

#1

1-65
~4-65

15

Champion

NOTE BOOK



No. 4384

80

Sheets

11 x 8½

QUADRILLE RULED
4 SQUARES TO INCH

Name W^m Thornton
2310 Westward Dr.
San Antonio, Tex.

1.28.64 (7)

6 electrodes: Problem; keep noise free C.T.G. electrodes in place for longest possible period & min. of discomfort and skin rx. - 5 hr schemes seem possible at this time -

- 1- Liquid junction electrodes cemented to the skin
- 2- A conductive adhesive holding a foil or similar electrode to the skin
- 3- An intradermal electrode

(m.D. Anderson Hosp., Houston)

Dr. Hawan, plastic surgery, M.D., states that Dr. Jesse, a general surgeon specializing in head and neck surgery, has used Castman 910 cement around the edge of burns for "patching" skin grafts.

Hawan felt that intradermal implantation of electrodes would be the logical procedure & discounted fears of infection.

He had little information on the effect on skin of prolonged contacts & electrolytes or adhesives except to say that Ring's lactate is used 5-6 days & difficultly.

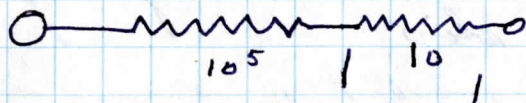
The dermatologists Dr. [unclear] similarly had little to offer in way of information.

In A.M. at St. Id. Id.

Calibrate EEG

See Col. Campbell about adhesives

Set up to run curves on Hb & HbO₂



$$\frac{E_1}{E_2} = \frac{10^5}{10}$$

$$E_1 = 10^4 E_2$$

100 μ V/V

36146 Cris colum

EDH A

Tiked Chemistry

Doshyhiku Osaka Japan

Robt C. Page, MD

Assoc. Med Dir

201- 5240400

Ethicon Inc

#151

AMDR-51 Somerville, N.J.

Methyl 2 Cyano Acrylate
Monomer

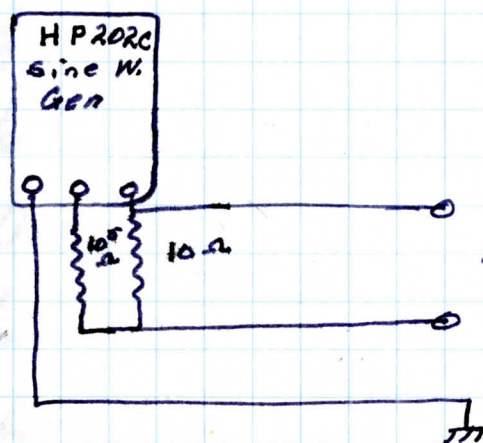
910-Adhesive

Dr. Page Promised to send samples

29.1.64

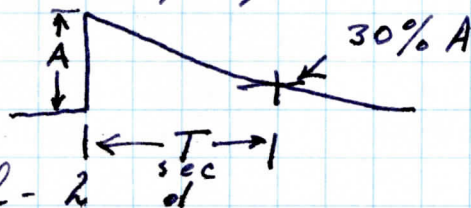
Calibration, frequency, of Gross EEG Mods 3 & 6
at H. 9d 9d.

Method:

All filters out of circuits ex as
noted.

mod. 3.									mod. 6.				
Channel	1	2	3	4	5	6	7	8	1	2	3	4	5
Freq. mm	Amplitude mm.												
1	8.8	7.6	8.8	8.9	8.5	8.6	8.5	7.6	8.8				
10	11.7	9.8	11.	11.	10.5	10.5	10.5	9.5	10.5				
20	10.8	9.75	9.6	9.6	9.8	9.4	9.4	9.3	10.				
30	9.8	8.0	9.7	9.0	8.9	8.8	8.8	8.0	10.3				
40	9.3	8.6	9.0	8.9	8.9	8.5	7.9	8.0	10.				
50	9.0	7.5	8.0	8.0	7.8	7.5	7.0	7.5	10				
60									$\sim$ Filt. In.				
70									7.0				
80	5.5	4.0	5.0	4.0	5.0	4.5	5.0	4.0	6.0				
90									5.0				
100	3.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0	4.0				

Response to step funct.



mod 3 - ch - 2

mod 6 - ch - 3 .15

Mrs. Butcher of Cardio-pul. lab does saturated O_2 's as follows - Blood is drawn & kept under oil (?) and hgb. released $\bar{c}$ a detergent (replaces Saponin). The hgb. quantity (O_2 max. cap.) is determined by saturating ^{by} passing saturated O_2 through agitated mixture & reading $\bar{c}$ spectrophotometer.

A D.U. unit is in the lab but its lower limit is not ~~det~~ known in spite of being calibrated to 2000 m.u. HbO_2 can be reduced to HHb by "outgassing" in a flowing N_2 atmosphere. Currently plan to try to run some points in IR next Wed. at W.H.H..

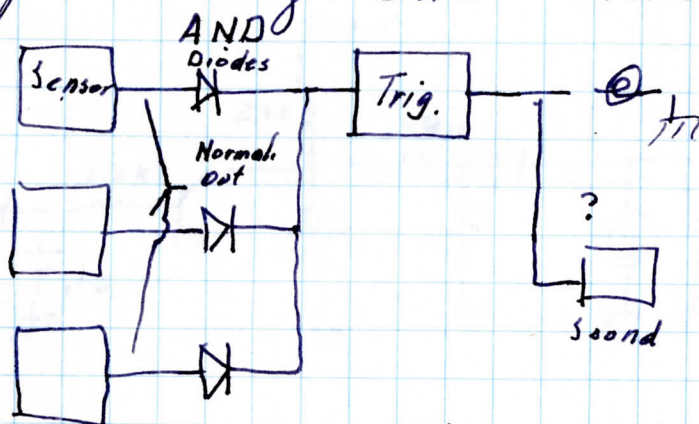
Col. Ord has agreed to restrict O_2 saturation to 90-100%. Cardio-green cannot be used because of rapid clearance. Evans blue was chosen since blood volume determinations can be also be ^{made} ~~determined~~ $\bar{c}$ this method.

Sat: 1.30.65

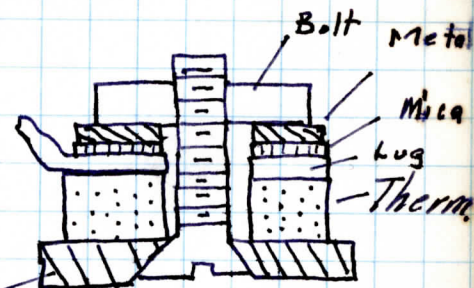
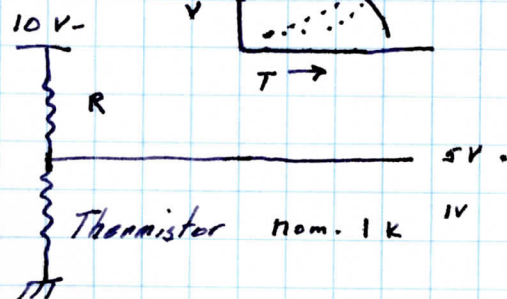
Monitors for auto: M.G. T.D.

	meter	Warning	Gauge
Temp.	?	X	
Fuel consumption	X		
Tach		?	X
Dwell	X		
Voltage	X		
Oil Press.		X	X
Acceleration	X		
Horse Power	?		

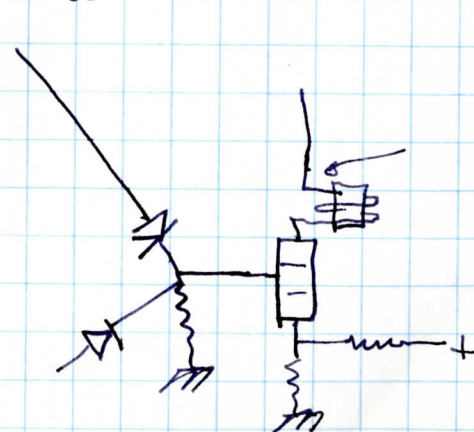
Temp Warning - General scheme:



Temp:

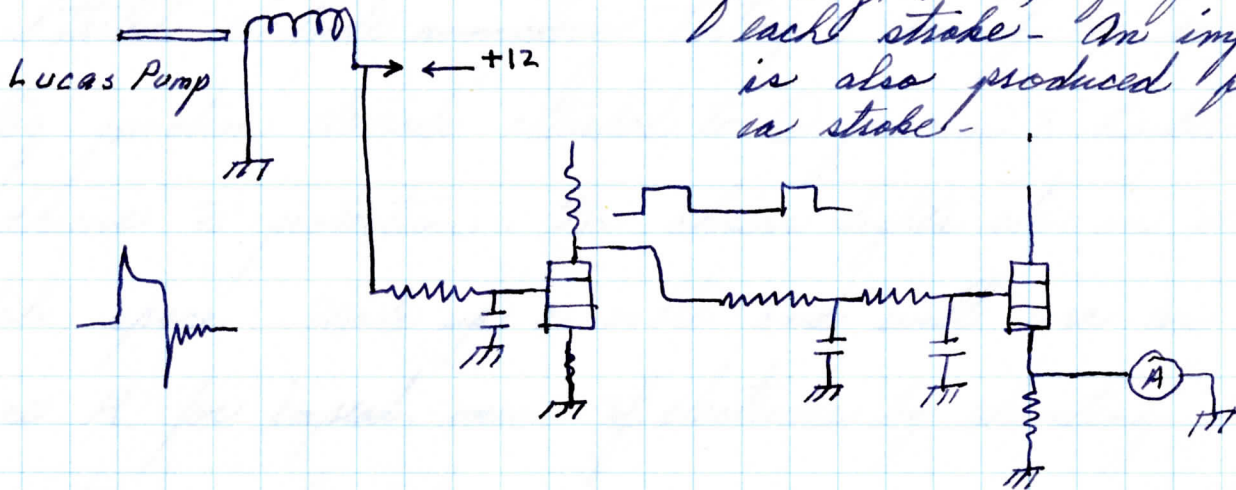


Cu Base

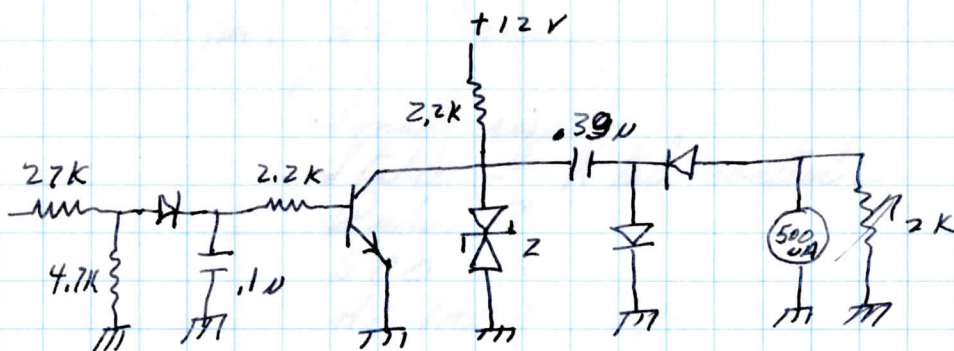


Fuel consumption:

Pump produces a ? const. quantity (vol.) of fuel for each stroke - An impulse is also produced for a stroke.



Tack - Knight ckt. P-71 Elec. Sys. July '63 V-6



1 Feb. '65

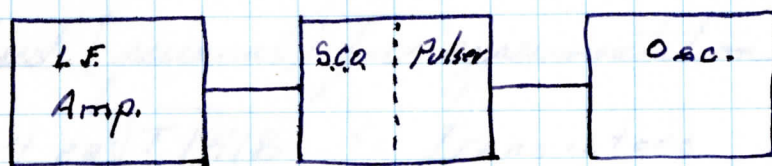
P-11

EKG Telemetry

Started electrode ~~sampling~~ testing - one of an epoxy lig. junction electrode attached to @ forearm - double backed adhesive - protection. No chairs lights etc. in new lab space. Made up a cable and will use an Offner type R for imped. meas of electrodes by shunting known resistance values ~~of~~ across source impedance until E_s is reduced by $1/2$.

Specs. for trans.

Small size -
Stable - X-tal. control -
Pulse ?
SCO
Hi Input Imp.



Amp. - .5 Sec T.C. Min. 100 cps Max.

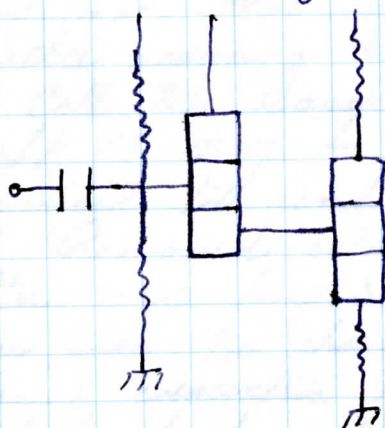
Gain - ? up to 50.

Input Z - ~ 2 Meg.

Output Z - < 50 K

Cost. ~ Si FET: Trans

Low Gain at Low Freqs. & FET's $\propto$ to
 bias resistor (source) degeneration - Behavior at
 very low drain voltages is unknown (to me).



Ordered (personal) for experimentation

4 ea	T/H/B	Si Transistors	110	P-49
2 ea	2N914	" "	2.47	P-49
1 ea	2N709	" "	2.48	P-43
2 ea	8E710	Mite T Lite	.91	P-454
100 "	40H879	Vector T-28 Terms -	4.55	348
1 ea	40H601	Insertion tool		
		for T-28 Terms	.50	348
1 ea	8E627	1K Thermistor Probe	2.00	74
1 ea	0E877	Therm. Eng. PKg	NC	74

1 ea	8E659	G-701 Therm Kit	9.95	74
6 ea	2N1304	Ge Trans.	.61	6.76 P-55 (55)
		Semiconductor list	366	

Ordered by phone 3.2.65 to be shipped to me personally -

3.2.65

P-15

Collected ^{heparinized} venous blood (W.T.) and saturated $\bar{c}$ O_2 & N_2 by flowing gases through an erlenmeyer flask & transferred in closed plastic syringes to Beckman DK-2 at Bio-mechonics lab and attempted to run curves. Thin cuvette was too thick & dilution was necessary which oxygenated reduced sample. Curves were run at a dil. of 20 mm. : 3 ml. & 40 c. mm. : 3 ml. This showed HbO_2 to be transparent from ~ 600 to at least 2000 m μ . Will try to N_2 sat. diluent & add (?) Lycopon or other reducing agent.

Call Mr. Bassport at Gen. Amelinie & Film 435 Hudson St. (?) N.Y. L #212-JU 27600 for PVP for electrodes. Promised to send sample -

Removed colostomy tape electrodes from @ fore arm after ~ 60 hrs. It had snagged on some object & elevated one side. No change noted in skin except pallor beneath areas & concentric hyperemic circles at inner & outer margins of electrode border. A 2-3 mm. erythematous papular area was present beneath the ~~hub of the lead~~ relief of the electrode. This persisted for 24+ hrs. and was attributed to irritation from "fresh" gory. The area including the blank electrode area was visible only by its smoothness as compared to the normal skin after 24 hrs -

Imp. shape of the electrode is wrong & should be tapered. The adhesive, 3 paste at least, would probably last 3-5 days.

4.2.65

AMDR-10

Beckman - Fullerton Calif.

P-17

2500 Harbor Blvd.

TR 14848

Drew blood in heparin this A.M. and completely oxygenated and H_2 saturated samples and also samples of 0.9% NaCl diluent fluid. With every effort to avoid reduction oxygenation ran these in K_2 & a curve that was similar for each but which bore no resemblance to yesterday's HbO_2 curve. Before proceeding further and in a more serious fashion called Beckman Instruments & talked to Mr. Jim McCallum Ext 528 (Dr. Wilbur Kay - 314 is the sage of IR work there) who gave me the following reference: Barlow, Robert B. and Polyani, Michael R. Clinical Chemistry V 8 P-67 - "Absorption measurement for oxygenated and reduced hemoglobin in the range 0.6 - 1.8 micra" - still done work which shows Hb & HbO_2 have ~ 100% transmission from $\nu = 1.2 - 1.8$ and reasonable separation at 1.0 to 1.1 μ .

At this point the most desirable procedure would undoubtedly be a dye which absorbed in the 1.2 - 1.8 ν region.

5.3.65 At this point the following needs doing on the expense

A. Attempt to find an "I.R." dye

B. Design & test dye & O_2 conc. at chosen wavelengths on $D.S.$

C. Preliminary design of various schemes and methods of testing them -

1. Chopped single light source
a. & feedback

2. Chopped multiple sources
a. & feedback

3 - D.C.

a. multiple sources & detectors -

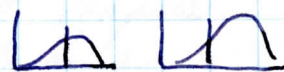
b. multiple detectors

Stability of an easpiece will be of primary consideration and the stability of each component will have to be carefully ascertained -

Lamp -

variation of ^{flux} output $\propto$ voltage -

variation of spectrum $\propto$ voltage -



variation of spectrum + flux $\propto$ age.

Feedback control of intensity

Chopping of light source - bulb. choppers

Mechanical - motor - speed 20 - 60

8 Feb. '65.

21
P-20

Submitted large number of requests for info on small motors. GARR describes 2 channel A.D. oximeter used by a Dr. Benson, Columbia Univ. and will write him on this.

Received Allied order but many 51 units B.O. - Dave gave me the name of the 3M representative and will see if they can produce anything interesting on the paste electrode. Placed 2 epoxy cast (MK I) electrodes on a shaved area of the an. manubrium & colostomy tape - Could not get imped. meas. since the affner is a D.C. coupler did not have adequate common mode rejection. Need a transmitter & might just as well settle some of the problems on it at this time.

9 Feb. '65 -

Feel that the EKG & EEG link will require the following:

1. 100' range

2. X-tal control unless a new order of stability can be obtained & some of the transistor chks.

3. min. drain & since the X-mtr. will use the majority of power, pulse operation will be required.

4. Battery voltage should be as low as possible.

5. R-C chks. are preferable since I.C. may be used.

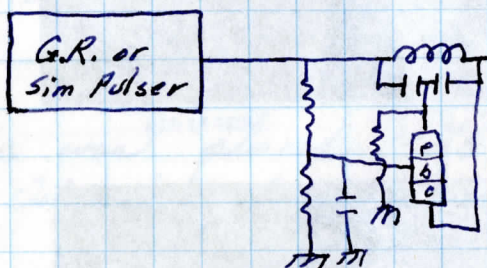
9 Feb.

P-23

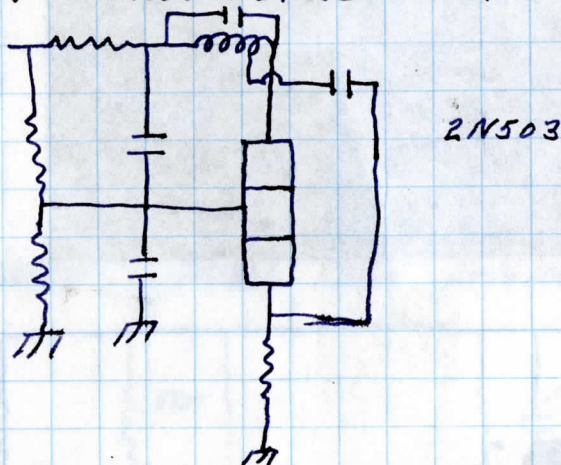
247
21246
22212

Determine lowest practical voltage for 100 M.C. osc.
and pulse this, testing for range as compared to -
conventional F.M. trans.

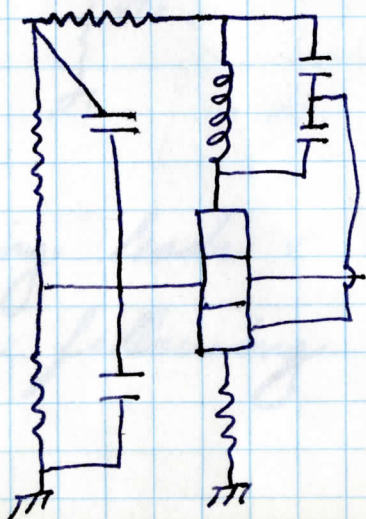
General pulse scheme.



Build 1- conventional MK I X mtr-



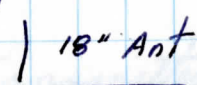
2. low volt unit -



3. above unit

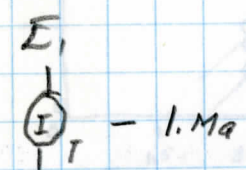
Run - Pwr 1a.
Range
Mod. Sens. #1 + 2

P. 25



6" from earth 3 other
70 nsec/cm & 4.5V/cm

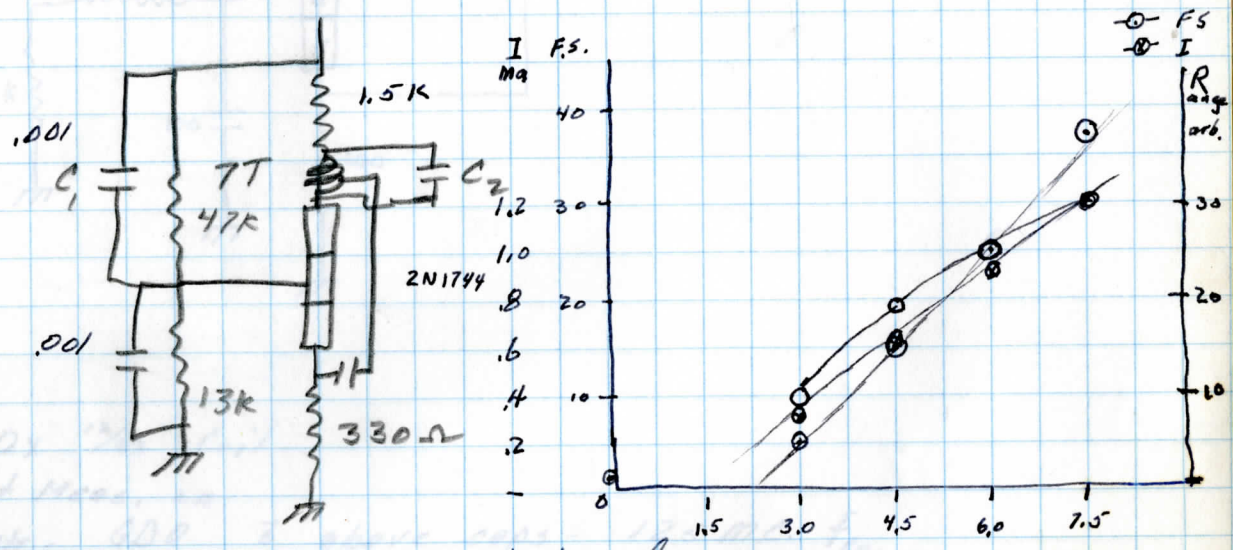
- $$7 \frac{24}{30} \text{ mAh}$$



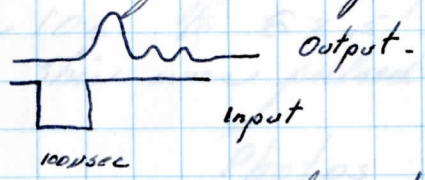
Breaking leads & applying varying volts. to E , the following were obtained.

F.	E,	I	F.S. (rel)	CE-901 Rec.
MC	V	mA	F.S. Meter Units	20KC AM & Fixed Gain
90.2	7.5	1.23	37.5	
90.2+	6.0	.92	25.0	
90.3	4.5	.61	15.0	
90.4	3.0	.3	5.0	
—	1.5	—	1.0 (offset meter)	

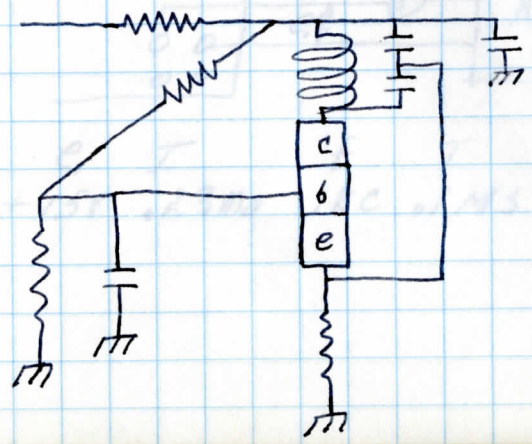
The transmitter was conn. as below and pulsed from a 1217 G.R. at 100 μ sec. & 1KC at -5 V. 1744 failed after ~ 45 sec. suspect spikes thru C_1 or C_2 ?



9 Feb. '65 Above ckt. operated this AM. - erroneous calibration applied 20+ volts yesterday. The osc. was operating & large shifts thru the cycle and on examination of receiver & input wave forms began its operation at the end of the pulse.

