

SECTION VI DIAGRAMS

6-1. INTRODUCTION. This section contains diagrams and associated data for maintaining the instrument. Included are front and rear panel control, connector, and indicator layouts; schematic diagrams with voltages and waveforms, and circuit board layouts with grid chart component locators.

6-2. ARRANGEMENT.

a. Schematic Diagrams. Schematic diagrams are drawn to group circuit functions; therefore, any one diagram may include portions of any number of circuit boards or assemblies. To aid in tracing circuits from one diagram to another, each diagram is identified with a name and a number in a diamond shaped box. Circuits going from one diagram to another identify the destination component and destination diagram number.

b. Symbols and Reference Designators.

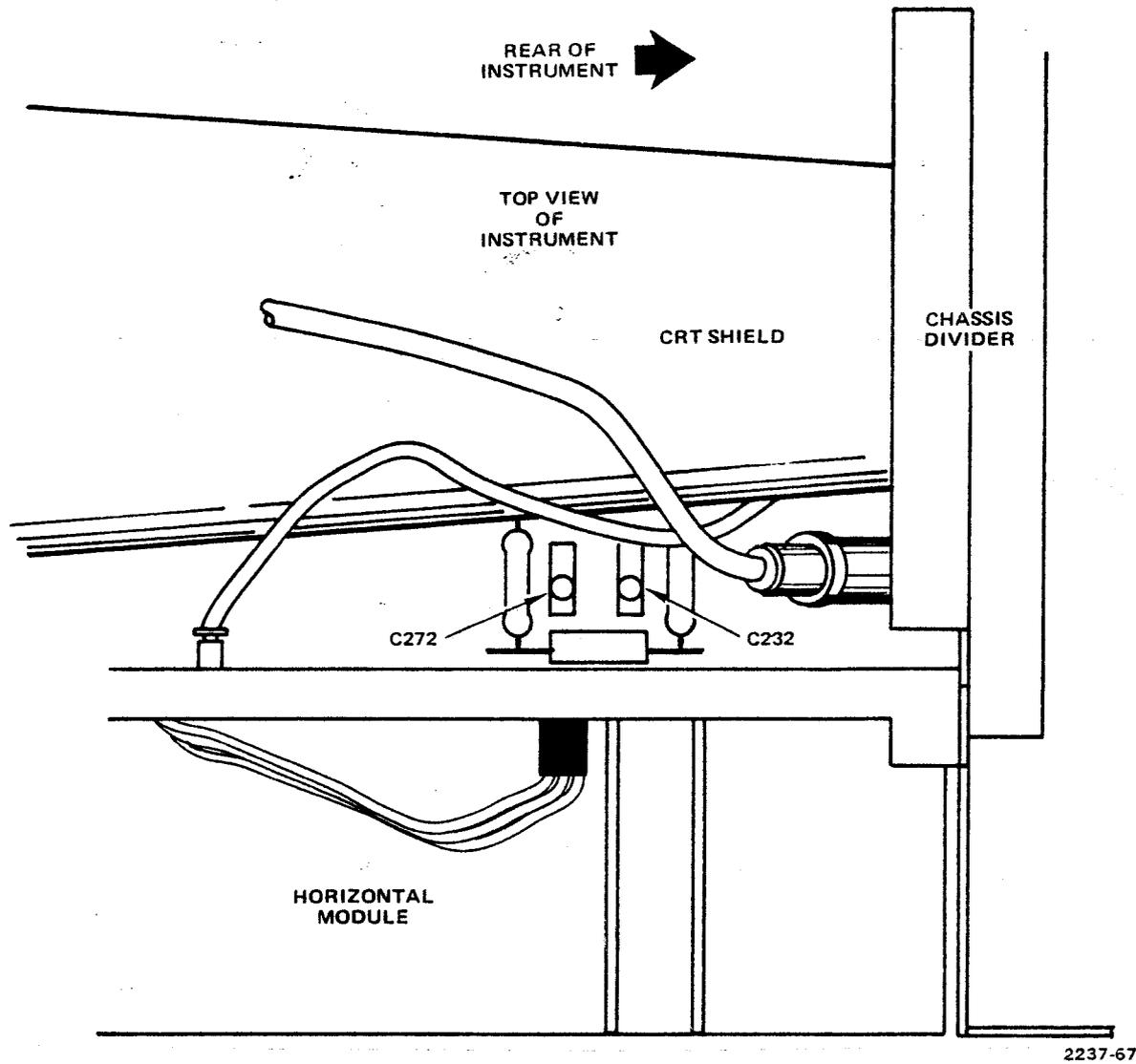
(1) Electrical components shown on the diagrams are in the following units unless noted otherwise.

Capacitors	Values one or greater are in picofarads (pF). Values less than one are in microfarads (μ F).
Resistors	Ohms (Ω).

(2) Table 6-1 is a partial listing of prefix letters used as reference designators. These are used to identify components or assemblies on the diagrams. A complete listing is contained in MIL STD 16 and also in the ANSI standard.

Table 6-1. Reference Designators

REFERENCE DESIGNATOR	DESCRIPTION	REFERENCE DESIGNATOR	DESCRIPTION
A	Assembly, separable or repairable (circuit board, etc.)	LR	Inductor/resistor combination
AT	Attenuator, fixed or variable	M	Meter
B	Motor	P	Connector, movable portion
BT	Battery	Q	Transistor or silicone-controlled rectifier
C	Capacitor, fixed or variable	R	Resistor, fixed or variable
CB	Circuit breaker	RT	Thermistor
CR	Diode, signal or rectifier	S	Switch or contactor
DL	Delay line	T	Transformer
DS	indicating device (lamp)	TC	Thermocouple
E	Spark Gap, Ferrite bead	TP	Test point
F	Fuse	U	Assembly, inseparable or nonrepairable (integrated circuit, etc.)
FL	Filter	V	Electron tube
H	Heat dissipating device (heat sink, heat radiator, etc.)	VR	Voltage regulator (zener diode, etc.)
HR	Heater	W	Wirestrap or cable
HY	Hybrid circuit	Y	Crystal
J	Connector, stationary portion	Z	Phase shifter
K	Relay		
L	Inductor, fixed or variable		



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Figure 5-24. 5 nanosecond timing adjustment locations.

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(10) Very slightly adjust C2784 so the time marker aligns with the center vertical graticule line.

INTERACTION NOTE

C2784 and C2684 may interact; therefore, repeat this procedure until no further adjustment is needed.

(11) Set DELAY TIME POS to 0.0.

(12) Continue to the next procedure.

t. 5 ns Timing (Figure 5-24).

(1) Set controls as follows:

HORIZ DISPLAY	A
A AND B TIME/DIV	.05 μ s
X10 MAG	In (on)

(2) Set time mark generator for 10 nanosecond time markers.

(3) Adjust C232 and C272 for one time marker per two divisions.

INTERACTION NOTE

The adjustment screws for C232 and C272 should be adjusted to about the same height; otherwise horizontal linearity may be degraded.

(4) Check the beginning and end of the .05 microsecond sweep using step 19 in Table 5-1 and excluding the first and last 40 nanoseconds of the sweep. If necessary, slightly readjust C232 and C272 for one time marker per two divisions.

(5) Disconnect the generator.

u. X Gain (Figure 5-22).

(1) Set controls as follows:

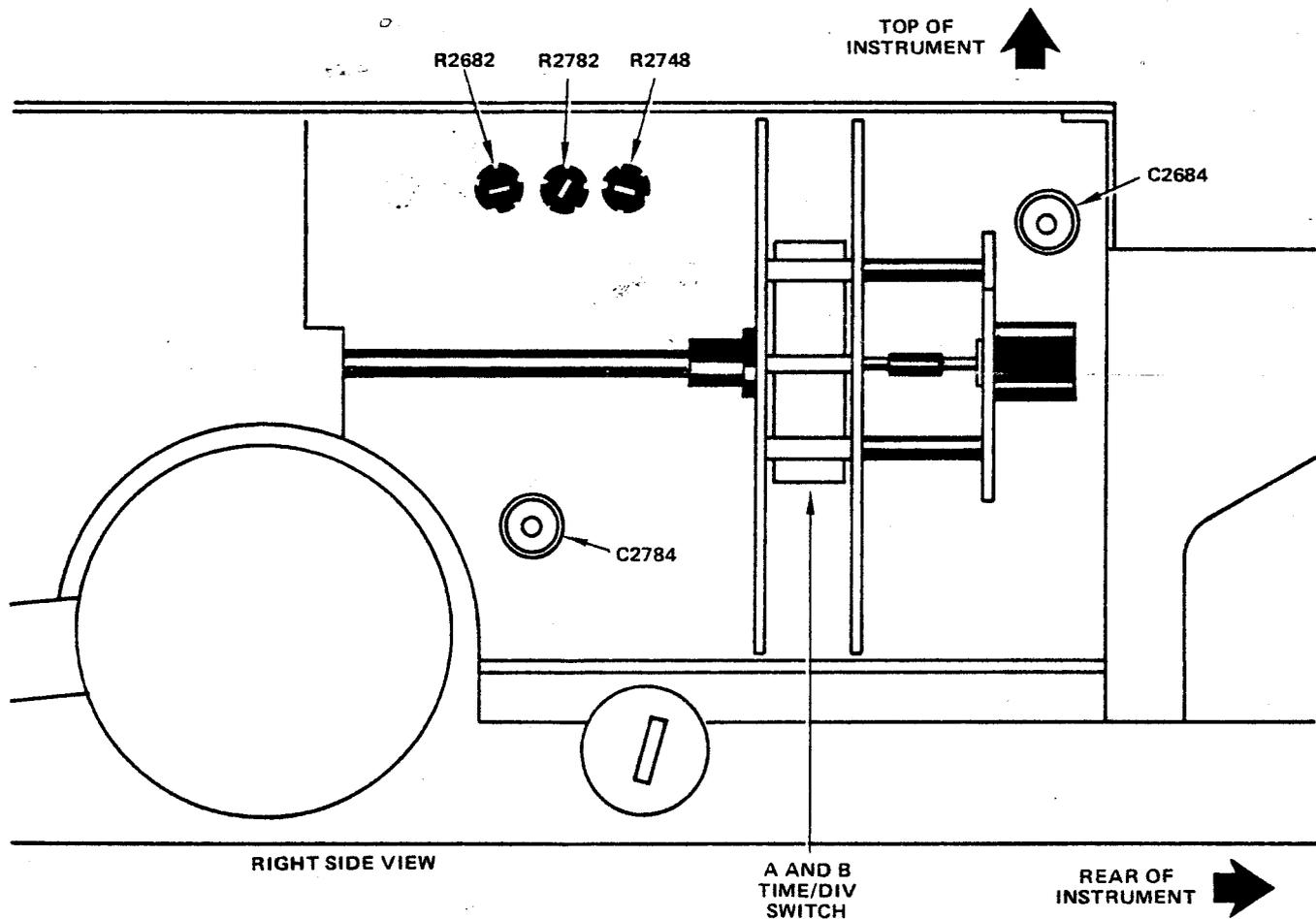
CH 1 VOLTS/DIV	5 m
VERT MODE	CH 2
A AND B TIME/DIV	X-Y
X10 MAG	Out (off)

(2) Connect a calibration generator STD AMPL OUTPUT to the CH 1 input through a 50 ohm BNC cable. Set the generator for a 50 millivolt output.

(3) Adjust X GAIN, R2916 for a 10-division (horizontal) display.

(4) Disconnect the generator.

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Figure 5-23. Sweep adjustment locations.

(2) Set time mark generator for one millisecond time markers.

(3) Set horizontal POSITION to align the first time marker with the left graticule line.

(4) Adjust R2782 for one time marker per division.

(5) Continue to the next procedure.

s. $.5 \mu\text{s}$ Timing (Figure 5-23).

(1) Set A TIME/DIV to $.5 \mu\text{s}$ and HORIZ DISPLAY to A.

(2) Set time mark generator for 0.5 microsecond time markers.

(3) Adjust C2784 for one time marker per division.

(4) Set HORIZ DISPLAY to B DLY'D.

(5) Set DELAY TIME POS to 1.00, then rotate it toward 0.0 until there is one time marker per division and a time marker is aligned with the left vertical graticule line.

(6) Adjust C2684 for one time marker per division.

(7) Set B TIME/DIV to $.05 \mu\text{s}$ and DELAY TIME POS to 1.00.

(8) Adjust horizontal POSITION and align the time marker with the center vertical graticule line.

(9) Set DELAY TIME POS to 9.00.

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INTERACTION NOTE

R2782 and R2748 may interact with each other; therefore, repeat steps (8) through (11) until no further adjustment is needed.

(12) Set DELAY TIME POS to 0.0.

(13) Continue to the next procedure.

p. Horizontal Gain (Figure 5-22).

(1) Set HORIZ DISPLAY to A.

(2) Adjust X1 GAIN, R2923 until the 1st and 11th time markers are exactly aligned with a graticule line. There should be one time marker per division within 0.25 minor divisions.

(3) Set X10 Mag to In (on).

(4) Set time mark generator for .1 ms time markers.

(5) Adjust X10 GAIN, R2925 for one time marker per division.

(6) Continue to the next procedure.

q. Magnifier Registration (Figure 5-22).

(1) Set X10 MAG to In (on).

(2) Adjust horizontal POSITION until the sweep starts at the center vertical graticule line.

(3) Set X10 MAG to Out (off).

(4) Adjust MAG REG, R2932 until the sweep starts at the center vertical graticule line.

INTERACTION NOTE

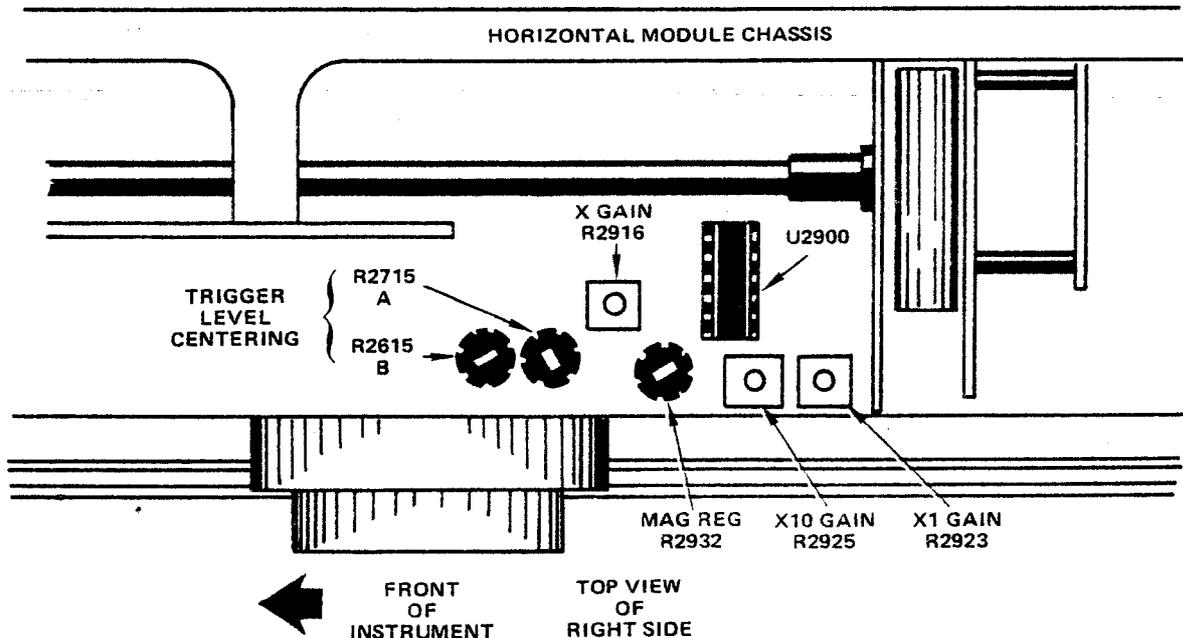
R2932 and horizontal POSITION may interact; therefore, repeat steps (1) through (4) until no further adjustment of R2932 is needed.

