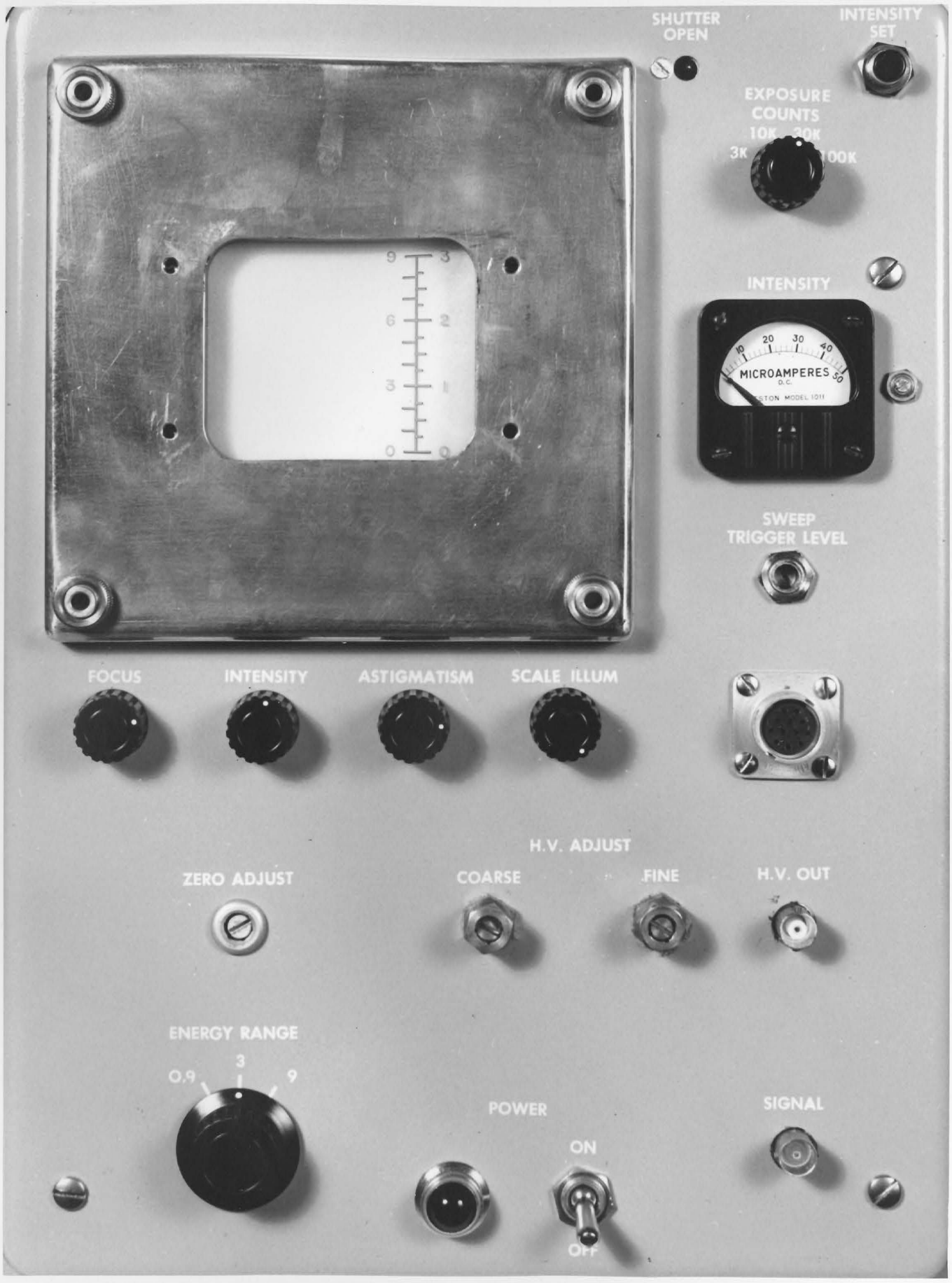
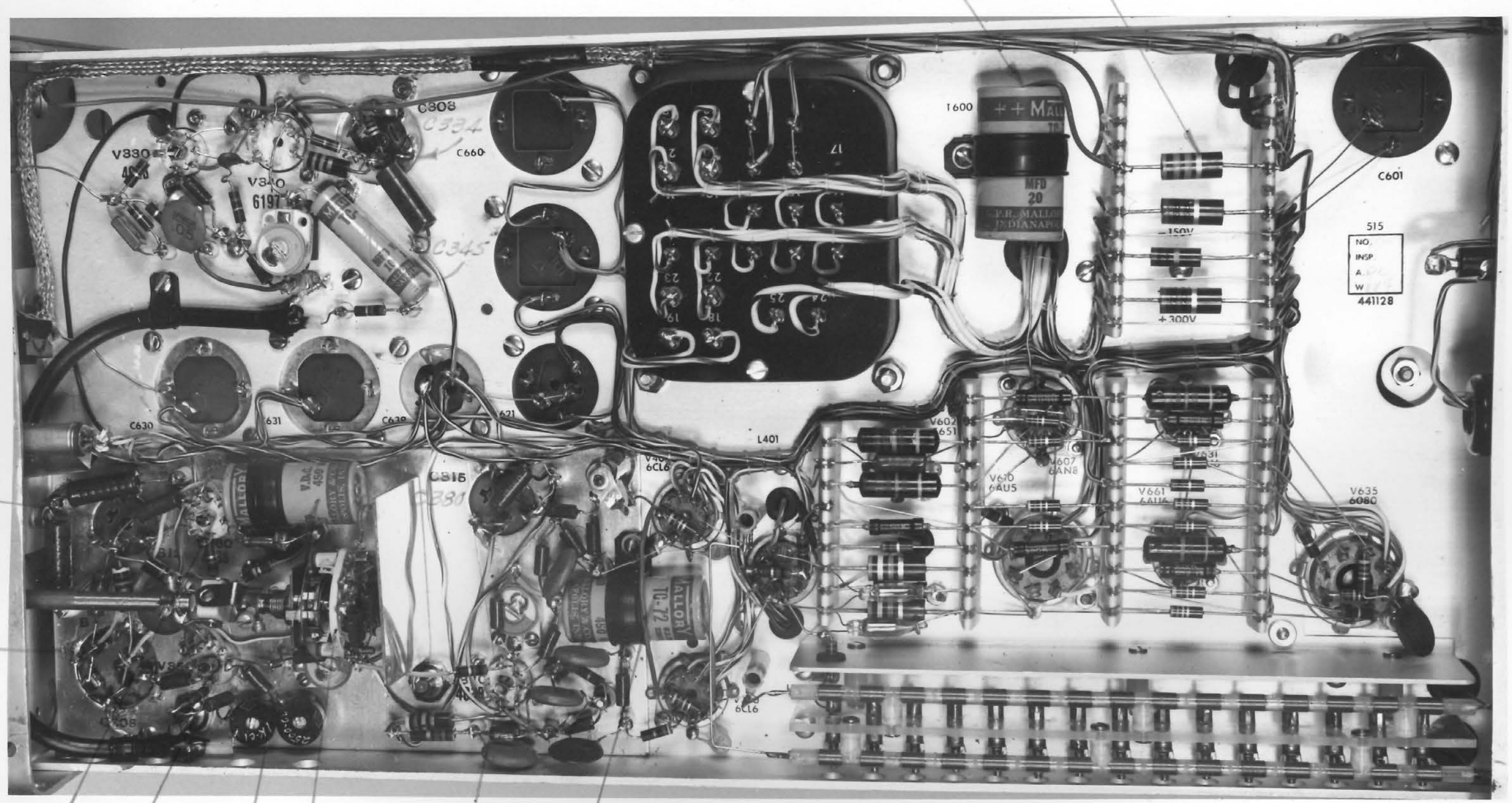
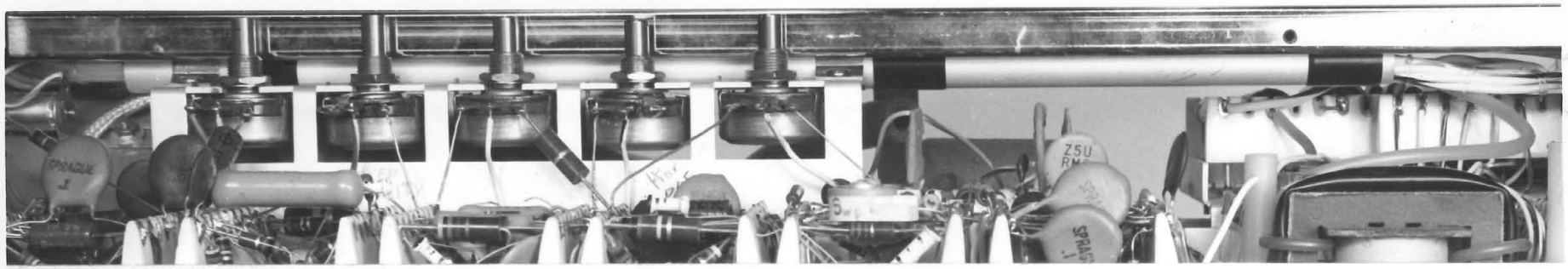
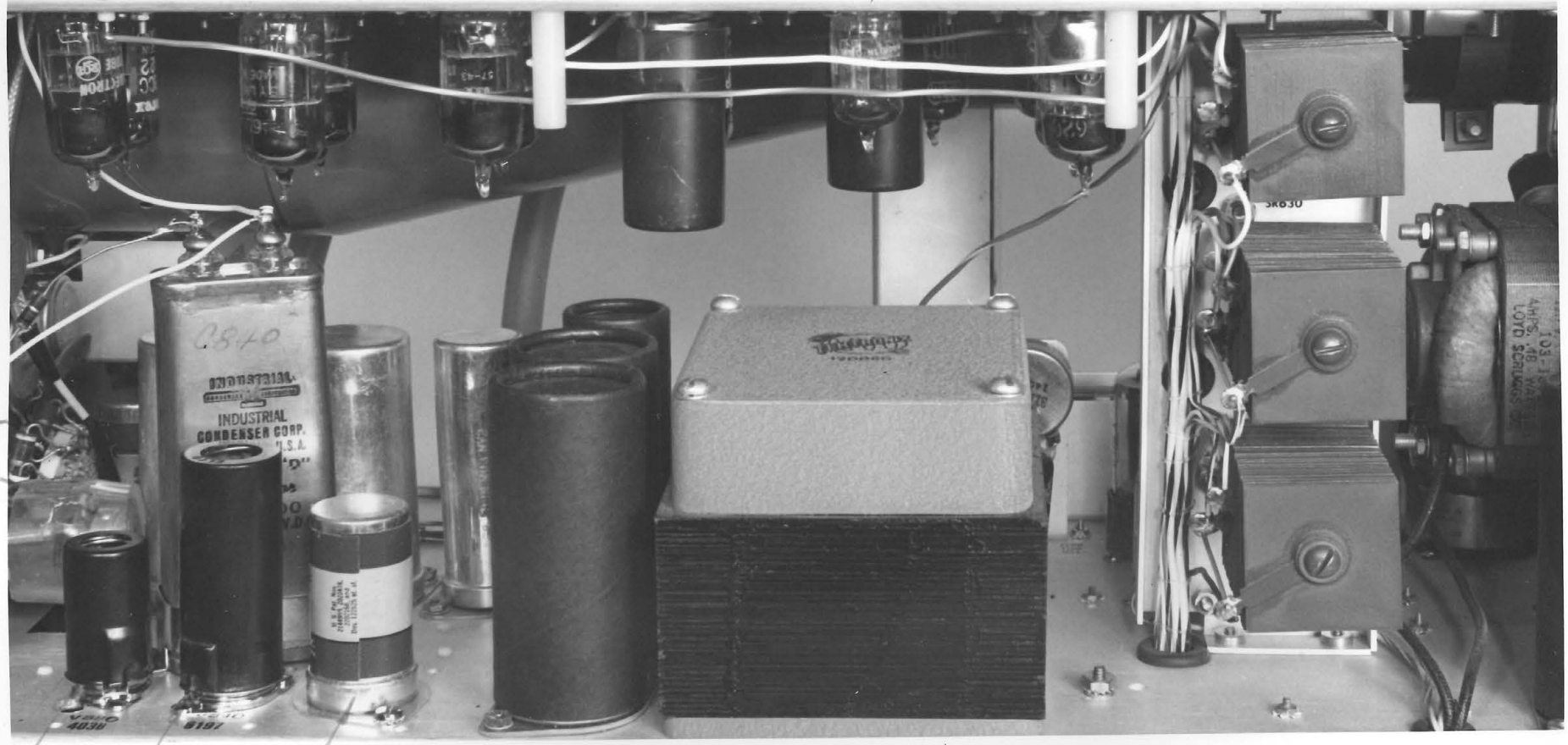

SHUTTER OPEN
INTENSITY SET
EXPOSURE COUNTS
10K
30K
3K
100K
INTENSITY
MICROAMPERES
D.C.
SWEEP TRIGGER LEVEL
FOCUS
INTENSITY
ASTIGMATISM
SCALE ILLUM
H.V. ADJUST
ZERO ADJUST
COARSE
FINE
H.V. OUT
ENERGY RANGE
0.9
3
9
POWER
ON
OFF
SIGNAL


C780
R780
V330
V340
6197
C808
C334
C660
C345
T600
MFD
20
C601
515
NO.
INSP
441128
+300V
C630
631
C638
621
L401
V602
6S1
V607
6AN8
V670
6AU5
V661
6AU6
V635
6080
6CL6
C815
C381
C352
C358
V360
C362
V370
V350
SW300
C395



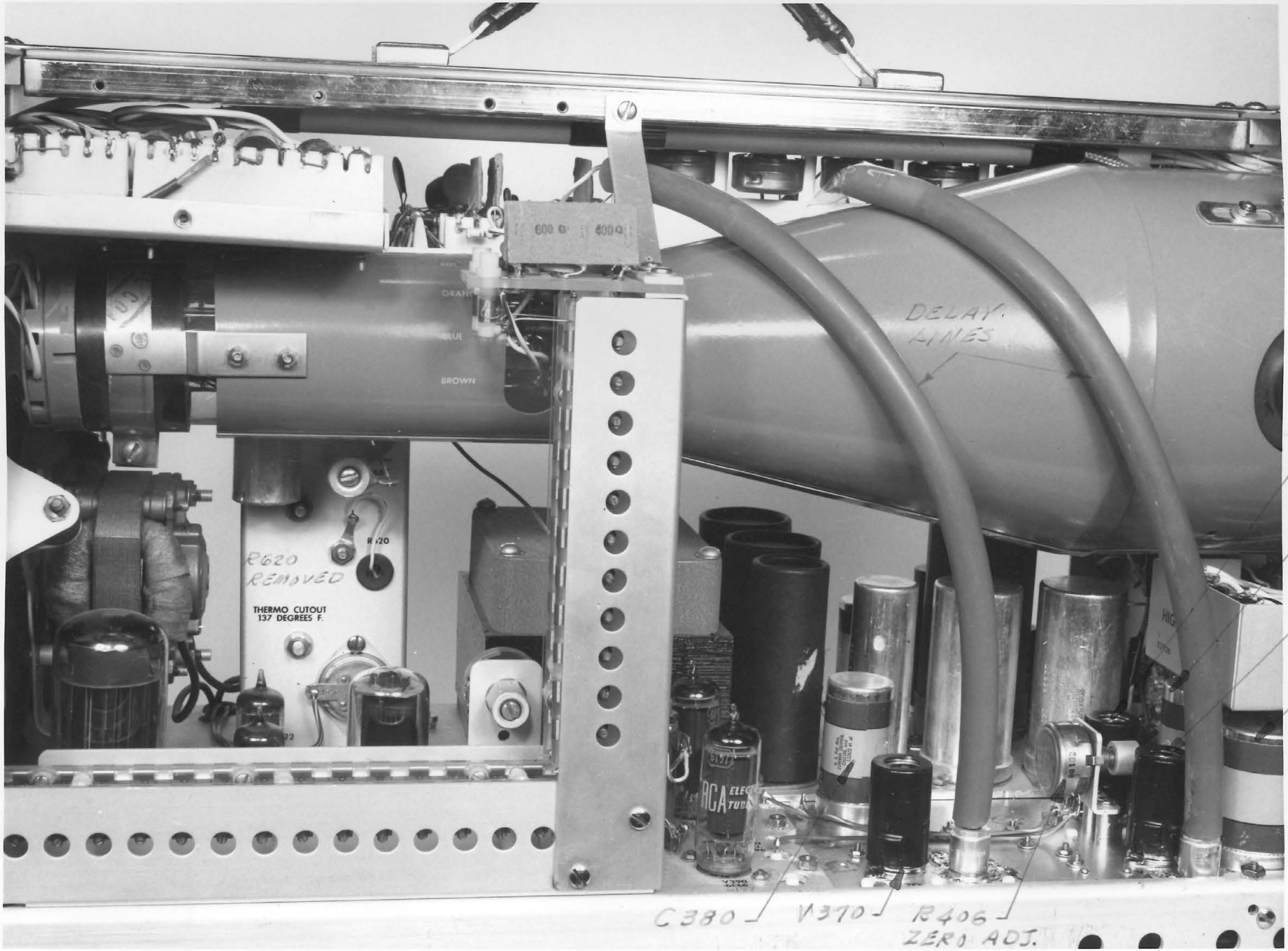
INT. TRIG.
LEVEL ADJ.

