SUPREME

Model 450 Radio Tester

STANDARD SERIES

OPERATING DATA

SUPREME INSTRUMENTS CORP.
GREENWOOD, MISSISSIPPI
U. S. A.

Stock No. 8110 Issued 10-1-36

PANEL LAYOUT OF 450 RADIO TESTER

Proper Part Name (used in instructions)	Function	Location on Panel
Meter	1 - 0 to 7 scale 1 - 0 to 35 scale 1 - 0 to 140 scale These three scales used for 6 - D. C. Volts ranges 6 - A. C. Volts ranges 6 - D. C. Milliampere ranges 6 - Output ranges 1 - 0 to 4,000 ohm scale (4 Resistance ranges)	Center of panel
4-5-6-7 and 8 prong analyzing tube sockets.	For use when making radio set measurements (connected through analyzing plug).	Grouped above and around meter.
"TOP CAP" pin jack.	To accommodate "TOP CAP" connections to tube in Radio Tester functions.	To left of meter.
Double Pin jacks numbered 1 to 8 and T.C.	Terminal pin jacks for radio set circuit analyses measurements.	Grouped along bottom edge of panel.
"OHMMETER ADJUSTER" potentiometer.	To be used in zero adjusting meter for resistance measurements.	To left of meter.
"METER CIRCUIT SELECTOR" switch.	For connecting proper functional circuit to meter.	To right of meter.
"ACV" push button (momentary contact).	Shorting and protective switch across rectifier (see instructions)	To right of meter.

PANEL LAYOUT OF 450 RADIO TESTER

Proper Part Name (used in instructions)	Function	Location on Panel
"D.C.M.A." pin jack and pin jacks marked "7", "35", "140", "350", "700" and "1400".	For connecting meter circuits to proper range for D.C. milliampere measurements.	Along left edge of panel.
"VOLTS" pin jack and pin jacks marked "7", "35", "140", "350", "700" and "1400".	For connecting meter circuits to proper range for A. C. and D. C. potential measurements.	Along right edge of panel.
Pin jacks marked "+45", "OHMS", "+4M", "+40M", "+400M" and "+ 4 MEG."	For connecting meter circuits to proper range for resistance measurements.	Grouped along top edge of panel.

MODEL 450 RADIO TESTER

TABULATION OF METER RANGES

"OHMS"	SCALE USED	MULTIPLY BY
0-4,000	4,000	Direct
0-40,000	4,000	10
0-400,000	4,000	100
0-4-meg. (with external 45 volt battery)	4,000	1,000

"A. C. VOLTS", "D. C. VOLTS", "D. C. MILS." AND OUTPUT VOLTS"	SCALE USED	MULTIPLY BY
0-7	7	Direct
0-35	35	Direct
0-140	140	Direct
0-350	35	10
0-700	7	100
0-1400	140	10

!IMPORTANT!

The Guarantee Policy on your Supreme instrument is not applicable unless this paragraph is complied with!

REGISTRATION. The Return Registration Card, which is included with each tester shipment, should be completed with the proper information and mailed immediately after the user's receipt of the tester. It is the purpose of the Return Registration Card (1) to apply the guarantee policy in favor of the owner of the tester, and (2) to assure the user's receipt of any additional data which may be issued with reference to the use of the tester. The issuance of new data may not be necessary; but in case new data be issued, the user is entitled to it and he will receive such new data if his ownership of the tester is registered by means of the Return Registration Card. The guarantee policy is not applicable unless the tester is registered within ten days after its receipt, and the serial number of the tester should be mentioned in all correspondence.

LOCATION OF "MODEL NUMBER" ON PANEL. The model number of this tester is located on the top edge of the panel, above and between the 5 prong and 6 prong socket. MENTION THIS NUMBER IN ALL CORRESPONDENCE.

LOCATION OF "SERIAL NUMBER" ON PANEL. The serial number of this tester is located on the bottom edge of the panel, directly below the "T.C." twin jack. MENTION THIS NUMBER IN ALL CORRESPONDENCE.

SUPREME RADIO TESTER
MODEL 450
OPERATING DATA

GENERAL. The new Supreme Model 450 Radio Tester has been designed to provide radio men with all of the essential testing functions in a simple form, at a moderate price, and without sacrificing Supreme's high standard of workmanship. It provides for a complete point-to-point analysis of any radio circuit, it is adaptable to changes in tube terminal arrangements, and is entirely up-to-the-minute. The meter employed permits easier and more accurate reading than is customary in equipment of this type by reason of the 26% longer scale which is available in the fan-shaped meter.

PANEL LAYOUT. The pin jacks associated with the various functions to which the meter has been adapted have been separated into groups and distributed around the sides of the panel. The meter occupies the lower central portion. The pin jacks associated with the voltage ranges are arranged vertically on the right side of the panel, and those for current ranges are in a corresponding position on the left side. The ohmmeter and megohmmeter pin jacks occupy the upper right and left corners of the panel. The twin jacks used for analysis work will be found in a row at the bottom of the panel in the center. The "METER CIRCUIT SELECTOR" switch in the lower right hand corner of the panel selects the group of pin jacks to which the meter

is connected, and the panel layout is balanced on the left hand side by a zero adjuster for the ohmmeter. Above these will be found the sockets necessary to permit analysis work. A "TOP CAP" pin jack is located directly to the left of the meter, while to the right is a push button type switch used in measuring A. C. voltage.

SCALE MARKING. The scale on the meter supplied shows two sets of markings:

(A) The upper scale is associated with the ohmmeter and megohmmeter circuits, and is read directly for the 4,000-ohm (4M) range, multiplied by 10 for the 40,000-ohm (40M) range, by 100 for the 400,000-ohm (400M) range and by 1,000 for the 4-megohm range.

(B) The lower scale is used for all readings of A. C. or D. C. voltage or D. C. current. Three sets of index numbers are provided, which at full scale read 7-35-140. The proper method of reading these scales will be determined by the pin jacks used, and simply involves the proper location of a decimal point. In reading A. C. or D. C. voltage or D. C. current, the scale may be multiplied by 10 or 100.

METER CIRCUIT SELECTOR. A 4-position, 2-gang switch is used as a function selector and automatically connects the meter into the circuit used for the various functions which are provided.

