FORM 100.50-EG1 (201)

YORK®

eco²

Packaged Rooftop Air Conditioning Units


00406VIP

R-407C OPTIMIZED
50 THROUGH 65 TONS

EPA energy BUILDINGS ALLY

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FIGURES

NOMENCLATURE

BASIC MODEL NUMBER

1 2 3 4 BASE PRODUCT TYPE
- Y : YORK
- P : Packaged Rooftop
- A : Air-Cooled
- L : Scroll

5 6 7 NOMINAL CAPACITY
- 0 5 0 : 50-ton
- 0 5 5 : 55-ton
- 0 6 0 : 60-ton
- 0 6 5 : 65-ton

8 9 APPLICATION
- C : Cooling Only
- C : Constant Volume
- V : VAV, VFD
- B : VAV, VFD w/ Manual Bypass

10 REFRIGERANT
- B : R-407C

11 12 VOLTAGE
- 1 7 : 200 / 3 / 60
- 2 8 : 230 / 3 / 60
- 4 6 : 460 / 3 / 60
- 5 8 : 575 / 3 / 60

13 14 DUCT LOCATIONS
- B : Bottom Supply
- L : Left Supply
- R : Right Supply
- B : Bottom Return
- F : Front Return
- S : Side Return

15 16 DESIGN SPECIAL
- A : Rev. Level A
- S : Std. Product
- X : Special

Introduction

00406VIP

FIG. 1 – PACKAGED ROOFTOP AIR CONDITIONING UNIT

FEATURES/BENEFITS

Ecological and Economical Design

- First packaged RTU with 407C optimized design
- **Cooling and Heating –** Superior operating performance provides lower operating costs. Smaller steps of cooling capacity provide tighter control of building environment and occupant comfort while optimizing energy efficiency.
- **Indoor Air Quality (IAQ) –** Outside air economizers provide energy savings in free cooling mode, and can provide a healthier and more comfortable building environment by introducing fresh outside air into the building as needed. Indoor Air Quality (IAQ) requirements for building ventilation and comfort are controlled through the microprocessor control panel. Optional air flow measurement provides an accurate means of tracking air quality and alerting the occupants or building owner to unhealthy situations.
- **High-Efficiency Motors –** High-efficiency motors are available for optimum energy efficiency. All motors used on the eco^2 packaged rooftop air conditioner meet U.S. EPACT 1992 minimum requirements.

Indoor Air Quality (IAQ)

- **Double-sloped stainless steel drain pan –** This double-sloped inclined stainless steel drain pan facilitates removal of evaporator condensate. Sloped in two directions conforming to ASHRAE 62n, this drain pan swiftly minimizes any condensate within the unit. Best of all, the drain pan is accessible for periodic cleaning required by IAQ standards.
- **Smart ventilation –** YORK maintains the leadership role in IAQ products with adaptive ventilation control. The OptiLogic™ controls provide continuous monitoring of air quality and take action by opening the outside air dampers, bringing in the right amount of fresh air before air impurities reach uncomfortable or even dangerous levels.
- **Air flow measurement –** Precise measurement of ventilation air flow is possible using an air flow measurement station which can be installed in the economizer section. Proper ventilation air flow is required to ensure sufficient fresh air is in the building. A myriad of air flow measurement options are available from minimum air flow to high-accuracy full air flow capabilities. The complete system is designed as an integrated component of the OptiLogic™ control system to ensure optimum system performance.
- **Double-wall construction –** Rigid double-wall construction throughout provides ease of cleaning and protects against insulation fiber entrainment in the breathable air. Double-wall construction also helps improve the acoustical characteristics of the air handling unit.

- **Enhanced filtration –** The Eco² unit gives designers the flexibility to meet various IAQ requirements with a full range of rigid and throwaway filters at various efficiency levels.

Reliable Scroll Compressor Technology

Reliable, efficient, trouble-free operation is the true measure of a packaged rooftop's value. That's why YORK Eco² Packaged Rooftop Air Conditioners use established scroll-compressor technology to deliver dependable, economical performance in a wide range of applications. With the Eco² Packaged Rooftop, you get the latest generation of compressor enhancements added to the scroll's inherent strengths. The simplicity of a hermetic scroll compressor allows the use of fewer moving parts to minimize breakdown. YORK also employs the latest sealing technology to avoid metal-to-metal contact. Axial sealing is accomplished with floating tip seals, while radial sealing utilizes a microcushion of oil. The result: a maintenance-free compressor providing minimum wear and maximum runtime.

A scroll compressor operates with two scroll members—a fixed scroll and an identical orbiting scroll turned 180 degrees, like two hands curled and interlocked together. As the orbiting scroll oscillates against the fixed scroll, it traps and compresses suction gas inside involute pockets. As the orbiting scroll moves, the gas is compressed into the central area, where it is discharged as compressed gas. High efficiency is achieved through a precisely controlled orbit and the use of advanced scroll geometry. There is no wasted motion. All rotating parts are statically and dynamically balanced to ensure optimal performance over the long haul.

Balanced components and precision machining also ensure that smooth compression occurs in all involute pockets simultaneously. When compression forces are equally distributed over the entire scroll surface, equal forces in opposing directions cancel one another, minimizing any imbalance. Consequently, compression is smooth, continuous, and quiet. Vibration isolators on each compressor handle normal vibration. For extra quiet operation, acoustic sound blankets for each compressor are available as options.

Serviceability

- **OptiLogic™ –** fully-integrated factory-packaged controls are standard on every unit and include a display unit with a 4x20 character LCD display. OptiLogic™ continually monitors all control setpoints and configurations. If a unit or control component, or sensor fails, the controller notifies the user of a problem. If desired, YORK service can provide remote monitoring and automatically schedule a service technician to make the repair and maintain your comfort.
- **Access doors –** full-sized access doors provide easy access into the unit for routine maintenance and inspection.
- **Suction & discharge service valves –** oversized service valves to provide isolation and quick reclamation and charging of system refrigerant are available to minimize downtime and simplify the service and repair task.
- **VFD Fan Motor Control with Manual Bypass –** Optional manual VFD bypass reduces time required for troubleshooting, commissioning and system balancing.
- **Convenience Outlet –** for maintenance tasks requiring power tools, an optional 110V GFCI power supply can power lights, drills or any other power hand tool needed.
- **Filter Maintenance Alarm –** An optional filter maintenance alarm indicates when a filter becomes dirty and requires replacement or cleaning.

Install with Ease and Safety

- **Factory run-tested –** Each unit is subjected to a series of quality assurance checks as well as an automated quality control process before being run-tested. Fans and drives are balanced at the factory during testing. The factory run-test ensures safe, proper operation when the unit is installed and reduces installation and commissioning time.
- **Single-point power connection –** Single-point power connection reduces installation time by providing a single point for incoming power, including

the optional convenience outlet. All incoming power is connected in one location, reducing the cost of field-supplied and installed power wiring.

- **Factory-mounted and wired controls –** All control points within the unit are factory-installed, wired and tested. The OptiLogic™ controls can communicate with BACNet IP.
- **Non-fused disconnect –** A factory-installed non-fused disconnect switch simplifies unit installation and serviceability by reducing installed labor costs. The disconnect switch is interlocked with the power cabinet ensuring that all power to the unit has been disconnected before servicing.

Design Flexibility

- **Low Ambient Operation –** Head-pressure control is accomplished via a VFD motor controller rather than an inefficient and noisy condenser fan damper. By varying the speed of the condenser fan, better control and quieter operation is obtained during the colder months. Low ambient controls are available on all systems offering higher rooftop cooling capacity than competitive units.
- **Hot Gas Bypass –** Optional on constant volume units, hot gas bypass reduces the cycling of compressors which helps prolong the life of the equipment.
- **Supply Air Openings –** Side supply connections are available on select configurations, offering more flexibility for duct layout and improving sound transmission characteristics.
- **Compressor Sound Blankets –** For applications in sound-sensitive areas, compressor sound blankets are available to reduce sound emitted from the rooftop unit.
- **Fan Spring Isolators –** One-inch spring isolation is used to prevent vibration transmission from the rooftop unit’s supply fan to the building. Two-inch spring isolation is also available.
- **Harsh Environments –** A variety of coil coating and materials are available as well as hail guards to protect coils from weather damage. Seismic and hurricane duty curbs and fan restraints are available.

Physical Data

TABLE 1 – PHYSICAL DATA

MODEL SIZE	50	55	60	65
GENERAL DATA				
Length (Inches)	336	336	336	336
Width (Inches)	92	92	92	92
Height (Inches)	82	82	82	82
Operating Weights (Lbs.) (base unit, no options)				
Cooling Only (Rigging & Refrigerant)	8,080	8,290	8,530	8,740
Rigging Weights (Lbs.) (base unit, no options)				
Cooling Only	8,010	8,210	8,440	8,640
Option Weights (Lbs.)				
Power Exhaust (Blower, motor, fan skid & mod damper)	647	647	647	647
Power Exhaust (Blower, motor, fan skid, VFD & baro damper)	654	654	654	654
100% AMS (Measurement Station & Mounting)	110	110	110	110
25/75% AMS (Measurement Station & Mounting)	130	130	130	130
Min. AMS (Measurement Station & Mounting)	40	40	40	40
Barometric only	36	36	36	36
Condenser Hail Guard	32	32	32	32
Copper Condenser Coils	617	617	793	793
Copper Evaporator Coils	262	320	400	500
Roof Curb Weights (Lbs.)				
14" Full Perimeter Roof Curb	787	787	787	787
14" Open Condenser Roof Curb	555	555	555	555
Compressor Data				
Quantity / Size (Nominal Tons)	4/13	4/13	4/15	4/15
Type	Scroll	Scroll	Scroll	Scroll
Capacity Steps (%)	25, 50, 75, 100	25, 50, 75, 100	25, 50, 75, 100	25, 50, 75, 100
Supply Fan and Drive				
Quantity	1	1	1	1
Type	FC	FC	FC	FC
Size	25-22	25-22	25-22	25-22
Motor Size Range (min. to max. HP)	7.5-40	7.5-40	7.5-40	7.5-40
Air Flow Range (min. to max. cfm)	10000-22500	12000-24000	14000-27000	14000-27000
Static Pressure Range (min. to max. ESP)	0-4"	0-4"	0-4"	0-4"
Exhaust Fan				
Quantity	2	2	2	2
Type	FC	FC	FC	FC
Size	15-15	15-15	15-15	15-15
Motor Size Range (min. to max. HP)	5-20	5-20	5-20	5-20
Air Flow Range (min. to max. cfm)	0-20000	0-20000	0-20000	0-20000
Static Pressure Range (min. to max. ESP)	0-1"	0-1"	0-1"	0-1"
Evaporator Coil				
Size (square feet)	48.8	48.8	48.8	48.8
Number of rows/fins per inch	3/8	4/8	4/12	5/10
Tube Diameter/Surface	1/2"/enhanced	1/2"/enhanced	1/2"/enhanced	1/2"/enhanced
Condenser Coil (Aluminum Fins)				
Size (square feet)	121.3	121.3	121.3	121.3
Number of rows/fins per inch	3/14	3/14	3/18	3/18
Tube Diameter	3/8"	3/8"	3/8"	3/8"
Condenser Coil (Copper Fins – Opt)				
Size (square feet)	121.3	121.3	121.3	121.3
Number of rows/fins per inch	3/14	3/14	3/18	3/18
Tube Diameter	3/8"	3/8"	3/8"	3/8"

Physical Data *(continued)*

TABLE 1 – PHYSICAL DATA (Cont'd)

MODEL SIZE	**50**			**55**			**60**			**65**		
GENERAL DATA												
Condenser Fans												
Quantity	4			4			4			4		
Type	Prop.			Prop.			Prop.			Prop.		
Diameter (inches)	36			36			36			36		
Filters – 2" throwaway												
Quantity	8	12		8	12		8	12		8	12	
Size (length x width) (in.)	25x16	25x20		25x16	25x20		25x16	25x20		25x16	25x20	
Total Filter Face Area (square feet)	63.9			63.9			63.9			63.9		
Filters – 2" cleanable												
Quantity	8	12		8	12		8	12		8	12	
Size (length x width) (in.)	25x16	25x20		25x16	25x20		25x16	25x20		25x16	25x20	
Total Filter Face Area (square feet)	63.9			63.9			63.9			63.9		
Filters – 2" pleated (30% efficient)												
Quantity	8	12		8	12		8	12		8	12	
Size (length x width) (in.)	25x16	25x20		25x16	25x20		25x16	25x20		25x16	25x20	
Total Filter Face Area (square feet)	63.9			63.9			63.9			63.9		
Filters – 12" rigid 65%, 2" 30% prefilter												
Quantity	1	4	9	1	4	9	1	4	9	1	4	9
Size (length x width) (in.)	16x20	25x16	25x20	16x20	25x16	25x20	16x20	25x16	25x20	16x20	25x16	25x20
Total Filter Face Area (square feet)	44.6			44.6			44.6			44.6		
Filters – 12" rigid 95%, 2" 30% prefilter												
Quantity	1	4	9	1	4	9	1	4	9	1	4	9
Size (length x width) (in.)	16x20	25x16	25x20	16x20	25x16	25x20	16x20	25x16	25x20	16x20	25x16	25x200
Total Filter Face Area (square feet)	44.6			44.6			44.6			44.6		
Filters – 2" carbon (30% efficient)												
Quantity	8	12		8	12		8	12		8	12	
Size (length x width) (in.)	25x16	25x20		25x16	25x20		25x16	25x20		25x16	25x20	
Total Filter Face Area (square feet)	63.9			63.9			63.9			63.9		
Refrigerant	HFC-407C			HFC-407C			HFC-407C			HFC-407C		
Minimum OA Temp. for Mech. Clg. (°F)	45			45			45			45		
Low Ambient Option Min. OA Temp. (°F)	0			0			0			0		

Application Data

LOCATION

Of the many factors that can affect the acoustical characteristics of a rooftop installation, one of the most important is the unit location. Ideally, the rooftop unit should be installed away from sound-sensitive areas, such as conference rooms, auditoriums and executive offices. Possible locations could be above storage areas, hallways, mechanical or utility rooms, or bathrooms.

