

$$\frac{CFM_n}{CFM_o} = \frac{RPM_n}{RPM_o}$$

o = old, *n* = new
CFM and RPM are interchangeable.

$$CFM_n = CFM_o \times \frac{RPM_n}{RPM_o}$$

$$RPM_n = RPM_o \times \frac{CFM_n}{CFM_o}$$

$$\left(\frac{CFM_n}{CFM_o}\right)^2 = \frac{Sp_n}{Sp_o} \quad \text{OR} \quad \frac{CFM_n}{CFM_o} = \sqrt{\frac{Sp_n}{Sp_o}}$$

$$CFM_n = CFM_o \times \sqrt{\frac{Sp_n}{Sp_o}}$$

$$Sp_n = Sp_o \times \left(\frac{CFM_n}{CFM_o}\right)^2$$

$$\left(\frac{CFM_n}{CFM_o}\right)^3 = \frac{BHP_n}{BHP_o} \quad \text{OR} \quad \frac{CFM_n}{CFM_o} = \sqrt[3]{\frac{BHP_n}{BHP_o}}$$

$$CFM_n = CFM_o \times \sqrt[3]{\frac{BHP_n}{BHP_o}}$$

$$BHP_n = BHP_o \times \left(\frac{CFM_n}{CFM_o}\right)^3$$

Hydronics: $\Delta P = Sp$, CFM = GPM, RPM = GPM

$$MAT = (OAT \times \%OA) + (RAT \times \%RA)$$

O = Outside
T = Temperature
R = Return
M = Mixed
A = Air

$$Btuh \text{ hydronic (H}_2\text{O only)} = 500 \times GPM \times \Delta T$$

$$Btuh \text{ sensible (at sea level)} = 1.08 \times CFM \times \Delta T$$

$$Btuh \text{ latent (at sea level)} = 0.68 \times CFM \times \Delta Grains$$

$$Btuh \text{ total (at sea level)} = 4.5 \times CFM \times \Delta Enthalpy$$

$$CFM = \frac{AC/Hr \times Volume}{60 \text{ min}}$$

$$V = 4005 \times \sqrt{Vp}$$

$$Vp = \left(\frac{V}{4005}\right)^2$$

$$Pressure \text{ (PSI)} = 0.433 \times Head \text{ (feet of water)}$$

$$1 \text{ IWC} = 0.0360 \text{ PSI}$$

$$1 \text{ PSI} = 27.72 \text{ IWC}$$

$$Pressure 1 \times Volume 1 = Pressure 2 \times Volume 2$$

$$Area = \pi \times radius^2$$

$$A^2 + B^2 = C^2$$

$$Diameter = \frac{Circumference}{\pi}$$

$$FR = \frac{ASP \times 100}{TEL} \text{ (IWC/100)}$$

$$\text{Rectangular Duct Area (ft}^2\text{)} = \frac{Length \times Width}{144}$$

$$\text{Round Duct Area (ft}^2\text{)} = \frac{\pi \times diameter^2}{576}$$

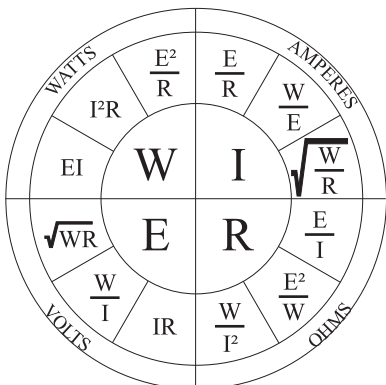
$$mfd = \frac{(2650 \times I)}{E}$$

$$CFM = Velocity \text{ (fpm)} \times Duct \text{ Area (ft}^2\text{)}$$

$$CFM = \frac{(Watts \times 3.413)}{(\Delta T \times 1.08)}$$

$$C_T \text{ (Series)} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_N}}$$

$$C_T \text{ (Parallel)} = C_1 + C_2 + \dots + C_N$$



TEMPERATURE PRESSURE CHART – at sea level



Pressure (PSIG), Vacuum (in. Of Hg) – Bold Italic Figures

To determine subcooling for 404A, 407C, and 422D, use BUBBLE POINT values (temperatures above 50°F – gray background)

To determine superheat for 404A, 407C, and 422D, use DEW POINT values (temperatures 50°F and below)

