BOOK93R

Notes:
"1955" wrote on post-it-note on front
"INST" on spine
"NB WI-3" on spine

Blank pages: page opposite page 1, 8, 9, 161, 162, 163, 291-300, inside back cover sheets

-half sheet between front cover sheets
-page 21 has graph taped to it
-page 25 has graph taped to it
-page 28 has (8.5x11) graph taped to it
-page 32 has graph plus 1 long sheet plus 1 (8.5x11) sheet taped to it
-pages 39/40, 41/42, 59/60, 67/68, 83/84, 111/112 each have their corner turned down
-page 43 has sheet taped to it
-page 53 has sheet taped to it
-pages 65, 137, 139, 149 have long sheet taped to each
-pages 100/101 have 4 half sheet between pages
-page 123 has 2 graphs taped/glued to it
-page 142 has graph taped to it
-page 156 has sheet taped to it
-page 161 has 4 sheets stapled to it
-page 162 has 3 big graphs stapled to it
-page 163 has 3 long thin sheets taped side by6 side, 6 big graph sheets and 1 sheet stapled to it
-page 165 has 2 graphs attached
-page 166 and 167 have 1 graph each
-page 231 has 3 sheets attached
-page 240 has 1 graph taped
-pages 241 and 242 have 1 long thin sheet
-page 243 has 1 graph and 1 small thin sheet taped
-pages 244 has 1 long thin graph and 1 (8.5x11) graph sheet
-pages 248, 250, 254, 257, 267, 268, 281, 283 each have 1 (8.5x11) graph attached
-page 271 has 4 long thin sheets taped side by side
-page 272 has 1 long thin sheet
-page 273 has 2 sets of 3 long thin sheets taped side by side
-pages 290/291 have 2 (8.5x11) sheets between pages

Scanned by:
Sheila Finch
RSICC /Oak Ridge National Lab.
September 7, 1999

ROHRER

NB-NI-3

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INSTRUMENTATION -
4/55 — 2/61

Expected Deviation

90% confidence
M = Avg. ct./observation
N = No. observations

$\sigma_1 = \sqrt{\frac{N-1}{N}} \cdot \frac{1.645}{\sqrt{M}}$

95%

$\sigma_2 = \sqrt{\frac{N-1}{N}} \cdot \frac{1.96}{\sqrt{M}}$

cf w/ observed variation - $\pm \sigma_2$

Probable error = .675 50% ±

Precision index - Standard stat. error

$\sigma = \frac{\sqrt{T}}{t}$ · T = total count
t = time in min.

$t^2\sigma^2 = Rt$

$t = \frac{R}{\sigma^2}$

INSTRUMENTATION INVENTORY 4/55

1, EAST AREA.

A. NUCLEAR DETECTION

C-1: BF_3 proportional counter (RCL); Pre-amp (AIC); Lin. Amp (AIC) Scaler (AIC)

BF_3 proportional counter (RCL); Pre-amp (AIC); Lin-Amp (AIC)

C-2: BF_3 proportional counter (RCL); Pre-amp (AIC); Lin. Amp (AIC) Scaler (AIC)

BF_3 proportional counter (RCL); Pre-amp (AIC); Lin Amp (AIC)

C-3: fission counter (NEPA); Pre-amp (AIC); Lin. Amp (AIC) Scaler (AIC)

TIMER, MICROFLEX, for above

AUDITORY MONITOR (NEPA)

A: BF_3 ion chamber (NEPA); Pre-amp (AP); VR Amp (AP); {RANGE SEL / TRIP} POWER SUPPLY (EMC); RECORDER (m-H)

B: BF_3 ion chamber (NEPA); Log N. Amp (ORNL); RECORDER (m-H)

C: BF_3 ion chamber (NEPA); Pre-amp (GE); DC Amp (GE); RELAY AMP (GE) CONTROL (GE) POWER SUPPLY (EMC) RECORDER (G.E)

D:

BF_3 ion chamber (NEPA); Preamp (AP); VR Amp (AP); {RANGE SEL / TRIP} POWER SUPPLY (EMC); RECORDER (MH)

E: ANTHRACENE-SB19; Amp.; Control; RECORDER (GE)

Monitron (109)

Monitron (109) RECORDER (GA)

BRUSH DC Amp; BRUSH Oscillograph - used with C above

B. CONTROL

1. TABLE

TABLE DRIVE

SOURCE DRIVE

CONTROL ROD DRIVE

SAFETY ROD POSITION

MAGNET SUPPLY

SCRAM PANEL

SERVO ROD

2. ARE - PW

a. ARE (PW) PANELS

SOURCE

CONTROL ROD

SAFETY ROD

REFLECTOR LEVEL INDICATOR

b. PW REFLECTOR CONTROL PANEL.

Pump; Feed-drain-dump valves; Level probe

C. GENERAL - Amplifier; CLOCK, minutes - 1/60 min.

TEMPERATURE INDICATOR; K-2 POTENTIOMETER - GALVANOMETER

4/56 INSTRUMENTATION INVENTORY:

II WEST AREA -

A. NUCLEAR DETECTION —

C-1: Proportional Counter (Met Lab); Pre-amp; Lin-Amps; Scaler; Timer-Reg.

C-2: B^{10} proportional counter (GE); Pre-amp; Lin-Amp; Scaler; Timer-Reg. (Reg firing) Power Supply, H.V.

C-3: proportional counter (Met Lab); Pre-amp; Lin-Amp-Scaler; Timer-Register; Power Supply, H.V.

TIMER, Veeder-Root, for above -

C-4: BF_3 proportional counter (RCL); Pre-amp; Lin-Amp-Scaler (AK)

C-5: BF_3 proportional counter (RCL); Preamp; Lin-Amp. Scaler (AK)

TIMER, microflex, for above

"Popper," audible monitor $C_{1,2,3,4,5}$ -

DC-1: BF_3 ion chamber; Amp; Control; RECORDER (MH)

DC-2: BF_3 ion chamber; Pre-amp; DC Amp; RECORDER (M-H)

DC-3: BF_3 ion chamber; Pre-amp; DC Amp; RECORDER (M-H)

R-1: BF_3 ion chamber (ORNL); Preamp (AP); VR Amp (AP); {Range sel / Trip}; RECORDER (LdN)

R-2: Argon ion chamber; Pre-amp (AP); VR Amp (AP); Range sel.; — — — —

PM: ANTHRACENE-931A; Amp; Power Supply, HV.

Power Supply (Oregon), L.V. for C_4, C_5 & PM.

LogN; BF_3 ion chamber (ORNL); meter; RECORDER (MH)

BF_3 ion chamber (ORNL); LogN Amp; Meter; RECORDER (MH); TRIP

— — — BF_3 ion chamber (ORNL);

— — BRUSH DC AMP; BRUSH OSCILLOGRAPH, used with R-1.

Monitor: i. G-M tube; pre-amp, 201 — RATE METER, 202 (RCL); RECORDER (EA) [for i, ii, iii]

ii. G-M tube; pre-amp, 202

iii. G-M tube, pre-amp 102 — RATE METER 102; RECORDER (EA) [for i, iii]

4/55 INSTRUMENTATION INVENTORY -

II WEST AREA (CONT'D)

B. CONTROL —

PANEL 1 (202): MOTOR DRIVE, control-indicator, S-N

MOTOR DRIVE, control, S

MOTOR DRIVE, control-indicator, S-N

MOTOR DRIVE, control-indicator, S-N

MOTOR DRIVE, control-indicator, S

SOURCE DRIVE, control, S-N

* WATER PUMP control, SN

FUEL DUMP VALVE, S

* WATER DUMP, S-N

MAGNET SUPPLY, S-N

* WATER FEED, S-N

FUEL LEVEL INDICATOR, S-N

PANEL 1a (202): For Neil only - controls marked *

PANEL 2 (202/102): SOLUTION STORAGE, vertical tanks; LEVEL INDICATORS, TANK SELECTORS

... FEED-DRAIN CONTROL, VACUUM PUMP, DUMP WELL

PANEL 2a. (202/102): SOLUTION STORAGE, "horizontal" tanks: LEVEL INDICATORS, TANK SELECTORS

PRIMARY SCRAM PANEL

SECONDARY SCRAM PANEL

★ WATER TEMPERATURE CONTROL -101

C. GENERAL —

AMPLIFIER

TEMPERATURE INDICATOR-RECORDER, 0-2 mv.

BOGEN INTERCOM

CLOCK, minutes, seconds

4/65 INSTRUMENTATION INVENTORY —

III Counting Room

C1 G-M end-window counter (AMP); Scaler (AIC)

C2 G-M end-window counter (AMP); Scaler (AIC) TIMER, MICROFLEX

C3 G-M end-window counter (AMP); Scaler (AIC)

C4 G-M end-window counter (AMP); Scaler (AIC)

C5 ANTHRACENE-5819; Lin-Amp (AIC); Scaler (AIC); Power Supply; Timer; V-R

PC-1 Gas-flow proportional counter (RCL); Nucleometer, power supply-amp- scaler (RCL)

* GSC1; HV power supply (RCL); pre-amp (RCL); lin amp (RCL); analyzer (RCL); 2 NaI - 6363 ;

* GSC2; HV power supply (RCL); pre-amp (RCL); lin-amp (RCL); analyzer (RCL); 2, NaI - 6363 ;

* GSC-1 & GSC-2 under construction (4/6/65). At least 1 scaler will be required for each unit.

4/65 INSTRUMENTATION INVENTORY —

II SHOP AREA

TEST RACK
* LINEAR AMPLIFIER (AIC) [East, Counting Room]
* SCALER (AIC) [East, Counting Room]
VIBRATING REED ELECTROMETER (AD); Pre-amp; BF_3 ion chamber
COUNTING RATE METER
H.V. POWER SUPPLY (NICC)
POWER SUPPLY (Kepco)
* SCALER (AIC) [West]

SPARE NUCLEAR COMPONENTS —

THOSE ABOVE MARKED *

C - EAST: pre-amp; DC amp; Relay amp; control pre-amp; DC amp; Relay amp;

DC2 WEST; pre-amp, DC Amp.

DC3 DC Amp.

B-EAST, or

LogN-WEST: Log N Amplifier.

Counter Tubes - RCL ½" - 2
1" - 2
2" - 1
Hanfd ½" - 1
5/16" - 1

Ion Chambers (ORNL) - 2

Pre. Amp (AIC) - 3

BRUSH DC AMP - EAST

MAGNET SUPPLY - EAST

4/55 INSTRUMENTATION INVENTORY —

IV SHOP AREA (CON'T)

TEST EQUIPMENT -

SIMPSON 260 VOM - 4

mcMurdo Silver VTVM

H-P VTVM

DC Microammeter, RCA

ELECTROSTATIC VOLTMETER

BALLENTINE AC VOLTMETER

DECADE AMPLIFIER

DC MILLIVOLTMETER (I.C.)

MICROVOLTER

H-P AUDIO GENERATOR

NICC PULSE GENERATOR

MEGOHMMETER (FREED)

TUBE TESTER, 533

TUBE TESTER, portable

G-R IMPEDANCE BRIDGE, 650-A

TEKTRONIX { WIDE BAND PRE AMP.
5111AD SCOPE

TEKTRONIX 511A SCOPE (215)

DUMONT 304H SCOPE

REGULATED POWER SUPPLY 0-300 V (OREGON)

D.C. SUPPLY, 0-100 V, 0-10 A.

PILE PERIOD SIMULATOR

RADIO, SX-71

DECADE RESISTOR BOX

4/55 INSTRUMENTATION INVENTORY —

II SHOP AREA (CON'T)

TEST EQUIPMENT (CON'T)

DECADE CAPACITOR BOX - 3

CLOCK, SECONDS - 1/60 SEC -

CLOCK, MINUTES - 1/100 MIN -

TIME INDICATOR, 0.1 SEC. -

COUNTING RATE METER (RCL)

RUBICON POTENTIOMETER

RUBICON GALVANOMETER

LSN GALVANOMETER

RECORDER (MH) CIRCULAR 0-10 MV.

RECORDER (M-H) 0-2 MV.

RECORDER (F) 0-10 MV - 2

HEATER CONTROL BOX

DUMONT 241 SCOPE

BUILDING INSTRUMENTATION, serviced by Y-12

INTERCOMS, 15 station.

TEMPERATURE CONTROLLERS S1a, S1b 103

S2: 107, 210, 215, 202

S3: 202

S4: 107

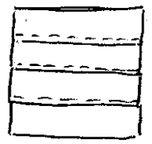
WATER HEATER, WEST (See* p 3)

SCINTILLATION DETECTOR – NEUTRON SENSITIVE { ref: WAPD-MR-42, p86 / WAPD-MR-41 / WAPD-MR-45, p96 / WAPD-MR-46, p 149

3/15/55 References suggest use of ZnS and Boric acid, anhydride, in a mixture as a phosphor for use with a photomultiplier tube.

⇒ Made up 5819 with ZnS (DuPont #1101 Phosphor, type D) phosphor: i. covered glass walls of tube with electrical tape for light seal.

ii. made phosphor screen – joined 4 strips of 3/4" cellophane tape, sprinkled on powder, shook off excess, cut to fit on face of tube, placed on tube with powder away from glass. The screen was secured to tube by cellophane tape along the edge.



iii – put new metal shield over tube and taped to base of tube with electrical tape.

iv. made Al cap to fit over opening over screen & taped in place with electrical tape. Aluminum was foil .0065" thick.

Ran rough check with alpha sources placed inside cap
Instrument – Unit II, 215 · SCDA II · Integral output, E = 50

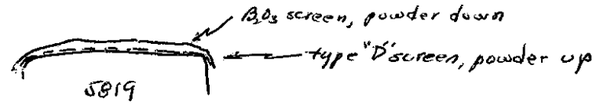
	Source	counting rate	
	1512 d/m	≈ 300 c/m	count not exact
14.9%	14850 d/m	2211 c/m	this good count.
	bkg	0	

counting efficiency 15%, source 3½" from screen // E.P. Rohrer

3/16/55 Neutron Scintillation Detector

Added B_2O_3 screen to type D made 3/15:

Sprinkled B_2O_3 powder (Boric Acid, Anhydride General Chem. Co.) on sticky side of cellophane tape sheet – Placed this powder side down against other screen in a loose fit by pinching edges around tube face.



PRELIMINARY CHECK

Time	SCDA "E"	Source	Count	Time of Count	Remarks
9:00	100	PuBe (No. 222) from 20 (6.5X10⁴ n/sec/sec)	46	1 min.	
:02:20		Bkg	0	1 min.	
:03:30		PN-4	2612	"	
:05:30		"	3207	"	
:06:45		"	3062	"	
:14:15		Bkg	33	1 min	
			34	2	These readings are accumulated counts for times noted.
			36	7	
			36	10	
			36	11	
9:38:30		PN-4	2751	1 min	
39:40			3168	"	
40:50			3241	"	
42:00			3236	"	
43:10			3014	"	

E.P. Rohrer

3/16/55 Neutron Scintillation Detector – (cont.)

Time	SCDA E	Source	Count	Time of Count	Remarks
am 9:05:10	100	Bkg	66	1	same procedure – accumulation count –
			95	2	
			99	3	
9:51:00		Bkg	62	5	Began new background –
			90	8	Calculator (Monroe) giving extra counts during first 8 min. of count – not in use between 8 & 12 minutes.
			91	12	
11:11	300	PN-4 (1" hole tube)	889	1 min	
			904	"	
			866	"	
	200		1441	"	
			1400	"	
			1407	"	
	100		3000	"	
			2947	"	
			2968	"	
	50		5691	"	
			5582	"	
			5497	"	
12:03	50	10 mg Ra_2	27	5m.	
108:30	100	@ 1 inch	5	"	
:14	200		2	"	
:20	300		1		
126:30	50		2		
132:00	100	—	—		Calculator begun during run. Spoiled count. E. R. Rohrer

Neutron Scintillation Detector

Made up new detector: a – mixed Type D & B_2O_3 in ratio 1:2.
b – Coated tube face with R-dope –
c – Sprinkled on mixture as evenly as possible
d – Covered with plastic spray can – this was too close & blew off some powder making uneven phosphor –
e – Covered with electrical tape –

3/22/55

Preliminary Check.

5 minute counts, unless otherwise noted

Sample	SCDA "E" (Int)	Hour of Day	Count	Counting Rate c/m
Bkg	400	10:14	0	0
	300	10:20	5	1.0
	250	10:26	3	0.3
	200	10:58	4	0.4
	175	11:04	5	1.0
	150	11:10	11	2.2
	125	11:16	21	4.2
Lunch	100	11:22	15	3.0
	75	11:52	22	4.4
	50	11:58	27	5.4
≈ 6.5×10^4 n/cm²/sec	Po Be 222	12:05	3188	637.6
	resting	12:11	2690	538.0
	Reclamp	12:17	2426	485.2
	Mtop	12:23	2280	456.0
Unit #	of tube	12:29	2139	427.8
LA = 1–32		12:35	2001	400.2
HV not measured		12:41	1902	380.4
		12:47	1852	370.4
		12:53	1690	338.0
		12:59	1563	312.6
		1:05	1513	302.6
		1:11	1359	271.8
		1:17	1407	281.4
		1:23	1234	246.8
		1:29	1194	238.8

Sample	SCDA E	Hour of Day	Count	Counting Rate c/m	
Po Be 222	450	1:35	1135	227.0	
	500	1:41	1046	209.2	
	550	1:47	883	176.6	
	600	1:53	835	167.0	
	650	1:59	750	150.0	
	700	2:05	635	127.0	
Po Be 222	E of 50 400	2:11	3108	621.6	
	25	2:17	2583	516.6	
	100	2:23	2284	456.8	

Differential reaching too much like integral –
Checked SCDA with pulse generator & found unable to isolate single pulses at instrument settings –
Stopped run to check instruments –
Checked HV: 800 volts.

E. R. Rohrer

Neutron Scintillation Detector -

3/23/55 Made up out of block of lucite a sample measuring device. Drilled a number of holes in block of varying depths and diameters. Filled with B_2O_3 to determine weight of material in measured holes.

Weight of block 30.6082 g.

Sample	Hole	Gross	B_2O_3	
	1	30.7975	0.1893	
	2	30.8801	0.2719	
	3	31.0286	0.4204	
	4	31.2835	0.6753	
	5	31.1093	0.5011	
—		30.6098	—	reweighed block
	6	31.3979	0.7881	
	7	31.6487	1.0389	
	8	31.9145	1.3046	
—	—	30.6079	—	re-weighed block

repeated on several holes to see if any marked differences.

	1	30.7918	0.1838
	2	30.8838	0.2759
~~5~~		~~30.6092~~	— weighed block

Checked wt. of "D" powder in several holes

2	31.1718 - 0.5646
5	31.6711 - 1.0639

E. R. Rohrer

Neutron Scintillation Detector

3/31/55 Tried another coating -

a. Painted tube face with C-dope
b. Sprinkled on "D" powder
c. "Painted" on with brush dipped in thickler to thin -
d. After drying added B_2O_3 by first spraying plastic on surface & sprinkling B_2O_3 over.

Tube of weight 4/11.

Covered with Aluminum reflector & electrical tape -

Hour of Day	Sample	SCA E	(INT)	Counts.	Counting Time	Counting Rate c/m	
12:23 P	Bkg	50		11	5 m.	2.2	picked up counts from rest of C5-
12:35	PB222	50	(I)	4430	5	886	
12:41:30	on tube	50	(D) 160	750	2	375	
12:44:30		100	(I)	537	1	537	
12:46		100	(D) 160	88	1	88	
12:47:30		150	(I)	487	1	487	
12:49:30		200	(I)	337	1	331	
12:57		250	(I)	240	1	240	
12:52:30		1000	(I)	186	1	186	
12:57	PB 222 @ 6"	200		49	5	9.8	varying source distance
1:03:30	3"	200		143	5	28.6	
1:09:30	2"	200		430	7	61.4	
1:17:30	1.5"	200		456	5	91.2	
1:25:10	1"	200		931	5	186.2	
1:31:10	3/8"	200		449	1	449	
1:35	-bkg-	200		3	20	0.15	
2:45:30	PB222 in H_2O 1"	200		534	3	178	

E. R. Rohrer

Neutron Scintillation Detector

4/1/55 New Tube (a) Mixture of 1:1 B_2O_3 - "D" powder made in paste in R-dope and poured on 6363 tube. (b) Let dry & covered with reflector & tape.

Low series of 1 minute counts

SCDA E	I Count	II Count	III Count	IV Count	V Count
50	316	335	332	314	322
100	131	130	133	152	164
150	97	112	79	107	102
200	75	68	65	68	66

Background @ 200 for E 0 counts in 20 m.

TROUBLE OCCURRED DURING EXTENDED BACKGROUND RUN COUNTING "SPORTS".

E.R. Rohrer

4/4/55 Checked system - SCDA II seemingly at fault refer to SCDA II file.

SUMMARY OF DETECTORS

DATE	TUBE	PHOSPHOR	TEST
3/15	5819 μmetal shield	"D" - scotch tape	∝ dust "E"=50 2211/1485.0 ; bkg = 0
3/16	"	B_2O_3 - scotch tape added	PB222 46 c/m @ E=100 ; bkg = 0
3/22	5819	"D" - B_2O_3 1:2 (weight)	PB222 485.2 " ; bkg = 3
3/31	5819	"D" on R-dope	
		B_2O_3 on spray 1:1	PB222 537 " ; bkg —
4/1	6363	"D" - B_2O_3 paste in R-dope	PB222 150 " ; " —

E. R. Rohrer

Neutron Scintillation Detector

4/5/55 6363 — B_2O_3 - "D" paste 1:1

Time of Day	Sample	SCDA E — (Int)	Count	Time of Count	Rate c/m	H.V.	
8:41 A	Bkg	100	X	5	0.8	800	H.V. R_3 = 1 meg
8:47	PB 222		806	5	161.2	800	
9:10			1333	5	266.6	850	
9:24			3021	5	604.2	900	
9:30			3029	5	605.8	900	R_3 = 1000 Ω
9:38			15868	5	3173.6	950	
9:45	bkg		2164	5	622.8	950	— HV off
9:55	Set HV	back to (Int)	800 + check background @ E = 100				
10:00	bkg	100	2427	5	485.4	800	R_3 = 1000 Ω
			3353	5	670.6	800	← SCDA I triples & II

→ TROUBLE IN WAY OF INCREASED COUNTING —

TUBE? TRIED 5819 used 3/31/55

11:05	bkg	100 (Int)	25	5	5	R_3 = 1000 Ω
11:11		100 (Int)	724	109	6.64	
2:00 PM		100 Int	196	42	4.67	new HV cable
3:00	PB 222 centered	100 (Int)	7413	10	741.3	

SCDA II not showing D-I difference - (as 3/22)

Operation shelved because of press of other projects -

E.R. Rohrer

5/2/55 Brought book up to date -
Activities during 4/55 principally routine:
Major effort - DC 233 - West area } modificate & strip
circuit & testing
Others: Safety Mtring Measurements - West Area
Instrument Maintenance: C3-W; R-1-W
Scintillation Counter System: material procurement.
APPR: preliminary design considerations.
HOT Critical: preliminary design considerations -

E. L. Rohrer

5/3/55 Checked out control rod drive mechanism on RW assembly before removal to Y-12 for fitting into "Hot" critical set-up.
East Area Maintenance - C_3 fission ch.
gas leak (w/ JFE)
scaler check (w/ VGH)
"A" - down drift ½ hr after power on.
"A" on "EP" power rather than "CP."
Take control rod switch sticking -
Crushed cables C_3 & C_1 w/JFE

E. L. Rohrer

5/4/55 - APPR - West Experimental Console Assembly Space requirements were studied. Instrument layout & arrangement of controls for West reactor Std. Drew up request for purchase requisition -

5/5/55 - APPR - West Experimental area design considerations continued. Procured sample selsyn motors from Y-10. Got hold of Veeder-Root catalogue & determine specifications of small counter to be used on console.
- Electrical reset mechanism for registers on AIC Scaler 1010: Two units received. Model 1290.
These are not immediately replaceable.
Jones plug on new model (1290) 8 contact, whereas old (1220B) 6 contact. Switched plugs -
Since mounting position & drive gear was closer to register in 1290, had to cut off two ducts & chain.

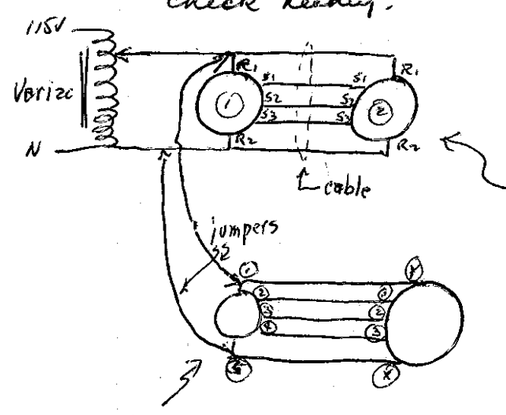
5/6/55 Drew up request for purchase requisition for Veeder-Root counters.
Continued APPR - West design considerations, checking out various selsyns on hand. Detailed check to follow,
ARE "Hot Critical": Electrical department Y-12 measured load on emergency circuit: full 10kw, without fence lights 4kw. Generator 35kw. This reported to design group

E. L. Rohrer

5/9/55 Hot Critical & Sketched rod drive mechanism for CMS.
APPR - West & Selsyn motors.

0930 power on - let motors stand idle for 4min to check heating.

0934 power off.
⇒ unmatched pair very hot.
⇒ matched pair cool



matched pair:
SYNCHRO 115V. TYPE 2324-1-B
① TRANSMITTER: 60N SER.NO. 9894
BENDIX AVIATION CORP.

SYNCHRO 115V TYPE 2330-1-B
② RECEIVER: 60N SER.NO. 7161
BENDIX AVIATION CORP.

Check is made on unmatched pair to see if such mismatch could be useable. Seems unlikely - let units cool while working on matched pair -

This pair indicates no run away as has been noted on pairs of larger transmitter units.

Put platten receiver marked in degrees to measure voltage at various positions of rotation.

Angle of Rotation	0	30	60	90	120	150	180	210	240	270	300	330
S1 - S2	85.5	76.4	45.2	1.25	37	71	84.8	77.4	48.5	4.2	41	74
S1 - S3	45.5	2.5	40	72.5	84.5	77.4	49.5	3.6	38.5	71	84.9	74
S2 - S3	40	76.5	85	76	50	5.5	40	71	84.5	77	48	4.6

voltage meter

E.R. Roberts

5/9/55 Power on: (a) matched pair - 12:09 PM
(b) two large Bendix Synchro transmitters -

To observe heating -

After 2 hour of operation of applied voltage - both pairs warm but not excessively hot.

⇒ Reviewed charts of monitor of regulated & unregulated voltage taken 4/20/55 - 4/27/55

CV: ran between 112-113 volts a few platens up to 113.5, months 112 - 112.6 no sharp changes

EP: ran between 118-121V. night 119-121 day 118-120 numerous small 1-2v spikes (voltage drops) during time ran following no particular pattern:

2	7:30-8:00 PM	4/20	4/23 1142A	M 4/25 1214LA 57.13 7:15V 8:20 8:27 10:15	T 4/26 1:45 2:05 5 4:10 3 4:16	W 4/27 12:38P 3:44 9V 12:40P 8V 2:59 8V
1	1 AM	4/21	1:25P			
1	7 AM		2:56P			
1	8:25A	4/22	11:45P			
1	2 P		4/24 midnite - 5:30 A.5 1:22P			

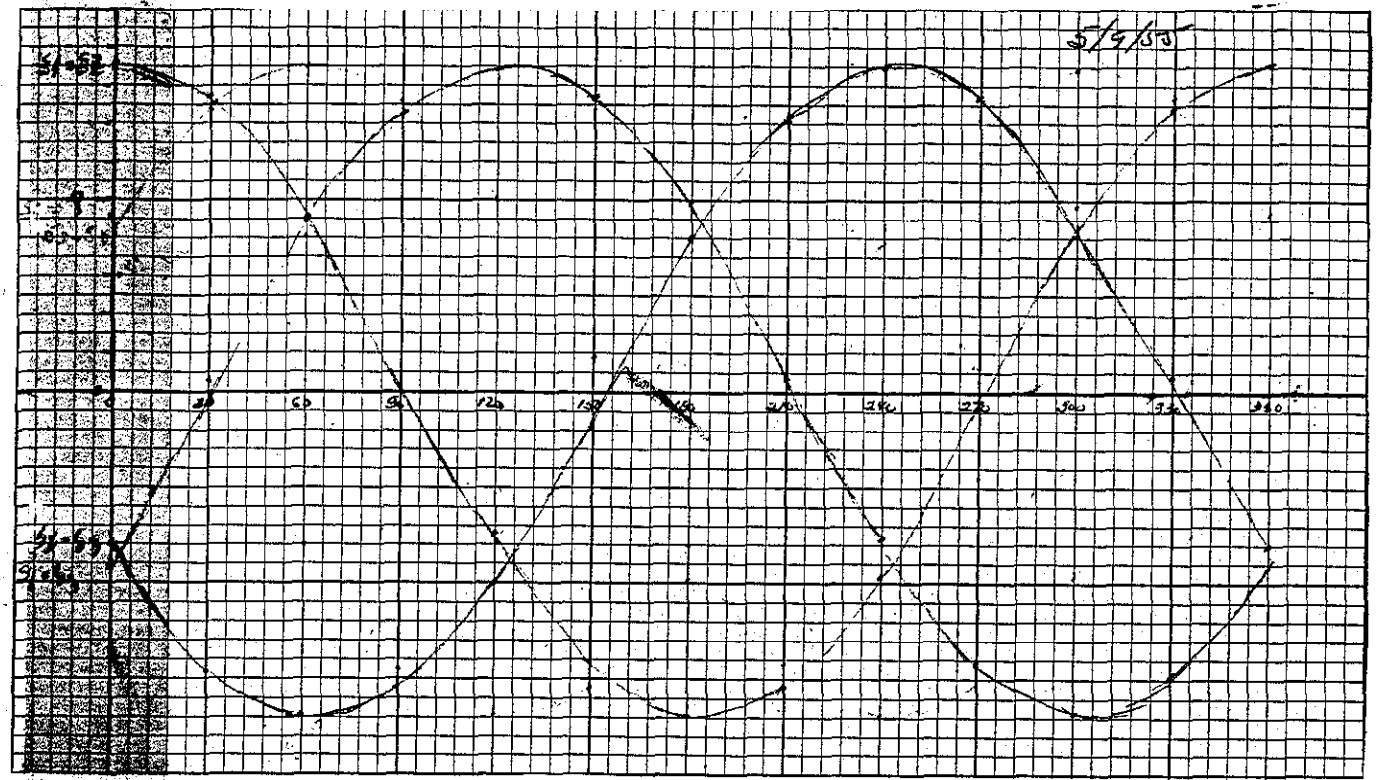
on 4/26 2,8 volt drops & on 4/27 once 9 volt drop
These were very marked, causing dimming of lights momentarily.

Checked fils on H.V. Power Supply, entry 2/28/55

E line	110	HV 907
	112.5	905
	115	904

$\frac{\Delta E_H}{\Delta E_L} = \frac{3}{5}$

E.R. Roberts


5/9/53

5/10/55 Checked synchro transmitters on reject shelf -

#1. Rotor resistance 3 Ω ← low -

S_1S_2	32 Ω
S_1S_3	32 Ω
S_1S_3	32 Ω

Rotor stuck in commutator bearing

Taken apart - signs of excessive heating on rotor. Insulation darkened & appears burnt at commutator end, shell marked

#2 Rotor open — Open heating in winding

S_1S_2	32 Ω
S_2S_3	32 Ω
S_1S_3	32 Ω

#3 Rotor 600 Ω high — Shaft sluggish

S_1S_2	32 Ω
S_2S_3	32 Ω
S_1S_3	32 Ω

Burned out Rotor -

#4 Rotor 23 Ω — Resistance values seem proper Some insulation rough on stator.

S_1S_2	32 Ω
S_2S_3	32 Ω
S_1S_3	32 Ω

#5 Rotor - 1.8 Ω low — Some heating ½ winding insulating coat cracking from stator, probably from heat

S_1S_2	- 34
S_2S_3	- 34
S_1S_3	- 34

The above are all Diehl selsyns.

E. R. Lohrer

6/10/55 New small Bendix synchros -

Receiver: R - 145 Ω; S_{12} = 220 Ω; S_{13} 220 Ω; S_{23} = 220 Ω

Transmitter R = 146 Ω; S_{12} = 220 Ω; S_{13} = 220 Ω; S_{23} = 220 Ω

Big Bendix - seemingly operable - R=14; S_{12}=38; S_{13}=38; S_{23}=38

R=14.5; 38; 38; 38

Pulled from shelf one big Bendix with shaft hard to turn (had been on shelf) - Resistances: Rotor 14.5 Ω

S_{12}	39 Ω
S_{23}	39 Ω
S_{13}	39 Ω

Examined - front bearing stuck - commutator shaft cracked

E. R. Lohrer

5/11/55 J.F. Fox reported selsyn on safety drive on Saint. All selsyns still on (power on overnight) selsyn on safety hotter than others. Took resistance measurements in 202.

	M1 Diehl	M2 Bendix	M3 Diehl	M4 Bendix
Rotor	22.5	14	23	14.6
S_{12}	34	41.5	35	39
S_{23}	34	41.5	35	39
S_{13}	34	41.5	35	39

Since M2 selsyn was excessively hot, removed for inspection replaced w/ another Bendix. Still not repaired - inspection in 201 showed loose neutral at terminal strip on motor dolly. -

E. R. Lohrer

5/11/55 Selsyn pulled from 202 as suspected, found OK. Put back together & shelved.
There are now 4 selsyns in stock - 2 Diehl & 2 Bendix

Foxboro recorder on output DC 231 under test (had been removed from 202 because of spurious tripping):
Take up spool slips & paper pulls up.
Put Rubber cement on shaft driving take up spool,

Selsyn with broken commutator shaft (see p 23 5/10).
Polished shaft w/ rubber cement - Left to dry at room temperature for at least 24 hours (JFG)

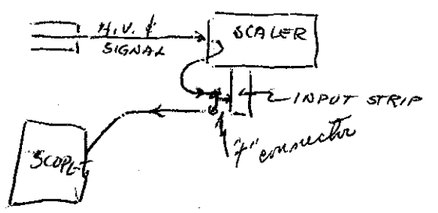
E. R. Rohrer

5/12/55 Preliminary consideration control panel APPR (no. of control/rack-selectors)

G-M counters, Rm 215. Negative pulses directly to scalers AEC 1010.
Checked for pulse size.
With NICC Pulse Generator calibrated Scope 511A, No 782 in 215.
Setting: 60 v, 100 μsec, negative,

Test Pulse	Scope Deft (cm)	Scope Setting	T.P.	S.D.	S.S.	T.P.	S.D.	SS
		2 stage; X1		Scope Delay Sys.				
0.1	.25	VAA-cw.	2.0	3.7 2.35 1.3 0.6	25st, X1 X2 X4 X8	4.0	2.45 1.375	X1 X2
0.2	.50		3.0	4.7 20st 1.75 .875	X1 X2 X4 X8	10.0	.75 .375	X4 X8
0.3 (5V)	.75		4.0	3.2 2.25 1.2	X1 X2 X4 X8	12.00	.45 .85 1.6	X8 X4 X2
0.4½ (6V)	.90			0.6	2st X8, X4		1.85	X2
0.4 (5.0)	.95	2 stage; X1; cw	5.0	1.35 0.7	1st X1 1st X2	14.00	.95 .50	X4 X8
0.5 5v.	.1625	2 stage, X2		1.75 .85 1.65	1st, X8, 1st X1 X2 X4	16.00	.59 1.10	X8 X4
	½2	2 stage, X1	6.0	.425	X8		2.00	X2
	2.25	2 stage, X1		2.05	1st X1		2.20	X1
1.0	1.2	2 stage, X2	~~7.0~~	1.125	X2	18.00	1.20	X4
	.1625	,X4	8.0	0.6 0.3	X4 X8		0.62	X8

5/12/55 Measured amplitude & pulse out of G-M counters -
#2 HV = 1400 - Deflection: 0.4 cm - 1 stage X1
0.45 cm 2 stage X8
Pulse amplitude ≈ 1.5 volts - negative
This is sign of pulse to scaling strips -
Cable ~~from~~ arrangement



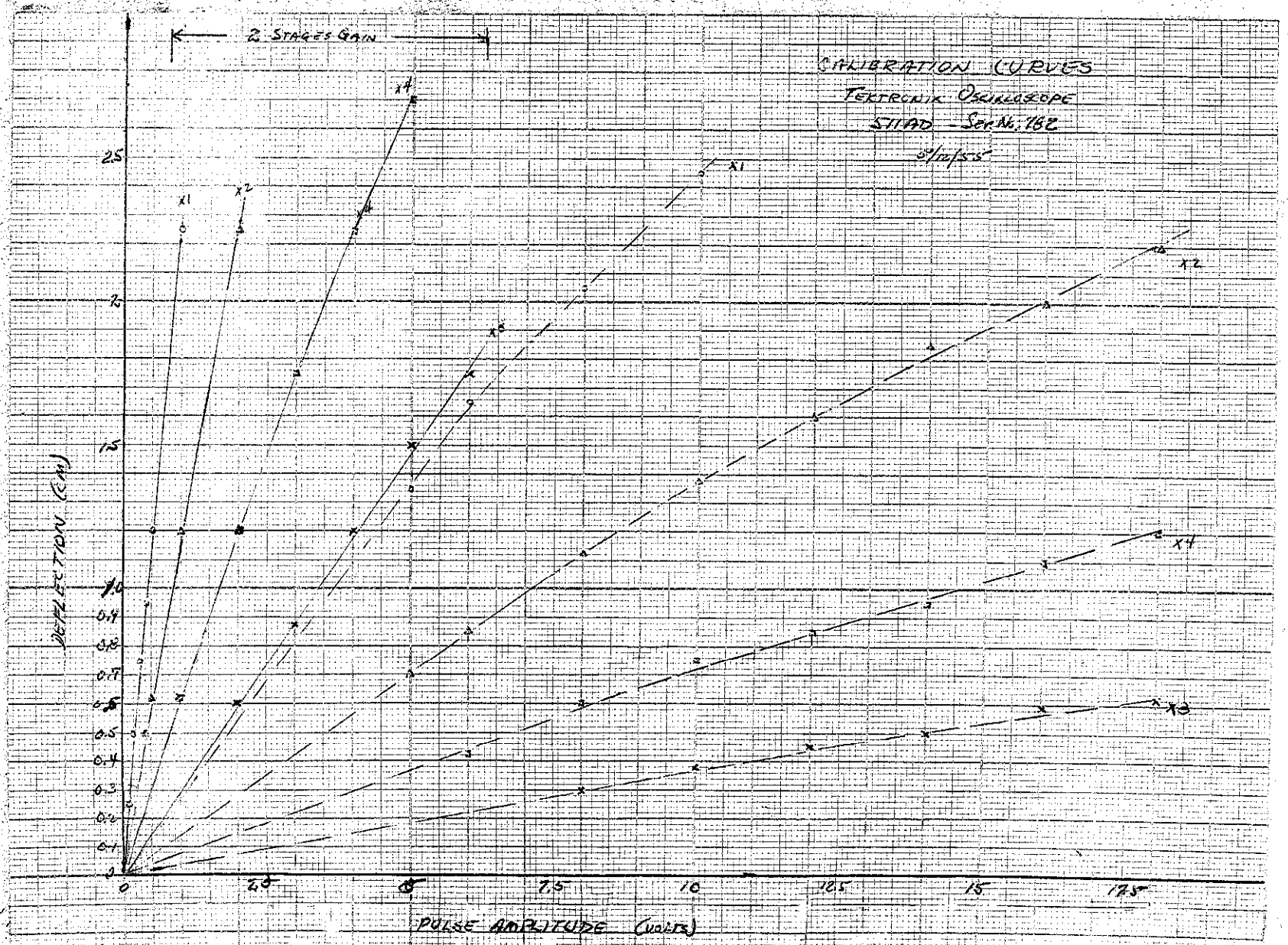
Plotted calibration.

Proof read paper for ADC -

E. R. Rohrer

5/13 Scintillation Counters - Discussed Cs counting system with D. Scott in light of standard normalization & errors found in data -
Counter and observation of analog DC amplifier DC 231 -

E. R. Rohrer


2 STAGES GAIN
CALIBRATION CURVES
TEKTRONIX OSCILLOSCOPE
SIAD - Ser No. 152
X1
X2
X3
X4
DEFLECTION (CM)
PULSE AMPLITUDE (VOLTS)
0
2.5
5
7.5
10
12.5
15
17.5

5/16/55 Preliminary on APPR:

Checked through points to note available power sources and wiring possibilities. APPR is to be set up in "NELL".

	WIRE DESIGNATION	ORIGINAL USE	PRESENT USE	CONN
	A, B, C	25 amp. breaker 3φ, 208, distribution	same	
	B, ; A,	115v, 20A, distribution	same	
	B/A	(?) 115v, 2A, distribution	same	CONNECTOR CABLE 201
M1	| H1			RIK-M12-22 6 1½"
terminal 202	| H2	208, 3φ, motor, from	same	7
| terminal 201	| H3	6 Amp. starter		12
	− H4	Neutral to starter relays & limit lights	same	
	− H5	relay starter, K_1, to "raise" (up) switch	same	
	− H6	relay starter, K_2, to "lower" (down) switch	same	
	+ H7	raise contact to up LS, N.C.	SPHERE FUEL CONTROL - FEED PUMP	2
	+ H8	lower contact to down LS, N.C.	SPHERE FUEL CONTROL - DRAIN VALVE	4
	+ H9	indicator light to up LS, N.O.	SPHERE FUEL CONTROL - DUMP VALVE	9
	+ H10	indicator light to down LS, N.O.	same	11
M2	| V1	from 3φ, 208, 6A. starter box to motor		5
	| V2		same	8
	| V3	~~neutral to starter relays & limit lights~~		7
	− V4	Neutral to starter relays & limit lights	same	
	− V5	starter relay, K_3, to "raise" switch	same	
	− V6	starter relay, K_4, "lower" switch	same	
	+ V7	raise contact to LSR N.C.	same	2
	+ V8	lower contact to LSL N.C.	same	4
	+ V9	indicator light to LSR N.O.	same	9
	+ V10	indicator light to LSL N.O.	same	11

5/16/55

	WIRE NUMBER	ORIGINAL USE	PRESENT USE	CONN
	+ V11	indicator light to LSD (red) N.O.	same	10
	− V12	switch to relay contact K-11 [magnet]	same {only mech switch}	
	+ V13	relay K-11 to transformer & lamp	same plus S12 tied here	
	| V14	− rect. output	same	12
	| V15	+ rect. output	same 10v, 5a.	6
M3	| S1	from 3φ, 208, 6A starter box to motor		5
	| S2		same	8
	| S3			7
	− S4	neutral to starter relays & limit lights	same	
	− S5	starter relay, K_5, to "raise" switch	same	
	− S6	starter relay, K_6, to "lower" switch	same	
JUNIOR	+ S7	raise contact to LSR NC	same	2
	| S8	lower contact to LSL NC	same	4
	| S9	indicator light - LSR NO	same	9
	+ S10	indicator light LSL NO	same	11
*	+ S11	indicator light LSD NO (1950)	Level Ind. Probe	
	| S12	switch to transformer & lamp	tied to V13	
	| S13	− rect. output	same	12
	| S14	+ rect. output	same	6
PUMP	P1	from 15A. 208, 3φ starter box to Pump		
	P2		same	
	P3			
	+ P4	1φ & 208 to starter relay & ind. lights	same	
	+ P5	starter relay & lamps to relay K-11 contact	same	
	− P6	contact relay K-11 to pump switch 202	same	
	+ P7	pump sw. 202 to pump sw. 201	same	
	| P8	pump sw 201 to K7 relay contact	same	

	WIRE NUMBER	ORIGINAL USE	PRESENT USE	
	+ P9	fuse CP201 to w[redacted]sw & K12 cont.	same	
	+ P10	[redacted] contact (up) to relay coil K12	same	
	+ P11	[redacted] contact (down) to valve	same	
	+ P12	PB scram 2½ W. DUMP SW -	same	
	| P13	PB sc & WDSW to relay K8 contact	same	
	+ P14	SET contact (down) relay K8	same {plus SPHERE CONTROL " DUMP RELAY K2'	
	+ P15	HOLD contact (up) relay K9	same	
	− P16	relay K8 & K9 to K10 contact.	same {plus SPHERE FUEL CONTROL DUMP RELAY K2'	
	P17	fuse 101 - K8 contact	same	
	P18	fuse 101 K8 contact	same	
	P19	K8 contact - K9 contact & K11	same	
	P20	K8 contact - K9 contact	same	
	P21	K9 contact transformer	same	
	P22	K9 contact transformer	same	
	+ P23	transformer ind. lights	same	
	+ P24	transformer ind. lights	same	
	+ PX	relay contact K12 solenoid valve	same	CONN AN 18-11
	+ SM1	rotor selsyns - 110v from switch	same	A
	+ SM2	selsyns M-1	"	C
	− SM3		"	D
	− SM4		"	E
	+ SM5	selsyns M-2	"	C
	+ SM6		"	D
	+ SM7		"	E
JUNIOR	+ SM8	selsyns M-3	"	C
	+ SM9		"	D
	+ SM10		"	E

AN-22-23P

WIRE NUMBER	ORIGINAL USE (52)	PRESENT USE	CONN.	WIRE NUMBER	ORIGINAL USE	PRESENT USE
T15 } T16 }	CA, lg, starter hdr to source resistor	same	E	+B7	raise contact to LSR NC	"
		"	G	+B8	lower contact to LSR NC	"
B4	fuse to strobe light	"		+B9	ind. light to LSR NO	"
-B5	starter relay K15 to raise sw.	"		+B10	ind. light to LSR NO	"
-B6	starter relay K16 to lower switch	"				

→ Room 107 cold - controller ok. - no voltag on relay. loose wire in 110 coil circuit - fixed -

5/17/55 East experimental Area:

Installed relay in table drive circuits. Relay contact normally closed, shunts table separation position switch (points 23 & 24 on terminal board on table drive chassis). Relay powered by normal unregulated power such that contact is open when there is power.

C-5 Scintillation Counter Run 215 -

Change of count with voltage line variation -

Meter box AC volts Weston 476 0-150v

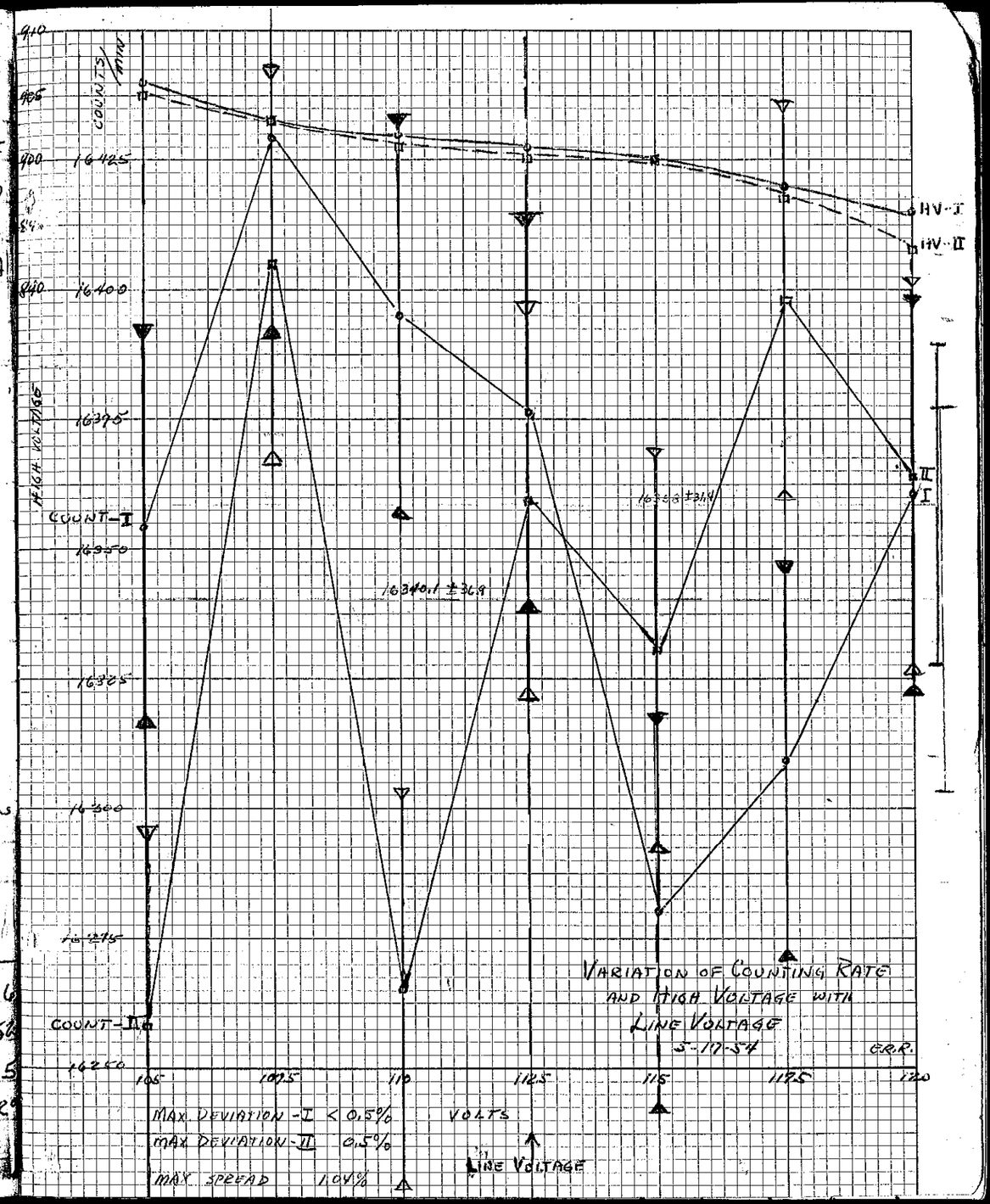
Power off 9:20 A - Inserted Variac & meters -

Power on 9:32 A HV on 0935.

LA: 1X8, 0.2μs neg. 15

5 min counts

Line	H.V.	Count x64		Line	H.V.	Count		Line	H.V.	Count x64	
9:41 A 105	906	1277	42	117.5	898	1274	11	112.5	900	1278	6
102.5	903	1283	35	120	896	1278	13	115	900	1275	58
9:53 110	902	1280	55	105 (10:25 A)	905	1270	10	117.5	899	1281	5
112.5	901	1279	28	107.5 (10:37)	903	1281	43	120	893	1278	2
115	900	1271	58	110	901	1270	47				



5/12 HV supply off 11:09 A.M. - Check line voltage - with meter - with HV supply on - Line = 112.5 ; HV = 895 - (HV just turned on) topped meter 900.

HV back on to stay 11:14 A.M.

Results:

Line	HV.	Counts/min
	906	16354 II
105	905	16258 II
	903	16429.4 I
107.5	903	16405.4 II
	902	16395 II
110	901	16265.4 II
	901	16376.8 II
112.5	900	16359.6 II
	900	16260.4 I
115	900	16320.4 I
	898	16309.4 I
117.5	897	16397.8 II
	896	16361 I
120	893	16364.2 II

E. R. Rohm

General Check of Cs-215 (Curves in folder file)

5/18/55

Lin. Amp Y100363

Cs-215; Standard - 1 min counts @ 900v - PDL Sweep. HV. off 8:19-8:23am & insert Vari... Lin = 112v.

Hour	Sample	LA Gain PDL	Scaler	Hour	Sample	LA Gain PDL 1-32	Scaler 64	Hour	Sample	LA Gain PDL 1-16	Scaler 64
0829	60N	—	16 224 9		Std-shld bare	40	255 13		Std shld bare	75	249 19
			224 9			45	253 62			80	204 35
0835	Std (bare)	1-8 15	64 256 10			50	250 26			85	197 29
3/64"	Std + Al	1-8 15	42 28			55	249 59	10:00		90	193 11
	"	"	43 58			60	248 18			95	195 34
	No shield Std (bare)	"	259 8			65	247 2			100	192 48
	Std shld (bare)	"	259 20			70	240 63			1-8 10	256 132 63
	Std-shld 1/32" Pb	"	2 52			75	241 50	10:30		15	64 256 39
										20	245 21
										25	239 59
										30	233 15
2#	"	"	16 9 11			80	240 5			35	223 53
										40	209 18
										45	197 28
0844	Std-sh bare	1-64 15	256 188 93			85	238 39			50	187 41
		20	182 163			90	234 14			55	174 46
		25	78 134			95	237 0			60	163 55
		30	64 277 53			100	237 36			65	150 39
		40	263 56			1-16 10.5	252 193 81			70	141 17
		50	257 57	0940		15	64 276 1			75	127 5
		60	253 21			20	254 57			80	116 60
		70	255 42			25	256 18			85	104 54
		80	251 17			30	249 2			90	98 46
		90	250 41			35	244 14			95	101 3
		100	254 42			40	243 5			100	101 13
		1-32 16	256 266 28			45	238 29			1-4 10.5	256 91 248
										15	64 245 58
										20	228 42
										25	209 29
										30	186 6
		15	94 79			50	229 43			35	161 45
										40	136 40
										45	111 34
		20	64 274 55			55	225 35			50	91 34
		25	262 37			60	224 36			55	72 45
		30	260 59			65	216 35			60	53 41
		35	255 29			70	211 43			65	39 42

Bkg 64 15 48(256)+1.6c

L.A. SENS.

5/18/55

Hour Sample	LA Gain PDL 1-4	Scaler 64	Bkg LA Gain PDL 1-2	Bkg Scaler 16	f/PDL	E_{Th}/E_0	f/PDL		f/PDL	
Std-shld bare	70	28 1	70	0 8	64-15	.00078 5.1	16-60	.0245 2.3	2-10	.0069
	75	18 3	50	0 7	20	.00133 10	70	.029 2.6	15	.0255
	80	11 46	40	0 10	30	.0025 18 (.96)	80	.0842 3.15	20	.0452
	85	6 63	30	0 12	40	.00368 24 (1.4)	90	.0387 3.55	30	.083
10:55A	90	6 24	20	1 4	50	.00493 1.17	100	.0439 3.45	35	.103 (.113)
	1-2 10	286 10	15	1 14	60	.0060 2.3	8-10	.00183	40	.124 (.132)
	15	224 18	10	2 1	70	.0070 2.77	15	.0062	45	.145 (.148)
	20	178 60	1-4 40	0 11	80	.0081 3.0	20	.0107	50	.168 (.161)
	25	129 12	70	0 12	90	.0092 3.45	30	.0200	55	.190
11:04A	30	86 14	50	0 7	100	.0104 3.45	40	.0297	60	.18-
	32.5	65 55	35	1 5	32-11	.00062 0.1	50	.0396	70	.218
	35	51 7	20	2 6	15	.00156 0.3	60	.045	75	
	37.5	36 57	15	2 8	20	.00269 0.5	70	.052	75	
	40	26 49	8:54P 10.5	3 1	30	.0051 0.9	80	.066	80	
	42.5	16 57	1-8 40	0 12	40	.0072 1.35	90	.076	85	
	45	11 20	~~30~~	—	50	.0095 1.78	100	.0865	90	
	47.5	6 22	70	0 15	60	.0118 2.23	4-10.5	.00433	95	
	50	3 6	[illegible]	—	70	.0142 2.58	15	.0125	100	
	52.5	16 5 8	50	1 7	80	.0168 3.15	20	.0218	Gain 2	Lo. 1-1.2; 2.1-2.4
	55	2 0	40	1 11	90	.0189 3.45	30	.0408	4	(.25μs) (1.65) 8
	57.5	0 11	30	2 1	100	.0214 3.95	40	.057	8	2.5 spread
	60	0 12	20	1 13	16 10.5	.00103 0.1	50	.078	16	1.65 (8) (1.2μs)
	~~62.5~~	—	15	2 5	15	.00319 0.3	60	.0985	32	3-4μs
	65	0 3	10	199 11	20	.0055 0.5	70	.1185	64	1.6μs
	~~67.5~~	—	1-32 20	18 7	30	.0099 0.96	80	.191		
	70	0 6	1-64 40	4 7	40	.0148 1.4	90	.1615		
11:23A std sh bare	end of run		30 / 20 / 15 (256)	29 7 / 293 4 / 160	50	.0193 1.78	100	.186		

(1.7) 2.1 V.
3.55-3.80V [.4μs]
4.05V .4μs
1.5GV .8μs
1.5GV 1.μs

5/18/55

Comparison of "Std" with other sources.

Std: Gain 2, pulse 1.7-2.1 v (lo amp output)

1.3-1.8 (x2) 1.15-1.6 volts

Cs137: Gain 2, pulse 2.6 2.3 v.

scope heavy to 1.5 trace to 3

Sample	CA Gain PDL 1-4	Scaler 64
2118 P Cs 137	100	0 39 (16)
	95	3 6
	90	3 2
	85	6 0
	80	15 12
	75	43 3
	70	117 11 (64)
	65	71 17
	60	195 49 (256)
	55	145 211
	50	397 91
	~~45~~	jam
2:50 Na24	1-64 ~~26~~	~~[illegible]~~
light shield not on	~~30~~	lite
	15	115 30 (64)
	20	61 59
much effect on 64	30	5/17 (16) 16/8
	40	
	50	15 11
	60	16 15
	70	14 5
	80	14 0
	90	13 3
	100	12 11
	1-32 50	11 12
3:10 P	60	9 8

Na24	PDL 1-32	Scaler
	70	8 13
	80	9 3
3:14:24	90	10 14
	100	7 13
	1-16 50	6 12
	60	5 1
	70	4 5
	80	3 11
	90	3 11
	100	3 0
	1-8 50	3 10
	80	1 12
	70	1 4
	80	1 11
	90	1 4
	100	0 13
	1-4 100	0 10
	1-2 70	0 9

back page do p31 + bkg 3:35 P

C-5 - {Scaler from C3 set input + put in cascade for high counts.

Curve in folder C5 -215-

5/20/55

None counting — Cs137 & [illegible] — Scalers cascade —

None counting

CA Gain PDL 1-2	I 100364 Scaler 16	II 100369 Scaler (II adj *)
100	0 1	—
90	0 1	
80	0 2	
70	0 4	
65	0 7	
60	0 6	
55	0 9	
50	1 3	
45	5 14	
40	37 13	
35	268 5 (256)	
30	141 5; 360 134	(22 16 8)
28	327 128	
26	(Jamming) (588 244)	44 16 13; ~~80 8~~
24	Jams	76 12; ~~5 244~~ (16)
22	~~6~~	142 14; ~~8 219~~; 376 6
20	—	22 91 (64)
18	—	259 31; ~~82 159~~ (256)
16	—	116 202; ~~105 218~~
14	—	157 225; ~~148 45~~
1-4	0 256 29	16
100	1 16 14	0 16 2
95	1 6	0 1
90	1 12	0 1
85	2 4	0 2
80	6 4	0 6
75	16 1	1 0

found cascade scaler skipping #1 repeat @ 1-2; 28

Cs137

CA Gain PDL 1-4	I 100364 Scaler 16	II 100369 Scaler 16
70	50 5	3 2
67.5	85 6	5 5
65	135 10	8 7
62.5	211 9	13 3
60	334 6	21 5
57.5	140 28	8 12
55	251 28	15 11
52.5	450 19 (256)	28 2
50	196 35	12 4
48	249 49	18 11
46	455 223 (jamming)	28 7
44	569 184	41 10
42	-	58 1
40		80 7
38		105 15
36		152 12
34		222 15 (64)
32		89 34
30		150 10
28		240 12 (256)
26		84 222
24		111 122
22		131 20
20		151 234
19		162 20
18		171 55
17		179 232
16		190 103
15		198 141
14		209 56
1-8 30		164 122
27.5		177 4
25		198 16

Scalers cascade

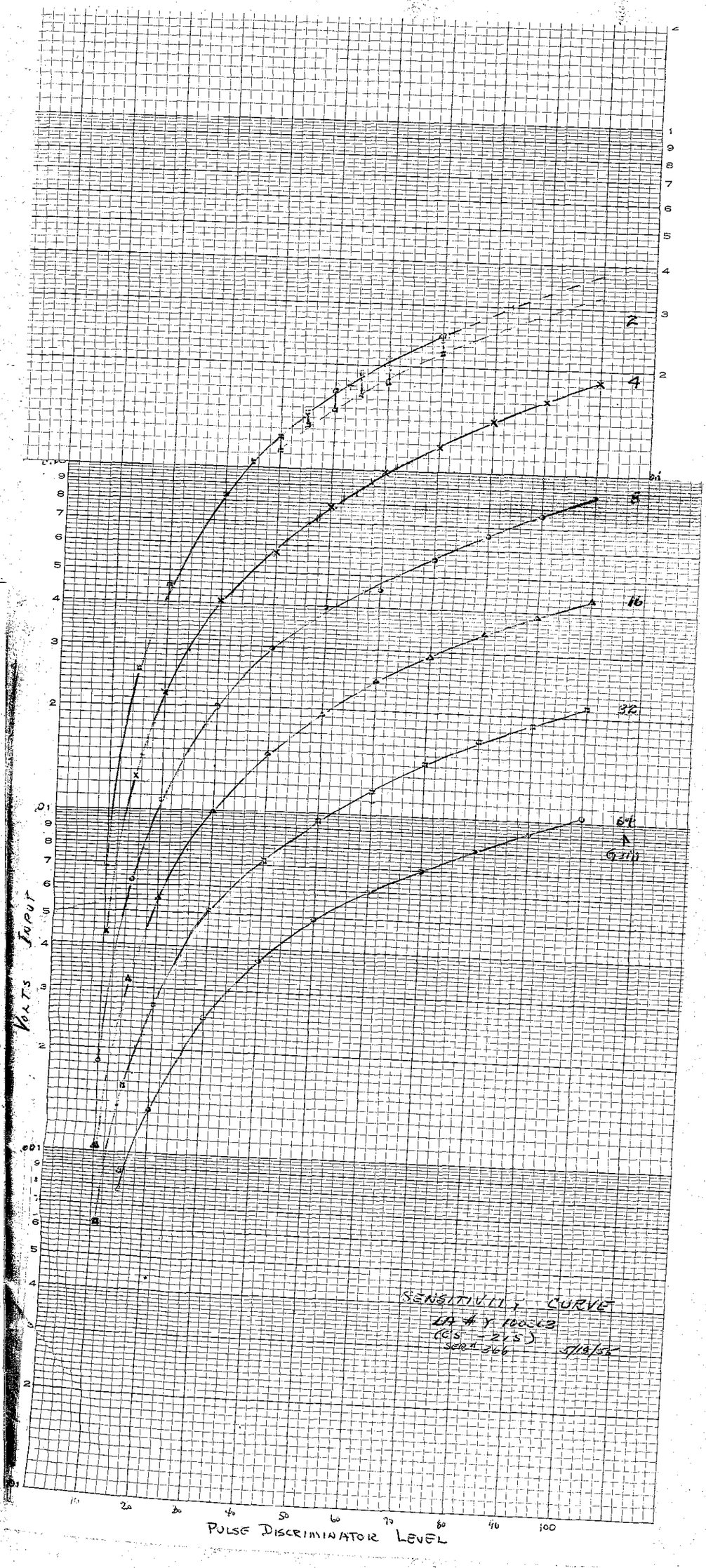
CA Gain PDL 1-8	I 100364 Scaler	II 100369 Scaler
~~24~~	—	193 72
23		198 135
22		204 24
21		209 149
20	—	214 31
19		219 86
18		225 69
17		229 214
16		236 195
15		242 79
14		249 183
13		256 113
12	—	263 184
1-16 25		241 202
24		245 176
23		249 100
22		252 35
21		256 219
20		260 185
19		264 59
18		268 115
17		272 240
16		278 4
15		282 129
14		288 108
13		293 248
12		301 2
11		310 22

CA Gain PDL 1-32 *	I 100364 Scaler	II 100369 Scaler
14	—	325 246
13	—	333 153
12		342 167
11		353 138
15		319 81
17		309 53
19		301 98
21		294 235
25		283 126
30		271 27
40		250 54
80		188 246

BACKGROUND (16)

PDL 1-32	Scaler	
100	1	12
95	2	3
90	2	2
85	1	14
80	2	13
75	2	2
70	1	15
65	2	0
60	1	11
55	2	8
50	3	1
45	3	3
40	2	3
35	2	11
30	2	10
25	3	3
22.5	3	8
20	7	11
18	19	10
16	92 (64)	14
14	60	13
12	151	63 (256)
11	102	91

rough scaler II reset


2
4
8
16
32
64
128
VOLTS INPUT
PULSE DISCRIMINATOR LEVEL
SENSITIVITY CURVE
LA # Y 100-62
(GIS - 215)
SER # 366
5/18/56

5/19/55 Summary of Data Aken 5/18

DISCRIMINATOR LEVEL	COUNTS/MIN.	P.E.	DISCRIMINATOR LEVEL	COUNTS/MIN.	P.E.	DISCRIMINATOR LEVEL	COUNTS/MIN.	P.E.	DISCRIMINATOR LEVEL	COUNTS/MIN.	P.E.	DISCRIMINATOR LEVEL	COUNTS/MIN.	P.E.	DISCRIMINATOR LEVEL	COUNTS/MIN.	P.E.
= "STANDARD"	(a) Bare & Covered	w/ 3/16" Al & 1/16" Pb (b)	.0168+	15,365		.0473+	10,487		.124	1,713		.0092	211		.049+	21	
.0062 (a)	16,394		.176+	15,271		.0517+	9,639		.134+	1,081		.0104	203		.0218	38	
(b)	2,716		.0189	14,990		.056	9,041		.145	724		.0095	188		.0125	40	
	2,810		.020+	15,168		.061+	8,133		.154+	406		.0118	152		.00433	49X	
(a)	16,584		.0214	15,204		.066	7,484		.166+	198		.0142	141		.076	12	
	16,596		.00103	49,489		.071+	6,710		.175+	88		.0165+	147		.056	15	
(c)	180		.00319	17,665		.076	6,318		.185+	32		.0189	110		.0383+	23	
	155		.0055	16,313		.081+	6467		.195+	11		.0214	125		.0297	21	
STANDARD - IDL SWEEP			.0077+	16,402		.0865	6477		.205+	12		.0193	108		.0200	33	
.00078	48,221	± 148.	.0099	15,938		.00433	23,538		.225+	3		.0245	81		.0107	29	
.00133	26,275	± 109	.0121+	15,630		.0125	15,730		.245	6		.029	69		.0062	37	
.00184+	20,102	± 95.6	.0148	15,557		.0218	14,634					.0342	59		.00183	3195X	
.0025	17,781	± 89.8	.0168+	15,261		.0304+	13,405		Cs 137 —			.0387	59		.00269	295	
.00368	16,888	± 87.6	.0193	14,699		.0408	11,910		.186	39		.0439	48		.00368	71	
.00443	16,494	± 86.6	.0217+	14,435		.049+	10,349		.173+	54		.0383+	58		.0025	491	
.0060	16,213	± 85.8	.0245	14,372		.058+	8,744		.1615	50		.0473	28		.00133	4052	
.0070	16,362	± 86.2	.0266+	13,859		.067+	7,138		.151+	46		.056	20		.00078	12448	
.0081	16,081	± 85.5	.029	13,547		.0773+	5,858		.141	252		.066	27				
.0092	16,041	± 85.4	.0315+	13,345		.0868+	4653		.129+	691		.076	20				
.0104	16,298	± 86	.0342	13,091		.0975+	3,433		.1185	1,883		.0865	13				
.00062	68,124		.0362+	12,637		.107+	2,538		.107	4561		.186	10				
.00156	24,143		.0387	12,363		.1185	1,793		.0975+	12,529		.245	7				
.00269	19,591		.041+	12,514		.129+	1,155		.0868+	37,331							
.00385+	16,805		.0434	12,336		.141	750		.0773+	101,703		BACKGROUND					
.0051	16,699		.00183	33,855		.151+	449					.245	8				
.0061+	16,347		.0062	16,423		.1615	408		No 24 —			.166+	7				
.0072	16,338		.0107	15,701		.0064	18,314		.00078	11,230		.124	10				
.0082+	16,254		.0148+	15,055		.0255	14,354		.00133	3,963		.083	12				
.0095	16,026		.0200	14,927		.0432+	11,452		.0025	592		.043	20				
.0105+	15,945		.0245+	14,325		.060+	8,268		.00368	280		.0255	30				
.0118	15,890		.0297	13,344		.083	5522		.00493	251		.0069	33X				
.0129+	15,810		.0339+	12,636		.093+	4215		.0060	271		.1615	11				
.0142	15,423		.0383+	12,009		.103	3271		.0070	229		.1185	12				
.0153+	15,474		.0426+	11,182		.114+	2361		.0081	224		.0773+	7				

5/20/85

BACKGROUND		Cs 137					
DISCRIMWATOR LEVEL	COUNTS/MIN	DISC. LEVEL	COUNTS/MIN.	DISC. LEVEL	COUNTS/MIN.	DISC. LEVEL	COUNTS/MIN
.0214	28	0.245	4 (2)	0.0655	170,680	0.00355	17,283,072
.0200+	35	0.225	7	0.0617	237,824	0.0077 (16)	15,845,888
.0184	34	0.205	6	0.058	329,472	0.0073	16,101,376
.0176+	30	0.185	9	0.0548	433,920	0.0068	16,314,064
.0168	45	0.166	19	0.051	625,664	0.0063	16,524,032
.0153+	34	0.144	44	0.0472	913,152	0.0058	16,833,280
.0142	31	0.123	605	0.0434	1,466,880	0.00545	17,086,720
.0129+	32	0.103	4293	0.0408	2,460,160	0.0048	17,316,608
.0118	27	0.083	36101	0.0364	3,935,232	0.0044	17,593,088
.0106+	40	0.073	92294	0.0325	5,561,856	0.00385	17,888,768
.0095	49	0.065	183552	0.0288	7,305,728	0.00345	18,220,032
.0082+	51	0.057	314368	0.0249	8,590,336	0.0030	18,514,176
.0072	35	0.049	585216	0.0218	9,955,584	0.00257	18,902,016
.0061+	43	0.042	1541632	0.0192	10,621,952	0.00215	19,264,768
.0051	42	0.0345	4218624	0.0177	11,220,736	0.00175 (17)	19,726,848
.00385+	51	0.0278	7653888	0.0160	11,790,336	0.00130 (11)	20,321,792
.00325+	56	0.0215	10346752	0.0144	12,478,208	0.00136 (20)	21,360,640
.00269	123	0.186	29 (4)	0.0125	13,013,760	0.00113 (13)	21,862,656
.00222+	314	0.174	22	0.0108	13,711,360	0.0009 (12)	22,456,064
.00178+	1166	0.162	28	(5) 0.0200	10,779,136	0.00062 (11)	23,169,536
.00137+	3853	0.151	36	0.0175	11,600,896	0.00152 (15)	20,926,720
.0009	9727	0.141	100	0.0148	12,362,752	0.0020 (17)	20,264,192
.00062	15963	0.129	257	0.0140	12,666,880	0.0024 (19)	19,751,424
		0.118	805	0.0130	13,010,688	0.0029 (21)	19,327,744
		0.113	1366	0.0122	13,375,488	0.00385 (23)	18,518,944
		0.107	2170	0.0113	13,735,168	0.0051 (30)	17,767,168
		0.103	3255	0.0107	14,032,640	0.0072 (90)	16,347,824
		0.097	5462	0.0094	14,274,496	0.0168 (80)	12,383,744
		0.092	8488	0.0086	14,763,264		
		0.0865	16092	0.0077	15,062,528		
		0.0819	28819	0.00695	15,516,416		
		0.077	50211	0.0062	15,879,936		
		0.073	76593	0.0053	16,365,312		
	22	0.069	116703	0.0044	16,821,504		

5/25/55 Test Rack - Check out preparatory to test of BF_3 Hanford counters & exp. w/ small wire chamber —

AIC Scaler Y/100355 - Model 1010 - Strips in & checks out on 60 ~.

Wrist Feeder-Rod Timer for use with scaler & connected.

Checked timer: One minute, 60 ~. scale-16.

	Count	Error
224 x 16	+13	-3
225 x 16	+2	+2
225 x 16	+0	0
225 x 16	+0	0
225 x 16	+0	0

4 min, 60 ~, Scale-64

225 x 64	+0	0
225 x 64	+0	0
224 x 64	+58	-6
224 x 64	+60	-4
225 x 64	+1	+1

16 min 60 ~ Scale 256

225 x 256	+2	+2
225 x 256	+1	+1
224 x 256	+61	-3
224 x 256	+60	-4
224 x 256	+62	-2

E. R. Rohrer

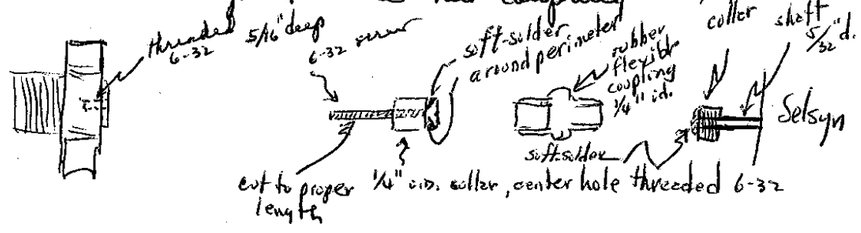
5/26/55 Worked on DC amplifier, GE type - System had been on ~~shelf~~ bench for long time. for detail, refer to file folder.

Conference with Hanman regarding points for air-conditioning system S-1 & S-3 in building.

5/27/55 Servo - control rod - drive.

selsyn - lead screw coupling loose, introducing error in readings.

Removed selsyn & made new coupling -



Remounted - trimmed al. clamps supporting Selsyn to allow better clearance.

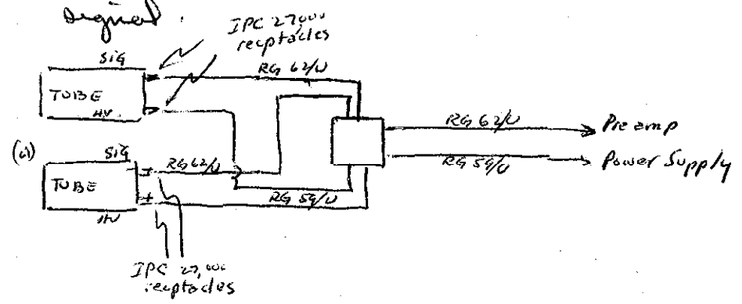
DC-232 - refer file folder -

E. R. Rohrer

6-13-55 New Scintillation Counting System :-

Two tube assemblies received 6-8-55.

Fabricated connecting cables for high voltage and signal.



Changed receptacles on PA's to IPC 2700

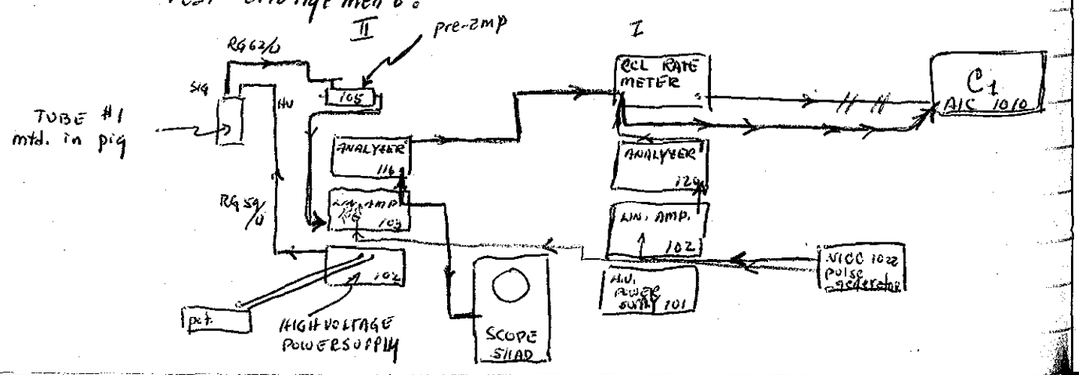
Wired one signal lead to Tube - #1

Thread on HV. measured Pot = .096 ≈ 850v

Connected to tube .0925 ≈ 825v -

Using Unit II.

Test arrangement:



(< 1" from tube)

6/13/55 Dried scan at 8250 ; Wiring as drawn - Cs137 source.

L.A. gain 32-1 to start - not satisfied -

Increased HV to 900 "

Checked w/ Cradeke on operating point ORNL test - ≈ 1100 volts -

Tried 1100 volts - still not happy with pattern on scope and counting indications -

Changed Analyzers - seemed somewhat better, but not good - to ~~further~~ investigate further -

---

6/14/55

Adjust C, (AIC 1010, Y100371) to accept positive pulses - sensitivity 0.26 volts. [No negative acceptance up to 20v]

Tie C, input to Analyzer output. Wiring as drawn in red.

Pulse generator set for positive, 1 μsec pulses fed to test point on linear amplifier this to test analyzer amplifier

(L.A. Gain 32-1, D.L.)

	E TEST	E SCOPE (VOLTS/DIV)	ANALYZER E	ANALYZER ΔE	
DOES NOT MATTER	0.1	10.75	113	- (I)	
		(1.45 cm	100.3	(I)	
WHAT GAIN SETTING		1st. x2	113.5	200	
		(1.45cm	241	- (I)	
IS - TEST PULSE	0.2	1st x4)	228-241	200 (I)	
INTRODUCED		(1.05cm	355.5	- (I)	
AFTER INPUT	0.3	1st x8)	343-355.5	200 (I)	
STAGES IN WHICH		(1.35	470	- (I)	
GAIN ADJ. LOCATED	0.4	1st x8)	458-470	200 (I)	
NEW SCALE		(1.95	624	- (I)	
	0.5	1st x8)	612-624	200 (I)	
		(2.15	767	- (I)	
	0.6	1st x8)	754-767	200 (I)	
		(2.35	878	- (I)	
	0.7	1st x8)	865-878	200 (I)	
		(2.6	973	- (I)	
	0.75	1st x8)	960-973	200 (I)	

E TEST	ANALYZER E	ANALYZER ΔE	
1st scale	466	- I	
0.4v	454 -	200 (I)	
	460 -	100	
	442 -	300	
	441 -	400	
	435 -	500	
	428 -	600	
	421 -	700	
	415 -	800	
	408	900	
	401.5	1000	
UNIT I WIRING AS DRAWN			
	502.8	- (I)	
	500	100 (I)	
	496	200	
	488.6	300	
	483.5	400	
	428	500	
	472.6	600	
	466	700	
	460.5	800	
	454.5	900	
	446.5	1000	

E TEST	E SCOPE (1.49 (1x2))	ANALYZER E	ANALYZER ΔE	
		125	-	
0.1	11.0	112.5	200 (I)	
	(1.45 (1x4)	257	-	
0.2		244.5	200 (I)	
	1.1	386		
0.3	(1st x 8)	373	200 (I)	
	1.4	509		
0.4	(1st x 8)	494.5	200 (I)	
	(1.8	658		
0.5	1st x 8)	646 -	200 (I)	
		848		
0.6	(2.2 1st x 8)	831	200 (I)	
		999.5		
0.7	(2.55 1st x 8)	976.5	200 (I)	

6/14/55 Adjusted H.V. Supply 122 on UNIT II

ESUM	Pot. Volts
800	.0946
900	.1106
1000	.1122
1100	.1225
1150	.1282
UNIT	I
800	.0893
900	.1015
1000	.1120
1100	.1220
1150	.1281

After checking voltage-potentiometer settings -
Set HV to ≈ 800v. (UNIT II).
Plugged in HV cable to TUBE I voltage dropped to 780 (.0870) -
Reset to 800v (.0891S) -
Oscilloscope on L.A II output; CRM & Scaler Output-SCDA II.

