

ADA 54A

Range Work

N.C. Mem. 11/

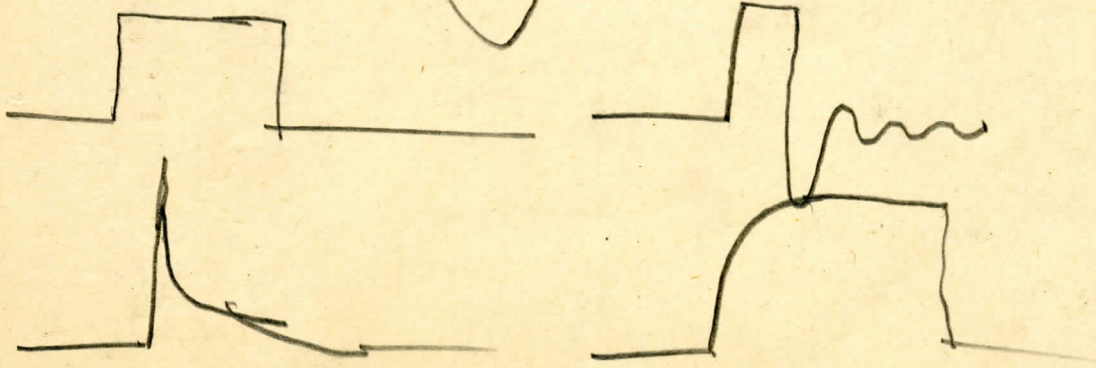
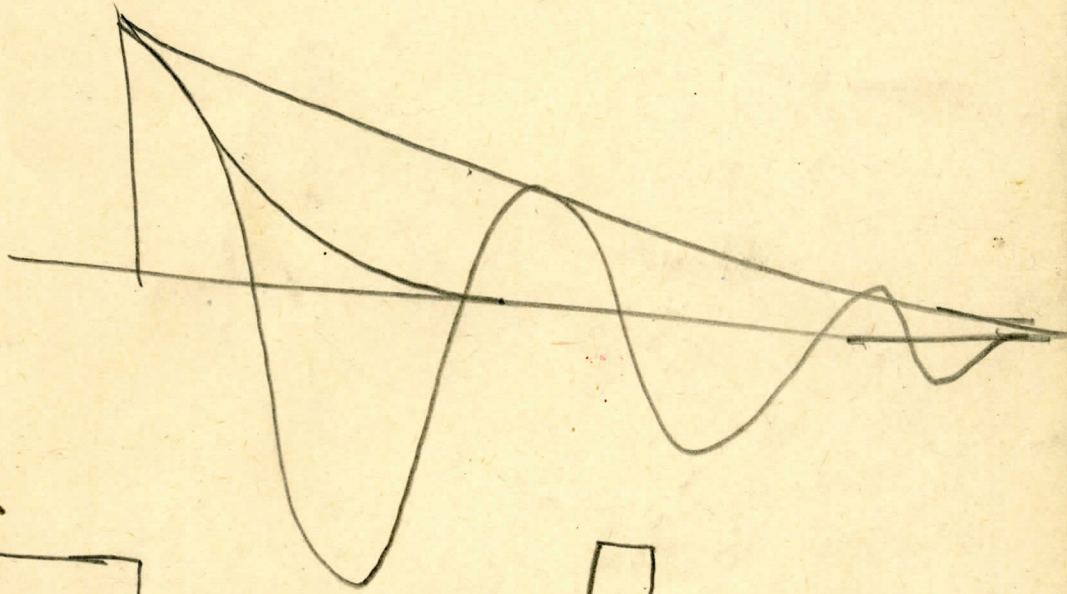
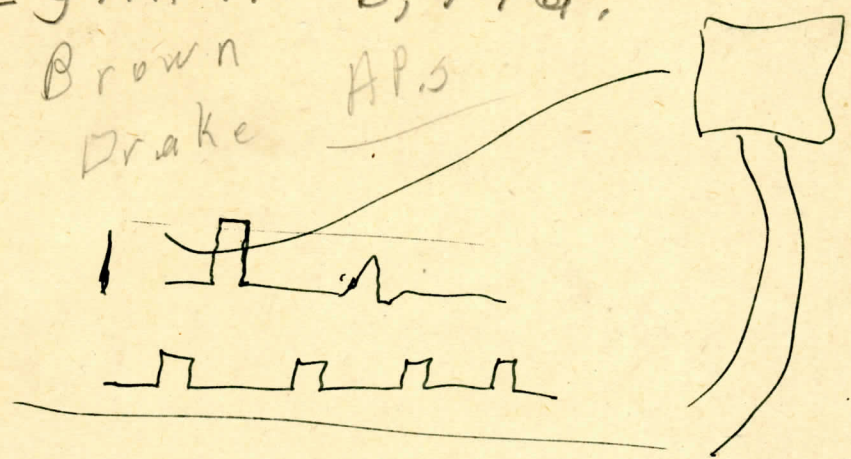
1/Lt W^m Thornton

Home 85437 3206 T.S. Lab.

Ext 576 Eglin AFB, Fla.

Brown
Drake A.P.S

1
1
1
b



B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

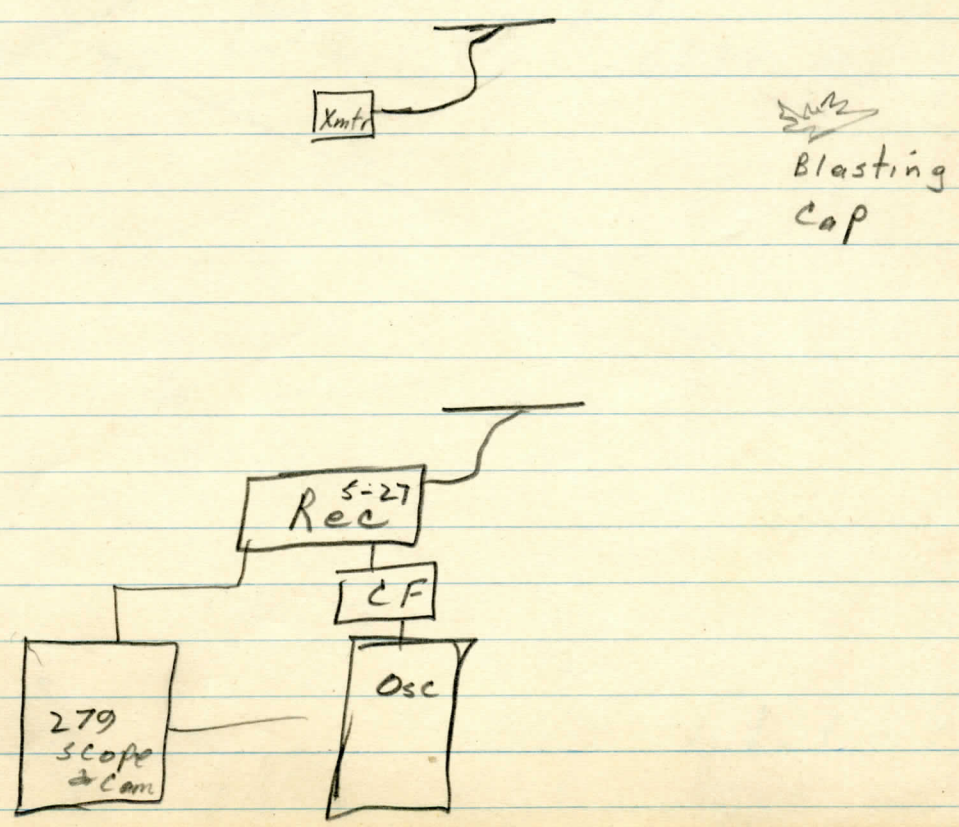
2/3/54

Set up test for M-2 SPU

1. Test Various mike diaphragm thicknesses + Air gaps
2. Directional response of mikes
3. Oscillograph Galvo characteristics
- 4.

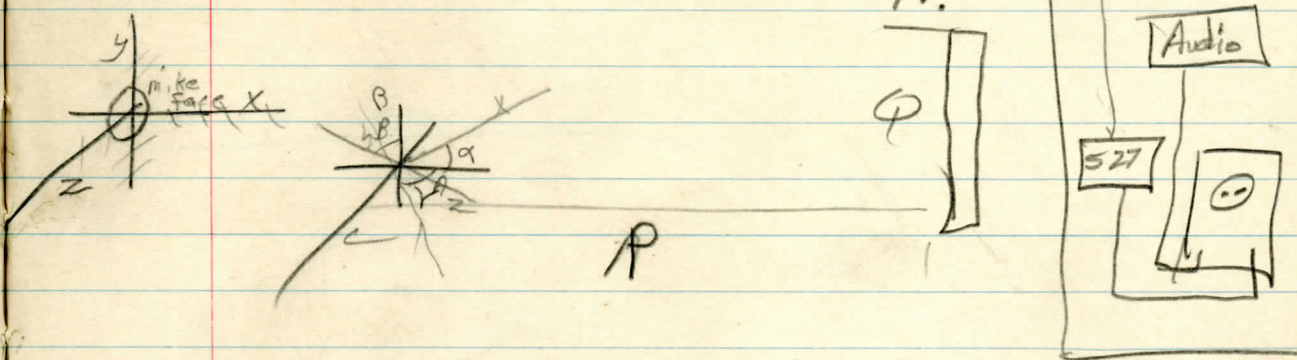
→ A. Call Maj. Foster (Hume) BD - 5232 50 EXP caps.
6164
B. Call For ~~trac~~ (Power unit)
23141 - Ext 7 (with cord.)

Test Set Up



2/4/54 Test of mike characteristics with
 blasting caps - R-22

static from X_{intr.} - 5000N timing



Mike #	P	Q	X	P	X
1 5	27'	4'	0	0	0
2 5	"	"	"	"	"
3 5					
4 5	10	2.5	"	"	"
5 4	10	"	"	"	"
6 4	10	"	"	"	90°
7 4	10	"	"	"	180

difficulty in firing long run
 vibration on scope Tr

Bum Camera

#1 4	20	0	"	"	"
#2 4	"	0	"	"	"
#3 4	"	0	"	"	90°
#4 4	"	0	0	0	0°
#5 4	"	1.	"	"	"
#6 3	"	2.	"	"	"
#7 3	"	"	"	"	"
#8 3	"	"	"	"	"
#9 2	"	"	"	"	"
#10 2	4	"	a	"	4

didn't title

#11	2	26	0	6	16	0	20
#12	2	"	"	"	"	90°	
#13	2	"	"	"	"	90°	
#14	2	"	"	"	"	180°	
#15	2	"	"	"	"	180	

Evaluation

C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

2/22 Drop test of chute from 135'
B' Line tower

Determine characteristics of 45' chute
with 3' reflector -

- A. Opening
- B. Launching
- C. Rate of descent
- D. Rigging

1st Drop - Packed + lightly taped lines
in accordion folds in one corner of
reflector - Use a piece of folded cardboard
at apex of chute + static line of binding
cord - Static line broke on launching - Impact
bent two sides of reflector + popped
nuts from seams

2nd Drop - Rigged same as before except
for heavier nylon static cord - Open fairly
well but close to gnd - Descent after
opening was possibly on the order of
600' min -

3rd Drop - ~~Rigged~~ Rigged same as 2nd drop
except for short static line - Chute
opened nicely but not more than 30' from
ground -

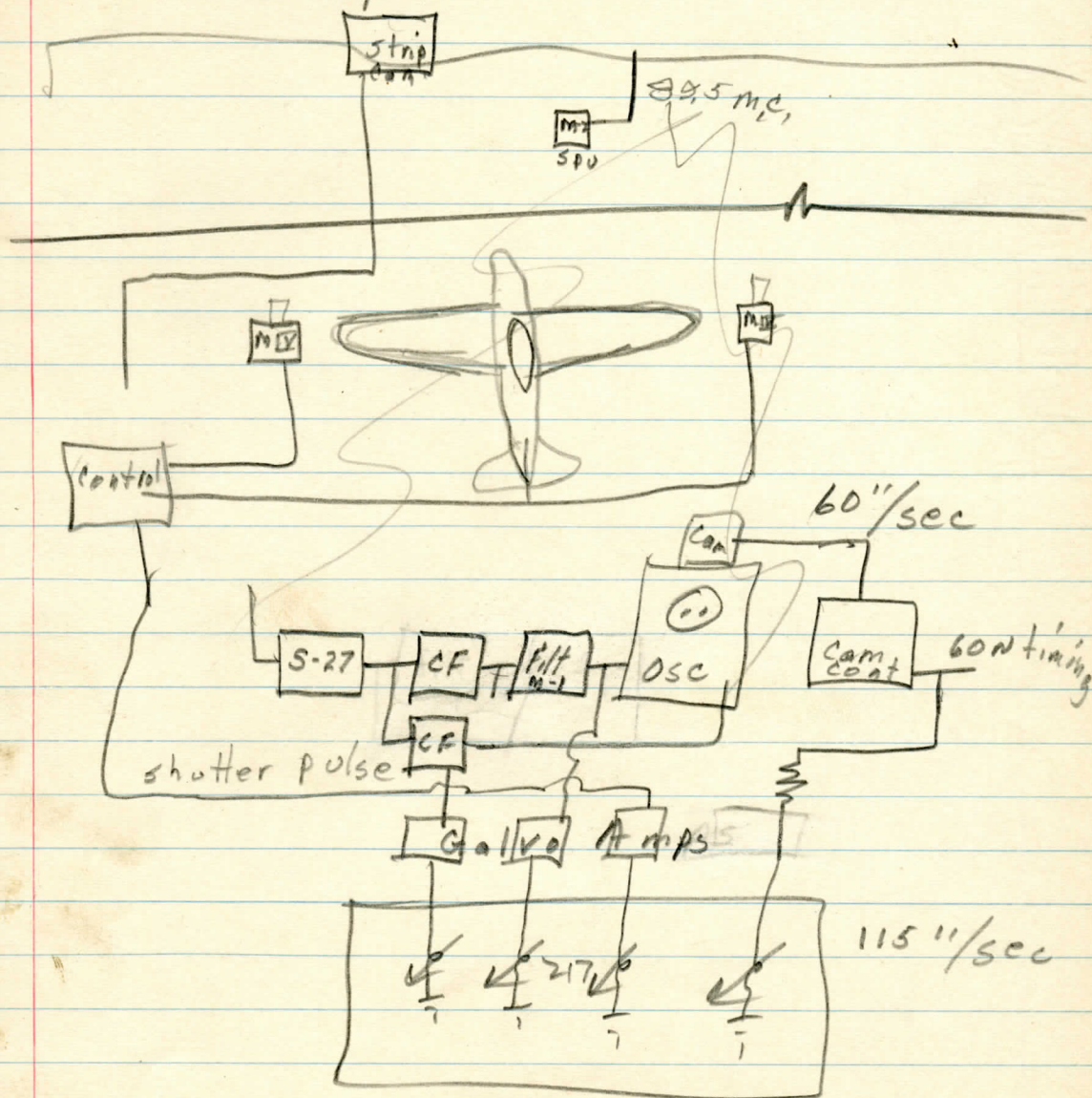
4th Drop - Use visual target of cloth +
concentric rings - packed chute in

Spiral inside rings - again used too light
a static cord which broke - chute
opened near gnd however & descended
very slowly -

3/3/54

Took Gooney Bird set up to
J.R.

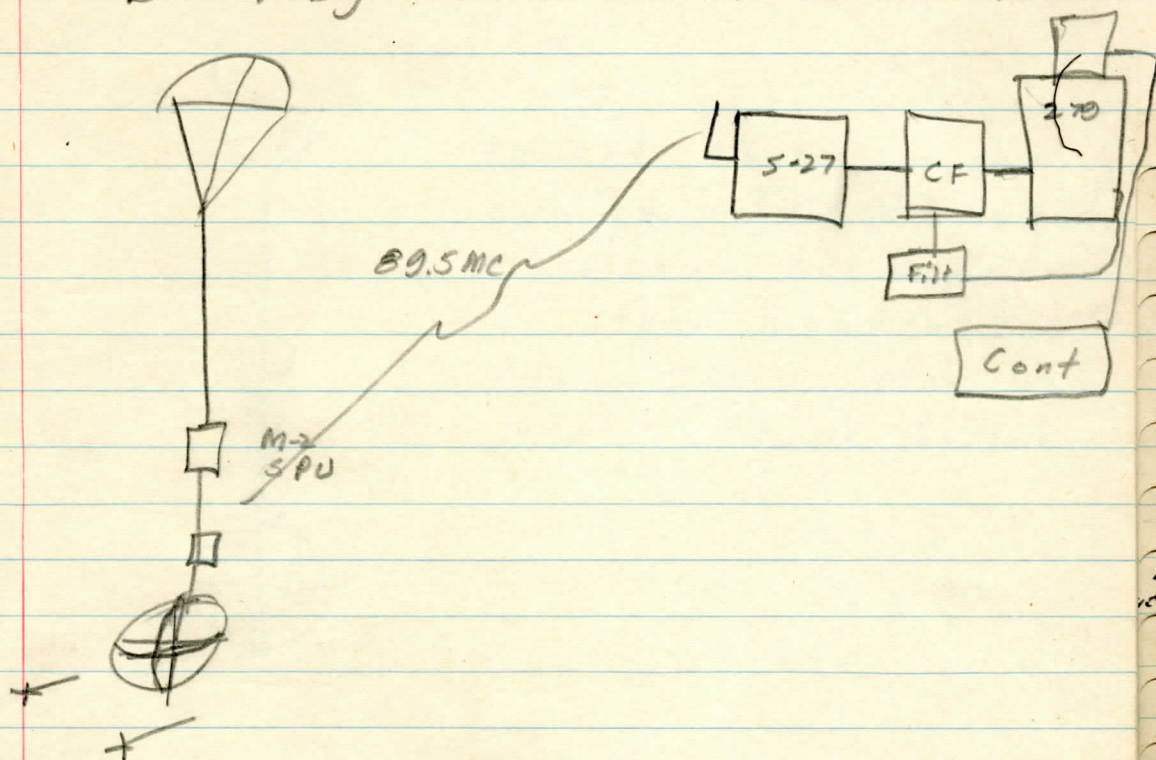
Set up as follows



Results: Approx 8 Firings of Knots
FFAR

Zenith M 2230 R 175.16

Gooney Bird Set Up
 Scheduled For Fri Mar 5
 Briefing 0800 AFOTC office



Thurs - Get work done on 970 -

Pick up & Rig Chutes -

Put diaphragms in mikes -

Fix Ant For G-47 -

Time base for Camera -

~~Thermos jug for Hot Water -~~

~~Regulate Voltage -~~

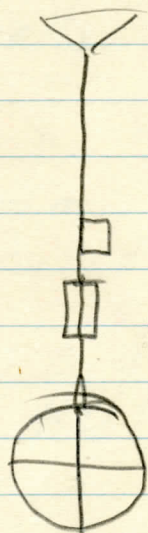
~~Balun for Rec~~

~~Knives & Harness, & clothes for Flight~~

Rescheduled for 28 Mar 1 p.m.

Set up as follows

Chute & C.R. #1



Packed chute in one quadrant (folded & taped) & Battery Box & Xmtr. in other quadrant, freq 90mc Max of 9 w. on dunk batteries

G
H
I
J
K
L
M
N
O
P

X
Y
Z

49

ADA ~~57~~ A4 to Yuma
6/19/54

30c/A

28 Flts.

31 ~~30~~ rolls class A

29 " " " L

7+0 " Color

16 mm color

28 roll Osc tape

5 pks 16 mm Kodack,

2-20 Fps MIV MR

2-40 " " MR

1- 16 mm movie MR

1 - Leica

1 - A-7 bare MR

1 - 6" lens MR

1 - 2" "

1 - inst book MIV

G
H
I
J
K
L
M
N
O
P

X
Y
Z

spare parts tubes

2-2X2

4-1X2

1-5R4

2-~~6AK~~7

2-6X4

2-0B2

2-829B

3-6AU5

1-2J42

3-6AK5

5-6AG7

2-5915

4-5964

1-5651

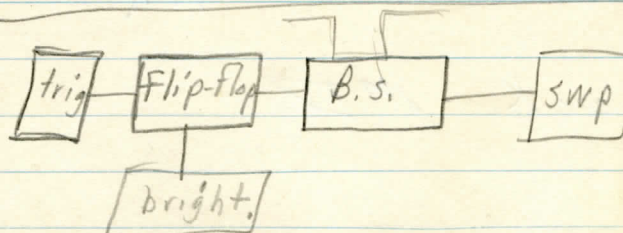
1- L.V. pwr Xfmr.

1- 6.3 Fil Xfmr.

1- HV Pwr supply

Wave guide

2- soldering irons



Video

6/21/54

Arrived 6-20 - Recd Film from
trip out - Unit ran 4 hrs on way out
Film looked O.K. Preflight O.K.
Wiring unit so that Maggy operates
from trigger

6/22

2 runs neither of which Fired
Inst O.K.

6/23

2 runs -

1st run

F-94

2nd "

tgt. speed-
fighter " -

Inst O.K.

Film poorly processed looked good

6-24 every CNX.

6-25

two runs

1st

2nd

1100 - no fire ran Film

H
I
J
K
L
M
Mc
N
O
P

X
Y
Z

8/13/54 791 Chase on Dogs at Tyn.

Mod 26 ~~RO~~ RO - F.E.I.

40 fps camera -

Loaded with CIA Film F-8

Scope int high enough to blur
Preflt. OK.

6 255.8 GCI 11-240. GCI.

7 303.2 " 12-245.4 "

8 308.6 "

882 + 896 -

Firing 24 rockets

No firings ~~to~~ made ran off
film

H
I
J
K
L
M
N
O
P

X
Y
Z

Aug 23
 ADA 49A4
 Mission #16

B-45 towing 5-27
 T-33 For insp
 958 Ascope Stereo pair
 791 MR6 ROFEI
 Preflight late but checked OK
 Mission aborted - '45 could not
 retract gear—
 A27 banded up on T.O. but
 landed O.K.

Aug 30

I
 J
 K
 L
 M
 MC
 N
 O
 P

X
 Y
 Z

Aug 30

958

R^W Camera CL-L F-16 40fps 36°

L^W " " " f-8 Red Filter

A-scope Wide open CL-L

~~Nose~~ Reticle - 32fps - set for B

Rear scope - CL-L Wide open

Sept- 22

Ran mission

970 made two ^{Stern} passes on Red Bird

All cameras + osc ran -

I
J
K
L
M
MC
N
O
P

W
X
Y
Z

Checked Voltages on TekX. 517

	+ HV	- HV	- HV
+10 pos	8.4 KV	3.9 KV	1.9 KV
+20 pos	17 KV	1.9 KV	3.9 KV

J

K

L

M

Mc

N

O

P

Q

R

S

T

U

V

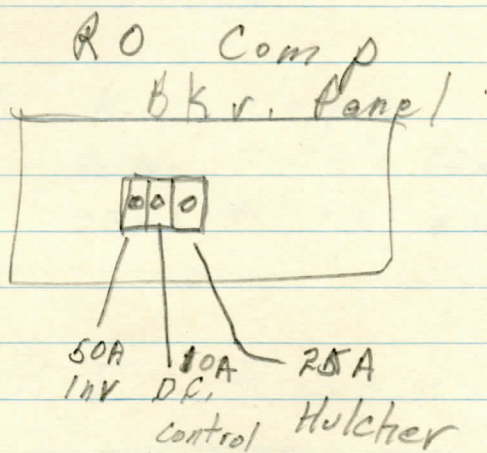
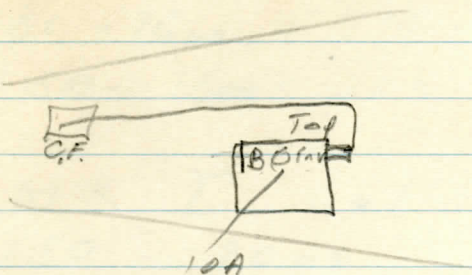
W

X

Y

Z

F-89-D 878



K
L
M
N
O
P

W
X
Y
Z

MK I Scope

$$\begin{array}{r} .073 \\ 47 \overline{) 340} \\ \underline{329} \\ 110 \end{array}$$

Current Drain Ma

+150 - 75ma + 475 - 1ma

-250 - 15ma + 300 - 55ma

$$\begin{array}{r} .015 \\ 47 \overline{) 600} \\ \underline{47} \\ 230 \end{array}$$

MK I Calib -

-250 - 20ma

+300 - 16ma

$$\begin{array}{r} .025 \\ 47 \overline{) 1020} \\ \underline{1020} \\ 0 \end{array}$$

$$\begin{array}{r} .002 \\ 47 \overline{) 95} \\ \underline{94} \\ 10 \end{array}$$

MKI R Scope

-250 - 6ma + 300 70ma

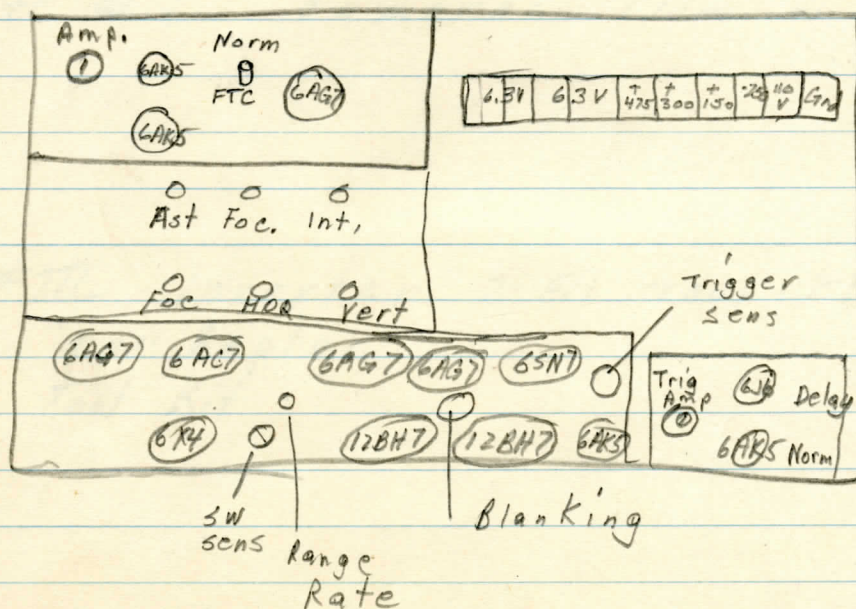
+150 43ma + 475 6ma

$$\begin{array}{r} .043 \\ 47 \overline{) 200} \\ \underline{188} \\ 120 \end{array}$$

$$\begin{array}{r} .005 \\ 47 \overline{) 250} \\ \underline{235} \\ 15 \end{array}$$

$$\begin{array}{r} .06 \\ 47 \overline{) 310} \\ \underline{282} \\ 28 \end{array}$$

MKI R Scope



#II

Multimeter -
~~20" Raptor lens~~
 Diagrams of ship
 1-5A4 6 - 05964
 3-6ACT - 4-6AGT
 4-5962 2-6AST
 5-6AK5 1-6X4
 5-UG88 conn
 6-6AUG
 1-5651

1 short pwr cable

2 - spare cables w/UG88

Test film + house

ckt diagrams of ROFEI

1-3JPI

900' Tri X

1

cameras Film & lens

Trans fil

Tool Kit

Box of cond

" " Res.