The eco^2 air conditioning units are designed for outdoor installation. When selecting a site for installation, be guided by the following conditions:

- Unit must be installed on a level surface.
- For the outdoor location of the unit, select a place having a minimum sun exposure and an adequate supply of fresh air for the condenser.
- Also avoid locations beneath windows or between structures.
- Optional condenser coil protection should be used for seashore locations or other harsh environments.
- The unit should be installed on a roof that is structurally strong enough to support the weight of the unit with a minimum of deflection. Extreme caution should be taken when the unit is mounted on a wood structured roof. It is recommended that the unit(s) be installed not more than 15 feet from a main support beam to provide proper structural support and to minimize the transmission of sound and vibration. Ideally, the center of gravity should be located over a structural support or building column.
- Location of unit(s) should also be away from building flue stacks or exhaust ventilators to prevent possible reintroduction of contaminated air through the outside air intakes.
- Be sure the supporting structures will not obstruct the duct, gas or wiring connections.
- Proper service clearance space of 6-feet around the perimeter of the unit and 12-feet to any adjacent units is required to eliminate cross contamination of exhaust and outdoor air, and for maintenance tasks such as coil pull and cleaning. No obstructions should be above the condensing unit section.

RIGGING

Proper rigging and handling of the equipment is mandatory during unloading and setting it into position to retain warranty status.

Spreader bars must be used to prevent damage to the unit casing. All lifting lugs must be used when lifting the rooftop unit.

Care must be taken to keep the unit in the upright position during rigging and to prevent damage to the watertight seams in the unit casing. Avoid unnecessary jarring or rough handling.

Ground Level Locations

It is important that the units be installed on a substantial base that will not settle, causing strain on the refrigerant lines and sheet metal and resulting in possible leaks. A one-piece concrete slab with footers extended below the frost line is highly recommended. Additionally, the slab should not be tied to the main building foundation as noises may be transmitted into the building structure.

For ground level installations, precautions should be taken to protect the unit from tampering by, or injury to, unauthorized persons. Erecting a fence around the unit is another common practice.

ECONOMIZER

The economizer section is used for ventilation of the conditioned space to maintain indoor air quality, and also to reduce energy consumption by using outdoor air cooling in lieu of mechanical cooling. If outdoor air is appropriate for cooling, but not sufficient for the cooling demand, mechanical cooling will stage on as necessary until the cooling load is met.

Comparative enthalpy operation is the most accurate and efficient means of economizer operation. The OptiLogic™ control monitors the return and outside air energy content, and selects the lower of the two for operation.

VAV SUPPLY AIR PRESSURE CONTROL

Traditional packaged rooftop systems use inlet guide vanes (IGVs) for duct static pressure control. These control supply duct pressure by modulating dampers (introducing losses and inefficiencies) on the intlet of the fan, open and closed. Variable frequency drives (VFDs) offer superior fan speed control and quieter, energy efficient operation.

IGV inefficiency can be compared to the operation of a car. Modulating air flow with an IGV is like pressing on the gas to drive the car, but modulating the speed of the car by simultaneously pressing on the brake. VFD modulation is speed modulation by using just the gas pedal.

For VAV applications, the YORK eco[2] unit uses a VFD to modulate fan speed and maintain a constant duct static pressure. VFDs offer superior control over the operation of the unit at part load, and offer the additional benefits of quieter and more efficient operation when compared to IGV.

HARSH ENVIRONMENTS – CONDENSER AND EVAPORATOR COIL PROTECTION

For harsh environmental conditions such as seashore applications, YORK offers three types of coil protection: copper fin material, black fin and Technicoat coatings. YORK recommends that for corrosive environments that copper fins be used to protect the evaporator and/or condenser coils. In areas where chemicals that can corrode copper are present, such as ammonia, YORK recommends that the black fin or Technicoat coating be used for maximum protection.

Copper Fin Condenser Coil

Copper fins can be used instead of aluminum for additional corrosion protection, however it is not suitable for areas that are subject to acid rain or exposed to ammonia.

Pre-Coated Condenser Fins

Black fin coating (yellow fin for evaporator fins) is precoated application epoxy on aluminum fin stock to guard from corrosive agents and insulate against galvanic potential. It is used for mild seashore or industrial locations. This can provide corrosion resistance comparable to copper fin coils in typical seashore locations.

Post-Coated Condenser Fins

Technicoat (a post-coated application of epoxy) can be used for seashore and other corrosive applications with the exception of strong alkalides, oxidizers, wet bromide, chlorine and fluorine in concentrations greater than 100 ppm.

Any of the above suitable options should be selected based on the particular project design parameters and related environmental factors. The application should be further reviewed and approved by the consulting engineer or owner based on their knowledge of the job site conditions.

BUILDING EXHAUST SYSTEMS

Building exhaust systems are often necessary when economizers are used to bring in outdoor air. Without proper building exhaust, the building may become overpressurized. The exhaust system maintains the proper building pressure by expelling the appropriate amount of air from the building. Exhaust systems are typically designed to exhaust approximately 10% less air than what is entering the building. This provides a slight positive pressure on the building.

100% modulating exhaust with building static pressure sensing and control

The 100% exhaust system can be configured with either control actuated dampers or VFDs for modulating control. The unit controller monitors the building pressure using a differential pressure transducer and maintains the required building static pressure by modulating the exhaust control. If the building has other means of exhaust or building pressure is not important, on/off or barometric control may be used.

100% modulating exhaust with fan on/off control

The 100% exhaust system can be configured for on/off operation eliminating the expense of the damper actuators or VFDs. This exhaust system can be controlled by either the outside air damper position, or a building static pressure sensor.

Barometric exhaust

Barometric exhaust can be used when smaller amounts of air at low static pressure variations within the building or other means of building exhaust are employed. Barometric exhaust is commonly used where there are only small fluctuations in building pressure or where building static pressure control is not necessary.

ROOF CURB

Optional 14-inch full-perimeter or open condenser roof curbs can be provided if necessary for mounting to the building roof. These curbs come disassembled and require installation in the field. For bottom supply and return duct openings, the curbs have matching connections to ease installation. A pipe chase that matches the rooftop unit is also included in the curb footprint for through-the-curb utility connections.

The curb should be located according to the location recommendations above, and properly sealed to prevent moisture and air leakage into and out of the duct system. Flexible collars should be used when connecting the duct work to prevent unit noise transmission and vibration into the building.

Duct work should be supported independently of the unit.

ACOUSTICAL CONSIDERATIONS

The eco^2 unit is designed for lower sound levels than competitive units by using flexible fan connections, fan spring isolators, double-wall construction, and lower speed and horsepower fans. For VAV applications, VFDs are used instead of inlet guide vanes. Additional sound attenuation can be obtained using compressor sound blankets and field-supplied sound attenuators when necessary.

Even with these equipment design features, the acoustical characteristics of the entire installation must never be overlooked. Additional steps for the acoustical characteristics of a rooftop installation should be addressed during the design phase of a project to avoid costly alterations after the installation of the equipment. During the design phase of a project, the designing engineer should consider, at a minimum, the impact of the equipment location, rooftop installation, building structure, and duct work.

SELECTION PROCEDURE

Given:

Required total cooling capacity of 600 mbh and sensible cooling capacity of 450 mbh with evaporator entering air conditions of 83°F dry bulb and 67°F wet bulb. Design ambient temperature is 95°F dry bulb. Supply air requirements are 17500 cfm of air at 2.25 IWG external static pressure. Power supply is 460V/3ph/60Hz and the unit requires a modulating economizer, 2-inch pleated filters, bottom supply and bottom return air openings and is constant volume.

Select Unit:

1. Determine the internal static pressure drop of the cabinet by referencing Table 8.

Wet evaporator coil	0.54
Bottom supply opening	0.14
Bottom return opening	0.13
2-inch pleated filters	0.10
Economizer openings	0.24
Modulating economizer dampers	0.31
Total	**1.46 IWG**

2. Determine the total static pressure by adding the internal to the external static pressure.

   TSP = 1.46 IWG + 2.25 IWG
   = 3.71 IWG total static pressure

3. Determine the BHP of the supply fan from Table 6 using the supply air flow and total static pressure. From the table, we interpolate to get 15.1 BHP. Assuming a drive loss of 3% and a motor efficiency of 90%, we can calculate the heat rejection of the supply fan motor as:

   (2545 x 15.1)/(0.90 x (1-0.03)) = 44.0 mbh

   Required Cooling Capacities:

   Total = 600 + 44.0 = 644 mbh

   Sensible = 450 + 44.0 = 494 mbh

4. Required total and sensible capacities are 644 mbh and 494 mbh, respectively. Using the Cooling Performance Data starting with Tables 2, locate the table with the correct ambient air temperature. Next, trace the 83°F entering air dry bulb temperature to match the 17,500 cfm and 67°F entering wet bulb temperature condition. The resulting conditions are, from the table, 645 mbh total cooling capacity and 497 mbh sensible cooling capacity. Thus, a 50-ton unit is selected.

Cooling Performance Data – 50 Ton Model

TABLE 2 – COOLING PERFORMANCE DATA – **50 TON MODEL**

85° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
10000	72	700	477	700	431	695	387	692	353	691	311	—	—
	67	653	548	646	500	635	454	637	416	632	377	626	343
	62	640	640	608	608	590	583	582	562	569	514	574	455
14000	72	711	500	708	445	705	399	701	360	699	316	—	—
	67	665	581	656	523	647	474	647	431	643	388	637	349
	62	654	654	625	625	606	606	594	547	583	498	585	439
17500	72	729	536	721	467	719	418	715	370	712	324	—	—
	67	684	634	672	558	666	505	663	454	660	406	653	359
	62	680	680	652	652	632	625	612	550	606	497	603	438
20000	72	749	576	736	492	736	439	732	382	726	333	—	—
	67	705	695	689	597	686	540	680	479	679	425	672	370
	62	710	710	682	682	661	661	633	582	631	523	622	467
22500	72	758	595	742	504	743	449	739	388	732	338	—	—
	67	715	715	697	616	696	557	689	492	688	435	680	376
	62	715	715	696	610	674	549	643	486	643	429	631	370

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

95° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
10000	72	673	468	673	416	669	375	667	340	664	301	—	—
	67	628	536	630	494	615	445	616	404	609	383	605	331
	62	618	618	590	590	569	513	571	481	562	435	562	390
14000	72	684	491	682	432	678	388	676	348	673	306	—	—
	67	642	569	638	515	627	465	625	419	619	382	615	338
	62	635	635	607	607	586	541	580	500	572	453	571	407
17500	72	701	526	696	458	693	407	690	360	686	315	—	—
	67	665	625	651	547	645	497	640	443	635	382	630	348
	62	661	661	634	634	612	587	594	531	588	481	586	433
20000	72	720	565	712	486	709	429	705	373	701	325	—	—
	67	691	691	665	582	665	532	656	470	653	382	647	360
	62	691	691	663	663	641	641	609	565	606	511	602	462
22500	72	729	584	720	500	717	439	712	380	708	329	—	—
	67	703	703	672	599	674	549	664	483	661	382	655	366
	62	704	704	675	658	655	629	617	556	614	488	610	447

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

TABLE 2 – COOLING PERFORMANCE DATA – **50 TON MODEL** (CONT'D)

105° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F) 90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
10000	72	649	464	650	409	645	365	644	330	644	290	—	—
	67	590	513	596	478	589	434	591	390	593	354	589	318
	62	597	597	573	573	536	498	549	460	544	429	542	384
14000	72	658	483	658	424	653	378	651	338	650	295	—	—
	67	609	550	608	501	600	454	600	406	601	366	597	326
	62	614	614	589	589	556	527	557	483	553	446	550	397
17500	72	673	512	670	447	667	397	663	350	661	303	—	—
	67	638	607	625	537	618	485	615	432	613	384	609	337
	62	641	641	614	614	587	571	570	520	567	472	563	419
20000	72	689	545	684	472	682	419	677	364	672	311	—	—
	67	670	670	645	577	638	520	631	461	626	404	623	350
	62	670	670	642	642	621	621	584	561	582	500	576	443
22500	72	696	560	690	485	690	430	683	371	678	315	—	—
	67	686	695	654	596	647	537	639	475	632	414	629	356
	62	684	684	655	655	637	644	591	580	590	514	583	455

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

115° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F) 90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
10000	72	563	368	562	318	567	286	558	258	563	233	—	—
	67	494	424	524	387	514	349	515	313	514	281	518	254
	62	498	498	501	501	442	424	458	349	467	343	467	306
14000	72	592	432	588	370	589	325	585	286	583	246	—	—
	67	548	509	545	449	541	406	539	359	536	317	537	276
	62	550	550	533	533	498	488	494	434	491	395	489	349
17500	72	608	465	603	397	600	346	600	300	594	253	—	—
	67	577	555	557	481	555	435	552	383	548	336	547	288
	62	578	578	550	550	527	522	513	478	504	422	500	371
20000	72	625	503	618	427	613	368	616	316	606	261	—	—
	67	609	609	570	517	571	468	566	410	562	357	558	301
	62	609	609	568	568	560	560	534	528	518	452	513	396
22500	72	633	520	626	441	619	379	623	324	611	265	—	—
	67	624	624	576	534	579	484	572	423	568	367	563	307
	62	624	624	577	577	575	578	544	548	525	467	520	408

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

Cooling Performance Data – 55 Ton Model

TABLE 3 – COOLING PERFORMANCE DATA – **55 TON MODEL**

85° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
12000	72	732	488	704	437	700	393	696	356	695	313	—	—
	67	677	564	651	511	641	463	642	423	637	382	631	346
	62	660	648	616	616	598	598	588	564	576	515	579	456
16000	72	743	512	712	452	709	405	706	363	703	319	—	—
	67	693	598	661	535	653	484	652	438	649	394	642	353
	62	680	661	634	634	615	587	600	531	591	481	591	421
19250	72	767	564	731	485	731	433	727	378	722	331	—	—
	67	728	677	684	586	680	530	675	472	673	419	666	367
	62	725	701	673	673	652	652	627	572	624	515	616	458
22000	72	781	592	741	502	742	448	738	387	731	337	—	—
	67	750	713	695	613	694	554	688	490	687	433	679	375
	62	750	713	694	613	672	554	642	490	641	433	630	375
24000	72	786	604	746	510	747	454	743	390	736	340	—	—
	67	758	720	701	625	701	565	693	497	692	439	685	378
	62	760	720	701	602	681	534	648	473	649	416	636	357

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

95° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
12000	72	706	479	678	424	673	381	671	344	668	303	—	—
	67	651	554	634	504	621	454	621	411	613	382	610	334
	62	641	626	598	598	577	527	575	490	567	444	566	398
16000	72	716	502	687	441	683	394	680	352	677	309	—	—
	67	668	585	643	525	633	476	630	427	624	382	620	341
	62	661	644	616	616	594	554	585	511	577	462	576	415
19250	72	738	554	708	478	704	422	700	369	696	322	—	—
	67	707	671	661	572	659	521	651	462	647	382	642	357
	62	705	682	654	654	633	625	605	555	600	502	598	453
22000	72	751	581	719	497	715	438	711	379	707	328	—	—
	67	728	701	671	597	673	546	663	481	660	382	654	365
	62	730	703	675	675	653	653	616	578	613	524	609	473
24000	72	756	593	723	506	720	444	715	383	711	331	—	—
	67	737	709	675	607	678	556	667	489	665	382	659	369
	62	740	709	675	607	662	556	620	489	618	382	614	369

