

# RCA WO-91B OSCILLOSCOPE ADJUSTMENT

**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-91B 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 compared with the operating voltages shown on the schematic diagram. Conventional trouble-shooting techniques should be used to locate trouble. Resistance and continuity checks can then be made to isolate the defective section or stage.

## Astigmatism Adjustment

1. Turn on the WO-91B 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. Adjust FOCUS control for sharpest trace.

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, as shown in Figure 23, and is accessible through a hole in the left side of the case.

## Alignment of Vertical Amplifier

Before alignment is attempted, the oscilloscope should be checked to make sure that all tubes and components are in good operating condition. The alignment procedure requires the use of another oscilloscope, such as the RCA WO-33A, a demodulator (rf) probe, such as the RCA WG-350A, a video-sweep generator such as the RCA WR-69A, a video marker source such as the RCA WG-295C, a sine/square wave audio generator such as the RCA

WA-44C, and a VTVM such as the RCA WV-77E, WV-98C or WV-87B VoltOhmysts.

1. Apply power to the instrument and allow at least fifteen minutes for warm-up.

2. Set the controls of the WO-91B as follows: Bandwidth Control, "4.5 MC"; V POLARITY, "+"; SWEEP, "100-1000"; SWEEP VERNIER, middle range; H GAIN, adjust for 4-inch trace on CRT screen, V RANGE ".5" on red scale; V CAL, maximum clockwise; SYNC-H SEL, "+INT".

3. Measure the voltage from V-2, pin 5 to ground. Adjust R-21 so that 89 volts is measured at this point.

4. Check the calibrating voltage in the WO-91B as follows: Set the Bandwidth Control to "CAL". With the V CAL control turned fully clockwise, the vertical trace should be at least as high as the distance between the two horizontal "CAL" lines on the CRT graph screen. If it is not, measure the voltage at the junction of R-12 and R-13 using a voltage-calibrated WO-33A oscilloscope. Set the V Range switch of the WO-33A to the ".6" position. A peak-to-peak voltage of 2.8 should be measured at this point, indicating that the calibrating voltage in the WO-91B is correct.

5. Set the bandwidth control to the "4.5 MC" position. Connect the WG-300B probe from the WO-91B to the WA-44C Sine/Square Wave Generator. Set the switch on the probe to the "DIRECT" position. Adjust the WA-44C for a 1,000 cps square-wave. Adjust the SWEEP VERNIER control so that approximately 5 square-waves appear on the CRT screen. Set the output of the generator so that the height of the pattern is approximately 3 inches. Note the square-wave response.

6. Set the switch on the WG-300B probe to the "LOW CAP" position. Adjust C-1 so that the quality of the square-wave is identical to that obtained when the probe switch is in the "DIRECT" position.

7. Set the probe switch to the "DIRECT" position. Turn the V RANGE switch to the "1.5" position (on red scale). Adjust SWEEP VERNIER control so that approximately 5 square-waves appear on the CRT screen. Adjust C-3 for best square-wave pattern.

8. Switch the bandwidth control to the "1.5 MC" position. Adjust the output of the square-wave generator so that the trace height is approximately 3 inches. Compare the square-wave to that obtained in step 7, above. Adjust C-3 so that the best possible square-wave pattern is obtained with the bandwidth control in either the "1.5" or "4.5" position.

9. Set the bandwidth control to the "4.5 MC" position, and the V RANGE switch to "5" (on red scale). Adjust the generator output so that a trace height of 3 inches is maintained. Adjust C-5 for best square-wave response.

10. Reset the V RANGE control to the "15", "50" and "150" position (on red scale) and adjust C-7, C-9, and C-11 respectively, for best square-wave response.

11. Adjust the square-wave generator to provide a 55 cycle signal. Set the V RANGE switch to the "1.5" position (on red scale). Set the SWEEP control to the "10-100" position, and adjust the SWEEP VERNIER control so that 3 square-waves appear on the CRT screen. Adjust R-31 and R-33 for best square-wave response.