(5) Continue to the next procedure.

r. B Sweep Timing (Figure 5-23).

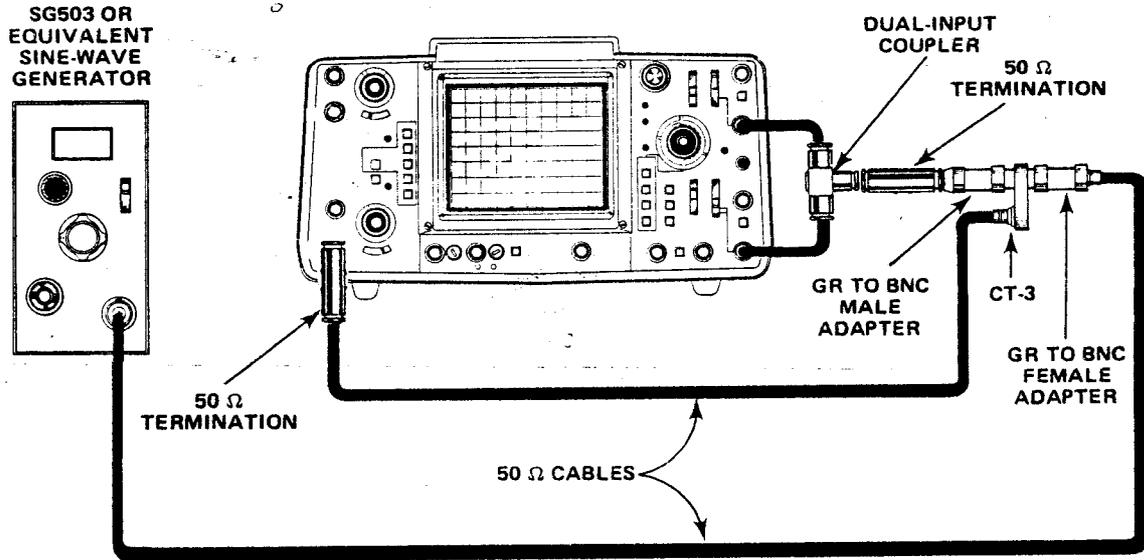
(1) Set controls as follows:

X10 MAG	Out (off)
A AND B TIME/DIV	1 ms
HORIZ DISPLAY	B DLY'D



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Figure 5-22. Trigger and horizontal adjustment locations.



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Figure 5-21. External trigger centering setup.

(9) Set B COUPLING to DC.

(10) Adjust B TRIGGER LEVEL CENTERING, R2615 for a stable display.

INTERACTION NOTE

B LEVEL and R2615 may interact with each other; therefore, repeat steps (2) through (5) until no further adjustment of R2615 is needed.

(11) Disconnect the sine wave generator.

o. Sweep Start-Stop (Figure 5-23).

(1) Set controls as follows:

VERT MODE	CH 1
CH 1 VOLTS/DIV	.5
A TIME/DIV	1 ms
B TIME/DIV	5 μs
HORIZ DISPLAY	A INTEN
A SOURCE	NORM
B SOURCE	STARTS AFTER
	DELAY
COUPLING	AC

(2) Connect a time mark generator to the CH 1 input through a 50 ohm BNC cable and 50 ohm termination. Set the generator for 1 millisecond time markers.

(3) Set DELAY TIME POS to 1.00.

(4) Adjust R2782 so the second time marker is intensified.

(5) Set DELAY TIME POS to 9.00.

(6) Adjust R2748 so the tenth time marker is intensified.

INTERACTION NOTE

R2782 and R2748 may interact with each other; therefore, repeat steps (3) through (6) until no further adjustment is needed.

(7) Set HORIZ DISPLAY to B DLY'D and horizontally position the start of sweep within the graticule area.

(8) Set DELAY TIME POS to 1.00.

(9) Very slightly adjust R2782 until the time marker starts at the beginning of the sweep.

(10) Set DELAY TIME POS to 9.00.

(11) Very slightly adjust R2748 until the time marker starts at the beginning of the sweep.

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NOTE

When making the next adjustment, set CH 2 VOLTS/DIV to .1 for a 0.2 division signal and .2 for a 0.1 division signal.

(6) Adjust R2245 and A LEVEL so a stable display is obtained with a 0.2-division display, but not with a 0.1-division display.

NOTE

If R2245 is set too sensitive, double triggering may occur at low frequencies. To desensitize R2245, adjust A LEVEL until the display just double triggers. Then slightly readjust R2245 until the double triggering disappears.

(7) Set CH 2 VOLTS/DIV to 5 m and A AND B TIME/DIV to 5 μ s.

(8) Repeat step (4) above.

(9) Set CH 2 VOLTS/DIV to 20 m and adjust A LEVEL for a stable display.

(10) Set controls as follows:

VERT MODE	CH 1
HORIZ MODE	B DLY'D
B SOURCE	CH 1
B LEVEL	0
A AND B TIME/DIV	5 μ s

(11) Set R2185 to midrange.

(12) Adjust R2183 so trace starts at the same point when switching B SLOPE between - (in) and + (out).

(13) Set CH 1 VOLTS/DIV to .1, A AND B TIME/DIV to 50 μ s, and B SLOPE to + (out).

NOTE

When making the next adjustment, set CH 1 VOLTS/DIV to .1 for a 0.2-division display and .2 for a 0.1-division display.

(14) Adjust R2185 and B LEVEL so a stable display is obtained with a 0.2-division display, but not with a 0.1-division display.

NOTE

If R2185 is set too sensitive, double triggering may occur at low frequencies. To desensitize R2185, adjust B LEVEL until the display just double triggers, then slightly readjust R2185 until the double triggering disappears.

(15) Set CH 1 VOLTS/DIV to 5 m and A AND B TIME/DIV to 5 μ s.

(16) Repeat step (12) above.

(17) Disconnect the generator.

n. External Trigger Centering (Figures 5-21 and 5-22).

(1) Set controls as follows:

CH 2 VOLTS/DIV	5 m
VERT MODE	CH 2
HORIZ DISPLAY	A
A AND B TIME/DIV	5 μ s
A SOURCE	EXT
B SOURCE	EXT

(2) Set A COUPLING to AC.

(3) Adjust A LEVEL for a stable display.

(4) Set A COUPLING to DC.

(5) Adjust A TRIGGER LEVEL CENTERING, R2715 for a stable display.

INTERACTION NOTE

A LEVEL and R2715 may interact with each other; therefore, repeat steps (2) through (5) until no further adjustment of R2715 is needed.

(6) Set HORIZ DISPLAY to B DLY'D

(7) Set B COUPLING to AC.

(8) Adjust B LEVEL for a stable display.

(20) Move the generator output from CH 2 input to CH 1 input.

(21) Set CH 1 VOLTS/DIV to 5 m and VERT MODE to CH 1.

(22) Adjust CH 1 vertical POSITION so top of waveform is on the center horizontal graticule line.

(23) Adjust C4173, R4173, C4174, and R4174 for the best transient response of the waveform. Total aberrations should not exceed $\pm 3\%$ or 3% peak-to-peak (+0.15 division, -0.15 division, or 0.15 division peak-to-peak).

INTERACTION NOTE

If CH 1 response cannot be adjusted within requirements, very slightly touch up the adjustment in step (12) above. Then recheck the CH 2 response and rise time of both channels.

(24) Set CH 1 VOLTS/DIV to 20 m and TIME/DIV to .1 μ s.

(25) Adjust R4167 for the best front corner of the waveform.

(25.1) Set CH 1 VOLTS/DIV to 50 m.

(25.2) Adjust generator for a 5-division display.

(25.3) Adjust R4108 for the best flat top on the front corner of the waveform.

(26) Set CH 1 VOLTS/DIV to .5.

(27) Remove the 10X attenuator from the CH 1 input.

(28) Adjust R4106 for the best front corner of the waveform.

(29) Disconnect the generator.

m. Trigger Hysteresis and Slope Centering (Figure 5-20).

(1) Set controls as follows:

VOLTS/DIV	5 m
A AND B TIME/DIV	5 μ s
X10 MAG	Out (off)
VERT MODE	CH 2
A LEVEL	0
A SOURCE	CH 2

(2) Connect a sine wave generator to CH 1 and CH 2 through a 50 ohm BNC cable, 50 ohm termination, and dual input coupler. Set the output for 50 kilohertz and adjust for a 4-division display.

(3) Set R2245 at midrange.

(4) Adjust R2249 so trace starts at the same point when switching A SLOPE between - (in) and + (out).

(5) Set CH 2 VOLTS/DIV to .1, A AND B TIME/DIV to 50 μ s, and A SLOPE to + (out).

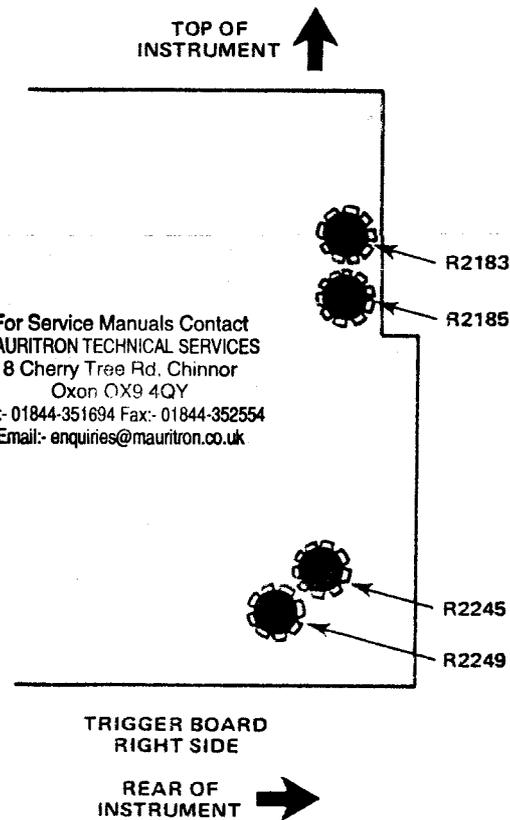


Figure 5-20. Trigger hysteresis and slope centering adjustment locations.

Maintenance Instructions—465M

(3) Set the generator output level for a 5-division display. During adjustments, reset the generator output as necessary to maintain a 5-division display.

NOTE

Use a low capacitance tuning tool when making compensation adjustments.

(4) Adjust C4101 for the best flat top waveform.

(5) Set CH 1 VOLTS/DIV to 50 m and readjust the generator for a 5-division display.

(6) Adjust C4108 for the best flat top, and C4107 for the best front corner on the waveform. Alternately readjust both capacitors for the best overall waveform response.

(7) Set CH 1 VOLTS/DIV to .5, remove the 10X attenuator, and readjust the generator for a 5-division display.

(8) Adjust C4105 for the best flat top, and C4104 for the best front corner on the waveform. Alternately readjust both capacitors for the best overall waveform response.

(9) Continue to the next procedure.

I. High-Frequency Compensation (Figure 5-19).

(1) Move the output of the square wave generator to its positive going, FAST RISE OUTPUT.

(2) Set CH 2 VOLTS/DIV to 5 m and VERT MODE to CH 2.

(3) Disconnect the square wave generator output from the CH 1 input, remove the input RC normalizer, install the 10X attenuator between the BNC cable and termination, and connect the generator output to CH 2. Set the generator output to 1 kilohertz and adjust for a 5-division display. During adjustments, maintain a 5-division display.

(4) Adjust R4406 for the best flat top on the waveform.

(5) Set TIME/DIV to 20 μ s.

(6) Set generator to 10 kilohertz and adjust for a 5-division display.

(7) Adjust C4405 for the best flat top on the waveform.

(8) Set TIME/DIV to .1 μ s.

(9) Set generator for 100 kilohertz and adjust for a 5-division display.

(10) Push in X10 MAG (on).

(11) Adjust CH 2 vertical POSITION so top of waveform is on the center horizontal graticule line.

(12) Adjust C4271, R4410, C4410, C4342, C4412, C4447, and R4447 for the best front corner of the waveform. Total aberrations should not exceed $\pm 3\%$ or 3% peak-to-peak (+0.15 division, -0.15 division, or 0.15 division peak-to-peak).

(13) Set CH 2 VOLTS/DIV to 20 m.

(14) Adjust generator for a 5-division display.

(15) Adjust R4267 for the best front corner of the waveform.

(15.1) Set CH 2 VOLTS/DIV to 50 m.

(15.2) Adjust generator for a 5-division display.

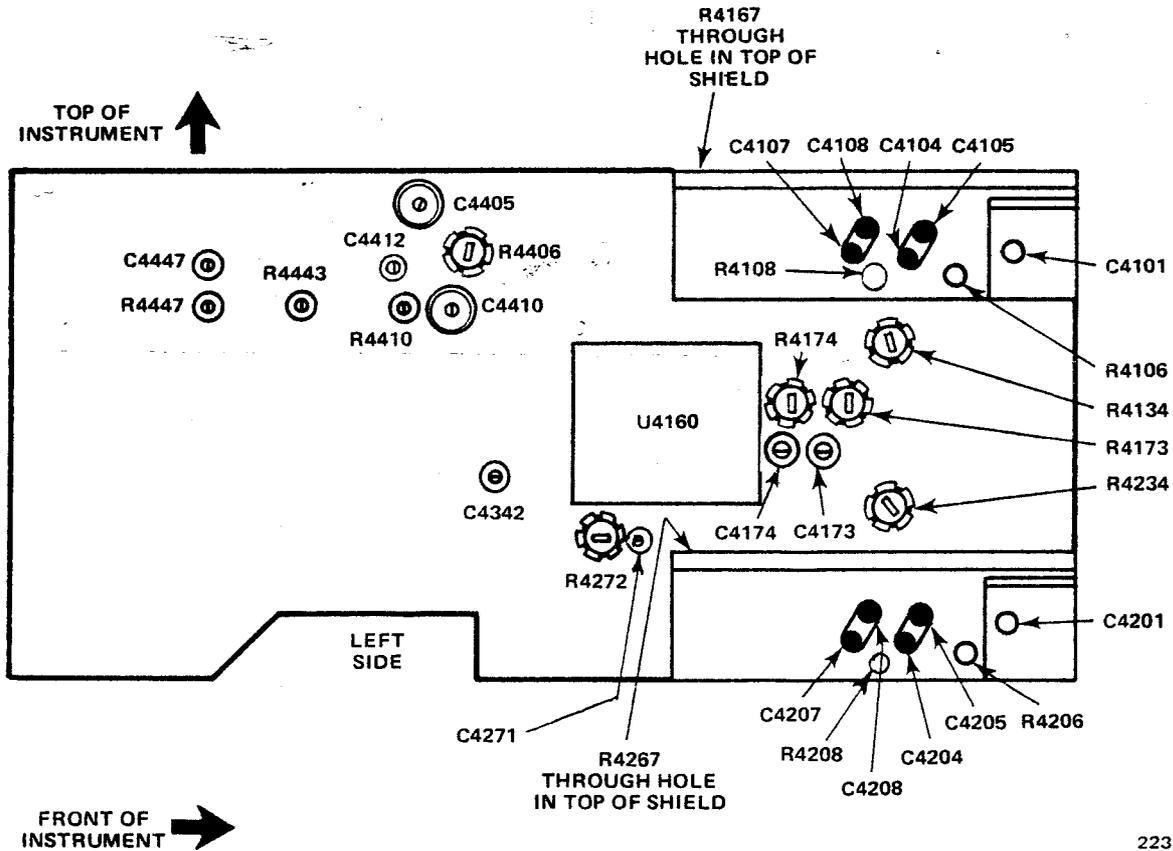
(15.3) Adjust R4208 for the best flat top on the front corner of the waveform.

