KS-15840, LIST 1 MICROMHOS METER CALIBRATOR

1. GENERAL

1.01 This section describes the KS-15840, List 1 micromhos meter calibrator. It is a small portable unit for checking the accuracy of the micromhos meter of any KS-type tube tester of Hickok Electrical Instrument Company origin.

1.02 The calibrator has been designed to replace Western Electric Company operational standard electron tubes which were used to check the micromhos meter indications of the KS tube testers.

1.03 The calibrator does not provide a check of the accuracy of the micromhos meter by itself. It does check that the various meter shunt arrangements provide consistent indications on the meter and that the tester is functioning properly to indicate the test results on the meter. It also provides a check of some of the principal overlapping scale points on the various scales. The check of functional operation is essentially what was accomplished by the operational standard tubes. It will not eliminate other maintenance tests specified for KS testers in their respective Bell System Practices.

2. DESCRIPTION

General

2.01 The KS-15840, List 1 micromhos meter calibrator is self-contained in a small case for portable use. It is equipped with a rubber-covered cord and a 5-pin male plug for connecting to the set to be tested. The overall dimensions of the calibrator are 6¼ inches long by 3¾ inches wide by 2½ inches high. The weight is 1 pound 10 ounces.

2.02 The front panel (Fig. 1) contains a calibrated ac iron-vane voltmeter with controls consisting of a 2-position slide-switch designated RANGE and a potentiometer marked METER ADJUST. Brief operating instructions also appear on the front panel.

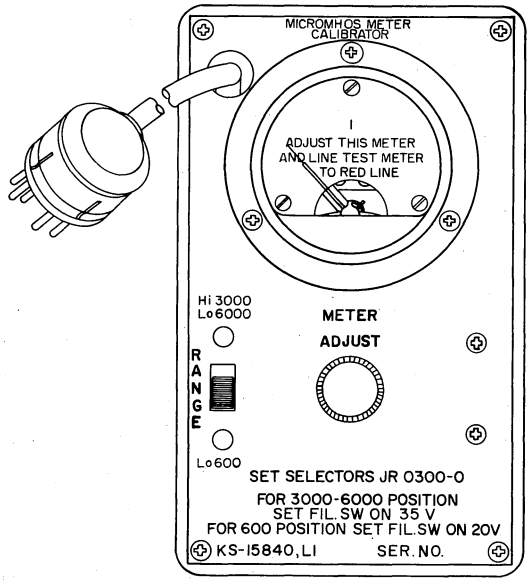

Fig. 1 — Micromhos Meter Calibrator, Panel Layout

2.03 The rear of the case has a label which contains more detailed operating instructions and a table of requirements.

2.04 It is important that the calibrator be used in a horizontal position on a firm and level surface because the voltmeter is calibrated for an accuracy of ±0.25 per cent, and because the meter is somewhat sensitive to position.

Circuit Description

2.05 The circuit used in the KS-15840, List 1 calibrator is designed to simulate a tube being tested in a KS tube tester. This is accomplished through an ac voltage and appropriate values of resistance which simulate plate impedance. The micromhos meter readings thus obtained can be compared with ideal requirements. This circuit is essentially the same as that used by the supplier to check the KS tube testers.

2.06 Fig. 2 is a schematic circuit of the calibrator. Two of the leads from the plug are bridged across the 1000-ohm potentiometer

R1, designated METER ADJUST. These leads obtain the ac voltage from the tapped filament supply secondary of the tester. The ac voltmeter, with a basic calibration of 6 volts, is connected across the METER ADJUST potentiometer and pin 5 on the plug. An ac voltmeter multiplier consisting of a 470-ohm R2 potentiometer and a 500-ohm R3 potentiometer is also connected to the ac voltmeter. The R3 potentiometer is precisely adjusted and sealed to obtain a 30-volt mid-scale reading. This multiplier is shorted out in the LO 600 position of the RANGE slide switch.

2.07 The remaining part of the circuit includes the proper resistances to make up the required load impedance. The 30-volt test position consists of two 4000-ohm resistors, R4 and R5 (the latter is adjustable). This part of the circuit is adjusted to 5950 ohms and has a normal drain of 0.025 amp. The 6-volt test position has supplementary resistors consisting of a 4700-ohm R6 potentiometer and a 1000-ohm R7 potentiometer adjusted and sealed to obtain 5530 ohms. This gives a total of 11,480 ohms with a normal drain of 0.005 amp for the 6-volt test position. This portion of the circuit is shorted out in the HI 3000 position of the RANGE switch. The load resistor circuit returns to the plate circuit of the KS tester by means of pin 3 on the five-prong plug.

