THE

HICKOK

ELECTRICAL
INSTRUMENT
COMPANY

OPERATING INSTRUCTIONS
DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER
MODEL 6000
READS DIRECTLY IN MICROMHOS

CHOICE OF THE EXPERTS
FOR SPEED, ACCURACY
and DEPENDABILITY...

OPERATING INSTRUCTIONS

FOR

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

MODEL 6000

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10514 Dupont Avenue - Cleveland, Ohio

2490-306

FUSE IN BIAS CIRCUIT

This tube tester is equipped with a fuse in the Grid Bias Circuit as a protection for the Bias potentiometer in case an attempt is made to test a shorted tube.

NOTE: ALWAYS MAKE SHORT CHECK BEFORE MAKING QUALITY TEST.

The fuse is mounted in the main control panel where is is readily visible.

A burned out bias fuse lamp will result in the failure of the mutual conductance meter to read when the TEST button is pressed. If the fuse lamp burns out, replace only with a No. 49 panel lamp.

NOTE: A socket adapter is available for testing sub-miniature 7 pin in-line and 8 pin round tubes.

Hickok Code No. 1050-94

OPERATING INSTRUCTIONS

FOR

DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER

MODEL 6000

READ THESE INSTRUCTIONS THROUGH BEFORE ATTEMPTING TO OPERATE THE TESTER

1. PURPOSE

   A. The Model 6000 Tube Tester is used to test and measure mutual conductance values of vacuum tubes used in television and radio receivers and transmitting tubes delivering less than 25 watts of power.

   B. The Model 6000 Tester is fundamentally of the Dynamic Mutual Conductance type designed to provide either REPLACE-GOOD readings or mutual conductance values in micromhos.

   C. This instrument is designed to operate on 60 cycles, 105-125 volt power source.

2. There are two rectifier tubes, an 83 and a 5Y3GT, necessary to operate this tester. They are included. The fuse lamp is a standard #81 auto lamp.

   There is a BIAS FUSE located near the BIAS dial. This serves as a protection for the bias potentiometer in case it is attempted to test a shorted tube. Replace only with a No. 49 panel lamp. Always check tubes for shorts before making mutual conductance test.

3. POWER-LINE ADJUST

   This control, when turned clockwise from the OFF position, will turn the power ON and cause the meter pointer to move up scale. Adjust the control until the meter pointer rests exactly over the mark, LINE TEST, at the center of the meter scale. This establishes standard voltages on the tube to be tested. Make final adjustment after tube to be tested is placed in socket.

4. ROLL CHART COLUMNS

   A. Tube Type (first column)
   The roll chart consists of two sections each with seven columns. Rotate the chart until the number of the tube to be tested appears in the window.

B. Fil (Second column)
The switch marked FILAMENT in the upper left corner of panel sets the proper voltage for the filament of tube to be tested.

C. Selectors (Third Column)
This row of seven switches across the panel just above the roll chart is for the purpose of conducting voltages to the base pins of the tube. This column consists of letters and numbers. EXAMPLE: JR-6237-5. Starting at left the first knob is turned until it points to the letter J, the second knob turned to R, the third knob to 6, the fourth to 2, the fifth to 3, the sixth to 7, and the seventh to 5.

D. Bias (fourth column)
This dial located to the left of socket panel, adjusts the voltage to the grid of the tube under test.

E. Shunt (fifth column)
This dial located on the left of socket panel controls the sensitivity of the indicating meter.

F. Function and Mutual Conductance (sixth column)
This switch, located at lower left of indication meter, selects the proper plate and screen voltages for the tube under test.

G. Notations (seventh column)
Special notes pertaining to the testing of the tube under test will appear in this column.

5. SHORTS

Located under a light shield in the center of the panel, are five glow lamps, these lamps will glow when tester is turned on and adjusted to line test.

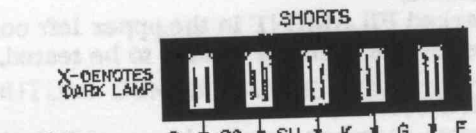
If any elements of the tube under test are shorted, the glow in one or more of the lamps will disappear. Shorted tubes should be discarded without further testing.

If by error two or more of the seven selector switches are set at the same position or number, a false short indication may result.

6. QUALITY CHECK

If the tube passes the shorts test, the red button marked TEST is pressed and the meter should indicate the condition of the tube.

LOCATING SHORTED ELEMENTS



SHORTED	P	SG	SU	K	G	F
FIL. - CATH.					X	X
FIL. - GRID						X
FIL. - SCRN.			X	X	X	X
FIL. - PLT.	X		X	X	X	X
FIL. - SUP.				X	X	X
CATH. - GRID					X	
CATH. - SCRN.			X	X		
CATH. - PLT.	X		X	X		
CATH. - SUP.				X		
GRID - SCRN.			X	X	X	
GRID - PLT.		X	X	X	X	
GRID - SUP.				X	X	
SCRN. - PLT.		X				
SCRN. - SUP.			X			
PLT. - SUP.		X	X			

7. MUTUAL CONDUCTANCE

The SHUNT setting is used if it is desired to read the value of the tube on the RED-GREEN scale of the meter. When using the Red-Green scale the micromho readings are disregarded; however, it is the micromho characteristic of an amplifier tube that causes the meter deflection.

