COPPER CAPILLARY TUBING

APPLICATION AND ENGINEERING DATA FOR A/C AND REFRIGERATION

MADE IN THE USA

FACTORS AFFECTING REFRIGERANT FLOW

The size of the cap tube is fairly critical. Unlike orifices, such as expansion valve seats, capillary tubes depend on their length as well as their diameter to determine their total restriction. The relationship between these two factors is shown in the following charts. A change in diameter on a percentage basis can change the flow more than an equal change in length. To illustrate, changing the diameter by .005" as between .026" ID and .031" ID can double the flow.

Restriction can also be changed by lengthening or shortening the cap tub. The longer the tube, the slower the flow; the shorter the tube, the faster the flow. The General Flow Curve Graph shows what happens to the flow of refrigerant through a cap tube as the length is changed. This curve is not meant to give specific flows, but to illustrate what happens with all cap tubes so that the general flow pattern can be understood.

By following the flow curve from left to right it can be seen that for the longest length the flow is the smallest. As the cap tube length is decreased, the flow increases slowly until critical point "L" is reached.

SHORT COIL	100 FT. COILS	10 COILS	DESCRIPTION
TC-26-16	TC-26-100	TC-26-100-101	.026 ID x .072 OD x 16'
TC-31-12	TC-31-100	TC-31-100-101	.031 ID x .083 OD x 12'
TC-36-12	TC-36-100	TC-36-100-101	.036 ID x .087 OD x 12'
TC-42-12	TC-42-100	TC-42-100-101	.042 ID x .093 OD x 12'
TC-44-12	TC-44-100	TC-44-100-101	.044 ID x .109 OD x 12'
TC-49-11	TC-49-100	TC-49-100-101	.049 ID x .099 OD x 11'
TC-50-11	TC-50-100	TC-50-100-101	.050 ID x .114 OD x 11'
TC-54-11	TC-54-100	TC-54-100-101	.054 ID x .106 OD x 11'
TC-55-11	TC-55-100	TC-55-100-101	.055 ID x .125 OD x 11'
TC-59-10	TC-59-100	TC-59-100-101	.059 ID x .112 OD x 10'
TC-64-10	TC-64-100	TC-64-100-101	.064 ID x .125 OD x 10'
TC-70-12	TC-70-100	TC-70-100-101	.070 ID x .125 OD x 12'
TC-75-9	TC-75-100	TC-75-100-101	.075 ID x .125 OD x 9'
TC-80-10	TC-80-100	TC-80-100-101	.080 ID x .145 OD x 10'
TC-85-9	TC-85-100	TC-85-100-101	.085 ID x .145 OD x 9'
TC-90-7	TC-90-100	TC-90-100-101	.090 ID x .145 OD x 7'
TC-100-10	TC-100-100	TC-100-100-101	.100 ID x .156 OD x 10'

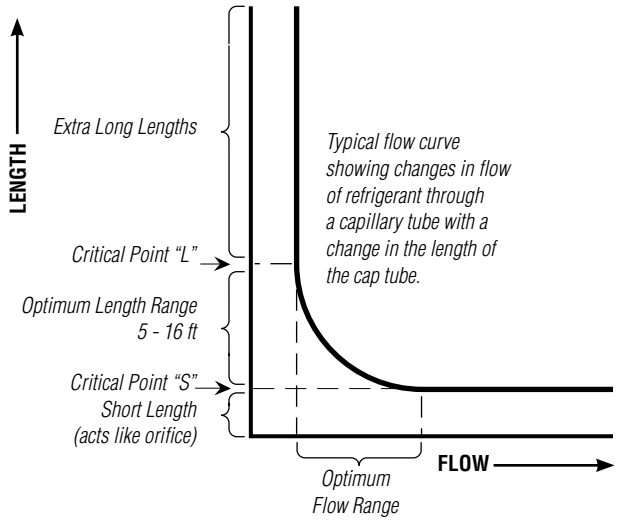
At this point, the flow increases rapidly with each reduction in length until critical point "S" is reached. From this point on, further decrease in length causes ever increasing flow. From the study of this typical curve, certain pertinent conclusions can be reached that directly affect the field application of capillary tubes.