Filter Cond -

1-HV Pwr supply

1-10" lens

2 boxes fuses

1 - spare cable

1 - bag of wire relays etc

1 - spare cath. follower

4 ea lufd cond

Asst nuts & Bolts

" Resistors

Set of spin tites

Tool Bag

20" Fototel

#III Inverter 2-Fil trans 1-Pl trans
 20" Raptor
 Tool Kit

L

M

MC

N

O

P

Q

R

S

T

U

V

W

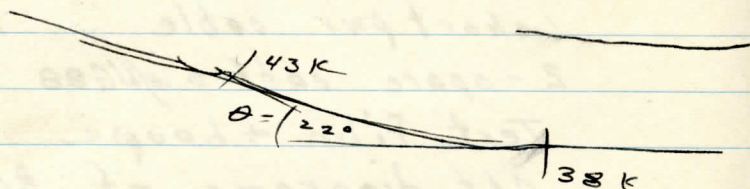
X

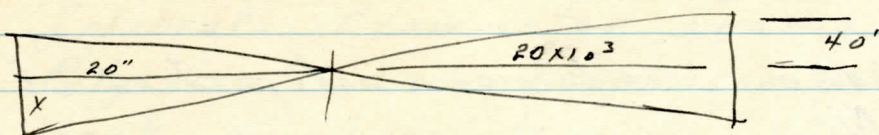
Y

Z

1 ea Hulcher
1 .. 40" lens

1 ea 20" lens

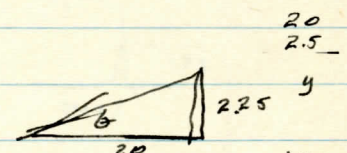
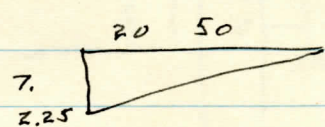




$$\frac{20}{X} = \frac{20 \times 10^{-3}}{40}$$

$$10^3 X = 40$$

$$X = 40 \times 10^{-3} = .04$$



$$\tan^{-1} \frac{2.25}{20} = .1125$$

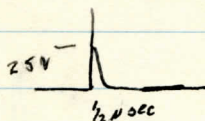
M
MC
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

Changes in F-89

Make Electronics independent of external A/C

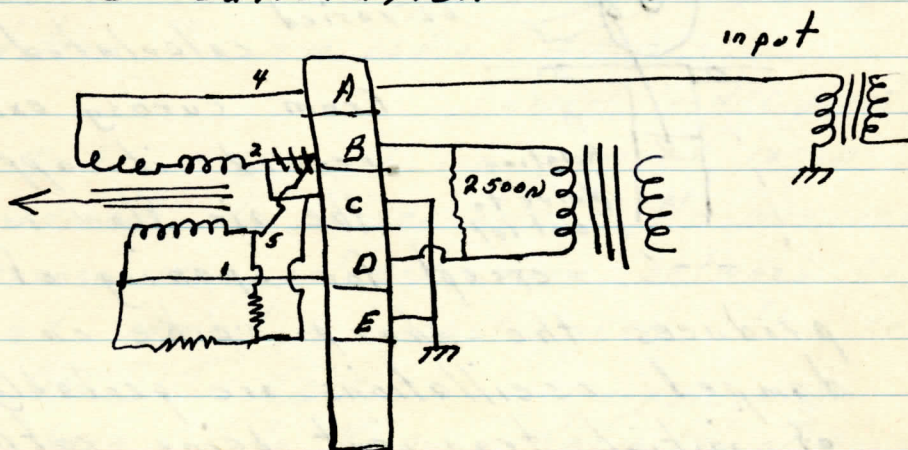
Add Trigger and Video test CKts

Improve Video CKts -



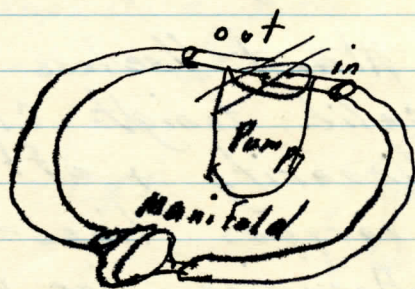
7/28/55

Calibrate Flowmeter using Sanborn
'Poly-Viso' and respirator pumps -
Check a- linearity
b- effect of diff. press hose
c- calibration

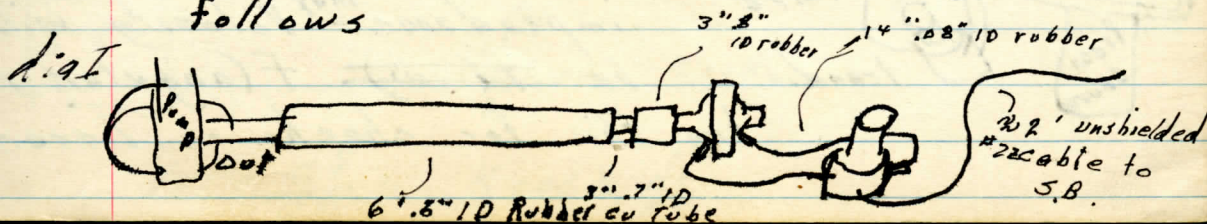


(Lower SG Amp)
Set up instrument on Sanborn as shown
above - Zeroed nicely - must be done
carefully - Cap. + Res. zero interact - so set up
pumps as follows - pump built up

large diff press
between in & out -
transducer had to
be rezeroed -

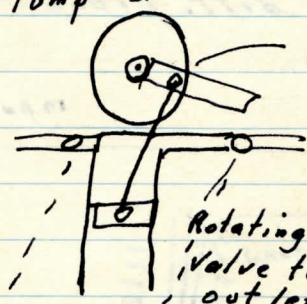


Rezeroed O.K. ran
a few prelim. checks with gear as
follows



pen response of Sanb. looked slow
 prob. excessive pen pressure. Make a few
 recording - either transducer or recorder
 is not symmetrical sensitivity wise -
 Used Pump #II

12
 12
 $\frac{1090}{12.00}$

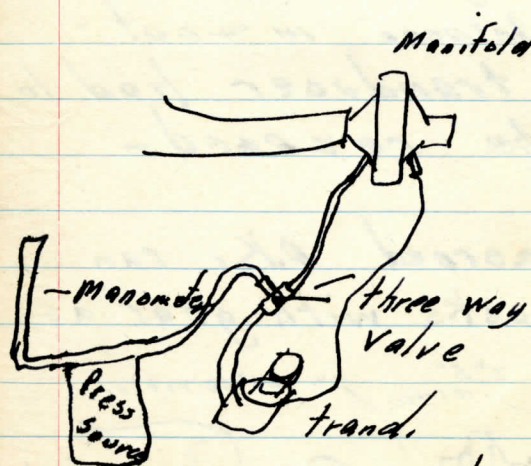


stroke can
 be varied

$\omega = \text{rpm}$

$V = \text{volume from calculated}$

From cursory examination of
 record it appears that
 the air flow is sinusoidal
 except for opening of valve which
 produces the sharp spike on leading edge
 damped oscillations are probably reflections
 of initial transient being reflected by
 connecting tube & manifold or possibly by
 diff. press. lines - period (ΔT) shows that it is
 most likely reflections in line - See sample
 recording - Some method of stdz. must
 be devised - the following might be satisfactory



Manifold

~~Almost~~ Useless to try to
 calib. tonight. Check on
 linearity & effect of
 various lines -

Assuming sine wave
 function of velocity & no
 impedance - $\text{Max Velocity will be } \frac{F}{\omega} \text{ (angular rate)}$
 try this for check on linearity

To check symmetry of pickup Manifold & diff press lines were reversed at with other cond. remaining the same (see ⑪ & ⑫)

Transients were $\approx \frac{5}{20} \approx 2.5\%$ higher - slower rates showed no appreciable dissymmetry - Condition I - same as Dia I ~~except~~

" II - " " " I except for diff. press lines of $\approx 3'$ poly ring tubing was (.12" ID .16" ID) was added to other lines - No measurable difference was noticed when between Cond I & II at lowest & highest avail. - flow rates see ⑭ ⑮ ⑯ ⑰ -

Sanborn Poly Viso is definitely ^(about) Asymmetric. When pressure line are reversed there was a ratio of $\frac{10}{20}$ in recording or an asymmetry of $\approx 10\%$ - see ⑩ & ⑪

Determine Volume & rate of flow assuming pump is a piston undergoing sinusoidal motion - $y = K \sin \theta$

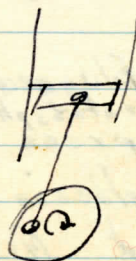
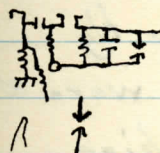
$$Vol = \sum_{x_0}^{x_1} y \Delta x$$

$$= \int_{x_0}^{x_1} y \Delta x$$

$$= \int_{x_1}^{x_2} K \sin x \Delta x = \left[K(-\cos x) \right]_{x_1}^{x_2}$$

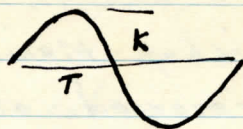
$$Vol = K [\cos x_1 - \cos x_2]$$

$$Vel = \frac{dV}{dt} = K \cos x \frac{dx}{dt}$$

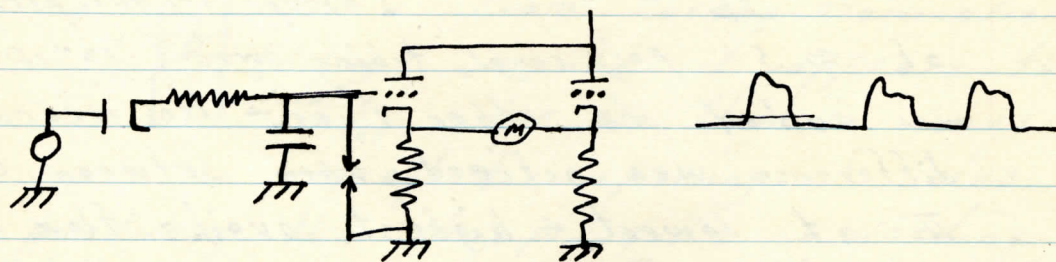


$$y = k \sin T$$

$$Vel = \frac{dy}{dT} = k \cos T$$



Devise ckt. to obtain integral over $\frac{1}{2}$ cycle
+ hold it ^{in pre readable form} for $\frac{1}{2}$ or more cycles



7/30/55 Obtain waveform of breathing cycle
flow rates -

Set up MK I flowmeter with Sanborn P.V. and
ran the following - Used 'B' strain gauge amp.
'A' would not balance properly -

Ran 1+2 using the manifold, plugged directly
into an anesthesia mask. ^{opening into the atmosphere} Diff. press lines were 26'
of 1/4" tubing. Ran ③ using anesthesia machine
+ manifold between NH. line + Y on mask ④ Same as before
but reversed lines ⑤ is manifold between mask + Y -

8/3/55

Attempt to cal + use CO_2 analyzer + flowmeter
on Sanborn -

Cal. CO_2 Analyz. by

Mc

N

O

P

Q

R

S

T

U

V

W

X

Y

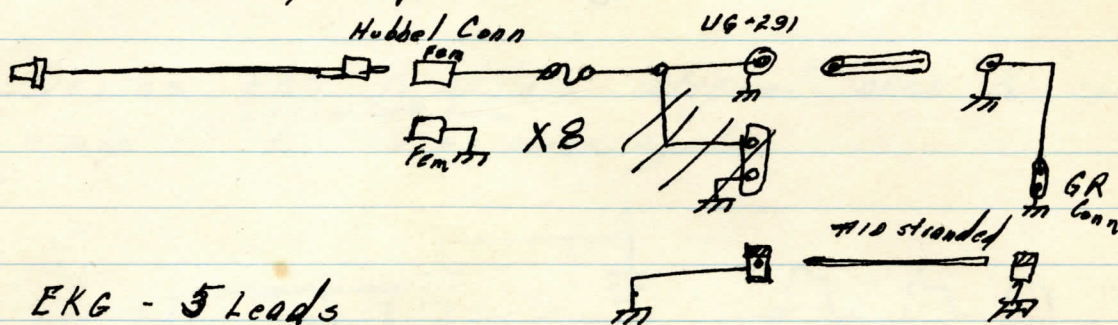
Z

8/10/55



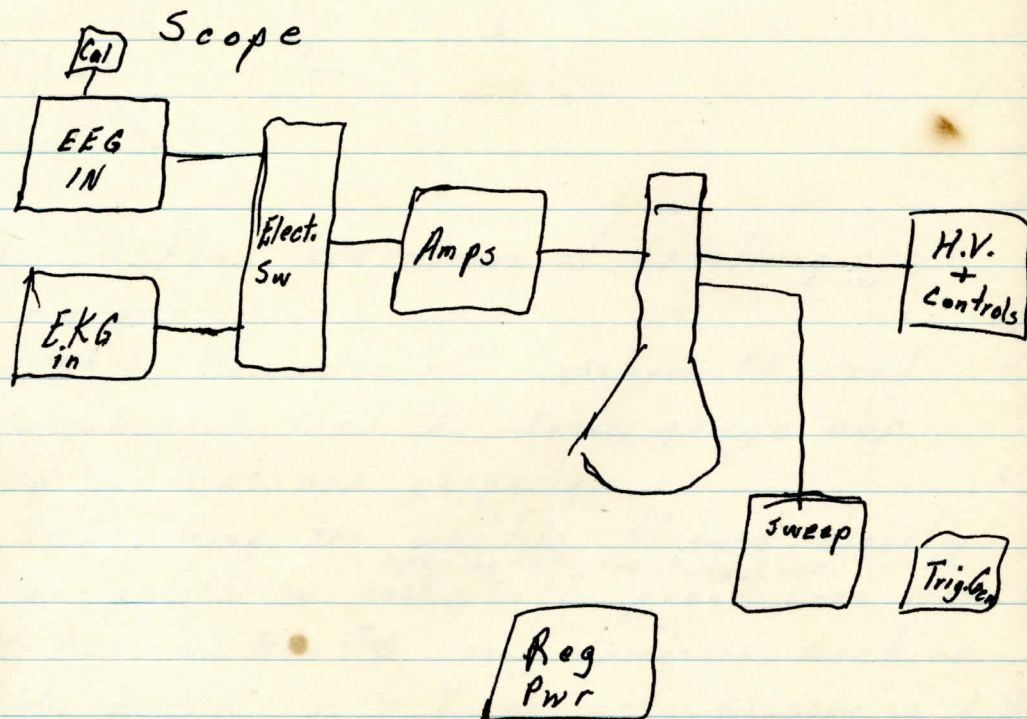
Layout Electro-Physio - set up for D.R.

Basic pickup Arr.



EKG - 5 Leads

EEG - 3 "



Check on drift of Liston B. CO₂ Analyz.

Removed 12AX7 - Sens at Max

Turned on 1535 - ^{Meter} 0.0 div No appreciable drift

1645 - 0.025 Replaced 12AX7 w 12AY7 +

set decade to ~~1~~ - ¹⁰⁰ sens to 1 +

recentered 1700 No appreciable drift in
several hours - There is an A/c signal being
picked up by the amplifier -

With input shorted at transducer head
+ Gain at max inst turned on + zeroed

1035 0.0 - there was -.25 div of noise at max

All meas. made with cover removed from chassis

+ pickup heads - over 1.5 hr period there was
a drift of $\approx .5$ scale div. No important

drift under these conditions - removed

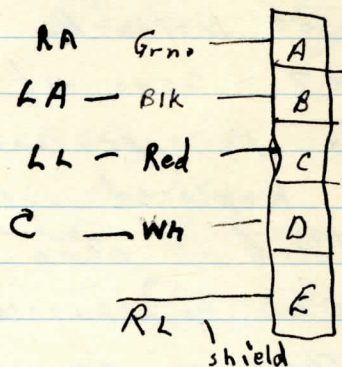
manometer cap from ckt - After first

ckg. for drift with out the 6A15

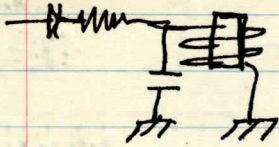
Mc
N
O
P

W
X
Y
Z

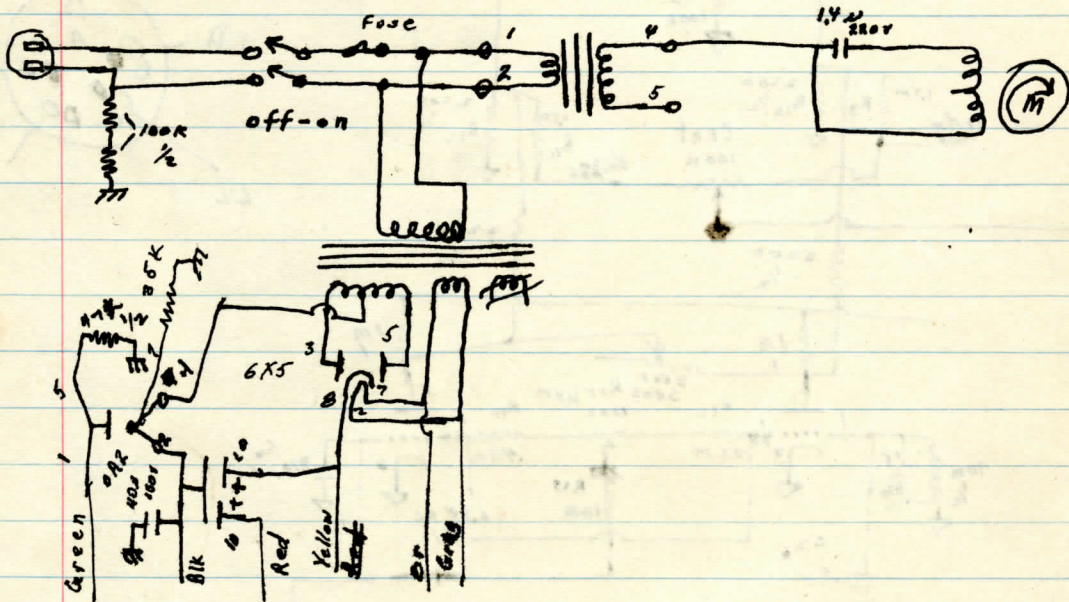
Sanborn EKG cable



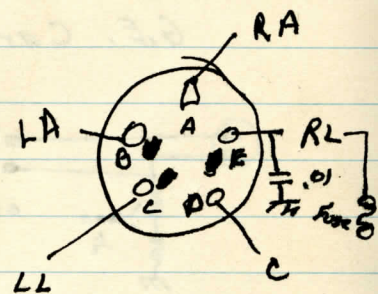
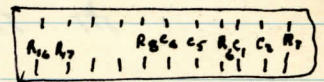
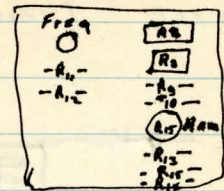
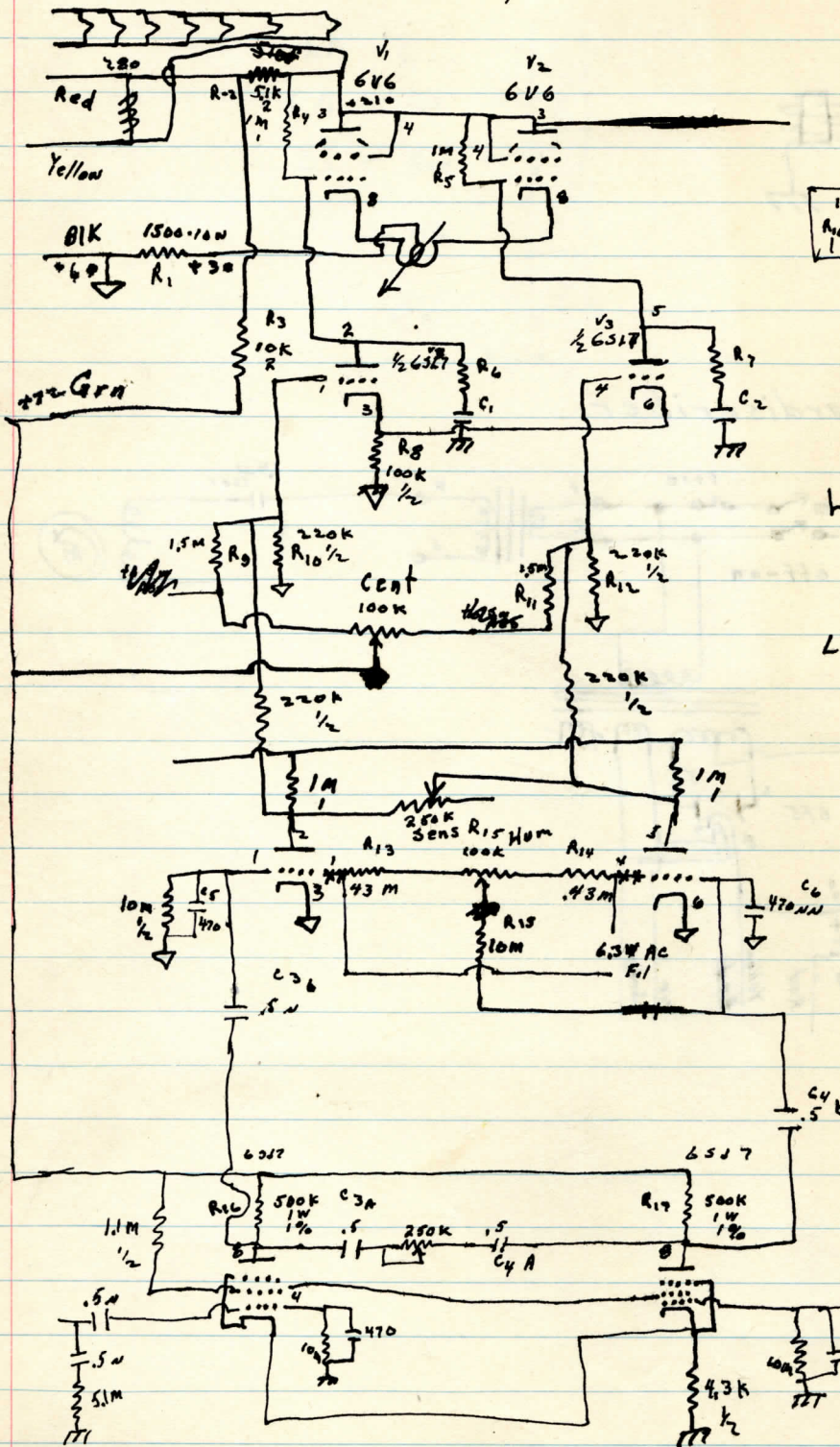
Devise timer for EKG



G.F. Cardiscriber

M
N
O
PW
X
Y
Z

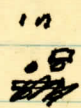
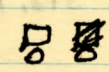
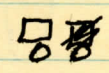
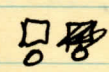
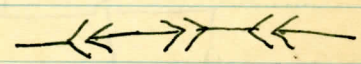
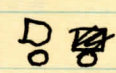
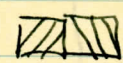
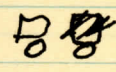
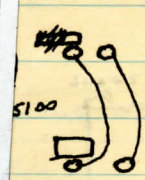
G.E. Cardiscrber Amp.



