

HICKOK

OPERATING INSTRUCTIONS
for
DYNAMIC
MUTUAL CONDUCTANCE
MULTI-TESTER
Model 534

Hickok
Dynamic Mutual
Conductance Tester

Reads Directly In
MICROMHOS

PRICE 50 CENTS
PER COPY

Manufactured by

THE HICKOK ELECTRICAL INSTRUMENT COMPANY

10514 DUPONT AVENUE • CLEVELAND 8, OHIO

OPERATING INSTRUCTIONS
FOR
MODEL 534
MULTI-TESTER

THE HICKOK ELECTRICAL INSTRUMENT COMPANY

10514 Dupont Ave.
Cleveland 8, Ohio

HICKOK MODEL 534 MULTI-TESTER

PACKER'S CHECK

MODEL 534 MULTI-TESTER

SERIAL NUMBER _____
INSTRUCTION BOOK, MODEL 534 _____
DATE _____
SIGNED _____

PACKER

NOTE

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO OPERATE THIS MULTI-TESTER.

SECTION I DESCRIPTION

1. PURPOSE.

a. The Model 534 Multi-Tester is used to test and measure mutual conductance values of vacuum tubes used in radio receivers and transmitting tubes delivering less than 25 watts of power. It is used also as a complete radio set analyzer measuring volts, ohms, milliamperes, microfarads, decibels etc.

b. The Model 534 Multi-Tester is fundamentally of the Dynamic Mutual conductance type designed to provide either REPLACE - GOOD readings or mutual conductance values in micromhos. Provision is made for locating shorts and leakages between tube elements. A sensitive noise test is also provided.

c. Mutual conductance values in three ranges can be measured: 0-3000, 0-6000, and 0-15,000 micromhos. Included is an ENGLISH reading range. By means of this range, a good tube will cause the pointer of the indicating meter to rest in the GREEN (GOOD) section of the meter scale. A bad tube will read in the RED (REPLACE) or doubtful (?) sector.

d. Gas Test: Provision is made to test amplifying vacuum tubes for gas content. Gassy tubes will ruin the automatic volume control or intermediate stages of a radio receiver.

2. TUBE COMPLEMENT.--The Model 534 requires one #83 mercury vapor rectifier, one 5Y3GT vacuum rectifier and two 6H6 diode tubes for its operation. These tubes are supplied and installed in the multi-tester. The fuse lamp is a stan-

dard #81 auto lamp. The neon lamp is a G.E. 1/4 watt, 105-125 volts, candelabra base.

SECTION II FUNCTIONS OF THE COMPONENTS USED AS A TUBE TESTER

3. LINE VOLTAGE ADJUSTMENT.-- The Model 534 Multi-Tester operates from A.C. power lines of 105 to 125 volts, 60 cycles. Turn the Master Switch in the jack panel at the upper left corner of the Model 534 control panel to the point designated TUBE TEST. After the power is turned on, press the push switch P7 (LINE ADJ.) which will cause the indicating meter pointer to move up scale. The button P7 is held down and the knob, LINE ADJUST, is turned until the meter pointer rests exactly over the mark, LINE TEST, at 1500 on the meter scale. This establishes standard voltages to the tube elements. This adjustment is made with the control settings properly arranged for the tube being tested and with the tube in its test socket.

4. SELECTORS.--The row of selector dials across the center of the control panel is for the purpose of conducting proper voltages to the tube's base pins. The operation of setting these dials is similar to DIALING A TELEPHONE NUMBER. On the roll data chart, below the word SELECTORS, appear the dialing numbers. These dialing numbers consist of two letters and five figures. Example: JR-6237-5. Starting at the left, the first dial is turned until the letter "J" appears through the window. The second dial is turned until "R" appears. The

third dial indicates 6; the fourth, 2; the fifth, 3; the sixth, 7 and the seventh, 5. The lettered dials control the filament or heater connections. The numbered dials control the GRID, PLATE, SCREEN, CATHODE and SUPPRESSOR in that order. In the example given above the heater terminals are connected to pins 8 and 1. The GRID is connected to pin 6; PLATE, to pin 2; SCREEN, to pin 3; CATHODE, to pin 7 and SUPPRESSOR, to pin 5.

These dial switches are electrically interlocked in such a way that it is impossible to connect two different voltage elements to the same pin. Thus accidental shorts are avoided.

