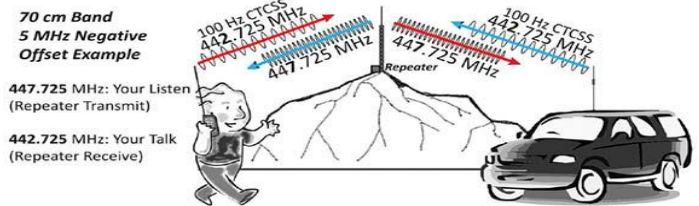


Local Repeater/Frequency Info

Courtesy of Chris N3XCK



(1.25m band frequencies are marked in GREEN)

Output Frequency / Memory Label / TX PL Tone / Call Sign / (NOTES) / Location

---- *Monroe county PA area* ----

147.045 / EPARA-V / 131.8 / WA3MDP / (linked to N3TXG, Bangor / [EchoLink](#)) / Bangor, PA
447.225 / EPARA-U / 131.8 / N3TXG / (linked to WA3MDP, Bangor) / Bangor, PA
146.865 / SKYWARN / 100.0 / WX3OES / (Monroe County OEM) / Snydersville, PA
145.230 / W3WAN / 77.0 / W3WAN / (linked to the Wide Area Network Repeater System / [AllStar](#)) / Tannersville, PA
445.375 / POHOB0 / 91.5 / K4MTP / (linked to the K4MTP Six Meter System) / Pohopoco Mountain, PA
448.375 / WOODALE / 91.5 / N3JNZ / (Limited range, 10 mile radius) / Wooddale, PA
446.575 / PMPLE-N / 151.4 / KG3I / (On Pimple Hill, linked to KA3NRJ, Allentown) / Long Pond, PA (Near the Pocono Raceway)
[224.340](#) / LPOND21 / 131.8 / KB3WW / () / Long Pond, PA
[224.920](#) / LPOND22 / 127.3 / K4MTP / () / Long Pond, PA
446.225 / ROSSTWP / 131.8 / N3TXG / (**MAY BE DOWN**, have not been able to reach it) / Ross Township, PA
449.875 / WINDGAP / 131.8 / KC2IRV / ([AllStar](#)) / Wind Gap, PA

---- *New Jersey* ----

448.175 / HOPATCG / 141.3 / N2OZO / () / Hopatcong Borough, NJ
[224.280](#) / HOPAT2 / 88.5 / N2QJN / () / Hopatcong, NJ
147.300 / NEWTONV / 151.4 / W2LV / (linked to both 1.25m and 70cm W2LV) / Newton, NJ
443.000 / NEWTONU / 103.5 / W2LV / (linked to both 2 meter and 1.25m W2LV) / Newton, NJ
147.210 / NEWTON / 151.4 / W2LV / () / Newton, NJ
[224.500](#) / NEWTON2 / 141.3 / W2LV / (linked to both 2 meter and 70cm W2LV) / Newton, NJ (Kittatiny Mountain)
448.075 / HACKETT / 141.3 / WW2BSA / () / Hackettstown, NJ (Strand Theater/Hackettstown Center for the Arts)
146.925 / VERNON / 141.3 / W2VER / () / Vernon, NJ
146.820 / WASHTON / 110.9 / W2SJT / ([EchoLink](#)) / Washington, NJ (Montana Mountain)
146.985 / ROXBURY / 131.8 / K2GG / ([EchoLink](#)) / Roxbury, NJ (Mooney Mountain Meadows)
147.375 / CHERRY / 151.4 / WB2NQV / () / Cherryville, NJ
[223.780](#) / WARREN2 / 110.9 / WC2EM / () / Washington, NJ
[223.860](#) / BDLAKE2 / 136.5 / W2RM / () / Budd Lake, NJ
[224.720](#) / MTARL2 / 141.3 / WB2SLJ / () / Mount Arlington, NJ

---- *New York state* ----

449.125 / PJARVIS / 114.8 / N2ACF / (Linked to the N2ACF System) / Port Jarvis, NY
145.350 / SHOLANY / 114.8 / K3TSA / (this is the remote receiver located in Port Jervis, NY for K3TSA) / Schahola, PA
446.125 / GLNSPEY / 114.8 / N2ACF / (Linked to the N2ACF System) / Glen Spey, NY
[224.540](#) / MIDDTOWN / 156.7 / WR2MSN / () / Middletown, NY
449.875 / WRTSBRO / 114.8 / N2ACF / (Linked to the N2ACF System) / Wurtsboro, NY
449.225 / NYC / 82.5 / KQ2H / (Linked to the KQ2H System) / Manhattan, NY (Empire State Building) **See Note #1**

---- *Pike, Lackawanna, and Luzerne counties, PA* ----

145.330 / DINGMAN / 141.3 / AA2HA / (**MAY BE DOWN**, have not been able to reach it) / Dingman's Ferry
146.715 / SHOHOLA / 82.5 / K3TSA / () / Shohola Falls, PA
145.350 / SHOLAPA / 100.0 / K3TSA / () / Schahola, PA
146.940 / SCRANTN / 127.3 / K3CSG / () / Scranton, PA
[224.560](#) / SCRANT2 / 136.5 / KC3MN / (Linked to 448.825 N3EVW, Scranton) / Scranton & Dunmore, PA
145.450 / WILKESB / 82.5 / K3YTL / () / Wilkes-Barre, PA (Bunker Hill)
[224.420](#) / WILKES2 / 94.8 / N3DAP / () / Wilkes-Barre, PA (Penobscot Knob)
146.805 / HUNLOCK / 88.5 / N3CSE / () / Hunlock Creek, PA
[224.600](#) / HAZLE2 / 77.0 / W3RC / () / Hazleton, PA
441.900 / HAZLETN / 114.8 / W3RC / ([EchoLink](#) [AllStar](#)) / Hazleton, PA

---- *Lehigh Valley PA area* ----

145.270 / EASTON / 151.4 / W3IFI / ([EchoLink](#)) / Easton, PA (Braden Airport)
[224.740](#) / EASTON2 / 100.0 / KB3AJF / () / Easton, PA
146.700 / NZRTH-V / 151.4 / W3OK / (Linked to 444.900 W3OK) / Nazareth, PA
444.900 / NZRTH-U / 151.4 / W3OK / (Linked to 146.700 W3OK) / Nazareth, PA
444.100 / PMPLE-S / 151.4 / KA3NRJ / (Linked to KG3I, Long Pond-[EchoLink](#) [AllStar](#)) / Allentown, PA (South Mountain)
146.655 / MGNHILL / 136.5 / N3LWY / () / Lehigh Valley-Easton, PA (Morgan Hill)
146.940 / LEHIGHM / 79.7 / W3OI / () / Allentown, PA (Lehigh Mountain)
[224.080](#) / ALLEN21 / 203.5 / KA3NRJ / (Linked to 444.100 KA3NRJ, Allentown) / Allentown, PA
[224.400](#) / ALLEN22 / 127.3 / K4MTP / () / Allentown, PA (South Mountain)
443.350 / ALNTOWN / 100.0 / N3XG / (Linked to W3EPE, Palmerton-[EchoLink](#)) / Allentown, PA (Scholl Woodlands Preserve)

---- *Carbon county, PA* ----

147.255 / JIMTHRP / 162.2 / W3HA / ([EchoLink](#)) / Jim Thorpe, PA
449.375 / PALMRTN / 100.0 / W3EPE / (Linked to N3XG, Allentown) / Palmerton, PA (Blue Mountain)

