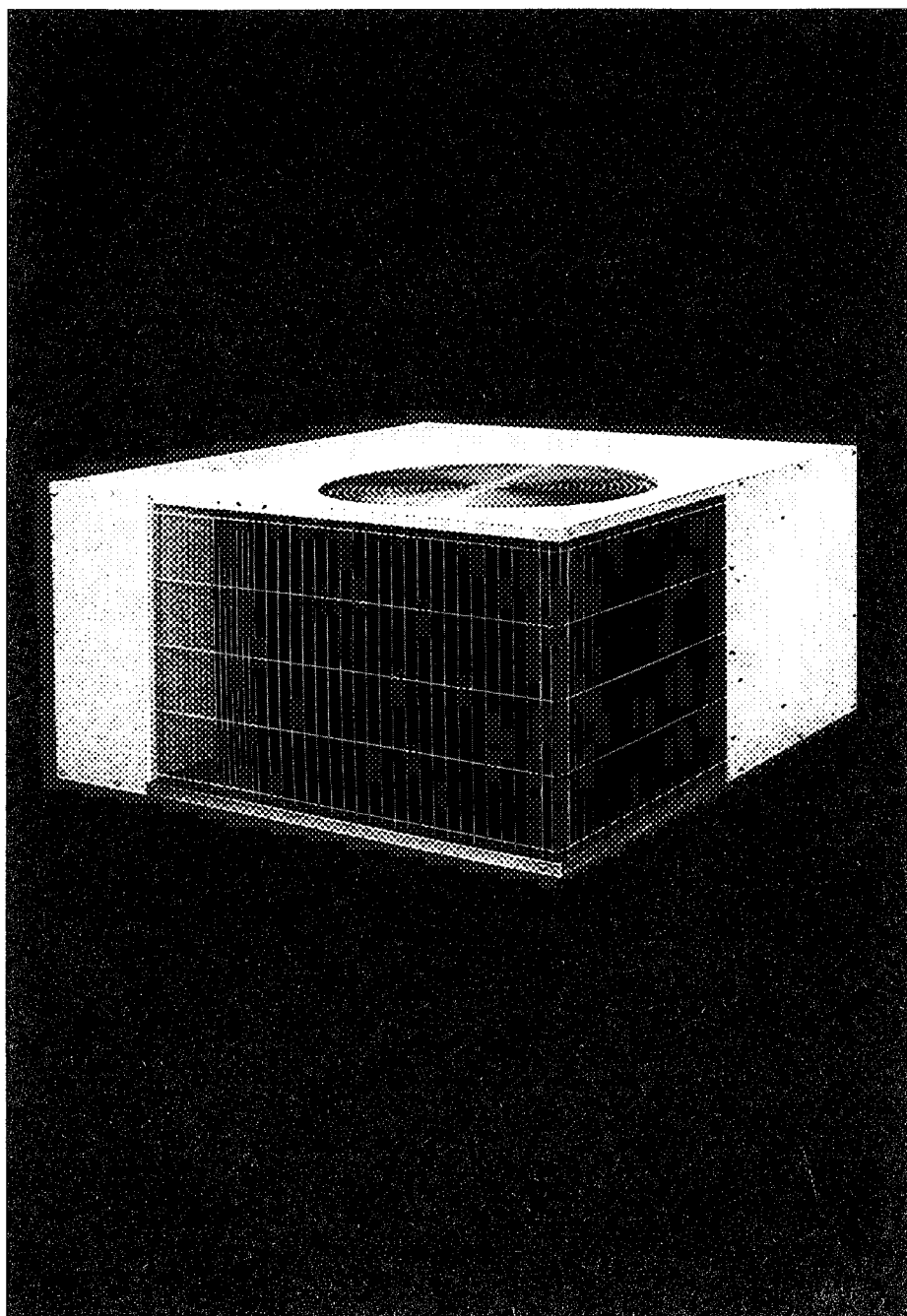




Product Data

50QQ Single-Package Heat Pumps

1-1/2 to 5 Nominal Tons



Single-Package Heat Pump Units with the following Premium Features as Standard:

- compressors with internal high-pressure and overcurrent protection
- suction-tube accumulator
- low-pressure switch
- crankcase heater
- compressor quick-start components

Features/Benefits

Compact, fully self-contained, all-electric, combination heating/cooling unit is prewired, prepiped, and precharged for minimum installation expense.

Easy installation

Round side-by-side duct configuration on sizes 018-048. Rectangular duct configuration is available on 060 size only. Models install easily on a rooftop or a ground-level pad.

Efficient operation

Rugged, efficient compressors are specifically designed for heat pump duty and high energy efficiency during heating and cooling operation. Each compressor is hermetically sealed against contamination to help promote longer life and dependable operation and is vibration isolated to provide quiet operation. During heating operation, these reliable compressors are designed for continuous operation down to extremely cold outdoor temperatures. All compressors have internal high-pressure and overcurrent protection.

Indoor fan motors have been carefully selected to minimize energy consumption and to withstand the heavy-duty, year-round operation required by heat pumps. These motors

are designed to meet the requirements of a wide variety of residential and light commercial applications

Direct-drive, PSC (permanent split capacitor), outdoor fan motors have been selected to help reduce energy consumption. Units are designed for cooling operation down to 55 F.

Built-in reliability components include a *suction-tube accumulator* that keeps liquid refrigerant from reaching the compressor, a *low-pressure switch* that stops the compressor if the refrigerant pressure drops to an unsafe operating level, a *crankcase heater* to keep the compressor oil warm and free of refrigerant for maximum lubricity,

compressor quick-start components to improve starting characteristics, and a unique metering device to eliminate potential serviceability requirements of check valves and expansion devices.

Indoor and outdoor coils are computer-designed for optimum heat transfer. Vertical outdoor fan discharge carries sound and air up and away. The high-voltage inlet panel is designed to accommodate a field-installed electrical disconnect. A low-voltage terminal block simplifies thermostat connections. Refrigerant service connections make checking operating pressures easier.

Time/temperature defrost system is used to increase heating cycle

efficiency. This type of defrost system has proven to be very reliable. The time/temperature control "looks" for coil icing conditions only at preset time intervals, starts the defrost cycle only if the defrost thermostat senses icing conditions, and automatically ends the defrost cycle when the coil has warmed sufficiently to melt the ice.

Weatherized cabinets are constructed of heavy-duty, phosphated, zinc-coated steel, and are finished with corrosion-resistant baked enamel. Interior surfaces of the blower section are insulated to help keep the conditioned air from being affected by the outdoor ambient temperature.

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Model number nomenclature

	50QQ	024	3
Model Number			
50QQ — Single-Package Heat Pump			
Nominal Capacity			
018 — 1 1/2 Tons	036 — 3 Tons		
024 — 2 Tons	042 — 3 1/2 Tons		
030 — 2 1/2 Tons	048 — 4 Tons		
	060 — 5 Tons		
		V-Ph-Hz	
		3 — 208/230-1-60	

ARI* capacities

COOLING AND HEATING CAPACITIES AND EFFICIENCIES

UNIT 50QQ	NOMINAL TONS	STANDARD CFM	NET COOLING† CAPACITIES AT 95 F (Btuh)	SEER†	NET HEATING† CAPACITIES AT 47 F (Btuh)	HSPF	SOUND RATINGS** (Bels)
018	1½	675	18,000	9.0	19,800	6.60	7.8
024	2	900	25,000	10.0	25,000	6.50	8.0
030	2½	1100	29,800	10.0	30,400	6.60	8.2
036	3	1300	35,200	10.0	35,400	6.50	8.2
042	3½	1470	40,500	10.0	40,500	6.80	8.2
048	4	1650	47,500	9.1	45,000	6.50	8.2
060	5	2250	58,000	8.9	58,000	6.60	8.6

LEGEND

Bels — Sound Levels (1 bel = 10 decibels)
DOE — Department of Energy
HSPF — Heating Seasonal Performance Factor
SEER — Seasonal Energy Efficiency Ratio

*Air-Conditioning & Refrigeration Institute

†Rated in accordance with ARI Standard 240-81 and/or U S Government DOE test procedures

**Rated in accordance with ARI Standard 270-84.



Physical data

MODEL 50QQ	018	024	030	036	042	048	060
REFRIGERANT (R-22)* Refrigerant Control	Piston						
SHIPPING WEIGHT (lb)	323	336	340	350	407	449	484
INDOOR FAN	Centrifugal — Direct Drive						
Speeds	2	2	2	2	3	3	2
Rpm	840	840	840	840	840	1100	1100
Diameter (in.)	10	12	12	12	12	12	12
Width (in.)	6	6	6	6	6	6	6
Range (cfm)	525-750	700-1000	875-1250	1050-1500	1225-1650	1400-1800	1750-2400
Motor Hp	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$
INDOOR COIL							
Rows...Fins/in.	3...14	3...14	3...14	3...14	3...14	3...14	3...14
Face Area (sq ft)	3.4	3.4	4.3	5.0	7.3	7.3	8.3
OUTDOOR FAN	Propeller — Direct Drive						
Cfm	2200	2200	2700	2700	3200	3200	3400
Rpm	840	840	1100	1100	1100	1100	1100
Diameter (in.)	22	22	22	22	22	22	22
Motor Hp	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$
OUTDOOR COIL							
Rows...Fins/in.	2...22	2...22	2...22	2...22	2...22	2...22	2...22
Face Area (sq ft)	8.8	8.8	8.8	10.3	12.0	12.0	14.0
FILTER SIZE (in.)†							
Disposable	20 x 25	20 x 25	(2) 15 x 20	15 x 20 20 x 20	(2) 20 x 20	20 x 25 20 x 20	25 x 25 20 x 25
Permanent	15 x 20	15 x 20	(2) 20 x 20	(2) 20 x 25	(2) 20 x 25	(2) 15 x 20	(2) 20 x 20

*Operating charge and piston size are listed on unit nameplate.