Circuit Theory

2.08 As discussed in 2.05, appropriate load resistors in series with 6 and 30 volts simulate an amplified 60-cycle signal in the micromhos meter circuit. The ideal values of these load resistors are 6000 ohms in series with 30 volts to check the HI 3000 and LO 6000 micromhos ranges. The LO 600 range has an ideal value of 11,530 ohms in series with 6 volts. Each of these ideal values is reduced by 50 ohms in the calibrator to compensate for a 50-ohm value in the cathode return circuit of the KS tester being checked. This 50 ohms is ½ of a filament-winding midtapped 100-ohm resistor which appears in all KS-type testers. The applicable part of a KS tester is shown in Fig. 3.

3. METHODS FOR CHECKING MICROMHOS METERS

Test Procedures

3.01 The KS-15840, List 1 micromhos meter calibrator applies to all KS tube testers listed in Table A. Table A is essentially the same as the one attached to the rear of the unit.

3.02 To check the HI 3000 MICROMHOS or FUNCTION switch position, proceed as follows:

(1) Place the KS-15840, List 1 calibrator in a horizontal position adjacent to the KS tube tester to be checked. With the tube tester power switch off, plug the calibrator into the five-pin test socket.

(2) On calibrator, set RANGE switch to HI 3000 and turn METER ADJUST knob to full counterclockwise position.

(3) On KS tester, set main SELECTORS to JRO300-0. For older testers with A and B main selectors, set A on 1, B on 1, and L POT. on 60.

(4) On KS tester, set MICROMHOS or FUNCTION switch to HI SIGNAL 3000.

(5) On KS tester, set FILAMENT switch to the 35-volt position.

(6) On KS tester, check zero setting of Gm meter.

(7) On KS tester, switch ac power on and adjust line voltage to red line on AC VOLTS meter.

(8) On KS tester, depress and lock P4 push button.

(9) Check and adjust the ac voltmeters, if necessary, on both the calibrator and KS tester.

(10) Observe micromhos reading on KS tester and compare with Required Micromhos column in Table A.

