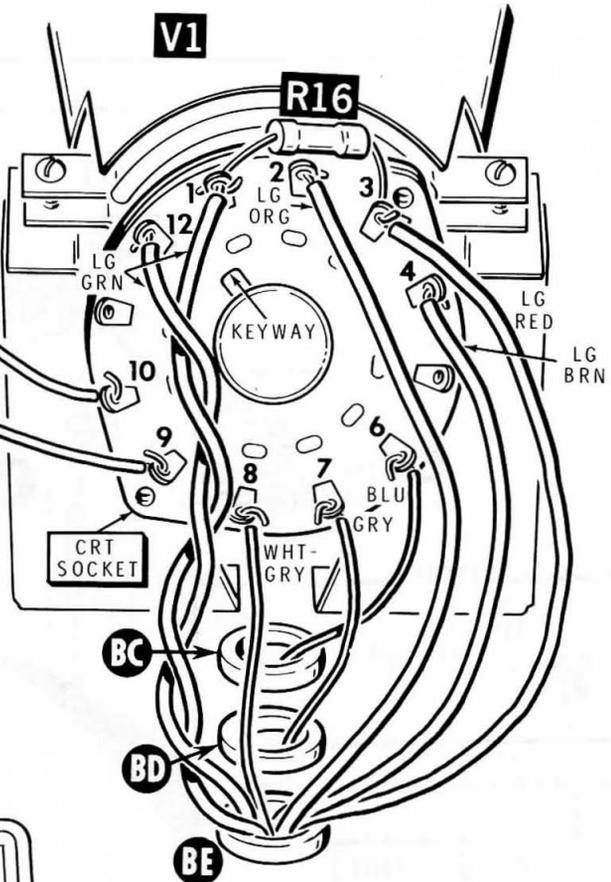
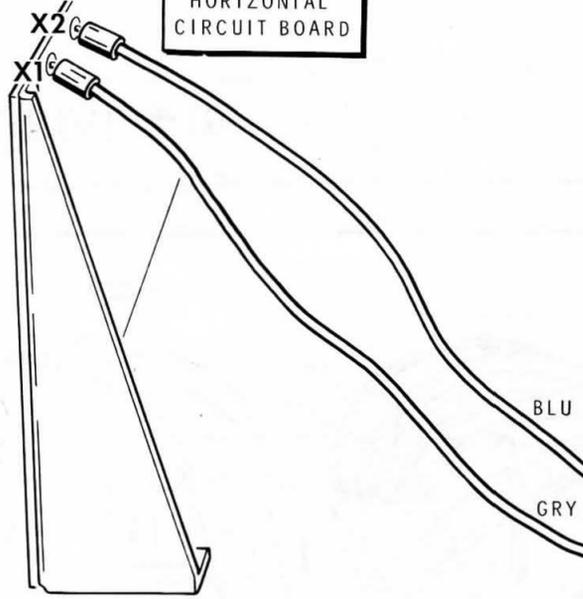
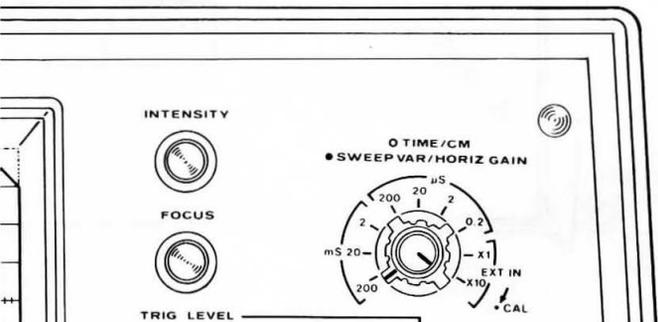
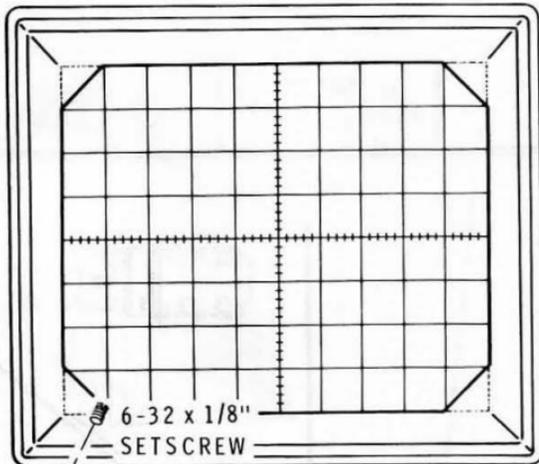


HORIZONTAL  
CIRCUIT BOARD



PICTORIAL 4-19





INTENSITY



FOCUS



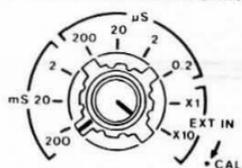
TRIG LEVEL



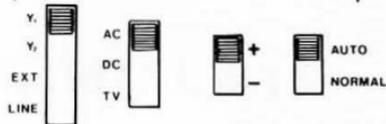
HORIZ POS



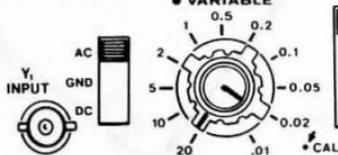
0 TIME/CM  
• SWEEP VAR/HORIZ GAIN



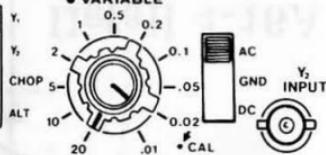
TRIGGERING



0 VOLTS/CM  
• VARIABLE



0 VOLTS/CM  
• VARIABLE



HEATHKIT  
OSCILLOSCOPE  
MODEL 10-4205

POWER



1V(P-P) 60Hz    EXT TRIG INPUT    GND    EXT INPUT



PICTORIAL 4-20

**INTENSITY** — Clockwise rotation increases the brightness of the display. Adjust as necessary for your room-lighting conditions. Refocusing may be necessary when the intensity is changed. **CAUTION:** Do not allow a bright spot to remain on the screen as it could damage the CRT.

**TIME/CM** — The time required for the beam to sweep one centimeter is determined by the TIME/CM switch when the SWEEP VAR/HORIZ GAIN control is fully clockwise (CAL). Counterclockwise rotation decreases the sweep speed.

In the EXT IN positions, the signal at the EXT INPUT connector is coupled to the horizontal amplifier; the SWEEP VAR control then adjusts the horizontal gain (HORIZ GAIN).

**POWER LAMP** — Glows when AC power is turned on.

**TRIGGER SOURCE** switch (Y1, Y2, EXT, LINE) — Connects the trigger circuits to the Y1 trigger signal, the Y2 trigger signal, an external trigger signal, or a 60 Hz internal signal.

**SLOPE** switch (+/-) — The sweep can be started on either a positive or negative slope, depending on the position of the +/- switch.

**TRIGGER MODE** switch (AUTO-NORMAL) — In the AUTO position, a base line will always be present in the absence of a trigger signal. In the NORMAL position, the base line is not automatically generated.

**TRIGGER COUPLING** switch (AC-DC-TV) — The DC position couples the trigger signals directly to the trigger circuits. This allows the sweep to be triggered from DC level changes or very low frequency AC signals. In the AC position, the DC component of the trigger signal is blocked so that only the AC component of the signal reaches the trigger circuits. The TV position cuts off unwanted high frequency signals so you can lock onto TV vertical frame signals.

