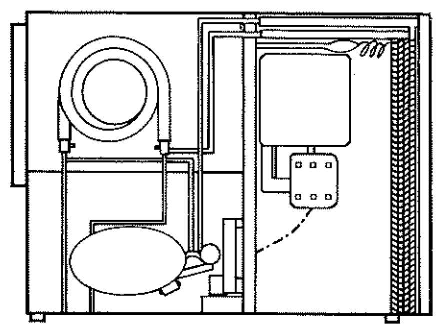
HORIZONTAL
WATER SOURCE
HEAT PUMPS

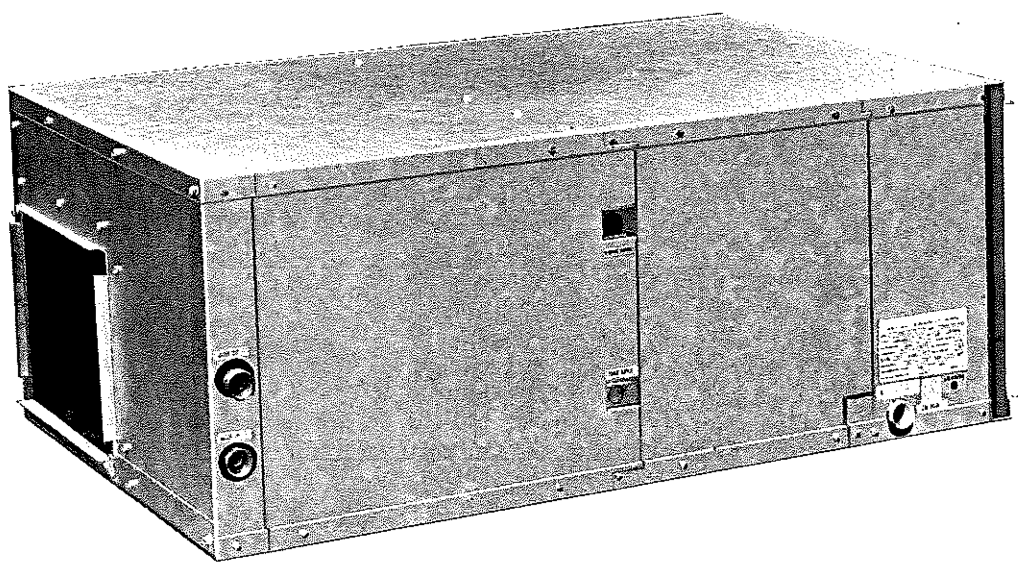
ENERGY EFFICIENT

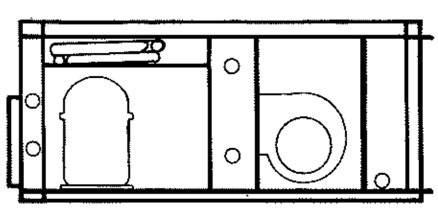
COMPACT, LOW PROFILE

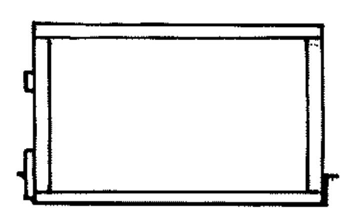
UNIQUE, QUIET BLOWER ARRANGEMENT

SINGLE SIDE SERVICE ACCESS





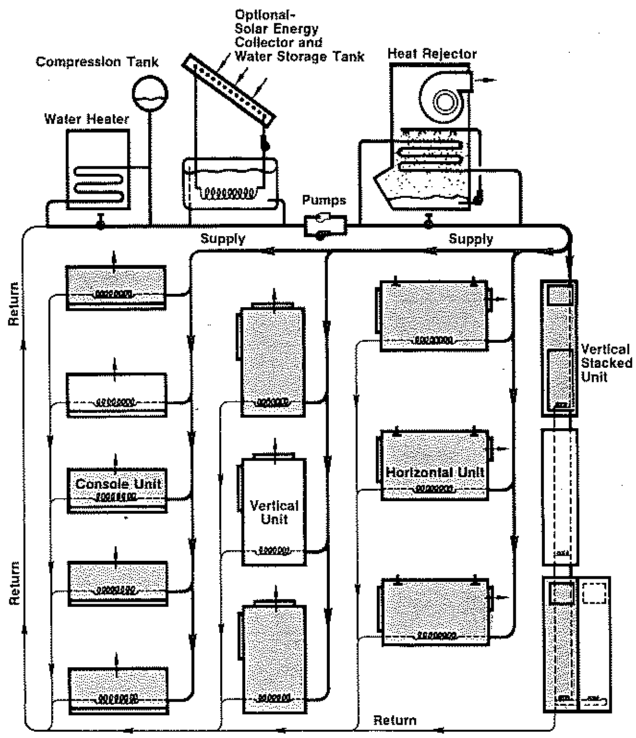




CHP co.

CALIFORNIA HEAT PUMP COMPANY

TYPICAL CLOSED LOOP SYSTEM

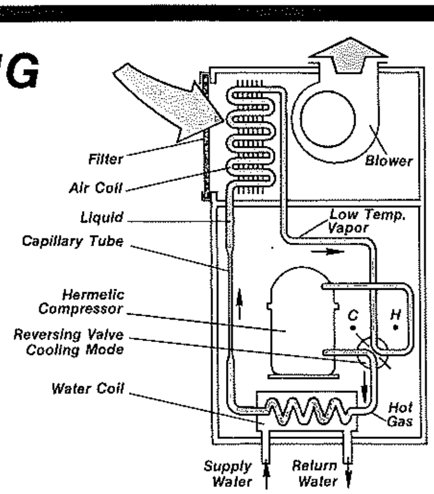


The CHP system consists of multiples of water source heat pumps connected in parallel by a two pipe closed loop through which water is circulated to each unit. The temperature of the water is maintained between 60°F and 90°F by means of a water heater which prevents the temperature from dropping below 60°F and a heat rejector which prevents the temperature from exceeding 90°F.

During heating season, the heat pump will absorb heat from the water loop and reject it into the space to be heated. When cooling is required, the heat pump will absorb heat from the space to be cooled and reject it into the water loop.

The water loop becomes a medium for storing excess heat from daytime operation, making it available the following night for heating. The water also provides a practical means of transporting energy from warmer spaces to cold spaces whenever they coexist in a building. If one-third of the units in operation are cooling, they will reject enough heat into the water loop to supply heat for the remaining units, thereby using energy that would otherwise be wasted.

COOLING



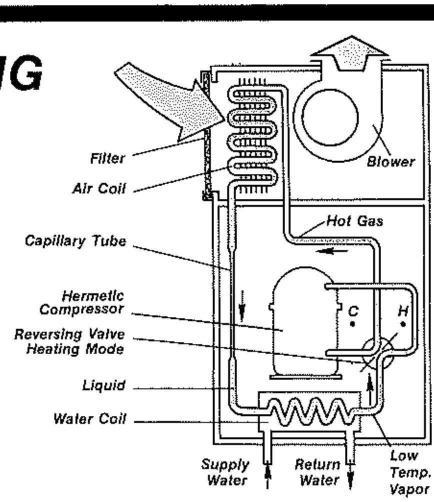
Upon demand for COOLING, the thermostat activates the blower and positions the reversing valve into the cooling mode.

High pressure vapor from the compressor is pumped through the reversing valve to the water coil where it condenses to a liquid, giving up its heat to the water loop.

Liquid refrigerant flows through the expansion device to the air coil where it evaporates to become a cold vapor and absorbs heat from the air drawn over the coil by the blower.

The refrigerant then flows through the reversing valve back to the compressor, completing the cycle.

HEATING



On demand for HEATING, the thermostat activates the blower and positions the reversing valve into the heating mode.

High pressure vapor from the compressor is pumped through the reversing valve to the air coil where it condenses to a liquid, discharging its heat to the air which is drawn over the coil by the blower.

The liquid refrigerant then passes through the expansion device to the water coil where it evaporates to a low temperature vapor, absorbing heat from the water loop.