The dialing system is designed so that a minimum of dial setting is required. For example, the heater setting is practically always JR so that these two dials seldom need resetting. It will also be noticed that when testing duo-diode triode tubes the amount of dialing has been reduced to a minimum.

5. SHORT TEST.--Turning the SHORTS switch successively through the positions 1-2-3-4-5 connects the various pairs of elements in turn across the test voltage. Tubes having shorted elements will complete the circuit and cause the neon SHORT lamp to glow. Tubes may be tested for shorts, either hot or cold.

A short is indicated by a steady glow of the neon lamp in certain positions of the SHORTS switch. A momentary flash of the lamp as the switch is turned from one position to another should be disregarded. This flashing is caused by the charging of a capacitor in the test circuit. A shorted tube should be discarded without further test.

6. LOCATING SHORTED ELEMENTS. -- In the following table (X) under any SHORT switch position indicates that the neon lamp glows in that position.

KIND OF SHORT	1	2	3	4	5
FIL -- CATHODE			X		
FIL -- GRID	X	X			X
FIL -- PLATE	X	X		X	X
FIL -- SCREEN	X		X	X	X
FIL -- SUP		X			
GRID -- CATHODE	X	X	X		X
GRID -- PLATE				X	
GRID -- SCREEN		X	X	X	
GRID -- SUP	X				X
PLATE --- SCREEN		X	X		
PLATE -- SUP	X			X	X
SCREEN -- SUP	X	X	X	X	X

7. NOISE TEST. -- The short test circuit is also used in making noise tests on vacuum tubes. Connections are made from the noise test jacks to the antenna and ground posts of any radio receiver. The tube under test is tapped with the finger as the SHORTS switch is turned through positions 1-2-3-4-5.

Intermittent disturbances which are too brief to register on the neon lamp will be reproduced by the loud speaker as static.

8. GAS TEST.--The push switch P5 (Gas 1) and P6 (Gas 2) are used to test an amplifier tube for gas content.

a. The MICROMHO switch is set on 3000.

b. The push switch P5 is pressed and held down while the BIAS dial is turned to cause the pointer of the indicating meter to read 100 micromhos.

c. P5 is held down and P6 is pressed.

d. If the tube contains gas the meter pointer will move up the scale. If the pointer movement is not more than one small division of the scale the gas content is satisfactory.

NOTE

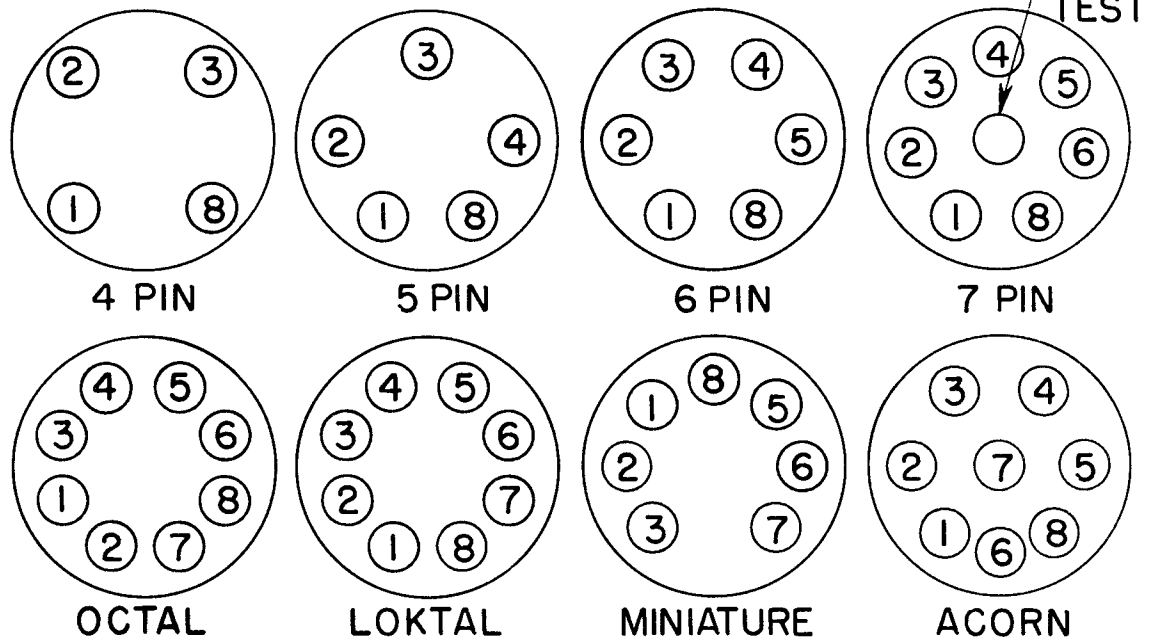
With some tubes, such as the type 45, the micromho reading cannot be brought down to 100 by turning the BIAS dial. In such a case turn the BIAS dial to 100 and test for gas.