TEMP.		REFRIGERANT						
°F	°C	22	134a	404A	407C	410A	422D	507
-40	-40.0	0.6	14.8	4.3	4.6	10.7	2.3	5.4
-38	-38.9	1.4	13.9	5.3	3.2	12.0	0.8	6.4
-36	-37.8	2.2	13.0	6.3	1.6	13.4	0.4	7.5
-34	-36.7	3.1	12.0	7.4	0.0	14.8	1.2	8.6
-32	-35.6	4.0	10.9	8.5	0.8	16.2	2.1	9.8
-30	-34.4	4.9	9.8	9.6	1.6	17.8	3.0	11.0
-28	-33.3	5.9	8.7	10.8	2.5	19.3	3.9	12.2
-26	-32.2	6.9	7.5	12.0	3.5	21.0	4.9	13.5
-24	-31.1	8.0	6.3	13.3	4.4	22.7	5.9	14.8
-22	-30.0	9.1	5.0	14.6	5.4	24.4	7.0	16.2
-20	-28.9	10.2	3.7	16.0	6.5	26.3	8.1	17.6
-18	-27.8	11.4	2.3	17.4	7.6	28.1	9.2	19.1
-16	-26.7	12.6	0.8	18.9	8.7	30.1	10.4	20.6
-14	-25.6	13.9	0.4	20.4	9.9	32.1	11.7	22.2
-12	-24.4	15.2	1.1	22.0	11.1	34.2	12.9	23.8
-10	-23.3	16.5	1.9	23.6	12.3	36.4	14.3	25.5
-8	-22.2	17.9	2.8	25.3	13.7	38.6	15.6	27.3
-6	-21.1	19.4	3.6	27.0	15.0	40.9	17.1	29.1
-4	-20.0	20.9	4.6	28.8	16.4	43.3	18.5	30.9
-2	-18.9	22.4	5.5	30.7	17.9	45.8	20.1	32.8
0	-17.8	24.0	6.5	32.6	19.4	48.3	21.6	34.8
1	-17.2	24.9	7.0	33.6	20.2	49.6	22.5	35.8
2	-16.7	25.7	7.5	34.6	21.0	51.0	23.3	36.9
3	-16.1	26.5	8.0	35.6	21.8	52.3	24.1	37.9
4	-15.6	27.4	8.5	36.6	22.6	53.7	25.0	39.0
5	-15.0	28.3	9.1	37.7	23.5	55.0	25.8	40.0
6	-14.4	29.2	9.6	38.7	24.3	56.5	26.7	41.1
7	-13.9	30.1	10.2	39.8	25.2	57.9	27.6	42.2
8	-13.3	31.0	10.8	40.9	26.1	59.3	28.5	43.4
9	-12.8	31.9	11.3	42.0	27.0	60.8	29.5	44.5
10	-12.2	32.8	11.9	43.1	27.9	62.3	30.4	45.7
11	-11.7	33.8	12.5	44.3	28.8	63.8	31.3	46.8
12	-11.1	34.8	13.1	45.4	29.8	65.4	32.3	48.0
13	-10.6	35.8	13.8	46.6	30.7	66.9	33.3	49.3
14	-10.0	36.8	14.4	47.8	31.7	68.5	34.3	50.5
15	-9.4	37.8	15.0	49.0	32.7	70.1	35.3	51.7
16	-8.9	38.8	15.7	50.2	33.7	71.7	36.4	53.0
17	-8.3	39.9	16.4	51.5	34.7	73.4	37.4	54.3
18	-7.8	40.9	17.0	52.7	35.7	75.1	38.5	55.6
19	-7.2	42.0	17.7	54.0	36.8	76.8	39.6	56.9
20	-6.7	43.1	18.4	55.3	37.9	78.5	40.7	58.2
21	-6.1	44.2	19.1	56.6	39.0	80.3	41.8	59.6
22	-5.6	45.3	19.9	58.0	40.1	82.0	42.9	61.0
23	-5.0	46.5	20.6	59.3	41.2	83.8	44.1	62.4
24	-4.4	47.6	21.3	60.7	42.3	85.7	45.2	63.8
25	-3.9	48.8	22.1	62.1	43.5	87.5	46.4	65.2
26	-3.3	50.0	22.9	63.5	44.7	89.4	47.6	66.7
27	-2.8	51.2	23.7	64.9	45.9	91.3	48.8	68.2
28	-2.2	52.4	24.5	66.4	47.1	93.2	50.1	69.7
29	-1.7	53.7	25.3	67.8	48.3	95.2	51.3	71.2
30	-1.1	55.0	26.1	69.3	49.6	97.2	52.6	72.7
31	-0.6	56.2	26.9	70.8	50.8	99.2	53.9	74.3

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TEMPERATURE PRESSURE CHART – at sea level