†Recommended field-supplied filters are one in thick.

Accessories

Electric heaters that mount inside the heat pump indoor-fan compartment are available in a variety of kW and voltage options. Each heater assembly includes automatic-reset switch, and heat limiters for primary and secondary, over-current, and thermal protection.

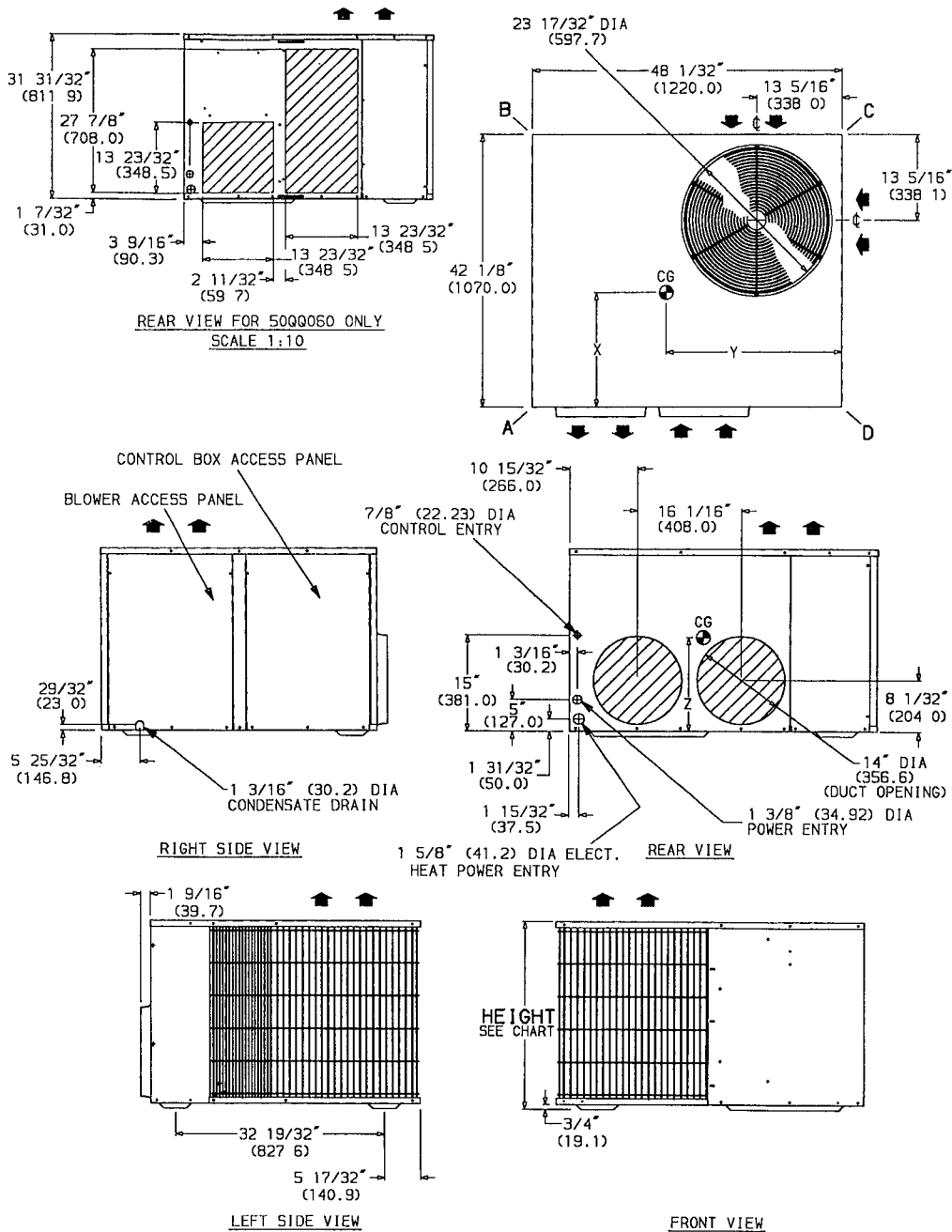
Emergency heat package activates auxiliary heat when mechanical heating is locked out.

Compressor cycle delay prevents compressors from re-starting for a minimum of 5 minutes after shutdown.

Service Sentry kit provides immediate warning when the compressor fails to operate after a call for heating or cooling. The control energizes a warning light located on the indoor thermostat.

Outdoor thermostat kit allows for staging of electric heaters based on outdoor air temperature.

Dimensions



INCHES (mm)

NOTE: CLEARANCES MUST BE MAINTAINED TO PREVENT RECIRCULATION
OF AIR FROM OUTDOOR FAN DISCHARGE

INCHES (mm)

UNIT	ELECTRICAL CHARACTERISTICS	HEIGHT	CORNER WT.				
			LBS./WT.	A	B	D	
5000018	208/230/1/60	22 3/32" (561.2)	323/146	67/30	80/36	72/33	104/47
5000024			336/152	69/31	83/38	76/34	108/45
5000030			340/154	70/32	85/39	79/35	109/45
5000036		24 1/2" (622.3)	350/158	71/32	86/38	84/39	110/50
5000042		28 5/16" (744.5)	364/165	84/38	100/45	100/45	123/55
5000048			449/204	93/42	111/50	107/45	137/56
5000050			484/218	101/45	120/54	109/45	144/56

UNIT	CENTER OF GRAVITY IN / MM					
	X		Y		Z	
500Q0018	19	13/16 (503.2)	21	7/8 (555.6)	10	1/4 (260.4)
500Q0024	19	7/8 (504.8)	21	3/4 (552.5)	10	1/4 (260.4)
500Q0030	20	1/16 (509.6)	21	1/2 (546.1)	10	5/16 (261.9)
500Q0036	20	7/16 (519.1)	21	9/16 (547.7)	11	1/2 (292.1)
500Q0042	20	9/16 (522.3)	21	3/4 (552.5)	13	1/3 (350.8)
500Q0048	20	3/4 (527.1)	21	13/16 (554.2)	13	15/16 (354.0)
500Q0060	20	13/16 (528.6)	21	15/16 (557.2)	15	5/8 (396.9)

HEATER-UNIT	HEATER-UNIT OPTIONS		HEATER MODELS		KW	
	208V	240V	208V	240V	208V	240V
BBE10050MA00	X	X	X	X	3.8	5.0
BBE10075MA00	X	X	X	X	5.6	7.5
BBE10100MA00	X	X	X	X	7.5	10.0
BBE10150MA00	X	X	X	X	11.3	15.0
BBE10200MA00	X	X	X	X	15.0	20.0

Selection procedure

I Determine cooling and heating requirements at design conditions.

Given:

Required Cooling Capacity (TC) 28,000 Btuh
Sensible Heat Capacity (SHC) 20,500 Btuh
Required Heating Capacity 30,000 Btuh
Outdoor Entering-Air Temperature 95 F
Outdoor-Air Winter Design Temperature 20 F
Indoor-Air Winter Design Temperature 70 F
Indoor Entering-Air Temperature 80 F edb,
67 F ewb
Indoor-Air Quantity 875 cfm
External Static Pressure 0.70 in. wg
Field-Supplied Filter Pressure Drop 0.15 in. wg
Electrical Characteristics (V-Ph-Hz) 230-1-60

II Select unit based on required cooling capacity.

Enter Cooling Capacities table at condenser entering temperature of 95 F, indoor air entering at 875 cfm and 67 F ewb. The 50QQ030 unit will provide a total cooling capacity of 28,900 Btuh and a sensible heat capacity of 20,500 Btuh.

For indoor-air temperature other than 80 F edb, calculate sensible heat capacity correction, as required, using the formula found in Note 3 following the cooling capacities tables.

NOTE: Unit ratings are net capacities.

III Select electric heat.

Enter the Heating Capacities table at 875 cfm. At 70 F return indoor air and 20 F air entering outdoor coil, the integrated heating capacity is 16,900 Btuh. (Select

integrated heating capacity value since deductions for outdoor-coil frost and defrosting have already been made. No correction is required.)

The required heating capacity is 30,000 Btuh. Therefore, 13,100 Btuh (30,000 - 16,900) additional electric heat is required.