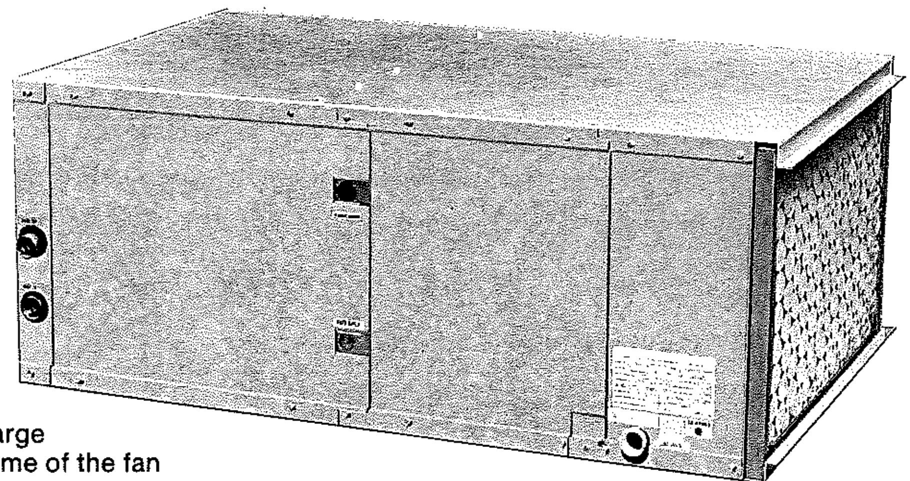
The refrigerant then flows through the reversing valve to the compressor, completing the cycle.

CALIFORNIA HEAT PUMP COMPANY

DESIGN FEATURES

CHP horizontal water source heat pumps with nominal cooling capacities ranging from 9,000 to 61,000 BTUH, are designed so that they may be installed within relatively shallow spaces such as the ceiling of a commercial building. Common applications include office buildings, schools, medical facilities, shopping centers, hotels or motels, manufacturing buildings and residences.

Typically concealed above the ceiling, CHP horizontal units take up no valuable floor space, and eliminate the need for an exposed, painted cabinet. All CHP horizontal units feature cabinets made of galvanized steel for maximum corrosion protection.



All units in the horizontal line are configured so that the supply and return air ductwork, as well as the longest dimension of the unit, can be positioned parallel to the joists. This configuration best fits limited spaces between the joists and minimizes conflict with other components in the ceiling.

However, where applications demand other inlet and/or discharge locations, the CHP horizontal units can be specified with various optional locations, identified on page 9.

The blower, with its acoustically lined discharge plenum section, operates quietly because some of the fan noise is absorbed within the unit and air velocity is reduced inside the enlarged plenum. This also allows some static pressure regain within the unit, and makes the contractor's duct transition less severe and therefore less expensive.

All electrical components can be repaired or replaced through access panels located on just one side of the unit. Single side service access permits the installer to place the opposite side of the unit next to a wall or truss, leaving maximum space available on the access side for installation and service.

Supply and return piping connections are typically made at the unit using hose kits. High burst strength, steel sheathed flexible rubber hose in two foot lengths, complete with threaded connections and swivel fittings, simplify installation. Ball valves for servicing and to regulate water flow can also be furnished.

A cupro-nickel water coil is optionally available for use in applications involving poor water quality.

Control options include 24 volt manual or automatic changeover thermostats. Optional night setback controls are also available, including a random start type of night setback relay furnished with or without override timer and/or low limit stat. Contact the factory regarding other possible control or unit options.

Reasons To Specify a CHP Horizontal System Include:

- ***Quiet Operation***
- ***Compact Units***
- ***Low Operating Cost***
- ***Single Side Service Access***
- ***Thermal & Acoustic Insulation***
- ***High Pressure Refrigerant & Low Water Temperature Protection***
- ***Galvanized Cabinets & Drain Pan***
- ***Stock Shipment Today (SST) Program***

COOLING PERFORMANCE

See page 7 for suggestions on proper use of Performance Data Tables.

HORIZONTAL WATER SOURCE HEAT PUMPS

ENTERING WATER TEMPERATURE				
55	1.03	0.82	0.68	0.58
60	1.37	1.02	0.81	0.68
65		1.36	1.02	0.81
70		2.04	1.36	1.01
72			1.56	1.13
74			1.85	1.27
76			2.26	1.45
78				1.69
80				2.03
82				
84				
86				
88				
90				
92				
94				

Table 3—Water Pressure Drop

MODEL AND RATED CFM	NOMINAL FLOW RATE		Low	Normal		High
	GPM/10 MBH HEAT REJ'T		1.0	1.3	1.6	2.0
09 300 CFM	WATER FLOW GPM		1.1	1.5	1.8	2.3
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	2.9	5.3	7.5	12.2
		Unit with Standard Supply & Return Hoses	3.5	6.2	8.6	14.0
11 400 CFM	WATER FLOW GPM		1.4	1.8	2.3	2.8
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	3.6	5.9	9.5	13.0
		Unit with Standard Supply & Return Hoses	4.4	7.0	11.3	15.4
13 450 CFM	WATER FLOW GPM		1.8	2.3	2.9	3.5
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	5.9	9.5	15.0	23.0
		Unit with Standard Supply & Return Hoses	7.0	11.3	17.8	27.2
19 700 CFM	WATER FLOW GPM		2.5	3.2	3.9	4.9
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	6.2	10.1	15.3	24.0
		Unit with Standard Supply & Return Hoses	6.6	10.6	16.1	25.0
27 950 CFM	WATER FLOW GPM		3.5	4.5	5.6	7.0
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	4.0	6.6	10.2	15.3
		Unit with Standard Supply & Return Hoses	4.6	7.5	11.4	17.1
35 1280 CFM	WATER FLOW GPM		4.6	6.0	7.3	9.2
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	3.1	5.3	7.8	12.3
		Unit with Standard Supply & Return Hoses	4.0	6.7	9.8	15.5
43 1500 CFM	WATER FLOW GPM		5.6	7.3	9.0	11.2
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	4.6	7.8	11.6	18.1
		Unit with Standard Supply & Return Hoses	5.8	9.8	14.7	22.7
52 1750 CFM	WATER FLOW GPM		6.9	9.0	11.0	13.8
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	5.2	8.8	13.0	21.0
		Unit with Standard Supply & Return Hoses	7.1	11.9	17.4	28.0
61 2100 CFM	WATER FLOW GPM		8.2	10.6	13.1	16.3
	PRESSURE DROP FT H_2O	Unit Only, No Hoses	5.6	9.4	14.1	22.0
		Unit with Standard Supply & Return Hoses	8.2	13.5	20.3	31.4

Table 2—Cooling Performance

MODEL AND RATED CFM	LEAVING WATER TEMP °F	75	80	85	90
09 300 CFM	TOT COOL CAP MBH	9.5	9.3	9.2	9.0
	TOT KW INP	0.62	0.65	0.69	0.73
	HT REJ'T MBH	11.6	11.6	11.5	11.5
	EER	15.3	14.3	13.3	12.4
11 400 CFM	TOT COOL CAP MBH	11.5	11.3	11.2	11.1
	TOT KW INP	0.90	0.92	0.94	0.96
	HT REJ'T MBH	14.5	14.5	14.4	14.3
	EER	12.7	12.3	11.9	11.5
13 450 CFM	TOT COOL CAP MBH	14.6	14.4	14.2	14.0
	TOT KW INP	1.09	1.13	1.17	1.21
	HT REJ'T MBH	18.3	18.2	18.2	18.1
	EER	13.4	12.8	12.1	11.5
19 700 CFM	TOT COOL CAP MBH	20.1	19.8	19.5	19.2
	TOT KW INP	1.48	1.54	1.60	1.67
	HT REJ'T MBH	25.2	25.1	24.9	24.9
	EER	13.5	12.9	12.2	11.5
27 950 CFM	TOT COOL CAP MBH	28.8	28.3	27.9	27.6
	TOT KW INP	2.09	2.16	2.24	2.28
	HT REJ'T MBH	35.9	35.7	35.5	35.4
	EER	13.8	13.1	12.5	12.1
35 1280 CFM	TOT COOL CAP MBH	38.0	37.3	36.6	36.0
	TOT KW INP	2.68	2.81	2.95	3.09
	HT REJ'T MBH	47.1	46.9	46.6	46.5
	EER	14.2	13.3	12.4	11.6
43 1500 CFM	TOT COOL CAP MBH	45.9	45.1	44.5	44.1
	TOT KW INP	3.43	3.59	3.68	3.75
	HT REJ'T MBH	57.6	57.3	57.1	56.9
	EER	13.4	12.6	12.1	11.8
52 1750 CFM	TOT COOL CAP MBH	55.8	55.0	54.1	53.4
	TOT KW INP	4.44	4.58	4.72	4.86
	HT REJ'T MBH	70.9	70.6	70.2	70.0
	EER	12.6	12.0	11.5	11.0
61 2100 CFM	TOT COOL CAP MBH	66.8	65.5	64.2	63.0
	TOT KW INP	5.06	5.32	5.58	5.84
	HT REJ'T MBH	84.0	83.6	83.2	83.0
	EER	13.2	12.3	11.5	10.8

