#21

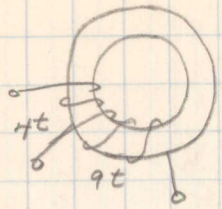
ENGINEERING

T[illegible]IEL
CORP[illegible]
MAMARONE[illegible]NEW Y RK

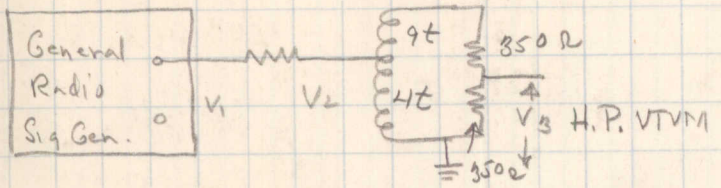
DATE	C[illegible]D.
DRAWN	APPD.
SHEET OF	NO

A.R. Bernardi

Test Data Coil 1-130



H Core
32 Cotenamel wire
2-32 mc
70-700 Ω



#	f	V_1	V_2	V_3	#	f	V_1	V_2	V_3	#	f	V_1	V_2	V_3
	2	1.0	.43	.65		2	1.0	.4	.6		2	1.0	.4	.62
1	8	1.0	.46	.68	11	8	1.0	.45	.68	21	8	1.0	.46	.68
	32	1.0	.51	.69		32	1.0	.49	.7		32	1.0	.51	.69
	2	1.0	.4	.61		2	1.0	.41	.62		2	1.0	.4	.61
2	8	1.0	.46	.68	12	8	1.0	.46	.69	22	8	1.0	.46	.69
	32	1.0	.5	.7		32	1.0	.49	.7		32	1.0	.49	.69
	2	1.0	.4	.62		2	1.0	.4	.61		2	1.0	.4	.61
3	8	1.0	.46	.68	13	8	1.0	.45	.68	23	8	1.0	.46	.68
	32	1.0	.49	.71		32	1.0	.49	.69		32	1.0	.49	.69
	2	1.0	.4	.61		2	1.0	.4	.6		2	1.0	.42	.62
4	8	1.0	.46	.69	14	8	1.0	.46	.69	24	8	1.0	.44	.68
	32	1.0	.51	.69		32	1.0	.5	.7		32	1.0	.52	.71
	2	1.0	.42	.6		2	1.0	.4	.6		2	1.0	.41	.61
5	8	1.0	.49	.68	15	8	1.0	.46	.69	25	8	1.0	.46	.69
	32	1.0	.53	.7		32	1.0	.49	.7		32	1.0	.5	.69
	2	1.0	.41	.61		2	1.0	.4	.61		2	1.0	.41	.61
6	8	1.0	.47	.69	16	8	1.0	.46	69	26	8	1.0	.46	.69
	32	1.0	.51	.69		32	1.0	.51	.69		32	1.0	.5	.69
	2	1.0	.4	.61		2	1.0	.41	.63		2	1.0	.41	.61
7	8	1.0	.46	.69	17	8	1.0	.46	.69	27	8	1.0	.46	.69
	32	1.0	.51	.69		32	1.0	.5	.69		32	1.0	.49	.69
	2	1.0	.4	.61		2	1.0	.4	.62		2	1.0	.41	.62
8	8	1.0	.46	.69	18	8	1.0	.46	.69	28	8	1.0	.48	.69
	32	1.0	.51	.69		32	1.0	.49	.69		32	1.0	.51	.69
	2	1.0	.4	.61		2	1.0	.4	.61		2	1.0	.42	.62
9	8	1.0	.46	.69	19	8	1.0	.46	.69	29	8	1.0	.49	.7
	32	1.0	.5	.7		32	1.0	.49	.7		32	1.0	.54	.68
	2	1.0	.42	.6		2	1.0	.4	.61		2			
10	8	1.0	.49	.69	20	8	1.0	.46	.69	30	8			
	32	1.0	.52	.71		32	1.0	.49	.69		32			

RCR System.

Send Filter	Receive		
425	425	} on hand.	2125
595			2805
765			765

4 3/26/53

att
Don Hall
Hallamore Mfg Corp
2001 E Artesia
Long Beach Calif

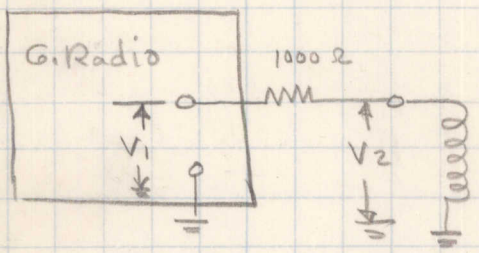
2-30 mc reactors for Herb Karsh
Hallamore Mfg Co. Calif.

#1 1000 Ω inductive reactance at 2mc

H core
#32 cotenamel
16 Turns

#2 1200 Ω X_L

18 turns



V_1 constant at 1 volt.

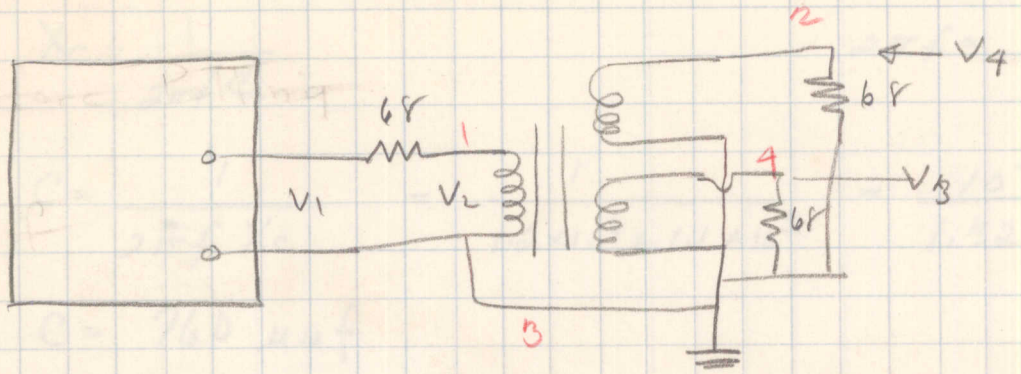
f	V_2
2	.65
4	.74
8	.81
12	.82
16	.8
20	.78
24	.74
28	.7
30	.68

#1 1000 Ω S-160

#2 1200 Ω S-161

4/22/58

70/ 70 ohm 2-32 mc TR-026



Before Potting

f	V1	V2	V3	V4
2	1.05	.5	.5	.3
8	|	.56	.52	.52
30	|	.65	.28	.24

After Potting in Plastic

f	V1	V2	V3	V4
2	1.05	.44	.26	.27
8	|	.52	.3	.3
30	|	.63	.27	.24

Design of impedance matching network

To match load of 5 - J1100 To 72 ohms at 190 kc

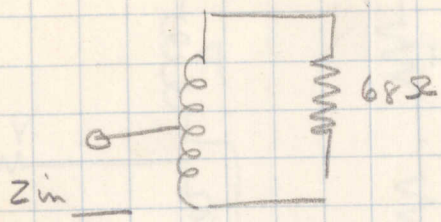
$$X_C = \frac{1}{2\pi f C}$$

$$2\pi f = 6.28 \times 190 \times 10^3 = 1.2 \times 10^6$$

$$C = \frac{1}{2\pi f X_C} = \frac{1}{1.2\times10^6 \times 1.1 \times 10^3} = \frac{10^{-9}}{1.32} = \frac{1000 \times 10^{-12}}{1.32}$$

$$C = 760 \ \mu\mu f$$

$$L = \frac{X_L}{2\pi f} = \frac{1100}{1.2\times10^6} = 920 \ \mu hy$$



$Z_{in} = 5 + J50$

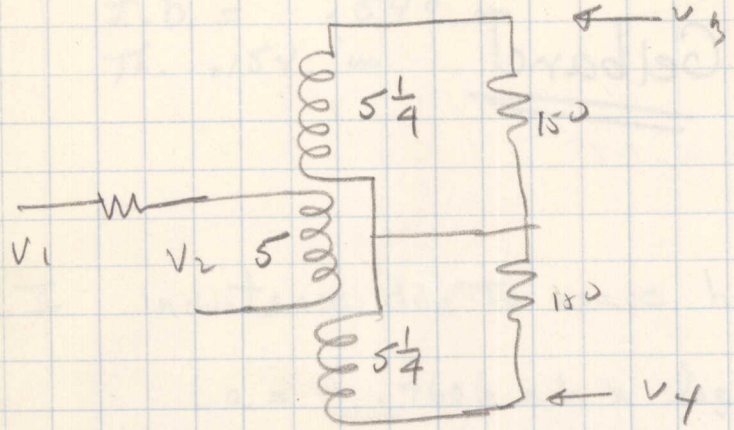
Q various cores at 195 kc

					Core loss R
Arnold - A 013015-2	Q = 102	Rdc - 2.8	Rac = 17		14
Stackpole - Std	Q = 74	Rdc 8.0	Rac = 20		12

R.F. Coupling Transformer 2 - 32 mc.

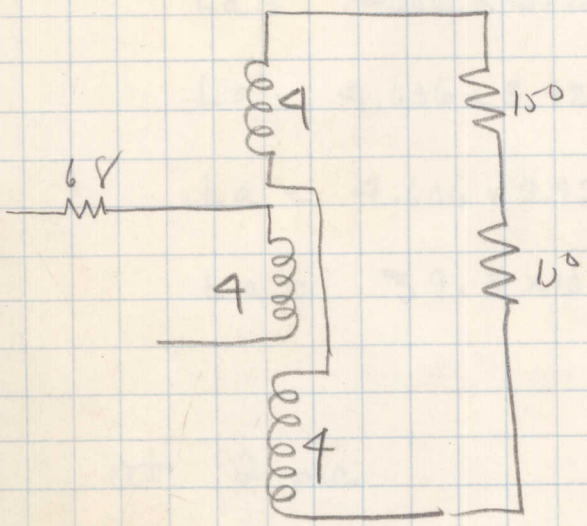
TR-027

70 ohms unballanced to 300 ohms ballanced.



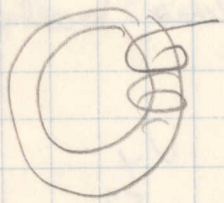
f	V_1	V_2	V_3	V_4
2	1.05	.46	.41	.52
8	1.05	.5	.42	.56
32	1.05	.66	.37	.45

high freq response off



f	V_1	V_2	V_3	V_4
2	1.05	.4	.4	.38
8	1.05	.47	.46	.43
32	1.05	.57	.41	.39

Test of RAE Core Type H with RF Bridge



5 turns # 30 coten amel

frequency 3 mc

Gelbard

R	X	X'
44	410	187

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unacceptable

R	X	X'
55	320	107

New

R	X	X'
39	260	97

Cores Received 7/8/53

R	X
43	280

Determination of Permiability by R.F. Permeameter. # 216 $K_b = 10.5 \times 10^{-9}$

General Ceramics Type H F109 Core dimensions

I O.D. = .892 in
I.D. = .540 in
Th. .154 in

$.154 \text{ in} \times \frac{2.54 \text{ cm}}{\text{in}} \times \frac{1 \text{ meter}}{100 \text{ cm}}$

$= 1.54 \times 2.54 \times 10^{-3} = 5.92 \times 10^{-3}$

II Inductance due To space having dimension of Test Core

$$La = .4606 \times h \times \log_{10} \frac{b}{a} \times 10^{-6}$$

$$La = .4606 \times 3.92 \times 10^{-3} \log_{10} \frac{.892}{.540} \times 10^{-6}$$

$$La = 4.606 \times 3.92 \times 10^{-10} \log_{10} 1.65$$

$$La = 4.606 \times 3.92 \times 2.18 \times 10^{-11}$$

$$La = 39.3 \times 10^{-11} = 3.93 \times 10^{-10}$$

check

$C_i = 244.4$
$Cf = 252$
$C_o = 395.7$

$C_{of} = C_o - C_f = 395.7 - 252 = 143.$

$C_{oi} = C_o - C_i = 395.7 - 244.4 =$

$C_{fi} = C_f - C_i = 252 - 244.4 = 7.6$

at 2 mc

$C_i = 245 \ \mu\mu f$ with Test Core and shorting plate removed
$Cf = 252 \ \mu\mu f$ with " " " " " installed
$C_o = 395 \ \mu\mu f$ minus Test core and with shorting plate installed

$C_{of} = C_o - C_f = 395 - 252 = 143$
$C_{oi} = C_o - C_i = 395 - 245 = 150$
$C_{fi} = C_f - C_i = 252 - 245 = 7$

$\frac{105}{3.93} \times \frac{143.7}{7.6}$

$\mu = 505$

$$\mu = K_b \frac{\frac{C_{of}}{C_{fi}}}{La} + 1 = 10.5 \times 10^{-9} \frac{\frac{143}{7}}{3.93 \times 10^{-10}} + 1 = \frac{105 \times 20.4}{3.93} + 1$$

$= 546$

Ferroxcube Toroid

I. D. = .500
O. D. = 1.005
ht = .245

$\frac{.245 \times 2.54 \times}{100} = 2.45 \times 2.54 \times 10^{-3} = 6.22 \times 10^{-3}$

$\frac{b}{a} = \frac{1.005}{.5} = 2.01$

$h_a = .4606 \times 6.22 \times 10^{-3} \log_{10} 2.01 \times 10^{-6}$

$= 4.606 \times 6.22 \times 10^{-10} \times .3032$

$= 8.68 \times 10^{-10}$

$C_0 = 396.2$
$C_1 = 244.3$
$C_f = 245.4$

+.4
−.8
1.2 ΔC

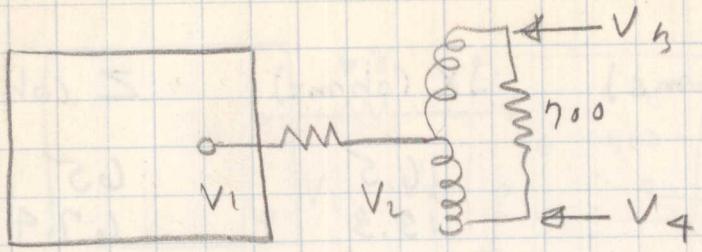
$C_{of} = C_0 - C_f = 396.2 - 245.4 = 150.8$

$C_{01} = C_0 - C_1 = 396.2 - 244.3 = 151.9$

$C_{f1} = C_f - C_1 = 245.4 - 244.3 = 1.1$ or 1.2

$\mu = \frac{105 \times 10^{10}}{8.68 \times 10^{10}} \quad \frac{150.8}{1.2} + 1 = 1500$

Test of ferroxicube Toroid on nac.



f	V_1	V_2	V_3	V_4
2	1.0	.52	.7	.74
8	1.0	.52	.7	.74
32	1.0	.54	.9	.7

Impedance Bridge Measurements

f	R	X_L	X'_L	Z
2	73	55	17	76
8	81	68	8	81
30	78	230	6	78

700 ohm termination 6/24/53

fmc	R (ohms)	JX' (ohms)	JX ohms	Z ohms
2	57	27	13.5	58.5
4	62	38	9.5	62.7
6	63	57	9.5	63.5
10	64	94	9.4	64.5
14	64	144	10.0	64.6
18	64	200	11.0	64.8
20	64	227	11.5	64.8
22	64	265	12.0	65.0
24	64	320	13.3	65.4
26	64	360	13.9	65.5
28	63	370	13.2	64.4
30	63	465	15.5	64.7
32	61	415	13.0	62.5
40	57	750	18.7	60.0

200 ohm termination 6/24/55

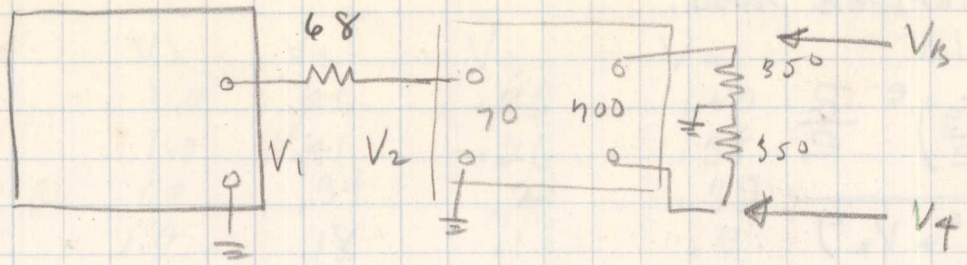
f (mc)	R (ohms)	JX' (ohms)	JX (ohms)	Z (ohms)
2	63	33	16.5	65
3	66	40	13.3	67.4
4	66	54	13.5	67.4
6	68	74	12.3	69.0
10	69	109	10.9	69.8
14	71	158	11.3	72.0
18	71	220	11.3	72.0
20	71	250	12.4	72.0
22	71	290	13.2	72.0
24	71	320	13.2	72.0
26	71	345	13.2	72.2
28	71	365	13.1	72.2
30	71	355	11.8	72.0
32	68	375	11.7	68.8
40	64	660	16.5	66.0

open ckt impedance at 8 mc

R	JX'	JX
300	280	35

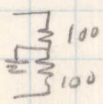
Sht ckt imp. at 8 mc

R	JX'	JX
0	81	10



f mc	V_1	V_2	V_3	V_4	Balance ratio		insertion loss
2	1.0	.48	.79	.73	1.08		.45
4	1.0	.49	.78	.74	1.05		.45
6	1.0	.50	.81	.75	1.07	1.06	.3
8	1.0	.51	.81	.76	1.06		.3
10	1.0	.51	.8	.75	1.05		.3
14	1.0	.51	.8	.76	1.05		.3
18							
20	1.0	.51	.8	.75	1.05		.3
24	1.0	.52	.81	.76	1.06		.3
28	1.0	.52	.82	.76	1.07		.2
30	1.0	.52	.82	.75	1.07		.2
32	1.0	.53	.82	.76	1.08		.2
40	1.0	.53	.83	.75	1.1		.2
50	1.0	.54	.84	.75	1.12		.2

200 ohm termination



6/25/53

f mc	V_1	V_2	V_3	V_4	Balance Ratio	insertion loss
2	1.0	.5	.37	.4	1.08	.86
4	1.0	.5	.37	.4	1.08	.86
6	1.0	.5	.38	.4	1.05	.86
8	1.0	.51	.38	.4	1.05	.86
10	1.0	.51	.38	.4	1.05	.86
14	1.0	.52	.39	.41	1.05	.6
20					1.05	
24	1.0	.52	.39	.41	1.05	.6
28	1.0	.53	.39	.41	1.05	.6
30	1.0	.53	.39	.41	1.05	.6
32					1.05	
40	1.0	.53	.39	.41	1.05	.6
50	1.0	.63	.38	.44	1.16	.6

Calculation of Insertion loss.

$$I_L = 10 \log \frac{\left(\frac{E_g}{2}\right)^2 \frac{R}{2}}{R_g (V_1^2 + V_2^2)}$$

Case I 700 ohm Termination

$E_g = 1.0$

$R/2 = 350$

$R_g = 68$

$$I_L = 10 \log \left[\frac{350}{4 \times 68} \frac{1}{(V_1^2 + V_2^2)} \right] = 10 \log \left[\frac{350}{272} \times \frac{1}{(V_1^2 + V_2^2)} \right]$$

$$I_L = 10 \log \frac{1.29}{V_1^2 + V_2^2}$$

Case II 200 ohm termination

$R/2 = 100$

$R_g = 68$

$$I_L = 10 \log \frac{100}{4 \times 68} \frac{1}{V_1^2 + V_2^2} = \frac{.368}{V_1^2 + V_2^2}$$

Extension of Frequency measurements on RAE-A

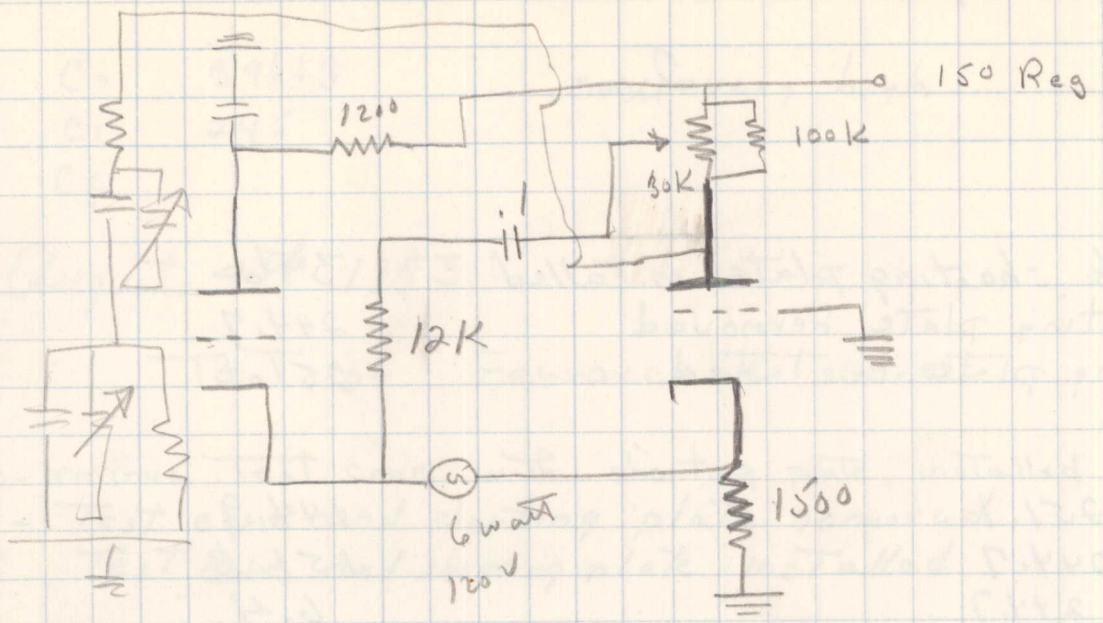
200 ohm termination

fmc	V_1	V_2	V_3	V_4	Balance Ratio	Insertion loss
1	1.0	.46	.36	.40		
.5	1.0	.41	.26	.38		2.4
.4	1.0	.34	.2	.37		4.0
.3	1.0	.18	.1	.3		5.6 dB
64.0	1.0	.5	.34	.36		
					← with Voxe multiplier	
64.0	1.0	.51	.36	.38		
96.0	1.0	.54				

700 ohm termination

fmc	V_1	V_2	V_3	V_4
100	.6	.36	.39	.49
110	1.0	.58	.59	.86
120	1.0	.6		

Audio Osc.



Determination of Permeability General Ceramics
H Core Received 7/8/53

ht = .152"
ID = .540
OD = .892

2 mc.

C_o - minus Test core with shorting plate installed	396
C_1 - Test core and shorting plate removed	244.7
C_f Test core and shorting plate installed	251.1

$C_{of} = C_o - C_f = 396 - 251.1$	144.9
$C_{o1} = C_o - C_1 = 396 - 244.7$	151.3
$C_{f1} = C_f - C_1 = 251.1 - 244.7$	6.4

$$\mu = Kb \frac{\frac{C_{of}}{C_{f1}}}{La} + 1$$

$$= 10.5 \times 10^{-9} \times \frac{\frac{144.9}{6.4}}{3.93 \times 10^{-10}} + 1$$

$$= 105 \times \cancel{10} \times \frac{144.9}{6.4} \frac{1}{3.93 \times \cancel{10}} + 1$$

$\mu = 600$

Permeability Ferroxocube

C_o 396.3 — μ very high
C_1 245
C_f

August 4th 1953

Test of Ferroxcube cores. at 2mc.

C_o - minus Test core with shorting plate installed 396
C_1 - Test core and shorting plate removed 245.7
C_f Test core and shorting plate installed 247.9

$C_{of} = C_o - C_f = 396 - 247.9 = 148.1$
$C_{o1} = C_o - C_1 = 396 - 245.7 = 150.3$
$C_{f1} = C_f - C_1 = 247.9 - 245.7 = 2.2$

$La = 8.68 \times 10^{-10}$

$$\mu = Kb \frac{\frac{C_{of}}{C_{f1}}}{La} = 105 \frac{\frac{148.1}{2.2}}{8.68 \times 10^{-10}}$$

$$\mu = \frac{105 \times 148.1}{2.2 \times 8.68} = 815$$

Aug 19 1953 Test of Ferroxcube cores at 2mc

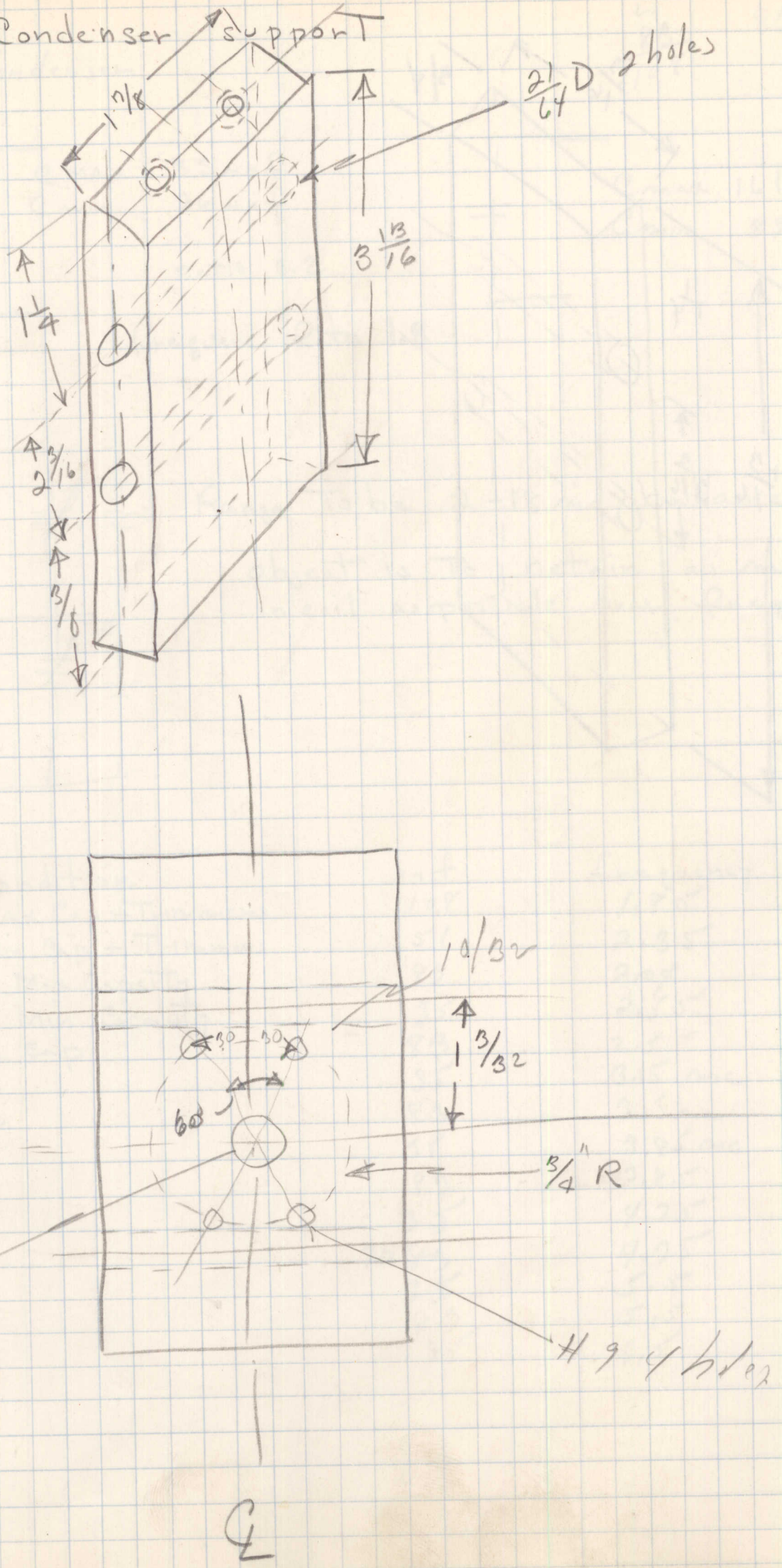
C_o 396
C_1 245.3
C_f 247.0

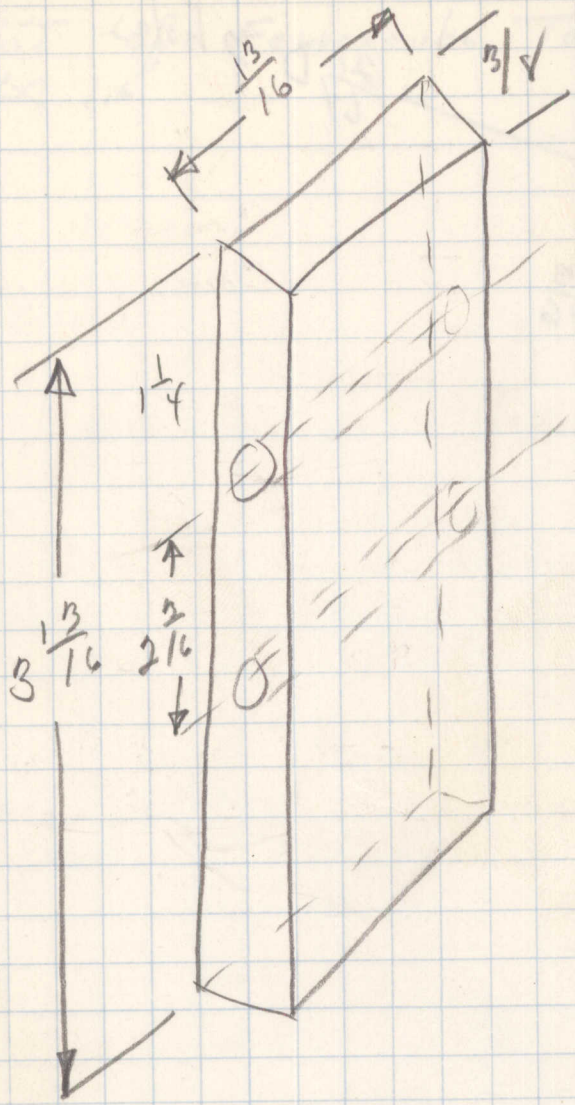
$C_{of} = 396 - 247. = 149$
$C_{o1} = 396 - 245.3 = 150.7$
$C_{f1} = 247.0 - 245.3 = 1.7$

$$\mu = \frac{105 \times 149}{1.7 \times 8.68} = 1060$$

Test of Ferroxcube Toroids Received Aug. 26 ≈
Δc 1.6

TAC Condenser support

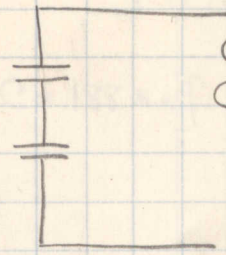



13/16
3/4
1 1/4
3 13/16
2 2/16

25
83
108

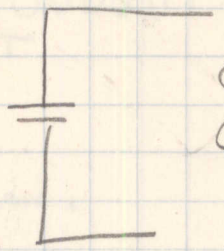
83
26
25
51

TAC Condenser



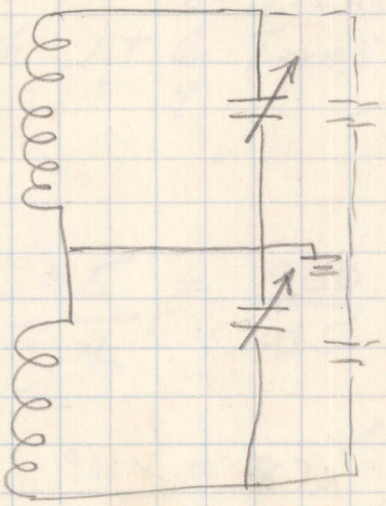
C_{MAX} 83 μμf
C_{min} 26 μμf

ratio 3.2



C_{max} 161 μμf
C_{min} 39 μμf

frequency Ratio 1.8

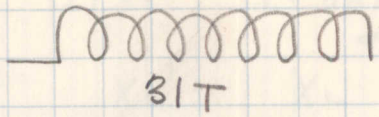


Range To be 2-18 mc ballanced.

