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USEFUL DATA FOR THE PRACTICAL RADIO MAN

PART II

By the Engineering Department

AEROVOX

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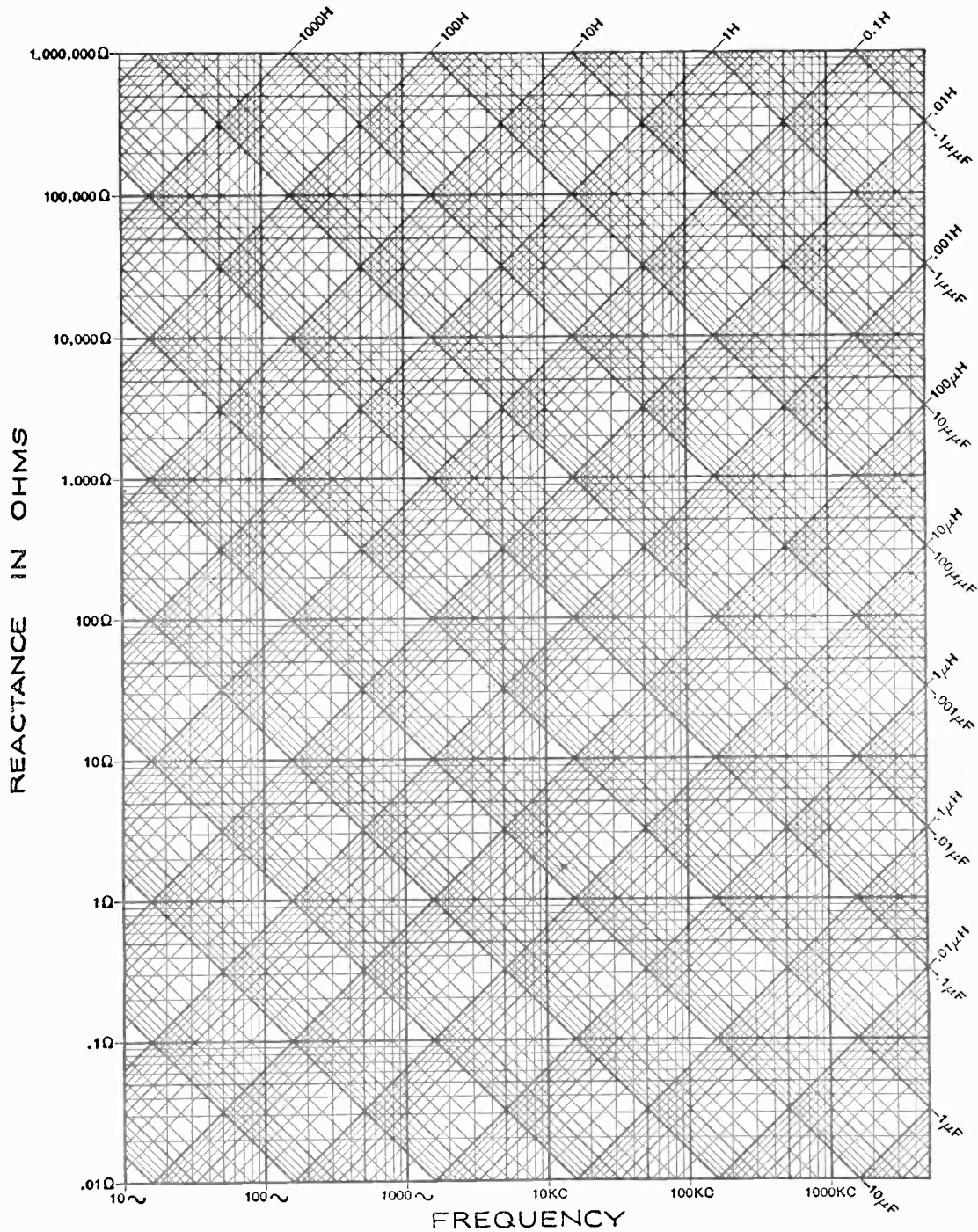


Part I of this paper was published in the combined November and December issue of the Research Worker.

