

RCA WO-91A OSCILLOSCOPE ADJUSTMENTS

CAUTION: Do not strike or subject the cathode-ray tube to more than moderate pressure as breakage of the tube may result in injury from flying glass. When the case of the instrument is removed, high voltages are exposed and the safety precautions outlined on Page 2 should be observed.

General

Performance of the WO-91A depends upon the quality of the components employed. If it should be necessary to replace any of the component parts, only RCA replacement parts or equivalents of those shown in the Replacement Parts List of this instruction booklet should be used.

The chassis may be removed from the case by removing 4 screws from the bottom of the instrument and two screws from the top of the front panel and applying pressure on the rear apron of the chassis through the hole provided for the power cord. **CAUTION:** This oscilloscope uses high-voltage circuits.

If any alignment adjustments are made, the line voltage should be 117 volts at 50-60 cps. If trouble is encountered, voltage readings should be taken and com-

pared with the operating voltages shown on the schematic diagram. Conventional trouble-shooting techniques should be used to locate trouble.

Trouble-Shooting

If operation difficulties are encountered, conventional trouble-shooting techniques should be employed. Voltage readings should be taken at various points in the circuit and checked against the voltage readings given on the schematic diagram. Resistance and continuity checks can then be made to isolate the defective section or stage.

Astigmatism Adjustment

1. Turn on the WO-91A and allow at least 15 minutes warm-up time.
2. Set the SYNC-H SEL to "LINE", the bandwidth control to "CAL", and adjust the PHASE, V CAL, and H GAIN control for a circular pattern approximately two inches in diameter.

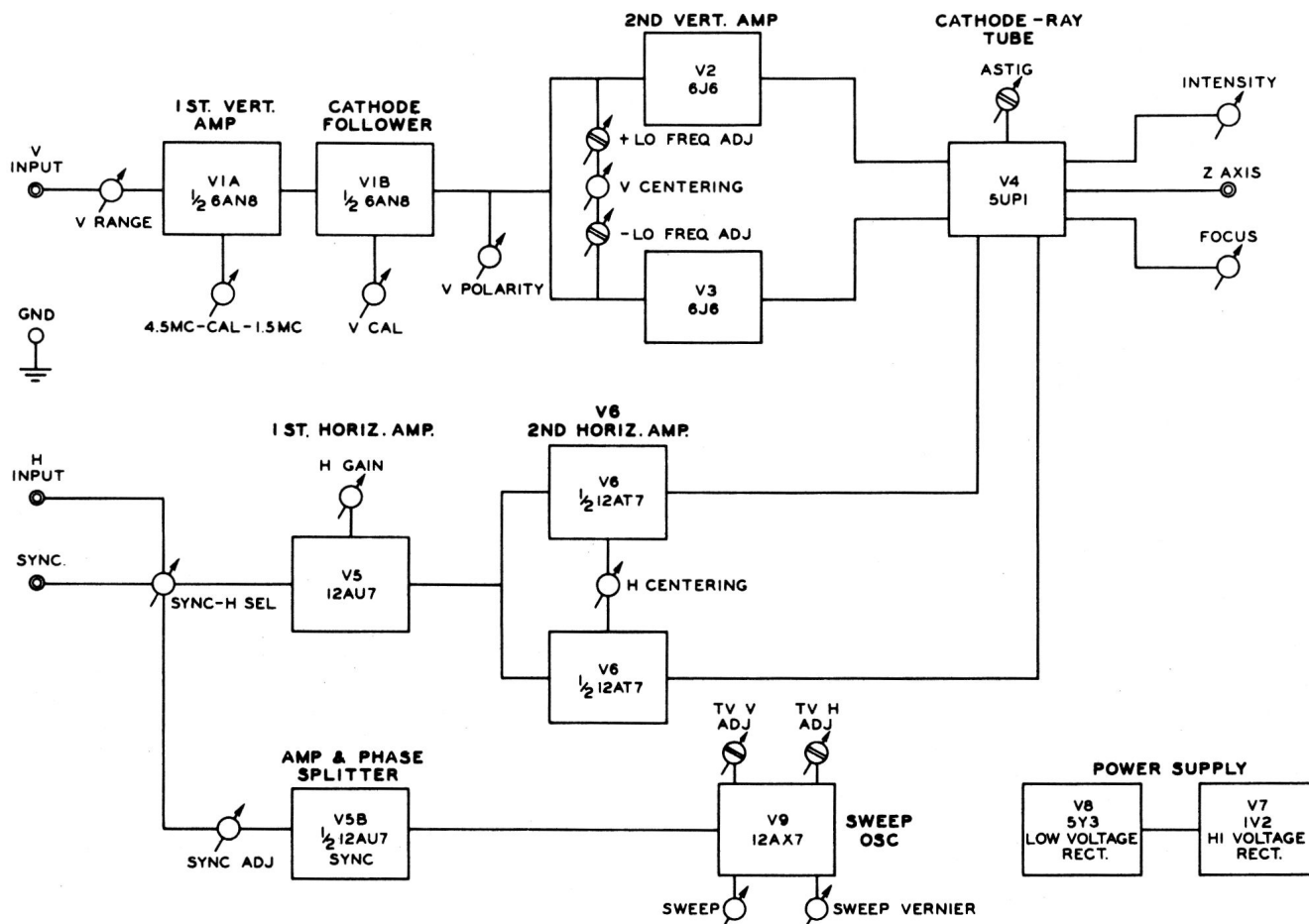


Figure 22. Block diagram of WO-91A

3. With a screw driver, adjust potentiometer R23 for best possible focus at all points on the circle. R23 is located on top of the chassis.

