SECTION L, FINAL ALIGNMENT

Final Alignment

Illustration: Figure 13.

Steps 1 through 51. Check (✓) each step as it is completed.

If any difficulties are experienced in the final alignment, and the scope dos not perform as indicated by the instructions, pull the power-cord plug from the outlet and consult section "M", Trouble Shooting the Oscilloscope.

Getting Acquainted with the Scope Controls:

1. ( ) Set the controls as follows:
INTENSITY—Snap on and turn full clockwise.
FOCUS—near center of rotation.
V POS—near center of rotation.
H POS—near center of rotation.
V CAL—full clockwise.
SYNC/PHASE—full counterclockwise.
SWEEP VERNIER—full clockwise.
H GAIN—full clockwise.
V RANGE—on position "CAL".
H SWEEP/SEL—on position "15-150".
SYNC—on position "EXT".

2. ( ) *CAUTION*—HIGH VOLTAGES ARE PRESENT IN THIS EQUIPMENT. IF YOU DO NOT UNDERSTAND ITS OPERATION, ENLIST THE AID OF A QUALIFIED TECHNICIAN TO ASSIST YOU IN THE FOLLOWING ALIGNMENT AND CALIBRATION PROCEDURES. USE INSULATED SCREWDRIVERS TO MAKE ALL INTERNAL ADJUSTMENTS.

3. ( ) Apply power to the instrument by inserting the power-cord-plug into an electric outlet carrying 105-to-125 volts, 60-cycle AC. Do NOT plug into a DC or 25-cycle line. The pilot lamp should light up immediately and the tube heaters should start to glow.

4. ( ) Watch for a random cross-hatch pattern which should appear on the CRT screen within 30 seconds. When it appears, rotate the INTENSITY control counter-clockwise to reduce the trace to medium brightness, and adjust the FOCUS control to sharpen the lines.

5. ( ) Rotate the H GAIN control counter-clockwise to reduce the width of the trace to about 2-inches. Reset the H POS control if necessary to center the trace on the CRT screen (clockwise rotation of the H POS control should move the trace to the right, and vice-versa).

6. ( ) Rotate the V CAL control counter-clockwise to reduce the height of the trace to about 1½-inches. Reset the V POS control if necessary to center the trace on the CRT screen (clockwise rotation of the V POS control should move the trace downward, and vice-versa).

7. ( ) Rotate sweep vernier slowly counter-clockwise until the waveforms appear to be nearly stationary.

8. ( ) Reset the SYN switch from EXT to INT. The waveforms should now become stationary, that is, synchronized.

9. ( ) Slowly rotate the SYNC/PHASE control clockwise. As you approach the center, the trace will lose synchronization, but will come back in sync as you approach the clockwise limit of rotation.

To Adjust the Astigmatism Control R-68:

10. ( ) Set the H/SWEEP SEL switch to "LINE" and adjust the SYNC/PHASE control to obtain a circular pattern.

11. ( ) Adjust the V CAL and H GAIN controls to produce a round pattern about 1½-inches in diameter. Re-center the pattern with the V POS and H POS controls if necessary; and readjust the FOCUS control to produce a fine sharp trace at one place of the circuit.

12. ( ) Identify the astigmatism control R-68, located on the upper part of the rear chassis, as viewed from the front. Adjust R-68 with an insulated screwdriver to make the trace uniformly thin all around the circle. Readjust the FOCUS control; then readjust R-68 and repeat until a uniformly sharp trace is produced all around the circle.

To adjust the position of the cathode ray tube (CRT) for a level horizontal line:

13. ( ) Set the V RANGE switch to "60", and readjust the V POS control to place the trace near the upper horizontal line on the graph screen.

14. ( ) If the trace is tilted with respect to the line on the graph screen, pull the power-cord-plug from the AC outlet. Loosen the screw on the CRT clamp, and gently rotate the CRT the estimated amount. Apply power to the scope, and recheck, repeating the process, if necessary, to get the trace and the graph screen in alignment. REMOVE POWER BY PULLING POWER-CORD FROM AC OUTLET WHILE MAKING THESE ADJUSTMENTS. Retighten the CRT clamp screw just enough to hold the CRT in place.