Cs 137 placed in tray, TUBE #1 against guide. -
upon insertion of sample pattern varies (green grows) -
high level source - @ 800 init. drops at E: / sec -
not enough scan to see peak - my guess.
check input pulse -
jumper from T on input preamp to scope set

6/15/55 Made up rest of signal cables & HV. cables as well as HV junction boxes for system.
Detects tubes 182 removed from pig to put on leads -
then replaced in lead house -

⇒ NOTE: One tube in use HV variable up to > 1100 v.
Two tubes in use on single supply only go up to 900 v. -
this may be cause for concern -

Tube #1 - on top -; #2 on bottom -
Checked signal from each detector. -

Signal check

6/15/55 Head from #1 seems weaker by far than Head from #2 -
This may be a problem.

6/16/55 Measured Signal Resistance (Voltage) T-1 1 meg.
T-2 1 meg.
H.V. Divider R: T-1 1.5 meg -
T-2 1.6 meg

II HV, no load = 1100 volts
, " # 3 B, = 1100
, T-1 only = 1060 volts
, T-2 only = 1062 volts
, T-1 & T-2 = 925 volts. max setting -

I HV. No load # 3 B, = 1100
T-1 only = 1065
T-1 + T-2 = 940 max setting

One tube load < 1 ma, Both tubes load < 2 ma
2x2A should be able to push this - what is load on regulator?
Check 2x2A plate current.

~~T-1 #2 1.2 ma HV = 1245~~

	(Simpson) I_p 2x2 underneath	HV.
~~No~~		
No Load	1.1 ma	1373
T-1	1.25 ma	1230
T-1 & 2	1.6 ma ↑ this is max	940

No Load	I_p 6BG6G	0 ma.
~~Full~~ 1/2 Load		10 μa
Full "		0

R output Power Supply - No. T-1 — > 3 meg
Both — 1.2 meg

Power Supply

6/16 I- Noticed 5651's seemed to glow (at least there was no reflection from tube shields - when full load on -
remove shield to check further -.

No load <600 -1370 - At lo voltage more current thru 5651's.

No Load - 800
T-1 - 765
T-1&2 - 770 -

Raised voltage w/ coarse adj until 5651's just glow -
Still glow at full setting of resistor - HV = 940 v
Lowered setting until change in voltage noted -
No Load point Rare = 1080 v
as is now - get 800-900 volts

Source Check.

T-1 only; HV = 900 =

Observed patterns w/ Scope 511AD (Y100 BC) & pre-amp -
(Att x1 2st. amp)
Rout T-1 = 2.4k. Scope at full gain & pre-amp full gain (att x100)
(Gain att x2 Scope)
Bkg pulses - varying in height most > 1 cm - up to 3 cm
Co^{60} (15 mil) gain x1 (full) - 1/2 - .8 cm -
Cs^{137} - -

T-1 attached to pre-amp I - 2.1K Ro -
Best pattern gain 16 on L.A..
Hard to see Cs^{137} above bkg. -

T-2: OK.
T-2 to pre-amp - I and scaler I.

6/16/55 @ HV 900V -
able to see Cs^{137} & Co^{60} well, above background.
2nd scan -
Will LA gain at 32-1 -
Got peaks for Cs^{137} (sample) on door
at 50-60 & 210
Co^{60} 380 430 as well as ~~Co~~
lower. ~~Cs~~
Ran a few scans with T-2 & scaler 1 to get feel of circuit.

Need to check T-1 again.

Another rough check T-2 &
gain
32 set HV @ 800 v. Two top peaks: 163 - 142
gain
64 HV 80v 340 - 290

T-1 responding at 1080 v @ gain 64 peak 120 for Cs^{137}
Tubes have different sensitivities.

E. R. Rothrock

Scintillation Counting System - 215

Co^{60} 1.17, 1.33
Cs^{137} 0.662

6/17/55 Further preliminary checkout -

T-1 & T-2 of instruments wired as follows: T-1 HV - I, SIG I → LA I → SCDA I; T-2 HV - 2, SIG II → LA II → SCDA II

Begin HV = 900 for Both T1 & T2
(when not counting turn E to 1000)
T-1: 32
Source Co^{60} (15 mr/h)
(I noted 895) (II 902)

LA GAIN	E/ΔE	2-m COUNT	LA GAIN	E/ΔE	1-m COUNT	LA GAIN	E/ΔE	COUNT (1m)
	100 (200)	3X16 +1	32	25	102 94		270	198 96
	95	17 3		27.5	102 152		260	248 68
	90	52 8		30	111 116		250	344 28
	85	89 10		32.5	125 224		240	293 209
	80	121 3		35	141 217		230	179 182
	75	144 15		37.5	140 71		220	148 188
	70	166 2		40	121 57		210	153 78
	65	201 10		42.5	86 75		200	192 105
	60	233 11		45	54 64		190	207 86
	55	296 5		47.5	99 57		180	209 167
	50	264 224		50	36 38		170	201 144
	45	251 255		52.5	15 44		160	155 25
	40	231 667 229	(110 900)	55	10 21		150	194 142
	35	1491 185		(crossed out)			140	186 41
	30	1833 171					130	182 247
	25	1284 104		T-2 @900V (CRM off)			120	183 184
	20	976 11		350	256 12		110	184 183
	15	963 27	32	200	117		100	186 246
				340	13 78			
	10	1070 167		330	14 251		90	189 38
	5	2295 164		320	19 159		80	196 74
				310	53 33		70	203 197
				300	172 227		60	224 14
				290	292 45		50	255 110
				280	259 229		40	331 172

T-2 sig > 4x that of T-1 seen on scope.

HV same T-1 t = 1m, 32:

E/ΔE	COUNT
5/100	426 1253
7.5	183 133
10	115 107
12.5	108 60
15	103 167
17.5	103 161
20	103 228
22.5	103 119

NEW SIG CABLE T-1 NO BETTER - ??
T-1 in Unit II
T-2 in Unit I
slight increase for T-1 to 240-200
T-2 240-200
Threshold at 900 v & LA = 32 (Scaler repaired)

T-1 @ 1000 V with Co-60
T-1 1050 gain 64 UNIT 2
T-2 900 gain 32 UNIT 1

E ΔE (T-1)	COUNT 1m	E ΔE	COUNT 1m	E ΔE	COUNT 1m
300	2 111	170	86 232	200	413 133
290	2 173	160	91 65	190	361 175
280	5 27	150	89 0	180	219 151
270	20 85	140	85 63	170	181 237
260	69 230	130	84 200	160	196 97
250	113 114	120	84 51	150	235 10
240	102 177	110	85 44	140	243 148
230	108 237	100	85 30	130	234 189
220	153 118	T-2 250	32 237	120	234 241
210	140 225	240	141 215	110	220 217
200	95 251	230	315 139	100	217 239
190	73 219	220	281 143	90	215 128
180	75 25	210	218 182	80	220 36

6/19/55

Cs^{137} - T-1 unit II 110-115
T-2 unit I 100-110

6/20/55 Peaks Co^{60} = 178-203 air conditioner off
Temp 88° — Reading at 0820 — Temp Controller T = 88°F
0905 Air Conditioning Still out.
T2 → Unit I. Co^{60} ΔE = 200, LA = 32, HV = 900

E	COUNT 1-m 64
240	20.57
230	36 - 54
220	197 - 36
210	439 5
200	455 61
190	115 230
180	191 118
170	123 100
160	80 30
150	321 25
140	389 60
130	424 50
120	394 20
110	370 34
100	361 2

(E II 64V)

P.G. NICC 1022		E (ΔE = 200)
0.1	-	128-141
0.2	-	256-264
0.4	-	505-517

T = 32°C 0935. T. Controller 88.5°F

Air Cond.: on 810 a.m.
10:10 - NaI 0.4 E: 501 - 513.5

3:15 P Checked Analyzer calib & scanned Co^{60} - T-2 Unit I - T = 75°F

Analyzer E	1 m Count -16-	check E	Input 1-m count	0.1 E	133.5 121.5 1-m COUNT	; Input = 0.4		505/501 491/495	
								80	256 152
400	14.4	320	136.9	240	275 8	160	372 95	70	250 180
390	28.0	310	141 8	230	285 10	150	224 194	60	248 150
380	96.8	300	150 13	220	88 13	140	225 30	50	284 162
370	114.8	290	162 13	210	310 59	130	271 107	40	322 79
360	90 13	280	175 13	200	283 135	120	284 58	30	449 160
350	76 6	270	167 4	190	359 239	110	248 25	20	632 107
340	110.6	260	201 13	180	334 212	100	262 60		
330	130.3	250	216 0	170	479 172	90	255 79		

Fan on - lead pig outside 3 Rounds

HV off - source out

6/20/54

Summary - Scintillation Counter System - 215

(6-14-55)

Analyzer Calibration - (ΔE @ 200)

Test	Analyzer E I	Analyzer E II	Analyzer E I	
0.1	112.5 - 125	100.3 - 113	128 - 141	121.5 - 139.5
0.2	244.5 - 257	228 - 241	256 - 269	—
0.3	373 - 386	343 - 355.5	[illegible]	—
0.4	494.5 - 507	458 - 470	505 - 517 ↑ ↑ ↑	495 - 507
0.5	646 - 658	612 - 624		
0.6	831 - 844	754 - 767	6-20-55 Room Hot 90°F	6-20-55 Room Normal 75°F
0.7	976.5 - 989.5	865 - 878		
0.75	—	960 - 973		

Analyzer Calibration - 6/14/55

Test Pulse (0.4v) ΔE	Win. 200 E-I	Win. 200 E-II	Width E interval I	Width E interval II
100	502 - 507.8	460 - 466	5.8	6
200	496 - 507.8	454 - 466	11.8	12
300	489.6 - 507.8	447 - 466	18.2	19
400	483.5 - 507.8	441 - 466	24.3	25
500	478 - 507.8	435 - 466	29.8	31
600	472.5 - 507.8	428 - 466	35.3	38
700	466 - 507.8	421 - 466	41.8	45
800	46.0 - 507.8	415 - 466	47.8	51
900	454.5 - 507.8	408 - 466	53.3	58
1000	446.5 - 507.8	401.5 - 466	61.3	64.5

Power Supply Calibration

VM	800 900	1000	1100	1150	
I Potentiometer	.0893 .1015	.1120	.1220	.1281	
II Potentiometer	.0896 .1006	.1122	.1225	.1282	

6-17-55 T-1 + Unit I ; T-2 + Unit II

HV ~ 900v ; LA Gain 32 (Both Units) ΔE = 200

I E	Counting Rate	II E	Counting Rate
100	245	350	3189
95	139.5	340	3406
90	420.0	330	3835
85	717.0	320	5023
80	969.5	310	13601
75	1159.5	300	44259
70	1329.0	290 280	66533 74797
65	1613.0	270 260	50784 76356
60	1869.5	250 240	100,892 75,217
55	2378.5	230 220	46,006 38,076
50	7173.5	210 200	39,246 46,697
45	32755.5	190 180	53,078 53,671
40	85490.5	170 160	51,600 49,945
35	183260.5	150 140	49,856 47,657
30	234709.5	130 120	46,602 42,032
25	164,404.0	110 100	47,287 47,941
20	124933.5	90 80	48,422 50,250
15	123,277.5	70 60	52,165 57,358
10	137043.5	90	65,390
5	293,942.0	20	84,908

Run one (at left) indicated drastic sensitivity difference between T-1 & T-2

Fed T-1 w.t. II & T-2 w.t. I : T-2 peaks lower (240 - 210) -

Set up for Run two

T-1 HV(I) 1050 Gain (II) 64 unit II

T-2 HV(I) 900 Gain I 32 unit I

T-1 E	6/17 Counting Rate	T-2 E	6/17 Counting Rate	6/20 Counting Rate
300	623			
290	685	250	8429	—
280	.1307			
270	5205	240	36,311	699
260	17894	230	80,779	2358
250	29044	220	72,079	12,644
240	26289	210	71,350	28,101
230	27885	200	105,861	31,101
220	39286	190	92,591	29,670
210	36065	180	63,215	43,894
200	24571	170	46,573	31,590
190	18907	160	50,273	20,516
180	19225	150	60,170	20,564
170	22248	140	62,356	24,956
160	23361			
150	22784	130	60,093	27,186
140	21823	120	60,145	25,236
130	21704	110	56,537	23,714
120	21555	100	55,791	23,106
110	21804	90	55,168	—
100	21790	80	56,406	—

Rm. temp high

-885 (Jan'48) Y-12 DATA SHEET

6/21/55 Calculation on Run 6/20 3:15 PM

E	Counting Rate	E	Counting Rate
400	228	190	92143
390	768	180	85716
380	1544	170	122796
370	1832	160	95327
360	1453	150	57538
350	1222	140	57630
340	1766	130	64583
330	2083	120	72762
320	2185	110	68633
310	2264	100	67132
300	2413	90	65359
290	2605	80	65688
280	2813	70	66228
270	2996	60	68758
260	3229	50	72866
250	3456	40	82511
240	3928	30	114594
230	4570	20	161849
220	5645		
210	14899		
200	72583		

215 - Scin. Ctrs.

6-21-65 0830 HV on unit I & II

① m-2, Unit I, HV 900, LA 32, ΔE 200

Co⁶⁰ - of 6/17, 6/20 source in 0830

TEST PULSE 0858 (P. Gen on over nite) 0.4 = 495-507.5

Adj HV to 900 up very slightly

Begin Count 0907

source out - 0958

Run 2 Cs137 sample on top pig. Begin 0953

① E	1-m Count -16-	E	1-m Count	① Counting Rate	① Counting Rate
400	145 3	140	237 [92]	723	60 764
390	105 6	130	276 [40]	1 686	70 696
380	108 9	120	271 [51]	1 737	69 427
370	82 2	110	261 [118]	1 314	66 934
360	75 15	100	252 [635]	1 215	64 747
350	164 0	90	249 [255]	1 664	63 444
340	123 13	80	252 [173]	1 981	64 685
330	133 8	70	254 [156]	2 136	65 180
320	141 10	60	268 [132]	2 266	68 740
310	151 15	50	281 [236]	2 431	72 172
		② E	1-m Count -64-		② Counting Rate
300	160 8			2 568	
290	175 9	140	1 [27]	2 809	91
280	184 4	130	2 [53]	2 948	181
270	204 15	120	8 [6]	3 279	518
260	221 9	110	42 [0]	3 545	2 688
250	250 15 -64	100	354 [43]	4 015	22 649
240	69 62	90	503 [18]	4 478	32 210
230	83 20	80	192 [31]	5 332	12 319
220	284 [12] -256	70	113 [29]	18 188	7 261
210	235 [77]	60	165 [52]	60 237	10 612
200	361 [34]	50	209 [36]	92 450	13 412
190	311 [74]	40	212 [13]	79 690	13 581
180	442 [43]	30	245 [44]	113 195	15 724
170	438 [31]	20	318 [41]	112 159	20 393
160	310 [80]	10	314 [32]	79 440	20 118
150	209 [25]			38 425	

2:40 PM ③ Cs137

E	Count -256- (1050-64, T-1-II)	Count -64- (900-32, T-2 I)
150	5 [233]	1 2
140	17 [57]	1 4
130	114 [149]	1 22
120	350 [48]	2 [29]
110	393 [29]	7 [40]
100	218 [9]	50 [27]
90	128 [236]	429 [35]
80	129 [168]	488 [57]
70	161 [8]	179 [12]
60	180 [144]	136 [16]
50	184 [128]	197 [60]
40	196 [127]	230 [40]
30	215 [248]	248 [35]
20	228 [92]	307 [53]
10	290 [143]	345 [42]
④	SC2 -16- -256-	SC2
150	8 +8	185
140	11 115	134
130	17 3	154
120	22 8	151
110	40 0	127
100	91 13	79
90	150 6	128
80	272 3	152
70	220 2	196
60	176 5	94
50	194 1.4	252

④ T-1 & T-2 II→I ↓ Cs137 in pig Co

Std - Integral 1&2 → I

E	Count -16-	Int. Bkg -16-
10	181 5	147 9
20	142 10	126 15
30	111 11	102 12
40	87 6	84 3
50	76 14	73 2
60	66 7	61 6

Left HV on I & II over night
I @ 1050
II @ 900

215 - Scin. Ctrs.

6/22/65 Checked HV.. HV I 1052 volts; .1166 mv.
HV II 900 volts; .1010 mv.

0838 - Cs137 source in pig dropped down to bottom, by mistake

① T-1 HV 1050 Gain 64 (II) ΔE = 200

② T-1 HV 1050 Gain 64 (II) ΔE = 200

③ T-2 HV 900 Gain 32 (I) ΔE = 100

④ T-2 HV 900 Gain 32 (I) ΔE = 50

NOTES: cascaded scaler seems to count high -

Run 3 questionable cascaded

1155 Read HV reset HV I to .1166

Run ⑤ SC2 cascaded Cs137 T-1 HV 1050 Gain 64 ΔE = 50 New source position

⑥ T-1 1050 Gain 64, T-2 900 Gain 32 parallel after LA. Cs137, new position

① E	Scaler 1m Count -256-	Count
150	7-320	2012
140	20-3	5123
130	135 [63]	34623
120	405 [225]	103905
110	408 [200]	104648
100	214 [211]	54945
90	162 [8]	41480
80	199 [230]	51174
70	248 [91]	63579
②		
145	14 [209]	3793
135	43 [89]	11097
130	106 [86]	27222
125	188 [29]	48157
120	245 [191]	62911
115	232 [11]	59403
110	175 [139]	44939
105	117 [21]	24973
100	86 [189]	22205
95	79 [39]	20263
90	83 [200]	21448
③		
110	35 [143]	
105	86 [86]	
100	224 [112]	
95	587 [104] (1108)	
90	1520 [56]	

E	Scaler 1m	Count
85	(1246) [143]	
80	361 [122]	
75	257 [136]	
70	231 [216]	
65	251 [158]	
60	309 [30]	
④		
105	41 [68]	
102.5	75 [20]	
100	136 [272]	
97.5	205 [95]	
87.5	354	
85		
82.5		
80		
77.5		
75		
72.5		
70		
97.5		
95		
92.5		
90		
87.5		

② E	Scaler 1m	Count
105	52 [78]	13390
102.5	94 [215]	24279
100	162 [123]	41595
97.5	240 [233]	61673
95	315 [84]	80724
92.5	354 [236]	90860
90	350 [110]	89710
87.5	306 [61]	78397
85	247 [86]	63318
82.5	218 [175]	55983
80	158 [159]	40607
77.5	123 [81]	31569
75	110 [15]	28175
72.5	104 [137]	26761
70	105 [68]	26880

12:55 P HV-I 0.1162 HV-II 0.1010

⑤ E	Scaler 1m	Count
150	15 [95]	3435
147.5	19 [7]	4871
145	22 [244]	5876
142.5	33 [102]	8550
140	50 [127]	12927
137.5	83 [111]	21359
135	123 [84]	31576
132.5	190 [64]	48709

E	Scaler 1m	Count
130	261 [42]	66858
127.5	330 [227]	84707
125	379 [93]	97117
122.5	416 [100]	106596
120	420 [31]	107551
117.5	385 [127]	98687
115	344 [194]	88258
112.5	280 [236]	71916
110	228 [224]	58592
107.5	173 [175]	44463
105	140 [103]	35943
102.5	115 [19]	29459
100	103 [92]	26460
97.5	99 [46]	25390
95	97 [98]	24930
92.5	100 [31]	25631
⑥ 130	100 [103]	25703
127.5	124 [3]	31744
125	138 [182]	35510
122.5	142 [131]	36483
120	138 [74]	35402
117.5	124 [2]	31746
115	106 [236]	27372
112.5	92 [1]	23526
110	83 [255]	21503

E	Scaler 1-m	Count
107.5	91 [38]	23334
105	114 [137]	29321
102.5	167 [22]	42774
100	240 [101]	61541
97.5	295 [107]	75627
95	348 [79]	89166
92.5	381 [111]	97647
90	385 [103]	98663
87.5	320 [23]	81943
85	275 [251]	70651
82.5	239 [79]	61263
80	189 [186]	48570
77.5	185 [235]	47545
75	171 [153]	43929
72.5	168 [131]	43139
70	172 [52]	44084
67.5	178 [49]	45617

6/23/55 Scin. Ctrs, 215 -

0900 Tubes 3 & 4 rec'd

① T-1, HV {0.1166 / ≈1050} ΔE=50 Gain 64 (II) Drift Check Run

② T-2 HV {0.1010 / 900} Gain 32 Drift Check Run ΔE=25

③ T-2 900, 32 Po-Be. ΔE=200

④ T-4 HV II 900 v G I 32 Cs^{137} ΔE 50

⑤ T-3 HV II 900 G I 32 Co^{137} ΔE 100

6 STD D.[illegible] T-3 HV II 900 G I ΔE 200

scaler seeming to have pulse counts *

E ①	Scaler	Count	E	Scaler	Count	E	Scaler	Count	E	Scaler	Count
135	103 (197)	26565	640	161 (12)	2588	380	31 (47)	2031	120	112 (17)	7185
132.5	146 (59)	37435	630	154 (15)	2479	370	32 (16)	2095	110	257 (14)	16462
130	191 (218)	49114	620	156 (14)	2510	360	33 (15)	2127	100	209 (25)	13401
127.5	234 (178)	60082	610	168 (6)	2694	350	32 (38)	2086	90	121 (40)	7784
125	271 (250)	69622	600	217 (7)	3479	340	32 (14)	2062	80	137 (11)	8779
122.5	285 (108)	73068	590	275 (13)	4413	330	33 (10)	2122	70	194 (61)	12477
120	280 (142)	71822	580	309 (8) -64-	4952	320	33 (24)	2136	60	225 (58) -256-	14458
117.5	249 (226)	63970	570	77 (31)	4459	310	35 (23)	2243	④ 75	12 (184)	3256
115	214 (207)	54991	560	72 (27)	4635	300	33 (62)	2174	72.5	15 (190)	4030
112.5	172 (18)	44056	550	62 (30)	4018	290	34 (1)	2177	70	22 (158)	5790
110	142 (1)	36353	540	57 (58)	3706	280	35 (37)	2277	67.5	40 (214)	10454
② 100	80 (240)	20720	530	56 (57)	3641	270	35 (61)	2301	65	86 (204)	22220
97.5	152 (124)	39036	520	59 (30)	3806	260	38 (22)	2454	62.5	174 (32)	44576
95	245 (11)	62731	510	66 (14)	4238	250	38 (3)	2435	60	280 (104)	71784
92.5	332 (234)	85231	500	68 (49)	4401	240	38 (2)	2434	57.5	388 (81)	99409
90	388 (215)	49543	490	67 (25)	4313	230	37 (63)	2431	55	441 (70)	112966
87.5	380 (186)	97466	480	54 (49)	3505	220	46 (56)	2616	52.5	437 (213)	112085
85	334 (151)	85655	470	45 (28)	2908	210	42 (12)	2700	50	368 (42)	94250
82.5	275 (175)	70575	460	40 (28)	2588	200	43 (27)	2779	47.5	295 (128)	75648
80 *	233 (219) -16-	59867	450	38 (41)	2473	190	46 (53)	2997	45	238 (182)	61110
③ 700	11 15	191	440	35 (7)	2247	180	46 (42)	2986	42.5	205 (130)	52610
690	35 4	564	430	34 (39)	2215	170	48 (44)	3116	40	189 (122)	48506
680	64 11	1035	420	33 (19)	2131	160	50 (57)	3251	37.5	195 (238)	50158
670	122 3	1455	410	33 (56)	2168	150	51 (16)	3280	35	217 (237)	55789
660	150 0	2100	400	33 (46)	2158	140	57 (48)	3496	~~32.5~~		
650	177 4	2836	390	30 (59)	1979	130	57 (20)	3668	~~30~~		

E ⑤	Scaler	Count
320	48 (256) (233)	25321
315	159 (448)	40852
310	221 (16)	56542
305	308 (77)	78925
300	383 (37)	98085
295	430 (254)	110334
290	437 (252)	112124
285	432 (240)	110832
280	394 (250)	101114
275	345 (188)	88508
270	305 (21)	78101
265	232 (141)	59533
260	183 (219)	47067
255	156 (170)	40106
250	141 (39)	36135
② S	14 1	225
10 B	5 6	86
S	20 9	647
20 B	9 11	155
S	32 9	841
30 B	11 0	176
S	34 5	864
40 B	7 11	123
S	29 15	479
50 B	7 3	113
S	21 10	246
60 B	8 7	135
S	23 4	372
70 B	9 4	148
S	31 2	498
80 B	4 6	150
S	23 15	383
90 B	7 6	118
S	13 11	219
100 B	6 6	102
T S	113 6	1814
160 B	84 9	1353

6/24/55 More - 215 Scin. Ctrs

Check HV: I 0.1166 ≈1050 (1044)
II 0.1010 - 900

Cs^{137} Drift Check

① T-1 HV I ≈1050 G 64 (II) ΔE = 50

② T-2 HV II 900 G 32 (I) ΔE = 50

E ①	Scaler	Count	E ②	Scaler	Count	E ① (6/27)	Scaler	Counts	E	Scaler	Counts
135	155 (106)	39786	100	155 (183)	39863	100	209 (5)	53509	135	244 (16)	62480
132.5	231 (19)	59328	97.5	285 (120)	73080	97.5	347 (94)	88926	132.5	313 (31)	80159
130	316 (163)	81054	95	360 (67)	92227	95	426 (90)	109146	130	362 (112)	92784
127.5	392 (84)	100436	92.5	449 (9)	114453	92.5	439 (69)	112453	127.5	396 (219)	101595
125	442 (181)	113333	90	473 (252)	121340	90	391 (196)	100294	125	395 (227)	101347
122.5	474 (63)	121407	87.5	450 (24)	115224	87.5	314 (144)	80533	122.5	371 (81)	95057
120	462 (151)	118423	85	383 (130)	98178	85	237 (215)	60927	120	323 (146)	82834
117.5	415 (178)	106368	82.5	315 (111)	80751	82.5	185 (33)	47393	117.5	268 (136)	68744
115	360 (229)	92384							115	207 (193)	53187
112.5	290 (103)	74343							112.5	165 (26)	42266
110	227 (143)	58255	80	250 (113)	64113	80	147 (28)	37660	110	133 (80)	34128

6/27/55 Note - Power failure over weekend 4:30 P 6/25 - 1:30 P 6/26
Drift check 0830 6/27, data recorded above
HV. I - 0.1166 ≈1044 v.
HV II 0.1010 ≈ 900 v
Run ① T2 HV II Gain I 32.
② T1 HV I Gain II 64

6/29/55 HV check I - .1166 ; II .1010 ✓✓
Gain I - 32 ; II 64 -
Set: T-1 → II , I HV
T-2 → I , II HV
Rough check of Cs^{137} peaks T-1 ≈ 120-125 (OK.) ; T-2 ≈ 90-92 (OK.)
over for continuation—

6/29/58

W foil - 3662
number down
away from T-1

① T-1 - ΔE = 50
begin 0925
(T-2 E: 445)

E	Scaler	Count	E		Scaler	Count	
	170			I	48 0	768	
7.5	897	101802	30	D	7 4	116	
	146			I	48 6	774	
10	154	34570	40	D	6 8	104	← T-2 E setting 1000
	65			I	47 15	767	
12.5	119	30017	70	D	8 0	128	← T-2 ΔE = 0
	1						
15	104	26625	70	D	6 6	100	← T-2 E 0, ΔE 0
	177			I	21 5	341	
17.5	94	24241	70	D	0 14	14	Bkg
	321			I	20 15	335	
20	92	23773	60				
	247			I	24 0	384	
22.5	100	25847	50	D	1 1	17	
	97			I	28 4	468	
25	117	30044	20	D	1 9	25	
	191			I	31 14	510	
27.5	136	35009	30	D	1 4	20	
	182			I	38 8	616	
30	144	37046	20	D	1 8	24	
	20			I	60 11	971	
32.5	134	34330	15	D	19 0	304	
	188			I			
35	107	27550	10	D	150 17		
	111			I	257 45	16104	
37.5	75	19311	10	D	212 22	13340	
	88						
40	43	11096					
	157						
42.5	22	5789					
	4383						
45	205	11041					
	213						
46	81	20944					
	116						
35	250	64116					
	660						
30	466	119356					
	206						
27.5	573	148844					

Scaler reports →

(Noted T-2 E setting)

Integral count

	I	24 49		6193
45	D	10 248		2608
	I	136 48		3632
47.5	D	19 9		1225
	I	39 31		2527
50	D	8 54		566
	I	27 11		1739
55	D	4 41		297
	I	52 13		1325
60	D	12 9		201
	I	63 1		1009
65	D	8 7		135

T-2 adj up against shield
Check all catch "1947" only range
noted system detects fast

6/29/58
Gold foil
19.3 (away)
T-2 - close to guide
ΔE 50

E		Scaler	Count	E		Scaler	Count
		256				256	
	I	168 15	43023		I	1248	31958
5	D	112 132	28804	5	D	109 24	27928
	I	53 52	13620		I	7 198	1940
7.5	D	13 22	3350	10	D	0 190	140
	I	165 31	10591		I	112 5	1797
10	D	7 27	475	15	D	5 14	94
	I	156 11	9945		I	94 2	1506
12.5	D	6 10	394	20	D	5 7	87
	I	151 19	9683		I	91 14	1470
15	D	6 36	420	25	D	5 10	90
	I	144 60	9276		I	83 6	1334
17.5	D	6 0	384	30	D	4 0	64
	J	141 2	9026		I	77 3	1235
20	D	6 4	388	35	D	3 8	56
	I	134 20	8596		I	66 8	1064
22.5	D	5 51	391	40	D	4 0	64
	J	125 61	8061		I	66 2	1058
25	D	5 43	363	45	D	2 7	39
	I	123 52	7924		I	60 5	965
27.5	D	5 26	346	50	D	2 10	42
	I	121 20	7744		I	54 14	878
30	D	4 26	276	55	D	2 11	44
	I	115 38	7398		I	47 14	766
32.5	D	3 52	244	60	D	3 12	60
	I	112 33	7201		I	44 1	705
35	D	3 15	207	65	D	1 4	38
	I	104 5	6981		I	40 8	648
37.5	D	2 26	154	70	D	1 7	39
	I	105 50	6772				
40	D	2 58	186				
	I	102 38	6556				
42.5	D	3 01	193				
	I	99 4	6340				
45	D	5 29	349				
	I	92 35	5923				
47.5	D	9 57	633				
	I	88 54	5686				
50	D	15 44	1004				
	I	68 16	4368				
52.5	D	19 50	1266				
	I	51 46	3310				
55	D	18 6	1158				
	I	38 41	2473				
57.5	D	13 0	832				
60	I	24 37	1573				
	D	7 50	498				
	I	18 24	1176				
62.5	D	3 24	216				
	I	14 15	911				
65	D	1 41	105				
67.5	I	13 0	832				
	D	1 6	70				

Bkg

Data on U-foil #3662 exposure, taken by Crandell, in binder with curves.

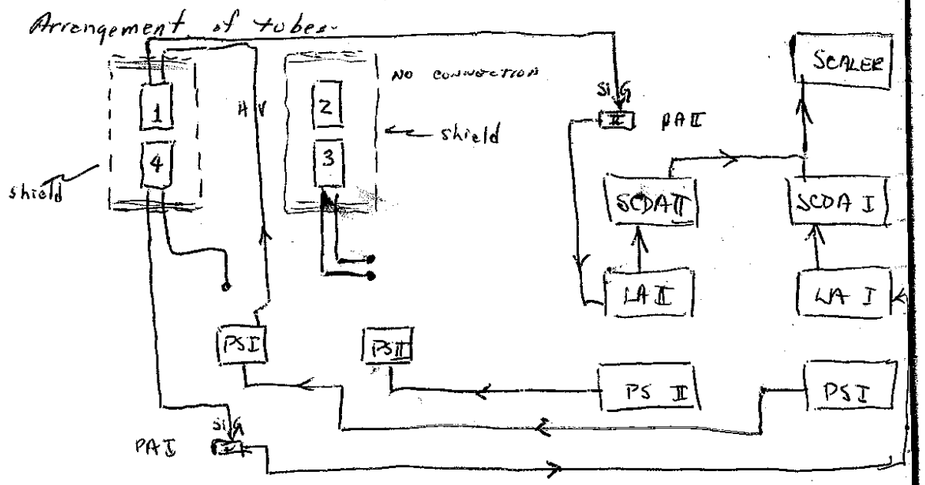
6-30/7-17 Vacation

7-18 Check status of instrumentation -
Clean up back log of documents

7-19-55 Check out servo chassis built by V.G.H. O.K.
West end - Magnet trouble. open lead at magnet.
Mounted 2-terminal barrier strips on plate supporting magnet for connection of DC leads to magnet leads. This should cut down on magnet failures.
Sc.in Ctrs -215. Spencer has noted tube 1 extremely sensitive to geometry - do counting U-foil, each & two done separately, then stacked. Stacked count > Σ separate counts.
Hot Crit Control Panel - Wiring engineer J.F.C.

Scintillation Counters -215:

Arrangement of tubes.



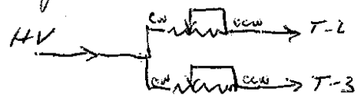
7/14/55 T-1 - HV from PS I ; SIG to PA II
T-2 - NO CABLES
T-3 - CABLES NOT CONNECTED TO ELECTRONIC INST.
T-4 - SIG CABLE CONNECTED TO PA I.

LEAVE T-1 AS IS -
Meesured HV on PS I POT = 0.11715 volts = 1048 v. cf 1044 v.
Measured HV on PS II NO TUBE IN: 0.1141 = 1021 v.
T-3 0.1105 = 988 v.

Cs 137 on T-3 @ 90° - scaler at right at E = 0 - check dark current at + this is how it had been set - - ok.
Check LA-SCDA calibration:
Input pulse 0.4 volts, +, from BICC pulse generator -
E = 510 ; ΔE = 100 E = 504-510 thus close

HV II 0.1010 = 900 v. T-2 peaks in Cs^{137} @ 60 (90) -
T-3 peaks Cs^{137} 220 (290) -
shift & peaks a problem -
HV = 900 - LA calibration check ok.
Possible - movement of tubes; repositioning in lead shields may have produced shift.
HV II ESVM = 900 (1010)
HV I ESVM 1064 (1173)

Fixed HV junction box II for parallel operation of tubes 2 & 3.
500,000 Ω potentiometers in each lines:



7/19/55 With junction box in place adjusted HV to 900v. for both tubes & adjusted T-3 so peak on Cs^{137} same as for T-2 (@ 90) 900v

---

7/20/55 Set HV II to pot reading of .1065 ~950v -

Check Cs^{137} peak -

① T-2 ΔE=50 beg: 0837

② T-2 ΔE 50 new source position begin: 0913

③ T-3 ΔE 50 beg: 1200

④ T-2 ΔE 50 begin: 1221

⑤ T-2 ΔE=100 (1238) source on top of shield

⑥ T-3 ΔE=100 source same

① E	1 min ct/256	②	③ E	1 min ct/256	④ E		⑤ E	
110	55 217	134 105	120	173 171	115	129 115	115	51 66
107.5	116 179	275 83	117.5	288 108	112.5	144 234	110	131 92
105	232 16	331 45	115	383 145	110	274 171	105	190 132
102.5	353 111	341 - 83	112.5	455 10	107.5	320 116	100	179 87
100	494 155	308 35	110	494 188	105	320 ~~159~~ 157	95	116 80
97.5	535 - 97	248 47	107.5	494 223	102.5	293 316	90	95 214
95	496 81	179 92	105	460 63	100	224 12	⑥ 120	34 63
92.5	433 88	131 71	102.5	410 139	~~97.5~~		115	44 168
90	321 75	107 27	100	342 40	~~95~~		110	40 121
87.5	234 226	91 53	97.5	303 247	~~92.5~~		105	30 94
85	164 244	84 127	95	252 213	~~90~~		100	
82.5	135 149	80 182	92.5	205 29	~~87.5~~		95	
80	116 108	83 47	90	174 103	~~85~~		90	
77.5	118 8							
75								
72.5								
70								

can not tell much with source so far from one of tubes

appears that T-3 needs to be adjusted down a bit in HV.

7/20/55

① ΔE=50 T-1 HV = .1171 Cs^{137}

3/4"

② Foil 11 (up); T-1 (.1171) ΔE=50 (No Al. over foil)

③ Foil 3665 (down) resting on paper taped to bottom of Al slide.

U-Foils

Cs^{137} at this

Scaler 43 10 / 2 8

	#11 (Up)		#3665 (DOWN)	
	INTEGRAL	DIFF	INTEGRAL	DIFF
7.5	8	80,701		102,589
10		59,989		95,724
12.5		58,148		95,278
15		55,613		90,854
		51,244		85,977
20		49,999		88,283
		54,095		98,437
25		61,708		114,141
		72,107		131,752
30		77,177		136,268
		71,044		121,550
35	122,674	56,312		90,553
	73,982	34,969	134,180	63,618
40	46,669	23,337	80,502	36,786
	26,857	11,446	47,322	17,508
45	16,889	5,459	33,195	9,304
	12,405	2,918	25,568	5,405
50	9,787	1,868	20,883	3,674
	8,275	1,508	(55) 15,338	2,907
55	6,908	1,343	~~11,195~~	
	6,364	1,193		
60	5,270	930	11,195	2,147
65	3,768	652	7,784	1,558
70	2,698	569	5,366	1,293
75	1,954	480		
80	1,193	316	2112	553
90	625	45	881	111
90	482	28	698	40

7/19/55 with junction box in place &
& adjusted T-3 at peak

7/20/55 Set HV II to get reading to
Check Cs^{137} peaks.

① E	1 min at 256	② E	1 min at 256	③ E	1 min at 256
110	35 217	139 105	120	173	
107.5	116 179	275 83	117.5	288	
105	232 16	331 45	115	383	
102.5	353 111	341 -83	112.5	455	
100	494 155	308 35	110	494	
97.5	535 -41	248 47	107.5	494	
95	496 81	179 92	105	400	
92.5	433 88	131 71	102.5	410	
90	321 75	107 27	100	342	
87.5	234 226	41 53	97.5	303	
85	164 244	84 127	95	252	
82.5	135 149	80 182	92.5	205	
80	116 108	83 47	90	179	
77.5	118 8				
75					
22.5					
70					

① T-2 ΔE=50 beg: 0637

② T-2 ΔE=50 new source position begun: 0913

③ T-3 ΔE=50 beg: 1200

④ T-2 ΔE=50 begun: 1221

⑤ T-2 ΔE=100 (1238) source on top of shield

⑥ T-3 ΔE=100 source down.

T-1 (now w/ T-4 in lead shield)

HV I : .1194 This a bit high. To check Cs^{137} at this then at .1166

① E	1 min at 256	② E	scaler count 256	③ E	scaler	④ E	scaler	⑤ E	scaler
140	101 107				168 10	256			
137.5	142 38	7.5 D	315 61	70 D	35 9	7.5 D	205 159	100	43 10
135	209 6	10 D	234 81				236		2 8
132.5	281 200	12.5 D	227 36	75 D	30 0	10 D	373		
130	344 52	15 D	217 61			12.5 D	372 44		
127.5	391 19	17.5 D	200 44	80 D	19 12	15 D	354 230		
125	407 124	20 D	195 74			17.5 D	335 217		
122.5	397 22	22.5 D	241 94			20 D	341 29		
120	368 15	25 D	241 12			22.5 D	384 133		
117.5	313 17	27.5 D	281 171	90 D	39 1 2 13	25 D	445 221		
115	//	30 D	321 121			27.5 D	514 168		
112.5	//	32.5 D	287 132			30 D	530 76		
110	//		474 50			32.5 D	474 226		
		35 D	219 248			35	363 185		
			288 259		30 2		524 36		
		37.5 D	144 165	100 D	1 12	37.5 D	248 136		
			162 97				314 118		
		40 D	91 41			40	103 176		
			104 233				184 218		
		42.5 D	47 182			42.5	68 100		
			65 249				129 171		
		45 D	21 83			45	36 88		
			143 53				99 224		
		47.5 D	45 58			47.5	21 24		
			152 89				326 19		
		50 D	28 12			50	57 26		
			129 19				289 42		
		52.5 D	23 36			55	45 21		
			101 60				174 59		
		55 D	20 63			60	33 35		
			99 28				121 40		
		57.5 D	18 41			65	24 22		
			309 4				84 10		
		60 D	58 V			70	20 12		
							132 6		
						80	34 9		
		65 D	235 8				53 1		
			40 12			90	6 15		

1313 decided to run U-foils without changing HV - Cs 137 peak close to early.

7/21/55 Small BF_3 proportional counter –

Check out 5/16" counter –

Scaler 1040 check out: No. Y-89637

OK. scale 16 – internal gen.

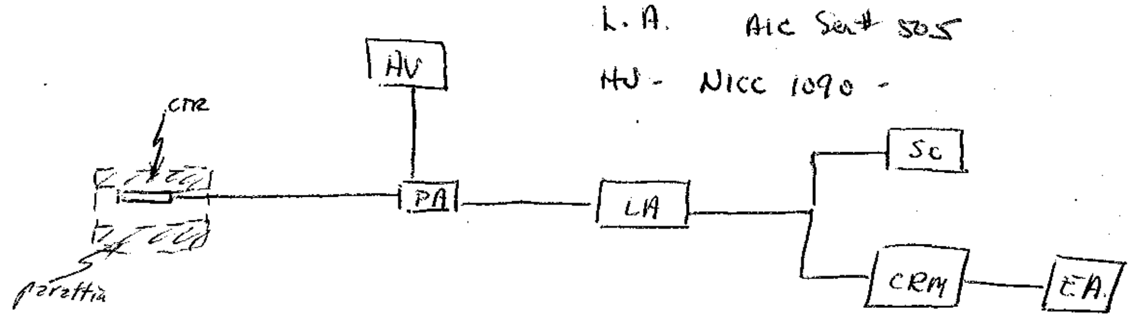
strip 115-2 → tried 64-256 w/ 115-2 no hi voltage – pres plug bad, needs to be replaced.

Decided to check counter w/ Pre-amp & linear amplifier, using scope to check output.

Pre-Amp – AIC Ser# 335

L.A. AIC Ser# 805

HV – NICC 1090 –



	HV	LA (set "1" to ...)	CRM	Scaler
bkg –	1700	4X1, 0.2, 20	X1 4100%m	632/5
	1600	"	x1 – 0	19/5
PB 262 Source next to counter inside paraffin	1300	"	50%	304/5
	1400	"	75	484/5
	1500	"	75	626/5
	1600	"		663/5
	1700	"	power failure	

BF_3 proportional counter. Placed ctr in new paraffin tube 1" & 1" thick w/ 3/4" center hole

7/22/55 ① LA: 4-1, 0.2, "1" D 20 BACKGROUND ② PB 267 81" out paraffin	HV	① Scaler 5 min	② Scaler 5 min	Scaler	HV	Scaler	HV	Scaler	HV	Scaler
	1300	0	548							
	1350	1	594							
	1400	1	677							
	1450	0	688							
	1500	2	700							
	1550	0	743							
	1600	0	803							
	1650	1	795							
	1700	2	856							
	1750	4	949							
	1800	23	1407							
	" 1850	① 453	② 879							

SCIN. CTR: Gold foils – 215; Foil Au 2; Two min. counts with T-1 & T-2,3

T-1 Integral at E=70 HV≈1050; T-2,3 Integral at E=50 HV≈900	T-1 Au 2 64	T-2,3 Au 2 64	T-1 Bkg 64	T-2,3 Bkg 64	T-1 Au 2 c/m	T-2,3 Au 2 c/m	T-1 Bkg c/m	T-2,3 Bkg c/m	T-1 Au2-Bkg (tube close 1/8")	T-2,3 Au2-bkg (tubes close)
	50 22	124 40	15 25	54 18	1611	4116	497.5	1737	1113.5	2379

Na can – Two min count on T-1 (Both T-1 & T-4 displaced from tray by 5 turns)

T-1 Integral E=100	Na 16	Bkg 16	Na	Bkg
	248-7	48-1	~~3975/m~~ 1987.5 c/m	~~7697/m~~ 384.5 c/m

ratio 5:1

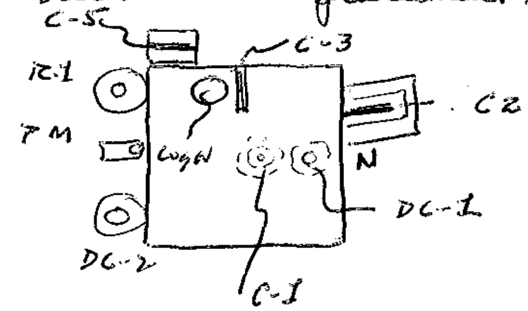
7/25/55

① T-1 INT BKG HV (.1171) (w/cm slide)

② 2-min. #16	E	c/m
92 - 2	20	737.0
84 - 12	30	678.0
74 - 4	40	594.0
64 - 5	50	514.5
52 - 3	70	417.5
48 - 7	90	387.5
43 - 6	100	349.0
counts thinning * 36 - 10	125	
31 - 8	150	
28 - 6	175	
25 - 8	200	

7-26/28 Instrument Servicing - West End
Counting Channels & DC-1 primary
Reference: Instrument files.

7/26 Instrument placement:

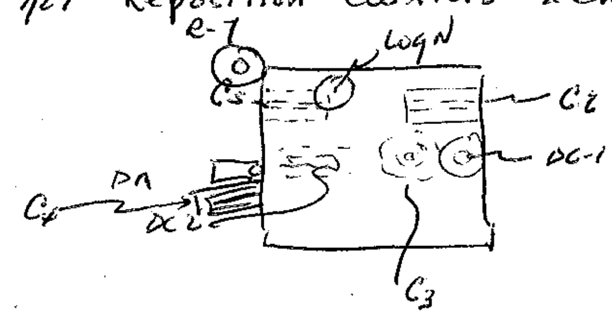


DC-3 (INSID)

Ion Chambers DC-2, DC-3, R-1, & Log N OK. DC-1 Side
P-M OK.

Counters: C-1 head shot.
Got C-2 head on C-1 amp & C_3 & C_5 to work.

7/27 Reposition counters & chambers for geometry improvement



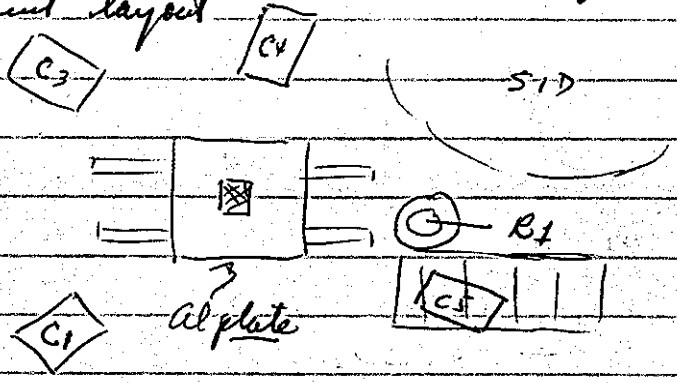
7/28 For West run C_2, C_3, C_4, C_5; DC_2, DC_3, R-1, Log N; PM

(7-29 sick)

8-1 Continued service work on C-1 C-2 channels in 202.
Refer to files.
Design coordination APPR Control

8-2, 8-3 Paper work on APPR-Nell control console.
Set up for instrument check out in 107
Noted need for servicing of I & II Scan Ctrs in 215.

8-4-55 8-11 Checked out counters for DFC. dry stacking.
Instrument layout



Checked counters with "Bkg" block in plate & no source from hour to hour to hour. Series of one minute counts

	C_1 x64	C_3 x64	C_4 x64	C_5 x64
DISC:	5 00	—	4-25	16-45
Hr	4-0	760	1800	1675
	50 33	34 47	81 0	16 58
	49 4	33 59	82 3	18 58
	60 4	33 20	82 11	16 62
			80 43	15 28
	20 24	73 60		
	20 46	77 40	5 43	51 44
	20 32	75 62	5 26	50 53
			5 36	49 15
	20 47	32 9	5 36	49 28
	20 12	33 27	5 25	48 24
	21 7	32 1	5 10	48 54
	21 8	33 6	5 46	48 38
	22 39	34 15	5 40	46 7
	22 34	34 14	5 11	46 7
			5 38	48 62

8-4-55 Scintillation Counter Units - 215

TO BRING TO DATE: a: Scott, in counting N_2 cans on T-1, reported trouble from T2-T3 channel throwing in hi count. Disconnected output of T23 h scaler.

b: Scott, in taking count after N_2 count, noted no count for T-1 system.

noticed VR 150 #0B2 in power supply of SCDA in T-1 system not firing. 5Y3 replaced still no firing —

refer - file

worked on LAI sensitivity check - refer file.

8-5-55 Hot Cut preparation - wired control rod -

8-8-55 Scin Ctrs - 215 - check out - I & II - refer file.

T-2: 1/2 Turn up

Co^{60} Source "centered" between T-2 - T3

E	1 min count	$2\bar{E}$	1 min count	G	1 min count	E	1 min count	E	1 min count	E	1 min count
ΔE=50 LA 82-1	x64	15	106 141								
100	372 52	170	120 148								
	x256	2.5	133 70								
110	95 85	175	142 132								
		7.5	167 234								
120	100 23	180	176 3								
		2.5	173 139								
125	101 17	185	170 77								
		7.5	163 33								
130	101 75	190	144 82								
		2.5	123 216								
135	97 71	195	114 176								
		7.5	107 147								
140	92 232	200	103 101								
		2.5	101 111								
145	84 138	205	104 151								
		7.5	114 119								
150	78 74	210	120 81								
		2.5	130 203								
155	75 0	215	129 206								
		7.5	117 184								
160	82 51	220	104 214								
2.5	86 149	2.5	88 1								
165	93 152	225	98 46								

8-8/19 - Hot Critical Preparation - Control Panel Check Out & Instrument servicing. Refer to file.

8/14/55 - APPR Console design.

8/20 - 8/2 Hot Critical Run (Evening Shift) Wiring APPR panels.

8/6/55 Scin. Anal. Chs 215 - - refer file -

9/7/55 From results of 9-6:

Gain of SA2 ≅ 2x gain SA1.

T2-3 had been used with SA-2

In earlier counting had used T-1 with SA-2 to improve operation.

T-1 in SA-2 Co^{60} 1.171; 1.332

Set HV I @ 1050 - .57855 ; Run - T-1 & 4 @ HV 2

	E	Scaler 60	c/min	E	Scaler	c/m	E	Scaler	c/m
②ΔE=100 HV=1050 ①e914 (5786) T1&24	①100	109 51	7029	80	137 49	8943	160	80 19	5139
	5	113 3	7235	85	167 13	10701	65	72 41	4649
②ΔE=100 T1 HV=1050 ONLY	10	114 53	7349	90	191 21	10965	70	69 47	4335
	15	116 15	7439	95	161 11	10315	75	73 5	4677
							80	88 61	5693
	20	118 0	7552	200	134 50	8946	85	110 23	7063
	25	119 5	7621	5	126 49	8113	90	147 4	9414
	30	121 56	7800	10	134 50	8626	95	173 39	11111
	35	114 43	7339	15	138 17	8849	200	170 44	10924
	40	114 34	7330	20	126 51	8115	5	144 14	9230
	45	110 12	7052	25	102 33	6561	10	114 33	7329
	50	101 16	6480	30	77 4	4932	15	111 5	7109
	55	96 50	6144	35	57 61	3704	20	125 17	8017
	60	94 39	6055	40	49 49	3184	25	132 20	8468
	65	92 4	5894	45	44 46	2862	30	115 4	7364
	70	98 62	6334	250	45 31	7411	233	83 46	5358
	75	115 38	7348						

9/7/55 SA2 T1-4

@ 1050 v · Gain 64 · pulse T-1: ⌀ 1cm, 1.7cm (scope 2 - x 2)

Adjusted R44 to bring pulse on T-4 down to level of T-1

①Run Scan on T-4 alone.

	① E	Scaler 64	c/m	② E	Scaler	c/m	E	T-1 Scaler	T-1 c/m	T-4 Scaler (12:03)	T-4 c/m	
④ Re-adj T-4 HV (scope attached)	170	77 57	4979	170	73 55	4727	180	72 43	4651	96 32	6176	
	75	73 10	4682	75	76 17	4881	85	82 36	5284	121 5	7749	
③ Re-adj T-4 HV	80	70 16	4496	80	87 31	5544	90	104 57	6713	154 53	9909	
	85	73 52	4728	85	103 27	6619	95	141 14	9038	166 62	10686	←
	90	83 7	5319	90	125 17	8017	200	168 10	10762	165 2	10562	
	95	96 61	6205	95	154 63	9919	05	172 12	11020	138 13	8845	
	200	118 25	7577	200	169 22	10839	10	147 46	9454	113 22	7254	
	5	144 33	9249	05	157 54	10102	15	114 21	9317	105 56	6776	
	10	162 18	10386	10	126 54	8118	20	103 24	6616	118 10	7562	
	15	154 53	9909	15	107 15	6863						
	20	130 14	8334	④ 180	97 42	6250	180	(④) 1109P 73 31	4703	(④) 79 7	5063	ADJ T4 HV
	25	103 11	6603	85	121 12	7756	85	88 13	5645	91 25	5849	
	30	97 12	6220	90	152 20	9748	90	115 34	7394	113 62	7294	
	35	108 34	6946	95	170 42	10922	95	145 17	9297	136 49	8753	
	40	112 59	7227	200	165 46	10606	200	169 30	10846	161 46	10350	
	45	107 53	6901	205	135 24	8664	05	170 31	10911	164 46	10542	
	50	86 49	5581	210	109 22	6998	10	138 63	8895	144 61	9277	
				215	108 25	6937	15	112 12	7180	113 43	7275	
							20	104 5	6661	101 27	6491	

12:12P - Noted that HV to tubes had increased from 1047 to 1054, due to increased R44 load. (5786)

Check T-1 & T-4

1:00P	175	131 56	8440	245 34	18914	Δ 200						
						16553 5						
	180	160 19	10259	258 41	13806 10							
				215 46								
				217 15	15583 15							
	185	210 21	13461	227 46	19532 20							
				227 4								
				234 25	15001 25							
	190	267 55	17143	201 4	17468 30							
	195	298 19	19091	146 36	9380 35							

 adj. 48 p. 53

T2-T3 SAL
(5802)
set 1050 v
Gain 32
ΔE = 100

(no adj on R33 from HV @ 960)

E	Scaler (64)		c/m	E	Scaler 16	64	Int
				INTEGRAL			
190	91	42	5866	50	77	10	2
95	105	11	6731	45	114	3	1
200	114	8	7304	40	163	4	13
5	160	13	10253	35	293	11	7
					16 - 64		
10	225	63	14463	30	193	14	33
					16 - 256		
15	251	10	16074	25	107	9	117
					T2-3 SA1 ΔE = 50		
20	249	43	15979	#49 up	16	64	
25	211	44	13548	15	57	9	12
				17.5	65	7	40
30	167	27	10715	20	90	11	63
				22.5	122	4	31
35	146	8	9352	25	144	6	5
				27.5	131	15	27
40	152	33	9761	30	82	12	47
45	186	10	11914	35	11	5	60
50	197	35	12643	40	4	0	13
55	168	22	10774	(1) 45	4	7	24
60	119	4	7620	50	3	9	18

U foils
SA-2
#26 (up) T1-4
ΔE = 50
HV .5817

E	Scaler 16	64	~~Int~~	E (INTEGRAL)	16	64	
2.5	392	9	45	50	19	13	56
5	183	7	30	45	27	14	59
7.5	141	14	31				
10	136	4	49	40	36	6	63
12.5	130	11	11				
15	130	6	19	35	53	1	9
17.5	145	4	24				
20	167	5	41	30	187	7	34
22.5	183	4	57		16	256	
25	176	9	31	25	115	9	205
27.5	142	12	18	BKG INTEGRAL	16	16	
30	94	11	18	25	9	3	14
32.5	55	15	56	25	7	0	0
35	110	3	12				
37.5	57	4	6				
40	36	15	1				
42.5	29	4	2				
45	25	5	15				
47.5	21	8	8				
50	18	0	11				

E	Scaler	E	Scaler

4/8/55 U-Foil #34

SA2 Gain 64 HV @ 1050 (5817) ΔE 50
(A) INTEGRAL 0833

	E	Scaler 1	Scaler 2
		x256	x16
	50	+167	189 + 15
77"	"	+123	190 5
	"	+63	190 6
	100	+33	93 0
381,542 c/m	"	+181	93 5
	"	+93	93 1
		x64	x64
	100	15	93 6
		x16	
#49 up (INT)	100	62 1	
970	"	61 4	
	"	58 10	
		x16	
BKG (INT)	100	46 15	
		47 5	
(743)		45 2	

3-9-55

SA-1 : Gain 32 ; ΔE = ~~50~~ 100 ; HV(pot) = .5805

0801
SA-1 Co60
peak check
4-ply source

E	Scaler x256		c/m
200	235	120	
5	278	198	
10	243	37	
15	312	137	
20	332	216	
25	332	20	
30	320	0	
35	301	148	
40	276	25	
45	264	228	
50	257	47	
55	242	191	
60	228	128	
65	206	133	
70	189	161	
0828 200	190	181	
0832	256 64	256	
SA2 INT E=100 — 100	97	59	
0834 100	98	17	
	x16		
ELLIS TIMER ½m GON	112	10	
	"	12	
	"	14	
	"	13	
	"	15	
	"	12	

INT CT - Co^{64} 4-ply SA-2 E=100

	0903	0904	0906	1017
256x64 :	98	98	98	92
256 :	22	34	37	18

INT SA-1 Co^{60} 4-ply E=100 -

	0910	0912	1015
256x64 =	~~[illegible]~~114	114	118
64 :	~~49~~ 5	10	2

DIFF SA-1 Co^{60} 4-ply E=200 ΔE=100

	0914	0922	0937
X256	212	197	195
INT	5	254	135

ELLIS TIMER

4/12/55 : SA-1 & 2 — 16/64)1024

Changed batteries in potentiometer. –

Cobalt peak check. Gain: 64. ΔE = ~~50~~ 100 HV(pot) = .58185

(SA-2) 0933
① Co^{60} - 4 ply source
② DWM source same as 4/7/55
(SA-1) ③ DWM source HV = ~~.58146~~ adj to .5803
④ 4 ply. Co^{60} source
(SA2) ⑤a repeat of ④ w/scaler 64→16
~~⑤b repeat of ④ w/scaler 256~~
⑥ repeat of ② DWM.

E ①	Scaler x256		c/m (1 min)	② Scaler x64		c/m (1 min)	E ③	Scaler 64		c/m (1 min)	④ Scaler 16 64 1	c/m (1 min)
170	222	67		109	14		215	173 / ~~[illegible]~~	11 / 45		76 8 37 / 70 8 7 / 62 15 44	215 210 205
75	272	24		115	34		20	215 / ~~[illegible]~~	33		80 14 14	
80	337	146		134	17		25	245	1		81 3 45	
85	399	92		168	63		30	232	32		80 1 16	
90	434	91		221	7		35	194	42		76 7 12	
95	423	218		254	37		40	160	53		71 8 5	
200	380	194		262	15		45	145	40		68 4 34 / 68 3 55 / 64 4 14	
05	337	189		236	21		50	149	46			
10	330	66		203	27		55	174	3			
15	336	164		181	50		60	183	44			
20	330	142		140	29		65	169	23			
25	242	228		201	24		70	121	63			
30	228	113		190	12		~~75~~					
35	156	143		146	6		~~80~~					

12:15 (⑤) 16 64 1 — ⑥ x64 12:24

7, 8, 9, 10 Cs^{137} in SA2 ΔE 50
7 - @ "1"
8 @ "2" 1 cm closer to center of Tubes
9 @ "3" 1 more cm
10 @ "4" 2 more cm

E	⑤ 16 64 1	⑥ x64	E	⑦ 16 64 1	⑧ 64 64 1	⑨ 64 64 1	⑩ 64 64 1	
180	87 4 11	142 60	90	–	–	91 51 60	132 38 26	60
85	105 5 28	187 46	92.5	–	–	104 4 39	143 26 31	2.5
90	114 10 19	231 31	75	–	–	116 51 37	152 6 56	65
95	107 8 1	264 47	77.5	–	101/38/21	129 15 57	158 3 46	7.5
200	93 11 61	260 60	80	325 12 15	113 35 15	134 56 25	158 32 1	70
05	82 10 6	225 52	82.5	389 15 33	122 62 45	135 5 47	155 13 55	2.5
10		190 61	85	428 11 37	125 52 13	136 2 9	145 33 35	75
15			87.5	454 8 42	123 34 20	120 7 3	134 11 13	7.5
20			90	456 8 62	115 6 30	106 45 41		80
25			92.5	432 8 41				
30			95	381 8 53				
			97.5					
			100					

9/12/58			ΔE	E		① Co^{60}-4 SA-2	② Co^{60}-1 SA-2	③ Co^{60}-1 SA-1	④ Co^{60}-4 SA-1	⑤ Co^{60}-4 SA-2	⑥ Co^{60}-1 SA-2
			100	170		56899	<6990 7394 +437				
				75		69656					
				80		86418	8543			89355	9148
				85		102236	10815			107868	12014
				90		(111,195)	14151			117395	15199
				95		108506	16293			110081	16938
				200		97474	16783			95997	16700
				5		86461	8135		64492	84614	14452
				10		84546	13019		71687		12221
				15		86180	11634	11083	77861		
				20		84642	12189	13793	82730		
				25		74980	12888	15681	83181		
				30		58481	12172	14880	82000		
				35		(40079)	9350	12458	78284		
				40				10293	73221		
				45				9320	69922		
				50				9582	68808		
				55				11139			
				60				11756			
				65				10839			
				270				7807			

ΔE	E	5%/10 off ctr	Δ : 1cm	Δ=1cm	Δ=2cm	
50	60				543,124	
					587,423	
	65				623,032	
					647,406	SA-2
	70			376,060	649,217	
				426,279	635,767	
	75			478,439	598,067	
			416,149	529,401	549,581	
SA-2	80	333,583	465,105	552,473	238,225	
		399,329	503,725	553,327	247,110	
	85	439,013	515,341	532,617	237,767	
		465,450	506,012	491,971	244,196	
	90	467,518	471,454	437,097	235,082	
		442,941			236,186	
	95	390709			230,487	
		169,520		281,387	222,173	
	100	191,563	221,500	252,394	210,706	
		212,284	237,477	256,511		
SA-1	105	223,456	248,875	258,818		
		241,137	253,902	256,849		
	110	245,752	260,086	245,758		
		248,025	245,264			
	115	243,350	229,409			
		230,517				
	120					

9/12/55

5 7/16 oz.

SA1 Cs^{137}
$\Delta E = 50$
Gain 32-1

E	16	"1" 64	1	16	"2" 64	1	16	"3" 64	1	16	"4" 64	1
70												
75												
80										232	10	17
2.5										241	5	4
85										232	3	7
7.5										238	7	26
90										229	9	10
2.5										230	10	26
95										225	1	23
7.5	165	8	48				225	15	27	216	15	29
100	187	1	11	216	4	60	246	7	42	205	12	18
2.5	201	2	60	231	14	37	250	7	63			
105	218	3	32	243	0	43	252	12	[illegible]			
7.5	235	7	44	247	15	14	250	13	17			
110	239	15	56	253	15	54	238	15	62			
112.5	242	3	25	239	8	19						
115	237	10	22	224	0	33						
117.5	225	1	55									
120												

refer p. 65, 61

1025
9-15-55 SA-2. Co^{60} - 1 peak -
Amplifier 64-1 H.V. .5820 B
Analyzer $\Delta E = 100$

E	scaler X256		c/m
INT→170	607	220	155,620
170	28 x64	91	7259
175	126	40	8104
180	152	35	9763
185	192	28	12316
190	250	48	16048
195	281	57	18041
200	264	16	16912
205	223	9	14281
210	187	2	11970
215	186	6	11910
220	207	48	13296
225	207	7	13255
230	176	24	11288
235	121	52	7796
240	73	19	4691
INT 240 ~~245~~	149 x256	81	38225
250			

Σd - 170-235
172,239
$I_{170} - I_{240}$ = 117,395
[illegible] 108911

TIMER CHECK
60.0 - X16 - 1 Min

1. 225 + 1
2. 225 + 1
3. 225 + 2
4. 225 + 4
5. 225 + 4

9-16-55 Scint. Water Counter Assembly.

Base change - shield change - visual check of leakage path & crystal

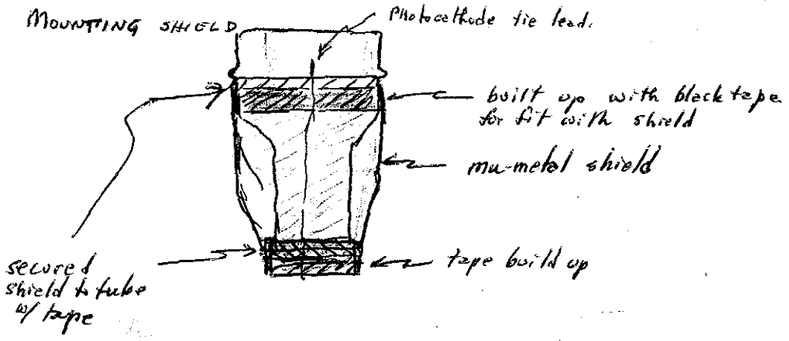
T-2 removed from mounting frame.

removed tube & crystal from Al shell -

NOTED (2) one strand of lead from photocathode & crystal folded back - possible source of corona & leakage to mu-metal shield.

(1) only 1/8" insulation along wire beyond mu-metal shield. VERY SHORT LEAKAGE PATH

removed mu-metal shield - to mount with black tape -



after mounting shield - new tape around tube - covered crystal flange with one layer of tape - To reduce leakage problem

removed anode lead resistor.

~~T-3~~:

replaced assembly in shell.

9/13/55 T-3: tube didn't appear to be as smug as was T-2 in shell. changes as T-2 -

Power off 9-17 #18 - Equipment 9-19 HV high & gradually dropped.

9-21-55 SA-2 ; Gain 68.1 , HV = .58205 -

SA-2 on Solo regulator -

Co^{60}-1

ΔE	E	X64 Scaler	
100	160	129	13
	65	151	26
	70	184	4
	75	235	15
	80	276	41
	85	291	44
	90	240	30
	95	200	62
	200	195	59
	05	212	42
	10	216	58
	15	179	42
	20	119	2
	25	70	56
	~~30~~		

T-3 load

9-21-55 High Voltage Supply SA-1 - (CVB5) not thru Sola - (~~[illegible]~~)

ESVM	Pot	Galv left	Galv right
1100	.6080		
1110	.6136		
1090	.6020		
1100	.6098		
"	.60645	5	
	.6067	4	
	.6069	3	
	.60725	2	
	.6075	1	
	.6078	0	0
	.6080	[illegible]	1
	.6083	[illegible]	2
	.60875		3
	.6090		4
	.60925		5

9-21-55 T-2 & T-3 checked individually with SA-2 channel of SA-1 HV power supply.

Ch-2 Gain 16

① Source Co^{60}-4

② T-3 Gain 16 Co^{60}-4 - adj HV pot

③ T-3 Gain 16 Co^{60}-4

④ T-2 " Co^{60}-4

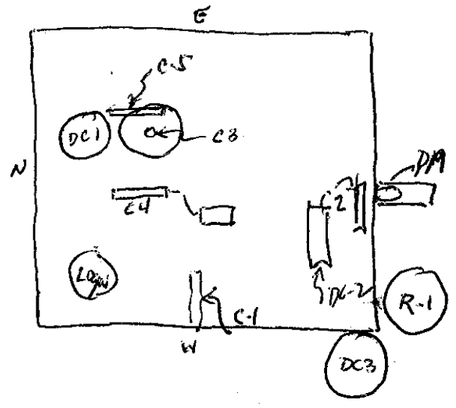
Peak adj. ⑤ T-3

ΔE	E	H.V.	Scaler ×64		ΔE	E	HV	Scaler	
① 100	290	1100	286	37	100	415	1100	149	184
	5		282	58		20		142	244
	300		281	39		25		129	49
	5		278	12		430		105	90
	10		284	7		35		76	195
	15		281 ×256 →	21	② 100	320	1100	86	45
	20		81	223		5		96	41
	25		91	18		30		111	206
	30		106	156		35		128	175
	35		125	96		40		145	244
	40		148	175		45		161	68
	45		173	206		50		176	85
	50		191	238		55		172	119
	55		201	14		60		160	240
	60		194	17		65		143	87
	65		172	133		70		121	189
	70		144	171		75		103	141
	75		115	37		80		94	221
	80		92	48		85		95	54
	85		80	92		90		101	247
	90		82	243		95		110	169
	95		93	119		400		119	208
	400		109	7		5		124	63
	05		129	87		10		124	10
	410		144	29		15		113	239

ΔE	E	HV	Scaler 64	
③ 40	340	1100	165	59
	2.5		177	17
	45		184	40
	7.5		145	15
	50		206	42
	2.5		219	36
	55		225	58
	7.5		238	46
	60		247	18
	2.5		249	7
	→ 65 ←		254	13
	7.5		250	49
	70		249	37
	2.5		242	58
	75		232	36
	7.5		219	26
	80		204	37
④ 40	350		142	63
	2.5		164	16
	55		182	58
	7.5		198	49
	60		220	61
	2.5		246	18
	65		263	25
	7.5		278	40
	70		284	62
	→ 2.5		286	38
	75		276	36
	7.5		261	31
	80		235	31
	2.5		209	47
	85		178	43
	7.5		160	29
	90		143	9

9/22, 23, 26/55 Wiring tie-in APPR-NOLL CONSOLE.

9/27/55 Instrument placement.



10 min. counts		counters -	background.
C_1	(6-20)x64	3-0	300
C_2	0	9-0	34
C_3	(1-1)x16	750v	
C_4	(1-0)x16	2000 v.	16-50
C_5	(1-14)x16	2000 v.	8-50

Experimental Run - observations.

C_1 - o.k.

C_2 - out of order

C_3 - check HVPS & platen

C_4 - check

C_5 - check

9-27-55

DC-1 down

DC-2 OK

DC 3 seems to go out at odd intervals.

R-1 O.K.

DM OK

Log N noisy

9/28/55 Log N: Substituting chamber - still noise

Signal from simulator - still noise - trouble in amplifier.

Replaced Log N amp ~~to~~ NEPA model. E-181 with ~~RCA~~ Log N amp, Y-99087. no noise O.K.

checked periods 3 & 7 seconds VV,

10/11/55 ref p68

T1 - T4 Tube Check & changes - { remove anode lead resistor / isolate mu-metal shield }

Noted on T-1 4 threads exposed on cap,
T-4 2½ threads " ".

T-4 threads not showing - not T-1 -

Removed Cap (base) T-1

Crystal centered ok.

16 V lead to crystal exposed - ¼" insulation ok.

Tube out of socket seat by ⅛"

Taped shield to tube - covered flange of crystal & ¾" of crystal -

T4: Crystal not taped to tube as were others (cross)

Photocathode lead held to crystal only by O-ring

Tube set high in socket as T-1

in taping crystal slid -

10-12-55

12-12-55 Set up in 210 for checking miniature counters —

Check period 202 log as — { Stock room housekeeping

12-13-55 Scintillation Counters 215 - Sargent-Scott

12-14-55 Scintillation Counters 215; Console panels 202

12-15-55 " " ; " " ; Control chst (202)

12-16-55 Scint Chamber Counters (215); DC-2 (202) -

12-19-55 Scint Chamber Counters (215); Mini Chamber set-up (210); Console (202)

12-20-55 60 v check C1-4 (215); 60 v check SA1&2 (215); Mini ch set-up (210)

Temp controller (½); GM, file contents tub. relay; adj point

12/21/55 Counter placement 201; C4 & 5 in SAD. This leaves only

C1 in Wall free-suspended tube W side of Tunnel 2 hr.

Prop. Counter 215' 2 hr.

Scint Chs 215 4 hr.

12/22/55 Cascades of counters 6

Scint Ctrs - calib - 2

12-23-55 Scint Ch . ; 202 3; 5

12-27 Scint Ctrs - 3; Gal 5;

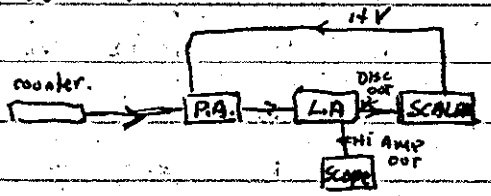
12-28 215 - 4; Gal 4.

12-29 Gal 1 ; ~~Scint Ctrs~~

Checked out guard button stations in Rm 216 - All functions normal - fans run & dampers operate when buttons pushed in either 217 or 216 - In tunnel guard had difficulty in getting emergency fan to operate properly -

Check-out test stand for small counters -

12-29-55 Test Stand:



Check out ½" RCL tubes to see if system is operable

Tube 1084 - attached thru ~ 6' cable.

HV turned on → high freq. signal developed - ~ 500 KC.

decks off - cable still on - H.F. still there

Applied HV from NICC supply - H.F. gone - disturbance fed from scaler HV supply.

Using H.V. SUPPLY - NICC MODEL 1090 - {Timer minute & 1/100th min. runs when counts.

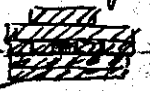
PRE-AMP - AIC MOD. 205 B ; SER. 335

LIN. AMP - AIC MOD. 204 B ; SER. 366

SCALER - AIC MOD 1010 ; "Y-89637"

Counter & source placed in center of paraffin slab pile.

Thickness absorb is 3" or greater - open at ends -



Noted w/ source in certain pulse height & counting rate.

⇒ this kept up when turned off H.V. & when disconnected

LA. sw - "1" (short RC) HV cable. Measured Voltage on HV input connects to pre-amp

Meter up range & return to zero -

run from lo to hi V. Check pre-amp. - seems OK

LA GAIN 6 V x 1

Tube 1" RCL

H.V.	time	scaler	Disc
1150	10m	45 x 16 + 0	15
1200	5m	94 + 2	15
1250	5m	68 + 13	15
	5	5 + 5	20
1300	5	125 + 11	15
		9 + 5	20
1350	2	73 + 12	15
	2	41 + 3	17.5
	5	15 + 3	20
	5	noctiz Bm. —	25

HV	time	Scale	Disc
1400	2m.	99 + 3	15
	2m	32 + 11	17.5
	2m	11 + 9	20
	2m	3 + 2	22.5
	2m	0 + 8	25
1450	2m	131 + 6	15
		57 + 7	17.5
		18 + 0	20
		4 + 15	22.5
		(?) 2 + 11	25
1500	1m	90 + 4	15
		42 + 1	17.5
	2m	20 + 5	20
	2m	12 + 5	22.5
	2m	3 + 4	25

12-24-55

HV	1.5 m Scaler	DISC.
1600	149+3	15
~~1650~~	29+14	20
	190+13	15
1650	(124+12)	20 (1.5m)
	235+15	15
1700	121+7	20
	276+12	15
1750	160+9	20
	301+14	15
1800	175+0	20
	343+2	15
1850	217+0	20
	386+2	15
1900	268+13	20
	405+12	15
1950	319+10	20
Bkg 1950	14+11	20

12-30-55
set scaler for + input pulses
Discriminator (-25)
check with no source & no HV.

		Scaler	DISC
LAG 64x1		0+0	15
this sets min "DISC" setting of 14	—	0+5	14
		32+8	13
SOURCE 10. (9:21)		6+3	14
(Time 2m unless noted)	0	2+6	15
		1+10	16
		1+3	17
		0+6	18
	1000	6+7	14
	1050	4+6	14
	1100	6+10	14
	1150	5+11	14
GND-to Bus - Sct to CV line	1200	16+5	14
		5+12	15
		3+10	16
		1+6	17
		0+9	18
	1250	22+2	14 (3m)
		8+8	15
		4+0	16
		2+2	17
		0+15	18
	1300	16+13	14
		9+5	15
		5+13	16
		3+1	17
		1+0	18

Same tube as 12-24

4.3
31
14.75

H.V	scaler	DISC.
1350	28+6	14
	16+9	15
	11+7	16
	4+9	17
	3+3	18
	1+10	19
	0+10	20 (3m)
1400	45+9	14
	21+0	15
	13+8	16
	7+1	17
	3+2	18
	1+5	19
	~~1+4~~	20
1450	61+0	14
	30+13	15
	19+11	16
	9+13	17
	4+13	18
	3+3	19
	1+8	20
1500	88+11	14
	53+4	15
	35	16
	19+13	17
	11+7	18
	6+6	19
	4+0	20
	1+12	21
	0+7	22

1-3-56

H.V	scaler	DISC.
1550	113+9	14
	74+2	15
	48+12	16
	27+10	17
	15+1	18
	8+14	19
	4+3	20
	3+6	21
	1+12	22
	0+6	23
	—	24
1600	138+7	14
	88+1	15
	60+9	16
	36+3	17
	27+12	18
	18+2	19
	10+0	20
	7+5	21

HV	Scaler	DISC
1600	2+6	22
	1+8	23
	0+7	24
1650	187+13	14
	141+2	15
	97+14	16
	56+3	17
	42+10	18
	28+1	19
	17+8	20
	10+7	21
	8+13	22
	6+7	23
	2+11	24
	0+15	25
1700	248+15	14
	187+15	15
	138+3	16
	98+13	17
	68+10	18
	48+0	19
		20
		21
		22
		23

run 10 min w/ HV off source left in position

1-4-56

HV	Scaler	DISC
1700	266+11	14
	217+14	15
	165+8	16
	114+2	17
	80+10	18
	65+9	19
	45+12	20
	33+15	21
	24+15	22
	19+12	23
	16+0	24
	8+13	25
(?)	45 ?	26
	379+10	14
HV off		
2m	374	14
30m	4713+8	
2m	262	
2m		

HV	Scaler	DISC

with ESU M measure pileup at output for preamp. 700V-

cont - next page

1-4-52 Having found HV hangover in pre-amp, modified set-up to measure HV with ESVM.

Paul meter reading of 1500 required to get ESVM to read slightly over 600 v.

Entire new 2V3G.

Now can get HV reading on ESVM to correspond to Paul meter. Checked cable to see if a certain lead leakage path. One occasion. Now get full HV to pre-amp & fall off after HV deenergized.

① Ignition key kept going on - may be three-way on counts -

② Plugged HV into CV line -

Power Off. 4:12 P.M.

