4066A NETWORK

DESCRIPTION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the 4066A network, which is a plug-in apparatus unit designed for use in V4 telephone repeater applications, but is also usable in other repeater applications.

1.02 This section is reissued to clarify information that pertains to the build-out capacitance adjustments required to balance the circuit.

1.03 The 4066A network is an adjustable 2-terminal network. It is normally used in conjunction with a 1-type terminating set for precision balancing of its hybrid when the 2-wire circuit consists of 19-, 22-, or 24-gauge high-capacitance (0.083 μf/mi) or 24-gauge low-capacitance (0.072 μf/mi) H88 loaded cable facilities. The resulting hybrid balance produces a high loss in the transmission path from one 4-wire leg to the other and thus reduces the possibility of "singing," or oscillations, in the 4-wire loop.

1.04 ♦The 4066A network is also used as a precision termination on cable facilities for return loss measurements. When it is used in this application, it is referred to as a terminal position.♦

1.05 The 24V4C repeater mounting shelf is equipped with a socket for mounting the 4066-type network. The 4066-type network, when plugged into the network socket, is connected through shelf wiring to the balancing network terminals (10 and 11) of the 1-type terminating set. Mounting for the 4066-type network is not provided in older 24V4 repeaters. When used with this older equipment, the network is separately mounted and cross-connected to the repeater as required.

2. EQUIPMENT DESCRIPTION

2.01 The 4066A network (see Fig. 1) consists of an aluminum can containing two printed circuit boards, a 20-pin connector plug, and a plastic faceplate that contains 14 screw-type switches. The network is approximately 1-3/4 inches high by 1-3/4 inches wide by 7 inches long. Tabs are provided on the front of the can to facilitate removal of the network from the mounting shelf socket through the use of a 602C or a 602D tool.

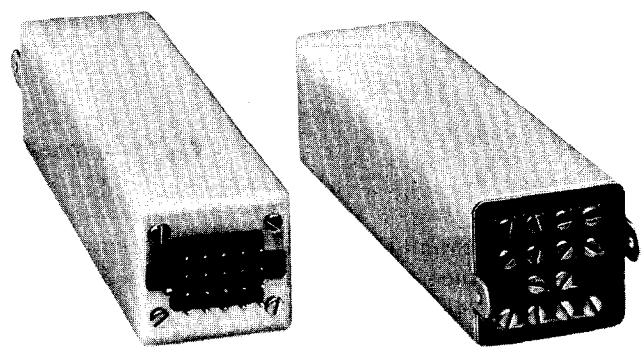

Fig. 1—4066A Network

2.02 The 14 screw-type switches are identified on the faceplate by letters A through P, omitting I and O. The components and/or circuits with which the switches are associated are shown in Fig. 2.

3. CIRCUIT DESCRIPTION

3.01 Figure 2 is the schematic of the 4066A network. The circuit consists of resistors, capacitors, inductors, and associated screw-type switches arranged in various series and parallel circuit combinations to provide an adjustable impedance across terminals 10 and 11.

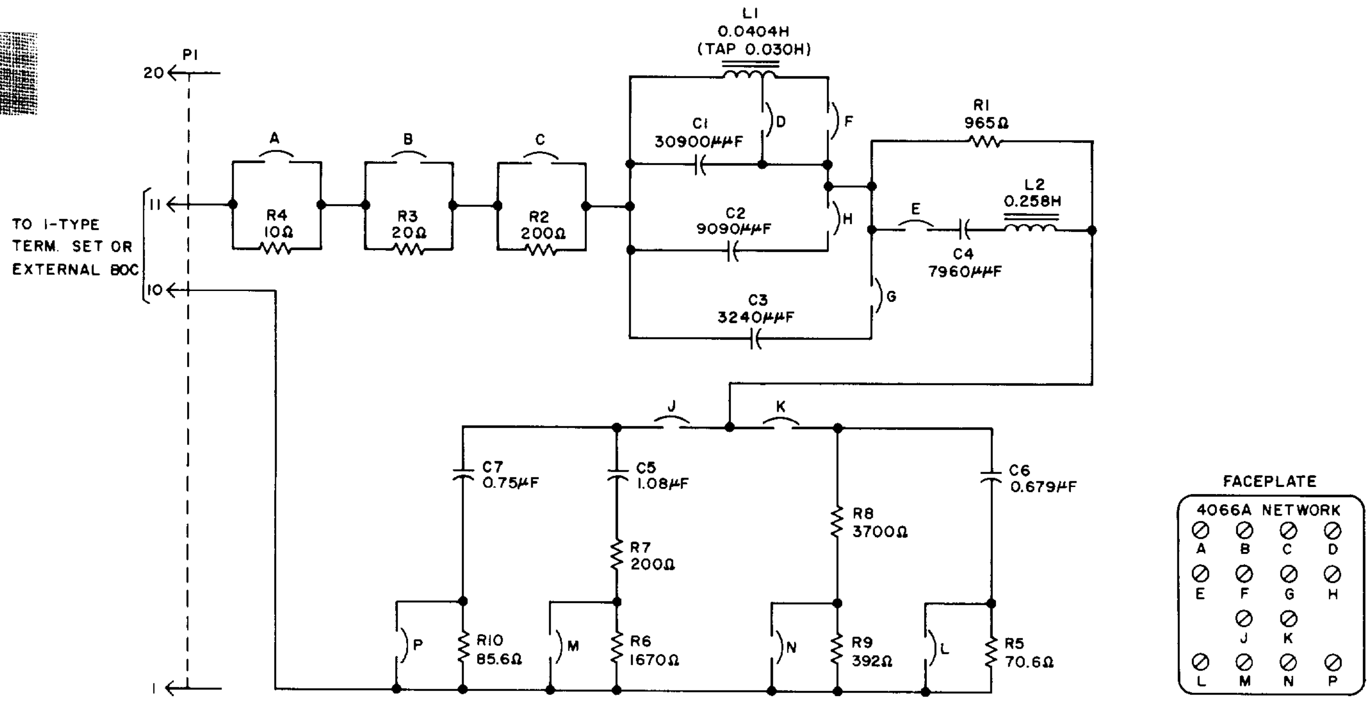

Fig. 2—4066A Network—Schematic

3.02 Adjustment of the network to provide an impedance match against the impedance of 19-, 22-, and 24-gauge cables having various values of cable capacitance is accomplished by opening or closing the appropriate faceplate screw-type switches. Table A lists the screw settings required to obtain the precision impedance balance of the cable facilities involved.

3.03 The 4066A network does not provide build-out capacitance adjustments; however, adjustable build-out capacitance must be provided by the network build-out capacitance of the 1-type terminating set or by an external building-out capacitor. Table B lists the recommended build-out capacitance for a given end section and type of cable.

