

SPORLAN

PRESSURE-TEMPERATURE CHART

at Altitude – 5,000 feet above Sea Level

PSIG	TEMPERATURE °F						
	YELLOW	GREEN	BLUE	ROSE	PURPLE	TEAL	WHITE
	REFRIGERANT - (SPORLAN CODE)						
	12 (F)	22 (V)	134a (J)	410A (Z)	502 (R)	507 (P)	717 (A)
5*	-38	-56	-30	-74	-64	-67	-42
4*	-36	-55	-29	-73	-63	-65	-40
3*	-34	-53	-27	-71	-61	-63	-39
2*	-33	-51	-25	-70	-59	-62	-37
1*	-31	-50	-24	-68	-58	-60	-36
0	-29	-48	-22	-67	-56	-59	-34
1	-26	-45	-19	-64	-53	-56	-32
2	-23	-43	-16	-62	-51	-53	-29
3	-20	-40	-14	-59	-48	-51	-27
4	-17	-38	-11	-57	-46	-48	-24
5	-15	-35	-9	-55	-43	-46	-22
6	-12	-33	-6	-53	-41	-44	-20
7	-10	-31	-4	-51	-39	-42	-18
8	-8	-29	-2	-49	-37	-40	-16
9	-5	-27	0	-47	-35	-38	-14
10	-3	-25	2	-45	-33	-36	-13
11	-1	-23	4	-44	-31	-34	-11
12	1	-21	6	-42	-29	-32	-9
13	3	-19	8	-40	-27	-31	-8
14	5	-18	9	-39	-26	-29	-6
15	6	-16	11	-37	-24	-27	-5
16	8	-15	13	-36	-22	-26	-3
17	10	-13	14	-34	-21	-24	-2
18	12	-11	16	-33	-19	-23	0
19	13	-10	17	-32	-18	-21	1
20	15	-9	19	-30	-16	-20	2
21	16	-7	20	-29	-15	-19	4
22	18	-6	22	-28	-13	-17	5
23	19	-4	23	-27	-12	-16	6
24	21	-3	24	-25	-11	-15	7
25	22	-2	26	-24	-9	-14	9
26	24	-1	27	-23	-8	-12	10
27	25	1	28	-22	-7	-11	11
28	26	2	29	-21	-6	-10	12
29	28	3	31	-20	-5	-9	13
30	29	4	32	-19	-3	-8	14
31	30	5	33	-18	-2	-7	15
32	31	6	34	-17	-1	-5	16
33	33	8	35	-16	0	-4	17
34	34	9	36	-15	1	-3	18
35	35	10	37	-14	2	-2	19
36	36	11	38	-13	3	-1	20
37	37	12	39	-12	4	0	21
38	38	13	41	-11	5	1	22
39	40	14	42	-10	6	2	23
40	41	15	43	-9	7	3	24
42	43	17	44	-7	9	5	25
44	45	19	46	-5	11	6	27
46	47	20	48	-4	13	8	29
48	49	22	50	-2	15	10	30
50	51	24	52	-1	17	12	32
52	53	26	54	1	18	13	33
54	55	27	55	2	20	15	35
56	56	29	57	4	22	16	36
58	58	30	59	5	23	18	38
60	60	32	60	7	25	19	39
62	62	34	62	8	26	21	41
64	63	35	63	9	28	22	42
66	65	36	65	11	29	24	43
68	66	38	66	12	31	25	45
70	68	39	68	13	32	27	46
72	70	41	69	15	34	28	47
74	71	42	70	16	35	29	48
76	73	43	72	17	36	31	49
78	74	45	73	18	38	32	51
80	75	46	74	19	39	33	52
85	79	49	77	22	42	36	55
90	82	52	81	25	45	39	57
95	86	55	83	28	48	42	60
100	89	58	86	30	51	45	62
105	92	60	89	33	54	47	65
110	95	63	92	35	56	50	67
115	98	66	94	37	59	52	69
120	100	68	97	40	61	55	71
125	103	71	99	42	64	57	74
130	106	73	102	44	66	59	76
135	108	75	104	46	69	62	78
140	111	77	106	48	71	64	80
145	113	80	108	50	73	66	82
150	116	82	110	52	75	68	83
155	118	84	113	54	77	70	85
160	120	86	115	55	79	72	87
165	122	88	117	57	81	74	89
170	125	90	119	59	83	76	90
175	127	92	121	61	85	77	92
180	129	93	122	62	87	79	94
185	131	95	124	64	89	81	95
190	133	97	126	66	91	83	97
195	135	99	128	67	93	85	99
200	137	101	130	69	94	86	100
205	139	102	131	70	96	88	102
210	141	104	133	72	98	89	103
220	144	107	136	75	101	93	106
230	148	110	139	78	104	96	109
240	151	113	143	80	107	99	111
250	155	116	146	83	110	102	114
260	158	119	148	86	113	104	116
275	163	124	153	89	118	108	120
290	167	128	157	93	122	112	124
305	171	131	161	97	126	116	127
320	176	135	164	100	130	120	130
335	180	139	168	103	133	123	134
350	184	142	172	106	137	127	137
365	188	146	175	109	140	130	140
380	191	149	178	112	144	133	142
400	196	153	183	116	148	137	146
420	201	157	187	120	152	141	150
440	205	161	191	123	156	145	153
460	209	165	194	127	160	148	157
480	214	169	198	130	164	152	160
500	218	173	202	133	167	155	163