out

B. Hom

SANBORN VISO-CARDIETTE Perma



N
O
P

W
X
Y
Z

8/17/55

not

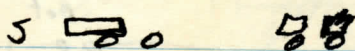
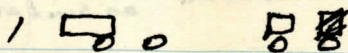
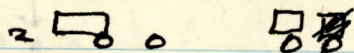
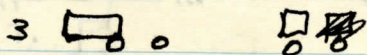
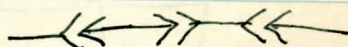
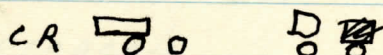
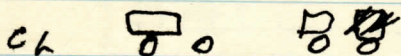
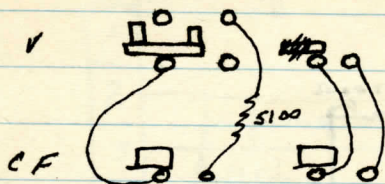
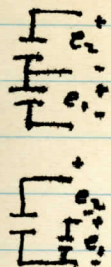
123

42 min

out

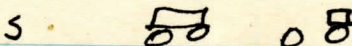
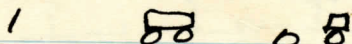
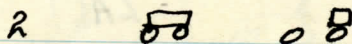
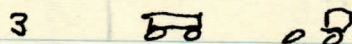
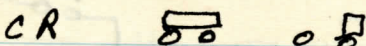
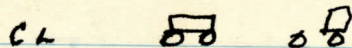
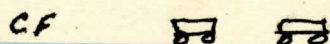
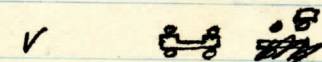
Top

Bottom



in

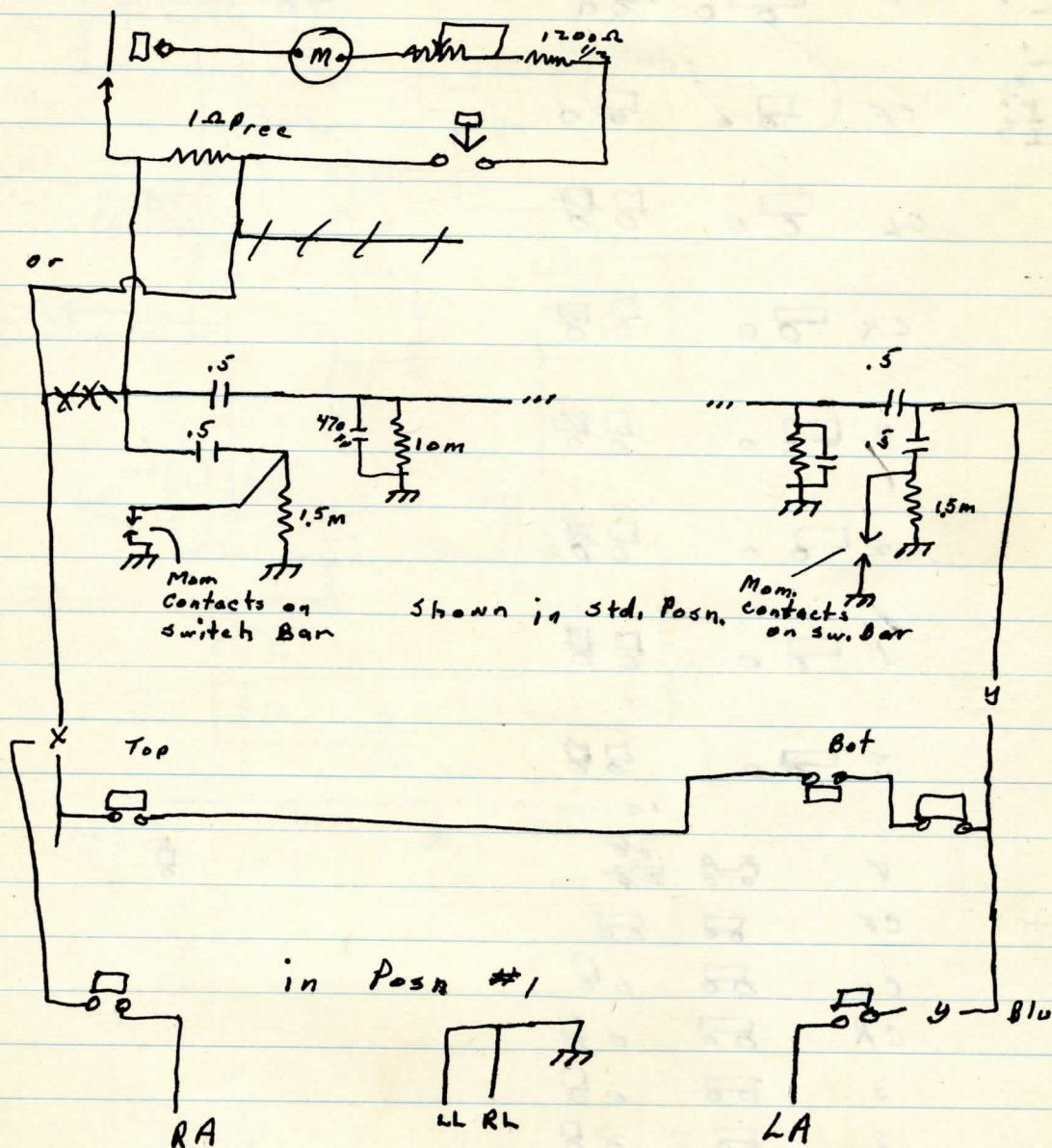
←



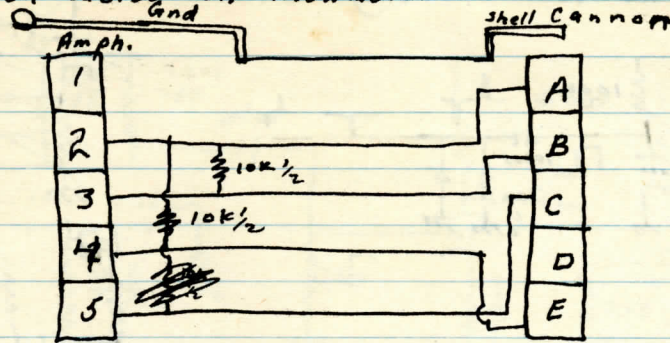
N
O
P

X
Y
7

Calib + Input

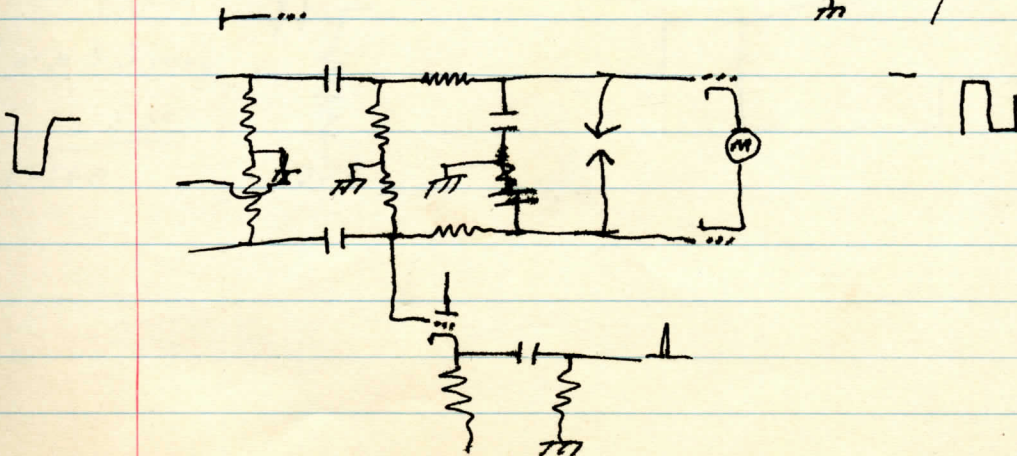
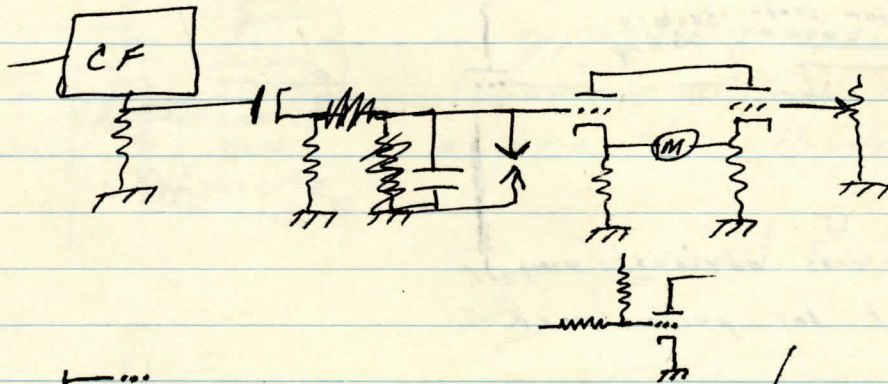
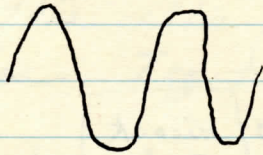


Check cables on Flowmeter

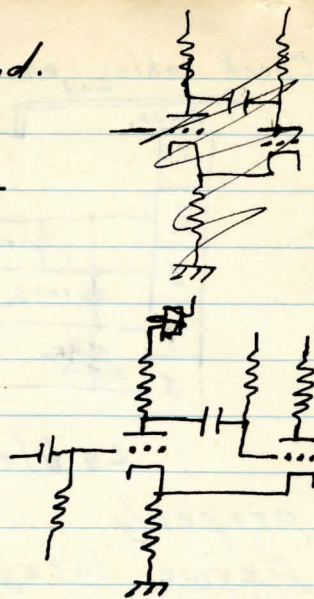
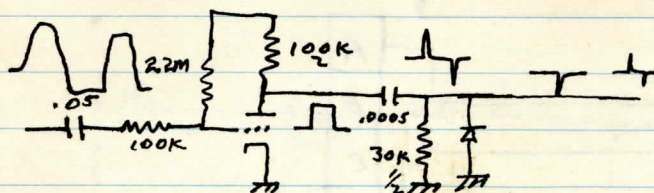


cables was wrong so rewired properly

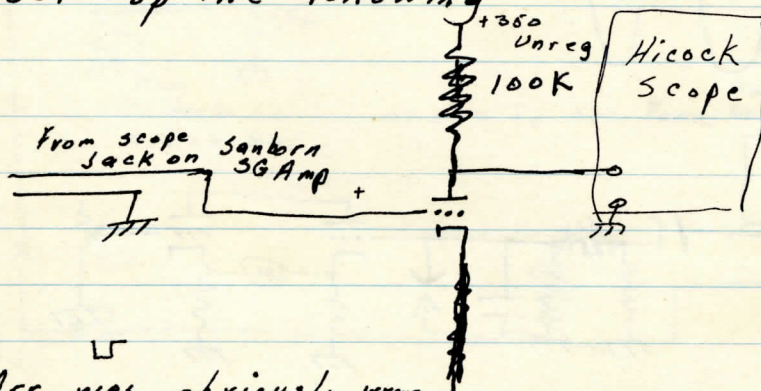
Devise Integrator for Flow meter -



Trigger CKT for shorting cond.



Set up the following



Arr. was obviously wrong
this was meant for pulse work -

291

75
1485

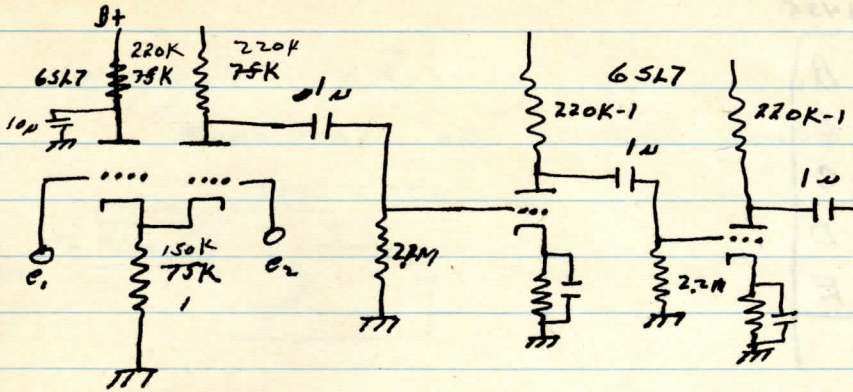
2037
218.25

25
88

605

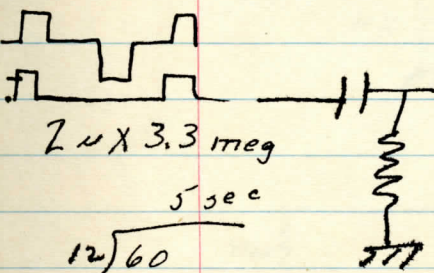
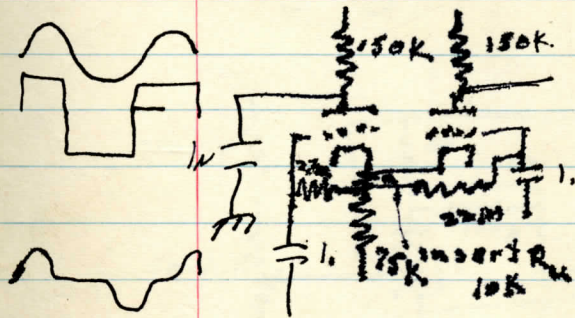
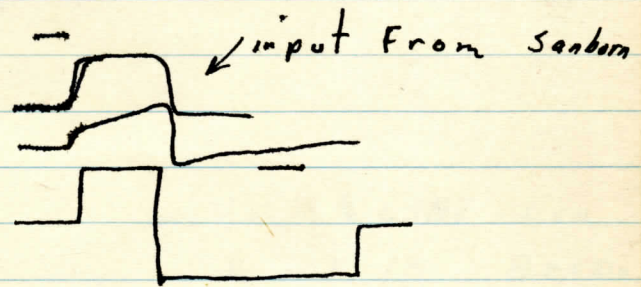
66.65

Integrator for T.V.I.



This ckt did not work. The diff. Amp would not function in this ckt. probably because of incorrect bias - Try this -

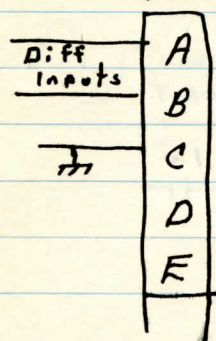
Time const. of this ckt is apparently deficient so the following action occurs on a breath - Under shoot



O
P

N
X
Y
7

Connections on output of Inst. Labo: Pre A.

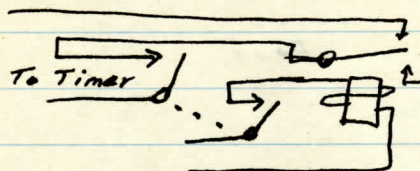


Work on Integrator

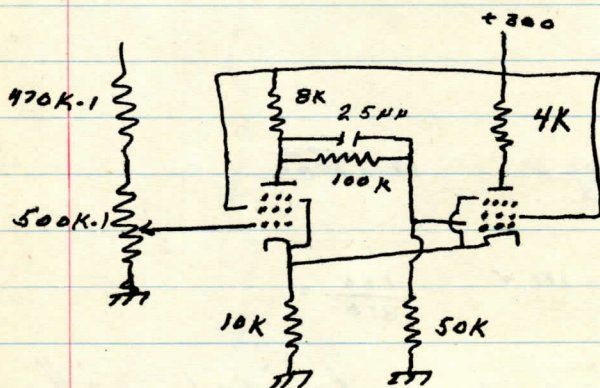
Trigger ckt.

Measuring set up for timing relays

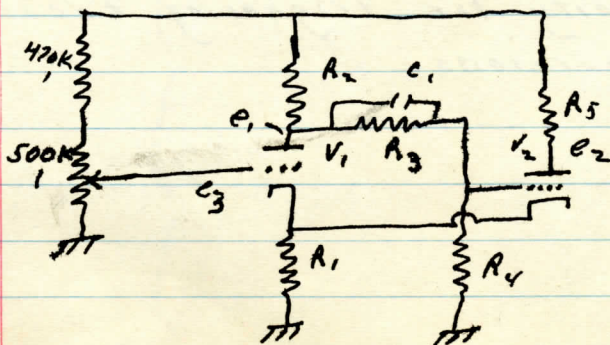
Timer
Was std. Elec
T. S-1



A BK-35 set up as above with $22\frac{1}{2}V$ on coil showed $\frac{9V}{\text{pull in}}$ of .02 sec. there was no significant difference shown by varying spring tension Gap. adj. etc- improved only slightly with 45V on coil-



ckt. for Electronics
Try Triodes



$V_{1+2} \frac{1}{2} 6SN7 \quad C_1 = 0$
 $R_1 10K \quad 1W \quad B+ = 310$
 $R_{2+5} 27K \quad 2W$
 $R_3 220K \quad 1$
 $R_4 100K \quad 1$
 $C_2 - N.C. \quad 310 \quad C - 130$
 $C_1 - N.C. \quad 280 \quad C - 125$

58

Cyelo

310

e₂

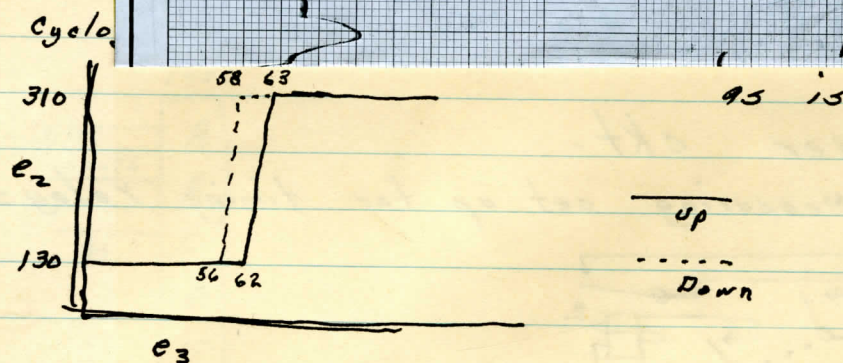
58 63

up

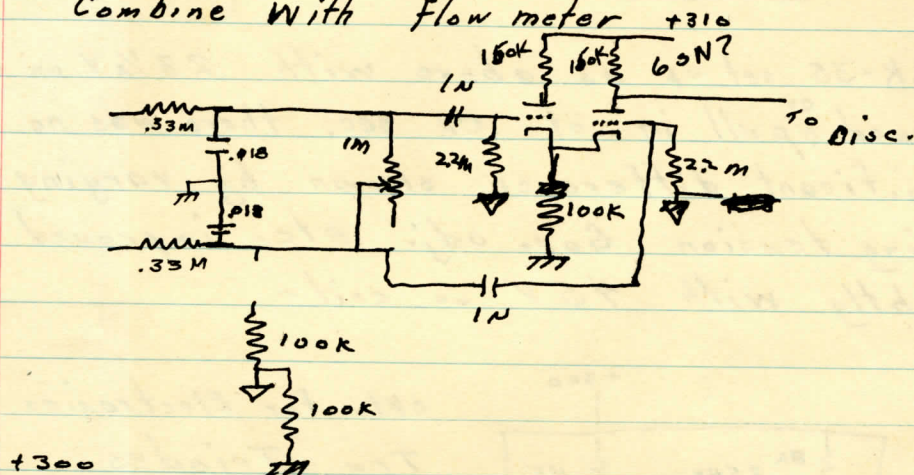
95 15

of 0.61e

CHART NO. 220



Combine With Flow meter



$$\frac{26}{30} =$$

$$\frac{175}{30} = \frac{100}{X}$$

$$1055 \text{ to } 60$$

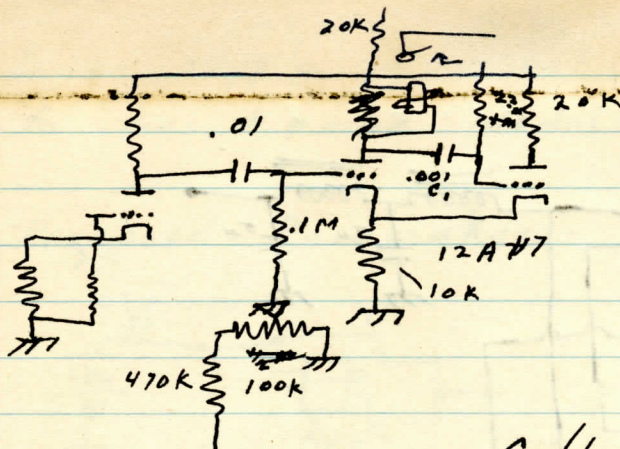
$$\frac{X}{30} = \frac{100}{175}$$

$$171 \text{ V}$$

$$\frac{166}{310} =$$

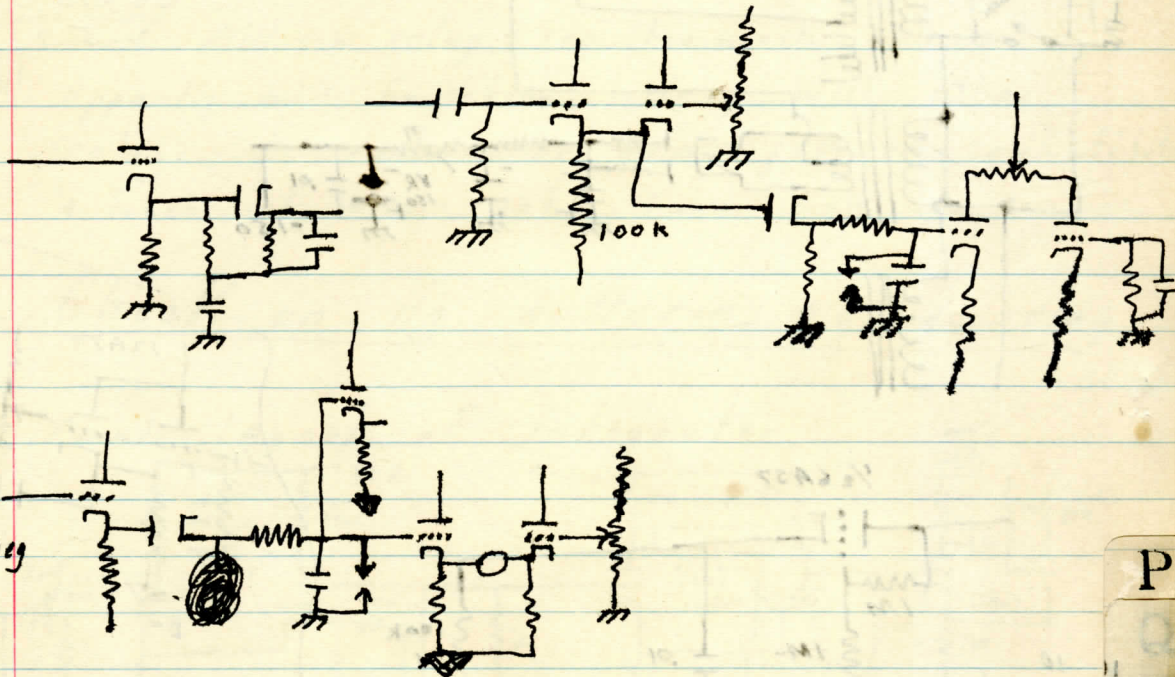
CKT looks good ran some typical patterns
One trouble spot is apparently insufficient
coupling capacity for triggering occurs on
return from large neg. excursions.

Look OK e, should
be changed to
.02 or more



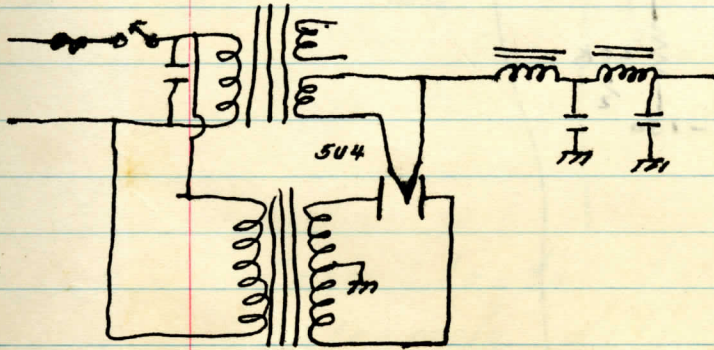
Cathode followers etc.

