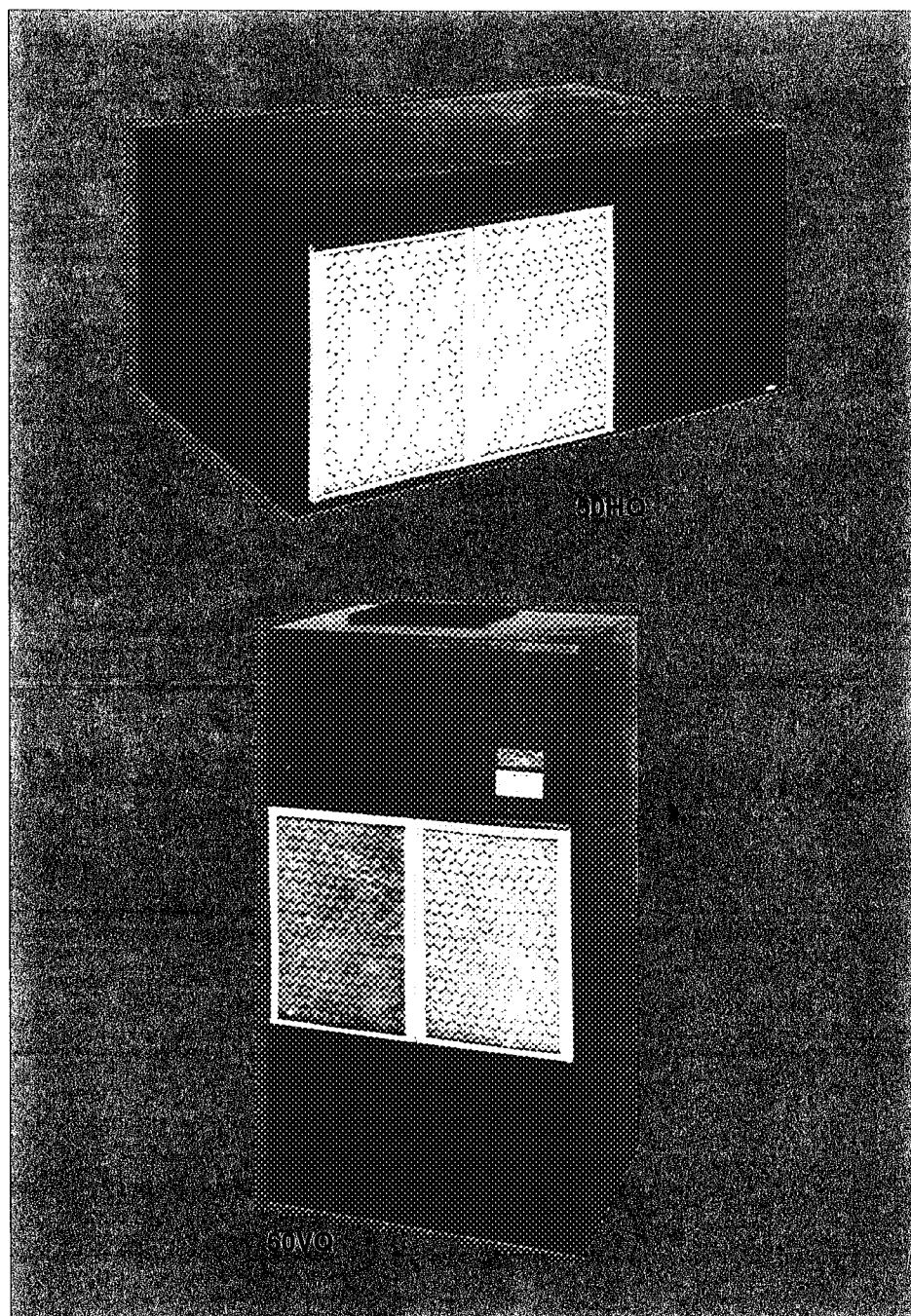




Product Data

50HQ,VQ Water Source Heat Pumps

100 to 240 Nominal Tons



Water-Source Heating and Cooling for High Efficiency Operation in Commercial and Industrial Applications

- four convenient capacities
- horizontal and vertical discharge models
- individually operating units connected to a common condenser water system
- constantly recirculating condenser water

Features/Benefits

Quality design and construction, combined with operating cost efficiency

Superior fuel savings

50HQ,VQ water source heat pump models produce a minimum of 10.3 EER (Energy Efficiency Ratio) in the cooling mode of operation, and a COP (Coefficient of Performance) of 3.3 in heating mode. Ratings are based on ARI standards. These ratings mean building owners can expect 20 to 30% more cooling, with the same electrical input, as other available units. They also produce 298% more Btu's as electric strip heaters from the same electrical input.

Superior construction

Unit panels are fabricated of #20 gage galvanized steel for years of service. All panels are thoroughly insulated with thermal barrier type acoustical insulation. Piping and electrical connections are manifolded within the units for single service connection for faster, more convenient installation.

Blower drive selections are available to provide the correct movement of air at proper static pressures. The 2 larger sizes (200 and 240) offer 2-stage operation with a time delay between circuits. Each circuit has a single thermostatic expansion, 2-way flow valve.

Additional heat recovery savings

Energy is conserved through the redistribution of energy within the total system. Since the system is a series of water source heat pumps connected to a common 2-pipe condenser water system, each unit has the capability of heating or cooling the area served, simply by operating a switch at the thermostat

Within a single system, one unit or a series of units operating on heating cause the temperature of the condenser water to fall. Other units operating on cooling cause the temperature of the condenser water to rise. As this condenser water is mixed, the heated or cooled water may be re-applied as needed, thereby economically transferring the energy. In cooling mode, heat is rejected to water loop from conditioned space. In heating mode, heat is absorbed from water loop to heat the conditioned space

Superior components

Chassis — Galvanized steel panels on angle iron frame, insulated throughout with 1.5 pound density thermal barrier type acoustical insulation. Easy service access from front or rear of unit (normally from front control panel)

Blower assembly and drive — Dynamically balanced assembly, blower is belt driven with motor secured to the framing internal to the cabinet, motor drive is selected for the cfm's listed and of the recommended horsepower.

Evaporator coil — Has 1/2-in seamless, staggered tube construction with rippled fins and circuited for optimum performance. Fin spacing does not exceed 12 per inch.

Refrigeration cycle — Metered with a single thermostatic expansion valve (TXV, 2-way flow) equipped for external equalization and adjustable superheat for each circuit. Access ports for high and low side are provided for service inspection

Compressor — 3500 rpm hermetic with internal and external vibration isolation. Contained in an acoustical lined compressor section inside the

chassis. Compressor motor offers solid state protection and is protected by Carrier warranty

Suction line accumulator — Increases compressor protection by allowing temporary storage of raw liquid refrigerant should liquid flooding occur, and meters the liquid refrigerant at a tolerable rate to the compressor.

Reversing valve — Of hermetic construction, with an external electric solenoid coil energized during the cooling cycle.

Condenser water coil — Coaxial, tube-in-tube, with water flowing through the inner copper tube

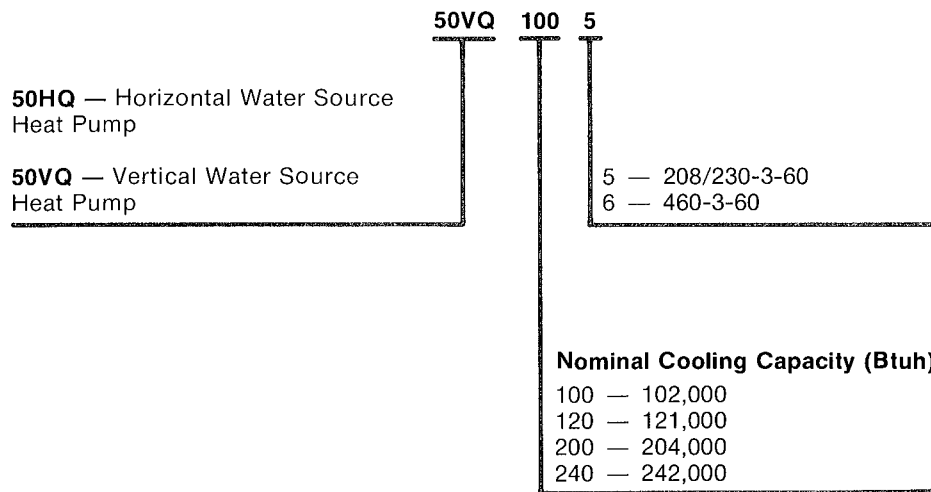
Control panel — Contained within the cabinet, front access, factory wired. Contains freeze protection, high and low safety switches, compressor and blower motor contactors, and impedance relay to avoid recycling while on safety and to allow remote electrical reset. Also included is the 24-v transformer for the control circuitry, and the terminal strip for control wiring connections

Cabinet finish — Two-process epoxy type lacquer is applied to a special galvanized steel primer.

