

KS-12054 L1 TEST SET FOR 400-TYPE GERMANIUM VARISTORS DESCRIPTION AND APPLICATION

1. GENERAL

1.01 This section describes the KS-12054 L1 portable test set used for testing 400-type germanium varistors.

1.02 This section is reissued to change KS-12054 test set to KS-12054 L1 test set and to change reference to the KS-9290 and KS-9291 test leads to KS-12054 L2 and KS-12054 L3, respectively.

1.03 This test set provides means for testing the forward and reverse voltage/current characteristics of 400-type germanium varistors at voltages which are consistent with design requirements and manufacturing limits. These voltages ordinarily are not obtainable with the use of ohmmeters.

2. DESCRIPTION

2.01 The test set is portable and is contained in a black phenolic case. The approximate dimensions of the set are 5 1/2 inches long, 3 3/4 inches wide, and 2 5/8 inches deep. The weight, less batteries, is approximately 1 1/2 pounds. The panel as viewed from the top is shown in Fig. 1. It is fastened to the casing by means of four screws which can be removed to make the panel, to which all the apparatus is attached, readily accessible for maintenance.

2.02 The test set is equipped with metal rings for the attachment of a KS-13632 L1 carrying strap which is furnished with the set.

2.03 Two pin jacks, designated as (1) and (2), are provided to accommodate a pair of KS-12054 L3 test clip leads or a pair of KS-12054 L2 test pick leads, both of which are supplied with the set.

2.04 A microammeter is provided for indicating the measured forward and reverse voltage/current characteristics of varistors and for checking the voltage of the self-contained test

batteries. The meter ranges which have been provided were chosen with the object of being adequate not only for the testing of varistors alone but also for in-circuit testing of the varistors over the expected range of circuit shunts which may be encountered in order to minimize the need for unsoldering to perform tests.

2.05 A 10-position rotary switch is provided to establish various test circuit conditions required for measuring the forward and reverse characteristics of the varistor and to check the voltage of the self-contained test batteries.

2.06 A rheostat is provided for adjusting the forward current through the varistor when the switch is on the CAL position.

2.07 A toggle-type reversing switch with positions designated +ON (1) and +ON (2) is provided to reverse the polarity of the test leads connected to pin jacks (1) and (2).

2.08 The test set operates from self-contained batteries which are not supplied with the test set and must be ordered separately. Figure 2 shows the test set, bottom view cover removed, with the five batteries in their proper positions. The following batteries are required for the operation of this set:

(a) A 45-volt battery consisting of:

- Two KS-14773—22.5 volts or
- Two Eveready No. 412E—22.5 volts or
- Two Ray-O-Vac No. 516—22.5 volts
- Two Olin No. 0915—22.5 volts or
- Two Burgess No. V15E—22.5 volts or equivalent.

