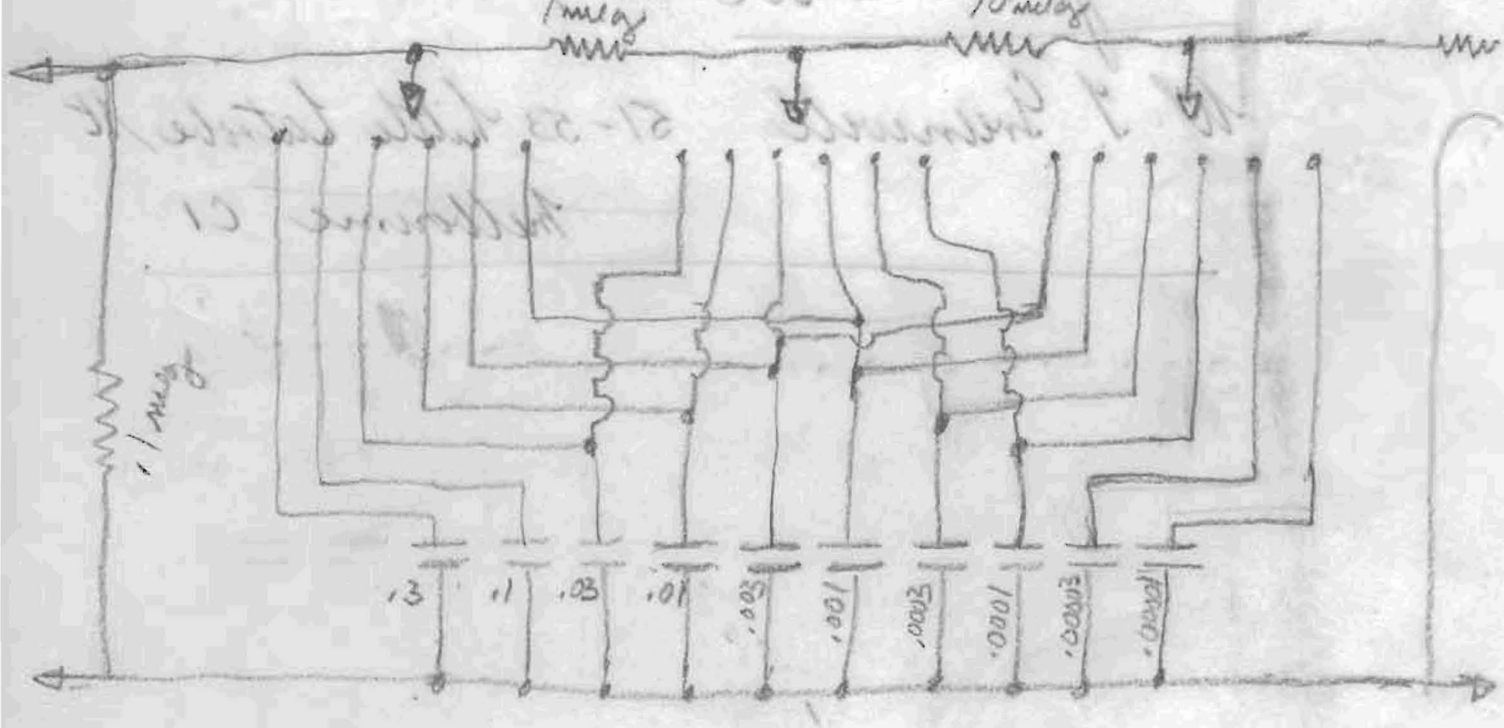
7-6-55

RC Values of R

Time Constant	10^5	10^6	10^7
	Values of Capacity		
10^{-4}	.001	.0001	.00001
$3 \cdot 10^{-4}$	.003	.0003	.00003
10^{-3}	.01	.001	.0001
$3 \cdot 10^{-3}$	.03	.003	.0003
10^{-2}	.1	.01	.001
$3 \cdot 10^{-2}$	.3	.03	.003



TELEPHONE: 9516 (4 LINES) TELEGRAMS: "WREST POINT." HOBART

Wrest Point Riviera Hotel

(Proprietors: Australian National Hotels Ltd.)

