Conversions and Formulas

CUBIC FEET	x	7.480	=	GALLONS
PSI	x	2.307	=	FEET of WATER
		2.30	=	IN HG
		27.7	=	IN. WATER COLUMN
HORSEPOWER	x	2547	=	BTUH
		745.7	=	WATTS
WATTS	x	3.413	=	BTUH
KILOWATT	x	3413	=	BTUH
		1.34	=	HORSEPOWER
CENTIGRADE	x	1.8 + 32	=	FAHRENHEIT

WATER SIDE - Chillers, Condensers

BTUH = 500 x GPM x △ T

△ T = BTUH / 500 x GPM

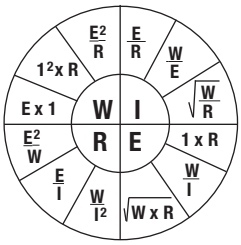
GALLON of WATER = 8.33 lbs.
8.33 lbs/GAL x 60 = 500 lbs/hr
DENSITY = 62.4 lbs/cubic ft

Pump HP = GPM x Ft. Water / Pump Eff. x 3960

AIR COILS - In BTUH

Qsensible = 1.08 x CFM x △ T
Qlatent = 0.68 x CFM x △ SH
Qtotal = 4.5 x CFM x △ H

Q = Heat Flow in BTUH
SH = Specific Humidity (grains of moisture)
H = Enthalpy



Single Phase Loads

W = Watts
I = Amperes
E = Voltage
R = Ohms

To obtain any value in the center circle, perform the operation in the adjacent segment of the outer circle.

Full Load Current = Watts / Voltage (1 Ø)

Full Load Current = Watts / 1.732 x Voltage (3 Ø)

Volts = Amps x Resistance
Watts = Volts x Amps

CHARGING TIPS- REFRIGERATION APPLICATIONS

(Does not apply to residential appliances)

Air Cooled condensing unit

INDOOR - NO FAN CYCLING - per HP
- Hot Shot - Two (2) pounds
- NU-22 - Three (3) pounds
- Plus the liquid line weight

OUTDOOR - FLOODED CONDENSER - per HP
- Hot Shot - Four (4) pounds
- NU-22 - Five (5) pounds
- Plus the liquid line weight

OUTDOOR FAN CYCLING - per HP
- Hot Shot - Three (3) pounds
- NU-22 - Four (4) pounds
- Plus the liquid line weight

WATER COOLED CONDENSING UNIT - per HP
- Hot Shot - One (1) pound
- NU-22 - Two (2) pounds
- Plus the liquid line weight

* NU-22 RESIDENTIAL A/C APPLICATIONS USE A 1 / 1 CHARGING RATIO

Approx. Weights of Refrigerant in CU lines - lbs/100 Lineal Feet

Line Size O.D. in.	Refrigerant	Suction Line	Liquid Line	Line Size O.D. in.	Refrigerant	Suction Line	Liquid Line
3/8	R-12	0.06	4.30	1 1/8	R-12	0.63	45.90
	R414B	0.06	3.40		R414B	0.50	36.70
	R22	0.08	3.90		R22	0.87	41.60
	R417A	0.08	3.80		R417A	0.85	40.77
1/2	R12	0.11	8.10	1 3/8	R12	0.96	69.90
	R414B	0.09	6.50		R414B	0.77	55.90
	R22	0.15	7.40		R22	1.33	63.50
	R414A	0.15	7.25		R414A	1.30	62.23
5/8	R12	0.19	12.90	1 5/8	R12	1.36	99.00
	R414B	0.15	10.30		R414B	1.10	79.20
	R22	0.25	11.80		R22	1.88	90.00
	R417A	0.25	11.56		R417A	1.84	88.20
7/8	R12	0.37	26.90	2 1/8	R12	2.40	172.00
	R414B	0.30	21.50		R414B	1.89	137.60
	R22	0.51	24.40		R22	3.26	156.00
	R417A	0.50	23.91		R417A	3.19	152.88

Always unload the cylinder in liquid phase. Don't clear the sightglass. As temperature approaches design, verify superheat, adjust charge if necessary to optimize performance.

ICOR International Coil Temperature Chart
HOT SHOT and NU-22

Evaporator						Condensing					
Design Temp. °F	NU-22 PSIG	Hot Shot PSIG	Design Temp. °F	NU-22 PSIG	Hot Shot PSIG	Design Temp. °F	NU-22 PSIG	Hot Shot PSIG	Design Temp. °F	NU-22 PSIG	Hot Shot PSIG
-40	0.2		8	27	13	90	151	106	116	222	164
-38	0.5		10	28	14	92	156	110	118	228	169
-36	1.0		12	30	15	94	161	112	120	234	174
-34	1.8		14	32	16	96	166	116	122	241	180
-32	2.5		16	34	17	98	171	121	124	248	184
-30	3.4		18	36	18	100	176	126	126	254	190
-28	4	1	20	38	19	102	182	131	128	261	196
-26	5	0.5	22	40	22	104	187	136	130	267	200
-24	6	0.2	24	42	24	106	193	141	132	275	204
-22	7	0.1	26	44	25	108	198	145	134	282	210
-20	8	0	28	46	26	110	204	149	136	289	216
-18	9	0.5	30	48	28	112	210	154	138	317	222
-16	10	1	32	51	30	114	216	159	140	305	227
-14	11	2	34	53	32						
-12	12	3	36	55	34						
-10	14	4	38	58	36						
-8	15	5	40	61	38						
-6	16	6	42	63	40						
-4	18	7	44	66	42						
-2	19	8	46	69	44						
0	20	9	48	72	46						
2	22	10	50	75	48						
4	24	11	52	78	50						
6	25	12	54	81	52						

COIL TEMPERATURE CHART INSTRUCTIONS

Select design temperature for your evaporator and condenser-
Match to approx. operational pressures.

