Nov. 22, 1954
Job 346
Peter Kruger

Reactance Measurement of CGW H35-30W 350R 5%

A Object: To measure reactance of Corning glass resistor H35-30W over frequency range 2 to 32 mcs.

B. Equipment used:

1- General Radio standard Signal Generator model 1001-A

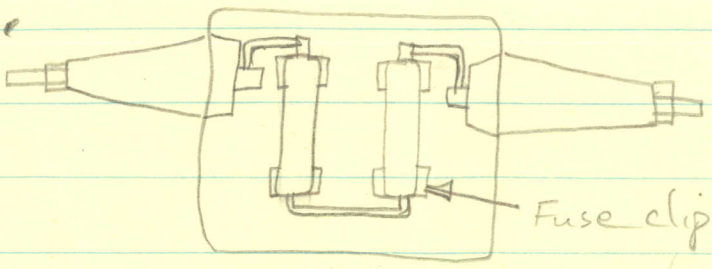
2- General Radio R.F. Bridge model 916-A

3- Receiver SP-600

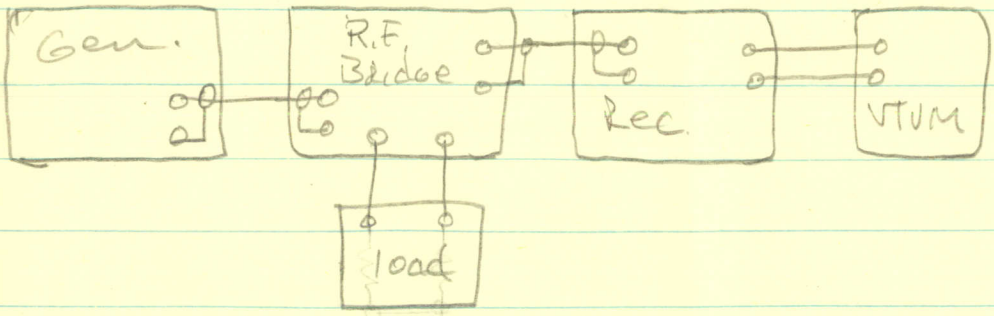
4- Vacuum tube Voltmeter - Heathkit V-6

C Wiring

1. Mount resistors in RAC casting box.

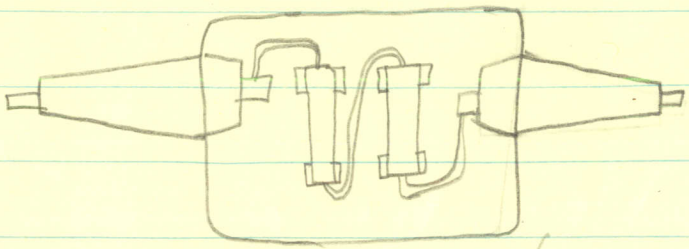


2. Connect equipment as follows



3. Record data.

4. Revise Resistors as follows



5. Record Data.

6. Measure Reatance of single Resistor.

D. Data.

	FREQ.	X Dial	X	R
(1.)	2	180	-j90	680
as above	4	600	-j150	640
	6	1400	-j230	600
	8	2500	-j310	550
	10	3150	-j315	490
	12	4000	-j330	440
	14	4900	-j345	390
	16	off range		

2. as 4 above; Same result as 1 above.

3. 1 resistor. IN Box

FREQ.	x dial	X	R.
2	25	-j13	340
4	100	-j25	338
6	220	-j36.6	335
8	290	-j36.2	330
10	600	-j60	325
14	1100	-j78	315
18	1900	-j105	300
22	2700	-j123	280
26	3500	-j135	265
32	5000	-j155	240

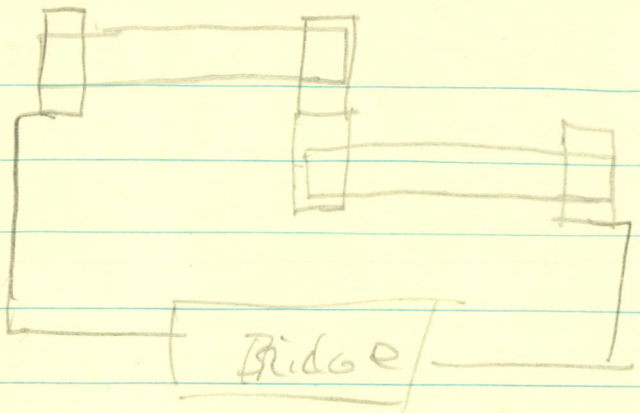
E. Results.

1. Resistance of two resistor in series decreases by 60% over frequency range 2 to 14 mc. The reactance increases from 90 to 345 ohms over the same frequency range.

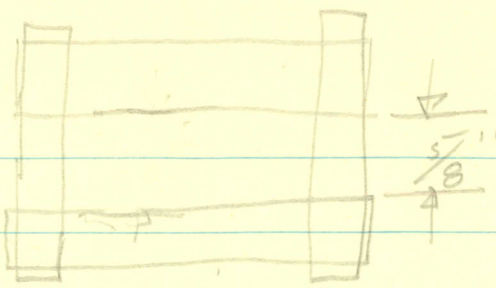
2. Resistance of single unit decreases by 20% over frequency range 2 to 32 MC. while its reactance increases 12 times.

