



Product Data

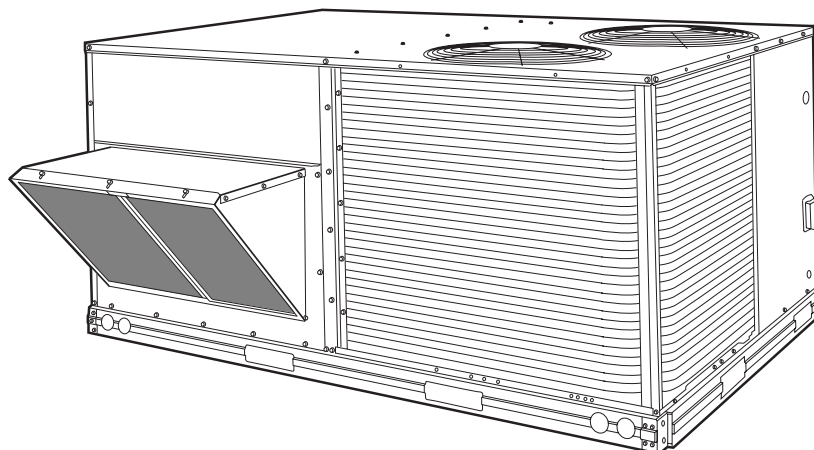
48HJD/HJE/HJF Single-Package Rooftop Gas Heating/Electric Cooling Units 50 Hz

Nominal Capacity: 21.5 to 35.9 kW
(6½ to 10 Tons)

Quality Assurance



Approvals:
ISO 9002
EN 29002
BS5750 PART 2
ANSI/ASQC Q92



Carrier has designed the new Weathermaster® series based on customer needs and requests to build the most efficient and reliable rooftop units ever.

Features/Benefits

- highly efficient cooling units using scroll compressors
- efficient heating using dimpled heat exchangers with 2-stage gas valves on all units
- high reliability — non-corrosive condensate pans, pre-painted cabinets and primed interior panels, and all units are fully protected by internal safeties
- quiet operation — isolated compressor rails. All compressors mounted on independent vibration isolators. Standard, belt-driven, evaporator-fan motors on all units
- unprecedented ease of maintenance achieved by standard size filters, optional direct digital controls, no tool filter access, simple compressor access, and permanently lubricated belt-driven fan motors
- environmentally designed rooftop — high efficiency means the 48HJ consumes less fossil fuels which results in a reduction of greenhouse gases expelled from industrial processes

Carrier means Top Quality and Reliability

Each component utilized in the Weathermaster® Series is designed and tested for a minimum of 15 years operation under the harshest conditions.

Every unit is thoroughly run tested at the factory in each operating mode and evacuated prior to final charging. Every coil is then leak-tested with helium. Automated run testing allows accurate undisputed tests and measurements which are second to none in the industry.

Each unit contains a factory print-out indicating tested pressures, amperages, dates, and inspectors, providing certification of the unit's status at the time of manufacture.

Units are equipped with valuable safety controls designed to monitor and protect the unit for life. The standard safeties include:

- low-pressure/loss-of-charge switch
- high-pressure switch
- freeze-protection thermostat
- internal compressor overload
- refrigerant filter drier

The cabinet is constructed of galvanized steel, bonderized and coated with a prepainted baked enamel finish. The paint finish is a non-chalking type, and is capable of withstanding Federal test Method Standard No. 141 (Method 6061) 500-hour salt spray test. In addition, all internal cabinet panels are primed, allowing the entire unit to have a longer life and more attractive appearance.

Easy maintenance and installation

All units are factory shipped in the vertical discharge configuration for fit-up to standard roof curbs. The contractor can order and install the roof curbs early in the construction stage, before decisions on size requirements have been made.

All units feature roll-formed base-rail design with forklift slots on 3 sides of the unit and rigging holes for easier maneuvering and installation. Stretch-wrap packaging protects the unit during shipment and storage.

Units are easily converted from vertical to horizontal applications to make retrofit and add-on jobs easier. To convert from vertical to horizontal discharge, simply move 2 panels.

The same basic unit can be used for a variety of applications and can be quickly modified at the jobsite. Standard high-static, high-performance, belt-driven indoor (evaporator) fan motors enable the 48HJ units to successfully operate in many ductwork configurations.

Ductwork connections are simplified by the logical 2 to 1 aspect ratio. On vertical discharge units, ductwork attaches directly to the roof curb.

Thru-the-bottom service connection capability allows power and control wiring to be routed through the unit basepan and roof curb, thereby minimizing roof penetrations. Both power and control connections are made on the same side of the unit to simplify installation.

The non-corrosive, sloped, condensate drain pan is factory installed and in conformance with ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) Standard 62 to meet many Indoor-Air Quality (IAQ) specifications (U.S.A. Standards). The condensate drain pan offers both bottom and end drain capability to minimize roof penetrations. The bottom drain can be used in conjunction with the thru-the-bottom connections. An external trap must be field supplied.

Standard 51 mm (2 in.) throwaway filters are easily accessed through a removable filter access panel located directly above the air intake hood; no tools are required to change the filters.

All units are designed with a single continuous top piece to eliminate any possible leaking at the seams or gasketing, which tends to deteriorate over time and shift during rigging procedures.

Belt-driven evaporator-fan motors on all sizes allow maximum on-site flexibility without changing motors or drive speeds.

Low-voltage wiring connections are easily made due to the terminal board which is conveniently located for quick simple access.

Quiet, efficient operation and dependable performance

All units are equipped with scroll compressors that are fully hermetic with internal vibration isolators

for extremely quiet and highly efficient operation. Compressors are mounted on independent base rails for additional sound integrity and structural support. Efficient condenser fan and motor design permits operation at a low sound power of 7.8 bels for size 008, 8.0 bels for size 012, and 8.8 bels for size 014.

Totally enclosed condenser fan motors and permanently lubricated bearings provide additional dependability.

All coils use state-of-the-art internally enhanced copper tubing.

Coils are thoroughly leak and pressure tested at the factory. Condenser coils have louvered, aluminum lanced fins to provide maximum heat transfer for optimum efficiency and easy cleaning.

Dimpled heat exchangers optimize heat transfer for improved efficiency. The tubular design permits hot gases to make multiple passes across the path of the supply air. In addition, dimpled heat exchanger tubes act as baffles, forcing the hot gases to stay in close contact with the cell walls to maximize heat transfer and efficiency.

The induced draft combustion system eliminates the unsightly appearance of flue stacks, and diminishes the effects of winds on heating operation. The inducer fan draws hot combustion gas through the heat exchanger at the optimum rate for the most effective heat transfer. The induced draft also prevents contaminants from entering the supply air if a leak in the heat exchanger occurs.

Dual-stage gas heat on all size units maximizes efficiency and customizes comfort.

The direct spark ignition system saves operating expense when compared to old-style pilot ignition systems. No crossover tube is required, therefore no sooting or pilot fouling problems can occur.

LP conversion kit — Standard units are designed for natural gas. An LP (Liquid Propane) Conversion Kit is available as an accessory, if required. Installation of the accessory LP kit simply involves changing the gas orifices to accommodate liquid propane gas.

Features/Benefits (cont)



Refrigerant circuit protection

ensures dependability. All units have standard:

- 1) loss-of-charge/low-pressure protection switch which allows operation at lower ambient conditions while protecting against low-charge operation
- 2) freeze-protection thermostat, which protects against evaporator coil frost build-up
- 3) high-pressure switch, which protects against above normal operating pressure
- 4) filter driers, which trap moisture and debris in the refrigeration system
- 5) Carrier's exclusive Acutrol™ metering device, which precisely controls refrigerant flow, preventing slugging and floodback, while maintaining optimum unit performance by metering the circuits individually.

Two independent compressor circuits provide pinpoint comfort control, improved efficiency, and back-up capability.

Carrier controls add reliability, efficiency, and simplification

The Apollo communicating control can be ordered as a factory-installed option. Designed exclusively by Carrier, the Apollo control can be used to actively monitor all modes of operation as well as evaporator fan status, filter status, indoor-air quality, supply-air temperature, and outdoor-air temperature.

The Apollo control board is factory-installed in the rooftop unit control box and comes equipped with built-in diagnostic capabilities. Light-emitting diodes (LEDs) simplify troubleshooting by indicating thermostat commands for both stages of heating and cooling, indoor fan operation, and economizer operation. The Apollo communicating control is designed to work specifically with Carrier TEMP and VVT® thermostats.

The standard control system is readily adaptable to all conventional and programmable thermostats. In addition, units are suitable for integration into monitor control systems if required.

Indoor air quality

The Weathermaster® series utilizes certain key features that assist in improving the quality of the building air. Sloped condensate pans eliminate possible biological growth in the rooftop unit. A face-split indoor coil design proves effective in additional moisture removal from the supply air. Fifty-one mm (2 in.) filters are standard in all rooftop units. An optional filter status sensor accessory is available.

Serviceability

Standardized components for the complete Weathermaster line of products are found in all safety devices, outdoor-fan motors, and control boards. This allows for greater inventory control, familiarity, and fewer stocked parts.

Easily accessible refrigerant access ports on all discharge, suction, and liquid lines permit easy and accurate measurements.

Resettable 24-v circuit breaker provides protection without replacing transformers or fuses.

Single-side utility connections provide easy access to perform any necessary service.

Color-coded wires permit easy tracing and diagnostics.

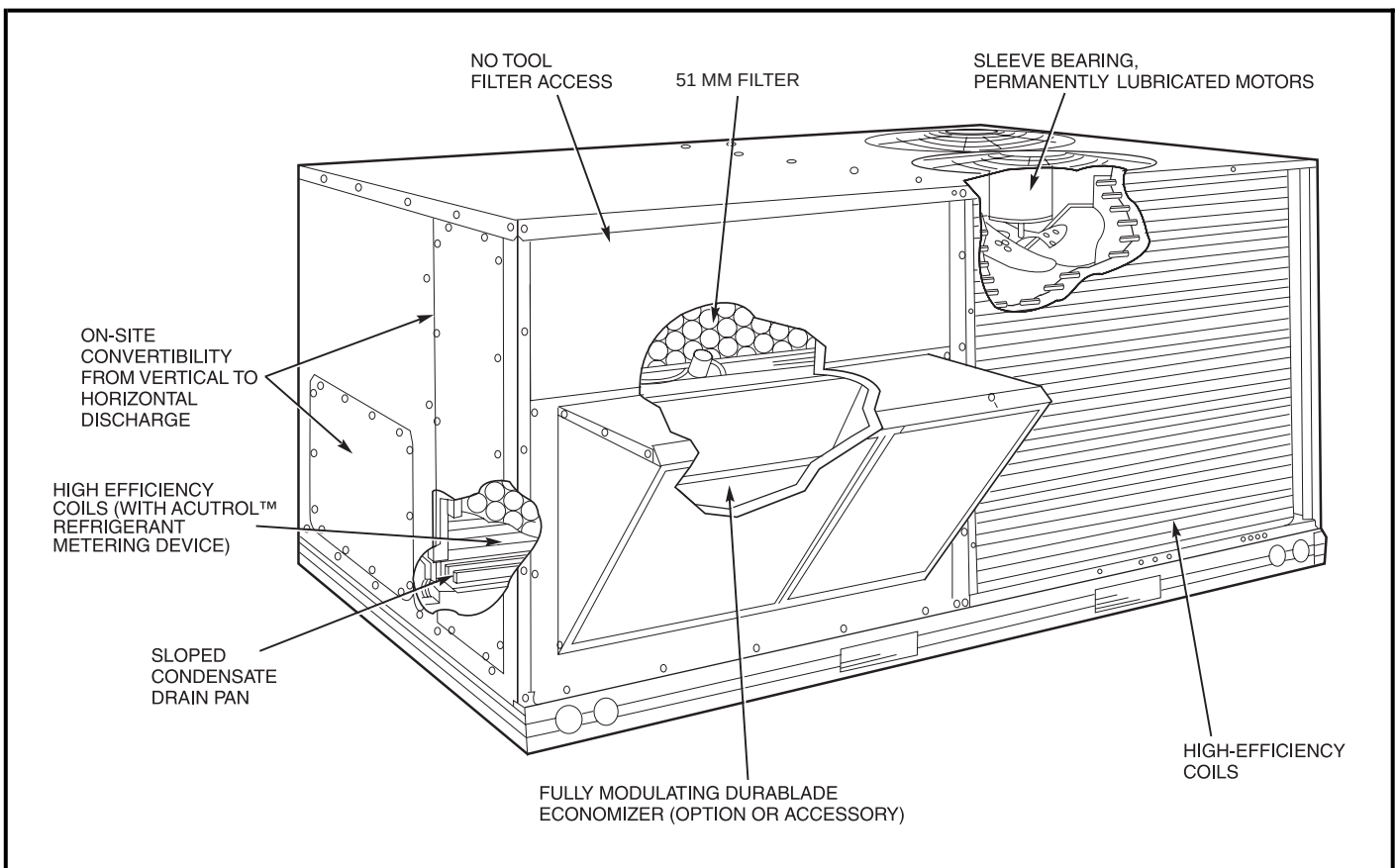
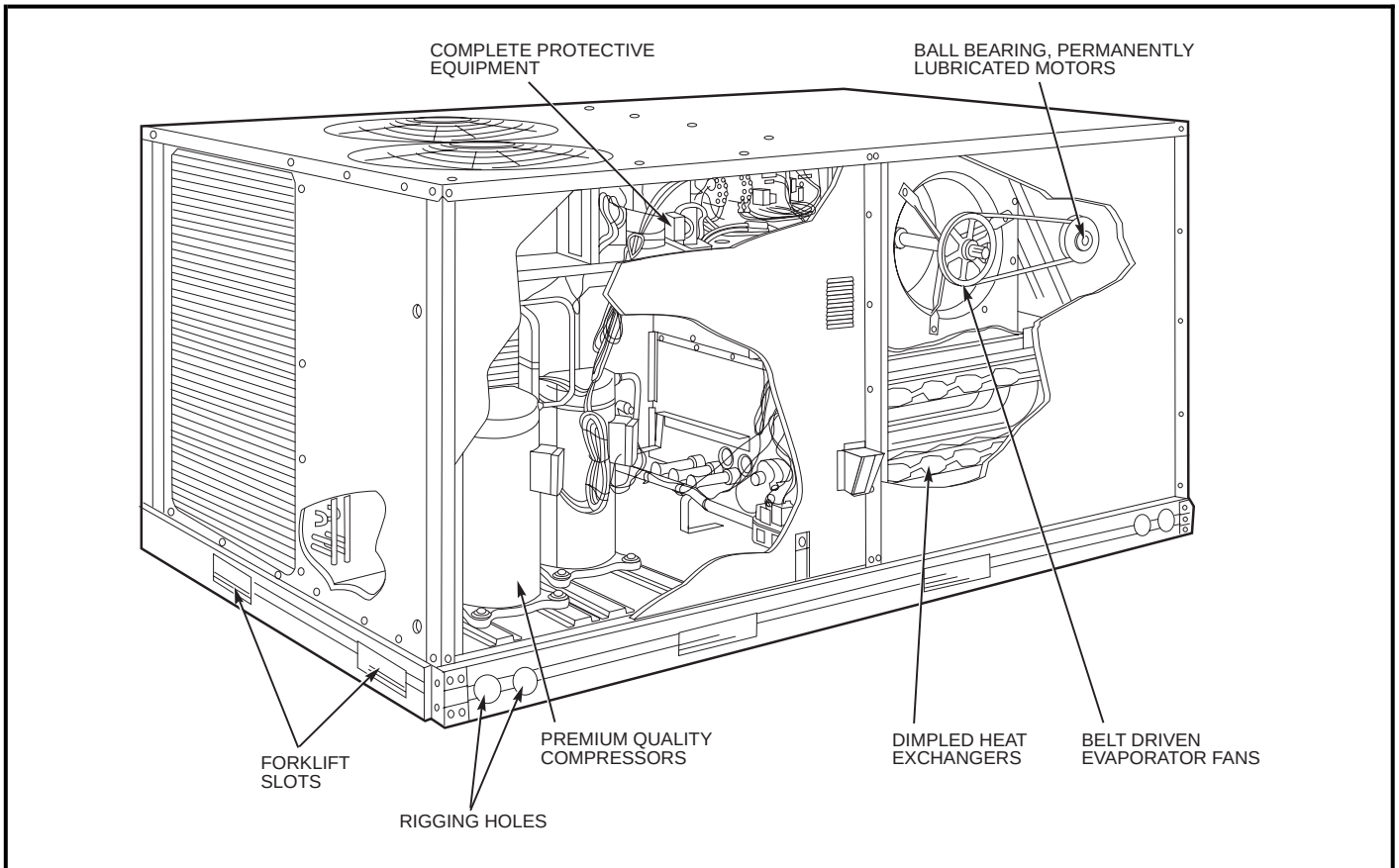
Belt-driven motors are accessible through a single access door to facilitate servicing and adjusting after installation.

Compressors and safety switches are easily accessible for troubleshooting and system analysis.

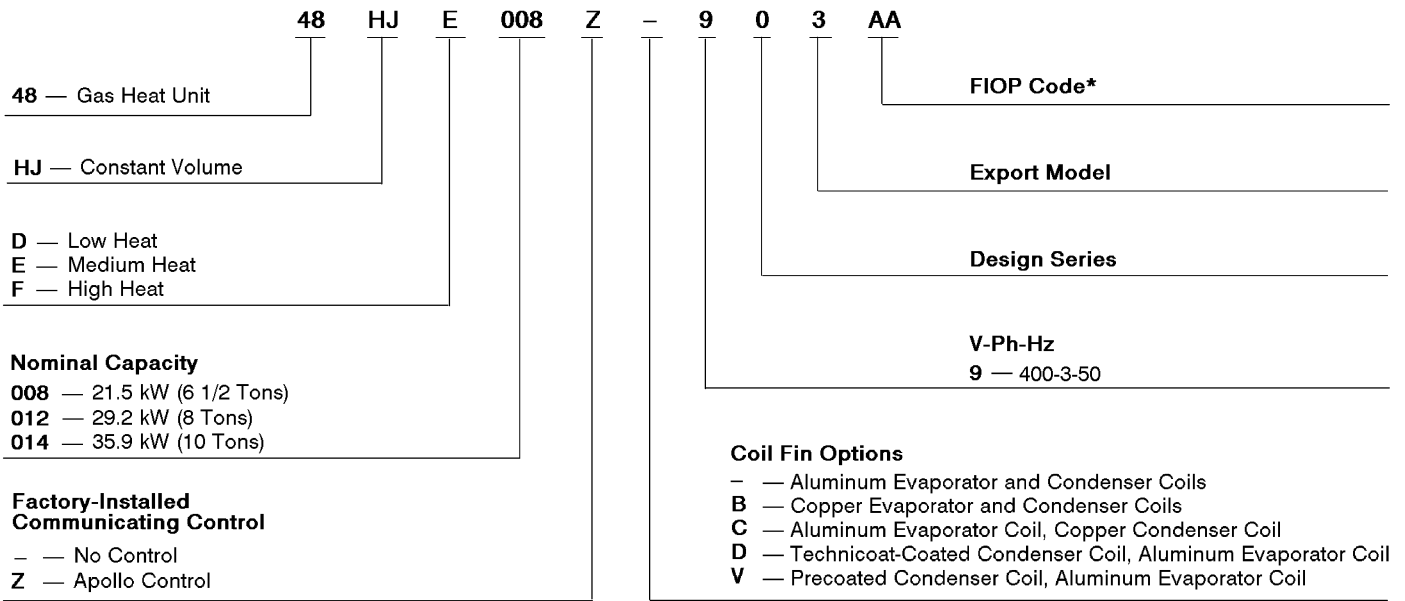
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Features/Benefits (cont)



Model number nomenclature



* Refer to 48HJ Product Ordering Data for FIOP (Factory-Installed Options) code table.