AEROVOX PRODUCTS ARE BUILT BETTER



FREQUENCY-REACTANCE CHART



KC = kilocycles
 Ω = ohms

μ F = microfarads
 $\mu\mu$ F = micromicrofarads

H = henries
 μ H = microhenries

By courtesy Bell Laboratories Record

Figure 1



CAPACITY-EQUIVALANT SERIES RESISTANCE-POWER FACTOR

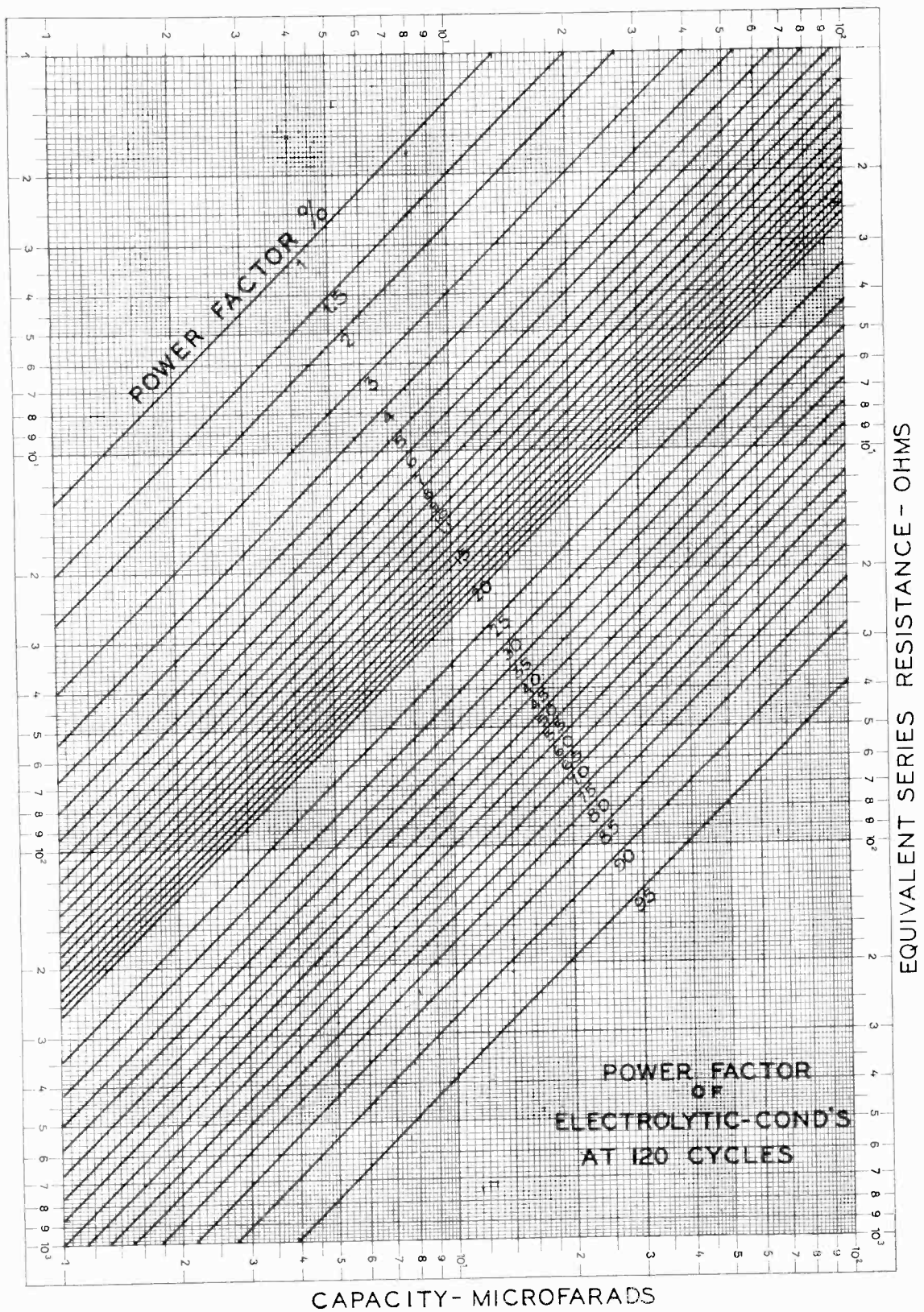


Figure 2



REACTANCE AND RESISTANCE

IN PARALLEL

When a resistance is in parallel with a reactance (either inductive or capacitive), the resultant impedance of the combination is found from the expression

$$Z = \frac{XR}{\sqrt{R^2 + X^2}}$$

Sometimes Z and R are given and X has to be found or Z and X are given and R is the unknown. In that case the equation can be solved for X and R and we have

$$X = \frac{ZR}{\sqrt{R^2 - Z^2}} \quad R = \frac{ZX}{\sqrt{X^2 - Z^2}}$$

In all three of the above equations X can be either inductive reactance ($X=6.28 fL$) or it can be capacitive in which case $X=1/(6.28 f C)$ where f is in cycles, L in henries and C in farads.

The table, Figure 3, has been prepared to permit the finding of any one of the three quantities X, R or Z when the other two are given. When X and R are given, divide the larger of the two quantities into the smaller one and thus get a ratio less than 1. Find this ratio in the left column and multiply the number obtained in the second column by R or X whichever is the larger and find Z.