1-5-52 Source in over night

③ Runs continued - Run checkpoint at 650 v.

stop 4:12 P/ leave source in

Linear Amp.
64 x 1
0.2 μs
neg. input

① HIGH VOLTAGE	DISC	SCALER
500	14	751+0
	16	28+0
	18	13+8
	20	4+4
	22	2+1
	24	2+2
	26	1+3
	28	1+11
	30	
② Hi supply in CV box 500	14	66+14
	16	24+12
	18	7+15
	20	2+2
	22	0+2
(ESUM) (570) 600	14	127+8
	16	48+11
	18	19+15
	20	5+12
	22	2+4
	24	0+5
(620) 650	14	157+9
	16	86+11
	18	31+13
	20	12+0
	22	4+1
	24	0+11

③ HIGH VOLTAGE	DISC	SCALER
Double pulse		
650	16	84+5
	20	14+2
(680)	14	211+15
700	16	127+0
	18	60+2
	20	28+6
	22	12+10
	24	4+13
(1000)	26	0+12
(735) 750	14	278+8
	16	180+14
	18	108+7
	20	51+4
	22	25+5
	24	12+11
	26	4+11
	28	1+3
(792) 800	14	360+2
	16	250+6
	18	168+7
	20	108+13
	22	61+3
	24	36+6
	26	16+14
	28	9+8
	30	2+15
	32	0+13
(836) 850	14	416+13
	16	304+1
	18	224+10
	20	159+14
	22	106+0
	24	66+9
	26	36+11
	28	18+4
	30	8+12
	32	4+4
	34	0+15
900 (878)	14	487+7
	16	393+2
	18	282+13
	20	224+2
	22	168+0
	24	125+3
	26	82+4
	28	51+3
	30	33+14
	32	18+1
	34	10+8

HIGH VOLTAGE	DISC	SCALER
900	36	3+9
(872)	38	1+3
	14	597+5
950	16	494+15
(930)	18	400+0
	20	322+9
	22	266+4
	24	207+3
	26	164+3
	28	120+6
	30	91+7
	32	65+1
	34	41+4
	36	24+4
	38	15+3
	40	7+14
	42	3+7
	44	1+1
(970)	14	634+4
1000	18	461+13
	22	331+3
	26	224+4
	30	145+11
	34	88+15
	38	40+5
	42	19+7
	46	7+5
	50	1+7
(1037)	14	708+15
1050	18	583+7
	22	454+2
	26	348+4
	30	262+9
	34	190+5
	38	140+3
	42	86+9
	46	48+14
	50	25+3
	54	13+12
	58	4+6
	62	0+11
1100	14	758+9
(1080)	18	646+12
	22	534+1
	26	434+6
	30	356+5
	34	279+1
	38	219+10
	42	168+8
	46	121+14
	50	82+3
	54	48+8
	58	27 —
	62	15+1
	64	8+1

HIGH VOLTAGE	DISC	SCALER
1100	10	2+2
	14	0+15
(1138) 1150	14	807+2
	22	638+13
	30	412+12
	38	341+6
	46	270+15
	54	159+9
	62	90+4
	70	40+12
	78	16 —
	86	3+2
	94	0+13
(1185) 1200	14	803+14
	22	708+1
	30	584+13
	38	483+2
	46	377+6
	54	285+12
	62	209+7
	70	145+13
	78	91+12
	86	57+10
	94	28 —
(1178)		

continuation of 1/5/56

1/6/56 drew up curves on data 1/5/56 -
check point @ 1200v -

IDiPS Scaler 8963 -
check 6AQ5 & 1X2A - OK
high frequency present in the output stuff -

LA: AIC 204B - SER 366 NIMS: NICC 1090
SCALER: AIC 1040 "Y89637"

HV	DISC	SCALER
	(550)	
1200	30	583
(1240)	14	799+0
1245	22	763+0
	30	683+14
	38	594+11
	46	505+12
	54	423+12
	62	345+14
	70	283+9
	78	219+10
	86	181+11
	94	128+6
	14	813+12
1300	20	786+10
	30	737+0
(1285)	40	652+6
	56	573+14
	60	481+8
	70	402+3
	90	345+1
	80	270+2
	100	210+8
	14	810+11
(x4) 1350	20	807+10
	30	781+2
(1340)	40	738+12
	50	671+3
	60	615+6
	70	639+15
	80	480+13
	90	433+10
	100	377+5
	14	814+4
1400	20	804+11
(1392)	30	802+9
	40	791+9
	50	750+4
	60	720+0
	70	670+11
	80	612+6
	90	569+8
	100	533+11
11:40		
	14	841+3
1350	20	818+6
	30	812+7
(1438)	40	798+0
	50	793+6
	60	757+15
	70	740+10
	80	701+5

HV	DISC	SCALER
	90	666+8
1450	100	620+15
	14	834+15
1505	20	825+9
	30	793+3
(1488)	40	793+13
	50	736+14
	60	794+9
	70	763+4
	80	750+5
	90	736+10
	100	703+5
(1545)	14	905+13
1550	20	849+9
	30	805+12
	40	802+1
	50	784+9
	60	803+6
	70	795+5
	80	786+9
	90	772+11
	100	758+6
(1580)	14	940+4
1600	20	884+5
	30	808+4
	40	—
	50	—
	60	785+9
	70	788+4
	80	—
	90	741+1
	100	775+15
	14	943+0
1650	20	907+9
	30	817+14
(1635)	40	815+9
	50	—
	60	—
	70	—
	80	788+5
	90	—
	100	791+13
	14	927+6
1700	20	846+7
(1696)	30	815+8
	40	—
	50	—
	60	—
	70	—
	80	—
	90	801+9
	100	795+11

HV	DISC	SCALER
	14	1140+9
1750	20	875+4
(1734)	30	832+15
	40	810+8
	90	809+11
	100	805+9
(1790)	20	1308+8
1800	30	869+6
	40	852+12
	50	820+10
	60	816+6
	70	817+9
	80	817+10
	90	824+1
	100	794+11
	14	13+7
1800	16	9+14
	18	6+8
Bkg	20	6+1
	25	2+15
(1790)	30	3+15
	35	
	40	2+8
	45	
	60	1+2
	70	
	80	1+7
	90	
	100	1+5

Stop 4:01 PM
1/6/86

#1087

1-9-56 Drew up bias & HV-EFF voltage curves for RCL, 1" α counter and test.
Suggest further tests of this type be at gain of 32 on LB

Investigation of ripple on HVPS scaler
– 150-200 KC – slight on output of supply (1st stage atten V1)
on gain 64 – signal drowns out any pulse signal.

1-10-56 Control System – solution storage – feed-drain switch –
Control Rod Drive (A) 107 – dual – fume –
Scintillation Counter 215; Counting set-up 202.

1-11-56 202: Reported Log N difficulties & switch trouble
Put in replacement switch – one capable of handling up to 10 amp
Same wiring as with telephone switch.

1-12-56 Scaling strip 114-7 from 107 up to 210 for use in rack.
215: Check out Scintillation Counter –
210: Serviced Tektronix Scope Ser# 1722.
107: Channel "C" getting some – start up range instability
~~1-13-56~~ Serviced ~~work on~~ pen holder "A"
1-13-56 107: "C" reported improved.
215: Scin. Ctr. check-out.
202: R2 – set-up.
210: Time-delay meters checked – can get down to
1 second delay.
Back to proportional counter set up

LA Gain 32- PA: 327 LA: 366 Decade Scaler-

Blq +

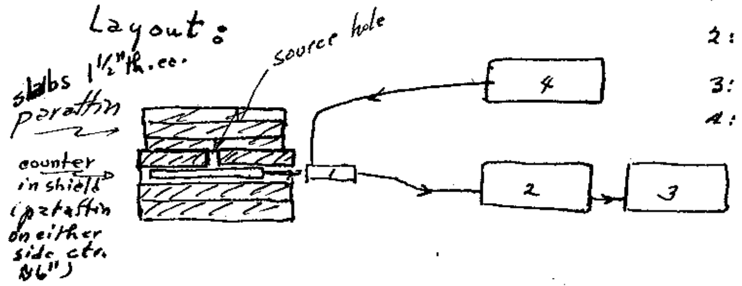
HV	DISC	SCALER	HV	DISC	SCALER	HV	DISC	SCALER	HV	DISC	SCALER	HV	DISC	SCALER
0	10	2 0												
	9	2 0												
	8	1 961												
(PB 209) 5														
1.6×10^6 11/4/04 0	9	5 5												
100	9	3 950												
	10	5 315												
	11	5 47												
	12	5 5												
200	9	⓪ 2209												
	10	2 924												
	11	5 621												
	12	5 124												
	14	5 2												
300	9	⓪ 4287												
	10	⓪ 1098												
	11	③ 1201												
	12	⑤ 409												
	14	⑥ 6												
400	9	⓪ 9771												
	10	⓪ 2866												
	11	⓪ 1121												
	12	③ 1111												
	14	⑥ 44												
	16	⑤ 1												
	9	⓪ 14,625												
500	10	⓪ 6434												
	11	⓪ 2445												
	12	⑥ 7074												
	14	⑤ 526												
	16	⑧ 56												
	9	③ 58,033												
600	10	⓪ 15,183												
	11	③ 17,198												
	12	⓪ 3843												
	14	(2) 2,038												
	16	(5) 460												
	18	(0) 105												

Miniature Counters - ORNL [System works fine w/ 1" counters, commercial]

2-16-56

BF$_3$ (Operating 500-1200v)

Layout:



1: A/C PreAmp #327
2: A/C Lin Amp #366
3: Decade scaler
4: Power Supply BF$_3$ N/C 1090 Fiss. Kepco

without shield, pickup transients badly.
with shield and ground lead taped to prevent shorting to B+ lead, got signal pulses. These pulses occurred with or without source.

Test:
HV = 1000 v Bkg = 4344 c/m; Source = 6642.4 c/m; Bkg > 10,000 c/m ??
LAG = 64 (RT 0.2μs)
PDL = 50

Turned off HV - counted spurious pulses at same settings of amplifier < 1 c/m over 60 min period. This counter #3.

Put this aside to check fission counter - (100-200 v)
Source 9.4 c/m (10) Bkg 0.27 c/m (15) Source 10.0 c/m (3)
(LAG 16
0.8μs RT
PDL = 40)

To get hotter source - present one PB 387 [1.6 x 10^6, 11-4-54]
≈ 1-2 x 10^5 now.

2-17-56 New Source PN-57 (used in "HOT" cut & see)
Strength (DFC) 3.7 x 10^7 on 6-24-54
now ≈ 1.83 x 10^6 ←

Take series of readings with no source in shop.
Roughly, seems that gain 64 PDL 50 (RT 0.2μs) cut out most Bkg @ 200 v.

Instrument Settings: LA - Gain 64, R.T. 0.2μs, PDL variable
Kepco Powersupply - HV variable.

* appear to be occasional bursts @ PDL 12
* pulses > 2.1 cm "trigger" scope 1x4 (37 v output)
*' noted HV lead off (How LONG?)

Bkg

PDL	c/m
10:10 < HV = 0	
* 12	18.8 (20)
15	3.5 (40)
20	1.7 (10)
10:40 < HV 20	
12	7913
15	3915
20	1603
25	919
30	601
35	376
40	380
45	155
50	73
* 55	11.4 (40)
60	0.3 (10)
< HV 50	
12	7466
15	3820
20	1553
30	634
40	261
55	12.0
60	.57 30
< HV 100	
15	3652
20	1634 (2)
40	272
55	15.6 (40)
60	0.85 (30)
< HV 200	
15	3561
20	1576
40	264 (4)
55	146
60	0.6 (15)
~~xxxx~~	

Source

HV	c/m
HV 20	
12	7554
15	4118
20	1754
25	1008
30	671 (2)
40	320
50	147 (3)
55	91.1 (6)
60	80.1 (10)
65	91 (5)
70	83.2 (5)
75	81 (10)
80	78.7 (2)
85	68.4 (10)
90	71.3 (10)
100	64.8 (10)
HV 100	
30	691 (2)
40	360 (2)
45	271 (2)
50	180 (6)
55	106.6 (5)
60	101.9 (6)
~~65~~	
70	93 (5)
~~75~~	
80	95.2 (5)
~~85~~	
90	91.8 (5)
HV 200	
40	360 (2)
45	289 (2)
50	162 (2)
55	109 (2) *'
~~60~~	
70	95.5 (10)
90	98.5 (10)

2-20-56 Continuation of 2-16-57 - MINIATURE COUNTERS

Check a few points of data run 2/17. Same counter, same equipment.

Source in 9:07 HV on allow warm-up	(1)	HV 100	
9:08		PDL	c/m (16)
		30	742.6 (16)
		50	164.2 (16)
		70	89.0 (16)
		90	53.3 (16)
GAIN from 64 to 32		90	945 (64)
		50	96.8 (16)
		60	85.0 (16)
		70	89.2 (16)
		80	82.2 (16)
		90	77.1 (16)
GAIN from 32 to 16		90	38.5 (32)
		80	47.8 (16)
		70	53.6 (16)
		60	68.6 (16)
11:34		50	78.6 (32)
		40	84.0 (16)
		30	90.3 (16)
		26	90.7 (16)
		20	96.9 (16)
		18	89.9 (16)
		16	94.0 (16)
		14	162.7 (16)
		12	392.5 (16)
		10	932.5 (16)
		9	1778 (16)
		8	
BKG. (Source in 209)		HV 100	
		9	1306 (16)
		10	632 (16)
		12	265.4 (16)
		14	68.1 (64)
		16	10.2 (32)
		16	1.4 (32)
		17	0.07 (32)

2-21-56 Set up for time tests on dump and drain valves in 201-202

Object: a. Determine time required for dump valve (fuel) to open.
b. Determine rate of fall of dump drain.
c. Determine rate of fall of normal drain.

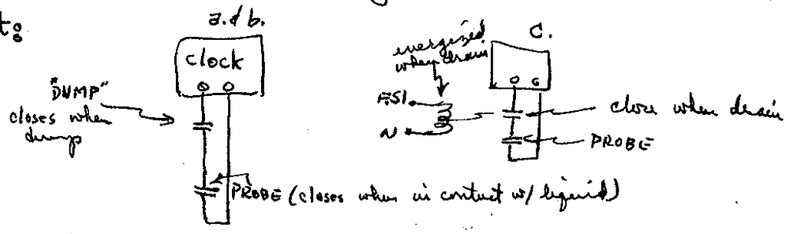
Panel modification of this is:

Fuel dump valve switch — one section used, closing when dump release. Disconnected leads at this point (sec. sections paralleled) ran leads to timing equipment.

Probe panel - modify 115v. leads to pin 4 of relays N & S so that could separate relay functions. Disturbed No contact (pin 3 & 4) of N- to drain timer. N-coil paralleled w/ S.

Drain switch. Tie-in leads across drain valve to actuate relay --

Circuit:



Ready -

[Need to give thought to instrument response tests.]

Data recorded in file of "Safety Test Measurements" -

~~Recorder Drive Time – (Period log N in particular)~~

2-22-56 MINIATURE FISSION COUNTER #1 – same arrangement as 2/20

Obtain data for "plateau" at reasonable PDL.

L.A. Gain = 16 ; PDL = 20 – This above bkg. cut off.

H.V.	Count Rate	(min)	
0	0	(5	
10	50.4	(5	
20	70.4	(5	
30	84.7	(6	
40	93.8	(5	
50	90.0	(5	
60	81.6	(5	90.8 (20
80	89.0	(5	
100	95.0	(8	
120	93.6	(5	
140	95.9	(27	
160	92.4	(5	
180	91.9	(7	
200	82.6	(7	
60	90.8	21 ↑	

stopped to check scale –, replacing 2-12AT7's

Fission Chamber #2 –

Background w/ Gain 16, HV = 100

PDL	COUNTS/MIN	(min)
8	~~x~~369	(1
9	1389	(1
10	680	(1
11	590	(1
12	252	(5
13	144.8	(5
14	63.8	(5
15	11.8	(10
16	1.07	(15
~~17~~		

2/22/56 Counter #2 –
1:18 L.A.G. 16; HV = 100

PDL	COUNTS/MIN	(min)
8	2989	(1
9	1297	(2
10	682	(19)
12	315	(51)
14	152	(14)
16	98.4	(5
18	93.9	(10
20	88.15	(20
30	85.9	(14
40	78.1	(15
50	71.8	10
60	68.3	10
70	55.5	(12

Source had been left in place over night.

2/23/56 Min. Fsn. Chr #2 — Data for Count rate vs voltage

8:07 A

HV	counts/min	(min)
10	51.3	(10
20	70.2	(15
30	82.2	(18
40	81.7	(10
50	88.1	(16
60	86.9	(12
80	85.4	(10
100	87.9	(32
120	93.0	(10
140	90.9	(13
160	81.3	(17
180	92.7	(13)
200	88.1	(18)

Suggested Instr. Modifications & Additions

2-28-56 Notes on Staff Meeting 2/27/56 - Re check of 2/1/56

ADC "The following items need attention as you can get to them:

1 - Transistor building alarm ✓
(see Vic, Jim, Scotty)

2 - West end. Trip point to follow scale changes.

✓ 3 - East end. Channels 7 & 8, make fail safe."

VGH -

a. Arrange to have vent fans in both ends of building tied together.

b. Am instrument in each end of building for:

P-M typ

✓ i. Loss sensitivity * see v.

✓ ii. Capable of being checked in operation (drift, etc.) once daily.

iii. Each end capable of setting off building alarm.

iv. Exclusive of all instrument scrams.

v. Sufficiently low in sensitivity so that normal operation will not scram the system.

vi. Sensitivity low enough so that burst on other end will not scram this instrument.

vii. Visual, or other, indication of which instrument caused trip."

3-13-56

Min. Fission Counter in probe - #1 -

Rough check HV = 100; LA Gain 16, PDL = 20 { Source #70 c/m (2m); bkg. 0 c/m (12 m)

Backgrounds: HV 100, Gain 16, PDL variable.

PDL	7 (2)	8 (3)	9 (10)	10 (10)	7 repeat (2)	8 (3)	9 (20)	10 (20)	15	20	25	27.3	30	35	40
c/m	1340	125	0.8	0.0	1309	142	0.6	0.1							

Source: PN-57

PDL	8	9	10	9	10 (1175)	11	12	15	20	25	27.3	30	35	40
c/m	321 (11)	90 (2)	172 (2)	94 (2)	87.5 (2)	86 (5)	852 (5)	78 (5)	73.2 (5)	57.6 (10)	52.2 (5)	44.6 (5)	28.8 (5)	16.6 (5)

PDL	45	50	55
c/m	108 (5)	27 (5)	7 (20) 0.45

3/15/52

Miniature Fission Counter #1

Volts \ PDL	8	9	10	11	12	13	14	15	17.5	20	22.5	25	27.5	30	35	40	45	50	55	60	65
10	178.8	89.4	44.4	21.6	12.8 (2)	2.33 (5)	0.5 (10)	0 (10)													
20	299 (2)	121 (5)	120.9	108.8	57.6	80.8	68.4	49.8	37.6 (5)	10.8	5.0	0.4									
40	230	134.2	131.0	131.8	121.2	117.3	112.8	98.4	99.2 (5)	70	45.2	32.2	19.4	12.4	2.8						
60	214.6	144.8	137.8	145.0	118.8	127.6	128.6	118.8	104.2	106.7	80.2	65.4	52.8	41.4	21.3	7.4					
2m. → 80	276	150	145	157	142.5	127	120.5	130.5	114	109	92	70	75	58.5	38	21.6	8.5				
120	314	149	147 (3)	143.5	142	141	135.5	127	118	107.5	120.5	104	82	74	24	36.5	21	9			
(140) 200	169	153	145	\	146.5	\	153.5	\	131	144	\	102.5	\	83.5	66	52.5	15	13.5			
150																					
175																					
200																					

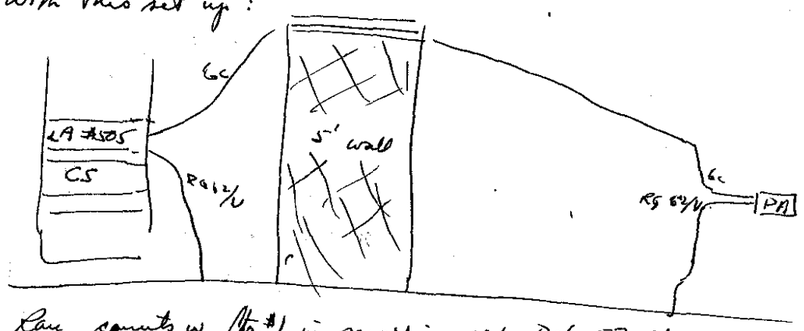
3/16/52 Plotted above data -

Took pre-amp (AIC #327) to 201.

Pulled 6c - cable (50') w/ Jones plugs - for pre-amp Htr & Bt.

Put new connector on RG62/U line in 201 - this for signal from p-a to linear amp (AIC 505) in 202

3/16/52 - With this set up:



Raw counts w Ctr #1 in paraffin w/ PN 57 source

LA Gain = 16 0.2 μs rise time (sw 1)

PDL = 10	40 X 16 + 12	(5 min)	≈ 130 c/m
	40 X 16 + 0		
PDL = 10	0 X 16 + 1	Background	
PDL = 5	0 X 16 + 2	Background	

2/27/52 Tested Miniature fission counter #1 in Tower Shielding Reactor Critical Experiment. - With DWM, ran up to power { Log N = 1.1 DC 3 = 92 (approx)

Linear Amplifier: Gain 16 ; 0.2 μs rise time (sw 1), neg, PDL = 10

Scaler: C4 , Disc -25

Original data in notebook for above series of experiments (p 39)

Calculated counts & curve in file in miniature counters - ORNL

3-29-56 Miniature Fission Counter #2. Check Gamma Response

Counter #2 +327 P.A + LA. 366 + Decade Scaler:

⇒ Gain of system seems lower. LA now @ 64 PDL 16

Count w/ PN 57 (Po Be n source): (5 minutes) ~~2887~~ (6)

Background (PN 57 & Rg w 8'): (10 minutes) 0

PN 57 : (5 min) 390 (78 c/m)

~~Src. Ra~~ : (30 min.) 1

Noted gain loss probably in amplifier system.

4-2-56 Check amplifier & pre-amps. refer to file

4-3-56 Put #1 in place pulses @ gain 16 w/ PN 57 oscillation 2-3 cm 1 x 2

Now #2 for comparison. 64 1.5-2 cm -

Ctr #1 80 μμf.

Ctr #2 80 μμf.

4-4-56 Miniature Fission Counter #1 - Check counter & LA.

Equipment: P.A 327 Gain 16 - 1 , 0.2 μs R.T., neg. (sw 1)

LA 366 HV: 2 - 67½ batteries in series 1350 -

Decade Scaler

		PDL	5	6	7	8	10	12	15	17.5	20	22.5	25	30	35	40
			(15)	(21)	(45)	(60)	(85)									
sw 1	0.2 μs rt.	Background	1631	46	8	2	0									
			(25)	(40)	(10)	(85)	(11)	(25)	(25)	(18)	(13)	(21)	(14)	(12)	(21)	(7)
		PN-57	6400	1611	1371	4559	1428	3106	2909	1938	1258	2755	1058	744	955	210
4/5/56		PDL	5	6	7	8	10	12	15	17.5	20	22.5	25	30	35	40
sw 1	0.2 μs rt.	Bkg.	6,585	14881	3725	5048	1298	2919	1015	48						
		PDL	5	4	7	8	9	10	11	12	13	15	17.5	20	22.5	25
		PN 57	16944	3592	1836	1220	6926	1039	1335	1407	1364	1245	2159	1288	2087	1456
		PDL	30	35	40	45	50	55	60	65	70					
		"									13					
		X	2846	1204	1193	1205	1115	1163	2181	1802	984					
			30	60	50	40	35	30	22.5	25	22.5	20	17.5	15	12.5	10
	6.0 μs	PN 57	223	329	284	253	228	241	224	276	290	389	358	430	722	

Miniature Fission Counter #1

continuation -

4/6/56

Each cell gives PDL; minutes; counts.

L.A. rt 5.0μs	Bkg	6; 2; 11756	7; 2; 4356	8; 2; 2335	9; 2; 1637	10; 3; 1712	11; 2; 860	12; 3; 886	13; 3; 601	14; 5; 641	15; 12; 687	16; 10; 2VC	17; 14; 24						
	PN-57	8; 6; 8362	9; 2; 1956	10; 3; 2090	11; 5; 2936	12; 6; 2689	13; 9; 3117	14; 0; 2901	15; 10; 1916	16; 17; 2727	17; 17; 2474	18; 11; 1511	20; 11; 1576	30; 15; 2001	40; 38; 4680	50; 16; 1932	60; 22; 2570	70
15-20 rph	5mg Re ~1/2"	17; 15; 45	16; 13; 828	15; 18; 3879	14; 13; 5847	10; 2; 1186	9; 2; 1672	8; 3; 3805	7; 0; 8614	6; 3; 16121		18; 21; 7	19; 45; 4					
													19	Blg				

4-9-56 Check scope pre-amp -

With scope pre-amp repaired, observed waveforms on pre-amplifier A1C Ser# 327.

Pulse from fission counter negative with rather sharp rise time but long decay ≈ 100-200 μsec.

Noted that pre-amp had 22 meg-Ω as series resistor.. Reduced this to 0.1 meg-Ω. Now pulse decay much shorter ≈ 30-40 μsec.

Before change in resistor output of amplifier on 5.0 μsec rise time position was 50 μsec.

After change, this value was 10 μsec.

4-10-56 Run tests with modified pre-amp. (EPC cv.)

Each cell gives PDL; minutes; counts.

G16 5.0μs rt.	Bkg	4; 1; 33337	5; 1; 5066	6; 2; 3494	7; 2; 1658	8; 2; 931	9; 2; 554	10; 2; 300	11; 6; 364	12; 10; 163	13; 13; 85	14; 38; 221	15; 10; 43	20; 40; 78	20; 72; 1	13; 20; 52	14; 20; 3	15 (crossed out)			
G16 50μs rt.	PN 57	5; 1; 5939	6; 2; 4784	7; 3; 3868	8; 5; 4105	9; 2; 1084	10; 5; 1907	11; 2; 589	12; 4; 1049	13; 6; 927	14; 3; 461	15; 2; 306	10.5; 4; 1279	11.5; 4; 934	12.5; 7; 1157	20; 10; 1343	25; 10; 1188	35; 5; 569	40; 11; 1249	50; 5; 515	
4-11-56 G16 5μs rt.	PN 57	90; 5; 399	65; 10; 845	60; 10; 873	55; 10; 995	50; 10; 1032	45; 10; 1072	40; 10; 1088	35; 10; 1172	30; 10; 1194	25; 12; 1489	20; 11; 1285	19; 13; 1733	18; 10; 1228	17; 10; 1318	16; 11; 1401	15; 11; 1483	14; 11; 1569	13; 10; 1433	12; 10; 1862	10; 5; 1768
G8 5.0μs rt.	PN 57	4; 1; 1802	5; 1; 903	6; 2; 926	7; 5; 1019	7.5; 5; 724	8; 5; 727	9; 6; 934	10; 10; 1252	12.5; 10; 1220	15; 15; 1887	17.5; 10; 1147	20; 10; 1099	22.5; 13; 1433	25; 14; 1454	30; 10; 916	35; 10; 801	40; 10; 649	45; 20; 970	50; 15; 539	
		55; 10; 250	60; 21; 301	65; 30; 147																	

4-12-56 Times tried w/ decade counter -

Bkg - Gain 16 5.0μs r.t. PDL = 5 (1) 4589, 4771, 4696, 4591, 4482

13 (5m) 11, 9, 6

PN57 Gain 16 5.0μs rt PDL 20 (1m) 1272, 1322; 1331; 1336.

70 (10m) 72.4, 804, 79.4; 78.0; 70.1; 80.0

4-13-56 Miniature Fission Counter #2 - Comparison with #1

Linear Amplifier Gain 16/8, Rise Time = 5.0 μsec. 10 min. counts -

Counter #2

PN57	PDL	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	25	30
		116026	95278	2078	962	837	696	618	535	486	429	359	319	211	165	135	105	84	70	66	73	32	17
		35	40	45	50																		
		8	4	2	0																		

4-16-56	4	5	6	7	8	9	10
Bkg	81016	631	8	3	1	3	0

Probe off., HV off., pre-amp input grounded PDL = 3, 4, 5, 6, 7, 10

10m Cts 10, 55, 12, 2, 6, 0

Counter #1

Bkg (G16) (rt 5)	PDL 5	10	13	15													
	46046	1730	5	0													
Source Gain 4 rt = 5	0	1	2	3	4	5	6	7	8	9	10	15	20	25	30		
	3573	3624	3562	3626	3349	1629	1293	1328	1205	1145	1152	900	534	365	145		
4-17-56 continuation	10	11	12	13	14	16	18	20	22	24	26	28	30	32	34	36	38
	1122	1100	1058	943	944	855	724	592	479	394	268	209	127	77	31	20	02
	40	37	36	35	34	33	32	31	30								
	0	10	18	28	41	57	77	101	136								

Miniature Fission Counters

4/17/56 #2 - Removed counter from probe - possibility of leakage path off to ground -
Try counter as tested before placing in probe -
Gain 16, RT. -5 μs. - PDL 10min. ct.

	30	112
PN 57 Source -	25	211
	15	463
	10	718

4/18/56 Background 10 1
NOTED glass seal rupture -

#3 Mounted counter #3 as above - for comparison & initial check (Gain 16 - RT 5μs) Background pulses 3-9mm Edge 1x4 -

Backgrnd PDL	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
10mct.	107827	49551	25043	14214	10301	7040	5799	4250	3409	2720	1433	1370	814	569	443	74

21	22	23
21	6	1

PN 57 (2cm @ full 100v output) Pulses up to 3-3.5cm (1x8) may estimate

PDL	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	30
10mct	9124	7617	6038	4866	3946	3139	2461	1841	1625	1192	993	920	863	871	898	840

35	45	55	70 (5min)
845	814	785	(403)

4-19-56 #3 put in probe.
found that glass seal larger than 3/16 O.D. of Kovar shell. Aluminum probe tube to Davis for drilling out.

4:10P 10min count w/ #3 in probe 761

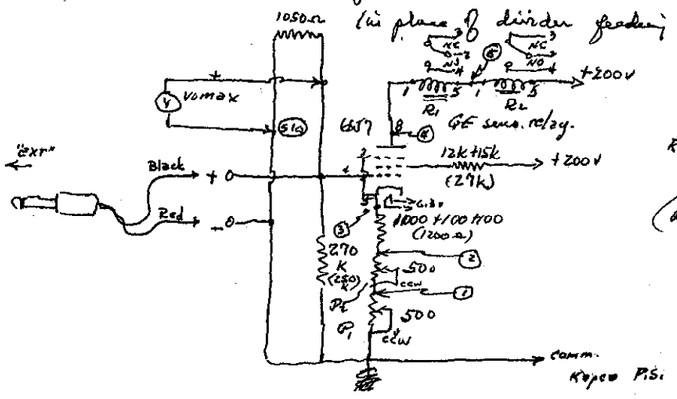
4/20/56 Source in over-night 5 minute counts -

Gain 16 RT 5μs		5	6	7	8	9	10	11	12	13	14	15	17.5	20	22.5	25	30	35
#3	PN57	18610	8112	4772	3085	2144	1652	1014	675	601	620	585	589	554	606	570	501	503
		40	45	50	55	60	65	70										
		522	494	463	434	422	362	332										

Trip Circuits (refer p 90)

4-23/24/56 Check out Vibrating Reed Electrometer for use as test instrument in developing modified Trip circuits for channels A&D, Run 107.

4-25-56 : Bread board Trip circuit as in use on A & D.



[values in parenthesis those on print.]

Reset (N.O.) P.B. from plate to B_1

(R_3 & light not included.)

E_B +200V

P_1	P_2	VR Range	(VOMAX) SIGNAL	TP 1	TP 2	TP 3	TP 4	TP 5	
"0" CCW	64	100	.02	1.76	2.5	6.8	184	192	
"0" CCW	"0" CCW	"	"	1.64	3.23	7.15	186	193	
0	(CW) 102	"	"	1.80	1.91	6.58	183	191	
(CW) 105	(CCW) 40	"	"	.02	1.88	6.60	183	181	
0→105	0→~~16~~	"	"	.02	1.81	6.84	183	190.9	R_2 trips only
105	18	"	"	.02	1.80	6.57	182.5	190.9	R_1 trips.
105	50	"	"	.02	1.13	6.24	181	190	
0	70 ~~65~~	"	.82-.80	1.96	2.64	7.55			R_2 fires
			.89-.82						R_1 fires
0	70	"	.85	1.93	2.54	7.25	192	191 ~~198~~	Both fired
			.89-.84						R_1
			1.05-1.01						R_2

150K across R_2 coil

P_1	P_2	VR	SIG	1	2	3	4	5	
0	70	100	9.5	1.94 ~~1.5~~	2.55	7.32	193	191	—

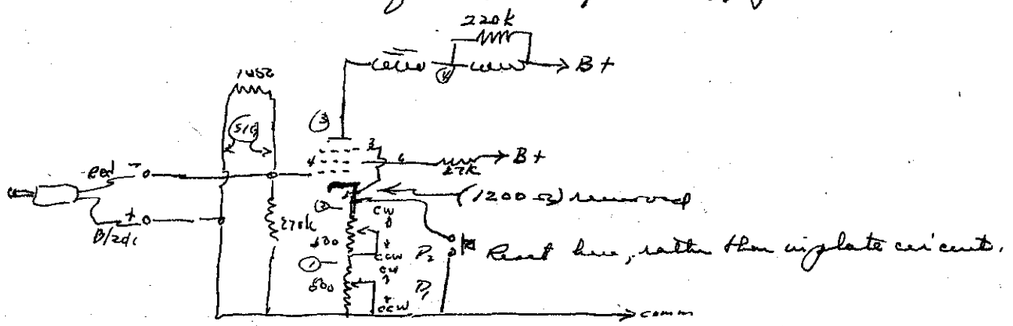
+74K both R_1 & R_2 fire about same.

220K R_1 @ 90 R_2 @ 100

Set to trip R_1 @ 90 & R_2 @ 100 v signal. $P_1 = 0$, $P_2 = 70$

by circuit with signal polarity reversed.

Note chassis is floating as is power supply.



Could not control @ B+ 200 ; reduced B+ to 100 -

Now: E_B = 100 & E_{sig} to 0 (100)

w P_1 @ 0 (500 Ω) & P_2 @ 60 comm trips R_2 @ .55 ; R_1 @ .65 E_{sig} no sig. applied - relays reset (energized)

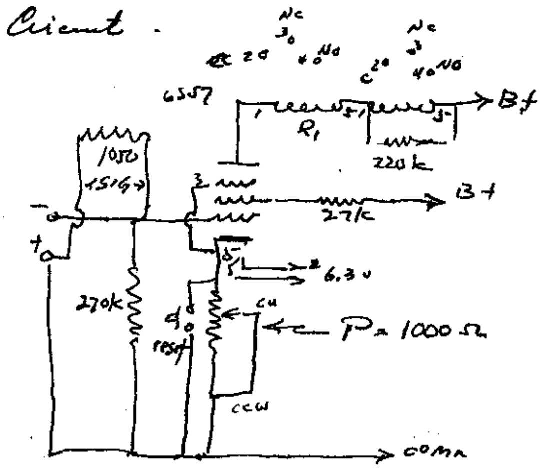
P_1 0-500 Ω no change - Can trip relays by rotating P_2 CCW increasing cathode resistance. @ to 20 P_2 relays "trip"

Cannot reset w/ P_2 but w/ P_2 @ 100 & P_1 rotating CW to 20 relays "in".

	P_1 0 ; P_2 100 :	P_1 0 ; P_2 0.	P_1 100 ; P_2 100	P_1 100 ; P_2 100 (reset)	P_1 0 P_2 20 (trip)	P_1 20 P_2 20 (reset)
	TP_1 = 1.78	1.30	1.78	.025	1.34	1.61
Trip	TP_2 = 1.80	2.62 (R_1 trip)	1.80	.05	2.54	1.63
	TP_3 = 85	89 (R_2 trip)	85	74	88	84
	TP_4 92.5	95 (tripped)	93	87	94	92

4-25-56 replaced 2-500Ω pots with one 2.5k - & raised B+ to 150 - adjustment not so good - to return to 100 volt operation.

4-26-56 Circuit.



Signal measured w/ Simpson 1007 3E
Test readings taken w/ Voma
[different from 4/25, had noted Simpson trigger relay]

⟹ Adj B+ to 100v. - Set signal to zero. Relays are energized ∴ with pot, P, @ 60.

Turn P ccw trips R_2 & R_1 @ ~~32~~ - 19 }
Turn P cw reset R_1 & R_2 @ ~~6~~ 62 - 65 }

Set P to 18 - Both relays de-energized E_K = 2.54, E_P = 88, E_R = 93.5 — reset voltage 5.5v.

Set P to 66 - Both relays re-set E_K = 1.58, E_P = 83, E_R = 91 — 6.5v firing voltage; R_1 8 volts, R_2 = 9 volts

Extremes of P - 0 - E_K = 2.67; 100 - E_K = 0

⟹ Adj B+ to 120. Extremes of P: 0 E_K = 3.10; E_P = 107.6; E_R = 113.5; 100 E_K = 0.01; E_P = 87.7; E_R = 104

w/ P=0, trip point. R_2 - .75v. signal E_R = 194.8
R_1 .80v. E_R = 194.8

P=20 R_2 1.07v, 1.13v

P=40 R_2 - 1.68v, R_1 - 1.76v @ P=40 "resets" at none 0 signal.

P = 60: trip @ 2.3 volts - reset @ .90 volts signal

⟹ Increase R_K - , inserting 470Ω on ground side of pot, P.
Now can ~~adjust~~ trip of cutoff relay w/ P
E_{sig} = 0
P ccw R_2 30; R_1 26 trips (cutoff)
P cw R_1 84; R_2 86 reset (energize)

P = 20 - .30, .40 ⟸ R_K added = 270Ω.
40 - .85, .95v
60 - 1.50, 1.55 - no reset -

⟹ B+ adj for 200 R_K 1000 not enough want to just about cutoff (reset) relays at P=0.

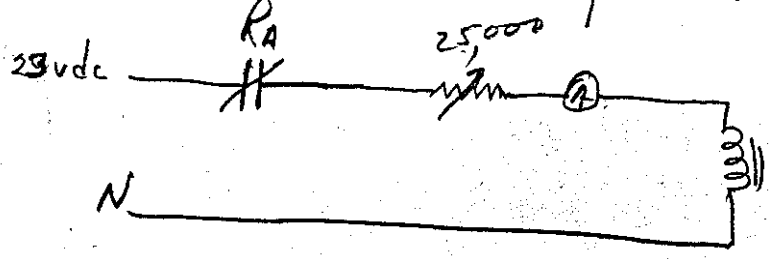
Now Voma across R_2 - E_R 6.7 - 9.6v (R_2 energized) +
R_K = 4700, too much E_R = 3.2 - 3.6v - (R_2 cutoff)
8.2k across 4.7k raises E_K to 5
5.6k " 5.6
3.9k " 6.3
2.0k "

(P_0 5.4 not cutoff -
P_{100} - 8.0 fire both relays) E cutoff 5.6 - 5.7 v.

R_K = 2000 - "reset" @ P = 40 -

6.2k across 2.0k in series w/ 1K give wide range of control
w/ Pot P - P=0 trip 2.25 P=100 trip > 2.5 no "reset". Good
E_R range 5.8 - 7.75 volts.
With P @ 30 trip @ 90-100 - recheck this.

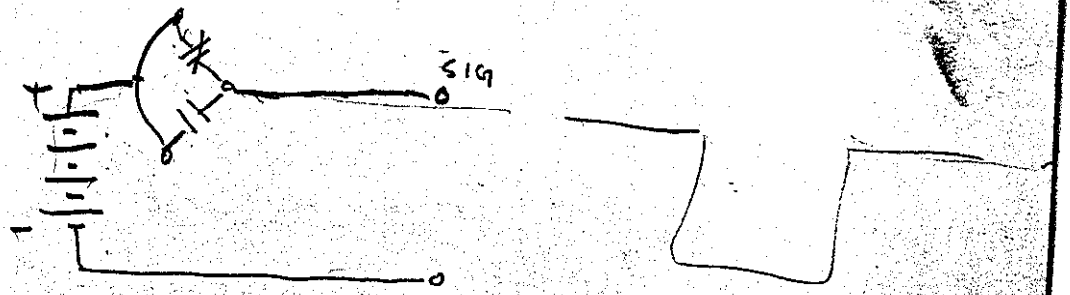
6/21 To check Sequence of other relay time of action.



2000 Ω - 2 ma -

$2 \times 10^3 \times 2 \times 10^{-3}$ 4v - 6v

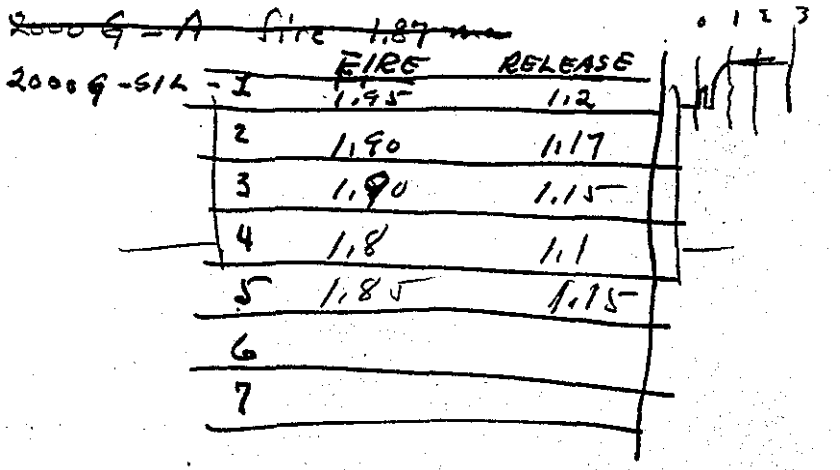
need to drop ≈ 18 v



C-21

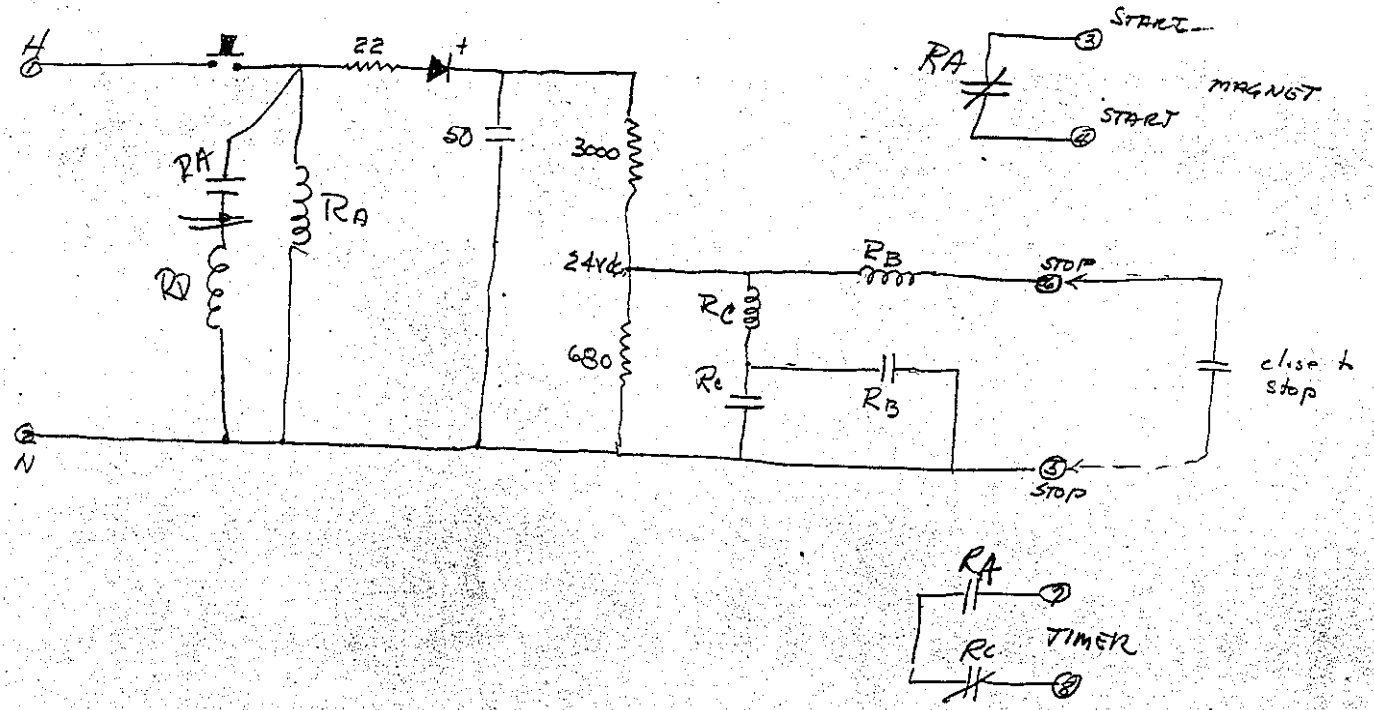
SIGMA

~~2000 G = A fire 1.87~~

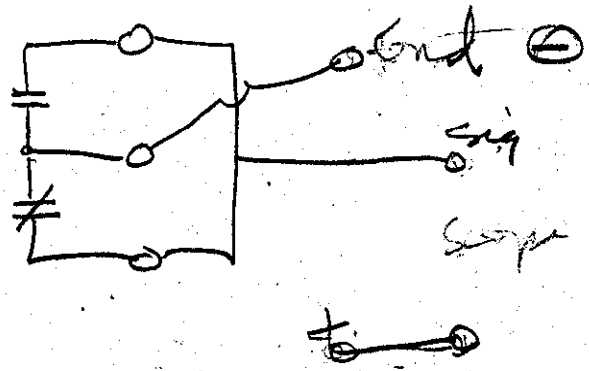


5000 G 1.1 0.6 5000 G

c/2'


H
22
+
50
3000
24VDC
680
RA
RA
RA
RB
RC
RC
RB
STOP
STOP
close to stop
N
START
RA
MAGNET
START
RA
RC
TIMER

6-21



4-27-56 Check circuit on bread-board for stability power on 8:40

Signal gen: P=0; E_{R_2} = 5.85v

P=100; E_{R_2} = 9.60v.

Trip points:

	P = 0	10	20	30	40	50	60	70	80	90	100
	R_1 30	.32	.63	.96	1.23	1.53	1.79	2.12	*2.60	2.95	3.20
SIG =	R_2 20	.24	~~.52~~	.85	1.08	1.40	1.72	2.00	2.44	2.85	3.10

11:24 P=30 R_2 .85; R_1 .95

3:15 .85 .94

Power off 4:15 P

5-2-56 Power on 8:25 - 8:37A 85, 95 @ P=30 - 3:50P 85-95 @ P=30 - } fixed - power on over night

5-8-56 8:00 A/ 78, 88 E_B = 200v, I_B 76 ma.

3:15 P 70-87 -

5-9-56 8:15 A - Trip @ 33-36 - Trip point has drifted -

Installed on bread-board trip indicator lights 6.3v, 150ma. Used N.C. contacts on relays. -

After power shut-down - Trip @ 75-88 @ 1:20 PM -

Power left on

5/8/56 8:22 A/ 78 - 90

1112 P/ 77 - 90

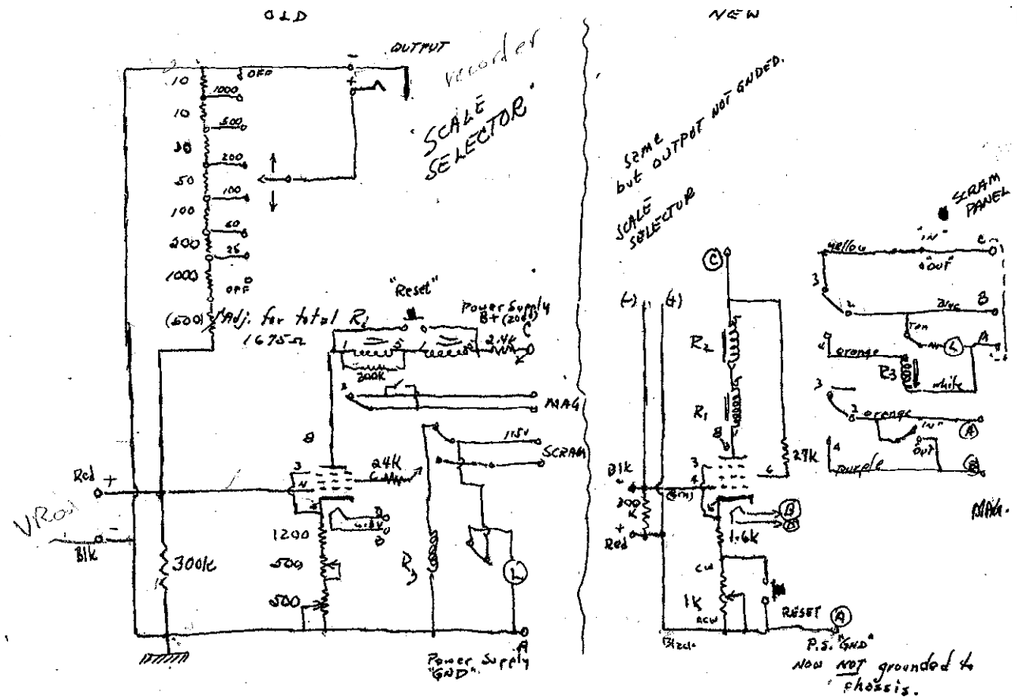
5/9/56 8:15 A/ 82-92

5-11-56 Modify trip circuit - Channel "A". *

Isolated input & output from chassis.

Vacuum tube supply common (B-) isolated from chassis

Wiring diagram:



B+ = 200v

Can trip & reset relays by adjustment of "trip level" pot. Check this-

Relays - R_1 - contact opens, upon "TRIP." Trip when power off

R_2 - contact closes, upon "TRIP":

i. - turning "Trip Level" counter-clockwise - R_1 trip, then R_2

ii " " clockwise R_1 reset, then R_2

5-14-56 (c) Voltage Readings -

"T.L." ccw. ; E_k = 7.3v Trip - 7.3

cw ; E_k = 6.0v Reset - 6.5v

This with relays on unit "A" in 107 - put in units in bread-board.

no such trip ~~reset~~ can reset once tripped.

Voltage Readings "T.L." ccw ; Ek = 7.25

"T.L." cw ; Ek = 6.0.

Source in for tripping -

"Trip Level"	~~[illegible]~~ R_1	R_2
c.c.w.	B1 0.63v	B2 0.39v
	B2 0.73v	B1 0.50 v
	B1 0.57	B2 .52
	B2 0.65v	B1 0.45v
	B1 0.49	B2 0.57
	B1 0.50	A1 0.2 tripped
	B1 0.53	A2 0.2 tripped

O.C. 8696

Left B1 - B2 in - Power on - overnight

5-15-56 Check - old circuit for operation characteristics after morning check of modified A.

modified A

ccw.	B1	B2		Reset
0	.49	.50		
1	.50	.52		0.4
2	.78	.80		0.4
3	1.02	1.06		0.4
4	1.35	1.35	Not reset 'A'	< 0.4
5	1.62	→ 1.62	Hard to tell trip.	"
6	1.92	1.92		"
7	2.27	2.27		
8	2.58	2.58		
9	/ /	/ /		
10			34207	

5-15-56 D - trip circuit - found that ground has connection thrown in large signal - This because output from this model VR is not grounded on either side - - left off ground.

AC on - DC - on - adj to B+ 200V.

T.L.	R1	R2	
"50"	.20	.30	
"75"	.55	.65	R_1 trips & resets self R(2) not sharp as "on-off" indication should be
"100"	1.00	1.10	No click on R_1 - resets .95?? R_2 normal -
"150"	1.90	2.05	D1 R_1 resets 1.85 R_2 will reset on P.B. @ 2.00

⇒ putting A1 in place of D1 gives click for both relays (check D1) ⇐

Back to Modified A -

Removed - B+ lead to R_2 & inserted DC ma meter - to measure relay currents.

current range T.L. 0-10 2.28 - 3.13ma

T.L.	Relay used R_1	Relay used R_2	Current R_1	Current R_2	Voltage [illegible] R_1	Voltage [illegible] R_2	Comments -
0	B1	B2	2.22	2.22	.38	.38	starting I = 2.28
1			"	"	"	"	not much change over "0"
2			"	"	.66	.60	I_s = 2.36 I_{rs} = 2.9 (I reset required 3.04 ma)
3					.95	.91	2.39
4							
5							
6							
7					2.72	2.80	2.67 ma 2.6
8							

5-15-52 Reset button across fixed cathode resistor.

TL = 7 R1(B1) E_t = 2.36 ; I_t = 2.2 I_T @ E_s 20 44ma reset a OK. Now
R2(B2) E_t = 2.42 ; I_t = 2.2

start current 2.68 ma

start current .23

TL 2		R_1 - E_s	.93	.90	.86	.90
		R_2	1.05	.98	.92	.96

Reverse ammeter, DC-out of meter

T.O.		0	2	3	4	5	6	7
E_s	B1	.60	.82	1.11	1.38	1.70	2.08	2.30
	B2	.66	.90	1.20	1.45	1.76	2.07	2.35

.85/.95

10:50 Leave set @ "2" - check stability

3:10P R_1 - .90 ; R_2 .92 || .85, .91

5-16-52 Work multiplex D —

9:54A Check A - .94 - .94

re-mounted D on panel.

Before further check, run test on each relay -
Used breadboard as test panel, with following changes.

adj R_1 to trip & reset

Relay	TRIP V	TRIP I	RESET V	RESET I ma.	
D2	5.3	2.17	7.56	3.04	Start w/trip R = 2,440/2,480
			6.45	2.75	Start w/ reset - reduce B+ to trip.
D1	4.2	1.7			
	6.3	2.54	6.53	2.61	Trip out before reset thrown in relay seen
D3	5.38	2.30	7.73	3.25	Start w/ trip
	5.4	2.3	7.76	3.26	R = 2,350/2,380

Relay	Trip V	Trip I	Reset V	Reset I	
A1	5.93	2.35	7.50	3.03	R = 2,440/2,470
A2	5.62	2.33	7.62	3.10	R = 2,410/2,460
B1	5.43	2.20	2.90	3.10	R = 2,460/2,540
B2	5.20	2.20	7.67	3.13	R = 2,360/2,450

If R_2 is known level trips - mark relay w/ high I_t such as D3, A1, A2
Then for R_1 use B1 or B2

Try on A' circuit A2 as R2 & B1 as R1
D' D3 as R2 & B2 as R1 -

B_t = 200

UNIT POT. SET	A Cont. B1(B2)	A Cont. R2(D2)	V_{R1}	V_{R2}
ccw(11)	S	S	7.9	7.7
1.5	S	T		5.7
2.2	S	S		7.5
0	S	T	5.8	5.6

unit D' R trip @ P.set 2.3 not reset by pot -

With B1 & A2 in A' as R1, R2 & B2 & D3 in D' difference in trip levels was too great, R_2 tripping @ pot .3 while R1 at 1.0 - This got too far.

Re-arranged Relays A unit: A2 - D3
D unit B2 - B1 This better -

Set up for on checks

~~5-17-52~~

5-28-52 Power at 8.42 Mw -

"A" - A2 - D3 relays			"D" - B2 - B1 relays		
9:12	TL	R1 R2	9:03	TL = 3	R1 .2 R2 .2
	3	.32 .2		4	.49 .49
	4	.62 .5		5	.78 .76
	5	.92 .78		6	.99 .99
	6	1.28 1.17		7	1.32 1.32
	7	1.61 ~~1.61~~ 1.52		8	1.55 1.52
	8	1.88 1.74		9	1.79 1.82
	9	2.35 2.30		10	2.20 2.20
9:16	10		OK 9:10 -		
set @ 5		.96 .86	set @ 6		1.17 1.17
10:44		1.04 .99	10:47		1.15 1.13
		1.02 .84			1.17 1.17
		1.04 .88			
		1.02 .94			
		1.04 .88			
		1.04 .90			
Ei		1.04 .95	2:54		1.25 1.25
		1.08 .98			
		1.08 .98			
		1.08 .95			
5/24	8:37	1.06 .95			1.24 1.24
5/31		1.04 .95			1.28 1.28

5/31 "D" 470K across R2 - scan panel - 50 k, fuse @ 12
& R1 @ 13

Period Measuring Device

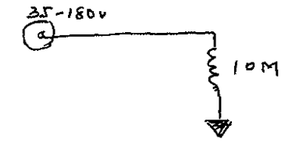
7-19-56 D.F.C. suggested need for device to measure period to a greater accuracy than the meter (too much "grass" for reliability) and the manual clock timing methods. The suggestion included the idea of some type of electronic circuitry which would start & stop the clock automatically when a pre-set range of power is covered by the log N amplifier channel.

7-20-56 log N amplifiers low terminal (B.N.C. type) on rear of chassis marked "OUTPUT." This is on the "top" of the leg including the power meter, the resistance of this leg being 8.8 meg. The voltage between this point & ground (chassis) varies between +35v to +180v over the entire power range (.0001 to 300) of 6½ decades. Voltage measurements with the HP VTVM on the unit mounted in Rm. 202 gave readings of

	+35 v.	at	.0001	
Lo Cal.	56 v	at	.001	1 decade ≈ 26v
Hi Cal.	156v	at	100	5 decades ≈ 100 v (20 v/decade)

A. First thought to use to build circuit fed by this signal of high enough impedance to have no effect on the amplifier and to include sensitive relays to activate the timer.

7/20/56 A Resistive network with total value of 10 meg may be first considered-



Current range

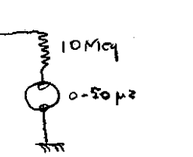
$I_{35} = \frac{35}{10^7} = 35 \times 10^{-7} = 3.5\,\mu a$

$I_{180} = \frac{180}{10^7} = 180 \times 10^{-7} = 18.0\,\mu a$

At "GND SET"	V = 35	I = 3.5μa	.0001
"Lo CAL."	V = 55	I = 5.5μa	.001
"Hi CAL."	V = 155	I = 15.5μa	100.

Sensitive relay (Assembly Products Inc) Bulletin 102 12/55

8/9/56 Checked current thru external circuit



@	.001	7μa
@	0.1	12μa

Min. Fission Counters

9-6-56 Set up to check out Miniature Fission Counter #1.
Had been in use with cube tables experiments. Seemed
→ to exhibit instability to extent that counts were
apparently not reproducible at fixed foil exposure levels.

a Check out linear amplifier - preamplifier.
Preamplifier from field - #327
Linear Amplifier, shop, #366. refer: file on Lin Amps. 366

9-7/9-17 Counts with B-Be source to check drift. No marked drift.
refer: file
mini. counters gen.

11-14-56 Set-up for testing new miniature fission counters from Instrument Shop - X-10.
- Depleted counters from X-10 to be checked as well as extra enriched counter.
- Procedure - a. Mount counter in test mount. Attach to pre-amp. Insert in paraffin housing. ~~with~~
b. Pre-amp is attached to linear amplifier and scaler and timer
c. Data on tubes are obtained with and as their source -

Equipment: Pre-amps #349 - adapted for counter use (see file Pre-amps)

Linear Amp #366
Scaler #Y-89641
Voltage Source - Kepco N.V. Power Supply - read
(Note - when meter on supply reads 1000, volts at connection at counter to pre-amp reads 92 v.

Preliminary -
Check count with counter mount in place, but no counter -

TEN MINUTE COUNTS - FOIL

H.V.	GAIN/RISETIME	6	7	8	9	10	
		4m					Scaler in unreg. line & Disc 16
0	16 /5 μs.	29,667.2	291.3	2.4	0.1	0.5	Plug in reg. line Disc. 20 Check - one min.
			2,240				
100	"	—	2893.7	28.5	0.5	0.0	
200	"	—	4,062.6	36.0	1.1	0.3	
Ctr. 238 #2 0	"	—	3,978.1	48.6	0.6	0.1	
100	"	—	3,667.1	45.2	6.7	3.5	
ARE source 100	—	—	—	—	—	2.8	Source +
PB 124 100		—	—	64.7 98.1	—	—	Bkg. 2

114 Min. Fission Counter -

11-15-52 Did not seem to get any response with depleted counter. Checked test setup with enriched counter - Monitoring amplifier output with Tektronix scope.

With amplifier gain of 16 (setting for operation of counter #1 -), signal at 100 volts seemed to overdrive. Set gain at 8 & rise time at 2. First to eliminate overdrive, second to shorten pulse width.

Output pulses with source ~~about~~ ~~too~~ up to 100 volts amplitude.

Removed PB 124 & put in ARE source (used in previous tests PN-57 at Amp X8 bkg (also in 6v HV=0) at PDL 5 & begin counts at PDL 6

Removed enriched fission counter

Counter #2 (rebuilt)	Amp.	8 ; 0.8μc	8 ; 0.8μc			11/16	Run (A)	(B)
	HV	100	100					
	PDL	c/m.			1 min.		c/m	
10 minute counts, unless otherwise noted.	6	485.1	PN Source	PN Source	PB124 Source	7	7458	
	7	329.9				8	116.3	
Scaler Disc @ -25	8	119.7				9	6.2	
	9	69.3				10	3.3	
	10	28.0				11	2.7	
	11	9.5		check		12	2.8	
	12	1.2	12 34.4	376	321	15	0.6	3.5
	13	0 (1m) (check)	15 32.1		363	20	0.0	3.3
	6	505 -	20 32.3		317	25		2.0
			25 30.9		280	30		1.8
		Bkg	30 29.1		304	40		0.6
			35 24.2		254	50		1.5
			40 23.0		254	60		1.8
			45 20.2		270			
			50 21.7		241	20		20m 2.25
			55 19.4		210			
			60 19.7		194	mkg 20		20m 0.05
			65 19.5		167			
			70 17.8		159			

11-16-32 Fast fission counter - depleted -

Run A - Background. Amp 16, 0.8 μs. H.V. = 100. (Found in preliminary check with hot source that signal too high for gain 32. Got tremendous pulses at gain 16)

B. SOURCE - PB-124 - same amplifier & H.V. -

11-19-56 Mounted fast fission counter in probe, removing counter 5-3, (enriched counter). Counter now in probe 8-2.

TDL	A c/m	D c/m
7	849.1	562.9
8	34.7	2.9
9	32.8	0.3
10	30.5	0.1
11	3.4 ± 2	
12	28.3	
13	26.8	
14		
15	28.4	
20	23.3	
25	25.8	
30	22.2	
35	20.5	
40	21.0	

Run A - { source # PN-213 6/13/56 3.3×10^7
Amp 16, 0.8 μs, HV = 100.

Run B - BACKGROUND

L&N SPEEDOMAX H. =Test=

11-16-56 Received, on loan, one instrument. From R.G. Attel 8201-3.

Items: 1. SPEEDOMAX H STRIP CHART RECORDER.

Catalog No. 3-30-41-044-6-02-0

Serial No. 56-39671-2-1

Chart # 600006 Chart Speed 2 in/hr.

Response Time 5.0 sec full travel.

Primary Element EMF source

Range 0-10 mv. - Ref. Junct - - -

(120v, 60~, [40 via (recording feature sel.)])

1- 124104 General Accessories kit envelope

1- roll chart paper

1- take-up spool.

1- battery.

1- INKING PENS (pen, nib) for strip chart work (4 labels)

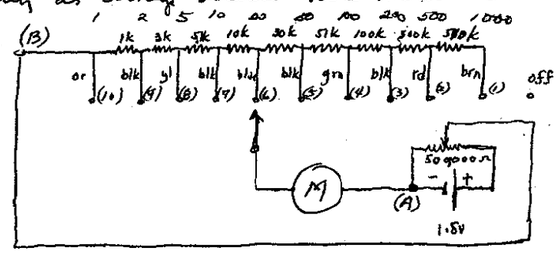
1- Instruction Manual

12-11-56 Trip Circuits for DC-2 · DC-3 type amplifiers.

Wired resistor board for use with 0-100 microamperes APE meter.

Using battery as voltage source took measurements - w/ HP VTVM.

Circuit.



V_{AB} = 1.27: Switch position 1, V_{A-2} = .638, I = 0.8ma, V_{A-3} 1.02, V_{A-4} = 1.14

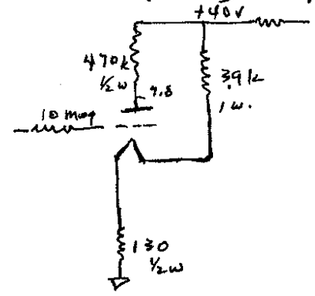
V_{A-5} = 1.215, V_{A-6} = 1.25

V_{AB}	SW	I	V_{A-1}	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10
1.27	1	0.8		.638	1.02	1.14	1.215	1.25				
			← low	.01			.646	1.03	1.15	1.22	1.25	1.29
	4	11.2				.644	1.03	1.16	1.22			
	6	65.0							.68	1.00	1.20	1.27
20.0	1	20.0		10.3	16.4	18.4	19.35	20.0	20.2	20.3		

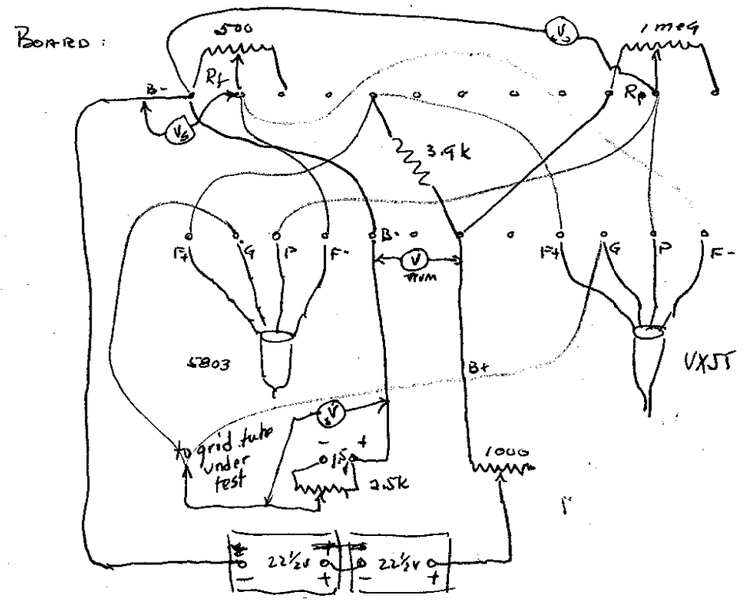
12/13/56 Set up instrument DC-231 on bench - This is DC-2-5 type.
Wired resistance bank on previous gauge & meter to output bus, in parallel with output meter circuit on panel of instrument. (Recorder output & 10mv for 1000)
Took series of readings, adjusting zero to simulate signal.

Switch position		API Meter				
R= 1k	10	100	—	—	—	—
2k	9	48	100	—	—	—
5k	8	19	41	100	—	—
10k	7	9	20	51	100	—
20k	6	—	10	26	52	100
50k	5	—	4	10	20	40
100k	4	—	2	5	9.5	19.5
200k	3	—	—	2.6	5	10
500k	2	—	—	—	2	4
1Meg	1	—	—	—	—	2

12/17/56 Comparing VX-55 - VX-32 (5803) log N application.



ckt -



Reading grid voltage with Simpson, F- w/ Simpson, Plate w/ Simpson; B+ and F+ w/ HP VTVM (not fixed in ckt)

Adjusted R_f to ~120 Ω, R_p to 470 kΩ.
Readings taken of E_f, E_g, E_p.

A. R_f ≈ 120 Ω, R_p ≈ 470 kΩ, 5803

E_g	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
E_{f-}	1.29	1.29	1.29	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
E_{f+}	2.53										
E_p	6.7	6.85	7.06	7.20	7.35	7.50	7.68	7.85	7.97	8.15	8.30
E_{B1}	40				40					40	

B. R_f ≈ 120, VX 55, R_p ≈ 470 kΩ

E_g	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
E_{f-}	1.30	1.30	1.3	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
E_p	5.04	5.19	5.33	5.50	5.67	5.80	6.00	6.15	6.30	6.45	6.60
E_{B1}	40	40	40		40						40

Adj R_p $E_g = 0$; $E_p = 6.7$ @ $E_g = 1.0$ – $E_p = 8.40$

C. Measure R_p ≈ 200 KΩ E_f 1.39 / 1.27 .

D. Variation of E_p with changes in E_g VX55 R_p ≈ 200 kΩ

E_g	E_p	ΔE_p/step
1.275	3.3 – 5.15	(1.85)
1.250	5.8 – 7.60	(1.80)
1.225	7.70 – 9.40	(1.70)
1.10	9.7 – 11.7	(2.0)

E. Variation of E_p with changes of E_g R_p ≈ 200 kΩ

E_g	E_p range (E_g 0–1)
1.33	5.05 – 6.95 (1.9)
1.30	9.3 – 11.5 (2.2)
1.275	12.2 – 14.0 (1.8)
1.250	14.10 – 16.0 (2.0)
1.225	17.2 – 19.10 (1.8)

12/19/56 modify test ckt for 5803 – VX-55. Incl. bias reference to f- point for further readings. First, a recap of data opposite page.

A. E_g values reference to B-. So $E_g = 0$ means $|E_g - E_{f-}| = 1.29$ v.

$E_g = 0$ i_p: $\frac{40 - 6.7}{4.7 \times 10^5} = \frac{33.3}{4.7} \times 10^{-5} = 7.09 \times 10^{-5} = 70.9$ μa.

$E_g = 1$ i_p: $\frac{40 - 8.3}{4.7 \times 10^5} = \frac{31.7}{4.7} \times 10^{-5} = 6.75 \times 10^{-5} = 67.5$ μa.

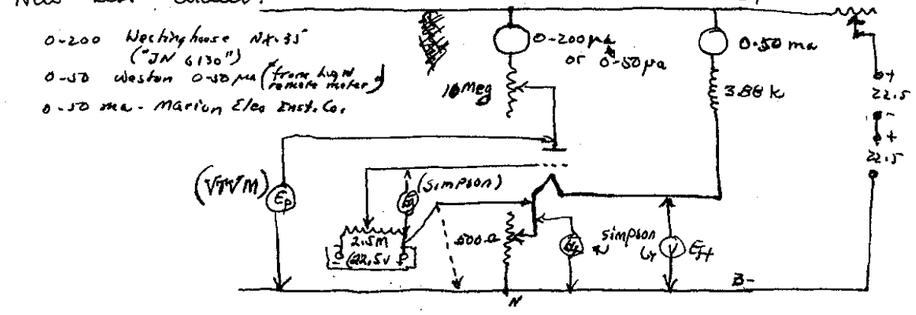
B. $E_g = 0$ i_p: $\frac{40 - 5.04}{4.7 \times 10^5} = \frac{34.96}{4.7} \times 10^{-5} = 7.44 \times 10^{-5} = 74.4$ μa.

$E_g = 1$ i_p: $\frac{40 - 6.60}{4.7 \times 10^5} = \frac{33.4}{4.7} \times 10^{-5} = 7.11 \times 10^{-5} = 71.1$ μa.

C. $E_g = 0$ i_p: $\frac{33.3}{2 \times 10^5} = 16.65 \times 10^{-5} = 166$ μa.

$E_g = 1$ i_p: $\frac{31.6}{2 \times 10^5} = 15.8 \times 10^{-5} = 158$ μa

New test circuit:



12/14/56 Data for 5893 characteristics - Tube used removed from Log N.

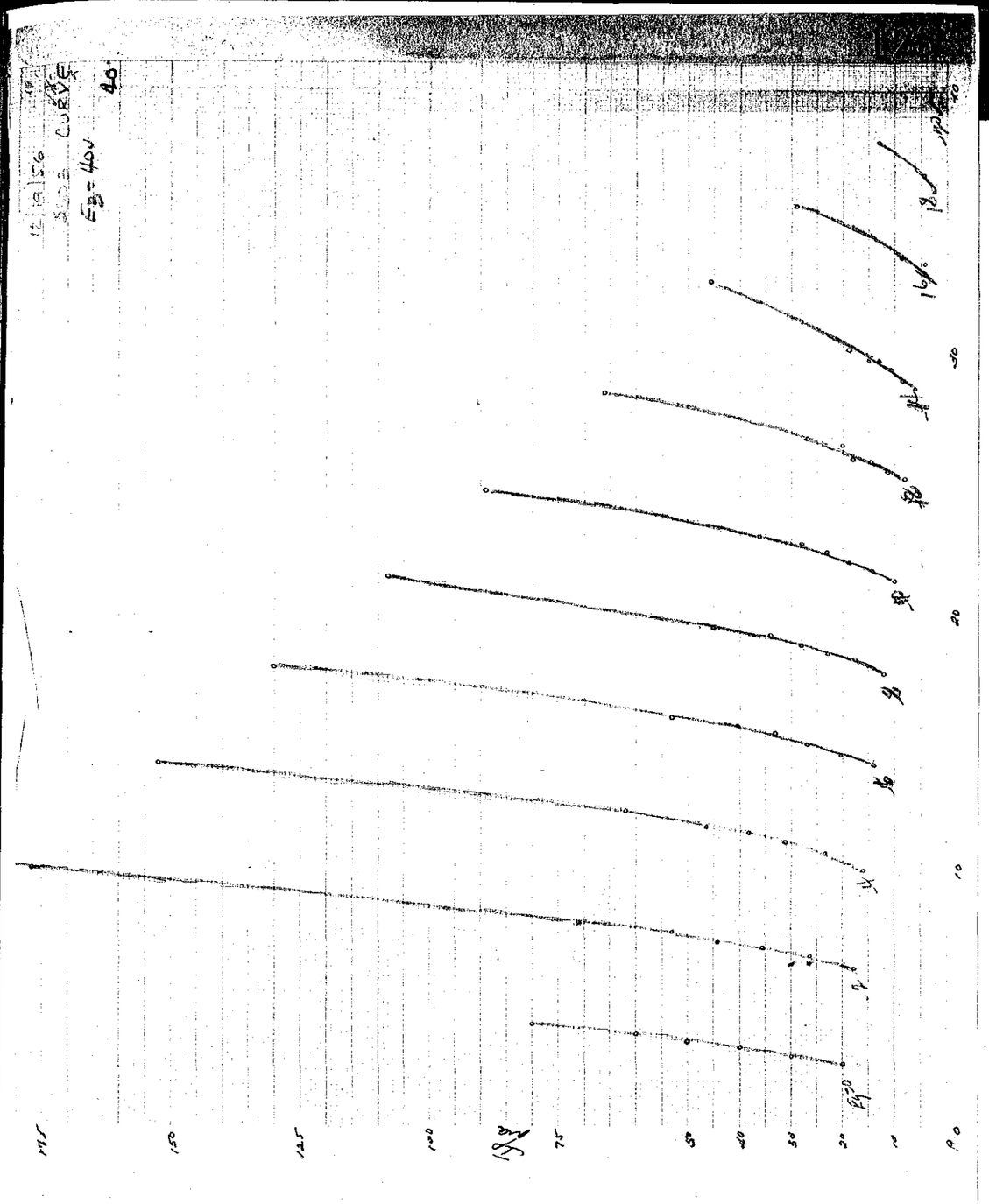
$E_{bb} = 40$ ($E_{g-} = 1.53$; $E_{g+} = 7.72$; $I_g = 9.3$ ma.)

Bias voltages taken with reference to (f-) point.

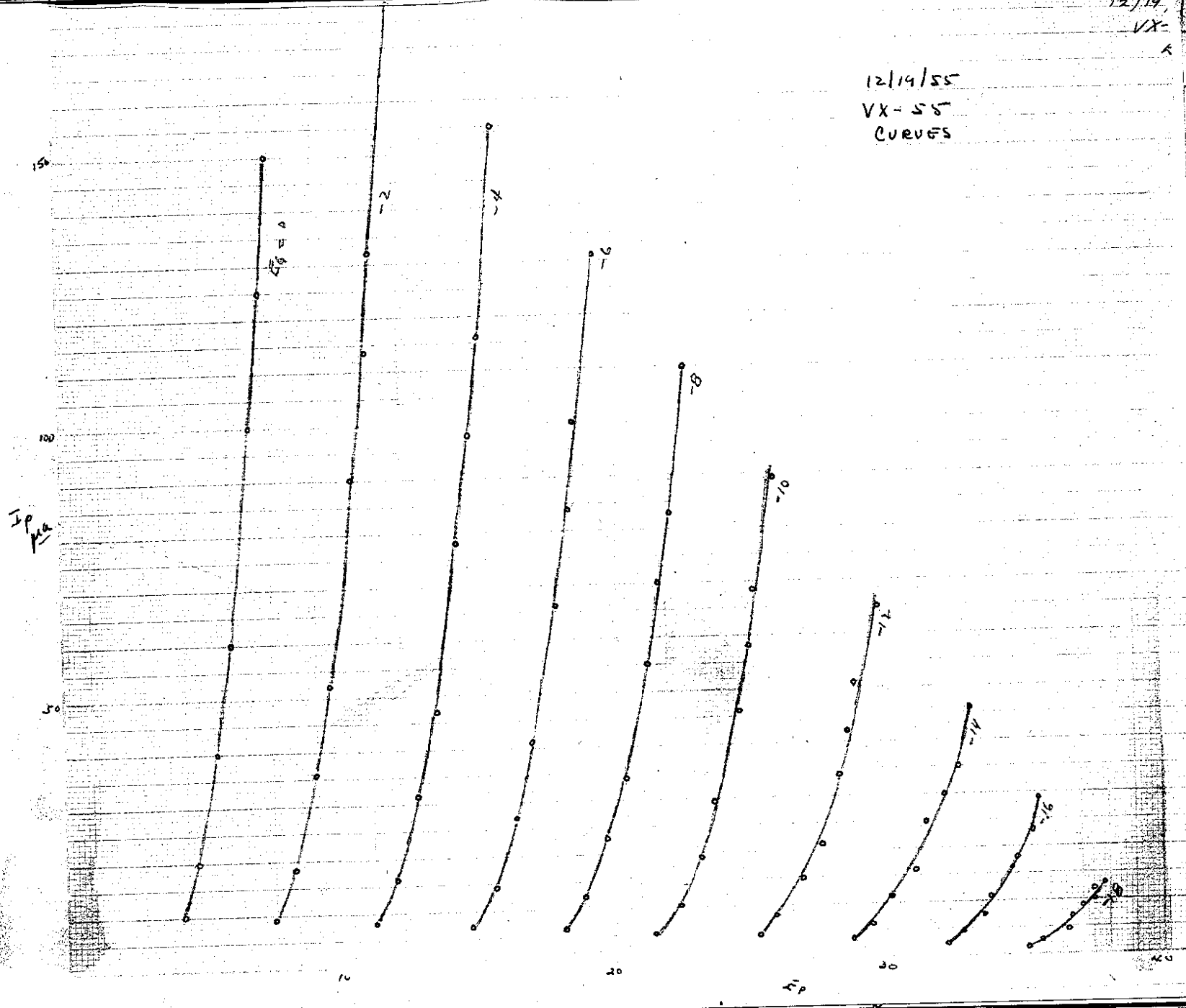
volts E_{gs}	volts E_p	ma I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p
0	2.46	20	2.8	30	3.10	40	3.35	50	3.6	60	3.95	80	5.72	200
-2	6.15	18	6.64	26.6	6.93	35.8	7.2	44.4	7.53	53	7.9	71	10	177
4	9.92	16	10.6	23.5	11.0	31.3	11.4	38.4	11.6	46.5	12.2	62	14	152.5
6	14.0	14	14.4	20.2	14.8	29	15.2	33.2	15.5	40.5	15.8	53	17.7	130
8	17.5	12	18.1	17.5	18.3	22.9	18.6	28	19	34	19.3	45	21.2	108
10	21.1	10	21.5	14.4	21.8	19	22.2	23	22.5	28	22.8	36	24.5	84
12	25	8	26.3	11.4	25.7	14.95	25.8	18	26.3	20	26.6	27	28.3	66
14	28.5	6.1	28.8	8.5	29.3	10.8	29.6	13	29.6	15	30	19	32.6	45.5
16	33.3	4.2	33.0	5.9	33.5	7.8	37.5	8.6	34	10.5	34.5	13	35.5	24
18	36.1	2.3	36.5	3.4	36.6	4.1	36.7	4.6	37	6	37.2	6.5	38	13
-20	38.6	1.0	38.8	1.2	39.0	1.7	39.1	1.4	39.2	3	29.4	2.5	39.7	3

Ran similar test on VX-55 Tube used was one tested shortly in Log N.

