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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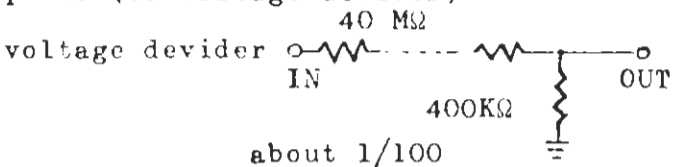
2nd edition Aug., 1987

CONTENTS

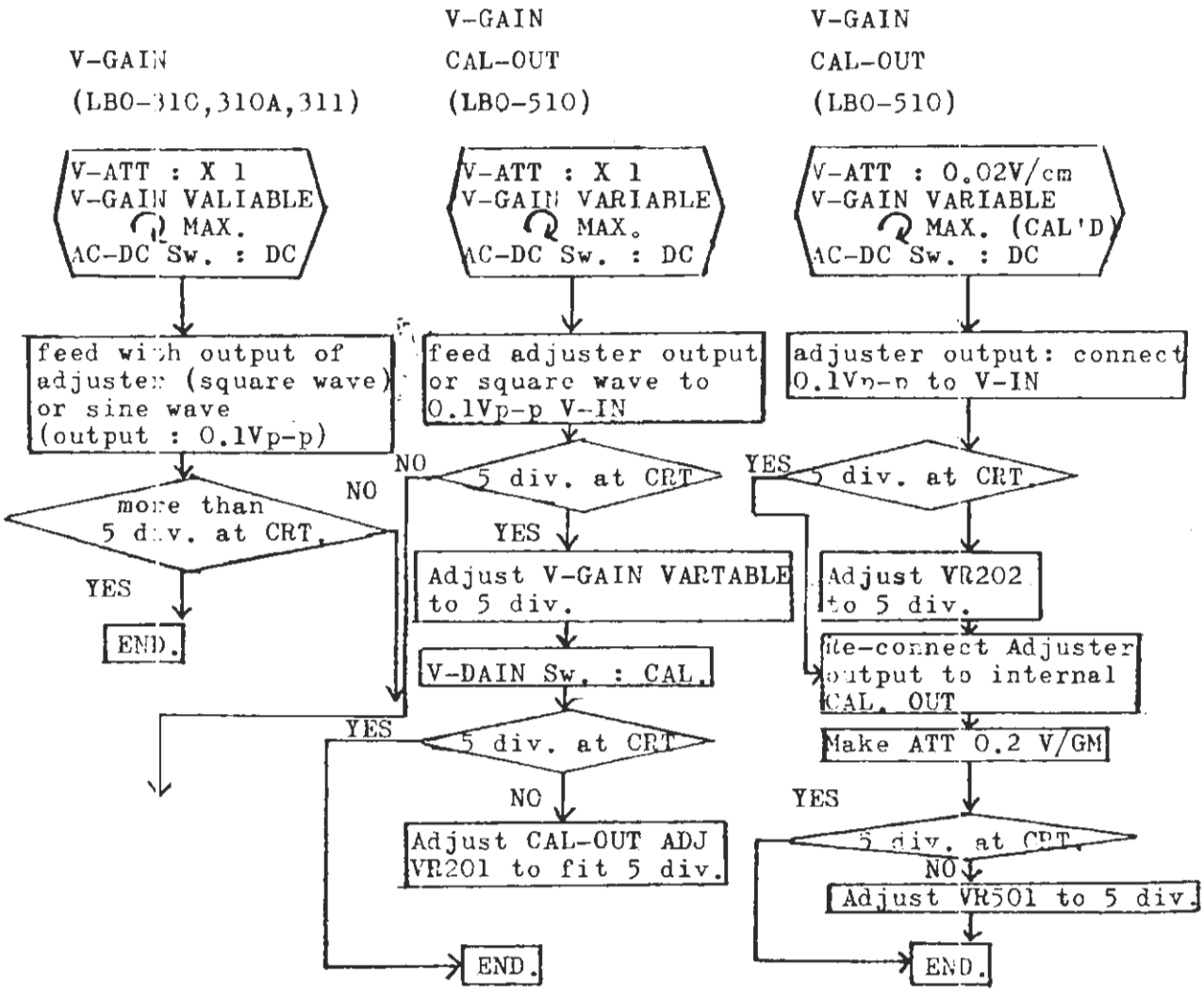
1. INSTRUMENST NEEDED FOR PEPAIR & ADJUSTMENT

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



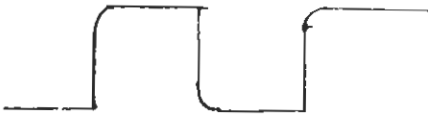
3) Triggered oscilloscope (DC to 7MHz e.g. LBO-503)
4) Audio oscillater (to cover 20Hz-10MHz)
5) Sensitivity caliblater (Should be 1kHz square wave oscillater, without sug or overshoot, to change output with 1-2-5- steps)

2. CHEKING ADJUSTMENT AND REPAIR.

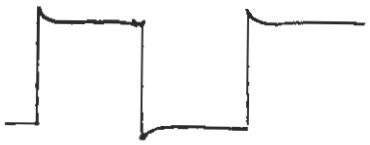


2) Check and adjust characteristic of Attenuator

Feed out-put (1KC square wave) signal from calibrator to V-IN.
(Sigral 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.



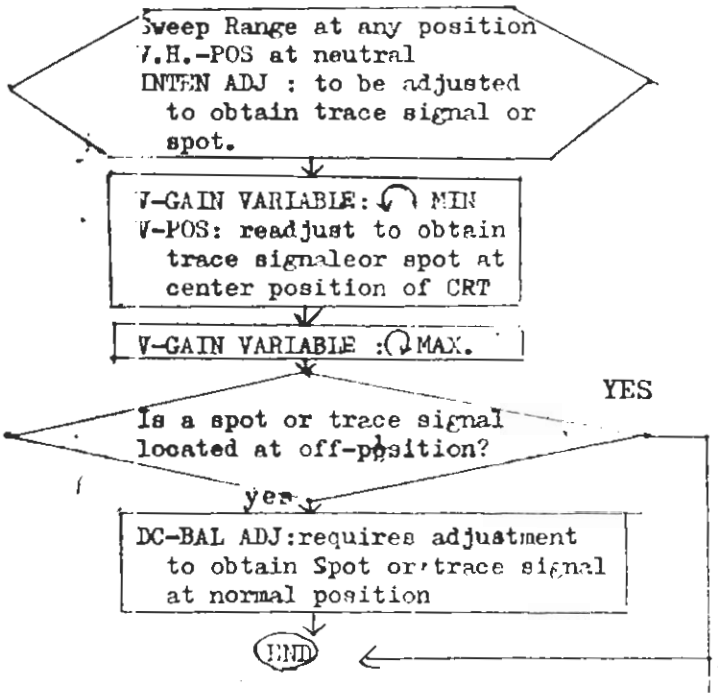
Distorted wave form 1



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 carve 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 valiable turn to max. position at max. freq. and/or sweep valiable turn to min. position at min. freq.

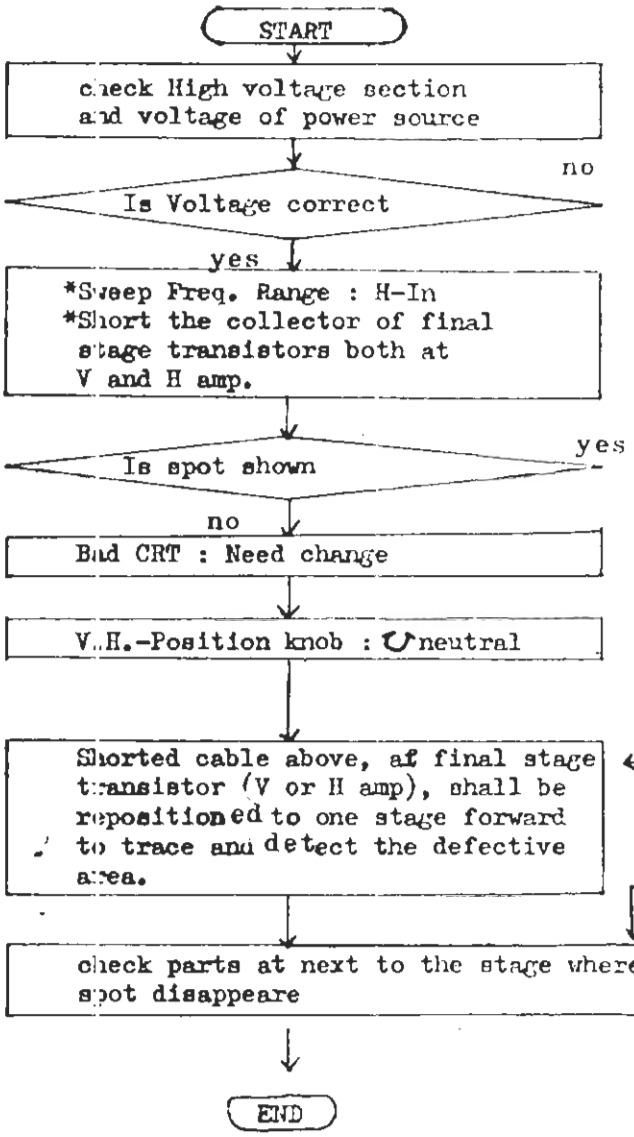
iii) If sweep freq. seems to be off calibrated in total toward high frequency side or low frequency side:

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

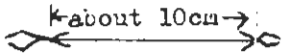
5) How to judge Good or No Good of CRT and V.H.- Amp. (No spot)