Table 4—Calculation of Cooling Tower Load and Total System GPM

AVG EER	11.6	11.4	11.2	11	10.8	10.6	10.4	10.2	10	9	8
BTUH/ TON*	15531	15593	15657	15723	15792	15864	15938	16015	16096	16551	17120
GPM/ 10 MBH HT REJ'T	GPM/TON OF COOLING										
0.6	0.93	0.94	0.94	0.94	0.95	0.95	0.96	0.96	0.97	0.99	1.03
0.8	1.24	1.25	1.25	1.26	1.26	1.27	1.28	1.28	1.29	1.32	1.37
1.0	1.55	1.56	1.57	1.57	1.58	1.59	1.59	1.60	1.61	1.66	1.71
1.1	1.71	1.72	1.72	1.73	1.74	1.75	1.75	1.76	1.77	1.82	1.88
1.2	1.86	1.87	1.88	1.89	1.90	1.90	1.91	1.92	1.93	1.99	2.05
1.3	2.02	2.03	2.04	2.04	2.05	2.06	2.07	2.08	2.09	2.15	2.23
1.4	2.17	2.18	2.19	2.20	2.21	2.22	2.23	2.24	2.25	2.32	2.40
1.5	2.33	2.34	2.35	2.36	2.37	2.38	2.39	2.40	2.41	2.48	2.57
1.6	2.48	2.49	2.51	2.52	2.53	2.54	2.55	2.56	2.58	2.65	2.74
1.7	2.64	2.65	2.66	2.67	2.68	2.70	2.71	2.72	2.74	2.81	2.91
1.8	2.80	2.81	2.82	2.83	2.84	2.86	2.87	2.88	2.90	2.98	3.08
1.9	2.95	2.96	2.97	2.99	3.00	3.01	3.03	3.04	3.06	3.14	3.25
2.0	3.11	3.12	3.13	3.14	3.16	3.17	3.19	3.20	3.22	3.31	3.42
2.1	3.26	3.27	3.29	3.30	3.32	3.33	3.35	3.36	3.38	3.48	3.60

Table 5—Water Flow by Model

MODEL	09	11	13	19	27	35	43	52	61
COOL @ARI	8.7	10.8	13.6	18.5	27	35	43	52	61
EER	11.3	11	10.9	10.5	11.6	11	11.2	10.4	10
BTUH/ TON*	15624	15723	15757	15901	15531	15723	15657	15938	16096
GPM/ 10 MBH HT REJ'T	CONVERSION OF GPM/10 MBH HEAT REJ'T INTO ACTUAL GPM								
0.6	0.68	0.85	1.07	1.47	2.10	2.75	3.37	4.14	4.91
0.8	0.91	1.13	1.43	1.96	2.80	3.67	4.49	5.53	6.55
1.0	1.13	1.42	1.79	2.45	3.49	4.59	5.61	6.91	8.18
1.1	1.25	1.56	1.96	2.70	3.84	5.04	6.17	7.60	9.00
1.2	1.36	1.70	2.14	2.94	4.19	5.50	6.73	8.29	9.82
1.3	1.47	1.84	2.32	3.19	4.54	5.96	7.29	8.98	10.64
1.4	1.59	1.98	2.50	3.43	4.89	6.42	7.85	9.67	11.45
1.5	1.70	2.12	2.68	3.68	5.24	6.88	8.42	10.36	12.27
1.6	1.81	2.26	2.86	3.92	5.59	7.34	8.98	11.05	13.09
1.7	1.93	2.41	3.04	4.17	5.94	7.80	9.54	11.74	13.91
1.8	2.04	2.55	3.21	4.41	6.29	8.25	10.10	12.43	14.73
1.9	2.15	2.69	3.39	4.66	6.64	8.71	10.66	13.12	15.55
2.0	2.27	2.83	3.57	4.90	6.99	9.17	11.22	13.81	16.36
2.1	2.38	2.97	3.75	5.15	7.34	9.63	11.78	14.50	17.18

* Heat Rejection

Table 1—GPM/10 MBH Heat Rejection

91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
0.56																			
0.65	0.63	0.61	0.59																
0.78	0.75	0.72	0.69	0.67	0.64														
0.96	0.92	0.87	0.84	0.80	0.77	0.74	0.71	0.69	0.66	0.64									
1.06	1.01	0.96	0.91	0.87	0.83	0.80	0.77	0.74	0.71	0.69	0.66								
1.19	1.12	1.06	1.00	0.95	0.91	0.87	0.83	0.80	0.77	0.74	0.71	0.68	0.66						
1.35	1.26	1.18	1.11	1.05	1.00	0.95	0.91	0.87	0.83	0.80	0.76	0.73	0.70	0.68	0.65				
1.56	1.44	1.34	1.25	1.18	1.11	1.05	1.00	0.95	0.91	0.86	0.83	0.79	0.76	0.73	0.70	0.67			
1.84	1.68	1.55	1.43	1.33	1.25	1.18	1.11	1.05	1.00	0.95	0.90	0.86	0.82	0.79	0.75	0.72	0.69		
2.25	2.02	1.83	1.67	1.54	1.43	1.33	1.25	1.17	1.11	1.05	0.99	0.94	0.90	0.85	0.82	0.78	0.75	0.72	
		2.23	2.01	1.82	1.67	1.54	1.43	1.33	1.25	1.17	1.10	1.04	0.99	0.94	0.89	0.85	0.81	0.77	0.74
				2.22	2.00	1.82	1.66	1.53	1.42	1.33	1.24	1.16	1.10	1.03	0.98	0.93	0.88	0.84	0.80
						2.22	2.00	1.81	1.66	1.53	1.42	1.32	1.23	1.16	1.09	1.03	0.97	0.92	0.88
								2.22	1.99	1.81	1.65	1.52	1.41	1.31	1.22	1.15	1.08	1.02	0.97
										2.21	1.98	1.80	1.64	1.51	1.40	1.30	1.22	1.14	1.07
												2.20	1.97	1.79	1.63	1.50	1.39	1.29	1.21