12. Connect the test equipment as shown in Figure 22. Set the SYNC-H SEL control to "LINE". Adjust the H GAIN control for approximately 3 inches of horizontal deflection.

13. Turn the SYNC-H SEL of the WO-33A to "LINE" and adjust the H-GAIN control for approximately 2 inches of horizontal deflection.

14. Adjust the sweep width of the WR-69A Video-Sweep Generator for approximately 7 MC. Adjust the IF/VF attenuator of the WR-69A and the WO-33A V GAIN control for about 2 inches of vertical deflection on the WO-33A CRT screen.

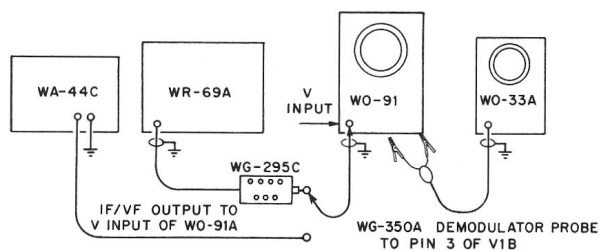


Figure 22. Test setup for alignment of vertical amplifier

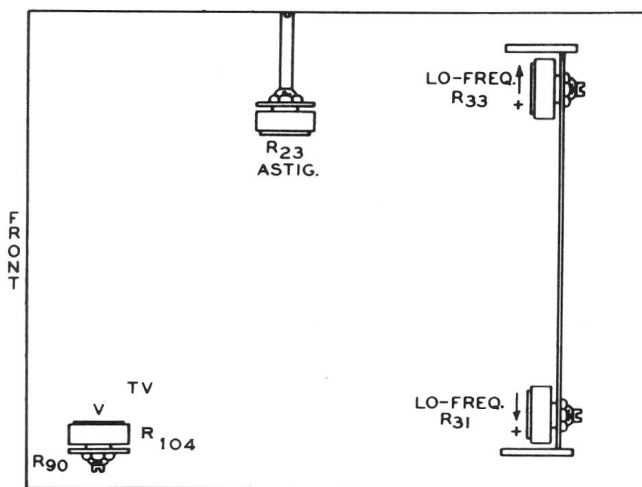
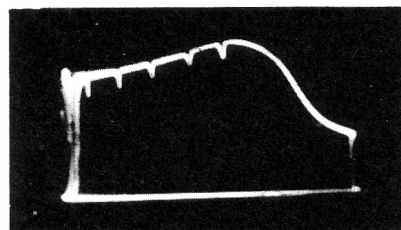


Figure 23. Top of chassis view showing locations of internal adjustments

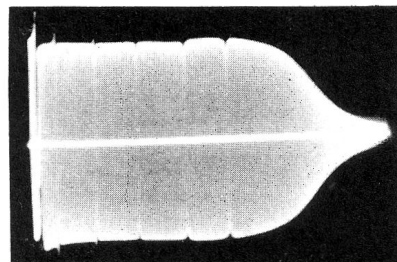
15. Turn the BLANKING control on the WR-69A to "OFF". Adjust the PHASE controls on both the WO-91B and the WO-33A so that the pattern on each scope is in phase.

16. Turn the BLANKING control on the WR-69A to "ON". Adjust L-1 in the WO-91B so that a response pattern like that shown in Figure 24A appears on the WO-33A screen.

17. Disconnect the WO-33A demodulator probe from pin #3 of VIB in the WO-91B. Adjust L-3 and L-4 so that the pattern on the WO-91B screen indicates flattest response out to 5.5 MC, as shown in Figure 24B. The pips provided on the trace by the WG-295C can be used as frequency reference points.



A



B

Figure 24. (A) Waveshape taken from output of cathode follower. (B) Overall response curve of WO-91B when set up for 4.5-Mc bandpass

### Sweep Oscillator Adjustments

1. Set the bandwidth control to the "CAL" position, and the SYNC-H SEL to "INT -". Set SWEEP control to the "10-100" range, and adjust the SWEEP VERNIER control for 2 sine waves.