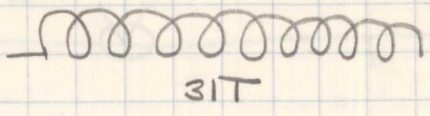
object is To retain as many Turns in coil as possible over freq range.

Condition	μμf	frequency	TAP freq
ToTal Coil + MAx Cap + Trimmers	108	1.85	0
ToTal Coil + Min Cap + Trimmers	51	2.35	0
ToTal Coil + Max Capcity	83	2.10	0
ToTal Coil + Min Capacity	35	2.55	0
max cap	83	2.55	9
min	35	3.15 mc	9
min	83	3.15 mc	15
	35	3.85 mc	15
	83	3.85	19
	35	4.75	19
	70 83	4.75	21
	35	5.5	21
	83	5.5	23
	35	6.5	23

Q > 250
L = 34.5 uh



L = 35 uh.



34.5
35.0
69.5

at 2mc C = 188 mmf

$L_1 + L_2 = 78$

C = 92 mmf for 2mc.

with 36 mmf Tuning Total coil fr - 17.f

8 Turns " " fr - 17.6 mc
with 1st 6 Turns on high end - fr - 18 mc Q 55
" 4 " " " fr - 21 mc Q 60
} 36 mmf C

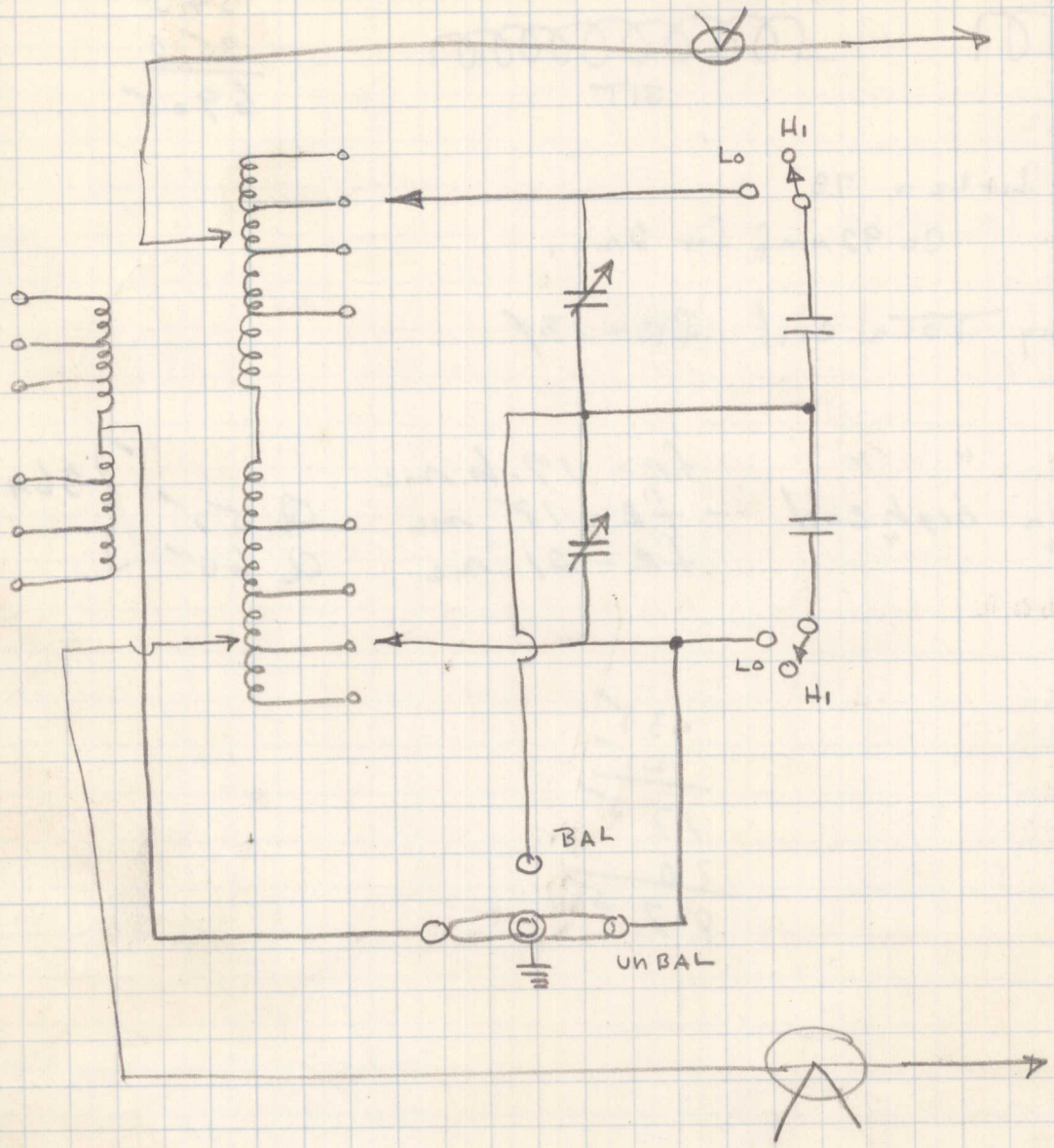
$\frac{35}{x} = \frac{900}{25}$

$900x = 875$

$x = 1$ uh

31.5
L1
17.5
70
87.5

TAC- Schematic 10/10/53



Frequency Characteristics Dummy load Ohmite.

Model D251 73 ohms #1

f	R	X_L'	X_L	Z
2	73.0	6.0	3.0	
4	73.0	21	5.25	
8	74.0	83	10.4	
16	73.8	325	20.3	
20				
24	84.0	710	29.6	
28				
32	93.0	1175	36.7	

Model D-251 600Ω

f	R	X_L'	X_L	Z
2	620	-100	-50	
4	610	-400	-100	
8	560	-1500	-188	
16	430	-5000	-313	
20				
24				
28				
32				

Model D-251 300Ω

f	R	X_L'	X_L	Z
2	310	0		
4	312	5	1.25	
8	325	-5	-1.25	
16	355	-500	-31.3	
20				
24				
28				
32				

Ward Leonard, SK 8511.29 25P140WL

f	R	XL'	XL	Z
2	136	85	42.5	
4	140	330	82.5	
8	159	1060	132.0	
16	230	6000	374.0	

TRU-OHM 75 ohm

f	R	XL'	XL
16mc	96	2300	144

Impedance of remote Thermocouple

16 mc .4 + J5.25

with 18" leads To DC meter

16 mc .5 + J8.45

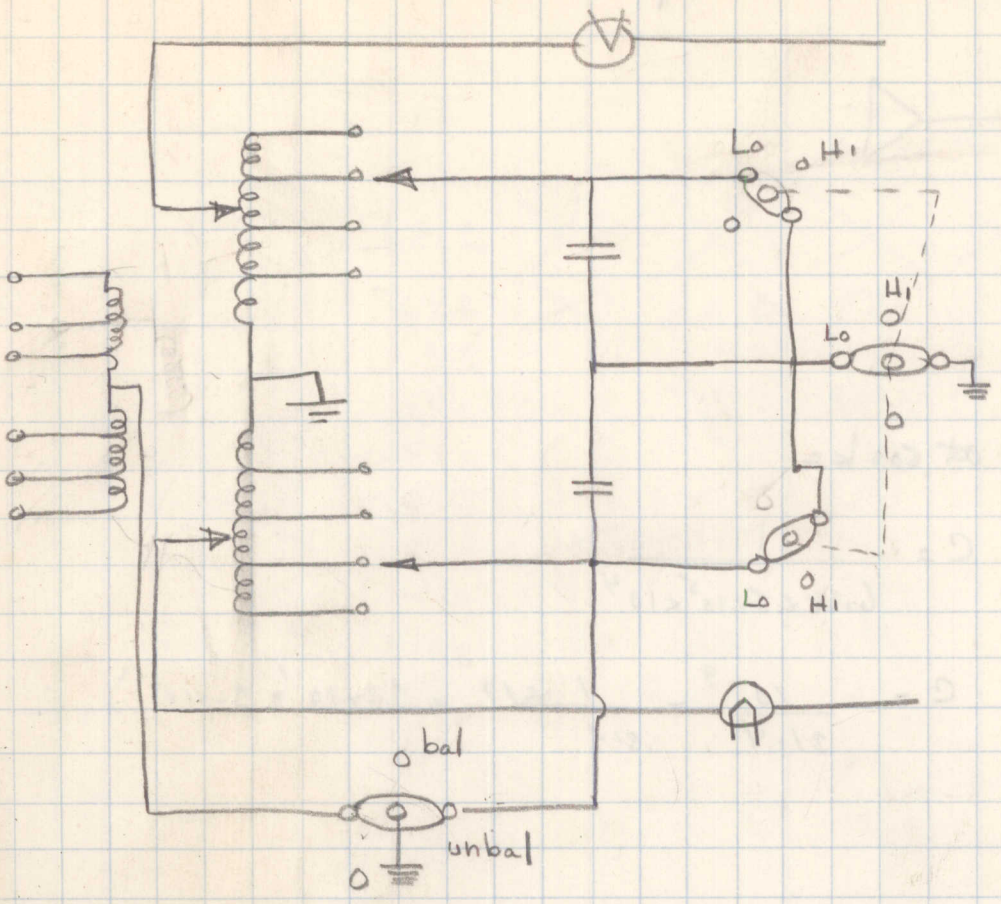
Thermocouple DC Meter.

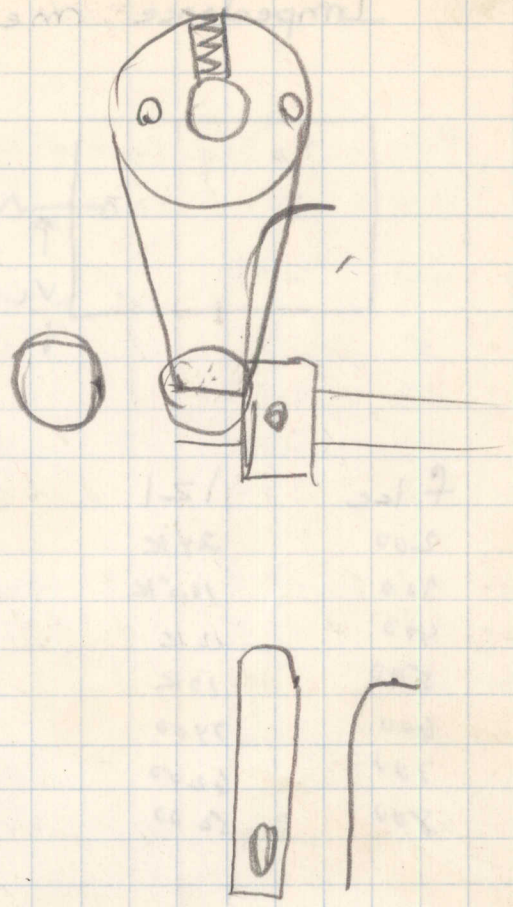
14 mv at 5.5 ma R= 2.54 ohms

2 watt allen Bradly composition resistor
nominal 68 ohm

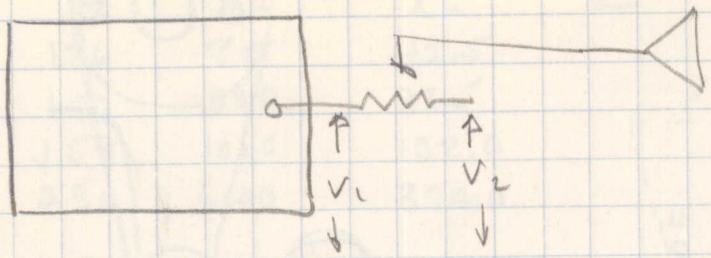
16 mc 72 + J2

TAC- Schematic 10/26/53





Impedance measurements 18' whip



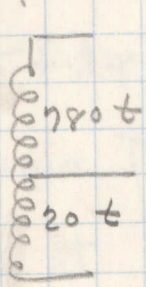
f kc	|Z|
200	24K
300	16.5K
400	12K
500	10K
600	7400
700	6200
800	5200

at 500 kc

$$C = \frac{1}{6.28 \times 5 \times 10^5 \times 10^4}$$

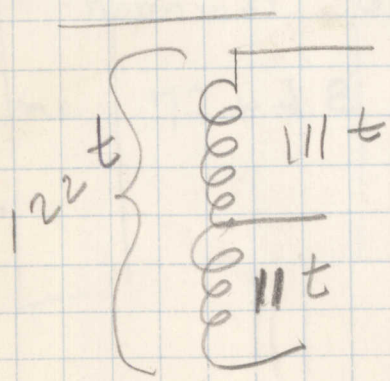
$$C = \frac{10^{-9}}{31.4} = \frac{1 \times 10^{11}}{.314} = 3.2 \times 10^{11} = 3.2 \times 10^{-12} \text{ f}$$

optimizing at 400 kc



← Tommy turns

TR-042



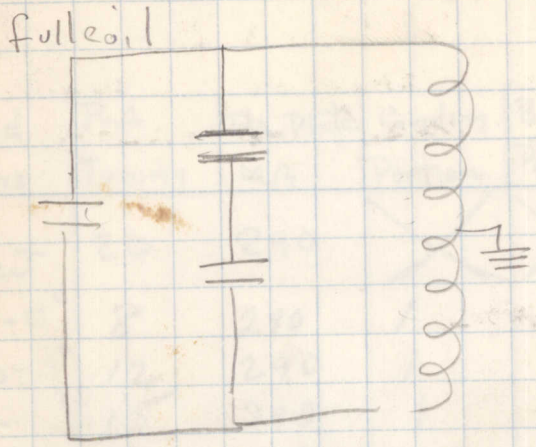
Bridge Determinations of Ohmite R.F. loads.

34 12/1/53

Test TAC.

tuning inductor 000 max
" Cap 0 max

Load ohms	P.A Tuning	PA. Plate MA	Coupling Position	Bandswitch Position	Tuning capacitor	Tuning Inductor	I_1	I_2	I_L	
72 Direct	20	290	X	X	X	X	X	X	2.32	unbal
72	8	290	1	1	0	159	2.26	X	2.15	
300	12	290	1	1	0	124	1.1		1.1	
600	15	290	1	1	0	119	.75		.76	
1200	12	290	1	1	0	106	.5		.52	
72	15	290	1	1	0	178	2.26	2.16	2.2	bal
300	16	290	1	1	0	147	1.06	1.06	1.05	
600	18	300	1	1	0	142	.8	.8	.75	
1200	16	290	1	1	0	110	.52	.52	.54	



freq 2 mc. 300 ohm load ballanced condition

The coupling unit showed poor high frequency action i.e. in the vicinity of 11 mc poor tuning was evidenced. when coupling coil was reduced 3 turns,

ballanced condition 300 ohm
IL 4.1 a tuning L 164 Capacitor 40
PA Plate 230

unballanced condition. 300 ohms
2 turns off end,

---

unballanced condition 300 ohms IL 1.0 amp tuning L 160
C .05 paplate 290 tuning at 07.
tank coil tapped 1 turn from end, tank coil doubled spaced
5 turns, on coupling switch side 1 amp on both
ballanced and unballanced.

12/6/53

T.A.C.

ballanced load 2 mc. 300 ohm load. .95 amp giving power of 275 watts or 90% efficiency. P.A. plate current 250 ma, the same output was observed at unballanced output.

Barker & Williamson CK208C Capacitor

Section Δ Max	208	mmf
Section 2 Max	206.5	mmf
minimum Section Δ	40	mmf
minimum section 2	40	mmf

Series max. 111 mmf
" min. 27 mmf

27
110
30

load ohms	P.A. Tuning	P.A. Plate Ma.	Coupling position	Bandswitch position	Tuning Capacitor	I_1	I_2	I_L	Freq.	Tuning Ind.	
300 bal.	16.0	240	1	1	0	.88	.96	.92	2 mc	174	
300 unbal.	8.5	260	1	1	0	.92	0	.90	2 mc	168	
300 bal	50	200	1	1	58	.8	.9	.8	3.2	190	
300 bal.	60	250	1	1	55			.8	3.4	190	
300 unbal									3.4		
300 bal.	60	270	1	2	0	1.0	1.1	1.0	3.45	195	
300 unbal.	63	300	1	2	0	1.0	0	1.0+	3.45	186	
300 bal.	38	290	1	2	18	1.0	1.05	1.0+	4.0	182	
300 bal.	72	270	1	2	39	.95	1.05	.98	5.0	189	
300 unbal	71	270	1	2	39	.95	0	.96	5.0	191	
300 bal.	40	290	1	2	44	1.0	1.05	1.0+	5.3	191	
300 unbal	36	300	1	2	42	1.05	0	1.0+	5.3	183	
300 bal	43	300	1	2	46	1.0	1.1	1.0+	5.4	193	✓
300 bal	41	290	2	2	5	1.05	1.2	1.0+	5.4	198	
300 bal.	23	300	2-	2	22	1.0	1.1	1.0+	6.0	199	
300 bal	50	300	1-	2	48	1.0	1.6	1.0	6.8	190	✓
300 bal	50	300	2	3	2	1.0	1.0	1.0	6.8	186	✓ +th+ lowest p
300 bal	56	280	1	3	14	1.0	1.1	1.0+	7.0	189	
300 bal	38	300	3	3	40	1.0	1.1	.9	16.0	211	
300 bal	64	300	3	4	30	.9	1.1	.72	18.0	213	

Notes.
The 1st tap (2nd position) The lowest frequency tunable (18 turns from end) is 3.45 mc. at the 1st position at 3.45 mc the output is reduced. insufficient loading.

18-24-27.

MA 9-2756

Transmitter puts out 340 watts at 18mc into a 80 ohm load.

1st 18
2nd 24
3rd 27
4th 29.

determination of coefficient of coupling

$M = k\sqrt{L_1 L_2}$

I New Coupling - 2.5 mc.

$L_a = 43\ \mu h$
$L_o = 33.6\ \mu h$

$L_a = L_1 + L_2 + 2M$
$L_o = L_1 + L_2 - 2M$
$L_a - L_o = 4M$

II old Coupling

$L_a = 43.2$
$L_o = 34.4$

$M = \frac{L_a - L_o}{4}$

I $M = \frac{43 - 33.6}{4} = \frac{9.4}{4}$

43.0
33.6
9.4

II $M = \frac{43.2 - 34.4}{4} = \frac{8.8}{4}$

43.2
34.4
8.8

New Coupling 3 turns off Tank

$L_a = 39.0\ \mu h$
$L_o = 30$

$M = \frac{9}{4}$

½ turn added to coupling coil

$L_o = 29\ \mu h$
$L_a = 39.5$

$M = \frac{10.5}{4}$

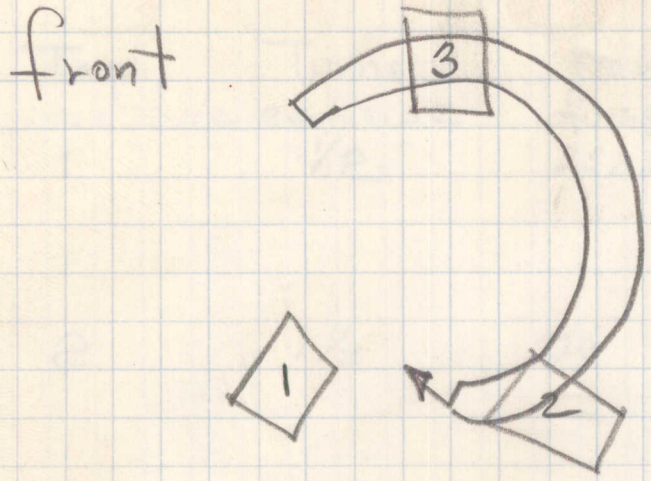
10.5
8.8
1.7

Coupling coil increased to 10 Turns.

$L_a = 43.4\ \mu h$
$L_o = 33.5\ \mu h$

$M = \frac{43.4 - 33.5}{4} = \frac{10}{4} = 2.5$

Changes in TAC Coil



Tank coil starts on 1

3 turns added To Tank

La = 48.2
Lo = 37.5
10.7

10.7 / 4 = 2.7

8 % increase

10.7
9.4
1.3

10.7
8.8
1.9

Lo = 41.6
La = 53.0
11.4

11.4 / 4

3 Turns on Tank.

11. with turn on outside
Lo = 37.4
La = 53.2
15.8

La = 47.0
Lo = 38.4
8.6

3 Turns off coupling

La 44.3
Lo 29.0
15.3

6 Turns off Tank

La 40.6
Lo 29.5
11.1

with single Turn added outside

La 47 uh
Lo 33.5
13.5

1/28/54

TAC Reaction to grid dip meter, with leads running as direct as possible.

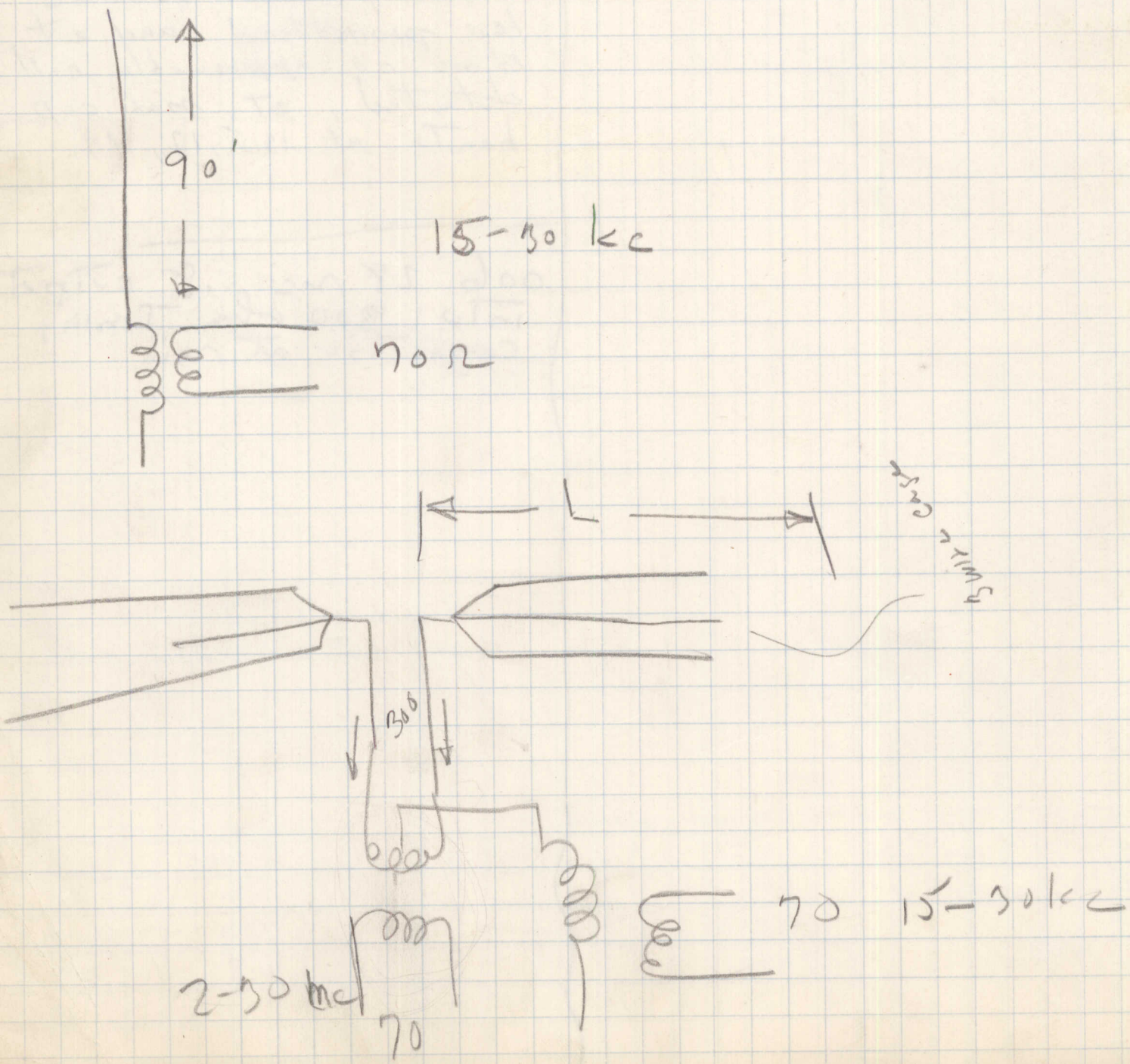
Tap	Turns each side	min freq	max freq	
1	1/2	23.8	40.5	deep dip at 44.8 light dip at 41.2. in toning up from max capacity a loading effect observed at 33.2
2	1½	20	32	not tunable dip at 16 mc 2 tap did not give clear indication of resonance until clips placed between 5th tap and end of coil
3	3½	14	17	in comming down To max capacity nulls become less pronounced and at 14 mc no appreciable null detected, at max cap beaTs at 13.5, 17, 19.