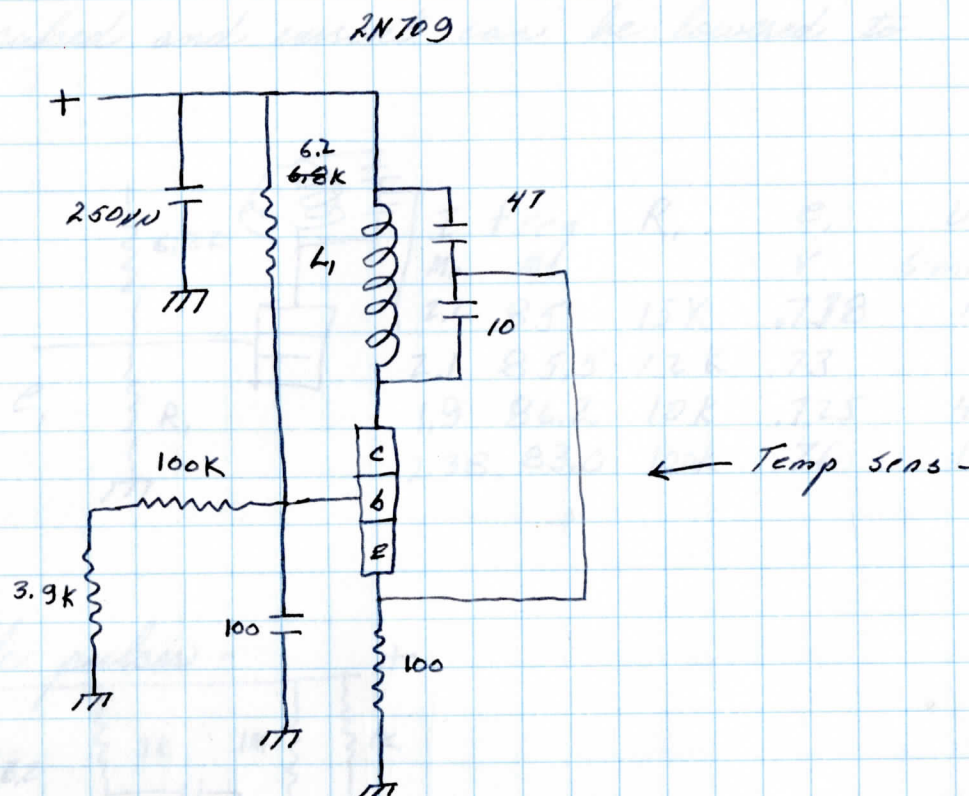


Build more convenient bread board.



$$\begin{aligned}
 T &= 2.2 RC \\
 &= 10^3 \times 10^{-10} \times 2.2 \\
 &= 2.2 \times 10^{-7} = 2.2 \mu \text{ sec}
 \end{aligned}$$

Will start on osc. using AMES osc. P-29

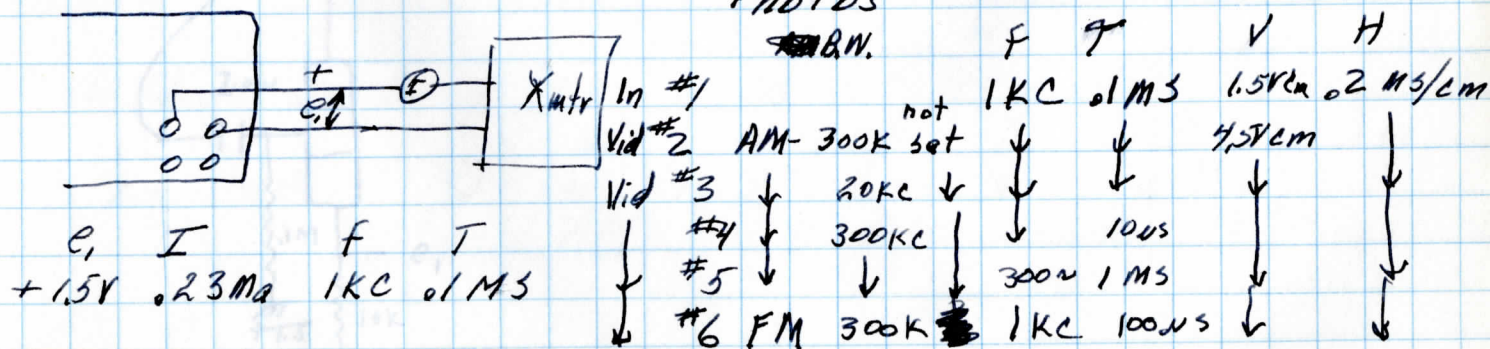


L_1 - 3T .5"D x $1\frac{1}{32}$ " Coil

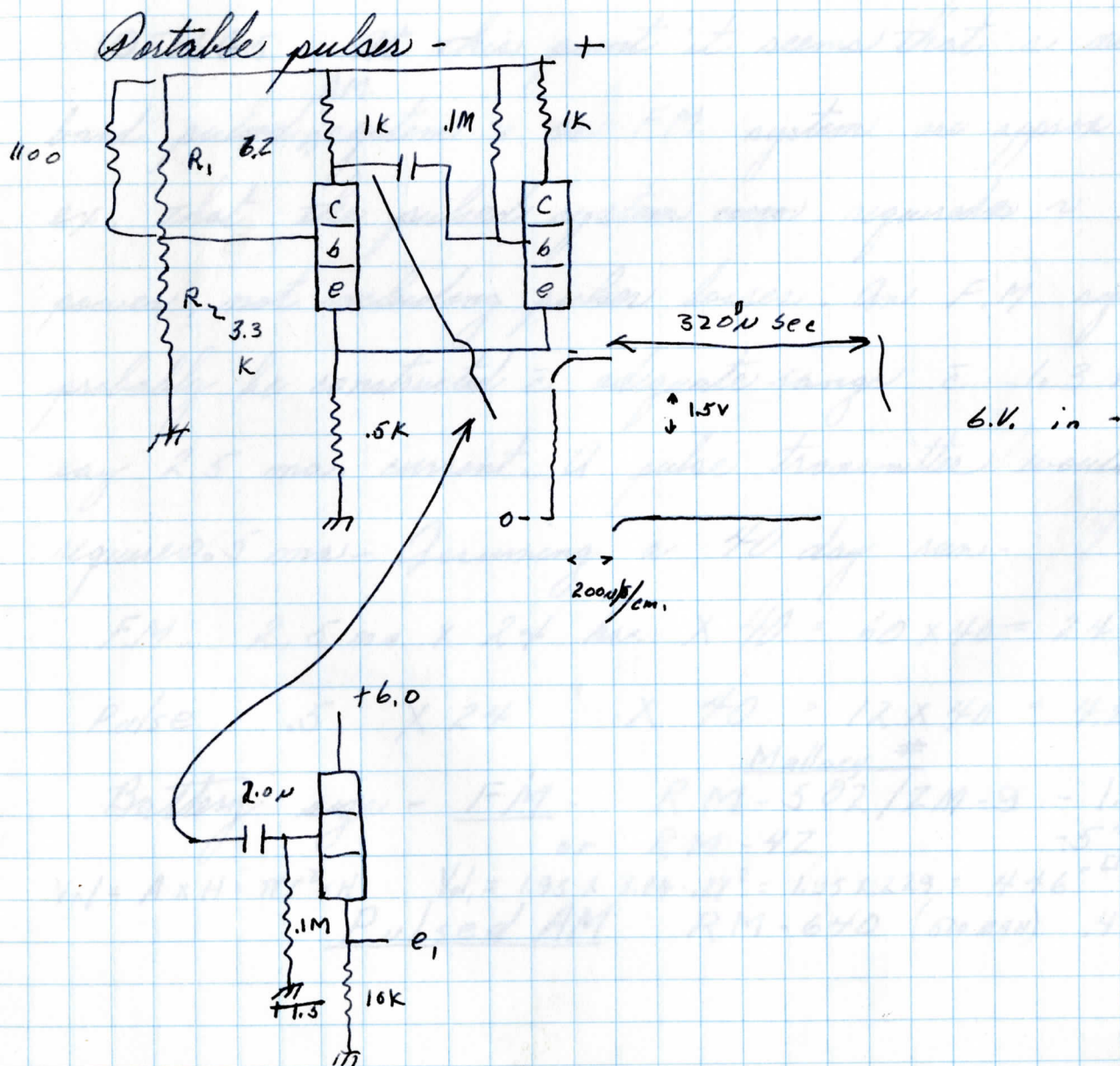
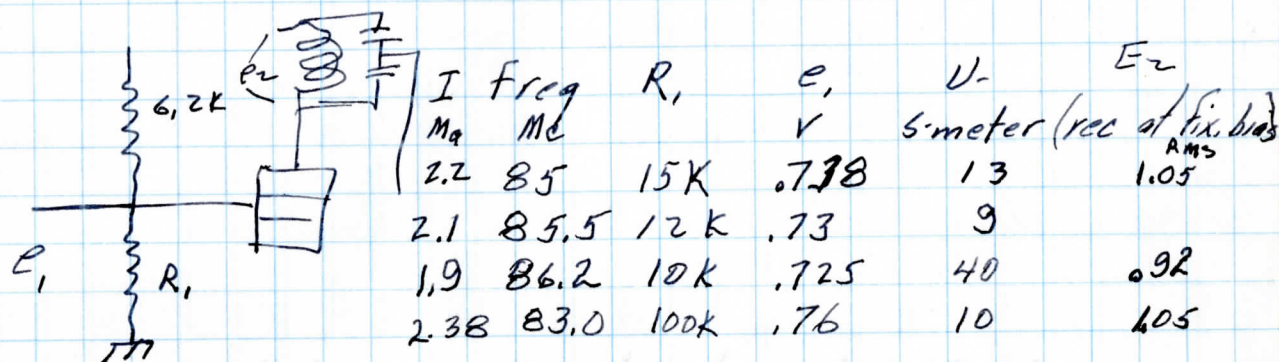
couldnt Meas. on

Tek LC Mtr. GDO $\bar{e}$ above caps - 125 MC. f_{res}
 with the above arrangement at 1.5 V. I_{tot} was 4 mA &
 could not be $\downarrow$ much below ~ 2 MA. $\bar{e}$ dropping out of osc.
 Replaced $\bar{e}$ 2N914 $\bar{e}$ same current but $\bar{e}$ a 7 T- #22 (?)
 $5/8 \times 5/16$ " coil all aspects of operation improved -
 $\bar{e}$ operate shifted from 106 to 82.5 MC - $I \downarrow$ to ~ 2 mA -
 $\bar{e}$ range was improved - This was pulsed $\bar{e}$ a GR 217 as
 below -

Photos



With $\downarrow$ bias circuit is still stable a little F.M.
when pulsed and current can be lowered to



8 - 20 KC 35' from. rec- not sat- 600 μ sec Com-
9 300 " " " " " "

10 Feb '65 At this point it seems that a narrow
band pulsed ^{AM} system & an F.M. system are approx. equal
ex. that the pulsed system ~~was~~ required $\sim$ 1/10 the
power, not including pulser losses. An F.M. system can
probably be constructed in adequate range $\bar{c}$ 1.3 V &
say 2.5 ma. current. A pulse transmitter would probably
require .5 ma - Assuming a 40 day run -

F.M. 2.5 ma $\times$ 24 hr. $\times$ 40 = 60 $\times$ 40 = 24 $\times 10^2$ MAH

Pulse .5 $\times$ 24 $\times$ 40 = 12 $\times$ 40 = 4.8 $\times 10^2$ "

Mallory #

Battery size - F.M. - RM-502 / ZM-9 - 1.95" $\times$.54" Dia.
or RM-4Z - .5" $\times$ 1.19"

$$Vol = A \times H = \pi r^2 \times H \quad Vol = 1.95 \times 3.14 \times .27^2 = 1.95 \times .229 = .446 \text{ " } \square$$

Pulsed AM RM-640 (500 MAH) .43" $\times$.62" Dia.

Photo #	f	Mode	B.W.	Ampl.	Sw. Sp.	Gain	3	Video
	mc		KC	V/cm	usec/cm			(same set)
1	84	AM	300	3.5 ~3.5	400	Max	14	not
2	↓	↓	↓	V.P.P. 2m	↓	A.V.C.	2 1/2	set
3	↓	↓	↓	↓	↓	~5/8 ↓	-	↓
4	↓	↓	20	↓	↓	↓	-	↓
5	↓	↓	↓	↓	↓	AVC	-	↓
6	↓	↓	↓	↓	↓	Max	-	?
7	84.2	FM	↓	↓	↓	-	12.5	Not sat
8	84.2	FM	300	↓	↓	-	17	↓

Repos.
Fr.

↑ X'intr. on prec. pg. 30' (indoors) From C.E. 901 rec. →

FM mod. est. to be ~ 200 KC AF

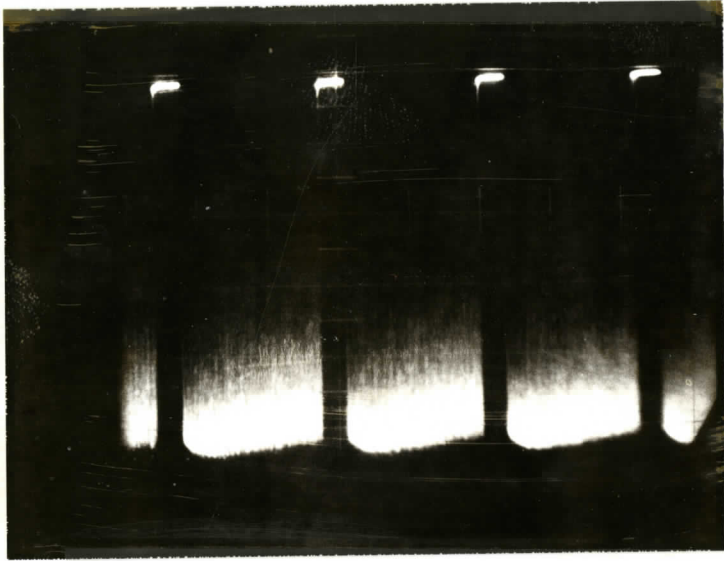
Moved	Rec. to ~ 65' away	(outdoors)	+ put on 1/2 λ ant. on rec.					
9	84	AM	20	As Above?	400	AVC	barely off peg	not set.
10	↓	↓	300	↓	↓	↓	↓	↓
11.	84.2	FM	300	↓	↓	↓	14	↓
11.A	↓	FM	20	↓	↓	↓		

Meas of Input Pwrs. & Waveforms -

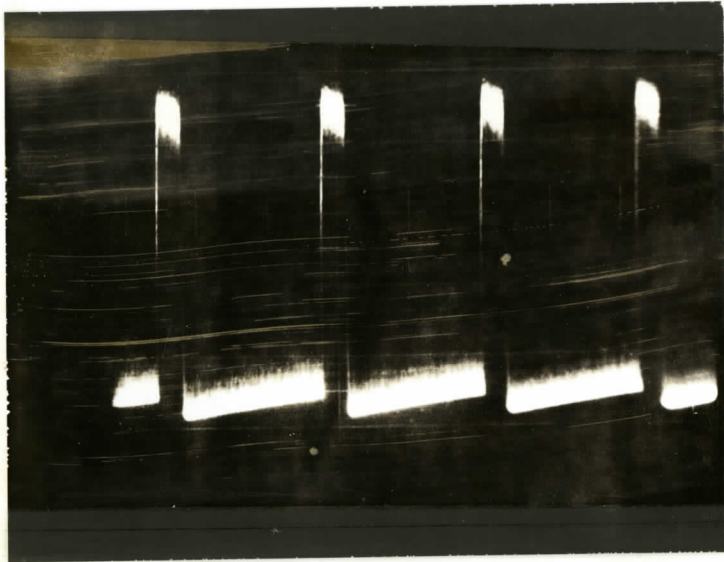
	V.Cal.	H.Cal.
		usec/cm
12.	Input to F.M. sect - 1.38V on R & D & 2.33 Ma. on Hp	
13.	↑ 400	Pulse input to X'intr. at A - 0.31 ma. on Hp.
14	↓	Pt B

The base of the transmitter may be pulsed a good efficiency but 1 splatter which might have been expected from the poor pulsing waveform - This form of modulation may be used to detected by F.M. by tuning one peak of the discrim. to the pulsed freq. The pulsing in this case was accomplished by connecting R₁ to the C.F. Q₃ emitter while A was conn. to +1.5 volts.

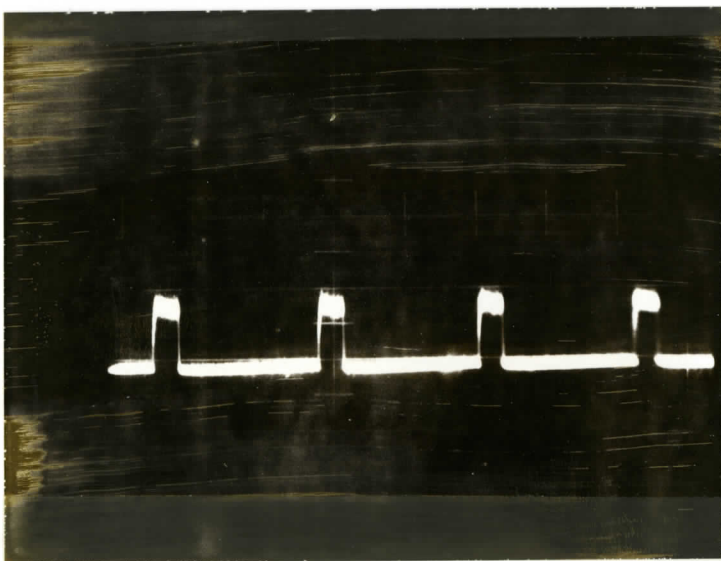
A usable signal could be obtained in either AM or P.M. config. to 75' - 2 1/2 λ ant on the receiver.



#1 Trans. nr. Rec
Pulse rad-
AM Recep. ~~AGC~~ Max Gain
300 KC

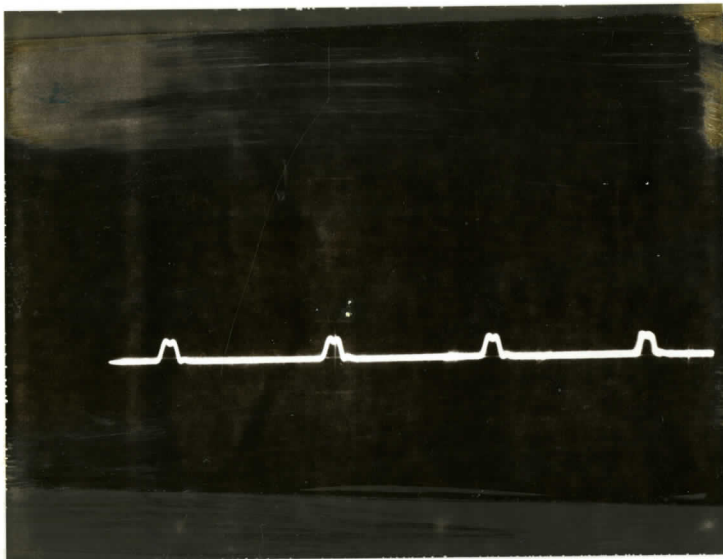


#2 As above $\bar{c}$ AGC
AM

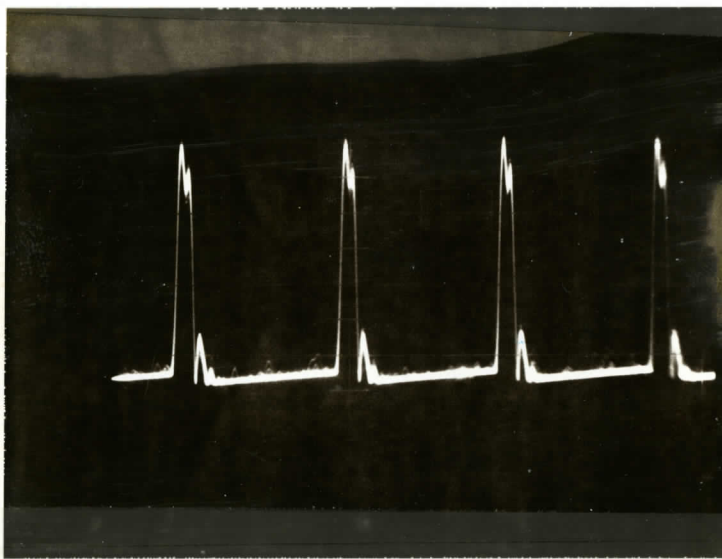


#3 As Above $\bar{c}$ + gain
on RF - Trace bloomed -
AM

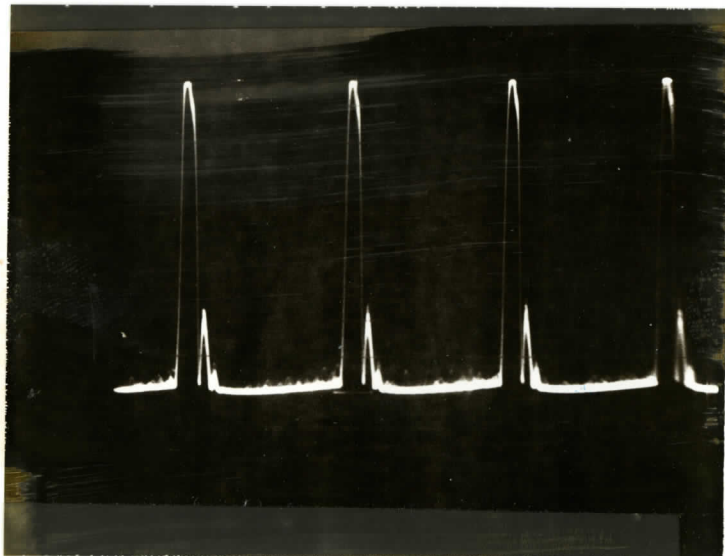
See Prec. Pp. P-41



#4 ↓ Gain (R.F.)
Xmtr. nr. revr. $\approx$ ~~466~~ +
20 KC. B.W.
A M



#5 As Above $\approx$ AGC
A M

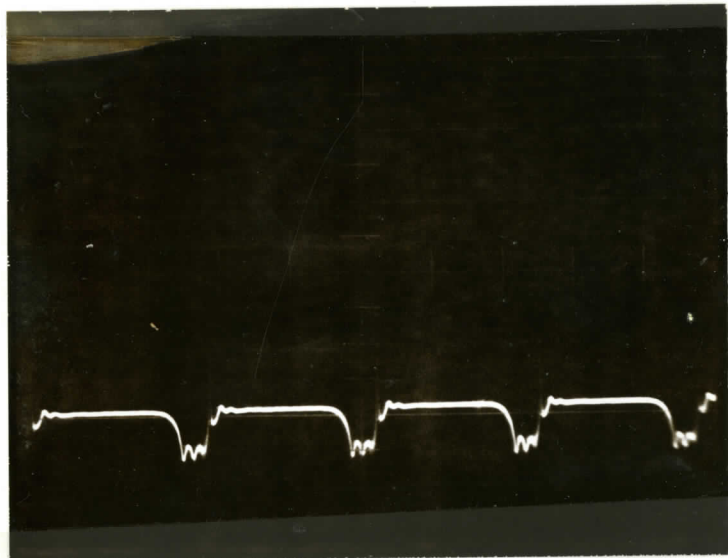


#6 As Above $\approx$ Max.
R.F. Gain

A M

#7

Rec. nr. Xmtr. in
FM Mode $\pm$ 20KC BW

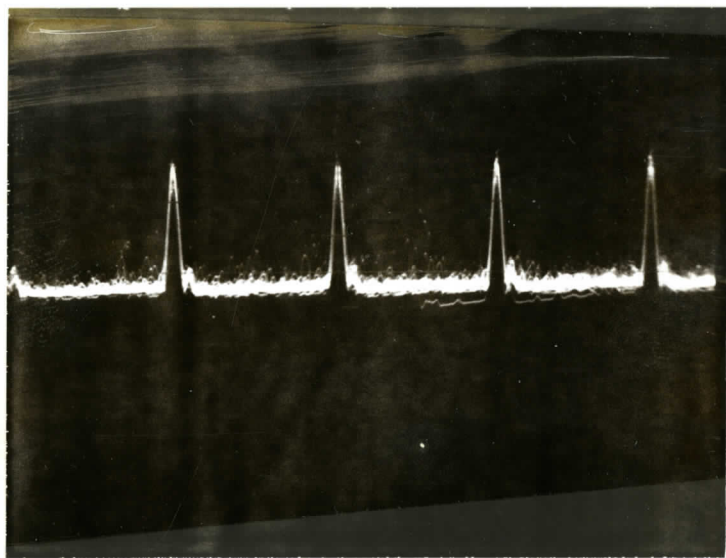


#8

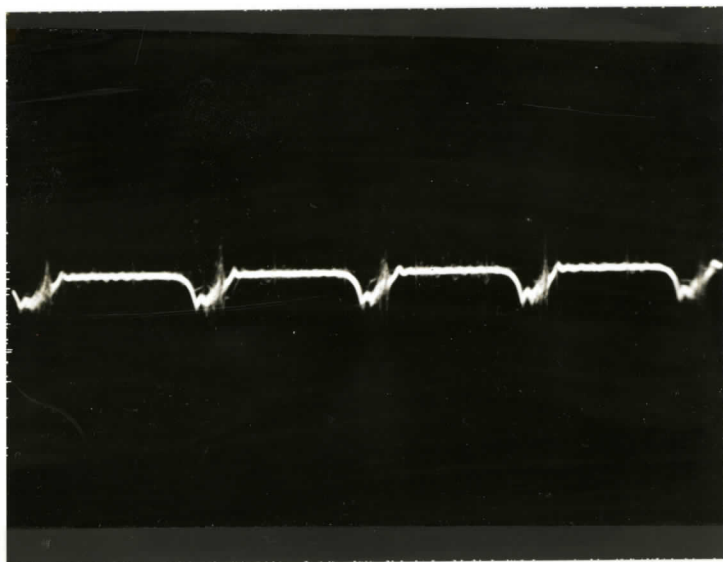
As above ex. BW-300KC
FM-



See Prec. Pp. p-45



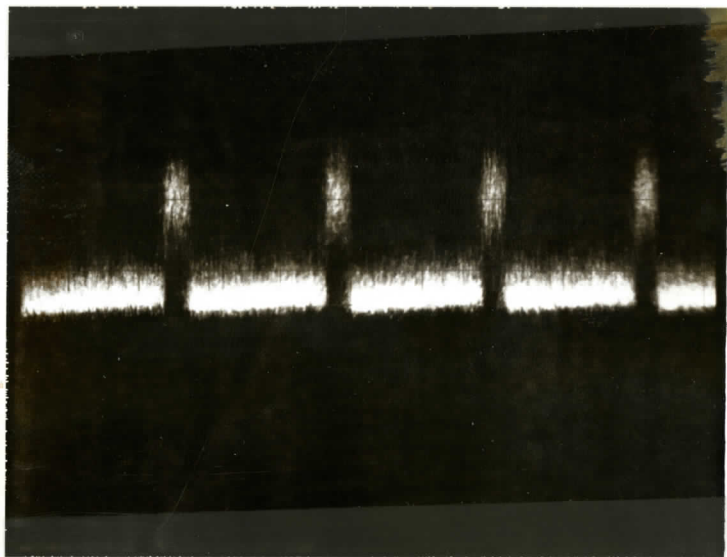
#9 X'mtr. in Pulse mode
~ 65' from Rec. in
A.M. $\pm$ 20Kc B.W.



#11-A As above $\pm$ X'mtr. in
FM $\pm$ Rec. in F.M. $\pm$ 20Kc
B.W.

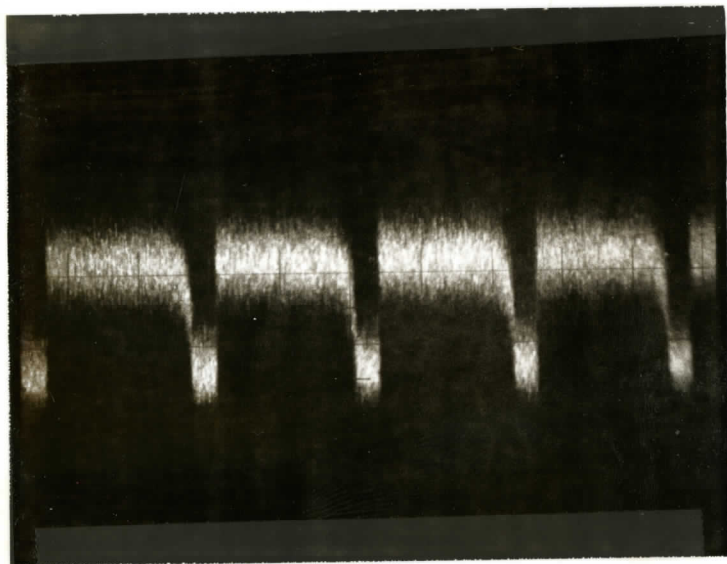
See Prec. P.P. P-47

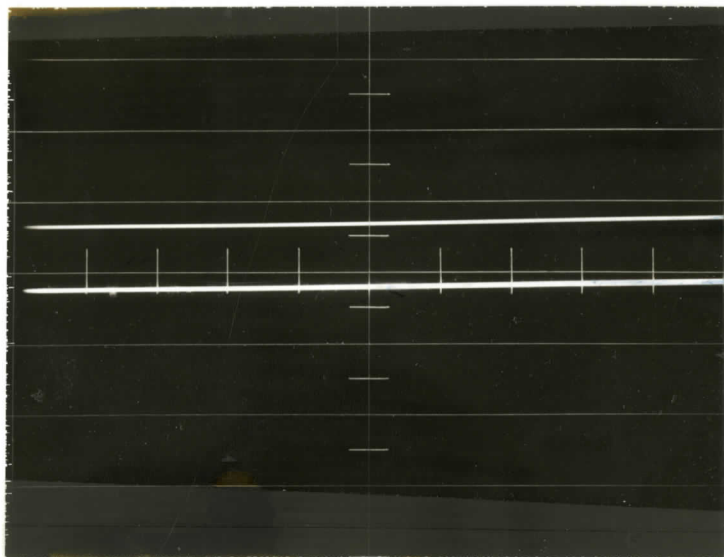
#10 X'mtr ~ 65' from
Rec. both in AM mode
& Rec. in AGC & B.W.
300 KC



#11

As above ex. both
in F.M.





