering condenser air temperature.
   2. Unit shall have a minimum of 3 stages of cooling capacity.
   3. Unit shall discharge supply air vertically or horizontally as shown on drawings.
   4. Unit shall provide supply air temperature control in cooling.
   5. Unit shall provide two-stages of gas heat.

F. (23 81 19.13.F.) Electrical Requirements:
   1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
   2. The unit power panel shall have a short circuit current rating (SCCR) of no less than 10kA.
   3. The single point electrical connection shall be at a factory-installed terminal block in the power panel.
   4. Power wiring shall be a copper conductor (no aluminum) sized for no less than 167°F (75°C).
   5. Separate enclosures shall be provided for high and low voltage components.

G. (23 81 19.13.G.) Unit Cabinet:
   1. Unit cabinet shall be constructed of galvanized steel (designated G60 per ASTM Standard A653) and shall be bonderized with a pre-painted finish or powder-coat on the outer surface.
   2. Unit cabinet exterior shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
   3. Unit cabinet interior top and side panels (supply air touching) shall be lined minimum 1/2 in. thick, 1.5-lb density, fiberglass insulation.
   4. Unit cabinet shall have an insulation rating of R4.
   5. Unit shall be available in the factory dedicated supply and return openings.
   6. Basepan:
      a. Unit shall have base rails on a minimum of 2 sides.
      b. Shall include a minimum of four lifting lugs to support rigging shackles for maneuvering and overhead rigging.
      c. Base rail shall be a minimum of 16 gauge thickness.
      d. Shall have a single thru-the-base power coupling and primary and secondary thru-the-base control couplings.
      e. Bottom shall be lined with minimum 1/2 in. thick, 1.5-lb density, fiberglass insulation.
   7. Condensate Pan:
      a. Shall be a sloped condensate drain pan made of galvanized steel.
      b. Shall use a single, drain connector through the side of the unit. Connection shall be made per manufacturer's recommendations.
   8. Gas Connections:
      a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit.
   9. Electrical Connections:
      a. All unit power wiring shall enter the power box at the bottom or back.
      b. Thru-the-base capability.
         1) Standard unit shall have a thru-the-base power and control couplings in the basepan.

2) No basepan penetration, other than those authorized by the manufacturer, is permitted.

10. Access Doors:
    a. Hinged access doors in the air handling section shall be double wall construction with a galvanized steel liner and 0.5 in thick, 1.5-lb density fiberglass insulation.
    b. At a minimum, access doors must be provided on the filter section, indoor fan motor section, compressor section, control box, and power box. The air handling doors shall seal against a rubber gasket to prevent air and water leakage.
    c. All doors shall require the use of tools to open the door to help prevent unauthorized access.
11. Access Panels:
    a. Removable panels shall be provided on areas that require infrequent access.

H. (23 81 19.13.H.) Gas Heat:
1. General:
    a. Low and high capacity gas heat options shall be available.
    b. Shall be factory configured for natural gas (NG) and shall be field convertible to propane (LP) using an accessory kit.
    c. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
    d. Shall incorporate a direct-spark ignition system and redundant main gas valve.
    e. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
    f. High-corrosion areas such as flue gas collection and exhaust areas shall be lined with corrosion-resistant material.
2. Control:
    a. The gas heater shall be controlled by an integrated gas controller (IGC) microprocessor.
    b. IGC board shall notify users of fault using an LED (light-emitting diode).
    c. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.
    d. Required gas heat stage signals shall be provided by SmartVu controls.
3. Heat Exchanger:
    a. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gauge steel coated with an aluminum-silicone alloy for corrosion resistance.
    b. Burners shall be of the in-shot type constructed of aluminum-coated steel.
    c. Burners shall incorporate orifices for rated heat output up to 2000 ft (610 m) elevation. Additional accessory kits may be required for applications above 2000 ft (610 m) elevation, depending on local gas supply conditions.
    d. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.
4. Induced Draft System:
    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.

I. (23 81 19.13.I.) Coils:
1. Evaporator (Standard):
    a. Shall be round tube, plate fin style coil with aluminum fins mechanically bonded to internally groved copper tubes (Al/Cu).
    b. Tube diameter shall be no less than 3/8 in. OD (outside diameter).
    c. Sizes 20-34: coils shall be fully active during cooling operation.
    d. Sizes 40-60: coils shall be intertwined between circuits.
    e. Coils shall be leak tested at 150 psig and pressure tested at 650 psig.
2. Condenser (Standard):
    a. Shall be a microchannel design, constructed of an aluminum alloy. The coils shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds.
    b. Microchannel coils shall consist of a two-pass arrangement.
    c. Coils shall be leak tested at 150 psig and pressure tested at 650 psig.

J. (23 81 19.13.J.) Refrigerant Circuit:
1. Refrigerant circuit shall have the following control, safety, and maintenance features:
    a. Single circuit refrigerant circuit on sizes 20-34 for optimal performance and efficiency. Dual refrigerant circuits on sizes 40-60.
    b. Electronic expansion valve (EXV) metering devices on all models. Thermostatic expansion valves (TXV) are not acceptable.

c. Refrigerant filter drier.
d. Service ports on suction and discharge lines.
e. Sight glass.
f. Fusible plug.

2. Compressors:
a. The unit shall have a maximum of two, unequally sized compressors per refrigerant circuit to ensure proper oil management and maximize cooling stages.
b. Compressors shall be mounted on rubber-in-shear vibration isolation.
c. Each compressor shall have crankcase heater that is only on when the compressor is off and the outdoor air temperature is below 80°F (26.6°C).

K. (23 81 19.13.K.) Pre-Filter Section:
1. The standard pre-filter is specified in the filter of this specification.
2. Shall have a minimum 2 in. vertical pre-filter rack.
3. Unit shall ship with a factory provided filter hook.
4. Filters shall be accessible through a hinged access door.

L. (23 81 19.13.L.) Indoor Fan:
1. Motor:
a. Shall be an inverter duty rated, open drip proof (ODP) induction motor. Non-inverter rated motors are not acceptable.
b. Shall include a fixed pitch pulley.
c. Each unit shall have a minimum of three motor horsepower sizes.
d. Shall be capable of operating at 110% of rated horsepower under appropriate conditions.
e. All indoor fan and power exhaust motors 5 hp and larger shall meet the minimum efficiency requirements as established by the Energy Independence and Security Act (EISA) of 2007.

2. Variable Frequency Drive (VFD)
a. All units shall include a variable frequency drive for the indoor fan motor. NOTE: Single speed or multi-speed motors are not acceptable.
b. The VFD shall be factory-installed and wired inside the unit cabinet. The motor shall be controlled by the SmartVu control via modbus communication.
NOTE: Field-installed or stand alone VFDs are not acceptable.

