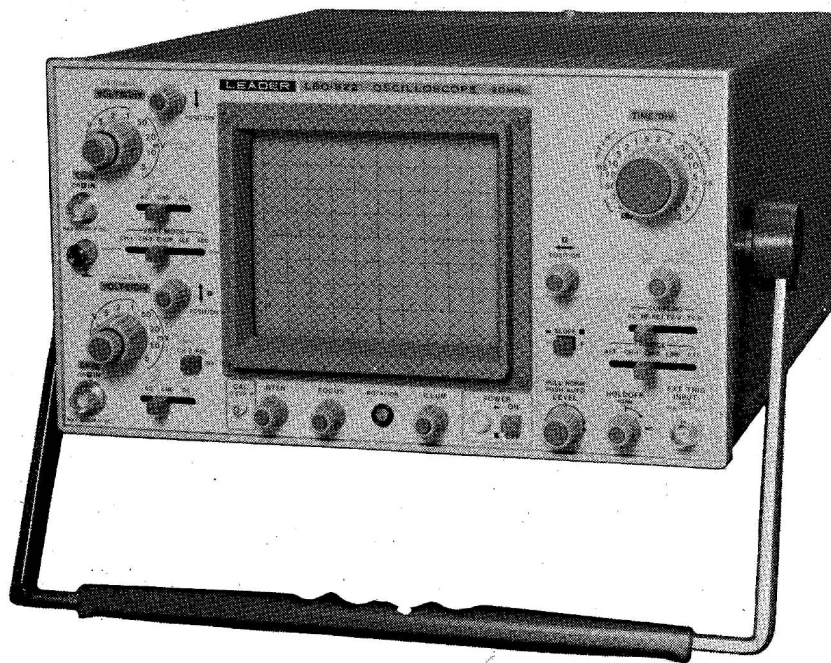


# LEADER TEST INSTRUMENTS

MODEL LBO-522  
LBO-523

## DUAL TRACE OSCILLOSCOPE

### INSTRUCTION MANUAL



LEADER ELECTRONICS CORP.

## 1. INTRODUCTION

The LBO-522·LBO-523 Oscilloscopes are portable ones with the functions of 5 mV/div. (20[35] MHz), 500  $\mu$ V/div. (5 MHz), maximum sweep rate 40[20] ns/div. (MAG x 5[10]), equipped with a 6-inch rectangular [metal-back] CRT with high brightness, internal graticule and the vertical sensitivity magnifier.

The LBO-522, 523 have a wide range of application in production and service areas for measurements and testings of TV set, VTRs and computer peripheral equipments, since the TV synchronization separator, variable hold off and V-AXIS magnifier functions are provided.

## 2. SPECIFICATIONS

### CRT Display

#### Type

150 mm Rectangular, Internal-graticule Scale, [Aluminized Screen] and Flat Face with illumination lamps and Percentage scale.

#### Accelerating Potential

2kV. [7kV/2kV] regulated

#### Effective display area

8 x 10 div. (1 div. = 10 mm)

#### Beam Rotator

Adjustment on front panel

#### Graticule Illumination

Continuously variable

#### Intensity Modulation

Blanked by TTL Level Signal

### Vertical Amplifiers (CH-1 and 2)

#### Sensitivity

5 mV/div. to 5V/div. (all bandwidth), 0.5 mV/div. to 2 mV/div. (5 MHz: MAG x 10) with variable in 10 steps, 1-2-5 sequence, continuously variable between steps.

#### Calibration Accuracy

$\pm 3\%$  ( $\pm 5\%$ : MAG x 10)

#### Bandwidth (−3 dB, 8 div.)

##### DC coupled

DC to 20[35] MHz

(DC to 5 MHz: MAG x 10)

##### AC coupled

10 Hz to 20 [35] MHz

#### Rise Time

17.5[10] ns (70 ns; MAG x 10)

#### Input Impedance

1 M $\Omega$   $\pm$  1.5%, 30 pF within  $\pm$  5 pF (Tolerance: within  $\pm$  2 pF)

#### Input Coupling

AC, GND, DC

#### Maximum Input

600V (DC + ACp-p)

#### Display Modes

CH-1, CH-2, CHOP, ALT, ADD

#### Polarity Invert

CH-2 INVERT

#### CH-1 Output

Approx. 0.1V/div. in to 50 $\Omega$  (DC to 20[35] MHz, −3 dB)

### Horizontal Amplifier

#### Sweep Method

Trigger sweep and Automatic trigger sweep.

#### Sweep Time

0.2  $\mu$ s/div. to 0.2 s/div., 1-2-5 sequence 19 steps with continuous adjuster.

#### Calibration Accuracy

$\pm 3\%$

#### Hold-off variable

One sweep or more

#### Magnifier

5[10] times  $\pm 5\%$

#### Max. Sweep Time

40[20] ns/div. (MAG x 5[10] ON)

Signal Sources	ALT, CH-1, CH-2, LINE, EXT.
Coupling	AC, HF-REJ, TV-V, TV-H
Slope	+ or -
Sensitivity	

	Bandwidth	INT.	EXT.
NORM	30 Hz — 10 MHz 2 Hz — 20[35] MHz	0.5 div. 1.5 div.	0.2Vp-p 0.6Vp-p
AUTO	30 Hz — 10 MHz 30 Hz — 20[35] MHz	0.5 div. 1.5 div.	0.2Vp-p 0.6Vp-p

TV Synchronization	Extracts the synchronizing signal from composite video signal and provides stable synchronization. Slope switch is selected according to polarity of video signals.
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X-Y Mode (X=CH-1, Y=CH-2)	
Sensitivity	X axis: 5 mV/div. to 5V/div. Y axis: 5 mV/div. to 5V/div.
X axis Bandwidth	DC or 10 Hz to 1 MHz (-3 dB, ref. 8 div.)
X-Y phase	Less than 3° at 100 kHz

Calibrator	
Output Voltage	0.5V p-p ±2%
Frequency	Approx. 1 kHz, square wave

Power Requirements	
Line Voltage	AC 100, 120, 200, 220, 240V 50/60 Hz
Power Consumption	50W

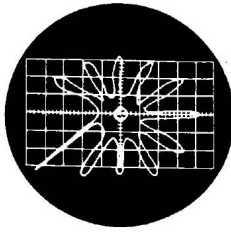
Size and Weight	160(H) x 290(W) x 375(D) mm, 8.5 kg
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Supplied Accessories	Direct/Low capacitance probe LP-16 AX ..... 2 BNC terminal adapter ..... 2 Time lag fuse ..... 1 Instruction manual ..... 1
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Optional Accessories	Protective front cover Accessories pouch
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Vector pattern

For more accurate measurement, use of the LVS-5850 Vector Scope is recommended.