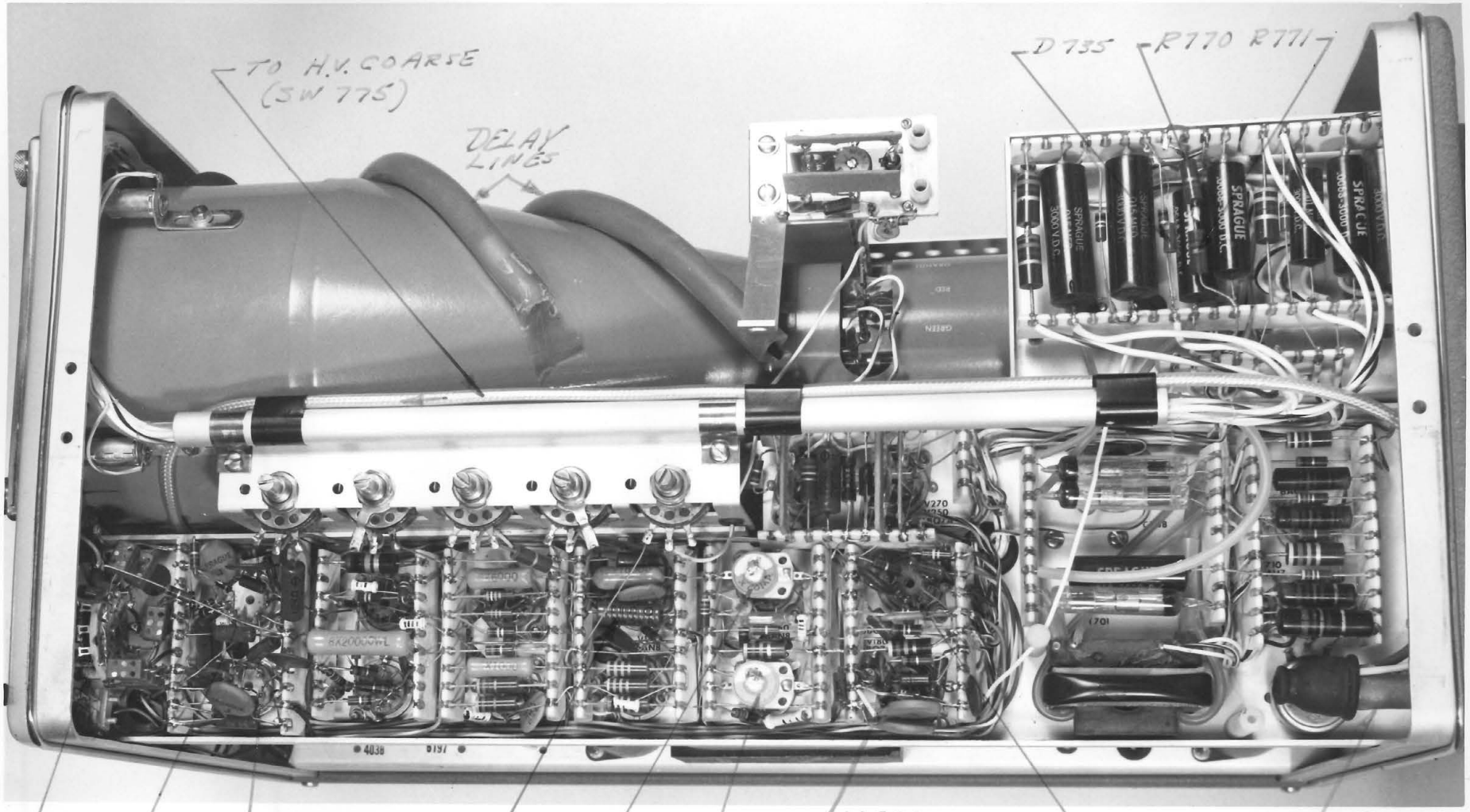


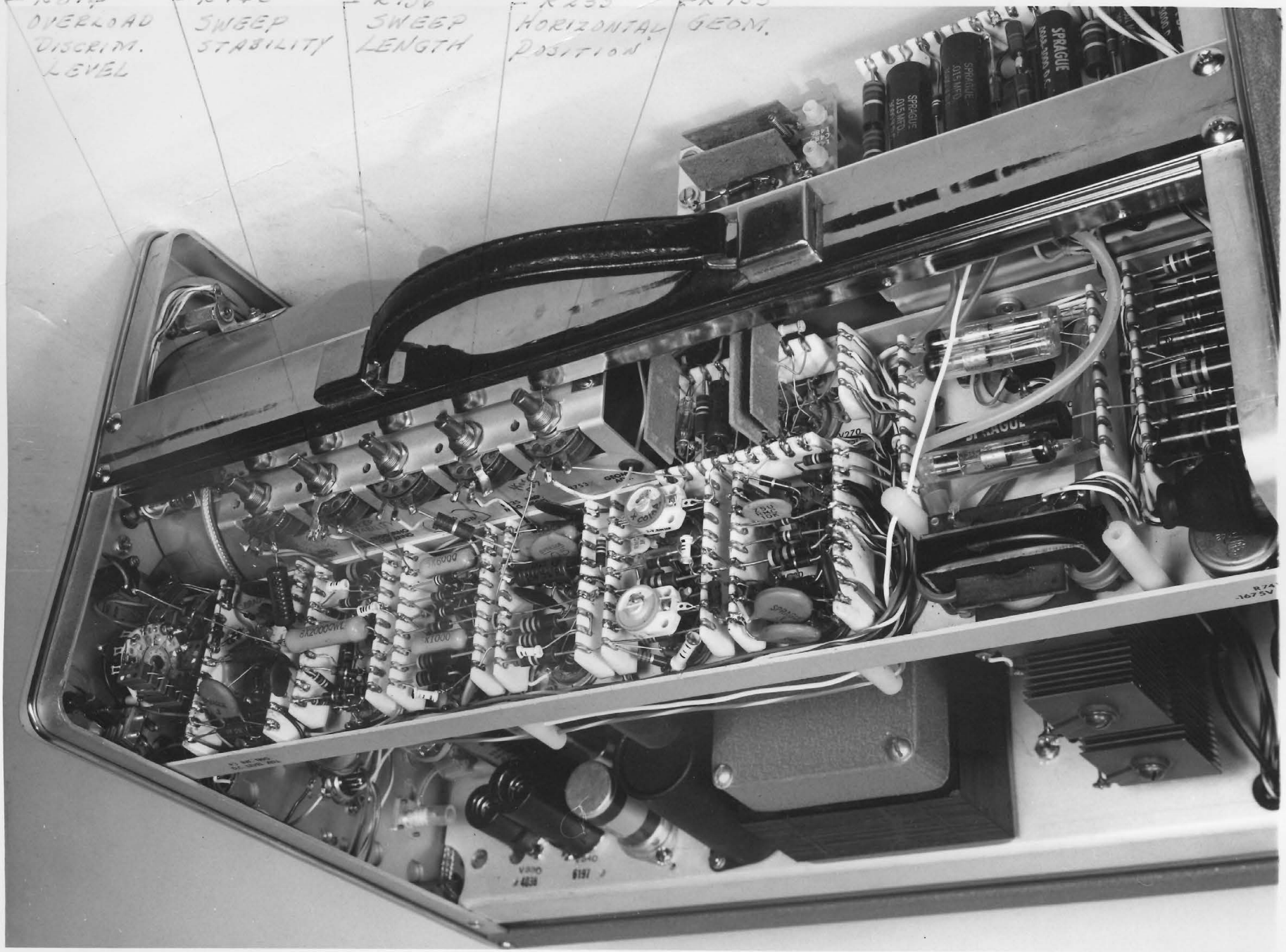
SW775

R775

V330 V340 C334


DELAY LINES
R620 REMOVED
THERMO CUTOUT 137 DEGREES F.
BROWN
V360
C352
V350
C358
C380
V370
R406 ZERO ADJ.


TO H.V. COARSE (SW 775)
DELAY LINES
D 735
R 770
R 771
SW800
V840
V850
V830
C220
C160
V820
V780
C 770


R814
OVERLOAD
DISCRIM.
LEVEL
R145
SWEEP
STABILITY
R156
SWEEP
LENGTH
R235
HORIZONTAL
POSITION
R753
GEOM.
SPRAGUE
.015 MFD.

DESCRIPTION OF THE RM5

The RM5 equipment is a gamma ray spectrometer. It yields a display that can show the distribution of energies of gamma rays emitted by a radioactive substance. It consists of 3 units:

1. A detector unit consisting of a 3" x 3" sodium iodide scintillation detector coupled to a 3" photomultiplier tube.

2. A modified Tektronix 515 oscilloscope.

3. A Dumont-Polaroid Land camera, type 339, with a special shutter release solenoid.

When a photon (or gamma ray) strikes the NaI scintillation crystal, it loses all, or a part of, its energy to the crystal. The crystal emits a light flash the intensity of which is proportional to the energy lost by the photon in the crystal. This light flash is converted into an electrical signal by the photomultiplier tube. This electrical signal is sent to the main unit, a cathode ray oscilloscope, where it is amplified and shaped and produces a vertical deflection of the cathode ray tube beam. It also turns on the beam, and initiates a horizontal sweep of the beam. The net result is the appearance of a horizontal trace of light on the cathode ray tube face which is displaced upward from the bottom of the scale. The amount of vertical deflection is proportional to the energy lost by the photon in the detector crystal. Therefore the vertical scale on the oscilloscope is a gamma ray energy scale.

A camera is provided to obtain a photographic accumulation of pulses over long times.

Description of the Modification of the Tektronix 515 Oscilloscope

The following changes were made:

1. The VERTICAL AMPLIFIER (except for output tubes and delay line) was removed and replaced by a "LINEAR AMPLIFIER" designed for scintillation spectrometry.

2. The TIME BASE TRIGGER (SWEEP TRIGGER) was wired in a single condition, "AC mode, + trigger," and the excess components removed.

3. The TIME BASE GENERATOR (SWEEP GENERATOR) was wired in a single condition and excess components removed. The GATE OUT and SAWTOOTH OUT cathode followers were removed.

4. The SWEEP TIMING SWITCH was removed and replaced by a single capacitor and resistor.

5. The HORIZONTAL AMPLIFIER (SWEEP AMPLIFIER) was modified by removing the input cathode follower and all magnifier circuitry.

6. The CALIBRATOR was removed entirely.

7. The POWER SUPPLY was modified only slightly as a result of the other changes. (Remove R620, R650, C650. Drop across R660, 2.05V. Drop across R630, 0.42V. Drop across R601, 0.90V.)

8. The CRT circuit was modified to provide high voltage for the photomultiplier and to provide information for an INTENSITY INDICATOR.

9. An EXPOSURE COUNTER was added to provide a means of accumulating a certain number of pulses on the photographic record.

These modifications are now described in detail. See also attached photographs, circuit diagrams, and parts lists.

The LINEAR AMPLIFIER is so-called because of its property of providing a voltage output proportional to charge input with extremely good linearity. In addition it is designed to perform a pulse shaping function and to recover quickly and gracefully from extreme overloads. It is highly fed back to provide good gain stability and tube life. The output pulse is symmetrical about the base line which helps to prevent base line shift with duty cycle variations and with large overloads.

The first group of the amplifier consists of V330 and V340. It has a gain of 1 or 3 and integrates the charge from the photomultiplier. Its output is a

quick rise (T = 0.25 μsec due to the NaI crystal) and a slow fall (T = 330 μsec, set by R335 and C335). Due to the large feedback factor in this group, very large input pulses (over 80 volts with A = 1) are necessary to overload in a manner deleterious to the pulse shape and recovery.

The shorted delay line at the input to the second group performs the first differentiation and shapes the pulse to 2 μsec from start of rise to start of fall. R352 and R353 make up the termination impedance of the line, and R354 and R355 provide compensation for line losses. The gain of the group is about 20 so that the overall gain from C345 to C362 is 10 since there is a gain of 1/2 at the delay line.

The first gain group also drives the attenuator, (ENERGY RANGE, SW 300). This attenuator forms the termination of the second delay line differentiator. It is the action of the second line that provides the lower half of the symmetrical output pulse. The attenuator is a constant impedance seen from either side and has 3 positions which correspond to gamma ray energies of 0.9, 3, and 9 Mev at full (5 cm) deflection on the CRT.

The output group is made up by including V390 and V400, the existing output tubes, into a feedback group with V370. Feedback is connected from the plate of V390 to cathode of V370 and V400 is a simple paraphase tube driven by cathode coupling from V390. Vertical positioning, (ZERO ADJUST, R406) is accomplished by varying the grid potential of V400.

The original delay line network and trigger cathode followers are retained essentially unaltered.

The TIME BASE TRIGGER was wired in the AC mode, + trigger position and the TRIGGER SELECTOR switch removed. The TRIGGERING LEVEL control was removed; over very small limits, the TRIGGER LEVEL CENTERING can serve the same function. This control has been mounted on the front panel and re-named SWEEP TRIGGER LEVEL. The

unused grid of V10 (triode grid, pin 9) is used as an injection point for pulses from the base line generator (in the EXPOSURE COUNTER).

The TIME BASE GENERATOR was also wired in a fixed position. The sweep speed is set fairly fast (C160 and R150) to get a reasonable lockout time, 8 μsec, set by the holdoff circuit. With the attenuation in the HORIZONTAL AMPLIFIER the result and sweep speed gives about 4 cm deflection per 2 μsec.

The gate and sawtooth cathode followers were removed as unneeded. A signal was obtained from the plate of V120A, unblanking pulse driver, to use as a correction signal in removing the spike from the CRT current waveform. (As described in the paragraphs on the EXPOSURE COUNTER, the CRT unblanking current is used to drive the INTENSITY INDICATOR.)

The HORIZONTAL AMPLIFIER was simplified by removing circuitry unneeded for the purpose. The magnifier was removed and the SWEEP MAG. REGIS. pot., R235, was wired to serve as HORIZONTAL POSITION. V210 was removed, and coupling made from V160A to V250A via the attenuator.

The EXPOSURE COUNTER is used to determine the number of pulses photographed at the face of the CRT, and operates in conjunction with the camera.

When the instrument is operating, the display is continuous (whether the camera is used or not) and can be viewed by opening the camera housing or by removing the camera as desired.

When the camera is used for recording a display, the shutter is set on BULB. The shutter is opened manually by pushing the handle on the side of the release mechanism. This starts the exposure counter and lights the SHUTTER OPEN light on the front panel. When the desired number of pulses are obtained, the shutter closes.

The exposure counter's operation is as follows:

Unblanking pulses from the cathode of V120A are fed to V830B, a cathode follower which drives a pump circuit (D845, D846) and an integrator circuit, V840A. Each unblanking pulse, representing a sweep of the CRT, pumps the cathode of V840A (and the grid of V850A) a small amount negative.

When sufficient pulses have been counted to pump the cathode of V840A down to about -40 volts, the base line generator, V850, free-runs. "Baseline pulses" are fed to the grid of V10B in the TIME BASE TRIGGER where they initiate horizontal sweeps with no vertical deflection, thereby producing a "zero" on the energy scale. "Baseline pulses" are also totaled by V840B and V780B and at about 25 milliseconds after the onset of the baseline generator operation, V780B initiates the release of the shutter mechanism.

When the shutter is closed, a microswitch in the shutter release mechanism shorts the integrator capacitor, C840, and holds the cathode of V840A somewhat above ground. When the handle is depressed, the relay latches open, and opens the microswitch and allows V840A to integrate. (The other side of the microswitch is used to light the SHUTTER OPEN bulb.) When the relay is tripped by V780B at the end of the cycle, the microswitch closes and locks the integrator.

Pulses (vertical C.R.T. deflections) off the energy scale (and hence representing overloads) should not be included in the counting for proper exposure. Therefore an overload discriminator, V820, announces overloads as such and the discriminator output is used via V830A to pump positive (or oppositely to the main operation) by D840 and D841 on the integrator, and inhibiting the count for that sweep. The discriminator itself is a biased univibrator whose output pulse is set to match the shape of the unblanking pulse.

The EXPOSURE COUNTS switch (SW 800) provides for shutter operation at the end of 3,000, 10,000, 30,000, and 100,000 on-scale pulses.

The baseline generator can be made to free-run by pushing the INTENSITY SET button. This provides a source of pulses to set the intensity by use of the INTENSITY indicator. Set intensity meter to red mark, with p.b. pushed. It will also terminate an exposure if the shutter has been opened.

To the CRT circuit has been added provision for the photomultiplier high voltage by means of a coarse and fine series resistance control. The values have been adjusted to provide a supply of around 750 volts to 1200V with the phototube connected. With the phototube disconnected the H.V. out terminal presents -1675 at 44 megohms source impedance.

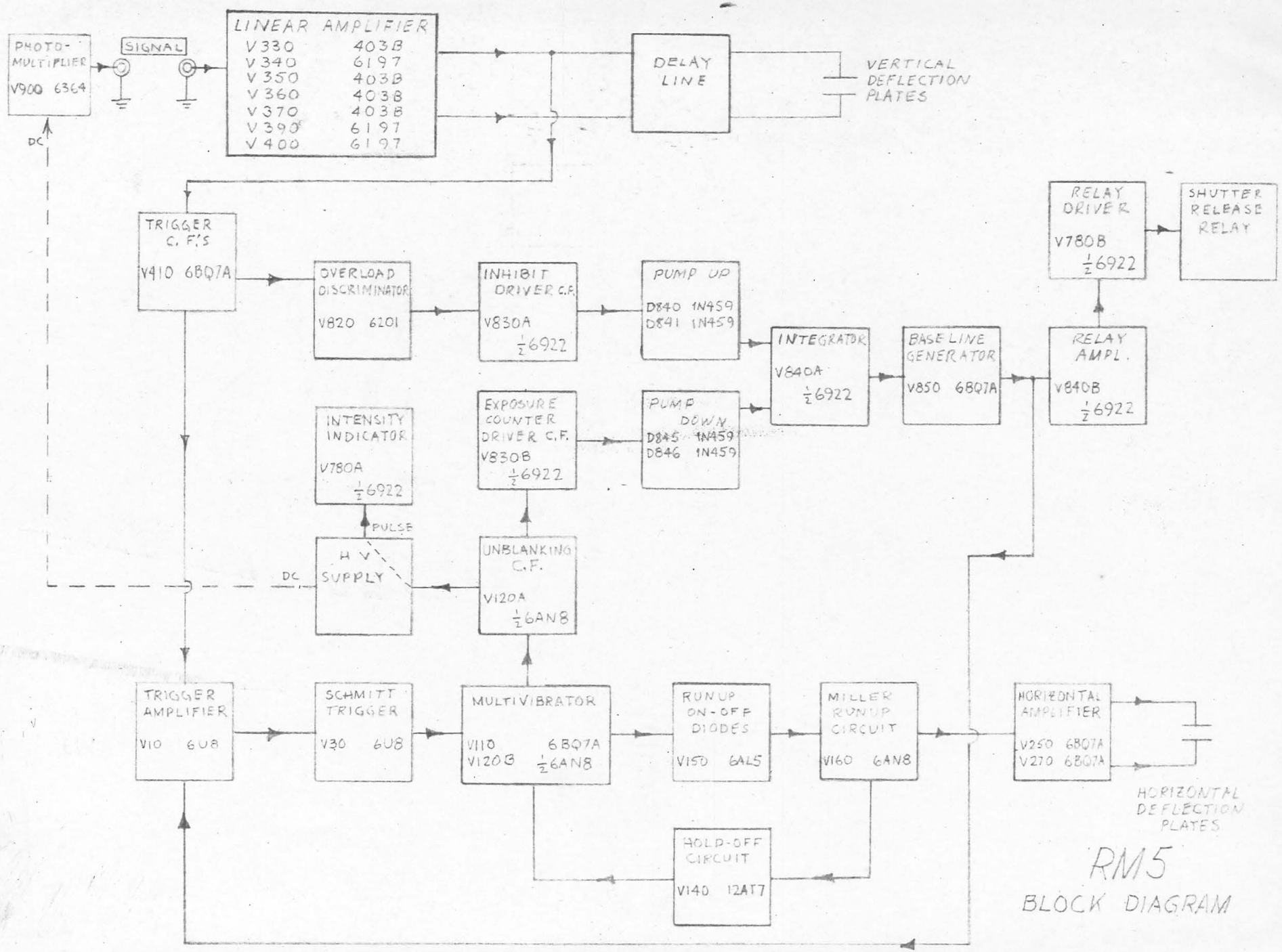
The current pulses of the CRT are read by a peak-reading voltmeter, V780A, and give a reading of CRT beam intensity on the INTENSITY meter.

The low voltage power supply has been only slightly altered, as noted before. The filament power for the exposure counter is obtained from the same winding as the sweep circuits (6.3V@ 5A). The filaments of V390, V400, and V410 have been strapped to + 100V in the linear amplifier.

A bezel mounts the camera, and a special graticule gives an energy scale on the face of the CRT.