Alignment of Vertical Amplifier

Before alignment is attempted, the oscilloscope should be checked to make sure all tubes and components are in good operating condition. Alignment requires use of another oscilloscope, such as the RCA WO-56A, a demodulator (rf) probe, such as the RCA WG-291, a video-sweep generator such as the RCA WR-59C, and a video marker source, such as the RCA WG-295A Video MultiMarker. Alignment is made as follows.

1. With the WO-91A removed from the case, connect the power cord to a 117-volt 50-60 cps source.

2. Apply power and allow at least 15 minutes warm-up time.

3. Connect the test equipment as shown in Figure 23. Set the WO-91A bandwidth control to "4.5 MC" and the SYNC-H SEL control to "LINE." Adjust the H GAIN control for approximately 3 inches horizontal deflection.

4. Turn the SYNC-H SEL of the WO-56A to "LINE" and adjust the H GAIN control for about 4 inches horizontal deflection.

5. Adjust the sweep width of the WR-59C for approximately 6 Mc and adjust the IF/VF attenuator to give 2 inches vertical deflection on the WO-91A screen.

6. Adjust the V GAIN control on the WO-56A for about 4 inches vertical deflection on the WO-56A screen.

7. Turn the BLANKING control on the WR-59C to "OFF" and adjust the PHASE controls on the WO-56A and WO-91A until the pattern on both scope screens are in phase. Return the BLANKING control to "ON".

8. With a neutralizing tool, adjust L3 and L5 in the WO-91A for flattest response out to 4.5 Mc, as viewed

on the WO-91A screen. The pips provided on the trace by the WG-295A Video MultiMarker can be used as frequency reference points.

9. While observing the trace on the WO-56A, adjust L1 for a response pattern like that shown in Figure 25A.

10. Readjust L3 and L5 for flattest response and smoothest roll-off above 4.5 Mc as viewed on WO-91A. It may be necessary to readjust L1 for best response on the WO-56A. Alternate adjustments of L3 and L5 will eliminate any bumps in the roll-off beyond 4.5 Mc as viewed on the WO-91A.

11. Disconnect the WO-56A, WR-59C, and the WG-295A from the WO-91A. Connect a square-wave generator to the V INPUT terminal. Tune the square-wave generator to 1000 cps.

12. Set the SYNC-H SEL of the WO-91A to "INT—", V RANGE to .15 (1.5 MC), and V CAL fully clockwise. Set the bandwidth control to "1.5 MC" and V POLARITY to the left-hand position.

13. Adjust output of the square-wave generator for 2 or 3 inches vertical deflection on the WO-91A. Adjust the SWEEP and SWEEP VERNIER controls to lock in two square waves on the WO-91A.

14. Observe the waveshape on the screen. Then, reset the V RANGE control to ".5" (1.5 Mc). With a neutralizing tool, adjust C3 to obtain a square wave exactly like that observed in step 13.

15. Reset the V RANGE control to the 1.5, 5, 15, and 50 positions (1.5 Mc) and adjust C5, C7, C9, and C11, respectively, for best square-wave response.

16. Set the V RANGE control to 1.5 (4.5 Mc) and adjust the output of the square-wave generator for 2 to 3 inches of vertical deflection. Adjust C13 for best square-wave response.

