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**HOT SALE!**

LBO – 507-508  
5” OSCILLOSCOPE  
SERVICE MANUAL

**WARNING**

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that contained in the service manual unless you are qualified to do so.

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## PCB. REPLACEMENT LIST

PCE. No.	Item	Model	Ser. No.	Principal changes
T-1312	TRIG. SWEEP	507	No. 7070001 ~ 7100450	
		508	No. 7070001 ~ 7100800	
T-1312A		507	No. 7110451 ~ 7010650	Additional parts: C340 ~ 342, R1301:508
		508	No. 7110801 ~ 7012150	R1302, Q326, GND-TP Replacement parts: connector (P-301, P-305, P-310: 508 ) Removement parts: D308
T-1312B		507	No. 7020651 ~	Additional parts: R1304, 1305, Q327
		508	No. 7022151 ~	Replacement parts: C331, R386 Removement parts: C309
T-1313	V-FINAL	507	No. 7070001 ~ 7021050	
		508	No. 7070001 ~ 7022550	
T-1313A		507	No. 7031051 ~	Replacement parts: C219
		508	No. 7032551 ~	connector (P-213)
T-1314	V-PREAMP	507	No. 7070001 7100450	
T-1314A			No. 7110451 ~	Replacement parts: connector (P-3201, 3204) Removement parts: C3230, 3231, R3261 C3226 → VC3207
T-1315	V-PREAMP	508	No. 7070001 ~ 7100800	
T-1315A			No. 7110801 ~ 7012150	Additional parts: C224, 225, 231, C228 ~ 230, D233, 234 Replacement parts: connector (P-203, P-204, P-1202)

PCB. No.	Item	Model	Ser. No.	Principal changes
T-1015B	V-PREAMP		No. 7022151~	Additional parts: C1233, R1263, 1264, R239 C1224 → VC1207, C214
T-1322	PWR. & H-AMP	507	No. 7070001 ~ 7100450	* NOTE: HIGH VOLTAGE TP-5: -1500V
		508	No. 7070001 ~ 7100800	
T-1322A		507	No. 7100451 ~ 7031250	Additional parts: C124, 126, 406, VC401 R137, 138, 423 GND- TP Replacement parts: connector (P-101, 109, 110, 111, 112, 402) * NOTE: HIGH VOLTAGE TP-5: -1500V
	508	No. 7110801 ~ 7032750		
T-1322B		507	No. 7041251~	Additional parts: C406 R140, 141 D121, 122 F113 J122....Rear panel Replacement parts: C122, C405 → VC401 R136, 407, 413, 422 D116 ~ 118 * NOTE: HIGH VOLTAGE TP-5: -2000V
		508	No. 7042751~	
T-1467	Beam rotator	507A	No. 8060401~	Additional Unit Beam rotator (Ref. O-995A 1/7)
		508A	No. 8060101~	

## TEST EQUIPMENT REQUIRED

Voltmeter	DC 0 to 2000V AC 0 to 600V
Amplitude Calibrator	Square-wave 50mV to 50V Frequency: approximately 1KHz
Sine-wave Generator	100Hz to 20MHz Constant Amplitude
Fast Rise Square-wave Generator	1KHz to 100KHz
Capacitance Meter	35pF
Time Marker Generator	0.2S to 0.5 $\mu$ S
Oscilloscope	10mV 20MHz







ADJUST: Set the VOLTS/CM to 0.05V/cm.  
 Position the trace to the scale center.  
 Set the VOLTS/CM to 0.01V/cm.  
 Position the trace to the scale center by adjusting  
 the CH-1 STEP BAL. ADJ. control 507 : VR3201  
508 : VR1201  
 Repeat the above procedures until the minimum  
 trace shift can be obtained.

CH-2: Apply the same procedures as CH-1.  
 CH-2 STEP BAL. ADJ.: VR2201

2) DC Balance

SET: VERT. MODE	CH-1
VOLTS/CM	0.01V/cm
AC-GND-DC	GND

Position the trace to the scale center.

CHECK: No trace shift when rotating the VARIABLE control—  
 fully clockwise (CAL'D) to fully counterclockwise.

ADJUST: Set the VARIABLE fully counterclockwise.  
 Position the trace to the scale center by VERTICAL  
 position control.  
 Turn the VARIABLE to CAL'D.  
 Position the trace to the scale center by adjusting  
 the CH-1 DC BAL. ADJ. 507 : VR3204  
508 : VR1202  
 Repeat the above procedures until the minimum trace  
 shift can be obtained.

CH-2: Apply the same procedures as CH-1.  
 CH-2 DC BAL. ADJ.: VR2202

3) ADD. Balance (only 508)

SET: VERT. MODE	DUAL
VOLTS/CM	0.01V/cm
AC-GND-DC	GND

Position both CH-1 and CH-2 traces to the scale center.  
 Push the ADD. button.

CHECK: No trace shift when changing the Dual to the ADD.

ADJUST: ADD BAL. ADJ. (VR201) for the minimum trace shift between the DUAL and the ADD.

Repeat the above adjustment for the minimum trace shift.

4) VOLTS/CM --- Gain of the Vertical Amplifier.

SET: VOLTS/CM 0.01V/cm  
VARIABLE CAL'D  
AC-GND-DC DC  
Amplitude Calibrator Connect to the CH-1.  
Freq.: 1KHz  
Output: 50mV

CHECK: Display of 5cm of deflection within  $\pm 3\%$  tolerance.

ADJUST: CH-1 GAIN ADJ. 507 : VR3204 for 5cm.  
508 : VR1204

CHECK: Accuracy of the other CH-1 VOLTS/CM according to Table-2

CH-2: Apply the same procedures as CH-1.  
CH-2 GAIN ADJ. (VR2204)

Table-2

VOLTS/CM	Calibrator Output (V)	Deflection (cm)	GAIN ADJ.
0.01	0.05	5	<span style="border: 1px solid black; padding: 0 2px;">507</span> VR3204 <span style="border: 1px solid black; padding: 0 2px;">508</span> CH-1: VR1204 CH-2: VR2204
0.02	0.1	5	
0.05	0.2	4	
0.1	0.5	5	
0.2	1	5	
0.5	2	4	
1	5	5	
2	10	5	
5	20	4	
10	50	5	
20	100	5	

5) Step Attenuator Phase Compensation

SET: CH-1 VOLTS/CM                    0.1V/cm  
       Amplitude Calibrator            Connect to CH-1.  
   Freq.: 1KHz  
   Output: 0.5V

CHECK: Display of a flat-top waveform without overshoot and ringing.

ADJUST: PHASE COMP. ADJ. (VC1201) for the best flat-top waveform.

CHECK: A flat-top waveform of 0.2V/cm and 0.5V/cm ranges.

CHECK and ADJUST the Phase Compensation of all the other VOLTS/CM ranges according to Table-3.

Table-3

VOLTS/CM	PHASE COMP. ADJ.	
	CH-1	CH-2
0.1V to 0.5V	507 : VC3201	VC2201
	508 : VC1201	
1V to 5V	507 : VC3203	VC2203
	508 : VC1203	
10V to 20V	507 : VC3205	VC2205
	508 : VC1205	

6) Input Capacitance

SET: CH-1 VOLTS/CM                    0.01V/cm  
       AC-GND-DC                        DC  
       Capacitance Meter                Connect to CH-1.

CHECK: Input Capacitance is 35pF ±5pF.  
       At the same time, Check the input capacitances of 0.02V/cm and 0.05V/cm ranges within the given limits.

The other ranges:  
       Check the input capacitances of all the other VOLTS/CM ranges within 0.01V/cm C-in ±0.5pF.

ADJUST: INPUT CAPACITANCE ADJ. for the given limits according to Table-4.

CH-2: Apply the same procedures as the CH-1.



CHECK: Display amplitude to be 2.8cm or greater.

Apply the above procedures for all CH-1 VOLTS/CM ranges and check the frequency response.

CH-2: Apply the same procedures as CH-1.

\* NOTE: Repeat adjustments and checks through 7) and 8) as these have an adjustment interaction.

#### 4 TIME BASE

##### 1) TIME/CM (Horizontal Amplifier X1 Gain)

SET: TIME/CM	0.5mS/cm
VARIABLE	CAL'D
VOLTS/CM	0.5V/cm
LEVEL	NORM.
Time Marker Generator	Connect to CH-1. Time: 0.5mS

Fill the scale with 11 Time Markers.

CHECK: 1 marker per centimeter is exactly within  $\pm 3\%$  tolerance on the scale line.

ADJUST: TIME/CM ADJ. (WIDTH ADJ.: VR304) to exactly make 1 Time Marker per cm.

CHECK: Accuracy of all CH-1 TIME/CM ranges.

READJUST: TIME/CM ADJ. (VR304) to be within the given limits at all CH-1 TIME/CM ranges.

##### 2) MAG. X5 (Horizontal Amplifier X5 Gain)

SET: TIME/CM	0.5mS/cm
VARIABLE	CAL'D
Time Marker Generator	0.5mS
MAG.	X5

CHECK: Two Time Markers are exactly at an interval of 5cm length.

ADJUST: MAG. GAIN ADJ. (VR403) to exactly make 1 mark per 5cm.

3) MAG. X5 Centering

SET: TIME/CM	0.5mS/cm
VARIABLE	CAL'D
Time Marker Generator	0.5mS
MAG.	x1

Position 2nd time marker from the sweep starting point exactly to the scale center.

Pull the MAG. knob.

CHECK: 3 Time Markers are obtained exactly at intervals of 5cm length.

ADJUST: MAG. CENTER ADJ. (VR402) to position the middle time marker on the scale center line.

\*NOTE: Repeat the above adjustments until no horizontal shift of the Time Marker is observed between X1 MAG. and X5 MAG.

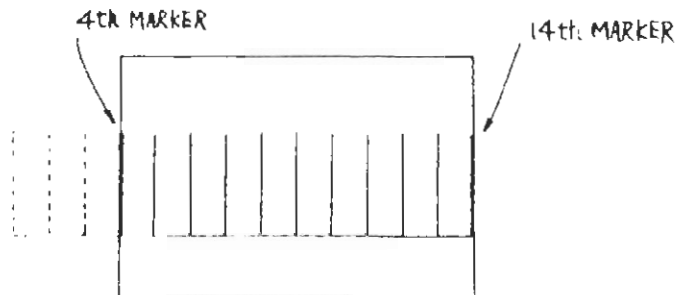
4) Sweep Length

SET: TIME/CM	0.5mS/cm
VARIABLE	CAL'D
LEVEL	NORM.
MAG.	X1
Time Marker Generator	Connect to CH-1. Time: 0.5mS

Position the 4th Time Marker from the sweep starting point to the left end of the scale.

CHECK: 14th Time Marker is just observed in the right end of the scale.

ADJUST: LENGTH ADJ. (VR305) until the 14th Time Marker appears in the right end of the scale as follows.







5) MAG. X5 LINEARITY

SET: TIME/CM	1mS/cm
VARIABLE	CAL'D
Time Marker Generator	Connect to CH-1. Time: 1mS
MAG.	X5

3 Time Markers are obtained on the scale.

Position the middle Time Marker exactly at the center.

CHECK: Linearity to be within  $\pm 10\%$  tolerance.

ADJUST: Linearity Compensation Capacitance VC401 for the given limits.

CHECK: Accuracy of  $1\mu\text{S/cm}$  and  $0.5\mu\text{S/cm}$  ranges in the same manner as mentioned above.

5 TRIGGER

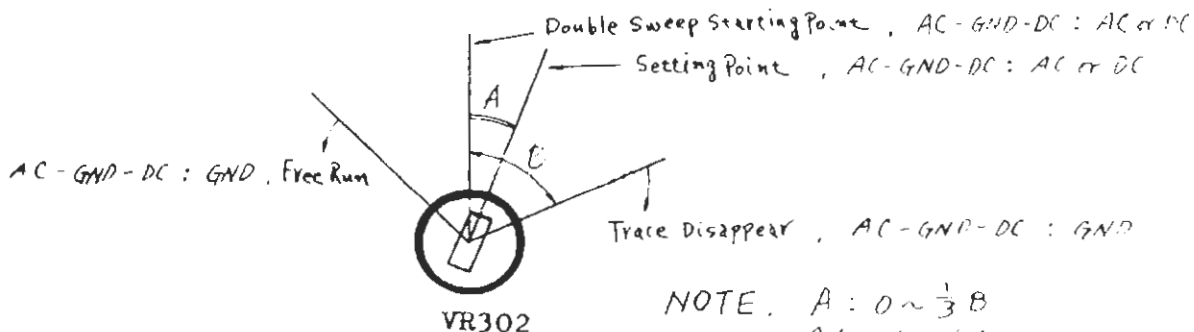
1) SWEEP STAB.

SET: TIME/CM	1mS/cm
VARIABLE	CAL'D
LEVEL	NORM.
V. MODE	DUAL
Sine-wave Generator	Connect to CH-1. Freq.: 100Hz Output: 1cm display

CHECK: Stable display to be obtained by rotating the LEVEL knob.

ADJUST: Position the STAB. ADJ. (VR302) to the starting point of free-runs and rotate the TIME/CM VARIABLE counterclockwise until the double sweep occurs.

Adjust the STAB. ADJ. (VR302) as follows.



2) Internal Trigger

SET: TIME/CM	0.5 $\mu$ S/cm
LEVEL	NORM.
V. MODE	DUAL
Sine-wave Generator	Connect to CH-1. Freq.: 20MHz Output: 1cm display

CHECK: Stable display to be obtained by rotating the LEVEL knob, and then by setting the TRIG. SLOPE to  -

CH-2: Apply the same procedure as CH-1.

At the same time, check if the stable display can be obtained by setting LEVEL knob to AUTO.

