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**HOT SALE!**

LBO - 510/511  
LBO - 310/310A/311

OSCILLOSCOPE  
SERVICE MANUAL

\*\*\*\*\*

[WARNING]

This service manual is for use by qualified personnel only. To avoid electrical shock, do not perform any service in this manual unless qualified to do so.

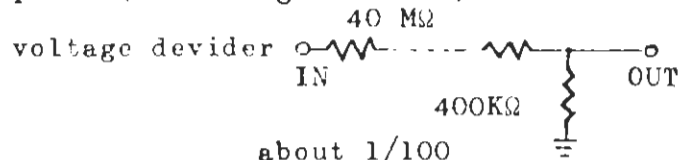
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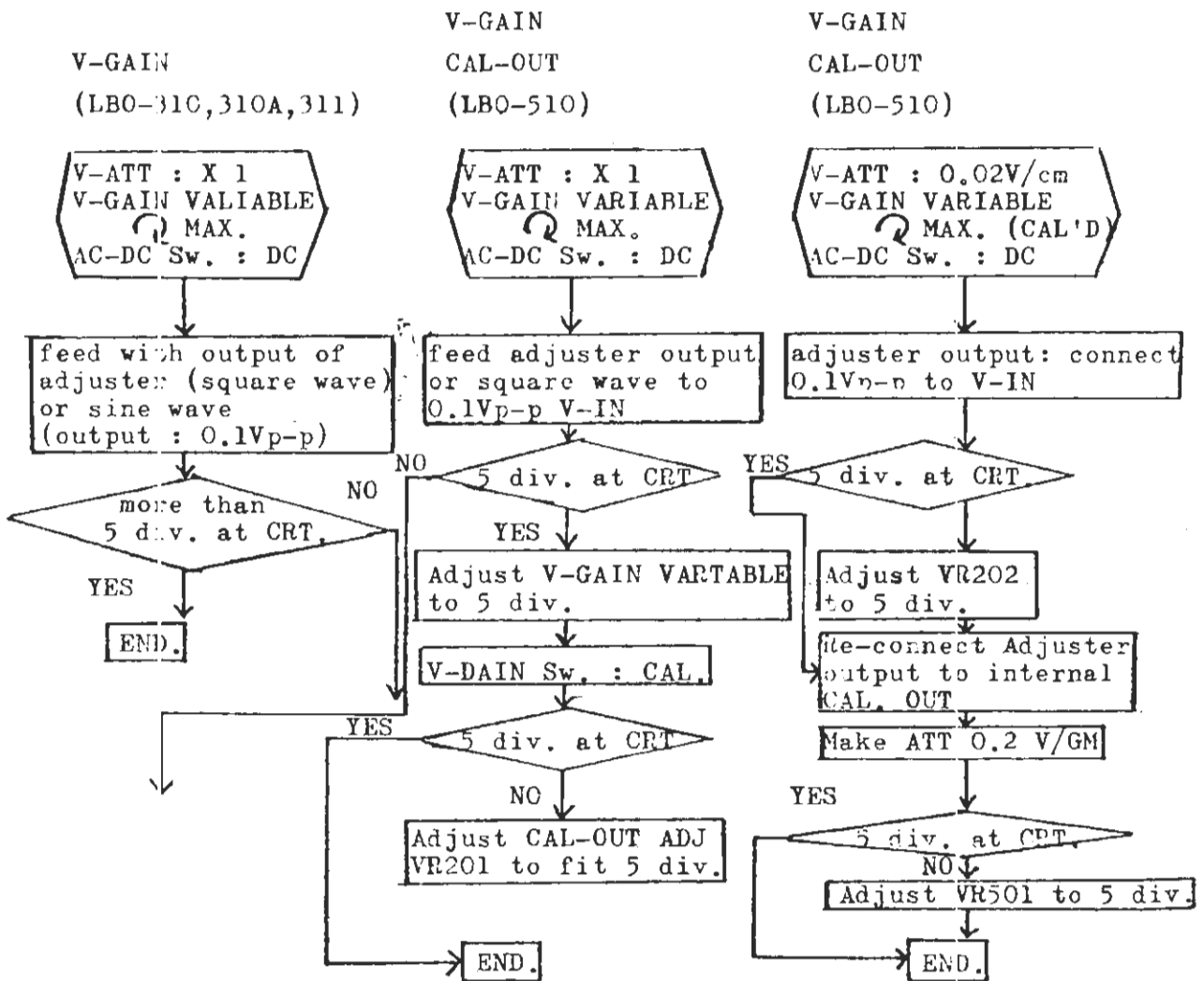
1. INSTRUMENTS NEEDED FOR REPAIR & ADJUSTMENT

- 1) DC volt meter
- 2) High-voltage probe (or voltage divider)



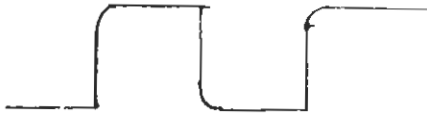
- 3) Triggered oscilloscope (DC to 7MHz e.g. LBO-503)
- 4) Audio oscillator (to cover 20Hz-10MHz)
- 5) Sensitivity calibrator (Should be 1kHz square wave oscillator, without sag or overshoot, to change output with 1-2-5- steps)

2. CHECKING ADJUSTMENT AND REPAIR.

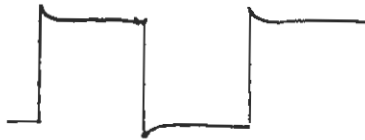


2) Check and adjust characteristic of Attenuator

Feed out-put (1KC square wave ) signal from calibrator to V-III.  
 (Signal shall be shown more than 5 div. in CRT)  
 Observe waveform at CRT if shows the figures as below.  
 Adjust a trimmer to get right wave form.



Distorted wave form 1

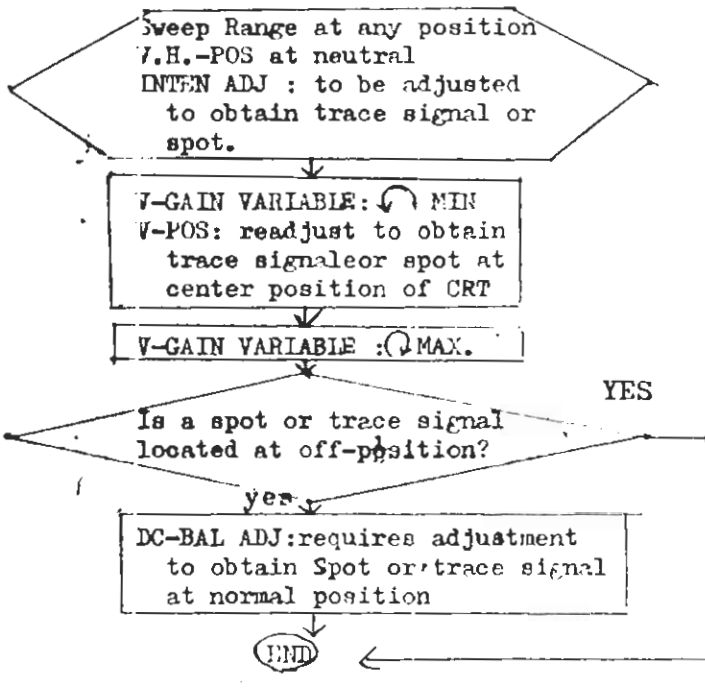


Distorted wave form 2



Normal

3) Check and adjust of DC-BAL  
 V-DC BAL ADJ



4) Check of sweep signal and sync

i) At every sweep frequency check sine curve of max and min. frequency to be shown in CRT. when feeding signal to obtain 1.DIV.

ii) Check whether it sync at every sweep freq. showing one cycle if sweep variable turn to max. position at max. freq. and/or sweep variable turn to min. position at min. freq.

