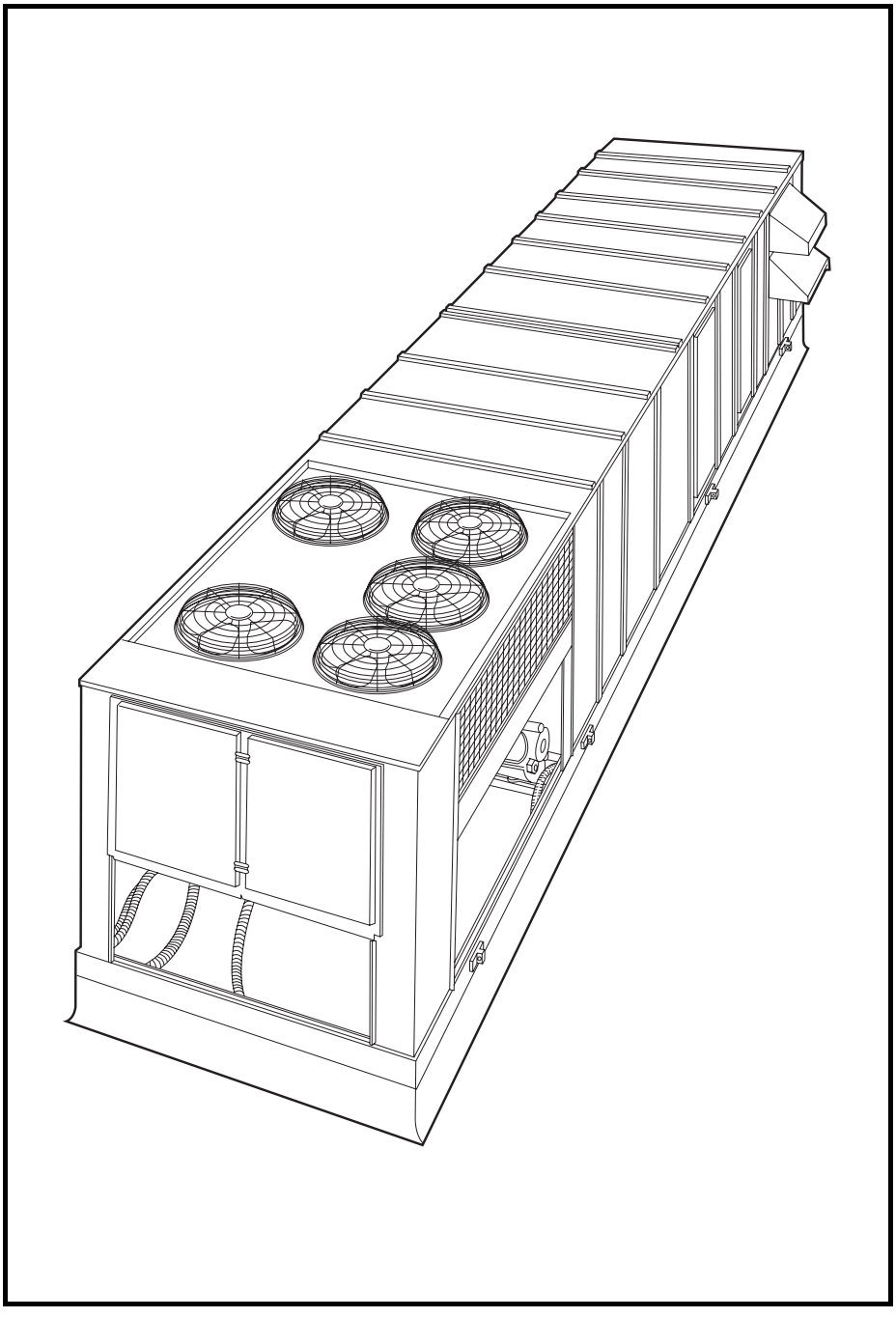
Carrier®

Product Data

48ZG,ZN and 50ZG,ZN,Z2,Z3030-105
48ZT,ZW,Z6,Z8 and
50ZT,ZW,ZX,ZZ,Z6,Z7,Z8,Z9075-105
Single-Package Rooftop Units
Gas Heating/Electric Cooling and
Electric Heating/Electric Cooling Units
with *Comfort*Link™ Controls

30 to 105 Nominal Tons



Single-package rooftop products with communicating controls designed to meet commercial and industrial application requirements

- constant volume (CV): for use when unit operation is to be based on the occupied space temperature
- variable air volume (VAV): for use when unit operation is to be based on discharge-air temperature
- *Comfort*Link controls
- controls can be further enhanced via field-installed accessories
- vertical supply/return units, available on gas heating/electric cooling and electric heating/electric cooling units
- horizontal supply/return units, available on cooling only units and size 075-105 units with electric heat
- discharge plenum, available on cooling only units (standard on sizes 075-105)
- extended chassis available (sizes 030-070)
- extended chassis with discharge plenum available on cooling only units (sizes 030-060)
- return fan/modulating power exhaust available (sizes 075-105)
- high-capacity modulating power exhaust available on vertical and horizontal units (sizes 075-105)
- staged gas control option for supply air tempering
- hydronic heat option (50 series units, sizes 030-070 only)
- high capacity evaporator coil (sizes 040-105)
- optional airfoil fan (sizes 075-105)

Features/Benefits

Factory-installed *Comfort*Link Controls provide free-standing operation. Unit can be linked with a larger control system by using a twisted, 3-wire communication bus. System performance is maximized when the units are used in

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conjunction with the Carrier Comfort Network (CCN). This communication capability can provide remote control as well as monitoring, data collection, and alarms.

The *Comfort*Link™ controls can also interface directly with ComfortID™ controls on 35 and 45 Series VAV terminals to form a ComfortID system for optimal efficiency and tenant comfort.

All units can be applied on non-CCN building control systems via switch and/or 4 to 20 mA signal to provide remote occupancy control, fire shutdown and smoke control modes, IAQ modes, and demand limit sequences.

In addition, VAV units can interface with other control systems via a 4 to 20 mA signal capability which permits control of supply-air temperature reset.

Standard *Comfort*Link control functions include:

- easy to use plain English display
- supply-fan control based on occupancy schedule
- up to 11 steps of capacity control
- lead-lag circuit control to equalize the operating hours between the dual refrigeration circuits
- 2-stage heat control
- adaptive optimal start/morning warm-up
- adaptive optimal stop (CV only)
- head pressure control to 0° F ambient outdoor-air temperature
- economizer and ventilation control
- economizer sequence enabled by standard outside air enthalpy switch
- adjustment of space set point in the occupied space on CV applications
- control of optional variable frequency supply-fan drives
- interface with 35 or 45 Series VAV terminals to create a ComfortID system
- IAQ (indoor air quality) and Demand Control Ventilation control support
- space temperature reset (VAV applications)
- local or remote unit alarm and alert monitoring
- filter maintenance alarm
- building ventilation mode purge
- self-monitoring diagnostics
- demand limiting (on CCN and non-CCN systems)
- external input to permit supply-air temperature reset using a 4 to 20 mA signal from another control system

Unique design

These units with *Comfort*Link controls are uniquely designed in that the controls will support both CV and VAV unit operations. The controls are configured in the factory, based on the unit model and options installed.

System functions like adaptive optimal start, nighttime free cooling, building smoke control modes, occupied heating and IAQ support are resident in the controls and can be easily integrated into the control system strategy.

Staged gas control

Staged Gas Control option provides a supply air TEMPERING HEAT function during conditions of low mixed air temperature while the system is still in a Ventilating mode. These low mixed air conditions occur when the outdoor temperature is low (and the percentage of outside air is usually higher than typical) and the economizer control has driven the outside-air damper back to its minimum position (it has no control range left to work with), so that the mixing of cold outside air and return-from-space air results in mixed-air temperatures below 50 F. At this point, some heat needs to be added to the mixed air to raise its temperature back up to a level suitable for use by the occupied space for ventilation — typically 55 to 70 F. This tempering condition does not warrant a full unit heating mode response. Staged Gas Control option provides this function.

The Staged Gas Control option consists of a supplemental control module with 3 dedicated supply air temperature sensor inputs. The Staged Gas Control option monitors compressor operation. If a compressor is operating, then all heating functions are locked out. If the compressors are off and the air temperature leaving the unit drops below the set point for the tempering mode, then the Staged Gas Control option will start to bring on small steps of gas heat in order to raise the air temperature leaving the unit up to the tempering mode set point.

Units with Staged Gas Control option have additional steps of heating control (5 or 9 based on unit size and gas heat capacity option). The Staged Gas Control option will determine how many of these steps (achieved by cycling gas valves in each heat exchanger between off, low-fire rate and full-fire rate) are required to maintain the tempering set point temperature.

The Staged Gas Control option also provides additional control stages of heating operation during the normal space demand heating function. During a call for First Stage Heat from the unit controller, the Staged Gas Control option will vary the quantity of heating stages in order to raise the unit's leaving-air temperature to the second set point level. This is an internally determined condition. On the unit controller's call for second stage heat, the Staged Gas Control option will bring on ALL heating steps and unit will deliver maximum heating capacity until second stage demand is removed (just like a standard control unit).

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Features/Benefits (cont)

Design flexibility

These rooftop units with *Comfort*-Link™ controls are designed to meet all customer requirements for new construction, replacement jobs, or special applications. Choose from CV or VAV applications, 4 or more supply-fan motor sizes (high and premium efficiency), 2 sizes of natural gas heat (48 series units), electric heat (50 series units), aluminum or copper fin condenser coils, and pre-coated or E-coated condenser coils. Add optional integrated economizer with low-leak dampers, barometric relief, or power exhaust. Economizer and power exhaust are standard on 48ZT, ZW and 50ZT,ZW,ZX,ZZ units. Return fan, economizer, and modulating power exhaust are standard on 48Z6,Z8075-105 and 50Z6,Z7,Z8,Z9075-105 units. Standard 2-in. filters are provided. Standard 2-in. filter tracks can be field-modified to accept 4-in. panel filters.

The units can be used for vertical discharge, discharge plenum vertical discharge, or special horizontal (50Z2,Z3,Z7,Z9,ZX,ZZ) applications, such as replacement or sound-sensitive applications. The 50Z2,Z3,Z7,Z9, ZX,ZZ horizontal installation allows sound to be attenuated before the duct penetrates the roof.

For applications requiring higher space exhaust requirements on size 075-105 units, select 48/50ZT,ZW vertical return and supply or 50ZX,ZZ horizontal return and supply models, with standard high-capacity modulating power exhaust and integrated economizer features.

For applications requiring high return duct static pressures, select 48Z6, Z8 or 50Z6,Z7,Z8,Z9 size 075-105 units with Return Fan and Building Pressure Control exhaust system. The return fan provides a separate fan system dedicated to overcoming flow losses in the return duct, thus reducing the total selection load on the unit's supply fan. The return fan option includes a variable frequency drive (VFD) which modulates return fan airflow to match supply fan airflow and to provide high exhaust flow rate. Building Pressure Control is provided by a modulating position exhaust damper with direct-driven actuator and a Building Pressure transducer (all factory installed).

Extended chassis units are provided with space and mounting tracks for a factory or field-installed heating coil.

Vertical discharge applications utilize a roof curb that follows NRCA (National Roofing Contractors Association) guidelines, which is installed and weather-proofed by the roofing contractor. Ducts attach directly to the roof curb, allowing all ductwork to be completed before the unit is positioned.

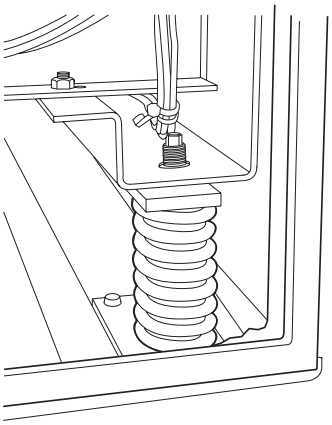
Horizontal applications can be either curb or slab mounted. Ducts attach to the unit utilizing the factory-supplied flanges.

Unit-mounted economizer systems allow for low-cost cooling at mild and low outdoor ambient temperatures by using cooler (and often drier) outdoor air for space cooling. The integrated economizer design operates in conjunction with mechanical cooling when required by internal space loads. The economizer system includes outdoor air temperature control, bottom entry outdoor air hoods with permanent aluminum mesh filters, low leak outdoor air damper section and spring-return actuator.

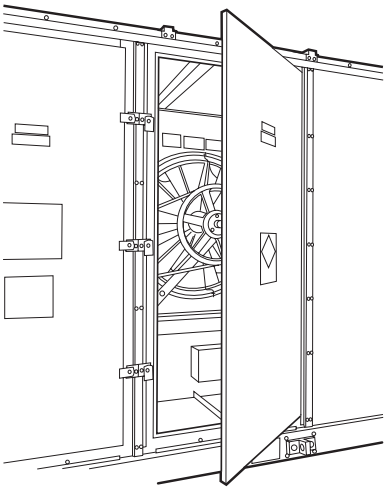
The economizer can be configured to operate in 5 different modes.

- For outdoor air enthalpy changeover mode (standard), economizer operation is enabled when outdoor enthalpy is below the switch setting.
- For outdoor air dry-bulb changeover mode, economizer operation is enabled when the outdoor air dry-bulb temperature is below the user-programmed lockout temperature.
- For differential dry-bulb changeover mode, the *Comfort*Link control compares the return air dry-bulb temperature and the outdoor air dry-bulb temperature. The control locks out economizer operation if the outdoor-air temperature is higher than the return-air temperature.
- For outdoor air enthalpy changeover mode with user-selected set point, economizer operation is enabled if the outdoor air enthalpy is below the user-programmed lockout value. An accessory outdoor air humidity sensor is required.
- For differential enthalpy changeover mode, the *Comfort*Link control compares the return air enthalpy and the outdoor and enthalpy. The control locks out economizer operation if the outdoor air enthalpy is higher than the return air enthalpy. Accessory outdoor air humidity and return air humidity sensors are required.

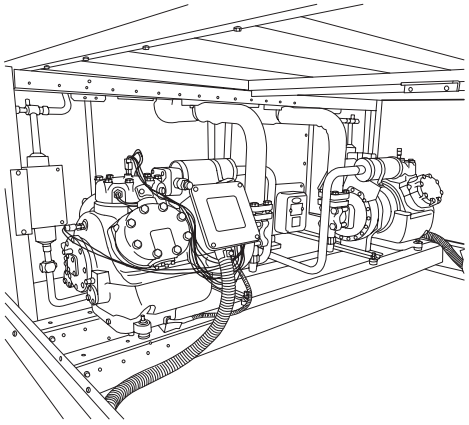
Superior space pressure control is provided by specifying one of the modulating power exhaust systems. Modulating power exhaust systems control exhaust fan airflow rates to maintain a user-established space pressure set point.



SPRING ISOLATION



HINGED ACCESS DOORS



MULTIPLE SEMI-HERMETIC COMPRESSORS

Features/Benefits (cont)

On unit sizes 030-050, the power exhaust system is rated at 20,000 CFM and is a factory-installed option on vertical return units only. On unit sizes 055-105, the standard power exhaust system is rated at 24,000 CFM and is available as a factory-installed option on both vertical and horizontal return models. The High Capacity design (available on sizes 075-105) is rated at 40,000 CFM and is offered in vertical and horizontal return arrangements. The Return Fan option (available on sizes 075-105) is rated at 34,000 CFM and is offered in vertical return arrangements only. High Capacity Power Exhaust and Return Fan options both include a variable frequency drive as a standard feature.

The ComfortID™ solution

The ComfortID system is a completely integrated control system that uses state-of-the-art direct digital control (DDC) to continually monitor and communicate the varying heating and cooling conditions in each zone of the building. Information collected from zone sensors is evaluated by microprocessors, which can be programmed in a variety of ways to interpret the information and direct the HVAC (heating, ventilation and air conditioning) equipment to respond.

The ComfortID system capabilities go well beyond temperature control. By adding humidity, CO_2, or other IAQ sensors, indoor air quality and consistent comfort conditions can be tailor-made for each zone. Proper ventilation based on the number of occupants can be precisely maintained. Using ComfortID system for Demand Control Ventilation (DCV) allows for compliance with ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) standard 62-1989 and helps keep energy costs down. The ComfortID system does not merely monitor air quality — it maintains air quality, adjusting to promote building health.

Indoor Air Quality (IAQ)

All units incorporate a sloped, stainless steel condensate drain pan to prevent standing water from accumulating inside the rooftop air-conditioning unit. The condensate pan has a recessed nonferrous condensate drain connection.

Interior cabinet surfaces (except in the supply fan discharge section) are insulated with a flexible fire-retardant dual-density fiberglass blanket, coated on the air side. The coating contains an EPA (Environmental Protection Agency) registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi.

These units and controls have been developed to provide the design community with the flexibility to meet individual job needs for both comfort and IAQ. The basic unit features include:

- integrated economizer operation to minimize mechanical cooling requirements during intermediate seasons
- optional economizers capable of handling up to 100% outdoor air
- low-leak dampers
- intertwined refrigeration circuits for optimum performance at part-load operation
- semi-hermetic compressors for high-efficiency operation
- dual circuits with semi-hermetic compressors on each circuit for reliability
- CV units provide 2-stage cooling capacity control based on thermostat or space sensor input
- VAV units provide multiple stage cooling capacity control through use of suction cutoff unloading, for improved part-load operation and efficiency
- VAV models provide a minimum of 4 steps of cooling capacity staging, with up to 11 steps of staging for unmatched load matching and part-load performance
- refrigeration system designed to operate down to 0° F outdoor-air temperature
- low rpm single-supply fan mounted on 2-in. deflection springs for low noise and vibration.
- options for a minimum of 4 sizes of high or premium efficiency supply fan motors, that meet or exceed EPACT motor efficiency requirements
- standard 2-in. return air filters
- units are fully tested at the factory
- modulating power exhaust fan control

Fan modulation

Two supply fan duct pressure control options are available on VAV models: Inlet guide vanes (IGV) and variable frequency (inverter) drive (VFD). Both options control supply fan airflow to maintain a user-established duct pressure set point in the unit's supply duct. Both options rely on the control algorithms in the base unit *Comfort*Link™ control system to determine and control IGV position or VFD speed output.

Installation/Serviceability

All full-size access panels are hinged for easy access to serviceable components. No fasteners need to be removed from any units, which reduces servicing time and prevents roof leaks caused by discarded screws puncturing the roof.

Single point electrical connections are standard on all units. Electrical service access can be made through roof curb or side of unit. All 48Z units provide a single point gas connection.

To ensure a successful start-up, every rooftop unit is factory run tested.

When using the Standard Scrolling Marquee, serviceability becomes even easier, including:

- Local or remote alarm and alert monitoring
- Self-diagnostic run testing to confirm control and component operation
- Expedited troubleshooting and unit repair through self-diagnostic display of unit troubleshooting alert and alarm codes with expanded text descriptions to immediately identify reason for unit outage
- Filter maintenance alarm
- Monitoring of supply-air fan run time, permitting easy service schedule planning

Serviceability is further facilitated with suction and discharge pressure transducers. These allow suction pressure and discharge pressure to be monitored remotely with alarm capability. These transducers also control condenser head pressure to maintain the minimum differential pressure required across the thermostatic expansion valve (TXV) for proper operation, which reduces energy consumption.

A factory-installed non-fused disconnect (NFD) option is available to simplify unit installation and improve unit serviceability. The NFD option is sized to accommodate the largest motor option. The location of the NFD beneath the entry to the main control box simplifies field power supply routing into the unit. The NFD incorporates an access panel interlock feature, ensuring that all power to the unit will be disconnected before a service person opens the control box.

Gas heat units (48Z units)

The 48Z units are gas heating units, using natural gas combustion, with two heat sizes available for every unit.

The unit heating systems employ multiple heat exchanger sections, with each section equipped with a 2-stage redundant gas valve and independent ignition control, with all sections operating in parallel.

The tubular steel heat exchanger design optimizes heat transfer for improved efficiency. The tubular design permits multiple passes across the supply air path. Each tube has an individual inshot burner, ensuring uniform combustion in each tube of the heat exchangers. Tubes are dimpled to create a turbulent gas flow to maximize heat efficiency and to ensure uniform surface temperatures for reduced corrosion effects, improved durability and long-life service. Heat exchanger material is aluminized steel or stainless steel, for improved corrosion resistance and reliability.

The IGC (integrated gas unit controller) ignition and safety control system is used on each heat exchanger section. The IGC, unique to Carrier rooftop units, simplifies system evaluation and troubleshooting by providing system status and visual fault notification via an on-board LED (light-emitting diode). Ignition is initiated by a direct spark ignition system; flame status is determined by flame rectification process. Combustion fan operation is proven by a Hall Effect speed sensor circuit. Safeties include flame rollout and limit switch. The ignition sequence provides for automatic reset in the event of failure to ignite, with time delay and purge between restarts; if ignition is not proven after 33 attempts (15 minutes), control will lock out and require manual reset. Auto reset with manual lockout is also provided for repeated limit switch trips. The IGC also prevents short-cycling due to thermostat jiggle by ensuring a full minute heating cycle operation on each call for heat.

The induced draft fan system draws hot combustion gas through the heat exchanger tubes at the optimum rate for the most effective heat transfer and combustion process. The heat exchanger operates under a negative pressure, preventing flue gas leakage into the indoor supply air.

Flue outlet hoods with wind baffles are located on the side of the unit, to minimize the effects of wind on heating operations.

All units use 2-stage control, for unoccupied, morning warm-up and occupied space heating.

Additional control stages for heating operation are available by specifying the Staged Gas Control option.

A single hinged panel gains access to the complete heat exchanger assembly and controls, for improved serviceability.

A single point gas connection provides for easy installation.

An LP (liquid propane) conversion accessory can be field-installed on gas units without staged gas control option (sizes 030-070).

Unit controls

A self-diagnostic microprocessor manages all unit sequences, including stages of cooling and unit safety controls. The microprocessor also controls stages of cooling and unit safety controls. At start-up, the self-diagnostic test verifies component operation and calibration. Fault codes and expanded fault descriptions reduce service troubleshooting time and difficulty.

VAV units provide supply air temperature set point reset via return air temperature to prevent overcooling of the space and maintain higher airflow to ensure adequate ventilation air to the space. SASP reset automatically resets the supply-air temperature upwards when the return air temperature reaches the Occupied Space Temperature set point. Supply-air temperature resets up by a user-defined amount for every degree below set point. SASP reset can also be controlled by space temperature when a Space Temperature Sensor has been installed.

A factory-installed hot gas bypass option provides a modulating offset evaporator load at low coil load conditions.

Most often hot gas bypass is not needed, as the unit will control to discharge air set point and cycle last stage of compression to maintain set point even at low load conditions.

Unit design is ETL and ETL, Canada, listed according to UL (Underwriters' Laboratories) Standard 1995.

When equipped with the modulating power exhaust and the economizer features, and a field-supplied interface with a fire and smoke control panel, units can be set to run in the pressurization, evacuation, or smoke purge mode. In the event of a fire or smoke condition, a zone can be pressurized to prevent smoke from entering the zone, or smoke can be exhausted from a zone. Refer to Smoke Control Modes section on page 99 for more information.

Control expansion module (CEM)

The control expansion module is available as a factory-installed option or as a field-installed accessory.

The CEM is a module which provides for connection of additional accessory or factory sensors and switches to allow the following control capabilities:

- Outdoor air CO_2 sensor (OAQ), for full differential IAQ sequence including ventilation lockout during high outdoor CO_2 levels
- Outdoor aid CFM control (CEM is factory installed when this option is specified)
- Smoke control modes including pressurization, evacuation and smoke purge are all available through software. Terminals are provided to interface with a field-supplied smoke/fire panel.

NOTE: Economizer and modulating power exhaust may be required for some functions.

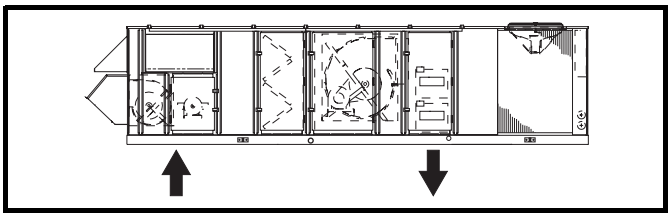
- Space and outdoor air relative humidity sensor inputs permit expanded enthalpy changeover control sequences and management of Dehumidification and/or Humidification sequences. (Additional hardware devices may be required.)
- SASP reset on VAV units via an external 4 to 20 mA signal
- IAQ outdoor damper ventilation sequence initiation by external discrete switch input

Features/Benefits (cont)

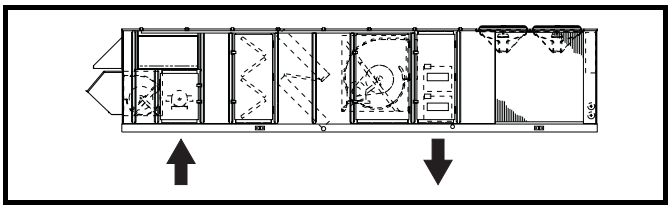
Chassis arrangements (48 Series units)

Standard length chassis with vertical discharge — The standard, compact, vertical discharge arrangement is provided with a bottom, return-air opening, straight-through air path, and horizontal discharge into the heating section with bottom supply air outlet. Ductwork is attached to accessory roof curb. These units are available with factory-installed optional power exhaust or barometric relief packages in conjunction with factory-installed optional economizers.

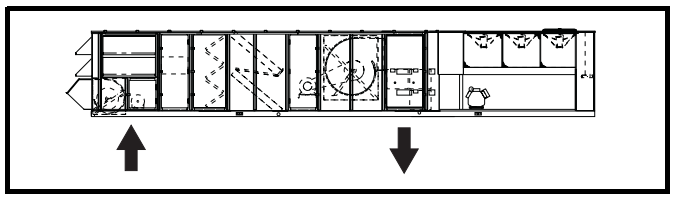
48ZG,ZN030,035



48ZG,ZN040,050

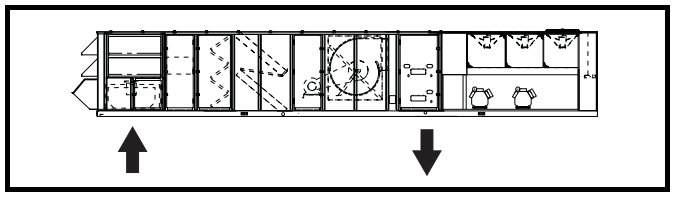


48ZG,ZN055-105



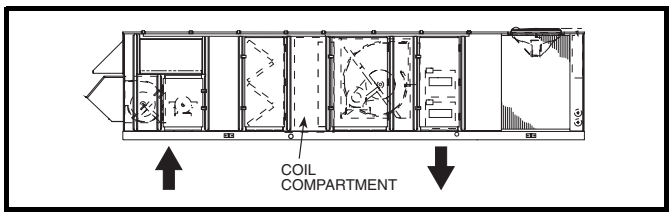
Vertical discharge with return fan and modulating exhaust damper — This vertical discharge arrangement adds a factory-installed return fan and VFD. Return air enters through the bottom opening upstream of the return fan and follows a straight-through path to the supply fan and into the heating section, where it exits through the bottom supply air outlet. Ductwork is attached to the accessory roof curb.

48Z6,Z8075-105

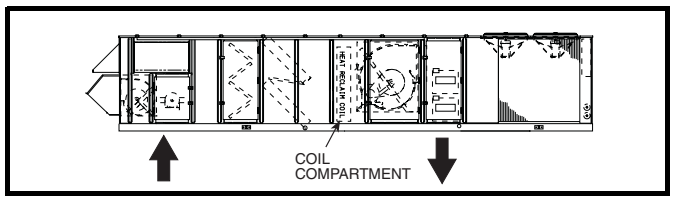


Extended length chassis with vertical discharge — The extended length chassis arrangement provides an additional 25-in. of unit length located between the evaporator coil section and the supply fan sled. This compartment is used for field-installation of an auxiliary coil. The auxiliary coil can be a hydronic heating coil, a steam heating coil, or a refrigeration heat reclaim coil. The extended length compartment includes tracks to accept the field-supplied and -installed auxiliary coil.

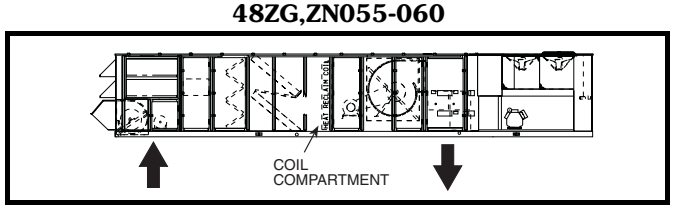
48ZG,ZN030,035



48ZG,ZN040,050

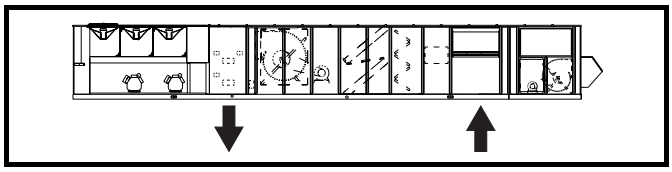


48ZG,ZN055-060



Vertical discharge with high-capacity modulating power exhaust system — This vertical discharge arrangement adds a factory-installed extended rear plenum to house the integrated economizer and high-capacity modulating power exhaust systems (standard features on these models). Return air enters unit through bottom opening upstream of the power exhaust system and follows a straight-through path to the supply fan and into the heating section, where it exits unit through bottom supply air outlet. Ductwork is attached to accessory roof curb.

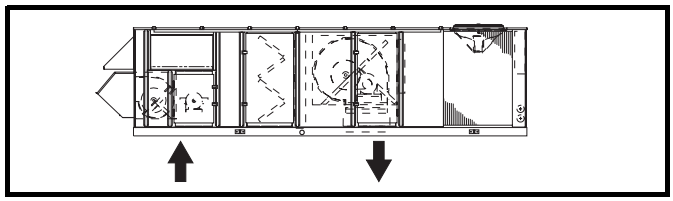
48ZT,ZW075-105



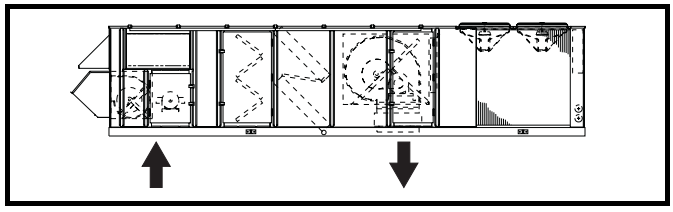
Chassis arrangements — (50 Series units)

Standard length chassis with vertical discharge — The standard, compact, vertical discharge arrangement is provided with a bottom return-air opening, straight-through air path, and direct, vertical-discharge, supply fan for bottom supply air. Ductwork is attached to accessory roof curb. These units are available with factory-installed optional (or field-installed accessory) electric heat. Factory-installed optional power exhaust is available in conjunction with factory-installed optional economizer.

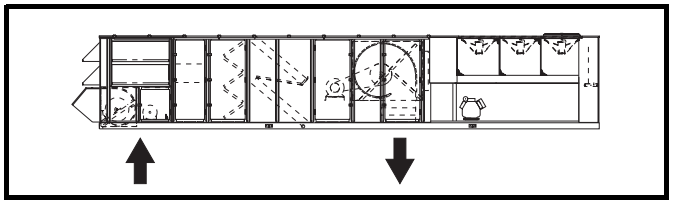
50ZG,ZN030,035



50ZG,ZN040,050

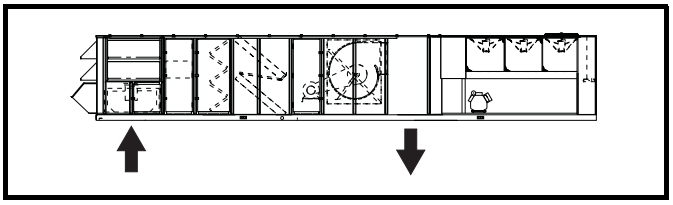


50ZG,ZN055-070



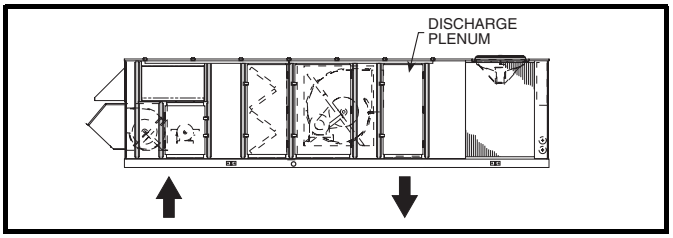
Vertical discharge with return fan and modulating exhaust damper — This vertical discharge arrangement adds a factory-installed return fan with VFD and extended rear plenum. Return air enters unit through bottom opening upstream of the return fan and follows a straight-through path to the supply fan and into the extended plenum section, where it exits unit through bottom supply air outlet. Ductwork is attached to accessory roof curb. Return air exhaust outlet is on the end of the chassis. Factory-installed optional electric heat is available on these units.

50Z6,Z8075-105

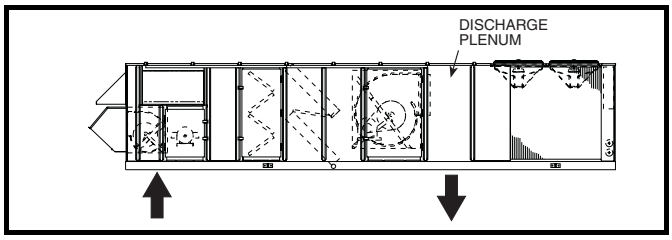


Standard length chassis with vertical discharge and discharge plenum — The standard, vertical discharge arrangement is provided with a bottom, return-air opening, straight-through air path. The supply fan is arranged for horizontal outlet into the discharge plenum area. Supply air exits from the discharge plenum area downward through the bottom of the unit. Ductwork is attached to accessory roof curb. These units are available with factory-installed optional power exhaust or barometric relief packages in conjunction with factory-installed optional economizers. Electric heaters are not available on these units on sizes 030-070.

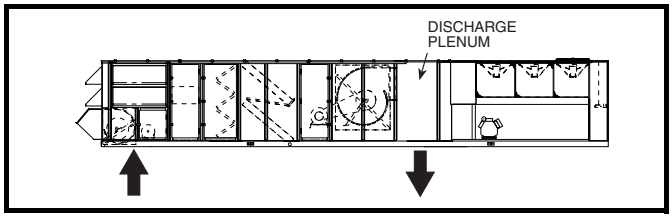
50ZG,ZN030,035



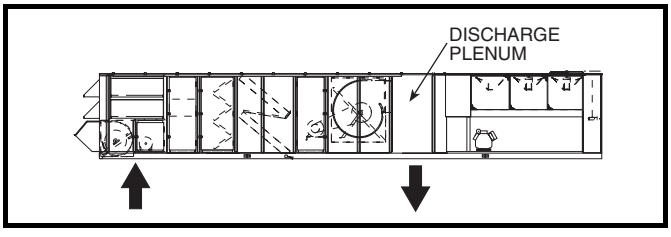
50ZG,ZN040,050



50ZG,ZN055-070



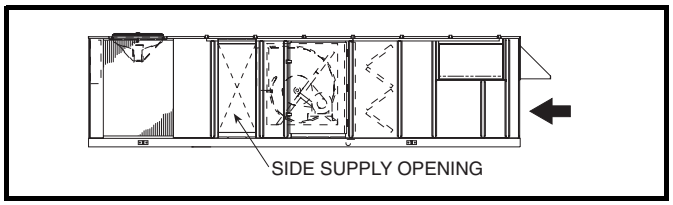
50ZG,ZN075-105



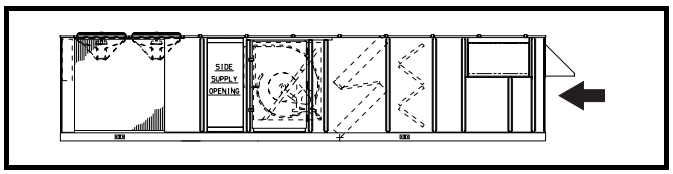
Features/Benefits (cont)

Standard length chassis with horizontal discharge — The standard, compact, horizontal discharge arrangement is provided with a return-air end opening, straight-through air path, and supply-air discharge on the unit left hand side. Ductwork is attached to flanges on the outer cabinet. Electric heaters are not available on size 030-070 units. Factory-installed optional economizers are available. Contact your Carrier representative for power exhaust on sizes 030-050. Factory-installed power exhaust is available on sizes 055-105.

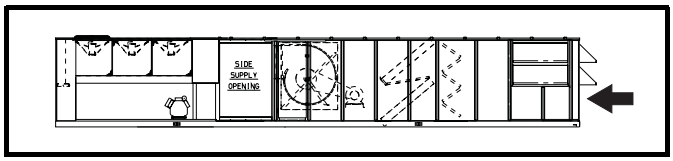
50Z2,Z3030,035



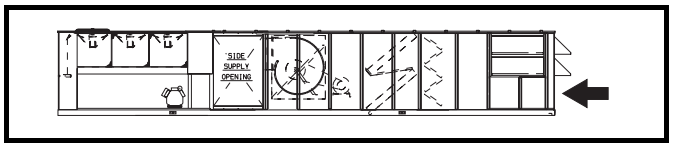
50Z2,Z3040,050



50Z2,Z3055-070

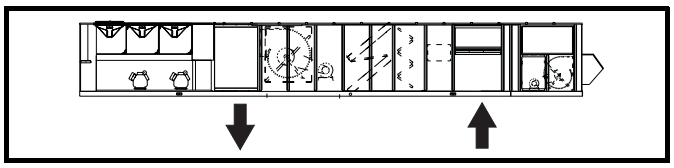


50Z2,Z3075-105



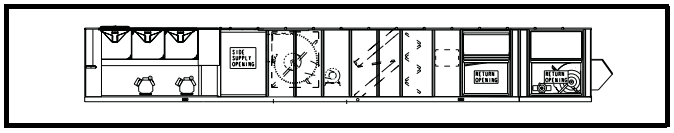
Vertical discharge with high-capacity modulating power exhaust systems — This vertical discharge arrangement adds a factory-installed extended rear plenum to house the integrated economizer and high-capacity modulating power exhaust systems (standard features on these models). Return air enters unit through bottom opening upstream of the power exhaust system and follows a straight-through path to the supply fan and into the extended plenum section, where it exits unit through bottom supply air outlet. Ductwork is attached to accessory roof curb. Economizer inlets are on both sides of the unit; power exhaust outlet is on the end of the chassis. Factory-installed optional electric heat is available on these units.

50ZT,ZW075-105



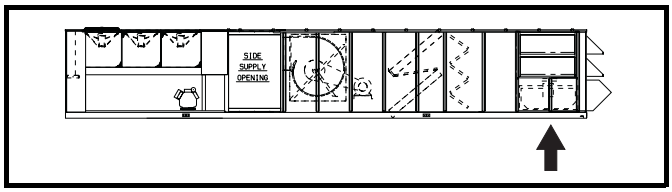
Horizontal discharge with high-capacity modulating power exhaust systems — This horizontal discharge arrangement adds a factory-installed extended rear plenum to house the integrated economizer and high-capacity modulating power exhaust systems (standard features on these models). Return air enters the chassis through dual openings on the left-hand side of unit. The supply fan discharges horizontally into the extended plenum section with unit supply air outlet on the left-hand side. Ductwork is attached to flanges on the outer cabinet. Economizer inlets are on both sides of the unit; power exhaust outlet is on the end of the chassis.

50ZX,ZZ075-105



Horizontal discharge with return fan and modulating exhaust damper — This horizontal discharge arrangement adds a factory-installed return fan with VFD and extended rear plenum. Return air enters the chassis through the bottom opening upstream of the return fan. The supply fan discharges horizontally into the extended plenum section with unit supply air outlet on the left-hand side. Ductwork is attached to flanges on the outer cabinet. Return air exhaust outlet is on the end of the chassis.

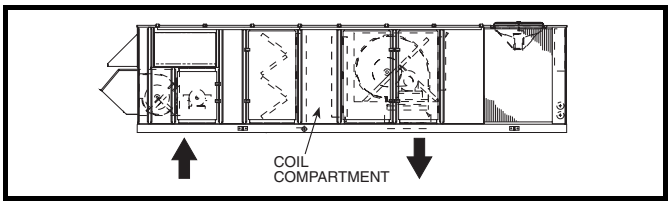
50Z7,Z9075-105



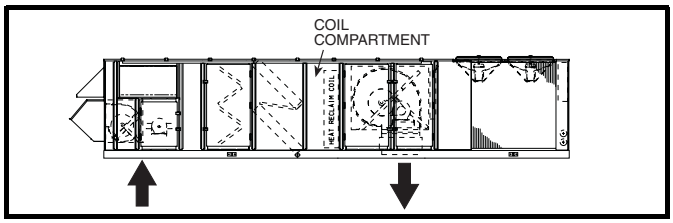
Extended length chassis — The extended length chassis arrangement provides an additional 25-in. of unit length located between the evaporator coil section and the supply fan sled. This compartment is used for factory installation of a hydronic coil or field installation of an auxiliary coil. The auxiliary coil can be a hydronic heating coil, a steam heating coil, or a refrigeration heat reclaim coil. The extended length compartment includes tracks to accept the field-supplied and installed auxiliary coil.

Extended length chassis with vertical discharge — The extended length, vertical discharge arrangement is provided with a bottom, return-air opening, straight-through air path, and direct, vertical-discharge, supply fan for bottom supply air. Ductwork is attached to accessory roof curb. These units are available with factory-installed optional power exhaust or barometric relief packages in conjunction with factory-installed optional economizers.

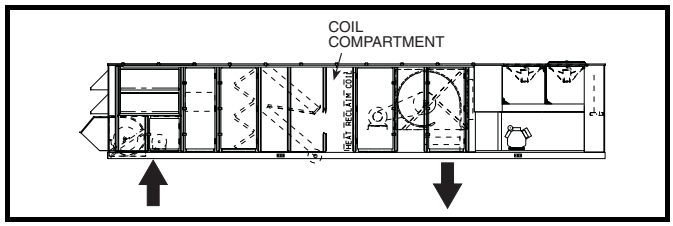
50ZG,ZN030,035



50ZG,ZN040,050

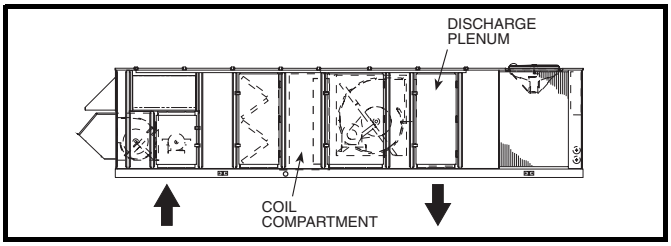


50ZG,ZN055-070

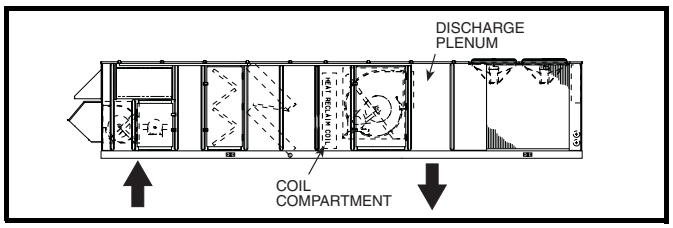


Extended length chassis with vertical discharge and discharge plenum — The extended length vertical discharge arrangement is provided with a bottom, return-air opening, straight-through air path. The supply fan is arranged for horizontal outlet into the extended plenum area. Supply air exits from the extended plenum area downward through the bottom of the unit. Ductwork is attached to accessory roof curb. These units are available with factory-installed optional (or field-installed accessory) power exhaust or barometric relief packages in conjunction with factory-installed optional economizers. Electric heaters are not available on these units.

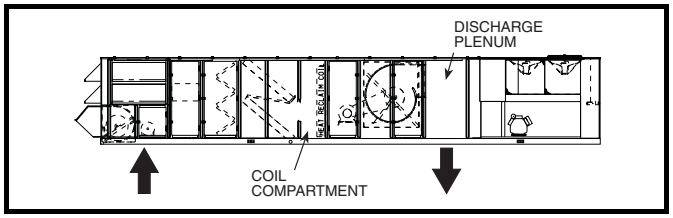
50ZG,ZN030,035



50ZG,ZN040,050

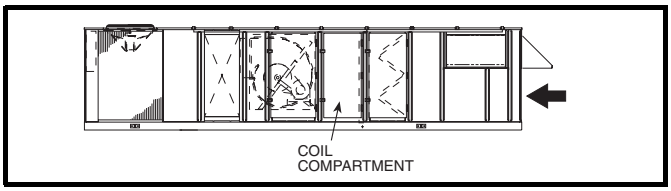


50ZG,ZN055,060

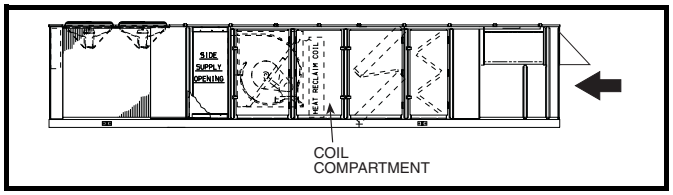


Extended length chassis with horizontal discharge — The extended length horizontal discharge arrangement is provided with a return-air end opening, straight-through air path, and supply-air discharge on the unit left hand side. Ductwork is attached to flanges on the outer cabinet. Electric heaters and barometric relief packages are not available on these units. Factory-installed optional economizers are available. Contact your Carrier representative for power exhaust on sizes 030-050. Factory-installed power exhaust is available on sizes 055-060.

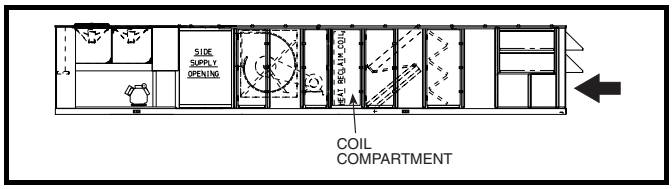
50Z2,Z3030,035



50Z2,Z3040,050



50Z2,Z3055,060



Model number nomenclature

Due to the complex nature of the model number nomenclature, the unit model number should be selected with the *RTU*Builder software. A brief model number explanation is provided below for the purposes of referencing units in this literature.

48ZG_030-105 — Gas Heating/Electric Cooling Unit with CV *Comfort*Link™ Controls — Vertical Supply/Return

48ZN_030-105 — Gas Heating/Electric Cooling Unit with VAV *Comfort*Link Controls — Vertical Supply/Return

48ZT_075-105 — Gas Heating/Electric Cooling Unit with CV *Comfort*Link Controls — Vertical Supply/Return with High-Capacity Power Exhaust

48ZW_075-105 — Gas Heating/Electric Cooling Unit with VAV *Comfort*Link Controls — Vertical Supply/Return with High-Capacity Power Exhaust

48Z6_075-105 — Gas Heating/Electric Cooling Unit with CV *Comfort*Link Controls — Vertical Supply/Return with Return/Exhaust Fan

48Z8_075-105 — Gas Heating/Electric Cooling Unit with VAV *Comfort*Link Controls — Vertical Supply/Return with Return/Exhaust Fan

50ZG_030-105 — Electric Heating/Electric Cooling Unit with CV *Comfort*Link Controls — Vertical Supply/Return

50ZN_030-105 — Electric Heating/Electric Cooling Unit with VAV *Comfort*Link Controls — Vertical Supply/Return

50ZT_075-105 — Electric Cooling Unit with CV *Comfort*Link Controls — Vertical Supply/Return with High-Capacity Power Exhaust

50ZW_075-105 — Electric Cooling Unit with VAV *Comfort*Link Controls — Vertical Supply/Return with High-Capacity Power Exhaust

50ZX_075-105 — Electric Cooling Unit with CV *Comfort*Link Controls — Horizontal Supply/Return with High-Capacity Power Exhaust

50ZZ_075-105 — Electric Cooling Unit with VAV *Comfort*Link Controls — Horizontal Supply/Return with High-Capacity Power Exhaust

50Z2_030-105 — Electric Cooling Unit with CV *Comfort*Link Controls — Horizontal Supply/Return

50Z3_030-105 — Electric Cooling Unit with VAV *Comfort*Link Controls — Horizontal Supply/Return

50Z6_075-105 — Electric Heating/Electric Cooling Unit with CV *Comfort*Link Controls — Vertical Supply/Return with Return/Exhaust Fan

50Z7_075-105 — Electric Cooling Unit with CV *Comfort*Link Controls — Horizontal Supply/Vertical Return with Return/Exhaust Fan

50Z8_075-105 — Electric Heating/Electric Cooling Unit with VAV *Comfort*Link Controls — Vertical Supply/Return with Return/Exhaust Fan

50Z9_075-105 — Electric Cooling Unit with VAV *Comfort*Link Controls — Horizontal Supply/Vertical Return with Return/Exhaust Fan

Positions 1-4: basic model number (heat type, CV or VAV controls, chassis arrangement)

Position 5: heat / disconnect / staged gas / extended chassis (075-105 units) / discharge plenum / heat exchanger material

Positions 6-8: nominal unit cooling capacity

Position 9: filtration /controls /convenience outlet

Position 10: supply fan / VFD / extended chassis (030-070 units)

Position 11: evaporator coil / hot gas bypass / condenser coil fin material / corrosion protection

Position 12: electrical characteristics / export packaging

Position 13: design series

Position 14: reserved

Position 15: supply fan motor

Position 16: outdoor air / power exhaust / return fan option motor size

Quality Assurance

Certified to ISO 9001:2000

Physical data — 48 series units

48ZG,ZN030-105

BASE UNIT	48ZG,ZN030		48ZG,ZN035	
NOMINAL CAPACITY (tons)	30		35	
OPERATING WEIGHT (lb)	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Base Unit				
Low Heat	5640	6140	5766	6266
High Heat	5770	6270	5895	6395
With Economizer				
Low Heat	5941	6441	6066	6566
High Heat	6070	6570	6195	6695
COMPRESSORS	Semi-Hermetic			
Quantity...Type	2...06D		1...06D, 1...06E	
Oil Charge (pints)	8		8, 14	
Capacity Steps (%)				
CV	50,100		43,100	
VAV	17,33,50,67,83,100		14,28,42,57,71,86,100	
Number of Refrigerant Circuits	2		2	
REFRIGERANT	R-22			
Operating Charge (lb), Ckt 1/Ckt 2				
Standard Evaporator Coil	29.0/29.0		29.0/30.5	
Standard Evaporator with HGBP	31.0/29.0		31.0/30.5	
Alternate High-Capacity Evaporator Coil	N/A		N/A	
Alternate High-Capacity Evaporator with HGBP	N/A		N/A	
CONDENSER COILS	3/8-in. Tube Diameter			
Quantity	2		2	
Rows...Fins/in.				
Aluminum	3...15.0		3...15.0	
Copper (Optional)	3...13.7		3...13.7	
Total Face Area (sq ft)	37.5		37.5	
EVAPORATOR COILS				
Quantity	1			
Total Face Area (sq ft)	32.1			
Refrigerant Feed Device...No. per Circuit	TXV...1			
Standard Evaporator Coils	1/2 in. Tube Dia		1/2 in. Tube Dia	
Rows...Fins/in.	3...15.0		4...15.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils	N/A		N/A	
Rows...Fins/in.	N/A		N/A	
Fin Type	N/A		N/A	
Tube Type	N/A		N/A	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	7	14	7	14
Input (MBtuh)	325	650	325	650
Output (MBtuh)	263	527	263	527
Temperature Rise Range (F)	10-40	25-55	10-40	25-55
Efficiency (%)	81	81	81	81
Burner Orifice Diameter				
Quantity (in. ...drill no.)	7 (.1285...30)	14 (.1285...30)	7 (.1258...30)	14 (.1258...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (min...max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Firing Stages	2	2	2	2
Number of Gas Valves	1	2	1	2
CONDENSER FANS	Propeller Type			
Quantity...Diameter (in.)	2...30		2...30	
Nominal Cfm	18,600		18,600	
Motor Hp...Rpm	1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 25 x 25 in.			
Nominal Cfm	10,500		10,500	
Maximum Allowable Cfm	15,000		15,000	
Maximum Allowable Rpm	900		900	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16	

SUPPLY-FAN MOTOR AND DRIVE		(Any motor available on any unit)				
Motor Hp		7.5	10	15	20	25
Motor Frame Size		213T	215T	254T	256T	284T
Efficiency at Full Load (%)						
High Efficiency		88.5	89.5	91.0	91.0	91.7
Premium Efficiency		91.7	91.7	93.0	93.6	93.6
Fan Pulley Pitch Diameter (in.)		13.7	13.7	13.7	13.7	13.7
Motor Pulley Pitch Diameter (in.)		3.4	4.3	4.9	5.5	6.5
Resulting Fan Speed (rpm)		438	549	626	703	830
Belts Quantity...Type		2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5VX650
Center Distance Range (in.)		17.74-14.30	17.74-14.30	17.63...14.01	17.63...14.01	16.63...12.87
OPTIONAL POWER EXHAUST		Centrifugal, 18 x 15 in. (Any motor available on any unit)				
Quantity...Motor Hp		2...3.0	2...5.0	2...7.5		2...10
Motor Frame Size	High Eff	56HZ	184T	213T		215T
	Prem Eff	182T	184T	213T		215T
Efficiency at Full Load (%) High/Premium		81.0/88.5	87.5/89.5	88.5/91.7		89.5/91.7
Fan Pulley Pitch Diameter (in.)	High Eff	11	10.4	12		12
	Prem Eff	11.0	10.4	12		12
Motor Pulley Pitch Diameter Range (in.)	High Eff	4.1-3.1	4.7-3.7	6.0-4.8		7.0-5.8
	Prem Eff	4.1-3.1	4.7-3.7	6.0-4.8		7.0-5.8
Motor Pulley Pitch Diameter Factory Setup (in.)		4.1	4.2	5.4		6.4
Blower Shaft Diameter at Pulley (in.)		1 7/16	1 7/16	1 7/16		1 7/16
Fan RPM Range		500-656	621-785	717-882		854-1000
Factory Setup Fan RPM		656	703	800		927
Maximum Allowable RPM		1000	1000	1000		1000
Belts Quantity...No.	High Eff	1...BX71	1...BX71	1...BX77		1...BX79
	Prem Eff	1...BX71	1...BX71	1...BX77		1...BX79
Center Distance Range (in.)		23.62...26.50	23.62...26.50	23.62...26.50		23.62...26.50

FILTERS				
Standard Efficiency Throwaway (Standard)	12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)	12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional)				
Quantity...Size (in.)				
Bag Filter	6...20 x 24 x 22		6...20 x 24 x 22	
	6...20 x 20 x 22		6...20 x 20 x 22	
Prefilter	12...16 x 20 x 2		12...16 x 20 x 2	
	3...20 x 24 x 2		3...20 x 24 x 2	
OUTSIDE AIR SCREENS				
Standard Hood (25%) Quantity...Size (in.)	None		None	
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent			
Quantity...Size (in.)	5...20 x 20 x 2		5...20 x 20 x 1	
	2...20 x 25 x 1		2...20 x 25 x 1	

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Physical data — 48 series units (cont)

48ZG,ZN030-105 (cont)

BASE UNIT	48ZG,ZN040		48ZG,ZN050	
NOMINAL CAPACITY (tons)	40		50	
OPERATING WEIGHT (lb)	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Base Unit				
Low Heat	6540	7040	6581	7081
High Heat	6670	7170	6710	7210
With Economizer				
Low Heat	6841	7341	6881	7381
High Heat	6970	7470	7010	7510
COMPRESSORS	Semi-Hermetic			
Quantity...Type	2...06E		2...06E	
Oil Charge (pints)	14		19, 14	
Capacity Steps (%)				
CV	50,100		57,100	
VAV	25,50,75,100		18,37,56,63,81,100	
Number of Refrigerant Circuits	2		2	
REFRIGERANT	R-22			
Operating Charge (lb), Ckt 1/Ckt 2				
Standard Evaporator Coil	40.0/40.0		41.5/39.0	
Standard Evaporator with HGBP	42.0/40.0		43.5/39.0	
Alternate High-Capacity Evaporator Coil	50.0/51.0		49.0/49.0	
Alternate High-Capacity Evaporator with HGBP	52.0/51.0		51.0/49.0	
CONDENSER COILS	3/8-in. Tube Diameter			
Quantity	2		2	
Rows...Fins/in.				
Aluminum	3...15.0		3...15.0	
Copper (Optional)	3...13.7		3...13.7	
Total Face Area (sq ft)	50.0		50.0	
EVAPORATOR COILS				
Quantity	2			
Total Face Area (sq ft)	45.5			
Refrigerant Feed Device...No. per Circuit	TXV...2			
Standard Evaporator Coils	1/2 in. Tube Dia		1/2 in. Tube Dia	
Rows...Fins/in.	3...15.0		4...15.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils	1/2 in. Tube Dia		1/2 in. Tube Dia	
Rows...Fins/in.	6...16.0		6...16.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	7	14	7	14
Input (MBtuh)	325	650	325	650
Output (MBtuh)	263	527	263	527
Temperature Rise Range (F)	10-40	25-55	10-40	25-55
Efficiency (%)	81	81	81	81
Burner Orifice Diameter				
Quantity (in. ...drill no.)	7 (.1285...30)	14 (.1285...30)	7 (.1285...30)	14 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (min...max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Firing Stages	2	2	2	2
Number of Gas Valves	1	2	1	2
CONDENSER FANS	Propeller Type			
Quantity...Diameter (in.)	3...30		3...30	
Nominal Cfm	26,000		26,000	
Motor Hp...Rpm	1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 25 x 25 in.			
Nominal Cfm	14,000		14,000	
Maximum Allowable Cfm	20,000		20,000	
Maximum Allowable Rpm	900		900	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16	

SUPPLY-FAN MOTOR AND DRIVE		(Any motor available on any unit)					
Motor Hp		7.5	10	15	20	25	30*
Motor Frame Size		213T	215T	254T	256T	284T	286T
Efficiency at Full Load (%)							
High Efficiency		88.5	89.5	91.0	91.0	91.7	92.4
Premium Efficiency		91.7	91.7	93.0	93.6	93.6	93.6
Fan Pulley Pitch Diameter (in.)		13.7	13.7	13.7	13.7	13.7	12.5
Motor Pulley Pitch Diameter (in.)		3.4	4.3	4.9	5.5	6.5	6.5
Resulting Fan Speed (rpm)		438	549	626	703	830	910
Belts Quantity...Type		2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5VX650	3...5VX630
Center Distance Range (in.)		17.74-14.30	17.74-14.30	17.63...14.01	17.63...14.01	16.63...12.87	16.63...12.87

OPTIONAL POWER EXHAUST		Centrifugal, 18 x 15 in. (Any motor available on any unit)			
Quantity...Motor Hp		2...3.0	2...5.0	2...7.5	2...10
Motor Frame Size	High Eff	56HZ	184T	213T	215T
	Prem Eff	182T	184T	213T	215T
Efficiency at Full Load (%) High/Premium		81.0/88.5	87.5/89.5	88.5/91.7	89.5/91.7
Fan Pulley Pitch Diameter (in.)	High Eff	11	10.4	12	12
	Prem Eff	11.0	10.4	12	12
Motor Pulley Pitch Diameter Range (in.)	High Eff	4.1-3.1	4.7-3.7	6.0-4.8	7.0-5.8
	Prem Eff	4.1-3.1	4.7-3.7	6.0-4.8	7.0-5.8
Motor Pulley Pitch Diameter Factory Setup (in.)		4.1	4.2	5.4	6.4
Blower Shaft Diameter at Pulley (in.)		1 7/16	1 7/16	1 7/16	1 7/16
Fan RPM Range		500-656	621-785	717-882	854-1000
Factory Setup Fan RPM		656	703	800	927
Maximum Allowable RPM		1000	1000	1000	1000
Belts Quantity...No.	High Eff	1...BX71	1...BX71	1...BX77	1...BX79
	Prem Eff	1...BX71	1...BX71	1...BX77	1...BX79
Center Distance Range (in.)		23.62...26.50	23.62...26.50	23.62...26.50	23.62...26.50

FILTERS				
Standard Efficiency Throwaway (Standard)	12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)	12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional) Quantity...Size (in.)				
Bag Filter	6...20 x 24 x 22 6...20 x 20 x 22		6...20 x 24 x 22 6...20 x 20 x 22	
Prefilter	12...16 x 20 x 2 3...20 x 24 x 2		12...16 x 20 x 2 3...20 x 24 x 2	
OUTSIDE AIR SCREENS				
Standard Hood (25%) Quantity...Size (in.)	None		None	
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent			
Quantity...Size (in.)	5...20 x 20 x 2 2...20 x 25 x 1		5...20 x 20 x 1 2...20 x 25 x 1	

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

*460-3-60 only.

48ZG,ZN030-105 (cont)

BASE UNIT	48ZG,ZN055		48ZG,ZN060		48ZG,ZN070	
NOMINAL CAPACITY (tons)	55		60		70	
OPERATING WEIGHT (lb)	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis	Standard Chassis	
Base Unit						
Low Heat	8700	9248	9000	9,540	9,420	
High Heat	8820	9368	9120	9,668	9,550	
With Economizer						
Low Heat	9230	9730	9530	10,030	9,950	
High Heat	9350	9850	9650	10,450	10,080	
COMPRESSORS	Semi-Hermetic					
Quantity...Type	2...06E		2...06E		2...06E	
Oil Charge (Pints)	19, 14		19		19	
Capacity Steps (%)						
CV	60,100		50,100		45,100	
VAV	20,40,60,80,100		17,33,50,67,83,100		14,29,43,51,66,71,85,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT	R-22					
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	59.0/44.5		61.0/61.0		70.5/64.5	
Standard Evaporator with HGBP	62.0/44.5		64.0/61.0		73.5/64.5	
Alternate High-Capacity Evaporator Coil	72.0/58.0		69.5/69.5		82.5/74.5	
Alternate High-Capacity Evaporator with HGBP	75.0/58.0		72.5/69.5		85.5/74.5	
CONDENSER COILS	$^{3}/_{8}$-in. Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	2...17.0, 3...17.0		3...17.0		3...17.0	
Copper (Optional)	2...15.7, 3...15.7		3...15.7		3...15.7	
Total Face Area (sq ft)	72.4		72.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^{1}/_{2}$ in. Tube Dia					
Rows...Fins/in.	3...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Smooth		Smooth		Smooth	
Alternate, High-Capacity Evaporator Coils	$^{1}/_{2}$ in. Tube Dia					
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	14	21	14	21	14	21
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	14 (.1285...30)	21 (.1285...30)	14 (.1285...30)	21 (.1285...30)	14 (.1285...30)	21 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (min...max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Firing Stages	2	2	2	2	2	2
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FANS	Propeller Type					
Quantity...Diameter (in.)	4...30		4...30		5...30	
Nominal Cfm	40,000		40,000		50,000	
Motor Hp...Rpm	1.0...1140		1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 25 x 25 in.					
Nominal Cfm	17,500		21,000		24,500	
Maximum Allowable Cfm	25,000		30,000		30,000	
Maximum Allowable Rpm	800		800		800	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	15		20	25	30	40*
Motor Frame Size	254T		256T	284T	286T	S324T
Efficiency at Full Load (%)						
High Efficiency	91.0		91.0	91.7	92.4	93.0
Premium Efficiency	93.0		93.6	93.6	93.6	94.5
Fan Pulley Pitch Diameter (in.)	13.7		13.7	13.7	15.5	16.1
Motor Pulley Pitch Diameter (in.)	4.5		5.1	5.5	5.9	6.7
Resulting Fan Speed (rpm)	575		651	703	711	740
Belts Quantity...Type	2...5VX1230		2...5VX1230	2...5VX1230	2...5VX1230	3...5VX1250
Center Distance Range (in.)	48.25-44.00		48.25-44.00	48.50-44.25	48.50-44.25	48.25-44.00
OPTIONAL POWER EXHAUST	Centrifugal, 15 x 15 in. (Any motor available on any unit)					
Quantity...Motor Hp	2...5		2...7.5		2...10	
Motor Frame Size	184T		213T		215T	
Efficiency at Full Load (%) High/Premium	87.5/89.5		88.5/91.7		89.5/91.7	
Resulting Fan Rpm	740		820		920	
Maximum Allowable Rpm	1000		1000		1000	
FILTERS						
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2	
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2	
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional)						
Quantity...Size (in.)						
Bag Filter	6...24 x 20 x 22		6...24 x 20 x 22		6...24 x 20 x 22	
	6...24 x 20 x 22		6...24 x 20 x 22		6...24 x 20 x 22	
Prefilter	6...24 x 24 x 2		6...24 x 24 x 2		6...24 x 24 x 2	
	6...20 x 24 x 2		6...20 x 24 x 2		6...20 x 24 x 2	
OUTSIDE AIR SCREENS						
Standard Hood (25%) Quantity...Size (in.)	4...25 x 16 x 1		4...25 x 16 x 1		4...25 x 16 x 1	
	2...20 x 16 x 1		2...20 x 16 x 1		2...20 x 16 x 1	
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent					
Quantity...Size (in.)	12...16 x 25 x 1		12...16 x 25 x 1		12...16 x 25 x 1	
	2...16 x 20 x 1		2...16 x 20 x 1		2...16 x 20 x 1	

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

*460-3-60 and 575-3-60 only.