100 sec
22k
 $1500 \times \frac{.01}{22.5}$



$.015 \times 20 = 300,000$
10wtd 22meg
 $\frac{3 \times 10^2}{22 \times 10^3}$
 $\frac{10 \times 8}{20 \times 10}$
 $\frac{10 \times 3}{3 \times 10}$

Rebuild pwr supply



When shunted
600v open with 10K
CKK - dropped to 400v
 $\frac{4 \times 10}{10^4} = 4 \times 10^{-2}$
shunted with 5K dropped
to 380 -

465-a-465
285ma

P

X
Y
7

490X

$$15 = \frac{E^2}{R}$$

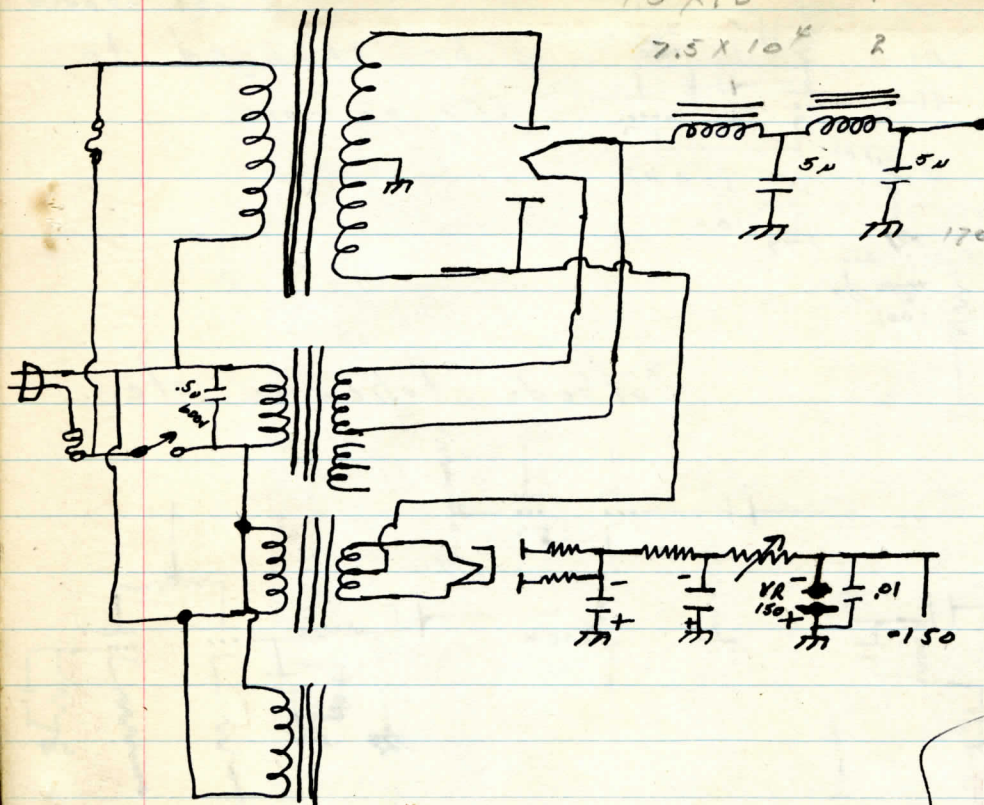
5X15

75X10

$$\frac{30}{170}$$

275
275

$$7.5 \times 10^4 \quad 2$$

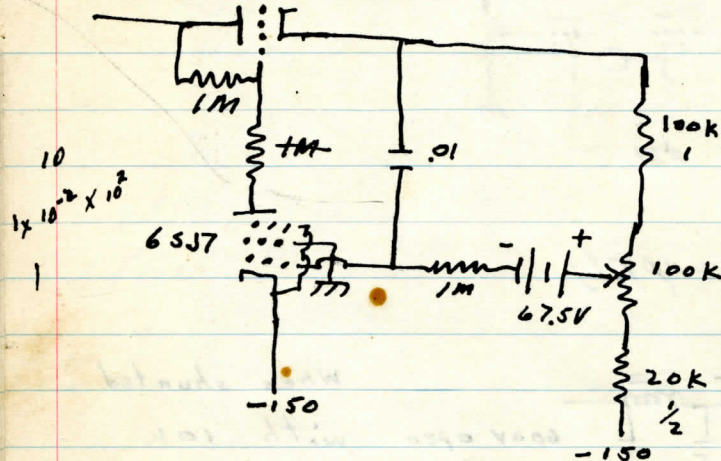


$$\frac{3 \times 10^{-3}}{34} = 8.8 \times 10^{-5}$$

$$\frac{450}{3} \times 10^{-3} = 150 \times 10^{-3}$$

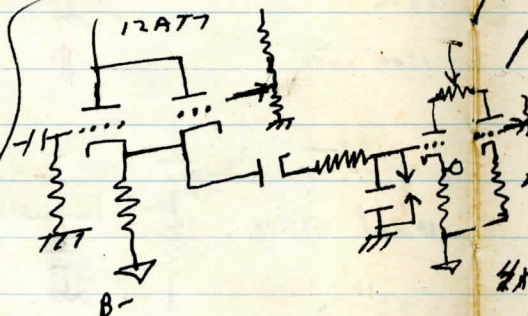
$$\frac{25 \times 10^4}{10^5} = 2.5 \times 10^{-1}$$

1/2 6A57



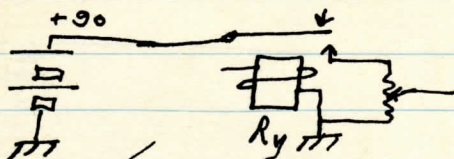
$$\frac{15}{15} = 1$$

$$.03 \overline{) 150.00} = 5000$$



Power supply was rebuilt somewhat similar to Los Alamos model 500 -

Proposed Pacemaker -

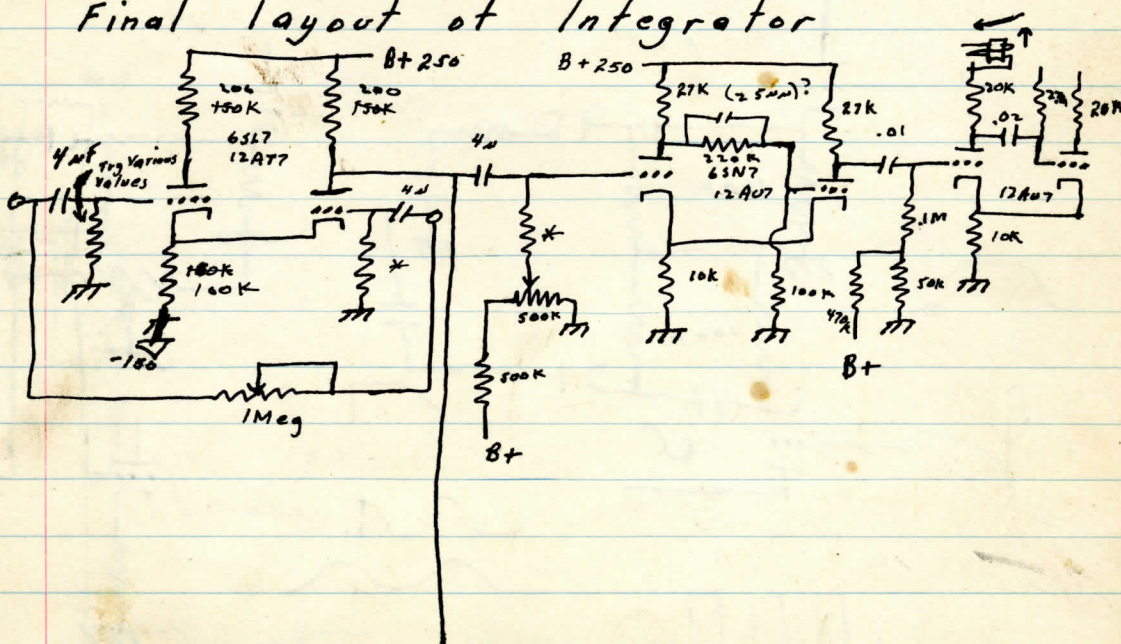


Check on Breadboard
This skt. would not
function with R_y 9

— Millisee relay - req. too much current -
Apparently will function nicely with other
relays - A radiosonde ~~event~~ job. was substituted
& functioned well - make time may be long -

Check on Hg. batteries + good relay

Final layout of Integrator



From tests it will apparently be extremely difficult to transfer the double ended output into single

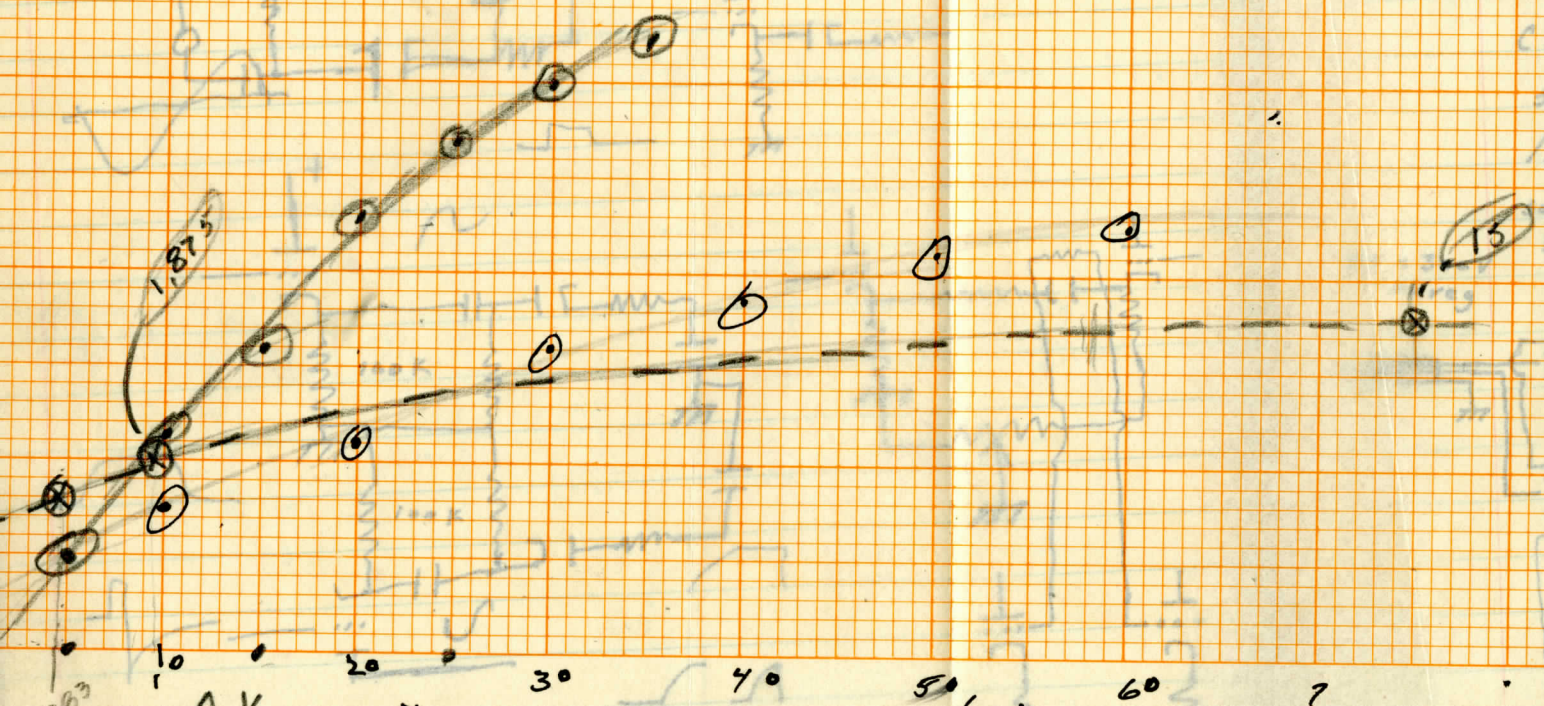
18 sec (Time 20) sec for $\frac{\Delta V}{\Delta T}$

$\Delta V = 10$ mV

1 sec Aug 25

Linearity Check of Integrator MKI

- Defl vs Vol. displ.
- Defl for Vol/c vs $\frac{\Delta V}{\Delta T}$

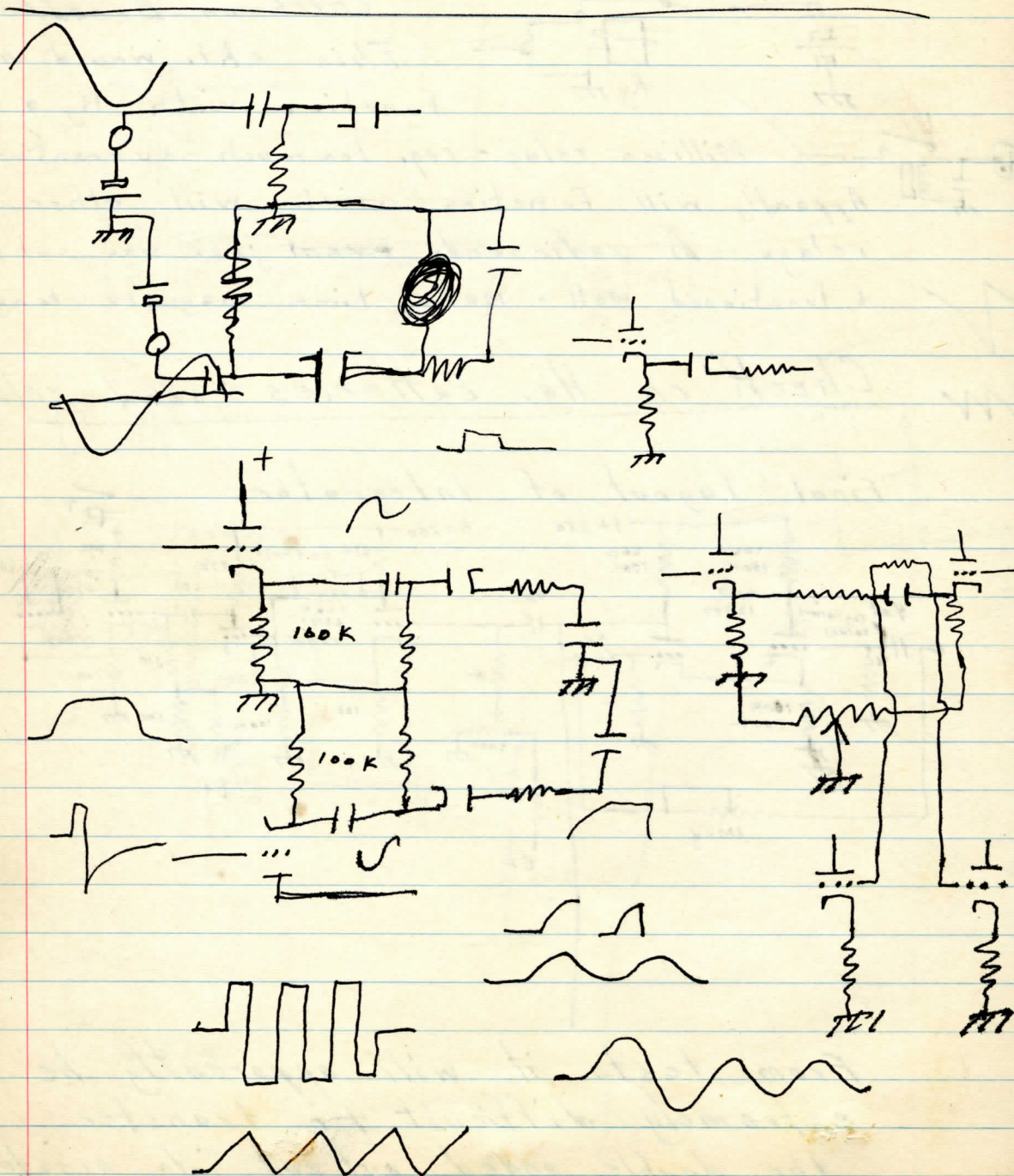


Notes on Defib.

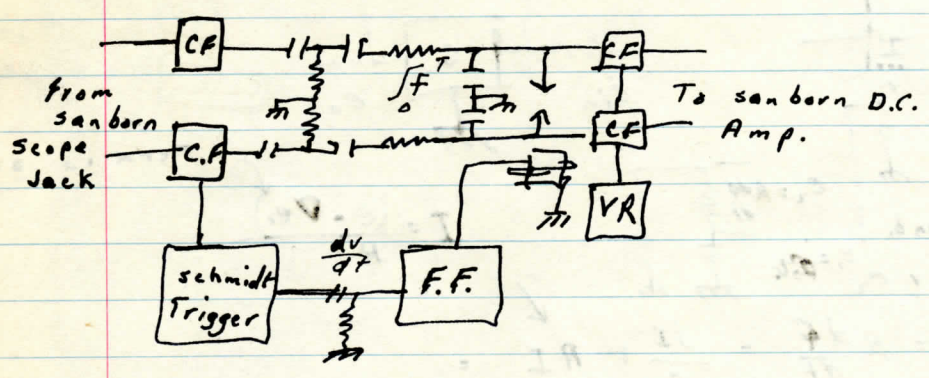
Min Times ≈ 0.2 to 1 sec with 60V

Act. times 1 to .5 sec

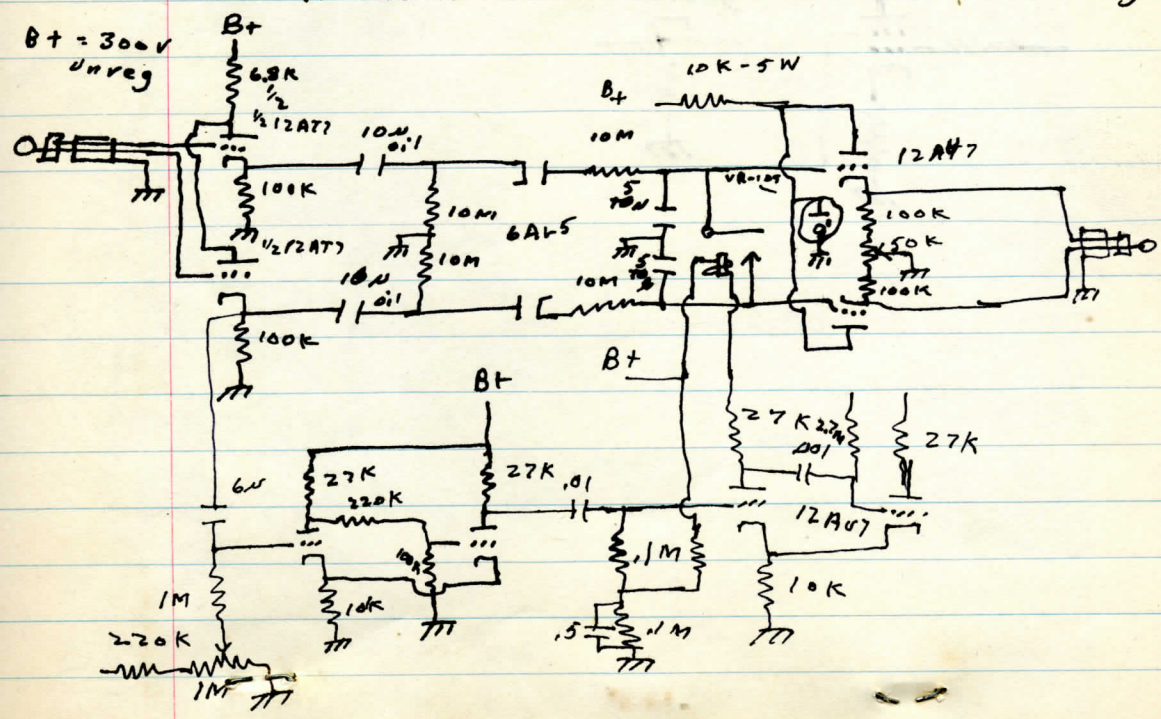
Min energy 4 Joules



From Aug 25 - 30 continued work on
 integrator as outlined below + finished
 A crude model (MK-I) + tested it briefly Aug 30



CKT looks good performance-wise - chief
 sources of trouble appears to be cap.
 leakage + time consts. See graph
 some trouble with schmidt - Trouble with relay



Q
R
S
T
U
V
W
X
Y
Z

CHART NO. 220

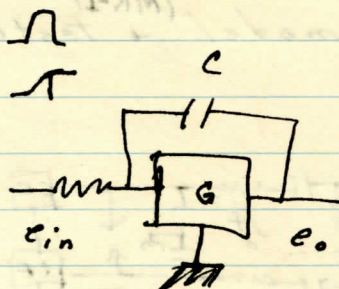
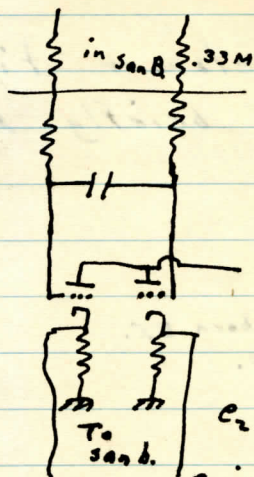
SANBORN POLY-VISO Permapaper

MK I integ
8/29/55

OSC V
V: 0.2

2
1

Another possible config. for recording integ.

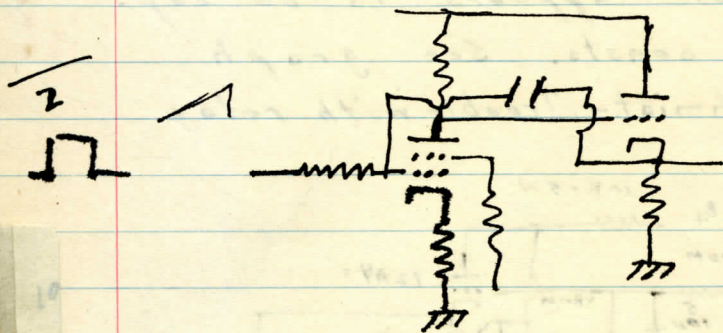


Term is small

$$I = \frac{(e - \phi e_i)}{R}$$

$$e = \frac{\phi}{C} + R \frac{d\phi}{dt} = \frac{\phi}{C} + RI$$

$$e_t = \frac{\int e}{C} = \frac{1}{RC} \int e$$



Calib. check of L.B. CO₂ Anal. (Micro Catheter

C.G.	FG	Warmed up for 2 or 3 hrs.
94-opre	7	Max Gas had been warmed for 2-3 hrs.
94-Neg-	.2%	units 4 3 in H ₂ O made no difference
"	3	in reading
"	3	
"	3	All readings were made at atm. press.
"	3	Cell was rezeroed before each reading

2.5% — 44	} 44	7.5% — 83 units	} 82
2.5% — 44		" — 83 "	
" — 44		" — 82 "	
" — 44		" — 81 "	
" — 43		" — 82 "	

5.5% — 71	} 71	10.5% — 95 "	} 95
5.5% — 72		" — 96 "	
" — 71		" — 96 "	
" — 71		" — 94 "	
" — 71		" — 95 "	

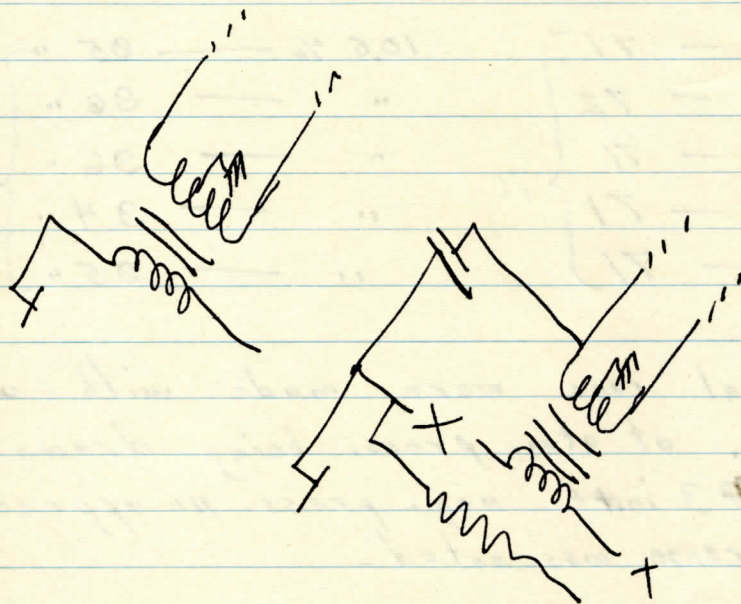
Several runs were made with above concs. at atm. press. being drawn through by 3 inst neg. press. no appreciable difference was noted.

Calib. Ck. of CO_2 Anal. same conditions as before except for warmup time of 6 or 7 hrs.

	Scale Units		
2.5 %	43	7.5 %	85
"	44	"	84
"	43 43	"	85
"	43	"	84
"	43	"	86

85

5.5 %	72	10.5	96
"	72	"	94
"	72	"	95
"	72	"	96
"	72	"	95



1030
7/23 Calib. ch of CO₂ Anal. Same Conds. as 7/21
except for meter W/O Time of ≈ 1 hr
gas warming time of ≈ 12 hrs.

2.5 %	41	} 44	7.5 %	84	} 83
"	44		"	83	
"	44		"	83	
"	43		"	83	
"	44		"	83	

5.5 %	70	} 71	10.5	97	} 96
"	70		"	96	
"	71		"	97	
"	71		"	96	
"	72		"	96	

0.2 %	- 3	} 3
"	- 3	
"	- 3	
"	- 3	
"	- 3	

2.5 - 44 } 44 75 82-83-85-86
43 }
44 }
5.5 71-72-71 } 71 10.5 96-95-95-95

R
S
T
U
V
W
X
Y
Z

1430

7/23 ck. of L.B. Conditions same as previously except both instr. + gas had been warmed since prev. run -

.2%	3	3	5% 68	67	10.5% 92	92
.2%	3		5% 67		10.5% 91	
.2%	3		5% 67		10.5% 91	
.2%	2		5% 67		10.5% 92	
.2%	3		5% 67		10.5% 94	

2.5%	39	40	10.5% 80	80
2.5%	41		7.5% 10.5% 80	
"	41		10.5% 80	
"	40		10.5% 78	
"	40		10.5% 78	

7/23 1510 same as prev. except for clearing case of CO₂

		5.5% - 84	10.5% 96
.2%	4	5.5% - 73	10.5% 96
.2%	3	5.5% - 73	10.5% 96
.2%	3	5.5% - 72	10.5% 96 Max Gain .2% 6
2.5%	- 46	7.5% 84	
2.5%	- 45	7.5% 84	
2.5%	- 46	7.5% 84	

beck of M.C. EEG.