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

TABLE 3 – COOLING PERFORMANCE DATA – **55 TON MODEL** (CONT'D)

105° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
12000	72	642	473	654	416	649	371	647	334	647	292	—	—
	67	593	531	602	489	594	443	595	397	597	359	593	322
	62	592	605	581	581	546	512	553	471	549	437	546	390
16000	72	661	493	662	432	658	384	655	342	654	297	—	—
	67	619	569	613	513	606	464	605	415	605	372	601	330
	62	618	623	598	598	566	542	561	496	558	454	554	405
19250	72	701	535	679	465	678	413	673	360	669	308	—	—
	67	679	651	639	565	632	510	626	452	622	398	619	346
	62	679	661	634	634	611	606	580	549	578	492	572	436
22000	72	723	558	689	483	689	428	682	370	677	314	—	—
	67	711	696	653	593	645	534	637	473	631	412	628	355
	62	711	682	653	653	635	641	590	577	588	512	582	453
24000	72	733	567	693	490	693	435	686	374	681	317	—	—
	67	724	693	659	605	651	545	642	481	635	418	632	359
	62	725	691	661	661	645	656	594	590	593	521	586	460

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

115° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
12000	72	657	460	624	400	618	357	613	321	610	284	—	—
	67	606	535	579	477	571	435	566	390	563	350	559	312
	62	598	581	557	567	528	517	519	458	517	425	512	381
16000	72	665	482	633	417	627	371	623	330	619	288	—	—
	67	623	562	588	498	582	454	577	406	573	362	570	319
	62	617	600	572	578	547	539	534	487	528	443	523	395
19250	72	682	529	653	455	647	399	645	350	640	297	—	—
	67	660	632	606	544	605	496	599	440	595	388	592	335
	62	659	639	602	602	589	587	565	551	552	481	547	426
22000	72	692	554	663	476	658	414	657	360	651	302	—	—
	67	680	660	617	568	617	518	611	458	607	402	603	343
	62	682	660	616	614	611	613	582	585	565	501	559	443
24000	72	696	565	668	484	663	421	662	365	656	304	—	—
	67	689	668	621	578	622	527	617	466	613	408	608	347
	62	692	669	622	620	621	624	589	589	570	510	565	450

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

Cooling Performance Data – *60 Ton Model*

TABLE 4 – COOLING PERFORMANCE DATA – **60 TON MODEL**

85° AIR ON CONDENSER COIL

		CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
CFM	ENTERING	90		86		83		80		77		74	
	WB (°F)	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
14000	72	804	495	804	461	801	277	798	383	792	344	—	—
	67	736	586	728	522	729	339	727	440	725	408	723	377
	62	689	689	663	663	658	442	656	543	647	493	654	424
18000	72	846	609	840	538	837	410	833	426	827	372	—	—
	67	795	720	773	632	771	504	769	519	767	468	761	415
	62	771	771	740	740	725	617	704	630	700	572	699	502
21000	72	867	666	858	576	855	477	851	448	845	386	—	—
	67	824	787	795	687	792	587	790	558	787	498	780	434
	62	813	813	779	779	759	705	728	673	726	611	722	541
24000	72	888	722	876	614	872	544	868	470	862	401	—	—
	67	854	854	818	742	814	670	810	598	808	528	799	453
	62	854	854	817	817	792	792	752	716	752	651	744	580
27000	72	897	748	884	632	880	574	876	480	870	407	—	—
	67	867	867	828	767	823	708	820	616	818	541	808	461
	62	873	873	835	835	808	817	763	736	764	669	755	598

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

95° AIR ON CONDENSER COIL

		CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
CFM	ENTERING	90		86		83		80		77		74	
	WB (°F)	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
14000	72	773	491	771	442	769	336	769	368	763	331	—	—
	67	723	527	692	464	703	397	703	432	699	437	696	363
	62	671	671	645	645	631	474	642	505	655	416	673	318
18000	72	814	599	808	524	804	434	802	414	797	361	—	—
	67	775	678	752	570	745	529	742	508	736	455	732	402
	62	750	750	719	719	699	620	684	604	682	550	681	494
21000	72	834	652	827	565	822	482	819	438	814	376	—	—
	67	802	753	783	623	766	594	761	546	755	463	751	421
	62	789	789	756	756	732	693	706	653	696	616	685	582
24000	72	854	706	846	607	840	531	835	461	831	391	—	—
	67	828	828	813	675	788	660	780	584	774	472	769	441
	62	828	828	793	793	766	766	727	703	709	683	689	670
27000	72	864	730	854	626	848	553	843	471	838	397	—	—
	67	840	863	827	699	797	691	789	601	782	476	778	450
	62	846	846	810	810	782	788	737	726	716	714	690	710

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

TABLE 4 – COOLING PERFORMANCE DATA – **60 TON MODEL** (CONT'D)

105° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F) 90 CAP	90 SHC	86 CAP	86 SHC	83 CAP	83 SHC	80 CAP	80 SHC	77 CAP	77 SHC	74 CAP	74 SHC
14000	72	753	500	744	438	741	392	741	357	737	319	—	—
	67	690	469	676	304	672	458	681	416	681	384	678	350
	62	652	652	627	627	587	554	616	489	632	454	624	412
18000	72	782	588	778	514	774	457	771	403	767	347	—	—
	67	745	635	718	508	713	550	715	494	711	442	708	389
	62	726	726	697	697	664	648	658	589	655	536	655	480
21000	72	797	633	794	551	790	490	787	425	782	361	—	—
	67	773	718	739	610	734	597	732	533	727	471	723	409
	62	763	763	732	732	702	694	679	639	667	576	670	515
24000	72	811	677	811	589	806	522	802	448	798	375	—	—
	67	801	801	761	712	754	643	750	572	742	500	738	428
	62	800	800	767	767	741	741	700	690	679	617	686	549
27000	72	818	697	818	606	814	537	809	459	804	382	—	—
	67	814	839	771	759	764	664	757	589	749	514	744	437
	62	817	817	783	783	758	759	710	709	684	636	693	565

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

115° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F) 90 CAP	90 SHC	86 CAP	86 SHC	83 CAP	83 SHC	80 CAP	80 SHC	77 CAP	77 SHC	74 CAP	74 SHC
14000	72	726	485	711	413	702	376	698	345	689	309	—	—
	67	629	574	647	512	647	447	643	411	635	370	633	338
	62	626	626	607	622	562	543	561	467	582	447	574	404
18000	72	749	572	742	496	736	440	732	389	726	335	—	—
	67	700	673	688	603	683	537	680	484	673	429	669	376
	62	699	699	666	673	639	629	625	578	620	524	617	472
21000	72	760	615	758	538	754	473	749	411	744	349	—	—
	67	736	722	708	648	701	582	699	521	692	458	687	395
	62	735	735	695	698	677	672	657	634	640	563	638	505
24000	72	772	658	774	580	771	505	766	433	763	362	—	—
	67	772	772	728	693	718	627	717	558	711	487	706	414
	62	772	772	724	724	715	715	690	690	659	602	659	539
27000	72	777	678	781	599	779	520	773	443	771	368	—	—
	67	788	788	737	714	727	647	726	574	719	501	714	423
	62	788	788	737	735	732	733	704	706	668	619	669	555

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

Cooling Performance Data – *65 Ton Model*

TABLE 5 – COOLING PERFORMANCE DATA – **65 TON MODEL**

85° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
14000	72	840	584	839	516	836	467	833	418	828	368	—	—
	67	785	669	774	605	771	554	772	502	768	456	764	406
	62	754	754	724	724	695	640	710	589	707	542	706	492
18000	72	853	615	851	540	848	486	844	431	840	377	—	—
	67	802	713	788	638	784	582	784	525	780	473	776	418
	62	779	779	748	748	719	676	723	620	719	568	717	513
21000	72	876	668	871	582	868	518	864	454	859	392	—	—
	67	827	788	810	694	806	630	804	563	800	502	796	439
	62	821	821	787	787	760	739	745	674	741	612	737	548
24000	72	899	721	892	623	888	550	884	477	878	407	—	—
	67	862	862	833	750	828	678	824	601	820	531	815	460
	62	862	862	827	827	801	801	767	727	762	656	757	584
27000	72	909	745	901	642	898	564	893	488	887	413	—	—
	67	878	878	843	776	838	700	833	619	829	544	824	469
	62	878	878	843	765	820	686	777	604	772	530	766	455

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

95° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
14000	72	810	572	808	504	806	454	802	405	798	357	—	—
	67	767	658	747	593	743	542	744	491	740	443	737	393
	62	733	733	704	704	676	631	686	581	682	530	680	477
18000	72	822	603	820	528	817	473	813	419	809	365	—	—
	67	782	699	759	625	756	570	755	513	751	460	748	406
	62	756	756	726	726	699	664	697	610	694	556	691	500
21000	72	844	656	839	569	836	505	832	442	827	380	—	—
	67	800	768	781	681	777	618	774	551	770	489	766	426
	62	797	797	764	764	737	720	717	661	714	600	710	538
24000	72	866	709	858	610	855	537	850	464	844	394	—	—
	67	837	837	802	737	798	665	793	589	788	519	784	447
	62	837	837	802	802	776	776	737	712	734	644	729	577
27000	72	875	733	867	629	863	552	859	475	852	401	—	—
	67	854	854	812	762	807	687	801	606	797	532	792	456
	62	854	854	812	753	794	674	746	592	743	518	738	441

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

TABLE 5 – COOLING PERFORMANCE DATA – **65 TON MODEL** (CONT'D)

105° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
14000	72	780	560	777	493	774	442	771	393	768	342	—	—
	67	737	646	717	581	714	529	714	476	711	430	708	381
	62	710	710	682	682	650	621	658	565	655	516	653	466
18000	72	792	591	788	516	785	461	781	406	777	351	—	—
	67	753	683	730	613	726	556	725	499	721	447	718	393
	62	732	732	703	703	672	650	669	595	666	542	663	486
21000	72	812	643	805	555	802	493	798	429	794	365	—	—
	67	771	746	752	668	746	604	744	538	738	476	734	413
	62	771	771	739	739	711	700	689	647	685	586	681	522
24000	72	831	696	822	595	820	524	816	452	810	379	—	—
	67	809	809	774	722	766	651	762	576	756	505	751	433
	62	809	809	774	774	750	750	709	698	704	630	699	558
27000	72	840	720	830	613	828	539	823	462	817	386	—	—
	67	826	826	784	747	775	673	770	594	763	518	759	442
	62	826	826	791	791	767	772	718	721	712	650	707	574

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

115° AIR ON CONDENSER COIL

CFM	ENTERING WB (°F)	CAPACITY (MBH) AT ENTERING DRY BULB (°F)											
		90		86		83		80		77		74	
		CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC	CAP	SHC
14000	72	748	548	744	478	742	429	738	378	735	330	—	—
	67	708	639	690	570	686	517	684	463	681	417	678	368
	62	681	681	664	664	621	608	625	550	628	503	625	452
18000	72	759	578	754	502	752	448	748	392	744	338	—	—
	67	724	671	700	599	696	544	694	486	690	434	687	380
	62	704	704	679	679	644	634	642	583	638	528	635	473
21000	72	776	629	771	543	768	479	766	415	759	352	—	—
	67	741	725	716	650	714	591	711	523	706	462	703	400
	62	741	741	706	706	682	678	669	640	655	571	651	508
24000	72	794	680	789	584	784	511	784	438	774	366	—	—
	67	779	779	732	700	732	637	728	561	722	491	718	419
	62	779	779	732	732	721	721	697	697	672	615	668	543
27000	72	802	703	797	603	791	525	792	449	781	372	—	—
	67	796	796	740	723	740	658	736	578	729	504	725	428
	62	796	796	740	717	738	648	710	563	680	490	676	414

* Rated performance is at sea level. Cooling capacities are gross cooling capacity.

Fan Performance

TABLE 6 – 50 THROUGH 65 TON SUPPLY FAN DATA

	TOTAL STATIC PRESSURE (inches of water column)											
CFM	**0.50**		**1.00**		**1.50**		**2.00**		**2.50**		**3.00**	
STD. AIR	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**
10000	249	1.7	321	2.5	382	3.3	—	—	—	—	—	—
12000	269	2.5	335	3.4	392	4.4	443	5.3	493	6.4	—	—
14000	290	3.6	352	4.7	405	5.8	454	6.9	497	8.0	540	9.1
16000	312	5.1	371	6.3	421	7.5	467	8.7	510	10.0	549	11.2
17500	329	6.3	386	7.7	435	9.0	478	10.4	519	11.7	558	13.1
18000	334	6.8	391	8.2	439	9.6	482	10.9	522	12.3	561	13.8
19250	348	8.1	404	9.6	451	11.1	493	12.5	532	14.0	570	15.5
20000	357	8.9	412	10.5	458	12.1	499	13.5	538	15.1	575	16.6
21000	370	10.1	423	11.9	468	13.5	510	15.1	547	16.7	583	18.3
22000	383	11.4	434	13.3	478	15.0	520	16.7	555	18.3	591	20.0
22500	387	12.0	440	14.1	484	15.8	524	17.6	560	19.2	595	20.9
24000	398	13.9	458	16.6	500	18.4	537	20.2	574	22.1	607	23.8
26000	417	16.8	478	20.2	520	22.3	559	24.4	593	26.3	626	28.3
27000	429	18.6	490	22.3	533	24.6	572	26.8	602	28.6	638	30.9

TABLE 6 – 50 THROUGH 65 TON SUPPLY FAN DATA (CONT'D)

	TOTAL STATIC PRESSURE (inches of water column)											
CFM	**3.50**		**4.00**		**4.50**		**5.00**		**5.50**		**6.00**	
STD. AIR	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**	**RPM**	**HP**
10000	—	—	—	—	—	—	—	—	—	—	—	—
12000	—	—	—	—	—	—	—	—	—	—	—	—
14000	585	10.5	—	—	—	—	—	—	—	—	—	—
16000	587	12.5	622	13.8	663	15.4	700	17.0	—	—	—	—
17500	595	14.5	629	15.9	664	17.3	697	18.8	549	15.9	575	17.3
18000	597	15.2	631	16.6	664	18.0	696	19.5	732	21.2	766	23.0
19250	605	17.1	638	18.6	670	20.1	702	21.6	734	23.3	765	25.0
20000	609	18.2	642	19.8	674	21.4	705	22.9	735	24.5	764	26.1
21000	617	19.9	649	21.6	681	23.3	710	24.9	740	26.6	769	28.2
22000	624	21.7	655	23.4	688	25.3	715	26.9	744	28.6	773	30.4
22500	628	22.7	659	24.4	691	26.3	719	28.0	748	29.8	776	31.5
24000	640	25.7	671	27.5	700	29.4	729	31.4	759	33.4	783	35.1
26000	656	30.2	687	32.2	716	34.2	742	36.1	769	38.2	798	40.5
27000	665	32.7	693	34.6	723	36.8	751	38.9	778	41.0	802	43.1