## 6.9 Intensity Modulation Terminal (Z axis)

Intensity modulation can be obtained when a voltage of 0V to +5V is applied to this terminal in DC coupling under ordinary intensity condition.

When a voltage of +2V to +5V (by a intensity control position) is applied, the trace line on the CRT will be erased. When a voltage of 0V to +1V (by a intensity control position) is applied, the trace line will be intensified. That is, the instrument is used to erase a certain part of the trace line on the CRT or to intensify a certain part of the trace line in particular.

## 7. MAINTENANCE CALIBRATION BY THE USERS

### ⊗ ROTATION

The ROTATION (beam rotation) ⑨ adjustment screw provided on the front panel is used to adjust

a tilt of the horizontal trace when it is caused by the terrestrial magnetism. Check if the tilt is caused by other external magnetic field source.

## 8. INTERNAL MAINTENANCE CALIBRATION BY SPECIALISTS

It is highly recommended that the internal adjustments described in this section be made by the specialists such as the LEADER's service engineers.

Before making the internal adjustments, the power of within  $\pm 3\%$  of the rating voltage should be applied, and aging of at least 30 minutes must be made.

Particularly, the BAL adjustment was made considering the environment temperature, and thus

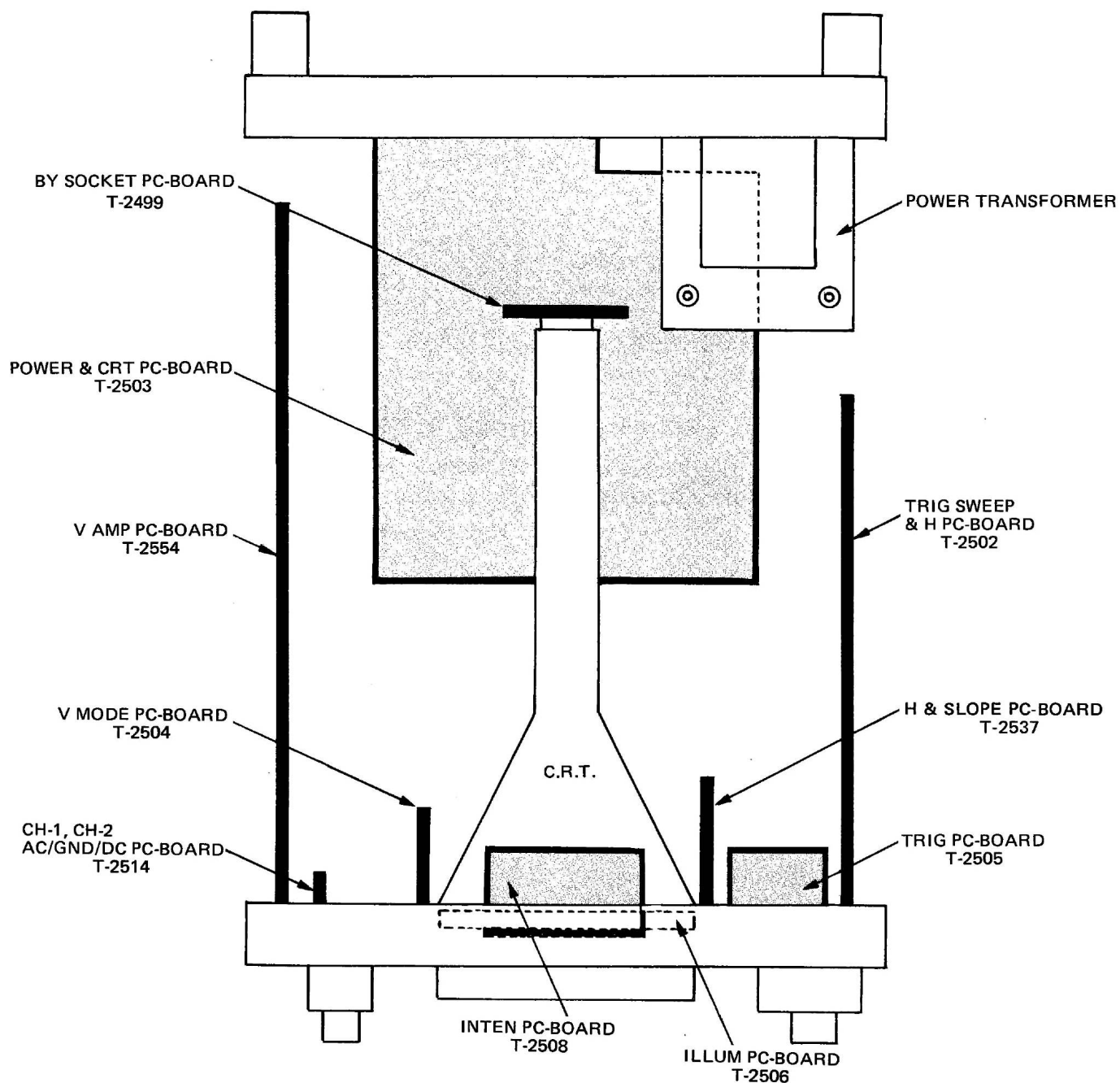
it should be calibrated in a temperature range of  $15^{\circ}$  to  $25^{\circ}\text{C}$ .

To open the cover, unscrew the upper 5 screws and lower 2 screws.

Disconnect AC power cord from the line.