HOBART, TASMANIA

Suppliers of Celluloid

G

Eliza Tinsley 640-652 Burke St.
Melbourne C1

L. S. Williams

~~W. J. Greenwell.~~

W. J. Greenwell 51-53 Little Latrobe St.
Melbourne C1

30-8-55

<u>Performance of Low pass filter</u>

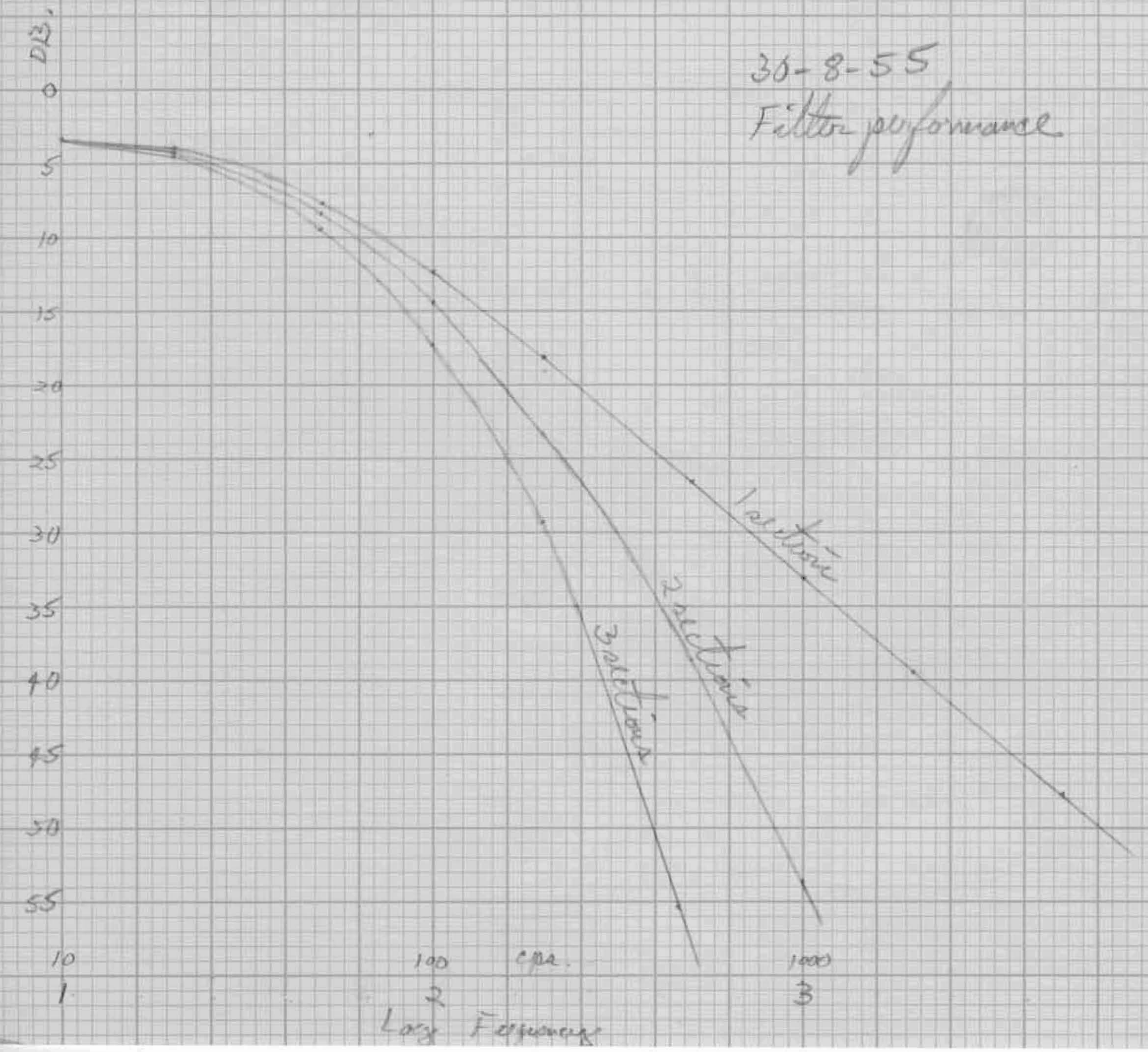
6SN7 tube 1500 Ω cathode resistor, $E_p = 150V$ $E_K = 5.1V$

