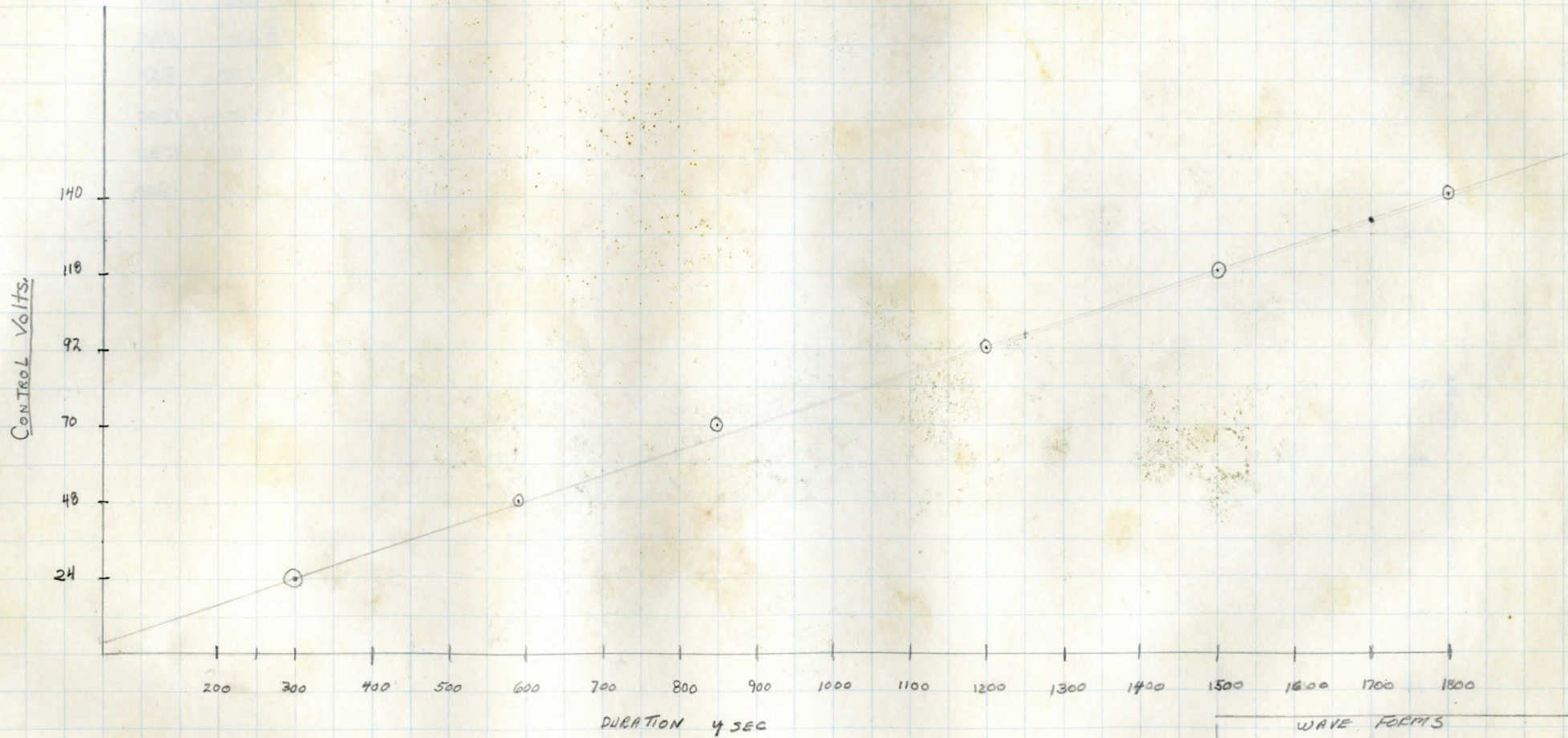


PHANTASTRON NBS. #57

DATE 18 NOV 58

INPUT = 15 V. AMP. 24 SEC DURATION

VOLTAGES B^+
300 = 300 VDC
 B^-
-150 = -150 VDC



EI DURATION.

+24V - 250

48V - 575

70V - 850

92V - 1200

118V - 1500

140 - 1800

$R_3 = 3.3 M$
 $C_3 = .001$ } REF. DIAGRAM

WAVE FORMS

1) INPUT $\begin{matrix} 24V \\ 15 \end{matrix}$

2) OUTPUT CONTROL VOLTS @ 140V

51V.M $\begin{matrix} 1800 \end{matrix}$

25 NOV 58 Bob. Getz
 PHANTASTRON N.B.S. #57
 OUTPUT VS CONTROL VOLT.

CONTROL VOLTAGE

E_i	E_o
24 VDC	250
48 VDC	575
70 VDC	850
94 VDC	1200
118 VDC	1500
140 VDC	1800

140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

PULSE DURATION
 4 SEC.

500

1000

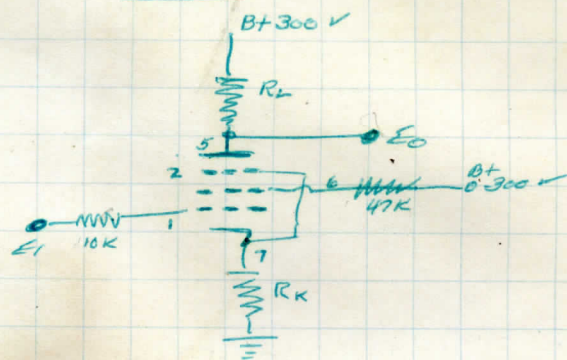
1500

2000

2500

LINEAR AMP.

6AV6



$$E_1 = \pm 5V$$

$$E_0 = 50-50V.$$

42K, $R_K = 680$

33K

E_1	E_0	E_1	E_0
+0	100	-0	100
+1	70	-1	120
+2	50	-2	150
+3	40	-3	170
+4	30	-4	190
+5	25	-5	215

$R_L = 47K$, $R_K = 2200$

+0	110	-0	100
+1	95	-1	120
+2	80	-2	175
+3	60	-3	210
+4	50	-4	225
+5	35	-5	240

$R_L = 1M$, $R_K = 33$

+0	165	+0	165
+1	150	-1	180
+2	140	-2	200
+3	130	-3	210
+4	115	-4	225
+5	100	-5	230

33K

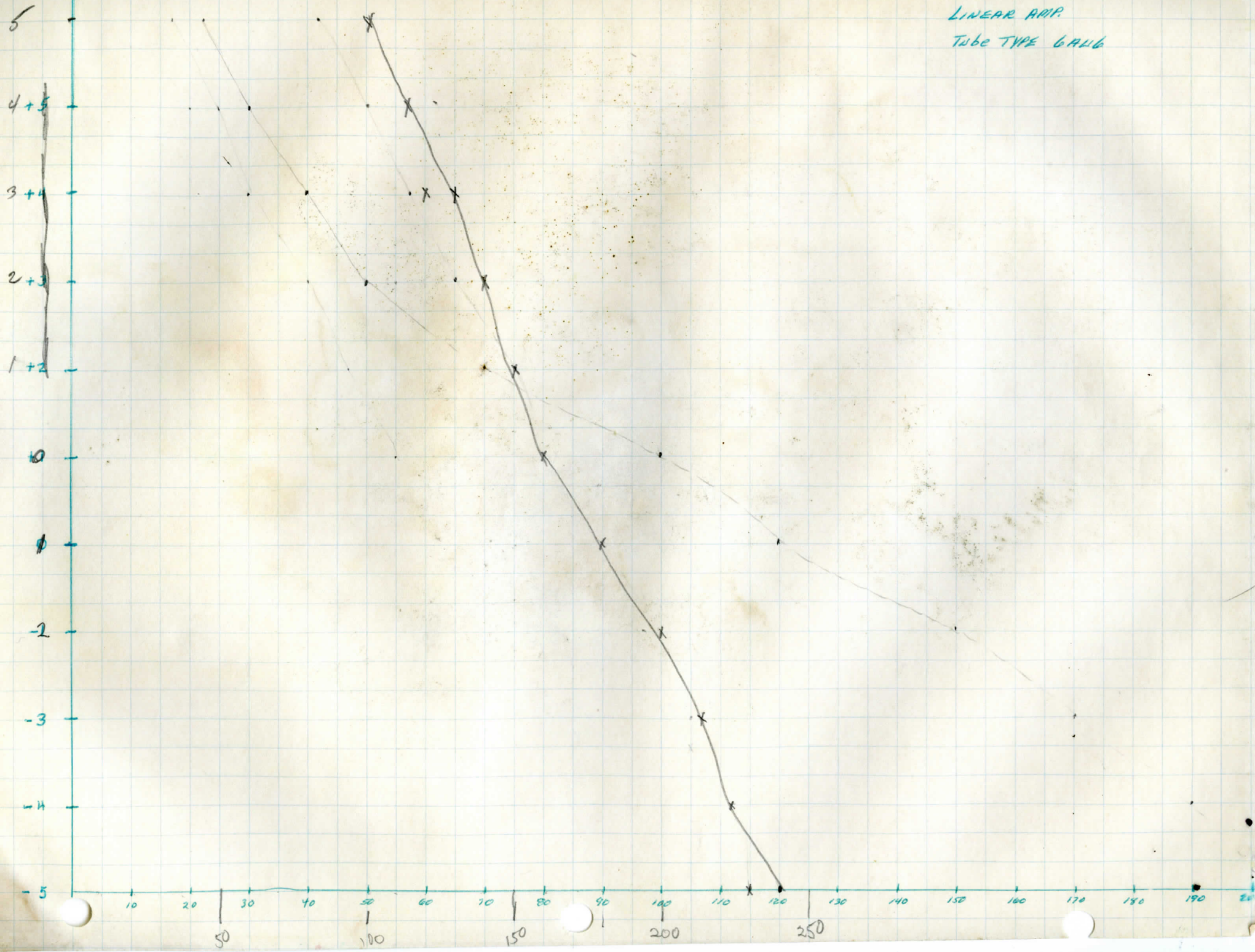
680

0	160	0	160
1	140	1	180
2	120	2	200
3	100	3	215
4	80	4	225
5	60	5	240

DATE

LINEAR APP.

TUBE TYPE GALL



$$R_L = 33K$$

$$R_K = 1K \sim$$

0	+150	0	+150
+1	140	-1	+160
2	130	2	170
3	114	3	180
4	101	4	195
5	88	5	205

$$R_L = 33K$$

$$R_K = 2200 \sim$$

0	190	0	+190
+1	185	-1	200
2	180	2	210
3	170	3	220
4	165	4	230
5	155	5	235

PAGE

$$R_L = 33K$$

$$R_K = 4.7K$$

E_1	E_0	E_1	E_0
0	+235	0	+235
+1	230	-1	240
2	225	2	245
3	220	3	250
4	215	4	255
5	210	5	255

$$R_L = 47K$$

$$R_K = 4.7K$$

0	215	0	210
+1	210	-1	220
2	200	2	225
3	195	3	230
4	190	4	235
5	180	5	240

$$R_L = 47K$$

$$R_K = 22K$$

0	+165	0	165
+1	155	-1	175
2	150	2	185
3	140	3	195
4	130	4	205
5	120	5	215

$$R_L = 47K$$

$$R_K = 470$$

0	90	0	90
1	70	1	105
+2	55	-2	120
3	55	3	135
4	52	4	150
5		5	165

$$R_L = 68K$$

$$R_K = 22K$$

+0	+90	-0	+90
1	70	1	100
2	55	2	120
3	45	3	130
4	30	4	145
5	28	5	160

$$R_L = 68K$$

$$R_K = 4.7K$$

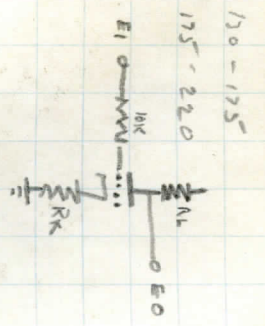
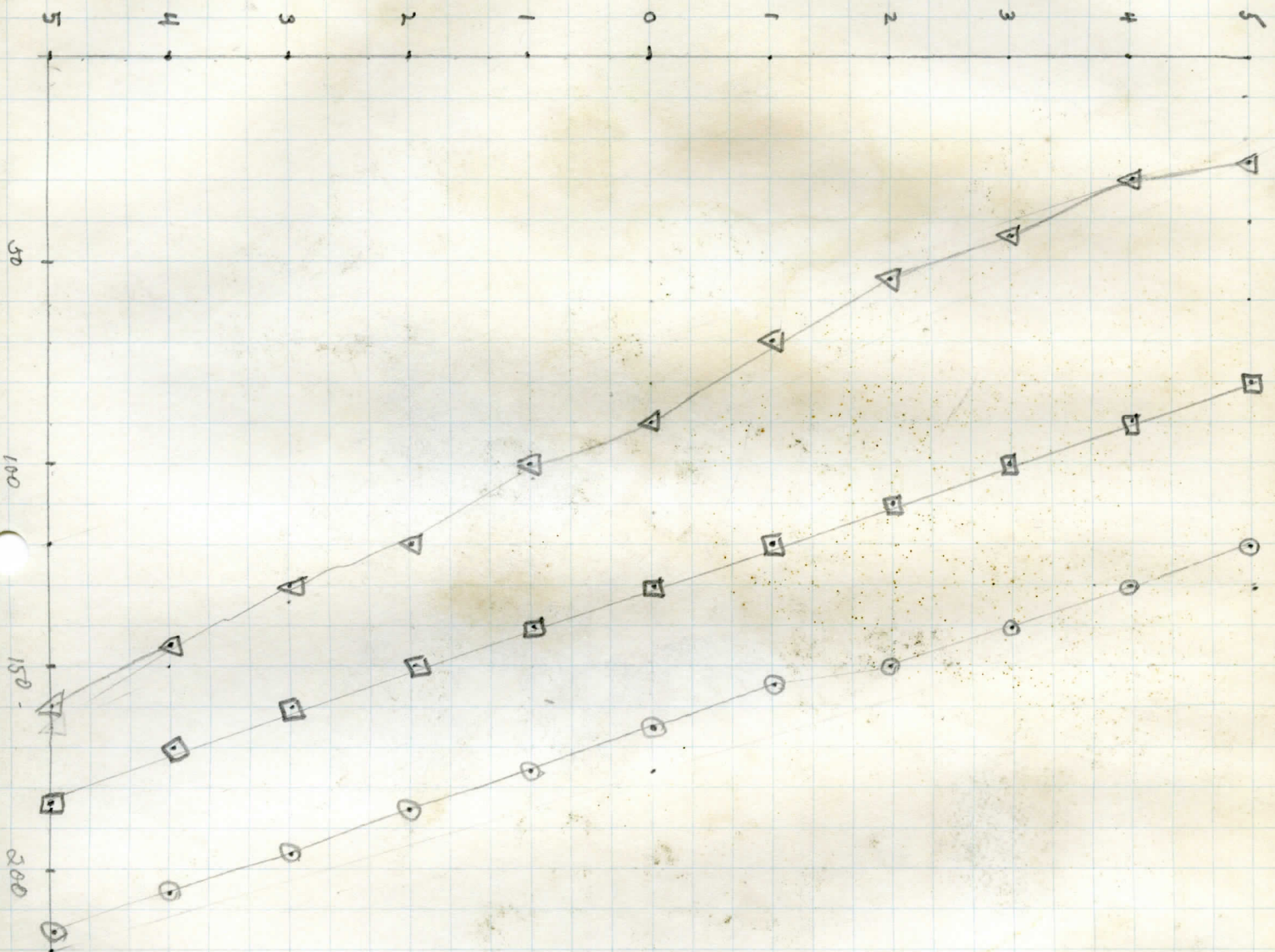
+0	120	-0	135
1	120	1	140
2	110	2	150
3	100	3	160
4	90	4	170
5	80	5	185

10.