* 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

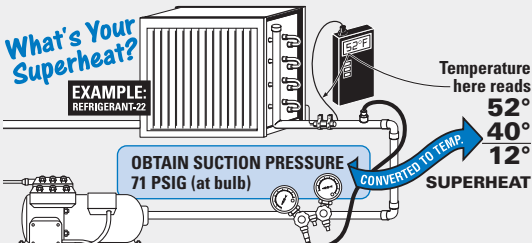
POSSIBLE CAUSES

1. Oversized valve
2. TEV seat leak
3. Low superheat adjustment
4. Bulb installation
 - a. Poor installation 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



What's Your Superheat?

EXAMPLE: REFRIGERANT-22

OBTAIN SUCTION PRESSURE 71 PSIG (at bulb)

Temperature here reads

52°

40°

12°

SUPERHEAT

CONVERTED TO TEMP.

SPORLAN

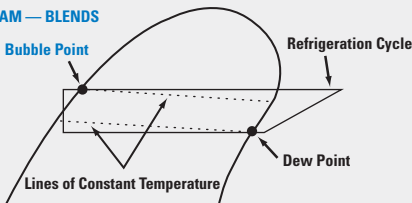
PRESSURE-TEMPERATURE CHART

at Altitude - 5,000 feet above Sea Level

PSIG	TEMPERATURE °F					
	PINK	SAND	ORANGE	LIGHT BROWN	REDDISH PURPLE	BROWN
	REFRIGERANT - (SPORLAN CODE)					
	401A (X)	402A (X)	404A (A)	407C (N)	408A (R)	422D (V)
5*	-32	-67	-64	-48	-62	-51
4*	-31	-65	-63	-47	-61	-50
3*	-29	-64	-61	-45	-59	-48
2*	-27	-62	-60	-44	-57	-47
1*	-26	-61	-58	-42	-56	-45
0	-24	-59	-57	-41	-54	-44
1	-21	-56	-54	-38	-51	-41
2	-18	-54	-51	-35	-49	-38
3	-16	-51	-49	-33	-46	-36
4	-13	-49	-46	-30	-44	-33
5	-11	-47	-44	-28	-41	-31
6	-8	-44	-42	-26	-39	-29
7	-6	-42	-40	-24	-37	-27
8	-4	-40	-38	-22	-35	-25
9	-2	-38	-36	-20	-33	-23
10	0	-37	-34	-18	-31	-21
11	2	-35	-32	-16	-29	-19
12	4	-33	-30	-15	-27	-18
13	6	-31	-28	-13	-26	-16
14	8	-30	-27	-11	-24	-14
15	9	-28	-25	-10	-22	-13
16	11	-27	-24	-8	-21	-11
17	12	-25	-22	-7	-19	-10
18	14	-24	-21	-5	-18	-8
19	16	-22	-19	-4	-16	-7
20	17	-21	-18	-3	-15	-5
21	18	-20	-16	-1	-13	-4
22	20	-18	-15	0	-12	-3
23	21	-17	-14	1	-11	-1
24	23	-16	-13	3	-9	0
25	24	-14	-11	4	-8	1
26	25	-13	-10	5	-7	2
27	26	-12	-9	6	-6	3
28	28	-11	-8	7	-5	5
29	29	-10	-7	9	-3	6
30	30	-9	-5	10	-2	7
31	31	-7	-4	11	-1	8
32	32	-6	-3	12	0	9
33	34	-5	-2	13	1	10
34	35	-4	-1	14	2	11
35	36	-3	0	15	3	12
36	37	-2	1	16	4	13
37	38	-1	2	17	5	14
38	39	0	3	18	6	15
39	40	1	4	19	7	16
40	41	2	5	20	8	17
42	43	4	7	22	10	19
44	45	5	9	23	12	21
46	47	7	10	25	14	23
48	49	9	12	27	16	24
50	50	10	14	28	17	26
52	52	12	15	30	19	28
54	54	14	17	32	21	29
56	56	15	19	33	22	31
58	58	17	20	35	24	32
60	60	18	22	36	25	34
62	62	20	23	37	27	35
64	64	21	25	39	28	37
66	66	23	26	40	29	38
68	68	24	27	42	31	39
70	70	25	29	43	32	41
72	72	27	30	44	33	42
74	74	28	31	46	35	43
