SECTION 5 MAINTENANCE & ADJUSTMENTS

5-1 GENERAL

This section contains information for preventive maintenance, adjustment and calibration.

5-1-(1) PREVENTIVE MAINTENANCE

Preventive maintenance consists of periodic cleaning, and recalibration of the oscilloscope. It should be performed on a regular bases to keep the instrument in its best operational and appearance condition.

5-1-(2) CLEANING

Accumulation of dirt, dust and grime should be removed whenever they become noticeable. The frequency of cleaning is largely dependent upon the environment in which the instrument is used. Dirt on the outside covers may be removed with a soft cloth moistened with a diluted household cleaning solution.

5-1-(3) RECALIBRATION

Recalibration of the instrument at regular intervals will assure that measurements within the accuracy specification. It is recommended that the instrument be recalibrated after 1000 hours of operation, or twice a year. The calibration procedures are provided in the latter part of this section of the manual.

5-2 ADJUSTMENT AND CALIBRATION

Most of the problems resulting in a malfunction will be a defective component or a mechanical defect. Verify that the problem is not due to an incorrect switch position. The CRT display can be a valuable aid in pinpointing the area of many problems. The defect of any of the amplifiers, triggering circuit will be noticeable on the CRT.

5-2-(1) POWER SUPPLY UNIT ADJUSTMENTS

Some problems may result in severe loading on the power supplies. The power supply unit for the BS-310S comprises a DC-to-DC converter. The normal operating frequency of the converter is approximately 17KHz. Modifying pulse width with the change of loads, this converter assures the constant voltage supply. When the secondary voltage of the converter is incorrect, remove the P3 and P4 connectors of the Power Supply unit for checking.

1. VOLTAGE ADJUSTMENTS . . . . . When voltages are out of adjustments, careful realignments may be necessary.

   a. 100V DC Adjustment . . . . . Adjust VR9 to obtain 100V ±0.5V between the 1st ~~2nd~~ pin on connector ~~P3~~ P4 and the ground.

   b. −1.4KV DC Adjustment . . . . . Adjust VR7 to maintain the voltage within −1.4KV between the 2nd Pin on Connector P2 and ground.

Test That Horizontal Time Base can be calibrated — May need to reduce to -1.4kV

CAUTION!!! EXCESS VOLTAGE MAY DAMAGE CRT OR SHORTEN CRT LIFE.

2. ADJUSTMENT OF RECHARGING CIRCUIT . . . . . When the length of time for charging and discharging the battery is questionable. Adjustment of FULL-CHARGED VOLTAGE LEVEL may be necessary.

Section 5
1 a)
b)
c)

NOTE: FULL-CHARGED VOLTAGE LEVEL IS SUBJECT TO AMBIENT TEMPERATURE.

Adjust VR1 in accordance with the algebraic equation below.

CAUTION!!! ACCURATE ADJUSTMENTS ARE REQUIRED IN ORDER TO AVOID POSSIBLE DANGERS FROM BATTERY DUE TO OVER-CHARGE OR IMPERFECT CHARGE, AND TO MAINTAIN THIS INSTRUMENT'S IN-SPEC OPERATIONS FOR A LONG TIME.

FULL-CHARGED VOLTAGE LEVEL (V)

