GRAPHICAL DETERMINATION OF INPUT IMPEDANCE OF REPEATING COIL WITH ANY TERMINATING IMPEDANCE

120C COIL

1. GENERAL

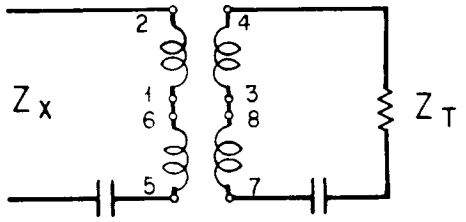
1.01 This section contains transmission characteristics of 120C repeating coils, and charts for graphically adding the effect of a 120C coil to, or subtracting it from, a given positive impedance. The charts are computed from the equivalent T network impedances and image parameters given for d-c currents up to 100 ma.

1.02 The method of using these charts is given in detail in Section 304-200-100.

1.03 Since capacitors are usually associated with repeating coils, a table of reactances of 1 mf. and 4 mf. at various frequencies is given below for convenience. The average value of Western Electric capacitors is usually 8 to 10% (and may be as much as 25%) higher than the nominal, with proportionately lower values of reactance.

Freq. cps	1 mf. Capacitor Nominal	1 mf. Capacitor Avg. 1.1 mf.	4 mf. Capacitor Nominal	4 mf. Capacitor Avg. 4.4 mf.
200	-j 796	-j 723	-j 199	-j 181
300	-j 531	-j 482	-j 133	-j 121
500	-j 318	-j 289	-j 80	-j 72
1000	-j 159	-j 145	-j 40	-j 36
2000	-j 80	-j 72	-j 20	-j 18
3000	-j 53	-j 48	-j 13	-j 12

2. COIL CONNECTIONS

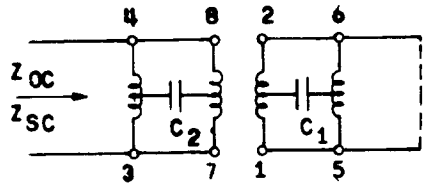


2.01 The 120C is a unity ratio coil; therefore, the charts are also valid for the case in which windings (2-1) (6-5) are interchanged with windings (4-3) (8-7). The capacitors shown in each side are electrically equivalent to and correspond to the units usually furnished at the midpoints of the windings in standard circuits.

3. LIST OF CHARTS

	Chart
200 Cycles per Second	1
300 " " "	2
500 " " "	3
1000 " " "	4
2000 " " "	5
3000 " " "	6

4. BASIC IMPEDANCE MEASUREMENTS



Z_{OC}= OPEN CIRCUIT IMPEDANCE

Z_{SC}= SHORT CIRCUIT IMPEDANCE

$= 6.65 + j\omega 0.001125$

C_1= .0080 μF.

C_2= .0116 μF.

Z_{OC} (.05 TO 3.5V. A-C)

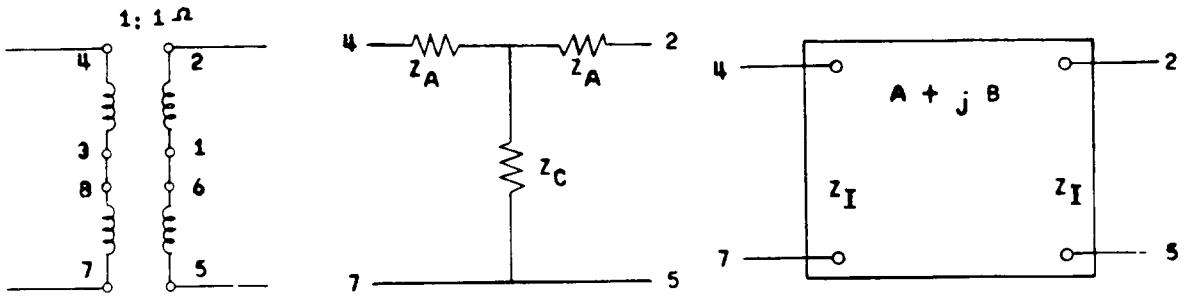
FREQ. CPS	0-200 MA.D-C	280 MA.D-C	360 MA.D-C
200	10 +j 217	6 +j 195	5 +j 184
300	13 +j 306	9 +j 280	7 +j 259
500	20 +j 495	15 +j 452	12 +j 416
1000	56 +j 974	48 +j 895	43 +j 817
1500	109 +j 1470	90 +j 1380	65 +j 1230
2000	175 +j 1917	145 +j 1740	118 +j 1610
2500	250 +j 2370	200 +j 2160	165 +j 2000
3000	338 +j 2830	255 +j 2570	215 +j 2370