91	92	93	94	**95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	MODEL AND RATED CFM
8.9	8.9	8.8	8.8	**8.7**	8.7	8.6	8.6	8.6	8.5	8.5	8.4	8.3	8.3	8.2	8.1	8.1	8.0	8.0	7.9	09
0.74	0.74	0.75	0.76	**0.77**	0.78	0.78	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.86	0.86	0.87	0.87	0.88	0.89	
11.4	11.4	11.4	11.4	**11.3**	11.3	11.3	11.3	11.3	11.3	11.3	11.2	11.2	11.2	11.1	11.1	11.0	11.0	11.0	10.9	
12.2	11.9	11.7	11.5	**11.3**	11.2	11.0	10.8	10.7	10.5	10.3	10.1	10.0	9.8	9.6	9.5	9.3	9.2	9.1	8.9	300 CFM
11.0	11.0	10.9	10.9	**10.8**	10.8	10.7	10.7	10.7	10.6	10.6	10.5	10.4	10.4	10.3	10.3	10.2	10.1	10.0	10.0	11
0.96	0.97	0.97	0.98	**0.98**	0.99	1.00	1.00	1.01	1.02	1.03	1.03	1.04	1.04	1.05	1.06	1.06	1.07	1.07	1.08	
14.3	14.3	14.2	14.2	**14.2**	14.1	14.1	14.1	14.1	14.1	14.1	14.0	14.0	14.0	13.9	13.9	13.8	13.8	13.7	13.7	
11.4	11.3	11.2	11.1	**11.0**	10.9	10.8	10.6	10.5	10.4	10.3	10.2	10.1	9.9	9.8	9.7	9.6	9.5	9.3	9.2	400 CFM
13.9	13.8	13.7	13.7	**13.6**	13.6	13.5	13.5	13.5	13.4	13.4	13.3	13.2	13.1	13.0	13.0	12.9	12.8	12.7	12.6	13
1.22	1.22	1.23	1.24	**1.24**	1.25	1.26	1.27	1.27	1.28	1.29	1.30	1.30	1.31	1.32	1.33	1.33	1.34	1.34	1.35	
18.1	18.0	18.0	17.9	**17.9**	17.8	17.8	17.8	17.8	17.8	17.7	17.7	17.6	17.6	17.5	17.5	17.4	17.4	17.3	17.2	
11.4	11.3	11.2	11.0	**10.9**	10.8	10.7	10.7	10.6	10.5	10.4	10.2	10.1	10.0	9.9	9.8	9.7	9.6	9.5	9.3	450 CFM
19.0	18.9	18.8	18.6	**18.5**	18.5	18.4	18.3	18.3	18.2	18.1	18.0	17.9	17.8	17.7	17.6	17.4	17.3	17.2	17.0	19
1.69	1.71	1.72	1.74	**1.76**	1.77	1.78	1.80	1.81	1.82	1.83	1.84	1.85	1.86	1.88	1.89	1.90	1.91	1.93	1.94	
24.8	24.7	24.6	24.6	**24.5**	24.5	24.5	24.5	24.5	24.4	24.4	24.3	24.2	24.2	24.1	24.0	23.9	23.8	23.7	23.7	
11.3	11.1	10.9	10.7	**10.5**	10.4	10.3	10.2	10.1	10.0	9.9	9.8	9.7	9.5	9.4	9.3	9.2	9.0	8.9	8.8	700 CFM
27.5	27.4	27.3	27.1	**27.0**	26.9	26.8	26.7	26.7	26.6	26.4	26.2	26.1	25.9	25.7	25.5	25.3	25.1	24.9	24.7	27
2.29	2.30	2.31	2.32	**2.33**	2.34	2.36	2.38	2.40	2.42	2.44	2.46	2.49	2.51	2.53	2.55	2.58	2.60	2.63	2.65	
35.3	35.2	35.1	35.0	**34.9**	34.9	34.9	34.9	34.9	34.8	34.7	34.6	34.5	34.4	34.3	34.2	34.1	34.0	33.8	33.7	
12.0	11.9	11.8	11.7	**11.6**	11.5	11.4	11.2	11.1	11.0	10.8	10.6	10.5	10.3	10.2	10.0	9.8	9.6	9.5	9.3	950 CFM
35.8	35.6	35.4	35.2	**35.0**	34.9	34.8	34.7	34.6	34.5	34.2	34.0	33.8	33.6	33.4	33.2	32.9	32.7	32.4	32.2	35
3.11	3.13	3.14	3.16	**3.18**	3.20	3.23	3.25	3.28	3.30	3.32	3.35	3.37	3.40	3.42	3.44	3.47	3.49	3.52	3.54	
46.4	46.2	46.1	46.0	**45.9**	45.8	45.8	45.8	45.8	45.7	45.6	45.5	45.3	45.2	45.1	44.9	44.8	44.6	44.4	44.3	
11.5	11.4	11.3	11.1	**11.0**	10.9	10.8	10.7	10.6	10.4	10.3	10.2	10.0	9.9	9.8	9.6	9.5	9.4	9.2	9.1	1280 CFM
43.9	43.6	43.4	43.2	**43.0**	42.9	42.8	42.7	42.6	42.5	42.1	41.8	41.5	41.2	40.9	40.6	40.3	40.0	39.8	39.5	43
3.77	3.79	3.81	3.83	**3.85**	3.87	3.89	3.91	3.93	3.95	3.99	4.04	4.08	4.13	4.17	4.20	4.22	4.25	4.27	4.30	
56.7	56.6	56.4	56.3	**56.1**	56.1	56.0	56.0	56.0	55.9	55.8	55.6	55.5	55.3	55.2	54.9	54.7	54.5	54.3	54.1	
11.6	11.5	11.4	11.3	**11.2**	11.1	11.0	10.9	10.8	10.7	10.6	10.4	10.2	10.0	9.8	9.7	9.6	9.4	9.3	9.2	1500 CFM
53.2	52.9	52.6	52.3	**52.0**	51.9	51.7	51.6	51.5	51.3	51.0	50.7	50.5	50.2	49.9	49.5	49.2	48.8	48.5	48.2	52
4.89	4.92	4.94	4.97	**5.00**	5.03	5.06	5.08	5.11	5.14	5.17	5.20	5.22	5.25	5.28	5.31	5.34	5.36	5.39	5.42	
69.8	69.7	69.5	69.3	**69.1**	69.0	69.0	69.0	68.9	68.9	68.7	68.5	68.3	68.1	67.9	67.7	67.4	67.2	66.9	66.7	
10.9	10.8	10.6	10.5	**10.4**	10.3	10.2	10.1	10.1	10.0	9.9	9.8	9.7	9.6	9.4	9.3	9.2	9.1	9.0	8.9	1750 CFM
62.6	62.2	61.8	61.4	**61.0**	60.8	60.7	60.5	60.4	60.2	59.9	59.5	59.2	58.8	58.5	58.1	57.7	57.3	57.0	56.6	61
5.89	5.94	6.00	6.05	**6.10**	6.13	6.16	6.20	6.23	6.26	6.30	6.33	6.36	6.40	6.43	6.46	6.48	6.51	6.53	6.56	
82.7	82.5	82.3	82.1	**81.8**	81.8	81.7	81.7	81.6	81.6	81.4	81.1	80.9	80.7	80.4	80.1	79.8	79.6	79.3	79.0	
10.6	10.5	10.3	10.2	**10.0**	9.9	9.8	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.0	8.9	8.8	8.7	8.6	2100 CFM

Table 6—Total & Sensible Cooling Multipliers

ENT WET BULB	TOTAL COOL MULT	HEAT REJ'T MULT	SENSIBLE COOLING AS A % OF TOTAL COOLING — ENTERING DRY BULB TEMPERATURE								
			75	76	77	78	79	80	82	85	90
61	0.87	0.92	0.77	0.79	0.81	0.82	0.84	0.86			
62	0.90	0.93	0.74	0.76	0.78	0.80	0.83	0.85			
63	0.92	0.95	0.71	0.73	0.76	0.78	0.81	0.83			
64	0.95	0.96	0.68	0.71	0.74	0.76	0.79	0.82	0.86	0.93	
65	0.97	0.97	0.65	0.68	0.70	0.73	0.76	0.79	0.84	0.91	
66	0.98	0.99	0.61	0.64	0.67	0.70	0.73	0.76	0.81	0.88	
67	1.00	1.00	0.58	0.61	0.64	0.67	0.70	0.73	0.78	0.86	0.97
68	1.02	1.01	0.55	0.58	0.61	0.64	0.67	0.70	0.75	0.83	0.96
69	1.03	1.03	0.52	0.55	0.58	0.61	0.64	0.67	0.72	0.81	0.95
70	1.05	1.04	0.49	0.52	0.55	0.58	0.61	0.64	0.70	0.78	0.94
71	1.07	1.05		0.49	0.52	0.55	0.58	0.60	0.66	0.75	0.91
72	1.09	1.07			0.49	0.52	0.54	0.57	0.63	0.71	0.88
73	1.11	1.08				0.49	0.51	0.53	0.59	0.68	0.85

Multiply the above Total and Sensible Cooling Factors times the Total Cooling Capacity listed in Table 2 to determine capacity at various entering wet bulb and dry bulb temperatures. Similarly, multiply the Heat Rejection Factor above times Heat Rejection listed in Table 2.

Table 7—CFM Correction Multipliers

% OF RATED CFM	TOTAL COOL CAP	SENS COOL CAP	HEAT OF REJ'T
80%	.93	.95	.96
90%	.96	.97	.98
100%	1.00	1.00	1.00
110%	1.02	1.04	1.04
120%	1.05	1.08	1.08

****Bold Type** ratings in Table 2 are the ARI certification points from ARI Standard 320.

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Table 8—GPM/10 MBH Heat Absorbed

ENTERING WATER TEMPERATURE \ LEAVING WATER TEMP °F	80	75	70	65	63	61	59	57	55	53	51	49	47	45
50														3.5
52													3.6	2.5
54												3.6	2.6	2.0
56											3.7	2.6	2.0	1.6
58										3.7	2.6	2.0	1.6	1.4
60									3.8	2.7	2.0	1.6	1.4	1.2
62								3.8	2.7	2.1	1.7	1.4	1.2	1.0
64							3.9	2.7	2.1	1.7	1.4	1.2	1.1	
66						4.0	2.8	2.1	1.7	1.4	1.2	1.1		
68					4.0	2.8	2.2	1.7	1.5	1.2	1.1			
70				4.1	2.9	2.2	1.8	1.5	1.3	1.1	1.0			
72				2.9	2.2	1.8	1.5	1.3	1.1	1.0				
74				2.3	1.8	1.5	1.3	1.1	1.0					
76			3.5	1.8	1.5	1.3	1.1	1.0						
80		4.3	2.1	1.4	1.2	1.0								
85	4.5	2.2	1.4	1.0	0.9									