Switch on 10^{-3} seconds. $I_p = 3.4$ ma

Log Freq.	Freq cps	1 section Input	1 section Output	1 section DB	2 section Input	2 section Output	2 section DB	3 section Input	3 section Output	3 section DB
1.0	10	2.90	2.00	3.2	2.95	2.00	3.4	3.00	2.00	3.5
1.3	20	3.18	2.00	4.0	3.28	2.00	4.3	3.40	2.00	4.6
1.7	50	4.78	2.00	7.6	5.2	2.00	8.3	6.00	2.00	9.5
2.0	100	8.2	2.00	12.2	10.4	2.00	14.3	14.3	2.00	17.1
2.3	200	15.8	2.00	18.0	21.8	1.50	23.2	23.2	.80	29.2
2.7	500	21.2	1.00	26.5	25.6	.30	38.6	29.0	.05	55.2
3.0	1K	22.1	.50	33.0	24.0	.05	53.6			
3.3	2K	23.4	.25	39.4						
3.7	5K	24.5	.10	47.8						
4.0	10K									

Input to filter

Output across cathode resistor of tube.



30-8-55
Filter performance
DB.
0
5
10
15
20
25
30
35
40
45
50
55
1 section
2 sections
3 sections
10
100
cps.
1000
1
2
3
Log Frequency

5-9-59

Stancore A 4712
Pri 7 henry 700 Ω
Sec 3 henry 325 Ω

Stancore A 73 C
Pri 13.5 henry 920 Ω
Sec. >110 henry 3300 Ω
(each half of sec. 33.5 henry)

If $k=1$ then $M = 40.5$ henries
Windings in series aiding $L = 13.5 + 122 + 81 = 217$ henries
$L_1 + L_2 + 2M$

chokes for surge limiter

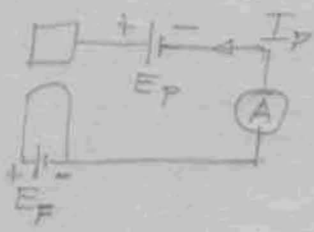
april 7, 1953

Merit Audio Trans.

	#1	#2
Pri. Inductance	4.2 h.	3.7 h
Pri. Resistance	440 Ω	450 Ω
Sec. Inductance	34 h	28 h
Sec. Resistance	1780 Ω	1750 Ω