On the graph, the section above the critical point "L" is marked as extra long lengths. Attempting to increase restriction (reduce flow) by increasing length into this region is not only uneconomical, but frequently hopeless. In addition, tubes in this range may not be responsive enough to changes in head pressures during operation. Tube lengths in this range should be avoided where possible.

Continuing down the graph, the section below critical point "S" should be avoided. In this range, the tube is so short that even small changes in length will cause very large increases in flow. This is caused by the fact that the length no longer affects the flow and the tube now begins to act more like an orifice than a capillary tube. Without the other components necessary to control an orifice, such as are present in an expansion valve or high side float, a very short cap tube will give wildly erratic operation under varying ambients and loads.

Although the critical points will vary depending on the ID of the cap tubing being used, a safe operating rule-of-thumb can be offered—keep the cap tube no shorter than 5 ft. and no longer than 16 ft.

GENERAL FLOW CURVE GRAPH



JB JUST BETTER

DATA SHEET

CAPILLARY TUBE LENGTH CONVERSION CHART

The conversion chart enables the user to translate the recommended length of tube diameter into sizes stocked. **It is recommended that conversions be made using factors within the unshaded area.**

To Use Chart:

1. Locate recommended cap tube ID in left hand column.
2. Read across and find conversion factor under Copper Cap Tube Size.
3. Multiply the given length of the recommended cap tube by the conversion factor.
4. The resultant length (min. 5 ft/max.16 ft) of copper cap tube will give the same flow characteristics as the original recommended cap tube.

Example:

Recommended cap tube: 9'–.040 ID

Locate .040 in left hand column. Read across the recommended conversion:

Part No. TC-36 = .62, Part No. TC-42 = 1.25

Multiply the recommended cap tube length of 9' by the conversion factor.

Part No. TC-36 = 9' x .62 = 5.58"

Part No. TC-42 = 9' x 1.25 = 11.25"

Either of these cap tubes will give the same results as the original cap tube.

RECOMMENDED CAP TUBE ID	PART NO.																
	TC-26 (.026)	TC-31 (.031)	TC-36 (.036)	TC-42 (.042)	TC-44 (.044)	TC-49 (.049)	TC-50 (.050)	TC-54 (.054)	TC-55 (.055)	TC-59 (.059)	TC-64 (.064)	TC-70 (.070)	TC-75 (.075)	TC-80 (.080)	TC-85 (.085)	TC-90 (.090)	TC-100 (.100)
.024	**1.44**																
.025	**1.20**																
.026	**1.00**	2.24															
.028	**.72**	1.59															
.030	**.52**	1.16															
.031	**.45**	**1.00**	2.00														
.032		**.86**	1.75														
.033		**.75**	1.54														
.034		**.65**	**1.35**														
.035		**.58**	**1.16**	2.31													
.036		**.50**	**1.00**	2.10													
.037		.45	**.90**	1.79	2.22												
.038		.39	**.80**	1.59	1.92												
.039		.35	**.71**	**1.41**	1.75												
.040		.31	**.62**	**1.25**	1.55	2.51											
.041		.28	**.56**	**1.12**	1.38	2.26	2.50										
.042		.25	**.50**	**1.00**	**1.24**	2.03	2.23										
.043		.23	.45	**.87**	**1.11**	1.83	1.98										
.044		.20	.39	**.81**	**1.00**	1.62	1.79										
.045			.35	**.73**	**.90**	**1.47**	1.60	2.32									
.046			.32	**.67**	**.82**	**1.34**	**1.47**	2.08	2.27								
.047				**.59**	**.74**	**1.20**	**1.31**	1.89	2.06								
.048				**.54**	**.67**	**1.10**	**1.20**	1.72	1.87								
.049				.49	**.61**	**1.00**	**1.09**	1.55	1.69								
.050				.45	**.56**	**.91**	**1.00**	**1.43**	**1.56**	2.14							
.051				.41	**.51**	**.84**	**.93**	**1.31**	**1.44**	1.96							
.052					.47	**.76**	**.85**	**1.19**	**1.32**	1.78							
.053					.43	**.69**	**.78**	**1.09**	**1.20**	1.64							
.054					.39	**.65**	**.70**	**1.00**	**1.09**	1.52	2.18						
.055					.36	**.59**	**.64**	**.92**	**1.00**	**1.38**	**2.00**						
.056						**.54**	**.60**	**.85**	**.94**	**1.27**	**1.85**						
.057						**.50**	**.55**	**.79**	**.87**	**1.17**	**1.72**						
.058						.46	**.51**	**.73**	**.80**	**1.07**	**1.56**						
.059						.42	.47	**.67**	**.73**	**1.00**	**1.44**	2.18					
.060						.39	.43	**.62**	**.67**	**.93**	**1.33**	2.04					
.064							.32	.47	**.50**	**.69**	**1.00**	**1.50**	**2.07**				
.070								.30	.33	.46	**.67**	**1.00**	**1.37**	**1.84**			
.075											.48	**.73**	**1.00**	**1.37**	1.75		
.080												**.54**	**.74**	**1.00**	**1.32**	1.71	
.085													**.57**	**.76**	**1.00**	**1.29**	
.090													.43	**.62**	**.76**	**1.00**	1.62
.095														.46	**.60**	**.79**	**1.27**
.100															.48	**.62**	**1.00**
.105																.49	**.80**
.110																	**.65**
.115																	**.53**
.120																	.43