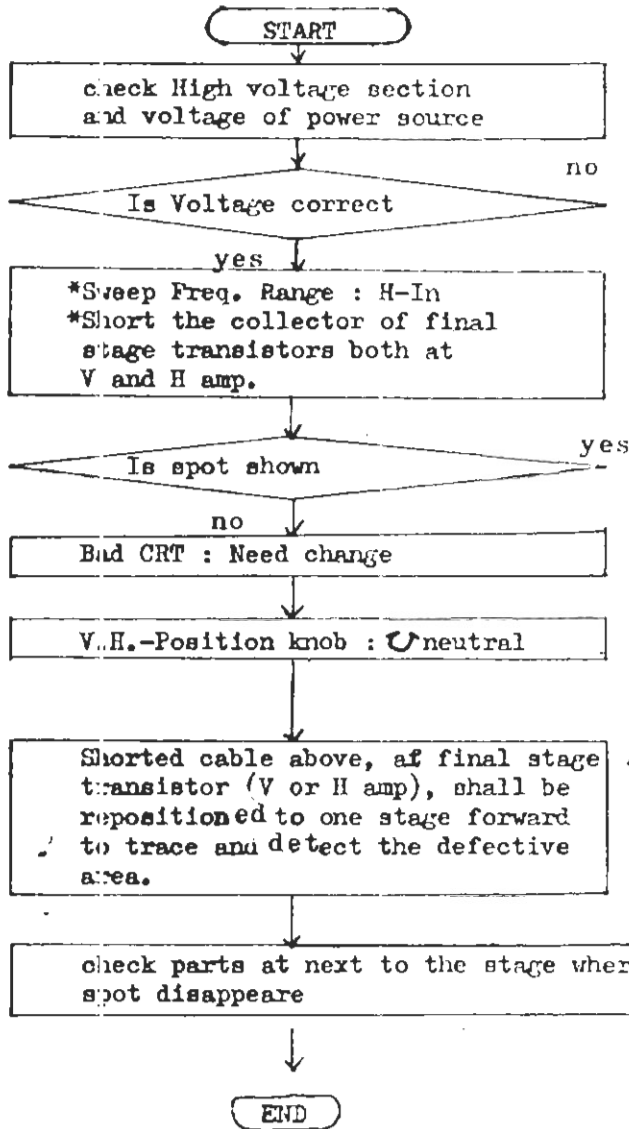
iii) If sweep freq. seems to be off calibrated in total toward high frequency side or low frequency side:

LBO-310	Adjust at
" 310A	VR401
" 311	(Freq ADJ or
" 511	BIAS ADJ)
LBO-510	Adjust at
	VR301 (Freq.ADJ)

iv) If sweep freq. seems to be off calibrated at any special range:

Change capacitor  
 LBO-310, 310A, 311, 511..C406-408  
 LBO-510 --- C-306-308

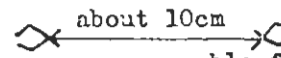
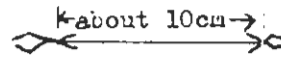
5) How to judge Good or No Good of CRT and V.H.- Amp. (No spot)



Refer voltage shown in diagram

Repair Power source

Ex. LBO-510 { V-Amp { Q208-C  
                  { H-amp { Q209-C  
                              { Q305-C  
                                  { Q306-C



cable for shorted test  
Defective V.H. amp.

← Ex. Start from V-Amp. all way up to first stage if still spot not shown, leave the shorted cable at V-Amp as is and then start same thing at H-Amp.

Ex. LBO-510  
208-C - Q-209-C

Spot appear

Shorted cable reposition

Q206-C - Q207-C short

Spot appear

Shorted cable reposition

Q204-C - Q205-C

No Spot

Q206, Q207 Check defective to change

Symptom 1)

Defective Horizontal Axis

- \* H-Amp Defective
- \* H-Amp Unstable
- \* H-Amp Low gain
- \* H-Position off linearity

- \* H-Pos Variable instable
- \* H-Linearity bad
- \* H-Pos gradually shifts off
- \* H-Pos juma

LBO-510

Defective H-AMP  
Q305.306(2SC515)  
Q304(2SK34C)

Defective SWEEP  
OSC  
Q301.302(2SC458)

+8V P.W.R.  
D 106(AW0108)

Defective H-AMP  
Q301(2SK34C)  
Q302.303(2SC515)

Defective SWEEP  
OSC  
Q401.402(2SC458)

+8V P.W.R.  
D 104(AW0108)

LBO-511

Defective H-AMP  
Q301(2SK34C)  
Q302.303(2SC1012A)

Devective SWEEP  
OSC  
Q401.402(2SC458)

+8V P.W.R.  
D 108(AW0108)

LBO-310

Defective H-AMP  
Q301(2SK34C)  
Q302.303(2SC1012A)

Devective SWEEP  
OSC  
Q401.402(2SC458)

+8V P.W.R.  
D 108(AW0108)

LBO-311

Symptom 11)

NO Sweep

Defective SWEEP OSC  
Q301.302(2SC458)  
Q303(2SK34D)  
D301(1N60)

Defective H-AMP  
Q304(2SK34C)

Defective SWEEP OSC  
Q401.402(2SC458)  
Q403(2SK34D)  
D401(1N60)

Defective H-AMP  
Q301(2SK34C)

Defective SWEEP OSC  
Q401.402(2SC458)  
D401(1N60)

Defective H-AMP  
Q301(2SK34C)

Defective SWEEP OSC  
Q401.402(2SC458)  
D401(1N60)

Defective H-AMP  
Q301(2SK34C)

- \* Sweep unstable
- \* Wrong sweep wave form

Symptom III)

No Spot

- \* No trace line
- \* Doesn't work
- \* Spot fades off after a period.

LBO-510

Defective V-AMP  
Q210.202.204-207  
(2SC458)  
Q203(2SK34C)  
Q208.209(2SC1012A)

Defective CRT

Defective H-AMP  
Q304(2SK34C)  
Q305.306(2SC515)

Defective High Voltage  
circuit. D107.108  
(LA60 white or 1 JA5)  
R108(150K)

Defective-15 P.W.R.  
D102.103(V06B)  
D105(AW0115)

LBO-511

Defective V-AMP  
Q201.202.204-209  
(2SC458)  
Q210.211(2SC1012A)  
Q203(2SK34C)

Defective CRT

Defective H-AMP  
Q301(2SK34C)  
Q302.303(2SC515)

Defective High Voltage  
circuit. D101.102(LA60  
white or 1 JA5)  
R108(150K)

Defective -15 P.W.R.  
D106.107(V06B)  
D103(AW0115)

LBO-310

Defective V-AMP  
Q201.203.-205  
208.209(2SC458)  
Q202(2SK34C)  
Q206.207(2SC1012A)

Defective CRT

Defective H-AMP  
Q301(2SK34C)  
Q302.303(2SC1012A)

Defective High Voltage  
circuit. D101(LA60  
white or 1 JA5) D102  
R108(220K)

Defective -15 P.W.R.  
D104.105(V06B)  
D107(AW0115)

LBO-311

Defective V-AMP  
Q201.203-205(2SC458)  
Q202(2SK34C)  
Q206.207(2SC1012A)