VOLTMETER CONNECTIONS. With the "METER CIRCUIT SELECTOR" set in either the A. C. or D. C. voltage

position, the pin jacks on the right side of the panel are connected to the meter through the proper multiplier circuits. The lowest pin jack which is marked "VOLTS" is common to all ranges, and should be used as the negative terminal when D. C. voltage is to be measured. Because of this requirement, the D. C. voltage ranges may be used for polarity testing, incorrect connections causing the needle to back off scale. Test leads should be brought from the "VOLTS" pin jack and the proper pin jack associated with this function which will provide an adequate range so that the meter needle will not be slammed. If A. C. voltage is being measured, it will be necessary to depress the push button switch marked "ACV" before a reading is obtained. This switch is incorporated so as to provide all of the protection possible for the rectifier unit. Before the switch is depressed, care should be taken to be absolutely sure that an excessive voltage will not be applied. The rectifier unit is not guaranteed.

MILLIAMMETER CONNECTIONS. With the meter circuit selector set in the "DCMA" position, the pin jacks arranged vertically on the left side of the panel may be used to measure D. C. milliamperes. The pin jack marked "DCMA" should be considered the negative terminal of the circuit. It is, of course, essential that care be used in selecting a range which will be adequate for the measurement.

OHMMETER CONNECTIONS. The internal 4.5-volt battery should be replaced when it depreciates to such an extent that the meter pointer cannot be adjusted to full-scale deflection for either of the

three lower resistance-measuring ranges. The highest range must be powered with an external 45-volt battery. With the "METER CIRCUIT SELECTOR" set in the position marked "OHMS," the two free ends of the test leads should be touched together and the "OHMMETER ADJUSTER" on the left side of the panel rotated until full-scale deflection is obtained on the meter. These leads may then be placed across the terminals between which an unknown resistance is located and the reading obtained on the meter will be indicative of the ohmic resistance existing between these terminals.

OUTPUT METER CONNECTIONS. With the meter circuit selector set in the "ACV" position, connections may be made to the pin jacks on the right side of the panel to permit the meter movement being used as an output meter. Certain precautions are essential when this procedure is attempted, and it is necessary that extreme care be used not to violate the instructions given under this heading. An adequate "VOLTS" range should be selected for the measurement, the "ACV" switch button should not be depressed until after the connections are completed, and the switch button should be released before the disconnecting or changing the location of the test leads. It is the purpose of the switch, in its normally-closed position to shunt damaging surges around the rectifier rather than to allow the instantaneous electrical surges to pass through the rectifier. The rectifier unit is not guaranteed.

PRECAUTIONS. It is essential that before making measurements the "METER CIRCUIT SELECTOR" be set in

the proper position and the test leads be connected to pin jacks which will provide an adequate range to prevent overloading the meter or any of the associated apparatus included in the circuits. It is always advisable, when values are unknown, to start with the highest range available and then work down until a suitable reading is obtained.

When the instrument is to be used as a voltmeter, it should be connected in parallel with the voltage source. If it is to be used as a milliammeter it must be connected in series with one of the leads. Failure to observe this precaution may result in damage to the meter movement or associated circuits. When A. C. measurements are being taken, the button marked "ACV," should always be released while changes are being made so that no initial surge will be applied to the rectifier unit. In using the ohmmeter it is essential that no voltage other than that supplied by the radio tester be across the unit under test as an external voltage will not only give an erratic reading, but may damage the meter movement or associated circuits.

ANALYZING CIRCUITS. This instrument is provided with a 9-wire analyzing cable terminating in a 7-pin analyzing plug which is provided with a center contact for 8-pin tubes and a thumb catch so that adapters may be plugged into position when tubes having other base arrangements are to be tested. This cable is connected to the sockets through twin jacks at the bottom of the panel. A lug attached to a short lead on the radio tester plug forms a connection for the top cap clip on the receiver and

a separate pin jack is provided on the radio tester panel so that the connections may be completed to the top cap of the tube. The twin jacks are so designed that it is unnecessary to insert the leads in any particular order when current measurements are required. The circuit is not opened until two leads are inserted. In this way protection has been provided against the surge which may occur when plate or grid circuits are broken, and one of the precautions frequently necessary in using other equipment becomes unnecessary.

To determine the voltage existing between any two elements of a tube, the tube should be removed from the receiver, the analyzer plug inserted, connections to the top cap being made if necessary, and the receiver then turned on. After the tubes in the receiver have had time to reach their normal operating temperature, proper voltage readings may be obtained. Using the "VOLTS" pin jack and a pin jack on the right side of the panel which will provide a range adequate for the voltage anticipated, and setting the scale selector in the "ACV" or "DCV" position in accordance with the character of the voltage, readings may be obtained between any two elements of the tube by inserting a pair of test leads in the "RANGE" pin jacks and the free ends of the test leads in the jacks associated with the two elements under test. If an A. C. voltage is being measured, it will be necessary to depress the "ACV" switch in order to obtain a reading. If D. C. is being used and the meter backs off scale, reverse the leads in the pin jacks associated with the tube

elements. If, in measuring A. C. voltage, it is found that a lower scale will be adequate, the "ACV" button should be released before changing the position of a test lead. Close observance of this precaution will result in additional protection for the rectifier unit. The current in any lead other than the heater leads may be read by setting the "METER CIRCUIT SELECTOR" in the "DCMA" position and connecting test leads to the "DCMA" pin jack and one of the other pin jacks on the left side of the panel. The free ends of these leads should then be inserted in the twin jack associated with the circuit in question. If it is found that a lower range than the one originally selected will prove adequate, remove one of the test leads from its twin jack and then shift to the proper range. This procedure will avoid opening the circuit and will prevent the occurrence of surges in the receiver. The numbers below the twin jacks correspond with the numbers radiating from the socket contacts. The corresponding tube elements may be determined by consulting the Tube Base Connection Finder or by reference to tube manufacturer's literature.

