

GRAPHICAL DETERMINATION OF INPUT IMPEDANCE OF
REPEATING COIL WITH ANY TERMINATING IMPEDANCE
120C COIL

1. GENERAL

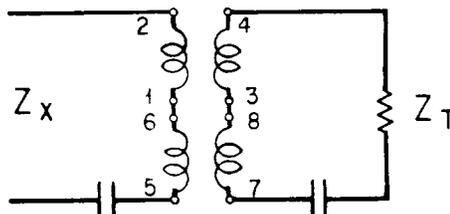
1.01 This section contains transmission characteristics of 120C repeating coils, and charts for graphically adding the effect of a 120C coil to, or subtracting it from, a given positive impedance. The charts are computed from the equivalent T network impedances and image parameters given for d-c currents 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		4 mf. Capacitor	
	Nominal	Avg. 1.1 mf.	Nominal	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

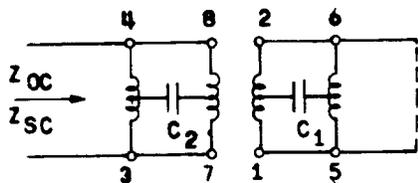


2.01 The 120C is a unity ratio coil; therefore, the charts are also valid for the case in which windings (2-1) (6-5) are interchanged with windings (4-3) (8-7). The capacitors shown in each side are electrically equivalent to and correspond to the units usually furnished at the midpoints of the windings 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
 $= 6.65 + j\omega 0.001125$
 $C_1 = .0080 \mu F.$
 $C_2 = .0116 \mu F.$

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

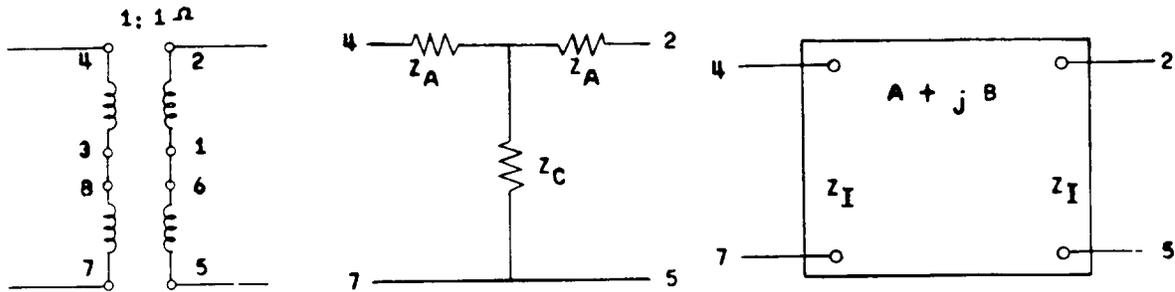
FREQ. CPS	Z_{OC} (.05 TO 3.5V. A-C)		
	0-200 MA. D-C	280 MA. D-C	360 MA. D-C
200	10 +j 217	6 +j 195	5 +j 184
300	13 +j 306	9 +j 280	7 +j 259
500	20 +j 495	15 +j 452	12 +j 416
1000	56 +j 974	48 +j 895	43 +j 817
1500	109 +j 1470	90 +j 1380	65 +j 1230
2000	175 +j 1917	145 +j 1740	118 +j 1610
2500	250 +j 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, $7.8\Omega \pm 15\%$.
 Outer windings (4-3) and (8-7), parallel wound, each 465 turns #25ES, $5.5\Omega \pm 15\%$.
 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	$14+j 42$	$36500+j 52500$

