



# Pressure-Temperature Chart at Sea Level

PSIG	TEMPERATURE °F					
	REFRIGERANT - (REFRIGERANT DESIGNATION)					
	22 (V)	134a (J)	410A (Z)	507 (S)	717 (A)	438A (V)
5*	-48	-22	-67	-59	-35	-40
4*	-47	-21	-66	-58	-33	-38
3*	-46	-19	-64	-56	-32	-37
2*	-44	-18	-63	-55	-30	-36
1*	-43	-16	-62	-53	-29	-34
0	-41	-15	-61	-52	-28	-33
1	-39	-12	-58	-50	-26	-31
2	-36	-10	-56	-47	-23	-28
3	-34	-7	-54	-45	-21	-26
4	-32	-5	-52	-43	-19	-24
5	-30	-3	-50	-41	-17	-22
6	-28	-1	-48	-39	-15	-20
7	-26	1	-46	-37	-13	-18
8	-24	3	-45	-35	-12	-16
9	-22	5	-43	-33	-10	-14
10	-20	7	-41	-32	-8	-13
11	-19	8	-40	-30	-7	-11
12	-17	10	-38	-28	-5	-9
13	-15	12	-37	-27	-4	-8
14	-14	13	-35	-25	-2	-6
15	-12	15	-34	-24	-1	-5
16	-11	16	-32	-22	0	-3
17	-9	18	-31	-21	2	-2
18	-8	19	-30	-19	3	-1
19	-7	21	-29	-18	4	1
20	-5	22	-27	-17	6	2
21	-4	24	-26	-16	7	3
22	-3	25	-25	-14	8	5
23	-1	26	-24	-13	9	6
24	0	27	-23	-12	10	7
25	1	29	-21	-11	11	8
26	2	30	-20	-9	12	9
27	4	31	-19	-8	14	10
28	5	32	-18	-7	15	12
29	6	33	-17	-6	16	13
30	7	35	-16	-5	17	14
31	8	36	-15	-4	18	15
32	9	37	-14	-3	19	16
33	10	38	-13	-2	20	17
34	11	39	-12	-1	20	18
35	12	40	-11	0	21	19
36	13	41	-10	1	22	20
37	14	42	-10	2	23	21
38	15	43	-9	3	24	22
39	16	44	-8	4	25	23
40	17	45	-7	5	26	24
42	19	47	-5	7	28	25
44	21	49	-4	9	29	27
46	23	51	-2	10	31	29
48	24	52	0	12	32	30
50	26	54	1	14	34	32
52	28	56	3	15	35	34
54	29	57	4	17	37	35
56	31	59	6	18	38	37
58	32	60	7	20	40	38
60	34	62	8	21	41	40
62	35	64	10	23	42	41
64	37	65	11	24	44	42
66	38	66	12	26	45	44
68	40	68	14	27	46	45
70	41	69	15	28	47	46
72	42	71	16	30	49	48
74	44	72	17	31	50	49
76	45	73	18	32	51	50
78	46	75	20	33	52	52
80	48	76	21	35	53	53
85	51	79	24	38	56	56
90	54	82	26	40	59	59
95	56	85	29	43	61	61
100	59	88	31	46	63	64
105	62	90	34	48	66	66
110	64	93	36	51	68	69
115	67	96	38	53	70	71
120	69	98	41	56	73	75
125	72	100	43	58	75	77
130	74	103	45	60	77	79
135	76	105	47	63	79	81
140	78	107	49	65	81	82
145	81	109	51	67	82	84
150	83	112	53	69	84	86
155	85	114	54	71	86	88
160	87	116	56	73	88	90
165	89	118	58	75	90	91
170	91	120	60	77	91	93
175	93	122	61	78	93	95
180	94	123	63	80	95	97
185	96	125	65	82	96	98
190	98	127	66	84	98	99
195	100	129	68	85	99	101
200	101	130	69	87	101	102
205	103	132	71	89	102	104
210	105	134	72	90	104	107
220	108	137	75	93	107	109
230	111	140	78	96	109	112
240	114	143	81	99	112	115
250	117	146	84	102	115	119
260	120	149	86	105	117	123
275	124	153	90	109	121	127
290	128	157	94	113	124	130
305	132	161	97	117	128	134
320	136	165	100	120	131	137
335	139	169	104	124	134	141
350	143	172	107	127	137	144
365	146	176	110	130	140	148
380	150	179	113	133	143	152
400	154	183	117	138	147	156
420	158	187	120	141	150	160
440	162	191	124	145	154	164
460	166	195	127	149	157	167
480	170	198	130	152	160	
500	173	202	134	156	163	

BUBBLE POINT

DEW POINT

\* Inches mercury below one atmosphere

## MAKE A SYSTEMATIC ANALYSIS

Based on the complaint and measurements taken

Changing Parts Might Be The First Reaction BUT...