AIR CONDITIONING APPLICATION CHART (R22)

Recommended capillary tube lengths for each circuit in an air conditioner evaporator where R22 is the refrigerant. All recommendations must be considered approximate and variations may arise in actual field applications.

Window air conditioners normally have one circuit and the recommended cap tube can be read directly from the chart. Larger units have two or more circuits in the evaporator. Where this is the case, simply divide the total BTU rating of the unit by the number of cap tube circuits to obtain the BTU/Circuit rating of each individual cap tube.

Example:

Air conditioner is rated at 27,000 BTU and has three cap tubes connected to the evaporator.

27,000 ÷ 3 = 9,000 BTU/Circuit

Locate 9,000 in the BTU/Circuit column.

From the chart, this would call for Part No. TC-75, 72 inch long. The length and ID of any cap tube may be adjusted to a more readily available size by using the conversion chart on page 2.

BTU/ CIRCUIT	CAP TUBE		BTU/ CIRCUIT	CAP TUBE	
	LENGTH (INCHES)	PART NO.		LENGTH (INCHES)	PART NO.
4000	69	TC-49	**8750**	78	TC-75
4250	63	TC-49	**9000**	72	TC-75
4500	90	TC-54	**9250**	67	TC-75
4750	81	TC-54	**9500**	84	TC-80
5000	72	TC-54	**9750**	84	TC-80
5250	63	TC-54	**10,000**	76	TC-80
5500	101	TC-64	**10,250**	72	TC-80
5750	94	TC-64	**10,500**	68	TC-80
6000	87	TC-64	**10,750**	64	TC-80
6250	79	TC-64	**11,000**	60	TC-80
6500	72	TC-64	**11,250**	87	TC-85
6750	64	TC-64	**11,500**	84	TC-85
7000	90	TC-70	**11,750**	78	TC-85
7250	84	TC-70	**12,000**	72	TC-85
7500	78	TC-70	**12,500**	82	TC-90
7750	73	TC-70	**13,000**	72	TC-90
8000	69	TC-70	**13,500**	66	TC-90
8250	64	TC-70	**14,000**	60	TC-90
8500	84	TC-75	**—**	—	—