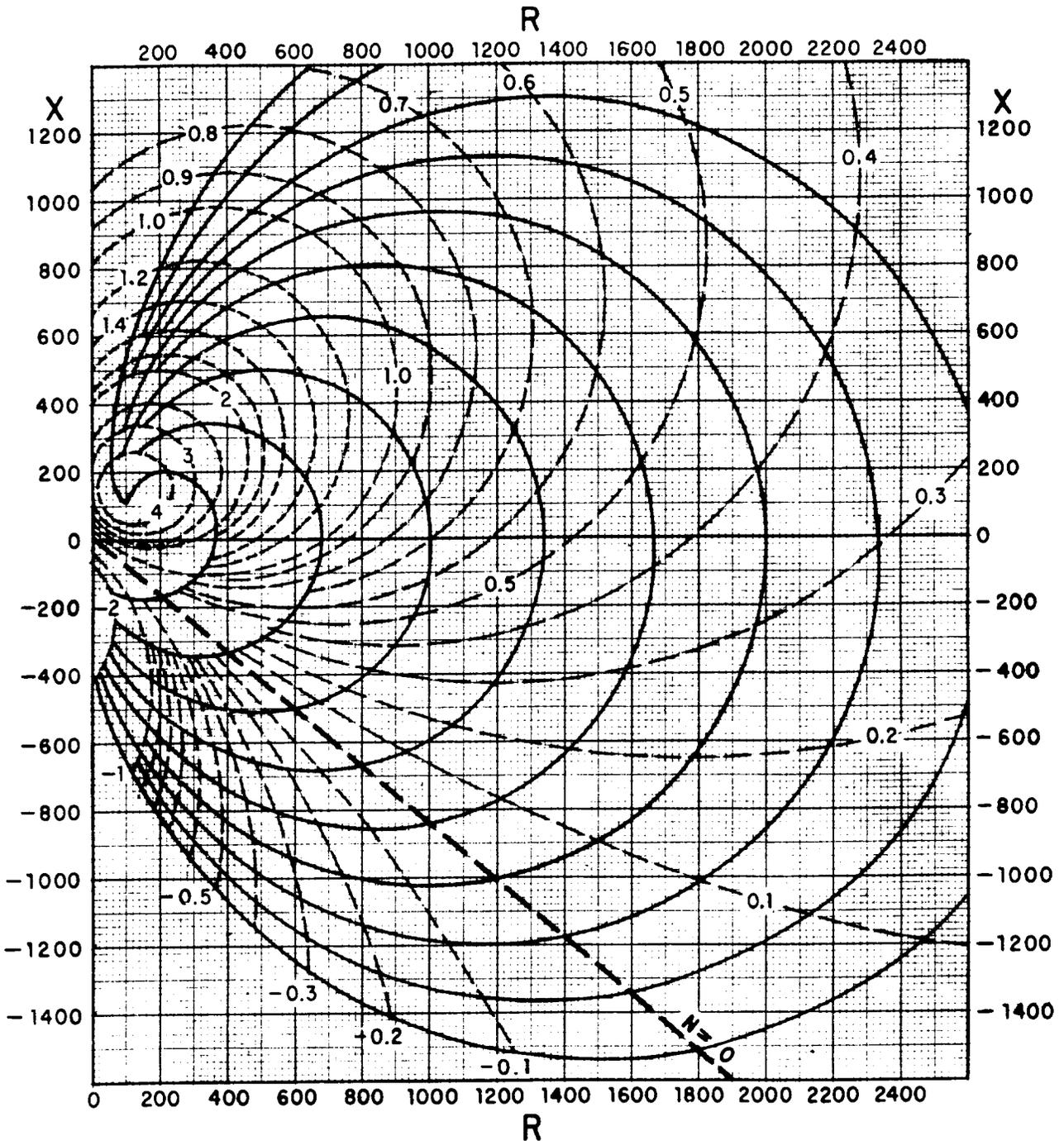
Image Parameters

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