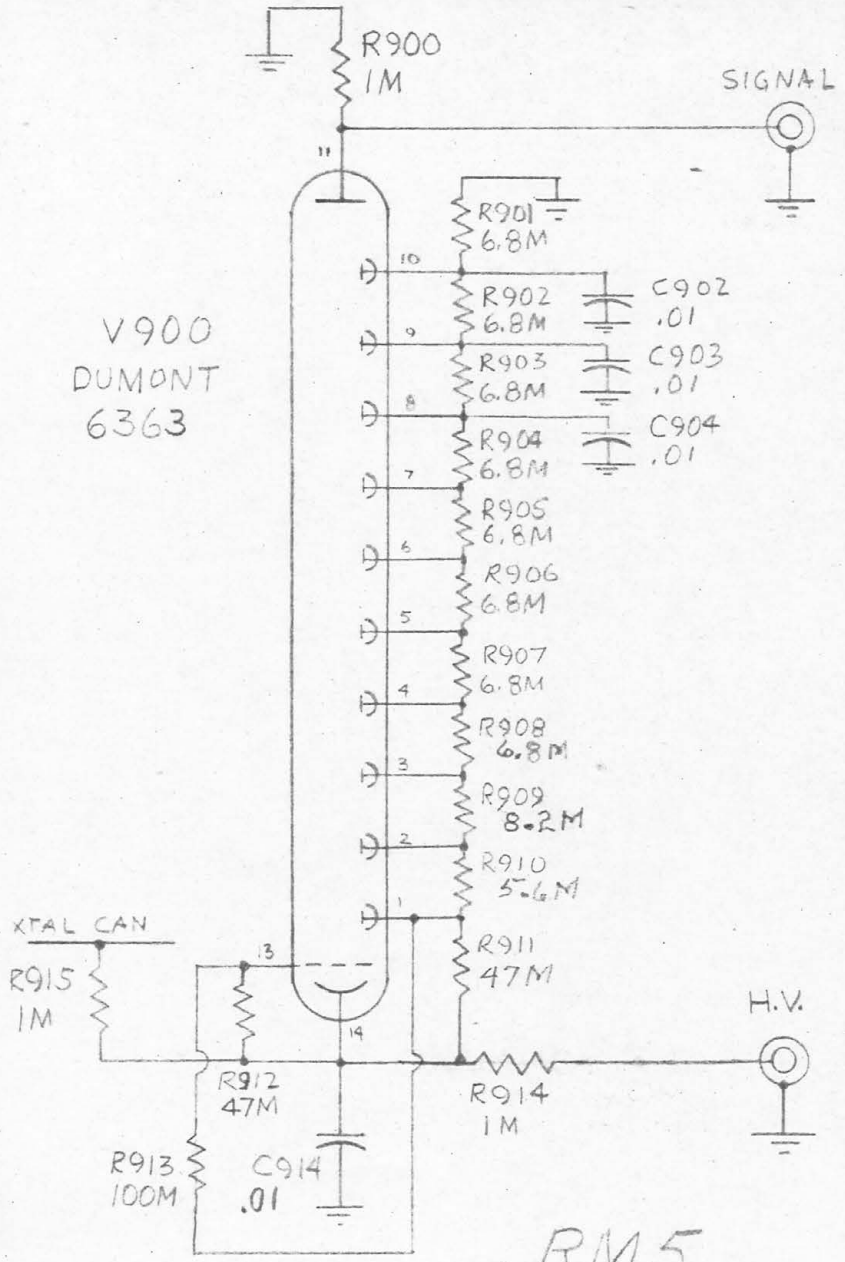
A new panel as seen on Photo 43411 is required.

In the parts list, only new or altered components are listed. Unless otherwise noted, composition resistors are Allen Bradley. The note "SM" denotes Arnhold Ceramic Stemag deposited carbon resistors, which could be supplied by ORNL.



RM5

BLOCK DIAGRAM



RM5

PHOTOMULTIPLIER BASE CIRCUIT

DETECTOR UNIT PARTS LIST

C902	.01	Cer.	Fixed	500v		
C903	.01	Cer.	Fixed	500v		
C904	.01	Cer.	Fixed	500v		
C914	.01	Cer.	Fixed	1.6KV		
R900	1M	½w	Fixed	Comp.	10%	
R901-R908 (8 ea)	6.8M	½w	Fixed	Comp	10%	
R909	8.2M	½w	Fixed	Comp.	10%	
R910	5.6M	½w	Fixed	Comp	10%	
R911	47M	½w	Fixed	Comp	10%	IRC
R912	47M	½w	Fixed	Comp	10%	IRC
R913	100M	½w	Fixed	Comp.	10%	IRC
R914	1M	½w	Fixed	Comp	10%	
R915	1M	½w	Fixed	Comp	10%	

TUBE SOCKET 14 pin CINCH 9403-14

V900 DUMONT 6363 Photomultiplier (3")

MAGNETIC SHIELD FOR V900 - Millen 80803-J

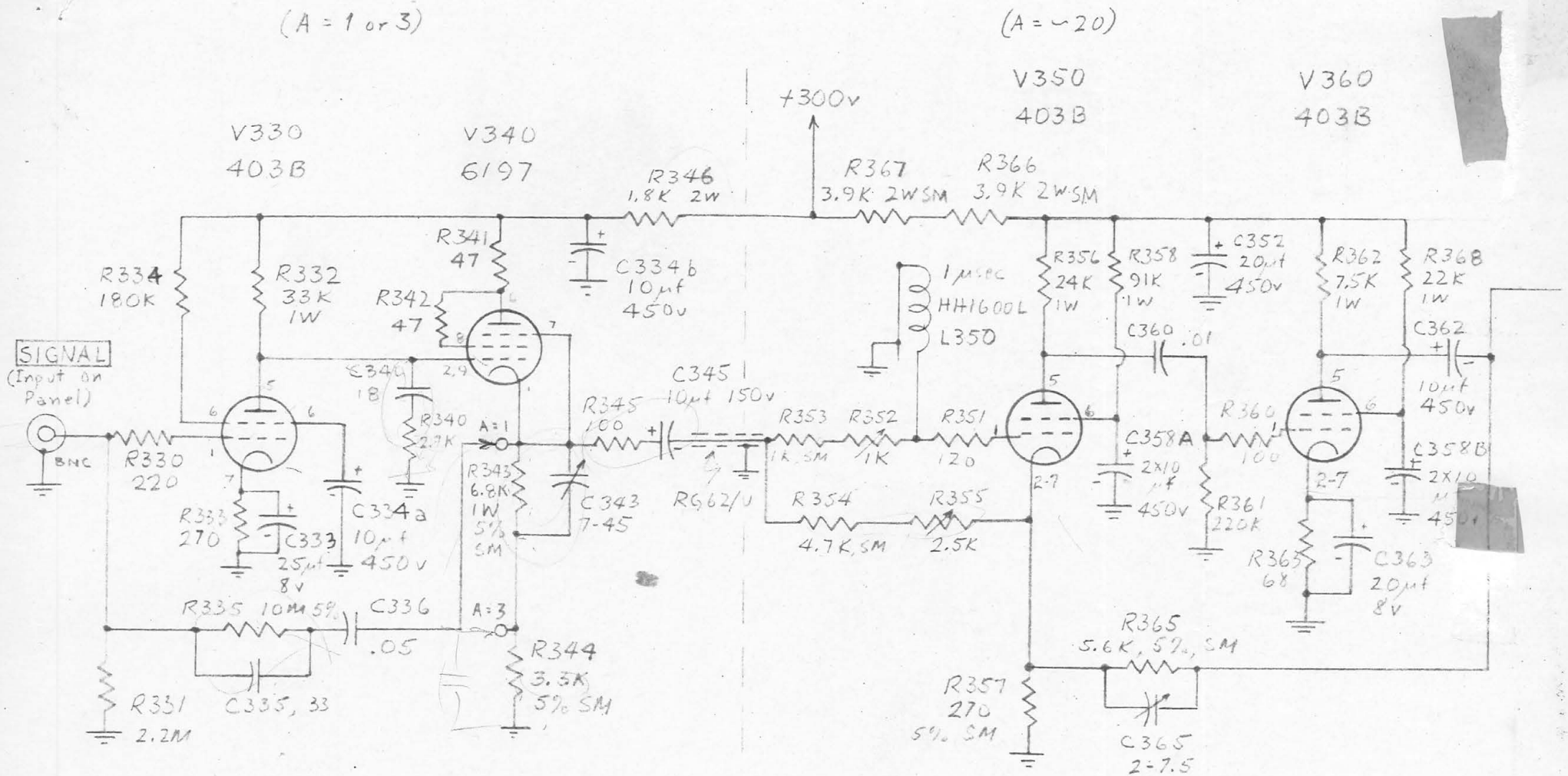
SCINTILLATION CRYSTAL NaI(Tl) 3" x 3"
Harshaw Chem Co.

SIG. CONN. BNC UG290/U (~~AMPH~~ 31-003)

HV CONN. UG931/U (I.P.C 27000)

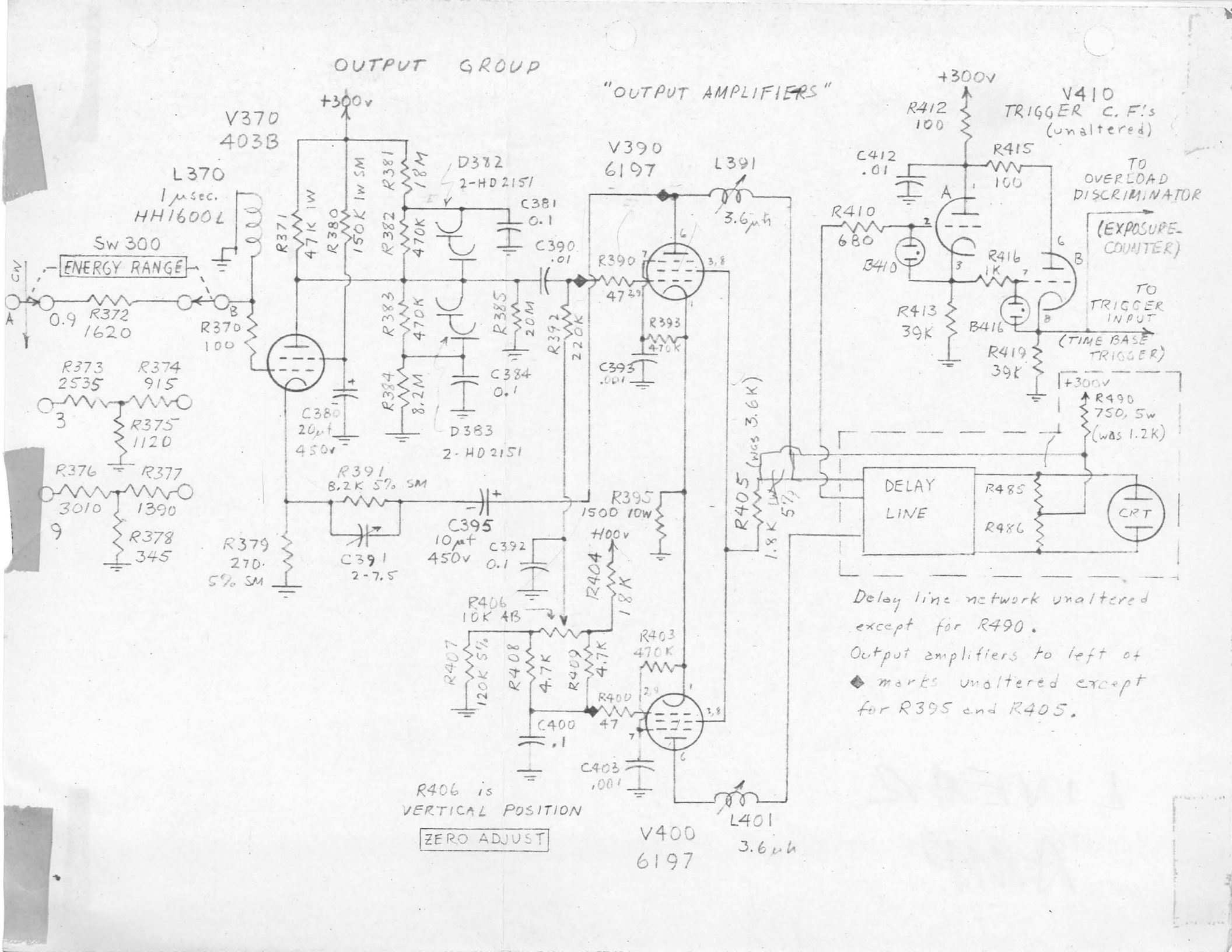
SIG. CABLE RG62/U, 7' long w/ BNC connectors on each end. (UG260/U)

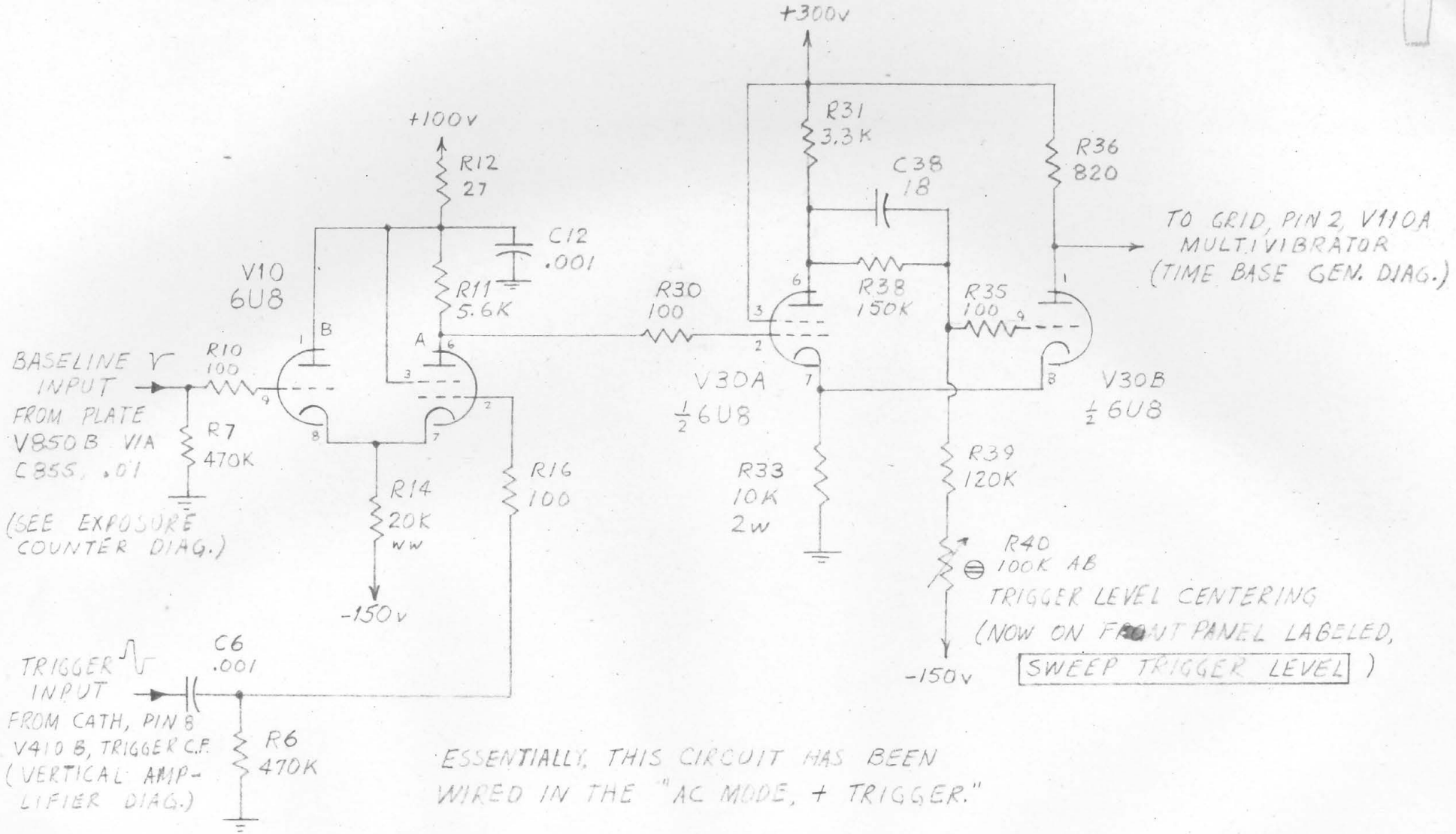
H.V. CABLE RG62/U or RG59/U w/ UG932/U conn. on each end.



In prototype, C334 was C303
C358 was C308
C352 was C312
C380 was C315

RM5
LINEAR AMPLIFIER
(replaces VERTICAL AMP.)

