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**Hickok 539B/C Transconductance Tube Tester Checkout and Calibration**

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Use this procedure to test and calibrate the Hickok Model 539B or 539C transconductance tube tester. All of the readings are taken with a 1000 ohms per volt meter. If an accurate 1000 ohms per volt meter is not available a modern high impedance analog or digital voltmeter can be used with appropriate shunt resistors in parallel with the input to simulate proper loading. The following resistor values should be used: 10 volt scale use 10K, 50 volt scale use 51K, 200 volt scale use 200K. All resistors are 1/2 watt 5% carbon composition. Calibration will be easier if you supply AC power through a constant voltage regulation type transformer to do the tests, but this is not essential.

For the identification and location of adjustments refer to the ADJUSTMENT CHART and UNDERSIDE VIEW at the end of this document.

Remove the screw from the bottom of the case. Remove all of the screws around the outside of the panel that hold the tester to the case. Remove the tester from the case and set it up on spacers so that the front panel is facing up in the normal operating position. Before applying power adjust the mechanical zero on all of the meters to set the pointers exactly at the zero line on the scale.

LINE ADJUST METER

1. Plug in the AC power cord and turn the POWER switch on. Connect an AC voltmeter across the AC supply and read the voltage. Push button P7 LINE TEST and verify that the AC panel meter, just above the power switch, reads the correct supply voltage. It is important that this meter reads correctly or the calibration procedure will be erroneous. When the panel meter is verified to be correct release the P7 button. Rotate the POWER ADJUST control until the AC panel meter needle is exactly over the red line. Remove the external AC voltmeter from the AC supply.

SHUNT POSITION  
2. Rotate the SHUNT control fully counter clockwise and verify that the pointer lines up with the 0 mark on the scale.

SHORTS TEST  
3. Set the SHORTS switch to the TUBE TEST position and the SHORT TEST switch to the OTHER TUBES position. Set both the CATHODE and the SUPPRESSOR switches to the number 1 position. Rotate the SHORTS switch counter clockwise. The SHORTS lamp should light in all positions except number 1. Repeat the procedure setting both the CATHODE and SUPPRESSOR switches simultaneously in positions 2 through Z. Return the SHORTS switch to the TUBE TEST position.

SHORTS LIGHT SENSITIVITY   
4. Set the CATHODE SWITCH to position 8 and the PLATE switch to position 3. Connect a 300K, 1/2 WATT, 5% resistor between pins 8 and 3 of the octal socket. Rotate the SHORTS switch counter clockwise to position 4. The SHORTS lamp should be glowing or flickering dimly. Rotate the SHORTS switch to the TUBE TEST position and disconnect the 300K resistor.

LEAKAGE RESISTANCE METER TEST   
5. Connect a 1MEG, 1/2 WATT, 5% resistor between pins 8 and 3 of the octal socket. Rotate the SHORTS switch clockwise to position D. The main meter should be reading approximately 1MEG ohms on the resistance scale. Rotate the SHORTS switch back to the TUBE TEST position and disconnect the 1MEG resistor.

Set up the tester for the remainder of the tests by setting the switches to the following positions:

NORMAL/SELF BIAS= NORMAL

VR VOLTS & MILS CONTROL= COUNTERCLOCKWISE

BIAS RANGE= 50V

BIAS VOLTS/VR VOLTS & MILS (toggle switch)= BIAS VOLTS

BIAS VOLTS CONTROL= COUNTERCLOCKWISE

METER= NORMAL

SELECTORS:

FILAMENT= H SCREEN= 4

FILAMENT= S CATHODE= 8

GRID= 5 SUPPRESSOR= 1

PLATE= 3

SHORT TEST= OTHER TUBES

SHORTS= TUBE TEST

CATH. ACT.= NORMAL

SHUNT= 0

FILAMENT= 6.3

PLATE VOLTS= NORMAL

FUNCTION SWITCH= C (15,000)

FILAMENT VOLTAGE TEST   
6. Connect an AC voltmeter to pins 2 and 7 of the octal socket. While observing the reading on the meter, rotate the FILAMENT switch from the minimum through the maximum voltage positions and verify that the voltage agrees with the setting. The readings should be within +-10% of nominal. Set the FILAMENT switch to the 10 volt position. Set the CATHODE ACTIVITY switch to the TEST position. The filament voltage should drop by about 10%. Return the CATHODE ACTIVITY switch to the NORMAL position and set the FILAMENT switch to the 6.3 volt position.

PLATE VOLTAGE TEST   
7. Connect the negative lead of a DC voltmeter to pin 8 of the octal socket. Connect the positive lead to pin 3. Push the P4 GM button and read the voltage. Normal plate voltage is 150 volts. Release P4. Set the PLATE VOLTS switch to the LOW position and press P4. The reading should be 65 volts. Release P4 and return the PLATE VOLTS switch to the NORMAL position.

SCREEN VOLTAGE TEST   
8. Move the positive lead of the DC voltmeter to pin 4 of the octal socket. Push P4 and read the screen voltage. Normal is 130 volts. Hold P4 and press P1. The reading should drop to 56 volts. Release P1 and P4.