006 28 mc .8 output into 300 ohm Tuning capacitor at min

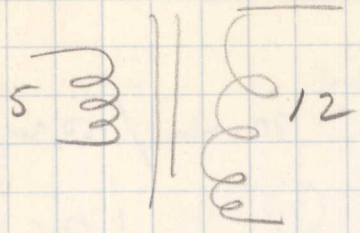
R.F. Bridge Test Resistor mfg by TMC

fmc	R	X
2	300	0
7	270	-22
14	210	-21
30	190	-35

Need Transformer

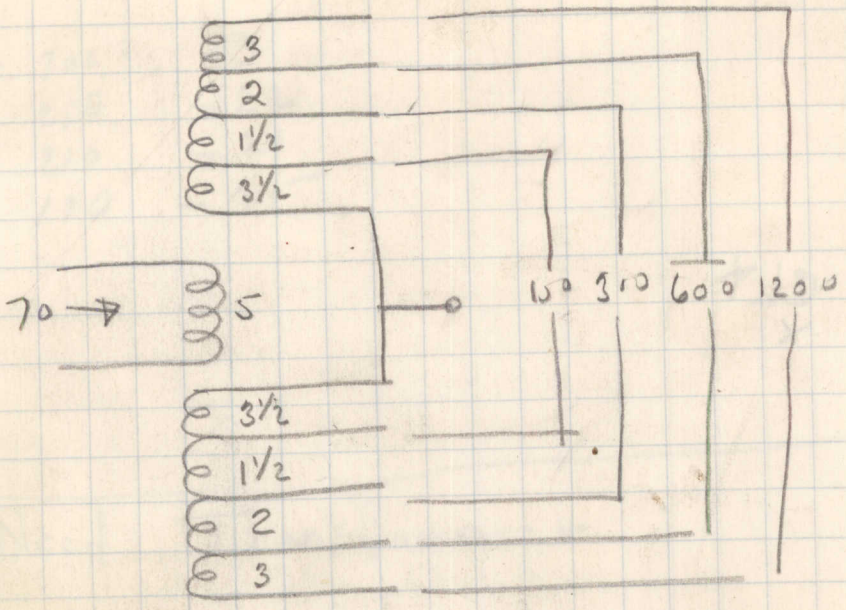


Gen'l Ceramics Q Core

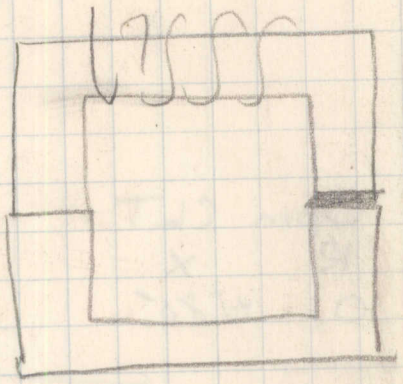


f	Open CkT		Sht. CkT	
	R	X	R	X
2	0	∞/85°		

R.F. Transformer ; General Ceramics "O" Material



70 unbal / 150, 300, 600, 1200 bal.



No air gap.

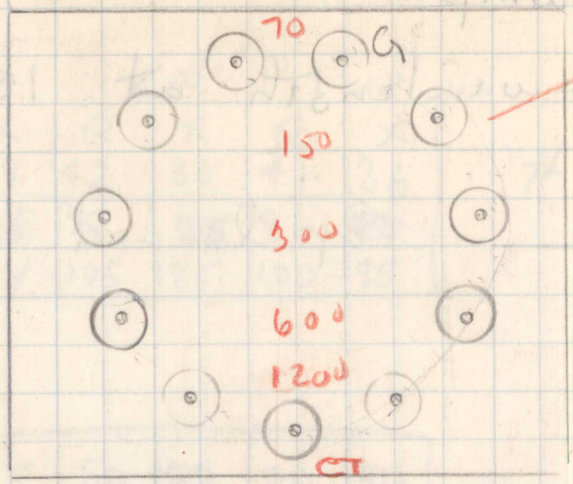
WI-125-5

20 Ceroc "T" Sprague Electric Co wire

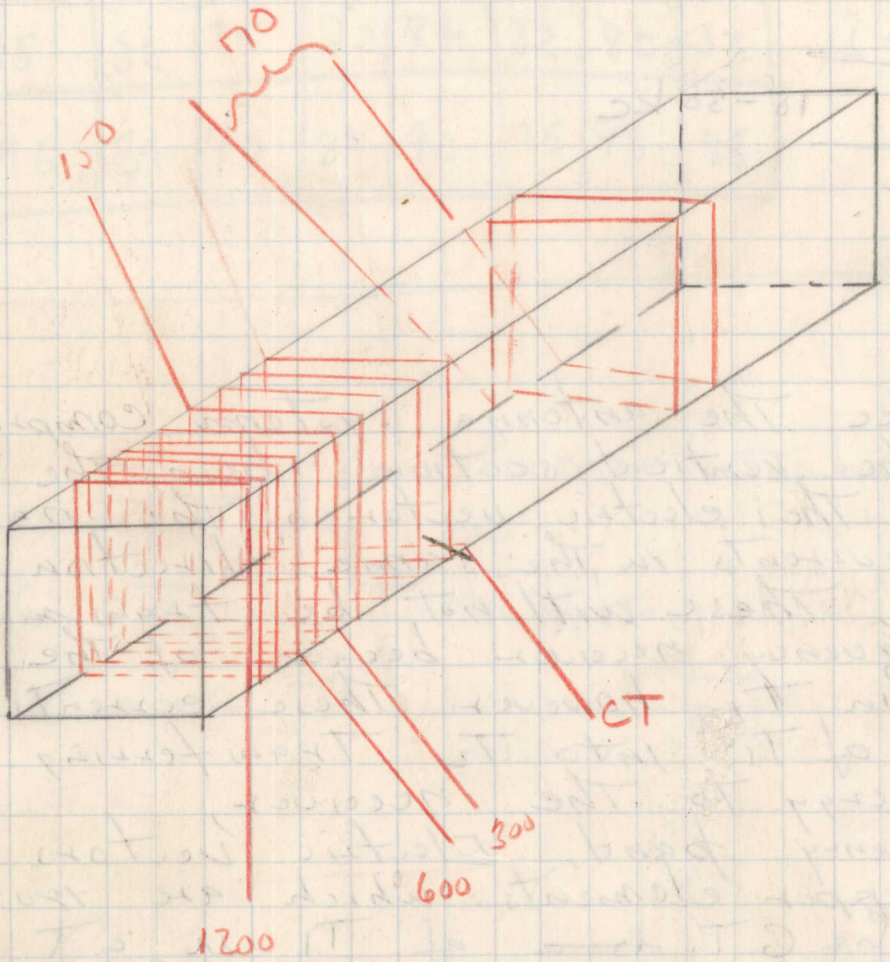
Bridge Impedance measurements.

freq mc	Termination 150Ω R	X	Z	300 R	X	Z	600 R	X	Z	1200 R	X	Z	open ckt
2 mc	40	50		42	50		42	100		40	50		0 + j 100
4 mc	76	50		68	48		66	48		68	48		
6 mc	94	37		76	37		75	37		76	37		
8 mc	100	29		80	40		78	35		78	31		
12 mc	95	22		76	45		72	42		74	35		
18 mc	80	25		75	67		68	56		64	52		
24 mc	63	45		77	95		65	65		62	84		

2



TE-101



close wound

20 AWG Sprague Croc wire

Case BX-100-12 S

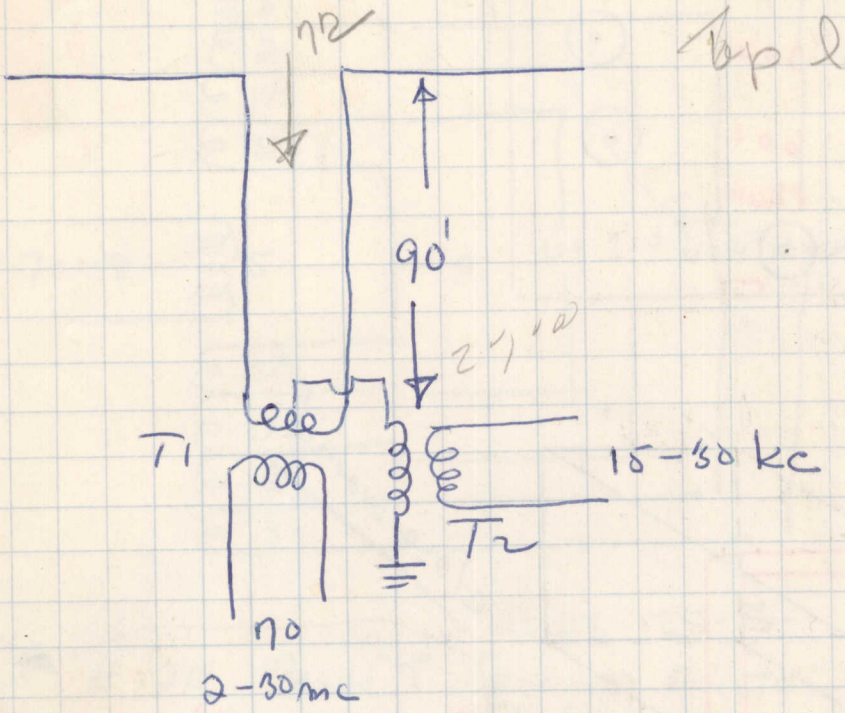
Core 2 (ea)
Gen'l Ceramics
F-137 Type Q material

CI-101-1-Q.

TR047 A

4/6/54

18 ft vertical whip.
a quarter-wavelength at 13.65 mc.



On the band 15-30 kc The antenna system comprises a top loaded L. The vertical sections being the effective antenna, The electric vector of the radiated field will induce currents in the same direction in the vertical radiators, These will not be transmitted To the high frequency receiver because of the opposed fields They set up in T, however These currents flow Through the C.T. of T1 into T2 Transferring The low frequency energy To The receiver,
On the high frequency band, Electric vectors induce voltages in the upper elements. which are 180° out of phase, ~~°~~ The C.T. ~~is a~~ of T1 is at ground potential, and all energy is transferred To the h.f. receiver.

Test TR-047

unpotted.

f	150		300		600		1200	
mc	R	X	R	X	R	X	R	X
2	43	29	43	29	42	30	41	36
8	70	26	79	26	79	26	86	27
24	98	84	86	84	105	85	100	85

#1

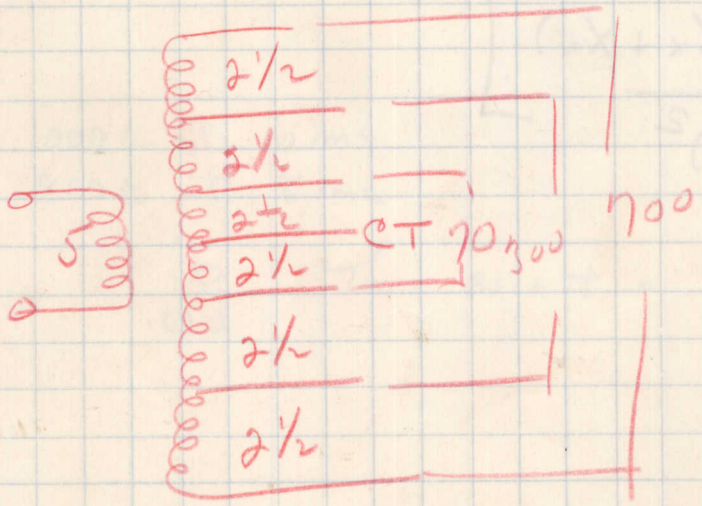
2	40	30	38	35	50	42	40	50
8	65	32	75	32	84	32	80	32
24	96	84	90	84	90	85	98	85

#2

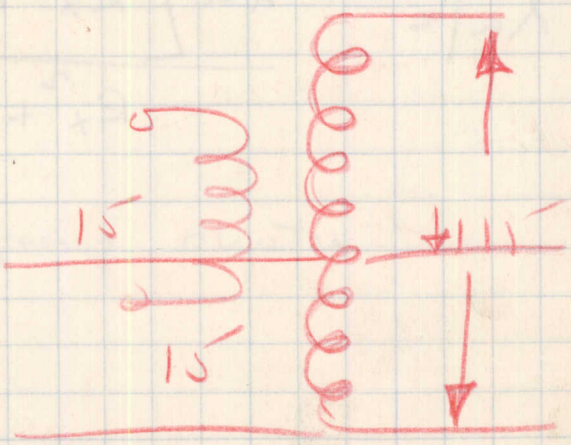
← High frequency transformer To have 700-300-70 bal. input Taps.

both outputs To be for 85/U cable, however The first model To have adapters for RG 8/U

Hi-Freq



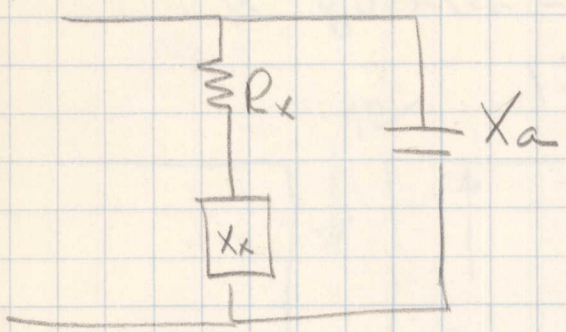
How Freq



TR-101

in HCL-1
LD-197

Shunting down Impedances on Bridge



$$Z_m = \frac{(R_x + jX_x)\,jX_a}{R_x + jX_x + jX_a} = \frac{jR_xX_a - X_aX_x}{R_x + j(X_x + X_a)} \cdot R_x - j(X_x + X_a)$$

$$= jR_x^2X_a + R_xX_a(X_x + X_a) - R_xX_aX_x$$
$$+ j(X_aX_x)(X_x + X_a)$$

$$= \cancel{R_xX_aX_x} + R_xX_a^2 - \cancel{R_xX_aX_x}$$
$$+ j(R_x^2X_a + X_aX_x^2 + X_a^2X_x)$$
$$= jX_a\left[R_x^2 + X_x(X_x + X_a)\right]$$

$$R_e = R_xX_a^2 \Big/ R_x^2 + (X_x + X_a)^2$$

$$|X_a| = \frac{X_a\left[R_x^2 + X_x(X_x + X_a)\right]}{R_x^2 + (X_x + X_a)^2}$$

Test of Non-inductive Resistor at 10 mc.

initial balance 4000
with Ca 2500
with Zx 8 – 2700

$$X_a = \frac{4000-2500}{10} = \frac{1500}{10} = -150$$

$$X_e = \frac{4000-2700}{10} = \frac{1300}{10} = -130$$

$$R_e = 8$$

$$R_x = \frac{R_e (X_a)^2}{(R_e)^2 + (X_e - X_a)^2} = \frac{8(-150)^2}{64 + (-130+150)^2} = \frac{8 \times 2.25 \times 10^4}{64 + (20)^2}$$

$$= \frac{18.00 \times 10^4}{4.64 \times 10^2} = \boxed{8902}$$ direct measurement 5002

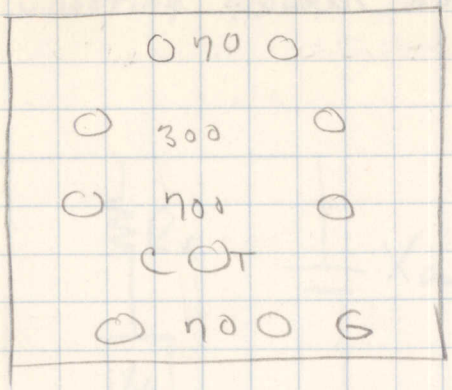
$$X_x = -\frac{X_a[(R_e)^2 + X_e(X_e - X_a)]}{D} = -\frac{-150[64 - 130(20)]}{4.64 \times 10^2}$$

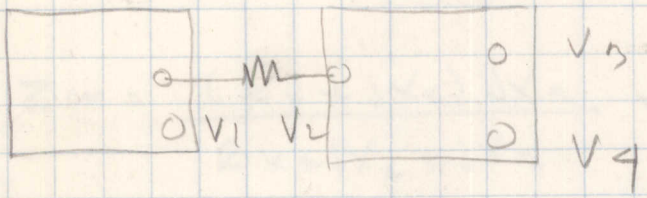
$$= -\frac{-150[-2534]}{4.64 \times 10^2} = -\frac{1.5 \times 2.534 \times 10^5}{4.64 \times 10^2} = .815 \times 10^3 = 815\,\Omega$$

1000 Ω at 6 mc
800 Ω at 8 mc

This is not a high frequency resistor

TR-101





70Ω Termination

f	V_1	V_2	V_3	V_4
2	1.0	.46	.24	.1
8	1.0	.49	.24	.12
32	1.0	.7	.2	.14

300Ω Term.

f	V_1	V_2	V_3	V_4
2		.5	.45	.42
8		.5	.45	.42
32		.1	.34	.38

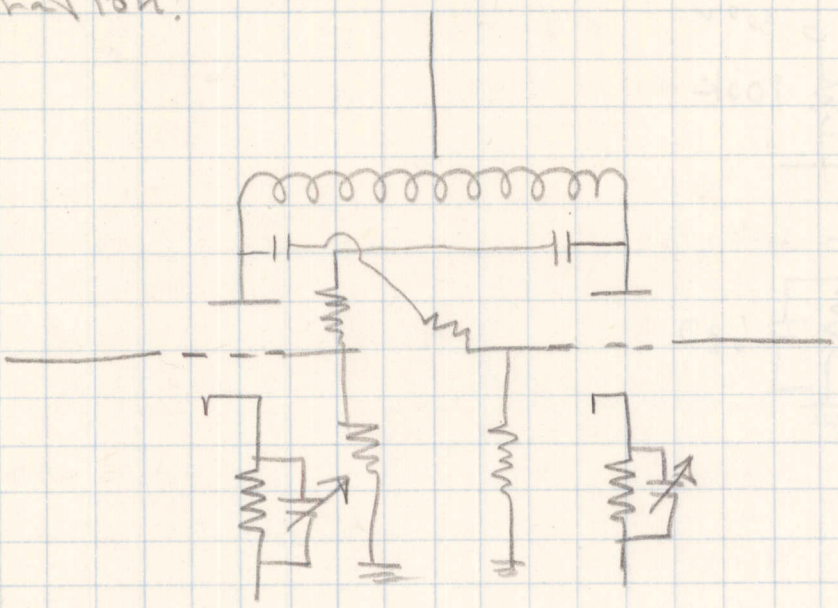
700Ω Term.

f	V_1	V_2	V_3	V_4
2		.48	.67	.6
8		.49	.65	.6
32		.7	.52	.52

4/12/54

Object: To develop an audio osc. capable of both F.S. and On/off Transmission.

1 Consideration:

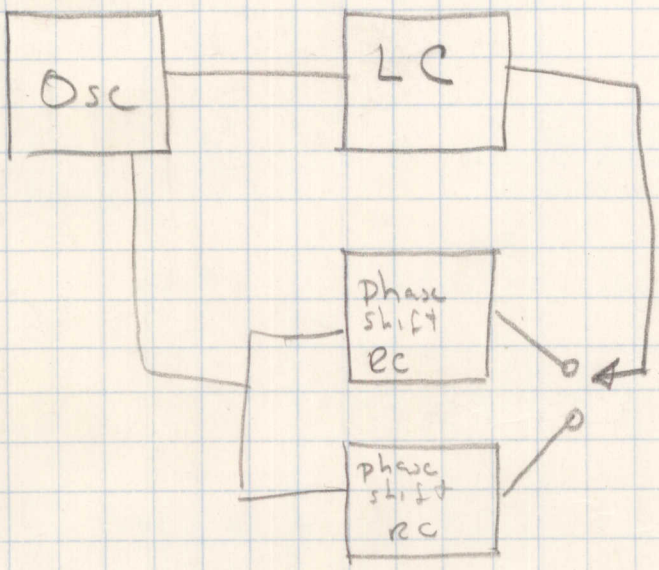


Key alternate sections on and off Phase shift in cathode To change frequency.

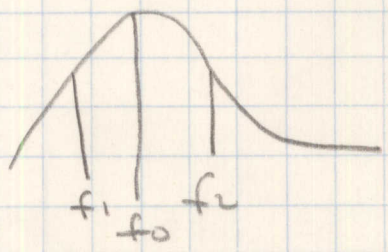
± 42.5 cs

This clct is suitable for an osc. but is difficult To F.M. amplitude changes, clct.

The Northern Radio System is essentially

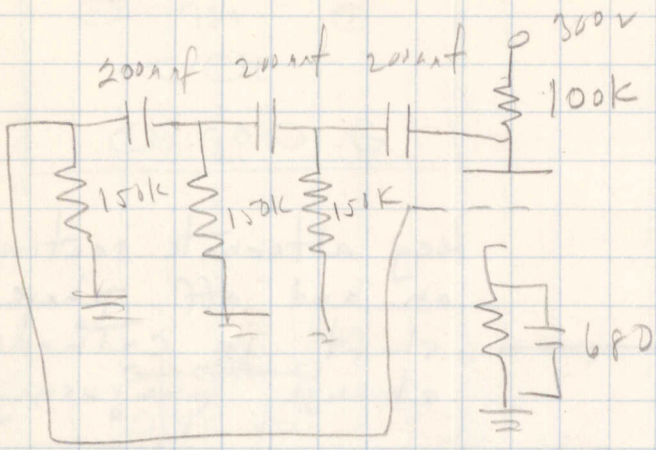


The L-C clct is a low Q



f1 & f2 being selected by the phase shift network. This system is very susceptable To keying transients since The Osc T-C has a complex load when not operating on fo

Investigation of Triode phase shift osc showed that Triode 12AX7 could not be employed over 2000 cps



Switching ckt.

initial balance with 51 uf Cond.

0 setting	4000
with condenser	1130
$X_a =$	2870

	4000
	1500
$X_e =$	2500

$R_e = 17.8$

$$R_x = \frac{R_e (X_a)^2}{R_e^2 + (X_e - X_a)^2} = \frac{17.8 (2870)^2}{(17.8)^2 + (370)^2} = \frac{(17.8)\ 8.22 \times 10^6}{3.15 \times 10^2 + 13.7 \times 10^4}$$

$$R_x = \frac{146.2 \times 10^6}{1.37 \times 10^5} = 1070$$

Finding unknown impedance by shunting down.

initial balance 4000 Z OR

R = 810 4000 X = -180
2200
1800

using a 51 μμf Condenser. 4000
1070
10 | 2930 = 293 = X_a "−"

parallel with unknown. 293
264
29

R_c = 85 4000
1360
2640 264 X_c "−"

R_c = 85 X_a = 293 X_c = 264
R_c^2 = 72.3 x 10^2 X_a^2 = 8.56 x 10^4 $X_c - X_a$ = 29 squared = 840

$$R_x = \frac{(85)(8.56)\times 10^4}{7230 + 840} = \frac{726 \times 10^4}{8070} = 895\,\Omega$$

$$X_x = -\frac{(-293)\left[7230 + 264(29)\right]}{7230 + 840} = \frac{-293\left[7230 - 7650\right]}{8070}$$

$$= -\frac{293 \times 420}{8070} = = 152$$

Shunting down Resistor with 51 μμf Condenser.

4000
1100
2900

$X_a = -290$

290
259
31

$R_c = 21$

4000
1460
2540

$X_c = -254$

$$R_x = \frac{(21)(8.41 \times 10^4)}{444 + 1300}$$

$$= \frac{21 \times 8.41 \times 10^4}{1744} - \frac{176.7 \times 10^4}{1744}$$

$R_1 = 1080$
$R_2 = 1290$
$X_x = ?$
} 2 measurements.

Can do $R_c = 20$
$X_a = -285$
$X_c = 256$

$R = 1290$
$X_x = ?$

Heat run on Tac. plastic bars. 4/26/54.

Assembled TAC and 1 bar with weighted middle installed in oven

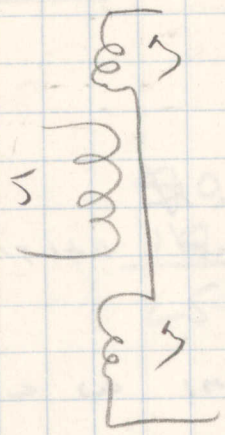
Room Temp 68° F
brought To 210° F 25 min
single bar deformed Tremedously.
oven shut off 10.25
no apparent visible bending on TAC unit itself
when cooled To room temp. bar retained original form when placed in that condition

2nd cycling start 10:40 same conditions as above

on 2nd cycling bar broke in Two.

no unbal – 100 bal 142 mc 400 watts

Q Core F-137



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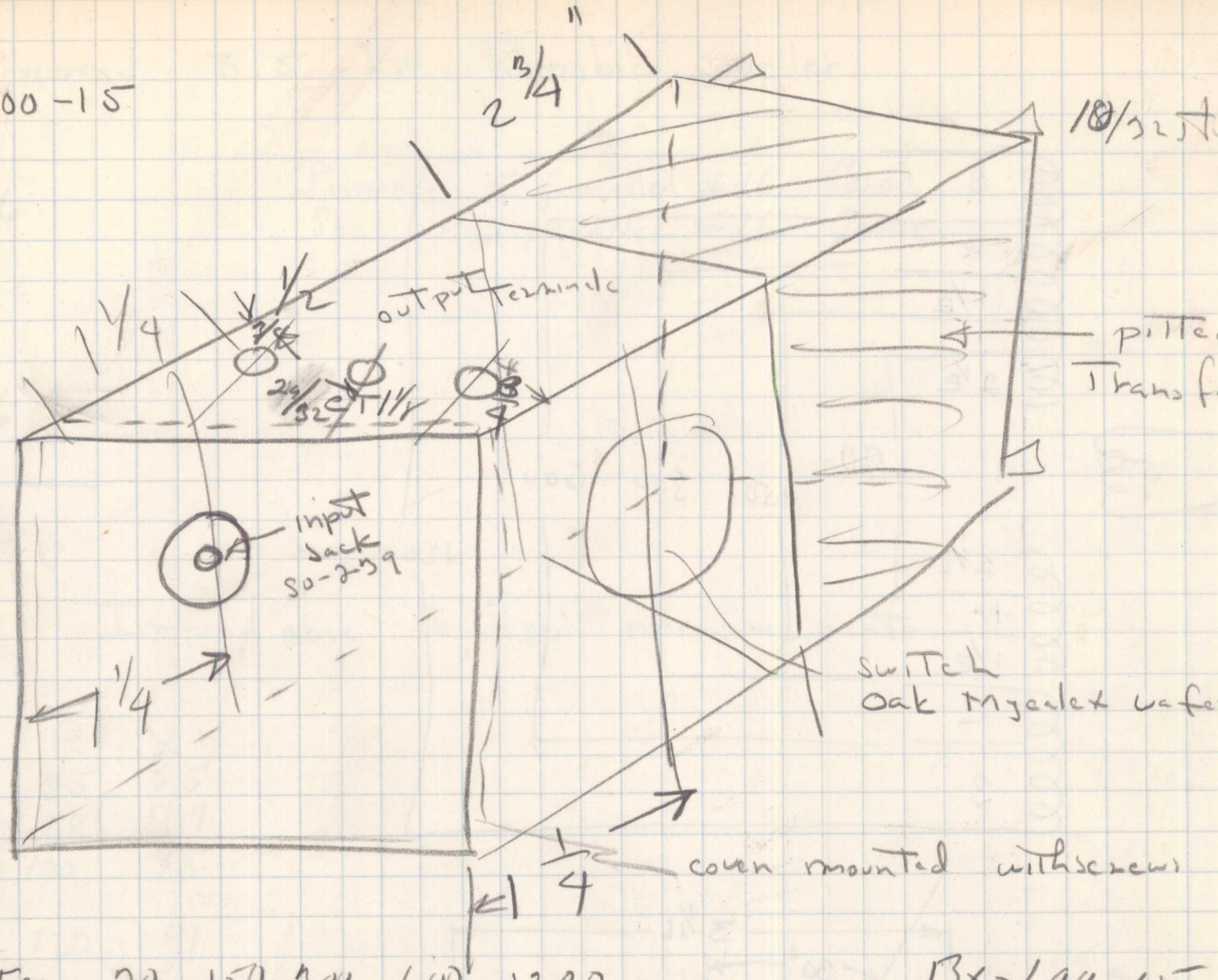
50 unbal 100 bal.