To adjust Hum Balance Control R-76:

15. ( ) Set the H/SWEEP SEL to the "15-150" position; the V RANGE to ".02"; the H GAIN to full counter-clockwise; the V CAL to full clockwise; and the SWEEP VERNIER to full clockwise.

16. ( ) Connect the shielded-input cable to the V INPUT jack, and clip together all three clip leads (yellow, blue, and black).

17. ( ) Recenter the trace if necessary, using the V POS and H POS controls.

18. ( ) Set the INTENSITY control for medium brightness, and the FOCUS control for the sharpest trace. A number of horizontal wavy lines will appear on the screen. The height of the line pattern indicates the amount of hum in the scope.

19. ( ) Identify the Hum Balance Control R-76, located on the right rear chassis just above the 6C4 tube. Using an insulated screwdriver, adjust R-76 for minimum amplitude of the trace. If the trace can not be reduced to less than 1/16-inch, make sure the hum is not being picked up from any nearby motor or transformer before referring to the Trouble Shooting Section "M".

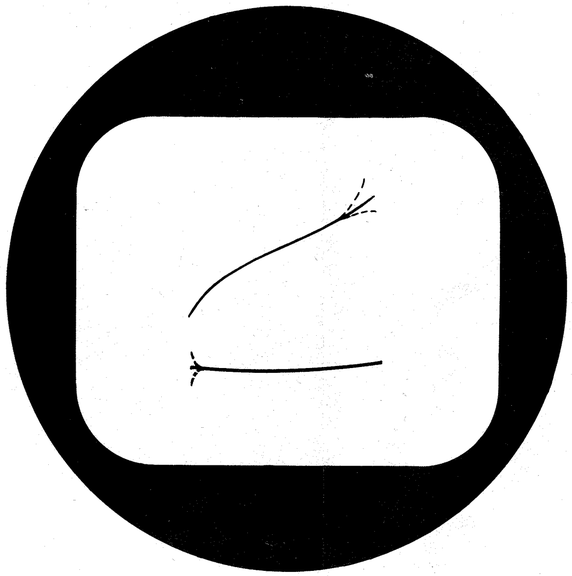


FIGURE 13

WORK AREA

To adjust the Amplifier Calibrate Control R-11:

20. ( ) Set the H/SWEEP SEL to "H IN"; and the V RANGE switch to "2". Adjust the INTENSITY control for a spot of medium brightness; and readjust the FOCUS control to produce a small spot. Do not allow a small spot of *high* brilliance to remain stationary on the screen for a prolonged period—damage to the CRT screen may result.

21. ( ) Turn the oscilloscope off by pulling the power cord plug from the AC outlet.

22. ( ) Disconnect the yellow, blue, and black lead-clips which were shorted together.

23. ( ) Identify the test point on the V RANGE switch S-1, wafer #2, lug #22, which is also the junction of R-10 (820 Ω) and R-5 (15K Ω). This point is marked with a "Z" on the circuit diagram.

24. ( ) Connect the input cable blue-lead-clip to the test point "Z"; and so place the input cable that the yellow-lead-clip and the black-lead-clip do not touch anything.

25. ( ) Turn the power on by inserting the power-cord-plug into the AC outlet. Allow a few minutes for warm-up.

26. ( ) Adjust the H POS control to move the trace just to the right of the "0-6" scale on the green graph screen.

27. ( ) Adjust the V CAL and V POS controls to make the trace extend exactly from scale point "2" to scale point "4".

28. ( ) Turn the scope off by pulling the power plug.

29. ( ) Disconnect the blue-lead-clip from test point "Z", and connect the yellow-lead-clip to the test point.

30. ( ) Turn the scope on by reinserting the power-cord-plug into the AC outlet. Allow a few minutes for warm-up.