Table 9 Heating Performance

MODEL AND RATED CFM	ARI RATE	LEAVING WATER TEMP °F	80	75	70	65	63	61	59	57	55	53	51	49	47	45
09	9.60	HEAT CAP MBH	10.5	10.3	10.0	9.7	9.6	9.4	9.3	9.2	9.1	8.9	8.8	8.7	8.6	8.4
	0.82	TOT KW INPUT	0.86	0.85	0.83	0.82	0.81	0.80	0.79	0.78	0.77	0.76	0.75	0.74	0.73	0.72
	6.80	HEAT ABS MBH	7.6	7.4	7.1	6.9	6.8	6.7	6.6	6.5	6.4	6.4	6.3	6.2	6.1	6.0
300 CFM	3.50	COP	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.4	3.4	3.4	3.4	3.4
11	14.00	HEAT CAP MBH	15.5	15.1	14.6	14.2	14.0	13.9	13.7	13.5	13.4	13.2	13.0	12.9	12.7	12.6
	1.11	TOT KW INPUT	1.20	1.17	1.14	1.12	1.11	1.10	1.10	1.09	1.08	1.07	1.07	1.06	1.06	1.05
	10.20	HEAT ABS MBH	11.4	11.1	10.7	10.4	10.2	10.1	10.0	9.8	9.7	9.5	9.4	9.3	9.1	9.0
400 CFM	3.70	COP	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.5	3.5
13	16.40	HEAT CAP MBH	18.1	17.6	17.1	16.6	16.4	16.2	16.0	15.8	15.5	15.3	15.1	14.9	14.7	14.4
	1.38	TOT KW INPUT	1.45	1.43	1.41	1.39	1.37	1.35	1.34	1.32	1.30	1.28	1.27	1.25	1.23	1.22
	11.70	HEAT ABS MBH	13.1	12.7	12.3	11.9	11.7	11.6	11.4	11.3	11.1	10.9	10.8	10.6	10.5	10.3
450 CFM	3.50	COP	3.6	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
19	22.00	HEAT CAP MBH	24.0	23.4	22.8	22.3	22.0	21.7	21.5	21.2	21.0	20.7	20.5	20.2	19.9	19.7
	1.76	TOT KW INPUT	1.79	1.77	1.77	1.76	1.75	1.73	1.72	1.71	1.70	1.69	1.68	1.66	1.65	1.64
	16.00	HEAT ABS MBH	17.9	17.4	16.8	16.3	16.1	15.8	15.6	15.4	15.2	15.0	14.7	14.5	14.3	14.1
700 CFM	3.70	COP	3.9	3.9	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.5	3.5
27	29.50	HEAT CAP MBH	32.3	31.5	30.6	29.9	29.5	29.2	28.8	28.5	28.2	27.8	27.5	27.1	26.7	26.4
	2.28	TOT KW INPUT	2.33	2.32	2.30	2.28	2.27	2.26	2.25	2.23	2.22	2.21	2.19	2.17	2.16	2.14
	21.70	HEAT ABS MBH	24.3	23.6	22.8	22.1	21.8	21.5	21.2	20.9	20.6	20.3	20.0	19.7	19.4	19.1
950 CFM	3.80	COP	4.0	4.0	3.9	3.8	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.7	3.6	3.6
35	42.00	HEAT CAP MBH	46.6	45.2	43.8	42.6	42.0	41.5	41.0	40.5	39.9	39.4	38.9	38.4	37.9	37.4
	3.25	TOT KW INPUT	3.50	3.42	3.33	3.26	3.23	3.20	3.18	3.15	3.12	3.09	3.07	3.04	3.02	2.99
	30.90	HEAT ABS MBH	34.6	33.6	32.5	31.4	31.0	30.6	30.1	29.7	29.3	28.9	28.5	28.0	27.6	27.2
1280 CFM	3.80	COP	3.9	3.9	3.9	3.8	3.8	3.8	3.8	3.8	3.7	3.7	3.7	3.7	3.7	3.7
43	47.00	HEAT CAP MBH	51.4	50.2	48.9	47.6	47.1	46.5	45.9	45.4	44.8	44.3	43.7	43.2	42.6	42.0
	3.75	TOT KW INPUT	3.85	3.82	3.79	3.76	3.74	3.71	3.69	3.66	3.64	3.61	3.58	3.55	3.53	3.50
	34.20	HEAT ABS MBH	38.3	37.1	35.9	34.8	34.3	33.8	33.4	32.9	32.4	32.0	31.5	31.0	30.6	30.1
1500 CFM	3.70	COP	3.9	3.8	3.8	3.7	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.5	3.5
52	59.00	HEAT CAP MBH	64.4	62.9	61.3	59.7	59.1	58.5	57.8	57.2	56.6	55.9	55.3	54.6	54.0	53.4
	4.95	TOT KW INPUT	5.06	5.03	5.00	4.96	4.94	4.93	4.91	4.90	4.88	4.86	4.84	4.82	4.80	4.78
	42.10	HEAT ABS MBH	47.2	45.7	44.2	42.8	42.2	41.7	41.1	40.5	39.9	39.3	38.8	38.2	37.6	37.0
1750 CFM	3.50	COP	3.7	3.7	3.6	3.5	3.5	3.5	3.4	3.4	3.4	3.4	3.3	3.3	3.3	3.3
61	77.00	HEAT CAP MBH	85.1	82.9	80.6	78.1	77.1	76.2	75.2	74.2	73.2	72.2	71.2	70.2	69.1	68.1
	6.44	TOT KW INPUT	6.88	6.78	6.67	6.50	6.44	6.37	6.31	6.24	6.18	6.10	6.02	5.94	5.86	5.78
	55.00	HEAT ABS MBH	61.6	59.7	57.8	55.9	55.2	54.4	53.7	52.9	52.1	51.4	50.6	49.9	49.1	48.4
2100 CFM	3.50	COP	3.6	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Table 10—Water Temperature Drop During Heating

MODEL	09	11	13	19	27	35	43	52	61
FACTOR	.61	.72	.66	.66	.62	.67	.61	.61	.67

If the water temperature rise during cooling is known, that Δt times the factor from Table 10 will provide the temperature drop during heating operation (ARI conditions).

GPM/10 MBH HT ABS (Table 8) = GPM/10MBH HT REJ'T (Table 1) ÷ Factor from Table 10.

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Table 11
Blower Data

MODEL and RATED CFM	MOTOR TAP	@.10	@.20	@.30	@.40	@.50	@.60
		AIR FLOW (CFM) VS. EXT. STATIC PRES. (I.W.G.)					
09 300 CFM	Hi	420	340	290	—	—	—
	Lo*	380	305	—	—	—	—
11 400 CFM	Hi*	420	340	290	—	—	—
	Lo	380	305	—	—	—	—
13 450 CFM	Hi*	475	455	425	—	—	—
	Lo	415	395	—	—	—	—
19 700 CFM	Hi*	780	750	710	660	—	—
	Lo	700	680	640	—	—	—
27 950 CFM	Hi*	990	930	870	820	—	—
	Lo	870	820	770	—	—	—
35 1280 CFM	Hi	1450	1410	1360	1300	1230	—
	Lo*	1290	1265	1230	1200	—	—
43 1500 CFM	Hi*	1710	1630	1540	1450	1360	1260
	Lo	1630	1560	1480	1390	1300	—
52 1750 CFM	Hi	2030	2000	1960	1910	1850	1750
	Lo*	1780	1760	1710	1680	1600	—
61 2100 CFM	Hi*	2250	2200	2150	2100	2050	1960
	Lo	2000	1950	1920	—	—	—

*Standard factory connection

Table 12
Heating Correction Multipliers

ENT. AIR DRY BULB TEMP °F	HEATING CAPACITY	HEAT OF ABSORPTION
60°	1.05	1.07
65°	1.03	1.04
70°	1.00	1.00
75°	.97	.95
80°	.94	.94

Table 13
CFM Correction Multipliers

% OF RATED CFM	HEATING		
	HEATING CAPACITY	HEAT OF ABSORPTION	POWER INPUT
80%	.93	.89	1.05
90%	.96	.95	1.02
100%	1.00	1.00	1.00
110%	1.02	1.04	.98
120%	1.05	1.08	.95

Use of Performance Data Tables For Unit Selection

Performance data has been tabulated in a format that increases accuracy over the entire range of information and, by listing data at more frequent temperature intervals, minimizes the extent of interpolation required.