$$\frac{100^2}{50} = \frac{36}{x^2}$$

$$x^2 = 18$$

$$x = 4.25$$

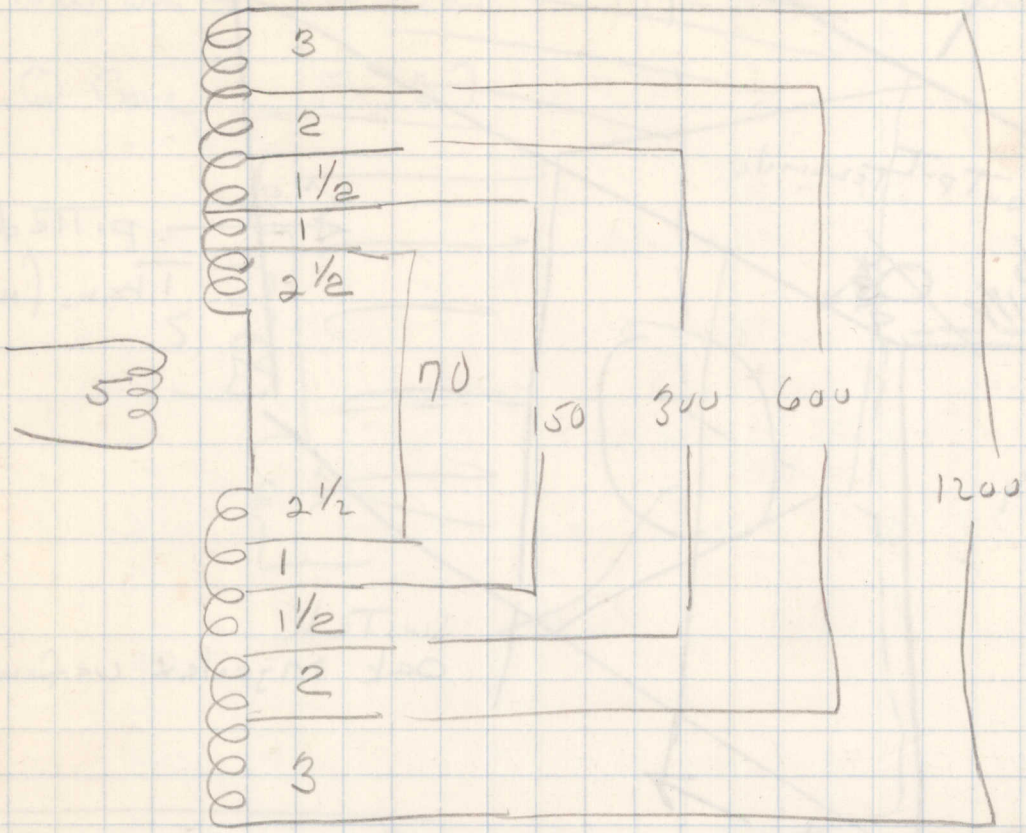
BX-100-15

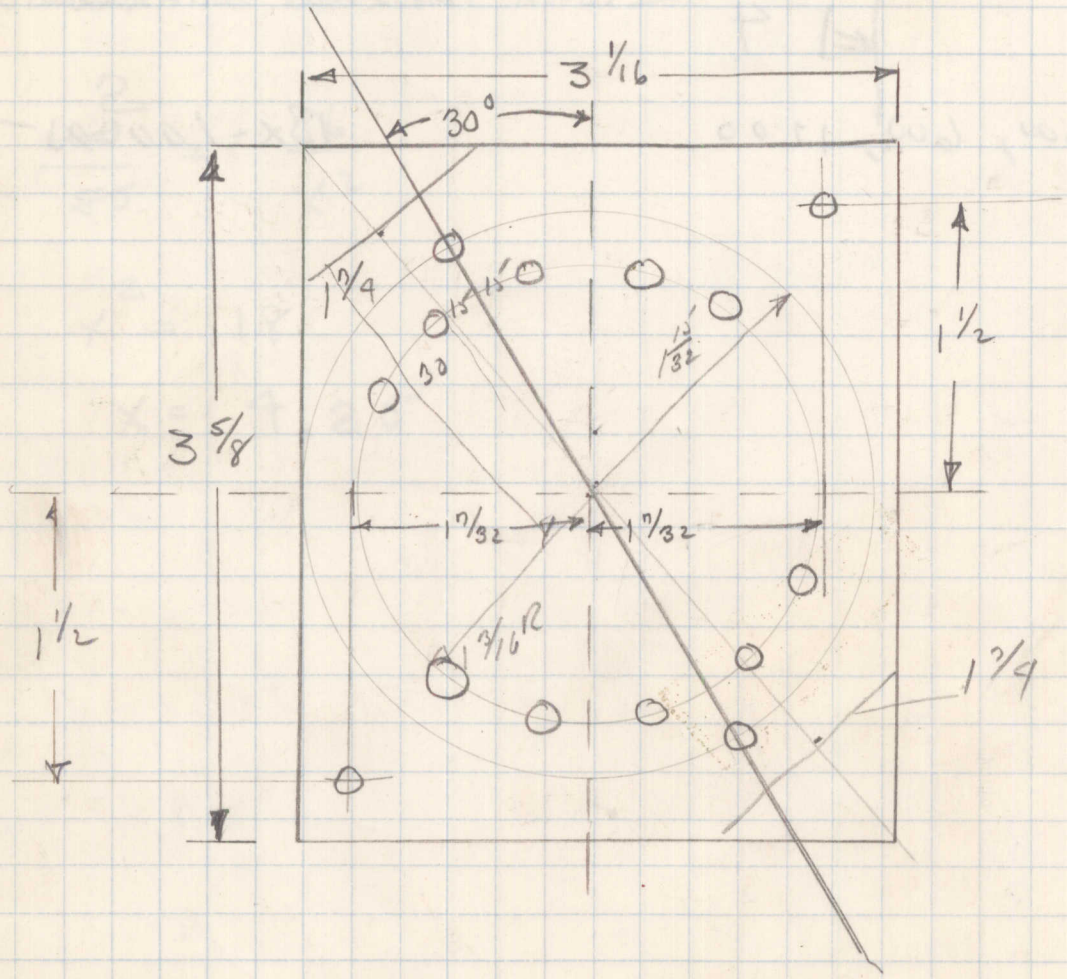


Taps 70, 150, 300, 600, 1200

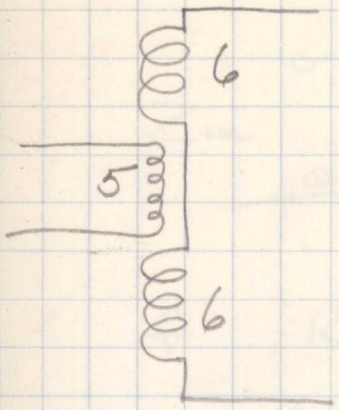
BX-100-15

TE-101-3


3
2
1 1/2
1
2 1/2
5
70
150
300
600
1200
2 1/2
1
1 1/2
2
3


3 1/16
30°
1 3/4
15°
15°
30°
1 1/2
1/32
3 5/8
1 1/2
1 7/32
1 7/32
7/16 R
1 3/4

Proposed 3.5 kw Rhombic coupler.



Primary 5 parallel #16 Ceroc
Sec. 2 parallel #16 Ceroc.

Impedance bridge measurements

f	R	X
2	35	55
4	68	77
8	100	95
12.	120	91

Short ckt impedance

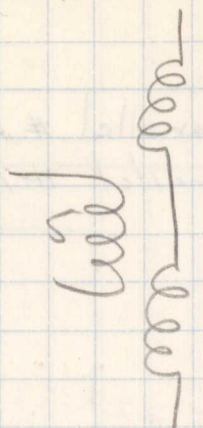
0+j15

open ckt

1.5+j87 ← small trans showed same figures.

Ray's Transformer

f	R	X_L
2	10	35
4	26	60
8	64	85
12	86	89



Primary 5 ll
Sec 2 ll

Pie wound

Test wound — core not continuous

secondary wound over primary.

f	R	X_L
2	71	50
4	96	40
8	105	22
12	105	14

#1 14 Turns on secondary

f	R	X_L
2	60	37
4	74	25
8	78	17
12	78	10
14	80	13
16	88	9
18		

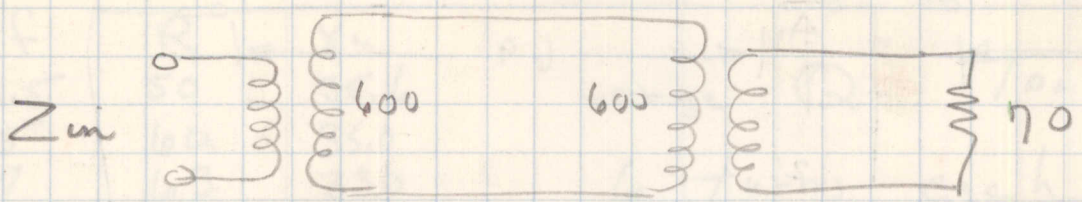
#2

f	R	X_L
2	60	35
4	74	20
8	81	20
12	80	26

Reverse

f	R	X_L
2	410	220
4	490	160
8	560	130
12	610	109

Back To Back



f	R	X_L
2	34	40
4	50	40
8	66	44
12	78	45

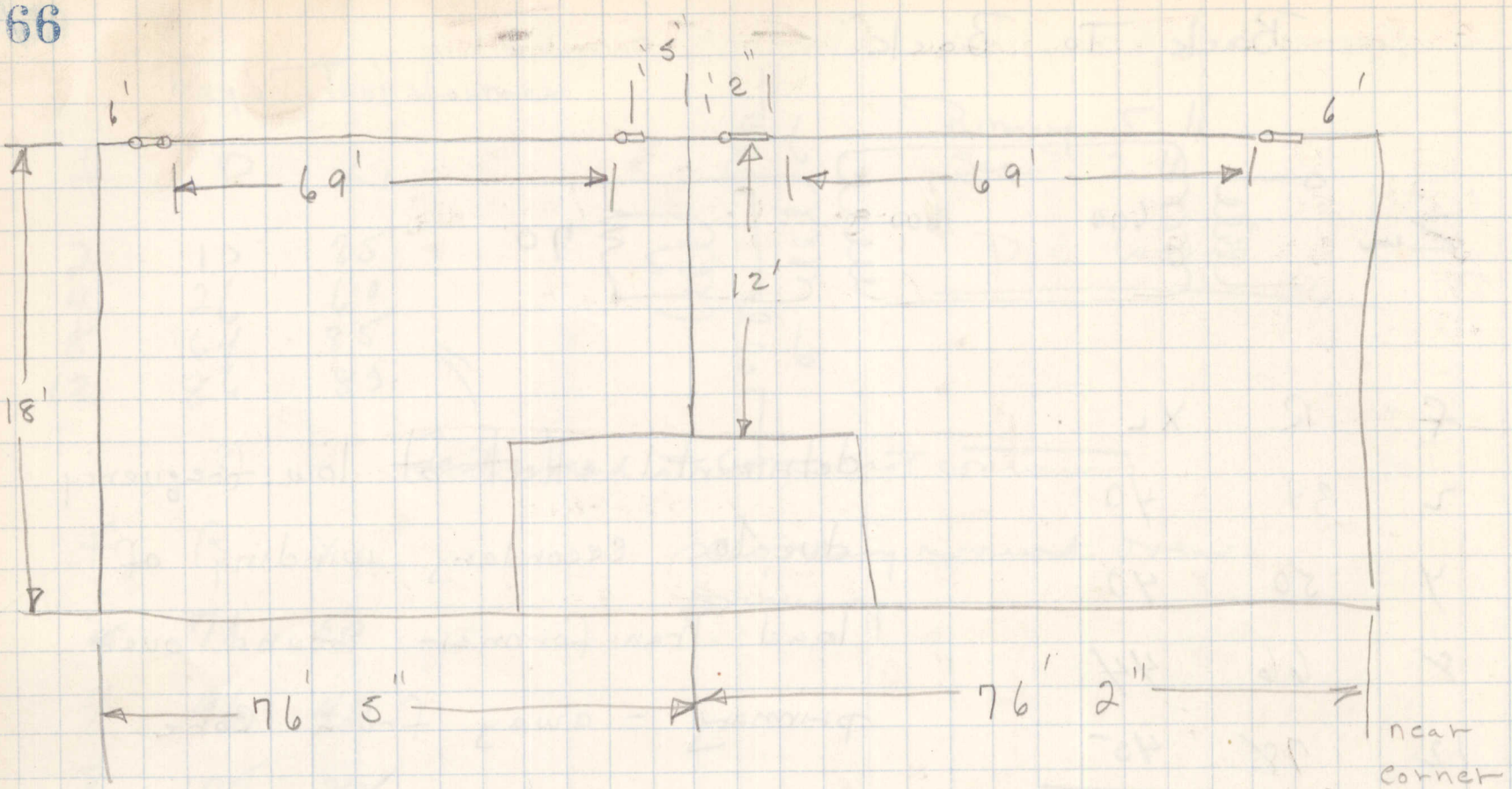
detrimental effect at low frequency due to secondary winding of load Transformer wound over primary - away from core.

12/9/54

Teflon tape.

.006 PTFE AC5T } Transparent
TEY 44E0598

.001 UEY 44E1L 82 } white
PTF B5T



fundamental = $\frac{492}{138}$ = 3.56 mc.

Check of Transformer (1:1) Termination

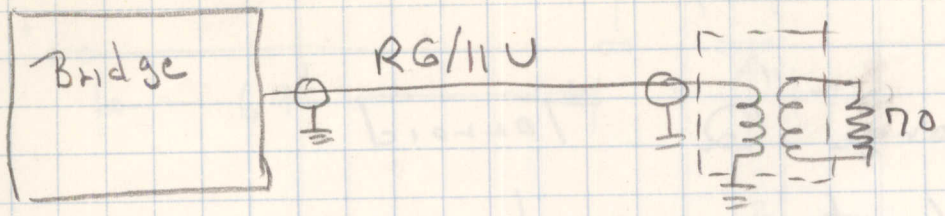
f	R	X_L
3.5	50	35.6
5	60	35.0
7	63	33.0
10	67	

Large "Q" Torroid

6 turns each

Smaller torroid

9 Turns each.

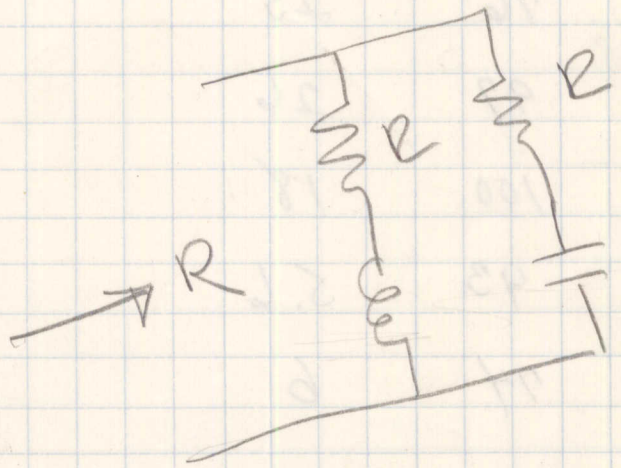


Impedance looking into Transformer terminated RG/11/U cable.

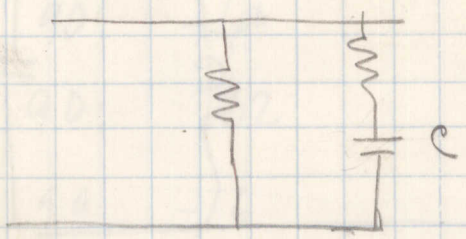
f(mc)	R	XL	
3.5	61	+30	
4.8	100	0	transformer in resonance with line
5.0	90	-24	
6.0	55	-5	
7.0	70	+22.8	
8.0	100	-6.3	
9.0			

Measurement Ward Leonard Non-inductive Resistor

f_{mc}	R	X
2	74	12.5
3	75	22.6
4	76	28.8
6	76	44.2
8	77.5	59.4
10	79.0	74.0
14	84.0	106.0
20	102.0	165
25	118.0	240



Tuning



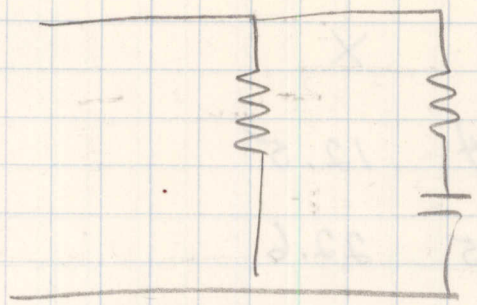
Tuned at 8 mc

f	R	X
2	74	5
4	78	9
6	81	9
8	77	5
10	65	4.7

f	R	X
12	53	16
14	45	32

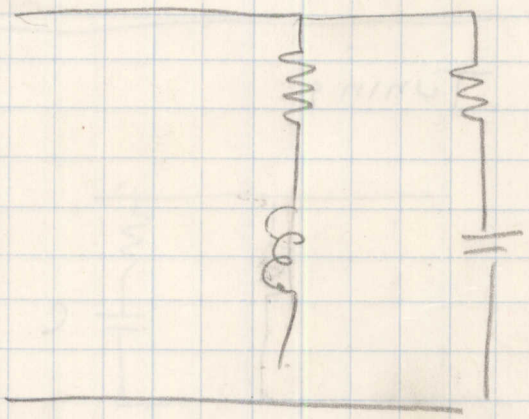
Tuned at 14 mc

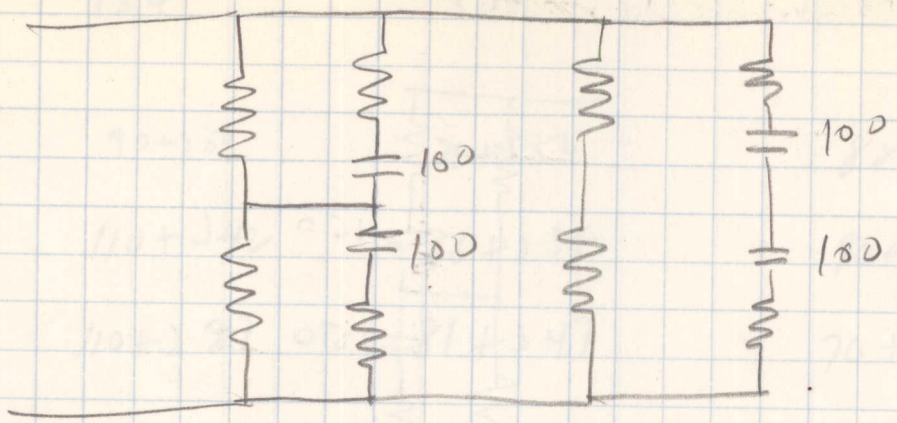
f	R	X
2	76	10
4	80	17
6	76	25
8	97	26
10	100	18
12	93	5.6
14	74	6



Tuned at 8 MC

f	R	X
2		
4	82	12.5
6	84	5.5
8	72	3
10	58	14.5
12		
14		





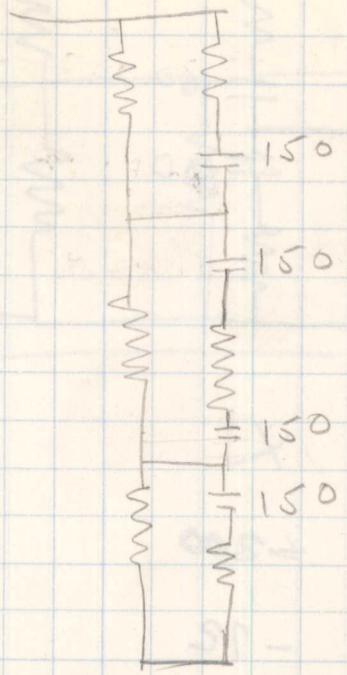
f	R	X
2	86	-200
4	90	-72
6	96	-38
8	98	-21

Condensers increased To 12 μf

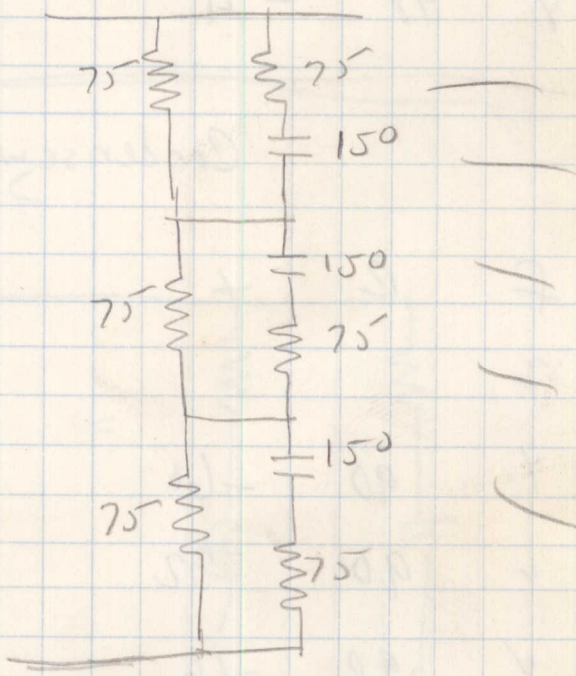
f	R	+
2		
4	90	-60
6	90	-32
8	90	-16

150 μμf capacitors

f	R	X
2	60	-75
4	60	-30
6	59	-10
8	56	+5
10	53	+20



f	R	X
2	75	+7.5
4	77	+10
6	75	+7.5
8	68	+12.5
10	59	+24



f	R	X
2	69	+17
4	80	+17
6	87	+25
8	87	+16
10	78	+16
16	63	+72

100 μμf Tuning

	150	300	600	1200
4	90+J50	78+J50	82+J50	78+J40
8	110+J42	88+J34	90+J26	77+J26
16	110+J27	81+J47	70+J47	58+J62

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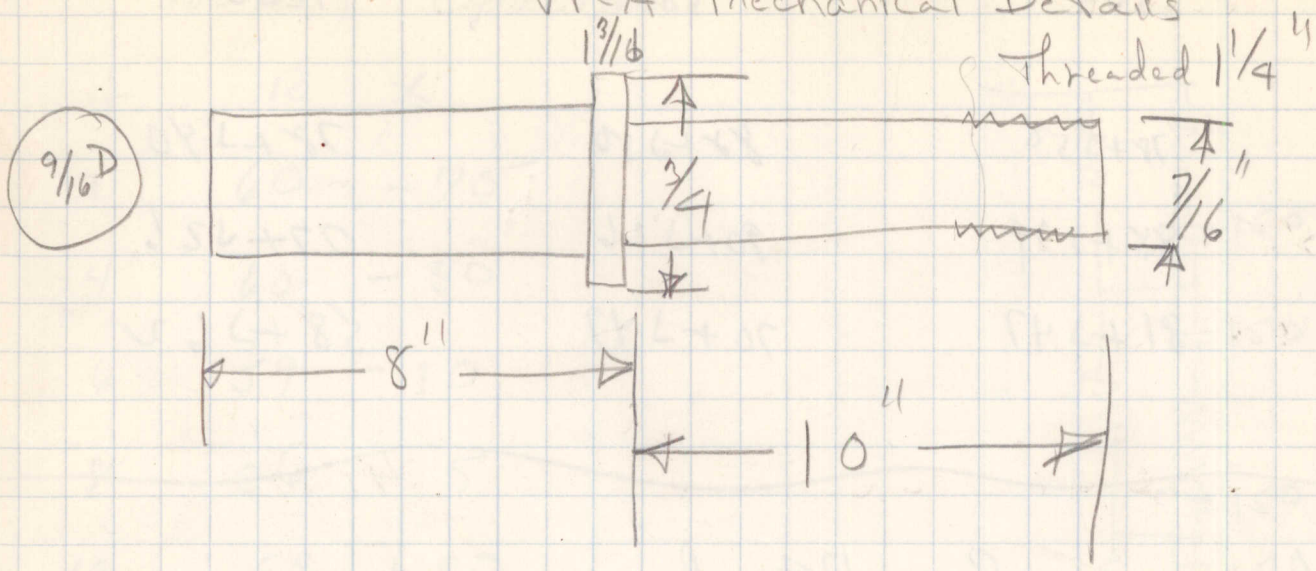
f	R	X
2	74	+10
4	79	+12.5
6	81	+13.5
8	77	+14.8
10	67	+24
16	58	+75

C = 124 μf

VRA Mechanical Details



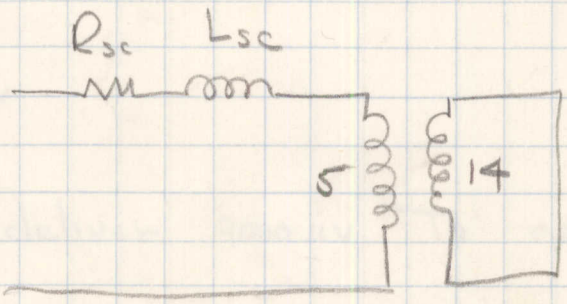
Frequency Response 8/9/54

f	R	X
2	80	45
4	86	70
8	86	134

measured with leads shortened 8/17/54

f	R	X_L
2	76	44
4	79	60
8	80	125

$Z_{sc} = 5 + j\,37.5$

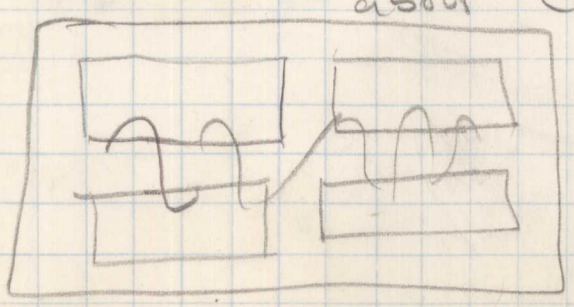


$h = \frac{X_L}{2\pi f} = \frac{37.5}{6.28 \times 2 \times 10^6} = \frac{37.5}{12.56} \times 10^{-6} = \underline{\underline{3\ \mu h}}$

$Z_{oc} = 0 + j\,480$ $\quad h = \underline{38.4\ \mu h}$

measured on Q meter $L_{oc} = 44\ \mu h$ $\quad Q \approx 150$

Primary and Secondary inter wound symetrically about core



8/18/54, Primary wound over secondary symmetrically end pieces of core turned so as to bring outside periphery closer to coil. P = 5 t S = 14 t

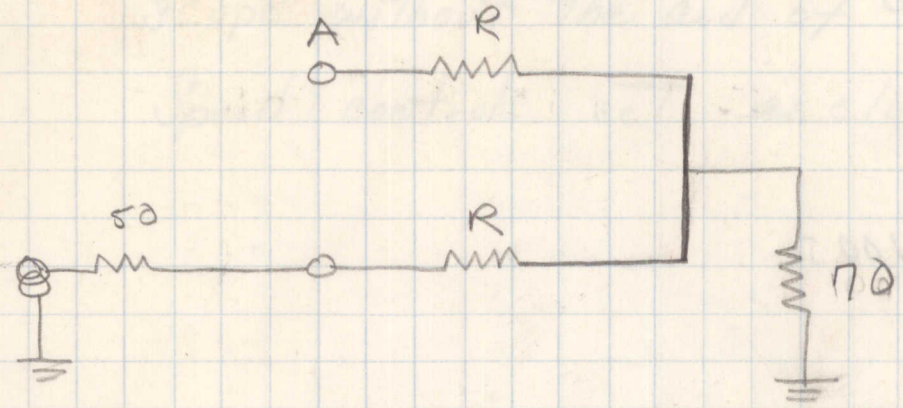
f	R	X
2	78	35
4	78	47.5
8	70	98
12	64	183

$Z_{sc_{12}} = 13.5 + j\,208$

8/12/54

Intermodulation AMC-613

Calculation of resistor network for proper generator Termination

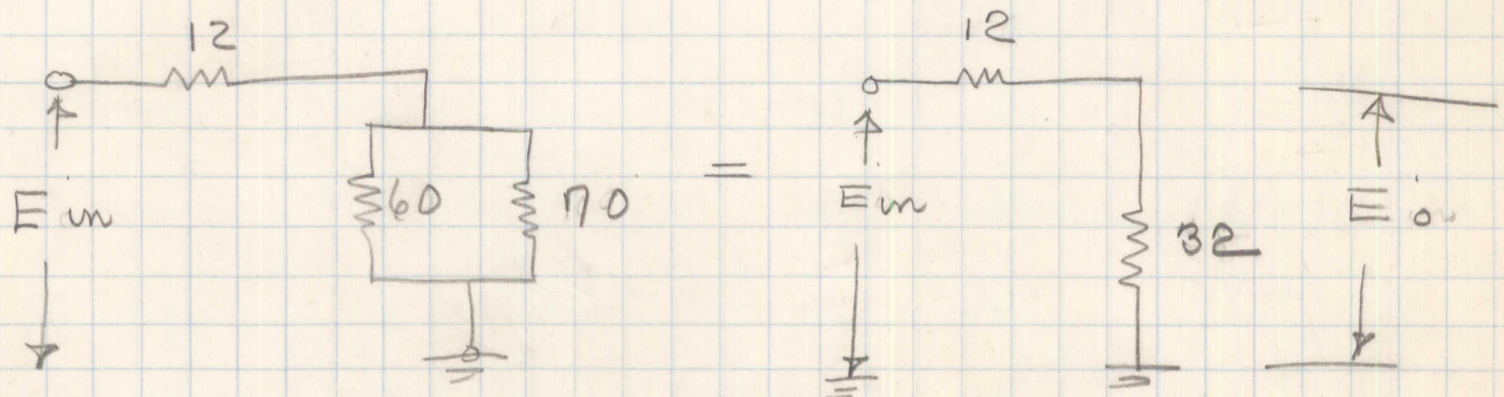


If the RF cable is To b
Terminated the resistance
To ground of A is 50

$$50 = R + \frac{(50+R)(70)}{50+R+(70)}$$

Solving $R = 15 \sim \approx 12$

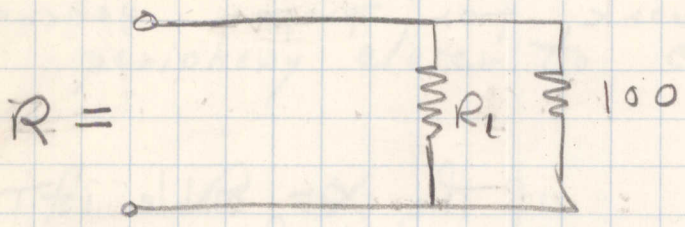
Each generator is To deliver 9000 μv To receiver



$$E_o = E_m \frac{32}{44} = E_m \frac{32}{44}$$

$$E_m = \frac{44\ E_o}{32} = \frac{44}{32} \times 9000 = \approx 1200\ \mu V$$

when the receiver is then checked at $F_2 - F_1$



$$\frac{50 = 100R_1}{100 + R_1} \qquad R_1 = 100\,\Omega$$

Investigation of Regenerator 8/28/54

Step 1 Regenerator is set up on the character Y by visual scope without the aid of TDA. Distortion & Speed controls set as close as possible

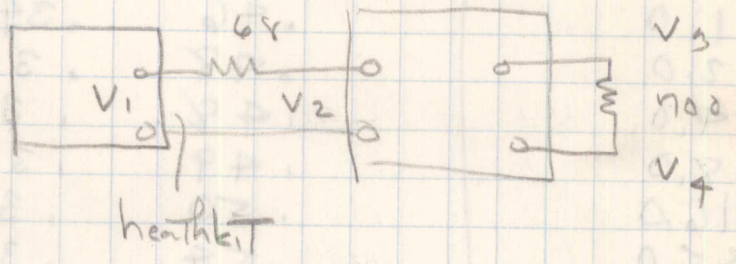
all Taken with Ferris Gen. HP. meter 9/3/54

f(mc)	V_1	V_2	V_3	V_4	V_3+V_4	Dial Rd / db →
40	1.0	.44	.68	.62	1.30	−1.0
42		.46	.78	.62	1.40	
44		.46	.82	.62	1.44	−.1
46		.48	.9	.62	1.52	+.3
48		.50	.94	.62	1.56	
50		.52	.96	.62	1.58	+.7
52		.51	.92	.62	1.54	
54		.54	1.0	.64	1.64	
56		.58	1.0	.67	1.67	
58		.6	.78	.74	1.52	
60		.52	.64	.64	1.28	−1.2
70		.64	1.25	.64	1.89	
75		.72	1.5	.24	1.74	
30		.5	.8	.7	1.5	+.2
35		.52	.7	.72	1.42	−.2
37		.46	.64	.64	1.28	~~+1.~~
~~39~~ (41)		~~.46~~	~~.84~~	~~.64~~	~~1.48~~	
~~40~~		~~.46~~	~~.76~~	~~.64~~	~~1.40~~	
5		.46	.68(.76)	.68(.64)	.36	−.6
10		.47	.68	.69	1.37	−.5
15		.48	.7	.7	1.4	−.4
20		.48	.76	.7	1.46	0 db ←
25		.5	.82	.72	1.54	+.4

there is an apparent difference of response when another signal generator is used.