NOTE: Tubes having less than 500 micromhos cannot be made to read in the GREEN sector of the meter scale. (Such tubes list micromho readings only and are good if the reading is above a specified minimum)

Micromhos are indicated in three ranges: 0-3000, 0-6000, 0-15,000.

a. On the shunt dial are three dots stamped into the metal and filled with red lacquer. These dots are the points used in setting the micromho ranges.

b. The dot near 73 on the dial is the setting point for the 3000 micromho scale.

c. The dot near 86 is the point for the 6000 micromho scale.

d. The dot near 93 is the point for the 15,000 micromho scale.

e. When reading micromhos the RED and GREEN sectors of the meter scale are disregarded.

f. Tubes having more than one section such as the 6J6, require different switch settings for each section.

8. RECTIFIER TUBE TEST

a. Rectifier tubes, including diode tubes and diode sections of multiple element tubes, having no mutual conductance are tested for emission only. Good diodes will cause the pointer of meter to move above the point marked DIODES OK.

In checking thyratrons, such as the 884 and the 885, the BIAS DIAL should be set initially at its highest negative value (100). The test button is held down while the bias dial is gradually turned counter clockwise until the tube "strikes", that is, begins to conduct which is indicated by a sudden deflection of the meter. The chart indicates the approximate point at which the tube strikes. There may be a small variation above or below this point. After it strikes, a good tube should produce a steady meter reading in the green sector of the scale.

9. GRID CURRENT (gas) TEST

Amplifier tubes can be tested for grid current by pressing button marked GAS while holding red TEST button down. Some tubes develop gas after being heated for a period of time. If a tube is suspected, allow it to heat for several minutes. During gas test, the meter reads grid current up to 100 microamps.

Each small division represents 1-2/3 microamps, and a cross reference to Army and Navy standards indicates most tubes with grid currents in excess of 2 microamps are considered undesirable. Therefore, reject a tube which shows a grid current in excess of about 2 small divisions.

10. FILAMENT CONTINUITY

After the filament voltage and the filament selectors are set the tube can be inserted in its socket and the continuity of its filament checked by pressing the button marked FILAMENT CONTINUITY. If the filament is open the meter will drop back to zero, if it is not open the meter will remain at line test and you can continue to set up the remaining switches and controls without removing the tube from socket.

11. SOCKETS

Elaborate field study has established that over 95% of all tubes in active use can be tested in the six standard sockets supplied with this equipment. However, to accommodate the testing of older tubes, foreign tubes, special purpose tubes, etc., low cost adapters are available to quickly plug in place, in eleven pin socket mounted beneath the panel. This new Hickok feature of replaceable socket adapter plates greatly facilitates replacement of these sockets when they become worn from excessive use.

To change socket adapter places remove the two large head screws at the left

and right edge
and right edge of socket panel and lift adapter from panel.

SOCKET NUMBERING

Sockets are wired in agreement with the EIA system of numbering. The No. 1 contact of the inline socket is indicated by a small red dot.

12. SPECIAL NOTES

Power line voltage varies with different localities. It may also vary with different hours of the day.

While a national survey indicated that the average voltage for the USA is about 117 volts, it does not mean that every locality maintains a constant voltage at that level.

Occasionally we have had the complaint that a used tube will test GOOD, but will not work in the radio receiver; but a NEW tube is substituted and the receiver will operate correctly. The answer is this: Tubes are built to specifications. Our tube testers are designed to test tubes in conformity with these specifications.

The used tube that would not perform in a certain receiver was not receiving its specified filament voltage. The new tube performed because of its initial reserve capacity. The used tube would have performed if it had received its specified filament voltage.

Tube failure frequently occurs in A. C. -D. C. sets where several tubes are connected with their heaters or filaments in series. Sometimes, even though the power line voltage is normal filament voltage, the robbed tube apparently fails but when tested under specified conditions, the tube will test GOOD.

13. The versatility of the Hickok Dynamic Mutual Conductance Tube Tester makes possible a special test that will reveal a tube's ability to perform under adverse conditions as mentioned above. This is possible because the tester measures mutual conductance instead of emission.

THE TEST

A. Measure the mutual conductance in the ordinary way.

B. Press test and adjust the shunt dial until the tube reads in the GREEN (good) sector at 2000 on the 0-3000 scale.

C. While holding everything else constant, reduce the FILAMENT voltage and note new reading.

D. If the meter still reads in the GREEN (good) sector, the tube has a large life reserve and will perform satisfactorily.