3.04 Figures 3 through 13 are graphic illustrations of return loss and impedance characteristics of the 4066A network. Figures 3, 4, and 5 illustrate typical return losses of the network against the midsection impedance of the cable facilities involved. Figures 6 through 9 show the return losses for end sections other than 0.5 loading section. The midsection impedance characteristics of the network are illustrated in Fig. 10, 11, 12, and 13. The R designations on these figures indicate the resistive components of the impedance, and the X designations indicate the reactive components.

TABLE A

4066A NETWORK – SCREW SETTINGS FOR BALANCING VARIOUS CABLE FACILITIES

CABLE TYPE	CABLE CAPACITANCE		SCREW CLOSED (TURNED IN)
	μF/SECTION	μF/MILE	
19H88 High CAP.	0.0955	0.084	ABCEFJMP
22H88 High CAP.	0.0932	0.082	ABCEFJ
24H88 High CAP.	<0.0927	<0.816	CDGHKN
	0.0927 to 0.0945	0.0816 to 0.0832	ACDGHKN
	0.0945 to 0.0964*	0.0832 to 0.0848	BCDGHKN
	>0.0964	>0.0848	ABCDGHKN
24H88 Low CAP.	<0.0798	<0.0702	DGKL
	0.0798 to 0.0811	0.0702 to 0.0714	ADGKL
	0.0811 to 0.0825*	0.0714 to 0.0726	BDGKL
	>0.0825	>0.0726	ABDGKL

* Use this line for nominal capacitance values.

TABLE B

BUILDING-OUT CAPACITANCE VERSUS END SECTION LENGTH FOR 4066A NETWORK (NOTE 1)

	CABLE GAUGE (H88 LOADING)							
END SECTION	19HC		22HC		24HC		24LC	
LENGTH (FEET)	REF* BOC	TERM† BOC	REF* BOC	TERM† BOC	REF* BOC	TERM† BOC	REF* BOC	TERM† BOC
0	0.0	0.080	0.0	0.080	0.0	0.076	0.0	0.065
200	0.0	0.077	0.0	0.077	0.0	0.073	0.0	0.062
400	0.0	0.074	0.0	0.074	0.0	0.070	0.0	0.059
600	0.0	0.071	0.0	0.071	0.0	0.067	0.0	0.057
800	0.0	0.068	0.0	0.068	0.0	0.064	0.0	0.054
1000	0.002	0.064	0.002	0.064	0.0	0.060	0.0	0.051
1200	0.005	0.061	0.005	0.061	0.0	0.057	0.0	0.048
1400	0.008	0.058	0.008	0.058	0.003	0.054	0.002	0.046
1600	0.011	0.055	0.011	0.055	0.006	0.051	0.005	0.043
1800	0.014	0.052	0.014	0.052	0.010	0.048	0.007	0.040
2000	0.017	0.049	0.017	0.049	0.013	0.045	0.010	0.037
2200	0.020	0.046	0.020	0.046	0.016	0.041	0.013	0.035
2400	0.024	0.042	0.024	0.042	0.019	0.038	0.016	0.032
2600	0.027	0.039	0.027	0.039	0.022	0.035	0.018	0.029
2800	0.030	0.036	0.030	0.036	0.025	0.032	0.021	0.027
3000	0.033	0.033	0.033	0.033	0.029	0.029	0.024	0.024
3200	0.036	0.030	0.036	0.030	0.032	0.025	0.027	0.021
3400	0.039	0.027	0.039	0.027	0.035	0.022	0.029	0.018
3600	0.042	0.024	0.042	0.024	0.038	0.019	0.032	0.016
3800	0.046	0.020	0.046	0.020	0.041	0.016	0.035	0.013
4000	0.049	0.017	0.049	0.017	0.045	0.013	0.037	0.010
4200	0.052	0.014	0.052	0.014	0.048	0.010	0.040	0.007
4400	0.055	0.011	0.055	0.011	0.051	0.006	0.043	0.005
4600	0.058	0.008	0.058	0.008	0.054	0.003	0.046	0.002
4800	0.061	0.005	0.061	0.005	0.057	0.0	0.048	0.0
5000	0.064	0.002	0.064	0.002	0.060	0.0	0.051	0.0
5200	0.068	0.0	0.068	0.0	0.064	0.0	0.054	0.0
5400	0.071	0.0	0.071	0.0	0.067	0.0	0.057	0.0
5600	0.074	0.0	0.074	0.0	0.070	0.0	0.059	0.0
5800	0.077	0.0	0.077	0.0	0.073	0.0	0.062	0.0
6000	0.080	0.0	0.080	0.0	0.076	0.0	0.065	0.0

* REF refers to the building-out capacitance at the end from which the measurement is made.

† TERM refers to the building-out capacitance at the far end when the 4066A network is used as a precision termination for return loss measurements.

Note 1: Building-out capacitance adjustments are made externally to the 4066A network, such as the 1-type terminating set. When the 1-type terminating set is used, the REF column for building-out capacitance settings should be consulted.

Note 2: Zero building-out capacitance indicates that the 4066A network has a characteristic impedance equal to the corresponding length of cable for that particular gauge cable. *Example:* In 19HC, the 4066A (adjusted per Table A) appears as 800 feet of cable.