1. May not be necessary and...
2. Does not always solve the problem

### SUPERHEAT AND SUCTION PRESSURE

symptoms can provide the real cause



#### POSSIBLE CAUSES

1. Moisture, dirt, wax
2. Undersized valve
3. High superheat adjustment
4. Gas charge condensation
5. Dead thermostatic element charge
6. Wrong thermostatic charge
7. Evaporator pressure drop — no external equalizer
8. External equalizer location
9. Restricted or capped external equalizer
10. Low refrigerant charge
11. Liquid line vapor
  - a. Vertical lift
  - b. High friction loss
  - c. Long or small line
  - d. Plugged drier or strainer
12. Low pressure drop across valve
  - a. Same as #11 above
  - b. Undersized distributor nozzle or circuits
  - c. Low condensing temperature

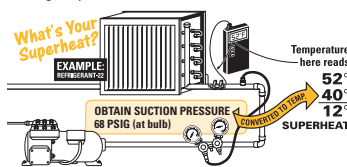
#### POSSIBLE CAUSES

1. Oversized valve
2. TEV seat leak
3. Low superheat adjustment
4. Bulb installation
  - a. Poor thermal contact
  - b. Warm location
5. Wrong thermostatic charge
6. Bad compressor – low capacity
7. Moisture, dirt, wax
8. Incorrectly located external equalizer



#### POSSIBLE CAUSES

1. Low load
  - a. Not enough air
  - b. Dirty air filters
  - c. Air too cold
  - d. Coil icing
2. Poor air distribution
3. Poor refrigerant distribution
4. Improper compressor-evaporator balance
5. Evaporator oil logged
6. Flow from one TEV affecting another's bulb



Parker Hannifin Corporation  
1-800-742-2681  
www.parker.com/coolparts

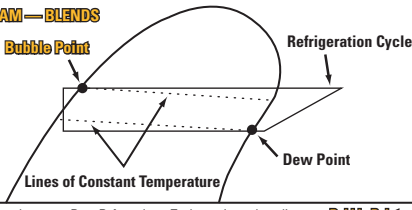


## Pressure-Temperature Chart at Sea Level

PSIG	TEMPERATURE °F					
	REFRIGERANT - (REFRIGERANT DESIGNATION)					
	401A (J)	404A (S)	407A (V)	407C (V)	407F (V)	422D (V)
5*	-24	-57	-44	-41	-46	-44
4*	-23	-55	-43	-39	-45	-42
3*	-21	-54	-41	-38	-43	-41
2*	-20	-52	-40	-36	-42	-40
1*	-18	-51	-39	-35	-41	-38
0	-17	-50	-37	-34	-39	-37
1	-14	-47	-35	-31	-37	-35
2	-12	-45	-33	-29	-35	-32
3	-9	-43	-31	-27	-33	-30
4	-7	-41	-28	-25	-30	-28
5	-5	-39	-26	-23	-28	-26
6	-3	-37	-25	-21	-27	-24
7	-1	-35	-23	-19	-25	-22
8	1	-33	-21	-17	-23	-20
9	3	-31	-19	-15	-21	-18
10	5	-29	-17	-14	-20	-17
11	7	-28	-16	-12	-18	-15
12	8	-26	-14	-11	-16	-13
13	10	-24	-13	-9	-15	-12
14	12	-23	-11	-7	-13	-10
15	13	-21	-10	-6	-12	-9
16	15	-20	-8	-5	-11	-7
17	16	-19	-7	-3	-9	-6
18	18	-17	-6	-2	-8	-5
19	19	-16	-4	-1	-7	-3
20	21	-15	-3	1	-5	-2
21	22	-13	-2	2	-4	-1
22	23	-12	-1	3	-3	0
23	25	-11	1	4	-2	2
24	26	-10	2	6	0	3
25	27	-8	3	7	1	4
26	28	-7	4	8	2	5
27	30	-6	5	9	3	6
28	31	-5	6	10	4	7
29	32	-4	7	11	5	9
30	33	-3	8	12	6	10
31	34	-2	9	13	7	11
32	35	-1	10	14	8	12
33	36	0	11	15	9	13
34	37	1	12	16	10	14
35	38	2	13	17	11	15
36	39	3	14	18	12	16
37	41	4	15	19	13	17
38	42	5	16	20	14	18
39	43	6	17	21	15	18
40	44	7	18	22	16	19
42	45	9	20	24	17	21
44	47	11	21	25	19	23
46	49	13	23	27	21	25
48	51	14	25	29	22	26
50	53	16	26	30	24	28
52	54	17	28	32	25	30
54	56	19	29	33	27	31
56	58	21	31	35	28	33
58	59	22	32	36	30	34
60	61	24	34	38	31	36
62	62	25	35	39	33	37
64	64	26	36	41	34	38
66	65	28	38	42	35	40
68	67	29	39	43	37	41
70	68	30	40	45	38	42
72	69	32	42	46	39	44
74	71	33	43	47	40	45
76	63	34	44	48	42	46
78	65	36	45	50	43	47
80	66	37	47	51	44	49
85	69	40	49	54	47	52
90	72	43	52	56	50	54
95	75	45	55	59	52	57
100	78	48	57	62	55	60
105	81	51	60	64	57	62
110	84	53	62	67	60	65
115	86	56	65	69	62	67
120	89	58	67	71	64	70
125	91	60	69	73	66	72
130	94	63	71	75	69	75
135	96	65	73	77	71	77
140	98	67	75	79	73	79
145	101	69	77	81	75	81
150	103	71	79	83	77	83
155	105	72	80	84	78	84
160	107	74	82	85	80	86
165	109	76	83	86	81	87
170	111	78	84	87	82	88
175	113	80	85	88	83	89
180	115	82	86	89	84	90
185	117	83	87	90	85	91
190	119	85	88	91	86	92
195	121	87	89	92	87	93
200	123	89	90	93	88	94
205	124	90	91	94	89	95
210	126	92	92	95	90	96
220	130	95	95	98	93	99
230	133	98	98	101	96	102
240	136	101	101	104	99	105
250	139	104	104	107	100	108
260	142	107	106	110	103	111
275	147	111	110	114	107	115
290	151	115	114	118	111	119
305	155	118	118	122	114	122
320	159	122	121	125	118	125
335	163	125	125	129	121	128
350	166	129	128	132	125	131
365	170	132	132	135	128	134
380	174	135	135	139	131	137
400	178	139	139	143	135	140
420	182	143	143	147	139	143
440	187	147	147	151	143	146
460	191	151	150	154	146	149
480	195	154	154	158	150	152
500	198	157	157	161	153	155