REFRIGERATION APPLICATION CHART (R12 AND R22)*

HP	REF.	TYPE**	NORMAL EVAPORATING TEMPERATURE DEGREES FAHRENHEIT							
			-10 TO +5		+5 TO +20		+20 TO +35		+35 TO +50	
			LENGTH (FEET)	PART NO.	LENGTH (FEET)	PART NO.	LENGTH (FEET)	PART NO.	LENGTH (FEET)	PART NO.
1/20	R12	S-F	16	TC-26	10	TC-26	—	—	—	—
1/12	R12	S-F	12	TC-26	12	TC-31	—	—	—	—
1/9	R12	S	12	TC-26	12	TC-31	—	—	—	—
1/9	R12	S	10	TC-26	10	TC-31	—	—	—	—
1/8	R12	S-F	10	TC-26	10	TC-31	—	—	—	—
1/6	R12	S	12	TC-31	12	TC-36	8	TC-36	10	TC-42
1/6	R12	F	10	TC-31	10	TC-36	—	—	—	—
1/5	R12	S	10	TC-31	10	TC-36	7-1/2	TC-42	7-1/2	TC-49
1/5	R12	F	8	TC-31	8	TC-36	10	TC-42	6	TC-42
1/4	R22	S-F	12	TC-36	6	TC-36	8-1/2	TC-42	6	TC-49
1/4	R12	F	10	TC-36	6	TC-36	8	TC-42	6	TC-49
1/3	R22	F	10	TC-36	6	TC-36	11	TC-49	—	—
1/3	R12	F	12	TC-42	6	TC-42	9	TC-49	6	TC-54
1/2	R22	F	6	TC-36	9	TC-42	7-1/2	TC-54	10	TC-64
1/2	R12	F	11	TC-54	9	TC-49	—	—	—	—
3/4	R22	F	11	TC-54	9	TC-54	—	—	—	—
3/4	R12	F	7-1/2	TC-54	12	TC-70	1	TC-80	—	—
1	R22	F	10	TC-64	12	TC-70	—	—	—	—
1	R12	F	10	TC-70	11	TC-54	7-1/2	TC-54 (2 pcs)	—	—
1-1/2	R22	F	7-1/2	TC-54 (2 pcs)	7-1/2	TC-54 (2 pcs)	8	TC-64 (2 pcs)	—	—
1-1/2	R12	F	—	—	9	TC-64 (2 pcs)	10	TC-80 (2 pcs)	—	—
2	R22	F	—	—	10	TC-70 (2 pcs)	9	TC-75 (2 pcs)	—	—
2	R12	F	10	TC-70 (2 pcs)	9	TC-75 (2 pcs)	10	TC-85 (2 pcs)	—	—
3	R22	F	—	—	10	TC-70 (3 pcs)	9	TC-75 (3 pcs)	—	—
3	R12	F	10	TC-70 (2 pcs)	8	TC-64 (4 pcs)	10	TC-80 (4 pcs)	—	—
4	R22	F	—	—	10	TC-70 (4 pcs)	9	TC-75 (4 pcs)	—	—
4	R12	F	—	—	10	TC-70 (5 pcs)	9	TC-75 (5 pcs)	—	—
5	R12	F	—	—	10	TC-80 (5 pcs)	9	TC-85 (5 pcs)	—	—