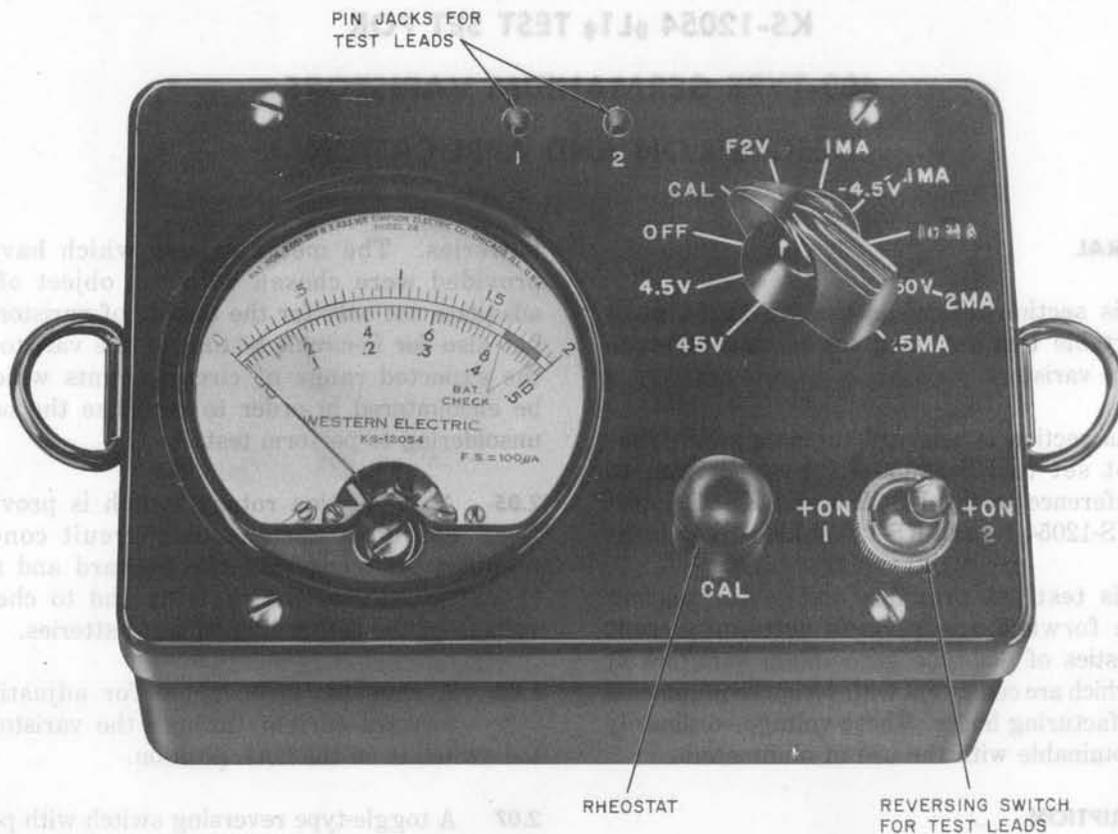


Fig. 1—K-12054 L1 Test Set—Top View

These batteries are each approximately 2 inches long, 1 inch wide, and 5/8 inch deep.

(b) A 4.5-volt battery consisting of:

- Three KS-14368—1.5 volts or
- Three Bright Star 59—1.5 volts or
- Three Burgess Z—1.5 volts or
- Three Eveready No. 915—1.5 volts or
- Three General AA—1.5 volts or
- Three Ray-O-Vac 7R—1.5 volts or equivalent.

These batteries are each approximately 2 inches long and 1/2 inch in diameter.

3. CIRCUIT DESCRIPTION

3.01 A schematic circuit diagram of the test set is shown in Fig. 3.

3.02 The K-12054 L1 test set provides the following features.

(a) **Internal Battery Measurements (Switch Positions 45V and 4.5V):** The two 22.5-volt internal batteries and the three 1.5-volt internal batteries are measured on the meter of the test set to insure they are within the limits specified in 4.02 and 4.03. The circuit arrangement for these measurements is shown in Fig. 4 and 5, respectively.

(b) **Forward Current (Switch Position CAL):** Means are provided for establishing a specified value of forward current through the varistor under test, under control of a knob rheostat adjustment with the designation (CAL). The