3) External Trigger

SET: TIME/CM	0.5 $\mu$ S/cm
V. MODE	DUAL
TRIG.	EXT.
LEVEL	NORM.
Sine-wave Generator	Connect to CH-1 in paralel with Ext. Trig. in. Freq.: 20MHz Output: 150mVp-p

CHECK: Stable display to be obtained by rotating the LEVEL knob and at the same time, by setting TRIG. SLOPE to  - .

\*NOTE: When no stable display can be observed in checking 2) and 3), readjust the STAB. ADJ. (VR302).

6 X-Y OPERATION

1) X GAIN

SET: TIME/CM	X-Y
VOLTS/CM	0.01C/cm
V. VARIABLE	CAL'D
H. POSITION	Midrange
Amplitude Calibrator	Connect to CH-1 Output: 50mV
AC-GND-DC	DC

CHECK: Two dots to be obtained at 5cm interval.

ADJUST: X Gain ADJ. (VR307) for 5cm.

2) X-Y Position Centering

SET: Switch DC to GND under the above setup.

CHECK: Dot to be positioned on the scale center line.

ADJUST: X-Y POSITION ADJ. (VR306)

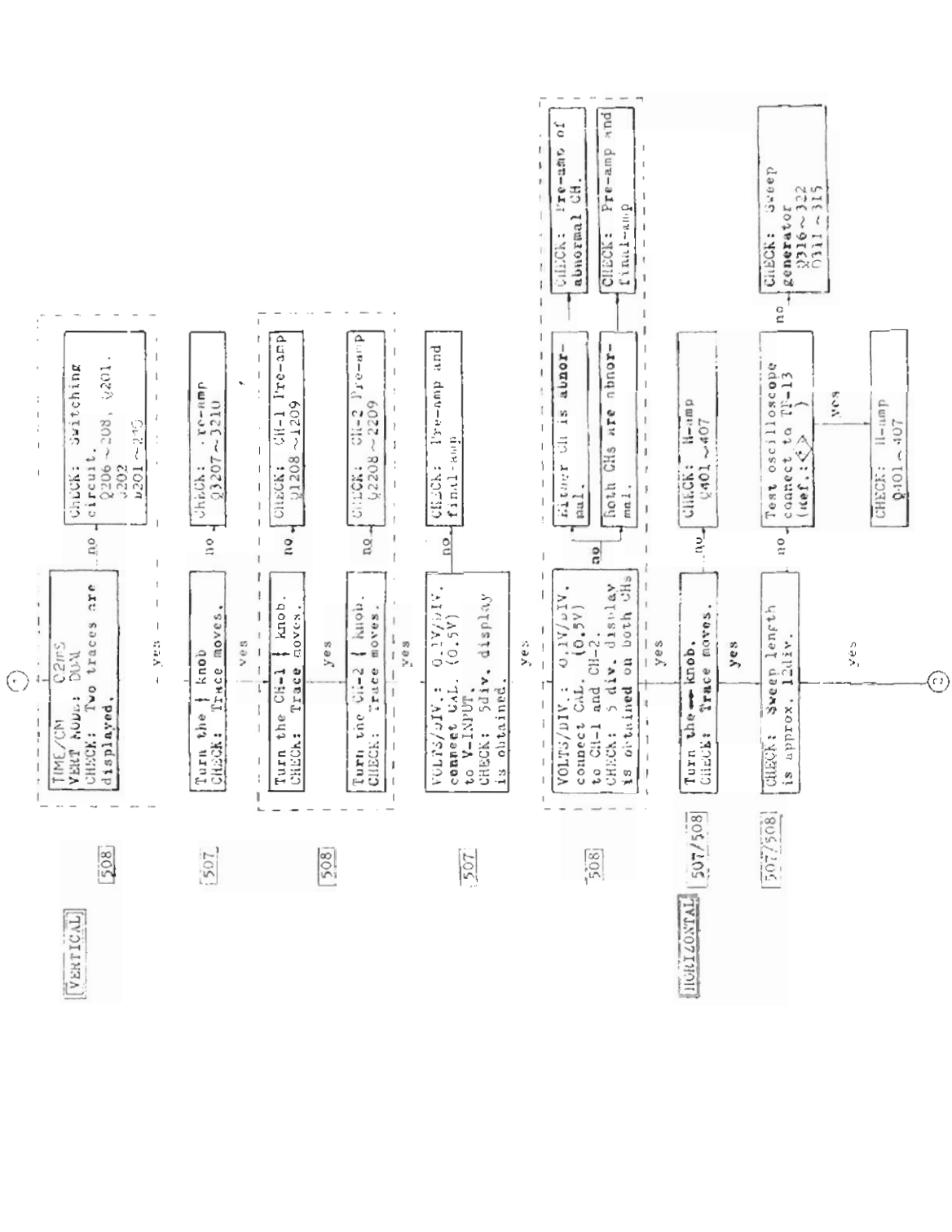
7 CALIBRATOR

SET: Test oscilloscope	VOLTS/DIV.	0.1Volts/div.
	TIME/DIV.	0.2mS/div.
	Connect to CAL. terminal.	

CHECK: Amplitude to be 0.5Vp-p  $\pm 1\%$ .

ADJUST: CAL. ADJ. (VR101) for 0.5Vp-p  $\pm 1\%$ .





TRIGGER

507

TIME/DIV.: 10mS  
TRIG. MODE: Auto  
CHECK: Stable display  
can be obtained.

CHECK: Trigger circuit  
Q3211~3212  
Q309~315  
CHECK: Sweep generator  
Q316~322, D311~315

2

yes

508

TIME/DIV.: 10mS  
TRIG. MODE: Auto  
CHECK: Stable display  
can be obtained on  
both CHs.

CHECK: Trigger circuit  
CH-1 Q1207, Q204  
CH-2 Q2207, Q203  
Q205, 325,  
Q309~315  
CHECK: Sweep generator  
Q316~322, D311~315

yes

TIME BASE

507/508

Shows approx. 5 cycle  
display.

CHECK: H-amp  
Q401~407  
CHECK: Sweep  
timing circuit  
R371~379  
C327~330, 343

yes

MAG. X5

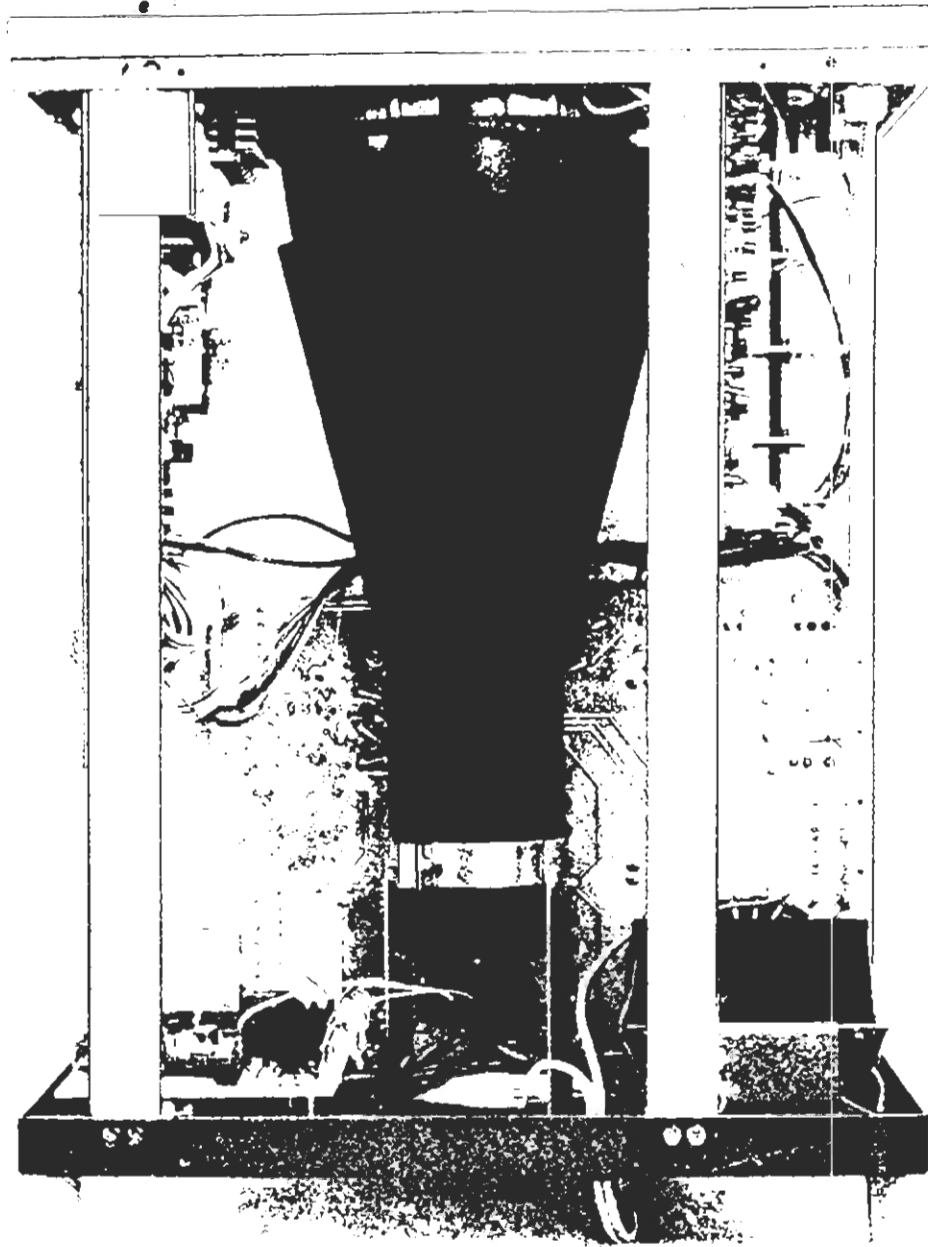
507/508

MAG. X5: Pull-out  
CHECK: Shows approx.  
1 cycle display.