Suppose R equals 1000 ohms and X is 200 ohms, which makes $X/R = .20$. The table shows us that Z/R is then 0.1961. Multiplying:

by R, we have $Z = 0.1961 \times 1000 = 196.1$ ohms.

IN SERIES

The impedance, Z, of a combination resistance, R, and a reactance, X, in series is given by the equation

$$Z = \sqrt{R^2 + X^2}$$

When Z is given and either X or R is the unknown, this equation can be re-written:

$$R = \sqrt{Z^2 - X^2}$$

$$X = \sqrt{Z^2 - R^2}$$

In all these equations all three quantities are expressed in ohms and X can be either capacitive reactance ($1/6.28 fC$) or inductive reactance ($6.28 fL$).

The table, Figure 4, gives the value of all three quantities for the case that either X or Z is equal to 1. In other cases, find the ratio R/X or X/R refer to the table and find the corresponding ratio Z/X or Z/R . The table can also be used when Z is given together with one of the other quantities. It was for this reason that the table had to be extended for values of R/X or X/R from .1 to 10 since otherwise it would have been sufficient to include values from 1 upwards or downwards but not both. Example: suppose $X = 1,600$ ohms and $R = 1,000$ ohms. Then $X/R = 1.6$; the table shows $Z/R = 1.8868$. Then Z, equals $1.8868 R$ or 1886.8 ohms.

Reactance and Resistance in Parallel reprinted from January 1936 Research Worker.

Reactance and Resistance in Series reprinted from July 1936 Research Worker.