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Model number nomenclature



ARI capacity ratings

UNIT 50	VOLTAGE	TC	COOLING					HEATING			NOMINAL	
			SHC Ent Air Dry Bulb (F)			Watts	EER	TC	Watts	COP.	Cfm	Gpm
			75	80	85							
HQ,VQ100*	208/230 460	102,000	56,910	72,500	88,090	9,710	10.5	120,000	9,500	3.7	3500	27.0
HQ,VQ120*	208/230 460	121,000	71,380	80,900	110,440	12,100	10.0	126,000	11,200	3.3	4200	33.0
VQ200*	208/230 460	204,000	113,820	145,000	176,180	19,420	10.5	240,000	19,000	3.7	7000	54.0
VQ240*	208/230 460	242,000	142,720	181,800	220,880	24,200	10.0	252,000	22,400	3.3	8400	66.0

Cfm — Cubic Feet Per Minute
COP — Coefficient of Performance
EER — Energy Efficiency Ratio
Gpm — Gallons (U.S.) Per Minute
SHC — Sensible Heat Capacity (Btuh)
TC — Total Capacity (Btuh)
Watts — Total Power Input



Rated in accordance with ARI Standard 320-86. Units 50VQ200 and 240 capacities exceed the scope of this standard.

Cooling Standard: 80 F db, 67 F wb indoor entering air temperature and 85 F entering, 95 F leaving water temperature.

Heating Standard: 70 F db indoor entering air temperature and 70 F entering water temperature.

*For units operating at 208 volts, deduct 1000 Btuh

Physical data

UNIT SIZE	50HQ			50VQ		
	100	120	100	120	200	240
OPER WT (lb)	960	1005	960	1005	1800	1960
R-22	128	176	128	176	104 (ea ckt)	176 (ea ckt)
REFRIG CONTROL	Thermal Expansion Valve (bi-flow)					
COMPRESSOR	Fully Hermetic					
Qty...Nom Rpm	1 3500			2 3500		
WATER-TO-REFRIGERANT HEAT EXCHANGER	Tube-in-Tube					
Max. Working Pressure (psig)	300					
Water Connections (in.)	1	1¼	1	1¼	1½	
Water Flow Range (min.-max. gpm)	14 0-33 0	17 0-40 0	14 0-33 0	17 0-40 0	28 0-66 0	34 0-80.0
Water Volume (gal.)	1 1	1 4	1 1	1 4	2 2	2.8
AIR-TO-REFRIGERANT HEAT EXCHANGER	½-in Tubes					
Rows...Fins/in.	3 12	4 12	3 12	4 12	3 12	4 12
FAN	Centrifugal, Belt-Drive, DWDI Type Wheels					
Diameter (in. nom)	15	15	15	15	15 (2)	15 (2)
Width (in. nom)	15	15	15	15	15	15
Range Cfm	3250-4090	3850-4630	3250-4090	3850-4630	6500-8180	7160-9260
Motor Type	PSC, Variable Pitch Sheaves					
Motor Hp	1½	2	1½	2	1½ (ea)	2 (ea)
Nominal Motor Rpm	1725					
FILTERS (in.)...Qty (Disposable)	20 x 28 x 2 2				20 x 28 x 2 4	

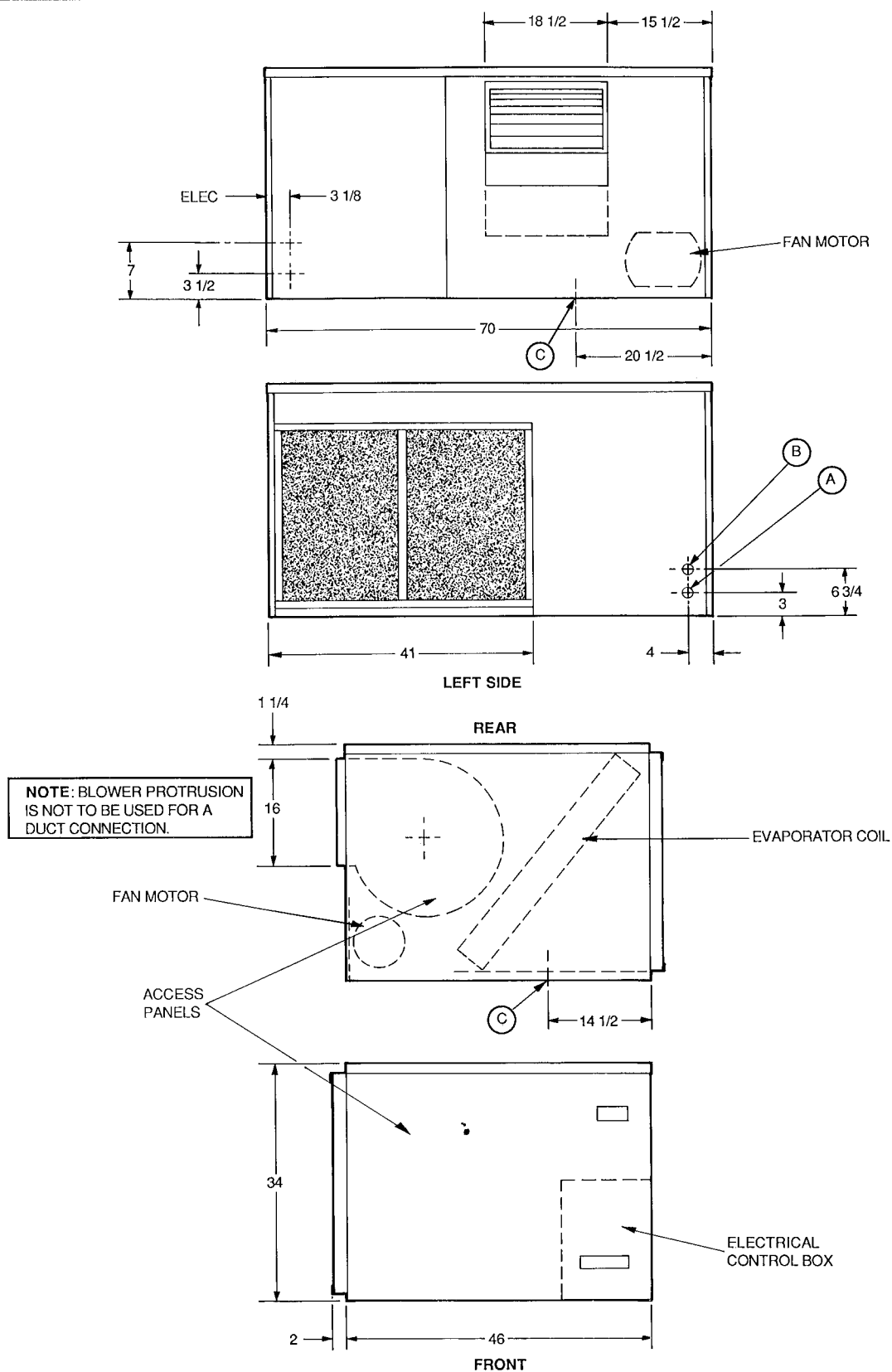
Options and accessories

ITEM	OPTION*	ACCESSORY†
Warranty Option I (1st Year Labor Allowance on Refrigerant Circuit Repairs)	X	
Warranty Option II (2nd-5th Year Parts and Labor Allowance on Refrigerant Circuit Repairs)	X	
Supply/Return Hose Kit		X
Condensate Hose Kit		X
Shutoff (Gas) Valves		X
Balancing (Ball) Valves		X
Central Water Loop Controller		X
Microprocessor-Based System Controller		X
Setback Override-Staggered Start (SOS) System		X
Thermostats:		
Manual Changeover		X
Automatic Changeover		X

*Factory installed

†Field installed

Base unit dimensions — 50HQ100,120



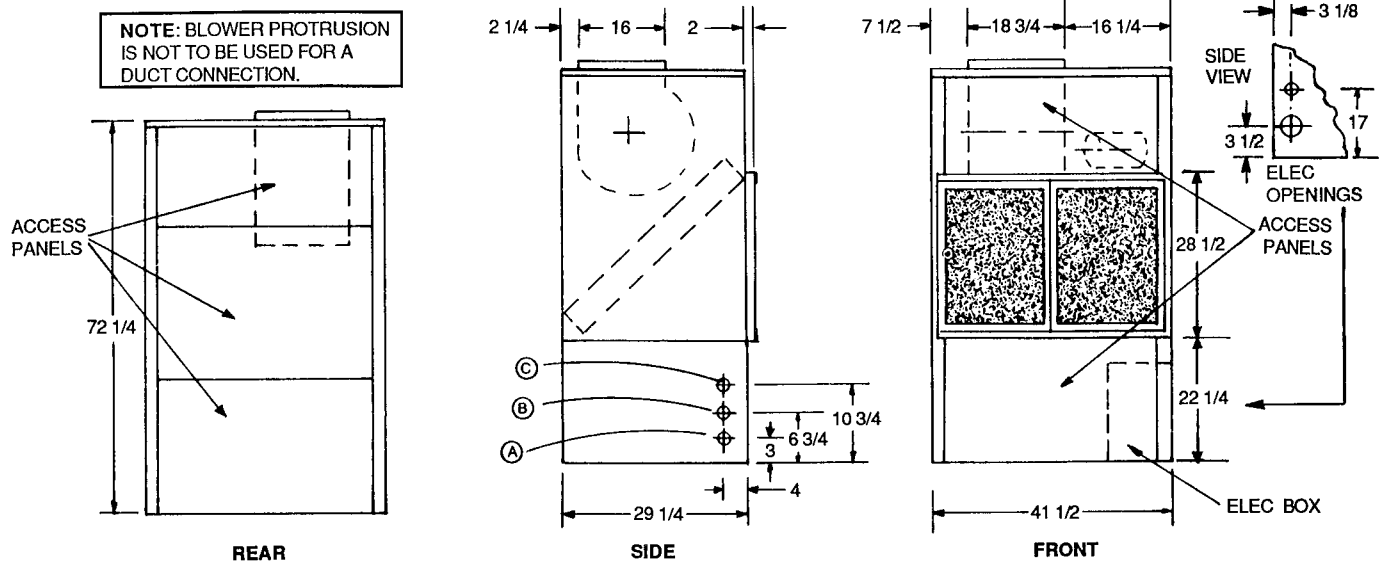
Piping Connections

- | | | | |
|---|-----------------------------|------------------------|--------------|
| Ⓐ | Condenser water inlet | Model 100 | 1-in FPT |
| | | Model 120 | 1 1/4-in FPT |
| Ⓑ | Condenser water outlet | Model 100 | 1-in FPT |
| | | Model 120 | 1 1/4-in FPT |
| Ⓒ | Condensate drain connection | 1-in FPT (both models) | |