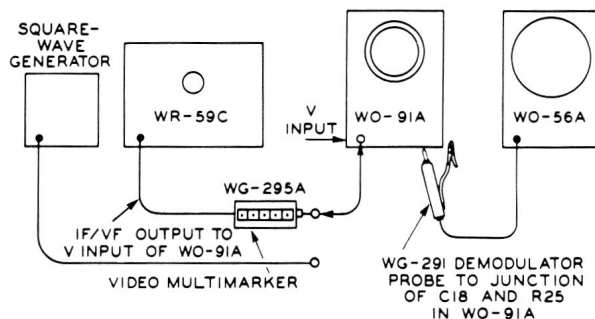


Figure 23. Test setup for alignment of vertical amplifier

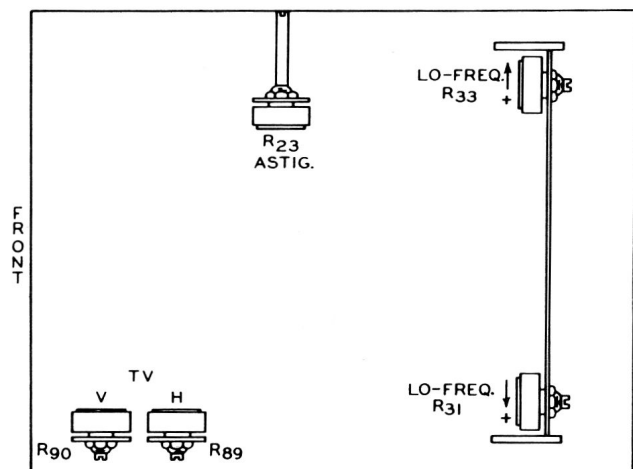


Figure 24. Top of chassis view showing locations of internal adjustments

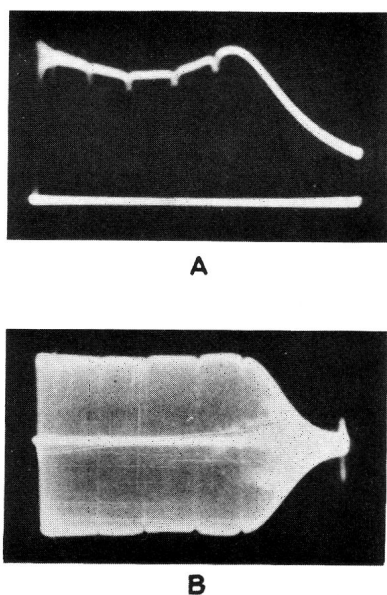


Figure 25. (A) Waveshape taken from output of cathode follower. (B) Overall response curve of WO-91A when set up for 4.5-Mc bandpass

17. Check adjustment of the WG-300A probe as described under "Adjustment of the WG-300A Probe".

18. Connect the cable connector of the WG-300A to the V INPUT connector on the WO-91A and connect the probe tip to the output of the square-wave generator. Set the probe switch to "DIRECT". Tune the generator to 60 cps.

19. Set the bandwidth control on the WO-91A to "1.5 MC" and V RANGE to .5. Adjust sweep controls to lock in two square waves on the screen. Set V POLARITY to the left-hand position. Adjust output from the generator for $2\frac{1}{2}$ to 3 inches vertical deflection.

20. With a screw driver, adjust potentiometer R31 for minimum tilt of the square wave. Set the V POLARITY control to the right-hand position. Adjust R33 for minimum tilt.

Adjustment of the WG-300A Probe

The WG-300A Direct/Low-Capacitance Probe is provided with a small variable capacitor to permit adjustment. The probe should be adjusted after the WO-91A has been aligned. A capacitor, C1, located across the input terminals of the vertical amplifier in the WO-91A provides an additional means of compensation. Adjustment procedure is as follows:

1. With the WG-300A connected to the V INPUT terminal, set the probe switch to "LOW CAP".

2. Set the bandwidth control on the WO-91A to .5 (4.5 Mc).

3. Set up the square-wave generator to provide a 1000-cps signal and connect the WG-300A probe tip to the output terminal. Adjust the output control on the generator for 2 to 3 inches vertical deflection on the WO-91A screen.

4. Adjust controls on the WO-91A to lock in two square waves.

5. With a neutralizing tool, set C1 in the WO-91A to its mid-range position.

6. Loosen the threaded nut on the tip of the probe. Slowly rotate the probe tip for the best square-wave pattern on the scope screen. Tighten the nut.

7. Adjust C1, if necessary, to improve the square-wave pattern.

Sweep-Oscillator Adjustments

Set the band width to "4.5 MC" and the SYNC-H SEL switch to "EXT".

1. Connect the output of an audio-frequency generator, such as the WA-44A, to the V INPUT terminal.

2. Set the bandwidth control on the WO-91A to "4.5 MC". Adjust the V RANGE and V CAL controls for 2 to 3 inches vertical deflection. Set the SWEEP control to "TV H".

3. Tune the audio generator to 6500 cps. With a screw driver, adjust potentiometer R89 to lock in a single sine wave on the screen.

4. Set the SWEEP control to "TV V" and tune the generator to 25 cps. Adjust potentiometer R90 to lock in a single sine wave.

5. Set the SYNC-H SEL to "INT-". Adjust the audio oscillator and the SYNC ADJ control to lock in five waveshapes. Then, adjust C27 until the "tail" on the left side of the sweep trace just disappears. The right-hand edge of the trace should slope downward on "INT-" and upward on "INT+".

RCA Repair Service

RCA maintains a complete repair service for the adjustment, calibration, and maintenance of RCA test equipment. If it becomes necessary to service this equipment, the report forms enclosed in this booklet should be filled out as described. It is important that:

1. Test equipment be packed carefully.
2. A full description of the trouble be included in the report.

Attention to these details will help prevent damage in transit and delay in repairs.