14 March 1956

Test of Diode Conductance



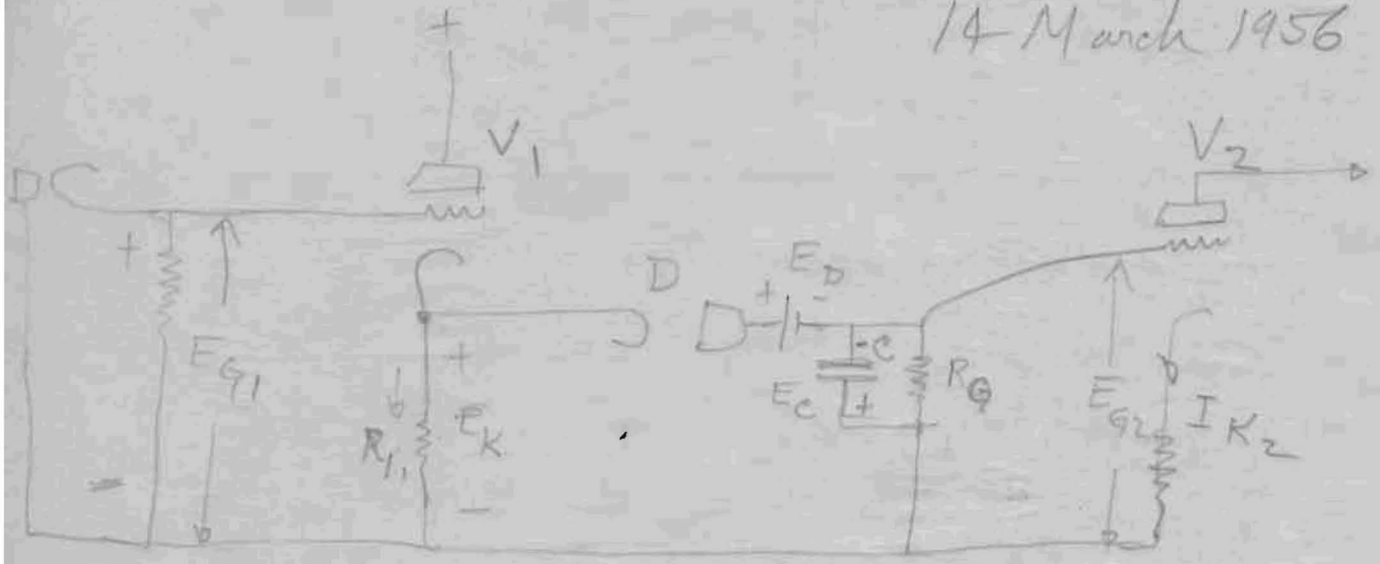
Meter A has 5.5 Ω on 50 ma scale
27 Ω " 10 ma "
250 Ω " 1 ma "

E_p volts	0	1.5	3
Tube \ I_p	ua	ma	ma
1C5GT	.05	.40	2.0
1Q5GT	.9	.58	2.7
1N5GT	17	.55	1.6
1T4	.8	.36	1.6
3S4	2	.53	2.1
3E6	.05	.36	2.8
1247 Filament 1.6V	5	.20	.54
1247 Filament 1.7V	14	.24	.60
1247 Filament 1.8V	21	.27	.66
3A5	26	2.4	7.0
3A5	8	1.9	5.9
3A5	26	2.2	6.8
3V4	1	.38	2.3
3V4	8	.52	2.4

E_p volts	0	1.5	3
Tube \ I_p	ua	ma	ma
10E/105 or VR92 or CV 1092, 6.3V 150 ma — Heater Voltage 3.5	2	3.1	7.2
4.0	11	4.0	10.5
4.5	22	4.6	12
5.0	43	5.0	13.5
5.5	130	5.5	14.3
6.0	230	6.0	15
6.5	340	6.4	16
1/2 6H6	210	1.4	3.0
Full 6H6	390	2.6	5.6
6AK5 RCA	220	5.4	16
RCA	140	4.2	10
Philips	760	9.3	22
	400	6.5	17
	40	.55	6.0
	1700	8.0	17
	270	5.1	13

The 3A5 seems to give best compromise between low filament power and high conductance. At 2.2 ma for 1.5V the internal resistance is 700 Ω approx.