TABLE 7 – 50 THROUGH 65 TON EXHAUST FAN DATA

CFM STD. AIR	TOTAL STATIC PRESSURE (inches of water column) 0.50		1.00		1.50		2.00		2.50		3.00	
	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP	RPM	HP
10000	674	3.30	801	4.18	––	–––	––	––	––	––	––	––
12000	713	4.84	823	5.82	929	6.87	––	––	––	––	––	––
14000	762	6.84	858	7.98	952	9.12	1043	10.32	1132	11.62	––	––
16000	819	9.36	904	10.73	988	12.04	1070	13.33	1150	14.69	1229	16.10
18000	879	12.42	957	14.04	1032	15.56	1107	17.02	1179	18.48	––	––
20000	943	16.18	1014	18.04	––	––	––	––	––	––	––	––

Fan Performance *(continued)*

TABLE 8 – COMPONENT STATIC PRESSURE DROPS (INCHES OF WATER COLUMN)

SIZE	AIR FLOW CFM STD. AIR	EVAPORATOR COILS		SUPPLY OPENING			RETURN AIR OPENING			FILTERS			
		WET	DRY	BOTTOM	LEFT	RIGHT	BOTTOM	REAR	SIDES	2" THROW-AWAY	2" CLEAN-ABLE	2" PLEAT-ED	2" CARBON
50	10000	0.22	0.15	0.04	0.08	0.08	0.04	0.06	0.04	0.05	0.01	0.04	0.08
	12000	0.30	0.21	0.06	0.11	0.11	0.06	0.09	0.06	0.07	0.02	0.06	0.11
	14000	0.38	0.27	0.09	0.15	0.15	0.08	0.12	0.09	0.09	0.03	0.07	0.14
	16000	0.47	0.35	0.11	0.20	0.20	0.11	0.15	0.11	0.11	0.04	0.09	0.16
	17500	0.54	0.41	0.14	0.24	0.24	0.13	0.18	0.14	0.12	0.05	0.10	0.19
	18000	0.57	0.44	0.14	0.25	0.25	0.13	0.19	0.14	0.13	0.05	0.10	0.19
	20000	0.67	0.53	0.18	0.31	0.31	0.17	0.24	0.18	0.15	0.06	0.12	0.22
	21000	0.72	0.58	0.20	0.35	0.35	0.18	0.26	0.20	0.16	0.07	0.13	0.24
	22000	0.78	0.63	0.21	0.38	0.38	0.20	0.29	0.21	0.17	0.08	0.14	0.26
	22500	0.80	0.66	0.22	0.40	0.40	0.21	0.30	0.22	0.17	0.08	0.15	0.26
55	12000	0.30	0.21	0.06	0.11	0.11	0.06	0.09	0.06	0.07	0.02	0.06	0.11
	14000	0.38	0.27	0.09	0.15	0.15	0.08	0.12	0.09	0.09	0.03	0.07	0.14
	16000	0.47	0.35	0.11	0.20	0.20	0.11	0.15	0.11	0.11	0.04	0.09	0.16
	18000	0.57	0.44	0.14	0.25	0.25	0.13	0.19	0.14	0.13	0.05	0.10	0.19
	19250	0.63	0.49	0.16	0.29	0.29	0.15	0.22	0.16	0.14	0.06	0.12	0.21
	20000	0.67	0.53	0.18	0.31	0.31	0.17	0.24	0.18	0.15	0.06	0.12	0.22
	22000	0.78	0.63	0.21	0.38	0.38	0.20	0.29	0.21	0.17	0.08	0.14	0.26
	24000	0.89	0.74	0.25	0.45	0.45	0.24	0.34	0.25	0.19	0.09	0.16	0.29
60	14000	0.38	0.27	0.09	0.15	0.15	0.08	0.12	0.09	0.09	0.03	0.07	0.14
	16000	0.47	0.35	0.11	0.20	0.20	0.11	0.15	0.11	0.11	0.04	0.09	0.16
	18000	0.57	0.44	0.14	0.25	0.25	0.13	0.19	0.14	0.13	0.05	0.10	0.19
	20000	0.67	0.53	0.18	0.31	0.31	0.17	0.24	0.18	0.15	0.06	0.12	0.22
	21000	0.72	0.58	0.20	0.35	0.35	0.18	0.26	0.20	0.16	0.07	0.13	0.24
	22000	0.78	0.63	0.21	0.38	0.38	0.20	0.29	0.21	0.17	0.08	0.14	0.26
	24000	0.89	0.74	0.25	0.45	0.45	0.24	0.34	0.25	0.19	0.09	0.16	0.29
	26000	1.01	0.86	0.30	0.53	0.53	0.28	0.40	0.30	0.21	0.11	0.19	0.32
	27000	1.07	0.92	0.32	0.57	0.57	0.30	0.43	0.32	0.23	0.12	0.20	0.34
65	14000	0.38	0.27	0.09	0.15	0.15	0.08	0.12	0.09	0.09	0.03	0.07	0.14
	16000	0.47	0.35	0.11	0.20	0.20	0.11	0.15	0.11	0.11	0.04	0.09	0.16
	18000	0.57	0.44	0.14	0.25	0.25	0.13	0.19	0.14	0.13	0.05	0.10	0.19
	20000	0.67	0.53	0.18	0.31	0.31	0.17	0.24	0.18	0.15	0.06	0.12	0.22
	21000	0.72	0.58	0.20	0.35	0.35	0.18	0.26	0.20	0.16	0.07	0.13	0.24
	22000	0.78	0.63	0.21	0.38	0.38	0.20	0.29	0.21	0.17	0.08	0.14	0.26
	24000	0.89	0.74	0.25	0.45	0.45	0.24	0.34	0.25	0.19	0.09	0.16	0.29
	26000	1.01	0.86	0.30	0.53	0.53	0.28	0.40	0.30	0.21	0.11	0.19	0.32
	27000	1.07	0.92	0.32	0.57	0.57	0.30	0.43	0.32	0.23	0.12	0.20	0.34

* For Aluminum Fins Only

FILTERS			ECONOMIZER FRESH AIR OPENINGS	ECONOMIZER DAMPERS		POWERED EXHAUST
RIGID FILTER RACK NO. MEDIA	12" RIGID 65%*	12" RIGID 95%*		MANUAL OR 2-POSITION	0 - 100% MODULATION	
0.05	0.21	0.30	0.07	0.05	0.11	0.08
0.07	0.28	0.38	0.11	0.08	0.16	0.11
0.09	0.34	0.46	0.15	0.11	0.21	0.15
0.11	0.42	0.55	0.20	0.14	0.26	0.20
0.12	0.47	0.62	0.24	0.17	0.31	0.24
0.13	0.49	0.65	0.25	0.18	0.32	0.25
0.15	0.58	0.74	0.31	0.22	0.39	0.31
0.16	0.62	0.79	0.35	0.24	0.42	0.34
0.17	0.66	0.84	0.38	0.27	0.46	0.37
0.17	0.68	0.87	0.40	0.28	0.48	0.39
0.07	0.28	0.38	0.11	0.08	0.16	0.11
0.09	0.34	0.46	0.15	0.11	0.21	0.15
0.11	0.42	0.55	0.20	0.14	0.26	0.20
0.13	0.49	0.65	0.25	0.18	0.32	0.25
0.14	0.54	0.71	0.29	0.20	0.36	0.29
0.15	0.58	0.74	0.31	0.22	0.39	0.31
0.17	0.66	0.84	0.38	0.27	0.46	0.37
0.19	0.75	0.95	0.46	0.32	0.54	0.45
0.09	0.34	0.46	0.15	0.11	0.21	0.15
0.11	0.42	0.55	0.20	0.14	0.26	0.20
0.13	0.49	0.65	0.25	0.18	0.32	0.25
0.15	0.58	0.74	0.31	0.22	0.39	0.31
0.16	0.62	0.79	0.35	0.24	0.42	0.34
0.17	0.66	0.84	0.38	0.27	0.46	0.37
0.19	0.75	0.95	0.46	0.32	0.54	0.45
0.21	0.84	1.06	0.55	0.37	0.62	0.52
0.23	0.89	1.11	0.59	0.40	0.67	0.56
0.09	0.34	0.46	0.15	0.11	0.21	0.15
0.11	0.42	0.55	0.20	0.14	0.26	0.20
0.13	0.49	0.65	0.25	0.18	0.32	0.25
0.15	0.58	0.74	0.31	0.22	0.39	0.31
0.16	0.62	0.79	0.35	0.24	0.42	0.34
0.17	0.66	0.84	0.38	0.27	0.46	0.37
0.19	0.75	0.95	0.46	0.32	0.54	0.45
0.21	0.84	1.06	0.55	0.37	0.62	0.52
0.23	0.89	1.11	0.59	0.40	0.67	0.56

Electrical Data

ELECTRICAL SERVICE SIZING

In order to use the electrical service required for the cooling only Eco[2] rooftop, use the appropriate calculations listed below from U.L. 1995. Based on the operating mode and configuration of the rooftop, the calculations will yield different MCA (minimum circuit ampacity), and MOP (maximum overcurrent protection).

Using the following load definitions and calculations, determine the correct electrical sizing for your unit. All concurrent load conditions must be considered in the calculations, and you must use the highest value for any combination of loads.

Load Definitions:

- **LOAD1** is the current of the largest motor – compressor or fan motor.
- **LOAD2** is the sum of the remaining motor currents that may run concurrently with LOAD1 (i.e., exhaust fan motor).
- **LOAD3** is the current of the electric heaters – zero for cooling only units.
- **LOAD4** is the sum of any remaining currents greater than or equal to 1.0 amp

Use the following calculations to determine MCA and MOP for units supplied with a single-point power connection:

MCA = (1.25 x LOAD1) + LOAD2 + LOAD4

MOP = (2.25 x LOAD1) + LOAD2 + LOAD4

If the MOP does not equal a standard current rating of an overcurrent protective device, then the marked maximum rating is to be the next lower standard rating. However, if the device selected for MOP is less than the MCA, then select the lowest standard maximum fuse size greater than or equal to the MCA.

TABLE 9 – COMPRESSORS

	COMPRESSOR		NOMINAL VOLTAGE							
MODEL	QUANTITY PER UNIT	MODEL	208V		230V		460V		575V	
			RLA*	LRA*	RLA*	LRA*	RLA*	LRA*	RLA*	LRA*
50	4	SZ160	54.0	265.0	48.8	265.0	24.2	135.0	19.4	120.0
55	4	SZ160	54.0	265.0	48.8	265.0	24.2	135.0	19.4	120.0
60	4	SZ185	62.3	380.0	56.3	380.0	27.9	175.0	22.3	140.0
65	4	SZ185	62.3	380.0	56.3	380.0	27.9	175.0	22.3	140.0

* Values shown are per compressor

TABLE 10 – SUPPLY AND EXHAUST FAN MOTOR (ODP OR TEFC)

High Efficiency

	NOMINAL VOLTAGE			
MOTOR	**208V**	**230V**	**460V**	**575V**
HP	**FLA**	**FLA**	**FLA**	**FLA**
5.0	14.0	13.4	6.7	5.3
7.5	22.2	21.6	10.8	8.2
10.0	28.5	28.4	14.2	11.4
15.0	44.8	39.0	19.5	16.0
20.0	61.0	50.0	25.0	20.0
25.0	74.0	60.0	30.0	24.2
30.0	87.0	76.0	38.0	30.3
40.0	113.0	95.6	47.8	38.0

Premium Efficiency

	NOMINAL VOLTAGE			
MOTOR	**208V**	**230V**	**460V**	**575V**
HP	**FLA**	**FLA**	**FLA**	**FLA**
5.0	14.9	13.6	6.8	5.5
7.5	22.5	20.0	10.0	7.9
10.0	29.2	25.8	12.9	10.3
15.0	41.5	36.0	18.0	14.5
20.0	55.0	48.0	24.0	19.3
25.0	71.0	61.0	30.5	24.5
30.0	85.5	74.0	37.0	30.0
40.0	109.0	96.0	48.0	38.0

TABLE 11 – CONDENSER FAN MOTORS / EACH

	NOMINAL VOLTAGE			
NOMINAL	**208V**	**230V**	**460V**	**575V**
TONS	**FLA**	**FLA**	**FLA**	**FLA**
50	7.5	6.8	3.4	2.7
55	7.5	6.8	3.4	2.7
60	7.5	6.8	3.4	2.7
65	7.5	6.8	3.4	2.7

TABLE 12 – CONTROLS AND CONVENIENCE OUTLET

	NOMINAL VOLTAGE			
DESCRIPTION	**208V**	**230V**	**460V**	**575V**
	AMPS	**AMPS**	**AMPS**	**AMPS**
Control Transformer	3.6	3.3	1.6	3.3
Convenience Outlet	9.6	8.7	4.3	3.5

CONTROL SEQUENCES FOR ALL UNITS

GENERAL

The control system for the YORK eco^2 Packaged Rooftop Unit is fully self-contained and based around an OptiLogic™ rooftop unit controller. To aid in unit setup, maintenance, and operation, the OptiLogic™ rooftop unit controller is equipped with a user interface that is based around a 4 line x 20 character backlit LCD display. The LCD displays plain language text in a menu-driven format to facilitate use. In addition to the display, the OptiLogic™ user interface is also equipped with an LED indicator light, which will warn of any abnormal operation of the equipment or communication failures.

For the maximum in system flexibility, the YORK ECO^2 Packaged Rooftop Unit can be operated by either a typical 7-wire thermostat (2 cool / 2 heat), a space temperature sensor, or stand-alone (VAV only). Note, a field wiring terminal block is provided to facilitate unit setup and installation.

In lieu of the hard-wired control options, the OptiLogic™ rooftop unit controller can be connected to and operated by a Building Automation System (BAS). If required, the OptiLogic™ rooftop unit controller can be equipped with an optional BACNet IP communication card, which allows communication, via Ethernet, to a BACNet IP based BAS.