E_{gs}	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p
0	4.2	10	4.8	20	5.52	40	6.1	60	6.9	100	7.36	125	7.7	150	8.46	20
-2	7.58	9.3	8.26	18.1	9.1	35.7	9.68	52	10.6	90	11.2	118.5	11.4	132	12.3	18
4	11.2	8.2	12.0	16.1	12.8	31.4	13.6	47	14.4	78	14.9	98	15.8	116	16	15
6	14.7	7.3	15.6	14.1	16.4	27.1	17	41	18	66	18.5	84	18.7	100	19.6	13
8	18.1	6.3	18.8	12.2	19.7	23	20.4	34	21.3	55	21.7	70	22.2	88	22.8	11
10	21.4	5.4	22.3	10.3	23.1	19.2	23.6	29.5	24.6	46	25	58	25.2	68.5	26	89
12	25.2	4.5	25.8	8.1	26.8	14.9	27.5	21	28.2	34	28.5	42	28.8	51	29.7	65
14	28.6	3.5	29.3	6.2	30	11.1	30.9	16	31.3	25	32	30	32.5	35	33	4
16	32	2.2	32.6	4.5	33.4	7.5	33.6	11	34.4	16	34.6	18	35.2	23	35.4	29
18	35	1.4	35.5	2.5	36.5	4.5	36.6	7	37	9	37.4	10	37.4	12	37.8	13
-20	37.4	0.8	38.2	1.0	38.5	1.5	38.7	3	39	4	29.2	4	39.4	4	39.2	3



12/19/55
VX-55
CURVES



More Miniature Tube Test.

12/20/56 5803 same tube

~~V55~~: Grid voltage reference ~~was~~ E_f ~~A-type~~) ~~only change~~.

10:44 ~~a~~

E_B = 40v
E_f = 1.58
I_f = 9.6

E_{gf}	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p	E_p	I_p
0	3.85	10	4.39	20	5.05	40	5.76	70	6.45	110	6.95	150	7.76	200
-2	7.5	9.1	8.12	18	8.9	35.8	9.66	63	10.6	99	11.2	131	11.8	175
4	11.4	8.1	12.0	15.9	12.9	31.3	13.8	54.5	14.5	85	15	113	15.7	152
6	15.2	7.2	15.8	13.8	16.7	26.8	17.4	46	18.2	73	18.7	98	19.3	128
8	18.7	6.2	19.3	11.8	~~22.7~~ 20.2	22.7	20.8	39	21.6	60	22.2	80	22.7	106
10	22.2	5.3	22.7	9.8	23.5	18.5	24.4	31	25.1	48.5	25.5	64	26.2	85
12	25.9	4.2	26.8	7.5	27.5	14.1	28.2	23	28.8	35	29.3	47	29.9	61
14	29.8	3.0	30.7	5.5	31.3	10.1	32	15	33	23	33.2	31	33.7	40
16	33.6	2.0	33.9	3.7	34.7	6.4	35.3	10	35.5	14.5	36	18	36.6	22
18	36.6	1.3	36.7	1.8	37.5	3.2	37.8	5	38.2	6	38.5	8	38.8	8

Bias to (Gnd)(B-)

E_{gN}	E_p	I_p	E_p	I_p
0	6.75	10		
2	10.5	9.1		
4	14.3	8		
6	17.8	6.9		
8	21.4 / 6.76	5.8		
10	24.7	4.8		

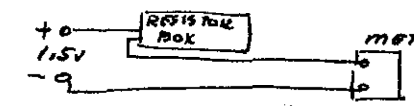
12/20 - 1/5/57 Check-out of new RCL instruments for gas-flow proportional counter. "Breadboarded" timer circuit. Refer to file 4096 scaler.

1/7/58 Dr. Von Hermann, of G. Motors -

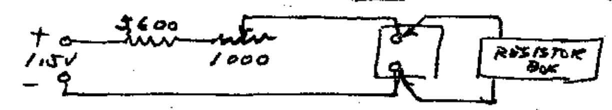
~~10~~ TRIP CIRCUIT. DC-2, DC-3 Type (last entry p 117-118)

1/9/57 Received 0-10 mv. meter from Assembly Products. This to be compared with 0-100 microampere movement for use in trip circuits of DC amplifiers in 202.

Meter internal resistance = 40 Ω, checked value as follows:

A. 

ADJUSTED RESISTOR BOX SO METER READ 10 mv. R=5770 Ω

B. 

WITH SERIES RESISTANCE at 5770 Ω, meter reading 10 mv, placed resistor box across meter & adjusted so meter read 5 mv. Value of resistor box is equal that of meter. R = 40 Ω.

Panel meter of DC-2 type amplifiers has resistance somewhat less than 100 Ω. Can insert "test" meter in place of panel meter and provide necessary series resistance for total "meter" resistance of 100 Ω. Meter should then work with divider-range selector on instrument panel.

Disconnected panel meter. Its series resistor was 33 Ω. Added in series 827 Ω for total series resistance of 860 Ω.

{ Sets on X1 range. Background { Recorder X1 range " { Ext meter (p117+118) range (10) X1 "	~~20~~	① 2-3 mv. 4.5 - 7.5 mv. 4 - 6 μa.
meter 1, range X1 meter 2, range X1 (10) recorder, range X1 } small source plastic block		② 2.5 - 3.5 mv 4.5 - 6.5 μa 5.5 - 9.0 mv.

③

1/9/57 10mg. Ra @ 6' from shell of ion-chamber

m-1 (x1)	6.2 - 6.8 mv.
m-2 (x1)[10)	14-15 μa
R (x2)	7 -8.5 μa

	m-1 (mv)	m-2 (μa)	R (mv)
12:25 Ra source @ 6'	9-10 x1	20-22 (x1)[10]	4-4.8 (x5)
1:45 With zero adj. set Recorder near full scale on x100			
max. recorder signal	8.6 x50 (400) (44)	9.1 x10 (100) (46)	9.3 (100) (40)

Have been able to operate up another factor of 10 by attenuating input to recorder x10. ~~This doing~~ Assuming this the case M-1 would read 8.6 on x500 and have another factor of 2 to go before the max.

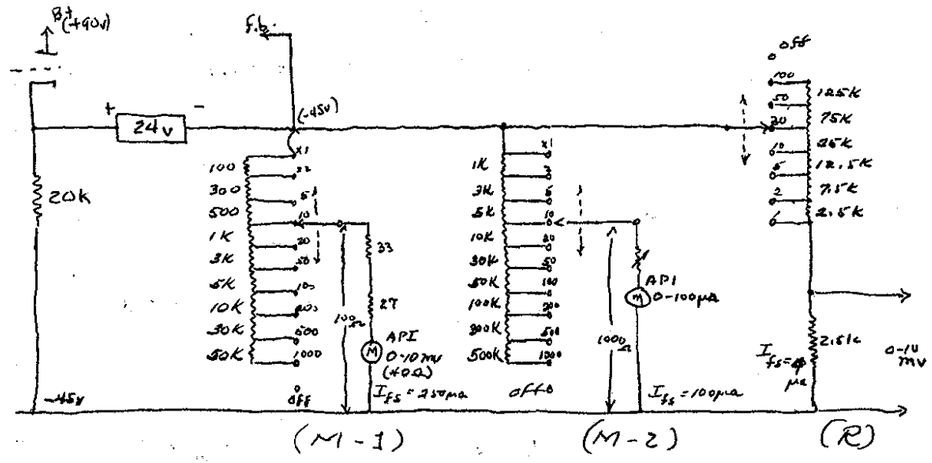
M-2 would read 91 (x40) - would have factor of 10 to go before the max.

1/10/57 Recorder chart showed steady decrease in level beginning at ~ 4:00 AM 1/10 dropping to 20.28 (from 39-47) at 8:00 AM. Had been steady from ~ 6 PM (1/9) to 4:00 AM (1/10).

Set recorder @ mark @ 10:00 AM. reading (20-27) scale (x5)

m-1	reading	4.5 - 5.0 mv (x1)
m-2	reading	10-12 μa scale (x1)

1/10/57 Circuit as under test:



Voltage signal for full scale reading at various ranges

	M-1	M-2	R
x1	(1)+.025	.100	.010
x2	.050	.200	.020
x5	.125	.500	.050
x10	.250	1.00	.100
x20	.500	2.00	.200
x50	1.25	5.00	.500
x100	2.50	10.00	1.00
x200	5.00	20.00	2.00
x500	12.50	50.00	5.00
x1000	25.00	100.00	10.00

Cathode current, output tube for various values E_c

E_c	0	-4	-6	-8	-10	-12	-14	-16	-18	-20	-22
I_c	1200μa	1000	900	800	700	600	500	400	300	200	100

~~o~~ For ranges as now limit M-1 = ~~x500~~ x200 R = x1000 (only go to 100)
M-2 = x200

128 Trip Circuits DC-2 type-

1/10/37 To check saturation of amplifier:

10 mg Ra against chamber-

M 2 & R "off" m-1 reads 35.5 (x1000) & 70 (x500)

& Switch m 2 through scales until m-1 drops-

Scale	m2 ma	C/c E.
1000	6.5	6.5
500	14.0	7.0
200	37.3	7.46
100	74.5 (0.05)	7.45
50	149	
20	380	
10	760 ⟸ here m-1 drops to 68	
5		
2		
1		

If m-1 reads 7 mv on x500 $I_{m-1} = \frac{7}{10} \times 250 = 175$ ma

$E_0 = 0.7 \times 12.50 = 8.75$ v

I_c = 762.5 ma $I_s = 700 + 175 = 875$

b Switch recorder selector arm 8.00 v

32 ma 100 (250 000) E_{max} = 1.00 v reads 8.75 - m-2 reads 1 ma

64 ma 50 (125)

160 ma 20

320 10

640 5 20 8.75 volts

1600 2 1008 43.2 5.4 volts (970 ma) 4 ma

1 650 26 3.2 volts (1110 ma) 2 ma

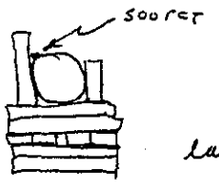
Measured E_0 = 47 = 39.3 = 7 volts

Trip Circuits -

1/10/57 continuation -

Set ion chamber on paraffin pile

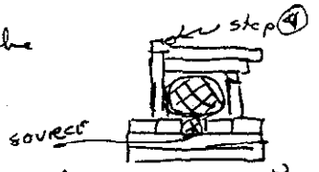
Set sources as shown



each layer ≈ 1½"

	M-1	M-2	R
	x5	x1	x10
PB 307 (~~2.67x10⁴~~ ~~2.44x10⁴~~)	6.4 - 7.0	70-76	7.0 - 7.6
	x50	x10	x100
PN 57 (~~3.44x10⁵~~ ~~3.7x10⁵~~)	7.2 - 7.4	78-78	7.7 - 8.0
	x500	x100	
PN 124 (3.2x10⁶)	~~5.4~~ - 5.5	57	

Relocate - chamber



	M-1	R
PB 307	8 (x10)	9 (x20)
PN 57	8.2 (x100)	
PN 124	5.8 (x1000)	

④ PN 124 + bg 2.6 (x1000)

add PN 57 ⊗ 3.0

PN 57 alone .94 (x1000)

bkg .05

.89 x1000 or 8.9 x 100

PN 57 increases by .4 or 4 x100

Value of input resistor 4x10¹⁰

Nell Superstructure –

1/11/57 D.F.C. desiring to re-mount old superstructure over Nell tank. APPR rig is removed.

Reference print C-10551 "Elementary Diagram Control Apparatus – SID & NELL"

	lead	Connection	Motor 2		(BLUE)	Motor 3		(RED)
Motor 1:	H1	6		V1	5		S1	5
Motor	H2	7		V2	8		S2	8
	H3	12		V3	7		S3	7
LS. common	B1A ~~H4~~	3		B1A	3		B1A	to M-2 "3" tied in frame
LS. Raised NC	H7	2		V7	2		S7	2
LS. Raised NO	H9	9		V9	9		S9	9
LS lowered NC	H8	4		V8	4		S8	4
LS. lowered NO	H10	11		V10	11		S10	11
LS. Rod Down	10			V11	10			10
DC Magnet	~~AAA~~ (N 5)			V14	12		(S13	12)
DC Magnet	8			V15	6		(S14	6)
	GND	1		~~GND~~	1		~~GND~~	1
	sm 1a	A		Sm 1a	A		Sm 1a	A
	N	B		N	B		N	B
Selsyn	sm 2a	C		Sm 5a	C		Sm 8 a	C
	Sm 3a	D		Sm 6a	D		Sm 9 a	D
	Sm 4a	E		Sm 7a	E		Sm 10a	E

Wiring OK.

Source Motor:	T15	E	LSR NO	B9	C
	T16	G	LSL NC	B8	D
	N	B	LSh NO	B10	A
	LS Common (N)	H			
	LS R NC	B7 F			

1/4/57 With VGH. run cables from terminal box at base of ARS test stand to P.U. control rod & source rod drive motor assemblies. Mounted source rod drive assembly.
The cable & rig had been checked earlier & ok'd. Assumed ok. now. after VGH repaired break on center limit switch source.

1/11/57 Pack to Trip Circuits. Run some data on linearity w/o sources.

By zero adj Set to read on scale		set on 10% x1000 (100 sf; 100 sc)	set 10% x200 (100 sf; 762 c)	set 10% x50 (100 sf; 627 c)	set 10% x10 (100 sf; 584 c)	set 10% x5.0 (100 sf; 571 c)	set 10% x2.0 (100 sf; 570 c)
scale	1000	10	5	2	1.4	–	–
	500	20.3	10	4	2.1	–	–
	200	50.2	25	10	5.2	2.5	–
	100	98.8	49	18.8	10	5.1	2
	50		96.5	39	19.8	10	4
	20			95	48.5	25	10
	10				95	49	20
	5					96	39
	2	— —		contact bad — — >			93
	1						

Source Strength	#	Room	Original x10⁷	Date	1/10
~~PN 213~~	PN 213		3.63	6-13-56	1.26×10^7
~~PN 214~~	PN 214		1.36	6-14-56	4.75×10^6
	PN 124	201	3.62	9-14-55	3.2×10^6
	PN 123	209	3.56	5-12-55	1.686×10^6
	PN 58	108	3.24	6-8-54	3.25×10^5
	PN 57 (Ra-Be)	209	3.70	6-24-54	3.49×10^5
	PB 307	209	3.35	2-16-53	2.67×10^4
	~~PB~~ 267	201	2.87	6-9-52	6.49×10^3

EXPERIMENTAL PLANNING.

1-11-57 Comments from A.D.C. on forthcoming project.
Some of needed instrumentation considerations - pulse oscillator, measurement of ΔK to $\approx 10^{-6}$
Rod movement presently in "ball park" What about instrument sensitivity.

1-14-57 Consideration of instrumentation for new Vertacell. - delayed
Check out superstructure over Nell.
"Blue" motor OK. in direction & limit switches
"Red" motor limit switches ok., direction reversed.
a. At control panel, 201: reversed S1 & S2.
b. Selsyn indicators reversed in direction.
On panel 1, on console 202:
swapped Sm 6 & Sm 7 black & orange
swapped Sm 9 & Sm 10 red & yellow
True, if electrical engineering, ever to talke Mdfg. modifications.

---

more on Nell:
"Elephant Gun" requested. Began making up cable for tying in to motor #1 (Yellow) connector on panel in 201.

Discussion w/ ADC on office space for instrument section.

1/15/57
0800-1150 / 1245-1800) Completed wiring for "Elephant Gun." Wired in & checked out. Cable got caught in gears on Mfg Motor 2 - repair cable. Request supply operation faulty, Observed two seemingly bad rectifier sections. VGH replaced. Now OK.
For detail refer to file on 201 Control Circuit Modification.

Consideration to new spaces - offices for Tim & Vic.

1/16/57 Fader - problem of noise bursts from RMS. on Mfg assembly.
Checked socket at 210, w/1000 volts & no 6292 OK
When tube in no change in divider voltages.
With scope see apparent noise pulses - source pulses normal.
Returned to test area - seems ok.

202 - Modified magnet circuit so "Rod Drop" switch opens magnet supply line. Refer to file.

ADC - reference to segment for circuit information from U.K.
Item of interest - Scintillation trip circuit.
Drew sketch of circuit, including notes on operation.
East end instrument used as guide.

DWM - 202. Paper not loud enough when used with C4.
Mounted speaker used with C3 on console near intercom speaker.

1/17/57 AM - Hanauer. Preliminary discussion new project.

PM. Summary of Present Instrumentation East End

1/18/57 AM. Summary of Present Instrumentation West End.

10:15 DC 2 Trip & Ion Chamber Considerations -

Test setup: Meter #1 (10 mv (40 Ω) / 100 μa) zeroed on scale 2 R = 200 Ω

Meter #2 (10 mv (2.5 k)) zeroed on scale 1 R = 1000 Ω

Recorder zeroed on scale 4 R = 12.5 kΩ / 5000 Ω

Source #307 @ 1 foot = 30.5 cm.

m 1 =	65 mv.	E_o	27.6 mv.
m 2 =	27 μa.	E_o	27. mv.
R 2 fs.	5.6 mv	E_o	28. mv.

R_i = 4×10^{10} Ω $I_i = \frac{28 \times 10^{-3}}{9 \times 10^{10}} = 7 \times 10^{-13}$ amps.

N = 2.6×10^4 n/sec.

$\phi = \frac{N}{A} = \frac{2.6 \times 10^4}{4\pi r^2} = \frac{2.6 \times 10^4}{1.257 \times 10 \times .960 \times 10^3} = \frac{2.6}{1.257 \times 960} = 2.08$ n/cm²/sec

Source PN57 @ 52" approx. same readings $\frac{2.5 \times 50}{127.00}$ cm

N = 3.4×10^5

$\phi = \frac{N}{A} = \frac{3.4 \times 10^5 \text{ n/s}}{1.257 \times 10 \times (1.27 \times 10^2)^2} = \frac{3.4 \times 10^5}{1.257 \times 11614 \times 10^5} = 1.7$ n/cm²/sec.

$i/\phi = \frac{7 \times 10^{-13}}{2} = 3.5 \times 10^{-13}$ amp/unit flux

1/18/57 PN57 @ 1' N = 3.4×10^5

$\phi = \frac{3.4 \times 10^5}{1.257 \times 10 \times .960 \times 10^3} = \frac{3.4 \times 10^5}{1.206 \times 10^4} = 2.82 \times 10 = 28$ n/cm²/sec

			R_T
m 1 =	(50)	2.9 mv	(5000 Ω)
m 2 =	(5)	64 μa	(5000 Ω)
R	(50)	6.8 mv	(125 kΩ)

m 1 & $I_m = \frac{2.9 \times 10^{-3}}{.4 \times 10^2} = 7.25 \times 10^{-5} = 72.5$ μa $E_o = 72.5 \times 10^{-6} \times 5 \times 10^3 = 362.5$ mv.

m 2 $I = 64$ μa $E_o = 64 \times 10^{-6} \times 5 \times 10^3 = 320$ mv.

R $I_R = \frac{6.8 \times 10^{-3}}{2.5 \times 10^3} = 2.72 \times 10^{-6}$ $E_o = 2.72 \times 10^{-6} \times 125 \times 10^3 = 340$ mv.

E_o = 340 mv $I_i = \frac{340 \times 10^{-2}}{4 \times 10^{10}} = 8.5 \times 10^{-12}$

$i/\phi = \frac{8.5 \times 10^{-12}}{2.8 \times 10} = 3.04 \times 10^{-13}$ amp/unit flux

PN57 @ 6" Note drop in meas.

		R
m 1 =	(100) 3.5	10 K
m 2 =	(10) 79	10 K
m 3 =	(100) 8.0	250 K

m 1: $3.5 \times 10^3 / .4 \times 10^2 = 8.75 \times 10^{-5} = 87.5$ μa $E_o = 87.5 \times 10^{-6} \times 10^4 = 875$ mv.

m 2: $I = 79$ μa $E_o = 79 \times 10^{-6} \times 10^4 = 790$ mv.

R: $I = 8 \times 10^{-3} / 2.5 \times 10^3 = 3.2 \times 10^{-6}$ a $E_o = 3.2 \times 10^{-6} \times 250 \times 10^3 = 800$ mv.

$I_i = 8.30 \times 10^{-2} / 4 \times 10^{10} = 2.07 \times 10^{-11}$

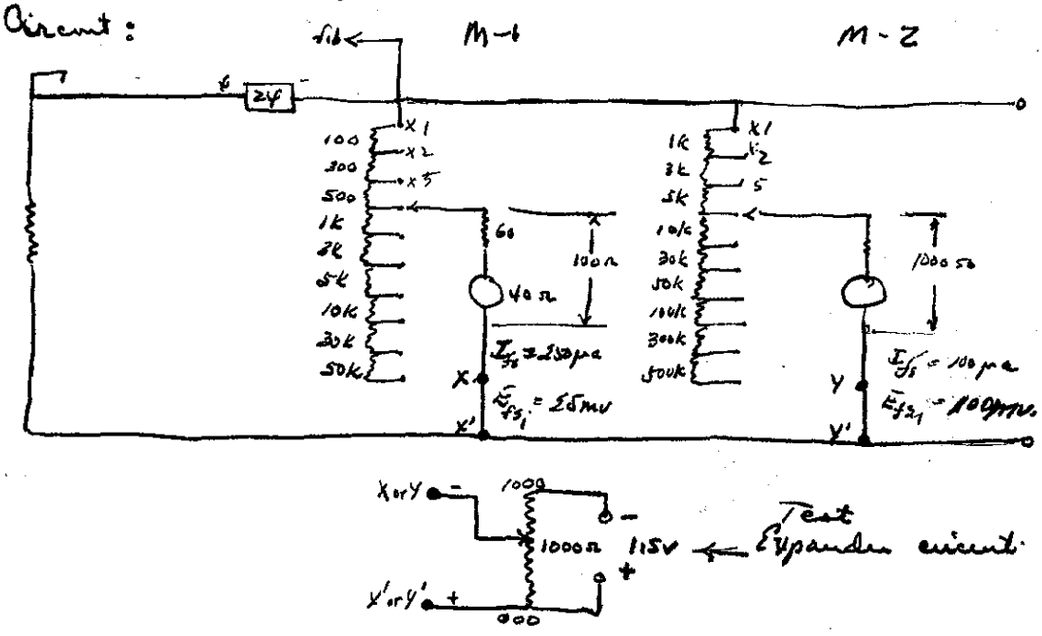
$\phi = \frac{3.4 \times 10^5}{1.257 \times 10 \times 2.32 \times 10^2} = \frac{3.4 \times 10^5}{2.92 \times 10^3} = 1.16 \times 10^2 = 116$ n/cm²/sec

Am Instrument -

DC-2 Type Trg. - Output -

1/21/57 Expanded scale operation -

Circuit:



Made rough check with expander in M-1 circuit -
did get, but - needle & meter as very jumpy - Try in M-2

A- With expander in M-2 circuit, between Y & Y' (short removed) made setg readings to see amount of expansion - Varying zero adj on DC-amps - Data on attached sheet ⇒

1/22/57 Continuation of 1-21-57

Brought in 2mv. Brown Recorder from 202. Attached to recorder output. Helipot still in M-2 circuit. ~~Scale~~

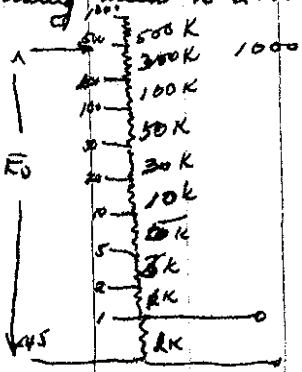
Amp Setting	M-1 Scale	M-1 meter	(calc.) E_o	Scale	M-2 Helipot	M-2 meter	(calc) E_o	Recorder Scale	Recorder Reading	(calc) E_o
9.58										
5.77	5	10mv	(125mv)	2	0.00	58μa	~~200~~ (116mv)	100	1.01mv	(105mv.)

Calculate network for 2-mv. Brown -

10 mv Brown uses R = 2500 @ 10mv $I_{FS} = \frac{10^{-2}}{.25 \times 10^{4}} = 4\,\mu a.$

For 2-mv. — using multi R = 2000 Ω $I_{FS} = \frac{10^{-2}}{.2 \times 10^{4}} = 5\,\mu a$ -

Try: $I_{FS} = \frac{10^{-2}}{.1 \times 10^{4}} = 10\,\mu a$



Removed M-1 from circuit (0-10 ma ARI)
Put panel meter back in service.
M-2 used with Brown 2 mv. recorder.

Grid expander on Brown circuit -

1/21/57

DC-Amp Zero-Adj.	M-1 Scale	M-1 meter	M-2 Scale	M-2 Helipot	(100 ohm) meter	$E_{o\,m1}$ ↓	$E_{o\,m2}$ ↓	R_{cal}	E_K	
5.585 8.30 f	x1	1 mv	x1	000	2 μa	2.5 mv	2 mv			
5.585	x1	4.4 mv.	x1	000	10 μa	11 mv	10 mv			
5.61	x1	10 mv	x1	000	25 μa	25 mv	25 mv			
"	x2	5.2 mv	"	"	"	26 mv	25 mv			
5.65	x2	10 mv	x1	000	48 μa	50 mv	48 mv			
"	x5	4.2 mv	"	"	"	52.5	48 mv			
5.745	x5	9.0 mv	x1	"	100 μa	112.5 mv	100 mv			
"	x10	4.5 mv	"	"	"	112.5 mv	100 mv			
"	x10	4.5 mv	x1	0.74	10 μa	112.5 mv		73 Ω	.098 v	100 mv
5.915	x10	8.9 mv	x1	"	100	222.5 mv				
"	x20	4.45 mv	x1	"	"	222.5 mv				
"	x20	4.45 mv	x1	1.51	10 μa	222.5 mv		148 Ω	.198	200 mv
6.10	x20	6.8 mv	x1	1.51	100 μa	340 mv				
6.10	x20	6.8 mv	x1	2.32	10 μa	340 mv		231 Ω	.296	300 mv
6.30	x20	9.15 mv	x1	2.32	100 μa	457.5 mv				
6.30	x50	3.65 mv	x1	2.32	100 μa	456 mv				
6.30	x50	3.65 mv	x1	3.19	10 μa	456 mv		318	.405	400 mv
6.52	x50	4.65 mv	x1	3.19	100 μa	582 mv				
"	"	"	x1	4.06	10 μa	582 mv		403	.515	
6.76	x50	5.1	x1	4.06	100 μa	713 mv				
6.76	x50	5.1	x1	4.94	10 μa	713 mv		491	.629	
6.895	x50	6.7	x1	4.94	100 μa	838 mv				
6.995	x50	6.7	x1	5.85	10 μa	838 mv		582	.745	
7.245	x50	7.7	x1	5.85	100 μa	963 mv				
7.245	x50	7.7	x1	6.75	10 μa	963 mv		675	.855	
7.50	x50	8.7	x1	6.75	100 μa	1.088 V				
7.50	x100	4.35	x1	6.75	100 μa	1.088 V				
7.5	x100	4.35	x1	7.625	10 μa	1.088 V		762	.962	
7.74	x100	4.85	x1	7.625	100 μa	1.212 V				
7.74	x100	4.85	x1	8.49	10 μa	1.212 V				
7.97	x100	5.30	x1	"	100 μa	1.325 V		949	1.09	
7.97	x100	5.30	x1	9.32	10 μa	1.325 V				
8.19	x100	5.75	x1	9.32	100 μa	1.438 V		932	1.20	

1/21/57

Calculation E_o –

M-1 : $E_{fs} = 10mv$, $R_m = 40\Omega$ $I_{fs} = 250\mu a$

$E_{fs(unit)} = 25mv$ $R_{(unit)} = 100\Omega$

Scale 5 $R = 500\Omega$ $I = 250\mu a$ $E = 125\ mv$

M-2 : $I_{fs} = 100\mu a$, $R_{(1)} = 1000\Omega$

$R_2 = 2000\Omega$, $I = 58\mu a$

~~$E_o = 10^{-4} \times 2 \times 10^3 = 200v.$~~

$E_o = 58 \times 10^{-6} \times 2 \times 10^3 = 116 \times 10^{-3}$

R : $E_{fs} = 2mv.$ $R_{(1)} = 2.5k$ (recorder res) $R_{(100)} = 250k$ (100 ohm res)

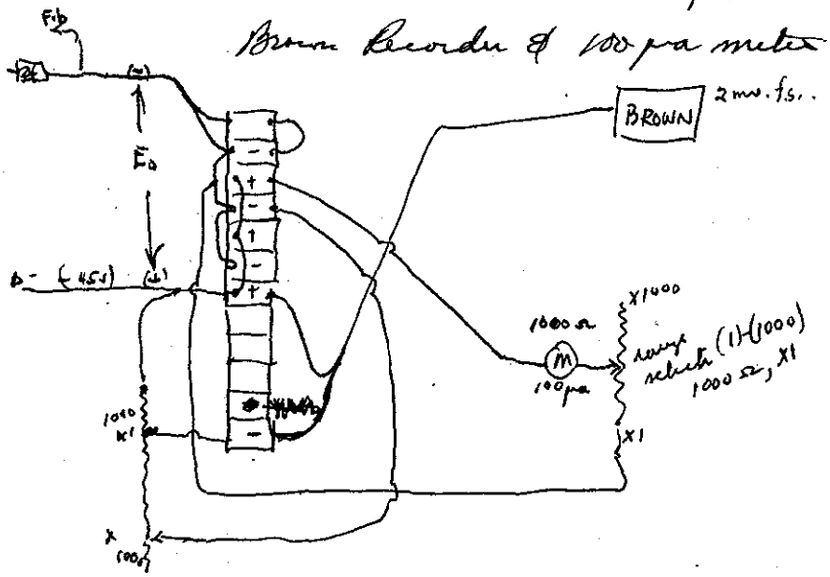
I : $E = 1.05\ mv$, $R = 2.5k\Omega$

$\frac{1.05}{2.5} \times \frac{10^{-3}}{10^3} = .42 \times 10^{-6}$

$E_o = .42 \times 10^{-6} \times 250 \times 10^3 = 105$

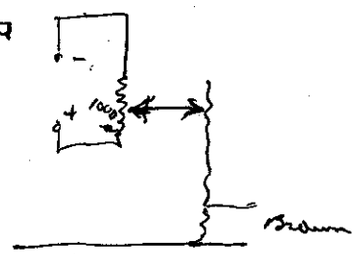
1/23/57 Am Japanese - looked at small recorders - Varian - Bristol - Westronics - L&N.

Am Re-located test rig for chemical manipulation. Brown Recorder & 100 μa meter on output



DC amplifier panel meter - 200 μa f.s. unit Res = 100 Ω. 20 mv f.s.
Microammeter (100 μa) — 100 μa f.s. unit Res = 1000 Ω 100 mv f.s.
Recorder (2 mv) — 2 μa f.s. unit Res = 1000 Ω 2 mv f.s.
Multivoltmeter (10 mv) 250 μa f.s. unit Res. 100 Ω 25 mv f.s.
unit Res = 50 Ω 12.5 mv f.s.

Expander in Brown circuit



1/23/57	DC AMP	← Panel meter		→	←	Microammeter →		←	Recorder		→	
	Zero Adj	Scale	Meter	E_o	Scale	Meter	E_o	Scale	Helipot	Reading	E_R	
	(7.165) 5.675	5 (500) ~~1 (1000)~~	35 μa ~~20 μa~~	17.5 mv ~~20 mv~~	1 (10 m) (1000Ω)	20 μa	20 mv	50 (5×10⁴Ω) 100 mv fs	0.00⁰	19.5%	19.5 mv	Keep recorder on scale 50 as 100 mv ≡ f.s.
	5.795	5 (100 mv fs)	183 μa	91.5 mv	1 (100 mv)	91 μa	91 mv		)61	95%	95 mv	
	"	10 (200 mv)	88 μa	88 mv	2 200 mv	46 μa	90 mv		0.61⁰	5%	(90) 5 mv	
	not recorded		45% 177	177 mv		40% 85 μa	170 mv		)73	95%	(85) 95 mv	
		20 400 mv	85	170 mv	5 500 mv	37 μa	185 mv		1.34	4%	(81) 4 mv	
	6.09⁰		42% 130	260 mv		16% 53 μa	265 mv		)67	95.5	(275.5) 95.5 mv	
		100 (2 v fs)	4% 25 μa	250 mv	20 2 v fs	3% 15 μa	300 mv		2.01	5%	(271.5) 5 mv	
	6.24⁰		33 μa	330 mv		18.5 μa	370 mv		)67	94.5	(366)	94.5
			4%			4.5%			2.68	4.5	(361)	4.5
	6.40⁰		41	410 mv		23 μa	460 mv		)65.5	94.5	(455)	94.5
			4.8%			4%			3.335	6.0	(449)	6
	6.56⁰		50	500 mv		27 μa	540 mv		)67.5	96	(545)	96
			4%			4%			4.01	5.5	(540)	5.5
	6.73⁰		58	580		31	620 mv		)66	94.5	(635)	94.5
			4%			4.4%			4.67	6	(629)	6
	6.90⁰		66	660		35.4	708 mv		)67	96	(725)	96
			4%			4.6%			5.34	5.5	(720)	5.5
	7.08		74	740		40	800 mv		)66.5	95	(815)	95
			4.5			4%			6.005	5.5	(810)	5.5
	727		83	830		44	880 mv			95.5	(905.5)	95.5
									6.67)66.5	5		

stop — UGH bringing in source.

Y-12 DATA SHEET

1/24/57 Work on 107-108 - wiring additions to control cabinets -

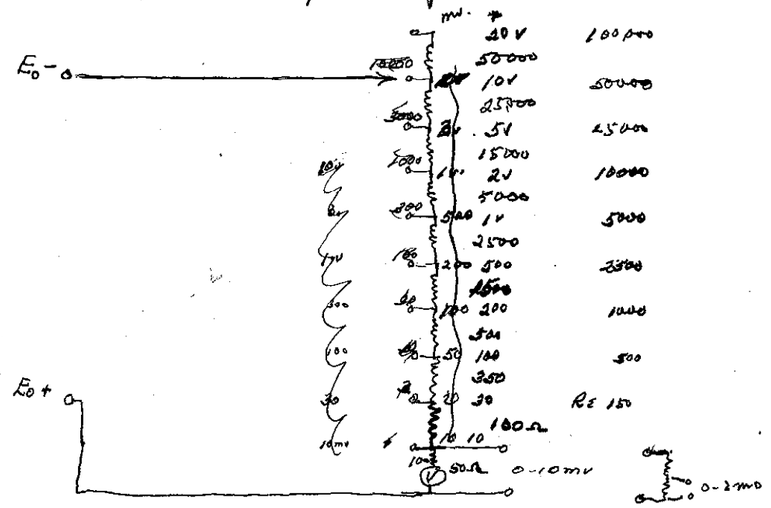
1/25/57 AM East End
PM West End - Consoles 102 - repair.

1/28/57 Instrumentation Considerations - New Wing -
AM - W/ Hanauer discussion of control console layout
PM - instrument needs listed & approx. prices set.

1/29/57 Rep Circuit Considerations -

Simply read 0-10 mv - has internal resistance of 40 ohms.

Try something like the following:



(no expansion considerations here)

2/4/57 (12-8) Check over record of Jan & Dec. No outstanding instrument problem.

Chemists in 211 reported poor gas supply - External tank ok.

Trap in lab "flooded."

Check at 0200 - all apparently normal.

→ Checked over Hanauer's console order suggestion & put in office for Dr. Callahan.

→ Received comment prints from Imm - electrical dic-ri of new work to present structure.

Reviewed prints. One question "Spare" conduit up from 103 thru 105.

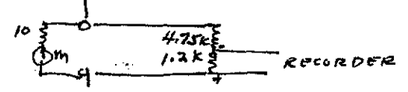
Working divider, shown p 140

2/5/57 (12-8) Conf. w/ADC re-console order-

Using rubicon potentiometer w/ thermocouple to check flow from switches to comp. - check on heat running.

Brought RCA Handbook up to date

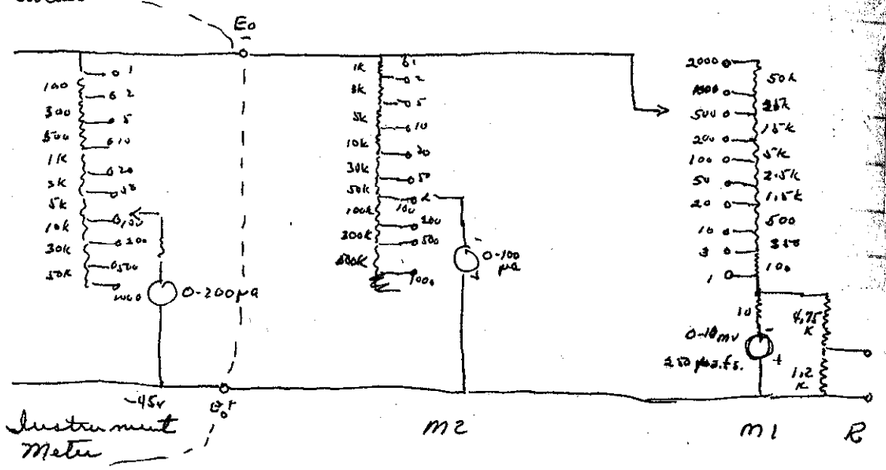
TR 12 ⇒ 0140 Put resistance divider across 0-10 mv output to drop Recorder signal to 0-2 mv. range.



2/5/57 (12-8)

Raw, wiring, clogging. Put back in ball point.

Circuit.



Instrument Meter

With 0-10 millivolt meter in divider shown above & recorder attached at points noted – much oscillation on large change. Meter undamped. This seems to affect recorder.

Disconnect meter, substituting 40Ω resistor.

Source by Chamber Recorder does not "hunt".

M2	26 μa x50	26 μa x50	26 μa x50	same	63 μa x20
M1	out	2.75 mv 1/60Ω shunt	5.46 mv x200	x500	x200
R	65% x200	34% x200	70% x200	28% x500	69% x200
IM	120 μa x100	120 μa x100	120 μa x100	same	120 μa x100

Removed Source IM out

M2 16μa @ x1

M1 1.5mv @ x10 R- 19%

4.2mv @ x3 54%

5 mv x1 85%

M1 on x1 upsets M2 & Recorder

Recorder off 0240

2/6/57 0010 Check Amplifier M2 = 9 μa. (x1)

M1 = 9 mv (x10)

(Recorder off)

Calculations from readings 2/5/57:

R- 6.39 x10³

METER	SCALE	TOTAL RESISTANCE (Ω)	CURRENT	METER VOLTS	METER RESISTANCE	Eo volts	IR μA	E 50Ω
IM	x100	10,000	120 μa 1.2x10⁻⁴	–	–	1.2		
R	x200	10⁴	127	.0013	1.24x10³	1.27	1.065	6.37 mv
M1	–	–	–	–	–	–		
M2	x60	5x10⁴	26			1.30		
IM	x100	10⁴	1.2x10⁻⁴	–	–	1.2		
R	x200	10⁴	132	.00068	1.22x10³	1.32	.857	3.33 (2.53) 4.97
M1	x200	10⁴	136	.00275	40Ω	1.36		3.44
M2	x50	5x10⁴	26			1.30		
IM	x100	10⁴	1.2x10⁻⁴	–	–	1.2	–	–
R	x200	10⁴		1.4mv	1.22x10³		1.18x10⁻⁴	685 mv
M1	x200	10⁴	136	5.45mv	40Ω	1.36		6.81 mv
M2	x50	5x10⁴	26			1.30		
IM	x100	10⁴	1.2x10⁻⁴	–	–	1.20	–	–
R	x500	2.5x10⁴		.54x10⁻³	1.22x10³		.443x10⁻⁴	2.64x10⁻³
M1	x500	2.5x10⁴	57.5 μa	2.3x10⁻³	40Ω	1.43		2.88x10⁻³
M2	x50	5x10⁴	26	–	–	1.30		
IM	x100	10⁴	1.20x10⁻⁴			1.20		
R	x200	10⁴		1.38mv			1.13x10⁻⁴	6.76
M1	x200	10⁴	137	5.5x10⁻³	40	1.37		6.88
M2	x20	2x10⁴	63			1.26		

RANGE "A"
Range "A"
RANGE "B"
2/5/57
Range change
oscillation
MD-1 & Recorder

2/7/57 Re-arranged components of test - potting amp. chassis. on holder on chassis vertical. Allows room for stroke theory (00

While waiting for instrument & warm-up. Made up 7 foot power cable. Always need extensions.

Wired stepping switch to operate 0-10 mv. meter & indicator lights. Made separate selenium rectifier power supply. Noted interaction on panel meter on range changes by means of stepping switch.
(Summary of types of dividers)

2/8/57 More re-arrangement.

added 0-100 μa meter - interaction sometimes present - not extremely serious.

added recorder (on same leg as millivoltmeter) large amplitude pointing, due to mv. meter.

Need to separate recorder & mv. meter dividers

E_0 -

Source in place - Panel meter 105 (x100) 1.05 volts

0-100 μa 59 μa (x20) 1.14 volts

0-10 mv. 4.8 mv (?) (x200) 1.22 volts

Recorder 59-63 %

Put 51 Ω resistance across 50 Ω meter branch.

Meter - from 4.9 mv to 2.65 mv

Recorder from 59-63% to 29%

to range 8 -

back to range 6 (x100) meter 4.9 mv

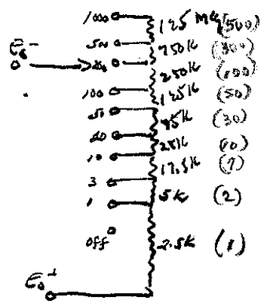
Recorder 60-61 greatly reduces pointing

2/8/57 Disconnect meter - recorder off-scale range 6

To range 7 - Recorder reads 58 % no appreciable.

Without voltmeter recorder reacts as one would expect.

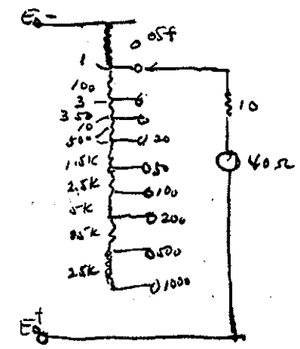
Try recorder on separate divider -



if use 1 kΩ unit

$\frac{10 \times 10^{-3}\ V}{10^3} = 10\ \mu a.$

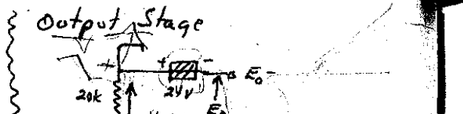
Re-arrange mv-divider so:



DC-2 Type

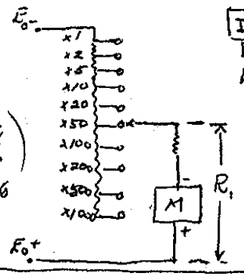
2/2/57 Summary of arrangements tested:

Output Stage



E_o	0	4	8	16	20	22	24	Volts
I_c	1200	1000	800	400	200	100	0	μamps

(A) Panel Meter, as Built:

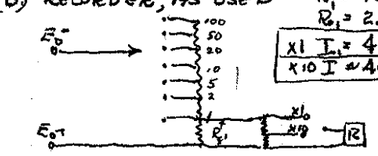


For use in future as test only (keep out of circuit in operation)

I_m = 200 μa.
R_1 = 100 Ω.
E_1 = 20 mv.

Scale:	1	2	3	5	10	20	50	100	200	500	1000	2000
R (Ω)	10^2	2×10^2		5×10^2	10^3	2×10^3	5×10^3	10^4	2×10^4	5×10^4	10^5	
E_o (V)	.02	.04		.10	.20	.40	1.0	2.0	4.0	10	20	

(B) Recorder, as used



E_1 = 10 mv.
R_1 = 2.5×10^3

x1 I_c = 4 μa
x10 I ≈ 40 μa

	x1	x2	x3	x5	x10	x20	x50	x100	x10 x20	x10 x50	x10 x100
R (Ω)	2.5^{3}	5×10^3		1.25×10^4	2.5×10^4	5×10^4	1.25×10^5	2.5×10^5			
E v	.01	.02		.05	.10	.20	.50	1.0	2.0	5.0	10.

(C) Microammeter, similar to (A)

LIMITED IN USEFUL RANGE

I_m = 100 μa
R_1 = 10^3 Ω
E_1 = 100 mv

Scale	1	2	3	5	10	20	50	100	200	500	1000
R (Ω)	10^3	2×10^3		5×10^3	10^4	2×10^4	5×10^4	10^5	2×10^5	5×10^5	10^6
E_o (V)	.100	.200		.500	1.0	2.0	5.0	10	20	50	100

NOT POSSIBLE

(D) Millivoltmeter, similar to (A)

meter undamped

I_m = 250 μa. (R_m = 40 Ω)
R_1 = 100 Ω (E_m = 10 mv)
E_1 = 25 mv

Scale	1	2	3	5	10	20	50	100	200	500	1000
R (Ω)	10^2	2×10^2		5×10^2	10^3	2×10^3	5×10^3	10^4	2×10^4	5×10^4	10^5
E_o	.025	.05		.125	.25	.5	1.25	2.5	5.0	12.5	25.0

(E) Recorder

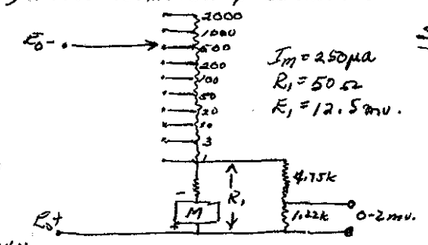
E_1 = 2 mv
R_1 = 10^3
I_m = 2 μa

Scale	1	2	3	5	10	20	50	100	200	500	1000
R (Ω)	10^3	2×10^3		5×10^3	10^4	2×10^4	5×10^4	10^5	2×10^5	5×10^5	10^6
Ev	.002	.004		.010	.02	.04	.10	.20	.40	1.0	2.0

similar to B, but no extra attenuator. single divider

→ added decade possible here ←

2/9/57 (F) Millivoltmeter & Recorder:



interaction between undamped meter & recorder (see p 142)

Scale	1	2	3	5	10	20	50	100	200	500	1000	2000
R (Ω)	50		150		500	1000	2500	5×10^3	10^4	2.5×10^4	5×10^4	10^5
E (V)	.0125		.0375		.125	.25	.625	1.25	2.5	6.25	12.5	25

(G) Millivoltmeter, as in (A)

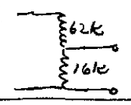
I_m = 250 μa R_m = 40 Ω
R_1 = 50 Ω E_m = 10 mv
E_1 = 12.5

using step-switch

Scale	1	2	3	5	10	20	50	100	200	500	1000	2000
R Ω	50		150		500	10^3	2.5^{3}	5×10^3	10^4	2.5×10^4	5×10^4	10^5
E (V)	.0125		.0375		.125	.25	.625	1.25	2.5	6.25	12.5	

(H) Recorder, as (F) but no meter

R_1 = 10^3 Ω
E_1 = 10^{-2} V
I_1 = 10 μa.
2 mv attenuator



Scale	(1) 1	(2) 3	(3) 10	(4) 20	(5) 50	(6) 100	(7) 200	(8) 500	(9) 1000	→ Indicator lamps
R (Ω)	10^3	3×10^3	10^4	2×10^4	5×10^4	10^5	2×10^5	5×10^5	10^6	
E (V)	.010	.03	.10	.20	.50	1.0	2.0	5.0	10.0	

At present (A) can be used 200 μa
(C) is wired 100 μa
(G) is wired to step switch 250 μa
(H) is wired to step switch 10 μa

2/9/57
0048

Run series of readings with Panel Meter out of circuits,
Microammeter, Millivoltmeter and Recorder

(C) (G) (H)

Vary Zero on Amp & record readings of meters. (Leave fine zero at 4.0

* Pen on scale 1 shutters slightly. , 2/50 on scale 2
* Before coming to 3½ pen had gone off scale negative. -
after reading 3½ pen breaks.
† with source added
noted that recorder did not follow meters.
when millivoltmeter < 10% recorder on zero.

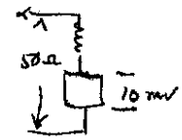
Calculation E_0.

μamp. sample on scale 1 $R = 10^3$

If $I = 2\,\mu a$ $E = 2\times10^{-6}\times10^3 = 2\,mv$

on range multiply by factor.

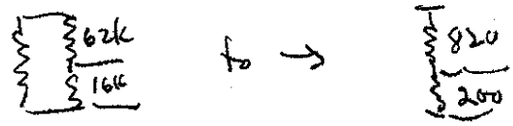
mv.:



meter reading × 1.25 = unit reading.
then use scale factor

If E_m = 1 mv 1.25 mv

Change recorder divider



This helps recorder reading.

→ Placing 0.1 capacitor across coil cut out large kick on range changes.

	DC AMP ZERO ↓↓↓	MICROAMMETER Scale	MICROAMMETER Meter	MILLIVOLTMETER SCALE	MILLIVOLTMETER METER	RECORDER SCALE	RECORDER RECORD
	5.74	1	2 μa	* 1	2-4 mv	1	2%
	5.74+	1	3 μa	1	1 mv	1	11%
	5.75	1	5.5 μa	1	2 mv	1	35%
	5.75+	1	8 μa	1	3 mv	1	61%
	5.76	1	11 μa	1	4 mv	1	89%
change scale	—	1	13 μa	* 2	3 mv.	2	30%
	5.775	1	24 μa	2	5 mv.	2	63%
	5.79	1	35 μa	2	7 mv	2	99%
Change range	"	1	35 μa	3	2.5 mv	3	21%
	5.86	1	77 μa	3	5.3	3	66%
	5.89	1	97 μa	3	7.2	3	88%
change range	"	1	97 μa	4	4.3	4	36%
"	"	2	49 μa	4	4.0	* 4	36%
	5.97	2	72 μa	4	6.0	4	62%
	6.05	2	93 μa	4	8.0	4	85%
change range	"	2	93 μa	5	3.5	5	25%
	"	5	40 μa	"	"	"	
	6.20	5	56	5	5.0	5	42.5
	6.30	5	67	5	6.0	5	55%
	6.40	5	77	5	7.0	5	66%
	6.51	5	88%	5	8.0	5	78%
	6.61	5	98%	5	9.0	5	89.5
change range	"	5	98%	6	4.35	6	37.5
"	"	10	52%	6	4.30	6	37.5
	6.27	10	54%	6	5.0	6	45.5
	"	10	70	6	6.0	6	57.5
	7.23	10	80	6	7.0	6	68.5
	7.49	10	91	6	8.0	6	81%
	.7	20	49	~~6~~ " 9		"	
	7.25	20	54	6	9.0	6	93.5
change	"	"	"	7	4.5	7	40
		20	70	7	6.0	7	56.5
		20	80	7	7.0	7	68.
		20	92	7	8.0	7	80

E_o (μa)	CALCULATED E_o (mv)	E_o (R)
2 mv	1.5 - .5 mv	.195
3 mv	1.25 mv	1.09
5.5 mv	2.5	3.41
8 mv	3.75	5.91
11 mv	5	(8.65)
13 mv	~~7.5~~ 11.5	8.8
24 mv	~~12.5~~ 18.9	18.1
35 mv	~~17.5~~ 26.2	28.9
35 mv	31.2	20.5
77 mv	66.3	64.7
97 mv	90	85.8
97 mv	107	70.4
98 mv	100	70.4
144 mv	150	12.2
186 mv	200	170
186 mv	219	122
200 mv	219	120
280 ~~290~~ mv	312	
335 ~~268~~ mv	377	
385 ~~308~~ mv	438	
~~440~~ 382 mv	580	
~~490~~ 392	563	
~~478~~ 392	544	
520	538	
590	625	
700	750	
800	~~1,000~~ 875	
910	1,00 v.	
980	1,00 v	
1.08 v.	1.12 v	
1.08	1.12 v	
1.4	1.50	
1.64	1.75	
1.94	2.00	

MICROAMMETER scale	MICROAMMETER meter	scale	millivolt-meter reading	RECORDER reading	E_o μa	E_o mv	E_o (R)
50	39	~~6~~ (7)	8.0	80%	1.95 v	2.00	
50	43	7	9.0	92.5	2.15	2.25	
		8	3.7	98%	2.15	2.31	
50	44	8	3.8	99.5	2.20	2.37	
* 50	58	8	5.0	45	2.90	3.12	
50	68	8	6.0	56	3.40	3,75	
50	79	8	7.0	68	3.95	4.37	
50	44	8	3.9	29.5	2.20	2.37	
		9	2.0	7		2.50	
1	10	2	2.5	18	10 mv.		

MCX-805 (Jan '48) Y-12 DATA SHEET

2/12/57 - Step. Switch contacts seem to be loose on several positions of millivoltmeter range. This is switch played with before use in divider.

Loose joints on recorder divider - Resoldered joints
Re-wired divider for millivoltmeter

2/12/57. Work on counters in Rm. 202.

2/14/57 Construction Inspection -
West End Instrumentation

2/15/57 Trip - Step Switch - loose contact on various positions
2/18-20/57 Ordering new equipment
2/20-21/57 Lucian Amplifier from 107 "Y-90319" see file
2/22/57 Log Count Rate Meter (see file)
2/23/57 Lucian Amp Y-90319 (see file)

Scaler Y 89681 from bench to tall rack
DC-2 to rack from bench

2/25-3/1 Log Count Rate Meter - (see file)
3/4 Log Count Rate Meter file up to date
Lucian Amplifier - Pre-Amps - check out for proton counter
To do - test counters S-2 #3 ; S-3 #4 [S-1 #8-2 in 201]
Data to be recorded in file to determine sensitivity & operating characteristics.
3/5-7 Calibration and checking Lucian amplifier.
3/8 Bell motor one re-installation.

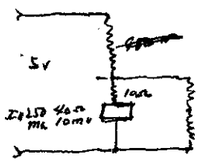
3-11-57 Regulator for miniature fission counter calibrators.

4/9/57 Keithley 410 check out - refer folder.

4/9/57 Output meter for Keithley $V_0 = 5v.$

$I_0 = 5 \times 10^{-3}$ a. ←

$R_0 = \frac{5}{5} \times 10^3 = 10^3 \Omega.$



$I = 250 \times 10^{-6}$ fs. $R = \frac{5}{.25} \times 10^3 = 20 \times 10^3 \Omega.$

Millivoltmeter - Meter + 20,000 Ω - undamped - reading slightly > panel meter. Damped with shunt of 500 Ω - reading as panel meter. Workable [Preferred for DC-2 Type]

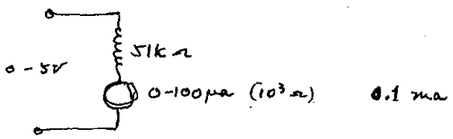
Microammeter - Meter + 50,000 Ω - reads as panel meter at This not fitted as DC-2 type] worst end. Refer to p. 196

10^{-4} a & $10^3 \Omega$ min. scale 100 mv fs.

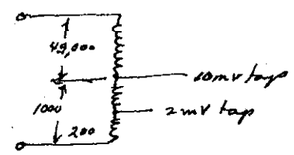
4-11-57 Recorder signal circuits for Keithley -

a. 0-10 mV.

Output, so far



Recorder

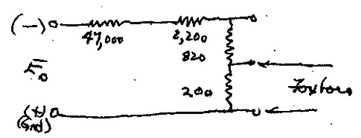


a' If run 2 ma fs.

$R_\varepsilon = \frac{5}{I} \times 10^3 = 2.5$ K Ω

$R_{10mv} = \frac{10 \times 10^{-3}}{2 \times 10^{-3}} = 5 \Omega$ too low.

Want $R_{10mv} \# 10^3$ $I = \frac{10 \times 10^{-2}}{10^3} = 10 \times 10^{-5} = 100$ μa.

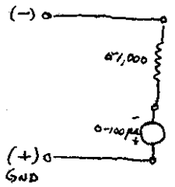


E_0

When Meter $\# 4 \times 10^{-11}$, 40 μa,

Foxboro read $\frac{1}{3}$ mv.

4/14/57 Output - Keithley



halted for fission chamber check.
C4, 202 had C5-3 & Pre-amp 347
C5, 202 had C5-2 & Pre-amp 349
20 channel had sharp high peak on C5.
This still present when C5-3 used w/ pre amp 349
Is it pre-amp trouble? Refer file on pre-amps for notes.

5/1/57 Conf. DWM - Controls for new installation
Conf. OFC - ½ inch BF_3 proportional counter. to normalize in scale reg.
Check out Ion Chamber Simulator on Keithley 410 - 180.
Testing Beckman Model V micro-microammeter.

5/2/57 Continuation of Beckman Model V. Trouble corrected 1020
Beckman mod V, Keithley 178, & Keithley, all w/ chambers to monitor
beam [illegible]. D. Scott raised objection to Channel E modification

5/3/57 Talked w/ J.F.E. regarding instrument modifications.
Beckman - drew up circuit of input. Monitor west end.
Call rc. Counting channel 4 - seems OK.
Run sensitivity curves on Linear Amp Y 90819-
Data on RCL COUNTERS 371 & 1018 -

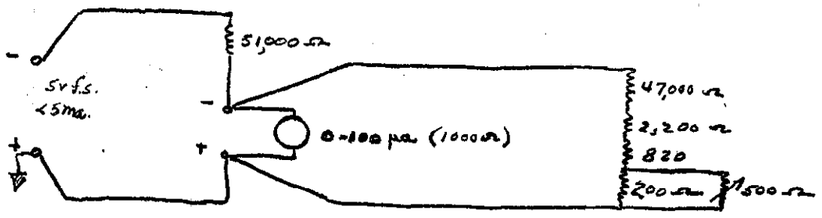
5/6/57 Continuation of data collection for RCL counters - Brought in numbers 367 and 1016 from 108. Refer file re counters
Re-wiring of AIC 20STB pre-amplifiers for better interchangeability.
Continuation of operation checks on Beckman Model V & Keithley 410

5/7/57 Further work with RCL counters
20-Channel analyzer resolution problem

5/8/57 More checks on new instruments of high design.
20-channel analyzer
Linear Amplifier, Pre 202, C5, blown fuse, fixed, replacing 5784 which was grassy.

5/9/57 20-channel analyzer.
New equipment.

5/9/57 Keithley output circuitry —



meter 100 μa f.s. ⇒ $10^3\Omega$ ⇒ $E_m = 10^{-4} \times 10^3 = 10^{-1} = 100mv$

Removed shunt — no change in readings or meter action

For bench check with 2mv. Brown design shunt:

- let $R_p = 1000\Omega$ $E_p = 2\times10^{-3}v.$ $I_p = \frac{2\times10^{-3}}{10^3} = 2\times10^{-6}a.$

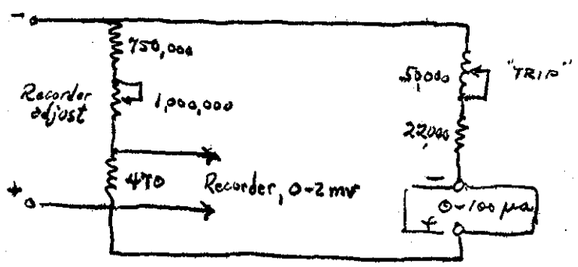
→ if shunt across meter only: $E_f = 100mv.$ $R_f = 50{,}000\Omega$
use shunt as above.

→ if shunt across entire output:

$E_f = 5V$ $R_f = ?$

$\frac{R}{10^3} = \frac{5000}{2}$ $2R = 5\times10^6$ $R = 2.5\times10^6$

As wired:

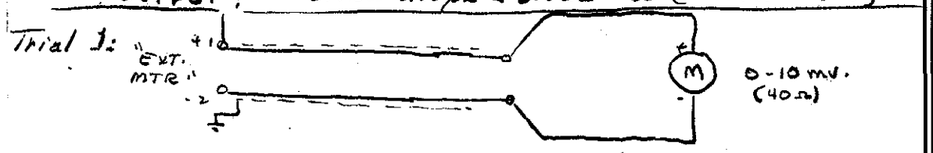


5/10/57 Continuation of trip circuit considerations —

Beckman:

OUTPUT: Either 200 μa < 500Ω or (0-50 mv 24kΩ)

Trial 1: "EXT. MTR"



Requirement (from circuit print) 200 μa, <500Ω.

With meter directly tied as shown —

Signal on Beckman meter 90-100% 3×10^{-12}

Meter dancing between 80-100% - NEEDS TO BE DAMPED

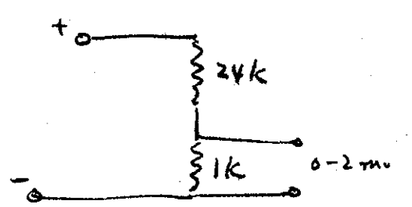
→ (want test meter to read less than instrument meter so that not trip with on-scale instrument readings)

Damping Resistor	0-10 mv Reads
∞	80-100%
470Ω	75-90
390	70-90
270	75-85
200	X X
150	

get less sensitive scale. 3×10^{-11}

Damping Res.	Beckman	Ext.	
270	85-90	68-72	
380	"	70-75	looks about ok.

Recorder



This works very well w/ 2mv. Brown

5/13/57 Further Readings on Beckman & Kuthley instruments —

weak η-source -	Beckman - 25%	3×10^{-12}	$.75 \times 10^{-12}$	2% 10×10^{-13} $.5 \times 10^{-13}$
	Kuthley - 2% "		$.72 \times 11^{-12}$	20% $\pi \times 10^{-13}$ $= 7 \times 10^{-13}$ 10×10^{-13}

→ Scale Selector Trouble in Beckman on two most sensitive scales

PN-57 source Beckman 38% (10×10^{-11}) ; 13% (3×10^{-10})

Kuthley 38% (10×10^{-11}) ; 12% (3.2×10^{-10})

Servicing C_1 & C_3

5/14/57 Work on several units of C_3 channel

Continued with final observations of Beckman & Kuthley.

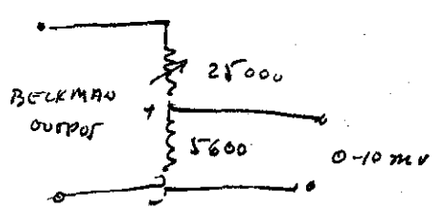
5/15/57 More on C_3.

Received 2 new Westronic recorders —

5/16/57 Completed C_3 -

Connected New recorders to power & signal from Beckman & Kuthley amplifiers.

Modified resistance networks for 10 mv. recorders



5/12/57 Recorder - Misc. Microammeter Calibrations

RANGE (BOTH INST)	(%) OUTPUT	BECKMAN (%) RECORDER	(%) TRIP	(%) OUTPUT	KEITHLEY (%) RECORDER	(%) TRIP	
5/ 3×10^{-12}	15-17	Trace 2% 15-17	—	not	narrow trace 14	—	
	28-30	Trace with K 2% 28-30	—	26-27	narrow trace 26-27	—	
	49-52	Trace 2% 50-53	—	53	narrow trace 53 minor trace	—	
	72-76	Trace 3% 73-78	60	71-72	72-73	60	
	adjusted recorder			adjusted recorder & meter			
	94-99	Trace 5% 98-99	80	98-10	Trace 1% 98-100	85	
10×10^{-12}	29-30	narrow w/spikes 29	26	30	29.5 1/2	27	
	55-57	1% trace 55-54	45	54-55	53-54 1/2	47	Source closest to K
	74-76	1% 75-76	62	76-77	75-76 1%	66	"
	92-94	1% 93-95	77	94-96	94 1%	81	K 16¼ tp B 16" tp
3×10^{-11}	32	hi: 3/4 (32)	28	33	31.5 (32)	29	B 27 K 27
	71	71 + (71.6)	59	70	69.2 (70)	60	
	89-90	HF: 89.5 (90)	74-75	85-86	84.8 1/2 (85)	74	
		Out (Brought in new Inst)					
3×10^{-10}	72	72 (72.5)	60	73	72 (72.6)	63	

figures in ( ) scale indications, shown paper off from scale.

(Adj. Keithley output to lower meter & recorder)

⇒ Found that pen holder is adjustable on Westronic recorders. Adj so proper correspond to scale.

72	72	(72.1)	60	73	73	(73) 60	OK.

Adjust scale on this recorder to get proper & read the same

with weak gamma source in position between chambers.

compared signals

Beckman trace 10 div Keithley trace 1 division

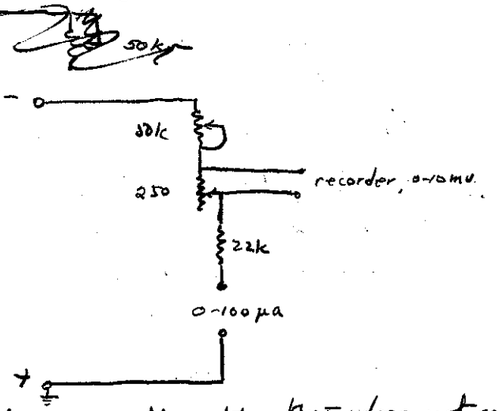
WCX-885 (Jan'48) Y-12 DATA SHEET

5/16/57 Keithly output -

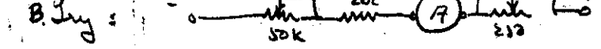
Network across entire output - cannot get recorder to track - (see p 164 for diagram) ↓

will not track when using net across (0-100 μa) meter.

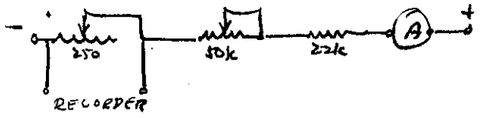
To get tracking try recorder in series w/ meter.



Tracking now all right, BUT does not zero. Can't zero recorder reading 2%.

B. Try: 

Have zero = 5%

C Try: 

Zero OK. ⇐

5/17/57 Plugged in at 9:00 AM - Runs began to operate in ± 15 sec.

Brought in gamma source (10 mg Ra) to provide signal to calibrate recorders with various instruments

Set source at different distances from chamber to obtain varying output readings from instruments.

Data to left.

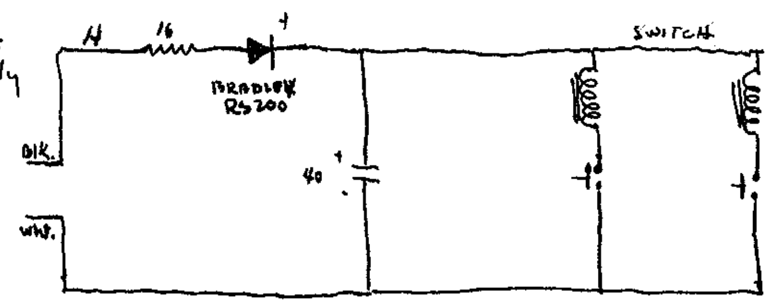
6-3/? S. Wing wiring.

6-5-57 Components yet to be built for South Wing.

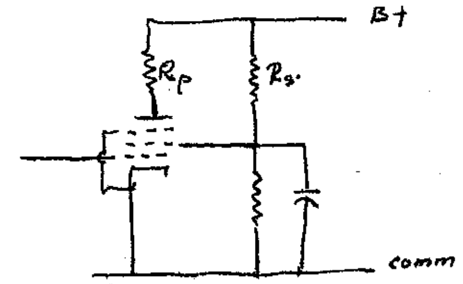
- H Scaler Timer - (V.G.H.)
- H Scaler Selector switch panel for Log C.R.M. input. (V.G.H.)
- Trip meter panel — Log CRM, Period (2), Linear (2) P.m (2)
- · Period Amp. Beckman VL
- H Audio Amplifier (V.G.H.)
- H Log N select switch panel for Wheelco Recorder
- Differential circuit for Beckman V output
- Relay Trip Keithly 410
- Lo Level P.M. Trip.
- H High Level Trip - (worked out - just needs be built as unit.

[Notes on Step Switch - Contemplated for West End -

Circuit: for power supply



6/5/57 Comparison of characteristics of sharp cut off pentodes - consideration of trip circuit application.

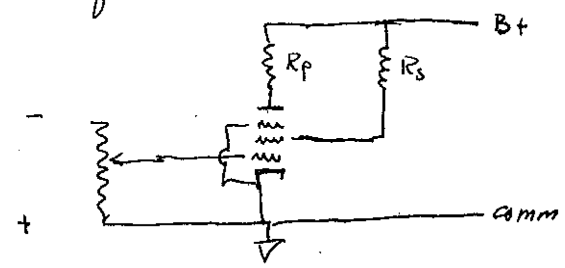


· Start with $E_{B+} = 150$ v

(6AK5) 5654
6AH6
6AU6
6CB6

6AH6 $E_A = 150$, $E_s = 150$, Try $R_p = 7500$. -

Set up changed from above



Collected data on 6AH6 & 6AU6. Began on 6CB6 drift conduct.

6CB6 looks doubtful.

6-7-57 Plotted data -

Took data on 6AH6 with E_s held at 150 volts - to plot $E_p - I_p$ curves.

6-10-57 Took data on 6AU6 - $E_B = 150$; $E_s = 150, 110, 50$ v

$E_B = 110$; $E_s = 110$

Plotted data -

6-11-57 Took data on 6AQ5 $E_B = 110$; $E_s = 110, 50$

$E_B = 150$; $E_s = 50, 110, 150$

Plotted data

6-12-57 Select as first choice 6AU6 from among three triads. Clean plate characteristics.