14 March 1956



Normally E_{G_1} large and positive due to atmospherics

" E_K greater than E_D, so condenser C discharges and $E_{G2} = 0$

" I_{K_2} is large

Instantaneously E_{G_1} drops

$E_{K_1} < E_D$

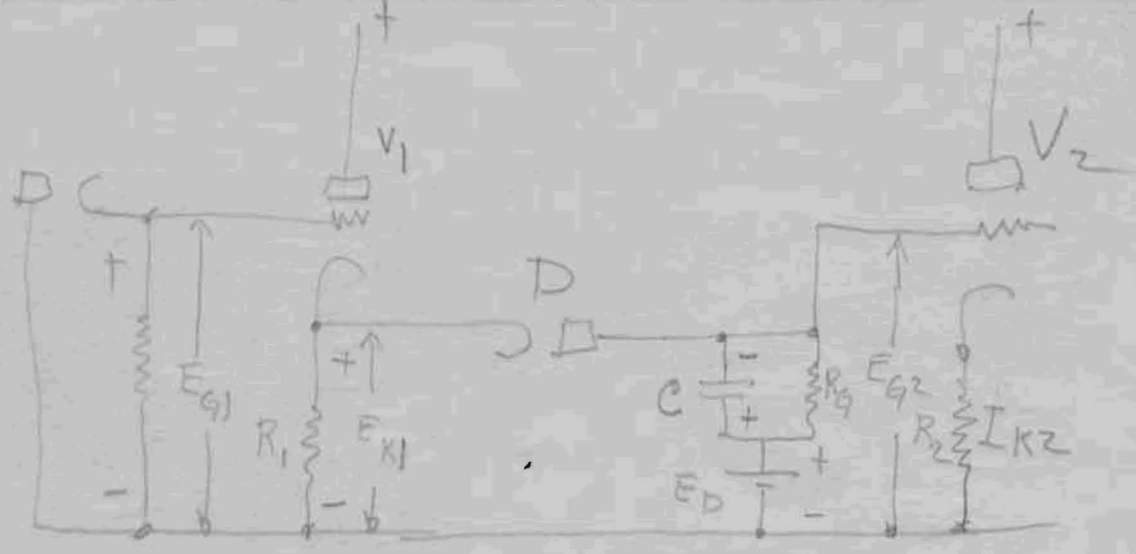
A large current flows thru diode D, R_1 and charges C up as shown.

This provides a negative bias on E_{G2} which reduces I_{K2}

Gradually C discharges,

E_{G2} goes less negative

System depends for operation on low values of R_1 and D plus large values of R_G. Thus C is charged fast and discharged slowly. The result is I_{K_2} drops rapidly and rises slowly



here situation is same in regard to E_{K1}, E_D, R_1, D and C. However now E_D is in series with grid of V_2 which helps hold E_{G2} near zero and thus make I_{K2} normally large. This is an advantage plus E_D does not have to be insulated from ground.

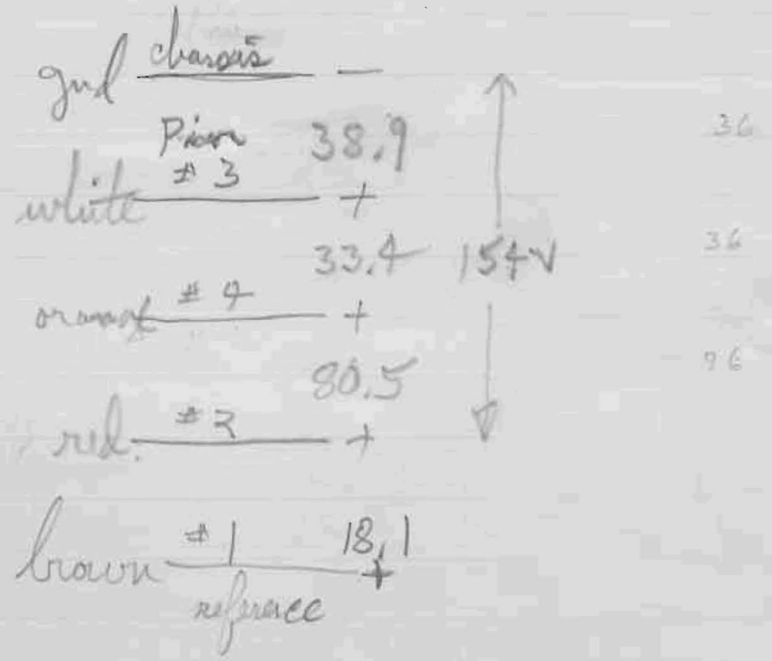
12 July 1956

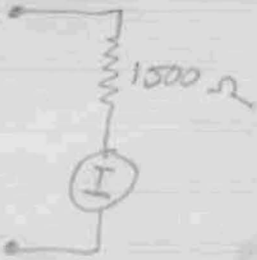
Overal Test of D.C. Amplifier

V	I	
Input Volts.	Output Current	ΔI
0	0	—
1	3.5	3.5
2	7.0	3.5
3	10.9	3.9
4	14.8	3.9
5	18.2	3.4
6	21.0	2.8
7	21.3	0.3
8	21.5	0.2
9	~~21.7~~	—
10	21.7	0.2
12	21.9	0.2
15	22.0	0.1