UNOCCUPIED / OCCUPIED SWITCHING

Depending on application, the unit can be indexed between unoccupied and occupied modes of operation by one of three methods, hard-wired input, internal time clock, or BAS. A contact-closure input is provided for hard-wiring to an external indexing device such as a central time clock, thermostat with built in scheduling, or a manual switch. The unit controller is also equipped with a built in 7-day time clock which can be used, in lieu of the contact closure input, to switch the unit between Unoccupied and Occupied modes of operation. The internal time clock is fully configurable via the user interface and includes Holiday scheduling. In addition to the hard-wired input or the internal time clock, the unit can also be indexed between unoccupied and occupied modes of operation via a BAS command.

Note a unit operated from a space sensor can be equipped to temporarily override an unoccupied mode of operation. This Unoccupied Override feature is fully configurable via the OptiLogic™ user interface.

ECONOMIZER OPERATION

The unit can be equipped with one of three types of optional economizers, dry bulb, single enthalpy, or comparative enthalpy. When the unit controller determines that Outside Air is suitable for economizing, the unit controller will control the outside air damper(s) open to provide economizer cooling. If economizer cooling alone is insufficient for the cooling load, the unit controller shall stage up compressors, one at a time, to meet demand.

The control logic for the three types of economizers is as follows:

Dry Bulb Economizer

The dry bulb economizer is the default economizer control scheme. With the dry bulb economizer, the unit controller monitors the Outside Air temperature only and compares it to a reference temperature setting. Outside Air is deemed suitable for economizing when the Outside Air temperature is determined to be less than the reference temperature setting. This method of economizing is effective, but is prone to some changeover inefficiencies due to the fact that this method is based on sensible temperatures only and does not take Outside Air moisture content into consideration.

Single Enthalpy Economizer

With the optional single enthalpy economizer, the unit controller monitors the Outside Air enthalpy in addition to the Outside Air temperature and compares it to a reference enthalpy setting and a reference temperature setting. Outside Air is deemed suitable for economizing when the Outside Air enthalpy is determined to be less than the reference enthalpy setting and the Outside Air temperature is less than the reference temperature setting. This method of economizing allows the reference temperature setting to be set higher than the DB Economizer and is consequently a more efficient packaged rooftop economizer.

Comparative Enthalpy Economizer

With the optional comparative enthalpy economizer, the unit controller monitors and compares the Outside Air and Return Air enthalpies in addition to comparing the Outside Air temperature to the reference temperature setting. Outside Air is deemed suitable for economizing when the Outside Air enthalpy is determined to be less than the Return Air enthalpy and the Outside Air temperature is less than the reference temperature setting. This method of economizing is the most accurate and provides the highest degree of energy efficiency for a packaged rooftop economizer.

VENTILATION CONTROL SEQUENCES

Minimum OA Damper Position (CV Units)

When the unit goes into the Occupied mode of operation, the unit controller shall open the Outside Air Damper to a fixed minimum position. The damper shall remain at this position as long as the unit is in the occupied mode. The minimum position may be overridden more open by the unit controller when Outside Air conditions are suitable for economizing.

Minimum OA Damper Position (VAV Units)

With Variable Air Volume units, there are two Minimum OA Damper Positions, one when the unit is at full speed and the second when the unit is at approximately half speed. These two points allow the control to linearly reset the position of the OA damper in response to fan speed.

When the unit goes into the Occupied mode of operation, the unit controller shall monitor the speed of the supply fan and open the Outside Air damper to a calculated minimum position based on the fan speed. This minimum position shall vary as the speed of the fan changes. The damper shall remain at this calculated position as long as the unit is in the occupied mode. The minimum position may be overridden more open by the unit controller when Outside Air conditions are suitable for economizing.

Air Measurement Stations

When the unit is equipped with an air measurement station, the unit controller shall control the Outside Air damper to a measured flow rate through the Air Measurement Station.

When the unit goes into the Occupied mode of operation, the unit controller shall control the Outside Air damper to maintain the Minimum AirFlow Setpoint through the Air Measurement Station. The unit controller shall control the Outside Air damper to this flow rate as long as the unit is in the Occupied mode. The Outside Air damper may be overridden more open by the unit controller when Outside Air conditions are suitable for economizing.

Demand Ventilation

If an optional CO2 sensor is connected to the unit, the unit controller can reset the minimum OA damper position(s) or minimum flow rate based on demand.

The unit controller shall monitor the CO2 level within the building. If the CO2 level rises above the CO2 setpoint, the controller will temporarily increase the Minimum OA Damper Position or Minimum OA flow rate to increase ventilation. If the CO2 level drops below the CO2 setpoint, the controller will decrease the Minimum OA Damper Position or Minimum OA flow rate to decrease ventilation.

Demand Ventilation shall remain active as long as the unit is in the Occupied mode of operation.

EXHAUST CONTROL SEQUENCES

Barometric

The optional barometric exhaust system consists of a lightweight barometric relief damper installed on the end of the unit in the Return Air section. As more outside air is introduced into the controlled zone due to Economizer and Ventilation control sequences, the pressure inside the building rises. This increase in building pressure forces the barometric relief damper open to allow exhaust air to escape. Because this type of exhaust system is not powered, it is limited to small amounts of exhaust.

Powered Fixed Volume Exhaust Based on Outside Air Damper Position

This optional fixed volume powered exhaust system consists of a fixed speed fan that is controlled ON and OFF based on the position of the Outside Air Damper. During operation, when the Outside Air Damper opens to a selected turn-on point, the Exhaust Fan is cycled ON. The fan remains on as long as the Outside Air damper is above a selected turn-off point. If the Outside Air Damper closes to the selected turn-off point, the Exhaust Fan is cycled OFF. The turn-on and turn-off points are user selectable from the OptiLogic™ User Interface panel.

Powered Fixed Volume Exhaust Based on Building Pressure

This optional fixed volume powered exhaust system consists of a fixed speed fan that is controlled ON and OFF based on the pressure inside the building. During operation, the pressure within the building in monitored by the OptiLogic™ controller. If the pressure rises to or above a selected turn-on pressure, the Exhaust Fan is cycled ON. The fan shall remain on as long as the pressure within the building remains above a selected turn-off pressure. If the building pressure falls to or below the selected turn-off pressure, the Exhaust Fan is cycled OFF. The turn-on and turn-off pressure setpoints are user selectable from the OptiLogic™ User Interface.

Powered Variable Volume Exhaust-Discharge Damper Controlled

This optional variable volume powered exhaust system consists of a fixed speed fan configured with a proportionally controlled discharge damper. The OptiLogic™ controller monitors the pressure inside the building and controls the Exhaust Damper and the Exhaust Fan. If the Building Pressure rises, the Exhaust Damper is proportionally controlled open and the Exhaust Fan is controlled ON. If the Building Pressure falls, the Exhaust Damper is proportionally controlled closed and the Exhaust Fan is controlled OFF. The position of the Exhaust Damper in which the Exhaust Fan is controlled ON and OFF as well as the Building Pressure setpoint is user selectable from the OptiLogic™ User Interface.

Powered Variable Volume Exhaust-VFD Controlled

This optional variable volume powered exhaust system consist of an Exhaust Fan driven by a Variable Frequency Drive (VFD), which is controlled by the OptiLogic™ controller. The OptiLogic™ controller monitors the pressure within the building. As the pressure rises, the VFD is controlled to increase Exhaust Fan speed. As the pressure falls, the VFD is controlled to decrease Exhaust Fan speed. The Building Pressure Setpoint is user selectable from the OptiLogic™ User Interface.

LOW AMBIENT OPERATION

The OptiLogic™ controller continuously monitors the outside air temperature to determine if mechanical cooling should be allowed. As a safety, if the Outside Air temperature falls to or below the Low Ambient Lockout temperature, mechanical cooling is prevented from operating. For units with economizers, the Low Ambient Lockout temperature is typically low enough that mechanical cooling will rarely be required. However, for some applications mechanical cooling is required when the Outside Air temperature is lower than the Low Ambient Lockout temperature. For these applications, the unit can be equipped with optional Low Ambient controls. For optional Low Ambient operation, the OptiLogic™ controller monitors the refrigeration system discharge pressure and controls the speed of the condenser fans. If the discharge pressure falls, the speeds of the condenser fans are reduced to maintain acceptable condensing pressures in the refrigeration system. With the optional Low Ambient controls, mechanical cooling is allowed down to Outside Air temperatures of 0°F.

SMOKE PURGE SEQUENCES

General

As a convenience, for when buildings catch fire or the building is inundated with smoke or fumes from manufacturing processes, etc., the OptiLogic™ control system provides one of five ventilation override control sequences for building purge. The five selectable purge sequences are, Shutdown, Pressurization, Exhaust, Purge and Purge with duct pressure control. Note, when any of the purge sequences are activated, cooling and heating modes are disabled. A contact closure is provided which indexes the OptiLogic™ controller into the selected purge sequence.

Shutdown

When this purge sequence is selected and activated, the supply and exhaust fans are controlled OFF and the Outside Air damper is overridden closed. This idle state is maintained until the purge input is deactivated and the unit returns to normal operation.

Pressurization

When this purge sequence is selected and activated, the exhaust fan is controlled OFF and the Supply Fan is controlled ON. The Outside Air damper is opened full and the Return Air Damper is closed full. If the unit is a VAV unit, the VAV boxes are also driven full open to prevent duct over-pressurization. This mode is maintained until the smoke purge input is deactivated and the unit returns to normal operation.

Exhaust

When this purge sequence is selected and activated, the Supply Fan is controlled OFF and the Exhaust Fan is controlled ON (Exhaust Damper driven full open). This mode is maintained until the smoke purge input is deactivated and the unit returns to normal operation.

Purge

When this purge sequence is selected and activated, the Supply Fan is controlled ON and the Exhaust Fan is controlled ON. The Outside Air damper is opened full and the Return Air damper is closed full. If the unit is a VAV unit, the VAV boxes are also driven full open to prevent duct over-pressurization. This mode is maintained until the smoke purge input is deactivated and the unit returns to normal operation.

Purge With Duct Pressure Control (VAV Only)

When this purge sequence is selected and activated, the Supply Fan is cycled ON and controlled to maintain the duct static pressure setpoint. The Exhaust Fan is also controlled ON (Exhaust Damper driven full open) and the Outside Air Damper is driven full open. This mode is maintained until the smoke purge input is deactivated and the unit returns to normal operation.

VAV SPECIFIC SEQUENCES

Supply fan operation

For VAV units, the supply fan is controlled ON and OFF based on the occupancy state or the G input from a Thermostat (Unit must be configured for Thermostat operation to respond to the G input). When the unit goes into the Occupied mode of operation (or "G" is called) the Supply Fan will be controlled ON. The OptiLogic™ controller will monitor the static pressure within the supply duct system and control the speed of the supply fan to maintain a specified Duct Static Pressure setpoint. A Variable Frequency Drive (VFD) is used on all VAV units to vary the speed of the supply fan. Note, the use of a VFD in lieu of inlet guide vanes provides for higher energy efficiency for the unit by eliminating the losses (air pressure drop) typical of inlet guide vane systems.

COOLING OPERATION

Thermostat Control

When a VAV unit is configured for thermostat operation, the OptiLogic™ controller will command the Supply Fan to start when the unit goes into the Occupied mode or a thermostat "G" signal is received by the control. With no thermostat calls for cooling, the unit shall remain idle with the Supply Fan operating as required.

When a Cooling Stage 1 call ("Y1") is received, and the unit is equipped with an economizer, the OptiLogic™ controller will check the Outside Air conditions to determine if conditions are suitable for economizing and modulate the outside air damper and or stage up compressors as required to maintain the VAV High Supply Air Temperature Setpoint. This setpoint is user selectable at the OptiLogic™ User Interface. The OptiLogic™ controller will control to this setpoint as long as Cooling Stage 1 ("Y1") remains active.

When a Cooling Stage 2 call ("Y2") is received, and the unit is equipped with an economizer, the OptiLogic™ controller will check the Outside Air conditions to determine if conditions are suitable for economizing and modulate the outside air damper and or stage up compressors as required to maintain the VAV Low Supply Air Temperature Setpoint. This setpoint is user selectable at the OptiLogic™ User Interface. The OptiLogic™ controller will control to this setpoint as long as Cooling Stage 2 ("Y2") remains active.

The VAV High SAT Setpoint is always greater than the VAV Low SAT Setpoint and because of this essentially makes this control sequence a Supply Air Temperature Reset algorithm based on Zone Temperature.

Zone Sensor Control

When a VAV unit is configured for Zone Sensor operation, the OptiLogic™ controller will monitor a reference Zone Temperature and command the Supply Fan to start when the unit goes into the Occupied mode.

If the zone temperature is above the VAV Setpoint for SAT Reset, the OptiLogic™ controller will modulate the outside air damper (Economizer available and conditions suitable) and/or stage compressors up and down, as required, to maintain the VAV High Supply Air Temperature Setpoint.

If the zone temperature is below or falls below the VAV Setpoint for SAT Reset, the OptiLogic™ controller will modulate the Outside Air Damper (Economizer available and conditions suitable) and/or stage compressors up and down, as required, to maintain the VAV Low Supply Air Temperature Setpoint.

As with thermostat operation, this sequence is also a Supply Air Temperature Reset algorithm based on Zone Temperature.

Stand Alone Control

If the unit is not configured for Thermostat or Zone Sensor operation, the unit will operate in Stand Alone Mode.

In Stand Alone Mode, the OptiLogic™ Controller will monitor only the Occupied/Unoccupied state. When the unit is commanded into the Occupied Mode of operation, the OptiLogic™ Controller will start the Supply Fan. If the unit is equipped with an Economizer, the Controller will check to see if Outside Air conditions are suitable for Economizing. The controller will then use Outside Air (when available and suitable) and/or stage compressors up and down, as required, to maintain the VAV Low SAT Setpoint.

CV SPECIFIC SEQUENCES

Cooling Operation

Thermostat Control

If a 7-wire thermostat (2 Cool/2Heat) controls the unit, all zone temperature setpoint control is maintained at the thermostat. With this operation, the unit remains idle until it receives a stage call from the Thermostat. If “G” is called from the thermostat, the Supply Fan will start and all occupied functions (if equipped), i.e. ventilation, economizer, etc. will be allowed to operate.

Stage 1 (“Y1”) Call

If Y1 is called and the unit is equipped with an economizer, the control will check to see if the Outside Air is suitable for economizing. If conditions are suitable for economizing, the control will control the economizer and stage up compressors, as required, to maintain a high SAT setpoint. If conditions are not suitable for economizing or not equipped with an economizer, the control will stage up 50% of the compressors. This shall be maintained until Stage 1 is deactivated or Stage 2 is called.