(16) Set CH 2 VOLTS/DIV to .5.

(17) Remove the 10X attenuator from the generator input to CH 2.

(18) Adjust R4206 for the best front corner of the waveform.

(19) Reinstall the 10X attenuator in the CH 2 input. Set VOLTS/DIV to 5 m and TIME/DIV to 0.5 μ s. Adjust for a 5-division display. Check rise time. If it is greater than 3.5 nanoseconds repeat steps (2) through (18).



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Figure 5-19. Vertical adjustment locations.

j. Channel 2 Low Frequency Compensation (Figure 5-19).

(1) Set square wave generator (same as calibration generator, if using PG 506) for a 1 kilohertz, HIGH AMPL OUTPUT.

(2) Disconnect the square wave generator output from CH 2 and reconnect it to CH 2 through a 10X attenuator, 50 ohm termination, and an input RC normalizer. Set the generator for a 5-division display. During adjustment, set the generator output as necessary to maintain a 5-division display.

NOTE

Use a low capacitance tuning tool when making compensation adjustments.

(3) Adjust C4201 for the best flat top waveform.

(4) Set CH 2 VOLTS/DIV to 50 m and reset the generator output level for a 5-division display.

(5) Adjust C4208 for the best flat top, and C4207 for the best front corner on the waveform. Alternately readjust both capacitors for the best overall waveform response.

(6) Set CH 2 VOLTS/DIV to .5, remove the 10X attenuator, and reset the generator output level for a 5-division display.

(7) Adjust C4205 for the best flat top, and C4204 for the best front corner on the waveform. Alternately readjust both capacitors for the best overall waveform response.

(8) Continue to the next procedure.

k. Channel 1 Low Frequency Compensation (Figure 5-19).

(1) Set VERT MODE to CH 1.

(2) Remove the square wave generator output from CH 2 input and reconnect it to CH 1 through a 50 ohm BNC cable, 10X attenuator, 50 ohm termination, and an input RC normalizer.

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(7) Set A AND B TIME/DIV, its associated VAR control, and horizontal POSITION for exactly one time marker per division.

(8) Adjust Y AXIS, R573 to align the center time marker with the center vertical graticule line.

INTERACTION NOTE

This adjustment may affect the TRACE ROTATION adjustment. Position the display baseline to the center horizontal graticule line and recheck display alignment. If TRACE ROTATION needs readjustment, alternate between it and the Y-AXIS adjustment until no further adjustment is needed.

(9) Continue to the next procedure.

f. Geometry (Figure 5-18).

(1) Readjust TIME/DIV VAR and horizontal POSITION for one time marker per division.

(2) Adjust GEOM, R572 for minimum bowing of time markers.

INTERACTION NOTE

This adjustment may affect Y-Axis Alignment and TRACE ROTATION. Repeat Y-Axis Alignment, TRACE ROTATION, and Geometry adjustments for optimum overall alignment.

(3) Reset TIME/DIV VAR fully clockwise in its detent.

(4) Disconnect the time mark generator.

g. Calibrator (Figure 5-18).

(1) Connect a digital voltmeter to the CALIBRATOR output.

(2) Connect a shorting jumper between TP376 and TP386 (a small alligator clip works nicely).

(3) Adjust CAL AMPL, R386 for a 1.00 volt dc reading.

(4) Disconnect the voltmeter.

(5) Remove the shorting jumper from TP376 and TP386.

h. Dc Balance (Figure 5-19).

(1) Set CH 1 and CH 2 VOLTS/DIV to 5 m (1X window) and A AND B TIME/DIV to .2 ms.

(2) Adjust CH 1 vertical POSITION to vertically center the trace.

(3) Adjust R4134 for no trace shift when switching CH 1 VOLTS/DIV between 5 m and 10 m.

(4) Set VERT MODE to CH 2.

(5) Adjust CH 2 vertical POSITION to vertically center the trace.

(6) Adjust R4234 for no trace shift when switching CH 2 VOLTS/DIV between 5 m and 10 m.

i. Vertical Gain (Figure 5-19).

(1) Set CH 1 and CH 2 VOLTS/DIV to 5 m (1X window) and VERT MODE to CH 1.

(2) Connect a calibration generator (select STD OUTPUT) to CH 1 input through an unterminated 50 ohm BNC cable. Set the generator for a 20 millivolt output.

(3) Adjust R4443 for a 4-division display.

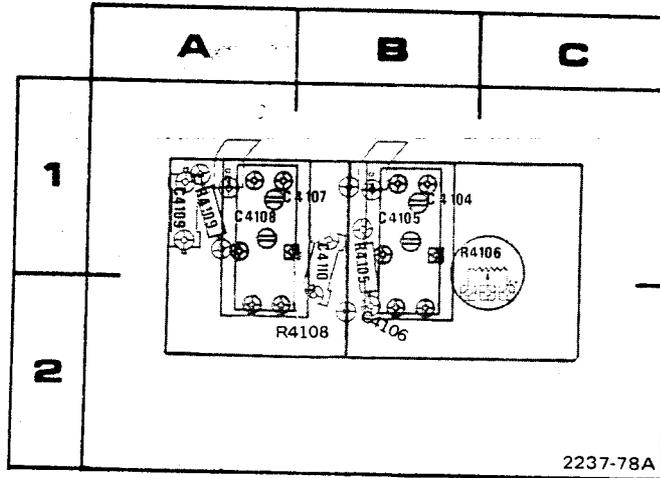
(4) Set VERT MODE to CH 2.

(5) Move the calibration generator output from CH 1 input to CH 2 input.

(6) Adjust R4272 for a 4-division display.

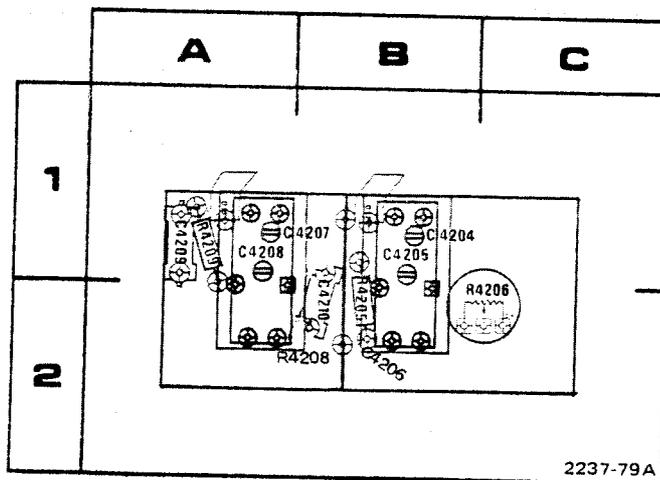
(7) Continue to the next procedure.

GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
3I	R4324	4B	R4416	2D
3H	R4327	4C	R4418	3E
3I	R4328	4A	R4419	3D
2F	R4332	5B	R4421	1D
4F	R4333	5B	R4423	1D
2I	R4334	5B	R4425	1D
	R4335	5B	R4427	1D
	R4336	5A	R4428	1C
4H	R4337	4C	R4429	1C
4I	R4338	5C	R4431	2D
4H	R4340	2E	R4433	2D
4H	R4341	3F	R4437	2C
4I	R4343	3E	R4441	2C
4H	R4345	3F	R4443	2C
4H	R4349	4E	R4446	1B
4J	R4351	3F	R4447	2B
4H	R4355	3F	R4448	2C
4H	R4356	3F	R4451	2C
4H	R4359	4E	R4453	2C
4H	R4361	4E	R4456	1C
4F	R4362	3E	R4457	1B
5F	R4363	4E	R4458	2C
4G	R4364	4D	R4459	2C
4G	R4365	3D	R4461	1B
4F	R4366	3D	R4463	1A
4F	R4371	3E	R4466	1A
4F	R4372	3E	R4471	2B
4E	R4373	3E	R4473	2B
4F	R4375	3D	R4474	2A
4F	R4376	4E	R4475	2A
4E	R4382	2E	R4476	2A
4E	R4383	2E		
4F	R4384	2E	RT4119	2D
4E	R4385	2F	RT4116	2D
4D	R4386	2F		
4D	R4400†		S4240	3I
4E	R4401	2D	S4330	3K
4E	R4403	2D	S4380	3B
4D	R4404	1D	S4378	3C
4I	R4405	2E		
4A	R4406	1E	U4160	3G
4A	R4408	1E		
4B	R4409	1E		
4C	R4410	2D		
4A	R4411	2E		
4A	R4413	2D		
4B	R4414	2D		



A2 ATTENUATOR BOARD.

CKT NO	GRID LOC	CKT NO	GRID LOC
C4104	1B	C4110	1B
C4105	1B		
C4106	2B	R4105	1B
C4107	1B	R4106	1B
C4108	1A	R4108	2B
C4109	1A	R4109	1A



A4 ATTENUATOR BOARD

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C4204	1B	C4207	1B	C4210	2B	R4206	1C
C4205	1B	C4208	1A			R4208	2B
C4206	2B	C4209	1A	R4205	2B	R4209	1A

VOLTAGE and WAVEFORM CONDITIONS

WAVEFORM AND VOLTAGE TEST CONDITIONS.

a. **Waveform Conditions.** The following test setup is used for all waveforms, except as noted. This uniform setup simplifies troubleshooting. The test oscilloscope trigger setup allows time comparison (horizontally) between the waveforms. Use an AN/JSM-425(V)1, Tektronix 465M, or equivalent for waveforms.

(1) **Instrument Setup.**

(a) Connect a P6104 Probe (10X) to CH 1 input and the probe tip to the CALIBRATOR.

(b) Set the instrument controls as follows:

- VOLTS/DIV 2
- AC-GND-DC DC
- VERT-MODE CH 1
- HORIZ DISPLAY MIXED
- SOURCE (both) CH 1
- SLOPE (both) OUT: +
- A TIME/DIV 2 ms
- B TIME/DIV 50 μ s
- LEVEL (both) For a stable mixed display

(2) **Test Oscilloscope Setup.**

(a) Connect a 50 ohm unterminated BNC cable between the A EXT Trigger input of the test oscilloscope and the +A GATE of the oscilloscope under test.

(b) Set the test oscilloscope controls as follows:

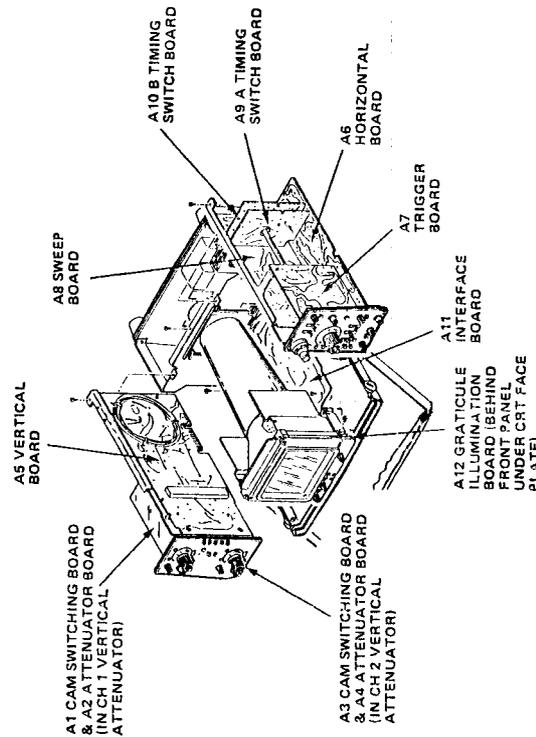
- A COUPLING DC
- A SLOPE OUT: +
- A SOURCE EXT \div 10
- VERT-MODE CH 1
- CH 1 AC-GND-DC DC
- A LEVEL Adjust so TRIG READY indicator is lit. Push TRIG VIEW to verify triggering on the positive slope.

b. **Voltage Conditions.** The voltages were taken between the indicated test point and chassis ground using a Tektronix DM 501A digital multimeter. Any change from the following setup may change some of the indicated voltages. Set controls as follows (where controls are duplicated, set both controls the same):

- VOLTS/DIV 5 m
- AC-GND-DC GND
- POSITION (Vertical) Midrange
- VERT-MODE CH 2
- DELAY TIME POS 5.00
- HORIZ DISPLAY A
- TIME/DIV 1 ms
- POSITION (Horizontal) Midrange
- INTEN Fully counterclockwise
- FOCUS Fully counterclockwise
- SCALE ILLUM Midrange
- TRIG-MODE NORM
- COUPLING AC
- SOURCE CH 1
- SLOPE +
- LEVEL Midrange

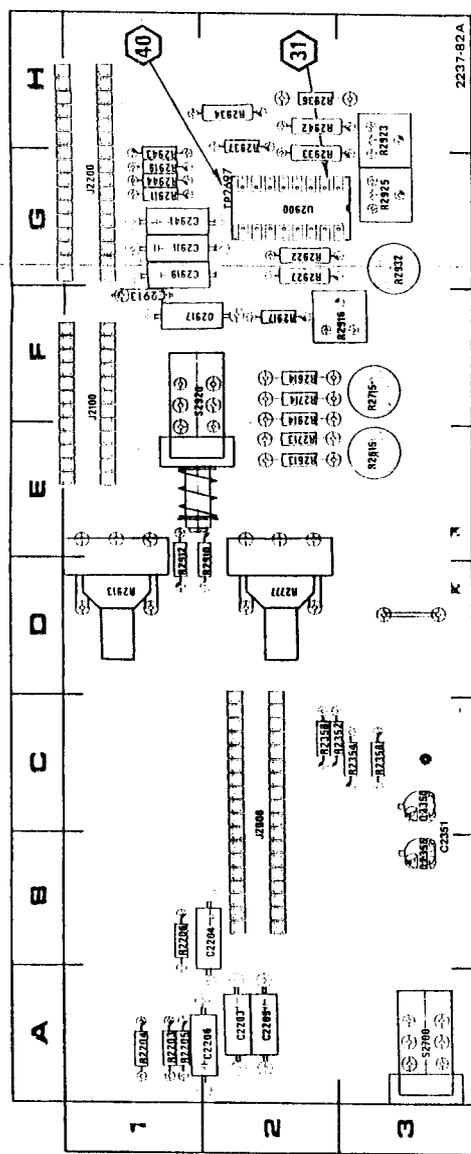
NOTE

These settings place the instrument in a quiescent operating state for making dc voltage measurements.