Dimensions are shown in inches

NOTE Hanger bracket material is field supplied

Base unit dimensions — 50VQ100,120

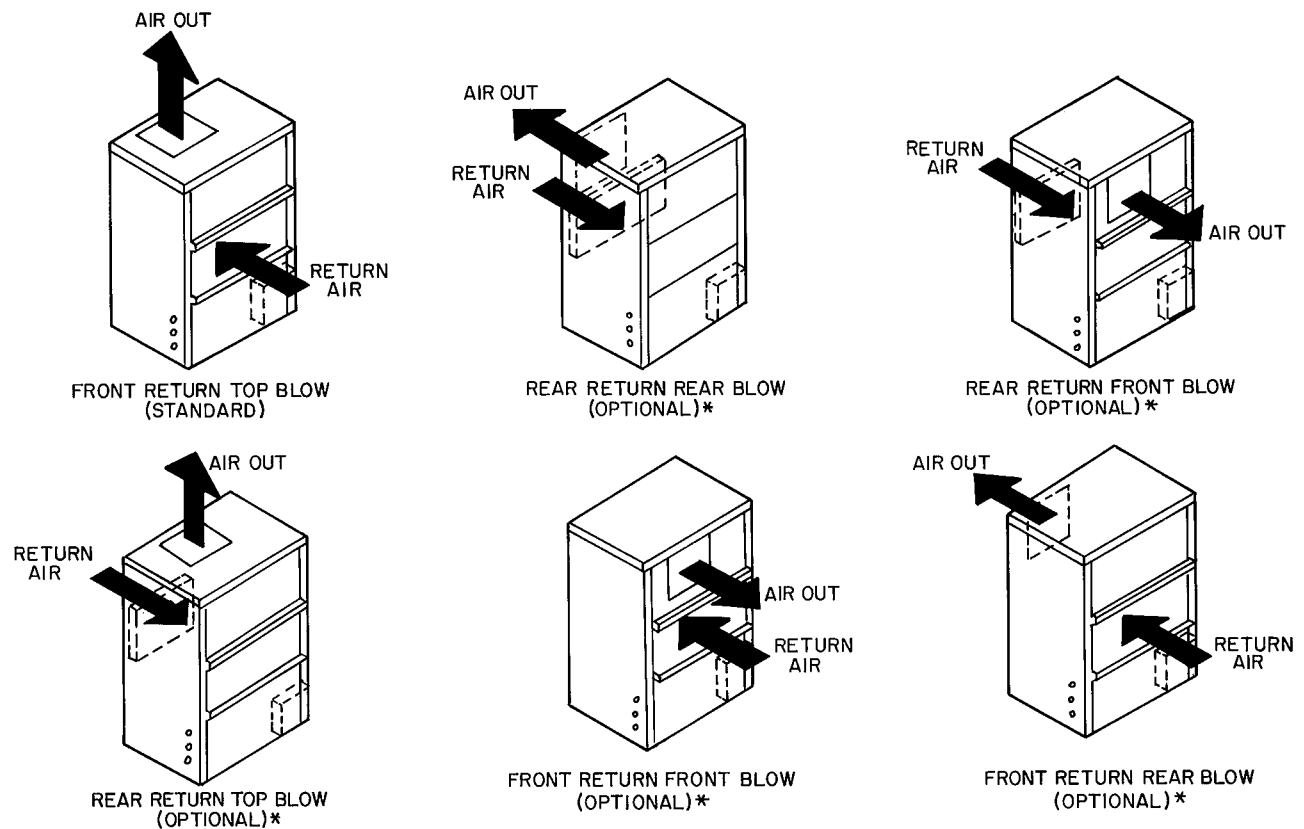


Dimensions are shown in inches

Piping Connections

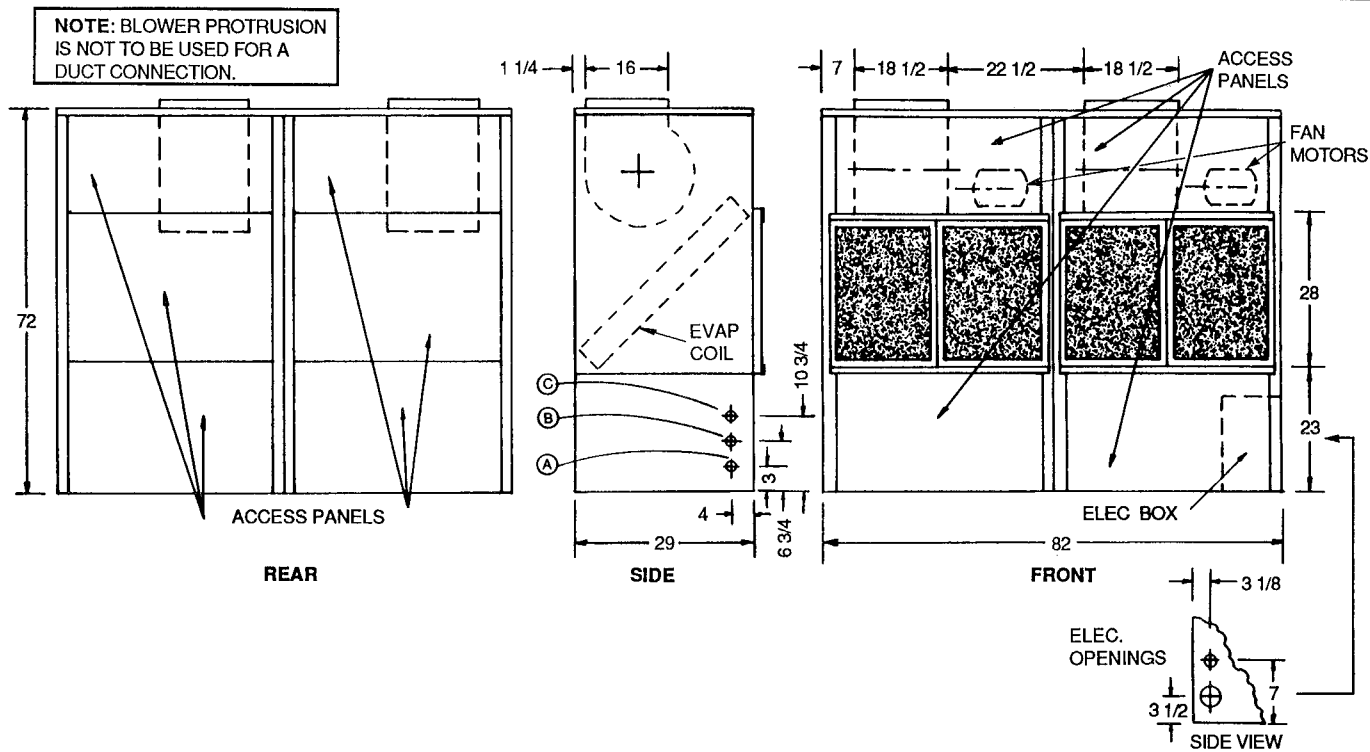
- (A) Condenser water inlet Model 100 1-in FPT
Model 120 1 1/4-in FPT
- (B) Condenser water outlet Model 100 1-in FPT
Model 120 1 1/4-in FPT
- (C) Condensate drain connection 1-in FPT (both models)