#12

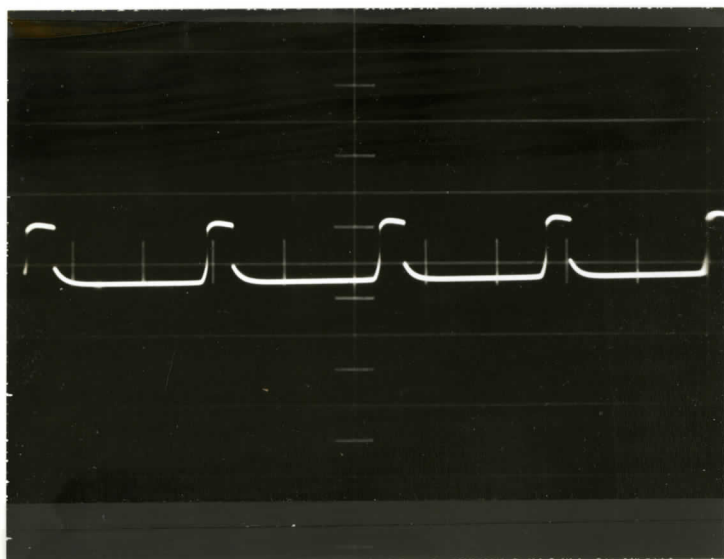
Calib-

V as noted

H- 400 μ sec/cm

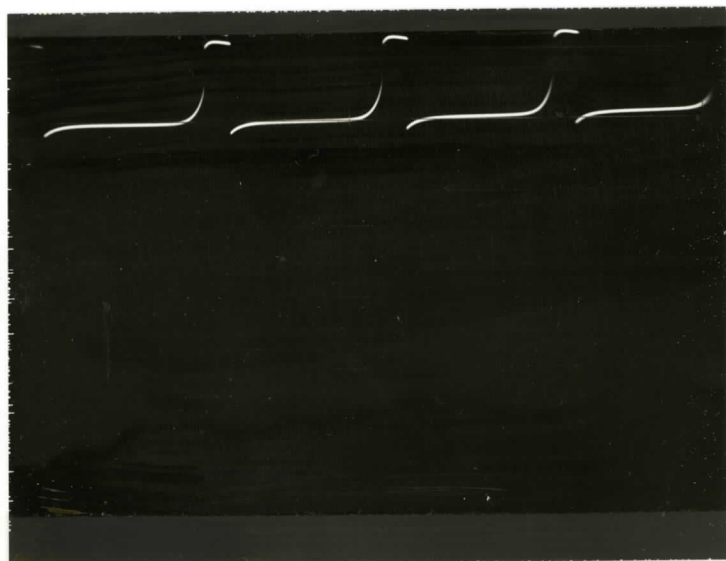
← +1.38V

← 0



#13

As above cal-
Input to Xmtr. in
pulse config.



As Above Cal.
#14 Volt. at input
of R₂ in FM mode

← 0

12 Feb. '65

P-51

Need transistors for general work, amplifiers + SCO.

AMES SCO-

1- FSP-8488 - 2N2484 - ^{Si-}NPN 360MW 60V $\bar{a}$ h_{fe} 200
National

\$10.50 ea P-70 Allied

2- FSP-202 - 2N1132 - Si PNP 2W 50V H_{fe} ~60
\$6.75 P-50 Allied

1 - 1N897 - ?

Need recur. + vmts. X'tals -

~~Note~~ Called Bliley Elec. Co.

200 Union Station Bldg.

Brim, Pa. GL 67561

Swartz, F.C.

1mw. drive - .05 MW

- 5th

BK-3-1 ~ \$16.50 90-100mc. .01

4-5 wks -

BX-W

Bulova Watch Co. Inc.

Electronics Div.

61-70 Woodside Ave.,

Woodside 77, N.J.

212 NE 95700

Hunt, Robt.

Duckett, Phillip

↓

Pay Us & we'll talk.

HC-18

\$25 5-6 wks

AT-5th

Midland Mfg. Co.

3155 Fillmore Rd.

Kansas City 15, Kan.

FI 27950

Reifil, D.D.

Micro Module

sub

1310 ^D X860

Series ckt. .02MW rating
shunt -

M1-

HC-18

Signal Corps -
Magnetron -

Coarse Crystal Freq. Control -

Contract # DA 36-039-8C 88892

D.D.C. - Cameron Sta.

DA Army

34 26 05-001

958 1110

Alexandria

1/4

.0

~~1/4~~ 1/4

Mon. N.J.

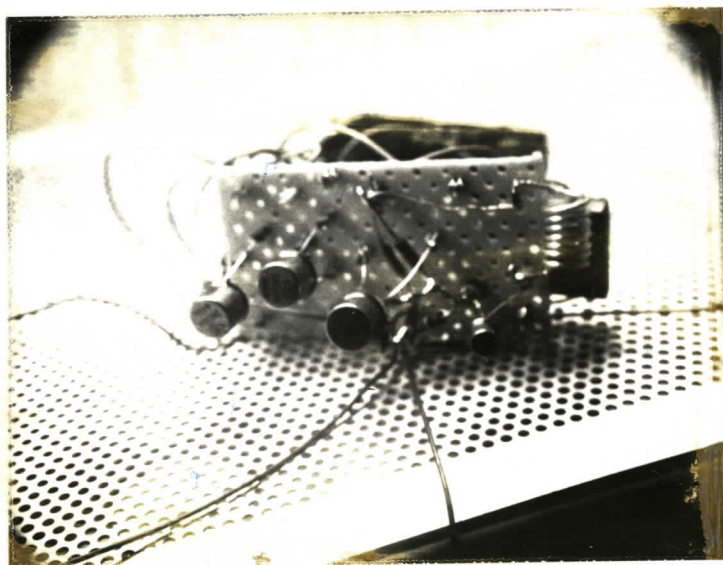
Auto Von -

552-1350

- 21298 -

Will send samples - Co. makes micro - min.

crystals .310" $\square$ X .060"



X'mtr. Bread Board.

15 Feb -64

Calib. of C.E. 901 5 meter $\pm$ HP 608 at
 CW + 95 mc.
 Same Fixed Gain of $\sim 3/4$ Max μV - dBm

Gen off

Gen On - Q1-

2.2

5.0

9.0

14.5

30.0

48.0

100.

165.

290.

580.

1080

2040

6010

20,000

50

200

125

1002

92.7

87.

84.8

77.5

73.2

67.0

62.5

57.8

52.0

46.2

38.3

31.0

21.0

13.0

1.0

+2.5

+1.

AM/FM

AM/300KC

Gain
AVC

300KC.
94 mc AM Fixed gain of $\sim 3/4$ max

5 Meter

μV

- dBm

1.5

Gen off

-125

1.5

0.1

-125

2.5

1.2

-105.5

5.0

2.5

99.

7.5

3.5

96.

10.0

4.0

95

15.

5.0

93

20.0

5.8

92.

25.0

6.3

91.

30.0

7.3

90.

35.0

8.0

89.

40.0

9.1

87.8

45.0

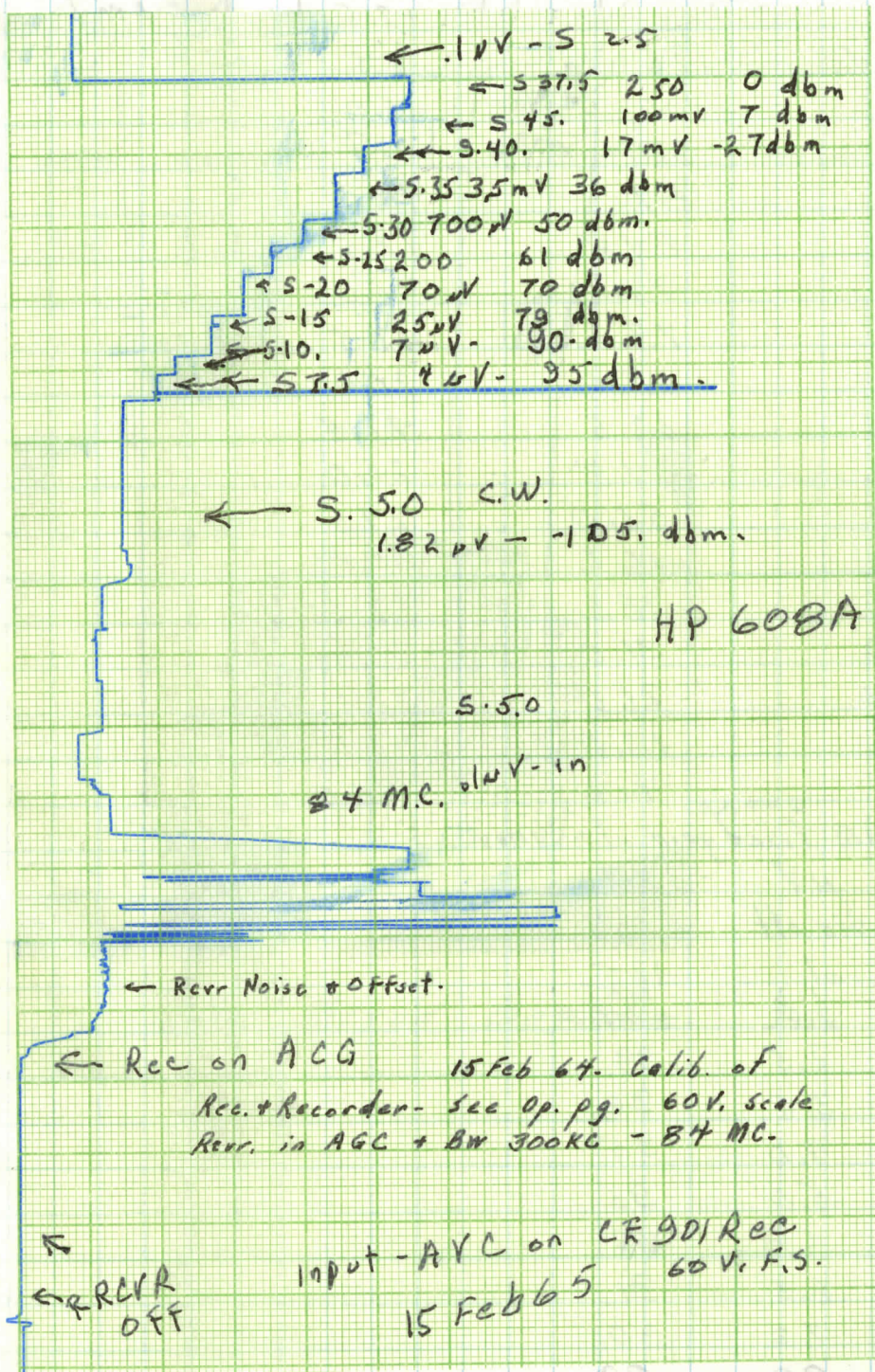
10.0

87.

50.0

10.5

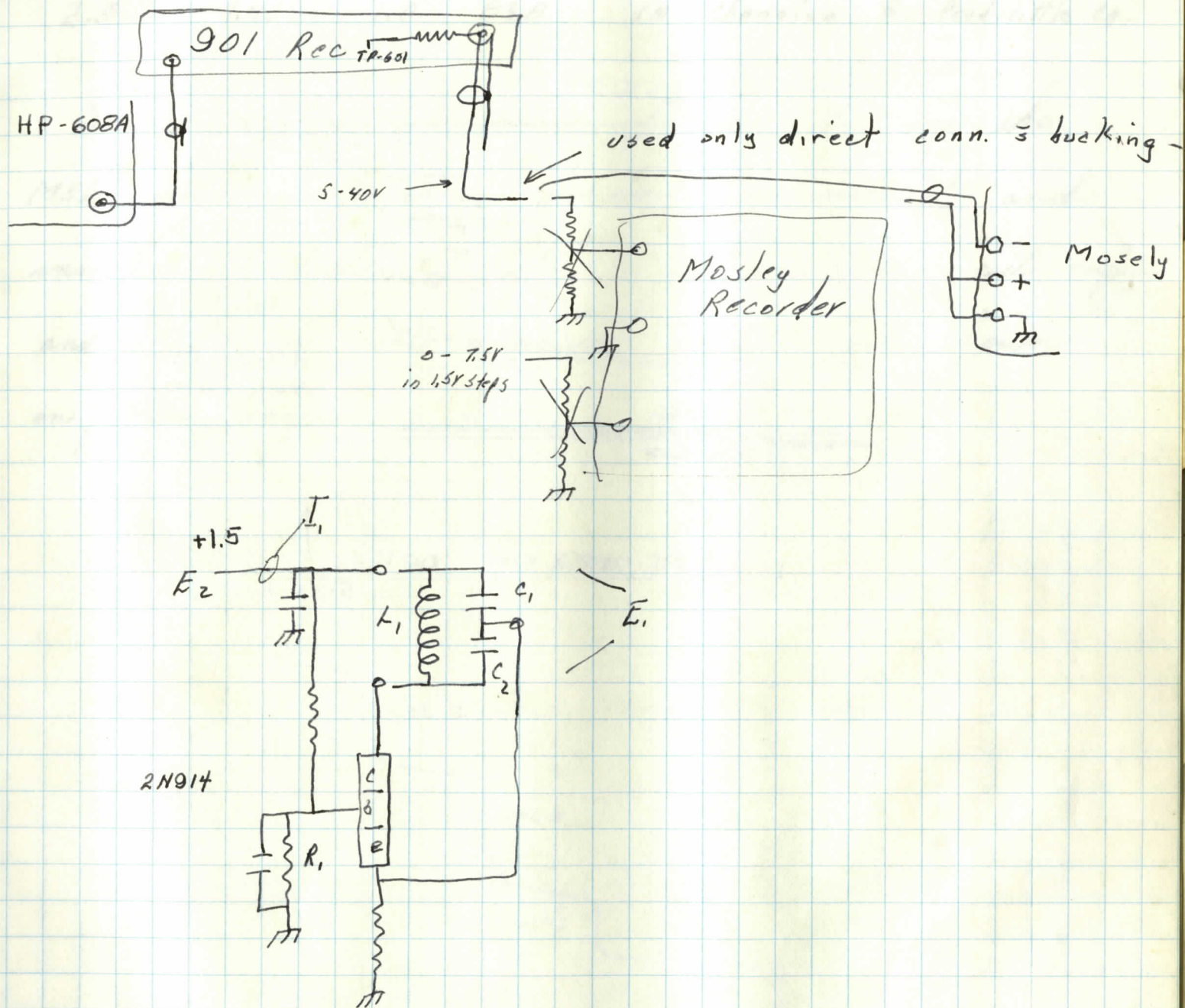
86.



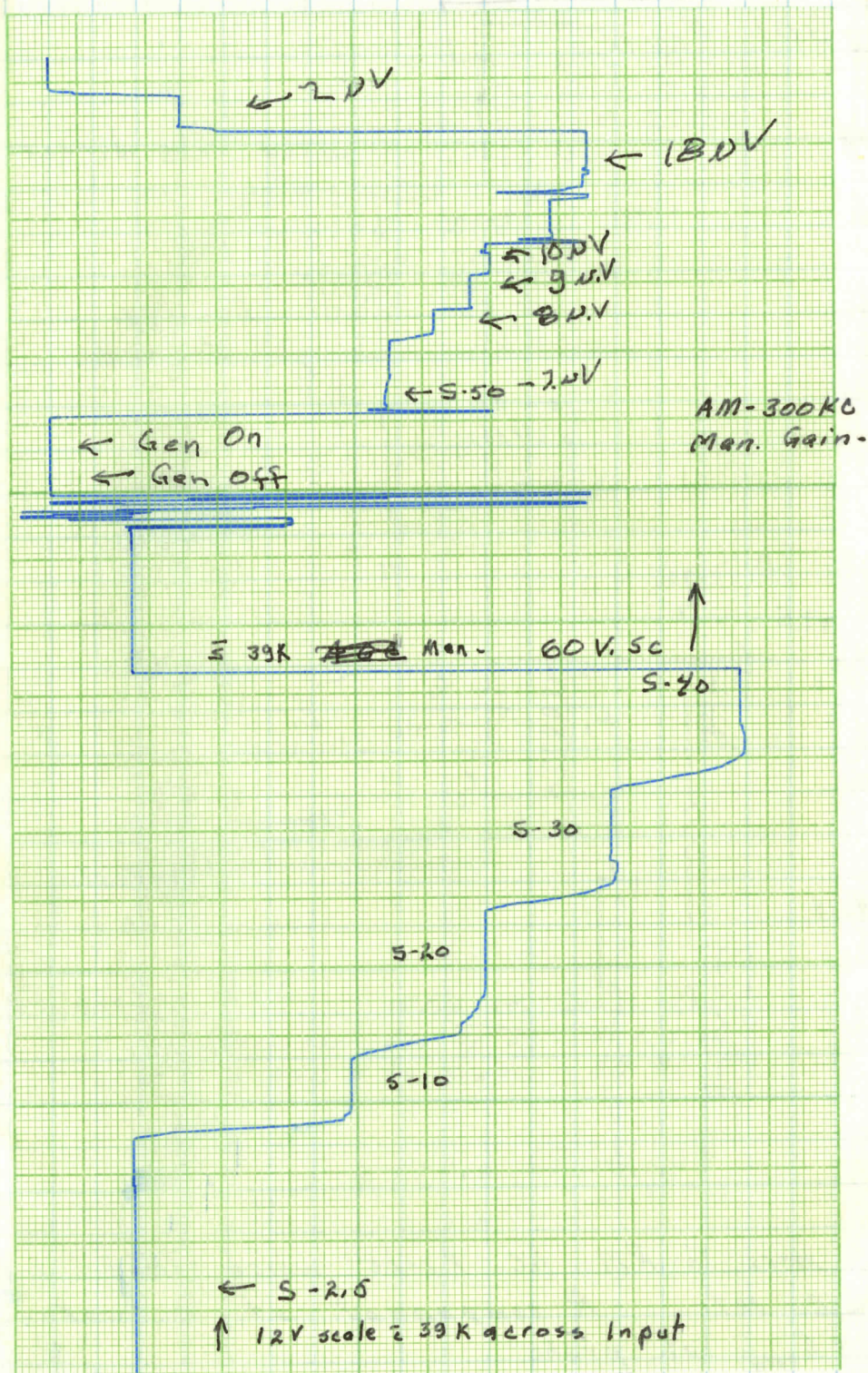
F.L. MOSELE

Goal - Determine effects of Metal enclosure approx. MDL size on Transmitter - Recv. Link for FKG
Look at optimum freq. & required pow. levels.

Plan -



E_1 meas. $\bar{e}$ RM A.C. Probe which has 1.75 μp cap on Tek h.c. mtr. R component of Z unknown.
 $C_{\text{hot}} = C_{\text{cold}}$ of probe



Cal. of Recr. Recorder - See Proc. Rp.

15 Feb.-'65

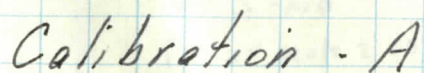
P-57

Det. Power vs Input Volt of ckt. of prec. pg.

$I_1(\text{ma})$	$E_1(\text{V})_{\text{rms}}$	$E_2 \text{ vac}$	F -	R_1
2.5	1.45	1.0	83.8	.1M

changing R_1 Prod. little ch.
See 16 Feb.

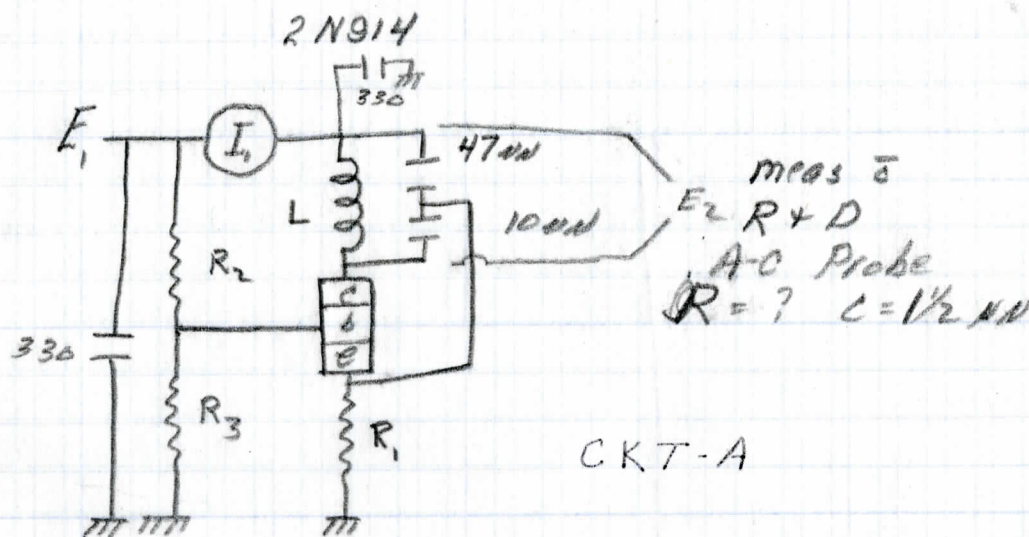
In preparation for meas. of sig. str. in the MOK mock up Calib. of the recvr. was continued and variation of field strength $\bar{c}$ distance, freq., coil config. and input powr. was examined. Results are shown on following pages.



16 Feb 65 -

F-61

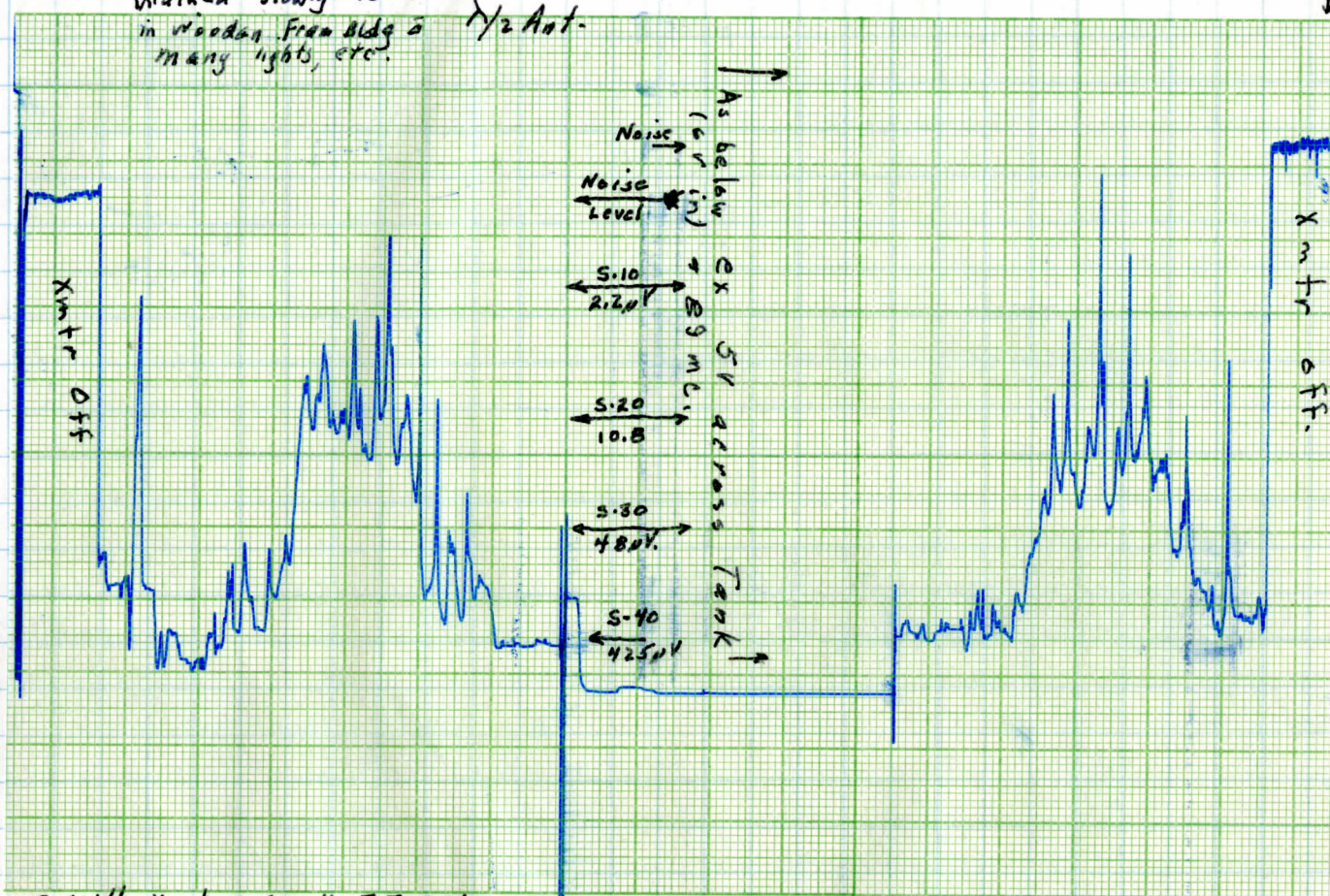
Look at efficiency of low pwr VHF Osc.



E_1 V.D.C.	E_2 VAC RMS	I_1 Ma	R_1 Ω	R_2 K	R_3 K	F mc.	E_3 V	Input Pwr. MW.
+ 1.45	1.12	1.8	100	6.2	100	83.1	.705	2.61
↓	1.05	1.5	↓	↓	10	83.8	.68	2.18
↓	1.00	1.35	↓	↓	8	84.8	.705	1.96
↓	.75	1.05	↓	↓	7	85.5	.68	1.53
↓	0	.5	↓	↓	6	—	.68	
3.00	2.60	3.7	↓	↓	100	85.5	.72	11.4
↓	2.55	3.5	↓	↓	10	↓	.66	10.5
↓	2.5	3.4	↓	↓	8	85.8	.66	10.2
↓	2.5	3.2	↓	↓	5	86.0	.64	9.6
↓	2.3	2.6	↓	↓	2	88.0	.58	7.8
4.3	3.7	4.7	↓	↓	2	87.7	.56	20.2
Further	De	Increasing	R_3	only	↑	I_1	↑ E_2	
5.8	5.0	6.8	↓	↓	2	87.7	.57	39.4
↓	5.0	6.2	↓	↓	1	88.8	.5	36.5
7.4	6.3	8.4	↓	↓	1	88.8	.5	62.1

↓

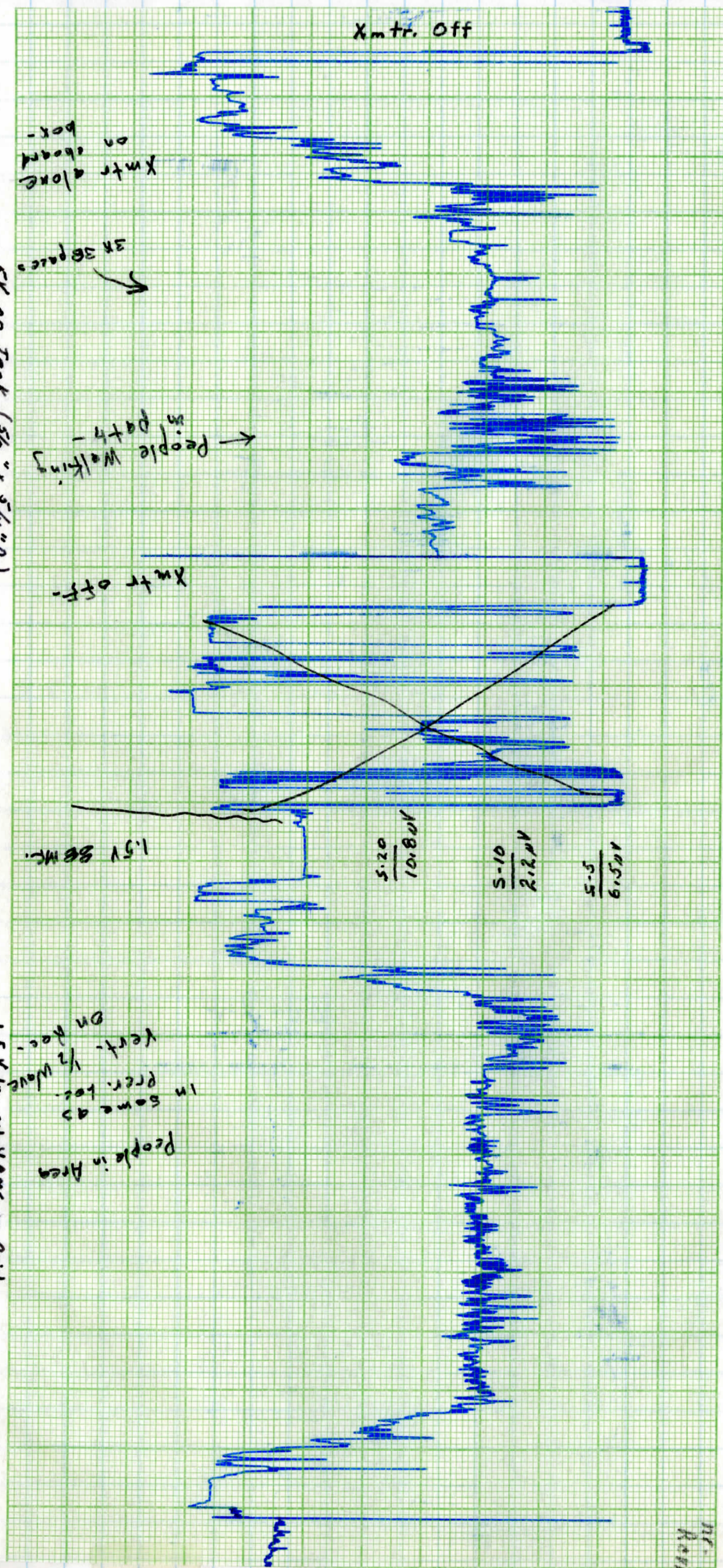
Walked slowly ~ 75'
in wooden frame bldg &
many lights, etc. 1/2 Ant.