E. The filament voltage reductions to be made are shown in the following table:

NORMAL FIL VOLTS	REDUCE TO
1.5	1.1
2.0	1.5
2.5	2.0
3.0	2.5
5.0	4.3
6.3	5.0
10.0	7.5
12.6	10.0
35.0	25.0
50.0	35.0

AUTOMOBILE RADIO TUBES

It often happens that automobiles operated at night with radio, light, fans, etc., all turned on at the same time, put such a severe load on the auto battery that the battery is unable to deliver full voltage, especially in slow moving traffic or when waiting for traffic lights. If auto radio trouble is experienced much time can be saved by first checking the tubes at 6.3 volts, then switching the filament voltage to 5 volts. If tube reading drops markedly at 5 volts, the tube should be replaced.

If the automobile has 12 volts radio system, first check the tubes at 12.6 then drop to 10 volts for recheck.

CHECKING TRANSISTORS AND DIODES ON THE MODEL 6000

Transistors - PNP - NPN

Testing Junction and Point Contact transistors:

Rotate FUNCTION SWITCH to position "H".

1. Insert the transistor to be checked in the proper socket, PNP or NPN. Consult manufacturer's data to determine the type. Transistors can be damaged if inserted in wrong socket.

2. SHUNT dial is adjusted until meter reads full scale (or to the maximum reading possible if transistor will not cause meter to read full scale). If meter fails to read, transistor is open or defective.

3. Push slide switch from GAIN to LEAKAGE position. Meter will now read leakage current. If reading is in the POOR area, the transistor should be discarded.

Rectifiers - Copper Oxide, Selenium, and Silicon

The red (+) and black (-) jacks, located near the transistor test sockets are used to check the forward to reverse conduction ratio of rectifiers. Rectifiers must be disconnected from circuit when testing.

1. The positive terminal of the rectifier is connected to the black (-) jack. The negative terminal of the rectifier is connected to the red (+) jack. When connected this way the rectifier is biased in the forward direction.

2. Rotate FUNCTION SWITCH clockwise to "H" position.

3. Adjust shunt dial for full scale deflection of meter (100%).

4. Connections to rectifier are then reversed, rectifier is then biased in reverse direction. Rectifiers that read 10% or more in reversed direction are probably defective and should be replaced.

Diodes - Silicon and Germanium

1. Diodes are checked by the same procedure as testing rectifiers, because they rectify but do not handle large currents like power rectifiers.

Some knowledge of the characteristics of the diode being tested will help because some high conduction diodes used in video detectors can be rated good if they produce a 10:1 (10%) forward to reverse conduction ratio.

PARTS LIST FOR MODEL 6000 TUBE TESTER

NOTE: There is a minimum charge of $1.50 for any parts order.

HICKOK CODE NO.	NAME AND DESCRIPTION
1050-71	ADAPTER, standard sockets
2490-306	BOOKLET, Instructions
2920-7	BUTTON, Push, black
2920-8	BUTTON, Push, red
3095-41	CAPACITOR, 5 mfd, 200 v, paper
3105-192	CAPACITOR, 50 mfd, 6 v. DC, electrolytic
3200-59	CHART, roll, tube data
4160-67	DIAL, Bias
4160-73	DIAL, Shunt
11505-46	KNOB
11500-11	KNOB, with pointer
12270-2	LAMP, Fuse line, #81 auto
12270-17	LAMP, Fuse, bias #49, .06 amp., 2 v. bayonet
660-099	METER, 66K, 0-100 microamps
16925-213	POTENTIOMETER, 250K, Snap-in type
16926-4	POTENTIOMETER, shunt, 150-150 ohms
16926-5	POTENTIOMETER, Bias, 3000 ohms
18422-122	RESISTOR, 1200 ohms, 1W, 10%
18423-151	RESISTOR, 15,000 ohms, 1W, 5%
18525-427	RESISTOR, 500 ohms, $\frac{1}{2}$W, 1%
18525-544	RESISTOR, 12 ohms, $\frac{1}{2}$W, 1%
18536-39	RESISTOR, 291 ohms, $\frac{1}{2}$W, 1%
18535-5	RESISTOR, 200 ohms, 2W, 1%
18575-12	RESISTOR, 1800 ohms, 10W, 10%
18575-19	RESISTOR, 100 ohms, center tapped, 10W, 10%
18575-89	RESISTOR, 8500 ohms, 10W, adjustable
18414-102	RESISTOR, 100K, $\frac{1}{2}$W, 10%
18414-472	RESISTOR, 470K, $\frac{1}{2}$W, 10%
18415-562	RESISTOR, 5.6 Megohms, $\frac{1}{2}$W
18412-332	RESISTOR, 3300 ohms, $\frac{1}{2}$W
18750-27	RHEOSTAT, 150 ohms, Ohmite "D" with #352 OFF position
19910-116	SWITCH, push button, gang, OAK
19912-333	SWITCH, Function, 3 section, 7 position
19912-336	SWITCH, Selectors, Filament, Grid 1 section, 12 position
19912-337	SWITCH, Selectors, Cathode and suppressor, Plate & Screen 1 section, 12 position
19912-338	SWITCH, Filament, 1 section, 20 position
20800-197	TRANSFORMER, power
20875-6	TUBE, 5Y3GT/G
20875-28	TUBE, #83
19350-156	SOCKET, Octal wafer, Cinch #11961
19350-157	SOCKET, 4 pin, wafer, Cinch #X154