---- *Simplex* ----

146.520 / V-CALL / 100.0 / (2 meter simplex calling frequency) / ---

VHF SIMPLEX FREQUENCIES

446.000 / U-CALL / 100.0 / (70cm simplex calling frequency) / ---

UHF SIMPLEX FREQUENCIES

223.500 / 2-CALL / 100.0 / (1.25 meter simplex calling frequency) / ---

---- Government (**RECEIVE ONLY!**) ----

460.500 / PDSOUTH / Monroe County POLICE SOUTH (Stroud Area Regional Police, ESU Police)

453.750 / MC FIRE / Monroe County Fire and Ambulance Dispatch, **See Note #2**

460.300 / BUSHKIL / Monroe County FIRE NORTHEAST (Bushkill & Marshalls Creek Fire Departments)

453.625 / BFD OPS / Bushkill Fire Department-Tactical

460.625 / STROUD / Monroe County FIRE EAST (Stroudsburg & East Stroudsburg Fire Departments)

453.5375 / FIRETAC / Monroe County Fire-Tactical

155.400 / EMS A6 / Monroe County EMS Channel A6 (Main channel)

460.400 / PTWP PD / Monroe County POLICE NORTH (Pocono Township PD)

460.150 / PMRP / Monroe County Pocono Mountain Regional Police

460.425 / COUNTYP / Monroe County Police "Countywide" (mostly Sheriff's Office)

460.275 / PD TAC / Monroe County Police-Tactical

453.450 / EMSCOMM / Monroe County EMS Command (used only during mass events)

452.200 / S SCRTY / Stroudsburg School District Security

155.775 / PIKE SD / Pike County Sheriff's Department

155.625 / PIKE PD / Pike County Police "Countywide"

159.210 / EPRPD / Eastern Pike Regional Police Department

154.445 / PIKE FD / Pike County Fire Dispatch, **See Note #3**

155.265 / PIKEEMS / Pike County Ambulance Dispatch, **See Note #3**

---- Multi-Use Radio Service ----

151.820 / MURS 1

151.880 / MURS 2

151.940 / MURS 3

151.625 / REDDOT / Red Dot •

151.955 / PURPLE / Purple Dot •

154.570 / BLUEDOT / Blue Dot •

154.600 / GREENDO / Green Dot •

---- Family Radio Service ----

462.5625 / FRS 1

462.5875 / FRS 2

462.6125 / FRS 3

462.6375 / FRS 4

462.6625 / FRS 5

462.6875 / FRS 6

462.7125 / FRS 7

467.5625 / FRS 8

467.5875 / FRS 9

467.6125 / FRS 10

467.6375 / FRS 11

467.6625 / FRS 12

467.6875 / FRS 13

467.7125 / FRS 14

---- General Mobile Radio Service ---- **See Note #4**

462.550 / GMRS 1

462.575 / GMRS 2

462.600 / GMRS 3

462.625 / GMRS 4

462.650 / GMRS 5

462.675 / GMRS 6

462.700 / GMRS 7

462.725 / GMRS 8

---- NOAA Weather (**RECEIVE ONLY!**) ----

162.400 / WX 01

162.425 / WX 02

162.450 / WX 03

162.475 / WX 04

162.500 / WX 05

162.525 / WX 06

162.550 / WX 07

Note #1: The repeater offset and PL tones in the Chirp programming file is set so that it actually transmits to a linked repeater in Wurtsboro NY.

Note #2: Also includes Lehman Township, Pike County (i.e. Bushkill).

Note #3: Does not include Lehman Township, Pike County (i.e. Bushkill) which is covered by the Monroe County Control Center.

Note #4: Currently set to RECEIVE ONLY in the Chirp programming file as I do not have a GMRS license. To use GMRS frequencies, you need a separate GMRS license from the FCC. Your Amateur Radio license does not authorize you for GMRS usage.

AMATEUR RADIO ANTENNA LENGTH CHART

	FREQUENCY (Mhz)	1/4λ (Feet)	1/2λ (Feet)	1λ (Feet)	1/2λ Inv Vee 90° (Feet)
160 METERS	1.800	130' 0"	260' 0"	558' 4"	257' 5"
	1.850	126' 6"	253' 0"	543' 3"	250' 5"
	1.900	123' 2"	246' 4"	528' 11"	243' 10"
	2.000	117' 0"	234' 0"	502' 6"	231' 8"
80 METERS	3.500	66' 10"	133' 9"	287' 2"	132' 5"
	3.750	62' 5"	124' 10"	268' 0"	123' 7"
	3.900	60' 0"	120' 0"	257' 8"	118' 10"
	4.000	58' 6"	117' 0"	251' 3"	115' 10"
40 METERS	7.000	33' 5"	66' 10"	143' 7"	66' 2"
	7.150	32' 9"	65' 5"	140' 7"	64' 10"
	7.300	32' 1"	64' 1"	137' 8"	63' 6"
30 METERS	10.100	23' 2"	46' 4"	99' 6"	45' 10"
	10.150	23' 1"	46' 1"	99' 0"	45' 8"
20 METERS	14.000	16' 9"	33' 5"	71' 9"	33' 1"
	14.150	16' 6"	33' 1"	71' 0"	32' 9"
	14.300	16' 4"	32' 9"	70' 3"	32' 5"
	14.350	16' 4"	32' 7"	70' 0"	32' 3"
17 METERS	18.068	12' 11"	25' 11"	55' 7"	25' 8"
	18.168	12' 11"	25' 9"	55' 4"	25' 6"
15 METERS	21.000	11' 2"	22' 3"	47' 10"	22' 1"
	21.200	11' 0"	22' 1"	47' 5"	21' 10"
	21.450	10' 11"	21' 10"	46' 10"	21' 7"
12 METERS	24.890	9' 5"	18' 10"	40' 5"	18' 7"
	24.990	9' 4"	18' 9"	40' 3"	18' 6"
10 METERS	28.000	8' 4"	16' 9"	35' 11"	16' 7"
	28.500	8' 3"	16' 5"	35' 3"	16' 3"
	29.700	7' 11"	15' 9"	33' 10"	15' 7"
6 METERS	50.000	4' 8"	9' 4"	20' 1"	9' 3"
	54.000	4' 4"	8' 8"	18' 7"	8' 7"
2 METERS	144.000	1' 8"	3' 3"	7' 0"	3' 3"
	148.000	1' 7"	3' 2"	6' 9"	3' 2"

Antenna length calculations are based on the following formulas:
 1/2 wave dipole (feet) = 468/frequency in Mhz
 Full wave loop (feet) = 1005/frequency in Mhz
 Inverted Vee with 90 degree included angle is 99% the length of 1/2 wave dipole

Note:
 Cut wire slightly longer to allow for connecting insulators and pruning.
 Height above ground, nearby wires, trees, etc. will change tuning slightly.