BIAS VOLTAGE TEST   
9. Move the positive lead of the DC voltmeter to pin 5. Set the BIAS RANGE switch to the 50V position. Adjust the BIAS VOLTS control fully clockwise. Verify that the maximum voltage is -40 volts. Return the BIAS VOLTS control to the counter clockwise, zero volts, position and disconnect the meter.

GRID SIGNAL VOLTAGE TEST   
10. Connect an AC voltmeter to pins 8 and 5 of the octal socket. Set the FUNCTION switch to positions A (60,000) through F (600) and verify that the voltages are: A=.25, B=.25, C=.25, D=.50, E=2.5, F=1.0 volts AC.

V.R. VOLTMETER TEST   
11. Set the FUNCTION switch to the H (V.R. TEST) position. Connect the negative lead of a DC voltmeter to pin 8 of the octal socket. Connect the positive lead to pin 3. Push P4 and read the voltage. Adjust the V.R. VOLTS & MILS control for a reading of 150 volts. Verify that the main panel meter reads 150 volts. Release P4. Set the V.R. VOLTS & MILS control to zero.

V.R. MILLIAMPERE METER TEST   
12. Set the BIAS VOLTS/VR VOLTS & MILS (toggle switch) to the VR VOLTS & MILS position. Connect a 2000 ohm, 5 watt, 1% resistor across the DC voltmeter used in the last test. Push P4 and adjust the V.R. VOLTS & MILS control for a reading of 100 volts. Verify that the V.R. VOLTS & MILS meter is reading 50 milliamperes. Release P4, disconnect the DC voltmeter and remove the 2000 ohm resistor. Return the BIAS VOLTS/VR VOLTS & MILS (toggle switch) to the BIAS VOLTS position. Set the VR VOLTS & MILS control fully counterclockwise.

MUTUAL CONDUCTANCE READING TEST   
13. Verify that the panel switches are set up to the conditions as given in the list at the beginning of this section, (HS 5348-1) FILAMENT at 6.3 volts. For the following mutual conductance tests you will need to set up an isolated current limited source of AC voltage. Use the setup drawing in figure 1 to connect the equipment to the tester. Be careful because improper connection can cause serious damage. Connect the source to pins 8 and 3 of the octal socket. If the main meter deflects downward instead of up when you perform the test, swap the connections to pins 8 and 3. All voltages are measured directly across the secondary of the isolation transformer.

**Figure 1**

Set the FUNCTION switch to each of the positions shown in the chart below. Push P4 and adjust the voltage source as indicated in the chart. Observe the reading on the main meter and verify that the reading matches the value given in the chart. After each reading set the voltage back to zero, release P4 and go to the next setting.

FUNCTION VOLTAGE METER READING

A 50.0VAC 1000 on 3000 scale

B 25.0 1000

C 12.5 1000

D 10.0 1000

E 25.0 1000

F 06.3 Full Scale

MUTUAL CONDUCTANCE CALIBRATION, F (600) SCALE   
14. Rotate the FUNCTION switch to the F (600) position. Push P4 and adjust the external AC voltage source to 6.30 volts. If the main meter is not reading full scale, adjust R8 for full scale deflection. Set the AC voltage back to zero, release P4 and disconnect the AC voltage source.

MUTUAL CONDUCTANCE CALIBRATION, A (60,000) through E (3000)   
15. Set the FUNCTION switch to the C (15,000) position. Set the BIAS RANGE switch to the 10 volt position. Insert a calibrated \*6L6 tube into the octal socket and allow it to warm up for a minimum of 5 minutes. Adjust the AC line voltage if necessary. Adjust the BIAS VOLTS control to 3.0 volts. Push P4 and observe the mutual conductance reading. If the reading is more than one division high or low of the calibration value of the tube, adjust R15 to make the reading agree. Be sure that the tester is blocked up and resting in its normal operating position or the meter calibration may be inaccurate. Release P4 and remove the 6L6 from the octal socket. Switch off the AC power to the tester and disconnect the power cord. Reinstall the tester in the cabinet.   
\*Calibrated 6L6, Hickok part number 20877-1.

ADJUSTMENT CHART   
1. LINE ADJUST METER: No adjustment. High readings can be brought into calibration by the addition of a selected resistor placed in series with a meter lead. Low readings cannot be raised.

2. SHUNT POSITION: Loosen the set screw on the knob and reposition the knob to the correct location. Retighten the set screw.

3. No adjustment.

4. SHORTS LIGHT SENSITIVITY: Perform the test and adjust R45 until the SHORTS light just comes on.

5. No adjustment.

6 No adjustment.

7. No adjustment

8. For the model 539B, the adjustment for the lower screen voltage is made by loosening the screw on the left sliding tap of R18 and sliding it to the position which gives the correct reading. For the 539C this setting is not adjustable. This adjustment will also effect the maximum bias voltage which is tested in the next step.

9. If necessary, adjust the maximum bias voltage by loosening the screw on the right sliding tap of R18 and sliding it to the position which gives the correct reading. This adjustment will also effect the screen voltage which was tested in the previous step and the screen voltage should be retested if an adjustment is made.

10. No adjustment.

11. Calibration of this function is controlled by the 600 ohm spool resistor R42.

12. Calibration of this function is controlled by the 2 ohm spool resistor R44.

13. No adjustment.

14. Adjust R15.

15. Adjust R8.