3. Fan:
a. Sizes 20-50: Shall be a belt driven fan assembly with a single, solid fan shaft and two, double width/double-inlet, forward curve fans. NOTE: Hollow shafts are not acceptable.
b. Size 60: Shall be a belt driven fan assembly with a two, solid fan shafts that are connected by a coupler and three, double width/double-inlet, forward curve fans. NOTE: Hollow shafts are not acceptable.
c. Fan shaft bearings shall be of the pillow-block type with positive locking collar and lubrication provisions with a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.
d. The fan bearings shall contain a factory grease charge.
e. Shall include a fixed pitch pulley.
f. Fan and motor shall be statically and dynamically balanced.

4. Control:
a. The indoor fan speed shall be controlled by SmartVu controls.
b. The default indoor fan control shall be staged air volume SAV™ based on cooling or heating capacity.
1) The control shall provide a minimum of four fan speeds in cooling and two fan speeds in heating.
2) The control shall be field configurable for SAV demand, constant volume (CV), or third-party modulation.
c. Variable Air Volume (VAV):
The control shall default to multi-zone variable air volume (MZ-VAV) duct pressure indoor fan control for multi-zone applications.
1) Shall have a duct pressure transducer with 0 to 5 in. wg range and low side pressure port reading atmospheric pressure. Requires field supplied and installed high side pressure tubing and duct pressure pick-up port.
2) The control shall be field configurable for Staged Air Volume (SAV™), single-zone variable air volume (SZ-VAV), constant volume (CV), or third-party modulation.

M. (23 81 19.13.M.) Condenser Fans:
1. Motor:
a. Shall be a three-phase totally enclosed motor. Single-phase motors are not acceptable.
b. Shall use permanently lubricated bearings.
c. Must be statically and dynamically balanced.

2. Fans (Standard):
a. Sizes 20-30, 40-60: shall be a direct-driven propeller type fan constructed of metal.

b. Size 34: shall be a direct-driven AeroAcoustic™ composite condenser fan with swept fan blades and blade edge optimization to reduce radiated sound.
c. Must be protected by PVC-coated steel wire safety guards.
d. Shall discharge air vertically.

N. (23 81 19.13.N.) Manual Outdoor Air Damper (Standard):
1. Shall have pressure activated (no actuator) damper assembly, sized to allow up to 25% outdoor air at maximum position. The damper is open when the indoor fan is on and closes when the indoor fan is off.
2. Must include an adjustable maximum position stopper.
3. Must include factory-supplied, field-installed outdoor air intake hoods and screens.

O. (23 81 19.13.O.) Factory-Installed Options:
1. Factory-installed options must be installed by the original equipment manufacturer.
NOTE: Third-party installed options are not acceptable (except where noted).
2. Multi-stage Gas Heat:
a. The unit shall have a factory-installed multi-stage gas heat system with a minimum of 5 stages of heat.
b. Shall include a stainless steel heat exchanger. Aluminum coated steel heat exchangers are not acceptable.
c. Shall be controlled based on supply air temperature.
d. Shall include a factory-supplied, field-installed supply air temperature (SAT) duct sensor.
3. Stainless Steel Heat Exchanger:
a. The unit shall include a stainless steel gas heat exchanger. Aluminum coated steel heat exchangers are not acceptable.
4. Low-Sound Package:
a. The unit shall have factory-installed low-sound condenser fans and compressor sound blankets that reduce sound output during cooling or dehumidification operation.
b. Shall include only AeroAcoustic™ composite condenser fans with swept fan blades and blade edge optimization to reduce radiated sound and allows for lower rpm operation. Metal condenser fans are not acceptable.
c. Must include vertically extended shrouds on all condenser fans to reduce radiated sound at ground levels.
5. Low Ambient:
a. All condenser fans shall be modulated by a variable frequency drive (VFD) using Greenspeed® intelligence control to optimize performance and allow mechanical cooling down to –10°F (–23.3°C) under appropriate conditions. Staged condenser fans on any circuit are not acceptable.
b. Shall include extended lubrication lines for the indoor fan shaft bearings that are obstructed by condenser fan VFDs.
6. Humidi-MiZer Adaptive Dehumidification:
a. The unit shall have a factory-installed dehumidification system that allows dehumidification in cooling, venting, or heating modes using a variable mixture of warm liquid refrigerant and hot gas refrigerant as a reheat source. Reheat systems that use only hot gas or liquid refrigerant in dedicated coils are not acceptable.
b. During dehumidification mode, the compressors shall control to cooling coil temperature (CCT, an approximation of supply air dew point temperature) and the reheat system shall be modulated to supply air temperature (SAT).
c. The dehumidification system shall have an e-coated reheat coil, on/off reheat valve, modulating condenser bypass valve, interconnecting refrigerant piping, and a cooling coil leaving air temperature sensor. Requires the enthalpy and humidity sensing options (OARH and RARH).
d. When the dehumidification system must provide cool, dehumidified air, the reheat coil shall utilize liquid refrigerant as a reheat source (sub-cooling mode). The further cooling of the liquid refrigerant increases the evaporator dehumidification capacity and improves latent capacity.
e. When the dehumidification system must provide warm, dehumidified air, the reheat coil shall utilize hot gas refrigerant as a reheat source (hot gas mode). The use of hot gas refrigerant allows for higher discharge air temperatures to be achieved compared to sub-cooling mode.
f. When the dehumidification system must dehumidify air and supply it between cool and warm, a modulated mix of hot gas and warm liquid refrigerant is supplied to the reheat coil as a reheat source.
g. The control shall provide configurations for dehumidification demands based on space relative humidity, return air relative humidity, or a discrete dehumidification input.
h. The control shall provide configurations to prevent dehumidification demands with low cool, high cool, VAV cool, low heat, high heat, or vent demands for improved space temperature control.