Determine additional electric heat capacity in kW.

$$\frac{13,100 \text{ Btuh}}{3414 \text{ Btuh/kW}} = 3.8 \text{ kW of heat required}$$

Enter the Electric Heater Packages table for 50QQ030 unit. The 5-kW heater at 240 v most closely satisfies the heating required. To calculate kW at 230 v:

$$5 \text{ kW} \times .92 = 4.6 \text{ kW}$$

$$5 \text{ kW} \times .92 \times 3414 = 15,704 \text{ Btuh}$$

To calculate kW at 208 v, see Note 2 of Electric Heater Packages table on page 13.

Total unit heating capacity is 32,604 Btuh (16,900 + 15,704).

IV Determine fan speed and power requirements at design conditions.

Before entering Air Delivery tables, calculate the total static pressure required. From the given and the Electric Heat Accessory Pressure Drop table, find:

External static pressure	0.70 in. wg
Filter	0.15 in. wg
Electric heat	0.03 in. wg
Total static pressure	0.88 in. wg

Enter the Air Delivery table. At 875 cfm and 230-v high speed for wet coil, by interpolation the standard motor will deliver 0.92 in. wg static pressure. This will adequately handle job requirements.

Performance data

COOLING CAPACITIES

50QQ018 (1½ Tons)													
Temp (F) Air Ent Cond		INDOOR AIR — CFM/BF											
		525/0.05				675/0.07				750/0.08			
		INDOOR AIR — EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	19.5	18.2	18.0	16.5	20.0	18.8	18.8	17.4	20.2	19.0	19.2	17.7
	SHC	9.60	12.2	15.8	14.6	10.3	13.6	18.1	16.7	10.7	14.3	19.0	17.6
	kW	1.94	1.91	1.96	1.86	2.01	1.97	2.03	1.94	2.04	2.00	2.06	1.97
95	TC	19.0	17.3	17.0	15.7	19.7	18.0	17.8	16.5	19.8	18.2	18.2	16.9
	SHC	9.43	11.9	15.3	14.2	10.3	13.4	17.5	16.2	10.7	14.2	18.2	16.9
	kW	2.08	2.02	2.07	1.96	2.15	2.10	2.14	2.04	2.18	2.13	2.18	2.08
105	TC	18.1	16.4	15.9	14.8	18.8	17.0	16.8	15.6	19.0	17.2	17.2	16.1
	SHC	9.12	11.5	14.9	13.8	10.1	13.0	16.8	15.6	10.5	13.8	17.2	16.1
	kW	2.21	2.13	2.18	2.06	2.28	2.21	2.26	2.15	2.31	2.24	2.31	2.19
115	TC	17.1	15.4	14.9	13.9	17.7	15.9	15.8	14.8	17.9	16.1	16.2	15.3
	SHC	8.74	11.1	14.4	13.3	9.67	12.6	15.8	14.8	10.1	13.4	16.2	15.3
	kW	2.32	2.23	2.29	2.16	2.40	2.31	2.38	2.26	2.43	2.35	2.43	2.30

50QQ024 (2 Tons)													
Temp (F) Air Ent Cond		INDOOR AIR — CFM/BF											
		700/0.07				900/0.10				1000/0.11			
		INDOOR AIR — EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	29.0	26.2	24.3	23.7	30.0	27.2	25.4	24.9	30.5	27.6	25.8	25.5
	SHC	14.3	17.9	20.9	21.4	15.6	20.1	23.6	24.2	16.2	21.2	24.9	25.4
	kW	2.73	2.62	2.54	2.52	2.86	2.75	2.66	2.66	2.92	2.81	2.72	2.72
95	TC	27.3	24.7	22.9	22.4	28.3	25.6	23.9	23.6	28.6	25.9	24.3	24.2
	SHC	13.7	17.3	20.2	20.7	15.0	19.5	22.9	23.2	15.6	20.6	24.0	24.2
	kW	2.89	2.77	2.68	2.66	3.02	2.90	2.81	2.81	3.08	2.95	2.87	2.88
105	TC	25.6	23.1	21.5	21.0	26.5	23.9	22.4	22.2	26.8	24.2	22.9	22.8
	SHC	13.1	16.6	19.5	20.0	14.3	18.8	22.0	22.1	15.0	19.9	22.9	22.8
	kW	3.04	2.91	2.82	2.81	3.17	3.04	2.95	2.96	3.23	3.10	3.02	3.03
115	TC	23.9	21.5	20.0	19.7	24.7	22.2	21.0	20.9	24.9	22.5	21.6	21.5
	SHC	12.4	16.0	18.9	19.1	13.7	18.2	20.9	20.9	14.3	19.2	21.6	21.5
	kW	3.19	3.06	2.96	2.95	3.32	3.19	3.10	3.11	3.38	3.25	3.18	3.19

50QQ030 (2½ Tons)													
Temp (F) Air Ent Cond		INDOOR AIR — CFM/BF											
		875/0.10				1100/0.12				1250/0.13			
		INDOOR AIR — EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	33.7	30.6	28.7	27.9	34.8	31.6	29.6	29.0	35.2	32.0	30.0	29.8
	SHC	16.8	21.2	20.8	25.4	18.2	23.5	23.0	28.4	19.0	25.0	24.4	29.8
	KW	3.13	3.04	2.97	2.96	3.24	3.15	3.08	3.08	3.31	3.22	3.15	3.15
95	TC	31.9	28.9	27.1	26.3	32.8	29.8	27.9	27.5	33.2	30.2	28.3	28.3
	SHC	16.1	20.5	20.1	24.7	17.5	22.8	22.3	27.4	18.3	24.2	23.6	28.3
	KW	3.33	3.24	3.16	3.15	3.45	3.35	3.27	3.27	3.52	3.42	3.34	3.36
105	TC	30.1	27.2	25.4	24.8	30.8	28.0	26.1	26.1	31.2	28.3	26.5	26.9
	SHC	15.4	19.8	19.4	23.9	16.8	22.1	21.5	26.1	17.6	23.5	22.8	26.9
	KW	3.54	3.43	3.34	3.33	3.66	3.54	3.46	3.47	3.72	3.62	3.53	3.56
115	TC	28.2	25.4	23.7	23.2	28.8	26.1	24.3	24.6	29.1	26.4	24.6	25.3
	SHC	14.8	19.1	18.6	22.9	16.1	21.4	20.7	24.6	16.9	22.7	22.0	25.3
	KW	3.74	3.62	3.52	3.51	3.86	3.74	3.64	3.67	3.93	3.81	3.71	3.76

LEGEND

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

*At 75 F entering dry bulb (Tennessee Valley Authority [TVA] rating conditions); all others at 80 F entering dry bulb

NOTES:

1. Direct interpolation is permissible. Do not extrapolate

2. The following formulas may be used:

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

$$t_{lwb} = \text{Wet-bulb temperature corresponding to enthalpy of air leaving indoor coil (} h_{lwb} \text{)}$$

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

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

3. The SHC is based on 80 F edb temperature of air entering indoor coil.

Below 80 F edb, subtract (corr factor x cfm) from SHC.

Above 80 F edb, add (corr factor x cfm) to SHC.

Correction Factor = $1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$

Performance data (cont)

COOLING CAPACITIES (cont)

50QQ036 (3 Tons)													
Temp (F) Air Ent Cond		INDOOR AIR — CFM/BF											
		1050/0.10				1300/0.13				1500/0.14			
		INDOOR AIR — EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	40.6	36.7	34.1	33.3	41.8	37.8	35.3	34.7	42.5	38.5	36.2	35.7
	SHC	20.3	25.5	29.7	30.6	21.8	28.1	32.9	33.8	23.0	30.1	35.2	35.7
	KW	3.85	3.71	3.59	3.59	3.99	3.84	3.73	3.73	4.08	3.94	3.83	3.84
95	TC	38.1	34.4	31.9	31.2	39.1	35.3	33.0	32.6	39.7	35.9	33.9	33.7
	SHC	19.3	24.6	28.7	29.5	20.9	27.2	31.7	32.4	22.0	29.1	33.7	33.7
	KW	4.09	3.93	3.81	3.80	4.22	4.06	3.95	3.95	4.32	4.16	4.05	4.07
105	TC	35.5	32.0	29.7	29.1	36.4	32.8	30.9	30.6	36.9	33.3	31.8	31.7
	SHC	18.4	23.6	27.6	28.3	19.9	26.2	30.4	30.6	21.1	28.1	31.8	31.7
	KW	4.32	4.15	4.02	4.01	4.45	4.29	4.17	4.18	4.55	4.38	4.29	4.30
115	TC	32.9	29.5	27.4	27.0	33.7	30.3	28.8	28.7	34.1	30.7	29.7	29.6
	SHC	17.5	22.6	26.5	26.9	19.0	25.2	28.7	28.7	20.1	27.0	29.7	29.6
	KW	4.55	4.36	4.22	4.22	4.68	4.50	4.39	4.41	4.78	4.60	4.52	4.54