MILLENNIA
ARTS

HF antenna & feeder lengths in metres

Band	CW	SSB	¼ wave	¼ - 5%	¼ x 0.66	½ wave	½ - 5%	½ x 0.66	Full wave	F - 5%	F + 10%	F x 0.66
160m	1.825		41.07	39.01	27.38	82.13	78.03	54.76	164.27	156.06	180.70	109.51
		1.850	40.51	38.49	27.01	81.02	76.97	54.02	162.05	153.95	178.25	108.03
80m	3.520		21.29	20.23	14.19	42.58	40.45	28.39	85.17	80.91	93.69	56.78
		3.800	19.72	18.74	13.15	39.45	37.47	26.30	78.89	74.95	86.78	52.60
40m	7.025		10.67	10.14	7.11	21.34	20.27	14.23	42.68	40.54	46.94	28.45
		7.100	10.56	10.03	7.04	21.11	20.06	14.07	42.22	40.11	46.45	28.15
30m	10.105		7.42	7.05	4.94	14.83	14.09	9.89	29.67	28.18	32.63	19.78
20m	14.020		5.35	5.08	3.56	10.69	10.16	7.13	21.38	20.31	23.52	14.26
		14.250	5.26	5.00	3.51	10.52	9.99	7.01	21.04	19.99	23.14	14.03
17m	18.075		4.15	3.94	2.76	8.29	7.88	5.53	16.59	15.76	18.24	11.06
		18.120	4.14	3.93	2.76	8.27	7.86	5.51	16.54	15.72	18.20	11.03
15m	21.020		3.57	3.39	2.38	7.13	6.77	4.75	14.26	13.55	15.69	9.51
		21.250	3.53	3.35	2.35	7.05	6.70	4.70	14.11	13.40	15.52	9.41
12m	24.900		3.01	2.86	2.01	6.02	5.72	4.01	12.04	11.44	13.24	8.03
		24.950	3.00	2.85	2.00	6.01	5.71	4.01	12.02	11.41	13.22	8.01
10m	28.025		2.67	2.54	1.78	5.35	5.08	3.57	10.70	10.16	11.77	7.13
		28.500	2.63	2.50	1.75	5.26	5.00	3.51	10.52	9.99	11.57	7.01
6m	50.100		1.50	1.42	1.00	2.99	2.84	1.99	5.98	5.68	6.58	3.99
		52.050	1.44	1.37	0.96	2.88	2.74	1.92	5.76	5.47	6.34	3.84

Where a full wave in metres = frequency in Hz divided by the speed of light (299,792,458 m/s)

Reduce dipoles by ~5% for end effects. Add 5-10% to fullwave loops. Trim all antennas to resonance.

Lose one third physical length for velocity factor of typical coax.

73 de ZL2IFB

AMATEUR FREQUENCIES

METER BAND	FROM	TO	MODE
160	1.810	1.850	LSB
80	3.500	3.800	LSB
40	7.000	7.100	LSB
30	10.100	10.150	USB
20	14.000	14.350	USB
18	18.068	18.168	USB
15	21.000	21.450	USB
12	24.890	24.990	USB
10	28.000	29.700	FM/SSB
6	50.000	54.000	FM/SSB
2	144.000	146.000	FM/SSB
70 cm	430.000	440.000	FM/SSB
23 cm	1240.000	1300.000	FM/SSB

MORSE CODE CHART

LETTERS

A	• —	N	— •
B	— • • •	O	— — —
C	— • — •	P	• — — •
D	— • •	Q	— — • —
E	•	R	• — •
F	• • — •	S	• • •
G	— — •	T	—
H	• • • •	U	• • —
I	• •	V	• • • —
J	• — — —	W	• — —
K	— • —	X	— • • —
L	• — • •	Y	— • — —
M	— —	Z	— — • •

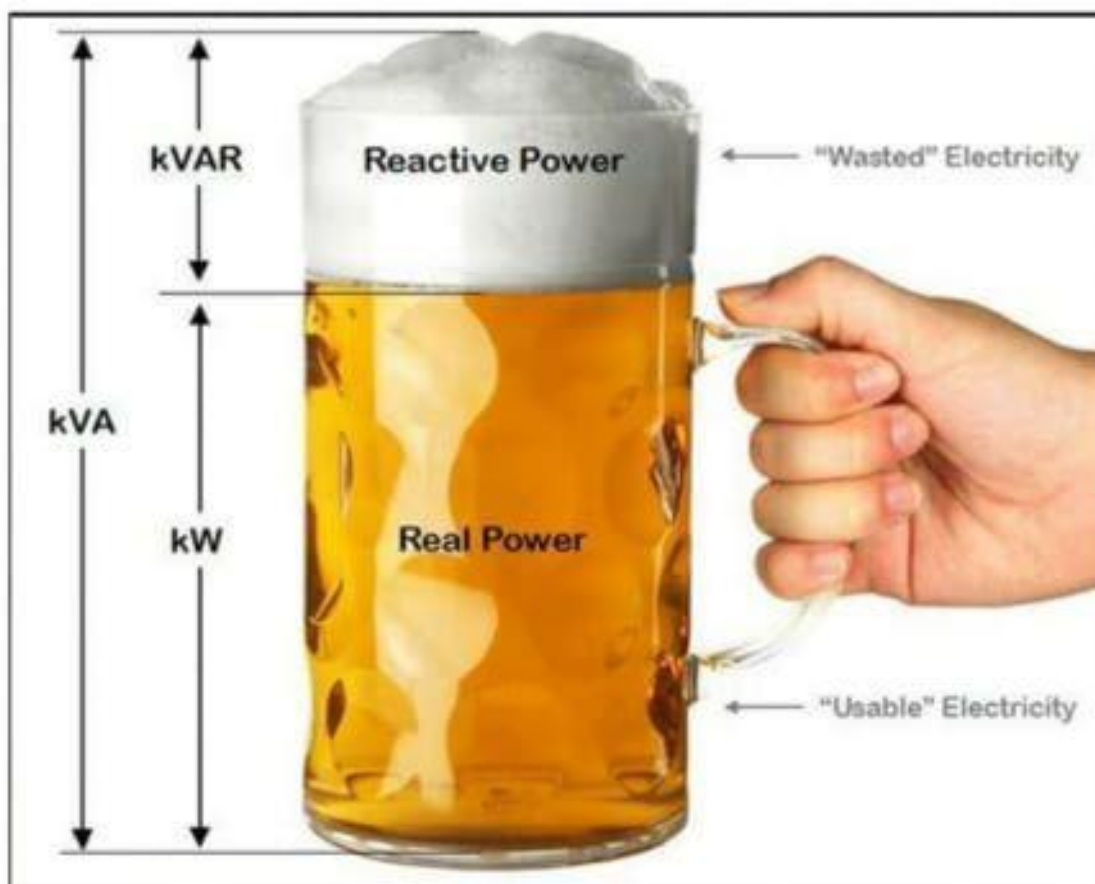
NUMBERS

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1	• — — — —
2	• • — — —
3	• • • — —
4	• • • • —
5	• • • • •
6	— • • • •
7	— — • • •
8	— — — • •
9	— — — — •

PUNCTUATION

Full Stop [.]	• — • — • —
Comma [,]	— — • • — —
Colon [:]	— — — • • •
Question Mark [?]	• • — — • •
Apostrophe [']	• — — — — •
Hyphen or Dash [-]	— • • • • —
Fraction Bar [/]	— • • — •
Parenthesis Open [(]	— • — — •
Parenthesis Close [)]	— • — — • —
Quotation Marks ["]	• — • • — •
Plus Sign [+]	• • — • •
At sign [@]	• — — • • •
Equal Sign [=]	— • • • • —