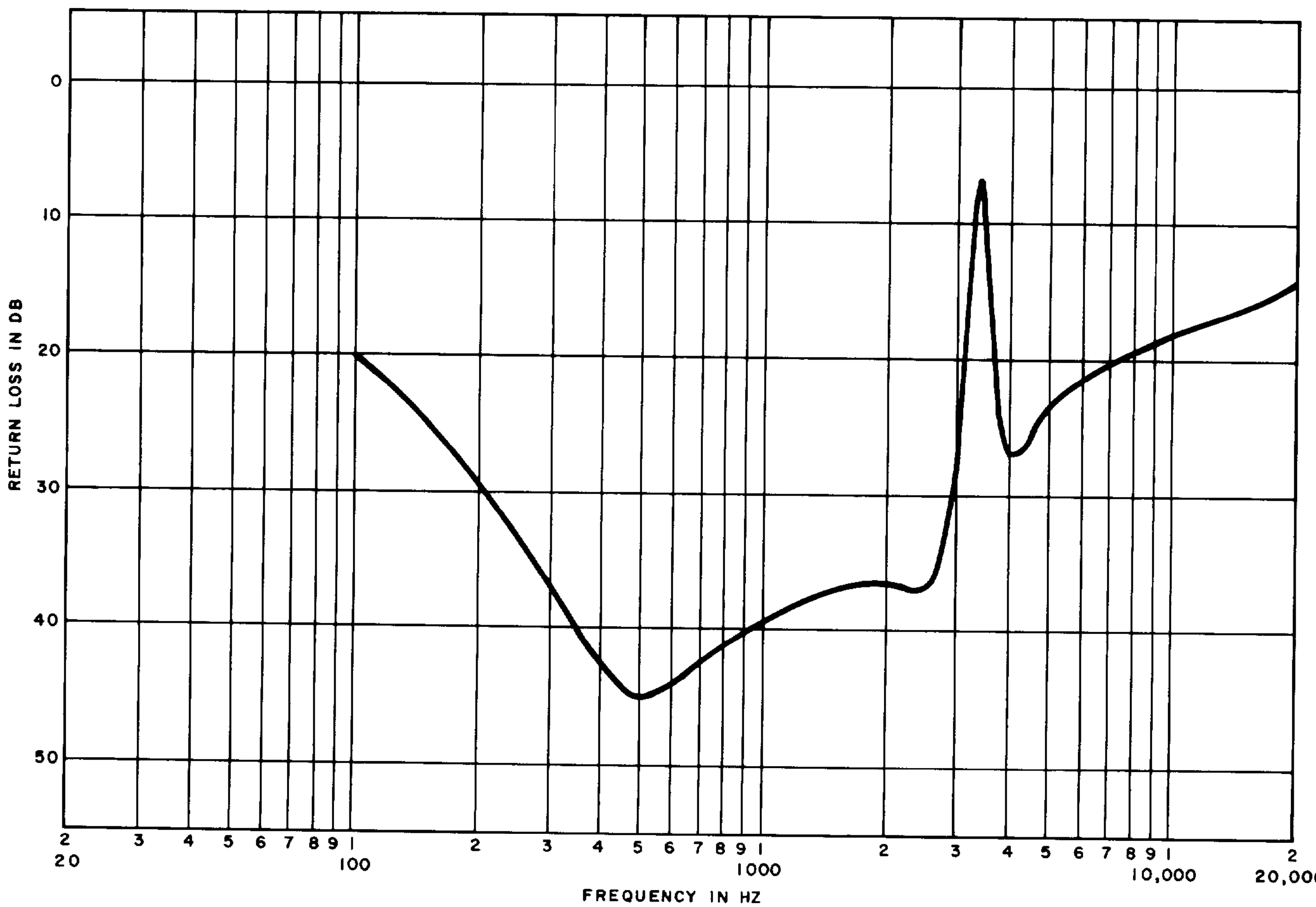

Fig. 3—4066A Network—Return Loss vs 19H88 High-Capacitance Cable—End Section = 0.5 Loading Section

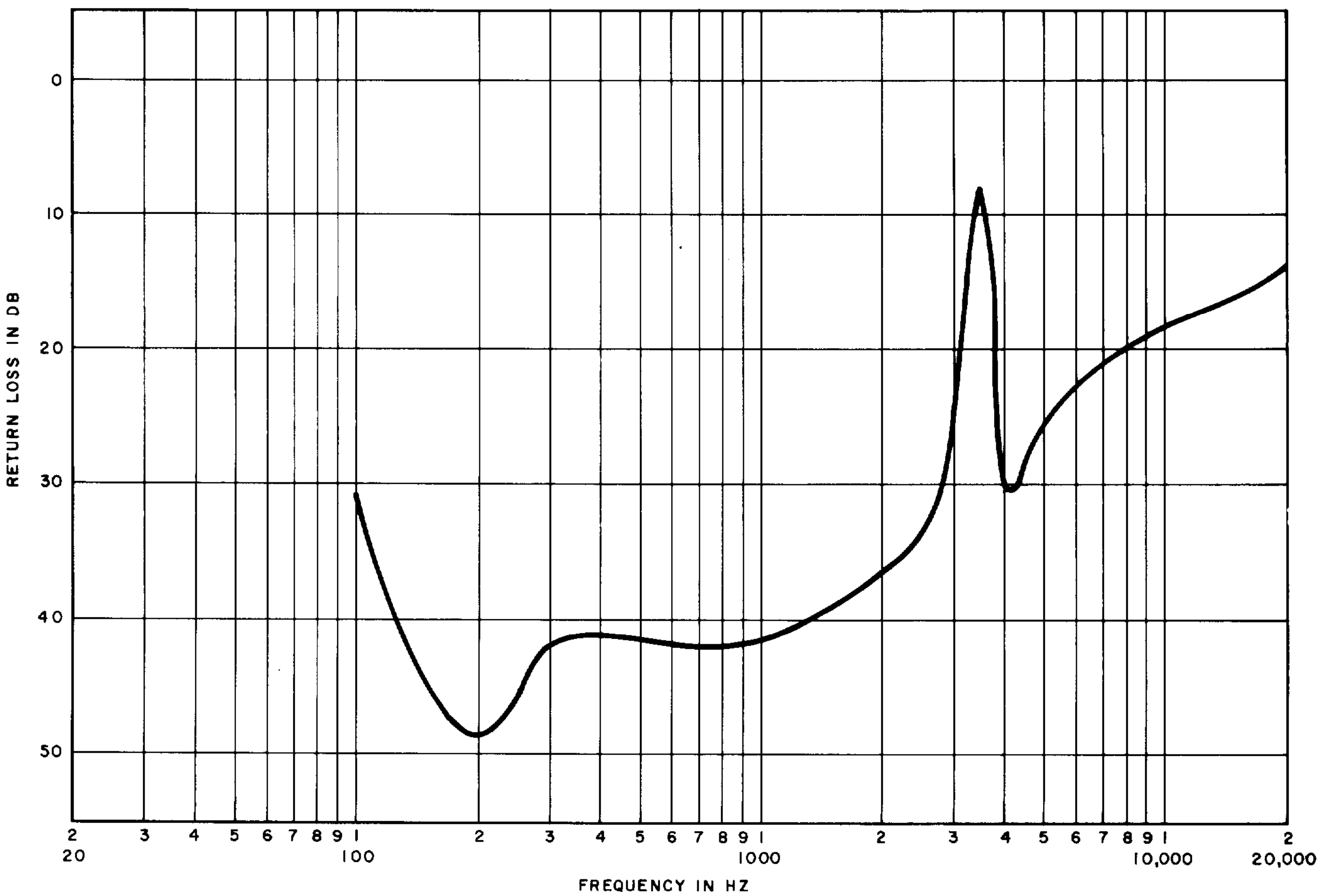

Fig. 4—4066A Network—Return Loss vs 22H88 High-Capacitance Cable—End Section = 0.5 Loading Section