PRELIMINARY TESTS. In view of the fact that the plate current of a tube is the result of practically all of the electrical factors involved in the circuits leading to the tube, a normal plate current value is fairly conclusive evidence that the circuits leading to the tube are performing their normal functions. It is, therefore, usually sufficient, in the preliminary analysis of a radio to measure only the plate current of each tube, in

turn, until a tube is encountered in which the plate current is incorrect, when other readings for that tube may be taken in an effort to isolate the defect in the circuit leading to the tube in which the incorrect plate current reading is observed. An abnormally high plate current reading usually suggests (1) an open grid circuit, (2) a shorted or leaky by-pass capacitor across the grid biasing resistor in the cathode circuit, (3) a leaky coupling capacitor connected to the plate circuit of a preceding tube, or (4) an excessively gaseous tube when resistance-coupled to the preceding stage. A low plate current indication usually suggests (1) a leaky plate by-pass capacitor, or (2) a leaky screen by-pass capacitor. No plate current usually suggests (1) an open grid bias resistor in the cathode (or filament) circuit, (2) a shorted plate by-pass capacitor, (3) a shorted screen grid by-pass capacitor, (4) an open plate circuit, or (5) an open screen grid circuit. There are other possible causes of incorrect plate current values, but those enumerated are the most usual. The use of high resistance coupling circuits in modern radios introduces errors in practically all voltage measurements, because of the multiplier effects of the resistors in the coupling circuit of such radios. Furthermore, potential measurements will vary with different ranges of ordinary service voltmeters applied to high resistance circuits, so that the voltage readings published by a radio manufacturer may be found quite different by the radio man when analyzing with a voltmeter of the same sensitivity but of a different range from that used by the

radio manufacturer. Such differences are much less likely to exist in milliammeter indications, and these factors make it advisable to rely more upon plate current and less upon voltage readings for indications of amplifier circuit conditions. This procedure of preliminary analysis by means of plate current indications only, saves time and is usually sufficient for all practical servicing purposes. Plate current measurements with this tester are accomplished in the following manner:

i. Complete all connections to the radio under test with all tubes in the proper sockets for normal operation.
ii. Remove all test lead conductors from tester panel.
iii. With the radio turned "OFF," remove a tube from the radio, place the tube in the proper tester socket, and connect the top terminal of the tube, if any, to the "TOP CAP" pin jack on the tester panel by means of the short "TOP CAP" lead.
iv. Insert the analyzing plug into the vacant radio tube socket, complete the radio "TOP CAP" terminal connection, if any, to the lug at the top of the analyzing plug, and turn the radio "ON." As the tubes attain their normal operating temperature, adjust the controls of the radio to whatever position may be recommended by the radio manufacturer for circuit analysis.
v. Set the "METER CIRCUIT SELECTOR" to the "DCMA" position, connect a test probe

conductor between the "DCMA" and the lower #2 pin jack, connect another conductor between the 350-mil. pin jack on the left edge of the tester panel and the upper #2 pin jack. If the meter backs off scale, reverse the connections to the "DCMA" and "350-mil." pin jacks.

The procedure outlined above applies to current measurements in the No. "2" circuit, which is usually a plate circuit. The current in other numbered circuits can be measured by following a similar procedure. It is usually advisable to first observe the plate current reading on the 350-mil. range, after which the connector may be shifted down to a suitable lower range. The above procedure may be continued from tube to tube until the plate current measurements have been made for all of the tubes in the radio; or until a tube is encountered in which there is an indication of an incorrect plate current value, in which case the radio man should undertake a more detailed analysis in an effort to isolate the cause of the incorrect plate current condition by the potential and resistance measurements as outlined in these instructions.

TUBE TESTING. So much emphasis has been placed upon the use of the tube checkers designed for testing radio tubes with A. C. power supply that many radio men do not appreciate the utility of radio testers for testing tubes in the sockets of operative radios. It is quite obvious that if a radio is inoperative it cannot be used to supply

power to a radio tester for testing tubes, but in such cases it is more important to repair the radio than to test the tubes. However, when the radio is in proper operating condition the use of a radio tester for testing the tubes in the radio tube sockets provides a method of tube testing which proves quite satisfactory for practical purposes in the detection of weak and/or noisy tubes. It is very often found that, after tubes have been in use for a long period of time, a rattling or raspy noise will be emitted from the loud speaker when the tubes are very lightly thumped or tapped with a rubber mallet or with the handle of a small screw driver, although the tubes may be indicated as satisfactorily operable by the usual meter tests. It is, therefore, advisable to clean the tube pins and gently thump or tap each tube during the regular tests, preferably while the tube is in the radio tester socket and held away from the radio so that any noise observed may be definitely assigned to the tube rather than the vibration of some loose part in the radio chassis. An exception may be observed in the case of detector tubes which may produce a ringing sound in the loud speaker when the tube is thumped, or tapped. A ringing musical sound may be natural, but a raspy or rattling sound is not generally natural, and the experienced radio man soon learns the difference between natural and unnatural sounds accompanying the test procedure. The logical explanation for the benefit of the customer is that tubes with vibratory noises will respond to the loud speaker vibrations and distort the reception; and that if the noises are caused by

loose elements, short circuits may develop which might harm other parts of the radio. Tube test readings of amplifier tubes are obtained with this tester as a logical step following the measurement of plate current as described in the preceding paragraph, and is accomplished by inserting the self-contained battery in the twin jack which corresponds to the input grid of the tube under test and observing the change in plate current. In the types 26 and 27 tubes, the number "3" terminal corresponds to the input grid, and the following tube testing procedure is recommended:

Insert test leads in the "OHMS" and "400M" pin jacks and then connect the lead from the "OHMS" pin jack to the upper #3 twin jack and the other lead to the lower #3 twin jack. When the second lead is inserted, a change in plate current will be observed.

In the types 24, 35 and similar tubes, the input grid is connected to the "TOP CAP" terminal, and the battery should be connected to the "T. C." twin jack, instead of to the number "3" twin jack. Similarly, the terminals numbered "6" and "7" may represent the input grids of the other types of tubes, and the radio man may determine from commercial tube data charts, or our Tube Base Connection finder booklet, the functions and terminals of the tube and circuit encountered in service. If it is desired that the plate current change be made in the reverse direction, the leads to the #3 twin jack may be reversed. It is the amount of increase (or decrease) in the plate current which indicates the

extent to which the input grid controls the plate current output which corresponds to the amplifying ability of the tube. An amplifier tube in which the plate current remains unchanged when the battery is connected into the input grid circuit will not amplify signals and should generally be replaced. Because of the variations in different radio circuits, definite discard limits cannot be defined, and the radio man must use his own good judgment, based on his experience, in determining when tubes should be discarded. Additional data on tube testing will be found in the discussion of output measurements.