For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
 8 Cherry Tree Rd, Chinnor
 Oxon OX9 4QY
 Tel: 01844-351694 Fax: 01844-352554
 Email: enquiries@mauritron.co.uk

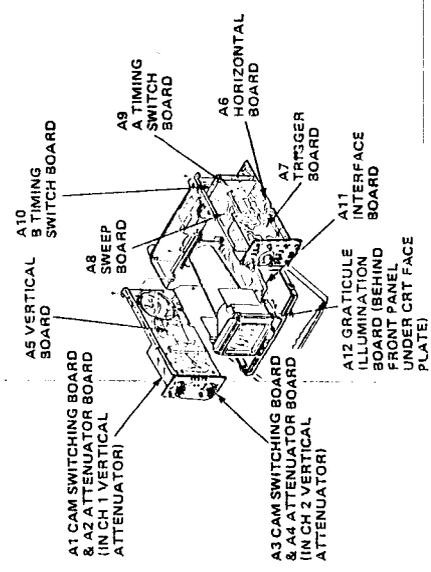
Diagrams—465M



2237-82A

§ Connected from A6 to bnc connector

CKT NO.	GRID		GRID		GRID		GRID		GRID		GRID	
	LOC	NO.	LOC	NO.	LOC	NO.	LOC	NO.	LOC	NO.	LOC	NO.
C2203	2A	J2000	2C	R2205	1A	R2715	3F	R2922	2G	R2943	1G	
C2204	2B	J2100	1F	R2206	1B	R2777	2D	R2923	3H	R2944	1G	
C2205	2A	J2200	1G	R2352	3C	R2910	2D	R2925	3G			
C2206	2A			R2356	2C	R2911	1G	R2927	2G	S2700	3A	
C2351	3B	OX350	3C	R2358	3C	R2912	1D	R2932	3G	S2920	1F	
C2911	1G	O2356	3B	R2613	2E	R2913	1D	R2933	2G			
C2913	1F			R2614	2F	R2914	2F	R2934	2H	U2900	2G	
C2917	1F	S22018		R2615	5E	R2916	3F	R2936	2H			
C2919	1G	R2203	1A	R2713	2E	R2917	2F	R2937	2H			
C2941	1G	R2204	1A	R2714	2F	R2919	1G	R2942	2H			

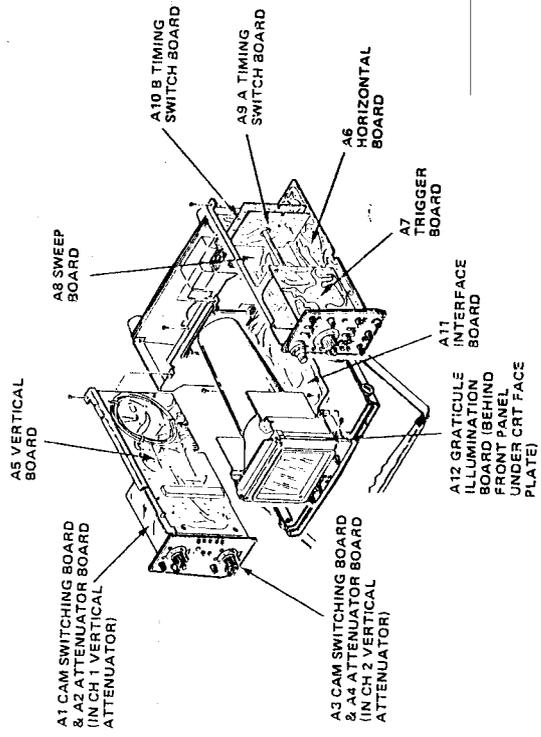
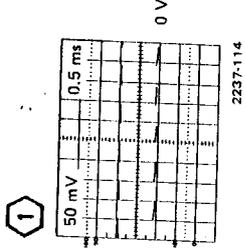


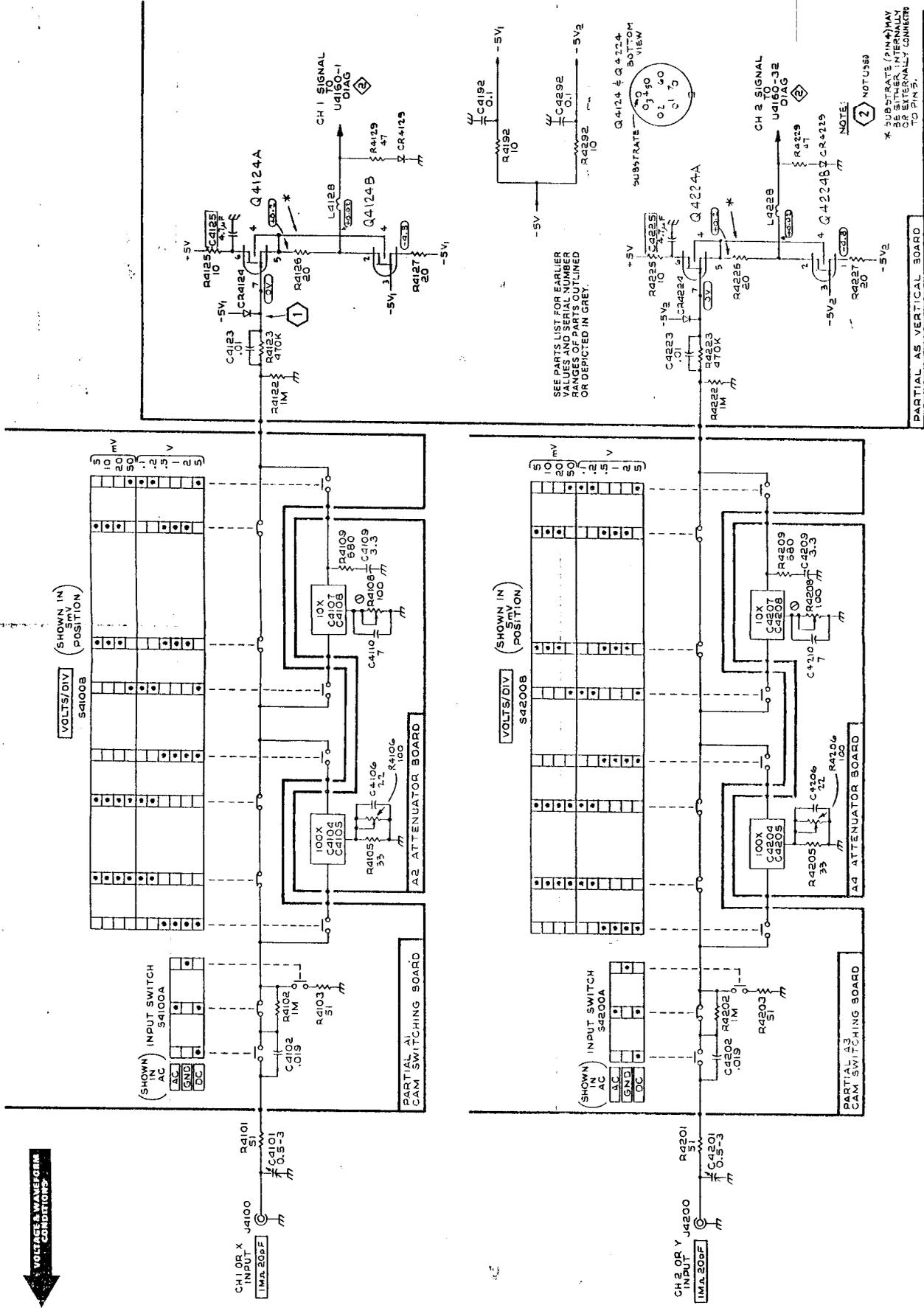
FO-3(Rear)

Figure 6-3. A6 Horizontal board component locations.

REV A SEP 1980

Refer to Waveform and Voltage Test Conditions.





VOLTS & WAVEFORM CONDITIONS

2237-99
REV A SEPT 1980

465M

CH 1 & CH 2 INPUT

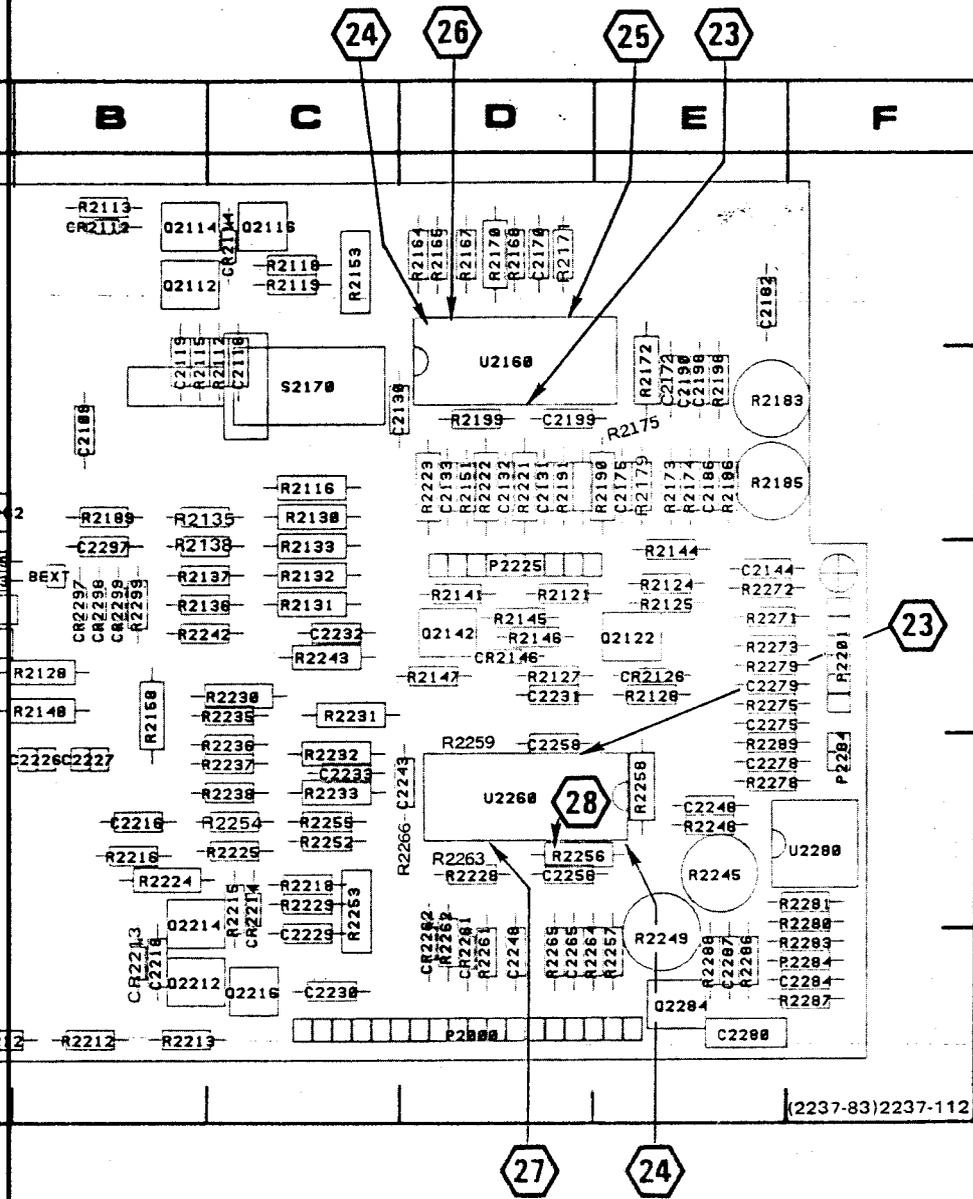
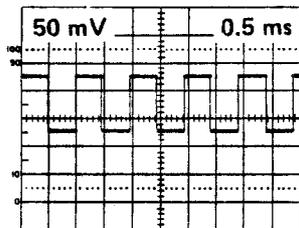


Figure 6-10. A7 Trigger board (below SN B021600) component locations.

GRID LOC	CKT NO												
2297	3B	R2101	3A	R2131	3C	R2167	1D	R2213	5B	R2238	4C	R2265	5D
2298	3B	R2103	3A	R2132	3C	R2168	1D	R2215	4C	R2242	3B	R2266†	S2100
2299	3B	R2104	3A	R2133	3C	R2170	1D	R2216	4B	R2243	3C	R2271	3E
		R2105	3A	R2135	2B	R2171	1D	R2218	4C	R2245	4E	R2272	3E
00	5D	R2106	4A	R2136	3B	R2172	2E	R2221	2D	R2246	4E	R2273	3E
01	3F	R2112	2C	R2137	3B	R2173	2E	R2222	2D	R2249	5E	R2275	3E
25	3D	R2113	1B	R2138	3B	R2174	2E	R2223	2D	R2252	4C	R2278	4E
84	4F	R2115	2B	R2141	3D	R2175	2E	R2224	4B	R2253	4C	R2279	3E
		R2116	2C	R2144	3E	R2179	2E	R2225	4C	R2254	4C	R2280	4F
12	1B	R2118	1C	R2145	3D	R2183	2E	R2228	4D	R2255	4C	R2281	4F
14	1B	R2119	1C	R2146	3D	R2185	2E	R2229	4C	R2256	4D	R2283	5F
16	1C	R2121	3D	R2147	3D	R2186	2E	R2230	3C	R2257	5E	R2284	5F
22	3E	R2124	3E	R2148	3B	R2189	2B	R2231	3C	R2258	4E	R2286	5E
42	3D	R2125	3E	R2151	2D	R2190	2E	R2232	4C	R2259†		R2287	5F
42	5B	R2126	3E	R2153	1C	R2191	2E	R2233	4C	R2261	5D	R2288	5E
14	4B	R2127	3D	R2158	3B	R2198	2E	R2235	3C	R2262	5D	R2289	4E
16	5C	R2128	3B	R2164	1D	R2199	2D	R2236	4C	R2263†		R2299	3B
84	5E	R2130	2C	R2165	1D	R2212	5B	R2237	4C	R2264	5D		

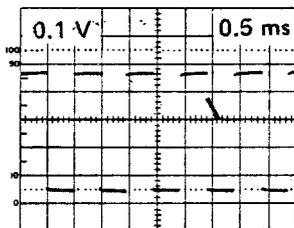
Refer to Waveform and Voltage Test Conditions.

3 4



0 V

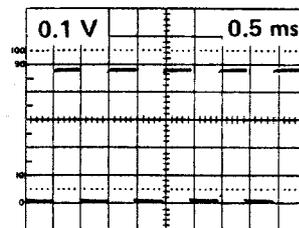
5 A 5 B



0 V

0 volt point depends on setting of instrument vertical POSITION control.

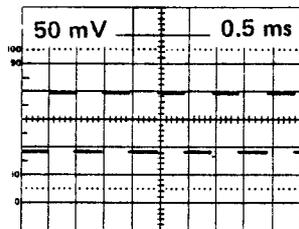
6



0 V

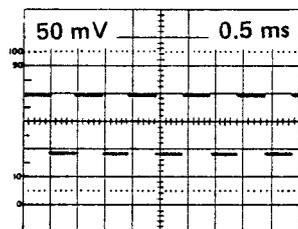
0 volt point depends on setting of instrument vertical POSITION control.