Zero set range -4 to +5.4 ma

Full scale range 19.1 to 23.8 ma





	Driver	Output	grid to cathode driver	Grid to white neg. driver
I_o	E_K	E_K	E_G	Input
0	21	34	-13	+7.5
5	32.0	42.0	-9.9	+21.0
10	42.0	50.0	-7.0	+35.0
15	51	57	-3.0	+47.0
20	60	64	-1.0	+58.0
25	70	72	0	+71

Both to white lead

Grid to bottom of 2200Ω resistor. This is input to cathode follower.

LOOSE LEAF
FILLER PAPER
FOR
3 RING NOTE BOOKS

NO. G-15964 H

4.76
.34
1.05
6.15

.00121
.0006

11000	13600	1.58	11000
out 8000	8600	1.49	6000
6000	5800	1.33	3200
out 4400	4200	1.31	1600
3200	+1600 3200	1.23	600
2600	+1600 — 2600		2600
	Net	ratio	tonnage

4964
8
5044

55

356
77
279

1698
2082
3780

1521
2548
4069

256
128
64
32
16
8

27/5/56

Complete Amplifier Overal.

Clamping circuit between driver and output stages
Limiter between input and driver stage.
Input voltage positive in relation to ground.
$E_1 = 33.5v$, $E_2 = 80.0v$, $E_B = 113.5v$ total.
E_K both in reference to negative end of E_B total.

E_i volts	I_o ma	ΔI_o ma	E_K driver	E_K output	E_o volts	I_1 ma	I_p ma
0	0	–	+19.5	+33.0	0	3.4	3.4
+2	1.1	1.1			1.7	3.5	4.6
4	2.5	1.4			3.8	3.7	6.2
6	4.0	1.5			6.0	4.0	8.0
8	5.6	1.4			8.4	4.2	9.8
10	7.1	1.5	34.5	44.0	10.8	4.4	11.5
12	9.0	1.9			13.5	4.7	13.7
14	10.8	1.8			16.2	4.9	15.7
16	12.8	2.0			19.2	5.3	18.1
18	14.6	1.8			21.9	5.5	20.1
20	16.4	1.8	53.0	57.5	24.6	5.8	22.2
22	18.2	1.8			27.3	6.1	24.3
24	20.1	1.9			30.2	6.3	26.4
26	20.5	.4			30.8	6.4	26.9
28	20.6	.1			30.9	6.4	27.0
30	20.6	0	60.5	64.0	30.9	6.4	27.0
42	20.6	0	60.5	64.0	30.9	6.4	27.0

Most of Nonlinearity at $E_i < +8v$ is due to driver stage when its $E_G > -11V$

(over)

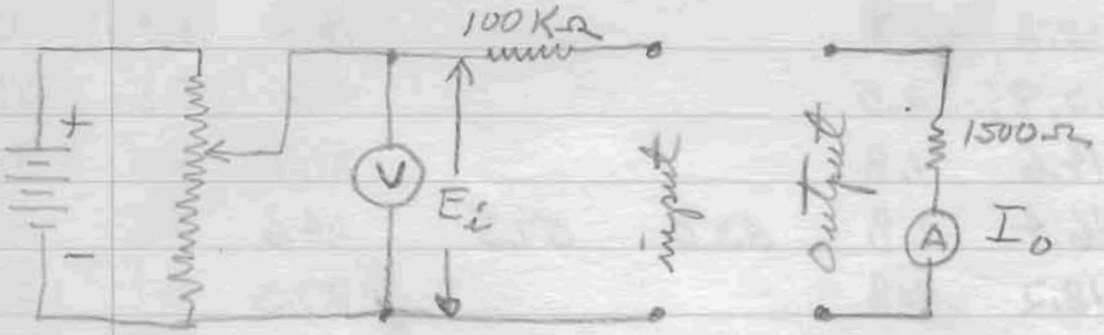
Zero set range -2.0 to +0.8 ma
When zero set correctly
Full scale set range 17.4 to 22.7 ma

Computed time constant 60 Megohms & 1 microfarad
is 60 seconds in relation to B+.