Physical data (SI)



BASE UNIT 48HJ	D/E/F008	D/E/F012	D/E014
NOMINAL CAPACITY (kW)	22.9	29.2	35.9
OPERATING WEIGHT (kg)			
Unit	395	469	476
With Durablade Economizer	20	20	20
Roof Curb	65	65	65
COMPRESSOR		Scroll	
Quantity	2	2	2
Oil (ml) (each compr)	1567	1479	1774
REFRIGERANT TYPE	HCFC-22		
Operating Charge (kg)			
Circuit 1	2.9	3.8	4.2
Circuit 2	3.0	4.1	3.9
CONDENSER FAN		Propeller Type	
Qty...Diameter (mm)	2...559	2...559	2...559
Nominal Airflow Rate (L/s)	2600	2645	2645
Motor Output...Speed (kW...r/s)	.34...16	.34...16	.34...16
CONDENSER COIL	Enhanced Copper Tubes, Aluminum Lanced Fin		
Rows...Fins/m	2...670	2...670	2...670
Total Face Area (sq m)	1.90	2.32	2.32
EVAPORATOR FAN		Centrifugal Type	
Size (mm)	381 x 381	381 x 381	381 x 381
Type Drive	Belt	Belt	Belt
Nominal Airflow Rate (L/s)	1180	1700	1980
Maximum Continuous Bkw	2.16	2.76	2.76
Motor Frame	56	56	56
Fan Speed Range (r/s)	11.7 to 15.0	11.8 to 14.8	11.8 to 14.9
Motor Bearing Type	Ball	Ball	Ball
Maximum Fan Speed (r/s)	35	35	35
Motor Pulley Pitch Diameter A/B (mm)	86.4-171.8	101.6-127.0	101.6-127.0
Fan Pulley Pitch Diameter (mm)	178	203	203
Belt — Type...Length (mm)	A...1295	A...1295	A...1295
Pulley Center Line Distance (mm)	425.5-489.0	402.6-444.5	402.6-444.5
Speed Change per Full Turn of Movable Pulley Flange (r/s)	.667	.600	.600
Movable Pulley Maximum Full Turns From Closed Position	5	5	5
Factory Setting — Full Turns Open	5	5	5
Factory Speed Setting (r/s)	11.7	11.8	11.8
Fan Shaft Diameter at Pulley (mm)	25.4	25.4	25.4
EVAPORATOR COIL	Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Acutrol™ Feed Device		
Rows...Fins/m	3...591	3...591	3...591
Total Face Area (sq m)	.83	1.03	1.03
FURNACE SECTION			
Rollout Switch Cutout (Temp C)	90.6	90.6	90.6
Burner Orifice Diameter (mm)			
Natural Gas — Std	3.05	3.05	3.05
Liquid Propane — Alt	2.44	2.44	2.44
Thermostat Heat Anticipator Setting (amps)			
400-v Stage 1	.14	.14	.14
Stage 2	.20	.20	.20
Gas Input (kW) Stage 1	21.1/31.9/39.8	31.9/39.8/43.9	39.8/43.9
Stage 2	31.4/50.4/59.8	50.4/59.8/65.6	59.8/65.6
Efficiency (Steady State) (%)	82/80/80	80/80/80	80/80
Temperature Rise Range (C)	-6-10/2-18/7-24	2-18/7-24/4-21	7-24/4-21
Manifold Pressure (kPa)			
Natural Gas — Std	8.3	8.3	8.3
Liquid Propane — Alt	8.3	8.3	8.3
Field Gas Connection Size (in.)	.50/.75/.75	.75/.75/.75	.75/.75
HIGH-PRESSURE SWITCH (kPa)			
Cutout		2950	
Reset (Auto.)		2205	
LOSS-OF-CHARGE/LOW-PRESSURE SWITCH (Liquid Line) (kPa)			
Cutout		48.3 ± 20.7	
Reset (Auto.)		151.7 ± 48.3	
FREEZE PROTECTION THERMOSTAT (C)			
Cutout		7	
Reset (Auto.)		-1	
OUTDOOR-AIR INLET SCREENS		Cleanable	
Qty...Size (mm)		1...508 x 635 x 25	
		1...406 x 635 x 25	
RETURN-AIR FILTERS		Disposable	
Qty...Size (mm)	4...406 x 508 x 51	4...508 x 508 x 51	

Physical data (English)



BASE UNIT 48HJ	D/E/F008	D/E/F012	D/E014
NOMINAL CAPACITY (tons)	6½	8	10½
OPERATING WEIGHT (lb)			
Unit	870	1035	1050
With Durablade Economizer	44	44	44
Roof Curb	143	143	143
COMPRESSOR		Scroll	
Quantity	2	2	2
Oil (oz) (each compr)	53	50	60
REFRIGERANT TYPE	HCFC-22		
Operating Charge (lb)			
Circuit 1	6.3	8.3	9.3
Circuit 2	6.6	9.1	8.6
CONDENSER FAN		Propeller Type	
Qty...Diameter (in.)	2...22	2...22	2...22
Nominal Cfm	5500	5600	5600
Motor Hp...Rpm	¼...920	¼...920	¼...920
CONDENSER COIL	Enhanced Copper Tubes, Aluminum Lanced Fin		
Rows...Fins/in.	2...17	2...17	2...17
Total Face Area (sq ft)	20.5	25.0	25.0
EVAPORATOR FAN		Centrifugal Type	
Size (in.)	15 x 15	15 x 15	15 x 15
Type Drive	Belt	Belt	Belt
Nominal Cfm	2500	3600	4200
Maximum Continuous Bhp	2.9	3.7	3.7
Motor Frame	56	56	56
Fan Rpm Range	697 to 900	713 to 896	713 to 896
Motor Bearing Type	Ball	Ball	Ball
Maximum Fan Rpm	2100	2100	2100
Motor Pulley Pitch Diameter A/B (in.)	3.4/4.4	4.0/5.0	4.0/5.0
Fan Pulley Pitch Diameter (in.)	7.0	8.0	8.0
Belt — Type...Length (in.)	A...51	A...51	A...51
Pulley Center Line Distance (in.)	16.75-19.25	15.85-17.50	15.85-17.50
Speed Change per Full Turn of Movable Pulley Flange (rpm)	40	36	36
Movable Pulley Maximum Full Turns From Closed Position	5	5	5
Factory Setting — Full Turns Open	5	5	5
Factory Speed Setting (rpm)	700	717	717
Fan Shaft Diameter at Pulley (in.)	1	1	1
EVAPORATOR COIL	Enhanced Copper Tubes, Aluminum Double-Wavy Fins, Acutrol™ Feed Device		
Rows...Fins/in.	3...15	4...15	4...15
Total Face Area (sq ft)	8.9	11.1	11.1
FURNACE SECTION			
Rollout Switch Cutout (Temp F)	195	195	195
Burner Orifice Diameter (in. ...drill size)			
Natural Gas — Std	.120...31	.120...31/.120...31/.129...30	.120...31/.129...30
Liquid Propane — Alt	.096...41	.096...41/.096...41/.102...38	.096...41/.102...38
Thermostat Heat Anticipator Setting (amps)			
400-v Stage 1	.14	.14	.14
Stage 2	.20	.20	.20
Gas Input (Btuh) Stage 1	72,000/109,000/136,000	109,000/136,000/150,000	136,000/150,000
Stage 2	107,000/172,000/204,000	172,000/204,000/224,000	204,000/224,000
Efficiency (Steady State) (%)	82/80/80	80/80/80	80/80
Temperature Rise Range (F)	20-50/35-65/45-75	35-65/45-75/40-70	45-75/40-70
Manifold Pressure (in. wg)			
Natural Gas — Std	3.5	3.5	3.5
Liquid Propane — Alt	3.5	3.5	3.5
Field Gas Connection Size (in.)	.50/.75/.75	.75/.75/.75	.75/.75
HIGH-PRESSURE SWITCH (psig)			
Cutout		428	
Reset (Auto.)		320	
LOSS-OF-CHARGE/LOW-PRESSURE			
SWITCH (Liquid Line) (psig)			
Cutout		7 ± 3	
Reset (Auto.)		22 ± 7	
FREEZE PROTECTION THERMOSTAT (F)			
Cutout		45	
Reset (Auto.)		30	
OUTDOOR-AIR INLET SCREENS		Cleanable	
Qty...Size (in.)		1...20 × 25 × 1	
RETURN-AIR FILTERS		1...16 × 25 × 1	
Qty...Size (in.)		Disposable	
	4...16 x 20 x 2		4...20 x 20 x 2

Bhp — Brake Horsepower

Physical data (cont)



HEATING CAPACITIES AND EFFICIENCIES

UNIT	HEATING INPUT kW (Btuh) FIRST STAGE/SECOND STAGE	OUTPUT CAPACITY kW (Btuh) FIRST STAGE/SECOND STAGE	TEMPERATURE RISE °C (°F)	AFUE (%)	STEADY STATE EFFICIENCY (%)
48HJD008	21.1/31.4 (72,000/107,000)	17.3/25.7 (59,000/87,700)	-6 to 10 (20 to 50)	82	82
48HJE008	31.9/50.4 (109,000/172,000)	25.5/40.3 (87,200/137,600)	2 to 18 (35 to 65)	80	80
48HJF008	39.8/59.8 (136,000/204,000)	31.9/47.8 (108,800/163,200)	7 to 24 (45 to 75)	80	80
48HJD012	31.9/50.4 (109,000/172,000)	25.5/40.3 (87,200/137,600)	2 to 18 (35 to 65)	80	80
48HJE012	39.8/59.8 (136,000/204,000)	31.9/47.8 (108,800/163,000)	7 to 24 (45 to 75)	80	80
48HJF012	43.9/65.6 (150,000/224,000)	35.2/52.5 (120,000/179,200)	4 to 21 (40 to 70)	80	80
48HJD014	39.8/59.8 (136,000/204,000)	31.9/47.8 (108,800/163,000)	7 to 24 (45 to 75)	80	80
48HJE014	43.9/65.6 (150,000/224,000)	35.2/52.5 (120,000/179,200)	4 to 21 (40 to 70)	80	80

AFUE — Annual Fuel Utilization Efficiency

Options and accessories



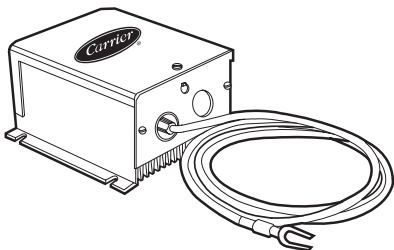
ITEM	OPTION*	ACCESSORY†
Apollo Communicating Controls	X	
Integrated Economizer (Durablade)	X	X
Manual Outdoor-Air Damper (25 and 50% Open)		X
Two-Position Damper (25% Open)		X
Two-Position Damper (100% Open)		X
Unit Mounted Disconnect	X	
Roof Curb (14 in.)		X
Roof Curb (24 in.)		X
Thru-the-Bottom Service Connections		X
Electronic Programmable Thermostat		X
Fan/Filter Status		X
Thermostat and Subbase		X
Time Guard® II Control Circuit		X
Motormaster® Head Pressure Control		X
Accusensor™ II Enthalpy Control		X
Accusensor III Differential Enthalpy Control		X
Remote Control Panel		X
Coil Guard Grille		X
Hail Guard		X
LP (Liquid Propane) Conversion Kit		X
No _x Reduction Kit		X
Flue Discharge Deflector		X
Flue Shield		X

*Factory installed.

†Field installed.

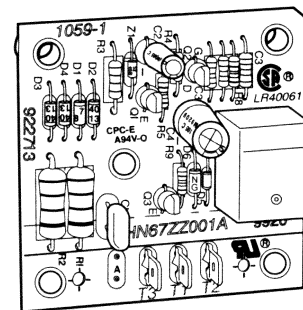
MOTORMASTER HEAD PRESSURE CONTROL

The 48HJ standard units are designed to operate at outdoor temperatures down to -4 (25 F). With accessory Motormaster control, units can operate at outdoor temperatures down to -18 C (0° F). The head pressure controls, which mount in the condenser section, modulate the condenser-fan motor to maintain correct condensing temperature.

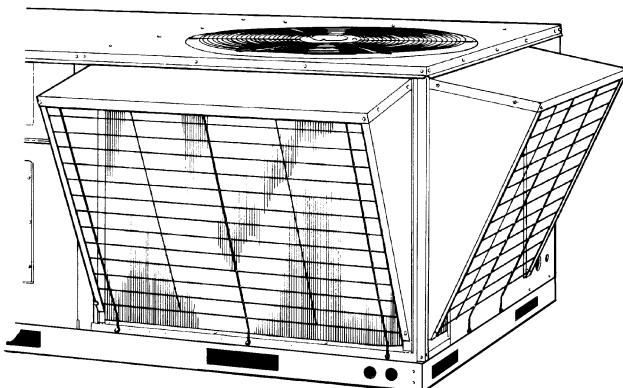


TIME GUARD II CONTROL

Time Guard II Control (standard on single-phase units) automatically prevents compressor from restarting for at least 5 minutes after a shutdown. Accessory prevents short cycling of compressor if thermostat is rapidly changed. Time Guard II device mounts in the control compartment of unit.

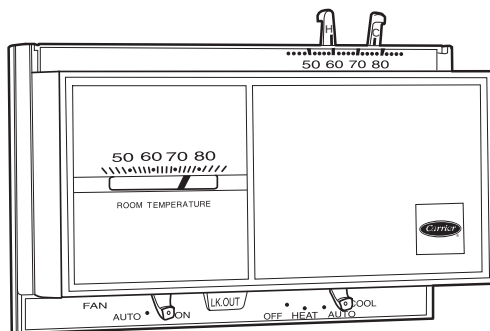


HAIL GUARD



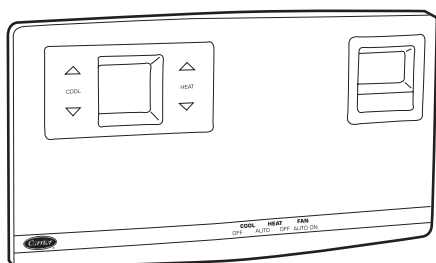
Hail guard accessory protects coil against damage from hail and other flying debris (field installed).

THERMOSTAT



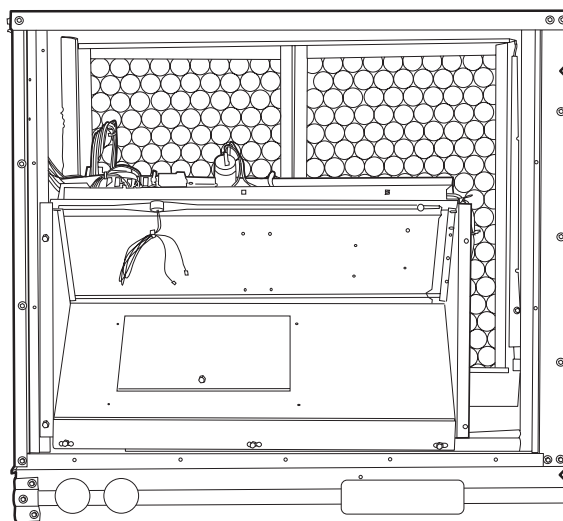
Zone thermostat (24 v) provides one- or 2-stage cooling for control of unit. Matching subbases are available with or without tamper-proof switches and automatic changeover.

ELECTRONIC PROGRAMMABLE THERMOSTAT



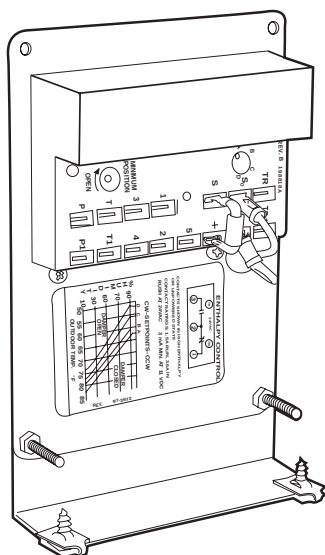
Electronic programmable thermostat provides efficient temperature control by allowing you to program heating and cooling setbacks and setups with provisions for weekends and holidays. The thermostat utilizes a time delay between operating modes. A Temp System relay pack is also required for thermostat operation. The relay pack is not required for Apollo option. It is designed to operate with Carrier direct digital control.

DURABLADE ECONOMIZER

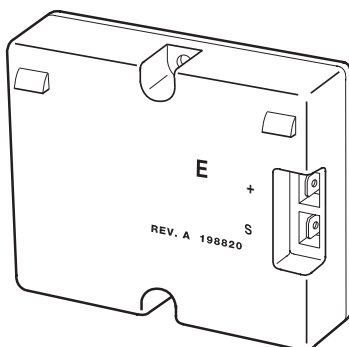


Exclusive Durablade economizer damper design saves energy while providing economical and reliable cooling. A sliding plate on the face of the economizer controls the amount of outdoor air entering the system. When the sliding plate is closed, it provides a leakproof seal which prevents ambient air from seeping in or conditioned air from seeping out. It can be easily adjusted for 100% outdoor air or any proportions of mixed air.

ACCUSENSOR™ II CONTROLS

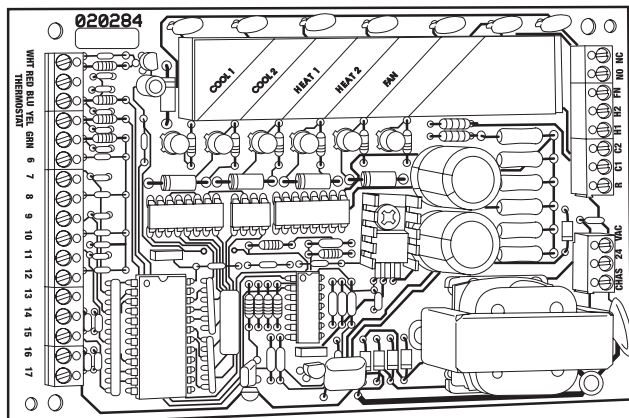


ACCUSENSOR III CONTROLS



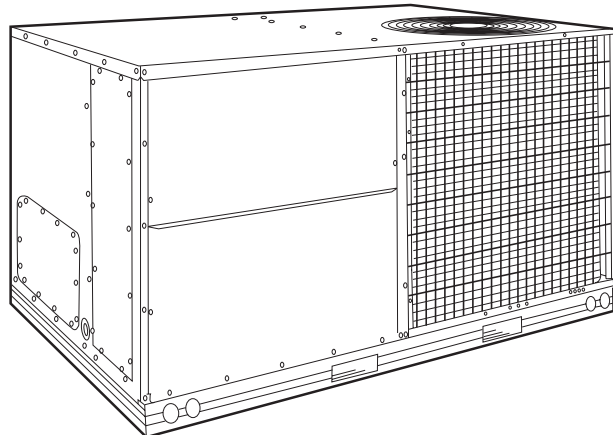
Accusensor economizer controls help provide efficient, economical Durablade economizer operation. The standard Accusensor I dry-bulb sensor measures outdoor temperature. The accessory Accusensor II solid-state enthalpy control senses both dry and wet bulb of the outdoor air to provide an accurate enthalpy reading. The accessory Accusensor III differential enthalpy control compares outdoor temperature and humidity to return-air temperature and humidity and determines the most economical mixture of air.

APOLLO DIRECT DIGITAL CONTROLS



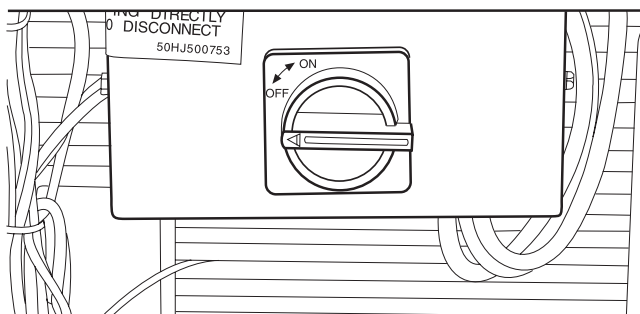
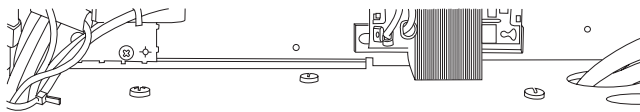
Apollo Direct Digital Controls are designed exclusively by Carrier, and are used to actively monitor all modes of operation as well as indoor fan status, filter status, indoor-air quality, supply-air temperature, and outdoor-air temperature. They are designed to work with Carrier TEMP and VVT® system thermostats.

COIL GRILLE



Coil grille protects coils against large objects and vandalism.

UNIT MOUNTED DISCONNECT



Factory-installed, internally-mounted, NEC (National Electrical Code, U.S.A.) and UL (Underwriters' Laboratories) approved non-fused switch provides unit power shutoff.