TRANSMISSION CHARACTERISTICS OF 120C REPEATING COIL

Miscellaneous Data

Inner windings (2-1) and (6-5), parallel wound, each 465 turns #28ES, 7.8Ω ± 15%.
Outer windings (4-3) and (8-7), parallel wound, each 465 turns #25ES, 5.5Ω ± 15%.
Permalloy core with 8 mil equivalent series air gap.
Impedance ratio (4-3) (8-7) to (2-1) (6-5) = 1:1 (± 4%).
Inductance unbalance: (2-1) and (6-5) = 0.3% max.; (4-3) and (8-7) = 0.3% max.

Equivalent Networks and Parameters



0.1-7V.a-c, 0-100MA.d-c on (4-3) (8-7)

Equivalent T Network

Freq. cps	Z_A	Z_C
200	14+j 3	27+j 874
300	14+j 4	39+j 1239
500	14+j 7	68+j 2030
1000	14+j 14	270+j 4410
1500	14+j 21	786+j 8010
2000	14+j 28	2430+j 14200
2500	14+j 35	12400+j 31400
3000	14+j 42	78900-j 37000

Image Parameters

Transfer Constant A + jB		A	Image Impedance
Nep.	Rad.	db	Z_I
.142-j	.112	1.23	102+j 121
.124-j	.0916	1.08	117+j 150
.107-j	.0640	0.93	137+j 213
.0885-j	.0340	0.77	172+j 382
.0767-j	.0197	0.67	214+j 600
.0652-j	.0102	0.57	296+j 903
.0472-j	.0014	0.41	590+j 1483
.0212+j	.0238	0.18	2554+j 1096

0.1-7V.a-c, 180MA.d-c on (4-3) (8-7)