**EXT INPUT** — Allows you to apply an external X-input signal. (A positive signal moves the trace to the right.)

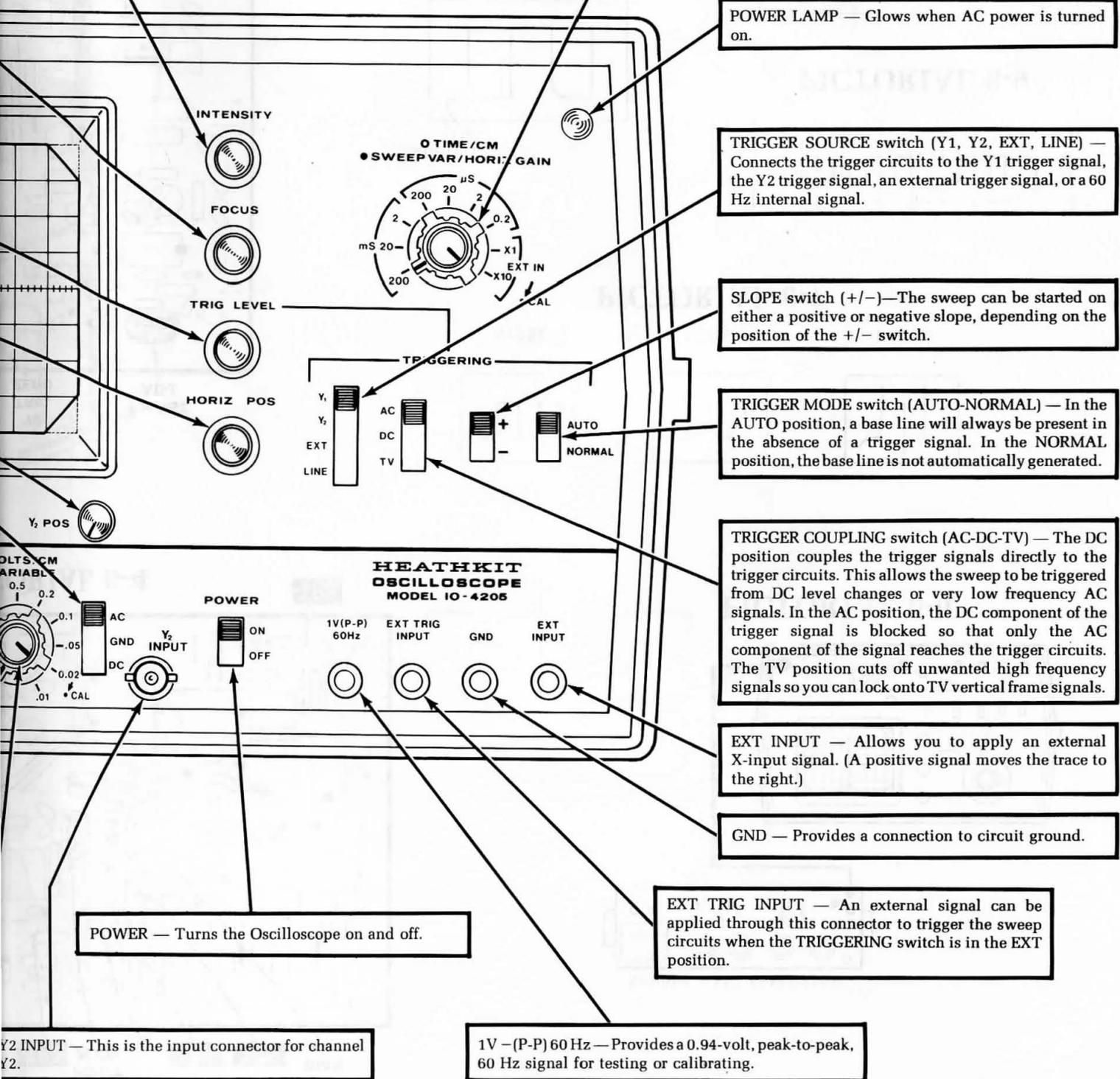
**GND** — Provides a connection to circuit ground.

**EXT TRIG INPUT** — An external signal can be applied through this connector to trigger the sweep circuits when the TRIGGERING switch is in the EXT position.

**POWER** — Turns the Oscilloscope on and off.

**Y2 INPUT** — This is the input connector for channel Y2.

**1V - (P-P) 60 Hz** — Provides a 0.94-volt, peak-to-peak, 60 Hz signal for testing or calibrating.



**FOCUS** — Varies the shape and size of the beam striking the face of the CRT. Adjust for the sharpest display.

**INTENSITY** — Clockwise brightness of the display. Adjust for room-lighting conditions. Reduce intensity when necessary when the intensity is high to allow a bright spot to remain on the CRT without damage to the CRT.

**TRIG LEVEL** — Adjusts the trigger circuit so the sweep can be started at any position on the input signal waveform.

**HORIZ POS** — Positions the trace horizontally on the screen.

**Y2 POS** — Positions the channel Y2 trace vertically on the screen.

**AC-GND-DC (Input switch)**—In the AC position, this switch blocks the DC level of the input signal so that only the AC component is displayed. In the GND position, the input is disconnected and the vertical amplifier input is grounded. Use this position when you wish to set the baseline (trace) at a desired position without disconnecting the input signal. In the DC position, both DC and AC components of the input signal are displayed.

**Y1 POS** — Positions the channel Y1 trace vertically on the screen.

**Y1 INPUT** — This is the input connector for channel Y1.

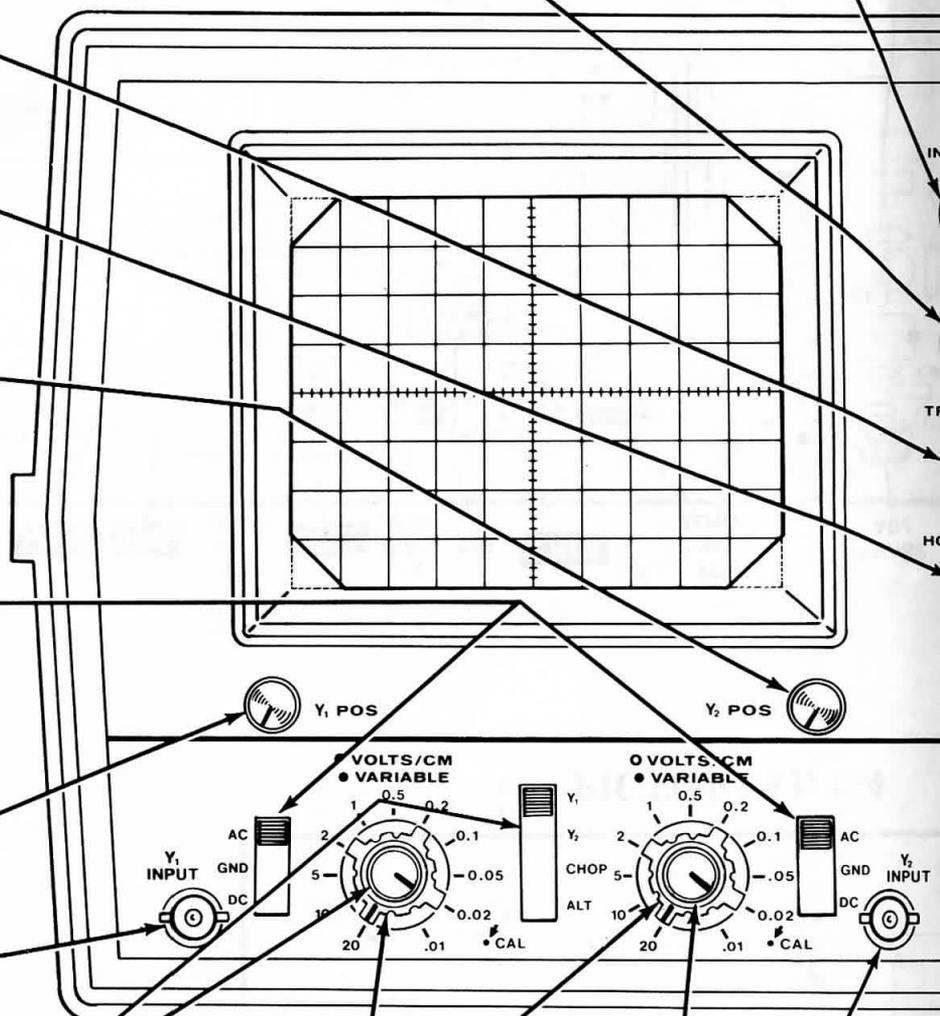
**VERTICAL MODE switch (Y1-Y2-CHOP-ALT)** — Displays either channel Y1, Y2, or both when in the CHOP or ALT position. In the CHOP position, the two inputs are sampled at approximately a 100 kHz rate and displayed. In the ALT position, the horizontal sweep alternates between inputs. A complete sweep of one input is displayed and then a complete sweep of the other input signal is displayed.

