# RADIO TUBE TESTER

Stock No. 156: Portable Type Stock No. 156-A: Counter Type

### **SPECIFICATIONS**

ower Supply Requirements:	
Line Rating	50 cycles
Power Consumption	25 watts
Tube Complement:	
Rectifier	A-6J5-G
Mechanical Specifications:	
Dimensions	3/4" high
Weight (net)14	pounds
Finish	etal trim

### DESCRIPTION

This radio tube tester is a highly-efficient and sturdy instrument featuring unusual simplicity of operation. By using a new interlocking design, the push buttons are retained or released automatically as required for testing purposes. An easy-reading roll chart affords ready reference to the active buttons and

control settings for each type of tube. Connecting guide lines are marked on the panel from the controls to the corresponding columns of the chart. To insure greater precision, the line voltage is indicated continuously for adjustment except during actual measurement.

# **APPLICATION**

Practically every standard type of receiving tube as well as special types including the regulator, ballast, tuning indicator (Magic Eye) and certain cathode-ray oscillograph tubes can be tested for acceptibility with this instrument. The standard RMA emission test is applied to all receiving and similar tubes whereas the regulator tubes, which are gaseous in type, are tested for breakdown voltage. Ballast tubes may be checked for open circuit, and "noisy" welds can be detected readily by means of a pair of phones. In tuning indi-

cators, the visible control range (opening and closing of the "eye") may be noted in addition to emission.

Although the emission of a tube normally is an excellent criterion of performance, sometimes it is not the definite limiting factor. Thus, a tube which tests "poor" may, in rare instances, be perfectly satisfactory for a given application, or the reverse may equally well be true. A knowledge of the operating conditions, therefore, is highly desirable.

# INSTALLATION

Upon unpacking this instrument, remove the panel assembly from the case. The panel assembly may be disengaged readily by prying with a screwdriver or similar tool inserted through the two slots at the front and the two holes at the rear after withdrawing the screw located near the center of the back. Remove the cardboard cover from the rectifier tube and make certain that the tube is properly seated and undamaged. Also, inspect the internal connections of the tester in a general manner.

Replace the instrument case and connect the power cord to an electrical outlet supplying 100 to 125 volts at 50 or 60 cycles. Throw the "POWER" switch to the "ON" position and observe the meter deflection which, after a short interval (approx. 15 seconds), will be indicative of the line voltage. Adjust this voltage by means of the "LINE VOLTS" control until the meter reads at the "LINE CHECK" (midscale) position.

### **OPERATION**

As noted under "Application," the test procedure will vary with different groups of tubes. Such groups are described separately in the following sections.

#### **RECEIVING TUBES**

This group of tubes is by far the largest and embraces the a-c and battery types of detectors and amplifiers, and the various full and half-wave rectifiers.

1. Rotate the chart to the type number of the tube to be tested and set the "FIL. VOLTS," the "CLASS" and the "TYPE" controls as indicated by the notations in the respective columns of the chart. Follow the guide lines from the chart to the control knobs to insure proper settings.

2. Insert the tube in the proper socket of the tester and attach the grid connector if the tube is equipped with a top contact.

3. Test initially for short-circuited elements by depressing the "SHORTS" button, which will lock in, and then pressing in consecutive order the buttons numbered "1" to "8." If the neon lamp glows steadily, a short-circuit is indicated and the tube should be discarded.

NOTE.—On some tubes, the neon lamp should glow when certain buttons are pressed as indicated by the word "SHORTS" printed on the chart opposite such buttons.

4. Assuming that the tube is not short-circuited, proceed to the emission test by depressing the "TEST" button which will lock in and release all other buttons. Now; press the numbered buttons opposite the corresponding numbers found on the chart. Check the line voltage and readjust the "LINE VOLTS" control if necessary. Finally, depress the "OUTPUT" button

and observe the condition of the tube on the "GOOD-POOR" scale of the meter. In the case of diodes, any tube which does not cause the pointer to rise to the "DIODES O. K." mark should be rejected.

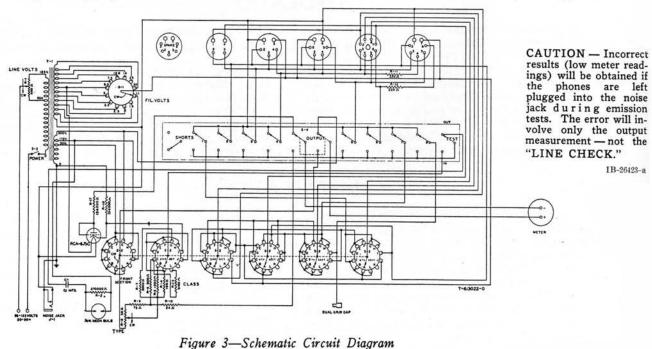
NOTE.—More than one test may be required to determine completely the condition of a tube. For instance, the Type-1A6 will require two tests, one each for the oscillator and converter sections. Similarly, three tests will be employed for the Type-1B5, one for the triode section and one for each diode section. Such multiple tests are given in order on the chart where involved.