Physical data — 48 series units (cont)

48ZG,ZN030-105 (cont)

BASE UNIT	48ZG,ZN075		48ZG,ZN090		48ZG,ZN105	
NOMINAL CAPACITY (tons)	75		90		105	
OPERATING WEIGHT (lb)						
Base Unit without Economizer						
Low Heat/High Heat	10,270/10,445		10,480/10,655		11,210/11,385	
With Economizer						
Low Heat/High Heat	10,800/10,975		11,010/11,185		11,740/11,915	
COMPRESSOR	Semi-Hermetic					
Number	2		2		4	
Circuit (No. Cyl)	A (6)	B (6)	A (6)	B (6)	A1 (6), A2 (4)	B1 (6), B2 (4)
Model 06E	-275	-299	-299	-299	-275, -250	-275, -250
Oil Charge (pints)	19	19	19	19	19, 14	19, 14
Capacity Steps (%)						
CV	43,100		50,100		50,100	
VAV	14,29,43,51,66,86,100		17,33,50,67,83,100		20,30,40,50,60,60,70,80,80,90,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT	R-22					
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	70.5/64.5		64.0/64.0		68.0/68.0	
Standard Evaporator with HGBP	73.5/64.5		67.0/64.0		71.0/68.0	
Alternate High-Capacity Evaporator Coil	83.0/75.0		76.0/76.0		79.5/79.5	
Alternate High-Capacity Evaporator with HGBP	86.0/75.0		79.0/76.0		82.5/79.5	
CONDENSER COILS	$^3/_8$-in. Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	3...17.0		3...17.0		3...17.0	
Copper (Optional)	3...15.7		3...15.7		3...15.7	
Fin Type	Double Wavy		Lanced, Sine-wave		Lanced, Sine-wave	
Tube Type	Smooth		Cross-Hatched		Cross-Hatched	
Total Face Area (sq ft)	108.4		108.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^1/_2$ in. Tube Dia		$^3/_8$ in. Tube Dia		$^3/_8$ in. Tube Dia	
Rows...Fins/in.	4...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Lanced, Sine Wave		Lanced, Sine Wave	
Tube Type	Smooth		Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils			$^1/_2$ in. Tube Dia			
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	2	3	2	3	2	3
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (Min...Max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FAN	Propeller Type					
Quantity...Diameter (in.)	5...30		6...30		6...30	
Nominal Cfm	50,000		60,000		60,000	
Motor Hp (ea)...rpm	1.0...1140		1.0...1140		1.0...1140	
STANDARD SUPPLY FAN	Forward Curved Centrifugal 36 x 30 in.					
Nominal Cfm	24,500		29,750		35,000	
Maximum Allowable Cfm	30,000		34,000		40,000	
Maximum Allowable Rpm	670		670		670	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	30		40	50	60	
Motor Frame Size	S268T		S324T	S36T	S364T	
Efficiency at Full Load (%)						
High Efficiency	92.4		93.0	93.0	93.6	
Premium Efficiency	93.6		94.5	94.5	95.4	
Fan Pulley Pitch Diameter (in.)	18.5		18.5	18.5	18.5	
Motor Pulley Pitch Diameter (in.)	5.3		5.7	6.5	7.1	
Resulting Fan Rpm	501		539	615	672	
Belts Quantity...Type	3...5VX1320		4...5VX1320	4...5VX1320	4...5VX1320	
Center Distance Range (in.)	47.88-45.01		47.64-44.76	47.42-44.52	47.42-44.52	
ALTERNATE, AIRFOIL FAN	Airfoil					
Nominal Airflow (cfm)	24,500		29,750		35,000	
Maximum Allowable Airflow (cfm)	30,000		34,000		40,000	
Maximum Allowable Wheel Speed (rpm)	1846		1846		1846	
Shaft Diameter at Pulley (in.)	$2^{11}/_{16}$		$2^{11}/_{16}$		$2^{11}/_{16}$	
ALTERNATE SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	30	40	50	60	75	
Motor Frame Size	S268T	S324T	S36T	S364T	365T	
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6	94.1	
Premium Efficiency	93.6	94.5	94.5	95.4	95.4	
Fan Pulley Pitch Diameter (in.)	9.7	10.2	8.9	8.9	10.8	
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1	
Resulting Fan Rpm	1353	1493	1593	1711	1799	
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230	
Center Distance Range (in.)	42.96...45.82	42.96...45.57	42.96...45.57	42.45...45.35	42.45...45.35	

48ZG,ZN030-105 (cont)

BASE UNIT	48ZG,ZN075	48ZG,ZN090	48ZG,ZN105
OPTIONAL POWER EXHAUST	Centrifugal, 18 x 15 in. (Any motor available on any unit.)		
Quantity...Motor Hp	2...5	2...7.5	2...10
Motor Frame Size	184T	213T	215T
Efficiency at Full Load (%)			
High Efficiency	87.5	88.5	89.5
Premium Efficiency	89.5	91.7	91.7
Fan Pulley Pitch Diameter (in.)	10.6	10.6	10.6
Motor Pulley Pitch Diameter (in.)	4.5	5.0	5.6
Shaft Diameter at Pulley (in.)	$1^{7}/_{16}$	$1^{7}/_{16}$	$1^{7}/_{16}$
Resulting Fan Rpm	740	820	920
Maximum Allowable Rpm	1000	1000	1000
FILTERS			
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
30% and 65% Pleated (Optional)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
OUTSIDE AIR SCREENS			
Standard Hood (25%) Quantity...Size (in.)	4...25 x 16 x 1 2...20 x 16 x 1	4...25 x 16 x 1 2...20 x 16 x 1	4...25 x 16 x 1 2...20 x 16 x 1
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent		
Quantity...Size (in.)	12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Physical data — 48 series units (cont)

48Z6,Z8075-105

BASE UNIT	48Z6,Z8075		48Z6,Z8090		48Z6,Z8105	
NOMINAL CAPACITY (tons)	75		90		105	
OPERATING WEIGHT (lb)						
Base Unit without Economizer						
Low Heat/High Heat	11,740/11,915		11,950/12,125		12,680/12,855	
With Economizer						
Low Heat/High Heat	12,270/12,445		12,480/12,655		13,210/13,385	
COMPRESSOR	Semi-Hermetic					
Number	2		2		4	
Circuit (No. Cyl)	A (6)	B (6)	A (6)	B (6)	A1 (6), A2 (4)	B1 (6), B2 (4)
Model 06E	-275	-299	-299	-299	-275, -250	-275, -250
Oil Charge (pints)	19	19	19	19	19, 14	19, 14
Capacity Steps (%)						
CV	43,100		50,100		50,100	
VAV	14,29,43,51,66,71,86,100		17,33,50,67,83,100		20,30,40,50,60,70,80,90,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT	R-22					
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	70.5/64.5		64.0/64.0		68.0/68.0	
Standard Evaporator with HGBP	73.5/64.5		67.0/64.0		71.0/68.0	
Alternate High-Capacity Evaporator Coil	83.0/75.0		76.0/76.0		79.5/79.5	
Alternate High-Capacity Evaporator with HGBP	86.0/75.0		79.0/76.0		82.5/79.5	
CONDENSER COILS	$^3/_8$-in. Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	3...17.0		3...17.0		3...17.0	
Copper (Optional)	3...15.7		3...15.7		3...15.7	
Fin Type	Double Wavy		Lanced, Sine-wave		Lanced, Sine-wave	
Tube Type	Smooth		Cross-Hatched		Cross-Hatched	
Total Face Area (sq ft)	108.4		108.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^1/_2$ in. Tube Dia		$^3/_8$ in. Tube Dia		$^3/_8$ in. Tube Dia	
Rows...Fins/in.	4...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Lanced, Sine Wave		Lanced, Sine Wave	
Tube Type	Smooth		Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils	$^1/_2$ in. Tube Dia					
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	2	3	2	3	2	3
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (Min...Max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FAN	Propeller Type					
Quantity...Diameter (in.)	5...30		6...30		6...30	
Nominal Cfm	50,000		60,000		60,000	
Motor Hp (ea)...rpm	1.0...1140		1.0...1140		1.0...1140	
STANDARD SUPPLY FAN	Forward Curved Centrifugal 36 x 30 in.					
Nominal Cfm	24,500		29,750		35,000	
Maximum Allowable Cfm	30,000		34,000		40,000	
Maximum Allowable Rpm	670		670		670	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60		
Motor Frame Size	S268T	S324T	S36T	S364T		
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6		
Premium Efficiency	93.6	94.5	94.5	95.4		
Fan Pulley Pitch Diameter (in.)	18.5	18.5	18.5	18.5		
Motor Pulley Pitch Diameter (in.)	5.3	5.7	6.5	7.1		
Resulting Fan Rpm	501	539	615	672		
Belts Quantity...Type	3...5VX1320	4...5VX1320	4...5VX1320	4...5VX1320		
Center Distance Range (in.)	47.88-45.01	47.64-44.76	47.42-44.52	47.42-44.52		
ALTERNATE, AIRFOIL FAN	Airfoil					
Nominal Airflow (cfm)	24,500		29,750		35,000	
Maximum Allowable Airflow (cfm)	30,000		34,000		40,000	
Maximum Allowable Wheel Speed (rpm)	1846		1846		1846	
Shaft Diameter at Pulley (in.)	$2^{11}/_{16}$		$2^{11}/_{16}$		$2^{11}/_{16}$	
ALTERNATE SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit.)					
Motor Hp	30	40	50	60	75	
Motor Frame Size	S268T	S324T	S36T	S364T	365T	
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6	94.1	
Premium Efficiency	93.6	94.5	94.5	95.4	95.4	
Fan Pulley Pitch Diameter (in.)	9.7	10.2	8.9	8.9	10.8	
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1	
Resulting Fan Rpm	1353	1493	1593	1711	1799	
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230	
Center Distance Range (in.)	42.96...45.82	42.69...45.57	42.69...45.57	42.45...45.35	42.45...45.35	

48Z6,Z8075-105 (cont)

BASE UNIT	48Z6,Z8075		48Z6,Z8090	48Z6,Z8105
RETURN/EXHAUST FAN	Plenum Fan, 47.13 in. (Any motor available on any unit.)			
Quantity...Motor Hp	1...20	1...25	1...30	1...40
Motor Frame Size	256T	284T	286T	324T
Efficiency at Full Load (%) High/Premium	91/93.6	91.7/93.6	92.4/93.6	93/93.8
Fan Pulley Pitch Diameter (in.)	8.5	9.8	8.5	8.5
Motor Pulley Pitch Diameter (in.)	5.3	6.7	6.1	6.7
Shaft Diameter at Pulley (in.)	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$	$2^{15}/_{16}$
Resulting Fan Rpm	1104	1209	1271	1396
Maximum Allowable Rpm	1447	1447	1447	1447
FILTERS				
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2		15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2	5...16 x 20 x 2
30% and 65% Pleated (Optional)	15...20 x 25 x 2		15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2	5...16 x 20 x 2
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent			
Quantity...Size (in.)	12...16 x 25 x 1 2...16 x 20 x 1		12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Physical data — 48 series units (cont)

48ZT,ZW075-105

BASE UNIT	48ZT,ZW075		48ZT,ZW090		48ZT,ZW105	
NOMINAL CAPACITY (tons)	75		80		100	
OPERATING WEIGHT (lb)						
Base Unit without Economizer						
Low Heat/High Heat	13,205/13,380		13,415/13,590		14,145/14,320	
COMPRESSOR	Semi-Hermetic					
Number	2		2		4	
Circuit (No. Cyl)	A (6)	B (6)	A (6)	B (6)	A1 (6), A2 (4)	B1 (6), B2 (4)
Model 06E	-275	-299	-299	-299	-275, -250	-275, -250
Oil Charge (pints)	19	19	19	19	19, 14	19, 14
Capacity Steps (%)						
CV	43,100		50,100		50,100	
VAV	14,29,43,51,66,71,86,100		17,33,50,67,83,100		20,30,40,50,60,70,80,90,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT	R-22					
Operating Charge (lb), Ckt 1/Ckt 2						
Standard Evaporator Coil	70.5/64.5		64.0/64.0		68.0/68.0	
Standard Evaporator with HGBP	73.5/64.5		67.0/64.0		71.0/68.0	
Alternate High-Capacity Evaporator Coil	83.0/75.0		76.0/76.0		79.5/79.5	
Alternate High-Capacity Evaporator with HGBP	86.0/75.0		79.0/76.0		82.5/79.5	
CONDENSER COILS	$^3/_8$-in. Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	3...17.0		3...17.0		3...17.0	
Copper (Optional)	3...15.7		3...15.7		3...15.7	
Fin Type	Double Wavy		Lanced, Sine-wave		Lanced, Sine-wave	
Tube Type	Smooth		Cross-Hatched		Cross-Hatched	
Total Face Area (sq ft)	108.4		108.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^1/_2$ in. Tube Dia		$^3/_8$ in. Tube Dia		$^3/_8$ in. Tube Dia	
Rows...Fins/in.	4...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Lanced, Sine Wave		Lanced, Sine Wave	
Tube Type	Smooth		Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils			$^1/_2$ in. Tube Dia			
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
HEATING SECTION	Low Heat	High Heat	Low Heat	High Heat	Low Heat	High Heat
Number of Heat Exchangers	2	3	2	3	2	3
Input (MBtuh)	650	975	650	975	650	975
Output (MBtuh)	527	790	527	790	527	790
Temperature Rise Range (F)	10-40	20-50	10-40	20-50	10-40	20-50
Efficiency (%)	81	81	81	81	81	81
Burner Orifice Diameter						
Quantity (in. ...drill no.)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)	7 (.1285...30)
Manifold Pressure (in. wg)	3.3	3.3	3.3	3.3	3.3	3.3
Line Pressure (in. wg) (Min...Max)	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0	5.0...13.0
Number of Gas Valves	2	3	2	3	2	3
CONDENSER FAN	Propeller Type					
Quantity...Diameter (in.)	5...30		6...30		6...30	
Nominal Cfm	50,000		60,000		60,000	
Motor Hp (ea)...rpm	1.0...1140		1.0...1140		1.0...1140	
STANDARD SUPPLY FAN	Forward Curved Centrifugal 36 x 30 in.					
Nominal Cfm	24,500		29,750		35,000	
Maximum Allowable Cfm	30,000		34,000		40,000	
Maximum Allowable Rpm	670		670		670	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	30		40	50	60	
Motor Frame Size	S268T		S324T	S36T	S364T	
Efficiency at Full Load (%)						
High Efficiency	92.4		93.0	93.0	93.6	
Premium Efficiency	93.6		94.5	94.5	95.4	
Fan Pulley Pitch Diameter (in.)	18.5		18.5	18.5	18.5	
Motor Pulley Pitch Diameter (in.)	5.3		5.7	6.5	7.1	
Resulting Fan Rpm	501		539	615	672	
Belts Quantity...Type	3...5VX1320		4...5VX1320	4...5VX1320	4...5VX1320	
Center Distance Range (in.)	47.88-45.01		47.64-44.76	47.42-44.52	47.42-44.52	
ALTERNATE, AIRFOIL FAN	Airfoil					
Nominal Airflow (cfm)	24,500		29,750		35,000	
Maximum Allowable Airflow (cfm)	30,000		34,000		40,000	
Maximum Allowable Wheel Speed (rpm)	1846		1846		1846	
Shaft Diameter at Pulley (in.)	$2^{11}/_{16}$		$2^{11}/_{16}$		$2^{11}/_{16}$	
ALTERNATE SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	30	40	50	60	75	
Motor Frame Size	S268T	S324T	S36T	S364T	365T	
Efficiency at Full Load (%)						
High Efficiency	92.4	93.0	93.0	93.6	94.1	
Premium Efficiency	93.6	94.5	94.5	95.4	95.4	
Fan Pulley Pitch Diameter (in.)	9.7	10.2	8.9	8.9	10.8	
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1	
Resulting Fan Rpm	1353	1493	1593	1711	1799	
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230	
Center Distance Range (in.)	42.96...45.82	42.96...45.57	42.96...45.57	42.45...45.35	42.45...45.35	

48ZT,ZW075-105 (cont)

BASE UNIT	48ZT,ZW075		48ZT,ZW090		48ZT,ZW105
POWER EXHAUST	Centrifugal, 22 x 20 in., $1^{11}/_{16}$ in. shaft diameter (Any motor available on any unit)				
Total Hp	20	30	40	50	60
Quantity...Motor Hp	2...10	2...15	2...20	2...25	2...30
Motor Frame Size	S215T	D254T	S256T	S284T	S286T
Efficiency at Full Load (%)					
High Efficiency	89.5	91	91	91.7	92.4
Premium Efficiency	91.7	93	93.6	93.6	93.6
Fan Sheave Pitch Diameter (in.)	12.4	12.4	11.1	11.1	11.1
Motor Sheave Pitch Diameter (in.)	4.8	5.8	5.9	6.5	6.9
Resulting Fan Rpm	714	841	928	1020	1094
Maximum Allowable Rpm	1175	1175	1175	1175	1175
Belts — Quantity...Type	2...BX93	2...BX93	2...5VX950	2...5VX950	2...5VX950
FILTERS					
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2
30% and 65% Pleated (Optional)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2
OUTSIDE AIR SCREENS					
Standard Hood (25%) Quantity...Size (in.)	8...25 x 16 x 1 2...20 x 16 x 1		8...25 x 16 x 1 2...20 x 16 x 1		8...25 x 16 x 1 2...20 x 16 x 1

LEGEND

HGBP — Hot Gas Bypass
MBtuh — Btuh in Thousands
TXV — Thermostatic Expansion Valve

Physical data — 50 series units

50ZG,ZN,Z2,Z3030-105

BASE UNIT	50ZG,ZN,Z2,Z3030		50ZG,ZN,Z2,Z3035	
NOMINAL CAPACITY (tons)	30		35	
OPERATING WEIGHT (lb)				
Base Unit	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Horizontal Discharge and Vertical Discharge With Discharge Plenum	5970	6470	6095	6595
Vertical Discharge	5400	5900	5525	6025
With Economizer				
Horizontal Discharge and Vertical Discharge With Discharge Plenum	6270	6770	6395	6895
Vertical Discharge	5700	6200	5825	6325
COMPRESSORS	Semi-Hermetic			
Quantity...Type	2...06D		1...06D, 1...06E	
Oil Charge (Pints)	8		8, 14	
Capacity Steps (%)				
CV	50,100		43,100	
VAV	17,33,50,67,83,100		14,28,42,57,71,86,100	
Number of Refrigerant Circuits	2		2	
REFRIGERANT	R-22			
Operating Charge (lb) Ckt A/Ckt B				
Standard Evaporator Coil	29.0/29.0		29.0/30.5	
Standard Evaporator With HGBP	31.0/29.0		31.0/30.5	
Alternate High-Capacity Evaporator Coil	N/A		N/A	
Alternate High-Capacity Evaporator With HGBP	N/A		N/A	
CONDENSER COILS	3/8-in. Tube Diameter			
Quantity	2		2	
Rows...Fins/in.				
Aluminum	3...15.0		3...15.0	
Copper (Optional)	3...13.7		3...13.7	
Total Face Area (sq ft)	37.5		37.5	
EVAPORATOR COILS				
Quantity	1			
Total Face Area (sq ft)	32.1			
Refrigerant Feed Device...No. per Circuit	TXV...1			
Standard Evaporator Coils	1/2-in. Tube Diameter		1/2-in. Tube Diameter	
Rows...Fins/in.	3...15.0		4...15.0	
Fin Type	Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils				
Rows...Fins/in.	N/A		N/A	
Fin Type	N/A		N/A	
Tube Type	N/A		N/A	
CONDENSER FANS	Propeller Type			
Quantity...Diameter (in.)	2...30		2...30	
Nominal Cfm	18,600		18,600	
Motor Hp...Rpm	1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 25 x 25 in.			
Nominal Cfm	10,500		10,500	
Maximum Allowable Cfm	15,000		15,000	
Maximum Allowable Rpm	900		900	
Shaft Diameter at Pulley (in.)	1 11/16		1 11/16	
SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)			
Motor Hp	7.5	10	15	20	25
Motor Frame Size	213T	215T	254T	256T	284T
Efficiency at Full Load (%)					
High Efficiency	88.5	89.5	91	91	91.7
Premium Efficiency*	91.7	91.7	93	93.6	93.6
Fan Pulley Pitch Diameter (in.)	13.7	13.7	13.7	13.7	13.7
Motor Pulley Pitch Diameter (in.)	3.4	4.3	4.9	5.5	6.5
Resulting Fan Rpm	438	549	626	703	830
Belts Quantity...Type					
Horizontal, Extended Plenum	2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5VX650
Vertical Discharge	2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5XV650
Center Distance Range (in.)					
Horizontal, Extended Plenum	17.74...14.30	17.74...14.30	17.63...14.01	17.63...14.01	16.63...12.87
Vertical Discharge	19.86...15.87	19.86...15.87	19.04...15.00	19.04...15.00	19.00...14.87
OPTIONAL POWER EXHAUST	Centrifugal, 18 x 15 in. (Any motor available on any unit)			
Quantity...Motor Hp	2...3.0	2...5.0	2...7.5	2...10
Motor Frame Size — High Eff	56HZ	184T	213T	215T
Motor Frame Size — Prem Eff	182T	184T	213T	215T
Efficiency at Full Load (%) High/Premium	81.0/88.5	87.5/89.5	88.5/91.7	89.5/91.7
Fan Pulley Pitch Diameter (in.) — High Eff	11	10.4	12	12
Fan Pulley Pitch Diameter (in.) — Prem Eff	11.0	10.4	12	12
Motor Pulley Pitch Diameter Range (in.) — High Eff	4.1-3.1	4.7-3.7	6.0-4.8	7.0-5.8
Motor Pulley Pitch Diameter Range (in.) — Prem Eff	4.1-3.1	4.7-3.7	6.0-4.8	7.0-5.8
Motor Pulley Pitch Diameter Factory Setup (in.)	4.1	4.2	5.4	6.4
Blower Shaft Diameter at Pulley (in.)	1 7/16	1 7/16	1 7/16	1 7/16
Fan RPM Range	500-656	621-785	717-882	854-1000
Factory Setup Fan RPM	656	703	800	927
Maximum Allowable RPM	1000	1000	1000	1000
Belts Quantity...No. — High Eff	1...BX71	1...BX71	1...BX77	1...BX79
Belts Quantity...No. — Prem Eff	1...BX71	1...BX71	1...BX77	1...BX79
Center Distance Range (in.)	23.62...26.50	23.62...26.50	23.62...26.50	23.62...26.50
FILTERS				
Standard Efficiency Throwaway (Standard)	12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)	12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)	4...16 x 20 x 2		4...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional) Quantity...Size (in.)				
Bag Filter	6...20 x 24 x 22 6...20 x 20 x 22 12...16 x 20 x 2 4...20 x 24 x 2		6...20 x 24 x 22 6...20 x 20 x 22 12...16 x 20 x 2 4...20 x 24 x 2	
Prefilter				
OUTSIDE AIR SCREENS				
Standard Hood (25%) Quantity...Size (in.)	None		None	
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent			
Quantity...Size (in.)	5...20 x 20 x 2 2...20 x 25 x 1		5...20 x 20 x 1 2...20 x 25 x 1	

LEGEND

HGBP — Hot Gas Bypass
TXV — Thermostatic Expansion Valve

*Not available on 575-v units.

50ZG,ZN,Z2,Z3030-105 (cont)

BASE UNIT		50ZG,ZN,Z2,Z3040		50ZG,ZN,Z2,Z3050	
NOMINAL CAPACITY (tons)		40		50	
OPERATING WEIGHT (lb)					
Base Unit		Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Horizontal Discharge and Vertical Discharge With Discharge Plenum		6620	7120	6660	7160
Vertical Discharge		6050	6550	6090	6590
With Economizer					
Horizontal Discharge and Vertical Discharge With Discharge Plenum		6920	7420	6960	7460
Vertical Discharge		6350	6850	6390	6890
COMPRESSORS		Semi-Hermetic			
Quantity...Type		2...06E		2...06E	
Oil Charge (Pints)		14		19, 14	
Capacity Steps (%)					
CV		50,100		57,100	
VAV		25,50,75,100		18,37,56,63,81,100	
Number of Refrigerant Circuits		2		2	
REFRIGERANT		R-22			
Operating Charge (lb) Ckt A/Ckt B					
Standard Evaporator Coil		40.0/40.0		41.5/39.0	
Standard Evaporator With HGBP		42.0/40.0		43.5/39.0	
Alternate High-Capacity Evaporator Coil		50.0/51.0		48.0/47.5	
Alternate High-Capacity Evaporator With HGBP		52.0/51.0		50.0/47.5	
CONDENSER COILS		3/8-in. Tube Diameter			
Quantity		2		2	
Rows...Fins/in.					
Aluminum		3...15.0		3...15.0	
Copper (Optional)		3...13.7		3...13.7	
Total Face Area (sq ft)		50.0		50.0	
EVAPORATOR COILS					
Quantity		2			
Total Face Area (sq ft)		45.5			
Refrigerant Feed Device...No. per Circuit		TXV...2			
Standard Evaporator Coils		1/2-in. Tube Diameter		1/2-in. Tube Diameter	
Rows...Fins/in.		3...15.0		4...15.0	
Fin Type		Double Wavy		Double Wavy	
Tube Type		Cross Hatched		Cross Hatched	
Alternate, High-Capacity Evaporator Coils		1/2-in. Tube Diameter		1/2-in. Tube Diameter	
Rows...Fins/in.		6...16		6...16	
Fin Type		Double Wavy		Double Wavy	
Tube Type		Cross Hatched		Cross Hatched	
CONDENSER FANS		Propeller Type			
Quantity...Diameter (in.)		3...30		3...30	
Nominal Cfm		26,000		26,000	
Motor Hp...Rpm		1.0...1140		1.0...1140	
SUPPLY FAN		Centrifugal 25 x 25 in.			
Nominal Cfm		14,000		14,000	
Maximum Allowable Cfm		20,000		20,000	
Maximum Allowable Rpm		900		900	
Shaft Diameter at Pulley (in.)		1 11/16		1 11/16	
SUPPLY-FAN MOTOR AND DRIVE		(Any motor available on any unit)			
Motor Hp		7.5	10	15	20	25	30†
Motor Frame Size		213T	215T	254T	256T	284T	286T
Efficiency at Full Load (%)							
High Efficiency		88.5	89.5	91	91	91.7	92.4
Premium Efficiency*		91.7	91.7	93	93.6	93.6	93.6
Fan Pulley Pitch Diameter (in.)		13.7	13.7	13.7	13.7	13.7	12.5
Motor Pulley Pitch Diameter (in.)		3.4	4.3	4.9	5.5	6.5	6.5
Resulting Fan Rpm		438	549	626	703	830	910
Belts Quantity...Type							
Horizontal, Extended Plenum		2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5VX650	3...5VX630
Vertical Discharge		2...BX60	2...5VX630	2...5VX630	2...5VX630	2...5XV650	3...5VX630
Center Distance Range (in.)							
Horizontal, Extended Plenum		17.74...14.30	17.74...14.30	17.63...14.01	17.63...14.01	16.63...12.87	16.63...12.87
Vertical Discharge		19.86...15.87	19.86...15.87	19.04...15.00	19.04...15.00	19.00...14.87	19.00...14.87
OPTIONAL POWER EXHAUST		Centrifugal, 18 x 15 in. (Any motor available on any unit)			
Quantity...Motor Hp		2...3.0		2...5.0		2...7.5		2...10
Motor Frame Size	High Eff	56HZ		184T		213T		215T
	Prem Eff	182T		184T		213T		215T
Efficiency at Full Load (%) High/Premium		81.0/88.5		87.5/89.5		88.5/91.7		89.5/91.7
Fan Pulley Pitch Diameter (in.)	High Eff	11		10.4		12		12
	Prem Eff	11.0		10.4		12		12
Motor Pulley Pitch Diameter Range (in.)	High Eff	4.1-3.1		4.7-3.7		6.0-4.8		7.0-5.8
	Prem Eff	4.1-3.1		4.7-3.7		6.0-4.8		7.0-5.8
Motor Pulley Pitch Diameter Factory Setup (in.)		4.1		4.2		5.4		6.4
Blower Shaft Diameter at Pulley (in.)		1 7/16		1 7/16		1 7/16		1 7/16
Fan RPM Range		500-656		621-785		717-882		854-1000
Factory Setup Fan RPM		656		703		800		927
Maximum Allowable RPM		1000		1000		1000		1000
Belts Quantity...No.	High Eff	1...BX71		1...BX71		1...BX77		1...BX79
	Prem Eff	1...BX71		1...BX71		1...BX77		1...BX79
Center Distance Range (in.)		23.62...26.50		23.62...26.50		23.62...26.50		23.62...26.50
FILTERS					
Standard Efficiency Throwaway (Standard)		12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)		4...16 x 20 x 2		4...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)		12...20 x 25 x 2		12...20 x 25 x 2	
Quantity...Size (in.)		4...16 x 20 x 2		4...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional) Quantity...Size (in.)					
Bag Filter		6...20 x 24 x 22		6...20 x 24 x 22	
		6...20 x 20 x 22		6...20 x 20 x 22	
		12...16 x 20 x 2		12...16 x 20 x 2	
Prefilter		4...20 x 24 x 2		4...20 x 24 x 2	
OUTSIDE AIR SCREENS					
Standard Hood (25%) Quantity...Size (in.)		None		None	
OPTIONAL ECONOMIZER FILTER		Aluminum Frame, Permanent			
Quantity...Size (in.)		5...20 x 20 x 2		5...20 x 20 x 1	
		2...20 x 25 x 1		2...20 x 25 x 1	

LEGEND

HGBP — Hot Gas Bypass
TXV — Thermostatic Expansion Valve

*Not available on 575-v units.
†460-3-60 only.

Physical data — 50 series units (cont)

50ZG,ZN,Z2,Z3030-105 (cont)

BASE UNIT	50ZG,ZN,Z2,Z3055		50ZG,ZN,Z2,Z3060		50ZG,ZN,Z2,Z3070	
NOMINAL CAPACITY (tons)	55		60		70	
OPERATING WEIGHT (lb)						
Base Unit	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis	Standard Chassis	Extended Chassis
Horizontal Discharge or Vertical Discharge With Discharge Plenum	8250	8800	8550	9100	8970	—
Vertical Discharge	7700	8248	8000	8548	8430	8978
With Economizer						
Horizontal Discharge or Vertical Discharge With Discharge Plenum	8780	9280	9080	9580	9500	10,000
Vertical Discharge	8230	8730	8530	9030	8960	—
COMPRESSORS	Semi-Hermetic					
Quantity...Type	2...06E		2...06E		2...06E	
Oil Charge (Pints)	19, 14		19		19	
Capacity Steps (%)						
CV	60,100		50,100		43,100	
VAV	20,40,60,80,100		17,33,50,67,83,100		14,29,43,51,66,71,85,100	
Number of Refrigerant Circuits	2		2		2	
REFRIGERANT	R-22					
Operating Charge (lb) Ckt A/Ckt B						
Standard Evaporator Coil	59.0/44.5		61.0/61.0		70.5/64.5	
Standard Evaporator With HGBP	62.0/44.5		64.0/61.0		73.5/64.5	
Alternate High-Capacity Evaporator Coil	72.0/58.0		68.5/68.5		76.5/74.0	
Alternate High-Capacity Evaporator With HGBP	75.0/58.0		71.5/68.5		79.5/74.0	
CONDENSER COILS	$^3/_8$-in. Tube Diameter					
Quantity	4		4		4	
Rows...Fins/in.						
Aluminum	2...17.0, 3...17.0		3...17.0		3...17.0	
Copper (Optional)	2...15.7, 3...15.7		3...15.7		3...15.7	
Total Face Area (sq ft)	72.4		72.4		108.4	
EVAPORATOR COILS						
Quantity	2					
Total Face Area (sq ft)	61.5					
Refrigerant Feed Device...No. per Circuit	TXV...2					
Standard Evaporator Coils	$^1/_2$-in. Tube Diameter		$^1/_2$-in. Tube Diameter		$^1/_2$-in. Tube Diameter	
Rows...Fins/in.	3...17.0		4...17.0		4...17.0	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Smooth		Smooth		Smooth	
Alternate, High-Capacity Evaporator Coils	$^1/_2$-in. Tube Diameter		$^1/_2$-in. Tube Diameter		$^1/_2$-in. Tube Diameter	
Rows...Fins/in.	6...16		6...16		6...16	
Fin Type	Double Wavy		Double Wavy		Double Wavy	
Tube Type	Cross Hatched		Cross Hatched		Cross Hatched	
CONDENSER FANS	Propeller Type					
Quantity...Diameter (in.)	4...30		4...30		5...30	
Nominal Cfm	40,000		40,000		50,000	
Motor Hp...Rpm	1.0...1140		1.0...1140		1.0...1140	
SUPPLY FAN	Centrifugal 30 x 27 in.					
Nominal Cfm	17,500		21,000		24,500	
Maximum Allowable Cfm	25,000		30,000		30,000	
Maximum Allowable Rpm	800		800		800	
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$		$1^{11}/_{16}$		$1^{11}/_{16}$	
SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)					
Motor Hp	15	20	25	30	40†	
Motor Frame Size	254T	256T	284T	286T	S324T	
Efficiency at Full Load (%)						
High Efficiency	91.0	91.0	91.7	92.4	93	
Premium Efficiency*	93.0	93.6	93.6	93.6	94.5	
Fan Pulley Pitch Diameter (in.)	13.7	13.7	13.7	15.5	16.1	
Motor Pulley Pitch Diameter (in.)	4.5	5.1	5.5	5.9	6.7	
Resulting Fan Rpm	575	651	703	711	740	
Belts Quantity...Type						
Horizontal Discharge and Extended Plenum Units	2...5VX1230	2...5VX1230	2...5VX1230	2...5VX1230	2...5VX1250	
Vertical Discharge Units	2...5VX1120	2...5VX1150	2...5VX1150	2...5VX1180	2...5XV1180	
Center Distance Range (in.)						
Horizontal Discharge and Extended Plenum Units	48.25...44.00	48.25...44.00	48.50...44.25	48.50...44.25	48.25...44.00	
Vertical Discharge Units	44.25...39.75	44.25...39.75	44.00...40.00	44.00...40.00	43.75...39.75	
OPTIONAL POWER EXHAUST	Centrifugal, 15 x 15 in. (Any motor available on any unit)					
Quantity...Motor Hp	2...5		2...7.5		2...10	
Motor Frame Size	184T		213T		215T	
Efficiency at Full Load (%) High/Premium	87.5/89.5		88.5/91.7		89.5/91.7	
Fan Pulley Pitch Diameter (in.)	10.6		10.6		10.6	
Motor Pulley Pitch Diameter (in.)	4.5		5.0		5.6	
Shaft Diameter at Pulley (in.)	$1^7/_{16}$		$1^7/_{16}$		$1^7/_{16}$	
Resulting Fan Rpm	740		820		920	
Maximum Allowable Rpm	1000		1000		1000	
FILTERS						
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2	
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2	
Medium Efficiency (30%) Pleated (Optional)	15...20 x 25 x 2		15...20 x 25 x 2		15...20 x 25 x 2	
Quantity...Size (in.)	5...16 x 20 x 2		5...16 x 20 x 2		5...16 x 20 x 2	
High Efficiency (90%) Bag Filters with High Velocity Prefilters (Optional) Quantity...Size (in.)						
Bag Filter	6...24 x 20 x 22		6...24 x 20 x 22		6...24 x 20 x 22	
	6...24 x 20 x 22		6...24 x 20 x 22		6...24 x 20 x 22	
Prefilter	6...24 x 24 x 2		6...24 x 24 x 2		6...24 x 24 x 2	
	6...20 x 24 x 2		6...20 x 24 x 2		6...20 x 24 x 2	
OUTSIDE AIR SCREENS						
Standard Hood (25%) Quantity...Size (in.)	4...25 x 16 x 1		4...25 x 16 x 1		4...25 x 16 x 1	
	2...20 x 16 x 1		2...20 x 16 x 1		2...20 x 16 x 1	
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent					
Quantity...Size (in.)	12...16 x 25 x 1		12...16 x 25 x 1		12...16 x 25 x 1	
	2...16 x 20 x 1		2...16 x 20 x 1		2...16 x 20 x 1	

LEGEND

HGBP — Hot Gas Bypass
TXV — Thermostatic Expansion Valve

*Not available on 575-v units.
†460-3-60 and 575-3-60 only.

50ZG,ZN,Z2,Z3030-105 (cont)

BASE UNIT	50ZG,ZN,Z2,Z3075	50ZG,ZN,Z2,Z3090	50ZG,ZN,Z2,Z3105
NOMINAL CAPACITY (tons)	75	90	105
OPERATING WEIGHT (lb)			
Base Unit without Economizer	9,870	10,080	10,810
With Economizer	10,400	10,610	11,340
COMPRESSOR	Semi-Hermetic		
Number	2	2	4
Circuit (No. Cyl)	A (6) | B (6)	A (6) | B (6)	A1 (6), A2 (4) | B1 (6), B2 (4)
Model 06E	-275 | -299	-299 | -299	-275, -250 | -275, -250
Oil Charge (pints)	19 | 19	19 | 19	19, 14 | 19, 14
Capacity Steps (%)			
CV	43,100	50,100	50,100
VAV	14,29,43,51,66,71,86,100	17,33,50,67,83,100	20,30,40,50,60,70,80,90,100
Number of Refrigerant Circuits	2	2	2
REFRIGERANT	R-22		
Operating Charge (lb) Ckt A/Ckt B			
Standard Evaporator Coil	70.5/64.5	64.0/64.0	68.0/68.0
Standard Evaporator With HGBP	73.5/64.5	67.0/64.0	71.0/68.0
Alternate High-Capacity Evaporator Coil	76.5/74.0	76.0/76.0	79.5/79.5
Alternate High-Capacity Evaporator With HGBP	79.5/74.0	79.0/76.0	82.5/79.5
CONDENSER COILS	$^3/_8$ in. Tube Diameter		
Quantity	4	4	4
Rows...Fins/in.			
Aluminum	3...17.0	3...17.0	3...17.0
Copper (Optional)	3...15.7	3...15.7	3...15.7
Fin Type	Double Wavy	Lanced, Sine-wave	Lanced, Sine-wave
Tube Type	Smooth	Cross-Hatched	Cross-Hatched
Total Face Area (sq ft)	108.4	108.4	108.4
EVAPORATOR COILS			
Quantity		2	
Total Face ARea (sq ft)		61.5	
Refrigerant Feed Device...No. per Circuit		TXV...2	
Standard Evaporator Coils	$^1/_2$-in. Tube Diameter	$^3/_8$-in. Tube Diameter	$^3/_8$-in. Tube Diameter
Rows...Fins/in.	4...17.0	4...17.0	4...17.0
Fin Type	Double Wavy	Lanced, Sine Wave	Lanced, Sine Wave
Tube Type	Smooth	Cross Hatched	Cross Hatched
Alternate High-Capacity Evaporator Coils	$^1/_2$-in. Tube Diameter	$^1/_2$-in. Tube Diameter	$^1/_2$-in. Tube Diameter
Rows...Fins/in.	6...16	6...16	6...16
Fin Type	Double Wavy	Double Wavy	Double Wavy
Tube Type	Cross Hatched	Cross Hatched	Cross Hatched
CONDENSER FAN	Propeller Type		
Quantity...Diameter (in.)	5...30	6...30	6...30
Nominal Airflow (Cfm)	50,000	60,000	60,000
Motor Hp (ea)...rpm	1.0...1140	1.0...1140	1.0...1140
STANDARD SUPPLY FAN	Centrifugal 36 x 30 in., Forward Curved		
Nominal Airflow (Cfm)	24,500	29,750	35,000
Maximum Allowable Airflow (Cfm)	30,000	34,000	40,000
Maximum Allowable Wheel Speed (Rpm)	680	680	680
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$	$1^{11}/_{16}$	$1^{11}/_{16}$
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)		
Motor Hp	30 | 40	50 | 60	
Motor Frame Size	S286T | S324T	S36T | S364T	
Efficiency at Full Load (%)			
High Efficiency	92.4 | 93.0	93.0 | 93.6	
Premium Efficiency*	93.6 | 94.5	94.5 | 95.4	
Fan Pulley Pitch Diameter (in.)	18.5 | 18.5	18.5 | 18.5	
Motor Pulley Pitch Diameter (in.)	5.3 | 5.7	6.5 | 7.1	
Resulting Fan Speed (Rpm)	501 | 539	615 | 672	
Belts — Quantity...Model No.	3...5VX1320 | 4...5VX1320	4...5VX1320 | 4...5VX1320	
Center Distance Range (in.)	47.88...45.01 | 47.64...44.76	47.42...44.52 | 47.42...44.52	
ALTERNATE SUPPLY FAN	Airfoil		
Nominal Airflow (cfm)	24,500	29,750	35,000
Maximum Allowable Airflow (cfm)	30,000	34,000	40,000
Maximum Allowable Wheel Speed (rpm)	1846	1846	1846
Shaft Diameter at Pulley (in.)	$2^{11}/_{16}$	$2^{11}/_{16}$	$2^{11}/_{16}$
ALTERNATE SUPPLY FAN MOTOR AND DRIVE	(Any motor available on any unit)		
Motor Hp	30 | 40	50 | 60	75
Motor Frame Size	S286T | S324T	S364T | S364T	365T
Efficiency at Full Load (%)			
High Efficiency	92.4 | 93.0	93.0 | 93.6	94.1
Premium Efficiency*	93.6 | 94.5	94.5 | 95.4	95.4
Fan Pulley Pitch Diameter (in.)	9.7 | 10.2	8.9 | 8.9	10.8
Motor Pulley Pitch Diameter (in.)	7.5 | 8.7	8.1 | 8.7	11.1
Resulting Fan Rpm	1353 | 1493	1593 | 1711	1799
Belts Quantity...Type	2...5VX1150 | 2...5VX1180	3...5VX1150 | 3...5VX1150	3...5VX1230
Center Distance Range (in.)	42.96...45.82 | 42.69...45.57	42.69...45.57 | 42.45...45.35	42.45...45.35
OPTIONAL POWER EXHAUST	Centrifugal, 18 x 15 in. (Any motor available on any unit)		
Quantity...Motor Hp	2...5	2...7.5	2...10
Motor Frame Size	184T	213T	215T
Efficiency at Full Load (%)			
High Efficiency	87.5	88.5	89.5
Premium Efficiency*	89.5	91.7	91.7
Fan Pulley Pitch Diameter (in.)	10.6	10.6	10.6
Motor Pulley Pitch Diameter (in.)	4.5	5.0	5.6
Shaft Diameter at Pulley (in.)	$1^7/_{16}$	$1^7/_{16}$	$1^7/_{16}$
Resulting Fan Rpm	740	820	920
Maximum Allowable Rpm	925	925	925
FILTERS			
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
30% and 65% Pleated (Optional)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
OUTSIDE AIR SCREENS			
Standard Hood (25%) Quantity...Size (in.)	4...25 x 16 x 1 2...20 x 16 x 1	4...25 x 16 x 1 2...20 x 16 x 1	4...25 x 16 x 1 2...20 x 16 x 1
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent		
Quantity...Size (in.)	12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1

LEGEND

HGBP — Hot Gas Bypass
TXV — Thermostatic Expansion Valve

*Not available on 575-v units.

Physical data — 50 series units (cont)

50Z6,Z7,Z8,Z9075-105

BASE UNIT	50Z6,Z7,Z8,Z9075	50Z6,Z7,Z8,Z9090	50Z6,Z7,Z8,Z9105
NOMINAL CAPACITY (tons)	75	90	105
OPERATING WEIGHT (lb)			
Base Unit without Economizer	11,340	11,550	12,280
With Economizer	11,870	12,080	12,810
COMPRESSOR	Semi-Hermetic		
Number	2	2	4
Circuit (No. Cyl)	A (6) / B (6)	A (6) / B (6)	A1 (6), A2 (4) / B1 (6), B2 (4)
Model 06E	-275 / -299	-299 / -299	-275, -250 / -275, -250
Oil Charge (pints)	19 / 19	19 / 19	19, 14 / 19, 14
Capacity Steps (%)			
CV	43,100	50,100	50,100
VAV	14,29,43,51,66,71,86,100	17,33,50,67,83,100	20,30,40,50,60,70,80,90,100
Number of Refrigerant Circuits	2	2	2
REFRIGERANT	R-22		
Operating Charge (lb) Ckt A/Ckt B			
Standard Evaporator Coil	70.5/64.5	64.0/64.0	68.0/68.0
Standard Evaporator With HGBP	73.5/64.5	67.0/64.0	71.0/68.0
Alternate High-Capacity Evaporator Coil	76.5/74.0	76.0/76.0	79.5/79.5
Alternate High-Capacity Evaporator With HGBP	79.5/74.0	79.0/76.0	82.5/79.5
CONDENSER COILS	$^3/_8$ in. Tube Diameter		
Quantity	4	4	4
Rows...Fins/in.			
Aluminum	3...17.0	3...17.0	3...17.0
Copper (Optional)	3...15.7	3...15.7	3...15.7
Fin Type	Double Wavy	Lanced, Sine-wave	Lanced, Sine-wave
Tube Type	Smooth	Cross-Hatched	Cross-Hatched
Total Face Area (sq ft)	108.4	108.4	108.4
EVAPORATOR COILS			
Quantity		2	
Total Face Area (sq ft)		61.5	
Refrigerant Feed Device...No. per Circuit		TXV...2	
Standard Evaporator Coils	$^1/_2$-in. Tube Diameter	$^3/_8$-in. Tube Diameter	$^3/_8$-in. Tube Diameter
Rows...Fins/in.	4...17.0	4...17.0	4...17.0
Fin Type	Double Wavy	Lanced, Sine Wave	Lanced, Sine Wave
Tube Type	Smooth	Cross Hatched	Cross Hatched
Alternate High-Capacity Evaporator Coils	$^1/_2$-in. Tube Diameter	$^1/_2$-in. Tube Diameter	$^1/_2$-in. Tube Diameter
Rows...Fins/in.	6...16	6...16	6...16
Fin Type	Double Wavy	Double Wavy	Double Wavy
Tube Type	Cross Hatched	Cross Hatched	Cross Hatched
CONDENSER FAN	Propeller Type		
Quantity...Diameter (in.)	5...30	6...30	6...30
Nominal Airflow (Cfm)	50,000	60,000	60,000
Motor Hp (ea)...rpm	1.0...1140	1.0...1140	1.0...1140
STANDARD SUPPLY FAN	Centrifugal 36 x 30 in., Forward Curved		
Nominal Airflow (Cfm)	24,500	29,750	35,000
Maximum Allowable Airflow (Cfm)	30,000	34,000	40,000
Maximum Allowable Wheel Speed (Rpm)	680	680	680
Shaft Diameter at Pulley (in.)	$1^{11}/_{16}$	$1^{11}/_{16}$	$1^{11}/_{16}$
STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)		
Motor Hp	30 / 40 / 50 / 60		
Motor Frame Size	S286T / S324T / S36T / S364T		
Efficiency at Full Load (%)			
High Efficiency	92.4 / 93.0 / 93.0 / 93.6		
Premium Efficiency*	93.6 / 94.5 / 94.5 / 95.4		
Fan Pulley Pitch Diameter (in.)	18.5 / 18.5 / 18.5 / 18.5		
Motor Pulley Pitch Diameter (in.)	5.3 / 5.7 / 6.5 / 7.1		
Resulting Fan Speed (Rpm)	501 / 539 / 615 / 672		
Belts — Quantity...Model No.	3...5VX1320 / 4...5VX1320 / 4...5VX1320 / 4...5VX1320		
Center Distance Range (in.)	47.88...45.01 / 47.64...44.76 / 47.42...44.52 / 47.42...44.52		
ALTERNATE SUPPLY FAN	Airfoil		
Nominal Airflow (cfm)	24,500	29,750	35,000
Maximum Allowable Airflow (cfm)	30,000	34,000	40,000
Maximum Allowable Wheel Speed (rpm)	1846	1846	1846
Shaft Diameter at Pulley (in.)	$2^{11}/_{16}$	$2^{11}/_{16}$	$2^{11}/_{16}$
ALTERNATE SUPPLY FAN MOTOR AND DRIVE	(Any motor available on any unit)		
Motor Hp	30 / 40 / 50 / 60 / 75		
Motor Frame Size	S286T / S324T / S364T / S364T / 365T		
Efficiency at Full Load (%)			
High Efficiency	92.4 / 930 / 93 / 93.6 / 94.1		
Premium Efficiency*	93.6 / 94.5 / 94.5 / 95.4 / 95.4		
Fan Pulley Pitch Diameter (in.)	9.7 / 10.2 / 8.9 / 8.9 / 10.8		
Motor Pulley Pitch Diameter (in.)	7.5 / 8.7 / 8.1 / 8.7 / 11.1		
Resulting Fan Rpm	1353 / 1493 / 1593 / 1711 / 1799		
Belts Quantity...Type	2...5VX1150 / 2...5VX1180 / 3...5VX1150 / 3...5VX1150 / 3...5VX1230		
Center Distance Range (in.)	42.96...45.82 / 42.69...45.57 / 42.69...45.57 / 42.45...45.35 / 42.45...45.35		
RETURN/EXHAUST FAN	Plenum Fan, 47.13 in. (Any motor available on any unit)		
Quantity...Motor Hp	1...20 / 1...25 / 1...30 / 1...40		
Motor Frame Size	256T / 284T / 286T / 324T		
Efficiency at Full Load (%) High/Premium	91/93.6 / 91.7/93.6 / 92.4/93.6 / 93/93.8		
Fan Pulley Pitch Diameter (in.)	8.5 / 9.8 / 8.5 / 8.5		
Motor Pulley Pitch Diameter (in.)	5.3 / 6.7 / 6.1 / 6.7		
Blower Shaft Diameter at Pulley (in.)	$2^{15}/_{16}$ / $2^{15}/_{16}$ / $2^{15}/_{16}$ / $2^{15}/_{16}$		
Resulting Fan RPM	1104 / 1209 / 1271 / 1396		
Maximum Allowable RPM	1447 / 1447 / 1447 / 1447		
FILTERS			
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
30% and 65% Pleated (Optional)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
OUTSIDE AIR SCREENS			
Standard Hood (25%) Quantity...Size (in.)	4...25 x 16 x 1 2...20 x 16 x 1	4...25 x 16 x 1 2...20 x 16 x 1	4...25 x 16 x 1 2...20 x 16 x 1
OPTIONAL ECONOMIZER FILTER	Aluminum Frame, Permanent		
Quantity...Size (in.)	12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1	12...16 x 25 x 1 2...16 x 20 x 1

LEGEND

HGBP — Hot Gas Bypass
TXV — Thermostatic Expansion Valve

*Not available on 575-v units.

50ZT,ZW,ZX,ZZ075-105

BASE UNIT	50ZT,ZW,ZX,ZZ075	50ZT,ZW,ZX,ZZ090	50ZT,ZW,ZX,ZZ105
NOMINAL CAPACITY (tons)	75	90	105
OPERATING WEIGHT (lb)			
Base Unit without Economizer	12,805	13,015	13,745
COMPRESSOR		Semi-Hermetic	
Number	2	2	4
Circuit (No. Cyl)	A (6) | B (6)	A (6) | B (6)	A1 (6), A2 (4) | B1 (6), B2 (4)
Model 06E	-275 | -299	-299 | -299	-275, -250 | -275, -250
Oil Charge (pints)	19 | 19	19 | 19	19, 14 | 19, 14
Capacity Steps (%)			
CV	43,100	50,100	50,100
VAV	14,29,43,51,66,71,86,100	17,33,50,67,83,100	20,30,40,50,60,70,80,90,100
Number of Refrigerant Circuits	2	2	2
REFRIGERANT		R-22	
Operating Charge (lb) Ckt A/Ckt B			
Standard Evaporator Coil	70.5/64.5	64.0/64.0	68.0/68.0
Standard Evaporator With HGBP	73.5/64.5	67.0/64.0	71.0/68.0
Alternate High-Capacity Evaporator Coil	76.5/74.0	76.0/76.0	79.5/79.5
Alternate High-Capacity Evaporator With HGBP	79.5/74.0	79.0/76.0	82.5/79.5
CONDENSER COILS		3/8 in. Tube Diameter	
Quantity	4	4	4
Rows...Fins/in.			
Aluminum	3...17.0	3...17.0	3...17.0
Copper (Optional)	3...15.7	3...15.7	3...15.7
Fin Type	Double Wavy	Lanced, Sine-wave	Lanced, Sine-wave
Tube Type	Smooth	Cross-Hatched	Cross-Hatched
Total Face Area (sq ft)	108.4	108.4	108.4
EVAPORATOR COILS			
Quantity		2	
Total Face ARea (sq ft)		61.5	
Refrigerant Feed Device...No. per Circuit		TXV...2	
Standard Evaporator Coils	1/2-in. Tube Diameter	3/8-in. Tube Diameter	3/8-in. Tube Diameter
Rows...Fins/in.	4...17.0	4...17.0	4...17.0
Fin Type	Double Wavy	Lanced, Sine Wave	Lanced, Sine Wave
Tube Type	Smooth	Cross Hatched	Cross Hatched
Alternate High-Capacity Evaporator Coils	1/2-in. Tube Diameter	1/2-in. Tube Diameter	1/2-in. Tube Diameter
Rows...Fins/in.	6...16	6...16	6...16
Fin Type	Double Wavy	Double Wavy	Double Wavy
Tube Type	Cross Hatched	Cross Hatched	Cross Hatched
CONDENSER FAN		Propeller Type	
Quantity...Diameter (in.)	5...30	6...30	6...30
Nominal Airflow (Cfm)	50,000	60,000	60,000
Motor Hp (ea)...rpm	1.0...1140	1.0...1140	1.0...1140
STANDARD SUPPLY FAN		Centrifugal 36 x 30 in., Forward Curved	
Nominal Airflow (Cfm)	24,500	29,750	35,000
Maximum Allowable Airflow (Cfm)	30,000	34,000	40,000
Maximum Allowable Wheel Speed (Rpm)	680	680	680
Shaft Diameter at Pulley (in.)	1 11/16	1 11/16	1 11/16

STANDARD SUPPLY-FAN MOTOR AND DRIVE	(Any motor available on any unit)			
Motor Hp	30	40	50	60
Motor Frame Size	S286T	S324T	S36T	S364T
Efficiency at Full Load (%)				
High Efficiency	92.4	93.0	93.0	93.6
Premium Efficiency*	93.6	94.5	94.5	95.4
Fan Pulley Pitch Diameter (in.)	18.5	18.5	18.5	18.5
Motor Pulley Pitch Diameter (in.)	5.3	5.7	6.5	7.1
Resulting Fan Speed (Rpm)	501	539	615	672
Belts — Quantity...Type	3...5VX1320	4...5VX1320	4...5VX1320	4...5VX1320
Center Distance Range (in.)	47.88...45.01	47.64...44.76	47.42...44.52	47.42...44.52

ALTERNATE SUPPLY FAN		Airfoil	
Nominal Airflow (cfm)	24,500	29,750	35,000
Maximum Allowable Airflow (cfm)	30,000	34,000	40,000
Maximum Allowable Wheel Speed (rpm)	1846	1846	1846
Shaft Diameter at Pulley (in.)	2 11/16	2 11/16	2 11/16

ALTERNATE SUPPLY FAN MOTOR AND DRIVE	(Any motor available on any unit)				
Motor Hp	30	40	50	60	75
Motor Frame Size	S286T	S324T	S364T	S364T	365T
Efficiency at Full Load (%)					
High Efficiency	92.4	93.0	93.0	93.6	94.1
Premium Efficiency*	93.6	94.5	94.5	95.4	95.4
Fan Pulley Pitch Diameter (in.)	9.7	10.2	8.9	8.9	10.8
Motor Pulley Pitch Diameter (in.)	7.5	8.7	8.1	8.7	11.1
Resulting Fan Rpm	1353	1493	1593	1711	1799
Belts Quantity...Type	2...5VX1150	2...5VX1180	3...5VX1150	3...5VX1150	3...5VX1230
Center Distance Range (in.)	42.96...45.82	42.69...45.57	42.69...45.57	42.45...45.35	42.45...45.35

POWER EXHAUST	Centrifugal, 22 x 20 in., 1 11/16 in. shaft diameter (Any motor available on any unit)				
Total Hp	20	30	40	50	60
Quantity...Motor Hp	2...10	2...15	2...20	2...25	2...30
Motor Frame Size	S215T	D254T	S256T	S284T	S286T
Efficiency at Full Load (%)					
High Efficiency	89.5	91	91	91.7	92.4
Premium Efficiency*	91.7	93	93.6	93.6	93.6
Fan Sheave Pitch Diameter (in.)	12.4	12.4	11.1	11.1	11.1
Motor Sheave Pitch Diameter (in.)	4.8	5.8	5.9	6.5	6.9
Resulting Fan Rpm	714	841	928	1020	1094
Maximum Allowable Rpm	1175	1175	1175	1175	1175
Belts — Quantity...Type	2...BX93	2...BX93	2...5VX950	2...5VX950	2...5VX950

FILTERS			
Standard Efficiency Throwaway (Standard)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
30% and 65% Pleated (Optional)	15...20 x 25 x 2	15...20 x 25 x 2	15...20 x 25 x 2
Quantity...Size (in.)	5...16 x 20 x 2	5...16 x 20 x 2	5...16 x 20 x 2
OUTSIDE AIR SCREENS			
Standard Hood (25%) Quantity...Size (in.)	8...25 x 16 x 1 2...20 x 16 x 1	8...25 x 16 x 1 2...20 x 16 x 1	8...25 x 16 x 1 2...20 x 16 x 1

LEGEND

HGBP — Hot Gas Bypass
TXV — Thermostatic Expansion Valve

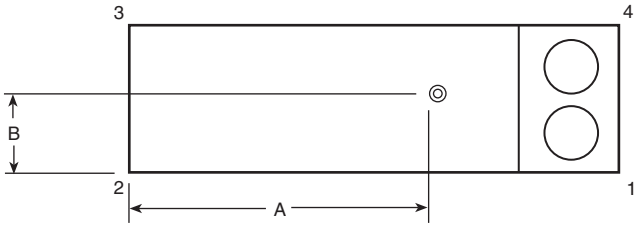
*Not available on 575-v units.

Physical data (cont)

HYDRONIC HEAT COIL

UNIT SIZE 50Z	030-050	055-070
COIL CONSTRUCTION	½-in. OD copper tubes, aluminum plate fins, galvanized steel frame	
FACE AREA (sq ft)	22.6	(2) sections: total 27.1
ROWS...FINS PER INCH	2…8	2…11
CIRCUIT ARRANGEMENT	Half	Half
CONNECTIONS — (Qty) Dim Supply Return	 (1) $2^1/_2$ NPT (1) $2^1/_2$ NPT	 (2) $1^1/_2$ NPT (2) $1^1/_2$ NPT
HEADER MATERIAL	Steel	Steel
INTERNAL VOLUME (cu. ft)	0.5272	0.6327

→ WEIGHT DISTRIBUTION AND CENTER OF GRAVITY — 48 SERIES UNITS



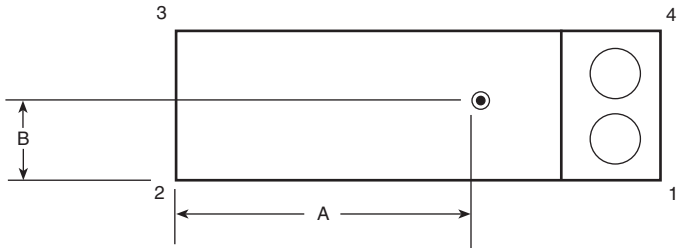
UNITS 48ZG,ZN	SIZE	CORNER WEIGHTS				TOTAL	A	B
		1	2	3	4		ft-in.	ft-in.
VERTICAL SUPPLY AND RETURN/ LOW GAS HEAT	030	1968	1004	1005	1964	5,941	14- $9^1/_8$	3-$9^{13}/_{16}$
	035	1851	1184	1142	1889	6,066	14-11	3-$9^{13}/_{16}$
	040	2246	1177	1179	2239	6,841	17- $2^7/_8$	3-$9^{13}/_{16}$
	050	2264	1182	1179	2256	6,881	17- 4	3-$9^{13}/_{16}$
	055	2478	2140	2144	2468	9,230	19- 7	3-$9^{13}/_{16}$
	060	2557	2211	2212	2549	9,530	19- 7	3-$9^{13}/_{16}$
	070	2648	2330	2334	2638	9,950	21- 0	3-$9^{13}/_{16}$
	075	2955	2447	2445	2953	10,800	21- $7^1/_2$	3-$9^{13}/_{16}$
	090	3035	2471	2471	3033	11,010	21- $9^7/_{16}$	3-$9^{13}/_{16}$
	105	3342	2529	2529	3340	11,740	22- 6	3-$9^{13}/_{16}$
VERTICAL SUPPLY AND RETURN/ HIGH GAS HEAT	030	2000	1037	1038	1995	6,070	14- $8^1/_8$	3-$9^{13}/_{16}$
	035	2061	1038	1037	2059	6,195	14-10	3-$9^{13}/_{16}$
	040	2277	1210	1213	2270	6,970	17- $1^7/_8$	3-$9^{13}/_{16}$
	050	2301	1206	1205	2297	7,010	17- 3	3-$9^{13}/_{16}$
	055	2510	2168	2172	2500	9,350	19- 7	3-$9^{13}/_{16}$
	060	2587	2242	2237	2584	9,650	19- 7	3-$9^{13}/_{16}$
	070	2683	2361	2365	2672	10,080	21- 0	3-$9^{13}/_{16}$
	075	3015	2474	2472	3013	10,974	21- $8^9/_{16}$	3-$9^{13}/_{16}$
	090	3095	2499	2498	3092	11,184	21-$10^7/_{16}$	3-$9^{13}/_{16}$
	105	3405	2554	2554	3401	11,914	22- 7	3-$9^{13}/_{16}$
VERTICAL SUPPLY AND RETURN/ EXTENDED CHASSIS/LOW GAS HEAT	030	2133	1089	1091	2127	6,441	16- $1^{11}/_{16}$	3-$9^{13}/_{16}$
	035	2198	1087	1087	2194	6,566	16- $3^7/_8$	3-$9^{13}/_{16}$
	040	2411	1262	1264	2404	7,341	18- $7^1/_2$	3-$9^{13}/_{16}$
	050	2434	1259	1256	2432	7,381	18- $8^5/_8$	3-$9^{13}/_{16}$
	055	2617	2251	2255	2607	9,730	20- 9	3-$9^{13}/_{16}$
	060	2698	2320	2325	2687	10,030	20- 9	3-$9^{13}/_{16}$
VERTICAL SUPPLY AND RETURN/ EXTENDED CHASSIS/HIGH GAS HEAT	030	2188	1100	1101	2182	6,570	16- $2^3/_4$	3-$9^{13}/_{16}$
	035	2187	1163	1161	2184	6,695	18- $6^7/_{16}$	3-$9^{13}/_{16}$
	040	2454	1284	1287	2446	7,470	18- $7^1/_2$	3-$9^{13}/_{16}$
	050	2017	1740	1738	2014	7,510	20- 9	3-$9^{13}/_{16}$
	055	2649	2279	2283	2639	9,850	20- 9	3-$9^{13}/_{16}$
	060	3442	1787	1791	3431	10,450	16- $0^9/_{16}$	3-$9^{13}/_{16}$

UNITS 48ZT,ZW WITH HIGH-CAPACITY POWER EXHAUST	SIZE	CORNER WEIGHTS				TOTAL	A	B
		1	2	3	4		ft-in.	ft-in.
VERTICAL SUPPLY AND RETURN/ LOW GAS HEAT, HIGH-CAPACITY POWER EXHAUST	075	3551	3053	3049	3551	13,204	24- $9^{13}/_{16}$	3-$9^{13}/_{16}$
	090	3629	3080	3075	3630	13,414	24- $1^5/_8$	3-$9^{13}/_{16}$
	105	3948	3126	3121	3948	14,144	25- $9^1/_8$	3-$9^{13}/_{16}$
VERTICAL SUPPLY AND RETURN/ HIGH GAS HEAT, CV, HIGH-CAPACITY POWER EXHAUST	075	3611	3081	3076	3611	13,380	24-$10^7/_8$	3-$9^{13}/_{16}$
	090	3691	3106	3102	3691	13,590	25- $0^3/_4$	3-$9^{13}/_{16}$
	105	4008	3155	3150	4008	14,320	25- $9^{15}/_{16}$	3-$9^{13}/_{16}$

UNITS 48Z6,Z8 WITH RETURN/EXHAUST FAN	SIZE	CORNER WEIGHTS				TOTAL	A	B
		1	2	3	4		ft-in.	ft-in.
VERTICAL SUPPLY AND RETURN LOW GAS HEAT, RETURN/EXHAUST FAN	075	2802	3002	3008	2868	11,740	19-4	3-$9^{13}/_{16}$
	090	2940	3029	3035	2946	11,950	19-6	3-$9^{13}/_{16}$
	105	3242	3091	3098	3249	12,680	20-2	3-$9^{13}/_{16}$
VERTICAL SUPPLY AND RETURN HIGH GAS HEAT, RETURN/EXHAUST FAN	075	2921	3029	3036	2928	11,914	19-6	3-$9^{13}/_{16}$
	090	2999	3056	3063	3006	12,124	19-7	3-$9^{13}/_{16}$
	105	3304	3116	3123	3311	12,854	20-4	3-$9^{13}/_{16}$

NOTE: The weight distribution and center of gravity information are representative of a standard unit and DO NOT include the impact of factory-installed options such as economizer, power exhaust, coil options, etc.

→ WEIGHT DISTRIBUTION AND CENTER OF GRAVITY — 50 SERIES UNITS



UNITS	SIZE	CORNER WEIGHTS (lb)				TOTAL (lb)	A ft-in.	B ft-in.
		1	2	3	4			
HORIZONTAL SUPPLY & RETURN (50Z2,Z3) VERTICAL SUPPLY & RETURN W/EXTENDED PLENUM (50ZG,ZN)	030	1939	1198	1200	1933	6,270	13- 9 1/4	3-9 13/16
	035	1997	1203	1202	1993	6,395	13-11	3-9 13/16
	040	2139	1323	1324	2133	6,920	16- 2 13/16	3-9 13/16
	050	2162	1320	1317	2161	6,960	16- 4	3-9 13/16
	055	2322	2071	2068	2319	8,780	18- 2	3-9 13/16
	060	2401	2142	2139	2398	9,080	18- 2	3-9 13/16
	070	2555	2198	2195	2552	9,500	21- 3	3-9 13/16
VERTICAL SUPPLY & RETURN (50ZG,ZN)	030	1826	1026	1027	1821	5,700	13- 3 1/4	3-9 13/16
	035	1885	1029	1028	1883	5,825	13- 5	3-9 13/16
	040	2035	1142	1144	2029	6,350	15- 9 7/8	3-9 13/16
	050	2059	1139	1137	2056	6,390	15-11	3-9 13/16
	055	2469	1649	1651	2461	8,230	19-10	3-9 13/16
	060	2559	1709	1712	2550	8,530	19-10	3-9 13/16
	070	2643	1840	1845	2632	8,960	21- 3	3-9 13/16
HORIZONTAL SUPPLY & RETURN (50Z2,Z3) VERTICAL SUPPLY & RETURN (50ZG,ZN)	075	2817	2385	2381	2817	10,400	21- 5	3-9 13/16
	090	2897	2410	2407	2896	10,610	21- 7	3-9 13/16
	105	3203	2469	2465	3204	11,340	22- 4	3-9 13/16
HORIZONTAL SUPPLY & RETURN W/EXTENDED CHASSIS (50Z2,Z3) VERTICAL SUPPLY & RETURN W/EXTENDED PLENUM/EXT. CHASSIS (50ZG,ZN)	030	2103	1284	1286	2096	6,770	15- 1 5/8	3-9 13/16
	035	2167	1283	1282	2163	6,895	15- 3 7/8	3-9 13/16
	040	2306	1406	1407	2300	7,420	17- 7 9/16	3-9 13/16
	050	2327	1406	1399	2328	7,460	17- 8 5/8	3-9 13/16
	055	2232	2411	2231	2406	9,280	19- 3 13/16	3-9 13/16
	060	2303	2490	2303	2484	9,580	19- 3 13/16	3-9 13/16
	070	3116	1887	1884	3113	10,000	22- 5 13/16	3-9 13/16
VERTICAL SUPPLY & RETURN/EXT. CHASSIS (50ZG,ZN)	030	1970	1132	1133	1965	6,200	14- 5 15/16	3-9 13/16
	035	2034	1131	1129	2031	6,325	14- 8 1/8	3-9 13/16
	040	2186	1241	1243	2180	6,850	17- 1 1/8	3-9 13/16
	050	2208	1239	1235	2208	6,890	17- 2 1/4	3-9 13/16
	055	2605	1763	1766	2596	8,730	20-11 11/16	3-9 13/16
	060	2694	1824	1827	2685	9,030	20-11 11/16	3-9 13/16
HORIZONTAL SUPPLY & RETURN, HIGH-CAPACITY POWER EXHAUST (50ZT,ZW) VERTICAL SUPPLY & RETURN, HIGH-CAPACITY POWER EXHAUST (50ZX,ZZ)	075	3415	2990	2986	3415	12,806	24- 7 5/16	3-9 13/16
	090	3493	3016	3011	3494	13,014	24- 9 1/4	3-9 13/16
	105	3811	3064	3059	3812	13,746	25- 7 5/64	3-9 13/16
HORIZONTAL SUPPLY AND VERTICAL RETURN WITH RETURN/EXHAUST FAN (50Z7,Z9) VERTICAL SUPPLY/RETURN WITH RETURN/EXHAUST FAN (50Z6,Z8)	075	2726	2938	2944	2732	11,340	19- 0	3-9 13/16
	090	2804	2964	2971	2811	11,550	19- 2	3-9 13/16
	105	3106	3028	3034	3112	12,280	20- 0	3-9 13/16

NOTE: The weight distribution and center of gravity information are representative of a standard unit and DO NOT include the impact of factory-installed options such as economizer, power exhaust, coil options, etc.

Physical data (cont)

OPERATING WEIGHTS OF OPTIONS AND ACCESSORIES (lb)

OPTION OR ACCESSORY	48/50Z UNIT SIZE							
	030,035	040,050	055	060	070	075	090	105
Electric Heat*	150	150	150	150	150	200	200	200
Condenser Section Roof Curb	—	—	540	540	625	625	625	625
Economizer	300†	300†	530†	530†	530†	530†	530†	530†
Power Exhaust (PE)	710†	710†	710†	710†	710†	710†	710†	710†
Barometric Relief	200	200	200	200	200	200	200	200
Roof Curb								
48Z Standard Length	455	495	605	605	605	605	605	605
48Z Extended Length	545	545	1200	1200	—	—	—	—
48Z with High Capacity PE	—	—	—	—	—	700	700	700
50Z Standard Length	390	480	560	560	560	605	605	605
50Z with Discharge Plenum	455	495	605	605	605	605	605	605
50Z Extended Length	545	545	545	545	545	—	—	—
50Z Extended Length with Discharge Plenum	545	545	1200	1200	—	—	—	—
50Z with High Capacity PE	—	—	—	—	—	700	700	700
High-Efficiency Filters	20	20	20	20	20	—	—	—
Bag Filters	35	35	40	40	40	—	—	—
Hail Guard	120	150	145	145	210	210	210	210
Copper Condenser Coil Fins	180	235	235	235	420	420	420	420
Inlet Guide Vanes	95	95	115	115	115	115	115	115
Variable Frequency Drive								
7.5 hp	65	65	—	—	—	—	—	—
10 hp	65	65	—	—	—	—	—	—
15 hp	110	110	110	110	110	—	—	—
20 hp	111	111	111	111	111	—	—	—
25 hp	190	190	190	190	190	—	—	—
30 hp	190	190	190	190	190	152	152	152
40 hp	—	190	190	190	190	155	155	155
50 hp	—	—	—	—	—	263	263	263
60 hp	—	—	—	—	—	266	266	266
75 hp	—	—	—	—	—	302	302	302
High-Capacity Evaporator Coil	—	300	300	300	300	300	300	300

*50 series units only.
†Includes hood.

SUPPLY FAN DRIVE DATA

HP	SHAFT DIA (in.)	SPEED (rpm)	MOTOR SHEAVE	MOTOR PITCH DIA.	WHEEL SHEAVE	WHEEL PITCH DIA. (in.)	QUANTITY ...BELT
Sizes 030-050							
7.5	1 3/8	438	2BK36	3.4	2B5V136	13.7	2...BX60
10	1 3/8	549	2B5V42	4.3	2B5V136	13.7	2...5VX630
15	1 5/8	626	2B5V48	4.9	2B5V136	13.7	2...5VX630
20	1 5/8	703	2B5V54	5.5	2B5V136	13.7	2...5VX630
25	1 7/8	830	2B5V64	6.5	2B5V136	13.7	2...5VX650
30*	1 7/8	910	3B5V64	6.5	3B5V124	12.5	3...5VX630
Sizes 055-070							
15	1 5/8	575	2B5V44	4.5	2B5V136	13.7	2...5VX1230† 2...5VX1120**
20	1 5/8	651	2B5V50	5.1	2B5V136	13.7	2...5VX1230† 2...5XV1150**
25	1 7/8	703	2B5V54	5.5	2B5V136	13.7	2...5VX1230† 2...5VX1150**
30	1 7/8	711	2B5V62	5.9	2B5V154	15.5	2...5VX1230† 2...5VX1180**
40	2 1/8	740	3B5V66	6.7	3B5V160	16.1	3...5VX1250† 3...5VX1180**
Sizes 075-105 (Forward Curved Fan)							
30	1 7/8	501	3B5V52	5.33	B5V184	18.5	3...5VX1320
40	2 1/8	539	4B5V56	5.74	B5V184	18.5	4...5VX1320
50	2 1/8	615	4B5V64	6.54	B5V184	18.5	4...5VX1320
60	2 3/8	672	4B5V70	7.14	B5V184	18.5	4...5VX1320
Sizes 075-105 (Airfoil Fan)							
30	1 7/8	1353	2B5V74	7.5	2Q5V97	9.7	2...5VX1150
40	2 1/8	1493	2B5V86	8.7	2Q5V103	10.2	2...5VX1180
50	2 1/8	1593	3B5V80	8.1	3R5V90	8.9	3...5VX1150
60	2 3/8	1711	3B5V86	8.7	3R5V90	8.9	3...5VX1150
75	2 3/8	1799	3B5V110	11.1	3R5V109	10.8	3...5VX1230

*Sizes 040,050 only.
†Horizontal discharge units (50 series only).
**Vertical discharge and extended plenum units.
NOTE: Part numbers are Browning Manufacturing Corp. reference.

POWER EXHAUST FAN DRIVE DATA (TWO DRIVE SETS PER UNIT)

TOTAL HP	MOTOR QTY...HP	MOTOR SHAFT DIAMETER (in.)	FAN SPEED RPM	MOTOR SHEAVE		BLOWER SHEAVE		BELTS QTY...P/N	CENTER DISTANCE RANGE (in.)
				Part Number	Pitch Diameter (in.)	Part Number	Pitch Diameter (in.)		
Sizes 030-050									
6*	2...3	7/8	656/500	1VL44	4.1-3.1	BK115	11	1...BX71	23.62-26.50
6†	2...3	1 1/8	656/500	1VP44L	4.1-3.1	BK115	11	1...BX71	23.62-26.50
10**	2...5	1 1/8	785/621	1VP50L	4.7-3.7	BK110	10.4	1...BX71	23.62-26.50
15**	2...7.5	1 3/8	882/717	1VP65	6.0-4.8	BK130	12	1...BX77	23.62-26.50
20**	2...10	1 3/8	1000/854	1VP75	7.0-5.8	BK130	12	1...BX79	23.62-26.50
Sizes 055-105									
10	2...5	1 1/8	740	2P3V45	4.5	2Q3V106	10.6	2...3VX800	26.8-28.5
15	2...7.5	1 3/8	820	2P3V50	5.0	2Q3V106	10.6	2...3VX800	26.8-28.5
20	2...10	1 3/8	920	2P3V56	5.6	2Q3V106	10.6	2...3VX800	26.8-28.5

*High-Efficiency Motor Option.
†Premium-Efficiency Motor Option.
**Applies to both motor options.

NOTE: Part numbers are Browning Manufacturing Corp. reference.

HIGH-CAPACITY POWER EXHAUST FAN DRIVE DATA (TWO DRIVE SETS PER UNIT) (48ZT,ZW AND 50ZT,ZW,ZX,ZZ UNITS)

TOTAL HP	MOTOR QTY...HP	MOTOR SHAFT DIAMETER (in.)	FAN SPEED RPM	MOTOR SHEAVE		BLOWER SHEAVE		BELTS QTY...P/N	CENTER DISTANCE RANGE (in.)
				Part Number	Pitch Diameter (in.)	Part Number	Pitch Diameter (in.)		
20	2...10	1.375	714	2B5V48	4.8	2B5V124	12.4	2...BX93	32.8 to 36.7
30	2...15	1.625	841	2B5V58	5.8	2B5V124	12.4	2...BX93	32.6 to 36.5
40	2...20	1.625	928	2B5V58	5.9	2B5V110	11.1	2...5VX950	32.6 to 36.5
50	2...25	1.875	1020	2B5V64	6.5	2B5V110	11.1	2...5VX950	32.5 to 36.3
60	2...30	1.875	1094	2B5V68	6.9	2B5V110	11.1	2...5VX950	32.5 to 36.3

RETURN/EXHAUST FAN DRIVE DATA (ONE DRIVE SET PER UNIT) (48Z6,Z8075-105 AND 50Z6,Z7,Z8,Z9075-105 UNITS)

TOTAL HP	MOTOR QTY...HP	MOTOR SHAFT DIAMETER (in.)	FAN SPEED RPM	MOTOR SHEAVE		BLOWER SHEAVE		BELTS QTY...P/N	CENTER DISTANCE RANGE (in.)
				Part Number	Pitch Diameter (in.)	Part Number	Pitch Diameter (in.)		
20	1...20	1.625	1104	3B5V52	5.3	3R5V85	8.5	3...5VX1000	38.1 to 41.0
25	1...25	1.875	1209	3B5V66	6.7	3R5V97	9.8	3...5VX1060	38.9 to 41.8
30	1...30	1.875	1271	3B5V60	6.1	3R5V85	8.5	3...5VX1030	38.9 to 41.8
40	1...40	2.125	1396	3B5V66	6.7	3R5V85	8.5	3...5VX1060	39.9 to 42.8

Options and accessories

→ **STANDARD UNITS**

ITEM	OPTION*	ACCESSORY†	DEC**
Economizer with Integrated Compressor Operation and Enthalpy Control	X		
Modulating Power Exhaust	X††		
Economizer with Barometric Relief	X††		
Electric Heat (50Z units only)	X		
Premium-Efficiency Fan Motor	X		
Variable Frequency Drive (VFD)	X		
Inlet Guide Vanes	X		
30% and 65% Two-in. Filters	X		
90% Bag Filters	X		
Non-Fused Disconnect	X		
Hot Gas Bypass	X		
Cu/Cu Condenser Coil	X		
Pre-Coated Condenser Coils	X		
E-Coated Condenser Coils	X		
Outdoor Air CFM Control Package	X		
Staged Gas Control	X		
Roof Curb		X	
Condenser Section Curb Pan		X	
Hail Guard		X	
Enthalpy Control and Differential Enthalpy Sensor		X	
VFD Remote Display Module		X	
Navigator Keypad/Display Module		X	
Relative Humidity Sensor (Wall Mount)		X	
Relative Humidity Sensor (Duct Mount)		X	
CO_2 (IAQ) Sensor for Conditioned Space		X	
CO_2 (IAQ) Sensor for Return Air		X	
Barometric Relief (Economizer required)		X	
Space Temperature Sensor (T-55)		X	
Space Temperature Sensor with Set Point Adjustment (T-56)		X	
Space Temperature Sensor with CO_2 Sensor		X	
Space Temperature Sensor with Set Point Adjustment and CO_2 Sensor		X	
Communicating Space Temperature Sensor (T-58)		X	
Control Expansion Module	X	X	
Airflow Switch		X	
Filter Status Switch		X	
LP Kit		X	
Double Wall Construction in Airstream of Unit			X
Special Filtration (Cartridge)			X
Alternate Speed Drive Sets			X
VFD Integral Bypass			X
VFD Manual Bypass Switch			X
VFD Added to Power Exhaust			X
VFD with Bypass on Power Exhaust			X
Fused Disconnect			X
Opposite-Side Supply Duct Location			X (Z2,Z3 only)
Mix-Match Supply/Return Sheet Metal			X
External Power Exhaust			X (Z2,Z3 only)
Power Exhaust on End Return			X (Z2,Z3 only)
Smoke Detector Installed in Supply or Return			X
Smoke Detector Installed in both Supply and Return			X
Power Monitor Package			X
UV-C Lamps (with door interlocks and disconnect switch)			X
115-V Convenience Outlet (field-wired)			X
115-V Convenience Outlet (factory-wired)	X		X
Marine Lights (field-wired)			X
Extended Lubrication Lines			X
Custom Color Paint			X

LEGEND

IAQ — Indoor Air Quality
LP — Liquid Propane

*Factory installed.
†Field installed.
**Design Enhancement Center Option. The DEC handles special orders to meet specific customer requirements. Quotations for DEC options can be requested over E-mail, phone, or fax. Lead times and prices vary with the option.
††Vertical supply/return sizes 030-105 and horizontal sizes 055-105.