Colpitt Xmtr - small TT coil
(5/16" x 5/16" Dia) 1VAC on coil 1.5VDC.

Comparison of circuits & varying E_{in} - Same Xmtr-
CKT A P-61

~ 1.5V in 100k-R
 $E_2 \sim 1.0V$



Cal A
P-58

Xmtr Off.

← Nr Xmtr

35 Paces

1. IVRM on Tank
Large Tank
 $f = 83.3$
AGC - $\frac{1}{2}$ Ant-V.
40.300 MC
Rec (90)

5.40 20 mV

5.30 15 mV

5.20 - 100 mV

← 5.10 7 mV

57 MC CW

AGC B

col.

← On (608)

← 608 conn to off

← Rec off

← Xmtr off

← Nr Rec.

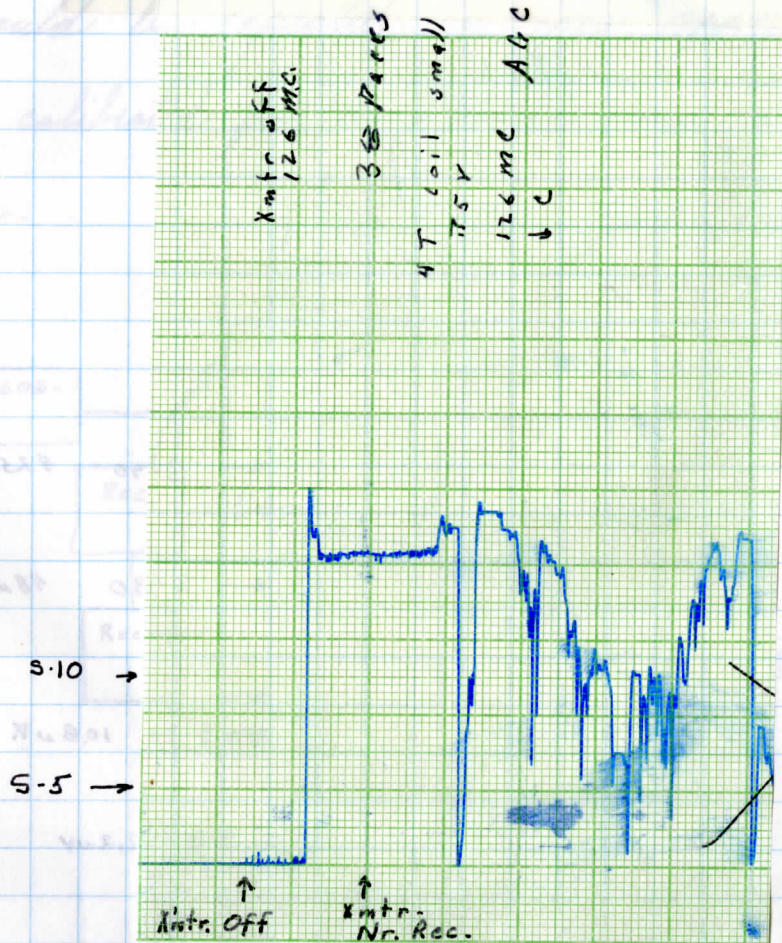
← 35 Paces
Same Rec
Ant

8W 300 KC ϕ AM "D"

1.0 VAC RMS
Across 57 MC
Tank T+TX
Dia of
Prev. Coil

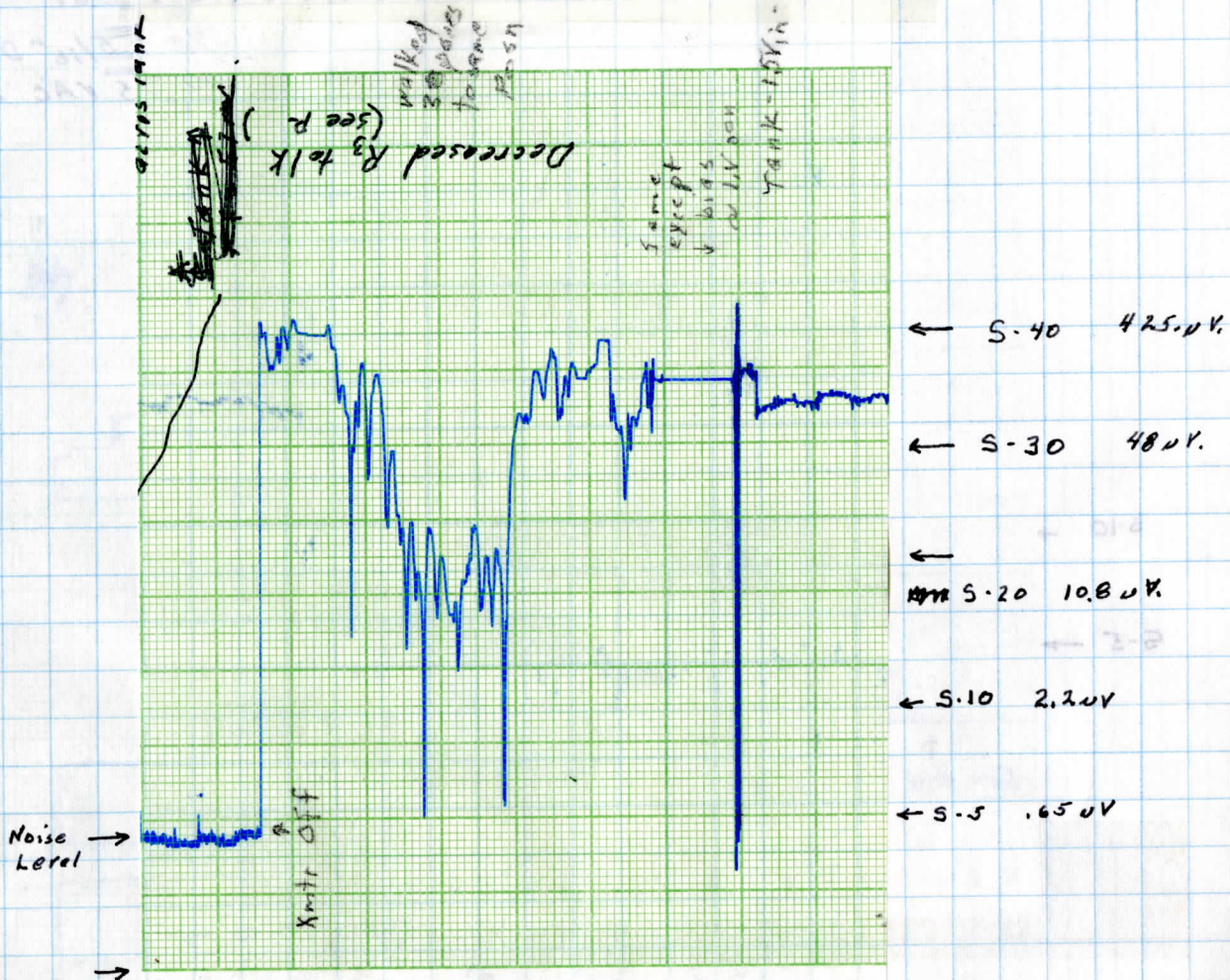
switched Rec.

IVRMS

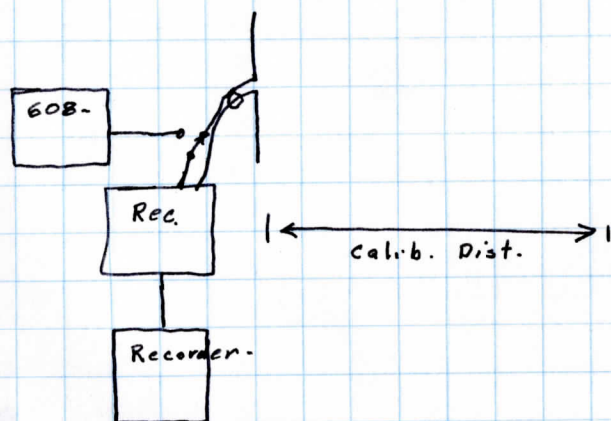


Variation of Sig. z
 Range at 12.5 mc.
 5/8 x 5/16" D. Coil a
 ~.75 VAC on Coil

Cal. A (p. 58)

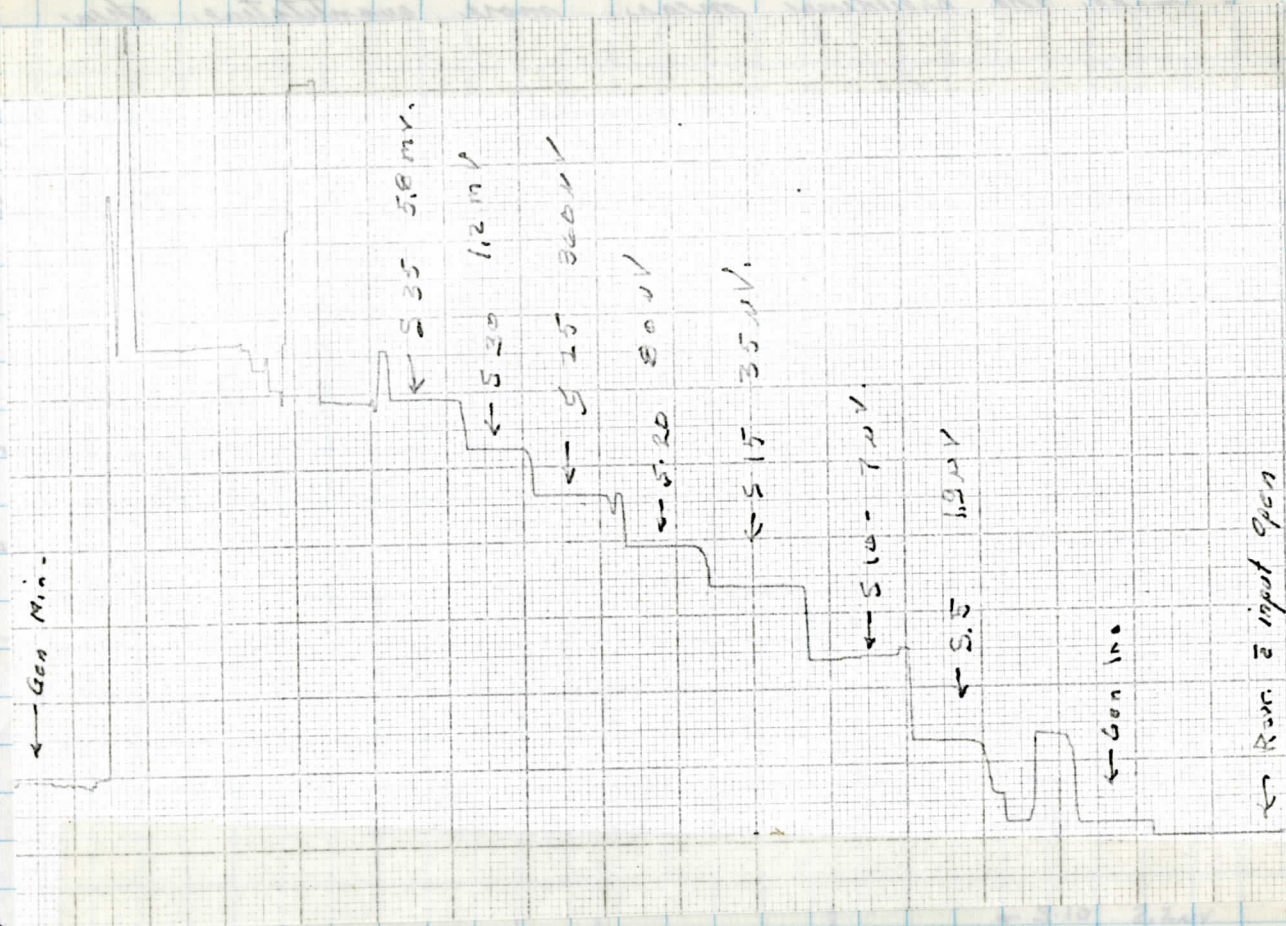


To make the preceding meas. more quantitative they P-67
 should be repeated in open space & the rec. more carefully
 & calibrated for background noise at each freq. - still plan
 this -



Plot: Sig. Str. Vs. Dist.
 at varying: Powers F_k
 Freqs. Power k
 Coil Size Power k

Mtr.
O.

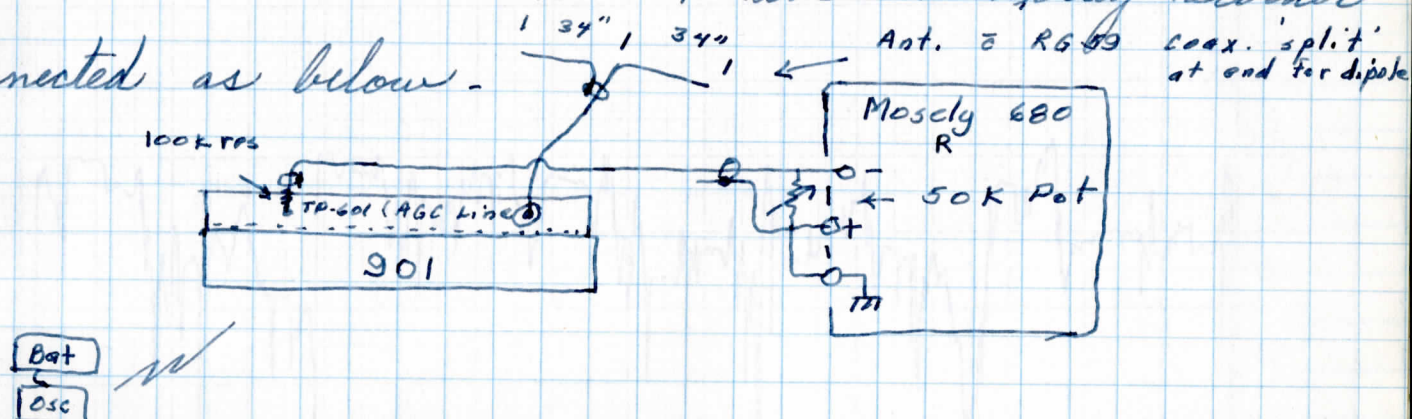


Calibration of 901 recvr. in AGC, BW 3 MHz,
F-83.2 MC. on 17 Feb immed. after lake runs.
608 Hp sig. gen. conn. directly to rec. input thru 26'
of RG 59 U/B cable.

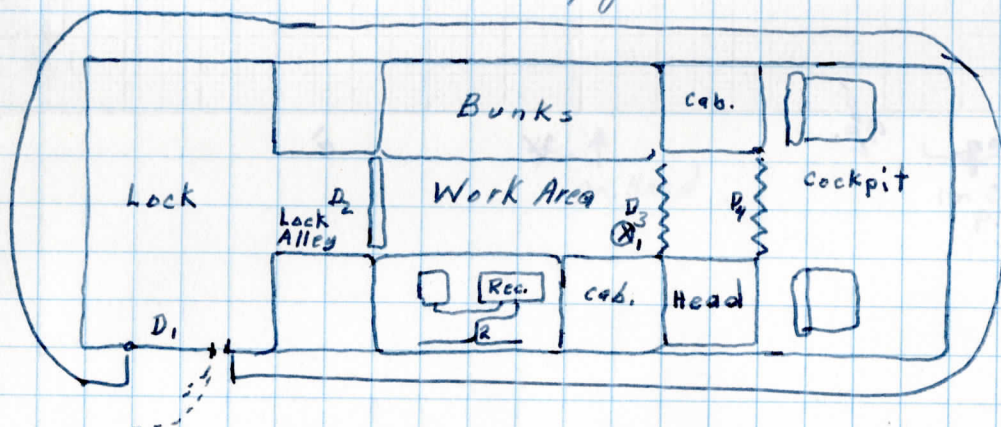
17 Feb. - '65

P-69

Variation of signal strength within simulated MOH was measured $\bar{C.C.E.}$ 901 recvr. + Mosely recorder connected as below.



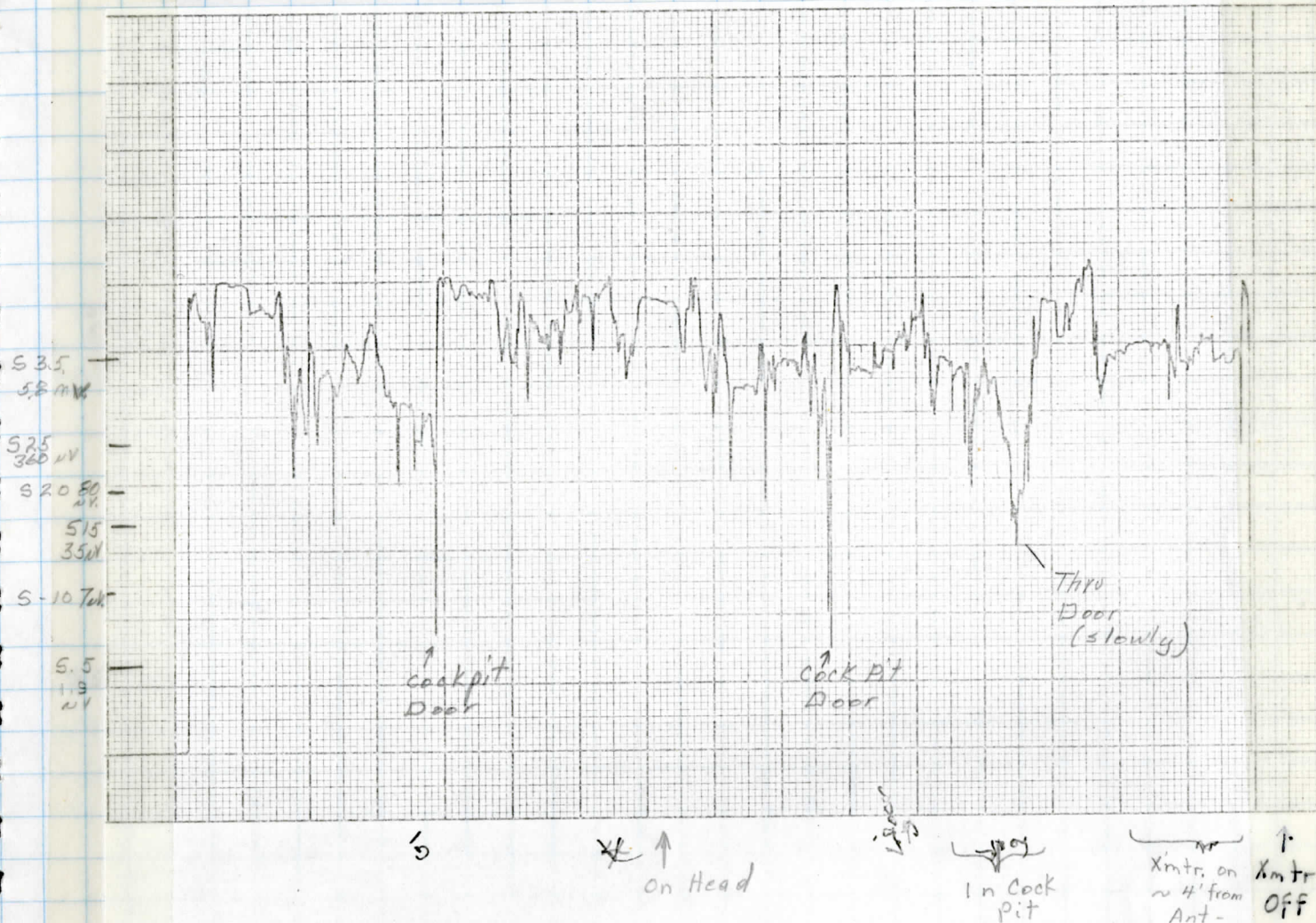
The receiver was placed in the work area and the recorder and dipole placed nearby - A number of recordings were made $\bar{C.C.E.}$ the osc. ckt. on pg. 61 held the the body and $\bar{C.C.E.}$ the following conds:



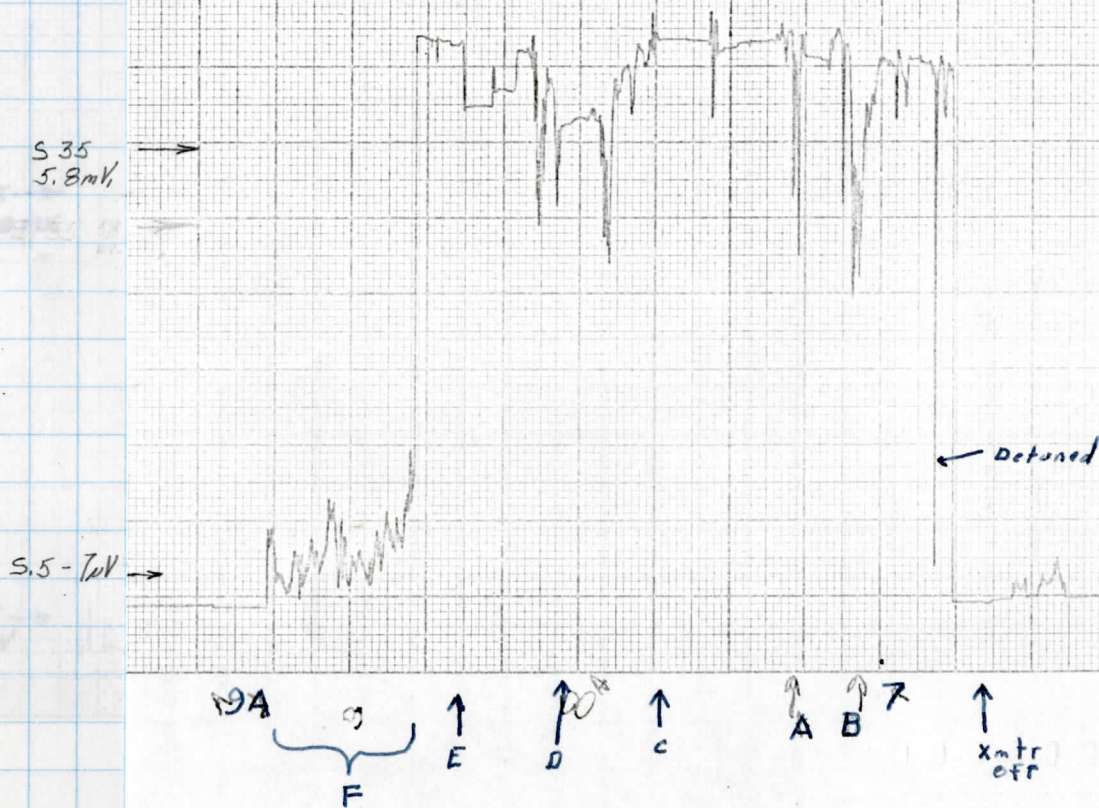
$R_3 - 100K$
 $L - 7T \ 5/16" D \times 5/8"$
 $E_1 = 1.5 \ R \times D \ V T W M$
 $E_2 = 1.2 \ V R M S \bar{C}$
 $R \times D \ probe$
 $I_0 = 1.8 \ ma. \ total$
 $F_0 = 83.2 \ MC.$

D_2 - Lock Door $\otimes_1$ - initial Ant loc.
 D_3 - Metal Screen Door $12 - 20$ " "
 D_4 - " " " " " " " " " " " "

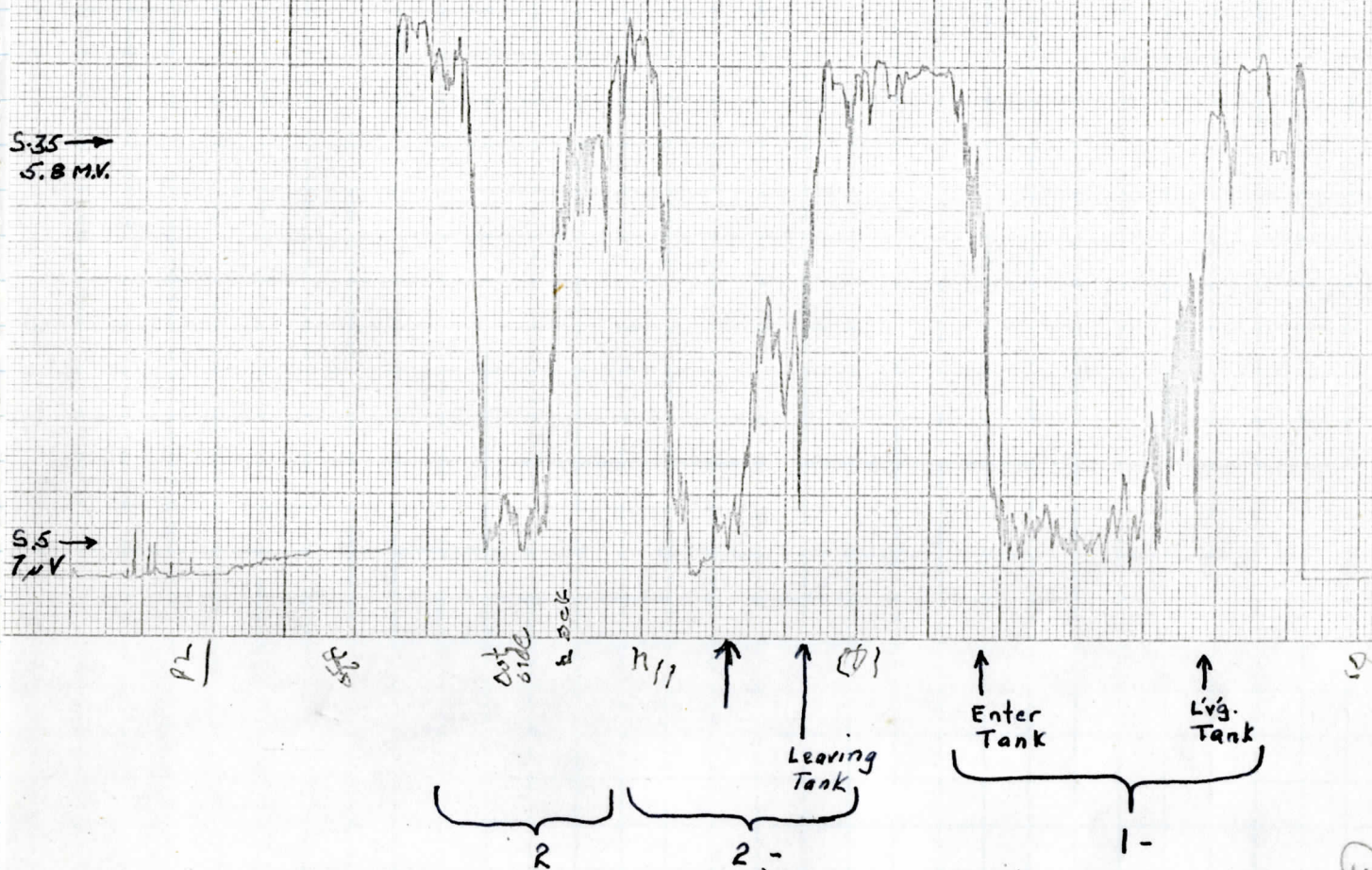
The receiver, and recorder were very extremely stable but when calibrating the recvr. afterward $\bar{C.C.E.}$ a HP 608 it developed two states of operation; one $\bar{C.C.E.}$ high sens. and high offset at (2+ maj. divs) $\bar{C.C.E.}$ signal which after a period permanently reverted to the mode present during testing $\bar{C.C.E.}$ $\downarrow$ sens. & 1 maj. div. defl. $\bar{C.C.E.}$ input signal - See calib. app. pages -



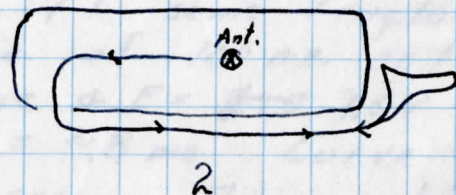
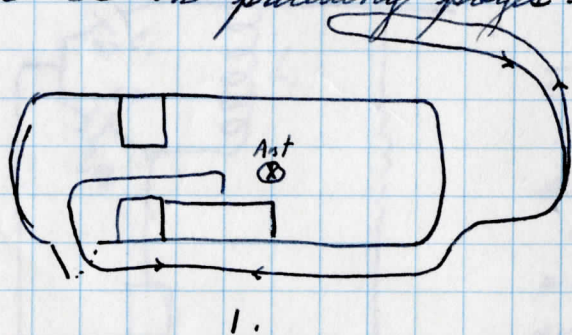
Turned transmitter on and walked forward sitting in cockpit + moving in Area to points which might cause blanking. The only area of marked reduction occurred in passing through the doorways - this was in fact limited to distances of a few inches. Some form of wave guide effect probably causes the sharp drop in Sig. Str. Ant was vert. here.