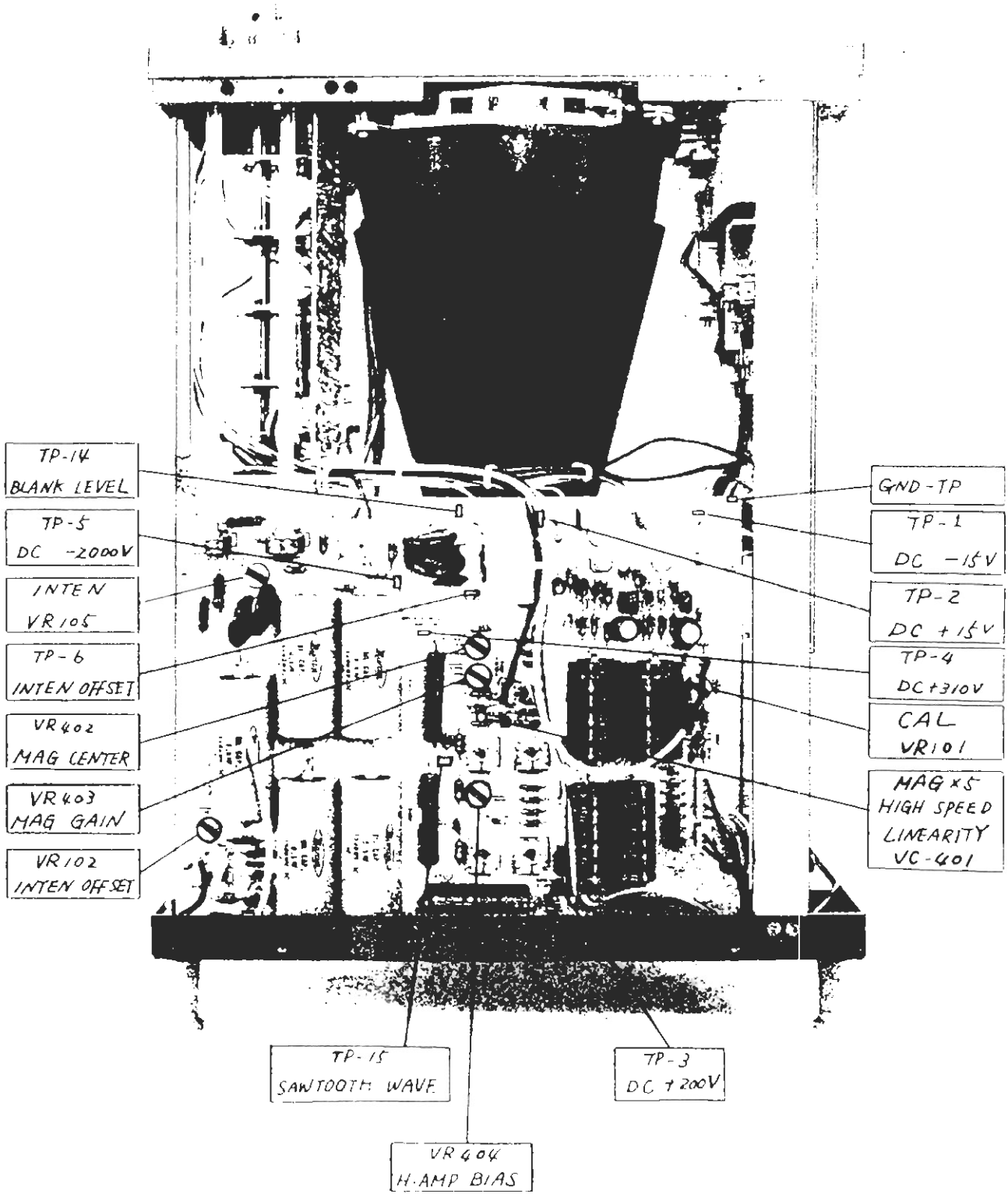
CHECK: H-amp  
Q402

END

LOCATION OF ADJUSTOR

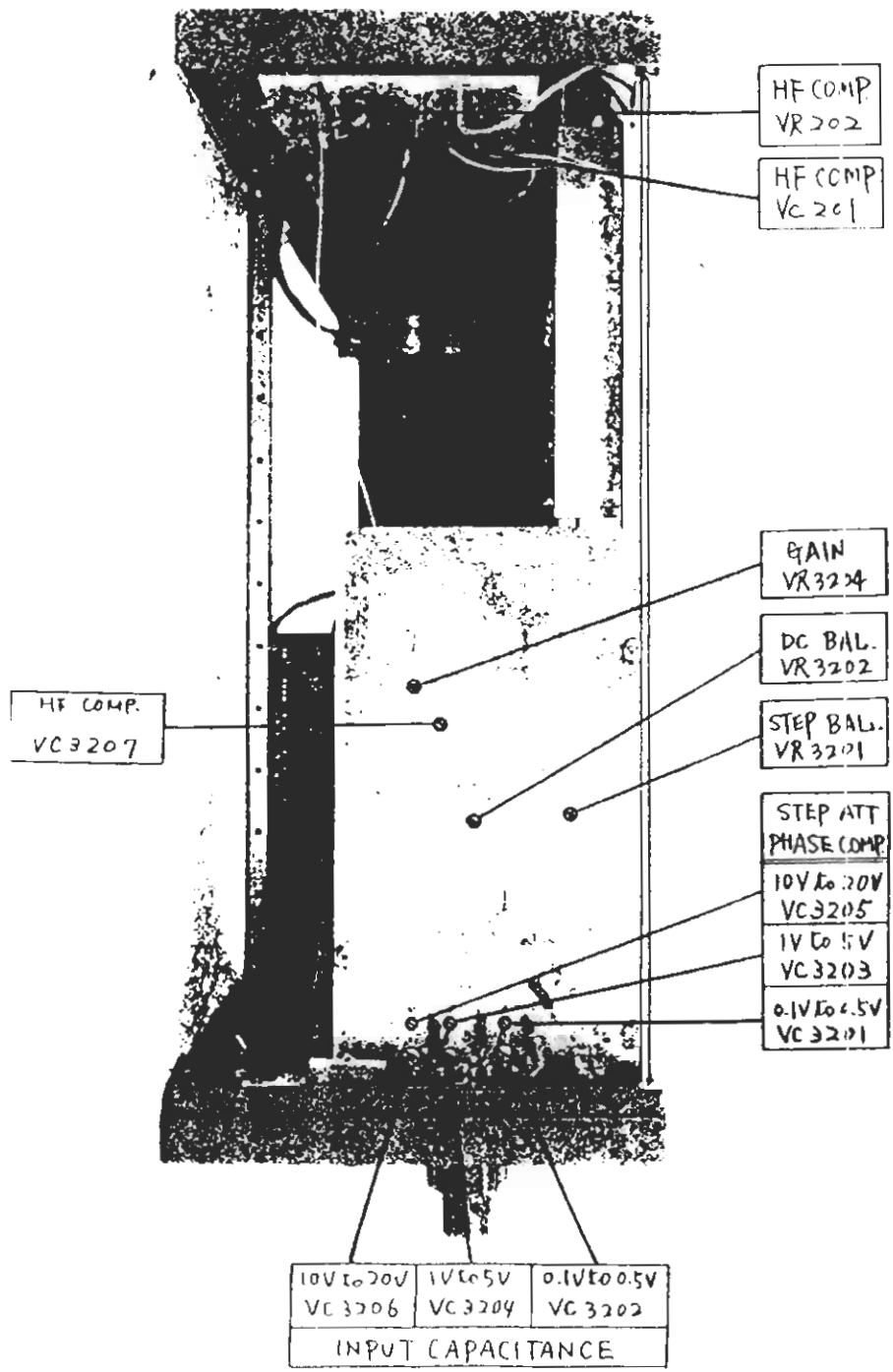


POWER , H-AMP, and V-FINAL AMP.

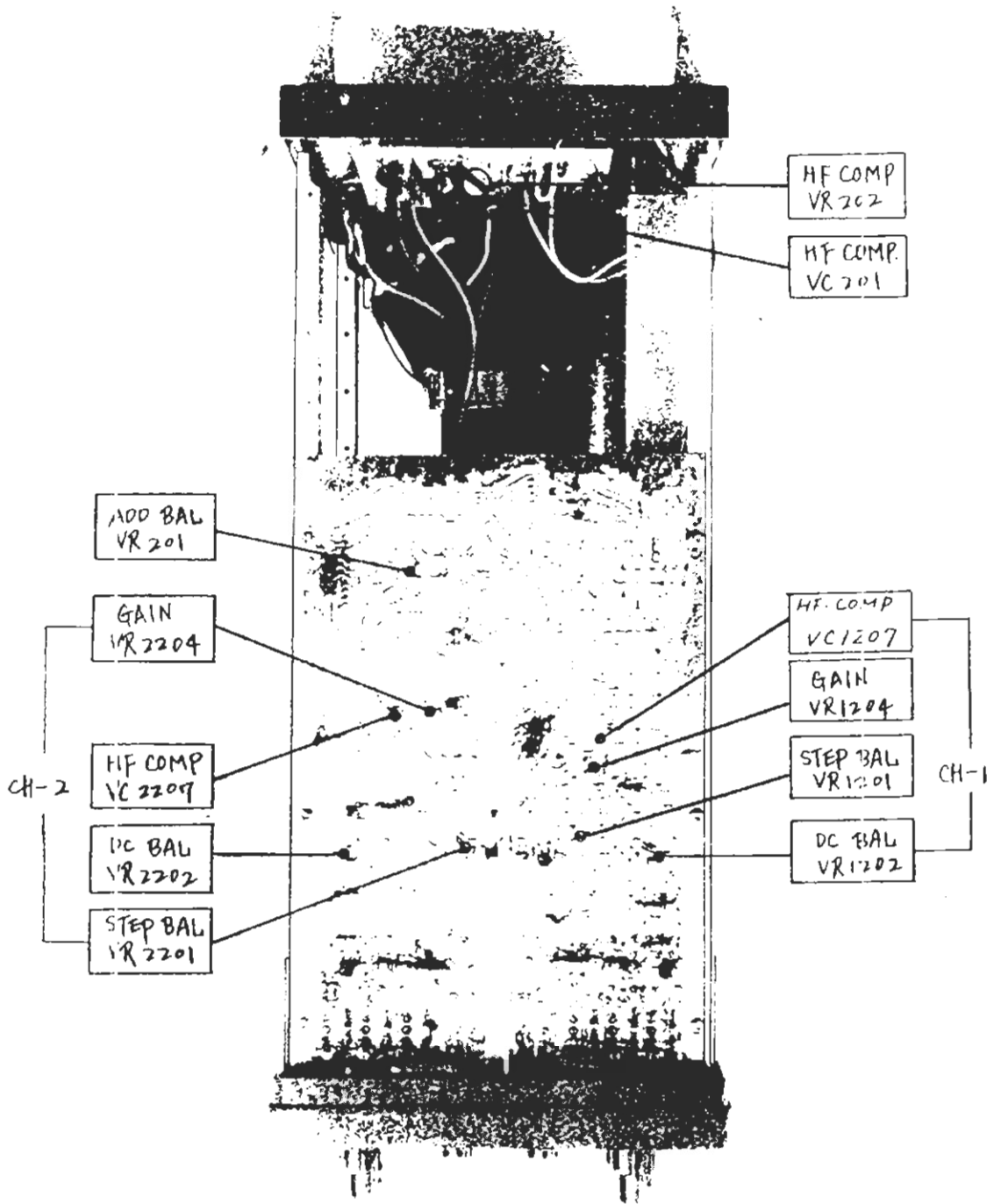


POWER and H-AMP

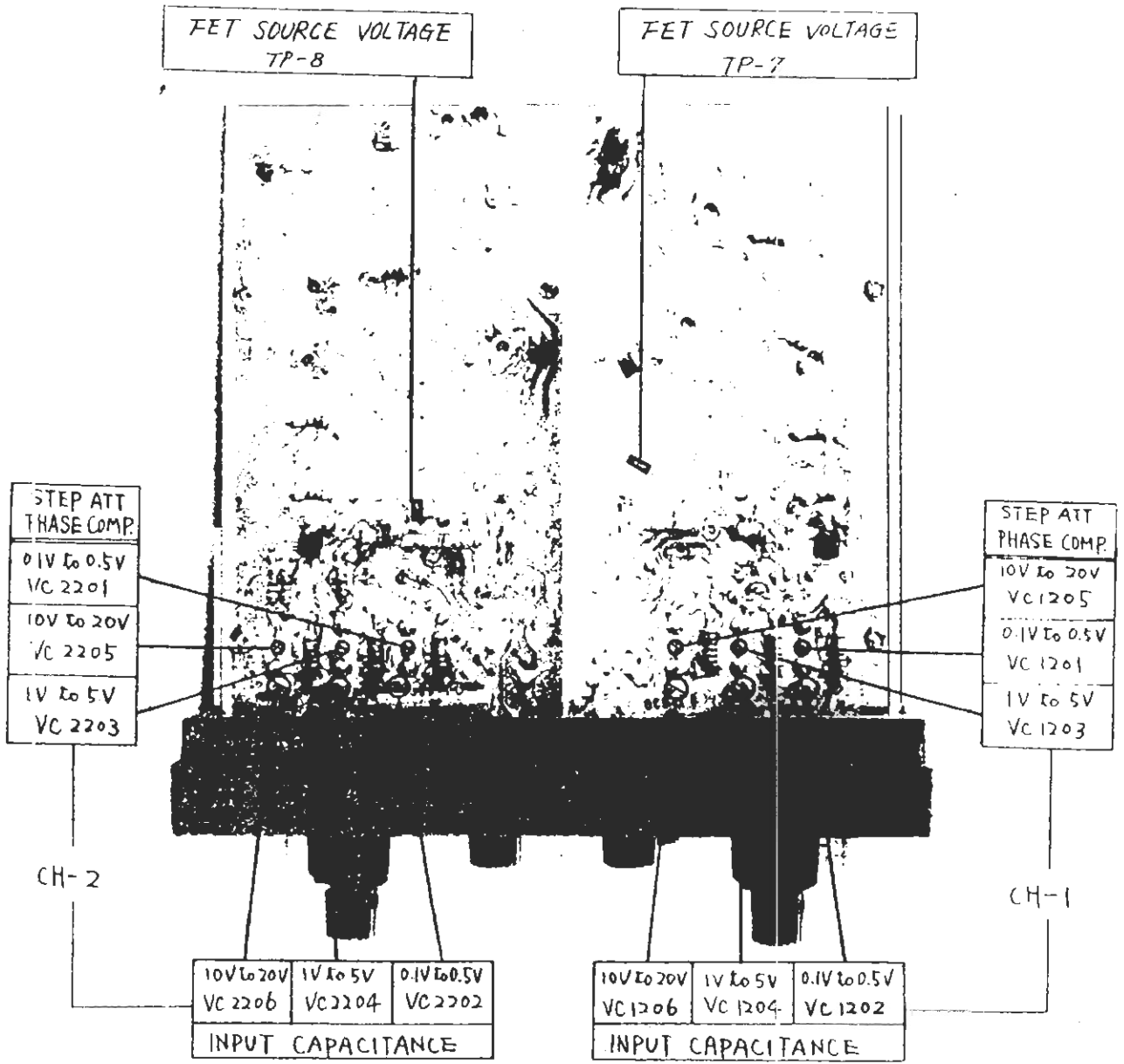




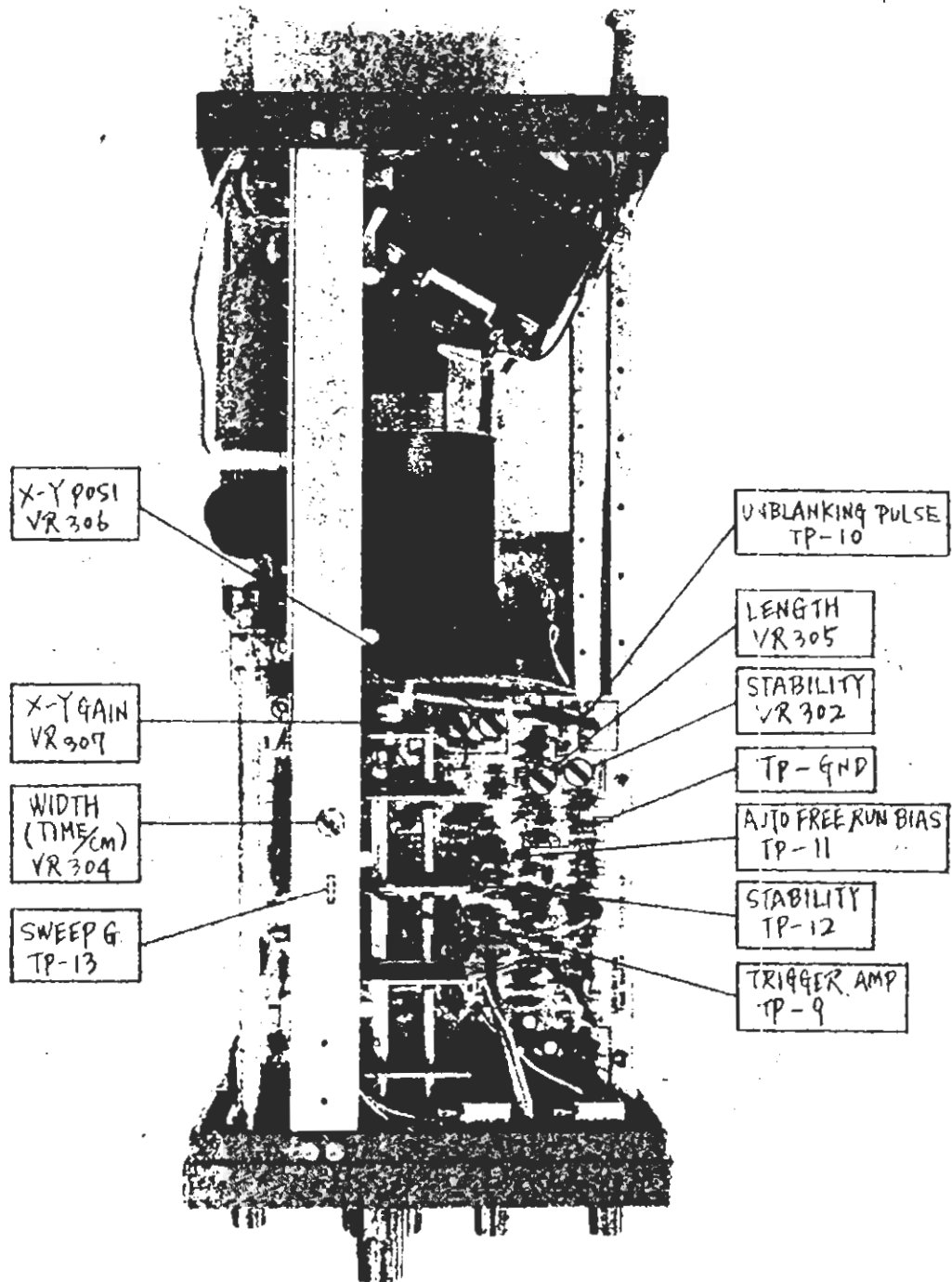
507 V-PREAMP and V-FINAL AMP



508 V-PREAMP and




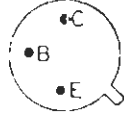

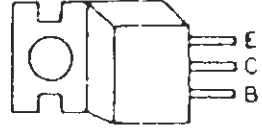
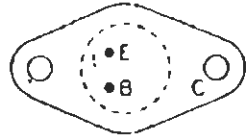