Air configurations — 50VQ100,120



*Specify optional models when ordering

Base unit dimensions — 50VQ200,240

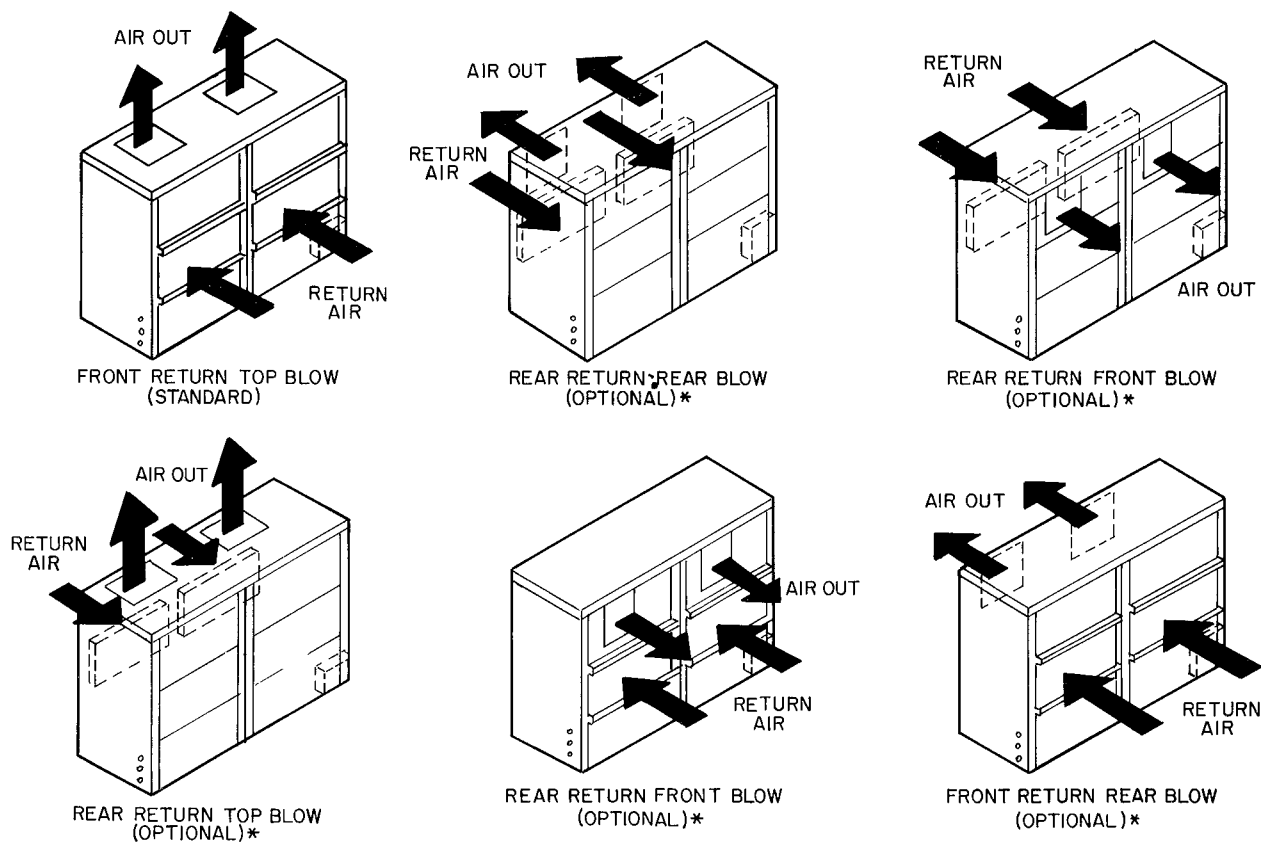


Dimensions are shown in inches

Piping Connections

- (A) Condenser water inlet 1 1/2-in FPT (both models)
- (B) Condenser water outlet 1 1/2-in FPT (both models)
- (C) Condensate drain connection 1 1/4-in FPT (both models)

Air configurations — 50VQ200,240



*Specify optional models when ordering

Selection procedure (with example)

I Determine cooling and heating load requirements.

Given

Total Net Cooling Load 125,850 Btuh
Sensible Heat Load 95,200 Btuh
Total Heating Load 125,700 Btuh
Indoor Air Quantity 4200 cfm
External Static Pressure Required 49 in. wg
Indoor Coil Air Temp — Ent Wet-Bulb (ewb) ... 67 F
Indoor Coil Air Temp — Ent Dry-Bulb (edb) 80 F
Water Temp Lvg Heat Exchanger (Cooling) 85 F
Water Temp Ent Heat Exchanger (Heating) 70 F

II Determine location of unit.

Given: Unit needed for installation in ceiling plenum.

Select. 50HQ horizontal discharge

III Select unit from Cooling Capacities table which meets cooling requirements.

Enter Cooling Capacities table at 4200 cfm, 67 F wet-bulb temperature air entering indoor coil and 85 F

temperature water leaving heat exchanger Select a 50HQ120 which has TC of 126,000 Btuh, SHC of 95,950 Btuh and THR of 163,800 Btuh with 11.1 kW power input. Required heat exchanger water at 10 F Δt is 34 gpm

IV Determine heating capacity of selected unit.

Enter Heating Capacities table for 50HQ120 at rated cfm (4200) entering air indoor coil and heat exchanger water flow of 34 gpm at 70 F Find total heating capacity of 186,000 Btuh with 11.2 kW power input. Total heat absorption (from water) is 88,000 Btuh.

V Determine external static pressure available from selected unit.

Enter Fan Performance table for selected unit. The 50HQ120 provides 0.50 in. wg at 4200 cfm with 3 turns open

VI Determine heat exchanger water pressure drop.

Per Heat Exchanger Pressure Drops table, the 50HQ120 has a pressure drop of 13.9 ft of water at 34 gpm

Performance data

HEATING CAPACITIES

MODEL 50		ENT AIR DRY BULB (F)	60 F ENT WATER TEMP			70 F ENT WATER TEMP			80 F ENT WATER TEMP			WATER FLOW RATE (Gpm)
			Heating Capacity (Btuh)	Heat of Absorption (Btuh)	Power Input Watts	Heating Capacity (Btuh)	Heat of Absorption (Btuh)	Power Input Watts	Heating Capacity (Btuh)	Heat of Absorption (Btuh)	Power Input Watts	
HQ,VQ100	3 7	70	104,990	75,060	8,770	116,200	80,700	9,310	128,550	94,340	10,000	21 0
			108,200	77,900	8,980	120,000	88,000	9,500	132,800	98,000	10,200	27 0
			110,900	79,540	9,190	125,300	92,600	9,740	138,640	103,120	10,460	37 5
HQ,VQ120	3 3	70	110,360	75,160	10,310	121,965	84,660	10,975	135,035	95,250	11,790	25 5
			113,120	77,550	10,520	126,000	88,000	11,200	139,500	99,000	12,029	33 0
			117,020	80,220	10,780	131,545	92,730	11,480	145,640	104,260	12,330	44 0
VQ200	3 7	70	209,980	150,120	17,540	232,400	161,400	18,620	257,100	186,680	20,000	42 0
			216,400	155,800	17,960	240,000	176,000	19,000	265,700	196,000	20,400	54 0
			221,800	159,080	18,380	250,600	185,200	19,480	277,280	206,240	20,960	75 0
VQ240	3 3	70	220,720	150,320	20,620	243,930	169,320	21,950	270,070	190,500	23,580	51 0
			226,240	155,100	21,040	252,000	176,000	22,400	279,000	198,000	24,060	66 0
			234,040	160,440	21,560	263,090	185,460	22,960	291,280	208,520	24,660	88 0

*C O P = Heating capacity at 70 F ent water
70 ent air in Btuh $\div$ watts input $\div$ 3.412

NOTES

- Ratings are in accordance with ARI Standard 320-86
- Cooling Standard:** 80 F db, 67 F wb indoor entering air temperature, and 85 F entering water, 95 F leaving water temperatures
Heating Standard: 70 F db indoor entering air temperature, and 70 F entering water temperature

VARIATIONS OF ENTERING AIR FOR HEAT

Entering Air Temp (F)	60	65	70	75	80
Total Heat Cap. Multiplier	1.06	1.03	1.00	.97	.95
Heat of Absorption Multiplier	1.09	1.04	1.00	.95	.90
Power Input Multiplier	.98	.99	1.00	1.03	1.06

CONDENSER WATER FLOW

COOLING CYCLE DESIGN ΔT (F)	MODEL 50							
	HQ,VQ100		HQ,VQ120		VQ200		VQ240	
	GPM	PD	GPM	PD	GPM	PD	GPM	PD
8	33	9.8	40	8.6	66	9.8	80	8.6
10	27	6.3	33	5.5	54	6.8	66	5.8
12	22	6.1	27	5.1	44	6.1	53	5.1
14	19	5.4	23	4.4	38	5.4	45	4.4
16	17	4.7	20	3.7	33	4.7	40	3.7
20	14	4.1	17	3.0	29	4.1	35	3.0

GPM — Gallons Per Minute
PD — Pressure Drop

NOTE PD Loss in lbs/sq inch

Example — Condenser Water Flow Design

Temperature rise selected = 10 (ΔT)
Model 120, gallons per minute = 33 GPM
Pressure Drop = 5.5 lbs per sq/inch

To evaluate make-up heat requirement for condenser water system
Heat $\Delta T \times 500 \times \text{GPM} = \text{Btuh required}$

Performance data (cont)