Some tubes develop gas after being heated for a period of time. If a tube is suspected, allow it to heat for a few minutes.

9. DYNAMIC MUTUAL CONDUCTANCE.--The push switch P4 is used when testing for mutual conductance value. The indicating meter will register the tube's value in MICROMHOS in three ranges: 0-3000, 0-6000 and 0-15,000. The range to be used is controlled by the MICROMHO switch. When measuring micromhos in any of the three ranges listed above, no setting of the ENGLISH dial is required.

The fourth range, ENGLISH, on the MICROMHO switch is used when it is desired to test the tube in terms of GOOD-

SOCKET NUMBERING BOTTOM VIEWS



REPLACE. In this case the ENGLISH dial must be set in accordance with the figures given on the data chart under the heading, ENG. When using the ENGLISH range, good tubes will cause the meter pointer to read in the GOOD sector. Worn out tubes will read in the REPLACE sector. Those tubes which read in the sector marked (?) have some useful life but should be replaced soon. The ENGLISH reading scale is also based on Dynamic Mutual Conductance. It is not an emission test.

The Micromho values printed on the data roll are average values. A small variation above or below these average values is to be expected even with new tubes.

The ENGLISH scale is designed to make tubes read at the left edge of the GREEN (GOOD) sector when 20% below average for amplifier tubes and 35% below average for power tubes.

10. RECTIFIER TEST. -- The push switches P1, P2 and P3 are used to test various types of rectifier elements.

a. The push switch P1 is used when testing detector diodes. It applies a low voltage which will not injure the

delicate cathode. Good diodes will cause the meter pointer to read above the mark, DIODES OK.

b. Push switch P2 is used when testing cold cathode rectifiers such as the OZ4. This applies a voltage sufficiently high to ionize the tube and start conduction. Good tubes will read in the GREEN (GOOD) sector of the meter.

c. Push switch P3 is used when testing ordinary rectifier tubes such as the 5Y3. This switch applies a medium voltage which is best adapted to reveal defects in this type of tube. Good tubes will read in the GREEN (GOOD) sector of the meter.

NOTE

On the data chart a star (★) following P1, P2, and P3 indicates that the MICROMHO switch is to be set on ENGLISH.

11. SOCKET NUMBERING. -- In order to reduce dialing to a minimum, the sockets in the Model 534 Tube Tester are numbered as shown in Plate 1, which shows

the bottom views. The numerical values of the lettered dials are as follows:

0	----	A	----	P
1	----	B	----	R
2	----	C	----	S
3	----	D	----	T
4	----	E	----	U
5	----	F	----	V
6	----	G	----	W
7	----	H	----	X
8	----	J	----	Y
9	----	K	----	Z

The letter "I" was omitted because of its resemblance to the figure "1". The letter "Q" was omitted because of its resemblance to the figure "0".

12. METER REVERSE. -- Directly below the indicating meter is a switch marked REVERSE-NORMAL. With certain tubes such as the 117N7, the meter, when set on NORMAL, will deflect backwards (to the left) when push switch P3 is pressed for rectifier test. In such a case, turn the meter switch to REVERSE which will cause the pointer to move up the scale. After this test has been made, return the switch to NORMAL.

13. TOP CAPS. -- There are two jacks in the upper center of the control panel marked GRID and PLATE. These are used when making connection to the top cap of the tube being tested. On the data chart in the NOTATIONS column opposite tube types having top caps, is the notation CAP=G or CAP=P. G means that the top cap is connected to the GRID and P, to the PLATE jack.

NOTE

The center of the seven pin socket is used to check pilot lamps. Voltages up to 12.6 are available for pilot lamp test. These voltages are controlled by the filament switch. No further switch setting is necessary.