Equivalent T Network

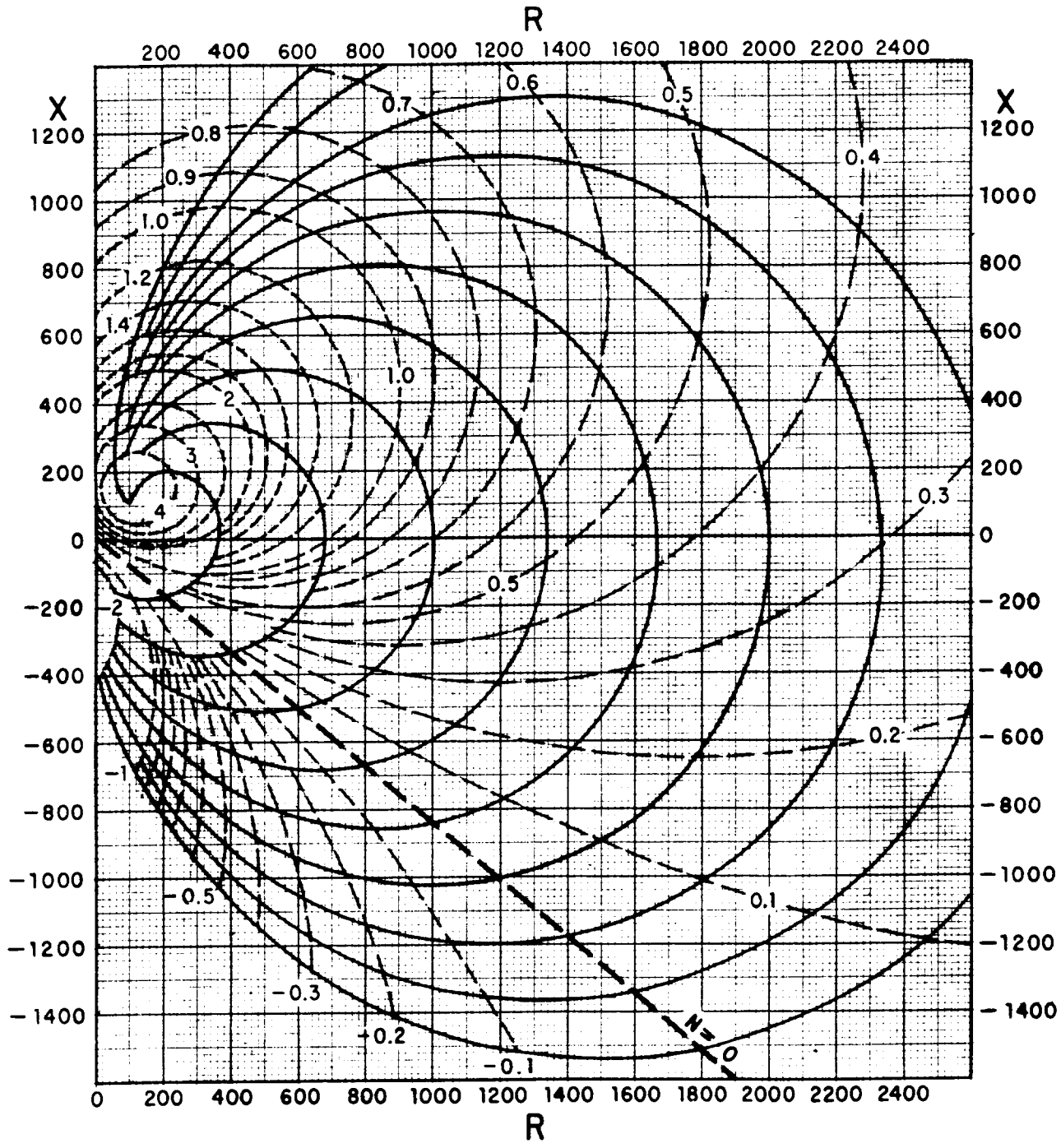
Freq. cps	Z_A	Z_C
200	14+j 3	8+j 736
300	14+j 4	15+j 1042
500	14+j 7	36+j 1700
1000	14+j 14	196+j 3620
1500	14+j 21	519+j 6320
2000	14+j 28	1254+j 10500
2500	14+j 35	4240+j 20100
3000	14+j 42	36500+j 52500

Image Parameters

Transfer Constant A + jB		A	Image Impedance
Nep.	Rad.	db	Z_I
.154-j	.123	1.34	93+j 112
.134-j	.0995	1.16	106+j 138
.116-j	.0700	1.01	124+j 195
.0976-j	.0373	0.85	155+j 346
.0859-j	.0222	0.75	186+j 535
.0758-j	.0132	0.66	234+j 780
.0603-j	.0052	0.52	361+j 1192
.0368+j	.0053	0.32	1066+j 2130