Observed time for meter hand to go from
zero to full scale.
Fast position about 1/2 second.
Slow position nearly 37 seconds

$R_1 = 10,000\,\Omega$, $I_1 = 33.5/11500 = 2.9$ ma starting current.

Test Circuit



26/5/56

Driver and Output Stages Together.

Grid of output tied to cathode of driver. No clamping circuit between. Input direct to grid of driver stage. $E_1 = 21.5v$, $E_2 = 83.5v$, $E_B = 105v$ total

$R_1 = 5000\Omega$

E_G	I_0	ΔI_0
0	26.3	—
-1	24.6	1.7
2	22.8	1.8
3	20.8	2.0
4	19.0	1.8
5	16.9	2.1
6	15.1	1.8
7	13.2	1.9
8	11.6	1.6
9	9.9	1.7
10	8.2	1.7
11	6.3	1.9
12	4.8	1.5
13	3.3	1.5
14	1.9	1.4
15	0.7	1.2
16	-0.3	1.0
17	-1.2	.9
18	-2.0	.8

I_0	E_K	ΔE_K	E_G	ΔE_G
0	8.9	—	-14.8	—
5	18.9	10.0	11.1	3.7
10	28.4	9.5	8.1	3.0
15	37.9	9.5	5.5	2.6
20	48.1	10.2	2.9	2.6
25	57.0	8.9	0.5	2.4

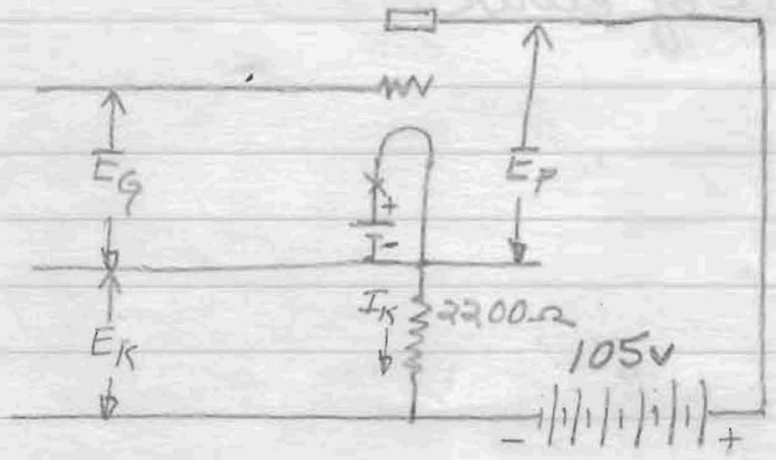
E_G is voltage from driver cathode to driver grid. E_K is voltage across 2200Ω resistor in driver cathode.

When $E_G > 11v$ the driver stage is non linear. More plate voltage or better tubes are required.

26/5/56

Test of Triode Driver Stage

3-1C5GT



$E_p = 105 - E_K$, $I_K = E_K/2200$

E_G	E_K	ΔE_K	E_p
0	58.0	—	47.0
-1	54.7	3.3	50.3
2	51.4	3.3	53.6
3	48.0	3.4	57.0
4	44.5	3.5	60.5
5	41.0	3.5	64.0
6	37.5	3.5	67.5
7	34.0	3.5	71.0
8	30.5	3.5	74.5
9	27.0	3.5	78.0
10	23.5	3.5	81.5

E_G	E_K	ΔE_K	E_p
11	20.2	3.3	84.8
12	17.0	3.2	88.0
13	14.0	3.0	91.0
14	11.4	2.6	93.6
15	8.9	2.5	96.1
16	6.5	2.4	98.5
17	4.5	2.0	100.5
18	3.1	1.4	101.9
19	2.0	1.1	103.0
20	1.1	0.9	103.9