7. Digital Compressor:
   a. The unit shall include a lead, digital compressor that provides an infinite number of capacity steps for improved supply air temperature control and low load capability.
   b. The unit shall comply with ASHRAE 90.1 requirements for a minimum of 4 stages of cooling capacity and minimum capacity of no more than 20% for systems that modulate airflow to maintain space temperature.
8. Double-wall Construction:
   a. The unit shall include double-wall top and side panels on the unit air handling section for wipe down capability and fiber free operation.
   b. The interior liner shall be constructed of galvanized steel. Aluminum or composite liners are not acceptable.
9. Agion® Double-wall Construction:
   a. The unit shall include double-wall top and side panels on the unit air handling section for wipe down capability and fiber free operation.
   b. The interior liner on air handling section panel and doors shall be constructed of galvanized steel with Agion® antimicrobial coating. Aluminum or composite liners or other anti-microbial coatings are not acceptable.
10. Double-wall Bottom:
    a. The unit shall include a galvanized liner over the bottom base pan insulation for protection in installations where the bottom is exposed, such as slab or structure mounted.
11. Stainless Steel Drain Pan:
    a. The unit shall have a factory-installed condensate drain pan constructed of 409 stainless steel for corrosion protection.
12. E-Coated Condenser Coils:
    a. The unit shall have factory-installed e-coated MCHX condenser coils for corrosion protection.
    b. Coating shall be flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.
    c. E-coat thickness of 0.8 to 1.2 mil with topcoat having a uniform dry thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
    d. Coated coils shall have hardness characteristics of 2H per ASTM D3363-00 and crosshatch adhesion of 4B-5B per ASTM D3359-02.
    e. Coated coils shall have superior impact resistance with no cracking, chipping, or peeling per NSF/ANSI 51-2002 Method 10.2. Impact resistance shall be up to 160 in./lb per ASTM D2794-93.
    f. E-coated aluminum microchannel coils shall be capable of withstanding more than 8,000-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 Standard.
13. E-coated Evaporator Coil:
    a. The unit shall have factory-installed, e-coated Al/Cu evaporator coil(s) for corrosion protection.
    b. Coating shall be flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.
    c. E-coat thickness of 0.8 to 1.2 mil with topcoat having a uniform dry thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
    d. Coated coils shall have a hardness characteristics of 2H per ASTM D3363-00 and crosshatch adhesion of 4B-5B per ASTM D3359-02.
    e. Coated coils shall have superior impact resistance with no cracking, chipping, or peeling per NSF/ANSI 51-2002 Method 10.2. Impact resistance shall be up to 160 in./lb per ASTM D2794-93.
    f. E-coated aluminum microchannel coils shall be capable of withstanding an 3,000-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 Standard.
14. Shaft Grounding Rings:
    a. The unit shall include shaft grounding rings on the indoor fan motor.
15. Variable Frequency Drive (VFD) Bypass:
    a. The unit shall include a VFD bypass device to allow indoor fan operation in the event the indoor fan VFD is inoperable.
16. Totally Enclosed Fan Cooled Motor:
    a. The unit shall include a TEFC indoor fan motor.
17. Humidity and Enthalpy Sensing:
    a. The unit shall have factory-installed outdoor air relative humidity and return air relative humidity sensors for use with dehumidification (return air relative humidity demand) or free cooling control (enthalpy or differential enthalpy changeover, outdoor air dew point lockout).
18. Return Air CO_2:
    a. The unit shall have a factory-installed return air CO_2 sensor to help detect space IAQ.

b. The sensor shall be mounted in the unit return air section and shall measure carbon dioxide (CO_2) concentration in parts per million with an accuracy of ±3%.

c. The sensor shall be connected to the control system to display the IAQ and for use as part of demand controlled ventilation (DCV) or IAQ override control.

19. Ultra-Low Leak Economizer:

a. The unit shall have a factory-installed economizer assembly with modulating outdoor air and return air dampers with damper actuator(s) for ventilation and free cooling operation.

b. The economizer shall be controlled by the unit controller. Separate, standalone economizer control systems are not acceptable.

c. Dampers shall be a gear-driven ultra low leakage type with blade and edge seals. Dampers shall exhibit a maximum leakage rate of 3 cfm per square foot of area at 1 in. wg pressure differential when tested in accordance with AMCA (Air Movement and Control Association) Standard 500.

d. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are capable of internal diagnostics.

e. The unit controller shall have configuration to control ventilation based on indoor fan speed, demand controlled ventilation (DCV), Third-party minimum position control, or third-party full control.

f. The economizer shall be controlled by the unit controller and shall meet California Title 24, ASHRAE 90.1 and IECC Fault Detection and Diagnostic (FDD) requirements.

g. The unit controller shall have configurations to allow free cooling based on outdoor air temperature and differential outdoor air and return air temperature as standard.

1) Configurations shall also be available for outdoor air enthalpy, differential outdoor air and return air enthalpy, outdoor air enthalpy switch, or outdoor air dew point (optional or accessory sensors required).

h. Must include factory-supplied, field-installed outdoor air intake hoods.

20. Barometric Relief:

a. The unit shall have a factory-installed barometric relief system with relief hoods and two pressure-activated damper assemblies in the unit return air section for relieving building pressure during free cooling operation.

b. The damper shall start to open when back pressure exceeds approximately 0.04 in. wg and shall gravity close when back-pressure is reduced.

21. Multi-stage Power Exhaust:

a. The unit shall have a factory-installed exhaust system with four (sizes 20-50) or six (size 60), direct-drive forward curve fans with single-phase motors, barometric dampers, and exhaust air hoods for applications with vertical return.

b. The control system shall have configurations to control the exhaust fan based on outdoor air damper position.

c. The exhaust assemblies ship tilted into the unit for shipping and rigging and are field tilted out for final installation.

22. Multi-stage Power Exhaust with Building Pressure Control:

a. The unit shall have a factory-installed exhaust system with four (sizes 20-50 or six (size 60), direct-drive forward curve fans with single-phase motors, barometric dampers, and exhaust air hoods for applications with vertical return.

b. The unit shall have a factory-installed building pressure transducer with –0.25 to 0.25 in. wg range and low side pressure port reading atmospheric pressure. Requires field-supplied and installed high side pressure tubing and space pressure pick-up port.

c. The control system shall have configurations to control the exhaust fan based on outdoor air damper position or building pressure.

d. The exhaust assemblies ship tilted into the unit for shipping and rigging and are field tilted out for final installation.

23. Power and Control for Accessory Multi-Stage Power Exhaust with Building Pressure Control:

a. The unit shall have a factory-installed power terminal block, control contractors, and updated unit nameplate to support single-point power and control for accessory multi-stage power exhaust systems for horizontal return applications.

b. The unit shall have a factory-installed building pressure transducer with –0.25 to 0.25 in. wg range and low side pressure port reading atmospheric pressure. Requires field supplied and installed high side pressure tubing and space pressure pick-up port.

c. The control system shall have configurations to control the exhaust fan based on outdoor air damper position or building pressure.

d. The accessory multi-stage power exhausts must be ordered separately and are field-installed in the return ductwork.