\* Inches mercury below one atmosphere

### P-H DIAGRAM — BLENDS



To determine superheat, use Dew Point values. To determine subcooling, use Bubble Point values.

### APPROXIMATE PRESSURE CONTROL SETTINGS

Pressure - Pounds Per Square Inch Gauge

APPLICATION	TEMPERATURE RANGE (°F)	EVAPORATOR TD (°F)	REFRIGERANT							
			22		134a		404A		507	
			Out	In	Out	In	Out	In	Out	In
Beverage Cooler	35 to 38	15	41	66	17	33	53	82	56	86
Floral Cooler										
Produce Cooler										
Smoked Meat Cooler	32 to 35	15	38	62	15	30	49	77	52	81
Meat Reach Thru										
Service Deli										
Seafood	26 to 29	15	32	54	11	25	42	68	45	72
Multi-Deck Fresh Meat										
Frozen Glass Door										
Frozen Walk-In	-10 to 0	10	9	24	-	-	15	33	16	35
Frozen Ice Cream										
Frozen Food - Open Type										
	-30 to -20	10	0	10	-	-	4	16	4	18

Pressure control settings assume a suction line pressure loss equivalent to 2°F.

### CARRYING CAPACITY OF REFRIGERATION LINES

Tons of Refrigeration - 200 Feet Equivalent Pipe Length

TYPE L COPPER TUBE O.D. Inches	REFRIGERANT						IRON PIPE SIZE Inches	SCHEDULE	REFRIGERANT 717 (Ammonia)	
	22		134a		404A / 507				Liquid Line	Suction Line
	Liquid Line	Suction Line	Liquid Line	Suction Line	Liquid Line	Suction Line				
	20°F Evap.		20°F Evap.		-20°F Evap.				20°F Evap.	
3/8	0.99	0.09	0.73	0.06	0.71	0.04	3/8	80	10.2	0.41
1/2	2.37	0.23	1.77	0.13	1.71	0.10	1/2	80	20.1	0.81
5/8	4.48	0.43	3.36	0.25	3.23	0.18	3/4	80	45.5	1.85
7/8	11.9	1.13	8.97	0.67	8.58	0.49	1	80	89.4	3.64
1-1/8	24.3	2.30	18.3	1.36	17.5	0.99	1-1/4	80	192	7.84
1-3/8	42.6	4.02	32.2	2.38	30.6	1.74	1-1/2	80	293	12.0
1-5/8	67.6	6.37	51.1	3.78	48.4	2.76	2	40	683	28.0
2-1/8	141	13.2	107	7.88	101	5.74	2-1/2	40	1930	44.7
2-5/8	250	23.4	190	14.0	179	10.2	3	40	1990	79.1
3-1/8	400	37.5	304	22.4	286	16.3	3-1/2	40	2820	116
3-5/8	595	55.7	453	33.3	425	24.2	4	40	3930	162
4-1/8	841	78.7	641	47.0	600	34.2	5	40	7100	292

Refrigerants 22, 134a, 404A, and 507 values are based on 100°F liquid temperature and the stated evaporator temperature. Refrigerant 717 (ammonia) values are based on 86°F liquid temperature and 20°F evaporator temperature. Both suction and liquid line values are based on a pressure drop equivalent to 1°F change in saturation temperature. For additional information on refrigerant line sizing, consult ASHRAE's Refrigeration Handbook or equipment manufacturer.