76	76	29	33	47	36	45
78	78	31	34	48	37	46
80	80	32	35	49	38	47
85	85	35	38	52	41	50
90	90	38	41	44	45	53
95	95	41	44	47	48	50
100	100	43	47	50	51	53
105	105	46	49	52	53	55
110	110	48	52	55	56	58
115	115	51	54	57	58	61
120	120	51	56	60	61	63
125	125	53	58	62	63	65
130	130	56	61	64	65	68
135	135	58	63	67	68	70
140	140	60	65	69	70	72
145	145	62	67	71	72	74
150	150	64	69	73	74	76
155	155	66	71	75	76	78
160	160	68	73	77	78	80
165	165	70	75	79	80	82
170	170	72	77	81	82	84
175	175	74	79	82	84	86
180	180	76	81	84	86	88
185	185	78	83	86	88	90
190	190	79	84	88	89	92
195	195	81	86	89	91	93
200	200	83	88	91	93	95
205	205	84	89	93	95	97
210	210	86	91	94	96	98
220	220	89	94	98	99	102
230	230	92	97	101	103	105
240	240	95	100	104	106	108
250	250	98	103	106	109	111
260	260	101	106	109	111	114
275	275	105	110	113	116	118
290	290	109	114	117	120	122
305	305	113	118	121	123	126
320	320	116	121	125	127	129
335	335	120	125	128	131	133
350	350	123	128	132	134	136
365	365	127	131	135	138	140
380	380	130	135	138	141	143
400	400	134	139	142	145	147
420	420	138	143	146	149	151
440	440	142	146	150	153	155
460	460	146	150	154	157	159
480	480	149	154	157	161	162
500	500	153	157	161	164	166

* 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 at Altitude - 5,000 Feet above Sea Level

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	43	68	20	36	54	85	57	89
Floral Cooler										
Produce Cooler										
Smoked Meat Cooler	32 to 35	15	40	64	18	33	52	80	55	84
Meat Reach Thru										
Service Deli										
Seafood	26 to 29	15	34	56	14	28	45	71	47	74
Multi-Deck Fresh Meat										
Frozen Glass Door										
Frozen Walk-In	-10 to 0	10	12	26	-	-	17	35	19	38
Frozen Ice Cream										
Frozen Food - Open Type	-30 to -20	10	2	13	-	-	6	19	7	20

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	0.10	3/8	80	10.2	0.41
1/2	2.37	0.23	1.77	0.13	1.71	0.04	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	1090	44.7
2-5/8	250	23.4	190	14.0	179	10.2	3	40	1930	79.1
3-1/8	400	37.5	304	22.4	286	16.3	3-1/2	40	2920	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.



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