

MODEL 333-S (STANDARD RADIO ANALYZER

OPERATING DATA

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

Stock #6671

SUPREME RADIO ANALYZER
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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.

General. The new Supreme Model 333-S (Standard) Analyzer is designed to provide a simple tester with the more essential testing functions at a moderate price for radiomen, without sacrificing the Supreme standard of workmanship. This new tester is up-to-date in every respect. It is designed for complete "Point-to-Point" analysis of all radio circuits, and is easily adaptable to the rapid changes in tube terminal arrangements. The new fan-shaped Supreme meter is employed which provides a much longer and more easily readable scale than meters used in similar equipment.

Panel Layout. The meter occupies the top central portion of the panel and the four pin jacks which are used for making connections to the meter ranges are also on the upper portion of the panel, two of them being located on each side. Between the pin jacks and the meter are the four sockets which are necessary to permit the analysis of tubes having various base arrangements; on the left hand side of the panel below these sockets is a zero adjuster for the ohmmeter, and on the right hand side in a corresponding position is the scale selector which makes the necessary connections to the meter circuits. Below the meter are the pin jacks used in analysis work, and these include six twin jacks which will automatically open the circuits with which they are associated.

Scale Marking. The dial marking on the meter shows three separate scales.

- (a) The upper scale is associated with the ohmmeter circuit only, and is read directly with the scale selector switch set in the 2M position, or multiplied by 100 if in the 200M position.
- (b) The center scale is utilized for A. C. potential measurements of potentials of less than 5 volts and is designated by means of an arrow bracket located at the left end of the scale arcs. To insure the greatest degree of accuracy of this range, a non-linear scale is employed which compensates for the current density characteristics of the instrument rectifier. Reference to the

potential graduations of the scale is accomplished by means of off-set markings.

- (c) The bottom scale which is marked "DC-V -- 5-V AC UP" at the right end of the scale arcs is used for all other readings. In other words, all D. C. volts and all A. C. voltages higher than 5 are to be read on the lowest scale. The 5 and 125 scales are direct reading. The 500 range is obtained by multiplying the 5 scale by 100, and the 1250 range by multiplying the 125 range by 10.

Scale Selector. A rugged, 12-position, 3-gang switch is used as the scale selector and automatically connects the meter into circuits which provide the following ranges:

5, 125, 500, 1250 volts D. C.
 5, 125, 500, 1250 volts A. C.
 5, 125 milliamperes D. C.
 2,000, 200,000 ohms

The current required by the meter for full scale deflection being but one milliamper, there is no appreciable drop across the switch contacts, thereby helping to eliminate the additive errors sometimes occasioned by contact resistances.

Voltmeter Connections. With the scale selector set in one of the voltage positions, the two upper pin jacks labelled "Volts-Mils." may be used to provide connections to the meter and the scale to be read will be that corresponding to the setting of the scale selector. The right hand pin jack, if the instrument is being used for measuring D. C., should be connected to the negative side of the potential being measured. If a sufficiently high range is used this may be used as a polarity test, the needle backing off scale unless these leads are properly connected. When D. C. voltages are being measured, the scale selector should be set to a position labelled "V.D.C." which may be found on the right hand side of the switch. A. C. voltages will require that the switch be set to one of the positions on the left hand side marked "V.A.C."

Milliammeter Connections. Using the same pin jacks used for voltage measurements, it will be possible to measure D. C. currents by setting the scale selector to one of the two milliammeter positions.

Ohmmeter Connections. Using either of the two positions on the upper left hand side of the switch in conjunction with the two pin jacks on the left hand side of the panel, ohmmeter circuits are available with ranges of 2,000 and 200,000 ohms. The ohmmeter zero adjustor, which is in a position on the left hand side of the panel corresponding to that occupied by the scale selector on the right hand side, may be properly set to give full scale deflection when zero resistance is included between the test leads.

A battery of three 1.5-volt flashlight cells (Eveready No. 935, or equivalent) should be obtained, locally, and inserted in the battery compartment so that the positive brass terminal of each cell is towards the opening of the battery compartment. The tester is shipped

without batteries because of the possible "shelf depletion" between the time the tester is packed and the time of its ultimate delivery to the user. The terminal contacts of each of the three cells of the battery should be thoroughly cleaned before the battery is installed, and periodically thereafter so as to prevent erratic resistance measurements, and the battery should be replaced when it depreciates to such an extent that the meter pointer cannot be adjusted to full-scale deflection for any range of the ohmmeter functions.