50QQ042 (3½ Tons)													
Temp (F) Air Ent Cond		INDOOR AIR — CFM/BF											
		1225/0.09				1325/0.11				1650/0.13			
		INDOOR AIR — EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	46.8	42.3	39.0	38.4	47.6	43.1	39.7	39.3	48.5	43.9	40.4	40.6
	SHC	23.4	29.7	28.6	35.7	24.5	31.5	30.4	38.0	25.9	34.0	32.7	40.5
	kW	4.12	4.00	3.91	3.89	4.22	4.10	4.01	4.00	4.35	4.23	4.13	4.14
95	TC	44.2	39.9	36.6	36.2	44.9	40.5	37.2	37.1	45.6	41.2	37.9	38.6
	SHC	22.4	28.7	27.6	34.5	23.5	30.5	29.3	36.7	24.9	33.0	31.6	38.5
	kW	4.39	4.26	4.15	4.14	4.49	4.35	4.25	4.25	4.62	4.49	4.38	4.40
105	TC	41.5	37.3	34.3	34.0	42.1	37.9	34.8	35.1	42.7	38.6	35.4	36.5
	SHC	21.5	27.7	26.6	33.4	22.5	29.5	28.3	35.0	24.0	31.9	30.5	36.5
	kW	4.66	4.51	4.39	4.38	4.76	4.61	4.49	4.50	4.90	4.74	4.62	4.66
115	TC	38.8	34.9	31.9	31.9	39.3	35.4	32.4	33.1	39.8	35.9	32.9	34.4
	SHC	20.5	26.7	25.6	31.9	21.6	28.5	27.2	33.1	23.0	30.9	29.4	34.4
	kW	4.93	4.75	4.62	4.62	5.03	4.86	4.72	4.75	5.16	5.00	4.86	4.93

50QQ048 (4 Tons)													
Temp (F) Air Ent Cond		INDOOR AIR — CFM/BF											
		1400/0.06				1650/0.08				1800/0.09			
		INDOOR AIR — EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	53.9	48.9	45.3	44.6	55.0	49.9	46.5	45.9	55.5	50.4	47.2	46.7
	SHC	27.0	34.4	40.2	41.6	28.6	37.2	43.7	45.0	29.5	38.8	45.5	46.6
	kW	5.41	5.22	5.07	5.04	5.57	5.37	5.23	5.21	5.66	5.46	5.33	5.31
95	TC	50.7	45.9	42.6	41.9	51.6	46.8	43.7	43.3	52.0	47.2	44.4	44.2
	SHC	25.9	33.2	38.9	40.3	27.4	36.0	42.2	43.1	28.3	37.5	43.9	44.2
	kW	5.77	5.55	5.39	5.36	5.93	5.71	5.56	5.54	6.02	5.80	5.66	5.66
105	TC	47.4	42.9	39.8	39.2	48.2	43.7	41.0	40.8	48.5	44.0	41.7	41.7
	SHC	24.7	32.0	37.6	38.8	26.3	34.7	40.5	40.8	27.2	36.3	41.7	41.7
	kW	6.12	5.88	5.71	5.68	6.28	6.04	5.89	5.88	6.37	6.13	6.00	6.00
115	TC	44.1	39.9	37.1	36.8	25.1	33.5	38.4	38.4	26.0	35.0	39.1	39.1
	SHC	23.5	30.8	36.2	36.8	25.1	33.5	38.3	38.4	26.0	35.0	39.1	39.1
	kW	6.46	6.19	6.01	6.00	6.62	6.36	6.22	6.22	6.71	6.45	6.34	6.34

LEGEND

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

*At 75 F entering dry bulb (Tennessee Valley Authority [TVA] rating conditions); all others at 80 F entering dry bulb.

NOTES:

1. Direct interpolation is permissible. Do not extrapolate.

2. The following formulas may be used:

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

$$t_{lwb} = \text{Wet-bulb temperature corresponding to enthalpy of air leaving indoor coil } (h_{lwb})$$

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

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

3. The SHC is based on 80 F edb temperature of air entering indoor coil.

Below 80 F edb, subtract (corr factor x cfm) from SHC.

Above 80 F edb, add (corr factor x cfm) to SHC.

Correction Factor = $1.10 \times (1 - \text{BF}) \times (\text{edb} - 80)$

COOLING CAPACITIES (cont)

50QQ060 (5 Tons)													
Temp (F) Air Ent Cond		INDOOR AIR – CFM/BF											
		1750/0.08				2250/0.10				2400/0.11			
		INDOOR AIR – EWB (F)											
		72	67	63*	62	72	67	63*	62	72	67	63*	62
85	TC	66.2	60.4	56.7	55 0	67 4	61.9	58 7	57.1	67 7	62 3	59.2	58.1
	SHC	32 7	42.1	49.6	50.9	35 0	46.6	55 9	56.8	36.0	48.5	57 5	58.1
	kW	7.00	6.74	6.68	6.47	7.33	7.07	7.08	6.86	7.46	7.21	7.20	7.03
95	TC	62.4	56.7	53.3	51.7	63 4	58.0	55 2	54.0	63 5	58.3	55.7	55.0
	SHC	31.3	40.6	48.0	49.3	33 6	45.2	53.9	54.0	34 6	47.0	55.3	55.0
	kW	7.38	7.08	7.02	6.79	7.68	7.44	7.43	7.21	7.81	7.54	7.56	7.39
105	TC	58 5	53.1	49.8	48 4	59.2	54 1	51.8	51.0	59 3	54.4	52.5	51.9
	SHC	29 9	39.1	47.5	46 4	32.3	43 7	51 6	51.0	33 1	45.7	52.5	51.9
	kW	7.73	7.41	7.36	7.12	8.04	7.77	7.80	7.57	8.16	7.91	7.93	7.76
115	TC	54.5	49 1	45.9	44.9	55 1	50.1	48.4	47.7	55.1	50.4	49.1	48.7
	SHC	28.5	37 5	44.4	44.9	30.8	42.2	48 3	47.7	31.8	44.1	49 1	48.7
	kW	8.08	7.74	7.69	7.46	8.39	8.09	8.17	7.93	8.52	8.24	8.31	8.12

LEGEND

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

*At 75 F entering dry bulb (Tennessee Valley Authority [TVA] rating conditions); all others at 80 F entering dry bulb.

NOTES:

1 Direct interpolation is permissible. Do not extrapolate.

2. The following formulas may be used:

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

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

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

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

3. The SHC is based on 80 F edb temperature of air entering indoor coil

Below 80 F edb, subtract (corr factor x cfm) from SHC.

Above 80 F edb, add (corr factor x cfm) to SHC.

Correction Factor = $1.10 \times (1 - BF) \times (edb - 80)$.

HEATING CAPACITIES

50QQ018 (1½ Tons)																						
CFM (Std Air)	RETURN AIR (F db)	TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)																				
			-10	0	10	17	20	30	40	47	50	60										
525	60	Cap.	5.75	5.31	1.52	7.09	9.67	8.37	11.2	10.2	11.9	10.2	14.6	12.8	17.6	17.6	20.1	20.1	21.2	21.2	25.1	25.1
		kW	1.46		1.52	1.58	1.62	1.64	1.70	1.77	1.82	1.85	1.94									
	70	Cap.	5.35	4.94	7.26	6.58	9.17	8.42	10.7	9.73	11.4	10.3	13.9	12.2	16.9	16.9	19.2	19.2	20.3	20.3	24.1	24.1
		kW	1.48		1.55	1.62	1.67	1.69	1.77	1.84	1.90	1.93	2.02									
	80	Cap.	4.74	4.38	6.70	6.17	8.67	7.95	10.1	9.23	10.8	9.79	13.3	11.6	16.1	16.1	18.4	18.4	19.4	19.4	23.1	23.1
		kW	1.50		1.58	1.67	1.72	1.75	1.83	1.91	1.98	2.01	2.10									
675	60	Cap.	5.93	5.48	7.94	7.31	9.95	9.13	11.6	10.5	12.3	11.1	15.0	13.2	18.2	18.2	20.6	20.6	21.8	21.8	25.7	25.7
		kW	1.50		1.55	1.61	1.64	1.66	1.71	1.77	1.83	1.85	1.95									
	70	Cap.	5.55	5.13	7.50	6.90	9.45	8.67	11.0	10.0	11.7	10.6	14.4	12.6	17.4	17.4	19.8	19.8	20.9	20.9	24.8	24.8
		kW	1.53		1.59	1.66	1.70	1.72	1.78	1.85	1.90	1.93	2.02									
	80	Cap.	4.99	4.61	6.96	6.41	8.94	8.20	10.4	9.52	11.1	10.1	13.7	12.0	16.6	16.6	19.0	19.0	20.1	20.1	23.8	23.8
		kW	1.54		1.62	1.70	1.75	1.77	1.85	1.92	1.98	2.00	2.09									
750	60	Cap.	6.01	5.55	8.04	7.40	10.1	9.24	11.7	10.7	12.4	11.3	15.2	13.3	18.3	18.3	20.8	20.8	22.0	22.0	25.9	25.9
		kW	1.52		1.57	1.62	1.66	1.67	1.72	1.78	1.84	1.87	1.96									
	70	Cap.	5.63	5.20	7.60	6.99	9.57	8.78	11.1	10.2	11.8	10.7	14.5	12.7	17.6	17.6	20.0	20.0	21.2	21.2	25.0	25.0
		kW	1.55		1.61	1.68	1.72	1.73	1.79	1.86	1.91	1.94	2.03									
	80	Cap.	5.09	4.70	7.07	6.51	9.06	8.31	10.6	9.64	11.3	10.2	13.9	12.1	16.8	16.8	19.2	19.2	20.3	20.3	24.0	24.0
		kW	1.57		1.64	1.72	1.77	1.79	1.86	1.93	1.98	2.01	2.10									