HIGH-CAPACITY POWER EXHAUST AND RETURN FAN OPTION UNITS

ITEM	OPTION*	ACCESSORY†	DEC**
Premium-Efficiency Fan Motor	X		
Variable Frequency Drive (VFD)	X		
Inlet Guide Vanes	X		
30% and 65% Two-in. Filters	X		
Non-Fused Disconnect	X		
Hot Gas Bypass	X		
Cu/Cu Condenser Coil	X		
Pre-Coated Condenser Coils	X		
E-Coated Condenser Coils	X		
Outdoor Air CFM Control Package	X		
Roof Curb		X	
Condenser Section Curb Pan		X	
Hail Guard		X	
Enthalpy Control and Differential Enthalpy Sensor		X	
VFD Remote Display Module		X	
Navigator Keypad/Display Module		X	
Relative Humidity Sensor (Wall Mount)		X	
Relative Humidity Sensor (Duct Mount)		X	
CO_2 (IAQ) Sensor for Conditioned Space		X	
CO_2 (IAQ) Sensor for Return Air		X	
Barometric Relief (Economizer required)		X	
Space Temperature Sensor (T-55)		X	
Space Temperature Sensor with Set Point Adjustment (T-56)		X	
Space Temperature Sensor with CO_2 Sensor		X	
Space Temperature Sensor with Set Point Adjustment and CO_2 Sensor		X	
Communicating Space Temperature Sensor (T-58)		X	
Control Expansion Module	X	X	
Airflow Switch		X	
Filter Status Switch		X	
LP Kit		X	
Double Wall Construction in Airstream of Unit			X
Special Filtration (Cartridge)			X
Alternate Speed Drive Sets			X
VFD Integral Bypass			X
VFD Manual Bypass Switch			X
VFD with Bypass on Power Exhaust			X
Fused Disconnect			X
Opposite-Side Supply Duct Location			X (Z2,Z3 only)
Mix-Match Supply/Return Sheet Metal			X
Smoke Detector Installed in Supply or Return			X
Smoke Detector Installed in both Supply and Return			X
Power Monitor Package			X
UV-C Lamps (with door interlocks and disconnect switch)			X
115-V Convenience Outlet (field-wired)			X
115-V Convenience Outlet (factory-wired)	X		X
Marine Lights (field-wired)			X
Extended Lubrication Lines			X
Custom Color Paint			X

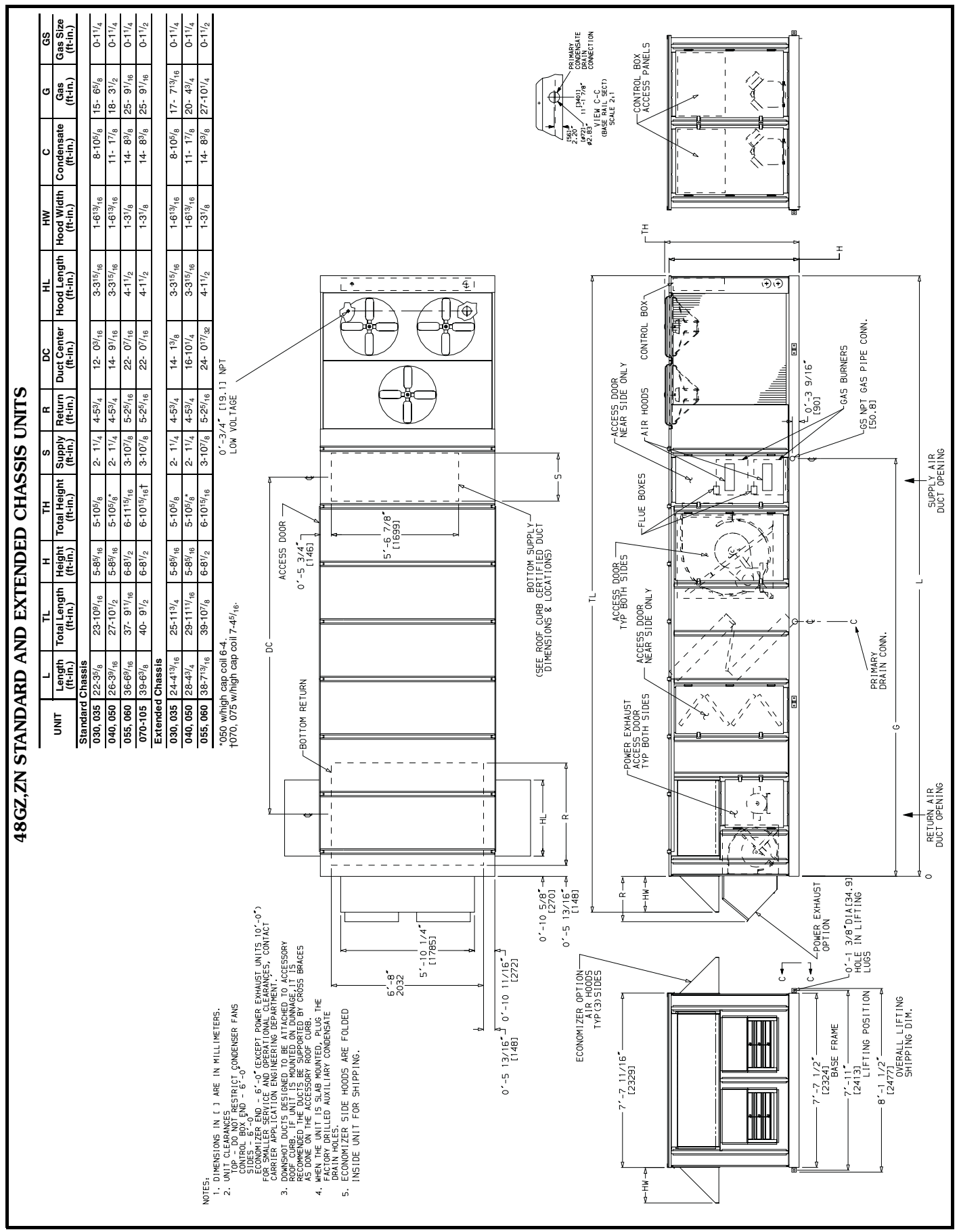
*Factory installed.
†Field installed.
**Design Enhancement Center Option. The DEC handles special orders to meet specific customer requirements. Quotations for DEC options can be requested over E-mail, phone, or fax. Lead times and prices vary with the option.

Base unit dimensions

48GZ,ZN STANDARD AND EXTENDED CHASSIS UNITS

UNIT	L	TL	H	TH	S	R	DC	HL	HW	C	G	GS
	Length (ft-in.)	Total Length (ft-in.)	Height (ft-in.)	Total Height (ft-in.)	Supply (ft-in.)	Return (ft-in.)	Duct Center (ft-in.)	Hood Length (ft-in.)	Hood Width (ft-in.)	Condensate (ft-in.)	Gas (ft-in.)	Gas Size (ft-in.)
Standard Chassis												
030, 035	22-3 3/8	23-10 9/16	5-8 5/16	5-10 5/8	2- 1 1/4	4-5 3/4	12- 0 3/16	3-3 15/16	1-6 13/16	8-10 5/8	15- 6 5/8	0-1 1/4
040, 050	26-3 9/16	27-10 1/2	5-8 5/16	5-10 5/8*	2- 1 1/4	4-5 3/4	14- 9 1/16	3-3 15/16	1-6 13/16	11- 1 7/8	18- 3 1/2	0-1 1/4
055, 060	36-6 9/16	37- 9 1/16	6-8 1/2	6-11 15/16	3-10 7/8	5-2 5/16	22- 0 7/16	4-1 1/2	1-3 1/8	14- 8 3/8	25- 9 1/16	0-1 1/4
070-105	39-6 3/8	40- 9 1/2	6-8 1/2	6-10 15/16†	3-10 7/8	5-2 5/16	22- 0 7/16	4-1 1/2	1-3 1/8	14- 8 3/8	25- 9 1/16	0-1 1/2
Extended Chassis												
030, 035	24-4 13/16	25-11 3/4	5-8 5/16	5-10 5/8	2- 1 1/4	4-5 3/4	14- 1 3/8	3-3 15/16	1-6 13/16	8-10 5/8	17- 7 13/16	0-1 1/4
040, 050	28-4 3/4	29-11 1/16	5-8 5/16	5-10 5/8*	2- 1 1/4	4-5 3/4	16-10 1/4	3-3 15/16	1-6 13/16	11- 1 7/8	20- 4 3/4	0-1 1/4
055, 060	38-7 13/16	39-10 7/8	6-8 1/2	6-10 15/16	3-10 7/8	5-2 5/16	24- 0 17/32	4-1 1/2	1-3 1/8	14- 8 3/8	27-10 1/4	0-1 1/2

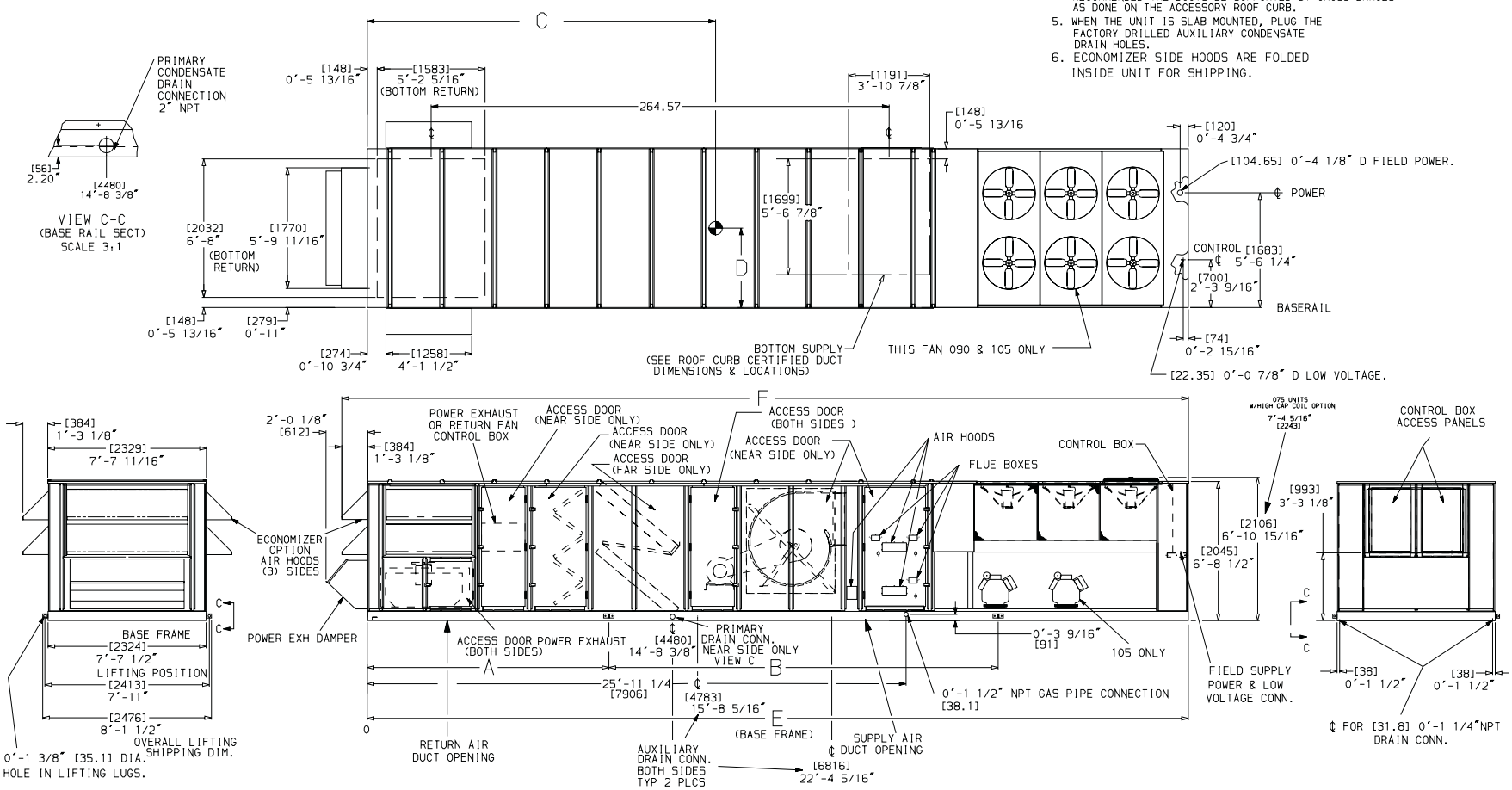
*050 w/high cap coil 6-4.
†070, 075 w/high cap coil 7-4 5/16.



48Z6,Z8075-105 RETURN/EXHAUST FAN UNITS

UNIT SIZE	WEIGHT LBS.	WEIGHT KGS.	A MM	A FT. IN.	B MM	B FT. IN.	C MM	C FT. IN.	D MM	D FT. IN.	E MM	E FT. IN.	F MM	F FT. IN.
075 LOW HEAT	11740	5325	3544	11'-7 1/2"	6494	21' 3 5/8"	5893	19' 4"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090 LOW HEAT	11950	5420	3544	11'-7 1/2"	6494	21' 3 5/8"	5944	19' 6"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105 LOW HEAT	12680	5752	3544	11'-7 1/2"	6494	21' 3 5/8"	6147	20' 2"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
075 HIGH HEAT	11914	5742	3544	11'-7 1/2"	6494	21' 3 5/8"	5944	19' 6"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090 HIGH HEAT	12124	5499	3544	11'-7 1/2"	6494	21' 3 5/8"	5969	19' 7"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105 HIGH HEAT	12854	5831	3544	11'-7 1/2"	6494	21' 3 5/8"	6198	20' 4"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

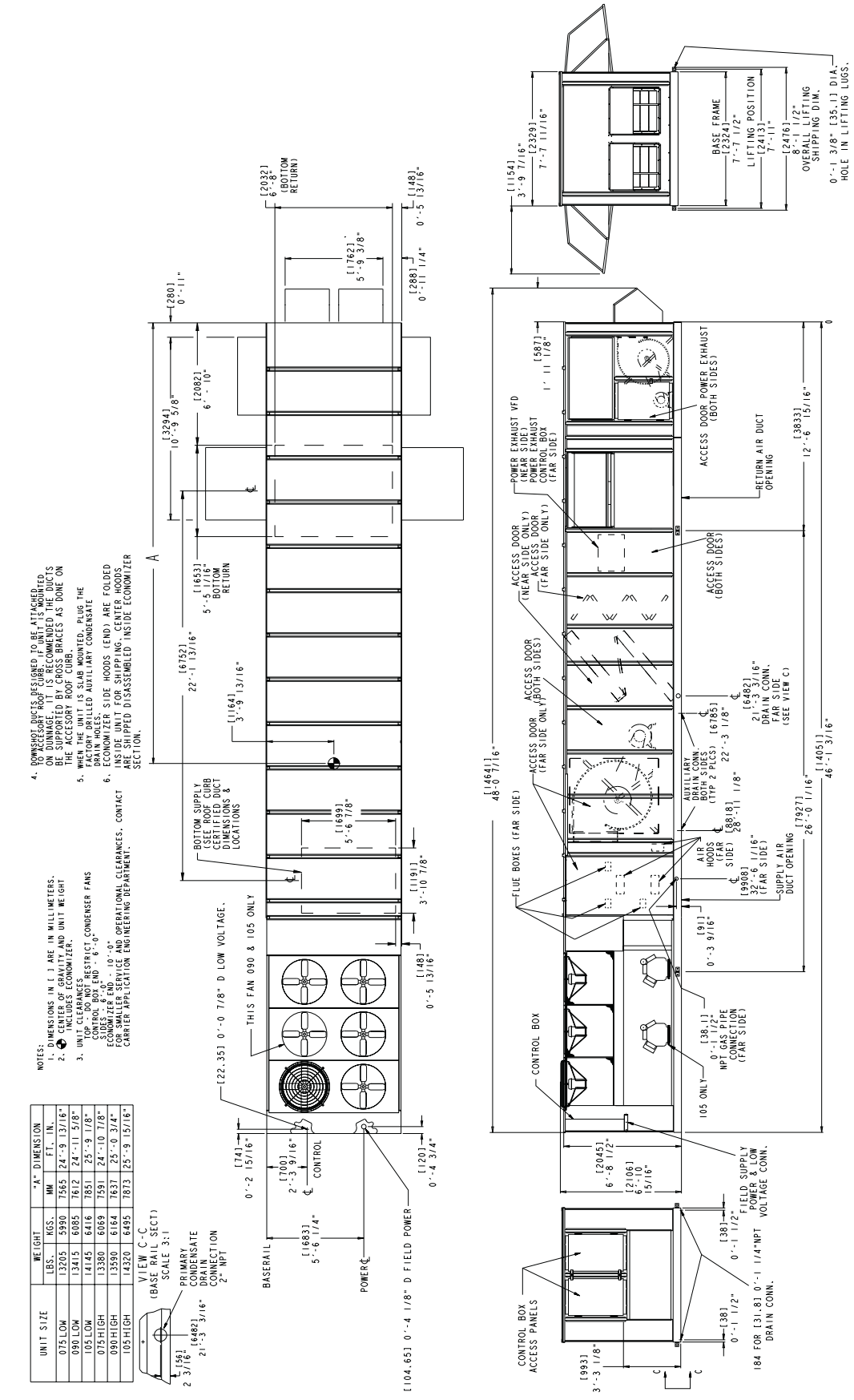


Base unit dimensions (cont)

48ZT,ZW075-105 HIGH-CAPACITY POWER EXHAUST UNITS

UNIT SIZE	WEIGHT		"A" DIMENSION	
	LBS.	KGS.	MM	FT. IN.
075 LOW	13205	5990	7565	24'-9 13/16"
090 LOW	13415	6085	7612	24'-11 5/8"
105 LOW	14145	6416	7851	25'-9 1/8"
075 HIGH	13380	6069	7591	24'-10 7/8"
090 HIGH	13590	6164	7637	25'-0 3/4"
105 HIGH	14320	6495	7873	25'-9 15/16"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ◐ CENTER OF GRAVITY AND UNIT WEIGHT INCLUDES ECONOMIZER.
3. UNIT CLEARANCES
   TOP CLEARANCE RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 10'-0"
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS (END) ARE FOLDED INSIDE UNIT FOR SHIPPING. CENTER HOODS ARE SHIPPED DISASSEMBLED INSIDE ECONOMIZER SECTION.

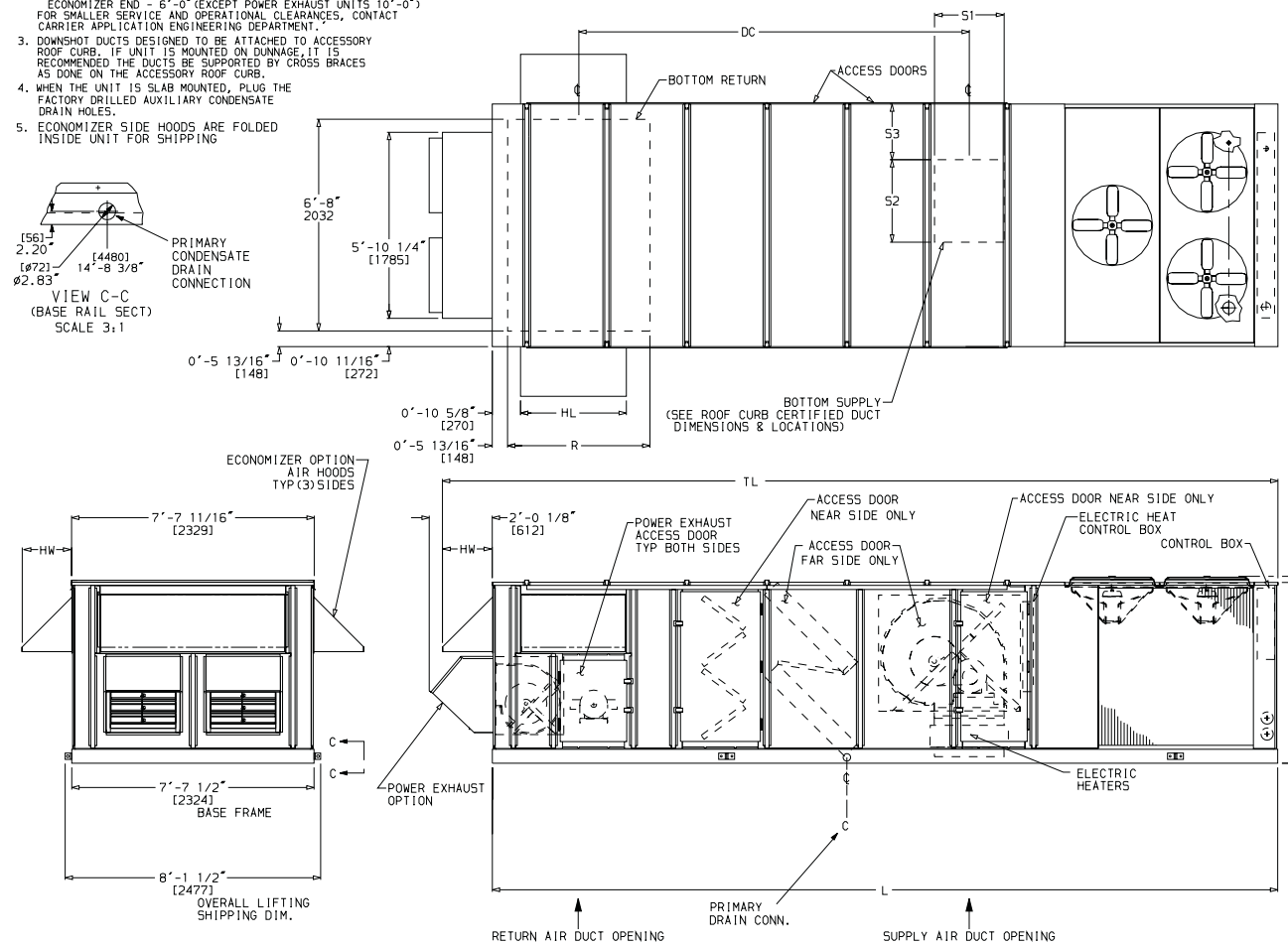


50ZG,ZN030-070 — VERTICAL SUPPLY/RETURN STANDARD AND EXTENDED CHASSIS UNITS

UNIT	L	TL	H	TH	S1	S2	S3	R	DC	HL	HW	C
	Length (ft-in.)	Total Length (ft-in.)	Height (ft-in.)	Total Height (ft-in.)	Supply Length (ft-in.)	Supply Width (ft-in.)	Supply Loc (ft-in.)	Return (ft-in.)	Duct Center (ft-in.)	Hood Length (ft-in.)	Hood Width (ft-in.)	Condensate (ft-in.)
Standard Chassis												
030, 035	20- 8 7/8	22-3 13/16	5-8 5/16	5-10 5/8	2-2 5/16	2-7 3/16	1-9	4-5 3/4	9-6 13/16	3-3 15/16	1-6 13/16	8-10 5/8
040, 050	24- 8 5/8	26-3 9/16	5-8 5/16	5-10 5/8*	2-2 5/16	2-7 3/16	1-9	4-5 3/4	12-3 1/2	3-3 15/16	1-6 13/16	11- 1 7/8
055, 060	33- 1 5/16	34-4 7/16	6-8 1/2	6-10 15/16	2-6	3-2	1-8 1/4	5-2 5/16	18-6	4-1 1/2	1-3 1/8	14- 8 3/8
070	36- 1 1/8	37-4 1/4	6-8 1/2	6-10 15/16†	2-6	3-2	1-8 1/4	5-2 5/16	18-6	4-1 1/2	1-3 1/8	14- 8 3/8
Extended Chassis												
030, 035	22-10 1/16	24-5	5-8 5/16	5-10 5/8	2-2 5/16	2-7 3/16	1-9	4-5 3/4	11-8	3-3 15/16	1-6 13/16	8-10 5/8
040, 050	26- 9 13/16	28-4 3/4	5-8 5/16	5-10 5/8*	2-2 5/16	2-7 3/16	1-9	4-5 3/4	14-4 5/8	3-3 15/16	1-6 13/16	11- 1 7/8
055, 060	35- 2 1/2	36-5 5/8	6-8 1/2	6-10 15/16	2-6	3-2	1-8 1/4	5-2 5/16	20-7 3/16	4-1 1/2	1-3 1/8	14- 8 3/8
070	38- 2 5/16	39-5 7/16	6-8 1/2	6-10 15/16†	2-6	3-2	1-8 1/4	5-2 5/16	20-7 3/16	4-1 1/2	1-3 1/8	14- 8 3/8

*050 w/high cap coil 6-4.
†070 w/high cap coil 7-4 5/16.

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
3. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
4. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
5. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING

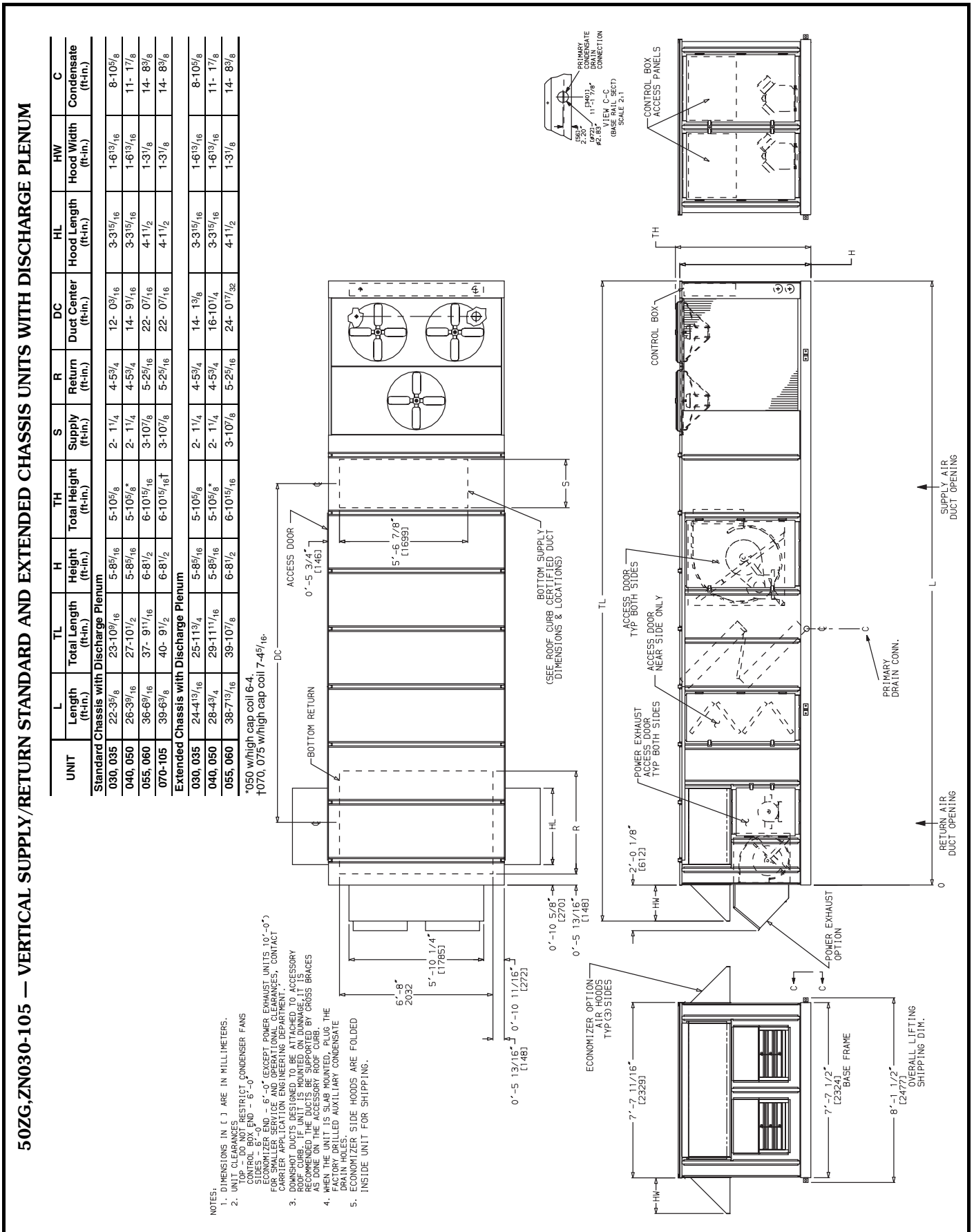


Base unit dimensions (cont)

50ZG,ZN030-105 — VERTICAL SUPPLY/RETURN STANDARD AND EXTENDED CHASSIS UNITS WITH DISCHARGE PLENUM

UNIT	L	TL	H	TH	S	R	DC	HL	HW	C
	Length (ft-in.)	Total Length (ft-in.)	Height (ft-in.)	Total Height (ft-in.)	Supply (ft-in.)	Return (ft-in.)	Duct Center (ft-in.)	Hood Length (ft-in.)	Hood Width (ft-in.)	Condensate (ft-in.)
Standard Chassis with Discharge Plenum										
030, 035	22-3 5/8	23-10 9/16	5-8 5/16	5-10 5/8	2- 1 1/4	4-5 3/4	12- 0 9/16	3-3 15/16	1-6 13/16	8-10 5/8
040, 050	26-3 9/16	27-10 1/2	5-8 5/16	5-10 5/8*	2- 1 1/4	4-5 3/4	14- 9 1/16	3-3 15/16	1-6 13/16	11- 1 7/8
055, 060	36-6 9/16	37- 9 11/16	6-8 1/2	6-10 15/16	3-10 7/8	5-2 5/16	22- 0 7/16	4-11 1/2	1-3 1/8	14- 8 3/8
070-105	39-6 3/8	40- 9 1/2	6-8 1/2	6-10 15/16†	3-10 7/8	5-2 5/16	22- 0 7/16	4-11 1/2	1-3 1/8	14- 8 3/8
Extended Chassis with Discharge Plenum										
030, 035	24-4 13/16	25-11 3/4	5-8 5/16	5-10 5/8	2- 1 1/4	4-5 3/4	14- 1 3/8	3-3 15/16	1-6 13/16	8-10 5/8
040, 050	28-4 3/4	29-11 11/16	5-8 5/16	5-10 5/8*	2- 1 1/4	4-5 3/4	16-10 1/4	3-3 15/16	1-6 13/16	11- 1 7/8
055, 060	38-7 13/16	39-10 7/8	6-8 1/2	6-10 15/16	3-10 7/8	5-2 5/16	24- 0 17/32	4-11 1/2	1-3 1/8	14- 8 3/8

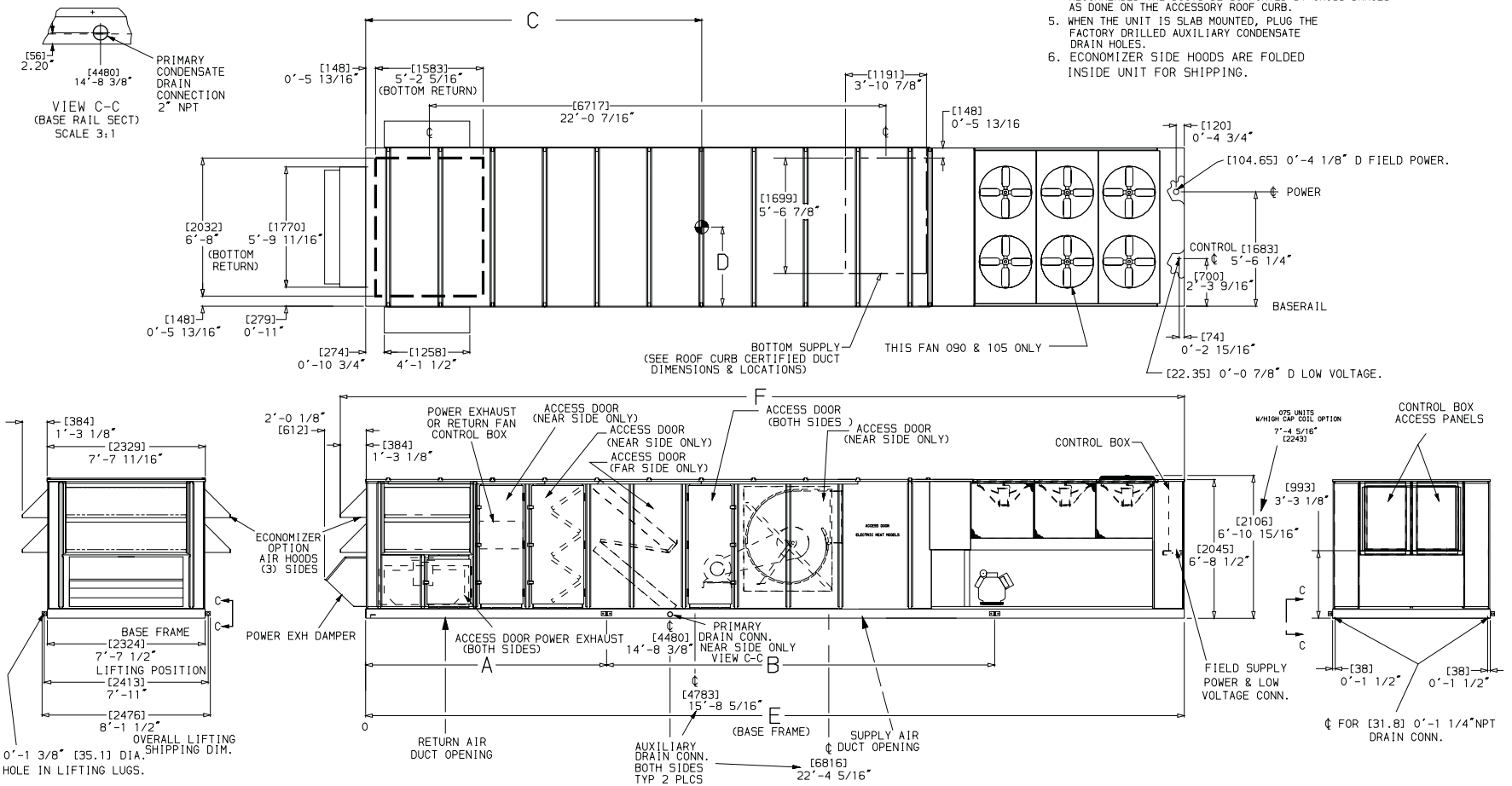
*050 w/high cap coil 6-4.
†070, 075 w/high cap coil 7-4 5/16.



50Z6,Z8075-105 — VERTICAL SUPPLY/RETURN — RETURN/EXHAUST FAN UNITS

UNIT SIZE	WEIGHT LB	WEIGHT KG	A MM	A FT - IN.	B MM	B FT - IN.	C MM	C FT - IN.	D MM	D FT - IN.	E MM	E FT - IN.	F MM	F FT - IN.
075	11340	5143	3543	11'-7 1/2"	6494	21' -3 5/8"	5791	19' 0"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
090	11550	5239	3543	11'-7 1/2"	6494	21' -3 5/8"	5842	19' 2"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"
105	12280	5570	3543	11'-7 1/2"	6494	21' -3 5/8"	6096	20' 0"	1163	3'-9 13/16"	12049	39'-6 3/8"	12433	40'-9 1/2"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0" (EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

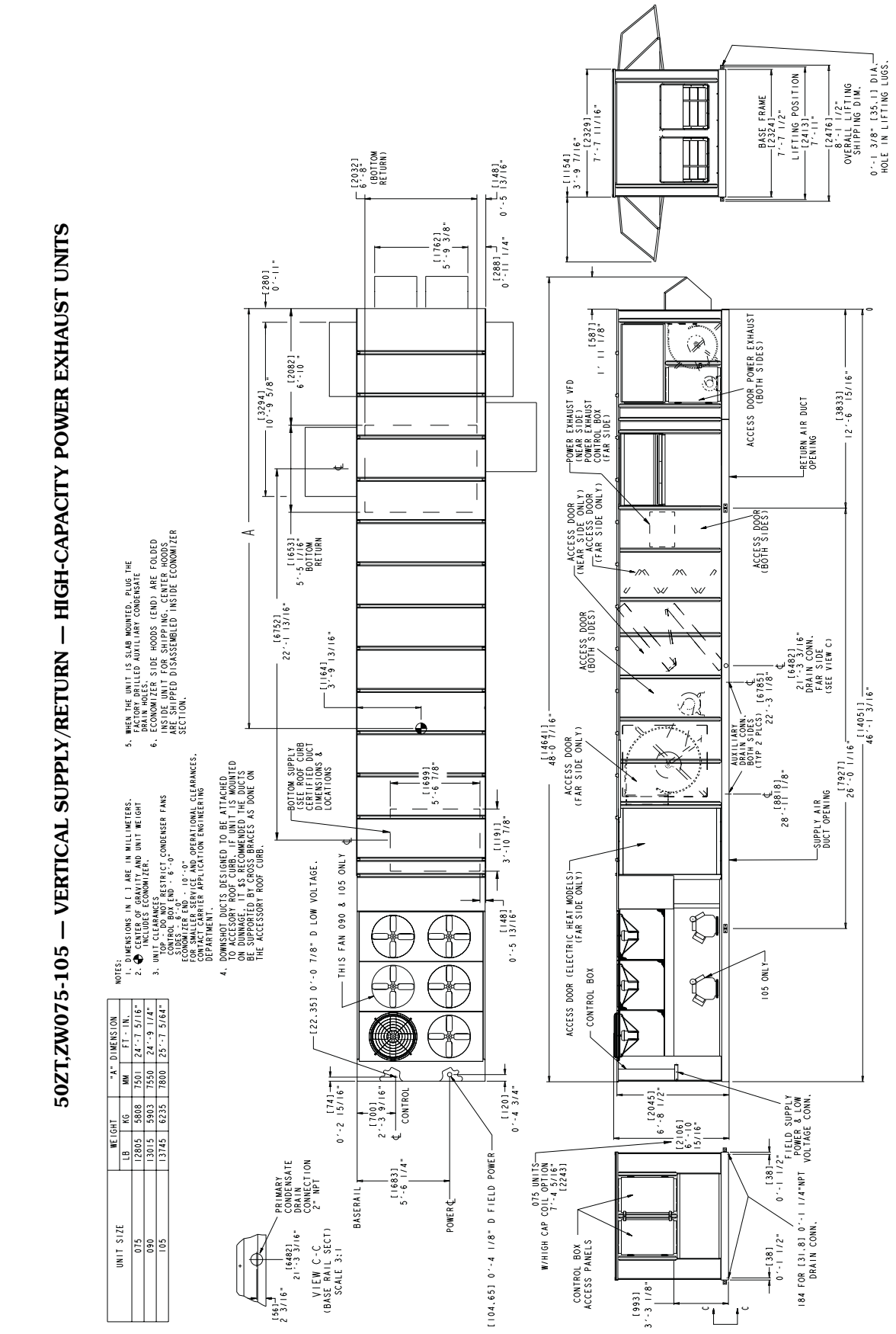


Base unit dimensions (cont)

50ZT,ZW075-105 — VERTICAL SUPPLY/RETURN — HIGH-CAPACITY POWER EXHAUST UNITS

UNIT SIZE	WEIGHT		"A" DIMENSION	
	LB	KG	MM	FT - IN.
075	12805	5808	7501	24'-7 5/16"
090	13015	5903	7550	24'-9 1/4"
105	13745	6235	7800	25'-7 5/64"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ◆ CENTER OF GRAVITY AND UNIT WEIGHT INCLUDES ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 10'-0"
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. DOWNSHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB. IF UNIT IS MOUNTED ON DUNNAGE, IT IS RECOMMENDED THE DUCTS BE SUPPORTED BY CROSS BRACES AS DONE ON THE ACCESSORY ROOF CURB.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS (END) ARE FOLDED INSIDE UNIT FOR SHIPPING. CENTER HOODS ARE SHIPPED DISASSEMBLED INSIDE ECONOMIZER SECTION.

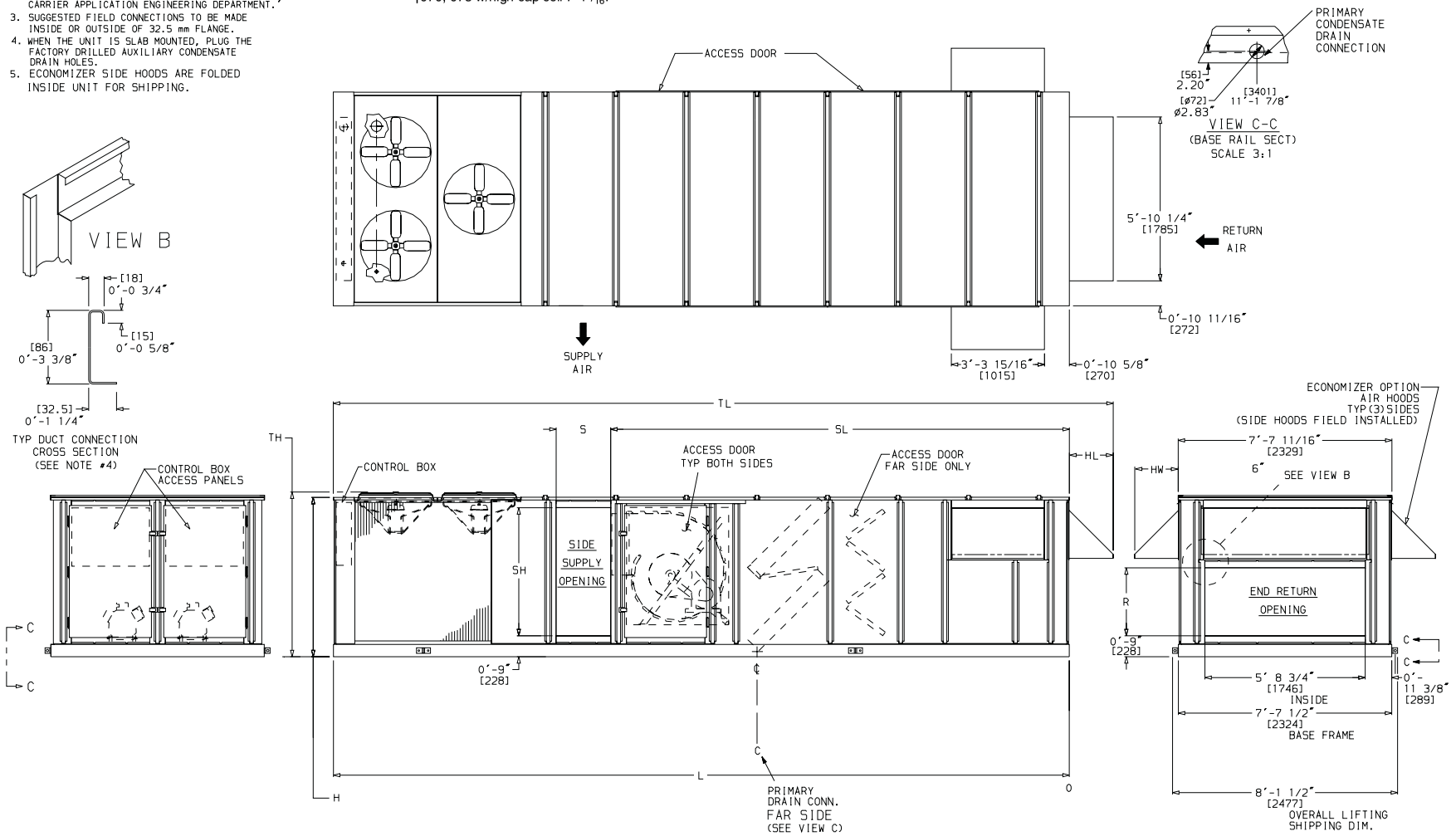


50Z2,Z3030-105 — HORIZONTAL SUPPLY/RETURN — STANDARD AND EXTENDED CHASSIS UNITS

UNIT	L	TL	H	TH	S	SH	SL	R	HL	HW	C
	Length (ft-in.)	Total Length (ft-in.)	Height (ft-in.)	Total Height (ft-in.)	Supply (ft-in.)	Supply Height (ft-in.)	Supply Location (ft-in.)	Return (ft-in.)	Hood Length (ft-in.)	Hood Width (ft-in.)	Condensate (ft-in.)
Standard Chassis											
030, 035	22-3 5/8	23-10 9/16	5-8 5/16	5-10 5/8	1-11 3/8	4-6 15/16	13-7 7/8	2-5 1/8	3-3 15/16	1-6 13/16	8-10 5/8
040, 050	26-3 9/16	27-10 1/2	5-8 5/16	5-10 5/8*	1-11 3/8	4-6 15/16	16-4 11/16	2-5 1/8	3-3 15/16	1-6 13/16	11- 1 7/8
055, 060	36-6 9/16	37- 9 11/16	6-8 1/2	6-10 15/16	3-11 5/16	5-6 31/32	23-2 17/32	2-0 5/16	4-1 1/2	1-3 1/8	14- 8 3/8
070-105	39-6 3/8	40- 9 1/2	6-8 1/2	6-10 15/16†	3-11 5/16	5-6 31/32	23-2 17/32	2-0 5/16	4-1 1/2	1-3 1/8	14- 8 3/8
Extended Chassis											
030, 035	24-4 13/16	25-11 3/4	5-8 5/16	5-10 5/8	1-11 3/8	4-6 15/16	15-9 1/16	2-5 1/8	3-3 15/16	1-6 13/16	8-10 5/8
040, 050	28-4 3/4	29-11 11/16	5-8 5/16	5-10 5/8*	1-11 3/8	4-6 15/16	18-5 7/8	2-5 1/8	3-3 15/16	1-6 13/16	11- 1 7/8
055, 060	38-7 13/16	39-10 7/8	6-8 1/2	6-10 15/16	3-11 5/16	5-6 31/32	25-3 23/32	2-0 5/16	4-1 1/2	1-3 1/8	14-8 3/8

*050 w/high cap coil 6-4.
†070, 075 w/high cap coil 7-4 5/16.

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. UNIT CLEARANCES.
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 6'-0"(EXCEPT POWER EXHAUST UNITS 10'-0")
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
3. SUGGESTED FIELD CONNECTIONS TO BE MADE INSIDE OR OUTSIDE OF 32.5 mm FLANGE.
4. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
5. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.

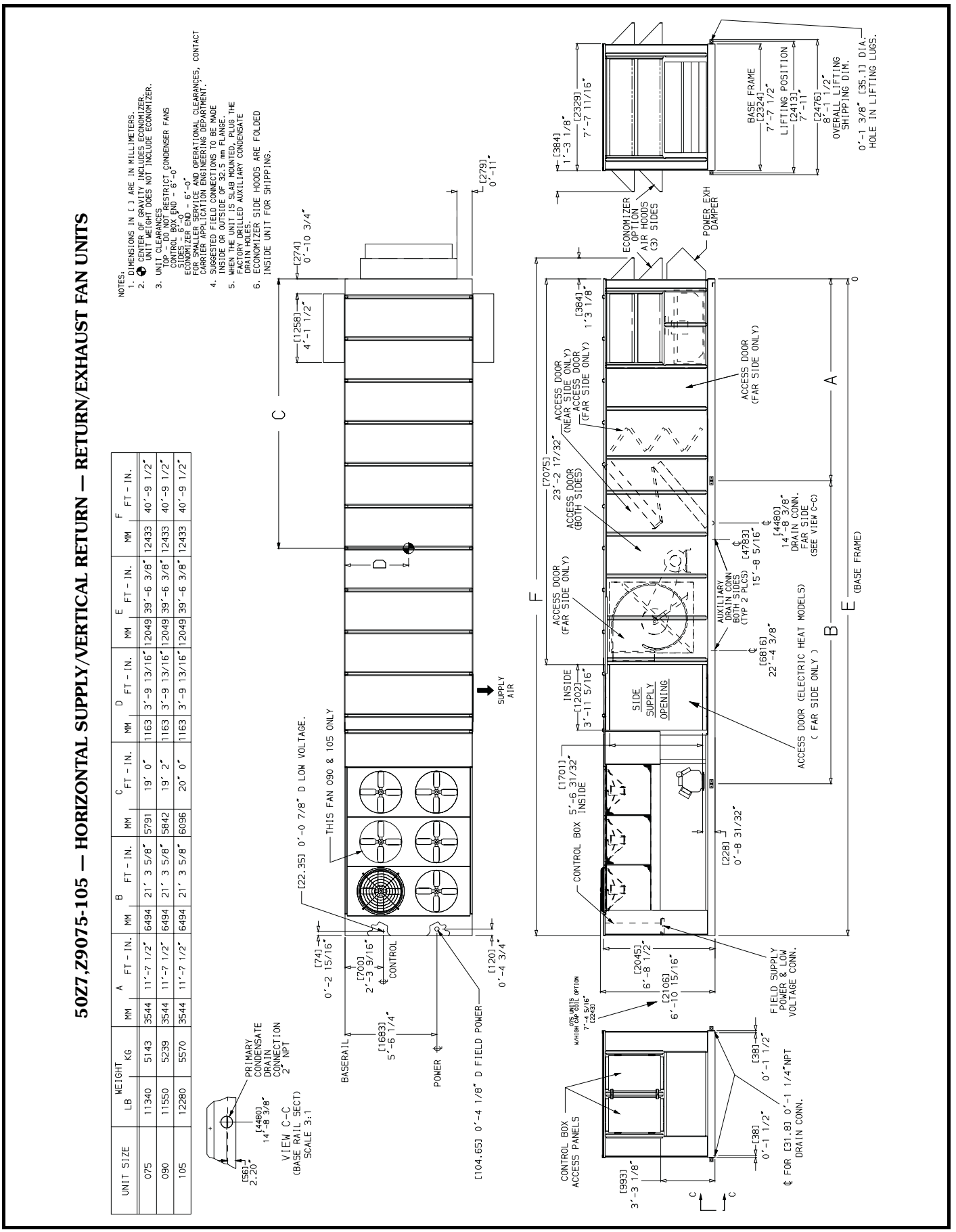


Base unit dimensions (cont)

50Z7,Z9075-105 — HORIZONTAL SUPPLY/VERTICAL RETURN — RETURN/EXHAUST FAN UNITS

UNIT SIZE	WEIGHT		A		B		C		D		E		F	
	LB	KG	MM	FT – IN.	MM	FT – IN.	MM	FT – IN.	MM	FT – IN.	MM	FT – IN.	MM	FT – IN.
075	11340	5143	3544	11′–7 1/2″	6494	21′ 3 5/8″	5791	19′ 0″	1163	3′–9 13/16″	12049	39′–6 3/8″	12433	40′–9 1/2″
090	11550	5239	3544	11′–7 1/2″	6494	21′ 3 5/8″	5842	19′ 2″	1163	3′–9 13/16″	12049	39′–6 3/8″	12433	40′–9 1/2″
105	12280	5570	3544	11′–7 1/2″	6494	21′ 3 5/8″	6096	20′ 0″	1163	3′–9 13/16″	12049	39′–6 3/8″	12433	40′–9 1/2″

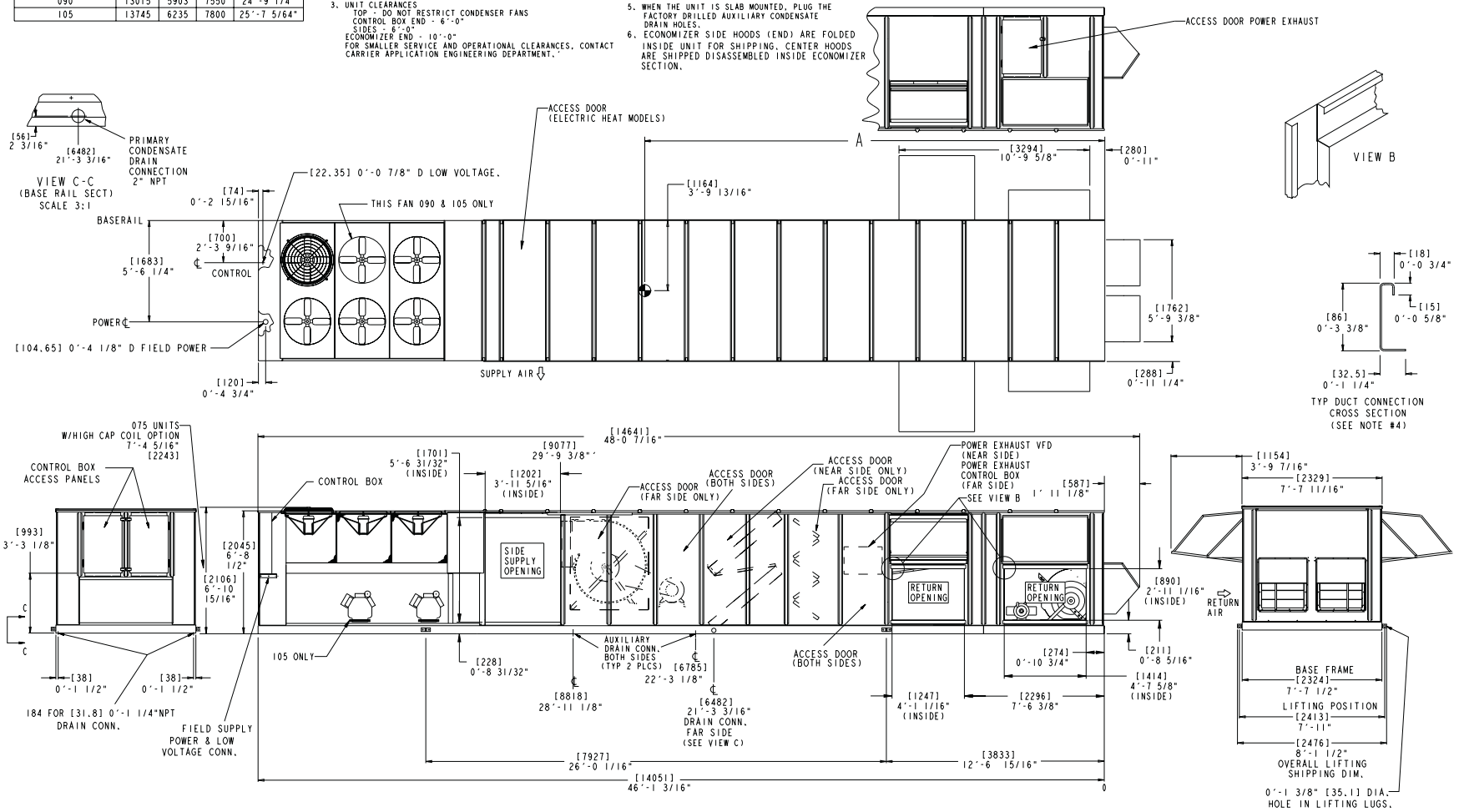
NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ◐ CENTER OF GRAVITY. INCLUDES ECONOMIZER. UNIT WEIGHT DOES NOT INCLUDE ECONOMIZER.
3. UNIT CLEARANCES
   TOP – DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END – 6′–0″
   ECONOMIZER END – 6′–0″
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. SUGGESTED FIELD CONNECTIONS TO BE MADE INSIDE OR OUTSIDE OF 32.5 mm FLANGE.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS ARE FOLDED INSIDE UNIT FOR SHIPPING.



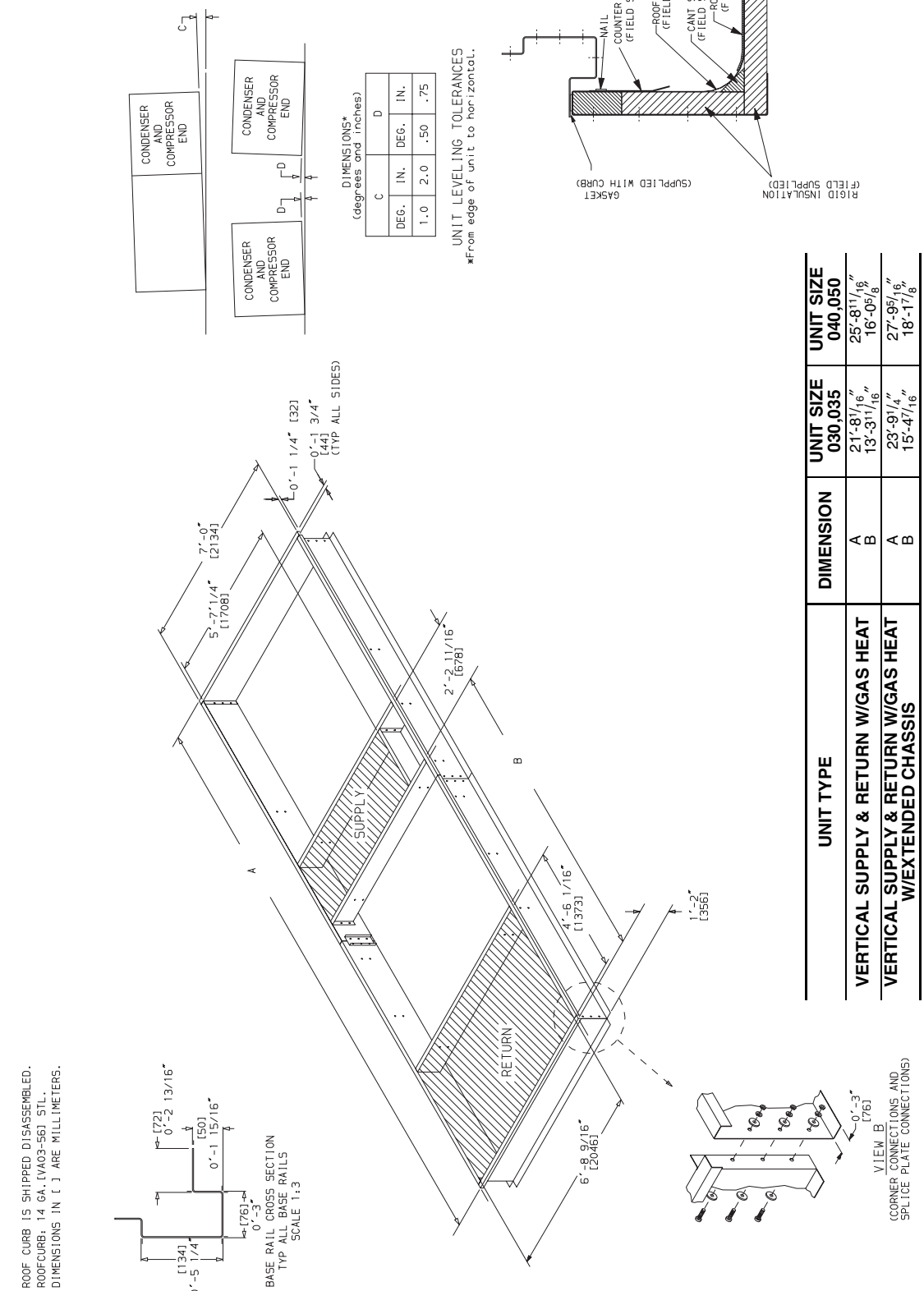
50ZX,ZZ075-105 — HORIZONTAL SUPPLY/RETURN — HIGH-CAPACITY POWER EXHAUST UNITS

UNIT SIZE	WEIGHT		"A" DIMENSION	
	LB	KG	MM	FT - IN.
075	12805	5808	7501	24'-7 5/16"
090	13015	5903	7550	24'-9 1/4"
105	13745	6235	7800	25'-7 5/64"

NOTES:
1. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
2. ⊕ CENTER OF GRAVITY AND UNIT WEIGHT INCLUDES ECONOMIZER.
3. UNIT CLEARANCES
   TOP - DO NOT RESTRICT CONDENSER FANS
   CONTROL BOX END - 6'-0"
   SIDES - 6'-0"
   ECONOMIZER END - 10'-0"
   FOR SMALLER SERVICE AND OPERATIONAL CLEARANCES, CONTACT CARRIER APPLICATION ENGINEERING DEPARTMENT.
4. SUGGESTED FIELD CONNECTIONS TO BE MADE INSIDE OR OUTSIDE OF 32.5 mm FLANGE.
5. WHEN THE UNIT IS SLAB MOUNTED, PLUG THE FACTORY DRILLED AUXILIARY CONDENSATE DRAIN HOLES.
6. ECONOMIZER SIDE HOODS (END) ARE FOLDED INSIDE UNIT FOR SHIPPING. CENTER HOODS ARE SHIPPED DISASSEMBLED INSIDE ECONOMIZER SECTION.



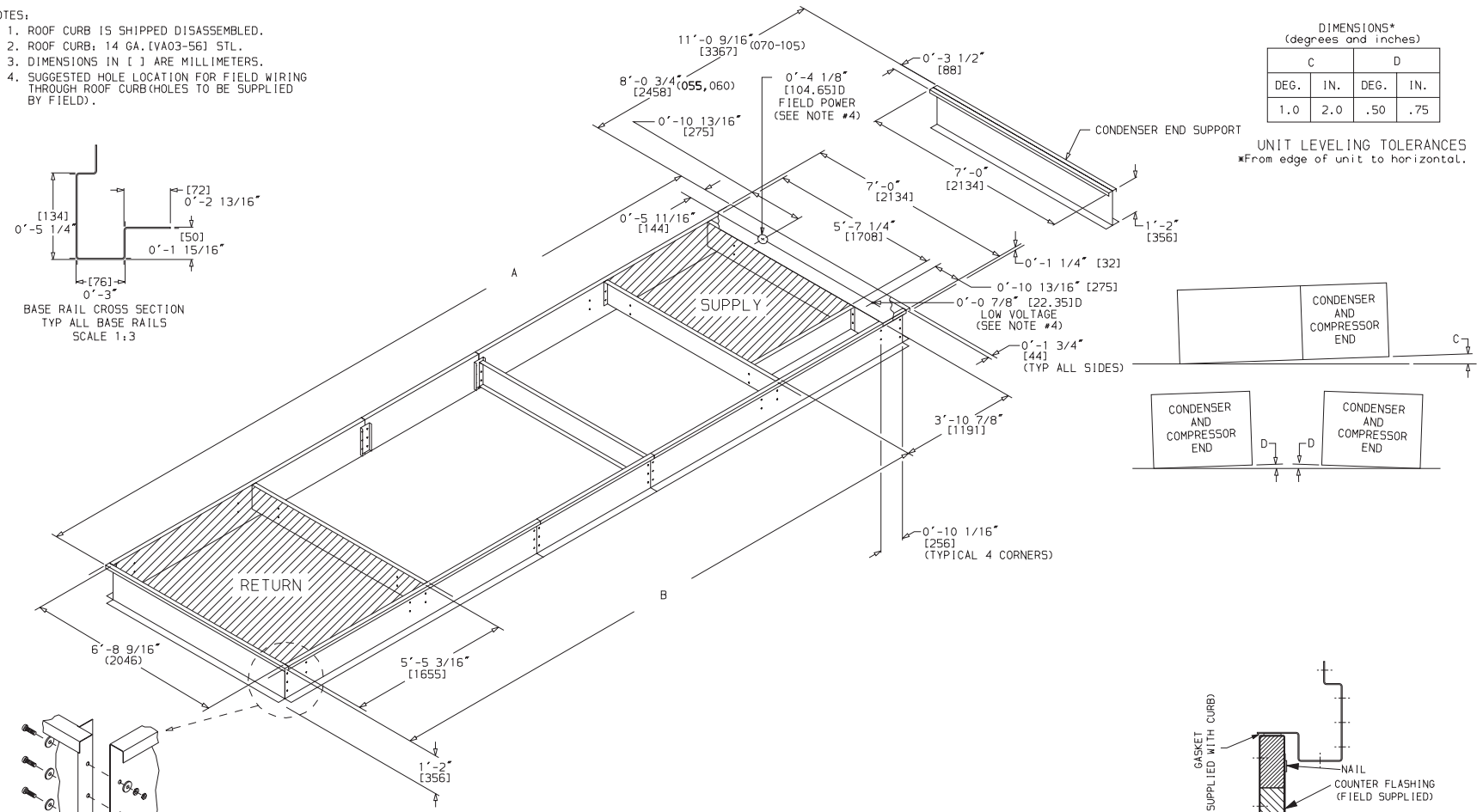
ROOF CURB; SIZES 48ZG,ZN030-050



UNIT TYPE	DIMENSION	UNIT SIZE 030,035	UNIT SIZE 040,050
VERTICAL SUPPLY & RETURN W/GAS HEAT	A	21′-8 1/16″	25′-8 11/16″
	B	13′-3 11/16″	16′-0 5/8″
VERTICAL SUPPLY & RETURN W/GAS HEAT W/EXTENDED CHASSIS	A	23′-9 1/4″	27′-9 5/16″
	B	15′-4 7/16″	18′-1 7/8″

ROOF CURB; SIZES 48ZG,ZN055-105 AND 48ZT,ZW,Z6,Z8075-105

NOTES:
1. ROOF CURB IS SHIPPED DISASSEMBLED.
2. ROOF CURB: 14 GA.[VA03-56] STL.
3. DIMENSIONS IN [ ] ARE MILLIMETERS.
4. SUGGESTED HOLE LOCATION FOR FIELD WIRING THROUGH ROOF CURB(HOLES TO BE SUPPLIED BY FIELD).



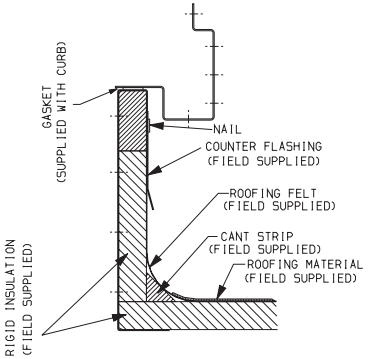
BASE RAIL CROSS SECTION
TYP ALL BASE RAILS
SCALE 1:3

VIEW B
(CORNER CONNECTIONS AND SPLICE PLATE CONNECTIONS)

DIMENSIONS*
(degrees and inches)

C		D	
DEG.	IN.	DEG.	IN.
1.0	2.0	.50	.75

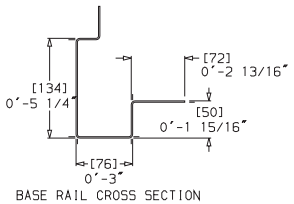
UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.



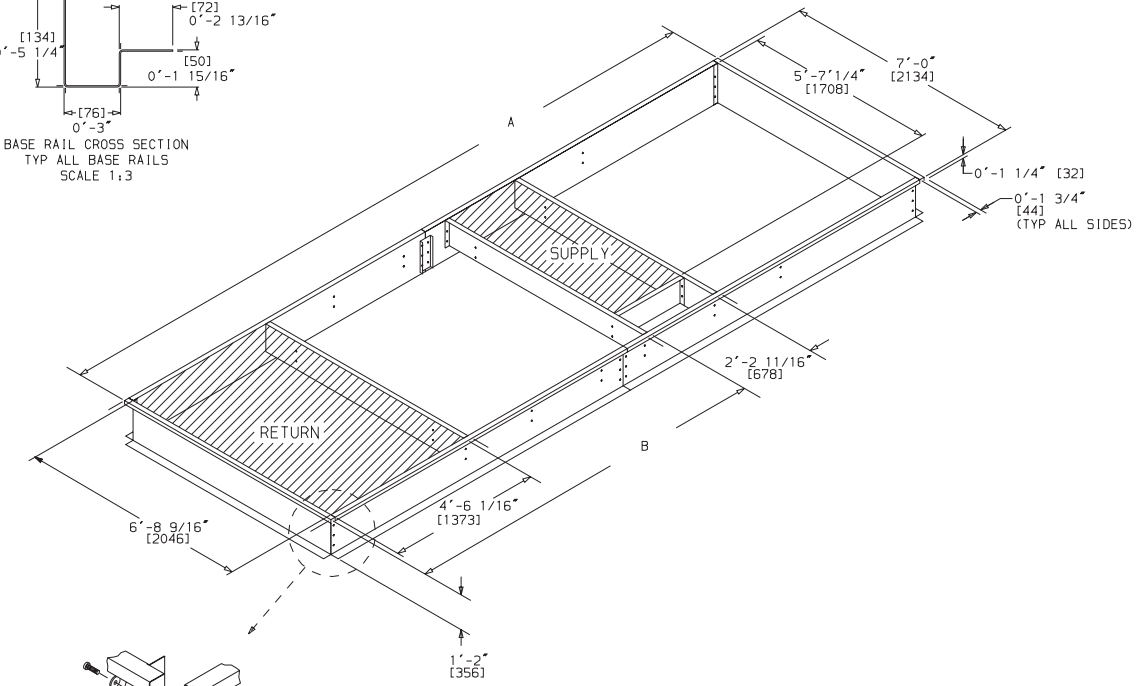
UNIT TYPE	DIMENSION	UNIT SIZE 055-105
VERTICAL SUPPLY & RETURN W/GAS HEAT	A	27′-9 11/16″
	B	22′-10 3/16″
VERTICAL SUPPLY & RETURN W/GAS HEAT W/EXTENDED CHASSIS (055-060 Only)	A	29′-10 7/8″
	B	24′-11 3/8″

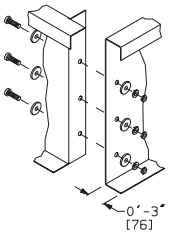
ROOF CURB; SIZES 50ZG,ZN030-050

NOTES:
1. ROOF CURB IS SHIPPED DISASSEMBLED.
2. ROOFCURB: 14 GA.[VA03-56] STL.
3. DIMENSIONS IN [ ] ARE MILLIMETERS.

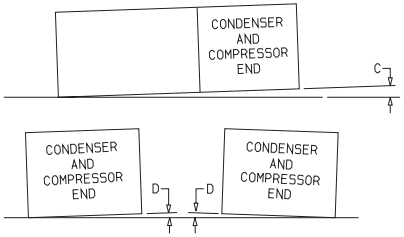


BASE RAIL CROSS SECTION
TYP ALL BASE RAILS
SCALE 1:3





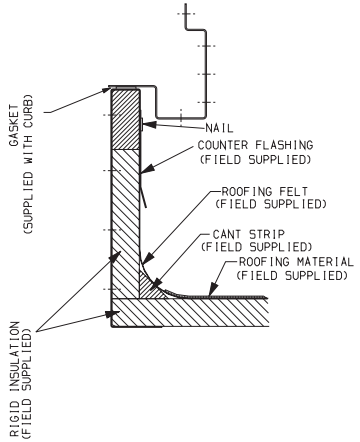
VIEW B
(CORNER CONNECTIONS AND SPLICE PLATE CONNECTIONS)



DIMENSIONS*
(degrees and inches)

C		D	
DEG.	IN.	DEG.	IN.
1.0	2.0	.50	.75

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.