24. Power and Control for High Capacity Power Exhaust:
    a. The unit shall have a factory-installed power terminal block, control provisions, and updated unit nameplate to support single-point power and control for accessory multi-high capacity exhaust systems for vertical or horizontal return applications.
    b. The unit shall have a factory-installed building pressure transducer with –0.25 to 0.25 in. wg range and low side pressure port reading atmospheric pressure.
    NOTE: Requires field-supplied and installed high side pressure.
    c. The control system shall have configurations to control the exhaust fan based on outdoor air damper position or building pressure.
    d. The accessory high capacity power exhausts must be ordered separately and are field-installed in the return ductwork for horizontal return or on the outside of the unit cabinet for vertical return tubing and space pressure pick-up port.
25. Powered Convenience Outlet:
    a. The unit shall have a factory-installed 115-v, ground-fault protected (GFI) duplex outlet for loads of up to 10A total.
    b. The outlet shall be powered from the unit power feed, using a factory-installed mains to 115-v transformer connected to the load side of the unit terminal block. When the main unit power feed is disconnected, power to the outlet is also disconnected.
    c. Fusing shall be provided on both the line side and load side of the transformer.
    d. The outlet shall be accessible from outside the unit.
    e. The unit nameplate minimum circuit ampacity (MCA) and maximum over-current protection (MOCP) shall have the outlet amp draw.
26. Unpowered Convenience Outlet:
    a. The unit shall have a factory-installed 115-v, ground-fault protected (GFI) duplex outlet for loads of up to 15A total.
    b. The outlet requires a field-supplied and installed 115-v power source.
    c. The outlet shall be accessible from outside the unit.
    d. Does not include a transformer.
27. Non-Fused Disconnect:
    a. The unit shall have a factory-installed, non-fused disconnect for disconnecting the unit power feed during maintenance or servicing.
    b. The disconnect shall be installed in the unit power box with an interlocking, through-the-door style disconnect handle. External disconnects are not acceptable.
    c. The disconnect shall be nominally sized to meet or exceed National Electric Code (NEC) requirements for combination loads. Field-provided breakers or fuses are still required for over-current protection.
    d. The disconnect handle shall support lock-out and tag-out locks.
28. Power Monitor:
    a. The unit shall have a factory-installed power monitor to help protect against damage from abnormal power.
    b. The monitor shall be normally closed and shall detect phase loss and phase reversal.
    c. The monitor shall trigger the control emergency shutdown to shut down the unit when a fault is detected.
29. High Short Circuit Current Rating (SCCR):
    a. The unit shall have factory-installed power box with upgraded high voltage components to provide an SCCR rating of 65kA for 208/230/460-v units or 25kA for 575-v units.
    b. Shall include a terminal block for power connection.
    c. The unit nameplate must reflect the high SCCR rating.
    d. Requires field-provided J-type fuses and fuse holder to be installed and wired before the unit terminal block.
30. Condensate Overflow Switch:
    a. The unit shall have a factory-installed condensate overflow switch to help protect against clogged drain pans.
    b. The overflow switch shall be an conducting type. Float switches are not acceptable.
31. Pre-Filter Status Switch and Access Door Retainers:
    a. The unit shall have a factory-installed pressure measuring switch across the entire pre-filter bank to detect when the filters are dirty.
    b. The unit shall have factory-installed retainers on all access doors to hold the doors open during maintenance.
    c. The pressure switch shall be field-set and adjustable from 0-2 in. wg.
    d. The dirty filter alert shall be viewable from the control interface.
    e. The door retainer shall be rod and stopper type with multiple stopping points.

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32. Return Air Smoke Detector:
    a. The unit shall have a factory-installed smoke detector in the return air section of the unit, to shut down the unit when smoke is detected.
33. Service Pack:
    a. The unit shall have factory-installed discharge and suction line isolation valves on the compressor tandem assembly and a replaceable core filter drier assembly with isolation valves on all circuits to facilitate faster service.
    b. The unit shall include extended lubrication lines with lube ports for the far side fan shaft bearings and coupler (size 60 only). The lube ports are accessible from the indoor fan motor access door.
34. Chicago Refrigerant Relief Valve:
    a. The unit shall have a factory-installed, pressure-activated, mechanical relief valve in all refrigerant circuits to comply with Chicago Building Code. Fusible plugs are not acceptable.
    b. The relief valve shall activate at 650 psig.
    c. The relief valve shall have a National Pipe Thread (NPT) connection for field relief outlet piping.
35. 2 in. MERV 8 Pre-Filters:
    a. The unit shall have a factory-installed 2 in. pre-filter rack with 2 in. MERV 8 pleated filters.
36. 4 in. MERV 8 Pre-Filters:
    a. The unit shall have a factory-installed 4 in. pre-filter rack with 2 in. MERV 8 pleated filters.
37. 4 in. MERV 13 Pre-Filters:
    a. The unit shall have a factory-installed 4 in. pre-filter rack with 4 in. MERV 13 pleated filters.
38. Ultraviolet (UV-C) Fixtures:
    a. Unit shall have factory-installed fixtures for field-provided and installed UV-C emitters.
    b. Fixtures shall be mounted down stream of the evaporator coil.
    c. Fixtures shall have factory wiring with evaporator door interlock switch, disconnect switch, and UV safe view port.
    d. Fixtures require field-provided and installed 115-v power supply.

NOTE: This specification is in the "Masterformat" as published by the Construction Specification Institute for use in a mechanical specification.

Electric Cooling Only or Electric Heat/Hot Water Heat Applied Rooftop Unit

Part 1 — HVAC Guide Specifications

Size Range: **20 to 60 Nominal Tons**

Carrier Model Number: **50K**

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.) Air handling compartment (standard construction):

1. Interior cabinet panels shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiberglass insulation.
2. Access doors shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiberglass insulation covered with galvanized steel liner on the air side (double wall).
3. The heat compartment shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiber-glass insulation.
4. The bottom of the base pan (exterior) shall be insulated with a minimum 1/2 in. thick, minimum 1-3/4 lb density, flexible fiberglass insulation.
5. Air touching doors and panels shall have a minimum nominal thermal efficiency rating of R4.
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

Part 3 — (23 09 13) Instrumentation and control devices for HVAC

3.01 (23 09 13.23) Sensors and Transmitters:

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

1. Thermostat shall:
   a. Have capability to energize up to two-stages of cooling, and two-stages of heating (for units with heating).

B. (23 09 13.23.B.) Sensors:

1. Standard sensors shall have outdoor air temperature, return air temperature, evaporator/DX reheat coil leaving air temperature, suction pressure (all circuits), discharge pressure (all circuits), and leaving evaporator refrigerant temperature (all circuits).

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.) Carrier SmartVu™ intelligent integrated unit controller with Direct Digital Control (DDC) shall:

1. Provide integrated unit operation for cooling, heating, and ventilation as well as monitoring, recording, and reporting capabilities. Controller shall also provide diagnostics and alarms of abnormal unit operation through the user interface.
2. Operate standalone, with a two-stage cooling, two-stage heating thermostat, or via building automation system (BAS).
3. Have plug-and-play compatibility with Carrier i-Vu® Open building automation system, including communication, points and properties pages, and graphics.
4. Shall include a 7 in. color touch screen user interface with intuitive icon based navigation as the primary user interface. Keypad or rotary interfaces or touchscreens less than 7 in. are not acceptable.
5. Allow control access via web browser using a secure, direct ethernet connection between the control and PC, without the need for special licenses or proprietary interface adapters or programs. The web browser interface shall match the local control interface.
6. Provide a minimum of four control interface access levels, including basic access (no password), user access (static password), service access (app authenticated password), and factory access (controlled password).
7. Provide the ability to read refrigerant pressures at local display, web browser, or via BAS network without the use of external refrigerant gauges.
8. Shall include a USB data port to allow for software upgrades without the need for special tools or programs.
9. Provide service capabilities of:
   a. Manual component test.
   b. Service run mode.
   c. Track component run hours and starts.
   d. Data trending.
   e. Alarm history.
10. Allow the use of multiple occupancy sources, including BAS, remote input, local schedules with 365 day real time clock, 8 occupancy schedules and 16 holiday schedules.