508 V-PREAMP


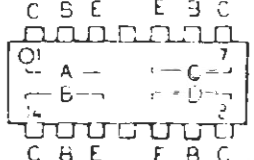
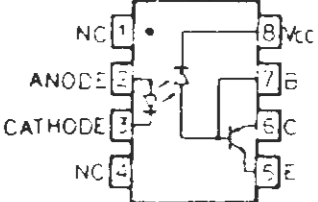
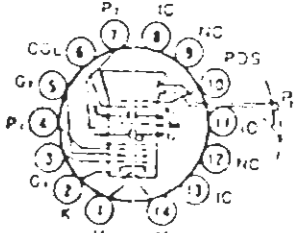
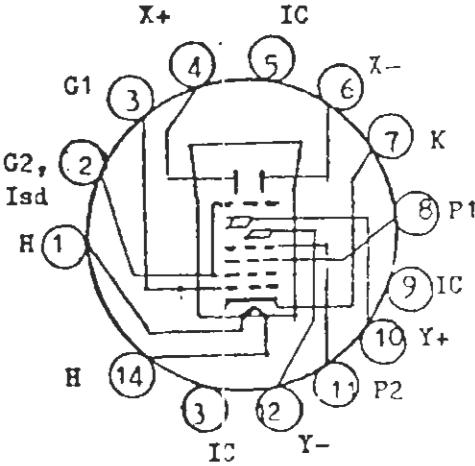



TRIG. AMP. and SWEEP GEN.

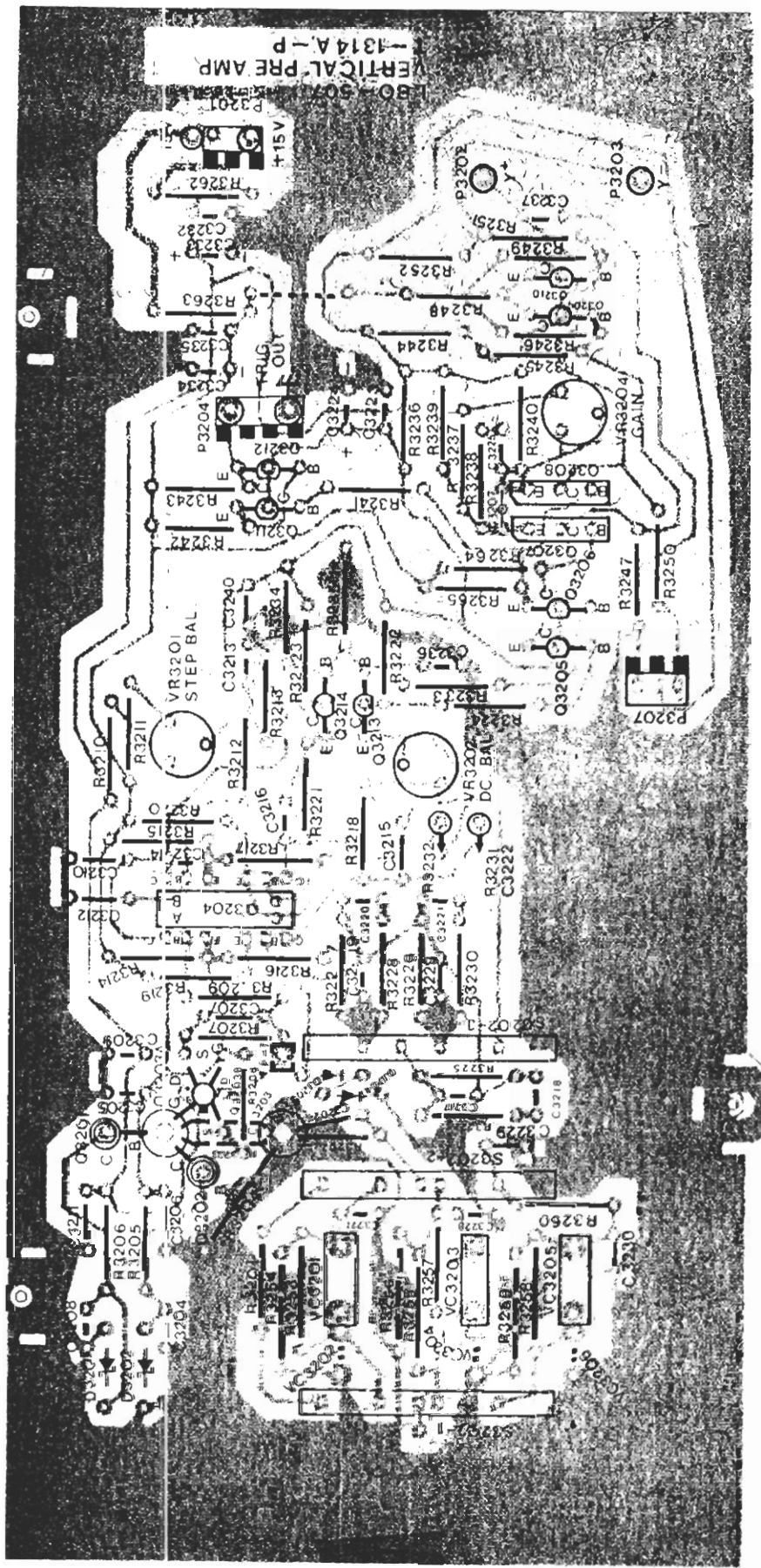
PIN CONNECTION, TRANSISTOR and CRT

name	type	connection
2SA-495 2SA-561	PNP	
2SC-372 2SC-780A 2SC-373 2SC-752	NPN	
2SA-628	PNP	
2SA-678	PNP	
S-A92	PNP	
2SA-497 2SA-711	PNP	
2SC-507 2SC-1012A 2SC-1216	NPN	
2N-3866	NPN	
2SC-288A	NPN	
2SC-1279 2SC-1215 2SC1815	NPN	
2SC-1569 2SC-1625	NPN	
2SD-315	NPN	
2SK-30A	FET	
2SK-33	FET	

PIN CONNECTION, TRANSISTOR and CRT

name	type	connection
IMF-3958 2N-3958	Pair FET	
ITS-30809	Pair FET	
TR. guard array NFQ-918	NPN	
photocoupler 5082-4351	NPN	
E2663331	CRT	
130BX331 C5S66P31B	CRT	
2SA1015	TR	