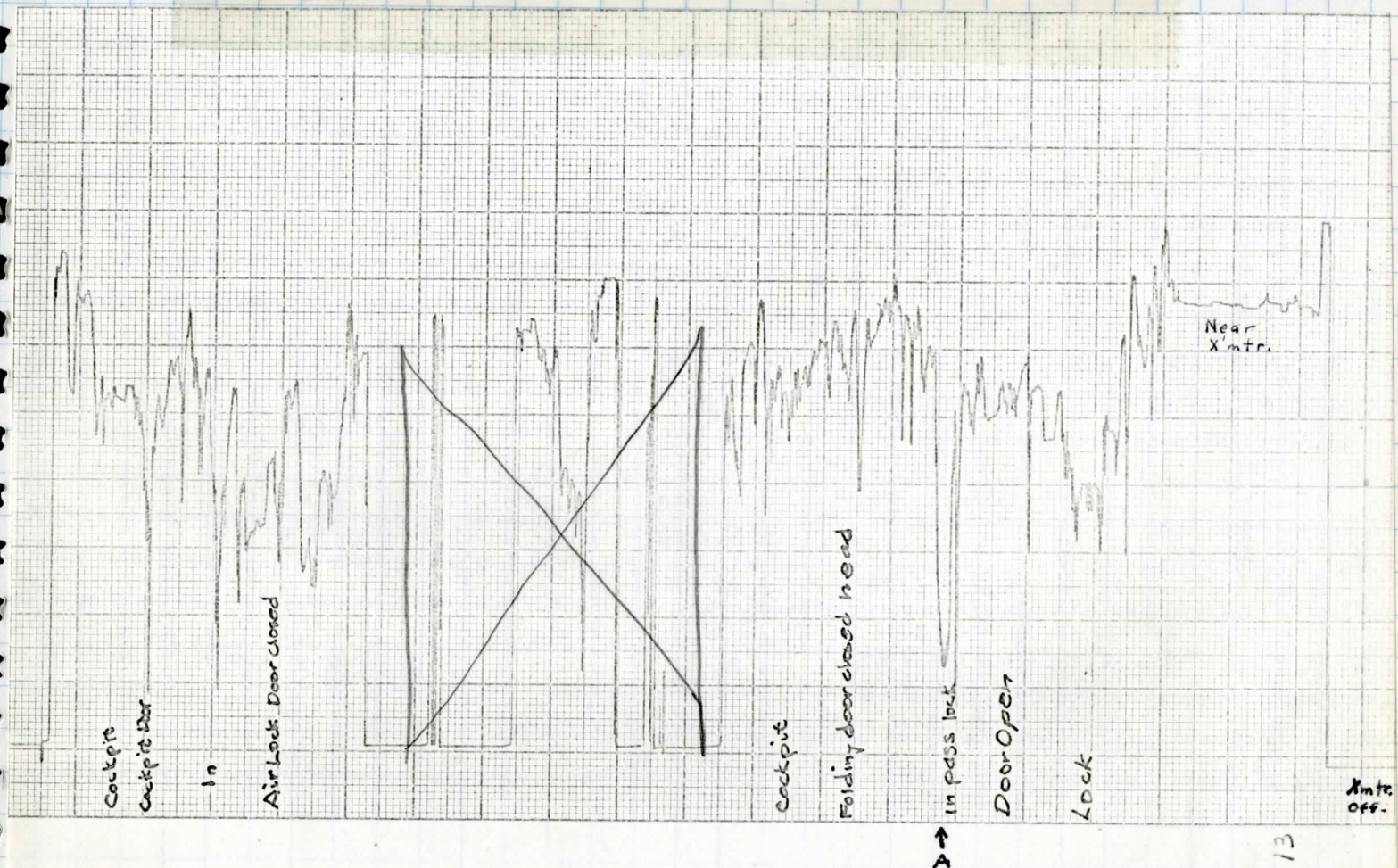
This arrangement is the same as in P-71. At 7B walked thru door into head area and sat in posn. 2 door D₃ closed and then at C went into cockpit & closed door D₄ until returning at D. E is the xmt'r. mv. the scur. following which it was turned off and F is noise from a drill & arcing brushes which was turned off at 9A.



Leaving the chamber and walking outside the chamber c arrangement as on preceding pages.



2N 332
 47
 20
 100
 50
 13



(2)

(1)

(7)

This was same as preceding runs except the antenna was placed very near flat to 1/2" from chamber wall. Runs were made from the entrance of the air lock, and in ① walking to cockpit closing the ~~me~~ 2 doors D₃ D₄. Some time was spent at ② trying to determine exact point of max. absorption which accounts for the broad dip.

TI HF Unit

2N792

TI 1304

TI 2N914

TI 2N914 {

I_{in} $A \times 10^{-6}$	I_{out} $A \times 10^{-3}$	β	E_c
47	.97	$\frac{970}{47} \approx 20$	1.5
20	100	50	1.5
100	.1	~ 50	
16	1000		
4	5000		
9 $\Delta 5$	1000.	~ 100	
16	↓		
7 1/2	500	~ 60	
7 1/2	↓		
13 1/2	1000	~ 166	
8	↓		
3 1/2	500	> 160	
9	↓		
19	1000	50	
26 11 1/2	↓		
13 1/2 6	500		
27 15	1000.		
8	5000	71.	

John Woodruff

Filbert Tillery Townsend

Wall - physiology at S. H. H. prev.

Bernie Landress

George Johnson

Phil Thomas

Integrated CKTs.
Moro program - (Thomas is chief adv. devel.)

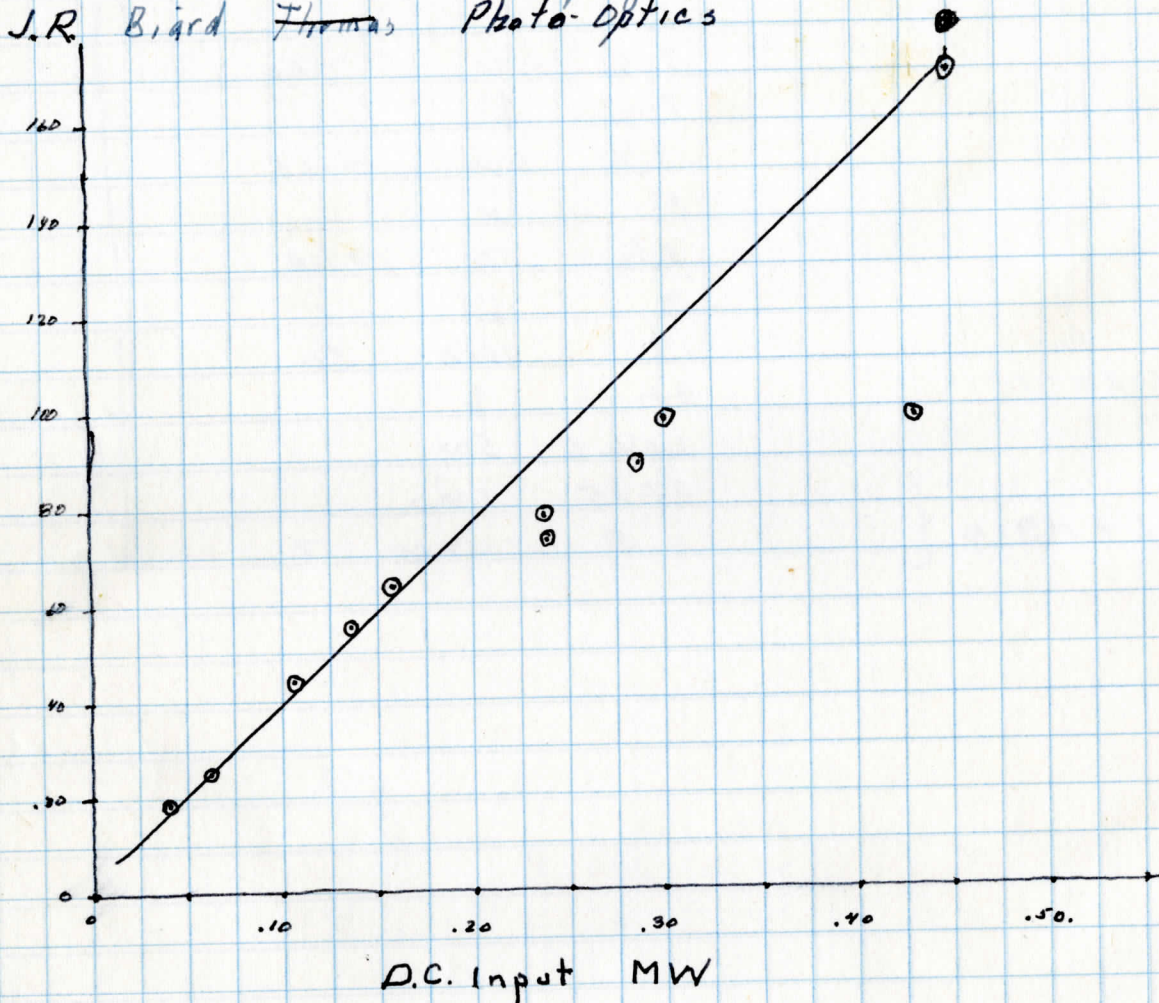
J.R. Beard Thomas Photo-Optics

RA-2

T-1

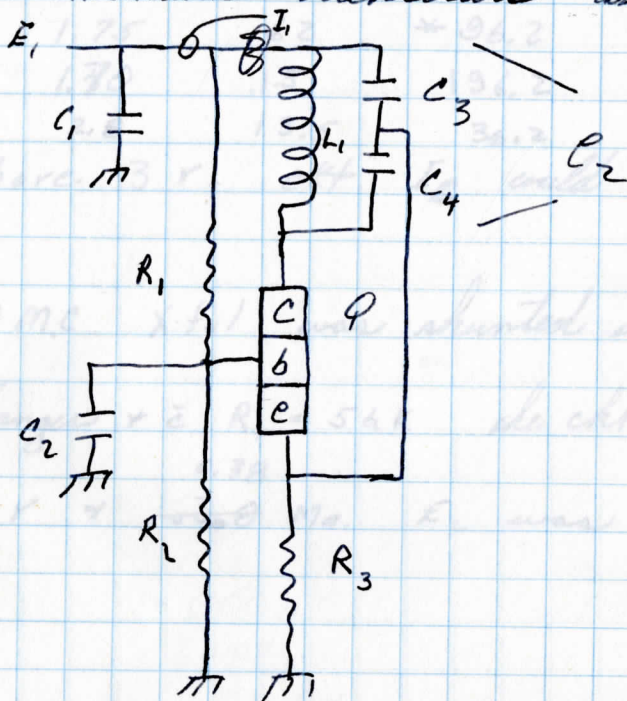
low Freq Amp 5500
162

AC
Across
Tank



22.2.65

Look at efficiencies of UHF PNP diffused base
Mesa Germanium transistors at 80 MC.



Q - #18 sample

C₁ - 330 μ N

C₂ - 100 μ N

C₃ - 47 μ N

C₄ - 15 μ N

R₃ - 100 Ω

L₁ - 7T - 5/16" D x 5/8" L.

Meas $\pm$ 1.5 μ V
Probe (R=0)

E ₁	C ₂	I _b	Pwr.	R ₁	R ₂	F
VDC	V _{RMS}	mA	MW	K Ω	K Ω	MC.
0.4	.18	.11	.044 0.15	6.2 K	100	
0.5	.26	.3	.078	$\downarrow$	$\downarrow$	
0.5	.26	0.12	.060	14.2	$\downarrow$	
.75	.47	.25	.187	$\downarrow$	$\downarrow$	
.75	.44	0.14	.105	36.2	$\downarrow$	100.2
.90	.58	.2	.18	$\downarrow$	$\downarrow$	99.8
$\downarrow$	$\downarrow$	1.3	1.17	6.2	$\downarrow$	90.8
$\downarrow$	$\downarrow$	.58	.522	16.2	$\downarrow$	95.3
$\downarrow$	.56	.15	.135	46.2	$\downarrow$	100.0
$\downarrow$	.54	.12	.108	56.2	$\downarrow$	
1.0	.64	.18	.180	$\downarrow$	$\downarrow$	
1.1	.72	.22	.242	$\downarrow$	$\downarrow$	
1.2	.81	.28	.336	$\downarrow$	$\downarrow$	
1.2	.80	.23	.276	66.2	$\downarrow$	100.6
1.2	.78	.2	.240	76.2	$\downarrow$	101.
1.3	.88	.22	.286	$\downarrow$	$\downarrow$	100.8
1.3	.89	.28	.364 *	66.2	$\downarrow$	
1.4	.97	.31	.433 *	$\downarrow$	$\downarrow$	104.2
1.5	1.05 A	.35	.525	$\downarrow$	$\downarrow$	101.2
1.5	.97	.2	.300	96.2	$\downarrow$	

* - part this
pt. $\uparrow$ I, did not
 $\uparrow$ E₂ signif.
A - 3.4 scale

$\leftarrow$ No spec

Exactly same
 $\leftarrow$ 20 Kc chg.

Same as Preced. pg.

Pwr E_1 E_2 I_1 R_1 F $5-R_1 = 100K$

1.86 -3. 1.75 .62 *96.2 102 44

.45. ↓ 1.70 .15 196.2 ↓ 40 ← {squeezing present
-4.5 2.8 13.5 36.2 78 42 $\bar{E} R_1 > 100K$

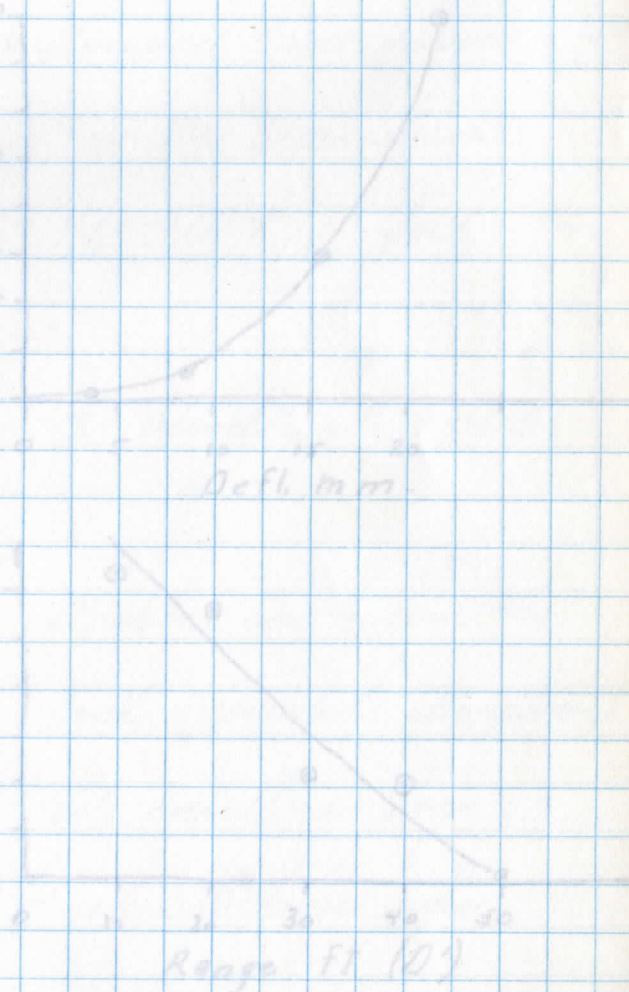
Above 3 v. ckt. I_C could not be controlled $\bar{E} R_1$

A 99 m.c. X-tal was shunted in place of C_2 & 3

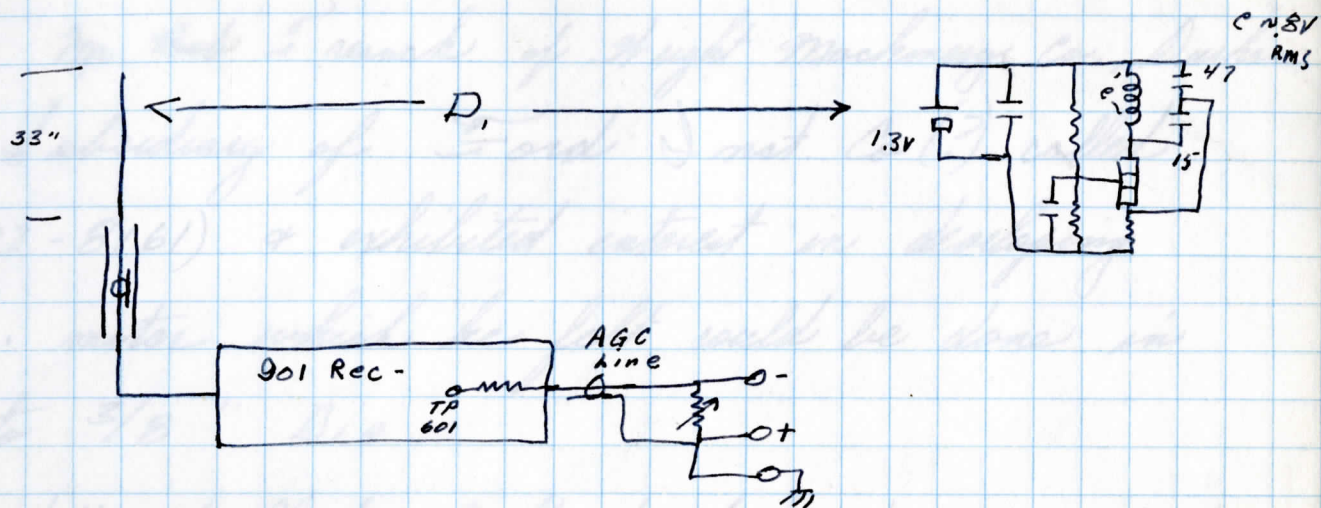
other changes & $\bar{E} R_1 = 56K$ the ckt. would osc. to .7 v.

At -1.3 v & ^{0.38}~~3.8~~ Ma. E_2 was 7.9 v.

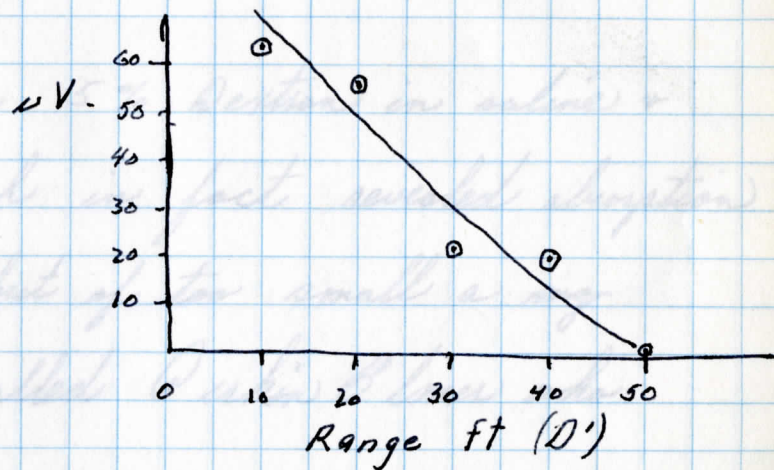
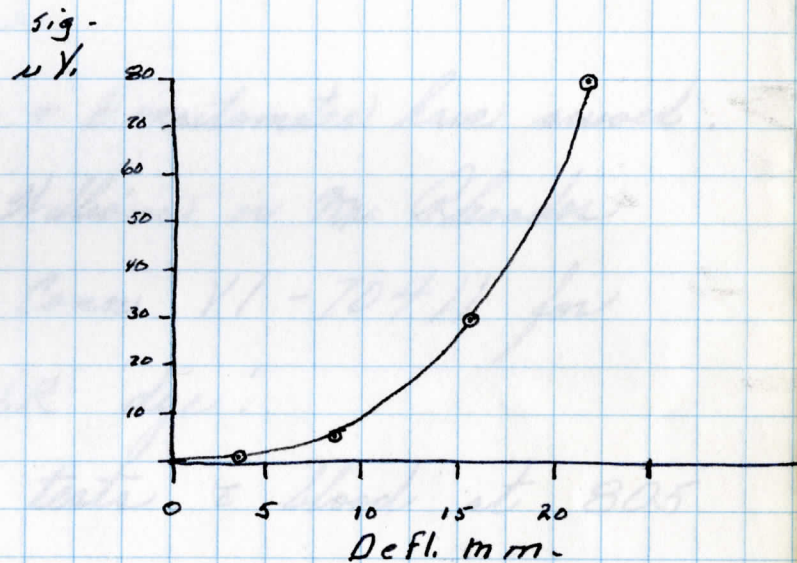
~ 600 μV
635 μV
57 μV
22 μV
20 μV
18 μV



Sig. Strength Vs. Distance & Colpitts Osc.



Dist- ft-	Sig. Str.
0 -	$\sim 600 \mu V$
10	$635 \mu V$
20	$57 \mu V$
30	$22 \mu V$
40	$20 \mu V$
50	$.8 \mu V$



25 Feb. '65

Mr. Bob Trnack of Wright Machinery Co., Durham N.C. Subsidiary of Ford Inst. Co (?) called (#682-8161) & exhibited interest in developing synch. motor which he felt could be done in $\frac{1}{2}$ to $\frac{3}{8}$ " Dia.

Will get Charles Craft to look at PVP + Dextran for me in near I.R. region -

The Waters Oximeter & Densitometer have arrived. Will call Mr. Van Sant Williams or Mr. Rhodes at Perkin Elmer Norwalk Conn. VI-70411 for possible info. on an I.R. 'dye'.

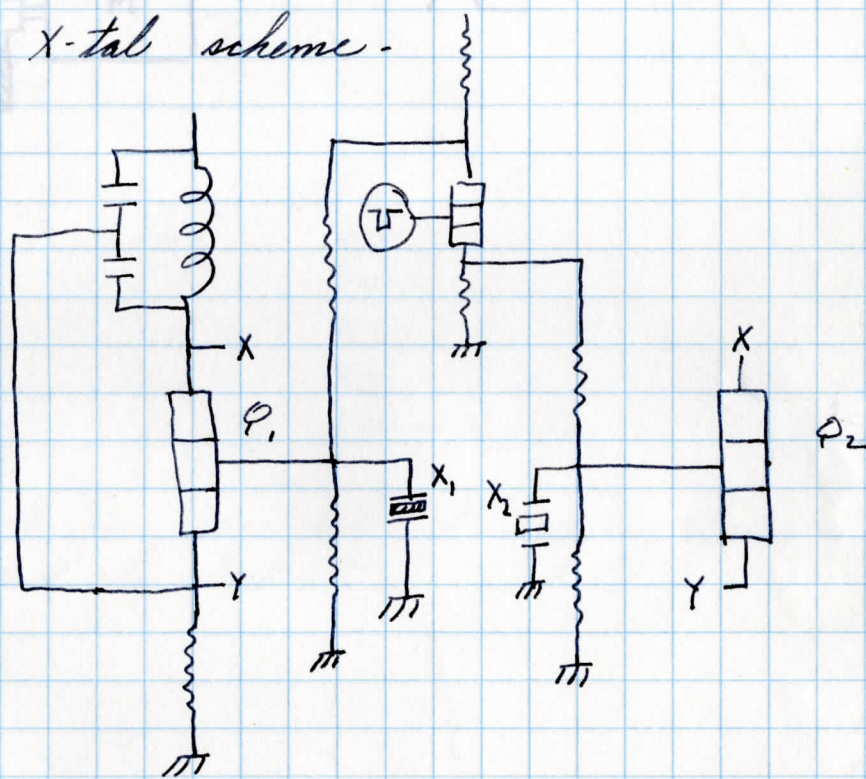
Also need to run tests $\pm$ blood at 805 + 1000 M μ .

26 Feb. Ran curves on 5% Dextran in saline & H₂O saturated $\bar{c}$ PVP which in fact revealed absorption in the 1.2 - 1.35 μ range but of too small a mag. magnitude to be of use. Called Perkin Elmer who could suggest nothing.

26 Feb '65

It now appears desirable to actually demonstrate a low power X-tal controlled ckt. for 30 days EKG use. There are several possibilities here. One is a pulsed A.M. system X-tal controlled & using existing components. Another is a X-tal controlled F.M. system. At this time a S.C.O. is needed.

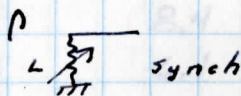
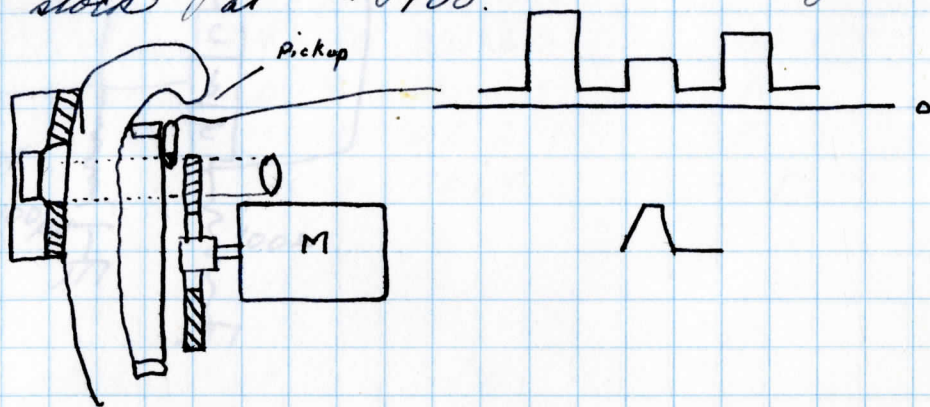
Possible F.M. X-tal scheme.



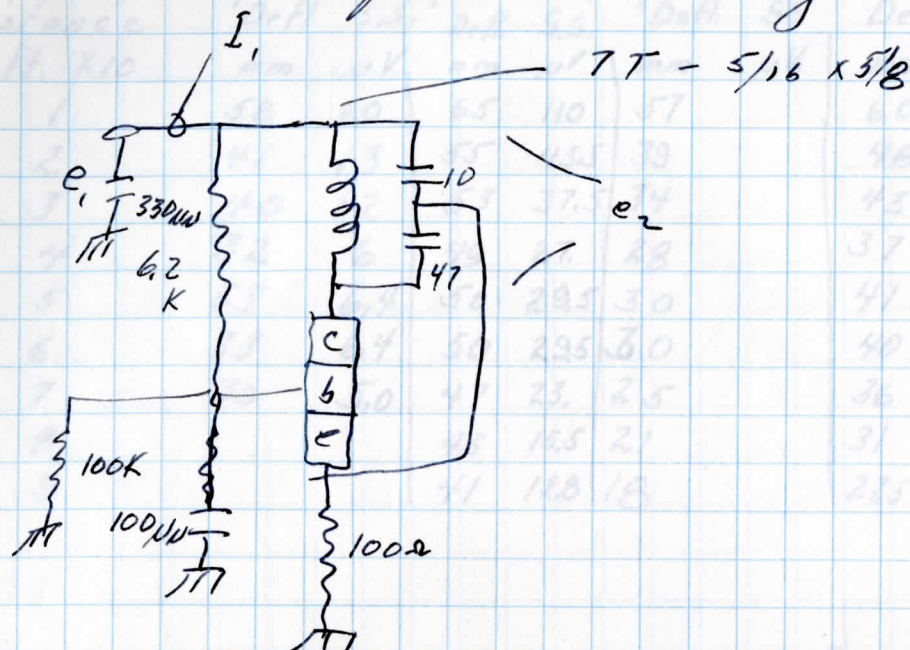
If the caps. etc of Q_1 & Q_2 are low enough it may be possible to switch them into alternately into the tank ckt. & X-tals tuned near each other.