2. Adjust C-33 until the "tail" on the left side of the sweep trace just disappears.

3. Set the bandwidth control to "1.5 MC". Set the SWEEP control to "TV V" and turn the SWEEP VERNIER control to the center of rotation. Adjust the sine/square-wave generator for a 25 cps sine-wave signal. Adjust potentiometer R-103 to lock in a single waveform.

### 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 provided with the instrument 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.

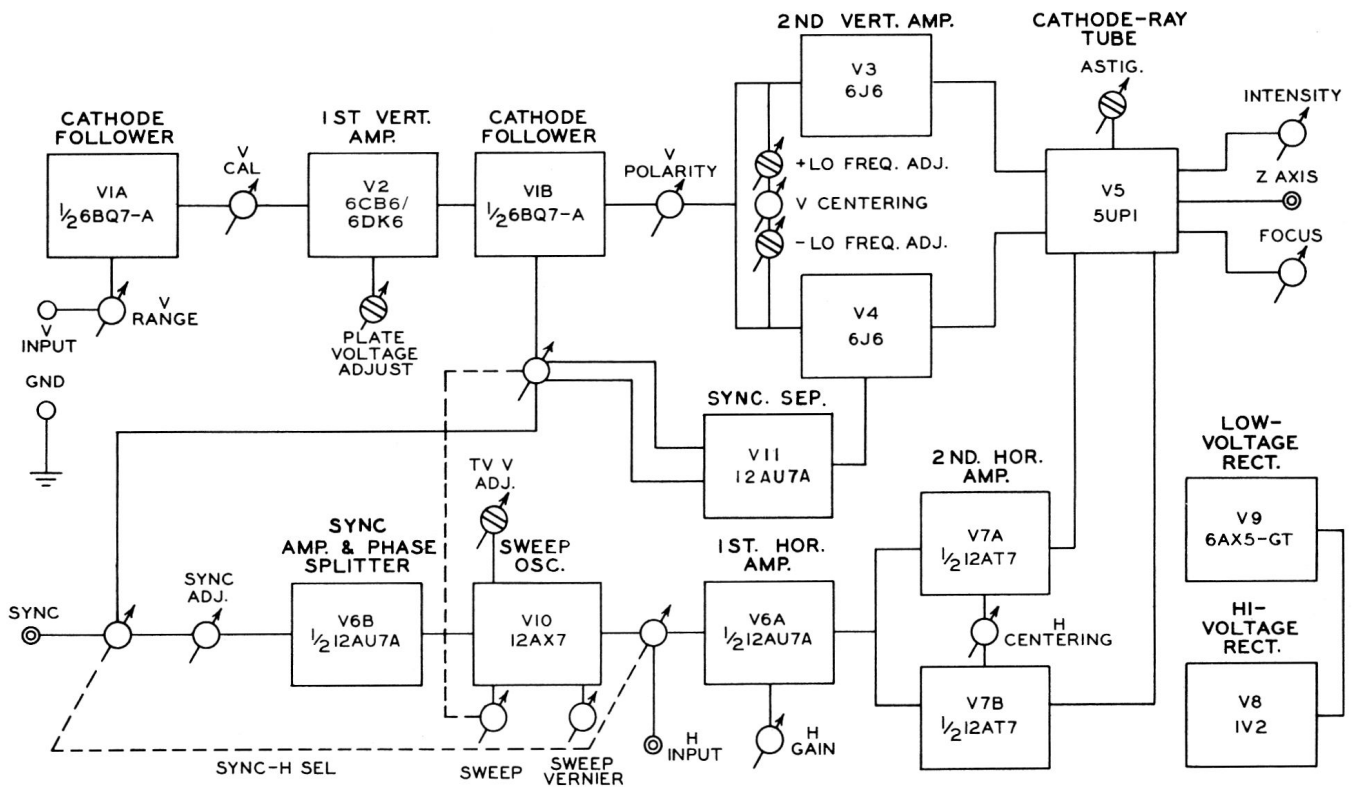


Figure 25. WO-91B Block Diagram