Stage 2 (“Y2”) Call

If Y2 is called and the unit is equipped with an economizer, the control will check to see if the Outside Air is suitable for economizing. If conditions are suitable for economizing, the control will control the economizer and stage up compressors, as required, to maintain a LOW SAT setpoint. If conditions are not suitable for economizing or not equipped with an economizer, the control will stage up 100% of the compressors. This shall be maintained until Stage 2 is deactivated.

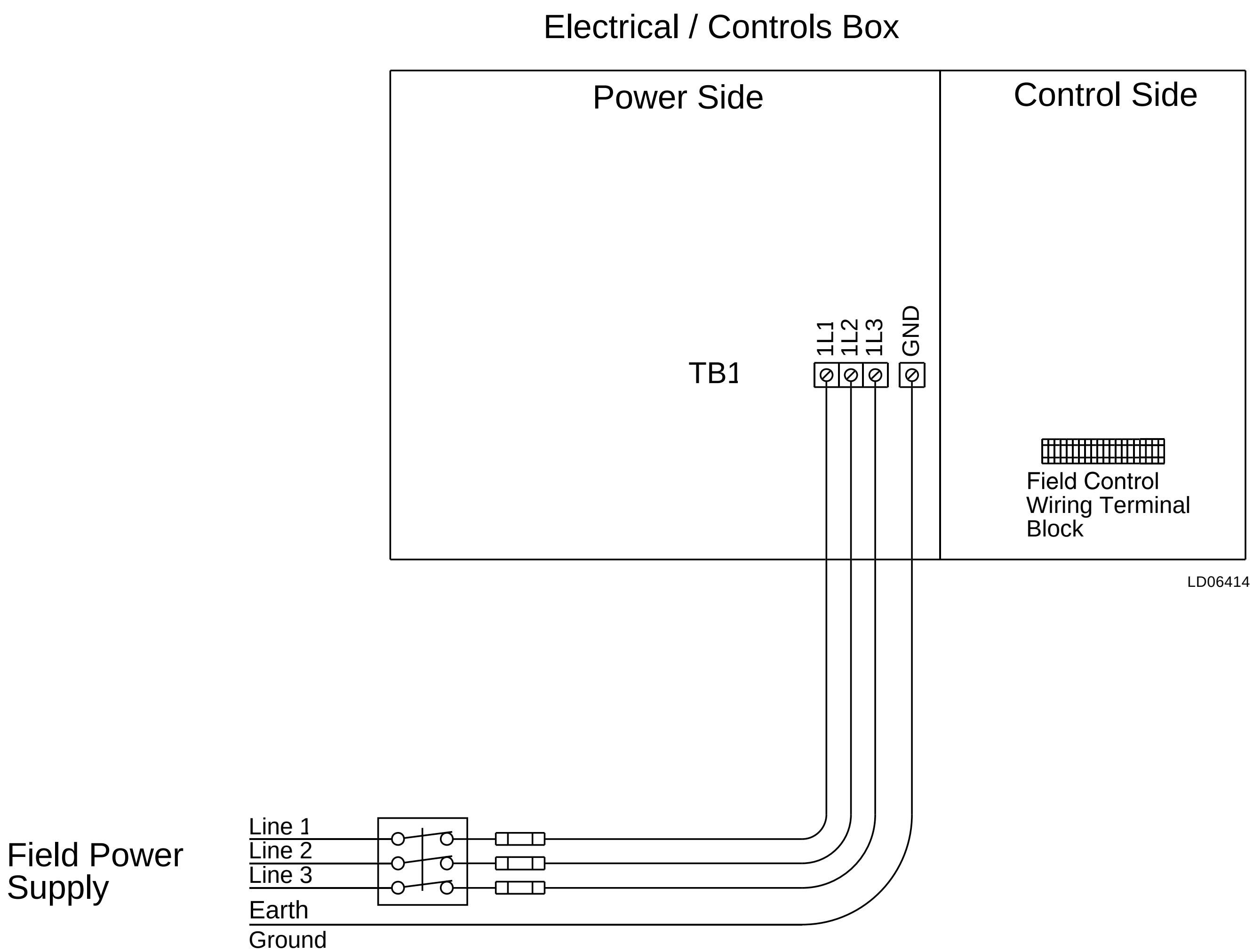
Zone Sensor Control

If a zone sensor controls the unit, the OptiLogic™ controller shall maintain all zone temperature setpoints. These setpoints are user selectable at the OptiLogic™ User Interface.

When a zone sensor is used for control, the OptiLogic™ unit controller will monitor the temperature within the space and control the unit accordingly. A closed-loop staging algorithm is used to stage compressors up and down as required to maintain the desired zone temperature setpoint. If the unit is equipped with an economizer, Outside Air conditions are continuously monitored by the control to determine if conditions are suitable for economizing. If conditions are suitable for economizing, the OptiLogic™ controller will modulate the Outside Air damper in addition to staging compressors up and down to maintain the zone temperature setpoint.

Power Wiring

SINGLE-POINT POWER SUPPLY WIRING

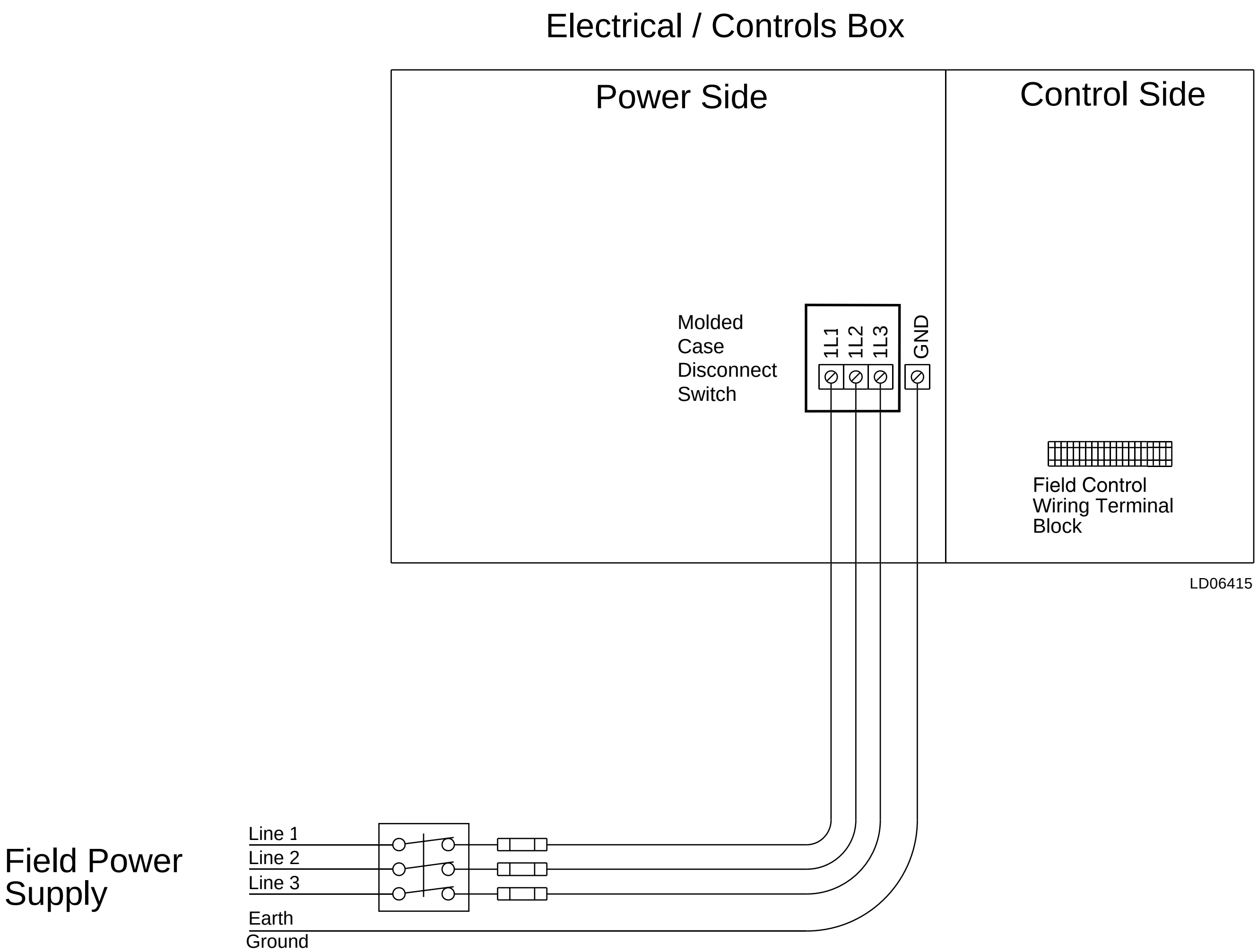


NOTES:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and/or local code requirements.
3. Minimum Circuit Ampacity (MCA) is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440.34).
4. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440.22)
5. Use copper conductors only.
6. On units with an optional disconnect switch, the supplied disconnect switch is a "Disconnecting Means" as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a Load Break Device.

FIG. 2 – SINGLE-POINT POWER SUPPLY WIRING

SINGLE-POINT POWER SUPPLY WIRING WITH NON-FUSED DISCONNECT

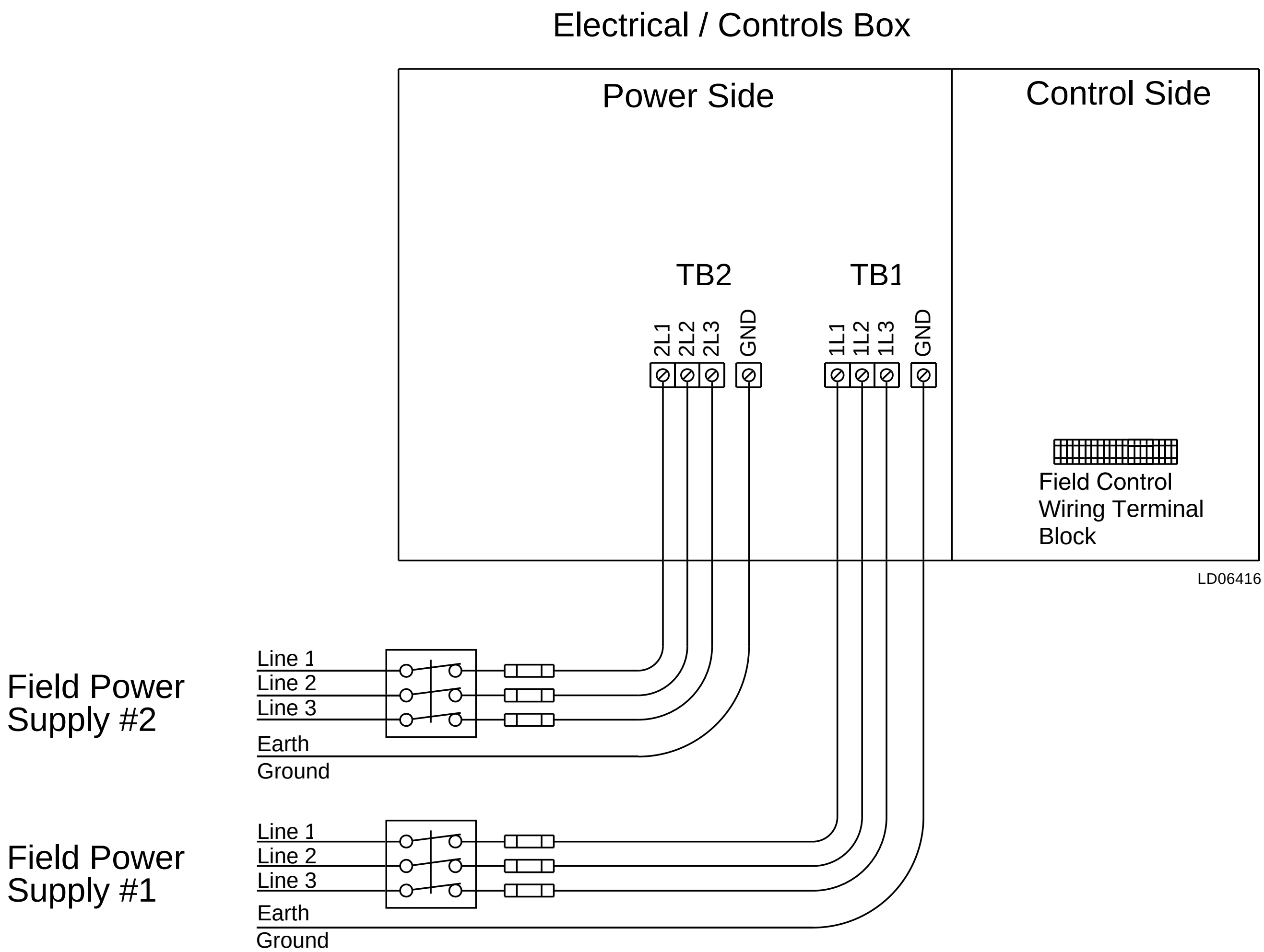


NOTES:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and/or local code requirements.
3. Minimum Circuit Ampacity (MCA) is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440.34).
4. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440.22)
5. Use copper conductors only.
6. On units with an optional disconnect switch, the supplied disconnect switch is a “Disconnecting Means” as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a Load Break Device.

FIG. 3 – SINGLE-POINT POWER SUPPLY WIRING WITH NON-FUSED DISCONNECT

DUAL-POINT POWER SUPPLY WIRING



NOTES:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and/or local code requirements.
3. Minimum Circuit Ampacity (MCA) is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440.34).
4. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440.22)
5. Use copper conductors only.
6. On units with an optional disconnect switch, the supplied disconnect switch is a “Disconnecting Means” as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a Load Break Device.

FIG. 4 – DUAL-POINT POWER SUPPLY WIRING

Field Control Wiring

Wiring Notes:

1. Wiring shown indicates typical wiring.
2. All wiring is Class 2, low voltage.
3. Maximum power available from the 24 VAC terminal is 40 VA.
4. Use shielded wire where shown.