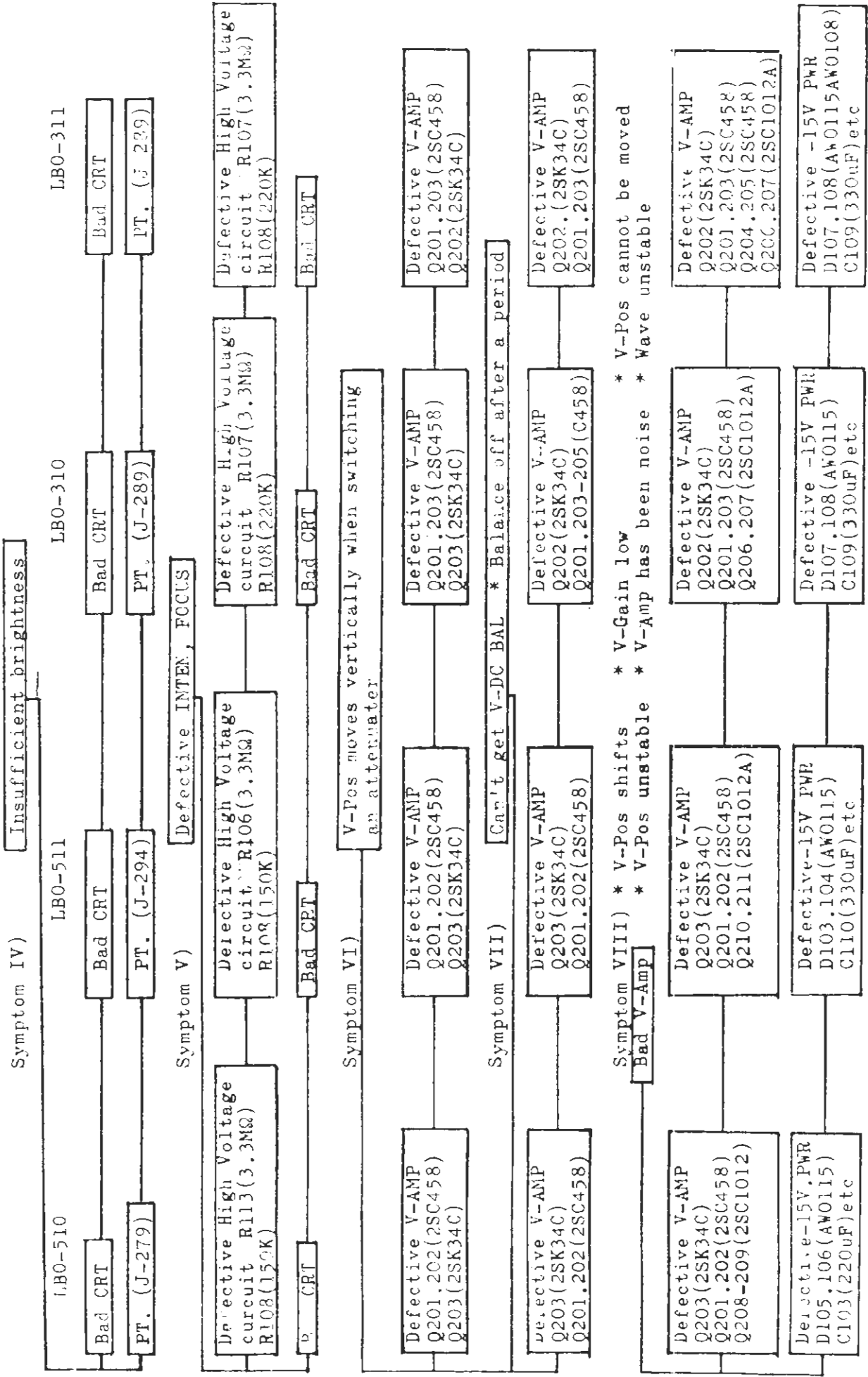
Defective CRT

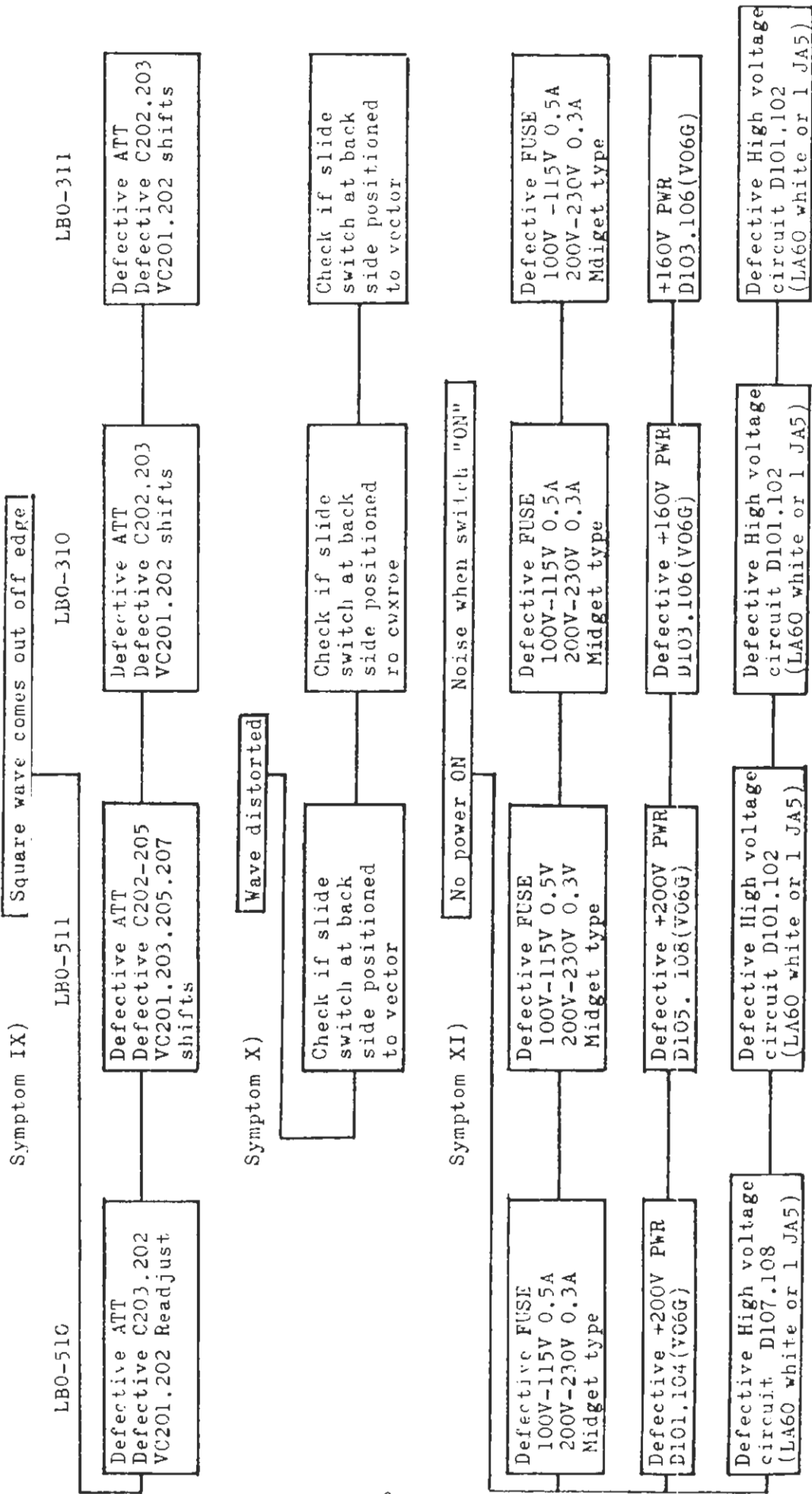
Defective H-AMP  
Q301(2SK34C)  
Q302.303(2SC1012A)

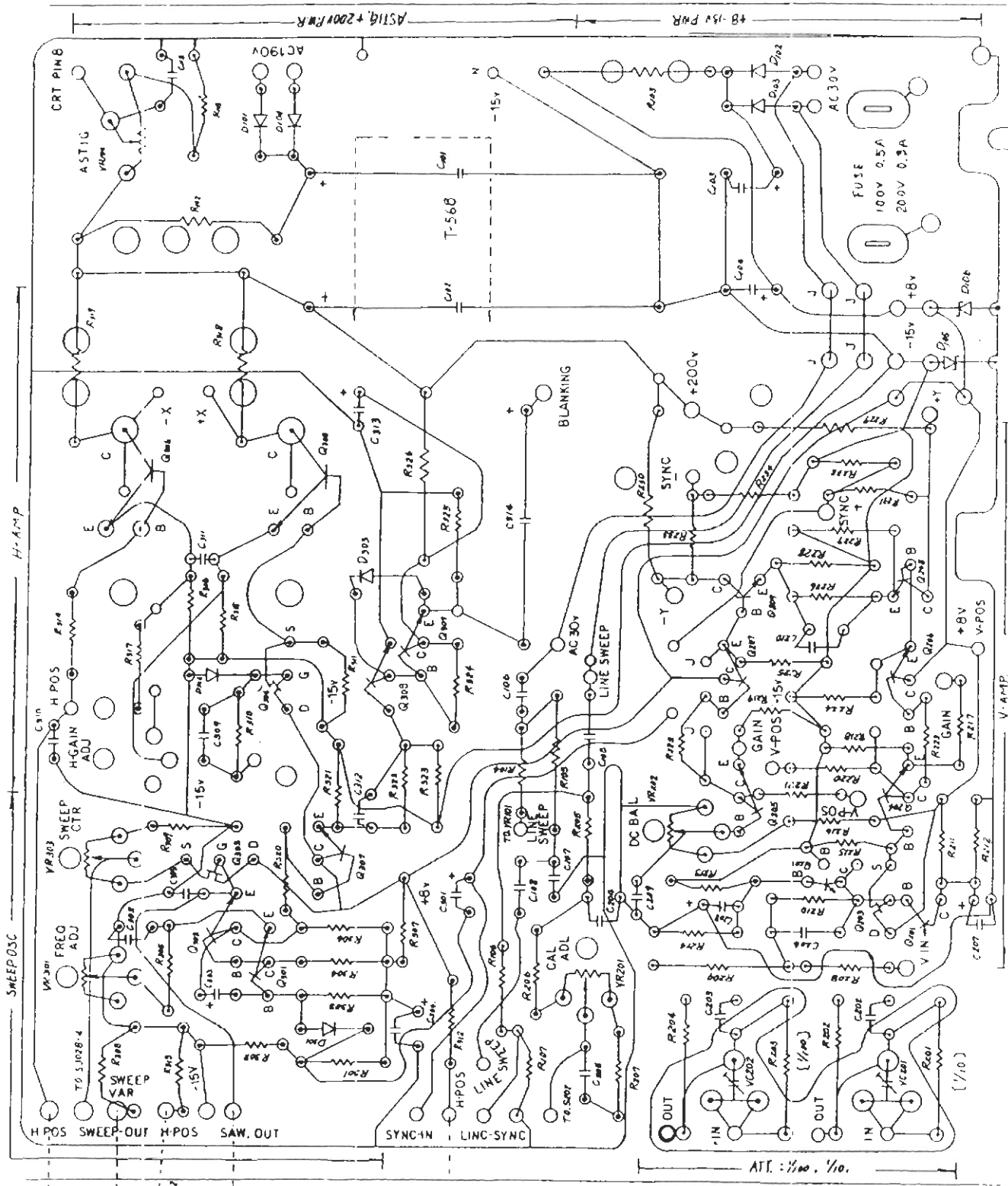
Defective High Voltage  
circuit. D101.102(LA60  
white or 1 JA5)  
R108(220K)