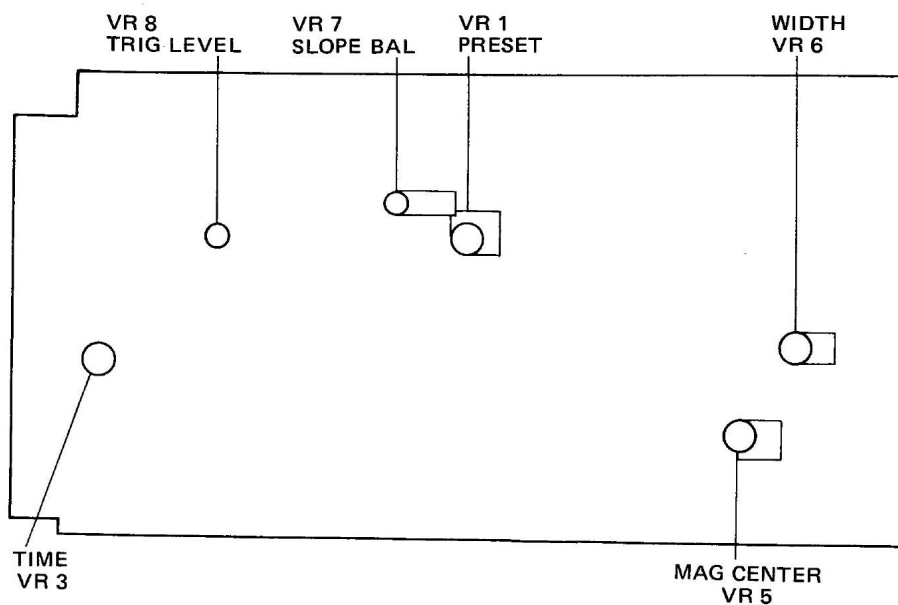
**WARNING: AFTER TURNING OFF THE POWER, VOLTAGES OF  $-2\text{ kV}/+5\text{ kV}$  STILL REMAINS INTERNALLY. WAIT 5 TO 10 MINUTES.**

### 8.1.1 Layout of main parts (Top view)

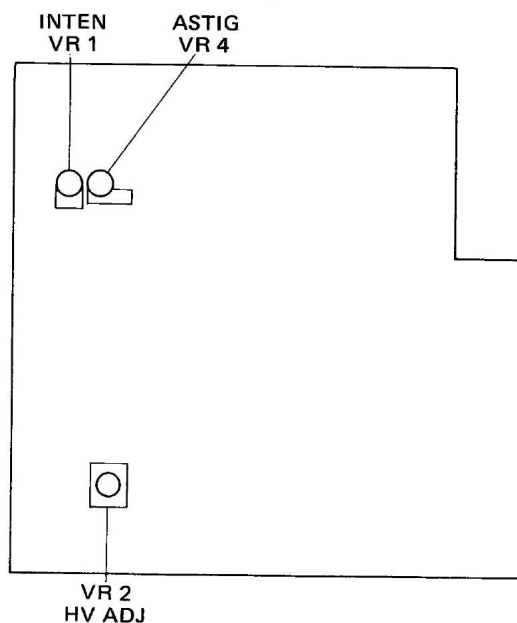


## 8.1.2 Layout of adjusters

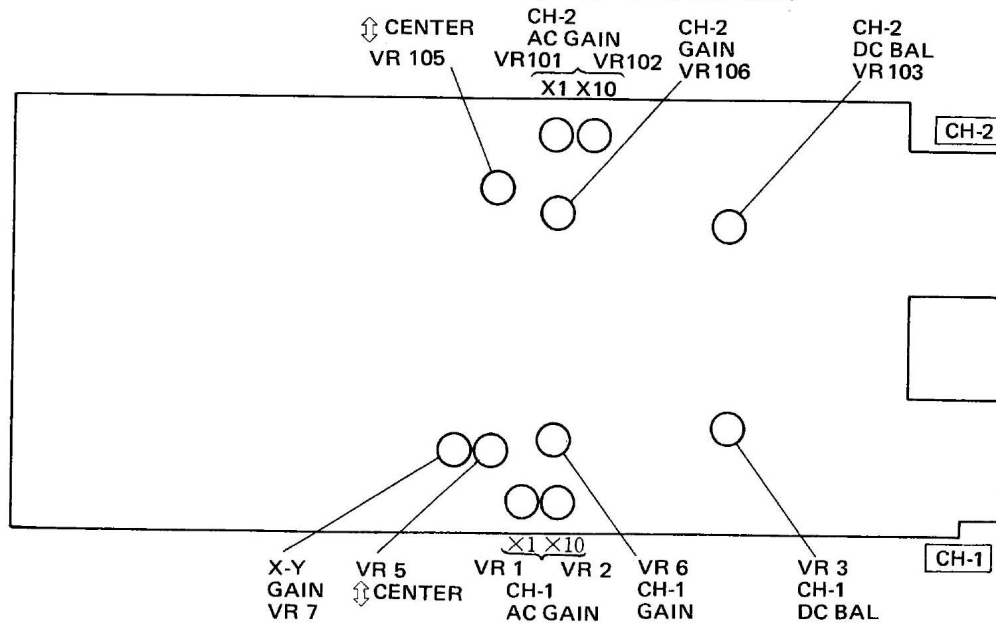
T-2502 TRIG SWEEP & H PC-BOARD (Components side view)



T-2503 POWER & CRT PC-BOARD (Components side view)



T-2554 V AMP PC-BOARD (Components side view)



Adjustment method which requires no special measurement instruments will be described below. For full-scale adjustment, use of the LOC-7005 Oscilloscope Calibrator is recommended.

8.2.1 Vertical gain (T-2554) VR6, VR106  
The CH-1 GAIN and CH-2 GAIN for both the channels should be calibrated with the same range. Particularly, for dual-trace operation, the adjustments should be made with no sensitivity difference between the channels.

(Example)  
Set both the channels in 0.1 V/DIV, DC, and the VARIABLE to CAL'D position, and apply rectangular waveform of 0.5 Vp-p to their input terminals for dual-trace operation.  
Then adjust the CH-1 GAIN and CH-2 GAIN to get the same amplitude of 5 div. each for both the display waveforms.

8.2.2 Vertical DC balance (T-2554) VR3, VR103  
While the AC/GND/DC switch is set to GND, if the vertical position unusually moves, e.g., as much as 1 div., when the V VARIABLE knob is turned or the VOLTS/DIV switch is switched, adjust the CH-2 DC BAL (VR3, VR103).