Output Meter Connections. The two pin jacks located at the right hand side of the panel with the word "Output" between them may be used as connections for an output meter when a scale selector is in one of the A. C. voltage positions. In this connection it should be observed that it is advisable to use the highest possible meter range in using this instrument as an output meter. If the connections are taken from one of the output tubes it will be obvious that the entire plate voltage of the tube will be applied to the meter through a condenser. The condenser at the instant when the voltage is applied has no appreciable D. C. resistance, and until it is charged current will flow through the circuit at an exceptionally high rate. In view of the fact that the rectifiers are not intended to carry more than 1 mil. of current, and that the plate voltages commonly used today are in the order of 250-volts, it will be obvious that even if there were a thousand ohms of resistance in the circuit, the initial surge before the condenser charged would be in the order of 250 mils., thereby overloading and probably damaging the rectifier unit. Under no circumstances should output measurements be attempted directly from the output tubes of a receiver on a range lower than 125-volts A. C. If all of the D. C. has been eliminated by an output transformer, or if leads are taken from the voice coil of a speaker it may be possible to use the 5-volt A. C. range but extreme care must be taken that there is no initial surge of current. For these same reasons it is also essential that the scale selector switch be properly set before any output measurements are attempted. Unfortunately, we know of no device which can be used to protect the rectifier unit from overload, and it becomes essential that the user exercise every possible precaution to prevent damage to this unit.

Precautions. With 12 meter ranges available it is obviously necessary that care be used in selecting the proper pin jacks and setting the scale selector to the proper position before proceeding with tests. It is always advisable when currents or voltages are unknown to start with the highest range available on the meter and work down until a suitable reading is obtained.

It is necessary when using the instrument as a voltmeter to connect the meter in parallel with the voltage source. If it is to be used as a milliammeter, it should be connected in series with one of the leads. Failure to observe this precaution may result in damage to the meter movement.

Care should be exercised not to overload the meter, or if A. C. measurements are being made, the rectifier unit, because these rectifiers will not safely handle excessive voltage, we cannot cover these units in our normal guarantee, and cannot provide free replacement if they are damaged.

Analyzing Circuits. This instrument is provided with a 9-wire analyzing cable terminating in a 7-prong analyzer plug which is provided with a thumb catch so that adapters may be locked in position when tubes having other base arrangements are to be tested. This cable is connected thru the pin jacks at the bottom of the panel to the sockets. The top cap connection is permanently attached, and will be found coming from the opening thru which the analyzer cable passes. There is a lug attached to a short lead on the analyzer plug that forms a connection for the T. C. clip on the receiver. The heater connections are brought directly to the sockets, and a single pin jack is provided in each lead so that measurements of heater voltage may be taken. There is no occasion for measuring the current flowing thru this circuit in view of the fact that this is determined by the construction of the tube itself and has no effect generally speaking upon the operation of the receiver.

All of the other leads which are brought thru specially designed circuit opening twin jacks, which are so designed that it is unnecessary to insert the leads in any particular order when current measurements are required. The circuit is not open until two leads are inserted. In this way protection has been provided against the surges which may occur when plate or grid circuits are broken, and one of the precautions frequently necessary in using other equipment becomes unnecessary. By setting the scale selector in the proper voltage position the voltage existing between any two elements of the tube may be read, and if it is desired to read the current in any lead other than the heater leads, setting the scale selector in the proper milliammeter position and inserting the milliammeter leads into the twin jack associated with the circuit in question will give the desired reading. A convenient disc is provided with each instrument which will show the connections of the tube elements to the prongs of various tubes. This disc incorporates the numbering system which has been used for many years and which is still used on the panels of Supreme instruments. It will be noted that the numbers conform to a clock-wise sequence beginning with the #1 grid terminal, next the conventional plate terminal, which will in these instructions be designated as the #2 terminal; and the terminals #3 and #4 are the filament and heater terminals on all types of tubes regardless of the total number of contacts. A 4-pin tube has no number "5" terminal which represents the conventional cathode in practically all tubes which have more than four terminals. The terminals numbered "6" and "7" are applicable to tubes which have more than five base terminals. The conventional control grid terminal is designated as the "TOP CAP" and abbreviated "T. C." and is so marked on the tester panel.