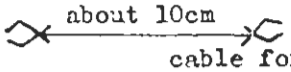


Refer voltage shown in diagram

Repair Power source

Ex. LBO-510 { V-Amp { Q208-C, Q209-C ; H-amp { 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 appeare

Shorted cable reposition

↓

Q206-C - Q207-C short

↓

Spot appeare

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 Valiable instable
* H-Linearity bad
* H-Pos gradually shifts off
* H-Pos juma

LB0-510	LB0-511	LB0-310	LB0-311
Defective H-AMP Q305.306(2SC515) Q304(2SK34C)	Defective H-AMP Q301(2SK34C) Q302.303(2SC515)	Defective H-AMP Q301(2SK34C) Q302.303(2SC1012A)	Defective H-AMP Q301(2SK34C) Q302.303(2SC1012A)
Defective SWEEP OSC Q301.302(2SC458)	Defective SWEEP OSC Q401.402(2SC458)	Devective SWEEP OSC Q401.402(2SC458)	Devective SWEEP OSC Q401.402(2SC458)
+8V P.W.R. D 106(AW0108)	+8V P.W.R. D 104(AW0108)	+8V P.W.R. D 108(AW0108)	+8V P.W.R. D 108(AW0108)

Sympton 11)

NO Sweep

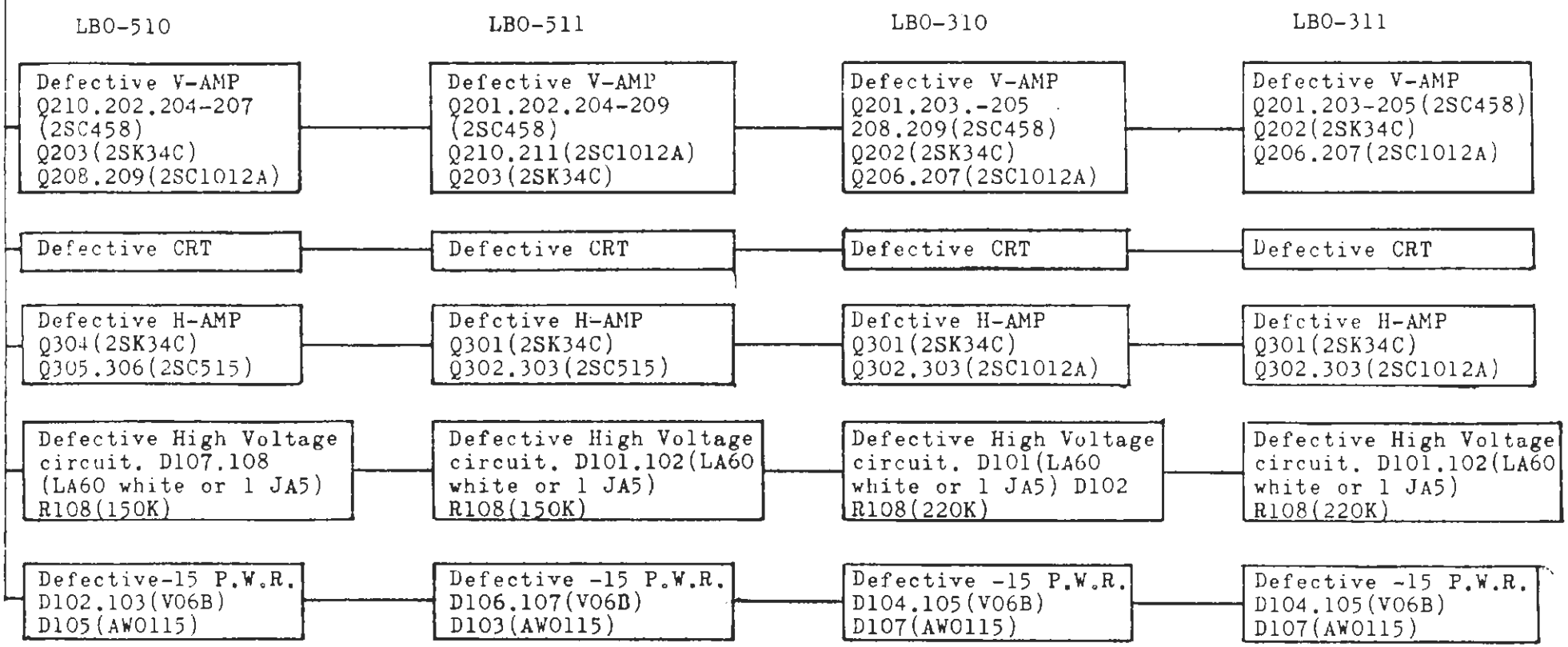
* Sweep unstable
* Wrong sweep wave form

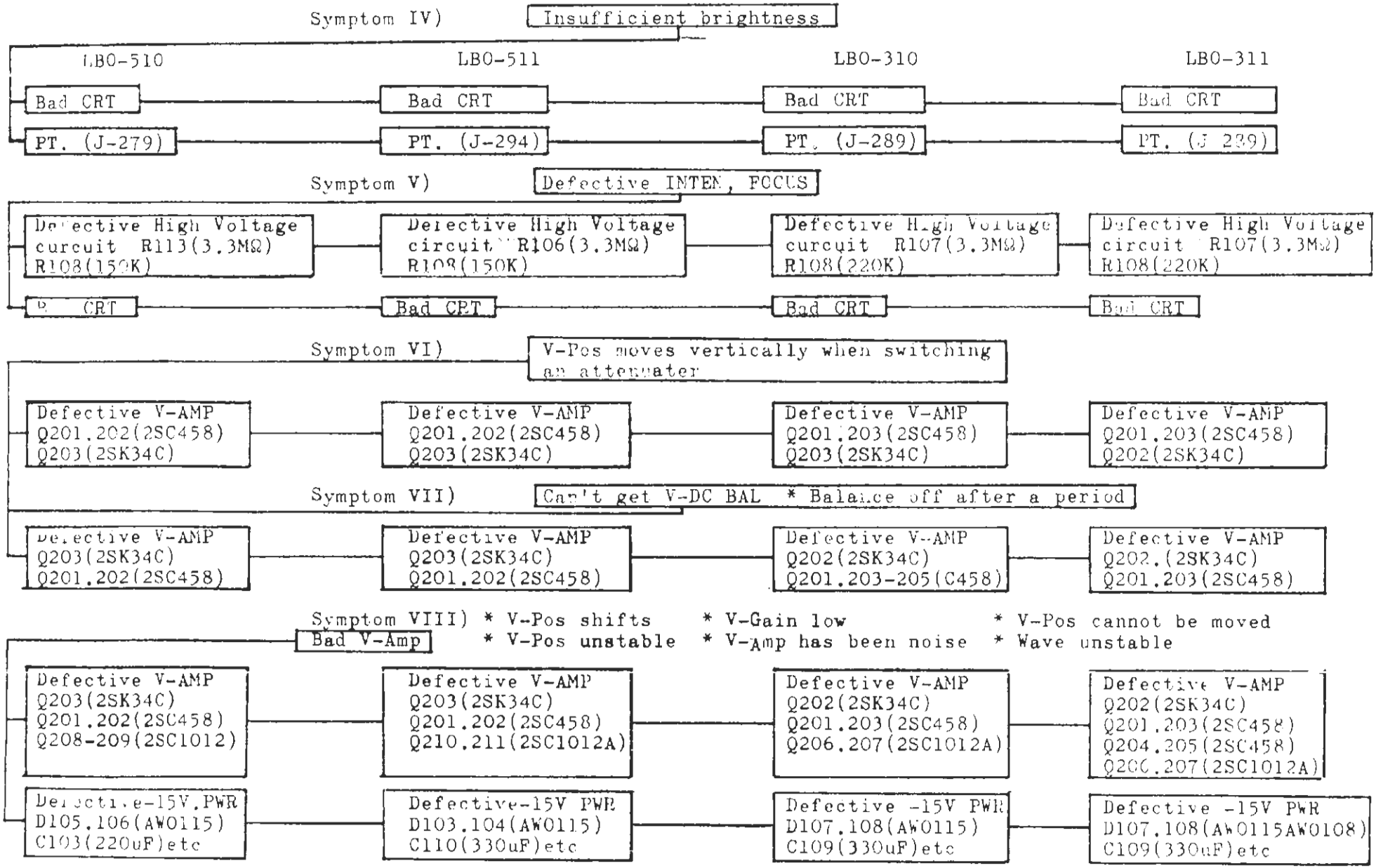
Defective SWEEP OSC Q301.302(2SC458) Q303(2SK34D) D301(1N60)	Defective SWEEP OSC Q401.402(2SC458) Q403(2SK34D) D401(1N60)	Defective SWEEP OSC Q401.402(2SC458) D401(1N60)	Defective SWEEP OSC Q401.402(2SC458) D401(1N60)
Defective H-AMP Q304(2SK34C)	Defective H-AMP Q301(2SK34C)	Defective H-AMP Q301(2SK34C)	Defective H-AMP Q301(2SK34C)