Pressure (PSIG), Vacuum (in. Of Hg) – Bold Italic Figures

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To determine superheat for 404A, 407C, and 422D, use DEW POINT values (temperatures 50°F and below)

TEMP.		REFRIGERANT						
°F	°C	22	134a	404A	407C	410A	422D	507
32	0.0	57.5	27.8	72.4	52.1	101.2	55.2	75.8
33	0.6	58.8	28.6	73.9	53.4	103.3	56.5	77.4
34	1.1	60.2	29.5	75.5	54.8	105.4	57.9	79.0
35	1.7	61.5	30.4	77.1	56.1	107.5	59.3	80.7
36	2.2	62.9	31.3	78.7	57.5	109.7	60.6	82.3
37	2.8	64.3	32.2	80.3	58.9	111.9	62.0	84.0
38	3.3	65.7	33.1	82.0	60.3	114.1	63.5	85.7
39	3.9	67.1	34.1	83.7	61.7	116.3	64.9	87.5
40	4.4	68.6	35.0	85.4	63.2	118.6	66.4	89.2
42	5.6	71.5	37.0	88.8	66.1	123.2	69.4	92.8
44	6.7	74.5	39.0	92.4	69.2	127.9	72.5	96.4
46	7.8	77.6	41.1	96.0	72.3	132.8	75.6	100.2
48	8.9	80.8	43.2	99.8	75.5	137.8	78.9	104.0
50	10.0	84.1	45.4	103.6	78.8	142.9	82.2	108.0
52	11.1	87.4	47.7	109.2	101.7	148.1	96.1	112.0
54	12.2	90.8	50.0	113.3	105.6	153.5	99.8	116.1
56	13.3	94.4	52.4	117.4	109.6	159.0	103.6	120.4
58	14.4	98.0	54.9	121.7	113.7	164.7	107.4	124.7
60	15.6	101.6	57.4	126.0	117.9	170.4	111.4	129.1
62	16.7	105.4	60.0	130.5	122.3	176.3	115.4	133.7
64	17.8	109.3	62.7	135.0	126.7	182.4	119.5	138.3
66	18.9	113.2	65.4	139.7	131.2	188.6	123.8	143.1
68	20.0	117.3	68.2	144.4	135.8	194.9	128.1	147.9
70	21.1	121.4	71.1	149.3	140.5	201.4	132.5	152.9
72	22.2	125.7	74.1	154.3	145.4	208.0	137.1	158.0
74	23.3	130.0	77.1	159.4	150.3	214.8	141.7	163.2
76	24.4	134.5	80.2	164.6	155.4	221.8	146.5	168.5
78	25.6	139.0	83.4	169.9	160.5	228.9	151.3	174.0
80	26.7	143.6	86.7	175.4	165.8	236.1	156.3	179.5
82	27.8	148.4	90.0	181.0	171.2	243.6	161.3	185.2
84	28.9	153.2	93.5	186.7	176.8	251.2	166.5	191.0
86	30.0	158.2	97.0	192.5	182.4	258.9	171.8	197.0
88	31.1	163.2	100.6	198.4	188.2	266.8	177.2	203.0
90	32.2	168.4	104.3	204.5	194.1	274.9	182.7	209.2
92	33.3	173.7	108.1	210.7	200.1	283.2	188.4	215.5
94	34.4	179.1	112.0	217.0	206.3	291.6	194.1	222.0
96	35.6	184.6	115.9	223.4	212.5	300.3	200.0	228.6
98	36.7	190.2	120.0	230.0	219.0	309.1	206.0	235.3
100	37.8	195.9	124.2	236.8	225.5	318.1	212.1	242.2
102	38.9	201.8	128.4	243.6	232.2	327.2	218.4	249.2
104	40.0	207.7	132.7	250.6	239.0	336.6	224.8	256.3
106	41.1	213.8	137.2	257.8	245.9	346.2	231.3	263.7
108	42.2	220.0	141.7	265.1	253.0	355.9	237.9	271.1
110	43.3	226.4	146.4	272.5	260.3	365.9	244.7	278.7
112	44.4	232.8	151.1	280.1	267.6	376.1	251.6	286.5
114	45.6	239.4	156.0	287.9	275.1	386.4	258.6	294.4
116	46.7	246.1	160.9	295.8	282.8	397.0	265.8	302.4
118	47.8	253.0	166.0	303.8	290.6	407.8	273.2	310.7
120	48.9	260.0	171.2	312.1	298.6	418.8	280.6	319.1
125	51.7	278.0	184.6	333.3	319.2	447.4	299.9	340.8
130	54.4	296.9	198.7	355.6	340.7	477.4	320.2	363.6