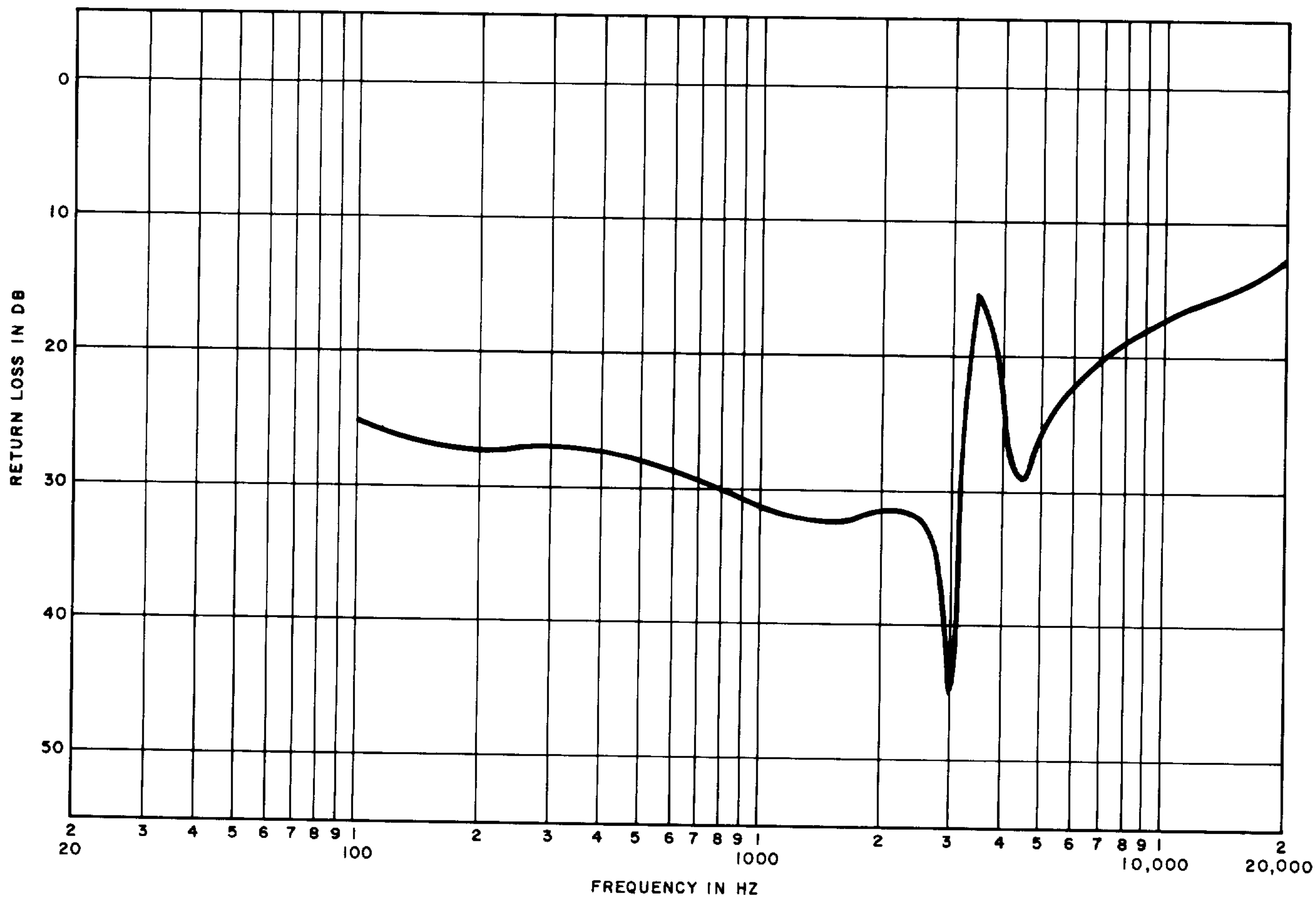

Fig. 5—4066A Network—Return Loss vs 24H88 High-Capacitance Cable—End Section = 0.5 Loading Section

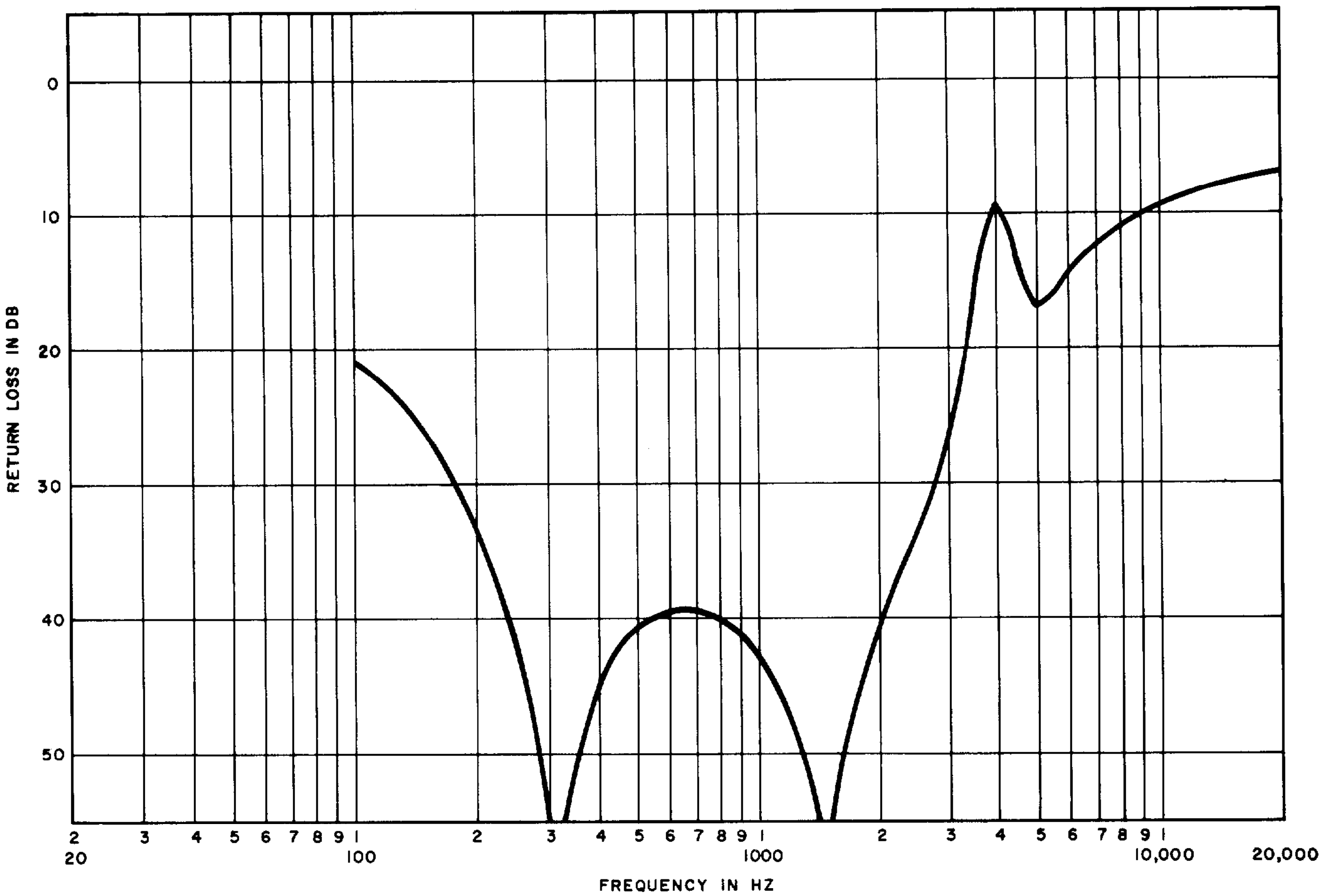

Fig. 6—4066A Network—Return Loss vs 19H88 High-Capacitance Cable—End Section = 0.25 Loading Section