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

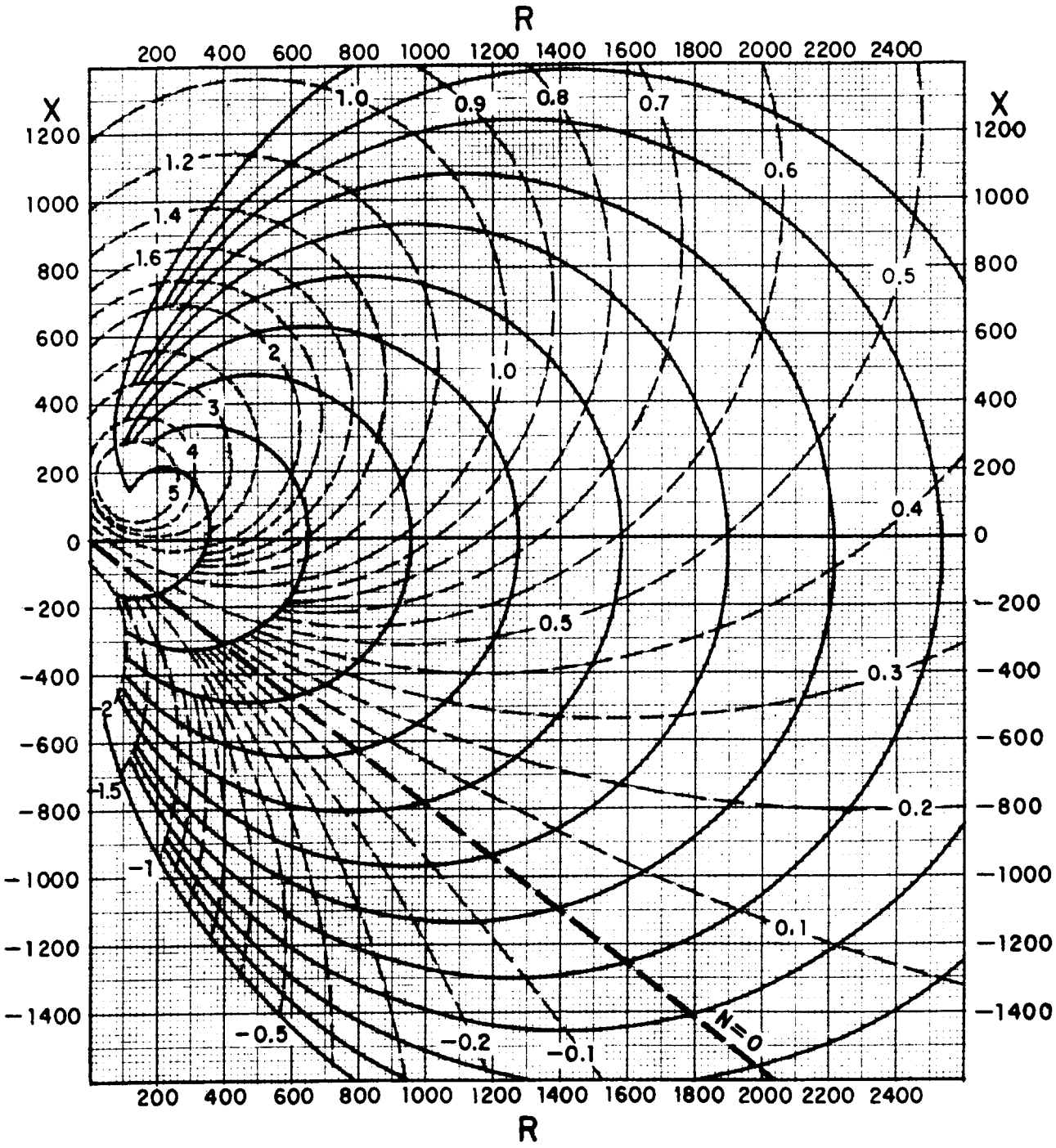
200 CPS



FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

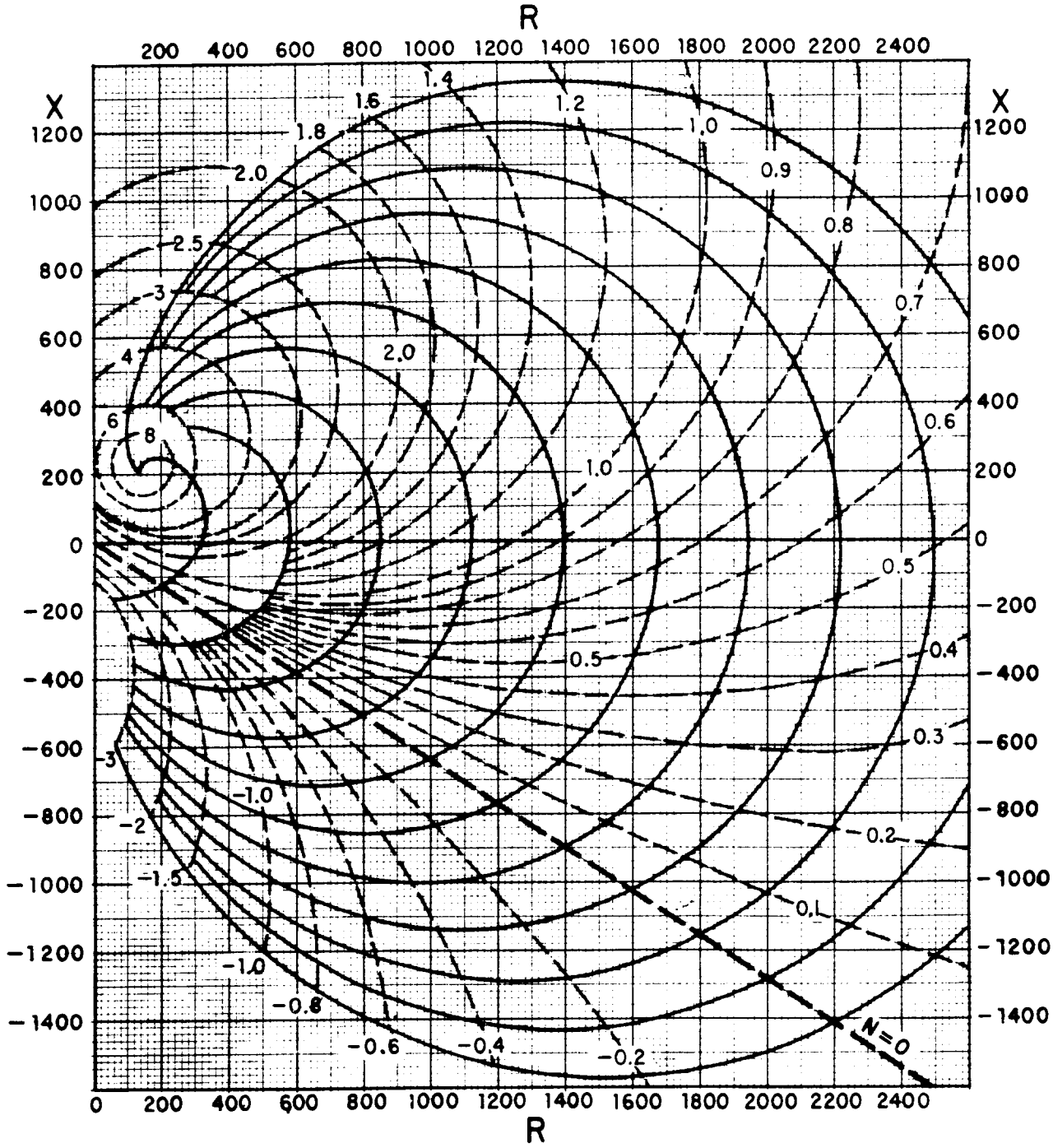
300 CPS



FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