6AH6 6-7-57

E_B = 150 E_S = 150

E_s	e_p K≈ 3.3 (3.1)	3.9 / 3.9	4.9 / 4.7	6.8 / 6.8	8.3 / 8.2	(11) / 10	(11.8) / 12	(15.1) / 15	(20) / 20	(26) / 27	(45) / 47	(145) / 150
0	74/23	67/20.3	60/18	48.5/14.1	42/12.5	32.6/10.5	30.5/10	23/8.25	19.6/6.26	17.2/4.52	14/2.85	6.3/.92
.5	76.5/22.8	69/19.8	63.5/17.5	51.8/13.8	45.5/12.2	37.2/10	35/9.8	27/7.95	19.4/6.25	15.7/4.38	11.7/2.9	6.1/.92
1	78/22.5	72/19	65.8/16.6	55/13.2	49.4/11.7	41.7/9.8	39.8/9.3	32.8/7.55	25.6/5.95	19.3/4.61	10.3/2.92	5.2/.93
1.5	84/20.2	72.5/19	66.4/16.5	56.6/13.2	51.5/11.5	44.5/9.6	42.5/9.1	36/7.3	30/5.7	24.4/4.5	15.7/2.8	4.7/.94
2.0	99/15	87.5/15	74.5/15	55.5/13.2	50.6/11.5	44/9.7	42.5/9.1	36.6/7.3	31/5.66	26.4/4.4	19.4/2.73	7.3/.92
2.5	112/11.4	103/11.3	95.7/11.3	68.5/11.5	52.5/11.5	42.6/9.8	41/9.15	35/7.4	30/5.74	25.4/4.48	19.4/2.74	9.3/.92
3.0	122/8.78	114/8.78	106/8.75	88/8.72	75.5/8.72	54.5/8.72	47.2/8.72	38.5/7.5	28.2/5.4	23.6/4.5	18/2.76	9.4/.92
3.5	127/6.6	122/6.63	116/6.63	103/6.62	96.3/6.53	76.6/6.47	61.7/6.5	48.6/6.5	27.5/5.82	22.8/4.17	16.4/2.8	8.7/.92
4.0	134/4.66	130/4.8	125/4.78	115/4.76	108/4.78	97.6/4.72	95.8/4.72	74.8/4.7	51/4.68	25/4.45	15.6/2.82	7.6/.92
5.0	142/2.17	140/2.20	137/2.22	133/2.25	130/2.26	124/2.25	122/2.26	113/2.26	102/2.29	82.6/2.26	45/2.22	6.2/.92
6.0	146/.92	144/.93	143/.93	142/.93	140/.93	138/.93	137/.93	133/.93	128/.93	123/.93	106/.93	28/.92
7.0	147 .3	147/.32	147/.32	147/.3	147/.32	145/.32	144/.32	143/.32	142/.32	140/.32	134/.32	103/.32
8.0												
9.0												
10												

6-7-57
6AH6
E_B = 150
E_S = 150

WCX-885 (Jan'48) Y-12 DATA SHEET

TUBE 6AH6

= 47k E_B 150

R_s = 33k

E_{sig}	R_p = 3.9k I_p	I_s	R_p = 8.2k I_p	I_s	R_p = 12k I_p	I_s	R_p = 20k I_p	I_s	R_p = 27k I_p	I_s	R_p = 3.9k I_p	I_s	8.2k I_p	I_s
0	8.65	1.93	8.4	2.0	8.2	1.98	5.8	2.1	4.52	2.2	10.4	2.45	10.2	2.45
.2	8.1	1.86	7.87	1.9	7.8	1.90	5.85	2.0	4.54	2.1	10.05	2.35	9.7	2.33
.4	7.55	1.75	7.3	1.78	7.25	1.80	5.92	1.88	4.58	1.97	9.3	2.2	9.0	2.2
.6	7.53	1.65	6.83	1.68	6.77	1.70	5.98	1.74	4.60	1.84	8.72	2.08	8.38	2.06
.8	6.54	1.55	6.35	1.57	6.26	1.60	5.92	1.60	4.62	1.70	8.0	1.92	7.67	1.90
1.0	6.05	1.45	5.87	1.47	5.79	1.48	5.58	1.50	4.68	1.57	7.34	1.80	7.1	1.78
1.2	5.60	1.35	5.46	1.37	5.40	1.40	5.20	1.40	4.61	1.43	6.72	1.65	6.6	1.65
1.4	5.18	1.27	5.00	1.30	4.93	1.3	4.80	1.30	4.48	1.33	6.22	1.55	6.18	1.55
1.6	4.73	1.20	4.62	1.20	4.59	1.2	4.45	1.20	4.27	1.24	5.68	1.4	5.38	1.4
2.0	4.00	1.02	3.90	1.00	3.90	1.05	3.77	1.04	3.70	1.06	4.7	1.2	4.64	1.2
2.4	3.32	0.86	3.24	0.86	3.22	0.90	3.12	0.88	3.1	0.9	3.84	1.0	3.87	1.0
2.8	2.7	0.73	2.65	0.72	2.65	0.75	2.55	0.75	2.56	0.76	3.05	0.84	3.08	0.83
3.2	2.23	0.60	2.13	0.59	2.10	0.60	2.14	0.63	2.1	0.62	2.46	0.65	2.48	0.67
3.6	1.78	0.50	1.68	0.47	1.65	0.48	1.63	0.50	1.62	0.5	1.94	0.50	1.90	0.50
4.0	1.35	0.38	1.30	0.35	1.26	0.39	1.25	0.38	1.28	0.4	1.40	0.38	1.42	0.40
4.5	0.94	0.26	0.90	0.25	0.88	0.28	0.87	0.28	0.88	0.3	0.95	0.25	0.96	0.25
5.0	0.63	0.18	0.60	0.18	0.58	0.20	0.58	0.19	0.6	0.2	0.60	0.17	0.63	0.18
6.0	0.20	0.08	0.20	0.07	0.20	0.06	0.20	0.08	0.2	0.09	0.2	0.06	0.20	0.07
7.0	0.06	0.02	0.05	0.02	0.04	0.02	0.05	0.02	0.05	0.02	0.05	0.02		

WCX-885 (Jan'48) Y-12 DATA SHEET

6AU6 — 6/6/57

EB=150	Rs=4.7k Rp=3.9k Ip	Is	Rp=12k Ip	Is	Rp=27k Ip	Is	Rs=10k Rp=3.9 Ip	Is	Rp=12k Ip	Is	Rp=27k Ip	Is	Ip	Is
0	13	5.25	10.5	6.3	5.15	8.8	10.4	4.15	9.6	4.4	4.95	5.73		
.5	11	4.48	10.12	5.65	5.04	6.9	8.76	3.4	8.35	3.57	4.90	4.50		
1.0	8.9	3.5	8.34	5.7	4.94	4.98	7.16	2.74	6.88	2.8	4.75	3.47		
1.5	7.15	2.8	4.84	2.8	4.75	3.7	5.8	2.24	5.60	2.45	4.54	2.60		
2.0	5.58	2.2	5.34	2.2	4.5	2.6	4.56	1.75	4.45	1.8	4.10	1.90		
2.5	4.2	1.64	4.34	1.6	3.8	1.66	3.5	1.34	3.44	1.34	3.20	1.34		
3.0	3.06	1.12	3.0	1.2	2.8	1.14	2.6	0.99	2.54	0.97	2.45	1.06		
3.5	2.17	0.83	2.13	0.82	2.02	0.8	1.85	0.70	1.80	0.67	1.80	0.7		
4.0	1.5	0.57	1.45	0.55	1.4	0.53	1.3	0.45	1.24	0.44	1.25	0.46		
4.5	1.0	0.36	1.0	0.35	0.97	0.35	0.9	0.30	0.88	0.3	0.9	0.30		
5.0	0.7	0.24	0.75	0.24	0.7	0.22	0.66	0.20	0.65	0.2	0.65	0.2		
5.5	0.53	0.18	0.56	0.15	0.53	0.15	0.50	0.15	0.5	0.15	0.50	0.15		
6.0	0.42	0.11	0.42	0.11	0.42	0.11	0.40	0.10	0.4	0.11	0.4	0.11		
6.5	0.38	0.10	0.38	0.10	0.36	0.10	0.35	0.10	0.35	0.10	0.35	0.10		
7.0	0.20	0.08	0.32	0.08	0.30	0.08	0.30	0.09	0.3	0.08	0.30	0.08		

Es	Rs=24k Rp=3.9k Ip	Is	Rp=12k Ip	Is	Rp=27k Ip	Is	Rs=47k Rp 3.9k Ip	Is	~~12k~~ Ip	Is	27k Ip	Is
0	7.68	2.88	7.3	2.92	4.8	3.36	5.13	1.95			4.52	2.02
.5	6.4	2.4	6.15	2.4	4.65	2.73	4.5	1.64			4.0	1.63
1.0	5.23	1.97	5.1	2.0	4.42	2.15	3.76	1.36			3.46	1.38
1.5	4.27	1.6	4.2	1.62	3.95	1.72	3.10	1.13				
2.0	3.46	1.3	3.4	1.3	3.30	1.25	2.54	0.93			2.40	0.92
2.5	2.64	1.0	2.63	1.0	2.60	1.05	2.02	0.74				
3.0	2.05	0.77	2.03	0.77	2.02	0.79	1.60	0.57			1.52	0.6
3.5	1.47	0.53	1.5	0.55	1.5	0.56	1.2	0.41				
4.0	1.06	0.38	1.1	0.4	1.1	0.4	0.92	0.3			0.9	0.32
4.5	0.80	0.25										
5.0	0.60	0.20	0.6	0.2	0.6	0.2	0.55	0.17			0.53	0.17
~~5.5~~												
6.0	0.40	0.10	0.4	0.1	0.4	0.1	0.38	0.1			0.37	0.1
~~6.5~~												
7.0	0.30	0.07	0.3	0.08	0.3	0.08	0.3	0.08			0.30	0.08

6CB6 — 6/6/57

6CB6	Rs 47 Rp 39 Ip	Is	Rp 12k Ip	Is	27k Ip	Is	Rs=10k Rp 3.9k		20k		27k	
0	12	2.45	7.68	2.35	4.7	2.8						
.5	10.5	2.95	7.0	2.05	4.6	2.15						
1.0	8.8	2.40	6.10	1.70	4.3	1.45						
1.5	7.0	1.80	5.6	1.4	3.8	1.15						
2.0	5.05	1.37	4.2	1.12	3.0	0.85						
2.5	3.40	0.85	2.75	0.7								
3.0	2.14	0.6	1.70	0.45								
3.5	1.24	0.35	0.95	0.25								
4.0	0.6	0.18	0.45	0.14								
4.5	0.25	0.08	0.2	0.07								
5.0	0.1	0.05	0.06	0.03								
5.5	0.03	0.02	0.02	0.01								
6.0	0.008	0.006	0.005	0.003								

* current drift before settling on value

stop

Es	Rs=24k Rp 3.9k		8.2k		27k		Rs=47k Rp 3.9k		20k		27k	
0												
.5												
1.0												
1.5												
2.0												
2.5												
3.0												
3.5												
4.0												
4.5												
5.0												

6AU6 — 6/6/57

partial 6CB6

WCX-885 (Jan'48) Y-12 DATA SHEET

6AH6 EB=150 — 6/6/57

Es	Rs 33k, Rp=12k Ip	Is	Rp 20k Ip	Is	Rp=27k Ip	Is	Rs=24k Rp=3.9 Ip	Is	Rp=8.2k Ip	Is	Rp=12k Ip	Is	Rp=20k Ip	Is
0	9.45	2.55	5.8	2.75	4.52	2.85	13.2	3.2	12	3.2	9.4	3.46	5.18	3.8
.2	9.54	2.40	5.83	2.64	4.53	2.72	12.5	3.04	11.9	2.96	9.55	3.2	5.85	3.58
.4	9.04	2.25	5.90	2.44	4.54	2.57	11.6	2.8	11.2	2.8	9.7	2.94	5.9	3.33
.6	8.46	2.12	5.95	2.26	4.56	2.39	10.7	2.65	10.8	2.6	9.8	2.67	5.94	3.05
.8	7.80	1.98	6.0	2.07	4.60	2.2	10.02	2.45	9.85	2.45	9.58	2.44	5.98	2.8
1.0	7.16	1.83	6.01	1.9	4.61	2.02	9.35	2.26	9.07	2.3	8.8	2.26	6.02	2.5
1.2	6.63	1.7	5.99	1.75	4.62	1.88	8.58	2.10	8.3	2.1	8.14	2.1	6.04	2.35
1.4	6.08	1.6	5.70	1.60	4.63	1.70	7.86	1.95	7.7	1.95	7.35	1.90	6.07	2.1
1.6	5.16	1.48	5.33	1.5	4.62	1.57	7.2	1.8	7.0	1.8	6.72	1.88	6.05	1.87
2.0	4.73	1.27	4.52	1.25	4.30	1.30	5.9	1.5	5.75	1.50	5.16	1.48	5.33	1.53
2.4	3.9	1.05	3.74	1.03	3.66	1.05	4.7	1.22	4.70	1.25	4.5	1.2	4.40	1.22
2.8	3.1	0.85	3.02	0.86	3.01	0.88	3.72	0.98	3.75	1.00	3.56	0.97	3.52	1.00
3.2	2.5	0.70	2.46	0.7	2.42	0.7	2.9	0.78	2.9	0.8	2.8	0.77	2.79	0.80
3.6	1.92	0.55	1.94	0.53	1.90	0.55	2.2	0.6	2.2	0.6	2.15	0.6	2.13	0.6
4.0	1.46	0.4	1.45	0.4	1.44	0.4	1.63	0.45	1.65	0.45	1.58	0.44	1.56	0.44
4.5	0.98	0.28	0.99	0.26	0.98	0.26	1.1	0.3	1.07	0.3	1.03	0.3	1.03	0.28
5.0	0.65	0.18	0.65	0.18	0.65	0.18	0.67	0.18	0.67	0.19	0.64	0.18	0.66	0.18
6.0	0.20	0.08	0.21	0.07	0.2	0.08	0.2	0.07	0.2	0.08	0.2	0.07	0.2	0.07

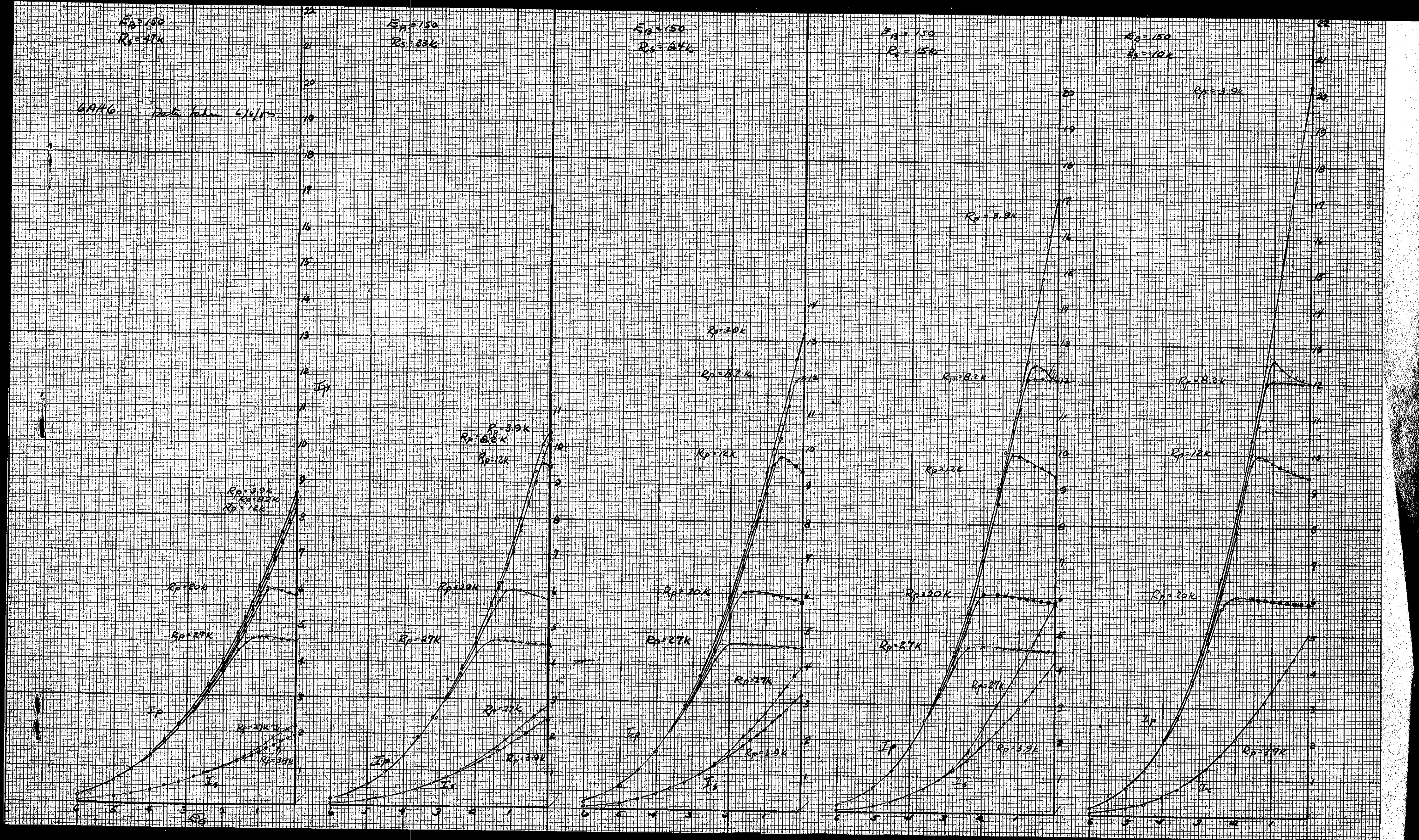
Es	(Rs 24k) Rp=27k Ip	Is	Rs=15k Rp=3.9 Ip	Is	Rp 8.2k Ip	Is	Rp=12k Ip	Is	Rp=20 Ip	Is	Rp=27 Ip	Is	RS=10k Rp 3.9 Ip	Is
0	4.52	3.95	17	4.18	12	4.76	9.36	5.1	5.85	5.6	4.5	5.8	20.2	5.0
2	4.52	3.79	16	3.97	12	4.32	9.48	4.7	5.88	5.3	4.52	5.5	19	4.7
4	4.55	3.47	14.8	3.68	12.3	3.9	9.6	4.28	5.9	4.88	4.53	5.1	17.6	4.35
6	4.55	3.25	13.8	3.40	12.4	3.5	9.67	3.93	5.93	4.44	4.54	4.73	16.3	4.07
8	4.56	2.95	12.5	3.16	12.2	3.14	9.79	3.52	5.96	4.08	4.54	4.38	15	3.8
1.0	4.60	2.72	11.7	2.92	11.2	2.9	9.9	3.12	5.99	3.7	4.56	4.02	13.6	3.46
1.2	4.60	2.50	10.6	2.66	10.4	2.7	9.94	2.72	6.01	3.31	4.57	3.66	12.5	3.18
1.4	4.61	2.27	10	2.5	9.66	2.46	9.5	2.5	6.02	3.0	4.59	3.32	11.4	2.9
1.6	4.62	2.08	9	2.27	8.7	2.28	8.56	2.25	6.06	2.65	4.60	3.0	10.4	2.65
2.0	4.62	1.82	7.3	1.86	7.1	1.86	7	1.86	6.07	2.05	4.62	2.35	8.5	2.15
2.4	4.17	1.3	5.7	1.45	5.64	1.5	5.53	1.47	5.3	1.53	4.6	1.7	6.6	1.7
2.8	3.46	1.02	4.47	1.17	4.47	1.2	4.35	1.18	4.3	1.2	4.05	1.25	5.1	1.32
3.2	2.8	0.82	3.42	0.90	3.36	0.9	3.32	0.93	3.33	0.93	3.26	0.93	3.8	1.0
3.6	2.13	0.6	2.53	0.68	2.53	0.67	2.5	0.68	2.5	0.7	2.45	0.7	2.8	0.75
4.0	1.57	0.44	1.8	0.5	1.82	0.48	1.8	0.5	1.85	0.5	1.83	0.5	2.0	0.53
4.5	1.05	0.3	1.17	0.3	1.16	0.32	1.14	0.3	1.18	0.32	1.2	0.33	1.24	0.33
5.0	0.66	0.18	0.7	0.19	0.7	0.18	0.7	0.18	0.7	0.18	0.73	0.2	0.75	0.20
6.0	0.2	0.08	0.2	0.07	0.2	0.07	0.2	0.07	0.21	0.08	0.21	0.08	0.2	0.07

Es	(Rs 10k) Rp=8.2k Ip	Is	Rp=12k Ip	Is	Rp=20k Ip	Is	Rs 4.7k Rp 3.9 Ip	Is	Rp 8.2k Ip	Is	Ip	Is	Ip	Is
0	12	6.3	9.4	6.7	5.87	7.4	20.5	8.9	12.2	11				
.2	12.1	5.76	9.45	6.24	5.9	6.94	20.8	7.75	12.2	10				
.4	12.2	5.1	9.53	5.7	5.9	6.4	21.3	7.37	12.3	8.85				
.6	12.2	4.54	9.62	5.1	5.9	5.86	21.4	5.73	12.4	7.67				
.8	12.4	4.06	9.70	4.6	5.94	5.37	19.5	4.86	12.5	6.50				
1.0	12.6	3.44	9.8	4.07	5.95	4.8	17.6	4.46	12.7	5.20				
1.2	12.0	3.13	9.9	3.53	5.98	4.4	16	4.05	13	4.4				
1.4	10.8	2.83	9.97	3.04	6.0	3.86	14.2	3.7	13	3.7				
1.6	10	2.6	9.25	2.60	6.02	3.4	13	3.33	12	3.1				
2.0	8.1	2.1	7.88	2.1	6.07	2.52	10.5	2.7	9.9	2.52				
2.4	6.3	1.65	6.2	1.65	5.76	1.93	8.0	2.05	7.7	2.0				
2.8	4.8	1.30	4.8	1.3	4.6	1.3	5.8	1.55	5.6	1.46				
3.2	3.66	0.98	3.65	0.98	3.5	0.96	4.3	1.15	4.12	1.1				
3.6	2.7	0.72	2.64	0.7	2.56	0.7	3.05	0.83	2.95	0.8				
4.0	1.95	0.53	1.85	0.5	1.9	0.52	2.16	0.6	2.02	0.55				
4.5	1.2	0.33	1.15	0.32	1.16	0.3	1.26	0.36	1.17	0.36				
5.0	0.73	0.2	0.67	0.18	0.7	0.18	0.75	0.2	0.7	0.2				
6.0	0.2	0.07	0.20	0.07	0.2	0.07	0.2	0.08	0.2	0.07				

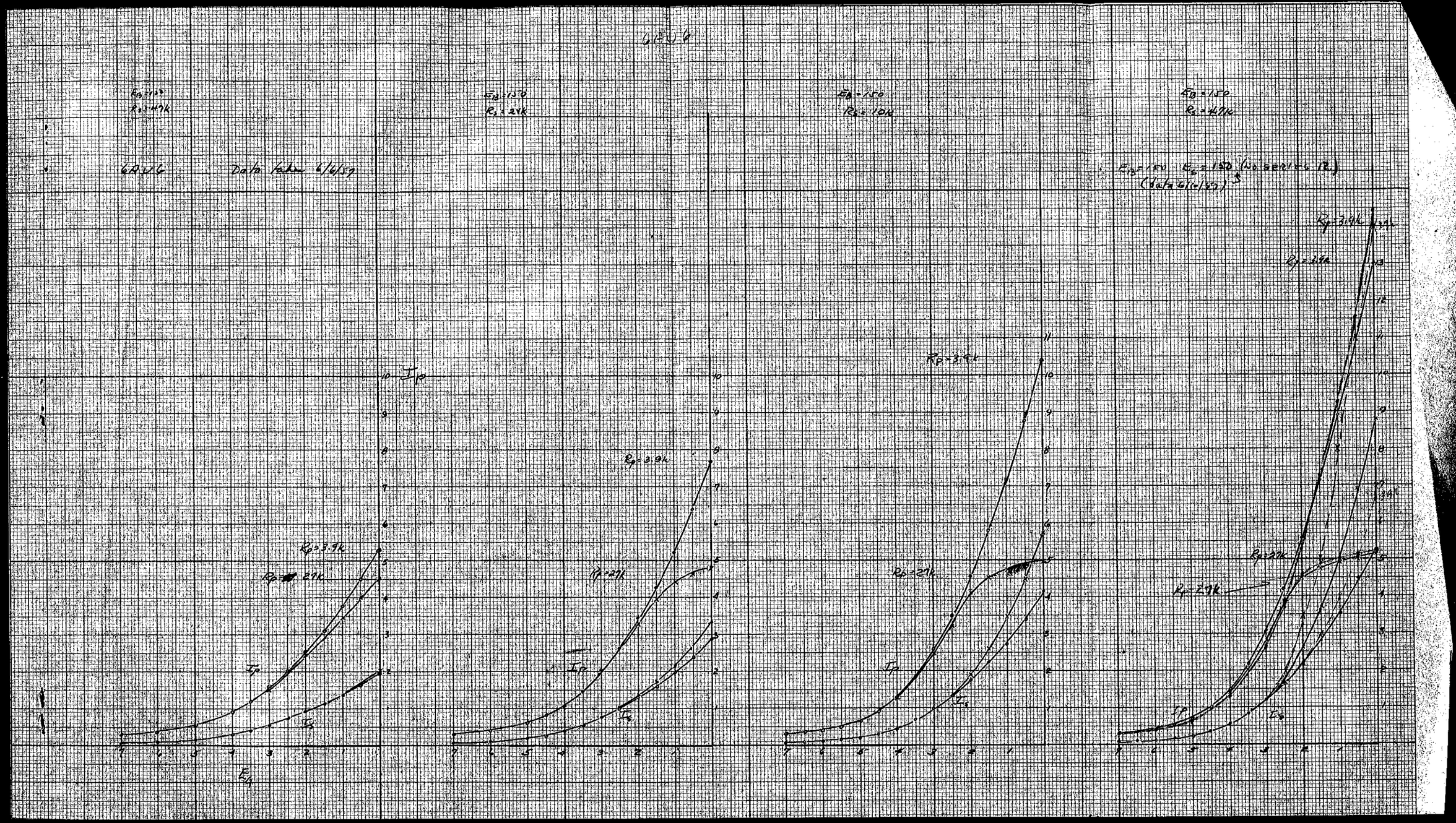
6/6/57

6AH6 EB=150

WCX-885 (Jan'48) Y-12 DATA SHEET



EB = 150
Rs = 47k
EB = 150
Rs = 33k
EB = 150
Rs = 24k
EB = 150
Rs = 15k
EB = 150
Rs = 10k
6AH6
Rp = 3.9k
Rp = 8.2k
Rp = 12k
Rp = 20k
Rp = 27k
Ip
Is
Eg


6BJ6
Data taken 6/6/57
E_{B}=150
R_{s}=1.47k
E_{B}=150
R_{s}=2.1k
E_{B}=150
R_{s}=1.0k
E_{B}=150
R_{s}=4.7k
E_{B}=150 E_{c2}=150 (No Series R.)
(Data 6/6/57)
I_P
E_g
R_P=3.9k
R_P=2.7k
I_P
I_{c2}

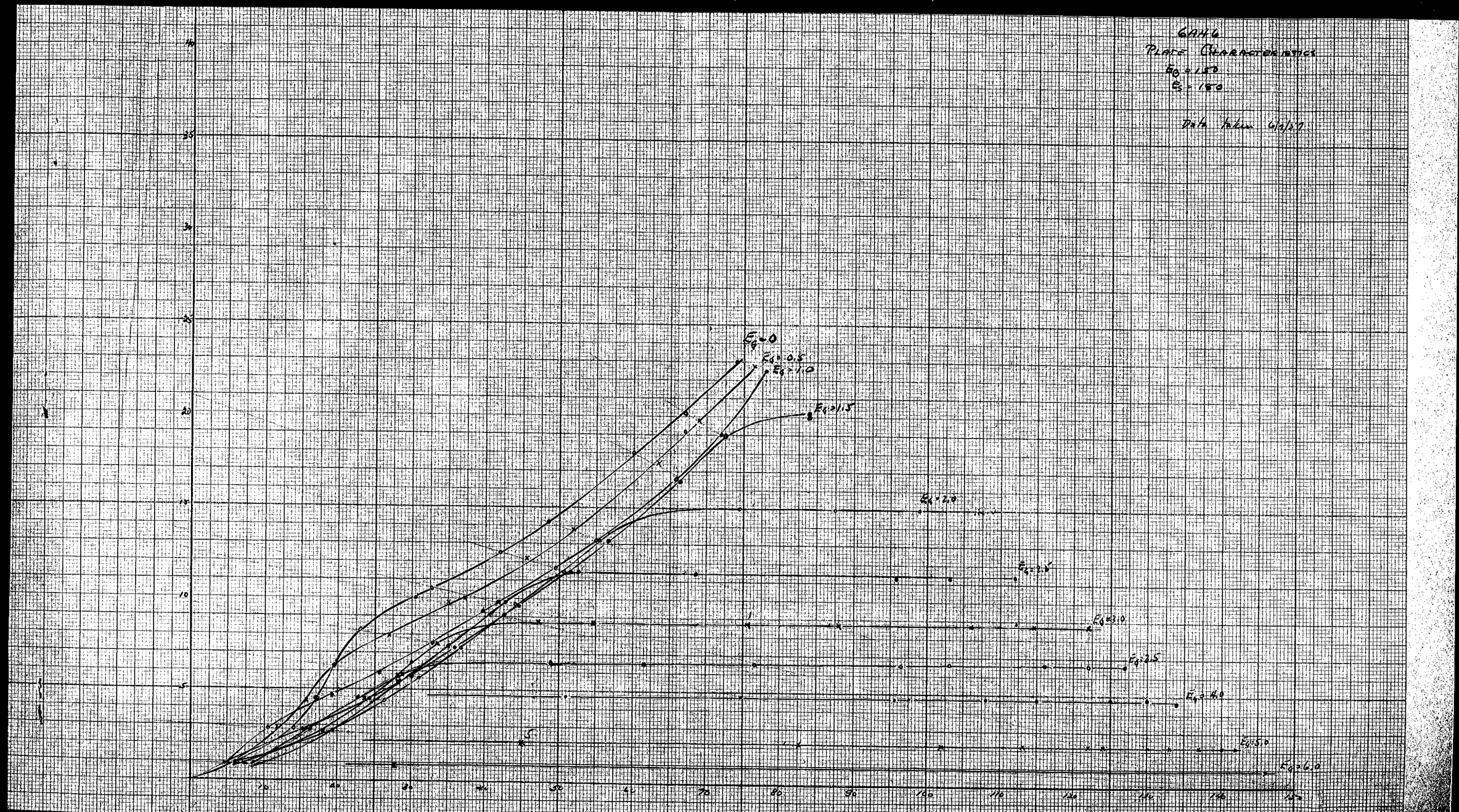
6AH6

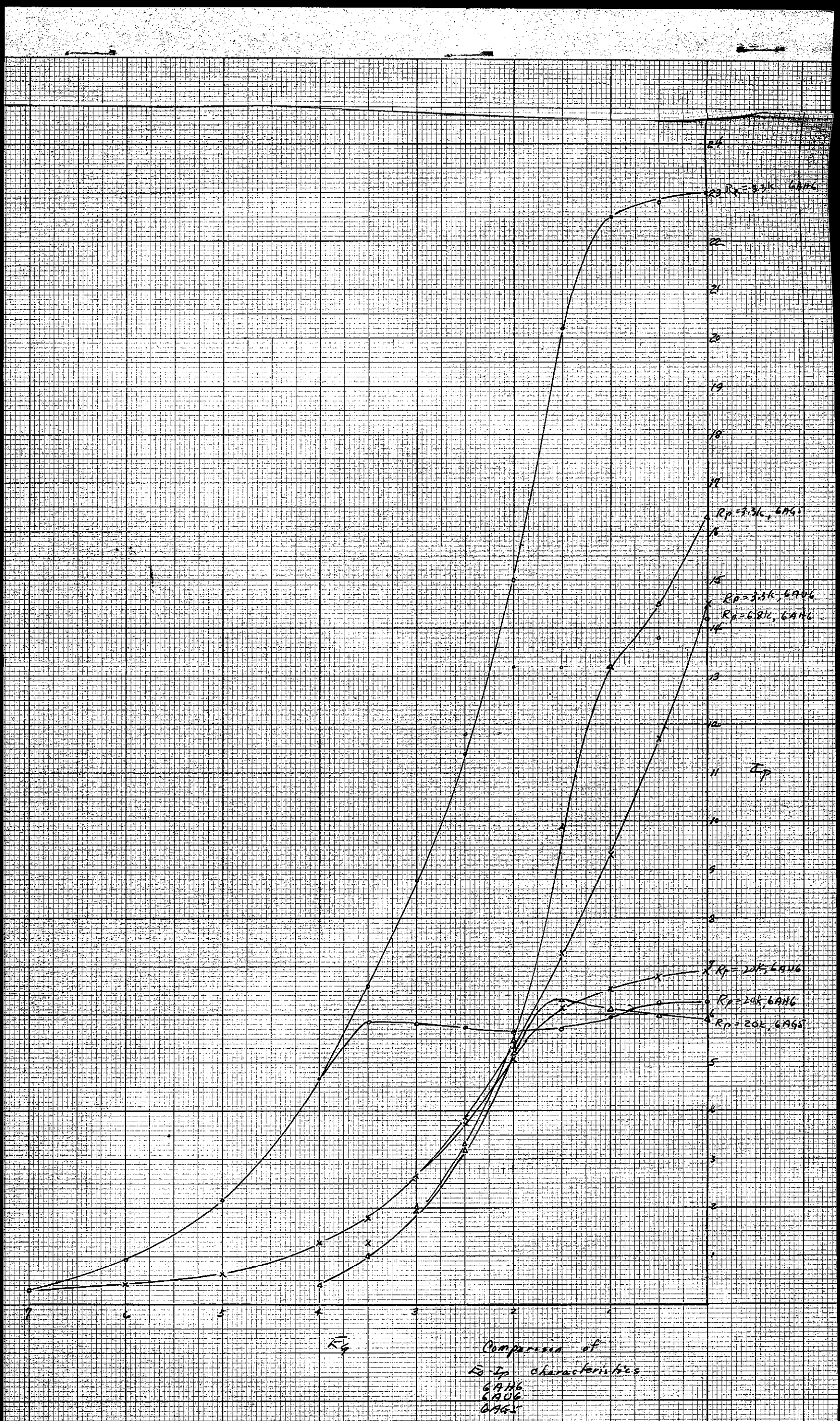
PLATE CHARACTERISTICS

$E_{G_2} = 150$

$E_{G_3} = 150$

Data taken 6/9/57





Comparison of
E_g-I_p characteristics
6AH6
6AU6
6AG5

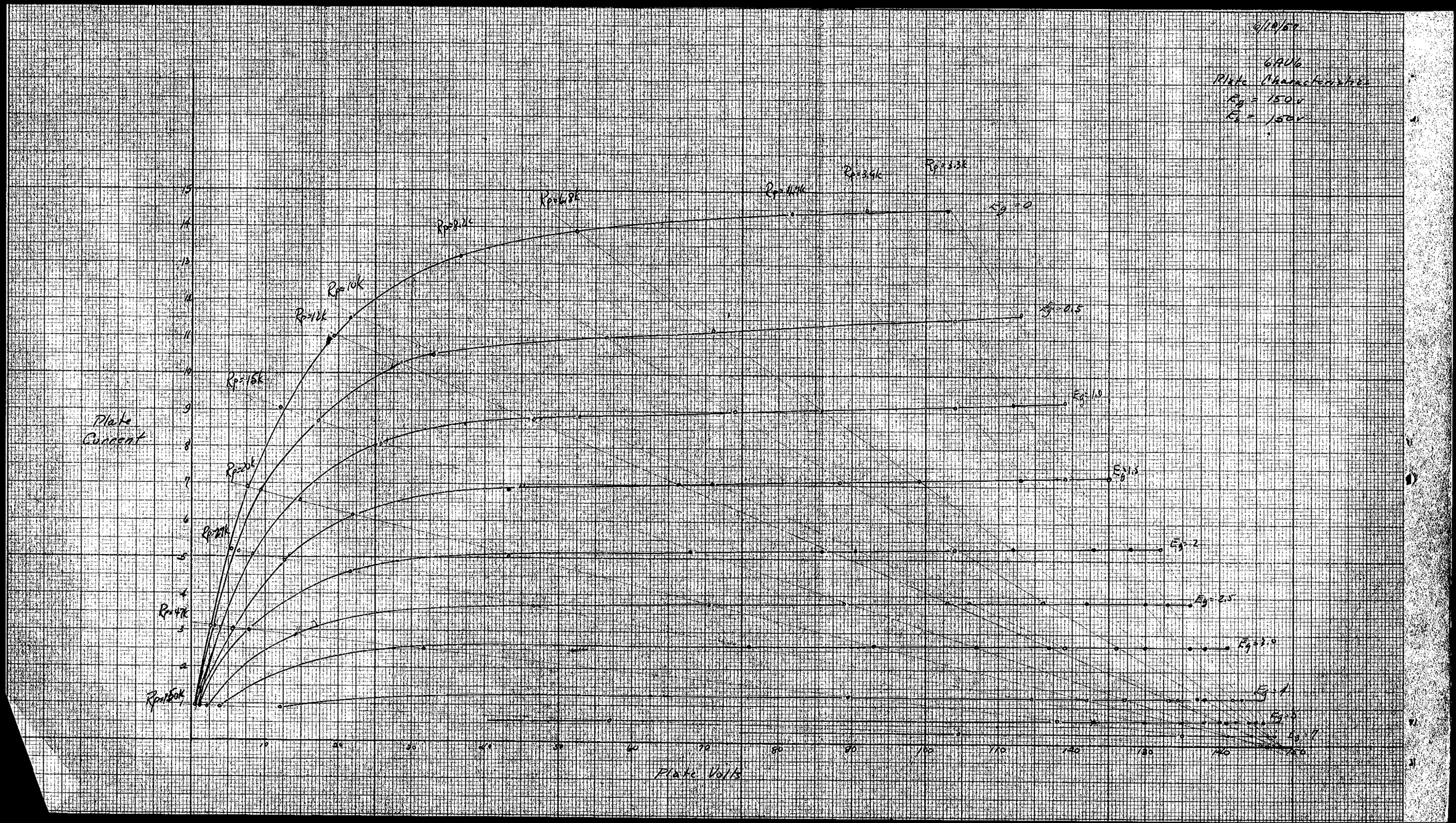
6/18/67

6AU6

Plate Characteristics

E_g = 150 v

E_b = 150 v



6/10/57

6AU6

PLATE CHARACTERISTICS

$E_{b_2} = 150$, $E_{c_2} = 100$ ○

$E_{b_2} = 150$, $E_{c_2} = 50$ ×

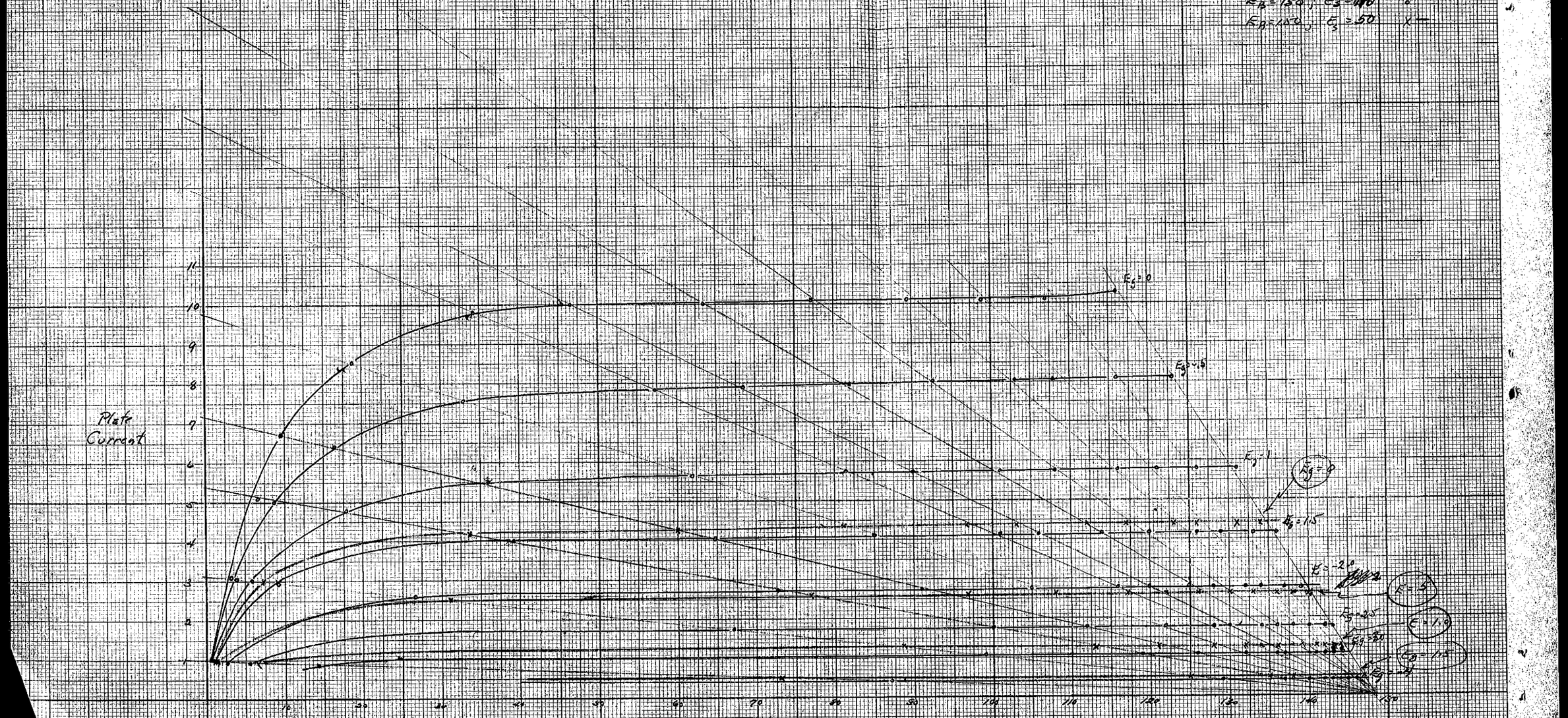


Plate Volts

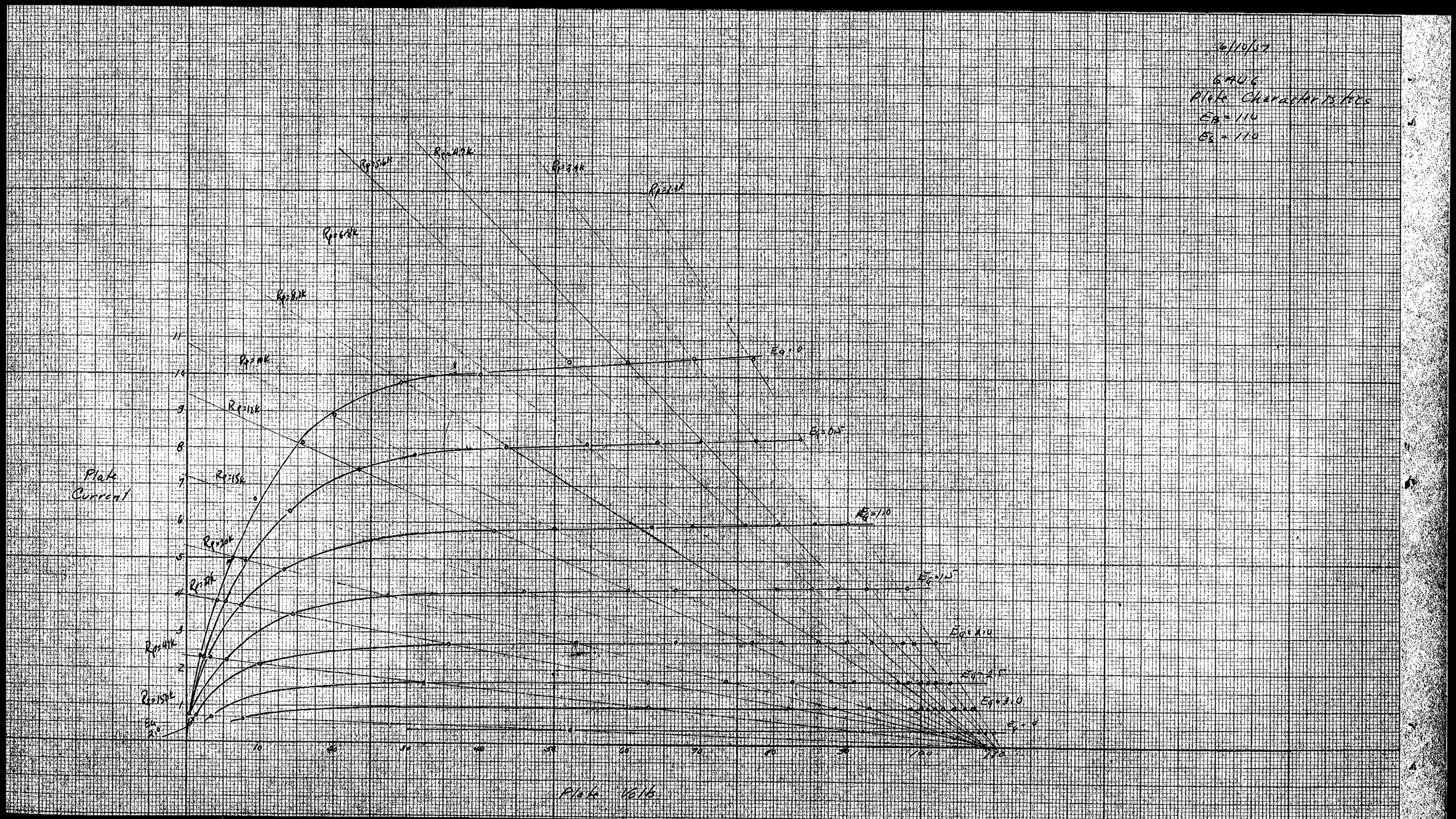
6/10/57

6AU6

Plate Characteristics

$E_B = 110$

$E_S = 110$



6/11/47

6AG5

PLATE CHARACTERISTICS

$E_{g2} = 150$

$E_{g2} = 110$

$E_{g2} = 150$

Plate Current

Plate Volts

$E_{g1} = 0$

$E_{g1} = 0.5$

$E_{g1} = 1.0$

$E_{g1} = 1.5$

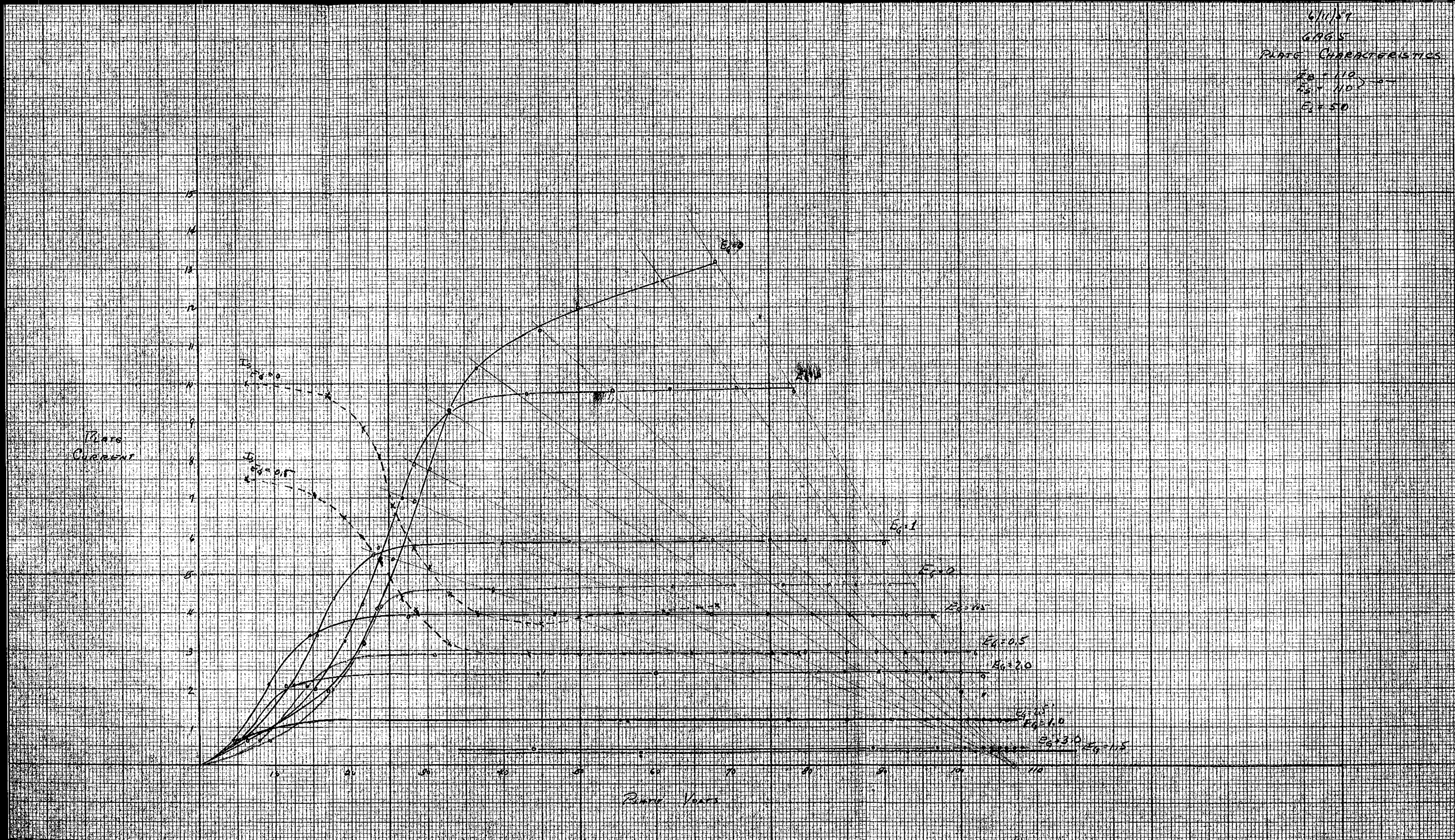
$E_{g1} = 2.0$

$E_{g1} = 2.5$

$E_{g1} = 3.0$

$E_{g1} = 3.5$

$E_{g1} = 4.0$


6/11/57
6AG5
PLATE CHARACTERISTICS
Eb = 110
Es = 110
E3 = 50
PLATE CURRENT
PLATE VOLTS
Eg = 0
Eg = 1
Eg = 0
Eg = -0.5
Eg = 0.5
Eg = 2.0
Eg = 2.5
Eg = 1.0
Eg = 3.0
Eg = 1.5
Is Eg = 0
Is Eg = 0.5

6-10-57 More tube characteristics -

Tube: 6AU6

E_B = 150 E_S = 150 Record E_p & I_p E_p · HP VTVM
Check I_s on Oregon panel meter. I_p · Simpson 260

E_s	Rp 3.3k	3.9	4.7	6.8	8.2	10	12	15	20	27	47	150
	(3.1)	(3.9)	(4.6)	6.8	8.3	10	11.8	15.1	20	26	45	145
0	103 14.5/7	92 14.5/7	79.3 14.3	52.5 13.9	36.7 13.2	21.7 11.5/9	19.4 11.0/9	12 9.05/11	7.6 6.9/13	5.36 5.2/14	2.6 3.1/16	0.44 .96/18
0.5	~~129~~ 113 11.7/5	~~120~~ 104 11.5/	~~119~~ 93 11.3	71 11.2	56.5 11/5.5	33 10.5/6	28.6 10.3/6	17.2 8.7/8	9.4 6.8/9	6.46 5.14/11	3.1 3.1/12.5	.35 .96/14
1.0	119 9.3/4	112 9.23/	104 9.15	86 9.08	74 9.0	52.8 8.84	46.6 8.78	25.8 8.08/5	14.7 6.53/6	8.33 5.07/8	4.0 3.08/9	0.47 .97/11
1.5	125 7.25/3	119 7.23	113 7.20	99.2 7.16	88.3 7.10	71 7.04	66.4 7.02	43.3 6.85	22 6.115/4	12.6 4.9/5	5.26 3.06/7	.71 .97/9
2.0	132 5.35/2	128 5.35	123 5.34	112 5.31	104 5.29	90.2 5.26	86 5.24	68 5.20	43.3 5.07	21.6 4.6/3	7.9 3.0/4	1.24 .97/6
2.5	136 3.85/1.5	133 3.86	130 3.86	122 3.86	116 3.86	106 3.84	103 3.84	89 3.8	70.5 3.76	46.6 3.7/2	14.2 2.86/2	2.2 .97/4
3.0	141 2.67/1	138 2.68	136 2.68	130 2.68	126 2.68	119 2.68	117 2.68	107 2.68	93 2.68	76 2.64	31.6 2.52	3.9 .96/2.5
3.5	142 1.78	141 1.78	139 1.79	135 1.79	133 1.79	128 1.79	126 1.79	120 1.79	111 1.78	99.5 1.77	67 1.73	7.1 .93/1
4.0	143 1.28	142+ 1.28	142- 1.28	138 1.28	137 1.28	134 1.28	133 1.28	127 1.28	122 1.28	113 1.28	89 1.27	12.2 .92
5.0	146 0.63	146 .63	145 .63	144 .63	142 .63	141 .63	140 .63	138 .63	135 .63	130 .63	118 .63	57 .60
6.0	146 0.42	146 .42	145+ .42	145 .42	144 .42	143 .42	142.5 .42	141 .42	139 .42	137 .42	128 .42	87 .40
7.0	148 0.3	148 0.3	148 .3	149 .3	147 .3	146 .3	146 .3	145 .3	143 .3	143 .3	135 .3	104 .3

E_B maximum 149 E_s = 145

E_B = 150 ; E_S = 110

E_s	3.3	3.9	4.7	5.6	6.8	8.2	10	12	15	20	27	47	150
0	116 10.3/4	107 10.1	98.7 10.1	85.4 10.1	77.2 10.1/5	63.5 10	46.5 10	34.4 9.8/5	18.8 8.55/6	9.5 6.7/8	6.6 5.1/9	3.1 3.1/11	.51 1/12
.5	123 8.1/3	116 8.1	108 8.08	103 8.05	92.6 8.02/4	82 7.96	68.5 7.9	57.3 7.84	33 7.35/4	16.5 6.43/5	8.65 5.05/6	3.9 3.07/8	.44 .98/9
1.0	131 5.8/2	126 5.8	121 5.79	116 5.78	108 5.76/2.5	101 5.74	90 5.73	81.3 5.72	61.8 5.65	36 5.5	17.8 4.8/3	5.9 3.04/5	.71 .97/7
1.5	136 4.15/2	133 4.15	129 4.18	126 4.18	120 4.18	114 4.17	106 4.15	101 4.15	85 4.12	64.6 4.06	39.2 4.0	~~20.5~~ 9.2 2.95	1.3 .97/4.5
2.0	139 2.77/1	137 2.8	134 2.8	132 2.8	128 2.8	125 2.8	120 2.8	116 2.79	105 2.78	91 2.76	72.6 2.75	26.7 2.60/1.5	2.6 .96/3
2.5	143 1.77	142 1.79	140 1.79	138+ 1.8	136 1.8	134 1.8	130 1.8	128 1.8	122 1.8	112 1.79	100 1.78	67 1.75	6.6 .95
3.0	144 1.08	143 1.08	142 1.08	142 1.08	141 1.08	140 1.08	137 1.08	136 1.08	132 1.08	126 1.08	119 1.08	99 1.08	14.3 .88
4.0	146 .42	146 .42	146 .42	146 .42	145 .42	145 .42	144 .42	143 .42	142 .42	140 .42	137 .42	129 .42	87 .41

E_B = 150 ; E_S = 50 v.

E_s	3.3	3.9	4.7	5.6	6.8	8.2	10	12	15	20	27	47	150
0	134 4.40/1.6	~~135~~ 131 4.4	126 4.4	123 4.4	117 4.4/1.7	112 4.4	103 4.36	96.6 4.35	81 4.32	60 4.28	33.6 4.2/1.8	7.3 3.0/2.7	1.12 .99/4.3
.5	140 2.62/1	138 2.62	136 2.62	133 2.62	130 2.62	126 2.62	122 2.62	117 2.62	108 2.62	97 2.62	77 2.60	31.2 2.52/1.1	1.6 .97/2.3
1.0	143 1.28/.5	143 1.28	142 1.28	141 1.28	139 1.28	136 1.28	134 1.28	132 1.28	128 1.28	121 1.28	113 1.28	88.5 1.28	6.0 .93/.8
1.5	147 .5/.2	147 .5	147 .5	146 .5	146 .5	144 .5	143 .5	142 .5	141 .5	138 .5	135 .5	125 .5	73 .5/.2

E_B = 110 , E_S = 110

E_s	Rp 3.3	3.9	4.7	5.6	6.8	8.2	10	12	15	20	27	47	150
0	77 10.5/4.4	69 10.5	60 10.4	52 10.14/4.6	40 10/4.7	29 9.8/5	20 8.9/5.8	15.7 8.15/6	9.2 6.6/7.7	6.2 5.0/8.9	4.1 3.85/9.4	1.9 2.32/11	.32 .75/12
.5	83.5 8.35/3.4	77.5 8.3/3.4	70 8.26	64 8.24	54.6 8.17	43.5 8.05	31 7.82/3.8	23.5 7.43/4	13.9 6.28/5	8 4.93/6	5.2 3.82/7	2.3 2.3/8.3	.25 .75/9.6
1.0	90 6.04/2.5	85.5 6.08	80.5 6.10	74 5.98	68.7 5.95	60.6 5.92	50 5.85/2.6	42 5.78/	25 5.15/2.8	13.2 4.7/3.5	7.4 3.72/4.3	3.2 2.3/5.4	.31 .75/6.9
1.5	98 4.3/1.7	92.5 4.26	88.7 4.26	85 4.26	80.4 4.24	74.5 4.22	66.7 4.20/1.8	60.3 4.2/	46 4.14/1.8	27.4 4.0/1.9	14.3 3.5/2.4	5.4 2.25/3.5	.58 .74/4.8
2.0	102 2.84/1.1	99 2.84	97.5 2.84	93.2 2.84	90 2.84	86 2.84	81 2.82	77 2.8/1.2	66.6 2.8	53 2.76	35.6 2.70	10 2.13/1.7	~~.6~~ 1.4 .73/3
2.5	104 1.75/.7	102 1.75	101 1.75	100 1.75	98.3 1.75	97 1.75	91 1.75	88 1.75	82.3 1.75	73.5 1.73	62.8 1.70	32.4 1.65/.8	3.46 .70/1.6
3.0	107 1.02/.4	106 1.02	104 1.02	103 1.02	102 1.02	101 1.02	100 1.02	98.5 1.02	93 1.02	88.5 1.02	82 1.02	63 1.02/.5	7.6 .68/.9
4.0	110 0.4/.2	110 .4	109 .4	108 .4	108 .4	107 .4	106 .4	106 .4	106- .4	103 .4	101 .4	92 .4	52.3 .4/.2

6-11-57: 6AG5 Characteristic Data

$E_B = 150$; $E_S = 110$

E_S	R_P/R_a 3.3	3.9	4.7	5.6	6.8	8.2	10	12	15	20	27	47	150
0	68 13.2/9.2	61 12.7/14	50 12/12.9	45 11.4/12.7	36.6 10.4/9	33 9.3/8.5	30.3 7.76/5.2	28.3 6.9/5.7	25.5 5.4/6.8	23.9 4.1/8.1	21.7 3.2/3.8	17.0 1.95/3.1	6.3 .66/.10
0.5	78.2 9.8/2.6	70.6 9.8/2.6	62 9.86/-	54.5 9.82/-	43.2 9.73/-	32.8 9.23/3.2	28.4 7.9/4.1	26.8 7.0/4.4	23.6 5.7/6.1	21.5 4.22/6	19.2 3.26/6.5	15.2 2.0/2.1	6.25 .67/.15
(1.2) 1.0	90 5.8/1.1	85.2 5.8/1.8	79.6 5.9/-	75 5.9/-	67.5 5.9/-	54.5 5.9	48.6 5.86/-	40 5.84/-	23 5.82/2.6	17.7 4.37/2.7	13.5 3.4/3.45	11.4 2.09/4.3	5.1 .67/.13
1.5	96.4 3.9/1.2	92.9 3.94/-	88.5 3.95/-	85.3 3.95/-	81.5 3.97/1.22	74.6 3.97/1.28	67.3 3.97/-	61.5 3.97/1.26	46.6 3.97/1.27	27.5 3.9/1.3	14.5 3.4/1.7	9.1 2.12/2.6	4.55 .68/.14
2.0	103 2.35/.17	100 2.94/-	98.8(97.5) 2.96/.8	96.5 2.96/.8	92.7 2.97/.8	89.2 2.96/.8	84.7 2.90/.2	81.3 2.98/.84	72.6 2.97/.8	60 2.90/.8	44 2.90/.8	12.4 2.10/.46	3.32 .17/2.1
2.5	106 1.16/.36	105 1.18/-	104 1.19/.27	103 1.20/.38	102 1.2/.39	100 1.2/.39	97 1.2/.4	95.5 1.2/.4	91 1.2/.4	85 1.2/.4	77.2 1.2/.4	55.2 1.19/.4	3.7 .17/.8
3.0	108 .47/.85	108 .49/.25	107 .46/.15	107- .46/.15	106 .46/.15	106- .46/.15	105 .46/.15	104 .46/.15	103 .46/.15	101 .46/.15	97 .46/.15	88.5 .45/.15	24 .43/.18
$E_B = 110$ $E_S = 50$ 0	94 4.72/1.4	90.7 4.72/1.4	86.4 4.72/1.5	82.8 4.72/-	76.8 4.72/1.45	70.2 4.71/1.45	62.4 4.68/1.46	58.2 4.66/1.47	38.6 4.63/1.5	24 4.17/1.86	21.7 3.2/2.4	17.7 1.96/3.6	9.26 .65/1.5
0.5	102 2.93/.84	98 2.96/.85	95 2.97/.86	92.7 2.97/.86	89 2.97/.86	85 2.96/.86	79.6 2.96/.82	75.2 2.95/.87	64.4 2.93/.48	50 2.9/.9	31 2.88/.4	14.2 2.07/1.5	7.8 .68/2.3
1.0	105 1.2/.32	104 1.2/.32	103 1.21/.32	102 1.21/.32	101 1.21/.32	99 1.2	97 1.2/.32	95.3 1.2/.32	90.8 1.2/.32	85 1.2/.32	77.5 1.16/.32	56.12 1.15/.33	4.66 .7/.9
1.5	107 .35/.1	107 .37/.1	106 .38/.1	106 .38/.1	106- .38/.1	105+ .38/.1	105 .38/.1	104 .38/.1	103 .38/.1	102 .38/.1	100 .38/.1	93 .34/.1	58.6 .32/.1
$E_B = 150$ $E_S = 50$ 0	134 5.0/1.4	130 5.0/1.4	126 4.98/1.4	122 4.96/1.4	116 4.96/1.4	108 4.92/1.45	100 4.9/1.47	92 4.88/1.47	75 4.85/1.5	50.8 4.8/1.5	26 4.5/1.7	20.8 2.75/.96	11.7 .92/.46
.5	140 3.36/.19	137 3.4/.9	134 3.41/.9	131 3.4/.9	127 3.39/.92	123 3.4/.93	116 3.4/.94	111 3.36/.95	98 3.35/.97	81.5 3.3/.98	60 2.88/.94	18 2.8/1.35	10 .92/2.7
1.0	146 1.46/.35	145 1.46/.35	144 1.46/.35	143 1.46/.35	141 1.46/.35	138 1.46/.35	156 1.46/.35	134 1.46/.35	127 1.46/.35	122 1.44/.34	112 1.42/.4	85 1.14/.4	6.68 .95/.7
1.5	148 .5/.1	148 .5/.1	148 .5/.1	147.5 .5/.1	147 .5/.1	146 .5/.1	146- .5/.1	145 .5/.1	144 .5/.1	141 .5/.1	138 .5/.1	128 .48/.11	81 .45/.13
$E_B = 150$ $E_S = 110$ 0	113 12.2/3.2	103 12/3.2	93 11.9/3.1	83.5 11.7/3.6	70.5 11.5/3.6	55 11.2/3.58	38.6 10.8/3.75	34.7 10/4.15	30.8 7.85/5.7	27.6 5.94/7.85	24.6 4.53/8.3	20.3 2.76/9.5	8.3 .93/10.6
.5	120 10.3/3.0	113 10/3	104 10/3	94 10/3	82.6 9.96/3	69.4 9.9/3	52.5 9.8/3	40 9.65/3.04	29 8/4.04	25.3 6.07/5.5	22.6 4.62/5.9	18.4 (3.8)/9.95	8.5 .93/2.7
1.0	127 7.46/2.15	121 7.5/2.15	115 7.5/2.18	108 7.47/2.2	98.6 7.45/2.2	88.6 7.4/2.2	75.2 7.34/2.2	65 7.13/2.2	40 7.2/2.2	23 6.2/2.9	20.3 4.17/4	15.9 2.85/5	7.3 .95/5.1
1.5	136 4.35/1.26	132 4.4/1.26	128 4.4/1.26	125 4.4/1.27	119 4.4/1.28	113 4.4/1.29	104 4.4/1.3	98 4.38/1.3	82.5 4.35/1.3	61 4.32/1.3	33 4.25/1.1	12.2 2.92/2.9	6.0 .94/3.7
2.0	142 2.52/.75	140 2.54/.75	137 2.54/.76	135 2.54/.75	132 2.56/.76	128 2.54/.76	124 2.53/.76	120 2.53/.76	111 2.52/.8	98 2.51/.8	81.5 2.48/.8	37.2 2/.8	4.55 .97/1.9
2.5	146 1.24/.37	144+ 1.27/.4	144- 1.27/.4	143 1.27/.4	141 1.28/.4	139 1.28/.4	136 1.28/.4	134 1.28/.4	130 1.28/.4	124 1.28/.4	115 1.26/.4	92 1.24/.4	8.45 .94/.65
3.0	147 .5/.15	147 .52/.15	147- .52/.17	146+ .51/.17	146- .52/.17	145 .52/.17	144 .51/.18	144- .52/.18	142 .52/.20	139 .51/.18	135 .51/.18	126 .61/.12	95.6 .5/.18
$E_B = 150$ $E_S = 150$ 0	98 16.3/4.96	86 16.3/5.08	72 16.3/5.7	58 16/5.6	44 15/5.44	28.5 13.3/4.9	35.3 11/8.2	33.5 10/9.8	30.6 7.8/10.8	27 5.9/11	24.5 4.53/12	17.6 2.8/12.8	5.2 .97/13.6
.5	104 14.5/4.3	93 14.4/4.9	80.3 14.4/4.8	68.7 14.3/4.8	57.5 14.1/4.4	37 13.7/4.8	32.5 11.4/6.7	32 10/7.6	29.4 7.9/9.5	26.4 5.96/10.4	23.7 3.96/10.4	17.5 2.82/11	4.74 .97/16.5
1.0	107 13.2/3.9	97.4 13.2/4	85.2 13.2/4.04	74.6 13.2/4.1	59 13.2/4.1	42 13.1/4.17	32 11.6/5.4	30.5 10.1/6.4	27.6 8/8.4	24.4 6.1/8.35	21.5 4.66/8.4	16.6 2.83/8.9	4.9 .97/8.8
1.5	117 9.88/2.9	110 9.85/2.9	102 9.8/2.9	94 9.75/2.9	82.6 9.7/2.9	70 9.64/2.93	57.3 9.62/2.96	39.3 9.57/2.96	23 8.35/3.7	20.3 6.3/5.1	18.3 4.75/6.2	14 2.9/6.35	5.73 .96/6.4
2.0	132 5.46/1.6	127 5.46/1.6	123 5.47/1.6	117 5.47/1.6	112 5.54/1.63	104 5.54/1.65	94 5.35/1.65	86.5 5.32/1.65	68.2 5.28/1.66	42.5 5.2/1.7	19.1 4.74/2.3	9.5 3/3	4.8 .97/4.3
2.5	137 3.2/.94	135 3.36/1.0	132 3.4/1.0	128 3.41/1.0	124 3.44/1.02	119 3.44/1.03	113 3.40/1.03	107 3.40/1.03	98.5 3.36/1.04	80.4 3.33/1.04	59 3.28/1.04	16.7 2.83/1.4	5.6 .96/2.65
3.0	143 1.96/.6	142 2.04/.6	139 2.05/.6	137 2.05/.6	134 2.05/.6	132 2.04/.61	127 2.04/.61	125 2.03/.6	117 2.03/.62	107 2.03/.63	94 2.0/.64	59 1.95/.66	5.5 .97/1.42
3.5	146 1.02/.3	144+ 1.02/.3	144- 1.04/.32	145 1.04/.32	142 1.04/.32	140 1.03/.32	138 1.04/.32	136 1.04/.32	132 1.03/.32	127 1.02/.32	121 1.02/.32	103 1.01/.32	255 82/.49
4.0	148 .42/.1	148 .42/.1	148 .42/.1	147 .42/.1	147 .41/.1	146+ .41/.1	146 .41/.1	146 .4/.1	144 .4/.1	143 .4/.1	140 .4/.1	132 .4/.1	92 .4/.1

1	[illegible]	[illegible]	8 1 2 6
2	[illegible]	[illegible]	8 3 8 5
3	[illegible]	[illegible]	8 2 1 4
4	[illegible]	[illegible]	8 2 1 8
5	[illegible]	[illegible]	8 2 1 6
6	7 4 4	8 2 1 4	8 2 0 7
7	7 3 5	8 2 1 7	8 2 0 3
8	6 6 7	8 2 8 7	8 2 1 4
9	6 9 2	8 2 0 7	8 2 1 6
10	7 0 0	8 2 9 4	8 2 1 3
11	7 3 3	8 2 0 4	8 2 1 2
12	6 9 1	8 3 0 9	8 2 1 7
13	6 9 2	8 2 6 4	8 2 1 7
14	6 8 1	8 2 5 7	8 2 1 4
15	6 8 9	8 2 5 6	8 2 0 9
16	6 7 4	8 3 0 1	8 2 1 2
17	6 7 9	8 1 6 6	8 2 1 0
18	6 6 7	8 2 8 9	8 2 1 6
19	6 5 4	8 1 7 2	8 2 0 1
20	6 5 0	8 2 8 4	8 2 0 7
21	6 2 2	8 0 9 1	8 2 2 2
22	6 7 3	8 2 2 2	8 2 1 2
23	6 4 9	8 3 1 2	8 2 2 0
24	6 4 1	8 1 8 1	8 2 0 7
25	6 4 5	8 3 8 6	8 2 0 4
26	6 4 4	8 2 9 0	8 1 7 5
27	6 3 2	8 4 2 7	8 2 1 5
28	6 0 4	8 2 0 6	8 2 2 5
29	6 4 6	8 3 8 8	8 2 1 0
30	6 1 9	8 1 7 6	8 2 1 7
31	6 0 7	8 1 7 6	8 2 0 9
32	6 1 9	8 1 9 8	8 2 1 3
33	6 3 9	8 2 3 8	8 2 1 9
34	6 2 9	8 1 4 9	8 2 2 2
35	5 8 3	8 1 8 4	8 2 1 4
36	6 1 7	8 2 6 7	8 2 0 9
37	5 9 2	8 3 6 1	8 2 1 3
38	5 6 5	8 1 7 0	8 2 0 8
39	6 0 8	8 3 6 5	8 2 1 0
40	5 6 7	8 2 1 9	8 2 1 0
41	6 0 9	8 1 8 1	8 2 0 0
42	5 5 8	8 2 1 2	8 2 1 3
43	5 8 7	8 3 0 7	8 2 0 8
44	5 3 1	8 3 0 7	8 2 1 9
45	5 6 6	8 2 2 3	8 2 2 2
46	5 4 8	8 2 2 0	8 2 1 3
47	5 5 5	8 1 9 4	8 1 9 1
48	5 7 7	8 2 7 9	8 2 2 1
49	5 7 0	8 2 0 8	8 2 1 0
50	5 1 3	8 3 4 5	8 2 1 4
51	5 6 7	8 2 8 8	8 2 0 8
52	5 7 6	8 2 3 6	8 2 1 4
53	5 1 4	8 2 1 8	8 2 0 9
54	5 3 5	8 2 2 1	8 2 0 2
55	5 5 3	8 3 2 5	8 2 1 3
56	5 1 0	8 1 9 0	8 2 0 9
57	5 3 0	8 3 5 1	8 2 1 2
58	[illegible]	[illegible]	8 2 0 9
59	[illegible]	[illegible]	8 2 1 5
60	[illegible]	[illegible]	8 2 1 6
61	[illegible]	[illegible]	8 2 0 8
62	5 0 2	8 3 2 9	8 2 0 8
63	5 0 2	8 2 3 6	8 2 1 2
64	5 0 2	8 1 0 9	8 2 0 1
65	5 0 8	8 3 8 5	8 2 2 1
66	4 9 2	8 2 1 0	8 2 1 1
67	4 9 0	8 1 7 9	8 2 0 1
68	4 8 4	8 2 3 5	8 2 1 0
69	4 8 2	8 1 5 9	8 2 1 7
70	4 9 2	8 2 4 2	8 2 1 2
71	4 4 3	8 2 7 7	8 2 1 6
72	5 2 3	8 2 0 9	8 2 2 1
73	4 7 4	8 2 5 1	8 2 0 5
74	4 8 4	8 2 4 2	8 2 1 6
75	4 5 8	8 2 0 9	8 2 0 2
76	4 9 5	8 2 6 8	8 2 1 8
77	4 7 9	8 2 7 7	8 2 0 7
78	4 8 6	8 3 3 0	8 2 2 0
79	4 7 0	8 2 4 6	8 2 1 2
80	4 5 0	8 2 8 1	8 2 1 4
81	4 6 3	8 2 4 9	8 2 2 1
82	4 6 1	8 2 9 9	8 2 1 1
83	4 4 2	8 1 5 9	8 2 1 5
84	4 5 2	8 2 9 8	8 2 0 9
85	4 7 0	8 1 8 0	8 1 9 6
86	4 7 0	8 2 7 5	8 2 1 1
87	4 3 0	8 1 3 0	8 1 9 9
88	4 9 8	8 2 7 2	8 2 1 0
89	4 4 0	8 2 2 6	8 1 9 8
90	4 6 3	8 2 0 2	8 2 1 7
91	4 7 4	8 3 8 4	8 2 1 3
92	4 2 4	8 3 2 0	8 1 9 6
93	4 3 4	8 2 9 7	8 2 1 4
94	4 4 8	8 1 9 9	8 2 0 7
95	4 5 2	8 2 4 7	8 2 1 6
96	4 3 5	8 1 2 5	8 2 0 3
97	4 4 2	8 2 0 6	8 2 1 7
98	4 2 9	8 1 8 7	8 2 0 6
99	4 4 3	8 2 0 3	[illegible]

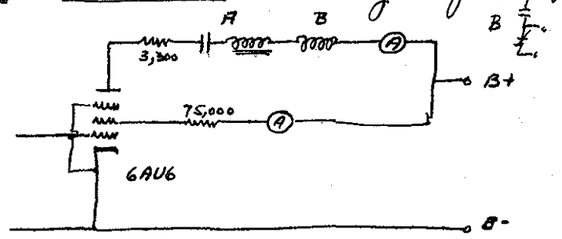
89	440	8226	8198
90	463	8202	8217
91	474	8384	8213
92	424	8320	8196
93	434	8297	8214
94	448	8199	8207
95	452	8247	8216
96	435	8125	8203
97	442	8206	8217
98	429	8187	8206
99	443	8203	8217
100	441	8140	8216
101	435	8254	8218
102	434	8326	8225
103	413	8292	8202
104	[illegible]	8170	8212
105	[illegible]	8369	8210
106	[illegible]	8188	8213
107	[illegible]	8184	8217
108	442	8229	8215
109	423	8254	8218
110	406	8258	8196
111	404	8094	8216
112	411	8269	8203
113	408	8198	8219
114	417	8251	8210
115	403	8192	8211
116	413	8338	8220
117	413	8297	8206
118	448	8286	8206
119	386	8326	8209
120	404	8201	8194
121	403	8272	8209
122	418	8175	8226
123	391	8336	8195
124	381	8333	8209
125	405	8394	8202
126	402	8322	8210
127	407	8290	8222
128	407	8214	8197
129	402	8403	8214
130	403	8250	8216
131	391	8191	8216
132	394	8320	8216
133	394	8237	8214
134	406	8290	8210
135	383	8202	8200
136	411	8160	8219
137	381	8253	8212
138	382	8258	8214
139	421	8268	8220
140	391	8201	8199
141	391	8249	8216
142	395	8165	8197
143	3[illegible]	8287	8201
144	3[illegible]	8269	8211
145	399	8297	8215
146	418	8231	8212
147	382	8211	8209
148	385	8265	8218
149	371	8217	8202
150	393	8219	8210
151	362	8289	8216
152	388	8193	8211
153	378	8317	8215
154	367	8140	8206
155	381	8327	8212
156	384	8148	8207
157	360	8181	8208
158	365	8378	8220
159	354	8272	8207
160	359	8250	8217
161	346	8188	8223
162	408	8148	8213
163	340	8113	8208
164	360	8223	8208
165	379	8144	8198
166	371	8329	8220
167	343	8234	8204
168	381	8296	8223
169	375	8365	8215
170	354	8258	8210
171	362	8175	8218
172	380	8338	8204
173	361	8163	8212
174	369	8164	8219
175	317	8233	8212
176	352	8212	8216
177	353	8246	8218
178	360	8145	8212
179	317	8290	8206
180	352	8223	8203
181	339	8200	8210
182	342	8110	8210
183	333	8369	8216
184	349	8160	8209
185	328	8282	8207
186	329	8294	8207
187	338	8208	8216
188	345	8240	8209
189	356	8192	8203
190	362	8306	8222

180	352	8223	8203
181	339	8200	8210
182	342	8110	8210
183	333	8369	8216
184	349	8160	8209
185	328	8282	8207
186	329	8294	8207
187	338	8208	8216
188	345	8240	8209
189	356	8192	8203
190	362	8306	8222
191	358	8245	8195
192	362	8368	8205
193	313	8408	8209
194	333	8329	8222
195	319	8334	8200
196	332	8431	8218
197	[illegible]	8233	8213
198	[illegible]	8207	8199
199	[illegible]	8327	8213
200	[illegible]	8225	8211
201	[illegible]	8246	8215
202	328	8204	8197
203	323	8203	8210
204	327	8218	8206
205	338	8275	8211
206	328	8331	8217
207	296	8157	8201
208	340	8266	8217
209	310	8227	8196
210	350	8313	8224
211	327	8310	8204
212	321	8295	8214
213	310	8250	8201
214	302	8202	8210
215	324	8273	8213
216	328	8212	8208
217	313	8193	8202
218	288	8295	8220
219	322	8201	8207
220	324	8304	8207
221	270	8177	8219
222	331	8355	8225
223	336	8151	8217
224	326	8186	8209
225	280	8440	8225
226	370	8266	8209
227	313	8288	8214
228	336	8141	8194
229	321	8154	8219
230	286	8169	8226
231	317	8207	8206
232	336	8213	8212
233	295	8416	8212
234	301	8187	8196
235	291	8305	8213
236	307	8336	8209
237	315	8214	8220
238	315	8134	8212
239	279	8296	8223
240	292	8206	8210
241	299	8243	8216
242	293	8235	8209
243	301	8240	8219
244	293	8295	8221
245	282	8170	8209
246	291	8260	8213
247	288	8303	8210
248	287	8251	8209
249	[illegible]	8213	8212
250	[illegible]	[illegible]	8202
251	[illegible]	[illegible]	8210
252	[illegible]	[illegible]	[illegible]
253	330	[illegible]	8205
254	319	[illegible]	[illegible]
255	283	8129	[illegible]
256	347	8241	8211

6/13 Kuthley output circuit refer to file Kuthley Book 178

Week -
6/17-21/57 Trip Circuit Considerations - Keithley Outputs

Circuit Under Test:



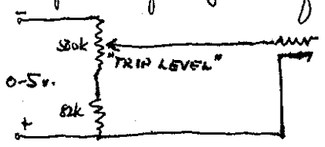
Chose B+ @ 110. With this B+ Ip ~~=~~ 2.5ma, I_s = .96 ma when grid is grounded.

Relays A & B = SIGMA SRJ 2000G - { I_{fire} ~ 19ma. / $I_{release}$ w/ 1.2ma. }

Set up Brush oscillograph, dual-channel, to make some time measurements. Interest in (a) response time } circuit.
(b) response time } relay.

Serviced one of Brush amplifiers (refer file on Brush)

(1) Input to grid of 6AU6 from Keithley - as shown -

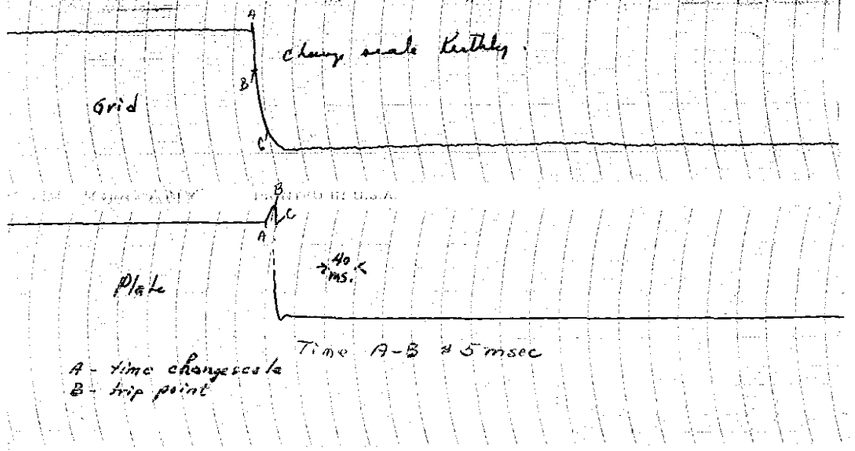


Set trip level to about 60% on any ranges (≈ 3 v bias to grid) with source going ready @ ≈ 40%, Changed scale to increase meter, causing trip.

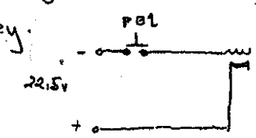
Attached - one channel across Keithley output.
- other channel from plate 6AU6 to ground.

Results in figure 1.

6/19/57 FIGURE 1



(2) Put battery in input to 6AU6 to provide step voltage in place of Keithley.



Insert push-button switch in grid to give steps.

Results in fig. 2.

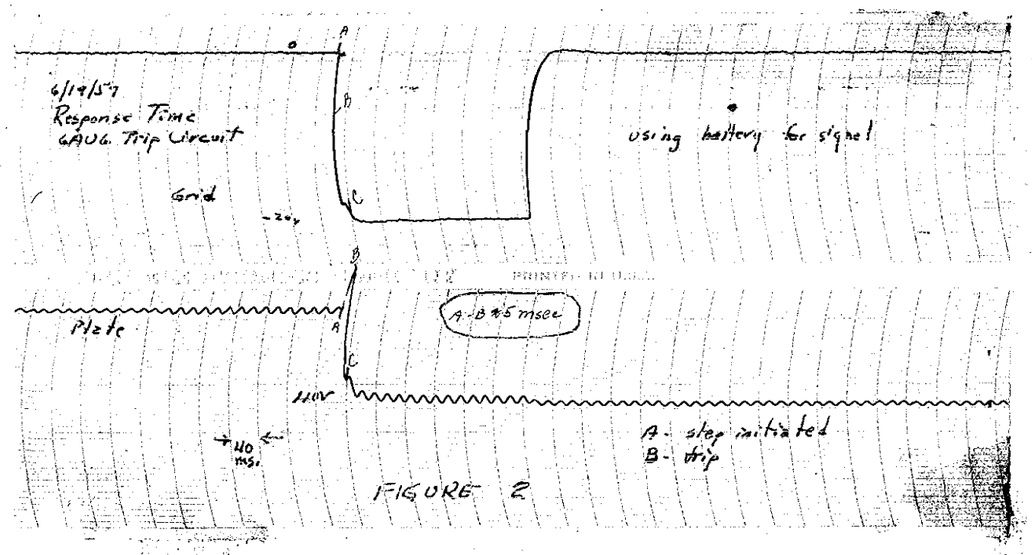
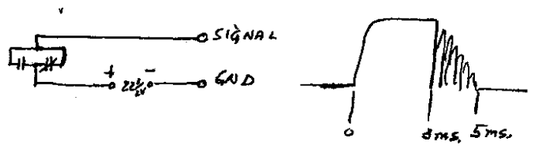


FIGURE 2

6-17/51

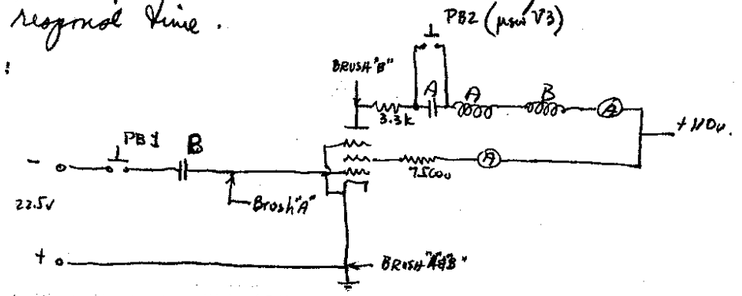
Using Tektronix Scope - checked operating time of microswitch V3.

Wiring:



③ With DC step on grid, inserted normally-opened contact of Sequence relay B in input. Then Brush trace would grid grip on grid, indicating time from closure of push-button to opening of relay contact - This would be equivalent to circuit response time.

Wiring:



As check, put scope across grid to ground. Pattern was ± 3ms. long.

Refer to fig. 3.-

Time from contact of PB1 to point grid reaches firing bias = 3-4 ms.

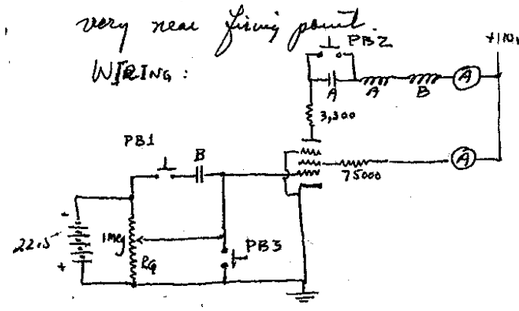
Peak on plate appears to ~~the~~ occur at firing bias point.

Grid continues negative for 1-2 ms. until striking min.

Plate trace shows action of reset push-button, PB-2.

④ Setup to take measurement of response when starting grid bias very near firing point.

WIRING:



CONDITION	I_p	I_s	E_g	E_p	E_s
Rg adj. to point near trip	1.15 ma.	.46ma	-1.63v.	103v.	74.5v
PB1	0	.45	(spike)	0	59
PB2 & 3	2.5	.96	0	92v.	94v.

FIGURE 3

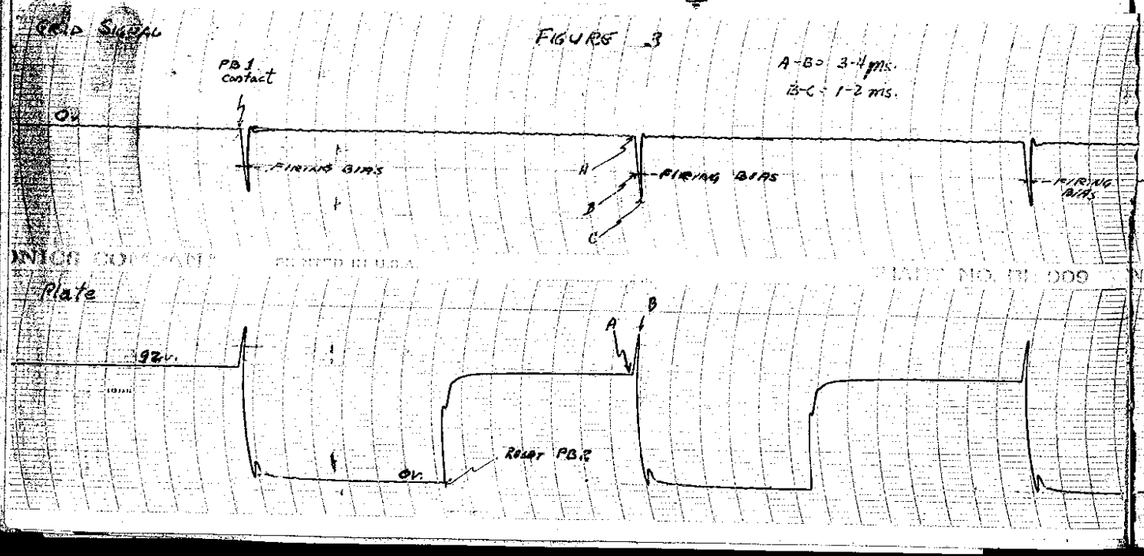
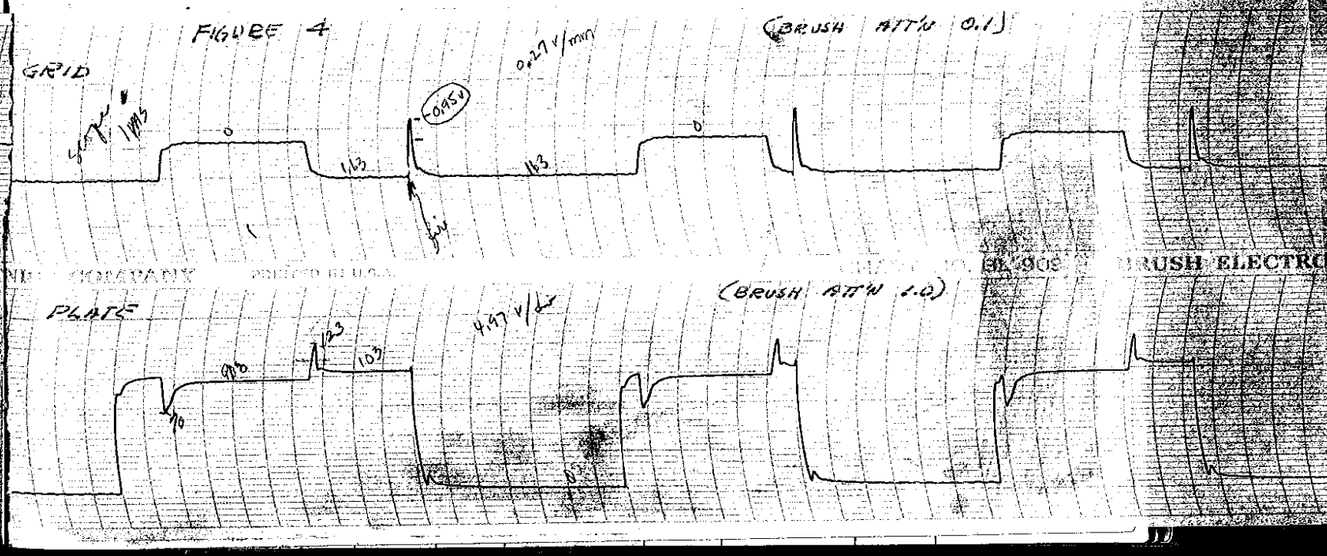
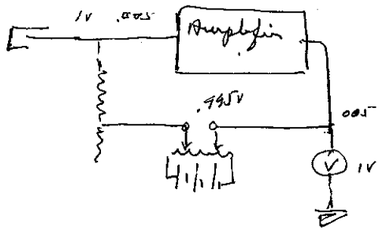


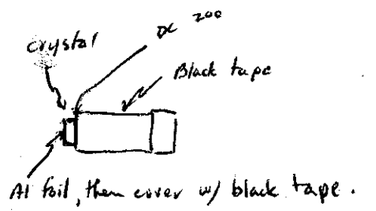
FIGURE 4



10-28-57 Notes on ~~[illegible]~~ Amplifier - feed-back differential measurement
Representative from Argonne on 10/25 suggested circuit as
indicated below & record very small changes in level.