+0	-0
1	1
2	2
3	3
4	4
5	5



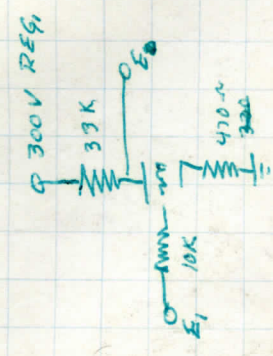
E1



$\odot = 2.2K, R_L = 47K$
 $\nabla = 2.2K, 68K$
 $\square = 4.7K, 68K$

28-140
 120-215
 170
 95

LINEAR AMP.
TUBE TYPE 6SN7

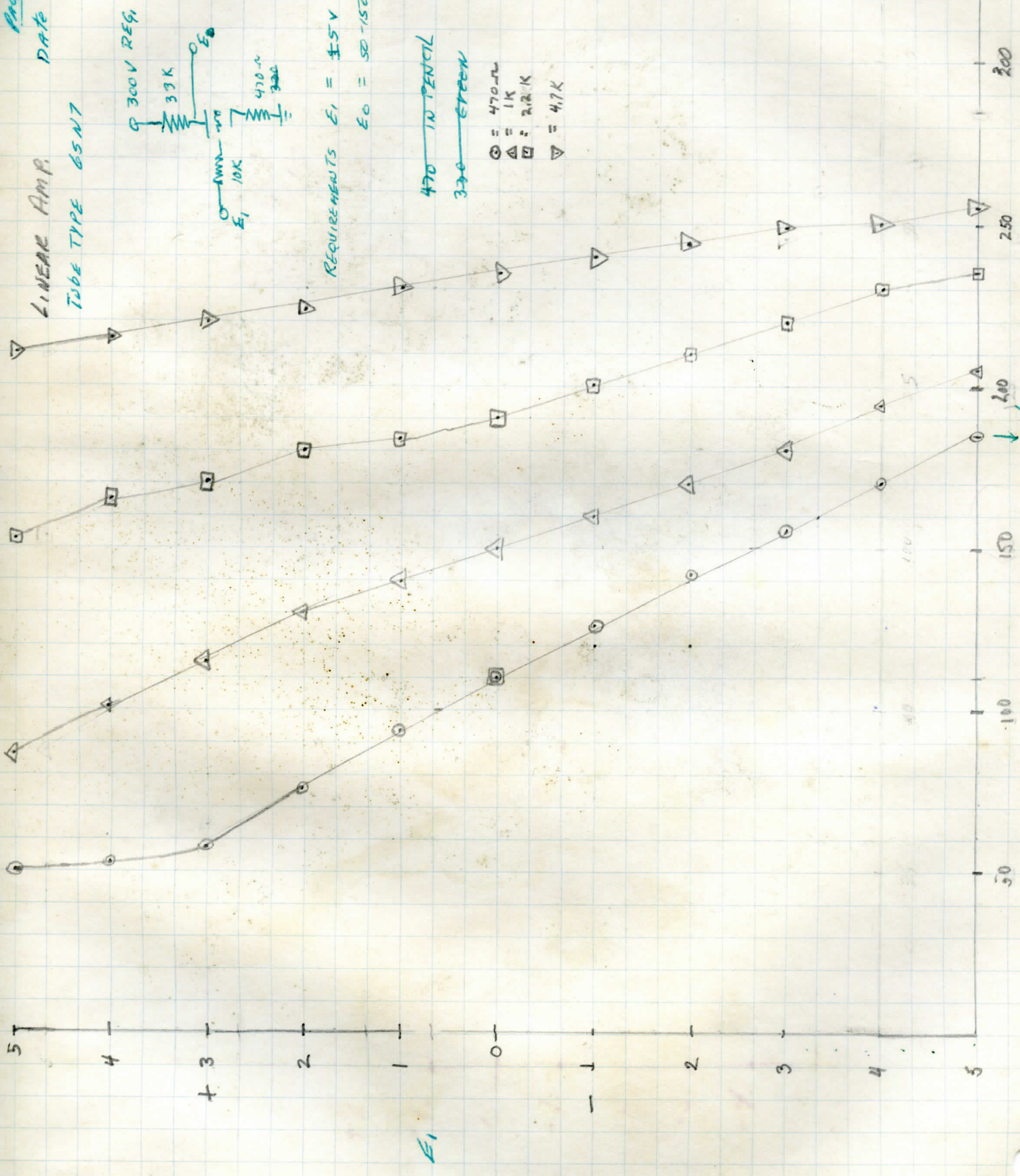


REQUIREMENTS $E_1 = 15V$
 $E_0 = 50-150V$

470 IN PENCIL
330 GREEN

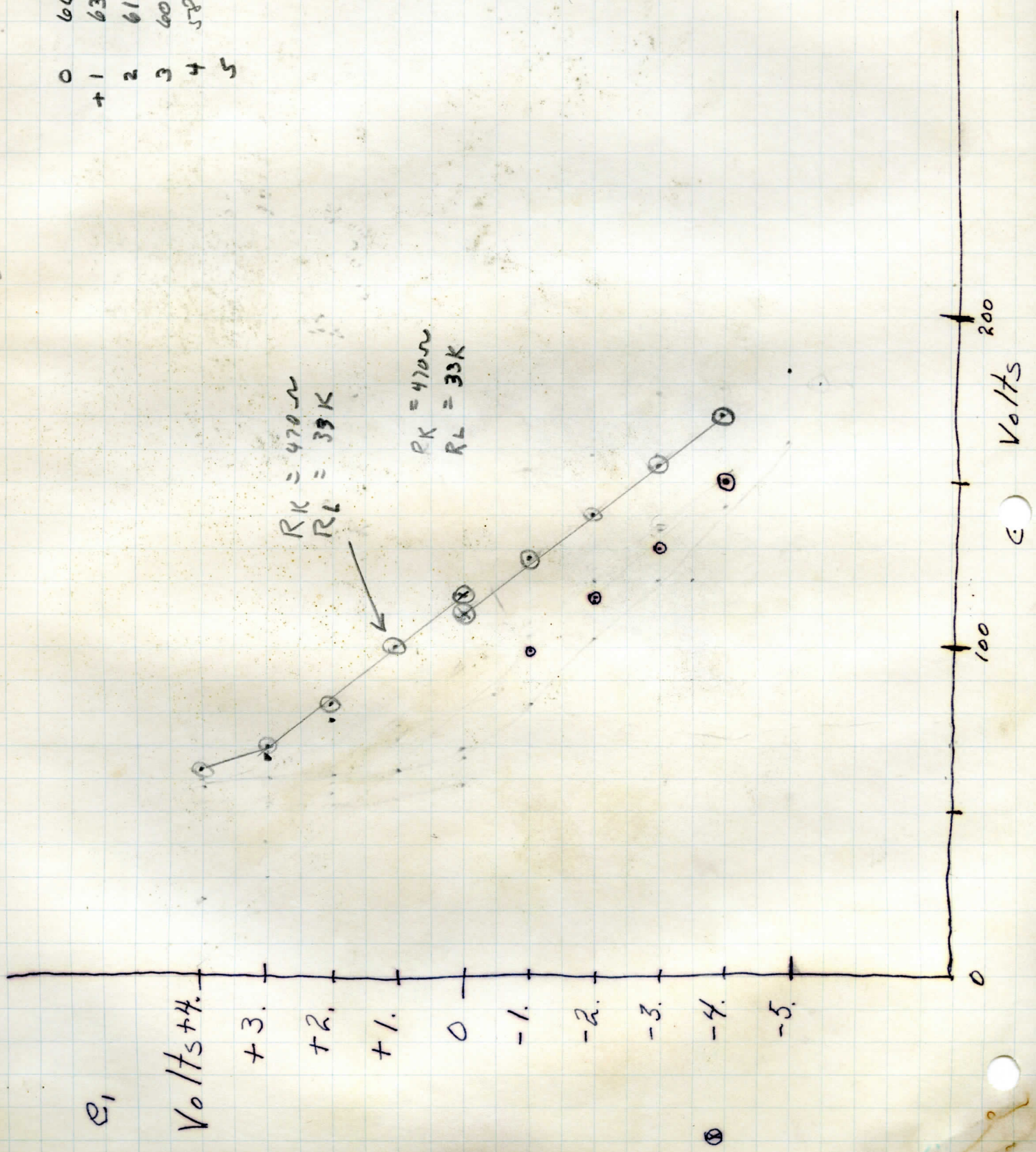
$\odot = 470\Omega$
 $\triangle = 1K$
 $\square = 2.2K$
 $\nabla = 4.7K$

470
470
940



22K $\rightarrow$ 47K

0	66	0	68
+1	63	-1	-84
2	61	2	104
3	60	3	120
4	58	4	142
5		5	162



$$R_L = 33K \quad 2\omega$$

$$R_C = 330$$

+ 0	102	- 0	102
1	86	1	118
2	70	2	132
3	65	3	150
4	63	4	162
5	61	5	175

Problem.

- (1.) MAKE LINEAR AMP with INPUT of ± 5 VOLTS AND AN OUTPUT OF 50-300 with NO distortion. This will be fed INTO the cathode of the cathode follower in the phantastron.

Results

IN plotting of a triode (6SN7) I Found that the AMP WAS ONLY 10-1. with some distortion ON the high NEGATIVE side. To be of ANY use the AMP will have to be approx. 20-1. disregarding the triode. I proceeded to try a pentode (6AV6). I Found THAT the AMP IS APPROX 18-1. There is HOWEVER from +5 to -5 VOLTS a difference of 2 VOLTS IN THE OUTPUT side. This is the SMALLEST amount of distortion AT ANY GIVEN TIME.

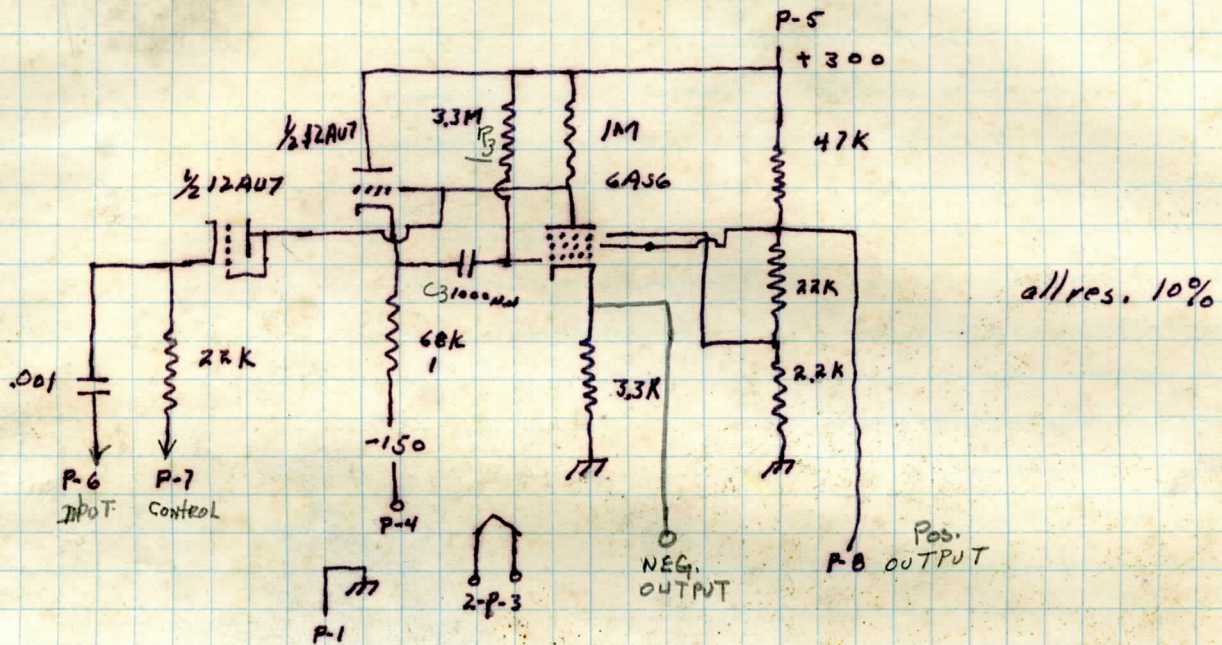
KEEPING THIS IN MIND I CONNECTED THE TWO CIRCUITS TOGETHER. THE NEXT STEP, WAS TO CHECK THE control SIGNAL INPUT. Plotting THIS info with THE LAST GRAPH I FOUND THEM TO be the SAME. I CAN SAY THAT THE AMP IS GOING TO be usable.

THE NEXT AND FINAL item IS TO PLOT A CURVE OF THE AMP INPUT AND THE PHANTASTRON OUTPUT. WITH THIS I WILL BE ABLE TO SEE IF BOTH CIRCUIT TOGETHER ARE LINEAR. SINCE THESE TWO UNITS ARE GOING TO be installed IN VECTOR CANS. THE PIN CONNECTIONS WILL REMAIN THE SAME THRU OUT THE ENTIRE UNIT.