REACTANCE AND RESISTANCE VALUES IN SERIES

X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X
0.10	1.0050	0.70	1.2207	4.1	4.2202
0.11	1.0060	0.71	1.2264	4.2	4.3174
0.12	1.0072	0.72	1.2322	4.3	4.4147
0.13	1.0084	0.73	1.2381	4.4	4.5122
0.14	1.0097	0.74	1.2440	4.5	4.6098
0.15	1.0112	0.75	1.2500	4.6	4.7074
0.16	1.0127	0.76	1.2560	4.7	4.8052
0.17	1.0144	0.77	1.2621	4.8	4.9030
0.18	1.0161	0.78	1.2682	4.9	5.0009
0.19	1.0179	0.79	1.2744	5.0	5.0990
0.20	1.0198	0.80	1.2806	5.1	5.1971
0.21	1.0218	0.81	1.2869	5.2	5.2952
0.22	1.0239	0.82	1.2932	5.3	5.3935
0.23	1.0261	0.83	1.2996	5.4	5.4918
0.24	1.0284	0.84	1.3060	5.5	5.5901
0.25	1.0308	0.85	1.3125	5.6	5.6885
0.26	1.0333	0.86	1.3190	5.7	5.7871
0.27	1.0358	0.87	1.3255	5.8	5.8856
0.28	1.0384	0.88	1.3321	5.9	5.9841
0.29	1.0412	0.89	1.3387	6.0	6.0828
0.30	1.0440	0.90	1.3454	6.1	6.1814
0.31	1.0469	0.91	1.3521	6.2	6.2801
0.32	1.0499	0.92	1.3588	6.3	6.3789
0.33	1.0530	0.93	1.3656	6.4	6.4777
0.34	1.0562	0.94	1.3724	6.5	6.5764
0.35	1.0595	0.95	1.3793	6.6	6.6752
0.36	1.0628	0.96	1.3862	6.7	6.7741
0.37	1.0662	0.97	1.3932	6.8	6.8731
0.38	1.0698	0.98	1.4001	6.9	6.9720
0.39	1.0733	0.99	1.4071	7.0	7.0711
0.40	1.0770	1.00	1.4141	7.1	7.1701
0.41	1.0808	1.1	1.4866	7.2	7.2691
0.42	1.0846	1.2	1.5621	7.3	7.3681
0.43	1.0885	1.3	1.6401	7.4	7.4671
0.44	1.0925	1.4	1.7205	7.5	7.5662
0.45	1.0966	1.5	1.8028	7.6	7.6654
0.46	1.1007	1.6	1.8868	7.7	7.7646
0.47	1.1049	1.7	1.9723	7.8	7.8638
0.48	1.1092	1.8	2.0591	7.9	7.9630
0.49	1.1136	1.9	2.1471	8.0	8.0623
0.50	1.1180	2.0	2.2361	8.1	8.1615
0.51	1.1225	2.1	2.3259	8.2	8.2608
0.52	1.1271	2.2	2.4166	8.3	8.3600
0.53	1.1318	2.3	2.5080	8.4	8.4594
0.54	1.1365	2.4	2.6000	8.5	8.5588
0.55	1.1413	2.5	2.6926	8.6	8.6576
0.56	1.1461	2.6	2.7857	8.7	8.7572
0.57	1.1510	2.7	2.8792	8.8	8.8566
0.58	1.1560	2.8	2.9732	8.9	8.9560
0.59	1.1611	2.9	3.0676	9.0	9.0554
0.60	1.1662	3.0	3.1623	9.1	9.1548
0.61	1.1714	3.1	3.2573	9.2	9.2542
0.62	1.1765	3.2	3.3526	9.3	9.3536
0.63	1.1819	3.3	3.4482	9.4	9.4530
0.64	1.1873	3.4	3.5440	9.5	9.5524
0.65	1.1927	3.5	3.6400	9.6	9.6518
0.66	1.1981	3.6	3.7362	9.7	9.7512
0.67	1.2037	3.7	3.8327	9.8	9.8507
0.68	1.2093	3.8	3.9293	9.9	9.9503
0.69	1.2149	3.9	4.0262	10.0	10.0499
		4.0	4.1231		