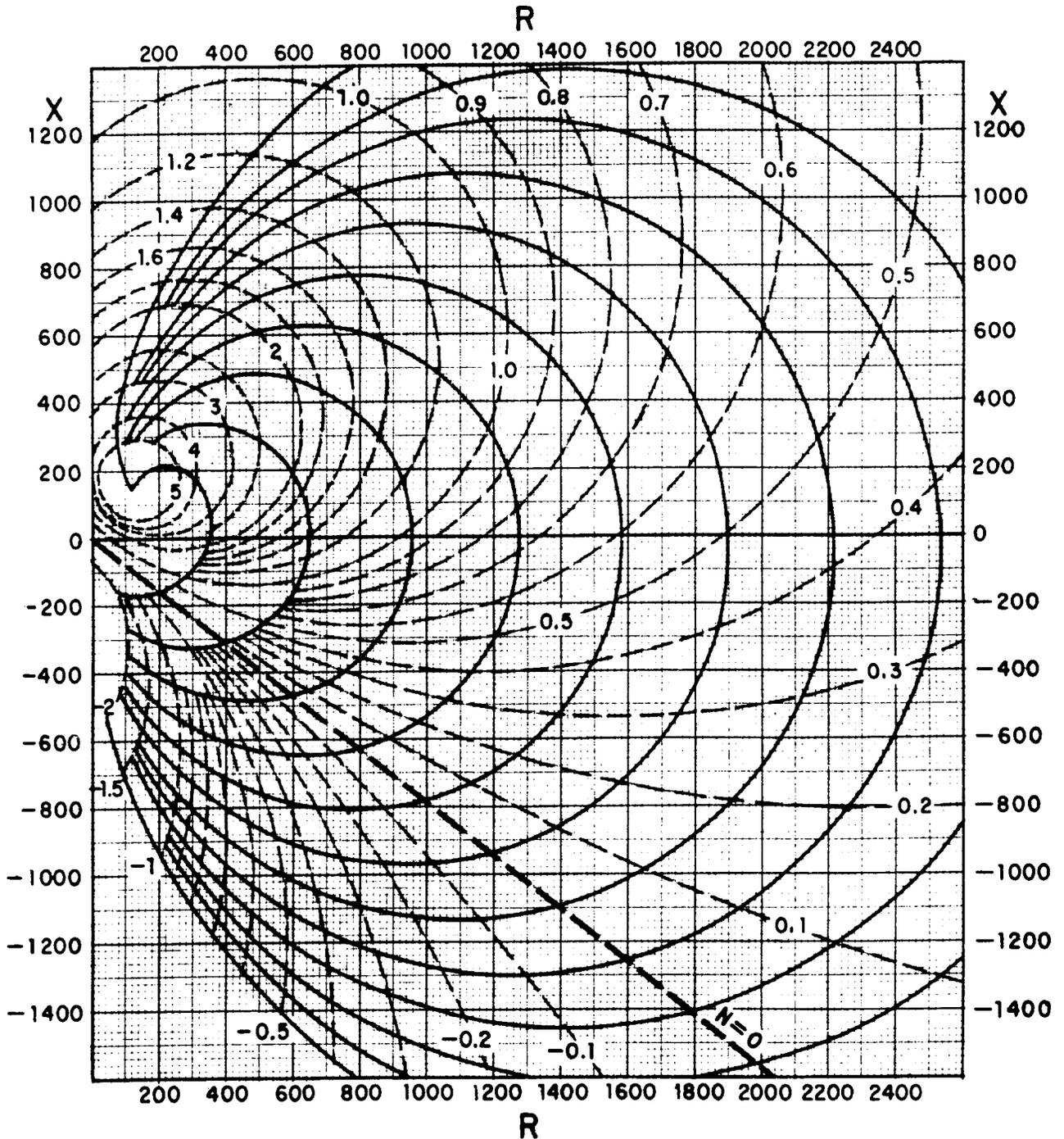
200 CPS



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

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

