TEKTRONIX USE ONLY

BALANCING THE 540-SERIES VERTICAL AMPLIFIER

Required Equipment:

Type TU-2 Test-Load Plug-in Unit

DC Voltmeter 20,000 Ω/v

Toroid shorting lead

Procedure:

1. Turn the oscilloscope on its side, insert the Type TU-2 Test-Load Plug-in Unit, and permit the instrument to warm up.
2. Short the CRT vertical-deflection plates to determine the CRT electrical center.
3. Attach the toroid shorting lead to pins 1 (control grids) of V1054 and V1064.
4. Remove one of the leads from the voltmeter and insert it in the +225 V banana jack on the TU-2 Test Unit. With the other end of the lead, make contact with pin 2 (cathode) of V1204. Press the +225 V push-button. The unbalance should not exceed 2 mm. Repeat the above procedure with V1184, V1164, V1144, V1124, and V1104; in no instance should the unbalance exceed 2 mm. Return the lead to the voltmeter. *
5. Use the voltmeter to measure the potential difference between pin 1 of V1064 and pins 2 (cathodes) of V1204, V1184, V1164, V1144, V1124, and V1104. The meter should give a bias reading of from a minimum of 1 to 2 volts for each 6DK6.
6. Remove the toroid shorting lead. Switch the voltmeter to the 300-volt scale. With one lead connected to ground, measure the voltage on pins 7 (suppressor grids) of V1204, V1184, V1164, V1144, V1124, V1104, V1214, V1194, V1174, V1154, V1134, and V1114. In each case the meter should give a reading of approximately 175 volts; if less than 165 volts, replace tubes.

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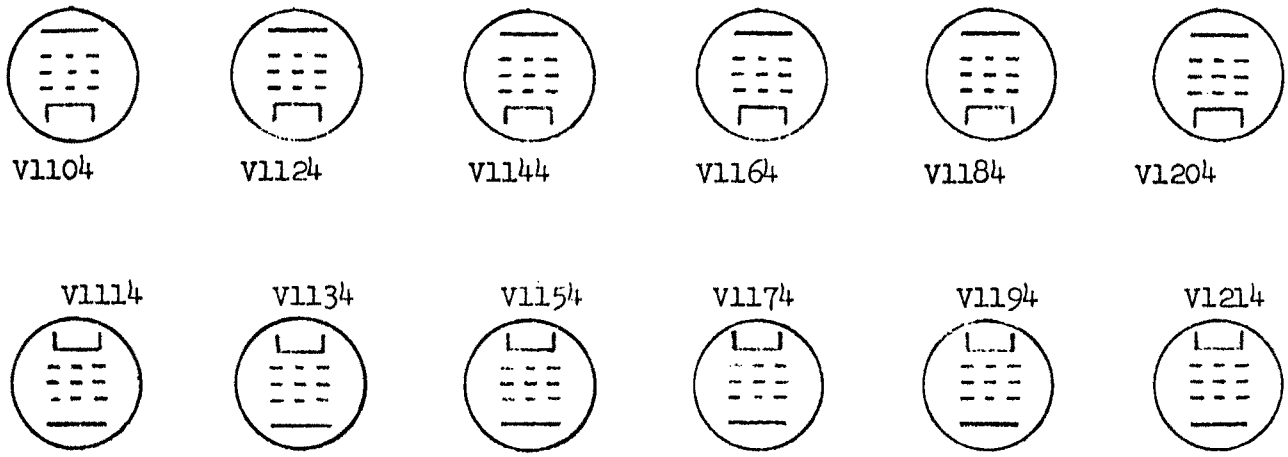
*See NOTE on page 2

7. Short the CRT vertical-deflection plates to determine the CRT electrical center. Next, position the trace at the CRT electrical center with the VERTICAL POSITION control.

8. With the toroid shorting lead, short pins 2 (control grids) of V1033 and V1043. The unbalance should not exceed 0.5 cm.

9. In order to determine the over-all amplifier unbalance, press the ZERO REFERENCE button on the TU-2 Test Unit. The over-all unbalance should not exceed 1.0 cm. If the unbalance is large, but less than 1.0 cm, try reversing the 12BY7's to reduce.

NOTE: When excessive unbalance is noted, it will be necessary to transpose and/or replace tubes. Referring to the diagram below, we may state these general rules:



A. When a tube indicates excessive unbalance, it will be transposed with another tube in the same horizontal row that indicates an excessive unbalance in the opposite direction. For example,

   1. In Procedure, Step 4, V1204 shifts the trace to the right and V1184 shifts it to the left (oscilloscope is on side). Transpose V1204 and V1184.

   2. V1204 shifts the trace to the left, V1184 and V1164 indicate proper balance, and V1144 shifts the trace to the right. Transpose V1204 and V1144.

B. When two tubes in the same horizontal row indicate excessive unbalance in the same direction, one of the tubes will be transposed with its paired tube, and then the two tubes (same horizontal row) will be transposed. For example,

1. V1184 shifts the trace to the right and V1144 also shifts the trace in the same direction. Transpose V1144 and V1154; the unbalance, as indicated by V1144, should now be in the opposite direction. Transpose V1144 and V1184.

If unbalance cannot be remedied by judicious transposition of tubes, it will become necessary to replace the tubes, either singly or in pairs, with aged tubes.

LL/ck
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