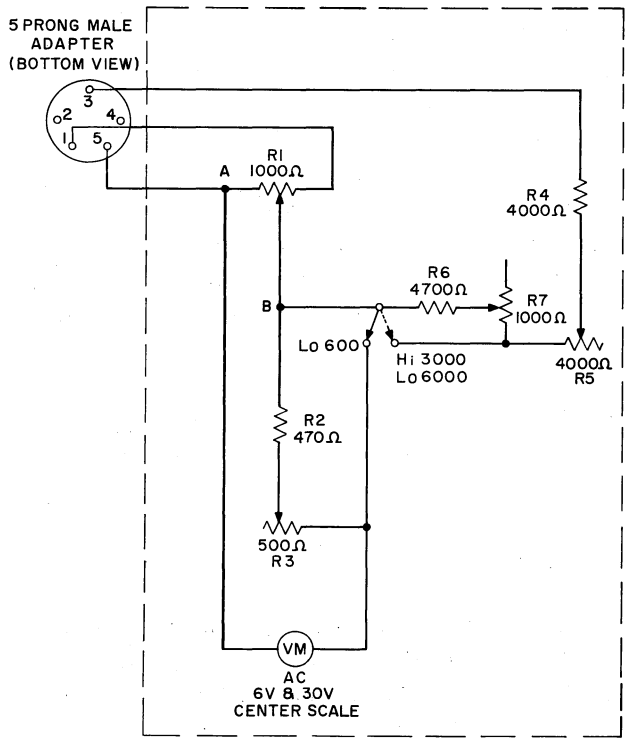

Fig. 2 — Micromhos Meter Calibrator, Schematic

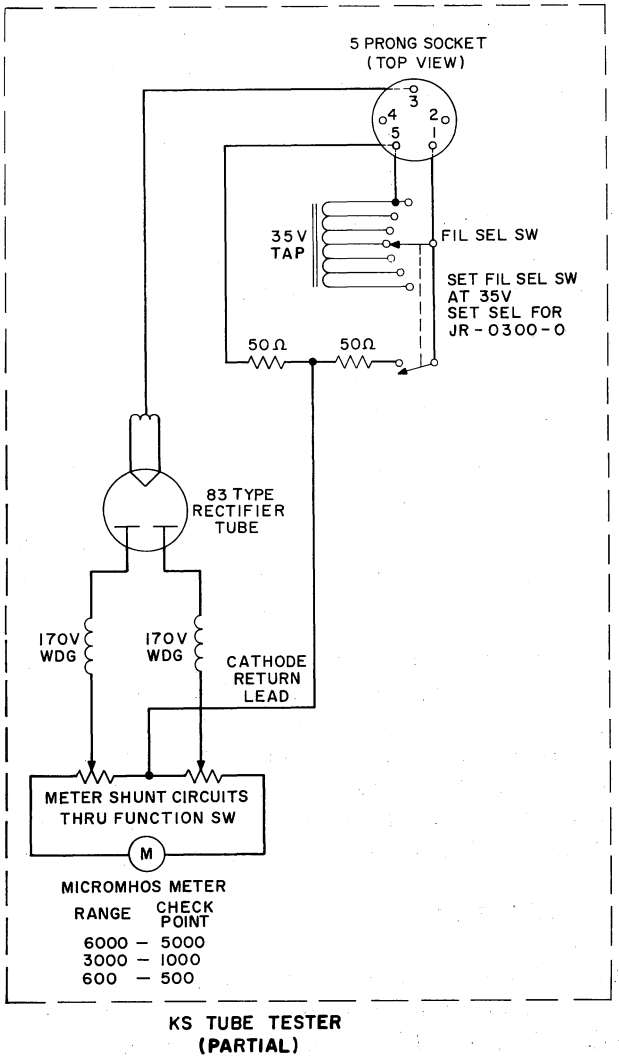

Fig. 3 — Micromhos Meter Calibrator, Application Circuit

TABLE A

TUBE TESTER	SETTING ON		REQUIRED MICROMHOS
	CALIBRATOR	TESTER	
KS-15750, L1, L2	LO 600 LO 6000 HI 3000	LO 600 LO 6000 HI 3000	500 ±2.5 div 5000 ±1.5 div 1000 ±1.5 div
KS-15560, L1, L2 KS-15559, L1, L2 KS-5727, L1, L2	LO 6000 HI 3000	LO 6000 HI 3000	5000 ±1.5 div 1000 ±1.5 div
KS-13588 KS-8235	HI 3000	L Pot. on 60* Micro SW 3000	1000 ±2.0 div

*Also, set the A and B selectors to 1.

3.03 LO SIGNAL 6000 — Testers that have this range may be checked by repeating 3.02 with the following substitution:

Step (4) Set FUNCTION switch to LO SIGNAL 6000.

3.04 LO SIGNAL 600 — The KS-15750 tester is the only one having this range. To test, repeat 3.02 with the following substitutions:

Step (2) Set RANGE switch at LO 600.

Step (4) Set FUNCTION switch at LO SIGNAL 600.

Step (5) Set FILAMENT switch at 20-volt position.

3.05 Other maintenance checks of KS tube testers are given in their respective Bell System Practices.

3.06 Older type testers, having L potentiometers, may be calibrated as follows (assuming the micromhos meter meets its accuracy requirements): Adjust L potentiometer until micromhos meter reads 1000 on 3000 scale, then loosen knob and set on 60 or Gm, and make sure that knob is firmly tightened at this adjustment.

4. CALIBRATION

4.01 Under normal usage of the calibrator, its ac voltmeter may be checked on an annual basis. This would require a Ballantine model 300 VTVM or equivalent in very good calibration to match the 0.25 per cent accuracy of the calibrator voltmeter.

4.02 To check the ac voltmeter in both the 30-volt (HI 3000) and 6-volt (LO 600) switch positions, proceed as follows: Remove the four panel-mounting screws and attach leads from the VTVM at points A and B as shown in Fig. 2.

4.03 With the voltmeter thus connected, block up the calibrator in a level position and repeat procedures 3.02 and 3.04.

Requirements

(a) With the calibrator RANGE switch in HI 3000 position and meter needle on the red line, a voltage of 30 $\pm$0.1 volts shall be obtained on the VTVM.

(b) With the calibrator RANGE switch in LO 600 position and both meter needles on the red line, a voltage of 6 $\pm$0.05 volts shall be obtained on the VTVM.

5. MAINTENANCE

5.01 No special maintenance is required.