POTENTIAL MEASUREMENTS. After proceeding with the preliminary procedure of plate current measurements and tube testing until a tube socket is encountered in which the tube is passing incorrect plate current, and in which the replacement of the tube does not correct this condition, it is advisable to resort to more specific tests for the purpose of isolating the circuit which is defective. For this purpose the following procedure is recommended:

i. Remove all test conductors from the tester panel.
ii. Set the "METER CIRCUIT SELECTOR" at the "DCV" position.
iii. Connect a test probe conductor between the "VOLTS" pin jack and one of the twin jacks which corresponds to the cathode terminal of the tube circuit.
iv. Connect one end of a test probe connector

to the 350 or other suitable pin jack on the right hand edge of the panel, and apply the free end of this conductor to the pin jack terminals numbered "1", "2", etc., for the purpose of measuring the potentials applied to the tube with respect to the terminal which corresponds to the cathode element. If the meter needle backs off scale, reverse the leads in the two twin jacks between which potential is being measured.

The potential readings obtained should be compared with those published for the radio involved in the tests in an effort to determine which circuit contains the defect causing incorrect plate current values. After determining the defective circuit, the ohmmeter should be utilized for locating the defective part. In the following paragraphs, some typical and representative potential analyses will be described.

FULL-WAVE TRANSFORMER RECTIFIER CIRCUITS. The following procedure is recommended for the analysis of full-wave rectifier tube circuits which are transformer supplied:

i. Remove all test conductors from the tester panel.

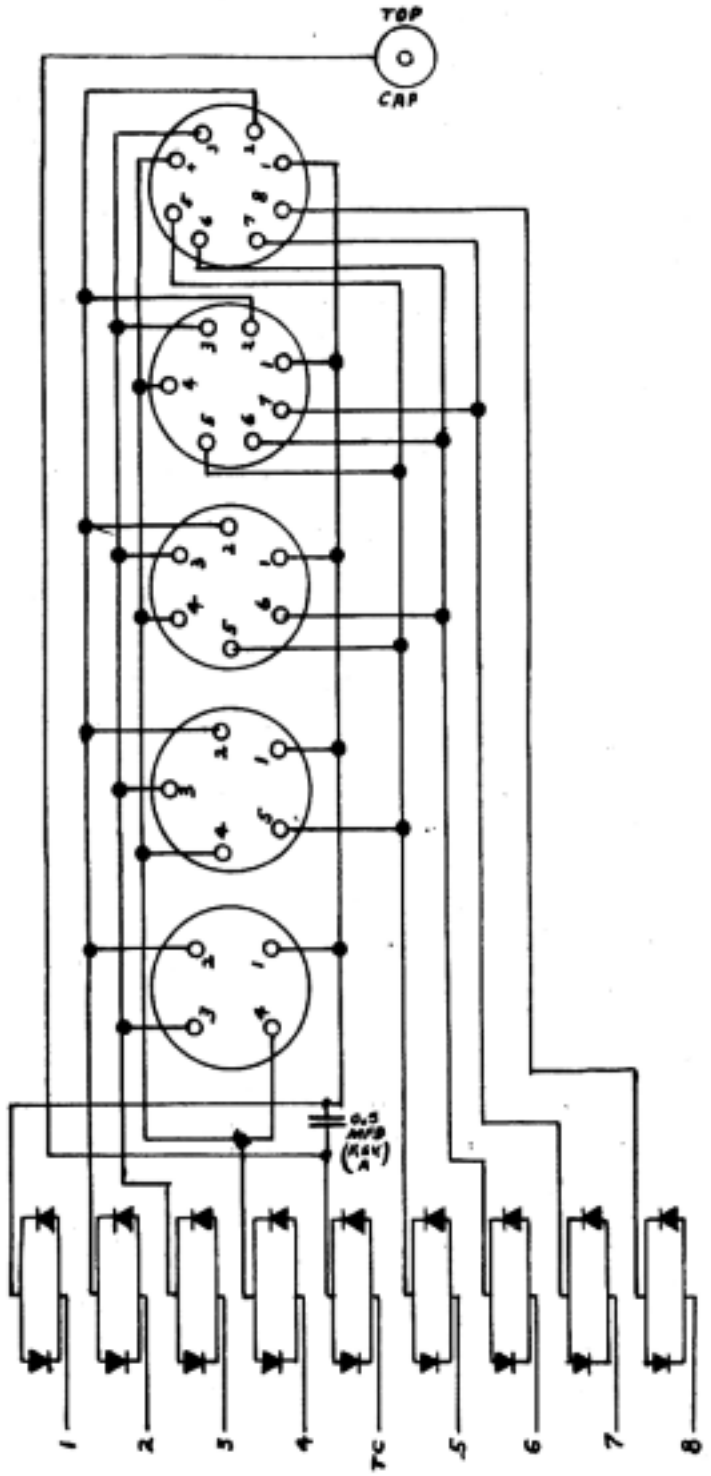
ii. Remove the rectifier tube from the radio under test and replace with the analyzing plug. Do not place tube in tester for A. C. potential measurements. Turn radio "ON".