NU-22 - 120° condensing / 40° evaporator
approx. 234 psig head / 60 psig suction
Hot Shot - 100° condensing / 28° evaporator
approx. 126 psig head / 26 psig suction
NU-22 - 100° condensing / -30° evaporator
approx. 176 psig head / 3 psig evaporator
Hot Shot - 100° condensing / -20 evaporator
approx. 126 psig head / 0 psig suction

Pressure Temperature Chart

ICOR International

"making your life easier"

800.497.6805

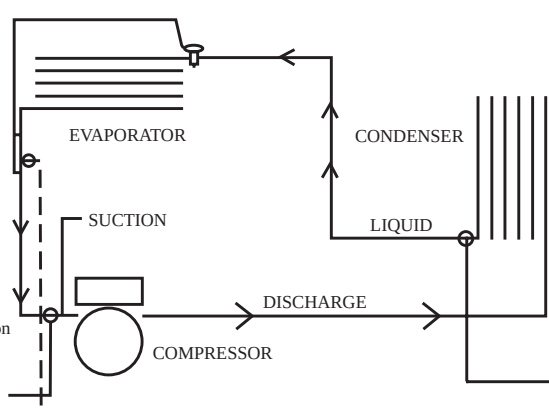
www.icorinternational.com

Saturation Chart - PSIG vs Temperature

Temperature - °F Refrigerant - PSIG

Temperature °F	R-417A BUBBLE POINT	R-417A DEW POINT	R-22	R-414B BUBBLE POINT	R-414B DEW POINT	R-12	R-134a	R-500
-40		*4.17*	0.56					
-38	1.21	*2.87*	1.37					
-36	1.99	*1.47*	2.2					
-34	2.80	*0.02*	3.08					
-32	3.64	0.73	3.98					
-30	4.51	1.54	4.92					
-28	5.47	2.34	5.9	0.71	*8.61*			0.17
-26	6.35	3.18	6.92	1.47	*7.43*			0.91
-24	7.32	4.05	7.97	2.28	*6.21*			1.64
-22	8.33	4.99	9.07	3.1	*4.93*			2.48
-20	9.37	5.93	10.21	3.96	*3.58*	0.54		3.31
-18	10.25	6.90	11.38	4.85	*2.18*	1.27		4.17
-16	11.57	7.92	12.61	5.78	*0.73*	2.03	0.4	5.06
-14	12.73	8.97	13.87	6.79	*0.38*	2.81	0.35	5.99
-12	13.92	10.09	15.19	7.73	1.15	3.62	1.12	6.95
-10	15.16	11.22	16.53	8.76	1.95	4.46	1.93	7.94
-8	16.44	12.39	17.93	9.83	2.79	5.33	2.77	8.97
-6	17.76	13.61	19.38	10.93	3.65	6.23	3.64	10.03
-4	19.13	14.91	20.38	12.07	4.55	7.16	4.55	12.26
-2	20.54	16.25	22.48	13.34	5.49	8.12	5.49	13.44
0	22.00	17.55	24.03	14.46	6.45	9.11	6.47	14.65
2	23.50	18.95	25.68	15.72	7.46	10.14	7.49	14.65
4	25.06	20.39	27.39	17.02	8.5	11.2	8.54	105.91
6	26.66	21.92	29.15	18.3	9.53	12.29	9.63	17.2
8	28.31	23.46	30.96	19.75	10.69	13.42	10.26	18.54
10	30.01	25.05	32.84	21.18	11.85	14.59	11.93	20.1
12	31.76	26.70	34.77	23.65	13.05	15.79	13.14	21.34
14	33.57	28.43	36.76	24.17	14.29	17.02	14.4	22.81
16	35.41	30.19	38.81	25.78	15.57	18.31	15.69	24.32
18	37.35	31.99	40.92	27.35	16.89	19.63	17.04	25.85
20	39.32	33.86	43.09	29.01	18.26	20.98	18.42	27.48
22	41.35	35.28	45.53	30.72	19.67	22.38	19.86	29.13
24	43.43	37.83	47.64	32.49	21.13	23.82	21.34	30.83
26	45.58	39.88	50.01	34.3	22.64	25.3	22.87	32.59
28	47.89	41.99	52.44	36.16	24.19	26.82	24.45	34.39
30	56.76	44.16	54.98	38.08	25.79	28.38	26.08	36.24
32	54.95	46.43	57.53	40.06	27.45	29.99	27.77	38.15
34	54.77	48.73	60.17	42.08	29.15	31.65	29.5	40.11
36	57.25	51.10	62.89	44.17	30.91	33.35	31.29	42.12
38	59.78	53.54	65.69	46.31	32.72	35.1	33.14	44.19
40	62.37	56.05	68.56	48.51	34.58	36.89	35.04	46.32
42	65.04	58.68	71.5	50.77	36.5	38.73	37	48.5
44	67.77	61.33	74.52	53.08	38.48	40.62	39.02	50.74
46	70.57	64.05	77.62	55.46	40.51	42.57	41.1	53.04
48	73.45	66.86	79.33	57.9	42.6	44.56	43.23	55.4
50	76.40	69.77	84.06	60.41	44.76	46.6	45.43	57.83