(V) = 15.50 − (0.04 X x°C) ** x°C . . . . . Ambient Temperature

15.5 − (0.04 × 20) = 14.7 v

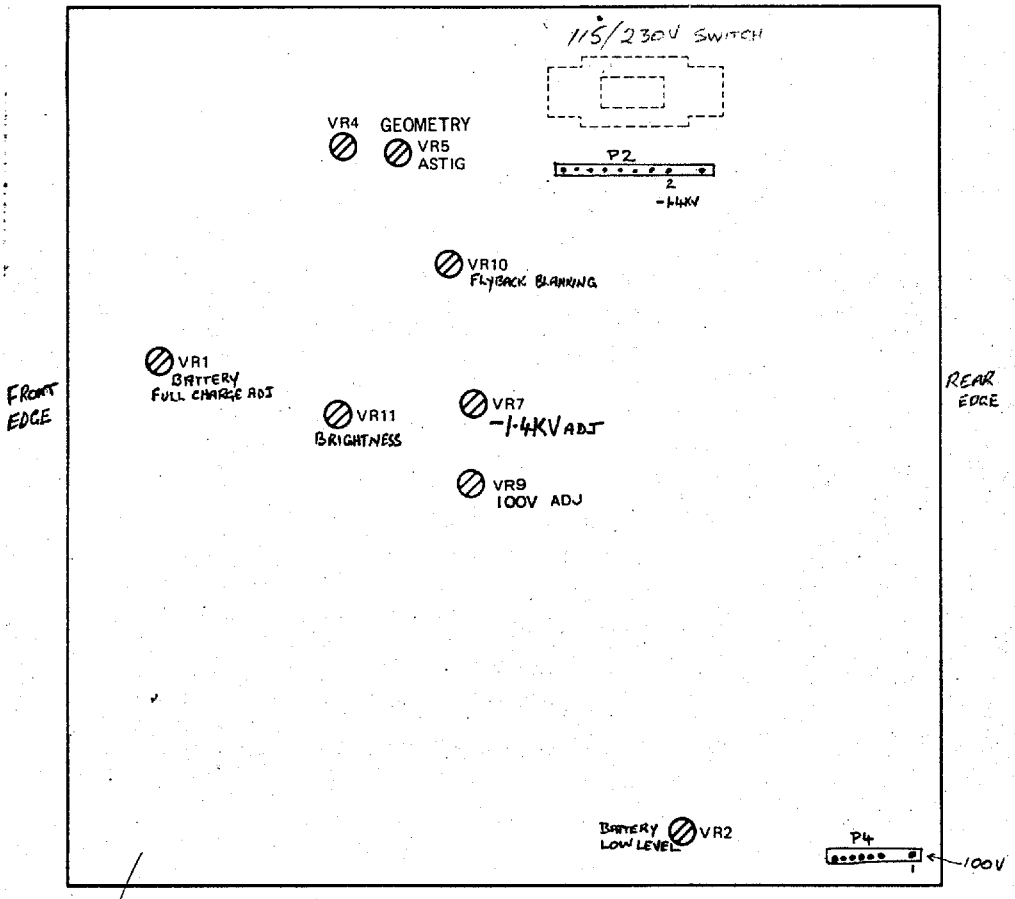
3. LOWER VOLTAGE LEVEL ADJUSTMENT FOR EXTERNAL DC SOURCE . . . . . If external DC supply voltage drops lower than 11V. This instrument stops functioning. That lower voltage level is adjustable with VR2.

4. ADJUSTMENTS ABOUT CRT . . . . . Aged CRT has tendency to lose brightness of trace line and distortion of waveform display increases.
   To compensate the detrition, readjustment may be required. In this case proceed as follows;

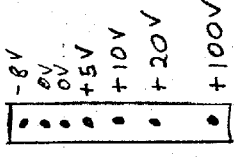
   a. When FLY-BACK LINE appears on the CRT with waveforms . . . . . Adjust VR10 to obtain the right tuning point of the lower blanking pulse level. And this to be done, observing the waveform between Emitter of Q14 and the ground.

   b. When Brightness decreased . . . . . Adjust VR11 for intensity control.

CAUTION!!! TOO MUCH BRIGHTNESS SHORTENS THE LIFE OF CRT.



FOIL SIDE VIEW
CALIBRATION LOCATIONS FOR POWER SUPPLY UNIT



Board is on bottom of 'scope (towards rear)

5-2-(2) VERTICAL AMPLIFIER UNIT ADJUSTMENTS

1. ADJUSTMENTS OF ATTENUATORS . . . . . When the voltage readings are in error or waveform is distorted.

   a. Adjustments of voltage reading (VOLT/DIV)
   Adjustments : VR5 for CH-A
   VR11 for CH-B

   b. Adjusting Balance of attenuator steps . . . . . When trace line shifts with the change of VOLT/DIV switch.
   Adjustments : VR1 for CH-A
   VR7 for CH-B

   c. Adjustments of DC Balance (VARI BAL) . . . . . When trace line moves up or down while tuning VARIABLE knob.
   Adjustments : VR3 for CH-A
   VR9 for CH-B

2. ADJUSTMENTS OF VERTICAL AMPLIFIER

   a. When trace lines shift with the change of DC-GND-AC slide switch.
   Short the Test Pin and adjust VR6

   b. Adjustment of Vertical POSITION's Linearity — (linearity or centred?)
   Adjust VR4 for CH-A and VR10 for CH-B.

   c. When adequate dynamic range is not obtained in display. (VR13)
   Confirm +8.7V between Base of Q11 and ground.