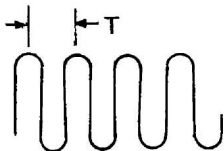
- (1) Pull the CH-1 VAR and CH-2 VAR knobs to make them in the magnification of X10.
- (2) Set both the AC/GND/DC switches to GND.
- (3) Set both the VOLTS/DIV switches to 5 mV/div. range.
- (4) Turn both the VARIABLE knobs full counter-clockwise.
- (5) Adjust both the POSITION knobs to locate the trace lines in the middle of the screen height.
- (6) Turn the VARIABLE knobs full clockwise.

center by adjusting the DC BAL (VR3, VR103).

- (8) Repeat the above procedure 2 to 3 times until the trace lines do not move.

8.2.3 ASTIG (T-2503)  
When a sharp trace of waveform is not available by the adjustment of the FOCUS knob alone on the front panel, adjust the ASTIG screw.  
The ASTIG condition can be determined when the focus is made dull. Adjust the ASTIG to make the trace dull to all the directions equally, when it is necessary.  
By the nature of a CRT used, display image on circumference of the CRT becomes dull always.  
Avoid use of a spot for the adjustment; otherwise the fluorescent material on the screen may be burnt.

8.2.4 Calibration of time axis (T-2502)  
An oscillator having the frequency accuracy of 1% or better in combination with a frequency counter is used to obtain the calibration signals.



f	T
100 Hz	10 ms
200 Hz	5 ms
500 Hz	2 ms
1 kHz	1 ms

f	T
2 kHz	0.5 ms
5 kHz	0.2 ms
10 kHz	0.1 ms
20 kHz	50 μs

The TIME is adjusted by the VR3.



Becomes dull to the vertical direction



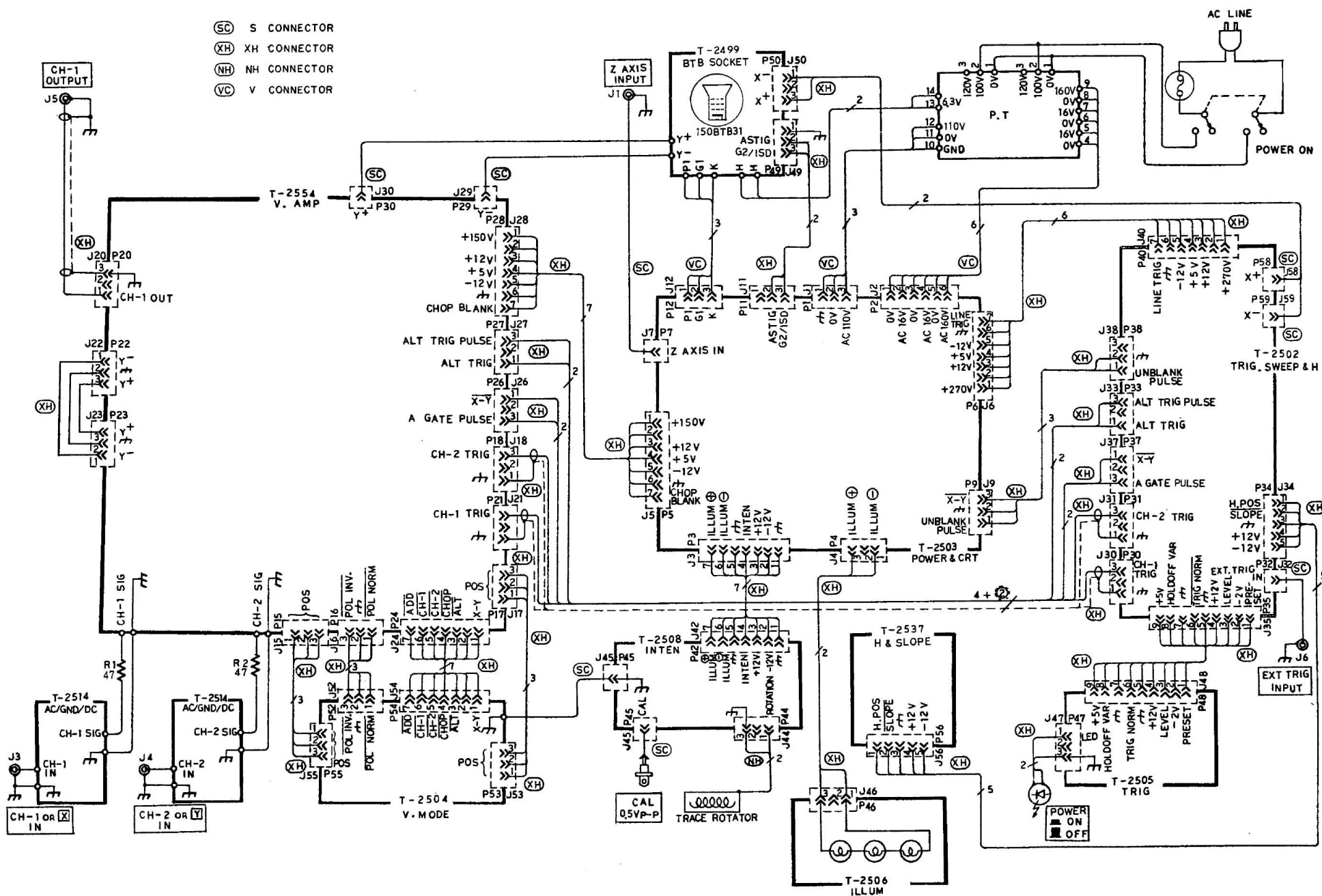
Becomes dull to all the directions (Good)



