SUPREME MODEL 339-D

DELUXE ANALYZER

****

OPERATING DATA

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SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI
U. S. A.

Stock No. 7219

MODEL 339-D (DELUXE) RADIO ANALYZER

PACKING LIST

REVISED AS OF JANUARY 21, 1936

ACCESSORIES INCLUDED IN ORIGINAL MODEL 339-D RADIO ANALYZER SHIPMENTS.

QUANTITY: INCLUDED:	STOCK: NUMBERS:	DESCRIPTION	:PACKER'S :CHECK
1	7091	Adaptor, 7/4-Pin Analyzing Plug	
1	7092	Adaptor, 7/5-Pin Analyzing Plug	
1	7093	Adaptor, 7/6-Pin Analyzing Plug	
1	7094	Adaptor, 7/8-Pin Analyzing Plug	
1	6725	Card, 3 x 5" Registration	
1	6288	Chart, sample analysis	
1	6135	Connector, 27" Black Pin Plug	
1	6571	Connector, 27" Red Pin Plug	
1	6744	Connector, 4-Ft. Black Test Probe	
1	6745	Connector, 4-Ft. Red Test Probe	
1	7051	Connector, 15-Inch Universal Top Cap	
1	7219	Data, Model 339-D Operating	
1	7220	Form, Model 339-D Accessories Order	

The above list of items was checked by the undersigned who is responsible for the completion of this package.

. . . . . (Signed) . . . . . .

(Serial Number)

The serial number of this tester is engraved (but not waxed) in the lower margin of the panel and should be mentioned in all correspondence pertaining to the analyzer.

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U. S. A.

MODEL 339-DELUXE

TABULATION OF METER RANGES

"OHMS"	SCALE USED	MULTIPLY BY
0-2,000	2,000	Direct
020,000	2,000	10
0-2000,000	2,000	100
0-2-meg.	2,000	1,000
0-20-meg.	2,000	10,000

"VOLTS" & "MILS"	SCALE USED	MULTIPLY BY
0-5	5	Direct
5-125	125	Direct
125-250	25	10
250-500	5	100
500-1250	125	10

"MFDS"	SCALE USED	DIVIDE BY
0.-0.05	5	100
0.05-0.25	25	100
0.25-1.25	125	100
1.25-2.5	25	10
2.5-5.0	5	Direct
5.0-12.5	125	10

SUPREME RADIO ANALYZER

MODEL 339-D

OPERATING DATA

GENERAL. The new Supreme Model 339-Deluxe Analyzer has been designed t[redacted] radiomen with all of the essential testing functions in a simple form a[redacted] moderate price and without sacrificing Supreme's high standard of workma[redacted] It provides for a complete point-to-point analysis of any radio circuit, i[redacted] 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 new 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 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 lower right side of the panel, and those for current ranges are in a corresponding position on the left side. The capacity measuring ranges are distributed around the upper left corner of the panel. The ohmmeter and megohmmeter pin jacks occupy a similar position around the upper right corner 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 scale selector switch in the lower right hand corner of the panel selects the group of pin jacks to which the meter is connected, and is balanced on the left hand side of the panel by a zero adjustor 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 or Microfarads.

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 2000-ohm (2M) range, multiplied by 10 for the 20,000-ohm (20M) range, by 100 for the 200,000-ohm (200M) range, by 1000 for the 2-megohm range, and by 10,000 for the 20-megohm range.

(B) The lower scale is used for all readings of A. C. or D. C. voltage, D. C. current or mfds. Three sets of index numbers are provided, which at full scale read 5-25-125. 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, while in reading capacities, it will be necessary to divide them similarly.

SCALE SELECTOR. A 5-position, 4-gang switch is used as a scale selector and automatically connects the meter into the circuit used for the various functions which are provided.

VOLTMETER CONNECTIONS. With the scale selector set in either the A. C. or D. C. voltage position, the pin jacks on the right hand 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. 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 this

terminal and one of the others 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-MFDS." before a reading is obtained. This switch has been 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 be [illegible]ed.

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

OHMMETER CONNECTIONS. A battery (Burgess No. 5360, or equivalent) should be obtained and inserted in the battery support bracket. The tester is shipped without batteries because of possible "Shelf-Depletion" between the time the tester is packed and the time of its ultimate delivery to the user. The 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 three higher ranges are powered with an A. C. supplied miniature "Power Pack". With the scale selector set in the position marked "OHMS", the two free ends of the test leads should be touched together and the zero ohms adjuster on the left hand 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 scale selector set in the "ACV" position, connections may be made to the pin jacks on the right hand 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, MFDS." 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.