Accessory dimensions — 48HJ008-014



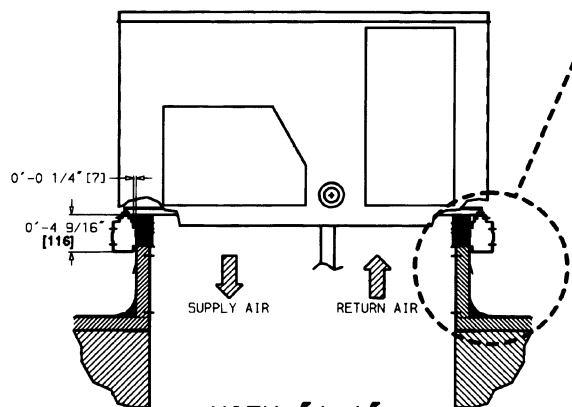
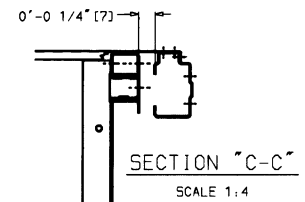
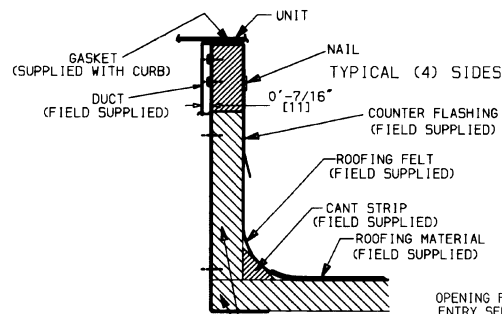
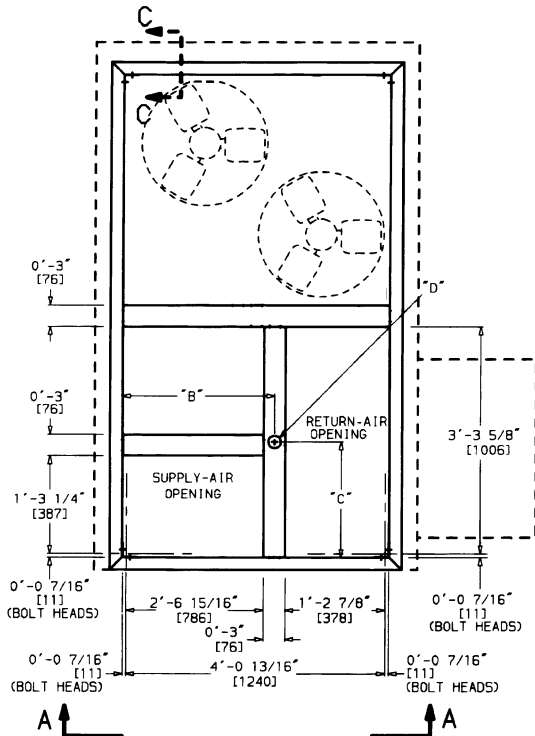
ROOF CURB — 48HJ008-014

UNIT SIZE	"B"	"C"	"D" ALT DRAIN HOLE	"E" GAS	POWER	CONTROL	CONNECTOR PKG ACY
48HJ008-014	2'-8 ⁷ / ₁₆ " [827]	1'-10 ¹⁵ / ₁₆ " [583]	1 ³ / ₄ " [45]	3/4" NPT	3/4" NPT	1/2" NPT	CRBTMPWR001A00 (THRU-THE-BOTTOM)
				3/4" NPT	1 ¹ / ₄ " NPT	1/2" NPT	CRBTMPWR002A00 (THRU-THE-BOTTOM)

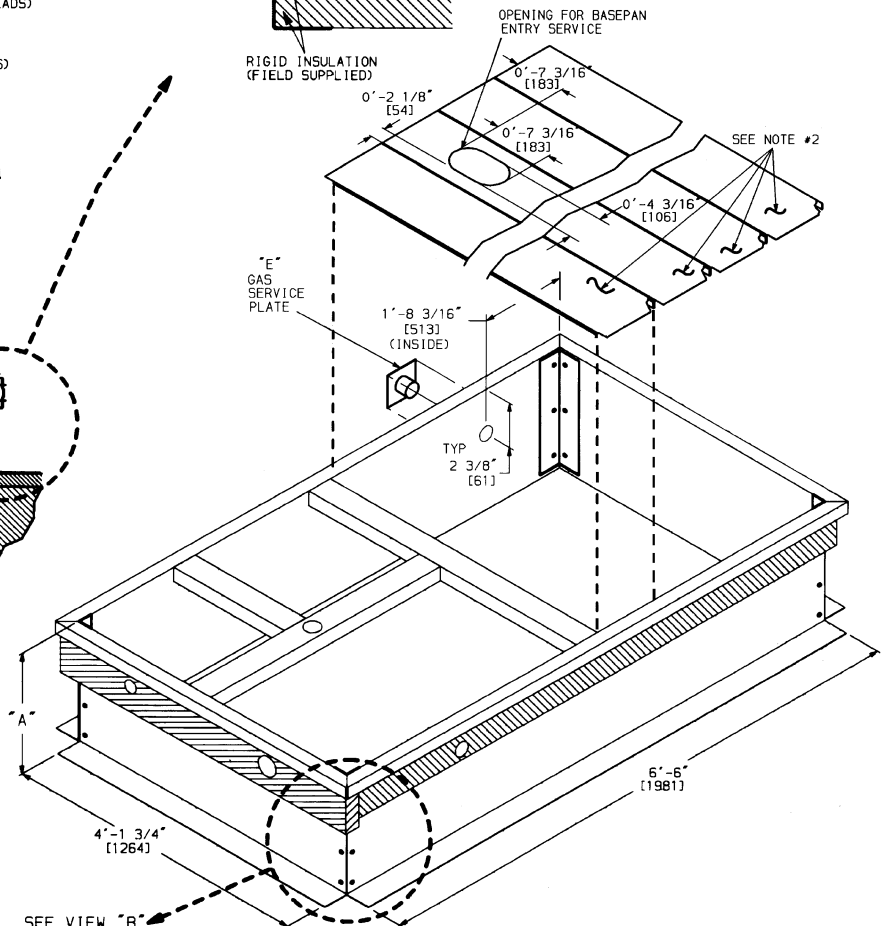
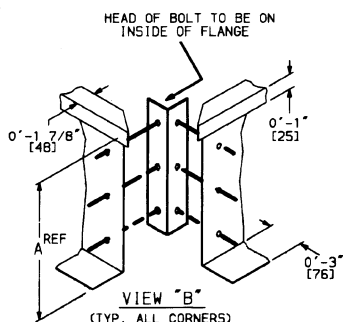
ROOF CURB ACCESSORY	"A"	UNIT SIZE
CRRFCURB003A00	1'-2" [356]	48HJ008-014
CRRFCURB004A00	2'-0" [610]	

NOTES:

1. Roof curb accessory is shipped unassembled.
2. Insulated panels.
3. Dimensions in [] are in millimeters.
4. Roof curb: galvanized steel.
5. Attach ductwork to curb. (Flanges of duct rest on curb.)
6. Service clearance 1.2 m (4 ft) on each side.
7. Direction of airflow.



VIEW "A-A"



Selection procedure (with 48HJD012 example) — SI



I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 28 kW
 Sensible Heat Capacity (SHC) 20 kW
 Required Heating Capacity 38 kW
 Condenser Entering-Air Temperature 36 C
 Evaporator Entering-Air Temperature 28 C edb,
 20 C ewb
 Evaporator Air Quantity 1600 L/s
 External Static Pressure (ESP) 300 Pa
 Electrical Characteristics (V-Ph-Hz) 400-3-50

II Select unit based on required cooling capacity.

Enter the 48HJD012 Cooling Capacities table on page 16 at condenser entering temperature of 36 C, evaporator-air entering at 1600 L/s, 28 C db (dry bulb) and 20 C wb (wet bulb). The 48HJD012 unit will provide cooling capacity of 32.1 kW and a sensible heat capacity of 19.5 kW. For evaporator-air temperature other than 26.7 C edb, calculate sensible heat capacity correction, as required, using the formula found in the notes following the Cooling Capacities table on page 17. The corrected SHC is 21.9 kW.

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

III Determine heating capacity of unit to meet design condition requirements:

Heating load required is 38 kW.

In Heating Capacities and Efficiencies table on page 8, note that unit 48HJD012 will provide output heating capacity of 40.3 kW which is adequate for the given application.

IV Determine fan speed and power requirements at design conditions.

Before entering the Fan Performance tables, calculate the total static pressure required based on unit components. From the given and the Pressure Drop tables (page 32), find:

External static pressure	300 Pa
Durablade Economizer	<u>9 Pa</u>
Total static pressure	309 Pa

Enter the Fan Performance table for the 48HJD012 vertical discharge unit on page 24. Find the fan r/s and bkW at 309 Pa and 1600 L/s. Note that the fan speed is 13.2 r/s and power required is 1.01 kW (interpolation required). The standard 1.5 kW motor will adequately handle the job requirements.

To determine the input power to the motor, use the Evaporator-Fan Motor Efficiency table found on page 32.

$$\begin{aligned} \text{IFM Watts} &= \frac{\text{bkW}}{\text{Motor Efficiency}} \\ &= \frac{1.01}{.85} \\ &= 1.19 \text{ kW} \end{aligned}$$

V Determine net capacities.

Capacities are gross and do not include the effect of evaporator-fan motor heat.

Determine net cooling capacity as follows:

$$\begin{aligned} \text{Net capacity} &= \text{gross capacity} - \text{IFM heat} \\ &= 32.10 \text{ kW} - 1.19 \text{ kW} \\ &= 30.91 \text{ kW} \end{aligned}$$

$$\begin{aligned} \text{Net sensible capacity} &= 21.90 \text{ kW} - 1.19 \text{ kW} \\ &= 20.71 \text{ kW} \end{aligned}$$

Determine net heating capacity as follows:

$$\begin{aligned} \text{Net capacity} &= \text{Gross capacity} + \text{IFM heat} \\ &= 40.3 \text{ kW} + 1.19 \text{ kW} \\ &= 42.29 \text{ kW} \end{aligned}$$

Selection procedure (with 48HJD012 example) — English



I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 96,000 Btuh
Sensible Heat Capacity (SHC) 67,000 Btuh
Required Heating Capacity 135,000 Btuh
Condenser Entering-Air Temperature 95 F
Evaporator Entering-Air Temperature . . . 80 F edb,
67 F ewb
Evaporator Air Quantity 3400 cfm
External Static Pressure (ESP) 1.10 in. wg
Electrical Characteristics (V-Ph-Hz) 400-3-50

II Select unit based on required cooling capacity.

Enter the 48HJD012 Cooling Capacities table on page 18 condenser entering temperature of 95 F, evaporator-air entering at 3400 cfm, 80 F db (dry bulb) and 67 F wb (wet bulb). The 48HJD012 unit will provide cooling capacity of 105,100 Btuh and a sensible heat capacity of 76,700 Btuh. For evaporator-air temperature other than 80 F edb, calculate sensible heat capacity correction, as required, using the formula found in the notes following the Cooling Capacities table on page 19.

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

III Determine heating capacity of unit to meet design condition requirements.

Heating load required is 115,000 Btuh.

In Heating Capacities and Efficiencies table on page 8, note that unit 48HJD012 will provide output heating capacity of 137,600 Btuh which is adequate for the given application.

IV Determine fan speed and power requirements at design conditions.

Before entering the Fan Performance tables, calculate the total static pressure required based on unit components. From the given and the Pressure Drop tables (page 32), find:

External static pressure	1.10 in. wg
Durablade Economizer	0.04 in. wg
Total static pressure	1.14 in. wg

Enter the Fan Performance table for the 48HJD012 vertical discharge unit on page 30. Find the fan rpm and bhp at 1.14 in. wg and 3400 cfm (interpolation required). Note that the fan speed is 837 rpm and power required is 1.59 bhp (interpolation required). The standard 2 hp motor will adequately handle the job requirements.

To determine the input power to the motor, use the Evaporator-Fan Motor Efficiency table found on page 32.

$$\begin{aligned} \text{IFM Watts} &= \text{Bhp} \times 746 \frac{\text{Watts}}{\text{Bhp}} \\ &\quad \text{Motor Efficiency} \\ &= \frac{1.59 \times 746}{.85} \\ &= \frac{1186}{.85} \end{aligned}$$

$$\text{IFM Watts} = 1395 \text{ Watts}$$

V Determine net capacities.

Capacities are gross and do not include the effect of evaporator-fan motor heat.

Determine net cooling capacity as follows:

Net capacity = gross capacity – IFM heat

$$\begin{aligned} &= 105,100 \text{ Btuh} - 1395 \text{ Watts} \times 3.413 \frac{\text{Btuh}}{\text{Watts}} \\ &= 105,100 \text{ Btuh} - 4761 \text{ Btuh} \\ &= 100,339 \text{ Btuh} \end{aligned}$$

$$\begin{aligned} \text{Net sensible capacity} &= 76,700 \text{ Btuh} - 4761 \text{ Btuh} \\ &= 71,939 \text{ Btuh} \end{aligned}$$

Determine net heating capacity as follows:

$$\begin{aligned} \text{Net Capacity} &= \text{gross capacity} + \text{IFM heat} \\ &= 137,600 \text{ Btuh} + 4761 \text{ Btuh} \\ &= 142,361 \text{ Btuh} \end{aligned}$$

Performance data



COOLING CAPACITIES (SI)

48HJ008 (22.9 kW)																
Temp (C) Air Ent Cond (Edb)		Evap Air — L/s / BF														
		850/0.2					1132/0.25					1420/0.3				
		Evap Air — Ewb (C)														
14	16	18	20	22	14	16	18	20	22	14	16	18	20	22		
20	TC SHC kW	19.8	21.4	23.2	24.6	26.4	21.6	23.0	24.3	25.8	27.4	22.4	23.5	24.6	26.4	28.0
		16.4	15.0	13.3	13.9	12.3	18.8	17.2	14.8	14.1	13.3	20.2	18.5	16.0	15.1	14.2
		3.60	3.64	3.64	3.64	3.68	3.64	3.66	3.68	3.69	3.70	3.64	3.65	3.68	3.68	3.78
24	TC SHC kW	19.3	20.9	22.8	24.0	25.8	21.1	22.5	24.1	25.2	27.0	22.1	23.1	24.5	25.8	27.4
		16.1	14.8	13.2	12.9	12.0	18.5	17.0	14.8	13.9	13.1	20.1	18.5	16.0	15.0	14.1
		3.95	3.99	4.01	4.06	4.08	4.00	4.02	4.05	4.08	4.12	4.01	4.02	4.05	4.10	4.14
28	TC SHC kW	18.5	20.1	22.1	23.4	25.2	20.4	21.8	23.4	24.6	26.4	21.7	22.6	24.1	25.2	27.0
		15.5	14.4	12.9	12.8	11.8	18.0	16.6	14.6	13.0	13.0	19.9	18.4	15.9	14.9	14.0
		4.35	4.39	4.42	4.46	4.48	4.40	4.43	4.45	4.50	4.52	4.42	4.44	4.46	4.50	4.54
32	TC SHC kW	18.0	19.6	21.6	22.8	24.6	19.8	21.1	22.9	24.0	25.8	21.0	22.1	23.5	24.6	26.2
		15.2	14.1	12.7	12.5	11.6	17.6	16.4	14.4	13.6	12.9	19.5	18.1	15.8	14.4	13.9
		4.77	4.81	4.85	4.90	4.94	4.83	4.86	4.88	4.93	4.98	4.86	4.88	4.91	4.96	5.00
36	TC SHC kW	17.4	19.0	21.0	22.2	24.0	19.2	20.5	22.2	23.2	25.2	20.5	21.4	23.0	23.8	25.8
		14.9	13.9	12.5	12.2	11.4	17.3	16.1	14.2	13.5	12.7	19.1	17.8	15.6	14.7	13.7
		5.22	5.26	5.30	5.36	5.40	5.28	5.31	5.34	5.39	5.44	5.33	5.33	5.36	5.41	5.46
40	TC SHC kW	16.8	18.3	20.3	21.4	23.4	18.6	19.7	21.5	22.4	24.4	19.9	20.7	22.3	23.0	25.0
		14.4	13.5	12.2	11.8	11.2	16.8	15.7	13.9	13.2	12.4	18.6	17.4	15.3	14.4	13.5
		5.70	5.74	5.79	5.86	5.90	5.77	5.80	5.84	5.89	5.94	5.82	5.83	5.86	5.91	5.96
44	TC SHC kW	16.3	17.7	19.5	20.8	22.6	17.9	19.1	20.7	21.8	23.6	19.2	20.0	21.5	22.2	24.2
		14.2	13.3	11.9	11.3	10.9	16.4	15.3	13.6	12.9	12.2	18.1	17.0	15.0	14.1	13.3
		6.22	6.26	6.32	6.38	6.44	6.29	6.31	6.35	6.41	6.48	6.34	6.36	6.39	6.45	6.50
48	TC SHC kW	15.9	17.1	18.9	20.0	21.8	17.3	18.4	19.9	21.0	22.8	18.6	19.3	20.7	21.4	23.2
		13.9	13.0	11.7	11.0	10.6	15.9	15.0	13.3	12.6	11.9	17.6	16.5	14.7	13.8	13.0
		6.76	6.81	6.87	6.94	6.98	6.83	6.86	6.91	6.98	7.02	6.89	6.91	6.95	7.01	7.06
52	TC SHC kW	15.4	16.5	18.2	19.2	21.0	16.7	17.6	19.2	20.0	21.8	17.8	18.6	19.9	20.6	22.4
		13.7	12.8	11.5	10.7	10.4	15.5	14.6	13.0	12.2	11.5	17.0	16.1	14.3	13.5	12.7
		7.33	7.38	7.44	7.50	7.54	7.41	7.45	7.49	7.55	7.60	7.47	7.49	7.53	7.58	7.64

48HJ012 (29.2 kW)																					
Temp (C) Air Ent Cond (Edb)		Evap Air — L/s / BF																			
		1200/0.03					1320/0.05					1600/0.05					2000/0.08				
		Evap Air — Ewb (C)																			
		14	16	18	20	22	14	16	18	20	22	14	16	18	20	22	14	16	18	20	22
20	TC	28.8	31.1	33.5	34.6	35.8	29.7	31.7	34.1	35.4	36.6	31.1	32.8	35.1	37.5	39.8	32.4	33.7	35.9	37.1	38.4
	SHC	24.7	22.4	19.8	18.4	17.0	25.8	23.4	20.7	19.0	17.4	27.9	25.7	22.6	20.9	19.2	30.4	28.4	25.1	22.9	20.8
	kW	5.34	5.39	5.46	5.51	5.59	5.37	5.42	5.48	5.54	5.61	5.42	5.46	5.52	5.58	5.64	5.47	5.50	5.57	5.64	5.77
24	TC	28.0	30.3	32.7	33.8	35.0	29.0	31.0	33.3	34.5	35.8	30.4	32.0	34.3	35.6	36.8	31.8	32.9	35.1	36.4	37.4
	SHC	24.2	22.1	19.6	18.2	16.7	25.4	23.1	20.4	18.8	17.2	27.5	25.3	22.2	20.5	18.8	29.9	28.1	24.7	22.6	20.6
	kW	5.84	5.90	5.97	6.04	6.11	5.86	5.92	5.99	6.08	6.17	5.91	5.97	6.03	6.09	6.18	5.98	6.01	6.09	6.19	6.28
28	TC	26.7	28.9	31.6	32.9	34.2	28.2	30.0	32.5	33.5	34.8	29.5	31.1	33.4	34.4	35.4	30.9	32.1	34.2	35.4	36.6
	SHC	23.2	21.4	19.0	17.8	16.5	24.8	22.7	20.1	18.7	17.1	27.0	25.0	22.0	20.2	18.4	29.2	27.6	24.3	22.3	20.4
	kW	6.37	6.44	6.51	6.58	6.65	6.42	6.48	6.55	6.62	6.70	6.47	6.53	6.59	6.65	6.73	6.53	6.58	6.65	6.73	6.81
32	TC	25.6	27.7	30.4	31.8	33.2	27.2	29.0	31.4	32.3	33.8	28.7	30.1	32.4	33.5	34.6	30.2	31.2	33.3	34.3	35.4
	SHC	22.4	20.8	18.7	17.5	16.1	24.1	22.3	19.7	18.5	16.8	26.4	24.6	21.7	20.0	18.1	28.7	27.1	23.8	21.9	20.0
	kW	6.94	7.01	7.10	7.19	7.28	7.00	7.06	7.14	7.22	7.30	7.06	7.11	7.19	7.25	7.35	7.12	7.17	7.24	7.33	7.40
36	TC	24.6	26.6	29.4	30.8	32.2	26.1	27.9	30.3	31.5	32.8	27.8	29.1	31.3	32.1	33.0	29.3	30.3	32.3	33.3	34.2
	SHC	21.7	20.3	18.2	17.0	15.8	23.5	21.8	19.3	18.1	16.4	25.8	24.1	21.2	19.5	17.8	28.0	26.5	23.4	21.5	19.6
	kW	7.55	7.62	7.71	7.80	7.89	7.61	7.67	7.75	7.83	7.93	7.68	7.72	7.80	7.92	8.02	7.75	7.79	7.86	7.93	8.05
40	TC	23.5	25.4	28.2	29.2	31.2	24.9	26.5	29.0	30.2	31.6	26.8	28.0	30.2	31.1	32.6	28.3	29.2	31.2	32.2	33.2
	SHC	20.9	19.8	17.8	16.6	15.4	22.6	21.1	18.9	17.7	16.1	25.0	23.5	20.8	19.1	17.4	27.2	25.8	22.8	21.2	19.4
	kW	8.19	8.27	8.37	8.47	8.57	8.25	8.31	8.40	8.49	8.58	8.34	8.39	8.47	8.53	8.60	8.41	8.45	8.52	8.61	8.70
44	TC	22.3	24.1	26.8	28.4	30.0	23.5	25.0	27.7	29.0	30.4	25.4	26.6	28.9	30.0	31.2	27.3	28.1	30.0	31.1	32.0
	SHC	20.2	19.1	17.3	16.1	15.1	21.6	20.4	18.2	17.4	15.8	23.9	22.6	20.2	18.6	17.1	26.4	25.1	22.4	20.8	19.0
	kW	8.88	8.96	9.06	9.10	9.15	8.94	9.01	9.10	9.19	9.28	9.04	9.09	9.18	9.27	9.36	9.14	9.17	9.24	9.31	9.40
48	TC	21.2	22.8	25.4	27.1	28.8	22.1	23.5	26.1	28.0	29.2	23.9	25.1	27.3	28.1	30.0	26.0	26.7	28.5	29.6	30.6
	SHC	19.5	18.5	16.7	15.6	14.6	20.5	19.5	17.5	17.0	15.4	22.7	21.6	19.4	18.1	16.7	25.2	24.2	21.7	20.4	18.6
	kW	9.62	9.69	9.78	9.86	9.94	9.67	9.72	9.83	9.91	10.00	9.78	9.83	9.91	9.99	10.08	9.88	9.91	9.98	10.05	10.12
52	TC	20.2	21.6	24.1	25.3	27.6	20.6	22.0	24.6	26.2	28.2	22.2	23.3	25.5	27.0	28.6	24.4	25.1	26.8	28.0	29.2
	SHC	18.8	17.9	16.1	15.1	14.2	19.3	18.5	16.8	16.0	14.8	21.3	20.5	18.6	17.5	16.3	23.9	23.1	20.8	19.9	18.1
	kW	10.38	10.44	10.56	10.63	10.72	10.42	10.48	10.59	10.68	10.78	10.53	10.57	10.67	10.77	10.87	10.65	10.67	10.74	10.81	10.95