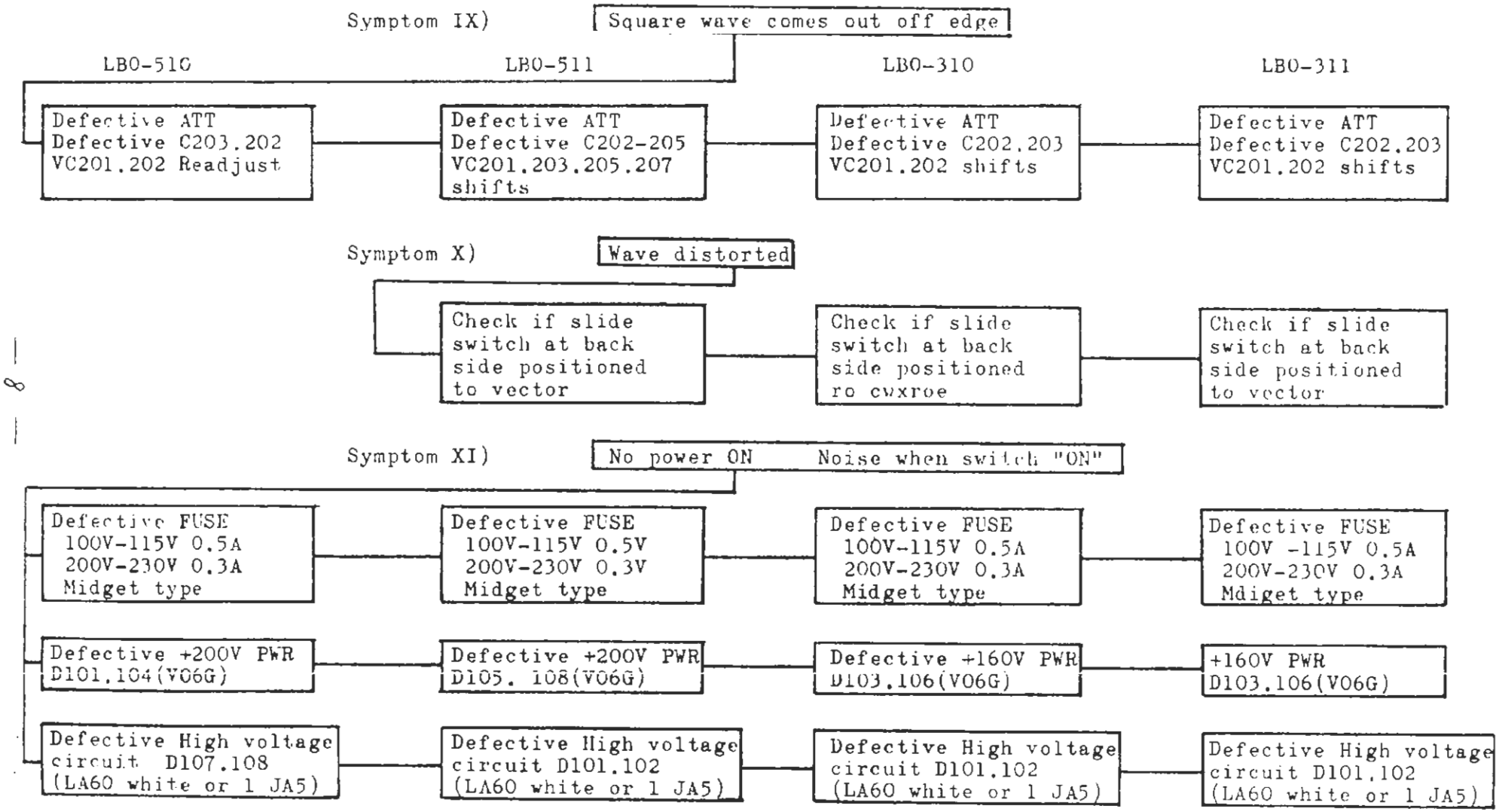
Symptom III)

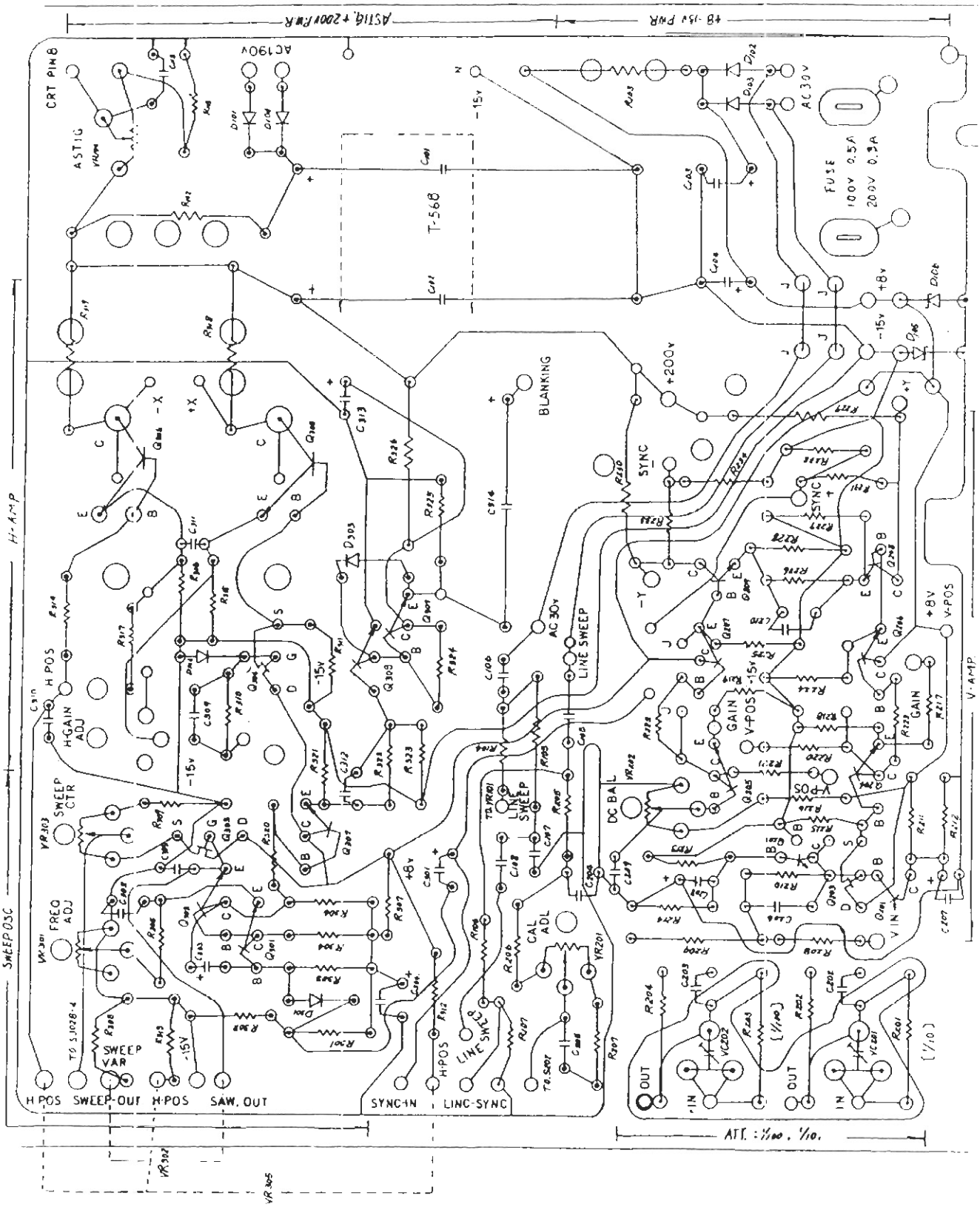
No Spot

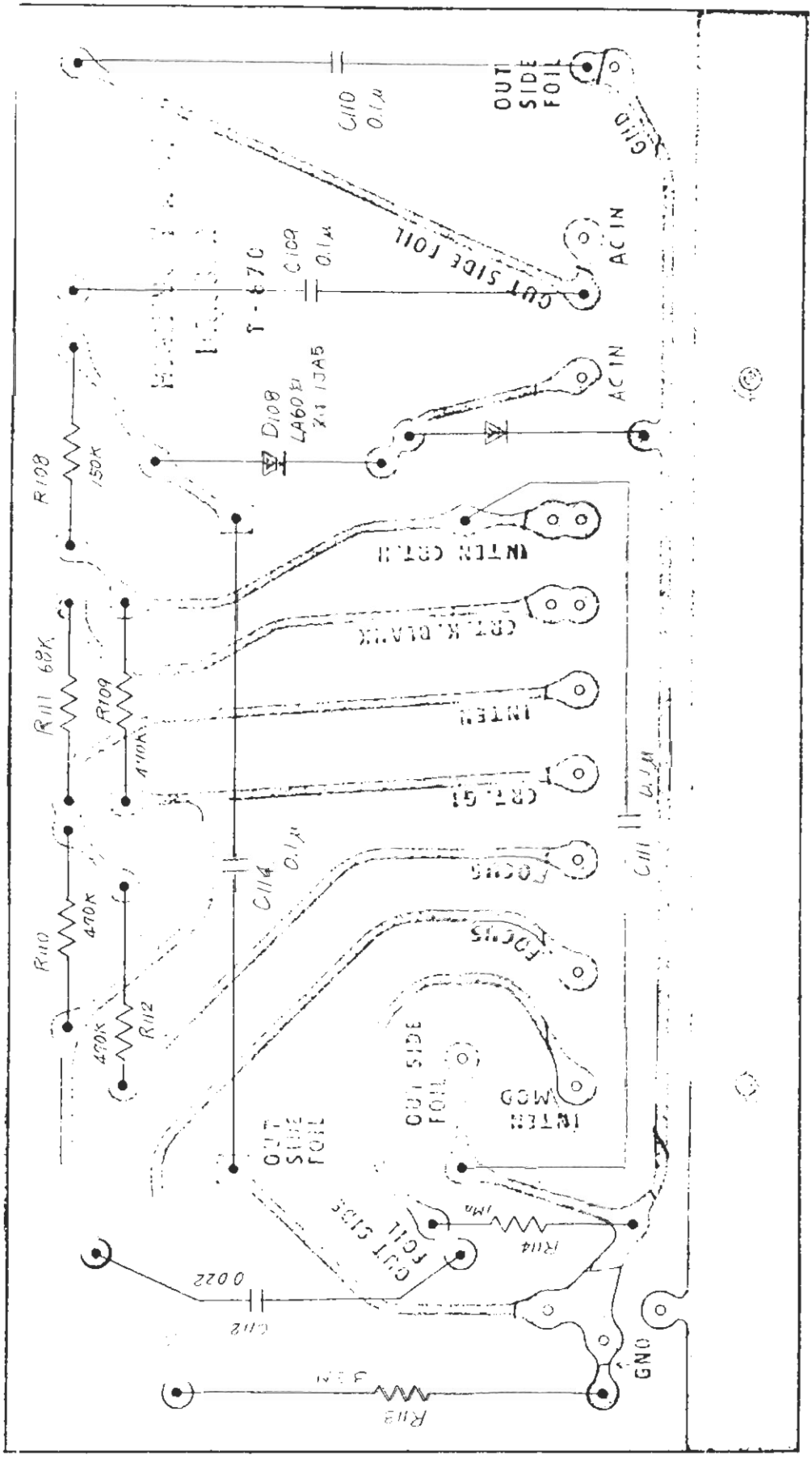
* No trace line
* Doesn't work
* Spot fades off after a period.