Heathkit calibration ck against H.P. 9/2/54 83

f	Heath	H.P.
1.5	.83	1.0
5	.83	1.0
10	.83	1.0
16	.82	1.0
25	.84	1.0
40	.84	1.0
50	.81	1.0



Frequency Response RAC
700 Ω output

f	V1	V2	V3	V4	V3+V4	db	corrected to ref.
.5	.83		.6	.62	1.22		
1.0	.83		.68	.74	1.42	1.4	-1.2
.3	.83		.34	.48	.82		
2.0	.83		.7	.76	1.46	1.1	-.9
4.0	.83		.71	.78	1.49	1.0	-.8
6.0	.83		.72	.79	1.51	.9	
8.0	.83	.48	.72	.8	1.52	.8	-.6
10.8	.83		.72	.81	1.53	.7	
16.0	.83	.49	.73	.88 ✓	1.61	.3	
20.0	.83		.72	.94	1.66 ✓	0	
25	.83		.72	1.0	1.7	.2	
30	.84	.51	.71	(1.1) ~~.8~~	1.7	.2	
35	.84		.76-.4	1.0	1.7	.2	
40	.84	.52	.69 .64	1.3 .9	1.59	.3	
45	.84		.76	1.3	1.56	.5	
50	.84		.82	1.3	2.12	+ 2.1	
70	H.P. 1.0	.74	.66	1.2	1.86	1.0	
90	1.0	.72	.98	.94	~~1.94~~		
120	1.0	.68	.76	1.2	1.9		
150	1.0	.62	.6	.64	1.28		
175	1.06	.24	.46	.94	1.40		

Rising

Correct ↓

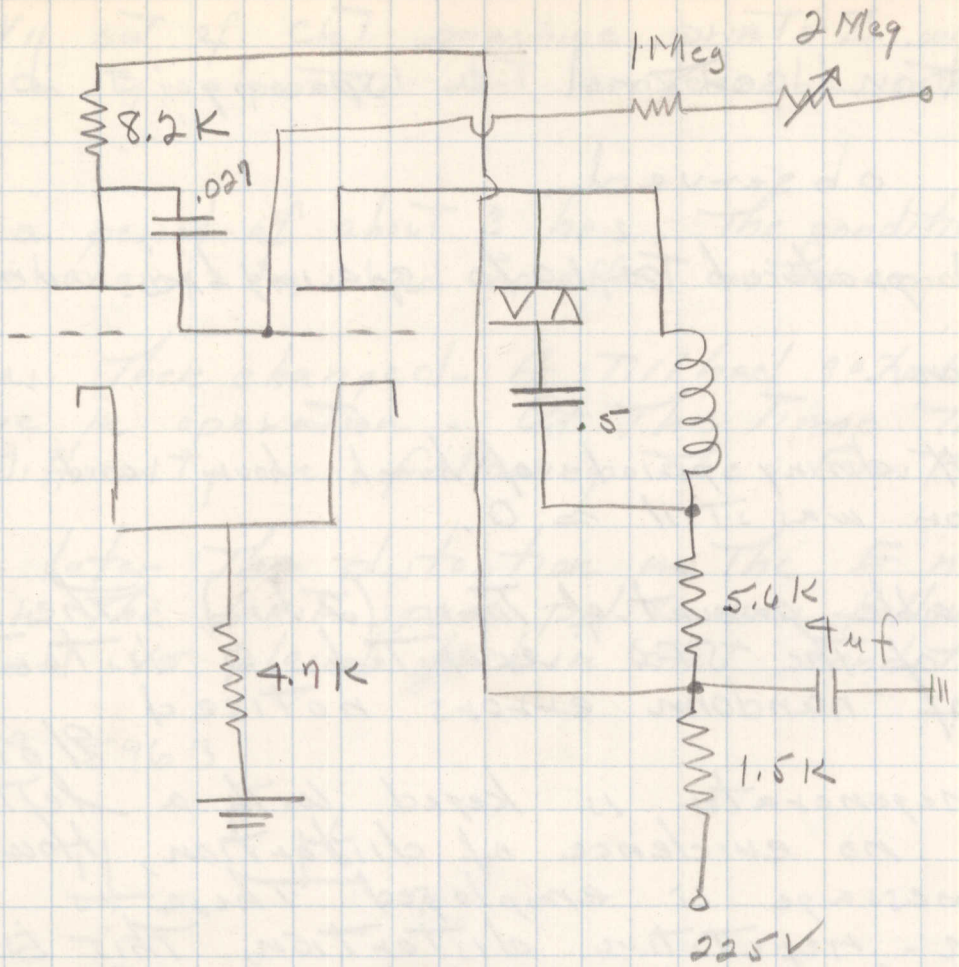
Falling

200 ohm termination

9/3/54

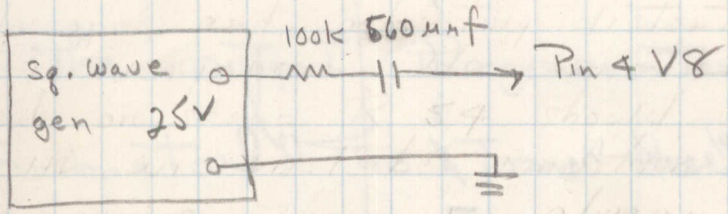
f	V_1	V_2	V_3	V_4
.3	1.0	.2	.1	.24
.5		.34	.24	.3
1.0		.46	.34	.36
2.0		.48	.36	.37
4.0		.48	.36	.37
8.0		.49	.36	.38
16.0		.50	.37	.41
25.0		.54	.39	.46
30.0		.52	.36	.48
40.0		.53	.36	.56
50.0		.58	.36	.7
70.0		.58	.31	.68
80.0		.72	.46	.74
90.0		.74	.48	.45
100.0		.7	.5	.5
110.0		.72	.54	.48
120.0		.58	.42	.34
130.0		.78	.44	.49
140.0		.78	.48	.43
150.0		.62	.47	.41
175.0	.9	.53	.41	.28

9/7/54



Relay 275-C

Tubes V11 - V6 - V7 removed



gen. set To 22.7 ≃ 23 cv

Distortion set To 0 by dist control R54 - both scope and TDA indicate ≃ 0 distortion. The distortion control has a fairly large range since it will ordinarily be set for zero distortion The range should be at most ≃ ± 20 % at the present Time the range is ≃ ± 50 % in addition at about 25% space distortion an additional 20% mark distortion is introduced, reason not yet determined. this additional distortion is in evidence only on TDA and not of oscilloscope. When The spare relay was installed with no disturbance

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of the distortion control a spacing bias of ≃ 3% was observed.

A third relay produced ≈ 10% spacing bias under the same conditions.

SFO was shut off during period of hunch hour and then turned on, distortion was still ≃ 0.

After a considerable amount of time (2 hrs) the regenerator portion of the SFO exhibited 0 distortion and no evidence of random errors noticed

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When the regenerator is keyed with a letter R or Y there is no evidence of distortion, however when the test message is employed there is considerable non-repetitive distortion, this is also visible on the oscilloscope. To determine if this is the cause of the fortuitous distortion each letter at a time will be impressed on the SFO.

Taken with V11 out of socket

A	OK -30%-V11	W	OK	'
B	OK	X	OK	(
C	OK	Y	OK	)
D	OK	Z	ok-25% with V11	/
E	var-upto 50% M Mixpx	FIG	OK	-
F	OK	LTRS	OK	11
G	OK	FEED	OK	/
H	OK-40% with V11 in	RET.	15-20% M	:
I	OK	1	OK	;
J	OK	2	ok	?
K	OK	3	occasional 40% S	)
L	OK	4	OK	.
M	5-10% M -40% with V11	5	20-30% M	Space OK
N	OK 35% with V11	6	OK	
O	10-20% M -30% V11	7	OK	
P	OK	8	OK	
Q	OK	9	20% M	
R	OK upto 10% with V11	0	OK	
S	OK			
T	occasional 30% M			
U	ok			
V	OK			

ok

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with V11 out of ckt machine prints Z when E is struck with V11 in E is printed but considerable distortion is evidenced.

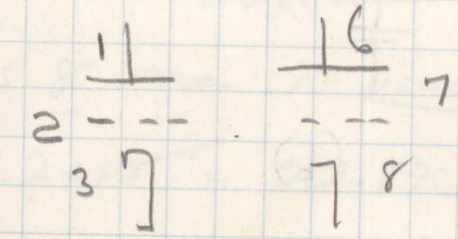
After a period of about 3 hrs, the condition stabilized, E was ok changing V4 had no effect on the condition, A hand up To 30% M

V5 was Then changed. A still had 30% M - no apparent change in operation. At This time The SFO seems To have no difficulty in following The First space pulse.

½ hr later The distortion on The E re-appeared, even though The first space pulse was followed with The original V5 placed back in ckt condition persisted.

5963

9/8/54



Apparent Reason for SFO Misprint.

The output Regenerator ckt utilizes a one shot multivibrator, The Time duration is ≈ 19 ms, That it when triggered by a pulse The tube flips opening The relay circuit after 19 ms The tube flops back to the original state. 22 ms after The initial pulse, if The next baud is a space another trisser flips The tube There is a 3 ms interval between The Time The tube flops and The next trisser, Orisnally The theory was that inherrant delay in the Relay would not permit This 3 ms interval To be transmitted To the output. This may have been true in The

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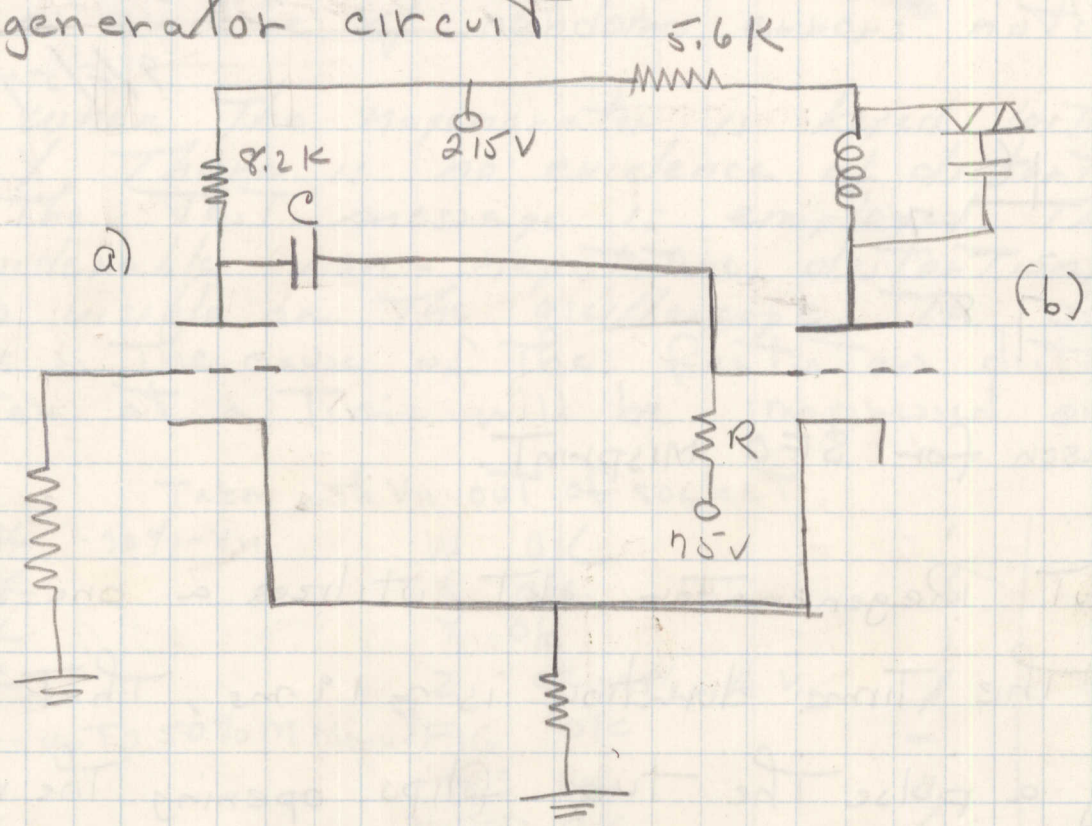
old relay but the new 275C may be faster hence the interval pulse is sometimes transmitted to the output. The present condition necessitates a very close control on the distortion control set the slightest deviation resulting in errors, especially the carriage return.

9/9/54

Regenerator circuit



Tube b is normally conducting - bias due to cathode resistor cuts off (a), when positive pip strikes grid of (a) Tube conducts, drop in plate voltage cuts off (b) (b) will remain cut off for a period determined by Time constant of ReC.

relay ckt draws 8 ma, when relay is closed.

Published information on 275C Relay.

Operate current - current required to operate. The least sensitive relay - 190 ampere turns.

Non-operate - value at which most sensitive relay will not operate 120 ampere turns.

with the two windings in series, 5925 + 16,950 = 22,875

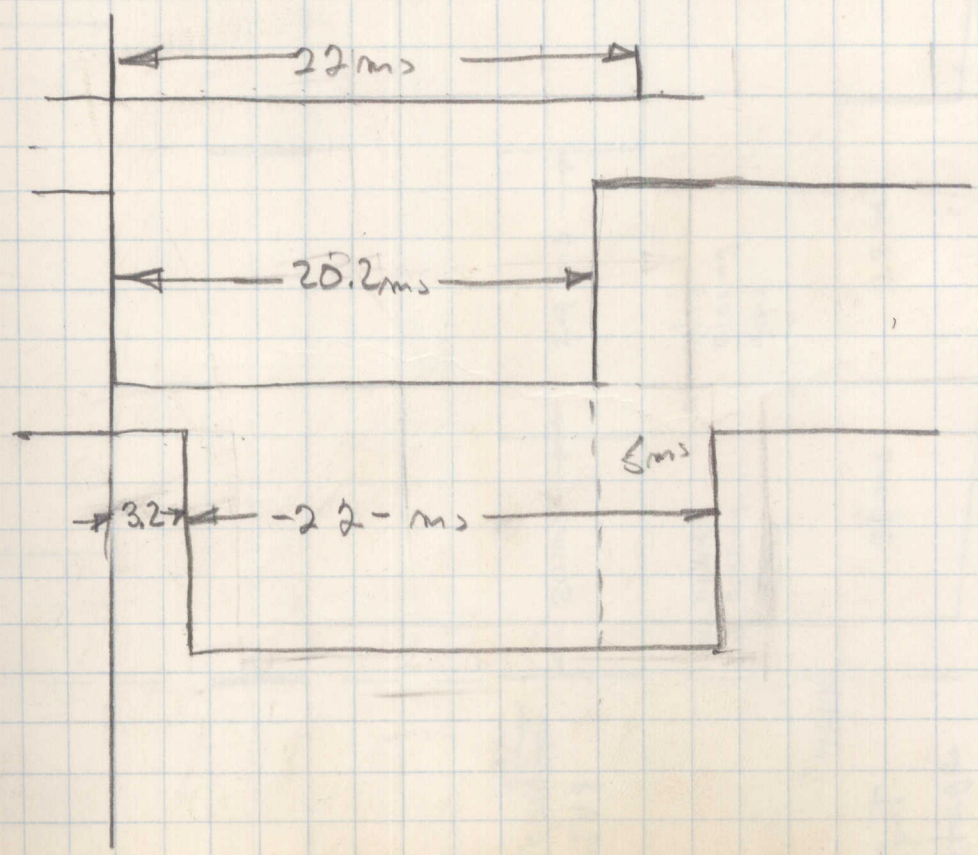
let an average relay be assumed, average NI = 155

$\therefore$ current = $\frac{155}{22,875} = \underline{\underline{6.8 \text{ ma}}}$

as 8 ma is used this is an excess NI of

$1.2 \times 10^{-3} \times 22.875 \times 10^{3} = 27.5$ NI

This is negligible since 100 excess NI gives 5.2 ± 1 milliseconds. The shortest release time is 3.2 ± .6 milliseconds.

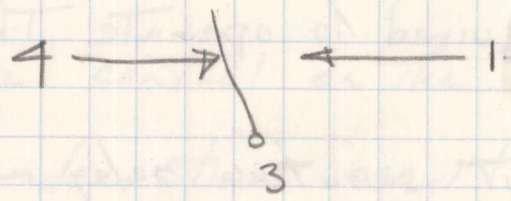


trigger voltage

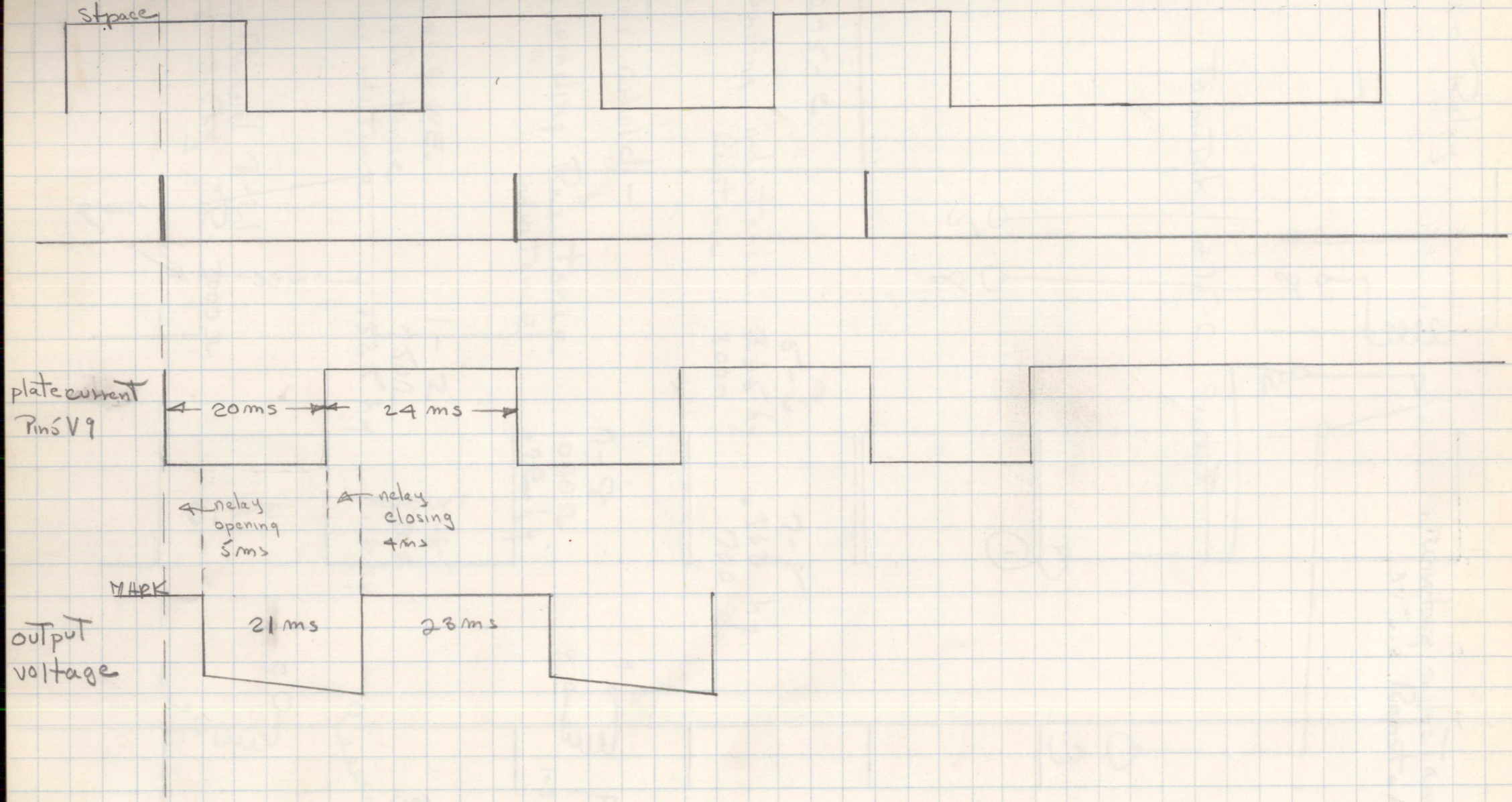
Plate current V & b

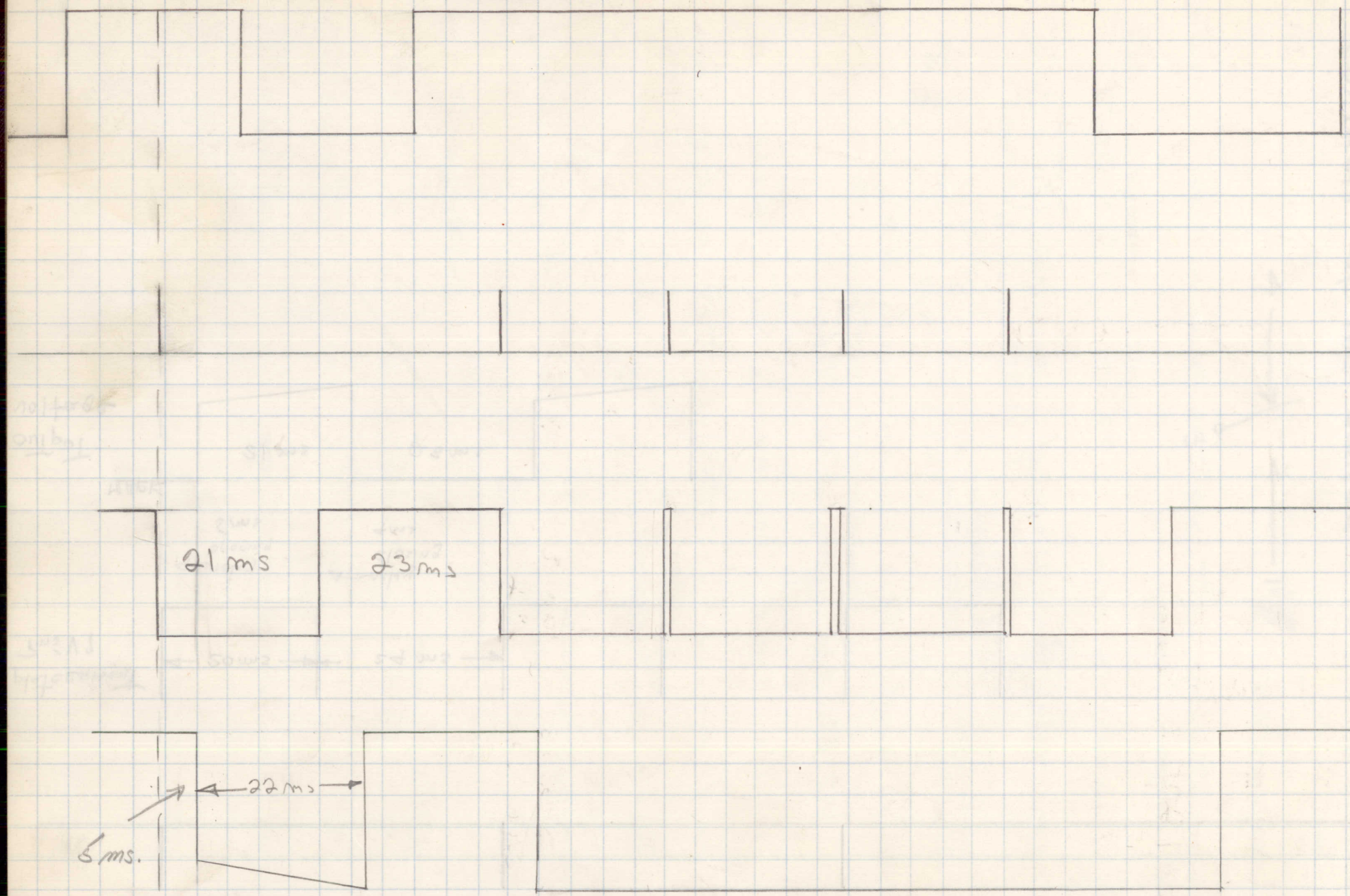
ouput current

275 C with the operating coil non-energized the armature is normally closed on the back contacts of the switch!



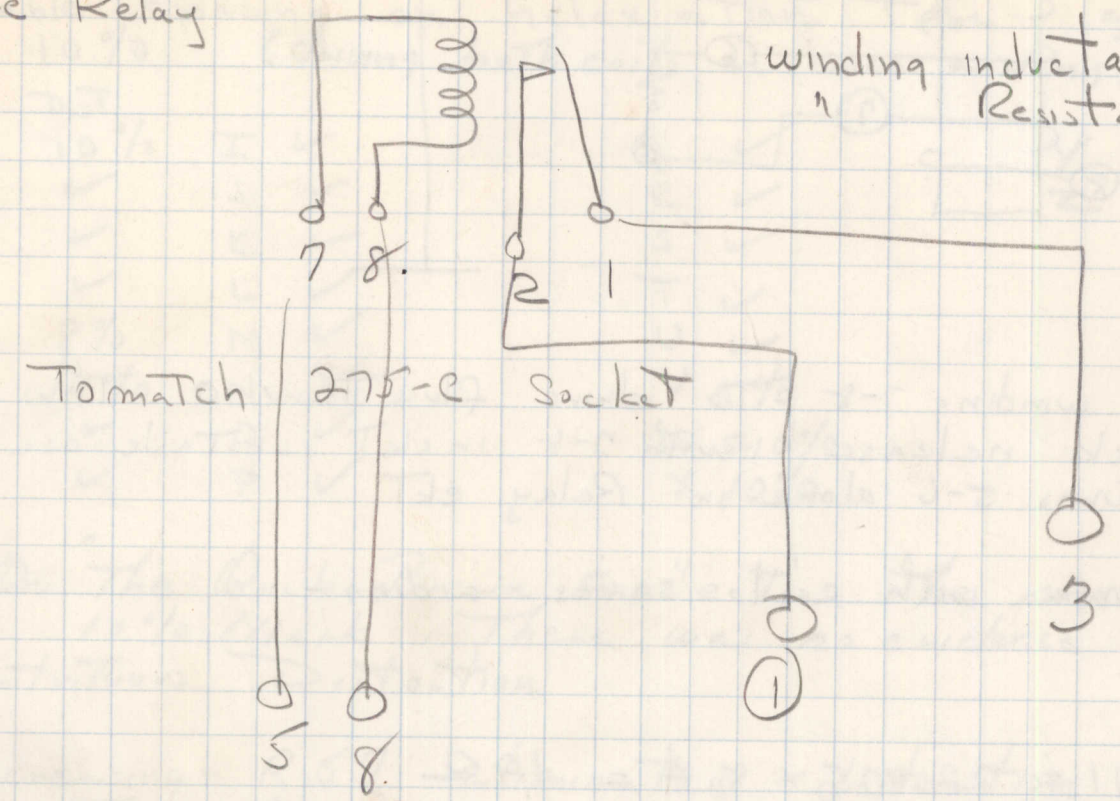
@character Y


Stpace
plate current
Pins V9
20 ms
24 ms
relay opening 5 ms
relay closing 4 ms
MARK
output voltage
21 ms
23 ms


21 ms
23 ms
22 ms
5 ms.