COOLING CAPACITIES

MODEL 50	CFM	ENT AIR WET BULB (F)	85 F WATER LEAVING CONDENSER							EER
			Total Capacity (Btuh)	Heat Rejection (Btuh)	Power Input Watts	Sensible Capacity (Btuh) Ent Air Dry Bulb (F)				
						75	80	85	90	
HQ,VQ100	3150	61	92,000	120,800	8,460	77,990	—	—	—	10.9
	3500		93,200	122,500	8,590	80,150	—	—	—	10.8
	3850		94,400	124,200	8,720	83,310	—	—	—	10.8
	3150	67	102,600	133,300	9,030	56,370	71,810	87,240	—	11.4
	3500		104,000	135,200	9,170	57,930	73,800	89,660	—	11.3
	3850		105,400	137,100	9,310	59,490	75,790	92,080	—	11.3
	3150	73	110,900	143,600	9,600	35,180	50,690	66,130	81,580	11.6
	3500		112,400	145,600	9,750	36,160	52,100	67,970	83,840	11.5
	3850		113,900	147,600	9,900	37,140	53,510	69,800	86,100	11.5
	3150	79	116,500	150,300	9,950	—	—	45,440	56,040	11.7
	3500		118,000	152,400	10,100	—	—	46,700	57,600	11.7
	3850		119,500	154,500	10,250	—	—	47,960	59,160	11.7
HQ,VQ120	3780	61	109,260	145,930	10,780	97,400	—	—	—	10.1
	4200		110,700	148,000	10,940	100,560	—	—	—	10.1
	4620		112,140	150,070	11,100	103,680	—	—	—	10.1
	3780	67	121,800	160,130	11,260	70,440	89,730	109,020	—	10.8
	4200		123,400	162,400	11,430	72,690	92,600	112,510	—	10.8
	4620		125,000	164,670	11,600	74,940	95,470	116,000	—	10.8
	3780	73	133,940	174,230	11,850	43,960	63,350	82,640	101,930	11.3
	4200		135,700	176,700	12,030	45,370	65,380	85,280	105,190	11.3
	4620		137,460	179,170	12,210	46,780	67,410	87,920	108,450	11.3
	3780	79	140,650	182,410	12,280	—	—	56,780	70,040	11.5
	4200		142,500	185,000	12,470	—	—	58,600	72,280	11.4
	4620		144,350	187,590	12,660	—	—	60,420	74,520	11.4
VQ200	6300	61	184,000	241,600	16,920	155,980	—	—	—	10.9
	7000		186,400	245,000	17,180	160,300	—	—	—	10.8
	7700		188,800	248,400	17,440	166,620	—	—	—	10.8
	6300	67	205,200	266,600	18,160	112,740	143,620	174,480	—	11.4
	7000		208,000	270,400	18,340	115,860	147,600	179,320	—	11.3
	7700		210,800	274,200	18,620	118,980	151,580	184,160	—	11.3
	6300	73	221,800	287,200	19,200	70,360	101,380	132,260	163,160	11.6
	7000		224,800	291,200	19,500	72,320	104,200	135,940	167,680	11.5
	7700		227,800	295,200	19,800	74,280	107,020	139,600	172,200	11.5
	6300	79	233,000	300,600	19,900	—	—	90,880	112,080	11.7
	7000		236,000	304,800	20,200	—	—	93,400	115,200	11.7
	7700		239,000	309,000	20,500	—	—	95,920	118,320	11.7
VQ240	7560	61	218,520	291,860	21,560	194,880	—	—	—	10.1
	8400		221,400	296,000	21,880	201,120	—	—	—	10.1
	9240		224,280	300,140	22,200	207,360	—	—	—	10.1
	7560	67	243,600	320,260	22,520	140,880	179,460	218,040	—	10.8
	8400		246,800	324,800	22,860	145,380	185,200	225,020	—	10.8
	9240		250,000	329,340	23,200	149,880	190,940	232,000	—	10.8
	7560	73	267,880	348,460	23,700	87,920	126,700	165,280	203,860	11.3
	8400		271,400	353,400	24,060	90,740	130,760	170,560	210,380	11.3
	9240		274,920	358,340	24,420	93,560	134,820	175,840	216,900	11.3
	7560	79	281,300	364,820	24,560	—	—	113,560	140,080	11.5
	8400		285,000	370,000	24,940	—	—	117,200	144,560	11.4
	9240		288,700	375,180	25,320	—	—	120,840	149,040	11.4

EER — Energy Efficiency Ratio

NOTE Cooling performance data shown is based on condenser water flow rate required for 10 F temperature rise. To determine water flow rate (gpm) required at any set of operating conditions in the above table, divide heat rejection Btuh by 5000. To determine approximate air temperature drop in F db, divide sensible Btuh by cfm x 1.08.

COOLING CAPACITIES (cont)

MODEL 50	CFM	ENT AIR WET BULB (F)	95 F WATER LEAVING CONDENSER							EER
			Total Capacity (Btuh)	Heat Rejection (Btuh)	Power Input Watts	Sensible Capacity (Btuh) Ent Air Dry Bulb (F)				
						75	80	85	90	
HQ,VQ100	3150	61	90,200	120,690	8,960	76,610	—	—	—	10.1
	3500		91,400	122,400	9,100	78,740	—	—	—	10.0
	3850		92,590	124,110	9,240	80,870	—	—	—	10.0
	3150	67	100,670	133,210	9,560	55,370	70,540	85,710	—	10.5
	3500		102,000	135,100	9,710	56,910	72,500	88,090	—	10.5
	3850		103,330	136,990	9,860	58,450	74,460	90,470	—	10.5
	3150	73	108,870	143,460	10,170	34,570	49,810	64,970	80,140	10.7
	3500		110,300	145,500	10,320	35,530	51,190	66,770	82,360	10.7
	3850		111,730	147,540	10,470	36,490	52,570	68,570	84,580	10.7
	3150	79	114,290	150,170	10,540	—	—	44,650	55,070	10.8
	3500		115,800	152,300	10,700	—	—	45,890	56,600	10.8
	3850		117,300	154,430	10,860	—	—	47,130	58,130	10.8
HQ,VQ120	3780	61	107,090	145,930	11,410	95,660	—	—	—	9.4
	4200		108,500	148,000	11,580	98,720	—	—	—	9.4
	4620		109,910	150,070	11,750	101,780	—	—	—	9.4
	3780	67	119,430	159,930	11,920	69,150	88,080	107,020	—	10.0
	4200		121,000	162,200	12,100	71,380	90,900	110,440	—	10.0
	4620		122,570	164,470	12,280	73,570	93,720	113,860	—	10.0
	3780	73	131,370	174,030	12,550	43,160	62,190	81,120	100,060	10.5
	4200		133,100	176,500	12,740	44,540	64,180	83,720	103,260	10.4
	4620		134,830	178,970	12,930	45,920	66,170	86,320	106,460	10.4
	3780	79	137,980	182,210	13,000	—	—	55,760	68,770	10.6
	4200		139,800	184,800	13,200	—	—	57,540	70,970	10.6
	4620		141,620	187,390	13,400	—	—	59,320	73,170	10.6
VQ200	6300	61	180,400	241,380	17,920	153,220	—	—	—	10.1
	7000		182,800	244,800	18,200	157,480	—	—	—	10.0
	7700		185,180	248,220	18,480	161,740	—	—	—	10.0
	6300	67	201,340	266,420	19,120	110,740	141,080	171,420	—	10.5
	7000		204,000	270,200	19,420	113,820	145,000	176,180	—	10.5
	7700		206,660	273,980	19,720	116,900	148,920	180,940	—	10.5
	6300	73	271,740	286,920	20,340	69,140	99,620	129,940	160,280	10.7
	7000		220,600	291,000	20,640	71,060	102,380	133,540	164,720	10.7
	7700		223,460	295,080	20,940	72,980	105,140	137,140	169,160	10.7
	6300	79	228,580	300,340	21,080	—	—	89,300	110,140	10.8
	7000		231,600	304,600	21,400	—	—	91,780	113,200	10.8
	7700		234,600	308,860	21,720	—	—	94,620	116,260	10.8
VQ240	7560	61	214,180	291,860	22,820	191,320	—	—	—	9.4
	8400		217,000	296,000	23,160	197,440	—	—	—	9.4
	9240		219,820	300,140	23,500	203,560	—	—	—	9.4
	7560	67	238,860	319,860	23,840	138,300	176,160	214,040	—	10.0
	8400		242,000	324,400	24,200	142,720	181,800	220,880	—	10.0
	9240		245,140	328,940	24,560	147,140	187,440	227,720	—	10.0
	7560	73	262,740	348,060	25,100	86,320	123,380	162,240	200,120	10.5
	8400		266,200	353,000	25,480	89,080	128,360	167,440	206,520	10.4
	9240		269,660	357,940	25,860	91,840	132,340	176,640	212,920	10.4
	7560	79	275,960	364,420	26,000	—	—	111,520	137,540	10.6
	8400		279,600	369,600	26,400	—	—	115,080	141,940	10.6
	9240		283,240	374,780	26,800	—	—	118,640	146,340	10.6

Performance data (cont)

COOLING CAPACITIES (cont)