3. ADJUSTMENT OF X-AXIS AMPLIFIER GAIN . . . After both channels are confirmed to be correct in normal operations, Set SWEEP TIME/DIV control to CH-B. If there is difference of sensitivity in Y-axis and X-axis, adjust VR12.

4. ADJUSTMENT OF ATTENUATOR CAPACITY

a.	CH-A	TC1	1/10	ATT	Square waveform ADJ
		TC2	1/10	ATT	Input Cap. ADJ
		TC3	1/100	ATT	Square waveform ADJ
		TC4	1/100	ATT	Input Cap. ADJ
		TC5	1/1000	ATT	Square waveform ADJ
		TC6	1/1000	ATT	Input Cap. ADJ
b.	CH-B	TC7	1/10	ATT	Square waveform ADJ
		TC8	1/10	ATT	Input Cap. ADJ
		TC9	1/100	ATT	Square waveform ADJ
		TC10	1/100	ATT	Input Cap. ADJ
		TC11	1/1000	ATT	Square waveform ADJ
		TC12	1/1000	ATT	Input Cap. ADJ

Use 0.1 V/div to about 5 kHz. (Bandwidth 3 MHz)

0.1 V/div, 50, 20 mV/div

1, .5, .2 V/div

10, 5, 2 V/div

Use Capacitance Standardizer box 1MΩ, 20pF

Correct adjustment is critical to frequency response

Y gain/attenuator can be correct with square wave as per 1(a) but mismatch with sine wave

Problem experienced on 0.1 V/div & .5 & .2 V/div with 50 kHz. — Gain of CH-B about 2/3 of CH-A owing to TC7 set incorrectly

Time TC1, 3, 5, 7, 9, 11 for fastest rise consistent with minimum overshoot / undershoot