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 bypass capacitor across the grid biasing resistor in the cathode circuit, (3) a leaky coupling capaci-

tor 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 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 the 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.
- 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 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.
- v. Set the scale selector switch to the 125 M. A. position, connect the test probe conductor between the upper right hand pin jack marked "Volts-Mils." and the lower twin jack on the #2 position. Connection another test lead from the " + Volts-Mils." pin jack in the upper left hand corner of the panel to the unused portion of the #2 twin jack. This will cause the current flowing to register on the meter. If the current is suf-

ficiently low so that the 5-mil. range may be used, remove one conductor from the twin jack, reset the scale selector and then reinsert the conductor in the twin jack. This procedure will eliminate the possibility of interrupting the plate circuit with the resultant surges. The effect of such an interruption is similar to that obtained by removing a tube from a socket with the receiver turned on.

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 a similar operation. 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.

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 scale selector in the 1250 V. D. C. position.
- iii. Connect a test probe conductor between the "- volts mils." pin jack in the upper right hand corner and one of the #5 pin jacks, or one which corresponds to the cathode terminal of the tube under test.
- iv. Connect one end of a test probe connector to the "+ Volts Mils." pin jack in the upper left hand corner 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 analysis will be described.

In all of the following procedure test leads are taken from the pin jacks marked " + Volts Mils." and "Volts Mils. -". In taking D. C. measurements if the meter needle backs off scale the free ends of the leads should be reversed. In all instances it is important that the scale selector be set to a range of the proper type and which will provide an adequate scale for the reading to be taken before connections are finally completed.

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. For the first plate potential measurement set the scale selector switch to the 1250 V. A. C. position. Connect suitable test lead conductors from the "Volts Mils." pin jacks and connect them to the #3 position or a position which corresponds to the cathode of the tube and connect the other leads to the #2 position. Observe the meter reading and remove the test probe conductor from the pin jack.
- iii. For the second plate potential measurement insert the conductor just removed from the #2 pin jack into the #1 pin 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.
- iv. For the filament potential measurement set the scale selector to an A. C. voltage range which will accommodate the filament voltage of the tube and connect conductors from the "Volts Mils." pin jacks to the #4 and #3 pin jacks.
- v. Turn the radio "Off," replace the tube in the radio socket, and remove all connectors from the tester panel.
- vi. The test readings obtained by the above procedure may be compared with those specified by the radio manufacturers concerned.

The primary functions 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. Generally speaking the grid is in position #1, the plate at #2, the filament at #3 and #4 and if a separate cathode is used, it is located at #5. The following test procedure is recommended:

- i. Remove all test leads from the tester panel.
- ii. For plate potential measurements set the scale selector switch at an adequate D. C. voltage position. Connect an insulated test conductor from the "Volts Mils. -" pin jack to #4 if a filament type tube, or #5 if a separate cathode is provided.
- iii. Connect an insulated test conductor from the " + Volts Mils." pin jack to one of the twin jacks numbered 2. Observe the meter reading and if a lower scale will be adequate reset the scale selector. Observe the reading and remove the test lead from the #2 jack.
- iv. For grid potential measurements, insert the lead connected to the "Volts Mils. -" pin jack into one of the #1 twin jacks and the lead from "Volts Mils + " into the #4 or #5 jack.
- v. For the filament or heater potential measurements, set the scale selector switch to the proper voltage range in the A. C. or D. C. position depending on the type of voltage applied to the heater. Make connections to pin jack #3 and #4 and if the voltage is D. C. and the motor backs off scale reverse the test leads.
- vi. For cathode potential measurement in 5-pin triode tubes, insert the test leads in the pin jacks numbered 4 and 5 and if the motor backs off scale reverse the loads.
- vii. Turn the radio "Off," 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 "control grid" connection, while a positive potential is connected to the number "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:

- i. Remove all test load conductors from the tester panel.
- ii. For plate potential measurements set the scale selector switch at an adequate D. C. voltage position. Connect an insulated test conductor from the "Volts Mils. -" pin jack to #4 if a filament type tube, or #5 if a separate cathode is provided. Connect another lead from the plus volts mils. pin jack to the #2 pin jack and observe the meter reading.
- iii. For screen potential measurement insert the lead from the "Volts Mils. +" pin jack into the #1 pin jack. After observing the meter reading remove the test lead from the #1 pin jack.
- iv. For input grid potential measurements connect the test lead from the "Volts Mils. -" pin jack to the top cap pin jack marked "T. C." on the panel and the lead from the " + Volts Mils." pin jack to the #4 or #5 position depending on which acts as the cathode of the tube. 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.
- v. For the filament or heater potential measurements, set the scale selector switch to the proper voltage range of the A. C. or D. C. position depending on the type of voltage applied to the heater. Make connections to pin jacks #3 and #4, and if the voltage is D. C. and the meter backs off scale reverse the test leads.
- vi. For cathode potential measurements in 5-pin triode tubes, set the scale selector to an adequate D. C. voltage range, insert the test leads in the pin jacks numbered 4 and 5 and if the meter backs off scale reverse the leads.
- vii. For screen grid current measurements set the scale selector to the 125 M. A. position and insert the test lead from the "Volts Mils. -" pin jack into the upper #1 twin jack and the other test lead into the lower #1 twin jack. If it is obvious that the 5 M. A. range will be suitable remove one of the test leads from the twin jack, reset the scale selector and re-insert the test lead.
- 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 investigation 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 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 analyzer cable circuits or from those 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 scale selector switch to either the 2M or 200M position.
- ii. Connect test leads to the two pin jacks in the upper left hand corner of the panel which have the word "OHMS" between them.
- iii. Touch the two free ends of the test leads together and use the ohmmeter adjuster to bring the meter needle to zero ohms.
- iv. The free ends of the test leads may then be applied to the terminals of a resistor of unknown value and the value of the resistance may be read on the meter. These readings will be direct if the 2M scale is used, but should be multiplied by 100 if the 200M scale is used. The M used in connection with these ranges of the meter and the scale selector has its Roman significance of 1,000. These ohmmeter circuits may also be used to check continuity of the wiring of the receiver in the event diagrams of the circuits are available.

Capacitor Leakage Tests. While the higher ranges of the ohmmeter may be used for measuring the leakage resistance of paper capacitors, the leakages which can be detected in this manner are 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 Fahrenheit, 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:

- 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 scale selector in the 500 V. D. C. position.
- iv. Connect the "Volts Mils -" pin jack using a suitable connector to the pin jack representing the cathode generally #4 and #5 of the tube being used.
- v. Bring test leads from the " + Volts Mils." pin jack, and the 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 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.

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 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, after disconnecting the capacitor, the scale selector

may be rotated to the 125 M. A. position and the capacitor reconnected so that the leakage current may be measured.

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, loud speakers, etc., in the plate circuit during the analyses for special tests. In some types of audio circuits phonograph pick-up devices may be inserted in the cathode or 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 metallized 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 reduces 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 analyzers 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 motor of this tester, are ideally suited for output measurements. The two pin jacks in the upper right hand corner of the panel are provided especially for output measurements and a blocking capacitor which isolates the A. C. output signals from the D. C. plate potentials applied to power tubes is automatically included in the circuit. 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:

- 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 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 connections, if any, to the lug at the top of the analyzing plug, and turn the radio "On."

- v. Set the scale selector to the 1250 V. A. C. position.
- vi. Connect test conductors to the two pin jacks in the upper right hand corner of the panel and insert the free ends in the pin jacks associated with the cathode and plate of the output tube.
- vii. The meter will now indicate the output of the oscillator or other signals, passed through the radio if the radio is operative, and the radio tuning adjustments should be set for maximum meter pointer indications.

If an adequate deflection is not obtained the scale selector may be moved to the 500-V. A. C. position, but an attempt to use a lower range than this is apt to damage the rectifier unit.

A range below the 125-volt range should never be used for output measurements from the plate circuit of an output tube; if it be necessary to use a lower range, the connections should be made across the speaker voice coil terminal so that the plate potential of the radio will not be applied to a low range of the meter. When the signals applied to the radio input terminals are modulated at the power supply frequency for which the tester is designed, the output readings will be actual potential readings in volts; although 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 100%-modulated oscillator, 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 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 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.

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.

Supreme Service Stations. For the purpose of effecting prompt repairs 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. 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 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.

Guarantee. 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 defects 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 Authorized Supreme Service Station for the correction of such defects in material or workmanship within 90 days after the user's original receipt of the tester upon the user's presentation of a paid receipt 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 this guarantee policy, in accordance with the standard practices of the Radio Manufacturers Association.