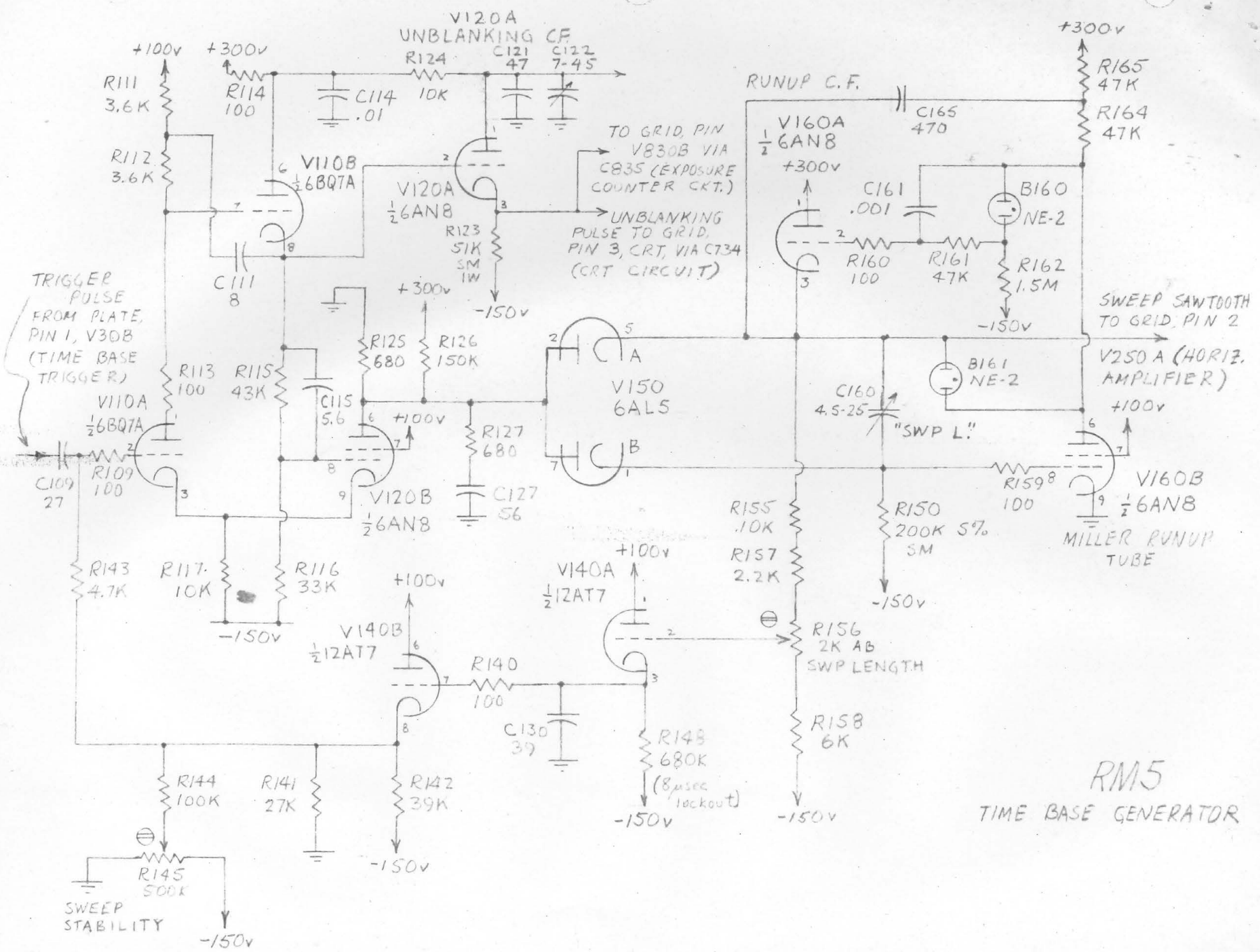

OUTPUT GROUP
"OUTPUT AMPLIFIERS"
+300v
V370
403B
L370
1 μsec.
HH1600L
Sw 300
ENERGY RANGE
CW
A
B
0.9
R372
1620
R370
100
R371
47K 1W
R380
150K 1w SM
R381
18M
R382
470K
R383
470K
R384
8.2M
R385
20M
D382
2-HD2151
C381
0.1
C390
.01
C384
0.1
D383
2-HD2151
C380
20μf
450v
R373
2535
R374
915
R375
1120
R376
3010
R377
1390
R378
345
R379
270
5% SM
R391
8.2K 5% SM
C391
2-7.5
C395
10μf
450v
C392
0.1
R392
220K
V390
6197
R390
47
R393
470K
C393
.001
L391
3.6μh
R395
1500 10W
H00v
R404
18K
R405
(was 3.6K)
1.8K
5%
R406
10K 4B
R407
120K 5%
R408
4.7K
R409
4.7K
R403
470K
R400
47
C400
.1
C403
.001
L401
3.6μh
V400
6197
R406 is
VERTICAL POSITION
ZERO ADJUST
+300v
V410
TRIGGER C. F.'s
(unaltered)
R412
100
C412
.01
R415
100
TO
OVERLOAD
DISCRIMINATOR
(EXPOSURE
COUNTER)
R410
680
B410
R416
1K
R413
39K
B416
TO
TRIGGER
INPUT
(TIME BASE
TRIGGER)
R419
39K
+300v
R490
750, 5w
(was 1.2K)
DELAY
LINE
R485
R486
CRT
Delay line network unaltered
except for R490.
Output amplifiers to left of
◆ marks unaltered except
for R395 and R405.

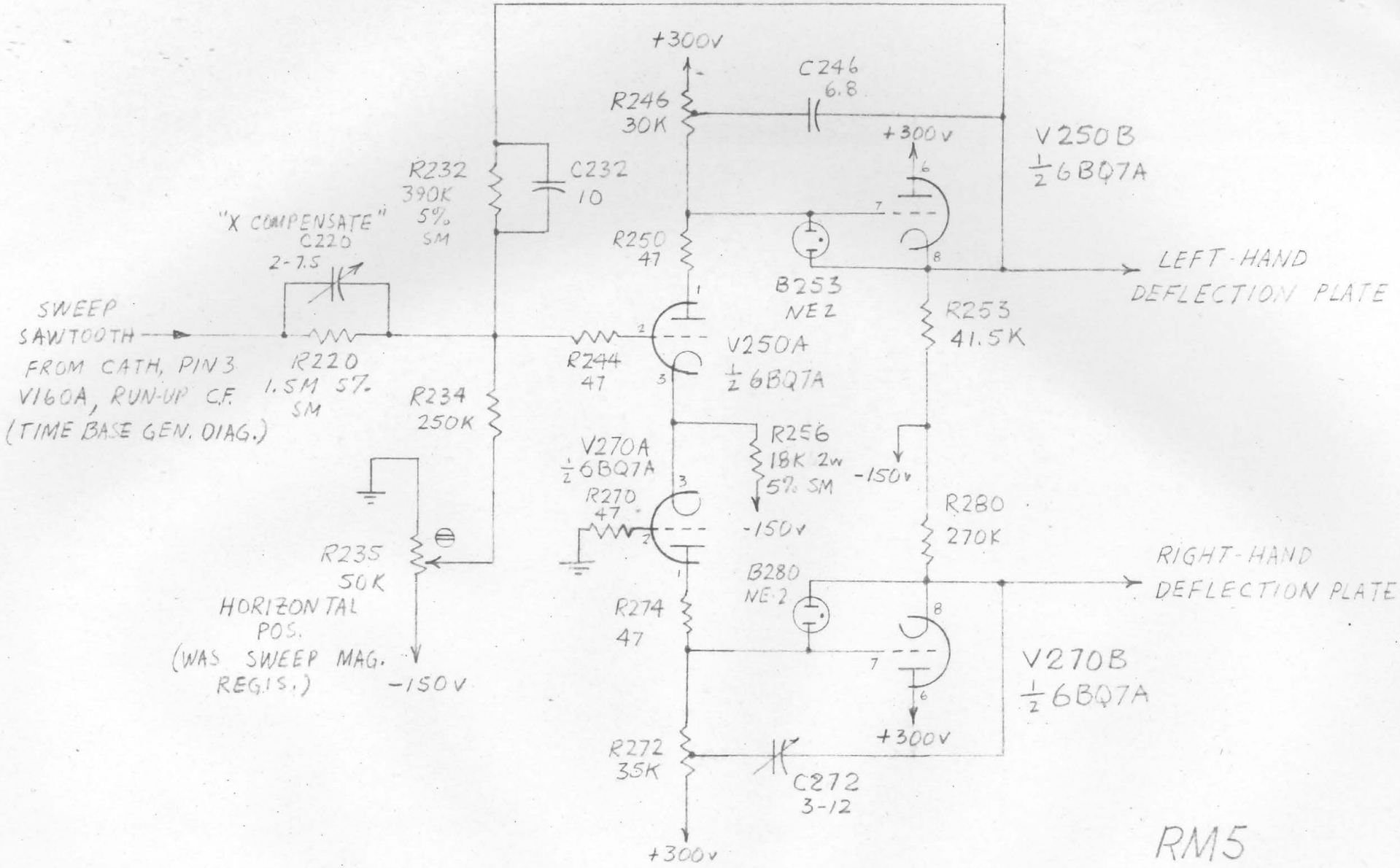


ESSENTIALLY, THIS CIRCUIT HAS BEEN WIRED IN THE "AC MODE, + TRIGGER."

RM5

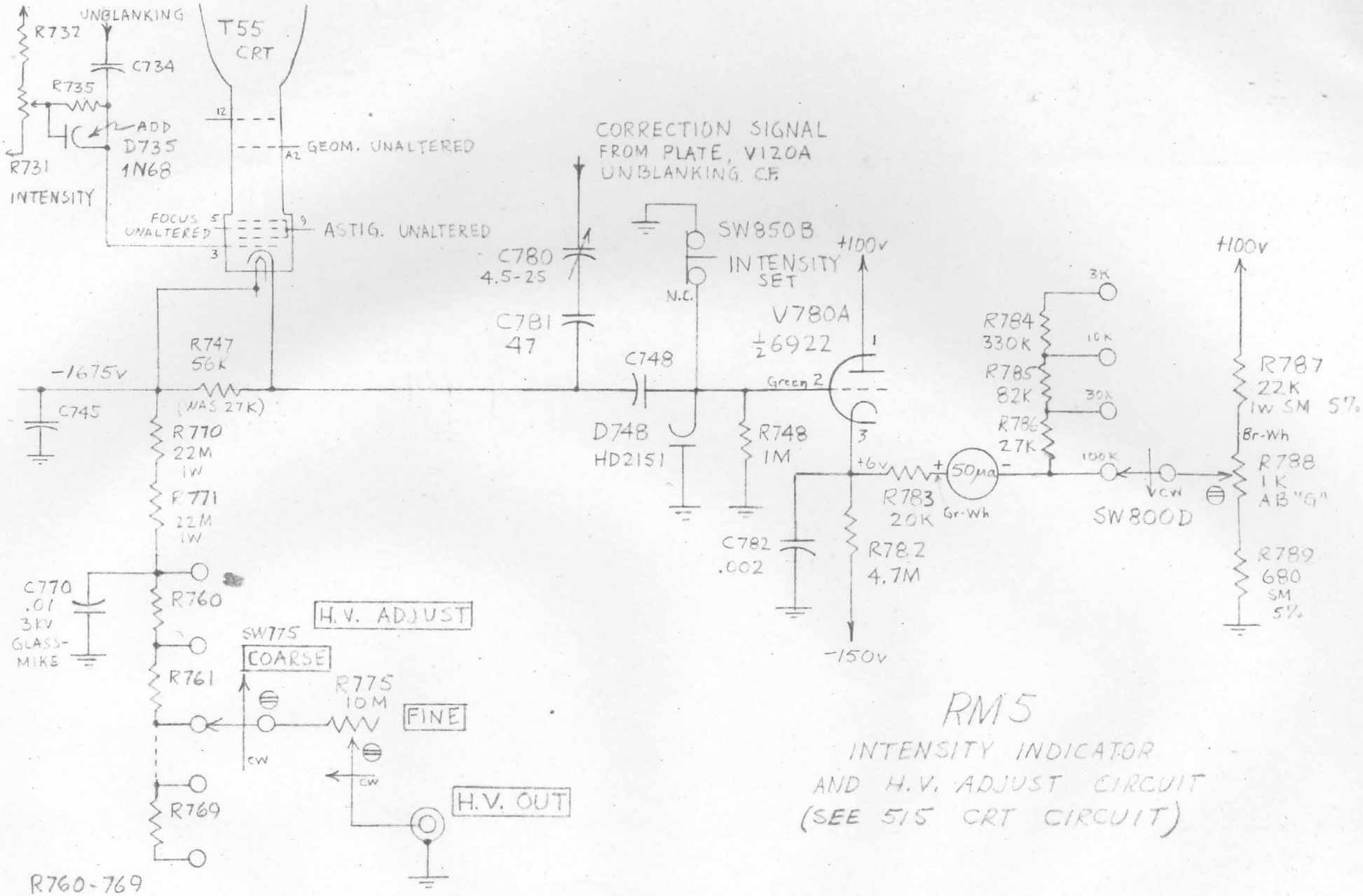
TIME BASE TRIGGER


V120A
UNBLANKING C.F.
+100v
+300v
R124
C121
47
C122
7-45
R111
3.6K
R114
100
C114
.01
10K
R112
3.6K
V110B
½6BQ7A
V120A
½6AN8
TO GRID, PIN
V830B VIA
C835 (EXPOSURE
COUNTER CKT.)
UNBLANKING
PULSE TO GRID,
PIN 3, CRT, VIA C734
(CRT CIRCUIT)
R123
51K
5M
1W
-150v
C111
8
TRIGGER
PULSE
FROM PLATE,
PIN 1, V30B
(TIME BASE
TRIGGER)
+300v
R125
680
R126
150K
R113
100
R115
43K
C115
5.6
+100v
V110A
½6BQ7A
R109
100
C109
27
V120B
½6AN8
R127
680
C127
56
V150
6AL5
A
B
RUNUP C.F.
+300v
R165
47K
R164
47K
C165
470
V160A
½6AN8
C161
.001
B160
NE-2
R160
100
R161
47K
R162
1.5M
-150v
SWEEP SAWTOOTH
TO GRID, PIN 2
V250A (HORIZ.
AMPLIFIER)
B161
NE-2
C160
4.5-25
"SWP L."
+100v
R159
100
V160B
½6AN8
MILLER RUNUP
TUBE
R155
10K
R157
2.2K
R150
200K 5%
5M
-150v
R143
4.7K
R117
10K
R116
33K
-150v
+100v
V140A
½12AT7
R156
2K AB
SWP LENGTH
V140B
½12AT7
R140
100
C130
39
R148
680K
(8 μsec
lockout)
-150v
R158
6K
-150v
R144
100K
R141
27K
R142
39K
-150v
R145
500K
SWEEP
STABILITY
-150v
RM5
TIME BASE GENERATOR



RM5

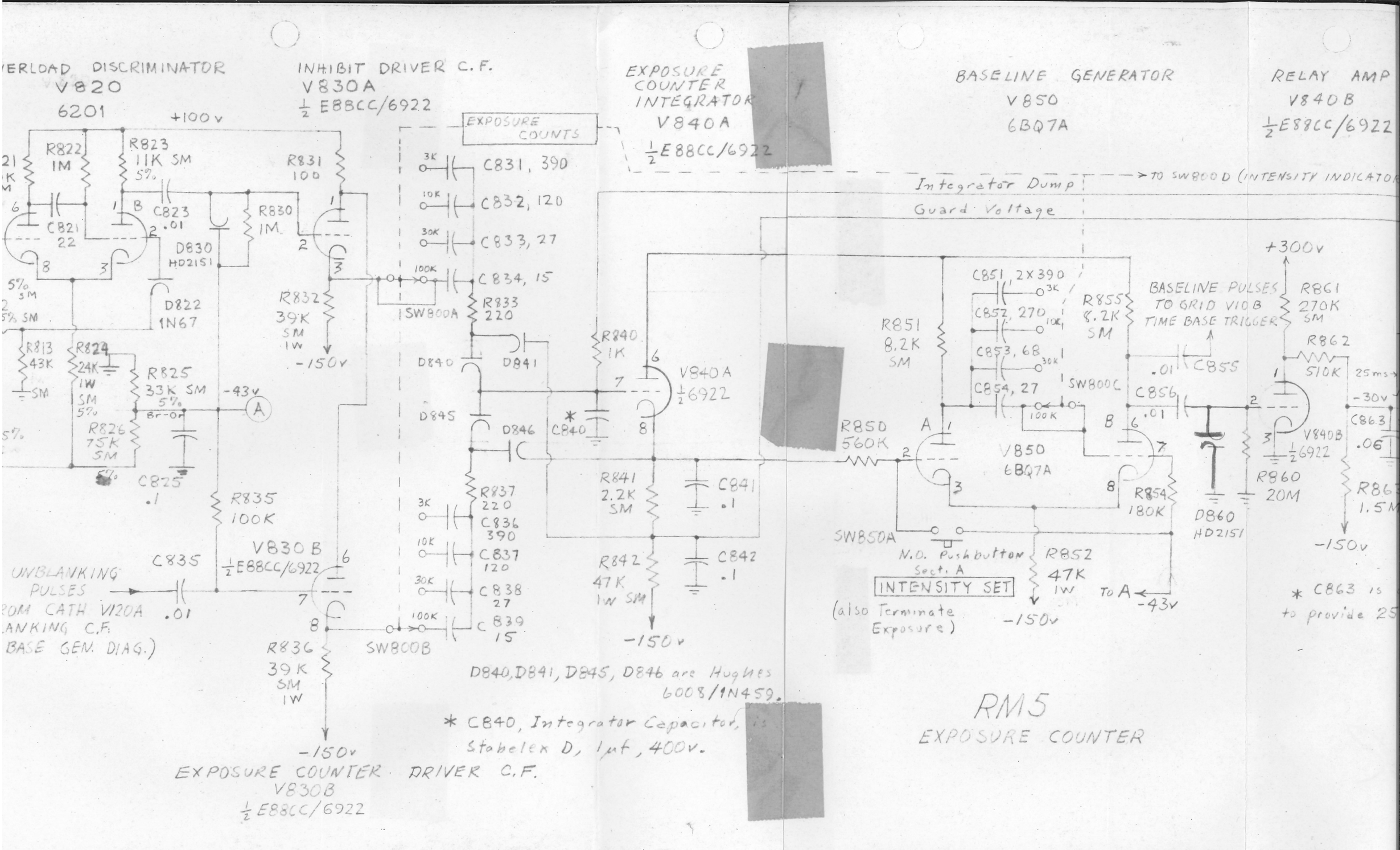
HORIZONTAL AMPLIFIER

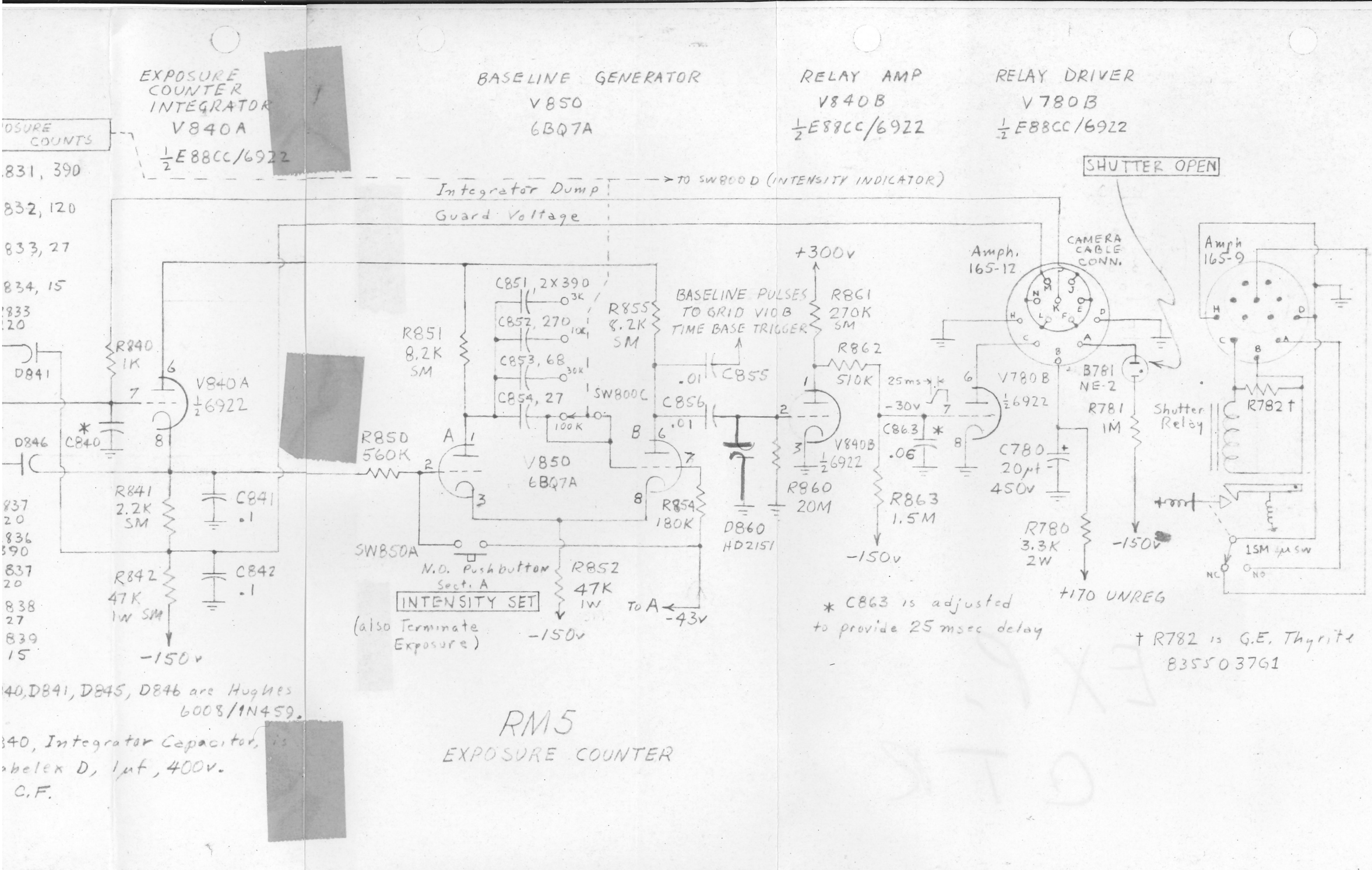


RM5

INTENSITY INDICATOR AND H.V. ADJUST CIRCUIT

(SEE 515 CRT CIRCUIT)