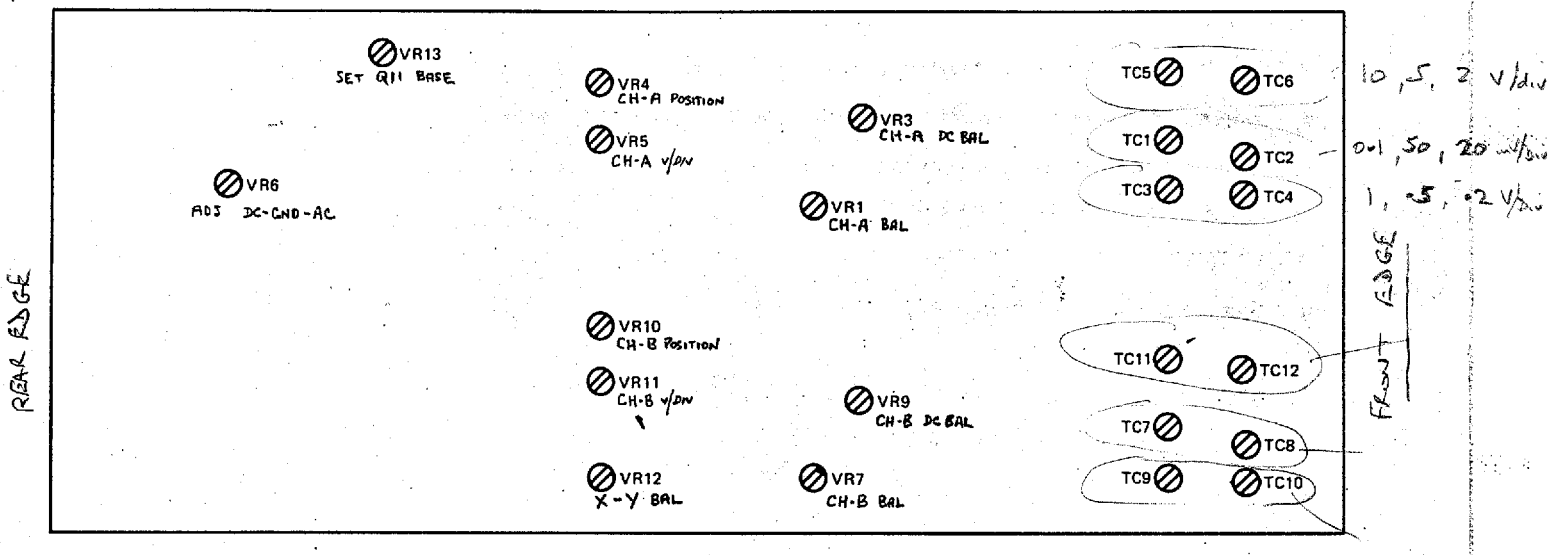
5. Y AMP BANDWIDTH ≥ 15 MHz

6. MODE SWITCH CHECK
ADD / CHOP FUNCTION

7. CH-B. INVERT SWITCH.

This → FAST rise

NOT → Slower rise

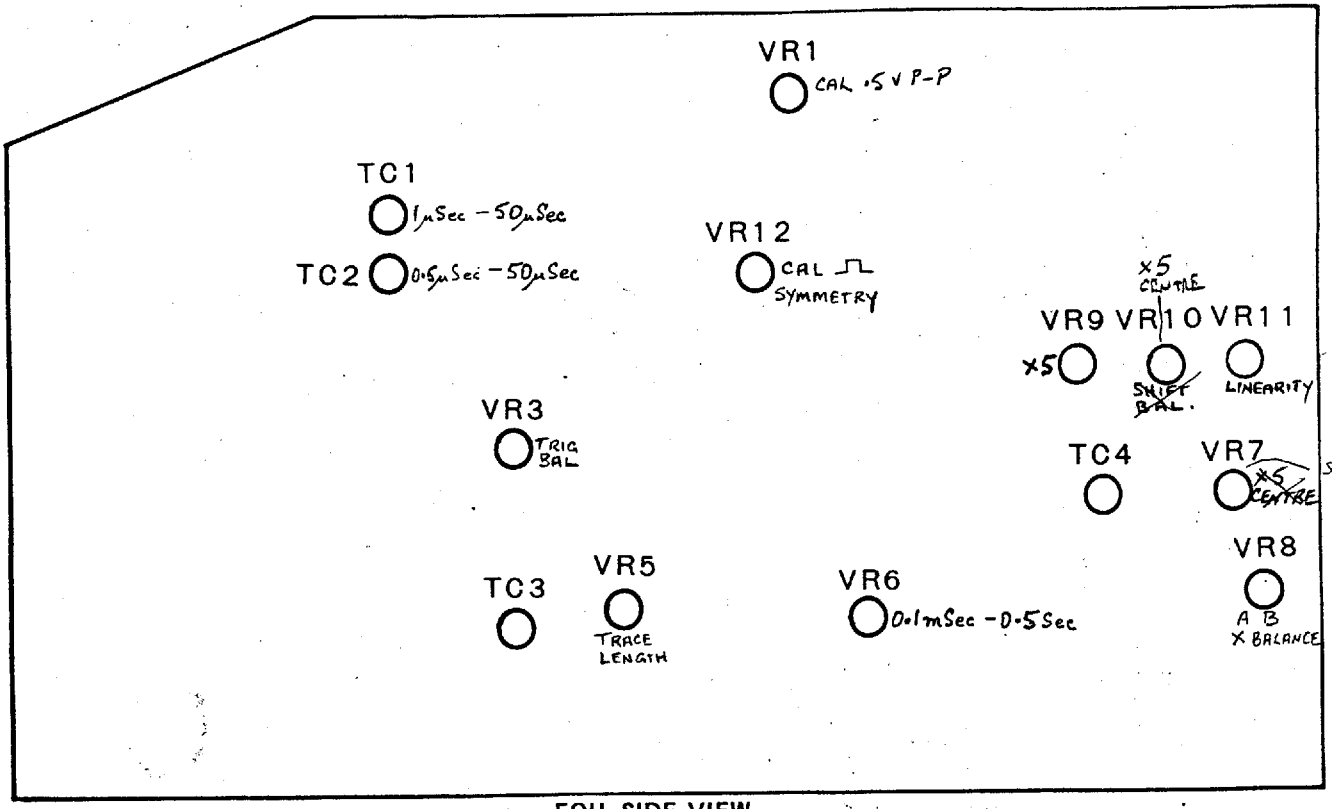


FOIL SIDE VIEW

CALIBRATION LOCATIONS FOR VERTICAL AMPLIFIER UNIT

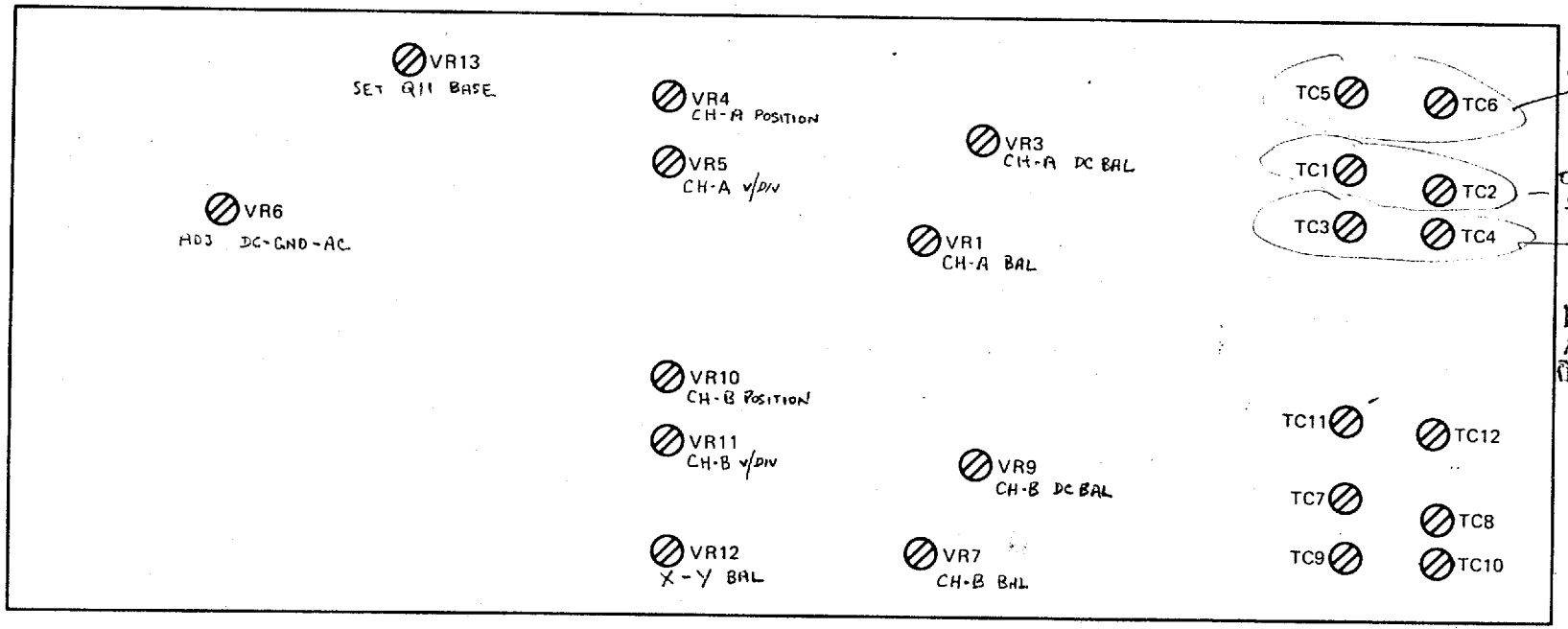
5-2-(3) HORIZONTAL/TIME BASE UNIT ADJUSTMENTS

1. ADJUSTMENT OF SWEEP TIME/DIV (A standard time marker generator required.)
   a. Adjust VR6 for realignment of the range from 0.1 msec/DIV to 0.5 sec/DIV.
   b. Adjust TC1 for realignment of the range from 1 μsec/DIV to 50 μsec/DIV.
   c. Adjust TC2 for realignment of the range from 0.5 μsec/DIV to 50 μsec/DIV.
2. ADJUSTMENT OF 5X MAGNIFIER
   a. When magnification is inaccurate.
      Adjust VR9.
   b. Shift of center position of screen. Adjust VR10 to obtain the same center position when the display is magnified.
3. OTHERS BESIDES TIME BASE CIRCUIT
   a. Adjustment of Horizontal POSITION . . . . . When shift range is unbalanced to left and right. Adjust VR7 to obtain the same shift ranges.
   b. Adjustment of Sweep Linearity . . . . . Adjust VR11.
4. ADJUSTMENT OF TRIGGERING . . . When the starting point shifts with the change of SYNC switch (+ to −, or vice versa), Adjust VR3.
5. ADJUSTMENT OF X-AXIS (CH-B) POSITION . . . . . With SWEEP TIME/DIV control set at CH-B, check if shift range is balanced when X-axis POSITION (CH-B VERTICAL POSITION) is turned. If there is unbalance, Adjust VR8.
6. ADJUSTMENT OF TRACE LINE LENGTH . . . . . Adjust VR5 to obtain the length of 11DIV on CRT screen.