**VOLTS/CM** — Each position of this attenuator switch is marked for the number of volts (peak-to-peak) required to produce a pattern one centimeter high on the graticule.

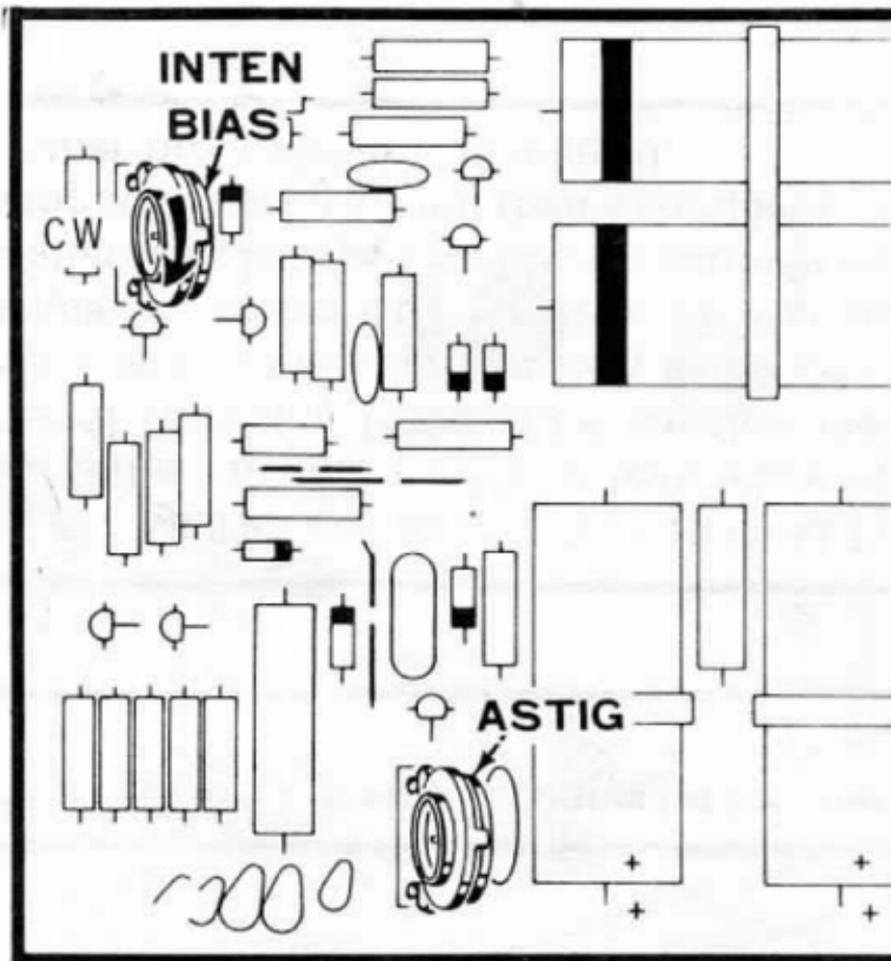
**VARIABLE** — This control is normally operated in its fully clockwise (CAL) position where the VOLTS/CM switch positions are calibrated. Vertical gain decreases as the control is turned counterclockwise, permitting the vertical trace size to be adjusted. However, the display is then uncalibrated.

**POWER** — T

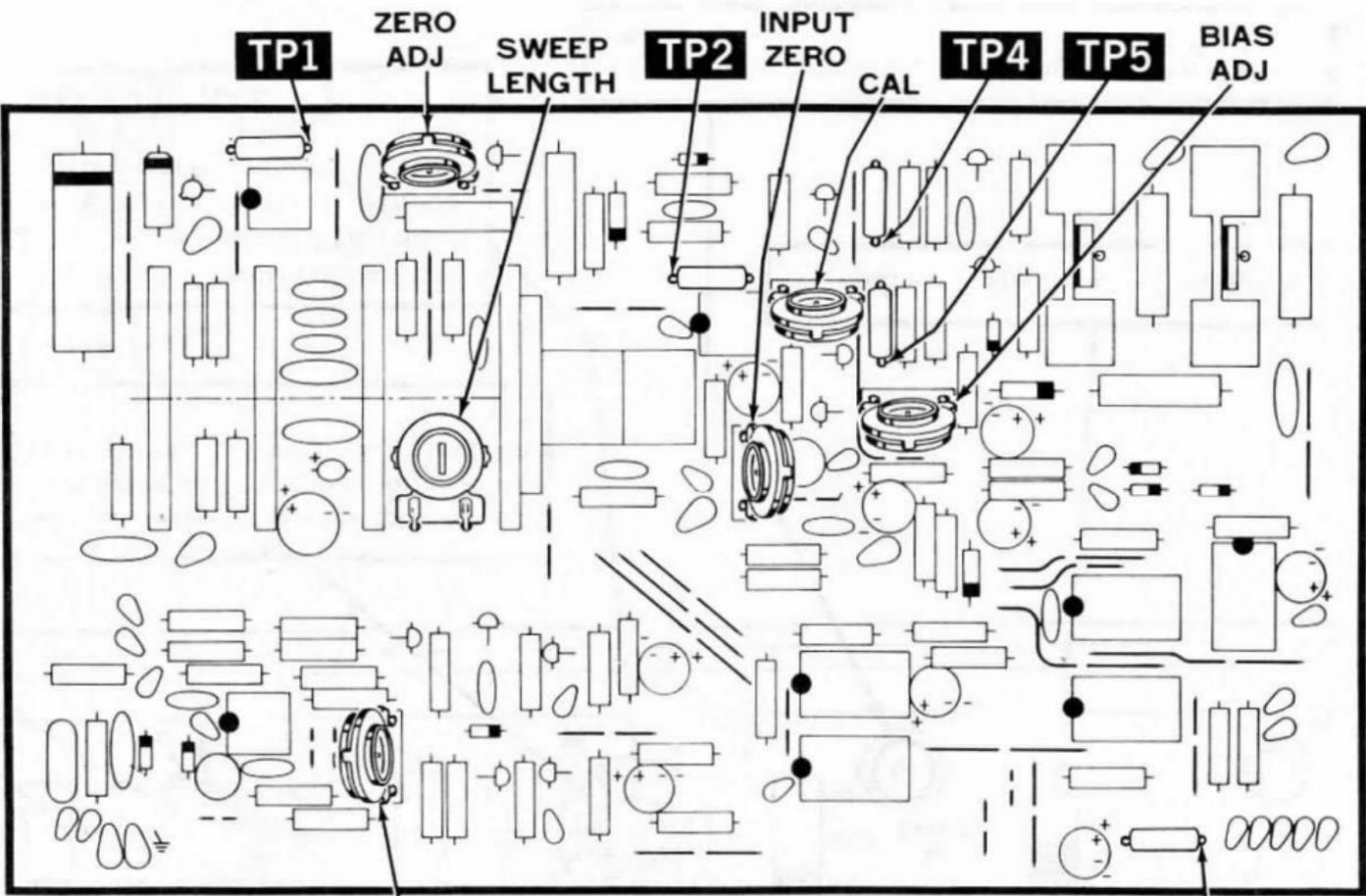
**Y2 INPUT** — This is the input for channel Y2.