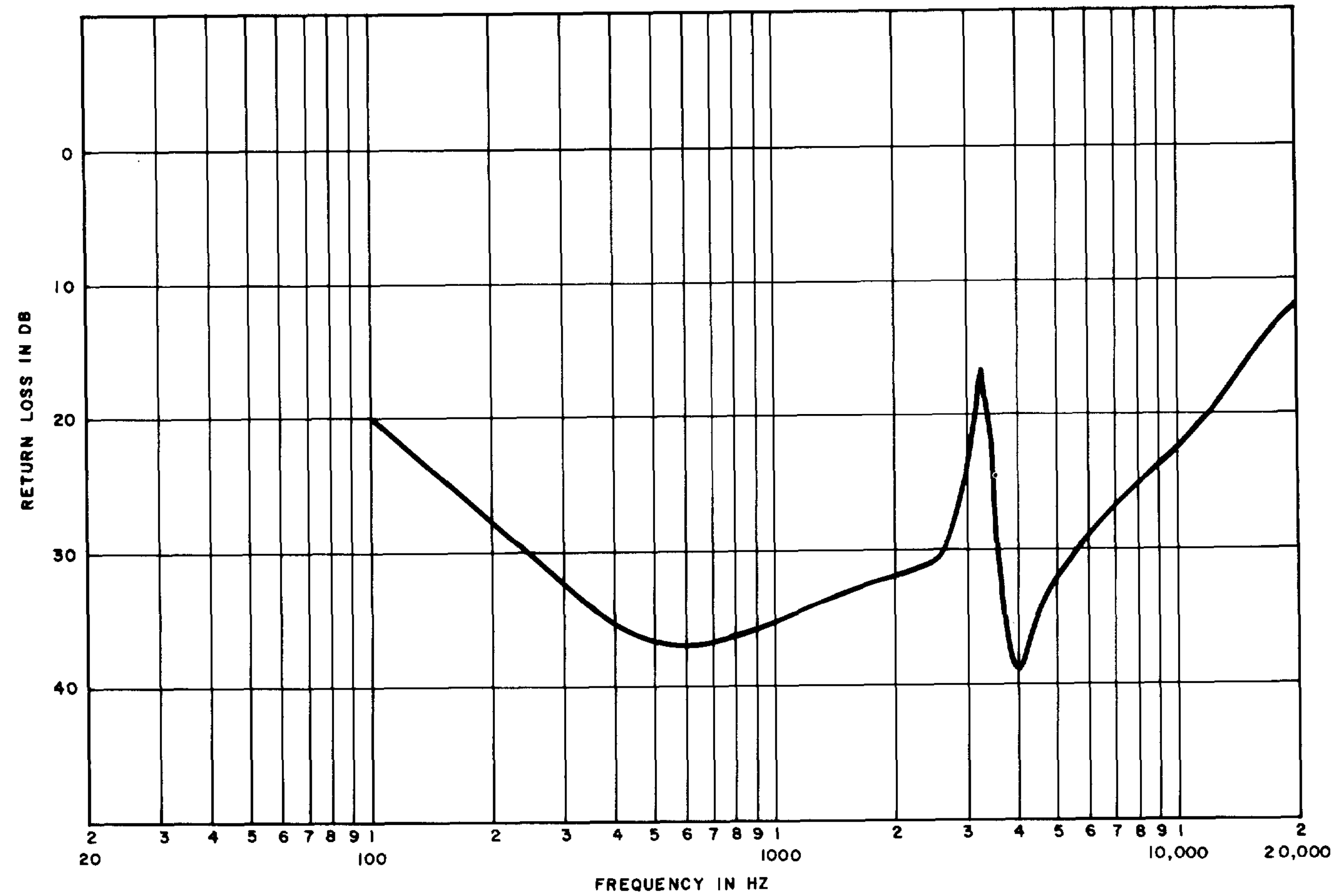

Fig. 7—4066A Network—Return Loss vs 19H88 High-Capacitance Cable—End Section = 0.75 Loading Section