Becomes dull to the horizontal direction

# 9. CONNECTION DIAGRAM AND SCHEMATICS FOR LBO-522

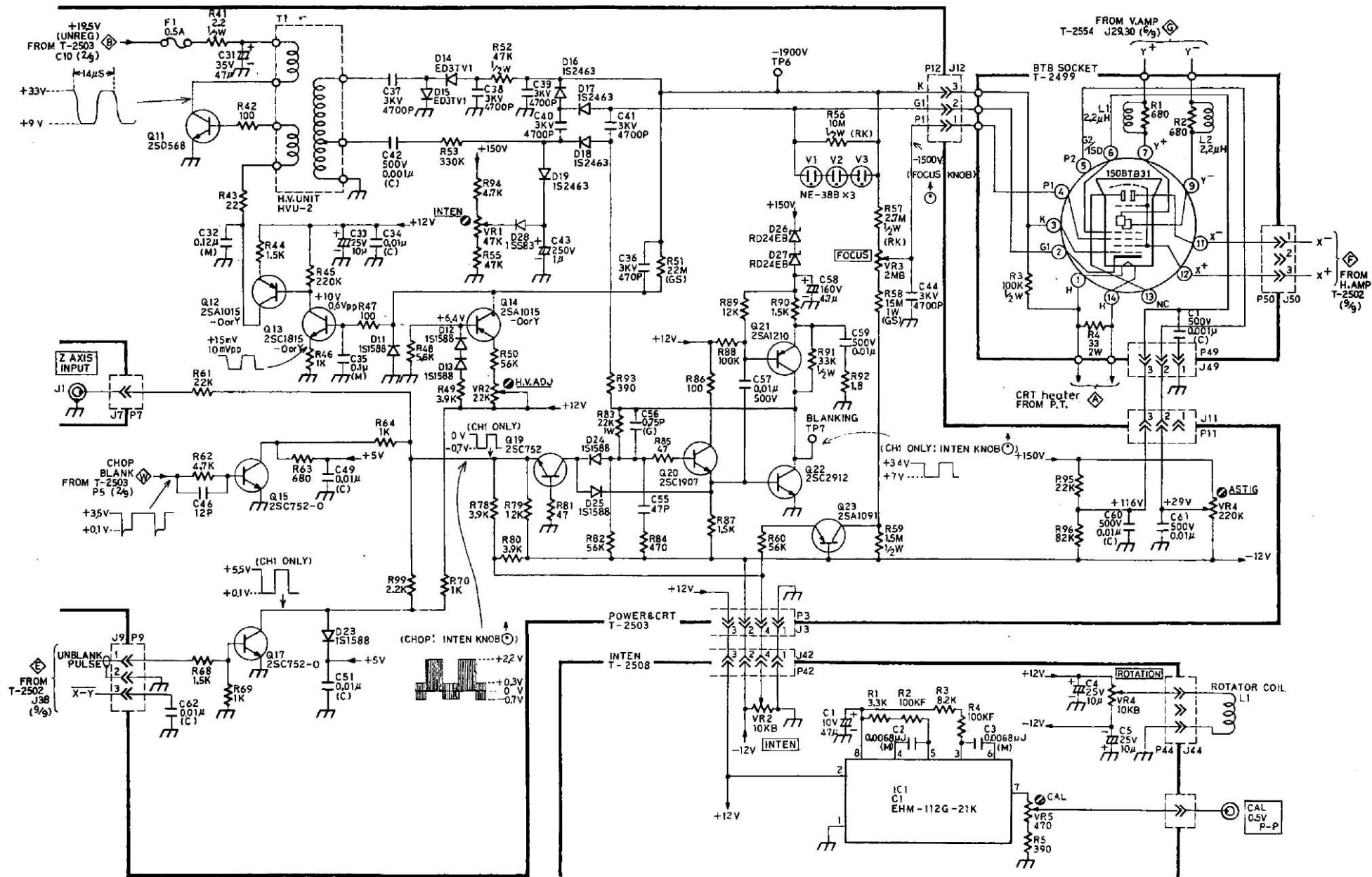
- (SC) S CONNECTOR
- (XH) XH CONNECTOR
- (NH) NH CONNECTOR
- (VC) V CONNECTOR

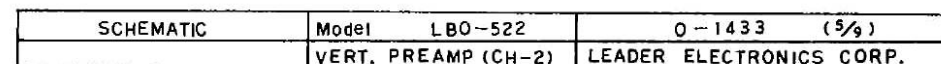


SCHEMATIC	Model LBO-522	0-1433 (1/9)
	PCB & WIRE CONNECTION	LEADER ELECTRONICS CORP.