CAPACITY METER CONNECTIONS. This analyzer is provided with an A. C. cord which may be plugged into a 110-Volt, 60 cycle line and which is connected through a 1/2-Ampere fuse to a transformer which supplies it with the necessary voltages for measuring the values of capacitors. The pin jacks used in taking these measurements are separated into two groups of four, the group at the top of the panel being marked "ELECTROLYTIC" for Electrolytic (Polarized Filter) and Electrostatic (Paper) capacitors, and the group in the upper left side being marked "ELECTROSTATIC" for paper (By-Pass) capacitors, only. As the transformer is of the type commonly called an auto transformer, it is essential that the capacitor under test be disconnected from ground; otherwise a direct short will be placed across the power line. A fuse has been incorporated to protect the instrument against the possibility of shorted capacitors. When low voltages are used it is permissable to test electrolytic capacitors with alternating current and for the higher values of capacity a relatively low voltage will result in obtaining the proper reading. However, if the capacity value is reduced it becomes necessary to increase the applied voltage in order to obtain sufficient

deflection of the meter needle, and for this reason, the low capacity ranges should not be used for measuring electrolytic capacitors. Those circuits are used by plugging the supply cord into a socket which will supply the proper vo[illegible] and frequency and then connecting the capacitor in question between the pin [illegible] od "MFDS." in the group which is being used and another pin jack which [illegible] do an adequate range. After these connections have been made the button m[illegible] MFDS." should be depressed and the reading taken.

PRECAUTIONS. It is essential that before making measurements the scale 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 come 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. When A. C. measurements are being taken, the button marked "ACV-MFDS.", should always be released while changes are made so that no initial surge will be applied to the rectifier unit. In using the ohmmeter or the capacity meter it is essential that no voltage other than that supplied by the analyzer be across the unit under test as an external voltage will not only give an erratic reading, but may damage the resistor and other parts of the analyzer.

ANALYZING CIRCUITS. This instrument is provided with a 9-wire analyzing cable terminating in a 7-pin analyzer 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 through twin jacks at the bottom of the panel to the sockets. A lug attached to a short lead on the analyzer plug forms a connection for the top cap clip on the receiver and a separate pin jack is provided on the analyzer 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 pin jacks on the right hand 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 reading may be obtained between any two elements of the tube by inserting the free ends of the test leads in the jacks associated with those elements. If an A. C. voltage is being measured, it will be necessary to depress the "ACV, MFDS". 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, MFDS," button should be released be-

fore 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 load other than the heater loads may be read by setting the scale selector to the "DC-MA" position and bringing test leads from the pin jacks on the left [redacted] of the panel. The free ends of those leads should then be inserted in the jacks 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 occurance of unusual surges in the receiver. The numbers below the twin jacks correspond with the numbers radiating from the socket contacts.

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 platecurrent reading is observed. An abnormally high plate current reading usually suggests (1) an open grid circuit, (2) a shorted or leaky bypass 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 bypass capacitor, or (2) a leaky screen bypass capacitor. No plate current usually suggests (1) an open grid bias resistor in the cathode (or filament) circuit, (2) a shorted plate bypass capacitor, (3) a shorted screen grid bypass 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 circuits 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 radioman 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 those 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:

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

2. Remove all test load conductors from tester panel.

3. 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.

4. 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 volume and tuning controls of the radio for normal response to broadcast signals or to whatever position may be recommended by the radio manufacturer for circuit analysis.

5. Set the scale selector to the "DC-MA" position, connect a test probe conductor between the "DC-MA" and the lower #2 pin jack, connect another conductor from the 250-Mil pin jack on the left edge of the tester panel and insert it in the upper #2 pin jack, in any case, if the meter backs off scale, reverse the connections to the "DC-MA" and "250-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 250-Mil range, after which the connector may be shifted down to a suitable lower range. The above procedure may be continued, without changing the connections, 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 radioman 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 radiomen do not appreciate the utility of analyzers 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 an analyzer 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 an analyzer for testing the tubes in the radio tube sockets provides a method of tube testing which is unexcelled by any tube tester 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 analyzer socket and hold 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 loudspeaker 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 radioman soon learns the difference between natural and unnatural sounds accompanying the the test procedure. The logical explanation for the benefit of the customer is

that tubes with vibratory noises will respond to the loudspeaker 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 connecting the self-contained battery to the terminal which corresponds to the input grid of the tube in which the plate current is to be observed. 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 "200M" pin jacks and then connect the lead from the "OHMS" pin jack to the lower #3 twin jack and the other lead to the upper #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 jacks instead of to the number "3" pin jacks; the tube test is then obtained by opening the "T. C." instead of the number "3" switch. Similarly, the terminals numbered "6" and "7" may represent the input grids of the other types of tubes, and the radioman may determine from commercial tube data charts the functions and terminals of the tube and circuit encountered in service. The multiplier and shunt resistors of the ohmmeter prevent short-circuiting the battery before opening the corresponding input grid switch. If it is desired that the plate current change be made in the reverse direction, the leads to the #3 twin jacks 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 radioman 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 purposes of isolating the circuit which is defective. For this purpose the following procedure is recommended:

1. Remove all test conductors from the tester panel.

2. Set the scale selector at the "D.C.V." position.

3. Connect a test probe conductor between the "VOLTS" pin jack and one of the pin jacks which corresponds to the cathode terminal of the tube circuit.

4. Connect one end of a test probe connector to the "250" 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.

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:

1. Remove all test conductors from the tester panel.

2. For the first plate potential measurement, set the scale selector to the "A.C.V." position, connect suitable test lead conductors from the "VOLTS" and "1,250" terminals on the right-hand 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. After observing the meter readings, remove the test probe conductor from the No. "3" twin jack.

3. For the second plate potential measurement, insert the free test probe conductor into one of the No. "2" twin jacks. 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.

4. For the filament potential measurement, set the scale selector to the "A.C.V." position and connect a suitable voltage range of the meter from the right hand margin of the panel to the No. "1" and "4" pin jacks.

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

6. 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 tranformer result in an oversaturation 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 procedure is recommended:

1. Remove all test leads from the tester panel.

2. For the plate potential measurement, set the scale selector at the "DCV" position, connect the insulated test conductor from the "VOLTS" to one of the No. "4" pin jacks when analyzing 5-pin triode tube circuits or to the No. "4" pin jack terminal when analyzing 4-pin triode tube circuits.

3. Connect one of the No. "2" pin jacks with a test conductor to the "250" volt pin jack, observe the meter indication of the plate voltage, and remove the test probe conductor from the No. "2" pin jack.

4. For the cathode potential measurement of 5-pin triode tube circuits, insert the free test conductor plug into one of the No. "5" twin jacks. 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.

5. For the filament or heater potential measurement, set the scale 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. After observing the meter reading remove the test probe conductors from the panel.

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

7. 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.

2. For the plate potential measurement, set the scale selector at the "DCV" position, connect a test conductor between the "VOLTS" pin jack and one of the No. "4" pin jacks (or to the No. "5" pin jack, if the tube does not have a separate cathode terminal) connect the "250" volts pin jack with a test conductor to one of the No. "2" pin jacks, observe the meter

reading of the plate voltage, and remove the test probe conductor from the No. "2" pin jack.

3. For the screen potential measurement, insert the free test conductor plug into one of the No. "3" twin jacks. After observing the meter reading, remove the test conductor plug from the No. "3" pin jack.

4. For the cathode potential measurement of a heater type tube, insert the free test conductor plug into the No. "5" pin 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

5. For the input grid potential measurement, connect a test conductor between the "VOLTS" and one of the unoccupied "T C." pin jacks, and connect the "25" volt pin jack to one of the No. "4"/jacks (or to the No. "5" pin jack, if the tube does not have a separate cathode terminal). If this 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 temporarily connecting a test conductor between one of the "T.C." pin jacks and the "GRID RETURN" which is usually the chassis or ground of the radio. After observing the meter reading remove the test conductor plug from the tester panel.

6. For the heater or filament potential measurement, set the scale selector at the proper position, and connect a suitable voltage range of the meter to the No. "1" and No. "5" pin jacks. After observing the meter reading, remove the test probe conductors from the tester panel.

7. For the screen grid current measurement, set the scale selector at the "DCMA" position, connect a test probe connector between the "DCMA" and the upper No. "3" pin jack, connect a test probe conductor between the lower No. "3" twin jack and the 5-Mil. pin jack.

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

9. 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 investigation may lead to the

the use of the ohmmeter functions of the tester for point-to-point tests of the component elements of the circuits of the socket. Before undertaking such tests, the radio must be disconnected from the power supply outlet. The resistance analysis may be made between the pin jack terminals of the analyser cable circuits, or from those terminals to the chassis or other reference points without ng the analy zing plug from the socket in which the circuit defect apparent s. Resistance analyses should not be made in lieu of the usual current and po al 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:

1. Set the scale selector at the "OHMS" position.

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

3. Connect a test lead conductor to the "2M", "20M" or "200M" pin jack, depending upon the desired 2,000, 20,000 or 200,000 range for ohmic measurements.