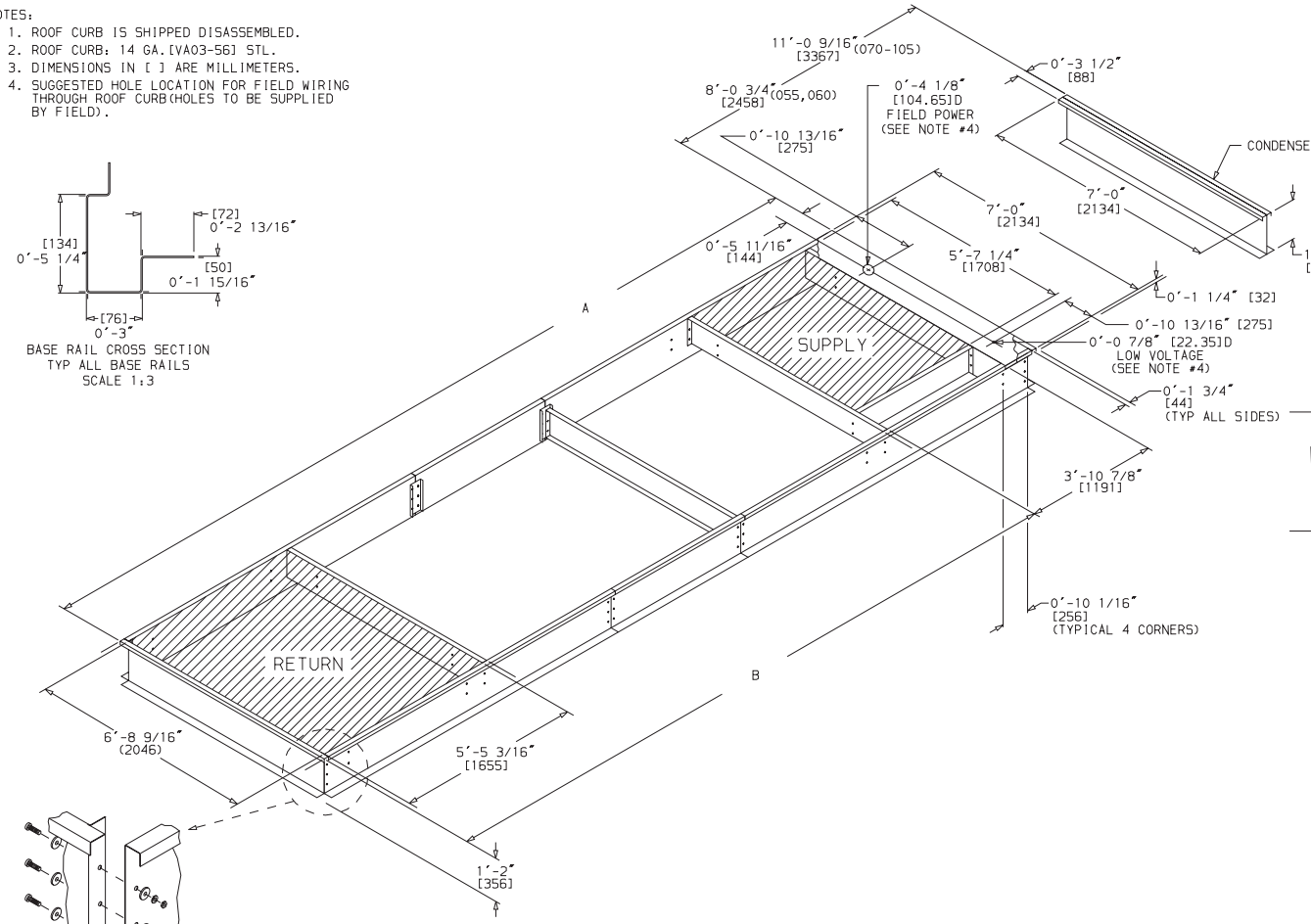


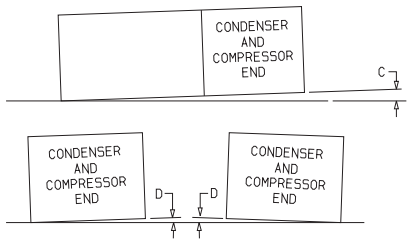
UNIT TYPE	DIMENSION	UNIT SIZE 030,035	UNIT SIZE 040,050
VERTICAL SUPPLY & RETURN	A	20′-1 3/8″	24′-1 1/8″
	B	10′-10 3/8″	13′-7 1/16″
HORIZONTAL SUPPLY & RETURN VERTICAL SUPPLY & RETURN W/DISCHARGE PLENUM	A	21′-8 1/16″	25′-8 11/16″
	B	13′-3 11/16″	16′-0 5/8″
VERTICAL SUPPLY & RETURN W/EXTENDED CHASSIS	A	22′-2 9/16″	26′-2 5/16″
	B	12′-11 9/16″	15′-8 7/32″
HORIZONTAL SUPPLY & RETURN W/EXTENDED CHASSIS VERTICAL SUPPLY & RETURN W/DISCHARGE PLENUM AND EXTENDED CHASSIS	A	23′-9 1/4″	27′-9 5/16″
	B	15′-4 7/8″	18′-1 7/8″

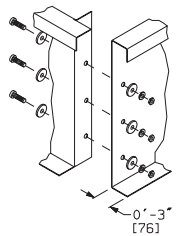
ROOF CURB; SIZES 50ZG,ZN050-105 AND SIZES 50ZT,ZW,Z6,Z7,Z8,Z9075-105

NOTES:
1. ROOF CURB IS SHIPPED DISASSEMBLED.
2. ROOF CURB: 14 GA.[VA03-56] STL.
3. DIMENSIONS IN [ ] ARE MILLIMETERS.
4. SUGGESTED HOLE LOCATION FOR FIELD WIRING THROUGH ROOF CURB(HOLES TO BE SUPPLIED BY FIELD).

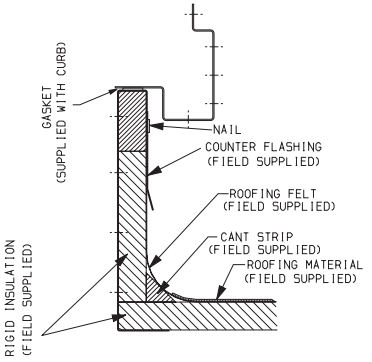
BASE RAIL CROSS SECTION
TYP ALL BASE RAILS
SCALE 1:3





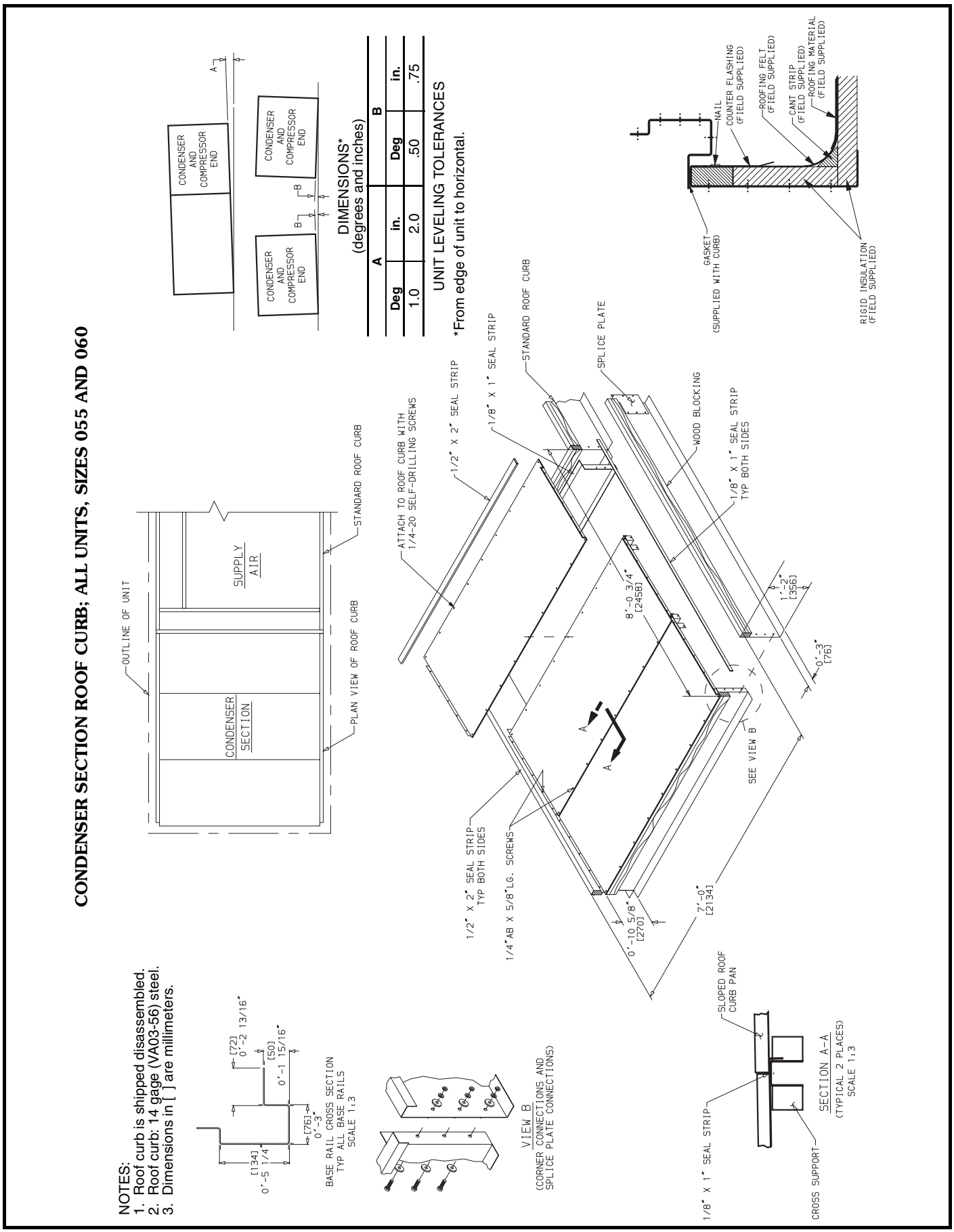


VIEW B
(CORNER CONNECTIONS AND
SPLICE PLATE CONNECTIONS)



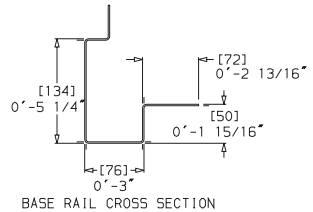
UNIT TYPE	DIMENSION	UNIT SIZE 055-105
VERTICAL SUPPLY & RETURN (Size 055-070 Only)	A B	24'-5 1/16" 19'-5 9/16"
VERTICAL SUPPLY & RETURN W/DISCHARGE PLENUM (Size 055-070 Only) VERTICAL SUPPLY & RETURN (Size 075-105 Only)	A B	27'-9 11/16" 22'-10 3/16"
VERTICAL SUPPLY & RETURN W/EXTENDED CHASSIS (Size 055-070 Only)	A B	26'-6 1/4" 21'-6 3/4"
HORIZONTAL SUPPLY & RETURN, W/EXTENDED CHASSIS VERTICAL SUPPLY & RETURN W/DISCHARGE PLENUM W/EXTENDED CHASSIS (Sizes 055-060 Only)	A B	29'-10 7/8" 24'-11 3/8"

Accessory dimensions — 48/50 series units

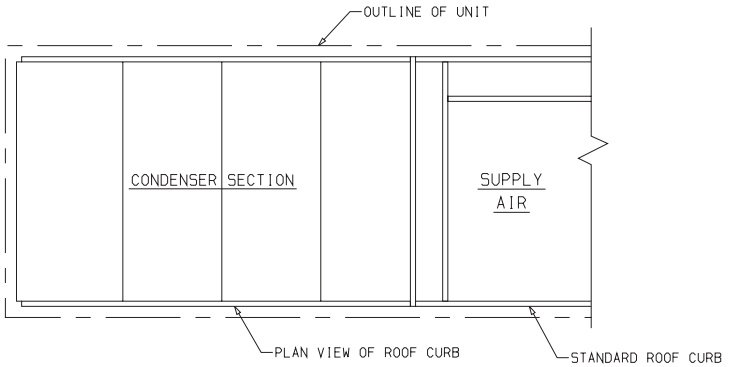


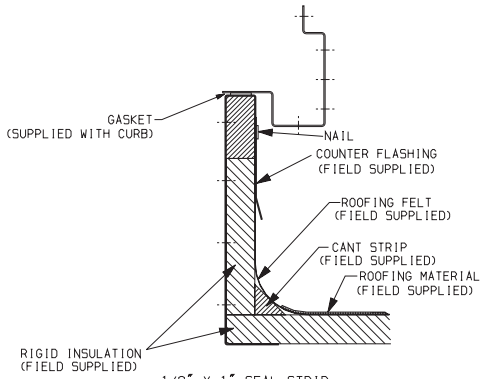
CONDENSER SECTION ROOF CURB; ALL UNITS, SIZES 070-105

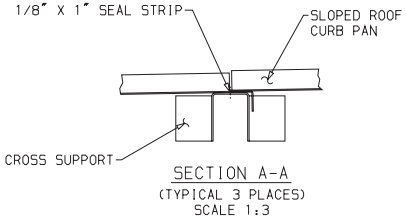
NOTES:
1. Roof curb is shipped disassembled.
2. Dimensions in [ ] are millimeters.
3. Roof curb: 14 gage (VA03-56) steel.
   Roof curb pans, 16 gage (VA03-56) steel.



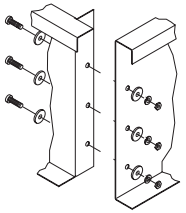
BASE RAIL CROSS SECTION
TYP ALL BASE RAILS
SCALE 1:3

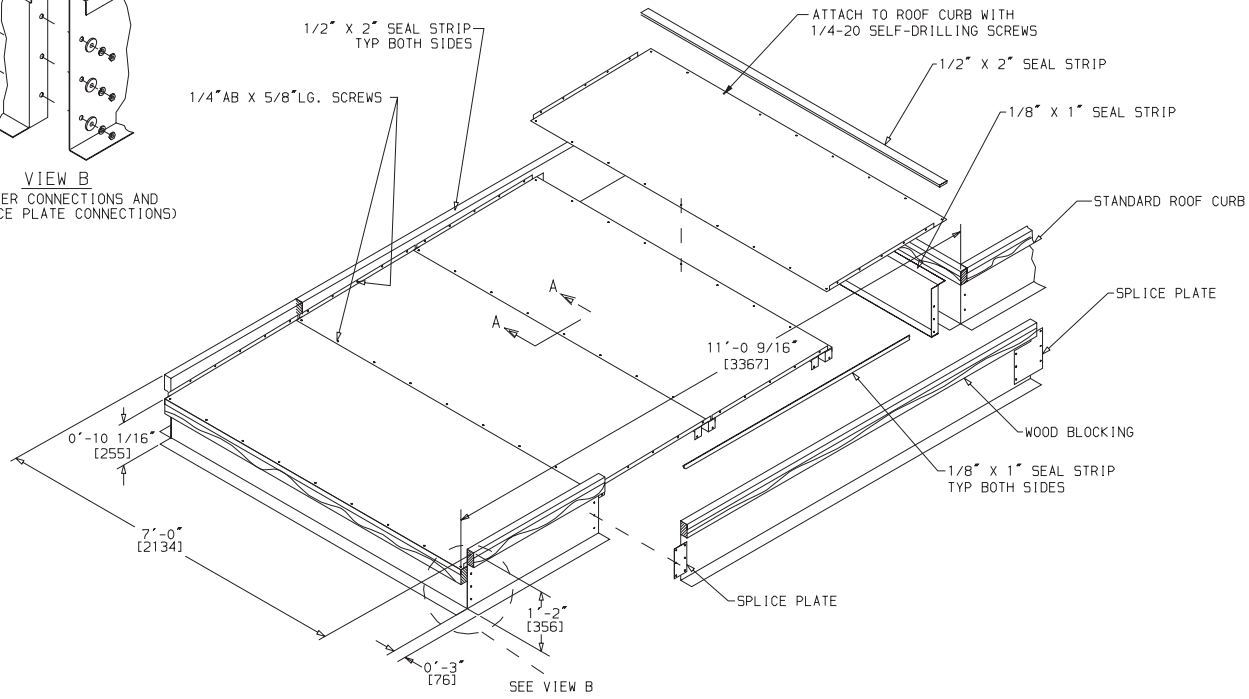


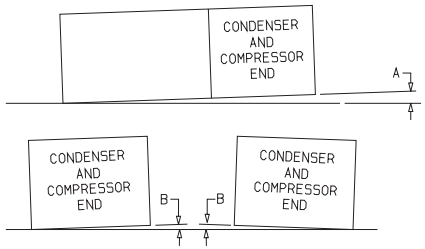




SECTION A-A
(TYPICAL 3 PLACES)
SCALE 1:3


VIEW B
(CORNER CONNECTIONS AND
SPLICE PLATE CONNECTIONS)





DIMENSIONS*
(degrees and inches)

A		B	
Deg	in.	Deg	in.
1.0	2.0	.50	.75

UNIT LEVELING TOLERANCES
*From edge of unit to horizontal.

Selection procedure (with 48ZG example)

I Determine cooling and heating loads at design conditions.

Given:

Required Gross Cooling Capacity (TC). . . . . .950,000 Btuh
Sensible Gross Heat Capacity (SHC) . .775,000 Btuh
Required Heating Capacity. . . . . .500,000 Btuh
Condenser Entering-Air Temperature db . . . . . .95 F
Indoor Air Temperature . . . . . .82 F edb, 67 F ewb
Evaporator Air Quantity. . . . . 29,750 Cfm
External Static Pressure . . . . . .3.0 in. wg
Electrical Characteristics (V-Ph-Hz) 460-3-60

Integrated economizer required.

Options: VFD on supply fan, 65% filters, premium efficiency motor, integrated economizer, power exhaust, airfoil fan.

II Select the rooftop unit based on required cooling capacity.

Enter cooling capacity table for size 090 at condenser entering temperature 95 F, evaporator air quantity of 29,750 cfm, and an indoor wet bulb temperature of 67 F.

The unit will provide a total gross cooling capacity of 1,003,000 Btuh and an SHC of 736,000 Btuh.

Since these values were not at 80 F edb, calculate an SHC correction (at 82 F edb) based on the notes following the Cooling Capacity tables. Calculate a corrected SHC of 795,600.

Unit meets design conditions for TC and SHC.

NOTE: Unit ratings are gross capacities and do not include the effect of supply-fan motor heat. To calculate net capacities see Step V.

III Select net heating capacity of unit to meet design condition requirements.

Enter the Gas Heating Capacities table. The 48ZG unit (low heat) will provide 527,000 Btuh of heating with an input of 650,000 Btuh.

IV Determine fan speed and power requirements at design conditions.

Before entering the Fan Performance tables, calculate the selection static pressure required based on unit components. Tabulated fan performance includes 2-in. filters and wet evaporator coils. From the given and the Component Pressure Drops table find:

Design external static pressure	3.00 in. wg
Low Gas Heat	0.49 in. wg
Economizer	0.26 in. wg
65% Filters	0.17 in. wg
Modulating PE	0.38 in. wg
Total Selection Static Pressure	4.30 in. wg

Enter the Fan Performance table for 48ZG090 with airfoil fan at 4.30 in. wg at 29,750 cfm. The 50 Hp motor will provide the required ESP at 1491 rpm and 41.69 Bhp.

V Determine net capacities (if required).

Cooling capacities are gross capacities and do not include supply-fan motor (IFM) heat.

Use the Bhp determined in Step IV to find IFM watts:

Watts = Bhp x 746/(Motor Efficiency/100)
= 41.69 x 746/(94.5/100)
= 32,910

Convert Watts to Btuh:

Btuh = Watts x 3.412 Btuh/Watt
= 32,910 x 3.412
= 112,289 Btuh (IFM Heat)

Net Capacity = Gross Capacity – IFM Heat
= 1,003,000 – 112,289
= 890,711 Btuh

Net Sensible Capacity = Gross SHC – IFM Heat
= 795,000 – 112,289
= 682,711 Btuh

VI Select the unit that corresponds to power source available.

The electrical data table shows that the 460-3-60 unit is available.

Performance data

UNIT DESIGN AIRFLOW LIMIT

UNIT SIZE	UNIT TYPE	MINIMUM COOLING CFM	MAXIMUM CFM
030	48ZG,ZN Low Heat	6,000	15,000
	48ZG,ZN High Heat	6,000	15,000
	50ZG,ZN,Z2,Z3	6,000	15,000
035	48ZG,ZN Low Heat	7,000	15,000
	48ZG,ZN High Heat	7,000	15,000
	50ZG,ZN,Z2,Z3	7,000	15,000
040	48ZG,ZN Low Heat	8,000	20,000
	48ZG,ZN High Heat	8,000	20,000
	50ZG,ZN,Z2,Z3	8,000	20,000
050	48ZG,ZN Low Heat	9,000	20,000
	48ZG,ZN High Heat	9,000	19,500
	50ZG,ZN,Z2,Z3	9,000	20,000
055	48ZG,ZN Low Heat	10,000	25,000
	48ZG,ZN High Heat	10,000	25,000
	50ZG,ZN,Z2,Z3	10,000	25,000
060	48ZG,ZN Low Heat	12,000	30,000
	48ZG,ZN High Heat	12,000	30,000
	50ZG,ZN,Z2,Z3	12,000	30,000
070	48ZG,ZN Low Heat	14,000	30,000
	48ZG,ZN High Heat	14,000	30,000
	50ZG,ZN,Z2,Z3	14,000	30,000
075	48ZG,ZN,ZT,ZW,Z6,Z8 Low Heat	15,000	30,000
	48ZG,ZN,ZT,ZW,Z6,Z8 High Heat	15,000	30,000
	50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9	15,000	30,000
090	48ZG,ZN,ZT,ZW,Z6,Z8 Low Heat	17,000	34,000
	48ZG,ZN,ZT,ZW,Z6,Z8 High Heat	17,000	34,000
	50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9	17,000	34,000
105	48ZG,ZN,ZT,ZW,Z6,Z8 Low Heat	20,000	44,000
	48ZG,ZN,ZT,ZW,Z6,Z8 High Heat	20,000	36,500
	50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9	20,000	44,000

NOTE: Refer to Application data section for more information concerning minimum operating airflow in Cooling mode.

GAS HEATING CAPACITIES — 48ZG,ZN,ZT,ZW,Z6,Z8 UNITS (Natural Gas and LP — 030-070; Natural Gas Only — 075-105)

UNIT 48ZG,ZN,ZT,ZW, Z6,Z8	GAS INPUT (1000 Btuh) Full Fire	OUTPUT CAPACITY		TEMP RISE (F)	EFFICIENCY (%)	AIRFLOW (Cfm)	
		(1000 Btuh) Stage 1	(1000 Btuh) Stage 2			Min	Max
030-050 Low Heat	325	197.6	263.0	10-40	81	6,094	20,000
030-050 High Heat	650	395.3	527.0	25-55	81	8,864	19,500
055-070 Low Heat	650	395.3	527.0	10-40	81	12,188	30,000
055-070 High Heat	975	527.0	790.0	20-50	81	14,625	30,000
075-105 Low Heat	650	263.5	527.0	10-40	81	12,200	44,000
075-105 High Heat	975	527.0	790.0	20-50	81	14,630	37,000

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

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

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

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

4. 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.
5. Temperature rise limits: see table.
6. On VAV applications set the zone terminals to provide minimum unit heating airflow as indicated in the table upon command from Heat Interlock Relay (HIR) function.

Performance data (cont)

GAS HEATING CAPACITIES — UNITS WITH STAGED GAS CONTROL OPTION

48ZG,ZN030-050 HIGH HEAT

HEATING STAGES	% FULL-FIRE	OUTPUT CAPACITY (1000 Btuh)	OUTPUT CAPACITY PER SECTION (1000 Btuh)			FIRING STAGE		
			Sect 1	Sect 2	Sect 3	Sect 1	Sect 2	Sect 3
1	37	197.0	197.0	0.0	N/A	LF	0	N/A
2	50	263.5	263.5	0.0	N/A	HF	0	N/A
3	75	394.0	197.0	197.0	N/A	LF	LF	N/A
4	87	460.5	263.5	197.0	N/A	HF	LF	N/A
5	100	527.0	263.5	263.5	N/A	HF	HF	N/A

48ZG,ZN055-070 LOW HEAT

HEATING STAGES	% FULL-FIRE	OUTPUT CAPACITY (1000 Btuh)	OUTPUT CAPACITY PER SECTION (1000 Btuh)			FIRING STAGE		
			Sect 1	Sect 2	Sect 3	Sect 1	Sect 2	Sect 3
1	37	197.0	197.0	0.0	N/A	LF	0	N/A
2	50	263.5	263.5	0.0	N/A	HF	0	N/A
3	75	394.0	197.0	197.0	N/A	LF	LF	N/A
4	87	460.5	263.5	197.0	N/A	HF	LF	N/A
5	100	527.0	263.5	263.5	N/A	HF	HF	N/A

48ZG,ZN055-070 HIGH HEAT

HEATING STAGES	% FULL-FIRE	OUTPUT CAPACITY (1000 Btuh)	OUTPUT CAPACITY PER SECTION (1000 Btuh)			FIRING STAGE		
			Sect 1	Sect 2	Sect 3	Sect 1	Sect 2	Sect 3
1	25	197.0	197.0	0.0	0.0	LF	0	0
2	33	263.5	263.5	0.0	0.0	HF	0	0
3	50	394.0	197.0	197.0	0.0	LF	LF	0
4	58	460.5	263.5	197.0	0.0	HF	LF	0
5	67	527.0	263.5	263.5	0.0	HF	HF	0
6	75	591.0	197.0	197.0	197.0	LF	LF	LF
7	83	657.5	197.0	263.5	197.0	LF	HF	LF
8	92	724.0	263.5	263.5	197.0	HF	HF	LF
9	100	790.5	263.5	263.5	263.5	HF	HF	HF

48ZG,ZN,ZT,ZW,Z6,Z8075-105 LOW HEAT

HEATING STAGES	% FULL-FIRE	OUTPUT CAPACITY (1000 Btuh)	OUTPUT CAPACITY PER SECTION (1000 Btuh)			FIRING STAGE		
			Sect 1	Sect 2	Sect 3	Sect 1	Sect 2	Sect 3
1	37	197.0	197.0	0.0	N/A	LF	0	N/A
2	50	263.5	263.5	0.0	N/A	HF	0	N/A
3	75	394.0	197.0	197.0	N/A	LF	LF	N/A
4	87	460.5	263.5	197.0	N/A	HF	LF	N/A
5	100	527.0	263.5	263.5	N/A	HF	HF	N/A

48ZG,ZN,ZT,ZW,Z6,Z8075-105 HIGH HEAT

HEATING STAGES	% FULL-FIRE	OUTPUT CAPACITY (1000 Btuh)	OUTPUT CAPACITY PER SECTION (1000 Btuh)			FIRING STAGE		
			Sect 1	Sect 2	Sect 3	Sect 1	Sect 2	Sect 3
1	25	197.0	197.0	0.0	0.0	LF	0	0
2	33	263.5	263.5	0.0	0.0	HF	0	0
3	50	394.0	197.0	197.0	0.0	LF	LF	0
4	58	460.5	263.5	197.0	0.0	HF	LF	0
5	67	527.0	263.5	263.5	0.0	HF	HF	0
6	75	591.0	197.0	197.0	197.0	LF	LF	LF
7	83	657.5	197.0	263.5	197.0	LF	HF	LF
8	92	724.0	263.5	263.5	197.0	HF	HF	LF
9	100	790.5	263.5	263.5	263.5	HF	HF	HF

LEGEND

HF — High Fire
LF — Low Fire
0 — No Fire

ELECTRIC HEATER CAPACITIES

50Z	NO. STAGES	LOW (kW)	CAPACITY PER STAGE (%)	MED (kW)	CAPACITY PER STAGE (%)	HIGH (kW)	CAPACITY PER STAGE (%)	MIN CFM	MAX CFM
50ZG,ZN030-050									
208 v	2	29	50,100	59	50,100	88	67,100	9,000	20,000
230 v	2	36	50,100	72	50,100	108	67,100	9,000	20,000
380 v	2	25	50,100	51	50,100	76	67,100	9,000	20,000
460 v	2	36	50,100	72	50,100	108	67,100	9,000	20,000
575 v	2	36	50,100	72	50,100	108	67,100	9,000	20,000
50ZG,ZN055-070									
208 v	2	29	50,100	59	50,100	88	67,100	15,000	30,000
230 v	2	36	50,100	72	50,100	108	67,100	15,000	30,000
380 v	2	25	50,100	51	50,100	76	67,100	15,000	30,000
460 v	2	36	50,100	72	50,100	108	67,100	15,000	30,000
575 v	2	36	50,100	72	50,100	108	67,100	15,000	30,000
50ZG,ZN,ZT,ZW, ZX,ZZ,Z2,Z3,Z6,Z7, Z8,Z9075-105									
460 v	2	—	—	108	67,100	216	50,100	15,000	44,000

NOTES:
1. High heat option is available only on CV units.
2. Electric heat options are NOT AVAILABLE on Discharge Plenum units or size 030-070 horizontal units.
3. Electric heat is available on horizontal size 075-105 units with airfoil fan option only.

Performance data (cont)

COOLING CAPACITIES

48ZG,ZN and 50ZG,ZN,Z2,Z3030 UNITS

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		6,000/0.03			7,500/0.04			9,000/0.05			10,500/0.06		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	371	339	311	385	355	325	400	369	339	415	384	353
	SHC	176	209	242	189	229	269	201	249	295	213	269	321
	kW	29.9	28.6	27.5	30.5	29.2	28.0	31.1	29.9	28.6	31.6	30.5	29.2
95	TC	356	326	299	370	340	311	383	353	325	397	367	338
	SHC	170	203	235	182	223	261	194	243	287	206	261	313
	kW	32.3	30.9	29.6	32.9	31.6	30.2	33.5	32.2	30.8	34.1	32.9	31.5
100	TC	349	319	292	362	333	305	374	346	317	388	358	330
	SHC	167	200	233	179	219	258	191	239	283	203	259	309
	kW	33.5	32.0	30.6	34.2	32.7	31.2	34.8	33.4	31.9	35.5	34.0	32.6
105	TC	342	313	286	354	325	277	366	338	310	379	350	322
	SHC	164	197	229	176	217	255	188	235	279	200	255	305
	kW	34.8	33.2	31.6	35.4	33.8	32.4	36.1	34.5	33.0	36.7	35.2	33.7
115	TC	326	299	273	338	310	266	349	322	296	361	333	307
	SHC	158	191	223	169	210	247	181	229	271	193	248	297
	kW	37.2	35.4	33.8	37.8	36.2	34.4	38.6	36.8	35.2	39.3	37.6	35.9
120	TC	318	292	267	329	302	261	340	314	288	351	324	299
	SHC	155	187	219	166	206	243	178	225	267	190	244	291
	kW	38.4	36.6	34.8	39.1	37.3	35.5	39.8	38.0	36.2	40.6	38.8	37.0

48ZG,ZN and 50ZG,ZN,Z2,Z3030 UNITS (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF								
		12,000/0.07			13,500/0.08			15,000/0.09		
		Evaporator Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	423	392	361	429	398	368	435	404	374
	SHC	224	287	343	235	303	359	245	320	374
	kW	32.0	30.8	29.5	32.2	31.1	29.8	32.4	31.3	30.0
95	TC	404	374	346	410	380	353	415	386	360
	SHC	217	279	334	227	295	347	237	312	360
	kW	34.5	33.2	31.8	34.8	33.5	32.2	35.1	33.7	32.5
100	TC	395	366	338	400	370	345	405	376	353
	SHC	214	277	329	224	293	341	234	309	353
	kW	35.9	34.4	33.0	36.1	34.7	33.3	36.3	34.9	33.7
105	TC	386	357	330	391	362	338	395	366	346
	SHC	210	273	324	220	289	335	230	305	346
	kW	37.1	35.6	34.1	37.4	35.9	34.5	37.7	36.1	34.9
115	TC	367	339	314	371	344	322	375	348	331
	SHC	204	265	312	214	281	321	224	297	331
	kW	39.6	38.0	36.4	40.0	38.3	36.9	40.2	38.5	37.5
120	TC	357	330	306	361	335	315	365	339	323
	SHC	200	261	306	210	277	315	220	293	323
	kW	41.0	39.2	37.5	41.2	39.4	38.1	41.5	39.8	38.7

48ZG,ZN and 50ZG,ZN,Z2,Z3035 UNITS

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		7,000/0.03			8,750/0.04			10,500/0.04			12,250/0.05		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	435	398	365	456	420	386	472	435	400	483	446	411
	SHC	188	224	261	202	248	293	215	271	322	229	291	347
	kW	34.8	33.1	31.5	35.7	34.1	32.6	35.4	34.9	33.1	37.0	35.3	33.7
95	TC	417	382	349	437	402	368	449	415	382	461	426	393
	SHC	181	218	253	196	242	284	209	262	314	221	283	339
	kW	37.4	35.6	338	38.4	36.6	34.8	39.2	37.3	35.6	39.7	37.9	36.1
100	TC	408	374	340	426	393	359	439	405	373	449	416	384
	SHC	178	214	250	192	237	281	205	259	310	218	281	334
	kW	38.7	36.7	34.9	39.7	37.8	35.9	40.5	38.6	36.7	41.2	39.2	37.3
105	TC	398	366	333	417	382	349	429	396	364	438	406	374
	SHC	174	211	246	189	233	277	202	255	305	214	276	328
	kW	40.0	37.9	35.9	41.0	39.0	37.0	41.8	39.8	37.8	42.5	40.3	38.5
115	TC	380	347	316	396	364	331	407	376	344	416	385	356
	SHC	167	203	239	181	226	269	194	248	295	208	268	317
	kW	42.4	40.2	37.9	43.6	41.3	39.1	44.4	42.2	39.9	45.0	42.7	40.8
120	TC	370	338	307	385	354	323	396	365	334	406	374	346
	SHC	164	201	235	178	222	264	191	243	292	204	264	310
	kW	436	41.2	38.9	44.7	42.5	40.1	45.6	43.3	41.0	46.3	43.8	41.8

See notes on page 54.

COOLING CAPACITIES (cont)

48ZG,ZN and 50ZG,ZN,Z2,Z3035 UNITS (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF					
		14,000/0.06			15,000/0.07		
		Evaporator Air — Ewb (F)					
		72	67	62	72	67	62
85	TC	491	453	422	494	458	428
	SHC	242	311	370	248	321	379
	kW	37.3	35.7	34.2	37.6	35.8	34.5
95	TC	470	434	404	474	438	410
	SHC	234	304	358	242	314	366
	kW	40.2	38.4	36.7	40.4	38.5	37.1
100	TC	458	424	394	461	426	400
	SHC	231	300	351	237	311	359
	kW	41.5	39.6	37.9	41.8	39.8	38.2
105	TC	446	412	386	449	417	391
	SHC	226	295	345	233	306	352
	kW	43.0	40.8	39.1	43.1	41.1	39.5
115	TC	424	391	366	425	393	371
	SHC	220	287	329	227	298	334
	kW	45.5	43.2	41.4	45.7	43.4	41.8
120	TC	412	379	357	414	382	363
	SHC	216	283	322	222	293	327
	kW	46.7	44.3	42.6	46.9	44.5	43.1

48ZG,ZN AND 50ZG,ZN,Z2,Z3040 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		8,000/0.06			10,000/0.07			12,000/0.08			14,000/0.10		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	496	452	412	517	473	431	538	494	451	559	514	469
	SHC	235	279	321	253	305	356	269	332	391	286	358	425
	kW	38.1	36.4	34.7	38.9	37.2	35.5	39.6	38.0	36.3	40.4	38.8	37.0
95	TC	474	431	392	493	451	410	512	469	427	532	488	445
	SHC	226	269	311	243	295	344	259	322	379	276	347	413
	kW	40.9	39.0	37.0	41.8	39.8	38.0	42.6	40.7	38.8	43.5	41.6	39.6
100	TC	463	420	381	481	439	398	500	457	416	519	475	434
	SHC	222	264	305	237	290	340	254	316	373	270	342	407
	kW	42.3	40.2	38.2	43.2	41.2	39.2	44.1	42.1	40.0	45.1	43.0	40.9
105	TC	451	410	371	469	428	388	487	445	405	505	463	422
	SHC	217	259	300	233	285	334	250	311	367	266	337	400
	kW	43.8	41.6	39.4	44.7	42.5	40.4	45.6	43.5	41.2	46.5	44.4	42.2
115	TC	427	388	351	444	404	366	460	420	382	477	436	398
	SHC	207	249	290	223	274	322	239	300	353	256	326	386
	kW	46.4	44.0	41.6	47.3	45.0	42.6	48.3	45.9	43.6	49.3	46.9	44.5
120	TC	416	377	340	431	392	355	446	407	370	462	422	384
	SHC	202	245	284	218	270	316	234	295	347	250	320	378
	kW	47.7	45.2	42.6	48.7	46.2	43.6	49.7	47.2	44.7	50.6	48.2	45.7

48ZG,ZN AND 50ZG,ZN,Z2,Z3040 UNITS WITH STANDARD COIL (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF								
		16,000/0.11			18,000/0.12			20,000/0.13		
		Evaporator Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	570	526	482	581	535	490	591	544	499
	SHC	301	381	455	314	403	476	328	426	499
	kW	41.0	39.3	37.6	41.4	39.7	37.9	42.0	40.1	38.2
95	TC	543	500	457	552	507	467	560	515	477
	SHC	290	370	440	304	393	458	317	414	477
	kW	44.0	42.1	40.2	44.4	42.5	40.6	44.8	42.8	41.1
100	TC	529	487	445	537	493	456	545	501	465
	SHC	285	365	432	298	387	449	312	408	465
	kW	45.6	43.5	41.4	45.9	43.8	41.9	46.3	44.2	42.5
105	TC	515	473	433	523	480	444	529	486	455
	SHC	280	360	425	293	381	439	306	401	455
	kW	47.1	44.9	42.7	47.4	45.2	43.3	47.7	45.6	43.9
115	TC	486	444	409	492	450	420	499	457	431
	SHC	269	349	406	283	368	418	296	389	431
	kW	49.8	47.5	45.3	50.2	47.8	45.9	50.5	48.1	46.6
120	TC	470	430	397	476	436	408	484	442	420
	SHC	264	343	396	277	362	408	290	383	420
	kW	51.2	48.8	46.5	51.6	49.1	47.2	51.9	49.4	48.0

See notes on page 54.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3040 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser(Edb)		Evaporator Air Quantity — Cfm/BF											
		8,000/0.011			10.000/0.014			12,000/0.016			14,000/0.019		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	552	504	460	591	541	494	619	566	518	640	586	537
	SHC	264	305	344	287	337	386	308	365	425	327	395	462
	kW	39.5	37.8	36.1	40.9	39.1	37.4	41.7	40.0	38.2	42.4	40.6	38.9
95	TC	533	485	442	568	519	473	595	543	496	614	562	513
	SHC	256	296	335	278	328	375	298	355	415	317	384	451
	kW	42.7	40.7	38.8	44.1	42.1	40.1	45.0	43.0	41.1	45.7	43.7	41.8
100	TC	522	475	432	556	508	463	582	531	485	599	549	501
	SHC	251	292	328	273	323	369	293	349	409	311	379	446
	kW	44.3	42.1	40.1	45.6	43.5	41.4	46.5	44.5	42.5	47.3	45.2	43.2
105	TC	513	465	423	544	496	451	568	519	473	585	535	488
	SHC	247	287	323	268	316	364	288	344	403	306	373	440
	kW	45.7	43.5	41.4	47.1	44.9	42.8	48.1	45.9	43.8	48.9	46.7	44.6
115	TC	489	443	401	519	472	429	541	492	448	556	507	462
	SHC	237	276	312	258	304	356	277	333	393	295	363	428
	kW	48.6	46.2	43.8	50.1	47.7	45.4	51.2	48.7	46.4	51.9	49.5	47.3
120	TC	482	432	391	505	462	417	526	478	434	540	493	448
	SHC	234	271	307	252	301	349	271	326	386	290	357	421
	kW	51.1	47.6	45.0	51.6	49.6	46.6	52.6	50.1	47.7	53.6	50.9	48.6

48ZG,ZN AND 50ZG,ZN,Z2,Z3040 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF								
		16,000/0.022			18,000/0.025			20,000/0.028		
		Evaporator Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	655	601	550	668	613	561	677	623	578
	SHC	345	424	497	362	450	527	379	476	539
	kW	42.9	41.1	39.4	43.3	41.5	39.9	43.6	41.7	40.5
95	TC	628	575	525	639	597	539	648	605	557
	SHC	335	413	485	352	444	506	368	471	516
	kW	46.2	44.2	42.3	46.6	46.7	43.0	47.0	47.0	43.7
100	TC	614	561	513	624	572	530	633	581	546
	SHC	330	407	479	346	433	495	363	460	504
	kW	47.8	45.7	43.8	48.2	46.2	44.6	48.6	46.5	45.3
105	TC	599	548	500	609	557	519	617	565	535
	SHC	324	401	471	341	427	483	357	429	491
	kW	49.4	47.2	45.3	49.8	47.7	46.1	50.2	47.9	46.9
115	TC	568	518	486	577	527	498	584	535	511
	SHC	313	389	458	330	415	461	346	439	468
	kW	52.4	50.1	49.9	52.9	50.5	49.8	53.3	51.0	49.9
120	TC	552	509	468	560	512	485	568	519	499
	SHC	307	386	436	324	409	446	340	433	455
	kW	54.0	52.6	49.8	54.4	52.0	50.8	54.9	52.4	51.5

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3050 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		9,000/0.02			11,250/0.03			13,500/0.05			15,750/0.06		
		Evaporator Air — Ewb (F)											
		72	67	62	72	62	62	72	67	62	72	67	62
85	TC	556	511	468	583	539	494	601	560	514	617	573	531
	SHC	248	296	343	267	326	383	283	354	420	299	379	455
	kW	47.1	44.7	42.5	48.4	46.2	43.9	49.3	47.3	44.9	50.1	47.9	45.7
95	TC	531	489	446	557	514	471	574	532	490	588	546	505
	SHC	239	285	332	256	315	372	272	343	409	289	369	443
	kW	50.2	47.8	45.3	51.8	49.2	46.9	52.8	50.3	47.9	53.6	51.1	48.7
100	TC	518	477	436	543	501	460	559	519	478	572	531	492
	SHC	233	281	327	251	310	367	267	338	403	284	363	435
	kW	51.9	49.3	46.8	53.4	50.9	48.2	54.3	51.9	49.3	55.1	52.6	50.2
105	TC	506	465	426	529	489	449	543	506	465	556	517	479
	SHC	228	276	322	246	305	361	262	332	397	277	358	430
	kW	53.4	50.8	48.1	55.0	52.3	49.6	55.9	53.4	50.7	56.7	54.2	51.7
115	TC	481	441	403	501	463	425	514	478	439	525	489	453
	SHC	219	266	311	236	295	350	252	321	385	268	347	414
	kW	56.5	53.6	50.7	58.0	55.2	52.3	59.0	56.3	53.4	59.8	57.1	54.5
120	TC	467	429	391	486	449	412	499	463	426	507	474	439
	SHC	213	260	306	231	289	344	246	314	377	261	341	406
	kW	57.9	55.0	51.9	59.5	56.6	53.6	60.5	57.7	54.8	61.2	58.6	55.8

48ZG,ZN AND 50ZG,ZN,Z2,Z3050 UNITS WITH STANDARD COIL (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF					
		18,000/0.07			20,000/0.08		
		Evaporator Air — Ewb (F)					
		72	67	62	72	62	62
85	TC	627	583	543	634	592	553
	SHC	314	405	485	327	425	508
	kW	50.7	48.5	46.4	51.0	48.8	46.9
95	TC	596	556	517	604	563	526
	SHC	303	394	471	315	414	490
	kW	54.0	51.7	49.5	54.3	52.1	50.0
100	TC	581	541	504	588	549	513
	SHC	298	387	463	310	408	479
	kW	55.7	53.3	51.0	56.0	53.7	51.5
105	TC	565	526	491	572	533	500
	SHC	292	382	454	304	402	468
	kW	57.2	54.7	52.5	57.7	55.2	53.0
115	TC	532	496	464	538	501	475
	SHC	280	370	434	292	390	445
	kW	60.3	57.7	55.3	60.6	58.0	56.2
120	TC	515	481	453	521	486	463
	SHC	274	364	424	286	383	433
	kW	61.7	59.1	56.8	62.1	59.4	57.7

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3050 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		10,000/0.023			12,500/0.029			15,000/0.035			17,500/0.041		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	659	601	549	699	640	588	727	667	611	748	686	629
	SHC	316	364	413	343	404	463	366	441	511	388	476	555
	kW	48.7	46.5	44.5	50.3	48.0	46.2	51.3	49.0	46.9	52.0	49.7	47.6
95	TC	639	579	528	671	621	561	705	639	585	725	665	602
	SHC	307	354	402	331	396	451	358	429	497	380	467	542
	kW	53.1	49.9	47.5	53.8	52.4	49.0	56.1	52.5	50.1	56.9	54.4	50.9
100	TC	623	567	517	660	601	549	682	625	575	700	642	588
	SHC	300	349	396	327	387	443	349	423	493	370	457	535
	kW	54.0	51.5	49.1	56.0	53.0	50.6	56.7	54.1	52.2	57.5	54.9	52.5
105	TC	612	558	506	643	588	537	667	614	558	684	626	574
	SHC	295	344	391	320	381	438	343	418	485	365	450	527
	kW	56.2	53.5	50.5	57.3	54.7	52.1	58.4	56.3	53.2	59.3	56.6	54.1
115	TC	583	530	483	614	560	511	635	580	530	657	602	548
	SHC	283	332	379	308	369	425	331	404	471	355	441	507
	kW	59.2	56.3	53.6	60.9	58.0	55.3	62.0	59.2	56.4	64.0	61.1	57.4
120	TC	571	518	474	598	555	500	—	565	519	—	579	540
	SHC	279	326	375	302	367	420	—	398	466	—	431	497
	kW	61.4	58.0	55.6	62.6	61.3	57.3	—	60.8	58.5	—	61.7	59.4

48ZG,ZN AND 50ZG,ZN,Z2,Z3050 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF		
		20,000/0.048		
		Evaporator Air — Ewb (F)		
		72	67	62
85	TC	738	701	644
	SHC	401	509	594
	kW	49.0	50.4	48.2
95	TC	730	678	618
	SHC	398	499	575
	kW	56.3	54.9	51.7
100	TC	713	654	605
	SHC	392	488	564
	kW	58.1	55.5	53.4
105	TC	696	638	593
	SHC	385	483	555
	kW	59.9	57.2	55.0
115	TC	669	606	569
	SHC	376	470	530
	kW	64.6	60.6	58.6
120	TC	—	589	552
	SHC	—	462	519
	kW	—	62.3	60.1

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3055 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		10,000/0.03			12,500/0.04			15,000/0.05			17,500/0.06		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	594	543	496	625	574	526	647	596	548	663	613	566
	SHC	285	339	397	306	372	438	326	406	480	344	435	516
	kW	47.5	45.4	43.5	48.8	46.7	44.7	49.6	47.6	45.6	50.3	48.3	46.4
95	TC	570	521	475	598	549	502	619	570	523	634	584	539
	SHC	274	329	385	294	362	425	315	394	467	333	423	500
	kW	51.1	48.7	46.5	52.5	50.1	47.9	53.4	51.1	48.9	54.1	51.8	49.6
100	TC	557	510	464	585	536	491	604	556	512	618	571	527
	SHC	269	324	379	289	356	419	310	387	461	328	417	492
	kW	52.9	50.4	48.0	54.2	51.7	49.4	55.3	52.8	50.5	55.9	53.6	51.3
105	TC	544	497	453	571	524	478	589	542	498	602	555	513
	SHC	264	320	373	284	351	414	304	382	454	321	411	484
	kW	54.5	52.0	49.4	56.0	53.5	50.9	57.0	54.4	51.9	57.7	55.1	52.9
115	TC	517	473	429	541	496	454	556	513	472	570	527	487
	SHC	253	308	362	273	339	401	292	370	438	310	398	467
	kW	57.8	54.9	52.1	59.4	56.5	53.7	60.3	57.5	54.9	61.2	58.4	55.9
120	TC	509	467	424	525	482	441	542	498	458	552	508	474
	SHC	248	302	357	267	333	394	286	364	431	303	392	457
	kW	59.9	56.8	53.8	60.9	57.9	55.1	62.1	59.1	56.3	62.7	59.8	57.4

48ZG,ZN AND 50ZG,ZN,Z2,Z3055 UNITS WITH STANDARD COIL (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF								
		20,000/0.07			22,500/0.08			25,000/0.08		
		Evaporator Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	676	625	581	685	635	594	693	643	607
	SHC	362	464	553	379	491	577	395	519	601
	kW	50.8	48.8	46.9	51.1	49.1	47.5	51.4	49.5	48.0
95	TC	644	596	555	655	605	568	661	613	581
	SHC	350	452	534	368	478	556	384	505	578
	kW	54.5	52.3	50.4	55.0	52.8	51.0	55.3	53.2	51.7
100	TC	630	581	541	638	590	555	644	598	567
	SHC	345	446	524	362	473	545	379	498	565
	kW	56.4	54.0	52.0	56.9	54.5	52.7	57.3	54.9	53.2
105	TC	614	566	529	622	575	541	628	582	554
	SHC	339	440	515	356	466	534	372	491	553
	kW	58.3	55.8	53.8	58.7	56.3	54.3	59.0	56.5	55.1
115	TC	580	535	502	587	543	514	592	550	526
	SHC	327	426	494	343	451	510	359	476	526
	kW	61.8	59.1	56.9	62.2	59.4	57.6	62.5	59.9	58.4
120	TC	563	519	488	569	527	500	575	533	513
	SHC	321	419	483	337	445	498	354	469	513
	kW	63.4	60.6	58.4	63.8	61.0	59.2	64.3	61.5	60.0

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3055 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		11,000/0.014			13,800/0.022			16,600/0.031			19,400/0.039		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	683	620	567	726	664	606	755	693	630	778	714	655
	SHC	329	381	431	357	423	484	383	460	531	408	496	566
	kW	51.6	49.3	47.0	53.2	50.8	48.5	54.2	51.9	49.7	55.0	52.7	50.7
95	TC	658	600	547	698	638	582	725	664	607	751	684	631
	SHC	318	371	421	346	411	473	372	447	520	398	483	549
	kW	55.5	52.9	50.4	57.1	54.6	52.0	58.3	55.7	53.3	61.0	56.6	54.5
100	TC	645	587	536	683	624	569	709	649	594	729	668	618
	SHC	313	365	416	340	405	466	365	441	512	389	476	540
	kW	57.4	54.6	52.0	59.1	56.3	53.7	60.3	57.5	55.1	61.1	58.4	56.3
105	TC	632	575	524	668	609	555	693	634	581	712	652	604
	SHC	307	359	409	334	398	460	359	434	501	383	470	530
	kW	59.2	56.3	53.6	60.9	58.1	55.4	62.2	59.3	56.8	63.1	60.2	58.0
115	TC	603	549	499	636	580	527	659	602	555	675	618	575
	SHC	295	347	397	322	386	446	347	421	483	369	456	509
	kW	62.8	59.7	56.6	64.7	61.6	58.6	66.1	62.9	60.2	66.9	63.8	61.6
120	TC	588	534	486	—	565	514	—	586	540	—	601	561
	SHC	289	341	392	—	379	440	—	414	471	—	447	500
	kW	64.6	61.3	58.1	—	63.2	60.2	—	64.6	61.9	—	65.5	63.2

48ZG,ZN AND 50ZG,ZN,Z2,Z3055 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF					
		22,200/0.047			25,000/0.056		
		Evaporator Air — Ewb (F)					
		72	67	62	72	67	62
85	TC	771	730	677	808	743	696
	SHC	396	531	596	453	565	622
	kW	54.8	53.4	51.6	56.2	53.9	52.3
95	TC	761	699	651	773	710	671
	SHC	418	517	576	440	551	596
	kW	59.8	57.3	55.4	60.4	57.7	56.3
100	TC	744	682	637	755	693	659
	SHC	412	510	567	434	544	585
	kW	61.8	59.1	57.3	62.4	59.6	58.2
105	TC	725	665	623	736	676	645
	SHC	405	503	555	427	536	570
	kW	63.8	60.9	59.1	64.3	61.5	60.2
115	TC	688	630	597	698	640	622
	SHC	392	490	527	413	519	546
	kW	67.7	64.5	62.9	68.2	65.2	65.6
120	TC	—	—	584	—	—	603
	SHC	—	—	510	—	—	525
	kW	—	—	64.8	—	—	65.9

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3060 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		12,000/0.03			15,000/0.04			18,000/0.04			21,000/0.05		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	731	670	613	769	707	647	793	733	674	811	751	694
	SHC	353	421	488	378	462	542	403	503	597	429	543	650
	kW	59.6	56.9	54.3	61.3	58.5	55.9	62.2	59.7	57.1	63.1	60.4	57.9
95	TC	703	644	588	738	678	621	761	702	645	778	719	666
	SHC	340	409	474	365	449	527	390	448	580	415	529	633
	kW	63.9	60.8	57.9	65.7	62.7	59.6	66.9	63.9	60.9	67.8	64.8	62.0
100	TC	689	630	575	720	663	607	745	684	630	761	702	649
	SHC	334	402	468	358	442	520	383	482	572	408	522	624
	kW	66.0	62.9	59.7	67.7	64.6	61.5	69.1	65.8	62.8	70.0	66.7	63.8
105	TC	674	616	561	704	647	592	727	668	616	743	685	633
	SHC	327	395	461	352	435	512	376	475	563	400	515	615
	kW	68.1	64.6	61.4	69.9	66.6	63.2	71.3	67.7	64.6	72.1	68.7	65.7
115	TC	641	587	534	669	616	563	691	635	585	704	650	603
	SHC	314	382	447	339	421	496	363	461	546	387	500	595
	kW	72.0	68.3	64.5	74.0	70.2	66.6	75.2	71.6	68.2	76.3	72.6	69.3
120	TC	629	575	524	649	595	546	669	615	568	688	635	590
	SHC	308	375	440	332	415	488	356	454	536	381	493	584
	kW	74.4	70.5	66.6	75.9	71.9	68.2	77.4	73.5	69.9	78.8	75.0	71.6

48ZG,ZN AND 50ZG,ZN,Z2,Z3060 UNITS WITH STANDARD COIL (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF								
		24,000/0.06			27,000/0.07			30,000/0.08		
		Evaporator Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	825	764	710	840	778	728	848	787	749
	SHC	450	580	695	472	614	722	493	647	749
	kW	63.7	61.0	58.7	64.3	61.6	59.4	64.6	61.9	60.1
95	TC	791	733	681	802	744	697	811	752	719
	SHC	437	566	672	458	599	695	480	632	719
	kW	68.4	65.4	62.7	69.0	66.0	63.6	69.4	66.4	64.5
100	TC	772	713	665	781	726	683	790	734	703
	SHC	429	558	661	451	591	682	473	624	703
	kW	70.6	67.4	64.8	71.1	68.1	65.7	71.6	68.5	66.6
105	TC	754	697	651	763	708	669	771	716	687
	SHC	423	551	650	444	584	669	466	617	687
	kW	72.8	69.5	66.7	73.3	70.1	67.7	73.8	70.6	68.8
115	TC	714	661	622	724	671	640	732	680	656
	SHC	409	535	622	430	568	640	451	600	656
	kW	76.9	73.3	70.4	77.5	74.0	71.7	78.0	74.6	72.7
120	TC	698	646	608	706	654	624	713	662	641
	SHC	403	529	608	424	560	624	445	591	641
	kW	79.6	75.8	73.0	80.1	76.4	74.1	80.7	77.0	75.3

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3060 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		12,000/0.012			15,000/0.015			18,000/0.019			21,000/0.022		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	822	750	685	877	801	732	914	837	767	942	865	793
	SHC	394	456	516	427	501	578	457	548	636	485	591	690
	kW	63.3	60.5	57.8	65.4	62.5	59.8	66.8	63.9	61.1	67.9	65.0	62.3
95	TC	793	736	659	843	770	703	878	818	735	904	829	759
	SHC	382	449	502	414	486	563	443	536	618	470	575	673
	kW	68.1	67.8	61.8	70.4	67.1	63.9	71.9	70.5	65.5	73.1	69.8	66.7
100	TC	778	709	651	826	754	688	859	786	719	885	819	742
	SHC	376	435	498	407	479	553	435	522	613	463	571	667
	kW	70.5	67.0	64.6	72.7	69.2	65.9	74.3	70.9	67.5	75.5	73.1	68.7
105	TC	762	694	632	815	743	678	840	768	709	864	791	724
	SHC	368	428	488	402	474	549	428	514	607	456	560	659
	kW	72.7	69.1	65.7	76.0	72.8	69.2	76.6	73.0	70.9	77.8	74.3	70.8
115	TC	742	676	603	771	702	640	801	731	666	821	767	687
	SHC	360	420	473	385	456	534	413	498	588	440	551	641
	kW	80.2	76.1	69.4	79.6	75.6	71.8	81.4	77.4	73.5	82.6	81.0	74.8
120	TC	711	646	594	—	684	623	—	711	648	—	730	674
	SHC	347	406	467	—	448	523	—	490	581	—	534	635
	kW	79.3	75.1	72.5	—	77.6	73.6	—	79.3	75.4	—	80.6	77.8

48ZG,ZN AND 50ZG,ZN,Z2,Z3060 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF								
		24,000/0.025			27,000/0.029			30,000/0.032		
		Evaporator Air — Ewb (F)								
		72	67	62	72	67	62	72	67	62
85	TC	964	885	812	980	901	828	993	913	854
	SHC	512	632	742	537	671	779	562	711	803
	kW	68.7	65.8	63.1	69.3	66.5	63.8	69.8	67.0	64.8
95	TC	924	848	777	939	862	797	951	874	823
	SHC	497	615	725	522	657	759	547	695	772
	kW	73.9	70.7	67.5	74.6	71.3	68.5	75.1	71.9	69.8
100	TC	903	828	766	917	842	787	929	852	812
	SHC	489	608	721	515	647	749	539	685	764
	kW	76.4	72.9	71.2	77.0	73.6	72.3	77.6	74.2	73.6
105	TC	881	808	741	895	821	767	906	831	791
	SHC	481	600	705	506	640	727	531	678	740
	kW	78.7	75.1	71.9	79.4	75.9	73.2	80.0	76.4	74.5
115	TC	854	766	710	—	778	735	860	788	757
	SHC	472	582	675	—	621	690	514	658	703
	kW	86.9	79.5	76.3	—	80.3	77.9	84.8	80.9	79.3
120	TC	—	—	699	—	—	723	—	—	—
	SHC	—	—	664	—	—	678	—	—	—
	kW	—	—	79.9	—	—	81.5	—	—	—

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3070 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		14,000/0.05			17,500/0.06			21,000/0.07			24,500/0.08		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	862	789	721	890	816	747	917	843	775	944	870	801
	SHC	406	485	565	435	531	624	463	577	684	492	622	742
	kW	70.9	67.5	64.1	72.2	68.8	65.4	73.6	70.0	66.8	74.9	71.4	68.1
95	TC	830	760	691	855	785	718	879	809	743	903	833	769
	SHC	393	472	551	421	517	609	449	562	667	477	607	725
	kW	75.7	71.8	68.1	77.0	73.1	69.5	78.3	74.5	70.9	79.6	75.8	72.3
100	TC	811	744	676	835	767	701	859	790	726	882	814	752
	SHC	386	465	544	413	510	601	441	554	658	470	600	715
	kW	77.8	73.9	70.0	79.3	75.3	71.4	80.6	76.6	72.9	82.0	78.1	74.4
105	TC	793	728	662	816	750	686	839	773	711	863	795	734
	SHC	377	457	537	406	502	594	434	547	649	462	592	705
	kW	80.1	76.1	71.9	81.5	77.4	73.5	83.0	78.9	75.0	84.4	80.2	76.5
115	TC	754	695	633	776	716	655	799	736	678	821	758	700
	SHC	363	443	524	391	487	579	419	532	632	447	577	684
	kW	84.5	80.3	75.8	86.1	81.7	77.4	87.5	83.1	79.0	89.1	84.5	80.7

48ZG,ZN AND 50ZG,ZN,Z2,Z3070 UNITS WITH STANDARD COIL (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF					
		28,000/0.09			30,000/0.09		
		Evaporator Air — Ewb (F)					
		72	67	62	72	67	62
85	TC	997	919	854	1005	926	865
	SHC	539	692	827	554	717	853
	kW	77.1	73.6	70.5	77.5	73.9	71.0
95	TC	952	879	818	960	887	829
	SHC	524	676	805	539	700	825
	kW	81.9	78.1	74.9	82.4	78.6	75.5
100	TC	931	858	800	937	864	811
	SHC	516	668	792	532	692	809
	kW	84.3	80.4	77.1	84.8	80.8	77.7
105	TC	908	836	782	915	843	794
	SHC	508	659	779	523	683	794
	kW	86.8	82.6	79.3	87.3	83.0	80.0
115	TC	864	793	746	870	799	760
	SHC	493	642	746	509	666	760
	kW	91.7	87.0	83.7	92.0	87.5	84.5

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Ewb — Entering Wet-Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Capacity (1000 Btuh) Gross

NOTES:

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
   Below 80 F edb, subtract (corr factor x cfm) from SHC.
   Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.07	3.11	4.14	5.18	Use formula shown below
.10	0.98	1.96	2.94	3.92	4.91	
.20	0.87	1.74	2.62	3.49	4.36	

Interpolation is permissible.

Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN AND 50ZG,ZN,Z2,Z3070 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		14,000/0.012			17,500/0.014			21,000/0.016			24,500/0.018		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	965	879	799	1034	936	855	1078	979	900	1106	1010	925
	SHC	465	536	604	506	589	677	540	641	747	571	692	812
	kW	72.9	70.0	66.9	75.0	72.6	69.2	76.7	73.7	71.4	78.4	75.5	72.1
95	TC	931	838	775	988	901	825	1030	940	858	1060	969	888
	SHC	450	516	591	487	573	663	521	624	728	553	675	794
	kW	78.7	72.5	73.3	81.0	77.5	74.4	83.1	79.3	75.0	84.3	80.6	77.0
100	TC	912	825	754	969	883	804	1008	920	840	1037	947	868
	SHC	441	510	580	479	565	652	513	616	720	544	666	785
	kW	81.2	76.4	73.5	83.9	80.0	76.1	85.8	81.7	78.0	87.1	83.1	79.3
105	TC	895	812	738	948	863	791	986	898	820	1013	923	850
	SHC	434	504	572	470	556	646	504	606	711	536	656	774
	kW	83.8	79.6	75.6	86.5	82.3	79.3	88.3	84.1	80.0	89.7	85.2	81.7
115	TC	856	776	704	905	823	749	939	856	782	965	880	813
	SHC	417	486	555	453	539	626	486	589	695	518	637	746
	kW	88.6	84.1	79.8	91.5	86.9	82.6	93.3	88.8	84.6	94.8	90.3	86.5
120	TC	836	758	687	883	803	730	916	834	762	940	857	793
	SHC	409	477	547	445	529	616	477	580	685	509	628	733
	kW	91.1	86.4	81.9	94.0	89.2	84.7	95.8	91.2	86.8	97.3	92.6	88.9

48ZG,ZN AND 50ZG,ZN,Z2,Z3070 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF					
		28,000/0.020			30,000/0.021		
		Evaporator Air — Ewb (F)					
		72	67	62	72	67	62
85	TC	1137	1037	951	1149	1053	976
	SHC	604	740	869	621	769	896
	kW	79.1	76.3	73.1	79.5	76.0	73.0
95	TC	1084	989	916	1094	1002	931
	SHC	584	722	842	601	749	865
	kW	85.4	81.4	78.4	86.0	82.1	79.0
100	TC	1059	969	897	1069	976	913
	SHC	575	713	829	592	744	852
	kW	88.1	84.1	80.9	88.7	84.5	81.6
105	TC	1034	945	878	1044	954	893
	SHC	566	703	815	583	732	837
	kW	90.7	86.4	83.2	91.2	87.0	84.0
115	TC	984	899	840	993	907	854
	SHC	548	685	787	565	710	803
	kW	95.8	91.4	88.1	96.3	91.9	89.0
120	TC	—	874	820	—	884	836
	SHC	—	674	772	—	700	784
	kW	—	93.7	90.5	—	94.3	91.5

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF											
		14,000/0.05			17,500/0.06			21,000/0.07			24,500/0.08		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	862	789	721	890	816	747	917	843	775	944	870	801
	SHC	406	485	565	435	531	624	463	577	684	492	622	742
	kW	70.9	67.5	64.1	72.2	68.8	65.4	73.6	70.0	66.8	74.9	71.4	68.1
95	TC	830	760	691	855	785	718	879	809	743	903	833	769
	SHC	393	472	551	421	517	609	449	562	667	477	607	725
	kW	75.7	71.8	68.1	77.0	73.1	69.5	78.3	74.5	70.9	79.6	75.8	72.3
100	TC	811	744	676	835	767	701	859	790	726	882	814	752
	SHC	386	465	544	413	510	601	441	554	658	470	600	715
	kW	77.8	73.9	70.0	79.3	75.3	71.4	80.6	76.6	72.9	82.0	78.1	74.4
105	TC	793	728	662	816	750	686	839	773	711	863	795	734
	SHC	377	457	537	406	502	594	434	547	649	462	592	705
	kW	80.1	76.1	71.9	81.5	77.4	73.5	83.0	78.9	75.0	84.4	80.2	76.5
115	TC	754	695	633	776	716	655	799	736	678	821	758	700
	SHC	363	443	524	391	487	579	419	532	632	447	577	684
	kW	84.5	80.3	75.8	86.1	81.7	77.4	87.5	83.1	79.0	89.1	84.5	80.7

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 UNITS WITH STANDARD COIL (cont)

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF					
		28,000/0.09			30,000/0.09		
		Evaporator Air — Ewb (F)					
		72	67	62	72	67	62
85	TC	997	919	854	1005	926	865
	SHC	539	692	827	554	717	853
	kW	77.1	73.6	70.5	77.5	73.9	71.0
95	TC	952	879	818	960	887	829
	SHC	524	676	805	539	700	825
	kW	81.9	78.1	74.9	82.4	78.6	75.5
100	TC	931	858	800	937	864	811
	SHC	516	668	792	532	692	809
	kW	84.3	80.4	77.1	84.8	80.8	77.7
105	TC	908	836	782	915	843	794
	SHC	508	659	779	523	683	794
	kW	86.8	82.6	79.3	87.3	83.0	80.0
115	TC	864	793	746	870	799	760
	SHC	493	642	746	509	666	760
	kW	91.7	87.0	83.7	92.0	87.5	84.5

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		14,000/0.012			17,500/0.014			21,000/0.016			24,500/0.018		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	965	879	799	1034	936	855	1078	979	900	1106	1010	925
	SHC	465	536	604	506	589	677	540	641	747	571	692	812
	kW	72.9	70.0	66.9	75.0	72.6	69.2	76.7	73.7	71.4	78.4	75.5	72.1
95	TC	931	838	775	988	901	825	1030	940	858	1060	969	888
	SHC	450	516	591	487	573	663	521	624	728	553	675	794
	kW	78.7	72.5	73.3	81.0	77.5	74.4	83.1	79.3	75.0	84.3	80.6	77.0
100	TC	912	825	754	969	883	804	1008	920	840	1037	947	868
	SHC	441	510	580	479	565	652	513	616	720	544	666	785
	kW	81.2	76.4	73.5	83.9	80.0	76.1	85.8	81.7	78.0	87.1	83.1	79.3
105	TC	895	812	738	948	863	791	986	898	820	1013	923	850
	SHC	434	504	572	470	556	646	504	606	711	536	656	774
	kW	83.8	79.6	75.6	86.5	82.3	79.3	88.3	84.1	80.0	89.7	85.2	81.7
115	TC	856	776	704	905	823	749	939	856	782	965	880	813
	SHC	417	486	555	453	539	626	486	589	695	518	637	746
	kW	88.6	84.1	79.8	91.5	86.9	82.6	93.3	88.8	84.6	94.8	90.3	86.5
120	TC	836	758	687	883	803	730	916	834	762	940	857	793
	SHC	409	477	547	445	529	616	477	580	685	509	628	733
	kW	91.1	86.4	81.9	94.0	89.2	84.7	95.8	91.2	86.8	97.3	92.6	88.9

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF					
		28,000/0.020			30,000/0.021		
		Evaporator Air — Ewb (F)					
		72	67	62	72	67	62
85	TC	1137	1037	951	1149	1053	976
	SHC	604	740	869	621	769	896
	kW	79.1	76.3	73.1	79.5	76.0	73.0
95	TC	1084	989	916	1094	1002	931
	SHC	584	722	842	601	749	865
	kW	85.4	81.4	78.4	86.0	82.1	79.0
100	TC	1059	969	897	1069	976	913
	SHC	575	713	829	592	744	852
	kW	88.1	84.1	80.9	88.7	84.5	81.6
105	TC	1034	945	878	1044	954	893
	SHC	566	703	815	583	732	837
	kW	90.7	86.4	83.2	91.2	87.0	84.0
115	TC	984	899	840	993	907	854
	SHC	548	685	787	565	710	803
	kW	95.8	91.4	88.1	96.3	91.9	89.0
120	TC	—	874	820	—	884	836
	SHC	—	674	772	—	700	784
	kW	—	93.7	90.5	—	94.3	91.5

Design operation in shaded area may result in design cooling airflow below minimum heating airflow range. Check Heating Capacity tables for minimum heating airflow limits. Design duct system and terminals to ensure proper airflow during heating operation.