1 Mar '65

Mr. of Gearlott in Dallas called about chopper motor. They can fabricate a 6.0 V 60 N 2 ϕ synch. unit in 75 days at $\sim$ 800 in a size 5 frame. He suggested using a 400 r servo motor whose speed may be varied by driving volt. & ϕ . They have size V units in stock at < 100 .

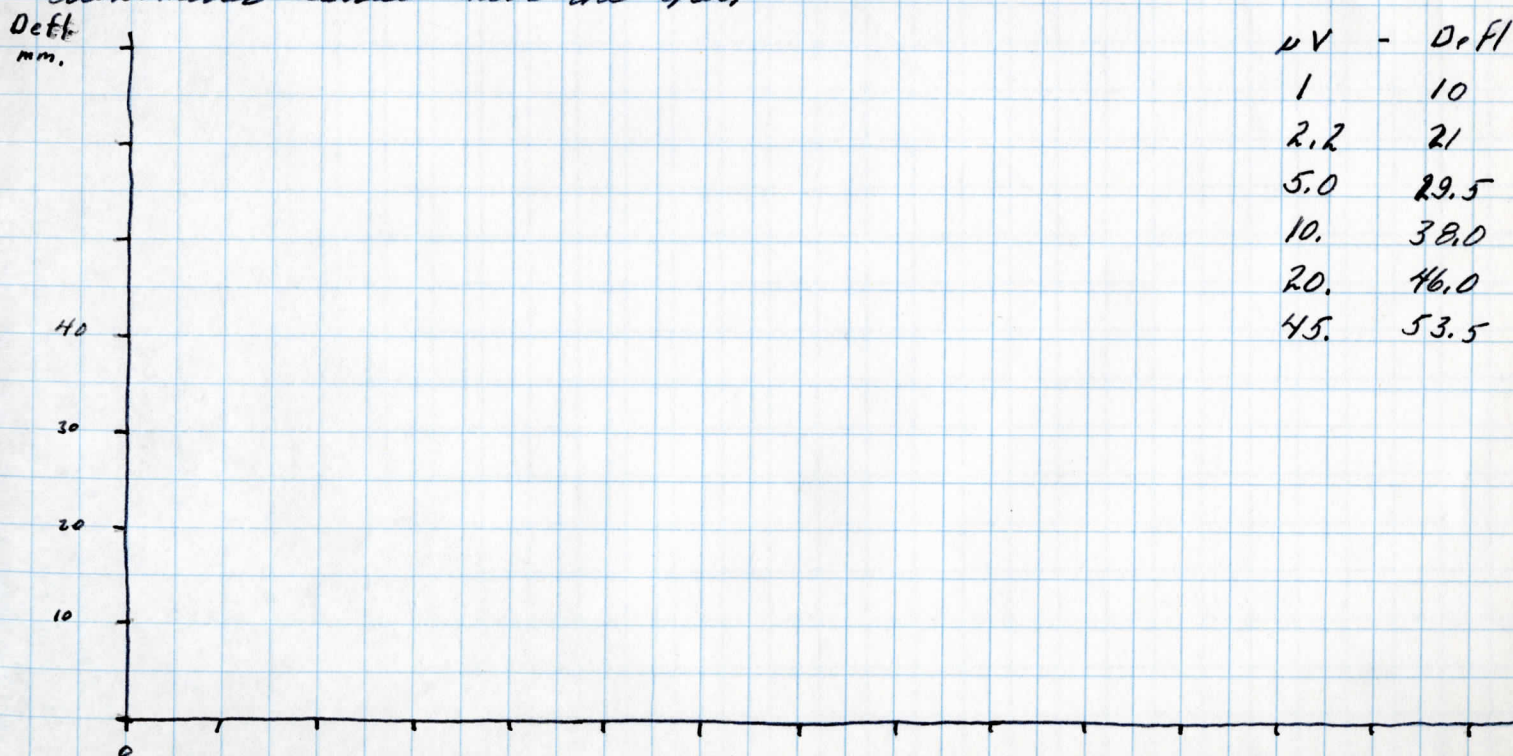


Dist. as F of Tank Voltage



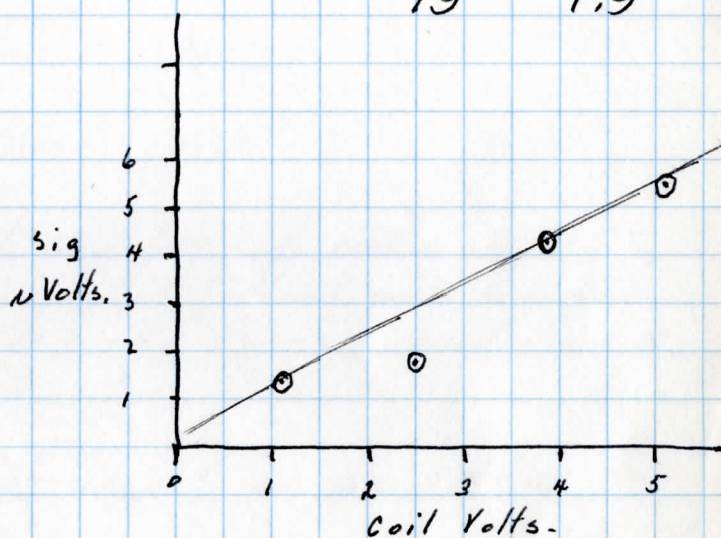
e_1	I_1	e_2	F
VDC	mA	VRMS	M.C.
+6	8.4	5.1	84
4.5	6.1	3.8	83.7
3.0	3.9	2.5	83
1.5	1.9	1.1	84, ← L Adj.

The field strength was recorded at varying ranges & the transmitter carried near the chest.

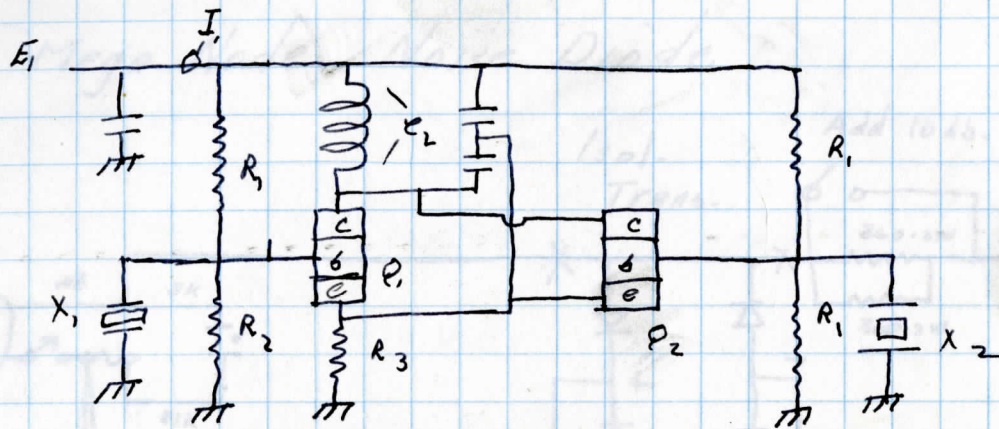


Distance Ft. X10	1.5 V in.		6 V in		4.5		3.0		1.5	
	Defl.	S.S.	Defl.	S.S.	Defl.	S.S.	Defl.	S.S.	Defl.	S.S.
	mm	μV	mm	μV	mm.	μV	mm		mm.	
1	58	60	65	110	57		60		57	57
2	41	13	55	45.5	39		48		40	14
3	40	12	53	37.5	34		43		38	10
4	32	6	49	27.	28		37		30	5.
5	33	6.4	50	29.5	30		41		35	7.8
6	33	6.4	50	29.5	30		40		35	7.8
7	30	5.0	47	23.	25		36		30	5.
8			43	15.5	21		31		28	4.3
9			41	12.8	18		27.5		22	2.5
11									19	1.9

Range	Volt.	Defl.	μV	Coil V.
$\sim 10^2$	1.5	15	1.4	5.7 1.1
	3.0	18	1.75	2.5
	4.5	28	4.3	3.8
	6.0	31	5.5	5.1



2 Mar CK. of possibility of parallel Xtal operation



$P_{1,2} - T_1$
Ge 3GC
Xistors -

E_1	R_1	R_2	I_1	R_3	X_1	X_2
-1.5	28K	.1M	$\frac{Ma}{\sim 1.0}$	100 Ω	91.45	92.46

The above ckt would operate at the freq. of either X_1 or X_2 by removing R_1 either R_1 from its supply. If both were connected the ckt. would still osc. at X_1 & X_2 & $X_1 + X_2$. $X_1 - X_2$ wasn't chd. Ckt was very stable. $e_2 \sim 1 \text{ V RMS}$.

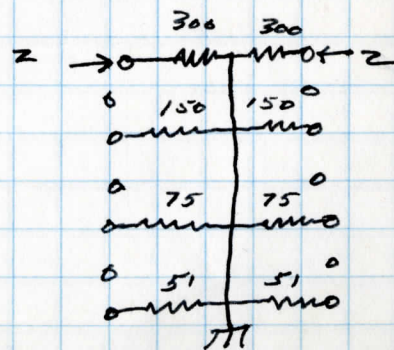
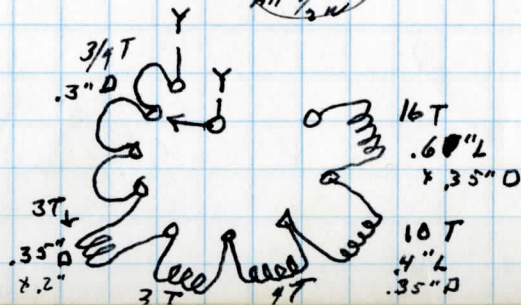
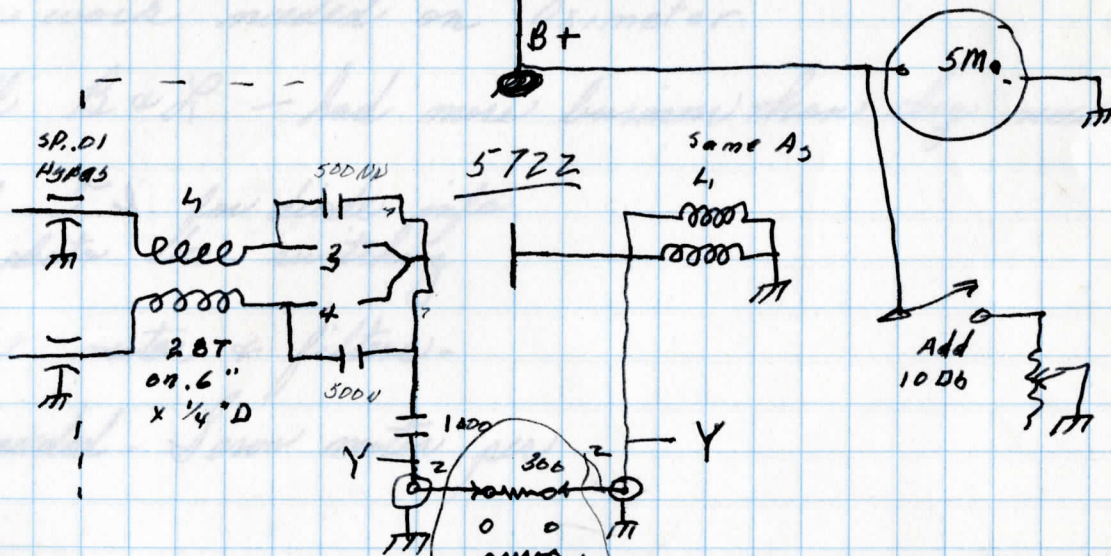
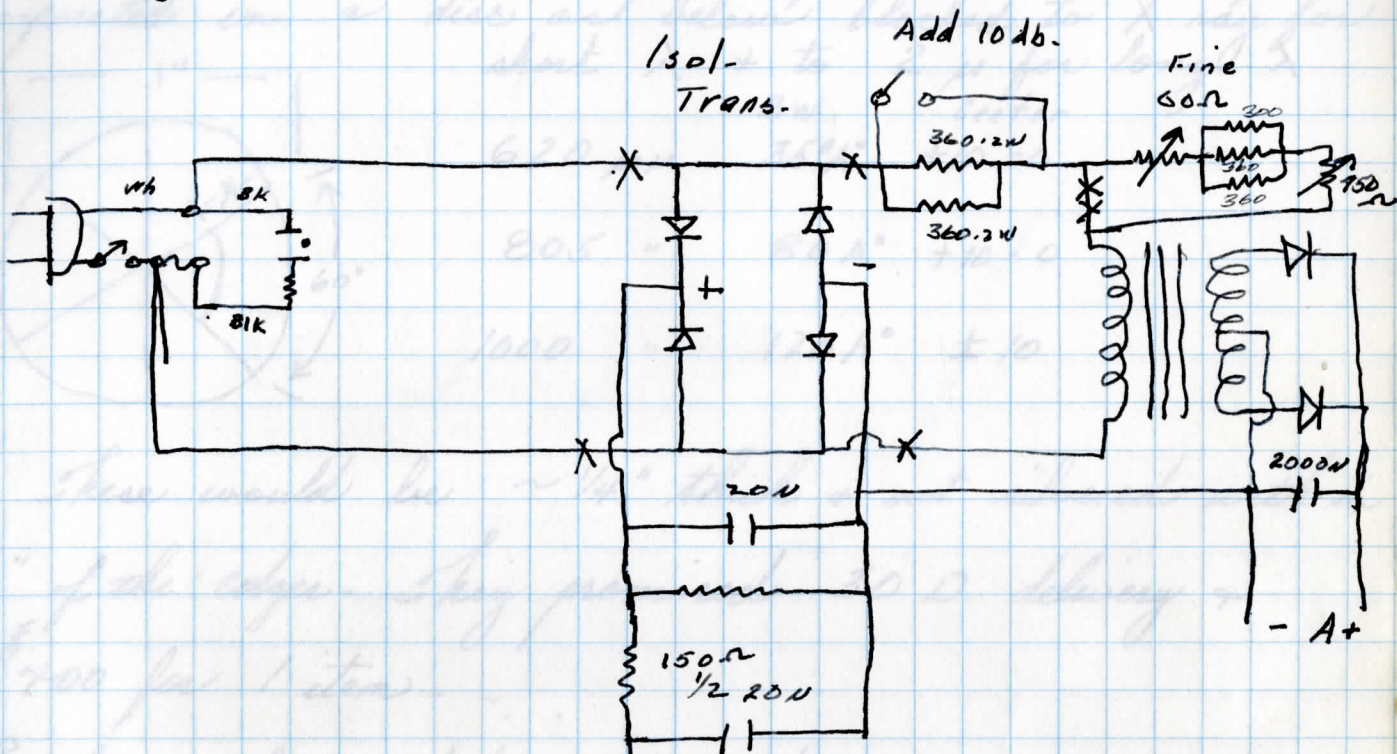
This unit will provide crystal control for an FPA/FM system but will require alternating sources of voltage for the base. A multi-vib. VCO may be the answer. Other possibilities are an Eccles Jordan flip-flop driven by a unijunction SCO.

Attempted to call 6d Palmation

Physics 9332079

Home 942 1329(?) -

Kay Mega Node Noise Diode

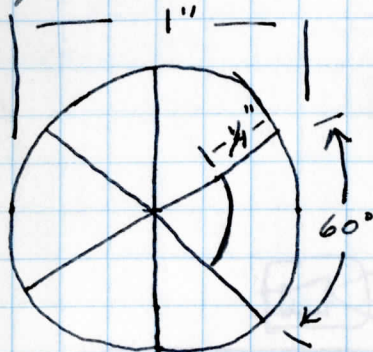


8 Mar '65

[sales]

Called by Mr. Charles Howe (Hony) of Baird Atomic
 & talked to Ed Cushing phys.

The can deliver interference filters to be incorporated
 in a disc as below blocked to X ray for
 short λ + to 2μ for long λ



	BW	Center
620 mm	35°A°	+10 - 0
805 "	80 A°	+10 - 0
1000 "	120 A°	± 10

These would be $\sim 1/4$ " thick & not silvered within
 $1/64$ " of the edges. They promised 30 D. delivery &
 $\sim \$400$ for 1 item.

Further work needed on Oximeter

Call B & R - had more business than they needed -

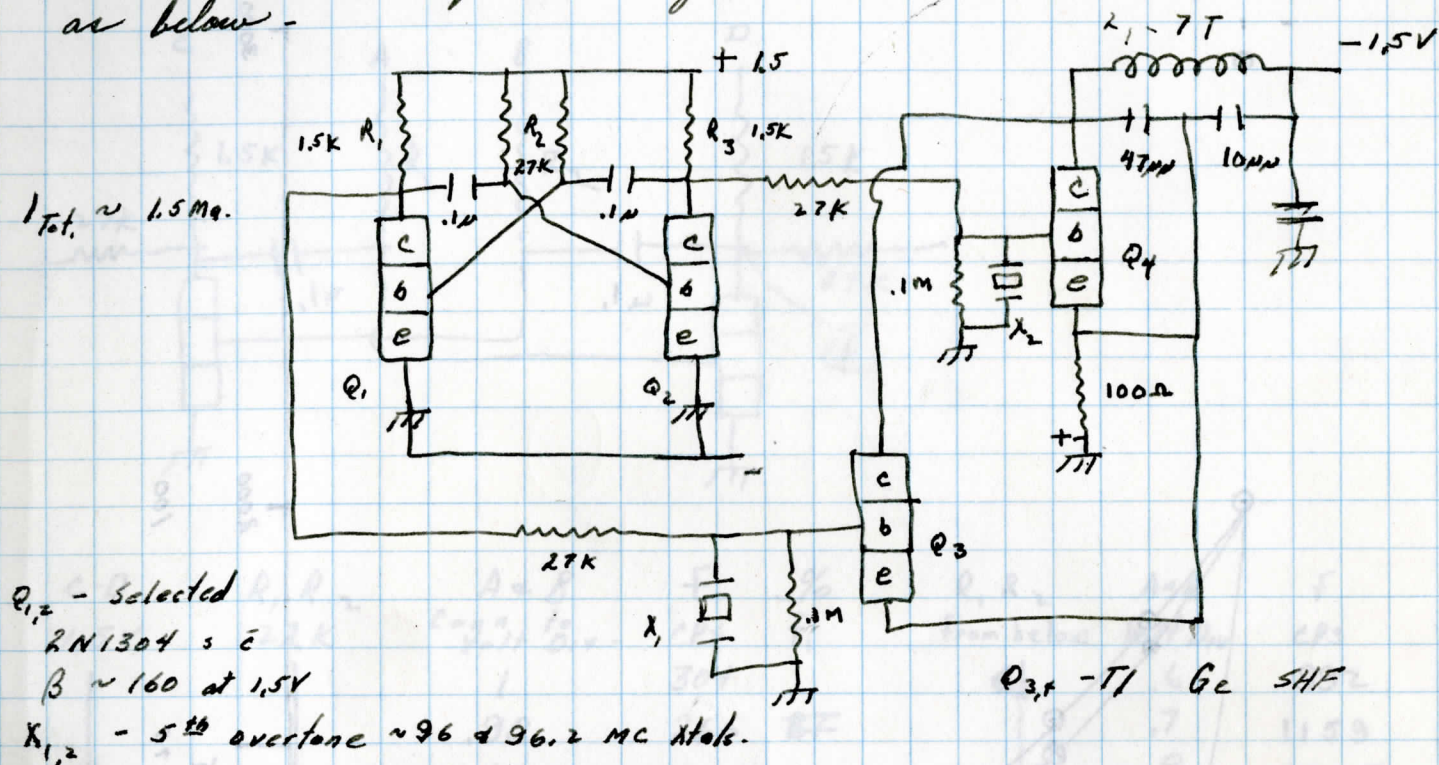
Call T.D. for diode info.
 & photo elec. switching

Order motor & filters -

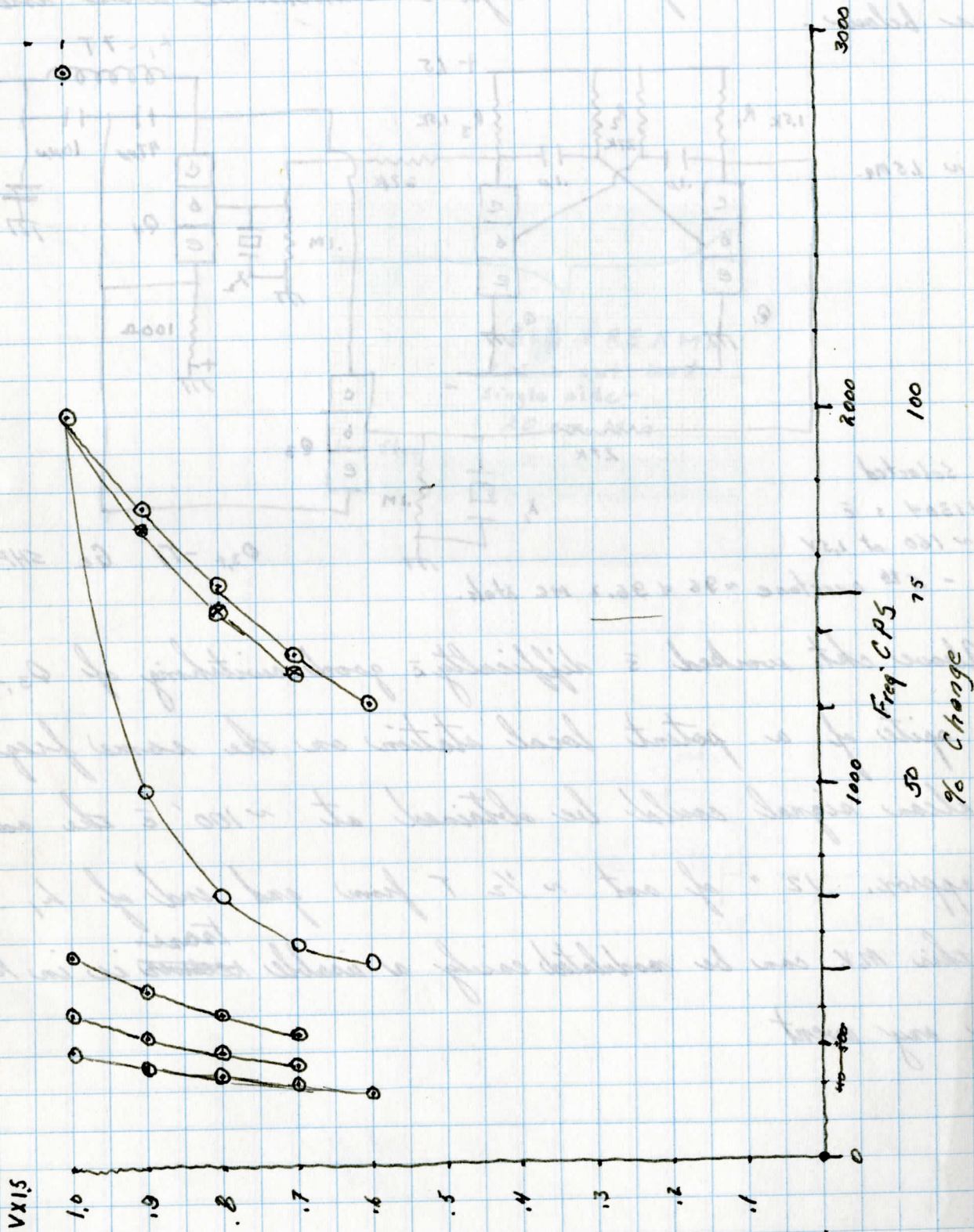
Parts needed - Servo motor per

15 Mar. '65-

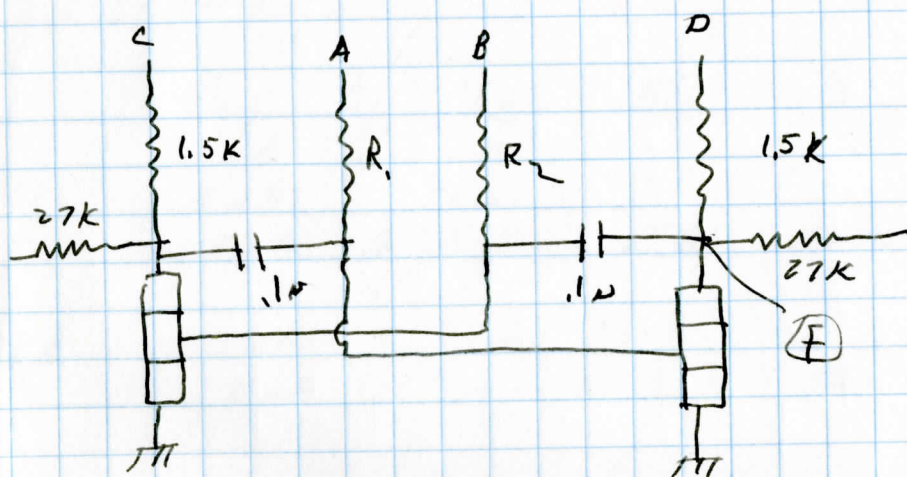
Breadboard for bi-crystal transmitter was assembled as below -



Above ckt. worked $\bar{s}$ difficultly $\bar{c}$ good switching of $Q_{3,4}$
 In spite of a potent local station on the same freq.
 a clean signal could be obtained at $\sim 100'$ $\bar{c}$ the addition
 of approx. 12" of ant $\sim 1/2 T$ from grd end of L_1 .
 If this M.V. can be modulated easily a usable ~~receiver~~ ^{trans.} is in hand.
 In any event



ckt. on preceding pg. examined as below



C-D	R_1, R_2	A & B Cogn. Volt Div.	F CPS	% F ₁	R_1, R_2 from below	A & B Volt Div	F CPS
1.5V	22K	1	304			.6	992
		.90	266	87		.7	1159
		1.0	309			.8	1465
		.9	269	87		.9	2249
		.8	238	77		1.0	<u>stopped</u>
		.7	212	68			
		.6	192	62			
		1.0	307				
			388 ?				
			402				
		.90	343	85			
		.8	309	74			
		.7	265	66			
		1.0	565	85			
		.9	466	83			
		.8	399	70.			
		.7	349	62.			
		1.0	2916	180			
		.9	1460	50.			
		.8	1058	36.			
		.7	865	29.			
		.6	748	25.6			
		.5	669				
		.4	612				
		.4	812				
		.5	886				