# POWER SUPPLY CIRCUIT BOARD



## PICTORIAL 6-3



**TP1**

ZERO  
ADJ

SWEEP  
LENGTH

**TP2**

INPUT  
ZERO

CAL

**TP4**

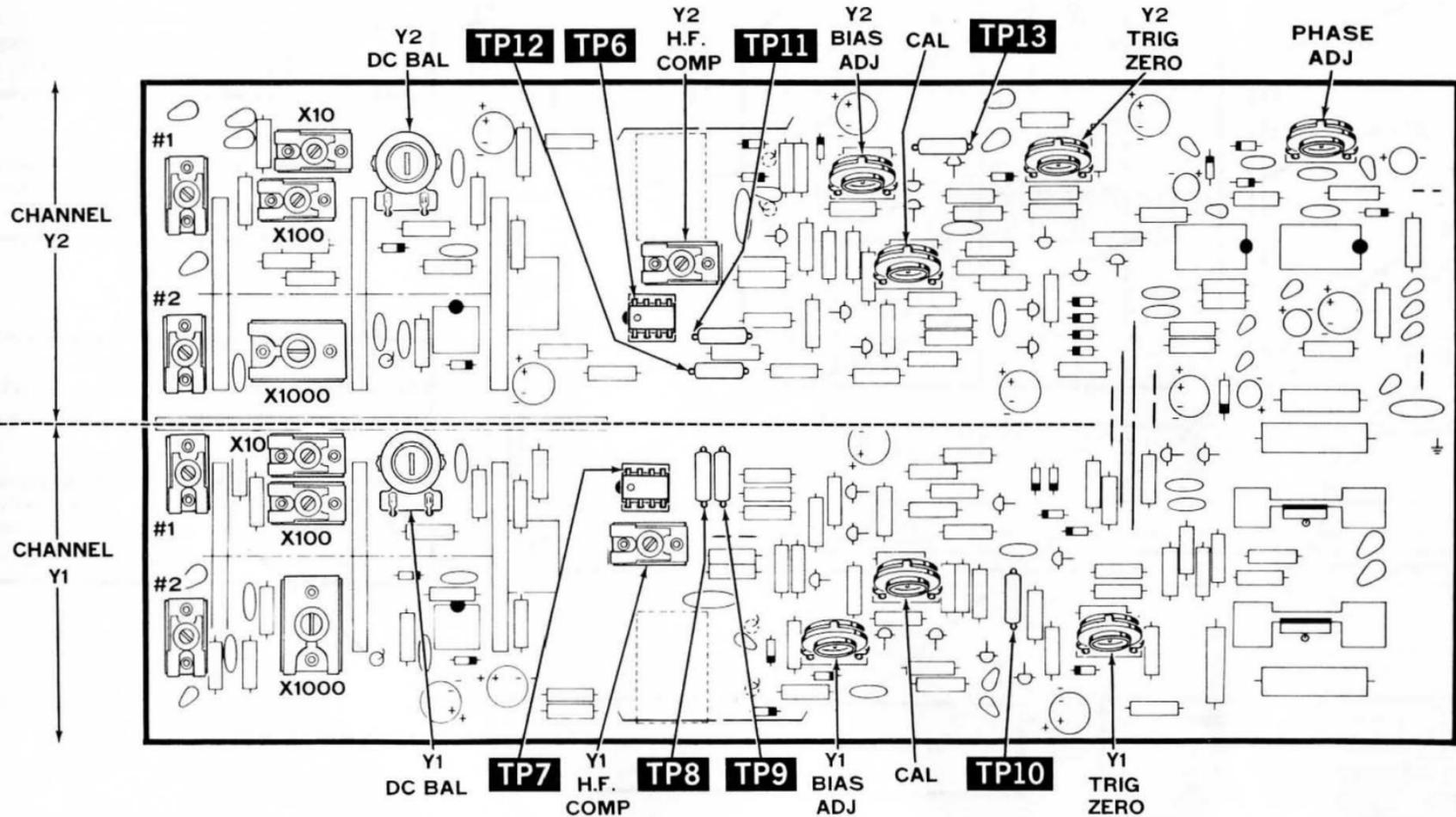
**TP5**

BIAS  
ADJ

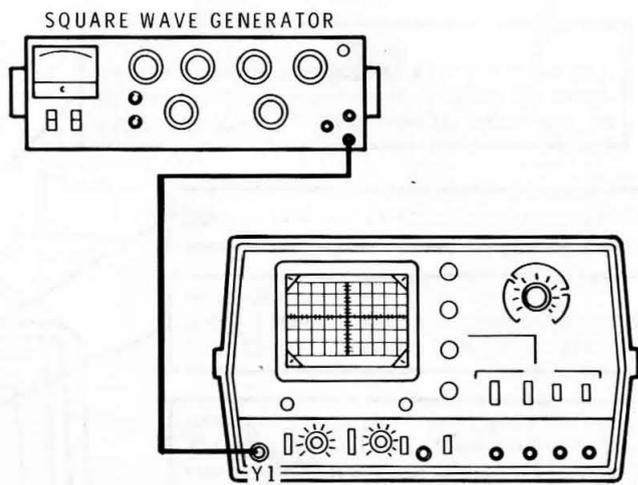
TRIG  
BAL

**TP3**

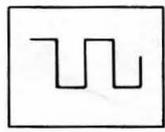
**PICTORIAL 6-4**



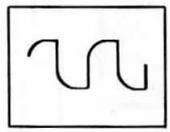
**PICTORIAL 6-5**



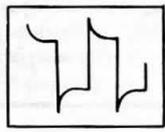
**PICTORIAL 6-6**



RIGHT