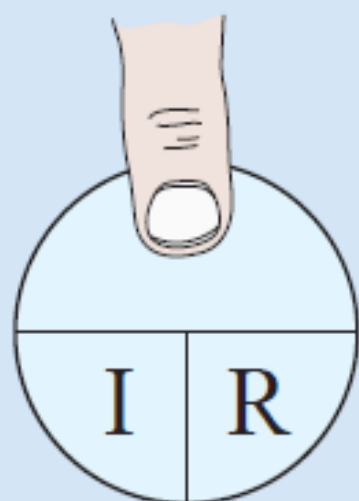
OFFGRIDWEB.COM



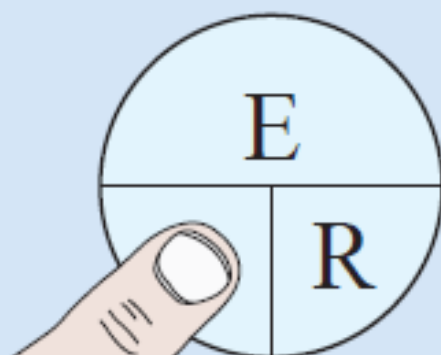
dBm	V	Po
+ 53	100.0	200 W
+ 50	70.7	100 W
+ 49	64.0	80 W
+ 48	58.0	64 W
+ 47	50.0	50 W
+ 46	44.5	40 W
+ 45	40.0	32 W
+ 44	32.5	25 W
+ 43	32.0	20 W
+ 42	28.0	16 W
+ 41	26.2	12.5 W
+ 40	22.5	10 W
+ 39	20.0	8 W
+ 38	18.0	6.4 W
+ 37	16.0	5 W
+ 36	14.1	4 W
+ 35	12.5	3.2 W
+ 34	11.5	2.5 W
+ 33	10.0	2 W
+ 32	9.0	1.6 W
+ 31	8.0	1.25 W

dBm	V	Po
+ 30	7.10	1.0 W
+ 29	6.40	800 mW
+ 28	5.80	640 mW
+ 27	5.00	500 mW
+ 26	4.45	400 mW
+ 25	4.00	320 mW
+ 24	3.55	250 mW
+ 23	3.20	200 mW
+ 22	2.80	160 mW
+ 21	2.52	125 mW
+ 20	2.25	100 mW
+ 19	2.00	80 mW
+ 18	1.80	64 mW
+ 17	1.60	50 mW
+ 16	1.41	40 mW
+ 15	1.25	32 mW
+ 14	1.15	25 mW
+ 13	1.00	20 mW
+ 12	0.90	16 mW
+ 11	0.80	12.5 mW
+ 10	0.71	10 mW

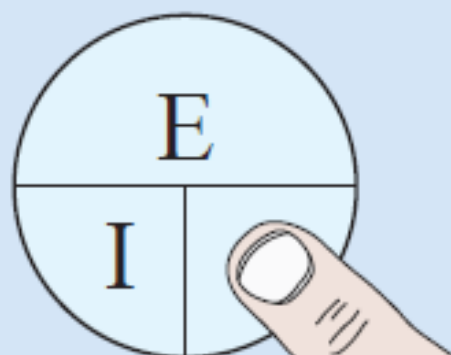
dBm	V	Po
+ 9	0.64	8 mW
+ 8	0.58	6.4 mW
+ 7	0.500	5 mW
+ 6	0.445	4 mW
+ 5	0.400	3.2 mW
+ 4	0.355	2.5 mW
+ 3	0.320	2.0 mW
+ 2	0.280	1.6 mW
+ 1	0.252	1.25 mW
0	0.225	1.0 mW
- 1	0.200	0.80 mW
- 2	0.180	0.64 mW
- 3	0.160	0.50 mW
- 4	0.141	0.40 mW
- 5	0.125	0.32 mW
- 6	0.115	0.25 mW
- 7	0.100	0.20 mW
- 8	0.090	0.16 mW
- 9	0.080	0.125 mW
- 10	0.071	0.10 mW



**To find
voltage**



**To find
current**



**To find
resistance**

VSWR/Return Loss vs. Transmitted Power

VSWR	VSWR (dB)	RETURN LOSS (dB)	TRANS. LOSS (dB)	VOLT. REFL. COEFF.	POWER TRANS. (%)	POWER REFL. (%)	VSWR	VSWR (dB)	RETURN LOSS (dB)	TRANS. LOSS (dB)	VOLT. REFL. COEFF.	POWER TRANS. (%)	POWER REFL. (%)
1.00	.0	∞	.000	.00	100.0	.0	1.64	4.3	12.3	.263	.24	94.1	5.9
1.01	.1	46.1	.000	.00	100.0	.0	1.66	4.4	12.1	.276	.25	93.8	6.2
1.02	.2	40.1	.000	.01	100.0	.0	1.68	4.5	11.9	.289	.25	93.6	6.4
1.03	.3	36.6	.001	.01	100.0	.0	1.70	4.6	11.7	.302	.26	93.3	6.7
1.04	.3	34.2	.002	.02	100.0	.0	1.72	4.7	11.5	.315	.26	93.0	7.0
1.05	.4	32.3	.003	.02	99.9	.1	1.74	4.8	11.4	.329	.27	92.7	7.3
1.06	.5	30.7	.004	.03	99.9	.1	1.76	4.9	11.2	.342	.28	92.4	7.6
1.07	.6	29.4	.005	.03	99.9	.1	1.78	5.0	11.0	.356	.28	92.1	7.9
1.08	.7	28.3	.006	.04	99.9	.1	1.80	5.1	10.9	.370	.29	91.8	8.2
1.09	.7	27.3	.008	.04	99.8	.2	1.82	5.2	10.7	.384	.29	91.5	8.5
1.10	.8	26.4	.010	.08	99.8	.2	1.84	5.3	10.6	.398	.30	91.3	8.7
1.11	.9	25.7	.012	.05	99.7	.3	1.86	5.4	10.4	.412	.30	91.0	9.0
1.12	1.0	24.9	.014	.06	99.7	.3	1.88	5.5	10.3	.426	.31	90.7	9.3
1.13	1.1	24.3	.016	.06	99.6	.4	1.90	5.6	10.2	.440	.31	90.4	9.6
1.14	1.1	23.7	.019	.07	99.6	.4	1.92	5.7	10.0	.454	.32	90.1	9.9
1.15	1.2	23.1	.021	.07	99.5	.5	1.94	5.8	9.9	.468	.32	89.8	10.2
1.16	1.3	22.6	.024	.07	99.5	.5	1.96	5.8	9.8	.483	.32	89.5	10.5
1.17	1.4	22.1	.027	.08	99.4	.6	1.98	5.9	9.7	.497	.33	89.2	10.8
1.18	1.4	21.7	.030	.08	99.3	.7	2.00	6.0	9.5	.512	.33	88.9	11.1
1.19	1.5	21.2	.033	.09	99.2	.8	2.50	8.0	7.4	.881	.43	81.6	18.4
1.20	1.6	20.8	.036	.09	99.2	.8	3.00	9.5	6.0	1.249	.50	75.0	25.0
1.21	1.7	20.4	.039	.10	99.1	.9	3.50	10.9	5.1	1.603	.56	69.1	30.9
1.22	1.7	20.1	.043	.10	99.0	1.0	4.00	12.0	4.4	1.938	.60	64.0	36.0
1.23	1.8	19.7	.046	.10	98.9	1.1	4.50	13.1	3.9	2.255	.64	59.5	40.5
1.24	1.9	19.4	.050	.11	98.9	1.1	5.00	14.0	3.5	2.553	.67	55.6	44.4
1.25	1.9	19.1	.054	.11	98.8	1.2	5.50	14.8	3.2	2.834	.69	52.1	47.9
1.26	2.0	18.8	.058	.12	98.7	1.3	6.00	15.6	2.9	3.100	.71	49.0	51.0
1.27	2.1	18.5	.062	.12	98.6	1.4	6.50	16.3	2.7	3.351	.73	46.2	53.8
1.28	2.1	18.2	.066	.12	98.5	1.5	7.00	16.9	2.5	3.590	.75	43.7	56.2
1.29	2.2	17.9	.070	.13	98.4	1.6	7.50	17.5	2.3	3.817	.76	41.5	58.5
1.30	2.3	17.7	.075	.13	98.3	1.7	8.00	18.1	2.2	4.033	.78	39.5	60.5
1.32	2.4	17.2	.083	.14	98.1	1.9	8.50	18.6	2.1	4.240	.79	37.7	62.3
1.34	2.5	16.8	.093	.15	97.9	2.1	9.00	19.1	1.9	4.437	.80	36.0	64.0
1.36	2.7	16.3	.102	.15	97.7	2.3	9.50	19.6	1.8	4.626	.81	34.5	65.5
1.38	2.8	15.9	.112	.16	97.5	2.5	10.00	20.0	1.7	4.807	.82	33.1	66.9
1.40	2.9	15.6	.122	.17	97.2	2.8	11.00	20.8	1.6	5.149	.83	30.6	69.4
1.42	3.0	15.2	.133	.17	97.0	3.0	12.00	21.6	1.5	5.466	.85	28.4	71.6
1.44	3.2	14.9	.144	.18	96.7	3.3	13.00	22.3	1.3	5.762	.86	26.5	73.5
1.46	3.3	14.6	.155	.19	96.5	3.5	14.00	22.9	1.2	6.040	.87	24.9	75.1
1.48	3.4	14.3	.166	.19	96.3	3.7	15.00	23.5	1.2	6.301	.88	23.4	76.6
1.50	3.5	14.0	.177	.20	96.0	4.0	16.00	24.1	1.1	6.547	.88	22.1	77.9
1.52	3.6	13.7	.189	.21	95.7	4.3	17.00	24.6	1.0	6.780	.89	21.0	79.0
1.54	3.8	13.4	.201	.21	95.5	4.5	18.00	25.1	1.0	7.002	.89	19.9	80.1
1.56	3.9	13.2	.213	.22	95.2	4.8	19.00	25.6	.9	7.212	.90	19.0	81.0
1.58	4.0	13.0	.225	.22	94.9	5.1	20.00	26.0	.9	7.413	.90	18.1	81.9
1.60	4.1	12.7	.238	.23	94.7	5.3	25.00	28.0	.7	8.299	.92	14.8	85.2
1.62	4.2	12.5	.250	.24	94.4	5.6	30.00	29.5	.6	9.035	.94	12.5	87.5