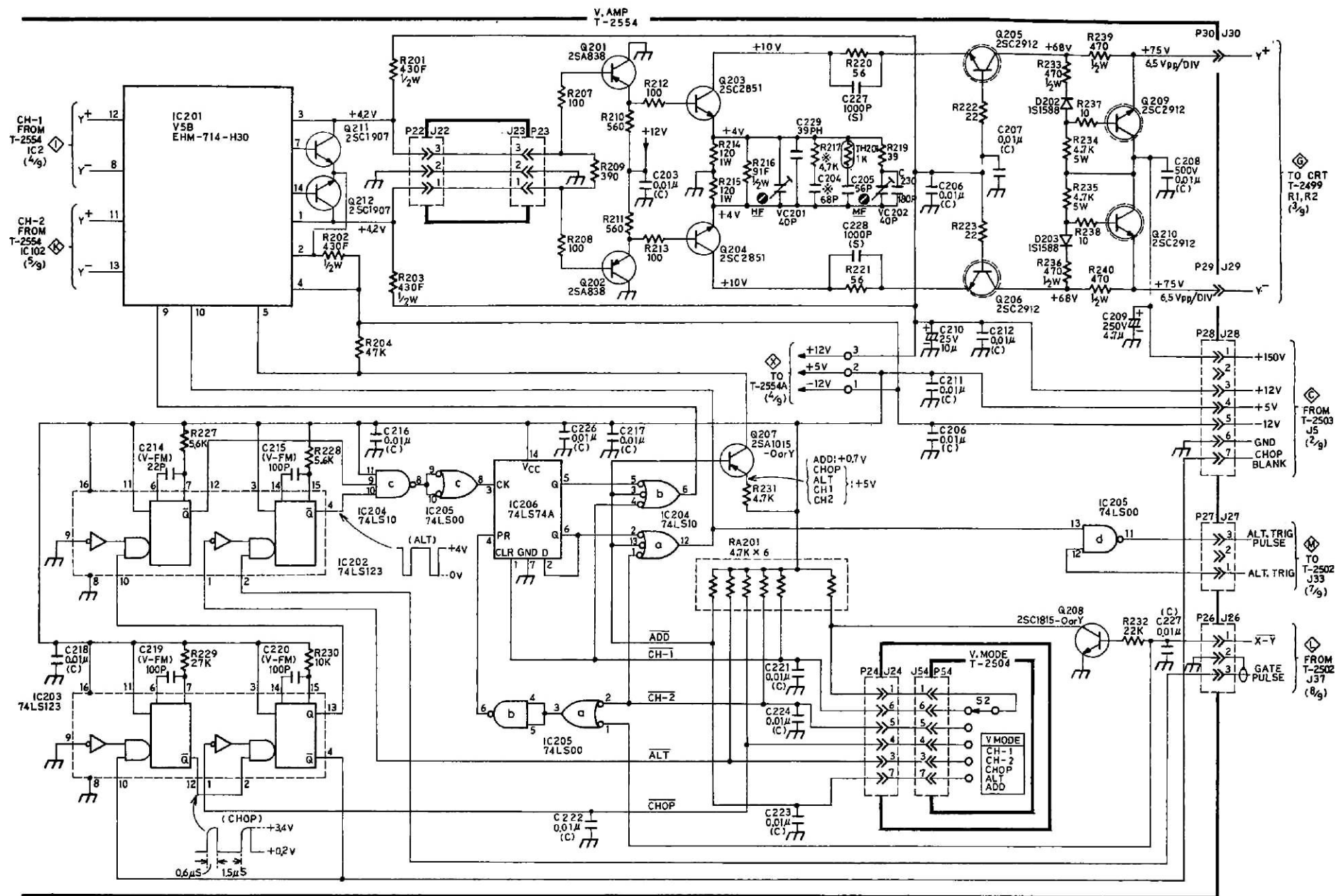




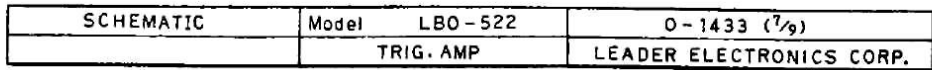


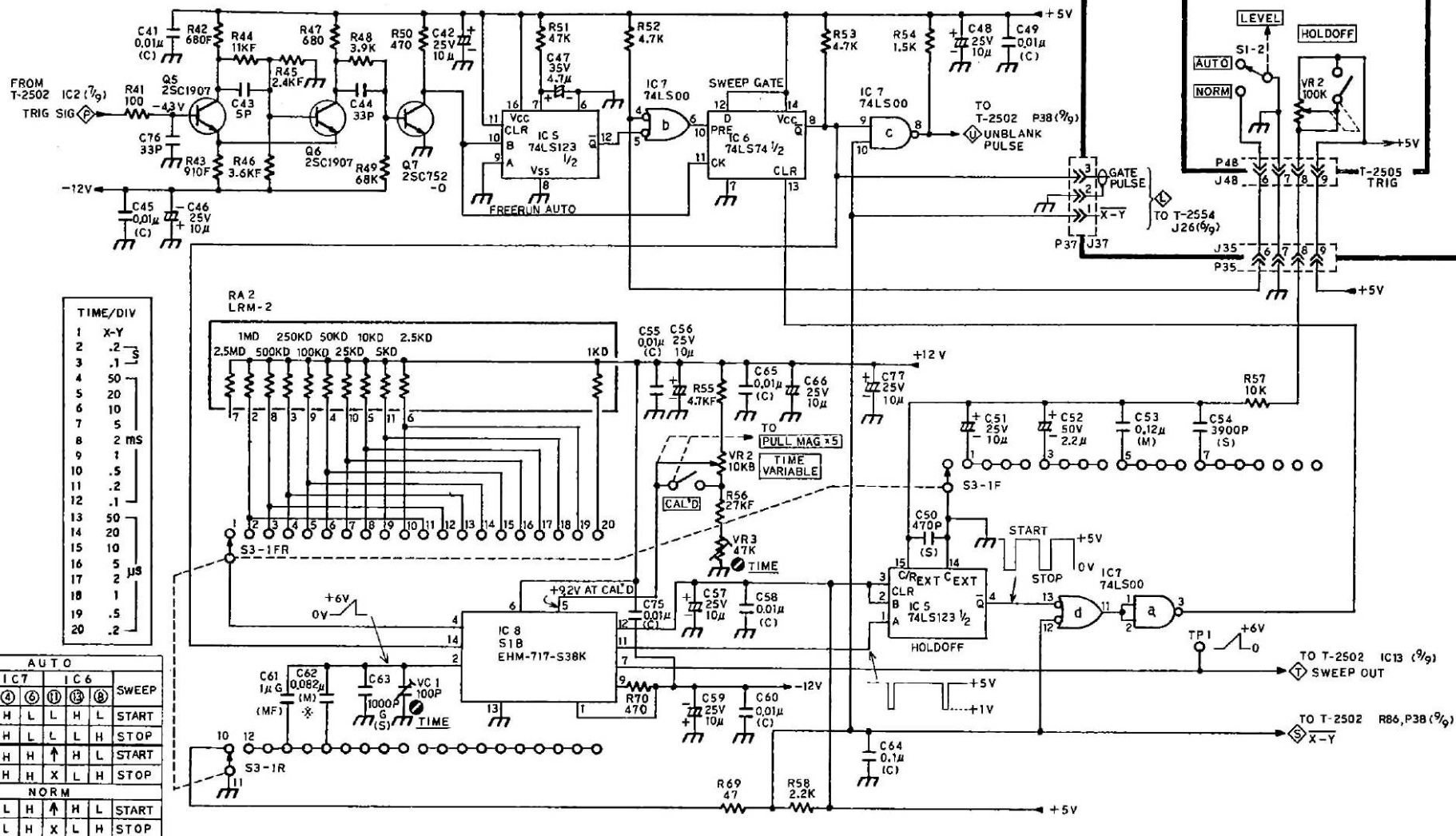


SCHEMATIC	Model LBO-522	0-1433 (5/9)
	VERT. PREAMP (CH-2)	LEADER ELECTRONICS CORP.



SCHEMATIC	Model LBO - 522	0-1433 (6/9)
	VERT. MODE & FINAL AMP	LEADER ELECTRONICS CORP.