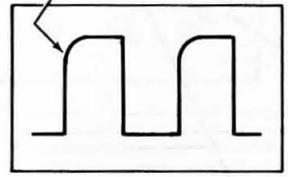
WRONG



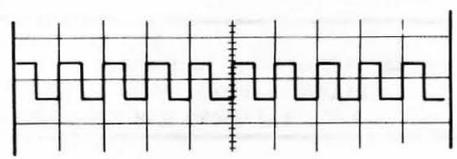
WRONG

**PICTORIAL 6-7**

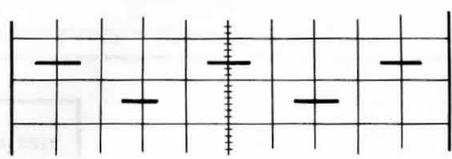
SMOOTH LEADING  
EDGE



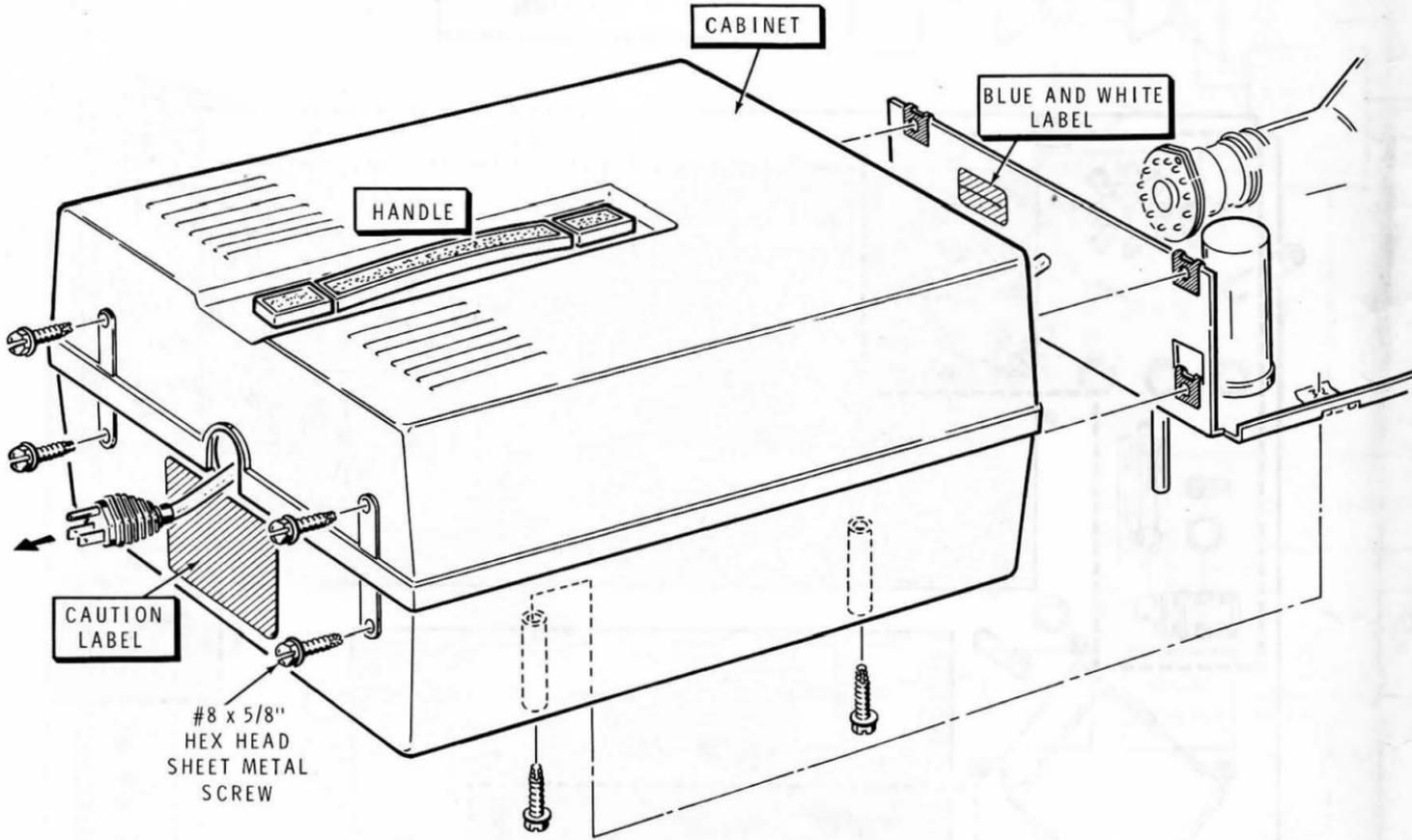
**PICTORIAL 6-8**



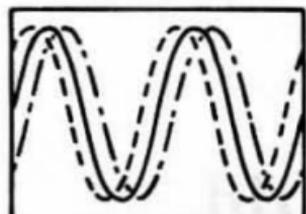
**PICTORIAL 6-9**



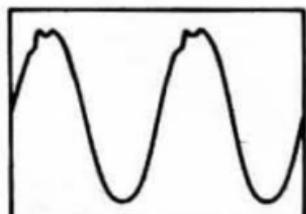
**PICTORIAL 6-10**



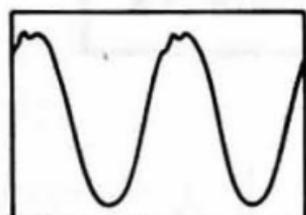