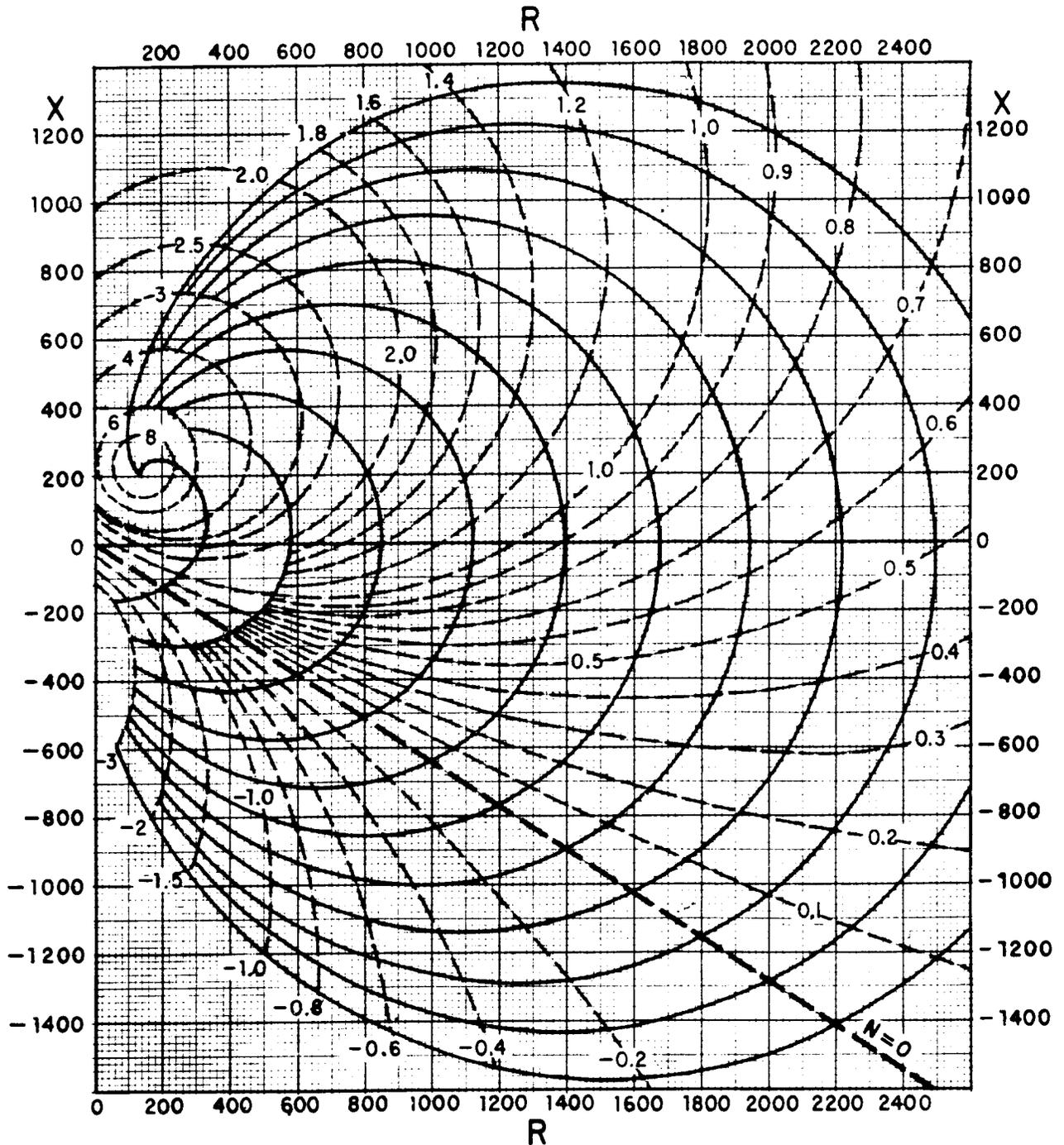
300 CPS



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