ERLOAD DISCRIMINATOR
V820
6201
+100v
R822 1M
R823 11K SM 5%
C821 22
C823 .01
D830 HD2151
R830 1M
D822 1N67
R813 43K SM
R824 24K 1W SM 5%
R825 33K SM 5% Br-On
R826 75K SM 5%
C825 .1
-43v
A
R835 100K
C835
UNBLANKING PULSES ROM CATH V120A ANKING C.F. BASE GEN. DIAG.)
.01
V830B
½E88CC/6922
INHIBIT DRIVER C.F.
V830A
½ E88CC/6922
R831 100
R832 39K SM 1W
-150v
EXPOSURE COUNTS
3K C831, 390
10K C832, 120
30K C833, 27
100K C834, 15
SW800A
R833 220
D840
D841
D845
D846
R837 220
C836 390
C837 120
C838 27
C839 15
SW800B
R836 39K SM 1W
-150v
EXPOSURE COUNTER DRIVER C.F.
V830B
½E88CC/6922
EXPOSURE COUNTER INTEGRATOR
V840A
½E88CC/6922
R840 1K
V840A ½6922
*C840
R841 2.2K SM
C841 .1
R842 47K 1W SM
C842 .1
-150v
D840, D841, D845, D846 are Hughes 6008/1N459.
* C840, Integrator Capacitor, is Stabelex D, 1μf, 400v.
Integrator Dump
Guard Voltage
TO SW800D (INTENSITY INDICATOR
BASELINE GENERATOR
V850
6BQ7A
C851 2X390
C852 270
C853, 68
C854, 27
SW800C
R851 8.2K SM
R855 8.2K SM
BASELINE PULSES TO GRID V10B TIME BASE TRIGGER
.01 C855
C856 .01
R850 560K
V850 6BQ7A
R854 180K
D860 HD2151
SW850A
N.O. Pushbutton Sect. A
INTENSITY SET
(also Terminate Exposure)
R852 47K 1W
-150v
To A -43v
+300v
R861 270K SM
R862 510K
R860 20M
V840B ½6922
25ms
-30v
C863 .06
R86 1.5M
-150v
* C863 is
to provide 25
RELAY AMP
V840B
½E88CC/6922
RM5
EXPOSURE COUNTER


EXPOSURE COUNTER INTEGRATOR V840A ½E88CC/6922
BASELINE GENERATOR V850 6BQ7A
RELAY AMP V840B ½E88CC/6922
RELAY DRIVER V780B ½E88CC/6922
SHUTTER OPEN
TO SW800D (INTENSITY INDICATOR)
Integrator Dump
Guard Voltage
+300v
Amph. 165-12
CAMERA CABLE CONN.
Amph 165-9
BASELINE PULSES TO GRID V10B TIME BASE TRIGGER
R861 270K 5M
R862 510K
R851 8.2K 5M
R855 8.2K 5M
C851 2X390 3K
C852, 270 10K
C853, 68 30K
C854, 27
SW800C
100K
C855 .01
C856 .01
R850 560K
V850 6BQ7A
R854 180K
D860 HD2151
R860 20M
V840B ½6922
25ms
-30v
C863 .06 *
V780B ½6922
B781 NE-2
R781 1M
C780 20µf 450v
R780 3.3K 2W
-150v
+170 UNREG
Shutter Relay
R782 †
1SM µsw
NC
NO
R840 1K
V840A ½6922
C840 *
D841
D846
R841 2.2K 5M
C841 .1
R842 47K 1w 5M
C842 .1
SW850A
N.O. Push button Sect. A
INTENSITY SET
(also Terminate Exposure)
R852 47K 1W
To A
-43v
-150v
OSURE COUNTS
831, 390
832, 120
833, 27
834, 15
833
120
837
20
836
390
837
20
838
27
839
15
* C863 is adjusted to provide 25 msec delay
† R782 is G.E. Thyrite 8355037G1
40, D841, D845, D846 are Hughes 6008/1N459.
340, Integrator Capacitor, is Sabelex D, 1µf, 400v. C.F.
RM5
EXPOSURE COUNTER

LINEAR AMPLIFIER

ALL ORIGINAL TEKTRONIX PARTS WITH NUMBERS BETWEEN 300 AND 390 HAVE BEEN REPLACED. THIS LIST GIVES ONLY NEW OR ALTERED PARTS. SEE TEKTRONIX 515 VERTICAL AMPLIFIER PARTS LIST. ABBREVIATIONS ARE SAME AS TEKTRONIX EXCEPT THAT "SM" DENOTES ARNHOLD CERAMIC "STEMAG" DEPOSITED CARBON. ALL FIXED COMPOSITION RESISTORS ARE ALLEN-BRADLEY UNLESS OTHERWISE STATED.

SIGNAL CONNECTOR BNC (UG290/U)

CAPACITORS

C333	25μf	EMC	FIXED	8v		TANTALUM
C334 A,B	2X10μf	EMC	FIXED	450v	-10% +50%	MALLORY FP231
C335	33μμf	Mica or Cer.	FIXED	500v	5%	
C336	.05μf	Cer.	FIXED	500v	GMV	
C340	18μμf	Cer.	FIXED	500v	10%	
C343	7-45μμf	Cer	VAR.	500v		
C345	10μf	EMC	FIXED	150v	-10% +100%	MALLORY TC42
C352	20μf	EMC	FIXED	450v	-10% +50%	MALLORY FP144
C358 A,B	4X10μf	EMC	FIXED	450v	-10% +50%	MALLORY FP434
C360	.01μf	Cer.	FIXED	500v	20%	
C362	10μf	EMC	FIXED	450v	-10% +50%	MALLORY TC72
C363	20μf	EMC	FIXED	8v		TANTALUM
C365	2-7.5μμf	Cer.	VAR.	500v		
C380	20μf	EMC	FIXED	450v	-10% +50%	MALLORY FP144
C381	0.1μf	Cer.	FIXED	500v	GMV	
C384	0.1μf	Cer.	FIXED	500v	GMV	
C390	.01μf	Cer.	FIXED	500v	20%	
C391	2-7.5μμf	Cer.	VAR.	500v		
C392	0.1	Cer	FIXED	500v	GMV	
C395	10μf	EMC	FIXED	450v	-10% +50%	MALLORY TC72
C400	0.1	Cer.	FIXED	500v	GMV	

DELAY LINES

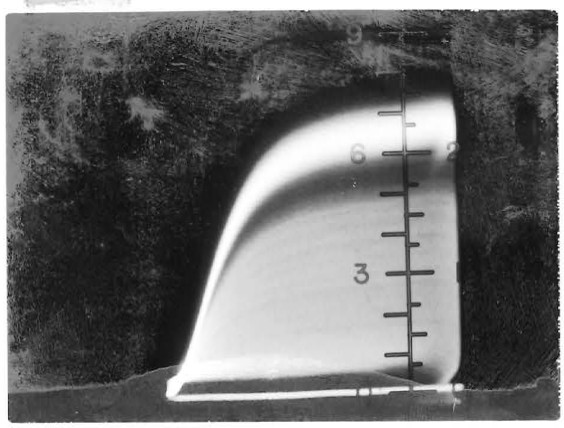
L350	1μsec.	SHORTED	HH1600L	COLUMBIA TECH. CORP.
L370	1μsec	SHORTED	HH1600L	" " "

THE ABOVE PREPARED ACCORDING TO INSTRUCTIONS BY R.R. HALL.

DIODES (SEMI-CONDUCTOR)

D382 2 HD2151 in series

D383 2 HD2151 in series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RESISTORS

R330	220Ω	½w	FIXED	COMP.	10%	
R331	2.2M	½w	FIXED	COMP.	10%	
R332	33K	1w	FIXED	COMP.	10%	
R333	270Ω	½w	FIXED	COMP.	10%	
R334	180K	½w	FIXED	COMP.	10%	
R335	10M	½w	FIXED	COMP.	5%	
R340	2.7K	½w	FIXED	COMP.	10%	
R341	47Ω	½w	FIXED	COMP.	10%	
R342	47Ω	½w	FIXED	COMP.	10%	
R343	6.8K	1w	FIXED	SM	5%	
R344	3.3K	½w	FIXED	SM	5%	
R345	100Ω	½w	FIXED	COMP.	10%	
R346	1.8K	2w	FIXED	COMP.	10%	
R351	120Ω	½w	FIXED	COMP	10%	
R352	1K	½w	VAR.	COMP.		CRL MODEL 1 RADIOHM
R353	1K	½w	FIXED	SM	10%	
R354	4.7K	½w	FIXED	SM	10%	
R355	2.5K	½w	VAR.	COMP.		CRL MODEL 1 RADIOHM
R356	24K	1w	FIXED	COMP.	5% (10% OK)	
R357	270Ω	½w	FIXED	SM	5%	
R358	91K	1w	FIXED	COMP.	5% (10% OK)	
R360	100Ω	½w	FIXED	COMP.	10%	
R361	220K	½w	FIXED	COMP.	10%	
R362	7.5K	1w	FIXED	COMP.	5% (10% OK)	
R363	68Ω	½w	FIXED	COMP.	10%	
R365	5.6K	½w	FIXED	SM	5%	
R366	3.9K	2w	FIXED	SM	10%	
R367	3.9K	2w	FIXED	SM	10%	
R368	22K	1w	FIXED	COMP.	10%	
R370	100Ω	½w	FIXED	COMP.	10%	
R371	47K	1w	FIXED	COMP.	10%	
R372	1620Ω	½w	FIXED	SM or EQUAL PREC. RESIS.	1%	
R373	2535Ω	½w	FIXED		1%	
R374	915Ω	½w	FIXED		1%	
R375	1120Ω	½w	FIXED		1%	
R376	3010Ω	½w	FIXED		1%	
R377	1390Ω	½w	FIXED		1%	
R378	345Ω	½w	FIXED		1%	

RESISTORS (CONT.)

	R379	270Ω	½w	FIXED	SM	5%
	R380	150K	1w	FIXED	SM	10%
	R381	18M	½w	FIXED	COMP.	10%
	R382	470K	½w	FIXED	COMP.	10%
	R383	470K	½w	FIXED	COMP.	10%
	R384	8.2M	½w	FIXED	COMP.	10%
	R385	20M	½w	FIXED	COMP.	10%
	R392	220K	½w	FIXED	COMP.	10%
	R395	1.5K	10w	FIXED	WW	10%
	R404	18K	½w	FIXED	COMP	10%
△	R405	1.8K	1w	FIXED	COMP.	5%
		WAS 3.6K	1w			
	R406	10K	2w	VAR.	COMP.	10% AB TYPE J, ZERO ADJUST
	R407	120K	½w	FIXED	COMP.	5%
	R408	4.7K	½w	FIXED	COMP.	10%
	R409	4.7K	½w	FIXED	COMP.	10%
△	R490	750Ω	5w	FIXED	WW	5%
		WAS 1.2K	5w			

SWITCHES

SW300 1 WAFER 3POSITION ROTARY CENTRALAB PA-2003

VACUUM TUBES

△	V330	403B	} PREAMP GROUP
△	V340	6197	
△	V350	403B	} 1st GROUP
△	V360	403B	
△	V370	403B	} OUTPUT GROUP
△	V390	6197	
△	V400	6197	

(6197's ARE PREFERRED OVER 6CL6's)

RETAINED
V410 6BQ7A TRIGGER C.F.'s

REMOVED
(OTHER THAN ALREADY NOTED)

R396
R398
R399
L390
L400

RETAINED UNALTERED

C393	R403	L391
C403	R410	L401
C412	R412	B410
[ENTIRE DELAY LINE]	R413	B416
	R415	
R390	R416	
R393	R419	
R400		

TIME BASE TRIGGER

DELETED

C3	R20	SW5
C4	R21	SW20
C9	R22	
C21	R23	
C28	R24	
R2	R25	
R3	R26	
R4	R27	
R5	R28*	
R8	R29*	
R9	R32	
R19	R45	

RETAINED UNALTERED

C12	
C38	
R10	R39
R11	R40 (CHANGED LOCATION AND FUNCTION)
R12	
R14	V10
R16	V30
R31	
R35	
R36	
R38	

* 515 ONLY -- NOT USED IN 515A

NEW OR ALTERED PARTS

C6	.001 μf	Cer.	Fixed	500v	GMV
R6	470K	½w	Fixed	Comp.	10%
R7	470K	½w	Fixed	Comp.	10%
R30	100Ω	½w	Fixed	Comp	10%
R33	10K	2w	Fixed	Comp	10%

TIME BASE GENERATOR

REMOVED

B152	ENTIRE SWEEP TIMING SWITCH ASSEMBLY EXCEPT C130
C120	SW145
R120	ENTIRE "GATE OUT" CKT.
R121	ENTIRE "SAWTOOTH OUT" CKT.
R146 (515A ONLY)	
R153	SW160
R154	

NEW OR ALTERED PARTS

	C121	47 μμf	Cer.	Fixed	500v	10%
	C122	7-45 μμf	Cer.	Fixed	500v	
△	C160	4.5-25 μμf	Cer.	Fixed	500v	
	R123	51K	1w	Fixed	SM	10%
	R124	10K	1w	Fixed	Comp.	10%
	R148	680K	½w	Fixed	Comp	10%
	R150	200K	½w	Fixed	SM	5%

HORIZONTAL AMPLIFIER

REMOVED

B222

ALL C's EXCEPT C246, C272

ALL R's 210-240 INCLUSIVE EXCEPT R234, R235

R257 - R267 INCLUSIVE

V210

NEW OR ALTERED PARTS

	C220	2-7.5 μμf	Cer.	Var.	500v	
	C232	10 μμf	Cer	Fixed	500v	10%
	R220	1.5M	½w	Fixed	SM	5%
	R232	390K	½w	Fixed	SM	5%
△	R256	18K	2w	Fixed	SM	5%

CRT, H.V., & INTENSITY INDICATOR CIRCUIT

NEW OR ALTERED PARTS ONLY

	C770	.01 μf	GLASSMIKE	Fixed	3KV	10%
	C780	4.5-25 μμf	Cer.	Var	500v	
	C781	47 μμf	Mica	Fixed	500v	10%
	C782	.002 μf	Cer.	Fixed	500v	20%
	D735	IN68 or equal		V780(A)	E88CC/6922	METER 0-50 μa WESTON 1011
	D748	HD2151		SW775	CRL PA-2000	CONN. (H.V. OUT)
△	R747	56K (was 27K)	½w	Fixed	Comp.	10% VG 931/V

R760-769 9 each

		9.1M	1w	Fixed	Comp.	5% (10% OK)
	R770	22M	1w	Fixed	Comp.	10%
	R771	22M	1w	Fixed	Comp.	10%
	R775	10M	½w	Var.	Comp.	CRL B-98 or equal FINE H.V.
	R782	4.7M	½w	Fixed	Comp.	
	R783	20K	½w.	Fixed	Comp.	5% (10% OK)
	R784	330K	½w	Fixed	Comp.	10%
	R785	82K	½w	Fixed	Comp.	10%
	R786	27K	½w	Fixed	Comp.	10%
	R787	22K	1w	Fixed	SM	5%
	R788	1K	1w	Var.	Comp.	AB Type G
	R789	680Ω	½w	Fixed	SM	5%

EXPOSURE COUNTER

B781	NE 2
D810	HD2151
D811	HD2151
D822	1N67
D830	HD2151
D840	HD6008/1N459
D841	HD6008/1N459
D845	HD6008/1N459
D846	HD6008/1N459
D860	HD2151

C780	20 µf	EMC	Fixed	450 v		MALLORY TC 75
C810	.01 µf	Cer.	Fixed	500 v	GMV	
C811	0.1 µf	Cer.	Fixed	500 v	GMV	
C812	0.1 µf	Cer.	Fixed	500 v	GMV	
C821	22 µf	Cer.	Fixed	500 v	10%	
C823	.01 µf	Cer.	Fixed	500 v	GMV	
C825	0.1 µf	Cer.	Fixed	500 v	GMV	
C831	390 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C832	120 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C833	27 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C834	15 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C835	.01 µf	Cer.	Fixed	500 v	GMV	
C836	390 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C837	120 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C838	27 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C839	15 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C840	1 µf	Stabelex D	Fixed	400 v	10%	I. C. C.
C841	0.1 µf	Cer.	Fixed	500 v	GMV	
C842	0.1 µf	Cer.	Fixed	500 v	GMV	
C851	2X390 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C852	270 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C853	68 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C854	27 µµf	Mica	Fixed	500 v	10%	1/4 PSS
C855	.01 µf	Cer.	Fixed	500 v	GMV	
C856	.01 µf	Cer.	Fixed	500 v	GMV	
C863	.01+.05 µf	Cer	Fixed	500 v	Trim to correct value	

R809	8.2K	½w	Fixed	Comp	10%

EXPOSURE COUNTER (CONT.)