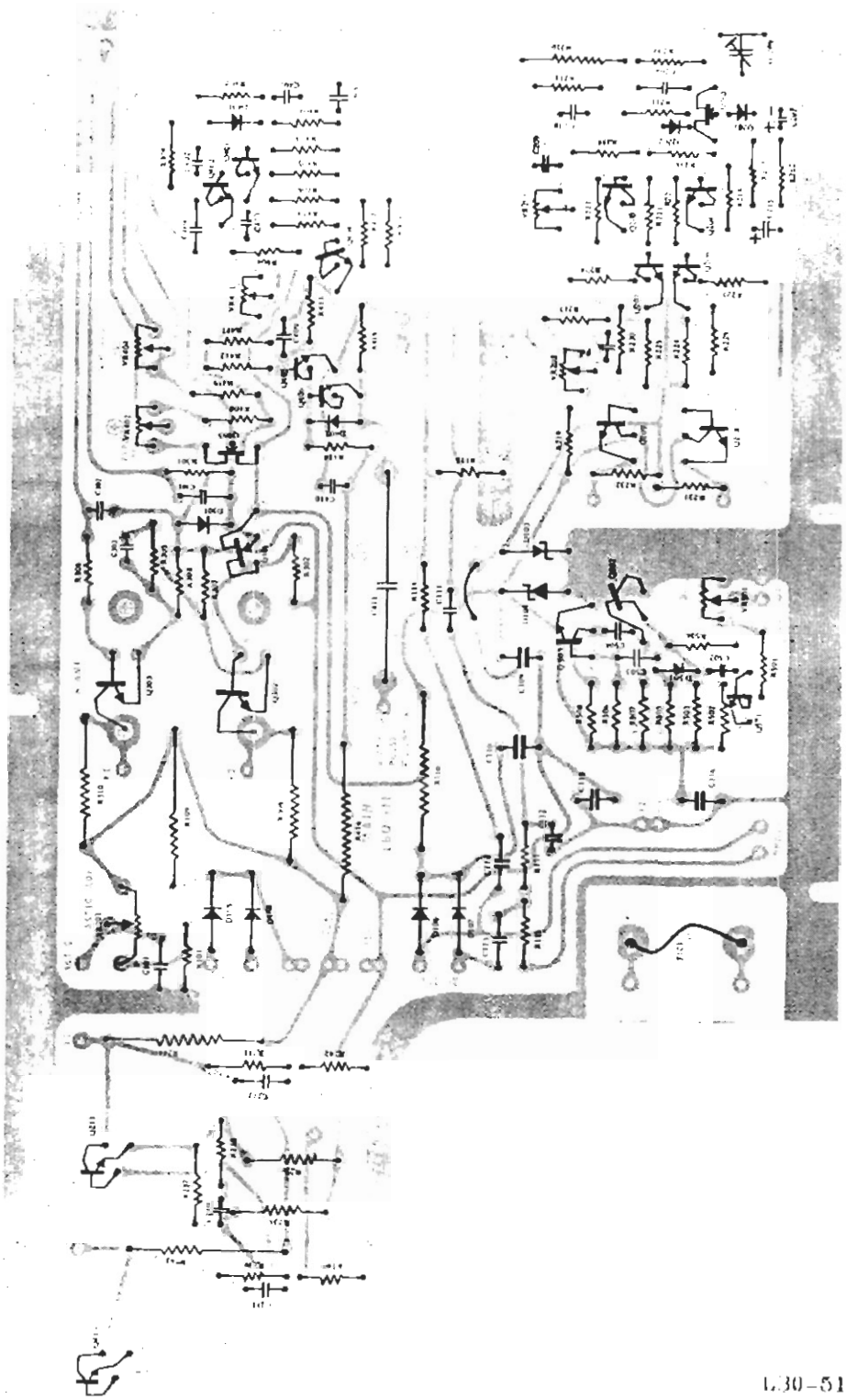

Symptom IV)
Insufficient brightness
LBO-510
LBO-511
LBO-310
LBO-311
Bad CRT
Bad CRT
Bad CRT
Bad CRT
PT. (J-279)
PT. (J-294)
PT. (J-289)
PT. (J 289)
Symptom V)
Defective INTEN, FOCUS
Defective High Voltage curcuit R113(3.3MΩ) R108(150K)
Defective High Voltage circuit R106(3.3MΩ) R108(150K)
Defective High Voltage curcuit R107(3.3MΩ) R108(220K)
Defective High Voltage circuit R107(3.3MΩ) R108(220K)
Bad CRT
Bad CRT
Bad CRT
Bad CRT
Symptom VI)
V-Pos moves vertically when switching an attenuater
Defective V-AMP Q201.202(2SC458) Q203(2SK34C)
Defective V-AMP Q201.202(2SC458) Q203(2SK34C)
Defective V-AMP Q201.203(2SC458) Q203(2SK34C)
Defective V-AMP Q201.203(2SC458) Q202(2SK34C)
Symptom VII)
Can't get V-DC BAL * Balance off after a period
Defective V-AMP Q203(2SK34C) Q201.202(2SC458)
Defective V-AMP Q203(2SK34C) Q201.202(2SC458)
Defective V-AMP Q202(2SK34C) Q201.203-205(C458)
Defective V-AMP Q202.(2SK34C) Q201.203(2SC458)
Symptom VIII)
Bad V-Amp
* V-Pos shifts
* V-Pos unstable
* V-Gain low
* V-Amp has been noise
* V-Pos cannot be moved
* Wave unstable
Defective V-AMP Q203(2SK34C) Q201.202(2SC458) Q208-209(2SC1012)
Defective V-AMP Q203(2SK34C) Q201.202(2SC458) Q210.211(2SC1012A)
Defective V-AMP Q202(2SK34C) Q201.203(2SC458) Q206.207(2SC1012A)
Defective V-AMP Q202(2SK34C) Q201.203(2SC458) Q204.205(2SC458) Q206.207(2SC1012A)
Defective-15V PWR D105.106(AW0115) C103(220uF)etc
Defective-15V PWR D103.104(AW0115) C110(330uF)etc
Defective -15V PWR D107.108(AW0115) C109(330uF)etc
Defective -15V PWR D107.108(AW0115AW0108) C109(330uF)etc


Symptom IX)
Square wave comes out off edge
LB0-510
LB0-511
LB0-310
LB0-311
Defective ATT
Defective C203.202
VC201.202 Readjust
Defective ATT
Defective C202-205
VC201.203.205.207
shifts
Defective ATT
Defective C202.203
VC201.202 shifts
Defective ATT
Defective C202.203
VC201.202 shifts
Symptom X)
Wave distorted
Check if slide
switch at back
side positioned
to vector
Check if slide
switch at back
side positioned
ro cuxroe
Check if slide
switch at back
side positioned
to vector
Symptom XI)
No power ON
Noise when switch "ON"
Defective FUSE
100V-115V 0.5A
200V-230V 0.3A
Midget type
Defective FUSE
100V-115V 0.5V
200V-230V 0.3V
Midget type
Defective FUSE
100V-115V 0.5A
200V-230V 0.3A
Midget type
Defective FUSE
100V -115V 0.5A
200V-230V 0.3A
Mdiget type
Defective +200V PWR
D101.104(V06G)
Defective +200V PWR
D105. 108(V06G)
Defective +160V PWR
D103.106(V06G)
+160V PWR
D103.106(V06G)
Defective High voltage
circuit D107.108
(LA60 white or 1 JA5)
Defective High voltage
circuit D101.102
(LA60 white or 1 JA5)
Defective High voltage
circuit D101.102
(LA60 white or 1 JA5)
Defective High voltage
circuit D101.102
(LA60 white or 1 JA5)