Inch - Fraction - Decimal - mm Conversion Chart

Inches	Decimal	mm
1/64	0.0156	0.3969
1/32	0.0313	0.7938
3/64	0.0469	1.1906
1/16	0.0625	1.5875
5/64	0.0781	1.9844
3/32	0.0938	2.3813
7/64	0.1094	2.7781
1/8	0.1250	3.1750
9/64	0.1406	3.5719
5/32	0.1563	3.9688
11/64	0.1719	4.3656
3/16	0.1875	4.7625
13/64	0.2031	5.1594
7/32	0.2188	5.5563
15/64	0.2344	5.9531
1/4	0.2500	6.3500
17/64	0.2656	6.7469
9/32	0.2813	7.1438
19/64	0.2969	7.5406
5/16	0.3125	7.9375
21/64	0.3281	8.3344
11/32	0.3438	8.7313
23/64	0.3594	9.1281
3/8	0.3750	9.5250
25/64	0.3906	9.9219
13/32	0.4063	10.3188
27/64	0.4219	10.7156
7/16	0.4375	11.1125
29/64	0.4531	11.5094
15/32	0.4688	11.9063
31/64	0.4844	12.3031
1/2	0.5000	12.7000

Inches	Decimal	mm
33/64	0.5156	13.0969
17/32	0.5313	13.4938
35/64	0.5469	13.8906
9/16	0.5625	14.2875
37/64	0.5781	14.6844
19/32	0.5938	15.0813
39/64	0.6094	15.4781
5/8	0.6250	15.8750
41/64	0.6406	16.2719
21/32	0.6563	16.6688
43/64	0.6719	17.0656
11/16	0.6875	17.4625
45/64	0.7031	17.8594
23/32	0.7188	18.2563
47/64	0.7344	18.6531
3/4	0.7500	19.0500
49/64	0.7656	19.4469
25/32	0.7813	19.8438
51/64	0.7969	20.2406
13/16	0.8125	20.6375
53/64	0.8281	21.0344
27/32	0.8438	21.4313
55/64	0.8594	21.8281
7/8	0.8750	22.2250
57/64	0.8906	22.6219
29/32	0.9063	23.0188
59/64	0.9219	23.4156
15/16	0.9375	23.8125
61/64	0.9531	24.2094
31/32	0.9688	24.6063
63/64	0.9844	25.0031
1	1.0000	25.4000

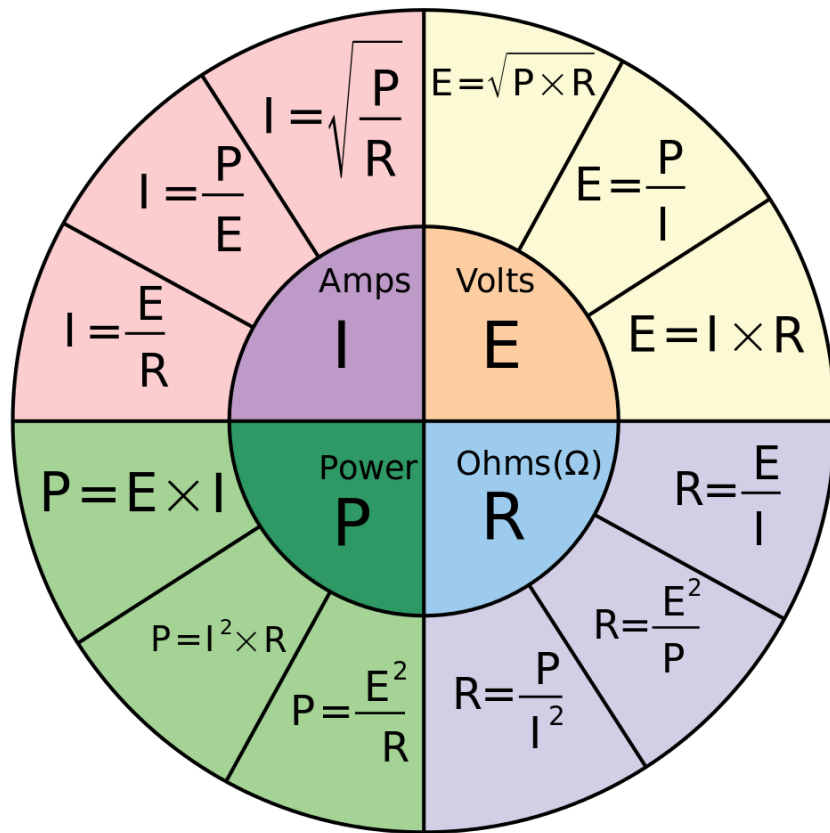
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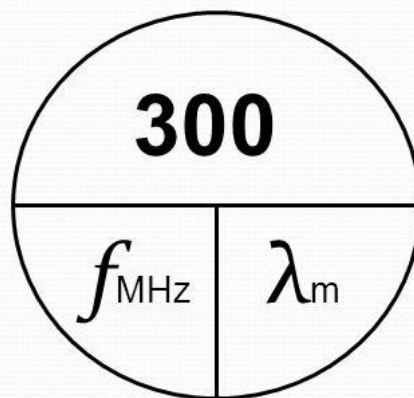
Phone: 800-777-0703 • Tech Support and International: 330-572-3200