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

While a national survey indicates that the average voltage for the USA is about 113 to 115 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 when a NEW tube is substituted, 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, a series tube with abnormally high filament resistance will rob its companion tube of its normal filament voltage. The robbed tube apparently fails; but when tested under specified conditions, the tube will test GOOD.

15. The wonderful 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. Set the MICROMHO range switch on ENGLISH.

c. Press P4 and adjust the ENGLISH dial until the tube reads in the GREEN (GOOD) sector at 2000 on the scale.

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

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

f. 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
7.5	6.3
10.0	7.5
12.6	10.0

TO TEST BALLAST TUBES

1. Turn Tester on.
2. Set filament switch to BLST.
3. Set SHORT TEST switch on 1.
4. Set first selector switch (lettered A to K) to letter shown in column marked (first selector switch).
5. ROTATE second selector switch (lettered P to Z) from P to Z. NEON LAMP SHOULD LIGHT IN POSITIONS NOTED.

TUBE TYPE	First Selector	Neon lamp should light in these positions.						
		R	S	T	U	V	W	X
1A1-1B1-1C1-1E1-1F1-1G1-1J1-1K1-1L1-1N1- 1P1-1Q1-1R1G-1S1G-1T1G-1U1G-1V1-1Y1-1Z1-2	J	R						
2UR224	J			T				X
2LR212	H	R	S		U			
3	J	R						
03G	J			T				
4-5	J	R						
6-133	J			T				
6-6AA	J	R						
7-8-9	J	R						
10A-10AG	J			T				
10AB	J			T				X
K17B-M17C-BM17C	J			T				X
M17HG-M17H	J		S					X
	D	R						
K23B-K23C-KX23B-KX30C	J			T				X
M30H	J		S					X
	D	R						
30A-K30A	J			T				
K30D	J	R		T				X
33A-33AG	J			T				
K34B	J			T				X

TUBE TYPE	First Selector	Neon lamp should light in these positions.					
36A	J			T			
K36B-BK36B-L36B-BM-L36C-KX36C	J			T			X
KX36A	J	R					
36D-L36D	J	R		T			X
L36DJ	J	R		T	U		X
K36H-M36H-M36HG	J		S				X
	D	R					
L40S1-L40S2	J	R		T		V	
42A	J			T			
42A1	H				U		
42A2-42B2	H		S		U		
K42B-L42B-M42B-KX42B-LX42B-L42BX-K42C-L42C-M42C	J			T			X
KB42D-K42D-L42D	J	R		T			X
LX42D-L42DX	J	R	S	T			
K42E-L42E	J			T			X
L42F	J						X
	D	R					
42HA-K42HJ-M42H-M42HG	J		S				X
	E	R		T			
KX42C	J			T			X
L42S1	J	R		T		V	
49A-49AJ-K49AJ	J			T			
KX49A	J			T			X
49A1	H				U		
49A2-49B2	H		S		U		
K49B-L49B-M49B-BM49B-K49C-M49C-BM49C-BK49C-K49E-L49E	J			T			X
K49D-BK49D-L49D	J			T			X
	D	R					
L49F	J						X
	D	R	S				X
M49H-M49HG	J	R					
KZ49B-KZ49C	J	R				V	
K49BJ-L49BJ	J			T	U		X
L49S2	J	R		T		V	
49AJ-K49AJ	J			T			
KX49B-LX49B-LX49C	J			T			X
L49DJ	J	R		T	U		X
L49S3	J	R		T		V	
50A2	J	R		T			
50A2MG-50B2	J	R				V	
50X3	J	R					
K52H-M52H	J		S				X
	D	R					