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

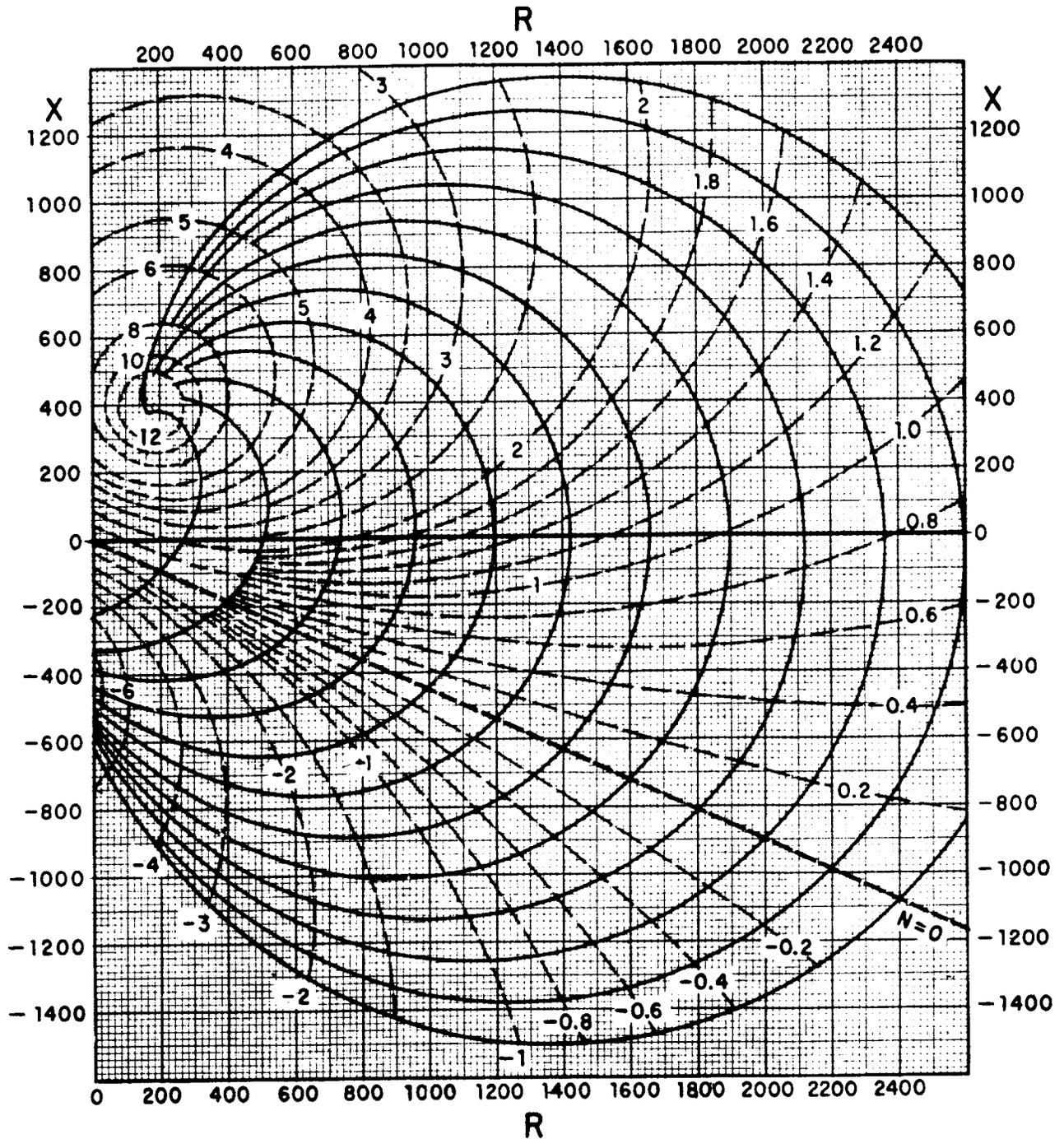
500 CPS



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