7



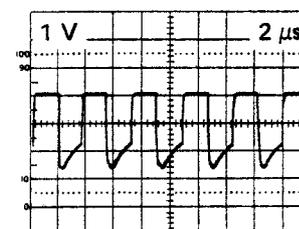
AC Coupled

8



AC Coupled

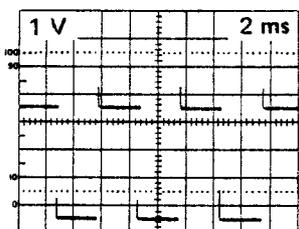
9 A



0 V

Instrument VERT MODE to CHOP
Test oscilloscope trigger SOURCE to CH 1

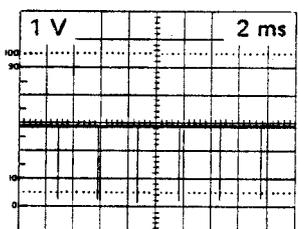
9 B



0 V

Instrument VERT MODE to ALT

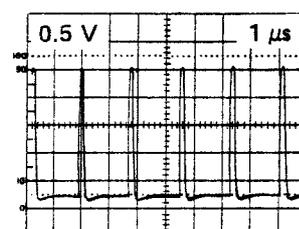
10



0 V

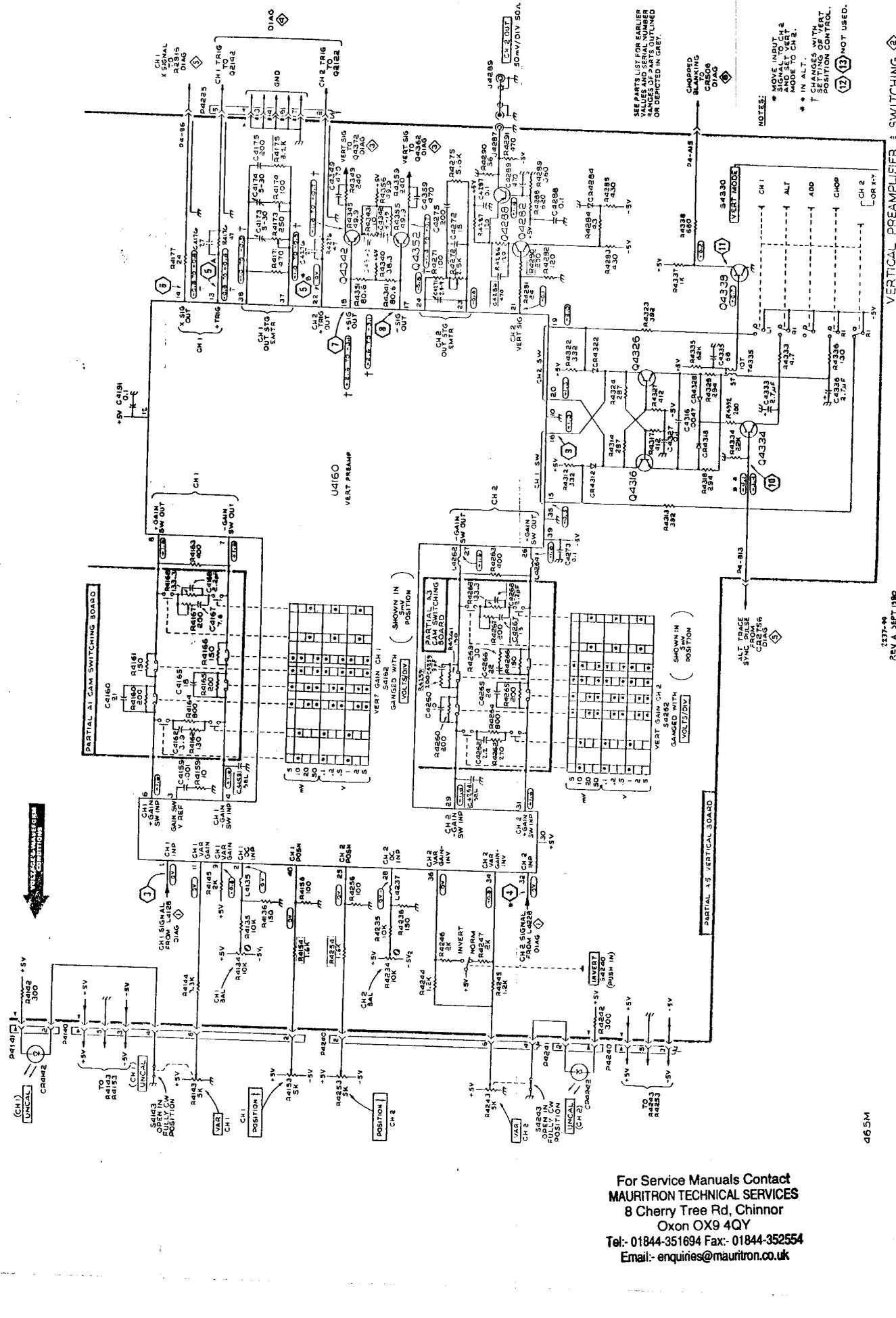
Instrument VERT MODE to ALT

11



0 V

Instrument VERT MODE to CHOP
Test oscilloscope trigger SOURCE to CH 1



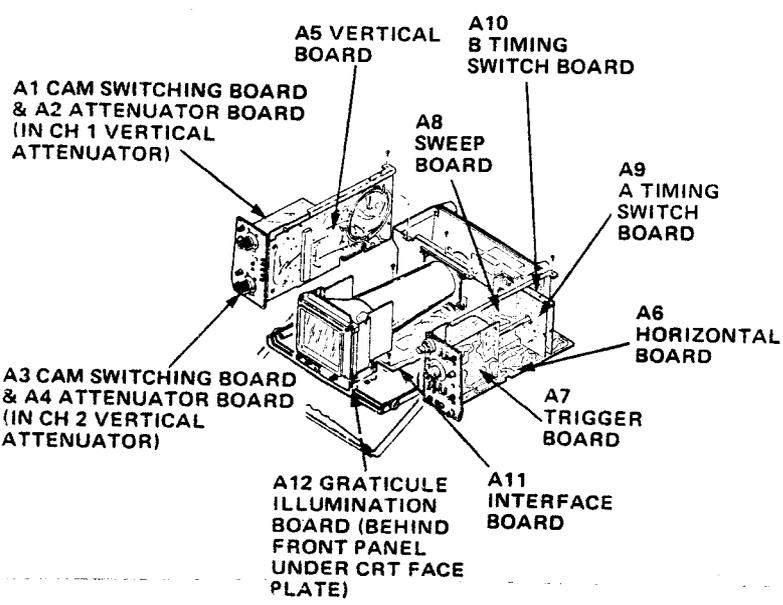
NOTES:
 * MOVE INVERT TO CH 2 AND SET VERT POSITION CONTROL.
 ** IN ALT POSITION WITH VERT POSITION CONTROL.
 † CHANGES WITH POSITION CONTROL.
 ‡ NOT USED.

VERTICAL PREAMPLIFIER : SWITCHING

46.5M

2277-99
 REV A SEPT 1980

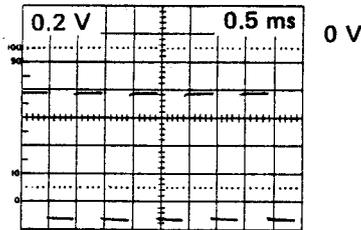
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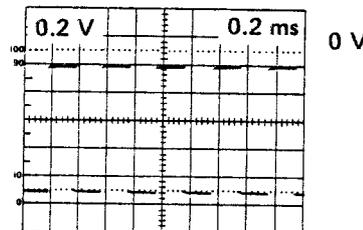
Refer to Waveform and Voltage Test Conditions.

14



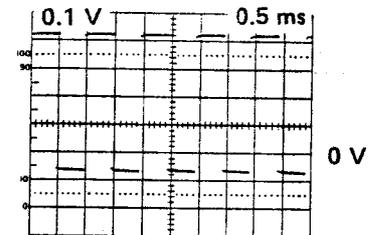
0 volt point depends on setting of instrument vertical POSITION control.

15



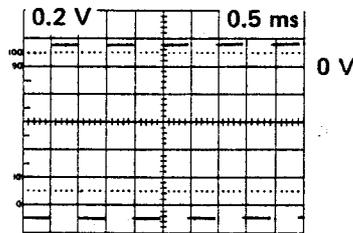
0 volt point depends on setting of instrument vertical POSITION control.

16



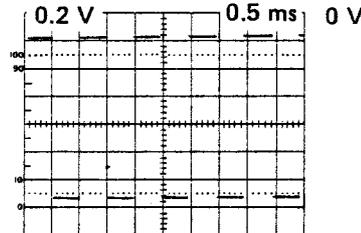
0 volt point depends on setting of instrument vertical POSITION control.

17



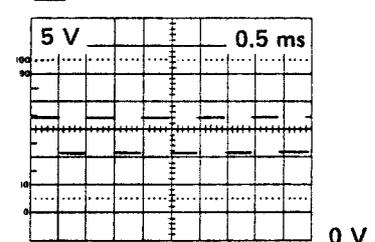
0 volt point depends on setting of instrument vertical POSITION control.

18



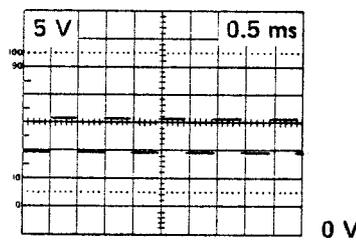
0 volt point depends on setting of instrument vertical POSITION control.

19



0 volt point depends on setting of instrument vertical POSITION control.

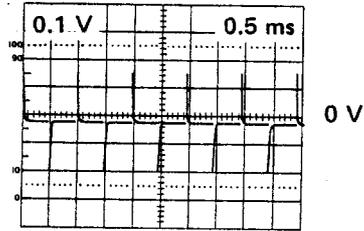
20



0 volt point depends on setting of instrument vertical POSITION control.

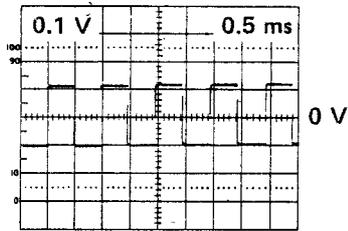
Refer to Waveform and Voltage Test Conditions.

23



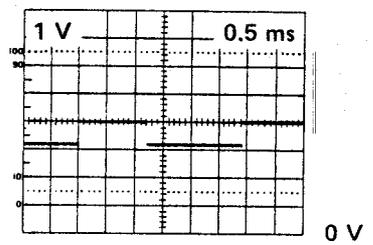
0 volt point depends on setting of instrument vertical POSITION control.

24

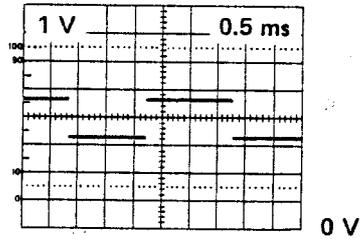


0 volt reference depends on setting of instrument LEVEL control. No signal with instrument coupling to LF REJ.

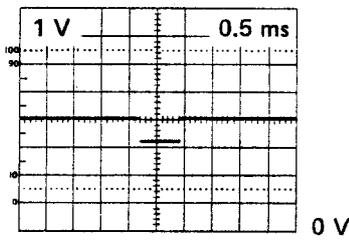
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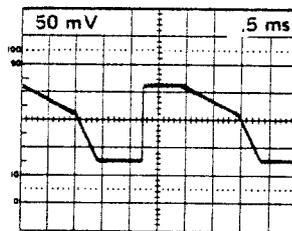
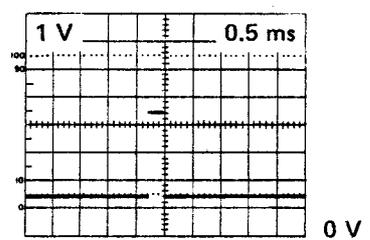
26



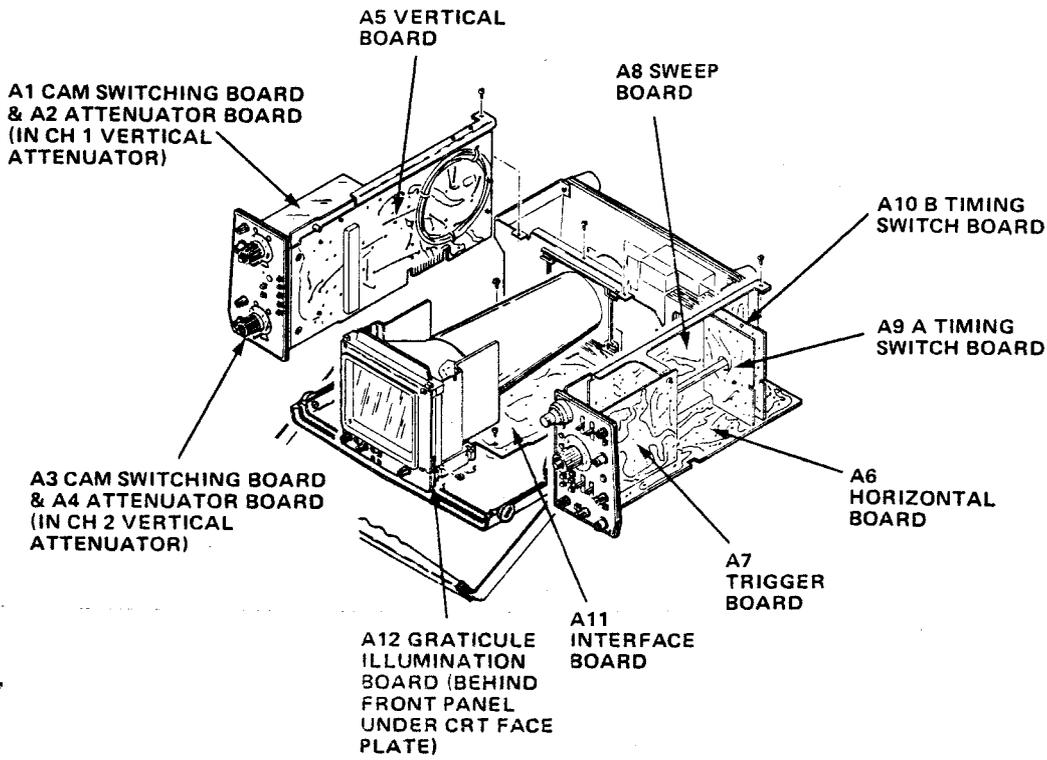
27

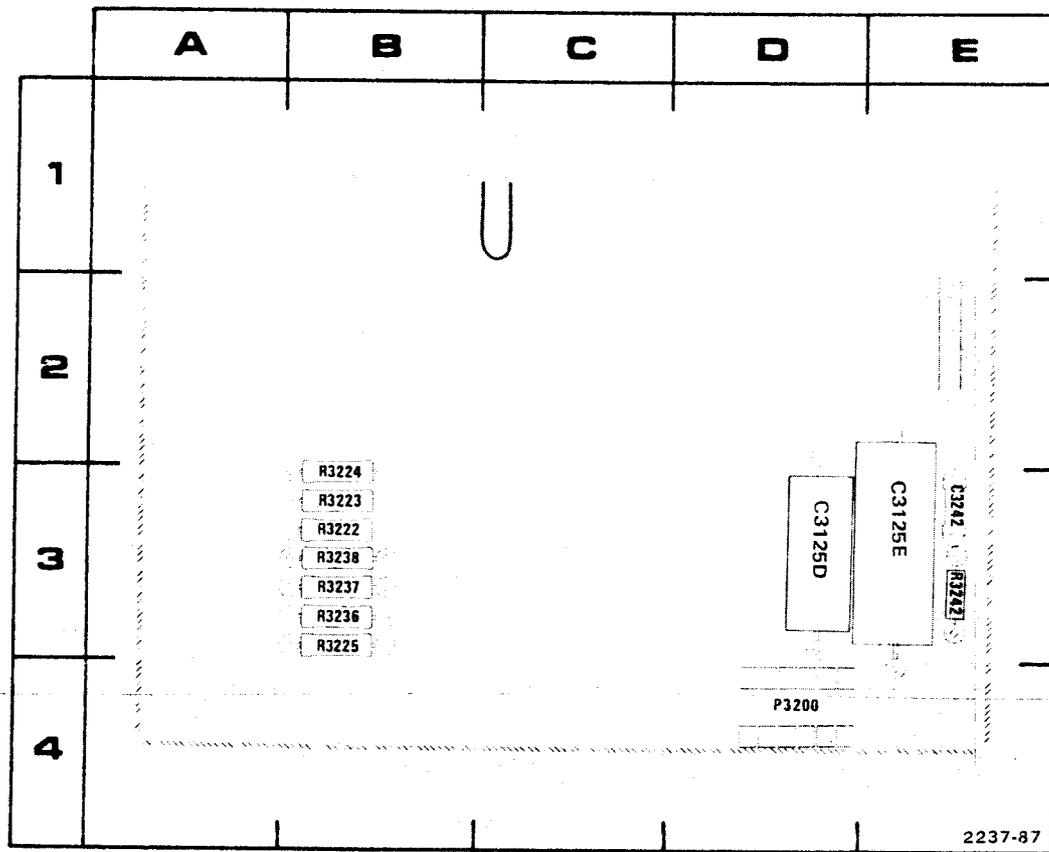


28



Sweep ramp from pin 2 of U2900 for time comparison.