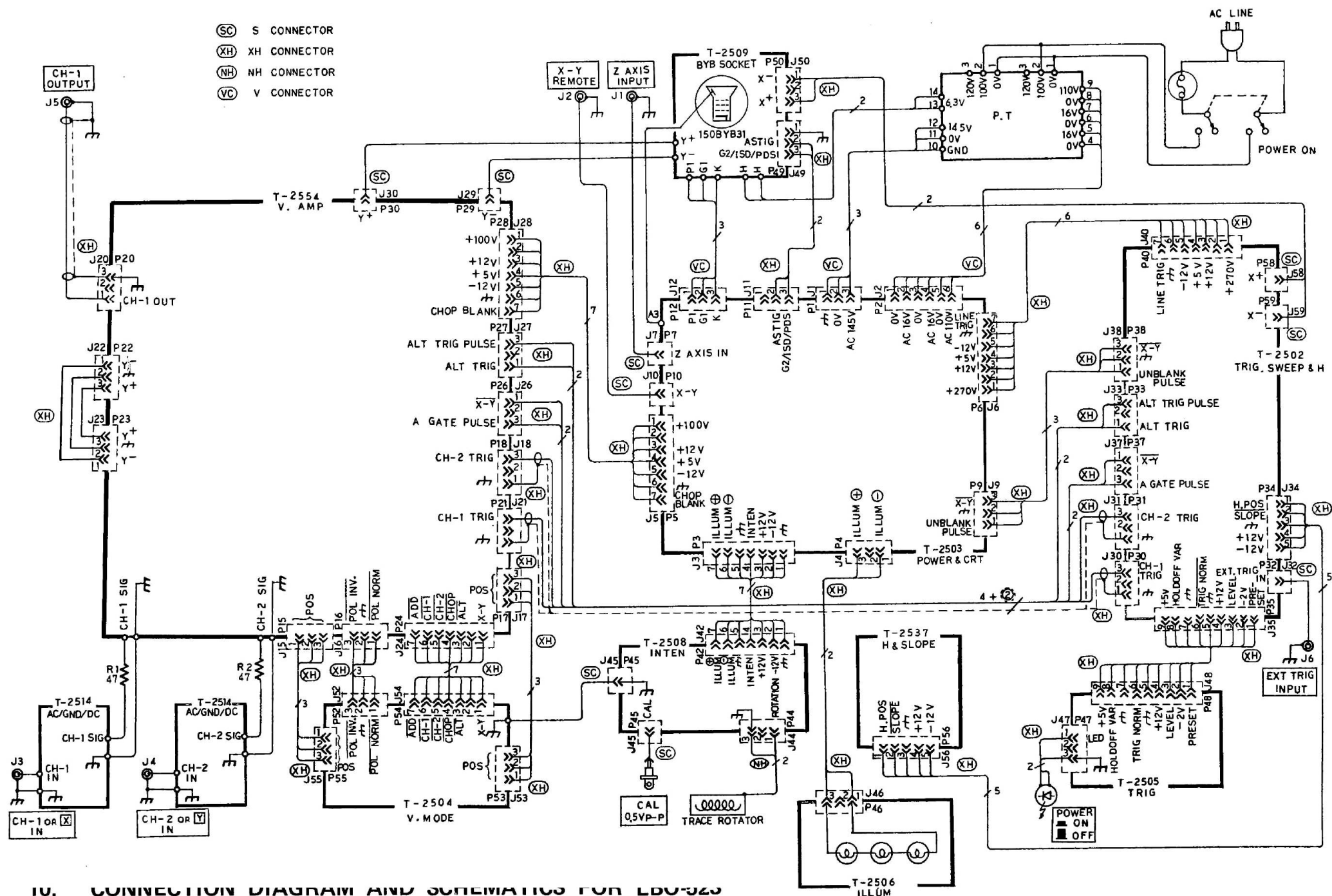
T-2502  
TRIG SWEEP & H

SCHEMATIC	Model LBO-522	O-1433 (8/9)
	SWEEP	LEADER ELECTRONICS CORP.