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9090 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF														
		17,000/0.05			21,250/0.06			25,500/0.07			29,750/0.09			34,000/0.10		
		Evaporator Air — Ewb (F)														
		72	67	62	72	67	62	72	67	62	72	67	62	72	67	62
85	TC	1035	939	851	1085	990	897	1122	1028	932	1150	1054	958	1171	1074	979
	SHC	485	576	664	554	633	742	556	686	813	588	734	879	615	781	941
	kW	81.8	78.0	74.3	84.0	80.2	76.5	85.4	81.9	78.2	86.5	83.1	79.4	87.4	83.9	80.4
95	TC	997	903	817	1051	950	862	1076	983	894	1101	1003	917	1120	1027	938
	SHC	469	560	647	475	615	724	538	667	794	566	736	860	597	762	919
	kW	87.4	83.1	79.0	89.8	85.5	81.4	91.1	87.2	83.2	92.4	88.3	84.5	93.3	89.5	85.6
100	TC	968	878	800	1023	929	842	1053	962	872	1077	985	896	1096	1004	915
	SHC	497	573	638	465	606	714	529	641	785	560	706	849	588	736	905
	kW	89.9	85.3	81.3	92.4	88.1	83.8	94.0	89.8	85.6	95.2	91.2	87.0	96.2	92.2	88.2
105	TC	949	861	782	998	909	825	1028	935	853	1051	957	875	1069	975	896
	SHC	482	563	629	488	597	706	518	650	775	549	699	839	579	745	892
	kW	92.6	87.9	83.6	95.1	90.6	86.2	96.7	92.1	88.0	98.0	93.6	89.5	99.0	94.6	90.8
115	TC	909	826	748	960	862	786	980	888	812	1001	910	833	1017	925	859
	SHC	439	524	613	442	581	686	502	631	755	533	680	816	558	726	857
	kW	97.9	93.1	88.2	100.8	95.4	90.9	102.2	97.1	92.8	103.5	98.7	94.4	104.5	99.7	96.2
120	TC	890	807	729	927	841	765	953	866	791	974	886	812	989	902	838
	SHC	425	516	603	460	571	679	492	621	745	523	669	802	548	716	838
	kW	100.5	95.4	90.4	103.0	97.8	93.1	104.7	99.6	95.1	106.0	101.1	96.8	107.0	102.3	98.6

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9090 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		18,000/0.025			22,500/0.031			27,000/0.038			31,500/0.044		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	1103	1009	922	1161	1064	988	1200	1101	1010	1228	1128	1037
	SHC	533	623	706	577	690	798	618	752	877	652	824	953
	kW	84.1	80.5	77.0	86.3	82.7	81.9	87.8	84.2	80.6	88.7	85.2	81.8
95	TC	1062	972	901	1116	1022	935	1152	1082	991	1196	1081	1019
	SHC	516	605	693	559	671	773	598	743	867	642	792	942
	kW	90.2	86.2	78.2	92.7	88.6	84.7	94.2	87.2	85.2	100.6	91.3	85.3
100	TC	1041	952	880	1093	1001	928	1127	1033	975	1152	1058	974
	SHC	507	596	683	550	661	770	589	723	860	626	782	918
	kW	93.1	88.9	88.0	95.7	91.3	90.8	97.2	92.9	85.9	98.3	94.2	90.3
105	TC	1020	933	851	1069	986	896	1102	1009	928	1126	1034	953
	SHC	498	588	668	541	656	756	580	713	838	616	772	905
	kW	96.0	91.7	87.1	98.6	96.2	89.7	100.2	95.7	91.5	101.3	97.0	93.0
115	TC	977	893	825	1021	935	853	1051	963	900	1074	1000	928
	SHC	481	570	655	522	633	736	562	694	822	597	761	885
	kW	101.7	96.9	95.8	104.2	99.3	94.5	105.9	101.0	96.8	107.2	107.0	96.5
120	TC	955	878	794	996	918	839	1025	945	864	1047	959	904
	SHC	472	563	642	513	627	731	553	687	810	590	743	867
	kW	104.5	100.5	94.4	107.0	104.0	99.0	108.8	105.8	99.1	110.2	105.0	100.5

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3, Z6,Z7,Z8,Z9090 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF		
		36,000/0.050		
		Evaporator Air — Ewb (F)		
		72	67	62
85	TC	1251	1150	1063
	SHC	689	868	1014
	kW	89.6	86.0	82.8
95	TC	1200	1100	1023
	SHC	675	841	975
	kW	96.2	92.2	88.9
100	TC	1173	1075	1001
	SHC	666	834	960
	kW	99.4	95.1	91.6
105	TC	1146	1050	987
	SHC	655	828	945
	kW	102.4	97.9	96.4
115	TC	1092	999	1003
	SHC	633	804	946
	kW	108.2	103.3	100.1
120	TC	1063	996	926
	SHC	623	803	872
	kW	111.1	106.1	103.2

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

COOLING CAPACITIES (cont)

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9105 UNITS WITH STANDARD COIL

Temp (F) Air Entering Condenser		Evaporator Air Quantity — Cfm/BF														
		20,000/0.06			25,000/0.07			30,000/0.09			35,000/0.11			40,000/0.12		
		Evaporator Air — Ewb (F)														
		72	67	62	72	67	62	72	67	62	72	67	62	72	67	62
85	TC	1207	1095	995	1266	1154	1046	1311	1195	1087	1336	1226	1116	1358	1249	1138
	SHC	564	669	774	604	735	862	605	795	944	681	850	1020	714	903	1089
	kW	99.5	94.4	89.8	102.3	97.4	92.5	104.1	99.4	94.6	105.5	101.0	96.2	106.6	102.1	97.5
95	TC	1156	1050	950	1219	1102	999	1247	1142	1038	1274	1166	1063	1292	1186	1085
	SHC	543	649	754	551	712	840	661	773	920	659	825	994	690	904	1061
	kW	106.1	100.7	95.4	109.3	103.7	98.5	111.0	105.9	100.7	112.3	107.4	102.4	113.4	108.6	103.7
100	TC	1129	1024	927	1190	1075	975	1228	1111	1013	1255	1137	1035	1275	1156	1059
	SHC	532	638	739	539	701	829	577	760	908	609	815	981	641	893	1047
	kW	109.4	103.6	98.2	112.7	106.8	101.3	114.6	109.0	103.6	116.1	110.6	105.3	117.3	111.8	106.8
105	TC	1107	998	905	1161	1045	950	1195	1077	986	1217	1103	1009	1236	1124	1033
	SHC	481	625	729	531	714	816	566	770	895	597	807	966	630	859	1028
	kW	112.6	106.6	101.0	115.9	109.6	104.2	117.9	111.7	106.5	119.3	113.4	108.3	120.6	114.7	109.9
115	TC	1043	948	857	1093	992	899	1119	1023	931	1142	1050	953	1159	1070	983
	SHC	496	604	706	574	666	789	575	707	870	610	763	935	644	819	981
	kW	118.4	112.2	106.2	122.1	115.5	109.5	123.6	117.7	111.9	125.2	119.8	113.9	126.5	121.2	116.1
120	TC	1011	922	831	1068	959	870	1083	985	900	1105	1013	924	1118	1029	956
	SHC	510	569	693	498	657	779	564	712	855	599	749	917	629	807	954
	kW	121.3	115.0	108.6	125.2	117.9	112.0	126.7	120.3	114.4	128.4	122.4	116.7	129.6	123.7	119.1

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

Performance data (cont)

COOLING CAPACITIES (cont)

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9105 UNITS WITH HIGH-CAPACITY COIL

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF											
		21,000/0.030			25,750/0.036			30,500/0.042			35,250/0.048		
		Evaporator Air — Ewb (F)											
		72	67	62	72	67	62	72	67	62	72	67	62
85	TC	1313	1204	1100	1374	1261	1156	1419	1248	1196	1453	1333	1229
	SHC	633	738	833	677	808	926	720	850	1016	762	935	1100
	kW	103.2	98.5	93.9	105.8	101.0	96.3	107.7	110.0	98.2	109.2	104.0	99.7
95	TC	1260	1175	1055	1318	1208	1107	1359	1248	1144	1390	1276	1172
	SHC	610	724	813	655	784	905	697	850	992	738	912	1068
	kW	110.4	109.4	100.2	113.2	107.9	102.9	115.3	110.0	104.8	116.8	111.3	106.2
100	TC	1233	1129	1040	1288	1181	1091	1329	1219	1117	1356	1245	1144
	SHC	599	704	806	643	772	894	686	837	978	725	899	1057
	kW	113.8	108.4	104.7	116.7	111.2	107.9	118.8	113.2	107.9	120.2	114.7	109.4
105	TC	1214	1112	1006	1268	1153	1055	1309	1198	1089	1323	1214	1117
	SHC	591	696	788	635	760	877	678	829	965	714	886	1042
	kW	118.8	113.2	106.0	121.8	114.4	108.7	124.6	118.5	110.9	123.7	117.9	112.6
115	TC	1148	1049	976	1198	1095	1001	1230	1126	1033	1254	1151	1060
	SHC	565	667	775	608	735	855	649	798	935	686	861	1007
	kW	124.1	117.9	115.6	127.3	120.9	114.9	129.3	122.9	117.1	130.8	124.6	119.0
120	TC	1127	1022	930	1174	1065	984	1208	1094	1003	1219	1119	1032
	SHC	556	656	748	599	722	846	641	786	920	674	848	989
	kW	129.1	121.0	114.5	132.3	123.9	119.8	134.5	126.0	119.8	134.1	127.6	122.1

48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3, Z6,Z7,Z8,Z9105 UNITS WITH HIGH-CAPACITY COIL (cont)

Temp (F) Air Entering Condenser (Edb)		Evaporator Air Quantity — Cfm/BF		
		40,000/0.055		
		Evaporator Air — Ewb (F)		
		72	67	62
85	TC	1478	1372	1254
	SHC	800	1000	1171
	kW	110.2	106.4	100.9
95	TC	1413	1300	1197
	SHC	778	971	1138
	kW	117.8	112.5	107.6
100	TC	1378	1281	1168
	SHC	765	963	1130
	kW	121.1	118.2	110.5
105	TC	1357	1236	1142
	SHC	752	943	1105
	kW	127.0	119.2	113.9
115	TC	1276	1168	1091
	SHC	727	914	1043
	kW	132.1	125.7	121.1
120	TC	—	1135	1065
	SHC	—	904	1014
	kW	—	128.8	124.4

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb
Ewb — Entering Wet Bulb
kW — Compressor Motor Power Input
SHC — Sensible Heat Cap. (1000 Btuh)
TC — Total Cap. (1000 Btuh) Gross

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

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

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

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

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

3. SHC is based on 80 F edb temperature of air entering evaporator coil.
Below 80 F edb, subtract (corr factor x cfm) from SHC.
Above 80 F edb, add (corr factor x cfm) to SHC.

BF	ENTERING AIR DRY-BULB TEMP (F)					
	79	78	77	76	75	under 75
	81	*82*	*83*	*84*	*85*	*over 85*
	Correction Factor					
.05	1.04	2.09	3.14	4.18	5.22	Use formula shown below
.10	0.99	1.98	2.97	3.96	4.95	
.20	0.88	1.76	2.64	3.52	4.40	

Interpolation is permissible.
Correction Factor = 1.10 x (1 – BF) x (edb – 80).

4. Cooling capacities are gross and do not include deduction for indoor fan motor heat.

FAN PERFORMANCE — 48ZG,ZN030 AND 50ZG,ZN030 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	222	0.59	284	0.91	339	1.27	388	1.66	430	2.07	469	2.50	504	2.93	536	3.38
7,500	248	0.94	300	1.28	350	1.68	395	2.11	437	2.57	475	3.05	511	3.54	544	4.05
9,000	278	1.46	323	1.80	366	2.22	407	2.69	446	3.19	483	3.71	517	4.25	550	4.81
10,500	311	2.16	349	2.52	387	2.95	424	3.43	459	3.96	493	4.51	526	5.10	558	5.70
12,000	344	3.08	378	3.44	412	3.89	445	4.39	477	4.93	508	5.51	539	6.12	569	6.75
13,500	379	4.25	410	4.62	440	5.07	469	5.58	498	6.13	527	6.73	555	7.36	583	8.02
15,000	415	5.69	442	6.06	470	6.52	496	7.04	523	7.61	549	8.22	575	8.87	601	9.55

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	567	3.84	595	4.30	622	4.78	647	5.26	671	5.75	695	6.25	717	6.76	738	7.27
7,500	575	4.57	604	5.10	632	5.63	658	6.18	683	6.73	707	7.29	730	7.86	752	8.43
9,000	581	5.38	611	5.97	639	6.56	665	7.16	691	7.78	715	8.40	739	9.03	761	9.66
10,500	588	6.31	617	6.95	645	7.59	672	8.25	697	8.92	722	9.59	746	10.28	769	10.97
12,000	598	7.41	625	8.08	652	8.77	679	9.47	704	10.19	728	10.91	752	11.65	775	12.39
13,500	610	8.71	637	9.41	662	10.14	687	10.88	712	11.63	736	12.40	759	13.18	782	13.98
15,000	626	10.25	651	10.98	675	11.74	699	12.51	723	13.30	746	14.10	768	14.92	790	15.75

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	759	7.79	779	8.32	799	8.85	817	9.39
7,500	773	9.01	794	9.60	814	10.20	833	10.80
9,000	783	10.30	805	10.95	825	11.60	845	12.26
10,500	791	11.67	812	12.38	833	13.09	854	13.81
12,000	797	13.15	819	13.91	840	14.68	860	15.45
13,500	804	14.77	825	15.59	846	16.41	867	17.23
15,000	812	16.59	833	17.45	853	18.31	874	19.19

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 48ZG,ZN035 AND 50ZG,ZN035 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	246	0.84	301	1.19	352	1.58	398	2.01	440	2.46	479	2.93	514	3.40	547	3.90
8,000	266	1.14	315	1.50	362	1.92	406	2.37	447	2.85	484	3.35	519	3.87	552	4.39
10,000	310	1.98	350	2.36	389	2.80	427	3.30	464	3.83	499	4.38	532	4.96	564	5.55
12,000	357	3.20	390	3.60	424	4.06	457	4.58	489	5.15	520	5.74	551	6.36	580	7.01
14,000	406	4.87	435	5.28	463	5.76	492	6.30	520	6.89	548	7.52	576	8.18	603	8.86
15,000	430	5.89	458	6.31	485	6.80	511	7.35	538	7.95	564	8.59	590	9.26	616	9.96

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	577	4.40	606	4.91	633	5.43	659	5.95	684	6.49	707	7.03	730	7.58	752	8.14
8,000	583	4.94	612	5.49	640	6.05	666	6.62	691	7.19	715	7.78	738	8.37	760	8.97
10,000	594	6.16	623	6.79	651	7.42	677	8.07	703	8.73	727	9.39	751	10.06	774	10.74
12,000	609	7.67	636	8.36	663	9.05	689	9.77	714	10.49	738	11.22	762	11.97	785	12.72
14,000	629	9.57	655	10.30	680	11.04	704	11.81	728	12.59	751	13.38	774	14.18	796	14.99
15,000	641	10.69	666	11.44	690	12.20	714	12.99	737	13.79	760	14.61	782	15.44	804	16.28

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	773	8.70	793	9.27	813	9.85	832	10.43
8,000	782	9.57	802	10.18	823	10.80	842	11.43
10,000	796	11.42	817	12.11	838	12.81	858	13.52
12,000	807	13.48	828	14.25	849	15.02	869	15.80
14,000	818	15.82	840	16.66	860	17.50	880	18.35
15,000	825	17.13	846	18.00	866	18.87	886	19.76

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 48ZG,ZN040 AND 50ZG,ZN040 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	252	0.98	303	1.33	350	1.72	394	2.14	434	2.58	472	3.06	507	3.55	540	4.07
10,000	290	1.67	333	2.11	373	2.55	412	3.01	448	3.51	483	4.03	517	4.58	549	5.16
12,000	330	2.65	369	3.18	404	3.70	438	4.23	470	4.78	501	5.35	532	5.94	562	6.56
14,000	372	3.96	407	4.61	439	5.22	469	5.83	498	6.44	526	7.07	554	7.72	581	8.38
16,000	415	5.67	447	6.44	476	7.15	504	7.85	530	8.54	556	9.24	581	9.95	605	10.67
18,000	459	7.84	488	8.72	515	9.55	541	10.34	565	11.12	589	11.91	612	12.69	634	13.47
20,000	503	10.51	530	11.51	555	12.46	579	13.36	602	14.24	624	15.11	645	15.98	666	16.84

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	571	4.60	600	5.14	628	5.70	654	6.27	679	6.85	703	7.44	726	8.04	748	8.65
10,000	579	5.75	608	6.36	636	6.98	662	7.62	688	8.28	712	8.94	736	9.62	758	10.30
12,000	590	7.21	618	7.87	645	8.55	671	9.25	696	9.96	720	10.69	744	11.43	766	12.19
14,000	607	9.07	633	9.78	658	10.51	683	11.25	707	12.02	730	12.80	753	13.60	775	14.41
16,000	629	11.41	653	12.16	676	12.94	699	13.73	722	14.54	744	15.37	766	16.22	787	17.08
18,000	656	14.28	678	15.09	700	15.91	721	16.76	742	17.62	762	18.49	783	19.39	803	20.29
20,000	687	17.71	707	18.60	727	19.48	747	20.38	766	21.30	785	22.22	804	23.17	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	770	9.27	791	9.90	811	10.54	830	11.18
10,000	780	11.00	802	11.71	822	12.43	842	13.15
12,000	789	12.96	810	13.73	831	14.52	851	15.32
14,000	797	15.24	818	16.07	839	16.93	859	17.79
16,000	808	17.95	828	18.85	849	19.75	868	20.67
18,000	823	21.21	842	22.15	862	23.11	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 48ZG,ZN050 AND 50ZG,ZN050 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	276	1.34	323	1.73	366	2.15	407	2.60	445	3.08	482	3.58	516	4.11	549	4.66
10,000	296	1.74	339	2.17	379	2.62	418	3.09	454	3.59	489	4.12	522	4.68	554	5.26
12,000	339	2.76	376	3.29	411	3.81	445	4.35	477	4.91	509	5.49	539	6.09	568	6.71
14,000	382	4.15	416	4.79	448	5.40	478	6.01	506	6.63	535	7.26	562	7.92	589	8.60
16,000	427	5.96	458	6.71	487	7.42	514	8.11	540	8.81	565	9.52	590	10.23	615	10.97
18,000	473	8.26	501	9.12	527	9.93	552	10.72	576	11.50	600	12.29	623	13.08	645	13.88
20,000	519	11.10	545	12.06	570	12.99	593	13.88	615	14.76	637	15.63	658	16.50	679	17.38

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	579	5.23	608	5.81	636	6.41	662	7.02	687	7.64	712	8.27	735	8.91	757	9.57
10,000	584	5.85	613	6.47	641	7.10	667	7.74	692	8.40	717	9.07	740	9.75	763	10.44
12,000	597	7.36	625	8.03	651	8.72	677	9.42	702	10.14	726	10.88	750	11.63	772	12.39
14,000	615	9.29	641	10.01	666	10.74	690	11.50	714	12.27	738	13.06	760	13.87	783	14.69
16,000	639	11.71	663	12.48	686	13.27	709	14.07	731	14.89	753	15.73	775	16.58	796	17.45
18,000	667	14.69	689	15.51	711	16.35	732	17.20	753	18.07	773	18.96	793	19.86	813	20.78
20,000	699	18.25	719	19.14	739	20.04	759	20.95	778	21.88	797	22.82	816	23.77	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	779	10.23	800	10.90	821	11.58	840	12.27
10,000	785	11.14	806	11.85	826	12.57	846	13.30
12,000	794	13.16	816	13.94	836	14.73	857	15.54
14,000	804	15.52	825	16.37	846	17.22	866	18.10
16,000	817	18.34	837	19.24	857	20.15	877	21.08
18,000	833	21.71	853	22.66	872	23.62	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 48ZG,ZN055 AND 50ZG,ZN055 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	207	1.04	253	1.50	295	2.03	334	2.66	371	3.41	405	4.26	438	5.20	468	6.20
12,500	235	1.69	276	2.23	312	2.78	346	3.40	379	4.10	410	4.88	440	5.75	469	6.70
15,000	265	2.59	302	3.23	335	3.85	365	4.51	394	5.20	422	5.96	449	6.78	476	7.67
17,500	295	3.78	331	4.52	361	5.24	389	5.97	415	6.71	440	7.48	465	8.30	489	9.17
20,000	327	5.31	360	6.15	388	6.98	414	7.79	439	8.60	462	9.43	485	10.28	507	11.17
22,500	359	7.23	390	8.16	417	9.09	442	10.00	465	10.90	487	11.81	508	12.72	528	13.65
25,000	392	9.59	421	10.60	447	11.62	470	12.64	492	13.64	513	14.63	533	15.62	552	16.62

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	497	7.27	523	8.39	549	9.55	573	10.75	596	11.98	618	13.23	639	14.51	659	15.81
12,500	497	7.73	523	8.83	549	10.00	573	11.22	597	12.49	619	13.81	641	15.16	662	16.55
15,000	501	8.63	526	9.67	550	10.77	574	11.94	597	13.17	619	14.46	641	15.80	662	17.19
17,500	512	10.09	535	11.07	557	12.11	579	13.21	601	14.38	622	15.60	643	16.88	663	18.21
20,000	528	12.09	549	13.06	570	14.07	590	15.12	610	16.24	630	17.40	649	18.62	668	19.89
22,500	548	14.60	567	15.59	587	16.61	605	17.66	624	18.75	642	19.88	660	21.06	678	22.28
25,000	571	17.63	589	18.66	607	19.71	624	20.78	642	21.89	659	23.02	676	24.19	692	25.39

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	679	17.13	697	18.46	715	19.81	733	21.17
12,500	682	17.98	702	19.43	721	20.90	739	22.40
15,000	682	18.63	702	20.10	721	21.62	740	23.17
17,500	683	19.60	702	21.04	721	22.53	740	24.06
20,000	687	21.20	706	22.57	724	24.00	742	25.46
22,500	696	23.55	713	24.86	731	26.22	748	27.62
25,000	709	26.62	725	27.91	741	29.22	—	—

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 48ZG,ZN060 AND 50ZG,ZN060 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	234	1.54	276	2.03	312	2.57	348	3.20	382	3.93	415	4.74	446	5.63	476	6.58
15,000	271	2.65	309	3.27	341	3.88	370	4.53	399	5.24	428	6.04	455	6.91	482	7.85
18,000	308	4.22	344	5.00	374	5.73	400	6.46	426	7.22	450	8.02	474	8.88	498	9.81
21,000	348	6.36	380	7.29	408	8.18	434	9.04	457	9.88	479	10.74	501	11.64	522	12.58
24,000	390	9.19	417	10.24	444	11.29	469	12.29	491	13.27	512	14.23	532	15.21	551	16.20
27,000	433	12.80	456	13.93	481	15.14	504	16.30	526	17.44	546	18.53	565	19.62	583	20.71
30,000	476	17.29	497	18.50	519	19.82	541	21.15	562	22.45	581	23.70	599	24.93	617	26.14

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	504	7.56	530	8.57	555	9.61	578	10.66	600	11.73	621	12.81	641	13.91	660	15.01
15,000	509	8.87	535	9.95	559	11.07	583	12.25	606	13.45	628	14.68	650	15.95	670	17.23
18,000	521	10.79	544	11.85	567	12.97	590	14.14	612	15.38	633	16.66	654	17.99	675	19.36
21,000	543	13.56	563	14.60	583	15.69	603	16.84	623	18.05	643	19.31	662	20.63	682	21.99
24,000	570	17.22	588	18.28	607	19.39	625	20.53	642	21.72	660	22.95	678	24.24	695	25.58
27,000	601	21.81	618	22.93	635	24.07	651	25.25	667	26.46	684	27.70	700	28.98	715	30.31
30,000	634	27.34	650	28.56	666	29.78	681	31.02	696	32.28	711	33.56	726	34.88	—-	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	679	16.11	697	17.23	714	18.35	730	19.49
15,000	690	18.52	709	19.84	727	21.15	745	22.49
18,000	695	20.76	714	22.20	733	23.66	—	—
21,000	701	23.41	719	24.87	738	26.38	—	—
24,000	713	26.97	730	28.40	747	29.89	—	—
27,000	731	31.67	747	33.08	—-	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 48ZG,ZN070 AND 50ZG,ZN070 UNITS WITHOUT DISCHARGE PLENUM*

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	258	2.23	297	2.80	330	3.38	362	4.02	392	4.73	422	5.53	451	6.42	480	7.37
17,500	302	3.92	338	4.67	368	5.39	395	6.10	421	6.84	446	7.64	471	8.50	495	9.42
21,000	348	6.36	380	7.29	408	8.18	434	9.04	457	9.88	479	10.74	501	11.64	522	12.57
24,500	397	9.74	424	10.80	450	11.88	475	12.91	497	13.91	517	14.89	537	15.88	556	16.89
28,000	447	14.18	470	15.35	494	16.60	516	17.82	538	19.01	558	20.16	576	21.29	594	22.41
30,000	476	17.29	497	18.50	519	19.82	541	21.15	562	22.45	581	23.70	599	24.93	617	26.14

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	507	8.39	533	9.46	558	10.57	582	11.71	605	12.89	627	14.08	648	15.29	668	16.52
17,500	519	10.42	542	11.48	565	12.60	588	13.78	610	15.02	632	16.30	653	17.62	674	18.99
21,000	543	13.56	563	14.60	583	15.69	603	16.84	623	18.05	643	19.31	662	20.63	682	21.99
24,500	575	17.93	593	18.99	611	20.10	629	21.24	646	22.43	664	23.67	681	24.96	698	26.29
28,000	612	23.55	628	24.69	645	25.86	661	27.05	677	28.27	692	29.53	708	30.82	723	32.15
30,000	634	27.34	650	28.56	666	29.78	681	31.02	696	32.28	711	33.56	726	34.88	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	687	17.76	706	19.01	724	20.27	741	21.54
17,500	694	20.38	713	21.79	732	23.24	—	—
21,000	701	23.41	719	24.87	738	26.38	—	—
24,500	715	27.67	732	29.10	749	30.58	—	—
28,000	739	33.51	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

48/50ZN units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 50ZG,ZN030 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3030 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	255	0.95	313	1.35	364	1.82	411	2.35	454	2.92	494	3.52	530	4.14	563	4.78
7,500	291	1.51	340	1.93	386	2.41	428	2.94	468	3.51	505	4.13	541	4.78	574	5.46
9,000	330	2.28	372	2.73	413	3.22	451	3.76	487	4.34	522	4.96	555	5.61	587	6.30
10,500	371	3.28	408	3.76	444	4.28	479	4.84	512	5.43	544	6.06	574	6.71	604	7.40
12,000	413	4.56	447	5.07	479	5.61	510	6.19	540	6.80	570	7.44	598	8.11	626	8.80
13,500	456	6.12	487	6.66	516	7.23	544	7.83	572	8.46	599	9.12	626	9.81	651	10.51
15,000	500	7.99	528	8.58	555	9.18	581	9.80	606	10.45	631	11.13	656	11.83	680	12.56

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	594	5.43	623	6.09	651	6.75	676	7.41	701	8.08	725	8.75	747	9.42	769	10.10
7,500	605	6.16	635	6.88	664	7.62	691	8.36	716	9.11	741	9.88	765	10.64	787	11.41
9,000	617	7.02	646	7.76	674	8.52	702	9.31	728	10.11	753	10.93	777	11.76	800	12.60
10,500	633	8.12	660	8.86	687	9.64	713	10.43	739	11.25	764	12.09	788	12.95	811	13.82
12,000	652	9.52	679	10.27	704	11.04	729	11.84	753	12.66	777	13.50	800	14.37	823	15.26
13,500	676	11.25	701	12.00	725	12.78	748	13.58	771	14.40	794	15.24	816	16.11	838	16.99
15,000	703	13.30	726	14.07	749	14.86	771	15.66	793	16.49	814	17.34	835	18.20	856	19.09

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	789	10.77	809	11.45	829	12.13	848	12.81
7,500	809	12.18	830	12.96	851	13.73	870	14.51
9,000	823	13.44	844	14.29	866	15.15	886	16.01
10,500	833	14.71	856	15.61	877	16.52	898	17.44
12,000	845	16.16	867	17.08	888	18.01	—	—
13,500	859	17.90	880	18.82	—	—	—	—
15,000	876	20.00	896	20.92	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data Table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data Table for motor efficiency.

FAN PERFORMANCE — 50ZG,ZN035 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3035 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	285	1.35	337	1.78	384	2.26	428	2.80	469	3.38	507	4.00	542	4.66	576	5.34
8,000	311	1.81	358	2.25	402	2.75	442	3.29	481	3.87	517	4.50	551	5.16	584	5.86
10,000	367	3.04	406	3.52	443	4.05	479	4.61	512	5.21	545	5.84	576	6.51	606	7.21
12,000	426	4.74	459	5.26	491	5.82	522	6.42	552	7.05	581	7.70	609	8.38	637	9.09
14,000	486	6.98	515	7.55	543	8.15	570	8.78	597	9.44	623	10.12	649	10.83	674	11.55
15,000	517	8.33	544	8.92	570	9.54	596	10.18	621	10.85	646	11.55	671	12.27	694	13.01

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	607	6.03	637	6.74	665	7.46	691	8.18	717	8.91	741	9.65	764	10.39	786	11.13
8,000	615	6.58	645	7.32	673	8.07	700	8.84	726	9.62	751	10.41	775	11.20	797	12.00
10,000	636	7.94	664	8.70	691	9.48	717	10.29	743	11.11	768	11.96	792	12.82	815	13.69
12,000	663	9.83	689	10.59	715	11.38	739	12.19	764	13.03	787	13.88	810	14.76	833	15.66
14,000	698	12.31	722	13.08	745	13.88	768	14.69	791	15.53	813	16.39	834	17.27	856	18.17
15,000	718	13.78	741	14.56	763	15.36	785	16.19	807	17.03	828	17.90	849	18.78	869	19.69

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
7,000	807	11.88	828	12.62	848	13.37	867	14.12
8,000	819	12.80	841	13.61	861	14.42	881	15.23
10,000	837	14.57	859	15.47	881	16.37	—-	—
12,000	855	16.57	876	17.51	897	18.45	—	—
14,000	876	19.10	897	20.04	—	—	—	—
15,000	890	20.61	—	—	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 50ZG,ZN040 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3040 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	293	1.62	344	2.10	390	2.62	432	3.18	470	3.76	507	4.36	541	4.97	573	5.60
10,000	343	2.66	385	3.19	425	3.76	463	4.36	498	4.99	532	5.64	563	6.31	594	7.00
12,000	395	4.09	431	4.68	466	5.29	500	5.93	532	6.60	562	7.30	592	8.01	620	8.75
14,000	449	5.97	481	6.62	512	7.28	541	7.96	570	8.67	598	9.40	626	10.16	652	10.93
16,000	504	8.32	533	9.06	560	9.77	587	10.50	613	11.25	638	12.02	663	12.81	688	13.62
18,000	559	11.20	586	12.04	611	12.82	635	13.59	659	14.38	682	15.19	705	16.01	727	16.86
20,000	615	14.66	640	15.59	663	16.44	685	17.28	707	18.11	728	18.96	749	19.83	770	20.71

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	603	6.23	632	6.87	659	7.50	685	8.14	710	8.78	734	9.43	757	10.07	779	10.71
10,000	623	7.70	651	8.41	678	9.13	703	9.86	728	10.60	752	11.33	776	12.08	798	12.82
12,000	648	9.50	674	10.26	699	11.04	724	11.83	748	12.63	772	13.44	794	14.25	817	15.07
14,000	677	11.73	702	12.54	726	13.35	750	14.19	772	15.04	795	15.89	817	16.76	838	17.64
16,000	712	14.45	735	15.30	757	16.16	779	17.03	801	17.92	822	18.82	843	19.73	863	20.65
18,000	749	17.73	771	18.61	792	19.50	813	20.42	833	21.34	853	22.27	873	23.23	—	—
20,000	790	21.61	811	22.52	830	23.45	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
8,000	800	11.35	821	12.00	841	12.64	860	13.28
10,000	820	13.57	841	14.31	862	15.06	882	15.81
12,000	838	15.90	859	16.73	880	17.57	900	18.40
14,000	859	18.53	879	19.42	899	20.32	—	—
16,000	883	21.58	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 50ZG,ZN050 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3050 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	324	2.15	369	2.67	412	3.23	452	3.83	488	4.44	523	5.08	556	5.73	587	6.40
10,000	349	2.74	392	3.28	431	3.87	469	4.48	504	5.12	537	5.78	569	6.46	599	7.16
12,000	403	4.23	439	4.82	474	5.45	507	6.11	539	6.80	570	7.51	599	8.23	627	8.98
14,000	459	6.17	490	6.83	521	7.50	550	8.20	579	8.93	607	9.69	634	10.46	660	11.25
16,000	515	8.63	544	9.34	571	10.07	597	10.82	623	11.59	649	12.38	674	13.20	698	14.03
18,000	573	11.65	599	12.44	623	13.21	647	14.00	671	14.82	694	15.65	716	16.50	739	17.37
20,000	630	15.28	654	16.14	677	16.97	699	17.81	720	18.66	741	19.53	762	20.43	783	21.34

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	617	7.08	645	7.77	672	8.47	698	9.18	723	9.90	747	10.62	770	11.34	793	12.07
10,000	628	7.87	656	8.59	682	9.33	708	10.07	733	10.82	757	11.58	780	12.35	802	13.12
12,000	654	9.74	680	10.51	706	11.30	730	12.10	754	12.90	778	13.73	800	14.56	822	15.39
14,000	686	12.06	710	12.88	734	13.71	757	14.55	780	15.41	802	16.27	824	17.15	845	18.04
16,000	721	14.88	744	15.74	767	16.62	789	17.51	810	18.41	831	19.32	852	20.24	872	21.17
18,000	761	18.27	782	19.17	803	20.09	824	21.02	844	21.96	864	22.92	884	23.88	—	—
20,000	803	22.27	823	23.21	—	—	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
9,000	814	12.79	835	13.52	855	14.25	875	14.99
10,000	824	13.89	845	14.67	866	15.45	886	16.23
12,000	844	16.24	865	17.09	885	17.95	—	—
14,000	866	18.94	886	19.85	—	—	—	—
16,000	892	22.12	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 50ZG,ZN055 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3055 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	217	1.21	258	1.71	296	2.29	334	2.97	371	3.76	407	4.63	440	5.56	471	6.51
12,500	248	2.01	286	2.63	319	3.26	349	3.95	380	4.71	410	5.58	440	6.52	469	7.54
15,000	281	3.13	317	3.90	347	4.64	374	5.38	400	6.18	425	7.03	450	7.95	476	8.95
17,500	315	4.64	348	5.55	378	6.43	403	7.29	426	8.16	449	9.05	471	10.00	493	10.99
20,000	351	6.64	381	7.64	409	8.68	433	9.68	456	10.66	477	11.64	497	12.65	516	13.68
22,500	389	9.20	414	10.25	440	11.43	464	12.59	486	13.71	506	14.81	525	15.91	543	17.03
25,000	427	12.39	449	13.48	473	14.75	496	16.06	517	17.34	537	18.59	555	19.82	573	21.04

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	500	7.48	527	8.46	552	9.45	576	10.44	598	11.42	619	12.41	639	13.41	659	14.41
12,500	498	8.63	525	9.76	552	10.93	577	12.12	601	13.32	624	14.54	646	15.76	667	16.99
15,000	501	10.03	526	11.17	550	12.38	575	13.65	598	14.97	621	16.32	644	17.71	666	19.11
17,500	514	12.05	536	13.17	557	14.35	579	15.60	600	16.91	621	18.28	643	19.70	663	21.18
20,000	535	14.76	554	15.88	573	17.06	592	18.29	611	19.58	630	20.91	649	22.31	668	23.77
22,500	561	18.17	579	19.34	596	20.54	613	21.78	629	23.06	646	24.40	663	25.78	680	27.20
25,000	590	22.27	606	23.51	622	24.78	637	26.07	653	27.39	668	28.75	683	30.13	699	31.56

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	677	15.40	695	16.40	712	17.40	728	18.41
12,500	687	18.22	706	19.45	725	20.69	742	21.92
15,000	687	20.54	707	21.98	727	23.43	746	24.89
17,500	684	22.69	704	24.24	724	25.83	743	27.43
20,000	686	25.27	705	26.84	723	28.44	742	30.09
22,500	697	28.68	713	30.21	730	31.79	747	33.42
25,000	714	33.04	729	34.55	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 50ZG,ZN060 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3060 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	241	1.82	280	2.41	314	3.04	346	3.72	376	4.47	405	5.26	433	6.11	460	7.01
15,000	281	3.14	316	3.87	346	4.61	374	5.38	400	6.19	426	7.05	450	7.95	474	8.90
18,000	323	5.03	355	5.92	382	6.80	408	7.68	431	8.58	454	9.53	476	10.50	498	11.52
21,000	366	7.61	395	8.66	421	9.69	444	10.71	466	11.73	487	12.78	507	13.85	527	14.94
24,000	410	10.97	437	12.20	460	13.39	482	14.55	503	15.71	523	16.88	541	18.07	560	19.27
27,000	455	15.23	479	16.65	501	18.00	522	19.33	542	20.64	560	21.95	578	23.26	595	24.58
30,000	500	20.52	522	22.11	543	23.64	563	25.14	581	26.61	599	28.06	616	29.52	632	30.97

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	486	7.94	511	8.91	535	9.91	559	10.94	581	11.99	603	13.07	624	14.16	645	15.28
15,000	498	9.90	520	10.93	543	12.01	564	13.11	586	14.26	606	15.43	627	16.63	646	17.86
18,000	518	12.57	539	13.66	559	14.78	579	15.95	598	17.15	617	18.39	636	19.65	654	20.95
21,000	546	16.07	564	17.23	583	18.42	600	19.64	618	20.90	635	22.19	653	23.51	669	24.86
24,000	577	20.49	594	21.74	611	23.00	628	24.31	644	25.63	660	26.99	676	28.38	691	29.77
27,000	611	25.91	628	27.26	643	28.63	659	30.03	674	31.44	689	32.87	703	34.33	718	35.82
30,000	648	32.43	663	33.90	678	35.38	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
12,000	664	16.40	683	17.55	702	18.70	720	19.87
15,000	666	19.12	685	20.39	703	21.69	721	23.01
18,000	672	22.28	690	23.64	708	25.02	725	26.44
21,000	686	26.25	703	27.67	719	29.11	735	30.59
24,000	707	31.23	722	32.71	737	34.20	—	—
27,000	—	—	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 50ZG,ZN070 UNITS WITH DISCHARGE PLENUM AND 50Z2,Z3070 UNITS

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	268	2.64	304	3.32	335	4.02	364	4.76	391	5.55	418	6.39	444	7.27	468	8.20
17,500	316	4.67	348	5.54	376	6.39	402	7.25	426	8.14	449	9.06	472	10.03	493	11.03
21,000	366	7.61	395	8.66	421	9.69	444	10.71	466	11.73	487	12.78	507	13.85	527	14.94
24,500	417	11.61	444	12.87	467	14.09	489	15.28	509	16.47	529	17.66	547	18.86	565	20.08
28,000	470	16.88	493	18.35	515	19.77	536	21.15	555	22.51	573	23.87	590	25.22	607	26.59
30,000	500	20.52	522	22.11	543	23.64	563	25.14	581	26.61	599	28.06	616	29.52	632	30.97

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	493	9.17	516	10.19	539	11.24	562	12.33	583	13.45	605	14.60	625	15.77	645	16.96
17,500	515	12.07	535	13.14	556	14.26	576	15.42	595	16.61	615	17.84	634	19.09	652	20.39
21,000	546	16.07	564	17.23	583	18.42	600	19.64	618	20.90	635	22.19	653	23.51	669	24.86
24,500	583	21.32	600	22.59	616	23.87	633	25.18	649	26.53	664	27.89	680	29.29	695	30.71
28,000	623	27.96	639	29.35	655	30.75	670	32.18	685	33.63	699	35.09	—	—	—	—
30,000	648	32.43	663	33.90	678	35.38	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	665	18.18	684	19.42	703	20.68	721	21.95
17,500	671	21.70	689	23.05	706	24.42	724	25.82
21,000	686	26.24	703	27.67	719	29.11	735	30.59
24,500	711	32.17	726	33.65	741	35.16	—	—
28,000	—	—	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—

LEGEND

50ZN,Z3 units only.

Bhp — Brake Horsepower

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. See Component Pressure Drop data table before using Fan Performance tables.
3. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 UNITS WITH FORWARD-CURVED FAN*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	211	2.35	243	3.06	272	3.80	299	4.59	325	5.43	349	6.30	372	7.21	395	8.15
16,000	232	3.27	261	4.06	288	4.88	313	5.74	337	6.65	360	7.59	381	8.57	402	9.58
18,000	253	4.42	281	5.31	305	6.21	329	7.14	351	8.11	372	912	393	10.17	413	11.25
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	416	9.12	437	10.10	457	11.10	476	12.13	495	13.17	513	14.22	531	15.29	548	16.38
16,000	423	10.62	442	11.68	462	12.77	480	13.88	498	15.00	516	16.15	533	17.31	550	18.48
18,000	432	12.36	450	13.50	469	14.66	486	15.84	504	17.05	521	18.27	537	19.53	553	20.78
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Hp	Rpm	Hp	Rpm	Hp	Rpm	Hp
14,000	564	17.47	581	18.58	596	19.71	612	20.84
16,000	566	19.68	582	20.88	597	22.10	613	23.33
18,000	569	22.06	585	23.36	600	24.66	615	25.99
20,000	574	24.68	589	26.06	604	27.45	618	28.85
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06

LEGEND

48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

Carrier®

FAN PERFORMANCE — 48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9075 UNITS WITH AIRFOIL FAN*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.30		0.60		0.90		1.20		1.50		1.80		2.10		2.40	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	622	3.32	673	4.27	721	5.24	768	6.27	815	7.33	859	8.44	903	9.57	945	10.63
16,000	657	3.86	705	4.85	751	5.87	795	6.93	839	8.02	882	9.15	924	10.32	965	11.43
18,000	727	5.11	771	6.20	812	7.30	853	8.42	892	9.58	931	10.66	970	11.92	1008	13.22
20,000	798	6.60	838	7.80	876	8.98	913	10.18	950	11.31	985	12.59	1021	13.91	1056	15.28
22,000	870	8.37	907	9.66	942	10.83	977	12.14	1010	13.47	1043	14.83	1076	16.22	1108	17.65
24,000	942	10.42	977	11.73	1010	13.13	1042	14.54	1073	15.96	1103	17.40	1134	18.87	1163	20.37
26,000	1015	12.73	1047	14.26	1078	15.77	1108	17.28	1137	18.79	1166	20.32	1194	21.87	1222	23.44
28,000	1088	15.52	1118	17.15	1147	18.77	1176	20.38	1203	21.99	1230	23.61	1257	25.25	1283	26.90
30,000	1162	18.68	1190	20.43	1218	22.15	1244	23.87	1270	25.58	1296	27.29	1321	29.01	1345	30.75

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	2.70		3.00		3.30		3.60		3.90		4.20		4.50		4.80	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	985	11.83	1024	13.05	1062	14.29	1098	15.54	1132	16.80	1166	18.07	1199	19.34	1230	20.63
16,000	1004	12.68	1042	13.95	1079	15.24	1114	16.55	1149	17.86	1182	19.19	1215	20.52	1246	21.87
18,000	1045	14.54	1081	15.90	1116	17.28	1150	18.69	1184	20.11	1216	21.54	1248	22.99	1279	24.45
20,000	1090	16.67	1124	18.10	1157	19.56	1190	21.05	1222	22.56	1253	24.09	1284	25.63	1314	27.19
22,000	1140	19.11	1171	20.61	1202	22.14	1233	23.69	1263	25.28	1293	26.88	1323	28.51	1352	30.16
24,000	1193	21.90	1222	23.45	1252	25.04	1280	26.67	1309	28.31	1337	29.99	1365	31.69	1393	33.42
26,000	1250	25.04	1277	26.67	1304	28.33	1331	30.01	1358	31.72	1385	33.46	1411	35.22	1437	37.01
28,000	1309	28.57	1335	30.27	1360	32.00	1386	33.75	1411	35.52	1436	37.32	1461	39.15	1486	40.99
30,000	1370	32.50	1394	34.28	1418	36.08	1442	37.89	1466	39.74	1490	41.60	1513	43.49	1537	45.40

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	5.10		5.40		5.70		6.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
15,000	1261	21.92	1291	23.22	1320	24.52	1348	25.84
16,000	1276	23.22	1306	24.58	1335	25.95	1363	27.32
18,000	1309	25.92	1338	27.40	1367	28.88	1395	30.37
20,000	1343	28.77	1372	30.35	1400	31.94	1428	33.55
22,000	1380	31.82	1408	33.50	1435	35.20	1462	36.90
24,000	1420	35.16	1447	36.92	1473	38.70	1499	40.49
26,000	1463	38.82	1489	40.66	1514	42.51	1539	44.38
28,000	1510	42.87	1535	44.77	1559	46.69	1583	48.63
30,000	1560	47.34	1583	49.30	1606	51.28	1629	53.28

LEGEND

48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9090 UNITS WITH FORWARD-CURVED FAN*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	232	3.27	261	4.06	288	4.88	313	5.74	337	6.65	360	7.59	381	8.57	402	9.58
18,000	253	4.42	281	5.31	305	6.21	329	7.14	351	8.11	372	9.12	393	10.17	413	11.25
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24
32,000	414	21.36	431	22.99	448	24.59	464	26.17	479	27.75	494	29.32	508	30.90	523	32.49
34,000	437	25.39	454	27.13	470	28.84	485	30.53	500	32.20	514	33.87	528	35.55	542	37.23

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	423	10.62	442	11.68	462	12.77	480	13.88	498	15.00	516	16.15	533	17.31	550	18.48
18,000	432	12.36	450	13.50	469	14.66	486	15.84	504	17.05	521	18.27	537	19.53	553	20.78
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11
32,000	536	34.11	550	35.73	563	37.38	576	39.04	589	40.73	601	42.45	614	44.18	626	45.94
34,000	555	38.92	568	40.63	581	42.36	593	44.10	605	45.87	618	47.64	630	49.45	641	51.27

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
16,000	566	19.68	582	20.88	597	22.10	613	23.33
18,000	569	22.06	585	23.36	600	24.66	615	25.99
20,000	574	24.68	589	26.06	604	27.45	618	28.85
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06
32,000	638	47.72	650	49.51	662	51.33	674	53.17
34,000	653	53.12	665	54.98	676	56.87	—	—

LEGEND

48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

Carrier®

FAN PERFORMANCE — 48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9090 UNITS WITH AIRFOIL FAN*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.30		0.60		0.90		1.20		1.50		1.80		2.10		2.40	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	692	4.45	737	5.50	781	6.56	824	7.64	865	8.77	906	9.93	946	11.03	985	12.29
18,000	727	5.11	771	6.20	812	7.30	853	8.42	892	9.58	931	10.66	970	11.92	1008	13.22
20,000	798	6.60	838	7.80	876	8.98	913	10.18	950	11.31	985	12.59	1021	13.91	1056	15.28
22,000	870	8.37	907	9.66	942	10.83	977	12.14	1010	13.47	1043	14.83	1076	16.22	1108	17.65
24,000	942	10.42	977	11.73	1010	13.13	1042	14.54	1073	15.96	1103	17.40	1134	18.87	1163	20.37
26,000	1015	12.73	1047	14.26	1078	15.77	1108	17.28	1137	18.79	1166	20.32	1194	21.87	1222	23.44
28,000	1088	15.52	1118	17.15	1147	18.77	1176	20.38	1203	21.99	1230	23.61	1257	25.25	1283	26.90
30,000	1162	18.68	1190	20.43	1218	22.15	1244	23.87	1270	25.58	1296	27.29	1321	29.01	1345	30.75
32,000	1235	22.25	1262	24.12	1288	25.94	1313	27.76	1338	29.57	1362	31.38	1386	33.20	1409	35.02
34,000	1309	26.26	1335	28.23	1359	30.17	1383	32.09	1407	34.00	1430	35.91	1452	37.82	1475	39.73

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	2.70		3.00		3.30		3.60		3.90		4.20		4.50		4.80	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	1024	13.58	1061	14.90	1097	16.24	1132	17.59	1166	18.96	1199	20.35	1231	21.74	1262	23.14
18,000	1045	14.54	1081	15.90	1116	17.28	1150	18.69	1184	20.11	1216	21.54	1248	22.99	1279	24.45
20,000	1090	16.67	1124	18.10	1157	19.56	1190	21.05	1222	22.56	1253	24.09	1284	25.63	1314	27.19
22,000	1140	19.11	1171	20.61	1202	22.14	1233	23.69	1263	25.28	1293	26.88	1323	28.51	1352	30.16
24,000	1193	21.90	1222	23.45	1252	25.04	1280	26.67	1309	28.31	1337	29.99	1365	31.69	1393	33.42
26,000	1250	25.04	1277	26.67	1304	28.33	1331	30.01	1358	31.72	1385	33.46	1411	35.22	1437	37.01
28,000	1309	28.57	1335	30.27	1360	32.00	1386	33.75	1411	35.52	1436	37.32	1461	39.15	1486	40.99
30,000	1370	32.50	1394	34.28	1418	36.08	1442	37.89	1466	39.74	1490	41.60	1513	43.49	1537	45.40
32,000	1433	36.87	1456	38.72	1479	40.58	1501	42.48	1524	44.38	1546	46.32	1568	48.27	1591	50.25
34,000	1497	41.66	1519	43.60	1540	45.55	1562	47.52	1583	49.50	1605	51.50	1626	53.52	1647	55.56

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	5.10		5.40		5.70		6.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
17,000	1292	24.55	1322	25.97	1351	27.40	1379	28.83
18,000	1309	25.92	1338	27.40	1367	28.88	1395	30.37
20,000	1343	28.77	1372	30.35	1400	31.94	1428	33.55
22,000	1380	31.82	1408	33.50	1435	35.20	1462	36.90
24,000	1420	35.16	1447	36.92	1473	38.70	1499	40.49
26,000	1463	38.82	1489	40.66	1514	42.51	1539	44.38
28,000	1510	42.87	1535	44.77	1559	46.69	1583	48.63
30,000	1560	47.34	1583	49.30	1606	51.28	1629	53.28
32,000	1613	52.25	1635	54.27	1657	56.31	1678	58.37
34,000	1668	57.63	1689	59.70	1710	61.80	1730	63.93

LEGEND

48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — 48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9105 UNITS WITH FORWARD-CURVED FAN*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	275	5.83	301	6.82	324	7.81	346	8.82	366	9.86	386	10.94	406	12.05	425	13.20
22,000	298	7.53	321	8.62	343	9.70	364	10.80	383	11.92	402	13.07	420	14.25	438	15.46
24,000	320	9.55	342	10.75	363	11.93	383	13.11	401	14.31	419	15.54	436	16.79	453	18.07
26,000	343	11.91	364	13.22	384	14.50	402	15.78	420	17.07	437	18.37	453	19.70	469	21.05
28,000	367	14.65	386	16.06	405	17.45	422	18.83	439	20.20	455	21.59	471	23.00	486	24.43
30,000	390	17.78	408	19.31	426	20.80	443	22.28	459	23.75	474	25.24	489	26.73	504	28.24
32,000	414	21.36	431	22.99	448	24.59	464	26.17	479	27.75	494	29.32	508	30.90	523	32.49
34,000	437	25.39	454	27.13	470	28.84	485	30.53	500	32.20	514	33.87	528	35.55	542	37.23
36,000	461	29.92	477	31.77	492	33.58	506	35.38	521	37.16	534	38.93	548	40.69	561	42.47
38,000	485	34.96	500	36.91	514	38.85	528	40.74	542	42.63	555	44.50	568	46.36	581	48.23
40,000	509	40.54	523	42.61	537	44.65	550	46.66	563	48.64	576	50.62	589	52.59	601	54.56

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	1.8		2.0		2.2		2.4		2.6		2.8		3.0		3.2	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	443	14.38	460	15.58	478	16.82	495	18.07	511	19.35	527	20.65	543	21.98	559	23.32
22,000	455	16.70	472	17.98	489	19.28	505	20.60	521	21.96	536	23.33	551	24.72	566	26.14
24,000	470	19.38	486	20.72	501	22.08	517	23.48	532	24.89	547	26.34	561	27.80	576	29.29
26,000	485	22.43	500	23.83	515	25.27	530	26.73	544	28.22	559	29.72	573	31.26	586	32.81
28,000	501	25.89	516	27.36	530	28.86	544	30.38	558	31.94	572	33.51	585	35.11	599	36.74
30,000	518	29.76	533	31.32	546	32.89	560	34.48	573	36.10	586	37.74	599	39.41	612	41.11
32,000	536	34.11	550	35.73	563	37.38	576	39.04	589	40.73	601	42.45	614	44.18	626	45.94
34,000	555	38.92	568	40.63	581	42.36	593	44.10	605	45.87	618	47.64	630	49.45	641	51.27
36,000	574	44.25	586	46.03	599	47.85	611	49.67	623	51.51	634	53.37	646	55.25	657	57.14
38,000	593	50.10	605	51.98	617	53.87	629	55.77	640	57.71	652	59.63	663	61.59	674	63.54
40,000	613	56.52	625	58.49	636	60.48	648	62.46	659	64.47	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	574	24.68	589	26.06	604	27.45	618	28.86
22,000	581	27.57	596	29.04	610	30.51	624	31.99
24,000	590	30.80	604	32.33	617	33.88	631	35.44
26,000	600	34.39	613	35.99	627	37.61	640	39.24
28,000	612	38.38	624	40.05	637	41.74	650	43.44
30,000	624	42.81	637	44.54	649	46.29	661	48.06
32,000	638	47.72	650	49.51	662	51.33	674	53.17
34,000	653	53.12	665	54.98	676	56.87	—	—
36,000	669	59.06	680	60.98	—	—	—	—
38,000	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—

LEGEND

48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp x .746}}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

Performance data (cont)

FAN PERFORMANCE — 48ZG,ZN,ZT,ZW,Z6,Z8 AND 50ZG,ZN,ZT,ZW,ZX,ZZ,Z2,Z3,Z6,Z7,Z8,Z9105 UNITS WITH AIRFOIL FAN*

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	0.30		0.60		0.90		1.20		1.50		1.80		2.10		2.40	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	798	6.60	838	7.80	876	8.98	913	10.18	950	11.31	985	12.59	1021	13.91	1056	15.28
22,000	870	8.37	907	9.66	942	10.83	977	12.14	1010	13.47	1043	14.83	1076	16.22	1108	17.65
24,000	942	10.42	977	11.73	1010	13.13	1042	14.54	1073	15.96	1103	17.40	1134	18.87	1163	20.37
26,000	1015	12.73	1047	14.26	1078	15.77	1108	17.28	1137	18.79	1166	20.32	1194	21.87	1222	23.44
28,000	1088	15.52	1118	17.15	1147	18.77	1176	20.38	1203	21.99	1230	23.61	1257	25.25	1283	26.90
30,000	1162	18.68	1190	20.43	1217	22.15	1244	23.87	1270	25.58	1296	27.29	1321	29.01	1345	30.75
32,000	1235	22.25	1262	24.12	1288	25.94	1313	27.76	1338	29.57	1362	31.38	1386	33.20	1409	35.02
34,000	1309	26.26	1335	28.23	1359	30.17	1383	32.09	1407	34.00	1430	35.91	1452	37.82	1475	39.73
36,000	1383	30.73	1407	32.80	1431	34.85	1454	36.87	1476	38.89	1498	40.89	1520	42.90	1541	44.90
38,000	1457	35.67	1480	37.85	1503	40.00	1525	42.13	1546	44.24	1567	46.36	1588	48.46	1608	50.56
40,000	1532	41.12	1554	43.40	1575	45.65	1596	47.88	1616	50.10	1637	52.31	1657	54.51	1676	56.71

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)															
	2.70		3.00		3.30		3.60		3.90		4.20		4.50		4.80	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	1090	16.67	1124	18.10	1157	19.56	1190	21.05	1222	22.56	1253	24.09	1284	25.63	1314	27.19
22,000	1140	19.11	1171	20.61	1202	22.14	1233	23.69	1263	25.28	1293	26.88	1323	28.51	1352	30.16
24,000	1193	21.90	1222	23.45	1252	25.04	1280	26.67	1309	28.31	1337	29.99	1365	31.69	1393	33.42
26,000	1250	25.04	1277	26.67	1304	28.33	1331	30.01	1358	31.72	1385	33.46	1411	35.22	1437	37.01
28,000	1309	28.57	1335	30.27	1360	32.00	1386	33.75	1411	35.52	1436	37.32	1461	39.15	1486	40.99
30,000	1370	32.50	1394	34.28	1418	36.08	1442	37.89	1466	39.74	1490	41.60	1513	43.49	1537	45.40
32,000	1433	36.87	1456	38.72	1479	40.58	1501	42.48	1524	44.38	1546	46.32	1568	48.27	1591	50.25
34,000	1497	41.66	1519	43.60	1540	45.55	1562	47.52	1583	49.50	1605	51.50	1626	53.52	1647	55.56
36,000	1562	46.92	1583	48.94	1604	50.97	1624	53.02	1645	55.08	1665	57.15	1685	59.25	1705	61.35
38,000	1628	52.66	1648	54.78	1668	56.89	1688	59.02	1707	61.16	1727	63.31	1746	65.47	1765	67.65
40,000	1696	58.91	1715	61.10	1734	63.31	1752	65.52	1771	67.74	1790	69.97	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)							
	5.10		5.40		5.70		6.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
20,000	1343	28.77	1372	30.35	1400	31.94	1428	33.55
22,000	1380	31.82	1408	33.50	1435	35.20	1462	36.90
24,000	1420	35.16	1447	36.92	1473	38.70	1499	40.49
26,000	1463	38.82	1489	40.66	1514	42.51	1539	44.38
28,000	1510	42.87	1535	44.77	1559	46.69	1583	48.63
30,000	1560	47.34	1583	49.30	1606	51.28	1629	53.28
32,000	1613	52.25	1635	54.27	1657	56.31	1678	58.37
34,000	1668	57.63	1689	59.70	1710	61.80	1730	63.93
36,000	1725	63.48	1745	65.63	1765	67.79	1785	69.97
38,000	1784	69.85	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—

LEGEND

48/50ZN,ZW,ZZ,Z3,Z8,Z9 units only.

Bhp — Brake Horsepower

*If calculating static pressure for a 48 series unit, be sure to add gas heat pressure drop from Component Pressure Drop table.

NOTES:
1. Fan performance is based on wet coils and clean 2-in. filters.
2. For return fan (48Z6,Z8 and 50Z6,Z7,Z8,Z9) and high-capacity power exhaust (48ZT,ZW and 50ZT,ZW,ZX,ZZ) units, add component pressure drop for economizer. Do not add component pressure drop for power exhaust.
3. See Component Pressure Drop data table before using Fan Performance tables.
4. Conversion — Bhp to kW:

$$\text{Kilowatts} = \frac{\text{Bhp} \times .746}{\text{Motor efficiency}}$$

See Physical Data table for motor efficiency.

FAN PERFORMANCE — STANDARD CAPACITY POWER EXHAUST
(Size 030-050 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.20		0.40		0.60		0.80		1.00		1.20		1.40		1.60		1.80		2.00	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
6,000	380	0.95	468	1.47	543	2.01	612	2.60	676	3.24	738	3.92	796	4.64	852	5.39	905	6.17	956	6.98
8,000	440	1.69	523	2.40	591	3.08	651	3.77	706	4.49	759	5.23	810	6.01	859	6.82	907	7.66	953	8.53
10,000	504	2.73	582	3.68	647	4.55	703	5.38	754	6.22	802	7.06	847	7.92	891	8.80	933	9.70	975	10.52
12,000	575	4.17	643	5.33	705	6.42	760	7.45	809	8.44	854	9.41	896	10.38	937	11.27	976	12.29	—	—
14,000	650	6.09	708	7.42	766	8.73	819	9.97	867	11.05	910	12.22	951	13.38	990	14.53	—	—	—	—
16,000	729	8.57	778	10.02	829	11.43	879	12.93	926	14.37	969	15.76	—	—	—	—	—	—	—	—
18,000	809	11.57	851	13.19	896	14.90	942	16.61	987	18.29	—	—	—	—	—	—	—	—	—	—
20,000	891	15.47	927	17.22	967	19.08	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(Size 055-155 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
10,000	416	1.65	469	2.03	522	2.47	574	2.97	624	3.51	673	4.08	720	4.66	765	5.26	808	5.86	850	6.47
12,000	480	2.67	524	3.09	568	3.56	612	4.09	656	4.67	699	5.29	741	5.94	782	6.61	822	7.30	861	8.00
14,000	546	4.09	584	4.55	621	5.05	659	5.61	697	6.21	735	6.87	772	7.56	809	8.28	845	9.03	881	9.80
16,000	613	5.95	647	6.46	680	7.00	713	7.59	746	8.22	779	8.90	812	9.62	845	10.37	878	11.16	910	11.98
18,000	682	8.32	712	8.88	741	9.47	771	10.10	800	10.76	830	11.47	859	12.21	889	13.00	918	13.81	—	—
20,000	752	11.27	779	11.89	805	12.53	832	13.19	858	13.90	885	14.63	911	15.41	—	—	—	—	—	—
22,000	821	14.86	846	15.53	871	16.23	895	16.94	919	17.69	—	—	—	—	—	—	—	—	—	—
24,000	892	19.16	915	19.89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Bhp — Brake Horsepower

FAN PERFORMANCE — RETURN/EXHAUST FAN (48Z6,Z8 and 50Z6,Z7,Z8,Z9075-105 Units)

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	594	3.61	594	3.61	617	4.02	646	4.58	674	5.16	700	5.75	725	6.36	749	6.99	772	7.62	795	8.25
16,000	619	4.09	652	4.76	681	5.40	708	6.02	733	6.65	757	7.29	781	7.94	803	8.61	825	9.30	847	9.99
18,000	687	5.57	718	6.35	746	7.07	771	7.76	795	8.45	817	9.14	839	9.85	860	10.56	881	11.20	901	11.96
20,000	756	7.37	786	8.25	812	9.06	836	9.84	858	10.59	879	11.25	900	12.03	920	12.82	939	13.62	958	14.43
22,000	825	9.50	853	10.50	878	11.31	901	12.20	923	13.06	943	13.90	962	14.75	981	15.60	1000	16.46	1018	17.33
24,000	895	11.94	922	13.08	945	14.12	967	15.10	988	16.05	1007	16.99	1026	17.91	1044	18.83	1061	19.76	1079	20.69
26,000	965	14.94	990	16.21	1013	17.36	1034	18.46	1054	19.51	1073	20.53	1091	21.54	1108	22.54	1125	23.54	1141	24.54
28,000	1035	18.43	1059	19.81	1081	21.09	1101	22.29	1120	23.45	1138	24.57	1156	25.67	1172	26.76	1189	27.83	1204	28.91
30,000	1105	22.42	1128	23.93	1149	25.33	1169	26.65	1187	27.92	1205	29.14	1222	30.34	1238	31.51	1253	32.67	1269	33.83
32,000	1176	26.96	1198	28.59	1218	30.11	1237	31.55	1255	32.93	1272	34.26	1288	35.56	1304	36.83	1319	38.08	1333	39.32
34,000	1246	32.09	1267	33.83	1287	35.47	1305	37.03	1322	38.53	1339	39.97	1355	41.38	1370	42.75	1385	44.10	1399	45.43
36,000	1317	37.83	1337	39.69	1356	41.46	1374	43.14	1391	44.75	1407	46.31	—	—	—	—	—	—	—	—
38,000	1388	44.22	1407	46.21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

AIRFLOW (Cfm)	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)																			
	2.2		2.4		2.6		2.8		3.0		3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	816	8.89	836	9.52	856	10.15	874	10.67	892	11.31	910	11.94	926	12.57	942	13.19	958	13.80	973	14.42
16,000	867	10.59	887	11.31	907	12.05	926	12.78	944	13.52	961	14.25	978	14.98	995	15.71	1011	16.44	1026	17.16
18,000	921	12.74	940	13.52	959	14.33	977	15.13	995	15.95	1012	16.77	1029	17.59	1046	18.42	1062	19.24	1078	20.07
20,000	977	15.25	995	16.10	1013	16.96	1031	17.82	1048	18.70	1065	19.59	1081	20.49	1097	21.39	1113	22.30	1129	23.21
22,000	1035	18.21	1052	19.10	1069	20.01	1086	20.93	1103	21.86	1119	22.81	1135	23.76	1150	24.73	1166	25.71	1181	26.69
24,000	1095	21.62	1112	22.58	1128	23.54	1144	24.51	1159	25.49	1175	26.49	1190	27.50	1205	28.52	1220	29.55	1234	30.58
26,000	1157	25.54	1173	26.55	1188	27.57	1203	28.59	1218	29.64	1233	30.68	1247	31.74	1262	32.81	1276	33.89	1290	34.98
28,000	1220	29.98	1235	31.06	1249	32.14	1264	33.23	1278	34.32	1292	35.42	1306	36.53	1320	37.65	1334	38.78	1347	39.93
30,000	1283	34.98	1298	36.13	1312	37.28	1326	38.42	1340	39.58	1353	40.74	1367	41.92	1380	43.09	1393	44.27	1406	45.46
32,000	1348	40.55	1362	41.78	1375	43.00	1389	44.22	1402	45.45	1415	46.67	—	—	—	—	—	—	—	—
34,000	1413	46.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: The 48Z6,Z8 and 50Z6,Z7,Z8,Z9 units come standard with economizer and exhaust/return power exhaust.

Performance data (cont)

FAN PERFORMANCE — HIGH-CAPACITY POWER EXHAUST
(48ZT,ZW075-105 and 50ZT,ZW,ZX,ZZ)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	436	3.79	480	4.28	520	4.86	557	5.48	592	6.11
16,000	486	5.37	526	5.86	563	6.47	597	7.12	629	7.80
18,000	536	7.37	574	7.84	608	8.45	639	9.14	670	9.86
20,000	588	9.81	622	10.26	654	10.87	684	11.57	712	12.32
22,000	639	12.75	671	13.16	701	13.76	730	14.46	757	15.23
24,000	692	16.21	722	16.59	750	17.16	777	17.86	802	18.65
26,000	745	20.24	772	20.58	799	21.13	824	21.82	849	22.60
28,000	798	24.87	824	25.18	849	25.70	873	26.37	896	27.14
30,000	851	30.15	875	30.43	899	30.91	922	31.55	944	32.31
32,000	905	36.10	928	36.35	950	36.80	972	37.41	993	38.14
34,000	959	42.76	980	42.98	1001	43.40	1022	43.98	1042	44.69
36,000	1013	50.17	1033	50.37	1053	50.75	1072	51.30	1092	51.98
38,000	1067	58.36	1086	58.53	1105	58.89	1124	59.40	1142	60.05
40,000	1121	67.37	1139	67.52	1157	67.84	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	626	6.76	659	7.42	691	8.09	722	8.77	752	9.45
16,000	660	8.50	690	9.22	720	9.94	749	10.68	777	11.42
18,000	698	10.60	726	11.36	754	12.14	780	12.93	806	13.73
20,000	739	13.10	765	13.91	791	14.73	816	15.57	840	16.41
22,000	782	16.05	807	16.89	831	17.75	854	18.63	877	19.52
24,000	827	19.48	850	20.35	873	21.25	895	22.16	917	23.10
26,000	872	23.44	894	24.33	916	25.26	937	26.21	958	27.17
28,000	918	27.99	940	28.89	961	29.83	981	30.81	1001	31.81
30,000	965	33.15	986	34.06	1006	35.01	1026	36.00	1045	37.02
32,000	1013	38.98	1033	39.88	1053	40.84	1071	41.84	1090	42.88
34,000	1062	45.50	1081	46.39	1100	47.35	1118	48.36	1136	49.41
36,000	1111	52.77	1129	53.65	1147	54.59	1165	55.60	—	—
38,000	1160	60.81	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	2.2		2.4		2.6		2.8		3.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	782	10.14	811	10.83	839	11.53	866	12.23	892	12.93
16,000	805	12.18	832	12.93	858	13.69	884	14.46	910	15.23
18,000	832	14.53	858	15.35	882	16.17	907	16.99	931	17.82
20,000	864	17.27	888	18.14	911	19.01	934	19.89	957	20.78
22,000	900	20.43	922	21.34	944	22.26	966	23.20	987	24.14
24,000	938	24.04	959	25.00	980	25.98	1000	26.95	1020	27.94
26,000	979	28.17	998	29.16	1018	30.17	1037	31.20	1057	32.23
28,000	1020	32.83	1040	33.86	1058	34.91	1077	35.98	1095	37.05
30,000	1064	38.07	1082	39.14	1100	40.23	1118	41.33	1135	42.44
32,000	1108	43.95	1126	45.05	1143	46.16	1160	47.29	—	—
34,000	1153	50.49	1170	51.61	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	3.2		3.4		3.6		3.8		4.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
14,000	918	13.64	943	14.34	967	15.05	990	15.75	1013	16.46
16,000	934	16.00	959	16.77	983	17.55	1006	18.33	1029	19.11
18,000	955	18.66	978	19.50	1001	20.34	1024	21.19	1046	22.04
20,000	979	21.67	1001	22.57	1023	23.47	1045	24.38	1066	25.29
22,000	1008	25.08	1029	26.03	1050	26.99	1070	27.96	1090	28.92
24,000	1040	28.93	1060	29.94	1080	30.94	1099	31.96	1118	32.98
26,000	1075	33.27	1094	34.32	1113	35.37	1131	36.44	1149	37.51
28,000	1113	38.14	1131	39.23	1148	40.33	1166	41.44	—	—
30,000	1152	43.56	1169	44.69	—	—	—	—	—	—
32,000	—	—	—	—	—	—	—	—	—	—
34,000	—	—	—	—	—	—	—	—	—	—
36,000	—	—	—	—	—	—	—	—	—	—
38,000	—	—	—	—	—	—	—	—	—	—
40,000	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower

COMPONENT PRESSURE DROPS (in. wg)
(Size 030-050 Units)

COMPONENT	CFM							
	6,000	8,000	10,000	12,000	14,000	16,000	18,000	20,000
ECONOMIZER	0.06	0.09	0.12	0.16	0.21	0.25	0.29	0.35
INLET GUIDE VANES	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.10
FILTERS								
Pleated (2-in.)	0.01	0.01	0.01	0.02	0.04	0.04	0.03	0.02
Bags With Prefilters*	0.36	0.38	0.41	0.51	0.64	0.77	0.91	1.01
POWER EXHAUST	0.07	0.08	0.09	0.13	0.18	0.24	0.32	0.41
LOW GAS HEAT	0.04	0.09	0.27	0.45	0.68	0.91	1.17	1.45
HIGH GAS HEAT	0.13	0.21	0.31	0.50	0.73	1.02	1.32	1.64
ELECTRIC HEAT†								
36 kW	0.03	0.04	0.07	0.11	0.17	0.25	0.35	0.47
72 kW	0.03	0.06	0.12	0.18	0.25	0.35	0.46	0.64
108 kW	0.09	0.12	0.18	0.26	0.34	0.45	0.59	0.78
HIGH CAP COIL (040)	0.05	0.08	0.12	0.16	0.21	0.27	0.33	0.40
HIGH CAP COIL (050)	0.03	0.05	0.08	0.11	0.14	0.19	0.23	0.29

*Bag filter cfm limit is 25,000.
†Available on vertical return and discharge units only.

→ **(Size 055-070 Units)**

COMPONENT	CFM										
	10,000	12,000	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000
ECONOMIZER	0.05	0.07	0.08	0.10	0.12	0.14	0.16	0.19	0.21	0.24	0.26
INLET GUIDE VANES	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.15
FILTERS											
Pleated (2-in.)	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.04	0.04	0.05	0.05
Bags With Prefilters*	0.45	0.57	0.68	0.80	0.94	1.07	1.23	1.38	—	—	—
VERTICAL POWER EXHAUST	0.02	0.04	0.06	0.10	0.13	0.17	0.21	0.25	0.29	0.33	0.38
HORIZONTAL POWER EXHAUST*	0.12	0.16	0.21	0.27	0.34	0.41	0.49	0.58	0.68	0.78	0.89
LOW GAS HEAT	0.22	0.24	0.27	0.33	0.33	0.35	0.37	0.41	0.44	0.51	0.61
HIGH GAS HEAT	0.25	0.28	0.30	0.35	0.41	0.47	0.54	0.58	0.68	0.81	0.94
ELECTRIC HEAT†											
36 kW	0.04	0.05	0.07	0.09	0.12	0.15	0.18	0.21	0.24	0.28	0.33
72 kW	0.05	0.07	0.10	0.13	0.17	0.20	0.24	0.29	0.34	0.39	0.46
108 kW	0.07	0.09	0.13	0.17	0.22	0.27	0.32	0.38	0.44	0.51	0.59
HIGH CAP COIL (055)	0.05	0.07	0.09	0.12	0.14	0.17	0.21	0.24	0.28	0.32	0.37
HIGH CAP COIL (060,070)	0.03	0.05	0.06	0.08	0.10	0.13	0.15	0.18	0.21	0.25	0.28

*Bag filter cfm limit is 25,000.
†Available on vertical return and discharge units only.

