SUPREME
Tube Checker

MODEL 45
OPERATING INSTRUCTIONS

GENERAL DATA

THE SUPREME MODEL 45 solves the ever increasing problem of testing new tubes as they are brought out without the necessity of adapters or circuit changes. The Supreme Model 45 meets the one most important requirement for a first class modern tube checker: INSURANCE AGAINST OBSOLESCENCE.

New types of tubes are being brought out for the trade so rapidly at this time that any of the so-called standard types of tube testers, regardless of design, become obsolete within a month or two.   In some cases, of course, the new tubes can be tested on the old tester by means of adapters, but it is generally recognized that their use is most unsatisfactory.   When using adapters, certain elements in the tube must often be tied together so that the test is not in accordance with actual operating conditions.   Certain testers are provided with spare sockets intended to be wired into the circuit to accommodate new types of tubes.   This, too, is very unsatisfactory since it involves partial dismantling of the original tester, and knowledge of the circuit changes is required which is usually unavailable when needed.   It is safe to say that 99% of the spare sockets placed on various designs of tube testers have never been and will never be used.

In the Supreme Model 45 the Point to Point Method of making circuit connections is utilized in a manner similar to that of the new Supreme analyzers.   One can easily recognize that this is a distinct step in tube tester design to meet present day requirements.   Each element in the tube is connected to the contact arm of an individual selector switch so that proper circuit connections can be made to each element regardless of its terminal connection at the tube base or metal cap.

An individual socket is provided for the four, five, six, and seven prong tubes. It is unnecessary to match each particular type of tube to a special socket.   All four prong tubes, regardless of their individual element connections, are inserted in the four hole socket; all five prong tubes in the five hole socket, etc.

All socket holes are numbered in accordance with R.M.A. standards.   There is a rotary switch for each of these socket terminals bearing a corresponding number.   The contact arm of this switch is directly connected to the socket terminal having the same number.   The eleven contacts on each of these rotary switches are connected to various parts of the tube checker circuit, and to a selection of grid and plate voltages.   By rotating the contact arm of the switch, the tube element located at the particular numbered terminal corresponding to the switch can be connected to any part of the circuit or to any voltage desired.   In this manner, if a tube has a plate, for example, where the cathode is usually located, this plate element at the cathode location can be connected to a suitable plate voltage instead of to the —B position in the circuit to which the cathode is ordinarily connected.   A complete change in the location of the

tube elements makes no difference to the Supreme Model 45. Let the tube manufacturer locate the plate at the tube cap, the control grid in the plate position and the cathode where the grid is usually placed—the Model 45 will test the tube perfectly.

The group of rotary switches also provides a means of applying alternating potentials of correct value to the tube elements as specified by the tube manufacturers. This is important since many times defects, such as partial shorts, will evidence themselves, which is not always the case when a potential is applied to a tube element considerably lower than the operating value.

The amplifying ability of the tube under test is determined by changing the bias on the grid by an amount automatically determined by the plate current load of the tube under test. The milliammeter used to indicate plate current emission and plate current change is a Weston double range meter. The low range is used to test detectors and amplifiers, and the high range for testing large power amplifiers and rectifiers. A toggle switch is provided for instantly and easily shifting the range of this milliammeter.

An automatic short test is incorporated in the Model 45 which does away with the troublesome procedure of first inserting the tube in a special socket for indication of shorted elements. A heavy duty resistor in the plate circuit prevents damage to the milliammeter in the case of a shorted tube, and the type of short is observed on the milliammeter itself. A means of determining whether or not the cathode and heater are either partly or totally shorted together is included in the short tests.

A gas test is provided by inserting a high resistance in the grid circuit so that the gas current will cause a change in the grid voltage, thereby also causing a change in the plate current which can be readily observed on the plate milliammeter. This eliminates the necessity of employing a delicate micro-ammeter in the grid circuit to determine the gas content of the tube.

Some of the later tubes incorporate the functions of two or more tubes in a single glass envelope. Individual tests of each combination of elements can be made in the Model 45. In the case of Duo-Diode tubes, such as the '55, a low voltage can be applied to each diode in turn, and the resulting current can be compared with the minimum values set by the tube manufacturers on these particular kind of tubes.

OPERATING PROCEDURE

MAKING CONNECTIONS FOR TEST: The "Off" and "On" toggle switch must always be left in the "Off" position until all of the following connections and switch settings are made. The connector plug on the tester should be inserted in an outlet having a nominal 110 volt alternating potential.

Adjust the seven rotary switches marked "1 - 2 - 3, 4 - 5 - 6 - 7 - TC" to the positions indicated on the chart in the lid of the carrying case. This operation places the different elements in the tube in their proper circuit connections. Insert the tube into the socket having the same number of holes as there are prongs on the tube. A 7-hole, 7-prong adapter is supplied to test the large 7-prong tubes such as the type '59. This adapter does not tie any of the elements together, but merely changes the geometrical dimensions of the 7-prong socket. Moreover, it is very probable that all future 7-prong tubes will have the prongs located on the .750" radii so that this adapter will seldom be needed.

Set the meter range toggle switch to the position shown on the chart. If ever in doubt, this switch should be left in the "High" position.

The Checker is now ready for testing the tube, and the line toggle switch can be thrown to the "On" position.