WK-6-216 - 5/16"

beck

12.34 9.09 1% 9.09 to ~~9.87~~ 8.91

of Nerve latency

loc. 200 cps

10 cps + 1 millisecond & 2 sec
above except F-2.8 $\approx$ 2 sec

4 2 sec lights out
-8 2 sec "

arity Check. of Flowmeter -
Poly-Viso & SG Amp # 557
tube # B 4-27-10/70 G

CO₂

12/2/55
Poly-Viso Flowmeter

10/24 Response Check of M.C. EEG.

Statham Conn. WK-6-216 - 5/16"

Resistance check

10 $\frac{1}{2}$ W Res 12.34 $\pm$ 1% 9.09 to ~~3.8~~ 8.91

11/22/55

Record of Nerve latency

#1 F-4

A- time fiduc. 200 cps

3) exc @ 10 cps + 0.1 millisecond $\approx$ 2 sec

B- same as above except F-2.8 $\approx$ 2 sec

C- " F-4 2 sec lights out

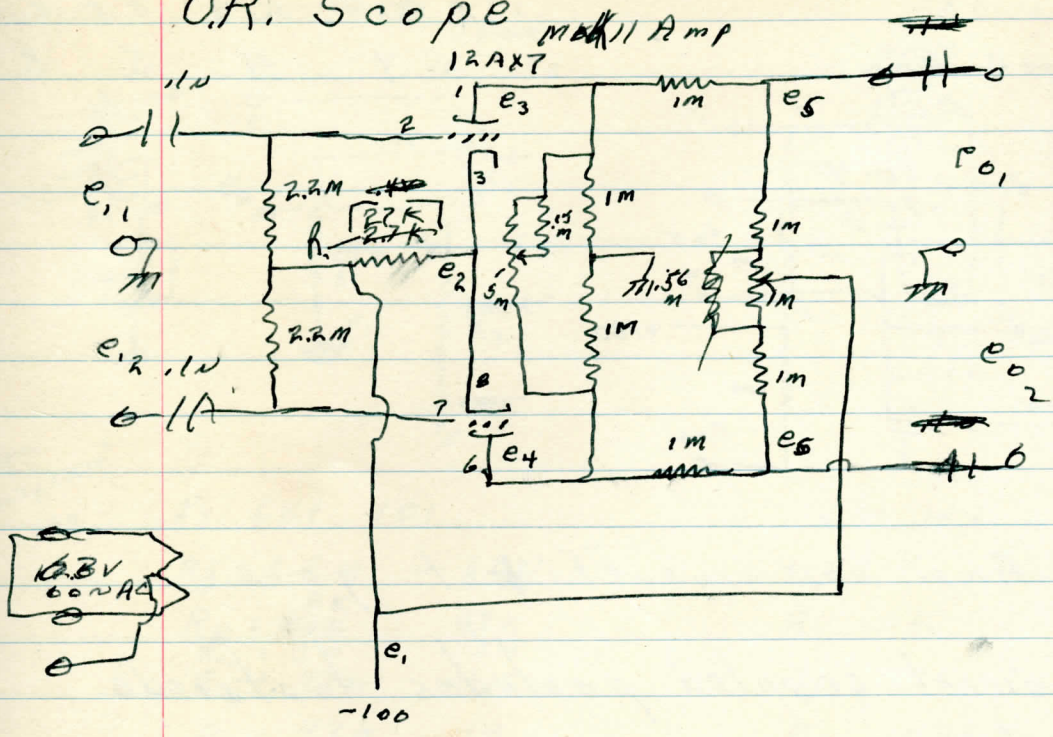
D- " F-8 2 sec "

12/2/55 Linearity Check of Flowmeter -

Sanborn Poly-Viso & SG Amp # 557

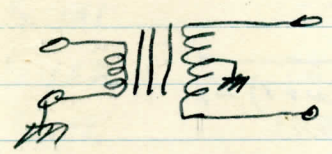
Flowrator tube # B 4-27-10/70 G

O.R. Scope



Gain — D.C. Volts. —

input —



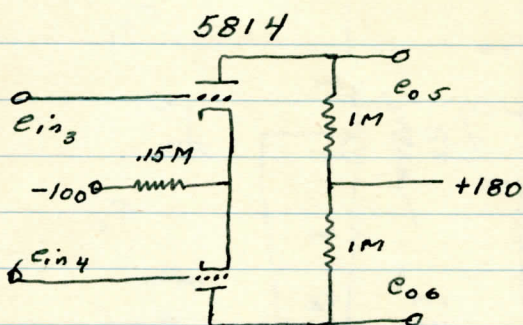
error

	e_1	e_2	e_3	e_4	e_5	e_6	e_{in}	e_{out}
No Sig	-98	97.6	85	85	94.2	94.2	Gain Max .1	.1
R ₁ should be 27K reran it —								
No Sig	-97	-94-65	-64	75	75	Gain Max .1	.1	.4 .4

S
T
U
V
W
X
Y
Z

MK 12 Amp.

e_{in3}	e_{in4}	e_{o5}	e_{o6}
.4	.4	5	5



This Amp. has insufficient gain

Try direct coupled pentodes to a triode output—

$$\text{Pentode Gain} - A = - \frac{g_m Z_L}{1 + g_k Z_k} \quad g_k \approx g_m \left(1 + \frac{I_{g2}}{I_p} \right)$$

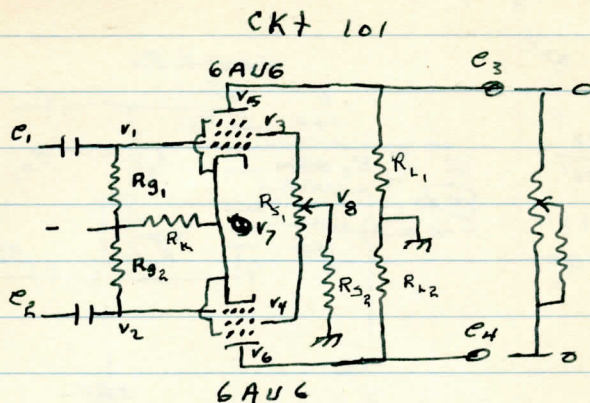
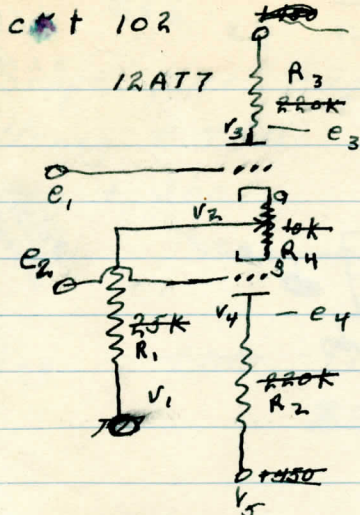
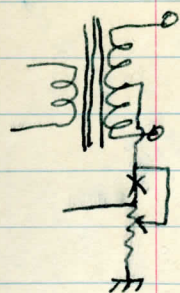
$$\text{Triode Gain} - A = - \frac{\mu Z_L}{Z_L + R_p + (\mu + 1) Z_k}$$

Pwr. supplies For Scope
 + 450 unreg
 - 200 reg + - 120
 + 200 reg

$$m = 3 \times 10^{-3}$$

$$3.7 \times 10^{-3}$$

$$.33 \times 10^{-3}$$



$$103 \times 22 \times 10^6 = 220$$

Ex. CKT 101

$R_g = 2.2 M$	2.2 M
$R_k = 1.8 K$	4.7 K
$R_{g1} = .1 M$	.1 M
$R_{g2} = .47 M$	1 M
$R_1 = .47 M$	1 M
$V_1 - 227$	-228
$V_2 - 227$	-228
$V_3 - 161$	-150
$V_4 - 161$	-150
$V_5 - 152$	-150
$V_6 - 152$	-158
$V_7 - 225$	-225
$V_8 - 148$	-145
$C_1 .1 \mu$	.1
$C_2 .1 \mu$	.1
$C_3 15 V$	16 V
$C_4 15 V$	16 V
$A = 150$	

CKT 102

$R_1 92 K$	
$R_2 10 K$	
$R_3 450 K$	
$R_4 150 K$	
$V_1 - 228$	
$V_2 - 150$	
$V_3 + 230$	
$V_4 + 230$	
$V_5 + 370$	With $R_{g4} - 220 K$
$C_1 5$	$E_0 = 250 V$
$C_2 5$	$A = 25 + sat.$
$C_3 100$	at 27 310 out
$C_4 100$	
$A = 20$	
saturates at 200V	
out -	

$$3 \times 10^3$$

Looks Good

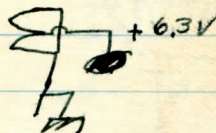
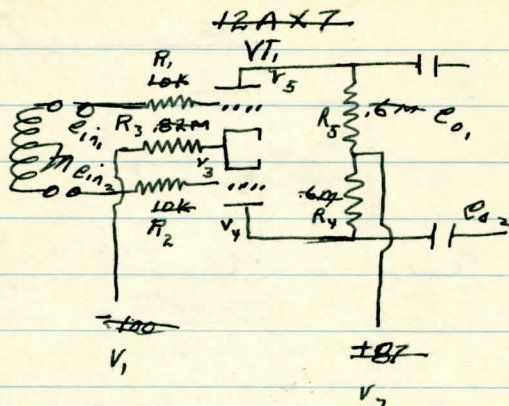
$$3 \times 10^3 \quad 9 \times 10^6$$

$$\frac{3}{6 \times 10}$$

$$\frac{1}{2} \times .5 \times 10$$

$$\frac{5 \times 10}{3 \times 10^3} = 2 \times 10^{-2} = .02 = 20$$

$$\frac{3 \times 10^4}{10^2} = 3 \times 10^2 = 30$$



$$\frac{900}{5 \times 10^6} = 2 \times 10^{-3}$$

$$V_1 - 100$$

$$V_2 + 100$$

$$V_3 + 915$$

$$V_4 + 50.$$

$$V_5 + 52.$$

$$R_{1,2} = 10k\Omega$$

$$R_3 = .47M$$

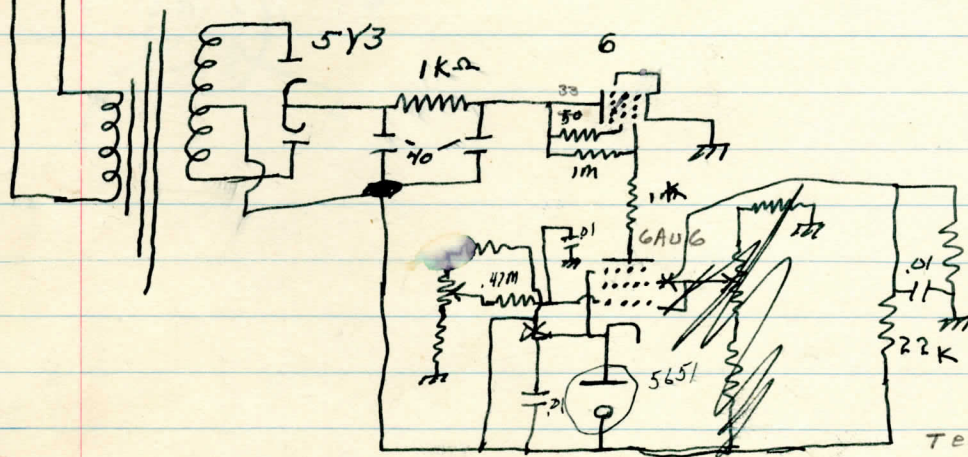
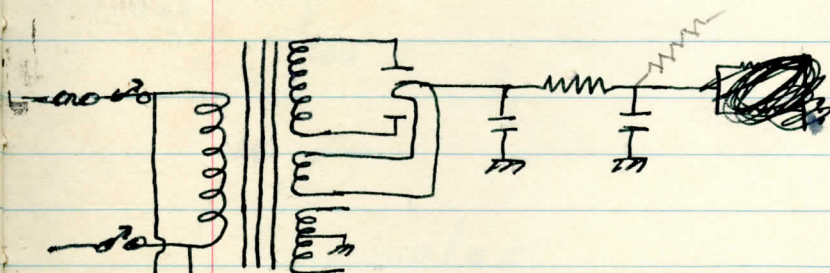
$$R_{4,5} = .47M \text{ matched}$$

$$e_{o1} = 4.8V \quad A = 1$$

$$e_{in1} = .1V$$

Scope pwr Supply
Unreg + 450
Reg + 300

Reg — 200 — 175
" — 88



250	175
175	33
75	525
	5775
250	33
175	X
	23
250	5775
	500
	775

Tests, run with
6K6/GT

Check Regulation + Ripple

5V drop when shunted with 10K res.

or int. res = $\frac{E}{I} = \frac{5}{2 \times 10^{-2}} = 2.5 \times 10^2 = 250 \Omega$

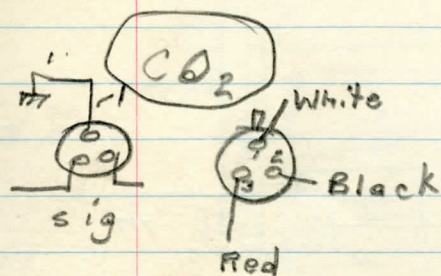
ripple @ 20 ma = .1V x $\frac{1.5}{10} \text{ div} = .05 \text{ Volt}$

T
U
V
W
X
Y
Z

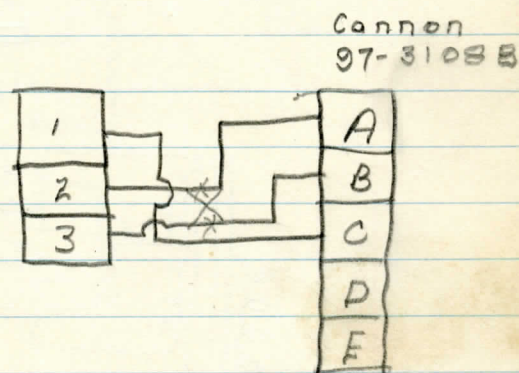
Offner pen length - 4.5"

Connections for Offner
CO₂ -

Flowmeter -

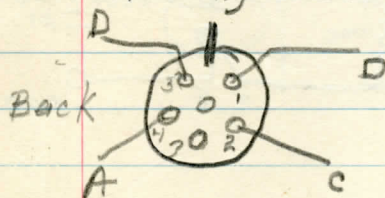


1 - C
3 - B
2 - A

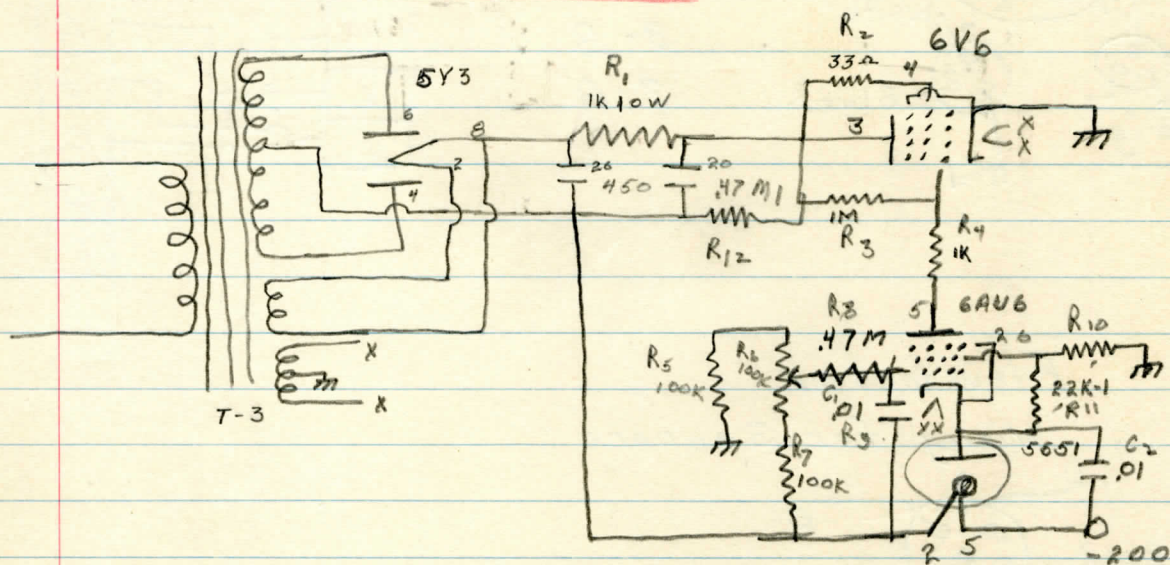
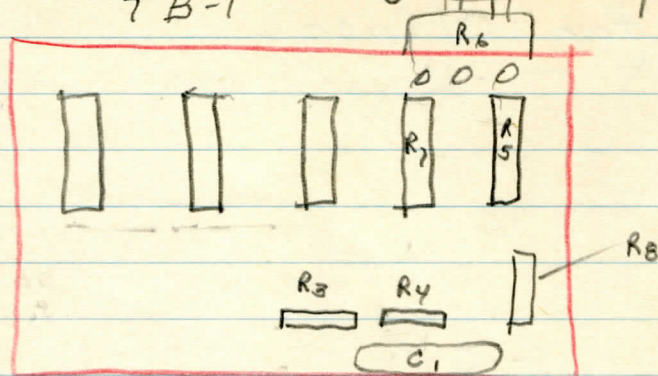


Flowmeter

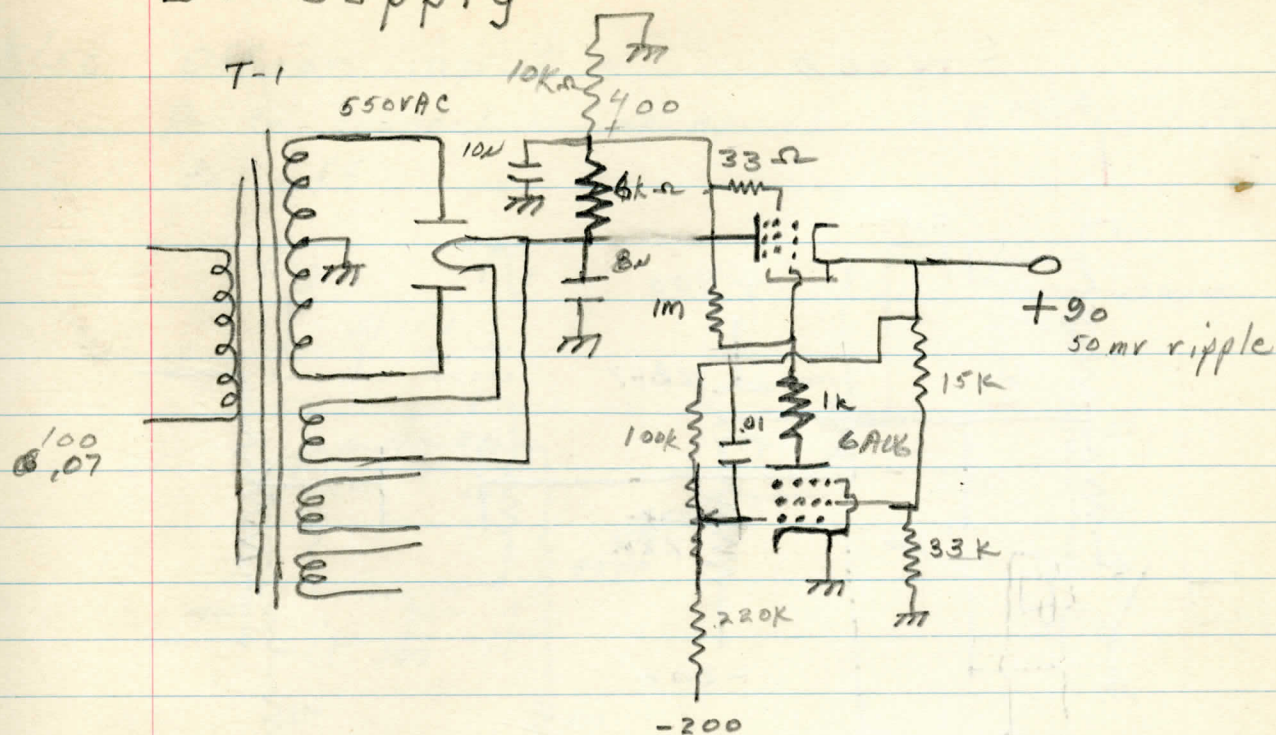
Wiring for Sanborn



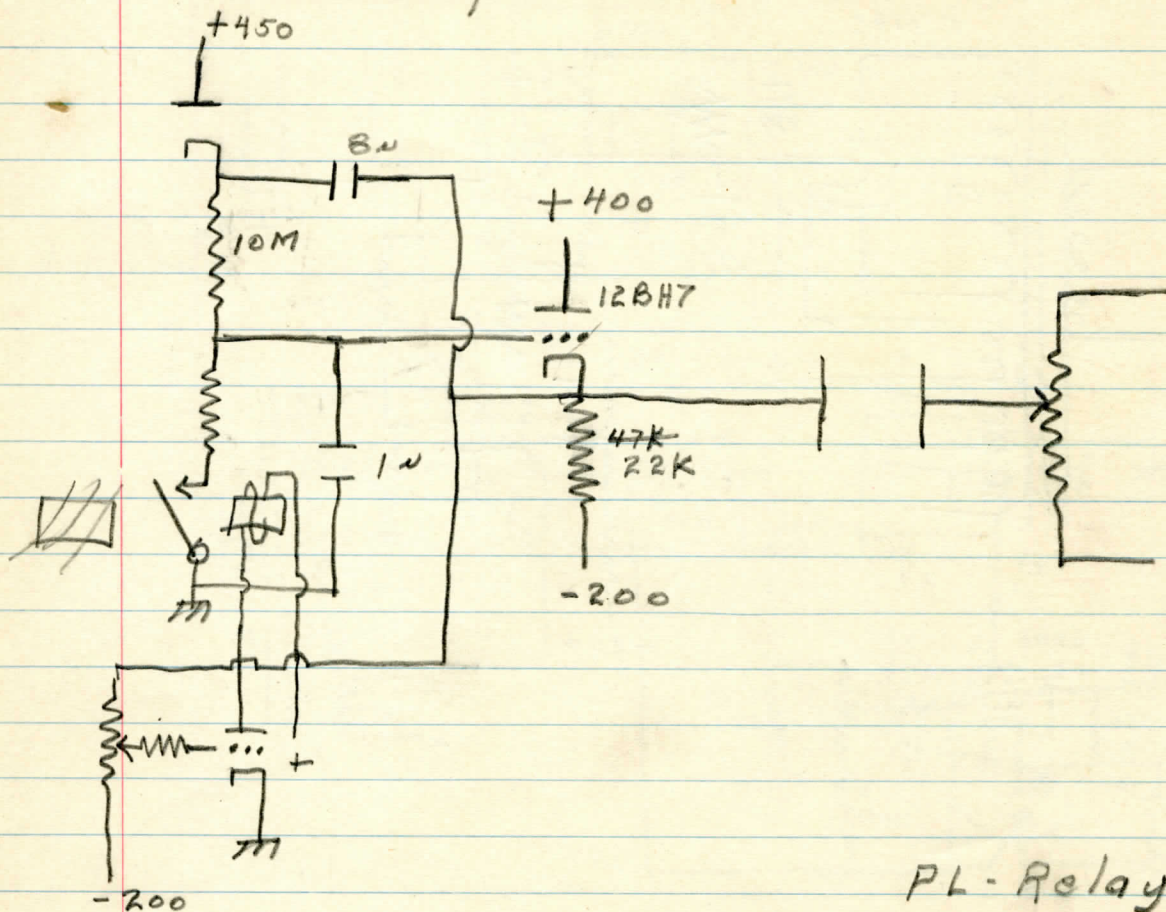
TB-1 Neg Pwr supply



B + Supply

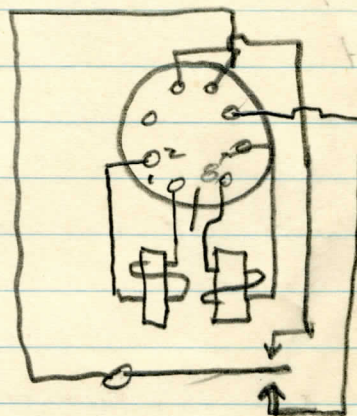


Sweep



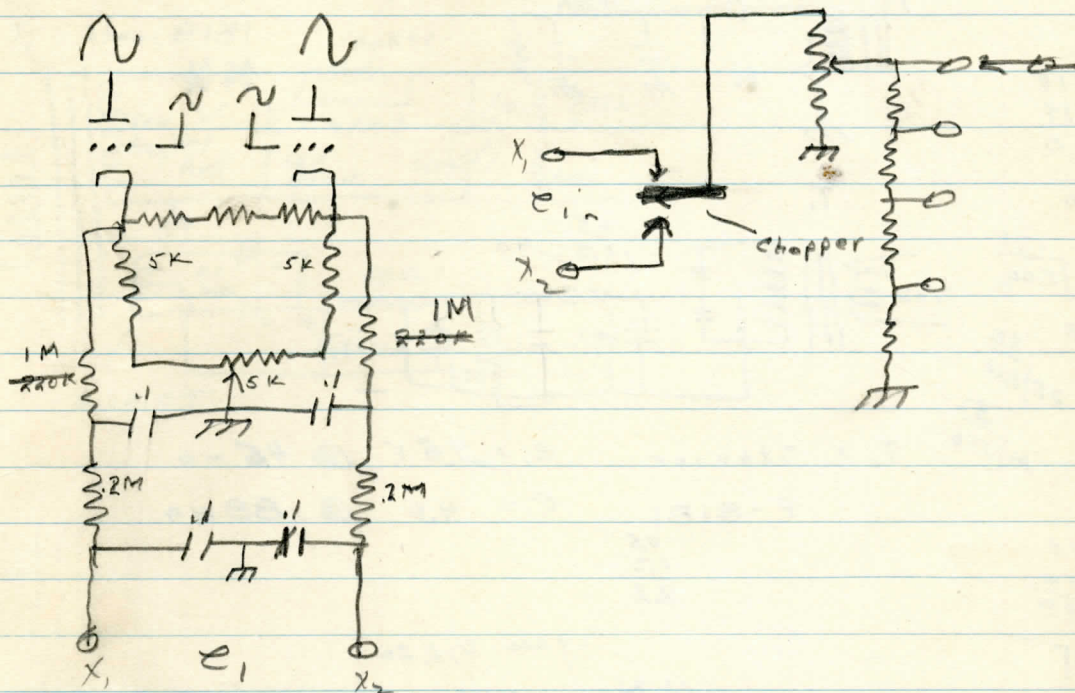
PL-Relay

$$\frac{9 \times 10^4}{1.5 \times 10^4} = 6$$

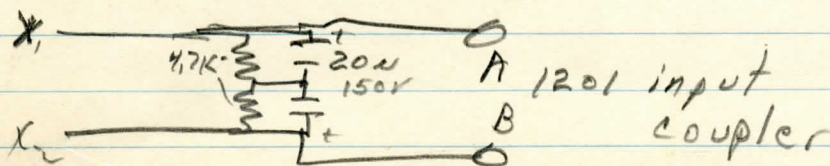


1/5/56 Offner input -

P. to connect hi. imp. op. of L.B. CO₂ Analyz. to off.



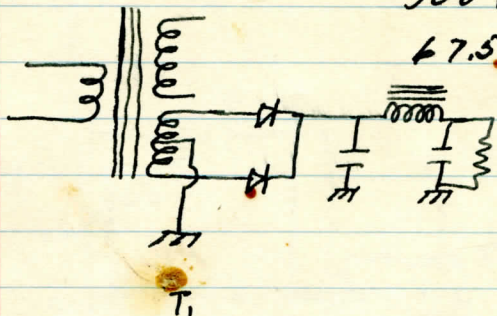
Excessive noise with this ckt -
 With Mult. @ X10 & Eq. Max noise from
 CO₂ (off) was 15mm - Off. guided.
 Had equiv. noise w. meter on @ X200 -
 This type of coupling is extremely susceptible
 to noise - try C.F.
 simplest arrangement seems to be the
 following



Build isolated 1.3 V. power supply 40 mA.