MODEL 50	CFM	ENT AIR WET BULB (F)	105 F WATER LEAVING CONDENSER							EER
			Total Capacity (Btuh)	Heat Rejection (Btuh)	Power Input Watts	Sensible Capacity (Btuh) Ent Air Dry Bulb (F)				
						75	80	85	90	
HQ,VQ100	3150	61	87,250	119,700	9,540	74,070	—	—	—	9.1
	3500		88,400	121,400	9,690	76,130	—	—	—	9.1
	3850		89,440	123,100	9,835	78,190	—	—	—	9.1
	3150	67	97,420	132,030	10,135	53,540	68,210	82,870	—	9.6
	3500		98,700	133,900	10,340	55,030	70,100	85,170	—	9.5
	3850		99,980	135,770	10,495	56,520	71,990	87,470	—	9.5
	3150	73	105,310	142,180	10,825	33,420	48,150	62,820	77,840	9.7
	3500		106,700	144,200	10,990	34,350	49,490	64,560	76,930	9.7
	3850		108,090	146,220	11,155	35,280	50,830	66,300	81,780	9.7
	3150	79	110,540	148,690	11,220	—	—	43,170	53,250	9.8
	3500		112,000	150,800	11,390	—	—	44,370	54,730	9.8
	3850		113,460	152,910	11,560	—	—	45,570	56,210	9.8
HQ,VQ120	3780	61	103,640	144,940	12,145	92,500	—	—	—	8.5
	4200		105,000	147,000	12,330	95,460	—	—	—	8.5
	4620		106,370	149,060	12,515	98,420	—	—	—	8.5
	3780	67	115,580	158,750	12,685	66,860	85,180	103,490	—	9.1
	4200		117,100	161,000	12,880	69,000	87,900	106,800	—	9.1
	4620		118,620	163,250	13,075	71,140	90,620	110,110	—	9.1
	3780	73	127,130	172,550	13,355	41,730	60,140	78,450	96,750	9.5
	4200		128,800	175,000	13,560	43,070	62,060	80,960	99,850	9.5
	4620		130,470	177,450	13,765	44,400	63,980	83,470	102,950	9.5
	3780	79	133,540	180,640	13,840	—	—	53,920	66,500	9.6
	4200		135,300	183,200	14,050	—	—	55,640	68,630	9.6
	4620		137,060	185,760	14,260	—	—	57,360	70,760	9.6
VQ200	6300	61	174,500	239,400	19,080	148,140	—	—	—	9.1
	7000		176,800	242,800	19,380	152,260	—	—	—	9.1
	7700		179,100	246,200	19,670	156,380	—	—	—	9.1
	6300	67	194,840	264,060	20,370	107,080	136,420	165,740	—	9.6
	7000		197,400	267,800	20,680	110,060	140,200	170,340	—	9.5
	7700		199,960	271,540	20,990	113,040	143,980	174,940	—	9.5
	6300	73	210,620	284,360	21,650	66,840	96,300	125,640	154,960	9.7
	7000		213,400	288,400	21,980	68,700	98,980	129,120	159,260	9.7
	7700		216,180	292,440	22,310	70,560	101,660	132,600	163,560	9.7
	6300	79	221,080	297,380	22,440	—	—	86,340	106,500	9.8
	7000		224,000	301,600	22,780	—	—	88,740	109,460	9.8
	7700		226,920	305,820	23,120	—	—	91,140	112,420	9.8
VQ240	7560	61	207,280	289,880	24,290	185,000	—	—	—	8.5
	8400		210,000	294,000	24,660	190,920	—	—	—	8.5
	9240		212,740	298,120	25,030	196,840	—	—	—	8.5
	7560	67	231,160	317,500	25,370	133,720	170,360	206,980	—	9.1
	8400		234,200	322,000	25,760	138,000	175,800	213,600	—	9.1
	9240		237,240	326,500	26,150	142,280	181,240	220,220	—	9.1
	7560	73	254,260	345,100	26,710	83,460	120,280	156,900	193,500	9.1
	8400		257,600	350,000	27,300	86,140	124,120	161,920	199,700	9.5
	9240		260,940	354,900	27,530	88,800	127,960	166,940	205,900	9.5
	7560	79	267,080	361,280	27,680	—	—	107,840	133,000	9.6
	8400		270,600	366,400	28,100	—	—	111,280	137,260	9.6
	9240		274,120	371,520	28,520	—	—	114,720	141,520	9.6

EER — Energy Efficiency Ratio

NOTE Cooling performance data shown is based on condenser water flow rate required for 10 F temperature rise. To determine water flow rate (gpm) required at any set of operating conditions in the above table, divide heat rejection Btuh by 5000. To determine approximate air temperature drop in F db, divide sensible Btuh by cfm x 1.08.

Fan performance

BELT-DRIVE UNITS

UNIT 50	MOTOR SHEAVE POSITION- TURNS OPEN	CFM														
		External Static Pressure (in. wg)*														
		0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95	1.0
HQ,VQ100	Closed											4090	3960	3830	3695	3560
	1							4030	3900	4075	3950	3830	3685	3540	3393	3250
	2							3750	3602	3775	3635	3500				
	3					4025	3884	3750		3465						
	4			3980	3850	3720	3577	3430								
	5	3900	3760	3625	3475	3330										
HQ,VQ120	Closed									4475	4379	4280	4156	4040	3903	3770
	1							4500	4380	4260	4144	4020	3878	3750		
	2					4470	4362	4250	4127	4000	3878	3750				
	3	4630	4533	4430	4318	4200	4070	3940	3810	3675						
	4	4375	4270	4160	4047	3930	3801	3670								
	5	4100	3860	3610	3597	3580										
VQ200	Closed											8180	7925	7660	7392	7120
	1							8060	7800	8150	7907	7660	7375	7080	6790	6500
	2							7500	7215	7550	7278	7000				
	3					8050	7778	7440	7155	6930						
	4			7960	7703	7440	7155	6860								
	5	7800	7525	7250	6959	6660										
VQ240	Closed									8950	8756	8560	8322	8080	7815	7540
	1							9000	8760	8520	8280	8040	7773	7500		
	2					8940	8723	8500	8253	8000	7753	7500				
	3	9260	9063	8860	8630	8400	8143	7880	7618	7350						
	4	8750	8544	8330	8100	7860	7605	7340								
	5	8200	7715	7220	7190	7160										

*Includes deduction for wet coil and clean filters

Electrical data

UNIT 50	V-PH-HZ	VOLTAGE RANGE		COMPRESSOR*		FAN	POWER SUPPLY	
		Min	Max	RLA	LRA	FLA	MCA	MOCP
HQ,VQ100	208/230-3-60	187	253	27 0	194 0	5 2	38 9	60
	460-3-60	414	506	13 0	97 0	2 6	18 8	30
HQ,VQ120	208/230-3-60	187	253	32 0	194 0	6 8	46 8	70
	460-3-60	414	506	16 0	97 0	3 4	23 4	35
VQ200	208/230-3-60	187	253	27 0	194 0	5 2	71 2	90
	460-3-60	414	506	13 0	97 0	2 6	34 5	45
VQ240	208/230-3-60	187	253	32 0	194 0	6 8	85 6	110
	460-3-60	414	506	16 0	97 0	3 4	42 8	50

FLA — Full Load Amps
LRA — Locked Rotor Amps
MCA — Minimum Circuit Amps (for wire sizing)
MOCP — Maximum Overcurrent Protection
RLA — Rated Load Amps

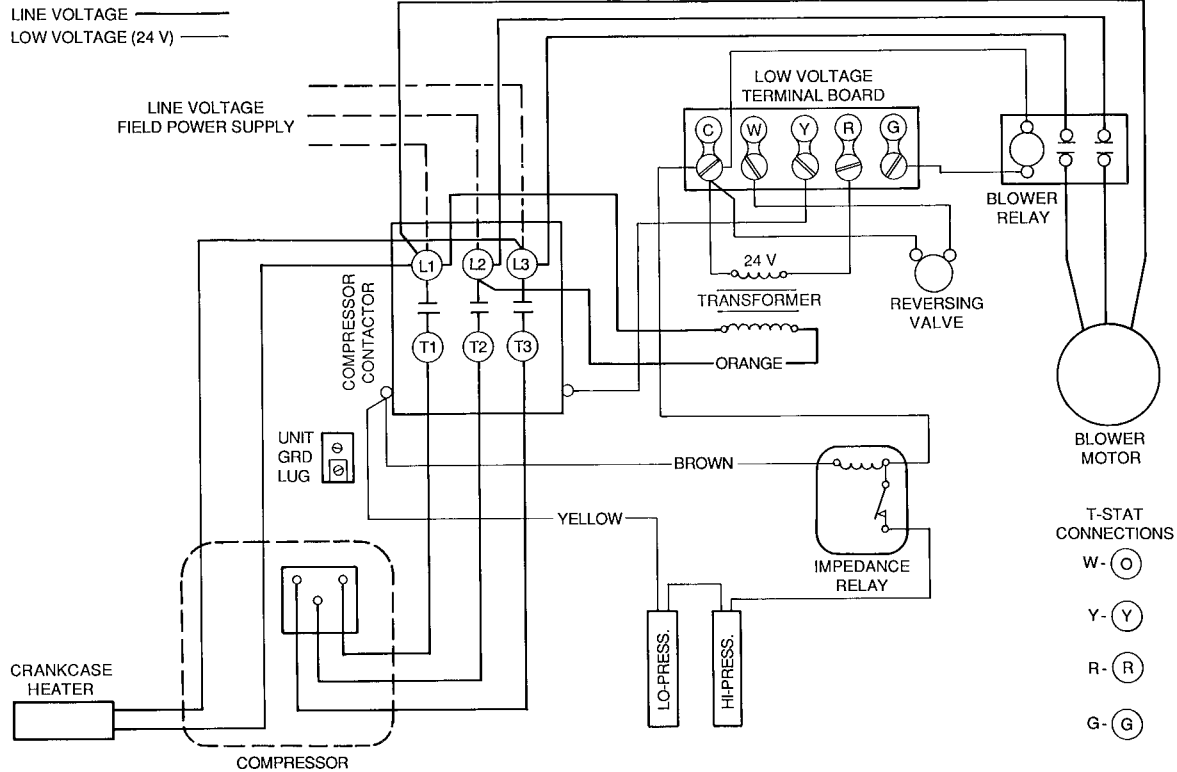
NOTES (wiring schematics)

