

Table 7.47

Voltage-Power Conversion Table

Based on a 50-ohm system

Voltage			Power	
RMS	Peak-to-Peak	dBmV	Watts	dBm
0.01 μV	0.0283 μV	-100	2×10 ⁻¹⁸	-147.0
0.02 μV	0.0566 μV	-93.98	8×10 ⁻¹⁸	-141.0
0.04 μV	0.113 μV	-87.96	32×10 ⁻¹⁸	-134.9
0.08 μV	0.226 μV	-81.94	128×10 ⁻¹⁸	-128.9
0.1 μV	0.283 μV	-80.0	200×10 ⁻¹⁸	-127.0
0.2 μV	0.566 μV	-73.98	800×10 ⁻¹⁸	-121.0
0.4 μV	1.131 μV	-67.96	3.2×10 ⁻¹⁵	-114.9
0.8 μV	2.263 μV	-61.94	12.8×10 ⁻¹⁵	-108.9
1.0 μV	2.828 μV	-60.0	20.0×10 ⁻¹⁵	-107.0
2.0 μV	5.657 μV	-53.98	80.0×10 ⁻¹⁵	-101.0
4.0 μV	11.31 μV	-47.96	320.0×10 ⁻¹⁵	-94.95
8.0 μV	22.63 μV	-41.94	1.28×10 ⁻¹²	-88.93
10.0 μV	28.28 μV	-40.00	2.0×10 ⁻¹²	-86.99
20.0 μV	56.57 μV	-33.98	8.0×10 ⁻¹²	-80.97
40.0 μV	113.1 μV	-27.96	32.0×10 ⁻¹²	-74.95
80.0 μV	226.3 μV	-21.94	128.0×10 ⁻¹²	-68.93
100.0 μV	282.8 μV	-20.0	200.0×10 ⁻¹²	-66.99
200.0 μV	565.7 μV	-13.98	800.0×10 ⁻¹²	-60.97
400.0 μV	1.131 mV	-7.959	3.2×10 ⁻⁹	-54.95
800.0 μV	2.263 mV	-1.938	12.8×10 ⁻⁹	-48.93
1.0 mV	2.828 mV	0.0	20.0×10 ⁻⁹	-46.99
2.0 mV	5.657 mV	6.02	80.0×10 ⁻⁹	-40.97
4.0 mV	11.31 mV	12.04	320×10 ⁻⁹	-34.95
8.0 mV	22.63 mV	18.06	1.28 μW	-28.93
10.0 mV	28.28 mV	20.00	1 2.0 μW	-26.99
20.0 mV	56.57 mV	26.02	8.0 μW	-20.97
40.0 mV	113.1 mV	32.04	32.0 μW	-14.95
80.0 mV	226.3 mV	38.06	128.0 μW	-8.93
100.0 mV	282.8 mV	40.0	200.0 μW	-6.99
200.0 mV	565.7 mV	46.02	800.0 μW	-0.97
223.6 mV	632.4 mV	46.99	1.0 mW	0
400.0 mV	1.131 V	52.04	3.2 mW	5.05
800.0 mV	2.263 V	58.06	12.80 mW	11.07
1.0 V	2.828 V	60.0	20.0 mW	13.01
2.0 V	5.657 V	66.02	80.0 mW	19.03
4.0 V	11.31 V	72.04	320.0 mW	25.05
8.0 V	22.63 V	78.06	1.28 W	31.07
10.0 V	28.28 V	80.0	2.0 W	33.01
20.0 V	56.57 V	86.02	8.0 W	39.03
40.0 V	113.1 V	92.04	32.0 W	45.05
80.0 V	226.3 V	98.06	128.0 W	51.07
100.0 V	282.8 V	100.0	200.0 W	53.01
200.0 V	565.7 V	106.0	800.0 W	59.03
223.6 V	632.4 V	107.0	1,000.0 W	60.0
400.0 V	1,131.0 V	112.0	3,200.0 W	65.05
800.0 V	2,263.0 V	118.1	12,800.0 W	71.07
1000.0 V	2,828.0 V	120.0	20,000 W	73.01
2000.0 V	5,657.0 V	126.0	80,000 W	79.03
4000.0 V	11,310.0 V	132.0	320,000 W	85.05
8000.0 V	22,630.0 V	138.1	1.28 MW	91.07
10,000.0 V	28,280.0 V	140.0	2.0 MW	93.01