LEGEND

Cap. — Heating Capacity (1000 Btuh) (Includes Indoor-Fan Motor Heat)
db — Dry Bulb
kW — Total Power Input (Includes Compressor Motor Power Input, Outdoor-Fan Motor Input and Indoor-Fan Motor Input)
rh — Relative Humidity

NOTES:

- 1 **Shading** indicates integrated ratings
2. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it

Performance data (cont)

HEATING CAPACITIES (cont)

50QQ024 (2 Tons)

CFM (Std Air)	RETURN AIR (F db)	TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)																				
			-10	0	10	17	20	30	40	47	50	60										
700	60	Cap.	8.72	8.02	11.2	10.3	13.7	12.5	15.5	14.2	16.4	14.8	19.4	17.0	22.7	22.7	25.2	25.2	26.3	26.3	30.2	30.2
		kW	1.42		1.56		1.70		1.81		1.86		2.03		2.22		2.37		2.43		2.67	
	70	Cap.	7.79	7.17	10.4	9.53	12.9	11.9	14.8	13.5	15.6	14.1	18.5	16.2	21.7	21.7	24.1	24.1	25.2	25.2	29.1	29.1
		kW	1.44		1.60		1.76		1.88		1.93		2.11		2.31		2.47		2.54		2.79	
	80	Cap.	6.73	6.19	9.35	8.60	12.0	11.0	14.0	12.7	14.8	13.4	17.6	15.4	20.8	20.8	23.1	23.1	24.2	24.2	27.9	27.9
		kW	1.46		1.63		1.80		1.93		1.99		2.19		2.40		2.57		2.64		2.90	
900	60	Cap.	9.14	8.41	11.7	10.7	14.1	13.0	16.1	14.7	16.9	15.3	20.0	17.5	23.4	23.4	26.1	26.1	27.2	27.2	31.3	31.3
		kW	1.49		1.62		1.76		1.86		1.91		2.06		2.24		2.38		2.44		2.67	
	70	Cap.	8.21	7.55	10.8	9.96	13.4	12.3	15.3	13.9	16.1	14.6	19.1	16.8	22.5	22.5	25.0	25.0	26.1	26.1	30.1	30.1
		kW	1.51		1.66		1.81		1.93		1.97		2.15		2.34		2.48		2.55		2.78	
	80	Cap.	7.14	6.57	9.82	9.04	12.6	11.5	14.5	13.2	15.3	13.9	18.2	16.0	21.5	21.5	23.9	23.9	25.0	25.0	28.4	28.4
		kW	1.53		1.70		1.86		1.99		2.04		2.23		2.43		2.58		2.65		2.90	
1000	60	Cap.	9.31	8.57	11.8	10.9	14.3	13.2	16.3	14.9	17.1	15.5	20.3	17.7	23.7	23.7	26.5	26.5	27.6	27.6	31.7	31.7
		kW	1.52		1.65		1.79		1.89		1.93		2.09		2.26		2.40		2.45		2.68	
	70	Cap.	8.40	7.72	11.0	10.1	13.6	12.5	15.5	14.1	16.3	14.8	19.4	17.0	22.8	22.8	25.4	25.4	26.5	26.5	30.5	30.5
		kW	1.55		1.70		1.84		1.96		2.00		2.17		2.36		2.50		2.56		2.79	
	80	Cap.	7.32	6.73	10.0	9.22	12.8	11.7	14.7	13.4	15.5	14.1	18.5	16.2	21.8	21.8	24.3	24.3	25.4	25.4	29.3	29.3
		kW	1.57		1.73		1.89		2.02		2.07		2.25		2.45		2.60		2.67		2.71	

50QQ030 (2½ Tons)

CFM (Std Air)	RETURN AIR (F db)	TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)																				
			-10	0	10	17	20	30	40	47	50	60										
875	60	Cap.	8.32	7.96	12.3	11.4	16.3	14.9	19.0	17.4	20.2	18.2	24.1	21.1	28.2	26.2	31.0	31.0	32.3	32.3	36.7	36.7
		kW	1.86		2.04		2.21		2.33		2.38		2.56		2.76		2.90		2.96		3.18	
	70	Cap.	6.02	5.83	10.2	9.53	14.4	13.2	17.4	15.8	18.7	16.9	22.6	19.8	26.8	25.8	29.8	29.8	31.0	31.0	35.3	35.3
		kW	1.85		2.05		2.26		2.40		2.46		2.66		2.87		3.03		3.10		3.34	
	80	Cap.	1.96	1.96	6.99	6.55	12.0	11.0	15.5	14.2	16.8	15.2	21.0	19.4	25.3	25.3	28.3	28.3	29.6	29.6	33.9	33.9
		kW	1.76		2.02		2.28		2.46		2.52		2.74		2.47		3.14		3.22		3.49	
1065	60	Cap.	8.66	8.30	12.7	11.9	16.8	15.4	19.6	17.9	20.8	18.9	24.8	21.7	28.8	26.8	31.8	31.8	33.1	33.1	37.7	37.7
		kW	1.92		2.09		2.25		2.37		2.42		2.58		2.76		2.89		2.95		3.15	
	70	Cap.	6.17	5.97	10.5	9.80	14.8	13.6	17.9	16.3	19.2	17.4	23.3	20.4	27.6	27.6	30.6	30.6	31.8	31.8	36.3	36.3
		kW	1.91		2.11		2.30		2.44		2.50		2.68		2.88		3.03		3.09		3.31	
	80	Cap.	1.95	1.95	7.17	6.72	12.4	11.4	16.0	14.6	17.3	15.7	21.7	19.0	26.1	26.1	29.2	29.2	30.5	30.5	35.0	35.0
		kW	1.82		2.07		2.32		2.50		2.56		2.77		2.99		3.15		3.22		3.47	
1250	60	Cap.	8.93	8.54	13.1	12.2	17.2	15.8	20.1	18.3	21.3	19.3	25.3	22.2	29.4	27.4	32.4	32.4	33.8	33.8	38.5	38.5
		kW	1.98		2.14		2.30		2.41		2.46		2.62		2.78		2.90		2.96		3.14	
	70	Cap.	5.24	5.14	10.2	9.53	15.2	13.9	18.7	17.0	19.9	18.0	24.0	21.0	28.3	26.3	31.2	31.2	32.5	32.5	37.1	37.1
		kW	1.93		2.14		2.35		2.50		2.55		2.72		2.91		3.04		3.10		3.31	
	80	Cap.	4.62	4.53	8.99	8.40	13.4	12.3	16.4	15.0	18.0	16.3	22.4	19.6	26.8	26.8	29.9	29.9	31.2	31.2	35.7	35.7
		kW	2.00		2.20		2.40		2.54		2.62		2.82		3.02		3.18		3.24		4.47	

LEGEND

Cap. — Heating Capacity (1000 Btu/h) (Includes Indoor-Fan Motor Heat)
 db — Dry Bulb
 kW — Total Power Input (Includes Compressor Motor Power Input,
 Outdoor-Fan Motor Input and Indoor-Fan Motor Input)
 rh — Relative Humidity

NOTES:

1. **Shading** indicates integrated ratings
2. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it.

HEATING CAPACITIES (cont)

50QQ036 (3 Tons)

CFM (Std Air)	RETURN AIR (F db)	TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)																				
			-10	0	10	17	20	30	40	47	50	60										
1050	60	Cap.	11.5	10.6	15.4	14.1	19.2	17.7	22.0	20.1	23.2	21.1	27.6	24.2	32.4	32.4	36.0	36.0	37.6	37.6	43.1	43.1
		kW	2.08		2.27		2.46		2.61		2.67		2.88		3.12		3.30		3.38		3.66	
	70	Cap.	9.86	9.07	13.7	12.6	17.8	16.3	20.7	18.9	21.9	19.9	26.2	23.0	30.9	30.9	34.4	34.4	35.9	35.9	41.3	41.3
		kW	2.11		2.32		2.53		2.69		2.76		3.00		3.25		3.45		3.53		3.84	
	80	Cap.	7.98	7.34	12.0	11.0	16.1	14.8	19.1	17.4	20.4	18.5	24.8	21.7	29.3	29.3	32.7	32.7	34.2	34.2	39.5	39.5
		kW	2.13		2.36		2.59		2.76		2.84		3.10		3.38		3.59		3.68		4.01	
1300	60	Cap.	12.0	11.0	15.9	14.6	19.8	18.2	22.7	20.7	23.9	21.7	28.4	24.9	33.3	33.3	37.1	37.1	38.7	38.7	44.5	44.5
		kW	2.16		2.34		2.53		2.66		2.72		2.92		3.14		3.31		3.38		3.64	
	70	Cap.	10.3	9.49	14.3	13.2	18.4	16.9	21.4	19.5	22.6	20.5	27.0	23.6	31.8	31.8	35.4	35.4	37.0	37.0	42.6	42.6
		kW	2.19		2.40		2.60		2.75		2.81		3.04		3.28		3.46		3.54		3.82	
	80	Cap.	8.40	7.73	12.5	11.5	16.7	15.3	19.8	18.1	21.1	19.1	25.5	22.4	30.2	30.2	33.7	33.7	35.3	35.3	40.8	40.8
		kW	2.21		2.44		2.66		2.83		2.90		3.15		3.41		3.61		3.69		4.00	
1500	60	Cap.	12.4	11.4	16.3	15.0	20.2	18.6	23.1	21.1	24.4	22.1	28.9	25.4	33.9	33.9	37.8	37.8	39.4	39.4	45.3	45.3
		kW	2.22		2.40		2.58		2.71		2.76		2.96		3.17		3.33		3.40		3.65	
	70	Cap.	10.6	9.80	14.7	13.5	18.8	17.3	21.8	19.9	23.0	20.9	27.5	24.1	32.4	32.4	36.1	36.1	37.7	37.7	43.4	43.4
		kW	2.25		2.46		2.65		2.80		2.86		3.08		3.31		3.48		3.56		3.83	
	80	Cap.	8.71	8.01	12.9	11.9	17.1	15.7	20.3	18.5	21.6	19.6	26.0	22.8	30.8	30.8	34.4	34.4	36.0	36.0	41.5	41.5
		kW	2.28		2.50		2.72		2.88		2.95		3.19		3.45		3.63		3.72		4.01	