31. ( ) Set the V RANGE switch to ".2" position.

32. ( ) Identify calibrate-control R-11, which is located on the upper left side of the rear chassis, as viewed from the front.

33. ( ) Using an insulated screwdriver, adjust R-11 so that the trace again extends exactly between scale points "2" and "4". You may have to readjust the V POS control, but do not readjust the V CAL control during this operation.

To adjust the frequency-compensated input attenuator capacitors:

34. ( ) Turn scope off by pulling the power plug. Wait 15 seconds.

35. ( ) Connect the yellow-lead-clip of the input cable to pin #3 of V-3 (12AT7). Looking at the socket from the top of the chassis, pin #3 is the third from the gap in the circle, counting counter-clockwise. This point is marked with an "X" on the circuit diagram. Position the probe and unused leads away from all components.

36. ( ) Turn the scope upside down, so that the ceramic trimmer capacitors on the V RANGE switch are accessible.

37. ( ) Turn the power on by plugging the power cord into the AC outlet.

38. ( ) Set the V RANGE switch to ".6"; SYNC switch to "INT"; H SWEEP SEL to "15-150"; SYNC/PHASE full clockwise; H GAIN full counterclockwise; SWEEP VERNIER full clockwise.

39. ( ) Adjust V CAL for a pattern about 1-inch high; and adjust V POS and H POS to center the trace in the clear area on the graph screen.

40. ( ) Slowly turn the SWEEP VERNIER counter-clockwise until a single trace appears and remains stationary. It will appear as in Figure 13.

41. ( ) Identify trimmer capacitor C-1, one end of which is attached to the orange wire from the V INPUT CONNECTOR. Adjust C-1 so that the ends of the fine diagonal line terminate abruptly without twist. The effects of improper settings are shown dotted in Figure 13.

42. ( ) Set the V RANGE switch to "2", and readjust V CAL for a pattern about 1-inch high.

43. ( ) Identify trimmer capacitor C-3 on the V RANGE switch S-1. It is the one closest to the metal shield. If you touch C-3 with a metallic screwdriver where it connects to wafer #2, the CRT trace will become distorted, thus it can be positively identified. Adjust C-3 with an insulated screwdriver to again remove any "tails" or spikes from the trace as shown by the dotted lines in Figure 13. If necessary, readjust C-1 to obtain the desired trace.

44. ( ) Turn off the scope by pulling the power-cord-plug from the AC outlet. Disconnect the yellow-lead clip from the test point at pin #3 of V3, and connect the blue-lead clip to the same point.

45. ( ) Set the V RANGE switch to "6". Identify trimmer capacitor C-4 by touching it with a metallic screwdriver and noting distortion of trace. Turn V CAL full counter-clockwise. Adjust C-4 to remove any tails or spikes from corner of trace, as above.

46. ( ) Turn the scope off by pulling the power-cord-plug from the AC outlet.

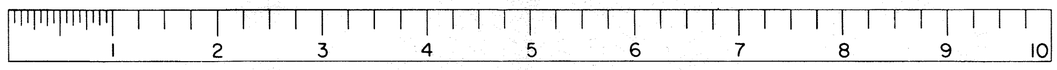
47. ( ) Identify the H SWEEP/SEL switch S-2, wafer #3, lug #12 to which is connected a violent wire. This point is marked with a "Y" on the circuit diagram. Connect the yellow-lead clip of the input cable to this point.

48. ( ) Turn the scope on by inserting the power-cord-plug into the AC outlet.

49. ( ) Set the V RANGE switch to position "20" and adjust V CAL for a pattern about 1-inch high. The scope pattern will appear as in Figure 13.

50. ( ) Identify C-5 by touching the metallic screwdriver and noting distortion of trace. Turn C-5 adjustment screw clockwise and note spike as shown in Figure 13—the back off to point where spike disappears.

51. ( ) Set V RANGE to "60", and rotate V CAL full clockwise. Identify C-6, and adjust as in step 44 above.



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