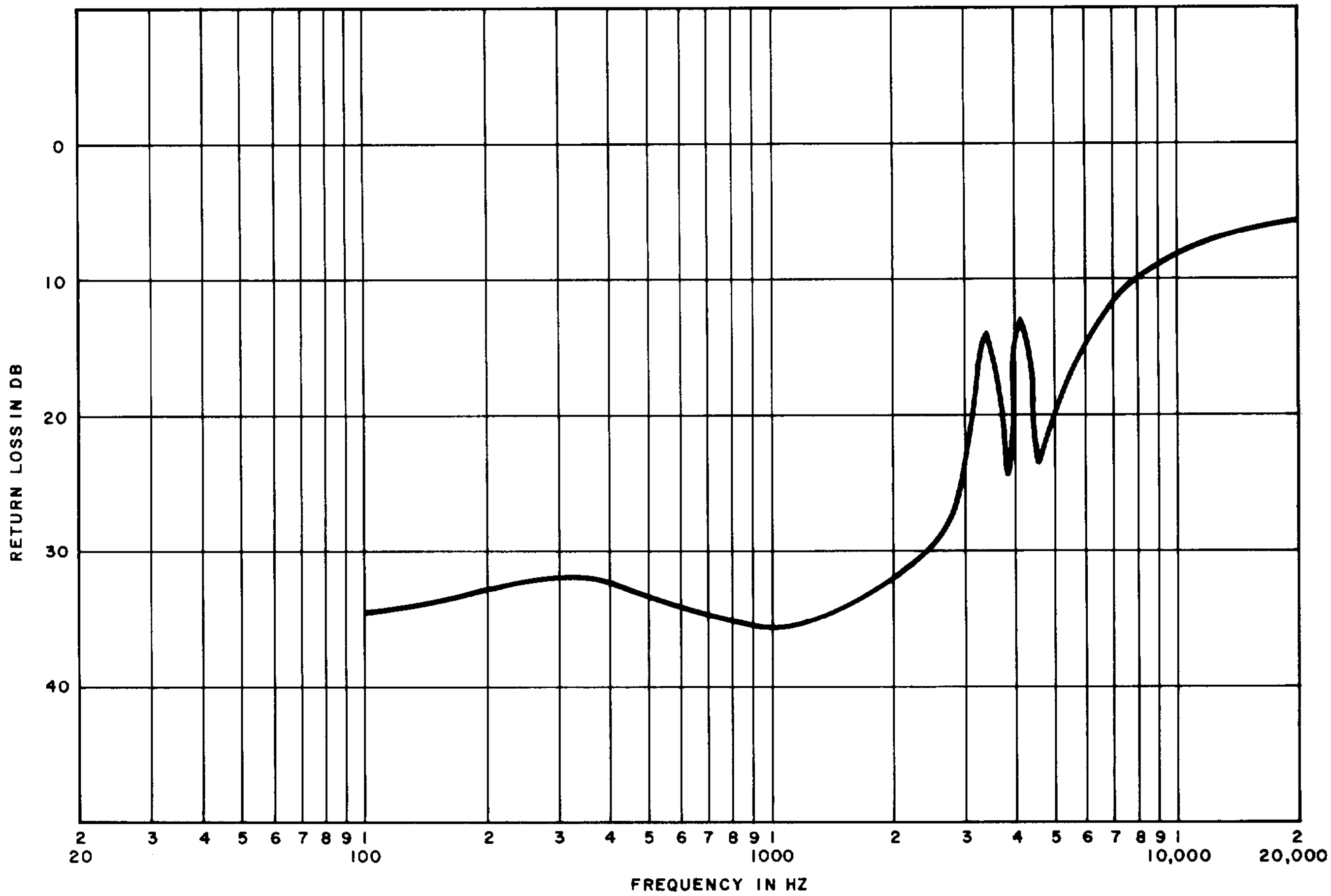

Fig. 8—4066A Network—Return Loss vs 19H88 High-Capacitance Cable—End Section = 0.25 Loading Section

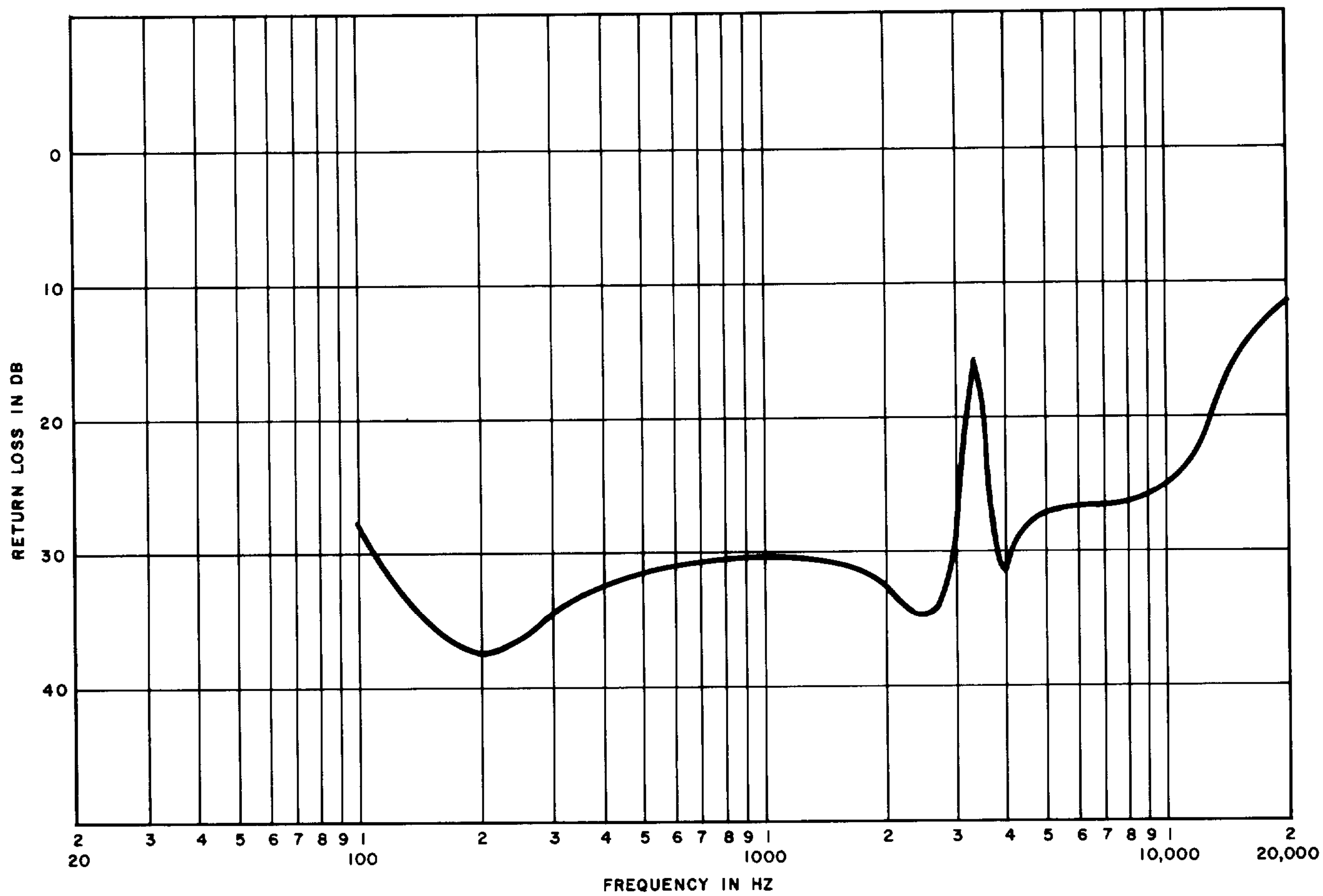

Fig. 9—4066A Network—Return Loss vs 22H88 High-Capacitance Cable—End Section = 0.75 Loading Section