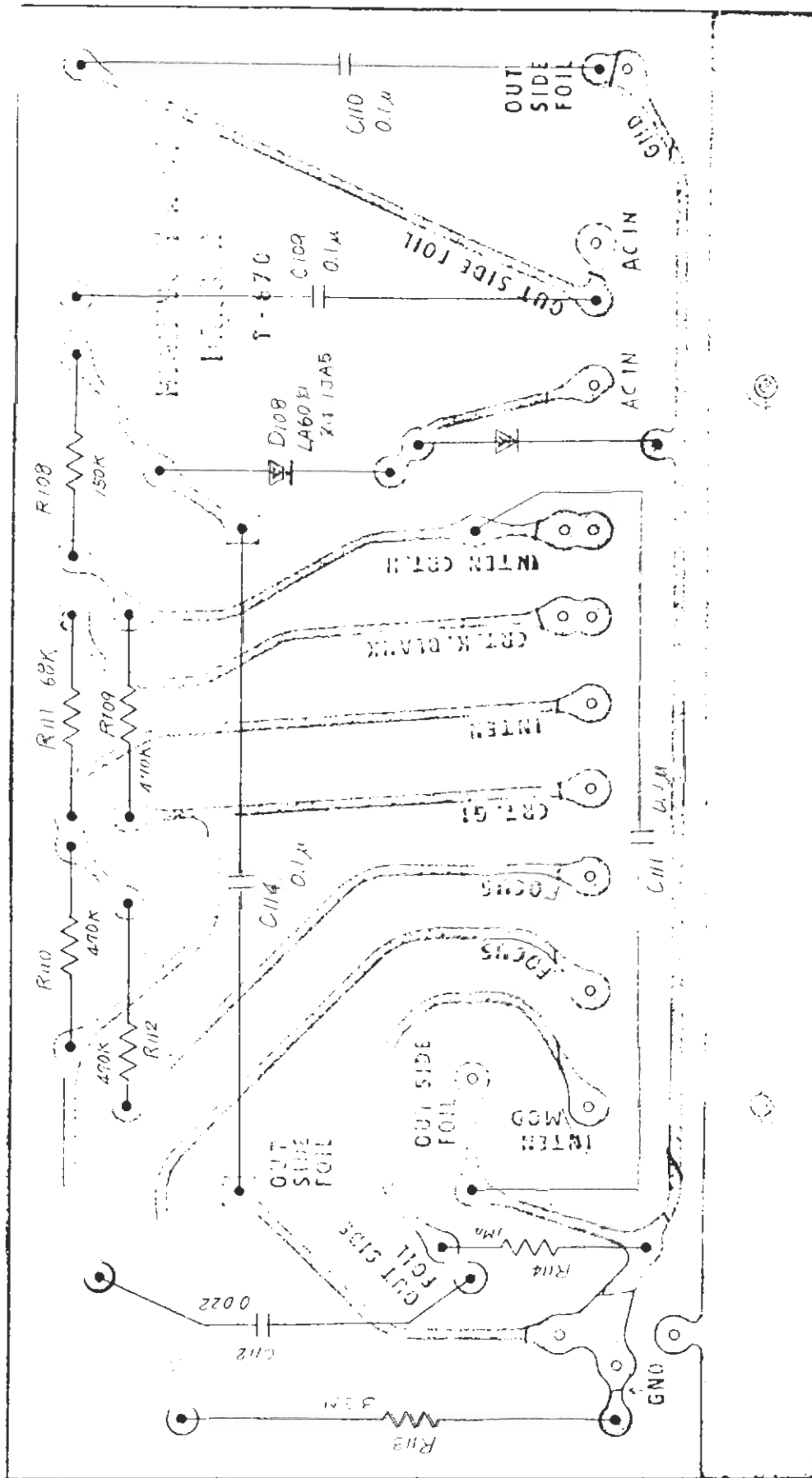
Defective -15 P.W.R.  
D104.105(V06B)  
D107(AW0115)