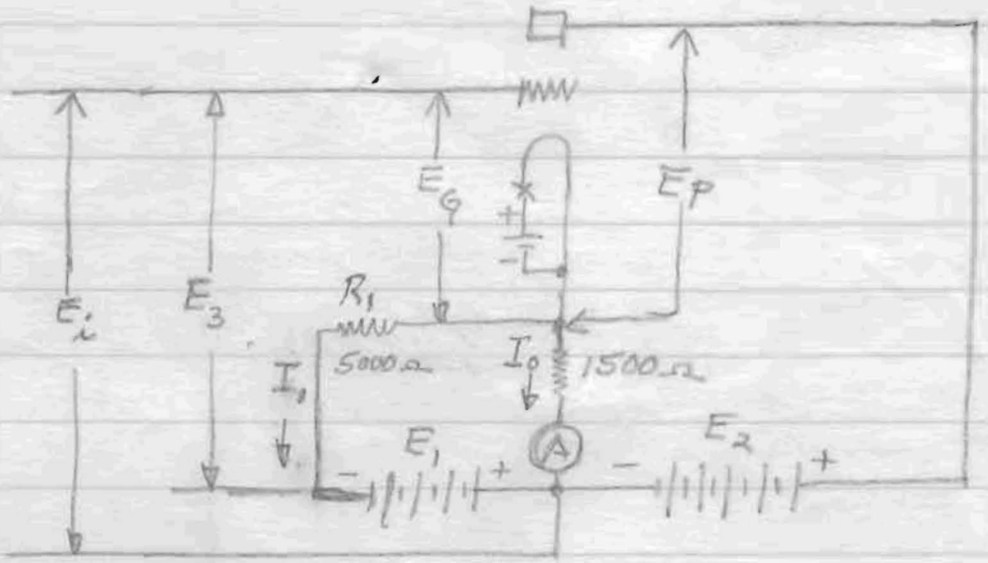
Gain $= \Delta E_K / \Delta E_G = 3.5/1.0 = 3.5$ max.
Linear working range of E_K = 58.0 to 17.0 = 41 volts
This is not enough to operate output stage. A higher plate voltage is needed or other tubes
(over)

with a linear range nearer to cutoff. about 8ma starting current are necessary to get up on linear part of curve.

24/5/56

Test of Cathode Follower Output Stage

6 - 1C5GT



$E_1 = 41.5$, $E_2 = 83.5$, Total B+ 125.0

$E_G = E_i - E_0$, $E_P = E_2 - E_0$, $E_3 = E_1 + E_i$, $I_P = I_0 + I_1$

$R_L = 1/(1/5000 + 1/1500) = 1152\,\Omega$, Gain $= \Delta E_0/\Delta E_G = 3.73$

$I_1 = (E_1 + E_0)/5000$, $I_1 = E_1/6500 = 6.4$ ma starting current.

I_0 ma	E_i volts	ΔE_i volts	E_0 volts	E_G volts	E_P volts	E_3 volts	I_P ma	I_1 (computed)
0	-12.0	—	0	-12.0	83.5	29.5	8.3	8.3
3	-6.0	6.0	4.5	-10.5	79.0	35.0	12.3	9.2
6	-0.4	5.6	9.0	-9.4	74.5	41.1	16.1	10.1
9	+5.1	5.5	13.5	-8.4	70.0	46.6	20.0	11.0
12	+10.5	5.4	18.0	-7.5	65.5	52.0	23.9	11.9
15	+16.1	5.6	22.5	-6.4	61.0	57.6	27.8	12.8
18	+21.9	5.8	27.0	-5.1	56.5	63.4	31.7	13.7
21	+27.6	5.7	31.5	-3.9	52.0	69.1	35.6	14.6
24	+33.4	5.8	36.0	-2.6	47.5	74.9	39.5	15.5

Necessary working range of E_3 = 45.4 volts.