- 5. A test for noise may be made if desired by plugging a pair of phones in the jack located at the lower right-hand corner of the panel and listening for "crackle" while tapping the tube. The "TEST" button should be left depressed during this test.
- 6. If any doubt still exists as to the tube condition, it will be advisable to repeat the short-circuit test. Excessive leakage may become evident after the tube has been heated over a longer period although the initial test usually will reveal such a defect.

### **TUNING INDICATOR (MAGIC EYE) TUBES**

Certain tubes of this type contain an amplifier section which should be tested for short-circuits and emission in the same manner as for receiving tubes.

To check the indicator section, set the "CLASS" control on position "H," thus reducing the applied potential to 110 volts. This reduced potential is desirable since such tubes often are used under analogous conditions in a c/d-c receivers. Depress the "TEST" button and the numbered buttons indicated on the chart which will cause the "eye" to appear



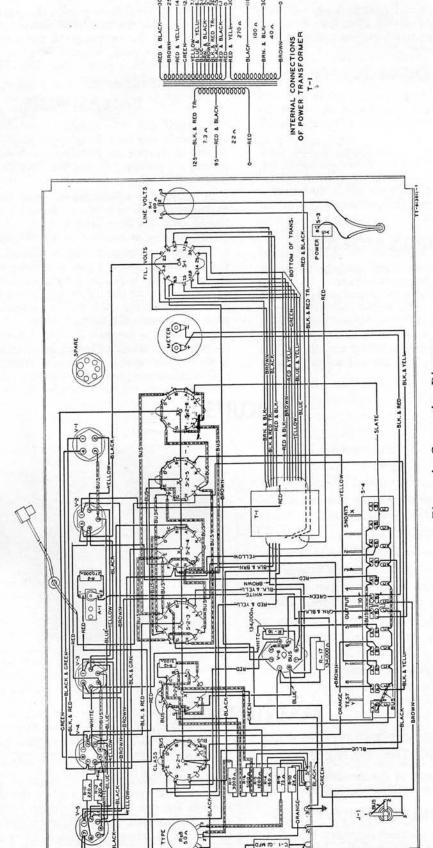


Figure 4—Connection Diagram

lighted. The "eye" should operate upon following the instructions printed on the chart directly above the "OUTPUT" button, the latter not being used for this test.

### CATHODE-RAY OSCILLOGRAPH TUBES

As shown on the chart, the Types-902 and -913 cathode-ray tubes can be checked with this tester. Its use in testing other tubes of this variety is not recommended.

In testing the Type-902 or the Type-913 tube, allow at least two minutes preheat before checking the emission. The testing procedure is the same as for receiving tubes, rejecting those on which the emission is not sufficient to cause the pointer to rise to the "DIODES O. K." mark.

### GASEOUS REGULATOR TUBES

These tubes should be tested initially for short-circuit and then for breakdown voltage.

For the short-circuit test, the procedure is the same as for receiving tubes. Due to the gaseous nature of these tubes, the neon lamp may glow faintly upon pressing button 1 or 3 in testing the Type-874, or upon pressing button 1 or 5 in testing the others. The tube, however, should not be rejected unless the glow is brilliant.

To test for breakdown voltage, depress the "TEST" button and then the numbered button indicated upon the chart. If the tube is good, the meter deflection will rise appreciably, whereas little or no rise will occur if the tube is poor. The "OUTPUT" button is not employed in this test.

#### **BALLAST TUBES**

Tubes of this type should be tested initially for open circuit and then for incipient noise due to poor welds. Both tests are performed with the "CLASS" control on position "I" and the "SHORTS" button depressed.

In testing for open circuits, press the numbered buttons indicated upon the chart which in each case should cause the neon lamp to glow. Failure to observe this glow is evidence of a defective tube.

The test for incipient noise is effected by listening for "crackle" through a pair of phones plugged into the jack located in the front right-hand corner of the panel. Defects of this nature usually are the result of poor welds and the noise will be exaggerated by tapping lightly upon the tube envelope.

Common type numbers of these tubes are listed in the left-hand column of the chart in numerical order, while the corresponding Clarostat (tentative RMA) type numbers are given in the right-hand column.

# **CIRCUITS**

The circuits used in this instrument are shown on the schematic diagram of Figure 3. As may be observed from this diagram, the design is comparatively simple, consisting fundamentally of the circuit elements described by RMA for standard emission tests.

Adjustment for different plate loads and voltages as required is provided by the "CLASS" control. This control also shifts the filament connections for the octal-base tubes and is equipped with an extra set of switch contacts to avoid obsolescence of the tester in the event of forthcoming new tube types. The "TYPE" control is simply a meter shunt or calibrating potentiometer, while the remaining knobs and buttons are self-explanatory in function.