900 V @ 25 mA

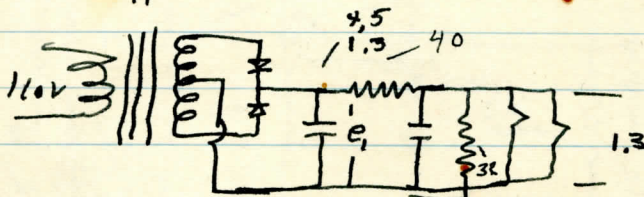
67.5 V @ 250 mA



$$\begin{array}{r} 15 \\ 14 \\ \hline 60 \\ 15 \\ \hline 210 \end{array}$$

$$.04 \overline{) 5.00} \begin{array}{r} 125 \\ 5.00 \end{array}$$

$$\begin{array}{r} 40 \\ 28 \overline{) 320} \\ 82 \\ 4 \overline{) 136} \end{array}$$



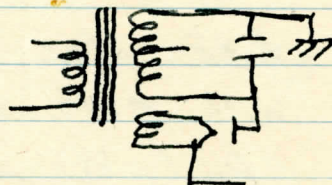
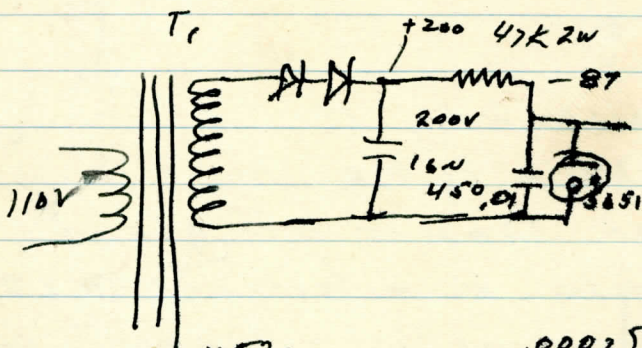
$T_1 = \text{stancor}$ $e_1 = 4.5 \text{ V. @ } 45 \text{ mA}$

P-8181 $e = 4.4 \text{ @ } 88 \text{ mA}$

$$\begin{array}{r} 4.5 \\ 1.3 \\ \hline 3.2 \end{array}$$

$$\begin{array}{r} 200 \\ 87 \\ \hline 113 \end{array}$$

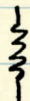
$$\begin{array}{r} 470 \\ 150 \\ \hline 620 \\ 14 \end{array}$$



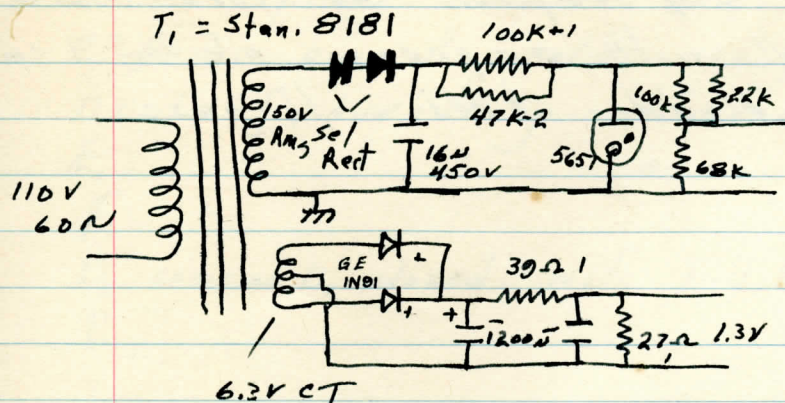
$$\begin{array}{r} 45260 \\ .0025 \overline{) 113.0000} \\ 100 \\ 130 \\ 125 \\ \hline 50 \end{array}$$

$$\begin{array}{r} 435000 \\ .0002 \overline{) 87.0000} \end{array}$$

$$1 \times 10^{-3} \times 10^2 = 82 \times 10^0$$



Set up T.R. Lab. Mod SUSA Survey meter as follows - apparently functions o.k.



CO₂ det. with L.B. + Offner

Calib. with CO₂ samples ~~by~~ thru micro-
catheter cell with a press of 3-4 cm H₂O
from rubber bladder filled with gases

11 Diff. in flow pattern

- A. Breathing on mach. closed sys. No res.
 B. " " " Semi " " 3L flow
 . W spring loaded exp. valve.
 C. Same as B with weight loaded valve
 D. Jeff, breathing closed sys.
 E. " " semi " " with leak @ mach
 F. " " " " " " @ mach -
 D₂ same as D₁ closed with full bag -
 E₂

V

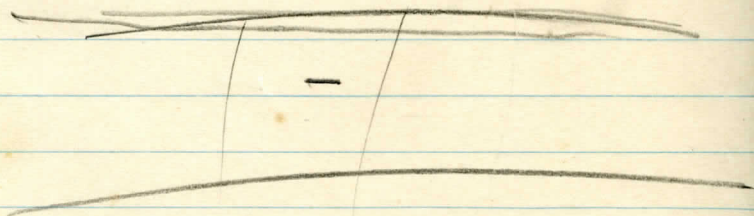
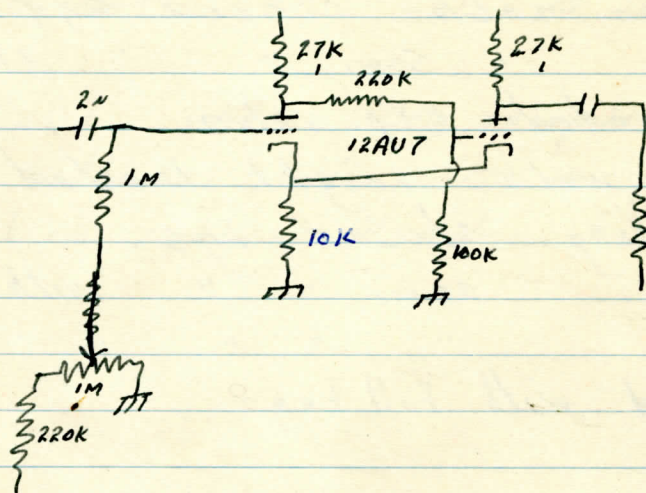
W

X

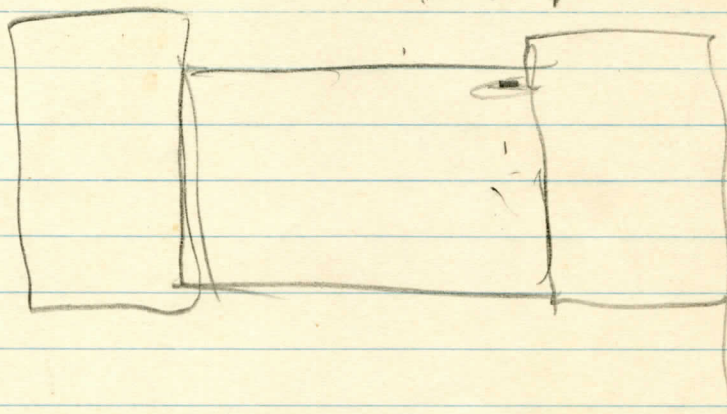
Y

7

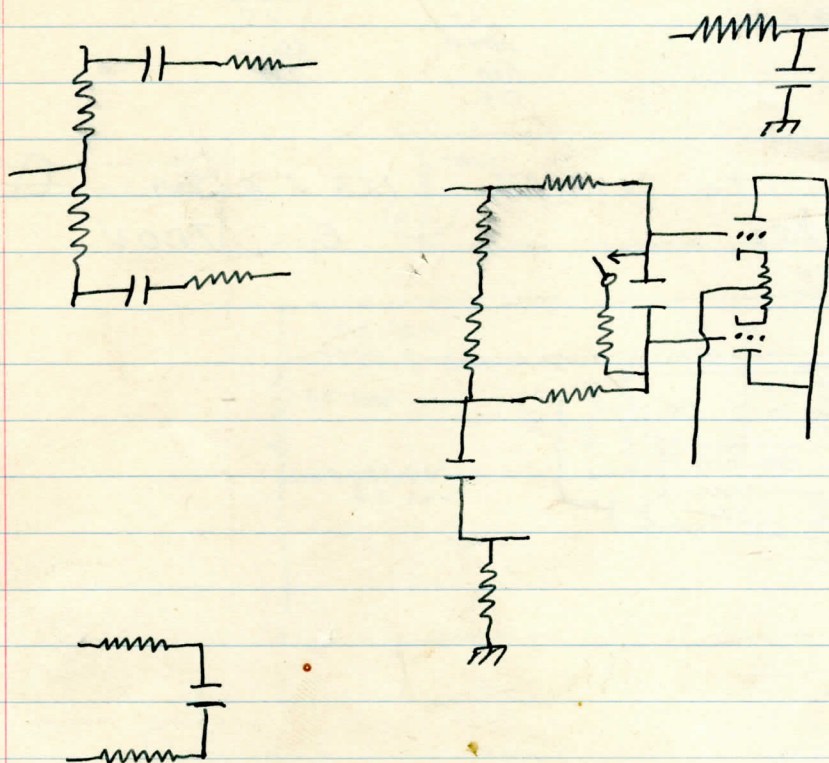
Trigger for $\int -$



$$F = eV$$

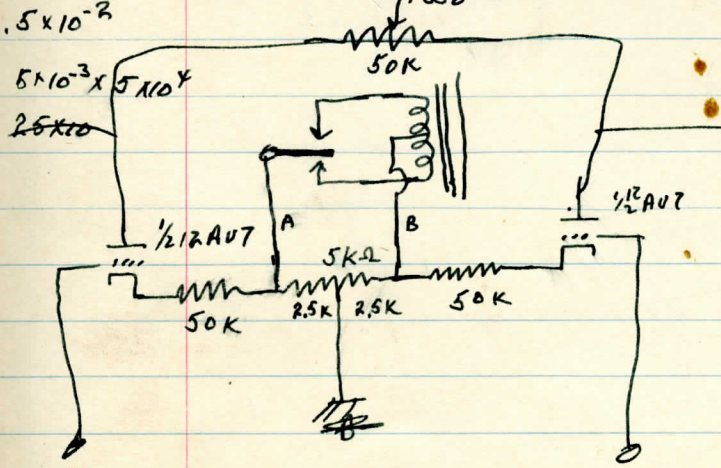


Integrator for Use with Sanborn

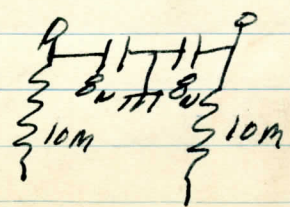
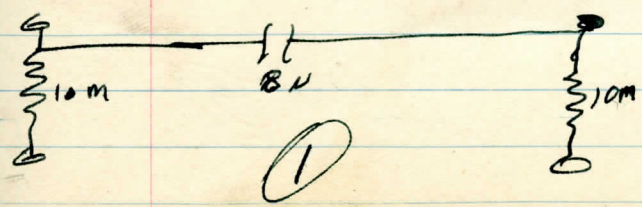


$\frac{25 \times 10^2}{5 \times 10^4}$
 5×10^{-2}

Cathode Follower to match Offner input



Works nicely
 Added ① to it but
 had slow drift which could
 not be bal. out - changed
 to ② & app. O.K. -



PM84/8 Pwr Trans-

#1 510 V.A.C. out

$$\begin{array}{r} 510 \\ 1.4 \\ \hline 2040 \\ 510 \\ \hline 714 \end{array}$$

$$\begin{array}{r} 1.5 \\ 1.4 \\ \hline 20 \\ 15 \\ \hline 220 \end{array}$$

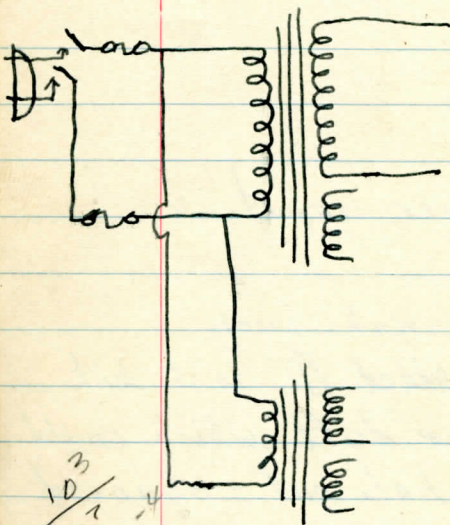
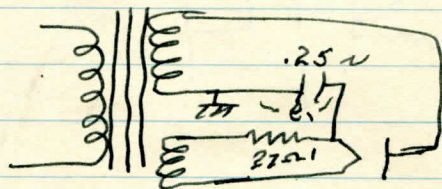
$$\begin{array}{r} 5 \\ .2 \\ \hline 1.0 \end{array}$$

$$\begin{array}{r} 6.3V \\ 1.25 \\ \hline .2 \end{array} \begin{array}{l} f_0 \\ 25.2 \\ 5.05 \end{array}$$

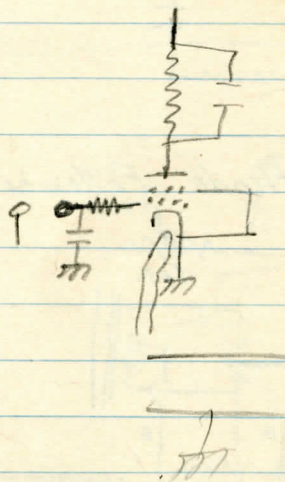
1x2 fil

125 V @ .2 A

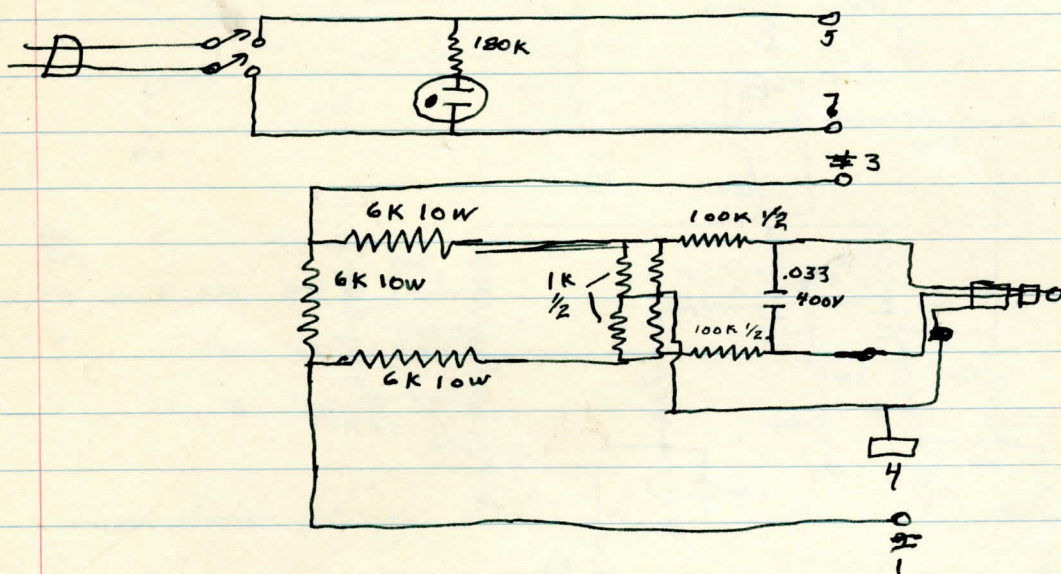
$C_1 = 700V$

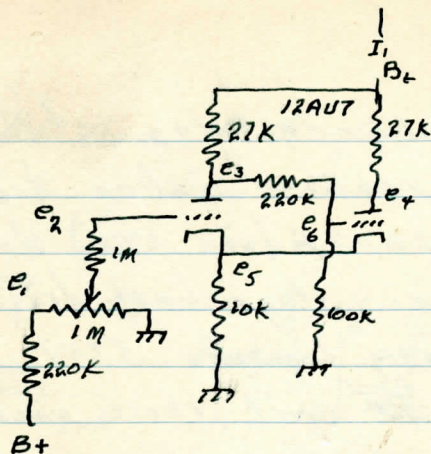


$$\begin{array}{r} 3 \\ 10 \\ \hline 10^3 \\ 10^4 \\ \hline 10^{-4} \end{array}$$



Ckt. for Sanborn Model E-1034





B+	e ₁	e ₂	e ₃	e ₄	e ₅	e ₆	I _a
300	130	0	270	110	60	110	8
"	"	51	250	120	66	45	9
"	"	55	118	300	55	35	8

 $\frac{10}{10}$

~~Slow drift~~ Steady deflection with this ckt

+350

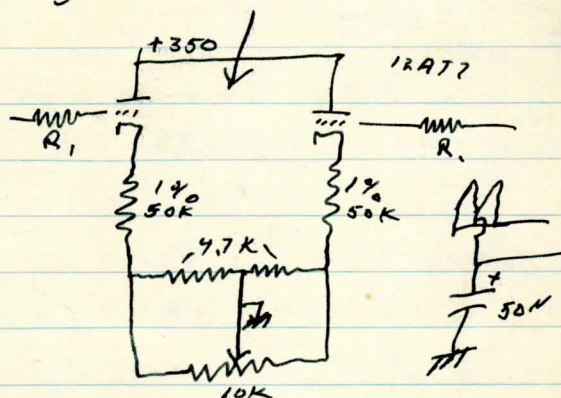
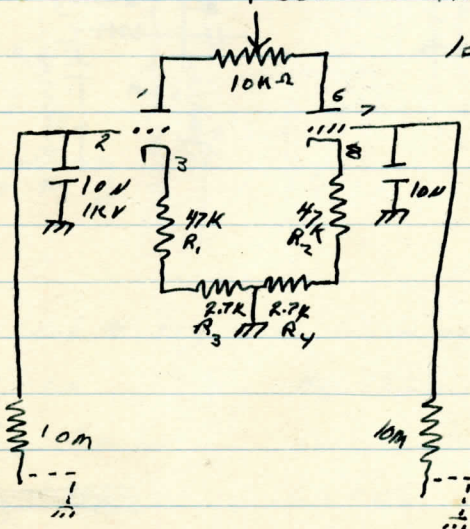
tried various tube + types

12BH7, 12AU7, 12AT7

Resistors were badly

matched - R_{1,2,3,4}

Try this scheme



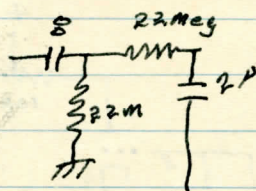
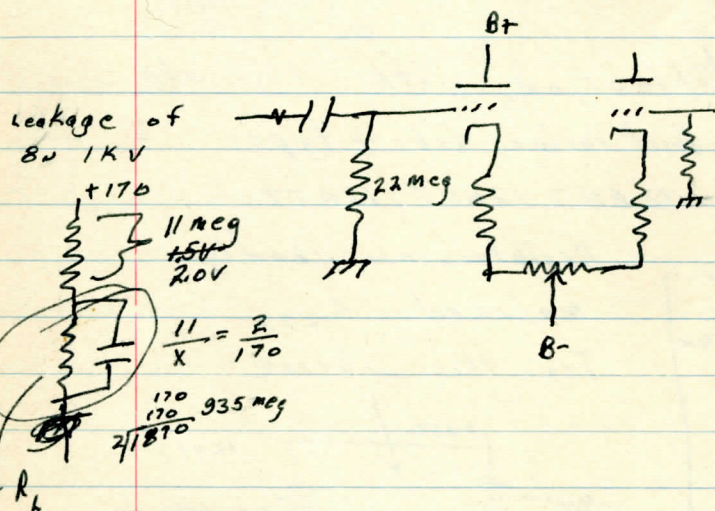
Ckt now balances nicely - with grids tied to gnd - with 10⁴ or 22 meg in ckt + grids by passes to gnd with 10⁴ there is slow consistent drift. No drift with caps. removed either with 10 or 22 meg. in ckt - some hum appeared - With varying voltages

W
X
Y
7

applied to both grids balance was still good until ≈ 200 V was reached when tubes became badly unbalanced—12AU7A (New SYV.) displayed same characteristic at lower voltage (opp. drift—used 12AT7 the same occurred at very low volt. 575/ OK. over range 0 to ± 300 —~~the~~ Drift occurs when caps. are in ckt—both units 8u1K Aerovox are polarized—
 OK with 2u1KV^{unit} Drift occurs when input voltage to both grids is raised—

check actual time const of ckt when blocking conds are used—From cursory inspection, looks O.K. Now add

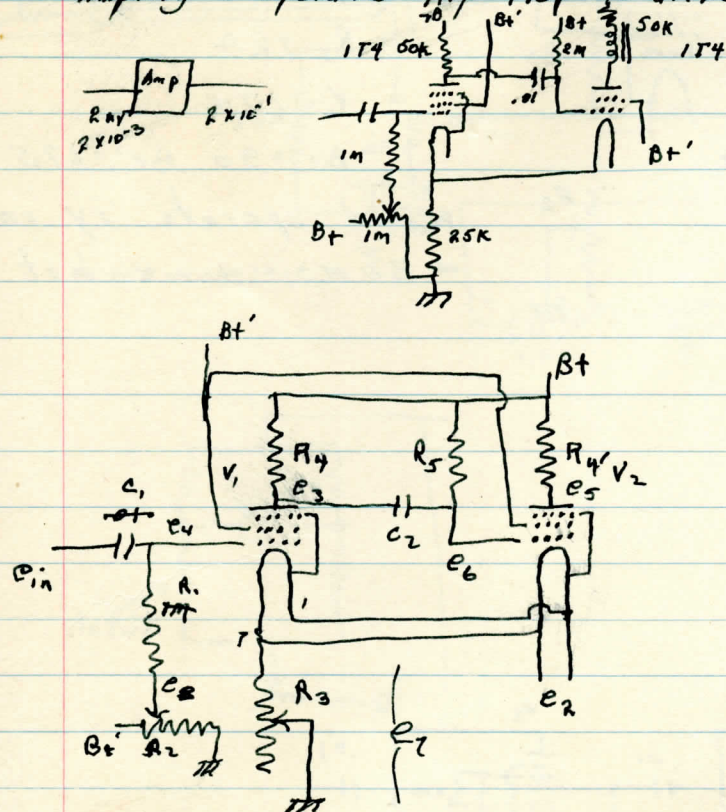
int.