11. Shall include field use control inputs, including space temperature, space temperature offset, space relative humidity, supply air temperature, mixed air temperature, two-stage cool/heat thermostat (Y1, Y2, W1, W2, G), dehumidify switch, two demand/capacity limit switches, analog demand limit/third-party supply air temperature reset, pre-filter status switch, indoor air quality (IAQ)/third-party outdoor air damper control, IAQ switch, third-party supply static pressure reset/third-party indoor fan control, remote shutdown/occupancy switch, smoke detector/fire shutdown, emergency shut-down, smoke purge, fire pressurization, and fire evacuation, as standard.
12. Shall include field use control outputs, including field provided modulating heat, field provided heat enable, alarm/aux relay, and damper override relay, as standard.
13. Provide cooling and heating demand source configurations for space temperature sensors, two-stage cool/heat thermostat or network inputs, or return air temperature.
14. Provide supply air temperature based operation for cooling and modulating heat with user adjustable supply air temperature setpoints for low cool, high cool, VAV cool, low heat, high heat, and vent demands.
15. Shall include occupied cooling, unoccupied cooling, occupied heating, and unoccupied heating setpoints and maintain a 5°F temperature difference between cooling and heating set points to meet the latest ASHRAE 90.1 Energy Standard. NOTE: Single setpoint configurations are not allowed.
16. Provide the ability to perform cool-tempered venting and heat-tempered venting operation to prevent hot or cold discharge air during vent mode.
17. Allow mechanical cooling operation down to 65°F (18.3°C) entering condenser coil, through the staging of condenser fan speeds as standard.
18. Provide user-adjustable compressor lockouts based on outdoor air temperature and mixed air temperature, and user-adjustable heating lockouts based on outdoor air temperature.

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

5.01 (23 09 33.13) Decentralized, Rooftop Units:

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

1. Shall be complete with self-contained low-voltage control circuit.
2. Shall utilize color-coded wiring.
3. Shall have wiring diagrams affixed to the interior door panels of each section.

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

1. Compressors.
   a. Over-temperature.
   b. Over-current.
   c. High refrigerant circuit pressure switch.
2. Refrigeration System
   a. Outdoor refrigerant leak detection.
   b. Indoor refrigerant leak detection.

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 Pre-filter Section:

1. Shall consist of factory-installed, disposable 2 in. pleated filters of commercially available sizes, unless optional filters are selected.

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

8.01 (23 81 19.16) Large-Capacity Self-Contained Air Conditioners:

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

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty.
2. Factory-assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge, operating oil charge, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.
3. Unit shall use Puron Advance™ (R-454B) refrigerant and include a factory refrigerant charge. The unit exterior must be marked as using R-454B and the nameplate must contain the refrigerant change weight.
4. Unit shall ship as a single piece and 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 and exceeds ASHRAE 90.1 (latest edition) minimum efficiency requirements.
2. Unit performance shall be certified in accordance with AHRI Standard 340/360 (latest edition).
3. Unit shall be designed to conform to ASHRAE 15 (latest editions).

4. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
5. Pre-painted exterior coating shall be capable of withstanding a minimum 500-hour salt spray exposure per ASTM B117 (scribed specimen).
6. Unit shall be manufactured in a facility registered by ISO 9001:2015.
7. Roof curb shall be designed to conform to National Roofing Contractors Association (NRCA) criteria per Guideline B-1986.
8. Unit shall pass an automated factory run test, including validation of refrigerant circuit performance, verification of operation of key components. A run test certificate shall ship with the unit.
9. Unit shall be designed in accordance with UL Standard 1995 or 60335-2-40, including tested to withstand rain. Compliance shall be listed with UL and UL Canada.

C. (23 81 19.13.C.) Delivery, Storage, and Handling:
1. Unit shall be stored and handled per manufacturer's recommendations.
2. Lifting by crane requires 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 in mechanical cooling from 65°F (8.3°C) to 115°F (46.1°C) entering condenser air temperature.
2. Unit shall have a minimum of the 3 stages of cooling capacity.
3. Unit shall discharge supply air vertically or horizontally as shown on drawings.
4. Unit shall provide supply air temperature control in cooling.

F. (23 81 19.13.F.) Electrical Requirements:
1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
2. The unit power panel shall have a short circuit current rating (SCCR) of no less than 10kA.
3. The single point electrical connection shall be at a factory-installed terminal block in the power panel.
4. Power wiring shall be a copper conductor (no aluminum) sized for no less than 167°F (75°C).
5. Separate enclosures shall be provided for high and low voltage components.

G. (23 81 19.13.G.) Unit Cabinet:
1. Unit cabinet shall be constructed of galvanized steel (designated G60 per ASTM Standard A653) and shall be bonderized with a pre-painted finish or powder-coat on the outer surface.
2. Unit cabinet exterior shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Unit cabinet interior top and side panels (supply air touching) shall be lined minimum 1/2 in. thick, 1.5 lb density, fiberglass insulation.
4. Unit cabinet shall have an insulation rating of R4.
5. The unit shall be available in factory dedicated supply and return openings.
6. Basepan:
   a. Unit shall have base rails on a minimum of 2 sides.
   b. Shall include a minimum of four lifting lugs to support rigging shackles for maneuvering and overhead rigging.
   c. Base rail shall be a minimum of 16 gauge thickness.
   d. Shall have a single thru-the-base power coupling and primary and secondary thru-the-base control couplings.
   e. Bottom shall be lined with minimum 1/2 in. thick, 1.5 lb density, fiberglass insulation.
7. Condensate Pan:
   a. Shall be a sloped condensate drain pan made of galvanized steel.
   b. Shall use a single, drain connector through the side of the unit. Connection shall be made per manufacturer's recommendations.
8. Electrical Connections:
   a. All unit power wiring shall enter the power box at the bottom or back.
   b. Thru-the-base capability.
      1) Standard unit shall have a thru-the-base power and control couplings in the basepan.
      2) No basepan penetration, other than those authorized by the manufacturer, is permitted.
9. Access Doors:
   a. Hinged access doors in the air handling section shall be double wall construction with a galvanized steel liner and 0.5 in thick, 1.5-lb density fiberglass insulation.
   b. At a minimum, access doors must be provided on the filter section, indoor fan motor section, compressor, control box, and power box. The air handling door shall seal against a rubber gasket to prevent air and water leakage.
   c. All doors shall require the use of tools to open the door to help prevent unauthorized access.

10. Access Panels:
    a. Removable panels shall be provided on areas that require infrequent access.

H. (23 81 19.13.H.) Coils:
1. Evaporator (Standard):
    a. Shall be round tube, plate fin style coil with aluminum fins mechanically bonded to copper tubes (Al/Cu).
    b. Tube diameter shall be no less than 3/8 in. OD (outside diameter).
    c. Sizes 20-34: coils shall be fully active during cooling operation.
    d. Sizes 40-60: coils shall be intertwined between circuits.
    e. Coils shall be leak tested at 150 psig and pressure tested at 650 psig.
2. Condenser (Standard):
    a. Shall be an microchannel design, constructed of an aluminum alloy. The coils shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds.
    b. Microchannel coils shall consist of a two-pass arrangement.
    c. Coils shall be leak tested at 150 psig and pressure tested at 650 psig.