Clare Relay

winding inductance 4.6 hy
" Resistance 2000 Ω



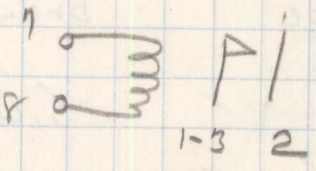
275-C

		5-6	7-8
winding	inductance	3.65 hy	.360 hy
"	Resistance	3000	700

---

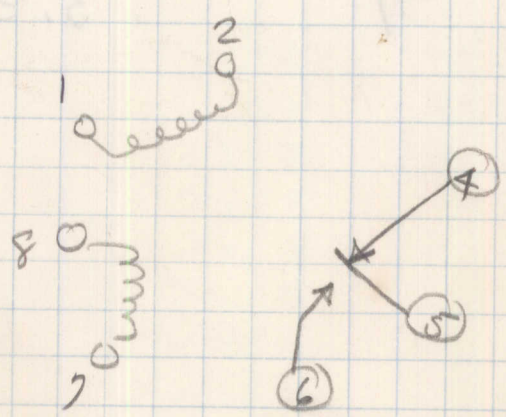
stevens arnold -

	7-8
winding Resistance	1000Ω
" inductance	.72 hy



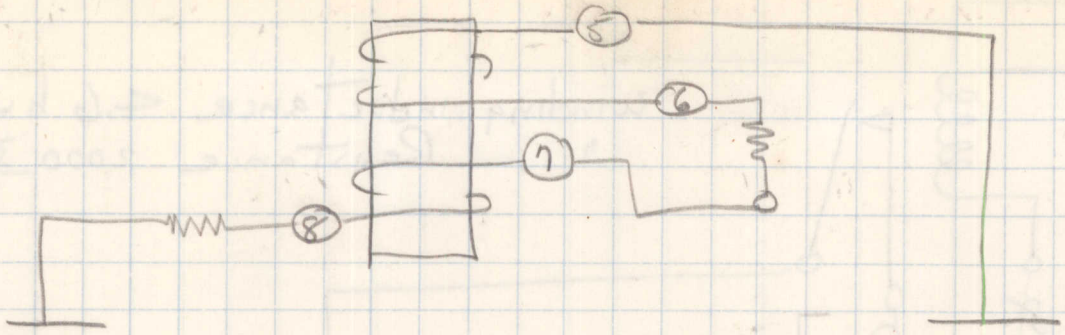
D-168479 W.E.

	1-2	7-8
winding Resistance	750Ω	3500
winding inductance	.325 hy	3.16 hy



---

stevens Arnold B-21
7-8 3.5 hy R = 3000 Ω



attempt To use winding 7-8 To drive flux Thru O Thus obtaining a quick release. with 7-8 in ckT unstable osc resulted. with Turns 5-6 alone in Relay ckT.

Tube draws 8.4 ma with coil series aiding -

Pri N 5925
Sec N 16950
22875

NI = 22.875 × 8.4 = 192

If sec coil is To produce the same NI

$I = \frac{192}{16.950} = 11.3$ ma

"Make" "Break" Current 27.5°C (ma)

#	Make	Break	
1	7	5.0	→ had in desk
2	5.9	4.7	2 & 3 were ones supplied with SFO
3	7	5.2	

Regenerator normal Distortion control set for suitable spacing on relaxation Tube giving a distortion of 10% (driving both coils in series aiding)

	Dist				
A	10%	H	✓	Q ✓	Y 8%
B	✓	J	✓	R ✓	Z 10%
C	✓	K	✓	S ✓	
D	✓	L	✓	T ✓	
E	8%	M	✓	U ✓	
F	10%	N	✓	V 5%	
G	✓	O	✓	W 5-10%	
H	✓	P	✓	X 10%	

On "The Quick Brown Fox" ect The maximum distortion was 10% Mark, There was no evidence of END or Fortuitous Distortion

increasing - R57 eliminates distortion except of following characters (7.9k)
M - 5% M - R 3% space, T 10-20%

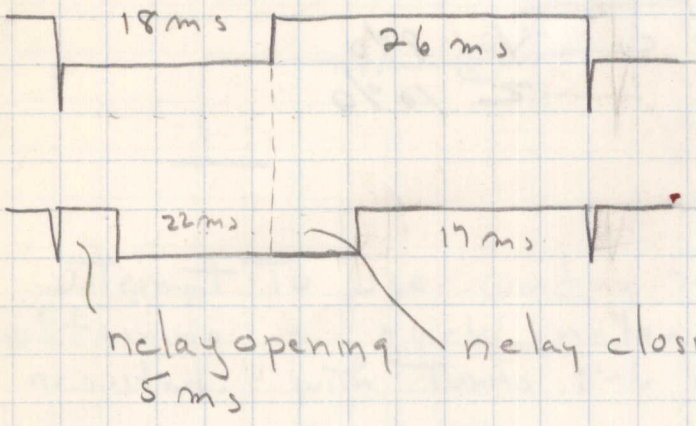
R60 decrease to bring up Tube b) current. (680 Ω)

Pin voltages To gnd Heath #231

1	21	
2	170	- B+ 180 Tube not quite cut off
3	34	
4	34	
5	100	
6	—	

34
21
13 volts bias on "A"

R 57 changed To 6.8K



Changes 9/24/54

2.7 meg ½ watt resistor added pin 4 V9 To gnd
R55 changed To 1.5 meg.
270K ½ watt resistor placed in parallel with R55

Changing V9 - original dist. negligible

#1	5%
2	3%
3	10% - space very close on V9
4	printed y " overlapped readjustment of dist control ok
5	5%
6	5%
7	5%
8	5%
V11	5%

OUTPUT ckt checked as per page 87 with square wave generator on 75 & 100 WPM
28 dot cycles on 75 wpm
36 dot cycles on 100 wpm

output appeared satisfactory with 5% Mark distortion
The distortion pot was unchanged during the test.

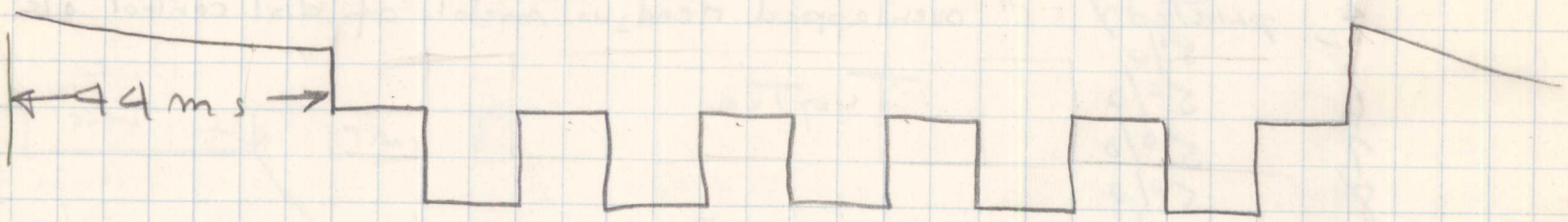
Changing V4 - On Tone keying

		TRIODE 1	TRIODE 2
#1	5%	2500	2600
#2	5%	2600	2540
3	5%	2375	2500
4	5%	2300	2550
5	5%	2400	2640
6	5%	2600	2650
8	5%	2600	2300
7		(4-5-6)	(2-1-3)
9		2550	2550
10		2500	2750
11	-V9	2450	2380
12		2500	2500
13		2500	2610
14		2600	2600
15		2550	2450
16		2525	2550
17		2450	2550
18		2525	2450
19	-V9	2350	2450
20		2350	2450
21		2450	2350

Changing Gate tube V6

9/23/54

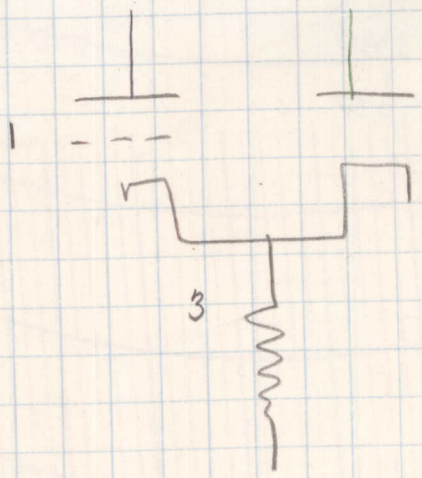
1 section To pin 2 V7
1 " " " 5 V6



#	Wave form	Dist
1	↙	↙
2	↙	↙
3	↙	↙
4	↙	↙
5	↙	↙
6	↙	↙
7		
8	↙	↙

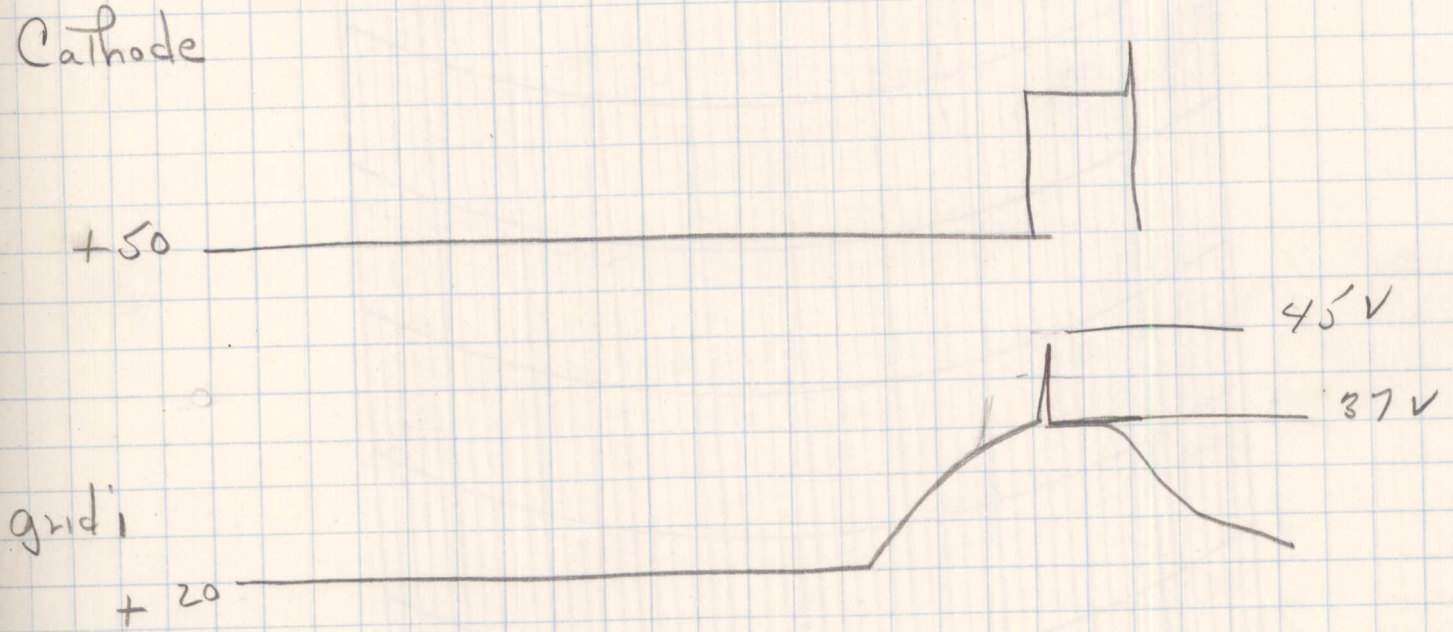
9/23/54

hag tube

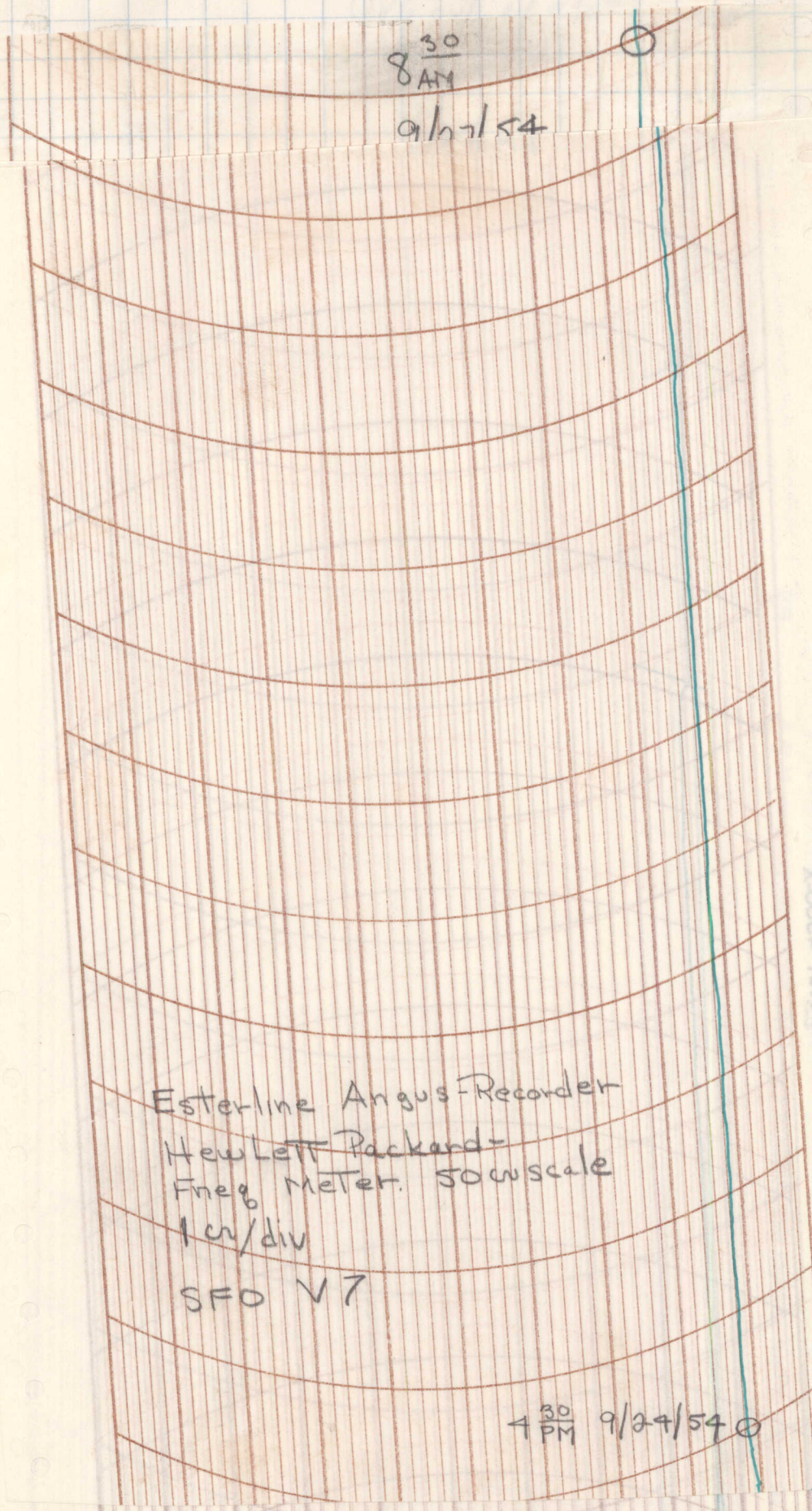


Mark Condition
1 - 34
3 - 44

Cathode



For positive switch over peak Trigger must be 42V


8 30 AM
9/24/54
Esterline Angus-Recorder
HewLett Packard-
Freq meter. 50 cu scale
1 cu/div
SFO V7
4 30 PM 9/24/54

Effect of Tube changes on Multivibrator frequency (V7)
(V6 out of clct)

Tube #	Freq c/s
ORIginal V7	45.3
1	44.7
2	44.3
3	45.0
4	47.2
5	45.5
6	45.0
8	45.5

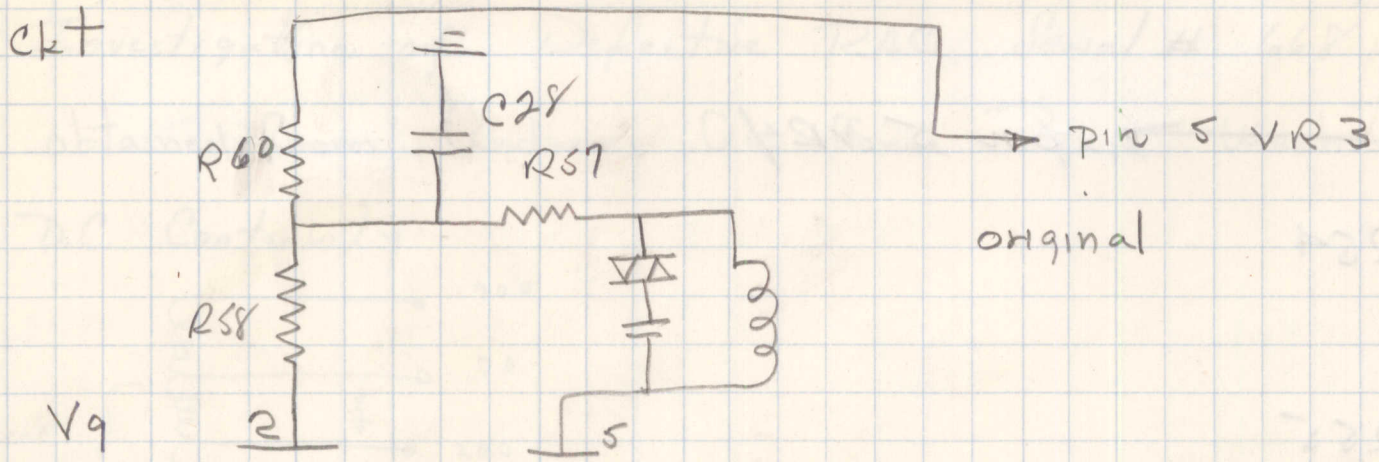
R58 8.2K returns To B+ Buss pin 5 V R3

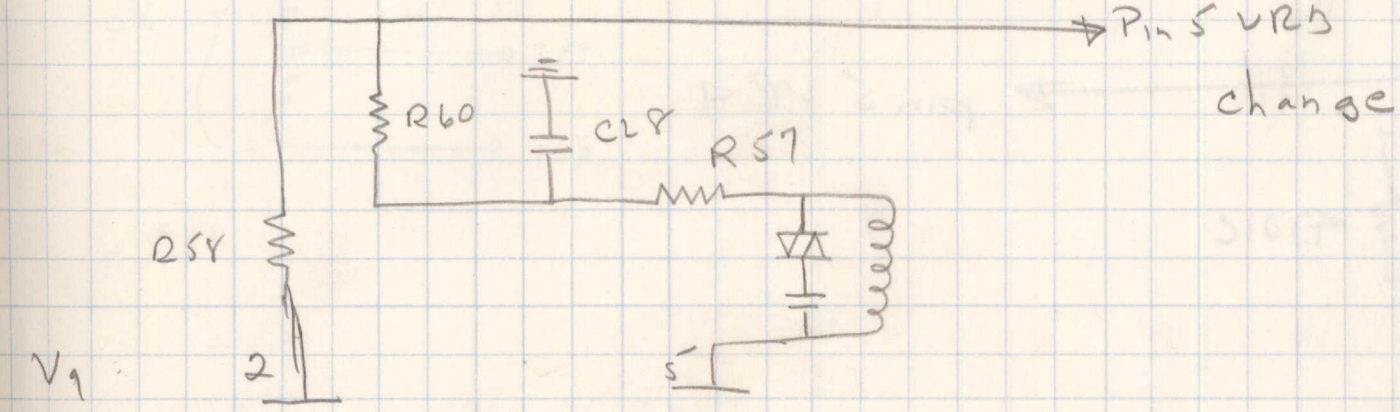
Effect of Tube changes of V9 - TesT Message. 35% space c/s.

	#1	occasional hit at 8% no adjustment possible
	2	hits at 8%
*	3	3%
*	4	5%
*	5	can be adjusted To practically zero
*	6	hits at 5% at best adjustment
	7	non operative
*	8	4%
*	9	hts at 2%
	10	Tube non operative
*	11	3%
*	12	4%
	13	
*	14	5%
	15	hits at 10%
*	16	5%
*	19	4%
*	18	5%
	19	
*	20	3%
	21	worked only if assisted

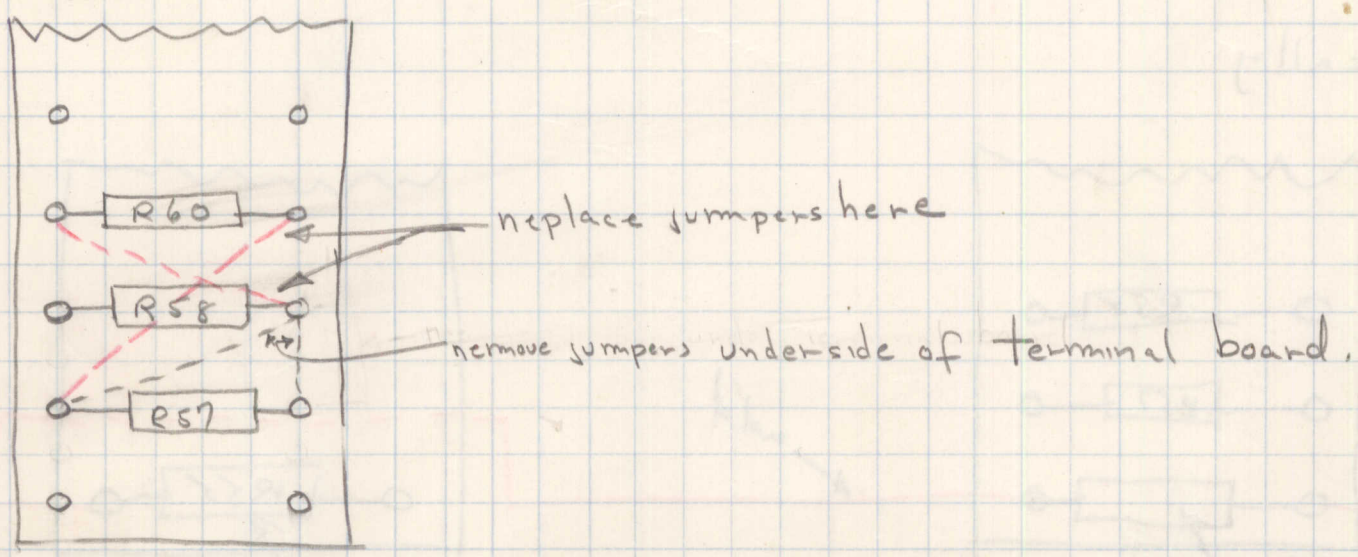
19 Tays
13 below 5%
3 below 10%
3 non-operative

ckt



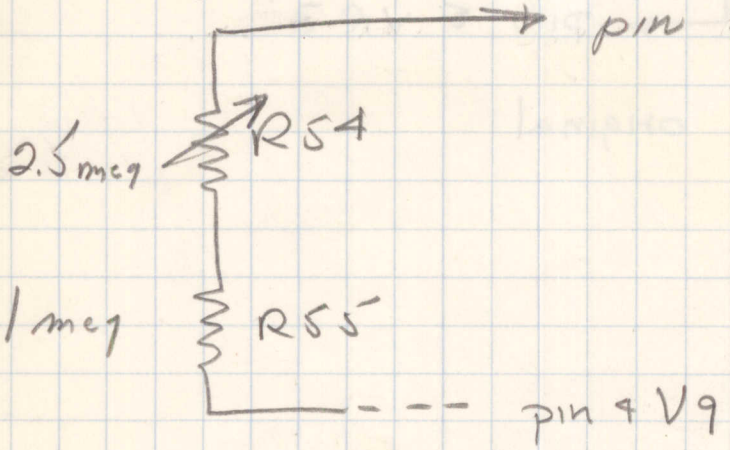


physically

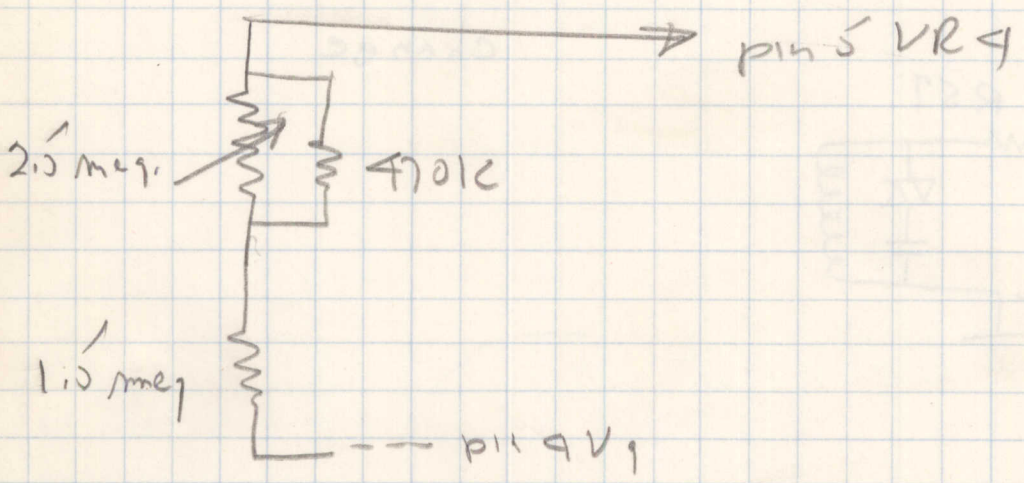


Modification TO limit range of Distortion control

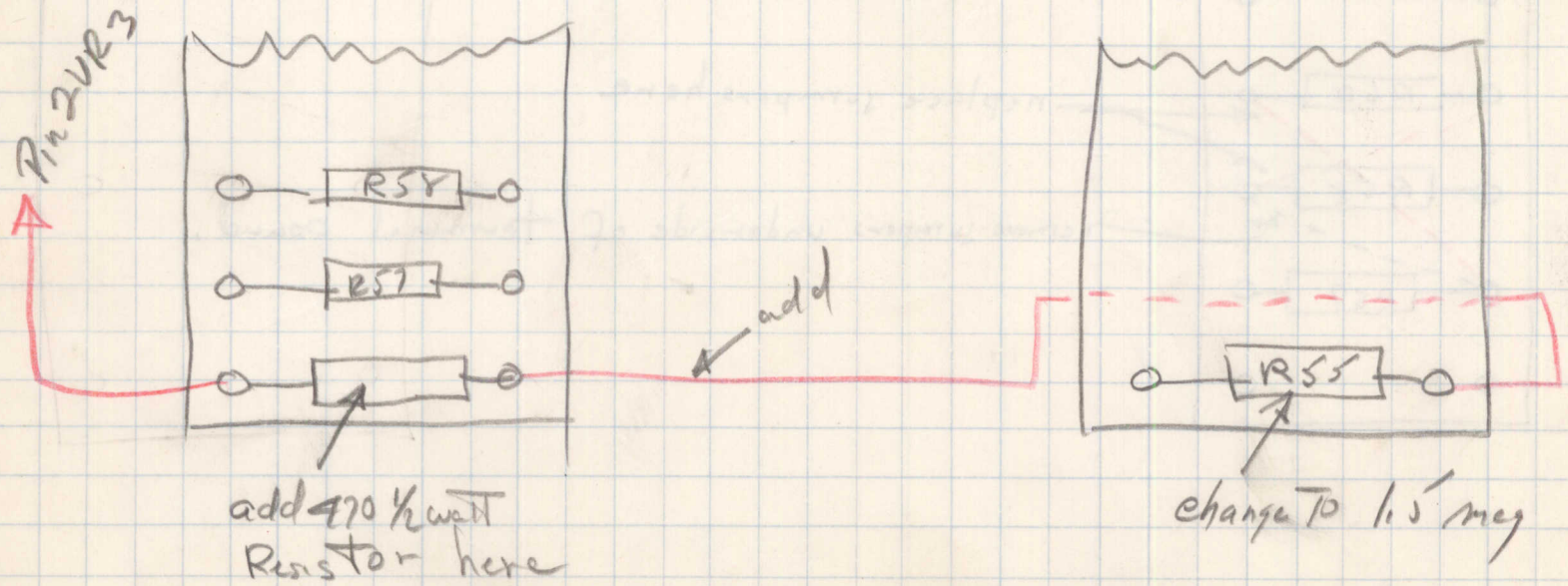
original



change TO



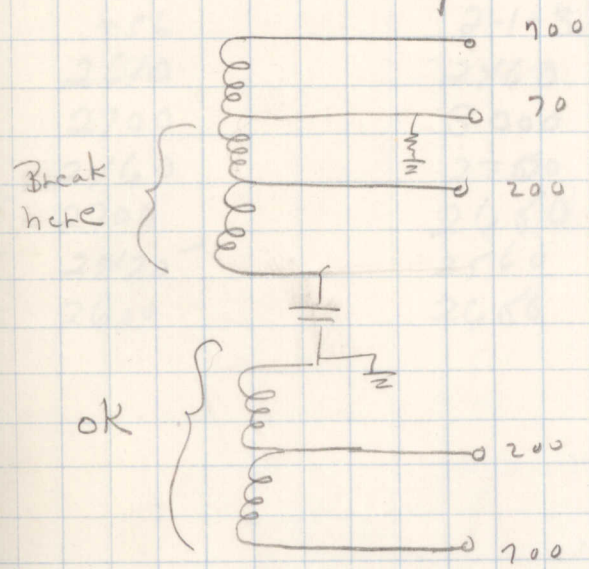
physically



10/8/54

Investigation of Defective RAC Serial # 668 obtained from Andrews Air Force Base Wash. DC.