4. While holding the free contact ends of the test lead conductors together, rotate the "ZERO OHMS ADJUSTER" control knob for an exact full-scale pointer deflection for indicating zero ohms.

5. The resistance values 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 "2M" range, should be multiplied by 10 for the "20M" range and by 100 for the "200M" range.

HIGH RESISTANCE MEASUREMENTS. A miniature "Power Pack" is included in this tester for extending the resistance-measuring ranges from 200,000 ohms to 2 and 20 megohms, and those high ranges may be used in the following manner:

1. Set the 4-position rotary switch at the "OHMS" position.

2. Connect the tester to a convenient A. C. power supply outlet.

3. Connect test lead conductors to the "+MEGOHMS" and the "-2 MEG.", or "-20 MEG.", pin jacks.

4. While holding the free contact ends of the test lead conductors together, rotate the "ZERO OHMS ADJUSTER" control knob for an exact full-scale meter pointer deflection of zero ohms.

5. The resistance value of an unknown resistor, if disconnected from other power-supplying or grounded circuits and connected between the free contact ends of the test lead

conductors, will be indicated on the ohms range. The indications of the meter should be multiplied by 1,000 by adding three zeros to the figures of 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 analysis of the rectifier socket, the radio man should proceed as follows:

1. Turn the radio "OFF", and disconnect the current range of the meter from the No. "2", or from the No. "3" pin jack in case the second plate current is being observed.

2. Set the scale selector to the "OHMS" position.

3. Connect the "OHMS" pin jack to the No. "2" pin jack with a suitable conductor.

4. Connect a test lead conductor from the "20M" pin jack to the No. "4" pin jack.

If the resistance reading is considerable 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 paper capacitors, the leakage which can be detected in this manner is so far in excess of the permissible leakages for paper capacitors that the use of higher potentials is recommended for such leakage tests. The Radio Manufacturers Association recommends that the insulation resistance of fixed paper capacitors should not be less than 500 megohm microfarads, at a capacitor temperature of 68 degrees Farenheit, the test being made by raising to a direct potential of 250 volts a completely discharged capacitor and maintaining this potential for 3 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 250 Volt D. C. range of the tester meter. Those radiomen 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:

1. Turn the radio "OFF", remove one of the power output tubes and place the tube in the proper tester socket.

2. Insert the analyzing plug into the vacant radio tube socket and turn the radio "ON".

3. Set the scale selector at the "D. C. V. " position.

4. Connect the "VOLTS" pin jack with a suitable test lead conductor to one of the No. "4" twin jacks.

5. Connect one terminal of a suitable test lead conductor

to the "250" pin jack on the right-hand edge of the tester panel and leave the other end free for application to the capacitor.

6. Connect one terminal of a suitable test lead conductor to one of the No. "2" twin jacks and leave the other end free for application to the capacitor.

7. A D. C. potential of approximately 250 volts should now 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. If the D. C. potential is considerably above 250 volts, the test lead conductor should be transferred from the "250" to the "500" pin jack on the right hand edge of the panel.

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 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 accomodate 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 relation must be observed for all connections to these capacitors for tests; and electrolytic capacitors should generally be discarded when the D. C. leakage exceeds one milliampere per rated microfarad. After determining by the above procedure that an electrolytic capacitor is not shorted, a suitable current range on the left-hand edge of the panel may be connected in series with the 250-volt potential and the capacitor, with the scale selector set at the "D.C.M.A." position, for measuring the leakage current.

CAPACITY MEASUREMENTS. Because of the possibility of "blowing" the fuse located beneath the tester panel when attempting to measure the capacity of a shorted capacitor, it is recommended that every capacitor be subjected to a leakage test before undertaking a measurement of the capacity. No attempt should be made to perform such measurements on capacitors which are connected to grounded radios or circuits. For capacity measurements with this tester a source of 60-cycle power supply, at an approximate potential of 115 volts, should be connected for the measurement in the following manner:

1. Disconnect the capacitor, the capacity of which is to be measured, form any circuit which may be "Alive" or grounded.

2. Set the scale selector to the "MFDS" position and plug the A.C. line cord into a receptacle which will supply the proper voltage.

3. If the capacitor is of the electrolytic type, connect it between the pin jack marked "MFDS." on the upper left margin of the panel and one of the pin jacks in that group which will provide an adequate range. Depress the "ACV-MFDS." button and observe the meter reading. If the capacitor is not of the electrolytic type, the same procedure may be used, but if the ranges on the upper left margin of the panel are too high to give discernable meter readings, those on the left margin of the panel may be used.