CRT PIN 8
ASTIG
AC190V
T-568
FUSE
100V 0.5A
200V 0.3A
AC 30V
+8V
-15V
+200V
BLANKING
SYNC
LINE SWEEP
H-AMP
V-AMP
SWEEP OSC
H POS
H GAIN ADJ
SWEEP CTR
FREQ ADJ
SWEEP VAR
DC BAL
CAL ADJ
GAIN
V-POS
V IN
H POS
SWEEP-OUT
H POS
SAW. OUT
SYNC-IN
LINE-SYNC
ATT. : 1/100 , 1/10.
OUT
IN
1/100
1/10

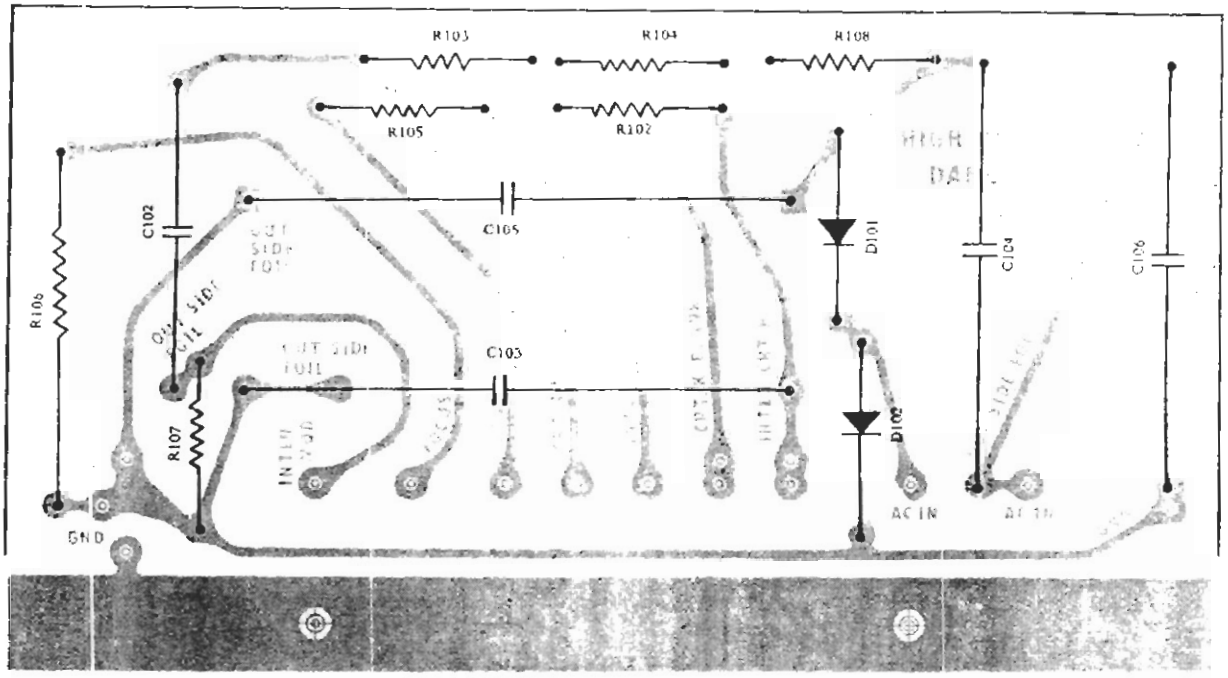

C110 0.1μ
OUT SIDE FOIL
GND
OUT SIDE FOIL
AC IN
T-470
C109 0.1μ
D108 LA60B
AC IN
R108 150K
INTEN CRT.K
CRT.K.BLANK
INTEN
CRT.G1
R111 68K
R109 470K
C111 0.1μ
C114 0.1μ
FOCUS
FOCUS
R110 470K
R112 470K
OUT SIDE FOIL
INTEN MOD
OUT SIDE FOIL
R114 1MΩ
C112 0.022
GND
R113 3.3K