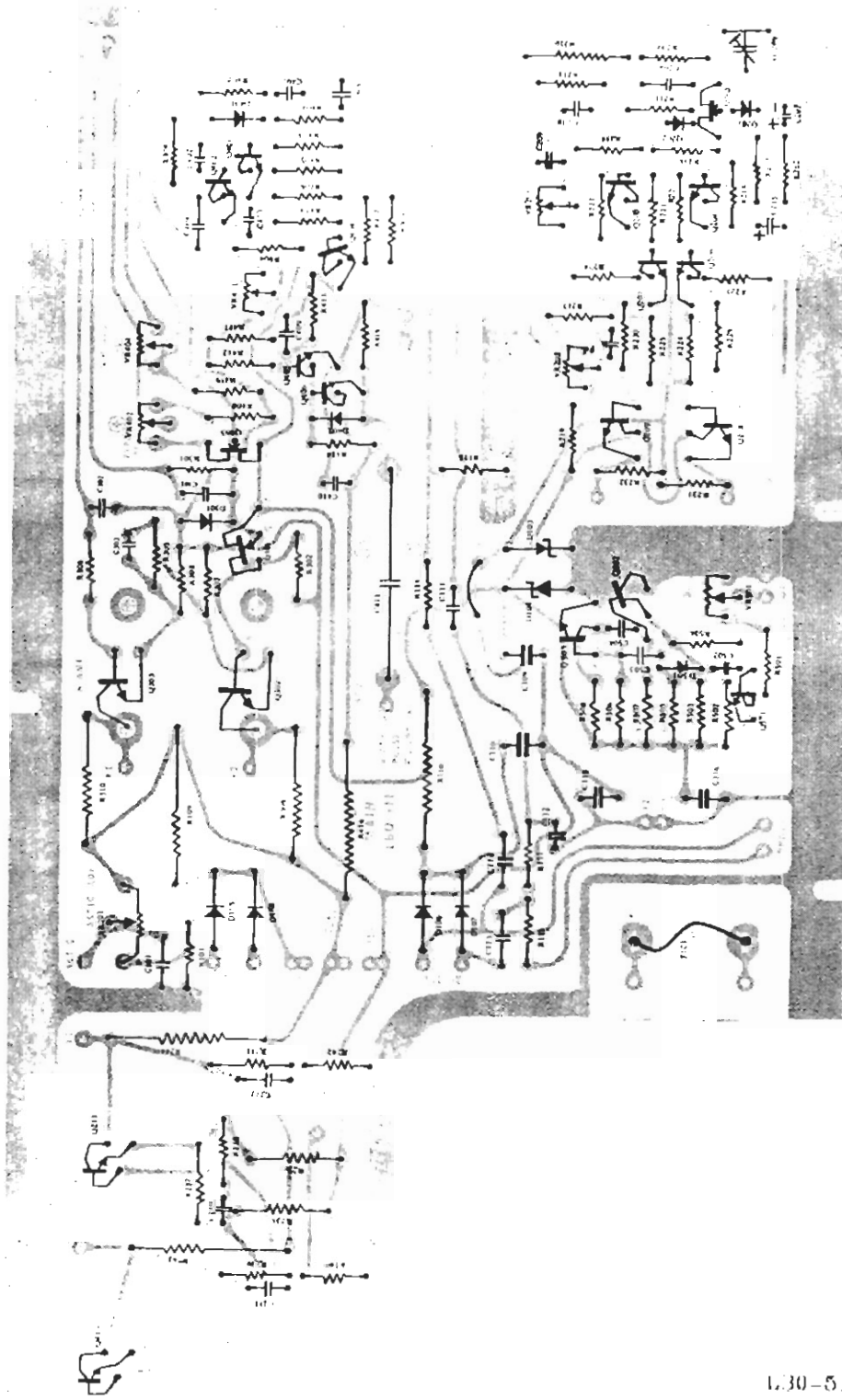






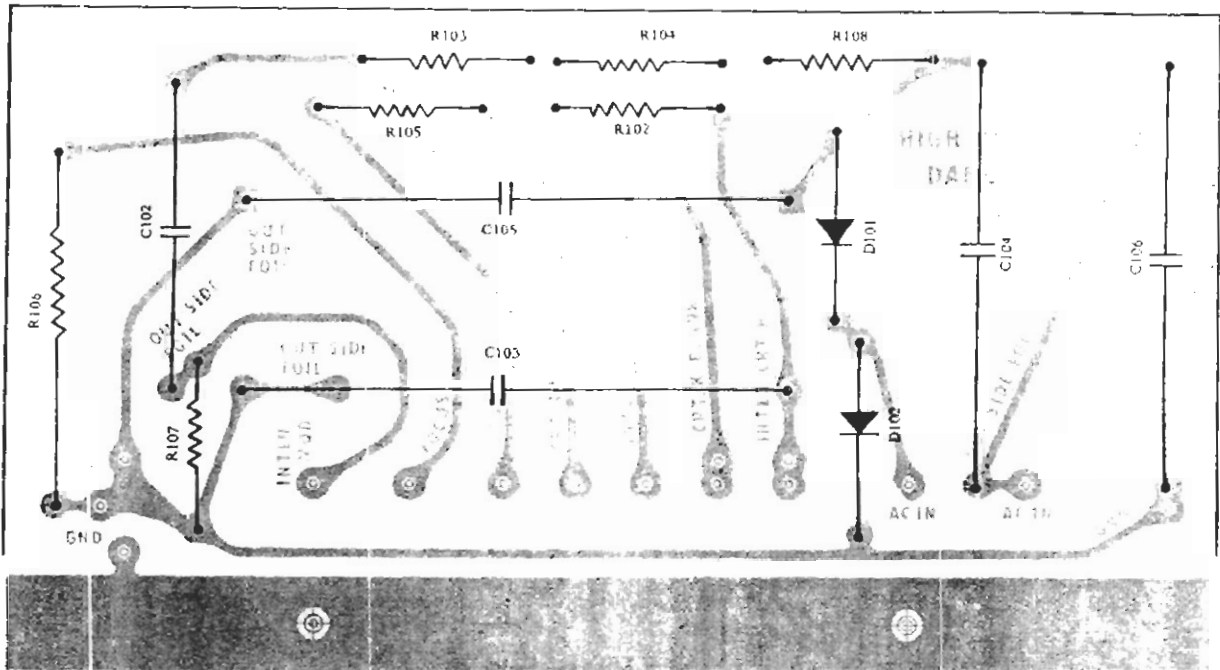
LBO-510

T-669 MAIN

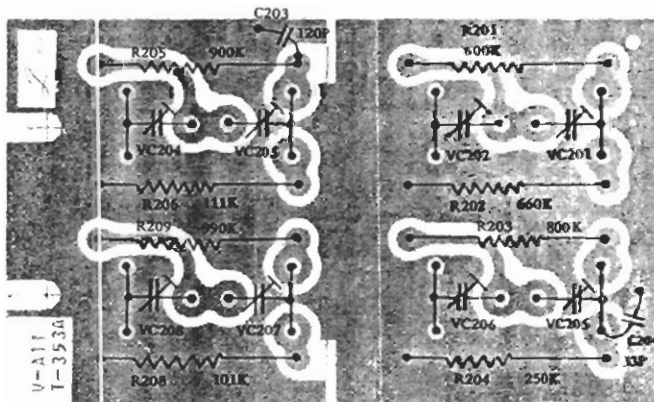


1.30-511

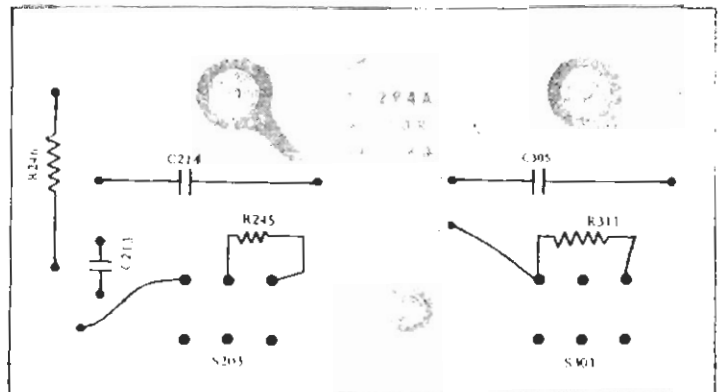