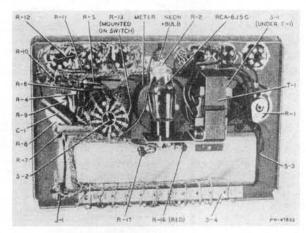


Figure 5-Bottom View of Panel

### MAINTENANCE

CAUTION—DISCONNECT THE POWER SUPPLY BY WITHDRAWING THE POWER CORD PLUG BEFORE REMOVING THE INSTRUMENT CASE TO MAKE SERVICE ADJUSTMENTS.

Instructions for removal of the instrument case are given under the section entitled "Installation."

#### RESISTANCE AND CONTINUITY TESTS

The instrument connection diagram, Figure 4, shows the wiring color codes and the physical rela-

tions of the various parts. All resistance and capacitance values are given in addition to the identification symbols for ease of reference to the schematic diagram, photographs, and replacement parts list. The transformer windings are rated in terms of their d-c resistances.

#### **VOLTAGE MEASUREMENTS**

The normal operating voltages of the equipment are represented diagramatically in Figure 6. These values should be observed within  $\pm 10\%$  when measured with the line voltage adjusted so that the

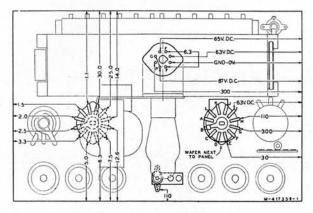


Figure 6-Voltage Diagram

meter reads at the "LINE CHECK" (mid-scale) position. A voltmeter of high internal resistance (at least 1,000 ohms per volt) should be employed. All voltages are a.c. (r-m-s) except in the one instance noted as "d.c."

#### CHART REPLACEMENT

In the event that replacement of the roll chart is required, proceed as follows:

- 1. Remove the instrument case (see "Installation").
- 2. Pull off the push buttons, then loosen the switch by taking out the two mounting screws, and swing it clear of the chart.
- 3. Rotate the chart to the *finish* end and remove the wood screw securing this end to the front spool.
- 4. Pull out the chart and detach the other end from the rear spool in the same manner.

To insert the new chart:

- 1. Pass the *start* end of the chart between the front spool and the panel, and attach that end to the rear spool using one of the two wood screws formerly removed.
- 2. Rotate the thumb-wheel until the entire length of the chart is snugly wound on the rear spool.
- 3. Attach the finish end of the chart to the front spool, leaving about four inches of slack.

Should any binding occur in operation, rewind the chart on the rear spool, remove the *finish* end from the front spool and reattach it allowing more slack.

# REPLACEMENT PARTS

Insist on genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

STOCK No.	DESCRIPTION		STOCK No.	DESCRIPTION	
32118	Bolt—Suitcase bolt	,	32549	Resistor—Matched pair of 134,000- ohm, ½-watt resistors (R-16	
32120	Button—Push-button (black)			R-17). Sum = 268,000 ohms $\pm 2\%$	
32121	Button—Push-button (red)		30651	Resistor—270,000 ohms, ½ watt	
32117	Cap—Dual contact cap			(R-2)	
4839	Capacitor—0.1 mfd. (C-1)		31251	Socket—Tube socket (octal, for rec-	
32180	Chart—Roll chart (tube data)		20100	tifier)	
30925	Handle—Carrying handle		32129	Socket—Tube socket (octal)	
7903	Jack—Phone jack (J-1)		32125	Socket—Tube socket (4-prong)	
32116	Knob—Control knob		32126	Socket—Tube socket (5-prong)	
23153	Lamp—Neon glow lamp		32127	Socket—Tube socket (6-prong)	
32079	Meter		32128	Socket—Tube socket (7-prong)	
32133	Panel—Control panel		32115	Socket—Neon lamp socket	
32130 32131 32182	Potentiometer—50 ohms (R-8) Potentiometer—400 ohms (R-1) Resistor—24 ohms, ¼ watt (R-10)		32132 32124	Spring—Spring for panel contact Switch—1-gang, 1-pole, 12-position (S-1)	
32181 32179	Resistor—75 ohms, ¼ watt (R-9) Resistor—160 ohms, 1 watt (R-4)		32123	Switch—6-gang, 6-pole, 12-position (S-2)	
5201	Resistor—220 ohms, ½ watt (R-11, R-12)		32119	Switch—Single-pole, single-throw (S-3)	
30152	Resistor—1,000 ohms, 1 watt (R-5) Resistor—3,000 ohms, 10 watts (R-7)		32080	Switch-Push-button switch (S-4)	
32122 3413	Resistor—5,100 ohms, 10 watts (R-7) Resistor—5,100 ohms, 1/2 watt (R-6, R-13)		32183	Transformer — Power transformer XT-2970 (T-1)	