T-669 MAIN

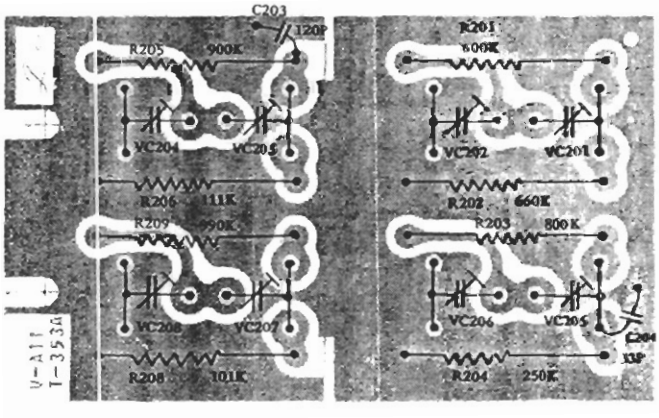


LBO-511

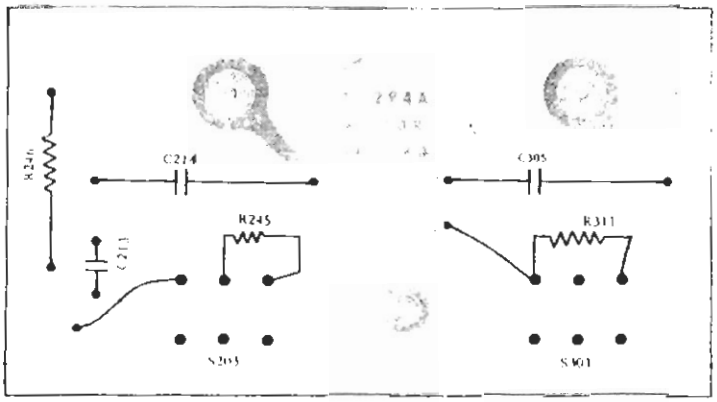
T-670 HIGH VOLT RECT



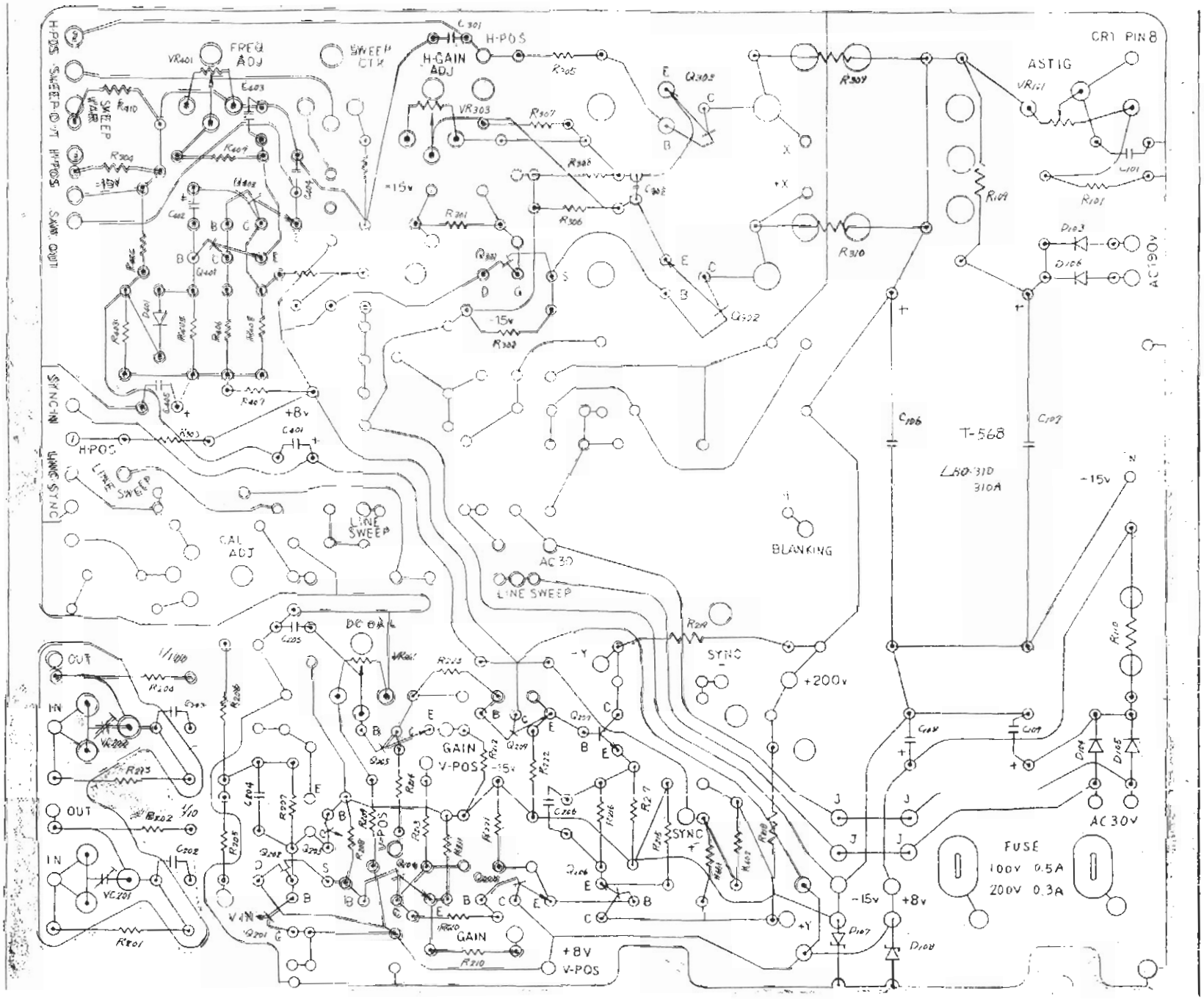
T-353A V-ATT

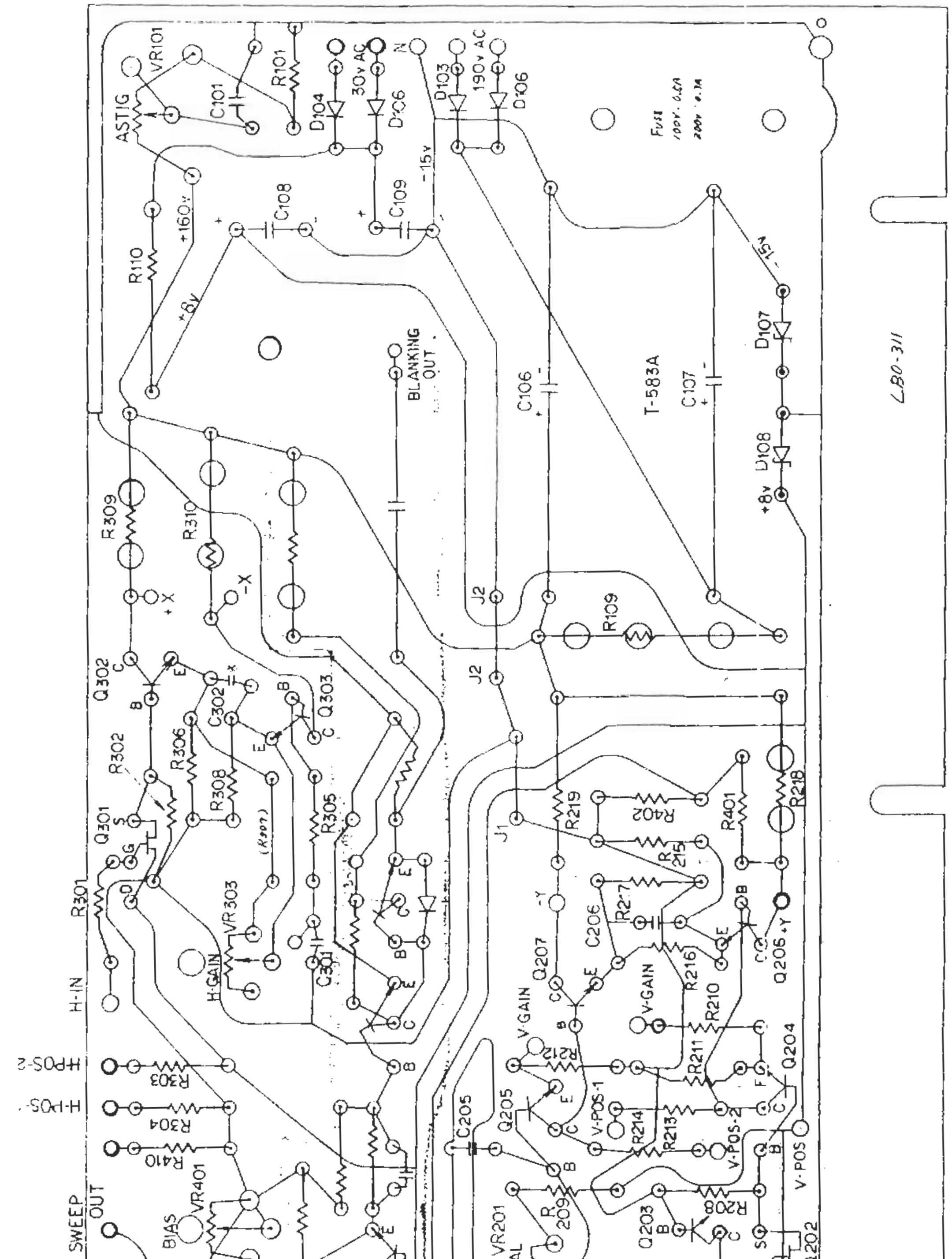


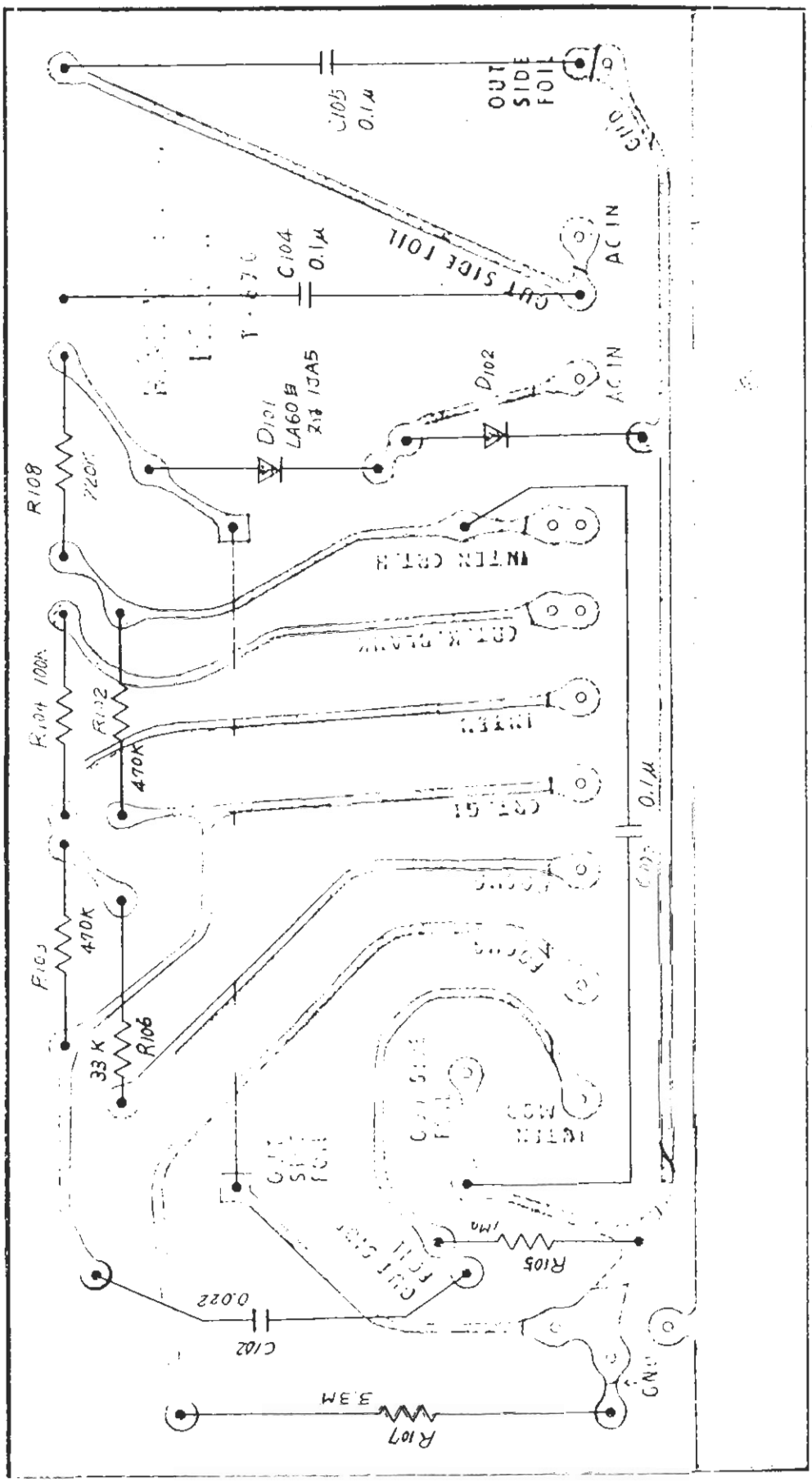
T-294A VECTOR SCOPE

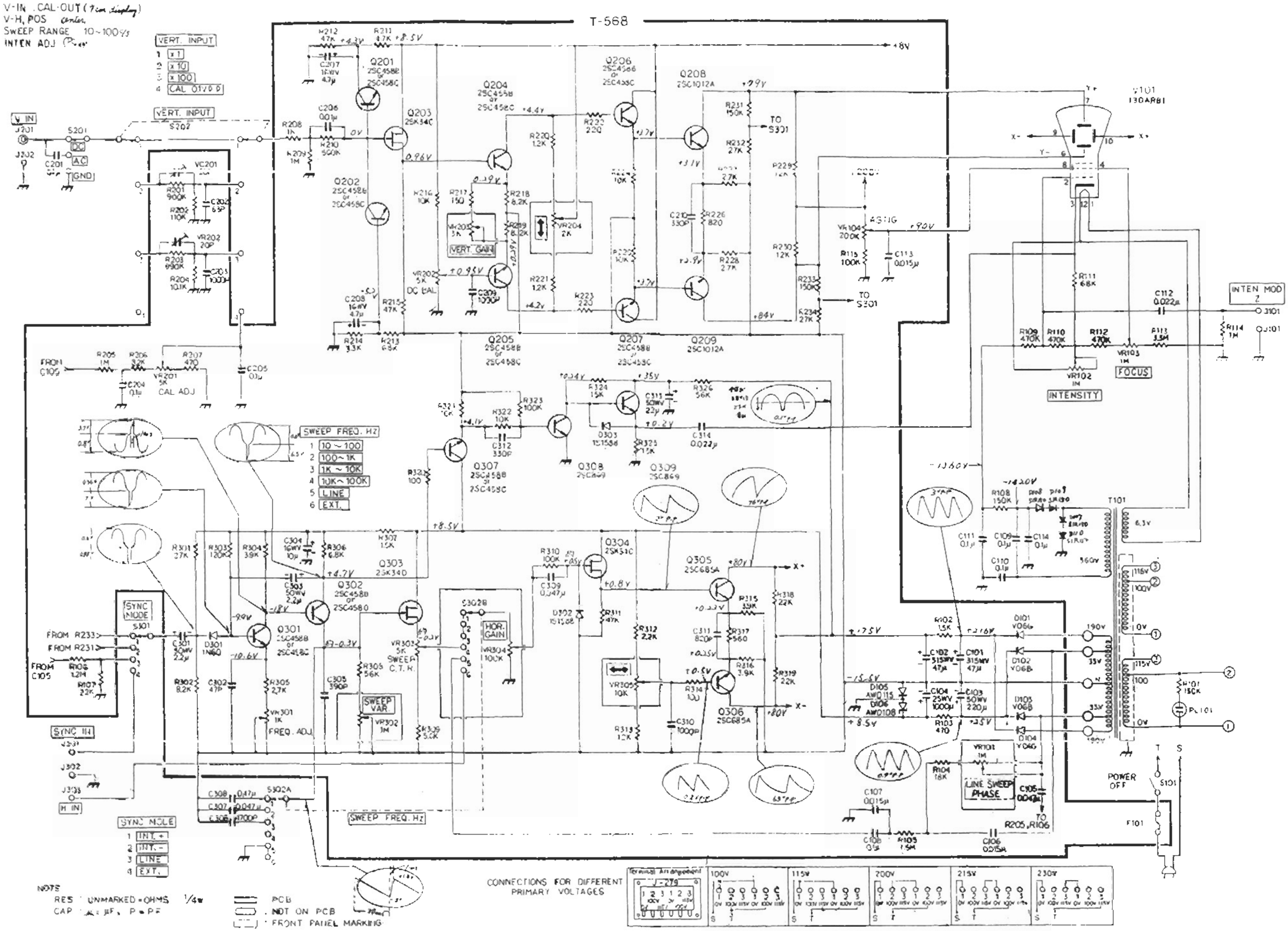