It is recommended that the heat pumps be selected based on required cooling capacity, not heating capacity. If a unit selected on cooling lacks adequate heating capacity, consideration should be given to the use of an outdoor reset control to supply system water at temperatures warmer than the normal 60°F, up to a maximum of 80°F. Use of supplementary heat may also be considered. It is also recommended that when the required capacity falls between the available capacity of two units, the smaller of the two should be selected for most applications. Selection of the smaller unit will reduce cycling, thus extending life of the unit. The more constant operation during normal loads will improve temperature and humidity control, minimize operating cost and maintain a uniform sound level.

Typical system designs are based on water entering each heat pump at 90°F during the cooling season, and leaving at 105°F. A flow rate of 1.31 "GPM/10 MBH Heat Rejection" should be used. In humid climates, to minimize cooling tower size, the system GPM is sometimes increased to as much as 1.6 "GPM/10 MBH Heat Rejection" to allow a higher supply water temperature, while retaining the 105°F return temperature.

To select units for cooling, entering air conditions in this example are assumed to be 75° DB/64° WB, with water entering at 90°F and leaving at 105°F. Refer to **Table 1** which indicates the flow rate to be 1.31 GPM/10 MBH Heat Rejection. This value can be multiplied times tabulated Heat Rejection to determine actual GPM for any model at any water temperature. It can also be used in **Table 5** to determine nominal GPM by model, then in **Table 3** for pressure drop by model, and again in **Table 4** to determine heat rejector or cooling tower load.

If the cooling load for one zone is 25,000 BTUH total and 18,000 BTUH sensible, enter **Table 2** at 105°F leaving water temperature and read downwards to find a model with matching capacity. A Model 27 has a tabulated total cooling capacity of 25,700 BTUH, based on entering air at 80°F dry bulb and 67°F wet bulb. Referring to **Table 6**, total capacity with air entering at 64°F WB will be 25,700 x 0.95 = 24,415 BTUH. Sensible cooling capacity will be 25,700 x 0.68 = 17,476 BTUH. Calculated load slightly exceeds the capacity of the Model 27, but is considerably under the capacity of a Model 35. The normally recommended selection is the Model 27.

In spaces where there is little or no latent load, moisture will be removed from the air by the unit and it will operate at a lower entering wet bulb temperature. Note from **Table 6** that the sensible capacity is greater when a unit operates at lower WB temperature, and sensible-to-total ratio approaches unity.

When designing the air distribution arrangement for a unit, it is recommended that grilles and ducts be sized so that the blower will deliver the nominal rated air flow. Blower performance and rated CFM are listed by model in **Table 11**. If air flow will be different than rated CFM, capacity adjustments may be made using the factors in **Table 7**. Air flow must be no less than 80% nor greater than 120% of rated CFM.

Heating capacity of this unit can be determined from **Table 9**. Assuming design conditions with air entering at 70°F and water entering at 60°F, first find leaving water temperature during heating operation.

Table 10 indicates that, for a Model 27, the heat absorption factor is 62% of the factor for heat of rejection during cooling. At the water flow rate used in this example, the cooling factor is 1.31 GPM/10 MBH HT REJ'T. The heating factor for the same water flow rate is 1.31/0.62 = 2.15 GPM/10 MBH HT ABSORBED. Now enter **Table 8** at 60°F entering water temperature and go across to the factor of 2.15 GPM/10 MBH HT ABSORBED, then down to determine that the leaving water temperature will be approximately 51.4°F. Heating capacity of the Model 27 at that temperature is about 27.5 MBH. If a greater heating capacity is required, first check the capacity of this unit at warmer system water supply temperature, up to a maximum of 80°F. With water entering at 80°F, **Table 8** at the 2.15 factor indicates a leaving temperature of 70.1°F. At that temperature, heating capacity is increased to 30,600 BTUH, as indicated in **Table 9**. An outdoor reset control might be utilized to provide the warmer supply water temperature only on very cold days. If still more heat is required, consider the addition of supplementary heat.

Use the factors in **Tables 12** and **13** to correct heating performance for different entering air temperatures and for air flow at other than nominal rated CFM.

Once all units required for a system have been selected as indicated above, the heat rejector or cooling tower may be selected based on the average EER for the units to be used. Referring to **Table 4**, note the BTUH/TON of heat rejected at the average EER for the units in the system. This will be 16,096 BTUH/TON if the average EER is 10.0 at a leaving water temperature of 105°F.

> Tower Heat Rejection = Total Building Tons Cooling* x Average BTUH/TON Heat Rejection
>
> *Total peak building block load (considering diversity) on a design cooling day

Table 4 may also be used to determine total system water flow, based on average EER for all heat pumps and the GPM/10 MBH HT REJ'T determined in **Table 3**.

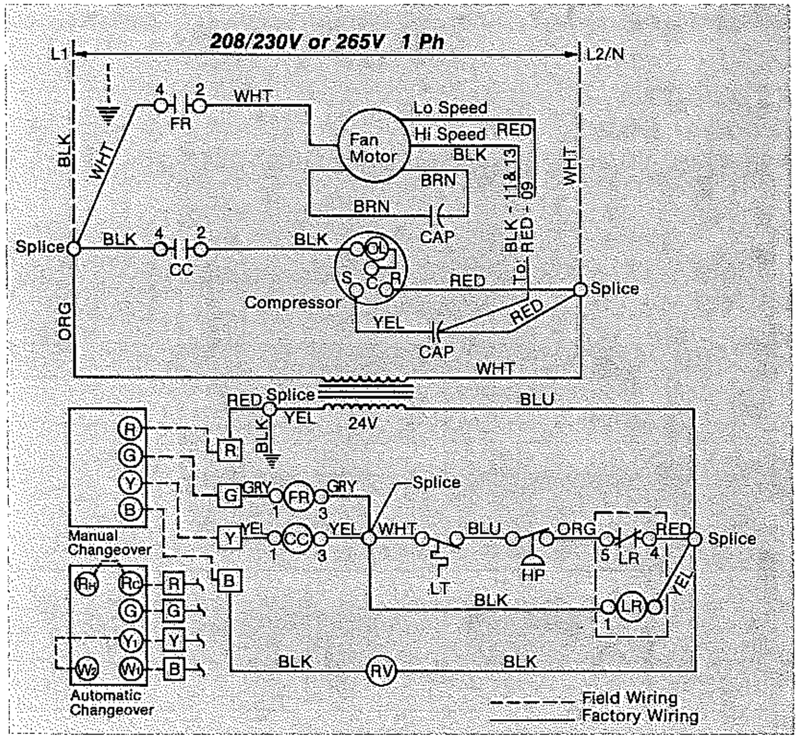
> Total GPM = GPM/TON from **Table 4** x Total Installed Capacity (Tons)

WIRING DIAGRAMS

Wiring Diagram for Horizontal

MODELS 09 - 13 208/230V or 265V Single Phase Power

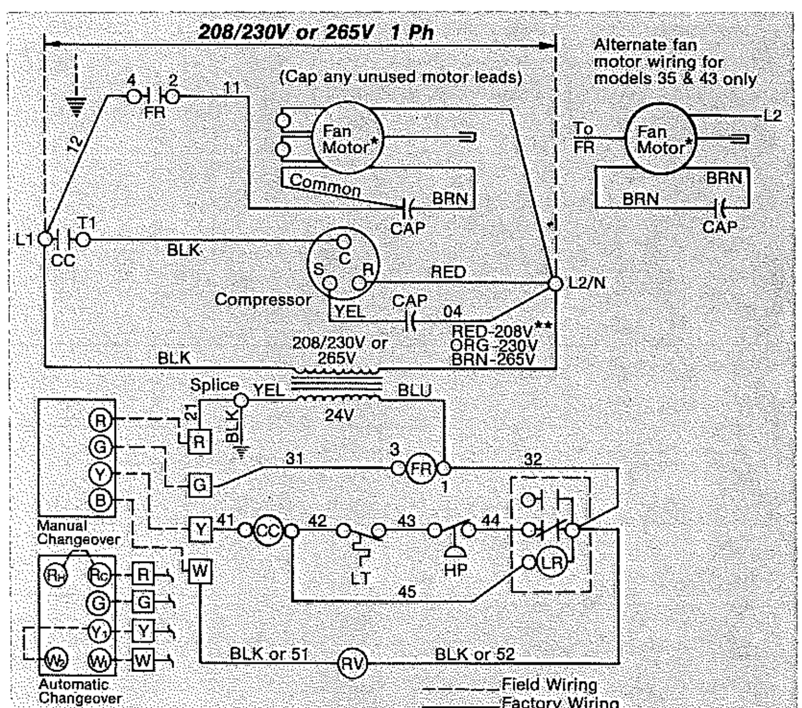
FR	FAN MOTOR RELAY
RV	REVERSING VALVE SOLENOID COIL
FM	FAN MOTOR
LR	LOCK OUT RELAY
CAP	CAPACITOR
LT	LOW TEMP. CUT OUT
HP	HI PRESSURE CUT OUT
CC	COMPRESSOR CONTACTOR



Wiring Diagram for Horizontal

MODELS 19 - 61 208/230V or 265V Single Phase Power

FR	FAN MOTOR RELAY
RV	REVERSING VALVE SOLENOID COIL
FM	FAN MOTOR
LR	LOCK OUT RELAY
CAP	CAPACITOR
LT	LOW TEMP. CUT OUT
HP	HI PRESSURE CUT OUT
CC	COMPRESSOR CONTACTOR



*See Chart

**208/230V units are factory wired for 230V (ORG). For 208V operation installer must change to (RED) lead and cap (ORG) lead. 265V units are factory wired (BRN).