Phantastron

NBS #57

build on a vector plug in



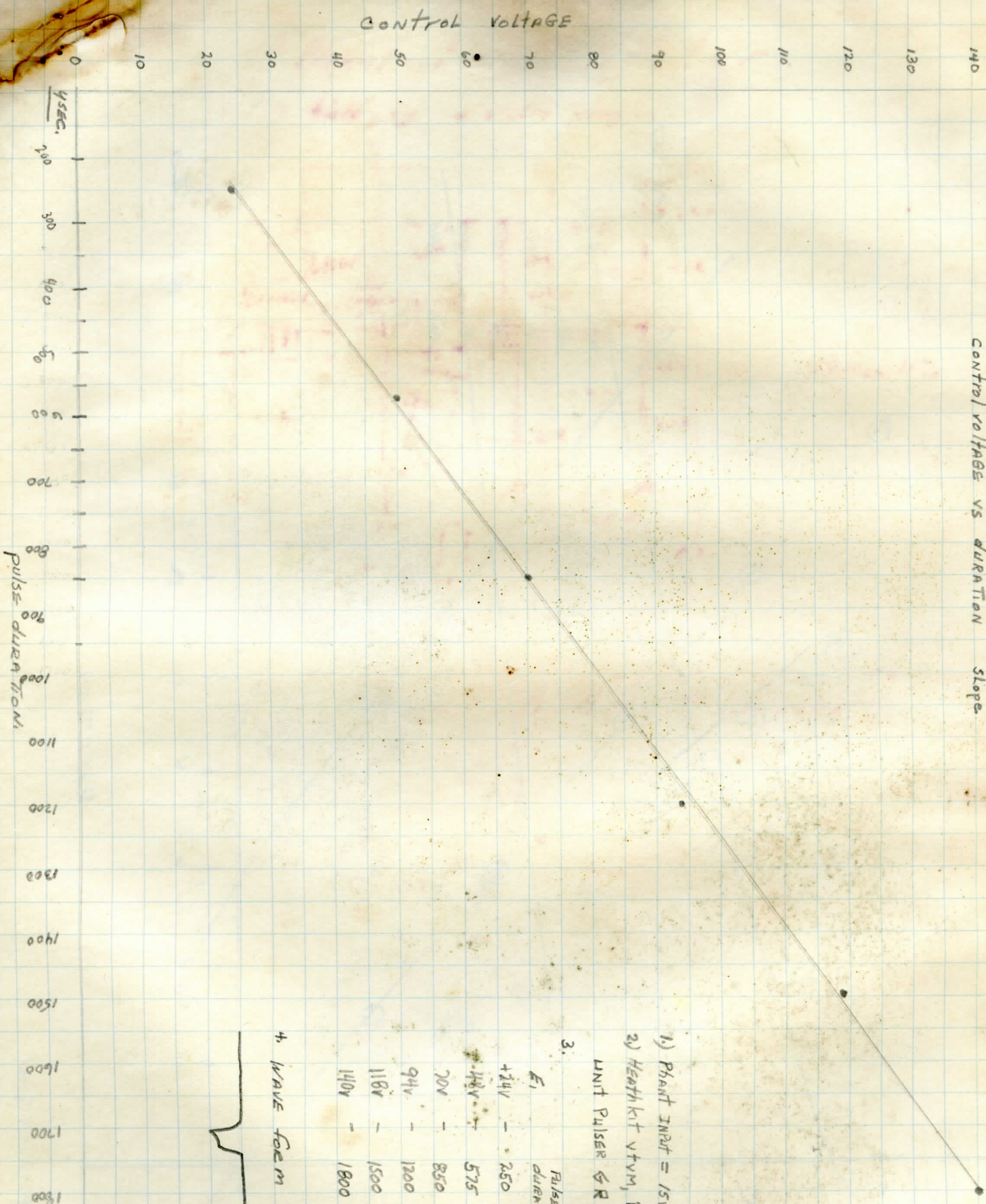
Build one ASAP + 2 more

Done
KNOW 5/4
B.G.

25 Nov 58 Bob Getz

PHANTASTRON NBS #57

Control voltage vs duration slope



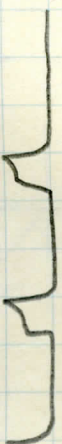
- 1.) PHANT INPUT = 15VAMP, 2.45SEC Pulse
- 2.) Heathkit vtm, Power Supply M.C.113

UNIT PULSER GR 1217A.

3.

E _i	Pulse duration (μsec)
+24V	- 250
-48V	- 575
20V	- 850
94V	- 1200
118V	- 1500
140V	- 1800

4. wave form



140 -

118 -

116 -

114 -

112 -

110 -

108 -

106 -

Control Volts

Omit. 15 N.G.

Phantastar NBS 57

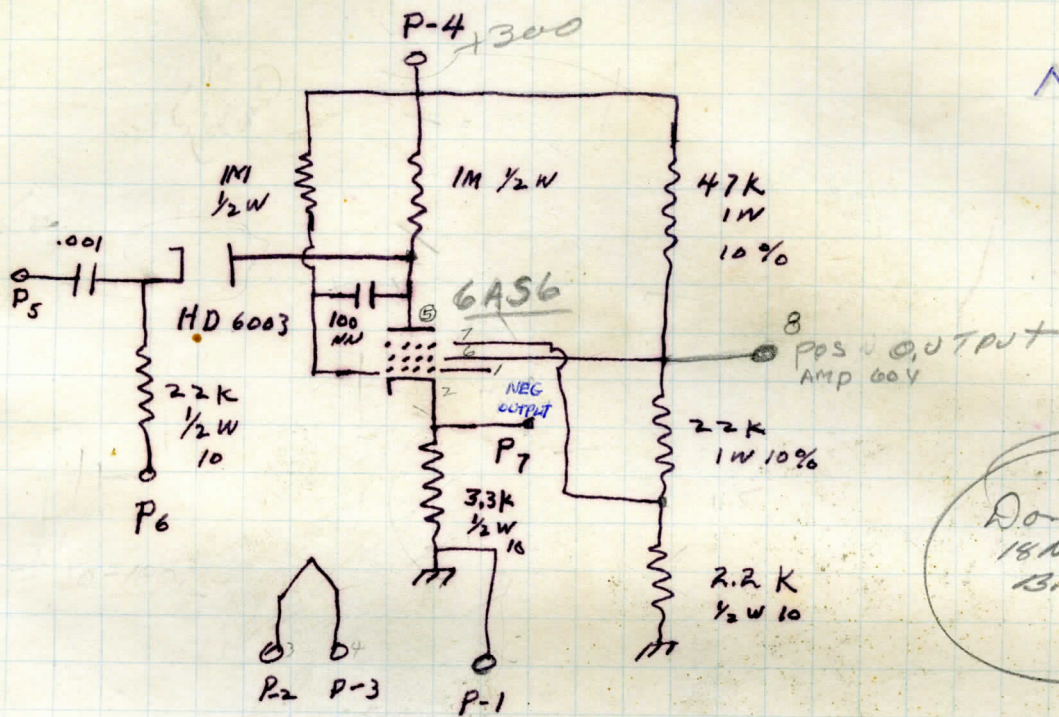
120V	250
140V	575
16V	850
146	1200
141	1500
140V	1800

200 10 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000

DURATION

control vs duration
input = 15V AMP DURATION = 24 hrs

Build on Vector



NBS Ckt. #56



Done
18 NOV 58
B. Getz

~~Mac have Laster who's coming in at 9:00 build this -~~

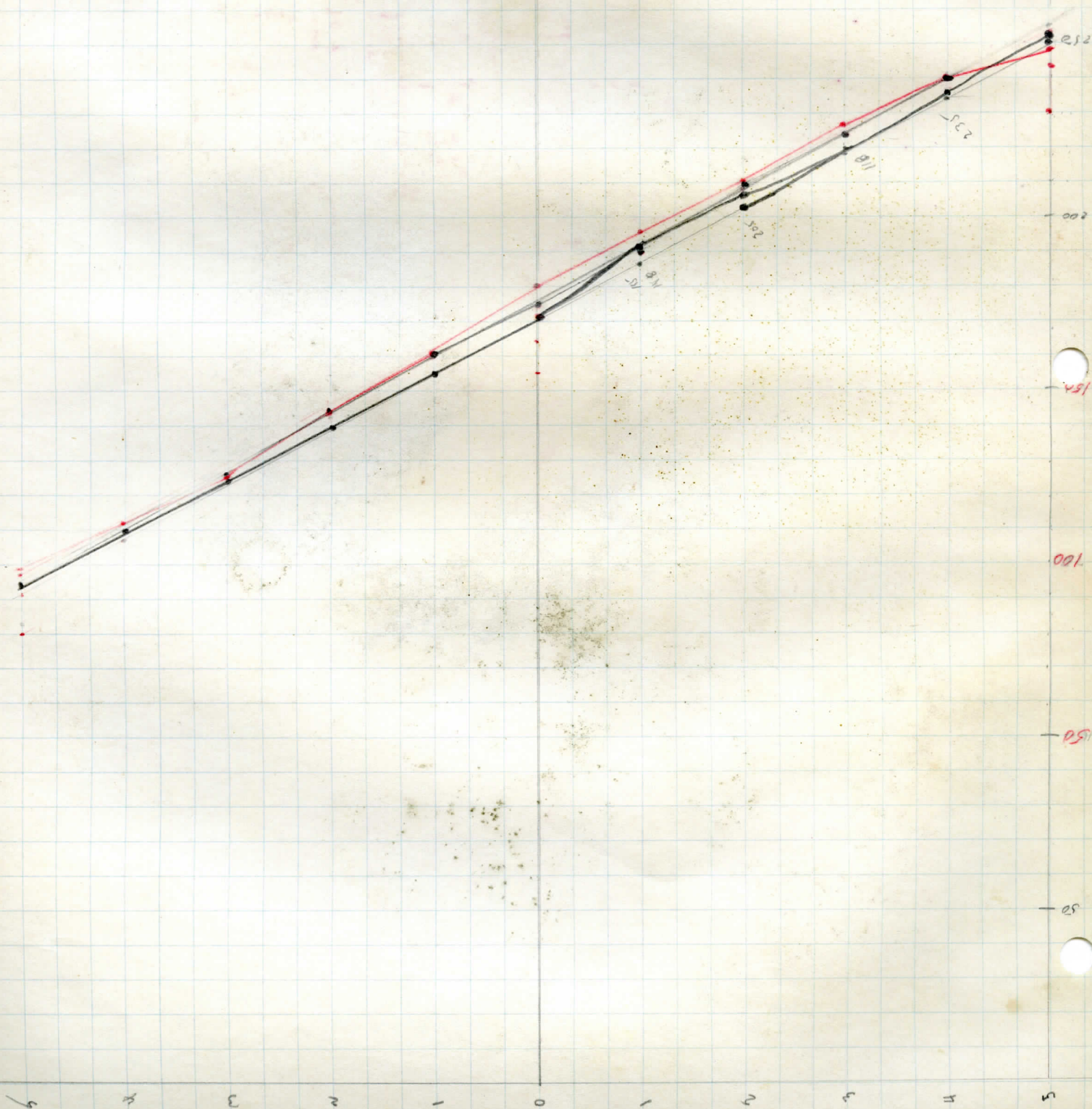
- 1 - 1001
1 - 10044
1 - HD 6003

- 2 - 1M $\frac{1}{2}$ W ✓
2 - 22K $\frac{1}{2}$ W 10% ✓
1 - 47K 1W 10% ✓
1 - 3.3K $\frac{1}{2}$ W 10%
1 - 2.2K $\frac{1}{2}$ W 10%



21 Nov 58 Page 4

$R_d = 23 K$
 $= 23,100$



470, 52K, 22K

0 130	0 130
+1 107	-1 150
+2 86	-2 175
+3 66	-3 195
+4 48	-4 215
+5 38	-5 235

680, 27K, 22K

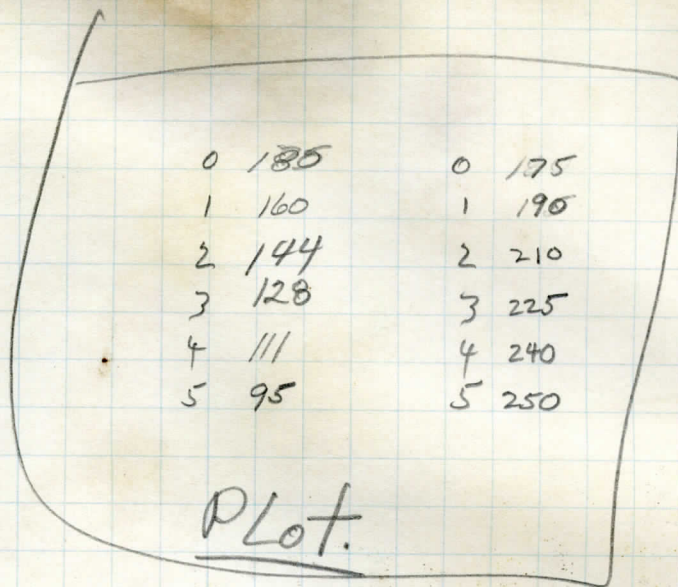
0 170	0 170
+1 155	-1 185
+2 136	-2 202
+3 116	-3 220
+4 100	-4 233
+5 84	-5 234

27K, 680, 33

0 175	0 175
+1 165	-1 190
+2 140	-2 210
+3 125	-3 226
+4 110	-4 240
+5 95	-5 250

0 165
1 180
2 175
3 210
4 225
5 240

0 165	0 165
1 145	1 180
2 125	2 200
3 105	3 220
4 90	4 235
5 88	5 250



22450
 2000
 24000
 23000
 1500

129
 118
 229
 118
 200

22K - 330 ~

0 160	0 160
+1 140	-1 180
+2 130	-2 200
+3 102	-3 215
+4 90	-4 230
+5 85	-5 245

22K 470 ~

0 175	0 175
1 160	1 195
+ 2 145	- 2 210
3 128	3 225
4 112	4 240
5 100	5 250

22K 470 33K

0 170	0 190
1 150 ✓	1 190
2 135 ✓	2 210
3 118	3 235
4 100	4 240
5 79	5 255

0 165 ✓	0 165
+1 149	-1 182
+2 130	-2 200
+3 110	-3 215
+4 90	-4 230
+5 75	-5 249