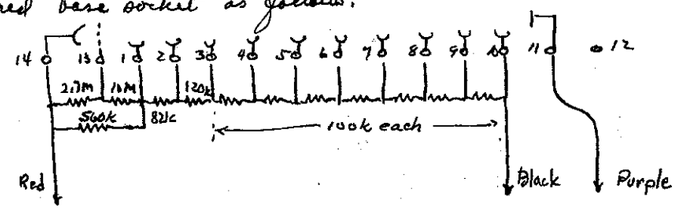
11-11-57 Instrumentation 112-113
Pam. Mount Antimonum crystal in 6292-



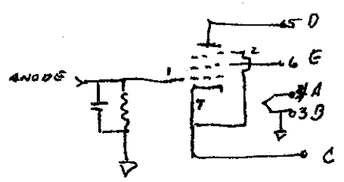
Found shield & pre-amps case on shelf in 209 which could be used for this instrument - Had been used earlier in some detector development.

Wired base socket as follows.

11/12/57

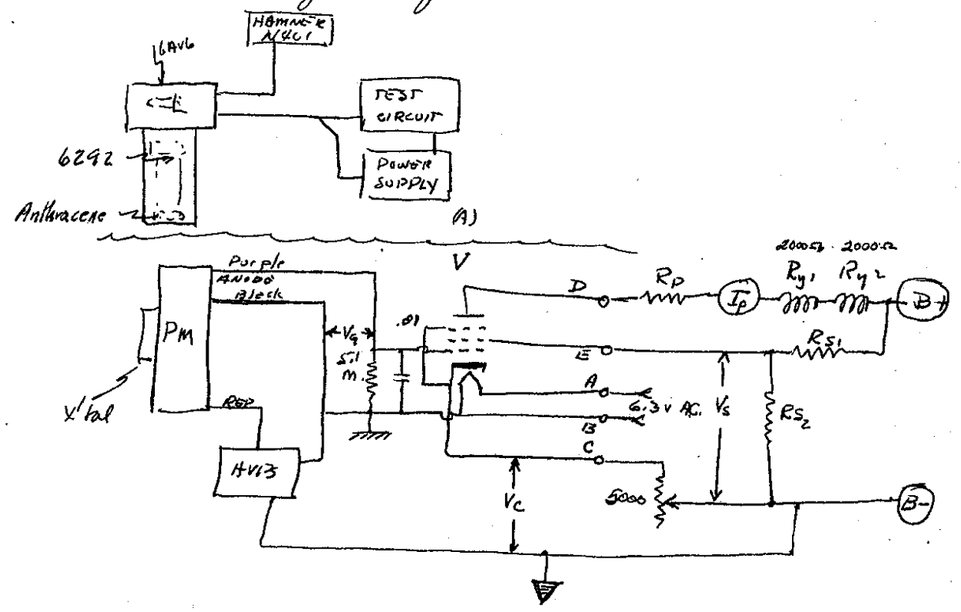


Tube to be used w/ PM. 6AU6



R	C	t
6×10^6	$.010000 \times 10^{-6}$	50 MSEC

11/13/59 Circuit Arrangement for Test.



V_g measured with HP VTVM.
V_c
V_s

~~V_s~~ I_p - measured with Simpson 260

Simpson voltages readings in error.

$B+ = 150$; V = 6AV6.

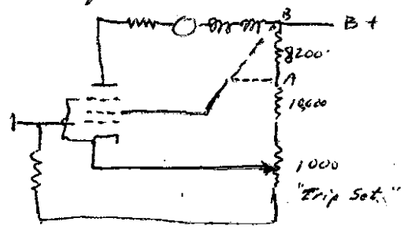
H.V.	V_c	I_p	V_p	Plate Ckt	V_s	Screen Ckt	V_g
	v	ma					
0	0	2.6	~~140~~ 139	$R_{y1}+R_{y2}$	69	R_{S1} = 75k	- 0.94
500	0	"	" no change		68 ~~rotated~~		- 0.97
750							- 0.98
1000	0	2.58	138		69		- 0.99
1250	0	2.55	137		69.5		-1.05
1000	0.2	2.5					- .84
0	0.2	2.6	139		68		- .78
0	0.4	2.56	138		68.5		- .61
0	0.6	2.53	138		69		-.44
0	0.79	2.48	140		71		-.29

HV	V_c	I_p	V_p	Plate Ckt	V_s	Screen Ckt	V_g
0	1.0	2.41	140		73		-0.14
	1.2	2.33	140		75		-0.05
	1.4	2.20	140		79		0
	1.75	1.91	143		89.5		+.01
	2.00	1.71	149		93		+.01
	3.00	1.00	146		114		+.01

need to "fix" V_s.

more comments over —

11-13-57 Circuit to fix value of screen of cathode

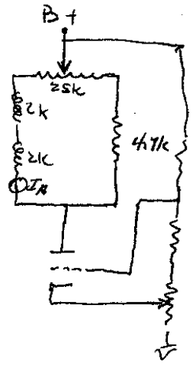


Screen tied to point A & then point B.

By fixing screen of cathodes in this way major effect of signal change was present in plate circuit. -
Other pentodes possible - 6AH6, 6AG5, 6AK5, 6CB6.
Only rough comparison made between of the several.

~~Plate Circuit~~

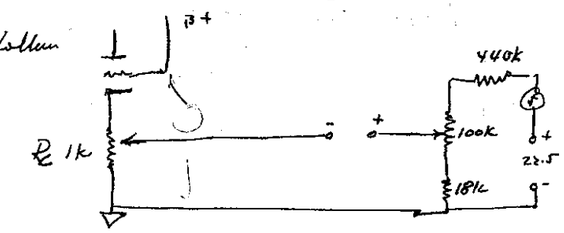
Trip set control in cathode affects plate current thru tube. This would upset recorder zero when one such instrument is incorporated in design.
To eliminate interaction of trip set with zero.
Used Ellis-type plate circuit.



11/4/57 Recorder Circuit.

Consideration given to taking IF signal for recorder in cathode - This would mean changing cathode circuits.

Done as follows



Found to be extremely sensitive & touchy at full Rc.
@ 2.5V E_c. Reduced sensitivity by reducing taps on Rc - & correspondingly reducing 100K value.

Had noted marked grid bias change with HV changes:
Probably poor 6292 -
Checked signal from several PM tubes -

Tube		HV 500	600	700	800	900	1000	1100	1200	1300
A	from 108				0	.01	.02	.05	.11	.30
B	~~in use~~	.20	.25	.30	.35	.39	.44	.84	.87	.67
C	from 108				.01	.05	.17	.44	.76	1.4
D	new stock				.06		.08	.08	(.11)	(.16)

Mounted crystal on Tube D and installed in place.

Battery checking loop 18.3 μa @ 4:20 P. Left on over night.

11/15/51 Battery backing voltage 18.3v 8.2mA

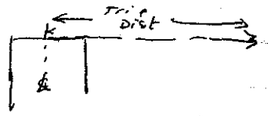
As more thought is put to circuit feeling is that plate take-off point should be compared w/ cathode If one can again "fix" cathode & get major changes in plate may get better response on trigs.

Cathode circuit: (Disconnect recorder)

B+ = 150 HV = 1100 Trigs set to I_p = 1.2 ma.

E_c = 3.1v (3.0 if set to 3.1)

E_g = -.055



HV = 1100	D_T =	inches	inches
		4	2⅞
		4	3¼
		4	2⅞
		4	2⅞

HV = 1300 - Reset trigs so both relays reset-

	D_T	D_T
E_c = 3.1v. ; E_g = -0.11 I_p = 1.24 ma.	5½	4⅛
	"	"
E_g	-.52v.	-.78v

W/o resetting trigs HV = 1000 : E_c = 3.1v. E_g = .055 I_p = 1.25 ma.

D_T	E_g	D_T	E_g
2⅞	.56	1⅞	.78
2⅜		1⅞	
2⅜	.54	1⅞	.78

11/15 Change circuit so cathode is essentially fixed.

HV = 1000 ; E_c set at 3.1v. ; E_g = 0.07 I_p = 1.25 -

D_T	E_g	D_T	E_g
3⅛	.36	2⅝	

Better to have cathode fixed.

Check to see value of R_K for min E_g = for this tube - 2100Ω

Suggest screw driver adj be chassis pot @ 250Ω

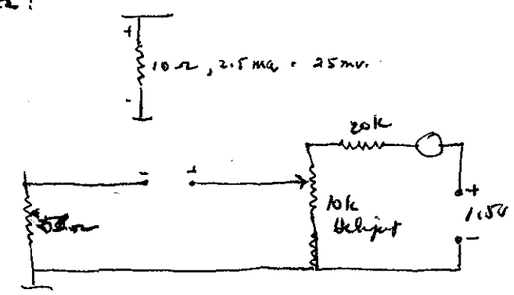
HV = 1300 D_T @ 7 in.

HV 1000 adj - 5" - 3½"

HV 1300 no adj 16" - 9"

Assume 2.5 ma I_p R_K for 10mm. $R = \frac{10^{-2}}{.25 \times 10^{-2}} = 4 \times 10^{0} = 4\Omega$

Trig 10Ω:



40 μa - E = 100 mv

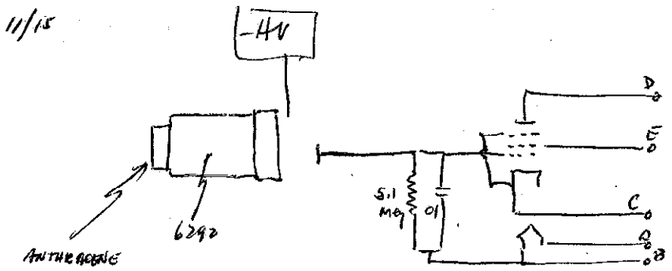
$\frac{1.4v.}{40\mu a}$ $\frac{1.4}{.4 \times 10^{-4}} = 3.5 \times 10^{4} = 35k$ $R = \frac{10^{-1}}{.40 \times 10^{-4}} = 2.5 \times 10^{3} = 2.5k$

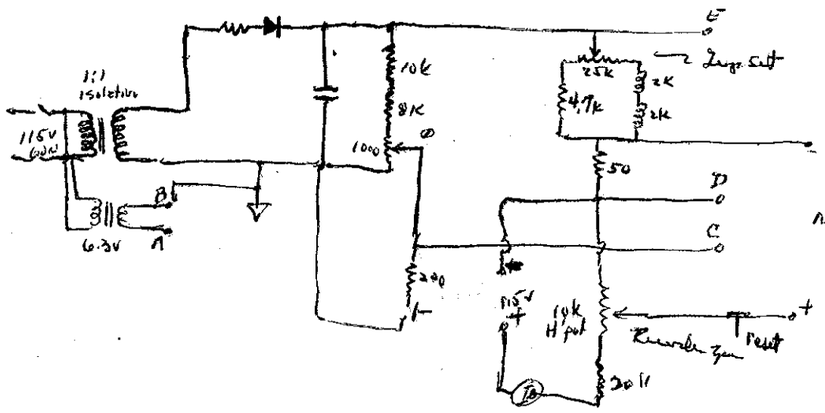
11:38 E_g = -1.3v ; HV = 1300 ; I_p = 1.18 ma. T = 6AH6

E_g = 3.15v. Set meter to 10% - I_B = 16.2

11:42 Set HV 1000 recorder 50
11:57 re-adj to 50 set pen UP

11/15





Components - top chassis
Isolation transformer
Filament transformer
Rectifier
Capacitor
Battery
Relays

Rear - Pre-Amp connector
Recorder output
Recorder adj calibrate

panel -
Ig meter
Helipot (Recorder Zero)
Trip set.
power switch
Recorder on
reset PB.
fuses

Downward drift noted during afternoon - Needs further checking →

11/14/57 9:30 A/ Power on Equipment. B+ = 148
HV = 1000 I_P = 1.13 ma. I_{T3} = 16.3 17 ma
E_G = -0.07
Balance recorder @ 9:47 to 50%
@ 11:30 still -50° had gone up to 70%, & back down -

Records shown for 11/14/57 - fairly steady, drift-wise.

11/14 Power on 8:15 HV = 1000; B+ 150; I = 17 ma; I_P = 1.2 I_{T3} = 16.2
E_G = -0.055
8:25 E_G pots removed.

Power on over night

11/20/57 8:03 Recorder - Had gone off-scale neg. B+150 HV 1000
E_G = -0.050

2y4200 & 100 as well as 150 100 OK.

4/18/57 DWN - need for instrument to read sensitivity ~~.01%~~ to show power level changes of order .001.

Purpose: To measure reactivity of order 10^{-4} $\frac{\Delta k}{k}$

Differential circuit of Argonne suggested.

4/21/57 Argonne Circuits Check-

Pre Amp 327
LA Y90319
Scaler Y100371

Source Pu-Be 1.28×10^6

LA Gain 16x1
.2 μs Rise Time
Disc. = 7

Background 0 counts in 3 minutes
Source $8 \times 16 + 4$ in 2 min

Disc 10		$6 \times 16 + 11$	2 min
20		$7 \times 16 + 1$	3 min.
30		$0 \times 16 + 15$	2 min.

Counts 5-2

6	Bkg	$< 0 \times 16 + 2$	2 min.
6	Source	$10 \times 16 + 2$	2 min.
7		$8 \times 16 + 11$ / $9 \times 16 + 9$	2
10		$8 \times 16 + 6$	2
15		$5 \times 16 + 13$	2
20 / 30		$5 \times 16 + 3$ / $0 \times 16 + 7$	2 / 2

Counts 5-1

Counts 5-3

6
7
10
Rise Time 15
Changed to 20
0.8 μs 30

Counts 5-1:

Disc	Scaler	2 min	Source
7	$15 \times 16 + 3$	2	Bkg
	$20 \times 16 + 11$	2	Pu Be
8	$0 \times 16 + 1$	3	Bkg
	$10 \times 16 + 3$	2	Pu Be
10	$52 \times 16 + 12$	11	"
15	$9 \times 16 + 2$	2	"
20	$11 \times 16 + 10$	3	"
30	$5 \times 16 + 10$	2	"
40	$4 \times 16 + 0$	3	"
50			

11/21/57
C 5-3

Gain 16-1 - RT 0.18μs

Disc	Scaler	Time	Pu Be only
7	29x16+11	2	
8	30x16+5	4	
10	23x16+10	6	
15	47x16+9	11	
20	77x16+6	19	
30	27	1	10
40	2	13	2

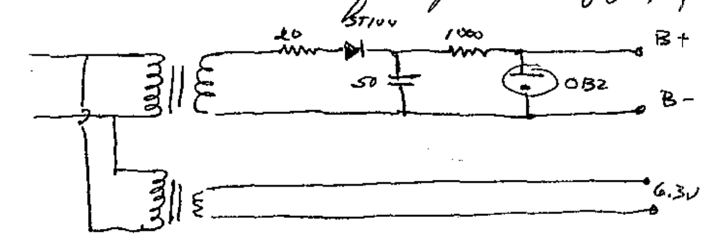
C-5-2
Gain 16-1
RT 0.8μs

Disc	Scaler (x16)		Time	Bkg	Source	Scaler (x16)	Time
6	277	8	20	← ✓	✓ →	19+5	1
7	13	2	3	← ✓	← →	26+10	3
8	2	1	3	✓	✓ -	10+11	3
10	21	5	5		✓		
15	13	1	3				
20	10	12	3				
30	18	6	7				
40	8	12	6				

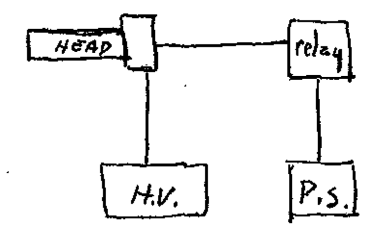
Source

11/25 Set up for timing test on photomultiplier. (Refer to timing test file)

Built selenium rectifier power supply for trip circuit:



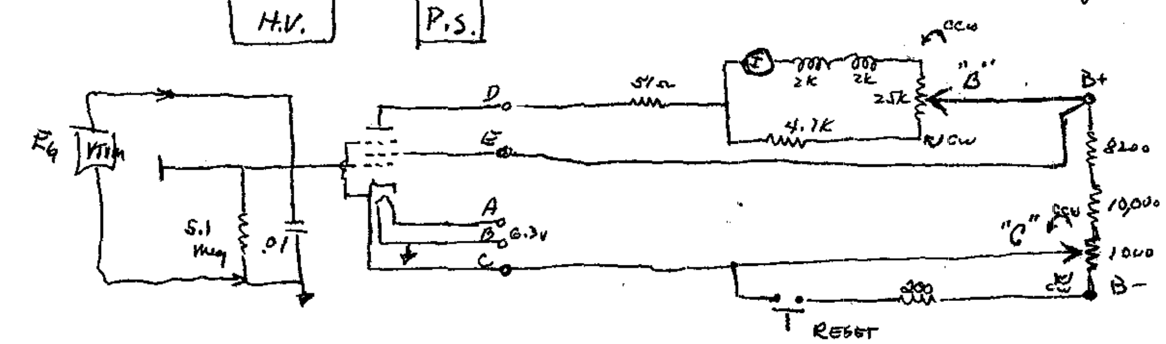
11/26 Circuit under test:



Head. { Anthracene Crystal
6292 Photomultiplier
6AH6 Amplifier

HV - Hammer N401

Relay - P.S. as shown in diagrams



Initial Adjustment:

1. Set Control "B" c.c.w. - max. trip relay current
2. Adjust "C" c.c.w. until I_p drops to ≈ 2ma, at which point relay can trip & reset by adjusting "B."
3. Set trip level by turning "B" clockwise to proper point.
Relays trip at ≈ 1.15 ma I_p.
During timing test trip point will be set at 1.2, 1.3, 1.4.

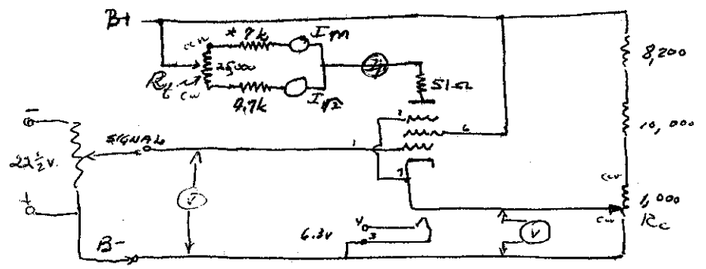
Signal, E_g, for trip: Set 1.2 : .22 ; .34 | Same for all HV.
1.3 : .40 ; .50
1.4 : .35 ; .45

11/20/51	Background signal	HV
	.075	1000
	.09	1100
	.10	1200
	.12	1300
	.155	1400
	.255	1500

4-7-58 PM- circuit - Has been in use in South Wing.
Certain modifications are necessary. -

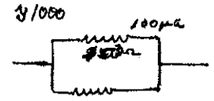
a. Wider separation of low & high trip points.
b. Reproducible trip points -

Set up "bread board" for further tests.



* 9k resistor same as resistance of 2 relays presently in PM.

Plate meters - 0-5 ma - 2½ inch API 0-100 μa -
rated 950 Ω @ 1000



$10^{-4} \times .8 \times 10^3 = .8 \times 10^{-1} = .1$
$E = .1V$
$R_s = \frac{10^{-1}}{5 \times 10^{-3}} = 10^{-1} \times \frac{1}{5} \times 10^3 = \frac{10^2}{5} = 20$

Shunt meters with 22 Ω @ 100 Ω in parallel. This gives approximate 5 ma full-scale =
I_m & I_n = each 0-100 μa API w/ shunt noted above.
I_p = 0-50 ma.
E_c, E_p, E_B = Simpson 260. Y-100302
E_q = DC millivoltmeter I.C. Type 200-A, Ser # 42. Y-3796 -

184

PM - 3:20

4-7-58

Tube = 6AH6

E_B = 201v. I_p = 8.5

E_p = 24v I_m = 85 (4.25)

E_c = 0 (-1.05) I_r = 87 (4.35)

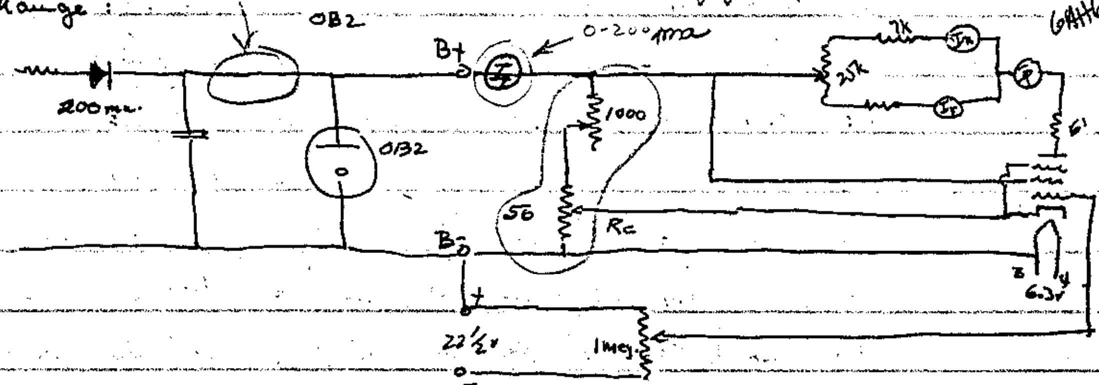
E_g = 0

With no signal adjusted R_c for max I_p. — R_f set @ mid-range

E_g	E_c	E_p	I_m	I_r	I_p	E_B
			(4.375)	(4.5)		
0	0.54v	21.5	825 (4.40)	90 (4.5)	8.9	101
-0.1	0.51	21.3	88	90	9.0	
-0.2	0.49	21.8	87.5 (4.3)	89.5 (4.40)	8.8	
-0.3	0.44	23.0	86 (4.1)	88 (4.2)	8.6	
-0.4	0.45	26.5	82 (3.8)	84 (3.9)	8.2	
-0.5	0.42	32	76 (3.55)	78 (3.65)	7.6	
-0.6	0.40	37.5	81	73	7.1	
-0.7	0.38	42.8	65.3	67.7	6.5	
-0.8	0.35	47.8	59.5 (2.7)	61.5 (2.8)	6.0	
-0.9	0.33	52	54	56	5.3	
-1.0	0.31	57	49.5	51.5	5.0	
-1.1	0.29	62	42.5 (1.92)	44.5 (2.10)	4.2	
-1.2	0.27	67	38.5	40	3.9	
-1.3	0.25	70	34 (1.562)	35.5 (1.568)	3.3	
-1.4	0.23	74	30.5 (1.3)	31.5 (1.36)	3.0	
-1.5	0.22	78	26.	27.3	2.6	
-1.6	0.21	81	23 (1.10)	24 (1.05)	2.2	
-1.7	0.20	83	20	21	2.0	
-1.8	0.19	86	17.3 (0.75)	18.5 (0.81)	1.7	
-1.9	0.18	88	15 (0.6)	16 (0.65)	1.5	
-2.0	0.17	90	12	13	1.2	

4-8-58 Noted change in cathode as grid signal introduced.
Bleeder current only the order of 5 ma.
Increase bleeder current to 100 ma & re-run.
(Put ammeter in B+ line)

Change: — removed 1000 Ω dropping resistor



E_B ~~E_p~~ measured on Voltmeter VTVM

E_g	E_c	E_p	I_m	I_n	I_p	I_t	E_B
0	.04	24	4025 / 80.5	425 / 85	8.28 / 8.2	132	101
0	.54	21.8	4.175 / 83.5	4375 / 87.5	8.55 / 8.5	128	102 adj. Rc for E_p min.
-0.2	.53	24.6	4025 / 80.5	4.25 / 85	8.28 / 8.2	126	* change E_g Batt = 3V Pot = 10k helipot.
-0.4	.52	35	3475 / 69.5	370 / 74	7.175 / 7.0	124	
-0.6	.51+	49	275 / 55	295 / 59	5.7 / 5.7	123	
-0.8	.51-	62	215 / 43	230 / 46	4.45 / 4.3	122	
-1.0	.50+	72	1,640 / 32.8	1.765 / 35.3	3.40 / 3.3	121	103
-1.2	.50	81	1.180 / 23.6	1,275 / 25.5	2.46 / 2.4	120	
-1.4	.50	87.5	.825 / 16.5	.90 / 18	1.72 / 1.7	119	
-1.6	.50	92	.55 / 11	.625 / 12.5	1.18 / 1.2	118	
-1.8	.49	95	.375 / 7.5	.425 / 8.5	0.8 / 1.0	118	
-2.0	.49	98	.260 / 5.2	.300 / 6.0	.56 / 0.7	118	103

I_o = operating current
I_r = releasing current
( ) = Voltage across relay

4/8/58 Relay Operation Check:

Relay:	201		202		203		~~501~~ 207		~~502~~ 205		~~503~~ 206		~~504~~ 207
I_o (4.1)	I_r (2.2)	I_o	I_r (2.35)	I_o (4.3)	I_r (2.5)	I_o (6.5)	I_r (5.1)	I_o (6.1)	I_r (2.8)	I_o (6)	I_m (3)	
1.9 (4.1)	1.03 (2.2)	2.0	1.13	2.0	1.1	1.25	.6	1.2	.55	1.15	.6	
1.9 (4.1)	1.04 (2.2)	1.9	1.13	2.0	1.1	1.25	.6	1.2	.55 (2.7)	1.15	.6	
1.9	1.04	1.9	1.13	2.0	1.1	1.25	.6	1.2 (60)	.52	1.15	.6	
1.9	1.04	1.9	1.13	2.0	1.1	1.25	.6	1.18	.58	1.15	.6	
1.9	1.05	1.9	1.13	2.0	1.1	1.25	.6	1.18	.55	1.15	.6	
1.9	1.05	1.9	1.13	2.0	1.1	1.25	.6	1.18	.53	1.15	.6	
1.9	1.05	1.9	1.13	2.0	1.1	1.25	.6	1.18	.55	1.15	.6	
1.9	1.05	1.9	1.13	2.0	1.1	1.25	.6	1.18	.55	1.15	.6	
1.9	1.05	1.9	1.13	2.0	1.1	1.25	.6	1.18	.55	1.15	.6	
1.9	1.05	1.9 (<4.0)	1.13	2.0	1.1	1.25	.6	1.18	.55	1.15	.6	

4-8-58 Inverted relays 201 & 501 in plate load of test circuit, replacing 7000 Ω resistor. Relay meter = I_m.

R_c 201 ~~"fires"~~ @ E_g = -1.12 v, I_m = 23.5 (1.17 S)

R_c 501 "fires" @ E_g = -1.55 v, I_m = 13 (0.65)

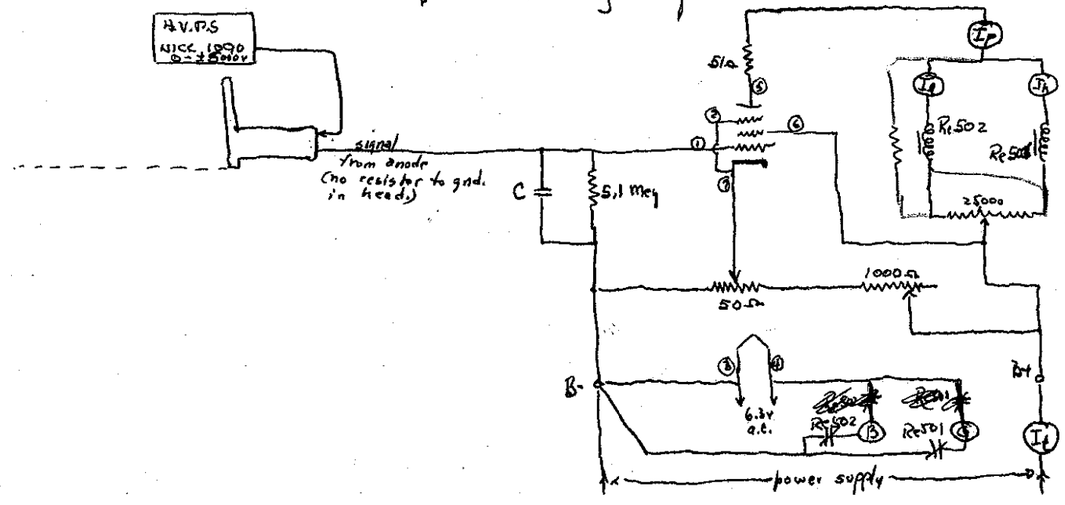
R_c 501 "resets" @ E_g = -1.28 v, I_m = 21 (1.05)

R_c 201 resets @ E_g = -1.0 v, I_m = 32.5 (1.62 S)

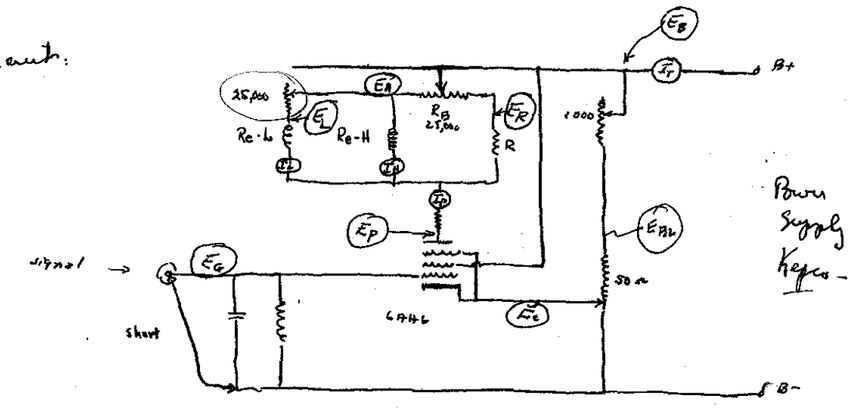
4-9-58 Set-up for operation with photo-multiplier head. — HV power supply not up-to-par - 2V3G weak.

Unable to get 2V3 from V-12 & X-10 stock - both stores have cancelled the item - Changed power supply to use 2X2A -

4-10-58 Circuit for test — new:
- signal from PM head (Anthracene + 5819)
- new meter for I_p, I_b, I_{high} (0-10 ma Weston 301)
- new lo relay 502 for 203



4-11-58 Circuit:



Power Supply Keyed -

New 5 dropping resistor in low level keying leg - To reduce current. This an effort to widen interval between low & high level keying. $R_{c-L} \approx 2000\Omega$; $R_{c-H} \approx 5000\Omega$ R_B 5,300 Ω

Voltage readings read all taken w/ HP VTVM. (Vomax developed trouble).

⇒ Behavior of circuit as R_B is varied. ⟸

($E_g = 0$, $E_c = .09$ v)

Dial R_B	E_P volts	I_P ma	E_L volts	I_L ma	E_H volts	I_H ma.	E_R volts	E_B volts	I_T ma	E_{B2} volts
ccw 100	50	19.5	58.5	3.48	110	>10	58.7	110	17.8	6.5
90	70.8	11.2	75.5	1.95	105	7.95	76.5	110	>200	
80	60	10	64	1.58	91	6.15	68.5	110	>270	
70	58	8.6	61.8	1.1	82	4.68	67.5	111	208	6.55
50	56.4	8.2	56.5	.95	71.7	3.4	67	111	209	
30	57	8.5	58.5	.55	70	2.55	73.5	111	213	
10	65	9.4	66.5	.38	74	1.8	87.3	111	212	
cw -15	85.4	12.5	89.5	.2	94.5	.96	111	111	204	

Note - sudden rise in total current as R_B turned slightly off full ccw position

4-11-58

Rise in total current not shown in I_P, I_L, or I_H - Probably screen current -

⇒ Try another type tube to see if rise occurs -

Circuit switches & Added - 0-50 ma - meter for I_S
to that opposite - 0-10 ma - meter for I_R meas. value

Components: R_{c-L} = #201 (2150 Ω) Common plate resistor = 57Ω (55Ω)

R_{c-H} = #502 (5100 Ω)

R_1 = 3300 (3200Ω)

R_2 [pot] set @ (18,000Ω)

Change measuring plate voltage at junction of meters, NOT plate.

Dial R_B	E'_P	I_P	E'_L	I_L	E_H	I_H	E_R	I_R	I_S	I_T	$E_c = .06$
100	75.2	13.0	80.4	2.28	110	9.00	80.5	1.67	5.5	151	$E_{BL} = 6.5$
80	46.6	12.4	51.5	1.95	84.3	7.56	56	2.96	5.7	150	$E_B = 110$
60	30.9	11.4	33.6	1.4	52.6	5.34	45.4	4.80	6.1	150	$I_{BL} = 135$ ma
40	31.3	11.0	33.4	1.04	51.5	3.97	50.6	6.28	5.7	149	
20	40	11.4	41.4	.73	54	2.8	64.5	8.07	5.4	149	
0	65.5	12.0	66.2	.48	73	1.5	95.6	>10	5.2	149	

Set up for use with pm head - Results fair

NS = 1200 R_B = 100 I_P = 7.8 $E_{B2} I_L$ = 1.34 Low hyp 22" } I_H = 5.55 I_R = 1.10 High hyp 4" } I_S = 3.3 I_T = 143

E_G = -.83 v - This is unusually high for background -

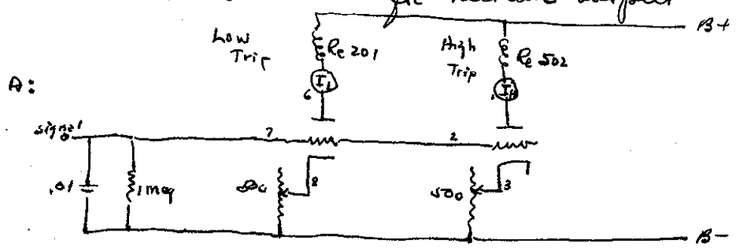
Set E_c at ≈ 10 v - reduced E_G to .15 volts background.

4-11-58 Replaced R_c 1 #201 with #503 Trips: L=9", H=4.5"
Added input capacitor of 0.1 μfd L=6", H=3.5"

⟹ Trip adjust range is limited.

4/14/58 Tried increasing E_B to get wider low-high trip.
Seemingly - the higher the supply voltage the narrower the interval.
Do make this test - added 1000 Ω to bleeder -

4/15/58 Single pentode with paralled plates relays is not satisfactory method of getting wide range trip —
Try new approach.
A - Dual triode - one relay for each plate - for trip
B - Dual triode - for recorder output -

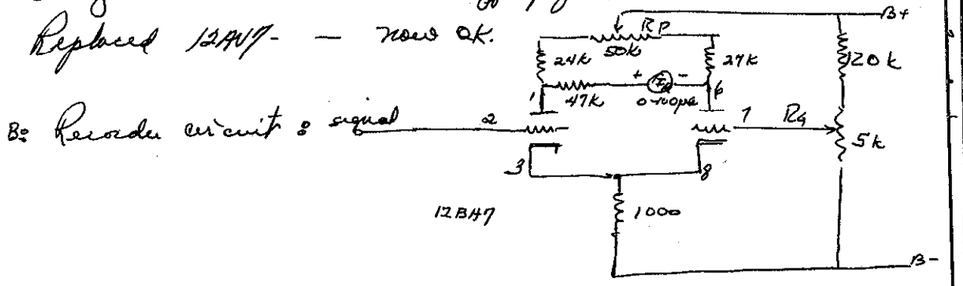


Found one needed R_c = 500 for low-half. To get good control of I_L.
Replaced 500 Ω pot w/ 25000 Ω.

Increased E_B to 250 volts -
Get good reproducible trips @ 12" & 3" -
Trip signal 1.5 v. & 17 volts.

mounted 570 Ω in R_c - high to give max I_H & < 10 ma -

4/15/58 During testing - found could get only max signal 3 v p/p into
Some component failure -
Tube - (PM) or Power Supply ? or tube under test
Brought in Sharon Power Supply from Rm 215 (20 channel)
⟹ Replaced 12AH7 - — now OK.



B: Recorder circuit & signal

With HV @ 1050 have trip range 29" — 5"
High trip 3"

E_B = 255 v.

Left power on over night to check drift.
4:25P I_H = 9.8 ma I_R adj to zero - by R_P -
I_L = 1.2 ma
I_T = 20 ma
E_B = 257 v.

4-16-58 I_H = 9.7 ma adj I_R to 0
8:10A I_L = 1.2 ma
I_R - off scale neg.
E_B = 259
I_T = ~~20~~ 19 ma

4-16-58 Trip point (Strong Ra) HV = 1050 I_R (bkg) 0.8 units
Low trip = 15.75 #
High trip = 3"

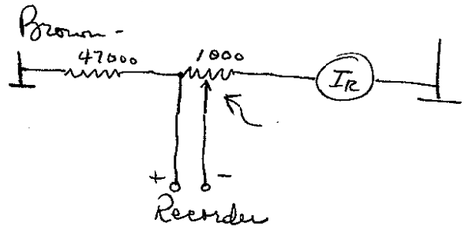
Variation of I_R with HV - Source @ 8 5 feet -

HV	I_e	
900	2.5	
950	5	
1000	7.8	
1050	10-13	
1000	0.5	Bkg
0	-0.4	

8:33 A adj - I_R to +1.0 no HV -

Provision for 0-10 mv. Recorder - -

Circuit Brown -



If recorder resistor is max — 1000 Ω
10 mv on recorder if I_R = 10 μa.
This makes for extremely sensitive recorder - good for measuring drift

set up circuit Brown for run - seemed to be responding after battery change & new PF7 -

11:30 A HV = 1000 - No source - I = 6 μa
V = 6 mv (R_{rec} = 1000 Ω)
(Thought saw rise in power level on West end)

3:15 Noticed recorder trace steady -
checked w/ source - NO RESPONSE on Recorder
Recorder extremely sluggish -
Quickly activated small Foxboro to run trace over night -
Trace from 4:15 P to 7:48 A Reading 50 to 51 P
very little fluctuation. Good -

4/17/58
I_H = 9.8
I_L = 1.2
I_R = 8.5 μa - R-51
I_T = 20
E_B = 257

Comparison of Recorder with I_R used Co-Source

Recorder	I_R	
61	80	
70	30	
79	40	
96	60	
44	0	manual

Why? → Reduced R_{rec} to minimum - Recorder still reading 20%
Noted recorder frame was grounded - disconnect ground pin to near zero.

4/17/58

9:10A In re-locating PM housing - noticed noise inputs

~~to~~ Removed base el slide to check crystal -

Found loose member was mu-metal shield.

Took out shield.

Put black tape over opening & powered - large indication on I_R - ???

Light leak first suspected - - Is tube damaged?

Kept getting high background current indications -

New tube the same - -

No response to source ? -

Found that signal & HV leads were reversed ??

Used new tube..

4:15 Rec - 5 mv.

4/18/58

7:45A I_H = 9.8 ma ; I_L = 1.2 ma ; I_T = 20 ; E_B 257

I_R = 3.5 μa HV = 1000

Rec: 3.3 mv.

8:11A checked response to Co. source Source @ 12" R = 8 mv.

8:50 Brown Recorder check. Circular int. failed after several hours operation 4/16.

Zeroed ok. Response & signal ok.

Standardize ok.

Tied Brown input across 1000 52 pt. in test circuit.

(Foxboro - one end to center wire of same)

Effect on Foxboro - - Initial upward step of trace. Settled down after 15 minutes to normal signal

- Width of trace narrowed -

Bkg F - 38

B - 38

10:10 → Co @ ~12" F - 82 ; B - 88

(Noticed during 1st hour of operation timing mechanism lagged. Set-up chart 4 times between 8:50 & 10:05)

Leaving source in place to see source trace -

10:29 → Source away -

10:55 - Source @ 12" away ~ 11:15 , up 11:45 - away 12:00 (WWV)

4:11P Bkg - HV = 1000

Leave on over week-end

4-21-58 7:5A 5% scale neg - adj zero only slight adj needed in R_p to balance recorder to new mid scale

E_B = 257 , I_T = 20 I_L = 1.2 ma , I_H = 9.9 ma.

4/22/58 8:15A Change charts - very little drift for 24 hour period.

Change may be as much as .4 mv in 6mv -

.4 μa x 50 $4 \times 10^{-7} \times 5 \times 10^{4} = 20 \times 10^{-3}$ V

in meter .4 μa /100

4/23/58 8:12A change charts.

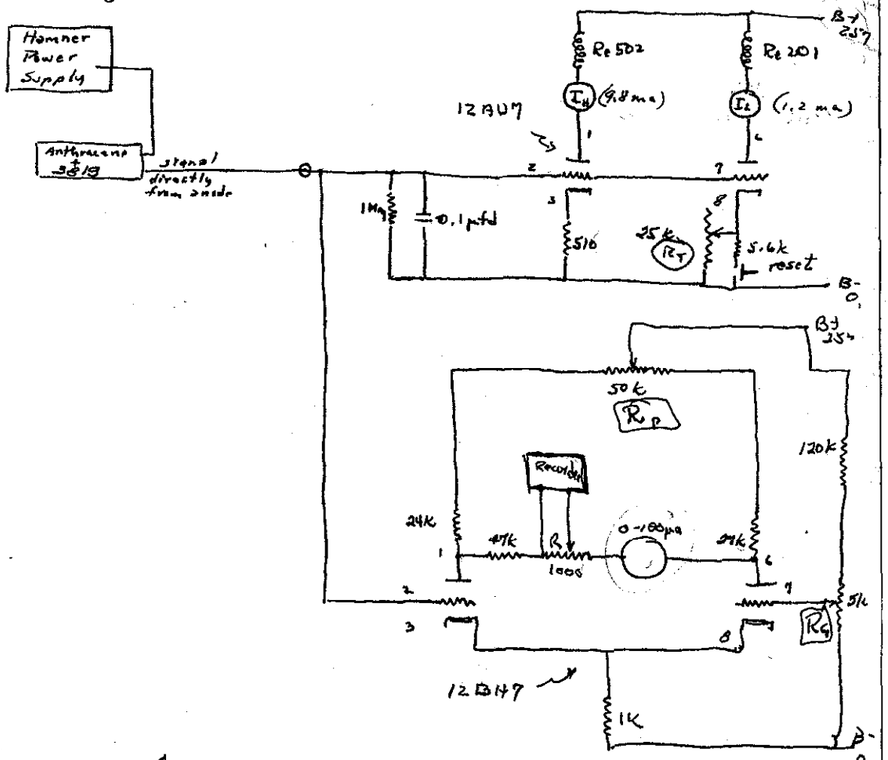
4/24/58 8:xxA change charts

Last adjustment was Monday (4-21) @ 7:56 Am.

Seems reasonably stable at this sensitivity.

Tony

4-24-58 Sketch of Circuit that has been under test —



from p190 Trip points 1.5V & 17V on signal

Adjust Brown to read on scale at low level trip. —
Bring Ra (5 meg) unit shop. —
Adjustment 100 μa @ 2.4 mv. $R_r = \frac{2.4 \times 10^{-3}}{10^{-4}} = 2.4 \times 10 = 24\,\Omega$
@ 10 mv - $I = \frac{10^{-2}}{2.4 \times 10} = \frac{1}{2.4}\,10^{-3} \doteq .4 \times 10^{-3} = 400\,\mu a$

1:15 P/ Removed 0-100 API & put in 0-500 μa unit.
No effect on recorder.

4-24-58

Instrument Response to 5 mg Ra source -

Source Distance	Recorder	Meter	[R]
24"	25%	100 μa	25 mr
22	29.5	115	25.6
20	34.8	140	24.8
18	42	165	25.4
16	57.3	210	24.4
14	65	290	24.1
13	75.3	315	23.9
~12⅛	~~82.5~~ 83	350	23.7) low trip
12	86.3	365	23.6
11	f.s.	#30	
10	f.s.	2500	

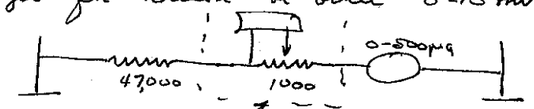
Adj trip @ ~70% records (~ 350-360 μa)
11.5" trips — 75% records — @ HV = 1000 V
F-80

2:45 Change HV to 900 V
Source v source distance I = 130 - R = 28
Trip - R = 79.5 D = 6 ¾"
I = 358-360

HV 1100 - Trip - R = 94-
I = 360-
D = 18.5"
High trip @ 4"

Many runs. overnight —

4-25-58 Modified recorder circuit - to provide three ranges for Brown or other 0-10 mv recording device.



as of 4/24/58.

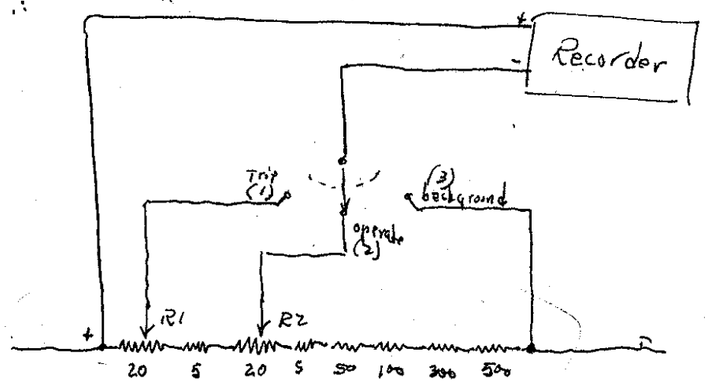
This pot. has been in test circuit & varied over entire range to give "full" for operating points. Full 1000 sc — high sensitivity on recorder. Full scale equal to 10 pca on meter -

Good for drift check

Referring to readings of 4-24- (p197), value of R for Krypton @ ≈ 3/4 f.s. was about 20 sc. A range with this characteristic on scale with Krypton is desirable.

An operating range with the Krypton point somewhere near mid-scale is needed.

To provide a trip, operating, background set of ranges, make up divider as follows, replacing 1000 sc pot.:



Check above with Ra (5 mg) sources

4-25-58 HV slightly < 1000 F-73

Source Distance	Meter	Setting Range	R_1 R_2 Resistors		Recorder	calc R_{top}
24"	82	1	max	max	18 1/2 8	24.7/20
	"	2	"	"	39	47.5/45
22"	96	2	"	"	45.2	47.1/45
	"	1	"	"	20.3	21.1/20
20"	115	1	"	"	24.3	21.1/20
	"	2	"	"	53.5	46.5/45
18"	138	1	"	"	29.2	21.2/20
	"	2	"	"	64.5	46.7/45
16"	172	1	"	"	36.1	21/20
	"	2	"	"	80	46.5/45
15"	200	1	"	"	41.8	20.9/20
	"	2	"	"	92.3	46.1/45
14"	225	1	"	"	46.2	20.5/20
13"	258	1	"	"	52.9	20.5/20
12"	300	1	"	"	60.8	20.3/20
≈ 11 1/2"	330	1	"	"	66.8	20.2/20
TAR → 11	360	1	"	"	72.5	20.1/20
10	428	1	"	"	85.5	19.9/20
≈ 9 1/4	490	1	"	"	97.5	19.9/20

* 11:45 set trip level for quick drift - Rtop - Trip ≈ 1/60 - pca

4-25-58

HV 1000 (adj up to F-80) Resis [New Trip-point]

Note	Source Distance	Meter	Range	Range Res. R_1	R_2	Recorder 15	(R_d) 22	R
			1	max	max			
	27"	68	2	max	max	32.8		48.3
			2	max	min	19.3		28.4
	25"	78	1	max	max	17.2	22	
			2	max	max	37.5		48.8
			2	max	min	21.8		27.4
	20"	118	1	max	max	25.2	21.9	
			2	max	min	55.8		47.3
			2			32.0		27.2
	18"	143	1	max	min	30.5	21.3	
			2	max	min	38.6		27.0
			2	max	max	67.2		47.[illegible]
Tripping ≈ 150 μa			1	max	max	42.3	20.6	
	15"	205	2	max	max	94		45.9
			2	max	min	53.8		26.2
	12"	312	1	max	min	63.8	20.4	
			2	max	min	81.2		26.0
	11"	372	1	max	min	75	20.2	
			2	max	min	94.7		25.9
	10"	446	1	max	min	89.0	19.9	
HV to 900 E/66	25"	28	1	max	max	7.5	25.8	
			2	max	min	14.2		48.4
	15"	72	1	Max	Max	16.2	22.5	
Trip 4"-10"			2			34.8		38.4
	9"	200	1	Max	Max	42.2	21.0	
			2			91.7		45.9
	6"	460	1	max	max	91.8	19.9	46
				(below all max)				
800 v	15"	27	2			12.8		47.5
	9"	65	2			30.9		47.5
			1			14.7	22.6	
just about to trip	6"	145	1			30.7	21.1	
			2			68.6		47.4
	5"	213	2			98.5	–	46.3
			1			44.7	21.0	
	3½"	450	1			89.6	19.9	

4/25/58

Range Resist @ max

	Source Dist	Meter	Range	Recorder	(Rcalc)
HV-1100 very close to trip	29 ~~1100~~	142	1	29	20.4
			2	64	45
	15"	480	1	95.8	19.9

		Recorder
Bkg -	1100 v -	38
	1000 v -	31.5 - 28.5
	900 v.	25

4:05 P Set HV @ 1020 F-80

4:10 — Chart on for weekend background count.

Monday - 4/28/58 No adjustment in meter zero has been made since last Monday morning, at which time meter was set at approximately 6 μa - Recorder reading 6 mv. across 1000 [illegible]

Drift. Summary

4/21	Monday	8:15 AM -	60	Tuesday
4/22	Tuesday	8:15 Am	54	
4/23	Wednesday	8:15 Am	50	
4/24	Thursday	8:15 Am	40	
4/25	Friday	8:15 Am	30	
4/26	Saturday	8:15 Am	29	
4/27	Sunday	8:15 Am	24	
4/28	Monday	8:08 Am	16.	

4-29-58 With Co source near detector 60% recorder on operating range
— added 30½' RG62/U cable to N 7' already in use —
No change in level, indicating negligible attenuation —
— added 15' RG62/U — still no change —
Should be able to operate w/o pre-amp cathode follower — unless speed of response is affected.

12:15P HV set to 1100 v. — Trip 17.5" — 3.5" OR
Bkg I_L=1.2 ma, I_H = 9.75 ma, E_B = , I_T =

Ra source in position over night.

4-30-58 Noted time for source had dropped from
50% @ 4:20 PM to
44.5% @ 8:00 AM
Trip distance @ 15" & 3" →
Zero drift down to off scale.
Set bkg level to 55-60% by adj of R_P ccw rotation. slight up to 65 shortly after adj.
Bkg avg 65 during day.

5-1-58 Over night drift negligible —
9:15 Trip Distances.
Hour @ 17" I = 310-360 μa I_L = 1.1 ma.
Rec = 70% I_H = 8.3 ma.
recorder fs @ Si Dist = 14¼" I = 50 μa.
HIGH @ 35'

5-2-58 No Drift over night - Ave background count 4 day.
5-5-58 No drift over weekend.

Instrument in operation to 5-16-58, when cut-off.
Record kept of output — Seems to be reasonably stable.

5-27-58 Keithly vacuum tube trip

6-2-58 PM Instrument w/ sample power supply (Had been using Regas regulator -

7-22-58 South Area counter + trouble w/ scalers C1 & C3
bad detector C3 #1016
removed to shop 210 — Tube in use #371 from 108.

8-18-58 Notes upon return from vacation - J.F.E.

West End instrumentation:

DC2 - DC3 DC3 when moved into "Lit" found to be operating (responding to source)

DC2 - no source response - removed extension - still no response.

Scale selector check -

On sensitive scale recorder F.S. +

Lowered zero - (was all way up)

Operation!, but wobbly

107 - Monitron - slight response no trip - some resistors blown. (see file) Slightly noisy response

215 SA1 & 2 Co peak 400 very little change needed

SA2 Scaler some 16 light unit

6AL5 & 12AU7 V101-102 Stuph (115)

Request for mon. counters in 108 - One 238 & One 235 -

Got counters & made battery boxes.

P.Gen. .010 V. 1μs, neg. C2 gain 2x1 .8μs, neg PDL = 5X; C3 4x1 .8μs, neg PDL = 40

Generator on input to pre-amp.

With counter no response at above settings

235 C3 gain to 64 some response (RT 5μs)

238 C2 excessive noise response at gain 64.

Amplifier check

3: Pre-amp 4 6AK5's used

PHS V14 6AC7

Amp 1-6AC7, 2-6AG7, 1-6SJ7

C2 - PA: 3 6AK5.

Amp 6AC7 - 1 ; 6AG7 - 1 ; 6SJ7 - 2 ; 6Y6 - 1 ; 5V4 - 1

PG check C2 RT .8μs, Gain 2x1 PHS 64

C3 4x1 PHS 55

None of C2 seems to be eliminated -

(235 counter is one pulled & fixed by DFC.)

8-18-58 107 - Further check out of C2 & C3 for fission Ctr. operation —

Fission counter, 5-2 attached to pre-amp for channel C-3. PA#335

Fission counter, 8-2 attached to pre-amp for channel C-2 PA#317

One channel dead, other counting, with source M-227 in place very close to counters, & gain setting of 8x1, rise time 0.8μs, input neg, & PDL of 10 & 5 (C2 & C3).

Brought down counter C-5-3 for additional check out. This known to be good.

Counters 5-3 & 5-2 seem to respond on either channels, indicating that amplifiers are apparently OK.

One gets no response to source with C-8-2, as follows

C2 - Gain 8x1 R.T. 0.8μs Input Neg PDL 10		C3 - Gain 8x1 R.T. 0.8μs Input Neg PDL 5	
5 min. Bkg	0 + 0/16	5 min. Bkg	0 + 1/16
(Grass at PDL = 7)		(Alpha c.o. ≈ 2)	
Source M-227	0 + 0/16		28 + 3/16

C 8-2 to shop for check - Found center wire loose - Re-soldered center wire. - Counter to 108 for response check.

107-108 Hoover counters -

8-18-58

	C2 (PA 313) Gain 8x1 RT 0.8 μs. PDL=10	C3 (PA 315) Gain 32x1 RT 0.8 μs PDL 5
C-5-2 source in plane	29 + 15/16	
5 min ea	28 + 13/16	
Bkg	30 + 5/16	
	0 + 1	
C 8-2		1 + 13/16
		0 + 10/16
		1 + 9/16
		1 + 0/16

PA 327 for 313	Gain 8x1 RT 0.8 μs PDL = 10	(C-5-2) Gain 8x10 8x1 PDL 5
(C-8-2) Source	0 + 12	28 + 12
	0 + 14	30 ± 5
Bkg	0 + 7	0 + 2
	0 + 11	0 + 3
Source	0 + 14	29 + 13
	1 + 0	29 + 6
	source + bkg = 2.8 c/m	source + bkg = 94.6 c/m
	bkg = 1.8 c/m	bkg = .5 c/m
	Source 1.0 c/m	Source - 94.1 c/m

Ran with S-2 & S=2 on C2 & C3 changed PDL on C3 to 10 so Amplifier settings were identical.

⟹ During run noted register on scaler C-3 not following as it should. Transferred signal to scaler C-1 OK.

Service Note - Check output of scaler C-3.

8-18-58 DWM - reported failure of emergency exhaust dampers to open. — (Also had been checked o.k. when scram systems were checked out)

Check w/ bldg prints showed safety switch in Rm 113. This was in "OFF" position. DWM threw "ON". Now fans on - dampers opened on third start-up. Apparently had been stuck shut.

DFC - etal. - Possible use of elephant gun safety on sphere experiments suggested. Holding power of magnet still in question -

8-19-58 West End - no trig. in for elephant gun - use Sol magnet.

DFC setting up to run Mell. Cannot change M-1 circuit.

Standardization of connectors for motors suggested.

Disconnect box for instrumentation:

Existing channels:	Counters 5	Provide 6
	Ion Chamber 5	Provide 6
	P.M Det 2	Provide 3

Counting Channel Connectors.

Signal	UHF-type
H.V.	BNC-
Power	AN-3102-16S (Jc)

Ion Chamber - HN-type

PM

Signal	UHF
H.V.	BNC
Power	AN 3102 (14S) (Jc)

8-19

(107 - C3 scaler. Take check output
Replace 6AQ5, 12AU7, 6AU6 (3)

West End - safety magnet non-operable (Sid)
Supply ok. Checked wire W/O power ckt near magnet.
Put on substitute magnet.
Repaired magnet.

8-20-58 ~~East end~~
West end - Work on sketch for junction box for 201.

South wing - With WCT & DWR observed reading for 113. For "out", just hum, with power applied

East wing :- Request set up for traversing fission counter Counters 5-2 & 8-2 to be used to traverse thru reactor, both to be positioned by single drive mechanism.
W/JSL set up drive unit on frame of fixed half of table.
C-5-2 to C-3 channel
C-8-2 to C-2 channel
Brought down C-5-3 to use as normalizing counter. Mounted under core at core-reflector face on moving table.

8-20-58 C-5-3 feeding channel C-1.

During run, noted irregularity of counts on C-3.
There was a sharp increase in reading on scaler 3.
Later, it appeared that the rate of count would fluctuate when supposedly there was a fixed neutron field.

By swapping leads from amplifier outputs, isolated trouble to scaler chassis.
In power supply replaced both rectifiers 6AX5
and control tube (very bad) 6AS7
(had replaced 6AU6 earlier)
In input strip 118#8 - replaced all tubes
V1 - V4 6AH6
V5 & V6 12AT7
Strips 114 & 115 seemed to be normal, so no check of tubes made.
Overnight GON test ok.

8-21-58 East end - Scaler test -
x 3000 c/s signal for 1 min counts
695x256+31 = 177,951 c/m
696x256+161 = 178,337 c/m
y 4000 c/s
943x256+235 = 241,638 c/m

8-21-58 With audio generator & pulse generator, checked counting channels.

A. Input sensitivity of scalers

C-1	+20 volts	OK
C-2	neg & pos	?
C-3	+5 volts.	OK.

Brought down input strip #3 (I.P.) from 216 shop.
(Could not get + only input with strip already in C2 #7)
Set input strip for + pulses > 3 volts.

B. Signal from generators to scalers only.

	C1		C2		C3
	x256		x16		x16
2500 N →	585 +148	(149,760%)	225+7	← 60 N →	225+1
60 N	x16 225+2	(2500 N)	x256 585+149	60	224+9
	—		586+53		224+12
60 N	x16 224+14		x16 224+13	2500 N	x256 586+102

C. Signal ~~input~~ to L.A. input.

	LA setting		Threshold
C1	8x1 0.8μs long in	PDL = 20	±.02 v
C2	8x1 0.8μs neg in	PDL = 10	very small
C3	8x1 .8μs neg in	PDL = 10	±.02 ✓

	C1	C2	C3
2500 C3	224x16+13	224x16+12	586x256+91
2500 C2	224x16+3	584x256+193	224x16+2
2500 C1	586x256+25	225x16+2	224x16+14

8-21-58 During 1st 10 m. count at power .017 noted that scaler 2 seemed to be "bunching" counts, throwing in more than expected; interpolator lights skipping.

Changed PDL from 10 to 15. Here threshold was ±.01 volts

West end - C2 register reported spurious response.
Tube check 5965 & 6AQ5 in output circuit.
6AQ5 OK.
5965 bad. Replaced.
Sketch for J-Box 201 to WCT for fabrication

calculation of γ sens of Ion chambers

West End
8-22-58 Started um fission probe =
Made up ≈ 3' cable to connect counter C5-1 to pre-amp. Compared count with & without extra cable.
There was no significant difference =
Assisted in operation

Fission Ch. Evaluation

Consideration to West End modification.

8-25-58 – Bring I.F.C. up to date on instrumentation activities in East End previous week.
– Conversation w/ "Da" Smith re Savannah River visit.
– West End : (a) Consideration of instrument modification
(b) Request small dramin counter.
All enriched Jemini counters are tied up & JWF would like an added Rn small bore counter to replace C5–
5.29x10⁵ n/sec → Mounted new Pu-Be source M-229 (5.29x10⁵ n/sec) for use as unit check source –
Prepare to check out RCL BF_3 & counters #1079 & 1084
Associated Equipment.

Pre-amp : BA #45B
Lin. Amp : BA Y123800
Scaler : BA Y123799
HVPS : BA Y123811

Approximate sensitivities:

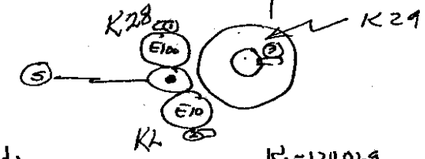
	Amp Gain	Amp PDL	Rise Time Gain	Rise Time PDL	0.8 μs. Gain	0.8 μs. PDL
1 mv	4	15	8	30	16	60
2 mv	4	30	8	60	—	—
3 mv	4	45	—	—	—	—
4 mv	4	60				
5 mv	4	75				

(From file BA Lin. Amp 20xB Y123800)

8-26-58 Along with checking out counter, take readings on air chamber instruments.

Detectors: ~~5x10⁻¹³ a/ϕ~~ Small dia. BF_3, in 3" paraffin
Chamber E-100 (4×10^{-13} a/ϕ)
E-10 (3×10^{-13} a/ϕ)

Lin. Amp: Keithley 410 Y124029
Keithley 410 Y124028
Log: Keithley 420 Y124289



	K-1	K-124029	K-124028
"Bkg" Source 209	$<10^{-13}$	$.25 \times 10^{-13}$	1×10^{-13}
M 229 @ 5	2.1×10^{-11}	7×10^{-12} ~~1×10^{-12}~~	3.6×10^{-11}
@ 1	5×10^{-12}	6×10^{-12}	1.6×10^{-11}
@ 2	8×10^{-12}	6×10^{-12}	$.65 \times 10^{-11}$
@ 3	2×10^{-12}	1.5×10^{-11}	3×10^{-12}

(File - RCL BF_3 & Ctrs)
Counter used (a) = = = = counter
Same Amp 1 mv Gain 4 - PDL 15 (RT = 0.8 μs) M 229
Data in file

8-26-58 Centering value for small BF_3 counter check ($1\frac{1}{2}$" x 10" RCL).
Mounted counter #1081 on connector adaptor.

Good curve data on #1081 - see file - { Op. voltage 1800 v
Shield - 10 mv.
@ 9000 c/m M229 @ 4.15"

Connection for #1079 -
Began data on 1079

8-27-58 West End: Set up C-5-3 Fission counter on channel 5.
East End: Removed fission counter from 108
C5-2 C8-2
C5-3
Reconnect C-1 & C2 2" BF_3 ∝ chs.

Continuation of check of ~~xxx~~ BF_3 counter.

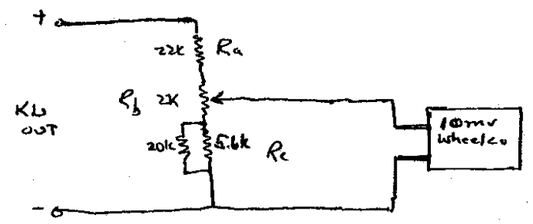
8-28-58 BF_3 Proportional Counter Characteristics
New PM circuit construction finished. Tests begun.
(See file)

8-29-58 Ion Chamber Reading 8.05 M-229 & 5 mg Ra in 209
K1 - 1.1×10^{-13}
K29 - $.1 \times 10^{-13}$
K29 - $< .1 \times 10^{-13}$
PM circuit tests continuing. - refer to P-M file.

9-2-58 Check drifts of PM circuit & spot-check trips.
Conference on self-multiplication - criticality experiment -
Consideration given to new trip-output circuitry 202.

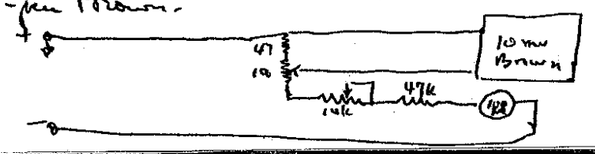
Output circuits for Keithley instruments -

Keithley log Recorder output is 50 mv, same as for Beckman VL
Ran output to network shown -



Balances recorder against panel meter, but may need to increase Rc.
Ran output to network as used in S. unit & to purple pen of 2-pen Brown.

Keithley 410 J



9-2-58 Noticed that trace on K-28 was indicated large fluctuations compared to K-29.
Trace on K.6. showed similar fluctuations, however not so extreme as on K28 - Chart record in file -

9-3-58 Check units - 8:45 AM.

KL output - Removed 20k shunt & 5.6k resistor. This gave better balance, calibration point near center of pot. adjustment.

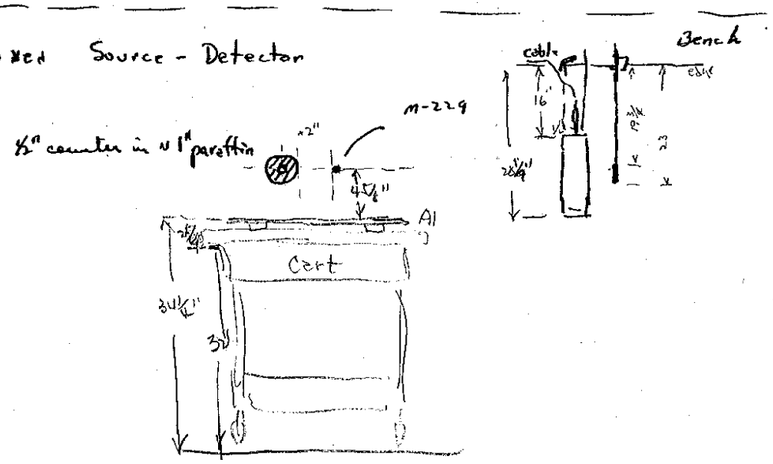
Output circuitry -
(Noted - fluctuation on K28 channel 9-2 due to input cable d/t switched leads at unit. Main swagged channel.) distrib

Disconnect E-100.

9-3-58 Set Up for Self-Multiplication Measurements -

Apparatus: Source: Pu-Be M-229 5.29×10^5 n/sec
Detector: RCA BF_3 filled proportional counter
½" d. (1800v op., 10mv sens.)
Cable: RG 62/U . Length -
Pre-amp: BA 219B 45B
Counting Channel: Amp: B-A 204B Y123800
Scaler: B-A 134 Y123799
Timer: B-A 960
Rate Meter: Y123878
HVPS: BA-318 Y-123871
Recorder: 10mv Wheelco
Ion Chamber; Channel. Detector: BF_3 filled chamber E-9
HV: 300v battery
Amplifier: Keithley 410 - Y128029
Recorder: 10 mv Brown.

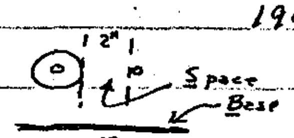
Fixed Source - Detector



4-3-58

Amplifier set to 10 mv. Gain 2, RT 0.8 μs, PDL 73. | Long Cable

Long cable	HV	Scaler	CRMR			
		655 629	600			
		646 700				
	1750	693				
		2234				
		2230				
	1800	2209	2100-2200			Operating point -
		2240				
		2548				
	1850	2696	2500			
		2565				1900 v.
		2673				
	1900	2624	2600			
		2750				
		2743				
		2727				
	1950	2982	2600			



	Time	Scaler	CRM	R-410		Remarks
HV=1900 3:18	10m.	29,593	-	3.7 × 10⁻¹³ a	2959.3	S: Air B: Aluminum
3:29	10m	32,755	-		3275.5	
	1m. 1	3591 *				
	2	3368 *				
	3	3243 ✓				
	7 4	3224 ✓	(2.75%)			
	0 5	3195	3214			
	6	3074 *				
3:47	7	3137	±88.4			
	8	3065 *				
	9	3193				
	10	3050 *				
	11	2998 ✓				
	12	2963 ✓				
	13	2953 ✓				
	14	2986 ✓	2939.8 ± 2.88%			
	15	2920 ✓	±84.7			
	16	2892 ✓				
	17	2946 ✓				
	18	3006 ✓				
	19	2790 *				
	20	2944 ✓	68% $\sqrt{m}$			

		Scaler	$\sqrt{m}$		$m_i - \bar{m}$		
Short cable 4:08	1	2706	52		-21	.77%	$\sigma_1(90\%) = \sqrt{\frac{n-1}{n}} \times \frac{1.645}{\sqrt{m}}$
1 min	2	2774	52.7		+47	1.72	$= \sqrt{\frac{9}{10}} \times \frac{1.645}{\sqrt{2727}}$
	3	2641 *	51.4		-86	3.15	
	4	2734	52.3	2727.0	+7	.26	$= .9487 \times \frac{1.645}{52.22} = \frac{1.5606}{.5222}$ %
	5	2730	52.3	±81	+3	.11	
	6	2733	52.3		+6	.22	= 2.99%
	7	2792	52.8		+65	2.38	95% = $\frac{1.8594}{.5222}$ = 3.56%
	8	2727	52.2		0	0	
	9	2734	52.3		+7	.26	
	10	2699	52.0		-28	1.02	
4:11	1	2892	53.8		+55.2	1.95	S: air B: ply-wood - 3/4"
	2	2817	53.1	2836.8	-19.8	.70	σ_1 = 2.68%
	3	2811	53.0		-25.8	.91	
	4	2827	53.2		-9.8	.35	
4:25 5 min		13833		2766.6			S: air B: Al.

9-4-58 Amplifier 10 min runs Gain 2, RT 0.8 μs, PDL 73
HV = 1900
Source placed @ 2" (as 9-3-58) at ~8:00 AM

9:34 AM Set HV to 1900

After running calculations on data of 9-3 began counts.

Scaler on 9:37

Series of 1-min counts - 10th set.

		AVG	MEAN DEVIATION
Begin 9:40	2816		-22.1
	* 2749		-89.1
	2887		+48.9
	2848	2838.1	+ 9.9
	2862		+23.9
	2832		- 6.1
	2832		- 6.1
	2878		+39.9
	2825		-13.1
	2852		+13.9
Begin 10:13	2799		-62.4
	2876		+15.6
	2811		-50.4
	2831	2861.4	-30.4
	2881		+19.6
	* 2959		+97.6
	2829		-32.4
	2828		-33.4
	2873		+11.6
10:37 to 10:42	2827		-34.4
	2971		

EXP. DEVIATION (90%)

$$\sigma_1 = \sqrt{\frac{9}{10}} \cdot \frac{1.645}{\sqrt{M}} = .9487 \times \frac{1.645}{\sqrt{M}} = \frac{1.561}{\sqrt{M}}$$

$$= \frac{1.561}{53.27} = \frac{1.561}{\sqrt{2327}} \times 10^2 = 2.930\%$$

$$\pm 83.2$$

$$P.E. = \frac{.6745}{\sqrt{n-1}} \sqrt{(m-a_1)^2 + (m-a_2)^2 + \cdots (m-a_n)^2}$$

$$= .2248 \sqrt{13518.90} = .2248 (116.27) = 26.14$$

$$\sigma_1 = \frac{1.561}{\sqrt{2861.4}} = \frac{1.561}{.5349} = 2.92\%$$

$$= \pm 83.6$$

received shipment

19% ~~Hung 10 min~~ =

9-4-58

Self-Multiplication Measurements- 820-1501 17,226 kg
820-1284 23,522 kg

10:45 Received Material: 2 Tuballoy billets for use as blanks
2 Oralloy billets for multiplication determination -

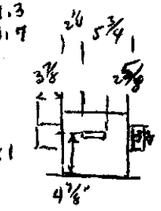
Depletion material to 210 in carriers.
Mount source closer to counter housing - d = 1 7/8"

A. Counts with no material - Cut of one slat away

	One minute Count	dev
1	3641	+54.1
2	3541	-45.3
11:27 3	3460	-126.3 *
4	3569	- 17.3
5	3636	+ 49.7
6	3698	+111.7 *
7	3630	+ 43.7
8	3508	- 78.3
9	3585	- 1.3
10	3595	+ 8.7
	3586.3	

$\sigma = .9847 \times \frac{1.645}{\sqrt{3586.3}} = \frac{1.561}{59.89} = 2.61\%$
$= \pm 93.6$

B: Tuballoy slab - 8x8x1



		dev.
11:50 1	7206	+22.1
2	7259	+75.1
3	7175	- 8.9
K=410 4	7175	- 8.9
4.2x10^-4 5	7157	- 26.9
6	7119	- 64.9
7	7143	- 40.9
8	7171	- 12.9
9	7299	+115.1
10	7135	- 48.9
	7183.9	

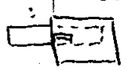
$\sigma = \frac{1.561}{\sqrt{7183.9}} = \frac{1.561}{84.76} = 1.84\%$
$= \pm 132.18$

+212.3
-212.3

12:21 Repeat A.= 3508

12:31 Repeat B.= 7145

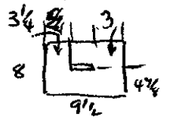
C: Source @ edge slab



6285
6215
6199

12:37 D - slab edge 1" - source tip 6641
6809
6630

E slab edge 2" - source tip 6927
6988
7149



F Tuballoy slab 8x9 1/2x1

		dev.
1	7012	+3.1
12:55 2	7014	+5.1
3	6979	-29.9
4	6949	-59.9
5	7039	+30.1
6	7111	+102.1
7	6953	-55.9
8	6913	-95.9
9	7086	+77.1
10	7033	+24.1
	7008.9	

$\sigma = \frac{1.561}{\sqrt{7008.9}} = \frac{1.561}{83.72} = 1.86\%$
$= \pm 130.68$

Repeat A 3457
3558
3479

Check F 7098
2096
7005

1:18 10 min air count A - 35940

1:55 Oralloy - 8 3" 9 1/4

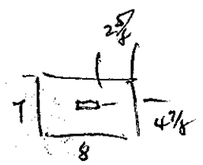
K=40 6.8x10^-13

1	10573	+17.4
2	10488	-67.6
3	10612	+56.4
4	10709	+153.4
* 5	10268	* -287.6
6	10567	+11.4
* 7	10389	-167.6
* 8	10763	+207.4
9	10611	+55.4
10	10577	+21.4
	10555.6	

$\sigma = \frac{1.561}{\sqrt{10555.6}} = \frac{1.561}{102.74} = 1.52\%$
$= \pm 160.4$

9-4-58.

Oralloy – small



1	9874	-88.7
2	10003	+40.3
3	10106	+143.3
4	10039	+76.3
5	10036	+73.3
6	9939	-23.7
7	9954	- 8.7
8	9812	-150.7
9	9927	- 35.7
10	9937	- 25.7
	99627	

5.15×10^{-13}

$\sigma = \frac{1.561}{\sqrt{9962.7}} = \frac{1.561}{99.81} = 1.56\%$

$= \pm 155.8$

Summary

		Kg		σ	
i. Oralloy	7x8x1	17.226	9962.7	±1.56%	±155.8
ii. Oralloy	8x9¼x1	23.522	105556	±1.52%	± 160.4
iii. Tuballoy	8x8x1		7183.9	±1.84%	± 132.2
iv. Tuballoy	8x9¼x1		7008.9	±1.86	± 130.7
Air			3586.3	± 2.61	± 93.6
1" Lucite		N	6800		

$i/iii = 1.3868$

$ii/iv = 1.5060$

wt $\frac{O_{ii}}{O_i} = 1.3655$ $\quad \frac{\sigma_{ii}}{\sigma_i} = 1.0585$

9/4/58

4:05 1" Lucite between some of counts

1	6391
2	6382
3	6417
4	6350
5	6398
6	6401
7	6250
8	6215
9	6435
10	6412

Noted sharp drop on count record

7

9/5/58 Continuation of Self-Multiplication Tests -

Procedure – 1. Determine optimum shield thickness for counter -

2. Repeat air, Tuballoy, Oralloy runs, with sufficient spacing between source & shield to insert 1" Lucite -

3. Step 2 with 1" Lucite

Spot check – wipe test: inside hut 210 ok

handle cart ok.

2 spots on floor near Tuballoy ok.

9:17 HV on – 1900v | Scaler on.

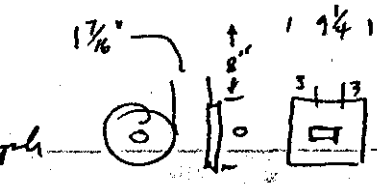
This may be answer to above?

HV Power Supply – fluctuation. Trouble seems to be in connection adapter at power supply.

Made new HV cable to fit, BNC on both ends – RG 59/U.

10:20 PM circuit on. See file.

HV on counter – Maybe ready



		dev	Counts	K	KL
2:30	Large Oralloy sample		6589		
			6655		
			6772		
SD 6723	$\sigma_{90} = \frac{1.561}{81.89} = 1.91\% = \pm 128.1$		6757		
6724			6741		
	6705.9		6667		
			6756		
6705.9 ± 128.1		*	6849		
			6676		
			6603		
	Add 1" limits between source & slab,		7616		
	carefully		7671		
			7613		
	$\sigma = \frac{1.561}{87.81} = 1.78\% = \pm 137.3$		7696		
			7643		
			7738		
7711.0 ± 137.3			7650		
		*	7881		
			7754		
			7848		
	Add 1" limits between slab & shield.		7848		
			7776		
	$\sigma = \frac{1.561}{98.38} = 1.77\% = \pm 138.2$		7831		
			7761		
			7836		
7811.9 ± 138.2			7817		
			7839		
			7845		
			7800		
3:15	Spot check Blank 2934 c/m		7768		
	Small Oralloy sample		6528		
			6714		
			6665		
	$\sigma = \frac{1.561}{81.25} = 1.92\% = \pm 126.8$		6574		
			6592		
6601.7 ± 126.8			6571		
			6497		
			6507		
			6601		
	Spot blank 3877 c/m	*	6768		
	Small Oralloy sample		5873		
			5876		
			5808		
			5928		
			5738		
5842.2 ± 119.2	$\sigma = \frac{119.21}{76.43} = 2.04\% = \pm 119.2$	*	5710		
			5891		
			5945		
			5850		
			5803		
	One inch limits between source & slabs				

KL

4:12 1" lucite between source & slab.

$\sigma_{\%} = \frac{1.561}{81.19} = 1.92\% = \pm 126.6$

6592.2 ± 126.6

Add 1" lucite between slab & shield.