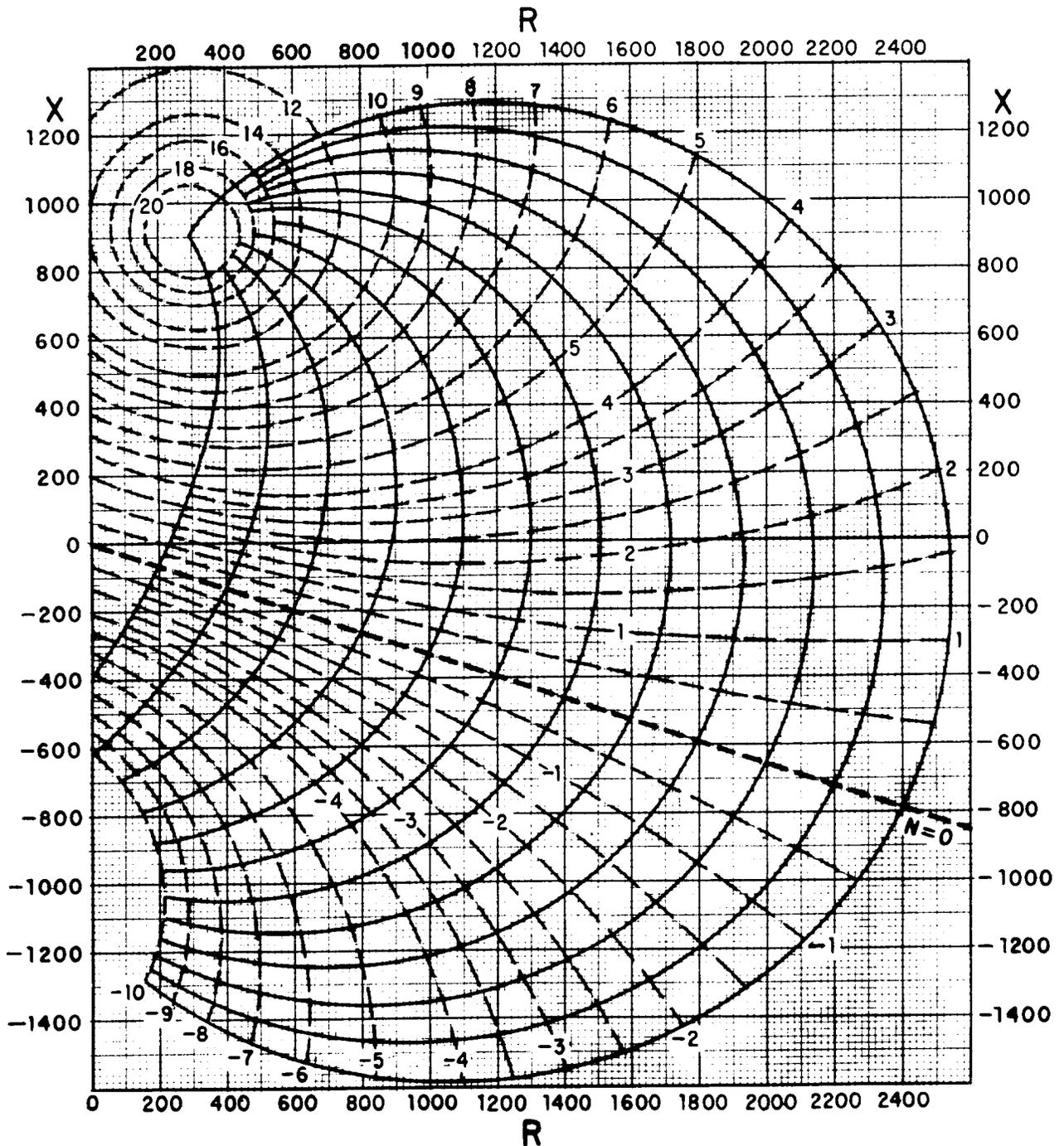
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1000 CPS