LB0-511

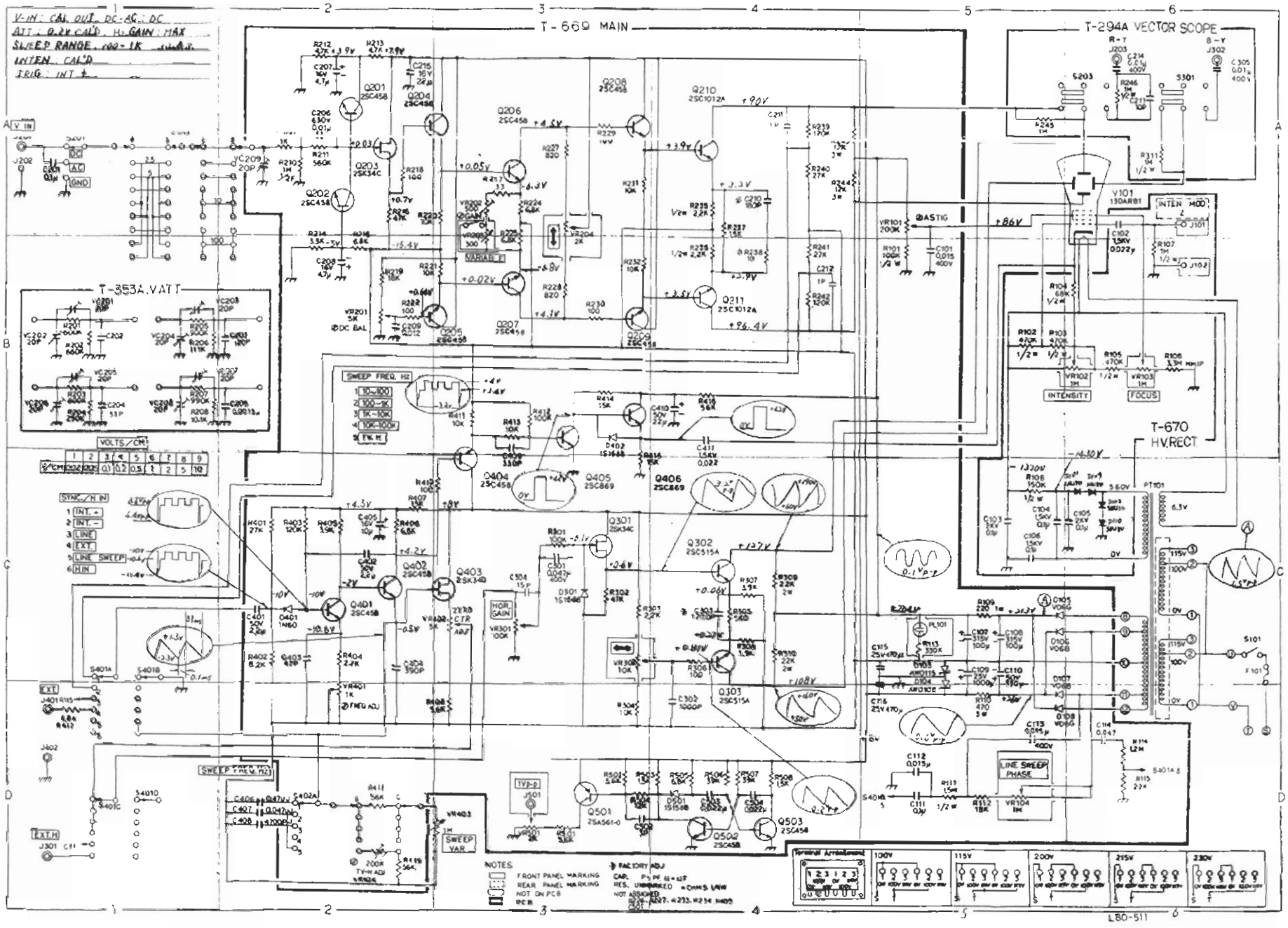

H-POS
SWEEP OUT
H-POS
SAW OUT
SYNCH IN
LINE SYNC
FREQ ADJ
SWEEP CTR
H-GAIN ADJ
H-POS
CR1 PIN 8
ASTIG
FOCUS
AC 190V
T-568
LBO-310
310A
BLANKING
CAL ADJ
LINE SWEEP
AC 30
DC BAL
GAIN
V-POS
SYNC
+200v
-15v
+8v
AC 30V
FUSE
100V 0.5A
200V 0.3A
OUT
IN
OUT
IN
+8V
V-POS
GAIN