### T-670 HIGH VOLT RECT



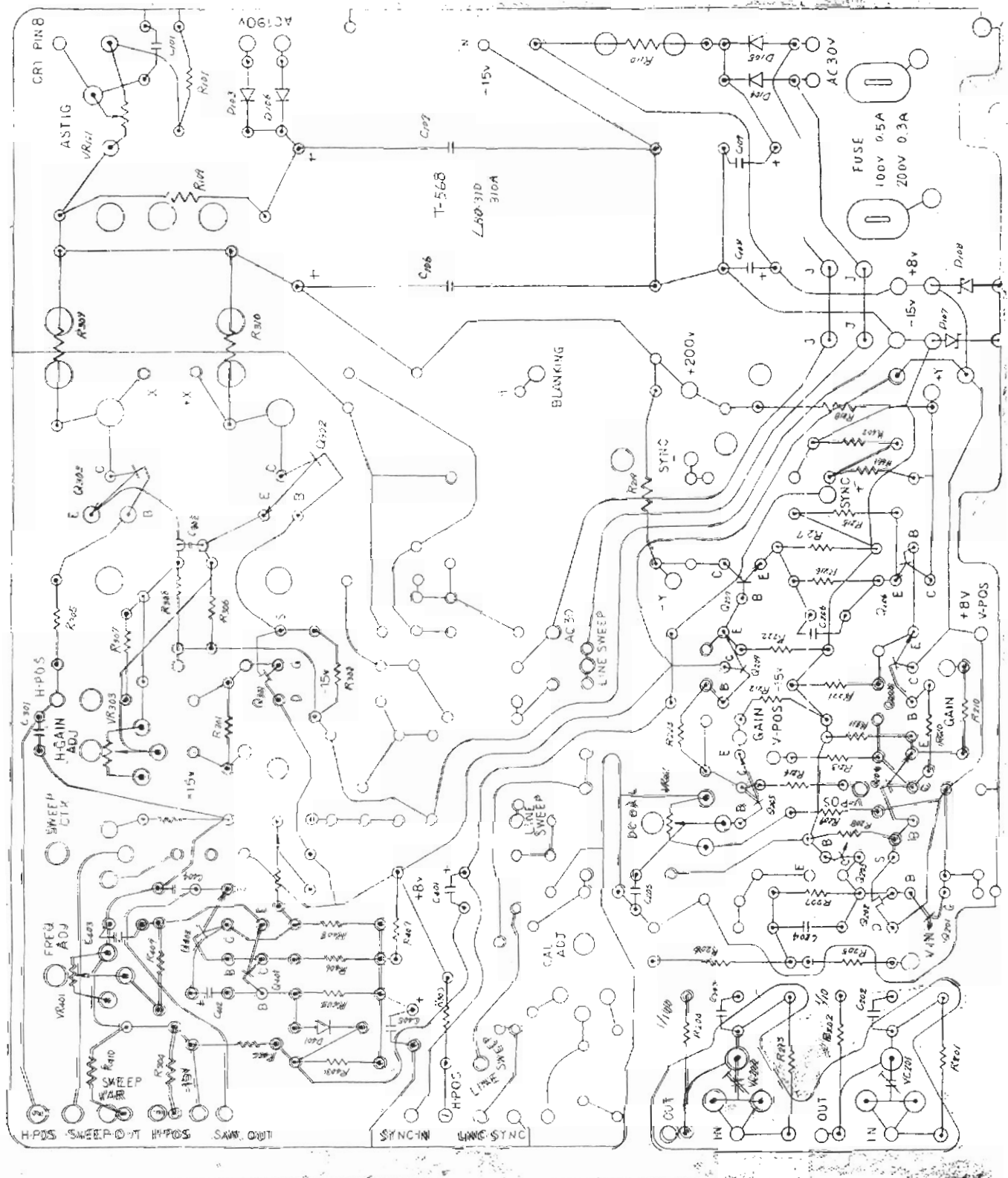
### T-353A V-ATT

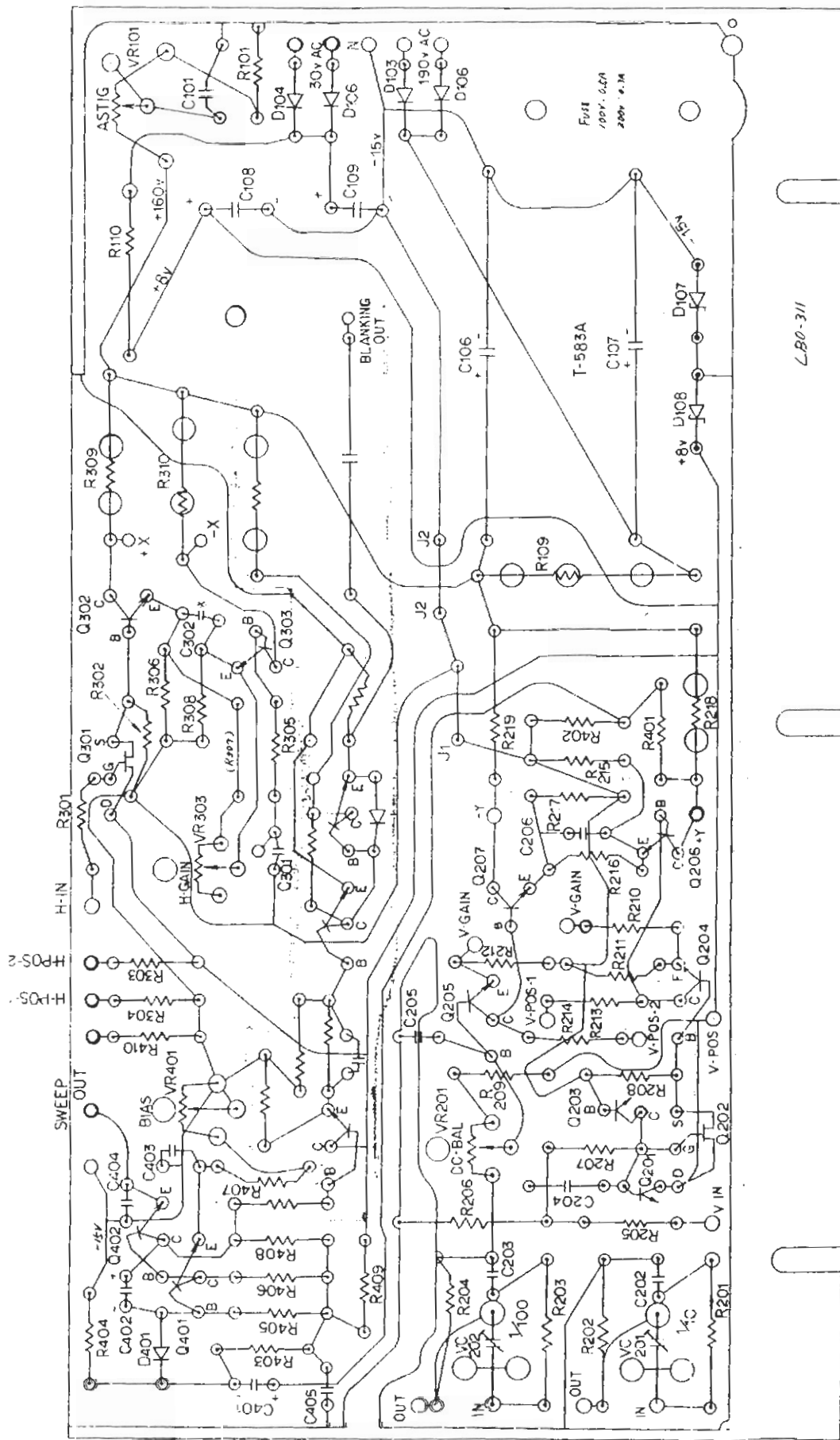


### T-294A VECTOR SCOPE



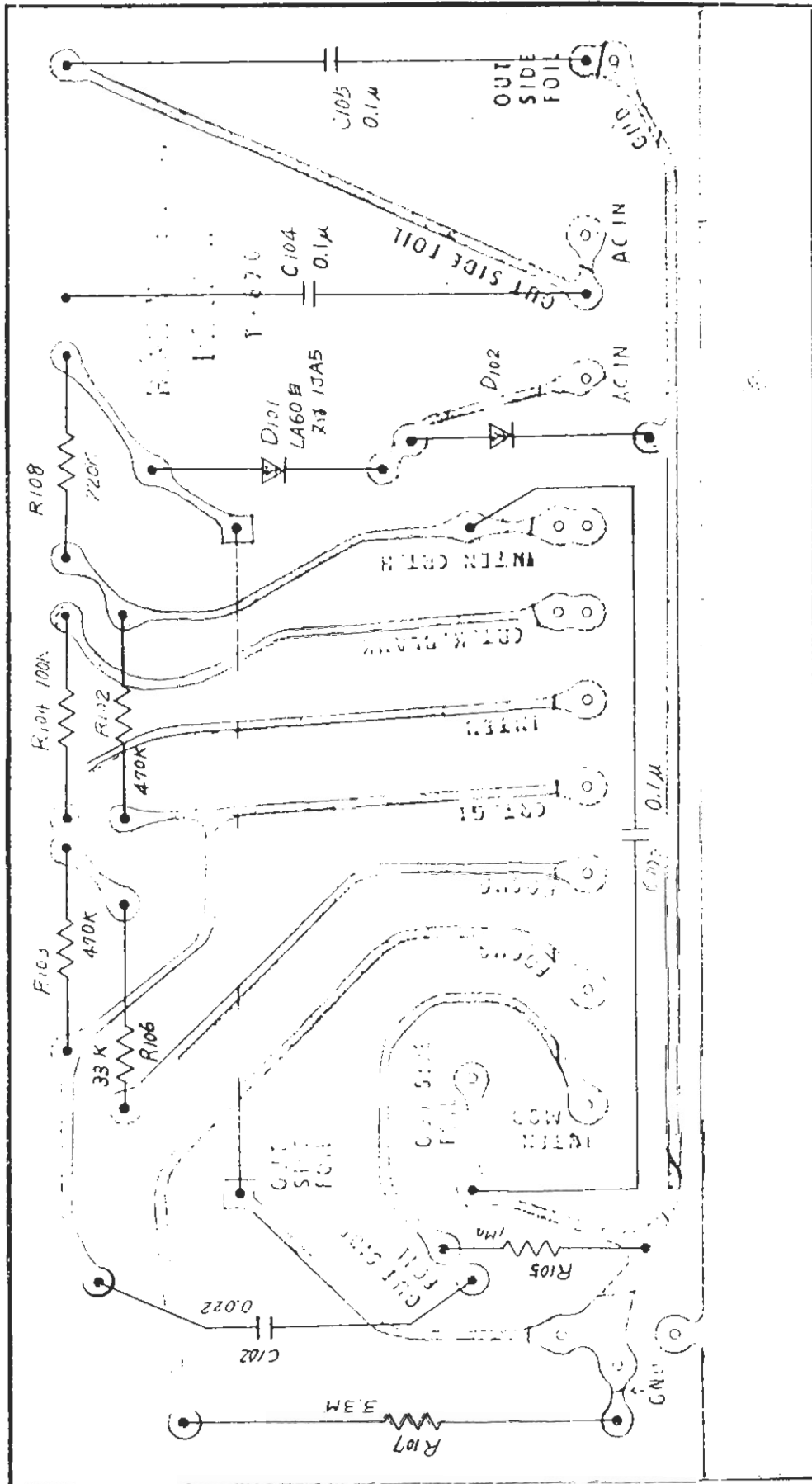
LB0-511





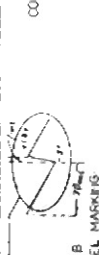