FOR LOCATION OF R3129, SEE
A8 SWEEP BOARD

Figure 6-13. A10 Timing Switch bd (B Sweep) component locations.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C3242	3E	R3222	3B	R3237	3B
C3125D	3D	R3223	3B	R3238	3B
C3125E	3E	R3224	3B	R3242	3E
P3200	4D	R3225	3B		
		R3236	3B		

Diagrams-465M

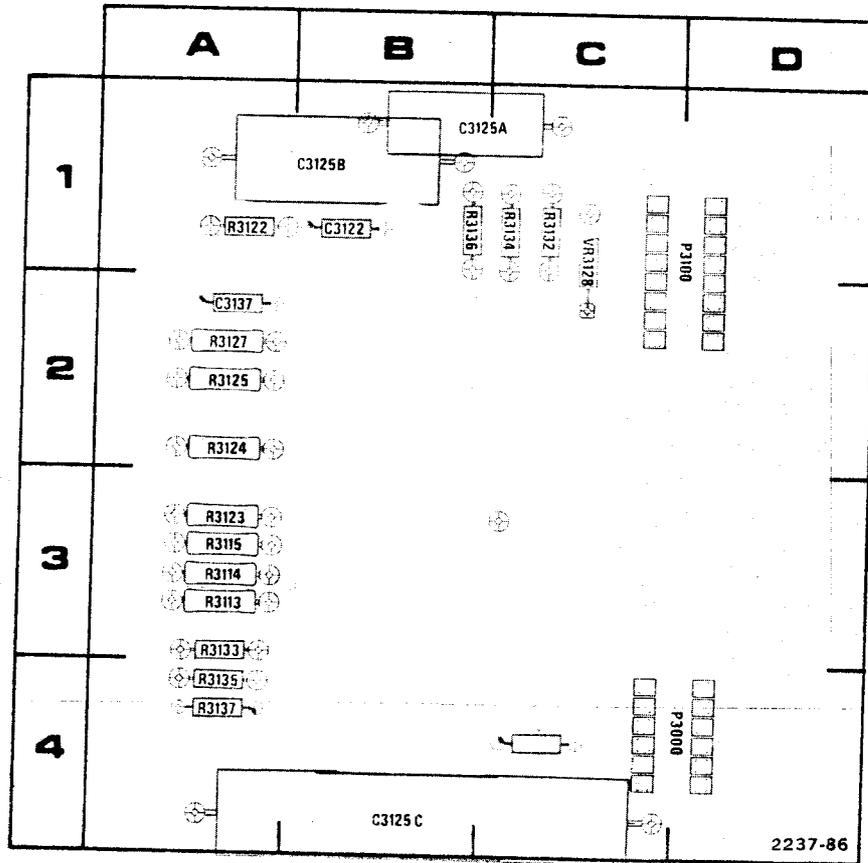
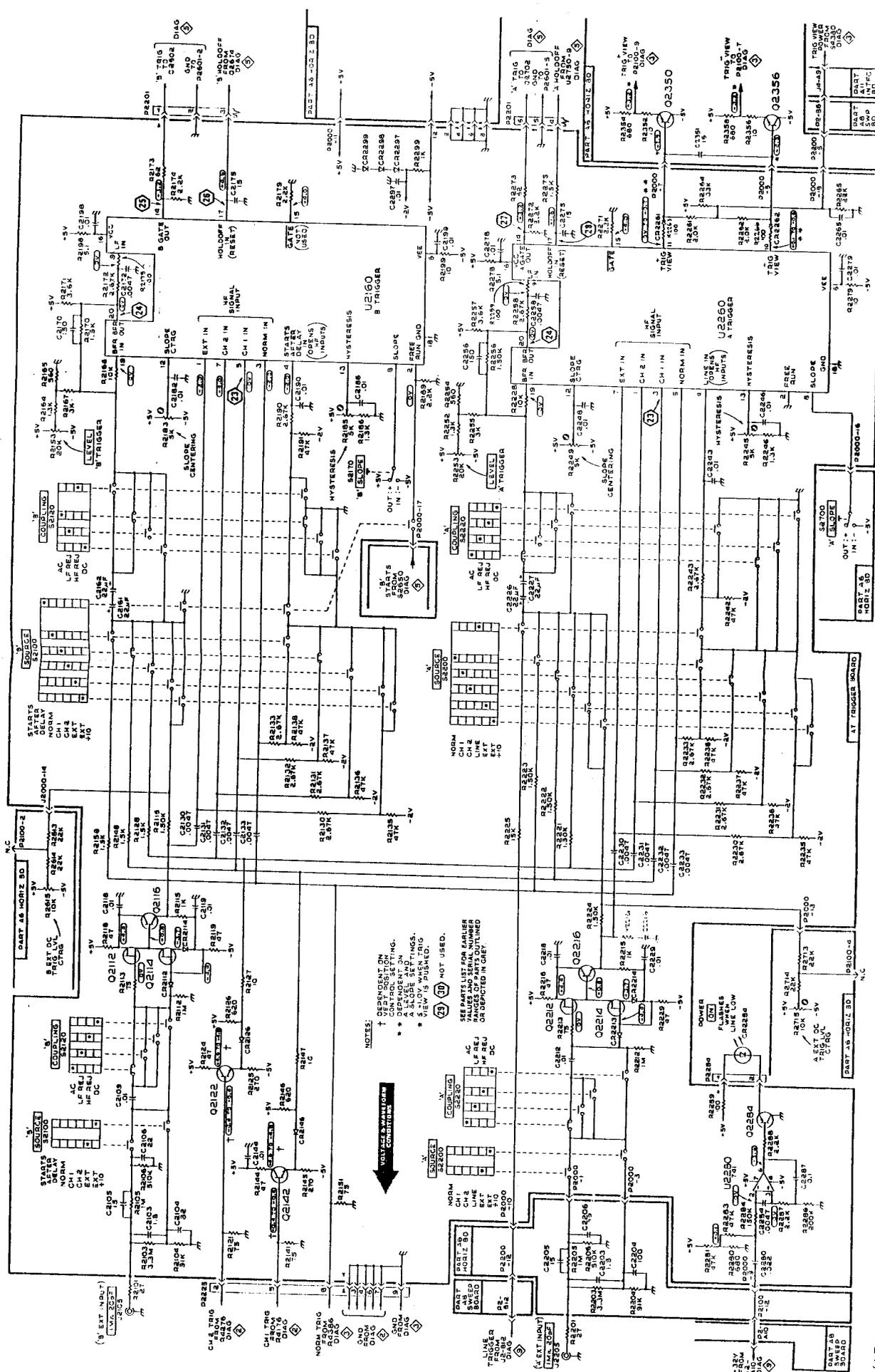


Figure 6-12. A9 Timing Switch bd (A Sweep) component locations.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC
C3122	1B	R3113	3A	R3132	1C
C3125A	1B	R3114	3A	R3133	3A
C3125B	1B	R3115	3A	R3134	1C
C3125C	4B	R3122	1A	R3135	4A
C3137	2A	R3123	3A	R3136	1B
		R3124	2A	R3137	4A
P3000	4D	R3125	2A		
P3100	1D	R3127	2A	VR3128	1C

A9 TIMING SW (A) BD & A10 TIMING SW (B) BD COMPONENT LOCATIONS



NOTES:

- † DEPENDENT ON CONTROL SETTING.
- * * * VALUES AND SERIAL NUMBER & SLOPE SETTINGS.
- * VIEW IS PUSHING.

VOLTAGE & WAVEFORM CONDITIONS

STARTS	COUPLING	SLOPE CENTERING
AC	LINE	LINE
HF REJ	EXT	EXT
DC	NORM	DC

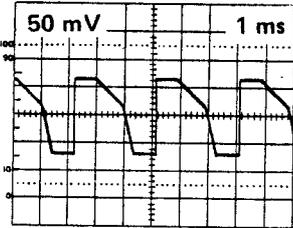
22377-101
REV A SEPT 1980

463 M

TRIGGER AMPLIFIER

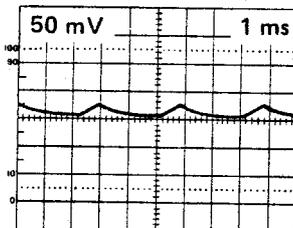
Refer to Waveform and Voltage Test Conditions.

31 Use this waveform for time comparison



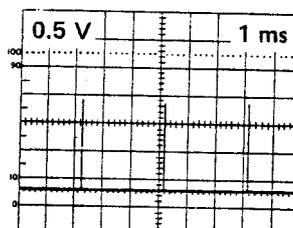
AC Coupled

32 AC Coupled

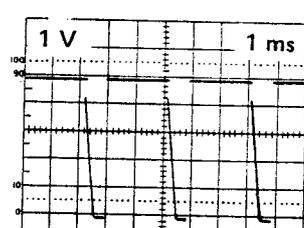


Amplitude of waveform increases as time between end of holdoff and triggering increases.

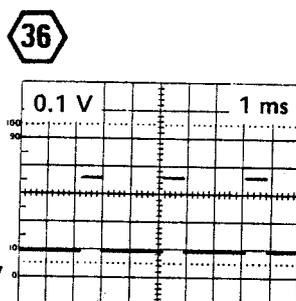
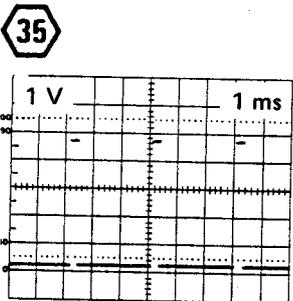
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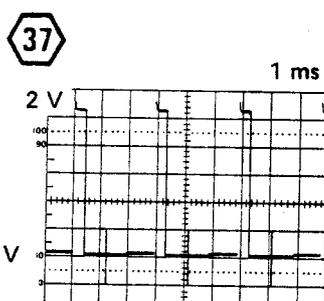
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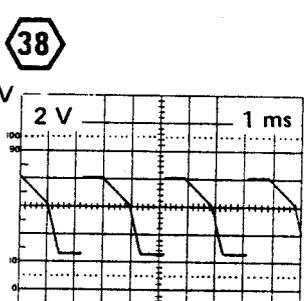
0 V



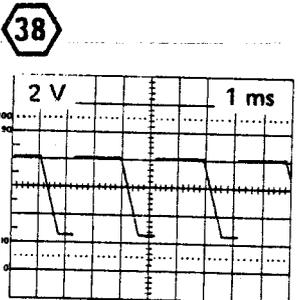
Instrument HORIZ MODE set to A or A INTEN. In B DLY'D or MIX, TP2797 is at -5 V dc.



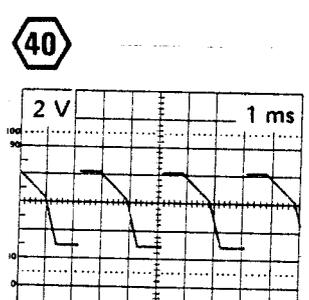
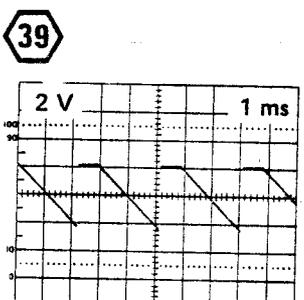
Slight positive step at -0.6 V only present in MIX. Positive spike at -0.6 V is higher in A INTEN and B DLY'D modes.



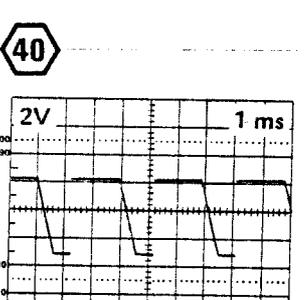
Position of transition between A and B sweep rates dependent on setting of instrument DELAY TIME POS control.



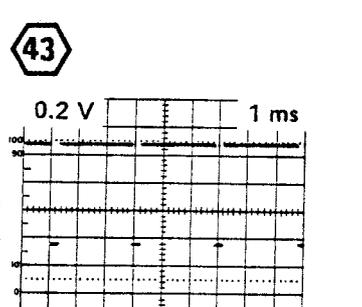
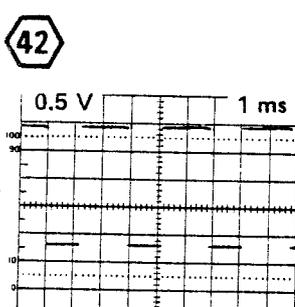
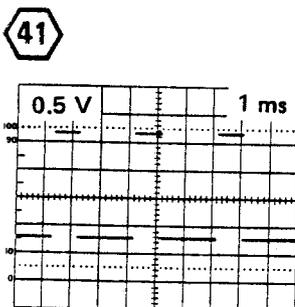
Instrument HORIZ MODE to B DLY'D. Beginning of sweep ramp dependent on setting of instrument DELAY TIME POS control.



Instrument HORIZ MODE set to B DLY'D.