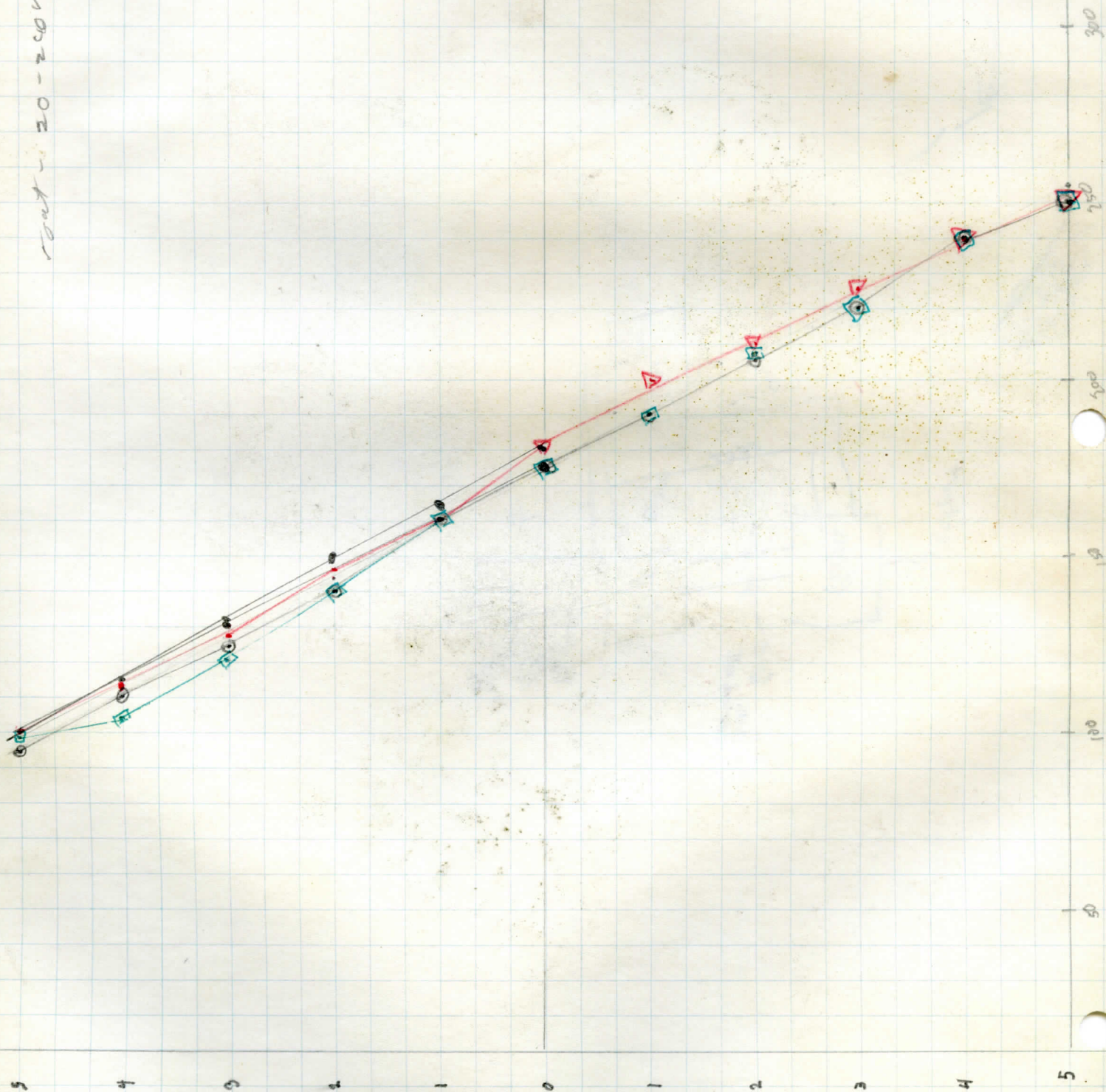
22K 330 47K
 11 470 47K
 11 470 33K
 22 470 27K

- (1) Find LIN. output & PLOT.
- (2) Find ALL PARAMETERS of CIRCUIT. & RECORD ON PLOT.
- (3) Plate Volt, SCREEN.

22K, 27K, 330,

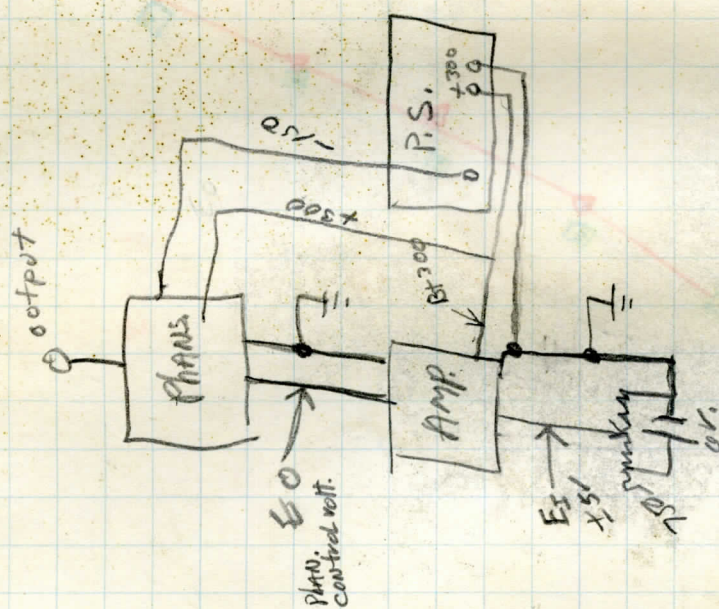
0 130	0 130
+1 110	-1 150
+2 88	-2 172
+3 68	-3 195
+4 48	-4 218
+5 38	-5 237

out - 30 - 200 ✓



11-5

1



21 Nov 58.

R-

E_1	E_0	E_1	E_0
15 MIN. WARM UP			
0	182	0	182
+1	168	-1	200
+2	150	-2	210
+3	130	-3	230
+4	115	-4	240
+5	99	-5	250

(7V)

E_1	E_0	E_1	E_0
30 MIN WARM UP			
0	182	0	182
+1	162	-1	199
2	150	-2	215
3	130	-3	230
4	115	-4	240
5	100	-5	255

(11)

- 1) FIND IF E_0 IS CONSTANT
- 2) FIND IF E_0 STAB AFTER PERIOD OF TIME.
- 3) FIND IF PLATE E VS E_0 PRO P.
- 4) CONCLUSION OF ALL FINDINGS
- 5) ALL TIME IS AN ESTIMATE ON WARM UP TEST

E_1	E_0	E_1	E_0
45 MIN.			
0	182	0	182
+1	165	-1	198
+2	150	-2	213
+3	132	-3	228
+4	115	-4	240
+5	98	-5	252

(14)

page 2

E_1	E_0	E_1	E_0
23,500			
0	172	0	175
+1	160	-1	190
+2	140	-2	208
+3	120	-3	220
+4	105	-4	240
+5	99	-5	250

(5V)

slown

E_1	E_0	E_1	E_0
RL 23,000 470 10K			
0	175	0	175
+1	160	-1	190
+2	140	-2	205
+3	125	-3	220
+4	110	-4	240
+5	95	-5	251

Smil 6V

E_1	E_0	E_1	E_0
22,500			
0	180	0	180
+1	160	-1	200
+2	145	-2	210
+3		-3	225
+4		-4	240
+5		-5	250

page 3

E_1	E_0	E_1	E_0
23,100			
0	175	0	175
+1	160	-1	190
2	144	-2	210
3	124 (126)	-3	225
4	109 (110)	-4	238 (240)
5	92 (94)	-5	252 (250)

E_1	E_0	E_1	E_0
23,150			
0	175	0	175
1	160	-1	190
2	140	-2	210
3	124	-3	225
4	108	-4	238
5	90	-5	250

95
175
250

14
250
175
95
70(5V) 170

(1) the 6V difference from +5 to -5 volts seems to be normal. 23,000 Ω plate load is the best slope that can be used.

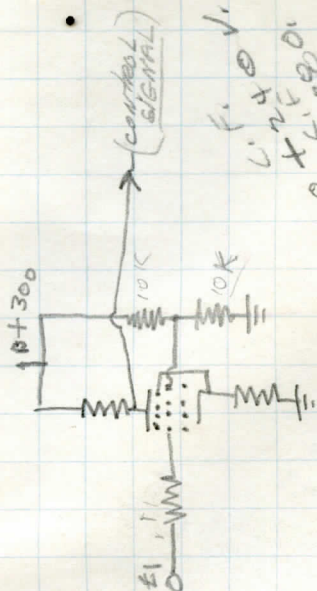
23,100			
E_1	E_0	E_1	E_0
0	175	0	175
1	160	1	190
2	148	2	209
3	126	3	225
4	107	4	237
5	92	5	252

23000			
E_1	E_0	E_1	E_0
0	190	0	180
1	162	1	195
2	144	2	210
3	126	3	228
4	112	4	240
5	98	5	254

$R_L = 6.8$
48.00

~~✓~~

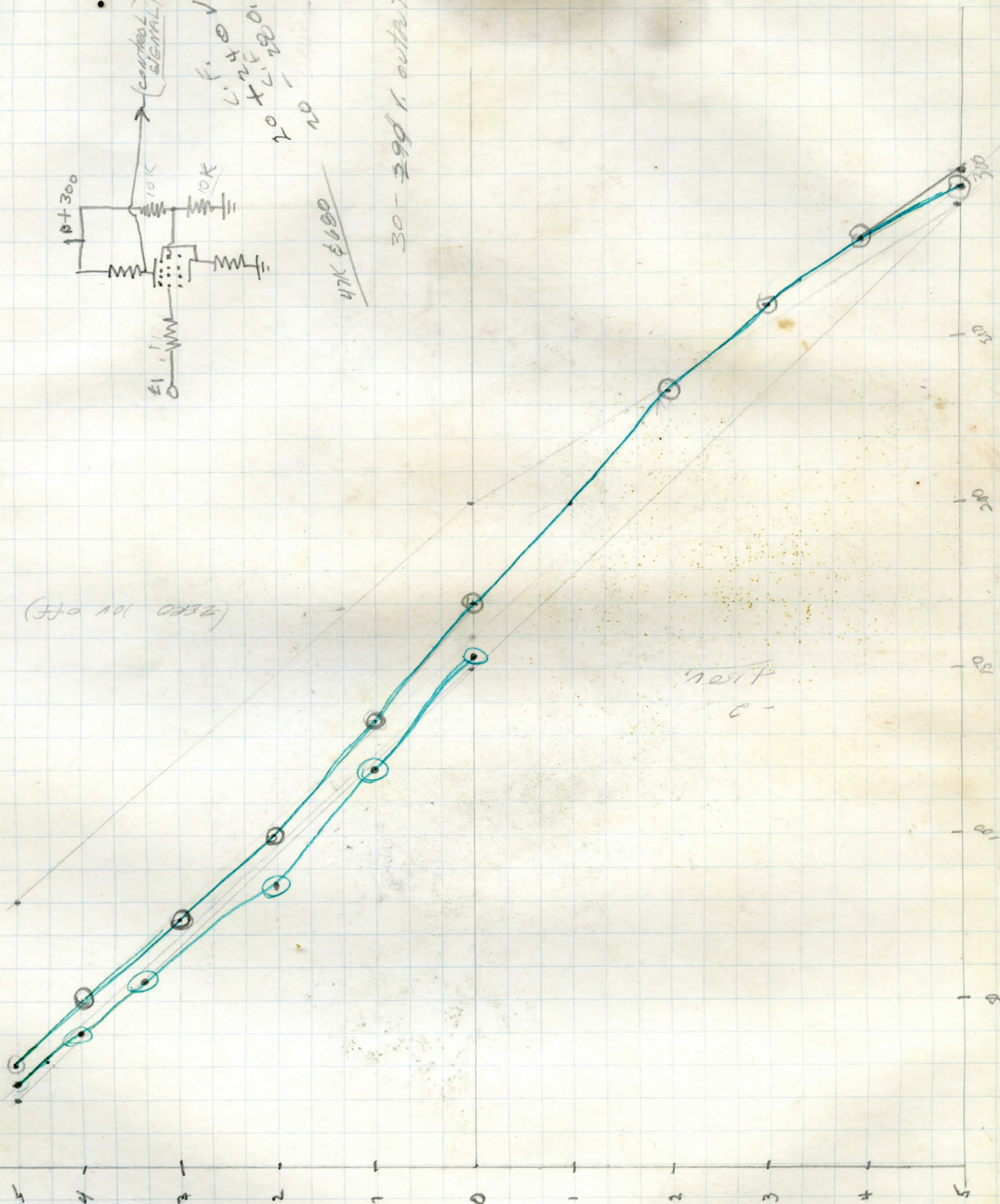
Lin. App.



$\frac{1}{2} \times 200$
 $\frac{1}{2} \times 200$
 $\frac{1}{2} \times 200$

47K 6680

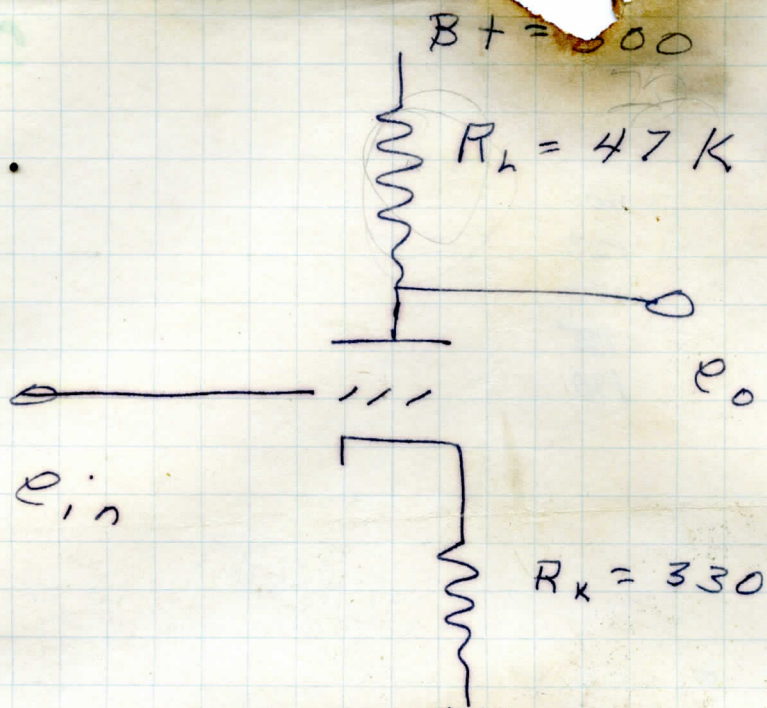
30 - 290 v. output



1051 F
C -

280-200
290-200

2021



e_{in}	e_o volts	108	88	470V	
0	+ 82	108	88	0 - 92	94
+ 1	+ 66	92	71	+1 76	67
2	+ 56	78	57	2 62	57
3			53	3 56	54
4				4 54	53
5				0 - 92	
- 1	+ 98.	+ 120	+ 104	- 1 108	
- 2	+ 115.	+ 136	120	- 2 124	
- 3	+ 130	+ 150	136	- 3 138	
- 4	+ 150	+ 165	150	- 4 150	
- 5					

470
33K

$R_1 = 47K$

0	110
1	100
2	83
3	70
4	66

110
128
140
155
170

$R_2 = 330$

0	110V
+ 1	94
2	78
3	67
4	64
5	42

0	110V
- 1	126
2	142 (140)
3	160 (158)
4	170
5	185 (172)

+ 120
+ 130
+ 110
+ 88

+ 120
+ 130
+ 110
+ 88

70
48
22

118
92
26

1. 24V. (5) 22V.

2. 22V.

3. 22V

4. 26V

28
24
24V.

White Blue
grid green
1K
5.0. orange

IP28 R.C.A.