- 1 All field wiring must be in accordance with N E C (National Electrical Code) NFPA No 70, latest edition
- 2 See unit rating plate for electrical ratings
- 3 Use copper conductors only

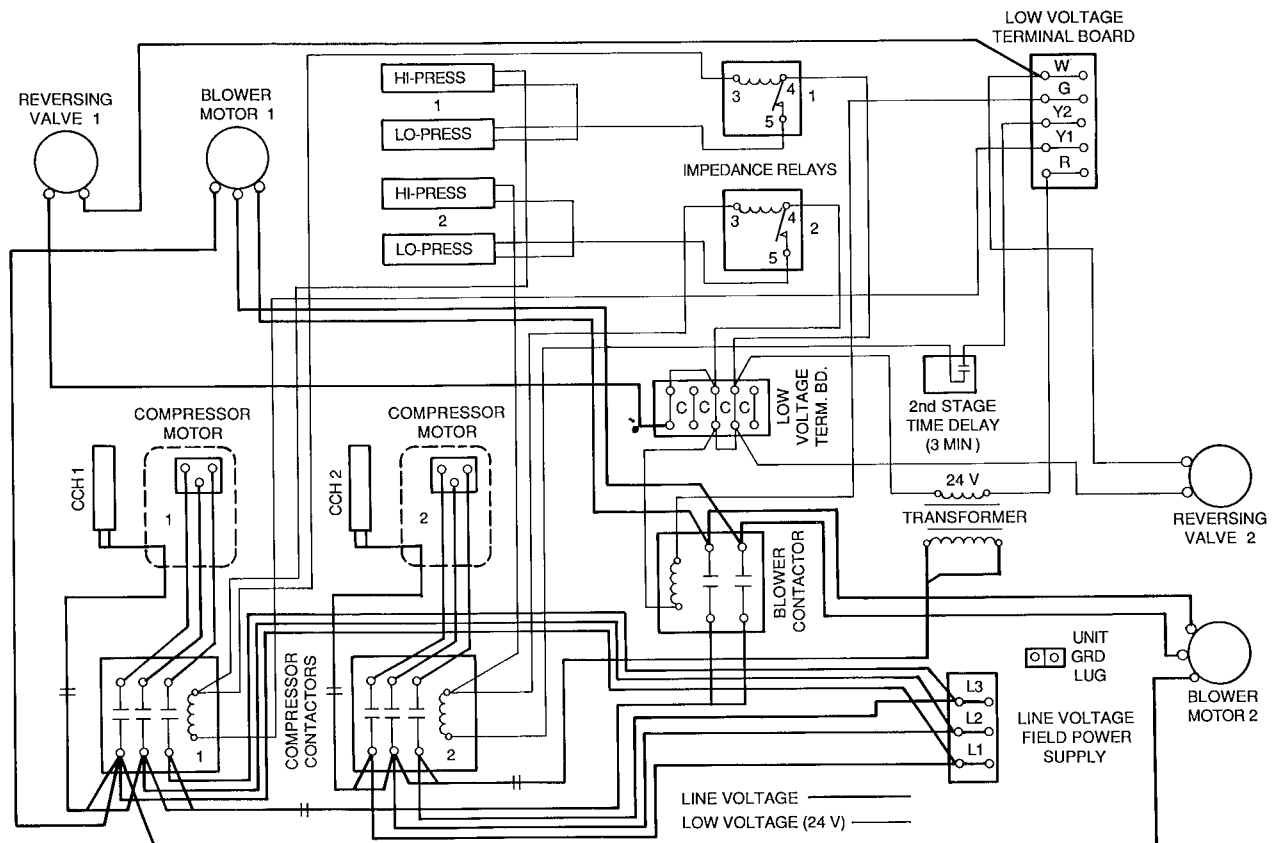
*Units 50VQ200 and 240 have 2 compressors, values shown are for each compressor



Typical wiring schematics



50HQ,VQ 100 AND 120 SIZES; 208/230-3-60, 460-3-60



50VQ 200 AND 240 SIZES; 208/230-3-60, 460-3-60

Controls

Sequence of operation

Fan switch — If the fan switch is at the ON position, the fan motor will run all the time power is supplied to the unit. At the AUTO. position, fan motor cycles with the compressor.

THERMOSTAT CALLS FOR COOLING (reversing valve solenoid [RVS] is energized in cooling position) — Control voltage (24 v) is available at 0 and RVS is energized. The control voltage is also available at Y and if low water temperature cutout (LWTC), high-pressure switch (HPS) and lockout relay (LOR) are closed, the contactor is energized and the compressor runs. With the RVS energized, the flow of refrigerant is through the heat exchanger (HX) which is acting as a condenser, and through the capillary to the evaporator.

When the room thermostat is satisfied, the cooling thermostat breaks the connection to Y and the compressor stops. To eliminate the sound associated with the revers-

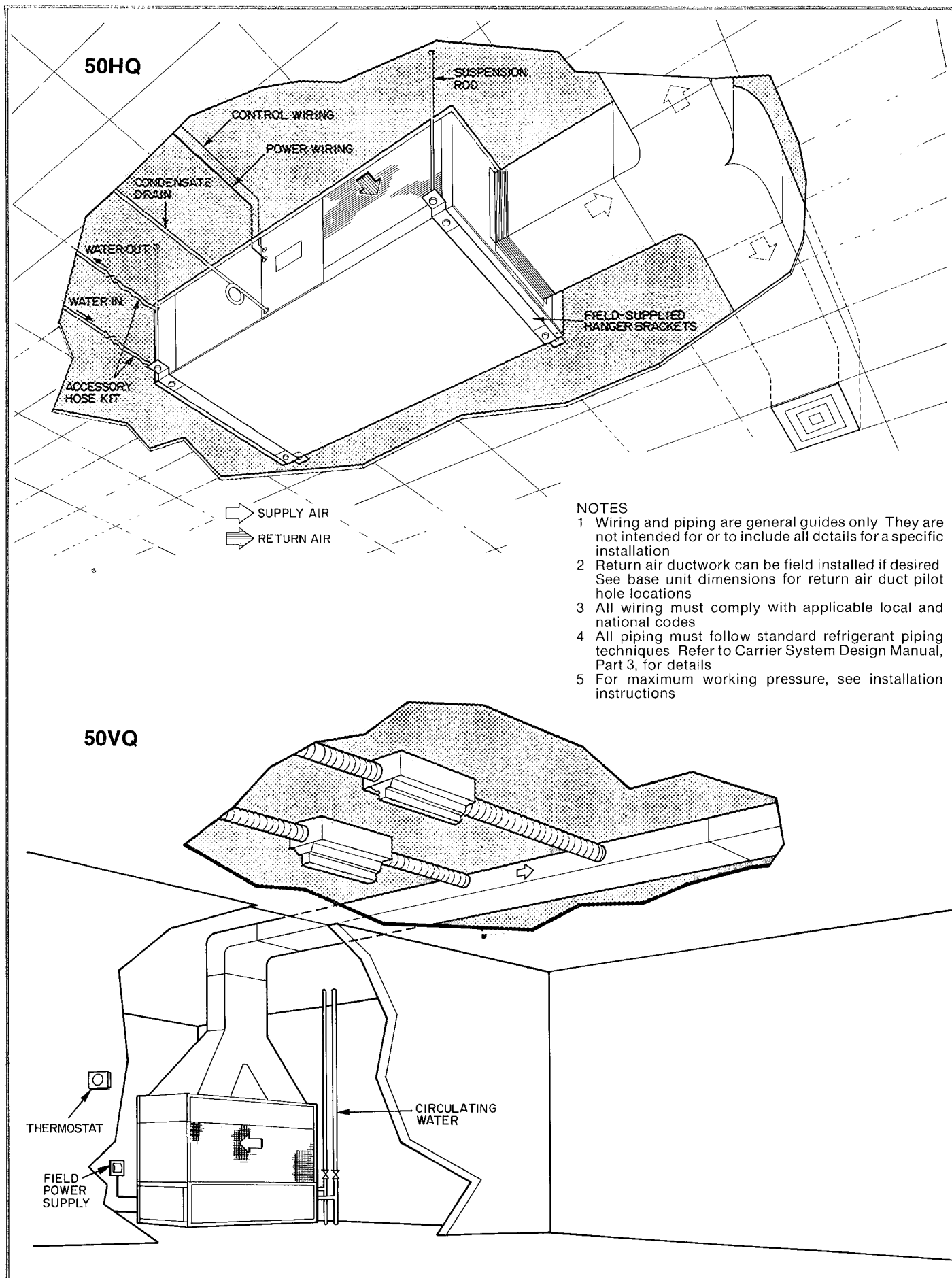
ing valve changing modes, power (24 v) to 0 keeps the RVS energized during the OFF cycle of the compressor.

THERMOSTAT CALLS FOR HEATING (reversing valve solenoid RVS is de-energized in heating position) — Due to the voltage drop across CC the voltage at 0 is insufficient to energize the RVS. Control voltage (24 v) is applied to W and the field-supplied jumper carries voltage to Y and energizes the contactor (C) if the switches are closed. The compressor starts and, since the RVS is de-energized, the refrigerant flow is to the indoor coil which now acts as a condenser, then through the capillary and the heat exchanger (HX), which acts as an evaporator.