50QQ042 (3½ Tons)

CFM (Std Air)	RETURN AIR (F db)	TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)																				
			-10	0	10	17	20	30	40	47	50	60										
1050	60	Cap.	10.8	9.94	14.8	13.6	19.2	17.6	22.6	20.6	24.0	21.8	29.3	25.7	35.3	35.3	40.3	40.3	42.1	42.1	48.1	48.1
		kW	2.52		2.72		2.92		3.07		3.13		3.34		3.58		3.77		3.82		4.00	
	70	Cap.	9.34	8.59	13.4	12.3	17.8	16.4	21.3	19.4	22.7	20.6	28.0	24.5	33.9	33.9	38.6	38.6	40.4	40.4	46.6	46.6
		kW	2.55		2.77		3.00		3.16		3.23		3.47		3.73		3.93		4.00		4.21	
	80	Cap.	7.59	6.99	11.7	10.8	16.3	14.9	19.7	18.0	21.2	19.2	26.7	23.4	32.5	32.5	36.9	36.9	38.9	38.9	45.5	45.5
		kW	2.57		2.81		3.07		3.24		3.32		3.59		3.88		4.09		4.18		4.45	
1325	60	Cap.	11.3	10.4	15.4	14.2	19.9	18.3	23.3	21.2	24.8	22.5	30.3	26.5	36.5	36.5	41.4	41.4	42.8	42.8	48.8	48.8
		kW	2.63		2.82		3.01		3.14		3.20		3.40		3.61		3.75		3.78		3.94	
	70	Cap.	9.86	9.07	14.0	12.9	18.6	17.1	22.1	20.1	23.6	21.4	28.9	25.4	35.0	35.0	40.0	40.0	41.8	41.8	47.4	47.4
		kW	2.67		2.88		3.09		3.24		3.31		3.53		3.77		3.95		4.00		4.16	
	80	Cap.	8.10	7.45	12.4	11.4	17.0	15.6	20.6	18.7	22.1	20.0	27.6	24.2	33.5	33.5	38.2	38.2	40.2	40.2	46.9	46.9
		kW	2.68		2.93		3.16		3.33		3.40		3.66		3.92		4.12		4.19		4.42	
1500	60	Cap.	11.6	10.7	15.7	14.5	20.3	18.6	23.7	21.6	25.2	22.9	30.7	26.9	37.1	37.1	41.3	41.3	43.3	43.3	49.1	49.1
		kW	2.70		2.88		3.07		3.20		3.25		3.44		3.64		3.74		3.79		3.94	
	70	Cap.	10.2	9.34	14.3	13.2	19.0	17.4	22.5	20.5	24.0	21.8	29.4	25.8	35.6	35.6	40.6	40.6	41.6	41.6	47.7	47.7
		kW	2.74		2.95		3.15		3.30		3.36		3.58		3.80		3.97		3.98		4.15	
	80	Cap.	8.39	7.72	12.7	11.7	17.4	16.0	21.0	19.2	22.6	20.5	28.1	24.6	34.1	34.1	38.9	38.9	40.8	40.8	46.6	46.6
		kW	2.76		3.00		3.23		3.39		3.46		3.71		3.96		4.14		4.21		4.38	

LEGEND

Cap. — Heating Capacity (1000 Btuh) (Includes Indoor-Fan Motor Heat)
 db — Dry Bulb
 kW — Total Power Input (Includes Compressor Motor Power Input,
 Outdoor-Fan Motor Input and Indoor-Fan Motor Input)
 rh — Relative Humidity

NOTES:

1. **Shading** indicates integrated ratings.
2. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it.

) stat data (cont)

HEATING CAPACITIES (cont)

TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)											
	0	0	10	17	20	30	40	47	50	60	
0.0	20.6	19.0	25.2	23.1	28.5	26.0	29.9	27.1	34.9	30.6	40.4
0.5	2.94		3.19		3.39		3.47		3.76		4.07
1.0	18.8	17.3	23.5	21.6	27.1	24.7	28.5	25.9	33.5	29.3	38.8
1.5	3.00		3.29		3.50		3.60		3.92		4.26
2.0	16.8	15.5	21.7	19.9	25.2	23.0	26.8	24.3	32.0	28.0	37.3
2.5	3.06		3.37		3.60		3.70		4.06		4.44
3.0	21.6	19.9	26.2	24.1	29.6	27.0	31.1	28.2	36.2	31.7	41.9
3.5	3.06		3.30		3.48		3.55		3.81		4.09
4.0	19.8	18.3	24.7	22.7	28.3	25.8	29.7	27.0	34.8	30.5	40.3
4.5	3.13		3.40		3.61		3.69		3.98		4.29
5.0	17.9	16.4	22.9	21.0	26.6	24.2	28.2	25.5	33.3	29.2	38.7
5.5	3.19		3.49		3.71		3.81		4.13		4.48
6.0	22.4	20.7	27.1	24.9	30.5	27.8	32.0	29.0	37.3	32.7	43.0
6.5	3.19		3.42		3.58		3.65		3.89		4.14
7.0	20.8	19.2	25.7	23.6	29.2	26.6	30.7	27.8	35.8	31.4	41.5
7.5	3.28		3.52		3.72		3.80		4.06		4.35
8.0	18.8	17.3	23.8	21.9	27.6	25.2	29.2	26.5	34.4	30.1	39.9
8.5	3.33		3.62		3.83		3.92		4.23		4.54

TEMPERATURE AIR ENTERING OUTDOOR COIL (F db at 70% rh)											
	0	0	10	17	20	30	40	47	50	60	
0.0	23.1	21.2	28.9	26.5	33.2	30.3	35.2	31.9	42.7	37.4	51.3
0.5	4.25		4.52		4.71		4.79		5.10		5.42
1.0	21.5	19.8	27.5	25.2	31.9	29.1	33.9	30.7	41.1	36.0	49.4
1.5	4.38		4.67		4.88		4.98		5.31		5.65
2.0	19.7	18.2	25.7	23.6	30.3	27.6	32.3	29.3	39.5	34.6	47.4
2.5	4.49		4.82		5.04		5.15		5.51		5.88
3.0	24.1	22.1	29.9	27.4	34.3	31.3	36.3	32.9	44.1	38.6	53.0
3.5	4.49		4.74		4.91		4.99		5.27		5.56
4.0	22.5	20.7	28.6	26.2	33.0	30.1	35.0	31.8	42.4	37.2	51.0
4.5	4.62		4.89		5.00		5.18		5.48		5.80
5.0	20.8	19.1	26.9	24.7	31.5	28.7	33.6	30.5	40.8	35.8	49.0
5.5	4.74		5.04		5.25		5.35		5.69		6.03
6.0	24.5	22.5	30.3	27.8	34.8	31.7	36.8	33.3	44.7	39.1	53.0
6.5	4.59		4.84		5.01		5.08		5.35		5.59
7.0	22.9	21.1	29.0	26.6	33.4	30.5	35.5	32.2	43.0	37.7	51.6
7.5	4.73		5.00		5.19		5.27		5.57		5.87
8.0	21.2	19.5	27.3	25.1	31.9	29.1	34.1	30.9	41.4	36.2	49.7
8.5	4.85		5.15		5.35		5.45		5.78		6.11

(Includes Indoor-Fan Motor Heat)
 Compressor Motor Power Input,
 Indoor-Fan Motor Input)

NOTES:

1. Shading indicates integrated ratings
2. Integrated capacity is maximum (instantaneous) capacity less the effect of frost on the outdoor coil and the heat required to defrost it.