**For R134a add 10% to length.*
***Condenser Type: S = Static; F = Fan*

REFRIGERATION REFERENCE CHART FOR CAPILLARY TUBING*

SINGLE FEED

HP	LOW		MED		HIGH	
R12 / R416A						
1/8	TC-26	110"	TC-26	84"	TC-26	48"
1/6	TC-26	71"	TC-31	96"	TC-31	72"
1/5	TC-31	54"	TC-31	36"	TC-31	24"
1/4	TC-31	43"	TC-42	90"	TC-42	60"
1/3	TC-42	93"	TC-42	72"	TC-42	36"
1/2	TC-49	96"	TC-49	48"	TC-64	90"
3/4	TC-49	60"	TC-64	92"	TC-64	72"
1	TC-49	36"	TC-64	84"	TC-64	54"
1-1/2	TC-64	84"	TC-64	60"	TC-64	43"
2	TC-64	55"	TC-64	40"	TC-64	26"
R134A / R401A / R401B / R406A / R409A / R500						
1/8	TC-26	121"	TC-26	92"	TC-26	53"
1/6	TC-26	78"	TC-31	106"	TC-31	79"
1/5	TC-31	59"	TC-31	39"	TC-31	26"
1/4	TC-31	47"	TC-42	99"	TC-42	66"
1/3	TC-42	102"	TC-42	79"	TC-42	39"
1/2	TC-49	105"	TC-49	52"	TC-64	99"
3/4	TC-49	66"	TC-64	101"	TC-64	79"
1	TC-49	39"	TC-64	92"	TC-64	59"
1-1/2	TC-64	92"	TC-64	66"	TC-64	47"
2	TC-64	61"	TC-64	44"	TC-64	29"
R22						
1/8	TC-26	132"	TC-26	101"	TC-26	58"
1/6	TC-26	86"	TC-31	116"	TC-31	86"
1/5	TC-31	64"	TC-31	42"	TC-31	28"
1/4	TC-31	51"	TC-42	109"	TC-42	72"
1/3	TC-42	112"	TC-42	87"	TC-42	43"
1/2	TC-49	115"	TC-49	57"	TC-64	109"
3/4	TC-49	72"	TC-64	111"	TC-64	87"
1	TC-49	42"	TC-64	101"	TC-64	65"
1-1/2	TC-64	101"	TC-64	72"	TC-64	51"
2	TC-64	67"	TC-64	48"	TC-64	32"
R402B / R403B / R404A / R407C / R408A / R502						
1/8	TC-26	144"	TC-26	111"	TC-26	63"
1/6	TC-26	95"	TC-26	78"	TC-31	95"
1/5	TC-31	70"	TC-31	46"	TC-31	31"
1/4	TC-31	56"	TC-31	31"	TC-42	79"
1/3	TC-31	30"	TC-42	96"	TC-42	47"
1/2	TC-42	29"	TC-49	63"	TC-49	32"
3/4	TC-49	79"	TC-49	32"	TC-64	96"
1	TC-49	46"	TC-64	111"	TC-64	72"
1-1/2	TC-64	111"	TC-64	79"	TC-64	56"
2	TC-64	74"	TC-64	52"	TC-64	34"
R402A / R407A / R407B / R507						
1/8	—		TC-26	122"	TC-26	69"
1/6	TC-26	104"	TC-31	138"	TC-31	105"
1/5	TC-31	77"	TC-31	50"	TC-31	34"
1/4	TC-31	62"	TC-31	34"	TC-42	86"
1/3	TC-31	33"	TC-42	105"	TC-42	52"
1/2	TC-42	31"	TC-49	69"	TC-49	35"
3/4	TC-49	87"	TC-49	37"	TC-64	106"
1	TC-49	52"	TC-49	30"	TC-64	79"
1-1/2	TC-49	32"	TC-64	86"	TC-64	62"
2	TC-64	82"	TC-64	58"	TC-64	37"
R410A						
1/8	—		TC-26	144"	TC-26	81"
1/6	TC-26	123"	TC-26	100"	TC-26	78"
1/5	TC-31	90"	TC-31	60"	TC-31	41"
1/4	TC-31	73"	TC-31	40"	TC-42	101"
1/3	TC-31	38"	TC-31	30"	TC-42	62"
1/2	TC-42	37"	TC-49	84"	TC-49	42"
3/4	TC-49	104"	TC-49	44"	TC-49	34"
1	TC-49	62"	TC-49	36"	TC-64	94"
1-1/2	TC-49	38"	TC-64	103"	TC-64	74"
2	TC-64	96"	TC-64	69"	TC-64	45"