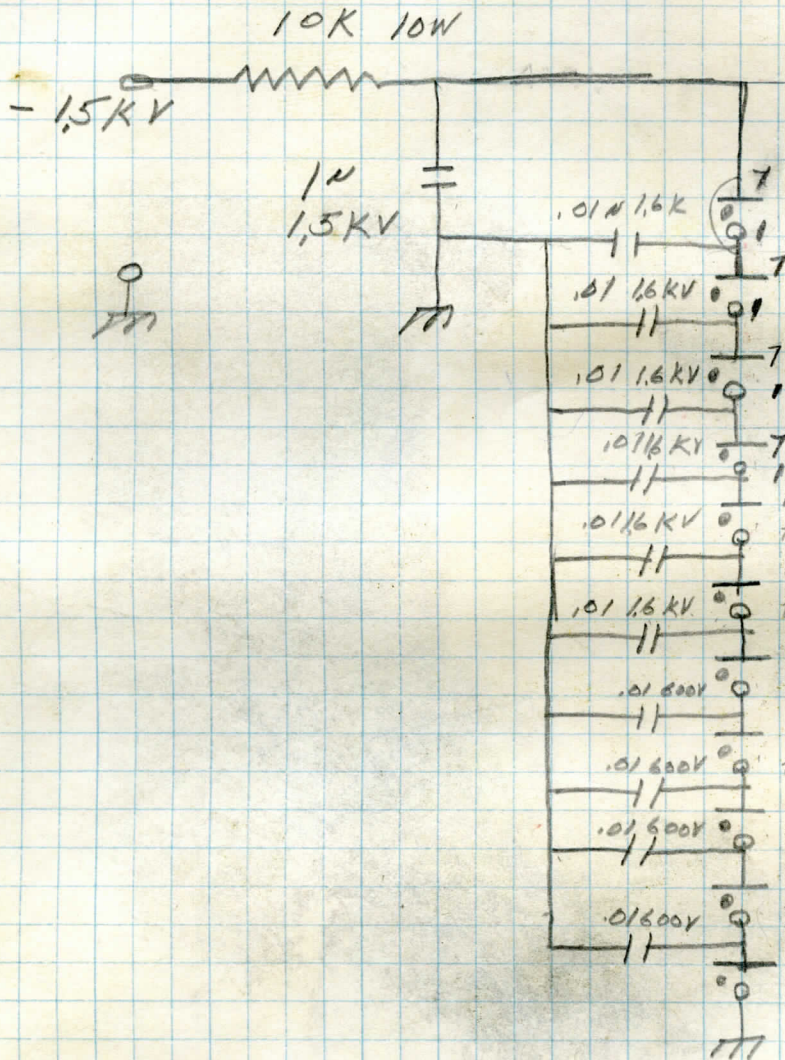
PHOTO MULTIPLIER

1. REGULATED SUPPLY DIAGRAM
2. REG. SUPPLY AND PHOTO TUBE DIAGRAM
3. LIGHT PROOF BOX DIAGRAM
3. REG. & TUBE, BOX Hook UP.
- 4.

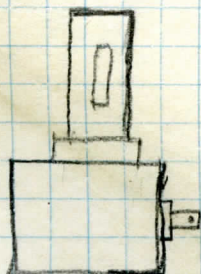
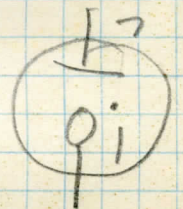
H.F. Radar

Photo multiplier

Regulated supply



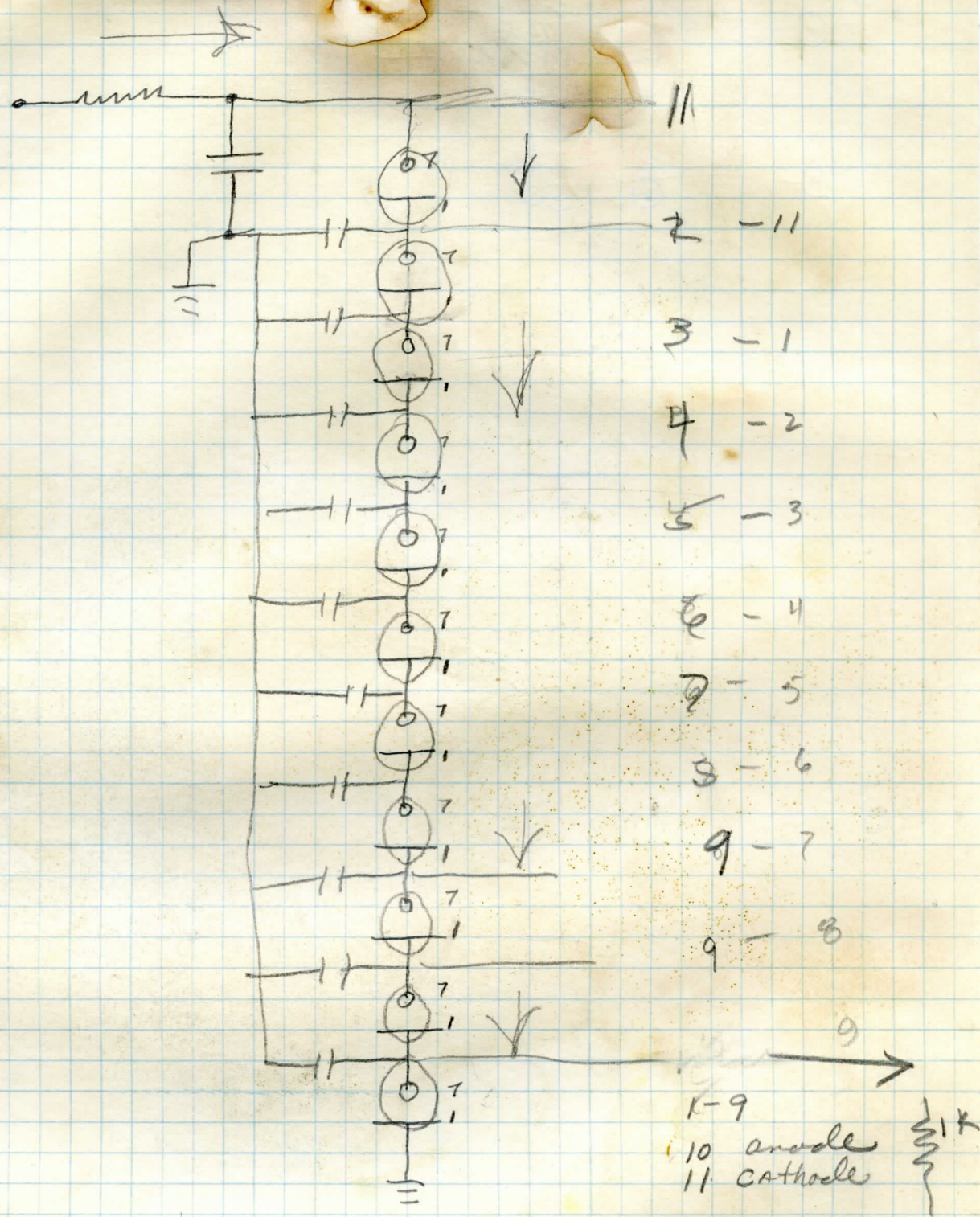
should be



PAGE 1
all 0.01uF drawn
upside down
NOTE

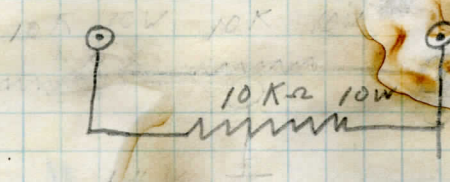
12

10 100K



1P28
1-9
10 - Anode
11 - Photocathode.

15KV
-○



1.5
PLATE - 1 and 5
cathode - 2, 4 and 7

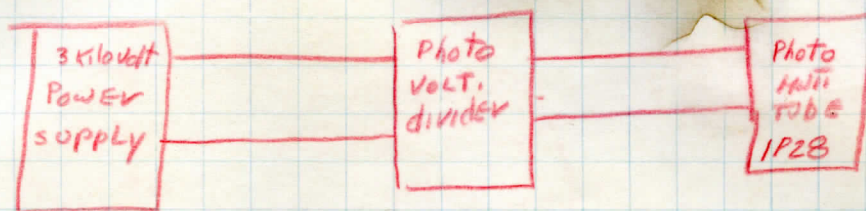
10.5

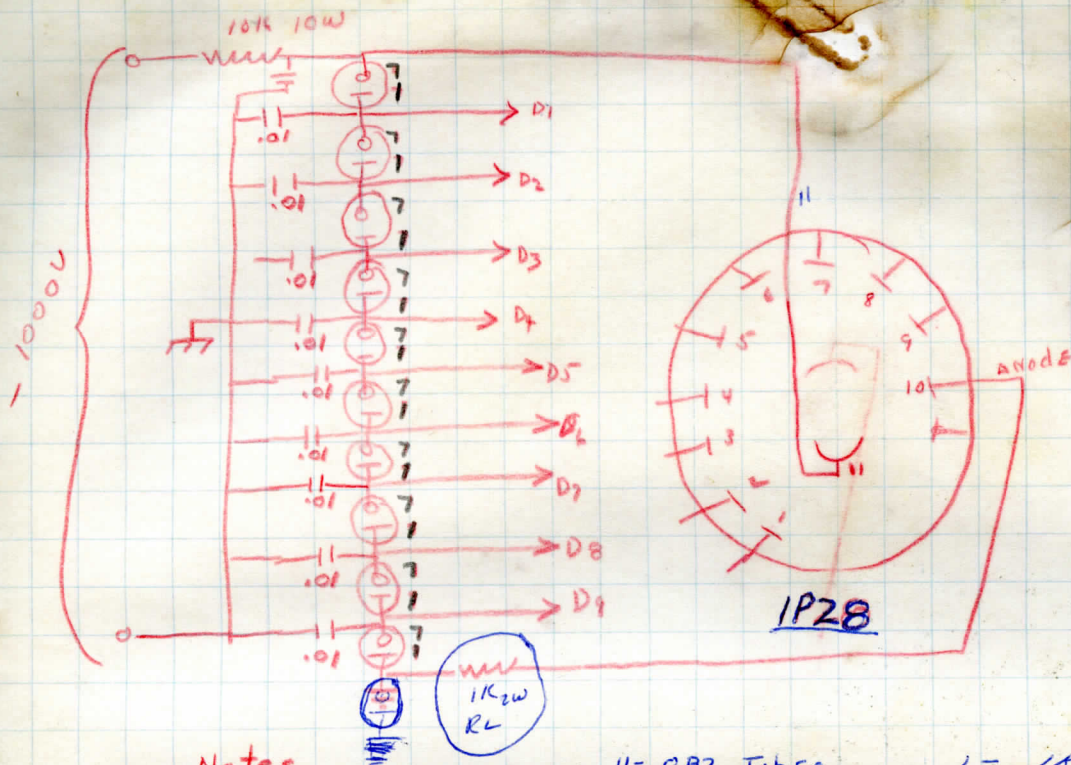
26 Nov 58
TEST SET.

Bob Getz

P. 3.

Block diagram.



Notes

IP28

MAX ANODE SUPPLY - 1250 V
 supply between D9 - anode 250V MAX

11 - 0B2 TUBES
 9 - .01 @ .16 KV
 1 - .1 @ 1600 V

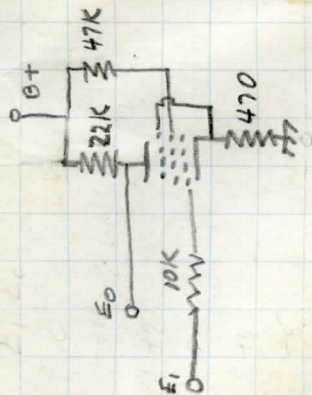
1 - 1K 2W

10% change of voltage on a 10 stage will result in a 7% change in output level.

current in bleed supply should be 5-10 times greater than the anode current

overload protection - figure 27, page 29

REWORK 3Kilovolt POWER SUPPLY TO GIVE -3Kilo VOLTS. AFTER TEST RETURN TO +3 Kilovolts.

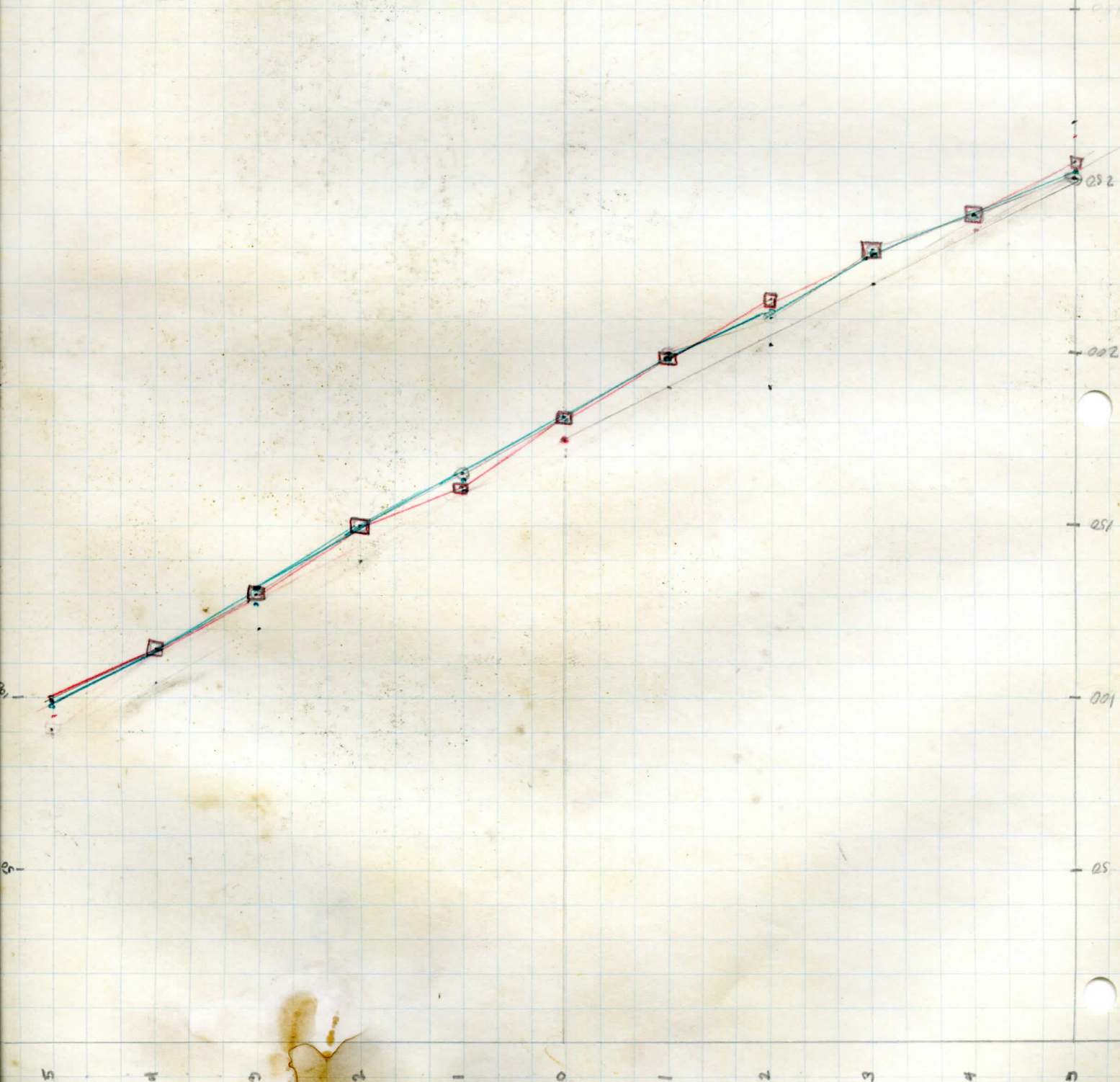


BLACK ○ - 15 MIN WARM UP
 RED □ - 30 MIN WARM UP
 GREEN △ - 45 MIN WARM UP
 ▽ - 1 HOUR WARM UP
 BT = +300VDC

NOTES

- 1) E TAKEN WITH V.T.M.
- 2) BT MODEL 113 M.C.
- 3) E, BATTERY.