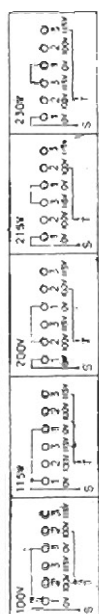
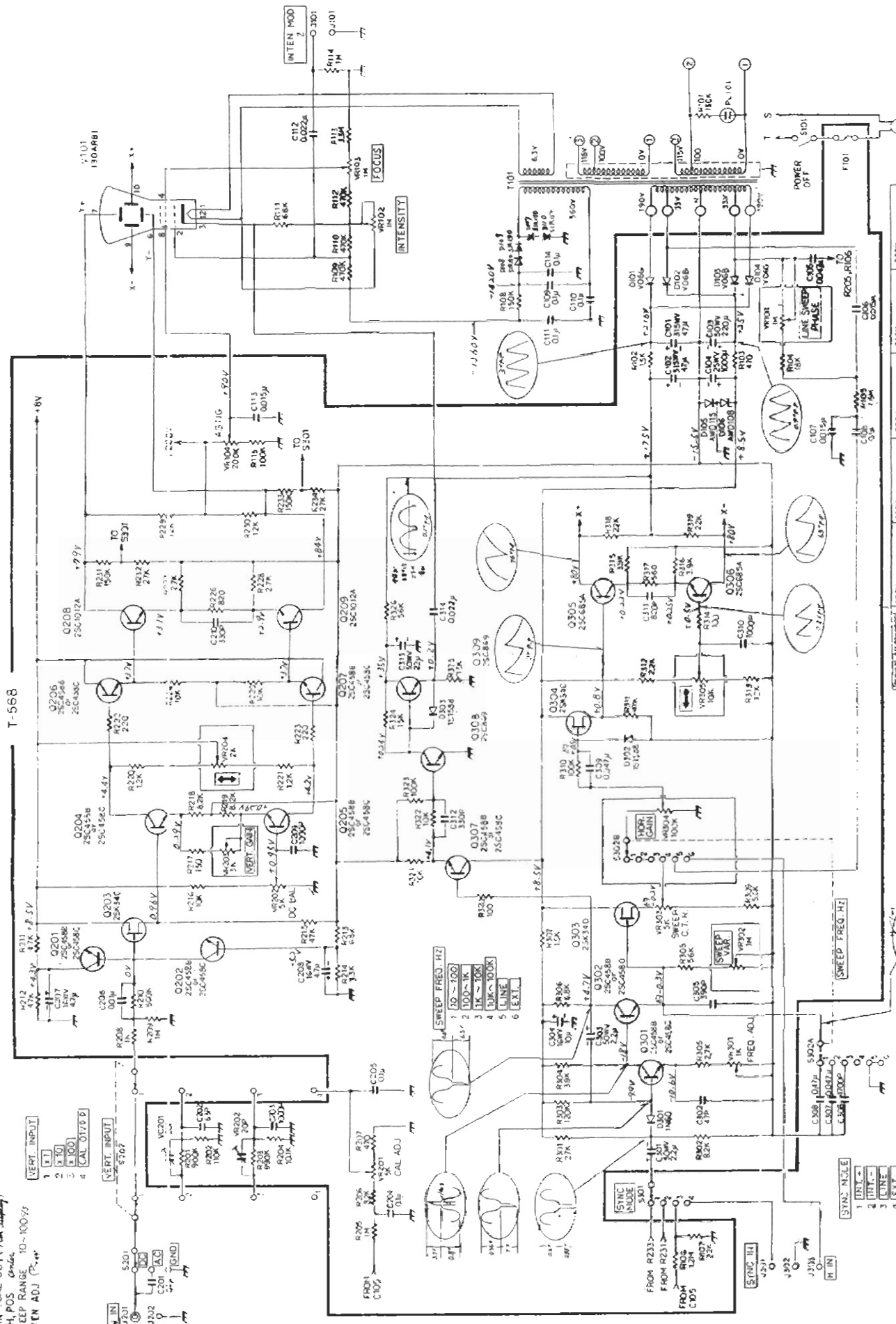
LBO-311





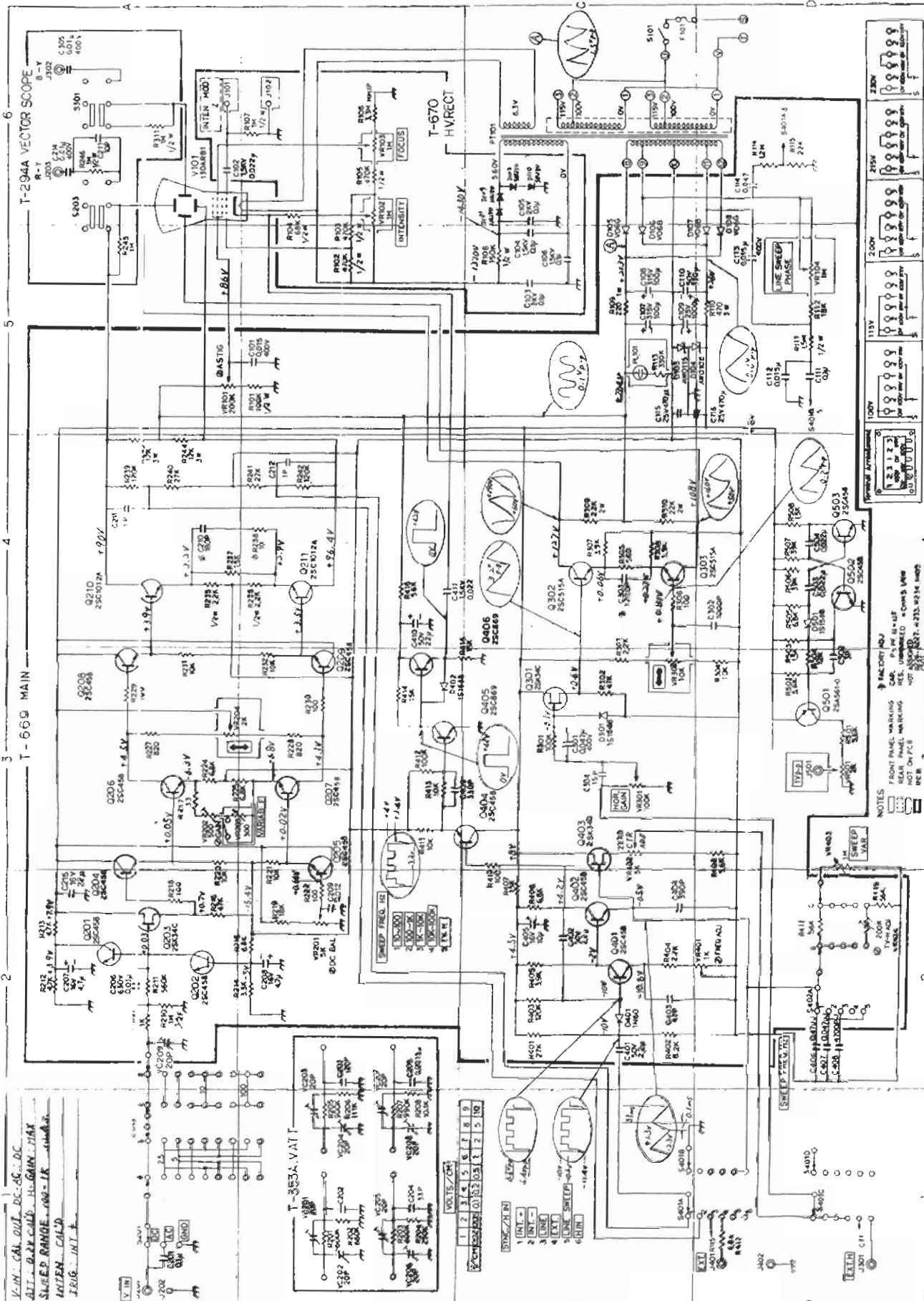
LBO-310, 310A, 311

V-IN CAL-OUT (From display)  
 V-H POS Center  
 SWEEP RANGE 10-100%  
 INTEN ADJ (P. 4)