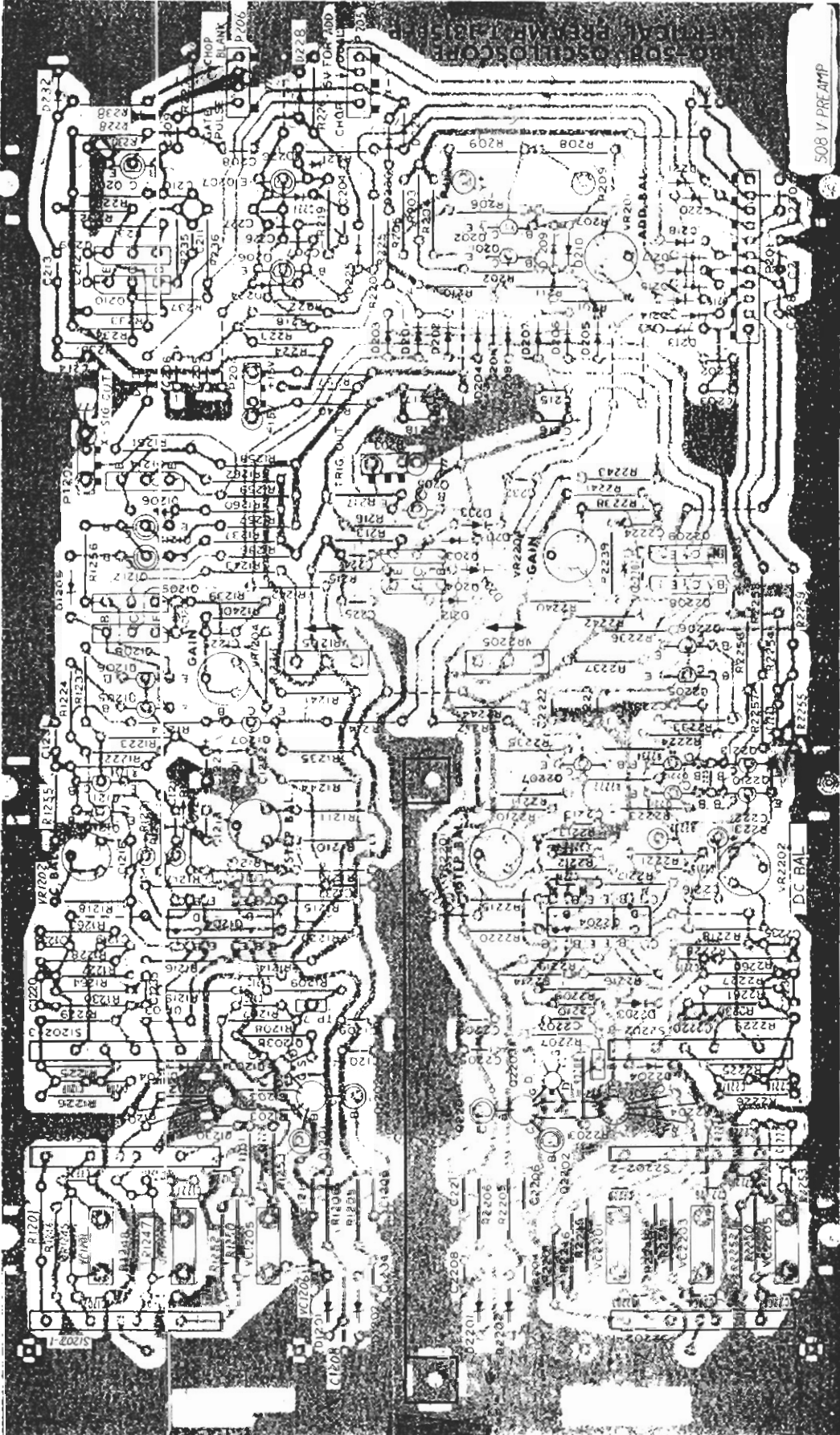




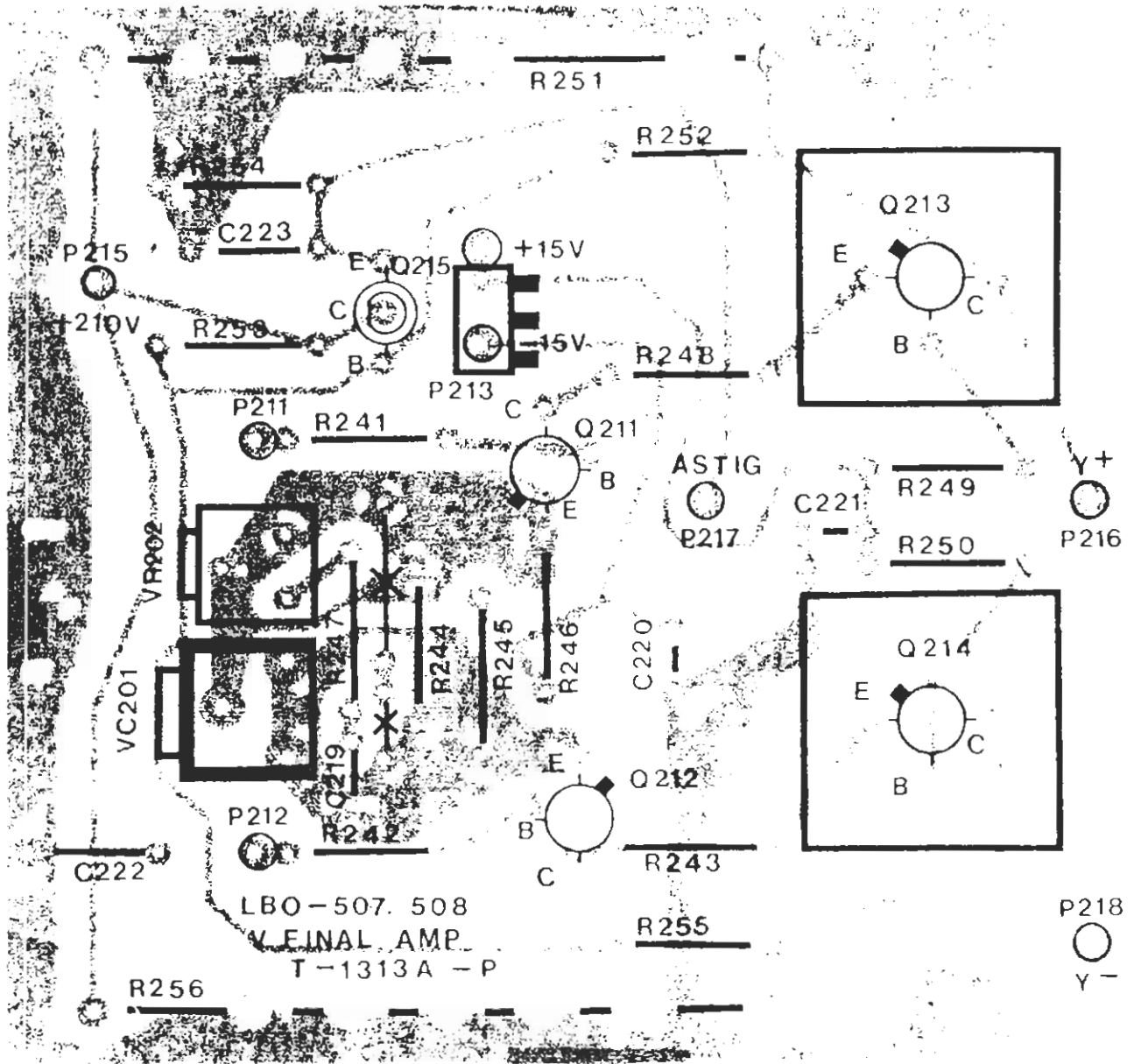
VERTICAL PRE AMP  
 --1314A-P

.507 V-PREAMP

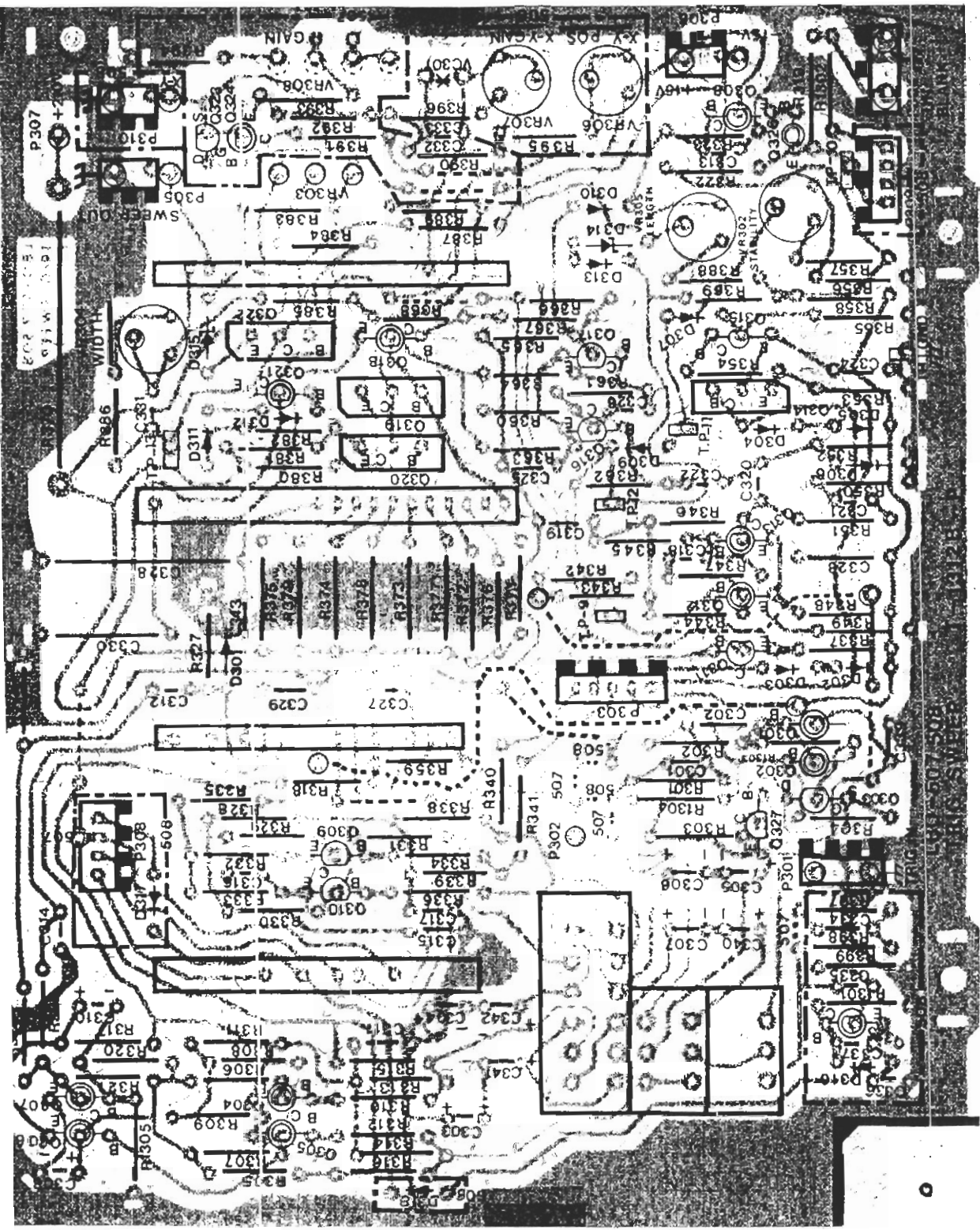




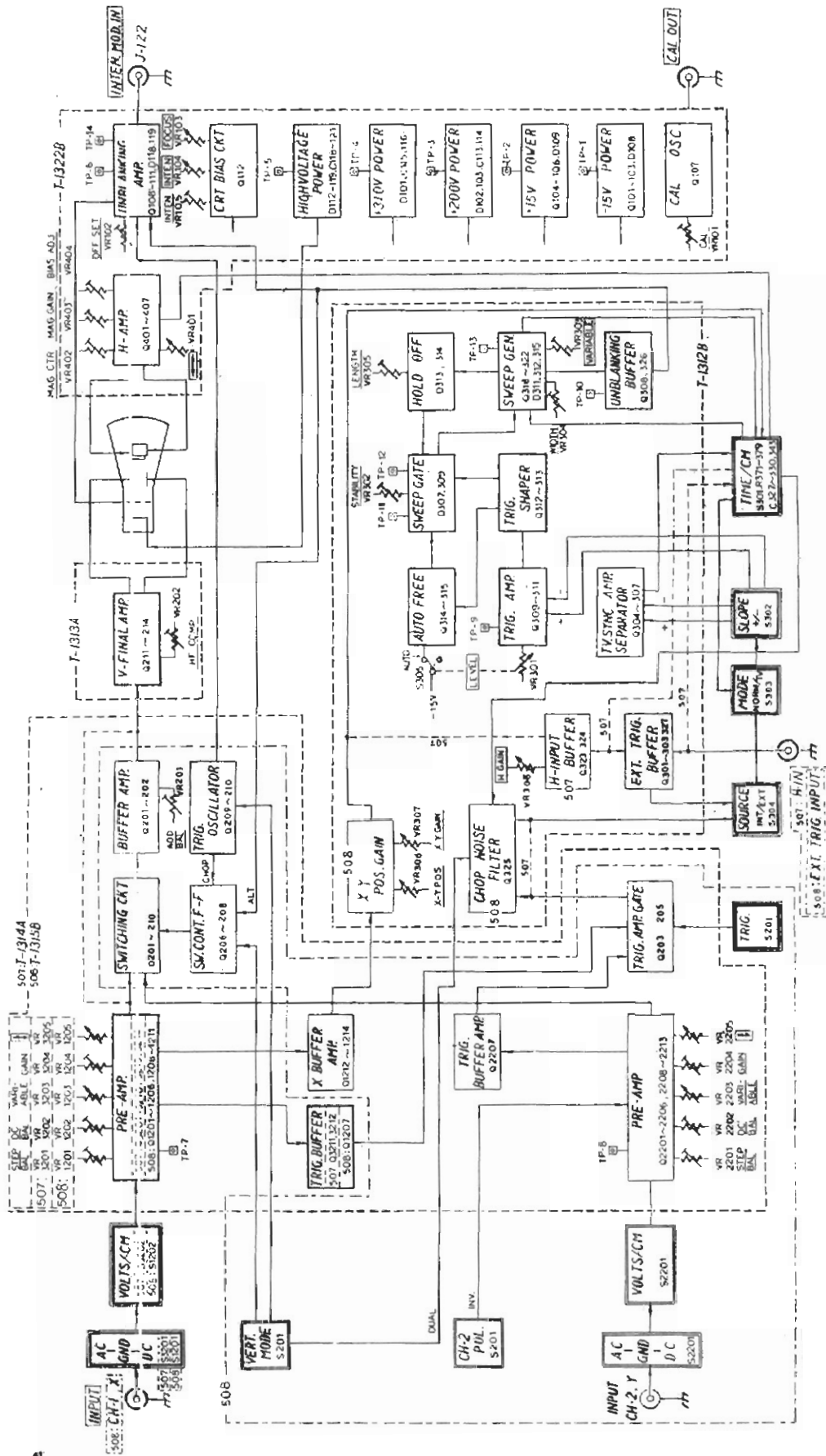
508 V. PRE AMP



V-FINAL



TRIG AMP and SWEEP GEN



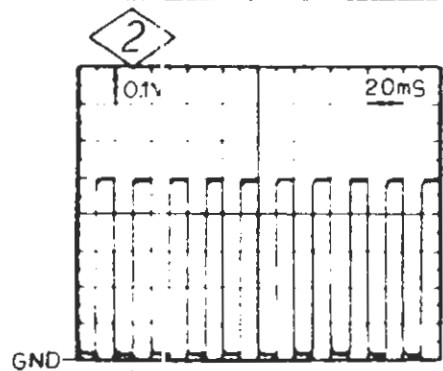
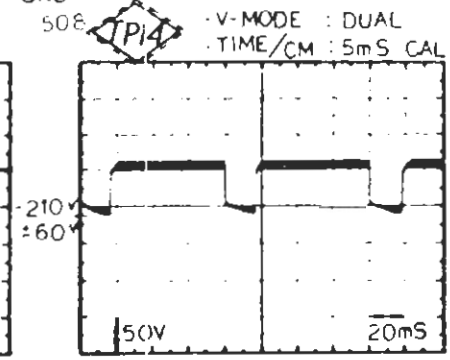
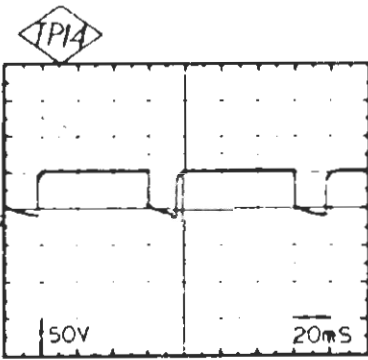
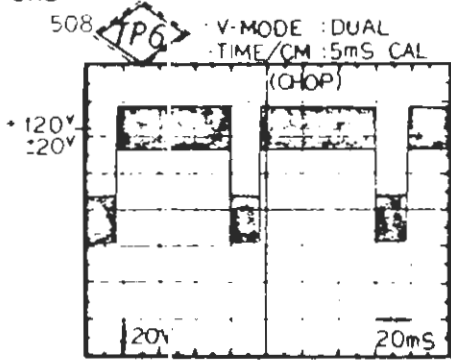
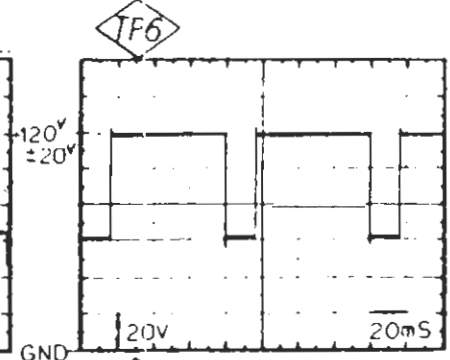
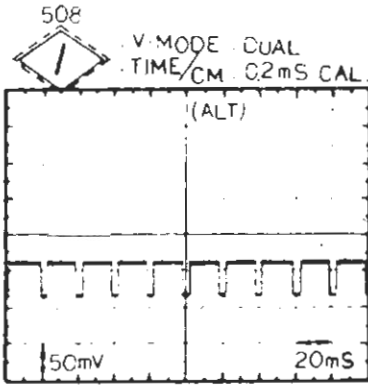
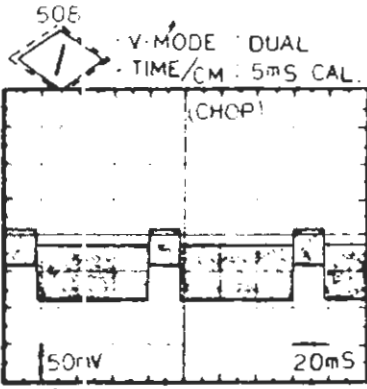
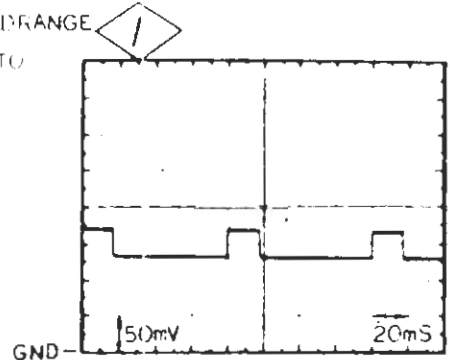
L80-507/508 BLOCKDIAGRAM