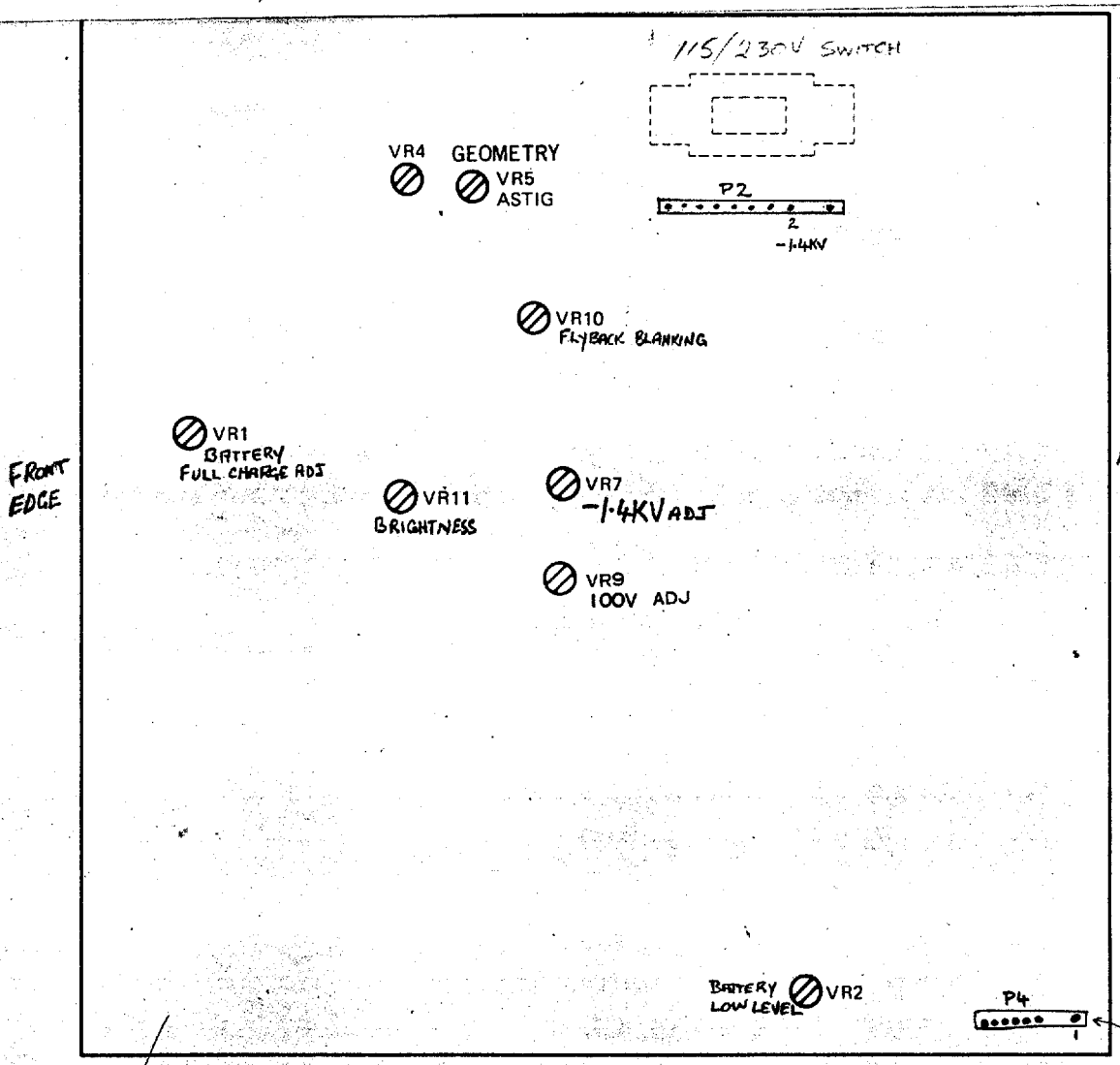
FOIL SIDE VIEW

CALIBRATION LOCATIONS FOR HORIZONTAL/TIME BASE UNIT



FOIL SIDE VIEW

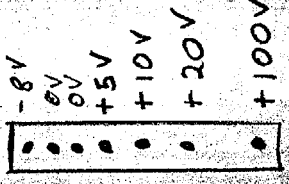
CALIBRATION LOCATIONS FOR VERTICAL AMPLIFIER UNIT



FOIL SIDE VIEW

CALIBRATION LOCATIONS FOR POWER SUPPLY UNIT

Board in on bottom of 'scope (towards rear)



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