NOTE  
 RES UNMARKED OHMS  
 CAP . . . . . NOT ON PCB  
 CAP . . . . . FRONT PANEL MARKING

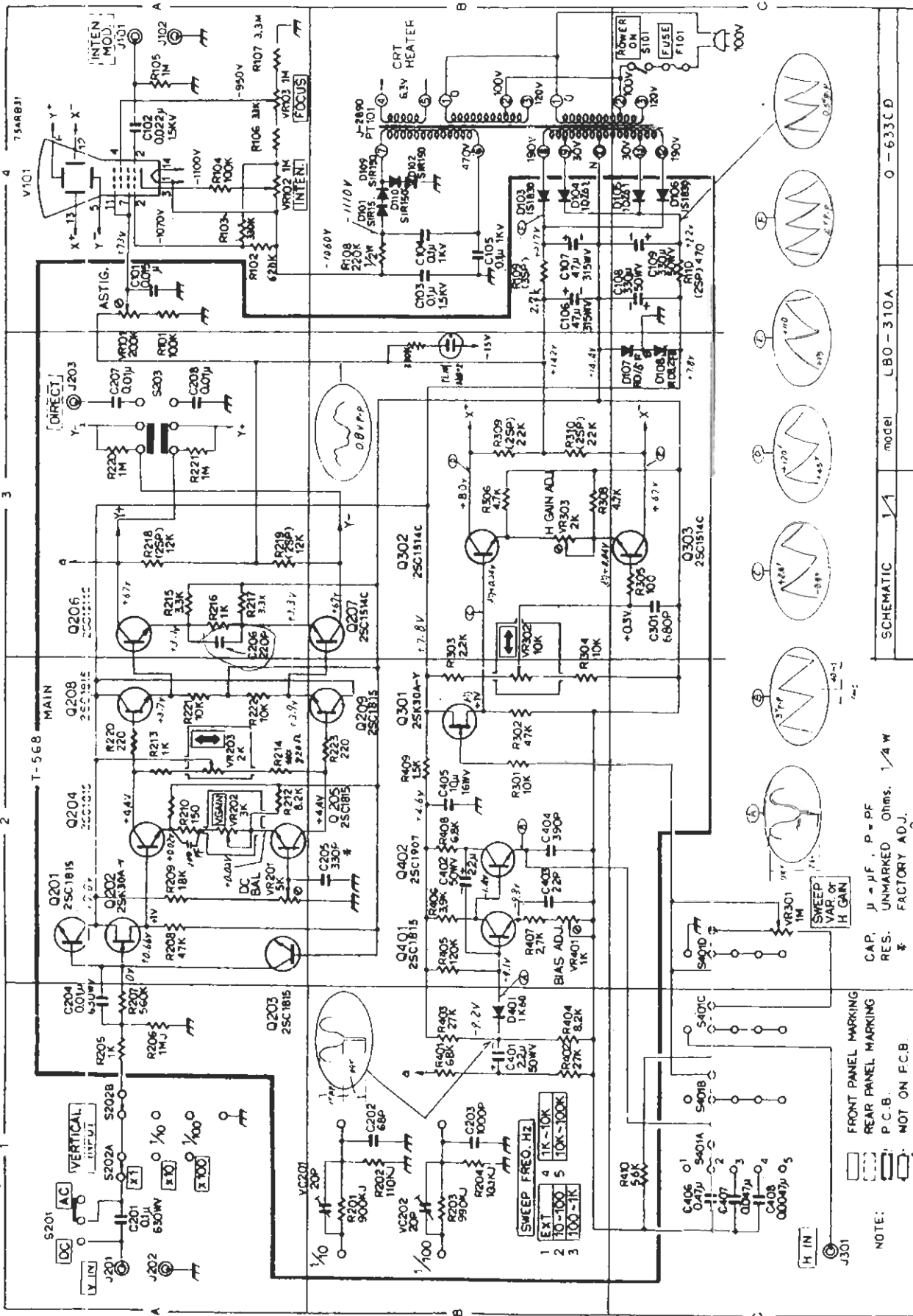
V.H. CAL. OUT. DC. DC.  
 ATT. 0.2X CALD. H. GAIN. MAX  
 SWEEP RANGE. 100-1K  
 INTEN. CALD.  
 TRIG. INT. 1



NOTES:  
 FRONT PANEL WIRING: SEE DRAWING 41-UP  
 REAR PANEL WIRING: NOT SHOWN  
 NOT ON PCB  
 PARTS LIST: 41-231, 41-234, 41-235, 41-236, 41-237, 41-238, 41-239, 41-240, 41-241, 41-242, 41-243, 41-244, 41-245, 41-246, 41-247, 41-248, 41-249, 41-250, 41-251, 41-252, 41-253, 41-254, 41-255, 41-256, 41-257, 41-258, 41-259, 41-260, 41-261, 41-262, 41-263, 41-264, 41-265, 41-266, 41-267, 41-268, 41-269, 41-270, 41-271, 41-272, 41-273, 41-274, 41-275, 41-276, 41-277, 41-278, 41-279, 41-280, 41-281, 41-282, 41-283, 41-284, 41-285, 41-286, 41-287, 41-288, 41-289, 41-290, 41-291, 41-292, 41-293, 41-294, 41-295, 41-296, 41-297, 41-298, 41-299, 41-300

1 2 3 4 5  
 6 7 8 9 10  
 11 12 13 14 15  
 16 17 18 19 20  
 21 22 23 24 25  
 26 27 28 29 30  
 31 32 33 34 35  
 36 37 38 39 40  
 41 42 43 44 45  
 46 47 48 49 50  
 51 52 53 54 55  
 56 57 58 59 60  
 61 62 63 64 65  
 66 67 68 69 70  
 71 72 73 74 75  
 76 77 78 79 80  
 81 82 83 84 85  
 86 87 88 89 90  
 91 92 93 94 95  
 96 97 98 99 100

V-IN AC 100V . ATT 1/100 : 6 div display SWEEP RANGE 2 cycles display

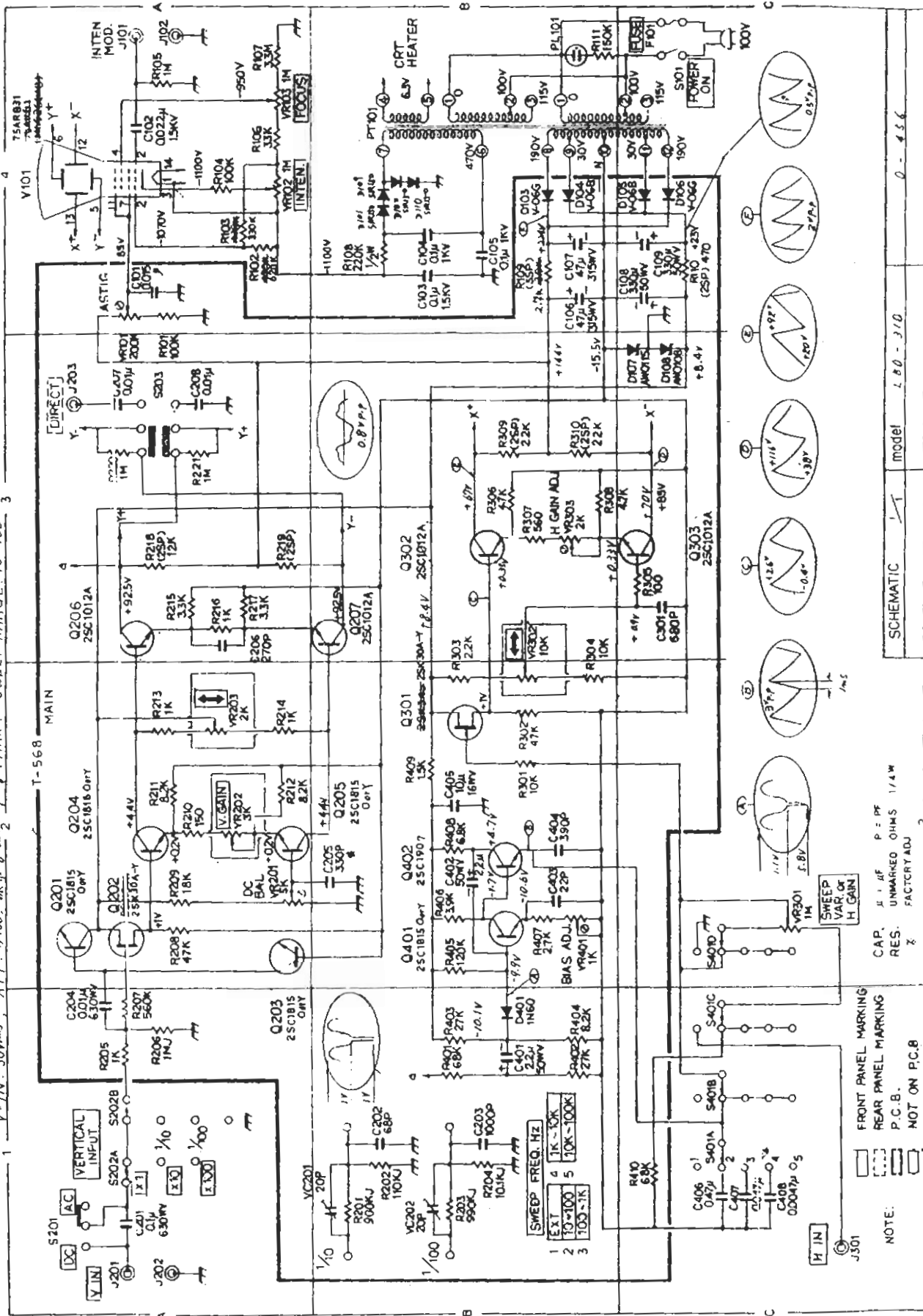


734RB31  
4  
3  
2  
1

T-568 MAIN  
Q208 2SC101C  
Q206 2SC111C  
Q204 2SC101C  
Q201 2SC1815  
Q202 2SK30A-7  
Q203 2SC1815  
Q209 2SC1815  
Q301 25K30A-Y  
Q302 25C1514C  
Q303 25C1514C

SCHEMATIC  
model  
LBO-310A  
0-633CD

AC (10V/S)  
 V-IN. 30Vrms, ATT: 1/100. 屏中 & 显示: MAX. SWEEP RANGE. 10~100



model 1.80-310

SCHEMATIC

NOTE:  
 FRONT PANEL MARKING  
 REAR PANEL MARKING  
 P.C.B.  
 NOT ON P.C.B.

0-456

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