9 Apr. CK. of Si Trans. characteristics

T1 415

I_B A_{I_B} I_C A_{I_C} β $E_C = 1.5V$

#1 $6 \mu A$ $3 \mu A$ $1 mA$ $.5 \downarrow$ $.5 MA$ $.66 \times 10^3$

#2 $3 \mu A$ $1.5 \mu A$ 1.5 $.5$ $.5$ 320

#3 $2.5 \mu A$ $5.$ $.5$ 1.0 200

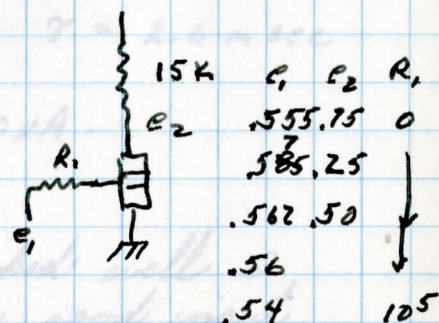
#4 $3 \mu A$ 5.5 $.5$ 1.0

#5 T141B

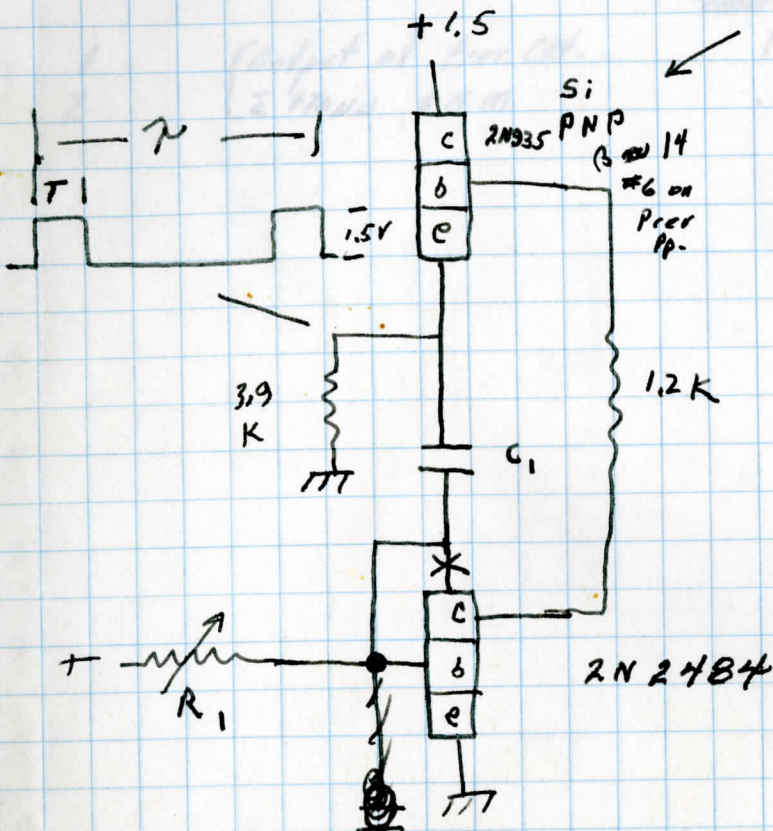
1.5 $.5$ 250
 35 1.0

#6 $30.$ $.50$
2N935 65 35 1.00

#7
2N935 27 $.50$
 57 30 100 16



Worked in either direction -



$$C_1 = 470 \mu F$$

$$T = 80 \mu sec$$

$$R_1 = 10 M$$

$$T = 5 m sec$$

$$R_1 = 5 M$$

$$T = 120 \mu sec$$

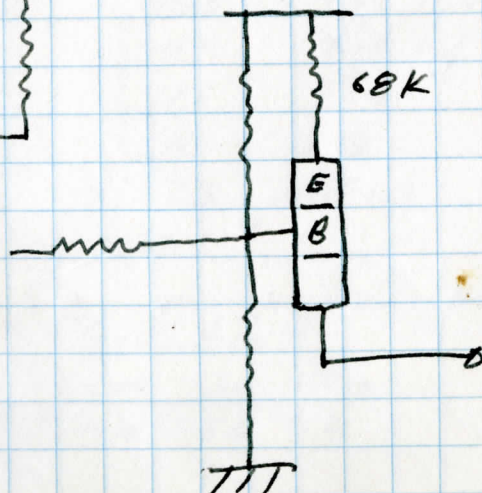
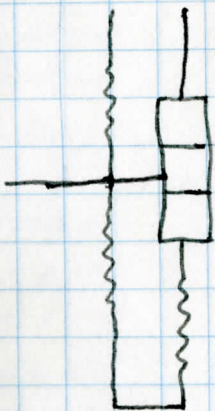
$$T = 2.6 m sec$$

$$I_{Total} < 50 \mu A$$

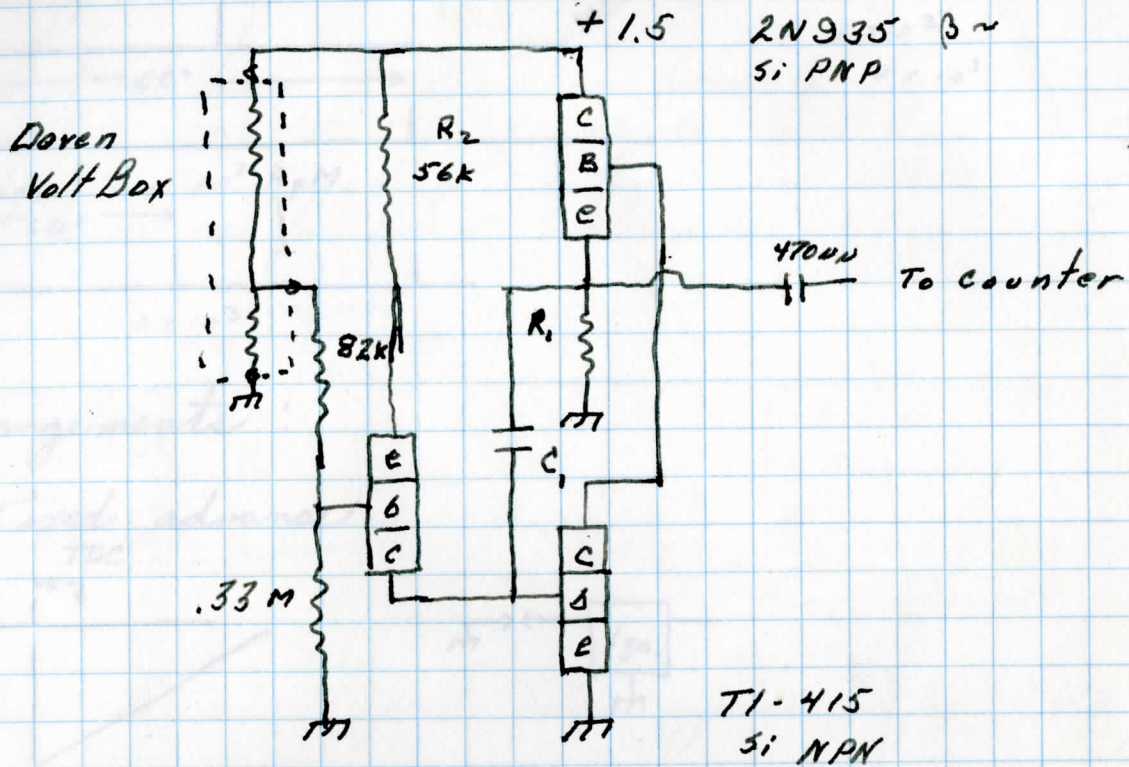
Ckt. worked well & apparently good input sensitivity and little or no discernible temp changes from raising cases to body temp.

Still examine various ckt. values and determine sensitivity linearity and stability of ckt in A.M.

A ~~FE~~ I device



Freq vs Volt of B-B SCO



Ratio (Fraction of 1.5V) ($\frac{1}{h} - X$)1.5	Freq CPS	Freq	Freq	Freq
Δ MV	C = 470 $R_2 = 56K$	% Dev.	C = 330 $R_2 = 56K$	C = 330
1.555	1300 (unstable)	(750=100%)	—	10000 .1555 .8445
15 .1455	1255	1253	32 187 2120, 220	18.4
15 .1355	1115	1113	31.8 1841 900, 230	21.7
15 .1255	977	975	31.2 1771 670, 222	18.4
15 .1155	845	842	30.6 1631 448, 218	18.2
15 .1055	714	720	29.2 1591 230, 199	16.6
15 .0955	600	601	14.3 1031, 180	15.0
15 .0855	493	494	12.8 851, 162	13.5
15 .0755	397	398	11.2 689, 144	12.0
15 .0655	313	314	545, 123	10.4
15 .0555	241	242	420, 116	550
15 .0455	179	235	119	314
15 .0355	165	Unstable		

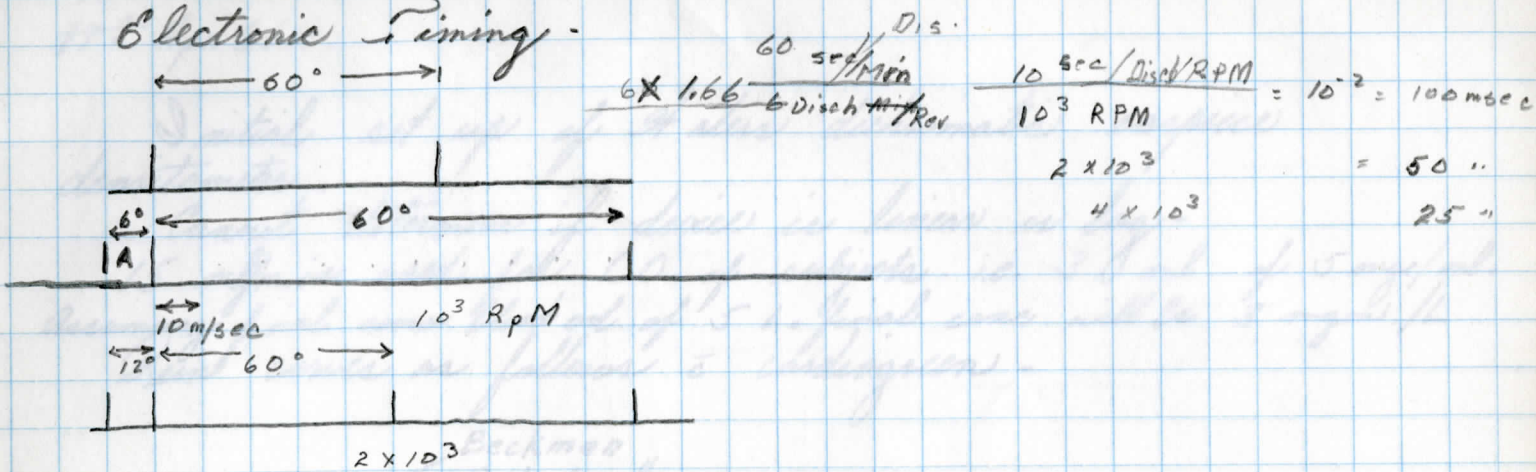
Sensitivity
 C $\neq$ R_2 cps/mV
 470 56 8

.0055

111

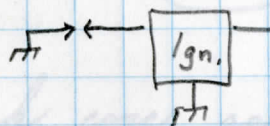
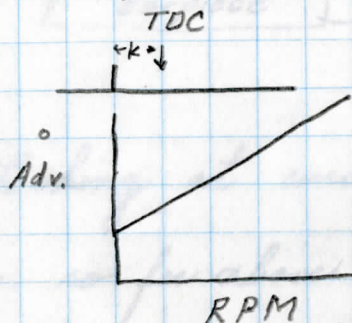
.025
 16.40
 .32
 80

Electronic Timing -



Arrangements:

1. Fixed advance



2. Adv.

1:10³ 1:500 1:250

$$\frac{10 \times 1}{0.1 \times 1} = 10^3 \text{ m/s}$$

Input path length - shows exposure, parameter. For later to record. Called detector and channel output in linear form of curve and output in linear up to 4 watts.

10 Apr 65

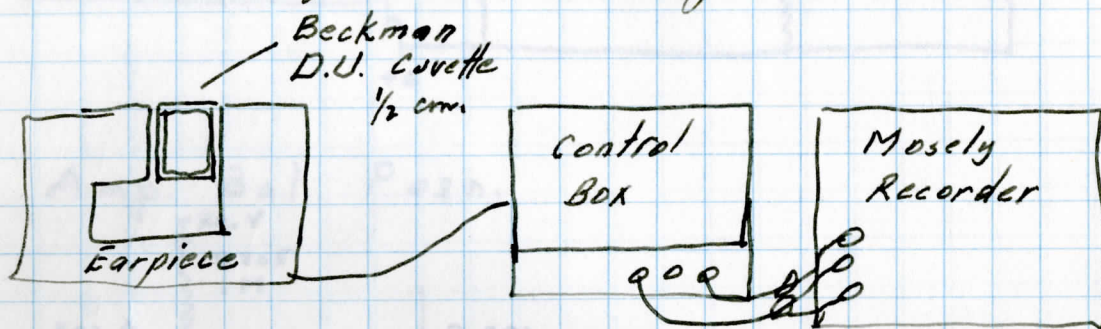
Attempted to get curves to engine during another demonstration. Device balanced, single but due to the release of pressure and air pressure (high) probably not fast enough - small detail was unaltered. Time to 12 sec during process. Will try again and also ch operating instructions against it further.

19
17.7 Apr. 65 -

Initial set up of Waters dichromatic earpiece densitometer.

Cannot determine if device is linear or log.

15 mgm. is used for C.O. of subjects. i.e. 3 ml. of 5 mgm./ml.
Assuming final conc. blood vol. of 5 L. final conc. will be 3 mgm./L.
Run curves as follows $\bar{c}$ cardiogreen.



Looking at curves peak conc. appears to be $\sim 6 \times$ final conc. so for above assumed conditions 18 mgm./L would be max. Measure output in increments of conc. of 2.5 mgm./L.

Initial dilution: $2.5 \text{ mgm./10 ml.} = 2.5 \text{ mgm./ml.}$

dil. $1:10^3$ $1:500$ $1:250$

$$2.5 \frac{10 \text{ ml}}{.01 \text{ ml}} = \frac{2.5 \text{ mgm.}}{10^3 \text{ ml}}$$

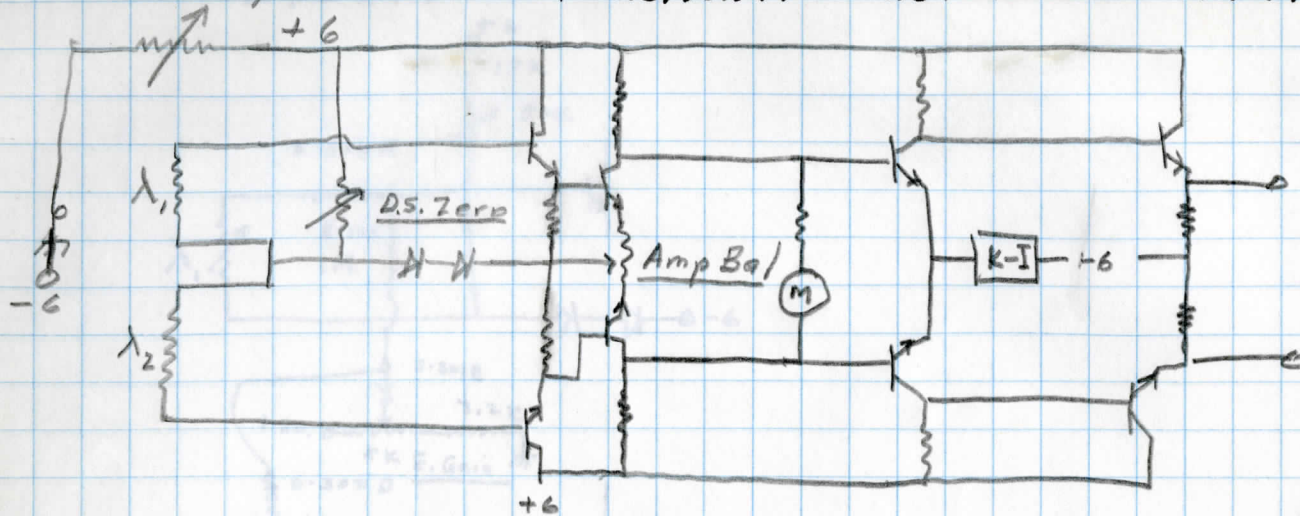
Forgot pathlength - above concs. per meter. Too late to rerun. Called Waters who claimed output is linear funct. of conc. and output is linear up to 4 volts.

20
18 Apr. 65

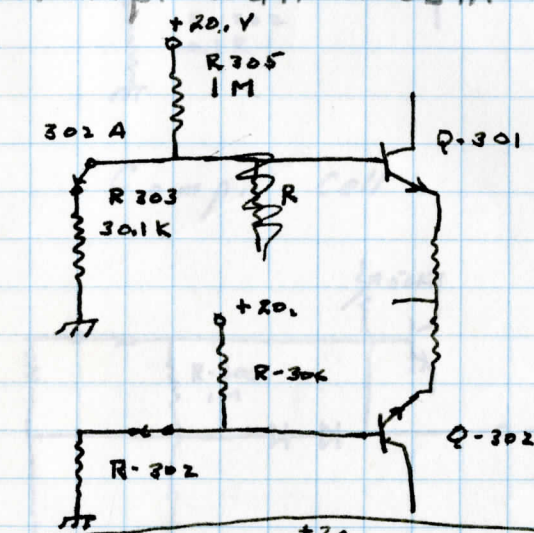
Attempted to get curves $\bar{c}$ earpiece during cuvette determinations. Device balanced nicely but after release of pressure on ear capsules large pulsatile artifacts were present + small distorted curve was obtained. Horse on 2^o run during exercise. Will try again and also ck. operating instructions against ht. functs.

Lamp Bal.

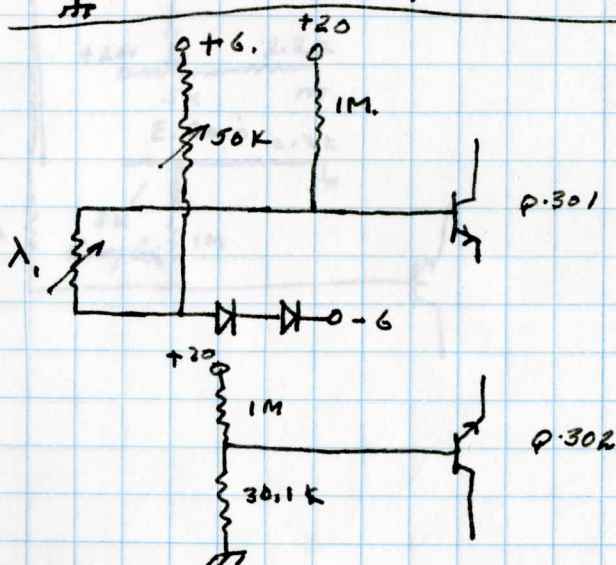
Functional Ckts. X-301 Waters



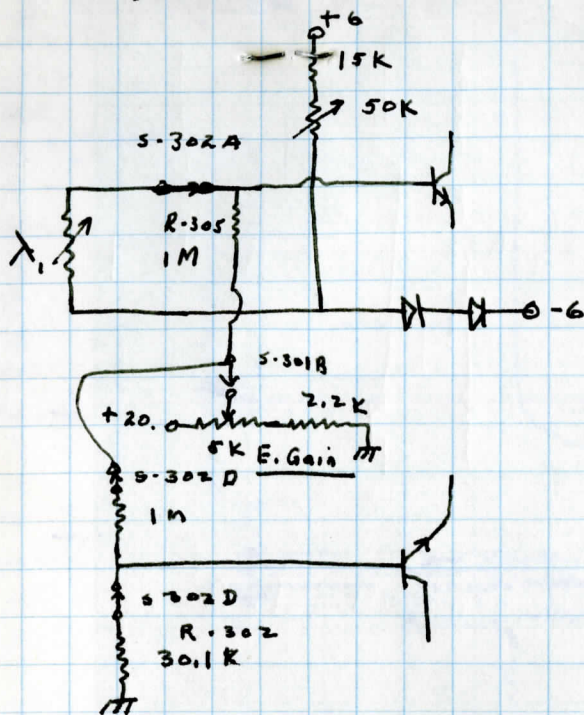
Amp. Bal. Posn.



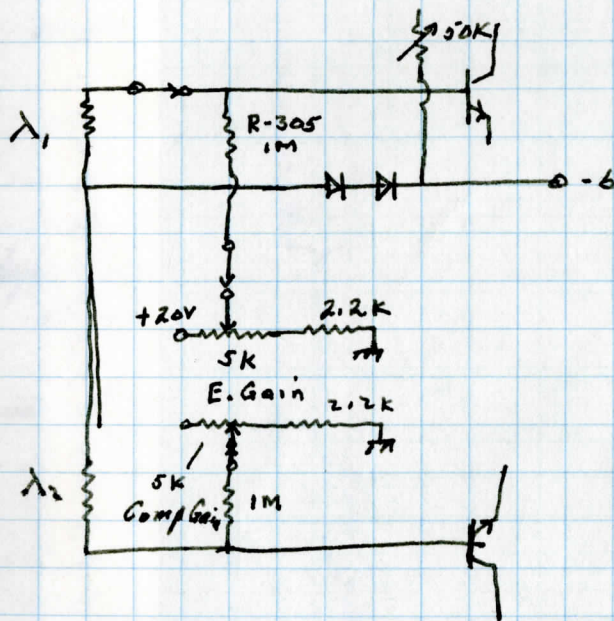
Lamp Bal. Posn.



E. Gairn



Comp. cell



20 Apr. 65

2nd Subj.

1^o run - on @ ear $\bar{c}$ 4 cc. of 2.5 mgm/ml. Cardiogreen dye inj. SVC. + cappiece on @ ear $\bar{c}$ Mosley 680 recorder at 1.2 V. span + 20 cm/min. The X-301 balances well but consistently shifts down scale when the pressure is released. Curve went off scale.

2^o run - as above except sens. 6 V span - Fair curve $\bar{c}$ large pulse artefacts. + device limited

3^o run - X-301 adjusted $\frac{6}{20} \times 60 = 18$ mins. prior to use + had large pulse artefacts $\bar{c}$ small distorted Cardiac output curve. There was no base line shift but progressive $\uparrow$ in pulse artefact after the adjustment.

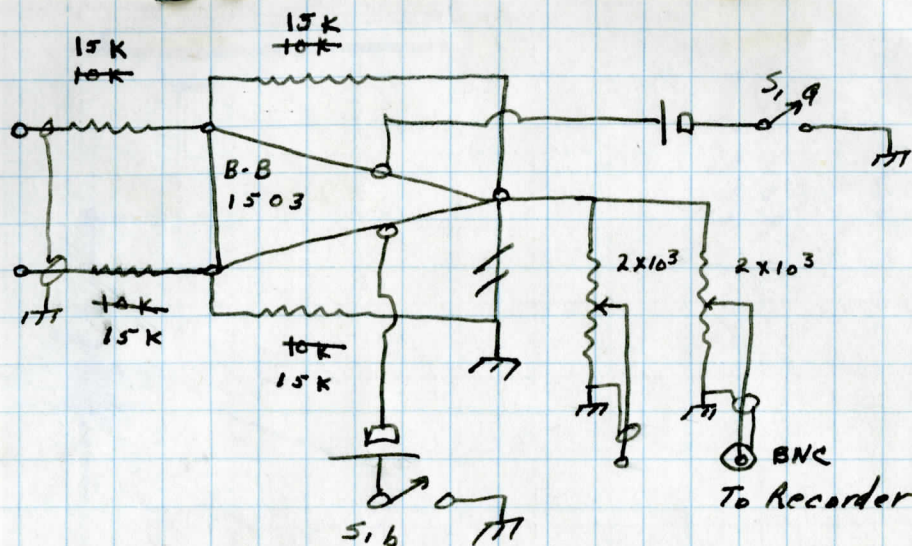
4^o run - press. capsule inflated

5^o run - missed

6^o run - could not zero $\bar{c}$ cuvette control (? too much dye present) + lamp was at upper limit of brightness. device limited

I'm looking over

5142

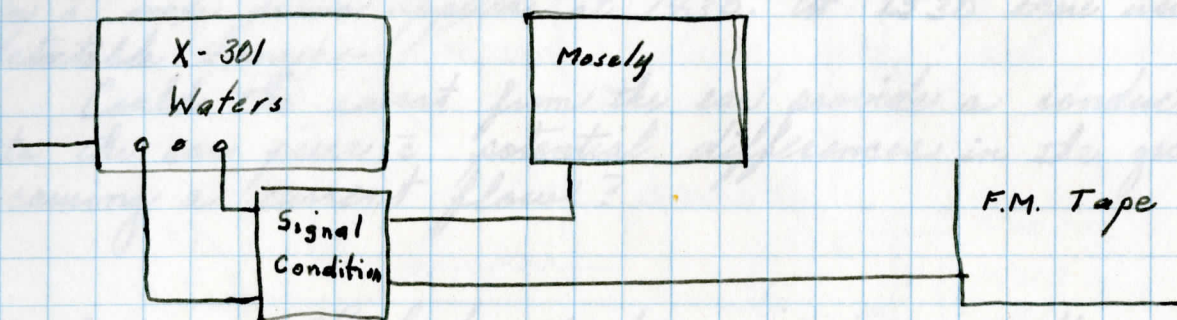


- 4 - 10K 1/2 W Prec - 1-Dp 5t 5W
- 2 - 2K pots
- Cable
- BNC connectors
- 2 - 15 V. batteries
- tip jacks

above ckt. was stable & low output offset and good differential action.

22 Apr. '65

Continue Dr. Carpenter cardiac outputs.



The two previous subjects sustained "burns" on the pinna of the ear adjacent to the photo-cell side. The first subj. a NM complained of burning during the procedure, $\sim 1\frac{1}{2}$ hrs., and the ear was noted to have a dark spot ($\sim \frac{1}{8}$ " dia.) on removal but this was felt to be a natural defect. The 2^o subj. did not complain of burning when questioned during the run and the ear piece was in place ≥ 2 hrs. A cursory investigation revealed no trauma on removal but pt. claims a "burn" was present that evening. The first pt. has an $\sim \frac{1}{16}$ " dark depression and the 2^o (also NM) $\sim \frac{3}{16}$ " dia. dark depression & smooth brownish edges.

The earpiece was used on today's 1^o subj., a NM for approx. 5 min & difficulty and a dye curve & good recording kept exceeding the span. Because of "burns" it was elected to wait until 1^o exercise to run a 2^o wave. No lesion was noted on removal of the earpiece from @ ear. After exercise the earpiece was placed on the @ ear and the curve recorded on the 12 V. scale to prevent clipping - Clipping still occurred possibly 2^o to the signal conditioner or in the recorder itself. A 2^o run was made & the instrument connected to recorder directly but & the polarity reversed. Following this the earpiece was removed & two small blisters under the window area of the cell pick up. The time in place was < 15 min. The 2^o subj. today a NM had the earpiece in place for 2 runs - total in use time of < 5 min. but to a small blister like area in the center of the window area.

On today's first subject and both of last Tuesday's it was impossible to adjust the lamp balance, inadequate brilliance, & to balance & the cuvette bal. after 3^o or 4^o previous inj. of 4 ml. $\times$ 2.5 mg/ml. dye. Assuming blood vol. of 4 L. this amounted to clearing a total of 7.5-10 mgw./L. background dye. The signal conditioner will be examined for limit level.

I put the arpiece in place for $\sim 1\frac{1}{2}$ hr. $\bar{e}$ power to attempt to R/O pressure, motion or contact ~~down~~ agents as causative. This produced no effect. The arpiece was then plugged in $\bar{e}$ max. power applied at 1430. At 1530 there were no detectable changes.

Could the sweat from the ear provide a conductive film to the ear piece $\bar{e}$ potential differences in the grounds causing a current flow?

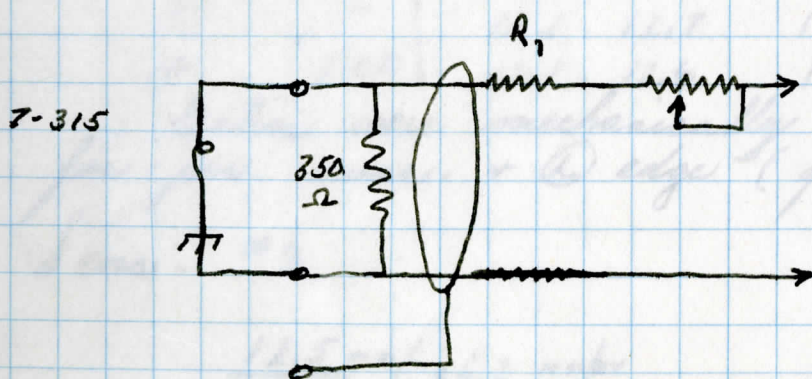
26 Apr. Checked % transmission on $\frac{1}{2}$ cm. cells + O.V. of hemolyzed venous samples from H.S.

λ m μ	slit width mm. (?)	% Trans.	Density
620	.068	0	∞
660	.052	3.5	1.45
805	.026	18.8	.730
1000	.035	36.5	.438

Will write program for measurements.