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

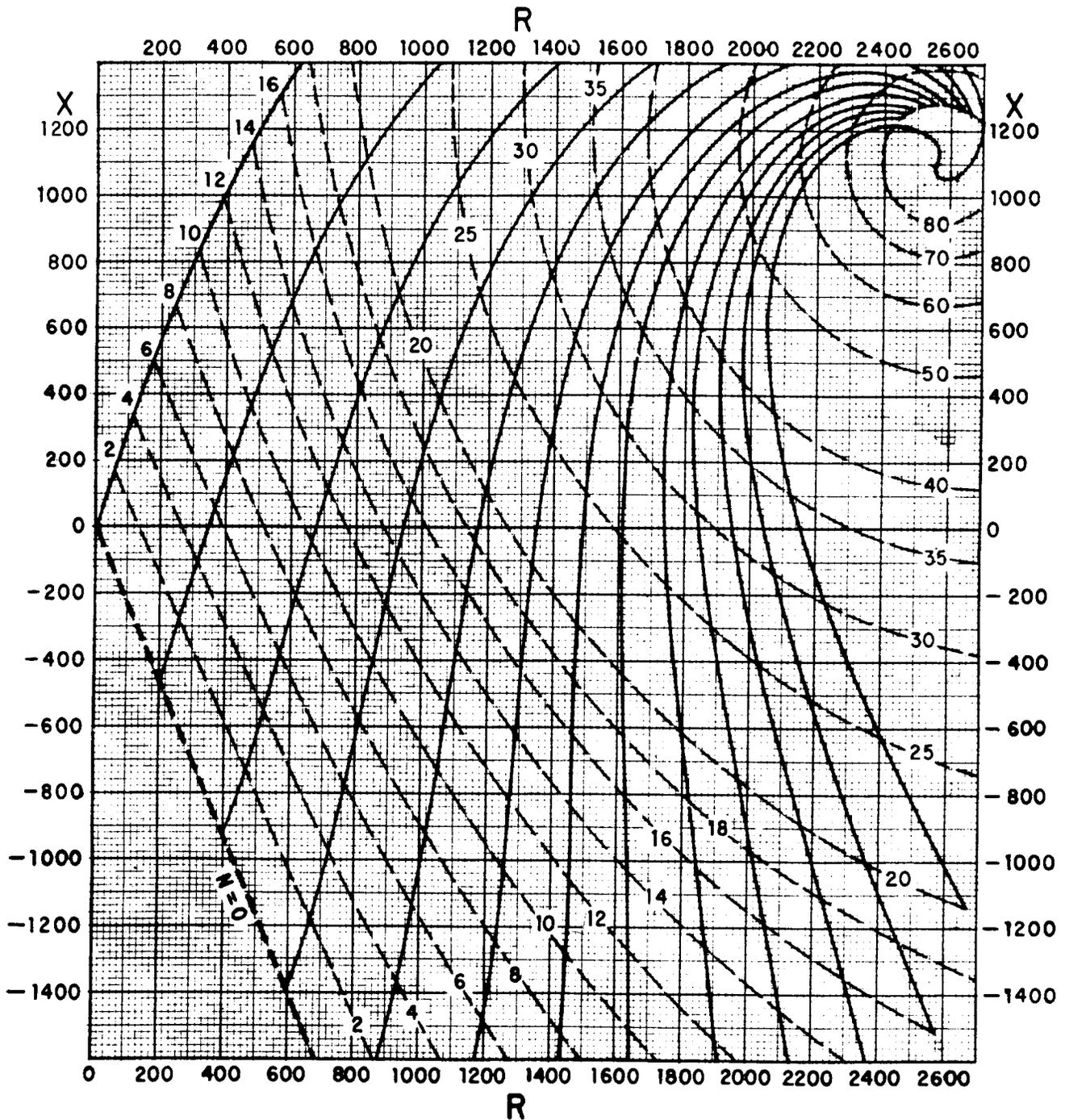
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FOR EXPLANATION OF USE OF CHARTS SEE SECTION 304-200-100

INPUT IMPEDANCE OF 120C REPEATING COIL WITH ANY TERMINATION

3000 CPS



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