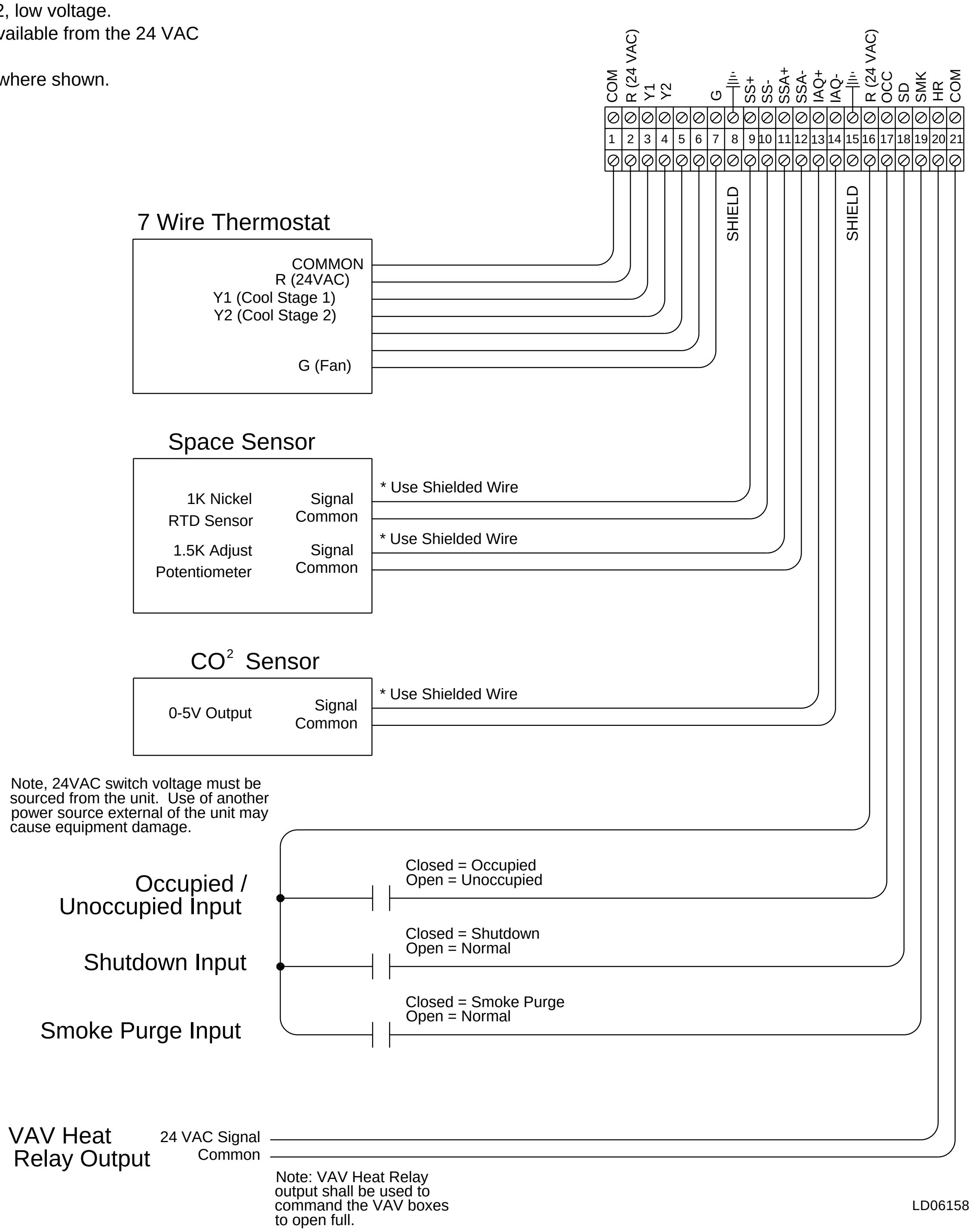
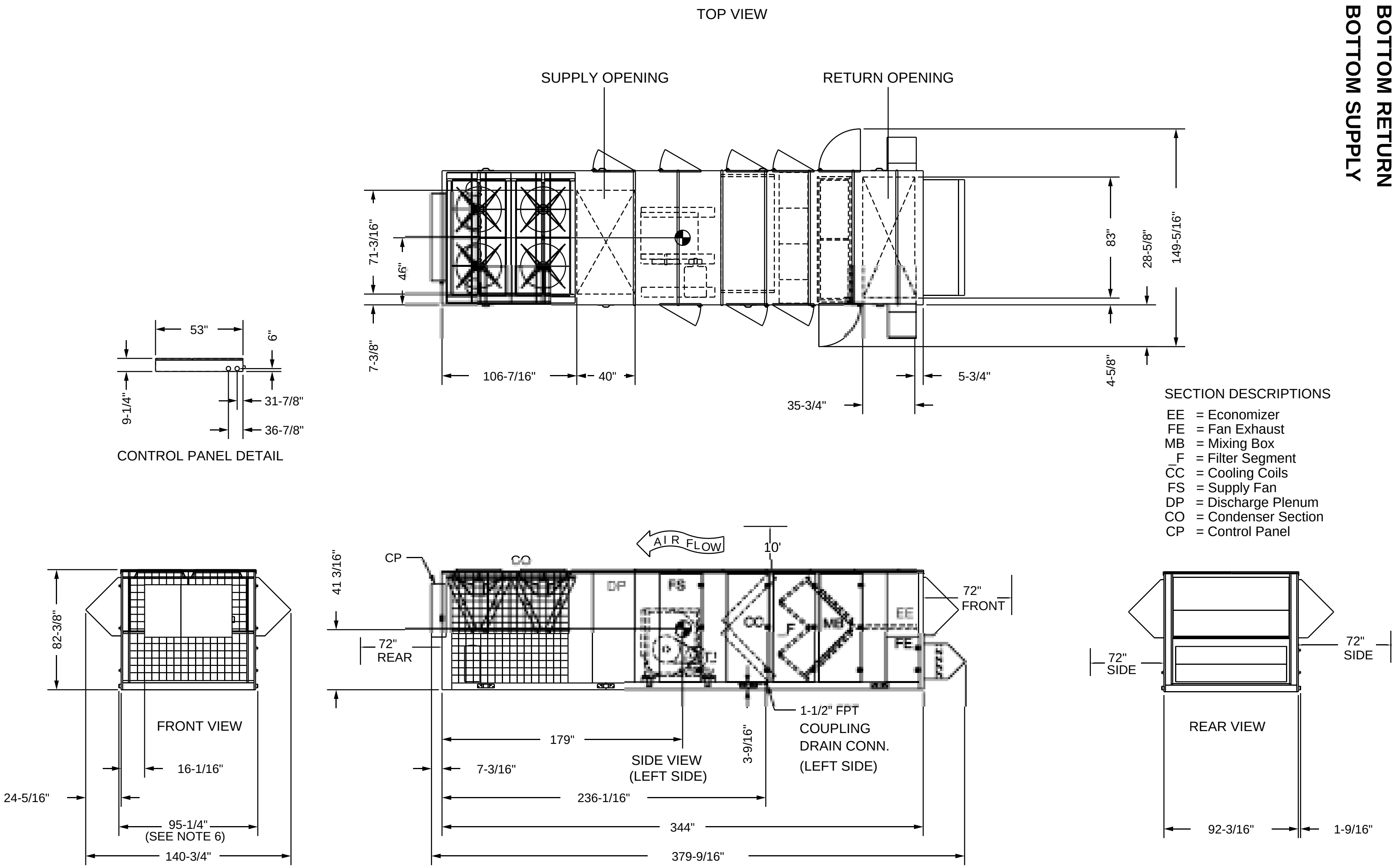


FIG. 5 – FIELD CONTROL WIRING

General Arrangement Drawing

BOTTOM RETURN
BOTTOM SUPPLY



NOTES:
1. 10' CLEARANCE MINIMAL OVER THE TOP OF THE CONDENSING UNIT.
2. ONLY ONE ADJACENT WALL CAN EXCEED UNIT HEIGHT.
3. 12' CLEARANCE REQUIRED TO ADJACENT UNITS.
4. 8' SERVICE ACCESS RECOMMENDED ON ONE SIDE.
5. ECONOMIZER AND EXHAUST HOODS, WHERE APPLICABLE, ARE FOLDED INSIDE UNIT FOR SHIPMENT.
6. DIM. IS TO OUTSIDE OF LIFTING LUGS

LD06417

FIG. 6 – GENERAL ARRANGEMENT DRAWING

REAR RETURN
LEFT OR RIGHT SUPPLY

NOTES:
1. 10' CLEARANCE MINIMAL OVER THE TOP OF THE CONDENSING UNIT.
2. ONLY ONE ADJACENT WALL CAN EXCEED UNIT HEIGHT.
3. 12' CLEARANCE REQUIRED TO ADJACENT UNITS.
4. 8' SERVICE ACCESS RECOMMENDED ON ONE SIDE.
5. ECONOMIZER AND EXHAUST HOODS, WHERE APPLICABLE, ARE FOLDED INSIDE UNIT FOR SHIPMENT.

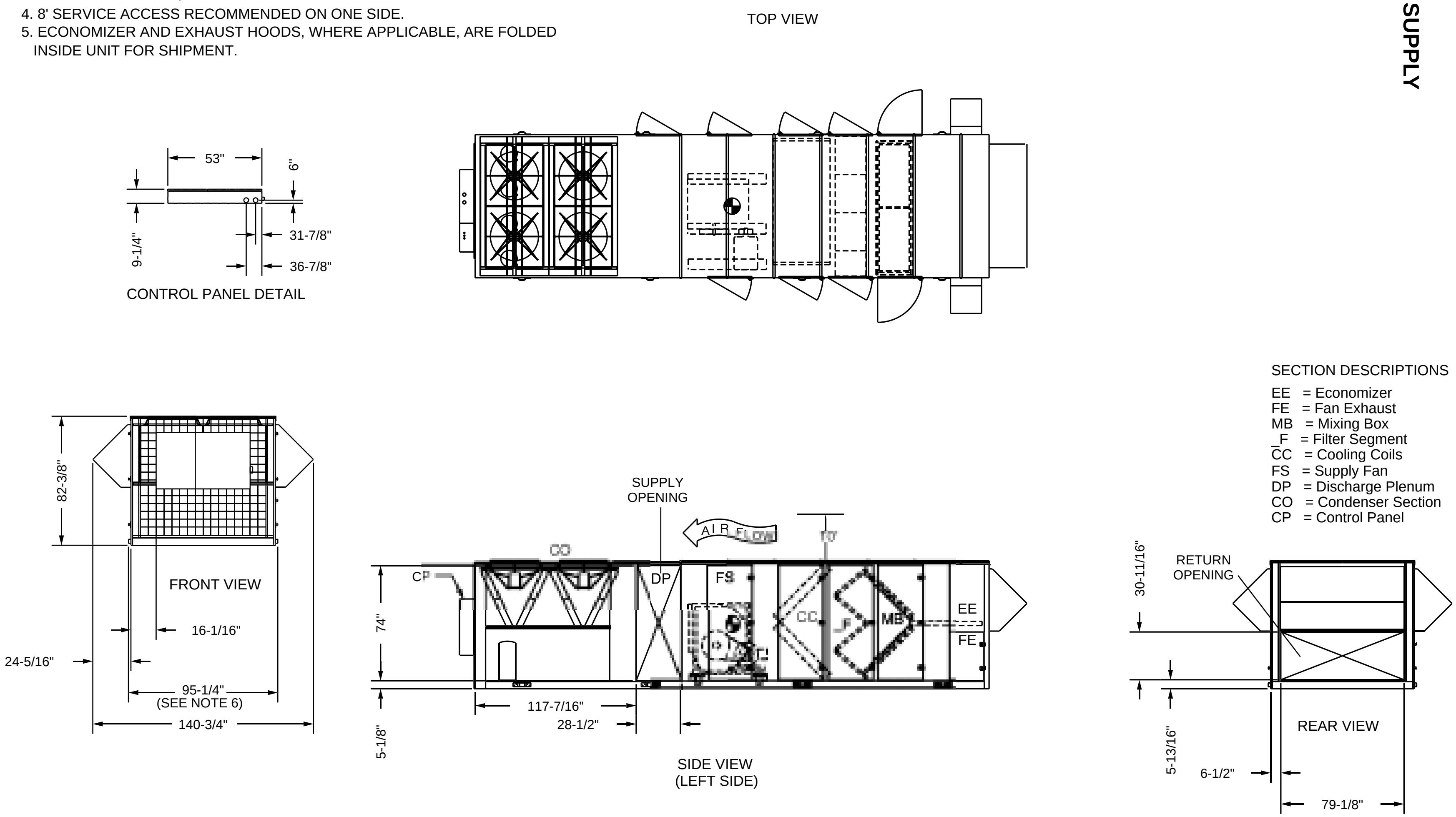


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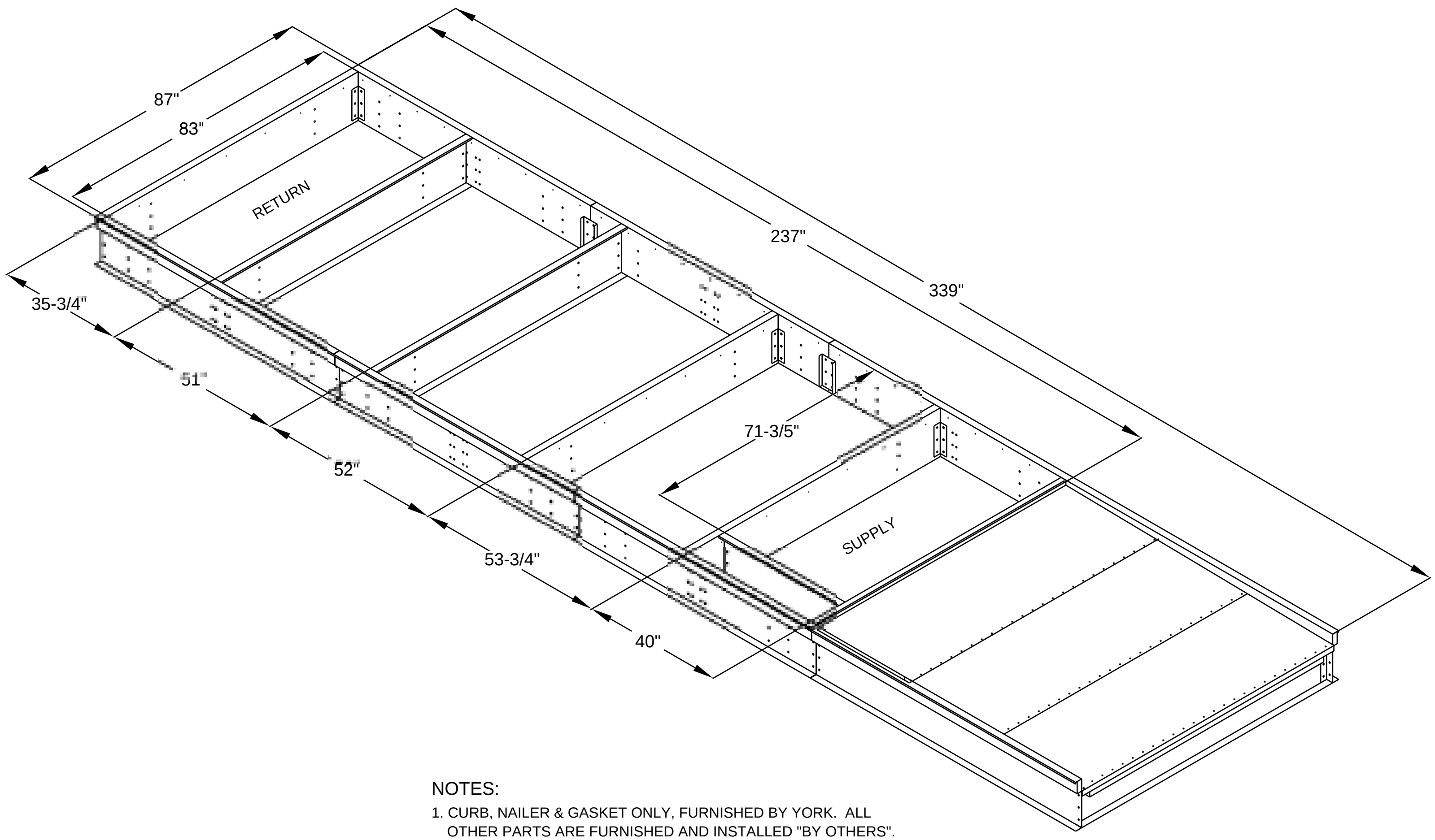
FIG. 7 – GENERAL ARRANGEMENT DRAWING

Curb Layout Drawing



NOTES:

1. CURB, NAILER & GASKET ONLY, FURNISHED BY YORK. ALL OTHER PARTS ARE FURNISHED AND INSTALLED "BY OTHERS".
2. ROOF CURB SHIPPED IN PIECES FOR FIELD ASSEMBLY.
3. ROOF CURB MUST BE INSTALLED SQUARE AND LEVEL.
4. CURB MATERIAL IS 14 GAUGE GALVANIZED, NOT PAINTED.
5. CURB INSULATED WITH 1.5"-3# INSULATION.