6679.2 ± 126.3

4:32

4:39 Check blank — 3869 c/m

Counts	Dev.
6539	✓
6485	✓
6448	*
6618	✓
6586	✓
6711	✓
6598	✓
6647	✓
6682	✓
6608	✓
6544	✓
6713	*
6461	✓
6667	✓
6553	✓
6550	✓
6521	✓
6599	✓
6565	✓
6619	✓

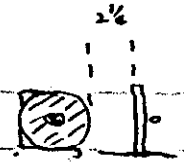
224 Ctr: HV = 1900 V.S. = 10 mv.
9-5-58 K-440 3×10^{-12}
Kd PM Moon Bkg

	Condition	Scaler		dev.	K	Kd	PM
s-ctr dist ~7"	source M229 6" ℄ source to	967	+	17.5			
10:30	BF_3 ctr w/~1" shield edge of shield	✱ 897	−	52.5	5×10^{-13}	5×10^{-13}	45
		945	−	4.5			
40% / 40% (1.19)	944.5 c/m	961	+	11.5			
	$\sigma_{90} = \frac{1.561}{\sqrt{944.5}} = \frac{1.561}{30.81} = 5.07\%$	944	−	5.5			
		981	+	31.5			
	$= \pm 48.1$	934	−	15.5			
949.5 ± 48.1	$\sigma_{95} = \frac{1.883}{30.81} = 6.03\% = \pm 57.25$	943	−	6.5			
		✱ 1004	+	54.5			
		919	−	30.5			
	Add 1" lucite @ source ~1½"	1700	+	19.9			
		1650	−	30.1	5×10^{-13}	5.8×10^{-13}	45
	1680.1	1646	−	34.1			
	$\sigma_{90} = \frac{1.561}{\sqrt{1680.1}} = \frac{1.561}{40.99} = 3.81\% = \pm 64.0$	1655	−	25.1			
		1697	+	16.9			
		1717	+	36.9			
		1715	+	34.9			
11:07		1695	+	14.9			
		1652	−	28.1			
1680.1 ± 64.0		1674	−	6.1			
	Add 1" lucite ⊙ ▥	2013					
		1979			3.5×10^{-13}	4.8×10^{-13}	45
	2002.2	2005					
		1984					
	$\sigma_{90} = \frac{1.561}{44.75} = 3.49\% = \pm 69.9$	1945					
		1945					
		✱ 2131					
		2025					
		2032					
2002.2 ± 69.9		1963					
	Add ½" lucite -	2042					
		2013			3.3×10^{-13}	4.8×10^{-13}	45
	2010.4	1959					
		2047					
		✱ 2087					
	$\sigma_{90} = \frac{1.561}{44.84} = 3.48\% = \pm 69.96$	1978					
	$= \pm 70.0$	2013					
2010.4 ± 70.0		2014					
		1997					
11:44 20		1956					
	Ctr in 3" paraffin shield ⊙ 3" 4"	4029					
s-c dist ~1"		3980			5×10^{-13}	8.6×10^{-13}	
		4094					
s-c same	$\sigma_{90} = \frac{1.561}{63.43} = 2.46\% = \pm 99.0$	✱ 3894					
		4100					
		4014					
		3960					
4023.4 ± 99.0		4053					
		✱ 4157					
		3957					

3" shield rests on bench source held in clamp.
Table built up to ~ bench level -

PM

Add - 1" lucite



$\sigma = \frac{1.561}{63.98} = 2.44\% = \pm 99.9$

4093.7 ± 99.9

Add ½" lucite

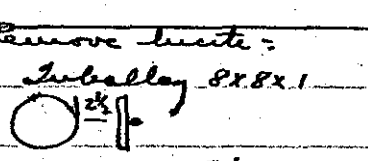
$\sigma \frac{1.561}{61.84} = 2.52\% = \pm 96.5$

3828 ± 96.5

1" more loss. 3249 KL 8.3×10^{-13} K 3.4×10^{-13}

Remove lucite:

Tubelloy 8x8x1



$\sigma = \frac{1.561}{69.03} = 2.26\% = \pm 107.7$

4765.3 ± 107.7

Re-position 8x8x1

$\sigma = \frac{1.561}{65.47} = 2.36\% = \pm 102.0$

4286.4 ± 102.0

Add 1" lucite between Tubelloy & source

$\sigma = \frac{1.561}{63.74} = 2.45\% = \pm 99.6$

4063.3 ± 99.6

~~3" shield~~ Remove 1" lucite

Tub closer "2⅜" shield

2121 Centaway — air with 3" shield

Counter	R	KL	Pm
✓4091			
✓4044			
✓4105	4.9×10^{-13}	8.3×10^{-13}	—
✓4102			
✓4100			
✓4089			
✓4046			
✓4087			
✓4145			
✓4128			
~~4024~~			
✓3990			
✓3806			
✓3878			
✓3894			
✓3866			
✓3793			
✓3746			
✓3810	4.5×10^{-13}	5.8×10^{-13}	—
✓3884			
✓3821			
✓4810			
✓4826			
✓4772			
✓4712			
*4649			
✓4815	4×10^{-13}	8×10^{-13}	
✓4703			
✓4745			
✓4870			
✓4787			
*4150			
*4412			
✓4307			
✓4277			
✓4287			
✓4371			
✓4244			
✓4294			
✓4239			
✓4283			
✓4057			
✓3979			
✓4064			
✓4002			
*4166			
✓4103			
✓4133			
✓4081			
✓4061			
✓3987			
4241 ✓			
4726 ✓			
3930 ✓			

9/5 Disconnect Chem pump (w-w, b-b, gm-frame) Connect - piston pump -

9-8-58 Am - Tabulation of self-multiplication data -

Pm -

West End - C-2 head registers sputtering when moved -

Lizz N - sick -

DC-2 - when cut off Power 9-5 did not get off scale meter indication, as expected, output batteries are weak, I guess.

C2: Head connector - UHF - on pre-amp loose -

Upon removing cover to pre-amp noted input capacitor HV lead arcing over to frame.

New input capacitor & HV dropping - resistor -

9-9-58 Am - Conference on new table design - 9-11:15

Talk w/ Wachter re - self-multiplication -

Pm - 1/2" etc on C-1 - 12' cable jumper made up.

New receptacle -

C-1 not count

A-2 throw in counts -

8-10-58 Layout for new panels 202

C-1 check No signal from detector

loose center lead at connector head. Fixed.

——— West End Change Over - Month of October ———

{ Instrument & Equipment files to be examined in 202.

{ Summary log in book — Details in files —

West wing - Instrumentation 1/2

11-6 South wing - fission counter check 1/4

East wing - control rod system - 1/4

11-7 South wing — new control rod - counter drive - system A - 1/4

West - Instrumentation

11-10-58 West - Instrumentation files up to date - files now in 202.

- DWM - possibilities of more fun etc - maybe W'house

- Temperature control S/A 204, etc

Controller ok. Demand at 77 reading 77

Set demand to 80° — Temperature recorder in 204

@ 1:35 P

- Decade scaler 248

11-11-58 Scaler 248 - 1 hr Counting. Reactor Scram for RGuin 7 hr

11-12-58

Self-Multiplication Measurements.

12-1-58

Record of data on insert opposite.
Run only preliminary counts to check system.
Calculation of variation.

N = no. of observations
M = avg.

Expected deviation ∇_1 (90%) $= \sqrt{\frac{N-1}{N}} \times \frac{1.645}{\sqrt{M}}$

$= \sqrt{\frac{9}{10}} \times \frac{1.645}{\sqrt{M}} = .9487 \times \frac{1.645}{\sqrt{M}} = \frac{1.561}{\sqrt{M}}$

(STANDARD STATISTICAL ERROR $\nabla_s = \frac{\sqrt{T}}{t} = \sqrt{T}$; Probable error .67 ∇_s

Case 1. Source & counter (in shield) only

COUNTS - EACH ONE MINUTE

M = 31,524

$\nabla_1 = \frac{1.561}{\sqrt{31524}} = \frac{1.561}{177.55} = \pm .879\ \%$

$= \pm 277.1$

31801.1
Range 31246.9

COUNT	DEV. VARIATION	% DEV. VAR.
31460	- 64	
31430	- 94	
31520	- 4	
31700	+ 176	
31420	- 104	
31480	- 44	
31600	+ 76	
31440	- 84	
31620	+ 96	
31570	+ 46	

Case 2. Source & counter with cart in place. No sample.

M = 33086

$\nabla = \frac{1.561}{\sqrt{33086}} = \frac{1.561}{1.819 \times 10^2} = \pm .858\ \%$

$= \pm 283.9$

Range (33370
32802

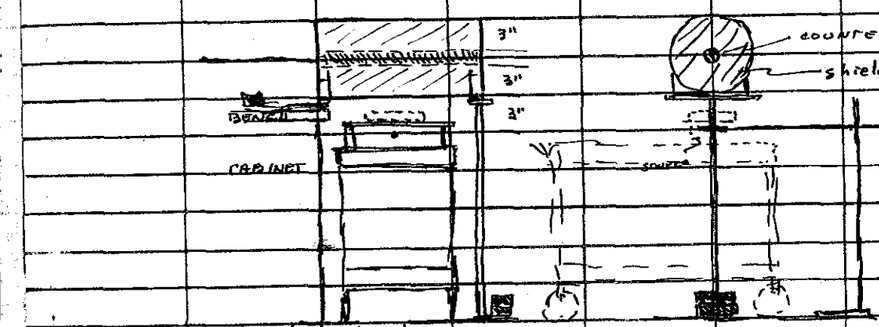
Ratio 2/1 = 1.050

33070	- 16		
33030	- 56		
33030	- 56		
32980	- 106		
32990	- 96		
32970	- 116		
33030	- 56		
33170	+ 84		
33110	+ 24		
* 33480	+ 394		

12-2-58 336
Source strength reported 14×10^6 @ 6-3-58 184
152 Days

12-1-58 Equipment for self-multiplication measurement -

Detector: RCL Mod 10180, Ser 1771 BF_3 counter Op Voltage
2" x 12" 1550V.
Pre-Amp: #641
Amplifier: V100363
Sound limit set at 4 mv: Rise Time 0.8 μsec, Gain 4, PDL 32.



	2:10 counts w/o cart: source & shield only	w/ cart no slabs	2:55 w/o cart	3:00 Background source removed
1	3146 (-64)	3307 (+16)	3159	30
2	3143 (-6.4)	3303 (-5.6)		
3	3152 (-6.4)	3303 (-5.6)		
4	3170 (+17.6)	3298 (-10.6)		
5	3142 (-10.4)	3299 (-9.6)		
6	3148 (-4.4)	3297 (-11.6)		
7	3160 (+7.6)	3303 (-5.6)		
8	3144 (-8.4)	3317 (+8.4)		
9	3162 (+9.6)	3311 (+2.4)		
10	3157 (+4.6)	3348 (+39.4)		

Note 12/2: Counts should be 31,460 c/m, etc.
NOT as recorded 3146 etc

12-2-58 :	8:07	HV on - 1550 v. Other equipment also energized.
	8:14	Ten minute background. Amp: G=4, PDL=32; RT 0.8
		300 counts 30 c/m.
	8:53	Source in place. Attempted to reproduce location of 12-1-58.
		Distance from edge of shield = 3"

Expected Deviation : $\sigma(90\%) = \sqrt{\frac{N-1}{N}} \cdot \frac{1.645}{\sqrt{m}}$. For N=10 $\sigma = \sqrt{\frac{9}{10}} \cdot \frac{1.645}{\sqrt{m}} = .9487 \times \frac{1.645}{\sqrt{m}} = \frac{1.561}{\sqrt{m}}$

Time	8:55	9:10	10:19	10:34	10:55	11:15	11:34	11:50
Sample	source only	cart in place NOTE 1*	source only (slabs in Rm)	cart in place no slabs	8x9½ Tuballoy	Oralloy 7x8	Oralloy 8x9	Oralloy 8x10½
1	3.056 x10⁴	3241 x10⁴	3156 x10⁴	3252 x10⁴	3839 x10⁴	5648 x10⁴	6.090 x10⁴	6.165 x10⁴
2	3055	3215	3131	3247	3815	5711	6.118	6.131
3	3081	3203	3112	3279	3819	5738	6.104	6.178
4	3.096	3219	3128	3282	3800	5.668	6.101	6.187
5	3.091	3226	3133	3271	3822	5.649	6.122	6.197
6	3100	3265 *	3160	3258	3811	5.668	6.163	6.176
7	3057	3238	3162	3309	3816	5.698	6.088	6.140
8	3029 *	3224	3091	3297	3837	5681	6.115	6.208
9	3091	3248	3139	3306	3828	5.692	6.087	6.180
10	3105 *	3238	3122	3294	3824	5.671	6.094	6.218
(m) Avg.	3.0761 x10⁴	3.2317 x10⁴ ±.0281	3.1334 x10⁴ (±.88)					
σ	±.0274 ±.89	±.8686	all slabs > 8' 3119					

Time:	12:06	1:07	1:22	1:41	1:58	2:20	2:36
Sample:	cart in place	cart (Cd sheath)	Tuballoy Cd	Oralloy 8x10½ Cd	8x9 Cd	7x8 Cd	Cart Cd-
1	3.293 x10⁴	3.290 x10⁴	3.814 x10⁴	5.785 x10⁴	5.784 x10⁴	5.337 x10⁴	3.321 x10⁴
2	3.282	3.281	3.786	5.806	5.779	5.380	3.320
3	3.304	3.318	3.814	5.800	5.760	5.369	3.268
4	3.324	3.286	3.823	5.781	5.752	5.405	3.316
5	3.322	3.270	3.814	5.785	5.774	5.355	3.285
6	3.299	3.291	3.768	5.756	5.805	5.379	3.302
7	3.321	3.305	3.832	5.779	5.818	5.349	3.313
8	3.274	3.298	38 38	5.785	5.779	5.390	3.274
9	3.299	3.332	3.761	5.827	5.815	5.382	3.304
12:19 10	3.313	3.308	3.780	5.766	5.760	5.333	3.300

2:50 HV off

NOTE 1* 7x8 on cart @ 4' others ≥ 8'

* 33480 +394

BF3 Counter & 3" paraffin cylinder

Run	Notes	m / σ		Count	Dev.
SOURCE & COUNTER 10:19 — A		m = 31,334		31560	+226
		$\sigma = \frac{1.561}{\sqrt{3.1334\times10^4}}$	$= \frac{1.561}{1.77\times10^2}$	31310	-24
		= ±.882 %		31120	-214
		= ± 276		31280	-54
				31330	-4
				31600	+266
			*	31620	+286
			*	30910	-424
				31390	+56
				31220	-114
CART IN PLACE 10:34 — B		M = 32795	*	32520	-275
		$\sigma = \frac{1.561}{\sqrt{3.2795\times10^4}}$	$= \frac{1.561}{1.811\times10^2}$	32470	-325
		= ±.862 %		32790	-5
		= ± 283		32820	+25
		{33078, 32512}		32710	-85
				32580	-215
			*	33090	+295
				32970	+175
				33060	+265
				32940	+145
TUBALLOY 8x9½ 10:55 — C		m = 38211		38390	+179
		$\sigma = \frac{1.561}{\sqrt{3.8211\times10^4}}$	$= \frac{1.561}{1.955\times10^2}$	38150	-61
	C:B 1.165	= ±.798 %		38190	-21
	C:G = 1.157	= ± 305		38000	-211
	C:K = 1.005			38220	+9
	C-B 5416	{38516, 37906}		38110	-101
				38160	-51
				38370	+159
				38280	+69
				38240	+29
ORALLOY 7x8 11:15 — D		m = 56824		56480	-344
		$\sigma = \frac{1.561}{2.384\times10^2}$ = ±.655 %	*	57110	+286
	D:B = 1.733		± 372	57380	+556
	D:G = 1.720			56680	-144
	D:L = 1.059	{57196, 56452}		56490	-334
	D-B = 24029			56680	-144
	D:C 1.487			56980	+156
				56810	-14
				56920	+96
				56710	-114
Oralloy 8x9 11:34 — E		m = 61082		60900	-182
		$\sigma = \frac{1.561}{2.471\times10^2}$ = ±.632 %		61180	+98
	E:B = 1.863		= ±386 *	61040	-42
	E:G = 1.849			61010	-72
	E:M = 1.056	{61468, 60696}		61220	+138
	E-B = 28,289			61630	+548
	E:C = 1.599			60880	-202
				61150	+68
				60870	-212
				60940	-142
Oralloy 8x10½ 11:50 — F		m = 61780	*	61650	-130
		$\sigma = \frac{1.561}{2.486\times10^2}$ = ±.628 %		61310	-470
	F:B = 1.884		= ± 388	61780	
	F:G = 1.870			61870	+90
	F:N = 1.068	{62168, 61392}		61970	+190
	F-B = 28,985			61760	-20
	F:C = 1.617			61400	-380
				62080	+300
				61800	+20
			*	62180	+400
CART IN PLACE 12:06 — G		m = 33021		32930	-101
		$\sigma = \frac{1.561}{1.817\times10^2}$ = ±.859 %		32820	-211
			= ± 284	33040	+9
		{33315, 32747}		33240	+209
				33220	+189
				32990	-41
				33210	+179
			*	32740	-291
				32990	-41
				33130	+99

BF3 counter, 3" paraffin cylinder + Cd sheath

Run	Notes	m / σ		Count	Dev.
CART IN PLACE				15/130	
				88%/95%	
CART IN PLACE 1:07 — J	J:B = 1.006	M = 32979		32900	-79
		$\sigma = \frac{1.561}{1.816\times10^2}$ = ±.860 %		32810	-169
			= ± 284	33180	+201
		{33263, 32695}		32860	-119
				32700	-279
				32910	-69
				33050	+71
				32980	+1
			*	33320	+341
				33080	+101
TUBALLOY 1:22 — K	K:J = 1.153	m = 38030		38140	+110
	K:O = 1.162	$\sigma = \frac{1.561}{1.950\times10^2}$ = ±.801 %		37860	-170
	K:C = .995		= ± 305 *	38140	+110
		{38335, 37725}		38230	+200
				38140	+110
			*	37680	-350
				38320	+290
			*	38380	+350
			*	37610	-420
				37800	-230
ORALLOY 7x8 2:20 — L	L:J = 1.628	m = 53679		53370	-309
	L:O = 1.626	$\sigma = \frac{1.561}{2.317\times10^2}$ = ±.674 %	*	53800	+121
	L:D = .945		= ± 362	53690	+11
	L:C 1.411	{54041, 53317}		54050	+371
				53550	-129
				53790	+111
				53490	-189
				53900	+221
				53820	+141
				53330	-349
ORALLOY 8x9 1:58 — M	M:J = 1.753	m = 57826		57840	+14
	M:O = 1.752	$\sigma = \frac{1.561}{2.405\times10^2}$ = ±.649 %		57790	-36
	M:E = .947		= ± 375	57600	-226
	M:C = 1.521	{58201, 57451}		57520	-306
				57740	-86
				58050	+224
				58180	+354
				57790	-36
				58150	+324
				57600	-226
ORALLOY 8x10½ 1:41 — N	N:J = 1.755	m = 57870		57850	-20
	N:O = 1.753	$\sigma = \frac{1.561}{2.406\times10^2}$ = ±.649 %		58060	+190
	N:F = .937		= ± 276	58000	+130
	N:C 1.522	{58246, 57494}		57810	-60
				57850	-20
				57560	-310
				57790	-80
				57850	-20
			*	58290	+400
				57660	-210
CART IN PLACE 2:36 — O	O:G = .999	m = 33003		33210	+207
		$\sigma = \frac{1.561}{1.817\times10^2}$ = ±.859 %		33200	+197
			= ± 283	32680	-323
		{33286, 32720}		33160	+157
				32850	-153
				33020	+17
				33130	+127
				32740	-21
				33040	+
				33000	-

12/2 Try Horwyak Button - using LA V100363 ~~[illegible]~~ PA 641
Gain 4, Rise-Time = 0.8 μs
Notice 5 mg Ra cut-off at ≈ 8 PDL - Set PDL @ 15

3:39 Oralloy 3 (8x10%) source - ctr dist = 1 7/8"	2.48×10^3	3:54 Background - cart in place	2.36×10^3
	2.47		2.32
	2.36		2.25
	2.37		2.27
	2.33		2.21
2,423 c/m	2.39	2,281 c/m	2.30
	2.42		2.21
	2.40		2.26
$\frac{O-3}{B} = 1.062$	2.53		2.26
	2.48		2.37

12-4-58 Horwyak Button check - LA 100363 Gain 4, RT 0.8 μs PA 641 HV = 850
Ran series of 10 amin' rate counters. Background, with Ra, and with Po-Be source bare & shielded with 2" of lead.

	PDL	c/m		PDL	c/m
① Background	5	9	② 5 mg Ra @ 3"	5	18,984
	10	0		7	102
				9	3
				10	0

3 a. PN 213 @ 3" c/m	PDL	4 - PN 213 @ 3" + 2" Pb between c/m	Ratio b/a
5,358	5	3,892	.726
2,902	7	2,228	.768
2,179	9	1,651	.758
1,186	15	906	.764
845	20	645	.763
459	30	365	.795
277	40	225	.81
169	50	134	.794
73	70	58	.795
36	90	25	—

Should try button with bias of ≈ 40 - This should get most gammas - counting rate rather low

12-4-58 Purpose to see if change in removal of plaster mask.

Set up: 2x12" BF_3 counter. PA: 4V4B ; LA Y123800

4mv sensitivity - Gen 4 ; PDL 50 ; RT 0.8

1kV = 1550.

		c/m
Source @ 3" from shield	– (10 minute counts)	30,881
, with cart in place		32,415
,	"	32,443
cart removed		30,968

12-5-58 Same as 12-4 except feed output of LA at ANP OUT - Scaler PHS @ +5.

		c/m	
		30,540	
10 minute counts:	Source & shield	30,521	
	Cart in place 9:06	32,031	
		31,905	
		32,035	
	9:36	32,193	
		32,215	
	9:48	32,246	32,229
		32,220	

Or-3/cart = 1.892

12:00	Or-3 (8x10½)	60,798 61,055 61,035	60,963
12:20	Or-3 Cd sheath	57,556 57,443 57,470	57,490
12:40	Or-3 Al cover. Cd	56,544 56,835 56,767	56,715
1:07	Source & shield - Cd	30,993	30,993

Power Supply failure @ 1:15 - stop to fix.

2:20 Power failure - stop to fix.

One minute counts:

Time	Condition		
3:34	Source-shield – Cd	3.093 x 10⁴ 3.060 x 10⁴ 3.074 x 10⁴	3.0757
3:40	Or-3, Al – Cd	5.658 x 10⁴ 5.682 x 10⁴ 5.640 x 10⁴	5.6600
3:44	Or-3, Al - 1/16" plexiglas, top-Cd	5.679 x 10⁴ 5.736 x 10⁴ 5.698 x 10⁴	5.7043
	Or-3, Al - 1/16" plexiglas, under-Cd	5.632 x 10⁴ 5.696 x 10⁴ 5.682 x 10⁴	5.6717
3:55	Source-shield - Cd	3.033 x 10⁴ 3.091 x 10⁴ 3.083 x 10⁴	3.0690

Remove Cd.

4:00	Source-shield	3.056 x 10⁴ 3.083 x 10⁴ 3.086 x 10⁴	3.0750
4:05	Or-3 Al 1/16 plexiglas, under	6.067 x 10⁴ 6.026 x 10⁴ 6.040 x 10⁴	6.0443
4:09	Or-3, Al ——	6.082 x 10⁴ 6.070 x 10⁴ 6.092 x 10⁴	6.0813
4:14	Cart in place, bkg	3.219 x 10⁴ 3.216 x 10⁴ 3.237 x 10⁴	3.2240
"	Source-shield	3.083 x 10⁴ 3.116 x 10⁴ 3.061 x 10⁴	3.0867

1.886

2-13-59

South ◆ : DWM

Unit to be "down" for ~ 10 days.

Projects: (2) 1- Inventory Chambers - if two enriched are in area, put both enriched on log channels.

(1) 2- Run counting tests on counting channels & check scatter observed during traverse runs.

3- Make up a second panel for pump control

4- Re-arrangement of meters -

5- A 2-pen Brown would be nice for both Freon instruments - (Freon Westron for LCRM)

6- Means of compensating out gamma on gerid measuring instruments be nice - 2 chambers, backing perhaps -

Recorders: { Bot Appl -
Ernie Lee - 9201-3

7- Make-up PM operational to replace existing unit.

2-13-59

General: Innovation vault ... monitors
→ for East & West ends V.G.H.

→ Monitor for Solution storage of 105 vault.
→ East Change in Screen panel –

Call: Howard Campbell re: Intercom ✓
Appel E/R Eren Lees re: recorders.
6-1198 9201-3 7744

2-16 Keith Martin 9:1– re intercoms – A. Mills.
with check –
Set up suggested activities S. wing for week 3/16 - VGH.
DFC colorimeter (...)
call from RIDL rep. – ... re ctry equipment.

7:30
2/17
8[44] Healy re – purchase req. county equipment.
DFC req –
2/18 DFC req – VGH & PM
Bids on County equipment.
2/19 DFC req – West clean up –
2/20 West –
ORDER – TUBES for W/end –
– NaI crystal for PM alarm –.

9-10-53 : Scintillation Detectors :

RCA-6655-A with NE404 - fast neutron phosphor mounted

HV = 900v - Signal to PM-2 -

With source in contact - Brown reads 21 - operate range

Background @ 900v - 27 - bkground range

800 - 11

700 - 5.5

Neutron source in contact 5.29 x 10^5 n/sec M-229 PuBe

	700v	— 1.5
	750	3.5
	800	7
	850	13
	900	21
5mg Ra	900	66
@ 3.5"	850	36.5
	800	22
	750	12
	700	5.5

9-22-53 Scintillation Detectors :

More : Phosphor : NE404 Nf Amplifier : V1238 01 & 45B.

PM : 6655-A

HV = 40 ma.

5mg. Ra on top of detector housing.-

GAIN 8, RT 0.8

PDL		
3	1149,080	1154,930
4	273,136	272,910
5	39,330	38,660
6	7,014	6,960
7	1,170	1,210
8	260	270
9	40	50
10	20	20

5 mg Ra

3	2760 /28m	
4	1200 /42m	
5	320 /14m	
10	20 /14m	

Poly.

3	621710 /4m	
5	15,810	16,390
10	4600	4620
15	2600	2440
20	1480	1560/5m
25	1820/2m	
30	27,990 /40m	

M

3	8,810	9980
4	250/3m	
5	40/6m	

~~Poly~~ = NO PHOSPHOR 5mg Ra

PDL 10 = ~~9980~~ 10/20m.

~~Bkg No Phosphor~~

NaI

	PDL		
Gain 8 0.8 RT	50	199,770	201,820
0.2 RT.	6	963,190	968,590
	8	868,950	867,830
	10	677,480	678,150
	12.	499,430	500,520
	14	375,480	—
	16	292,360	
	18	218,520	
	20	164,620	
	22	134,340	
	24	120,410	
	26	105,930	
	28	92,720	
	30	77,020	
	32	64,680	
	34	58,640	
	36	52,580	
	38	46,800	
	40	42,220	
	45	33,230	
	50	25,120	
	55	17,990	
	60	12,990	

5mg Ra @ ~ 1 meter.

9/22

Source ~20' PDL 50 gain 8 RT 0.2. ~ 2.9 x 10^3

M229 & Bkg both produce response. M229 at top 9 x 10^4

Ra @ 20' on top rack 30" above floor 2.9 x 10^3

on floor 5 x 10^2

Bkg - both sources in 201 in shields - 2.5 x 10^2 c/m Chan.

$\frac{920}{5}$ = 184 c/m.

9-23-59 (3) Detector on C3 - NE404-66537A HV = .4 - Gain 8 - RT 0.2 PDL = 25.

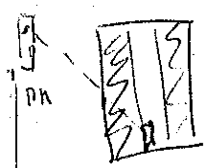
1 m. counts

(1) Main BF3 on C1 Gain 16 RT 0.8, PDL = 10 HV = 500

Source of (1) in per. can - Pm.

Scintillation Detector: NE404 66537A - Channel 3.

HV = .4 Gain 8 RT = .2 PDL = 25



M226 (~18")	Bkg	
3129	59	
3107	67	
3201	54	
3381	63	
3410	66	
3364		
3148		
11868		M229 on TOP of PM
12296		
11669		
11772		
12533		
12262		
11949		
11220		
12249		
11525		
11763		
11844		
4608		M226 in Can
4266		
4106		
4514		
4454		

20	26	Bkg (226 in 102, 229 @ 20')
17	21	
22	28	

9-23-59 M 229 @ 18" : 227 336 432 287
Gain 8, 0.2 RT 255 253 268
PDL = 25 370 280 418

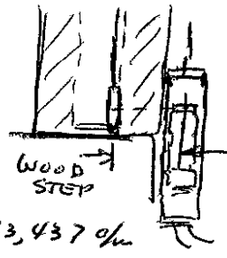
Bkg (10 minutes) c/m: 18.2
19.0
17.9

15.0

225 @ 20'

3:49 BF3 M226 in contact HV = 1000 Gain 18, RT 0.2 PDL 10 refer DRWG

9/24/59 HV = 0.4 ma ± 745 volts -
Source M-226 (9.30×10^6 n/sec)



ARRANGEMENT

phosphor NE 404 Source at d = 4½" with 3" paraffin
45,157 c/m ; 43,855 c/m ; 43,437 c/m
Source at 22 ft "Bkg"
116 ; 90 ; 90
M226 @ d = 5" with 3" paraffin
91,095 ; 87,773 ; 88,194
M226 @ 5" no paraffin
142,172 ~~147,878~~ ; 144764

NE 400 gain 8 RT = 0.2 PDL = 40
"Bkg"
286 257
M226 5" with 3" paraffin
85,550 ; 86,133 ; 85235
M226 @ 5" w/o paraffin
16,134 ; 16,573
Source in 10 2
19 ; 18 ; 18

9/24/59

NE 400 - PPM

AN 900

C3. Gain 2 RT 0.2

M-226 - 5" 3 paraffin

5 mg R. @ 5"

PDL

SEMI-LOGARITHMIC 359-81G
KEUFFEL & ESSER CO. MADE IN U.S.A.
4 CYCLES X 70 DIVISIONS

240

9/24/59 Source in 202 @ 22'

305 307 318

9-25-59 2:10 Begun series with slow neutron phosphor NE400 –
HV = 900 – Gain 2 R.T. 0.2. Source M-226 in 3" paraffin can w/ 2" plexiglas reflector s.d. = 5"
5 mg Ra at 22'.

HV = 900 PDL
C3 10

9/25/59 2:10 PM

1 = 1" BF_3 @ 1500 V @ 4 mV i.s. inside rack near test stand [d ≈ 30"]

2 = NE400 + Am
HV = 900 [M 226 d = 5"] 5 mg Ra @ 22'

Gain 2, RT 0.2 PDL 10

(A)

1	12560
2	1,876,1140
1	12970
2	18955660
1	13110
2	18545880
1	13000 15
2	2,86,3750
1	12790
2	2791270
1	13080
2	2745190
1	12690
2	2617780
1	13560 20
2	1422000
1	13270
2	1422260
1	12990
2	1441210
1	12710 25
2	1159090
2	1027960
1	12510 30
2	950330
1	12830
2	944110
1	12670 40
2	895830
1	12600
2	895210
1	12150 45

9/24/59 Source in 202 @ 22'

305 307 318

9-25-59 2:10 Began series with slow neutron phosphor NE400 -

HV = 900 - Gain 2 R.T. 0.2. Source M-226 in 3" paraffin can w/2" plexiglas reflector s.d. = 5"

5 mg Ra at 22'.

HV = 900 PDL

C3 10

1 = 1" BF_3 @ 1500V @ 4mV i.s. inside rack near test stand ~~d ≈ 30"~~

2 = NE400 4 in. HV = 900 M226 d = 5" 5 mg Ra @ 22'

Gain 2, RT 0.2 PDL 10

(A)

1	12560	10
2	18761140	
1	12970	
2	18955660	
1	13110	
2	18545880	
1	13000	15
2	2863750	
1	12790	
2	2791270	
1	13080	
2	2745190	
1	12690	
2	2617780	
1	13560	20
2	1422000	
1	13270	
2	1422260	
1	12990	
2	1441210	
1	12710	25
2	1159090	
[illegible]		
2	1027960	
1	12510	30
2	950330	
1	12830	
2	944110	
1	12670	40
2	895830	
1	12600	
2	895210	
1	12150	45
2	858410	
1	12810	
2	858600	50
1	12090	
2	828390	
1	12690	
2	829030	
1	12560	55
2	794290	
1	12110	
2	796900	
1	~~1520~~	
1	~~92770~~	
1	12470	60
2	775000	
1	12430	
2	774670	
1	12330	65
2	747250	
1	11870	
2	749450	
1	12370	70
2	724660	
1	12460	
2	717010	
1	~~4610~~	
2	~~10365~~0	75
1	12560	
2	704960	
1	12470	
2	704500	
1	12270	80
2	678320	
1	11380	
2	677070	85

1	11380	
2	677070	15
1	13070	
2	656710	
1	12640	
2	658330	
1	12540	
2	656370	
1	~~94700~~	
2	~~509750~~	10
1	13070	
2	637820	
1	12660	
2	642930	30
1	12280	
2	598590	
1	12650	
2	596270	

BF3 @ PM tube

1	352590	100
2	608500	
1	324510	
2	602280	

Both sources @ 22"

PDV 100

1	11100	
2	11780	
1	11390	
2	11710	
1	11200	
2	11410	
1	11300	
2	11830	

5mg Ra @ 5" in paraffin mixed in w-end tunnel.

PDV 10

(B) 1	220	
1	11090	
1	150	
2	12830	15
1	240	
2	950	
1	190	
2	8700	20
1	150	
2	2600	
1	150	
1	1700	
1	120	
2	2000	25
1	130	
1	110	
1	180	
2	600	
1	150	
2	1300	30
1	230	
2	50	
1	160	
2	40	
1	140	
2	700	35
1	170	
2	50	
1	130	
2	500	50
1	210	
2	40	
1	110	
2	10	
1	140	
2	300	75
1	150	
2	00	
1	90	
2	40	
1	160	
2	10	
1	130	
2	000	100
1	90	
2	00	
1	100	
2	10	
1	120	
2	00	

5mg Ra @ 5" in paraffin mixed in tunnel

PDV 10

(C) 1	150	
2	6364110	
1	120	

2	50
1	160
2	40
1	140
2	70
1	170
2	50
1	130
2	50
1	210
2	40
1	110
2	10
1	140
2	30
1	150
2	00
1	90
2	40
1	160
2	10
1	130
2	00
1	90
2	00
1	100
2	10
1	120
2	00

5mg Ra @ 5" in paraffin
M226 in tunnel
M226 in Club

(C)

1	150
2	6364110
1	120
2	6331640
1	130
2	1074610
1	80
2	1088500
1	160
2	2,763 00
1	120
02 00277220	
1	110
2	201200
1	20150
2	80010
1	120
2	79360
1	140
2	232 10
1	110
2	23050
1	130
2	5330
1	120
2	6110
1	110
2	1830
1	110
2	1770
1	110
2	530
1	130
2	490
1	90
2	660
1	110
2	270
1	140
2	200
1	70
1	100
1	130
2	130
1	120
2	110
1	120
2	40
1	110
2	80
1	130
2	70

9-28-59

As noted on tape,
HV = 850 scaler 1 records data from BF_3 counter (RCL 1"x8"), at 4mv. sensitivity.
Scaler 2 records data from detector under test.
Amplifier: C8. Gain 2, R.T. = 0.2 μs.
HV = 850.

RUN A: neutron source, M-226 (7.3×10^6 n/s) @ 5" 3" paraffin can, 2" plexiglas reflector in 3¾" hole in can.

5 mg Ra @ 22' (SW corner 202)

RUN B: neutron source, M226 in west end of tunnel >5' concrete.
5 mg in Ph pig 201

RUN C: 5 mg Ra in contact with Detector shield @ 1½" from ℄ ~~crystal~~ phosphor.

D: M-226 in 102 NE corner.

[illegible] 10 min ct. ~~[illegible]~~ [illegible]

1 = BF_3 ctr at PM. 1500V
Gain 4, RT 0.8, PDL = ~~45~~ (5mv)
2 = NE402 - HV = 850 (46)
GAIN 2, RT 0.2 PDL
M-226 3" PM ~~100~~
3" par. can 2" plex. refl.
5 mg Ra @ 22' c/m

			PDL
Ⓐ	1	37,596.5 0	100
	— 2	45,033.9 0	
	1	34,706.4 0	90
	— 2	49,640.4 0	
	1	34,814.3 0	80
	— 2	54,314.8 0	
	1	34,543.3 0	70
	— 2	59,179.2 0	
	1	34,453.8 0	60
	— 2	65,590.8 0	
	1	34,594.0 0	50
	— 2	72,185.0 0	
	1	34,093.7 0	40
	— 2	79,752.9 0	
	1	33,731.7 0	30
	— 2	89,017.1 0	
	1	33,787.6 0	25
	— 1	95,804.8 0	
	1	33,892.1 0	20
	— 2	107,797.3 0	
	1	33,557.9 0	15
	— 2	136,634.7 0	
	1	33,471.4 0	10
	— 2	800,075.1 0	

Ⓑ M-226 w-end tunnel
5 mg in 201 -
11:48 AM BKG PDL 10

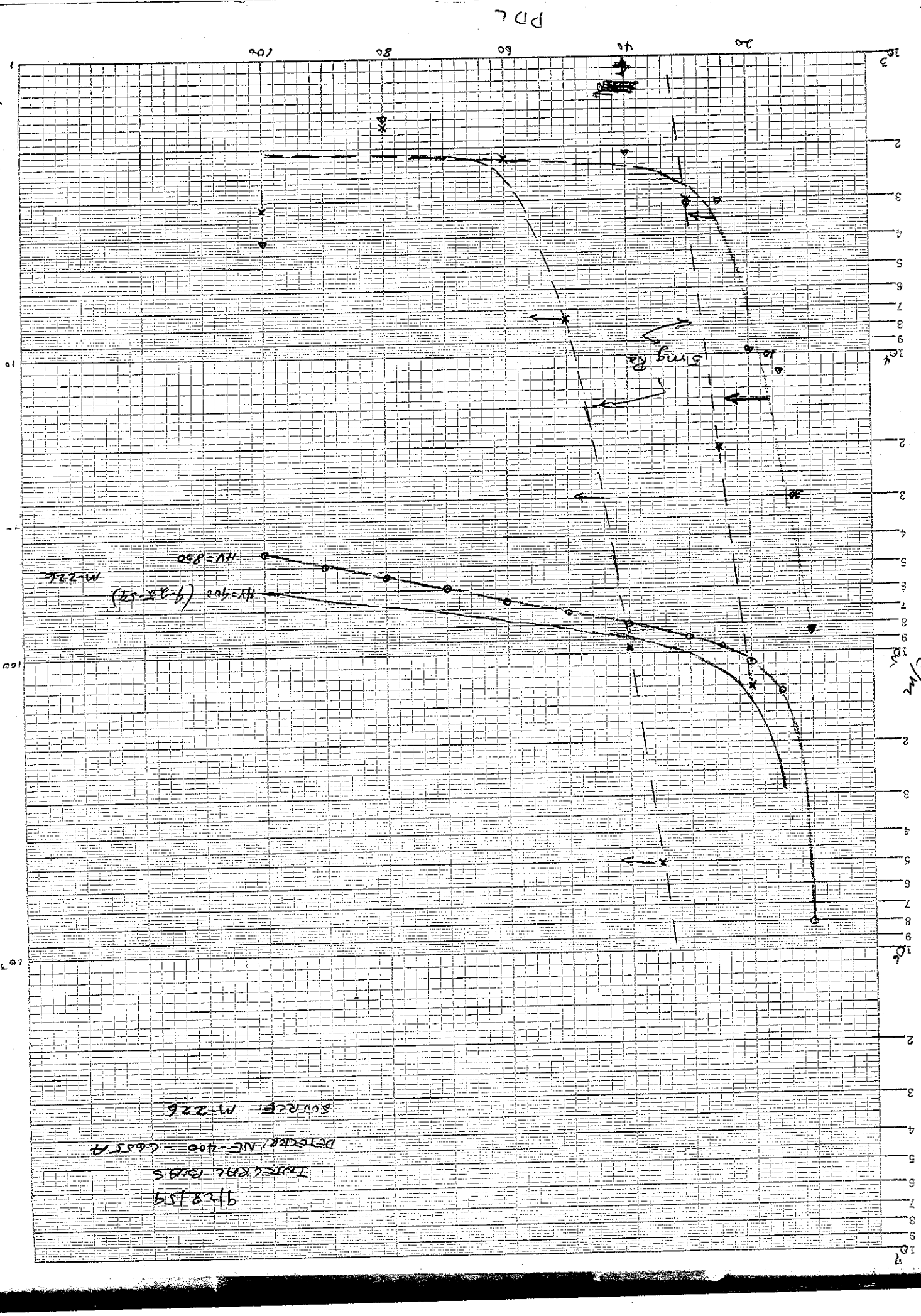
			PDL
	1	~~4000~~ 10.4 0	10
	[illegible]	85.9	
	[illegible]	9.2	15
	[illegible]	11.5	
	[illegible]	[illegible]	20
	1	9.7 0	
	1	9.4 0	25
	2	3.1 0	
	1	7.5 0	30
	2	3.2 0	
	1	8.2 0	40
	2	2.1 0	
	1	7.4 0	60
	2	.7 0	
	1	9.4 0	80
	1	1.6 0	
	1	10.7 0	100
	2	4.1 0	

5 mg Ra contact PM

			PDL
Ⓒ	1	9.8 0	100
	2	3.2 0	
	1	6.9 0	80
	1	1.7 0	
	1	8.1 0	60
	2	2.2 0	
	1	7.6 0	50
	2	7.5 0	
	1	8.3 0	40
	2	97.1 0	
	1	6.7 0	35
	2	502.6 0	
	1	10.2 0	30
	2	3,026.6 0	
	1	6.6 0	25
	2	20,649.1 0	
	1	8.3 0	20
	2	131,123.2 0	

5 mg Ra in 201 [illegible]

			PDL
Ⓓ	1	18.1 0	60
	2	13.6 0	


SEMI-LOGARITHMIC 359-81G
KEUFFEL & ESSER CO. MADE IN U.S.A.
4 CYCLES X 70 DIVISIONS
PDL
5mg Ra
HV=400 (9-23-54)
HV=850
M-226
SOURCE M-226
DETECTOR ALC-400 CoSTA
TANTALUM DAYS
9-28-54

[redacted]

Neutron detector - 7

9-30-59

Scaler system just on
Detector in 202.

(A) M-226 in NE corner Rm 102

C3 Gain [redacted]

(A)		c/m
	1	0 0
	2	69.0 0
	1	0 0
	2	19.3 0
	1	0 0
	2	18.0 0
	1	0 0
	2	17.6 0
	1	0 0
	2	30.7 0
	1	0 0
	2	23.1 0

M 226 in 201

(B) M-226 in Rm 201

(B)	1	0 0
	2	2.3 0
	1	0 0
	2	.1 0
	1	0 0
	2	.6 0
	1	0 0
	2	1.5 0
	1	~~0.0~~
	2	~~1.0~~

Setup detector in Rm 201.
Channel C3

1:20 pm
NE 100 - C3 preamp in 201
GAIN 2, 10T 0.2 PDL 60

M 230 "in" Sid
M 43 in ... bynell
... in ...

1	0 0
1	200.0 0

Source M230 "OUT"

1	0 0
2	93.6 0

Source in (1 C2 BF_3 100)

1	52.0 0
2	200.7 0

[redacted]

244 Scintillation Counter

Automatic
10-?-59 Scaling System on @9:45

NE 400 A: #1 no signal
#2 { NE 400, 6655-A, C3
{ Gain 2, RT 0.2μs, PDL 60
{ HV @ 850V
Count time 1.0 minute
SID SOURCE DOWN -
HIGH COUNTS - scaler 2 malfunction
during warmup - 1st decade transferring
to 2nd decade after 3 cts.

B: #1: 100KC timer signal.
#2: As in A
#1 indicates seconds counting time
(Timer set on "Live-Timer")

C: (Timer set on "Clock-Timer")
During run - stopped & re-set
1st digit on printer.

10:18
D: Output from C3 to both S1 & S2
(Any run time hung up on
Recycle)

E: SID SOURCE NOW UP

10:32
NE 404 F: Removed NE 400 detector -
NE 404 detector in place
No change in Gain or HV settings
SOURCE UP

G: SOURCE DOWN

10-9-59
9:45 Am
NE 400 - Nth detector
ampl. 2, 0.2, 60
HV 460 ~ 850V
Calm. (R 0.1μ)

A:
1 00
2 33320
1 00
2 17630
1 00
2 17410
1 00
2 13870
1 00
2 10570
1 00
2 5460
1 00
0 2 3820
1 (1)0

Sift timer
"Live Timer"

B:
1 600244 50
2 ~~4000~~ 3730
1 600247 10
2 ~~2000~~ 3330
1 600247 70
2 ~~1000~~ 3600
1 600244 70
2 ~~4000~~ 3560
1 600245 30
2 ~~4000~~ 3540

"Clock Timer"

C:
1 600244 30
2 ~~4000~~ 3690
1 600250 10
2 ~~4000~~ 3890
1 600248 30
2 ~~4000~~ 3870
0 10
0 10
0 10
0 10
1 600244 40
2 3460
1 600244 60
2 ~~4000~~ 3480
1 600245 60
2 ~~4000~~ 3640
1 600246 20
2 ~~4000~~ 3690

No difference between ...

244 Scintillation Counters

Automatic Scaling System on @ 9:45

NE 400 A: #1 no signal
#2 { NE 400, 6655-A, C3
Gain 2, RT 0.2 μs, PDL 64
HV @ 950V
Count time 1.0 minute
SID SOURCE DOWN -
HIGH COUNTS — scaler 2 malfunction during warmup - 1st decade transferring to 2nd decade after 3 hits.

B: #1: 100KC timer signal.
#2: As in A
#1 indicates seconds counter timing
(Timer set on "Live-Timer")

C: (Timer set on "Clock-Timer")
Device run - stopped & re-set 1st digit on printer.

10:18
D: Output from C3 to both SID 1 & 2
(Device run timer hung up on Recycle)

E: SID SOURCE NOW UP

10:32
NE 404 F: Removed NE 400 detector - NE 404 detector in place
No change in Gain or HV settings
SOURCE UP

G: SOURCE DOWN

B & C - Comparison between live & clock timer - No difference noted.

0 2 3 8 2 0
1 0 0
2 3 5 7 0

Scaler Test
"Live-Timer"

B:-
1 6 0.0 2 4 4 5 0
2 0 0 0 3 7 3 0
1 6 0.0 2 4 7 1 0
2 0 0 0 3 3 3 0
1 6 0.0 2 4 7 7 0
2 0 0 0 3 6 0 0
1 6 0.0 2 4 4 7 0
2 0 0 0 3 5 6 0
1 6 0.0 2 4 5 3 0
2 0 0 0 3 5 4 0

Clock Timer

C:
1 6 0.0 2 4 4 3 0
2 0 0 0 3 6 9 0
1 6 0.0 2 5 0 1 0
2 0 0 0 3 8 9 0
1 6 0.0 2 4 8 3 0
2 0 0 0 3 8 7 0
0 1 0
0 1 0
0 1 0
0 1 0
1 6 0.0 2 4 4 4 0
2 3 4 6 0
1 6 0.0 2 4 4 6 0
2 0 0 0 3 4 8 0
1 6 0.0 2 4 5 6 0
2 0 0 0 3 6 4 0
1 6 0.0 2 4 6 2 0
2 0 0 0 3 6 9 0

10,16

1 3 6 9 0
2 3 6 9 0

E: SOURCE UP

1 9 8 0

1 6 0.0 2 4 4 6 0
2 ~~4 0 0 0~~ 3 4 8 0
1 6 0.0 2 4 5 6 0
2 ~~4 0 0 0~~ 3 6 4 0
1 6 0.0 2 4 6 2 0
2 ~~4 0 0 0~~ 3 6 9 0

Disconnect Tuning Signal

Signal Generator (A) Output

10:16

1 3 6 9 0
2 3 6 9 0

E: Source up

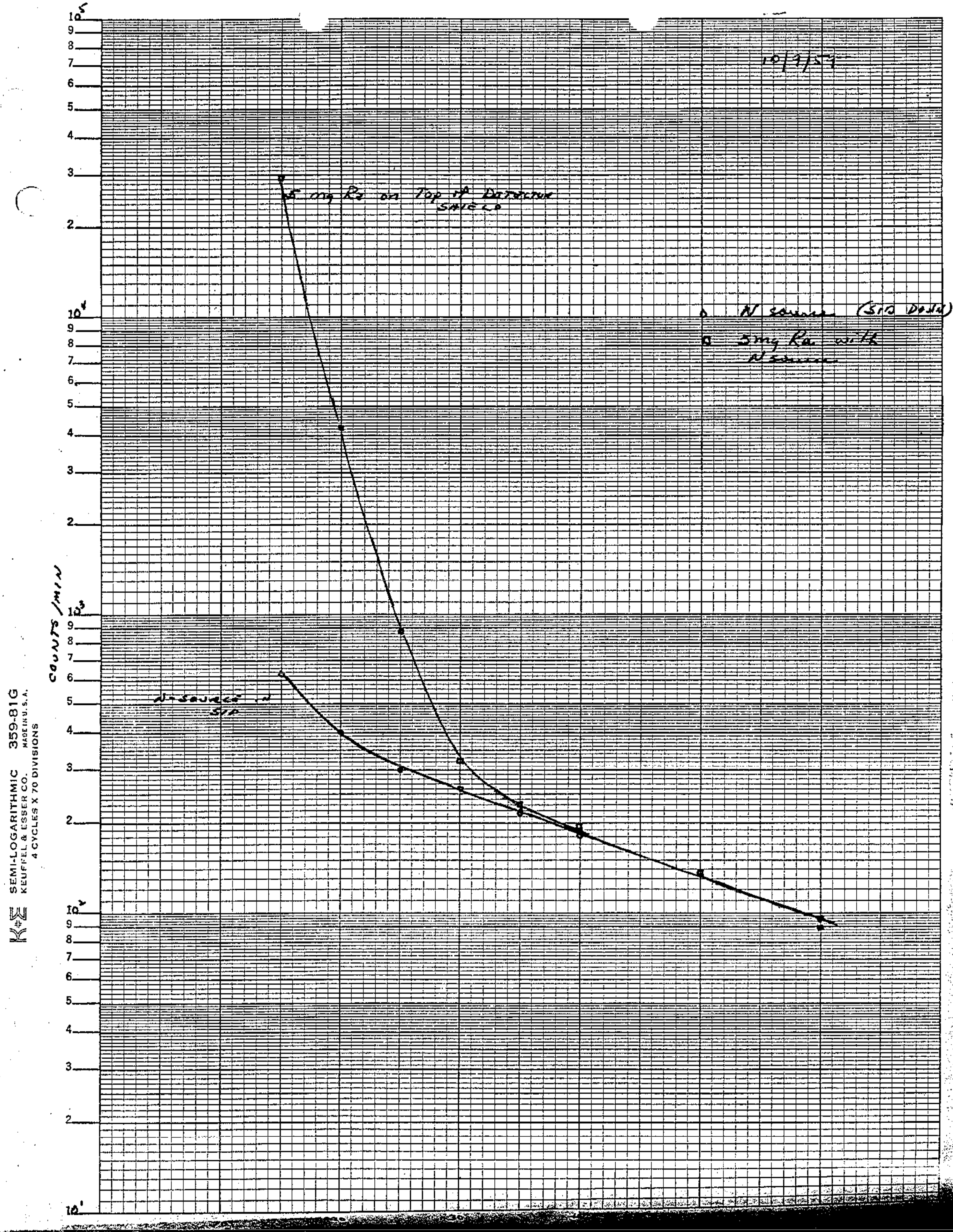
1 9 8 0
2 9 8 0
1 1 0 5 0
2 1 0 5 0
1 1 1 1 0
2 1 1 1 0
1 1 1 1 0
2 1 1 1 0

F: Neutral no appreciable change

1 0 0
2 0 0
1 0 0
2 1 2 0
1 0 0
2 4 0
1 0 0
2 1 0 0
1 0 0
2 9 0
1 0 0
2 1 5 0

G: Source down

1 0 0
1 9 9 0
1 0 0
2 9 3 0


10/7/57
5 mg Ra on Top of Detector Shield
N source (STD DOWN)
5 mg Ra with N source
N-source in STD
COUNTS/MIN
SEMI-LOGARITHMIC 359-81G
KEUFFEL & ESSER CO. MADE IN U.S.A.
4 CYCLES X 70 DIVISIONS

10-9-57. Took data for determination of gamma cut-off with NE404 crystal - 5 mg Ra in top of shield - SID source down.

10-12-57 8:50 Automatic System On - -

9:40 Set for 10 minute one-shot count.

(W.C.T. SUGGESTS BUZZER ON WASTE TANKS)

NE404 detector + 6655A HV 850v. Gain 2, RT-0.2

PDC-60

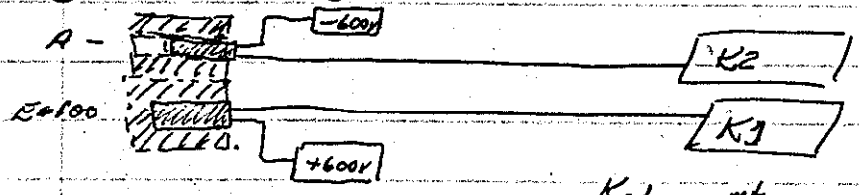
SID SOURCE UP : 9.1 c/m

DOWN: 102.1 c/m

DOWN: 1020 c/m (M-226 @ 15' in Run 201)

M-226 @ 21' : 5,730.8 c/m -

Ion Chambers:



	K-1 mtr	K-2 mtr
5 mg Ra - in contact with paraffin shields	4.2×10^{-11} (+)	2.25×10^{-11} (−)
Background	7×10^{-13} (+)	1.8×10^{-13} (+)
M-226 (7.5×10^{6} n/s)	7.3×10^{-10} (+)	2.3×10^{-12} (−)
10 mg Ra in contact	9.1×10^{-11} (+)	5.3×10^{-11} (−)

These readings taken preliminary to consideration of parallel operation of 2 ion chamber for compensating gammas.

10-12-59 Further Semi-Filtered Detector —

Attach 6655A PM tube to PM-2 channel.

Set PM-2 zero. Helipot .305.

→ Purpose: to measure dark-current signal & compare with several 6292 tubes.

(E_b = 1200) (E_{PM} = 1100)

HV	6655-A	6292 1	2	3	4	5	6
0	.05mv	.07					
600	neg	"					
700	neg	"					
800	neg	"					
900	.075	"					
950	.140	"					
1000	.400	"					
1050	.600	"					
1100	.850 mv	.Vern					
1200	"	.10mv					
1300		.50mv *					

(1 mv ≈ 1 μa)

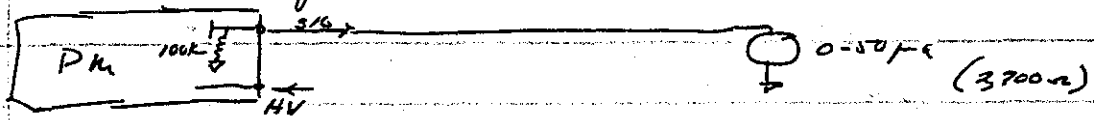
* When first set HV at 1300 there was sharp rise in reading. Then signal tapered down to recorded reading.

→ Check response to gamma source with no crystal

HV = 1100v 6655-A - ± 15 μa on panel meter

6292-1 ± 1 μa (records read 1 mv)

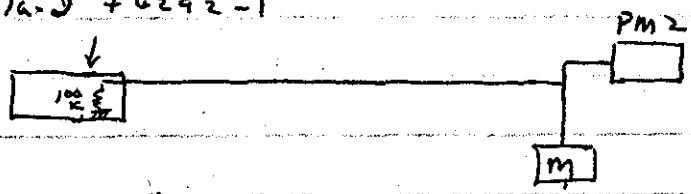
10-12-59 Place NaI crystal on 6292-1



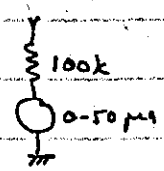
with 5mg Ra - got readings on meter =

10-13-59 Moved of above =

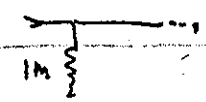
Na-I + 6292-1



m =



Pm2 :

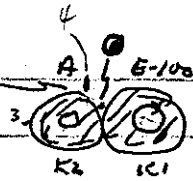


Pm2 w/o m @ a given HV = 42 % on meter

w/ m = 21 % on meter

10-13-59 Jon Chambers:

5mg Ra tried w/ chambers as follow.



12:30 P.

K1 = [redacted] + 1165 x10^{-12} a

K2 = −1.7 x10^{-12} a.

E-100
A — K1

Both 6.7 x10^{-10} a M226 @ [redacted]

add { E 100 only 6.8 x10^{-10} a
5mg Ra @ 2 6.9 x10^{-10} a

Both I.C. 6.65 x10^{-10} a

Remove Rc 6.8 x10^{-10} a. −

@ Ra both I.C. 7.1 x10^{-10} a

Ra @ 2 6.75 x10^{-10} a

@ 3 6.65 x10^{-10} a.

Remove Ra 6.85 x10^{-10} a −

Ra @ 4 6.9 x10^{-10} a

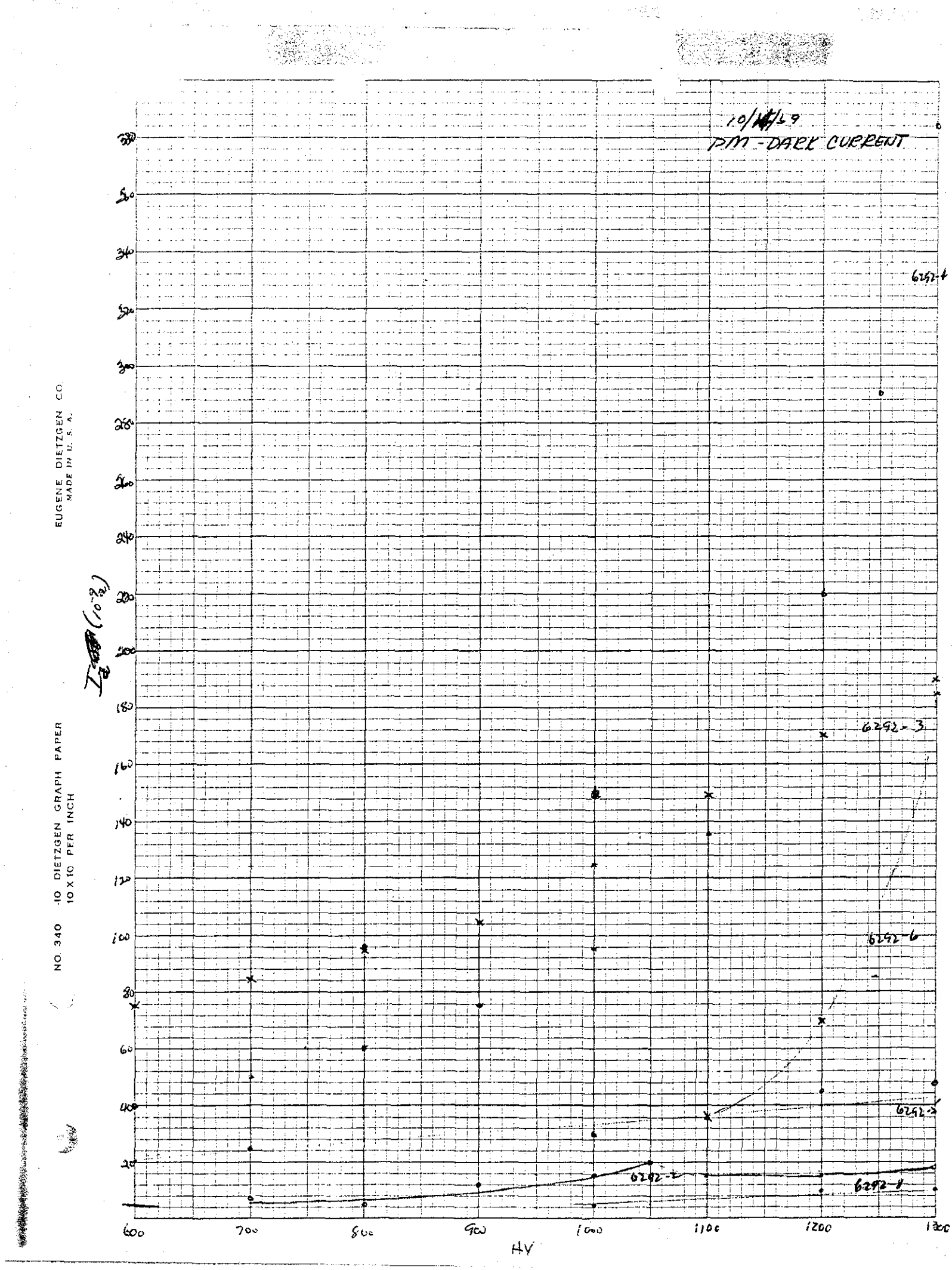
E 100 only 7.05 x10^{-10} a.

Remove M226

Ra @ 4 1.7 x10^{-11} = .17 x10^{-10}

Both I.C. 6.4 x10^{-12} = .06 x10^{-10}

− 1 x10^{-12}



EUGENE DIETZGEN CO.
MADE IN U. S. A.

NO 340 -10 DIETZGEN GRAPH PAPER
10 X 10 PER INCH

10-14-59 **P-M. Dark Current –**

HV	6292-1 (348.5)	6292-2
Zero	0	0
500	.01 μa	.02
600	.01	.02
700	.01	.02
800	.01	.02
900	.02	difficult to read readings
1000	.05	
1100	.13	
1150 (+.58 back down)	.13	
1200	.23	
1250 (to 1 μa then down)	.17	
1300	.20	

10:35 put 20 μa meter in series with 500 μa panel meter - To do this cut power - Need to let current warm-up

W/ 20 μa - set zero w/o HV & check

Reading μa

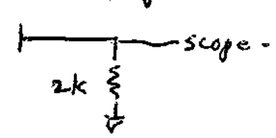
Load 10^10 Ω

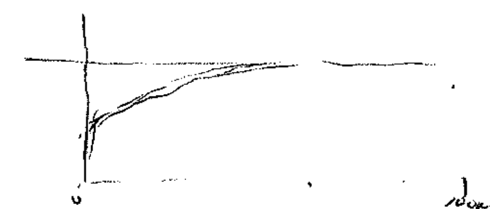
HV	6292-2	6292-1	6292-3	6292-4	6292-5	6292-6	6655-1	
500	≤.1		1.1	.6	.3	.2	<<.1	
600	<.1		1.5	.8	.4	.2	<<.1	
700	.15		1.7	1.0	.5	.2	<<.1	
800	.1		1.9	1.2	.6	.4	<<.1	
900	.25	<.1	2.1	1.5	.65	.4	<<.1	
950							<.1	
1000	.30	.1	2.5	1.9	.6	.5	.1 –	5x10^-9 Ω
1050	.40	.1					.3	15x10^-9 Ω
1100	.30		3.0	2.7	.70	.70	.8	40x10^-9 Ω
1150	.30		3.3	3.3				
1200	.30	.2	3.4	4.4	.90	1.40		
1250	.30		3.6	5.7				
1300	.35	.2	(3.8)	(7.7)	.95	3.40		

Sm

	7.7 μa	1100 V
6655-A mly - 5 my Ra -	3 μa -	1000 V
	1.1 μa	900 V
	0.3 μa	900 V
6292-2 mly - 5 my Ra -	0.5 μa	1000 V
	1.0 μa.	1100 V
	1.5 μa	1200 V
	2.8 μa.	1300 V

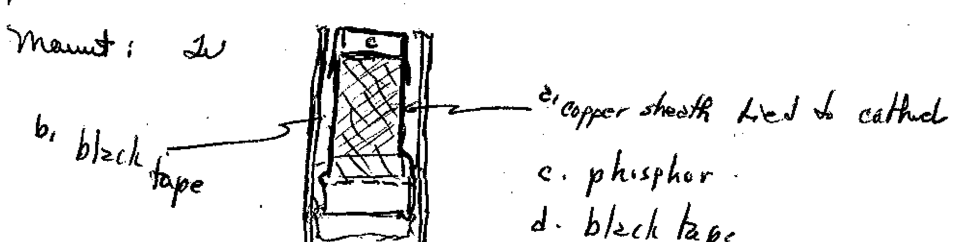
1-20-60: Check pulse from fast neutron scintillator with 6653-A photomultiplier tube -



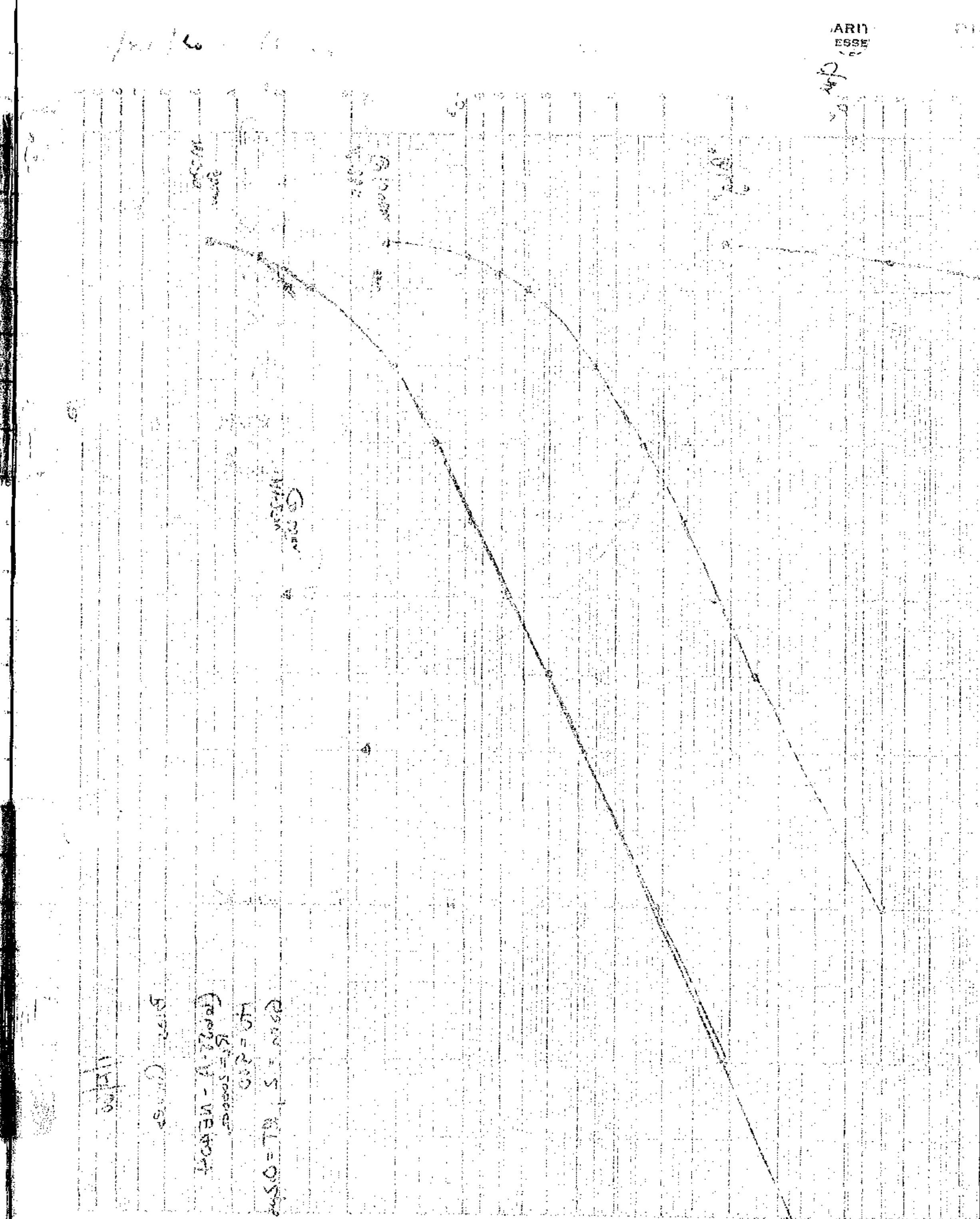


Pulses much longer than anticipated - In method current
Scope pre-amp is in poor condition -
Nothing conclusive here -

Mount: 1.

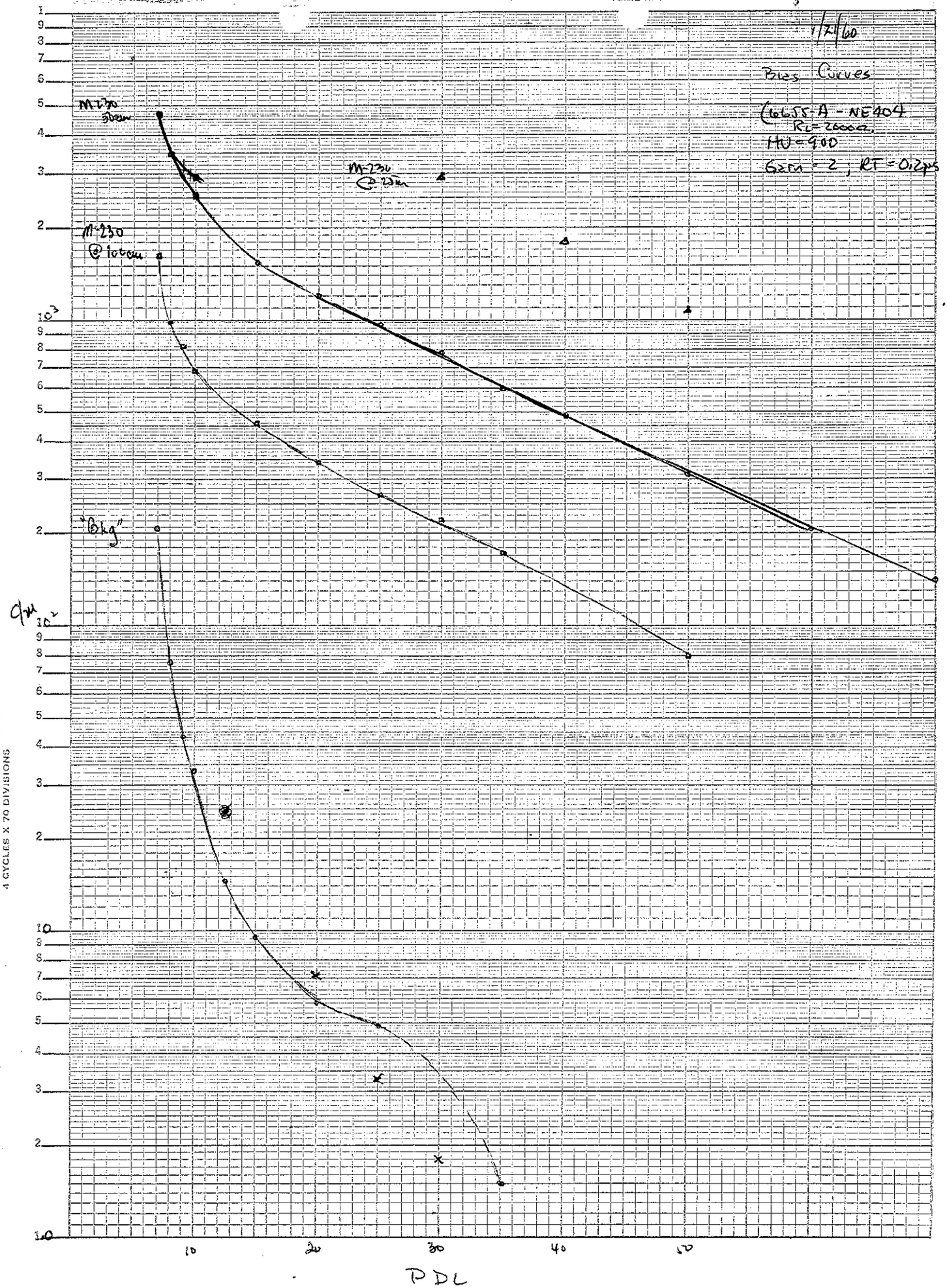


This assembly mounted in socket & aluminum tube as protective shield. Top of phosphor in line w/ edge of Al. can. This end covered w 1/16" cork & black tape.

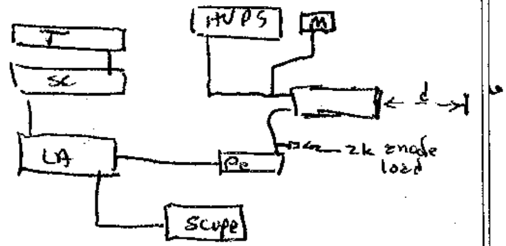


35 10 171.2

dpm 254



1/21/60. Using detector assembly collect data with source
M-230, PuBe, -



Pre-amp: AIC SN 641
L.A: AIC-B, 123800
Scaler: B-A 123798
Timer: BA 124254
Scope: Tektronix 100330
HVPS: NJE 100304 HV meter - ESVM

source distance from ℄ source to top of ~~except~~ phosphor container

A: HV @ 900: LA gain 2; RT 0.2

	PDL	Time	Counts/m	
Background	7	1	229, 194, 202	(11:05)
	8	1	78, 81, 70	
	9	1	45, 32, 55	
	10	10	28.5, 38.6, 33.3	
	12.5	10	15.2, 14.1	
	15.0	10	8.9, 10.1	
Source @ 1 meter	7	1	1280, 1366	(12:45)
		10	1639.5	
(11:17)	8	10	978.2	
	9	10	824.7	
	10	10	685.3	
	15	10	459.0	
	20	10	340.3	
	25	10	267.8	
	30	10	220.5	
	35	10	171.2	

20	6.8
25	4.9
35	1.15
50	0.6

50, 10m, 80.7

to pg 254

1/22 Source @ 25 cm

8:40AM

Time 10m	PDL	c/m
	30	2948.6
	40	1817.4
	50	1072.6
	60	
	70	

PM 6292-2 & Shurn phosphor "400"

(HV ≈ 1100 1105) = inside paraffin can

	PDL	c/m
Time 1m	10	33063
Source 25 cm	20	24,913 / (25),142
from paraffin	30	18,513
	40	13,740
	50	9,855
	60	6,789
	70	4,751
	80	3,172
	90	2,197
	100	1,204
	10	33,099

Bkg	10	65	60	13 c/m
	20	49	70	6
	30	31	80	8
	40	33	90	4
	50	26	100	2

1/22 – BF_3 ctr attached –

Check overall sensitivity at gain 2

PDL =	Input 1 mv
5	
10	2.7
20	6.9
30	11.25
50	24.7
100	63.

Set PDL@15 ≈ 4 mv – HV 1500 v BF_3 ctr – 1046 –

Bkg – 96 c/m, 189 c/m, 83 c/m

11:25: 36 c/m   w/source no counts –

Try new counter 10502, 1682   PDL – 12 ≈ 4 mv

HV = 1500.

	C/m =
	14149
	13979
HV = 1400 –	13866
HV 1300 –	13426
HV 1200 –	9922
1400	13806

Bkg (10 m) 52.4 c/m

1/21/60 1:50: Source @ 50cm :

PDL	Time	Counts/m
7	1	55411 24820
	10	4773.8
8	"	3463.6
9	"	2912.2
10	"	2552.5
15	"	1545.9
20	"	1200.4
25	"	960.6
30	"	785.6
35	"	597.7
40	"	486.7
~~45~~		3
50		312.5
~~55~~		
60		206.2
70		141.6

1/22/60

1:57 Bkg.

PDL	Time	c/m
30	10m	1.8
20	"	7.2
25	"	5.3
30	"	2.8

back to 252 please

1/21/60

1/28/60 →

Bias Curves

6655A + NE404 (Nf)

R_L = 2000 Ω

HV = 900v

Gain 2 ; Rt = 0.2

M-230 10cm & 100cm

5mg Ra 10cm

Background

1/22/60

Path 252 please

1-28-60 LA Gain = 2 6655-A + NE-404

RT = 0.2

A - HV = 900v. Source 5mg Ra

distance = 10cm

Same units as on 1/21/60 (p 251)

Time = 1m

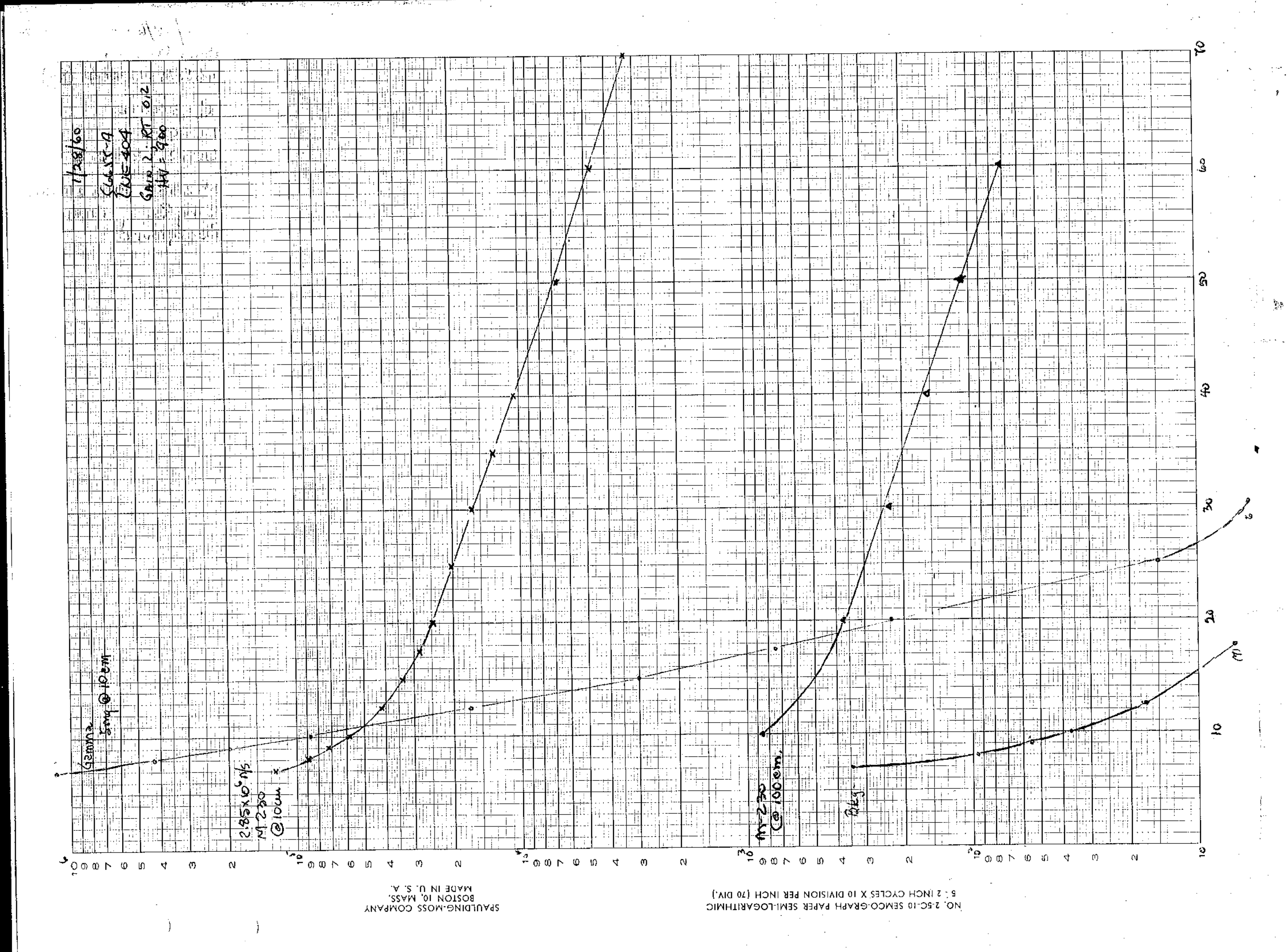
PDL	c/m
7	1,201,510
8	430,562
9	197,330
10	87,920
12.5	16,996
15	3,023
17.5	748
20	227
25	15
30	6
35	2
40	1

Background

7	343
8	95
9	65
10	37
12.5	17
15	17
17.5	7
20	(1) 14
25	5
30	5
35	2
40	3

2.85×10^6 n/s M-230

7	125,057
8	89,246
9	72,612
10	58,483
12.5	41,976
15	33,437
17.5	28,446
20	24,827
25	20,212
30	16,384
35	13,195
40	10,586
50	6,743
60	4,702
70	3,282



1/28/60 M-230 @ 100 cm:

PDL			
10	832	890	911
20	369	375	398
30	232	244	218
40	169	157	149
50	129	102	101
60	21	72	

2 minute counts 30 — 455 ct = 227.5 c/m

70 ct = 35 c/m body @ detector

478 ct = 239 c/m Cd cover

466 ct = 233 c/m no cover

6292 + NE400

HV = 1100 v.