- (SC) S CONNECTOR  
(XH) XH CONNECTOR  
(NH) NH CONNECTOR  
(VC) V CONNECTOR

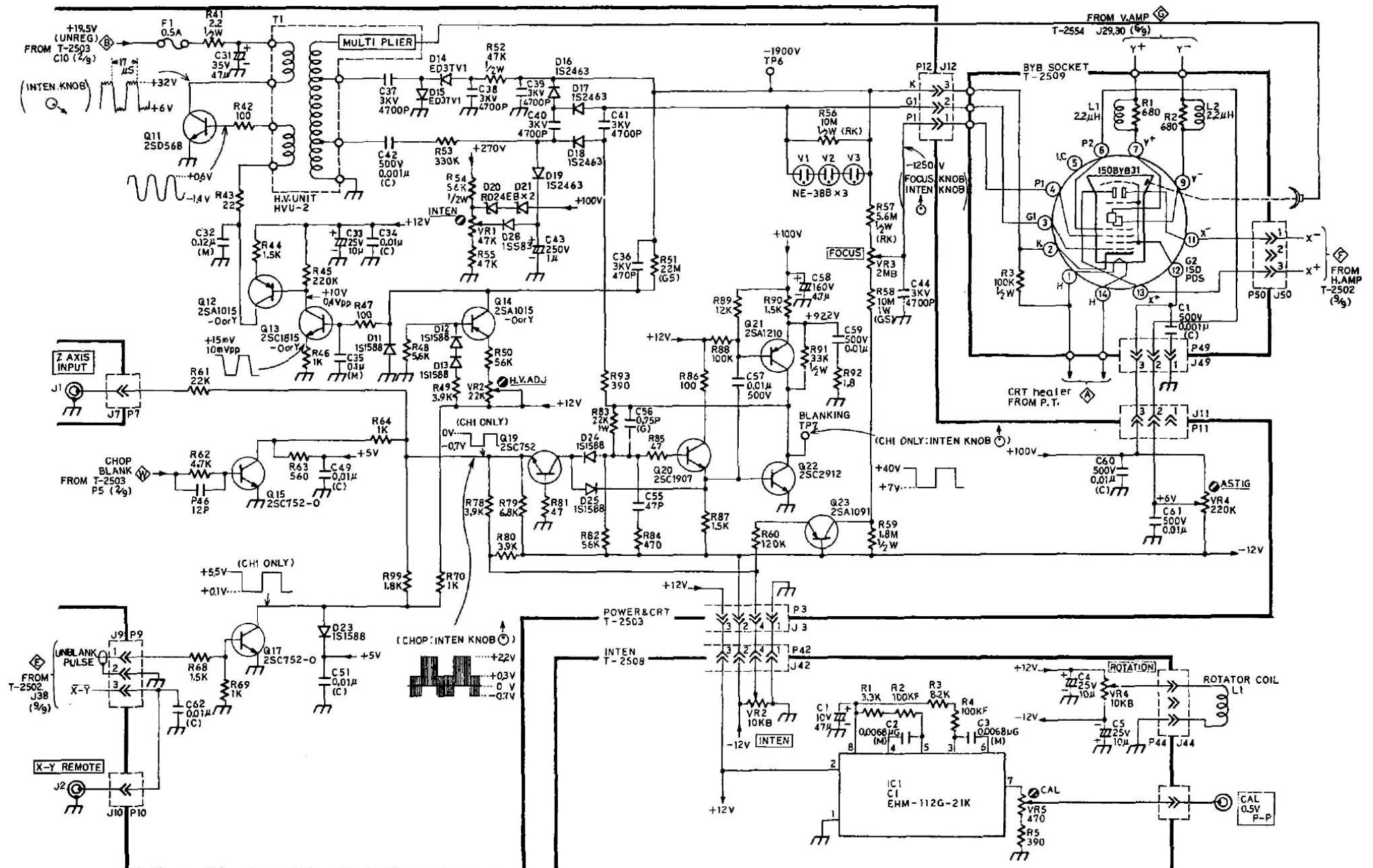


10. CONNECTION DIAGRAM AND SCHEMATICS FOR LBO-523

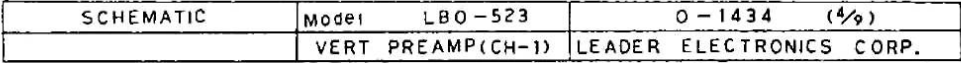
SCHEMATIC	Model LBO-523	0-1434 (1/9)
PCB & WIRE CONNECTION	LEADER ELECTRONICS CORP.	

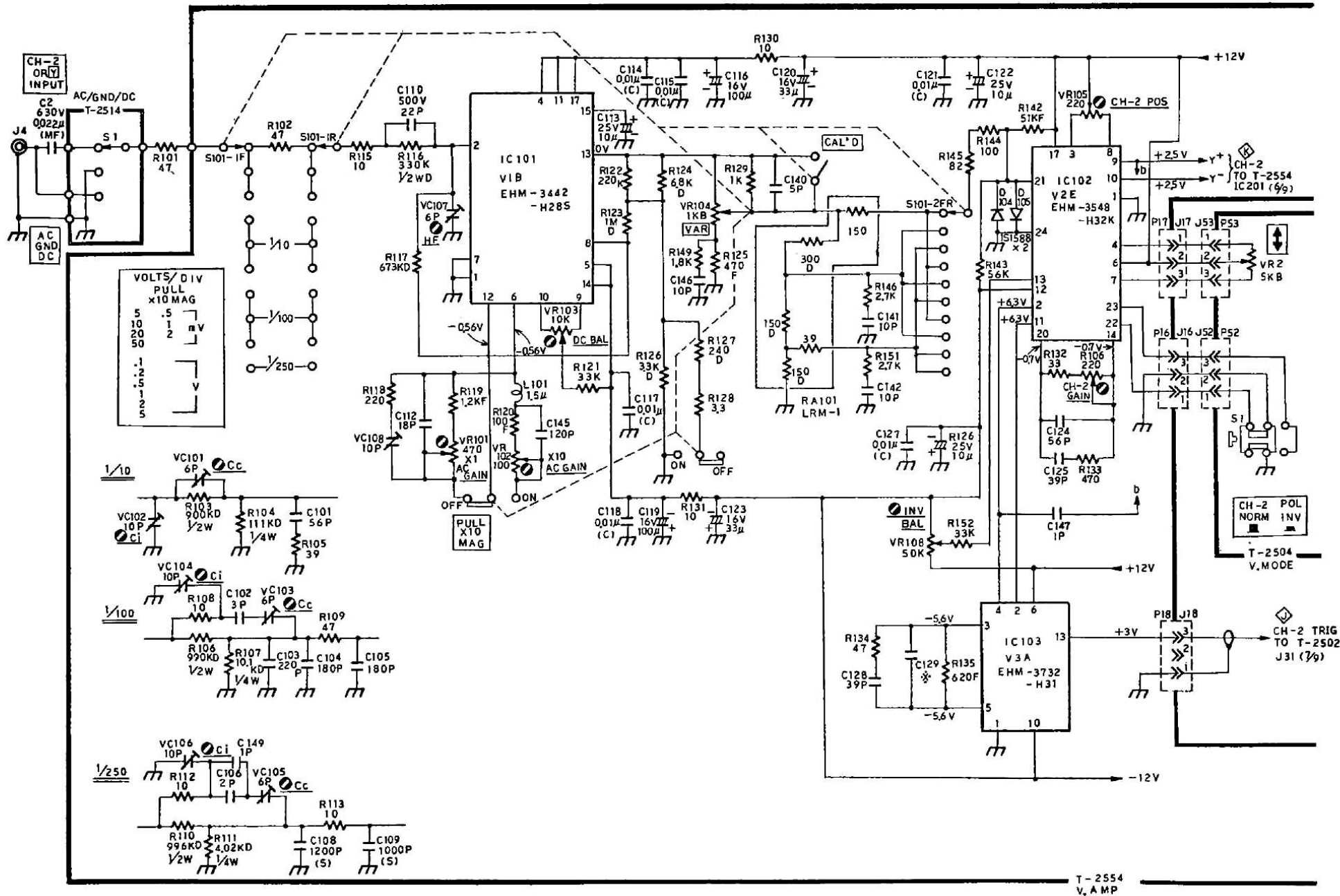






SCHEMATIC	Model LBO-523	O-1434 (3/9)
	H.V. & CRT	LEADER ELECTRONICS CORP.





SCHEMATIC	Model LBO-523	0-1434 (5/9)
	VERT. PREAMP (CH-2)	LEADER ELECTRONICS CORP.