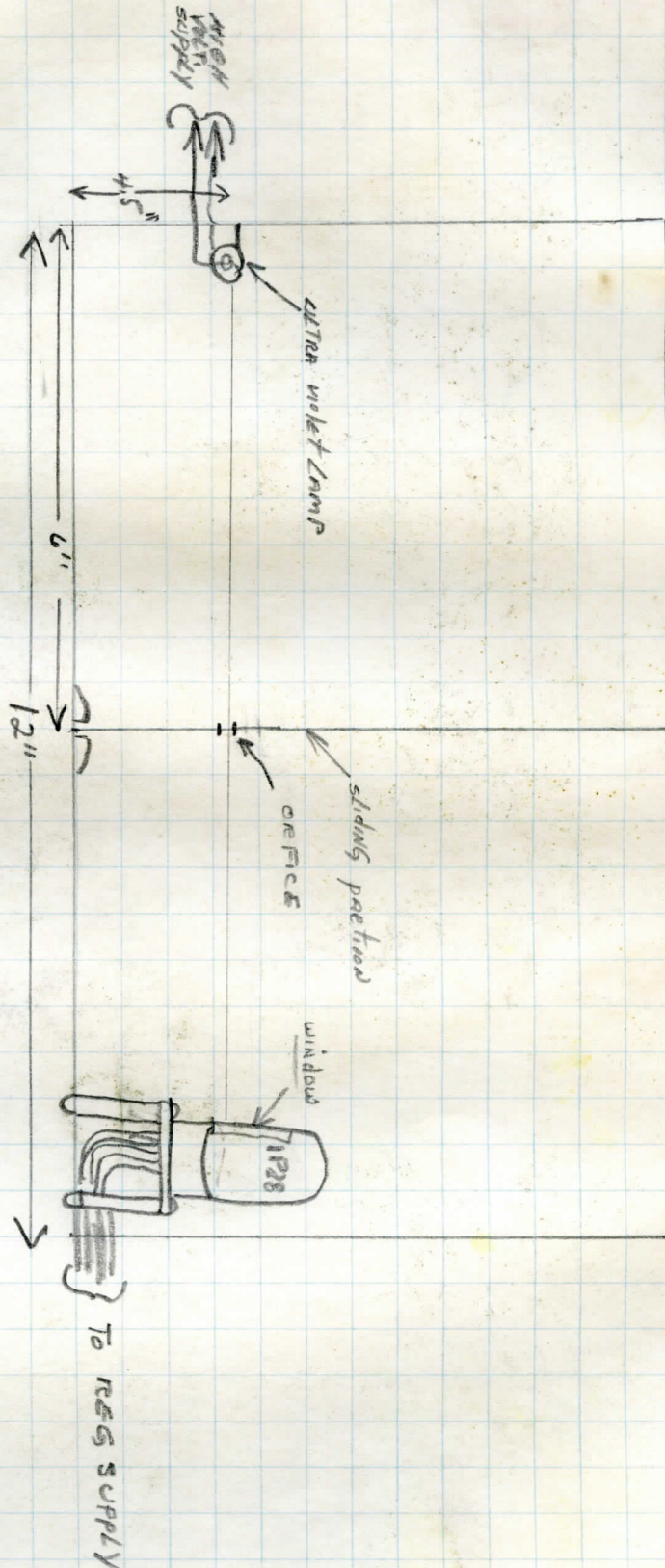
NOTE ALL READINGS TAKEN WITH V.T.M. HEATHKIT.



LIGHT-PROOF BOX

NOTES.

1. SHIELD 1P28 TUBE WITH FOIL.
2. FACE WINDOW TOWARDS ORFICE IN PARTITION.
3. MOUNT ULTRA-VIOLET IN LINE WITH ORFICE AND 1P28.
4. SHIELD U.V. LAMP WITH FOIL.
5. CUT DESIRED ORFICE IN PARTITION, 1P28 AND U.V. LAMP.
6. PAINT INTERIOR OF BOX LIGHT BLACK.

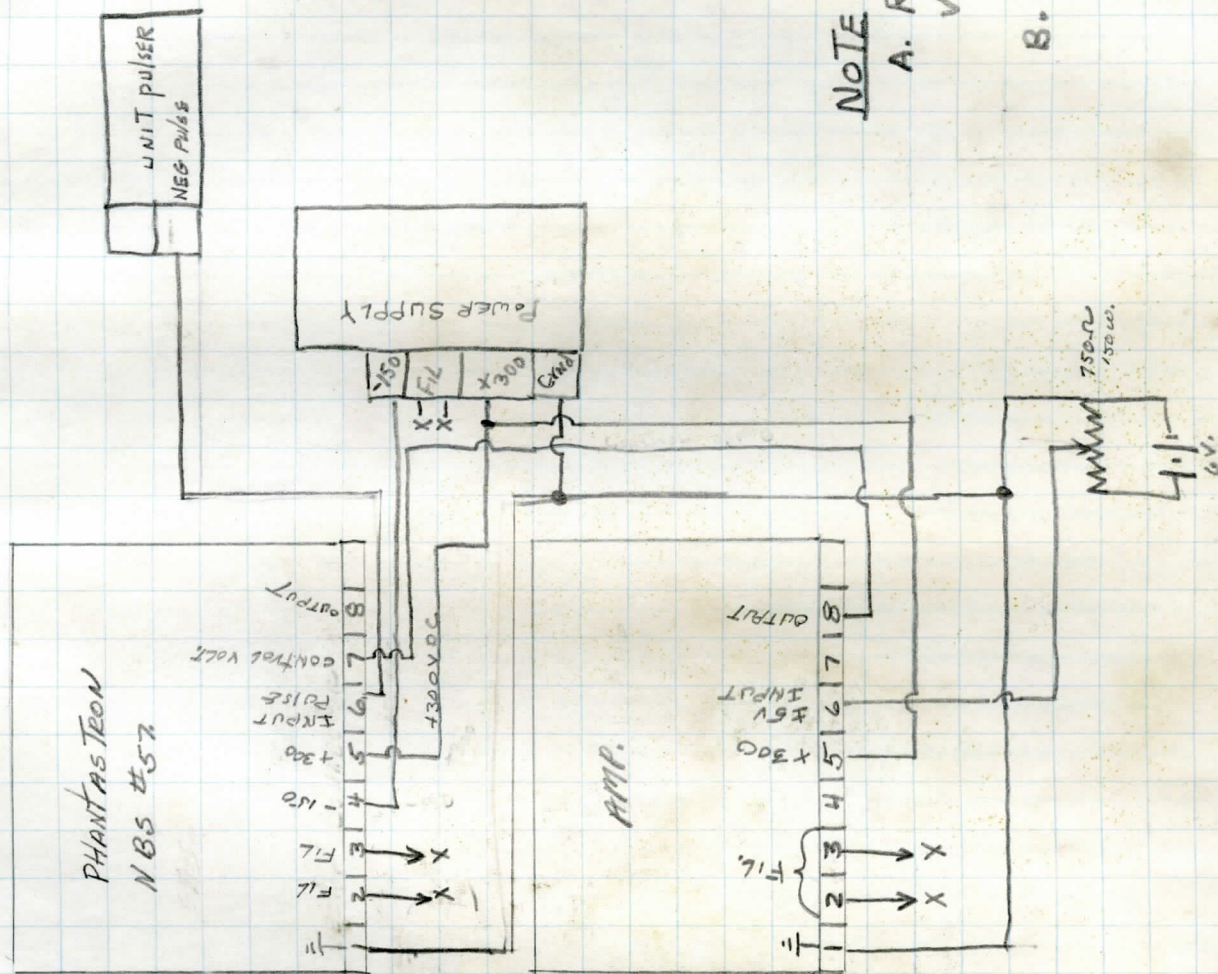




LINE AMP	PHANST
P1 GRND	P1 GRND
2 FL	2 FL
3 FL	3 FL
4	4 -150
5 +300	5 +300
6 ±5V INPUT	6 INRLT
7	7 CONFID VOLT
8	8 OUT VOLT

Schematic No. 1

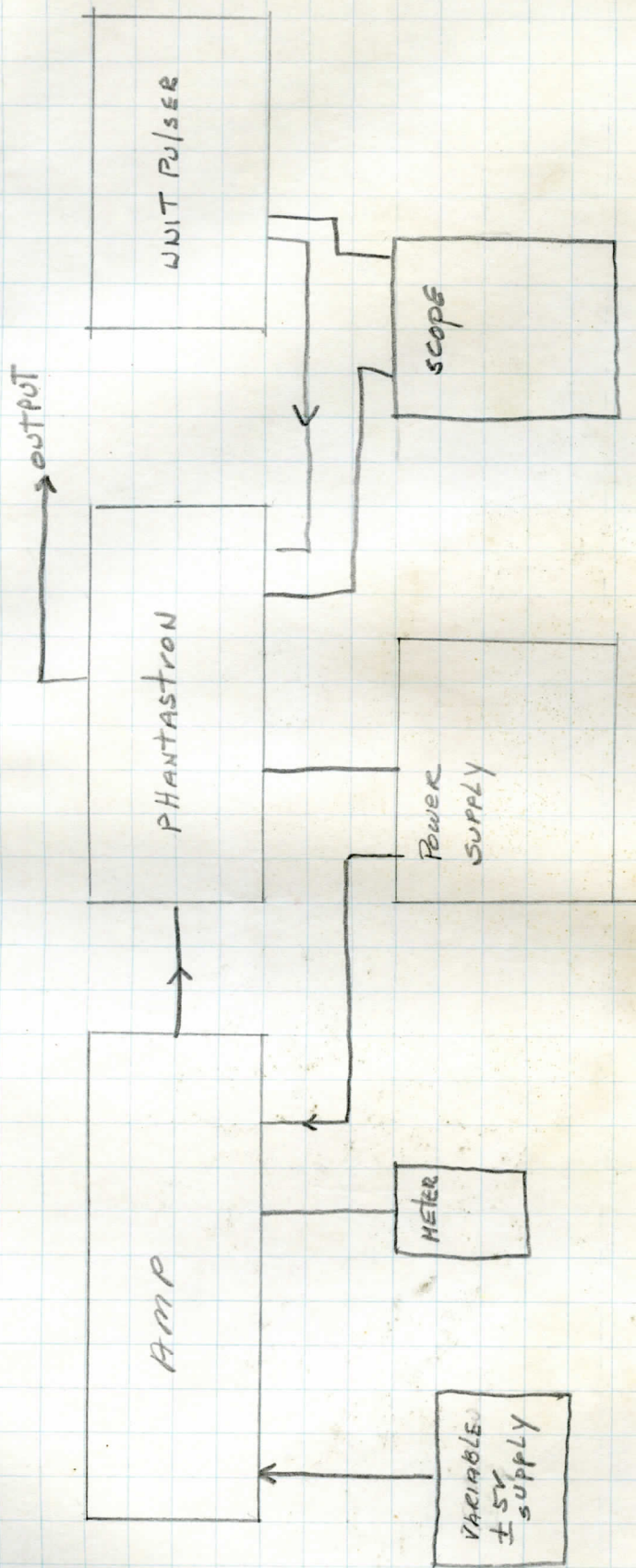
WIRING diagram of checkout of PHANTASTRON & Lin. AMP.



NOTE

A. READINGS TAKEN WITH
VTVM.

B. SEE SCHEMATIC



Block diagram for
TEST SET UP.

(1.) CHECKING AMP.

(2.) CHECKING AMP AND PHANT.

LIN AMP & PHANTASTRON

25 Nov 58.

Ref. GTE

E_1	y_{sec}	E_1	y_{osc}	E_1	E_2	E_3	E_0
0	2500	0	2500	0	180	0	180
+1	2300	-1	2900	+1	165	-1	195
+2	2050	-2	3100	+2	150	-2	210
+3	1800	-3	3300	+3	132	-3	225
+4	1600	-4	3500	+4	114	-4	240
+5	1350	-5		+5	98	-5	252

(1) Handheld vtm, Tek 541 scope, RS Model 113

unit Pulser GR TYPE 1217A.

(2) WAVE FORM.