LD06419

FIG. 8 – CURB LAYOUT DRAWING

Guide Specifications

GENERAL

Units shall be designed for outdoor rooftop installation on a roof curb. Units shall be rated according to ARI 360. Units shall be shipped in a single package, fully charged with HFC-407C refrigerant. The manufacturing facility shall be registered under ISO 9001 Quality Standards for Manufacturing. All units shall be completely factory assembled and run tested.

Units shall be ETL listed and be tested according to UL 1995. Tags and decals to aid in the service or indicate caution areas shall be provided. Installation, operation and maintenance manuals shall be supplied with each unit.

Units shall be capable of providing mechanical cooling down to 45° F (0°F with a low ambient kit). Unit shall be capable of starting and running at 120° F. Unit electric and gas connections shall be either through the curb or the side of the unit.

CONSTRUCTION

Base

The base rail shall be constructed of 12 gauge galvanized steel, extending the full perimeter of the unit. All components shall be supported from the base, and the base shall include integral lifting lugs. The unit base rail shall overhang the roof curb for water runoff and shall have a fabricated recess with a continuous flat surface to seat on the roof curb gasket, providing a positive, weather tight seal between the unit and the curb.

Casing

The unit cabinet shall be double wall construction to provide both maximum resistance to bacterial growth in the air stream and superior structural integrity. All sheet metal shall be G90 mill galvanized sheet metal, formed and reinforced to provide a rigid assembly. Cabinet shall be coated with baked on powder paint which, when subject to ASTM B117, 500 hour, 5% salt spray test, yields minimum ASTM 1654 rating of “6”. The unit shall be insulated with 1-1/2,” 1 pound fiberglass insulation between the two sheet metal skins. Insulation shall meet NFPA-90A regulations for smoke and flame spread ratings. Single-wall units, or foil-faced insulation in the air stream shall be not acceptable.

The cabinet corner post and the intermediate side supports shall be a minimum of 16-gauge steel. All access doors shall be a minimum of 18 gauge on the exterior surfaces, and 20 gauge on the interior. Interior floor panels shall be 18 gauge.

All serviceable sections shall have hinged access doors with latches on both sides of the unit. All access doors shall be constructed of 20-gauge steel on the outside, with 24 gauge on the inside. Each door shall seal against PVC gaskets to prevent air and water leakage.

The roof shall be double wall, with 18 gauge on the external surface and 24 gauge on the interior. The roof shall be formed with a 45 degree “drip lip” overhanging the side walls to prevent precipitation drainage from streaming down the side of the unit. Roof sections shall be connected together via integral channels fastened with screws and sealed with gasketing. Each fastened seam shall be further protected by a sheet metal channel covering the full length of the gasket surface, making a completely water tight seal.

SUPPLY AIR SYSTEM

Supply Air Fan

Fans shall be centrifugal type, statically and dynamically balanced in the factory. Fan wheels shall be designed for continuous operation at the maximum rate of fan speed and motor HP. Fans shall be double-width, double-inlet with forward curved blades.

The fan and motor assembly shall be mounted on a common base to allow consistent belt tension with no relative motion between the fan and motor shafts. The entire assembly shall be isolated from the unit base with 1" deflection springs. The fan discharge shall be connected to the cabinet through a reinforced neoprene flexible connection to eliminate vibration transmission from the fan to the unit casing.

BEARINGS AND DRIVES

Bearings shall be self-aligning pillow-block re-greasable ball bearings with an average life expectancy L10 of 40,000 hours. Grease fittings shall be accessible through access doors.

Fan motors shall be NEMA designed, Standard efficiency ball bearing type with electrical characteristics and horsepower as specified. Motors shall be 1750 RPM, open drip proof type. The motor shall be located within the unit on an adjustable, heavy steel base.

All fan motor drives shall be selected for a minimum service factor of 1.2 and have fixed pitched sheaves.

AIR FILTERING SYSTEM

All filter holding frames shall be of heavy-duty construction designed for industrial applications. All filters shall be either side accessible via access doors on both sides of the filter section.

All filter media shall be Class II listed under UL Standard 900. Filter efficiencies shall be rated in accordance with ASHRAE Standard 52-76

Two-inch throwaway filters in an angled filter rack shall be standard. On units with rigid filters, two-inch prefilters shall be installed upstream of the rigid filters.

AIR INLET SYSTEM

General

A factory installed outside air rain hood permanently attached to the cabinet to prevent windblown precipitation from entering the unit shall cover inlet openings. The rain hoods on the sides of the unit shall be rotated into the cabinet and secured for shipment so that upon installation they need only be rotated upwards and screwed into place. The outside air hood shall contain a removable and cleanable filter.

All damper assemblies shall be of low leak design. Damper blades shall be fabricated from a minimum of 16 gauge galvanized steel.

REFRIGERATION SYSTEM

Units shall have four compressors for maximum load-matching capability. Each refrigerant circuit shall be controlled with a thermal expansion valve for maximum control at low load conditions.

Evaporator Coils

Evaporator coils shall be direct expansion. Coil tubes shall be 3/8” OD copper, with internally enhanced tubes. Fins shall be enhanced aluminum mechanically expanded to bond with the copper tubes. Coil casing shall be fabricated from heavy gauge galvanized steel.

A stainless steel double-sloped drain pan shall be provided under the entire width of the evaporator coil, including all return bends. The main drain pan shall be sloped a total of 1/4” per foot towards the drainage point according to ASHRAE 62 guidelines. Main drain pan shall be accessible and cleanable in the field. The condensate drain opening shall be flush with the bottom of the drain pan to allow complete drainage. Coils in excess of 48” high shall have an intermediate drain pan, extending the entire width of the coil to provide better water drainage.

Compressors

Compressors shall be hermetic, scroll-type, including tip seals to provide efficient axial sealing while preventing scroll tip to base contact, controlled orbit design for radial sealing to incorporate minimum flank-to-flank contact for long service life, refrigerant cooled motors, large suction side free volume and oil sump to provide liquid handling capability, annular discharge check valve and reverse vent assembly to provide low pressure drop, silent shutdown and reverse rotation protection, initial oil charge, oil level sight glass, vibration isolator mounts for compressors, and brazed-type connections for fully hermetic refrigerant circuits.

Condenser Coils

Condenser coils shall have 3/8” seamless copper tubes, arranged in staggered rows, mechanically expanded into aluminum fins. Coils shall be protected from hail damage with a “V” configuration, with individual flat coils rotated from the vertical plane for each condensing circuit.

Condenser Fans and Motors

Condenser fans shall be direct drive, propeller type, discharging vertically. Condenser fan motors shall be 3-phase, totally enclosed air over (TEAO). Thermal overload protection shall be provided for each condenser fan motor.

Refrigerant Piping

All interconnecting piping between refrigeration components shall be copper tubing with brazed joints.

Each refrigerant circuit shall be equipped with liquid line filter drier, and moisture indicating sight glass. Each circuit shall also have both high and low pressure switches installed on either side of the compressor and include access fittings for replacement of the pressure switches without removing charge.

Polyurethane sleeves shall protect all small diameter distributor tubing to the evaporator coil to prevent the tubes from copper-to-copper contact during shipment or operation.

POWER SUPPLY

Unit power supply shall be 460V 3-phase 60Hz (208, 230 and 575V optional) single-point power connections with terminal block connections.

CONTROLS

A factory-mounted unit controller with a 4x20 character alphanumeric display and user keypad shall be included as standard. The controller and keypad shall be housed inside the low-voltage compartment of the control/power panel. On units with supply or exhaust VFDs, the VFD keypads shall be located inside the same panel as the unit controller and interface keypad. Control operating data, setpoints, unit setup, configuration, service and history shall all be accessible via a single key. A system alarm LED shall indicate failures to the operator with more detail provide in the menu screens. The user interface shall function with a simple menu-driven display for easy access to unit data with integral time clock for weekly and holiday scheduling. The unit keypad shall include password protection to prevent unauthorized access and tampering with unit setpoints and configuration.

A single terminal strip shall be provided for all thermostat and customer hard-wired field connections.

Unit controls shall be completely factory packaged and compatible with a room thermostat. Constant volume units shall operate with a two (2) cool/two (2) heat thermostat. Staging decisions shall be based upon the deviation of space temperature from set point and the rate of change of the space temperature.

VAV units shall operate with a sensor in the supply air stream for cooling operation. Staging decisions shall be based upon the deviation of supply air temperature from set point and the rate of change of the supply air temperature.

Controllers shall have the following safeties (both VAV and CV):

- High and low pressure cut-outs (one each refrigerant circuit)
- Minimum on time for compressors
- Delay between compressor stages
- Anti-short cycle delays (minimum off time) for compressors and supply fan
- Cooling lockout at 40° F; 0° F if equipped for low ambient operation
- Air flow proving switch requiring proper air flow for cooling operation

ACCESSORIES AND OPTIONS

Full perimeter and partial perimeter roof curbs - 14” high roof curb with wood nailer. Roof curb covers the entire perimeter of the unit (full curb) or that portion of the unit that has airflow (partial curb).

Supply Fan VFD Manual Bypass – provides full airflow in the event of a VFD failure.

Power Supply Connections – single-point power with manual disconnect, and dual-point power wiring options are available for various applications.

Supply air setpoint reset by outside air or space air temperature - Allows VAV supply air setpoint to float upward (saving energy) if the outdoor air temperature or the space temperature is sufficiently low.

Supply Fan Isolation – the entire supply fan assembly shall be isolated from the unit base with 2" deflection springs.

Supply and Exhaust Fan Motors – high efficiency ODP, and standard and high efficiency TEFC motors are available all meeting the Energy Policy Act of 1992 (EPACT).

Low Ambient Operation – a low ambient kit is available to control compressor head pressure via VFD condenser fan speed control. Head pressure control is accomplished by monitoring head pressure with suction and discharge line pressure transducers rather than less accurate temperature control.

ECONOMIZERS

Manual Damper Economizer – economizer is available with a manual damper adjustable between 0-25 percent.

Two-Position Damper Economizer – economizer is available with a two-position damper with the open position adjustable between 0-25 percent. The operation of the two-position economizer shall be based on occupancy; occupied is open, unoccupied is closed.

Modulating Damper Economizer – economizer is available with a modulating damper arrangements. Modulating damper economizers shall have outdoor air and return air dampers that are interlocked and positioned by fully modulating, solid state damper actuators. The actuators shall be spring loaded so that the outside air damper will close when power to the unit is interrupted. The operation of the modulating economizer shall be fully integrated into the cooling control system. The modulating economizer control shall be via a dry bulb sensor, single or dual enthalpy sensors.

Airflow Measurement – airflow measurement is available for the Modulating Damper Economizer option listed above. Three options exist for airflow measurement; minimum airflow and 100% air flow. Minimum airflow measures airflow between 0 and the minimum ventilation airflow up to 25% outside air. 100% airflow measurement measures air flow from 0-100% of the outside airflow.

RELIEF SYSTEM

Barometric Relief - building air exhaust shall be accomplished through barometric relief dampers installed in the return air plenum. The dampers will open relative to the building pressure.

Exhaust Air Fans - two (2) forward curved centrifugal fans shall be installed in the return air plenum for positive power exhaust. Fan impellers shall be on a common shaft, driven by a single motor. The fans, motors and drives shall be of the same quality and design as specified for the supply air fan, except the fans shall be Class I. Exhaust control options are on/off, modulating discharge damper, or VFD fan speed control. On units with non-modulating exhaust a barometric relief damper is included to prevent outside air from entering in the off cycle. Fans shall cycle on and off with building pressure. On units with modulating exhaust and two position control based on building pressure, a field-installed static pressure sensor mounted in the conditioned space or return air duct is required for damper and VFD modulation.

EVAPORATOR COIL PROTECTION

Copper Fins – provided in lieu of aluminum fins.

Pre-Coated Fins – an epoxy-coated aluminum fin stock to guard from corrosive agents and insulate against galvanic potential. Used for mild seashore or industrial locations.

CONDENSER COIL PROTECTION

Copper Fins – provided in lieu of aluminum fins.

Pre-Coated Fins – an epoxy-coated aluminum fin stock to guard from corrosive agents and insulate against galvanic potential. Used for mild seashore or industrial locations.

Post-Coated Fins – Technicoat coil-coating process used on condenser coils for seashore and other corrosive applications (with the exception of strong alkalis, oxidizers, wet bromide, chlorine and fluorine in concentrations greater than 100ppm).

Hot Gas Bypass (Optional on Constant Volume; Standard on VAV) – permits continuous, stable operation at capacities below the minimum step of unloading by introducing an artificial load on the evaporator.

BACNet Communications Card – for BAS communications, a BACNet card is available with Ethernet connection.

Compressor Sound Blankets – compressor acoustic sound blankets for sound sensitive applications.

CO_2 Sensors – carbon dioxide sensors for occupied space that operate demand ventilation control opening outside air dampers to ventilate building.

Suction and Discharge Pressure Transducers – monitor and readout of suction and discharge pressures.

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