R810	47K	½w	Fixed	SM	5%	
R811	270K	½w	Fixed	Comp	10%	
R812	3.9K	½w	Fixed	SM	5%	
R813	43K	½w	Fixed	SM	5%	
R814	25K	2w	Var.	Comp.	10%	AB'J' OVERLOAD DISCRIM.
R815	62K	½w	Fixed	SM	5%	
R821	10K	½w	Fixed	SM	10%	
R822	1M	½w	Fixed	Comp	10%	
R823	11K	½w	Fixed	SM	5%	
R824	24K	1w	Fixed	SM	5%	
R825	33K	½w	Fixed	SM	5%	
R826	75K	½w	Fixed	SM	5%	
R830	1M	½w	Fixed	Comp.	10%	
R831	100Ω	½w	Fixed	Comp.	10%	
R832	39K	1w	Fixed	SM	5%	
R833	220Ω	½w	Fixed	Comp.	10%	
R835	100K	½w	Fixed	Comp.	10%	
R836	39K	1w	Fixed	SM	5%	
R837	220Ω	½w	Fixed	Comp.	10%	
R840	1K	½w	Fixed	Comp.	10%	
R841	2.2K	½w	Fixed	SM	5%	
R842	47K	1w	Fixed	SM	5%	
R850	560K	½w	Fixed	Comp.	10%	
R851	8.2K	½w	Fixed	SM	5%	
R852	47K	1w	Fixed	Comp.	10%	
R854	180K	½w	Fixed	Comp.	10%	
R855	8.2K	½w	Fixed	SM	5%	
R860	20M	½w	Fixed	Comp.	5%	(10% OK)
R861	270K	½w	Fixed	SM	10%	
R862	510K	½w	Fixed	Comp.	5%	
R863	1.5M	½w	Fixed	Comp.	10%	
R780	3.3K	2w	Fixed	Comp.	10%	
R781	1M	½w	Fixed	Comp.	10%	

R782 Thyrite ¼w GE No. 8355037G1

SW800 1 Wafer 4 pole - 4 pos. Modified CRL PA-2015

SW850 Push Button DPDT Mallory #1016

V820	6201
V830	E88CC/6922
V840	E88CC/6922
V850	6BQ7A

CAMERA CABLE CONNECTOR - AMPHENOL #165-9 (MALE) #165-12 (FEMALE)

SHUTTER RELAY - MODIFIED SODECO TZ4CE Counter (To Be redesigned)

CONSTRUCTION OF BUSHING MOUNTED DELAY LINES FROM HH1600L CABLE STOCK

R. R. Hall

5/21/58

The mechanical and material features of the HH1600L delay cable make it very sensitive to heat damage. The standard practice of using soldered type mounting bushings demands extreme care and creates a high mortality rate.

A heatless type bushing has been devised at ORNL and tried with good results. The bushing is an IPC28000 (UG932/U) cable connector modified as per drawing. The preparation of the cable is facilitated by the following procedure:

1) Cut desired length of cable plus 2 inches extra for fabrication and possible second try.
2) Install nut, flat washer and rubber washer in manner common to the UG932/U connector. Temporarily position them well back from the end of the cable. The sequence of the nut and washers will now dictate the end to receive the bushing.
3) Remove 3/4 inch of jacket and outer wrapping from each end of cable. Do not nick the shield wires.
4) To prevent pulling out the shield wires while scraping, turn wires backward over the jacket of the "un-bushed" end and temporarily tape snugly.
5) On the bushing end, fan out the shield wires to slightly more the 90 degrees from the cable. To do this, use a knife point with care not to disturb the polystyrene inner wrapping.
6) Secure the exposed inner wrapping to the center conductor coil with two turns of black plastic electrical tape, 1/2 inch wide, placed close against shield wires and wound in proper direction to tighten the polystyrene wrapping. Wind the tape snugly but not tight since the center wire must be pulled out later.

7) For scraping the insulation from the shield wires, prepare a dressed wooden block jig about 2 x 4 x 10 inches with a 5/16 inch wide, 1/2 inch deep slot, centered on a 2" x 4" face and parallel to the 2 inch dimension. Clamp the wooden block to work bench so that the slot is vertical and overhangs the bench.

8) Place the cable in the slot so that the shield wires fan out on the top surface (4" x 10") of the wooden block. Using a knife blade, near the point, scrape the wires with gentle outward strokes, beginning close against the core. The wire ends need no care since they will be cut off later. Rotate the cable in the slot as needed to place the wires favorably for scraping. Invert the cable in the slot to scrape the opposite sides of the wires.

9) When the wires are reasonably clean of insulation, return them to their original position and secure the ends, temporarily, close to the core with a one turn "hold down" wrap of bare solid wire near the end. Slip the beveled washer, large diameter first, over the ends of the shield wires. Remove the "hold-down" wrap and slide the beveled washer home against the end of the outer jacket.

10) Turn the shield wires snugly over the beveled washer. Do not allow the wires to cross. Cut off excess wire length evenly at the large diameter of the beveled washer. Gently scrape off any visible insulation.

11) Slip the bushing body over the end of the cable until the shield wires are bottomed in the bushing body. Keep the cable bottomed with slight pressure while pushing the rubber washer in place against the beveled washer. Slide the flat washer against the rubber washer. Slide the threaded nut into place and thread down tightly with pliers and wrench. Cut off any excess core with a square cut at end of black tape. Postpone pulling out the center wire.

PREPARING THE UN-BUSHED END

The un-bushed end, either open or shorted, is prepared by extending the shield wires past the end of core and collapsing the ends to a soldered joint. The shorted end type is prepared as follows:

12) Remove the temporary tape wrap and lift the shield wires clear of the jacket.

13) To cut the line to the proper length, start the measurement from the extreme end of the bushing. Cut only the jacket at the desired length and remove the excess jacket. Do not nick the shield wires.

14) Position the wires radially about 90 degrees from cable at the end of the jacket. Cut off all wires to about 5/8 inch exposed length and scrape off insulation as in step No. 8 except that good scraping is required only near the ends.

15) Cut off the excess core assembly with a square cut close against the spreaded shield wires. Pick up the end of the center wire and pull out (unspiral) about 2 inches. Clean insulation from center wire, with gentle scraping or liquid wire stripper, on area that will contact ends of shield wires when they are extended and collapsed.

16) Bend the shield wires back in line with and past the end of the cable. Collapse the shield wires so as to form a cone shaped end over the center wire. Draw wire ends together, around the center wire, with a tie wrap of small bare copper wire and solder all together. Cool quickly to prevent heat damage. Cover cable end with sleeve or tape.

PREPARING OPEN ENDED LINE

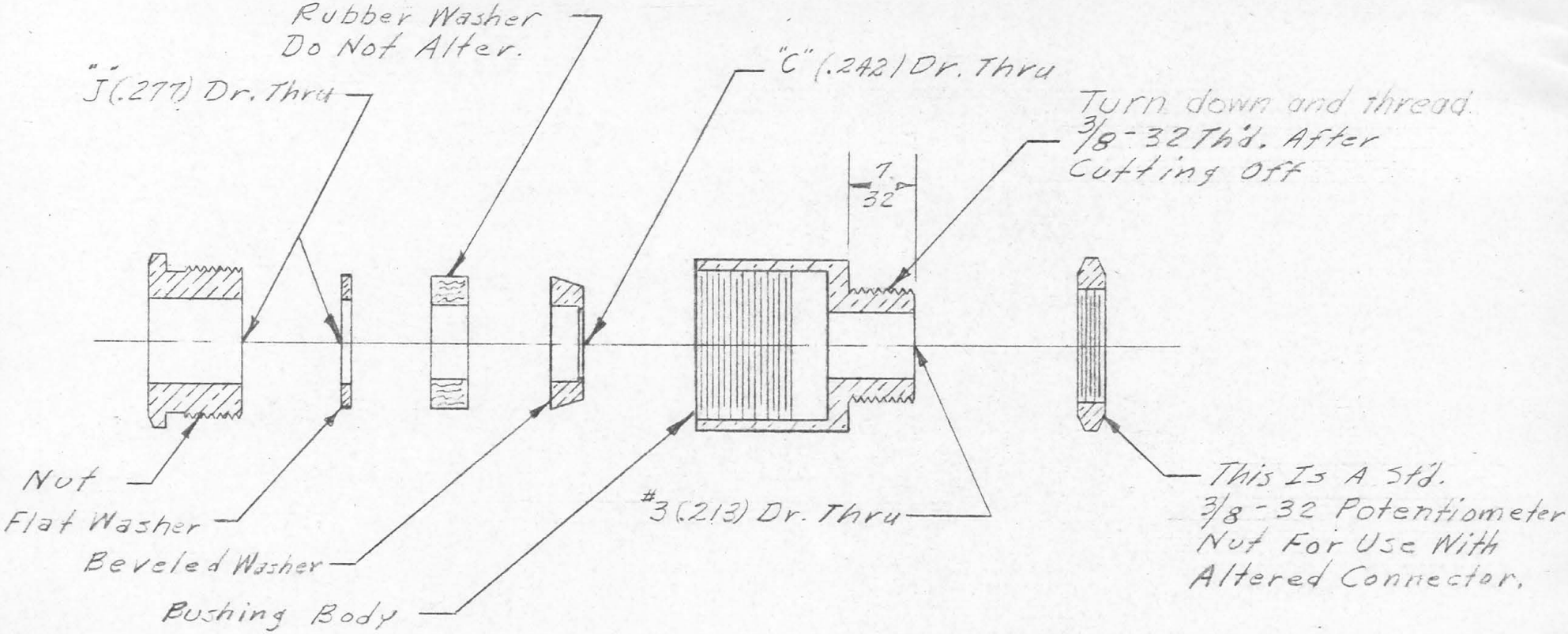
17) The open ended line is prepared in same manner as the shorted type except that the center wire is not connected to the shield wires. After cutting

of excess core (step 15) remove any remnants of center wire due to unsquare cut and secure the "real" end with a drop of household cement.

FINISHING OF BUSHING END

18) Pull out center conductor until its spiraling begins about even with the threaded end of the bushing. Cut to desired length and remove insulation near end.

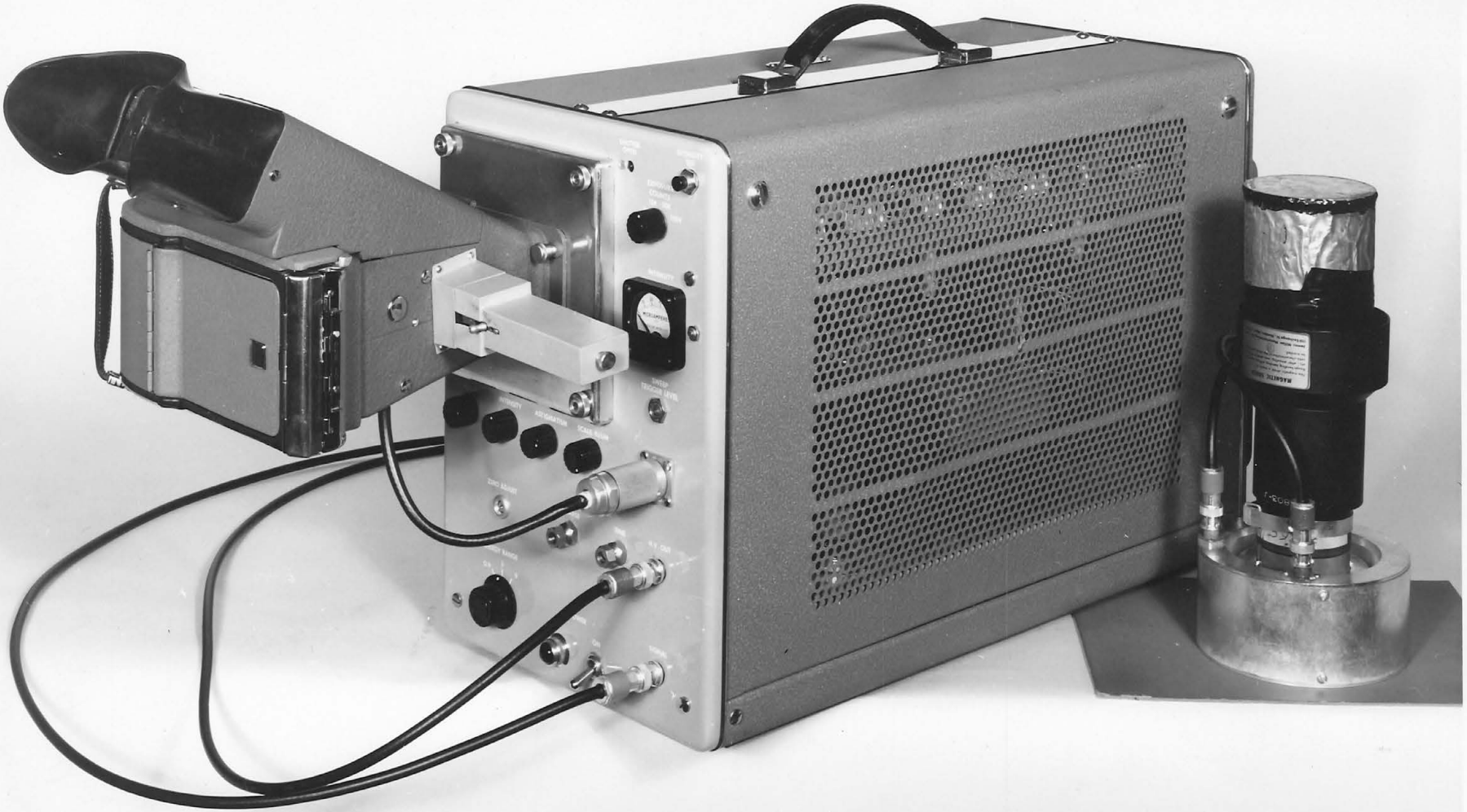
19) Check resistance with ohmmeter. The center conductor, of shorted type line, should measure about 70 ohms per cable foot. The open type line should, of course, measure infinity.



DELAY LINE CHASSIS BUSHING

MODIFICATION OF IPC 28000
CABLE CONNECTOR (UG-932/U)

Alter As Noted
Scale 1" = 1/2"



7-21-58

CRAIG HARRIS – OAK RIDGE

(IT IS) LIKE BROOKHAVEN G.W. ANAL. WITHOUT GREY WEDGE.

NO COMCL MARKET

1. RELEASE (PATENT. ETC)
2. QUALITY CONTROL.
3. MONEY SAVING FOR US TO STOP. 515 AT STAGE OF PRODUCTION

CONTRACT SERVICE TO OAK RIDGE.

P.R. BELL – LINEAR AMPLIFIER

CRAIG HARRIS
OAK RIDGE

STRIPPED DOWN
515's

6 – 10 UNITS

POSSIBLY SPECIAL
PUNCHING

9-30-58

Eastern Division CallReport

Syracuse

Bill Kladke

GeneralElectric Co., Schenectady, N.Y.

Discussed modified 515 (Radiation Spectrometer.) They are presently using a 200 channeltime of flight analyzer for checking the distribution of energies of gamma rays. Will Bryant thought it might make a good monitor device. EPI has taken over this nuclear lab.

George Edens

June 24, 1958

Will Marsh

Oak Ridge---Radiation Spectrometer

Dear George,

Oak Ridge has come up with a radiation spectrometer consisting of a scintillation detector, a modified 515A, and a DuMont Polaroid camera. A description is enclosed.

They would like us to bid on a couple of these, but before we bid, we'd like to have an idea of its usefulness to other Nuclear people.

Can we have an early comment from your offices that traffic with Nuclear installations or applications?

Best,

Will

WM/pb

cc: Chuck Nolan

Inter-Office Communication

To: ~~Will Marsh~~ & Chuck Nolan

Date: July 22, 1958

From: George Edens

Subject: RM5

Dear Will and Chuck:

Though the RM5 already looks pretty dead, here are some Central Division comments which should help to reinforce your decisions.

Largest objection seems to be to crippling a perfectly good scope. In any event, it doesn't look like a high demand item.

Best regards,

George

GE/ik

Discussed the RMS with Dr. Richard Miller of the cyclotron group at U of Chi.

He felt that the RMS would be very little improvement over the standard Gray Wedge Analyzer.

He felt that if we planned to expend any developmental energy in the spectrometer field that we should stick to digital devices because of their greater flexibility, quantitative value, etc.

Doris

Talked with Dr. Anders Chemistry Dept. U of Chi. He is presently using a 515A in this type of application. He indicated he would have seriously considered an instrument of this type had it been available. He did indicate most experimenters have linear amplifier already available and that he likes the versitility of a scope for other associated studies.

Round table discussion with the Electronics Group at Argonne. Bill Brookshire, Don Thompson Hans Cremer & L. Epstein. These people did not forsee a use for such an instrument at Argonne since it lacks the quantitative features they desire. They further point out that using the H.V. from the scope could cause problems in accuracy. In order to get 1% readings the

regulation of the H.V. Supply would have to be .01% or better. The main use they see for such a unit is to give an experimenter a quick idea of the spectrum he should look for if he is using a single channel analyzer. Possible customers may be the medical people who would like to make quick qualitative test of unknown radiation. Most everyone would still like to see the scope have some other usefulness other than as the spectrometer indicator.

Not too warm a reception so far here in Chi

R.

George Edens

July 18, 1958

Don Clifford

Oak Ridge - - Modified 515A

Dear George:

Because our copy of Will's letter was delayed in getting to us Inge asked that I offer my comments immediately. My sampling of the impressions of appropriately engaged customers in this area is therefore very sketchy.

I discussed the modified 515A with Elmo Brekhus at the LINAC Lab. and with Dr. Blair at the University of Minnesota Physics Department. Both felt that an instrument of the type described would be extremely limited in its usefulness.

Unless it be someone in the Chemistry Department, no one at the U. is engaged in gamma ray spectroscopy. Dr. Blair felt that for the general case there are easier ways of analyzing radiation, such as by means of counters, etc. Dr. Blair suggested we talk to the people at Argonne National Labs., as they might offer a more representative opinion.

One thought that persists with me is that a Heathkit Professional scope is closer in its original form to the description of the spectrometer scope than the 515A.

The information contained in the "Description of the RM5" is very interesting, and certainly shows a great deal of resourcefulness on the part of whoever did the necessary engineering. It contains information that I feel will be useful in dealing with people in nuclear applications.

Best always,

Don

Don

DC:sh
cc: Chicago

Inter-Office Communication

TEKTRONIX, INC.
PORTLAND, OREGON

To: Inge Kremeyer

Date: July 15, 1958

From: Bill Ward

Subject: Oak Ridge---Radiation Spectrometer

Dear Inge:

I have one customer who is involved in a project similar to this. This customer is Westinghouse Engineering Center and the Person involved is Dr. Stan Ruby.

Not too sure as to how much interest this conglomeration would generate down there since they have a new 545 which they are working into their program, in fact, I spent sometime with Dr. Ruby last week going over the operation of the 545.

At any rate, the market looks quite limited from here.

Best regards,

Bill

Bill

BW/rt

Inter-Office Communication

To: George Edens

Date: July 15, 1958

From: Warren Dixon

HOUSTON

Subject: Radiation Spectrometer

Dear George:

I talked to Stig Ekroot of M. D. Anderson Hospital concerning the proposed Radiation Spectrometer and will condense his views for your use:

Stig thinks that there is a fairly good market in this area for a good Radiation Spectrometer and would like to be informed of the developments if we proceed to build one. At the present time, he has three radiation Spectrometers in the hospital and suggested that the following places either have one or could use one:

University of Houston - Physics Lab.
Rice Institute - Physics Lab.
Methodist Hospital

Since this is a rush request, I will forward this info and look into the subject deeper if anybody desires.

I would like about five copies of the description of this instrument for further evaluation of the proposed equipment by several individuals.

Best regards,

Warren

Warren /amb

NR:amb

Inter-Office Communication

To: George Edens

Date: July 14, 1958

From: Sandy

Subject: Radiation Spectrometer

Dear George,

Don't have any customer comments available until I can visit NEMO project at Convair. Well Surveys will also be a source when next I can call there.

I assume the spectrometer cooked up by Oak Ridge does the same basic job as a grey-wedge system. If so, would guess that a number of customers now using grey-wedge techniques might be very much interested in such a modified 515. Big question is just how much of an improvement does Oak Ridge's spectrometer represent? Since the "pump down" circuit represents a 3,000 to 100,000 count-down divider, would seem that ± 1% changes in count would be expected from ripple and noise. ↑ or more

Conclusion:

1) I'd like to have a little more complete run-down on how Oak Ridge's system outperforms previous methods;

2) Are we free to discuss Oak Ridge's system with any and all customers?