When the thermostat is satisfied, the heating thermostat breaks, de-energizing C by the loss of voltage to W. If any safety devices are energized, the lockout circuits can be reset at the thermostat by turning it off and then back on.

There is no defrost cycle with a water-to-air heat pump.

Typical piping and wiring



Application data

HEAT EXCHANGER PRESSURE DROPS

UNIT 50	WATER FLOW RATE (Gpm)	PRESSURE DROP (ft H ₂ O)	UNIT 50	WATER FLOW RATE (Gpm)	PRESSURE DROP (ft H ₂ O)
HQ,VQ100	14.0	9.5	VQ200	28.0	9.5
	17.0	10.8		34.0	10.8
	19.0	12.5		38.0	12.5
	22.0	14.0		44.0	14.0
	23.0	14.2		46.0	14.2
	24.0	14.4		48.0	14.4
	26.0	14.7		52.0	14.7
	27.0	14.9		54.0	14.9
	28.0	15.5		56.0	15.5
	33.0	22.5		66.0	22.5
HQ,VQ120	17.0	6.9	VQ240	34.0	6.9
	20.0	8.5		40.0	8.5
	23.0	10.0		46.0	10.0
	26.0	11.5		52.0	11.5
	27.0	11.7		54.0	11.7
	29.0	12.5		58.0	12.5
	31.0	12.9		62.0	12.9
	33.0	13.3		66.0	13.3
	35.0	14.5		70.0	14.5
	40.0	19.8		80.0	19.8

Gpm — Gallons Per Minute

MAXIMUM-MINIMUM WATER QUANTITY

MODEL 50	SIZE	WATER FLOW RANGE (Gpm)
HQ,VQ	100	33.0-14.0
	120	40.0-17.0
VQ	200	66.0-28.0
	240	80.0-34.0

Gpm — Gallons Per Minute

Data in the following table should be used in the selection of tube material for heat exchangers utilizing well or surface water in once-through systems where chemical treatment is not practical

WATER QUALITY LIMITATIONS

WATER CHARACTERISTICS	COPPER
Water velocity, FPS	Up to 9
Suspended solids, PPM — particles over 25 microns	200 max
Chlorides, PPM	200 max
Carbon Dioxide, PPM*	20 max
pH	5.5-12
Sulfides, PPM†	Less than 0.1
Oxygen, PPM	0.1 max‡ 0.5 max**

FPS — Feet Per Second PPM — Parts Per Million

*Dissolved carbon dioxide can either be calculated from the pH and total alkalinity values, shown below, or measured on the site using a test kit. The 20 PPM value shown may be exceeded safely if the water used is from a well source having less than one PPM oxygen present.

Dissolved Carbon Dioxide, PPM = $TA \times 2 \left[\frac{(6.3 - pH)}{0.3} \right]$
where TA = Total Alkalinity, PPM as CaCO₃

†Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, the water is considered to be basic. Neutral water contains a pH of 7.0.

‡Closed systems (not exposed to air)

**Surface water sources (lake, river, reservoir, etc.)

IMPORTANT Failure to comply with the above required water quality and quantity limitations may cause damage to the tube-in-tube heat exchanger and void manufacturer's warranty.

Guide specifications

Packaged Water-to-Air Heat Pump

HVAC Guide Specifications — Section 15783

Size Range: **102,000 to 242,000 Btuh Cooling Capacity**
126,000 to 252,000 Btuh Heating Capacity

Carrier Model Number: **50HQ Horizontal**
50VQ Vertical

Part 1 — General

1.01 SYSTEM DESCRIPTION

Heat pump units packaged for horizontally suspended mounting (50HQ) and vertically mounted (50VQ), capable of operating in 60 F minimum to 90 F maximum entering water temperature. Units shall be individually

packaged and wrapped for maximum unit protection to the job site.

1.02 QUALITY ASSURANCE

- Basic unit shall be rated in accordance with ARI standard 320-86, have insulation and adhesive which meet NFPA 90A requirements for flame spread and smoke generation, and assembled units shall be UL and CSA certified.
- In addition, all units shall be factory tested to assure proper operation of all components and safety devices. An extended warranty shall include first year labor allowance on refrigerant circuit repairs and/or second through fifth year parts and labor allowance on refrigerant circuit repairs.

Guide specifications (cont)

Part 2 — Product

2.01 HEAT PUMP ASSEMBLY

Factory-tested and assembled single-piece packaged heating and cooling heat pump unit shall be factory wired, charged with non-CFC R-22, contain refrigerant-to-water heat exchanger, air-to-refrigerant heat exchanger, 4-way reversing valve, fan motor/assembly, compressor, metering device, internal controls and safety devices, and 2-in disposable return air filters.

2.02 UNIT CABINET

- A. Unit shall be constructed of heavy gage galvanized steel, with large removable insulated service panels to access all major components. Cabinet construction shall permit service testing without air bypass on coil, and shall incorporate factory furnished supply air duct connections to minimize sound transmission. Unit shall have separate entrance for high- and low-voltage electrical supplies, and return air filter tracks for disposable filters.
- B. All units shall contain FPT water connection anchored to unit casing, and a FPT condensate connection not less than 3/4-in. diameter.
- C. Some local codes may require horizontal units to be equipped with a secondary condensate drain pan to catch any condensate that may accumulate on cabinet due to high humidity conditions. The secondary drain pan is field supplied. Check local codes for this requirement and for proper routing of condensate.

2.03 FAN AND MOTOR ASSEMBLY

Unit shall have belt driven centrifugal fan(s) and DWDI type wheel(s), dynamically balanced. Fan motor shall also be a PSC type with variable pitch sheaves.

2.04 COMPRESSOR(S)

Unit shall have heat pump duty, fully hermetic type compressor(s) with internal and external isolation. Compressor(s) shall contain overcurrent, overtemperature protection and be PSC type.

2.05 HEAT EXCHANGERS

- A. Air-to-refrigerant heat exchanger shall be constructed with aluminum plate fins mechanically bonded to non-ferrous tubing with all joints brazed and cleaned.
- B. Water-to-refrigerant heat exchanger shall be coaxial tube-in-tube type with a steel outer shell and copper inner tubing. Maximum water side working pressure shall be 300 psig.

2.06 REFRIGERANT COMPONENTS

Unit shall include independent circuit(s) controlled by bi-flow thermostatic expansion valve, have high and low refrigerant service access Schrader ports, and reversing valve that shall fail safe to the heating mode. Models above 120 size shall be a 2-circuit design.

2.07 CONTROLS

- A. Unit shall include high pressure and low pressure protection safety switches (per circuit) that shall be latching lock-out types to hold unit off until reset at remote thermostat or by the main circuit breaker.
- B. On model sizes 200 and 240 a factory supplied time delay relay shall be furnished to stage multi-compressor systems. All model sizes shall contain a low voltage terminal strip for field wiring remote thermostats and supply power ground connection.

Special Features:

- 1. Supply/Return Hose Kit:
 - a. A one-in. diameter x 36-in. long EPDM tube

with teflon seal on threaded swivel connections on each end.

- b. Hose shall have a maximum working pressure of 300 psig. Hoses only for 100 size units.
- 2. Condensate Hose Kit
 - a. A required diameter x 48-in. long clear PVC tube with threaded adapter and clamps.
- 3. Gate Valves:
 - a. UL-listed cast iron body type with O-ring packing. Connection shall be via a one-in. NPT female fitting.
 - b. Valve shall also have 200 W.O.G. rating.
- 4. Ball Valves:
 - a. UL-listed brass body, ball and stem type with teflon seats and seals. Connection shall be via a one-in. NPT female fitting.
 - b. Valve shall also have 400 W.O.G. rating.
- 5. Setback-Override-Staggered Start (S.O.S.) System
 - a. Contains central time clock, central setback panel and remote satellite setback boxes.
 - b. Provides time-of-day scheduling, night setback, override capability and staggered starting and shall also have the capability to be field expanded to control numerous units.
- 6. Central Water Loop Control Panel:
 - a. Provided by unit manufacturer for reliable, accurate, and automatic control of heat rejector (tower), heat supplier (boiler) and circulating pumps.
 - b. Panel shall include visual and audible alarms, temperature indication, and safety cutouts for emergency shutdown.
 - c. A master contact shall provide an interlock for a central system controller to de-energize all units in the event of abnormal conditions.
 - d. Available options shall include outdoor temperature reset, test simulation kits, flow switches, temperature sensors and remote repeater panels.
- 7. Microprocessor-Based System Controller:
 - a. Provided by unit manufacturer for monitoring and energy savings functions.
 - b. Signal transmission shall be via hard wire, one-way or 2-way power line communication.
 - c. Control functions include time of day and holiday scheduling, night setback, demand limiting, central start/stop, optimal start-up, status-monitoring using LCD's, 30-day temperature display, electrical and peak demand displays.
- 8. Thermostats:
 - 24-volt, wall-mounted type capable of automatic changeover, manual changeover and energy-saving programmable.
- 9. Extended Warranty:
 - a. Option I shall include the first year labor allowance on refrigerant circuit repairs.
 - b. Option II shall include a second through fifth year parts and labor allowance on refrigerant circuit repairs.