email: DXEngineering@DXEngineering.com

DXE-CONV-CHART Rev. 0



Wavelength



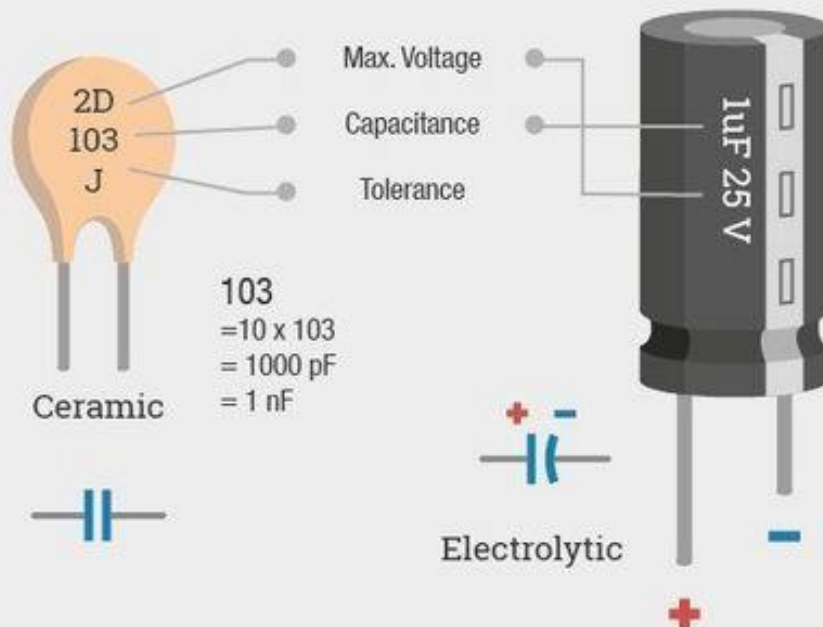
Frequency (MHz) = 300 / Wavelength (meters)
Wavelength (meters) = 300 / Frequency (MHz)





Capacitor Coding

Common Capacitors



Capacitance Conversion Table

Microfarads (μF)		Nanofarads (nF)		Picofarads (pF)
0.000001 μF	=	0.001 nF	=	1 pF
0.00001 μF	=	0.01 nF	=	10 pF
0.0001 μF	=	0.1 nF	=	100 pF
0.001 μF	=	1 nF	=	1 000 pF
0.01 μF	=	10 nF	=	10 000 pF
0.1 μF	=	100 nF	=	100 000 pF
1 μF	=	1 000 nF	=	1 000 000 pF

Max. Operating Voltage

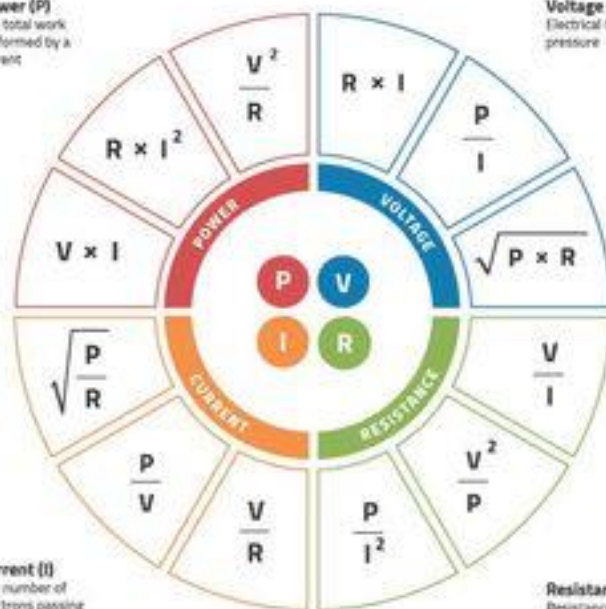
1H	50 V	2E	250 V
2A	100 V	2G	400 V
2T	150 V	2J	630 V
2D	200 V		

Tolerance

B	± 0.1 pF	H	$\pm 3\%$
C	± 0.25 pF	J	$\pm 5\%$
D	± 0.50 pF	K	$\pm 10\%$
F	$\pm 1\%$	M	$\pm 20\%$
G	$\pm 2\%$	Z	+80% -20%

Ohm's Law

Power (P)
The total work performed by a current



Voltage (V)
Electrical force or pressure

Current (I)
The number of electrons passing in a single point

Resistance (R)
Resistance to the flow of current

Basic Units

Quantity	Unit
Capacitance	F Farad
Charge	C Coulomb
Current	A Ampere
Energy	J Joule
Force	N Newton
Frequency	Hz Hertz
Inductance	H Henry
Magnetic Flux	Wb Weber
Potential	V Volt
Power	W Watt
Resistance	Ω Ohm

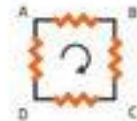
Kirchhoff's Laws

Closed Loop Rule

The directed sum of the electrical potential differences (voltage) around any closed circuit is zero

$$\sum \Delta V_{\text{closed loop}} = 0$$

$$V_{AB} + V_{BC} + V_{CD} + V_{DA} = 0$$

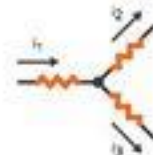


Junction Rule

The sum of currents entering the junction are thus equal to the sum of currents leaving

$$\sum I_{\text{in}} = \sum I_{\text{out}}$$

$$I_1 = I_2 + I_3$$



Resistor Network

Series $R_T = R_1 + R_2 + R_3$



Parallel $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

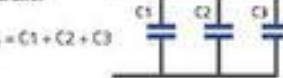


Capacitor Network

Series $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$



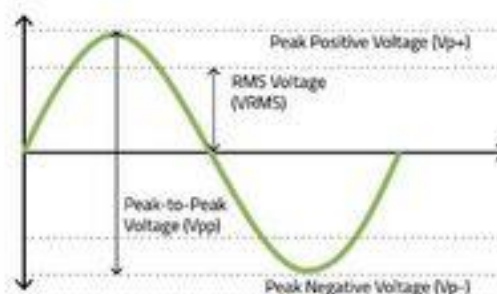
Parallel $C_T = C_1 + C_2 + C_3$



Unit Prefixes

Tera-	T	$\times 10^{12}$	Milli-	m	$\times 10^{-3}$
Giga-	G	$\times 10^9$	Micro-	μ	$\times 10^{-6}$
Mega-	M	$\times 10^6$	Nano-	n	$\times 10^{-9}$
Kilo-	K	$\times 10^3$	Pico-	p	$\times 10^{-12}$
Hecto-	H	$\times 10^2$			
Deka-	Da	$\times 10^1$	examples:		
(base)	-	$\times 10^0$	25 μ A		
Deci-	d	$\times 10^{-1}$	$= 25 \times 10^{-6}$ A		
Centi-	c	$\times 10^{-2}$	$= 0.000025$ A		
			4.7M Ω		
			$= 4.7 \times 10^6 \Omega$		
			$= 4,700,000 \Omega$		