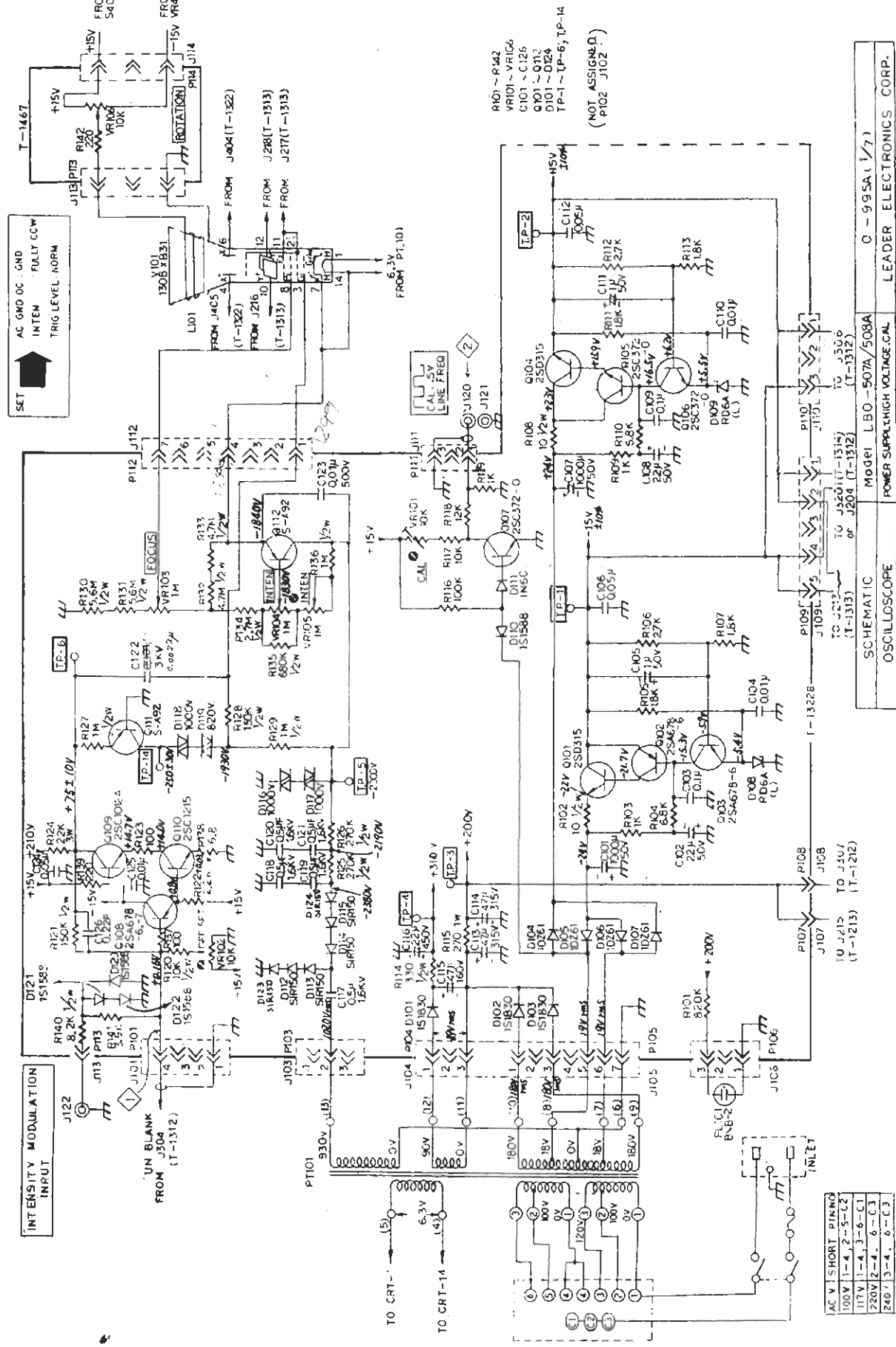
# POWER

## BASIC SET FUNCTION

508 | V-MODE : CH-1  
 | TRIG : CH-1  
 | AC-GND-DC : DC  
 | VOLTS/CM : 0.1V/CM.CAL  
 | CAL OUT : CONNECT TO V-IN  
 | SLOPE : +  
 | MODE(NORM/TV) : NORM  
 | SOURCE : INT

LEVEL : AUTO.KNOB MIDRANGE  
 V POS : 0LT WAVEFORM TO CTN  
 MAG. : NORM  
 TIME/CM : 5mS CAL  
 H-POS : MIDRANGE





SET  
 AC GND OC : GND FULLY CCW  
 INTEN TRIG LEVEL NORM

INTENSITY MODULATION INPUT

UN BLANK FROM J504 (T-1312)

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

TO CRT-14

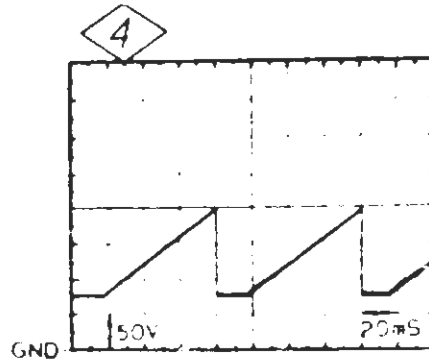
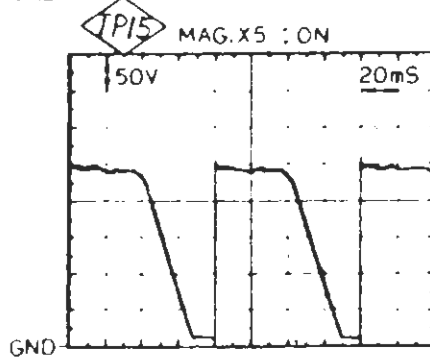
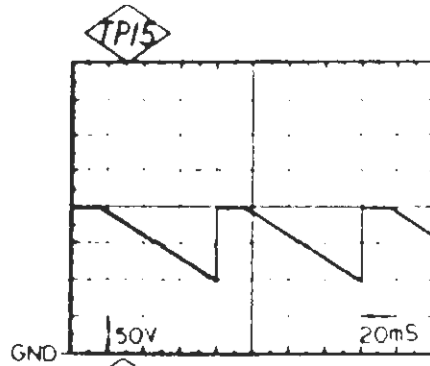
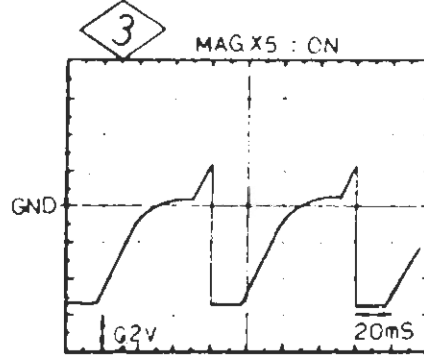
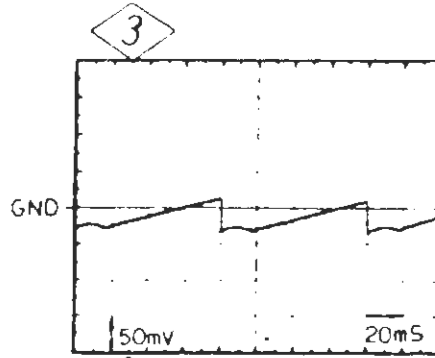
TO CRT-14

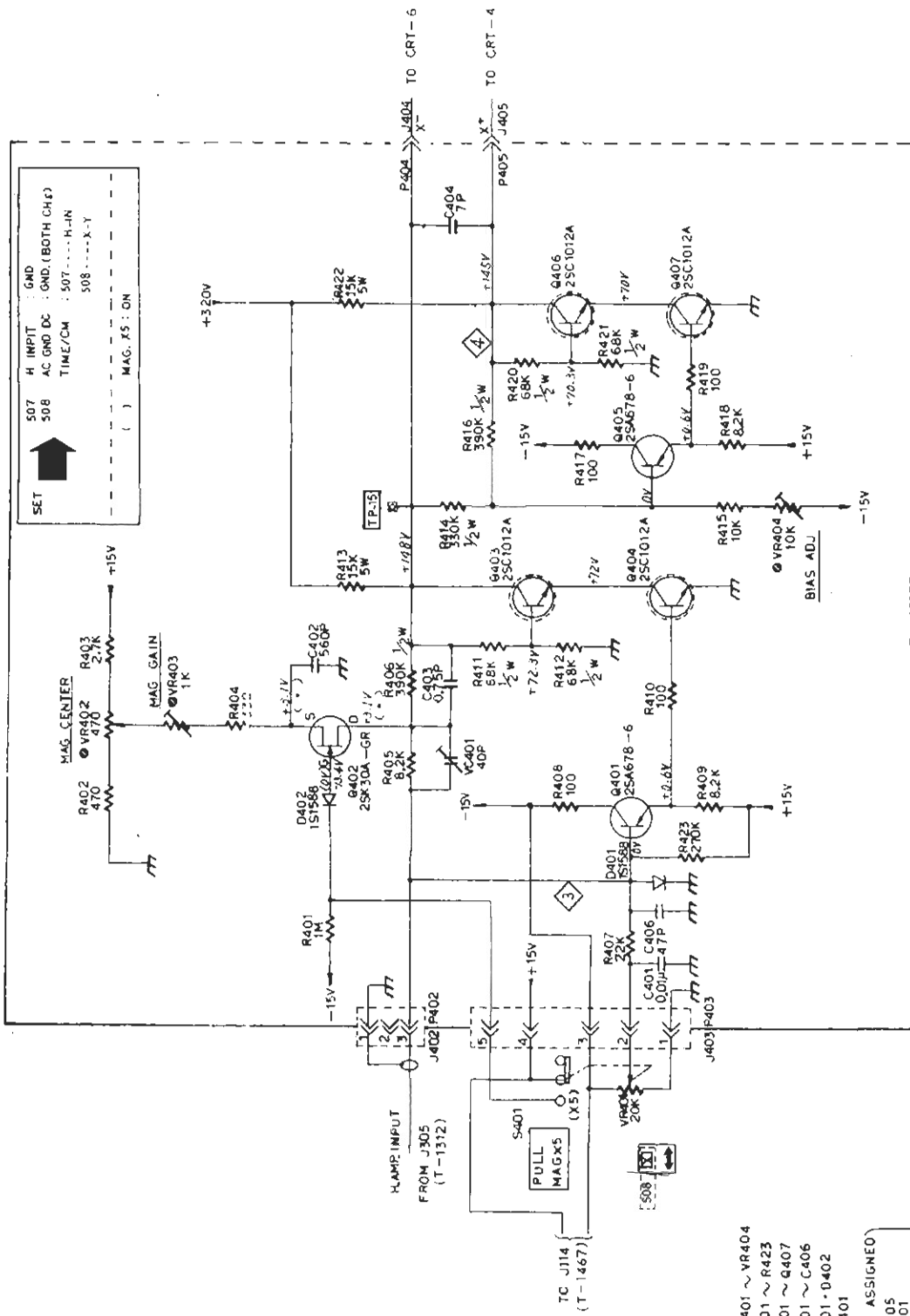
- R101 ~ R142
- VR101 ~ VR106
- C101 ~ C126
- D101 ~ D124
- TP-1 ~ TP-6, TP-14

(NOT ASSIGNED)  
 (PI02 J102)

AC V SHORT PINNO	Model LBO-507A/508A
100V 1-4, 2-5-C2	POWER SUPPL HIGH VOLTAGE CAL
117V 1-4, 3-6-C1	OSCILLOSCOPE
220V 2-4, 6-C3	
240V 3-4, 6-C3	

Model LBO-507A/508A	LEADER ELECTRONICS CORP.
SCHEMATIC	
0 - 9.9 SA (1/7)	