REACTANCE AND RESISTANCE VALUES IN PARALLEL

X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X	X/R or R/X	Z/R or Z/X
0.10	0.0995	0.49	0.4400	0.88	0.6606
0.11	0.1093	0.50	0.4472	0.89	0.6648
0.12	0.1191	0.51	0.4543	0.90	0.6690
0.13	0.1289	0.52	0.4613	0.91	0.6730
0.14	0.1386	0.53	0.4683	0.92	0.6771
0.15	0.1483	0.54	0.4751	0.93	0.6810
0.16	0.1580	0.55	0.4819	0.94	0.6849
0.17	0.1676	0.56	0.4886	0.95	0.6888
0.18	0.1771	0.57	0.4952	0.96	0.6925
0.19	0.1867	0.58	0.5017	0.97	0.6963
0.20	0.1961	0.59	0.5082	0.98	0.6999
0.21	0.2055	0.60	0.5145	0.99	0.7036
0.22	0.2149	0.61	0.5208	1.00	0.7071
0.23	0.2242	0.62	0.5269	1.10	0.7400
0.24	0.2334	0.63	0.5330	1.20	0.7682
0.25	0.2425	0.64	0.5390	1.30	0.7926
0.26	0.2516	0.65	0.5450	1.40	0.8137
0.27	0.2607	0.66	0.5508	1.50	0.8320
0.28	0.2696	0.67	0.5566	1.60	0.8480
0.29	0.2785	0.68	0.5623	1.70	0.8619
0.30	0.2874	0.69	0.5679	1.80	0.8742
0.31	0.2961	0.70	0.5735	1.90	0.8850
0.32	0.3048	0.71	0.5789	2.00	0.8944
0.33	0.3134	0.72	0.5843	2.20	0.9104
0.34	0.3219	0.73	0.5895	2.40	0.9231
0.35	0.3304	0.74	0.5948	2.60	0.9333
0.36	0.3387	0.75	0.6000	2.80	0.9418
0.37	0.3470	0.76	0.6051	3.00	0.9487
0.38	0.3552	0.77	0.6101	3.20	0.9545
0.39	0.3634	0.78	0.6150	3.40	0.9594
0.40	0.3714	0.79	0.6199	3.60	0.9635
0.41	0.3793	0.80	0.6246	3.80	0.9671
0.42	0.3872	0.81	0.6289	4.00	0.9702
0.43	0.3950	0.82	0.6341	5.00	0.9807
0.44	0.4027	0.83	0.6387	6.00	0.9864
0.45	0.4103	0.84	0.6432	7.00	0.9902
0.46	0.4179	0.85	0.6477	8.00	0.9921
0.47	0.4254	0.86	0.6520	9.00	0.9939
0.48	0.4327	0.87	0.6564	10.00	0.9950