Alternating Current



Average AC Voltage
 $= 0.637 \times \text{Peak}$
 $= 0.9 \times \text{RMS}$

RMS AC Voltage
 $= 0.707 \times \text{Peak}$
 $= 1.11 \times \text{Average}$

Peak AC Voltage
 $= 1.414 \times \text{RMS}$
 $= 1.57 \times \text{Average}$

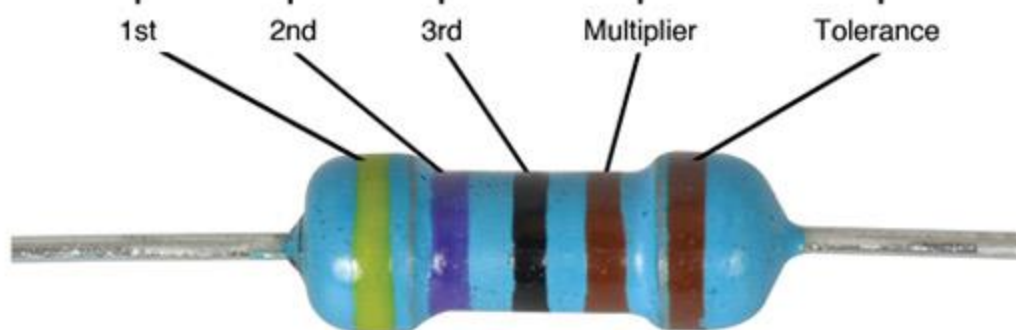
Basic Electronics Theory

TinkrPostr

VISUAL REFERENCE for MAKERS & LEARNERS

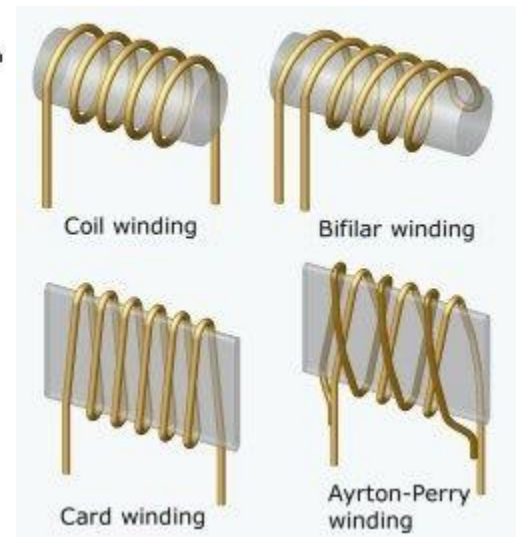
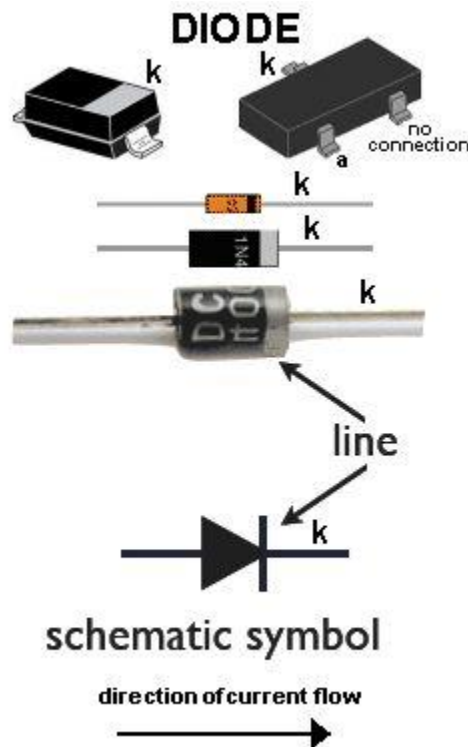
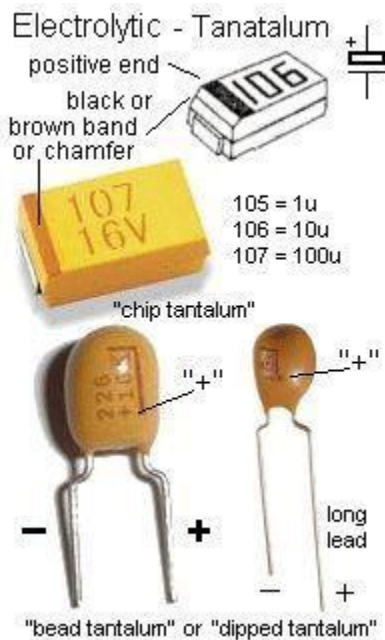
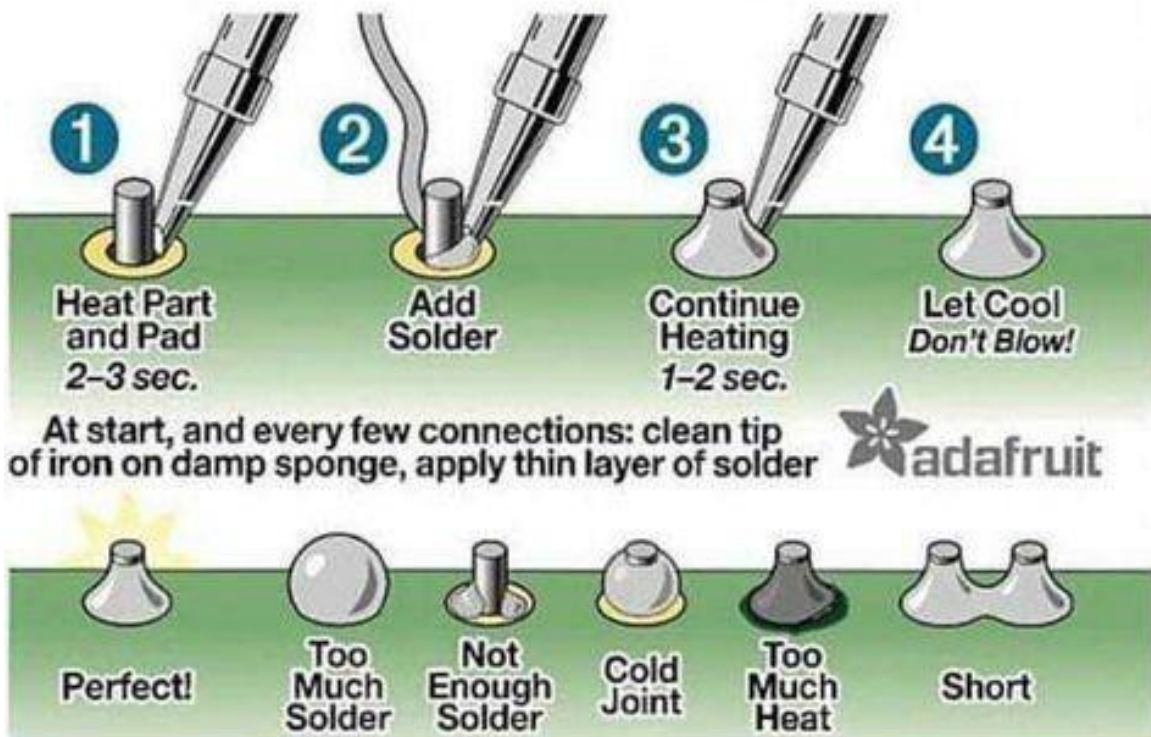


	1st	2nd	3rd	Multiplier	Tolerance	
0	Black	Black	Black	Black	1	
1	Brown	Brown	Brown	Brown	10^1	Brown 1%
2	Red	Red	Red	Red	10^2	Red 2%
3	Orange	Orange	Orange	Orange	10^3	
4	Yellow	Yellow	Yellow	Yellow	10^4	
5	Green	Green	Green	Green	10^5	
6	Blue	Blue	Blue	Blue	10^6	
7	Violet	Violet	Violet	Violet	10^7	
8	Grey	Grey	Grey	Grey	10^8	
9	White	White	White	White	10^9	
				Gold	0.1	Gold 5%
				Silver	0.01	Silver 10%