COOLING CAPACITIES (SI) (cont)

48HJ014 (35.9 kW)																
Temp (C) Air Ent Cond (Edb)		Evap Air — L/s / BF														
		1500/0.13					2000/0.17					2500/0.22				
		Evap Air — Ewb (C)														
		14	16	18	20	22	14	16	18	20	22	14	16	18	20	22
20	TC SHC kW	35.8	38.0	40.3	42.4	44.4	38.0	40.0	42.1	44.3	46.3	37.8	40.1	42.5	44.8	46.9
		35.8	33.8	30.0	26.1	22.0	38.0	39.9	34.4	29.0	24.0	37.8	40.1	37.1	31.3	25.4
		8.94	8.99	9.05	9.10	9.13	9.02	9.06	9.11	9.15	9.22	8.89	8.97	9.07	9.16	9.26
24	TC SHC kW	33.3	35.8	38.4	40.8	43.0	35.9	38.2	40.4	42.7	44.9	36.8	38.9	41.2	43.4	45.6
		33.3	32.8	29.3	25.5	21.6	35.9	38.2	33.6	28.6	23.7	36.8	38.9	36.4	31.0	25.2
		9.38	9.46	9.56	9.64	9.70	9.50	9.57	9.64	9.71	9.80	9.45	9.55	9.64	9.74	9.85
28	TC SHC kW	30.8	33.6	36.6	39.2	41.6	34.0	36.3	38.8	41.1	43.4	35.9	37.8	39.8	41.9	44.3
		30.8	31.9	28.4	24.9	21.1	34.0	36.3	32.8	28.2	23.3	35.9	37.8	35.6	30.9	25.1
		9.83	9.94	10.06	10.18	10.27	9.99	10.08	10.17	10.27	10.39	10.02	10.11	10.21	10.31	10.43
32	TC SHC kW	28.3	31.5	34.7	37.7	40.2	32.0	34.5	37.1	39.5	42.0	34.9	36.7	38.5	40.5	43.0
		28.3	30.9	27.7	24.3	20.7	32.0	34.5	32.1	27.7	22.9	34.9	36.7	34.9	30.7	24.9
		10.27	10.42	10.57	10.71	10.85	10.46	10.59	10.70	10.82	10.96	10.58	10.68	10.78	10.89	11.03
36	TC SHC kW	25.8	29.3	32.7	36.1	38.7	30.0	32.6	35.3	37.9	40.5	33.9	35.5	37.1	39.0	41.6
		25.8	29.3	26.9	23.7	20.2	30.0	32.6	31.2	27.3	22.6	33.9	35.5	34.1	30.5	24.7
		10.72	10.90	11.08	11.25	11.42	10.96	11.10	11.24	11.39	11.55	11.15	11.26	11.36	11.47	11.62
40	TC SHC kW	23.0	26.8	30.5	34.0	37.1	28.2	30.8	33.3	36.0	38.8	32.7	34.1	35.4	37.2	39.9
		23.0	26.8	25.8	23.0	19.7	28.2	30.8	29.8	26.7	22.1	32.7	34.1	33.1	30.1	24.4
		11.20	11.40	11.61	11.81	12.00	11.49	11.64	11.80	11.96	12.13	11.77	11.86	11.94	12.04	12.23
44	TC SHC kW	22.1	25.3	28.5	31.8	35.2	26.7	28.8	30.9	33.4	36.9	31.0	32.0	33.0	34.7	37.9
		22.1	25.3	24.7	22.2	19.1	26.7	28.8	28.3	25.8	21.5	31.0	32.0	31.5	29.2	23.9
		11.72	11.93	12.14	12.35	12.58	12.11	12.24	12.36	12.51	12.73	12.38	12.44	12.51	12.61	12.82
48	TC SHC kW	21.6	24.1	26.5	29.3	33.2	25.3	26.9	28.4	30.7	34.9	29.3	29.9	30.5	32.0	35.7
		21.6	24.1	23.5	21.2	18.4	25.3	26.9	26.7	24.8	21.0	29.3	29.9	29.9	28.3	23.3
		12.25	12.45	12.66	12.89	13.17	12.73	12.84	12.93	13.07	13.33	12.98	13.03	13.09	13.19	13.41
52	TC SHC kW	21.0	22.8	24.5	27.0	31.3	23.8	24.9	25.9	28.1	33.1	27.6	27.8	28.0	29.3	33.6
		21.0	22.8	22.4	20.4	17.8	23.8	24.9	25.1	23.9	20.3	27.3	27.7	28.0	27.3	22.8
		12.77	12.98	13.19	13.43	13.75	13.37	13.43	13.49	13.62	13.93	13.58	13.63	13.66	13.76	13.99

LEGEND AND NOTES FOR COOLING CAPACITY TABLES (SI)

LEGEND

BF	— Bypass Factor
Edb	— Entering Dry Bulb Temperature (C)
Ewb	— Entering Wet Bulb Temperature (C)
kW	— Compressor Input (kW)
TC	— Total Capacity (kW)
SHC	— Sensible Heat Capacity (kW)

NOTES:

- Ratings are gross and do not account for the effects of the evaporator-fan motor power and heat.
- Direct interpolation is permissible. Do not extrapolate.
- SHC is based on 26.7 C db temperature of air entering the unit. At any other temperature, correct the SHC read from the table of cooling capacities as follows:

Corrected SHC_{kW}

$$= \text{SHC} + [1.23 \times 10^{-3} \times (1 - \text{BF}) \times (\text{C}_{\text{db}} - 26.7) \times \text{L/s}]$$

Observe the rule of signs. Above 26.7 C, SHC correction will be positive; add it to SHC. Below 26.7 C, SHC correction will be negative; subtract it from SHC.

4. Formulas:

$$\text{C}_{\text{ldb}} = \text{C}_{\text{edb}} - \frac{\text{SHC}_{\text{kW}} \times 1000}{1.23 \times \text{L/s}}$$

Leaving wet bulb = wet bulb temperature corresponding to enthalpy of air leaving coil (h_{ldb}).

$$h_{\text{ldb}} = h_{\text{ewb}} - \frac{\text{TC}_{\text{kW}} \times 1000}{1.20 \times \text{L/s}}$$

Where h_{ewb} is enthalpy of air entering evaporator coil (kJ/kg).

Performance data (cont)



COOLING CAPACITIES (English)

48HJ008 (6½ Tons)										
Temp (F) Ent Air Cond (Edb)		Evap Air — Cfm/BF								
		1800/0.1			2400/0.125			3000/0.15		
		Evap Air — Ewb (F)								
		62	67	72	62	67	72	62	67	72
75	TC SHC kW	66.3	76.5	83.9	72.0	80.0	87.1	73.9	81.8	88.5
		54.8	47.2	38.1	64.2	53.0	41.1	70.6	58.0	43.7
		3.96	3.99	4.01	4.00	4.01	4.04	3.98	4.02	4.06
85	TC SHC kW	62.5	74.0	82.2	67.9	77.6	85.3	71.5	79.4	87.2
		53.0	46.4	37.6	62.4	52.6	40.8	69.9	57.7	43.7
		4.50	4.57	4.59	4.56	4.59	4.62	4.56	4.60	4.64
95	TC SHC kW	59.6	71.1	79.8	64.7	74.9	83.2	68.7	76.6	85.1
		51.7	45.2	36.8	60.9	51.7	40.4	68.1	57.1	43.5
		5.10	5.18	5.22	5.15	5.21	5.26	5.18	5.22	5.27
105	TC SHC kW	56.0	67.3	77.0	60.9	71.6	80.3	65.5	73.4	81.9
		50.0	43.8	35.9	59.0	50.6	39.6	65.5	56.3	42.7
		5.76	5.86	5.92	5.82	5.90	5.95	5.87	5.91	5.97
115	TC SHC kW	53.2	63.9	73.6	57.8	68.0	76.6	62.8	69.8	78.5
		48.7	42.5	34.8	57.2	49.2	38.5	62.7	55.1	41.8
		6.49	6.59	6.66	6.55	6.63	6.70	6.61	6.66	6.72
125	TC SHC kW	51.0	60.1	70.1	54.6	63.7	73.1	59.8	65.9	74.5
		47.7	41.1	33.5	54.6	47.8	37.4	59.8	53.7	40.6
		7.27	7.37	7.48	7.33	7.43	7.52	7.41	7.47	7.53

48HJ012 (8 Tons)													
Temp (F) Air Ent Cond (Edb)		Evap Air — Cfm/BF											
		2550/0.015			2800/0.025			3400/0.025			4250/0.04		
		Evap Air — Ewb (F)											
		62	67	72	62	67	72	62	67	72	62	67	72
75	TC SHC kW	96.0	109.2	121.7	99.2	111.1	123.4	102.3	114.4	127.0	106.1	117.0	130.1
		81.5	69.5	56.7	86.4	72.8	58.3	96.0	79.7	62.5	105.8	89.6	68.3
		5.84	5.92	6.04	5.85	5.95	6.05	5.89	5.99	6.10	5.95	6.04	6.15
85	TC SHC kW	88.2	105.3	117.5	94.8	107.0	119.6	97.9	109.8	123.1	102.7	112.3	125.8
		78.2	68.1	55.0	84.7	71.2	57.2	94.3	78.4	61.7	102.7	88.0	67.8
		6.57	6.69	6.80	6.62	6.72	6.84	6.65	6.76	6.90	6.72	6.81	6.94
95	TC SHC kW	82.5	100.7	112.9	89.4	102.3	114.7	93.5	105.1	118.0	99.0	107.3	120.7
		75.7	66.4	53.6	82.4	69.6	55.4	92.1	76.7	60.0	99.0	86.3	65.6
		7.37	7.53	7.65	7.44	7.56	7.68	7.49	7.61	7.75	7.57	7.65	7.79
105	TC SHC kW	76.4	95.5	108.0	82.1	97.1	109.6	88.7	99.7	112.7	94.9	101.8	114.9
		72.8	64.4	51.9	79.0	67.6	53.9	88.7	74.8	58.3	94.9	84.7	64.0
		8.25	8.45	8.58	8.31	8.47	8.60	8.41	8.52	8.67	8.49	8.57	8.71
115	TC SHC kW	70.0	86.9	102.5	74.2	89.3	104.1	81.9	92.8	106.7	90.1	95.7	109.1
		69.8	61.2	50.1	74.1	64.7	51.9	81.9	72.5	56.6	90.1	82.7	62.6
		9.21	9.41	9.57	9.26	9.46	9.61	9.38	9.52	9.65	9.51	9.57	9.72
125	TC SHC kW	66.1	77.6	95.9	67.8	79.1	97.5	74.7	81.6	100.2	82.9	86.1	102.3
		66.1	57.7	48.0	67.8	61.1	50.1	74.6	68.6	54.8	82.9	79.3	60.7
		10.27	10.44	10.65	10.32	10.47	10.69	10.44	10.54	10.75	10.57	10.63	10.80

COOLING CAPACITIES (English) (cont)

48HJ014 (10 Tons)										
Temp (F) Air Ent Cond (Edb)		Evap Air — Cfm/BF								
		3150/0.13			4200/0.17			5250/0.22		
		Evap Air — Ewb (F)								
		62	67	72	62	67	72	62	67	72
75	TC SHC kW	125.1	137.3	147.5	133.0	143.5	154.1	135.4	145.9	156.4
		107.5	90.6	71.7	125.8	101.9	78.7	135.4	111.0	83.8
		9.48	9.60	9.69	9.58	9.67	9.79	9.56	9.69	9.84
85	TC SHC kW	115.4	129.6	140.9	124.4	135.9	147.3	129.6	139.0	150.3
		103.1	87.7	69.8	120.8	99.8	77.0	129.6	110.1	83.0
		10.15	10.33	10.49	10.29	10.43	10.61	10.35	10.49	10.67
95	TC SHC kW	105.5	122.0	134.4	115.8	128.2	140.4	123.8	132.0	144.1
		98.9	84.8	67.8	115.7	97.8	75.3	123.8	109.2	82.2
		10.83	11.06	11.30	11.01	11.20	11.41	11.13	11.28	11.48
105	TC SHC kW	94.1	112.2	126.9	106.5	118.9	132.4	116.6	123.2	136.4
		92.7	81.2	65.3	106.5	94.8	73.2	116.5	107.4	80.4
		11.54	11.83	12.10	11.76	11.98	12.22	11.95	12.07	12.33
115	TC SHC kW	86.9	100.4	117.9	96.5	105.3	123.7	105.9	109.9	126.6
		86.8	76.4	62.5	96.5	89.8	70.5	105.9	102.2	78.3
		12.26	12.55	12.91	12.58	12.74	13.07	12.76	12.85	13.15
125	TC SHC kW	79.9	88.5	108.8	86.4	91.7	115.0	95.4	96.7	116.8
		79.9	71.7	59.6	96.3	84.8	67.8	95.4	96.2	76.0
		13.00	13.29	13.72	13.40	14.49	13.91	13.57	13.64	13.97

LEGEND AND NOTES FOR COOLING CAPACITY TABLES (ENGLISH)

LEGEND

BF — Bypass Factor
Edb — Entering Dry Bulb Temperature (F)
Ewb — Entering Wet Bulb Temperature (F)
kW — Compressor Input (kW)
TC — Total Capacity (1000 Btuh)
SHC — Sensible Heat Capacity (1000 Btuh)

NOTES:

- Ratings are gross and do not account for the effects of the evaporator-fan motor power and heat.
- Direct interpolation is permissible. Do not extrapolate.
- SHC is based on 80 F db temperature of air entering the unit. At any other temperature, correct the SHC read from the table of cooling capacities as follows:

Corrected SHC_{Btuh}

$$= \text{SHC} + [1.10 \times (1 - \text{BF}) \times (\text{F}_{\text{db}} - 80) \times \text{cfm}]$$

Observe the rule of signs. Above 80 F, SHC correction will be positive; add it to SHC. Below 80 F, SHC correction will be negative; subtract it from SHC.

4. Formulas:

$$\text{F}_{\text{ldb}} = \text{F}_{\text{edb}} - \frac{\text{SHC}_{\text{Btuh}}}{1.09 \times \text{cfm}}$$

Leaving wet bulb = wet bulb temperature corresponding to enthalpy of air leaving coil (h_{ldb}).

$$h_{\text{ldb}} = h_{\text{ewb}} - \frac{\text{TC}_{\text{Btuh}}}{4.50 \times \text{cfm}}$$

Where h_{ewb} is enthalpy of air entering evaporator coil (Btu/lb).

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (SI)

48HJ008 (21.5 kW)																		
Airflow (L/s)	External Static Pressure (Pa)																	
	50		100		150		200		225		250		300		350		400	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1100	8.1	0.34	9.5	0.49	10.7	0.66	11.8	0.81	12.4	0.92	12.9	1.03	13.9	1.29	15.0	1.60	15.7	1.89
1150	8.4	0.39	9.7	0.53	10.9	0.71	12.0	0.89	12.5	0.98	13.0	1.08	14.0	1.34	15.1	1.68	15.9	1.92
1200	8.6	0.42	9.9	0.58	11.1	0.78	12.2	0.96	12.7	1.05	13.1	1.13	14.1	1.38	15.2	1.69	16.0	1.96
1250	8.9	0.46	10.2	0.64	11.3	0.81	12.4	1.02	12.8	1.11	13.3	1.21	14.3	1.42	15.2	1.74	16.1	2.01
1300	9.1	0.51	10.4	0.70	11.5	0.87	12.6	1.08	13.0	1.19	13.5	1.29	14.4	1.48	15.3	1.78	16.2	2.06
1350	9.4	0.56	10.7	0.75	11.7	0.93	12.7	1.14	13.2	1.25	13.7	1.37	14.5	1.56	15.4	1.81	16.3	2.09
1400	9.7	0.62	10.9	0.82	12.0	0.99	12.9	1.22	13.4	1.33	13.9	1.44	14.7	1.66	15.5	1.84	16.4	2.19
1450	10.0	0.67	11.2	0.88	12.2	1.07	13.2	1.27	13.6	1.40	14.1	1.52	14.9	1.77	15.7	1.07	16.4	2.18
1500	10.2	0.74	11.4	0.94	12.4	1.15	13.4	1.36	13.8	1.48	14.3	1.60	15.1	1.86	15.9	2.08	16.6	2.29
1550	10.5	0.80	11.7	1.02	12.7	1.23	13.6	1.44	14.0	1.56	14.2	1.68	15.3	1.94	16.1	2.21	16.8	2.43
1600	10.8	0.88	11.9	1.09	12.9	1.32	13.8	1.53	14.2	1.65	14.8	1.77	15.5	2.04	16.3	2.31	17.0	2.55
1650	11.1	0.97	12.2	1.17	13.2	1.41	14.0	1.63	14.4	1.75	14.9	1.86	15.7	2.13	16.5	2.42	17.4	2.70
1700	11.4	1.04	12.4	1.25	13.4	1.51	14.3	1.73	14.7	1.65	15.1	1.97	15.9	2.24	16.6	2.52	17.4	2.82
1750	11.7	1.12	12.7	1.35	13.7	1.61	14.5	1.85	14.9	1.97	15.3	2.08	16.1	2.35	16.8	2.64	17.6	2.94
1800	12.0	1.23	13.0	1.45	13.9	1.70	14.8	1.95	15.1	2.07	15.5	2.20	16.3	2.45	17.0	2.76	17.7	3.05
1850	12.2	1.33	13.2	1.54	14.2	1.81	15.0	2.08	15.4	2.20	15.8	2.32	16.5	2.58	17.2	2.87	17.9	3.19
1875	12.5	1.42	13.5	1.65	14.4	1.92	15.2	2.20	15.6	2.34	16.0	2.46	16.7	2.70	17.5	2.99	18.1	3.31

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum usable output power (BkW) is 2.16. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 11.7 to 15.0 r/s. All other r/s's require field-supplied drive.



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (SI) (cont)

48HJ012 (29.2 kW)																				
Airflow (L/s)	External Static Pressure (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1500	7.8	0.41	10.9	0.67	12.0	0.79	13.2	0.90	14.1	1.10	14.9	1.31	15.6	1.48	16.3	1.60	17.0	1.82	17.7	1.91
1550	8.2	0.45	11.1	0.71	12.1	0.85	13.4	0.95	14.3	1.15	15.1	1.37	15.8	1.54	16.5	1.65	17.1	1.86	17.8	2.02
1600	8.6	0.50	11.3	0.76	12.3	0.91	13.6	1.01	14.5	1.22	15.2	1.44	16.0	1.61	16.6	1.72	17.3	1.91	17.9	2.14
1650	8.9	0.56	11.5	0.81	12.5	0.96	13.8	1.08	14.7	1.27	15.4	1.50	16.1	1.68	16.8	1.79	17.4	1.97	18.1	2.19
1700	9.3	0.63	11.7	0.87	12.7	1.02	13.9	1.16	14.9	1.35	15.5	1.57	16.3	1.75	17.0	1.87	17.6	2.04	18.2	2.25
1750	9.8	0.73	11.9	0.92	12.9	1.08	14.1	1.24	15.1	1.43	15.7	1.65	16.4	1.83	17.1	1.94	17.8	2.12	18.4	2.32
1800	10.5	0.84	12.1	0.99	13.1	1.15	14.3	1.31	15.3	1.52	16.0	1.73	16.6	1.90	17.3	2.02	17.9	2.21	18.5	2.40
1850	11.3	0.90	12.5	1.07	13.5	1.24	14.5	1.42	15.5	1.63	16.4	1.82	17.3	2.01	18.0	2.17	18.6	2.30	18.9	2.38
1900	11.5	0.96	12.7	1.14	13.7	1.32	14.7	1.49	15.6	1.71	16.6	1.91	17.5	2.11	18.2	2.29	18.8	2.44	19.3	2.55
1950	11.8	1.04	12.9	1.22	13.9	1.40	14.9	1.57	15.8	1.80	16.7	2.00	17.6	2.21	18.4	2.41	19.1	2.58	19.6	2.71
2000	12.1	1.11	13.2	1.30	14.2	1.49	15.1	1.66	16.0	1.88	16.9	2.10	17.8	2.31	18.6	2.52	19.3	2.71	—	—
2050	12.3	1.19	13.4	1.38	14.4	1.59	15.3	1.75	16.2	1.97	17.1	2.20	17.9	2.42	18.7	2.64	—	—	—	—
2100	12.6	1.27	13.6	1.47	14.6	1.68	15.5	1.86	16.4	2.06	17.2	2.31	18.1	2.53	18.9	2.76	—	—	—	—
2150	12.8	1.36	13.9	1.56	14.9	1.78	15.7	1.96	16.6	2.15	17.4	2.41	18.2	2.64	—	—	—	—	—	—
2200	13.1	1.44	14.1	1.66	15.1	1.88	15.9	2.08	16.8	2.26	17.6	2.51	18.4	2.76	—	—	—	—	—	—
2250	13.4	1.53	14.4	1.76	15.3	1.99	16.2	2.19	17.0	2.37	17.8	2.61	—	—	—	—	—	—	—	—
2300	13.6	1.63	14.6	1.87	15.5	2.10	16.4	2.31	17.2	2.50	18.0	2.72	—	—	—	—	—	—	—	—
2400	13.9	1.74	14.9	1.98	15.8	2.20	16.6	2.44	17.4	2.64	—	—	—	—	—	—	—	—	—	—
2450	14.1	1.84	15.1	2.10	16.0	2.32	16.8	2.56	17.6	2.77	—	—	—	—	—	—	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 5).
2. Values include losses for filters, unit casing, and wet coils.
3. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.

4. Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
5. Motor drive range is 11.8 to 14.8 r/s. All other r/s's require field-supplied drive.

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (SI) (cont)

48HJ014 (35.9 kW)																				
Airflow (L/s)	External Static Pressure (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1900	11.5	0.96	12.7	1.14	13.7	1.32	14.7	1.49	15.6	1.71	16.6	1.91	17.5	2.11	18.2	2.29	18.9	2.44	19.3	2.55
1950	11.8	1.04	12.9	1.22	13.9	1.40	14.9	1.57	15.8	1.80	16.7	2.00	17.6	2.21	18.4	2.41	19.1	2.58	19.6	2.71
2000	12.1	1.12	13.2	1.29	14.2	1.49	15.1	1.65	16.0	1.89	16.9	2.11	17.8	2.31	18.6	2.52	19.3	2.71	19.9	2.87
2050	12.3	1.18	13.4	1.38	14.4	1.59	15.3	1.75	16.2	1.96	17.1	2.20	17.9	2.42	18.7	2.64	19.5	2.84	20.1	3.02
2100	12.6	1.27	13.6	1.46	14.6	1.68	15.5	1.86	16.4	2.05	17.2	2.30	18.1	2.53	18.9	2.76	19.6	2.97	20.3	3.17
2150	12.8	1.36	13.9	1.56	14.9	1.78	15.7	1.96	16.6	2.15	17.4	2.42	18.2	2.64	19.0	2.88	19.8	3.10	20.5	3.31
2200	13.1	1.44	14.1	1.66	15.1	1.88	16.0	2.07	16.8	2.26	17.6	2.52	18.4	2.76	19.2	2.99	20.0	3.23	20.7	3.45
2250	13.3	1.53	14.4	1.75	15.3	1.99	16.2	2.20	17.0	2.36	17.8	2.61	18.6	2.88	19.4	3.11	20.1	3.37	20.9	3.60
2300	13.6	1.63	14.6	1.87	15.5	2.10	16.4	2.30	17.2	2.50	18.0	2.71	18.8	3.00	19.5	3.26	20.3	3.49	21.0	3.75
2400	13.9	1.74	14.9	1.98	15.8	2.20	16.6	2.44	17.4	2.64	18.2	2.83	18.9	3.13	19.7	3.39	20.5	3.64	21.2	3.89
2450	14.1	1.84	15.1	2.10	16.0	2.31	16.8	2.56	17.6	2.77	18.4	2.97	19.1	3.24	19.9	3.52	20.6	3.77	—	—
2500	14.4	1.95	15.4	2.22	16.2	2.44	17.1	2.69	17.8	2.90	18.6	3.09	19.3	3.35	20.0	3.66	20.8	3.93	—	—
2550	14.7	2.07	15.6	2.34	16.5	2.56	17.3	2.83	18.1	3.05	18.8	3.25	19.5	3.49	20.2	3.81	—	—	—	—
2600	14.9	2.18	15.8	2.47	16.7	2.69	17.5	2.96	18.3	3.20	19.0	3.42	19.7	3.63	20.4	3.95	—	—	—	—
2650	15.2	2.32	16.1	2.60	16.9	2.83	17.8	3.11	18.5	3.34	19.2	3.58	19.9	3.81	—	—	—	—	—	—
2700	15.4	2.44	16.4	2.74	17.2	2.96	18.0	3.26	18.7	3.51	19.4	3.73	20.1	3.92	—	—	—	—	—	—
2750	15.7	2.57	16.6	2.89	17.4	3.11	18.5	3.38	19.0	3.67	19.7	3.91	—	—	—	—	—	—	—	—
2800	15.9	2.71	16.9	3.03	17.7	3.27	18.4	3.55	19.2	3.84	—	—	—	—	—	—	—	—	—	—
2850	16.2	2.86	17.1	3.18	17.9	3.46	18.7	3.70	—	—	—	—	—	—	—	—	—	—	—	—
2900	16.5	2.98	17.3	3.32	18.2	3.57	18.9	3.85	—	—	—	—	—	—	—	—	—	—	—	—
2950	16.7	3.11	17.6	3.46	18.4	3.72	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3000	17.0	3.25	17.8	3.60	18.7	3.87	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3050	17.3	3.38	18.1	3.74	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3100	17.5	3.52	18.3	3.89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.
4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 11.8 to 14.9 r/s. All other r/s's require field-supplied drive.



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (SI)

48HJ008 (21.5 kW)																
Airflow (L/s)	External Static Pressure (Pa)															
	50		100		150		200		250		300		350		400	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1150	8.8	0.45	10.1	0.62	11.2	0.79	12.2	0.96	13.2	1.15	14.1	1.39	15.1	1.73	15.8	1.96
1200	9.0	0.47	10.3	0.65	11.4	0.82	12.4	1.02	13.3	1.21	14.1	1.41	15.2	1.76	15.9	2.00
1275	9.3	0.53	10.5	0.70	11.6	0.89	12.6	1.08	13.5	1.28	14.3	1.46	15.3	1.76	16.1	2.17
1325	9.6	0.58	10.8	0.78	11.9	0.96	12.8	1.17	13.8	1.37	14.6	1.55	15.2	1.72	16.3	2.17
1400	9.9	0.63	11.1	0.85	12.1	1.02	13.1	1.26	14.0	1.45	14.7	1.65	15.5	1.84	16.5	2.10
1450	10.1	0.68	11.3	0.86	12.3	1.09	13.2	1.29	14.1	1.53	14.9	1.73	15.6	1.88	16.7	2.10
1500	10.4	0.78	11.5	0.96	12.6	1.18	13.5	1.38	14.4	1.61	15.2	1.84	15.8	2.04	16.4	2.18
1550	10.7	0.81	11.8	1.06	12.8	1.25	13.7	1.48	14.5	1.72	15.4	1.95	16.1	2.15	16.7	2.34
1600	11.0	0.90	12.0	1.10	13.0	1.35	14.0	1.56	14.8	1.80	15.6	2.07	16.3	2.29	17.0	2.49
1650	11.3	0.99	12.4	1.22	13.3	1.43	14.2	1.67	15.0	1.92	15.8	2.15	16.6	2.42	17.2	2.66
1700	11.5	1.06	12.6	1.30	13.6	1.54	14.4	1.78	15.2	2.01	16.0	2.27	16.7	2.56	17.5	2.80
1750	11.8	1.16	12.9	1.38	13.8	1.65	14.7	1.88	15.5	2.14	16.2	2.41	16.9	2.65	17.6	2.92
1800	12.2	1.24	13.2	1.49	14.1	1.75	14.9	2.00	15.7	2.24	16.4	2.52	17.2	2.82	—	—
1850	12.4	1.35	13.4	1.60	14.4	1.84	15.1	2.10	15.9	2.37	16.7	2.66	17.4	2.92	—	—
1900	12.8	1.47	13.7	1.70	14.6	1.97	15.4	2.24	16.2	2.51	16.9	2.78	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

- 1. Boldface** indicates field-supplied drive required (see Note 6).
-  indicates field-supplied motor and drive required.
- Values include losses for filters, unit casing, and wet coils.

- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- Maximum usable output power (BkW) is 2.16. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 11.7 to 15.0 r/s. All other r/s's require field-supplied drive.

Performance data (cont)



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (SI) (cont)

48HJ012 (29.2 kW)																				
Airflow (L/s)	External Static Pressure (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1500	9.2	0.47	10.3	0.59	11.3	0.69	12.2	0.72	12.4	0.76	12.5	0.82	13.2	0.89	13.1	1.01	14.7	1.08	15.7	1.36
1550	9.4	0.51	10.5	0.63	11.5	0.74	12.4	0.79	12.4	0.80	12.6	0.86	14.2	1.00	14.7	1.07	15.5	1.34	16.1	1.61
1600	9.7	0.56	10.8	0.69	11.7	0.79	12.6	0.85	12.8	0.96	13.0	1.00	14.9	1.08	16.1	1.35	16.3	1.60	16.4	1.77
1650	9.9	0.61	11.0	0.74	11.9	0.86	12.8	0.95	12.9	1.01	13.5	1.04	16.0	1.32	16.5	1.53	16.6	1.76	17.0	1.92
1700	10.2	0.67	11.2	0.80	12.1	0.91	13.0	1.05	13.4	1.11	13.8	1.20	16.5	1.55	16.9	1.80	17.1	1.95	17.4	2.02
1750	10.4	0.72	11.5	0.86	12.4	0.98	13.2	1.11	14.0	1.22	14.3	1.37	16.8	1.82	17.1	1.95	17.9	2.04	18.3	2.16
1800	10.7	0.78	11.7	0.92	12.6	1.06	13.4	1.18	14.2	1.40	14.9	1.65	17.1	1.91	17.7	2.06	18.3	2.16	18.7	2.30
1850	12.2	1.02	13.2	1.18	14.1	1.34	15.0	1.54	15.9	1.72	16.8	1.91	17.7	2.10	18.5	2.28	19.2	2.45	19.8	2.59
1900	12.5	1.10	13.5	1.27	14.4	1.42	15.3	1.63	16.1	1.81	17.0	2.00	17.9	2.21	18.7	2.39	19.4	2.58	20.1	2.74
1950	12.7	1.18	13.7	1.36	14.6	1.52	15.5	1.72	16.4	1.92	17.2	2.11	18.0	2.31	18.8	2.51	19.6	2.71	20.3	2.88
2000	13.0	1.27	14.0	1.46	14.9	1.62	15.7	1.81	16.6	2.03	17.4	2.22	18.2	2.43	19.0	2.63	19.8	2.84	20.5	3.02
2050	13.3	1.36	14.3	1.56	15.1	1.73	16.0	1.91	16.8	2.14	17.6	2.33	18.4	2.54	19.2	2.76	19.9	2.97	20.6	3.17
2100	13.6	1.46	14.5	1.67	15.4	1.84	16.2	2.02	17.0	2.25	17.8	2.46	18.6	2.66	19.3	2.89	20.1	3.10	20.8	3.32
2150	13.9	1.56	14.8	1.78	15.7	1.95	16.5	2.13	17.3	2.37	18.0	2.59	18.8	2.79	19.5	3.02	20.3	3.24	21.0	3.46
2250	14.2	1.67	15.1	1.89	15.9	2.07	16.7	2.24	17.5	2.48	18.2	2.72	19.0	2.92	19.7	3.15	20.4	3.38	21.2	3.61
2300	14.5	1.78	15.4	2.01	16.2	2.19	17.0	2.37	17.7	2.60	18.5	2.85	19.2	3.06	19.9	3.29	20.6	3.52	21.3	3.76
2350	14.8	1.90	15.7	2.13	16.4	2.32	17.2	2.51	18.0	2.72	18.7	2.99	19.4	3.21	20.1	3.44	20.8	3.67	21.5	3.92
2400	15.1	2.02	15.9	2.25	16.7	2.46	17.5	2.65	18.2	2.85	18.9	3.13	19.6	3.37	20.3	3.59	21.0	3.83	—	—
2450	15.4	2.15	16.2	2.38	17.0	2.60	17.7	2.80	18.5	2.99	19.2	3.26	19.8	3.52	20.5	3.75	21.2	3.99	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 11.8 to 14.8 r/s. All other r/s's require field-supplied drive.

FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (SI) (cont)

48HJ014 (35.9 kW)

Airflow (L/s)	External Static Pressure (Pa)																			
	50		100		150		200		250		300		350		400		450		500	
	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW	R/s	BkW
1900	12.5	1.10	13.5	1.27	14.4	1.42	15.3	1.63	16.1	1.81	17.0	2.00	17.9	2.21	18.7	2.39	19.4	2.58	20.1	2.74
1950	12.7	1.18	13.7	1.36	14.6	1.52	15.5	1.73	16.4	1.92	17.2	2.11	18.0	2.31	18.8	2.51	19.6	2.71	20.3	2.88
2000	13.0	1.27	14.0	1.46	14.9	1.62	15.7	1.81	16.6	2.02	17.4	2.22	18.2	2.43	19.0	2.63	19.8	2.84	20.5	3.02
2050	13.3	1.36	14.3	1.56	15.1	1.72	16.0	1.91	16.8	2.14	17.6	2.33	18.4	2.54	19.2	2.76	19.9	2.97	20.7	3.17
2100	13.6	1.46	14.5	1.66	15.4	1.84	16.2	2.01	17.0	2.25	17.8	2.45	18.6	2.66	19.3	2.89	20.1	3.10	20.8	3.32
2200	13.9	1.56	14.8	1.78	15.7	1.95	16.5	2.13	17.3	2.37	18.0	2.59	18.8	2.79	19.5	3.01	20.3	3.24	21.0	3.46
2250	14.2	1.67	15.1	1.89	15.9	2.07	16.7	2.24	17.5	2.48	18.2	2.71	19.0	2.93	19.7	3.15	20.4	3.37	21.2	3.60
2300	14.5	1.78	15.4	2.00	16.2	2.19	17.0	2.37	17.7	2.60	18.5	2.85	19.2	3.05	19.9	3.29	20.6	3.52	21.3	3.76
2350	14.8	1.89	15.7	2.13	16.4	2.32	17.2	2.51	18.0	2.72	18.7	2.99	19.4	3.21	20.1	3.43	20.8	3.67	21.5	3.92
2400	15.0	2.01	15.9	2.25	16.7	2.46	17.5	2.64	18.2	2.85	18.9	3.12	19.6	3.36	20.3	3.59	21.0	3.82	21.7	4.08
2450	15.4	2.16	16.2	2.38	17.0	2.60	17.7	2.79	18.5	2.99	19.2	3.27	19.8	3.53	20.5	3.74	21.2	3.99	—	—
2500	15.7	2.28	16.5	2.52	17.3	2.75	18.0	2.95	18.7	3.13	19.4	3.38	20.1	3.67	20.7	3.93	21.4	4.15	—	—
2550	15.9	2.43	16.8	2.65	17.5	2.90	18.2	3.10	18.9	3.29	19.6	3.54	20.3	3.83	21.0	4.09	21.6	4.33	—	—
2600	16.2	2.58	17.1	2.81	17.8	3.05	18.5	3.26	19.2	3.47	19.9	3.69	20.5	4.01	21.2	4.27	—	—	—	—
2650	16.5	2.72	17.3	2.95	18.1	3.22	18.8	3.43	19.4	3.64	20.1	3.86	20.8	4.16	21.4	4.44	—	—	—	—
2700	16.8	2.89	17.6	3.12	18.4	3.39	19.0	3.60	19.7	3.83	20.4	4.03	21.0	4.32	—	—	—	—	—	—
2750	17.1	3.05	17.9	3.28	18.7	3.56	19.3	3.80	20.0	4.01	20.6	4.21	—	—	—	—	—	—	—	—
2800	17.4	3.21	18.2	3.45	18.9	3.74	19.6	3.98	20.2	4.19	20.9	4.40	—	—	—	—	—	—	—	—
2850	17.7	3.40	18.5	3.64	19.2	3.93	19.9	4.18	20.5	4.41	—	—	—	—	—	—	—	—	—	—
2900	18.0	3.57	18.8	3.81	19.5	4.11	20.2	4.37	—	—	—	—	—	—	—	—	—	—	—	—
2950	18.3	3.76	19.1	4.02	19.8	4.29	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3000	18.6	3.96	19.4	4.21	20.1	4.51	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3050	18.9	4.15	19.6	4.40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3100	19.2	4.38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

BkW — Fan Input kW x Motor Efficiency
R/s — Revolutions per Second of Blower Wheel

NOTES:

- Boldface** indicates field-supplied drive required (see Note 6).
- indicates field-supplied motor and drive required.
- Values include losses for filters, unit casing, and wet coils.
- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- Maximum usable output power (BkW) is 2.76. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using your fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 11.8 to 14.9 r/s. All other r/s's require field-supplied drive.

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (ENGLISH)

48HJ008 (6.5 Tons)																		
Airflow (Cfm)	External Static Pressure (in. wg)																	
	0.2		0.4		0.6		0.8		0.9		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
2200	499	0.50	580	0.70	652	0.94	717	1.17	748	1.30	779	1.43	839	1.78	905	2.21	951	2.57
2250	507	0.53	586	0.73	658	0.97	722	1.22	752	1.34	783	1.46	843	1.81	908	2.25	955	2.59
2300	513	0.55	592	0.76	663	1.00	727	1.26	756	1.38	786	1.49	846	1.84	910	2.25	959	2.61
2400	528	0.60	606	0.83	674	1.06	738	1.34	766	1.46	795	1.58	853	1.88	912	2.31	967	2.68
2500	542	0.66	619	0.90	686	1.13	748	1.41	777	1.55	806	1.68	859	1.94	919	2.37	971	2.73
2550	550	0.69	627	0.94	692	1.17	754	1.45	783	1.60	812	1.74	864	1.99	920	2.39	974	2.76
2600	557	0.72	634	0.97	698	1.21	759	1.49	787	1.64	816	1.79	868	2.04	921	2.41	976	2.78
2700	573	0.79	648	1.05	711	1.29	770	1.58	798	1.73	827	1.88	878	2.16	928	2.45	983	2.88
2800	588	0.86	662	1.13	723	1.38	782	1.66	809	1.82	837	1.98	889	2.29	937	2.57	986	2.91
2900	604	0.94	676	1.21	737	1.48	794	1.76	821	1.92	848	2.08	900	2.41	947	2.70	993	3.01
3000	620	1.02	690	1.30	750	1.58	806	1.86	832	2.02	849	2.18	910	2.52	958	2.85	1002	3.15
3100	636	1.11	704	1.39	764	1.69	818	1.97	844	2.13	870	2.29	920	2.64	968	2.99	1012	3.30
3200	652	1.21	718	1.49	778	1.80	831	2.09	856	2.25	882	2.40	931	2.76	979	3.13	1023	3.47
3300	668	1.31	732	1.59	793	1.92	844	2.21	869	2.37	894	2.53	942	2.89	989	3.26	1034	3.63
3400	684	1.41	747	1.70	807	2.04	857	2.35	882	2.51	907	2.66	954	3.02	1000	3.40	1044	3.79
3500	701	1.53	762	1.82	821	2.16	871	2.48	895	2.64	919	2.80	966	3.15	1011	3.55	1054	3.94
3600	717	1.65	777	1.94	835	2.29	885	2.63	908	2.79	932	2.95	978	3.30	1022	3.69	1065	4.10
3700	733	1.77	792	2.07	849	2.42	899	2.78	922	2.95	945	3.11	990	3.45	1034	3.84	1076	4.26
3750	742	1.84	800	2.14	856	2.49	907	2.86	929	3.03	952	3.20	997	3.54	1040	3.93	1082	5.27

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 2.9. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 697 to 900 rpm. All other rpm's require field-supplied drive.



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (ENGLISH) (cont)

48HJ012 (8 Tons)																				
Airflow (Cfm)	External Static Pressure (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3000	478	0.57	658	0.92	721	1.08	796	1.23	851	1.50	898	1.78	942	2.01	983	2.17	1023	2.46	1063	2.61
3100	500	0.62	669	0.97	731	1.16	808	1.30	861	1.57	907	1.86	951	2.09	992	2.24	1031	2.51	1070	2.75
3200	519	0.69	680	1.03	741	1.23	818	1.38	873	1.65	916	1.95	960	2.18	1000	2.32	1039	2.58	1077	2.88
3300	537	0.77	692	1.10	751	1.30	828	1.47	884	1.72	925	2.03	969	2.27	1009	2.41	1048	2.66	1086	2.95
3400	561	0.86	704	1.17	761	1.37	837	1.57	896	1.82	934	2.12	978	2.36	1018	2.51	1057	2.75	1094	3.02
3500	592	0.98	715	1.24	773	1.45	847	1.66	907	1.92	945	2.22	987	2.46	1027	2.60	1066	2.85	1102	3.12
3600	632	1.12	727	1.32	784	1.54	857	1.76	917	2.03	957	2.32	996	2.55	1036	2.71	1075	2.96	1111	3.22
3700	677	1.20	748	1.43	810	1.65	869	1.89	928	2.17	984	2.43	1036	2.68	1080	2.90	1114	3.07	1135	3.17
3800	691	1.28	761	1.52	822	1.75	880	1.98	937	2.28	993	2.55	1046	2.81	1092	3.05	1129	3.25	1156	3.39
3900	705	1.37	773	1.62	834	1.86	891	2.08	947	2.39	1002	2.66	1055	2.94	1102	3.20	1143	3.42	1174	3.59
4000	720	1.47	786	1.71	847	1.97	902	2.19	957	2.50	1011	2.79	1064	3.07	1112	3.34	1156	3.59	1190	3.80
4100	734	1.56	800	1.82	860	2.09	914	2.31	967	2.60	1021	2.91	1072	3.20	1121	3.49	1165	3.76	1203	3.99
4200	749	1.66	813	1.92	873	2.21	926	2.44	978	2.71	1030	3.04	1081	3.34	1130	3.64	1175	3.92	1215	4.18
4300	764	1.77	826	2.04	886	2.33	938	2.57	989	2.83	1040	3.18	1090	3.48	1139	3.79	1185	4.08	1226	4.36
4400	779	1.88	840	2.16	899	2.46	951	2.71	1000	2.96	1050	3.31	1100	3.63	1148	3.94	1194	4.25	1236	4.54
4500	793	1.99	854	2.28	912	2.59	963	2.86	1012	3.09	1061	3.43	1109	3.78	1157	4.09	1203	4.42	1246	4.72
4600	808	2.11	868	2.42	925	2.73	975	3.00	1024	3.25	1071	3.56	1119	3.93	1166	4.26	1212	4.58	1255	4.91
4700	822	2.24	882	2.56	937	2.86	988	3.16	1036	3.42	1082	3.70	1129	4.09	1175	4.43	1221	4.76	1264	5.09
4800	837	2.37	896	2.71	950	3.00	1001	3.32	1048	3.59	1093	3.86	1139	4.24	1185	4.60	1230	4.93	1273	5.28
4900	852	2.51	910	2.86	963	3.15	1014	3.48	1060	3.76	1105	4.02	1150	4.38	1194	4.77	1239	5.12	1282	5.47
5000	867	2.65	924	3.01	977	3.30	1027	3.65	1073	3.94	1117	4.20	1161	4.54	1204	4.95	1248	5.31	1291	5.66

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

- Boldface** indicates field-supplied drive required (see Note 6).
- indicates field-supplied motor and drive required.
- Values include losses for filters, unit casing, and wet coils.
- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.