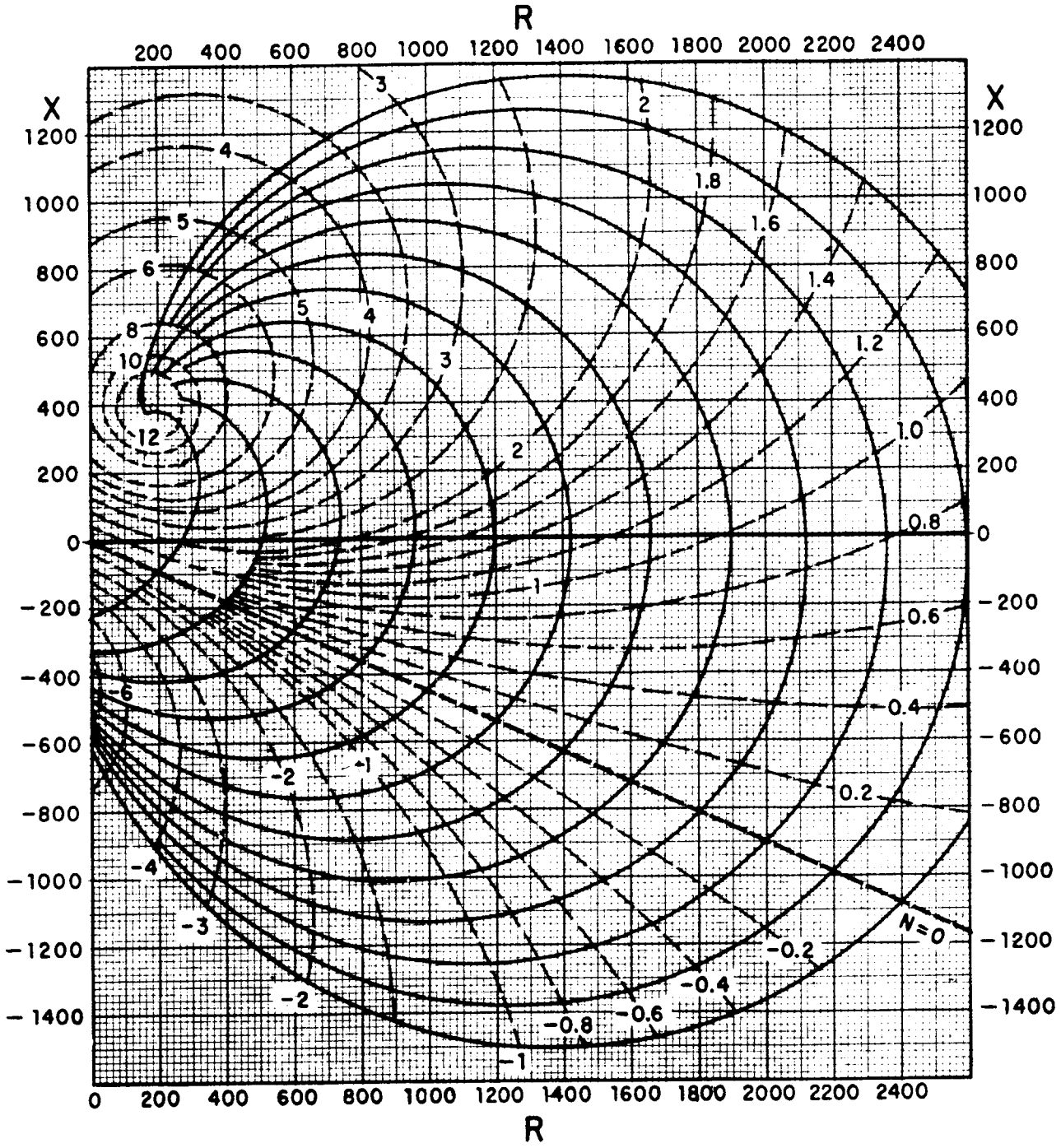
500 CPS



FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

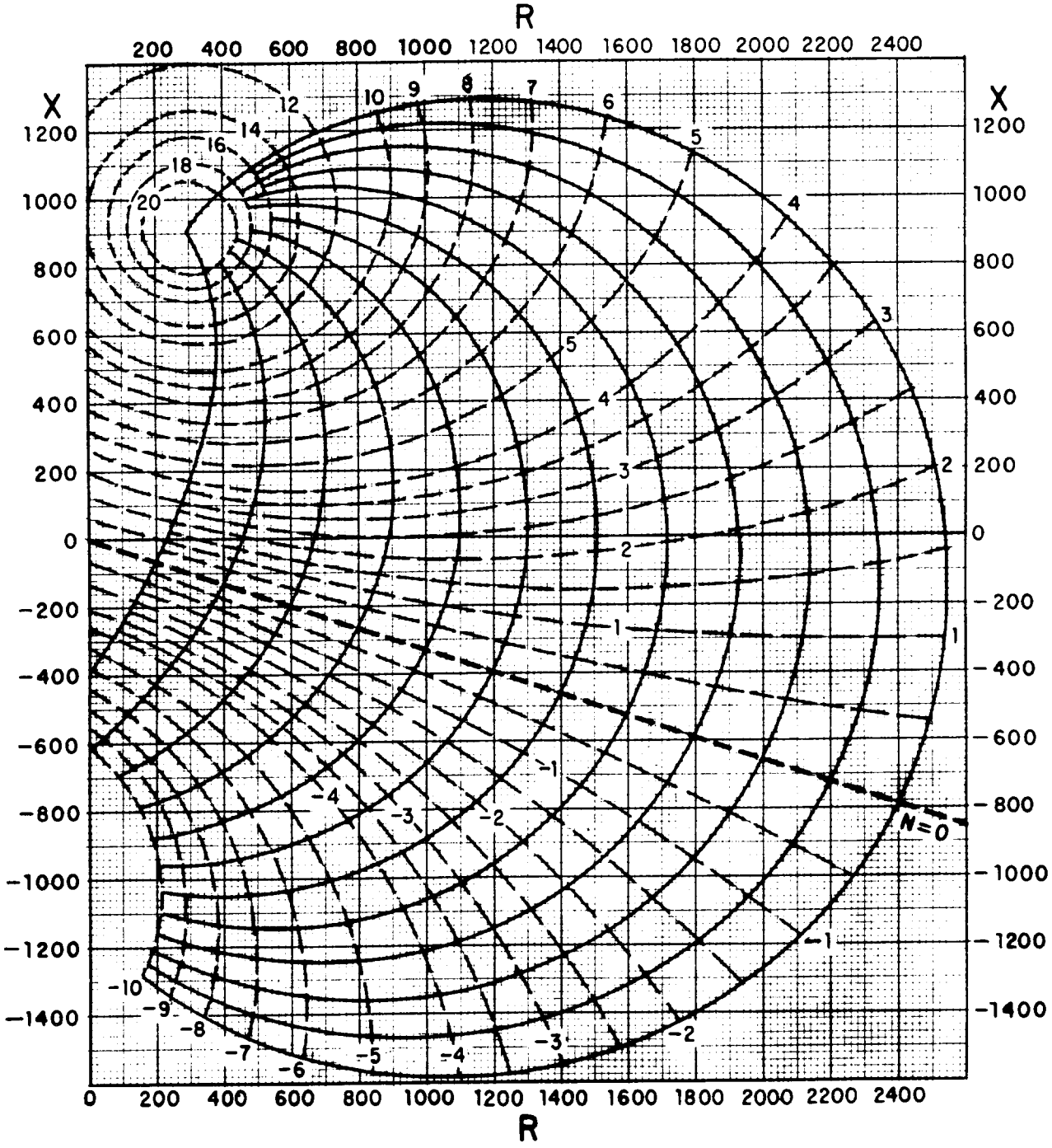