Voltage, $V_{p-p} = V_{RMS} \times 2 \sqrt{2}$

Voltage, dBmV = $20 \times \log_{10} \left[\frac{V_{RMS}}{0.001V} \right]$ or $20 \times \log_{10} [mV_{RMS}]$

Power, watts = $\left[\frac{V_{RMS}^2}{50 \Omega} \right]$

Power, dBm = $10 \times \log_{10} \left[\frac{\text{Power (watts)}}{0.001W} \right]$ or $10 \times \log_{10} [mW_{RMS}]$

Table 7.55
Standard vs American Wire Gauge

SWG	Diam (in.)	Nearest AWG
12	0.104	10
14	0.08	12
16	0.064	14
18	0.048	16
20	0.036	19
22	0.028	21
24	0.022	23
26	0.018	25
28	0.0148	27
30	0.0124	28
32	0.0108	29
34	0.0092	31
36	0.0076	32
38	0.006	34
40	0.0048	36
42	0.004	38
44	0.0032	40
46	0.0024	—

Table 7.56
Pi-Network Resistive Attenuators (50 Ω)

dB Atten.	R1 (Ohms)	R2 (Ohms)
1.0	870	5.77
2.0	436	11.6
3.0	292	17.6
4.0	221	23.8
5.0	178	30.4
6.0	150	37.4
7.0	131	44.8
8.0	116	52.8
9.0	105	61.6
10.0	96.2	71.2
11.0	89.2	81.7
12.0	83.5	93.2
13.0	78.8	106
14.0	74.9	120
15.0	71.6	136
16.0	68.8	154
17.0	66.4	173
18.0	64.4	195
19.0	62.6	220
20.0	61.1	248
21.0	59.8	278
22.0	58.6	313
23.0	57.6	352
24.0	56.7	395
25.0	56.0	443
30.0	53.2	790
35.0	51.8	1405
40.0	51.0	2500
45.0	50.5	4446
50.0	50.3	7906
55.0	50.2	14,058
60.0	50.1	25,000

Note: A PC board kit for the Low-Power Step Attenuator (Sep 1982 QST) is available from FAR Circuits. Project details are in the Handbook **template package STEP ATTENUATOR**.

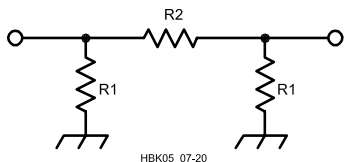


Table 7.57
T-Network Resistive Attenuators (50 Ω)

dB Atten.	R1 (Ohms)	R2 (Ohms)
1.0	2.88	433
2.0	5.73	215
3.0	8.55	142
4.0	11.3	105
5.0	14.0	82.2
6.0	16.6	66.9
7.0	19.1	55.8
8.0	21.5	47.3
9.0	23.8	40.6
10.0	26.0	35.1
11.0	28.0	30.6
12.0	30.0	26.8
13.0	31.7	23.5
14.0	33.3	20.8
15.0	35.0	18.4
16.0	36.3	16.2
17.0	37.6	14.4
18.0	38.8	12.8
19.0	40.0	11.4
20.0	41.0	10.0
21.0	41.8	9.0
22.0	42.6	8.0
23.0	43.4	7.1
24.0	44.0	6.3
25.0	44.7	5.6
30.0	47.0	3.2
35.0	48.2	1.8
40.0	49.0	1.0
45.0	49.4	0.56
50.0	49.7	0.32
55.0	49.8	0.18
60.0	49.9	0.10

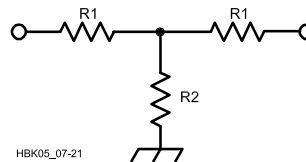


Table 7.58
Impedance of Various Two-Conductor Lines

Wire Size	Twists per Inch				
	2.5	5	7.5	10	12.5
no. 20	43	39	35		
no. 22	46	41	39	37	32
no. 24	60	45	44	43	41
no. 26	65	57	54	48	47
no. 28	74	53	51	49	47
no. 30			49	46	47

Measured in ohms at 14.0 MHz.

This illustrates the impedance of various two-conductor lines as a function of the wire size and number of twists per inch.