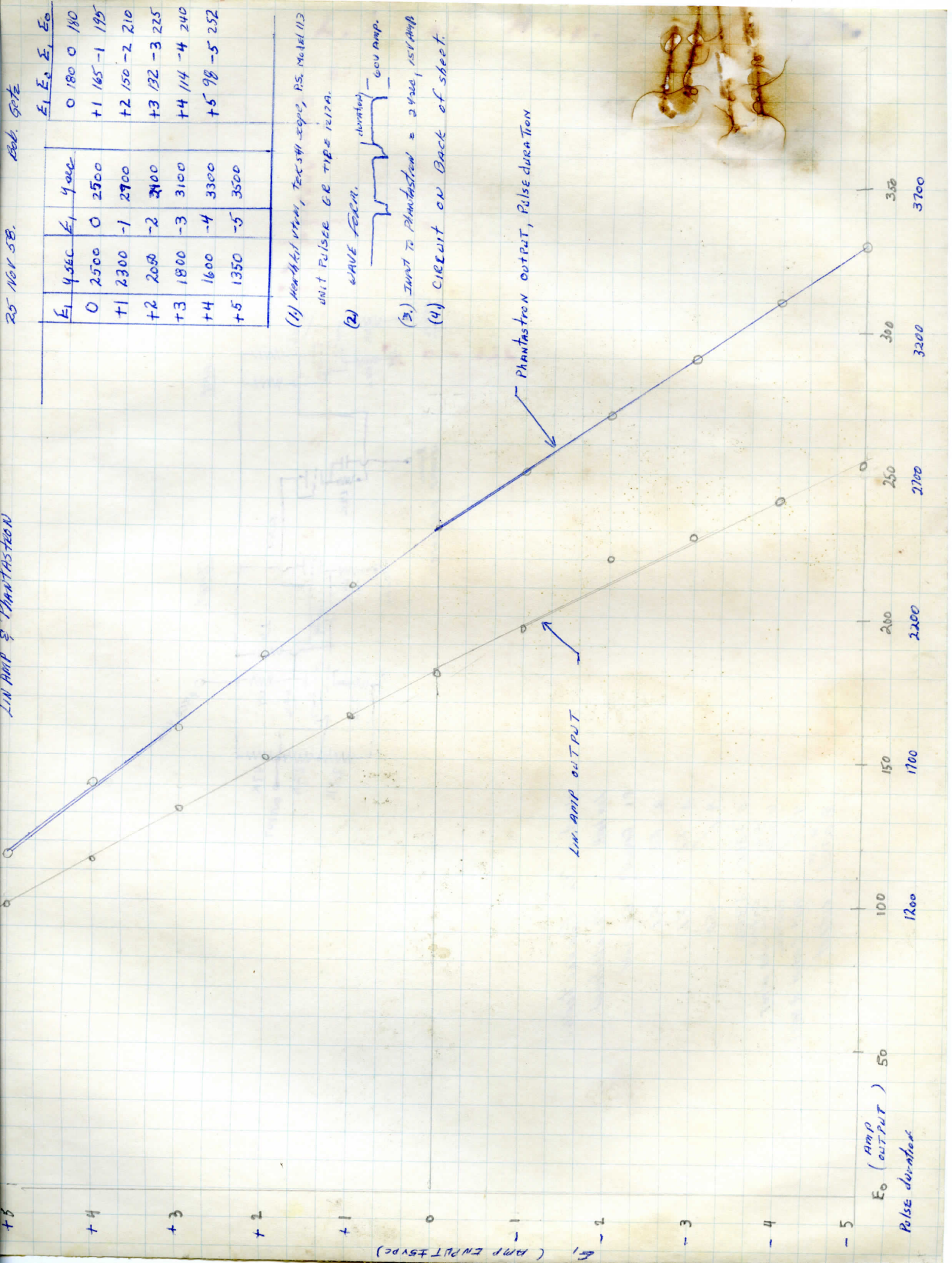


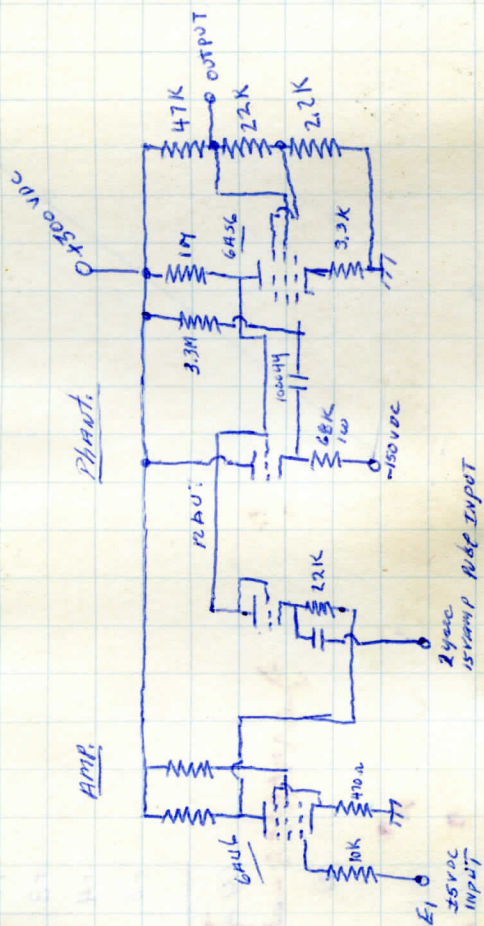
(3) Input to Phantatron = 2420, 15V AMP

(4) CIRCUIT ON BACK OF SHEET.

PHANTASTRON OUTPUT, PULSE DURATION

LIN. AMP OUTPUT

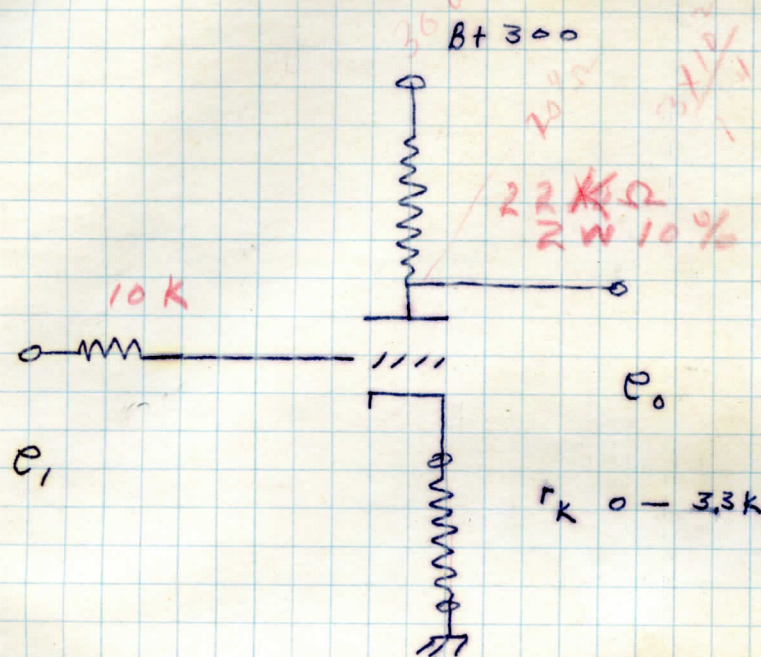




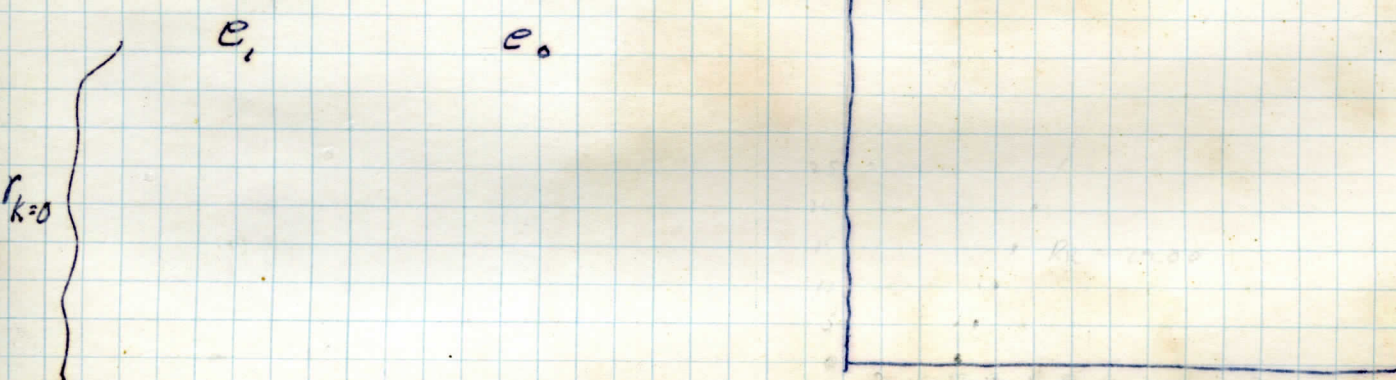
VECTOR PIN CONNECTIONS.

VECTOR	741 AMP.	PHANTASTRON
1	Ground	Ground
2	FL	FL
3	FL	FL
4	/	-150
5	+300	+300
6	+5V INPUT	15VAMP 24VDC PULSE INPUT
7	/	CONTROL
8	90-250 OUTPUT	Volt. Output of AMP

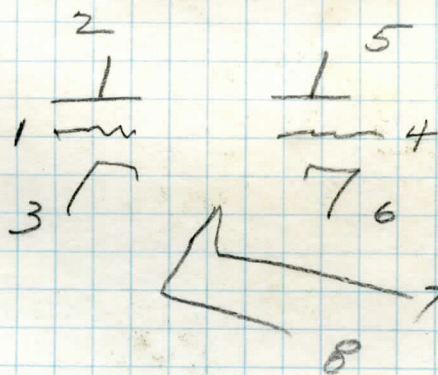
Linear Amp.



6SN7

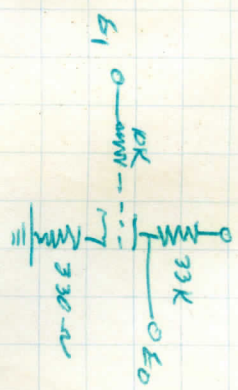


6SN7



LINEAR AMP

TUBE TYPE 6SN7



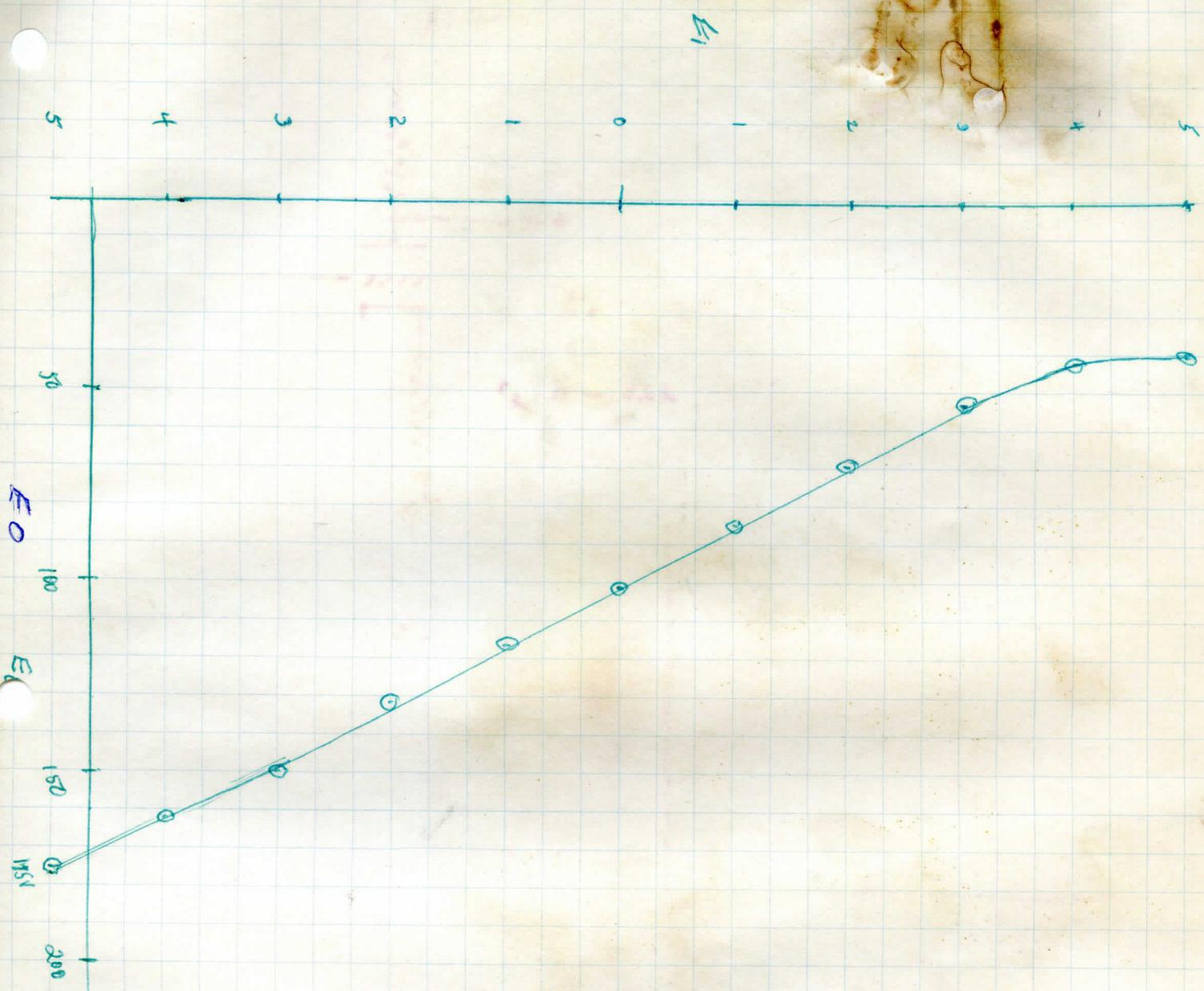
$$E_1 = \pm 5V$$

$$E_0 = 50-100V$$

(1) All readings taken with Hewlett Packard Power Supply, Mattson Cowley 113

$$2. R_K = 330\Omega$$

$$R_L = 33,000\Omega \text{ } 1W$$

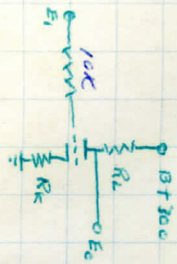


Bb Getz

DATE Nov 12, 58

LINEAR AMP.