**PICTORIAL 7-1**



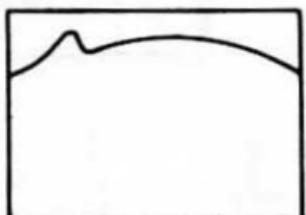
**(A)**



**(B)**

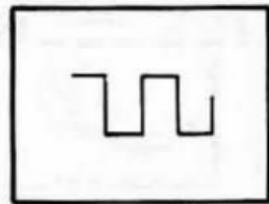


**(C)**

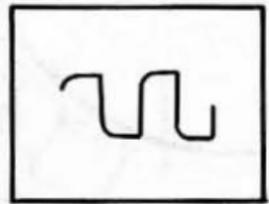


**(D)**

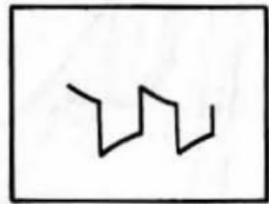
**PICTORIAL 8-1**



**A**

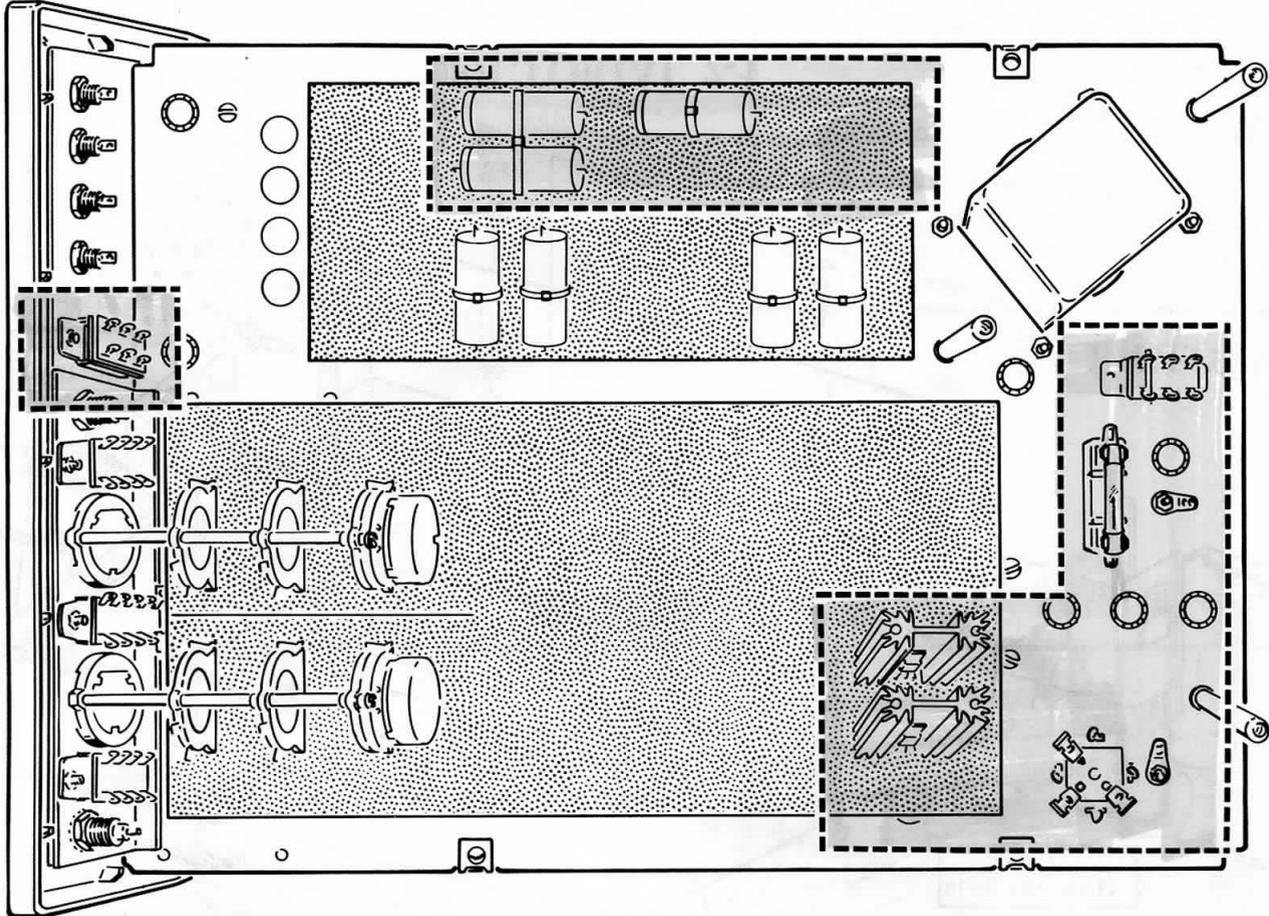


**B**



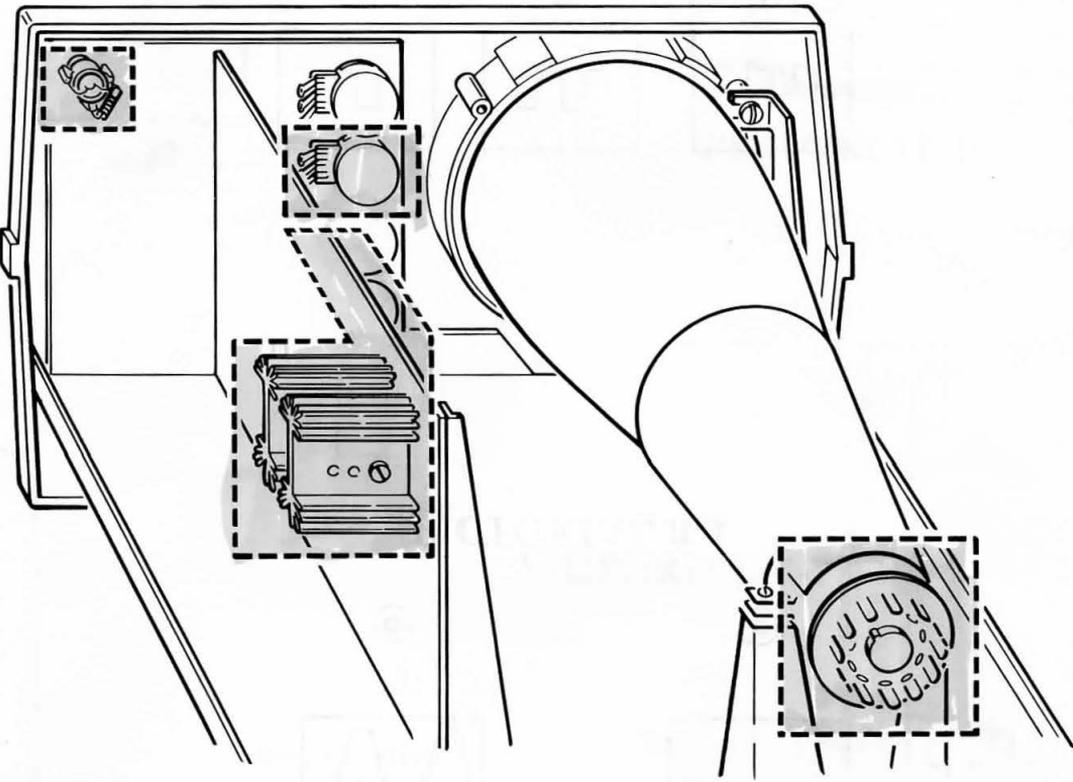
**C**

**PICTORIAL 8-6**



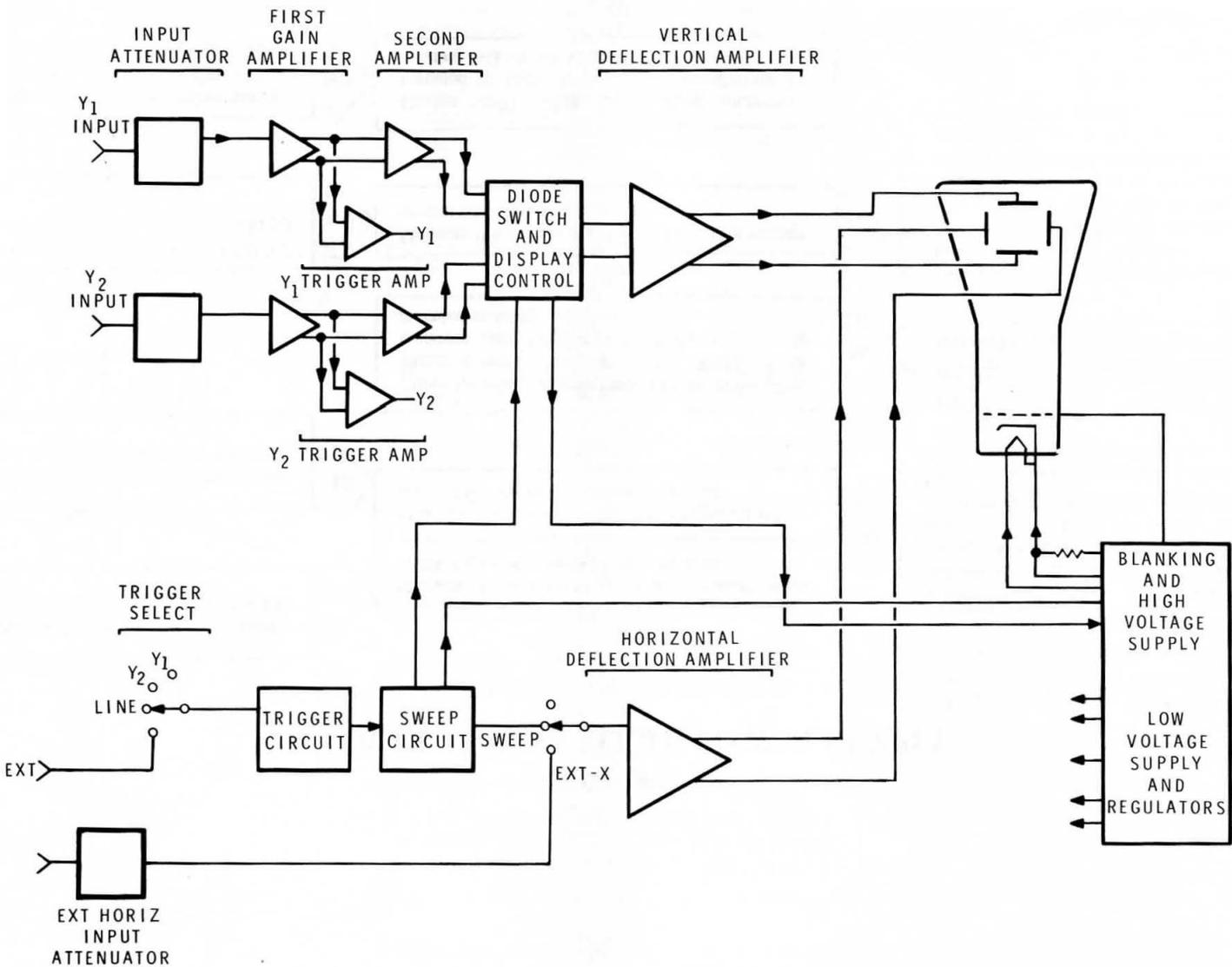
**WARNING**  
DANGEROUS VOLTAGE  
IN BOXED-IN AREAS