PLATE CURRENT EMISSION TEST: With the tester properly connected, and after the tube filament has become heated, the pointer on the meter will deflect to the right. This deflection indicates the plate current emission of the tube, and since definite potentials are applied to the elements, a measurement of comparative plate resistance is observed. When testing a new tube, the plate emission should be of a value approximately equal to that indicated on the chart under the heading: "Normal Plate Emission." A lower value indicates an excessively high plate resistance. After the tube has become deteriorated through use, the plate current emission will naturally drop to a value considerably lower than the value on the chart.

MUTUAL CONDUCTANCE TEST: After noting the value of the first meter reading, the "Bias" button should be pressed. The difference between the first and second readings should be compared to the value on the chart, and, for a new tube, this value should compare favorably to that shown on the chart under the heading: "Normal M. A. Change." If this change in plate current milliamperes is lower than the value indicated on the chart under "Discard M. A. Change," the tube may in general, be considered unsatisfcatory for amplification purposes.

SHORTED ELEMENT TUBES: Various types of tube shorts can be identified on the Model 45 as follows:

1. A cathode-heater short is determined by setting the rotary selector switch, whose contact arm is connected to the cathode element of the tube, to the "O" position. The number of the cathode element can always be found by referring to the R.M.A. Standard numbering system. For all heater type tubes shown on the chart, the rotary selector switch for the cathode is No. 5. If the plate milliammeter drops to "O" when this rotary switch is thrown to the "O" position, the cathode and heater are free from each other. If the plate milliammeter drops only part way to zero, this is an indication of a partial short between the cathode and the heater. If the plate milliammeter remains in its original position, the cathode and heater are directly shorted together.

2. Control Grid to Cathode (or Filament) short circuits will cause no change in the plate current indication when the "Bias" button is depressed.

3. Plate to Cathode (or Filament) short circuits will cause the meter pointer to vibrate about the "O" position.

4. Control Grid to Plate short circuits will cause the meter pointer to vibrate about the "O" position when the "Bias" button is depressed.

GAS TEST: The gas content of Amplifier types of tubes is proportional to the downward deflection of the meter pointer when the "Gas" button is depressed. The gas test is provided for comparative tests, only, of amplifier types of tubes, and no gas discard limits are set. In general, a tube should be discarded when the gaseous condition is such that a purple glow surrounds the cathode (or filament) during the operation of the tube. Mercury Vapor type rectifiers are naturally gassy and should have a purple glow during operation. The purple spots sometimes seen on the inside glass envelope of power tubes do not indicate a harmful gaseous condition, and such tubes should be considered operable if otherwise satisfactory. However, if this condition causes a hissing sound or other noises during operation, the offending tubes should be replaced.

RECTIFIER TUBE TEST: In testing rectifier tubes, the "Bias" button is not used since a grid shift test cannot be made. The plate current emission for one plate is obtained directly from the first meter deflection. In the case of full-wave rectifiers, the second plate current emission is read by resetting the rotary selector switches as shown on the chart. You will note when resetting these switches that it is only necessary to reset two of them, leaving the others in their original position. The operation merely removes the voltage from one plate and places it on the other. The two plate current readings should be compared with each other and the closer these two readings are to-gether, the better the tube will function as a rectifier. Each of the two readings should also be compared with the value on the chart. A new rectifier tube will show a plate current emission very closely to that shown on the chart under the heading, "Normal Plate Emission." If the plate current emission is lower than the value shown on the chart under the heading "Discard M. A. Change," the tube should, in general, be rejected.

MULTI-FUNCTION TUBES: Some of the later types of tubes incorporate the functions of two or more tubes in a single glass envelope. Individual tests of each combination of elements can be made in the Model 45 by resetting the rotary switches as indicated on the chart. As an example, in the case of the type 19, the value of plate current change obtained by the first setting of the rotary switches indicates the condition of one of the triode units in the tube. The second setting of the rotary switches makes it possible to determine the condition of the second triode unit in the tube. In the case of Duo-diode tubes, such as the '55, the first setting of the rotary switches provides a means of testing the triode unit in this tube with no voltage on the two diodes. The second setting of the rotary switches removes the voltage from the triode and places a low potential upon one of the diodes in order to determine what this diode current is. The third setting of the rotary switches removes the voltage from one diode and places it on the other in order to read the second diode current. For a new tube, these two diode currents should be similar to the values shown on the chart under the heading, "Plate Current Emission." The value of the diode current is usually specified by the manufacturer to be not less than one-half of a milliampere with ten volts on the diode. On all of the diode tubes shown on the chart, a potential of ten volts is placed on the diode plate.

SUMMARY: In general, it can readily be seen that the Supreme Model 45 is a very flexible tube checker indeed, and many tests can be made which are beyond the scope of other testers. The various filament voltages from the transformer of the tube checker are also brought out to external pin jacks. This makes it possible to test the external heater types of tubes and also provides a group of voltages which are often convenient to use in the radio laboratory for one purpose or another.

REGISTRATION: The owner of a Model 45 Tube Checker should fill out the registration blank supplied with the tester so that his name can be placed on our mailing list for any additional data which may be prepared in the future for this Tube Checker. The serial number should be mentioned in all correspondence. As new tubes are announced, a complete new chart will be made up by the Supreme Instruments Corporation which will be supplied to the owners of the Model 45 at a very nominal cost.

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