NOTE: Models 43, 52 & 61 not available for 265-1-60 power.

Fan Motor Connections

MODEL	COMMON	HI SPEED	LO SPEED	SPLICED	SPLICED
19	WHT	*BLK	RED	—	—
27	WHT	*BLK	RED	—	—
35	YEL	BLK	*RED	—	—
43	YEL	*BLK	RED	—	—
52	YEL	BLK	*RED	BRN/ORG	PUR/YEL
61	YEL	*BLK	RED	BRN/ORG	PUR/YEL

*Factory connected motor lead.

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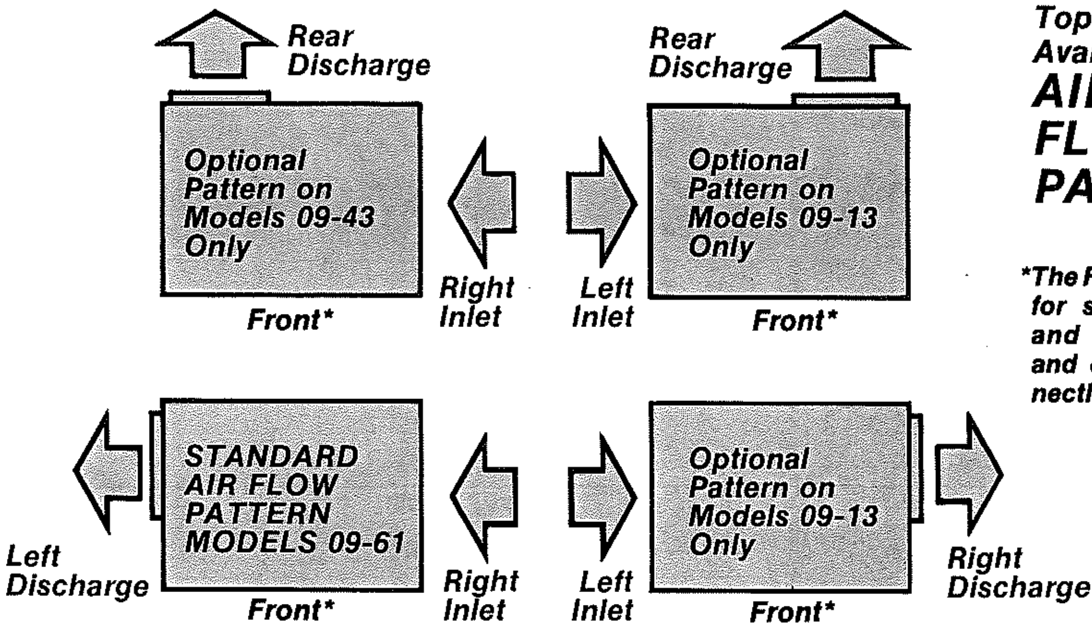
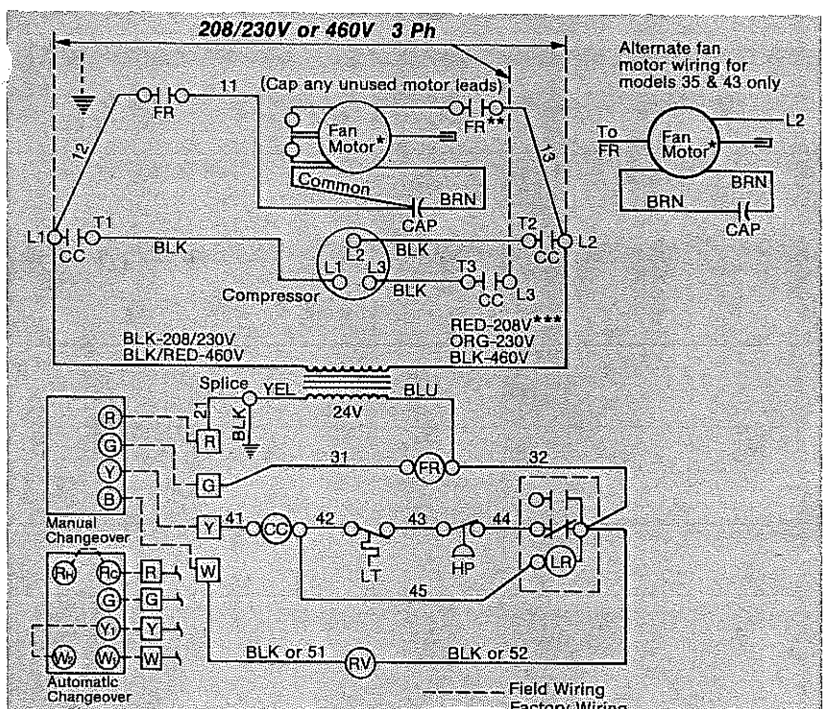


Top Views of Available

AIR FLOW PATTERNS

***The Front is the side for service access and where water and electrical connections are made.**



*See Chart

**This contact used on 460V units only.

***208/230V units are factory wired for 230V (ORG). For 208V operation, installer must change to (RED) lead and cap (ORG) lead. 460V units are factory wired (BLK).

Wiring Diagram for Horizontal

MODELS 35 - 61 208/230V or 460V Three Phase Power

FR	FAN MOTOR RELAY
RV	REVERSING VALVE SOLENOID COIL
FM	FAN MOTOR
LR	LOCK OUT RELAY
CAP	CAPACITOR
LT	LOW TEMP. CUT OUT
HP	HI PRESSURE CUT OUT
CC	COMPRESSOR CONTACTOR

Fan Motor Connections

MODEL	COMMON	HI SPEED	LO SPEED	SPLICED	SPLICED
35	YEL	BLK	*RED	—	—
43	YEL	*BLK	RED	—	—
52	YEL	BLK	*RED	BRN/ORG	PUR/YEL
61	YEL	*BLK	RED	BRN/ORG	PUR/YEL

*Factory connected motor lead.

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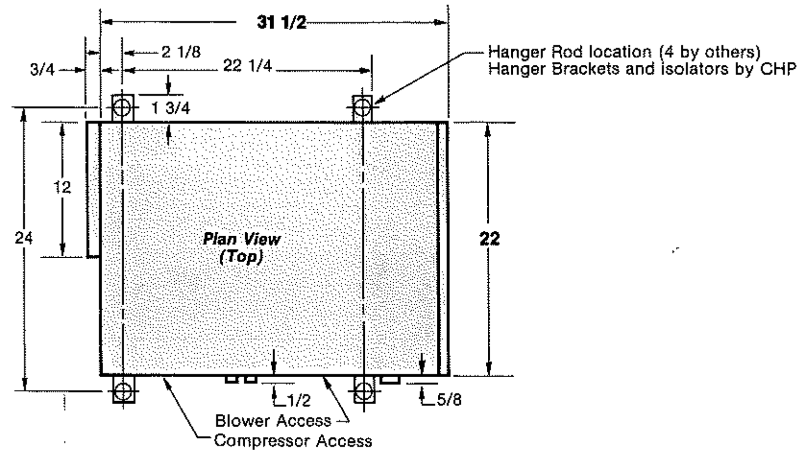
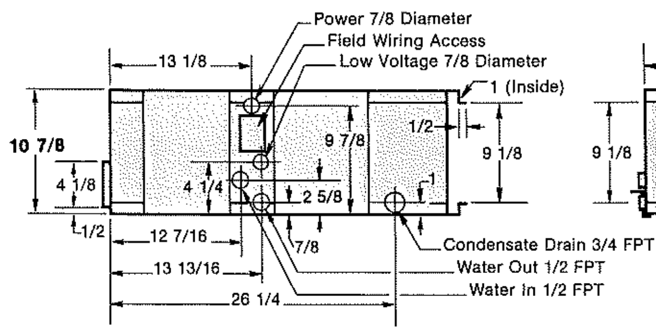
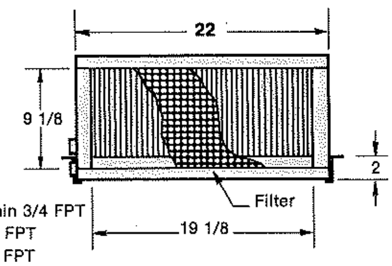
DIMENSIONAL DATA