27 Apr. (716-325-2000)
Called Eastman Kodak on IR dyes and talked to Mr. Frank Bennet who had little to offer.

Connection of GEC oscillograph to densitometer:

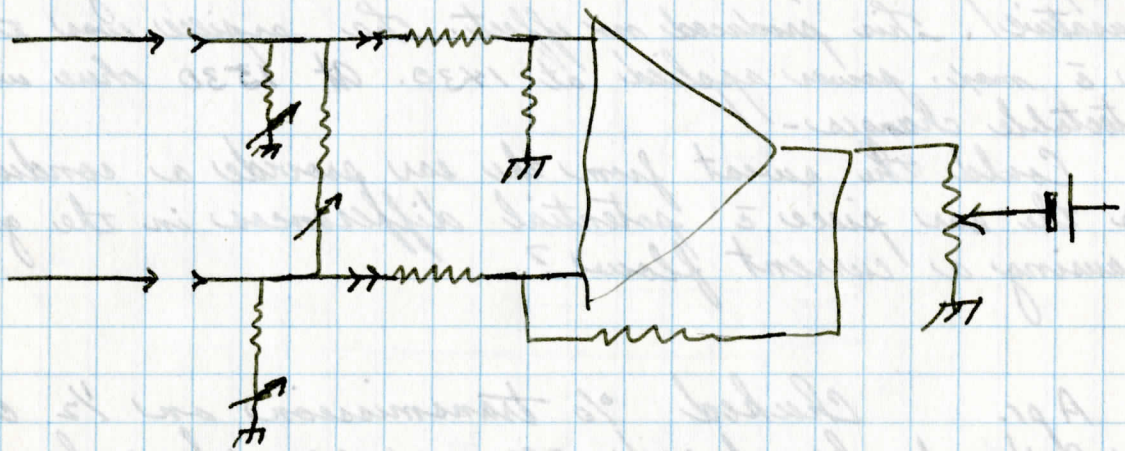


$$R_1 = \frac{E_{\max}}{I_{\max}(\text{calc})} = \frac{12}{15 \times 10^{-3}}$$

use 1k

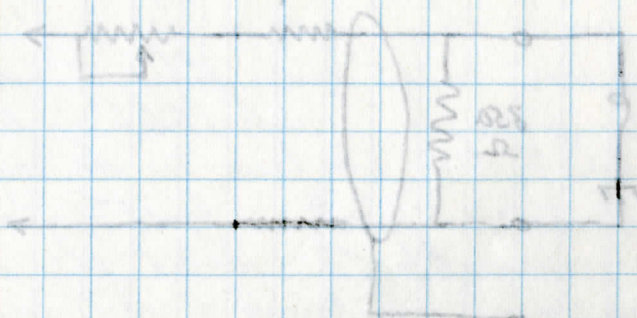
Sens. .08 in/ μ A
12.2 μ A/in
2 in or 24 μ A

$$\frac{12 \text{ V}}{24 \times 10^{-6}} \approx \frac{1}{2} \text{ Meg}$$



Sens 16 cm -

.1 - 1.	.1 -	1.6 V
	→ .05	.80 -
	→ .2	3.2
	.3	
	→ .4	6.4
	→ .5	8.0
	.6	9.6
	.7	11.2
	→ 1.0	16.0
	→ .8	12.8



$$R' = \frac{F_{max}}{12 \times 10^{-3}} = \frac{15}{12 \times 10^{-3}} = 1250 \text{ } \Omega$$

$$A_{v/i} = 80 - 200$$

$$A_{v/A} = 5.51$$

$$R_{i/A} = 24 \text{ } \Omega$$

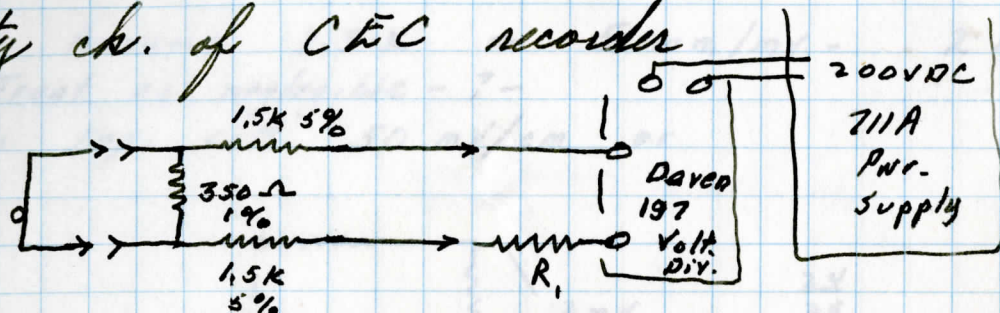
$$R_{o/A} = 24 \text{ } \Omega$$

$$20 \text{ mV} = 1.5 \text{ V}$$

$$1.5 \text{ V} = 1.5 \times 10^{-3} \text{ V}$$

Called CEC Dallas 214 ME #13700
 Mrs. Cruseman - about improving permanence of
 records - They have a Data flash kit CEC
 # 217240 - 7.95 in stock & a two soln.
 fixing kit for records which does not permanently
 fix them. Promised to send sample.

Linearity ch. of CEC recorder



Galvos in posn. 9 10 11 deflect.

were meas., see opp. page - by applying 10 steps of .0001
 $\bar{e} R_1 = 0$

2nd alt meas. $\bar{e}$ H.P. 410 C -

Step	Volt.	Defl. mm	10		11	
0	~ 1 mv.	+ -	+	-	+	-
1	20	13.5 13.0	14.	14.7	14.	13.0
2	40	13.2 13.2	14.5	14.4	14.	13.8
3	60	13.2 13.0	14.0	14.3	13.9	13.4
4	79	13.0 12.8	13.8	14.0	13.7	13.2
5	99	12.6 12.7	13.8	14.0	13.7	12.8
6	118.5	12.5 12.7	13.8	13.9	13.5	12.5
7	138.0	12.2 12.6	13.8	13.9	13.6	12.8
8	-	12.3 12.7	13.9	14.0	13.6	12.8
9	-	12.1 12.7	13.8	13.9	13.5	12.5
10	200	12.1 12.6	13.8	14.0	13.5	12.8

Galvos were mechanically centered on (R) edge
 for pos. meas. & (L) edge (galvo * side) for -

Sens. #9

#10

#11

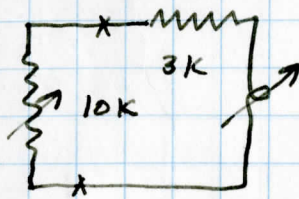
$$\frac{12.5 \text{ mm/mv}}{20 \text{ mv}} = 6.2 \text{ mm/mv}$$

$$\text{or } \frac{6.25 \times 10^{-3} \text{ mm}}{3 \times 10^{-3} \text{ A}} = 2.06 \text{ mm/A}$$

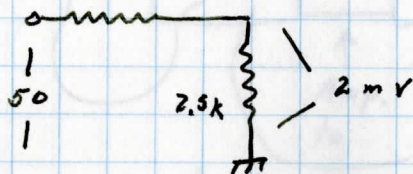
$$\frac{14}{20} = 7. \text{ mm/mv}$$

$$\frac{13.}{20} = 6.5 \text{ mm/mv}$$

Assume 5 mm/mv at 2.5 K



Assume $2.5\text{ K} \pm 5\text{ mm/mv} - 2\text{ mv/cm}$
 Treat as negligible - ? -
 Min inp. volt. 50 mv/cm or

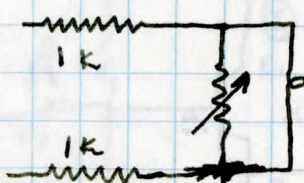


$$\frac{24}{25} = \frac{120}{48} = \frac{600}{600}$$

.05	600K
.1	120 ⁴ K
.2	250K
.4	500K
.8	750K
B	100 M
1	124. M

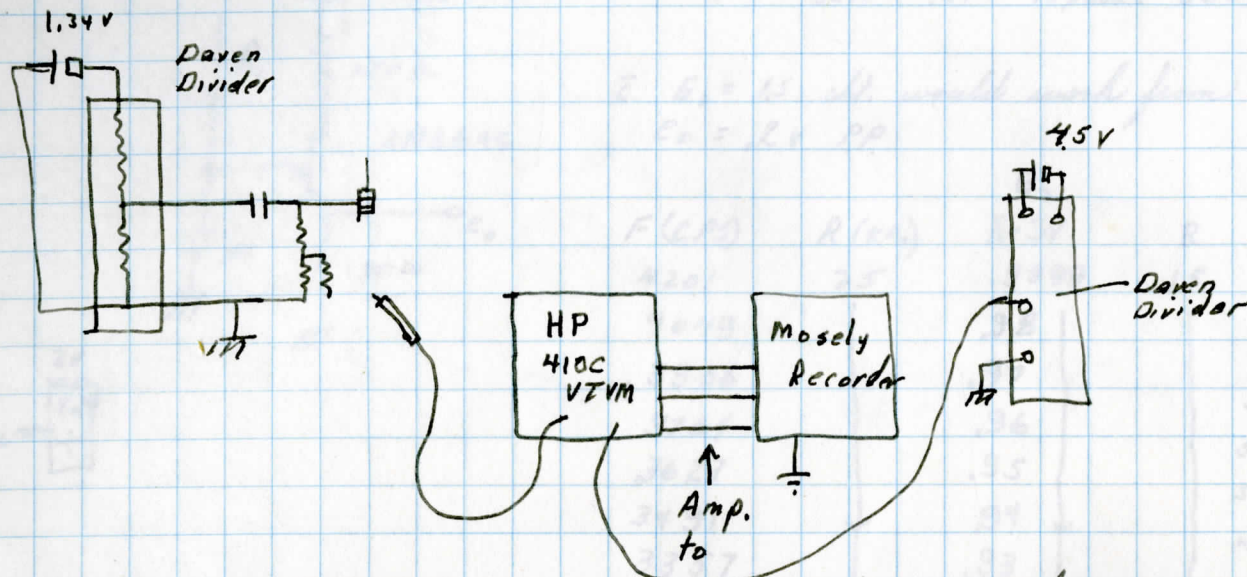
Jacks -
 10 pt. sw -

Above is loose: use shunt at galvo since damping resistance is not critical -



Shunt to $5\text{ mm/MV} \pm 3\text{ K in Series}$

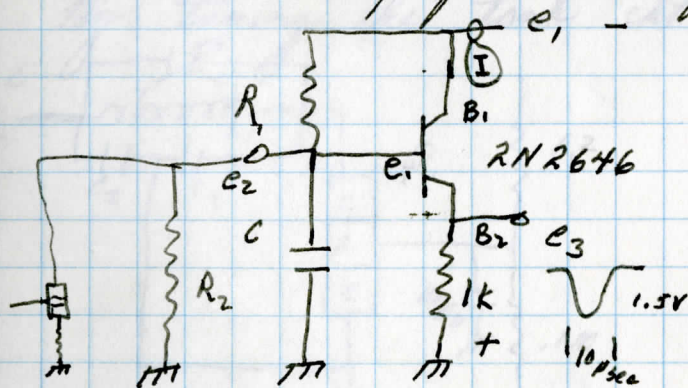
Ch. of Davis mtr.



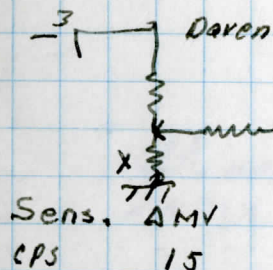
Ch. had time constants obviously too short but they were meas. at various points in the transmitter. Input was a 1.34×10^{-3} step ①. Gain was only 4.

29 Apr 65

Examine performance of unijunction S.C.O.



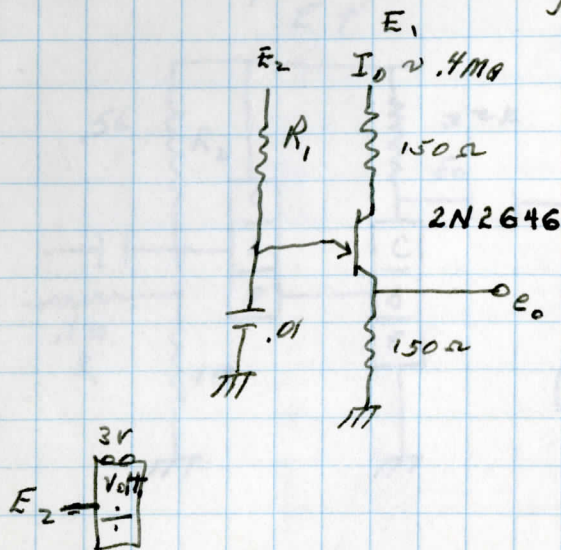
This "reversed" connection of C is used by SAM. A value of $28 K \min.$ was reqd. $C = .025 + R_1 = 220 K$ F was 358 CPS & these values & increased to 370 at body temp. At 1.5V. This value of R_2 required for operation was $\sim 9K$. E_3 PP was $-.5V$ & same waveform.



≈ 3.15

		$I = .4 mA$			
Δf	R_2	f	X	R_2	f
CPS	K	CPS		K	CPS
37	37	956	0	17	2484
43	37	913	.01		2384
42		871	.02		2288
41		830	.03		2196
44		786	.04		2107
43		743	.05		2022
43		700	.06		1940
45		655	.07		1859
		608	.08		1782

2 Ckt. in "normal" config.



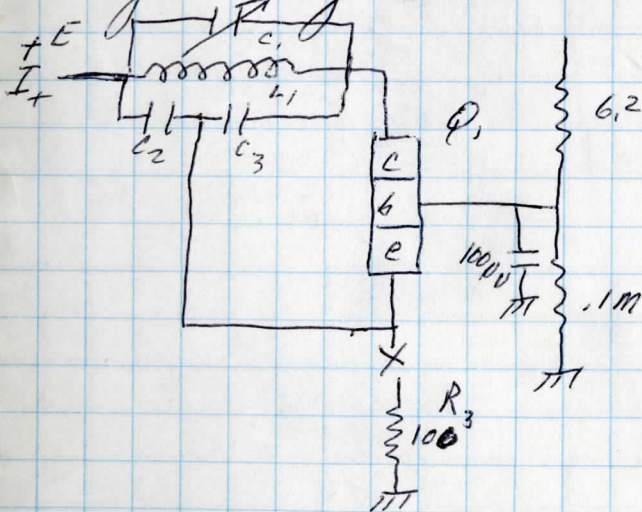
E_1 3V R_1 35K E_0 ~.5V + 10psec. 3698 | 3795 Temp 3698 | 3795

$E_1 = 1.5$ ckt. would work from 3-6 K(R_1)
 $E_0 = .2V$ P.P.

F (CPS)	R (K Ω)	$X \cdot 3V$	R	F
4201	25	.9999	15	6177
4049		.98		5944
3906		.97		5722
3764		.96		5519
3627		.95		5315
3491		.94		5118
3357		.93		4920
3225		.92		4720

above ckt has good linearity, fair temp. stability, cheapness, simplicity but it ~~has~~ requires appreciable signal voltage & uses 64 mA min. Still stay in PNP-NPN multib.

Adapt crystal osc. to reasonably priced transistors -
Crystal would not work as a bypass across the base -
By tuning the tank ckt. carefully the ckt. below was stable.



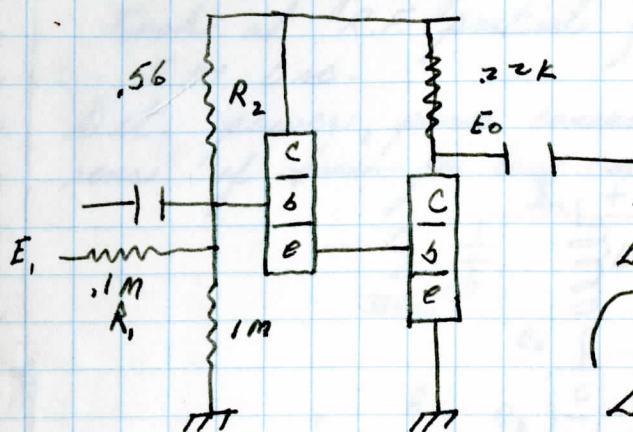
E_1 2N744 there was no improvement
by add L at pt. X & R_3 could
be decreased $\bar{c}$ slight improvement

E_1 1.5V C_2 47 C_3 10 C .5-8 I 2 mA
1.15 still osc.

Ckt. is more stable by increasing feedback.
 C_1 was removed & 2-15 μ trim. in place of
 C_3 $\bar{c}$ $C_2 = 15 \mu$

Ckt. worked well $\bar{c}$ crystals at 91 & 97 MC + 2 diff. 2N744 +
2N914 Trans. Should work well down to 1 V + < 2 mA drain at 1.5V.

Low Freq Amplification



E_1	E_+	E_0
1.5	1.5	.84
$\Delta .01$	$\downarrow$	.97
$\Delta .01$	$\downarrow$	.68
$\Delta .01$	$\downarrow$	$\Delta .46$
$\Delta .01$	3.0	$\Delta .30$
$\Delta .06$	3.0	$\Delta .135$
$\Delta .07$	$\downarrow$	.178

R_2 changed to 1.6M, R_1 .56M $\in R_2$ conn. to E_0

$G=30$

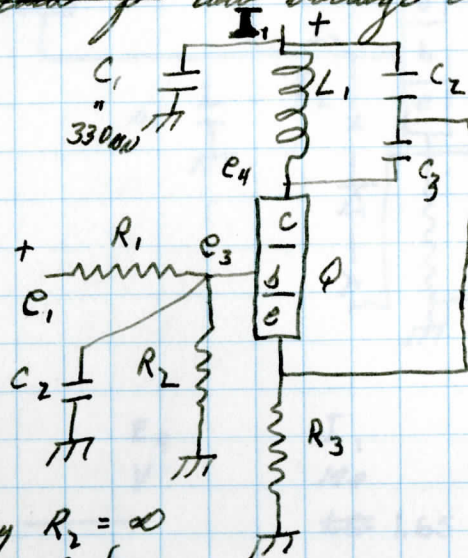
$\Delta .042 G=7$

Construct and extensively test an EKG system suitable for P-12 & 40 days life & full freq. response.

Look at R.F. portion first:

F.M. Osc.

Det. power, power consumption and, freq. stability & deviation sens. of ~~low~~ low voltage oscs. (1.3, 2.6 & 4.0 V.)



The Daven Divider is a relatively high imp. device & renders these meas questionable

Modify above by $R_2 = \infty$ & $R_1 = 2.2 \text{ k}\Omega$ & C_1 from a volt. divider.

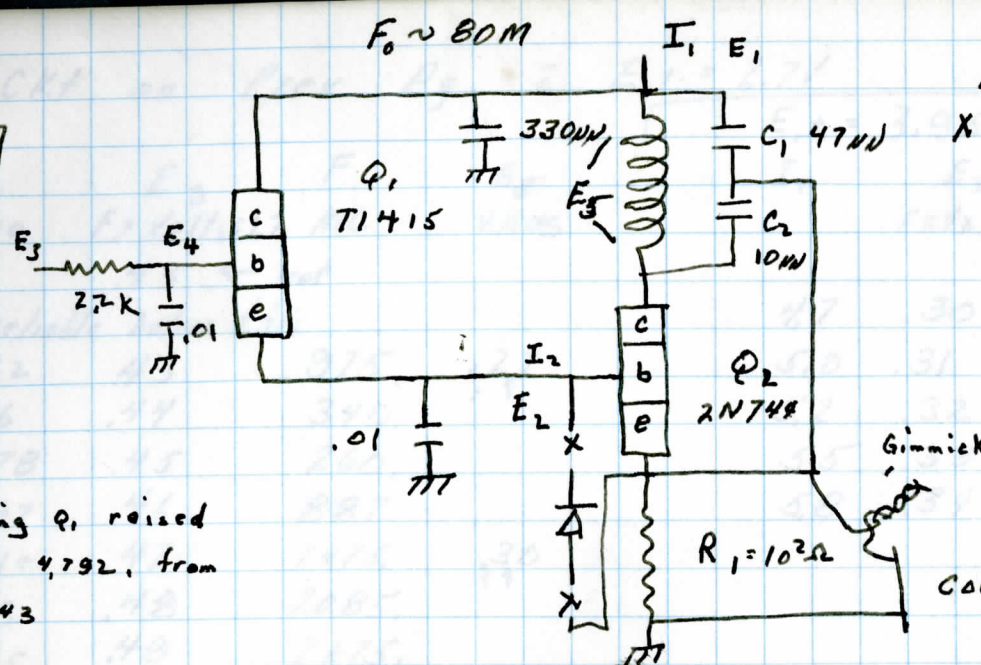
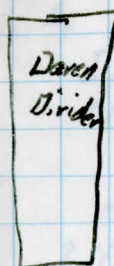
$C_1 = 77 \text{ pF}$ D.X L. $F_{Res} = 113 \text{ MC}$ $C_2 = 10 \text{ pF}$ $C_3 = 47$
 $R_3 = 100 \Omega$ $Q =$ 2° Run

E_+ Volts	I_1 mA	Fract. Volt. $\times E_+$	F MC	C_3 VDC	C_4 VRMS	Fract FMC	Fract F MC	Imq
1.32	1.05	.600	80 ± .944	.60	1.0	.600 - .950	.86	1.956 1.35
		.61	± .856	.60		.61 - .858	.88	2.245
		.62	.764			.62 - .766	.90	2.643 (41)
			.674			.63 - .670	.92	2.773
						.64 - .574	.94	2.978 1.5
						.65 - .474	.96	3.248
						.66 - .375	.98	2.231
						.67 - .264	1.00	1.172 1.75
						.68 - .144		VRMS (1.15)
				.61	1.0	.69 - .14		
						.70 .48		
						.71 .539		
						.72 .603		
						.74 .755		
						.76 .946		
				.62		.78 1.174		
						.80 1.471		(1.05)
						.82 1.580		
						.84 1.740		

Crossover
on Counts

1.30
1.12
1.18 1.18

1.3
1.3



Daren Cond to Follower

Fract	Meas V.
X 1.32 V.	
.2	2.26
.4	.53
.5	.66
.6	878 .79
.7	.92
.8	1.06
.9	1.06 1.18
.95	1.25

Holding Q_1 raised
F to 4.792, from
4.243

E_2 $E_1 = 1.32$ V	E_3 V	E_4 V	I_1 Ma	I_2 Ma	E_3 Fract. V X 132	$E_3 - E_4$ (Meas. Directly) MV, F MC
.69	1.32	—	1.65	.300	1.000	5.3 4.247
.61	1.19	—	1.00	.06	.900	1.1 -4.01
.64	1.25	—	1.25	.15	.95	3.0 1.975

26 KC NA.

E_3 V X 1.3	I_1 Ma	$F \rightarrow$ Run MC	Hughes diode F(MC) place	I_1 Ma	Reversed Diode (H to neg End) I_1 (Ma) F(MC)
.90 (Min. Acc. P.H.H.)	.95	-.407	+.401		1.0 280.
.91	1.00	.076	.103	504	1.02 201.
.92	1.07	.560	.593	99	1.07 658
.93	1.13	1.410	1.062	489	1.13 1107.
.94	1.20	—	1.520	58	1.2 1550.
.95	1.27	—	1.975	523, .91	1.27 1990.
.96	1.35	—	2.426	406, .92	1.33 1250 2450.
.97	1.45	—	2.875	65.0 .95	1.40 2890
.98	1.50	—	3.307	130.0 .96	1.50 3362.
.99	1.55	—	3.780	352.0 .97	1.57 3826.
1.00	1.65	—	4.247	590.0 1.0	1.67 4275.

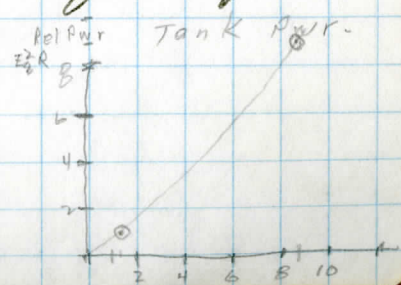
Heat soak from Iron 2" beneath 2 min.

1849 - F = .94

2Min 4000 " 1.7 The above ch. is extremely temp.
sens + will need compensation -

1.3V Mod Sens $\approx \frac{460 \text{ KC}}{13 \text{ MV}} = 35.3 \text{ KC/MV}$

2.6V " " $\approx \frac{610 \text{ KC}}{27 \text{ MV}} = 24.5 \text{ KC/MV}$

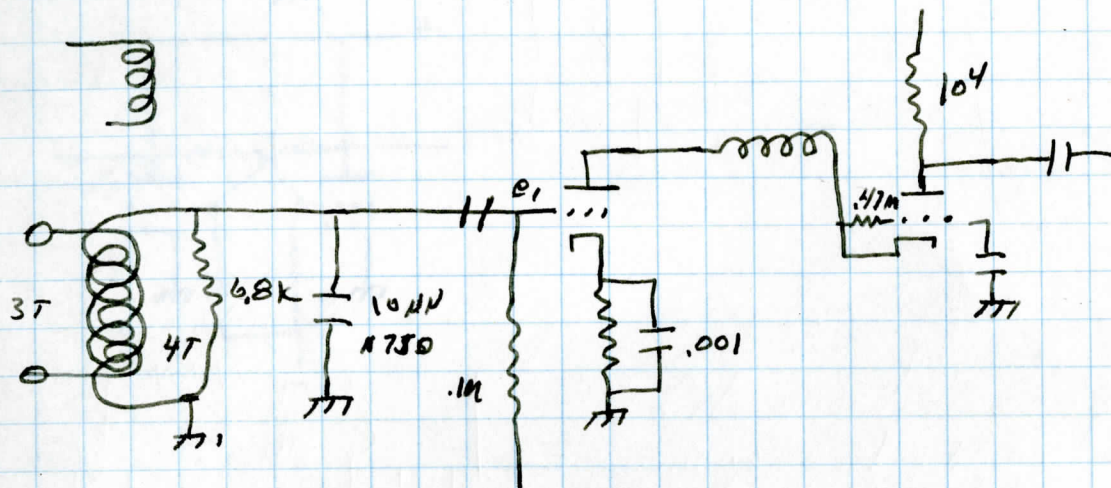
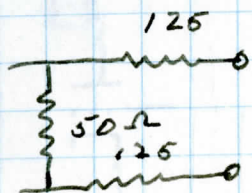
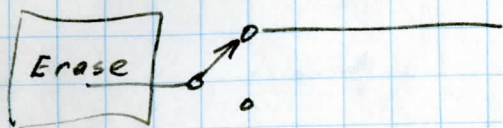


CKT on Prev Pg. $E_1 = 2.7V$

$E_1 = 2.7V$				$E_1 = 3.95V$			
I_1	E_3	F	E_5	I_1	E_3	F mc	E_3
mA	$F \times V_{0.1} \times 2.7$	MC	VRMS		$F \times V \times 4$		
	.43 ← not						
reliable below this				4.7	.30	78,525	4.15
2.42	.43	975	2.7	5.0	.31	8,662	
2.6	.44	340		5.2	.32	8,280	4.25
2.78	.45	260		5.5	.33	7,670	
2.97	.46	887		5.8	.34	7,115	4.3
3.1	.47	1475	30				
3.3	.48	2085					
3.5	.49	2675					
3.7	.50	3230					
3.8	.51	3720					
4.0	.52	4190	32				
4.2	.53	4629					
4.3	.54	5040					
4.5	.55	5422	315				

Effect of changing R_1				$E_1 = 2.7V$	$I = 2.6$	$R = 100\Omega$	F_5	sens	ADLE-MC
2.7 F 4.5							2.9		$\frac{900}{270}$
$F_0 - 78mc$					31	" shunted $\bar{r} 220$	3.0		$2080 - 1370$
83mc	.45				1.1	220 Ω	2.65		$3675 - 3218$
84.9 M	.45				2.0	150 Ω	2.85		$1450 - 940 = 510$
Changed C_2 from 10 to 7 μF									700
$F_0 84.5M$	.45	$E_1 = 2.7$	2.4			100 Ω	2.8		$4480 \wedge 5180$
Reduced L_1 from 7 to 6 T						$\bar{C}_2 = 7\mu F$			760
$F_0 92.26$	.45	2.7V	2.7			100 Ω	2.65		$2360 \wedge 1600$
Chgd to 2N 744 & reqd:						220 Ω reqd.	2.0 mA		$+ E_5 = 2.5$
$F_0 94.9$	$F: 63 \times 2.7V$		2.5 3.0			220	2.5		$+ 6T - L$
Reduced R_1 to 100 Ω									
9840	.52		3.0						$\theta 2.55 \quad 8400 - 7000 = 1400$

5ch.



F

C₁
22 uF
HP Probe