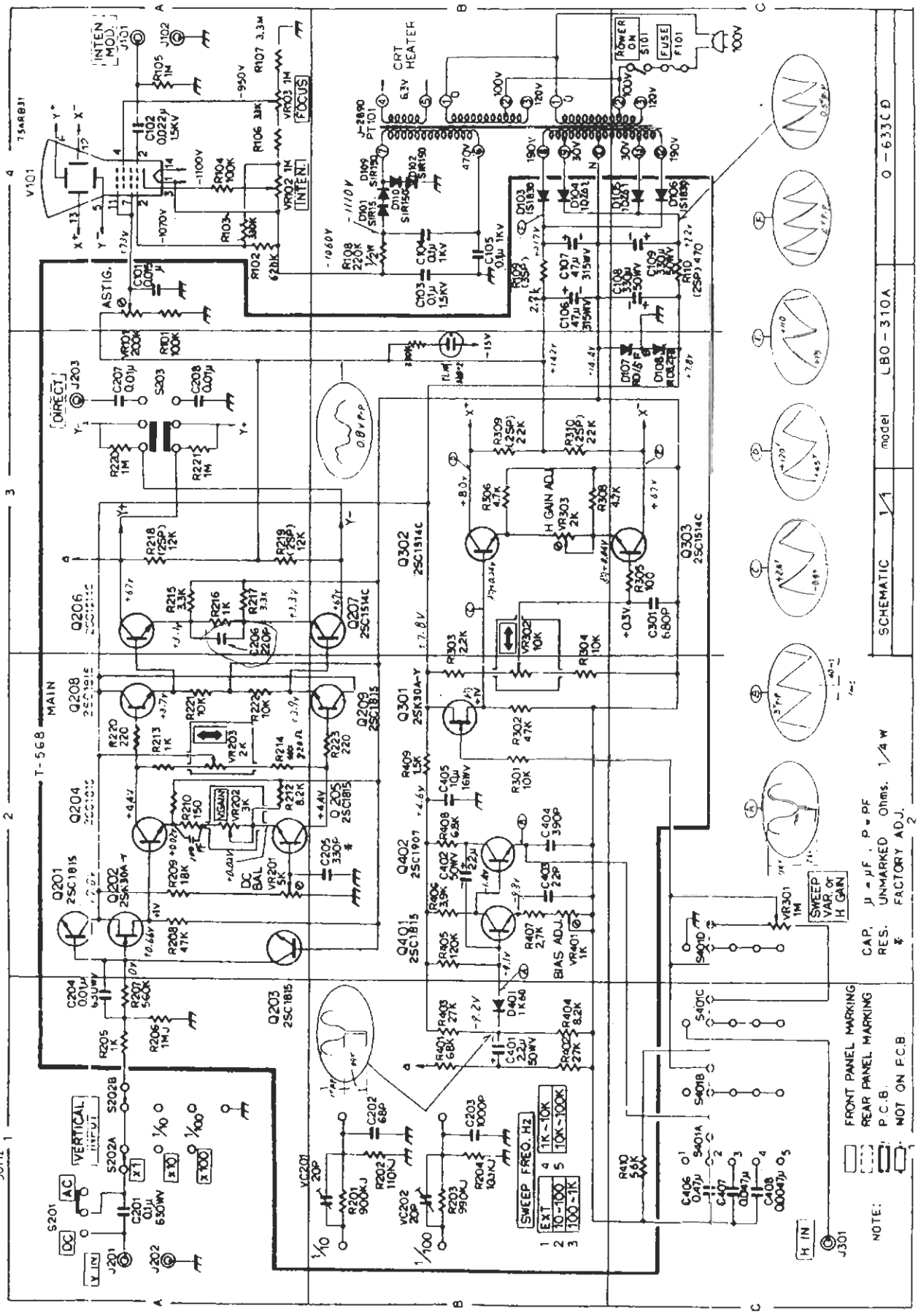

ASTIG
VR101
C101
R101
D104
30V AC
D106
D103
190V AC
FUSE
+160V
C108
C109
-15V
R110
+8V
BLANKING OUT
C106
C107
T-583A
D107
D108
LBO-311
R309
R310
+X
-X
J2
R109
Q302
Q303
C302
R302
R306
R308
R305
Q301
R301
VR303
H-GAIN
C301
H-IN
H-POS-2
H-POS-1
R303
R304
R410
SWEEP OUT
BIAS
VR401
C403
C404
R407
R408
R406
R405
R403
R404
R409
Q401
Q402
D401
C402
C401
C405
J1
R219
R402
R401
R218
R215
R217
C206
Q207
Q206
-Y
+Y
V-GAIN
R216
R210
R211
R212
Q204
Q205
V-POS-1
V-POS-2
V-POS
R214
R213
C205
R209
R208
Q203
VR201
DC-BAL
Q202
R207
C204
C201
R206
R205
V IN
C203
R204
R203
1/100
1/10
C202
R202
R201
VC 202
VC 201
OUT
IN

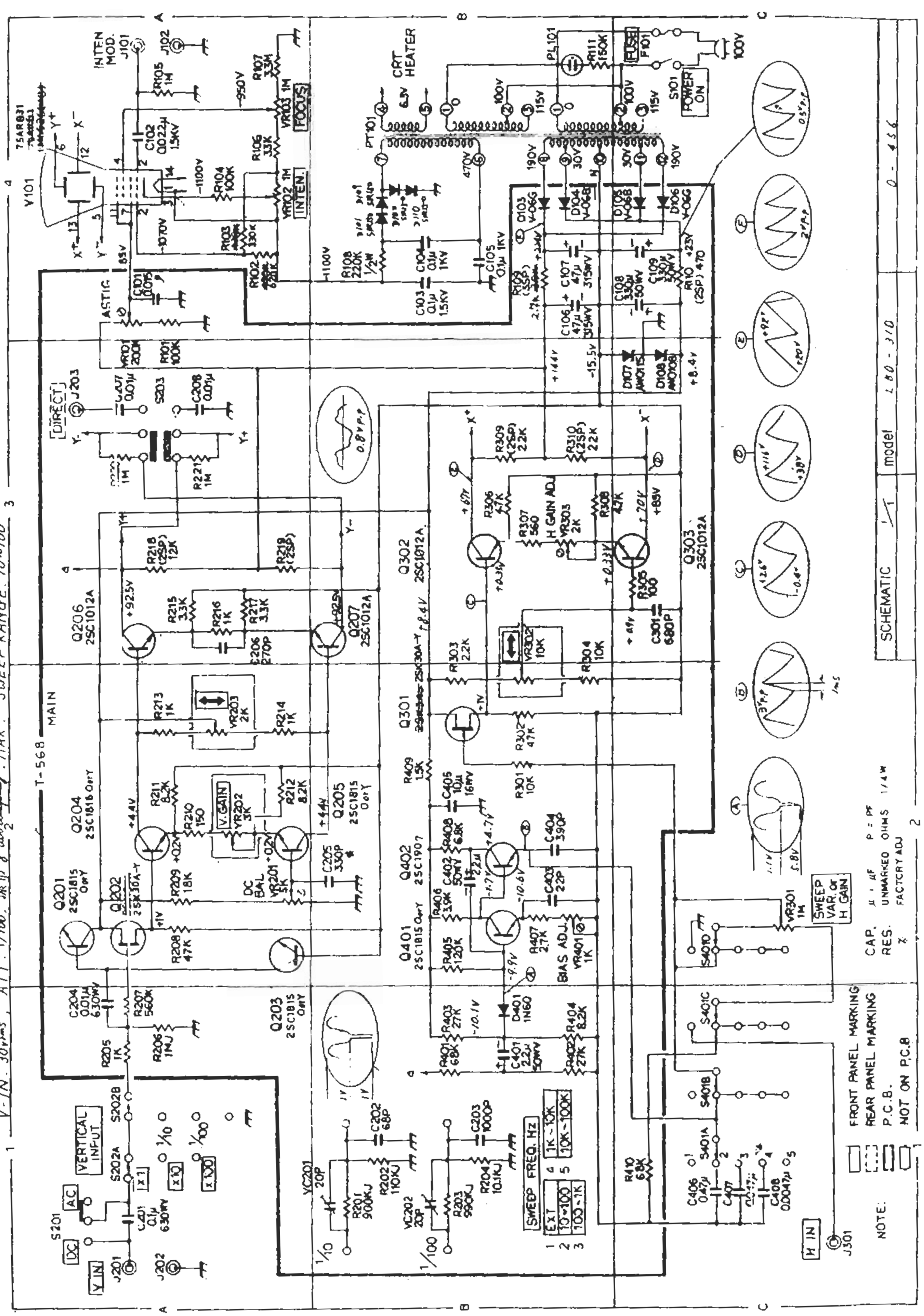

C105 0.1μ
OUT SIDE FOIL
C104 0.1μ
CUT SIDE FOIL
AC IN
D101 LA60B 2nd 13A5
D102
R108 220K
R104 100K
R102 470K
R103 470K
R106 33K
0.1μ
R105 1MΩ
C102 0.022
R107 3.3M



T-568
VERT. INPUT
1 x1
2 x10
3 x100
4 CAL 0.1V P-P
V IN
J201
S201
DC
AC
GND
VERT. INPUT S202
SWEEP FREQ. Hz
1 10 ~ 100
2 100 ~ 1K
3 1K ~ 10K
4 10K ~ 100K
5 LINE
6 EXT.
SYNC MODE S301
SYNC IN
H IN
SYNC MODE
1 INT. +
2 INT. -
3 LINE
4 EXT.
VERT. GAIN
DC BAL
CAL ADJ
FREQ. ADJ
SWEEP VAR
HOR. GAIN
INTENSITY
FOCUS
LINE SWEEP PHASE
V101 130ARB1
T101
POWER OFF
INTEN MOD Z
CONNECTIONS FOR DIFFERENT PRIMARY VOLTAGES
100V
115V
200V
215V
230V
NOTE
RES : UNMARKED = OHMS 1/4W
CAP : μ = μF, P = PF
PCB
NOT ON PCB
FRONT PANEL MARKING


T-669 MAIN
T-294A VECTOR SCOPE
T-353A.VATT
T-670 H.V.RECT
V-IN : CAL OUT, DC-AC : DC
ATT : 0.2V CAL'D, H. GAIN : MAX
SWEEP RANGE : 100 - 1K
INTEN : CAL'D
TRIG : INT +
V IN
INTENSITY
FOCUS
SWEEP FREQ. Hz
SYNC. / H IN
VOLTS / CM
EXT
EXT.H
SWEEP VAR
LINE SWEEP PHASE
NOTES
FACTORY ADJ
Terminal Arrangement
100V
115V
200V
215V
230V
LBO-511


V-IN AC 100V, ATT 1/100 : 6 div display SWEEP RANGE 2 cycle display
50Hz
T-568 MAIN
SCHEMATIC 1/1
model LBO-310A
0-633CD
CAP. μ = μF, P = PF
RES. UNMARKED Ohms. 1/4 W
* FACTORY ADJ.
NOTE: FRONT PANEL MARKING
REAR PANEL MARKING
P.C.B.
NOT ON P.C.B.
VERTICAL INPUT
DIRECT
INTEN MOD.
FOCUS
ASTIG.
H IN
SWEEP VAR. or H GAIN
SWEEP FREQ. H2
H GAIN ADJ.
BIAS ADJ.
DC BAL
CRT HEATER
POWER ON S101
FUSE F101
Q201 2SC1815
Q202 2SK30A-Y
Q203 2SC1815
Q204 2SC1815
Q205 2SC1815
Q206 2SC1514C
Q207 2SC1514C
Q208 2SC1815
Q209 2SC1815
Q301 2SK30A-Y
Q302 2SC1514C
Q303 2SC1514C
Q401 2SC1815
Q402 2SC1907


SCHEMATIC
model L80-310
SWEEP RANGE. 10~100
MAIN
T-568
VERTICAL INPUT
Y IN
H IN
DIRECT
V.GAIN
DC BAL
H GAIN ADJ
BIAS ADJ.
SWEEP VAR or H GAIN
SWEEP FREQ. Hz
EXT
10~100
100~1K
1K~10K
10K~100K
ASTIG
INTEN.
FOCUS
INTEN MOD.
CRT HEATER
POWER ON
FUSE
NOTE:
FRONT PANEL MARKING
REAR PANEL MARKING
P.C.B.
NOT ON P.C.B
CAP. μ : μF P : PF
RES. UNMARKED OHMS 1/4W
FACTORY ADJ