3) Oak Ridge's approach seems to be an ingenious attack on the spectrometer problem---several problems appear to be solved by their circuit design.

Best regards,

Sandy

Sandy

bm

Kansas City

Inter-Office Communication

To: George Edens

Date: June 24, 1958

From: Will Marsh

Subject: Oak Ridge---Radiation Spectrometer

Dear George,

Oak Ridge has come up with a radiation spectrometer consisting of a scintillation detector, a modified 515A, and a DuMont Polaroid camera. A description is enclosed.

They would like us to bid on a couple of these, but before we bid, we'd like to have an idea of its usefulness to other Nuclear people.

Can we have an early comment from your offices that traffic with Nuclear installations or applications?

Best,

Will

WM/pb

cc: Chuck Nolan

Dear Chuck,
Would it be possible for you to get your reply out to Chicago today. I'd very much appreciate it.
Best regards,
Inge. for George
7/8/58

Saturday Morning-

Dear Inge:

Without having this looked at by some of my "radioactive customers" (Iowa State, Washington U. and possibly but probably not Bendix I can't give much of an idea of it's possible usefullness. The best I can do is to comment two weeks from now after I return from St. Louis.

Regards
Chuck

Inter-Office Communication

To: Will Marsh

Date: 7/8/58

From: Bill Kladke

Subject: Oak Ridge Radiation Spectrometer

Dear Will:

Since Scotty had already left when your memo arrived, I took the liberty of making a survey of people who might be interested in the Oak Ridge Type Radiation Spectrometer.

After talking to individuals at G.E., K.A.P.L. and R.P.I., I found very little interest in this method of displaying the distribution of energies of gamma rays. Some might be interested if they knew the accuracy involved and the relative merits of this system over other systems.

If you think it is worthwhile, please pass this information along and I, in turn, will talk to more people in the nuclear industry. In the meantime, I'll pass your document on to the New York Offices for further comments.

Best regards,

Bill eh

Bill

WK/eh
nr

B + C

Smitty

Oak Ridge Tennessee.

C.C. HARRIS (Craig)

(home ill) Oak R. 5-1723

Rt. hand man

DR. P R Bell

Electronic consulting for non-commercial group.

Gamma Ray Spectrometer

have developed 1 prototype

unobtainable final pres. on CRT.

have used Mod. 515

AEC issued orders to go ahead

will want 10

may be followed by 100's

his concern is discription of
mod. around TEK Specs
& schematics.

Device Unclassified

Front panel re-done
removed most of V A Cases driven.
Cut out most of frame to fit
O. Ridge Cmpl.
n swp. removed quite a bit.
1 — swp. / Trigger
this requirement &
added space

installed

PULSE Accumulator circuit.
also associated with camera
trip -

Borrows enough power for
photo multiplier -

---

want to arrange to procure.
also arrange to have
O ridge man coming thru.

---

will want permission to
quote manual and schematics.

1 -

2 - call Craig

TEKTRONIX

MEMO

000-125

To Chuck Nolan Department _____ Date _____

Subject V-Radiation Spectrometer

Gordon Allison talked to Rad Lab at Livermore: he says they don't feel Oak Ridge RM 5 is accurate enough for them.

Name Will

Dept. _____

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION
UCC
POST OFFICE BOX Y
OAK RIDGE, TENNESSEE

July 21, 1958

Mr. Charles A. Nolan
Engineer-in-Charge
Custom Instruments Dept.
Tektronix Inc.
P. O. Box 831
Portland 7, Oregon

Dear Chuck:

I have received your letter of July 7th and have read your comments on the RM5. I am disappointed, of course, in the position in which you find yourself. However, things may not be entirely what they seem, and I want to pass on certain further comments.

We are not afraid to dig into a strange piece of gear, because we are a group of physicists and electronics people of considerable experience. (Although we are now in the Thermonuclear Experimental Division, this work was done while we were the Physical Electronics Group of the Physics Division of ORNL. George Kelley, who published an early article on a fast synchroscope in R.S.I. in 1947 is our group leader). In addition, Tektronix scopes are not strange to us because we have known them and used them for many years. We consider them to be the "only" oscilloscope for our kind of work. Consequently, when we were approached to design this particular piece of gear, the 515 was chosen as the logical vehicle to carry the little bit of specialized equipment that it did not ordinarily provide.

I agree with your field people in the undesirability of this instrument as a laboratory type gamma-ray spectrometer. Not only can the energy not be read very accurately, but neither can the relative intensities at the various energies. If we had intended to read intensity, we would have lengthened the pulse and displayed only a perfectly horizonatal straight trace. Then we would have used a gray wedge to estimate the intensities. However, the application in which this instrument is to be used cannot be disclosed at this time. Suffice it to say, that the design requirements were partially dictated by the application, and partly specified by us from our knowledge of the problem. We did not intend to imply that this instrument might become "commercial" in the ordinary sense.

cc- C.B.

I do mean to state that the quantity may become more or less commercial if the agency that is to use them finds them suitable for their purpose, and want to buy more. I do not think that it would ever become an instrument that you could put your name on and sell in the same manner that you do your oscilloscopes. I hope that this clears up any misunderstanding about the future of the machine. I should reiterate that the intended application is non-commercial, and can be considered research by a Federal agency. Also, our services in design and procurement for this agency are rendered at cost from Federal funds provided to us for the purpose.

We had hoped that if you made them for us it would be done on the same basis on which we have similar things done by the nuclear instrument companies. In these cases they are free to use the design afterwards, if they so choose, but they need to be identified with the instrument only as having made them on a contract basis to our exact specifications. Therefore, we are asking you to provide a service for us, for a fee, rather than asking you to establish a new marketable instrument line. If the agency wants to expand the use of these instruments, you would be the most logical vendor, having made the prototypes.

Our reasons for contacting you were threefold: First we wanted to clear with you against the possibility of any patent troubles, or at least to obtain from you a release to do this with your oscilloscope. The second reason was to see if you would build them for us, because if you did we would worry neither about the quality of the materials nor the workmanship. The important thing is that these instruments must work, and we felt that with your company we have a higher probability of this than with anyone else that we could think of at the time. Third, it occurred to us that in order to build them, you could intercept some 515 chassises at an early enough stage of manufacture to result in savings to the taxpayer. (We have a cost problem, since the auxiliaries-crystal camera, etc. - will cost nearly $1200 per instrument).

If your interest in this instrument continues I would like to go over the circuitry with you in very great detail. However, for right now I shall confine myself to a brief statement of why we removed your vertical amplifier. We did not mean to imply any incompetence in your amplifier. Rather, since we have a very specialized application, we replaced your vertical amplifier with a specialized amplifier for the purpose with which we have had considerable experience. First of all the linear amplifier must perform well a very definite function: namely it must provide a voltage output that is proportional to the integral of the charge input. The manner in which we do this is to integrate and amplify with feed-back. We then, by means of a delay line, differentiate, terminate the integration process. This is loosely called by some people "delay line differentiation." Since the useable signals at this point are small we then provide amplification with feed-back stabilization of the gain to raise the signal level. The second "differentiation," provides an equal and opposite latter half of the pulse. This is done to equalize the areas of the pulse above and below the base line, to minimize cycle shifts of the base line and to assist in the overload recovery. The entire amplifier should perform well under overloads of several hundred to one; that is to say, it should recover quickly and gracefully from an overload and not introduce any false initiations

of sweeps due to afterpulse artifacts introduced by the delay lines. Small "twiggles" introduced by delay line imperfections occur on all signals. When the signal in question is very large, the "twiggles" can appear as normal-sized signals. The overload performance of your amplifier is not necessarily inadequate, it is just that we felt it necessary to provide the necessary circuitry to perform these specialized functions in a manner that is well understood by us. Except for not providing these particular functions, the only inadequacy that I can find in your amplifier is the lack of feed-back. (If you are still interested in the problem, however, chances are that we can get together for a detailed discussion)

I hope that this additional comment and explanation refreshes your outlook on our problem and I anxiously hope that you can offer to build these machines for us. Of course you realize that we must put these out for bids, but if you can do it at all without modifying existing, completed 515 scopes it is very likely that you will be low bidder. Since we can use a criterion of quality, workmanship, etc. we are not necessarily confined to the low bid.

This letter is the basis for the phone call that I will make to you this day, and any additional comments that arise from the phone conversation are attached, and we desire, very greatly, to hear what your latest reaction is.

Sincerely,

Craig

Craig Harris
THERMONUCLEAR EXPERIMENTAL DIVISION

am
Enclosre 1

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE NUCLEAR COMPANY
DIVISION OF UNION CARBIDE CORPORATION
UCC
POST OFFICE BOX Y
OAK RIDGE, TENNESSEE

July 21, 1958

Dear Chuck:

It was good to talk to you again. I had meant to get to this sooner but things are pretty hectic here.

This is just a note to confirm some of the things we said in our phone call today. We will probably approach you with a request for bid when we have been informed that the money is available. Meanwhile certain items of redesign, namely, detector housing and shutter release mechanism have not been finished. However, that will be accomplished before we send out a request for bid.

We still hope, of course, that you people can contract to make these instruments for us. Your offer of partially completed instruments does open up some interesting possibilities. I realize that it would not result in a reduction in purchase price of such oscilloscope; it would enable us to deal with nuclear instrument companies that are more familar with this sort of thing, and who might find it a bit easier since they are already set up to do it. Such partly completed instruments would remove, of course, the labor and overhead charge on ripping out the unused items.

As far as drift in the instrument is concerned, drift should be equal to, or better than the original 515, since only the last group is DC connected. Of course, we talked about the fact that the continuator should be AC connected on the input side. This would remove the drift due to the second group and prevent possible shifts due to DC changes at the input of the last group caused by switching positions on the continuator.

Thank you for your time and we are eager to hear from you.

Sincerely,

Craig

Craig Harris

am

July 7, 1958

sent 7-14

Mr. Craig Harris
Thermonuclear Experimental Div.
Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, Tennessee

Dear Craig:

I've been intending to answer your letter, but it took longer than I anticipated to digest the information which you had sent. Your description of the RM5 equipment is certainly quite complete; and considering the limited time in which you had to work, you did a magnificent job. I was particularly impressed with the outward appearance of the instrument in the photograph. You fellows certainly aren't afraid to dig into a strange piece of gear, though I suppose before you finished, this was far from strange.

On paper this modification which you had described on the phone is a little more involved than I had anticipated. I can certainly see where there is a need for a device such as this. We have had inquiries over the past few years for an instrument of this type; however, in general we prefer to do our own circuit design. Did you find that the regular 515 amplifier did not perform adequately under the overload conditions which you had described?

Since your inquiry we have put out a "feeler" to our field people as to the advisability of producing an instrument of this type. We have recently received several answers which indicate that this specific type meets with some opposition, due to inability to read energy levels to the accuracy required. In the case of a new instrument useful in a field relatively foreign to us, particularly where the modification to a standard instrument is moderately complex, we need to have some assurance that this instrument might satisfy, or nearly satisfy, several users' needs.

This is not to say that we have cooled off, but rather we are wondering if you would accept anything but what you had described. From your rather complete description of the instrument you require, it's quite apparent that someone spent a lot of time arriving at the detailed changes necessary. Hence, I could understand your reluctance to consider

cc. C.B

anything else. I guess what it really boils down to is that we find ourselves between the devil and the deep blue sea in that we don't want to put our name on something which we have not designed ourselves, and in this case there would be a need for a lot of background work and understanding before we could intelligently know what we were shooting for. For ten instruments the outlook isn't too bright for justifying the time and effort expended unless we were reasonably certain that the completed instrument would satisfy the needs of others.

I would appreciate your reactions or comments, and I am sorry to sound a little bit discouraging.

Cordially,

TEKTRONIX, INC.

Charles A. Nolan
Engineer-in-Charge
Custom Instruments Dept.

CAN/dvm

cc: B.B./F.A.T.
W.M.

cc: C.B.

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE NUCLEAR COMPANY
UCC
POST OFFICE BOX X
OAK RIDGE, TENNESSEE

June 13, 1958

Mr. C. A. Nolan
Tektronix, Inc.
P. O. Box 831
Portland, Oregon

Dear Chuck:

Enclosed you will find the description of what we did to the 515 to make it into an RM-5. I am sorry I am so late in sending this, but I got in the position of having to do a rather complete description anyway for the purpose of describing it to the other possible bidders.

You will probably receive an inquiry from our Purchasing Department asking you to state an intention to bid. That is all we can do at the moment since we have no money right now. As soon as our money is available, we will put out a more complete description and an exact specification and ask for bids.

I believe that the enclosed material is quite descriptive of the instrument as it now stands. Before it is put out forfinal bids, however, we will redesign the detector unit to make a more portable, totally-enclosed unit. (The photograph showing the detector, shows the actual contents of the enclosed unit.) In addition, we will surely redesign the shutter release mechanism, and we might even come up with a more suitable camera. These cameras are frightfully expensive for the quality in them. I suppose it is the Polaroid back that makes them expensive. One thing we will almost sureful do in the final instrument is to put in a normally closed time delay relay to provide graticule illumination at the beginning of each photograph. One thing we would like to do if we can work it out is to have an illuminated numeral appear in the photograph to give a recorded indication of which energy range the amplifier is set on. Any ideas you have in this respect would be gratefully received.

I am enclosing a photograph (taped to the front of the description) that gives a sample of a spectrum photograph. The subject is the gamma radiation from Cs^{137} which has essentially a single energy of 661 kev. (The energy range is 0.9 Mev.) This line can be seen as well as the Compton distribution of partial interactions in the crystal. The undeflected base line can be seen at the bottom. This was inserted automatically by the action of the exposure counter.

CC; C.B.

We will be in touch with you in the future to ascertain your interests in making some of these and to discuss any details that seem appropriate. Please feel free to contact me if you have any questions.

Sincerely yours,

Craig Harris

Craig Harris
Thermonuclear Experimental Div.

CH:rb

Encl.

cc: C.B.

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE NUCLEAR COMPANY
A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
UCC
POST OFFICE BOX Y
OAK RIDGE, TENN.

May 19, 1958

Mr. C. A. Nolan
Tecktronix, Inc.
P. O. Box 831
Portland 7, Oregon

Dear Chuck:

I was glad to meet you by telephone last week and am happy to know that you are interested in our problem.

I promised to send you in crude form a description of the modifications which we did; however, I find that our descriptive material is so crude, at this point, that it would not make much sense to you. Therefore, I hope that you will forgive me if I delay long enough to make it more legible and to jot down sufficient descriptive words to accompany it.

Our Purchasing Department informs me that we cannot place a direct contract but must place it on bid. For this reason, they complained a little bit about my sending you this material. However, since we are going to have to place the item out for bids, and since each possible vendor will have the material to examine at great length, they will agree to my sending you the material if I inform them as to what was sent. I must say that the way in which the machine will be described will necessarily be to your advantage, but I do not feel that this is a calamity. I do hope to get the material out to you in about 10 days.

Thank you very much for calling and we certainly do appreciate your interest in this matter. You will be hearing from us soon.

Sincerely yours,

Craig

Craig Harris

CCH:dtp

cc: C. B.

October 16, 1958

Mr. C. C. Harris
Thermonuclear Experimental Division
Oak Ridge National Laboratory
P.O. Box X
Oak Ridge, Tennessee

Dear Craig:

In response to your letter of October 2, we would be willing to supply six to ten partial 515A Oscilloscopes as per your letter - in addition the instrument would not have a front panel included - at a price of $600 each for a minimum of six instruments, and at the present time not to exceed ten instruments.

Since it would be impractical to do a complete test job on the instruments, we would make certain the power supply is regulating and that the sweep generator functions, but that would be the extent of testing done by us.

Craig, you indicated that you would like the entire vertical amplifier omitted. It seems in our other correspondence you had intended to keep in the output amplifier.

Incidentally, one of our boys in Dallas, Texas had heard about this instrument and indicated he knew of a small company in Dallas which might be interested in bidding on this. The name of the firm is Summers and Mills, Inc., located at 911 West Commerce Street, Dallas, Texas. I don't know whether you would be interested in them, but this would be up to you.

Delivery of these partial instruments would likely take about six weeks.

Sincerely,

TEKTRONIX, INC.

Charles A. Nolan
Engineer-in-Charge
Custom Instruments Department

CAN/dvm
cc: W.M.
Handy Rayford
Chuck Bauffion

TEKTRONIX PD GA

311

Called

TEKTONIS DALLAS 10-13-58

MSG 1 TO CHUCK NOLAN

TWX DALLAS
OCT 13 1958

ADDRESS OF SUMMERS AND MILLS INC. IS ...

911 WEST COMMERCE STREET

DALLAS, TEXAS

OAK RIDGE NATIONAL LABORATORY

OPERATED BY

UNION CARBIDE NUCLEAR COMPANY

UCC

POST OFFICE BOX X

OAK RIDGE, TENNESSEE

October 2, 1958

Mr. Charles A. Nolan
Engineer-in-Charge
Custom Instruments Department
Tektronix, Inc.
P. O. Box 831
Portland 7, Oregon

Dear Chuck:

In confirmation of today's phone conversation, I would like to know if you can supply to our successful bidder on the RM5's the following:

Six to ten 515A oscilloscopes modified as follows:

1. VERTICAL AMPLIFIER. Omit entire vertical amplifier, including Sw 301, and Sw 321, up to R 390 and R 400. Omit R 390, R 398, R 399.

2. DELAY LINE. Leave in, complete.

3. CALIBRATOR. Omit entirely except for tube sockets.

4. SWEEP TRIGGER (or TIME BASE TRIGGER)
   Omit Sw 5, Sw 20
   R2, R3, R4, R5, R8, R9, R19, R21, R22, R23, R24, R25, R27, R28, R29, R39, R40
   C3, C4, C9, C20, C21

5. SWEEP TRIGGER (or TIME BASE GENERATOR)
   Omit. Sweep Timing Switch, Sw 155 and all attached components
   V180A and V180B except for socket

6. SWEEP AMPLIFIER (or HORIZONTAL AMPLIFIER)
   Omit. Sw 200, V 210
   R210, R211, R214, R215, R216, R238, R240
   C210, C215

7. POWER SUPPLIES. Leave in, complete.

It is realized that to remove all of the above might cause you inconvenience; therefore, we propose that you remove as much of the above as is possible. Those components that are switch-mounted should be easy to omit. To speed delivery I will not request that the vertical amplifier section be punched according to the new layout.

I would appreciate a statement from you as to just what you can conveniently supply. Since it is necessary for us to inform our prospective vendors as to supply and cost, it would help a great deal if you can give a rough idea of the cost. Some rough idea of delivery time would be of great help.

I would appreciate hearing from you at your earliest convenience.

Sincerely yours,

Craig

C. C. Harris
Thermonuclear Experimental Division

CCH:rlb

SUMMERS and MILLS, Inc.

Designers, Manufacturers

CUSTOM ELECTRONICS
APPARATUS AND SYSTEMS

911 WEST COMMERCE
DALLAS 8, TEXAS
PHONE RI 1-4246

9 December 1958

Mr. Will Marsh
Tektronix Inc.
Post Office Box 831
Portland 7, Oregon

Dear Will:

I'm sorry you had influenza - both because you didn't feel very well and because it kept me from getting to talk to you. Sandy and I are glad you are back on the job.