D.C. Continuity



10/8/54

SFO brought Back from Andrews Air Force base

On unpacking The first Thing evidenced was That a 6SN7 was plugged into socket V-8 which normally takes a 6SL7

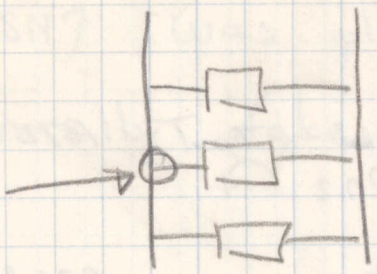
Tube section V7

object is To find characteristics of tube required To give symmetrical multivibrator output whith R72 somewhere in its middle range

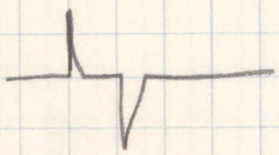
	Triode 1	Triode 2	
	4-5-6	2-1-3	
1	2610	2460	Tube gave sym output R72 0½
2	2700	3000	only sym with R72 ↺
3	2460	2700	"
4	2700	2650	sym output R72 0K
5	2470	2560	" " "
6	2600	2650	ok

Method of setting up R72

Set scope on C 23 inside toward centre

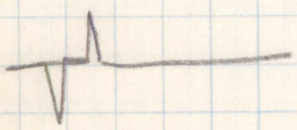


Sync on external.

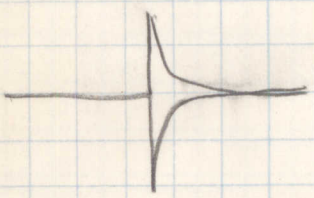


incorrect

adjust sweep vernier so that differentiated Traces superimpose.



incorrect



correct

Examination of 275c Relay for possibility of reducing distortion by shunting relay coil with resistor.

	CUT OUT R	ohms for 0 distortion E
~~#1~~	~~8000~~	2 spaces in plate Vg
#1	8000	12K
#2	20,000	
#3	11,000	

11/29/37

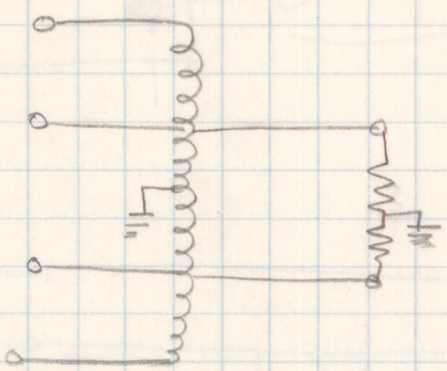
R24 changed to 33K
R21 changed to 120K

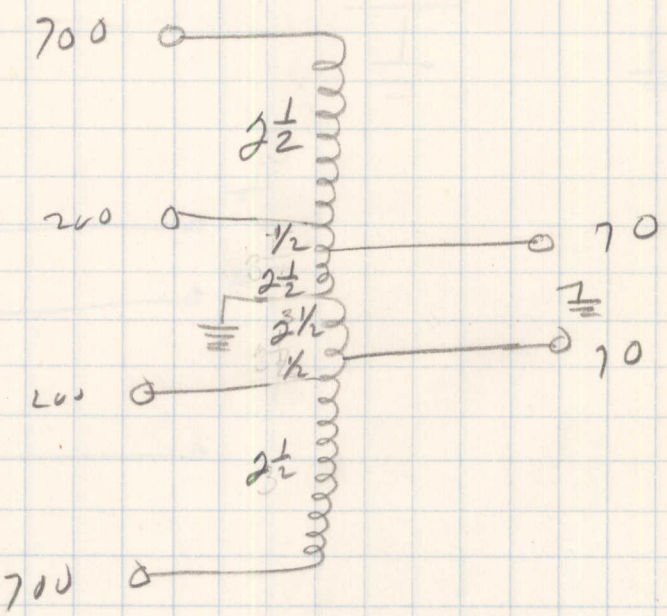
R74 changed to 2.2K

R24 changed to 3.3K

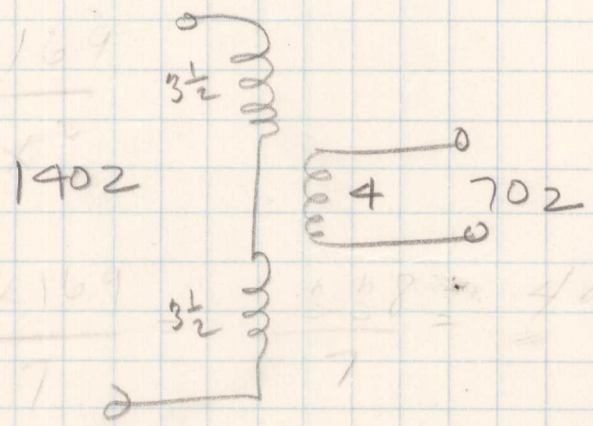
TR-102 RF Transformer

Input 700 / 200 } bal to 2 70 ohm unbalanced

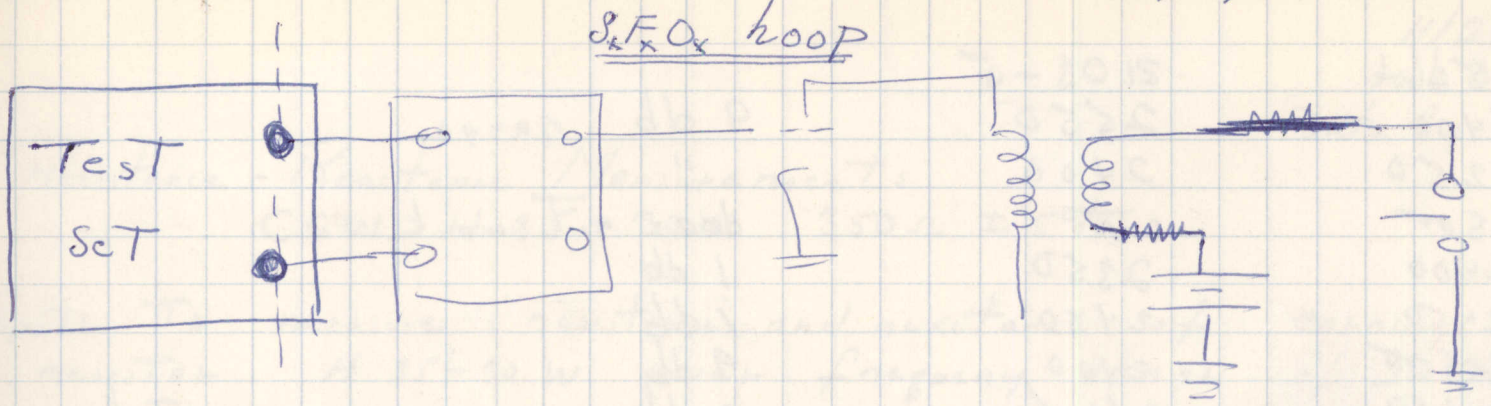


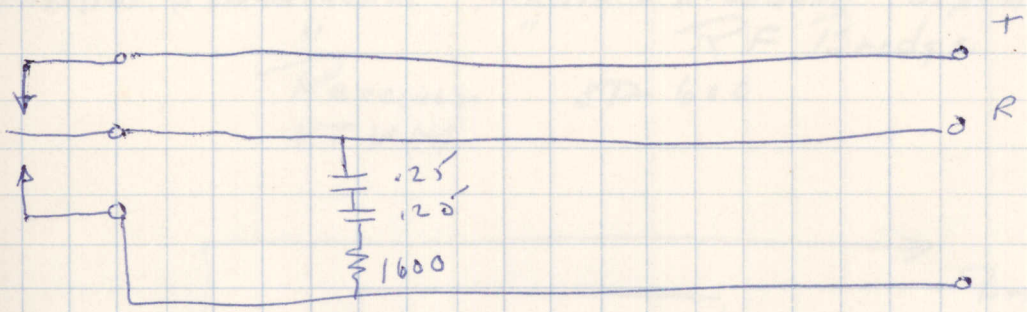


Test Transformer



Andrews Field
11/18/54





Modified 1223
1252

#	4506-	2103-5	
1	2400	2550	9 db range
2	2250	2400	"
3	2500	out	does not work
4	2400	2350	1 db
5	2350	2450	1 db
6	2500	2400	9 db
7	2450	2525	9 db
8	2400	2560	9 db

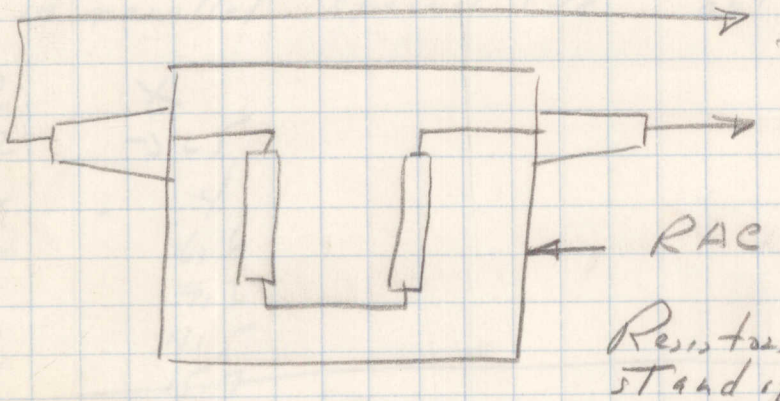
need Tube
Marked V4

11/22/54
Job 346
Data by P.K.

Resistance - Reactance Measurements
CGW H 35-30W 350Ω ±5%

Object: To measure resistance and reactance of corning glass resistor H 35-30 W over frequency range of 2-32 mc

Apparatus: General Radio Standard Signal Gen Model 100-A
" " RF Bridge 916-A
Receiver SP-600
VTVM

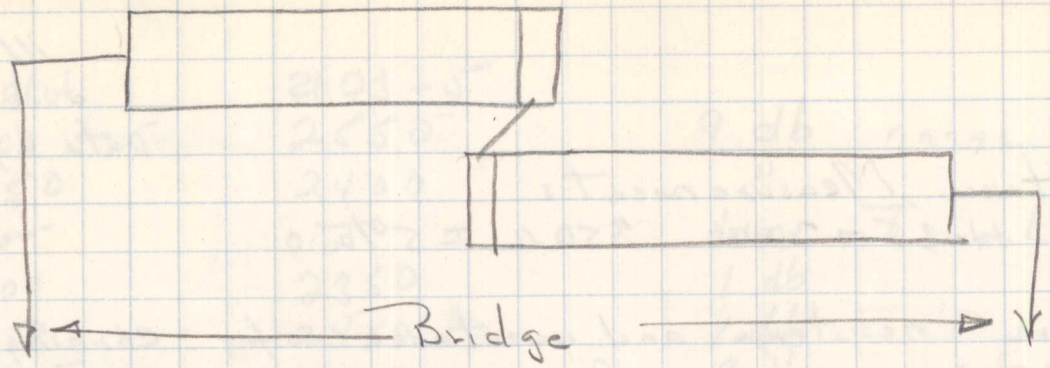


Resistors mounted on 1" ceramic standoffs.

fmc	R	X
2	680	-J90
4	640	-J150
6	600	-J230
8	550	-J310
10	490	-J325
12	440	-J330
14	390	-J345

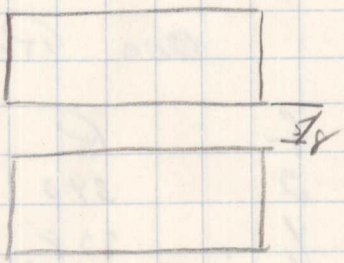
One Resistor in Place

f	R	X
2	340	-J13
4	338	25
6	335	37
8	330	37
10	325	60
14	315	78
18	300	105
22	280	123
26	265	135
32	240	155



physically out of Case on 1/4" Bakelite

f	R	X
2	690	-340
4	680	97
6	660	117
8	640	163
10	620	210
12	590	300
14	560	263
16	540	275
18	≈ 510	—



out of box parallel

f	R	X
2	172	0
4	172	-5
6	170	6.6
8	170	9
10	170	12
12	169	12
14	167	14
18	165	21
22	162	22
26	160	20
32	163	30.5

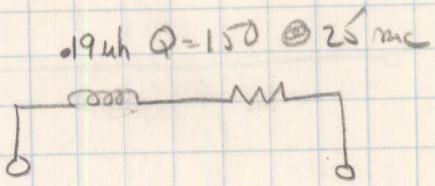
Single Resistor out of box

f	R	X
2	350	-J10
4	345	-J20
6	343	-J28.3
8	340	-J37.5
10	340	-J45
14	325	-J61
18	315	-J80.5
22	305	-J100
26	290	-J110
32	263	-J135

Two in parallel spaced 1 5/8" out of box

f	R	X
2	172	-J.45
4	172	4
6	172	6.6
8	170	9.2
10	170	11.5
14	168	15.7
18	165	20
22	160	24.5
26	158	27.6
32	152	32.4

Measurement with series Co.1



f(mc)	R	X
5	340	0
10	336	0
15	330	0
20	322	-J1
25	315	+J1
30	305	+J4

· out of box

12/13/54

Navy transmitting filter Ships-C-1687

Each network shall consist of two constant K T section terminated in series M derived half-sections, the shunt arms of the series M derived shall be omitted, since

12/15/54

Object: To develop R.F. Transformer To cover the frequency range 100kc To 100 mc (?)

input 800 ohms balanced
output 70 Ω unbalanced.

Core Ferroxcube III C W1-104
wire # 30 cotenamel

Design based on data obtained previously on

RAC (page) 82-84 9/2/54

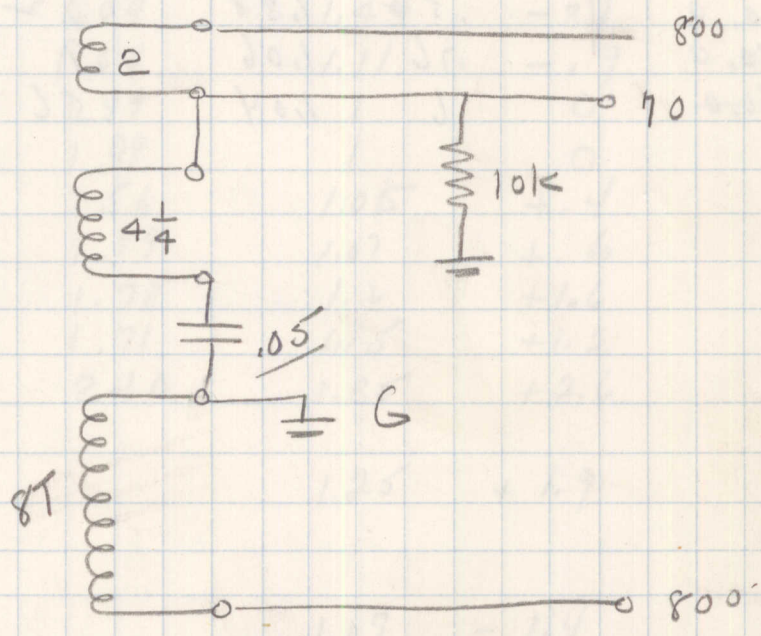
A first assumption of 4½ t primary will be assumed.

$$\frac{800}{70} = \frac{x^2}{18}$$

$$11.4 \times 18 = x^2$$

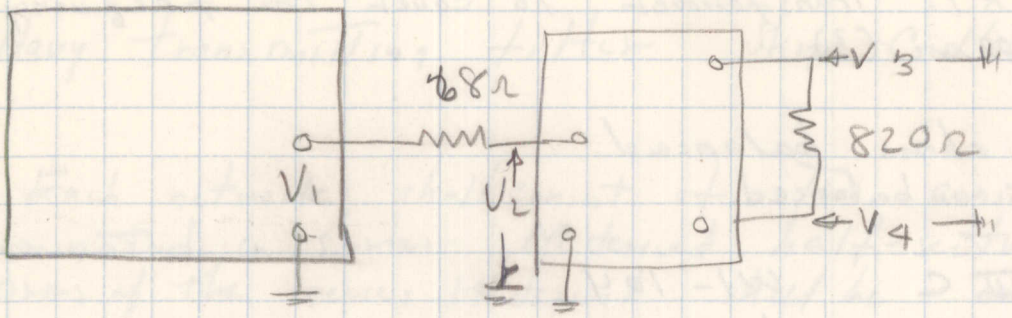
$$206 = x^2$$

$$14\tfrac{1}{4} = x$$

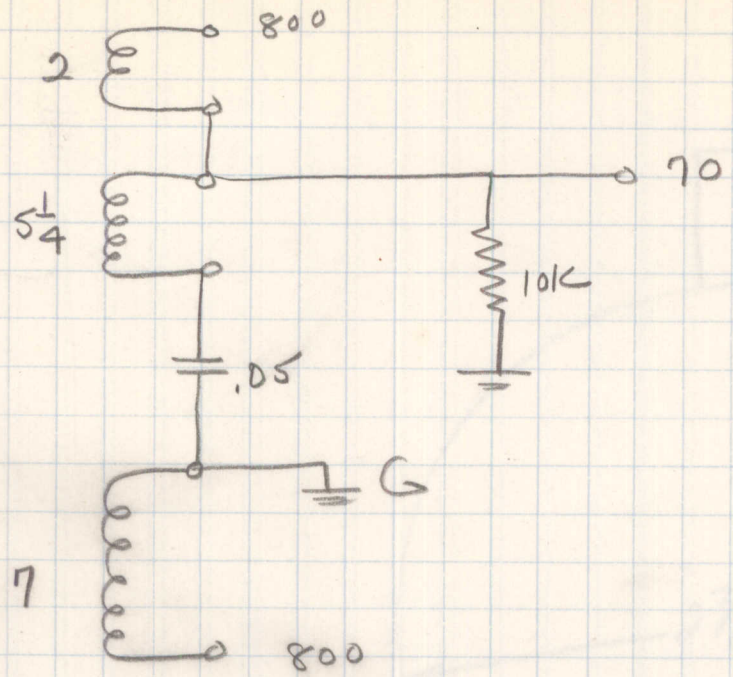


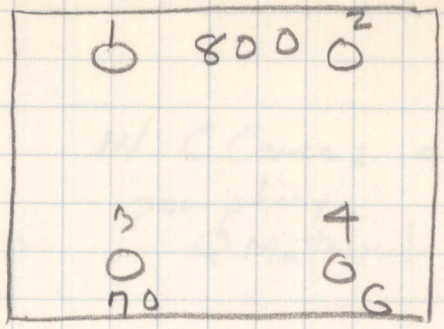
TR-105

Frequency Response



f (mc)	V_1	V_2	V_3	V_4
.1	1.0	.28	.18	.24
.3		.14	.6	.3
.5		.26	.72	.42
1.0		.38	.88	.60
4.0		.4	.9	.62
8.0		.42	.96	.62
16.0		.42	1.06	.6
30.0		.52	1.38	.62
40.0		.76	1.06	.9
50.0		.6	1.04	.56

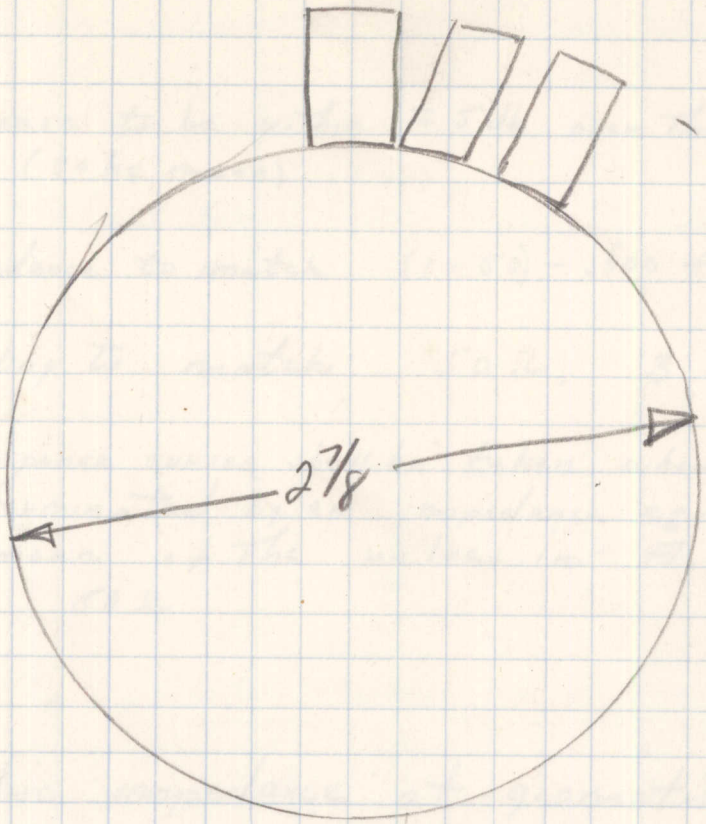




TR-105

CURVES GP-128

f	V_1	V_2	V_3	V_4	V_3+V_4	Ratio	db	
.2	1.0	.11	.48	.28	.76	1.96	-5.8	
.1	1.0	.2	.22	.14	.36	4.15	-12.4	
.3		.28	.58	.46	1.04	1.43	-3.1	
.5		.44	.67	.67	1.34	1.11	-.9	
1.0		.5	.77	.72	1.49	1	0	— reference
4.0		.51	.77	.72	1.49	1	0	
8.0		.52	.82	.74	1.56	1.05	+.4	
16.0		.52	.87	.72	1.59	1.07	+.6	
30.0		.54	1.12	.66	1.78	1.2	+1.6	
40.0		.58	1.13	.58	1.71	1.15	+1.2	
50.0		.8	1.16	.94	2.10	1.85	+2.6	
70						1.25	+1.9	
90								
120						1.17	-1.4	



14 C Cores around periphery - Q Material

Primary wound first 1/8" copper tubing covered with teFlon Tape (UEY 4 4EIL 82 PTF B5T)

12 turns

Inductance without completing C Cores
@ 2.5 mc
L = 110 uh
Q = 210

entire secondary covered then with layer of above tape, previously coated with Silicone compound
Dow Corning Silicone Varnish # 997

Primary wound on next - 4½T (should be 5T) Then coated with silicone varnish

Q Meter measurements both sections of Cores on

Primary .09 mh Q = 160 C = 450 at 790 kc..

Secondary L = .7 mh Q = 150 at 790 kc

12/22/54

Object: To design R.F. Transformer with following characteristics

1. Frequency response to be within ± 5 db over the frequency range 10 - 550 kc (90 kc mean)
2. Primary impedance to match (1 - 50) - J(100 ÷ 16000) ohms
3. Secondary winding to match 50 Ω, 3 windings
4. Frequency response curves shall be taken when the primary winding is terminated by an impedance equal to the geometric mean of the values in # (2) and secondary in 50 Ω

Assuming Geometic impedance at geometic frequency

$$R = \sqrt{50 \times 1} = \sqrt{50} \approx 7$$

$$JX_c = \sqrt{16000 \times 100} = \sqrt{1.6 \times 10^6} = 1260$$

① impedance at 90 kc to be matched
$7 - J1260$

The transformer input impedance at 90 kc is to be the conjugate of ① if match is to be accomplished.

$$Z_{in} = 7 + J1260$$

The reactance term is quite high Hence possibly a series inductor will be required in addition to the leakage reactance of transformer

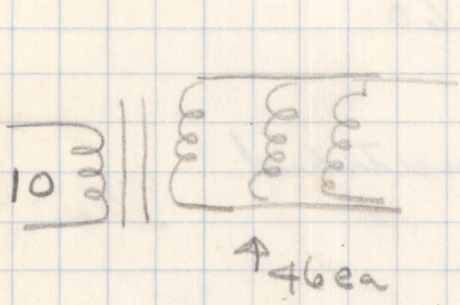
biased on experimental history the primary should be 10 turns, since the secondary is 3 paralleled 50 ohm outputs effectively the coil should be designed for 150 ohms.

$$\frac{150}{7} = \frac{x^2}{100}$$

$$x^2 = \frac{100 \times 150}{7} = \frac{16000}{7} = 2140$$

$x = 46$ turns

1st Model



on RF bridge large core indicated practically a short - permeability of Q material may be Too low.

a Test core on Ferrotacube was wound each with 10 turns.

large core 15.8 uh Q = 150 at 2.5 mc.