Performance data (cont)



FAN PERFORMANCE — HORIZONTAL DISCHARGE UNITS (ENGLISH) (cont)

48HJ014 (10 Tons)																				
Airflow (Cfm)	External Static Pressure (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3700	677	1.20	748	1.43	810	1.65	869	1.89	928	2.17	984	2.43	1036	2.68	1080	2.90	1114	3.07	1135	3.17
3800	691	1.28	761	1.52	822	1.75	880	1.98	937	2.28	993	2.55	1046	2.81	1092	3.05	1129	3.25	1156	3.39
3900	705	1.37	773	1.62	834	1.86	891	2.08	947	2.39	1002	2.66	1055	2.94	1102	3.20	1143	3.42	1174	3.59
4000	720	1.47	786	1.71	847	1.97	902	2.19	957	2.50	1011	2.79	1064	3.07	1112	3.34	1155	3.59	1190	3.80
4100	734	1.56	800	1.82	860	2.09	914	2.31	967	2.60	1021	2.91	1072	3.20	1121	3.49	1165	3.76	1203	3.99
4200	749	1.66	813	1.92	873	2.21	926	2.44	978	2.71	1030	3.04	1081	3.34	1130	3.64	1175	3.92	1215	4.18
4300	764	1.77	826	2.04	886	2.33	938	2.57	989	2.83	1040	3.18	1090	3.48	1139	3.79	1185	4.08	1226	4.36
4400	779	1.88	840	2.16	899	2.46	951	2.71	1000	2.96	1050	3.31	1100	3.63	1148	3.94	1194	4.25	1236	4.54
4500	793	1.99	854	2.28	912	2.59	963	2.86	1012	3.09	1061	3.43	1109	3.78	1157	4.09	1203	4.42	1246	4.72
4600	808	2.11	868	2.42	925	2.73	975	3.00	1024	3.25	1071	3.56	1119	3.93	1166	4.26	1212	4.58	1255	4.91
4700	822	2.24	882	2.56	937	2.86	988	3.16	1036	3.42	1082	3.70	1129	4.09	1175	4.43	1221	4.76	1264	5.09
4800	837	2.37	896	2.71	950	3.00	1001	3.32	1048	3.59	1093	3.86	1139	4.24	1185	4.60	1230	4.93	1273	5.28
4900	852	2.51	910	2.86	963	3.15	1014	3.48	1060	3.76	1105	4.02	1150	4.38	1194	4.77	1239	5.12	1282	5.47
5000	867	2.65	924	3.01	977	3.30	1027	3.65	1073	3.94	1117	4.20	1161	4.54	1204	4.95	1248	5.31	1291	5.66
5100	882	2.79	938	3.17	990	3.46	1040	3.82	1085	4.12	1129	4.40	1172	4.71	1214	5.13	1257	5.61	—	—
5200	896	2.95	952	3.33	1003	3.63	1053	4.00	1098	4.30	1141	4.60	1183	4.91	1225	5.29	1267	5.70	—	—
5300	911	3.11	967	3.50	1017	3.80	1066	4.18	1111	4.50	1153	4.80	1194	5.08	1236	5.47	—	—	—	—
5400	926	3.27	981	3.68	1030	3.98	1079	4.35	1124	4.70	1166	5.01	1206	5.29	1247	5.65	—	—	—	—
5500	940	3.44	995	3.86	1044	4.17	1092	4.54	1137	4.91	1178	5.22	1218	5.52	—	—	—	—	—	—
5600	955	3.62	1010	4.04	1058	4.38	1105	4.73	1150	5.12	1190	5.44	1230	5.75	—	—	—	—	—	—
5700	970	3.80	1024	4.23	1072	4.59	1118	4.93	1163	5.34	1203	5.67	—	—	—	—	—	—	—	—
5800	985	3.99	1039	4.42	1086	4.80	1131	5.14	1176	5.56	—	—	—	—	—	—	—	—	—	—
5900	1000	4.18	1053	4.62	1100	5.02	1144	5.36	—	—	—	—	—	—	—	—	—	—	—	—
6000	1015	4.39	1068	4.83	1114	5.25	1158	5.58	—	—	—	—	—	—	—	—	—	—	—	—
6100	1030	4.59	1083	5.04	1128	5.48	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	1046	4.81	1097	5.26	1142	5.71	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

1. **Boldface** indicates field-supplied drive required (see Note 6).
2. indicates field-supplied motor and drive required.
3. Values include losses for filters, unit casing, and wet coils.

4. Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
5. Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
6. Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (ENGLISH)

48HJ008 (6.5 Tons)																
Airflow (Cfm)	External Static Pressure (in. wg)															
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
2200	506	0.52	586	0.72	656	0.95	718	1.18	776	1.43	838	1.78	898	2.21	935	2.58
2250	514	0.55	593	0.76	662	0.99	724	1.22	781	1.78	841	1.81	902	2.25	939	2.60
2300	521	0.57	600	0.79	668	1.02	730	1.26	786	1.50	843	1.83	905	2.28	943	2.62
2400	536	0.63	613	0.85	680	1.09	741	1.34	796	1.59	849	1.88	910	2.31	952	2.74
2500	551	0.69	626	0.93	693	1.17	753	1.43	808	1.69	859	1.96	912	2.31	963	2.81
2550	559	0.72	634	0.97	700	1.21	759	1.48	814	1.74	864	2.01	915	2.34	968	2.81
2600	567	0.75	641	1.00	706	1.25	764	1.52	819	1.79	869	2.06	918	2.37	973	2.81
2700	582	0.83	655	1.08	719	1.34	776	1.61	831	1.89	880	2.17	927	2.47	976	2.84
2800	598	0.90	670	1.17	732	1.43	789	1.71	842	2.00	892	2.29	938	2.58	983	2.92
2900	614	0.98	684	1.25	745	1.53	802	1.81	854	2.11	903	2.42	949	2.71	993	3.03
3000	630	1.07	699	1.35	759	1.63	815	1.92	866	2.23	915	2.54	961	2.85	1003	3.17
3100	646	1.16	714	1.45	773	1.74	828	2.04	878	2.35	926	2.67	972	3.00	1015	3.32
3200	662	1.26	729	1.55	787	1.86	841	2.16	891	2.48	938	2.81	983	3.14	1026	3.47
3300	679	1.36	744	1.66	801	1.98	854	2.29	904	2.61	950	2.95	995	3.30	—	—
3400	695	1.47	759	1.78	816	2.10	867	2.42	917	2.75	963	3.10	1007	3.45	—	—
3500	712	1.59	774	1.90	830	2.23	881	2.56	930	2.90	976	3.25	—	—	—	—
3600	729	1.71	790	2.03	845	2.37	895	2.71	943	3.05	988	3.41	—	—	—	—
3700	745	1.84	805	2.17	860	2.52	909	2.87	956	3.22	—	—	—	—	—	—
3750	754	1.91	813	2.24	868	2.59	917	2.95	963	3.30	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

- Boldface** indicates field-supplied drive required (see Note 6).
- indicates field-supplied motor and drive required.
- Values include losses for filters, unit casing, and wet coils.

- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- Maximum continuous bhp is 2.9. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 697 to 900 rpm. All other rpm's require field-supplied drive.

Performance data (cont)



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (ENGLISH) (cont)

48HJ012 (8 Tons)																				
Airflow (Cfm)	External Static Pressure (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3000	556	0.65	624	0.81	682	0.95	737	0.99	745	1.04	750	1.12	809	1.24	815	1.40	899	1.56	950	1.92
3100	569	0.70	636	0.87	693	1.01	748	1.08	755	1.12	757	1.20	862	1.38	903	1.53	943	1.88	971	2.21
3200	583	0.76	649	0.94	705	1.08	758	1.17	787	1.30	819	1.36	905	1.52	971	1.86	982	2.19	992	2.41
3300	597	0.83	662	1.00	717	1.16	770	1.29	815	1.37	830	1.43	965	1.82	991	2.10	1000	2.40	1025	2.59
3400	611	0.90	675	1.08	730	1.23	781	1.41	830	1.50	840	1.63	992	2.11	1015	2.43	1030	2.62	1050	2.72
3500	625	0.97	688	1.15	742	1.32	792	1.49	840	1.64	860	1.85	1011	2.45	1028	2.62	1072	2.74	1099	2.90
3600	639	1.04	701	1.23	755	1.41	803	1.57	850	1.87	890	2.21	1026	2.55	1063	2.75	1095	2.89	1119	3.08
3700	729	1.36	790	1.58	847	1.79	902	2.06	955	2.29	1008	2.55	1060	2.80	1108	3.05	1152	3.27	1190	3.46
3800	745	1.46	805	1.69	861	1.89	915	2.17	967	2.41	1019	2.67	1070	2.94	1118	3.19	1163	3.44	1203	3.65
3900	761	1.56	820	1.80	875	2.01	928	2.29	979	2.56	1029	2.80	1079	3.07	1128	3.34	1173	3.60	1214	3.83
4000	777	1.67	836	1.92	889	2.14	941	2.40	991	2.68	1040	2.94	1089	3.22	1137	3.49	1183	3.76	1225	4.00
4100	793	1.79	851	2.05	904	2.27	955	2.52	1004	2.82	1052	3.08	1100	3.36	1147	3.65	1193	3.93	1236	4.19
4200	810	1.91	867	2.18	918	2.41	968	2.65	1017	2.96	1064	3.23	1110	3.51	1157	3.81	1202	4.09	1245	4.38
4300	826	2.04	883	2.32	933	2.55	982	2.79	1030	3.11	1076	3.40	1121	3.67	1167	3.97	1212	4.27	1255	4.56
4400	842	2.17	898	2.46	948	2.70	996	2.93	1043	3.25	1088	3.56	1133	3.84	1178	4.14	1222	4.44	1265	4.74
4500	859	2.31	914	2.60	962	2.85	1010	3.09	1056	3.40	1101	3.73	1144	4.00	1188	4.31	1232	4.62	1274	4.93
4600	876	2.45	930	2.76	977	3.01	1024	3.26	1070	3.55	1114	3.90	1157	4.19	1199	4.49	1242	4.81	1284	5.13
4700	892	2.60	945	2.91	992	3.18	1039	3.43	1083	3.71	1126	4.07	1169	4.38	1210	4.68	1262	5.00	1294	5.33
4800	909	2.77	961	3.07	1008	3.36	1053	3.61	1097	3.88	1140	4.25	1181	4.58	1222	4.87	1263	5.20	—	—
4900	926	2.93	977	3.24	1024	3.54	1068	3.80	1111	4.06	1153	4.41	1194	4.77	1234	5.09	1274	5.40	—	—
5000	942	3.11	993	3.41	1039	3.73	1080	3.99	1125	4.26	1166	4.59	1207	4.97	1247	5.30	1286	5.62	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

- Boldface** indicates field-supplied drive required (see Note 6).
- indicates field-supplied motor and drive required.
- Values include losses for filters, unit casing, and wet coils.
- Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.



FAN PERFORMANCE — VERTICAL DISCHARGE UNITS (ENGLISH) (cont)

48HJ014 (10 Tons)																				
Airflow (Cfm)	External Static Pressure (in. wg)																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp	Rpm	Bhp
3700	729	1.36	790	1.58	847	1.79	902	2.06	955	2.29	1008	2.55	1060	2.80	1108	3.05	1152	3.27	1190	3.46
3800	745	1.46	805	1.69	861	1.89	915	2.17	967	2.41	1019	2.67	1070	2.94	1118	3.19	1163	3.44	1203	3.65
3900	761	1.56	820	1.80	875	2.01	928	2.29	979	2.55	1029	2.80	1079	3.07	1128	3.34	1173	3.60	1214	3.83
4000	777	1.67	836	1.92	889	2.14	941	2.40	991	2.68	1040	2.94	1089	3.22	1137	3.49	1183	3.76	1225	4.00
4100	793	1.79	851	2.05	904	2.27	955	2.52	1004	2.82	1052	3.08	1100	3.36	1147	3.65	1193	3.93	1236	4.19
4200	810	1.91	867	2.18	918	2.41	968	2.65	1017	2.96	1064	3.23	1110	3.51	1157	3.81	1202	4.09	1245	4.38
4300	826	2.04	883	2.32	933	2.55	982	2.79	1030	3.11	1076	3.40	1121	3.67	1167	3.97	1212	4.27	1255	4.56
4400	842	2.17	898	2.46	948	2.70	996	2.93	1043	3.25	1088	3.56	1133	3.84	1178	4.14	1222	4.44	1265	4.74
4500	859	2.31	914	2.60	962	2.85	1010	3.09	1056	3.40	1101	3.73	1144	4.00	1188	4.31	1232	4.62	1274	4.93
4600	876	2.45	930	2.76	977	3.01	1024	3.26	1070	3.56	1114	3.90	1157	4.19	1199	4.49	1242	4.81	1284	5.13
4700	892	2.60	945	2.91	992	3.18	1039	3.43	1083	3.71	1126	4.07	1169	4.38	1210	4.68	1252	5.00	1294	5.33
4800	909	2.77	961	3.07	1008	3.36	1053	3.61	1097	3.88	1140	4.25	1181	4.58	1222	4.87	1263	5.20	—	—
4900	926	2.93	977	3.24	1024	3.54	1068	3.80	1111	4.06	1153	4.41	1194	4.77	1234	5.09	1274	5.40	—	—
5000	942	3.11	993	3.41	1039	3.73	1080	3.99	1125	4.25	1166	4.59	1207	4.97	1247	5.30	1286	5.62	—	—
5100	959	3.29	1009	3.60	1056	3.92	1097	4.19	1139	4.46	1180	4.78	1220	5.18	1259	5.52	—	—	—	—
5200	976	3.47	1025	3.78	1071	4.12	1112	4.40	1153	4.67	1194	4.98	1233	5.38	1272	5.74	—	—	—	—
5300	993	3.67	1041	3.98	1086	4.33	1127	4.61	1168	4.90	1208	5.19	1246	5.58	—	—	—	—	—	—
5400	1010	3.87	1057	4.18	1102	4.54	1142	4.84	1182	5.13	1221	5.41	—	—	—	—	—	—	—	—
5500	1027	4.07	1073	4.39	1118	4.76	1157	5.07	1197	5.36	1235	5.64	—	—	—	—	—	—	—	—
5600	1043	4.29	1090	4.61	1133	4.99	1173	5.31	1211	5.61	—	—	—	—	—	—	—	—	—	—
5700	1060	4.51	1106	4.83	1149	5.22	1189	5.55	—	—	—	—	—	—	—	—	—	—	—	—
5800	1077	4.74	1122	5.07	1165	5.46	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5900	1094	4.98	1139	5.31	1181	5.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6000	1111	5.22	1155	5.55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6100	1128	5.48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6200	1145	5.74	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LEGEND

Bhp — Brake Horsepower at Motor Shaft
Rpm — Revolutions per Minute of Blower Wheel

NOTES:

- 1. Boldface** indicates field-supplied drive required (see Note 6).
- 2.** indicates field-supplied motor and drive required.
- 3.** Values include losses for filters, unit casing, and wet coils.

- 4.** Use of a field-supplied motor may affect wire sizing. Contact a Carrier representative to verify.
- 5.** Maximum continuous bhp is 3.7. Extensive motor and electrical testing on these units ensures that the full range of the motor can be utilized with confidence. Using the fan motors up to the ratings shown will not result in nuisance tripping or premature motor failure. Unit warranty will not be affected.
- 6.** Motor drive range is 713 to 896 rpm. All other rpm's require field-supplied drive.

Performance data (cont)



FAN R/s AT FAN PULLEY SETTINGS, 48HJ008-014 (SI)

UNIT 48HJ	MOTOR/DRIVE	MOTOR PULLEY TURNS OPEN										
		0	½	1	1½	2	2½	3	3½	4	4½	5
008	Std	15.0	14.5	14.1	13.8	13.5	13.2	12.9	12.6	12.3	12.0	11.7
012	Std	14.8	14.5	14.1	13.8	13.5	13.2	12.9	12.6	12.3	12.0	11.8
014	Std	14.9	14.5	14.2	13.9	13.6	13.3	13.0	12.7	12.4	12.1	11.8

FAN RPM AT FAN PULLEY SETTINGS, 48HJ008-014 (English)

UNIT 48HJ	MOTOR/DRIVE	MOTOR PULLEY TURNS OPEN										
		0	½	1	1½	2	2½	3	3½	4	4½	5
008	Std	900	878	859	839	818	798	778	758	737	717	697
012	Std	896	878	859	841	823	804	786	768	749	731	713
014	Std	896	878	859	841	823	804	786	768	749	731	713

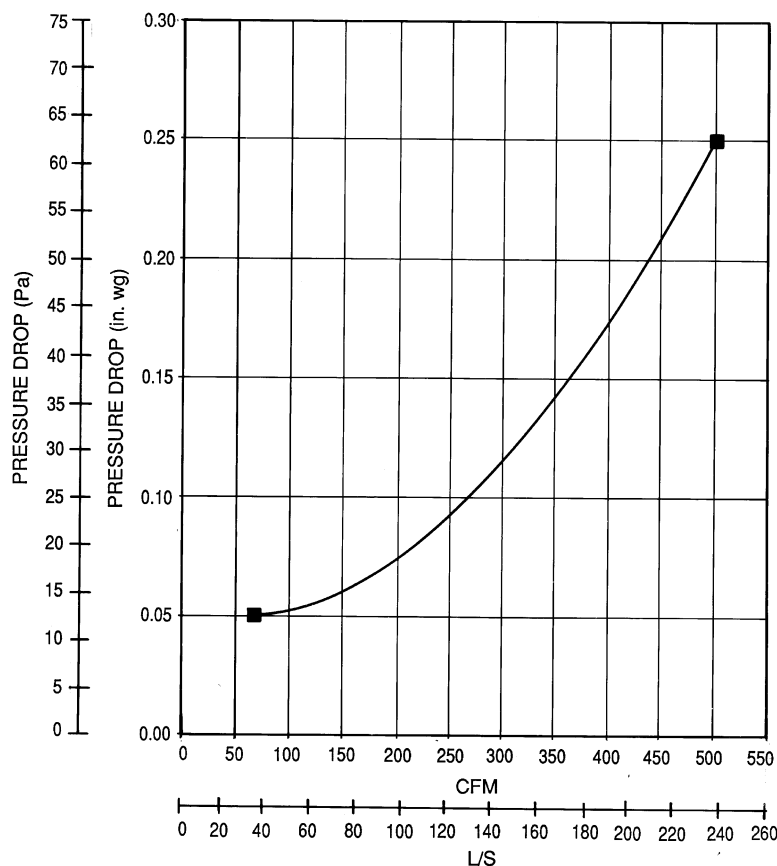
ACCESSORY/FIOP STATIC PRESSURE DROP (Pa), 48HJ008-014

COMPONENT	L/s									
	1040	1180	1415	1650	1890	2125	2360	2595	2830	
Durablade Economizer	5.0	5.0	7.5	10.0	12.5	15.0	17.4	19.9	22.4	

ACCESSORY/FIOP STATIC PRESSURE DROP (in. wg), 48HJ008-014

COMPONENT	CFM									
	2200	2500	3000	3500	4000	4500	5000	5500	6000	
Durablade Economizer	.02	.02	.03	.04	.05	.06	.07	.08	.09	

DURABLADE ECONOMIZER DAMPER BAROMETRIC RELIEF DAMPER CHARACTERISTICS



EVAPORATOR-FAN MOTOR EFFICIENCY

MOTOR	EFFICIENCY
48HJ008	80
48HJ012	85
48HJ014	87

NOTE: Convert bhp to watts using the following formula:

$$\text{Watts} = \frac{746 \times \text{Bhp}}{\text{Motor Efficiency}}$$

SOUND POWER (TOTAL UNIT)

48HJ	SOUND RATING	OCTAVE BANDS							
		63	125	250	500	1000	2000	4000	8000
008	7.8 Bels	55.0	67.5	70.5	71.6	70.5	68.4	63.2	58.7
012	8.0 Bels	60.4	66.6	68.4	73.4	73.8	71.2	67.7	62.3
014	8.8 Bels	59.6	66.4	79.3	82.9	78.7	76.4	73.4	68.8

Bels — Sound Levels (1 bel = 10 decibels)

Electrical data



UNIT 48HJ	NOMINAL VOLTAGE (50 Hz)	VOLTAGE RANGE		COMPR (Each)		OFM (Each)	IFM	POWER SUPPLY		DISCONNECT SIZE*	
		Min	Max	RLA	LRA	FLA	FLA	MCA	MOCPT†	FLA	LRA
008	400 (3-phase)	360	440	6.4	44.0	0.6	3.4	19.0	25	20	121
012	400 (3-phase)	360	440	10.0	62.0	0.6	4.8	28.5	35	30	170
014	400 (3-phase)	360	440	12.9	72.0	0.6	4.8	35.0	40	37	190

LEGEND

FLA	—	Full Load Amps
HACR	—	Heating, Air Conditioning and Refrigeration
IFM	—	Indoor (Evaporator) Fan Motor
LRA	—	Locked Rotor Amps
MCA	—	Minimum Circuit Amps
MOCPT	—	Maximum Overcurrent Protection
OFM	—	Outdoor (Condenser) Fan Motor
RLA	—	Rated Load Amps

*Used to determine minimum disconnect size per NEC (U.S.A. standard).