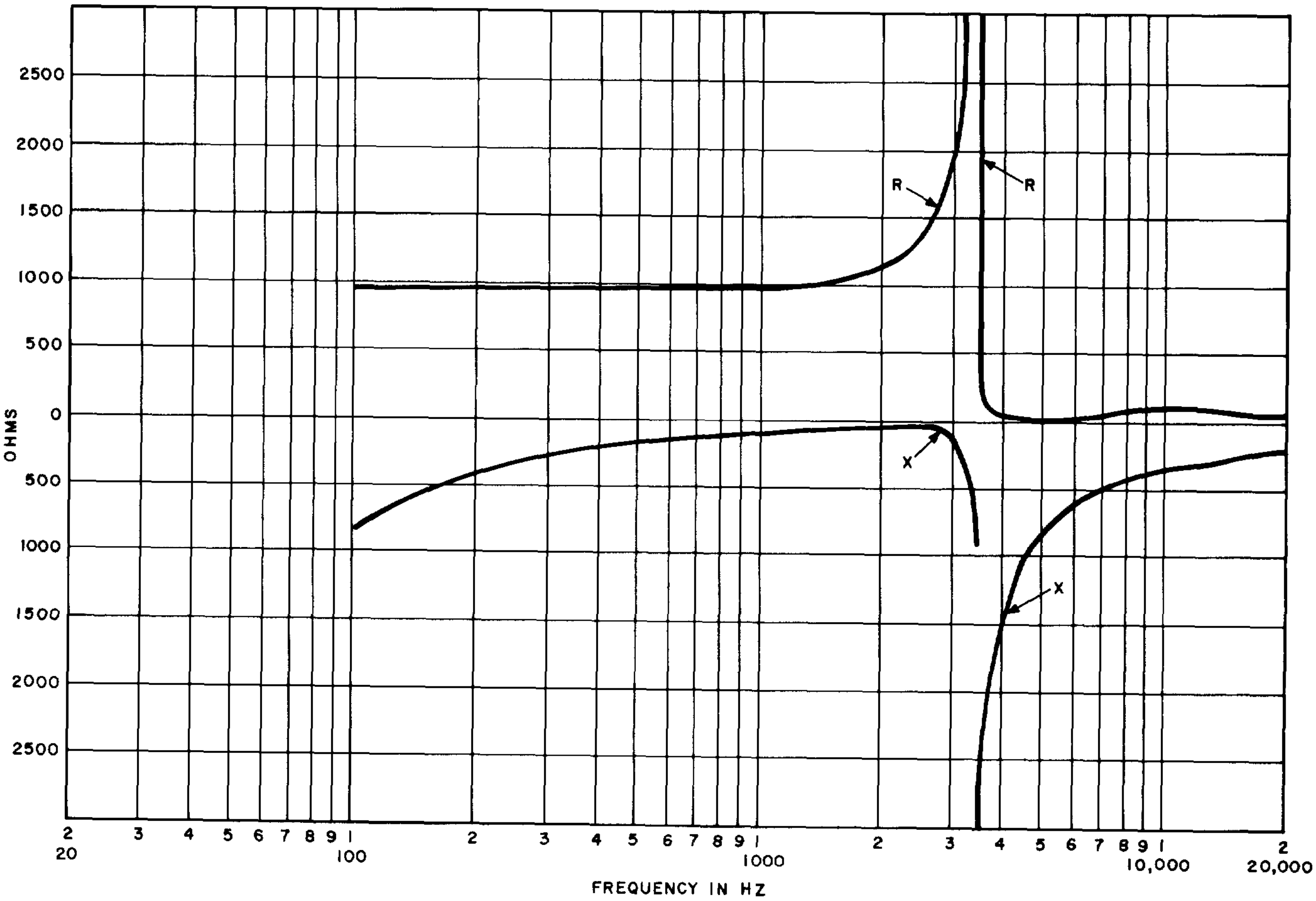

Fig. 10—4066A Network—Simulating Midsection Impedance of 19H88 High-Capacitance Cable

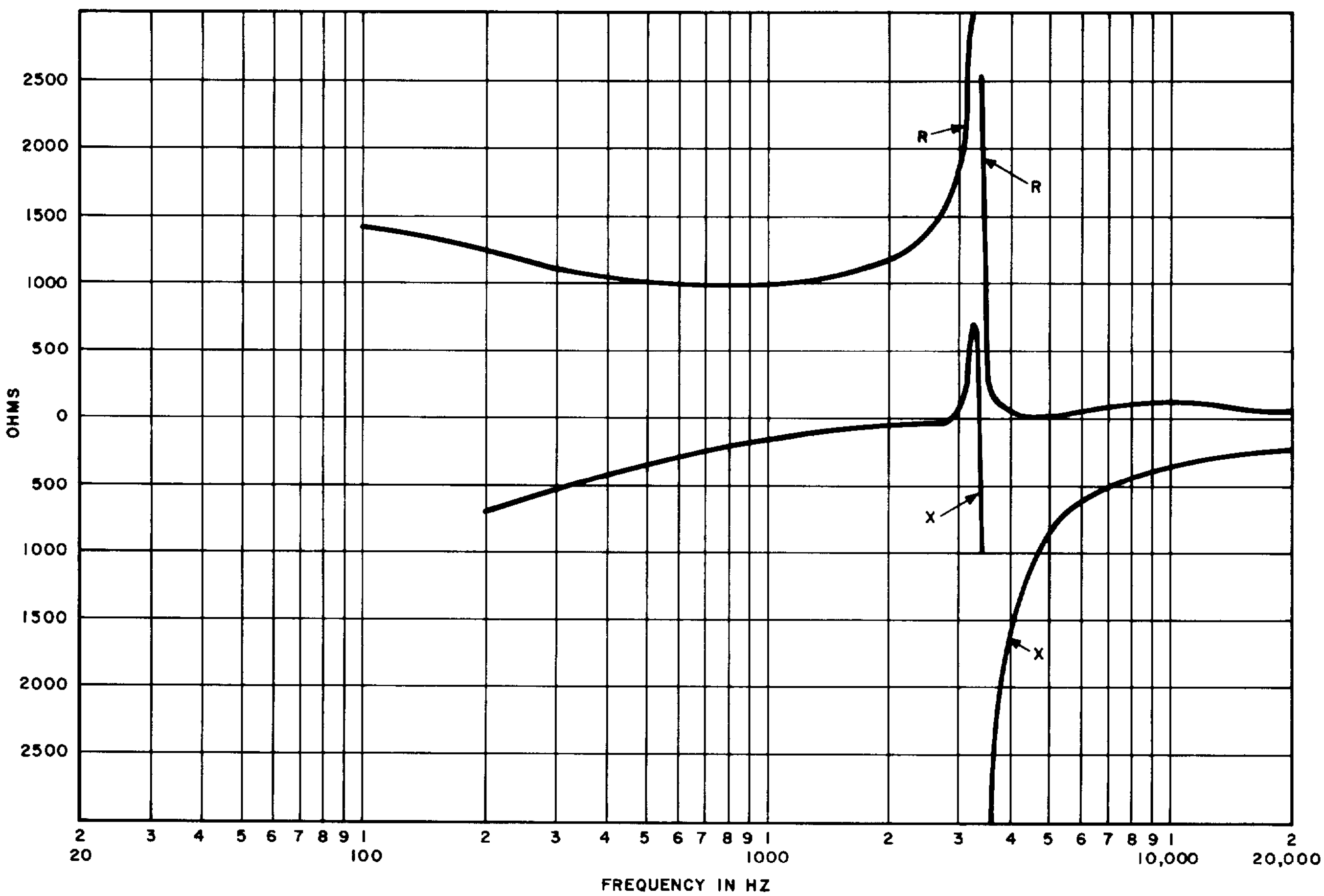

Fig. 11—4066A Network—Simulating Midsection Impedance of 22H88 High-Capacitance Cable