1000 CPS



FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

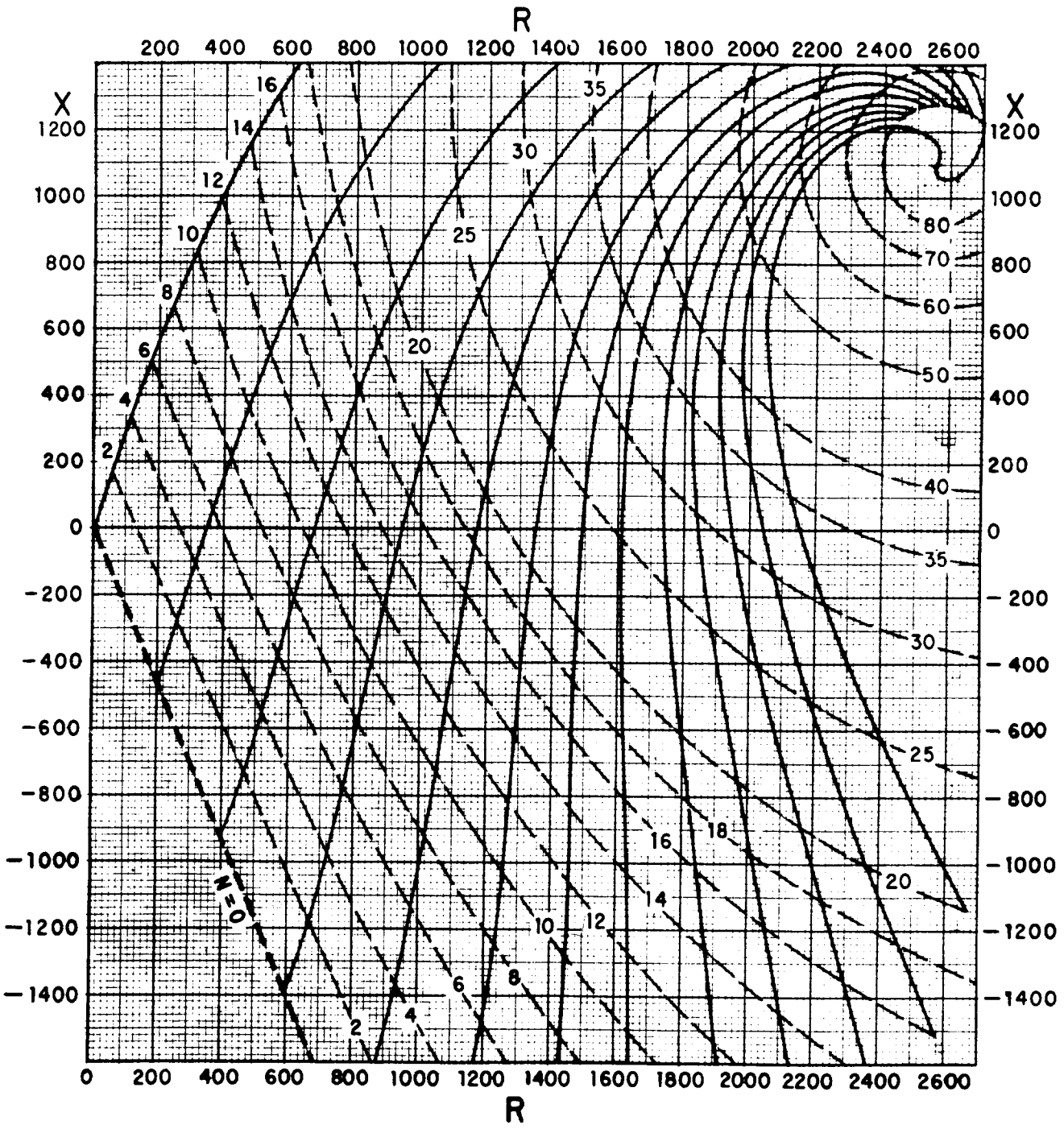
2000 CPS



FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

3000 CPS



FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100