**PICTORIAL 9-1**



**WARNING: DANGEROUS VOLTAGE  
IN BOXED-IN AREAS**

**PICTORIAL 9-2**

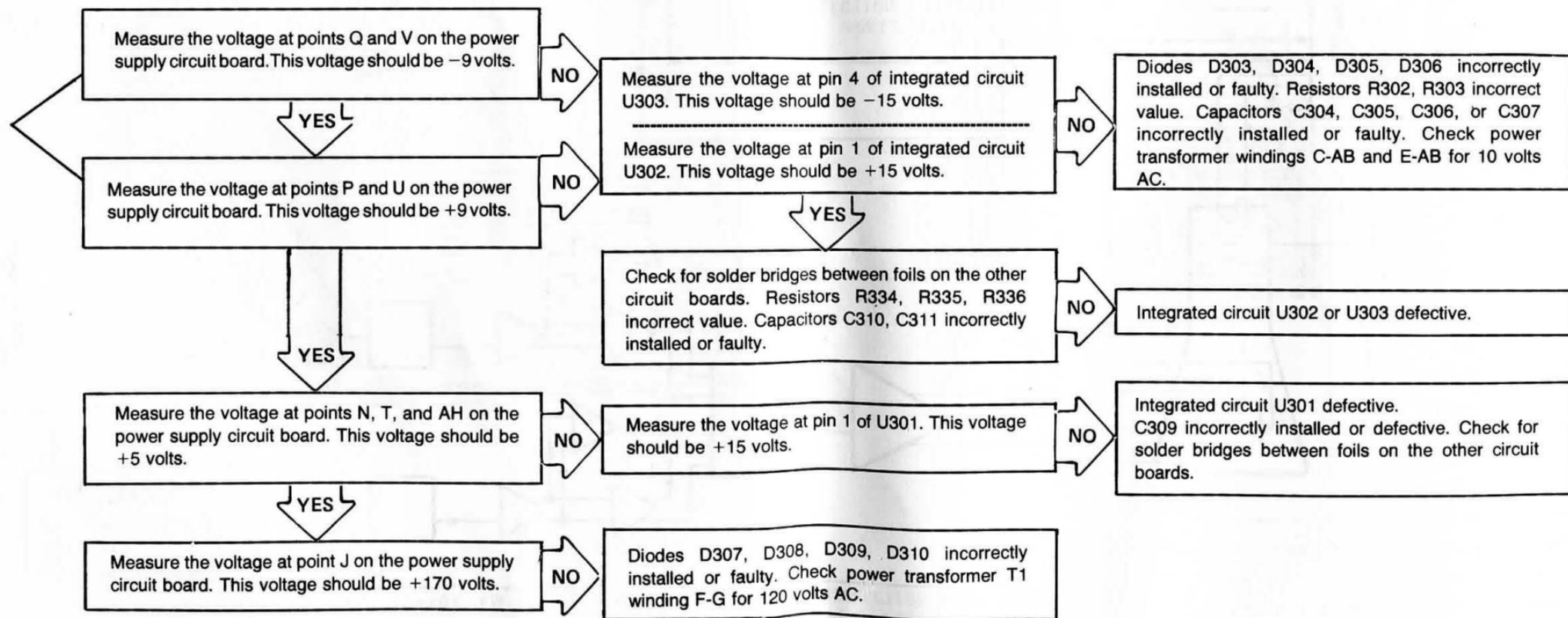


**BLOCK DIAGRAM**

# TEST #1

## ±9 VOLTS AND +5 VOLTS POWER SUPPLY

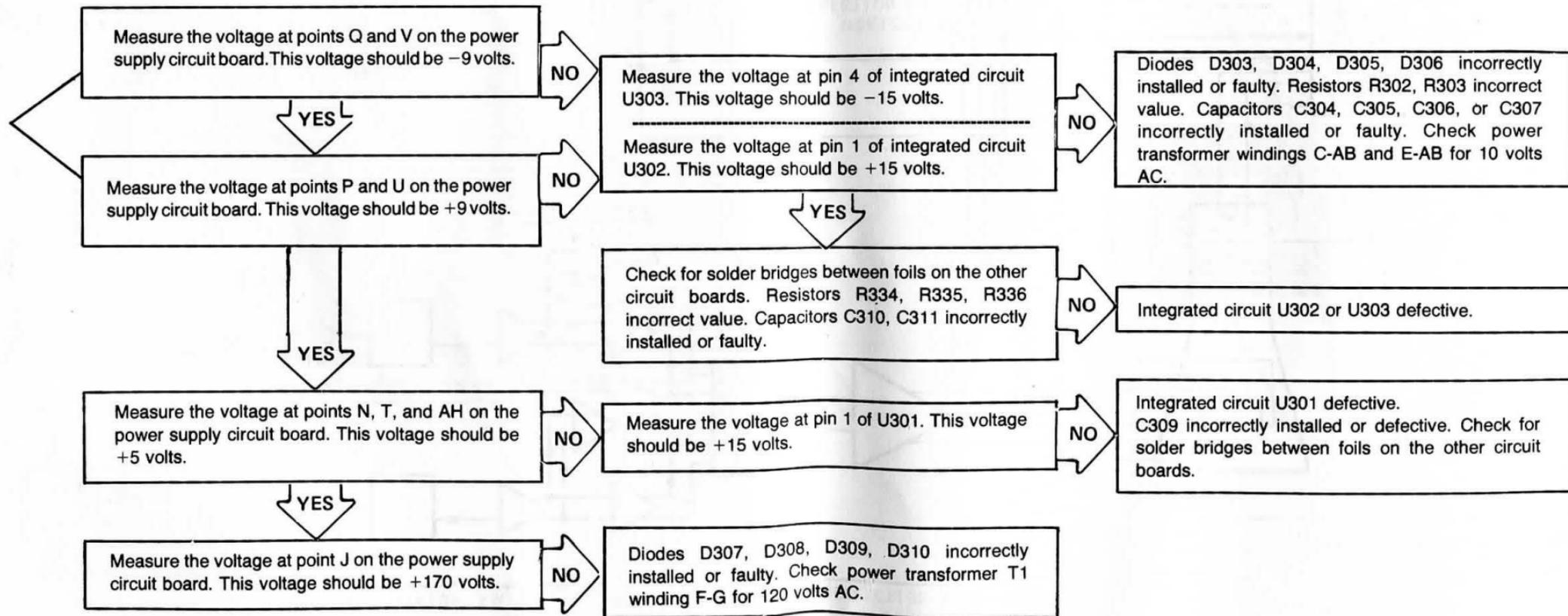
: These supplies track each other. If supply fails, the other will also shut



# TEST #1

## ±9 VOLTS AND +5 VOLTS POWER SUPPLY

These supplies track each other. If one supply fails, the other will also shut



# TEST #2

## VERTICAL DEFLECTION AMP

### (Y1-Y2-CHOP-ALT)

NOTE: Components on the vertical circuit board have their numbers followed by "A" for channel Y1, and "B" for channel Y2.

Make sure Vertical Mode switch SW4 (Y1-Y2-CHOP-ALT) is in the Y1 position. Measure the voltage at the collector (c) of Q118. This voltage should be +9.0 volts. Then measure the voltage at the collector of Q117. This voltage should be +.6 volts. NOTE: These voltages will be reversed with the Vertical Mode switch in the Y2 position.

NO

Measure the voltage on U102. These should be: pin 6 greater than +2.4 volts and 8 less than +.8 volts.

YES

Q117 or Q118 incorrectly installed or faulty

YES

Measure the voltages at the collector of Q115 and Q116. These voltages should be the same.

NO

Measure the voltage at the drain (pin 6) of U102. Adjust the VERTICAL DC BAL control to 0 DC.

YES

Turn the power off and short the base of Q113 to the base of Q114. Turn the Oscilloscope on.

YES

The collector voltages of Q115 and Q116 are the same.

YES

Turn the power off and remove the short between Q113 and Q114. Then short the base of Q111 to the base of Q112. Turn the Oscilloscope on.

YES

The collector voltages of Q115 and Q116 are the same.

YES

Turn the power off and remove the short between Q111 and Q112. Then short the base of Q104 to the base of Q105. Turn the Oscilloscope on.

YES

The collector voltages of Q115 and Q116 are the same.

YES

Turn the power off and remove the short between Q104 and Q105. Then short pin 6 of U102 to the base of Q102. Turn the Oscilloscope on.

YES

The collector voltages of Q115 and Q116 are the same.