I. (23 81 19.13.I.) Refrigerant Circuit:
1. Refrigerant circuit shall have the following control, safety, and maintenance features:
    a. Single circuit refrigerant circuit on sizes 20-34 for optimal performance and efficiency. Dual refrigerant circuits on sizes 40-60.
    b. Electronic expansion valve (EXV) metering devices on all models. Thermostatic expansion valves (TXV) are not acceptable.
    c. Refrigerant filter drier.
    d. Service ports on suction and discharge lines.
    e. Sight glass.
    f. Fusible plug.
2. Compressors:
    a. The unit shall have a maximum of two, unequally sized compressors per refrigerant circuit to ensure proper coil management and maximize cooling stages.
    b. Compressors shall be mounted on rubber-in-shear vibration isolation.
    c. Each compressor shall have crankcase heater that is only on when the compressor is off and the outdoor air temperature is below 80°F (26.6°C).

J. (23 81 19.13.J.) Pre-Filter Section:
1. The standard pre-filter is specified in the filter of this specification.
2. Shall have a minimum 2 in. vertical pre-filter rack.
3. Unit shall ship with a factory provided filter hook.
4. Filters shall be accessible through a hinged access door.

K. (23 81 19.13.K.) Indoor Fan:
1. Motor:
    a. Shall be an inverter duty rated, open drip proof (ODP) induction motor. Non-inverter rated motors are not acceptable.
    b. Shall include a fixed pitch pulley.
    c. Each unit shall have a minimum of three motor horsepower sizes.
    d. Shall be capable of operating at 110% of rated horsepower under appropriate conditions.
2. All indoor fan and power exhaust motors 5 hp and larger shall meet the minimum efficiency requirements as established by the Energy Independence and Security Act (EISA) of 2007.
    a. Variable Frequency Drive (VFD).
    b. All units shall include an variable frequency drive for the indoor fan motor.
    NOTE: Single speed or multi-speed motors are not acceptable.
    c. The VFD shall be factory installed and wired inside the unit cabinet. The motor shall be controlled by the SmartVu control via modbus communication. Field-installed or stand alone VFDs are not acceptable.
3. Fan:
    a. Sizes 20-50: Shall be a belt driven fan assembly with a single, solid fan shaft and two, double width/double- inlet, forward curve fans. Hollow shafts shall not be acceptable.
    b. Size 60: Shall be a belt driven fan assembly with a two, solid fan shafts that are connected by coupler and three, double width/double-inlet, forward curve fans. Hollow shafts shall not be acceptable.
    c. Fan shaft bearings shall be of the pillow-block type with positive locking collar and lubrication provisions with a life of 200,000-hours at design operating conditions in accordance with ANSI B3.15.
    d. The fan bearings shall contain a factory grease charge.
    e. Shall include a fixed pitch pulley.
    f. Fan and motor shall be statically and dynamically.
4. Control:
    a. The indoor fan speed shall be controlled by SmartVu controls.

b. The default indoor fan control shall be staged air volume (SAV™) based on cooling or heating (if equipped) capacity.
   1) The control shall provide a minimum of four fan speeds in cooling and two fan speeds in heating (if equipped).
   2) The control shall be field configurable for SAV demand, constant volume (CV), or third-party modulation.

c. Variable Air Volume (VAV):
The control shall default to mutli-zone variable air volume (MZ-VAV) duct pressure indoor fan control for multi-zone applications.
   1) Shall have a duct pressure transducer with 0 to 5 in. wg range and low side pressure port reading atmospheric pressure. Requires field-supplied and installed high side pressure tubing and duct pressure pick-up port.
   2) The control shall be field configurable for staged sir volume (SAV), single-zone variable air volume (SZ-VAV), constant volume (CV), or third-party modulation.

L. (23 81 19.13.L.) Condenser Fans:
1. Motor:
   a. Shall be a three-phase totally enclosed motor. NOTE: Single-phase motors are not acceptable.
   b. Shall use permanently lubricated bearings.
   c. Must be statically and dynamically balanced.
2. Fans (Standard):
   a. Sizes 20-30,40-60: shall be a direct-driven propeller type fan constructed of metal.
   b. Size 34: shall be a direct-driven AeroAcoustic™ composite condenser fans with swept fan blades and blade edge optimization to reduce radiated sound.
   c. Must be protected by PVC-coated steel wire safety guards.
   d. Shall discharge air vertically.

M. (23 81 19.13.M.) Manual Outdoor Air Damper (Standard):
1. Shall have pressure activated (no actuator) damper assembly, sized to allow up to 25% outdoor air at maximum position. The damper is open when the indoor fan is on and closes when the indoor fan is off.
2. Must include an adjustable maximum position stopper.
3. Must include factory-supplied, field-installed, outdoor air intake hoods and screens.
4. Outdoor air screens shall ship inside the unit for field installation.

N. (23 81 19.13.N.) Factory-installed Options:
1. Two-Stage Electric Heat:
   a. The unit shall have a factory-installed electric heater with two-stages of operation, powered from the unit power feed to reduce installation cost.
   b. The heater shall be available in low or high capacity options.
   c. The heater shall have nickel-chromium (NiCr) resistive heating elements, internal fusing, and manual reset thermal cut-outs.
2. Silicon Rectifier Controlled (SCR) Modulating Electric Heat:
   a. The unit shall have a factory-installed modulating electric heater with SCR control for improved supply air temperature control. Solid state relay (SSR) controlled electric heat is not acceptable.
   b. The heater shall be powered from the unit power feed to reduce installation cost.
   c. The heater shall be available in low or high capacity options.
   d. The heater shall have nickel-chromium (NiCr) resistive heating elements, internal fusing, and manual reset thermal cut-outs.
   e. Shall include a factory-provided, field-installed supply air temperature sensor.
3. Low-Sound Package:
   a. The unit shall have factory-installed low-sound condenser fans and compressor blankets that reduce sound output during cooling or dehumidification operation.
   b. Shall include only AeroAcoustic™ composite condenser fans with swept fan blades and blade edge optimization to reduce radiated sound and allows for lower RPM operation. Metal condenser fans are not acceptable.
   c. Must include vertically extended shrouds on all condenser fans to reduce radiated sound at ground levels.
4. Low Ambient:
   a. All condenser fans shall be modulated by a variable frequency drive (VFD) using Greenspeed® intelligence control to optimize performance and allow mechanical cooling down to –10°F (–23.3°C) under appropriate conditions. Staged condenser fans on any circuit are not acceptable.
   b. Shall include extended lubrication lines for the indoor fan shaft bearings that are obstructed by condenser fan VFDs.
5. Humidi-MiZer Adaptive Dehumidification:
   a. The unit shall have a factory-installed dehumidification system that allows dehumidification in cooling, venting, or heating modes using a variable mixture of warm liquid

refrigerant and hot gas refrigerant as a reheat source. NOTE: Reheat systems that use only hot gas or liquid refrigerant in dedicated coils are not acceptable.