AIR DELIVERY* (Cfm) PERFORMANCE
(Deduct 8% for 208 V)

50QQ UNIT SIZE	UNIT VOLTAGE (Single Phase)	INDOOR-FAN MOTOR SPEED	COIL	EXTERNAL STATIC PRESSURE (in. wg)										
				0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
018	230	Low	Dry	—	—	—	—	—	800	730	640	—	—	—
		High	Wet	—	—	—	—	—	750	680	550	—	—	—
024	230	Low	Dry	1450	1410	1375	1320	1345	1175	1090	985	850	760	—
		High	Wet	1390	1340	1290	1225	1165	1105	1020	915	740	—	—
030	230	Low	Dry	1500	1475	1435	1390	1335	1260	1180	1090	980	840	—
		High	Wet	1460	1405	1350	1295	1255	1190	1110	1020	870	—	—
036	230	Low	Dry	—	—	1425	1360	1295	1235	1160	1080	995	925	815
		High	Wet	—	—	1380	1315	1250	1190	1125	1045	960	895	790
042, 048	230	Low	Dry	—	—	1500	1425	1345	1275	1190	1120	1020	935	830
		High	Wet	—	—	1450	1375	1295	1230	1145	1080	985	905	805
060	230	Low	Dry	—	—	1440	1400	1345	1290	1225	1140	1040	930	—
		High	Wet	—	—	1400	1365	1290	1240	1185	1090	990	890	—
060	230	Low	Dry	1540	1507	1480	1430	1380	1350	1300	1260	1210	1155	1100
		High	Wet	1400	1370	1345	1300	1260	1230	1195	1150	1100	1050	1000
060	230	Med	Dry	1960	1915	1885	1830	1780	1725	1655	1600	1540	1470	1400
		High	Wet	1895	1880	1850	1795	1745	1690	1620	1565	1510	1445	1375
060	230	Low	Dry	2230	2160	2120	2070	2010	1950	1890	1820	1750	1675	1590
		High	Wet	2145	2105	2060	2000	1940	1880	1820	1750	1690	1615	1540
060	230	Low	Dry	2395	2365	2335	2290	2245	2205	2150	2100	2050	2000	1915
		High	Wet	2375	2325	2295	2250	2225	2180	2135	2070	2020	1960	1875
060	230	Low	Dry	2570	2525	2470	2425	2370	2335	2265	2220	2160	2100	2030
		High	Wet	2550	2485	2435	2385	2345	2310	2235	2190	2130	2075	2000

*Heating airflows with dry coil; cooling airflows with wet coil.

NOTES:

- Air delivery values are based on 230-v unit operating voltage without air filter or optional electric heaters. Deduct field-supplied air filter and electric heater pressure drop to obtain external static pressure available for ducting.
- Dashes indicate portions of table that are beyond indoor-fan motor capability.

- Do not operate unit at a cooling airflow less than 350 cfm for each 12,000 Btuh of rated cooling capacity. Operation at airflow below this point may result in frost on indoor coil.
- See Minimum Airflow (Cfm) for Safe Electric Heater Operation table below for minimum airflow required for field-installed electric heaters.

ELECTRIC HEAT ACCESSORY PRESSURE DROP (in. wg)

HEATER kW	CFM								
	600	800	1000	1200	1400	1600	1800	2000	2200
5.0 - 7.5 - 10.0	.020	.030	.040	.045	.050	.055	.060	.070	.080
15.0 - 20.0 - 25.0	—	—	.050	.055	.060	.070	.080	.090	100

ELECTRIC HEATER PACKAGES

50QQ UNIT SIZE	HEATER PART NO.	HEATER V-PH	kW	BRANCH CIRCUIT							
				Heater Amps	Minimum Circuit Ampacity	MOC Amps	Stages*	Elements	Power Wire Size†	Ground Wire Size	Capacity (MBtuh)
018-060	88EM0050MA00	240-1	5.0	20.8	26.0	30	1	1	10	10	17.1
	88EM0075MA00		7.5	31.3	39.1	40	1	2	8	10	25.6
	88EM0100MA00		10.0	41.6	52.0	60	1	2	6	10	34.1
030-060	88EM0150MA00		15.0	62.5	78.1	80	2	3	3	8	51.2
036-060	88EM0200MA00		20.0	83.3	104.2	110	2	4	2**	6	68.2
060	88EM0250MA00		25.0	104.0	130.0	150	3	5	1**	6	85.4

LEGEND

HACR — Heating, Air Conditioning, and Refrigeration

MOC — Maximum Overcurrent Protection
(Fuses or HACR-Type Circuit Breaker)

*The va draw per stage is 6.2.

†Wire size based on 60 C copper conductors unless otherwise noted.

**Wire size based on 75 C copper conductor

NOTE: The heater kW ratings shown above are at 240 v. Use the following table to determine heater capacity for your particular voltage:

HEATER kW RATING	VOLTAGE DISTRIBUTION V-1-60	MULTIPLICATION FACTOR
240	208	.75
	230	.92

**MINIMUM AIRFLOW (CFM) FOR
SAFE ELECTRIC HEATER OPERATION**

SIZE	018	024	030	036	042	048	060
Airflow (Cfm)	600	875	875	1300	1400	1700	1800

Electrical data

50QQ UNIT SIZE	V-PH-HZ	OPERATING VOLTAGE*		COMPRESSOR		IFM FLA	OFM FLA	MAX FUSE† OR HACR CKT BKR AMPS	MCA
		Max	Min	LRA	RLA				
018	208/230-1-60	254	187	50.0	9.3	3.5	1.4	25	16.5
024				61.0	13.0	3.5	1.4	30	21.2
030				82.0	16.0	3.5	2.2	35	25.7
036				83.5	18.1	3.5	2.2	45	28.3
042				105.0	19.0	4.7	2.2	45	30.7
048				110.0	26.2	4.7	2.2	50	39.7
060				178.0	30.2	6.7	2.8	60	47.3

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning, Refrigeration
IFM — Indoor Fan Motor
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps
OFM — Outdoor Fan Motor
RLA — Rated Load Amps

*Permissible limits of the voltage range at which units will operate satisfactorily.

†Maximum dual element fuse.

NOTE: Use copper wire only



Controls

Operating sequence

When power is supplied to unit, transformer (TRAN) and crankcase heater (CH) are energized.

Cooling — On a call for cooling, thermostat makes circuit R-O, R-Y, and R-G. When room temperature rises to within 2° F of control setting of thermostat, circuit R-O makes, energizing reversing valve solenoid (RVS). Unit is now in standby condition for cooling. As room temperature rises, the second-stage bulb makes, allowing a circuit (R-Y) through low-pressure switch (LPS) to contactor (C), starting compressor (COMP) and outdoor fan motor (OFM). Circuit R-G energizes indoor fan relay (IFR), starting indoor fan motor (IFM).

When thermostat is satisfied, contacts open, deenergizing contactor; indoor fan relay, compressor, and motor stop.

Heating — On a call for heat, thermostat makes circuits R-Y and R-G. Circuit R-Y is completed, allowing circuit

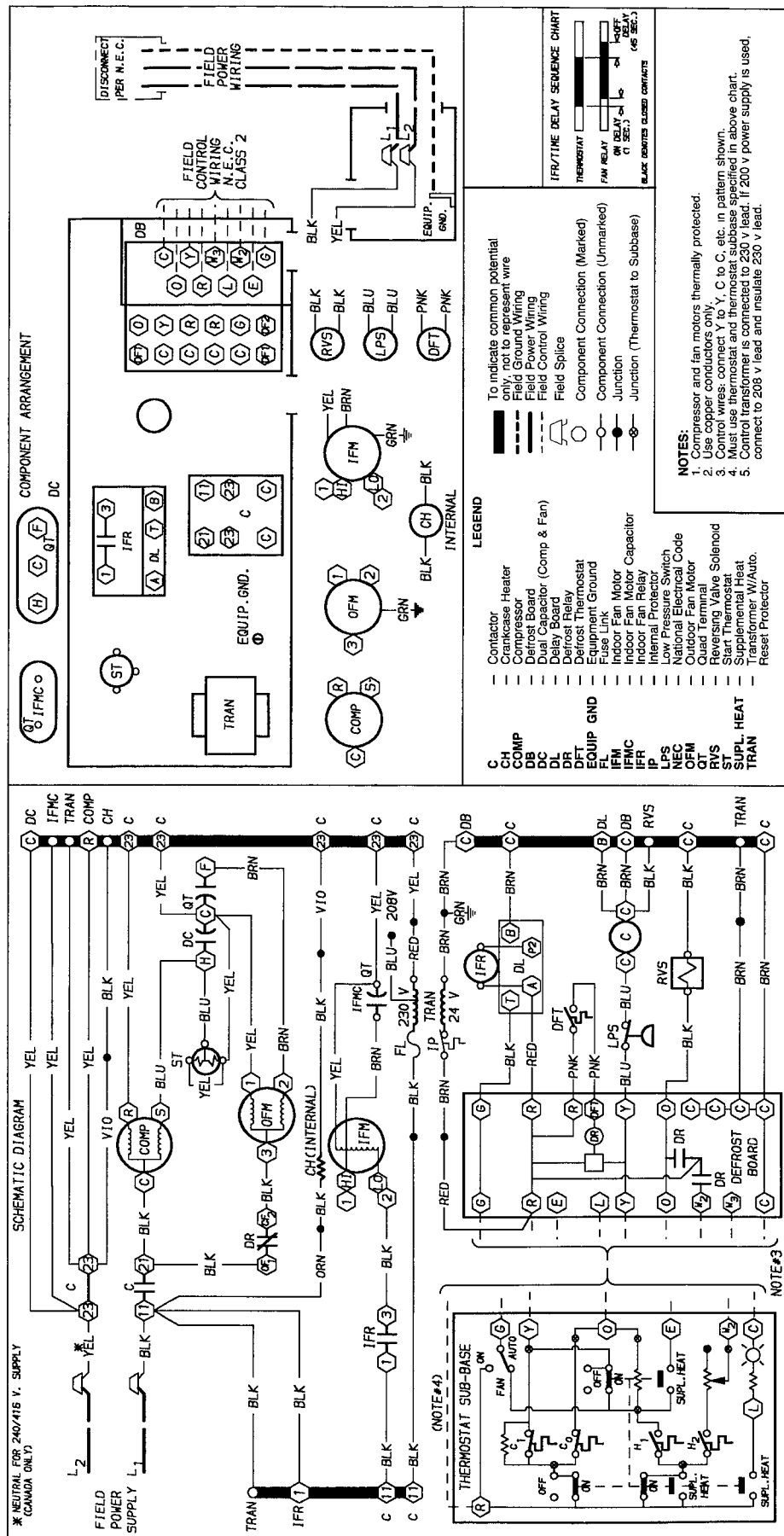
through LPS to C, starting COMP and OFM. Circuit R-G also is completed, energizing IFR and starting IFM.