MISCELLANEOUS CONNECTIONS. In view of the fact that all of the analytical circuits, except the filament or heater circuits numbered "3" and "4" may be broken by inserting two test leads, numerous other uses may be found for these facilities, such as the connection of headphones, loudsspeakers, etc., in the plate circuit during the analyses for special tests. In sometypes of audio circuits phonograph pick-up devices may be inserted in the cathode of No. "5" 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 jacks. 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 ter-

minals 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.

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

3. 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.

4. 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".

5. Set the scale selector to the "ACV" position.

6. Connect the volts pin jack with a test lead conductor to one of the No. "4" twin jacks.

7. Connect the "250" pin jack on the right-hand edge of the analyzer panel with a test lead conductor to one of the No. "2" twin jacks.

8. While the output signals of a modulated oscillator, or other signals, are being passed through the radio, the "ACV-MFDS." 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-MFDS." 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 oscillaotr, when used with the output-measuring functions of this tester provides an ideal method for comparative tube testing with operative radios. This method of tube testing is accomplished by observing the effects 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 ideal for detecting fading conditions within the radio or tubes, and is being practiced by many leading radio service engineers as a result of the recommendations of some of the leading tube manufacturers.

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 may be refused by the consignee. Immediate repairs or replacements can usually be effected for the customers who have not established credit; some delay may be expected on services rendered for a credit customer when it is necessary to write to the credit customer for an acceptance of the transportation and any repair or replacement costs which are not covered by the standard guarantee policy. When repairs are requested of a service station on a tester which has been registered within 10 days after its receipt, and under the conditions of the guarantee policy, the repair charges should be paid or accepted, and a copy of the Supreme invoice covering the repairs should be obtained from the service station and forwarded to the factory for any refund or credit which may be properly made under the terms of the guarantee policy.

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.

GUARNATEE. 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, the tester will be guaranteed to be free from defects in material or workmanship; and any such defect in material or workmanship will be corrected, without charge, when the tester is delivered to the Supreme Instruments Corporation, Greenwood, Mississippi, within 90 days after its receipt by the user; or, the Supreme Instruments Corporation will refund the repair charges paid to an aurhorized Supreme Service Station for the correction of such defects in material or workmanship upon the user's presentation, within 90 days after the user's original receipt of the tester, of a paid invoice for such repairs, indicating the correct serial number of the tester and describing the repairs; 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 the guarantee policy, in accordance with the Standard practices of the Radio Manufacturers Association.

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U. S. A.

I M P O R T A N T

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.

GUARANTEE

The tester is not guaranteed unless the ownership thereof is properly registered. When the user registers his ownership of this tester within ten days after he receives it, the tester will be guaranteed to be free from defects in material or workmanship; and any such defects in material or workmanship will be corrected, without charge, when the tester is delivered to the Supreme Instruments Corp., Greenwood, Miss issippi, within ninety days after its receipt by the user; or, the Supreme Instruments Corporation will refund the repair charges paid to an authorized Supreme Service Station for the correction of such defects in material or workmanship upon the user's presentation within ninety days after the user's original receipt of the tester, of a paid invoice of such repairs, indicating the correct serial number of the tester and describing the repairs; provided that (1) the free repair or replacement of materials shall not include the replacement cost, or the installation of, an instrument rectifier (on models using same), 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 condition of this guarantee policy, in accordance with the standard practices of the Radio Manufacturer's Association.

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U. S. A.

MODEL 339-DELUXE ANALYZER

ACCESSORIES ORDER

TO

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U. S. A.

PLEASE SHIP TO .....

STREET ADDRESS .....

P. O. & STATE .....

QUANTITY	STOCK NO.	DESCRIPTION	PRICE	TOTAL
.....	6346	Adapter, 7/7-pin anaylzing plug	0.59	.....
.....	6920	Battery, 1.5-volt, 6 required	0.10	.....
.....	6288	Chart, analysis, per pad of 50	0.25	.....
.....	6986	Connector, 4-ft., black, with alligator test clip and insulated pin plug	0.45	.....
.....	6987	Connector, 4-ft., red, with alligator test clip and insulated pin plug	0.45	.....
		TOTAL		.....

A Deposit, amounting to not less than fifty cents is enclosed herewith; and it is understood that, if this order amounts to less than fifty cents including transportation costs, a handling charge will be made so as to make the order total fifty cents. If the deposit is insufficient to cover the cost of the merchandise and transportation charges, you are requested to make shipment via C.O.D. Express for the balance due. It is understood that your quoted prices are subject to change without notice.

_____ 193_____ (Signed) _____

Stock No. 7220