b. During dehumidification mode, the compressors shall control to cooling coil temperature (CCT, an approximation of supply air dew point temperature) and the reheat system shall be modulated to supply air temperature (SAT).

c. The dehumidification system shall have an e-coated reheat coil, on/off reheat valve, modulating condenser bypass valve, interconnecting refrigerant piping, and a cooling coil leaving air temperature sensor. Requires the enthalpy and humidity sensing options (OARH and RARH).

d. When the dehumidification system must provide cool, dehumidified air, the reheat coil shall utilize liquid refrigerant as a reheat source (sub-cooling mode). The further cooling of the liquid refrigerant increases the evaporator dehumidification capacity and improves latent capacity.

e. When the dehumidification system must provide warm, dehumidified air, the reheat coil shall utilize hot gas refrigerant as a reheat source (hot gas mode). The use of hot gas refrigerant allows for higher discharge air temperatures to be achieved compared to sub-cooling mode.

f. When the dehumidification system must dehumidify air and supply it between cool and warm, a modulated mix of hot gas and warm liquid refrigerant is supplied to the reheat coil as a reheat source.

g. The control shall provide configurations for dehumidification demands based on space relative humidity, return air relative humidity, or a discrete dehumidification input.

h. The control shall provide configurations to prevent dehumidification demands with low cool, high cool, VAV cool, low heat, high heat, or vent demands for improved space temperature control.

6. Digital Compressor:
   a. The unit shall include a lead, digital compressor that provides an infinite number of capacity steps for improved supply air temperature control and low load capability.
   b. The unit shall comply with ASHRAE 90.1 requirements for a minimum of 4 stages of cooling capacity and minimum capacity of no more than 20% for systems that modulate airflow to maintain space temperature.
7. Double-wall Construction:
   a. The unit shall include double-wall top and side panels on the unit air handling section for wipe down capability and fiber free operation.
   b. The interior liner shall be constructed of galvanized steel. Aluminum or composite liners are not acceptable.
8. Agion® Double-wall Construction:
   a. The unit shall include double-wall top and side panels on the unit air handling section for wipe down capability and fiber free operation.
   b. The interior liner on air handling section panel and doors shall be constructed of galvanized steel with Agion® antimicrobial coating. Aluminum or composite liners or other anti-microbial coatings are not acceptable.
9. Double-wall Bottom:
   a. The unit shall include a galvanized liner over the bottom base pan insulation for protection in installations where the bottom is exposed, such as slab or structure mounted.
10. Stainless Steel Drain Pan:
    a. The unit shall have a factory-installed condensate drain pan constructed of 409 stainless steel for corrosion protection.
11. E-coated Condenser Coils:
    a. The unit shall have factory-installed E-coated MCHX condenser coils for corrosion protection.
    b. Coating shall be flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.
    c. E-coat thickness of 0.8 to 1.2 mil with topcoat having a uniform dry thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.
    d. Coated coils shall have a hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02.
    e. Coated coils shall have superior impact resistance with no cracking, chipping, or peeling per NSF/ANSI 51-2002 Method 10.2. Impact resistance shall be up to 160 in./lb per ASTM D2794-93.
    f. E-coated aluminum microchannel coils shall be capable of withstanding more than 8,000-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 Standard.
12. E-coated Evaporator Coil:
    a. The unit shall have factory-installed, e-coated Al/Cu evaporator coil(s) for corrosion protection.
    b. Coating shall be flexible epoxy polymer coating uniformly applied to all coil external

surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges.

c. E-coat thickness of 0.8 to 1.2 mil with topcoat having a uniform dry thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided.

d. Coated coils shall have a hardness characteristics of 2H per ASTM D3363-00 and crosshatch adhesion of 4B-5B per ASTM D3359-02.

e. Coated coils shall have superior impact resistance with no cracking, chipping, or peeling per NSF/ANSI 51-2002 Method 10.2. Impact resistance shall be up to 160 in./lb per ASTM D2794-93.

f. E-coated aluminum microchannel coils shall be capable of withstanding an 3,000-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 Standard.

13. Shaft Grounding Rings:
    a. The unit shall include shaft grounding rings on the indoor fan motor.
14. Variable Frequency Drive (VFD) Bypass:
    a. The unit shall include a VFD bypass device to allow indoor fan operation in the event the indoor fan VFD is inoperable.
15. Totally Enclosed Fan Cooled (TEFC) Motor
    a. The unit shall include a TEFC indoor fan motor.
16. Humidity and Enthalpy Sensing:
    a. The unit shall have factory-installed outdoor air relative humidity and return air relative humidity sensors for use with dehumidification (return air relative humidity demand) or free cooling control (enthalpy or differential enthalpy changeover, outdoor air dew point lockout).
17. Return Air CO_2:
    a. The unit shall have a factory-installed return air CO_2) sensor to help detect space IAQ.
    b. The sensor shall be mounted in the unit return air section and shall measure carbon dioxide (CO_2) concentration in parts per million with an accuracy of ±3%.
    c. The sensor shall be connected to the control system to display the IAQ and for use as part of demand con-trolled ventilation (DCV) or IAQ override control.
18. Ultra-Low Leak Economizer:
    a. The unit shall have a factory-installed economizer assembly with modulating outdoor air and return air dampers with damper actuator(s) for ventilation and free cooling operation.
    b. The economizer shall be controlled by the unit controller. Separate, standalone economizer control systems are not acceptable.
    c. Dampers shall be a gear-driven ultra low leakage type with blade and edge seals. Dampers shall exhibit a maximum leakage rate of 3 cfm per square foot of area at 1 in. wg pressure differential when tested in accordance with AMCA (Air Movement and Control Association) Standard 500.
    d. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are capable of internal diagnostics.
    e. The unit controller shall have configuration to control ventilation based on indoor fan speed, demand controlled ventilation (DCV), third-party minimum position control, or third-party full control.
    f. The economizer shall be controlled by the unit controller and shall meet California Title 24, ASHRAE 90.1 and IECC Fault Detection and Diagnostic (FDD) requirements.
    g. The unit controller shall have configurations to allow free cooling based on outdoor air temperature and differential outdoor air and return air temperature as standard.
        1) Configurations shall also be available for outdoor air enthalpy, differential outdoor air and return air enthalpy, outdoor air enthalpy switch, or outdoor air dew point (optional or accessory sensors required).
    h. Must include factory-supplied, field-installed outdoor air intake hoods and screens.
19. Barometric Relief:
    a. The unit shall have a factory-installed barometric relief system with relief hoods and two pressure-activated damper assemblies in the unit return air section for relieving building pressure during free cooling operation.
    b. The damper shall start to open when back pressure exceeds approximately 0.04 in. wg and shall gravity close when back-pressure is reduced.
20. Multi-stage Power Exhaust:
    a. The unit shall have a factory-installed exhaust system with four (sizes 20-50) or six (size 60), direct-drive forward curve fans with single-phase motors, barometric dampers, and exhaust air hoods for applications with vertical return.
    b. The control system shall have configurations to control the exhaust fan based on outdoor air damper position.

c. The exhaust assemblies ship tilted into the unit for shipping and rigging and are field tilted out for final installation.