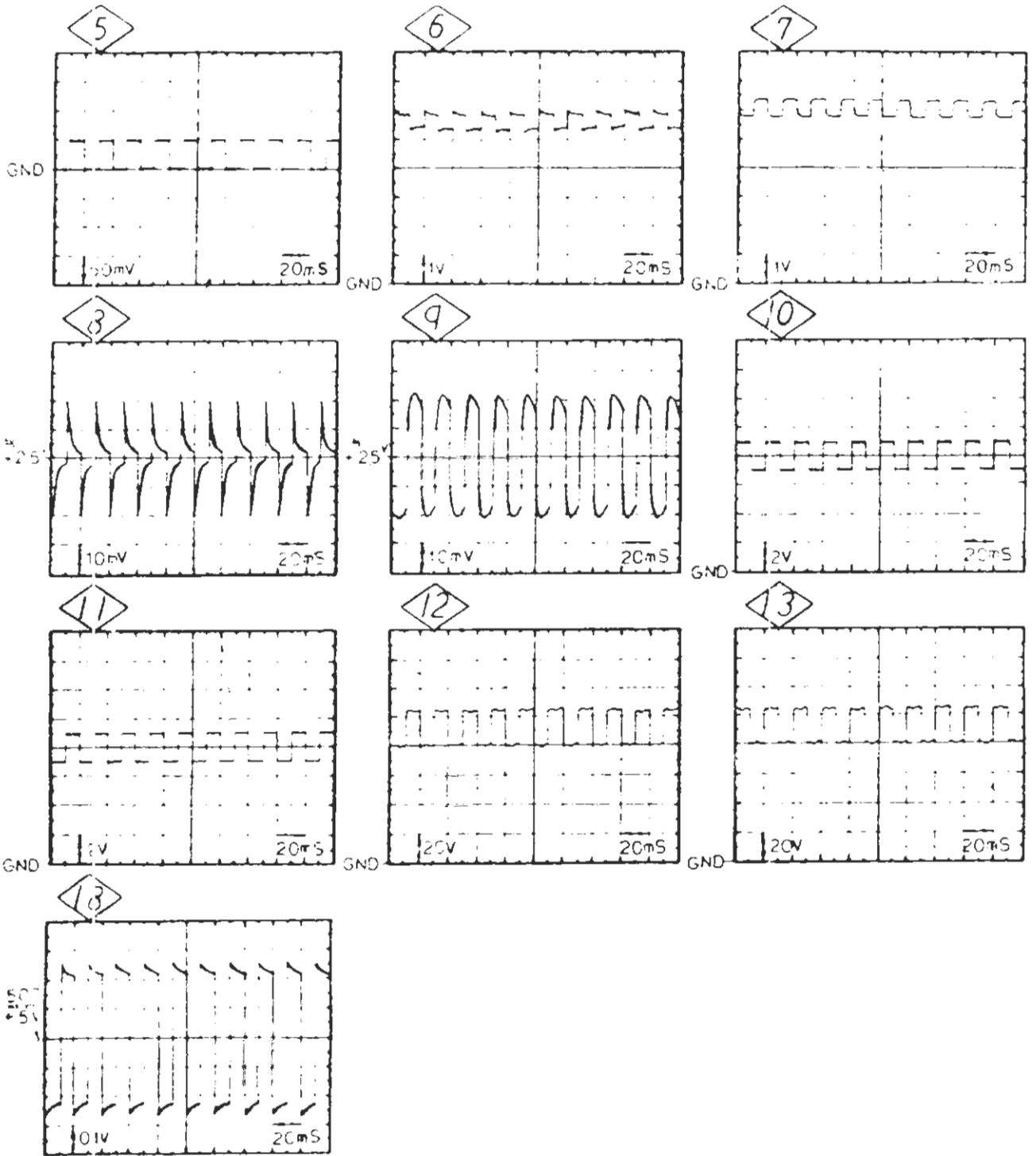
VR401 ~ VR404  
 R401 ~ R423  
 Q401 ~ Q407  
 C401 ~ C406  
 D401 ~ D402  
 VC401  
 ( NOT ASSIGNED )  
 C405  
 P401  
 J401

T-1322B

SCHEMATIC	Model LBO-507A/508A	0-995A (2/1)
OSCILLOSCOPE	HORIZONTAL AMP.	LEADER ELECTRONICS CORP.

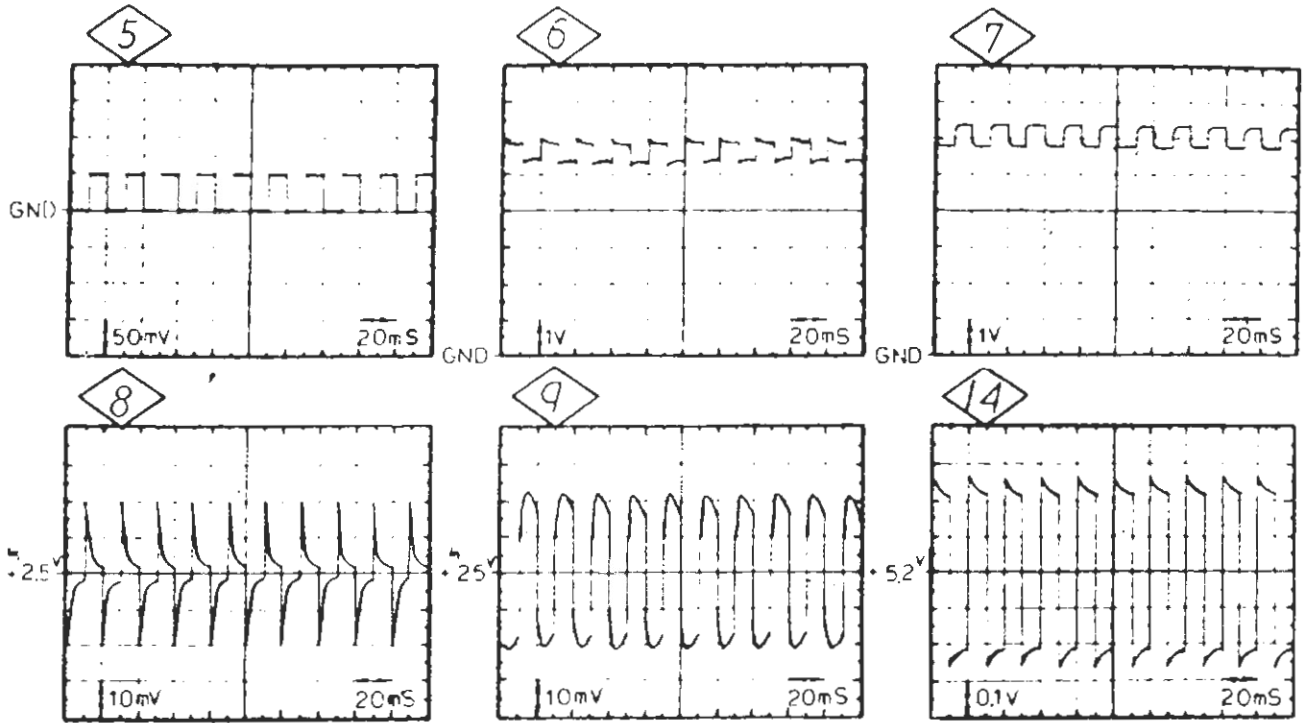


V-PREAMP and FINAL AMP

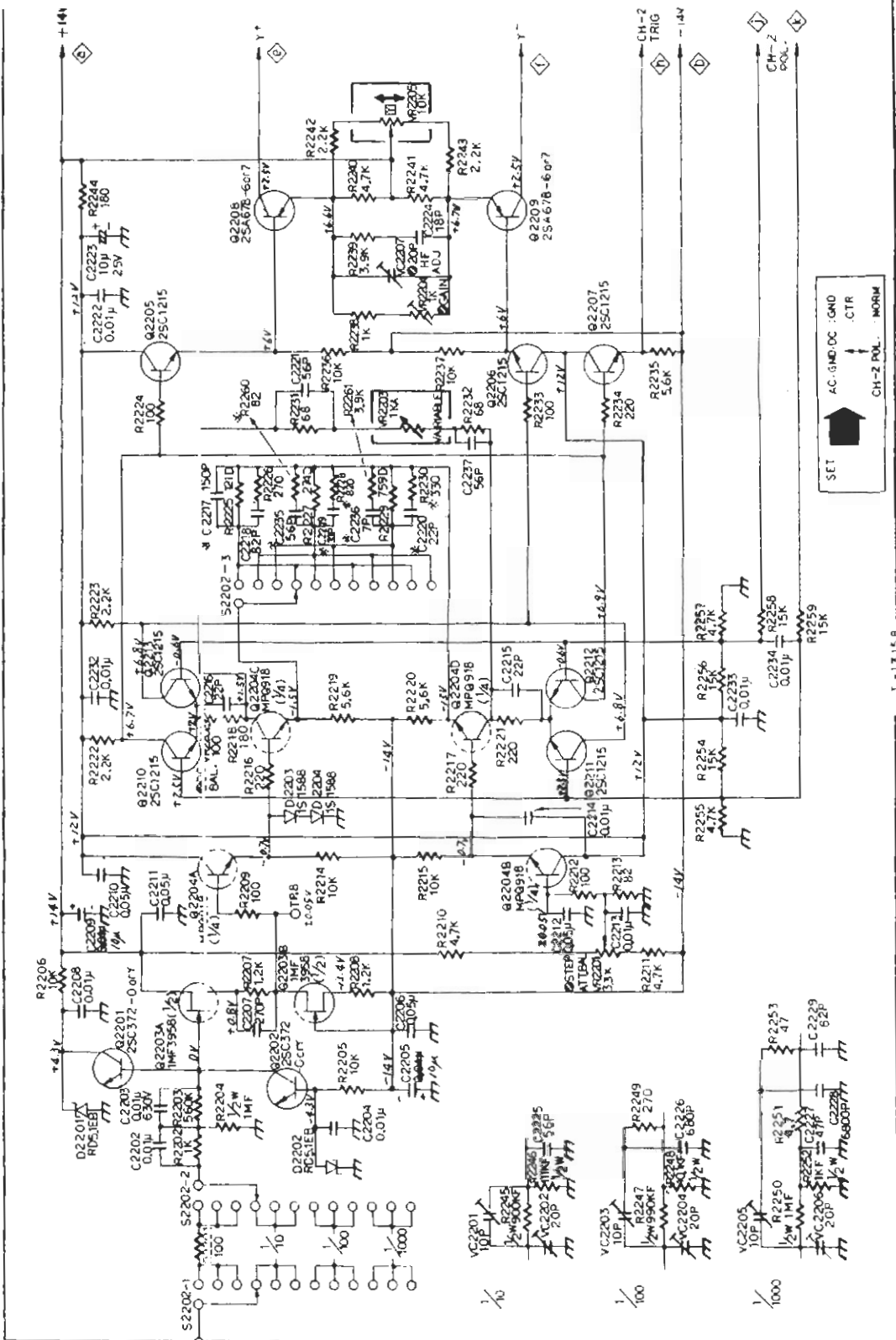




V-PREAMP







SET  AC-GND-DC :GND  
 CTR  
 CH-2 POL. : NORM

SCHEMATIC MODEL LBO-508A 0-995A 5/7  
 OSCILLOSCOPE 2-VERTICAL PRE AMP; CH-2 LEADER ELECTRONICS CORP.

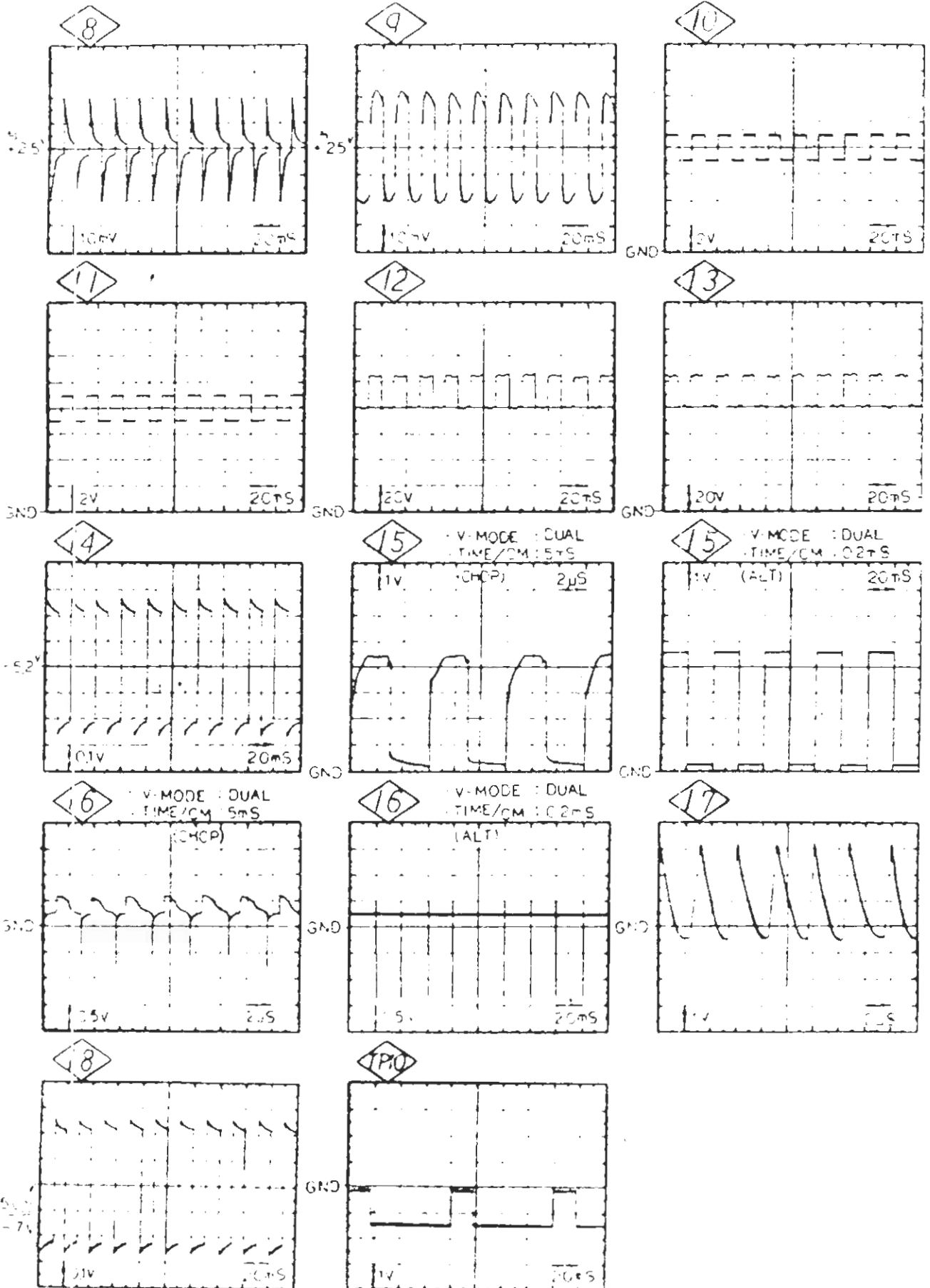
NOT ASSIGNED  
 (C2230, R2231)