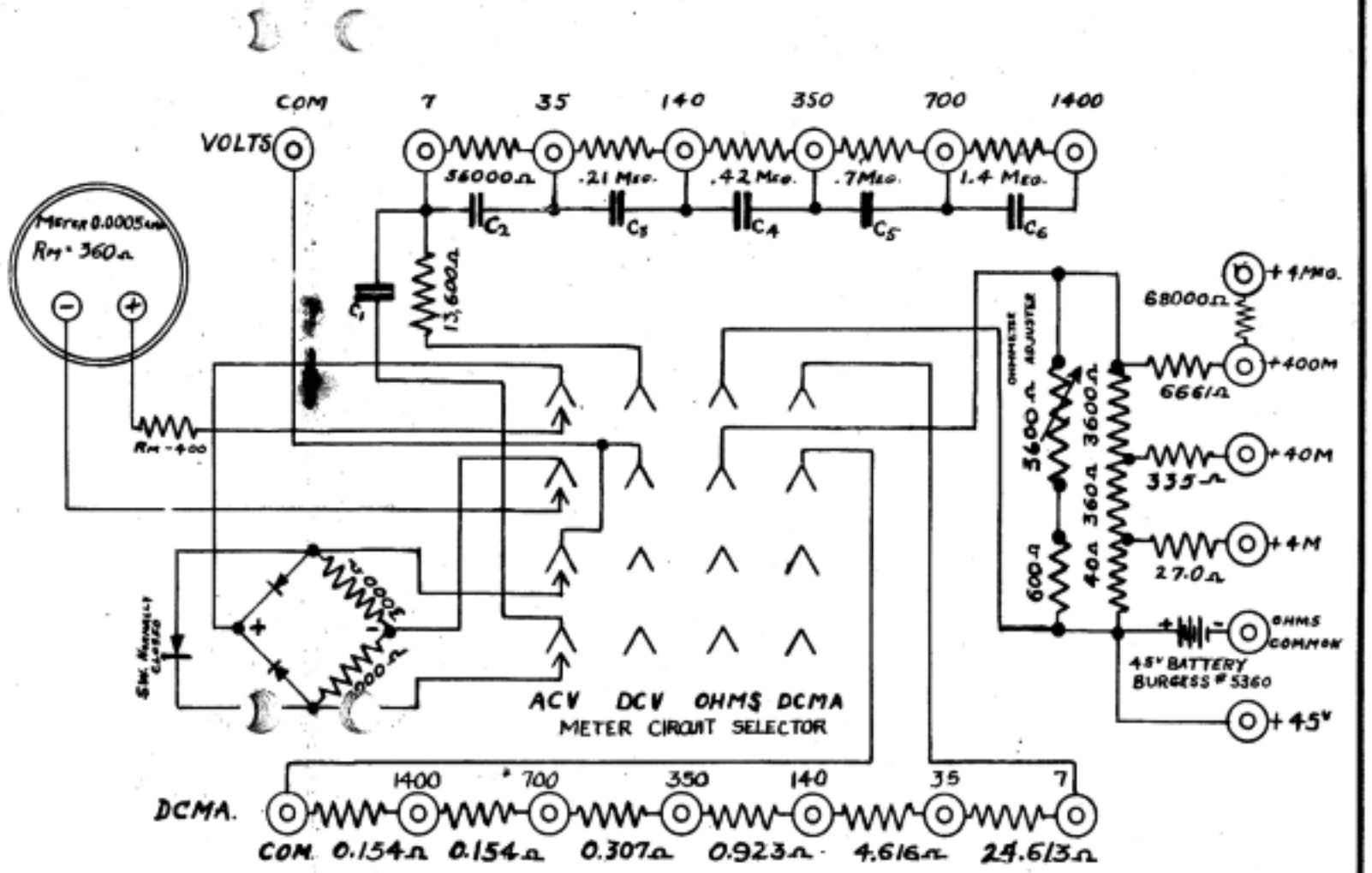
iii. For the first plate potential measurement, set the "METER CIRCUIT SELECTOR" to the "ACV" position, connect suitable test lead conductors from the "VOLTS" and "1400" terminals on the right margin of the panel to one of the No. "3" and one of the No. "4" twin jacks, and observe the meter indications of plate voltage. Depress "ACV" push button and observe meter reading. After observing the meter reading, release "ACV" push button and remove the test probe conductor from the No. "3" twin jack.

iv. For the second plate potential measurement, insert the free test probe conductor into the No. "2" twin jack. If the meter reading differs considerably from that observed in the preceding sub-paragraph, some of the high voltage plate transformer secondary windings may be short-circuited, although a slight difference between these two readings may be caused by the capacity effects of the analyzing cable.

v. For the filament potential measurement, set the "METER CIRCUIT SELECTOR" to the "ACV" position and connect a suitable voltage range of the meter from the right margin of the panel to the No. "1" and "4" pin jacks. Depress "ACV" push button and observe meter reading. Release "ACV" push button.

vi. Turn the radio "OFF", replace the tube in the radio socket, and remove all connectors





f	C_1	C_2	C_3	C_4	C_5	C_6
25						
40						
50						
60	0.40	0.075	0.020	0.0112	0.006	0.003

MATERIAL _____ FINISH _____

UNLESS OTHERWISE SPECIFIED DECIMAL DIMENSIONS TO BE ± _____ OTHER DIMENSIONS TO BE ± _____ SCALE _____

A	HEJ	NOT	10-2-36
REV.	BY	MAS	DATE

SUPREME INSTRUMENTS CORPORATION
GREENWOOD, MISS., U.S.A.

SCHEMATIC WIRING DIAGRAM FOR MODEL 450
STANDARD SERIES

DRAWN	TRACED	DATE 8-25-36
H. Campbell		NO. 8122-B
CHECKED H.E.J.	APPROVED	

from the tester panel.

vii. The test readings obtained by the above procedure may be compared with those specified by the radio manufacturers concerned.

The primary function of the above test is to determine whether or not some of the turns of one side of the secondary plate windings of the power transformer are short-circuited. Since these windings carry the highest potentials of the transformer, they are usually the first windings to break down. It should be remembered that short-circuited windings in any transformer result in an over-saturation of the iron core with resultant over-heating and lowered secondary potentials.

TRIODE TUBE CIRCUIT TESTS. A triode tube is one of the general class in which the 01A, 45 and 27 belong. They consist of three elements which perform the actual work of the tube plus the necessary additions for heating the cathode which may be the filament itself or be heated indirectly by a filament. The following test procedure is recommended:

i. Remove all test leads from the tester panel.

ii. For the plate potential measurement, set the "METER CIRCUIT SELECTOR" at the "DCV" position, connect the insulated test conductor from the "VOLTS" pin jack to one side of the No. "4" twin jack (or whatever numbered twin jack corresponds to the cathode or filament).

iii. Connect the "350" volt pin jack with a test conductor to one side of the #2 twin jack or whatever numbered twin jack corresponds to the tube's plate. Observe the

meter indication of the plate voltage, and remove the test probe conductor from the #2 twin jack.

iv. For cathode potential measurements, insert the free test conductor plug into one side of the No. "5" twin jack, or whatever twin jack connects to the tube's filament. If the meter needle backs off scale, reverse the connections. After observing the meter reading, remove the test conductor from the No. "5" twin jack.

v. For the filament or heater potential measurement, set the "METER CIRCUIT SELECTOR" at the proper position, and connect a suitable voltage range of the meter to the No. "1" and to the highest numbered twin jack for the socket being used. For A.C. filaments, remember to depress "ACV" push button. After observing the meter reading, release push button (if A. C. volts) and remove the test probe conductors from the panel.

vi. For control grid potential measurements, set the "METER CIRCUIT SELECTOR" to the "DCV" position. Insert one test conductor between the pin jack marked "VOLTS" and one side of the "T.C." twin jack. Insert the second test conductor between a suitable range pin jack on the right side of the panel and one side of the twin jack corresponding to either filament terminals. If meter backs off scale, reverse leads.

vii. Turn the radio "OFF", and replace the tube

in the radio tube socket, and remove the connectors from the tester panel.

viii. The test readings obtained by the above procedure may be compared with those specified by the radio and tube manufacturers concerned.