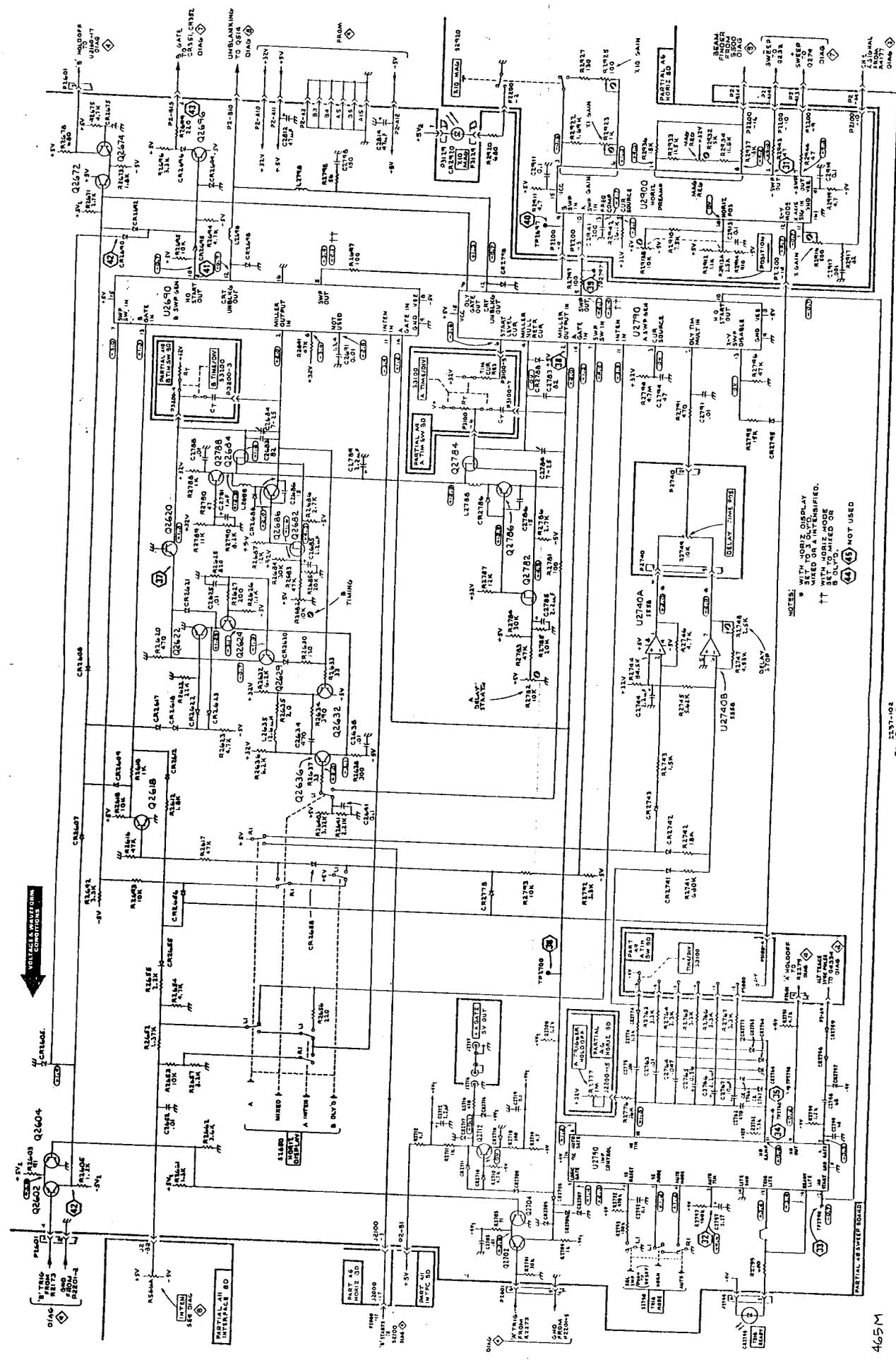
With instrument HORIZ MODE set to A or A INTEN, TP2697 goes to -5 V dc.



0 V

LO when 41 42 are both LO

SWEEP & HORIZONTAL PREAMPLIFIER



NOTES:
 * WITH HORIZ DISPLAY MIXED OR UNDEFINISHED.
 †† WITH HORIZ MODE B SELECTED OR (4) (4) NOT USED

REV 1-02
REV 5 FEB 1981

465M

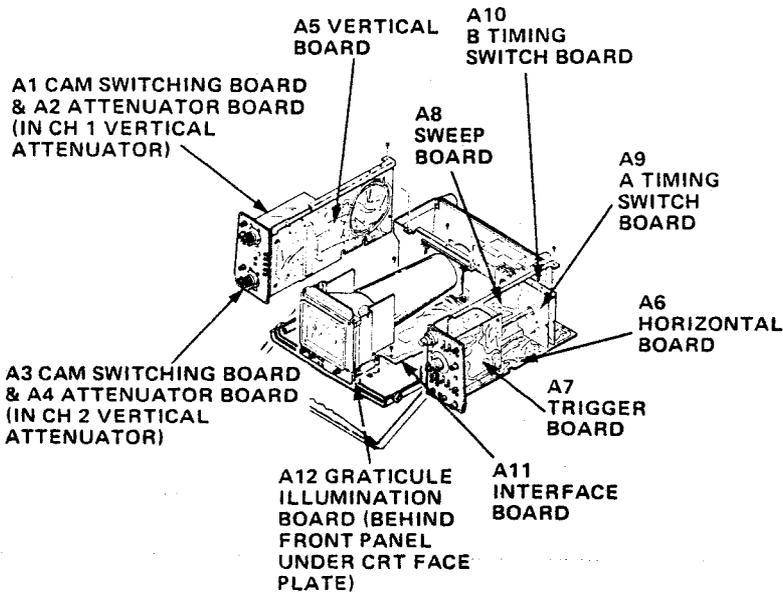
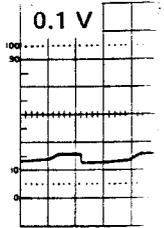
between A
ident on
ELAY

Z MODE set
987 goes to

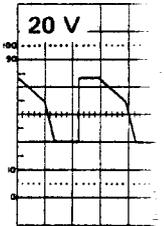
CKT NO	GRID LOC														
C232	4G	C721	4B	CR557	9D	P571	6H	R235	4F	R506	5C	R723	2B	TP376	9H
C233	4G	C722	1B	CR582	8E	P573	6F	R236	4F	R512	5B	R725	2B	TP382	9H
C236	3G	C723	1B	CR584	8F	P575	7F	R241	4F	R513	5C	R728	3B	TP526	6B
C244	4F	C725	2B	CR721	3C	P736	4B	R243	5F	R514	5B	R731	3B	TP527	6B
C246	4F	C735	2B	CR734	3B	P746	4C	R244	5F	R515	6B	R732	3B	TP552	9D
C272	4G	C738	5F	CR735	1B	P768	4D	R245	5H	R516	6B	R733	2B	TP773	2E
C273	4H	C741	2D	CR738	4E	P780	4I	R246	5F	R517	5B	R734	5D		
C284	4H	C743	1C	CR741	3C			R247	5G	R521	6B	R735	1C	U550	8B
C286	5H	C748	6F	CR744*	2B	Q232	3G	R272	4G	R522	6B	R736	1D	U722	1B
C288	4H	C761	4D	CR748	4E	Q234	4F	R273	4G	R523	6B	R737	1C	U762	1C
C354	5B	C763	2D	CR762	1D	Q244	4F	R275	4H	R524	6B	R738	3C		
C376	9I	C768	5F	CR763	1E	Q246	4F	R276	3F	R525	5C	R740	3E	VR288	4H
C383	9I	C773	2E	CR764	1E	Q274	4H	R283	5H	R526	6B	R741	2C	VR353	5B
C386	8G			CR765	1E	Q284	4H	R284	5H	R532	9F	R742	2C	VR524	5B
C503	5C	CR235	4G	CR766	1E	Q286	4H	R285	4H	R533	6B	R743	1C	VR533	9E
C515	6B	CR236	4G	CR768	4E	Q356	4B	R286	5H	R541	6F	R745	3C	VR552	8B
C516	6B	CR351	4C			Q358	5B	R287	5G	R542	6F	R746	2C	VR553*	8B
C518	5B	CR352	4B	DS563	7C	Q376	8G	R288	5H	R543	8F	R747	2C	VR566	7I
C522	6B	CR353	5B	DS564	7C	Q382	9H	R352	5C	R544	6D	R748	5D	VR722	1B
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C533	9E	CR504	5C	F746	4C	Q524	6B	R358	5B	R553	9C	R764	1D	VR749	7G
C543	6F	CR505	6E	F768	4C	Q526	6C	R372	9H	R554	9D	R765	2C	VR769	6H
C546	7F	CR506	7F			Q544	5D	R373	9H	R556	9C	R766	2C	VR782	4I
C548	8E	CR507	5C	J2	3H	Q548	8F	R374	9H	R563	6C	R767	2E		
C558	9D	CR513	5C	J4	7G	Q552	9D	R375	9H	R564	6D	R768	4D	W744*	2C
C564	6D	CR514	5B	J358	5B	Q556	9C	R376	8H	R566A	7I	R769	1D		
C566	7F	CR518	5B	J503	5B	Q732	3B	R377	8H	R566B	7I	R772	2E		
C572	7F	CR524	6B			Q734	2B	R382	9H	R571	6I	R773	2E		
C575	7F	CR525	6C	L386	9G	Q742	2C	R383	9I	R572	9F	R776	2E		
C576	7F	CR528	6C	L554	9C	Q744	2C	R386	9G	R573	9G	R777	4D		
C577	5D	CR541	6F	L558	9E	Q764	1D	R387	9I	R574	6F	R782	4I		
C582	7E	CR552	9B	L582	7E	Q766	2D	R388	9I	R575	6F	R785	4J		
C584	5G	CR553	9C			Q784	2E	R502	8G	R576	7H				
C707	3C	CR554	9C	P244	4G			R503	5C	R577	5D	S500	6I		
C708	3D	CR555	9C	P284	4G	R232	4G	R504	5E	R721	3B				
C709	3D	CR556	9C	P386	9I	R233	4G	R505	5B	R722	2B	T550	8D		

For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
 8 Cherry Tree Rd, Chinnor
 Oxon OX9 4QY
 Tel:- 01844-351694 Fax:- 01844-352554
 Email:- enquiries@mauritron.co.uk

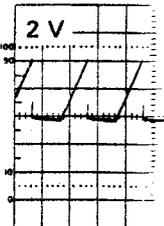
46



49



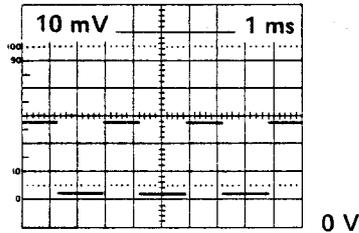
52



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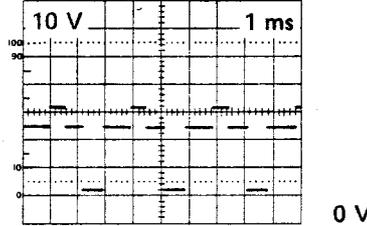
Refer to Waveform and Voltage Test Conditions.

56



0 V

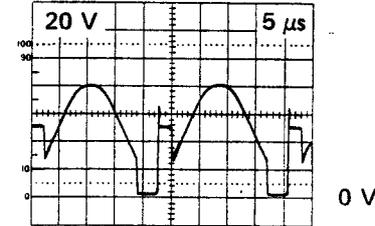
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0 V

Instrument HORIZ MODE to A INTEN

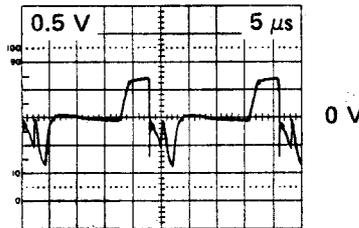
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0 V

Test scope trigger SOURCE to CH 1

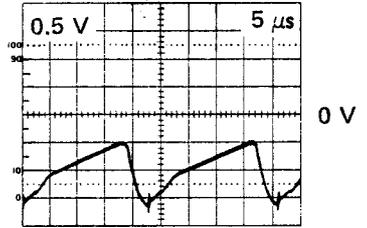
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0 V