TUBE TYPE	First Selector	Neon lamp should light in these positions.					
K54B	J			T			X
55A-K55A	J			T			
55A1	H				U		
KX55A	J	R					
55B-K55B-M55B-BM55B-L55BG-LX55B	J			T			X
55A2-55B2	H		S		U		
K55C-L55C-KX55C	J	R		T			
K55CP	J			T		V	X
K55D-L55D	J	R		T			X
L55E-M55E	J			T			X
L55F-M55F-BL55F	J						X
	D	R					
K55H-M55H-M55HG	J		S				X
	D	R					
L55S1-L55S2	J	R		T		V	X
60R30G	J	R		T			
64.23	J			T			
67A	J			T			
K67B-L67B	J			T			X
L73B-K74B-L74B-CX74C	J			T			X
80A	J			T			
K79B-K80B-M80B-K80C-KX80B-L80B	J			T			X
K80F	J						X
	D	R					
KX87B-LX87B-L90B	J			T			X
K90F-M90F-K92F-M92F	J						X
	D	R					
92A	J			T			
L92B-95K2	J			T			X
L99D	J	R		T			X
100R8	J			T			X
120R	J	R					
120RS-135K1	J			T			X
135K1A	J			T	U		X
140L4-140L8-140R4-140R8	J	R		T			
140R	J	R					
140L44-140R44	J	R	S	T			
165L4-165R4-165R8	J	R		T			
165R	J	R					
165L44-165R44	J	R	S	T			
185L4-185L8-185R4-185R8	J	R		T			
185R	J	R					
185L44-185R44	J	R	S	T			
200R-250R	J	R					
250R8-290L4	J			T			X
300R4-320R4	J			T			X
340	J	R					
808-1	J			T	U		X
E14980-W43357-W4588-3613	J			T			X
3334-3334A	J	R		T			X
8593-8598-8601-8664	J			T			X
3ER248	J	R		T	U		X
3CR241	J	R		T			X

SECTION III

FUNCTIONS OF THE COMPONENTS USED AS AN ANALYZER

16. The small panel mounted in the upper left corner of the main panel of the Model 534 contains the controls which are used when measuring volts, ohms, milliamperes, microfarads and decibels.

This panel contains 22 jacks and two rotary switches. The analyzer section is entirely independent of the tube tester section but uses the same indicating meter. The rotary switch at the right is the MASTER SWITCH. The switch at the left is the CAPACITY SWITCH.

17. VOLTS D. C.

a. In measuring D.C. volts the meter has a sensitivity of 20,000 ohms per volt. Volts are measured in five ranges 0-20, 0-200, 0-500, 0-1000, 0-5000.

b. Set the master switch on VOLTS D. C.

c. Furnished with the model 534 are two test leads with pin tips on one end and prods on the other end.

d. Insert the pin tips in the jacks giving the proper range. Apply the prods to the source being measured and read the voltage on the VOLTS scale of the meter.

18. VOLTS A. C.

a. In measuring A.C. volts the meter has a sensitivity of 1000 ohms per volt. A. C. volts are measured in the same ranges as D. C. volts and are read on the same scale of the meter.

b. Power must be turned on for A.C. volts in order to heat the 6H6 diode tubes. Approximately 10 seconds are required to heat these tubes.

c. When using the 0-20 volt range set the master switch on VOLTS A.C. 20.

d. When using the 0-200, 0-500, 0-1000, 0-5000 ranges set the master switch on VOLTS A.C. 200-500-1000-5000.

19. OHMS.--Ohms are measured in three overlapping ranges, the center scale readings of which are respectively 75, 7500

and 750,000 ohms. The scale on the meter is read directly when the master switch is set on Ohms X1 and the connecting leads are placed in the corresponding pin jacks. To measure lower resistance, move the connector lead from the pin jack marked X1 to the pin jack marked \pm 100. Then the center scale reading of the meter is 75 ohms. In this position, resistance as low as 1/10 ohm can be estimated. The third range of the ohm-meter multiplies the scale by 100. In this range, the center reading of the scale is 750,000 ohms. The connecting leads are placed in the corresponding pin jacks. In this position, resistance as high as 100 megohms can be measured. To operate, throw the master switch to the range desired. The pointer of the meter will move to the end of the "Ohms" scale marked infinity (INF). By means of the "Line Adjustment" knob bring the pointer of the meter exactly over the "INF" mark. Resistance is then determined by connecting the flexible lead wires to the resistor being measured and noting the reading of the meter on the ohms scale.

20. TO CHECK LEAKAGE OF ELECTROLYTIC CAPACITORS.--Set the master switch on OHMS X 100. Adjust the meter to "INF". Place one connecting lead in the pin jack marked "OHMS 0" and the other lead in the pin jack marked "OHMS X 100". The pin jack marked "0" is to be connected to the negative terminal of the electrolytic capacitor, the X 100 jack is connected to the positive terminal. When connection is made to the electrolytic capacitor, the pointer of the meter will drop back about half-scale then gradually rise to about 2 megohms if the capacitor leakage is normal. If the capacitor is OK for leakage, check for capacity as explained in the following paragraph.