21. Multi-stage Power Exhaust with Building Pressure Control:
    a. The unit shall have a factory-installed exhaust system with four (sizes 20-50) or six (size 60), direct-drive, forward curve propeller fans with single-phase motors, barometric dampers, and exhaust air hoods, for applications with vertical return.
    b. The unit shall have a factory-installed building pressure transducer with –0.25 to 0.25 in. wg range and low side pressure port reading atmospheric pressure. Requires field-supplied and installed high side pressure tubing and space pressure pick-up port.
    c. The control system shall have configurations to control the exhaust fan based on outdoor air damper position or building pressure.
    d. The exhaust assemblies ship tilted into the unit for shipping and rigging and are field tilted out for final installation.
22. Power and Control for Accessory Multi-Stage Power Exhaust with Building Pressure Control:
    a. The unit shall have a factory-installed power terminal block, control contractors, and updated unit nameplate to support single-point power and control for accessory multi-stage power exhaust systems for horizontal return applications.
    b. The unit shall have a factory-installed building pressure transducer with –0.25 to 0.25 in. wg range and low side pressure port reading atmospheric pressure. Requires field-supplied and installed high side pressure tubing and space pressure pick-up port.
    c. The control system shall have configurations to control the exhaust fan based on outdoor air damper position or building pressure.
    d. The accessory multi-stage power exhausts must be ordered separately and are field-installed in the return ductwork
23. Power and Control for High Capacity Power Exhaust:
    a. The unit shall have a factory-installed power terminal block, control provisions, and updated unit nameplate to support single-point power and control for accessory multi-high capacity exhaust systems for vertical or horizontal return applications.
    b. The unit shall have a factory-installed building pressure transducer with –0.25 to 0.25 in. wg range and low side pressure port reading atmospheric pressure.
    NOTE: Requires field-supplied and installed high side pressure.
    c. The control system shall have configurations to control the exhaust fan based on outdoor air damper position or building pressure.
    d. The accessory high capacity power exhausts must be ordered separately and are field-installed in the return ductwork for horizontal return or on the outside of the unit cabinet for vertical return tubing and space pressure pick-up port.
24. Powered Convenience Outlet:
    a. The unit shall have a factory-installed 115-v, ground-fault protected (GFI) duplex outlet for loads of up to 10A total.
    b. The outlet shall be powered from the unit power feed, using a factory-installed mains to 115-v transformer connected to the load side of the unit terminal block. When the main unit power feed is disconnected, power to the outlet is also disconnected.
    c. Fusing shall be provided on both the line side and load side of the transformer.
    d. The outlet shall be accessible from outside the unit.
    e. The unit nameplate minimum circuit ampacity (MCA) and maximum over-current protection (MOCP) shall have the outlet amp draw.
25. Unpowered Convenience Outlet:
    a. The unit shall have a factory-installed 115-v, ground-fault protected (GFI) duplex outlet for loads of up to 15A total.
    b. The outlet requires a field-supplied and installed 115-v power source.
    c. The outlet shall be accessible from outside the unit.
    d. Does not include a transformer.
26. Non-Fused Disconnect:
    a. The unit shall have a factory-installed, non-fused disconnect for disconnecting the unit power feed during maintenance or servicing.
    b. The disconnect shall be installed in the unit power box with an interlocking, through-the-door style disconnect handle. NOTE: External disconnects are not acceptable.
    c. The disconnect shall be nominally sized to meet or exceed National Electric Code (NEC) sizing for combination loads. Field-provided breakers or fuses are still required for over-current protection.
    d. The disconnect handle shall support lock-out and tag-out locks.
27. Power Monitor:
    a. The unit shall have a factory-installed power monitor to help protect against damage from abnormal power.

b. The monitor shall be normally closed and shall detect phase loss and phase reversal.

c. The monitor shall trigger the control emergency shutdown to shut down the unit when a fault is detected.

28. High Short Circuit Current Rating (SCCR):
    a. The unit shall have factory-installed power box with upgraded high voltage components to provide an SCCR rating of 65kA for 208/230/460-v units or 25kA for 575-v units.
    b. Shall include a terminal block for power connection.
    c. The unit nameplate must reflect the high SCCR rating.
    d. Requires field-provided J-type fuses and fuse holder to be installed and wired before the unit terminal block.
29. Condensate Overflow Switch:
    a. The unit shall have a factory-installed condensate overflow switch to help protect against clogged drain pans.
    b. The overflow switch shall be an conducting type. NOTE: Float switches are not acceptable.
30. Pre-Filter Status Switch and Access Door Retainers:
    a. The unit shall have a factory-installed pressure measuring switch across the entire pre-filter bank to detect when the filters are dirty.
    b. The unit shall have factory-installed retainers on all access doors to hold the doors open during maintenance.
    c. The pressure switch shall be field-set and adjustable from 0-2 in. wg.
    d. The dirty filter alert shall be viewable from the control interface.
    e. The door retainer shall be rod and stopper type with multiple stopping points.
31. Return Air Smoke Detector:
    a. The unit shall have a factory-installed smoke detector in the return air section of the unit, to shut down the unit when smoke is detected.
32. Service Pack:
    a. The unit shall have factory-installed discharge and suction line isolation valves on the compressor tandem assembly and a replaceable core filter drier assembly with isolation valves on all circuits to facilitate faster service.
    b. The unit shall include extended lubrication lines with lube ports for the far side fan shaft bearings and coupler (size 60 only). The lube ports are accessible from the indoor fan motor access door.
33. Chicago Refrigerant Relief Valve:
    a. The unit shall have a factory-installed, pressure-activated, mechanical relief valve in all refrigerant circuits to comply with Chicago Building Code. NOTE: Fusible plugs are not acceptable.
    b. The relief valve shall activate at 650 psig.
    c. The relief valve shall have a National Pipe Thread (NPT) connection for field relief outlet piping.
34. 2 in. MERV 8 Pre-Filters:
    a. The unit shall have a factory-installed 2 in. pre-filter rack with 2 in. MERV 8 pleated filters.
35. 4 in. MERV 8 Pre-Filters:
    a. The unit shall have a factory-installed 4 in. pre-filter rack with 2 in. MERV 8 pleated filters.
36. 4 in. MERV 13 Pre-Filters:
    a. The unit shall have a factory-installed 4 in. pre-filter rack with 4 in. MERV 13 pleated filters.
37. Ultraviolet (UV-C) Fixtures:
    a. Unit shall have factory-installed fixtures for field-provided and installed UV-C emitters.
    b. Fixtures shall be mounted down stream of the evaporator coil.
    c. Fixtures shall have factory wiring with evaporator door interlock switch, disconnect switch, and UV safe view port.
    d. Fixtures require field-provided and installed 115-v power supply.

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