Figure 3

Figure 4

REACTANCE AND RESISTANCE IN PARALLEL

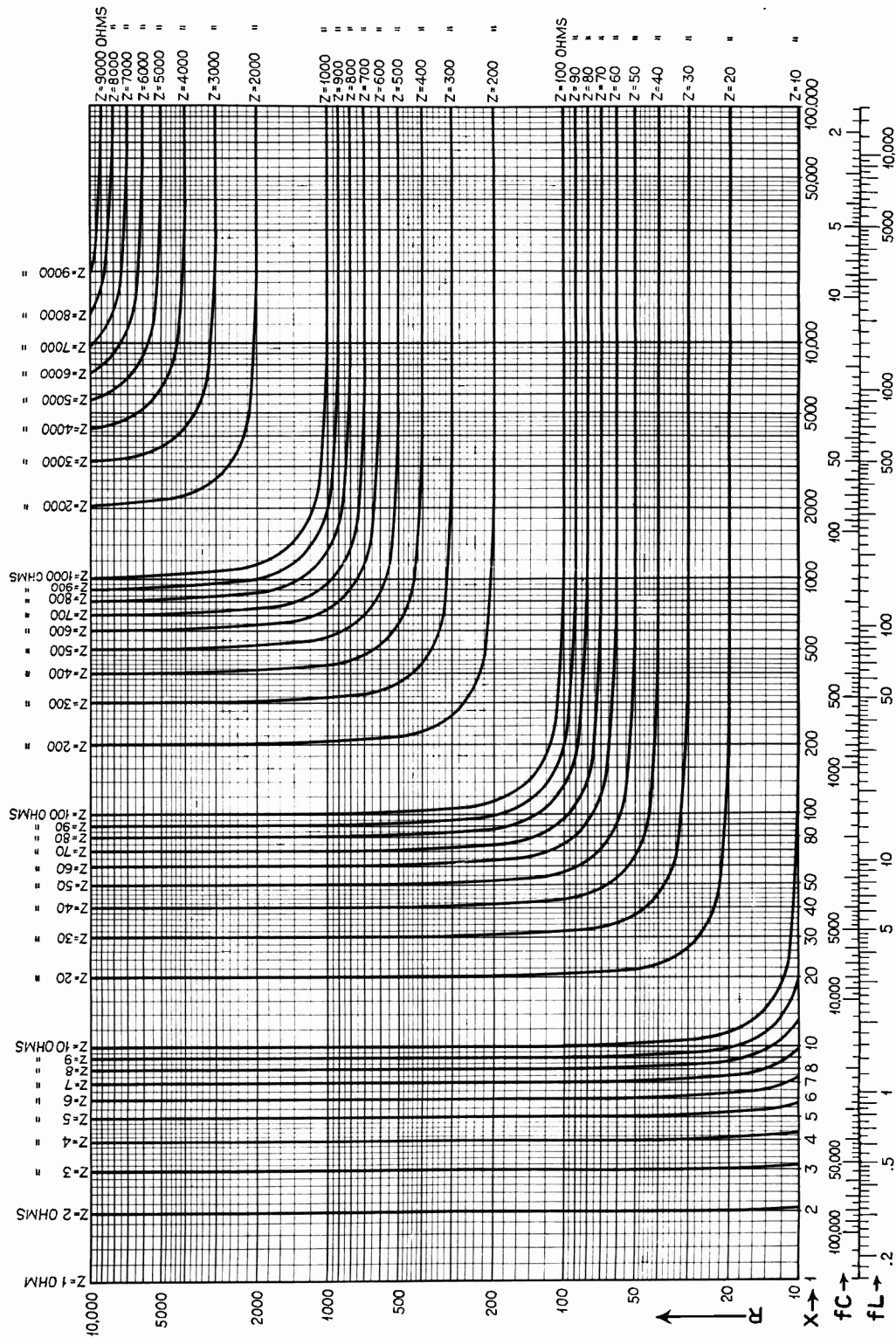


Figure 5

REACTANCE AND RESISTANCE IN SERIES