21. CAPACITY.

a. Set the master switch on OHMS X 100 and adjust meter to INF.

b. Turn master switch to VOLTS A.C. 20-CAP.

c. Place the connecting leads in the two jacks marked CAP.

d. For electrolytic condensers set the CAPACITY switch on CAPX1. Capacity can then be read directly in microfarads on the scale of the meter.

e. In checking smaller condensers set the capacity switch on CAP ÷ 10. The meter scale is then divided by 10.

NOTE

Set FIL. switch to OFF when measuring CAPACITY or INDUC-TANCE.

22. INDUCTANCE.

a. In measuring the inductance of choke coils, place the connecting leads in the pin jacks marked "CAP". Adjust the meter as for capacity, see paragraph 21a above. Set the capacity switch on Capacity ÷ 10. Connect the ends of the leads to the terminals of the choke and read the capacity scale on the meter.

b. EXAMPLE - If the meter reads .4 microfarads, divide this into 7.04 which gives 17.6 henries. In like manner, when measuring chokes of any size divide the reading in microfarads into 7.04 which will give the result in henries.

c. Conversion table for Inductance Values.

CAPACITY READING M. F.		INDUCTANCE HENRIES
.1	-	70.4
.2	-	35.2
.3	-	23.4
.4	-	17.6
.5	-	14.1
.6	-	11.7
.7	-	10.1
.8	-	8.8
.9	-	7.8
1.0	-	7.0

23. MILLIAMPERES, D. C.

a. IN MEASURING MILLIAMPERES BE SURE TO TURN THE OFF-ON SWITCH TO "OFF" POSITION.

b. The four jacks -, 5, 20, 200 are used in measuring milliamperes, giving the three ranges 0-5, 0-20, 0-200 M. A.

c. Set the Master Switch on OHMS ÷ 100.

d. Set Capacity Switch on NORMAL.

e. Milliamperes are read on VOLTS scale of the meter.

24. DECIBELS.

a. The term "Decibel" is relative and the point selected for comparison, zero decibels, can be any level of power. However, it has been agreed that zero decibels shall be represented by the power expended by 1.73 volts across a resistance of 500 ohms, or 6 milliwatts. This voltage is the A.C. component, and must be measured by a meter that does not respond to direct current, if direct current is present. This is true of the 0-20 volts A. C. range of the Model 534 Multi-Tester.

A good way, when aligning receivers, is to:

b. Disconnect the voice coil of the speaker.

c. In parallel with the primary of the regular audio transformer connect an audio transformer with a multi-tapped secondary. The multi-tapped transformer should have about 3000 turns in the primary. The turn ratio of each tap should be known.

d. The ratio to be used can be determined from the following formula:

$$T = \sqrt{\frac{R}{500}} \quad \text{Where: } T = \text{turn ratio}$$

$$R = \text{plate resistance of power tube.}$$

e. EXAMPLE 1 - Power tube is a single #45. Then R is 2000 ohms, and -

$$T = \sqrt{\frac{2000}{500}} = 2 = \text{turn ratio}$$

f. EXAMPLE 2 - Power tubes are two #45's in push pull. Then R is 4000 ohms, and

$$T = \sqrt{\frac{4000}{500}} = 2.83 = \text{turn ratio}$$

g. When the proper turn ratio has been determined connect a resistance of 500 ohms across the taps of the transformer which are nearest to the computed ratio. These ratios are not critical so if the computed ratios were 2.83, connection could be made to the 3:1 ratio taps, etc.

h. Connect the 0-20 range of the A.C. voltmeter across the 500 ohm resistor.

The decibel output of the receiver is found by consulting the Conversion Table for Decibels, which is printed below.

CONVERSION TABLE FOR DECIBELS

DECIBELS	VOLTS ACROSS 500 OHMS	RELATIVE LOUDNESS AT 400 CYCLES WITH SAME SIGNAL
10	.55	48.
9	.61	51.
8	.69	54.
7	.77	58.
6	.87	63.
5	.97	67.
4	1.09	73.
3	1.23	79.
2	1.38	85.
-1	1.54	92.
0	1.73	100.
+1	1.94	108.
2	2.18	117.
3	2.45	128.
4	2.75	139.
5	3.08	150.
6	3.46	168.
7	3.88	186.
8	4.35	207.
9	4.88	230.
10	5.47	256.
11	6.12	285.
12	6.89	314.
13	7.74	351.
14	8.68	388.
15	9.74	432.
16	10.93	482.
17	12.26	535.
18	13.76	593.
19	15.44	658.
20	17.32	730.
21	19.43	805.