"TOP CAP" TUBE CIRCUIT TESTS. In the normal use of the screen grid tubes, such as the types 24 and 35, a small negative potential is applied to the top contact of the tube which is generally called the "control grid" connection, while a positive potential is connected to the No. "1" pin of the tube base. The following procedure should be followed in testing screen grid tube circuits,or other circuits which involve tubes with "top cap" terminals:

1. Remove all test lead conductors from the tester panel.

ii. For the plate potential measurement, set the "METER CIRCUIT SELECTOR" at the "DCV" position, connect a test conductor between the "VOLTS" pin jack and one side of the No. "4" twin jack (or to the twin jack corresponding to the cathode or filament). Connect the 350 volts pin jack with a test conductor to one side of the No. "2" twin jack (or the corresponding "PLATE" twin jack), observe the meter reading of the plate voltage, and remove the test probe conductor from the No. "2" twin jack.

iii. For the screen potential measurement, insert the free test conductor plug into one

side of the No. "3" twin jack (or the corresponding "SCREEN GRID" twin jack). After observing the meter reading, remove the test conductor plug from the No. "3" twin jack.

iv. For the cathode potential measurement of a heater type tube, insert the free test conductor plug into one side of the No."5" twin jack (or the corresponding "FILAMENT" twin jack). If the meter needle backs off scale, reverse the connections. After observing the meter reading, remove the test conductor plugs from the tester pin jacks.

v. For the input grid potential measurement, connect a test conductor between the "VOLTS" and one side of the "T. C." twin jack (or corresponding "CONTROL GRID" twin jack), and connect the "35" volt pin jack to one of the No."4" twin jacks (or to the corresponding "CATHODE" twin jack). If this control grid of the radio tube socket being analyzed is resistance-coupled to the preceding stage, a more accurate reading of the applied control grid potential will be indicated by testing between "CATHODE" and "GROUND" or "CHASSIS". After observing the meter reading, remove the test conductor plug from the tester panel.

vi. For the heater or filament potential measurement, set the "METER CIRCUIT SELECTOR" at the proper position, and connect a suitable voltage range of the meter to the No. "1" and No."5" twin jacks (or corres-

ponding "FILAMENT" twin jacks). After observing the meter reading, remove the test probe conductors from the tester panel. Remember, for A. C. volts, push "ACV" button to read, releasing before changing connections.

vii. For the screen grid current measurement, set the "METER CIRCUIT SELECTOR" at the "DCMA" position, connect a test probe connector between the "DCMA" and the lower No. "3" twin jack, connect a test probe conductor between the upper No. "3" twin jack and the 7-mil. pin jack (or suitable range). Note reading.

viii. Turn the radio "OFF", replace the tube in the radio socket, and remove the connectors from the tester panel.

ix. The test readings obtained by the above procedure may be compared with those specified by the radio and tube manufacturers concerned.

RESISTANCE ANALYSIS. For general radio analyses, it is recommended that the plate current indications be relied upon as having primary importance, because correct plate current values almost invariably indicate correct potentials applied to the tube sockets. Whenever a socket is encountered during a general analysis in which the plate current fluctuates or is radically low or high, it is then advisable to concentrate the investigation at that socket in an effort to determine the cause of the incorrect plate current condition. This investiga-

tion may lead to the use of the ohmmeter functions of the tester for point-to-point tests of the component elements of the circuits of the sockets. Before undertaking such tests, the radio must be disconnected from the power supply outlet. The resistance analysis may be made between the twin jack terminals of the radio tester cable circuits, or from these terminals to the chassis or other reference points without removing the analyzing plug from the socket in which the circuit defect apparently exists. Resistance analyses should not be made in lieu of the usual current and potential analyses because some types of resistors change in resistance values when operating under their normal loads. Furthermore, it is generally advisable to disconnect resistors from parallel circuits in order to test them, whereas, current and potential values can be analyzed without disturbing normally permanent connections.

OHMMETER ADJUSTMENTS. Before using any range of the ohmmeter, the following adjustment procedure should be followed:

i. Set the "METER CIRCUIT SELECTOR" at the "OHMS" position.

ii. Connect a test lead connector to the "OHMS" pin jack.

iii. Connect a test lead conductor to the "4M", "40M" or "400M" pin jack, depending upon the desired 4,000, 40,000 or 400,000 range for ohmic measurements.

iv. While holding the free contact ends of the test lead conductors together, rotate the

"OHMMETER ADJUSTER" control knob for an exact full-scale needle deflection indicating zero ohms.

v. The resistance value of an unknown resistor, if disconnected from other power supplying circuits and connected between the free contact ends of the test lead conductors, will be indicated on the "OHMS" range. The indications will be direct for the "4M" range, should be multiplied by 10 for the "40M" range and by 100 for the "400M" range.

HIGH RESISTANCE MEASUREMENTS. The resistance-measuring ranges may be extended to 4 megohms by using a 45 volt battery and the following procedure:

i. Set the "METER CIRCUIT SELECTOR" at the "OHMS" position.

ii. Connect the "+ 45" pin jack to the + 45 volt tap of the battery using one of the 27" pin plug connectors.

iii. Connect a test probe connector to the " — " tap of the 45-volt battery.

iv. Connect another test probe connector to the "4 MEG." pin jack.

v. While holding the free ends of the test probe connectors together, rotate the "OHMMETER ADJUSTER" control knob for an exact full scale needle deflection indicating zero ohms.

vi. The resistance value of an unknown resistor, if disconnected from power supplying or grounded circuits, and connected between the free contact ends of the test probe connectors, will be indicated on the ohms range. The indications of the meter should be multiplied by 1,000 by adding three zeros to the indicated value on the "OHMS" range of the meter.