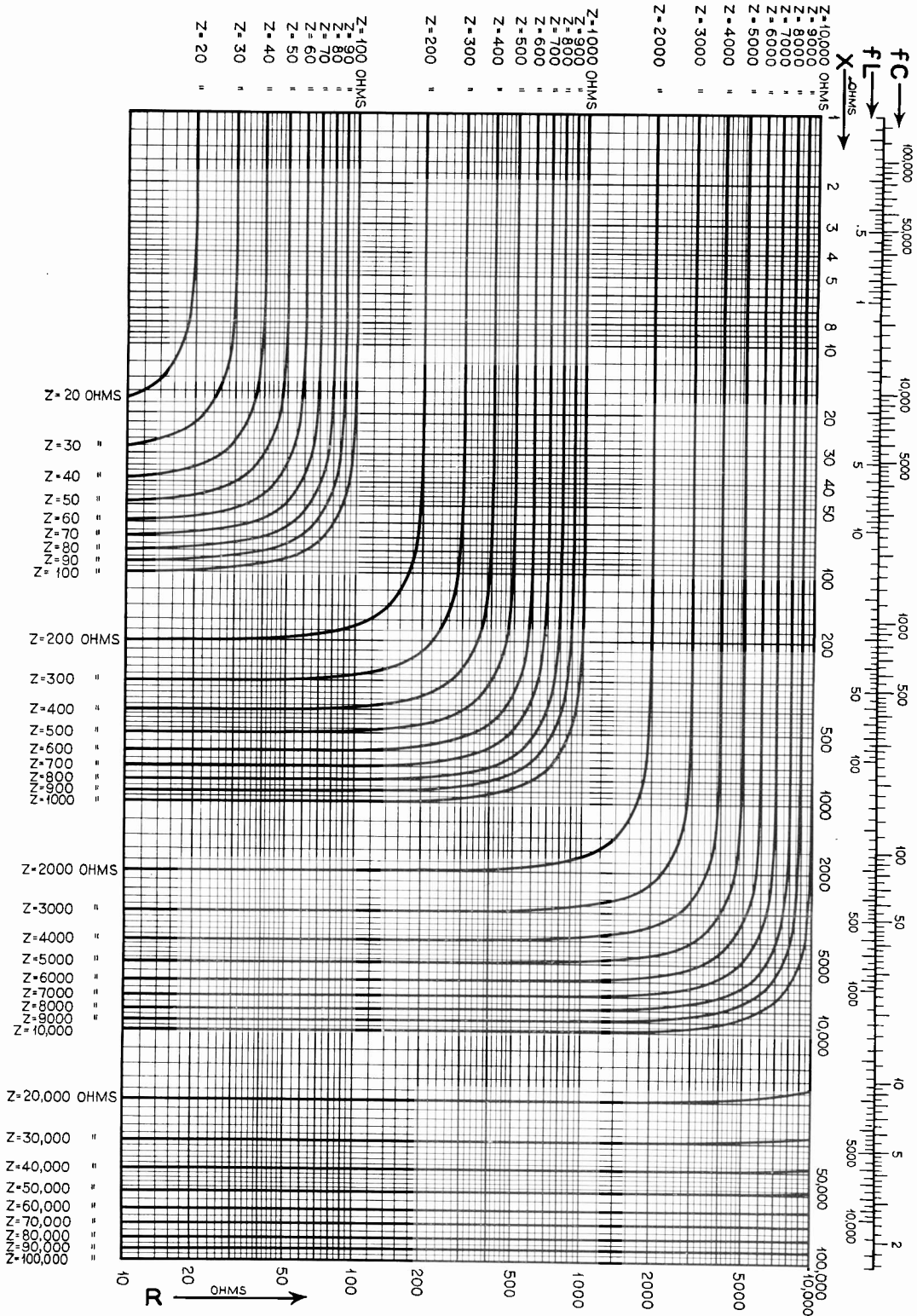


Figure 6



CURRENT, VOLTAGE AND POWER CURVE FOR RESISTANCE

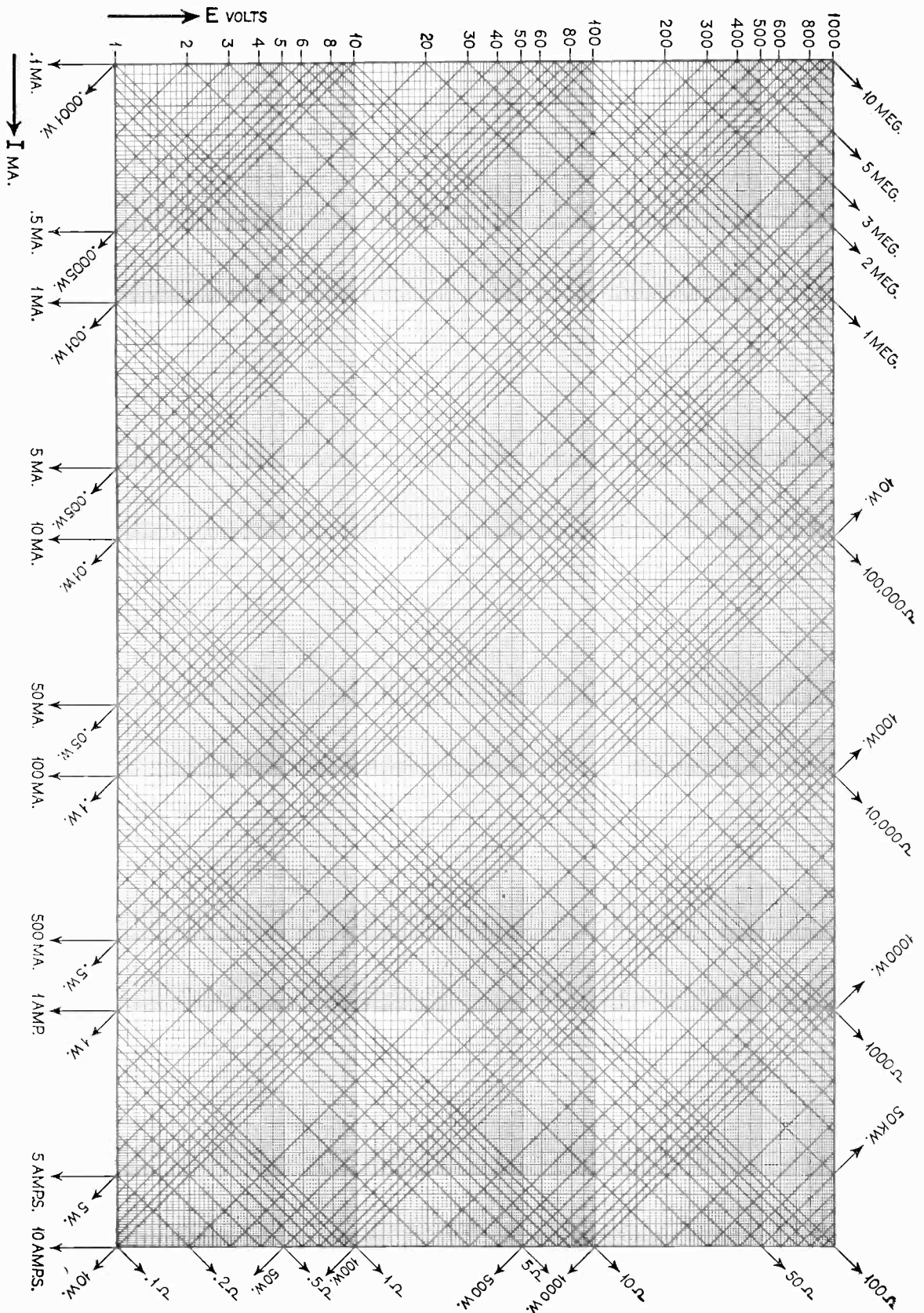