$X_L = 2\pi fL = 6.28 \times 9.0 \times 10^4 \times 1.5 \times 10^{-5}$

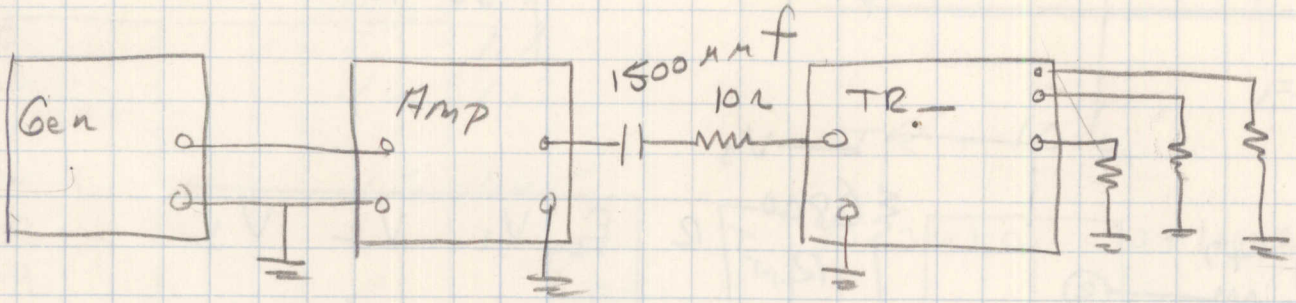
$= 85 \times 10^{-1} = 8.5\ \Omega$

At 90 kc antenna reactance $-J\,1260$

$$C = \frac{1}{2\pi f X_c} = \frac{1}{6.28 \times 90 \times 10^4 \times 1.26 \times 10^3}$$

$$C = \frac{10^{-7}}{71} = \frac{10^5 \times 10^{-12}}{71} = 1410\ \mu\mu f$$

——— freq response



fkc	V_i	V_o
15		.2

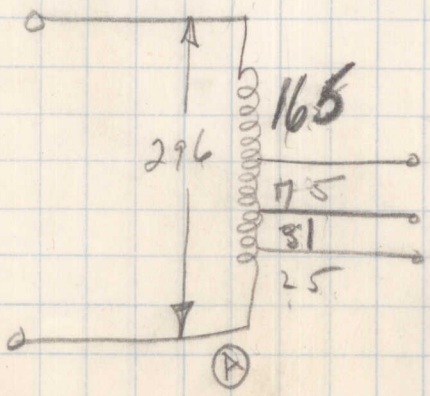
Ranges 15–50 kc 50–7000Ω
50–150 kc 50–1400Ω
150–500 kc 50–260Ω

$$\frac{140}{7000} = \frac{x^2}{625}, \quad x^2 = 625 \times 140 = 25 \times 11.8 = 296$$

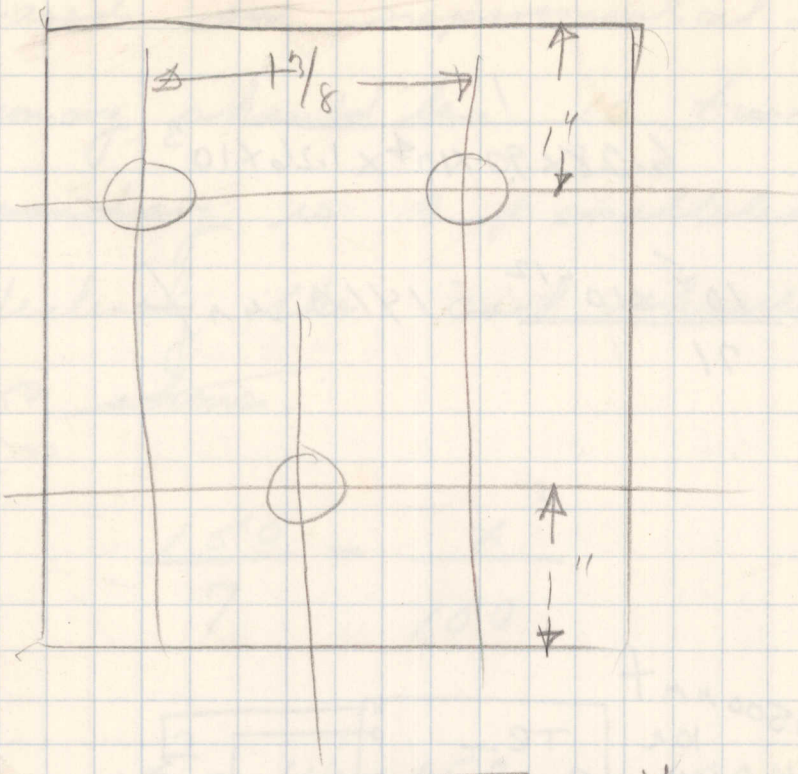
$$\frac{28}{1400} = \frac{296^2}{x^2} \quad x = \frac{296}{\sqrt{28}} = \frac{296}{5.28} = 56$$

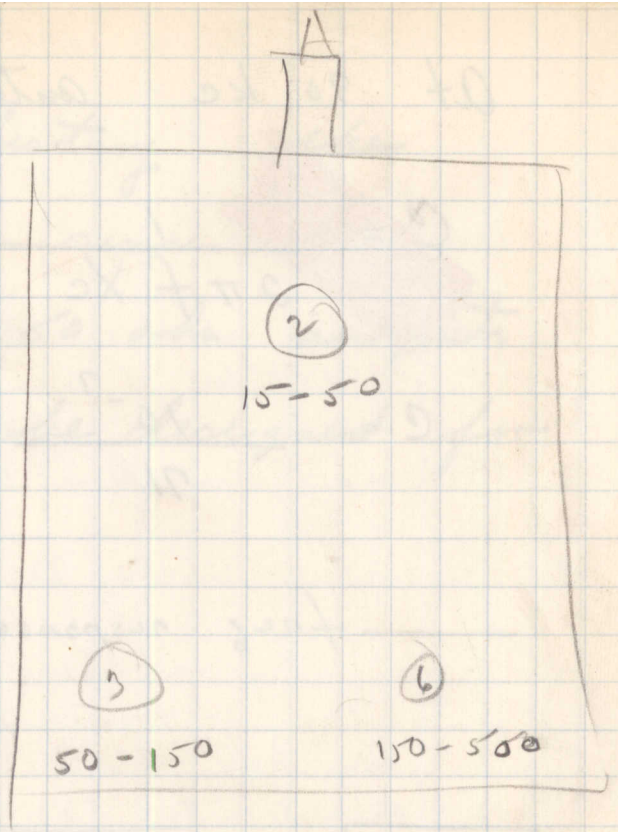
$$\frac{5}{260} = \frac{296^2}{x^2} \quad x = \frac{296}{\sqrt{5}} = \frac{296}{.131}$$

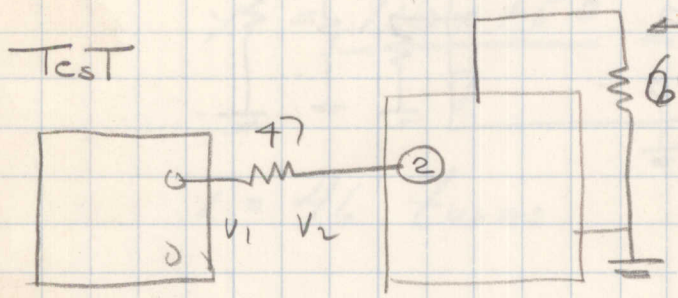
1st Configuration



25–31–37 on first layer.
38–45 on 2nd layer # 36 DSC.
85 on 3rd layer
35 on 4th layer.



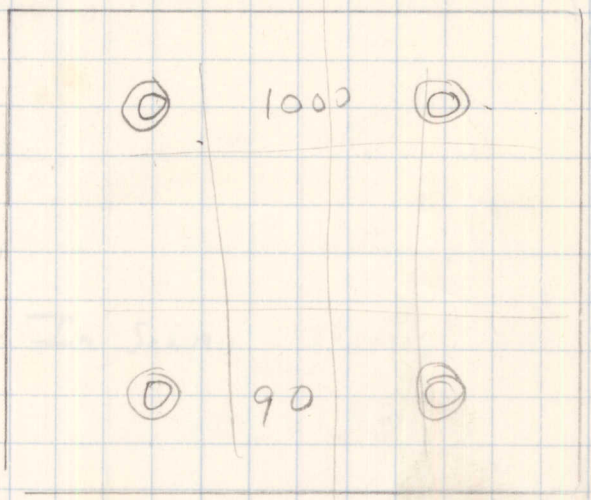




	R	f_{cc}	V_1	V_2	V_3
2	6800Ω	15	1.0	.5	4.2
		50	1.0	.5	3.9
3	1500	50	1.0	.5	2.5
		100	1.0	.5	2.5
		150	1.0	.6	2.4
6	270Ω	150	1.0	.6	1.0
		200	1.0	.7	.8
		500	1.0	.8	.6

TE-101-2
B+-100-125

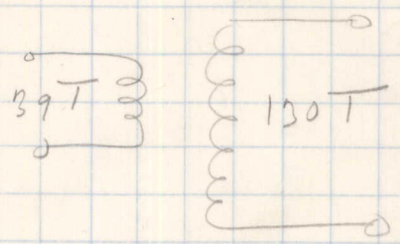
f kc	V_1	V_2	V_3
~~55~~	~~1.0~~	~~1.1~~	~~1.7~~
70	1.0	.45	1.6
20	1.0	.49	1.8
30	1.0	.49	1.6
~~40~~	~~1.0~~	~~.5~~	~~1.~~
50	1.0	.49	1.7
70	1.0	.49	1.6
90	1.0	.49	1.5
120		.5	1.5
150		.5	1.85
200		.5	1.8
250		.5	1.8
300		.5	1.8
350		.5	1.7
400		.46	1.7
450			
500		.45	1.65
550			
600			
650			
700			
800			
900			
1000			



F-137-1H Coz
Gen'l Ceramics
C1-101-1H

TR-106

30-300 kc 90 → 1000Ω



65 turns first T #36.

39 turns next T #26

65 turns last T #36

joint end of 1st and
beginning of 3rd

Bridge Measurements 3.5 kw Transformer 1/17/55

f	R	X_L	Sht ckt
2 mc	78	27.0	
4 mc	78	45.0	0 + j65
6 mc	79	67.0	1 + j100
8 mc	82	97.0	1.6 + j145
10 mc	86	125	3.6 + j200
14 mc	115	200	23 + j350

150 μμf Capacitor In Series

f	R	X_L
2		
4		
6		
8		
10	80	16

1/21/54

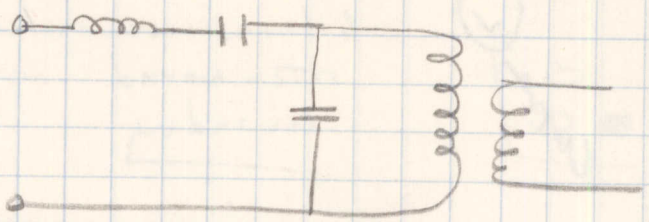
Summary of Field trip To Transmitter Site Andrews Air Force Base on Test of 3.5 kw coupler.

1. Don Dewey & Dick Berry (Ext 3298 Redwood 1-5-8900) measured coupler on Admittance Bridge (English type) are arrived at an impedance curve similar To The one on page 137.

2. Mr Ogus (?) accompanied us To The site and with The assistance of Chucks _____. performed Tests on The coupler on a AN FRT-15 Transmitter with a 600Ω resistive termination and The 70Ω unbalanced input connected To The transmitter ≈ 2.1 KW was transmitted. Transmitter was unable to fully balance out reactance. Tests were made at 3 & 7 mc with essentially The same results.

Modulation was introduced at 3 mc and avg power rose To 2.6 kw no breakdown resulted and at no time was any evidence of heating noticed on The transformer.

a filter configuration of this nature might be considered



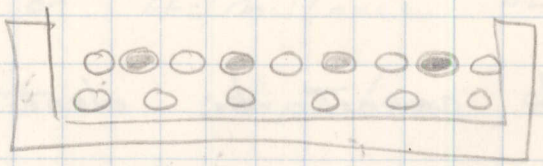
If the job cannot be done with one transformer in the range 3-24 mc. It was suggested by Mr O'Gus that a suitable distribution would be 3-10 mc & 10-24 mc since this is the demarcation utilized in the antenna fields

H 2

f	R	X_L
3	70	6
4	64	7.5
6	50	23
8	40	45
12	30	110

Curve (2)

6 turns secondary wound.
#10 buss covered #9 plastic tubing
6 turns secondary 2 ½ turns primary
Primary wound wound over 6 turns of secondary



○ secondary
● primary

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open ckt voltage ratio

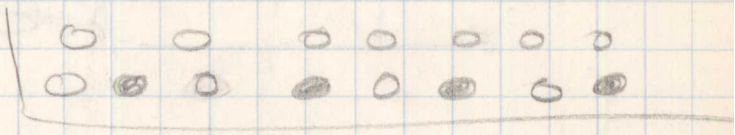
freq (mc)	E_m	E_{o-T}
2	1.0	3.6
3	1.0	4.7
4	1.0	4.8
5	1.0	2.8
6	1.0	1.2
7	1.0	1.0
8	1.0	.5

Open ckt test

Curve (3)

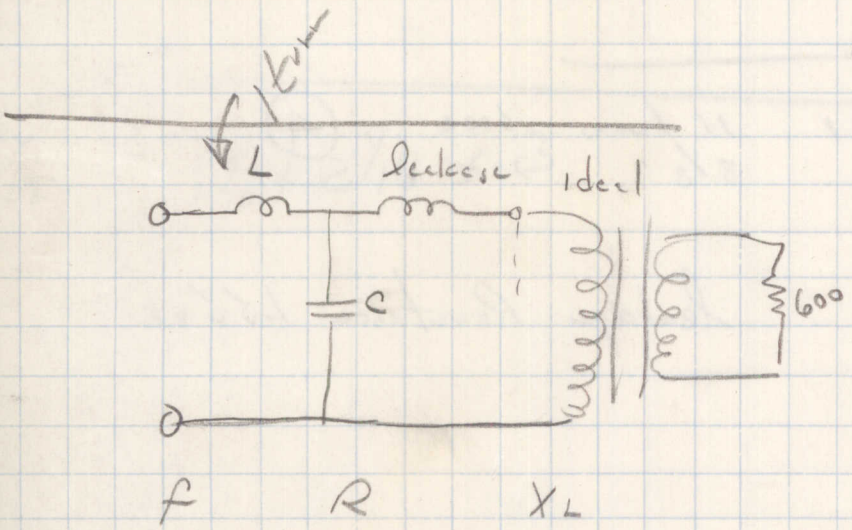
freq (mc)	E_{in}	E_o
2	1.0	2.9
3	1.0	3.6
3.5	1.0	4.0
4.0	1.0	4.5
5.0	1.0	6.4
6.0	1.0	1.7
7.0	1.0	.3
8.0	1.0	.3
9.0	1.0	.6
10.0	1.0	.8

Primary and ½ secondary wound on interwound then secondary wound on



Bridge Measurements

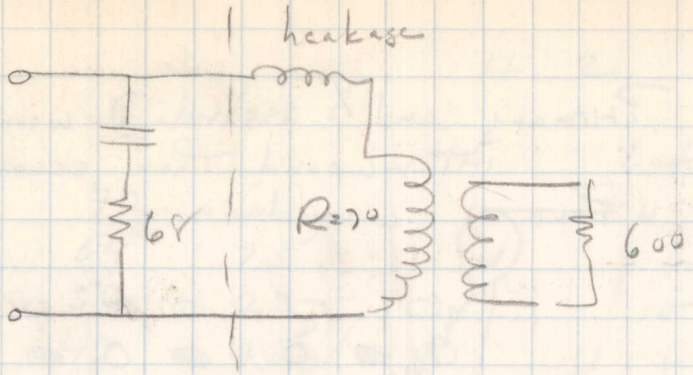
f	R	X_L
2	90	10
3	86	13
3.5	83	15.4
4.0	82	17.0
5.0	76	22.0
6.0	71	29.0
7.0	66	38.0
8.0	61	47.5
9.0	58	59.0
10.0	55	70.0



f R X_L

C adjusted for zero reactance at 6 mc

f	R	X
2	90	−2
3	86	−3
4	82	−5
5	78	−2
6	78	0
7	80	+5
8	86	+9.4
9	98	+10
10	118	+1



f	R	X
2	88	-7
3	78	-10
4	70	-10
5	63	- 7
6	59	-2
7	56	+3.6
8	55	+8.0
9	54	+13.5
10	54	+14.0
12	54	+25.0

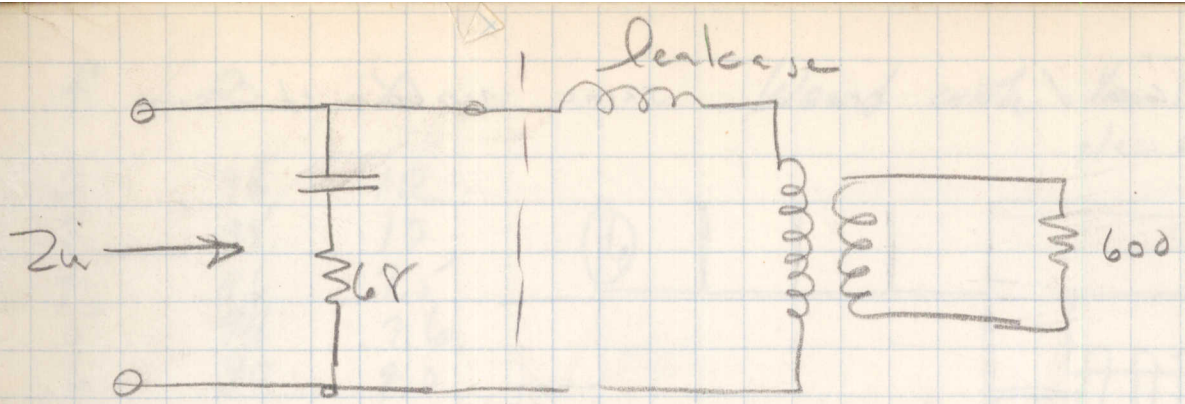
transformer wound as per winding #3

Transformer wound as per #1 11 turns 600Ω ④
8 1/3 " 70Ω

xformer alone

f	R	X
2	70	+28
3	70	+34
4	69	+40
5	69	+48
6	69	+58.4
7	69	+69.0
8	68	+80.0
9	68	+90.0
10	69	+100.0

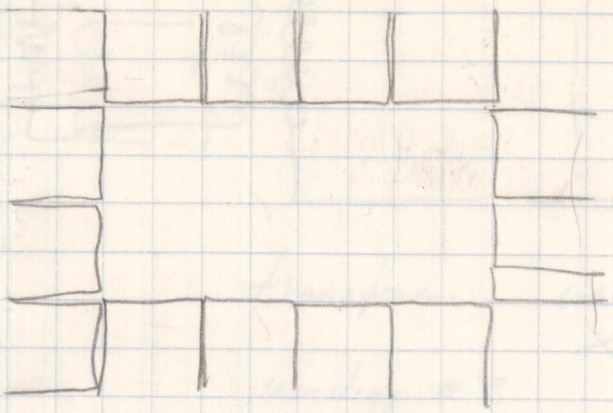
leakage Reactance 1.55 mh



f	R	X
2	72	+20
3	72	+ 12
4	71	+ 5
5	68	+ 5
6	66	+ 5
7	64	+ 8
8	61	+9.1
9	58	+11.0
10	56	+16.0

$1\frac{7}{8} + 2\frac{1}{16} \times 3$

Transformer wound on square same number of C cores as original



primary 4 turns #10 wide spaced

secondary 10½ turns #10

primary wound over secondary. (5)

f	R	X
2	80	27
3	80	34
4	80	42
5	81	46
6	82	63.5
7	84	74.0
8	87	85.0
9		
10		

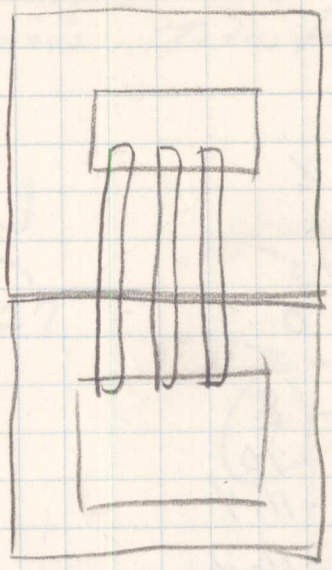
Measurement of 50-100 Ω transformer

f	R	X
2	25	27
3		
4	35	36.8
5		
6	40	42.5
7		
8	42	31
9		
10		
14	45	45 Ω

f	R	X
2	98	12
3	98	10
4	96	7.5
5	94	7.6
6	90	9.0
7		
8	84	11.5
9		
10	78	19.0
11		
12	71	28.4
13		
14	66	38.6

(6)

Wound with 1/4" braid
glass braid covered



10 turn secondary wound over 4 turn primary

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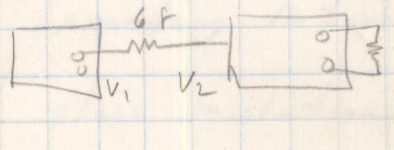
winding on 5 turns secondary
Then 4 turns primary and Then 5 turns secondary
glass braid

f	R	X
2		
3	96	+3
4	94	-5
5	90	-5
6	87	-7
7		
8	78	-6.5
9		
10	70	-3.5
11		
12	60	+2.5
13		
14	52	+10.7
16	45	+18.7

(7)

Frequency Response



f	V_1	V_2	V_3	V_4
2	1.0	.56	.9	.5
3	1.0	.56	.9	.5
4	1.0	.54	.9	.5
5	1.0	.54	.88	.52
6	1.0	.54	.88	.52
7	1.0	.52	.88	.54
8	1.0	.52	.86	.56
9	1.0	.5	.86	.58
10	1.0	.5	.86	.56
12	1.0	.46	.86	.64
14	1.0	.4	.84	.72
16	1.0	.3	.82	.76

wound with ¼ braid. plastic covered

½ sec. (5) primary (4) ½ sec (5) turns

f	R	X
2	98	+5
3	97	0
4	94	-5
5	90	-8
6	86	-10
7	81	-11.4
8	77	-11.2
9	72	-10.3
10	68	-9.4
12	59	-4.6
14	52	+1.5
16	45	+11.2
21	32	+12.0

(8)

wound again with glass tubing

not giving same results as previous Transformers —

f	R	X	tuned load	
2	96	-7		
3	90	-20		
4				
5				
6	64	-32	70	-27
7				
8				
9				
10				
12				
14	25	-10	30	-13
16				

(9)

4.1 / 5 / 11 .4

Same as above but primary reverse wound.

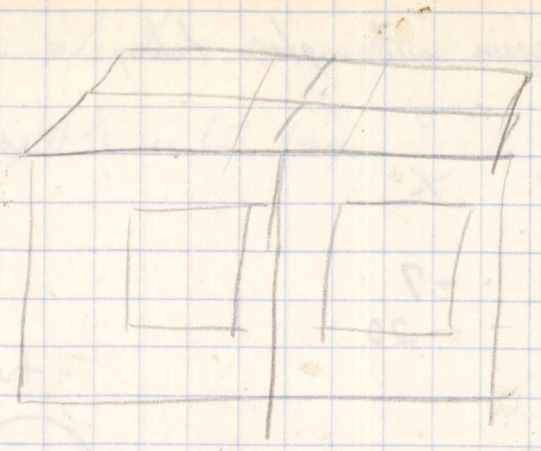
f	R	X
2	97	+5
3	97	-2
4	94	-6
5	91	-11
6	87	-14
7	82	-14
8	78	-17
9	73	-15.8
10	70	-16
11		
12	68	-13.9
13		
14	52	-8.6
15		
16	45	+2.5
21	31	+22.0

(10) Primary 1/4" braid 4 turns

Secondary 10 turns same glass insulation

5 turns secondary wound on then 4 turns primary, then remaining 5 turns secondary.

f	R	X
2	100	37
4	96	22
6	97	16
10	96	12
14	94	12.3
16	91	14.4



2 sets

#22 Teflon covered

10 turns secondary
4 turns primary

Secondary wound under primary
close spaced.

#22 teFlon

Secondary wound spaced across window, primary interwound in same direction as secondary

f	R	X
2	86	45
4	98	34
8	102	35
12	102	46
16	102	59

Secondary wound in opposite

2	82	+42
6	100	+25
12	102	+27
40	155	+100

2/1/55

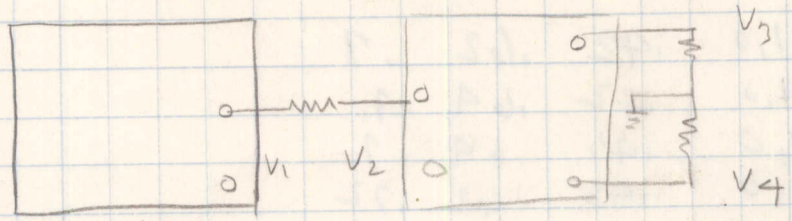
Transformer: 2-30 mc 70/700 bal

primary 5 t.

$\frac{700}{70} = \frac{x^2}{25}$ (10)

$x^2 = 250$

$x = 16.8$



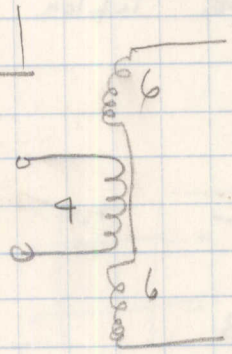
f	V_1	V_2	V_3	V_4
2	1.0	.42	.78	.68
6	1.0	.45	.79	.68
10	1.0	.49	.76	.67
14	1.0	.54	.74	.65
25	1.0	.62	.62	.62
30	1.0	.6	.4	.3 ← low

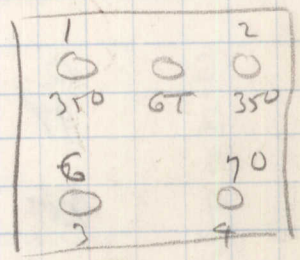
rewind using less turns -

$\frac{700}{70} = \frac{x^2}{16}$

$x^2 = 160$

$x = 12.7$





RAC Case

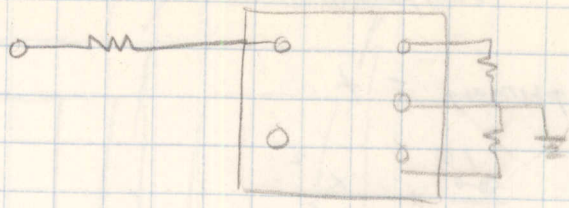
f	V_1	V_2	V_3	V_4
2	1.0	.43	.72	.64
6	1.0	.46	.75	.66
10	1.0	.48	.74	.64
14	1.0	.5	.74	.64
25	1.0	.58	.66	.58
30	1.0	.6	.68	.6

f	R	X
2	54	+22
4	58	+20
8	60	+15
16	65	+40
30	66	+46

TR-108

after potting

f	V_1	V_2	V_3	V_4
2	1.0	.42	.62	.7
4	1.0	.42	.64	.7
6	1.0	.43	.64	.7
8	1.0	.43	.62	.72
10	1.0	.44	.63	.72
16	1.0	.46	.62	.72
24	1.0	.48	.6	.62
30	1.0	.52	.56	.64



3.5 kw wound with Teflon

f	R	X
2	98	+10
3		
4	95	-2.5
5		
6	90	-8.3
7		
8	82	-12.0
9		
10	74	-12.0
12	69	-9.5
14	62	-6.4
16	56	-3.1
20	45	+14.0
25	34	+32.0
30	26	+60.0

Radio Free Europe

110 W 57th St

PL-7-7600

E+T 56

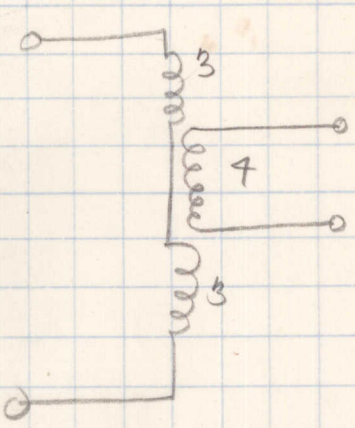
Howard Moffat

Taken in case

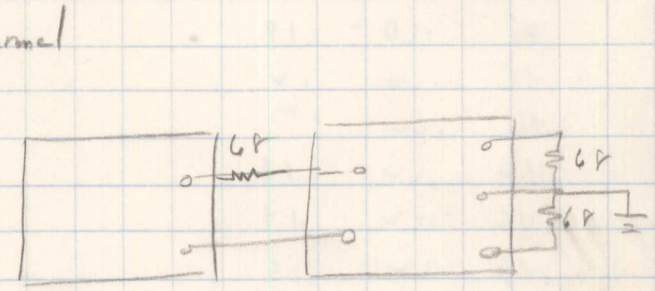
f	R	X
2	97	+6
3		
4	94	−6.0
5		
6	86	−13.3
7		
8	78	−15.0
9		
10	71	−14.0
12	62	−13.0
14	54	− 9.0
16	47	− 2.8
20	39	+13.5
25	33	+38.0
30		

TR-107

2/10/55



#30 cotenamel



f	V_1	V_2	V_3
2	.39	.26	.3
4	.39	.26	.3
8	.42	.26	31
~~10~~			
~~12~~	.48	.26	.31
16	.5	.26	.3
20	.57	.24	.27
25	.59	.22	.21
30	.64	.24	.24

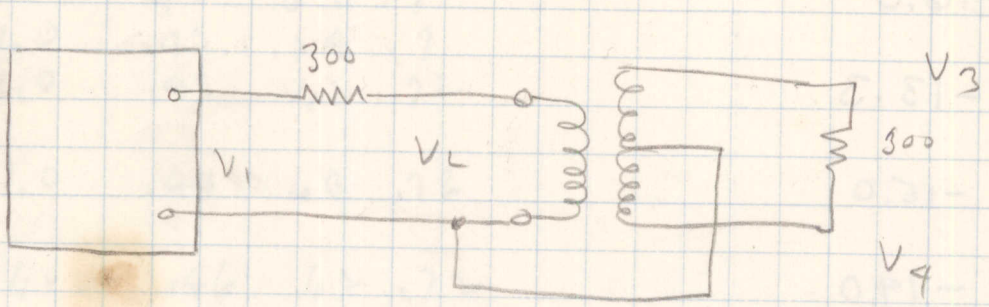
2/21/55

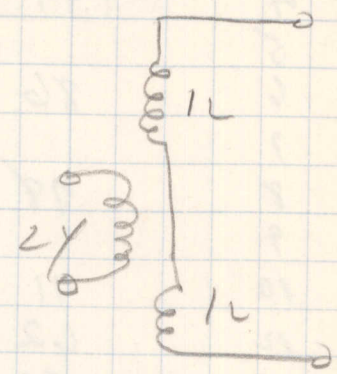
TR-109

Antenna Transformer for FFR-L 3M

500 kc

TEST 1





f kc	V_1	V_2	V_3	V_4
100	1.0	.4	.16	.16
150	1.0	.43	.2	.19
200		.44	.21	.2
300		.44	.21	.2
400		.45	.21	.2
500		.45	.20	.19
600		.45	.22	.2
700		.46	.22	.2
800		.46	.22	.19
1000		.46	.22	.19
1.5		.46	.22	.19
2.0		.1	.22	.18

FFR Audio

line voltage 110v

change R124 = 13.5K
R122 2.2K
remove C126

5% dist
at 2 watts

Suggested wiring for how Reactance transformer

1. 4 turns 3/8" Xape
2. 8 turns # 30 this is Xap.
3. 1 layer Tape
4. 6 turns # 30
5. 5 layer of Tape
6. 8 turns # 30