$$\frac{.04}{25/600}$$

Prob. Dev. Batt. Op. ~~Heart~~ Ind-

Pick up EKG from precord leads
 2 MV. in Triang. Wave Form of $\frac{1}{25}$ sec. duration
 Amplify + operate flip-flop to drive spkr + light-



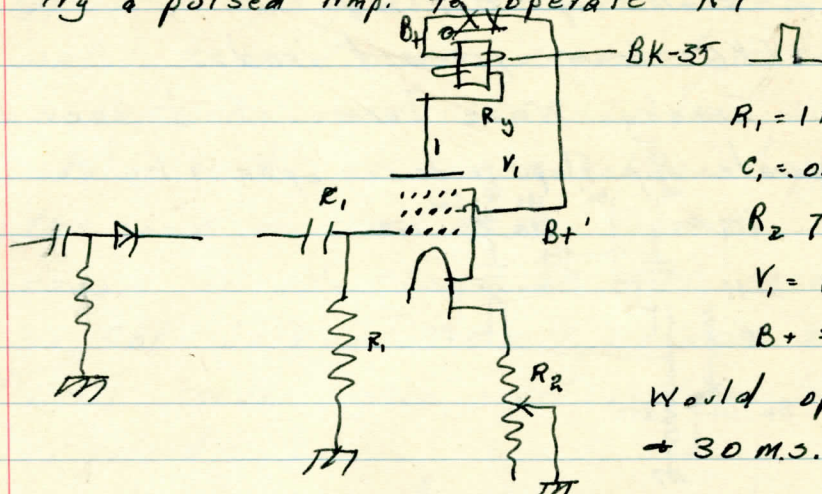
By cut & try the following values were optimized -

$R_1 = 1M$	$R_5 = 2.2M$	$Bt' = 60.5V$	$R_{4'} = BK-35 \text{ Relay}$
$R_2 = 5M$	$C_1 = .01$	$Bt = 90V$	$C_5 = 55$
$R_3 = 75K$	$C_2 = .02$	$C_2 = 15V$	$C_6 = 16$
$R_4 = 47K$	C_{in}	$e_3 = 80V$	$C_7 = 16$
$R_3 \approx 10K$	e_1	$V_{12} = 1T4$	$C_8 = 7.1V$

With above values & $e_{in} = 2V \rightarrow 7ms$ $Bt \times Bt'$ could be varied 15V
 to 15V 10V resp. not width sens - $C_{in} \text{ min} = .8 \text{ max} = 9V$

Looks good

Try a pulsed Amp. to operate RY



$$R_1 = 1M$$

$$C_1 = .05 \mu$$

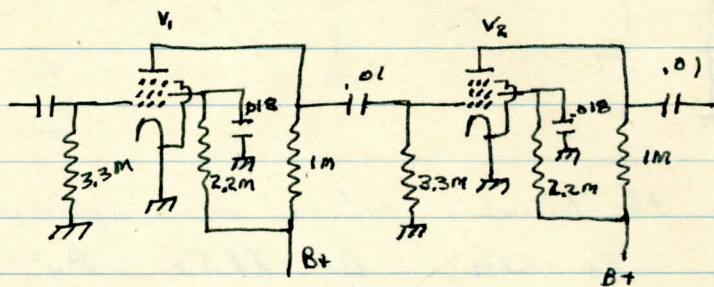
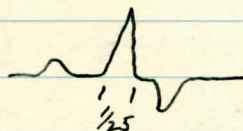
$$R_2 = 7K \Omega$$

$$V_1 = 174$$

$$B+ = 90 \quad B+ ' = 67.5$$

Would operate ry on 8V
+ 30 m.s. somewhat critical

Amplifiers



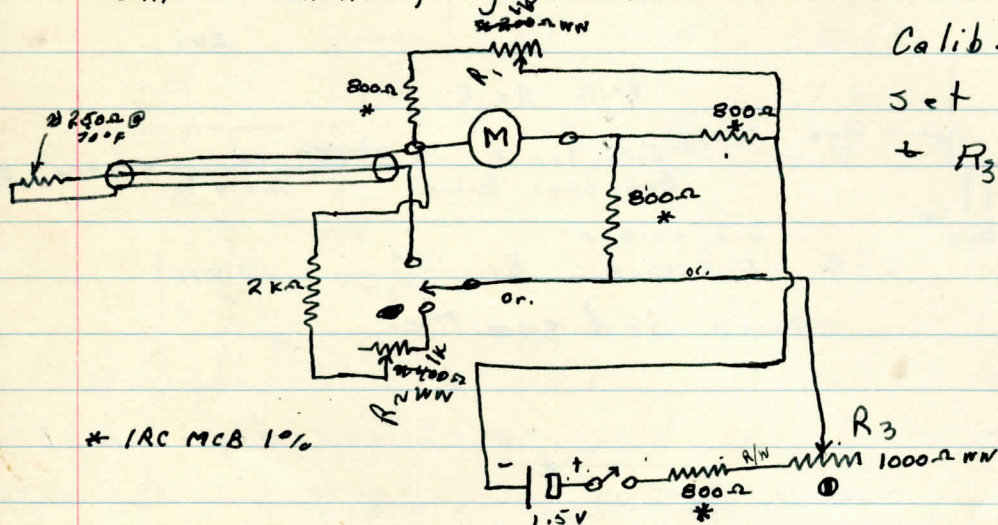
Values from R.C.A.H.B.

$$V_1 + V_2 = 144$$

$$\text{Theor. gain} = (114)^2$$

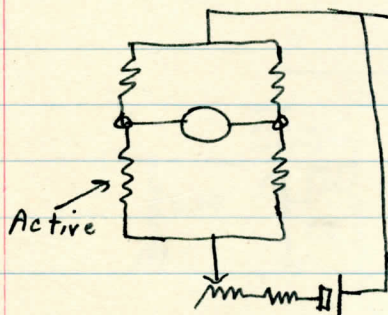
HP

Ckt of Yellow Springs Thermometer



Calib. Proceed.

Set R_1 at Hi Reading
 + R_3 at Lo Read.



check calib. with rectal therm + H_2O

std	std	Res. Therm.	
100.1		100.1	
97.3		97.3	
96.2		96.6	
102.0°F	38.6°C	102.3°F	39.0°C
100.3	37.8°C	100.6	37.5°C
	38.0°C		38.7°C
98.8		99.1	

104.0	104.0	96.8 + 96.9
102.3	102.3	95.4 95.4
100.4	100.5	94.9 95.0
98.1 +	98.2	94.3 94.3

Transistor ~~for~~ relay control -

$$E = IR \quad R = \frac{E}{I}$$

$$\text{Collector } R = \frac{16}{2 \times 10^{-3}} = 80 \times 10^3 = 8 \times 10^4 \Omega$$

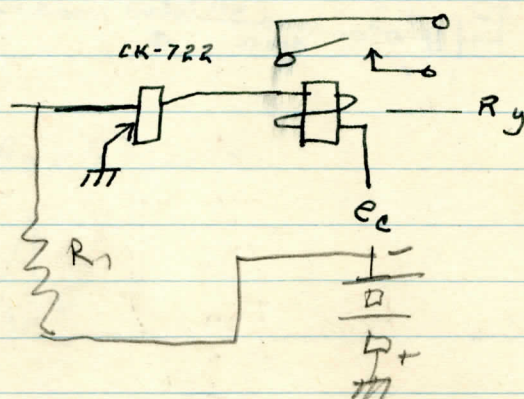
Gnd. emitter

$$I_e = 100 \mu A$$

$$R = \frac{18.5}{2.5 \times 10^{-3}} = 7.4 \times 10^3$$

Use Gnd. emitter

CKT became
rapidly complicated
with 2 std components



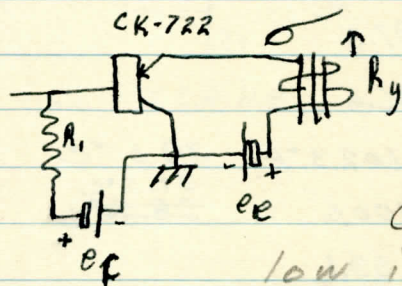
Try common collector

$$E_c = +15V$$

$$E_b = +6$$

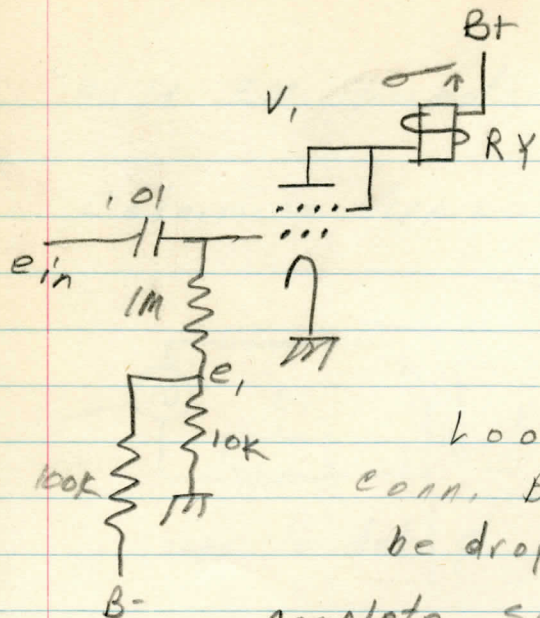
$$R_1 = 270K$$

R_y = Price elec 3V Relay
150 Ω D.C. res.



Collector showed Very
low imp. relay pulled in
& would not open even with R_1 .

$$R_1 = 150 \Omega \text{ } E_c +6$$



$R_Y = BK-35$

$V_1 = 1T4$

$e_{in} =$

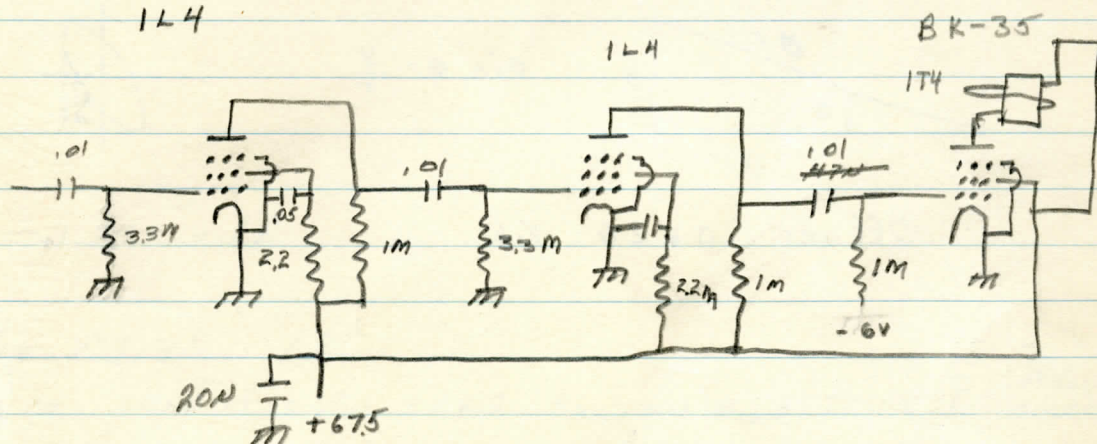
$e_1 =$

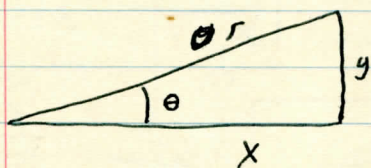
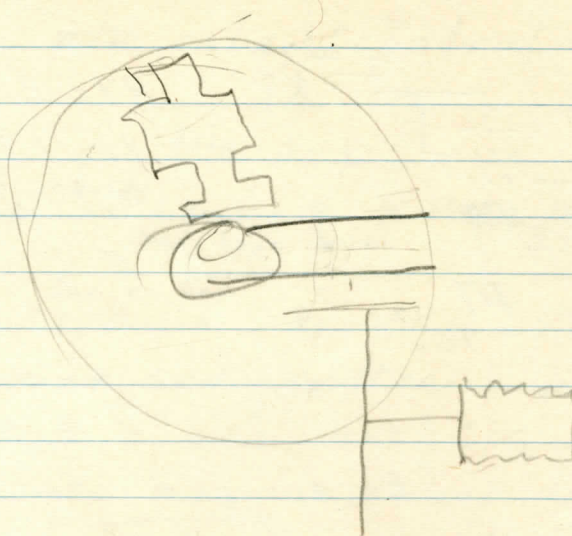
$B+ = 67.5$

Looks good with pentode
conn. $B+ 67.5$ & $e_1 -6V$ e_{in} can
be dropped to 1V — & 10ms —

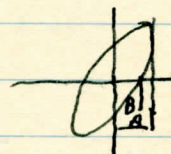
complete schematic MK-1

1L4



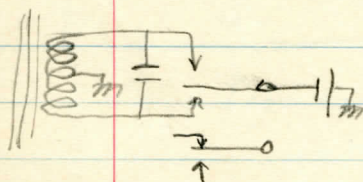


$$\sin \theta = \frac{y}{r}$$



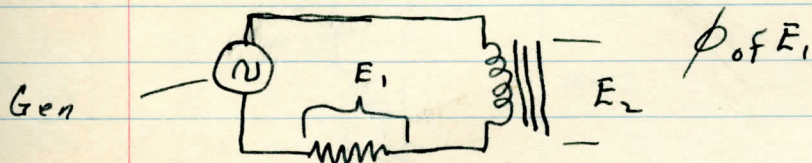
$$\sin \theta = \frac{B}{A}$$

Offner 5V2G Vib.



Build E.M. Flowmeter - use Winston Salem Mod.

Determine Approx. Imp. of coil @ 400 n



scope to det. ϕ VTVM for E_2 s

$$\frac{5 \times 10^1}{5 \times 10^2} = 1 \times 10^{-1} = .1 A$$

$$\frac{(50)^2}{5 \times 10^3} \text{ Try Vibrator } 15\% -$$

Adj. reed of off SVRG to 60 n from 115 by ~~shifting~~ loading

$$\frac{2.5 \times 10^3}{5}$$

.5

Conv. of BC-603

B+ A+

220V@ 12V

80ma. @

2-6517 - .150 - .3

1-6H6 - .3 .3

1-6V6 - .45

3-6AC7 - .45

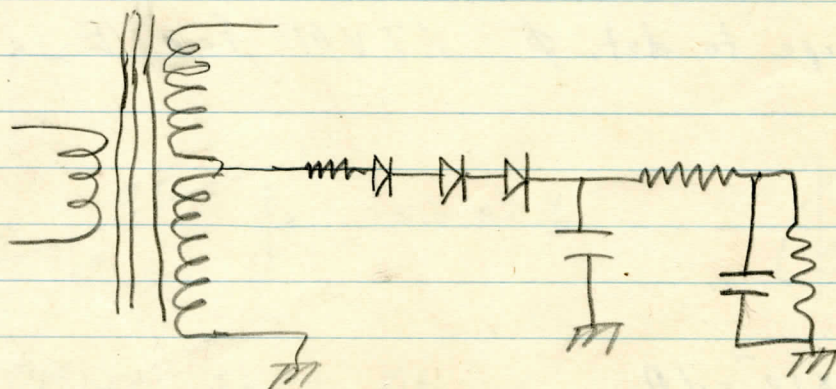
1-6J5 - .3

2-12SG7 - .15 .3

1.65

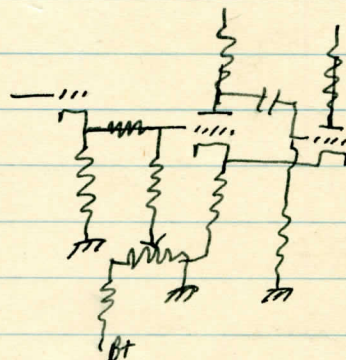
.3

$$\begin{array}{r}
 220 \\
 .08 \\
 \hline
 17.60 \\
 \\
 2500 \\
 108 \overline{) 22000} \\
 \underline{180} \\
 40
 \end{array}$$

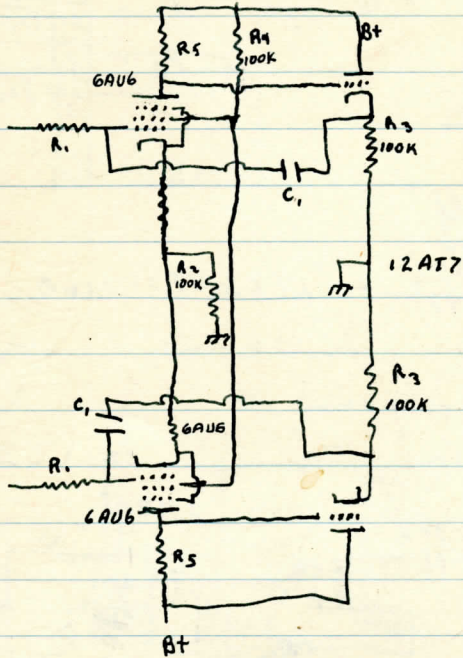


Statham P-23D for Sanborn

A	White
B	Green
C	Black
D	Red
E	Braid

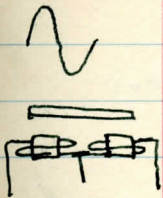


Try. $\frac{d(f)}{dt}$ ckt. in diff. Amp. form -



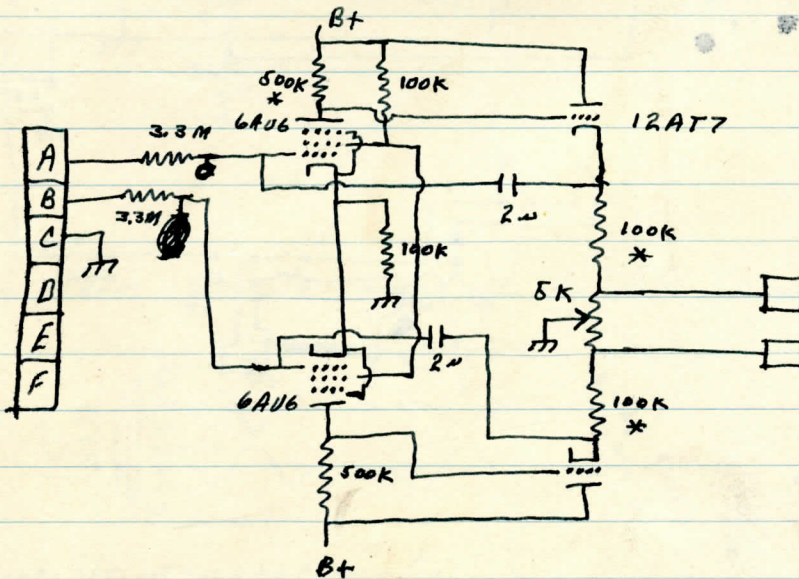
$R_1 = 3.3M$
 $R_2 = 100K$
 $R_3 = 100K$
 $R_4 = 100K$
 $R_5 = 470K$
 $C_1 = 2 \mu 600V$

Looks good - Need
 Balancing for when
 Grids are shorted to
 cathode slight unbalance
 remains -



9942

C.F.



Conv. of 683

$$C = K$$

$$F = \frac{1}{2\pi r_2 C}$$

$$F \propto \frac{1}{\sqrt{c}}$$

$$F \propto \frac{1}{r^2}$$

$$F_1 = \frac{1}{2\pi\sqrt{L_1 C_1}}$$

$$F_2 = \frac{1}{2\pi\sqrt{L_2 C_2}} = k \frac{\sqrt{L_2 C_2}}{\sqrt{L_1 C_1}}$$

$$\frac{F_1}{F_2} = \frac{\sqrt{L_2}}{\sqrt{L_1}}$$

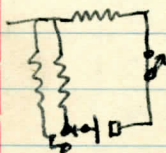
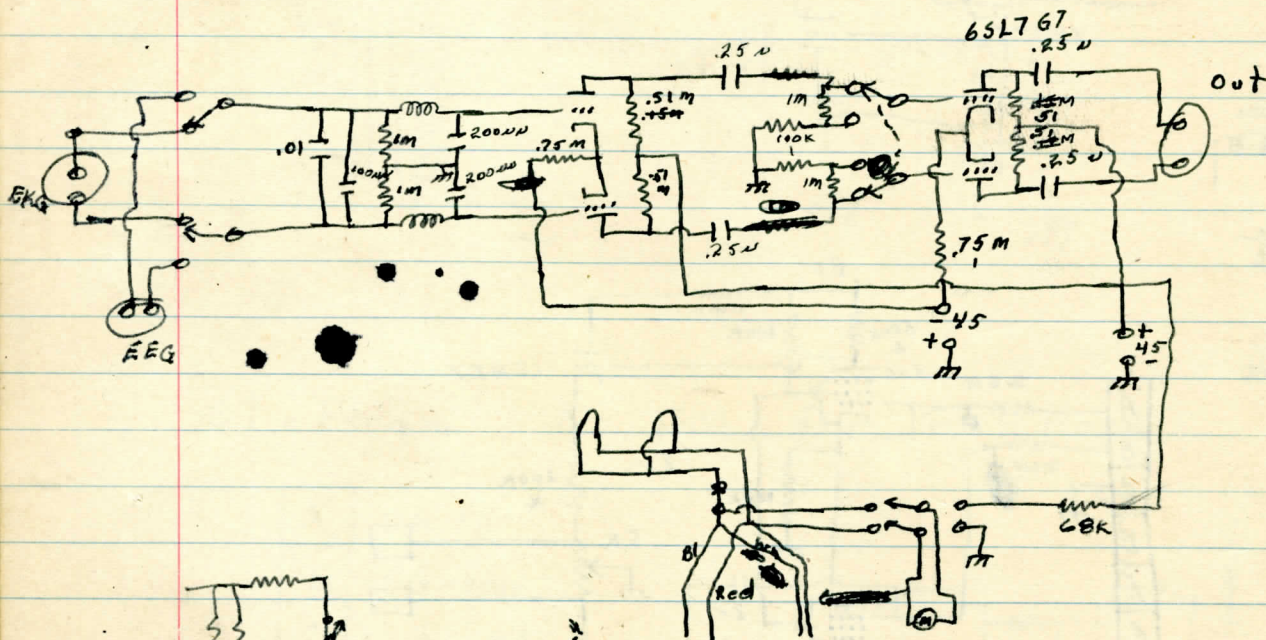
$$\left(\frac{39}{47}\right)^2 = \frac{42}{1.7}$$

$$\left(\frac{F_1}{F_2}\right)^2 = \frac{L_2}{L_1}$$

$$L_2 = 1.7 \left(\frac{39}{47} \right)^2 = 1.7 \times 0.687 = 1.169$$

$$Q \left(\frac{1}{\sqrt{2}} \right)^2 = \frac{4}{16} = \frac{1}{4}$$

Ckt. of Anesthesiometer

 $\checkmark_z$ 

$$\frac{10}{10^{-4}}$$

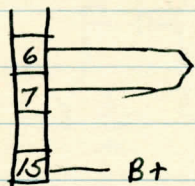
$$\frac{10}{x} = 0.44$$

$$15 \times 10^4$$

1345
13450

$$x_1 = 0, x_2 = 0$$

Blue ribbon conn for integ-

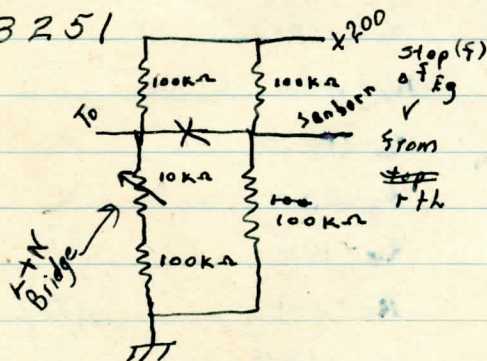


Joe Hopper Col. of S

OP 261

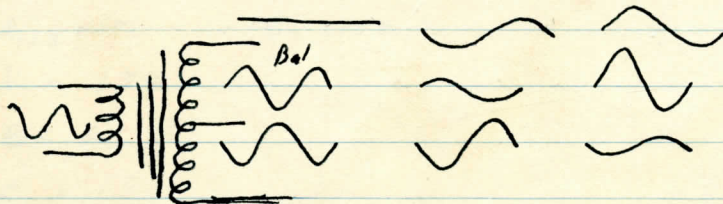
↳ linearity ck. of Sanborn D.C. Amp-

Gr 88251

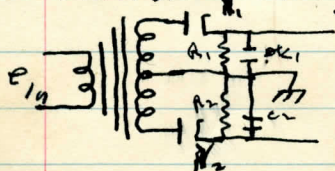


999 -	1005
5	6.4
5	5.8
6	5
5	5.6
5	5.9
5	5.7
5	5.5
4	5.1

Try to dev. simple ~~amp~~ ckt. for diff. trans.