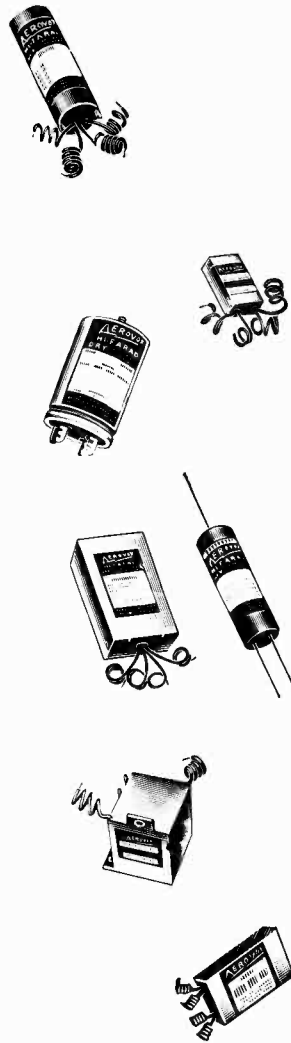


Figure 7

In tune with
TODAY...



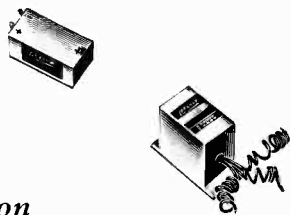
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