RECTIFIER RESISTANCE ANALYSES. The most common defect of rectifier circuits which utilize the types 80, 81, 82 and 83 rectifier tubes is represented by short-circuited filter capacitor sections. This condition is usually evidenced by heavy rectifier plate current values. When this defect is suspected during the regular current analysis of the rectifier socket, the radio man should proceed as follows:

i. Turn the radio "OFF", and disconnect the current range of the meter from the No. "2", or from the No. "3" twin jack in case the second plate current is being observed. (i.e., Remove all test leads from panel.)

ii. Set the "METER CIRCUIT SELECTOR" to the "OHMS" position.

iii. Connect the "OHMS" pin jack to the No. "2" twin jack (or corresponding "PLATE #1" twin jack) with a suitable conductor.

iv. Connect a test lead conductor from the "40M" pin jack to the No. "4" twin jack (or corresponding "FILAMENT" twin jack).

If the resistance reading is considerably less than 10,000 ohms, a shorted paper filter capacitor

section or a defective electrolytic capacitor should generally be suspected.

CAPACITOR LEAKAGE TESTS. While the higher ranges of the ohmmeter may be used for measuring the leakage resistance of electrostatic (paper) capacitors, the leakages which can be detected in this manner are so far in excess of the permissible leakages for electrostatic capacitors that the use of higher potentials is recommended for such leakage tests. The Radio Manufacturers Association recommends that the insulation resistance of fixed electrostatic capacitors should not be less than 500 megohms per microfarad, at a capacitor temperature of 68 degrees Fahrenheit, the test being made by raising to a direct potential of 250 volts a completely discharged capacitor and maintaining this potential for3 minutes before insulation resistance is measured. These conditions can generally be sufficiently approximated in practical service procedure by employing a 250-volt D. C. potential in series with the 350 D. C. volt range of the tester meter. Those radio men who do not have a testing device for supplying a 250-volt D. C. potential can utilize the plate potential of the output tube of an operative radio in the following manner:

i. Turn the radio "OFF", remove one of the power output tubes and place the tube in the proper tester socket.
ii. Insert the analyzing plug into the vacant radio tube socket and turn the radio "ON".
iii. Set the "METER CIRCUIT SELECTOR" in the "DCV" position.

iv. Connect the "VOLTS" pin jack, using a suitable connector, to the twin jack representing the cathode element of the tube.
v. Bring a test lead from the "350" pin jack, and another test lead from the twin jack associated with the plate of the tube. The ends of these leads may be applied to the capacitor in question.
vi. A D. C. potential of approximately 250 volts should exist between the free terminals of the test lead conductors which may be applied to a capacitor for determining the condition of the capacitor, and the leads may be touched together without harming the radio or tester circuits.

When the potential is applied, a good capacitor will take a charge through the meter which will indicate the charge by a maximum reading at the instant the connection is made, the reading decreasing to zero as the charge is completed. The instantaneous maximum reading varies with the capacities of capacitors under test. A capacitor with a resistance leakage will be indicated by the failure of the meter pointer to complete its return to the zero position. Paper capacitors which have any discernable leakage should be discarded. The failure of the meter to make any response to the charging potential would indicate an "open" capacitor or a capacitor of a capacity too low to accommodate a discernable charge with the applied potential. A shorted capacitor will be indicated by a reading on the meter of the full voltage of the

D. C. power supply. Electrolytic capacitors are polarized, and the proper polarity relations must be observed for all connections to these capacitors. After determining by the above procedure that an electrolytic capacitor is not shorted, and after disconnecting the capacitor, the "METER CIRCUIT SELECTOR" may be rotated to the "DCMA" position and the capacitor reconnected so that the leakage current may be measured; i. e., connect the "DCMA" pin jack by a lead to the positive side of the electrolytic capacitor. Connect the "CATHODE" twin jack to the negative side of the electrolytic capacitor. Connect the "PLATE" twin jack to a suitable current pin jack on the left side of the panel. Observe leakage current on meter. Electrolytic capacitors should generally be discarded when the D. C. leakage exceeds one milliampere per rated microfarad.

MISCELLANEOUS CONNECTIONS. In view of the fact that all of the analytical circuits may be broken by inserting two test leads, numerous other uses may be found for these facilities, such as the connection of headphones, loud speakers, etc., in the plate circuit during the analysis for special tests. In some types of audio circuits phonograph pick-up devices may be inserted in the "CATHODE" circuit or in other circuits for demonstrational purposes. A gas test which may be useful in the course of the analysis of the amplifier circuits of radios may be very simply devised by the use of a 250,000-ohm metalized or other resistor with terminals arranged for plugging into the "input grid" twin jack.

Observe the effect of this resistor on the plate current, and the effect compared with that produced by replacing the tube with another of the same type; the more gassy the tube the greater the effect upon the plate current produced by the resistor, as gaseous tubes are generally evidenced by a small value of current in the input grid circuit which will produce across the resistor in the circuit a potential which reduced the negative input grid potential in most types of tubes. It is for this reason that gaseous tubes should not be used in resistance-coupled input circuits. These miscellaneous tests are enabled only in point-to-point analyses which utilize the circuit principles of this tester.

OUTPUT MEASUREMENTS. The sensitive A. C. potential measuring facilities, which are enabled by the use of an instrument rectifier associated with the meter of this tester, are ideally suited for output measurements. The blocking capacitor isolates the A. C. output signals from the D. C. plate potentials applied to power tubes. The meter may be connected (1) between the power tube plate terminals and the cathode or filament of the tube, or the chassis of the radio, without the use of output adapters, or (2) across the voice coil terminals for output measurements during the usual radio re-adjustment operations. The following procedure is recommended as being the most practicable:

1. Complete all connections to the radio under test with all tubes in the proper sockets for normal operation.

ii. Remove all test lead conductors from the tester panel.

iii. With the radio turned "OFF", remove a power output tube from the radio, place the tube in the proper tester socket, and connect the "TOP CAP", if any, of the tube to the "TOP CAP" pin jack on the tester panel.

iv. Insert the analyzing plug into the vacant radio tube socket, complete the radio top cap terminal connection, if any, to the lug at the top of the analyzing plug, and turn the radio "ON".

v. Set the "METER CIRCUIT SELECTOR" to the "ACV" position.

vi. Connect the "VOLTS" pin jack with a test lead conductor to one side of the No. "4" twin jack (or corresponding "CATHODE" or "FILAMENT" twin jack).

vii. Connect the "350" pin jack on the right edge of the radio tester panel with a test lead conductor to one side of the No. "2" twin jack (or corresponding "PLATE" twin jack).

viii. While the output signals of a modulated oscillator, or broadcast signals, are being passed through the radio, the "ACV" push button switch may be depressed to enable the meter to indicate the magnitude of the signals, and the radio tuning adjustments should be set for maximum meter pointer indications.