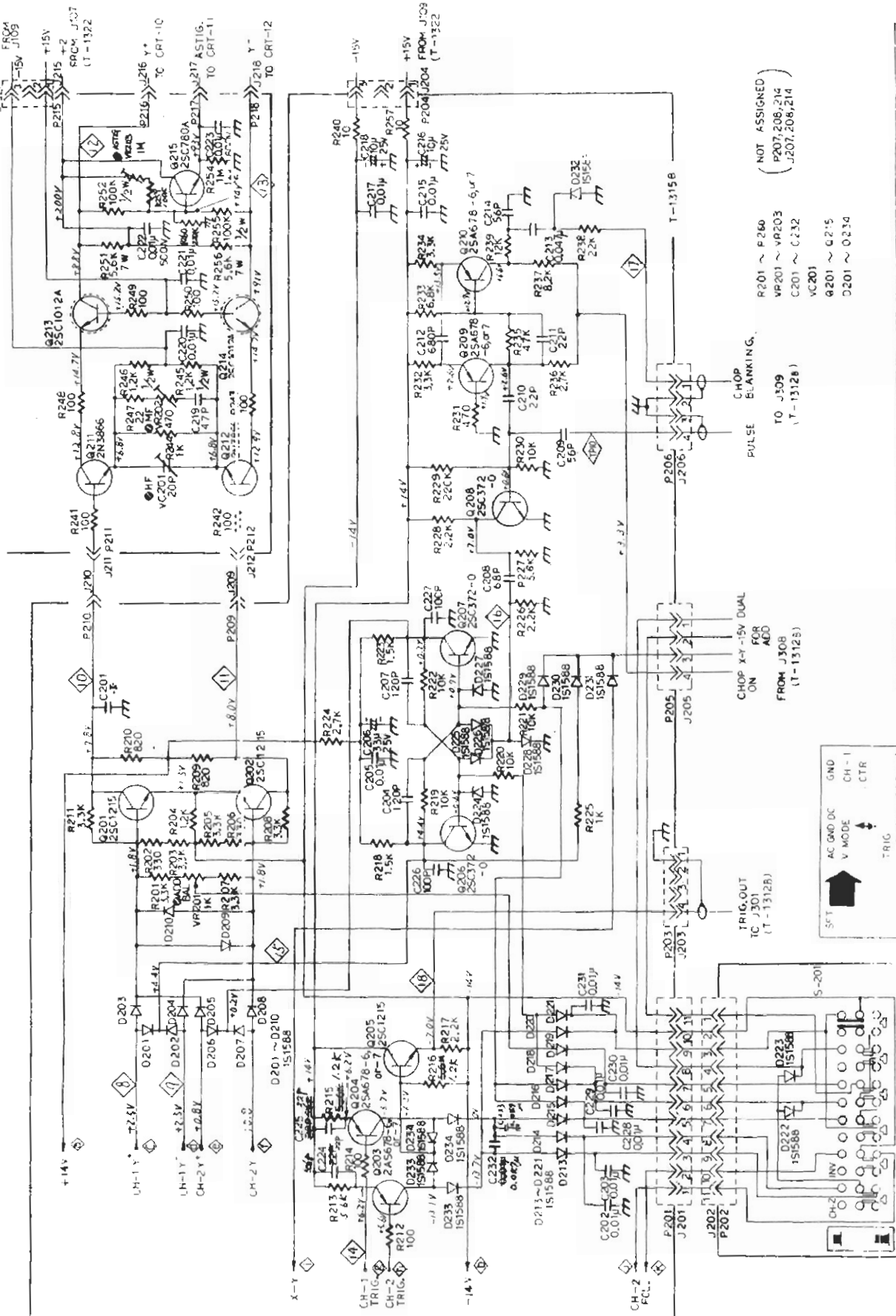
- R2201 ~ R2261
- VC2201 ~ VC2205
- C2201 ~ C2237
- VC2201 ~ VC2207
- R2201 ~ R2213
- D2201 ~ D2204

S2202	0.1	0.2	0.5	1	2	5	10	20
INPUT								
MAX								
500K(EP-DC)								
INPUT								
A.C.								
GND								
D.C.								

0V LBS/CH

# V-AMP AND SWITCHING CKT





P201 ~ P260 (NOT ASSIGNED)  
 VP201 ~ VP203 (P207, 208, 214)  
 C201 ~ C232 (J207, 208, 214)  
 VC201  
 Q201 ~ Q215  
 D201 ~ D234

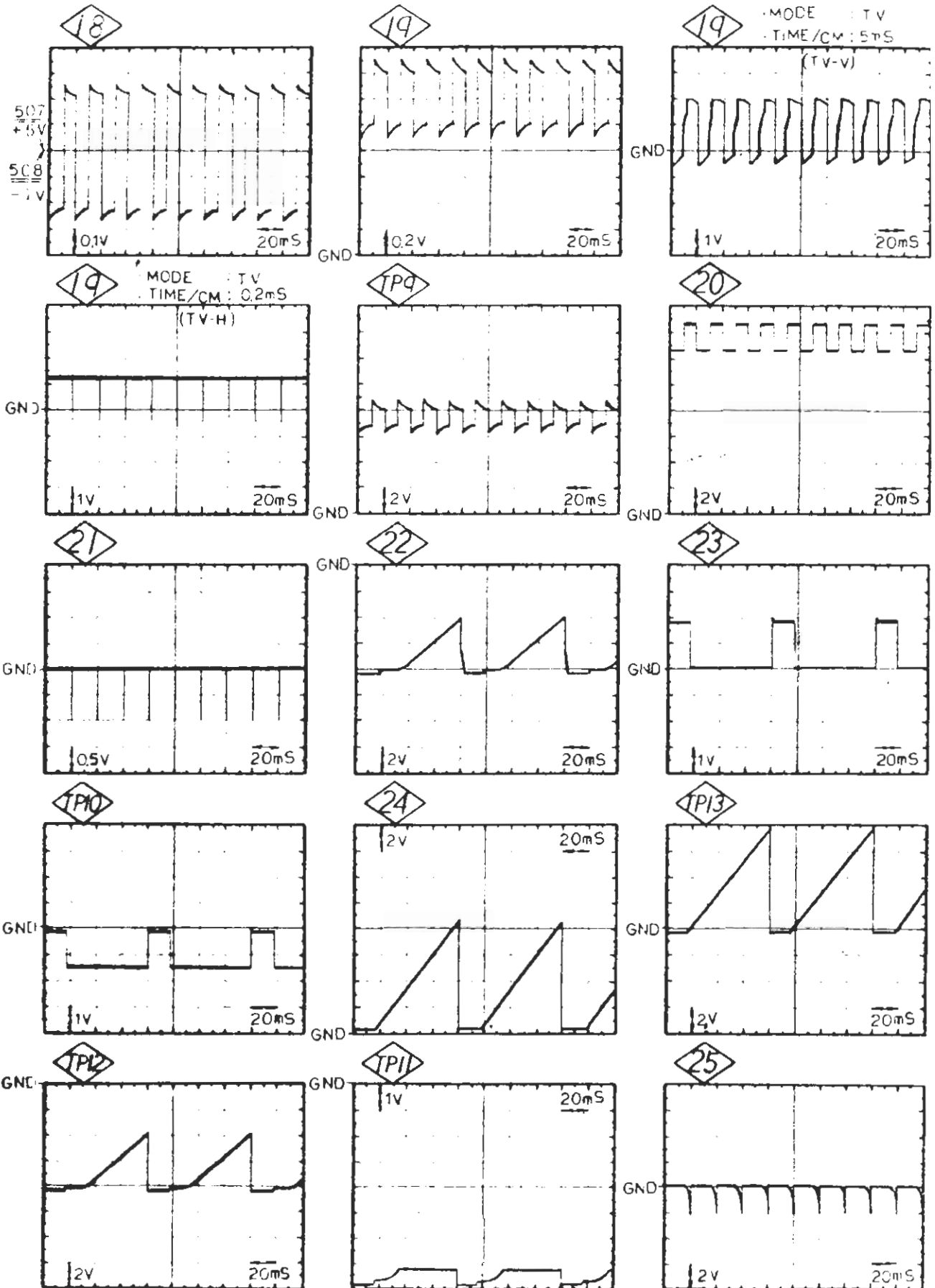
PULSE CHOP BLANKING  
 TO J309 (T-1312B)  
 FROM J308 (T-1312B)  
 CHOP X-Y -15V DUAL FOR AOD  
 CHOP ON



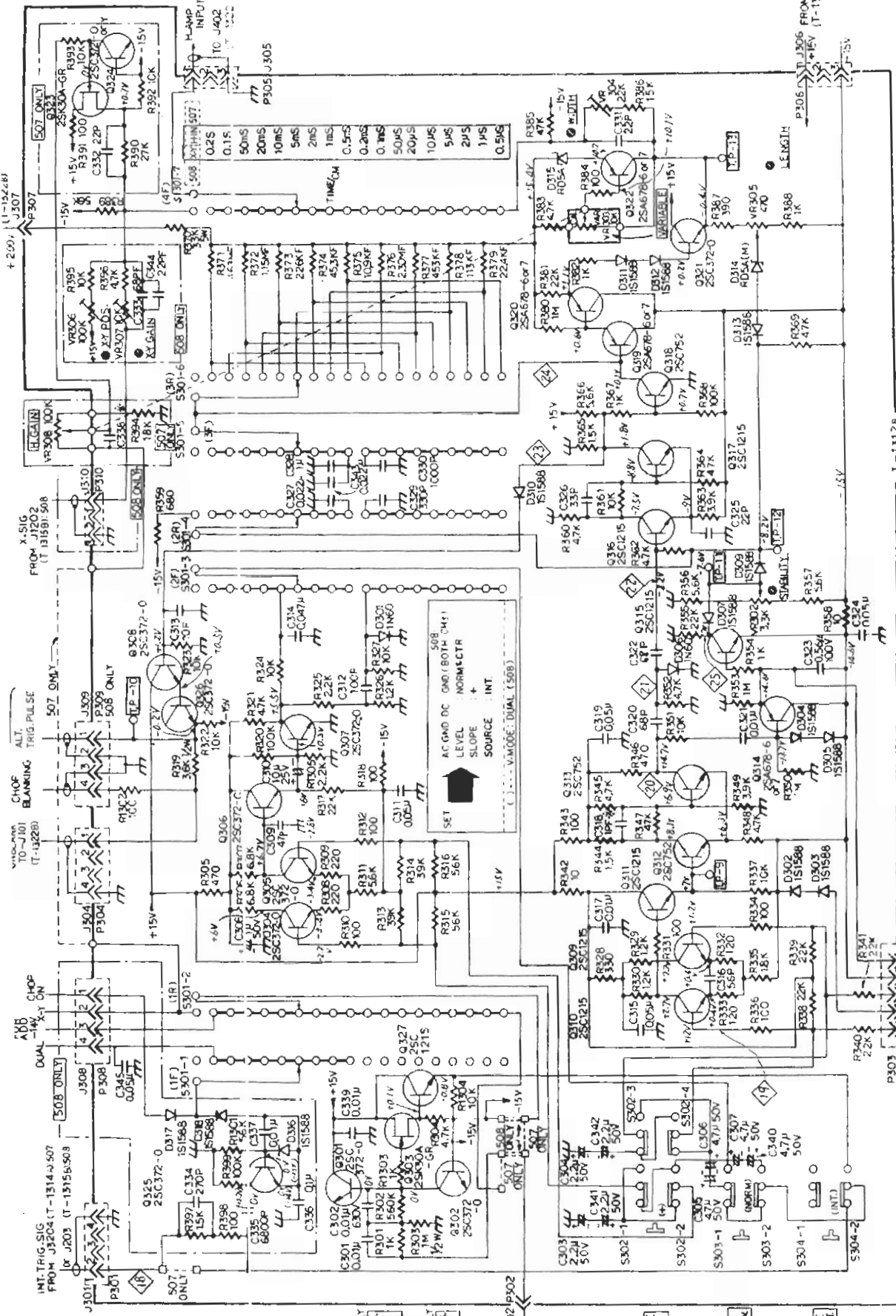
SCHEMATIC	MODEL	LBO-308A	0-995A	5/7
OSCILLOSCOPE		3 VERTICAL AMP.	LEADER ELECTRONICS CORP.	

T-1316  
 TRIG. CH-2 CH-2 ADD DUAL CH-1  
 POL.

TRIG. AMP. and SWEEP GEN.







SCHEMATIC	Model LBO-507A/508A	O-995A (177)
OSCILLOSCOPE	TRIG. SWEEP CIRC.	LEADER ELECTRONICS COMP.

INT. TRIG. SIG FROM J304 (T-1314-J-507) or J203 (T-1315B-508)

CHOP BLANKING ALT. TRIG. PULSE FROM J1202 (T-1315B-508)

507 ONLY EXT. TRIG. INPUT

508 ONLY EXT. TRIG. INPUT

MODE NORMIN

SOURCE INT.EXT.

LEVEL

PULL NORM. PUSH AUTO

VR301 5K

J301 ~ 309 RI301 ~ 1305

VR301 ~ 308 D301 ~ 318

C301 ~ 345 (NOT ASSIGNED)

Q301 ~ 326 (D308 VC301)

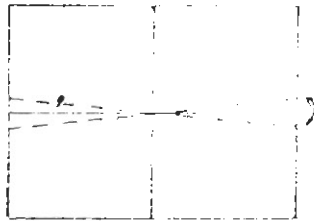
CHANGE INFORMATION

PCB. No.	Item	Model	Ser. No.	Principal changes
T-1467	Beam rotator	507A	No. 8060401 ~	Additional Unit
		508A	No. 8060101 ~	Beam rotator (Ref. O-995A 1/7)

## TRACE ROTATION

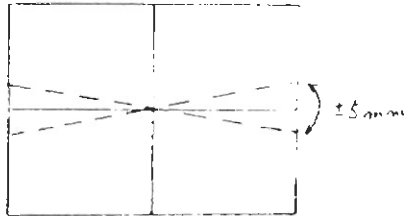
### ROTATION

ROTATION to make the trace parallel with the horizontal center line on the seal.



ROTATION

Limit controlled by ROTATION



Remark: CRT must be remounted when ROTATION can't make the trace parallel with the horizontal center line.

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