Horizontal MODELS 09 - 13



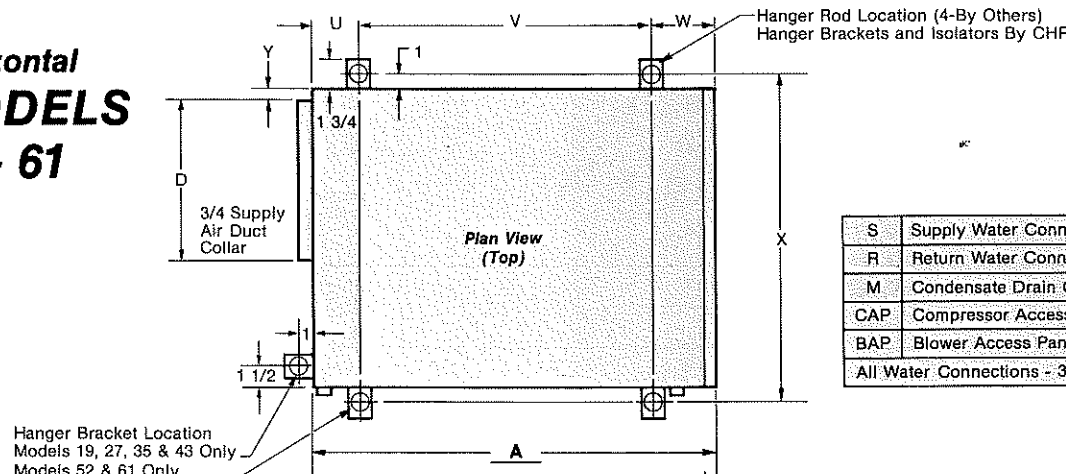


Front View

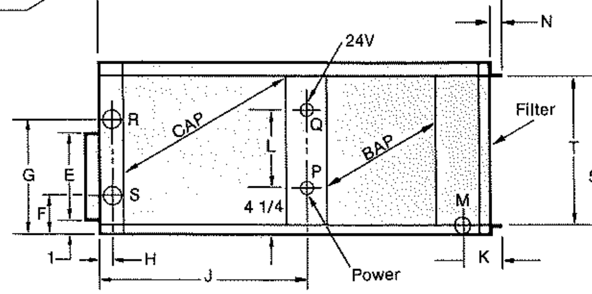


Inlet End

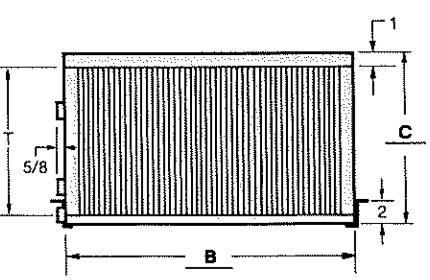
Horizontal MODELS 19 - 61



S	Supply Water Connection
R	Return Water Connection
M	Condensate Drain Conn.
CAP	Compressor Access Panel
BAP	Blower Access Panel
All Water Connections - 3/4 FPT	



Front View



Inlet End

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ELECTRICAL DATA

MODEL	POWER SUPPLY	COMPRESSOR RLA	COMPRESSOR LRA	BLOWER MOTOR HP	BLOWER MOTOR FLA	TOTAL FLA	MIN. CIRCUIT AMPACITY	MAX. FUSE SIZE AMPS[1]
09	208/230-1-60	3.9	20.0	1/12	.6	4.5	5.5	15
	265-1-60	3.0	16.0	1/12	.4	3.4	4.2	15
11	208/230-1-60	4.8	31.0	1/12	.7	5.5	6.7	15
	265-1-60	3.8	22.9	1/12	.6	4.4	5.3	15
13	208/230-1-60	5.8	31.0	1/10	.7	6.5	8.0	15
	265-1-60	4.7	27.0	1/10	.6	5.3	6.5	15
19	208/230-1-60	8.5	43.3	1/8	.9	9.4	11.5	20
	265-1-60	7.1	36.0	1/8	.7	7.8	9.6	15
27	208/230-1-60	11.5	54.0	1/5	1.6	13.1	16.0	25
	265-1-60	10.3	45.0	1/5	1.0	11.3	13.9	20
35	208/230-1-60	15.5	78.0	1/2	3.2	18.7	22.6	35
	265-1-60	14.1	73.8	1/3	2.2	16.3	19.8	30
	208/230-3-60	10.6	59.5	1/2	3.2	13.8	16.5	25
	460-3-60	4.6	30.7	1/3	1.1	5.7	6.9	10
43	208/230-1-60	19.7	95.0	3/4	4.8	24.5	29.4	45
	208/230-3-60	11.6	73.4	3/4	4.8	16.4	19.3	30
	460-3-60	5.3	37.7	3/4	2.5	7.8	9.2	15
52	208/230-1-60	24.0	116.0	3/4	8.0	32.0	38.0	60
	208/230-3-60	15.1	92.0	3/4	8.0	23.1	28.0	40
	460-3-60	7.5	46.0	3/4	4.1	11.6	13.5	20
61	208/230-1-60	27.2	132.0	3/4	8.0	35.2	42.0	65
	208/230-3-60	15.5	103.0	3/4	8.0	23.5	27.4	40
	460-3-60	7.8	54.0	3/4	4.0	11.8	13.8	25

[1]Dual element, time delay fuses, or HACR type circuit breakers.

PHYSICAL DATA

MODEL		09	11	13	19	27	35	43	52	61
REFRIGERANT-TO-AIR HEAT EXCHANGER	TUBE (COPPER) OD. IN.	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜	⅜
	ROWS DEEP	3	3	3	3	4	4	4	4	4
	FINS/IN. (ALUMINUM)	12	12	12	12	12	14	14	14	14
	FACE AREA, FT^2	1.33	1.33	1.33	2.26	2.26	3.10	3.10	4.51	5.00
SUPPLY AIR BLOWER (DIA. x WIDTH), IN.		6¾ x 6½	6¾ x 6½	6¾ x 6½	7⅝ x 7	9 x 7	10 x 8	10 x 8	11 x 8	11 x 8
OPERATING CHARGE (R-22), OZ.		17	16	18	27	32	51	51	71	102
NOMINAL FILTER SIZE, IN.	1 IN. THICK	10 x 22	10 x 22	10 x 22	16 x 25	16 x 25	17 x 28	17 x 28	21¼x35¾	21¼x35¾
WEIGHT, LBS.	OPERATING	120	125	130	175	205	260	275	350	395
	SHIPPING	130	135	140	205	235	295	310	385	430

Water coil suitable for 400 PSIG working pressure.

MODEL DIMENSIONS

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	T	U	V	W	X	Y
19	41	25	16	12½	9¾	4	7½	1	19	7	7½	¾*	9/16	⅞**	⅞**	14	1½	31½	8	27	¾
27	41	25	16	12½	9¾	4	7½	1	19	7	7½	¾*	9/16	⅞**	⅞**	14	1½	31½	8	27	¾
35	46	30	18	16¼	10¼	4	14⅛	1	22¾	6	7½	¾*	9/16	⅞**	⅞**	16	1½	35½	9	32	¾
43	46	30	18	16¼	10¼	4	14⅛	1	22¾	6	7½	¾*	9/16	⅞**	⅞**	16	1½	35½	9	32	¾
52	51¾	38	22	20	12½	3¼	18¼	1⅝	24¾	7⅛	14¾	¾*	3/4	1⅛**	⅞**	20¼	2¾	39½	9½	40	2
61	51¾	38	22	20	12½	3¼	18¼	1⅝	24¾	7⅛	14¾	¾*	3/4	1⅛**	⅞**	20¼	2¾	39½	9½	40	2

*FPT
**Diameter in Inches

All dimensions in inches.

CHP co.
CALIFORNIA HEAT PUMP COMPANY