Test 2 res in series

out of Box



Freq	X Dial	X	R
2 MC.	80 ÷ 2 =	-j40	690 Ω
4 MC	380 ÷ 4 =	-j97	680 Ω
6 MC	4000 3300 700 ÷ 6 =	-j117	660 Ω
8 MC	1300 ÷ 8 =	-j163	640 Ω
10 MC	2100 ÷ 10 =	-j210	620 Ω
12 MC	3600 ÷ 12 =	-j300	590 Ω
14 MC	4400 3600 ÷ 14 =	-j263	560 Ω.
16 MC	4400 ÷ 16 =	-j275	540 Ω
18 MC	off scale		R ≈ 510 Ω



out of Box

2 res. in parallel

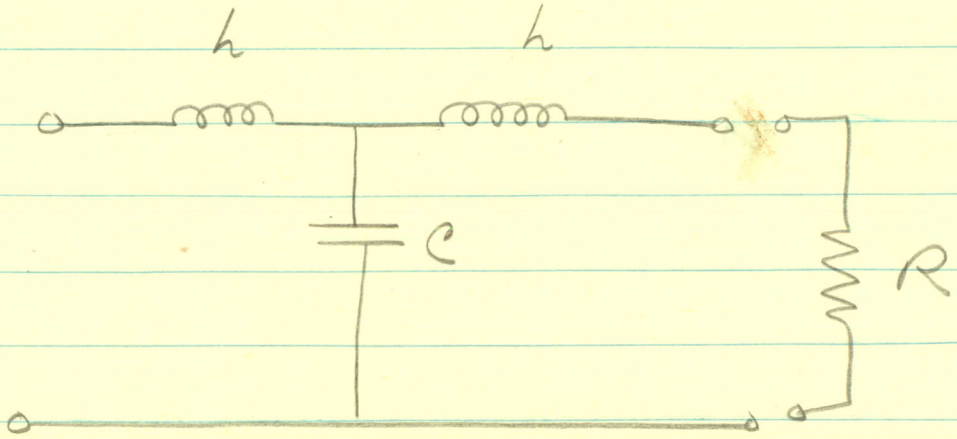
Freq	x Dial	x	Res.
2MC.	0	0	172Ω
4MC	20÷4=	-j5	172Ω
6MC	40÷6=	-j6.6	170Ω
8MC	70÷8=	-j8.75	170Ω
10MC.	115÷10=	-j11.5	170Ω
12MC.	145÷12=	-j12	169Ω
14MC.	200÷14=	-j14	167Ω
18MC.	380÷18=	-j21	165Ω
22MC	480÷22=	-j21.8	162Ω
26MC	650÷26=	-j25	160Ω
32MC	975÷30=	-j30.5	153Ω

single res. out of Box.

Freq	X Dial	X	Res.
2	20 ÷ 2 =	-j10	350Ω
4	80 ÷ 4 =	-j20	345Ω
6	170 ÷ 6 =	-j28.3	343Ω
8	300 ÷ 8 =	-j37.5	340Ω
10	450 ÷ 10 =	-j45	340Ω
14	865 ÷ 14 =	-j61	325Ω
18	1450 ÷ 18 =	-j80.5	315Ω
22	2200 ÷ 22 =	-j100	305Ω
26	2800 ÷ 26 =	-j111	290Ω
32	4100 ÷ 32 =	-j135	263Ω

Two Res. in parallel spaced 1 5/8 in. out of Box

Freq	X Dial	X	Res
2MC	5 ÷ 2 =	-j2.5	172
4MC.	16 ÷ 4 =	-j4	172Ω
6MC	40 ÷ 6 =	-j6.6	172Ω
8MC.	74 ÷ 8 =	-j9.2	170Ω
10MC	115 ÷ 10 =	-j11.5	170Ω
14MC	220 ÷ 14 =	-j15.7	168Ω
18MC.	360 ÷ 18 =	-j20	165Ω
22MC.	540 ÷ 22 =	-j24.5	160Ω
26MC	720 ÷ 26 =	-j27.6	158Ω
32MC.	1200 ÷ 32 =	-j37.4	152Ω



$$Z_{in} = j\omega L + \frac{\left(\frac{1}{j\omega C}\right)(j\omega L + R)}{j\omega L + \frac{1}{j\omega C} + R}$$

$$= j\omega L + \frac{\frac{L}{C} + \frac{R}{j\omega C}}{R + j\left(\omega L - \frac{1}{\omega C}\right)}$$

$$= \frac{j\omega LR - \omega L\left(\omega L - \frac{1}{\omega C}\right) + \frac{L}{C} + \frac{R}{j\omega C}}{R + j\left(\omega L - \frac{1}{\omega C}\right)}$$

$$= \frac{4R}{C} - \frac{\omega L R \left[\omega L - \frac{1}{\omega C}\right] + R\left[\omega L - \frac{1}{\omega C}\right]^2}{R^2 + \left[\omega L - \frac{1}{\omega C}\right]^2}$$

$$+ J \left[\frac{R^2 \left[\omega L - \frac{1}{\omega C}\right] - \frac{L}{C}\left[\omega L - \frac{1}{\omega C}\right] + \omega L \left[\omega L - \frac{1}{\omega C}\right]^2}{R^2 + \left[\omega L - \frac{1}{\omega C}\right]^2} \right]$$

$$= \frac{h}{C} - \omega L\left[\omega L - \frac{1}{\omega C}\right] + jR\left[\omega L - \frac{1}{\omega C}\right]$$

$$\overline{\qquad\qquad R + j\left[\omega L - \frac{1}{\omega C}\right]}$$

$$= \frac{hR}{C} - \omega LR\left[\omega L - \frac{1}{\omega C}\right] + jR^2\left[\omega L - \frac{1}{\omega C}\right]$$

$$- j\frac{L}{C}\left[\omega L - \frac{1}{\omega C}\right] + j\omega L\left[\omega L - \frac{1}{\omega C}\right]^2$$

$$+ R\left[\omega L - \frac{1}{\omega C}\right]^2$$