Test scope trigger SOURCE to CH 1

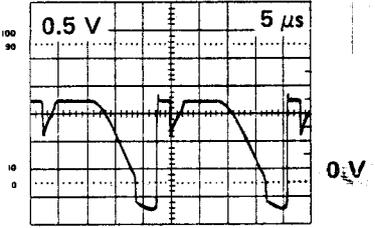
59



0 V

Test scope trigger SOURCE to CH 1

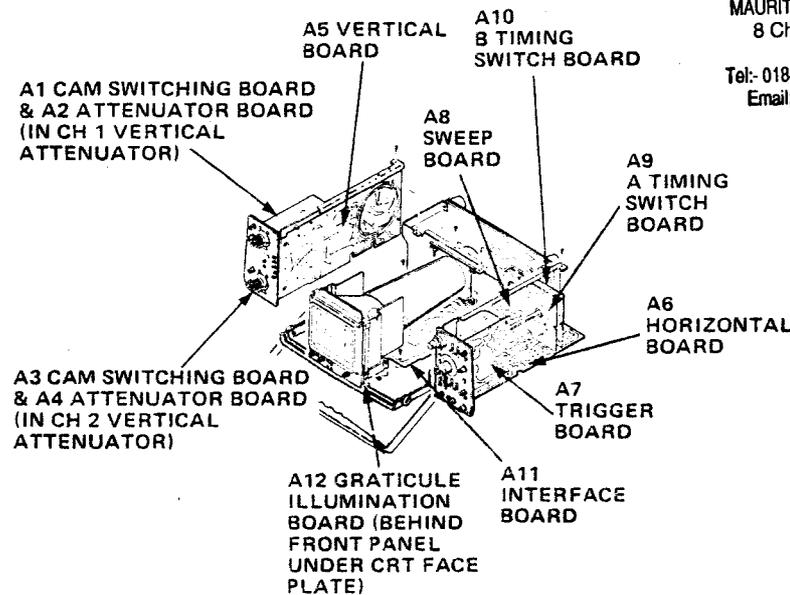
60



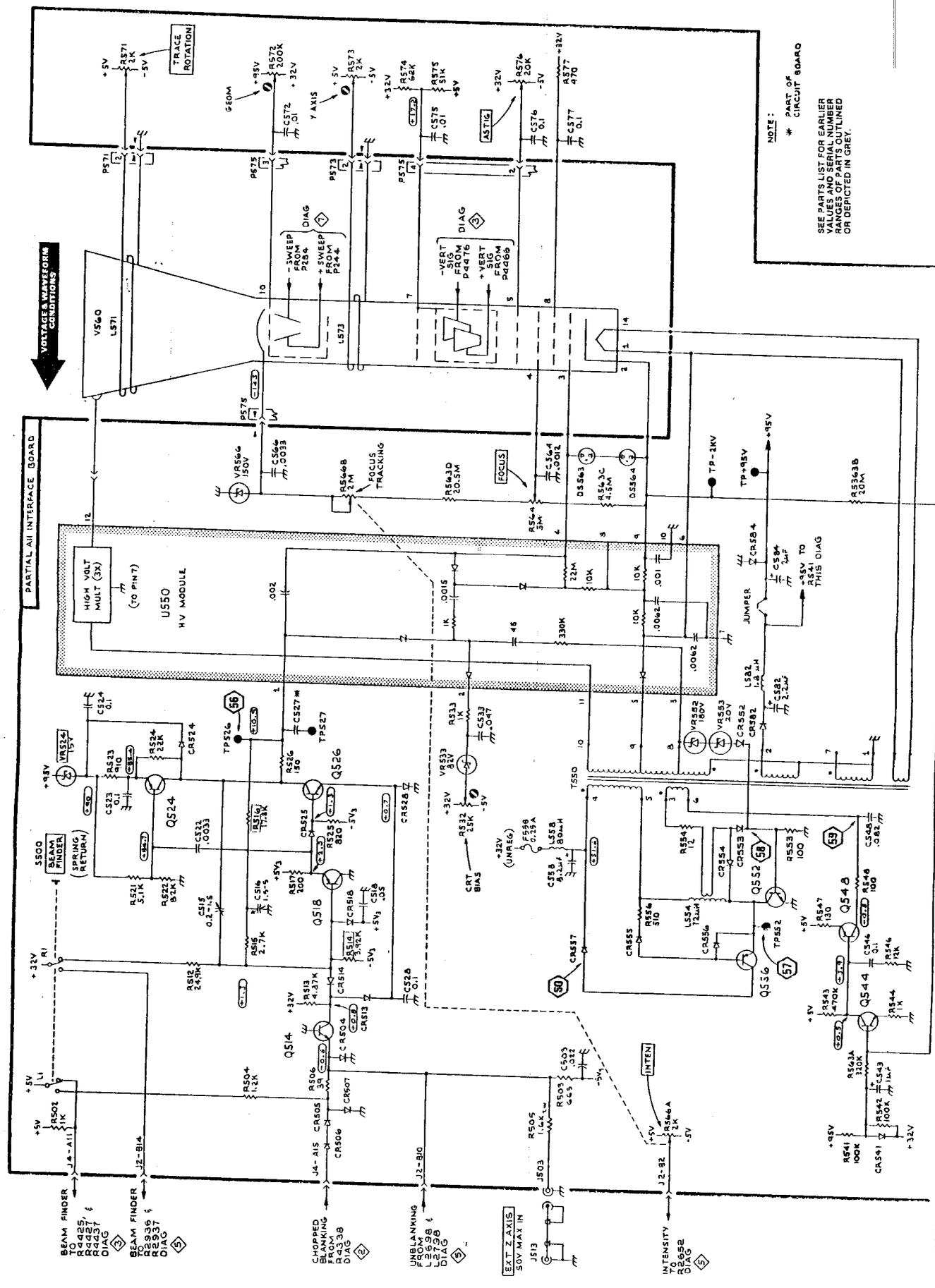
0 V

Test scope trigger SOURCE to CH 1

2237-120



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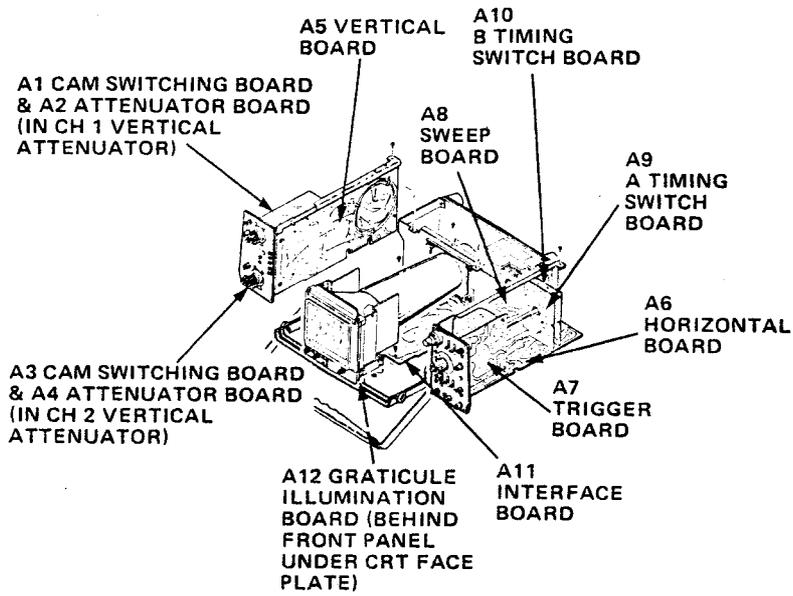
VOLTAGE WAVEFORM CONDITIONS

PARTIAL A11 INTERFACE BOARD

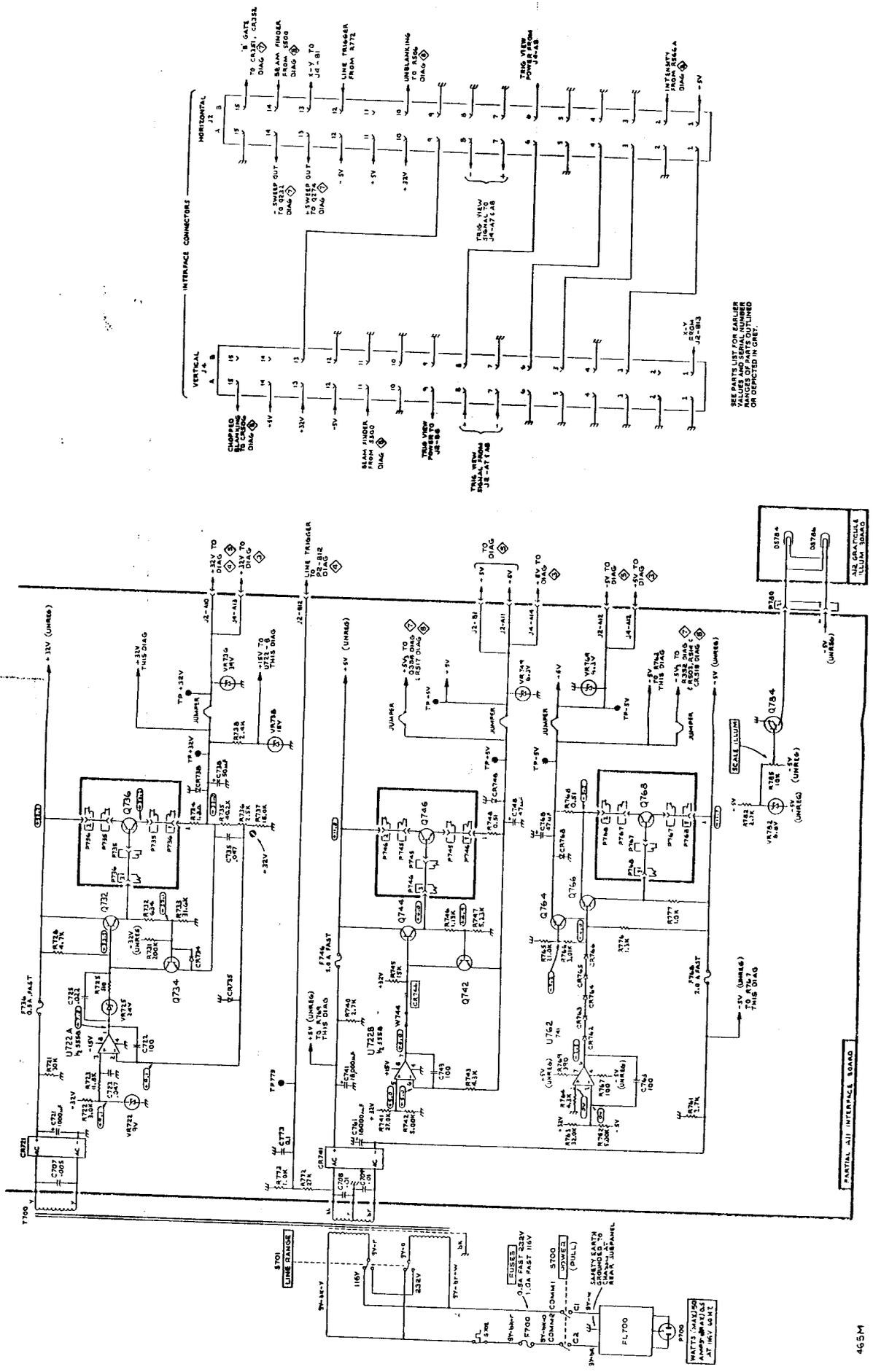
HIGH VOLT MULT (3X)
U550
HV MODULE

NOTE:
* PART OF CIRCUIT BOARD

SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS OUTLINED
OR DEPICTED IN GREY.



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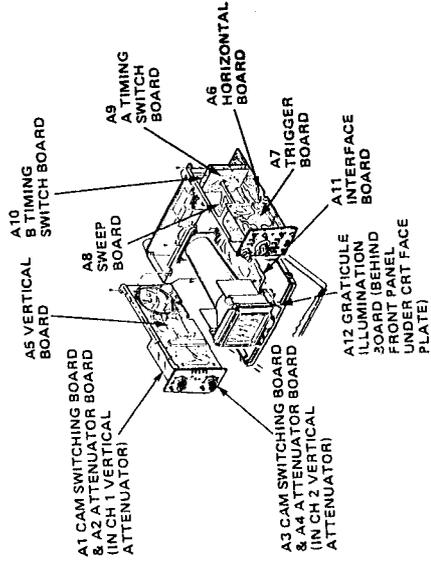
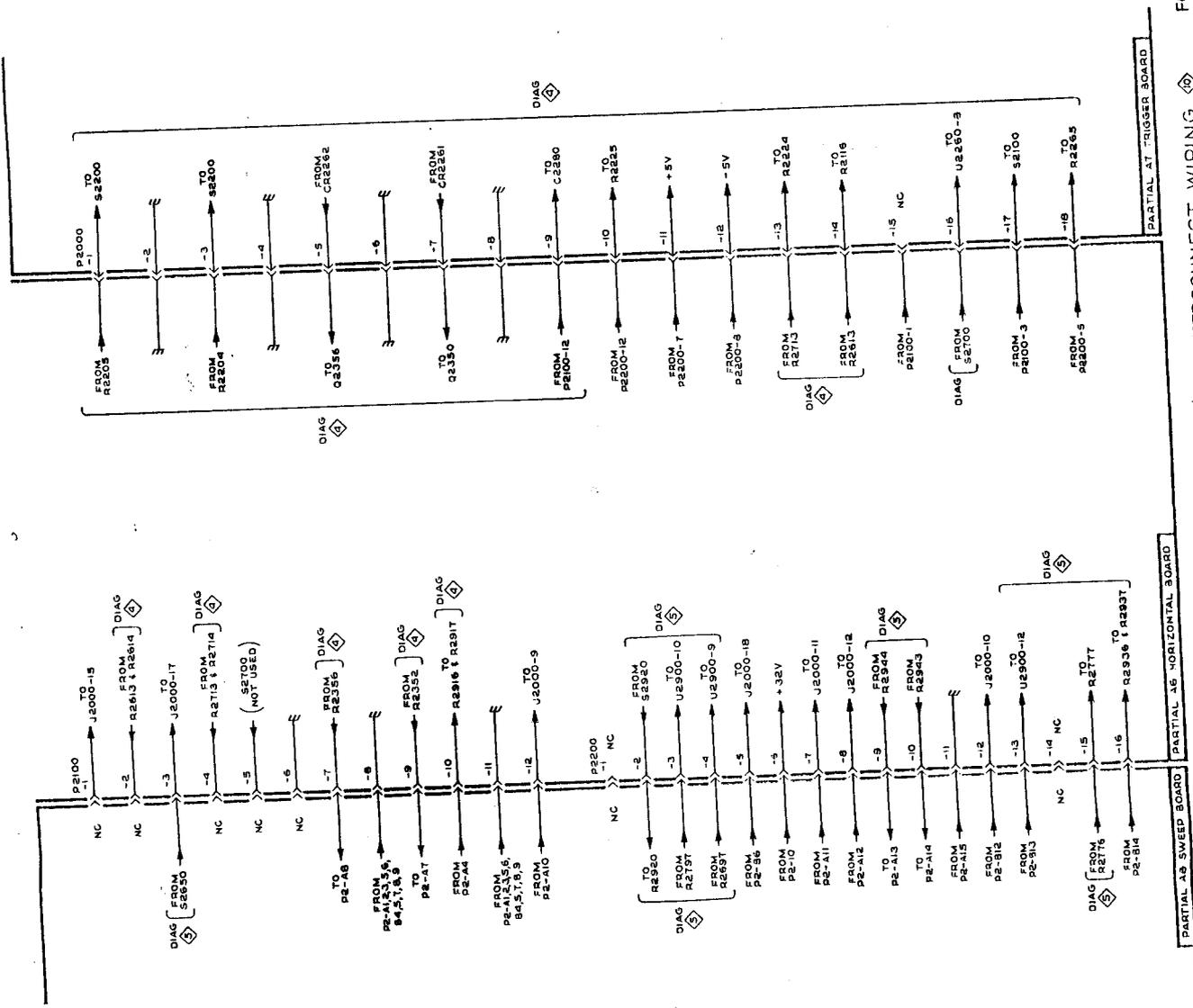


SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
DIFFERENCES. PARTS LISTED
OR OBTAINED IN CABINET.

POWER SUPPLY & INTERFACE CONNECTORS

465M

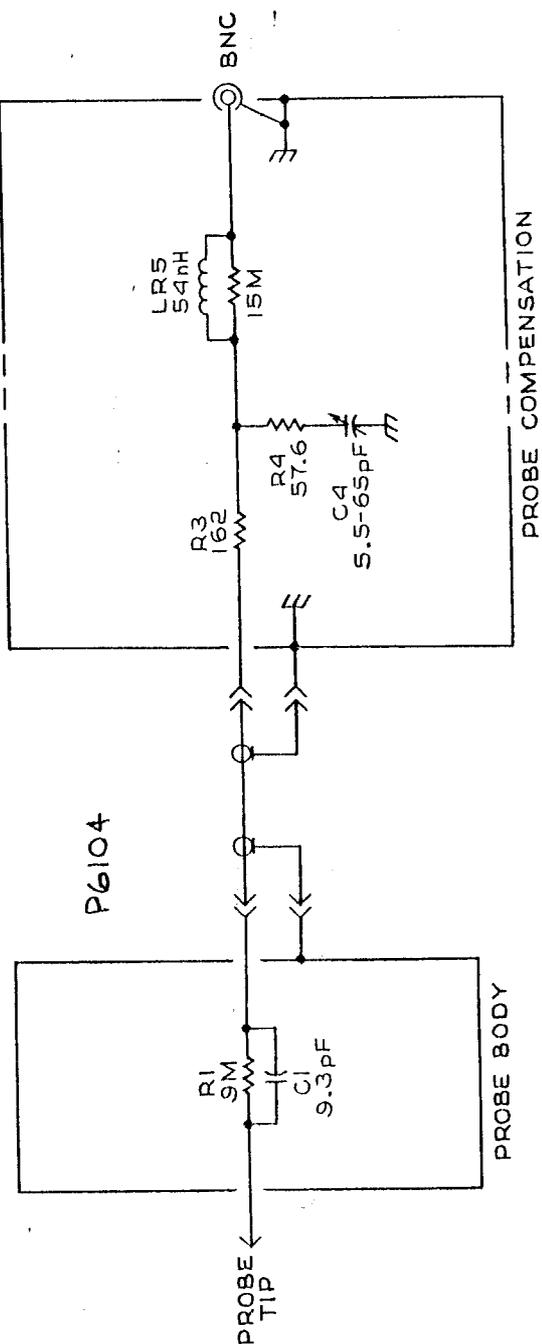
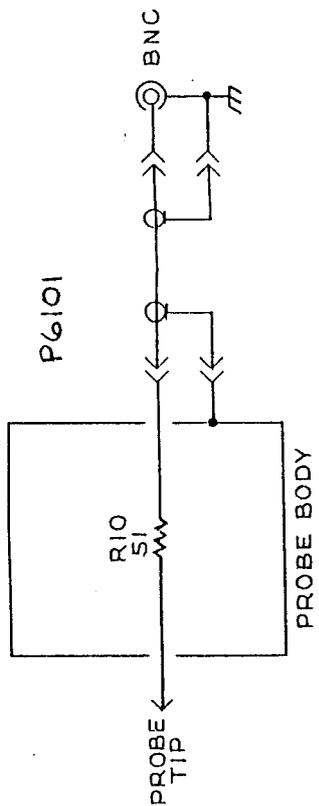
REV 5 FEB 1961



A3, A4, A7 INTERCONNECT WIRING

1137-107
REV 5 FEB 1981

465M



2237-108
REV B FEB 1981

P6101 & P6104 PROBE



465M