Tube type 6SN7



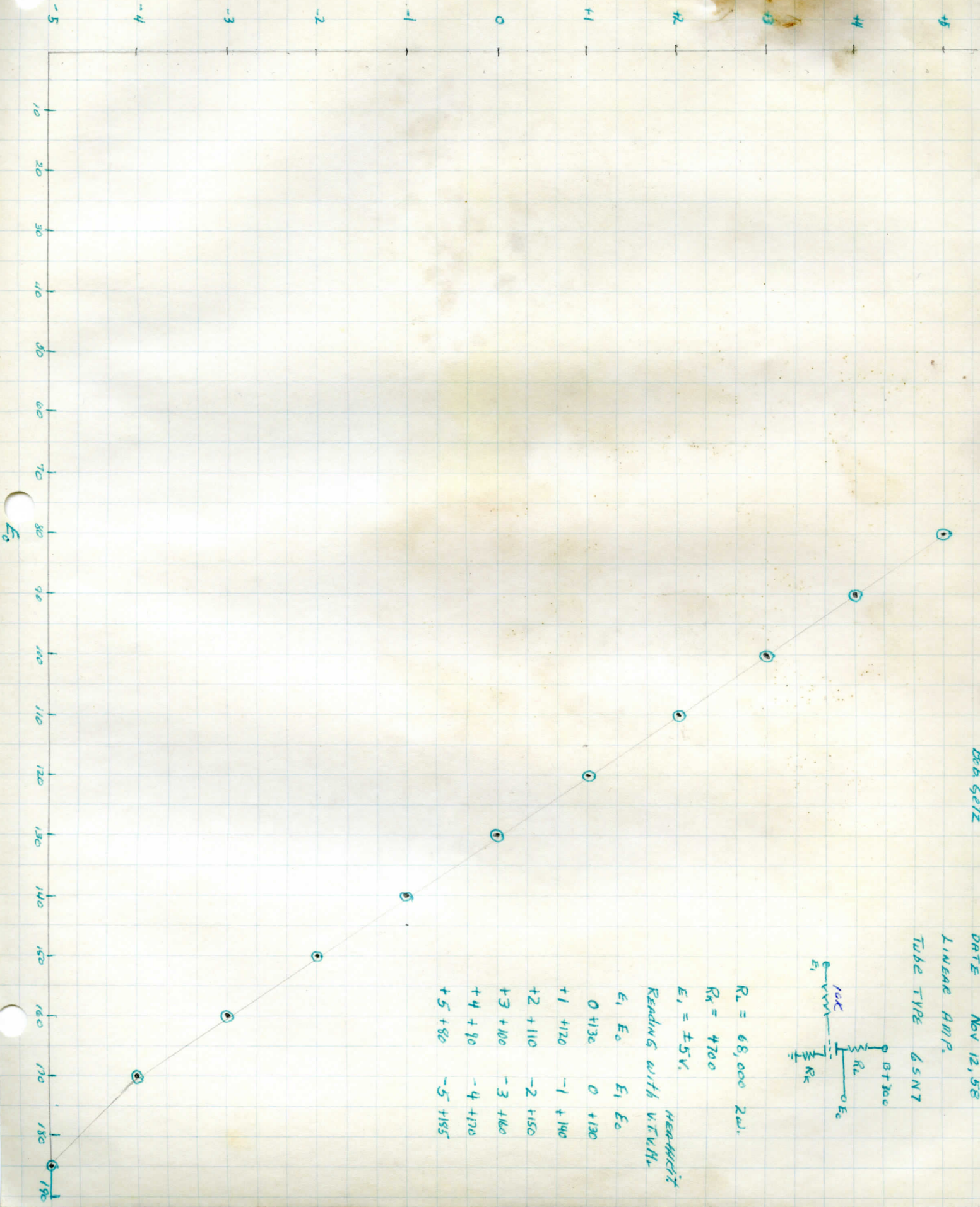
$R_L = 68,000 \Omega$

$R_K = 4700$

$E_1 = \pm 5V$

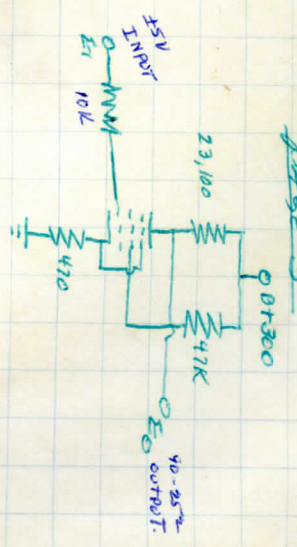
Reading with WVM

E_1	E_0	E_1	E_0
0	+130	0	+130
+1	+120	-1	+140
+2	+110	-2	+150
+3	+100	-3	+160
+4	+90	-4	+170
+5	+80	-5	+185



LIN AMP SLOPE TUBE 6H16
2546158, 7306. Get

PAGE 5

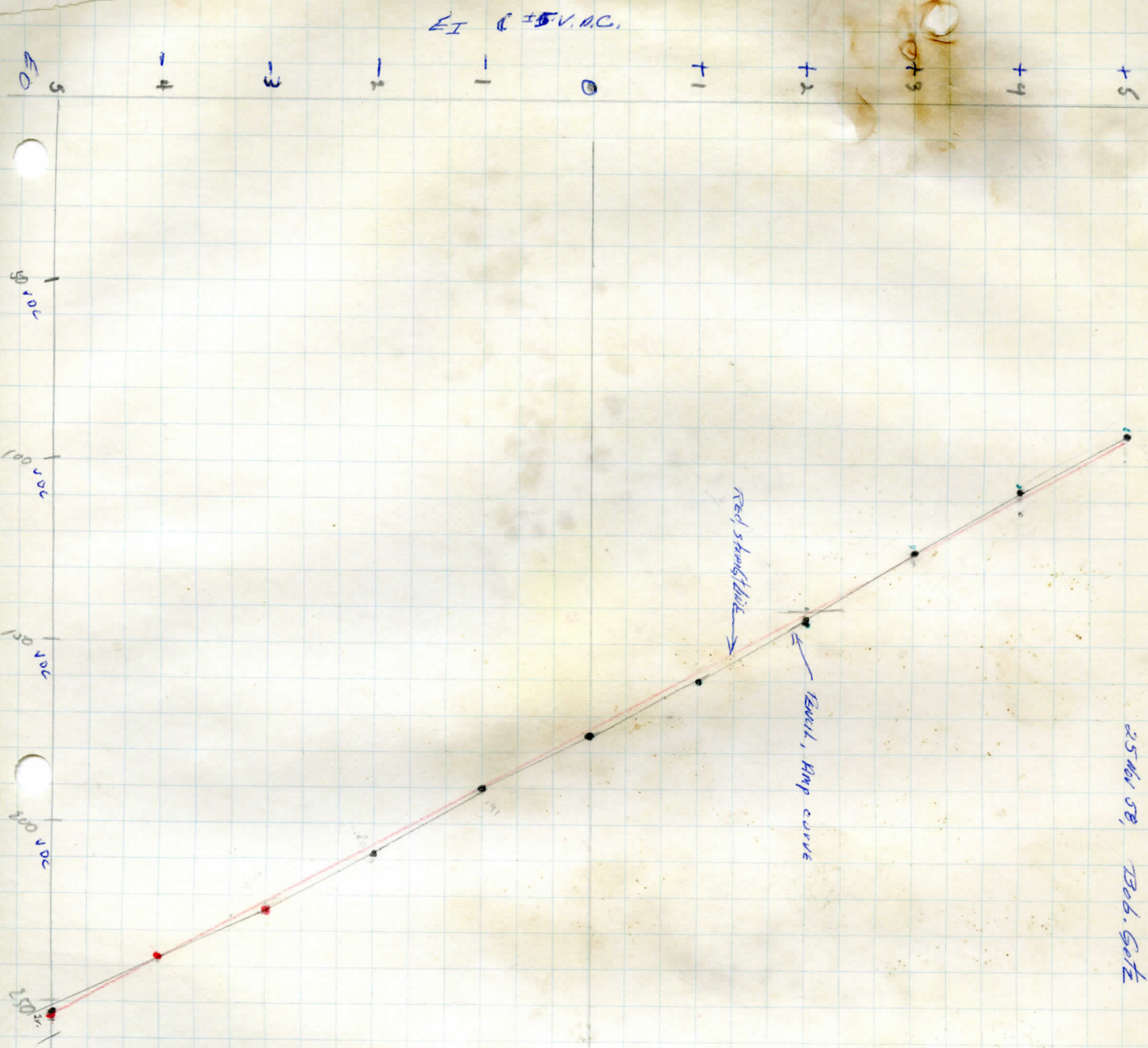


(1) Readings taken with Heath kit

VTUM, Power Supply Mattson-Cowley

Model 113.

(2.) E_1	E_0	E_1	E_0
0	175	0	175
+1	160	-1	190
+2	140	-2	210
+3	125	-3	225
+4	109	-4	238
+5	92	-5	252

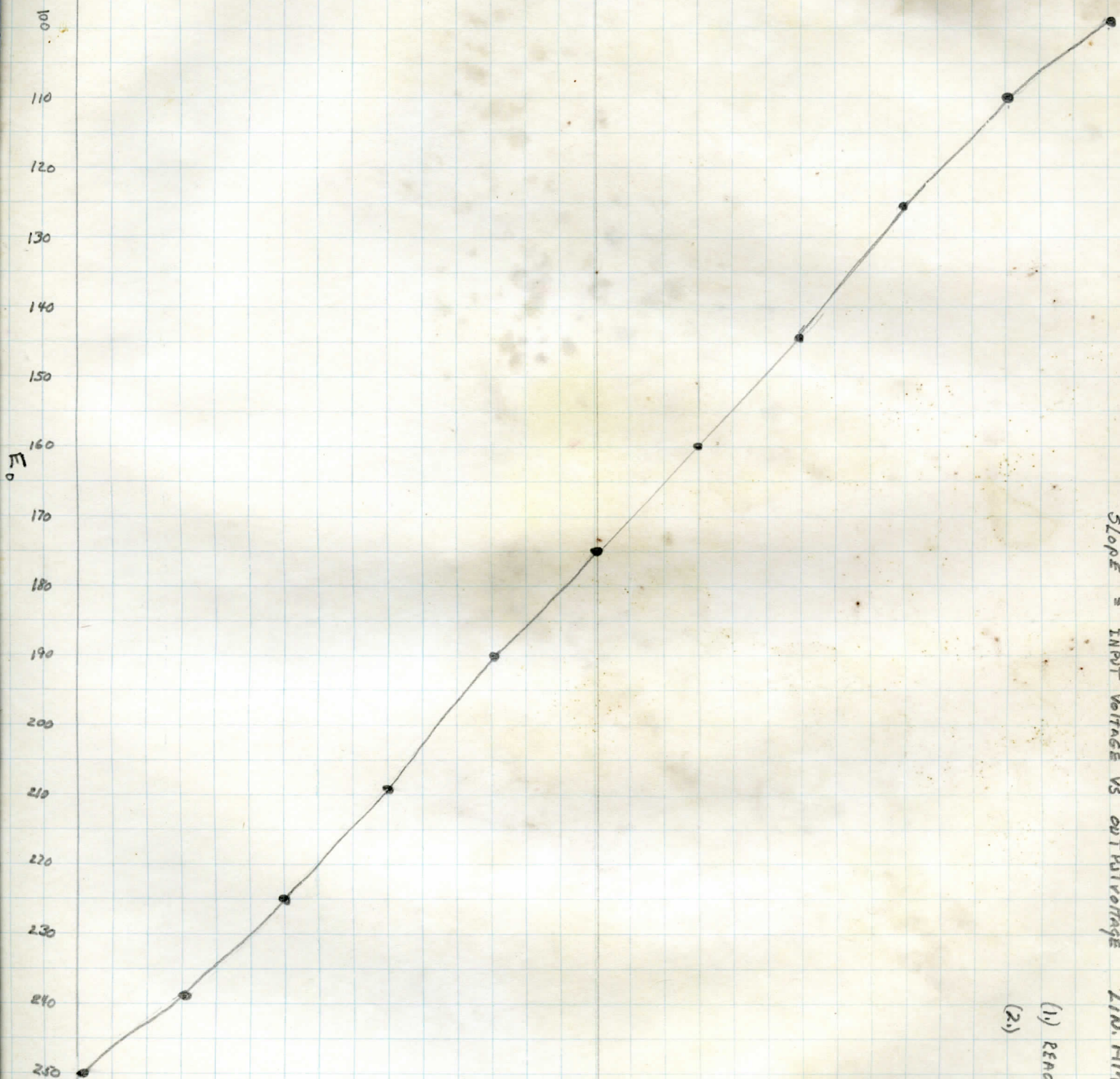


E_1 $\pm 5V, AC$

SLOPE = INPUT VOLTAGE VS OUTPUT VOLTAGE

27 Nov. 58. Bob Getz

- (1) Read with V.T.V.M. Heath kit.
- (2)



0	125	0	125
1	160	-1	190
2	144	2	208
3	126	3	225
4	110	4	238
5	98	5	250

27 Nov 58. Bob. Getz
 Lin. Amp. Tube Type 6AU6

1. $E_f = \pm 5VDC$ INPUT.
2. E_o read with V.T.V.M. HEATHKIT.
3. Graph used to determine R_L Rec.

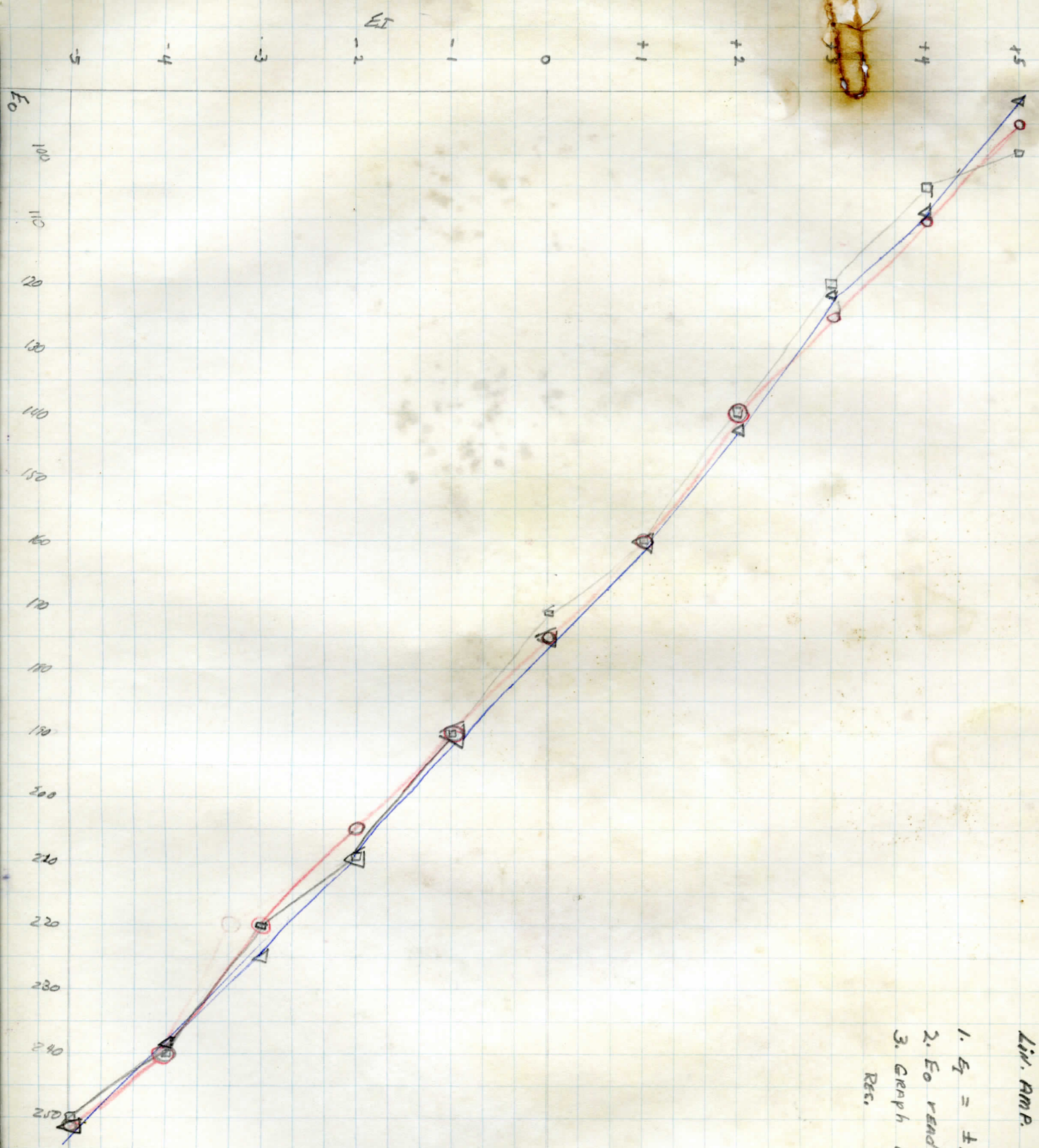


Plate Load
 $Q = 23,500 \Omega R_L$
 $O = 23,000 \Omega R_L$
 $V = 23,100 \Omega R_L$