10/29/59

Background (No thermalizing medium around detector)

PDL		
10	50	Time (m
15	44	
20	(0)51	(41?)
25	39	
30	19	
40	18	
50	14	
60	13	
70	12	

5mg Ra @ 10cm.

10	1163
15	124
20	44
25	37

M 230 @ 10 cm no paraffin or lucite

10	9,093
15	6,851
20	5,860
30	3,977
40	2,850
50	2,012

All platform — 24 cm below

30 — 4,219 c/m

1" plexiglas @ detector face 30 — 6,158

2" 30 — 12,391

2⅞" wide

PDL 30

M 230 @ 20 cm

No plexiglas	1,420
1"	2,045
2"	3,251
3"	3,172
3" near source	2967

@ detector

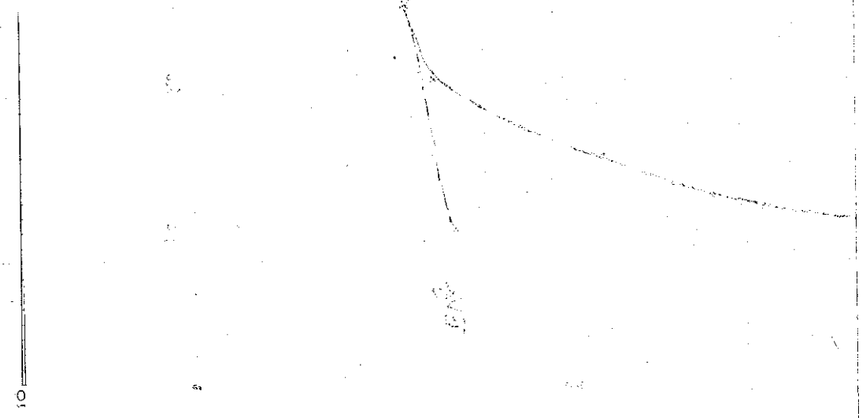
1/28/60
6292
NE400
HV = 1100V.

Sources: M230 @ 10 cm.
5mg Ra @ 10 cm.

sd = 20 cm

er.

DL 10
15
20
25
30
35
40
10
20
25
30



1/28/60

11:05- 1" box 3650 c/m

3" in front 3346 c/m

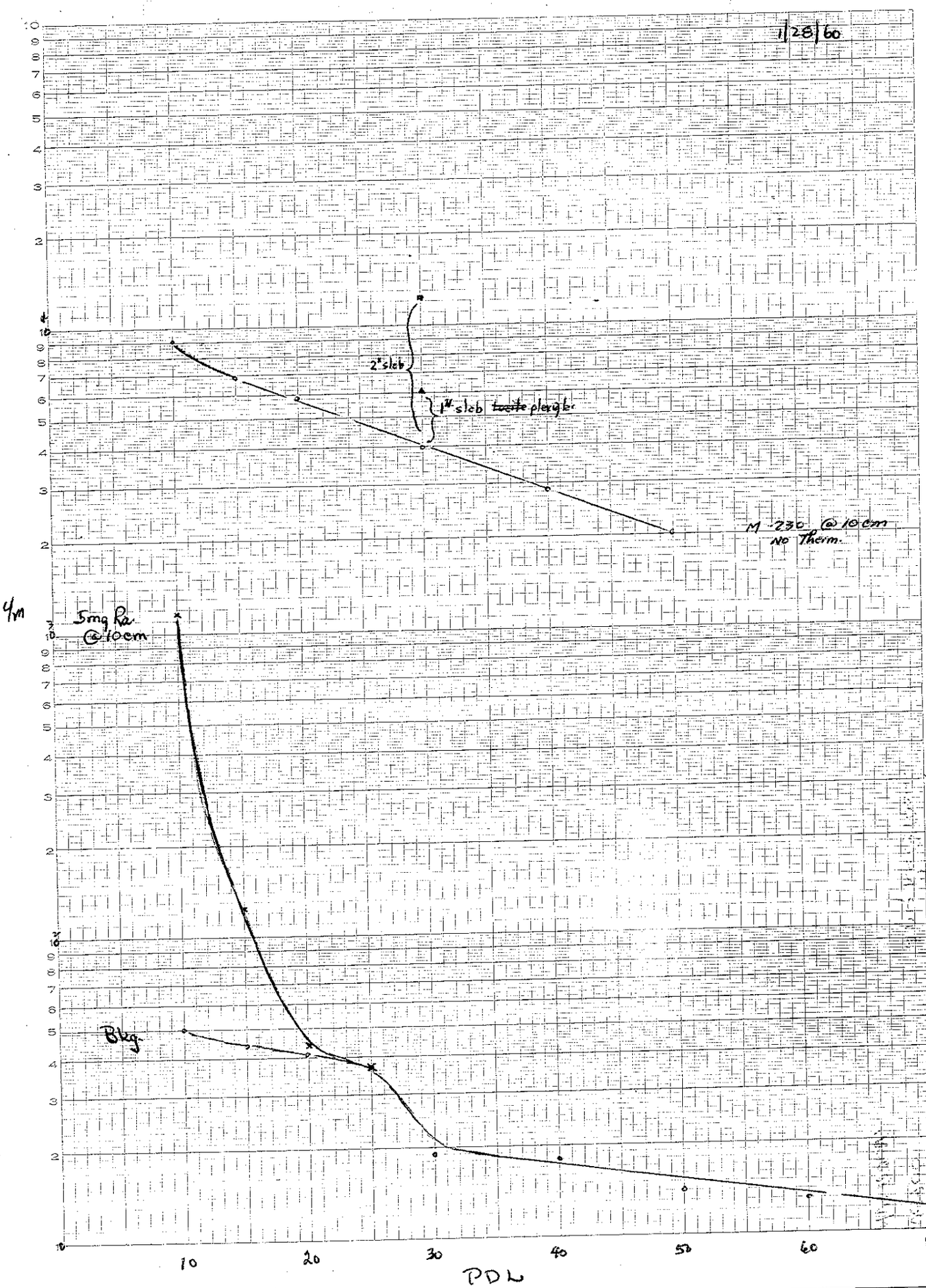
Cd cover - 1254 c/m no plexiglas.

Cd + 3" face - 1095 c/m

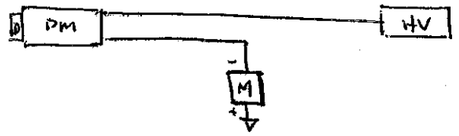
11:21

Twin (10 min)	1130.9 c/m	Cd + 3" face	sd = 20cm
PDL=30	1183.9 c/m	Cd only -	
	1342.5 c/m	Cd off - no plex.	
	3479.4 c/m	3" face -	

12:10P	(3" face)	+	58.1 c/m	Bkg - PDL 10
			59.5 c/m	15
		+	47.9 c/m	20
		+	46.10	25
			34.9	30
			33.7	35
			26.1	40
	5 mg Ra -		298.8 c/m	10
			48.6	20
			45.2	25 30



5-23-60



1:32 D = anthracene S = 5mg Ra source
PM = 6810A
M = API - 100 μa
HV -- NJE

(S.D. = 1 for 1)	HV	M	
	1500	1 μa	Background
		3 μa	Source, 1'
	1600	5.5 μa ; 1 μa	Source, 1' ; Background
	1700	8.5 μa ; 1 μa	" "
	1800	15 μa ; 1 μa	" "
	1900	27 μa ; 1.5 μa	" "
	2000	43 μa ; 2.5 μa	" "
	2100	62 μa ; 4 μa	" "
	2200	90 μa ; 5 μa	" "

1:58 HV off.
Not On

1:58 NV MT
1500 28 ; 1

5-25-60

12:42 6810A & NBI - HV = NJE Surgely M = API 0-100 μa
Source = 10 mg Ra - ADJUST METER ZERO
Backgrounds at varying HV settings

HV	Bkg
1500	0.5
1600	0.5
1700	0.7
1800	.8
1900	1.0
2000	2.0
2100	3.0
2200	5.0

Source @ 1'
~~95 μa~~ >100 μa -

M	HV
35	1500
68	1600

Source @ 1' wall & slag rack effect of unistrut angle in air M = 90

Source @ 1'

HV	S=1'	S=2'	S=3'	S=4'	S=8'
1100	3.5	2			
1200	7.0	2.5			
1300	17.5	5			
1400	39	11			
1500	88, 91	23	13	8.5	4.
1600		49	23	15	5
1700		99	45	28	9
1800			86	52	16
1900				88	27
2000					45
2100					72
2200				(2150	87)

5/26/60 734A Check - S@8 2100 - 71 μa

5-26-60 - Need coincidence device for central area monitoring to catch rising pulse of burst. "incident."

7-11-60 Reports from Vacation 7-1 / 7/4

ADC - 20 channel fan stalled & "hot" Sat, 7/4

DWM - Man from Monroe was here to adjust data-log unit. Talked with him about setting up means of identifying, [illegible].

- Has talked with people about pre-amps. Suggested [illegible] of available low noise pre-amps.
- Has ordered 8 flat fission counters.
- Question about use of amplifiers with positive input signal from fission counters.

JFE - Has checked IC-3 & IC-4 in 112.

7-12-60 2:30 PM - Power off for ~ 10 sec. When an building alarm & cut off.

- Import fan - 20 channel - remove
- Check out RIDL unit in 210, Timer ok.
- Check position input to 219 preamps - ok
- Initial check of HP amplifier.

7-13-60

- Scintillation counter 215 - adj H.V.
- HP amplifier check
- RIDL unit timer - service -

7-14-60 Channel C3 - 107. high counting rate at times.

Channel on "count" with scope monitoring high amp. output. Pulse amplitude increases producing counts. This followed by large transient and which upon collapse reduces signal to normal. -

NICC Test Pulse Generator attached to input of amplifier. Seems to be still some instability in signal -

Pulse Generator in place of U233 detector - Signal: 60 cycle negative 1 psec wide, 1 mv.

PDL	c/m	
28	223 14	
	225 12	
34	222 10	
	222 12	
35	160 5	135 13
	129 13	
36	151 1, 31 3, 67 8, 81 3	150 3, 110 13

37.	V4 N
C1	essentially no 60 v pattern on bkg,
C2	60 v amp 1/2 cm {1722 Scope 1x1
C3	60 v amp., 8 cm

7-14-60 Check battery for C3 - 3-45v in plastic case -
when meter attached read 110v - dropping to 95v.
Such batteries - held 10,000Ω load, dropped to <50v/Hr.
Fresh supply - box found in bench supply 107.
133 volts no load, 129 volts 10,000Ω load.
With new battery in place, & U^{233} detector attached took extended count of background to see if neon is gone.
Time started 9:18:15 - Scale 16 - {PDL 28 LA, Gain 8, RT 0.8 p/s}

Stop 9:38:15 20 min

Start 9:42 -
@ 11:37 no counts - Good sign

Check 112 Instrumentation
RIDL Timer repaired & check out -

7-15-60 AM West End - Bottle Exp - set up
P. 1-3 PM East End - set up 235 & 238 fission counters on Channels 1 & 2 -
3-4 PM West End - Counter set up Bottle Exp.
" - Write up -

7-18 - Conf on CTU -
7-19-22 Gen Inst
7-25 - Inst. Rm 215 -
7-26 Conf. on CTU - Rm 215

July 27, '60 Excerpt from WAPD-MRT-10 3/8-60 report p-57: Pulsed Neutron Measurements in Multiplying Media - E Carroll, N. Vachon

Detectors: 2 - BF_3 counters
2 - Boron polyester crystals
2 - w/ 6810 RCA photomultiplier
2 - w/ 1002 CBS photomultiplier.

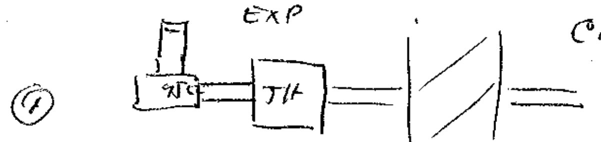
Consideration of comments on CTU specs. regarding testing.

8-16-60 Consideration of detector & distributed amplifier for TMC

TMC signal - ≥ 1 volt; +

2. 6810A - anthracene - Ra 210 operation of 6810A @ 1600 v w/ 75Ω
Ra - gives good pulses out through 1 460BR.

Trial run in South cavity.

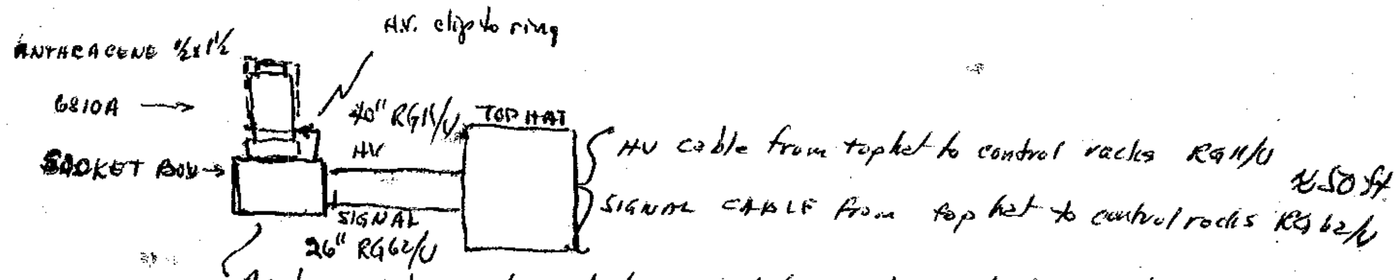


Using existing cable - try to see what pulses obtained with HP amb in CR.

~~6810A - Anthracene & 75Ω Ra in 113 connected to Top hat (any loss where normalizer counts had been) get 0.18v pulse with 460BR linear at 1700v.~~

8-17-60. 8:30 Further check of neutron detector for pulsed neutron work.

LAYOUT:



Anode resistor external to socket box and equal to 75 ohms

8-17-60

HV 1700v - (1 ma)   HP 460BR ~~[illegible]~~

Bkg - ~ ½ cm (scope 2x1), with 1 cm of low freq noise.

Ra Gamma Source - 1 cm. ~~LINEAR~~ 1x4
.7 cm ~~PULSES~~ 1x2

Po Be Source - 1.3 cm LINEAR 1x4

HP460BR to Scaler - at input of scaler to scope - - Scale PHS

Both sources - (1 min) 46.17 x 10³ c/m
46.46

Remove PoBe - Ra 2.18 x 10³
1.95
1.83 x 10³

~~[illegible]~~ PHS	Bkg	NW 10mg Ra	Ra + PoBe M227	PoBe
+ 2	8 x 10	28.13 x 10⁵	53.543 x 10⁵	1.9479 x 10⁵
3	5 x 10	16.76 x 10⁵	32.6078 x 10⁵	1.3093 x 10⁵
4	2 x 10	5.9148 x 10⁵	13.9156 x 10⁵	.8022 x 10⁵
5	0	3.656 x 10⁴	19.368 x 10⁴	.844 x 10⁴
6	-	2.33 x 10³	24.41 x 10³	
7	-	2.0 x 10³	38.3 x 10²	

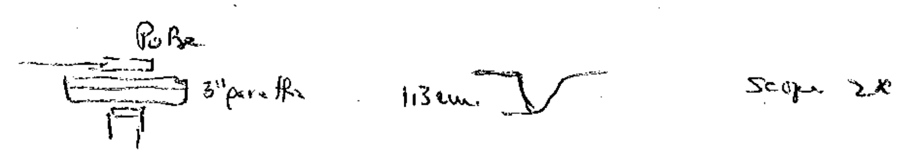
HV = 1700
HP LIN.

No good.

Source were not fixed.

Clamp PoBe source to step stool - put 3" paraffin over detector

Scope only on HP460BR output 75Ω on output of HP460BR. HV -



Ra Gamma - built of 1 cm. ; Remove paraffin
no apparent change.

(S2) M227 above page

8-17-60 Condition 6810A - Anth - Co^{60} (S1) on top / cross - 3" per above Co^{60} -

HV - AMP

1460 A+B Amax - Blin. Co^{60} S1 - Scope 1cm (1x1)

Scaler - PHS 1 - 10 m - 178 c/m

Most of day spent in preliminary adjustments.
Brought back TMC analyzer - Checked it out. (Tape cycle)

8-18-60. Comparison of responses of [illegible] & several sources -

overnight { HV off, TMC on }

To calculate count rate

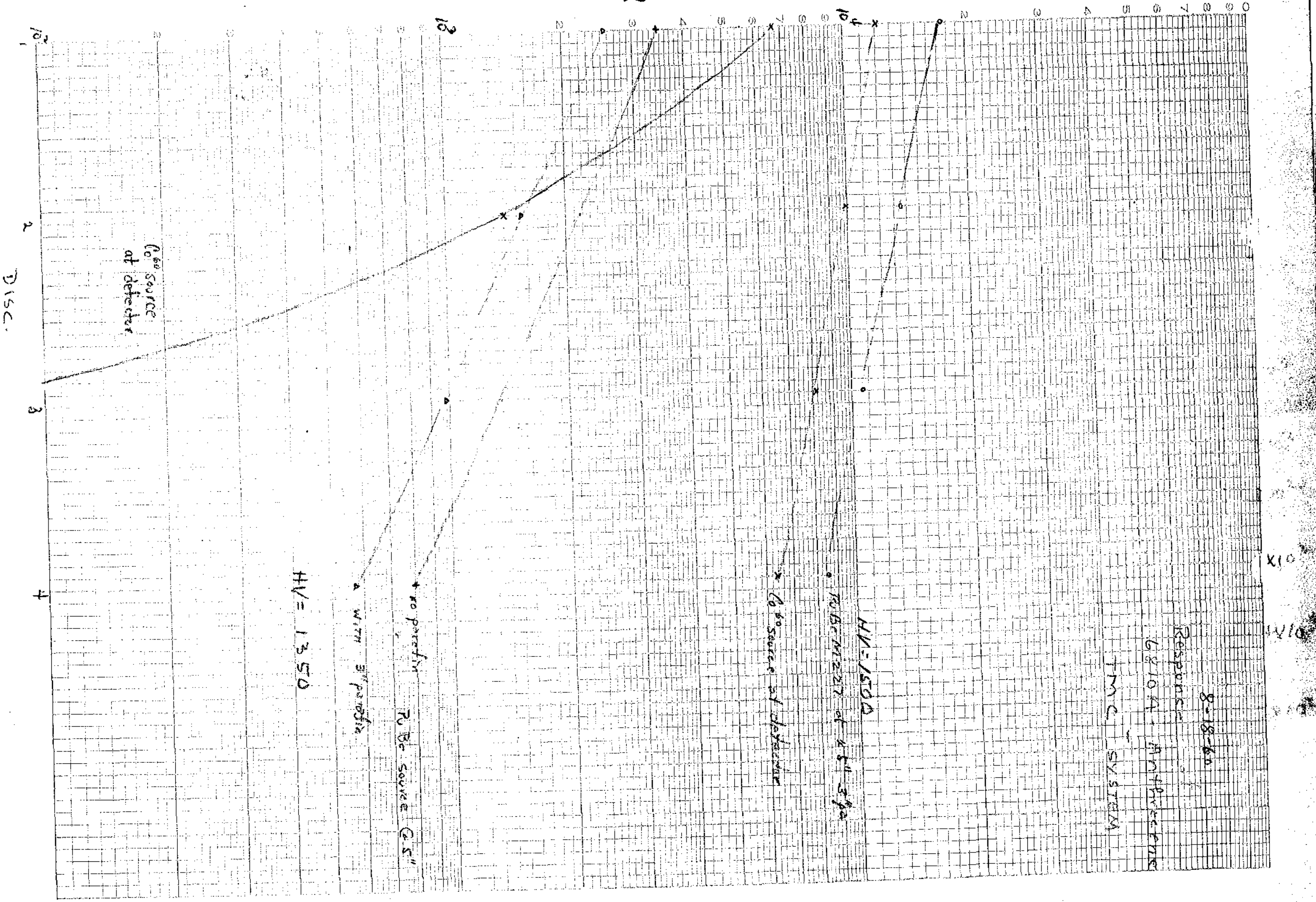
$$\%/s = \frac{1}{N} \cdot \frac{C}{2^{14}} \cdot 10^6 = \frac{51.2 \times 10^6}{N}$$

	HV	1P46A	1P46B	TMC 212 Dec N	(N) cycles	Preset count	Digit ct.	Source	8/18/60 - check setup; sources in place. TMC 1002, 1002, L=16, M¼ ok for 600 sys. trig.
1.	1500	max	LIN	1	2921	2^{14}	16385	M227 + Co^{60}	
					2924		16387		
				2917	2906	16384	16385		%/s 1.755 x 10^4
					8751				
				2	3766	2^{14}	16384		
				3961	3747		16385		
					3771		16388		1.361 x 10^4
					8284				
				3	4776	2^{14}	16385		
					4765		16390		
				4776	4789		16386		1.074 x 10^4
					18330				
				4	5999	2^{14}	16384		
				6001	5990		16384		
					6016		16386		8.53 x 10^3
					18005				Removed M-227
2.				1 N	4231	2^{14}	16384	Co^{60}	
				4223	4220		16386		
					4218		16385		1.212 x 10^4
					12669				
				2	5083	2^{14}	16388		
					5123		16384		
				5129	5181		16385		9.98 x 10^3
					15387				
				3	6362	2^{14}	16386		
				6284	6248		16385		
					6243		16385		8.15 x 10^3
					18853				
				4	8033	2^{14}	16385		
					8045		16385		
					7996		16384		6.38 x 10^3
				8025	24074				

(S2) M227

Reduced HV to 1350V & Preset count 6 × 10[12]

EUGENE DIETZGEN CO.
PRINTED IN U. S. A.



Reduced HV to 1350V & Preset count to 2^{12}
(During some set preset cycles to 20,000)

PA max, PB LIN.

8-18-60

$c/s = \frac{1}{N} \cdot 12.79 \times 10^{?}$ (for preset ct 2^{12})

$c/s = \frac{1}{6.4} \times C$ (for preset cycle 2×10^4)

Run	212 Disc	cycles		Bkg ct.		source	c/s
3	1	1926		4096		Co^{60}	6.66×10^3
		1900	1920	4097			
		1933		4096			
	2	9080	9132 / 27396	4096			1.401×10^3
		8918		4096			
		9398		4097			
	3	20,000		151	C		
		20,000		115	128 / 383		20
		20,000		117			
	4	20,000		15	17 / 52		2.66
		20,000		18			
		20,000		19			
4	1	4977	5004 / 15012	4096		M^{227} Co removed (+3" paraffin)	2.558×10^3
		5078		4096			
		4957		4096			
	2	8334	8239 / 24716	4096			1.553×10^3
		8166		4096			
		8216		4097			
	3	12991	12969 / 38906	4096			9.86×10^2
		12837		4096			
		13078		4096			
	4	20,000		3693	3667 / 11002		5.73×10^2
		20,000		3687			
		20,000		3622			
5	1	3,762	3744 / 11233	4097		M^{227} no paraffin	3.44×10^3
		3,762		4096			
		3,709		4096			
	4	15,868	15,944 / 79,772	4097			8.02×10^2
		15,438		4096			
		15,818		4096			
		16,403		4096			
		16,245		4096			
Bkg. (6)	1	20,000		41	37.7 / 113		
		20,000		38			
		20,000		34			
	4	20,000		0			.315
		20,000		3			
		20,000		3			

For all scans – every address correct 64/64 on tape –

8 1 8 ?? B backed polyester [illegible] NE 400 - on 28104. PS Ct : 2^{12}, PSay 20,000
(HV = 1700V) APA [illegible] APB LIN -

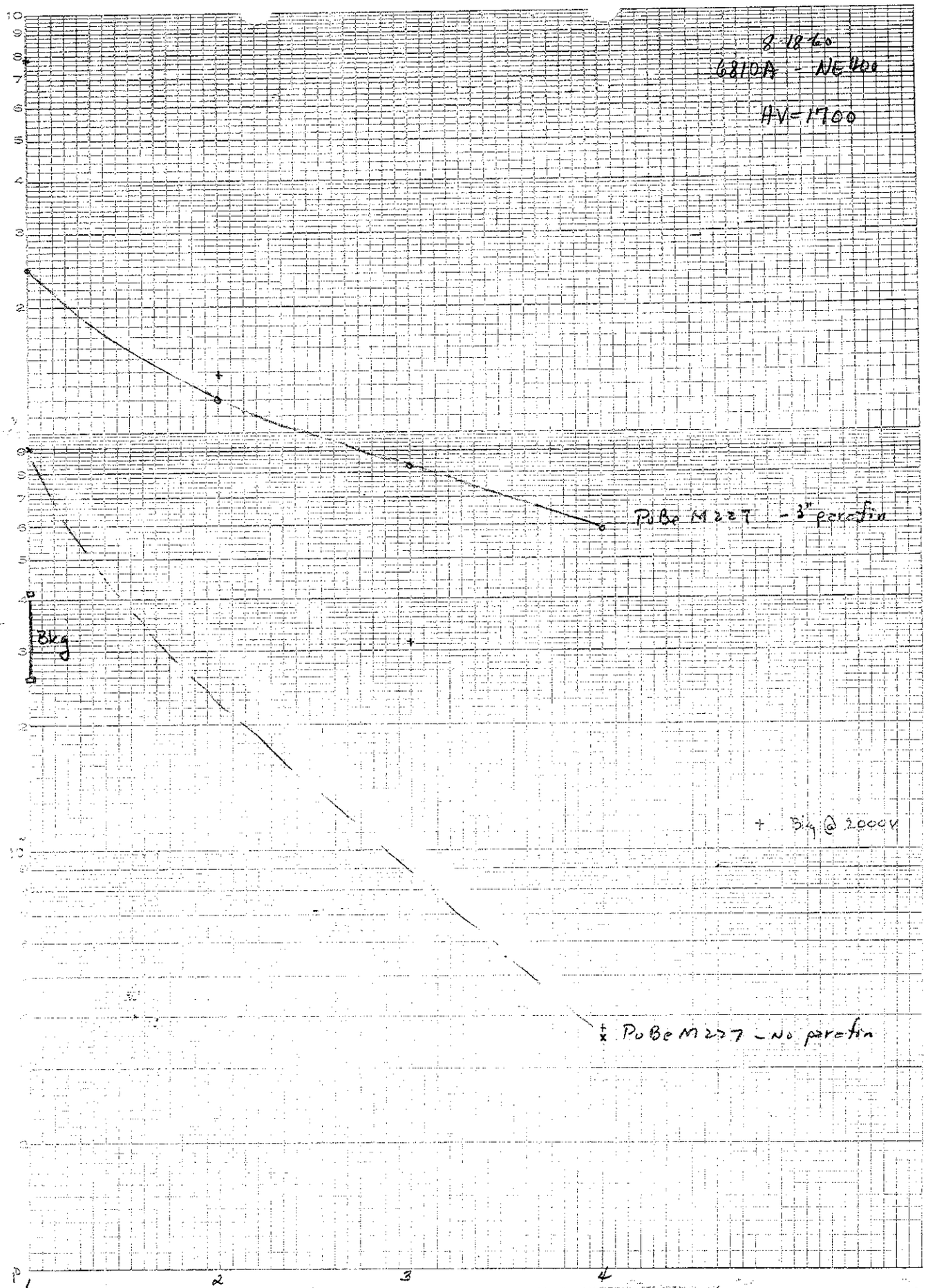
B-227 source with 3" paraffin

		Cycles	Counts, B	212 Disc	c/s
	N 5169 / 11504	5516	4096	1	
		4947	4096		2.47×10^3
		5043	4099		
	10642 / 131927	10941	4097		
		10518	4096	2	1.202×10^3
		10468	4096		
	15456 / 146369	15185	4096	3	
		15643	4096		8.[illegible]
		15411	4096		
		20,000	3691		
		20,000	3781 3736	4	5.[illegible]
			[illegible]		
Remove paraffin -	14028 / 129057	14,318	4097	1	9.1[illegible]
		14,739	4096		
		20,000	217	4	35[illegible]
		20,000	235 226		
Background		20,000	2680	1	419
		20,000	1653		258

appear to be bursts of counts in bkg. Display of 2^7 movement of dots is slow then speeds up & slows down ?
Why irregular counts

2000 V M227 @ 1" w/paraff 2^{15} 794 32,770
618 32,790

Bkg 2^{12}



DISC

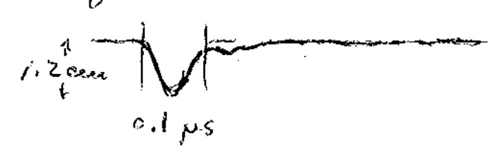
8-19-66 8:04 AM – Peculiar background behavior could be residual light effect which is common among such phosphors.

Check use of 511 scope + gate as system trigger for TMC –
B = 2, D = 2, b = 10 –

Range	Scope Setting mult.	Cycles per minute
10,000 µs	1.0	3869 3333 3805
~~10,000~~	~~10.0~~	
10,000	10	328 324
~~1,000~~	~~1.0~~	same as 10,000 1 – ?

Use 10,000, 1.0 to approximate 600 trigger 1806 ? no good.

+P 460 AR MIN
+P 460 BR LIN Pulse from AP460BR ; HV = 2000V Bkg – NE 400



Scope at 10,000 ; 1.0 – HV = 2000

Preset Count = 2[16]
Preset cycles 10,000 –

Bkg.	212 D.	Cycles	Time	Channel 1	
B2 b=160 D2 M44	1	10,000	201.7	33463	(1)
		10000	202.4	32177	(2)
		10,000	202.9	30835	(3)

Some difference in rate of accumulation of bkg. count and values not predictable.

Change scope mux threshold max key.

Bkg.	212 D.	Cycles	Time	Channel 1	
	1	4425	58.7	65538	(4)
b=40	1	10,000	40.2	7851	(5)
		"	40.2	9810	(6)
		"	40.2	6441	(7)
b=80		"	86.1	34585	(8)
B=2, D=2, b=40		10,000	40.1	1535	(9)
	2	"	40.1	1782	(10)
		"	40.0	1539	(11)
		"	40.0	1015	(12)
		"	40.0	1188	(13)

preset cycles 10,000

6810 A + NB 400 — HV = 2000 HP 460 AR MIN R_0 = 75 Ω
R_3 = 75 Ω HP 460 BR LIN

8-19-60

Run	Time	Channel I	212 D	
14	40.0	235	3	
15	40.0	300		
16	40.0	259		
17	40.0	235		
18	40.0	34	4	Background in spurts –
19	40.0	26		

HV = 1700 — HP 460 A MAX HP 460 B LIN. Set TMC. for 500,000 cycles 2000 sec –

	RUN	Time	Channel I	212D
10:14	20	2000.3	8421	1

$c/s = \frac{10^6}{N \cdot 2L} \times C = \frac{1}{40} \cdot C$

c/s = 210.5

Background does not appear to come in spurts at this HV. at first –
After longer observation, still erratic.

PS cy 50,000

	21	1999	11818	1

M-227 above 3" paraffin set auto (full) deadtime –

start series

~~Hit~~ 1	22	1991.8	12113	1
11:29	23	2597.1	12250
			12400
			12201
			12004
			12217
			12176
			12019
			12352
			12309
			12114
			12455
			12123
			12053

13 ~~[illegible]~~ items

158693 / 12,206

c/s = 3,052.

Replace HV Clips to newy J 6810·A

M227 at far corner by door
10,000 40 s 1018
M227 in pig 696

2 kg 24 598.8 998
PS cycle 50,000 3 – 1488
12:44 1441

Spurt counting still present

–	50000	50000	50000	50000
1	2831	2791	2930	3798
2	1543	1598	1600	1934
3	1196	1213	1307	1753
4	1175	1179	1213	1817
5	1172	1139	1205	1764
6	1124	1103	1216	1758
7	1063	1070	1131	1747
8	1026	1056	1170	1768
9	1008	974	1137	1732
10	974	980	1102	1716
11	961	982	1087	1719
12	954	935	1100	1632
13	927	932	1020	1695
14	913	959	1046	1670
15	854	891	1006	1613
16	876	898	1042	1693
17	857	874	997	1630
18	857	816	992	1618
19	870	868	982	1666
20	843	833	941	1485
21	868	855	977	1565
22	813	812	914	1591
23	798	847	918	1593
24	781	755	923	1539
25	810	763	903	1557
26	738	781	923	1532
27	768	724	910	1582
28	763	732	886	1547
29	703	724	892	1529
30	730	701	838	1490
31	704	700	872	1491
32	714	632	888	1490
33	683	659	856	1520
34	678	681	870	1475
35	662	648	816	1482
36	670	608	812	1475
37	714	619	857	1467
38	636	597	804	1459
39	655	639	797	1488
40	615	627	792	1383
41	627	598	798	1447
42	600	594	784	1417
43	608	603	783	1404
44	615	547	752	1428
45	609	570	739	1455
46	586	558	767	1408
47	602	521	750	1390
48	601	539	756	1449
49	594	547	742	1378
50	583	525	745	1391
51	559	539	777	1399
52	551	591	754	1388
53	564	545	744	1405
54	567	487	779	1365
55	555	562	707	1376
56	571	550	735	1347
57	526	527	752	1364
58	506	486	693	1323
59	508	491	715	1375
60	493	483	731	1331
61	499	504	688	1369
62	523	503	723	1326
63	485	479	793	1306
64	635	617	828	1413
	0			

8-19-6

1:00 Ground IP460A P212 D Bkg start fast slow after 90 sec
preset sec CH1
50000 199.6 652 1

199.6 1960 Begin fast. slow after 160 s.

Slide out 110 to mount 4/150 -1.3V ok.

During one scan background rate varied & voltage [illegible] fixed.

Comments on Rate

1:18 500,000 1996.75. 8286 I. Dwell 2? - fast rate at start

Bkg,

c/s = 207.2 -

slow @ 18 s	fast 108 s
200	283
395	530
587	678
725	800
855	965
1050	1140
1210	1325
1380	— etc

HP Audio Sig Gen + NICC pulse gen. 212 D = 1 V_i = 4V - set @ 5V, 1 μs.

B02, D02 1:40 5×10⁴ cycles; 200.0 s; 4048 (1.012 kc) signal 1000 cycles/s

2:45 P/ 5×10⁴ cycles; 200 s/final 3972 (.994 kc) 4 dev, 1 μs 1 kc

5×10⁴ Preset cycles	385 Time	Channel 1		signal 100 cy/s
3:05 1×10⁴ cycles (@100 c/s)	S	88, 88, 94	274 91	100 cycles/sec, 5.0V, 1 μs.

1×10⁴ (2500) 400 s/trial 5 trials	199.8 sec.	815, 764, 784, 784, 808	3955, 3910	1000 c/s 5.0V - 1 μs
5×10⁴ (2500/s) 200 s/t		3982, 3991, 3952, 3989	3978, 15914	1000 c/s 5.0V 1 μs

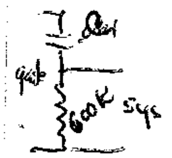
5×10⁴ (250 c/s) 200 s/t (212 disc 1.3) @ thresh. 1000 c/s 5.0V, 1 μs

8 8-22-66 8:32 A [illegible] TMC –

Check System Trigger w/ w/o capacitor set [illegible] ccw, stability mid-range to get good sweep on [illegible].

Trigger | | TMC

	Range	Mult.	Start	Trig	B	D	L	Time	cps
System signal Direct to gate	10,000	1	½	MIN	2	2	10		3389
			Max	Max					14991
			½	MIN					3412
	1,000	1	½	MIN					34935
			Max	Max					19389
Direct to gate 50,000 pps	1,000	1	½	MIN	2	2	10	87.2	573.4
								87.3	572.7
								87.5	571.4
								87.6	570.8
								87.8	569.5



$RC = 100 \times 10^{-12} \times .6 \times 10^{6} = 60 \times 10^{-6}$ 600 sec count

R=100K

signal input 5 V, 1000 c/s DISC 11.6

Range	Mult.	Start	Trig	B	D	L		cps
1,000	1	½	MIN	2	2	10		569.57
								568.05
								567.60
		Max	Max				appears to be missing some channels	235.91
10,000	1	Max	Max	2	2	10		250.22

seems to have tapering scan at this condition, NOT CORRECT

250.07

250.46

print ①

Range	Mult.	Start	Trig	B	D	L		cps
10,000	1	½	MIN	2	2	10	(200 sec)	55.65
				2	2	160		55.56
~~10,000~~	~~5~~	~~½~~	~~MIN~~	~~2~~	~~2~~	~~40~~		
1000	10	½	MIN	2	2	40		53.18
	2	½	MIN					274.42

8-22-60
sys: scope 10,000; 1
stab & trig max.
sig = border line - 5V INPUT 1000 c/s
DISC 1.4 -

999	(1)	99999
100		250.46 g/s
1		1291
2		356
3		382
4		229
5		269
6		262
7		248
8		258
9		289
10		241
11		291
12		255
13		292
14		218
15		244
16		207
17		212
18		252
19		248
20		234
21		216
22		214
23		207
24		215
25		188
26		223
27		189
28		190
29		190
30		230
31		206
32		175
33		235
34		217
35		205
36		180
37		183
38		212
39		260
40		167
41		171
42		157
43		190
44		170
45		188
46		179
47		240
48		166
49		162
50		221
51		181
52		189
53		183
54		173
55		179
56		125
57		177
58		127
59		199
60		117
61		169
62		158
63		115
64		109

8-22

Sig 5.0 v 1000 c/s - IP/MIC
TMC DISC 1.4

Scope trigger

SCOPE-GATES TRIGGER

							TIME	cyc/s
Preset cycles 10000	1000	5.5	1/2	MIN	2, 2, 2, 4	40	101.3 101.4 101.4	
5	1000	5.5	1/2	MIN	2,	2 20	101.4	
6						40	101.45	
7						80	101.5	

(100 missing 1/2 of each)

Scan

80 101.5 (in 3/4)

sw from 1/4 to 1/2, then xfr to 3/2, erasing 1/2 above in 3/4

record 2nd in 1/2 80 101.5 (in 4/4)

2nd higher trace 80 101.5 / in 3/4

101.55

8 1000 5.5 1/2 MIN 2 2 20 406.6 (full mem)

still tapes — Manual Signal on scope - top reasonably flat

1:25 Input sig 5.0V (1000 c) (4pot 1000) P 212 DISC = 1.0 -

Oct 2[14] ⑨ 1000 5.5 1/2 MIN 2 2 20 full mem

CP

signal too Kc.

Set Signal generator at 5.0V - adj thelipot to determine range of discrimination point

Sig 5.0 V

thelipot	
1000	
995	) normal pattern
943	
933	) distorted pattern
930	low rate, but flat.

2	216	398		494							
3	216	406		360							
4	203	388		310							
5	207	391		254							
6	213	392		218							
7	189	383		167							
8	201	397		126							
9	198	387		118							
10	185	395		123							
11	184	396		98							
12	196	379		93							
13	197	399		88							
14	203	387		77							
15	191	380		62							
16	204	404		54							
17	183	395		55							
18	194	395		47							
19	198	380		43							
20	189	386		46							
21	194	374		50							
22	175	372		29							
23	192	374		35							
24	214	374		28							
25	189	390		30							
26	186	373		25							
27	192	380		28							
28	190	397		20							
29	189	375		21							
30	211	374		31							
31	175	383		23							
32	186	393		21							
33	193	394		21							
34	192	364		24							
35	184	374		22							
36	206	373		19							
37	183	380		20							
38	186	396		17							
39	206	374		20							
40	212	370		13							
41	200	369		20							
42	190	339		19							
43	188	356		16							
44	205	360		7							
45	188	368		16							
46	181	344		24							
47	186	352		20							
48	183	337		13							
49	197	324		20							
50	202	344		16							
51	185	322		11							
52	209	346		13							
53	191	336		16							
54	194	326		14							
55	186	324		7							
56	190	326		15							
57	190	329		14							
58	197	332		10							
59	187	326		15							
60	220	314		12							
61	186	297		13							
62	191	299		12							
63	199	319		12							
64	205	337		14							

	10000	10000	10000
1	-784-	-823-	-789-
2	387	389	411
3	382	402 1029	395
4	402	380	395
5	388	397	383
6	407	373	395
7	363	374	412 98C
8	362	382	378
9	400	409	390
10	380	389	390
11	362	373	380
12	357	400	414
13	349	384	399
14	348	383	364
15	367	401	401
16	354	359	397
17	353	378	393
18	317	353	375
19	304	386	382
20	321	401	386
21	306	375	401
22	305	387	385
23	301	376	376
24	310	358	387
25	268	373	370
26	303	344	395
27	267	330	398
28	257	350	366
29	253	356	382
30	251	331	366
31	243	325	390
32	251	330	374
33	209	300	352
34	215	328	345
35	235	328	376
36	218	307	362
37	207	311	357
38	196	291	354
39	178	296	339
40	236	314	337
41	180	276	355
42	182	307	355
43	174	253	305
44	176	259	353
45	187	272	310
46	184	252	334
47	166	276	338
48	165	261	328
49	163	250	322
50	179	245	306
51	150	234	324
52	150	234	297
53	143	248	305
54	145	227	303
55	155	221	304
56	152	232	311
57	142	227	309
58	124	204	301
59	113	200	302
60	121	231	291
61	111	186	303
62	111	234	273
63	119	191	[illegible]
64	123	222	

$f_s = \frac{10^6}{10^4 \times 8} c = 125 kc$

980

SYS. TRIG. 1.5 U SCOPE

RANGE 1000 STAB. ½ ‖ SIGNAL: HP+NICC ‖ TMG 1.0 ‖ BCL=D ‖ PS SUP 10 V

MULT 5.5 TRIG. MIN ‖ 5 V / 1 μs : 1000 c/s ‖ DEC 1.0 ‖ LO-40 ‖ ATTN 10, 4 s

8-30-60 Turned TMC on 9:55 AM.

1:25 PM - Set up NICC pulser as System Trigger. (Scaler reads = 3V, + pulses)

Check for proper triggering -

NICC pulse rate 60 c/s.

Ran for 200 sec, got 12003 cycles. 60 c/s ✓✓

Detector: NE400 + 6810A

Brought from 210 (Had been cleaned & new mylar skip put on)

Set up in 112. HV cable 25' RG 11/U

(in rack 8 by Wall Detector) Same as when in 113.

SIG cable ~ 7' RG 62/U

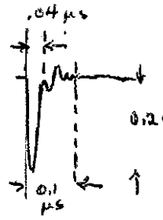
R_2 = 75Ω (+270pf cap).

Tektronix 543 scope brought down from 216 -

HV = 1900 Note varying intensity of trace, indicating changes rate of background still evident -

Observed background pulses -

Direct from detector to scope.



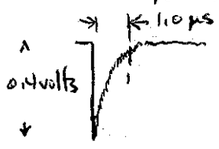
HV = 1700 Same shape pulses - Amplitude reduced to 0.04 v.

Varying intensity trace present.

When Dim - count rate low

Bright - high.

Observed pulses with Neutron source & detector



8-30-60

Arrangement: R_2 = 75Ω, RG 62/U → Signal to HP460AR (gain max)

HP460BR (RG 174/U) (clamps) R_0 = 75Ω

Scopes & TMC

On TMC - got indications of count rate changes -

→ Try removal of mylar skip at detector - Still changes -

HV1700 - Bkg	212 DISC =	MIN	1	2 (b)
pre-set at 2⁶		642	2020	
(2⁶ · 10⁴ sweeps)		1111	1945	92 cts
		845	1567	
		610	1978	
		873	1812	
		650	2028	

8-31-60 Made up new HV cable - RG 59/U ≈ 8' BNC assembly & HN connector.

Lower HP amplifiers from top of Rack 7 to working surface.

Place Detector on working surface -

Seem to be no bkg bursts - {need to compare counts with 4 hours of 8-18/19-}

System trig 60.0 NICC pulser - Memory full B=2, D=2, L=40

HV = 1700	212 DISC	MIN (pre-set-at=2⁶)	1	2 (10⁴ sweeps)	3	
Bkg		580	1624			
		736	1906	3 counts	0 counts.	
		930	2093			
		733	1542			
		657	1596			
		633	1401			
		703	1644			
		642	1585			
		620	1852			
		760	1495			
M-230			665	2398	4156	
1½" lucite			606	2433	3444	
			668	2108	5876	
			652	1887	3137	
			778	2151	4299	
			623	2089	3625	m = 2/2
			624	2373	3840	
			742	1916	3562	
			621	1880	2932	
			428	2080	4016	

8-31-60 – Try different detectors –

NE400+6292-2. @ 1500 v just see neutrons on TMC with disc minimum.

Li I +6655-A @ 1200 just see neutrons on TMC.

Back to 6810A & NE400

BACKGROUND HV 1200
Series on TMC –

$c/s = \frac{1}{N} \cdot \frac{C}{2L} \cdot 10^6$

$N = 10^4, L = 40$ $2LN = 80 \times 10^4 = 8 \times 10^5$

$c/s = \frac{10^6}{.8 \times 10^6} \times C = 1.25C$

PA&B max disc
TMC: Disc – min
B=2, D=2, L=40
Mem = 1/4
Preset count 10^4

	C	c/s
	1646	2055
	605	756
	522	652
	443	554
	505	631
	551	689
	544	680
	513	641
	[illegible]	611
DISC = 1	184	230
	186	232
	190	237
	237	296
	211	264
	202	252
	186	232
	235	294
	185	231
	176	220
	229	286
	268	335
	165	206

c/s

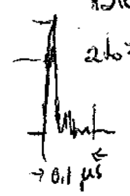
8-31-60 6810A + NE400 HV = 1700 PA&B – max disc.
TMC – B 2, D 2, L 40 mem 1/4.

M-230 1½" paraffin

Counts for 10^4 cycles.

DISC = 1		DISC = 2	
925	1156	368	460
980	1225		
967	1208	387	484
981	1226		
1016	1269	389	486
974	1217		
1006	1257	415	519
1009	1260		
1092	1364	389	486
1057	1320		
1020	1275	365	456
995	1244		
1024	1280		

Bkg. 2.63 volts ampl.



no counts in 1st channel at DISC = 2

Detector in 113 – HV cable RG59/U, Sig RG 62/U –

Bkg at ~~Disc 1~~. Peak height appears about same –

Preset 10^4 cycles

DISC →	1	c/s	2	c/s	3	c/s	4
	460	575					
	292	365					
2:00 pm →	273	341					
	221	276					
	205	256					
	217	271					
M-227 + 3" paraffin	2425	3030	1485	1855	1032	1290	
	2376	2967	1420	1775	979	1223	
	2445	3057	1436	1795			
	2483	3105	1458	1822	978	1222	
	2505	3130	1480	1850			
	2434	3042			1062	1328	
	2471	3090	1408	1760			
	2527	3158					
begin 3:20 am Bkg.	264	330	1	1.25	0	single	
	222	278	1				
	236	295					
	307	384					
	342						

8-31-60

3:50 HVPS on 113 · Disc = 1 · HV = 1700
(Still getting uneven rate at bkg.)

220	275	218	272
312	390		
244	305		
177	221		
187	234		
183	229		

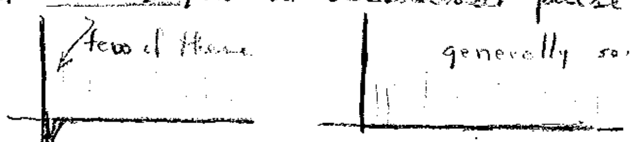
9-1-60 8[42] TMC power on (in 113)
8[44] AVDC on · 1700 v.

TMC Settings Unchanged -
B = 2 Mem 1/4
D = 2
L = 90

8[46] Start count - (at 60 sec had accumulated 3600 sweeps)

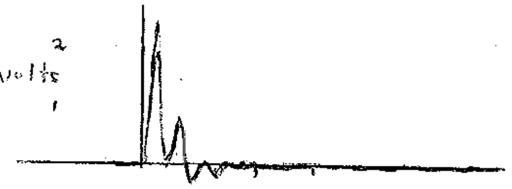
Pre-set sweeps 10[4] or pre-set time 2:66 · Disc 1 Counts in Ch 1: 374, 348, 316, 214, 159, 157, 147, 138, 161, 173, 130, 122, 136, 124
c/s : 467, 435, 395, 269, 199, 194, 184, 172, 201, 216, 162, 152, 158, 155

Observing trace at .1 millisec/cm see occasional pulse with neg. tail -



pulses are ~ .7 μs wide at base line - similar to normal counter pulses.

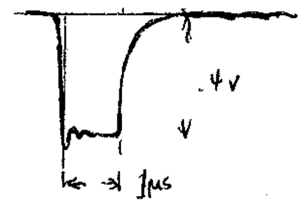
Bkg: Output of detector as measured 8-30 - .04 volts.
Output of HP460BR AR comb. :



9:31 Stop run to check HP amplifiers - Disconnect - NKC pulser
Synch trigger 543 + gate 1 ms ≈ 80 p/s rise check.
.5 80 p/s 50s,
seems to lose some count in later chan (in 1/2.)
Set 1/4 mem .5 139 p/s. -
(.8 too fast -)

HP Amp.

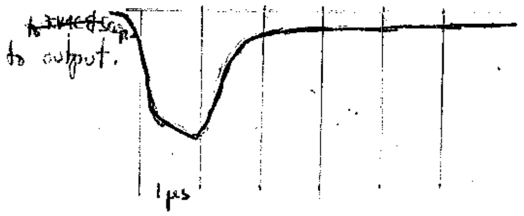
signal NKC 1 μs .4 v neg.



no running over base line after pulse

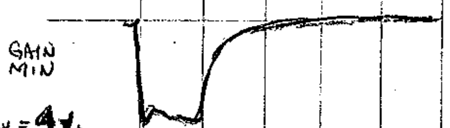
OUTPUT

HP460AR : A. RG62U directly to output.
Gain: Min. amp = 4 v.
Max amp = 10 v.

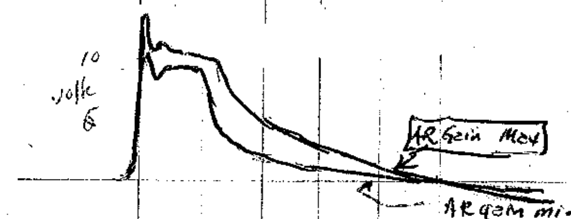


Max 75Ω on output · RG62U

R0 = 200 Ω at output C - 100' RG 114/U GAIN MIN
amp Gain Max = 4 v.

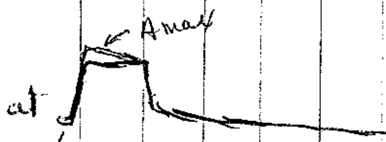


HP460A → BR AR Gain MIN 1 BR MIN.



Same with 2nd BR.

HP460A/B w 75Ω 4 RG62/U max at 5V.



9-1-60 - More Bkg - counts. { TMC 2, 2, 40, 1/4 NICC box pulser. AV 1700 in 113 - Same as earlier

Disc 1 Ch I counts : 102, 96, 85, 90, 92, 94 :

lunch -

Disc 1 More/above : 100, 68, 78, 60.

Check signals from detector on .275 R + RG 62/U line then through .b. 100 .a 1 RG 114/U line then hill. (100')

HP460 AR at min gain. amplitude ±4 volts
" " ±5 volts.

Very little difference -

M-227 of 3" pen. HP460AR MW, BR LW

Disc 1	Channel I Counts	858, 879, 941, 859, 848
		1073, 1099, 1176, 1074, 1060
Disc 2	"	511, 508, 514*, 566, 536
		639, 635, 642, 708, 670
Disc 3	"	236, 258, 235, 247, 215, 231
		295, 320, 294, 302, 269, 289
Disc 4		82, 89, 87, 95, 90, 86
		102, 111, 109, 94, 112, 107

*Sig trig Scope .5 of fine sweep set to 100 s/sec

Bkg Disc 1 - 0.01

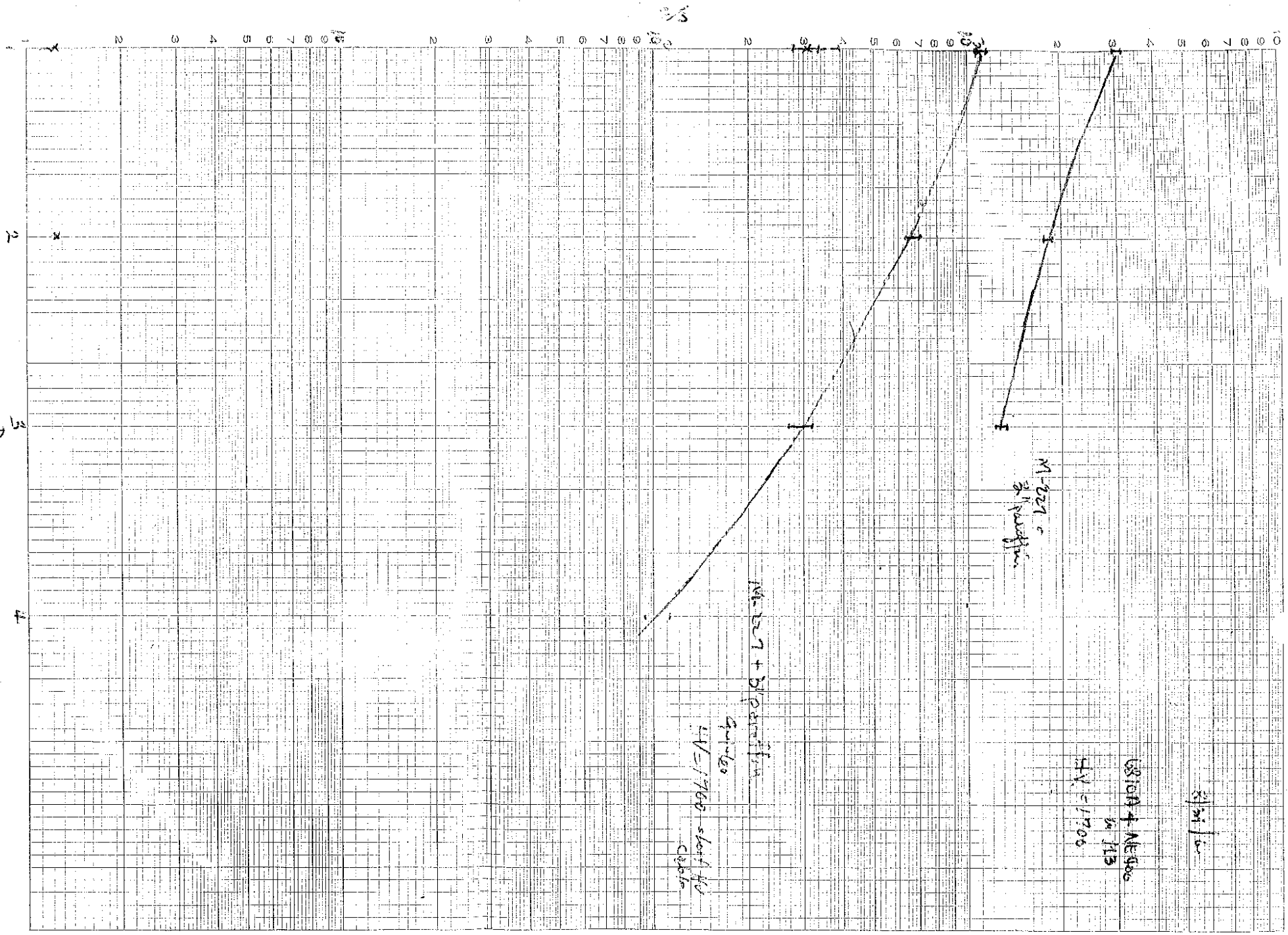
HVPS Back in 1/2 = HV @ 1700 - long cable TMC { B=2, D=2, Mem=1/4, L=40 Disc = 1 }

Background: Pre-set cycle 10^5 - Ch. 1 = 3. < 1 c/s

M227 Pre set cycles 10^5 Ch 1 = 8400 1050 c/s
8516 1066 c/s

NO. 340R-L410 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
4 CYCLES X 10 DIVISIONS PER INCH

EUGENE DIETZGEN CO.
MADE IN U. S. A.



9-2-60 Set M-229 wiplace on paraffin 113.
Prepared for run.

DESIRING TO RUN W/O SCOPE MONITORING SIGNAL, SET ABOUT TO DISCONNECT SCOPE. IT & HP LEAD JOINED IN "T" at SIG. INPUT of TMC UNIT. GOT BAD SHOCK WHEN SEPARATED TWO CABLES, AFTER REMOVING "T" (had HP lead in one hand, scope lead in other). Broke hold by pulling away from cables on the run - could not release hand hold.

CHECK OUT - FOUND 110V AC on GND of scope & TMC (scope connected to TMC by "SYS. TRIG" cable) DISCONNECT this cable. 110V on TMC - coming from Monroe - this was plugged in same receptacle as NJE power supply. - IN another receptacle NO HOT CHASSES. - LEADS TO NJE HVPS wrong - CORRECTED FAULT QUICKLY & -

10:01 Power On TMC units.
10:02 Check system trigger operation - ok.
(Scope used as trigger - "STABILITY" full c.w.)
range at .5 millisec/cm. ~180 c/s.

HV = 1700v.

TMC { B=2, D=2, L=40; M=1/4; Disc = 1 } Preset Cy 105, Ct 216

M227 - 564.0sec, Tm Σ = 45140 Avg 564.25.

(1)	19376	18719	18548	18312	17980	18233	18031	17957	18211
c/s	2422	2340	2318	2290	2248	2279	2254	2244	2278
Bkg.	627	672	781	552	549	517	570	507	509.
(2)	784	84	97.6	69	68.6	64.6	71.2	63.4	63.6

4-2-60 Disc = 1.5 Channel 1 = 20 2.5 c/s 10^5 cycles

Disc = 2 = 6 2 4
.75 .25 .50

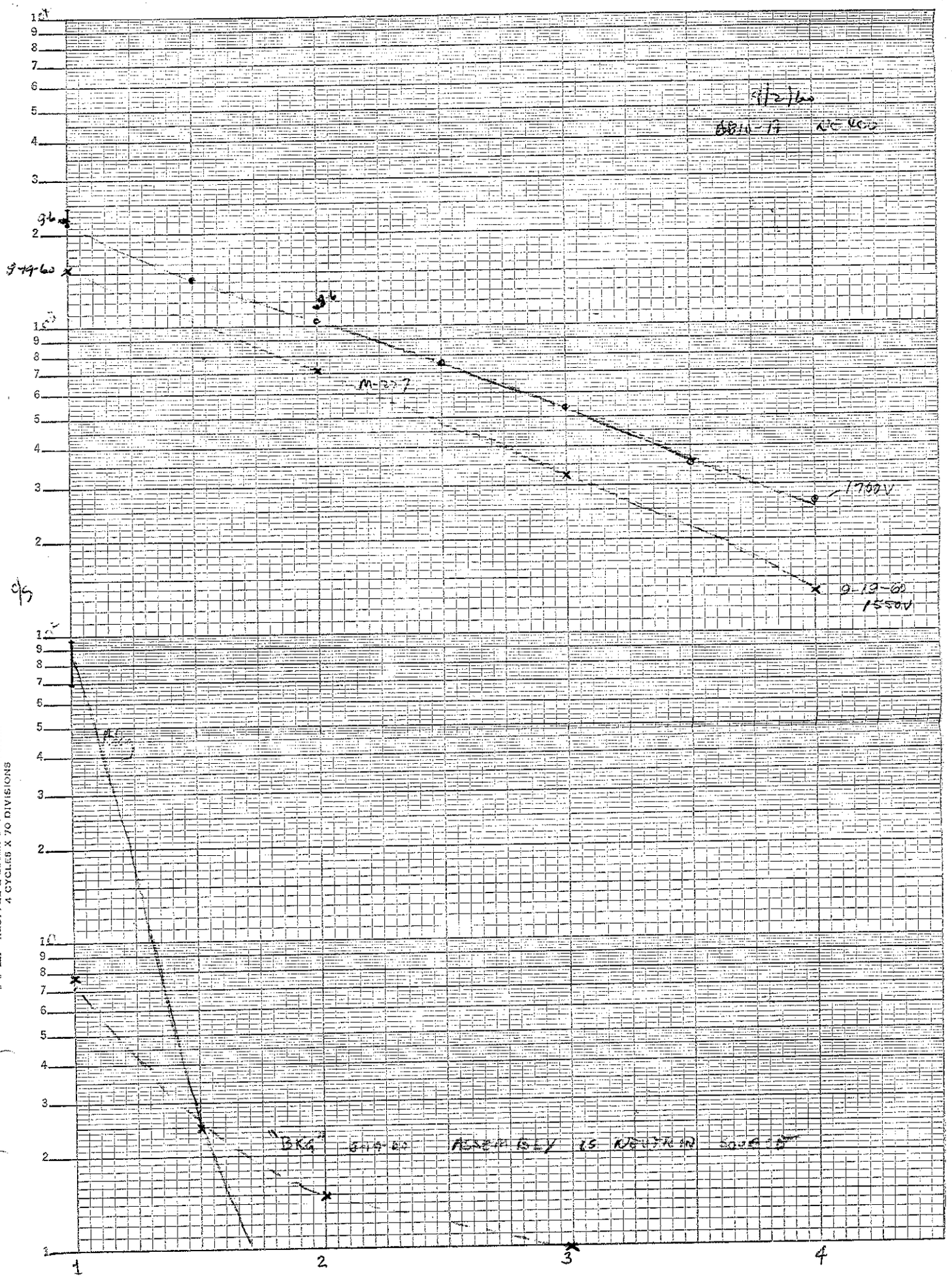
M-227 Disc 1 17,334 2167 c/s
1.5 11,383 1424
2 8,352 1041
2.5 6,069 758.0
3 4,262 533.0
3.5 2,827 353.4
4 2,145 268.1

Blg. 3:28 10^4 cycles - Disc 1 56.4 sec - 31
56.4 sec - 41
27

T Counter - 49, 39

Scope lead attached (LG 11/8) 0

Scope [illegible] alternate [illegible]


9-19-60
M-27
1700V
9-19-60
1550V
BKG
ASSEMBLY
KEUFFEL & ESSER CO.
4 CYCLES X 70 DIVISIONS
359-81G
MADE IN U.S.A.

9-6-60: TMC on 8:21 Dy, Scope ON (SYS TRIG), HVPS on @ 1700 v.
TMC: 2, 2, 40, 1/4 M. Print Cycle 10^5 -

Bkg - Disc 1. 8:33 339, 374

M-227 Disc 1. 9:01 2219, 2272, 2218, 2258, 2260, 2260
1755, 1810, 1744, 1852, 1881, 1879

Disc 2 10:56 1153, *1176, *1157, 1180, *1172, *1161, *1143 (10:58)
9223, *9412, *4261, 9443, *4377, *4285, *4385

*These points in error - Channels 2-64 indicate that Channel 1 should be 9___,

This point was observed during printout.
Data Output Unit scaler read 9385. Printer printed 4385.

Bkg Disc 2: 12:16 One Sample Channel 1=3 —

Signal: EP 4550A (see next page) Output: Neg - 30db, 10 - ½, 23 v.
Through 100' RG 114A/U to HP 460AR - gain min → HP 460BR Linear → 75Ω RG62/U to input TMC - signal cut off between 3 5/4 or determined ½3.7

Signal EP 4550A to TMC - after checking + adjusting E-P
Signal ½7.2 v = exceeds all discriminator settings -

Determine EP setting for Disc 1, 2, 3, 4
18db, 6 ; 13db, 6 ; 10db, 6 ; 8db, 6
(.7 v, 1.3 v, 1.8 v, 2.3 v)

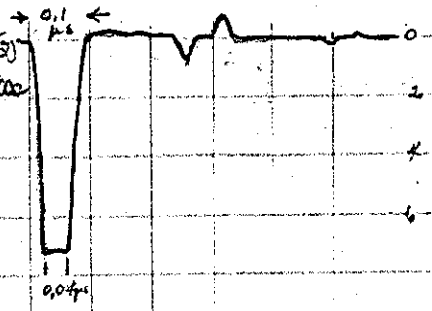
Signal thru HP's signal for threshold @ Disc 3 30db-4 = 18 v
-12db, 8 - Disc 1 1.6 volts [RG 114 A/U terminated in 200Ω at TMC]
3db 8 4 5 v.

284

~~TMC~~ E-P signal generator.

9-6-66 Took EP 4JJ3OA, 492 & 112 to check out with TMC & other counting instruments.

TD111 fixed at (.1+0)X.1 μs	TB411 P.S. μs	PW111 μs	OA601 Attn	OA601 Ampl	
neg -	(.9+.1)X1	(.5+0)X0.1	(a) 0	10	~7.2V. 100 @ 1114A/Ukrm@scope 200
			(b) 10b	10	~2.1V.
			(c) 20b	10	~0.72V
			(d) 30b	10	~0.23V.
			(e) 30b	0	~0.15V
positive			0	10	~7.2V..



9-6-60 TMC - with signal from E-P 450A-492 -

	Pulse Spacing	Pulse Width	TM2 B	D	L	M	Sweeps N	Coarse Pre-set
EP: TD111 fixed @ (1+0)x.1μs; OA601 30db, 10, neg.	(.9+.1) x1 μs	(5+0) x.1μs	2	2	40	1/4	804	65536
							804	

volts

$f_{mc} = \frac{1}{N}\frac{C}{2L} = \frac{1}{N}\frac{655.36 \times 10^2}{80} = \frac{819.2}{N} =$ 1.019 Mc

(.5+0)x1 μs	(.5+0)x.1 μs	2	2	40	1/4	409	2.012	
(.2+0)x1 μs	(.5x0)x.1μs	2	2	40	1/4	164	4.995	
(.1+.05)x1	(.5+0)x.1 μ	2	2	40	1/4	112	9.31 Mc	
(.1+.04)x1	(.5+0)x.1μs	2	2	40	1/4	102	8.03	
(.1+.03)x1	(.5+0)x.1μs	2	2	10	1/4	398		

9-16-60 Setup in 108

DWM Reports varying counting rate.

Evidence: different readings for given N-source
varying intensity of signal trace on scope

Made up new detector NE 4403 + 6810A 3-60-199
(Detector was NE 4403 + 6810A 3-60-226)

10:10 Am Del to DWM

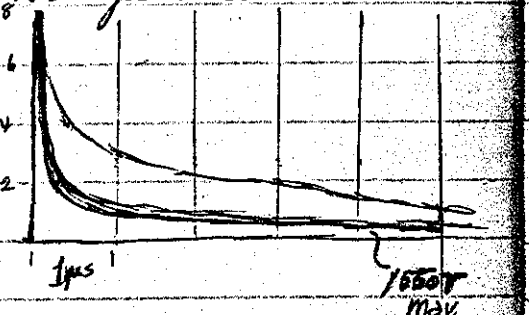
9-19-60 8:08 A Scope, HVPS, HP's on -

scope settings for sweep — Trig Slope + Line +
Mode - AC slow
Stability ⊙
Trig level slightly +
Time/Cm 0.1 sec.

10:05 Detector in place in 108 — N-source at paraffin face
near face of detector tube

To compare pulses for varying HV - Gain combinations.

HV	A-Gain	B Setting	
1750	MIN —	LIN	
	MAX —		
1650	MAX	LIN	peak still 4.7v
	MIN		peak slightly under 6v
1550	MAX —	LIN	peak 6-7v.



4-14-60

1038 - HV = 1550, HP max, LIN

Source at base of PMT DETECTOR IN paraffin on assembly.

TMC DISC

B=256, D=2, L=2560, M=1/4, Survey rate = 1 sec

Note counts in channel 1 (Bkg) for 10 surveys

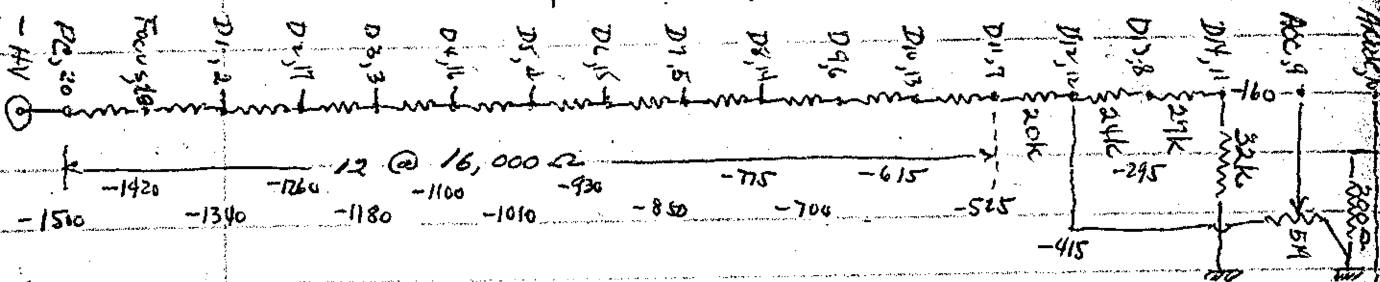
DISC		"BKG"		SOURCE			
		51	55	10150	9983		
1	7.74 c/s	51	52	10237	10283		1547 c/s
		47	48	10058	10012		
		61	41	10199	10218		
				10674	10644		
					10132		
		6		4701	4617		
2	1.46 c/s	9	9	4731	4656	4701.3	717 c/s
		10	9	4825	4680		
		10		4699			
		13					
		10		2098	2055		
3	.99 c/s	6		2064	2106	2111	322
		7		2171			
		5	6.5	2135			
		6		2148			
		5					
				860	891		
4		4	4	871		884.9	135
		1	2	981			
	.35 c/s	2		879			
		2	2	923			
		1		889			

plotted, see graph p 282-283

6-19-60
11:30 A

HV 1550
HP A MAX
HP B LIN
DISC TMC 2

9-26-60 Wired divider for 6810A with variable accelerating grid adjustment, & higher current string.



Total R in string is 295 kΩ @1500V we get 5.1 ma
2000V " 6.78 ma.

Measured current in tube

V =	1500 (3:42)	1750	2000 3:44
I ma =	5.2 3:48	6.0	6.7 3:48
	4.8		6.4

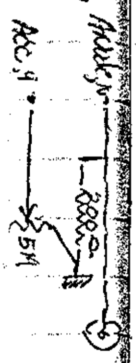
Measured voltages at pins with "1500v" on EICO VTVM (NJE 1350)

9-27-60 6810A - NE400:
HV on 8:13 - NJE-74767 -
1700v, 5.75 ma

Went to 112 for check with HP amplifiers of 543 scope.

a. Compare low current divider with high current divider.
b. Check max. gain setting of accelerating electrode.
c. Check effect of addition of capacitors.
d. Check pulse pattern of several scintillators,

4-27-61 (For pulses refer to Scintillation Detector File)
OUTPUT FROM DETECTOR TO SCOPE
2- 6810A (360-226)+NE400 HV-1500v ; I_D = 0.8ma Bkg pulse ≈6mv ; N pulse .10 v.



Low Current 1700 v ; .09 ma .03 v ; 0.4 v.
Divider 1900 v ; 1.0 ma .15 v ; 2.0 v.
and R=100k (40 ms)
acc. anode Noted that N pulse never overshot reference line.
tap to Dy 14. - N pulse returns to reference in ≈ 10 μs.

@ 1700 v & IP460AR :, N-pulse amplitude ≈ 4 volts. (Gain 10)
Pulse tail different. Overshoots in 7 μs, reaches peak overshoot in 15 μs, & settles down at 40 μs.
@ 1700 v & IP460BR :, slight overshoot evident.
N pulse amplitude ≈ 2.0 volts (Gain 5)
@ 1500 v & both IPunits: N-pulse amplitude = 8 volts. (64)
Returns to 25% of peak in .15 μs.
Tail decays to reference at 10 μs.
Neg hump at 20 μs.
Back to reference at ≈ 30 μs.
Put same detector on divider for high current.
Tube 3-60-179 +NE 400 (HV = 1500 v. Detector to scope. -
I_D = 4.55 ma. Pulse shape same, amplitude about same.
Sig. Trig. 0.1 sec - limit Adjusted accelerating grid for max gain of bkg peak.
N-pulse ≈ .06 volts Gain just about the same -

HV = 1500 v	Ch 1	c/s	(Accl grid 6810A at gnd.)		(acc pos A)	Dy 12
TMC B=252 n=10	39644	6,049	26,823		19,843	7329
D=2	39648	6,050	27,426	27,222	19905	7286
L=256 c DKC=1	39651	6,050	27,417		19876 19,841	7298 7280
			381,666		479584 19,915	4895

Reset Acc. anode at max mark.

	Bkg -
37412	20
37640 37755	19
37754	16
112921	55 18

2-14-61 Use SA-2 as scintillation detector chamber.

[NJE HVPS ; Signal to Pre-amp input (gain in SA-2 discrim

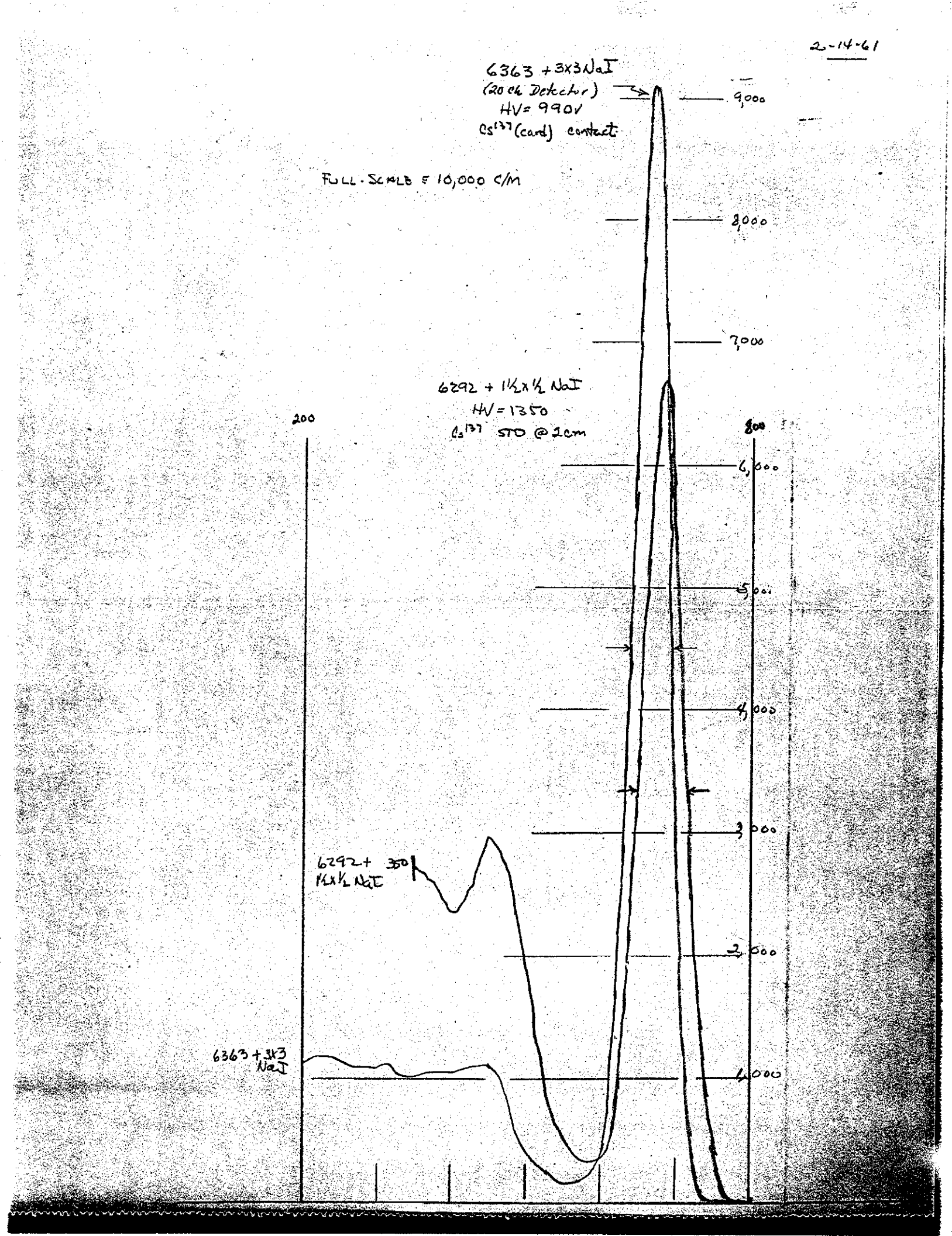
A- with JTE rate meter & recorder run scan of Cs^{137} on

6363 in 2-channel geometry

6363+3x3

SCAN	Source	HV	GAIN	DE	RATE METER DAMPING	RATE METER CPM	PEAK	RESOLUTION
UP	Cs^{137} @ 9.3cm	910	32	100	FAST	30,000	64% @ (NOT NOTED)	NOT RECORDED
500→125					MED	30,000	62% @ 397	38/347 9.57
500→25					SLOW	30,000	58% @ 392	39/392 9.95
25→475					"	"	58% @ 402	40/402 9.95
475→325					"	"	38% @ 392	39/392 9.95
300→450					MED	"	64% @ 393	39/393 9.41
450→300					"	"	64% @ 395	37/395 9.32
800→20	Cs^{137} @ 9.3	990	32	100	MED	30,000	38% @ 660	41/660 9.24
800→200	Cs^{137} @ 0.0 cs (small)	990	32	150	MED	10,000	90% @ 667	54/667 8.10
45	6292 + NaI							
400→800	Cs^{137} @ 0.0 cs (small)	1350	320	150	MED	1,000	>100% @ 685	— —
800→350	"	"	"	"	"	3,000	34% 670	70/670 10.45
800→350	Cs^{137} STD @ 2cm	"	"	"	"	10,000	67% 684	69/684 10.08
400→0	"	1175	"	"	"	30,600	42% 240	37/34 10.9
600→50	Probe	"	8	50	"	10,000	—	—

2-14-61


6363 + 3x3 NaI
(20 ch Detector)
HV = 990V
Cs137 (card) contact
FULL-SCALE = 10,000 c/m
9,000
8,000
7,000
6292 + 1½x½ NaI
HV = 1350
Cs137 5TO @ 1cm
200
800
6,000
5,000
4,000
3,000
6292 + 350
1½x½ NaI
2,000
6363 + 3x3
NaI
1,000

Pu-Be Source

Gain 8

6292 + NaI

HV = 1175

(Cs = 3x0, gain 32)