Possible arrangements:



with $V_{1,2} = 1N34A$ $e_{1,n} = 13Kc @ 3V$

$$R_{12} = 2.2 M \quad C_{12} = .01$$

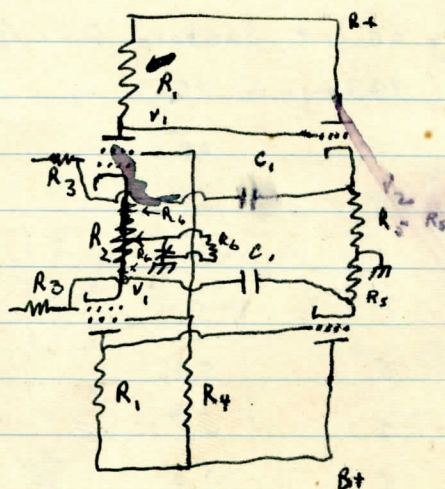
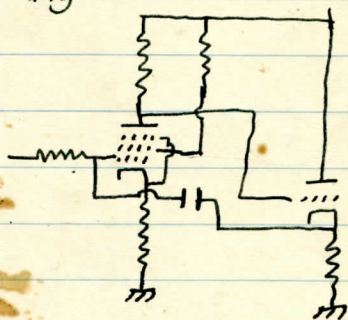
114 $\frac{1}{2}$ This arr. ^{App.} has ample sens to use directly with Gfner - ≈ 0.1 Volt out for Amp-

Y
7

Check. Amp. of integrator to see if it can be used directly -

$g_m \approx$

5×10^{-3}



$$V_1 = 6A06$$

$$V_2 = 12AT7$$

$$R_1 = .68M$$

$$R_2 = 1K$$

$$R_3 = 33M$$

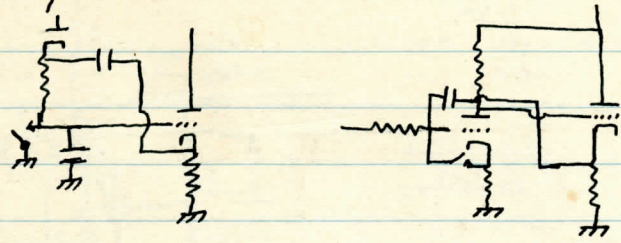
$$R_4 = 1/2M$$

$$R_5 = .1M$$

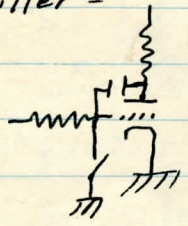
$$R_6 = 1K\Omega$$

Ckt is not stable enough to be used directly with low output of transducer detector.

Bootstrap ckt's.

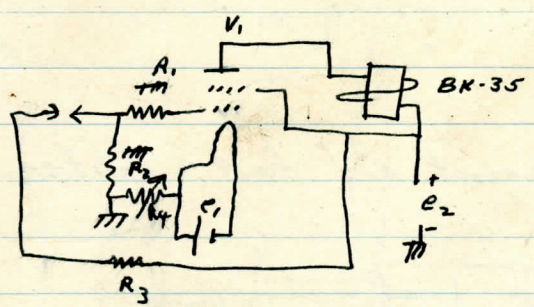


Miller -



Drop detector for I.V.

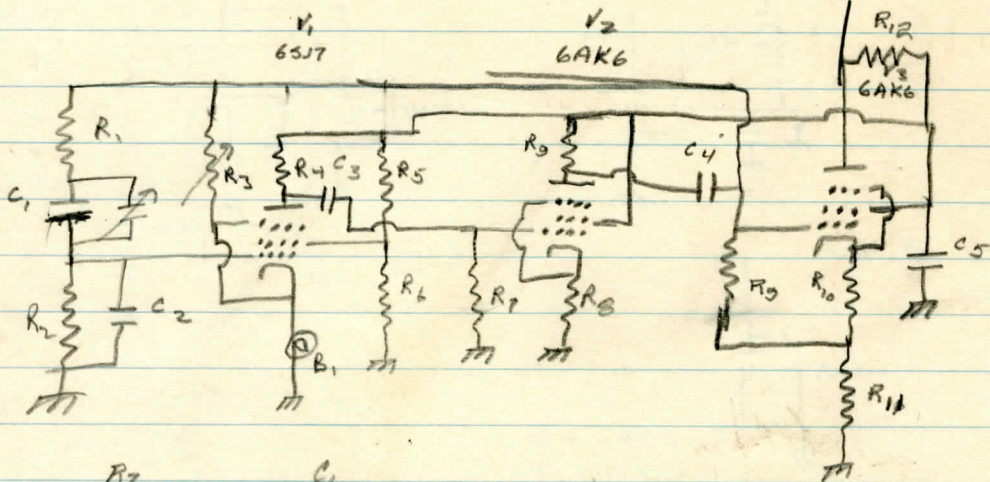
Drop of Isotonic saline has ≈ 1 meg. res. between two #18 needles inserted as below.



- $R_{1,2,3} - 1M$
- $R_4 = 10 K\Omega$
- $V_1 - 174$
- BK 35 RY
- $C_1 = 1.5V$
- $e_2 = 67.5V$

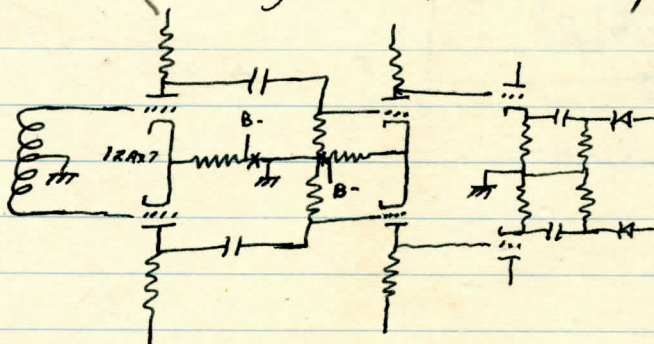
Osc. for

B+



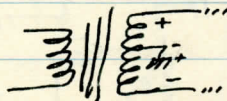
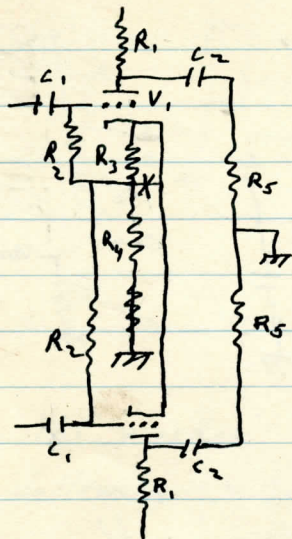
R ₁	R ₇	C ₁
R ₂	R ₈	C ₂
R ₃	R ₉	C ₃
R ₄	R ₁₀	C ₄
R ₅	R ₁₁	C ₅
R ₆	R ₁₂	C ₆

Layout and test amplifiers for diff. Xfmr.

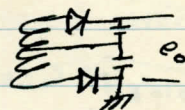


447
504
512
467
491
485
479
483
477
476

Check VG etc of diff. Amp. - Diff Amp. is of no use here
since ^{input} sigs. are out of ϕ

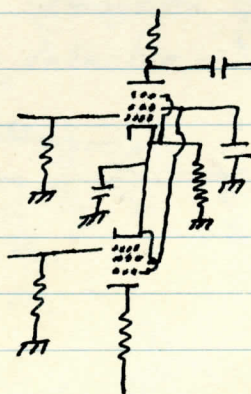


Use ϕ sens. bal. detector
+ take off one end $\rightarrow$



Try pentode input - 6AV6's

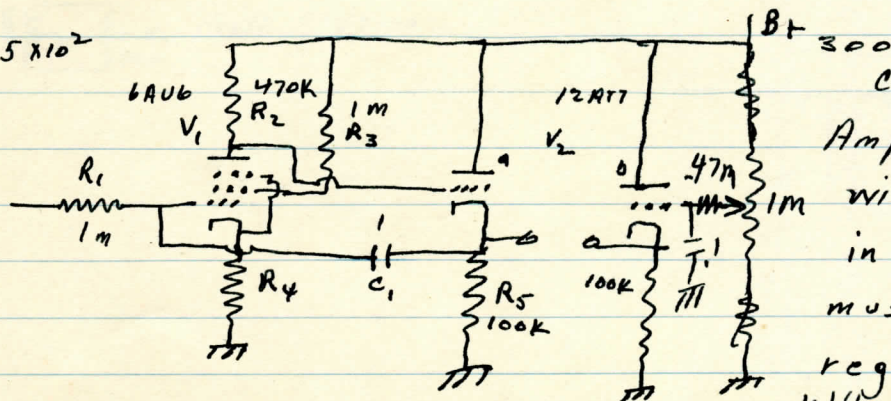
Hold off on this
to ~~the~~ ck. int. drift-



- $C_1 - .01$
- $C_2 - .01$
- $V_1 - 12AX7$
- $R_1 -$
- $R_2 - 1M\ 1\%$
- $R_3 - 3300\Omega$
- $R_4 - 220K$
- $R_5 - 500K\ 1\%$

$$\frac{10^{-1}}{.2 \times 10^{-3}} = 5 \times 10^2$$

200
 2×10^2



ckt Looks Good
Ample gain
with .15 volt
in - supply
must be well
reg - otherwise
little drift-

12AX7 amps. for diff Trans conn. UTC

76
75
70
70
49.00

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

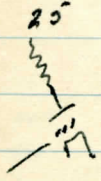
$$= \frac{1}{6.28 \times 10^4 \times 10^{-10}}$$

$$= 6.28 \times 10^{-6}$$

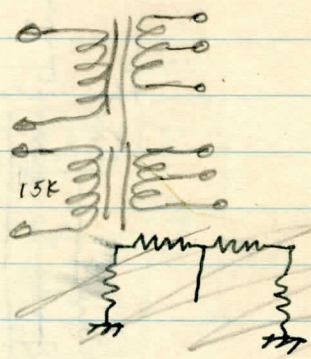
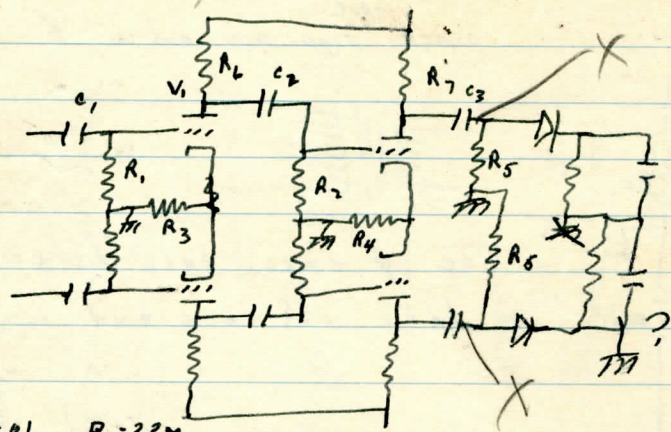
$$=$$

2.3

2.5

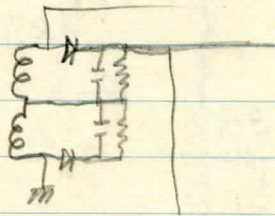
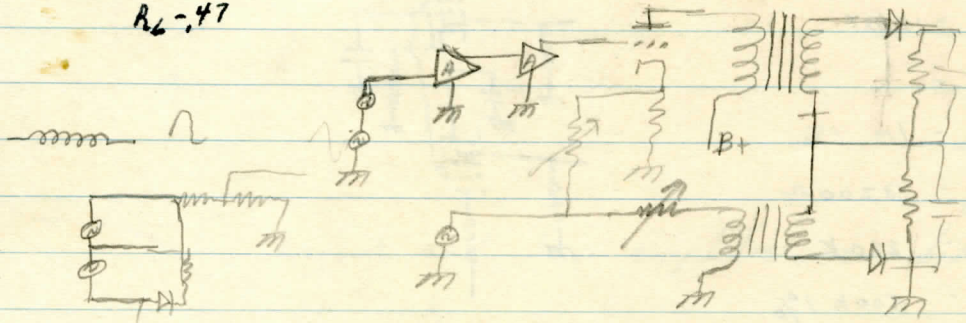


$$\frac{21}{1.002} = 21$$



- $C_1 = .01$ $R_1 = 2.2M$
- $C_2 = .01$ $R_2 = 2.2M$
- $C_3 = .01$ $R_3 = 2700$
- $V_{1,2}$ 12AX7 $R_4 = 2700$
- $R_5 = 2.2M$
- $R_6 = .47$

This rectifier arr. was not useable - replaced with one shown in X's
Amp. was only 100 limited at 16 V.
out - Was not useable with diff. trans.



5009 B

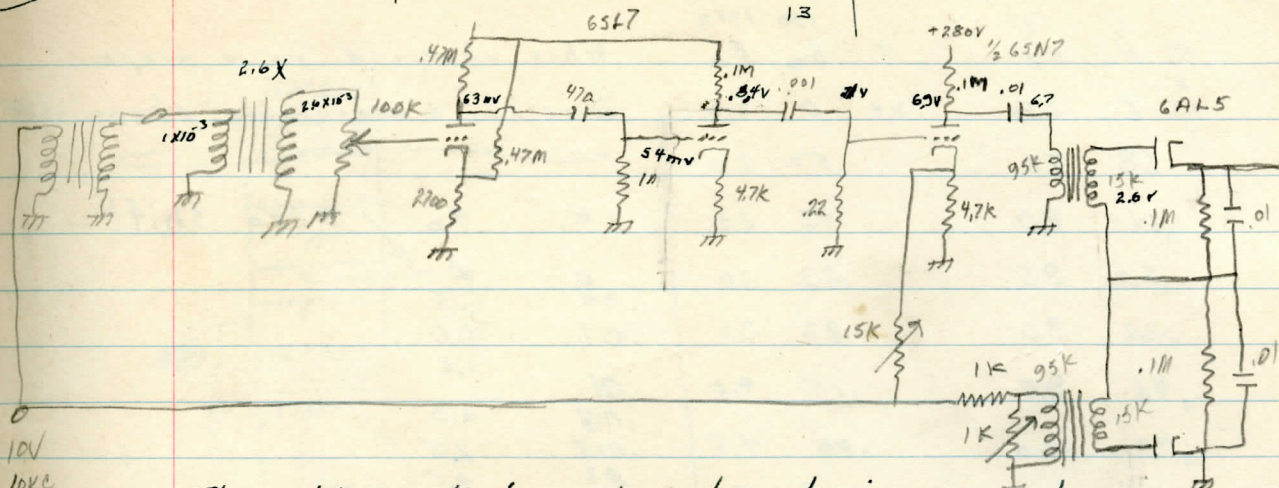
52

675

111

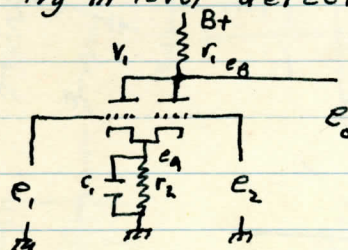
22

13



This ckt. worked well but needs improvement on the following - balancing out of diff. trans. - more gain in amps. - more bucking voltage for balance diode - detector needs more range -

Try hi level detector -



$r_1 - 2.7K$

$r_2 - 33K$

$V_1 - 12A07$

B+ 250
K
 $e_1 = .8V$

e_2

e_3

e_4

e_5

e_6

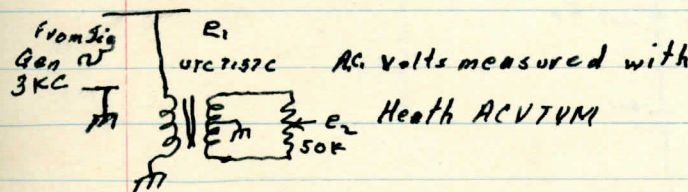
e_7

e_8

e_9

e_{10}

discrepancy
on meter
scale



AC volts measured with

Heath ACVTVM

B+ 250
K
 $e_1 = .8V$

e_2

e_3

e_4

e_5

e_6

e_7

e_8

e_9

e_{10}

e_{11}

e_{12}

e_{13}

e_{14}

e_{15}

e_{16}

e_{17}

e_{18}

e_{19}

e_{20}

	$1V$	$10V$
e_1	e_2	e_0
k		
1.5	0.	6.8

48 7.5

1.6 8.0

2.4 8.5

3.2 9.0

4,1 9,5

4.9 10.0

461 6.0

2.0 5.5

29 5.0

3.8 4.5

4.8 4.0

e_1	e_2	e_0
3.4	0	5.0

$.53 / 2.0$

43 2.5

.33 3.0

.23 3.5

$\sim 1.15 \quad 4.0$

1 .06 4.5

00 50

.06 5.5

14 60

.22 6.5

30 70

39 7.5

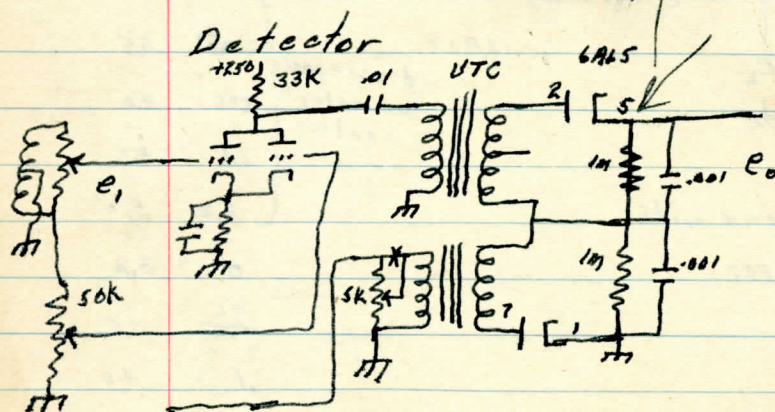
.46 80

17.5

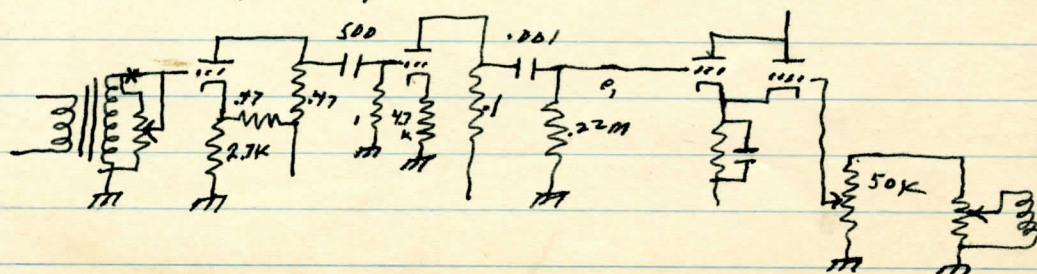
When observed on a scope
there is a measurable phase shift.

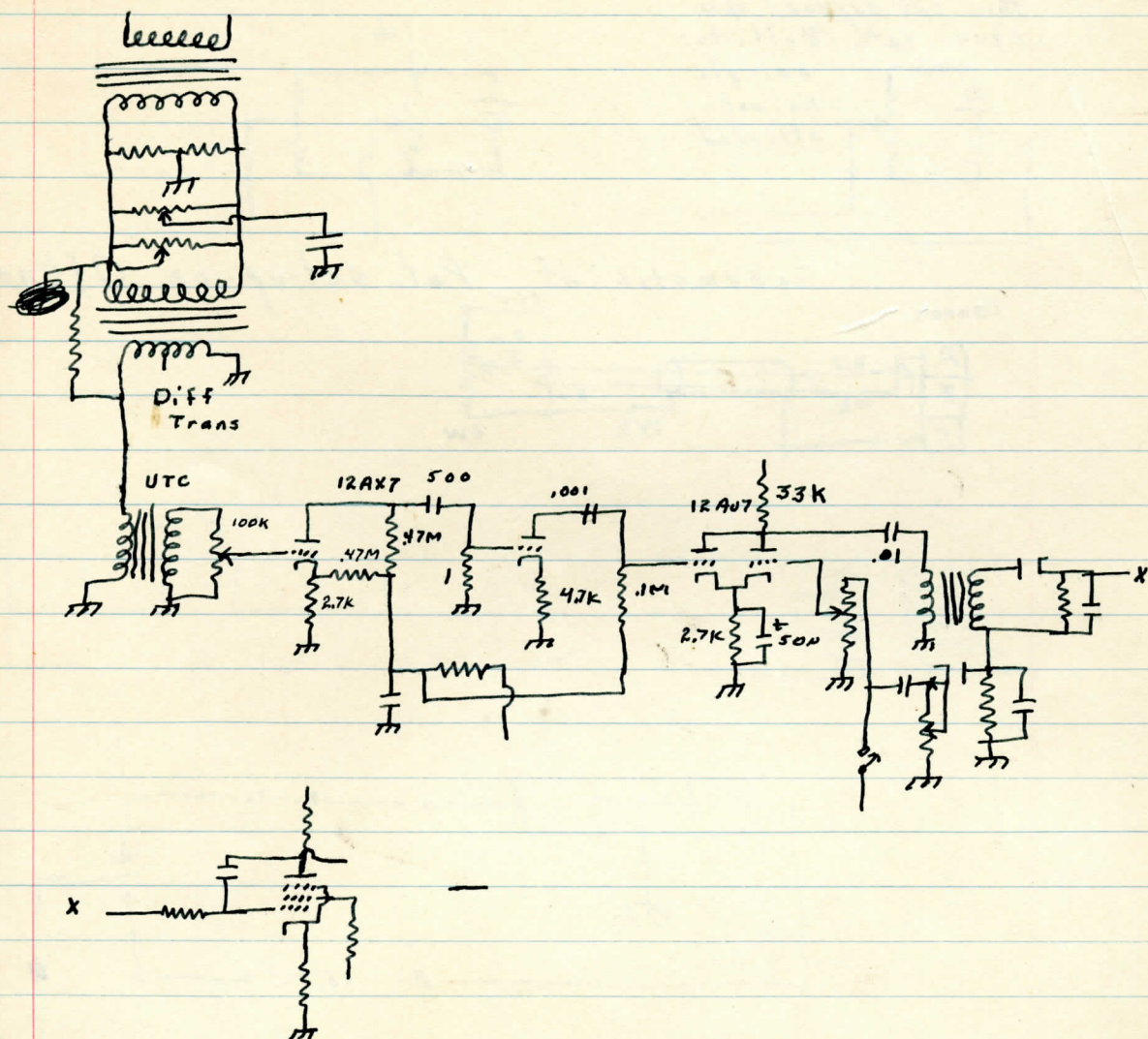
e, e_0 / zero shift -

0	0
.04	.5
.07	1.0
.01	1.5
.013	2.0
.017	2.5
.02	3.5
.04	1.0
.07	1.5
.01	2.0
.013	2.5
.017	3.0

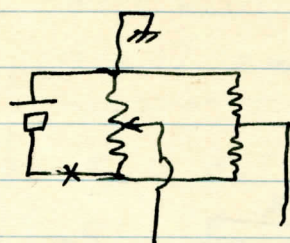
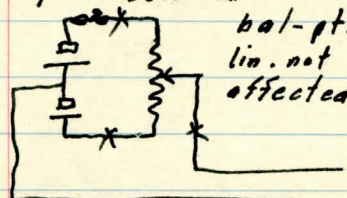


Try whole amp. 5751

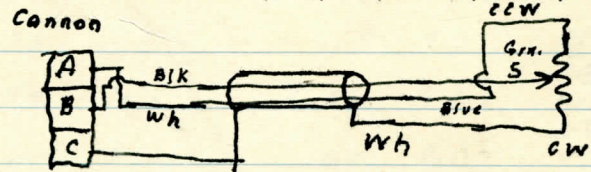




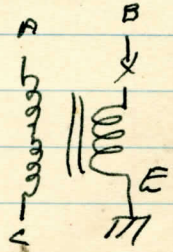
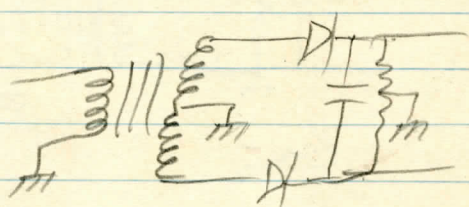
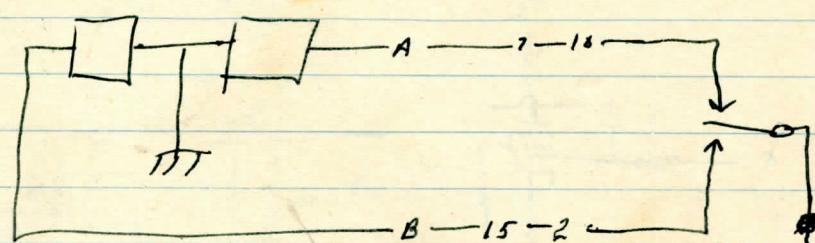
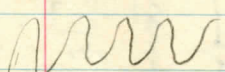
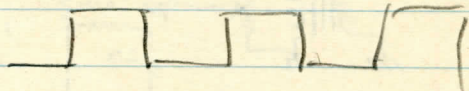
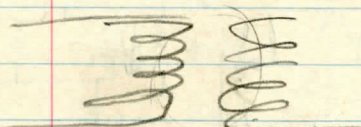
This ckt depends upon equal batt. Volt. for bal-pt. lin. not affected



Schematic of Pot. set-up on Offner



115 n



12.1
6 7.5
60
24
90.0 100
6 900

my

Supplies
Male Conn. A.C.

Tellurian

Tresca

Dudgeon