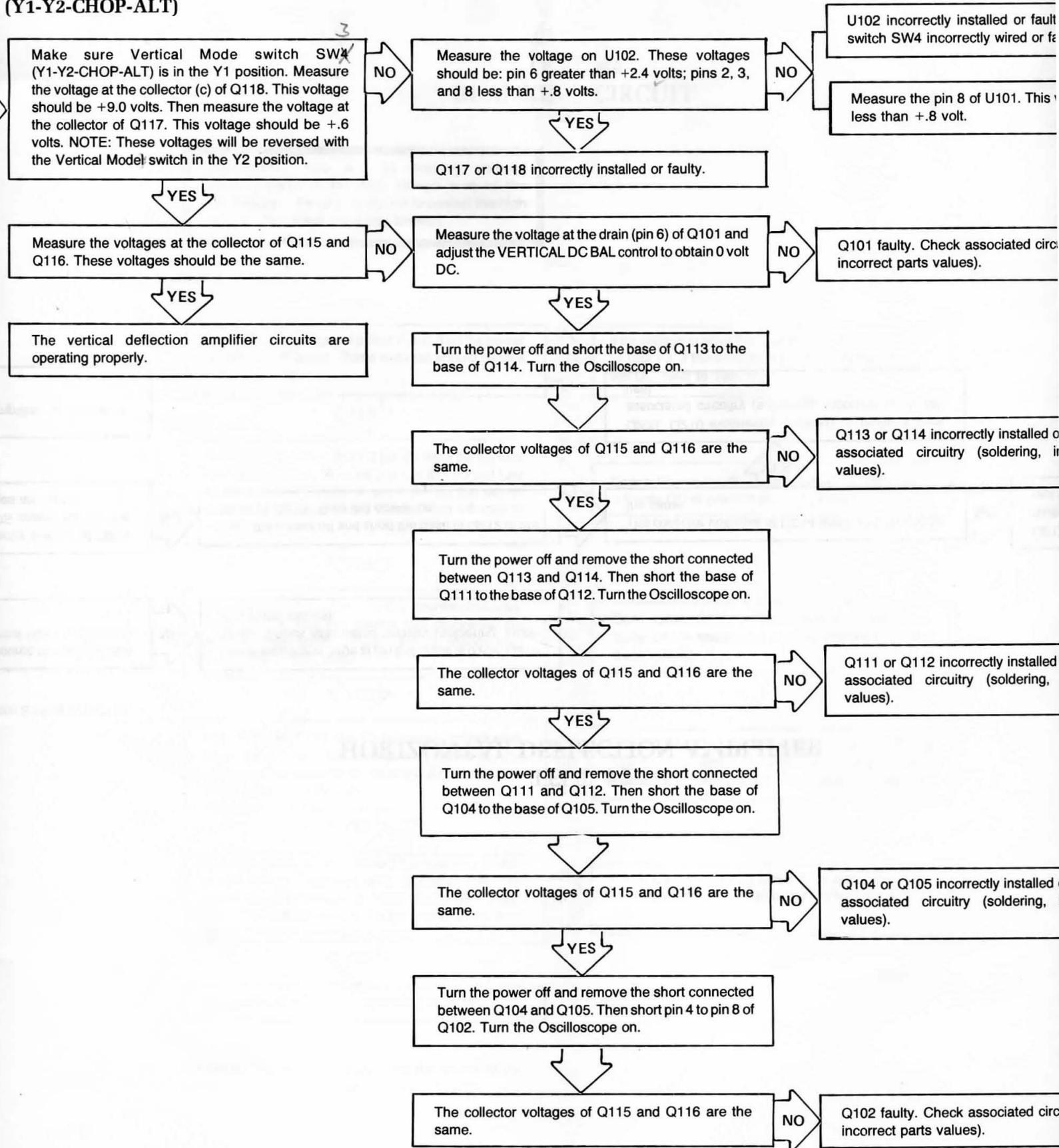
YES

The vertical deflection amplifier circuits are operating properly.

Q118 c +.2  
117 c +6.0

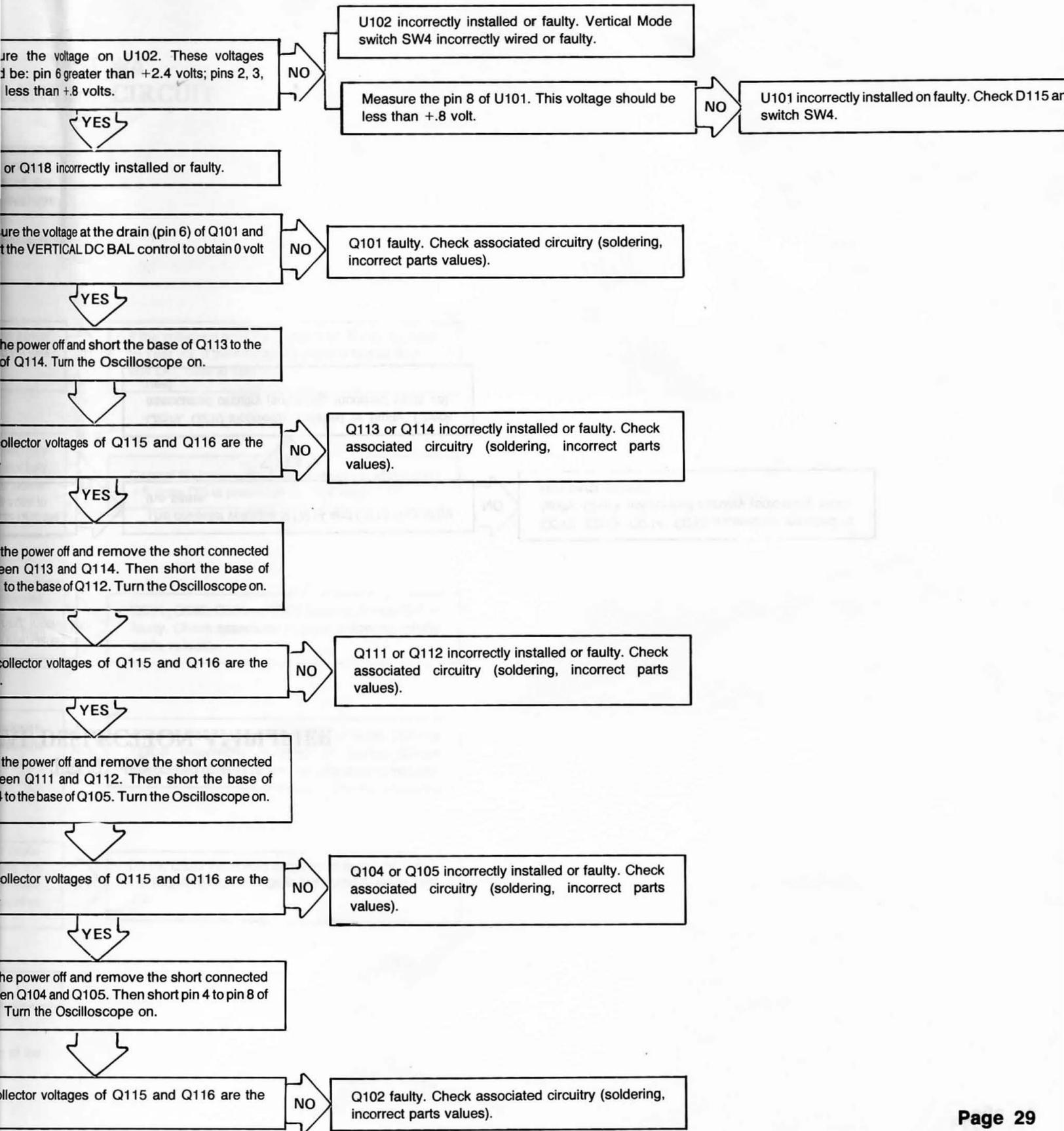
## TEST #2 VERTICAL DEFLECTION AMPLIFIER

(Y1-Y2-CHOP-ALT)



# TEST #2

## VERTICAL DEFLECTION AMPLIFIER



# TEST #3 HORIZONTAL DEFLECTION

NOTE: Make sure TIME/CM switch SW5 is in EXT IN,  $\times 10$  position.

Measure the voltage at the source (pin 2) of Q208 and adjust INPUT ZERO control R247 to obtain 0 volt DC.

NO

Make sure the voltage at pin 8 of Q208 is 0 volt. Q208 faulty. Check associated circuitry (soldering, incorrect parts values).

YES

Alternately measure the collector voltage of Q214 and Q215. Adjust HORIZ POS control R8 (on the front panel) until these voltages are equal.

NO

Turn the power off and short the base of Q212 to the base of Q213. Turn the power on.

Th  
the

YES

The horizontal deflection amplifier is operating properly.

Q2  
as  
ue

## TEST #3

# HORIZONTAL DEFLECTION AMPLIFIER

The voltage at pin 8 of Q208 is 0 volt. Q208  
check associated circuitry (soldering, incor-  
rect values).

Turn the power off and short the base of Q212 to the  
ground. Turn the power on.

The collector voltages of Q214 and Q215 should be  
the same.

NO

Q212, Q213, Q214, Q215 incorrectly installed or  
faulty. Check associated circuitry (soldering, incor-  
rect parts values).

YES

Q209, Q210 incorrectly installed or faulty. Check  
associated circuitry (soldering, incorrect parts val-  
ues).