I am going to send in our bid on the 'scopes with the assumption that we buy complete units, amendment to be made later if justified. Delivery of the completed projects is desired by the Ides of March, and I feel that will not be possible if we throw something special at you. I feel, also, that their desire to eliminate all the sweep circuits will cost them just as much in the long run, since we will have to replace the circuits exclusive of the range selection. Nevertheless, I am including the specifications just as they wrote them and would appreciate a triplicated answer from you giving an estimate of cost and delivery of stripped down 'scopes as they wanted them. Their specs follow:

V. PROCUREMENT OF PARTS

A. The seller shall supply Tektronix, Inc. 10 partially completed 515A oscilloscopes according to the following specifications (part numbers refer to original Tektronix numbers):

1. Vertical Amplifier: Entire amplifier, with the exception of the output stage, will be omitted. All components up to the grids of V370A and V370B will be omitted. In addition, R390, R398, and R399 will be omitted.

2. Delay Line: Delay line will be installed.

3. Calibrator: The calibrator will be omitted.

4. Time base trigger and time base generator will be omitted, except for the tube sockets, which will have heater connections made. Socket for V180 will have heaters for a 6201 tube wired into the socket.

5. Horizontal Amplifier will be left out up to grids of V250A and V270A. Omitted will be R256, R257, R258, R259 and C260. Socket for V210 will be left in and heaters wired.

6. Power supplies shall be included.

7. CRT circuit shall contain type T55P11CRT installed.

8. The above instruments are to be provided without outer front panels.

9. The seller shall supply ten 515A instruction books, ten blank panels (Sec. IV, Par. B8), and ten blank graticules.

My comments are as follows and, if you concur on any or all of them, a written statement to that effect will add weight to my decision:

1. Leaving out vertical amplifier is fine but it may have to be installed for you to test the delay line. See 2 below.

forget

2. Sandy tells me that a delay line is something you don't just throw in. The delay line is the only part of the 'scope we would be unable to adjust easily. Sandy admits he may be wrong on this matter.

no cal.

3. It seems the calibrator could be left out if nothing else could. Would doing so cause delay, however?

4. I feel that for us to put these back, even though they would be simpler, would cost more than the sum of modification by us and the amount you would reduce the price if you did leave out the sweep circuits. What's more, the sweep circuit would be checked out on a production line basis. A further problem if you left out the horizontal circuits as specified would be our procurement of the correct ceramic terminal strips unless they are installed at the same time as the tube sockets.

will throw in ceramic strips

5. Comment 4 above applies here also.

6. No comment.

7. No comment except we want to make sure that any 'scopes received on this job have the new light shields to prevent light leaks from inside the instrument.

9 December 1958

8. Perhaps you check instruments before front panels are installed. In that case you could deliver instruments without front panels.

9. You could at the very least leave out the probes from a standard package. The blank panel will definitely be needed and would be desired with the CRT hole and graticule studs in place if practicable. We can make the studs, but prefer to buy them from you even if we have to install them. Also provide the knurled nuts for the studs.

In summation, please quote as follows: (ALL CRT'S TO HAVE P-11 Phosphor)

1. Ten 515A instruments stripped as per above specifications. Include cost of blank panel, studs, and knurled nuts. Also include cost of ceramic component strips.

$600
$5

2. Ten complete instruments less probes but including ten blank panels, forty studs, and forty knurled knobs.

3. Any stripped down combination on which you would be more interested in quoting than telephone communications have indicated would be your interest in 1 above. I suggest consideration of leaving out the calibrator for example.

As I have said, we have to have our quote in by December 16th. We are thus quoting as though we were getting complete instruments, but I will leave the way open for a reduction if you find one justified.

Give my regards to Earl and to his and your families. A Very Merry Christmas to all.

Sincerely,

SUMMERS AND MILLS, INC.

Gerald C. Summers, Vice President

GCS:prs
cc: C. V. Sanford

$5 - Anodized Blank overlays
2.50 Blank Sub Panels

5-13-58

HOME PHONE OAK RIDGE 5-1723

MR. CRAIG C HARRIS. OAK RIDGE TENNESSEE.
(PHYSICS & ELECTRONICS GROUP)

SPECIAL 515 (10 INITIALLY)

GAMMA RAY SPECTROMETER

VERT. DISPL ≈ ENERGY. GAMMA RAY

1) RIPPED OUT VERT AMPL 1.2 μ SEC
2) FIXED SWEEP
3) WOULD USE TEK LITERATURE

(1) LINEAR AMPL VOLT. OUT ∝ CHG.
3 FB LOOPS
GOOD RECOVERY CAPABILITIES

WILL SEND COMPLETE DESCRIPTION ON THIS IN DAY OR SO.

HOME ADDRESS
129 PEMBROKE RD.
OAK RIDGE, TENNESSEE

TRY TO SEND ROUGH COST SHORTLY AFTER RECEIPT OF DESCRIPTION OF CHANGE.

10-27-68

CRAIG HARRIS — OAK RIDGE

515 PARTIAL

HEATERS ~~ONLY~~ WIRED ON SWP DECK

NEED TWO 11 SLOT STRIPS

LIMITED TO 10 UNITS

WILL DROP LINE TO US CONFIRM

WILL SEND DOPE ON SPECIAL RESISTORS.

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE NUCLEAR COMPANY
UCC
POST OFFICE BOX X
OAK RIDGE, TENNESSEE

October 28, 1958

Mr. Charles A. Nolan
Engineer-in-Charge
Custom Instruments Department
Tektronix, Inc.
P. O. Box 831
Portland 7, Oregon

Dear Chuck:

Thank you for your letter of October 16, and for your offer to sell to our vendor ten partial 515 oscilloscopes. We appreciate this offer very much.

At the risk of pushing your generosity too far, I would like to propose a change in the degree of completion. It has come to my attention that considerable relocation is necessary on the sweep deck in order to get in all of the components for the exposure counter in the RM5. It is believed that a substantial saving in labor can be achieved if the sweep deck is unwired except for heaters. Therefore, our proposal of October 2 would now read:

Ten 515A oscilloscopes modified as follows:

1. VERTICAL AMPLIFIER: Omit entire amplifier with the exception of the output stage. This means omission of SW301 and SW321, and all components up to the grids of V370A and V370B. Also omit R390, R398, R399.

2. DELAY LINE: Leave in, complete.

3. CALIBRATOR: Omit entirely.

4. SWEEP TRIGGER (or TIME BASE TRIGGER), and SWEEP GENERATOR (or TIME BASE GENERATOR): Omit completely except for tube sockets, heaters wired.

5. SWEEP AMPLIFIER (or HORIZONTAL AMPLIFIER): Leave in output stage, omit all else up to grids of V250A and V270A. Leave socket for V210 and wire heaters. Omit R256, R257, R258, R259, and C260.

6. POWER SUPPLIES: Leave in, complete.

7. CRT CIRCUIT: Leave in complete.

The enclosed sketch shows the sweep deck of the RM5. We would like to have the sockets mounted and heaters wired for the tubes noted. We would like to have the terminal strips mounted. We can mount the sockets for V830, V840, and V850, and tie on to the heater bus, ourselves. It would be nice, however, to have mounted by you, two 10-terminal strips in the location shown, by V840 and V850. Please note that with only one exception, our V820, the heater wiring is the same as in the original 515A.

It is realized that this leaves you very little to test for proper operation. However, if you can load the power supplies and get them working, we will take the responsibility for the rest. Our vendor will make these instruments on a construction specification only. We will get them working and make the alignment here at ORNL.

It is also realized that to sell an "inoperative" instrument probably is a breach of your policy, and we deeply appreciate your willingness to help us out. Believe me, it is in a good cause.

Please let me know on this as soon as is convenient.

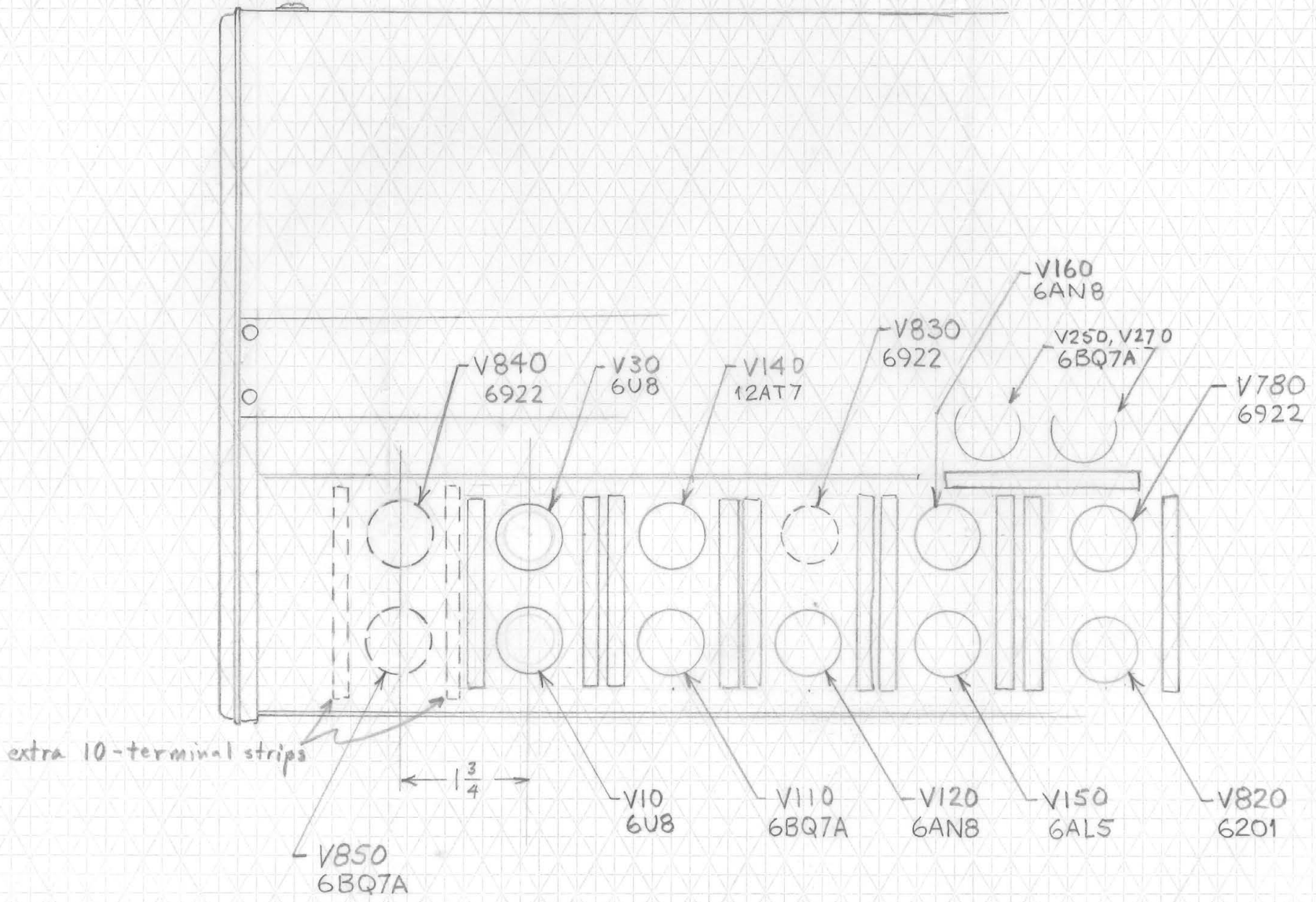
Sincerely yours,

C. C. Harris
Thermonuclear Experimental Division

CCH:rlb

Enclosure

Euclid
Nolan



Top View RA15
cabt

T

TEKTRONIX PD GA

TEKTRONIX MISSION KAN 12-10-58

MSG TO RON GOARD

HAVE WE MADE A QUOTE TO ANYONE ON A PARTIALLY COMPLETED TEK TYPE515A TO BE USED IN A SETUP FOR OAK RIDGE TENNESSEE UNDER THEIR REQUEST FOR QUOTE - XX A24212-71, SECTION VA RM5 REVISION 0, ITEMS ONE TO NINE.

IF WE HAVE QUOTED TO SOMEONE -- HOW MUCH ETC END OR GA

WILL CHECK AND LET U KNOW.

WUDNT KNOW HUOW MUCH UNLESS WE KNEW WHAT THE ITEMS WERE THO.

IF I CANT FIND RECORD OF THIS, WUD U LIKE FOR

YES I WAS.

WAS GOING TO SAY IF WE CUDNT FIND RECORD, DO U WANT TO LIST THE PARTS AND WE LL FIND OUT IF WE CAN DO, WILL DO AND PRICES

GA

TWX KC
DEC 10 1958

THIS IS FOR A CUSTOMER WHO TALKED TO GEOFF AND THE CUSTOMER SEEMS REAL POSITIVE THAT TEK HAS HAD WORD OF THIS PARTICULAR JOB FROM SOMEWHERE ELSE AND WILL KNO ALL ABOUT WHAT THE PARTIALLY COMPLETE 515A IS SUPPOSED TO CONSIST OF. RON IS THE ONLY ONE WHO MITE KNO AS GEORGE IS HERE AND THEY HAVENT HEARD OF IT IN CHI. GEOFF SAYS THE MAN HAS PUT A COPY OF THE SPECS FOR THE WHOLE SET UP O XX IN THE MAIP

FOR US AND THAT IT INCLUDES THE 515A WE SHUD GET THIS TOMORROW AND IF RON DOESNT KNO ANYTHING ABOUT THIS WHEN U CALL BACK WELL EITHER TWX MORE INFO TOMORROW OR TELECALL TO HIM OK HUH

GA

OK WILL LET U KNOW

END ER

BY THE WAY THIS CO MUST HAVE THEIR QUOTE IN THE MAIL NO LATER THAN THIS FRI PM SO THAT IS THE REASON FOR THE HURRY UPL

END LB

VEND ER

advise Geoff to
call Chuck Nolan re- this.

Ron

ADVISED GEOFF
FRI 12/12/58

Attn: Chuck Nolan

December 12, 1958

Designs for Tomorrow
6425 Etzel Avenue
St. Louis, Missouri

Attention: Mr. Stropes

Dear Mr. Stropes:

This will confirm our telephone conversation of this afternoon in which I gave you the following quotation.

10 each Partially completed Tektronix Type 515A Oscilloscopes per specifications agreed on with Mr. Craig Harris - Instruments only (including Instruction Manuals) . .	$6000.00
10 each Blank Front Panels (unpunched)	$ 50.00
	$6050.00

Also Available if necessary:

10 each Blank Front Subpanels (unpunched)	$ 25.00

Tektronix terms are Net Thirty Days, F.O.B. factory, Portland, Oregon.

Estimated shipping charges via REA (580#).	$ 110.00

As Mrs. Boyd explained to you shipping charges via over-the-road methods are some cheaper; however, there is less possibility of shipping damages via REA. We will be happy to ship via whatever method you specify.

20 each Tek #114-055 Variable Coil . .($1.75 ea.).	$ 35.00

It should be understood that the figures quoted here apply only to this specific arrangement made as an accomodation to Mr. Harris, and would not apply to future orders for the same materials.

The estimated shipment capability of approximately six weeks, which I gave you in our telephone conversation, is, as I explained, a very broad estimate and may vary from this figure.

If we can help you further, Mr. Stropes, feel free to call any time.

Sincerely yours,

Geoffrey A. Gass, Field Engineer

GAG: lmb

Scotty Pyle December 10, 1958

Bill Ewin

Oak Ridge Radiation Spectrometer
Ref: IOC from Will Marsh to Scotty Pyle, 6/24/58
IOC from Howard King to Harry Allison, 9/5/58

Dear Scotty:

The Radiation Spectrometer mentioned in the papers forwarded by Will to you on 6/24/58, and passed around the division, sounds peculiarly like something we have been asked to quote on here in Philadelphia.

Nuclear Electronics Corp., (a slow-account of long standing, by the way) through a Mr. Long, has asked for a quote on 10 - 515A's, including 10 blank front panels, which will be extensively reworked along lines similar to the ones outlined here. This is to be a government job.

Have not had a chance to pin this down exactly or to scout around among the other groups here. Will certainly do so. Will inform you by IOC of any further developments here.

Best regards,

Bill

WHE:DS
cc:Will Marsh

December 12, 1958

Mr. Gerald C. Summers
Summers and Mills, Inc.
911 West Commerce
Dallas 8, Texas

Dear Jerry,

Thanks for your note---since time is short I'll get right down to the meat of the problem.

The best quote we can make timewise, is to quote the regular 515A plus blank panels, graticule studs and nuts, and less probes, for $750 each, shipment within three weeks or sooner after receipt of order. For ten instruments there would be 2% quantity discount.

For "Option A", according to the enclosed sheet (this is the same as outlined in your letter, except more detail) the charge would be $600 per instrument, plus $5 each for blank panels, blank graticules, graticule studs and nuts, and additional ceramic strips. The lumpy part of this deal is the shipment delay; it will take at least six weeks, and possibly longer to process the special leaving-out features. Also, no quantity discount on these specials.

All quotations are FOB Portland.

We have had several inquiries about this, so other people are interested.

As I understand it, your invitation from Oak Ridge is for untested units. I think you would be buying trouble for quoting units complete and tested because this is where you can easily get into unanticipated difficulties, and I doubt very much if any other bidder will suggest this.

On your comments:

1. The delay lines are pre-tweaked before going into scopes. Adjusting the line to an arbitrary amplifier wouldn't buy anything.

2. See above.

3. No more delay to leave out calibrator.

4. If you pull all this stuff out, your pretest won't be completely valid anyhow. We will throw in necessary ceramic strips.

5. Same.

6. OK.

7. Fil, OK.

8. Right.

9. OK, per quote above.

It's too late to modify the conditions of Option A now, Jerry; we have to quote the same to all comers, and time is getting thin.

I hope this works out a little smoother than it looks from here.

Best of luck,

TEKTRONIX, INC.

Will Marsh
Service Manager

WM/ej
enc.

cc: Tektronix, Inc.
6211 Denton Drive
P. O. Box 35104
Dallas 35, Texas

OPTION A.

1. VERTICAL AMPLIFIER. Omit entire vertical amplifier, including SW301 and SW321, up to R390 and R400. Omit R390, R398, R399.

2. DELAY LINE. Leave in, complete.

3. CALIBRATOR. Omit entirely except for tube sockets.

4. SWEEP TRIGGER (or TIME BASE TRIGGER)
   Omit SW5, SW20
   R2, R3, R4, R5, R8, R19, R21, R22, R23, R24, R25, R27, R28, R29, R39, R40
   C3, C4, C9, C20, C21

5. SWEEP TRIGGER (or TIME BASE GENERATOR)
   Omit Sweep Timing Switch, SW155 and all attached components
   V180A and V180B except for socket

6. SWEEP AMPLIFIER (or HORIZONTAL AMPLIFIER)
   Omit SW200, V210
   R210, R211, R214, R215, R216, R238, R240
   C210, C215

7. POWER SUPPLIES. Leave in, complete.