→ **(Size 075-105 Units)**

COMPONENT	CFM											
	15,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000	34,000	36,000	38,000	40,000
ECONOMIZER*	0.10	0.12	0.14	0.16	0.19	0.21	0.23	0.26	0.31	0.34	0.37	0.40
INLET GUIDE VANES	0.04	0.05	0.06	0.08	0.10	0.11	0.13	0.15	0.20	0.22	0.24	0.27
VERTICAL POWER EXHAUST*	0.08	0.13	0.17	0.21	0.25	0.29	0.33	0.38	0.46	0.51	0.55	0.60
HORIZONTAL POWER EXHAUST*	0.24	0.34	0.41	0.49	0.58	0.68	0.78	0.89	1.13	1.26	1.40	1.55
LOW GAS HEAT	0.09	0.14	0.19	0.23	0.29	0.35	0.42	0.49	0.67	0.76	0.86	0.97
HIGH GAS HEAT	0.27	0.37	0.46	0.55	0.65	0.77	0.89	1.03	1.33	1.50	1.68	1.87
108 kW ELECTRIC HEAT†	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.20	0.26	0.29	0.32	0.36
216 kW ELECTRIC HEAT†	0.08	0.12	0.14	0.17	0.20	0.24	0.28	0.32	0.41	0.46	0.51	0.57
30% PLEATED FILTER	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.06	0.07
65% PLEATED FILTER	0.14	0.14	0.15	0.15	0.16	0.16	0.17	0.17	0.18	0.19	0.20	0.20
HIGH CAP COIL (075)	0.08	0.11	0.13	0.15	0.18	0.21	0.23	0.26	0.33	0.36	0.40	0.43
HIGH CAP COIL (090,105)	0.01	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.14	0.16	0.19	0.21

*The 48ZT,ZW and 50ZT,ZW,ZX,ZZ units come standard with economizer and high-capacity power exhaust.
†Available on vertical return and discharge units only.

NOTE: Power exhaust pressure drop does not need to be added to supply fan static pressure on return fan units (48Z6,Z8 and 50Z6,Z7,Z8,Z9075-105) and on high-capacity power exhaust units (48ZT,ZW and 50ZT,ZW,ZX,ZZ075-105).

Electrical data

Please refer to the *RTU*Builder software for the unit electrical data. The unit electrical data may also be found in the unit Installation Instructions.

SUPPLY FAN MOTOR LIMITATIONS (SIZES 030-070)

HIGH-EFFICIENCY MOTORS

Nominal		Maximum		Maximum Amps				Rated Efficiency
Bhp	BkW	Bhp	BkW	230 v	380 v	460 v	575 v	
7.5	5.60	8.7	6.49	22.0	—	—	—	84.1
		9.5	7.09	—	15.0	12.0	10.0	88.5
10	7.46	10.2	7.61	28.0	—	—	—	89.5
		11.8	8.80	—	20.7	14.6	12.0	89.5
15	11.19	15.3	11.41	43.8	—	—	-	91.0
		18.0	13.43	—	27.0	21.9	19.0	91.0
20	14.92	22.4	16.71	62.0	—	—	—	91.0
		23.4	17.46	—	37.4	28.7	23.0	91.0
25	18.65	28.9	21.56	72.0	—	—	—	91.7
		29.4	21.93	—	43.8	37.4	31.0	91.7
30	22.38	35.6	26.56	95.0	—	—	—	92.4
		34.7	25.89	—	N/A	48.0	47.0	92.4
40	29.80	42.0	31.30	N/A	N/A	55.0	N/A	93.0

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts

NOTES:
1. Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

PREMIUM-EFFICIENCY MOTORS

Nominal		Maximum		Maximum Amps		
Bhp	BkW	Bhp	BkW	230 v	460 v	Rated Efficiency
7.5	5.60	8.7	6.49	22.0	—	91.7
		9.5	7.09	—	12.0	91.7
10	7.46	10.2	7.61	28.0	—	91.7
		11.8	8.80	—	15.0	91.7
15	11.19	15.3	11.41	43.8	—	93.0
		18.0	13.43		21.9	93.0
20	14.92	22.4	16.71	58.2	—	93.6
		23.4	17.46	—	28.7	93.6
25	18.65	28.9	21.56	73.0	—	93.6
		29.4	21.93	—	36.3	93.6
30	22.38	35.6	26.56	82.6	—	93.6
		34.7	25.89	—	41.7	93.6
40	29.84	42.0	31.33	—	55.0	94.5

SUPPLY FAN MOTOR LIMITATIONS (SIZES 075-105)

HIGH-EFFICIENCY MOTORS

Nominal HP	BkW	Max Bhp	Max BkW	Max Amps		Rated Efficiency
				460 V	575 V	
30	22.4	34.7	25.9	48.0	47.0	92.4
40	29.8	42.0	31.3	55.0	48.8	93.0
50	37.3	57.5	42.9	71.0	52.8	93.0
60	44.8	69.0	51.5	82.6	60.5	93.6
75	59.5	86.25	64.3	99.5	N/A	94.1

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts

NOTES:
1. Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

PREMIUM-EFFICIENCY MOTORS

Nominal HP	BkW	Max Bhp	Max BkW	Max Amps		Rated Efficiency
				460 V	575 V	
30	22.4	34.7	25.9	48.0	N/A	93.6
40	29.8	42.0	31.3	55.0	N/A	94.5
50	37.3	57.5	42.9	71.0	N/A	94.5
60	44.8	69.0	51.5	75.0	N/A	95.4
75	59.5	86.25	64.3	95.5	N/A	95.4

HIGH-CAPACITY POWER EXHAUST SYSTEMS MOTOR LIMITATIONS

48ZT,ZW AND 50ZT,ZW,ZX,ZZ UNITS

HIGH-EFFICIENCY MOTORS						
Nominal HP	BkW	Max Bhp	Max BkW	Max Amps (ea)		Rated Efficiency
				460 V	575 V	
20	14.9	23.6	17.6	14.6	12.0	89.5
30	22.4	36.0	26.9	21.9	19.0	91.0
40	29.8	46.8	34.9	28.7	23.0	91.0
50	37.3	58.8	43.9	37.4	31.0	91.7
60	44.8	69.0	51.5	48.0	47.0	92.4
PREMIUM-EFFICIENCY MOTORS						
Nominal HP	BkW	Max Bhp	Max BkW	Max Amps (ea)		Rated Efficiency
				460 V	575 V	
20	14.9	23.6	17.6	15.0	N/A	91.7
30	22.4	36.0	26.9	21.9	N/A	93.0
40	29.8	46.8	34.9	28.7	N/A	93.6
50	37.3	58.8	43.9	36.3	N/A	93.6
60	44.8	69.0	51.5	41.7	N/A	93.6

LEGEND

Bhp — Brake Horsepower
BkW — Brake Kilowatts

NOTES:
1. Extensive motor and electrical testing on the Carrier units has ensured that the full horsepower range of the motor can be utilized with confidence. Using your fan motors up to the horsepower ratings shown in the Motor Limitations table will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
2. All motors comply with Energy Policy Act (EPACT) Standards effective October 24, 1997.

MAIN CONTROL BOARD (MBB) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
IGCIFO	IGC IFO input	Switch Input	DI1	J6, 3-4
FSD	Fire Shutdown Switch	Switch Input	DI2	J6, 5-6
G	Thermostat 'G' Input	Switch Input	DI3	J7, 1-2
W2	Thermostat 'W2' Input	Switch Input	DI4	J7, 3-4
W1	Thermostat 'W1' Input	Switch Input	DI5	J7, 5-6
Y2	Thermostat 'Y2' Input	Switch Input	DI6	J7, 7-8
Y1	Thermostat 'Y1' Input	Switch Input	DI7	J7, 9-10
CSB_A1	Compressor A1 Lockout — Current Sensor Board	Digital Input	DIG1	J9, 10-12
CSB_B1	Compressor B1 Lockout — Current Sensor Board	Digital Input	DIG2	J9, 7-9
CSB_A2	Compressor A2 Lockout — Current Sensor Board	Digital Input	DIG3	J9, 4-6
CSB_B2	Compressor B2 Lockout — Current Sensor Board	Digital Input	DIG4	J9, 1-3
DP_A	Discharge Pressure Circuit A	Pressure Transducer	AN1	J8, 21-23
DP_B	Discharge Pressure Circuit B	Pressure Transducer	AN2	J8, 24-26
SP_A	Suction Pressure Circuit A	Pressure Transducer	AN3	J8, 15-17
SP_B	Suction Pressure Circuit B	Pressure Transducer	AN4	J8, 18-20
RAT	Return Air Temperature	10 K Thermistor	AN5	J8, 9-10
SAT	Air Temperature Leaving Supply Fan	10 K Thermistor	AN6	J8, 11-12
OAT	Outside Air Temperature	10 K Thermistor	AN7	J8, 13-14
SPT	Space Temperature	10 K Thermistor	AN8	J8, 1-2
SPTO	Space Temperature Offset	10 K Thermistor	AN9	J8, 3-4
IAQ, IAQMINOV	IAQ Input	4-20 ma	AN10	J8, 5-6
FLTS	Filter Status Switch	Switch Input	AN11	J8, 7-8
OUTPUTS				
CMPB2	Compressor B2	Relay	RLY 1	J10, 20-21
CMPB1	Compressor B1	Relay	RLY 2	J10, 22-23
CMPA2	Compressor A2	Relay	RLY 3	J10, 24-25
CMPA1	Compressor A1	Relay	RLY 4	J10, 26-27
CONDFANB	Condenser Fan Circuit B	Relay	RLY 5	J10, 10-11
CONDFANA	Condenser Fan Circuit A	Relay	RLY 6	J10, 12-13
HS2	Heat Stage 2	Relay	RLY7	J10, 14-16
HS1	Heat Stage 1	Relay	RLY 8	J10, 17-19
PE1	Power Exhaust #1 (MPE/PR)	Relay	RLY 9	J10, 4-6
SFAN	Indoor Fan (VAV)/Supply Fan (CV)	Relay	RLY 10	J10, 7-9
ALRM	Alarm Relay	Relay	RLY 11	J10, 1-3

ROOFTOP CONTROL BOARD (RCB) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
RMTIN	Remote Occupancy Switch	Switch Input	DI1	J4, 1-2
ENTH	Outdoor Enthalpy Switch	Switch Input	DI2	J4, 3-4
SFS	Fan Status Switch	Switch Input	DI3	J4, 5-6
CIRCAHPS	Compressor A1 HPS Feedback	Switch Input	DI4	J4, 7-8
CIRCBHPS	Compressor B1 HPS Feedback	Switch Input	DI5	J4, 9-10
FRZ	Hydronic Heat Freeze Stat	Switch Input	DI6	J4, 11-12
BP	Building Pressure	Pressure Transducer	AN1	J5, 1-3
SP	Supply Duct Pressure	Pressure Transducer	AN2	J5, 4-6
CCT	Air Temp Leaving Evaporator Coil	10 K Thermistor	AN3	J6, 1-2
Not Used	—	—	AN4	J6, 3-4
Not Used	—	—	AN5	J6, 5-6
Not Used	—	—	AN6	J6, 7-8
OUTPUTS				
SFAN_VFD	Supply Fan VFD Speed	4 - 20 ma	AO1	J9, 1-2
PULSCFAB	Pulsed Condenser Fan AB	Digital	PP/MP	J7, 1-3
UNL_1_A1	Unloader A1 (VAV)	Relay	RLY1	J8, 1-3
UNL_2_A1	Unloader A2 (VAV)	Relay	RLY 2	J8, 4-6
PE2/ HIR	Power Exhaust 2 (CV) — HIR (VAV)	Relay	RLY 3	J8, 7-9
UNL_1_B1	Unloader B1 (VAV)	Relay	RLY 4	J8, 10-12
HUMIDRLY	Humidifier Relay	Relay	RLY 5	J8, 13-15
UNL_2_B1	Unloader B2 (VAV)	Relay	RLY 6	J8, 16-18

ECONOMIZER CONTROL BOARD (ECB) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
PPS	Plenum Pressure Switch	Switch Input	DI1	J4, 1-2
Not Used	—	—	DI2	J4, 3-4
Not Used	—	—	DI3	J4, 5-6
Not Used	—	—	DI4	J4, 7-8
Not Used	—	—	DI5	J4, 9-10
Not Used	—	—	DI6	J4, 11-12
SACFM	Supply Air CFM 4-20	Pressure Transducer	AN1	J5, 1-3
RACFM	Return Air CFM 4-20	Pressure Transducer	AN2	J5, 4-6
Not Used	—	—	AN3	J6, 1-2
Not Used	—	—	AN4	J6, 3-4
Not Used	—	—	AN5	J6, 5-6
Not Used	—	—	AN6	J6, 7-8
OUTPUTS				
EFAN_VFD	Building Pressure VFD Speed	4 - 20 ma	AO1	J9, 1-2
Not Used	—	—	PP/MP	J7, 1-3
PE2_VFD	Power Exhaust 2	Relay	RLY1	J8, 1-3
Not Used	—	—	RLY 2	J8, 4-6
Not Used	—	—	RLY 3	J8, 7-9
Not Used	—	—	RLY 4	J8, 10-12
Not Used	—	—	RLY 5	J8, 13-15
Not Used	—	—	RLY 6	J8, 16-18

CONTROLS EXPANSION MODULE (CEM) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
Not Used	—	—	DI 1	J7, 1-2
DMD_SW1	Demand Limit 1 — Redline	Switch	DI 2	J7, 3-4
DMD_SW2	Demand Limit 2 — Loadshed	Switch	DI 3	J7, 5-6
PRES	Pressurization	Switch	DI 4	J7, 7-8
EVAC	Evacuation	Switch	DI 5	J7, 9-10
PURG	Purge	Switch	DI 6	J7, 11-12
IAQIN	IAQ Switch	Switch	DI 7	J7, 13-14
OACFM	Outside Air CFM — 4-20 (VAV)	4 - 20 ma	AN7	J6, 1-3
OARH	Outside Air RH (VAV)	4 - 20 ma	AN8	J6, 4-6
SPRH	Space RH	4 - 20 ma	AN9	J6, 7-9
RARH	Return Air RH	4 - 20 ma	AN10	J6, 10-12
DMDLMTMA	Demand Limit — 4-20	4 - 20 ma	AN1	J5, 1-2
SATRESMA	SAT Reset 4-20 (VAV)	4 - 20 ma	AN2	J5, 3-4
OAQ	OAQ — 4-20	4 - 20 ma	AN3	J5, 5-6
Not Used	—	—	AN4	J5, 7-8
Not Used	—	—	AN5	J5, 9-10
Not Used	—	—	AN6	J5, 11-12

STAGED GAS CONTROL BOARD (SCB) INPUTS AND OUTPUTS

POINT NAME	POINT DESCRIPTION	TYPE OF I/O	I/O POINT NAME	CONNECTOR PIN NO.
INPUTS				
LIMSWTMP	Limit Switch Temp	10 K Thermistor	AN1	J5, 1-3
LAT1SGAS	Supply Air Temp #1	10 K Thermistor	AN2	J5, 4-6
LAT2SGAS	Supply Air Temp #2	10 K Thermistor	AN3	J5, 7-9
LAT3SGAS	Supply Air Temp #3	10 K Thermistor	AN4	J5, 10-12
Not Used	—	—	AN5	J5, 13-15
Not Used	—	—	AN8	J6, 1-3
Not Used	—	—	AN7	J6, 4-6
Not Used	—	—	AN6	J6, 7-9
Not Used	—	—	AN9	J7, 1-2
Not Used	—	—	AN10	J7, 3-4
OUTPUTS				
Not Used	—	—	AO1	J8, 1-2
Not Used	—	—	AO2	J8, 3-4
HS3	Relay 3 W1 Gas Valve 2	Relay	RLY1	J9, 1-3
HS4	Relay 4 W2 Gas Valve 2	Relay	RLY 2	J9, 4-6
HS5	Relay 5 W1 Gas Valve 3	Relay	RLY 3	J9, 7-9
HS6	Relay 6 W2 Gas Valve 3	Relay	RLY 4	J9, 10-12
Not Used	—	—	RLY 5	J9, 13-15

Application data

General

The Z series units equipped with *Comfort*Link™ controls are designed with state-of-the-art features and benefits. Some features are a function of the base unit, and some are a function of the *Comfort*Link controls. Many of these features and benefits are standard, and additional applications and functions can be achieved through the purchase of options and/or accessories. The appropriate applications are described in this section.

Base unit applications

Integrated economizer — The factory-installed integrated economizer (option on 48ZG,ZN030-105 and 50ZG,ZN,Z2,Z3030-105 units, standard on 48ZT,ZW,Z6, Z8075-105 and 50ZT,ZW,ZX,ZZ,Z6,Z7,Z8,Z9075-105 units) provides ventilation of the conditioned space with outdoor air, as well as economical cooling through the use of outdoor air instead of mechanical cooling whenever possible. When the outdoor air enthalpy is appropriate for cooling, but outdoor air alone cannot provide enough cooling for the space, outdoor air will be used as the first stage of cooling, with mechanical cooling stages added as needed (there are 2 to 11 stages available per unit). During the first stage of mechanical cooling, the economizer will modulate or trim to meet the leaving air temperature set point. This will prevent the mechanical cooling from cycling on and off causing the supply-air temperature to fluctuate.

The economizer can be configured to operate by several control means:

Outdoor air enthalpy changeover — Economizer operation is enabled if the outdoor air enthalpy is below the user set point. Unit-mounted enthalpy switch is a standard feature.

Differential enthalpy based on external control and sensor — Economizer operation is enabled if the outdoor enthalpy value is less than the enthalpy value in the return air. Requires field-installation of an accessory return air enthalpy sensor.

Differential enthalpy changeover based on enthalpy calculation — Economizer operation is locked out whenever the outdoor air enthalpy is greater than the return air enthalpy. This feature also includes dew point lockout. Requires Controls Expansion Module (CEM) option or accessory plus accessory outdoor air and return air humidity sensors.

Indoor Air Quality (IAQ) monitoring and ventilation control are available on the base unit when equipped with the economizer option, by installing and connecting a Space or Return Duct CO_2 sensor.

With the addition of the CEM (factory-option or accessory), Outdoor Air Quality monitoring and true differential IAQ can be applied. See Controls Expansion Module section on page 98 for more information.

Supply duct pressure/fan modulation (IGV and VFD) — It is desirable on most VAV applications to maintain a constant static pressure in the supply duct which helps avoid unacceptable noise levels in the duct and at the room terminals. Maintaining constant duct pressure is accomplished with supply fan modulation systems. In addition to reducing the noise levels, supply fan modulation systems contribute to reduced operating costs at part-load operation as supply fans require less input power when operating at constant duct static pressure at reduced airflow rates.

The 48/50Z units offer two different factory-installed supply fan regulation systems for use on VAV applications: inlet guide vanes (IGV) or variable frequency drives (VFD). Units with airfoil fan option are available with VFD only. Both options manage the supply fan operation to maintain a user-established duct pressure set point in the unit's supply duct. Both options rely on the control algorithms in the *Comfort*Link control system to sense the current status of the supply duct static pressure and to direct the IGV or VFD to change position or speed to bring actual static pressure back to user configured set point. Both options use a factory-installed pressure transducer to sense duct pressure (via a 4 to 20 mA input signal). The IGV position is dictated by the unit control communicating to the electronic IGV actuator. The VFD receives a 4 to 20 mA signal from the unit control dictating supply fan motor speed.

The 48/50Z units with *Comfort*Link controls also provide the capability of Duct Pressure Reset. Duct Pressure Reset provides a dynamic calculation for duct pressure set point based on the current air terminal damper position of all connected terminals, to allow for the minimum duct pressure possible, for maximum energy savings in supply fan motor operation. A CCN application with ComfortID™ air terminals is required to implement this function.

Modulating power exhaust — The unit-mounted power exhaust systems are used to maintain space pressure at user-established set points by exhausting excess air from within the occupied space to the outside. Capacity of the power exhaust systems is modulated to exhaust only enough air to maintain the interior space at the desired pressure level. Modulating power exhaust fans run only when the space pressure demands their operation and they handle only the amount of exhaust air required to maintain the desired space pressure set point. (Compare power exhaust fans to return fans used for space pressure control which must run at all times with the supply fan and which must be sized for the design return air quantity.)

There are two modulating power exhaust (MPE) systems available on these rooftop units — the optional MPE (available on all sizes) and the high-capacity MPE (available on sizes 075-105 only). Each system uses dual belt-driven centrifugal fans with independent operation of each fan.

The optional modulating power exhaust system is available as a factory-installed option on 48/50ZG,ZN030-105 (bottom return) units and on 50Z2,Z3055-105 horizontal return units. On sizes 030-050, this option has a nominal capacity of 20,000 cfm. On sizes 055-105, this option has a nominal exhaust capacity of 24,000 cfm. The MPE uses parallel operation of modulating position discharge dampers in the outlet of each exhaust fan. Space pressure is monitored by a differential pressure transducer and the unit control. The outlet damper positions are determined by algorithms in the *Comfort*Link controls.

NOTE: The optional factory-installed economizer is required for this option.

The high-capacity modulating power exhaust system is a standard feature on 48/50ZT,ZW (bottom return) and 50ZX,ZZ (horizontal/side return) units. This system is rated to 40,000 cfm. Operation of this system is a combination modulating/staged control, with capacity of exhaust fan no. 1 being managed by a variable frequency drive responding to commands from the *Comfort*Link™ controls, and fan no. 2 being staged on and off according to VFD outlet level. Space pressure is monitored by a differential pressure transducer.

Barometric relief — The barometric relief package (factory-installed option or field-installed accessory on 48/50ZG,ZN030-105 and 50Z2,Z3055-105 units only) prevents overpressurization of the conditioned space.

NOTE: The optional factory-installed economizer is required with this option or accessory.

Return fan — The return fan is a standard feature on 48Z6,Z8075-105 and 50Z6,Z7,Z8,Z9075-105 units. The return fan will run at the same time as the unit's supply fan. The primary function of the return fan is to handle the static pressure losses in the return duct (thus reducing the design static pressure load on the unit's supply fan). The return fan is also a component of the Building Pressure control function on these units.

When determining the performance of the supply fan and the return fan on these units, it is necessary to have separate design conditions for each duct system (i.e., designer must specify the design airflow rate for the return duct and the supply duct separately with corresponding duct static pressure requirements). Using these design conditions, enter the fan performance data tables (or use the Carrier E20-II® RTUBuilder program) and determine required fan wheel speed, fan power and fan motor size. Do not add the return duct static pressure loss to the supply duct static pressure loss when selecting the supply fan performance. (Do not add a component loss for "power exhaust" to either the supply fan selection static pressure value or to the return fan selection static pressure value. This is already accounted for in the performance data for the return fan system.)

Hot gas bypass — The factory-installed hot gas bypass option prevents short cycling of the compressor at low load conditions. The 48/50Z VAV units include, as standard, the maximum number of stages of unloading possible, which are controlled electronically. In applications where there is the potential for loads beneath the minimum unloading capability of the unit, the compressor would need to be cycled often to meet the low load. The hot gas bypass option prevents this from happening by providing additional unloading capability for the unit.

NOTE: When hot gas bypass is used, the lead/lag compressor feature should be disabled.

Staged gas control — The Staged Gas Control function provides a means to temper cool mixed air without requiring a full demand heating sequence. Increments of unit heating capacity are energized to maintain a user-established mixed-air temperature level into the supply duct. The available set point range for tempering mode is 35 to 70 F. On VAV applications, select a set point that will maintain a supply duct temperature consistent with the reheat capacities of the space terminals. Typical set point values will be 45 to 50 F — slightly below the cooling Supply Air Set Point value. Lower set point values will reduce the amount of heating required by the space but may also cause occupant complaints about drafts during low outdoor ambient periods.

On VAV applications, tempering mode operation will not require that the space terminals be commanded to open to Minimum Heating CFM positions. However, either space demand heat mode (Heat1 or Heat2) will require that space terminals be open to Minimum Heating CFM positions. Use the HIR relay function to provide this signal to the terminals.

Rooftop unit-based heating is not a substitute for adequate space terminal reheat methods on VAV applications. Demand heating systems on rooftop units are constant volume systems and require that wide areas of the occupied space be heated during all demand heating sequences. Reserve rooftop unit-based heating systems for unoccupied and morning warm-up heating functions and for tempering heat requirements only.

Premium-efficiency evaporator fan motor — The premium-efficiency fan motors reduce electric consumption because they consume less electrical power, while delivering the same horsepower. Further, the premium high-efficiency fan motors may qualify for rebates from the local utility company.

Space temperature averaging — Space temperature monitoring (including automatic Supply Air Set Point Reset on VAV units) can be done with only a single space temperature sensor. Wide areas typical of Variable Air Volume applications may require averaging of multiple space temperature sensors to determine a more accurate average space temperature. Use either 4 or 9 sensors.

NOTE: Only Carrier Type T-55 sensors may be used (part no. 33ZCT55SPT). Sensors must be used in multiples of 1, 4 and 9 only, with total sensor wiring not to exceed 1000 ft.

Condenser coil protection — Proper coil option is recommended for products applied in corrosive environments. These options include:

Pre-coated aluminum-fin coils have a durable epoxy-phenolic coating applied to the fin prior to the fin stamping process to provide protection in mildly corrosive coastal and industrial environments. Pre-coated coils have an inert barrier between the aluminum fin and copper tube. This barrier electrically disconnects the dissimilar metals to minimize the potential for galvanic corrosion. This economical option provides substantial corrosion protection beyond the standard uncoated coil construction.

Copper-fin coils provide increased corrosion resistance in severe coastal environments where industrial air pollution is not present. All copper coils eliminate bi-metallic construction to eliminate the potential for galvanic corrosion. Application in industrial environments is not recommended due to potential attack from sulfur, sulfur oxide, nitrogen

oxides, carbon, and several other industrial airborne contaminants. In moderate seacoast environments, copper-fin coils have extended life compared to standard or pre-coated aluminum-fin coils.

E-coated aluminum-fin coils have an extremely flexible and durable epoxy coating uniformly applied to all coil surfaces. Unlike brittle phenolic dip and bake coatings, E-coat provides superior protection with unmatched flexibility, edge coverage, metal adhesion, thermal performance and most importantly, corrosion resistance. E-coated coils provide this protection since all coil surfaces are completely encapsulated from environmental contamination. Specify E-coated aluminum-fin coils for industrial environments with high levels of air pollution. This option also provides better protection compared to standard or pre-coated aluminum-fin coils in industrial environments.

E-coated copper-fin coils have the same flexible and durable epoxy coating as E-coated aluminum-fin coils. However, this option combines the natural salt and environmental resistance of all-copper construction with the highest level of corrosion protection. Specify E-coated copper-fin coils in the harshest combination of coastal and industrial environments.

*Comfort*Link™ controls

Scrolling Marquee Display (STDU, for Standard Tier Display Unit) — The Scrolling Marquee Display is a standard unit-mounted feature on 48/50Z units with *Comfort*Link controls. The scrolling marquee is used for initial unit start-up and for service and diagnostic functions. The scrolling marquee is the main means to interface with the unit control.

Control modules

Main Base Board (MBB) — The MBB is supplied on all units and is a microprocessor control system with associated electronic and electrical hardware. The control system determines control sequences through monitoring operational variables.

INPUTS:

- Scrolling Marquee Display inputs
- Space Thermostat (CV applications)
- Space Temperature Sensor
- Refrigerant Pressure Transducers
- Unit Thermistors
- Space or Return Air CO_2 Sensor
- Fire Shutdown Switch
- Filter Status Switch
- CSB (Compressor Safety Board, size 105 only)

OUTPUTS:

- Scrolling Marquee Display status, run, alert and alarm data
- Alarm Output Contacts
- Capacity control
- Heating control
- Auxiliary Heating Control

SYSTEM INFORMATION:

- Adaptive Optimal Start
- Timed Override function
- Nighttime Free Cooling
- Modulating Power Exhaust
- Smoke Control
- Demand Control Ventilation
- Indoor Air Quality Monitoring
- Dehumidification and Reheat
- Supports LEN (local equipment network)
- Supports Carrier Comfort Network (CCN) communications

Rooftop Control Board (RCB) — The RCB is provided on all units and provides the following inputs and outputs:

INPUTS:

- Outdoor Enthalpy Switch
- Remote Occupancy Switch
- Supply Duct Pressure Transducer
- Building Pressure Transducer
- Fan Status Switch
- Hydronic Heating Coil Freezestat

OUTPUTS:

- Compressor Electric Unloaders (VAV models)
- Supply Fan VFD Speed
- Heat Interlock Relay Function
- Humidifier

Staged Gas Control Board (SCB) — The SCB is supplied on units with the staged gas control option and provides the following inputs and outputs.

INPUTS:

- limit switch thermistor
- staged gas supply air thermistors

OUTPUTS:

- staged gas heat relays

Controls Expansion Module (CEM) — The CEM is used on units with the outdoor air CFM option or with units requiring additional accessories. The CEM provides the following inputs:

INPUTS:

- IAQ switch
- fire/smoke control switches
- Loadshed and Redline switches
- demand limit
- SAT reset
- OAQ sensor
- outdoor, space, and return air humidity

Economizer Control Board (ECB) — The ECB is NOT used for economizer control. The ECB is supplied on all 075-105 units with high-capacity exhaust or return fan.

Humidity — The accessory relative humidity sensor provides information on the current humidity levels. Once installed, the unit dehumidification control routine becomes available. When used in conjunction with a field-installed humidifier, the conditioned space can be kept within a preset comfort range.

Smoke control modes — It is common practice to use the rooftop unit's supply and exhaust fan systems to facilitate space or zone smoke control in the event of a building fire. This functionality is enhanced when multiple rooftop units are used to zone a building.

The unit control design permits four separate inputs to initiate the four smoke control modes available with these models. These modes are:

Fire shutdown: Terminates all unit operation upon input switch closure.

Pressurization: Provides excess air into the controlled zone (by opening the outside air dampers and running the supply fan while closing return and exhaust dampers), to prevent or delay smoke entry from adjacent zones.

Evacuation: Removes smoke from the controlled space by running optional exhaust fans only.

Smoke purge: Flushes smoke and/or contaminated air from the controlled space by running both the supply fan and the optional exhaust fan, using 100% outside air.

Details on unit operation are provided below. Fire Shutdown is available on all units. Application of Pressurization, Evacuation and/or Smoke Purge require the optional economizer, a power exhaust option and the Controls Expansion Module (option or accessory).

IAQ monitorinq — Indoor-air quality is critical. Many retail establishments will have to spend far more money than necessary to meet the generic outdoor-air cfm per square ft required by the ASHRAE 62-89 Standard if they are not able to monitor the contaminant levels (such as CO_2) in the conditioned space. Being able to monitor the indoor-air quality permits compliance with the ASHRAE Standard while saving money, since only the amount of outdoor ventilation air that is required to meet the standard is used.

The *Comfort*Link™ control units have been developed to provide the design community with the flexibility to meet individual job needs for both comfort and IAQ.

The controls and control logic are designed to fully utilize the mechanical capabilities of the unit using the following features:

- purge cycle to flush the conditioned space with fresh air (starts 2 hours prior to building occupancy and lasts up to 60 minutes)
- 4 to 20 mA analog input for IAQ sensors (carbon dioxide and/or volatile organic compounds)
- three control schemes for outdoor-air management:
  1. Full IAQ control of outdoor air to satisfy IAQ sensors.
  2. IAQ control of outdoor air to satisfy IAQ sensors with a comfort override to maintain minimum comfort conditions by limiting economizer operation.
  3. IAQ monitoring only with alarm capability.

In addition, accessory software provides data collection and report generation capabilities.

Outdoor Air CFM control — Minimum space ventilation requirements can also be maintained by applying the minimum Outdoor Air CFM control option. This option provides an airflow monitoring station at the outside air damper inlet. The *Comfort*Link control can be programmed to monitor this airflow rate and to override the current outside air damper position to maintain a minimum quantity of outdoor air at the user's design set point even as the unit's supply fan slows during part load operating periods.

Hydronic heating coil control — The heating coil control is used to control the factory-installed or field-supplied hydronic heating coil control valve. The valve is modulated to prevent the space temperature from falling below the desired set point or to maintain the desired leaving-air temperature when high quantities of low-temperature outdoor air are introduced by the IAQ routine (IAQ reheat function). The desired set point can be programmed into the *Comfort*Link control software, and the valve modulation will be controlled based on temperature sensed in the heating coil.

Communication and control with BAS/BMS — The 48/50Z units with *Comfort*Link controls are ready for direct connection to a Carrier Comfort Network (CCN) system. Complete access to unit set point tables, status tables, run history tables, alarms and alerts messages are possible using ComfortVIEW™ or ComfortWORKS® building management programs and systems.

For non-CCN building management systems, similar access to 48/50Z unit *Comfort*Link controls may be possible by installing Carrier DataPort™ or DataLINK™ control interface devices between the unit's CCN bus terminal connection and the non-Carrier (off-network) BAS/BMS system.

The DataPort device allows the non-network system to view (read only) data points in the 48/50Z unit controls. The DataLINK device permits the non-network system to both view and command (read/write) control points in the 48/50Z unit controls. Both devices translate the available *Comfort*Link control data into ASCII characters and then output these characters to the non-network system (where the ASCII characters will be translated into the language consistent with the non-network BAS/BMS system). The DataLINK device also receives ASCII character data from the BAS/BMS system, translates them into CCN language and then sends these data to the *Comfort*Link controls. Each DataPort or DataLINK device is capable of communicating with up to 15 Carrier CCN-ready units.

Smoke control modes

Rooftop units can be used for aid in building smoke control in the event of a building fire. The available functions include: Fire Shutdown, Pressurization, Evacuation, and Smoke Purge. These functions are enhanced when multiple rooftop units are used to zone a building.

NOTE: Fire Shutdown is available on all units, with use of factory-installed smoke detector or field-installed smoke detector or field switch. Pressurization mode requires optional economizer plus optional or accessory Controls Expansion Module (CEM). Evacuation and Smoke Purge modes require optional economizer, a power exhaust option plus the CEM.

Fire shutdown — Fire Shutdown mode terminates all unit operation (cooling, heating, supply fan, and power exhaust). This mode prevents recirculation of contaminated air back into the space. The mode will not allow admission into the space of unsuitable outside air.

Pressurization — Pressurization mode is intended to keep smoke out of a zone. Pressurization is accomplished by the following:

- opening the economizer
- running the supply fan (optional inlet guide vanes open or optional VFD at normal duct static pressure set point)
- closing the power exhaust dampers
- shutting off the power exhaust fans

This allows the space to be overpressurized relative to adjacent zones and prevents or slows entry of smoke into this space from adjacent zones.

Evacuation — Evacuation mode removes smoke or undesirable air from interior spaces without reintroducing unsuitable air. Evacuation is accomplished by the following:

- turning the supply fan off
- opening the economizer
- running the exhaust fans
- opening the exhaust dampers

Smoke purge — Smoke Purge mode removes smoke from the interior spaces and replaces it with fresh outside air. Smoke purge is accomplished by the following:

- turning supply fan on
- opening the economizer
- running the exhaust fans
- opening the exhaust dampers

Smoke control installation — Implementation of the various Smoke Control modes on these units requires the installer to modify the unit wiring to add contacts (via either manual switches or relays) that will selectively interrupt standard factory control sequences and initiate the preprogrammed smoke control sequences.

Roof curb installation

For units with bottom return air and supply air openings, secure vertical return and supply ductwork to the roof curb. Interior installation may proceed before unit is set in place on the roof.

For units with horizontal return air and supply air duct arrangements, attach ductwork to unit flanges (typically 14-gage, $1^1/_4$-in. deep). Use flexible isolation collars. Support ductwork separately from unit.

Units with power exhaust (option) — Bottom return units equipped with power exhaust option require a 90-degree elbow directly below the unit return air opening. (Refer to unit installation instructions for further details.)

Units with electric heat — Units equipped with electric heat require a 90-degree elbow directly below the unit supply duct opening.

Through-the-curb service connections — Electrical power supply and control power cable may be routed through the inside perimeter of the accessory roof curb and then into the bottom of the unit control box. On unit sizes 055-105, the curb connection route will terminate at the curb top panel at the end of the air handler section and beneath the unit condenser section. Install a weatherproof pitch pocket on top of the curb and then continue the electrical cables with weatherproof flexible conduit over to the bottom of the unit main control box.

Unit mount on structural steel — If roof curb installation is not used, support the unit with steel beams along its entire length and then support the steel as required. As a minimum, the unit must be supported across its width at each lifting lug location.

→**Horizontal units with power exhaust —** Horizontal discharge/return units equipped with power exhaust must utilize a straight section of return duct prior to entering the unit. This straight section must be at least 65 inches in length. Any elbows or transitions must be at least 65-in. from the return air connection at the unit.

Airflow limits

Cooling

Minimum design airflow — Observe the limits for specifying and selecting units in Cooling mode as presented in the Unit Design Airflow Limit table on page 49. Typically these limits are based on a minimum airflow of 300 cfm per nominal ton for Constant Volume units and 200 cfm per nominal ton for VAV units.

Minimum operating airflow — On VAV units, a minimum airflow of 70 cfm per nominal ton is required for operation at minimum step of capacity control. Units equipped with optional Hot Gas Bypass feature may be applied to slightly lower limits (varies by unit size). Adjust terminal minimum vent position to ensure adequate airflow is available at cooling part-load conditions.

Maximum airflow — To minimize the possibility of condensate blow-off from evaporator coils, airflow through units must not exceed values shown in the Unit Design Airflow Limit table on page 49 and in Cooling Capacity tables on pages 52-68.

Heating (Gas/Electric)

Minimum and maximum airflow — Observe the limits for specifying and selecting units in Heating mode as presented in the Gas Heating Capacities and the Electric Heater Capacities tables on pages 49-51.

Motor limits

Due to Carrier's internal unit design (draw-through evaporator arrangement), air path and specially designed motors, the full horsepower listed in the Supply Fan Motor Limitations tables (page 92) can be utilized with full confidence. Using Carrier motors with the values listed in this table will not result in nuisance tripping or premature motor failure. The unit warranty will not be affected.

Field-supplied fan drives

Supply fan and power exhaust fans are fixed-pitch, non-adjustable selections, for maximum reliability and long belt life. If the factory drive sets must be changed to obtain other wheel speeds, consult the nearest Browning Manufacturing Co. sales office with the required new wheel speed and the data from Physical Data and Supply Fan Drive Data tables (center distances, motor and fan shaft diameters, motor horsepower) for a modified drive set selection. For minor speed changes, the fan sheave size should be changed. (Do not reduce the size of the motor sheave; this will result in reduced belt horsepower ratings and reduced belt life.)

Cooling

Minimum outdoor temperature — Units equipped with factory-option economizer allow free cooling down to 0° F If mechanical cooling is required, the units are designed to operate at outdoor temperatures down to 0° F with standard head pressure control algorithm.

Maximum outdoor temperature — Units are designed for operation at 115 F.

Heating

Minimum entering air temperature, 48ZG,ZN, ZW,ZT,Z6,Z8 — There is no minimum temperature limit for the mixed-air temperature entering the heat exchanger when the unit is operating at full fire.

Variable air volume (VAV) — The 48ZN,ZW,Z8 (gas heat) units and 50ZN,ZW,ZZ,Z3,Z8,Z9 units equipped with electric heat are intended for heating during unoccupied periods or for morning warm-up function. These units may also be configured for Occupied Heating.

During all heat cycle operation, the system airflow rate must satisfy the operating limits described in the Gas Heating Capacities and the Electric Heater Capacities tables on pages 49-51. To achieve these minimum airflow rates, it will be necessary to drive the room terminals to their wide-open or minimum heating positions. The Heat Interlock Relay (HIR) function in the unit control system will provide the signal to the terminal controls to move to their heating position whenever the unit heating cycle is initiated.

Space temperature sensors

The 48/50Z VAV units do not require thermostats for sensing space temperature and indicating demand to the rooftop unit. Instead, these units rely on a space temperature sensor for monitoring space temperature and control instructions (including set points) that are configured by installer, owner, or user into the unit control system (using factory default values or modifying via Scrolling Marquee Display, Navigator tool, Network Service Tool or CCN ComfortVIEW™ software).

The basic space sensor is the T-55 device. It must be field-installed in the space and wired to the unit terminal block (2 wires required) to complete the unit installation. In addition to sensing space temperature, the T-55 sensor also includes a Schedule Override button on the face of the device. The override button permits an occupant to initiate a short Occupied period from the space after the rooftop unit has entered an unoccupied period (as determined by the on-board Time Schedule programming of the unit). The override period can be configured by the user to permit 1, 2, 3, or 4 hours of occupied period operation. The T-55 sensor can be used on Constant Volume or VAV unit applications, as a single sensor or in an averaging grid.

For constant volume applications, an accessory T-56 sensor is available which also permits an occupant to adjust the space temperature control set points from the conditioned area. The T-56 sensor requires 3 wires between sensor and unit terminal block. The T-56 sensor includes a slide switch on the front face which permits an occupant to adjust the set points by ±5° F from the configured set points. This sensor also includes the Schedule Override button which permits an occupant to initiate a short occupied period from the conditioned area.

The T-58 Communicating Sensor is also available. This sensor connects to the *Comfort*Link™ controls via the CCN communication bus terminals This sensor permits an occupant to change the Occupied Set Points via Up and Down buttons on the sensor face. Schedule Override initiation is also available from this sensor.

Static pressure sensor locations

Supply fan (IGV or VFD) — Units equipped with factory-option supply duct pressure controls (inlet guide vanes or variable frequency drive) require a static pressure pick-up to be field-supplied and installed in the supply duct. Locate the field-supplied pickup in the main supply duct approximately $^2/_3$ of the length of the duct away from the HVAC unit, and before any main branch take-offs. Install fire-retardant plenum tubing of appropriate size from the duct pressure pick-up to the control device located in the HVAC unit.

Modulating power exhaust — Units equipped with modulating power exhaust (factory-installed option) require a static pressure pick-up be provided and installed in the conditioned space. Install fire-retardant plenum tubing of appropriate size from the space pressure pick-up to the building pressure transducer located in the HVAC unit.

Minimum service clearances — Carrier's recommended minimum service clearances for these units are listed in the unit dimensional drawings. These recommendations include requirements for safety (observing National Electrical Code requirements for working space around electrical components), unit performance impact, and service access (for routine and possible major service work). If installations with service clearances less than these minimum distances are being considered, only those clearances involving performance impact and/or service access may be candidates for exception. Note that reduced service clearances at installation may contribute to higher labor costs for future service work.

Service disconnect — The National Electrical Code and most local safety codes require that a disconnecting device be provided in all conductors from the main power supply to the unit, and that such disconnecting devices must be installed within sight of and at a readily accessible location from the air-conditioning unit, and may be installed either on or in the unit.

A factory-mounted non-fused disconnect is available that satisfies these requirements. The factory-mounted disconnect is an interlocking door-type. The disconnect handle locks the access door to the unit control box when the handle is in the ON position. The disconnect handle must be in the OFF position to open the control box door. The disconnect is located inside the main control box.

Field-supplied and installed service disconnects may also be mounted on the unit corner post, to the left of the main control box. These disconnects may be non-fused or fused (per project plans).

Application data (cont)

Overcurrent protection devices — If units are to be installed in the U.S.A., the device to provide unit overcurrent protection (per the MOCP value on the unit informative dataplate) may be a fuse or a "HACR" circuit breaker. If units are to be installed in Canada, circuit breakers acceptable to Canadian national codes may be used. In other locations, consult local codes for specific requirements for ground-fault and short-circuit protection devices and select size based on MOCP values as marked on unit informative dataplate.

Hydronic heating coil

A factory-installed hydronic heat coil option is available on 50 series units, sizes 030-070, without electric heat. This option requires the Extended Length chassis option. There is a single coil option offered for each size. There is no factory-provided flow modulation device included in this option.

The *Comfort*Link™ control system includes an algorithm for controlling the performance of the hydronic heating coil. Refer to Controls and Troubleshooting Manual for *Comfort*Link control models for complete information on selecting heat coil valve actuator and for field connection of control wiring.

Application of hydronic coils in outdoor located equipment should always be considered very carefully. Design such systems for low temperature protection in the event of power failure to the rooftop unit.

Refer to the Carrier E20-II® RTUBuilder computerized selection program for determining the heat performance of the factory-option hydronic heating coils.

Auxiliary coil

48ZG,ZN030-060, 50ZG,ZN030-070, and 50Z2,Z3030-060 units with extended chassis are capable of accepting field-supplied and installed auxiliary coils (typically hydronic heating, steam heating, or refrigeration heat reclaim coils). These units include coil tracks and face framing to facilitate installation of auxiliary coils. See the figure below for dimensions on coil tract locations inside these units. See the Auxiliary Coil Frame Dimension table for dimensions for the auxiliary code.

AUXILIARY COIL FRAME DIMENSIONS (in.)

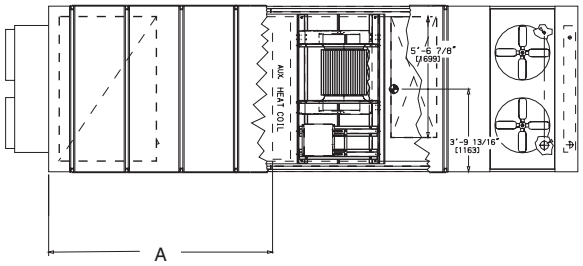
UNIT SIZE	030-050	055-070
Casing Depth	9.80	9.80
Casing Height	55.52	66.00
Casing Length*	69.50	69.50
Overall Length†	83.90	83.90

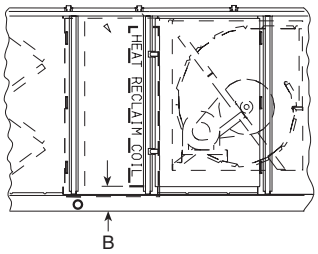
*Longer casing lengths possible but modifications to face framing sheet metal will be required during installation.
†Represents the maximum overall length of the coil plus all piping and coil control devices located inside the air handler cabinet.

Application of hydronic coils and steam heating coils in outdoor located equipment should always be considered very carefully. Design such systems for low temperature protection in the event of power failure to the unit.

Steam coils are typically not recommended for installation in outdoor located equipment, due to added space required for fluid control and need to protect all piping and controls in the event of power failure to the building and/or the unit. Consider installing small steam-to-hydronic heat exchangers with circulating pump to deliver hydronic fluids out to the auxiliary coil in the air conditioner unit.

LOCATION OF COIL TRACKS



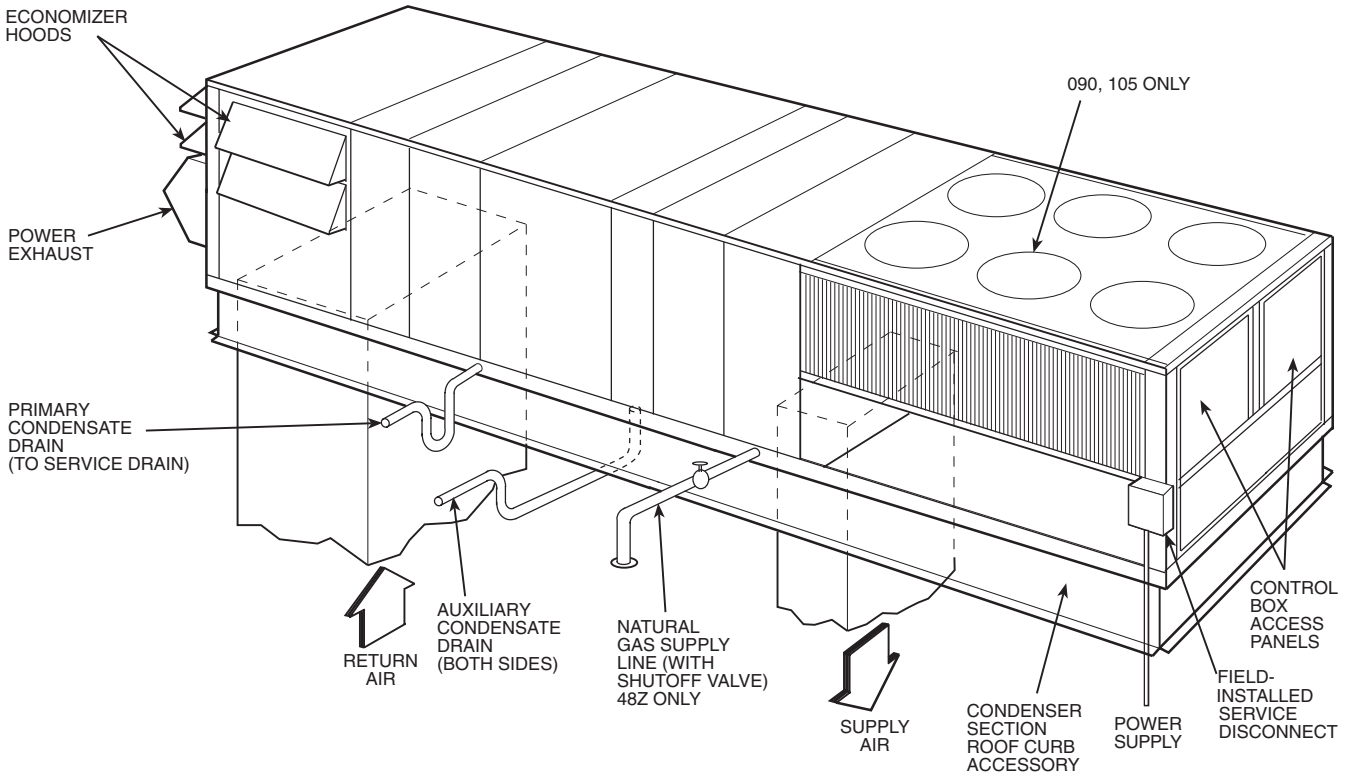


AUXILIARY COIL LOCATION — in.

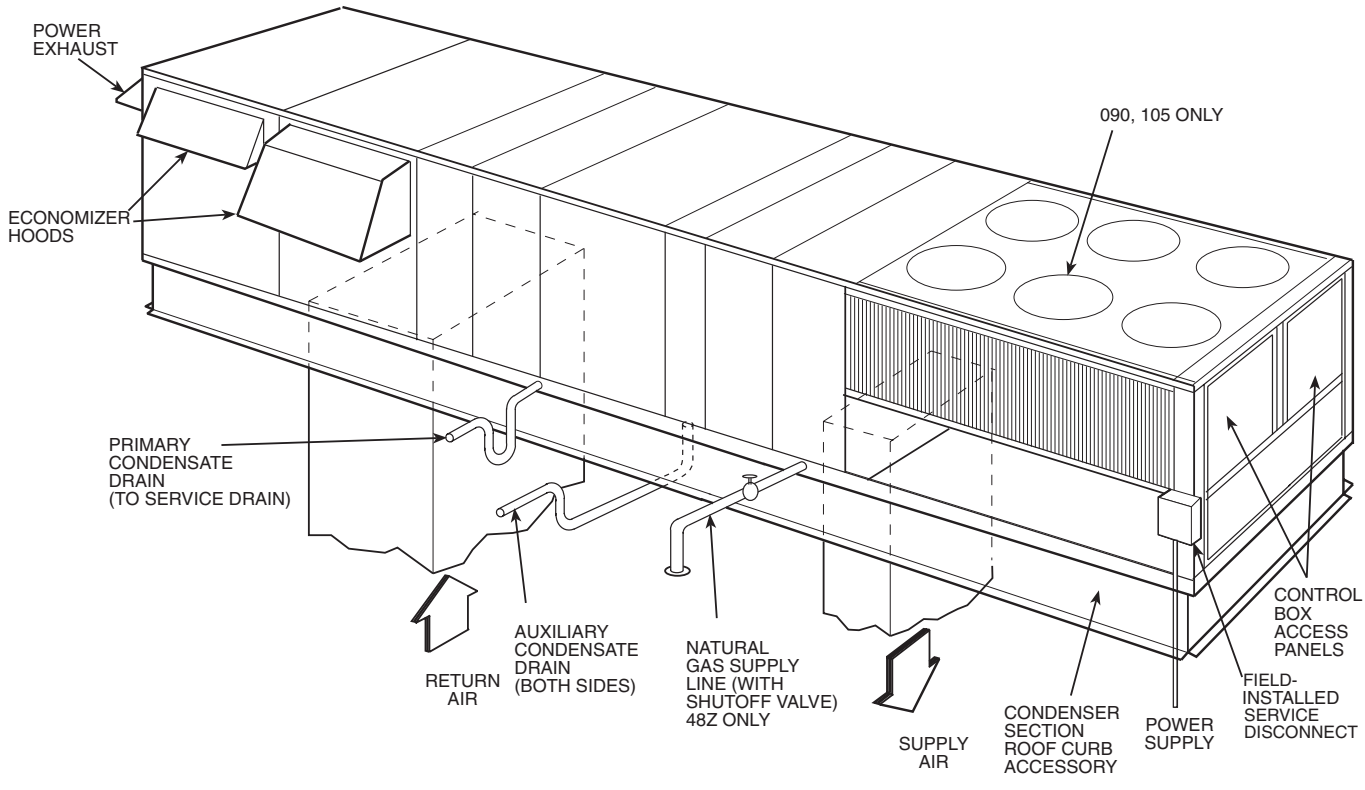
UNIT SIZES	DISTANCE A		HEIGHT B
	50 Series Vertical Units	48 Series and 50 Series Horizontal Units	
030,035	123.0	123.0	6.6
040,050	156.8	156.8	6.6
055-070	200.2	200.6	6.6

Typical installation

STANDARD UNITS (48ZG,ZN AND 50ZG,ZN055-105 SHOWN)

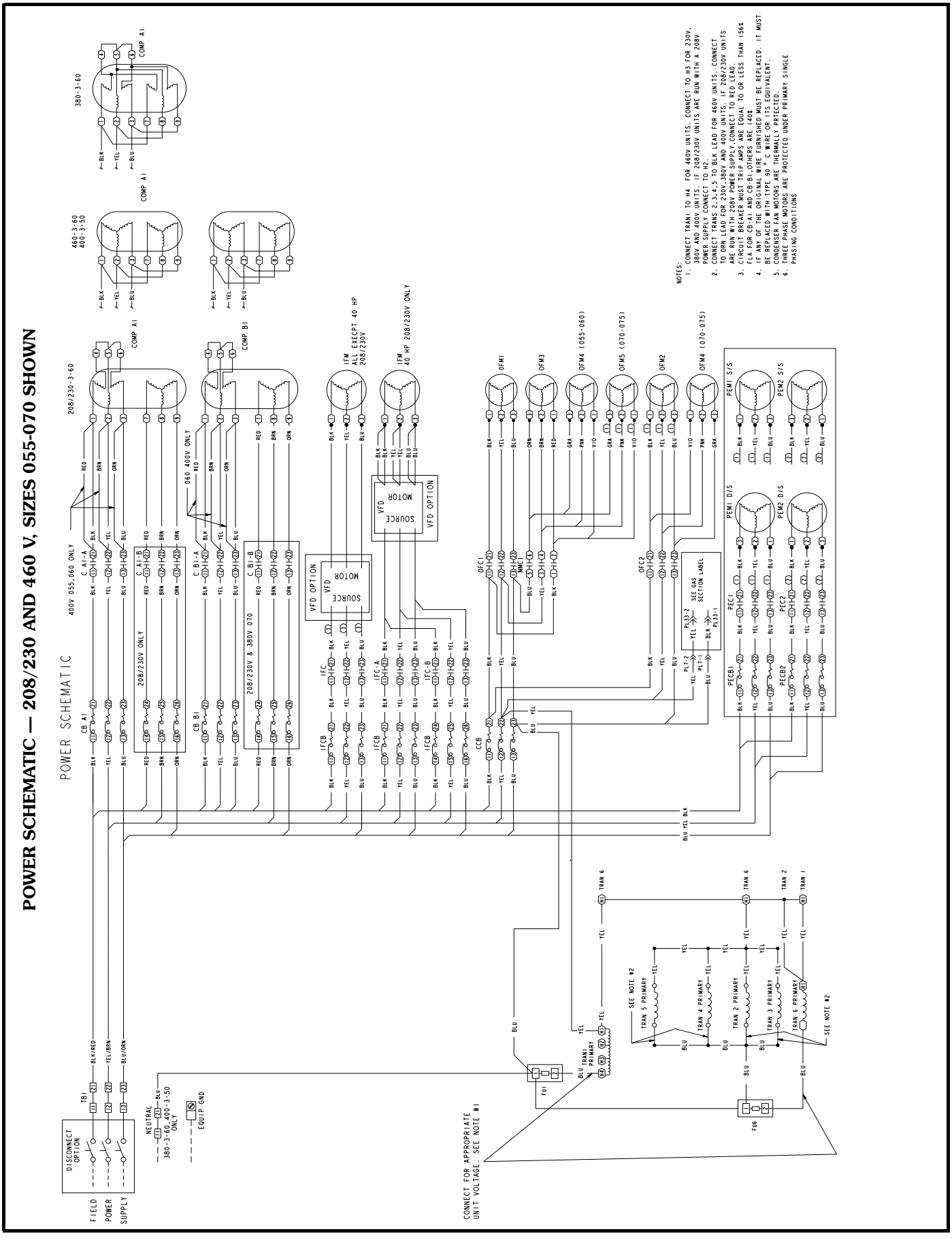


HIGH-CAPACITY POWER EXHAUST UNITS

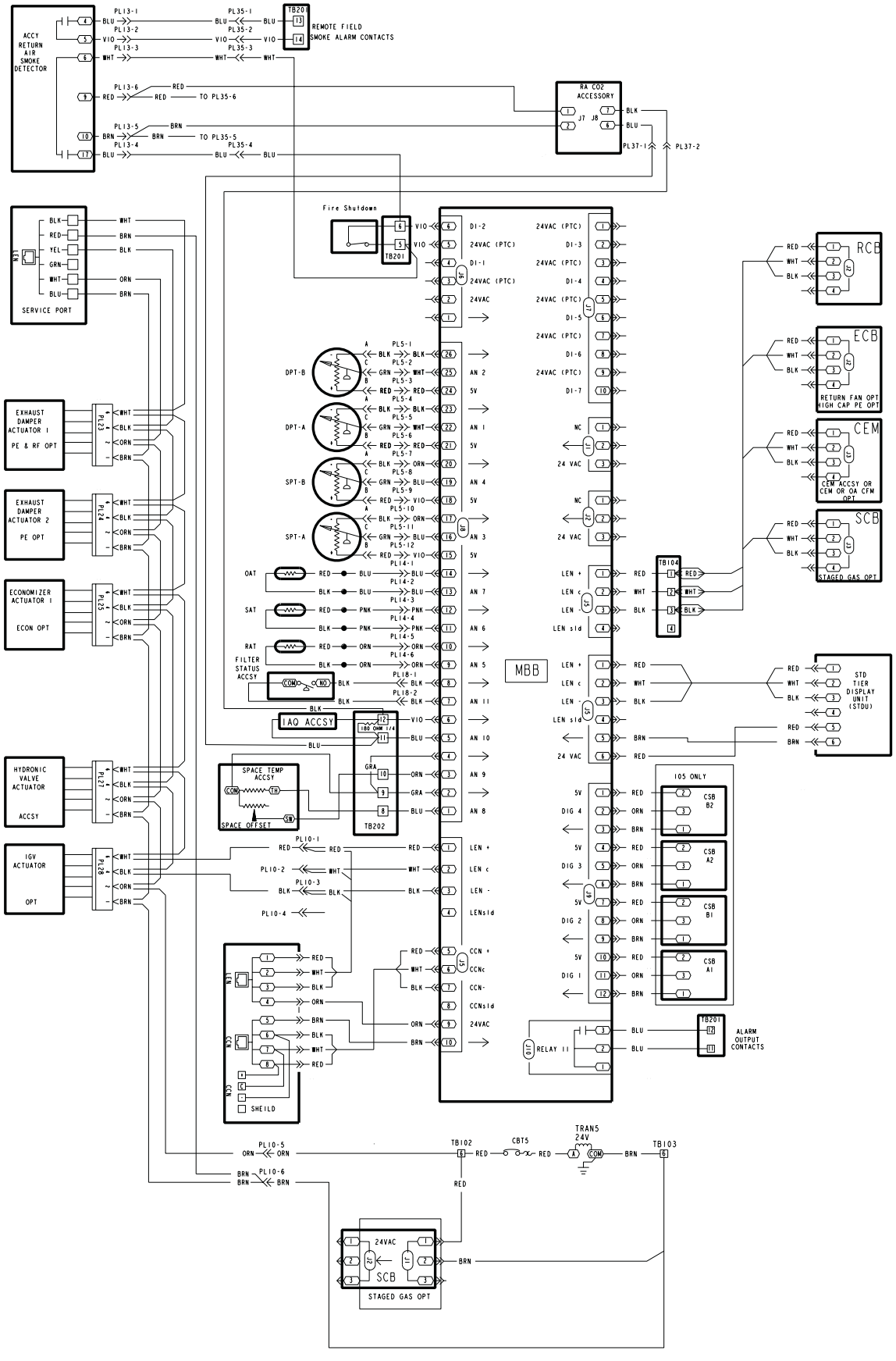


Typical wiring diagrams

POWER SCHEMATIC — 208/230 AND 460 V, SIZES 055-070 SHOWN

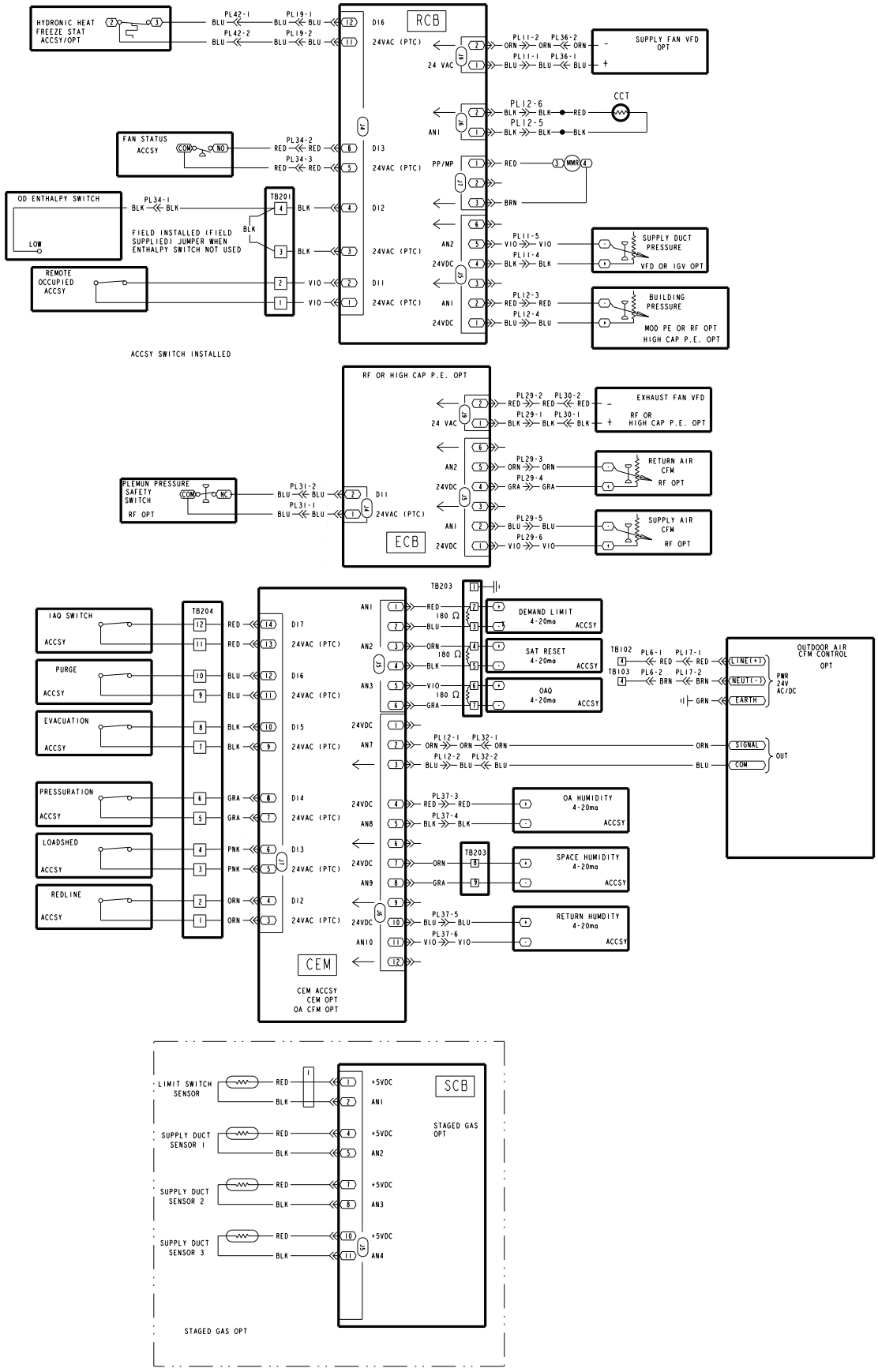


INPUT/OUTPUT DIAGRAM — MAIN BASE BOARD

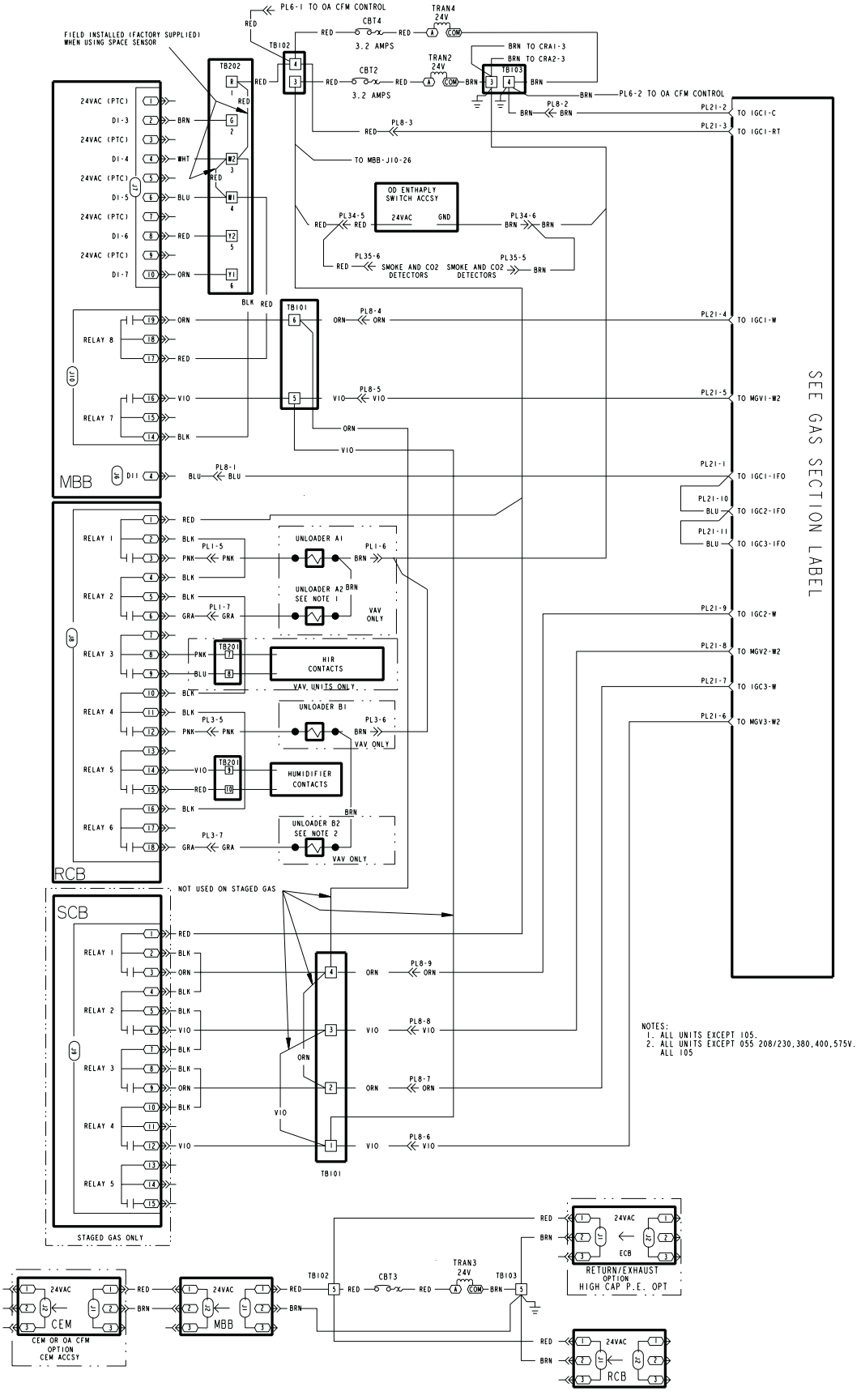


Typical wiring diagrams (cont)

INPUT/OUTPUT DIAGRAM — RCB, ECB, CEM, SCB

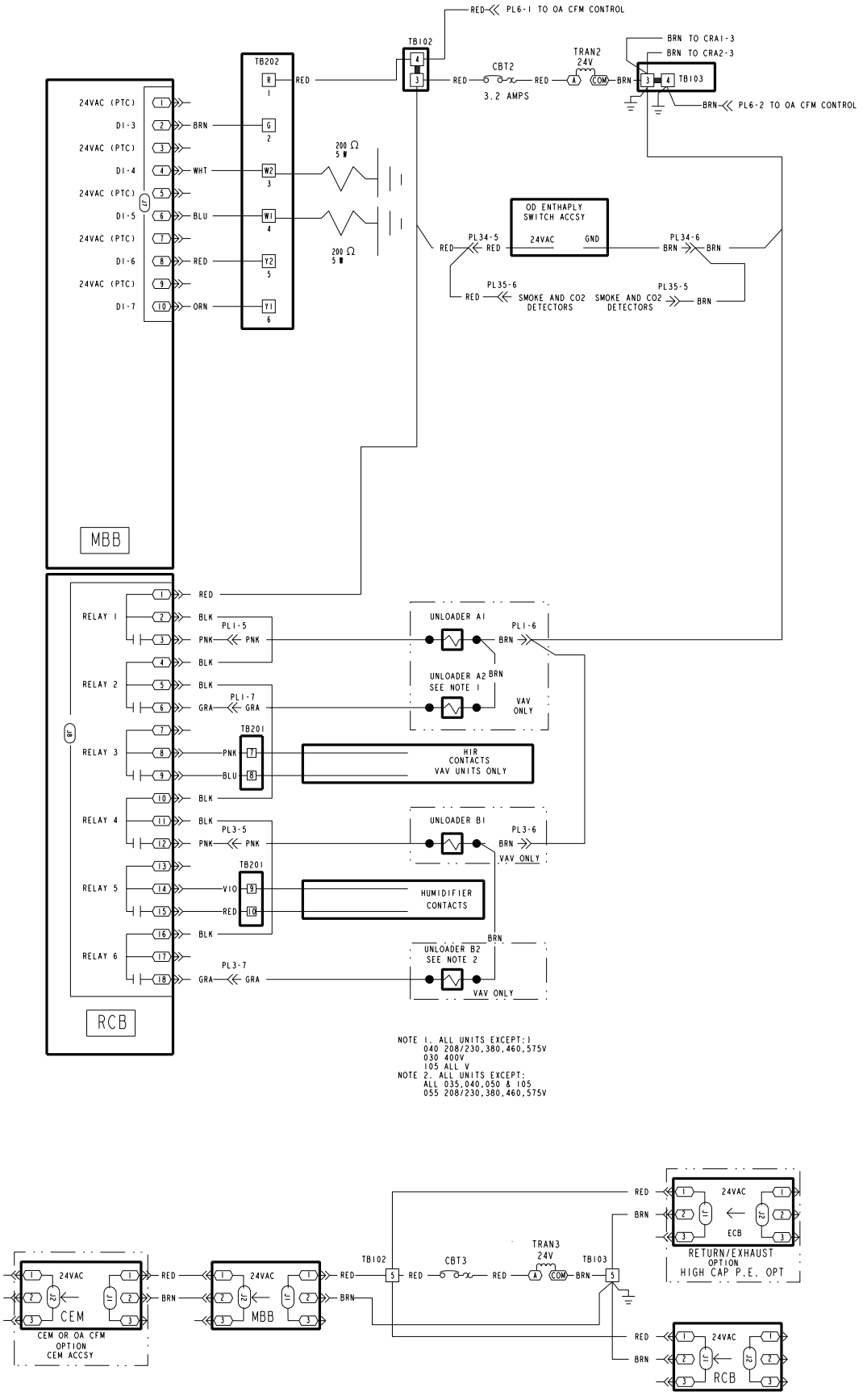


CONTROL SECTION — 48Z UNITS

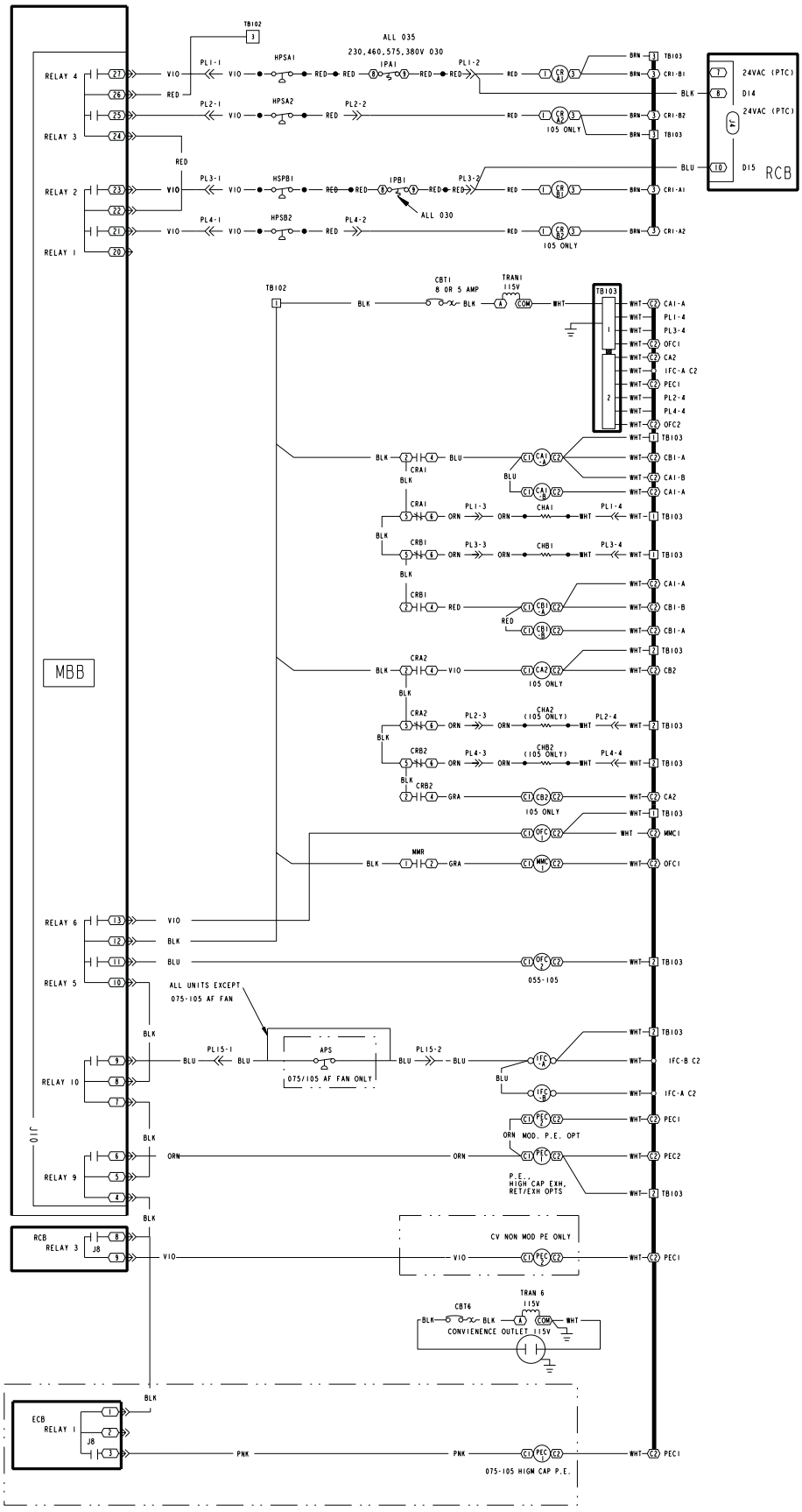


Typical wiring diagrams (cont)

CONTROL SECTION — 50Z UNITS

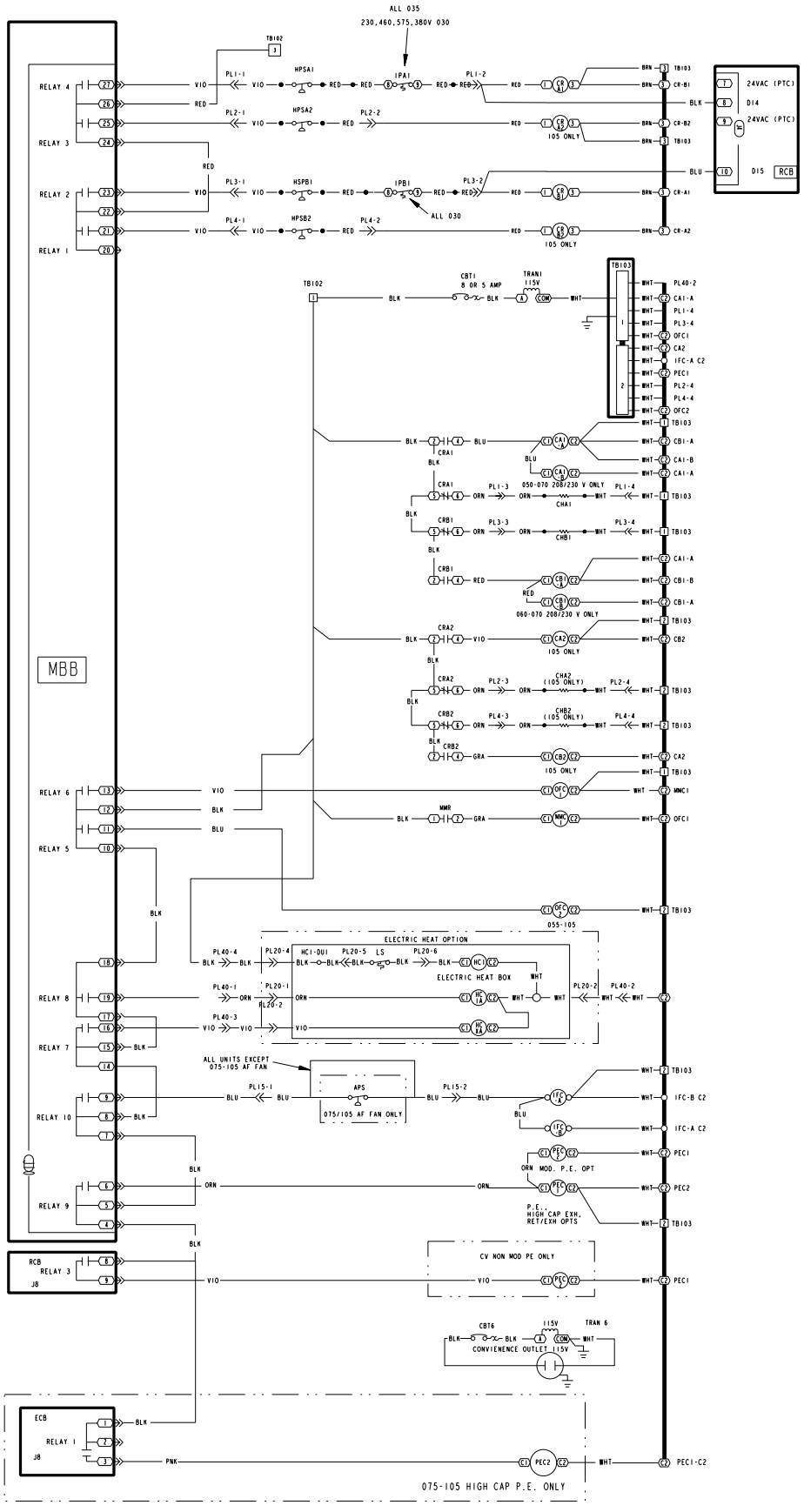


115-VOLT WIRING — 48Z UNITS



Typical wiring diagrams (cont)

115-VOLT WIRING — 50Z UNITS



LEGEND FOR TYPICAL WIRING DIAGRAMS

ACCSY — Accessory
ACC'Y — Accessory
AN — Analog
APS — Air Pressure Switch
C — Compressor Contactor
CB — Compressor Circuit Breaker
CBT — Circuit Breaker, Transformer
CCB — Control Circuit Breaker
CCN — Carrier Comfort Network
CCT — Cooling Coil Thermistor
CEM — Controls Expansion Module
CH — Crankcase Heater
COMP — Compressor
CR — Control Relay
CSB — Current Sensor Board
CV — Constant Volume
DI — Digital Input
DPT — Discharge Pressure Transducer
ECB — Economizer Control Board
ECON — Economizer
EQUIP — Equipment
FU — Fuse
GND — Ground
HC — Heater Contactor
HIR — Heat Interlock Relay
HPS — High-Pressure Switch
IAQ — Indoor Air Quality
IFC — Indoor Fan Contactor
IFCB — Indoor Fan Circuit Breaker
IFM — Indoor Fan Motor
IFO — Indoor Fan Operation
IGC — Integrated Gas Controller
IGV — Inlet Guide Vane
IP — Internal Protector
LS — Limit Switch
MBB — Main Base Board
MGV — Main Gas Valve
MMC — Motormaster® Contactor
MMR — Motormaster Relay
MOD PE — Modulating Power Exhaust
OA — Outdoor Air
OAQ — Outdoor Air Quality
OAT — Outdoor-Air Thermostat
OD — Outdoor
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
OPT — Option
PE — Power Exhaust
PEC — Power Exhaust Contactor
PECB — Power Exhaust Circuit Breaker
PEDM — Power Exhaust Damper Motor
PEM — Power Exhaust Motor
PL — Plug Assembly
PTC — Positive Temperature Coefficient Power Reference
RA — Return Air
RAT — Return Air Thermistor
RCB — Rooftop Control Board
RF — Return Fan
SAT — Supply Air Thermistor
SCB — Staged Gas Control Board
SPT — Suction Pressure Transducer
STDU — Standard Tier Display Unit
S/S — Side Shot (Horizontal Supply)
TB — Terminal Block
TRAN — Transformer
VAV — Variable Air Volume
VFD — Variable Frequency Drive

Terminal Block

Terminal (Unmarked)

Terminal (Marked)

Splice

Factory Wiring

Field Wiring

To indicate common potential only, not to represent wiring.