52	79.40	72.72	87.4	62.98	46.97	48.7	47.7	60.31
54	85.52	75.76	90.8	65.61	49.24	50.85	50.02	62.86
56	88.95	78.88	94.3	68.31	51.58	53.05	52.42	65.47
58	92.29	82.08	97.9	71.07	53.98	55.31	54.88	68.15
60	95.67	85.36	116.3	73.91	56.45	57.62	57.41	70.9
62	99.16	88.73	105.4	76.81	58.98	59.99	60	73.71
64	102.74	92.18	109.3	79.78	61.58	62.42	62.67	76.59
66	106.40	95.72	113.2	82.82	64.25	64.91	65.41	79.54
68	110.13	99.34	117.3	85.9	66.99	67.45	68.22	82.56
70	113.96	103.06	121.4	89.1	69.8	70.06	71.1	85.7
72	117.88	106.87	125.7	92.4	72.68	72.72	74.07	88.8
74	121.89	110.78	130.0	95.7	75.64	75.45	76.38	91.7
76	125.99	114.78	134.5	99.1	78.67	78.24	80.22	95.4
78	30.18	118.81	139.0	102.6	81.77	81.09	83.41	98.8
80	134.46	123.00	143.6	106.2	84.96	84.01	86.7	102.2
82	138.83	110.70	148.4	109.8	88.2	87	90	105.8
84	143.30	131.59	153.2	113.6	91.6	90	93.5	109.4
86	147.88	136.00	158.2	117.4	95	93.2	97	113.1
88	152.54	140.67	163.2	121.3	98.5	96.3	100.6	116.9
90	157.30	145.37	168.4	125.3	102.9	99.6	104.3	120.7
92	162.16	150.18	73.7	129.3	105.7	102.9	108.1	124.7
94	167.13	155.10	179.1	133.5	109.5	106.3	112	128.7
96	172.17	159.93	184.6	137.7	113.3	109.8	115.9	132.9
98	177.33	165.06	190.2	142	117.3	113.3	120	137.1
100	182.60	170.30	195.9	146.4	121.3	116.9	124.2	141.4
102	187.98	175.66	201.8	150.9	124.4	120.6	128.4	145.7
104	193.40	80.82	207.7	155.5	129.6	124.4	132.7	150.2
106	199.05	186.40	213.8	160.2	133.9	128.2	137.2	154.8
108	204.75	192.10	220	165	138.3	132.1	141.7	159.4
110	210.56	197.91	226.4	169.9	142.8	136.1	146.4	164.2
112	216.48	203.85	232.8	174.8	147.4	140.2	151.1	169.1
114	222.50	209.37	239.4	179.9	152.1	144.3	156	174
116	228.65	215.29	246.1	185	156.9	148.6	160.9	179
118	234.91	221.33	253	190.3	161.8	152.9	166	184.2
120	241.29	227.49	260	195.7	166.8	157.3	171.2	189.4
122	247.79	234.36	267.1	201.1	171.9	161.8	176.4	194.8
124	254.40	240.75	274.3	206.7	177.1	166.3	181.8	200.2
126	261.14	247.25	281.7	212.4	182.4	171	187.3	205.8
128	267.99	253.87	289.2	218.1	187.8	175.7	193	211.4
130	274.97	260.61	296.9	224	193.4	180.5	198.7	217.2
132	282.07	268.07	304.7	230	199	185.5	204.6	223.1
134	289.29	275.04	312..6	236.1	204.8	190.5	210.5	229.1
136	296.64	282.12	320.7	242.3	210.7	195.6	216.6	235.2
138	304.12	289.32	329	248.6	216.7	200.8	222.9	241.4
140	311.73	297.32	337.4	255	222.8	206	229.2	247.7

Bold Italics = IN. Hg For 5000 ft. elevation PSIG + 2.3



SUPERHEAT

CHECK SUCTION PRESSURE

(always use dew point for conversion)

Check at evap. if possible, add for suction line pressure drop if taken at compressor.

CHECK SUCTION TEMPERATURE

SUBCOOLING

CHECK LIQUID PRESSURE (always use bubble point for conversion)

CHECK LIQUID TEMPERATURE

SUCTION TEMPERATURE – EVAPORATOR TEMPERATURE = SUPERHEAT

CONDENSING TEMPERATURE – LIQUID TEMPERATURE = SUBCOOLING