The sensitivity of the human ear varies with frequency, also with different sound levels. As an average, an increase of 24 decibels in power will produce a sound that appears to be 10 times as loud as the original sound.

A SIMPLE WAY TO EXTEND THE DECIBEL RANGE.--Simply remember that an increase of 20 decibels represents a voltage 10 times as great.

EXAMPLE: Find the voltage corresponding to +25 decibels. Subtract 20 decibels which leaves 5 decibels. The voltage corresponding to 5 decibels is

3.08. This multiplied by 10 gives 30.8 volts which is the voltage corresponding to 25 decibels.

HUM IN FILTER SYSTEM

25. HUM VOLTAGE IN THE FILTER SYSTEM CAN BE MEASURED AS FOLLOWS:

a. Disconnect the antenna and ground wires.

b. Turn down the volume control.

c. Turn on the power.

d. Connect the 0-20 volt A.C. range of the Model 534 MULTI-TESTER from plate to cathode of any socket in which it is desired to check hum.

e. The meter reads ripple volts directly. Disregard the swing of the pointer as connection is first made. The 0-20 A. C. voltage range does not respond to direct current.

26. TO CHECK SMALL CAPACITORS.--Capacitors from .0001 to .05 M.F. may be checked as follows:

a. Make Line Adjustment the same as for tube testing. See paragraph 3, page 1.

b. Set the master switch on A.C. volts 200.

c. Set Selectors: JR-0204-0.

d. Furnished with the Model 534 MULTI-TESTER is a special cable. One end of this cable is equipped with a 5 pin plug. The black wire terminates in a pin tip. The red wire terminates in an alligator clip.

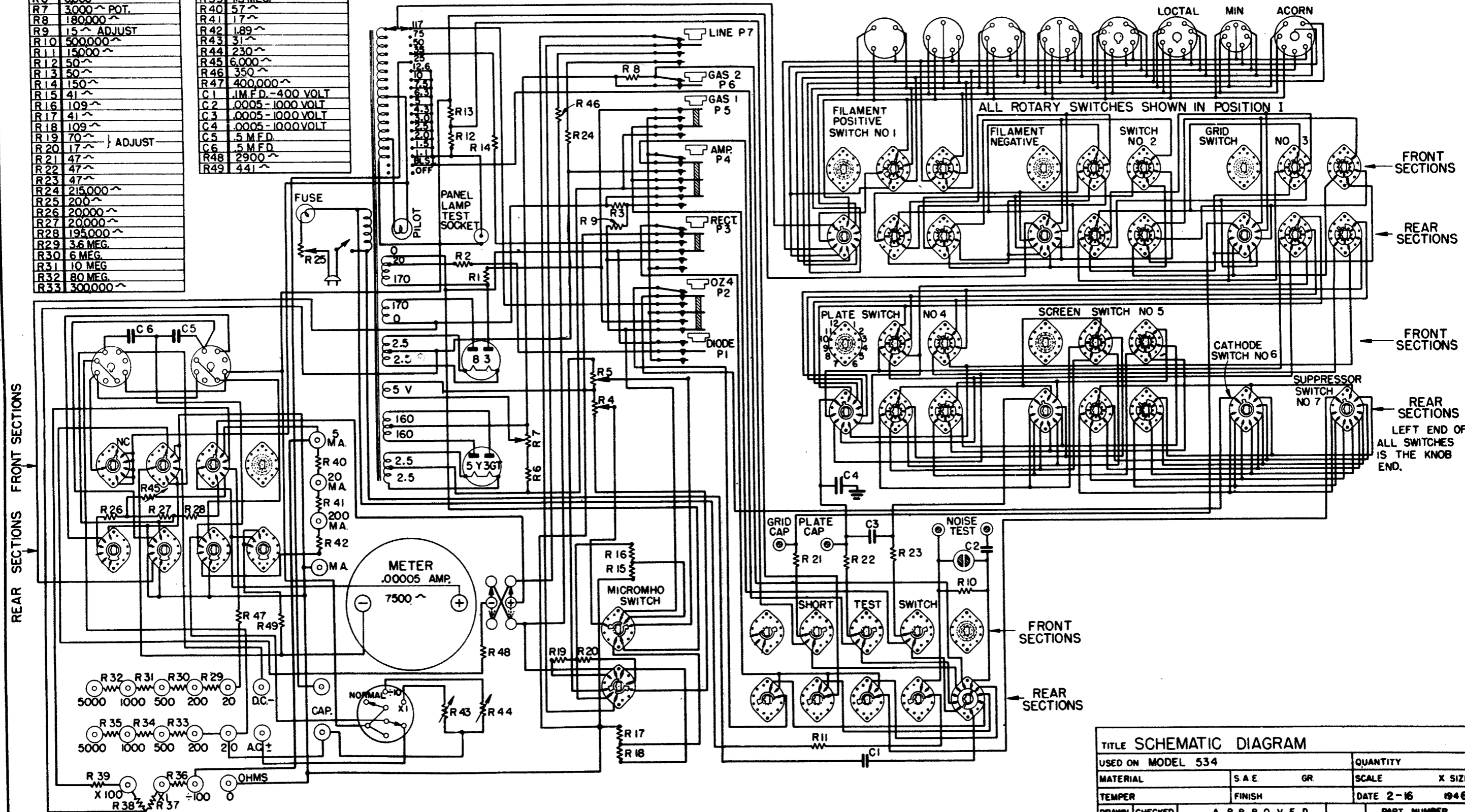
e. Insert the plug in the 5 pin socket. Insert the pin tip in the plus-minus (\pm) pin jack, A.C. Volts.