SUPREME INSTRUMENTS CORPORATION

GREENWOOD, MISSISSIPPI

U.S.A.

MODEL 333 STANDARD
 TABULATION OF METER RANGES

"OHMS"	SCALE USED	MULTIPLY BY
0-2,000	2,000	Direct
2,000-200,000	2,000	100

"MILS"	SCALE USED	MULTIPLY BY
0-5	5	Direct
5-125	125	Direct

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

MODEL 333-S (STANDARD) RADIO ANALYZER

PACKING LIST

March 30, 1935

Accessories included in original Model 333-S (Standard) Radio Analyzer Shipments.

Quantity: Included:	Stock: Number:	Description	:Packer's :Check
1	: 6347	: Adapter, small 7-hole, 6-pin and locking stud	:
1	: 6348	: Adapter, small 7-hole, 5-pin and locking stud	:
1	: 6349	: Adapter, small 7-hole, 4-pin and locking stud	:
1	: 6617	: Card, reference point dialing	:
1	: 6725	: Card, 3 x 5" Registration	:
1	: 6288	: Chart, analysis, sample	:
1	: 6744	: Connector, 4-ft. black test probe	:
1	: 6745	: Connector, 4-ft. red test probe	:
1	: 6135	: Connector, 27" black pin plug	:
1	: 6571	: Connector, 27" red pin plug	:
1	: 6671	: Data, Operating	:
1	: 6758	: Form, Model 333-S 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 panel directly below the meter movement and should always be mentioned in all correspondence pertaining to the analyzer.

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

ACCESSORIES ORDER FORM

FOR

MODEL 333-S (STANDARD)

TO

SUPREME INSTRUMENTS CORPORATION
GREENWOOD, MISSISSIPPI

PLEASE SHIP TO

STREET ADDRESS.....

P. O. & STATE.....

<u>QUANTITY</u>	<u>STOCK NO.</u>	<u>DESCRIPTION</u>	<u>PRICE</u>	<u>TOTAL</u>
.....	6346	Adapter, small 7-hole to large 7-pin with locking stud	0.70
.....	6920	Battery, 1.5-volt, 3 required	0.10
.....	6288	Chart, analysis, per pad of 50	0.25
.....	6135	Connector, 27-inch black pin plugs	0.27
.....	6571	Connector, 27-inch red pin plugs	0.27
.....	820-A	Drawing, Model 333-S circuit	0.15
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).....

RECOMMENDED RADIO PUBLICATIONS

"AN HOUR A DAY WITH RIDER" SERIES
RIDER'S MANUALS - JOHN F. RIDER
SERVICING SUPERHETRODYNES - JOHN F. RIDER
PUBLISHED BY - JOHN F. RIDER, PUBLISHER
1440 BROADWAY, NEW YORK CITY

ELEMENTS OF RADIO COMMUNICATION - JOHN H. MORECROFT
EXPERIMENTAL RADIO ENGINEERING - JOHN H. MORECROFT
PUBLISHED BY - JOHN WILEY & SONS, INC.
440 - 4TH AVENUE, NEW YORK CITY

RADIO PHYSICS COURSE - ALFRED GHIRARDI
MODERN RADIO SERVICING - GHIRARDI AND FREED
RADIO FIELD SERVICE DATA - GHIRARDI AND FREED
PUBLISHED BY - RADIO TECHNICAL PUBLISHING COMPANY
22 WEST 21ST STREET, NEW YORK CITY

SOUND MOTION PICTURES RECORDING & REPRODUCTION
SERVICING SOUND EQUIPMENT
PUBLIC ADDRESS SYSTEMS
BY JAMES R. CAMERON
PUBLISHED BY - CAMERON PUBLISHING COMPANY
WOODMONT, CONN.

PROJECTION SOUND PICTURES - AARON NADELL
PUBLISHED BY - MCGRAW-HILL BOOK COMPANY
330 WEST 42ND STREET, NEW YORK CITY

THE CATHODE RAY TUBE AT WORK - JOHN F. RIDER
PUBLISHED BY - JOHN F. RIDER, PUBLISHER
1440 BROADWAY, NEW YORK CITY



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**Antique Technolgy, Tube Radios and Test Equipment
Vintage Schematics, and Publications**

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