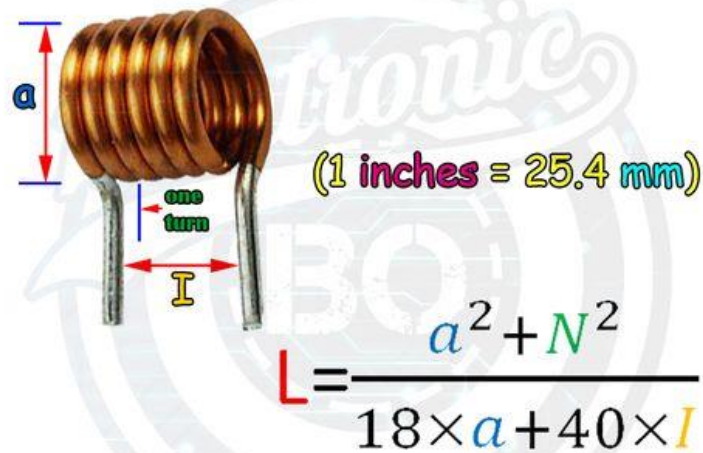


4.7k ohm 1%

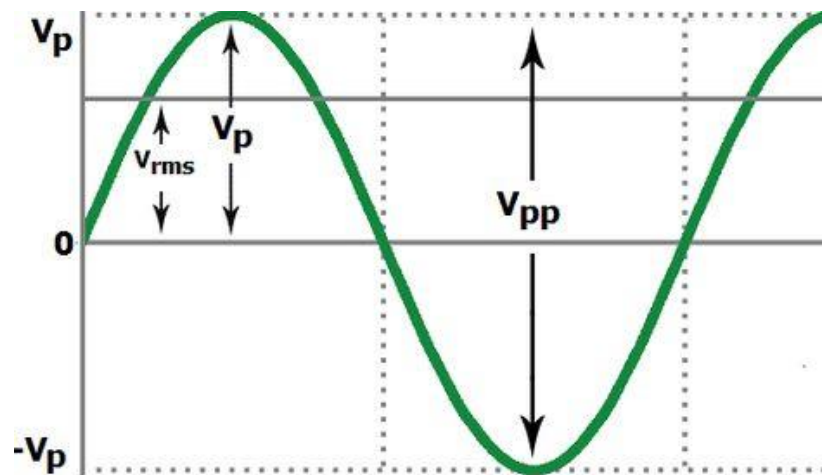
Soldering Procedures



Coil Design and Inductance Calculator



L =Inductance (uH)
 N =Total Number of Turns
 I =Length of the Coil (inches)
 a =Coil Outside Diameter (inches)



$$V_{rms} = \frac{1}{\sqrt{2}} * V_p = 0.7071 * V_p$$

$$V_{rms} = \frac{1}{2\sqrt{2}} * V_{pp} = 0.35355 * V_{pp}$$

$$V_{rms} = \frac{\pi}{2\sqrt{2}} * V_{avg} = 1.1107 * V_{avg}$$

CIRCUIT SYMBOLS									
AC current		AC voltage		ALTERNATOR Triac		Main Terminal 1	Antenna (see note)		Antenna balanced
AND Gate		AND Gate		Antenna Loop, Shielded		Antenna Loop, Unshielded	Antenna unbalanced		Antenna unbalanced
Attenuator, fixed (see Resistor)		Attenuator, variable (see Resistor)		Battery					
Bilateral Switch (DAC)		Bridge Rectifier (Diode Bridge)		BUFFER (Amplifier Gate)					
BUFFER (amplifier gate)		Buzzer		Capacitor feedthrough					
Capacitor non-polarized		Capacitor polarized (see electrolytic)		Capacitor Variable					
Carry Resistor		Cell		Circuit Breaker					
Coaxial Cable		CRO - Cathode Ray Oscilloscope		Crystal Microphone (Piezoelectric)					
Connectors		Crystal Piezoelectric		DC current					
Connector		Darlington Transistor		Delay Line					
Connector		DIAC (Bistable Switch)		Diode					
Diode - Diode		Diode - Light Emitting (LED)		Diode Photo Sensitive					
Diode Photovoltaic		Diode Bridge (Bridge Rectifier)		Diode - Pin					
Diode - Varactor		Diode - Zener		Earth Ground					
Earpiece (earphone, crystal receiver)		Electroluminescence		Electret Microphone (Condenser mic)					
Electrolytic (Polarized Capacitor) standard symbol (positive on top)		Electrolytic - Tanaluminum positive and black band or character		Exclusive-OR Gate (XOR Gate)					
Field Effect Transistor (FET) n-channel also N-Channel J FET		Field Effect Transistor (FET) p-channel also P-Channel J FET		Flashing LED (Light Emitting Diode) (Indicates chip mode LED)					
Ferrite Bead		Fuse		Galvanometer					
Globe		Ground Chassis		Ground Earth					
Heater (immersion heater, cooker etc)		IC Integrated Circuit		Inductor Air Core					
Headphone		Inductor Variable		Inductor Iron Core or ferrite core					
Inductor Tapped		INVERTER (NOT Gate)		Integrated Circuit					
Inverter (NOT Gate)		Jack Co-axial		Jack Phone (Switched)					
Jack Co-axial		Jack Phone (Phone Jack)		Lamp Incandescent					
Jack Phone (Co conductor)		Key Telegraph (Bistable Flip)		LDR Light Dependent Resistor					
Lamp - Neon		LASCR Light Activated Silicon Controlled Rectifier		Light Emitting Diode (LED) - tuning					
LED diode		Light Emitting Diode (LED)		Light Emitting Diode (LED) - tuning					
Mercury Switch		Micro-amp meter (micro-ammeter)		Microphone (see Electret Mic)					
Microphone (Crystal - piezoelectric)		Milliamp meter (milli-ammeter)		Motor					
NAND Gate		NAND Gate		Nitinol wire "Muscle wire"					
Negative Voltage Connection		NOR Gate		NOR Gate					
NOT Gate		NOT Gate		Ohm meter					
Operational Amplifier (Op Amp)		Optocoupler (Transistor output)		Opto Coupler (Opto-isolation)					
Optocoupler (Darlington output)		Optocoupler (see CRO)		Outlet (Power Outlet)					
OR Gate		Photo Cell (photo sensitive resistor)		Photo Diode					
Piezo Diaphragm		Photo FET (Field Effect Transistor)		Photo Transistor					
Photo Darlington Transistor									
Photovoltaic Cell (see Cell)		Piezo Tweeter (Piezo Speaker)		Positive Voltage Connection					
Potentiometer Variable resistor		Programmable Unijunction Transistor (PUT)		Rectifier Semiconductor					
Relay - spot		Relay - spot		Relay - spot					
Relay - spot		Relay - spot		Relay - spot					
Resistor Fixed		Resistor Non inductive		Resistor variable					
Resistor variable		Resonator 3-pin		Rheostat (Variable Resistor)					
Schottky Diode (see Diode) Low forward voltage 0.3V Fast switching also called Schottky Barrier Diode		Shielding		Silicon Bilateral Switch (SBS)					
Silicon Bilateral Switch (SBS)		Silicon Unilateral Switch (SUS)		Silicon Controlled Rectifier (SCR)					
Signal Generator		Solar Cell		Switch - process activated normally open normally closed					
Shockley Diode 4 layer PNPN device Remains off until forward current reaches the forward break-over voltage		Shockley Diode		Speaker					
Silicon Controlled Rectifier (SCR)		Shockley Diode		Switch - push (Push-Button)					
Solar Cell		Shockley Diode		Switch - push-off (used in alarm etc)					
Switch - process activated normally open normally closed		Shockley Diode		Switch - push-off (used in alarm etc)					
Switch - push (Push-Button)		Shockley Diode		Switch - push-off (used in alarm etc)					
Switch - push-off (used in alarm etc)		Shockley Diode		Switch - push-off (used in alarm etc)					
Switch - push-off (used in alarm etc)		Shockley Diode		Switch - push-off (used in alarm etc)					
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