To indicate FIOP or Accessory

Guide specifications — 48ZG,ZN030-070 units

Packaged Rooftop Cooling Unit with Gas Heat and *Comfort*Link™ Controls

HVAC Guide Specifications — Section 48ZG, ZN

Size Range: **30 to 70 Tons, Nominal**

Carrier Model Number:

48ZG (Vertical Supply/ Return, CV Application) (030-070)

48ZN (Vertical Supply/Return, VAV Application) (030-070)

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor, roof-curb mounted, electronically controlled heating and cooling unit utilizing semi-hermetic reciprocating type compressors for cooling duty and gas combustion for heating duty. Units shall discharge supply air downward as shown on the contract drawings.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 340/360.

B. Unit shall be designed to conform to ANSI/ ASHRAE 15 (latest revision), ASHRAE 62, UL Standard 1995, and National Electrical Code (U.S.A.).

C. Unit shall be listed by ETL and ETL Canada as a total package.

D. Unit shall be designed to conform to ANSI Standard Z21.47 (U.S.A.)/CSA Standard 2.3 (Canada), Gas-Fired Central Furnaces.

E. Roof curb shall be designed to NRCA criteria per Guideline B-1986.

F. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. Factory-assembled, single-piece heating and cooling unit.

Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B. Extended Chassis (48ZG,ZN M, N, P, Q, R, S, T, V, W, X, Y, Z units only)

Extended chassis designs shall contain an added length module, after the evaporator section, as shown in the contract drawings. Module shall contain tracks to accept field-supplied/installed auxiliary heating coil.

C. Unit Cabinet:

1. Constructed of galvanized steel (designated G90 per ASTM Standard A653 — minimum coating weight of 0.9 oz. of zinc per square foot [275 grams per square meter]), bonderized and primer-coated on both sides and coated with a baked polyester thermosetting powdercoating finish on the outer surface.
2. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Sides shall have *man size* insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces (except heat exchanger section) shall be insulated with flexible fire-retardant dual-density (1.75-lb/cu. ft. [28.0 kg/ cu. m]) fiberglass blanket, coated on the air side. Insulation coating shall be cleanable and shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM Standards G21 and G22.
5. Interior cabinet surfaces within heat exchanger section shall be lined with sheet metal on all surfaces, insulated on the side opposite the airstream.
6. Insulation shall be applied by means of adhesion using a water reducible adhesive sprayed onto interior surface. Adhesive shall maintain a satisfactory adhesion and cohesion within the temperature range of –20 to 180 F (–29 to 82 C) and have excellent resistance to water and water vapor when cured.
7. Unit shall contain a sloped drain pan, to prevent standing water from accumulating. Pan shall be fabricated of stainless steel. Unit shall contain a factory-installed nonferrous main condensate drain connection.
8. Units shall be equipped with lifting lugs to facilitate overhead rigging.

D. Fans:

1. Supply Fan:
   a. Double-width, double-inlet, centrifugal belt driven forward-curve type with single outlet discharge.
   b. Fixed-pitch pulley drive.
   c. Mounted on a formed steel sled with flexible outlet connection consisting of canvas transitions.
   d. Fan shaft bearing shall be of the pillow-block type with lubrication provisions.
   e. Statically and dynamically balanced.
   f. Supply fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

g. Solid fan shaft construction.

h. Unit shall be equipped with 5-in. (127 mm) (030-050 units) or 7-in. (178 mm) (055-070 units) spring vibration isolators, each with 2-in. (51 mm) deflection.

2. Condenser Fans:

a. Direct-driven propeller type only.

b. Discharge air vertically upward.

c. Protected by PVC-coated steel wire safety guards.

d. Statically and dynamically balanced.

e. Three-phase, totally enclosed motors.

E. Compressors:

1. Reciprocating, semi-hermetic type only and shall be located for easy servicing.

2. Equipped with a suction-cutoff type electrically controlled unloader(s).

3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.

4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor.

5. Equipped with suction and discharge service valves.

6. Maximum operating speed of 1800 rpm (30 r/s).

F. Coils:

1. Evaporator Coil:

a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Full-face active type during full and part load conditions.

c. Coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).

2. Condenser Coils:

a. Constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3403 kPa).

c. All coils shall be same manufacturer as unit.

G. Outdoor-Air Hood Assembly:

Factory-installed manual outdoor-air damper shall allow intake of up to 25% nominal airflow (on units not equipped with optional economizer).

H. Heating Section:

1. Induced-draft combustion type with energy saving direct spark ignition systems and redundant main gas valves.

2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage steel coated with a nominal 1.4 mil aluminum-silicone alloy for corrosion resistance.

Optional construction:

Heat exchanger shall be constructed of minimum 20-gage Type 409 Stainless Steel for corrosion resistance. Tubing material shall be suited for high temperature and corrosion resisting service. Tubing material shall comply with ASTM A268, Grade TP409. Tubing shall be welded and annealed.

3. Burners shall be of the in-shot type constructed of aluminized steel.

4. Induced Draft Fans:

a. Direct-driven, single inlet, forward-curved centrifugal type.

b. Statically and dynamically balanced.

c. Made from steel with a corrosion-resistant finish.

5. High-corrosion areas such as flue gas collection and exhaust areas shall be lined with corrosion-resistant material.

6. All gas piping shall enter the unit cabinet at a single location.

I. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits, each containing:

1. Liquid line service valve.

2. Filter drier.

3. Moisture indicating sight glass.

4. Thermostatic expansion valve.

5. Fusible plug.

J. Filter Section:

1. Filter section shall consist of 2-in. (51 mm) thick, disposable fiberglass filters of commercially available sizes.

2. Factory 2-in. (51 mm) filter track shall allow easy field conversion to accept 4-in. (102 mm) thick, disposable fiberglass filters of commercially available sizes.

K. Controls, Safeties, and Diagnostics:

1. Controls:

a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:

1) Day and Time.
2) Schedule (Unoccupied/Occupied).
3) Set points (Unoccupied/Occupied, Economizer, Duct Pressure, others)
4) Space temperature.
5) Outdoor air temperature.
6) Unit supply air temperature.

7) Unit return air temperature.
8) Supply-air fan status.
9) Economizer position.
10) Compressor suction and discharge pressure.
11) Scrolling marquee display.
12) Accessory and/or field-supplied sensors, function switches and/or signals.

b. Controls shall be capable of performing the following functions:
1) Capacity control based on supply air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of electric unloaders (ZN units only) and compressor staging.
2) Perform a quick test to check the status of all input and output signals to the control system using scrolling marquee display or Navigator.
3) Control of integrated economizer operation, based on unit supply-air temperature.
4) Supply fan volume control shall modulate the position of Inlet Guide Vane dampers or control output from a Variable Frequency Drive to maintain duct static pressure at user-configured set point (VAV). Static pressure reset in conjunction with Carrier communicating terminals to reduce supply fan power requirements. Control system calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop).
5) Heating control shall provide space temperature control for unoccupied period heating, morning warm-up sequence and occupied period heating (when configured).
6) Adaptive optimal start shall determine the time unit will commence cooling [or heating or heating for morning warm-up] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode.
7) Adaptive optimal stop shall turn off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV only).
8) Alerts and Alarms: Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation) or that an output has not functioned as expected or that a safety device has tripped. Current alarms shall be maintained in STATUS function; up to 9 (current or reset) shall be stored in HISTORY function for recall.
9) Timed override function shall permit a system in unoccupied mode to be returned to occupied mode for a user-configured period of 1, 2, 3 or 4 hours by pressing the override button on the front of the space temperature sensor.
10) Nighttime Free Cooling (NTFC) shall start the supply fan and open the economizer on cool nights to precool the building structure mass using only outdoor air. Function shall be restricted to operation above a user-configured low lockout temperature set point.
11) Modulating power exhaust control shall modulate capacity of exhaust fan system in response to building static pressure at user-configured set point. Power exhaust fan operation shall be interlocked with supply fan operation.
12) Smoke Control functions: Control shall initiate any of four separate smoke control functions in response to closure of field switches. Functions shall include: Pressurization, Evacuation, Smoke Purge and Fire Shutdown. Should two or more switches be closed simultaneously, Fire Shutdown shall be initiated.
13) Support demand control ventilation through a reset of the economizer's minimum position. This reset based on differential CO_2 PPM (outdoor and indoor) can be chosen as linear or as fast or slow-acting exponential curves.
14) Indoor air quality (IAQ) mode shall admit fresh outdoor air into the space whenever space air quality sensors detect unsuitable space conditions, by overriding economizer minimum damper position. IAQ shall be permitted only during occupied periods, unless configured to be allowed during unoccupied periods also.
15) Provide control for reheat via auxiliary heating coil during ventilation.
16) IAQ pre-occupancy purge function shall provide complete exchange of indoor air with fresh air during unoccupied periods, when outdoor conditions permit. Function shall energize supply fan and

open economizer two hours before next occupied period; duration of purge shall be user-configured (5 to 60 minutes).

17) Outdoor Air Control (OAC) function shall maintain a minimum quantity of outdoor airflow into an occupied space. OAC mode shall be available only during an occupied period. Outdoor air flow shall be monitored by an airflow station and transducer. Economizer maximum damper opening position during OAC mode shall be user-configured.
18) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
19) Supply Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0° to 20 F (0° to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
20) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5 F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
21) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
22) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
23) Supply Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0° to 20 F (0° to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
24) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5 F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
25) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
26) Condenser-fan cycling control shall maintain correct head pressure down to 0° F (–18 C).
27) Refrigeration system pressures shall be monitored via pressure transducers. Alarms for low pressure, high pressure will be permitted.
28) Timed Discrete Output function shall control an external function or device via user-configured activity schedule. This schedule shall be separate and different from the unit's occupied/unoccupied time schedule.
29) Hydronic heating coil control shall modulate a control valve in a steam or hydronic heat system to maintain space temperature at user-configured set points. Control valve actuator shall communicate via LEN (Local Equipment Network) protocol.
30) Humidifier control shall provide control for either LEN communicating control valve or discrete-type output, to maintain space humidity conditions at user-configured set points.
31) Two-step demand limit control (when used in conjunction with CEM [Controls Expansion Module]).
32) Display in Metric units: Display may be configured to display data in Metric or English (Imperial) units of measure.
33) Optional LEI (Local Equipment Interface) communication board to provide linkage with IP (Internet Protocol) communication protocol, LON (Local Operating Network) communication and RS485 serial communication capability.

2. Safeties:

   Unit components shall be equipped with the following protections:

   a. Compressors:
      1) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
      2) Crankcase heaters.
      3) High-pressure switch (shuts down individual compressor, automatic reset type).

4) Low-pressure switch (shuts down individual compressor, automatic reset type).
5) Check filter switch.

b. Belt-Drive Fan Motors:

Overcurrent protection manual reset circuit breakers.

c. Heating Section:

1) Redundant gas valves
2) Flame proving controls.
3) Induced-draft fan motor speed sensor.
4) High-temperature limit switch.
5) Flame rollout switch.

3. Diagnostics:

a. The display shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.

b. The display shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.

c. Test Mode must also be capable of displaying outputs of microprocessor-controller and to verify operation of every thermistor, actuator motor, fan, and compressor before unit is started.

L. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature per maximum load criteria of ARI Standard 340/360.
2. Unit shall be capable of mechanical cooling operation down to 0° F (–18 C) ambient outdoor temperature.
3. Provides multi-stage cooling capability.
4. Provides 2 stages of heating capability.

M. Motors:

1. Compressor motors shall be cooled by suction gas passing over motor windings.
2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection.
3. Supply and exhaust fan motors shall be of the 3-phase, NEMA rated, Open Dripproof (ODP), ball bearing type, with efficiencies per EPACT (U.S.A.) requirements.

N. Electrical Requirements:

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

O. Special Features:

1. Roof Curb:

Designed to comply with criteria established by NRCA Guideline B-1986.

Size 030-050 Units:

Formed 14-gage (1.85 mm) galvanized steel with wood nailer. Supports full perimeter of unit.

Size 055-070 Units:

Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip as perimeter curb supporting the air-handling portion of unit, and rail for supporting the condenser portion of the unit.

2. Roof Curb Condenser Section (Accessory for 055-070 Units only):

Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip for supporting condenser section of the unit to complete a full perimeter curb under entire unit.

3. Integrated Economizer:

Dry bulb or differential dry bulb temperature controlled or optional enthalpy or differential enthalpy controlled integrated type consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary.

a. Dampers shall be a low-leakage type, not to exceed 1% leakage at 1-in. wg (249 Pa) pressure differential when fully closed.

b. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are communication capable of internal diagnostics.

c. Equipped with a solid-state humidity sensor (accessory) that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level. The user can also configure dew point limiting.

4. 100% Modulating Power Exhaust:

Package shall include 2 double-width, double-inlet centrifugal belt drive, forward-curved power exhaust fans with modulating devices at the discharge of each fan to maintain a field adjustable interior space pressure set point.

a. Fan bearings shall be of the pillow block type with an average design life of 200,000 hours.

b. Fans shall be statically and dynamically balanced.

5. Barometric Relief Package:
   a. Package shall relieve excess internal pressure and consist of damper assemblies, hoods, damper screens, seal strips and required hardware.
   b. Damper assemblies shall close due to gravity upon unit shutoff.
6. Pleated Filters:

   Unit shall be factory equipped with medium efficiency pleated filters having the following characteristics:
   a. Efficiency of no less than 30% based on testing per ASHRAE Standard 52.
   b. Minimum average arrestance of 90%.
7. Bag Filters with Prefilters:

   Unit shall be factory equipped with bag filters and 2-in. (51mm) prefilters, and shall have an average efficiency of 90% based on testing per ASHRAE Standard 52.
8. Supply Fan Static Pressure Control/Inlet Guide Vanes:

   Inlet Guide Vane option shall include:
   a. Factory-installed double guide vane assemblies, consisting of rolled steel support rings and actuating rings, galvanized steel vanes capable of opening to full 90-deg position, and pivot bearings, designed for 250,000 cycles (full-open to full-closed) and protected against corrosion (painted, galvanized or plated).
   b. Factory-mounted single actuator, with factory-mounted linkages to modulate both inlet rings.
   c. Factory-mounted duct pressure sensing controller: Differential Pressure Transducer, 2 to 10 vdc output to unit control module, with adjustable setpoint range (0.0 to 5.0 in. wg [0 to 1246 Pa]), adjust via scrolling marquee display or Navigator.
   d. Low pressure reference tube factory installed.
9. Supply Fan Static Pressure Control/Variable Frequency Drive:

   Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, -wired and -tested. The VFD shall control motor speed to maintain set point static pressure control at the supply duct sensor tube location. The supply fan drive shall be field-adjustable to maintain supply duct static pressure set point from 0.0-in. wg to 5-in. wg (0 to 1246 Pa), adjusted via scrolling marquee display or Navigator.

   A pressure transducer shall be factory-mounted and -wired. (Control tubing from sensor tube location to transducer shall be field-supplied and -installed.) Transducer shall provide a 4 to 20 mA signal to the unit control module; unit control module shall provide a 4 to 20 mA signal to the VFD indicating desired VFD output level.

   The variable speed drive shall include the following features:
   a. Full digital control.
   b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
   c. Inverters capable of operation at a frequency of 8 kHz so no acoustic noise shall be produced by the motor.
   d. NEMA 1 metal enclosure for reduction of RFI (radio frequency interference).
   e. Digital display keypad module, mounted on the VFD enclosure.
   f. Local/Remote and Manual/Auto function keys on the keypad.
   g. UL-listed electronic overload protection.
   h. Critical frequency avoidance.
   i. Self diagnostics.
   j. On-board storage of unit manufacturer's customer user settings, retrievable from the keypad.
   k. RS232C communications capability standard.
   l. RS485 communications capability (accessory card source required).
   m. Internal electronic filtration to reduce EMI generation.
10. VFD Remote Display Service Module:

    Accessory package shall contain VFD adapter plate, remote display housing (to accept the keypad module removed from the VFD housing) and cable assembly with quick-connect plug to connect to mating plug on VFD adapter plate, to facilitate VFD diagnostics and servicing.
11. Premium Efficiency Motors (Supply Fan/ Exhaust Fans):

    Unit shall be factory-equipped with premium efficiency motors on Supply Fan (and Power Exhaust Fans) with NEMA efficiency ratings per contract drawings. Available all motor sizes.
12. Staged Gas Control:
    a. Staged Gas Control option shall monitor unit supply-air temperature and sequence the unit heat exchanger staging to provide the following sequences:
       1) Tempering heat control, based on user-configured ventilation supply air temperature set point, to eliminate cold draft conditions with low mixed-air temperatures.

2) First-stage demand heating control, with staging selected to maintain user-configured heating supply air temperature set point.
3) Full-fire demand heating on heating control command.

b. Staged Gas Control option shall consist of:
1) Supply air temperature thermistors with duct-mounting base.
2) Limit switch temperature thermistor.
3) Stainless steel heat exchanger tubes and construction option.

c. Field installation shall be limited to installing three supply air temperature thermistors in the supply duct. All other hardware, wiring and piping shall be factory-completed.

13. LP (Liquid Propane) Conversion Kit:

Provides all necessary hardware and labels for conversion from natural gas to LP gas. (Not for use with Staged Gas Control option.)

14. Non-Fused Disconnect:

A non-fused electrical disconnect for main unit power shall be factory installed. The disconnect shall be an interlocking through-the-door type.

15. 115-Volt Convenience Outlet:

A duplex GFCI receptacle shall be factory mounted in a weatherproof enclosure and wired for a 10 amp load. It will remain powered when all unit circuit breakers have been turned off. The outlet will be deenergized by the unit disconnect.

16. Navigator Display Module:

The Navigator display module shall be a portable hand-held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.

17. Control Expansion Module:

Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:

a. Building pressurization, evacuation, smoke purge and fire shutdown control.
b. Supply Air Reset from external 4 to 20 mA signal.
c. 2-step Demand Limit inputs (when used with the CCN network).
d. Indoor Air Quality (IAQ) switch monitoring.
e. Outdoor Airflow (OAC) monitoring
f. Outdoor Humidity monitoring.
g. Space Humidity monitoring (required for dehumidification control, reheat and humidifier control).
h. Return Air humidity monitoring.

18. Relative Humidity Sensors:

Package shall contain either duct-mounted or wall-mounted sensors to measure the relative humidity of the air within the occupied space (specify location) or return duct and/or outside air.

NOTE: For Relative Humidity sensor monitoring, the CEM must also be ordered.

19. Indoor Air Quality (CO_2) Sensor:

a. Shall have the ability to provide demand ventilation indoor-air quality (IAQ) control through the economizer with an indoor air quality sensor.
b. The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO_2 in parts per million. The set point shall have adjustment capability.

20. Return Air Smoke Detector:

The smoke detector shall send input to the controller to shut down the unit in case smoke is detected.

21. Outdoor Airflow Sensor:

Outdoor Airflow Sensor package shall contain a airflow station with airflow sensor, a transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer and CEM are required with this accessory.

22. Differential Enthalpy Switch or Sensors (when equipped with both return air and outdoor air humidity sensors):

a. For use with economizer only.
b. Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.

23. Hot Gas Bypass:

    Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.

24. Condenser Coil Protective Coating — Pre-Coated:

    Condenser coil aluminum fins shall be coated with protective coating. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Coating material shall be a durable epoxy phenolic organic coating, capable of 1000 hr salt spray exposure per ASTM B117 test and ASTM DI 654 evaluation, 2000 hr corrosion weathering cycle and moist sulfur dioxide exposure per DIN 50018 (ASTM G87) test and ASTM DI 654 and ASTM D714 evaluation. Pre-coated aluminum fin coils shall provide protection in mildly corrosive coastal and industrial environments.

25. Optional Condenser Coil Material:

    Unit shall be factory equipped with condenser coils made from copper tubes and copper fins. Coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal basepan to minimize potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

26. Condenser Coil Protective Coating — E-Coat with Aluminum Fins:

    E-Coated aluminum fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

27. Condenser Coil Protective Coating — E-Coat with Copper Fins:

    E-Coated copper fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting sheet metal basepan to maintain coating integrity and minimize corrosion potential between the coil and pan.

28. Condenser Coil Hail Guard:

    Canted face enclosure and welded wire grille complete with support retainers and fasteners shall be provided for protection of condenser coils. Field-assembled.

29. Space Temperature Sensor (T-56):

    The T-56 space temperature sensor (for CV applications) shall monitor space temperature. Device shall be suited for wall mounting in the occupied space. The T-56 sensor shall incorporate a front-panel located slider switch to effect a remote change in set point of ±5° F (2.8 C). The T-56 sensor shall also include a button used to initiate Unoccupied Override function.

30. Space Temperature Sensor (T-56) with CO_2 Sensor:

    This device shall incorporate interior space temperature sensing and interior space CO_2 level monitoring functions. Space temperature sensor shall sense the actual temperature in the conditioned space via 10K ohm thermistor. Temperature set point adjustment potentiometer via slide scale shall provide ±5 F adjustment. CO_2 sensor shall provide CO_2 measurement range of 0 to 2000 PPM. IAQ signal to unit base board terminals shall be 4 to 20 mA. Sensor shall be equipped with an override button for timed override. Sensor must be powered by a separate field-supplied 24-v transformer.

Guide specifications — 48ZT,ZW075-105 units

Packaged Rooftop Cooling Unit with Gas Heat and *Comfort*Link™ Controls

HVAC Guide Specifications — Section 48ZT, ZW

Size Range: **75 to 105 Tons, Nominal**

Carrier Model Number:

48ZT (Vertical Supply/Return, CV Application)
48ZW (Vertical Supply/Return, VAV Application)

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor, roof-curb mounted, electronically controlled heating and cooling unit utilizing multiple semi-hermetic reciprocating type compressors on dual independent circuits for cooling and gas combustion for heating duty. Unit shall incorporate factory-installed economizer system with high-capacity modulating power exhaust system. Unit shall discharge supply air downward as shown on the contract drawings.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 340/360.

B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest revision), ASHRAE 62, UL Standard 1995, and National Electrical Code (U.S.A.).

C. Unit shall be listed by ETL and ETL Canada as a total package.

D. Unit shall be designed to conform to ANSI Standard Z21.47 (U.S.A.)/CSA Standard 2.3 (Canada), Gas-Fired Central Furnaces.

E. Roof curb shall be designed to NRCA criteria per Guideline B-1986.

F. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. Factory-assembled, single-piece heating and cooling unit.

Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B. Unit Cabinet:

1. Constructed of galvanized steel (designated G90 per ASTM Standard A653 — minimum coating weight of 0.9 oz. of zinc per square foot per side (275 grams per square meter) of sheet metal), bonderized and primer-coated on both sides and coated with a baked polyester thermosetting powdercoating finish on the outer surface.
2. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Sides shall have *man size* insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces (except heat exchanger section) shall be insulated with flexible fire-retardant dual-density (1.75-lb/cu. ft. [28.0 kg/cu. m]) fiberglass blanket, coated on the air side. Insulation coating shall be cleanable and shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM Standards G21 and G22.
5. Interior cabinet surfaces within heat exchanger section shall be lined with sheet metal on all surfaces, insulated on the side opposite the airstream.
6. Insulation shall be applied by means of adhesion using a water reducible adhesive sprayed onto interior surface. Adhesive shall maintain a satisfactory adhesion and cohesion within the temperature range of –20 to 180 F (–29 to 82 C) and have excellent resistance to water and water vapor when cured.
7. Unit shall contain a sloped drain pan, to prevent standing water from accumulating. Pan shall be fabricated of stainless steel. Unit shall contain a factory-installed nonferrous main condensate drain connection.
8. Units shall be equipped with lifting lugs to facilitate overhead rigging.

C. Fans:

1. Supply Fan:
   a. Unit shall have one fan wheel, scroll and motor only.
   b. Fan scroll, wheel, shaft, bearings, drive components and motor shall be mounted on a formed steel assembly which shall be isolated from the unit outer casing with factory-installed 2-in. deflection spring isolators and vibration-absorbent fan discharge seal.
   c. Fan shall be double-width, double-inlet, centrifugal belt driven forward-curve type with single outlet discharge (standard) or centrifugal belt driven airfoil blade section type with single outlet discharge (optional).
   d. Fan wheel shall be designed for continuous operation at the maximum rated fan speed and motor horsepower.

e. Fan wheel and shaft shall be selected to operate at 25% below the first critical speed and shall be statically and dynamically balanced as an assembly.

f. Fan shaft shall be solid steel, turned, ground and polished, and coated with rust-preventative oil.

g. Fan shaft bearings shall be self-aligning, pillow-block, regreasable ball- or roller-type selected for a minimum average life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

h. A single motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members.

i. Fan drive shall be constant-speed fixed-pitch. All drives shall be factory-mounted, with belts aligned and tensioned.

2. Power Exhaust Fans:

a. Dual fan assemblies.

b. Double-width, double-inlet, centrifugal belt driven forward-curve type with individual outlet discharge.

c. Statically and dynamically balanced.

d. Individual fixed-pitch pulley drives, matched to motor size selections.

e. Fan shaft bearing shall be of the pillow-block type with lubrication provisions.

f. Fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

g. Solid fan shaft construction.

3. Condenser Fans:

a. Direct-driven propeller type only.

b. Discharge air vertically upward.

c. Protected by PVC-coated steel wire safety guards.

d. Statically and dynamically balanced.

e. Three-phase, totally enclosed motors.

D. Compressors:

1. Multiple, reciprocating, semi-hermetic type only and shall be located for easy servicing.

2. Equipped with a suction-cutoff type electrically controlled unloader(s) (VAV only).

3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.

4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor.

5. Equipped with suction and discharge service valves.

6. Maximum operating speed of 1800 rpm (30 r/s).

E. Coils:

1. Evaporator Coils:

a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Full-face active type during full and part load conditions.

c. Coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).

2. Condenser Coils:

a. Constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3403 kPa).

c. All coils shall be same manufacturer as unit.

F. Integrated Economizer:

Dry bulb or differential dry bulb temperature controlled or optional enthalpy or differential enthalpy controlled integrated type consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary.

1. Dampers shall be a low-leakage type, not to exceed 1% leakage at 1-in. wg (249 Pa) pressure differential when fully closed.

2. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are communication capable of internal diagnostics.

3. Equipped with a solid-state humidity sensor (accessory) that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level. The user can also configure dew point limiting.

4. Outside air hoods shall be bottom-entry design, equipped with serviceable permanent washable aluminum mesh filters. Total face area of hood filters shall be minimum 48 sq ft (4.46 sq m).

G. Modulating Power Exhaust System:

High-capacity modulating power exhaust system shall be factory-installed and contain fans and motors, exhaust hoods and controls (including Variable Frequency Drive and staging sequence) to maintain space pressure at user-configured set point.

1. Dual fan assemblies with individual motors.

2. Variable Frequency Drive for modulating capacity of lead fan.

3. Staged control on lag fan.

4. Differential pressure transducer for monitoring space pressure.

5. Exhaust air hood assemblies containing backdraft dampers on each fan outlet, factory-installed.
6. All wiring and pressure tubing (except to space pressure pickup location) shall be factory supplied and installed.

H. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits, each containing:

1. Liquid line service valve.
2. Filter drier.
3. Moisture indicating sight glass.
4. Thermostatic expansion valve.
5. Fusible plug.

I. Heating Section:

1. Induced-draft combustion type with energy saving direct spark ignition systems and redundant main gas valves.
2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage (0.91 mm) steel coated with a nominal 1.4 mil aluminum-silicone alloy for corrosion resistance.

   Optional construction:

   Heat exchanger shall be constructed of minimum 20-gage Type 409 Stainless Steel for corrosion resistance. Tubing material shall be suited for high temperature and corrosion resisting service. Tubing material shall comply with ASTM A268, Grade TP409. Tubing shall be welded and annealed.
3. Burners shall be of the in-shot type constructed of aluminized steel.
4. All gas piping shall enter the unit cabinet at a single location.

J. Filter Section:

1. Filter section shall consist of 2-in. (51 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.
2. Factory 2-in. (51 mm) filter track shall allow easy field conversion to accept 4-in. (102 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.

K. Controls, Safeties, and Diagnostics:

1. Controls:
   a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:
      1) Day and Time.
      2) Schedule (Unoccupied/Occupied).
      3) Set points (Unoccupied/Occupied, Economizer, Duct Pressure, others).
      4) Space temperature.
      5) Outdoor air temperature.
      6) Unit supply air temperature.
      7) Unit return air temperature.
      8) Supply-air fan status.
      9) Economizer position.
      10) Compressor suction and discharge pressure.
      11) Scrolling marquee display.
      12) Accessory and/or field-supplied sensors, function switches and/or signals.
   b. Controls shall be capable of performing the following functions:
      1) Capacity control based on supply air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of compressor staging.
      2) Perform a quick test to check the status of all input and output signals to the control system using scrolling marquee display or Navigator.
      3) Control of integrated economizer operation, based on unit supply air temperature.
      4) Supply fan volume control shall modulate the position of Inlet Guide Vane dampers or control output from a Variable Frequency Drive to maintain duct static pressure at user-configured set point (VAV). Static pressure reset in conjunction with Carrier communicating terminals to reduce supply fan power requirements. Control system calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop).
      5) Heating control shall provide space temperature control for unoccupied period heating, morning warm-up sequence and occupied period heating (when configured).
      6) Adaptive optimal start shall determine the time unit will commence cooling [or heating or heating for morning warm-up] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode.
      7) Adaptive optimal stop shall turn off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV only).

8) Alerts and Alarms: Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation) or that an output has not functioned as expected or that a safety device has tripped. Current alarms shall be maintained in STATUS function; up to 9 (current or reset) shall be stored in HISTORY function for recall.
9) Timed override function shall permit a system in unoccupied mode to be returned to occupied mode for a user-configured period of 1, 2, 3 or 4 hours by pressing the override button on the front of the space temperature sensor.
10) Nighttime Free Cooling (NTFC) shall start the supply fan and open the economizer on cool nights to precool the building structure mass using only outdoor air. Function shall be restricted to operation above a user-configured low lockout temperature set point.
11) Modulating power exhaust control shall modulate capacity of exhaust fan system in response to building static pressure at user-configured set point. Power exhaust fan operation shall be interlocked with supply fan operation.
12) Smoke Control functions: Control shall initiate any of four separate smoke control functions in response to closure of field switches. Functions shall include: Pressurization, Evacuation, Smoke Purge and Fire Shutdown. Should two or more switches be closed simultaneously, Fire Shutdown shall be initiated.
13) Support demand control ventilation through a reset of the economizer's minimum position. This reset based on differential CO_2 PPM (outdoor and indoor) can be chosen as linear or as fast or slow-acting exponential curves.
14) Indoor air quality (IAQ) mode shall admit fresh outdoor air into the space whenever space air quality sensors detect unsuitable space conditions, by overriding economizer minimum damper position. IAQ shall be permitted only during occupied periods, unless configured to be allowed during unoccupied periods also.
15) Provide control for reheat via auxiliary heating coil during ventilation.
16) IAQ pre-occupancy purge function shall provide complete exchange of indoor air with fresh air during unoccupied periods, when outdoor conditions permit. Function shall energize supply fan and open economizer two hours before next occupied period; duration of purge shall be user-configured (5 to 60 minutes).
17) Outdoor Air Control (OAC) function shall maintain a minimum quantity of outdoor airflow into an occupied space. OAC mode shall be available only during an occupied period. Outdoor airflow shall be monitored by an airflow station and transducer. Economizer maximum damper opening position during OAC mode shall be user-configured.
18) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
19) Supply Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0° to 20 F (0° to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
20) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5 F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
21) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
22) Condenser-fan cycling control shall maintain correct head pressure down to 0° F (–18 C).
23) Refrigeration system pressures shall be monitored via pressure transducers. Alarms for low pressure, high pressure will be permitted.

24) Timed Discrete Output function shall control an external function or device via user-configured activity schedule. This schedule shall be separate and different from the unit's occupied/unoccupied time schedule.
25) Hydronic heating coil control shall modulate a control valve in a steam or hydronic heat system to maintain space temperature at user-configured set points. Control valve actuator shall communicate via LEN (Local Equipment Network) protocol.
26) Humidifier control shall provide control for either LEN communicating control valve or discrete-type output, to maintain space humidity conditions at user-configured set points.
27) Two-step demand limit control (when used in conjunction with CEM [Controls Expansion module]).
28) Display in Metric units: Display may be configured to display data in Metric or English (Imperial) units of measure.
29) Optional LEI (Local Equipment Interface) communication board to provide linkage with IP (Internet Protocol) communication protocol, LON (Local Operating Network) communication and RS485 serial communication capability.

2. Safeties:

Unit components shall be equipped with the following protections:

a. Compressors:
1) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
2) Crankcase heaters.
3) High-pressure switch (shuts down individual compressor, automatic reset switch with manual software reset).
4) Low-pressure switch (shuts down complete circuit, automatic reset switch with manual software reset).
5) Check filter switch (accessory).

b. Belt-Drive Fan Motors:

Overcurrent protection manual reset circuit breakers.

c. Heating Section:

Heating section shall be protected with the following minimum protections:
1) Redundant gas valve.
2) Flame proving controls.
3) Induced-draft motor speed sensor.
4) High-temperature limit switch.
5) Flame rollout switch.

3. Diagnostics:

a. Diagnostic display module shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.

b. Diagnostic display module shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.

c. Diagnostic module must also be capable of displaying outputs of microprocessor-controlled "quick test" to verify operation of every thermistor, actuator motor, fan, and compressor before unit is started.

L. Operating Characteristics:
1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature per maximum load criteria of ARI Standard 340/360.
2. Unit shall be capable of mechanical cooling operation down to 0° F (–18 C) ambient outdoor temperature.
3. Unit shall provide multi-stage cooling capability.
4. Unit shall provide 2 stages of heating control capability.

M. Motors:
1. Compressor motors shall be cooled by suction gas passing over motor windings.
2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection.
3. Supply and exhaust fan motors shall be of the 3-phase, NEMA rated, Open Dripproof (ODP), ball bearing type, with efficiencies per EPACT (U.S.A.) requirements.

N. Electrical Requirements:

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

O. Special Features:
1. Roof Curb:

Designed to comply with criteria established by NRCA Guideline B-1986. Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip as perimeter curb supporting the air handling portion of unit, and rail for supporting the condenser portion of the unit.

2. Roof Curb Condenser Section:

Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip for supporting condenser section of the unit to complete a full perimeter curb under entire unit.

3. Medium-Efficiency Pleated Filters:

   Unit shall be factory equipped with 2-in. (51 mm) medium-efficiency pleated filters having the following characteristics:

   a. Filters shall have a design dust spot efficiency with an average of 30% based on the ASHRAE Standard 52.1 test method.
   b. Filters shall have a minimum arrestance of 90%.
   c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.

4. High-Efficiency Pleated Filters:

   Unit shall be factory equipped with 2-in. (51 mm) high-efficiency pleated filters having the following characteristics:

   a. Filters shall have a design dust spot efficiency with an average of 60 to 65% based on the ASHRAE Standard 52.1 test method.
   b. Filters shall have a minimum arrestance of 90%.
   c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.

5. Supply Fan Static Pressure Control/Inlet Guide Vanes:

   Inlet Guide Vane option shall include:

   a. Factory-installed double guide vane assemblies, consisting of rolled steel support rings and actuating rings, galvanized steel vanes capable of opening to full 90-deg position, and pivot bearings, designed for 250,000 cycles (full-open to full-closed) and protected against corrosion (painted, galvanized or plated).
   b. Factory-mounted single actuator, with factory-mounted linkages to modulate both inlet rings.
   c. Factory-mounted duct pressure sensing controller:

      Differential Pressure Transducer, 4 to 20 mA output to unit control module, with adjustable set point range (0.0 to 5.0 in. wg [0 to 1246 Pa]), adjust via HSIO keypad.

   d. Low pressure reference tube factory installed.

6. Supply Fan Static Pressure Control/Variable Frequency Drive:

   Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, -wired and -tested. The VFD shall control motor speed to maintain set point static pressure control at the supply duct sensor tube location. The supply fan drive shall be field-adjustable to maintain supply duct static pressure set point from 0.0-in. wg to 5-in. wg (0 to 1246 Pa), adjusted via scrolling marquee display or Navigator.

   A pressure transducer shall be factory-mounted and -wired. (Control tubing from sensor tube location to transducer shall be field-supplied and -installed.) Transducer shall provide a 4 to 20 mA signal to the unit control module; unit control module shall provide a 4 to 20 mA signal to the VFD indicating desired VFD output level.

   The variable speed drive shall include the following features:

   a. Full digital control.
   b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
   c. Inverters capable of operation at a frequency of 8 kHz so no acoustic noise shall be produced by the motor.
   d. NEMA 1 metal enclosure for reduction of RFI (radio frequency interference).
   e. Digital display keypad module, mounted on the VFD enclosure.
   f. Local/Remote and Manual/Auto function keys on the keypad.
   g. UL listed electronic overload protection.
   h. Critical frequency avoidance.
   i. Self diagnostics.
   j. On-board storage of unit manufacturer's customer user settings, retrievable from the keypad.
   k. RS232C communications capability standard.
   l. RS485 communications capability (accessory card source required).
   m. Internal electronic filtration to reduce EMI generation.

7. VFD Remote Display Service Module:

   Accessory package shall contain VFD adapter plate, remote display housing (to accept the keypad module removed from the VFD housing) and cable assembly with quick-connect plug to connect to mating plug on VFD adapter plate, to facilitate VFD diagnostics and servicing.

8. Premium-Efficiency Motors (Supply Fan/ Exhaust Fans):

   Unit shall be factory-equipped with premium efficiency motors on Supply Fan (and Power Exhaust Fans) with NEMA efficiency ratings per contract drawings. Available all motor sizes.

9. Staged Gas Control:
   a. Staged Gas Control option shall monitor unit supply air temperature and sequence the unit heat exchanger staging to provide the following sequences:
      1) Tempering heat control, based on user-configured ventilation supply air temperature set point, to eliminate cold draft conditions with low mixed air temperatures.
      2) First-stage demand heating control, with staging selected to maintain user-configured heating supply air temperature set point.
      3) Full-fire demand heating on heating control command.
   b. Staged Gas Control option shall consist of:
      1) Supply air temperature thermistors with duct-mounting base.
      2) Limit switch temperature thermistor.
      3) Stainless steel heat exchanger tubes and construction option.
   c. Field installation shall be limited to installing three supply air temperature thermistors in the supply duct. All other hardware, wiring and piping shall be factory-completed.
10. Non-Fused Disconnect:

    A non-fused electrical disconnect for main unit power shall be factory installed. The disconnect shall be an interlocking through-the-door type.
11. 115-Volt Convenience Outlet:

    A duplex GFCI receptacle shall be factory mounted in a weatherproof enclosure and wired for a 10 amp load. It will remain powered when all unit circuit breakers have been turned off. The outlet will be deenergized by the unit disconnect.
12. Navigator Display Module:

    The Navigator display module shall be a portable hand-held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.
13. Control Expansion Module:

    Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:
    a. Building pressurization, evacuation, smoke purge and fire shutdown control.
    b. Supply Air Reset from external 4 to 20 mA signal.
    c. 2-step Demand Limit inputs (when used with the CCN network).
    d. Indoor Air Quality (IAQ) switch monitoring.
    e. Outdoor Airflow (OAC) monitoring.
    f. Outdoor Humidity monitoring.
    g. Space Humidity monitoring (required for dehumidification control, reheat and humidifier control).
    h. Return Air humidity monitoring.
14. Relative Humidity Sensors:

    Package shall contain either duct-mounted or wall-mounted sensors to measure the relative humidity of the air within the occupied space (specify location) or return duct and/or outside air.

    NOTE: For Relative Humidity sensor monitoring, the CEM must also be ordered.
15. Indoor Air Quality (CO_2) Sensor:

    Shall have the ability to provide demand ventilation indoor-air quality (IAQ) control through the economizer with an indoor air quality sensor.

    The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO_2 in parts per million. The set point shall have adjustment capability.
16. Return Air Smoke Detector:

    The smoke detector shall send input to the controller to shut down the unit in case smoke is detected.
17. Outdoor Airflow Sensor:

    Outdoor Airflow Sensor package shall contain a airflow station with airflow sensor, a transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer and CEM are required with this accessory.
18. Differential Enthalpy Switch or Sensors (when equipped with both return air and outdoor air humidity sensors):

    Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.

19. Hot Gas Bypass:

    Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.

20. Condenser Coil Protective Coating — Pre-Coated:

    Condenser coil aluminum fins shall be coated with protective coating. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Coating material shall be a durable epoxy phenolic organic coating, capable of 1000 hr salt spray exposure per ASTM B117 test and ASTM DI 654 evaluation, 2000 hr corrosion weathering cycle and moist sulfur dioxide exposure per DIN 50018 (ASTM G87) test and ASTM DI 654 and ASTM D714 evaluation. Pre-coated aluminum fin coils shall provide protection in mildly corrosive coastal and industrial environments.

21. Optional Condenser Coil Material:

    Unit shall be factory equipped with condenser coils made from copper tubes and copper fins. Coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal base pan to minimize potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

22. Condenser Coil Protective Coating — E-Coat with Aluminum Fins:

    E-Coated aluminum fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B-5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

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24. Condenser Coil Hail Guard:

    Canted face enclosure and welded wire grille complete with support retainers and fasteners shall be provided for protection of condenser coils. Field-assembled.

25. Space Temperature Sensor (T-56):

    The T-56 space temperature sensor (for CV applications) shall monitor space temperature. Device shall be suited for wall mounting in the occupied space. The T-56 sensor shall incorporate a front-panel located slider switch to effect a remote change in set point of ±5° F (2.8 C). The T-56 sensor shall also include a button used to initiate Unoccupied Override function.

26. Space Temperature Sensor (T-56) with CO_2 Sensor:

    This device shall incorporate interior space temperature sensing and interior space CO_2 level monitoring functions. Space temperature sensor shall sense the actual temperature in the conditioned space via 10K ohm thermistor. Temperature set point adjustment potentiometer via slide scale shall provide ±5 F adjustment. CO_2 sensor shall provide CO_2 measurement range of 0 to 2000 PPM. IAQ signal to unit base board terminals shall be 4 to 20 mA. Sensor shall be equipped with an override button for timed override. Sensor must be powered by a separate field-supplied 24-v transformer.

Guide specifications — 48ZG,ZN,Z6,Z8075-105 units

Packaged Rooftop Cooling Unit With Gas Heat and *Comfort*Link™ Controls

HVAC Guide Specifications — Section 48ZG, ZN, Z6, Z8

Size Range: **75 to 105 Tons, Nominal**

Carrier Model Number:

48ZG (Vertical Supply/Return, CV Application)

48ZN (Vertical Supply/Return, VAV Application)

48Z6 (Vertical Supply/Return, CV Application with Return Fan and Building Pressure Control)

48Z8 (Vertical Supply/Return, VAV Application with Return Fan and Building Pressure Control)

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor, roof-curb mounted, electronically controlled heating and cooling unit utilizing multiple semi-hermetic reciprocating type compressors on dual independent circuits for cooling and gas combustion for heating duty. Units shall discharge supply air downward as shown on the contract drawings.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 340/360.

B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest revision), ASHRAE 62, UL Standard 1995, and National Electrical Code (U.S.A.).

C. Unit shall be listed by ETL and ETL Canada as a total package.

D. Unit shall be designed to conform to ANSI Standard Z21.47 (U.S.A.) / CSA Standard 2.3 (Canada), Gas-Fired Central Furnaces.

E. Roof curb shall be designed to NRCA criteria per Guideline B-1986.

F. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. Factory-assembled, single-piece heating and cooling unit.

Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B. Unit Cabinet:

1. Constructed of galvanized steel (designated G90 per ASTM Standard A653 — minimum coating weight of 0.9 oz. of zinc per square foot per side (275 grams per square meter) of sheet metal), bonderized and primer-coated on both sides and coated with a baked polyester thermosetting powdercoating finish on the outer surface.
2. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Sides shall have *man size* insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces (except heat exchanger section) shall be insulated with flexible fire-retardant dual-density (1.75-lb/cu. ft [28.0 kg/cu. m]) fiberglass blanket, coated on the air side. Insulation coating shall be cleanable and shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM Standards G21 and G22.
5. Interior cabinet surfaces within heat exchanger section shall be lined with sheet metal on all surfaces, insulated on the side opposite the airstream.
6. Insulation shall be applied by means of adhesion using a water reducible adhesive sprayed onto interior surface. Adhesive shall maintain a satisfactory adhesion and cohesion within the temperature range of –20 to 180 F (–29 to 82 C) and have excellent resistance to water and water vapor when cured.
7. Unit shall contain a sloped drain pan, to prevent standing water from accumulating. Pan shall be fabricated of stainless steel. Unit shall contain a factory-installed nonferrous main condensate drain connection.
8. Units shall be equipped with lifting lugs to facilitate overhead rigging.

C. Fans:

1. Supply Fan:
   a. Unit shall have one fan wheel, scroll and motor only.
   b. Fan scroll, wheel, shaft, bearings, drive components and motor shall be mounted on a formed steel assembly which shall be isolated from the unit outer casing with factory-installed 2-in. deflection spring isolators and vibration-absorbent fan discharge seal.

c. Fan shall be double-width, double-inlet, centrifugal belt driven forward-curve type with single outlet discharge (standard) or centrifugal belt driven airfoil blade section type with single outlet discharge (optional).

d. Fan wheel shall be designed for continuous operation at the maximum rated fan speed and motor horsepower.

e. Fan wheel and shaft shall be selected to operate at 25% below the first critical speed and shall be statically and dynamically balanced as an assembly.

f. Fan shaft shall be solid steel, turned, ground and polished, and coated with rust-preventative oil.

g. Fan shaft bearings shall be self-aligning, pillow-block, regreasable ball- or roller-type selected for a minimum average life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

h. A single motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members.

i. Fan drive shall be constant-speed fixed-pitch. All drives shall be factory-mounted, with belts aligned and tensioned.

2. Condenser Fans:

a. Direct-driven propeller type only.

b. Discharge air vertically upward.

c. Protected by PVC-coated steel wire safety guards.

d. Statically and dynamically balanced.

e. Three-phase, totally enclosed motors.

D. Compressors:

1. Multiple, reciprocating, semi-hermetic type only and shall be located for easy servicing.

2. Equipped with a suction-cutoff type electrically controlled unloader(s) (VAV only).

3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.

4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor.

5. Equipped with suction and discharge service valves.

6. Maximum operating speed of 1800 rpm (30 r/s).

E. Coils:

1. Evaporator Coils:

a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Full-face active type during full and part load conditions.

c. Coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).

2. Condenser Coils:

a. Constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3403 kPa).

c. All coils shall be same manufacturer as unit.

F. Outdoor-Air Hood Assembly (48ZG, ZN only):

Factory-installed manual outdoor-air damper shall allow intake of up to 25% nominal airflow (on units not equipped with optional economizer).

G. Heating Section:

1. Induced-draft combustion type with energy saving direct spark ignition systems and redundant main gas valves.

2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage (0.91 mm) steel coated with a nominal 1.4 mil aluminum-silicone alloy for corrosion resistance.

Optional construction:

Heat exchanger shall be constructed of minimum 20-gage Type 409 Stainless Steel for corrosion resistance. Tubing material shall be suited for high temperature and corrosion resisting service. Tubing material shall comply with ASTM A268, Grade TP409. Tubing shall be welded and annealed.

3. Burners shall be of the in-shot type constructed of aluminized steel.

4. All gas piping shall enter the unit cabinet at a single location.

H. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits, each containing:

1. Liquid line service valve.

2. Filter drier.

3. Moisture indicating sight glass.

4. Thermostatic expansion valve.

5. Fusible plug.

I. Filter Section:

1. Filter section shall consist of 2-in. (51 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.

2. Factory 2-in. (51 mm) filter track shall allow easy field conversion to accept 4-in. (102 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.

J. Controls, Safeties, and Diagnostics:
1. Controls:
a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:
1) Day and Time.
2) Schedule (Unoccupied/Occupied).
3) Set points (Unoccupied/Occupied, Economizer, Duct Pressure, others).
4) Space temperature.
5) Outdoor air temperature.
6) Unit supply air temperature.
7) Unit return air temperature.
8) Supply-air fan status.
9) Economizer position.
10) Compressor suction and discharge pressure.
11) Scrolling marquee display.
12) Accessory and/or field-supplied sensors, function switches and/or signals.
b. Controls shall be capable of performing the following functions:
1) Capacity control based on supply air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of electric unloaders (ZN,Z8 units only) and compressor staging.
2) Perform a quick test to check the status of all input and output signals to the control system using scrolling marquee display or Navigator.
3) Control of integrated economizer operation, based on unit supply-air temperature.
4) Supply fan volume control shall modulate the position of Inlet Guide Vane dampers or control output from a Variable Frequency Drive to maintain duct static pressure at user-configured set point (VAV). Static pressure reset in conjunction with Carrier communicating terminals to reduce supply fan power requirements. Control system calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop).
5) Heating control shall provide space temperature control for unoccupied period heating, morning warm-up sequence and occupied period heating (when configured).
6) Adaptive optimal start shall determine the time unit will commence cooling [or heating or heating for morning warm-up] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode.
7) Adaptive optimal stop shall turn off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV only).
8) Alerts and Alarms: Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation) or that an output has not functioned as expected or that a safety device has tripped. Current alarms shall be maintained in STATUS function; up to 9 (current or reset) shall be stored in HISTORY function for recall.
9) Timed override function shall permit a system in unoccupied mode to be returned to occupied mode for a user-configured period of 1, 2, 3 or 4 hours by pressing the override button on the front of the space temperature sensor.
10) Nighttime Free Cooling (NTFC) shall start the supply fan and open the economizer on cool nights to precool the building structure mass using only outdoor air. Function shall be restricted to operation above a user-configured low lockout temperature set point.
11) Modulating power exhaust control (ZG, ZN units only) shall modulate capacity of exhaust fan system in response to building static pressure at user-configured set point. Power exhaust fan operation shall be interlocked with supply fan operation.
12) Return fan control (Z6, Z8 units only) shall measure supply fan CFM and modulate return fan to maintain constant CFM differential between supply and return fan. Return fan operation shall be interlocked with supply fan operation. Capacity of exhaust air shall modulated in response to building static pressure at user-configured set point.

13) Smoke Control functions: Control shall initiate any of four separate smoke control functions in response to closure of field switches. Functions shall include: Pressurization, Evacuation, Smoke Purge and Fire Shutdown. Should two or more switches be closed simultaneously, Fire Shutdown shall be initiated.
14) Support demand control ventilation through a reset of the economizer's minimum position. This reset based on differential CO_2 PPM (outdoor and indoor) can be chosen as linear or as fast or slow-acting exponential curves.
15) Indoor air quality (IAQ) mode shall admit fresh outdoor air into the space whenever space air quality sensors detect unsuitable space conditions, by overriding economizer minimum damper position. IAQ shall be permitted only during occupied periods, unless configured to be allowed during unoccupied periods also.
16) Provide control for reheat via auxiliary heating coil during ventilation.
17) IAQ pre-occupancy purge function shall provide complete exchange of indoor air with fresh air during unoccupied periods, when outdoor conditions permit. Function shall energize supply fan and open economizer two hours before next occupied period; duration of purge shall be user-configured (5 to 60 minutes).
18) Outdoor Air Control (OAC) function shall maintain a minimum quantity of outdoor airflow into an occupied space. OAC mode shall be available only during an occupied period. Outdoor airflow shall be monitored by an airflow station and transducer. Economizer maximum damper opening position during OAC mode shall be user-configured.
19) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
20) Supply Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0 to 20 F (0 to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
21) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5 F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
22) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
23) Condenser-fan cycling control shall maintain correct head pressure down to 0° F (–18 C).
24) Refrigeration system pressures shall be monitored via pressure transducers. Alarms for low pressure, high pressure will be permitted.
25) Timed Discrete Output function shall control an external function or device via user-configured activity schedule. This schedule shall be separate and different from the unit's occupied/unoccupied time schedule.
26) Hydronic heating coil control shall modulate a control valve in a steam or hydronic heat system to maintain space temperature at user-configured set points. Control valve actuator shall communicate via LEN (Local Equipment Network) protocol.
27) Humidifier control shall provide control for either LEN communicating control valve or discrete-type output, to maintain space humidity conditions at user-configured set points.
28) Two-step demand limit control (when used in conjunction with CEM [Controls Expansion module]).
29) Display in Metric units: Display may be configured to display data in Metric or English (Imperial) units of measure.
30) Optional LEI (Local Equipment Interface) communication board to provide linkage with IP (Internet Protocol) communication protocol, LON (Local Operating Network) communication and RS485 serial communication capability.

2. Safeties:

   Unit components shall be equipped with the following protections:

   a. Compressors:
      1) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
      2) Crankcase heaters.

3) High-pressure switch (shuts down individual compressor, automatic reset switch with manual software reset).
4) Low-pressure switch (shuts down complete circuit, automatic reset switch with manual software reset).
5) Check filter switch (accessory).

b. Belt-Drive Fan Motors:

Overcurrent protection manual reset circuit breakers.

c. Heating Section:

Heating section shall be protected with the following minimum protections:

1) Redundant gas valves.
2) Flame proving controls.
3) Induced-draft fan motor speed sensor.
4) High-temperature limit switch.
5) Flame rollout switch.

3. Diagnostics:

a. Diagnostic display module shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.

b. Diagnostic display module shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.

c. Diagnostic module must also be capable of displaying outputs of microprocessor-controlled "quick test" to verify operation of every thermistor, actuator motor, fan, and compressor before unit is started.

K. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature per maximum load criteria of ARI Standard 340/360.
2. Unit shall be capable of mechanical cooling operation down to 0° F (–18 C) ambient outdoor temperature.
3. Unit shall provide multi-stage cooling capability.
4. Unit shall provide 2 stages of heating control capability.

L. Motors:

1. Compressor motors shall be cooled by suction gas passing over motor windings.
2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection.
3. Supply fan motor shall be of the 3-phase, NEMA rated, Open Dripproof (ODP), ball bearing type, with efficiencies per EPACT (U.S.A.) requirements.

M. Electrical Requirements:

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

N. Special Features:

1. Roof Curb:

Designed to comply with criteria established by NRCA Guideline B-1986. Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip as perimeter curb supporting the air handling portion of unit, and rail for supporting the condenser portion of the unit.

2. Roof Curb Condenser Section:

Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip for supporting condenser section of the unit to complete a full perimeter curb under entire unit.

3. Integrated Economizer:

Dry bulb or differential dry bulb temperature controlled or optional enthalpy or differential enthalpy controlled integrated type consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary.

a. Dampers shall be a low-leakage type, not to exceed 1% leakage at 1-in. wg (249 Pa) pressure differential when fully closed.

b. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are communication capable of internal diagnostics.

c. Equipped with a solid-state humidity sensor (accessory) that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level. The user can also configure dew point limiting.

4. 100% Modulating Power Exhaust (Option on 48ZG,ZN):

Package shall include 2 double-width, double-inlet centrifugal belt drive, forward-curved power exhaust fans with modulating devices at the discharge of each fan to maintain a field adjustable interior space pressure set point.

a. Fan bearings shall be of the pillow block type with an average design life of 200,000 hours.

b. Fans shall be statically and dynamically balanced.

c. Available in Internal or External Locations.

5. Return Fan/Building Pressure Control (Standard on 48Z6, Z8, with Economizer):
   a. Functions provided shall be:
      1) Airflow control for return duct path (dedicated to overcoming flow losses in return duct system).
      2) Modulate return airflow rate to track Supply Fan airflow rate and maintain a user set delta CFM between the supply and return airflow.
      3) Maintain Building Pressure by sensing Building Pressure and modulating exhaust damper position.
   b. Option shall consist of following hardware:
      1) Plenum fan assembly, with welded steel airfoil blade fan.
      2) Spring isolation.
      3) Belt-drive fan system, fixed pitch for maximum belt life and reliability.
      4) Variable Speed Drive (VFD) for Return Fan modulation control.
      5) Supply air CFM and Return air CFM sensors to measure supply and return airflow.
      6) Exhaust damper with outlet hood.
      7) Direct-acting damper actuator.
      8) Building Pressure transducer.
   c. Installation:
      1) Site installation shall require supply and installation of Building Pressure sensing pick-up and tube to connect to BP transducer in unit.
      2) All other wiring and pressure tubing shall be factory-supplied and factory-installed.
6. Barometric Relief Package (48ZG, ZN only):
   a. Package shall relieve excess internal pressure and consist of damper assemblies, hoods, damper screens, seal strips and required hardware.
   b. Damper assemblies shall close due to gravity upon unit shutoff.
7. Medium-Efficiency Pleated Filters:

   Unit shall be factory equipped with 2-in. (51 mm) medium-efficiency pleated filters having the following characteristics:
   a. Filters shall have a design dust spot efficiency with an average of 30% based on the ASHRAE Standard 52.1 test method.
   b. Filters shall have a minimum arrestance of 90%.
   c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.
8. High-Efficiency Pleated Filters:

   Unit shall be factory equipped with 2-in. (51 mm) high-efficiency pleated filters having the following characteristics:
   a. Filters shall have a design dust spot efficiency with an average of 60 to 65% based on the ASHRAE Standard 52.1 test method.
   b. Filters shall have a minimum arrestance of 90%.
   c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.
9. Supply Fan Static Pressure Control/Inlet Guide Vanes:

   Inlet Guide Vane option shall include:
   a. Factory-installed double guide vane assemblies, consisting of rolled steel support rings and actuating rings, galvanized steel vanes capable of opening to full 90-deg position, and pivot bearings, designed for 250,000 cycles (full-open to full-closed) and protected against corrosion (painted, galvanized or plated).
   b. Factory-mounted single actuator, with factory-mounted linkages to modulate both inlet rings.
   c. Factory-mounted duct pressure sensing controller: Differential Pressure Transducer, 4 to 20 mA output to unit control module, with adjustable set point range (0.0 to 5.0 in. wg [0 to 1246 Pa]), adjust via scrolling marquee display or Navigator.
   d. Low pressure reference tube factory installed.
   e. Not available with optional airfoil supply fan.
10. Supply Fan Static Pressure Control/Variable Frequency Drive:

    Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, -wired and -tested. The VFD shall control motor speed to maintain set point static pressure control at the supply duct sensor tube location. The supply fan drive shall be field-adjustable to maintain supply duct static pressure set point from 0.0-in. wg to 5-in. wg (0 to 1246 Pa), adjusted via scrolling marquee display or Navigator.

    A pressure transducer shall be factory-mounted and -wired. (Control tubing from sensor tube location to transducer shall be field-supplied and -installed.) Transducer shall provide a 4 to 20 mA signal to the unit control module; unit control module shall provide a 4 to 20 mA signal to the VFD indicating desired VFD output level.

The variable speed drive shall include the following features:

a. Full digital control.
b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
c. Inverters capable of operation at a frequency of 8 kHz so no acoustic noise shall be produced by the motor.
d. NEMA 1 metal enclosure for reduction of RFI (radio frequency interference).
e. Digital display keypad module, mounted on the VFD enclosure.
f. Local/Remote and Manual/Auto function keys on the keypad.
g. UL listed electronic overload protection.
h. Critical frequency avoidance.
i. Self diagnostics.
j. On-board storage of unit manufacturer's customer user settings, retrievable from the keypad.
k. RS232C communications capability standard.
l. RS485 communications capability (accessory card source required).
m. Internal electronic filtration to reduce EMI generation.

11. VFD Remote Display Service Module:

    Accessory package shall contain VFD adapter plate, remote display housing (to accept the keypad module removed from the VFD housing) and cable assembly with quick-connect plug to connect to mating plug on VFD adapter plate, to facilitate VFD diagnostics and servicing.

12. Premium-Efficiency Motors (Supply Fan/ Exhaust Fans):

    Unit shall be factory-equipped with premium efficiency motors on Supply Fan (and Power Exhaust Fans) with NEMA efficiency ratings per contract drawings. Available all motor sizes.

13. Staged Gas Control:

    a. Staged Gas Control option shall monitor unit supply-air temperature and sequence the unit heat exchanger staging to provide the following sequences:
        1) Tempering heat control, based on user-configured ventilation supply air temperature set point, to eliminate cold draft conditions with low mixed air temperatures.
        2) First-stage demand heating control, with staging selected to maintain user-configured heating supply air temperature set point.
        3) Full-fire demand heating on heating control command.
    b. Staged Gas Control option shall consist of:
        1) Supply air temperature thermistors with duct-mounting base.
        2) Limit switch temperature thermistor.
        3) Stainless steel heat exchanger tubes and construction option.
    c. Field installation shall be limited to installing three supply air temperature thermistors in the supply duct. All other hardware, wiring and piping shall be factory-completed.

14. Non-Fused Disconnect:

    A non-fused electrical disconnect for main unit power shall be factory installed. The disconnect shall be an interlocking through-the-door type.

15. 115-Volt Convenience Outlet:

    A duplex GFCI receptacle shall be factory mounted in a weatherproof enclosure and wired for a 10 amp load. It will remain powered when all unit circuit breakers have been turned off. The outlet will be deenergized by the unit disconnect.

16. Navigator Display Module:

    The Navigator display module shall be a portable hand-held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.

17. Control Expansion Module:

    Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:

    a. Building pressurization, evacuation, smoke purge and fire shutdown control.
    b. Supply Air Reset from external 4 to 20 mA signal.

c. 2-step Demand Limit inputs (when used with the CCN network).

d. Indoor Air Quality (IAQ) switch monitoring.

e. Outdoor Airflow (OAC) monitoring.

f. Outdoor Humidity monitoring.

g. Space Humidity monitoring (required for dehumidification control, reheat and humidifier control).

h. Return Air humidity monitoring.

18. Relative Humidity Sensors:

    Package shall contain either duct-mounted or wall-mounted sensors to measure the relative humidity of the air within the occupied space (specify location) or return duct and/or outside air.

    NOTE: For Relative Humidity sensor monitoring, the CEM must also be ordered.

19. Indoor Air Quality (CO_2) Sensor:

    Shall have the ability to provide demand ventilation indoor-air quality (IAQ) control through the economizer with an indoor air quality sensor.

    The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO_2 in parts per million. The set point shall have adjustment capability.

20. Return Air Smoke Detector:

    The smoke detector shall send input to the controller to shut down the unit in case smoke is detected.