†Fuse or HACR circuit breaker.

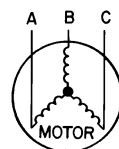
NOTES:

1. MCA and MOCPT values are calculated in accordance with NEC (National Electric Code) (U.S.A. standard), Article 440.
2. Motor RLA and FLA values are established in accordance with UL (Underwriters' Laboratories) Standard 465 (U.S.A. standard).
3. **Unbalanced 3-Phase Supply Voltage**
Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

% Voltage Imbalance

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

EXAMPLE: Supply voltage is 400-3-50.



AB = 393 v

BC = 403 v

AC = 396 v

$$\text{Average Voltage} = \frac{393 + 403 + 396}{3}$$

$$= \frac{1192}{3}$$

$$= 397$$

Determine maximum deviation from average voltage.

$$(AB) 397 - 393 = 4 \text{ v}$$

$$(BC) 403 - 397 = 6 \text{ v}$$

$$(AC) 397 - 396 = 1 \text{ v}$$

Maximum deviation is 6 v.

Determine percentage of voltage imbalance.

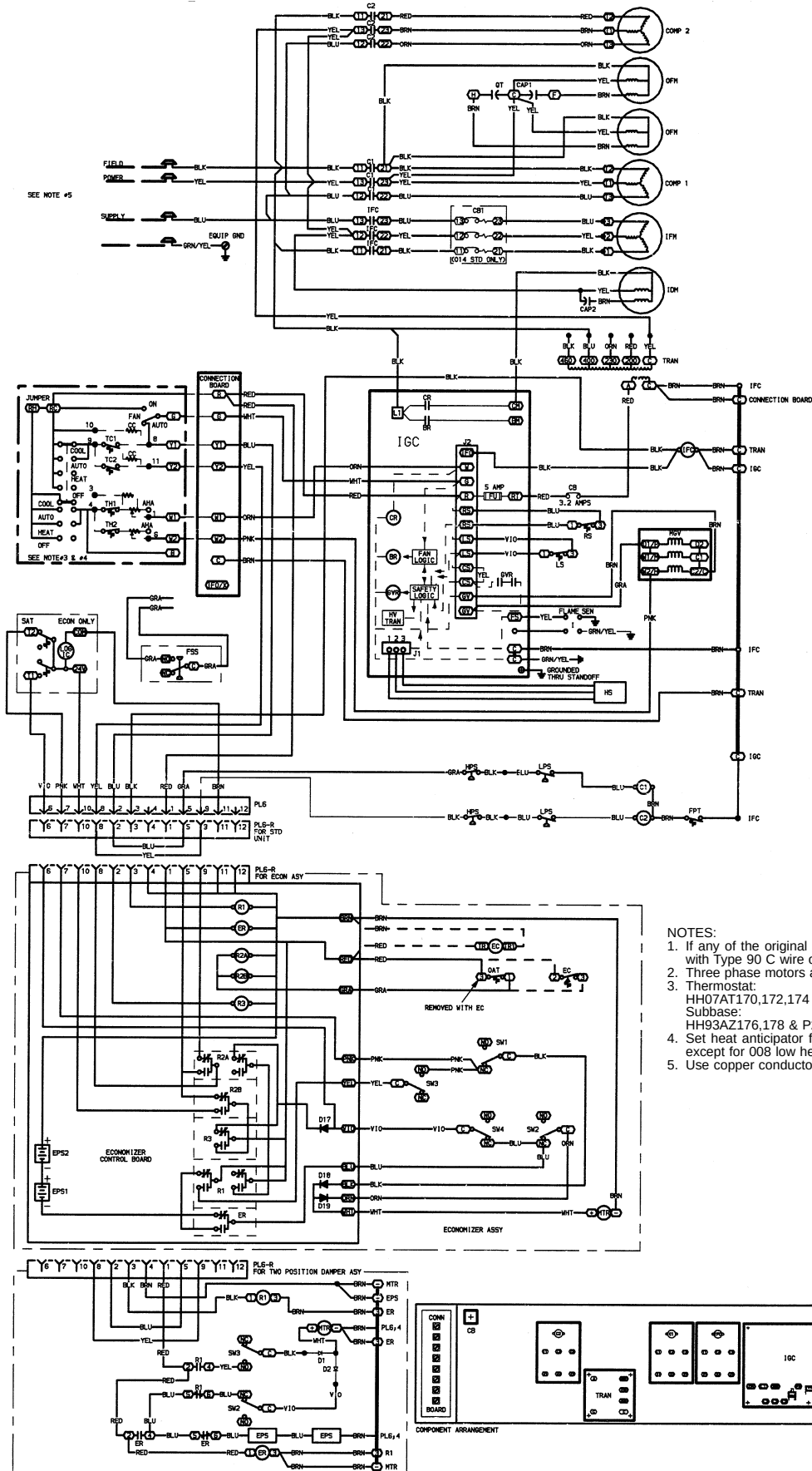
$$\% \text{ Voltage Imbalance} = 100 \times \frac{6}{397}$$

$$= 1.5\%$$

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

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

Typical wiring schematic



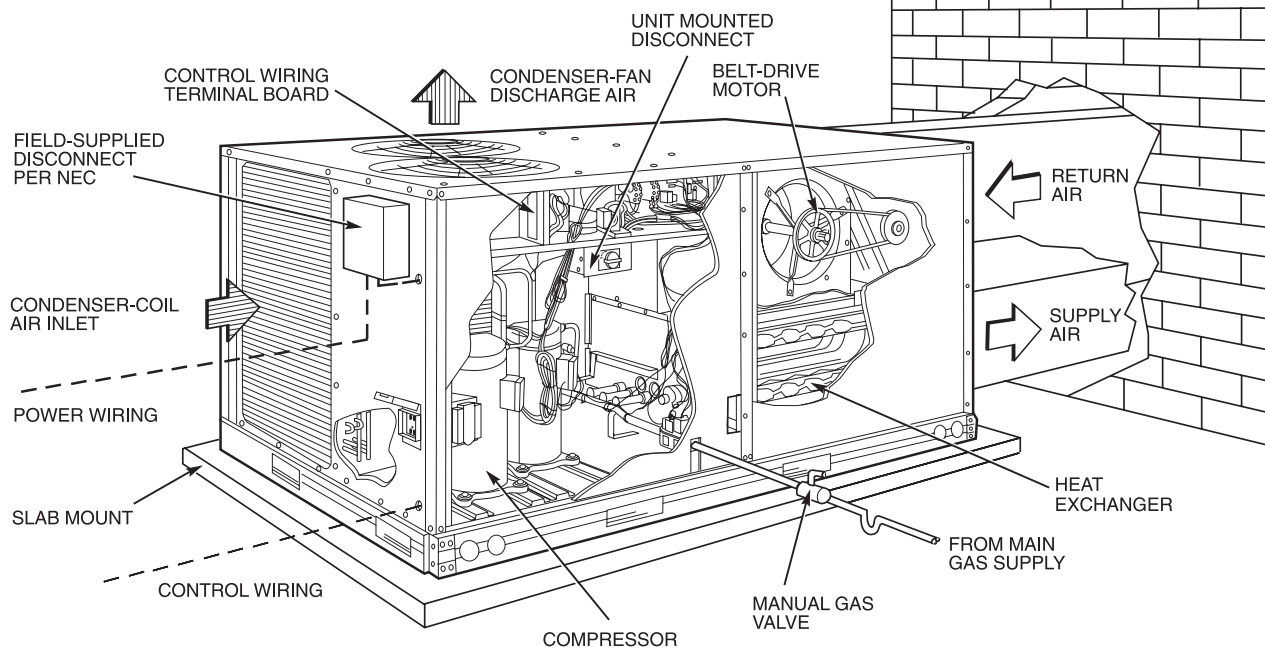
- NOTES:
1. If any of the original wire furnished must be replaced, it must be replaced with Type 90 C wire or its equivalent.
 2. Three phase motors are protected under primary single phasing conditions.
 3. Thermostat:
HH07AT170,172,174 & P272-2783
Subbase:
HH93AZ176,178 & P272-1882,1883
 4. Set heat anticipator for first stage at 0.14 amp, second stage at 0.2 amp, except for 008 low heat, set both first and second stage at 0.14 amp.
 5. Use copper conductors only.

LEGEND FOR TYPICAL WIRING SCHEMATIC

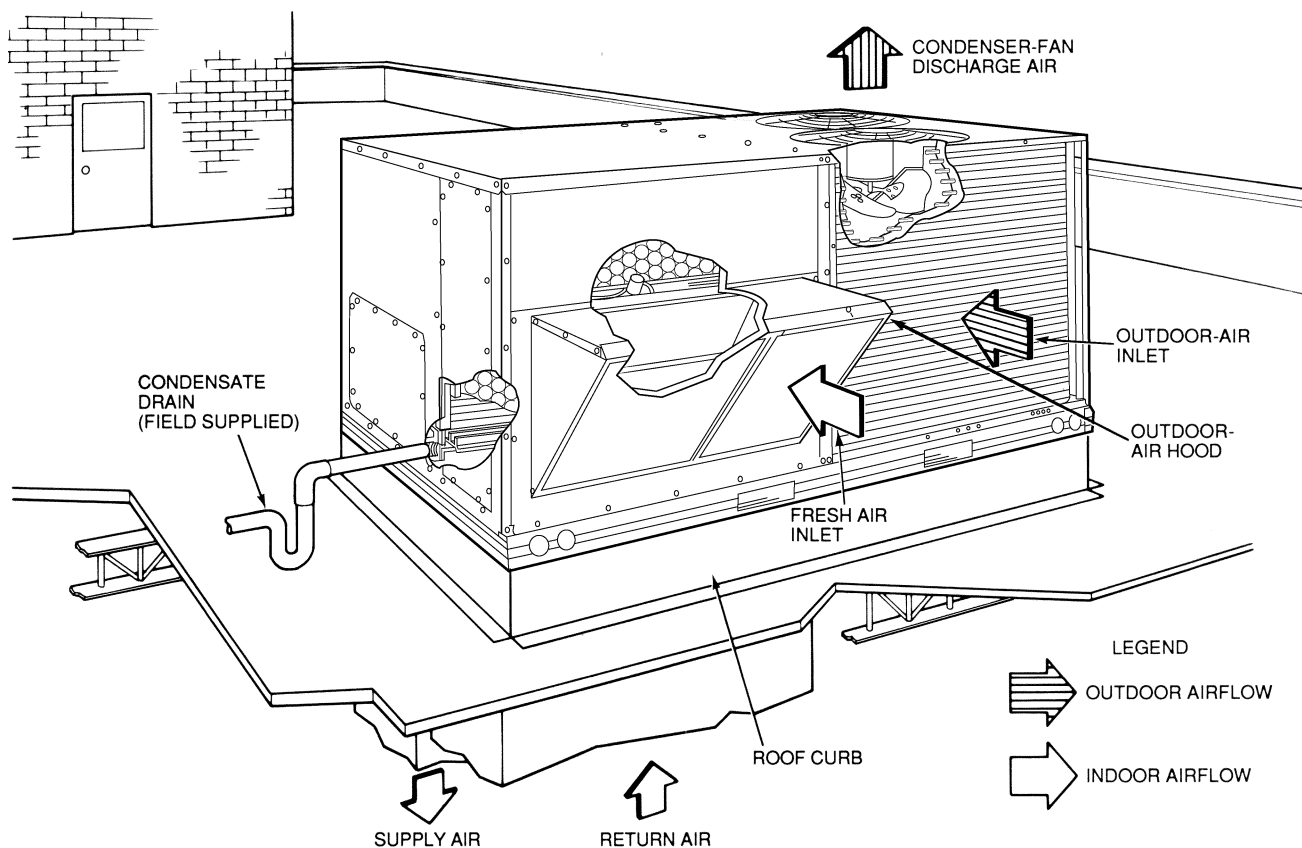
AHA	— Adjustable Heat Anticipator
BR	— Blower Relay
C	— Contactor, Compressor
CAP	— Capacitor
CB	— Circuit Breaker
CC	— Cooling Compensator
COMP	— Compressor Motor
CR	— Combustion Relay
D	— Diode
EC	— Enthalpy Control
ECON	— Economizer
EPS	— Emergency Power Supply (9-volt battery)
EQUIP	— Equipment
ER	— Economizer Relay
FPT	— Freeze Protection Thermostat
FSS	— Filter Status Switch
FU	— Fuse
GND	— Ground
GVR	— Gas Valve Relay
HPS	— High-Pressure Switch
HS	— Hall Effect Sensor
IDM	— Induced Draft Motor
IFC	— Indoor (Evaporator) Fan Contactor
IFM	— Indoor Fan Motor
IFR	— Indoor (Evaporator) Fan Relay
IGC	— Integrated Gas Unit Controller
LPS	— Low-Pressure Switch
LS	— Limit Switch
MGV	— Main Gas Valve
MTR	— Motor
NC	— Normally Closed
NO	— Normally Open
OAT	— Outdoor-Air Thermostat
OFM	— Outdoor Fan Motor
PL	— Plug Assembly

QT	— Quadruple Terminal
R	— Relay
RS	— Rollout Switch
SAT	— Supply Air Thermostat
SW1	— Switch, Fully Open
SW2	— Switch, Fully Closed
SW3	— Switch, Minimum Vent Position
SW4	— Switch, Maximum Vent Position
TC	— Thermostat-Cooling
TH	— Thermostat, Heating
TRAN	— Transformer
	Field Splice
	Marked Wire
	Terminal (Marked)
	Terminal (Unmarked)
	Terminal Block
	Splice
	Splice (Marked)
	Factory Wiring
	Field Control Wiring
	Field Power Wiring
	Accessory or Optional Wiring
	To indicate common potential only. Not to represent wiring.

Typical piping and wiring



HORIZONTAL DISCHARGE



VERTICAL DISCHARGE

NEC — National Electrical Code (U.S.A. Standard)

Operating sequence for 48HJ008-014 units

Cooling, units without economizer — When thermostat calls for cooling, terminals G and Y1 are energized. The indoor (evaporator) fan contactor (IFC) and compressor contactor no. 1 (C1) are energized, and evaporator-fan motor, compressor no. 1, and condenser fans start. The condenser-fan motors run continuously while unit is cooling. For units with 2 stages of cooling, if the thermostat calls for a second stage of cooling by energizing Y2, compressor contactor no. 2 (C2) is energized and compressor no. 2 starts.

When the thermostat is satisfied, C1 and C2 are deenergized and the compressors and outdoor (condenser) fan motors (OFM) shut off. After a 30-second delay, the indoor (evaporator) fan motor (IFM) shuts off. If the thermostat fan selector switch is in the ON position, the evaporator motors will run continuously.

Cooling, units with Durablade economizer — When the outdoor-air temperature is above the outdoor-air thermostat (OAT) setting and the room thermostat calls for cooling, the compressor contactor is energized to start the compressor and outdoor (condenser) fan motor (OFM). The indoor (evaporator) fan motor (IFM) is energized and the economizer damper moves to the minimum position. Upon a further call for cooling, compressor contactor no. 2 will be energized, starting compressor no. 2. After the thermostat is satisfied and the IFM is deenergized, the damper moves to the fully closed position.

When the outdoor-air temperature is below the OAT setting and the thermostat calls for Y1 and G, the economizer damper moves to the minimum position when the indoor fan starts. The first stage of cooling is provided by the economizer. If the supply-air temperature is above 57 F, a switch on the supply-air thermostat is closed between the T2 terminal and the 24 vac terminal. This causes the damper to continue to modulate open until the supply-air temperature falls below 55 F or the damper reaches the fully open position.

When the supply-air temperature is between 55 F and 52 F, the supply-air thermostat has open switches between the T2 and 24 vac terminals and between the T1 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the supply-air temperature falls below 52 F, a switch on the supply-air thermostat is closed between the T1 terminal and the 24 vac terminal. This causes the damper to modulate closed until the supply-air temperature rises above 55 F or the damper reaches the minimum position.

When the supply-air temperature is between 55 F and 57 F, the supply-air thermostat has open switches between the T2 and 24 vac terminals. This causes the economizer damper to remain in an intermediate open position.

If the outdoor air alone cannot satisfy the cooling requirements of the conditioned space, economizer cooling is integrated with mechanical cooling, providing second stage cooling. The compressor and outdoor fan will be energized and the position of the economizer damper will be determined by the supply-air temperature. Compressor no. 2 is locked out.

When the second stage of cooling is satisfied, the compressor and outdoor (condenser) fan motors will be deenergized. The damper position will be determined by the supply-air temperature.

When the first stage of cooling is satisfied, the IFM shuts off after a 30-second delay. The damper then moves to fully closed position.

Heating, units without economizer — When the thermostat calls for heating, terminal W1 is energized. In order to prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute when W1 is energized. The induced-draft motor (IDM) is then energized and the burner ignition sequence begins. The indoor (evaporator) fan motor (IFM) is energized 45 seconds after a flame is ignited. When additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45-second time-off delay.

Heating, units with economizer/two-position damper — When the thermostat calls for heating, terminal W1 is energized. In order to prevent thermostat short-cycling, the unit is locked into the Heating mode for at least 1 minute when W1 is energized. The induced-draft motor is then energized and the burner ignition sequence begins. The indoor (evaporator) fan motor (IFM) is energized 45 seconds after a flame is ignited and the damper moves to the minimum position. If the accessory two-position damper is used, the outdoor-air damper opens to the minimum position whenever the evaporator fan runs. When additional heat is needed, W2 is energized and the high-fire solenoid on the main gas valve (MGV) is energized. When the thermostat is satisfied and W1 and W2 are deenergized, the IFM stops after a 45-second time-off delay. The economizer damper then moves to the fully closed position. When using continuous fan, the damper will remain in the minimum position.

Controls (cont)

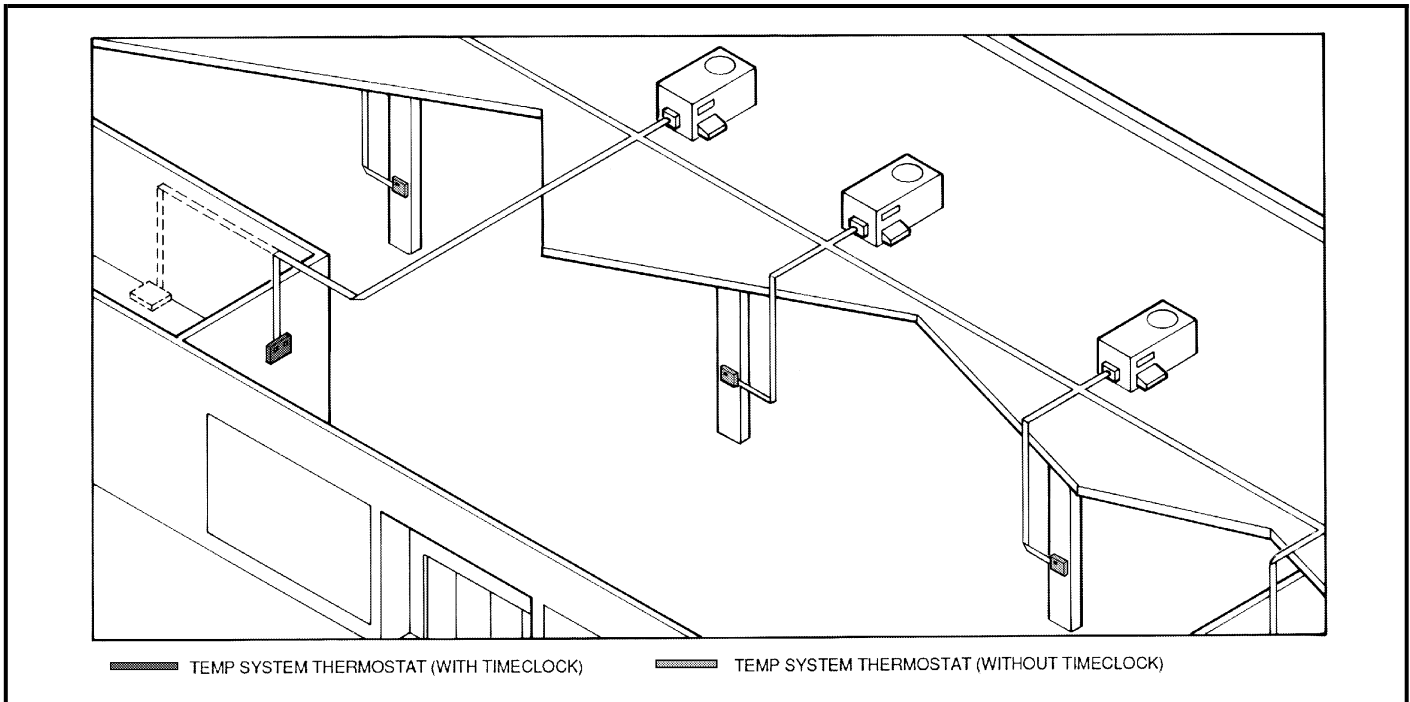


TEMP Systems

A TEMP System is a network of communicating Carrier TEMP System Thermostats and rooftop factory-mounted Apollo direct digital controls, each serving its own zone and heating/cooling unit. Networking allows your building manager to easily access each of your systems from a single location... whether they are in the same building or located throughout town.