If better readability of the meter indications is necessary, a lower potential-measuring range may be used, but the "ACV" switch button should be released while changing ranges. It is not necessary to interpret output readings in electrical terms, as maxima readings, only, are desired. It is generally found advantageous to keep records of the output readings of various radios for comparative and reference purposes in future adjustments. A modulated oscillator, when used with the output-measuring functions of this tester provides a satisfactory method for comparative tube testing with operative radios. This method of tube testing is accomplished by observing the effect on the output meter readings resulting from the replacement of questionable tubes with new tubes. Tubes tested by this method are usually designated as "set tested" tubes. This method of testing is also satisfactory for detecting fading conditions within the radio or tubes, but it cannot take the place of a regular test with a regular tube tester.

TRANSPORTATION DAMAGES. The office of origin of the transportation agency which accepted this tester for the original shipment assured the shipper against external and concealed damages in transit. If the tester be received in a damaged condition, or if some part of the tester be damaged in transit, the user of the tester should ask the transportation agency, which delivered the tester, for a "concealed damage report" which should be forwarded to the factory, with the Return Registration Card, for factory instructions as to the procedure which

should be followed for effecting the necessary repairs or replacements. If the destination office of the transportation agency refuses to furnish a "concealed damage report", that fact should be reported in a letter to the factory with the return of the Registration Card.

SUPREME SERVICE STATIONS. For the purpose of effecting prompt repair of damages sustained by inadvertent misuse, or for any other reason, the services of the Supreme Service Stations may be utilized instead of returning damaged testers to the factory. A list of the Supreme Service Stations may be obtained from the Supreme factory offices. If it should be necessary to ship a tester to the factory or to a Supreme Service Station, the shipment should be made via Express -- never via parcel post -- and a letter should be written and forwarded, separately, advising of the shipment and including complete instructions as to the desired handling and disposition of the merchandise; otherwise, the merchandise will be refused by the consignee.

If a separate letter is received by the factory, ahead of the tester's arrival, the proper acceptance forms will be made out by the factory, the tester will be received and usually repairs will be effected at once and the tester re-shipped. If the tester is not within the 90 day guarantee period, repairs will be made up to $5.00 without sending the user an estimate unless we receive specific instructions to send an estimate in any case. If the necessary repair charges total more than $5.00, an

estimate will be sent in any case, unless the factory has received specific instructions to repair the tester regardless of cost.

When the user sends his registration card to the factory within 10 days after receipt of the tester, he will be furnished with a pocket size "Guarantee Card" which should be included with the tester shipment to either the factory or an Authorized Service Station if the tester is still within the 90 day period.

When repairs are requested of the factory or a Service Station by a customer having a "Guarantee Card" and including same in shipment, and the guarantee is found to be still in effect, the Factory or Authorized Service Station will make the repairs in accordance with the guarantee policy herein stated and will return the tester to the user without charge with the exception of (1) an instrument rectifier replacement (instrument rectifiers are not guaranteed) and (2) transportation charges which must be borne by the customer.

Our Service Stations are not authorized to make no-charge repairs on Supreme testers unless the "Guarantee Card" (furnished the user by the factory upon the return of the user's registration card) accompanies the tester and the tester is returned before the expiration of the 90 day period.

All disputes regarding repair charges should be referred to the "Service Engineer" at the factory.

REPLACEMENT PARTS, ETC. If some part of the tester be damaged in service, or if the user should

want to order circuit drawings, analysis charts, test leads, or other accessories, his order should be accompanied by a deposit amounting to not less than fifty cents. Since an order amounting to less than fifty cents cannot be assembled, packed and shipped without financial loss, a handling charge may be made so as to make the order total fifty cents, including transportation charges. If an order be accompanied by a deposit which does not cover the cost of the merchandise and transportation charges, the shipment will be made via Express C.O.D. for the balance due. A list of replacement parts may be obtained upon request. We do not recommend the installation of instrument rectifiers by the user as this invariably leads to difficulties with the factory. Service men do not have proper calibration standards by which the A. C. ranges can be recalibrated. Instrument rectifiers are very liable to damage by inexperienced repair men and are, therefore, not guaranteed in any manner, even when new. Instrument rectifiers should be replaced by the factory or an Authorized Service Station.

GUARANTEE. The tester is not guaranteed unless the ownership thereof is properly registered. When the user registers his ownership of this tester within 10 days after he receives it, he will receive, in return, a "Guarantee Card" stating that the tester will be guaranteed to be free from defects in material or workmanship. Any such defect in material or workmanship will be corrected, without charge, when the tester, together with the "Guarantee Card", is delivered to the Supreme Instruments

Corporation, Greenwood, Mississippi, or to any Authorized Supreme Service Station within 90 days after its receipt by the user; provided that (1) the free repair or replacement of materials shall not include the cost of the installation of instrument rectifiers which are incapable of withstanding appreciable electrical overloads and are not, therefore, guaranteed by the manufacturers, and (2) the user accepts the obligation of the payment of all transportation costs involved in the corrections effected under the conditions of this guarantee policy, in accordance with the Standard practices of the Radio Manufacturers Association.

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U. S. A.

RECOMMENDED RADIO PUBLICATIONS

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Published by - Cameron Publishing Company
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Projection Sound Pictures - Aaron Nadell
Published by - McGraw-Hill Book Company
330 West 42nd Street, New York

SPECIAL INSTRUCTIONS FOR THIS SUPREME MODEL 450 RADIO TESTER

In this particular Model 450 Radio Tester we have incorporated an extra 45 volt battery which is located in the tester compartment so that it will not be necessary to use any external battery when operating the 4 megohm range. This battery is internally connected in series with the plus 45 volt pin jack so that when utilizing the 4 megohm range, it is only necessary to plug your test leads into the "Plus 45 Volt" pin jack and the "4 Meg" pin jack, turn your "Meter Selector" switch to the "Ohms" position and, shorting your test leads together, rotate the "Ohms Adjuster" for zero ohms as instructed in the Operating Data. Release the test leads and you are ready to test any resistance from 400,000 to 4 megs.

No other functions or ranges have been changed.