21. Outdoor Airflow Sensor:

    Outdoor Airflow Sensor package shall contain a airflow station with airflow sensor, a transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer and CEM are required with this accessory.

22. Differential Enthalpy Sensor:

    a. For use with economizer only.

    b. Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.

23. Hot Gas Bypass:

    Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.

24. Condenser Coil Protective Coating — Pre-Coated:

    Condenser coil aluminum fins shall be coated with protective coating. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Coating material shall be a durable epoxy phenolic organic coating, capable of 1000 hr salt spray exposure per ASTM B117 test and ASTM DI 654 evaluation, 2000 hr corrosion weathering cycle and moist sulfur dioxide exposure per DIN 50018 (ASTM G87) test and ASTM DI 654 and ASTM D714 evaluation. Pre-coated aluminum fin coils shall provide protection in mildly corrosive coastal and industrial environments.

25. Optional Condenser Coil Material:

    Unit shall be factory equipped with condenser coils made from copper tubes and copper fins. Coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal basepan to minimize potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

26. Condenser Coil Protective Coating — E-Coat with Aluminum Fins:

    E-Coated aluminum fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

27. Condenser Coil Protective Coating — E-Coat with Copper Fins:

    E-Coated copper fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to

minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting sheet metal basepan to maintain coating integrity and minimize corrosion potential between the coil and pan.

28. Condenser Coil Hail Guard:

    Canted face enclosure and welded wire grille complete with support retainers and fasteners shall be provided for protection of condenser coils. Field-assembled.

29. Space Temperature Sensor (T-56):

    T-56 space temperature sensor (for CV applications) shall monitor space temperature. Device shall be suited for wall mounting in the occupied space. The T-56 sensor shall incorporate a front-panel located slider switch to effect a remote change in set point of ±5° F (2.8 C). The T-56 sensor shall also include a button used to initiate Unoccupied Override function.

30. Space Temperature Sensor (T-56) with CO_2 Sensor:

    This device shall incorporate interior space temperature sensing and interior space CO_2 level monitoring functions. Space temperature sensor shall sense the actual temperature in the conditioned space via 10K ohm thermistor. Temperature set point adjustment potentiometer via slide scale shall provide ±5 F adjustment. CO_2 sensor shall provide CO_2 measurement range of 0 to 2000 PPM. IAQ signal to unit base board terminals shall be 4 to 20 mA. Sensor shall be equipped with an override button for timed override. Sensor must be powered by a separate field-supplied 24-v transformer.

Guide specifications — 50ZG,ZN,Z2,Z3030-070 units

Packaged Rooftop Cooling Unit with *Comfort*Link™ Controls and Optional Electric or Hydronic Heat

HVAC Guide Specifications — Section 50ZG, ZN, Z2, Z3

Size Range: **30 to 70 Tons, Nominal**

Carrier Model Number:

50ZG (Vertical Supply/Return, CV Application) (030-070)

50ZN (Vertical Supply/Return, VAV Application) (030-070)

50Z2 (Horizontal Supply/Return, CV Application) (030-070)

50Z3 (Horizontal Supply/Return, VAV Application) (030-070)

50ZG,Z2 (Vertical Supply/Return, CV Application with Extended Chassis) (030-070)

50ZN,Z3 (Horizontal Supply/Return, VAV Application with Extended Chassis) (030-060)

NOTE: Items throughout the specification which apply only to "With Electric or Hydronic Heat" are indicated by single brackets [i.e.].

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor, roof-curb mounted, electronically controlled [heating and] cooling unit utilizing semi-hermetic reciprocating type compressors for cooling duty [and utilizing electric resistance coils or hydronic coil assembly for heating duty]. Units shall discharge supply air downward (50ZG,ZN) or horizontally (50Z2,Z3) as shown on the contract drawings.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 340/360.

B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest revision), ASHRAE 62, UL Standard 1995, and National Electrical Code (U.S.A.).

C. Unit shall be listed by ETL and ETL Canada as a total package.

D. Roof curb shall be designed to NRCA criteria per Guideline B-1986.

E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. Factory-assembled, single-piece [heating and] cooling unit.

Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B. Extended Chassis (**50ZG, Z2, ZN, Z3** K, L, M, N, P, Q, R, S, T, V, W, X, Y, Z units only):

Extended chassis designs shall contain an added length module, after the evaporator section, as shown in the contract drawings. Module shall contain tracks to accept field-supplied/installed auxiliary heating coil (except W, X, Y, Z).

C. Discharge Plenum (**50ZG, ZN** H, J, P, Q, Y, Z units only):

Discharge plenum design shall contain added length module for bottom supply air discharge, as shown in contract drawings. Discharge plenum design shall provide horizontal discharge arrangement supply fan which shall discharge into insulated plenum. Electric heat not available with discharge plenum models.

D. Unit Cabinet:

1. Constructed of galvanized steel (designated G90 per ASTM Standard A653 — minimum coating weight of 0.9 oz. of zinc per square foot per side [275 grams per square meter]), bonderized and primer-coated on both sides and coated with a baked polyester thermosetting powder-coating finish on the outer surface.
2. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Sides shall have *man size* insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces shall be insulated with flexible fire-retardant dual-density (1.75-lb/cu. ft [28.0 kg/cu. m]) fiberglass blanket, coated on the air side. Insulation coating shall be cleanable and shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM Standards G21 and G22.
5. Interior cabinet surfaces within Discharge Plenum section shall be lined with sheet metal on all surfaces, insulated on the side opposite the airstream.
6. Insulation shall be applied by means of adhesion using a water reducible adhesive sprayed onto interior surface. Adhesive shall maintain a satisfactory adhesion and cohesion within the temperature range of –20 to 180 F (–29 to

82 C) and have excellent resistance to water and water vapor when cured.

7. Unit shall contain a sloped drain pan, to prevent standing water from accumulating. Pan shall be fabricated of stainless steel. Unit shall contain a factory-installed nonferrous main condensate drain connection.
8. Units shall be equipped with lifting lugs to facilitate overhead rigging.

E. Fans:
1. Supply Fan:
   a. Double-width, double-inlet, centrifugal belt driven forward-curve type with single outlet discharge.
   b. Fixed-pitch pulley drive.
   c. Mounted on a formed steel sled with flexible outlet connection consisting of canvas transitions.
   d. Fan shaft bearing shall be of the pillow-block type with lubrication provisions.
   e. Statically and dynamically balanced.
   f. Supply fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.
   g. Solid fan shaft construction.
   h. Unit shall be equipped with 5-in. (127 mm) (030-050 units) or 7-in. (178 mm) (055-070 units) spring vibration isolators, each with 2-in. (51 mm) deflection.
2. Condenser Fans:
   a. Direct-driven propeller type only.
   b. Discharge air vertically upward.
   c. Protected by PVC-coated steel wire safety guards.
   d. Statically and dynamically balanced.
   e. Three-phase, totally enclosed motors.

F. Compressors:
1. Reciprocating, semi-hermetic type only and shall be located for easy servicing.
2. Equipped with suction-cutoff type electrically controlled unloaders (ZN, Z3 units only).
3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.
4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor.
5. Equipped with suction and discharge service valves.
6. Maximum operating speed of 1800 rpm (30 r/s).

G. Coils:
1. Evaporator Coil:
   a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes.
   b. Full-face active type during full and part load conditions.
   c. Coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).
2. Condenser Coils:
   a. Constructed of aluminum fins mechanically bonded to seamless copper tubes.
   b. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3403 kPa).
   c. All coils shall be same manufacturer as unit.

H. Outdoor-Air Hood Assembly:

Factory-installed manual outdoor-air damper shall allow intake of up to 25% nominal airflow (on units not equipped with optional economizer).

I. [Electric Heating Section:]

Electric resistance heaters shall be factory installed, open wire nichrome element type, insulated with ceramic bushings, and shall include operating and safety controls.

J. [Hydronic Heating Section:]

Hydronic heating option shall consist of factory-installed plate fin-tube coil assembly, installed in the Extended Length section. Coil assembly shall be supplied with die formed casing and tube sheets of mill galvanized steel. Tubes shall be minimum $^1/_2$-in. (12.7 mm) OD copper tubes mechanically expanded into aluminum plate fin coils with belled collars. Headers shall be constructed of steel with steel MPT connections. Headers shall have drain and vent connections. Coils shall be suitable for a design working pressure of 300 psig at 200 F (2068 kPa at 93 C). Coils shall be tested at 450 psig (3403 kPa) air pressure.

K. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits, each containing:

1. Liquid line service valve.
2. Filter drier.
3. Moisture indicating sight glass.
4. Thermostatic expansion valve.
5. Fusible plug.

L. Filter Section:
1. Filter section shall consist of 2-in. (51 mm) thick, disposable fiberglass filters of commercially available sizes.

2. Factory 2-in. (51 mm) filter track shall allow easy field conversion to accept 4-in. (102 mm) thick, disposable fiberglass filters of commercially available sizes.

M. Controls, Safeties, and Diagnostics:

1. Controls:

a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:

1) Day and Time.
2) Schedule (Unoccupied/Occupied).
3) Set points (Unoccupied/Occupied, Economizer, Duct Pressure, others).
4) Space temperature.
5) Outdoor air temperature.
6) Unit supply air temperature.
7) Unit return air temperature.
8) Supply-air fan status.
9) Economizer position.
10) Compressor suction and discharge pressure.
11) Scrolling marquee display.
12) Accessory and/or field-supplied sensors, function switches and/or signals.

b. Controls shall be capable of performing the following functions:

1) Capacity control based on supply air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of electric unloaders (ZN,Z3 units only) and compressor staging.
2) Perform a quick test to check the status of all input and output signals to the control system using scrolling marquee display or Navigator.
3) Control of integrated economizer operation, based on unit supply-air temperature.
4) Supply fan volume control shall modulate the position of Inlet Guide Vane dampers or control output from a Variable Frequency Drive to maintain duct static pressure at user-configured set point (VAV). Static pressure reset in conjunction with Carrier communicating terminals to reduce supply fan power requirements. Control system calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop).
5) Heating control shall provide space temperature control for unoccupied period heating, morning warm-up sequence and occupied period heating (when configured).
6) Adaptive optimal start shall determine the time unit will commence cooling [or heating or heating for morning warm-up] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode.
7) Adaptive optimal stop shall turn off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV only).
8) Alerts and Alarms: Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation) or that an output has not functioned as expected or that a safety device has tripped. Current alarms shall be maintained in STATUS function; up to 9 (current or reset) shall be stored in HISTORY function for recall.
9) Timed override function shall permit a system in unoccupied mode to be returned to occupied mode for a user-configured period of 1, 2, 3 or 4 hours by pressing the override button on the front of the space temperature sensor.
10) Nighttime Free Cooling (NTFC) shall start the supply fan and open the economizer on cool nights to precool the building structure mass using only outdoor air. Function shall be restricted to operation above a user-configured low lockout temperature set point.
11) Modulating power exhaust control shall modulate capacity of exhaust fan system in response to building static pressure at user-configured set point. Power exhaust fan operation shall be interlocked with supply fan operation.
12) Smoke Control functions: Control shall initiate any of four separate smoke control functions in response to closure of field switches. Functions shall include: Pressurization, Evacuation, Smoke Purge and Fire Shutdown. Should two or more switches be closed simultaneously, Fire Shutdown shall be initiated.

13) Support demand control ventilation through a reset of the economizer's minimum position. This reset based on differential CO_2 PPM (outdoor and indoor) can be chosen as linear or as fast or slow-acting exponential curves.
14) Indoor air quality (IAQ) mode shall admit fresh outdoor air into the space whenever space air quality sensors detect unsuitable space conditions, by overriding economizer minimum damper position. IAQ shall be permitted only during occupied periods, unless configured to be allowed during unoccupied periods also.
15) Provide control for reheat via auxiliary heating coil during ventilation.
16) IAQ pre-occupancy purge function shall provide complete exchange of indoor air with fresh air during unoccupied periods, when outdoor conditions permit. Function shall energize supply fan and open economizer two hours before next occupied period; duration of purge shall be user-configured (5 to 60 minutes).
17) Outdoor Air Control (OAC) function shall maintain a minimum quantity of outdoor airflow into an occupied space. OAC mode shall be available only during an occupied period. Outdoor airflow shall be monitored by an airflow station and transducer. Economizer maximum damper opening position during OAC mode shall be user-configured.
18) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
19) Supply Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0° to 20 F (0° to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
20) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5 F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
21) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
22) Condenser-fan cycling control shall maintain correct head pressure down to 0° F (–18 C).
23) Refrigeration system pressures shall be monitored via pressure transducers. Alarms for low pressure, high pressure will be permitted.
24) Timed Discrete Output function shall control an external function or device via user-configured activity schedule. This schedule shall be separate and different from the unit's occupied/unoccupied time schedule.
25) Hydronic heating coil control shall modulate a control valve in a steam or hydronic heat system to maintain space temperature at user-configured set points. Control valve actuator shall communicate via LEN (Local Equipment Network) protocol.
26) Humidifier control shall provide control for either LEN communicating control valve or discrete-type output, to maintain space humidity conditions at user-configured set points.
27) Two-step demand limit control (when used in conjunction with CEM [Controls Expansion module]).
28) Display in Metric units: Display may be configured to display data in Metric or English (Imperial) units of measure.
29) Optional LEI (Local Equipment Interface) communication board to provide linkage with IP (Internet Protocol) communication protocol, LON (Local Operation Network) communication and RS485 serial communication capability.

2. Safeties:

   Unit components shall be equipped with the following protections:

   a. Compressors:
      1) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
      2) Crankcase heaters.
      3) High-pressure switch (shuts down individual compressor, automatic reset switch and manual software reset).
      4) Low-pressure shutdown (shuts down individual compressor, automatic reset switch and manual software reset).
      5) Check filter switch (accessory).

b. [Electric Heating Section:]

1) Automatic reset high-temperature limit switches.
2) Heat limiters (fusible links).
3) Overcurrent protection manual reset circuit breakers.
4) Branch circuit protection.

3. Diagnostics:

a. The display shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.

b. The display shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.

c. Test Mode must also be capable of controlling outputs of microprocessor controller and to verify operation of every thermistor, actuator motor, fan, and compressor before unit is started.

N. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature per maximum load criteria of ARI Standard 340/360.
2. Unit shall be capable of mechanical cooling operation down to 0° F (–18 C) ambient outdoor temperature.
3. Provides multi-stage cooling capability.
4. [Provides 2 stages of electric heating capability.]

O. Motors:

1. Compressor motors shall be cooled by suction gas passing over motor windings.
2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection.
3. Supply and exhaust fan motors shall be of the 3-phase, NEMA rated, Open Dripproof (ODP), ball bearing type, with efficiencies per EPACT (U.S.A.) requirements.

P. Electrical Requirements:

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

Q. Special Features:

1. Roof Curb:

Size 030-050 Units:

Formed 14-gage galvanized steel with wood nailer. Supports full perimeter of unit.

Size 055-070 Units:

Formed 14-gage galvanized steel with wood nailer strip as perimeter curb supporting the air handling portion of unit, and rail for supporting the condenser portion of the unit.

2. Roof Curb Condenser Section (Accessory for 055-070 Units only):

Formed 14-gage galvanized steel with wood nailer strip for supporting condenser section of the unit to complete a full perimeter curb under entire unit.

3. Integrated Economizer:

Dry bulb or differential dry bulb temperature controlled or optional enthalpy or differential enthalpy controlled integrated type consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary.

a. Dampers shall be a low-leakage type, not to exceed 1% leakage at 1-in. wg (249 Pa) pressure differential when fully closed.

b. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are communication capable of internal diagnostics.

c. Equipped with a solid-state humidity sensor (accessory) that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level. The user can also configure dew point limiting.

4. 100% Modulating Power Exhaust:

Package shall include 2 double-width, double-inlet centrifugal belt drive, forward-curved power exhaust fans with modulating device at the discharge of the lead fan to maintain a field adjustable interior space pressure set point from –.25 in. wg to .25 in. wg.

a. Fan bearings shall be of the pillow block type with an average design life of 200,000 hours.

b. Fans shall be statically and dynamically balanced.

5. Barometric Relief Package:

a. Package shall relieve excess internal pressure and consist of damper assemblies, hoods, damper screens, seal strips and required hardware.

b. Damper assemblies shall close due to gravity upon unit shutoff.

c. Unit-mounted on vertical applications, 055-070 size horizontal applications and duct mounted on 030-050 size horizontal applications.

6. Pleated Filters:

   Unit shall be factory equipped with medium-efficiency pleated filters having the following characteristics:

   a. Efficiency of no less than 30% based on testing per ASHRAE Standard 52.

   b. Minimum average arrestance of 90%.

7. Bag Filters with Prefilters:

   Unit shall be factory equipped with bag filters and 2-in. (51 mm) prefilters, and shall have an average efficiency of 90% based on testing per ASHRAE Standard 52.

8. Supply Fan Static Pressure Control/Inlet Guide Vanes:

   Inlet Guide Vane option shall include:

   a. Factory-installed double guide vane assemblies, consisting of rolled steel support rings and actuating rings, galvanized steel vanes capable of opening to full 90-deg position, and pivot bearings, designed for 250,000 cycles (full-open to full-closed) and protected against corrosion (painted, galvanized or plated).

   b. Factory-mounted single actuator, with factory-mounted linkages to modulate both inlet rings.

   c. Factory-mounted duct pressure sensing controller:

      Differential Pressure Transducer, 4 to 20 mA output to unit control module, with adjustable setpoint range (0.0 to 5.0 in. wg [0 to 1246 Pa]), adjust via scrolling marquee display or Navigator.

   d. Low pressure reference tube factory installed.

9. Supply Fan Static Pressure Control/Variable Frequency Drive:

   Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, -wired and -tested. The VFD shall control motor speed to maintain set point static pressure control at the supply duct sensor tube location. The supply fan drive shall be field-adjustable to maintain supply duct static pressure set point from 0.0-in. wg to 5-in. wg (0 to 1246 Pa), adjusted via scrolling marquee display or Navigator.

   A pressure transducer shall be factory-mounted and -wired. (Control tubing from sensor tube location to transducer shall be field-supplied and -installed.) Transducer shall provide a 4 to 20 mA signal to the unit control module; unit control module shall provide a 4 to 20 mA signal to the VFD indicating desired VFD output level.

   The variable speed drive shall include the following features:

   a. Full digital control.

   b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.

   c. Inverters capable of operation at a frequency of 8 kHz so no acoustic noise shall be produced by the motor.

   d. NEMA 1 metal enclosure for reduction of RFI (radio frequency interference).

   e. Digital display keypad module, mounted on the VFD enclosure.

   f. Local/Remote and Manual/Auto function keys on the keypad.

   g. UL listed electronic overload protection.

   h. Critical frequency avoidance.

   i. Self diagnostics.

   j. On-board storage of unit manufacturer's customer user settings, retrievable from the keypad.

   k. RS232C communications capability standard.

   l. RS485 communications capability (accessory card source required).

   m. Internal electronic filtration to reduce EMI generation.

10. VFD Remote Display Service Module:

    Accessory package shall contain VFD adapter plate, remote display housing (to accept the keypad module removed from the VFD housing) and cable assembly with quick-connect plug to connect to mating plug on VFD adapter plate, to facilitate VFD diagnostics and servicing.

11. Premium-Efficiency Motors (Supply Fan/Exhaust Fans):

    Unit shall be factory-equipped with premium-efficiency motors on Supply Fan (and Power Exhaust Fans) with NEMA efficiency ratings per contract drawings.

12. Accessory Electric Resistance Heaters (50ZG,ZN only):]

    a. Open wire nichrome elements with all necessary safety and operating controls.

    b. ETL listed and indicated on base unit informative plate.

    c. Multiple heat capacities available.

13. Non-Fused Disconnect:

    A non-fused electrical disconnect for main unit power shall be factory installed. The disconnect shall be an interlocking through-the-door type.

Disconnect shall be sized to accommodate field-installation of power exhaust package.

14. 115-Volt Convenience Outlet:

    A duplex GFCI receptacle shall be factory mounted in a weatherproof enclosure and wired for a 10 amp load. It will remain powered when all unit circuit breakers have been turned off. The outlet will be deenergized by the unit disconnect.

15. Navigator Display Module:

    The Navigator display module shall be a portable hand-held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.

16. Control Expansion Module:

    Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:

    a. Building pressurization, evacuation, smoke purge and fire shutdown control.
    b. Supply Air Reset from external 4 to 20 mA signal.
    c. 2-step Demand Limit inputs (when used with the CCN network).
    d. Indoor Air Quality (IAQ) switch monitoring.
    e. Outdoor Airflow (OAC) monitoring.
    f. Outdoor Humidity monitoring.
    g. Space Humidity monitoring (required for dehumidification control, reheat and humidifier control).
    h. Return Air humidity monitoring.

17. Relative Humidity Sensors:

    Package shall contain either duct-mounted or wall-mounted sensors to measure the relative humidity of the air within the occupied space (specify location) or return duct and/or outside air.

    NOTE: For Relative Humidity sensor monitoring, the CEM must also be ordered.

18. Indoor Air Quality (CO_2) Sensor:

    a. Shall have the ability to provide demand ventilation indoor-air quality (IAQ) control through the economizer with an indoor air quality sensor.
    b. The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO_2 in parts per million. The set point shall have adjustment capability.

19. Return Air Smoke Detector:

    The smoke detector shall send input to the controller to shut down the unit in case smoke is detected.

20. Outdoor Airflow Sensor:

    Outdoor Airflow Sensor package shall contain a airflow station with airflow sensor, a transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer and CEM are required with this accessory.

21. Differential Enthalpy Switch or Sensors (when equipped with both return air and outdoor air humidity sensors):

    a. For use with economizer only.
    b. Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.

22. Hot Gas Bypass:

    Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.

23. Condenser Coil Protective Coating — Pre-Coated:

    Condenser coil aluminum fins shall be coated with protective coating. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Coating material shall be a durable epoxy phenolic organic coating, capable of 1000 hr salt spray exposure per ASTM B117 test and ASTM DI 654 evaluation, 2000 hr corrosion weathering cycle and moist sulfur dioxide exposure per DIN 50018 (ASTM G87) test and ASTM DI 654 and ASTM D714 evaluation. Pre-coated aluminum fin coils shall provide protection in mildly corrosive coastal and industrial environments.

24. Optional Condenser Coil Material:

    Unit shall be factory equipped with condenser coils made from copper tubes and copper fins. Coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal basepan to minimize potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

25. Condenser Coil Protective Coating — E-Coat with Aluminum Fins:

    E-Coated aluminum fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

26. Condenser Coil Protective Coating — E-Coat with Copper Fins:

    E-Coated copper fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting sheet metal basepan to maintain coating integrity and minimize corrosion potential between the coil and pan.

27. Condenser Coil Hail Guard:

    Canted face enclosure and welded wire grille complete with support retainers and fasteners shall be provided for protection of condenser coils. Field-assembled.

28. Space Temperature Sensor (T-56):

    The T-56 space temperature sensor (for CV applications) shall monitor space temperature. Device shall be suited for wall mounting in the occupied space. The T-56 sensor shall incorporate a front-panel located slider switch to effect a remote change in set point of ±5° F (2.8 C). The T-56 sensor shall also include a button used to initiate Unoccupied Override function.

29. Space Temperature Space Temperature Sensor (T-56) with CO_2 Sensor:

    This device shall incorporate interior space temperature sensing and interior space CO_2 level monitoring functions. Space temperature sensor shall sense the actual temperature in the conditioned space via 10K ohm thermistor. Temperature set point adjustment potentiometer via slide scale shall provide ±5 F adjustment. CO_2 sensor shall provide CO_2 measurement range of 0 to 2000 PPM. IAQ signal to unit base board terminals shall be 4 to 20 mA. Sensor shall be equipped with an override button for timed override. Sensor must be powered by a separate field-supplied 24-v transformer.

Guide specifications — 50ZT,ZW,ZX,ZZ075-105 units

Packaged Rooftop Cooling Unit with ComfortLink™ Controls and Optional Electric or Hydronic Heat

HVAC Guide Specifications — Section 50ZT, ZW, ZX, ZZ

Size Range: **75 to 105 Tons, Nominal**

Carrier Model Number:

50ZT (Vertical Supply/Return, CV Application)

50ZW (Vertical Supply/Return, VAV Application)

50ZX (Horizontal Supply/Return, CV Application)

50ZZ (Horizontal Supply/Return, VAV Application)

NOTE: Items throughout the specification which apply only to "With Electric Heat" are indicated by single brackets [i.e.].

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor, roof-curb mounted, electronically controlled [heating and] cooling unit utilizing multiple semi-hermetic reciprocating type compressors on dual independent circuits for cooling duty [and utilizing electric resistance coils for heating duty]. Unit shall incorporate factory-installed economizer system with high-capacity modulating power exhaust system. Units shall discharge supply air downward (50ZT, ZW) or horizontally (50ZX, ZZ) as shown on the contract drawings.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 340/360.

B. Unit shall be designed to conform to ANSI/ASHRAE 15 (latest revision), ASHRAE 62, UL Standard 1995, and National Electrical Code (U.S.A.).

C. Unit shall be listed by ETL and ETL Canada as a total package.

D. Roof curb shall be designed to NRCA criteria per Guideline B-1986.

E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. Factory-assembled, single-piece [heating and] cooling unit.

Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B. Unit Cabinet:

1. Constructed of galvanized steel (designated G90 per ASTM Standard A653 — minimum coating weight of 0.9 oz. of zinc per square foot per side (275 grams per square meter) of sheet metal), bonderized and primer-coated on both sides and coated with a baked polyester thermosetting powdercoating finish on the outer surface.
2. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Sides shall have *man size* insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces (except supply fan discharge plenum section) shall be insulated with flexible fire-retardant dual-density (1.75-lb/cu. ft [28.0 kg/cu. m]) fiberglass blanket, coated on the air side. Insulation coating shall be cleanable and shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM Standards G21 and G22.
5. Interior cabinet surfaces within supply fan discharge plenum section shall be lined with sheet metal on all surfaces, insulated on the side opposite the airstream.
6. Insulation shall be applied by means of adhesion using a water reducible adhesive sprayed onto interior surface. Adhesive shall maintain a satisfactory adhesion and cohesion within the temperature range of –20 to 180 F (–29 to 82 C) and have excellent resistance to water and water vapor when cured.
7. Unit shall contain a sloped drain pan, to prevent standing water from accumulating. Pan shall be fabricated of stainless steel. Unit shall contain a factory-installed nonferrous main condensate drain connection.
8. Units shall be equipped with lifting lugs to facilitate overhead rigging.

C. Fans:

1. Supply Fan:
   a. Unit shall have one fan wheel, scroll and motor only.
   b. Fan scroll, wheel, shaft, bearings, drive components and motor shall be mounted on a formed steel assembly which shall be isolated from the unit outer casing with factory-installed 2-in. deflection spring isolators and vibration-absorbent fan discharge seal.
   c. Fan shall be double-width, double-inlet, centrifugal belt driven forward-curve type with

single outlet discharge (standard) or centrifugal belt driven airfoil blade section type with single outlet discharge (optional).

d. Fan wheel shall be designed for continuous operation at the maximum rated fan speed and motor horsepower.

e. Fan wheel and shaft shall be selected to operate at 25% below the first critical speed and shall be statically and dynamically balanced as an assembly.

f. Fan shaft shall be solid steel, turned, ground and polished, and coated with rust-preventative oil.

g. Fan shaft bearings shall be self-aligning, pillow-block, regreasable ball- or roller-type selected for a minimum average life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

h. A single motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members.

i. Fan drive shall be constant-speed fixed-pitch. All drives shall be factory-mounted, with belts aligned and tensioned.

2. Power Exhaust Fans:

a. Dual fan assemblies.

b. Double-width, double-inlet, centrifugal belt driven forward-curve type with individual outlet discharge.

c. Statically and dynamically balanced.

d. Individual fixed-pitch pulley drives, matched to motor size selections.

e. Fan shaft bearing shall be of the pillow-block type with lubrication provisions.

f. Fan shaft bearings shall have a life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.

g. Solid fan shaft construction.

3. Condenser Fans:

a. Direct-driven propeller type only.

b. Discharge air vertically upward.

c. Protected by PVC-coated steel wire safety guards.

d. Statically and dynamically balanced.

e. Three-phase, totally enclosed motors.

D. Compressors:

1. Multiple, reciprocating, semi-hermetic type only and shall be located for easy servicing.

2. Equipped with a suction-cutoff type electrically controlled unloader(s) (VAV only).

3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.

4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor.

5. Equipped with suction and discharge service valves.

6. Maximum operating speed of 1800 rpm (30 r/s).

E. Coils:

1. Evaporator Coil:

a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Full-face active type during full and part load conditions.

c. Coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).

2. Condenser Coils:

a. Constructed of aluminum fins mechanically bonded to seamless copper tubes.

b. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3403 kPa).

c. All coils shall be same manufacturer as unit.

F. Integrated Economizer:

Dry bulb or differential dry bulb temperature controlled or optional enthalpy or differential enthalpy controlled integrated type consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary.

1. Dampers shall be a low-leakage type, not to exceed 1% leakage at 1-in. wg (249 Pa) pressure differential when fully closed.

2. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are communication capable of internal diagnostics.

3. Equipped with a solid-state humidity sensor (accessory) that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level. The user can also configure dew point limiting.

4. Outside air hoods shall be bottom-entry design, equipped with serviceable permanent washable aluminum mesh filters. Total face area of hood filters shall be minimum 48 sq ft (4.46 sq m).

G. Modulating Power Exhaust System:

High-capacity Modulating power exhaust system shall be factory-installed and contain fans and

motors, exhaust hoods and controls (including Variable Frequency Drive and staging sequence) to maintain space pressure at user-configured set point.

1. Dual fan assemblies with individual motors.
2. Variable Frequency Drive for modulating capacity of lead fan.
3. Staged control on lag fan.
4. Differential pressure transducer for monitoring space pressure.
5. Exhaust air hood assemblies containing backdraft dampers on each fan outlet, factory-installed.
6. All wiring and pressure tubing (except to space pressure pickup location) shall be factory supplied and installed.

H. [Electric Heating Section:]

Electric resistance heaters shall be factory installed, open wire nichrome element type, insulated with ceramic bushings, and shall include operating and safety controls.

I. Refrigerant Components:

Unit shall be equipped with dual refrigerant circuits, each containing:

1. Liquid line service valve.
2. Filter drier.
3. Moisture indicating sight glass.
4. Thermostatic expansion valve.
5. Fusible plug.

J. Filter Section:

1. Filter section shall consist of 2-in. (51 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.
2. Factory 2-in. (51 mm) filter track shall allow easy field conversion to accept 4-in. (102 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.

K. Controls, Safeties, and Diagnostics:

1. Controls:
   a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences through monitoring the following operational variables:
      1) Day and Time.
      2) Schedule (Unoccupied/Occupied).
      3) Set points (Unoccupied/Occupied, Economizer, Duct Pressure, others).
      4) Space temperature.
      5) Outdoor air temperature.
      6) Unit supply air temperature.
      7) Unit return air temperature.
      8) Supply-air fan status.
      9) Economizer position.
      10) Compressor suction and discharge pressure.
      11) Scrolling marquee display.
      12) Accessory and/or field-supplied sensors, function switches and/or signals.
   b. Controls shall be capable of performing the following functions:
      1) Capacity control based on supply-air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of compressor staging.
      2) Perform a quick test to check the status of all input and output signals to the control system using scrolling marquee display or Navigator.
      3) Control of integrated economizer operation, based on unit supply air temperature.
      4) Supply fan volume control shall modulate the position of Inlet Guide Vane dampers or control output from a Variable Frequency Drive to maintain duct static pressure at user-configured set point (VAV). Static pressure reset in conjunction with Carrier communicating terminals to reduce supply fan power requirements. Control system calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop).
      5) Heating control shall provide space temperature control for unoccupied period heating, morning warm-up sequence and occupied period heating (when configured).
      6) Adaptive optimal start shall determine the time unit will commence cooling [or heating or heating for morning warm-up] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode.
      7) Adaptive optimal stop shall turn off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV only).
      8) Alerts and Alarms: Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation) or that an

output has not functioned as expected or that a safety device has tripped. Current alarms shall be maintained in STATUS function; up to 9 (current or reset) shall be stored in HISTORY function for recall.

9) Timed override function shall permit a system in unoccupied mode to be returned to occupied mode for a user-configured period of 1, 2, 3 or 4 hours by pressing the override button on the front of the space temperature sensor.
10) Nighttime Free Cooling (NTFC) shall start the supply fan and open the economizer on cool nights to precool the building structure mass using only outdoor air. Function shall be restricted to operation above a user-configured low lockout temperature set point.
11) Modulating power exhaust control shall modulate capacity of exhaust fan system in response to building static pressure at user-configured set point. Power exhaust fan operation shall be interlocked with supply fan operation.
12) Smoke Control functions: Control shall initiate any of four separate smoke control functions in response to closure of field switches. Functions shall include: Pressurization, Evacuation, Smoke Purge and Fire Shutdown. Should two or more switches be closed simultaneously, Fire Shutdown shall be initiated.
13) Support demand control ventilation through a reset of the economizer's minimum position. This reset based on differential CO_2 PPM (outdoor and indoor) can be chosen as linear or as fast or slow-acting exponential curves.
14) Indoor air quality (IAQ) mode shall admit fresh outdoor air into the space whenever space air quality sensors detect unsuitable space conditions, by overriding economizer minimum damper position. IAQ shall be permitted only during occupied periods, unless configured to be allowed during unoccupied periods also.
15) Provide control for reheat via auxiliary heating coil during ventilation.
16) IAQ pre-occupancy purge function shall provide complete exchange of indoor air with fresh air during unoccupied periods, when outdoor conditions permit. Function shall energize supply fan and open economizer two hours before next occupied period; duration of purge shall be user-configured (5 to 60 minutes).
17) Outdoor Air Control (OAC) function shall maintain a minimum quantity of outdoor airflow into an occupied space. OAC mode shall be available only during an occupied period. Outdoor airflow shall be monitored by an airflow station and transducer. Economizer maximum damper opening position during OAC mode shall be user-configured.
18) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
19) Supply Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0° to 20 F (0° to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
20) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5° F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
21) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
22) Condenser-fan cycling control shall maintain correct head pressure down to 0° F (–18 C).
23) Refrigeration system pressures shall be monitored via pressure transducers. Alarms for low pressure, high pressure will be permitted.
24) Timed Discrete Output function shall control an external function or device via user-configured activity schedule. This schedule shall be separate and different from the unit's occupied/unoccupied time schedule.
25) Hydronic heating coil control shall modulate a control valve in a steam or hydronic heat system to maintain space temperature at user-configured set points. Control valve actuator shall communicate via LEN (Local Equipment Network) protocol.

26) Humidifier control shall provide control for either LEN communicating control valve or discrete-type output, to maintain space humidity conditions at user-configured set points.
27) Two-step demand limit control (when used in conjunction with CEM [Controls Expansion module]).
28) Display in Metric units: Display may be configured to display data in Metric or English (Imperial) units of measure.
29) Optional LEI (Local Equipment Interface) communication board to provide linkage with IP (Internet Protocol) communication protocol, LON (Local Operation Network) communication and RS485 serial communication capability.

2. Safeties:

Unit components shall be equipped with the following protections:

a. Compressors:
1) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
2) Crankcase heaters.
3) High-pressure switch (shuts down individual compressor, automatic reset switch with manual software reset).
4) Low-pressure switch (shuts down complete circuit, automatic reset reset switch with manual software reset).
5) Check filter switch (accessory).

b. Belt-Drive Fan Motors:

Overcurrent protection manual reset circuit breakers.

c. [Electric Heating Section:]
1) Automatic reset high-temperature limit switches.
2) Heat limiters (fusible links).
3) Overcurrent protection manual reset circuit breakers.
4) Branch circuit protection.

3. Diagnostics:

a. Diagnostic display module shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.

b. Diagnostic display module shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.

c. Test Mode must also be capable of controlling outputs of microprocessor controller and to verify operation of every thermistor, actuator motor, fan, and compressor before unit is started.

L. Operating Characteristics:

1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature per maximum load criteria of ARI Standard 340/360.

2. Unit shall be capable of mechanical cooling operation down to 0° F (–18 C) ambient outdoor temperature.

3. Unit shall provide multi-stage cooling capability.

4. [Unit shall provide 2 stages of electric heating control.]

M. Motors:

1. Compressor motors shall be cooled by suction gas passing over motor windings.

2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection.

3. Supply and exhaust fan motors shall be of the 3-phase, NEMA rated, Open Dripproof (ODP), ball bearing type, with efficiencies per EPACT (U.S.A.) requirements.

N. Electrical Requirements:

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

O. Special Features:

1. Roof Curb:

Designed to comply with criteria established by NRCA Guideline B-1986. Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip as perimeter curb supporting the air handling portion of unit, and rail for supporting the condenser portion of the unit.

2. Roof Curb Condenser Section:

Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip for supporting condenser section of the unit to complete a full perimeter curb under entire unit.

3. Medium-Efficiency Pleated Filters:

Unit shall be factory equipped with 2-in. (51 mm) medium-efficiency pleated filters having the following characteristics:

a. Filters shall have a design dust spot efficiency with an average of 30% based on the ASHRAE Standard 52.1 test method.

b. Filters shall have a minimum arrestance of 90%.

c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.

4. High-Efficiency Pleated Filters:

Unit shall be factory equipped with 2-in. (51 mm) high-efficiency pleated filters having the following characteristics:

a. Filters shall have a design dust spot efficiency with an average of 60 to 65% based

on the ASHRAE Standard 52.1 test method.

b. Filters shall have a minimum arrestance of 90%.

c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.

5. Supply Fan Static Pressure Control/Inlet Guide Vanes:

   Inlet Guide Vane option shall include:

   a. Factory-installed double guide vane assemblies, consisting of rolled steel support rings and actuating rings, galvanized steel vanes capable of opening to full 90-deg position, and pivot bearings, designed for 250,000 cycles (full-open to full-closed) and protected against corrosion (painted, galvanized or plated).

   b. Factory-mounted single actuator, with factory-mounted linkages to modulate both inlet rings.

   c. Factory-mounted duct pressure sensing controller: Differential Pressure Transducer, 4 to 20 mA output to unit control module, with adjustable set point range (0.0 to 5.0 in. wg [0 to 1246 Pa]), adjust via scrolling marquee display or Navigator.

   d. Low pressure reference tube factory installed.

6. Supply Fan Static Pressure Control/Variable Frequency Drive:

   Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, -wired and -tested. The VFD shall control motor speed to maintain set point static pressure control at the supply duct sensor tube location. The supply fan drive shall be field-adjustable to maintain supply duct static pressure set point from 0.0-in. wg to 5-in. wg (0 to 1246 Pa), adjusted via scrolling marquee display or Navigator.

   A pressure transducer shall be factory-mounted and -wired. (Control tubing from sensor tube location to transducer shall be field-supplied and -installed.) Transducer shall provide a 4 to 20 mA signal to the unit control module; unit control module shall provide a 4 to 20 mA signal to the VFD indicating desired VFD output level.

   The variable speed drive shall include the following features:

   a. Full digital control.

   b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.

   c. Inverters capable of operation at a frequency of 8 kHz so no acoustic noise shall be produced by the motor.

   d. NEMA 1 metal enclosure for reduction of RFI (radio frequency interference).

   e. Digital display keypad module, mounted on the VFD enclosure.

   f. Local/Remote and Manual/Auto function keys on the keypad.

   g. UL listed electronic overload protection.

   h. Critical frequency avoidance.

   i. Self diagnostics.

   j. On-board storage of unit manufacturer's customer user settings, retrievable from the keypad.

   k. RS232C communications capability standard.

   l. RS485 communications capability (accessory card source required).

   m. Internal electronic filtration to reduce EMI generation.

7. VFD Remote Display Service Module:

   Accessory package shall contain VFD adapter plate, remote display housing (to accept the keypad module removed from the VFD housing) and cable assembly with quick-connect plug to connect to mating plug on VFD adapter plate, to facilitate VFD diagnostics and servicing.

8. Premium-Efficiency Motors (Supply Fan/ Exhaust Fans):

   Unit shall be factory-equipped with premium-efficiency motors on Supply Fan (and Power Exhaust Fans) with NEMA efficiency ratings per contract drawings. Available all motor sizes.

9. Non-Fused Disconnect:

   A non-fused electrical disconnect for main unit power shall be factory installed. The disconnect shall be an interlocking through-the-door type.

10. 115-Volt Convenience Outlet:

    A duplex GFCI receptacle shall be factory mounted in a weatherproof enclosure and wired for a 10 amp load. It will remain powered when all unit circuit breakers have been turned off. The outlet will be de-energized by the unit disconnect.

11. Navigator Display Module:

    The Navigator display module shall be a portable hand-held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be

accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.

12. Control Expansion Module:

    Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:

    a. Building pressurization, evacuation, smoke purge and fire shutdown control.
    b. Supply Air Reset from external 4 to 20 mA signal.
    c. 2-step Demand Limit inputs (when used with the CCN network).
    d. Indoor Air Quality (IAQ) switch monitoring.
    e. Outdoor Airflow (OAC) monitoring.
    f. Outdoor Humidity monitoring.
    g. Space Humidity monitoring (required for dehumidification control, reheat and humidifier control).
    h. Return Air humidity monitoring

13. Relative Humidity Sensors:

    Package shall contain either duct-mounted or wall-mounted sensors to measure the relative humidity of the air within the occupied space (specify location) or return duct and/or outside air.

    NOTE: For Relative Humidity sensor monitoring, the CEM must also be ordered.

14. Indoor Air Quality (CO_2) Sensor:

    Shall have the ability to provide demand ventilation indoor-air quality (IAQ) control through the economizer with an indoor air quality sensor.

    The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO_2 in parts per million. The set point shall have adjustment capability.

15. Return Air Smoke Detector

    The smoke detector shall send input to the controller to shut down the unit in case smoke is detected.

16. Outdoor Airflow Sensor:

    Outdoor Airflow Sensor package shall contain a airflow station with airflow sensor, a transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer and CEM are required with this accessory.

17. Differential Enthalpy Switch or Sensors (when equipped with both return air and outdoor air humidity sensors):

    a. For use with economizer only.
    b. Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.

18. Hot Gas Bypass:

    Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.

19. Condenser Coil Protective Coating — Pre-Coated:

    Condenser coil aluminum fins shall be coated with protective coating. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Coating material shall be a durable epoxy phenolic organic coating, capable of 1000 hr salt spray exposure per ASTM B117 test and ASTM DI 654 evaluation, 2000 hr corrosion weathering cycle and moist sulfur dioxide exposure per DIN 50018 (ASTM G87) test and ASTM DI 654 and ASTM D714 evaluation. Pre-coated aluminum fin coils shall provide protection in mildly corrosive coastal and industrial environments.

20. Optional Condenser Coil Material:

    Unit shall be factory equipped with condenser coils made from copper tubes and copper fins. Coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal basepan to minimize potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

21. Condenser Coil Protective Coating — E-Coat with Aluminum Fins:

    E-Coated aluminum fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM

D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

22. Condenser Coil Protective Coating — E-Coat with Copper Fins:

    E-Coated copper fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting sheet metal basepan to maintain coating integrity and minimize corrosion potential between the coil and pan.

23. Condenser Coil Hail Guard:

    Canted face enclosure and welded wire grille complete with support retainers and fasteners shall be provided for protection of condenser coils. Field-assembled.

24. Space Temperature Sensor (T-56):

    The T-56 space temperature sensor (for CV applications) shall monitor space temperature. Device shall be suited for wall mounting in the occupied space. The T-56 sensor shall incorporate a front-panel located slider switch to effect a remote change in set point of ±5° F (2.8 C). The T-56 sensor shall also include a button used to initiate Unoccupied Override function.

25. Space Temperature Space Temperature Sensor (T-56) with CO_2 Sensor:

    This device shall incorporate interior space temperature sensing and interior space CO_2 level monitoring functions. Space temperature sensor shall sense the actual temperature in the conditioned space via 10K ohm thermistor. Temperature set point adjustment potentiometer via slide scale shall provide ±5° F adjustment. CO_2 sensor shall provide CO_2 measurement range of 0 to 2000 PPM. IAQ signal to unit base board terminals shall be 4 to 20 mA. Sensor shall be equipped with an override button for timed override. Sensor must be powered by a separate field-supplied 24-v transformer.

Guide specifications — 50ZG,ZN,Z2,Z3,Z6,Z7, Z8,Z9075-105 units

Packaged Rooftop Cooling Unit with *Comfort*Link™ Controls and Optional Electric Heat

HVAC Guide Specifications — Section 50ZG, ZN,Z2,Z3,Z6,Z7,Z8,Z9

Size Range: **75 to 105 Tons, Nominal**

Carrier Model Number:

50ZG (Vertical Supply/Return, CV Application)
50ZN (Vertical Supply/Return, VAV Application)
50Z2 (Horizontal Supply/Return, CV Application)
50Z3 (Horizontal Supply/Return, VAV Application)
50Z6 (Vertical Supply/Return, CV Application with Return Fan and Building Pressure Control)
50Z7 (Horizontal Supply/Vertical Return, CV Application with Return Fan and Building Pressure Control)
50Z8 (Vertical Supply/Return, VAV Application with Return Fan and Building Pressure Control)
50Z9 (Horizontal Supply/Vertical Return, VAV Application with Return Fan and Building Pressure Control)

NOTE: Items throughout the specification which apply only to "With Electric Heat" are indicated by single brackets [i.e.].

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor, roof-curb mounted, electronically controlled [heating and] cooling unit utilizing multiple semi-hermetic reciprocating type compressors on dual independent circuits for cooling duty [and utilizing electric resistance coils for heating duty]. Units shall discharge supply air downward (50ZG, ZN, Z6, Z8) or horizontally (50Z2, Z3, Z7, Z9) as shown on the contract drawings.

1.02 QUALITY ASSURANCE

A. Unit shall be rated in accordance with ARI Standard 340/360.

B. Unit shall be designed to conform to ANSI/ ASHRAE 15 (latest revision), ASHRAE 62, UL Standard 1995, and National Electrical Code (U.S.A.).

C. Unit shall be listed by ETL and ETL Canada as a total package.

D. Roof curb shall be designed to NRCA criteria per Guideline B-1986.

E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A. Factory-assembled, single-piece [heating and] cooling unit.

Contained within the unit enclosure shall be all factory wiring, piping, refrigerant charge (R-22), operating oil charge, dual refrigerant circuits, microprocessor-based control system and associated hardware, and all special features required prior to field start-up.

B. Unit Cabinet:

1. Constructed of galvanized steel (designated G90 per ASTM Standard A653 — minimum coating weight of 0.9 oz. of zinc per square foot per side (275 grams per square meter) of sheet metal), bonderized and primer-coated on both sides and coated with a baked polyester thermosetting powdercoating finish on the outer surface.
2. Unit casing shall be capable of withstanding ASTM Standard B117 500-hour salt spray test.
3. Sides shall have *man size* insulated hinged access doors for easy access to the control box and other areas requiring servicing. Each door shall seal against a rubber gasket to prevent air and water leakage, and is equipped to permit ease and safety during servicing.
4. Interior cabinet surfaces (except supply fan discharge plenum section) shall be insulated with flexible fire-retardant dual-density (1.75-lb/ cu. ft [28.0 kg/cu. m]) fiberglass blanket, coated on the air side. Insulation coating shall be cleanable and shall contain an EPA-registered immobilized antimicrobial agent to effectively resist the growth of bacteria and fungi as proven by tests in accordance with ASTM Standards G21 and G22.
5. Interior cabinet surfaces within supply fan discharge plenum section shall be lined with sheet metal on all surfaces, insulated on the side opposite the air stream.
6. Insulation shall be applied by means of adhesion using a water reducible adhesive sprayed onto interior surface. Adhesive shall maintain a satisfactory adhesion and cohesion within the temperature range of –20 to 180 F (–29 to 82 C) and have excellent resistance to water and water vapor when cured.
7. Unit shall contain a sloped drain pan, to prevent standing water from accumulating. Pan shall be fabricated of stainless steel. Unit shall contain a factory-installed nonferrous main condensate drain connection.
8. Units shall be equipped with lifting lugs to facilitate overhead rigging.

C. Fans:
   1. Supply Fan:
      a. Unit shall have one fan wheel, scroll and motor only.
      b. Fan scroll, wheel, shaft, bearings, drive components and motor shall be mounted on a formed steel assembly which shall be isolated from the unit outer casing with factory-installed 2-in. deflection spring isolators and vibration-absorbent fan discharge seal.
      c. Fan shall be double-width, double-inlet, centrifugal belt driven forward-curve type with single outlet discharge (standard) or centrifugal belt driven airfoil blade section type with single outlet discharge (optional).
      d. Fan wheel shall be designed for continuous operation at the maximum rated fan speed and motor horsepower.
      e. Fan wheel and shaft shall be selected to operate at 25% below the first critical speed and shall be statically and dynamically balanced as an assembly.
      f. Fan shaft shall be solid steel, turned, ground and polished, and coated with rust-preventative oil.
      g. Fan shaft bearings shall be self-aligning, pillow-block, regreasable ball- or roller-type selected for a minimum average life of 200,000 hours at design operating conditions in accordance with ANSI B3.15.
      h. A single motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members.
      i. Fan drive shall be constant-speed fixed-pitch. All drives shall be factory-mounted, with belts aligned and tensioned.
   2. Condenser Fans:
      a. Direct-driven propeller type only.
      b. Discharge air vertically upward.
      c. Protected by PVC-coated steel wire safety guards.
      d. Statically and dynamically balanced.
      e. Three-phase, totally enclosed motors.

D. Compressors:
   1. Multiple, reciprocating, semi-hermetic type only and shall be located for easy servicing.
   2. Equipped with a suction-cutoff type electrically controlled unloader(s) (VAV only).
   3. Mounted on spring-vibration isolators with an isolation efficiency of no less than 95%.
   4. Each equipped with an automatically reversible oil pump, operating oil charge, insert-type crankcase heater to prevent refrigerant migration to the compressor.
   5. Equipped with suction and discharge service valves.
   6. Maximum operating speed of 1800 rpm (30 r/s).

E. Coils:
   1. Evaporator Coil:
      a. Intertwined circuiting constructed of aluminum fins mechanically bonded to seamless copper tubes.
      b. Full-face active type during full and part load conditions.
      c. Coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3103 kPa).
   2. Condenser Coils:
      a. Constructed of aluminum fins mechanically bonded to seamless copper tubes.
      b. Air-cooled condenser coils shall be leak tested at 150 psig (1034 kPa) and pressure tested at 450 psig (3403 kPa).
      c. All coils shall be same manufacturer as unit.

F. Outdoor-Air Hood Assembly (50ZG,ZN,Z2,Z3 only):

   Factory-installed manual outdoor-air damper shall allow intake of up to 25% nominal airflow (on units not equipped with optional economizer).

G. [Electric Heating Section:]

   Electric resistance heaters shall be factory installed, open wire nichrome element type, insulated with ceramic bushings, and shall include operating and safety controls.

H. Refrigerant Components:

   Unit shall be equipped with dual refrigerant circuits, each containing:
   1. Liquid line service valve.
   2. Filter drier.
   3. Moisture indicating sight glass.
   4. Thermostatic expansion valve.
   5. Fusible plug.

I. Filter Section:
   1. Filter section shall consist of 2-in. (51 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.
   2. Factory 2-in. (51 mm) filter track shall allow easy field conversion to accept 4-in. (102 mm) thick, high-velocity panel-type fiberglass filters of commercially available sizes.

J. Controls, Safeties, and Diagnostics:
   1. Controls:
      a. Control shall be accomplished through the use of a factory-installed, microprocessor-based control system and associated electronic and electrical hardware. Control system shall determine control sequences

through monitoring the following operational variables:

1) Day and Time.
2) Schedule (Unoccupied/Occupied).
3) Set points (Unoccupied/Occupied, Economizer, Duct Pressure, others).
4) Space temperature.
5) Outdoor air temperature.
6) Unit supply air temperature.
7) Unit return air temperature.
8) Supply-air fan status.
9) Economizer position.
10) Compressor suction and discharge pressure.
11) Scrolling marquee display.
12) Accessory and/or field-supplied sensors, function switches and/or signals.

b. Controls shall be capable of performing the following functions:

1) Capacity control based on supply air temperature and compensated by rate of change of return-air temperature (VAV) or room temperature (CV). Capacity control shall be accomplished through the use of electric unloaders (ZN,Z3,Z8,Z9 units only) and compressor staging.
2) Perform a quick test to check the status of all input and output signals to the control system using scrolling marquee display or Navigator.
3) Control of integrated economizer operation, based on unit supply-air temperature.
4) Supply fan volume control shall modulate the position of Inlet Guide Vane dampers or control output from a Variable Frequency Drive to maintain duct static pressure at user-configured set point (VAV). Static pressure reset in conjunction with Carrier communicating terminals to reduce supply fan power requirements. Control system calculates the amount of supply static pressure reduction necessary to cause the most open damper in the system to open more than the minimum value (60%) but not more than the maximum value (90% or negligible static pressure drop).
5) Heating control shall provide space temperature control for unoccupied period heating, morning warm-up sequence and occupied period heating (when configured).
6) Adaptive optimal start shall determine the time unit will commence cooling [or heating or heating for morning warm-up] during the unoccupied mode to ensure occupied space reaches the set point in time for occupied mode.
7) Adaptive optimal stop shall turn off the compressors a preset amount of time before the end of the occupied mode to conserve energy (CV only).
8) Alerts and Alarms: Control shall continuously monitor all sensor inputs and control outputs to ensure safe and proper system operation. Alerts shall be generated whenever sensor conditions have gone outside criteria for acceptability. Alarms shall be initiated when unit control detects that a sensor input value is outside its valid range (indicating a defective device or connection that prevents full unit operation) or that an output has not functioned as expected or that a safety device has tripped. Current alarms shall be maintained in STATUS function; up to 9 (current or reset) shall be stored in HISTORY function for recall.
9) Timed override function shall permit a system in unoccupied mode to be returned to occupied mode for a user-configured period of 1, 2, 3 or 4 hours by pressing the override button on the front of the space temperature sensor.
10) Nighttime Free Cooling (NTFC) shall start the supply fan and open the economizer on cool nights to precool the building structure mass using only outdoor air. Function shall be restricted to operation above a user-configured low lockout temperature set point.
11) Modulating power exhaust control (ZG, ZN,Z2,Z3 units only) shall modulate capacity of exhaust fan system in response to building static pressure at user-configured set point. Power exhaust fan operation shall be interlocked with supply fan operation.
12) Return fan control (Z6,Z7,Z8,Z9 units only) shall measure supply fan CFM and modulate return fan to maintain constant CFM differential between supply and return fan. Return fan operation shall be interlocked with supply fan operation. Capacity of exhaust air shall modulated in response to building static pressure at user-configured set point.
13) Smoke Control functions: Control shall initiate any of four separate smoke control functions in response to closure of field switches. Functions shall include: Pressurization, Evacuation, Smoke Purge and Fire Shutdown. Should two or more switches be closed simultaneously, Fire Shutdown shall be initiated.
14) Support demand control ventilation through a reset of the economizer's

minimum position. This reset based on differential CO_2 PPM (outdoor and indoor) can be chosen as linear or as fast or slow-acting exponential curves.

15) Indoor air quality (IAQ) mode shall admit fresh outdoor air into the space whenever space air quality sensors detect unsuitable space conditions, by overriding economizer minimum damper position. IAQ shall be permitted only during occupied periods, unless configured to be allowed during unoccupied periods also.
16) Provide control for reheat via auxiliary heating coil during ventilation.
17) IAQ pre-occupancy purge function shall provide complete exchange of indoor air with fresh air during unoccupied periods, when outdoor conditions permit. Function shall energize supply fan and open economizer two hours before next occupied period; duration of purge shall be user-configured (5 to 60 minutes).
18) Outdoor Air Control (OAC) function shall maintain a minimum quantity of outdoor airflow into an occupied space. OAC mode shall be available only during an occupied period. Outdoor airflow shall be monitored by an airflow station and transducer. Economizer maximum damper opening position during OAC mode shall be user-configured.
19) Dehumidification and Reheat: Dehumidification function shall override comfort condition set points to deliver cooler air into the space and satisfy a user-configured humidity set point at the space or return air humidity sensor. Reheat function shall energize an auxiliary heating device should dehumidification operation result in cooling of the space down to the occupied heating set point.
20) Supply-Air Temperature Set Point Reset: Control shall automatically reset the unit supply air temperature set point on VAV models from either space temperature or return-air temperature, at user-configured rate and limit. Control shall also reset supply air temperature set point via external 2 to 10 vdc signal representing 0° to 20 F (0° to 11 C) range of reset. Control shall respond to higher of either reset if both are active.
21) Space Temperature Offset function shall permit occupants to adjust space temperature set point by ±5° F (2.8 C) using T-56 space sensor (equipped with sliding scale adjuster).
22) Lead-lag function shall distribute starts between the two refrigeration circuits in an effort to equalize the running time on the two circuits.
23) Condenser-fan cycling control shall maintain correct head pressure down to 0° F (–18 C).
24) Refrigeration system pressures shall be monitored via pressure transducers. Alarms for low pressure, high pressure will be permitted.
25) Timed Discrete Output function shall control an external function or device via user-configured activity schedule. This schedule shall be separate and different from the unit's occupied/unoccupied time schedule.
26) Hydronic heating coil control shall modulate a control valve in a steam or hydronic heat system to maintain space temperature at user-configured set points. Control valve actuator shall communicate via LEN (Local Equipment Network) protocol.
27) Humidifier control shall provide control for either LEN communicating control valve or discrete-type output, to maintain space humidity conditions at user-configured set points.
28) Two-step demand limit control (when used in conjunction with CEM [Controls Expansion module]).
29) Display in Metric units: Display may be configured to display data in Metric or English (Imperial) units of measure.
30) Optional LEI (Local Equipment Interface) communication board to provide linkage with IP (Internet Protocol) communication protocol, LON (Local Operation Network) communication and RS485 serial communication capability.

2. Safeties:

   Unit components shall be equipped with the following protections:

   a. Compressors:
      1) Overcurrent using calibrated circuit breakers (shuts down individual compressor).
      2) Crankcase heaters.
      3) High-pressure switch (shuts down individual compressor, automatic reset switch with manual software reset).
      4) Low-pressure switch (shuts down complete circuit, automatic reset reset switch with manual software reset).
      5) Check filter switch (accessory).

   b. Belt-Drive Fan Motors:

      Overcurrent protection manual reset circuit breakers.

c. [Electric Heating Section:]
   1) Automatic reset high-temperature limit switches.
   2) Heat limiters (fusible links).
   3) Overcurrent protection manual reset circuit breakers.
   4) Branch circuit protection.

3. Diagnostics:
   a. Diagnostic display module shall be capable of indicating a safety lockout condition (alarm) through an expandable scrolling display.
   b. Diagnostic display module shall also be capable of indicating an alert condition which does not lock out the unit, but informs the system monitor of a condition which could be detrimental to either the unit or the comfort of the occupants if allowed to continue.
   c. Test Mode must also be capable of controlling outputs of microprocessor controller and to verify operation of every thermistor, actuator motor, fan, and compressor before unit is started.

K. Operating Characteristics:
   1. Unit shall be capable of starting and running at 115 F (46 C) ambient outdoor temperature per maximum load criteria of ARI Standard 340/360.
   2. Unit shall be capable of mechanical cooling operation down to 0° F (–18 C) ambient outdoor temperature.
   3. Unit shall provide multi-stage cooling capability.
   4. [Unit shall provide 2 stages of electric heating control.]

L. Motors:
   1. Compressor motors shall be cooled by suction gas passing over motor windings.
   2. Condenser-fan motors shall be 3-phase, totally enclosed type with permanently lubricated ball bearings and internal overtemperature protection.
   3. Supply and exhaust fan motors shall be of the 3-phase, NEMA rated, Open Dripproof (ODP), ball bearing type, with efficiencies per EPACT (U.S.A.) requirements.

M. Electrical Requirements:

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

N. Special Features:
   1. Roof Curb:

      Designed to comply with criteria established by NRCA Guideline B-1986. Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip as perimeter curb supporting the air handling portion of unit, and rail for supporting the condenser portion of the unit.

   2. Roof Curb Condenser Section:

      Formed 14-gage (1.85 mm) galvanized steel with wood nailer strip for supporting condenser section of the unit to complete a full perimeter curb under entire unit.

   3. Integrated Economizer:

      Dry bulb or differential dry bulb temperature controlled or optional enthalpy or differential enthalpy controlled integrated type consisting of dampers, actuator, and linkages in conjunction with control system to provide primary cooling using outdoor air, enthalpy permitting, supplemented with mechanical cooling when necessary.
      a. Dampers shall be a low-leakage type, not to exceed 1% leakage at 1-in. wg (249 Pa) pressure differential when fully closed.
      b. Actuator shall have a spring-return feature which shuts dampers upon a power interruption or unit shutdown. Actuators are communication capable of internal diagnostics.
      c. Equipped with a solid-state humidity sensor (accessory) that is capable of sensing outdoor-air heat content (temperature and humidity) and controlling economizer cut-in point at most economical level. The user can also configure dew point limiting.

   4. 100% Modulating Power Exhaust (50ZG,ZN,Z2 Z3 only):

      Package shall include 2 double-width, double-inlet centrifugal belt drive, forward-curved power exhaust fans with modulating devices at the discharge of each fan to maintain a field adjustable interior space pressure set point.
      a. Fan bearings shall be of the pillow block type with an average design life of 200,000 hours.
      b. Fans shall be statically and dynamically balanced.
      c. Available in Internal or External Locations.

   5. Return Fan/Building Pressure Control (Standard on 50Z6,Z7,Z8,Z9, with Economizer):
      a. Functions provided shall be:
         1) Airflow control for return duct path (dedicated to overcoming flow losses in return duct system)
         2) Modulate return airflow rate to track Supply Fan airflow rate and maintain a user set delta CFM between the supply and return airflow.
         3) Maintain Building Pressure by sensing Building Pressure and modulating exhaust damper position.
      b. Option shall consist of following hardware:
         1) Plenum fan assembly, with welded steel airfoil blade fan.
         2) Spring isolation.

3) Belt-drive fan system, fixed pitch for maximum belt life and reliability.
4) Variable Speed Drive (VFD) for Return Fan modulation control.
5) Supply air CFM and Return air CFM sensors to measure supply and return airflow.
6) Exhaust damper with outlet hood.
7) Direct-acting damper actuator.
8) Building Pressure transducer.

c. Installation:
1) Site installation shall require supply and installation of Building Pressure sensing pick-up and tube to connect to BP transducer in unit.
2) All other wiring and pressure tubing shall be factory-supplied and -installed.

6. Barometric Relief Package (50ZG,ZN,Z2,Z3 only):
a. Package shall relieve excess internal pressure and consist of damper assemblies, hoods, damper screens, seal strips and required hardware.
b. Damper assemblies shall close due to gravity upon unit shutoff.
c. Unit mounted on vertical applications, and duct mounted on horizontal applications.

7. Medium-Efficiency Pleated Filters:
Unit shall be factory equipped with 2-in. (51 mm) medium-efficiency pleated filters having the following characteristics:
a. Filters shall have a design dust spot efficiency with an average of 30% based on the ASHRAE Standard 52.1 test method.
b. Filters shall have a minimum arrestance of 90%.
c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.

8. High-Efficiency Pleated Filters:
Unit shall be factory equipped with 2-in. (51 mm) high-efficiency pleated filters having the following characteristics:
a. Filters shall have a design dust spot efficiency with an average of 60 to 65% based on the ASHRAE Standard 52.1 test method.
b. Filters shall have a minimum arrestance of 90%.
c. Filters shall be classified as a Class 2 air filter according to UL Standard 900.

9. Supply Fan Static Pressure Control/Inlet Guide Vanes:
Inlet Guide Vane option shall include:
a. Factory-installed double guide vane assemblies, consisting of rolled steel support rings and actuating rings, galvanized steel vanes capable of opening to full 90-deg position, and pivot bearings, designed for 250,000 cycles (full-open to full-closed) and protected against corrosion (painted, galvanized or plated).
b. Factory-mounted single actuator, with factory-mounted linkages to modulate both inlet rings.
c. Factory-mounted duct pressure sensing controller: Differential Pressure Transducer, 4 to 20 mA output to unit control module, with adjustable setpoint range (0.0 to 5.0 in. wg [0 to 1246 Pa]), adjust via scrolling marquee display or Navigator.
d. Low pressure reference tube factory installed.
e. Not available with optional airfoil supply fan.

10. Supply Fan Static Pressure Control/Variable Frequency Drive:
Unit shall be equipped with Variable Frequency Drive (VFD, inverter). The VFD shall be provided with a metal enclosure and shall be factory-mounted, -wired and -tested. The VFD shall control motor speed to maintain set point static pressure control at the supply duct sensor tube location. The supply fan drive shall be field-adjustable to maintain supply duct static pressure set point from 0.0-in. wg to 5-in. wg (0 to 1246 Pa), adjusted via Scrolling Marquee display or Navigator.
A pressure transducer shall be factory-mounted and -wired. (Control tubing from sensor tube location to transducer shall be field-supplied and -installed.) Transducer shall provide a 4 to 20 mA signal to the unit control module; unit control module shall provide a 4 to 20 mA signal to the VFD indicating desired VFD output level.
The variable speed drive shall include the following features:
a. Full digital control.
b. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
c. Inverters capable of operation at a frequency of 8 kHz so no acoustic noise shall be produced by the motor.
d. NEMA 1 metal enclosure for reduction of RFI (radio frequency interference).
e. Digital display keypad module, mounted on the VFD enclosure.
f. Local/Remote and Manual/Auto function keys on the keypad.
g. UL listed electronic overload protection.
h. Critical frequency avoidance.
i. Self diagnostics.

j. On-board storage of unit manufacturer's customer user settings, retrievable from the keypad.
k. RS232C communications capability standard.
l. RS485 communications capability (accessory card source required).
m. Internal electronic filtration to reduce EMI generation.

11. VFD Remote Display Service Module:

    Accessory package shall contain VFD adapter plate, remote display housing (to accept the keypad module removed from the VFD housing) and cable assembly with quick-connect plug to connect to mating plug on VFD adapter plate, to facilitate VFD diagnostics and servicing.

12. Premium-Efficiency Motors (Supply Fan/ Exhaust Fans):

    Unit shall be factory-equipped with premium-efficiency motors on Supply Fan (and Power Exhaust Fans) with NEMA efficiency ratings per contract drawings. Available all motor sizes.

13. Non-Fused Disconnect:

    A non-fused electrical disconnect for main unit power shall be factory installed. The disconnect shall be an interlocking through-the-door type.

14. 115-Volt Convenience Outlet:

    A duplex GFCI receptacle shall be factory mounted in a weatherproof enclosure and wired for a 10 amp load. It will remain powered when all unit circuit breakers have been turned off. The outlet will be deenergized by the unit disconnect.

15. Navigator Display Module:

    The Navigator display module shall be a portable hand-held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, Portuguese or French language. Display menus shall provide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.

16. Control Expansion Module:

    Factory-installed package shall include all hardware for additional control of base unit operation and product integrated controls features. The functions supported are:

    a. Building pressurization, evacuation, smoke purge and fire shutdown control.
    b. Supply Air Reset from external 4 to 20 mA signal.
    c. 2-step Demand Limit inputs (when used with the CCN network).
    d. Indoor Air Quality (IAQ) switch monitoring.
    e. Outdoor Airflow (OAC) monitoring.
    f. Outdoor Humidity monitoring.
    g. Space Humidity monitoring (required for dehumidification control, reheat and humidifier control).
    h. Return Air humidity monitoring.

17. Relative Humidity Sensors:

    Package shall contain either duct-mounted or wall-mounted sensors to measure the relative humidity of the air within the occupied space (specify location) or return duct and/or outside air.

    NOTE: For Relative Humidity sensor monitoring, the CEM must also be ordered.

18. Indoor Air Quality (CO_2) Sensor:

    Shall have the ability to provide demand ventilation indoor-air quality (IAQ) control through the economizer with an indoor air quality sensor.

    The IAQ sensor shall be available in duct mount, wall mount, and wall mount with LED display of CO_2 in parts per million. The set point shall have adjustment capability.

19. Return Air Smoke Detector:

    The smoke detector shall send input to the controller to shut down the unit in case smoke is detected.

20. Outdoor Airflow Sensor:

    Outdoor Airflow Sensor package shall contain a airflow station with airflow sensor, a transducer and all hardware required to measure the quantity of outdoor air brought in through the economizer dampers. Optional economizer and CEM are required with this accessory.

21. Differential Enthalpy Switch or Sensors (when equipped with both return air and outdoor air humidity sensors).

    a. For use with economizer only.
    b. Capable of comparing heat content (temperature and humidity) of outdoor and return air and controlling economizer cut-in point at the most economical level.

22. Hot Gas Bypass:

    Unit shall be factory equipped with hot gas bypass valve, shutoff valve, and tubing to maintain capacity control at minimal cooling loads.

23. Condenser Coil Protective Coating — Pre-Coated:

    Condenser coil aluminum fins shall be coated with protective coating. Coating shall be applied to the aluminum fin stock prior to the fin stamping process to create an inert barrier between the aluminum fin and copper tube. Coating material shall be a durable epoxy phenolic organic coating, capable of 1000 hr salt spray exposure per ASTM B117 test and ASTM DI 654 evaluation, 2000 hr corrosion weathering cycle and moist sulfur dioxide exposure per DIN 50018 (ASTM G87) test and ASTM DI 654 and ASTM D714 evaluation. Pre-coated aluminum fin coils shall provide protection in mildly corrosive coastal and industrial environments.

24. Optional Condenser Coil Material:

    Unit shall be factory equipped with condenser coils made from copper tubes and copper fins. Coils shall be constructed of copper fins mechanically bonded to copper tubes and copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting the sheet metal basepan to minimize potential for galvanic corrosion between the coil and the pan. All copper construction shall provide protection in moderate coastal environments.

25. Condenser Coil Protective Coating — E-Coat with Aluminum Fins:

    E-Coated aluminum fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be aluminum fins mechanically bonded to copper tubes.

26. Condenser Coil Protective Coating — E-Coat with Copper Fins:

    E-Coated copper fin coils shall have a flexible epoxy polymer coating uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation. Color shall be high gloss black with gloss — 60 deg of 65 to 90% per ASTM D523-89. Uniform dry film thickness from 0.8 to 1.2 mil (20.3 to 30.5 microns) on all surface areas including fin edges shall be provided. Superior hardness characteristics of 2H per ASTM D3363-92A and cross-hatch adhesion of 4B to 5B per ASTM D3359-93. Impact resistance shall be up to 160 in./lb (9.0 m/kg) (ASTM D2794-93). Humidity and water immersion resistance shall be up to minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-90). Corrosion durability shall be confirmed through testing to be no less than 1000 hours salt spray per ASTM B117-90. Coil construction shall be copper fins mechanically bonded to copper tubes with copper tube sheets. Galvanized steel tube sheets shall not be acceptable. A polymer strip shall prevent coil assembly from contacting sheet metal basepan to maintain coating integrity and minimize corrosion potential between the coil and pan.

27. Condenser Coil Hail Guard:

    Canted face enclosure and welded wire grille complete with support retainers and fasteners shall be provided for protection of condenser coils. Field-assembled.

28. Space Temperature Sensor (T-56):

    The T-56 space temperature sensor (for CV applications) shall monitor space temperature. Device shall be suited for wall mounting in the occupied space. The T-56 sensor shall incorporate a front-panel located slider switch to effect a remote change in set point of ±5° F (2.8 C). The T-56 sensor shall also include a button used to initiate Unoccupied Override function.

29. Space Temperature Space Temperature Sensor (T-56) with CO_2 Sensor:

    This device shall incorporate interior space temperature sensing and interior space CO_2 level monitoring functions. Space temperature sensor shall sense the actual temperature in the conditioned space via 10K ohm thermistor. Temperature set point adjustment potentiometer via slide scale shall provide ±5° F adjustment. The CO_2 sensor shall provide CO_2 measurement range of 0 to 2000 PPM. IAQ signal to unit base board terminals shall be 4 to 20 mA. Sensor shall be equipped with an override button for timed override. Sensor must be powered by a separate field-supplied 24-v transformer.

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