The TEMP System's inherently flexible, modular base design supports the *exact* number of independent, single zone systems you require...no more, no less, no compromises.

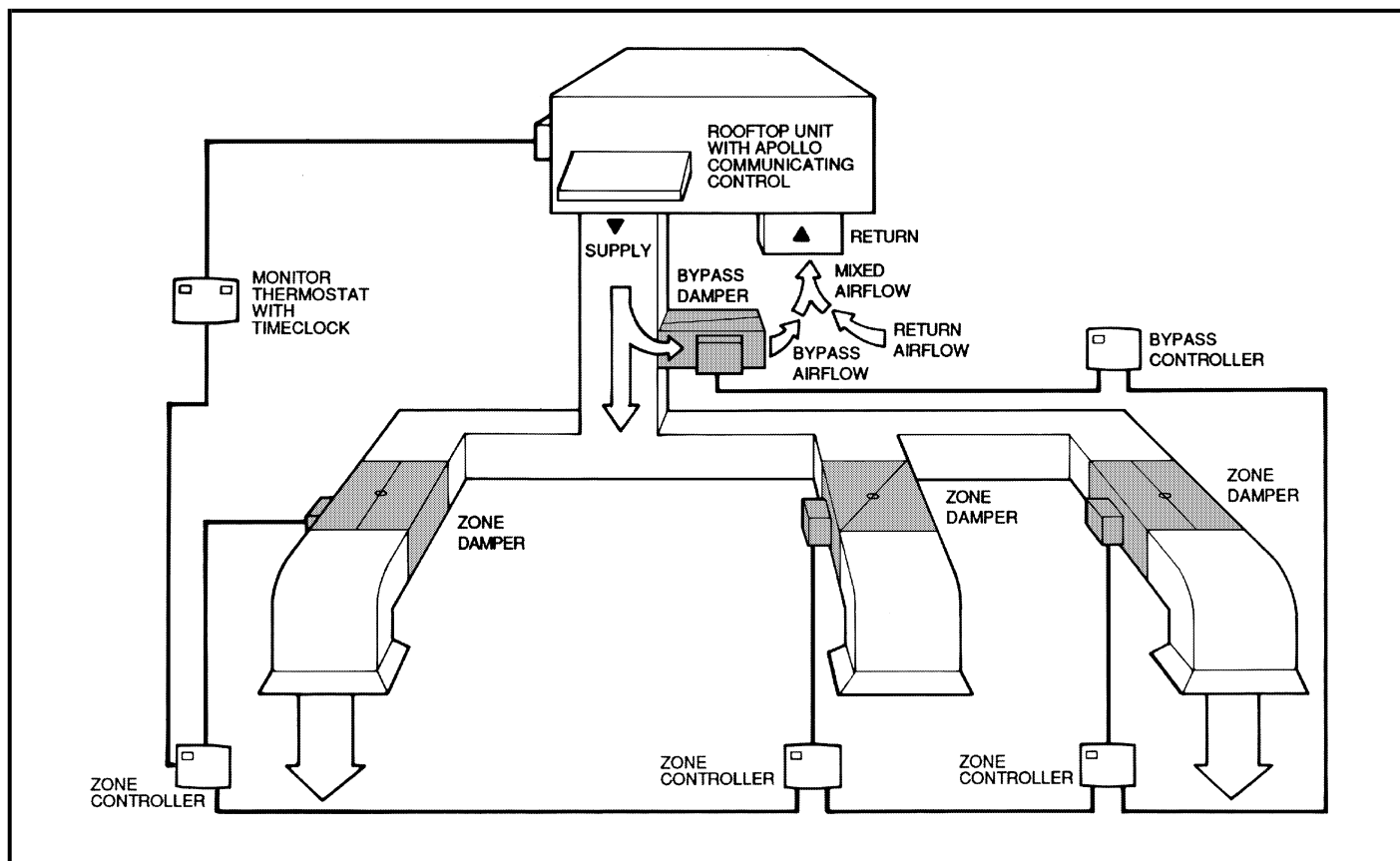
Ideal for department stores, small office buildings, fast food chains, schools, and hotels, a TEMP System is a cost-effective way to maintain comfortable building environments.



Variable Volume/Variable Temperature (VVT®) Systems

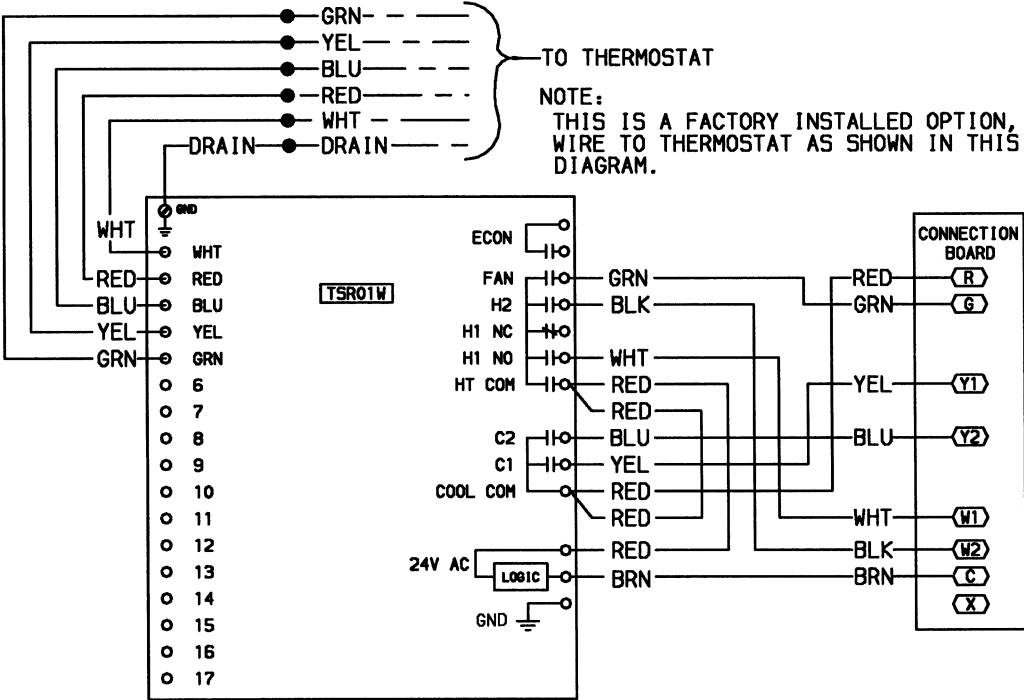
VVT Systems are dedicated to total building comfort. Carrier thermostats, zone dampers, and HVAC equipment with factory-mounted Apollo direct digital controls continually monitor and adjust their operation to ensure uninterrupted and personalized comfort for all occupants.

Through the use of communicating electronic controls, VVT Systems are able to provide the comfort of a multiple zone system while using the installation, operating, and maintenance economics of single zone equipment. . .virtually putting an end to the cost vs. comfort compromise.





APOLLO AND THERMOSTAT WIRING (48HJ008-014)



Application data



Condensate drain pan — A sloped condensate drain pan is supplied on all units. The condensate drain pan must be externally trapped. Condensate drains are located on both the bottom and end of the unit. The bottom drain can be used for thru-the-curb connections.

Ductwork — Secure vertical discharge ductwork to roof curb. For horizontal discharge applications, attach ductwork to unit, or field-supplied flanges can be attached to horizontal discharge openings and all ductwork attached to flanges.

Discharge conversion — To convert from vertical discharge to horizontal discharge:

1. Remove economizer or two-position damper to gain access to return duct opening.
2. Move the horizontal-discharge duct opening covers to the vertical discharge openings.
3. Rotate economizer or two-position damper 90 degrees (until the economizer motor faces the condenser section).
4. Rotate the barometric relief damper 90 degrees.
5. Install block-off plate over the opening on the access panel.

Thru-the-bottom connections — Roof curb connections allow field power wires and control wires to enter through the roof curb opening. Accessory thru-the-bottom connection kit must be purchased to ensure watertightness.

Thermostat — Use of 2-stage cooling thermostat is required for all units.

Heating-to-cooling changeover — All units are automatic changeover from heating to cooling when automatic changeover thermostat and subbase are used.

Airflow — Units are draw-thru on cooling and blow-thru on heating.

Maximum airflow — To minimize possibility of condensate blow-off from evaporator, airflow through units should not exceed 236 L/s (500 cfm/ton).

Minimum airflow — The minimum airflow for cooling is 142 L/s (300 cfm/ton).

Minimum ambient operating temperature — The minimum ambient operating temperature for standard units is -4 C (25 F). With accessory Motormaster® control units can operate at outdoor temperatures down to -18 C (0° F).

Maximum operating outdoor-air temperature — The maximum operating outdoor-air temperature for cooling is 52 C (125 F).

Motor data — Due to Carrier's internal unit design (draw-thru over the motor), air path, and specially designed motors, the full power (maximum continuous bkW or bhp) listed in the Physical Data table and the notes following each Fan Performance table can be utilized with extreme confidence.

Using Carrier motors to the values listed in the Physical Data and Fan Performance tables *will not* result in nuisance tripping or premature motor failure.

Apollo direct digital controls — Apollo direct digital controls must be used with a Carrier master or monitor thermostat.

Packaged Rooftop Cooling Unit with Gas Heat — Constant Volume Application

HVAC Guide Specifications

Size Ranges: **21.5 to 39.9 kW (6½ to 10 Tons),
Nominal (Cooling)**

**21.1 to 65.6 kW (72,000 to
224,000 Btuh), Nominal
(Input Heating)**

Carrier Model Number: **48HJD
48HJE
48HJF (008, 012 only)**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor rooftop mounted, electrically controlled heating and cooling unit utilizing a scroll compressor for cooling duty and gas combustion for heating duty. Unit shall discharge supply air vertically or horizontally as shown on contract drawings.

1.02 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standards 210/240 or 360 and 270. Designed in accordance with UL standard 1995 (U.S.A. Standards).
- B. Unit shall be designed to conform to ANSI/ASHRAE 15, latest revision (U.S.A. Standards).
- C. Unit shall be manufactured in a facility registered to ISO 9002/BS5750, Part 2 quality standard.
- D. Roof curb shall be designed to conform to NRCA Standards (U.S.A. Standards).
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation (U.S.A. requirements).
- F. Unit casing shall be capable of withstanding Federal test Method Standard (U.S.A. Standard) No. 141 (Method 6061) 500-hour salt spray test.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT (STANDARD)

A. General:

Factory-assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (HCFC-22), and special features required prior to field start-up.

B. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces, with primer coated internal panels.
2. Indoor blower (evaporator fan) compartment interior cabinet surfaces shall be insulated with a minimum 13-mm (½-in.) thick, flexible fiberglass insulation, coated on the air side. Aluminum foil faced fiberglass insulation shall be used in the furnace compartment.

3. Cabinet panels shall be easily removable for servicing.
4. Filters will be accessible through a removable access door, and will require no screw removal (tool-less).
5. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
6. Unit shall have a factory-installed internally trapped condensate drain pan made of non-corrosive material, providing a minimum 19-mm (¾-in.) connection. The condensate pan shall be externally trapped in the field. Unit shall be shipped in the end condensate drain position, but can be easily changed to the bottom condensate drain position. Condensate pan has a sloped design to conform to ASHRAE Standard 62 (U.S.A. Standard).
7. Thru-the-bottom power connection capability is standard.

C. Fans:

1. Indoor blower (evaporator fan):
 - a. Fan shall be belt driven as shown on the equipment drawings. Belt drive shall include an adjustable-pitch motor pulley.
 - b. Fan wheel shall be double-inlet type with forward-curved blades which are statically and dynamically balanced.
 - c. Bearings shall be sealed, permanently lubricated ball-bearing type for longer life and lower maintenance.
2. Indoor blower (evaporator fan) shall be made from steel with a corrosion resistant finish and shall be dynamically balanced.
3. Outdoor (condenser) fans shall be of the direct driven propeller type and shall discharge air vertically upwards.
4. Outdoor (condenser) fan motors shall be totally enclosed with permanently lubricated bearings.
5. Outdoor (condenser) fans shall have aluminum blades riveted to corrosion resistant steel spiders and shall be dynamically balanced.
6. Induced-draft blower shall be of the direct driven, single inlet forward-curved centrifugal type, made from steel with a corrosion resistant finish and shall be dynamically balanced.

D. Compressors:

1. Fully hermetic scroll type, on independent circuits and internally protected with internal high-pressure relief.
2. Internally spring-mounted and fastened to poly-core plate for vibration isolation.

E. Coils:

1. Evaporator and condenser coils shall have aluminum plate fins mechanically bonded to seamless internally-enhanced copper tubes with all joints brazed.
2. Tube sheet openings shall be belled to prevent tube wear.
3. Evaporator coil shall be of the full face active design.

F. Heating Section:

1. Induced draft combustion type with energy saving direct spark ignition system, redundant main gas valve, and 2-stage heat.
2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20-gage steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance, and shall have a 10-year warranty.
3. Burners shall be of the in-shot type constructed of aluminum coated steel.
4. All gas piping shall enter the unit cabinet as a single location.
5. The Integrated Gas Unit Control (IGC) board shall provide timed control of the evaporator fan functioning and burner ignition. An LED (light-emitting diode) shall provide diagnostic information. The LED shall be visible without removing control box access panel.
6. The IGC board contains anti-cycle protection for gas heat operation.

G. Refrigerant Components:

Refrigerant components shall include:

1. Multiple independent circuit feed system.
2. Filter drier to eliminate any moisture or foreign matter.
3. Service gage connections on suction, discharge, and liquid lines to charge, evacuate, and contain refrigerant.
4. Ability to route gage hoses through unit side panels to eliminate air bypass during diagnostic periods.

H. Filter Section:

1. Standard filter section shall consist of factory-installed low velocity, throwaway 51-mm (2-in.) thick fiberglass filters of commercially available sizes.
2. Filter face velocity shall not exceed 1.63 mps (320 fpm) at nominal airflows.
3. Filters shall be accessible through an access panel with "no-tool" removal.

I. Controls and Safeties:

1. Unit Controls:

Unit shall be complete with self-contained low-voltage control circuit protected by a manually resettable circuit breaker on the 24-v transformer side.

2. Safeties:

- a. Unit shall incorporate a solid-state compressor protector which provides anti-cycle reset capability at the space thermostat, should any of the following safety devices trip and shut off compressor:

- 1) Compressor overtemperature, overcurrent.
- 2) Loss-of-charge/low-pressure switch.
- 3) Freeze-protection thermostat, evaporator coil.
- 4) High-pressure switch.

The lockout protection shall be easily disconnected at the control board, if necessary.

- b. Heating section shall be provided with the following minimum protections:

- 1) High-temperature limit switch.
- 2) Induced draft motor speed sensor.
- 3) Flame rollout switch (automatic reset).
- 4) Flame proving controls.

J. Operating Characteristics:

1. Unit shall be capable of starting and running at 52 C (125 F) ambient outdoor temperature.
2. Compressor with standard controls shall be capable of operation down to -4 C (25 F) ambient outdoor temperature.
3. Unit provided with fan time delay to prevent cold air delivery before heat exchanger warms up.

K. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single factory-predrilled location.

L. Motors:

1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
2. Indoor (evaporator) fan motor shall have permanently lubricated bearings and inherent automatic reset thermal overload protection.
3. Outdoor (condenser) fan motor, totally enclosed, shall have permanently lubricated bearings, and inherent automatic reset thermal overload protection.
4. Induced-draft motor shall have permanently lubricated, sealed bearings and inherent automatic reset thermal overload protection.

M. Special Features:

Certain features are not applicable when the features designated by * are specified. For assistance in amending the specifications, your local Carrier Sales Office should be contacted.

1. Roof Curb:
 - a. Formed galvanized steel with wood nailer strip and capable of supporting entire unit weight.
 - b. Allows for installing and securing ductwork to curb prior to mounting unit on the curb.
- * 2. Direct Digital Controls:
 - a. Shall be available as a factory-installed option.
 - b. Shall actively monitor all modes of operation as well as indoor-fan status, filter status, and indoor air quality.
 - c. Shall work with Carrier TEMP and VVT® systems.
 - d. Shall have built-in diagnostic capability for thermostat commands for both stages of heating and cooling, evaporator fan operation, and economizer operation.
 - e. Shall be equipped with a 5-minute time delay between modes of operation.
 - f. Reference the Apollo control Application Guide for Apollo control guide specifications.
- * 3. Integrated Economizer:
 - a. Integrated type capable of simultaneous economizer and compressor operation.
 - b. Includes all hardware and controls to provide cooling with outdoor air.
 - c. Equipped with low-leakage variable sliding dampers not to exceed 3% leakage, at 248 Pa (1.0 in. wg) pressure differential.
 - d. Capable of introducing up to 100% outdoor air.
 - e. Equipped with a barometric relief damper for up to 30% of nominal cfm.
 - f. Designed to close damper during loss of power situations with emergency power supply.
 - g. Dry bulb outdoor thermostat provided.
- * 4. Manual Damper:

Manual damper package shall consist of damper, birdscreen, and rainhood which can be preset to admit up to 50% outdoor air for year round ventilation.
- * 5. 100% Two-Position Damper:
 - a. Two-position damper package shall include single blade damper and motor. Admits up to 100% outdoor air.
 - b. Damper shall close upon indoor (evaporator) fan shutoff.
 - c. Designed to close damper during loss of power situations.
 - d. Equipped with barometric (30%) relief damper.
- * 6. 25% Two-Position Damper:
 - a. Two-position damper package shall include single blade damper and motor. Admits up to 25% outdoor air.
 - b. Damper shall close upon indoor (evaporator) fan shutoff.
 - c. Designed to close damper during loss of power situations.
 - d. Equipped with barometric relief damper.
7. Compressor Cycle Delay:

Compressor shall be prevented from restarting for a minimum of 5 minutes after shutdown.
- * 8. Solid-State Enthalpy Control:
 - a. For use with economizer package only.
 - b. Capable of sensing outdoor-air heat content (temperature and humidity) and control economizer cut-in point to have minimum heat content air passing over the evaporator coil for most efficient system operation.
- * 9. Differential Enthalpy Sensor:
 - a. For use with economizer only.
 - b. Capable of comparing heat content (temperature and humidity) of outdoor air and return air and controlling economizer cut-in point at the most economical level.
- * 10. Head Pressure Control Package:
 - a. Consists of solid-state control and condenser temperature sensor for head pressure control.
 - b. Capable of controlling outdoor fan motor speed to maintain condensing temperature between 32 and 43 C (90 and 110 F) at outdoor ambient temperatures down to -18 C (0° F).
- * 11. Remote Control Panel:

Panel shall be a decorative, indoor, wall-mounted panel consisting of:

 - a. Two-stage heat/2-stage cool thermostat.
 - b. Automatic changeover.
 - c. System switch with HEAT-COOL-AUTO.-OFF settings.
 - d. Fan switch with ON-AUTO. settings.
 - e. Indicator lights for HEAT-COOL-FAN operation.
 - f. Three unused indicator lights for field use.
 - g. Control of economizer to forced open or forced closed position.
- * 12. LP Gas Kit:

Package shall contain all the necessary hardware and instructions to convert a standard natural gas unit for use with liquefied propane (LP) gas.
13. Thru-the-Bottom Service Connections:

Allow gas and electrical connections to be brought to the unit through the basepan.

- * 14. Electronic Programmable Thermostat:
Capable of using deluxe full-featured programmable electronic thermostat. Shall use built-in compressor cycle delay for both heating and cooling. Capable of working with Carrier direct digital controls.
- 15. Flue Shield:
Provides protection from the hot sides of the gas flue hood.
- * 16. Thermostat and Subbase:
Provides staged cooling and heating automatic (or manual) changeover, fan control, and indicator light.
- * 17. Hail Guard:
Hail guard shall protect against damage from hail and flying debris.
- 18. NO_x Reduction Kit:
Package shall contain all necessary hardware and instructions to convert a standard natural gas unit to reduce the nitrous oxide (NO_x) emissions to a level of 40 nanograms/joule.
- 19. Flue Discharge Deflector:
Package shall contain single-piece deflector and hardware to exhaust the flue discharge up and away from unit. The flue discharge deflector shall allow minimum flue side clearances to combustibles to be reduced to 457 mm (18 in.)
- 20. Unit Mounted Disconnect Switch:
Factory-installed, internally-mounted, NEC and UL approved (U.S.A. Standards) switch provides unit power shutoff. Shall be accessible from outside the unit if desired. Shall provide power off lockout safety capability.
- * 21. Coil Guard Grille:
Protects condenser coil from penetration by large objects and vandalism.
- 22. Fan/Filter Status Switch:
Provides status of indoor fan (ON/OFF) or filter (CLEAN/DIRTY). Status shall be displayed over communication bus when used with direct digital controls or with an indicator light at the thermostat.