2 FEED TUBES *(Requires 2 lengths of each size listed)*

HP	LOW		MED		HIGH	
R12 / R416A						
1/2	TC-31	43"	TC-42	90"	TC-42	60"
3/4	TC-31	30"	TC-42	63"	TC-42	42"
1	TC-49	96"	TC-49	48"	TC-64	90"
1-1/2	TC-49	60"	TC-64	92"	TC-64	72"
2	TC-49	36"	TC-64	84"	TC-64	54"
2-1/2	TC-64	108"	TC-64	72"	TC-64	49"
3	TC-64	84"	TC-64	60"	TC-64	43"
3-1/2	TC-64	70"	TC-64	54"	TC-64	35"
4	TC-64	55"	TC-64	40"	TC-64	26"
R134A / R401A / R401B / R406A / R409A / R500						
1/2	TC-31	47"	TC-42	99"	TC-42	66"
3/4	TC-31	33"	TC-42	69"	TC-42	46"
1	TC-49	105"	TC-49	52"	TC-64	99"
1-1/2	TC-49	66"	TC-64	101"	TC-64	79"
2	TC-49	40"	TC-64	92"	TC-64	59"
2-1/2	TC-64	119"	TC-64	79"	TC-64	53"
3	TC-64	92"	TC-64	66"	TC-64	47"
3-1/2	TC-64	77"	TC-64	59"	TC-64	38"
4	TC-64	60"	TC-64	44"	TC-64	29"
R22						
1/2	TC-31	52"	TC-42	108"	TC-42	72"
3/4	TC-31	36"	TC-42	77"	TC-42	50"
1	TC-49	115"	TC-49	58"	TC-64	108"
1-1/2	TC-49	72"	TC-64	110"	TC-64	86"
2	TC-49	43"	TC-64	101"	TC-64	65"
2-1/2	TC-49	39"	TC-64	87"	TC-64	58"
3	TC-64	101"	TC-64	72"	TC-64	52"
3 1/2	TC-64	84"	TC-64	64"	TC-64	41"
4	TC-64	66"	TC-64	48"	TC-64	31"
R402B / R403B / R404A / R407C / 408A / R502						
1/2	TC-31	56"	TC-42	119"	TC-42	78"
3/4	TC-31	39"	TC-42	85"	TC-42	55"
1	TC-42	28"	TC-49	63"	TC-64	119"
1-1/2	TC-49	79"	TC-49	32"	TC-64	94"
2	TC-49	47"	TC-64	110"	TC-64	71"
2-1/2	TC-49	43"	TC-64	96"	TC-64	64"
3	TC-64	111"	TC-64	79"	TC-64	57"
3-1/2	TC-64	92"	TC-64	70"	TC-64	46"
4	TC-64	73"	TC-64	53"	TC-64	34"
R402A / R407A / R407B / R507						
1/2	TC-31	52"	TC-31	32"	TC-42	85"
3/4	TC-31	43"	TC-42	92"	TC-42	60"
1	TC-42	31"	TC-49	70"	TC-49	36"
1-1/2	TC-49	87"	TC-49	35"	TC-64	103"
2	TC-49	52"	TC-49	28"	TC-64	78"
2-1/2	TC-49	47"	TC-64	106"	TC-64	70"
3	TC-49	32"	TC-64	86"	TC-64	62"
3-1/2	TC-64	101"	TC-64	77"	TC-64	50"
4	TC-64	80"	TC-64	58"	TC-64	37"
R410A						
1/2	TC-31	72"	TC-31	37"	TC-42	102"
3/4	TC-31	50"	TC-42	116"	TC-42	70"
1	TC-42	37"	TC-49	83"	TC-49	42"
1-1/2	TC-49	102"	TC-49	44"	TC-49	34"
2	TC-49	62"	TC-49	37"	TC-64	93"
2-1/2	TC-49	55"	TC-49	32"	TC-64	81"
3	TC-49	38"	TC-64	101"	TC-64	74"
3-1/2	TC-64	118"	TC-64	90"	TC-64	55"
4	TC-64	92"	TC-64	70"	TC-64	41"

**Fan cooled units only. Add 10% to length for static cooled.*

JB INDUSTRIES

Form No. TC-803-308 0417