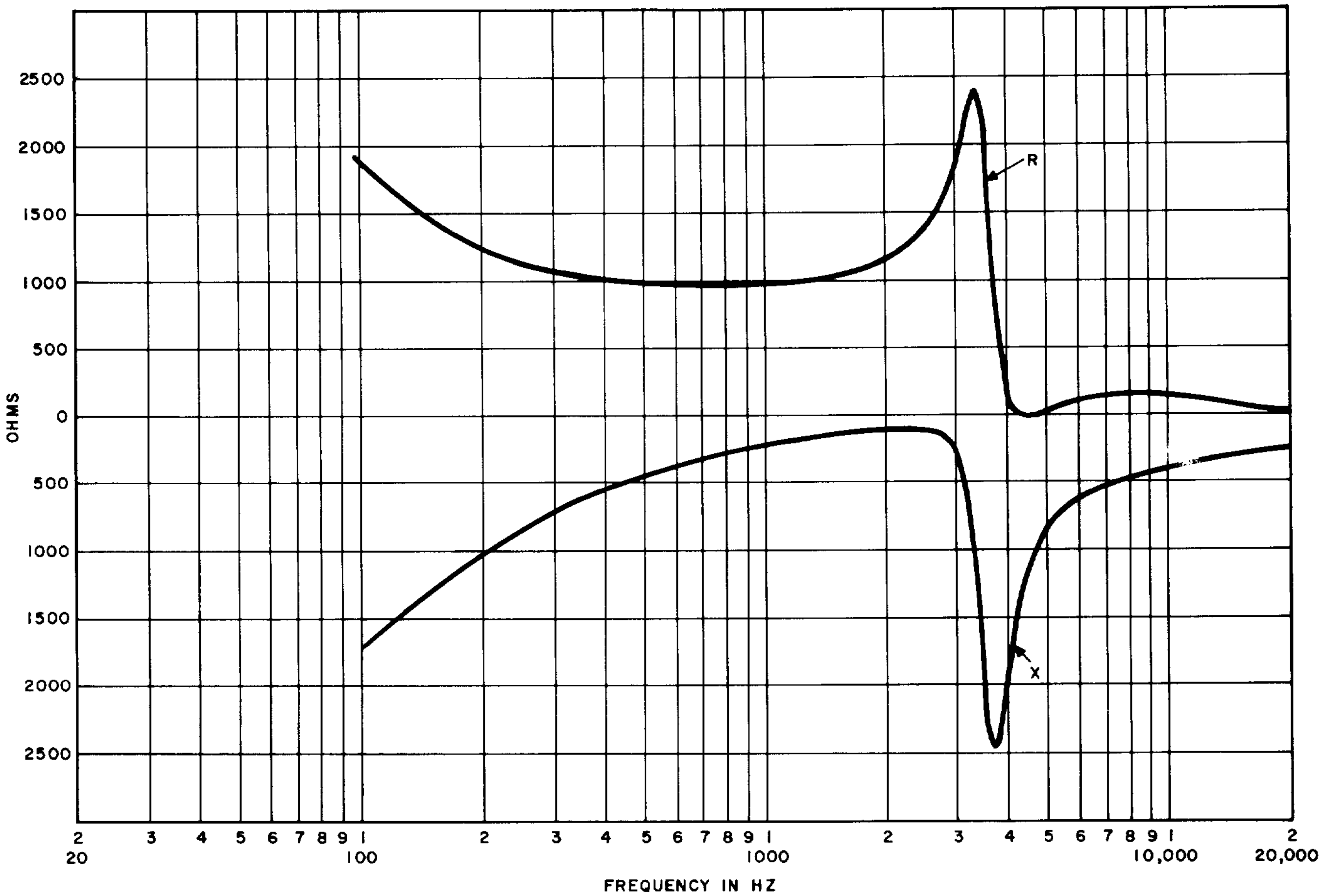

Fig. 12—4066A Network—Simulating Midsection Impedance of 24H88 High-Capacitance Cable

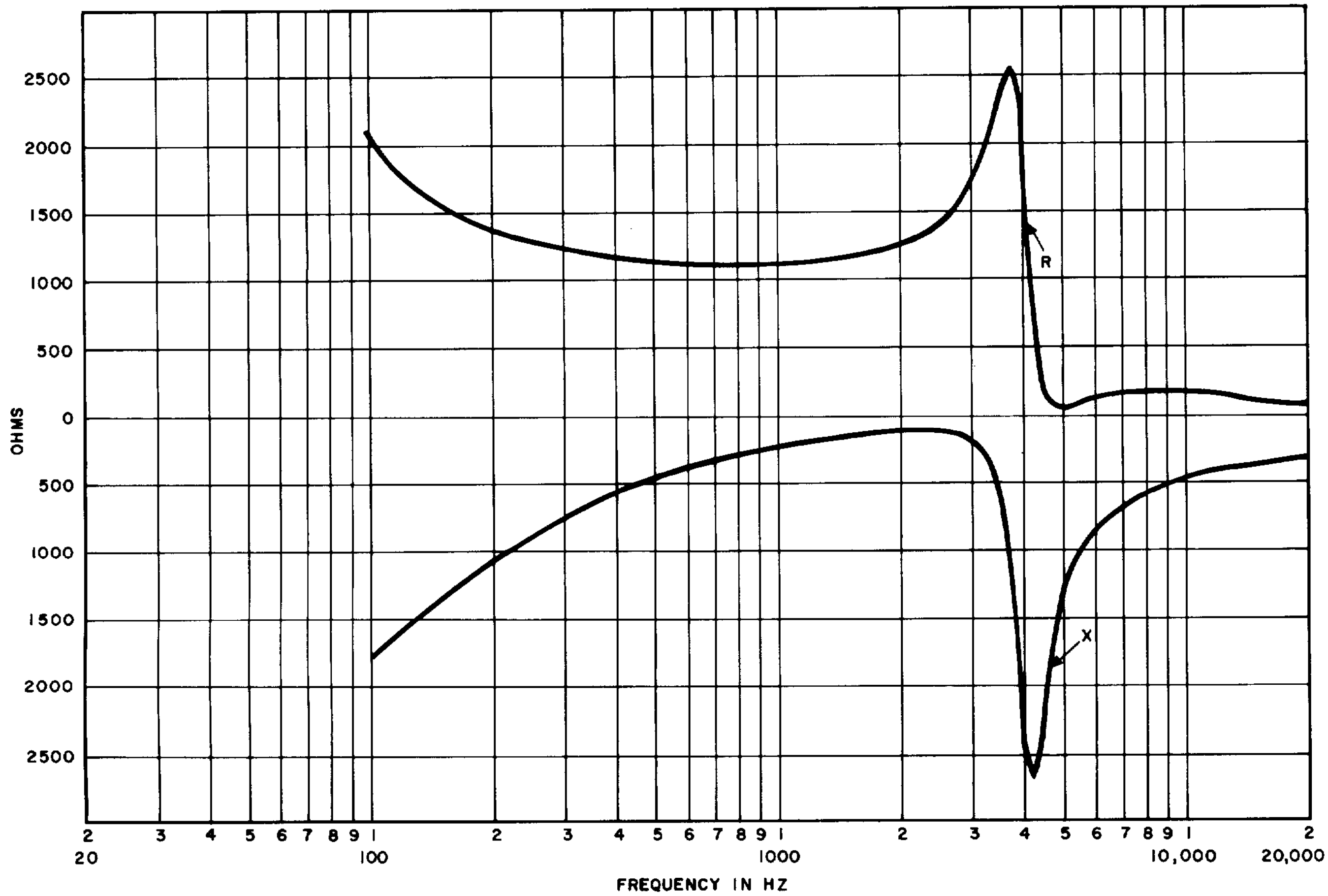

Fig. 13—4066A Network—Simulating Midsection Impedance of 24H88 Low-Capacitance Cable