f. Connect the alligator clip to one terminal of the capacitor to be measured. Insert one of the voltmeter leads in the 200 V. pin jack and hold the prod on the other terminal of the capacitor.

g. Press button marked P5 and note the reading of the voltmeter. The value of the capacitor is found in the table below.

<u>CAPACITY IN M.F.</u>	<u>VOLTMETER READING ON 200 VOLT SCALE</u>
.0001	1.5 Volts
.0002	3. "
.00025	3.5 "
.0005	7. "
.001	13. "
.002	25. "
.003	37. "
.004	49. "
.005	59. "
.006	70. "
.007	79. "
.008	85. "
.009	92. "
.01	99. "
.015	125. "
.02	139. "
.025	147. "
.03	153. "
.035	156. "
.04	160. "
.05	162. "

R1	1800 ~	R34	500,000 ~
R2	1200 ~	R35	4 MEG.
R3	15,000 ~	R36	15,000 ~
R4	150 ~	R37	15,000 ~
R5	150 ~	R38	1.5 MEG.
R6	6,000 ~	R39	1.5 MEG.
R7	3,000 ~	R40	57 ~
R8	180,000 ~	R41	17 ~
R9	15 ~	R42	1.89 ~
R10	500,000 ~	R43	31 ~
R11	15,000 ~	R44	230 ~
R12	50 ~	R45	6,000 ~
R13	50 ~	R46	350 ~
R14	150 ~	R47	400,000 ~
R15	41 ~	C1	.1 M.F.D. - 400 VOLT
R16	109 ~	C2	.0005 - 1000 VOLT
R17	41 ~	C3	.0005 - 1000 VOLT
R18	109 ~	C4	.0005 - 1000 VOLT
R19	70 ~	C5	.5 M.F.D.
R20	17 ~	C6	5 M.F.D.
R21	47 ~	R48	2900 ~
R22	47 ~	R49	441 ~
R23	47 ~		
R24	215,000 ~		
R25	200 ~		
R26	20,000 ~		
R27	20,000 ~		
R28	195,000 ~		
R29	3.6 MEG.		
R30	6 MEG.		
R31	10 MEG.		
R32	80 MEG.		
R33	300,000 ~		



TITLE SCHEMATIC DIAGRAM			
USED ON MODEL 534		QUANTITY	
MATERIAL	S.A.E.	GR.	SCALE X SIZE
TEMPER	FINISH		DATE 2-16 1946
DRAWN	CHECKED	APPROVED	
S.S.	H.G.M.		
			PART NUMBER
			W-623

Schematic Drawing of Model 534 Multi-Tester

HICKOK