Should room temperature continue to fall, circuit R-W is made through second-stage thermostat bulb. If optional electric heat package is used, a sequencer is energized bringing on first bank of supplemental electric heat. When thermostat is satisfied, contacts open, deenergizing contactor and sequencer; motors and heaters deenergize.

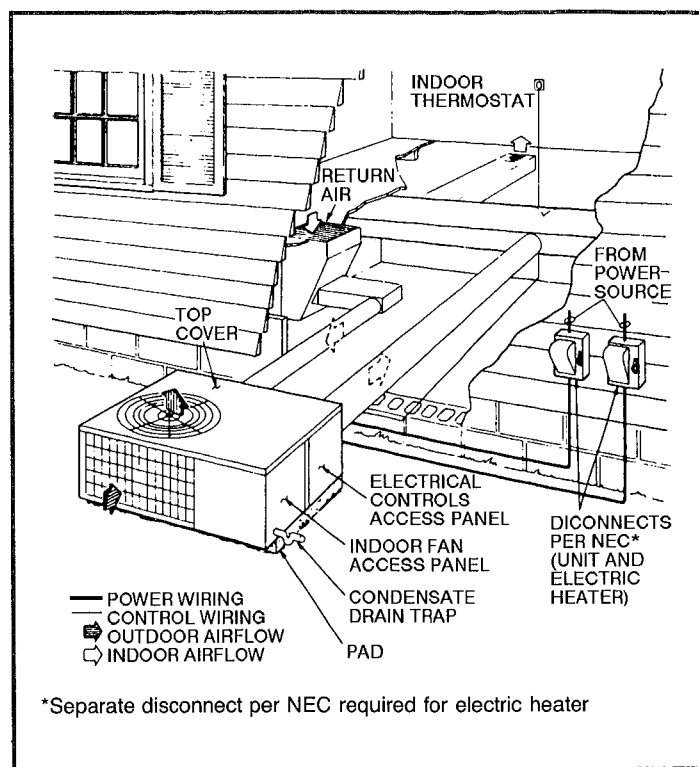
Defrost — Defrost board (DB) is a time/temperature control which includes a field-selectable time period between checks for defrost (30, 50, and 90 minutes). Electronic timer and defrost cycle start only when contactor is energized and defrost thermostat (DFT) is closed.

Defrost mode is identical to Cooling mode, except outdoor fan motor stops and a bank of optional electric heat turns on to warm air supplying the conditioned space.

Typical control wiring schematic



Typical installation



Guide specifications

Packaged Rooftop Air-to-Air Heat Pump Constant Volume Application

HVAC Guide Specifications

Size Range: **1½ to 5 Tons, Nominal (Cooling)**

18,000 to 60,000 Btuh, Nominal (Heating)

Carrier Model Numbers: **50QQ**

Part 1 — General

1.01 SYSTEM DESCRIPTION

Outdoor package, electrically controlled, air-to-air heat pump utilizing a reciprocating-type compressor for heating and cooling duty. Unit shall discharge supply air horizontally as shown on contract drawings.

1.02 QUALITY ASSURANCE

- A Unit shall be rated in accordance with ARI Standards 240 and 270. Designed in accordance with UL Standard 559.
- B. Unit shall be designed to conform to ANSI B9.1.
- C. Unit shall be UL listed and CSA certified as a total package for safety requirements.
- D. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

1.03 DELIVERY, STORAGE, AND HANDLING

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

Part 2 — Products

2.01 EQUIPMENT

A General:

Factory-assembled single piece, air-to-air heat pump. Contained within the unit enclosure shall be all factory wiring, piping, controls, and refrigerant charge (R-22).

B. Unit Cabinet:

- 1. Unit cabinet shall be constructed of phosphated, bonderized, zinc-coated, prepainted steel.
- 2. Indoor-fan compartment interior cabinet surfaces shall be insulated with a minimum ½ in. thick, flexible fiberglass insulation, coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heating compartment.
- 3 Cabinet panels shall be easily removable for servicing.
- 4. Unit shall have a factory-installed condensate drain.

C. Fans:

1. Indoor Blower (Indoor Fan):

- a. Fan shall be 2-speed direct drive as shown on the equipment drawings.
- b. Fan wheel shall be made from steel, be double-inlet type with forward-curved blades with a corrosion-resistant finish and shall be dynamically balanced.

- 2. Outdoor (condenser) fan shall be of the direct-driven propeller type with aluminum blades, riveted to corrosion-resistant steel spiders, and shall be dynamically balanced and shall discharge air vertically upwards.

D. Compressor:

- 1. Fully hermetic type with internal and external vibration isolation.

E. Coils:

- 1. Indoor and outdoor coils shall have aluminum-plate fins mechanically bonded to seamless copper tubes with all joints brazed.
- 2. Tube sheet openings shall be belled to prevent tube wear.

F. Refrigerant Components:

- 1. AccuRater® feed system.
- 2 Reversing valve.
- 3 Accumulator.

G Controls and Safeties.

1. Unit Controls:

- a. Unit shall be complete with self-contained low-voltage control circuit.
- b. Unit shall incorporate an outdoor coil defrost system to prevent excessive frost accumulation during heating duty, and shall be controlled as follows:
 - 1) Defrost shall be initiated on the basis of time and coil temperature.
 - 2) A 30/50/90 minute timer shall activate defrost cycle only if coil temperature is low enough to indicate a heavy frost condition.
 - 3) Defrost cycle shall terminate when defrost thermostat is satisfied or shall have a positive termination time of 10 minutes.

2. Safeties:

- a. Compressor, overtemperature, overcurrent.

H. Operating Characteristics:

- 1. Unit shall be capable of starting and running at 115 F ambient outdoor temperature per maximum load criteria of ARI Standard 240.
- 2. Compressor with standard controls shall be capable of operation down to 55 F ambient outdoor temperature in cooling duty.
- 3. Compressor shall be capable of operation in heating duty down to -20 F ambient outdoor-air temperature.
- 4. Unit shall be capable of simultaneous heating duty and defrost cycle operation when using electric heaters indicated in Section K, Special Features.

I. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single location. Separate power supply required for electric heaters.

J. Motors:

- 1. Compressor motors shall be of the refrigerant-cooled type with line break thermal and current overload protection.
- 2 All fan motors shall have permanently lubricated bearings, and inherent automatic reset thermal overload protection.
- 3 Outdoor fan motor shall be open drip-proof.

Guide specifications (cont)

K. Special Features:

Certain standard features are not applicable when the features designated * are specified. For assistance in amending the specifications, contact your local Carrier Sales Office.

1 Electric Resistance Heaters:

- a. Open-wire nichrome elements with all necessary safety and operating controls
- b. Heaters are UL listed as indicated on basic unit informative plate.
- c. Each heater assembly shall include the following safety features:
 - 1) Automatic-reset switches.
 - 2) Heat limiters for primary and secondary, over-current, and thermal protection.

* 2. Emergency Heat Package:

When mechanical heating is locked out, auxiliary heat shall be activated when necessary

3. Compressor Cycle Delay:

Compressors will be provided from restarting for a minimum of 5 minutes after shutdown.

4. Service Sentry Kit:

Device provides immediate warning when the compressor fails to operate after a call for heating or cooling. The control energizes a warning light located on the indoor thermostat

5. Outdoor Thermostat Kit:

Thermostat allows for staging of electric heaters based on outdoor air temperature.