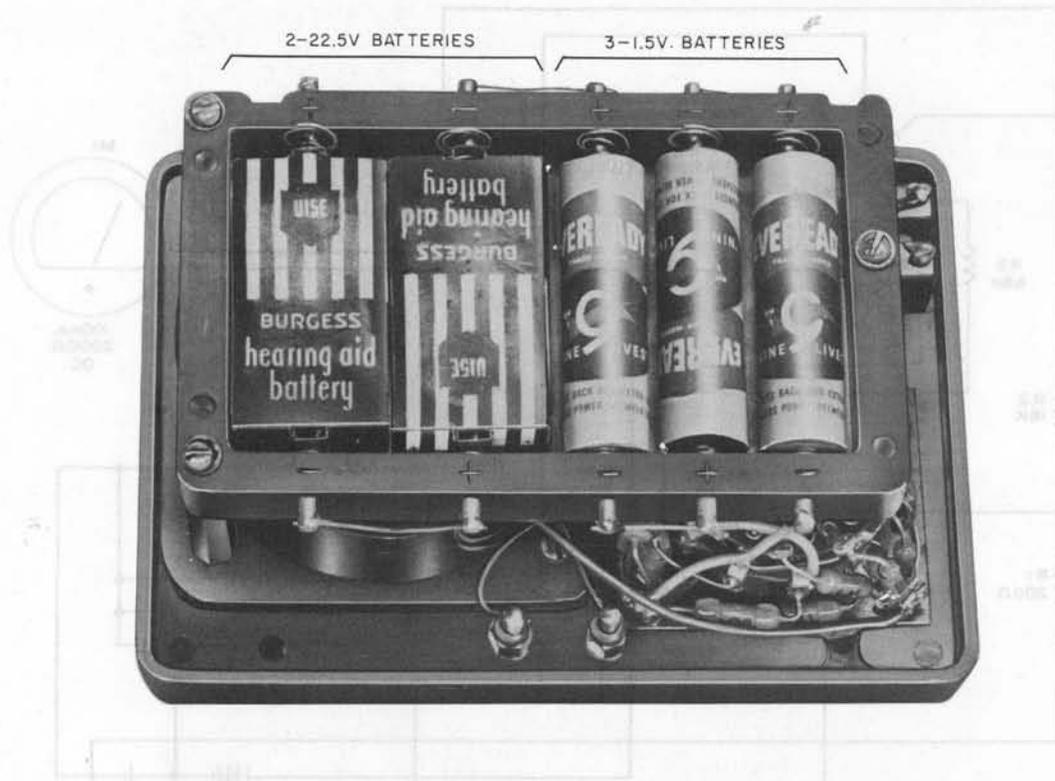


Fig. 2—K-12054 Test Set—Bottom View—Cover Removed

full-scale meter range under this condition is 10 mAs, as shown in Fig. 6.

(c) **Forward Voltage (Switch Position F2V):**

After the forward current has been established, the forward voltage necessary to produce this current can be determined. Figure 7 shows a schematic of the circuit arranged for making the forward voltage measurement.

(d) **Reverse Current Measurement at $-4.5V$ (Switch Positions 1 mA and .1 mA):** The reverse current through a varistor with 4.5 volts applied can be measured with the meter circuit set for either 1-mA full scale or .1-mA full scale, as shown in Fig. 8.

(e) **Reverse Current Measurement at $-49.5V$ ($-50V$) (Switch Positions 10 mA, 2 mA, and .5 mA):** The measurement of the reverse current at -49.5 volts through a varistor can be made with the meter circuit established for 10-mA full scale, 2-mA full scale, or .5-mA full scale. Figure 9 shows the schematic for this feature.

4. METHOD OF OPERATION

GENERAL

4.01 The following procedures apply to the use of this test set for the testing of germanium varistors:

- (a) Voltage test of test set internal batteries
- (b) Connection of test set to varistor
- (c) Measurement of voltage/current characteristic of varistor in forward direction
 - (1) Establishment of forward current
 - (2) Measurement of applied forward voltage
- (d) Measurement of current through varistor in reverse direction
 - (1) With 4.5 volts applied
 - (2) With 49.5 volts applied.

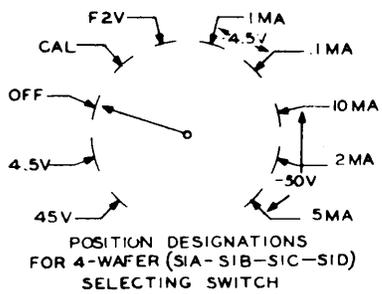
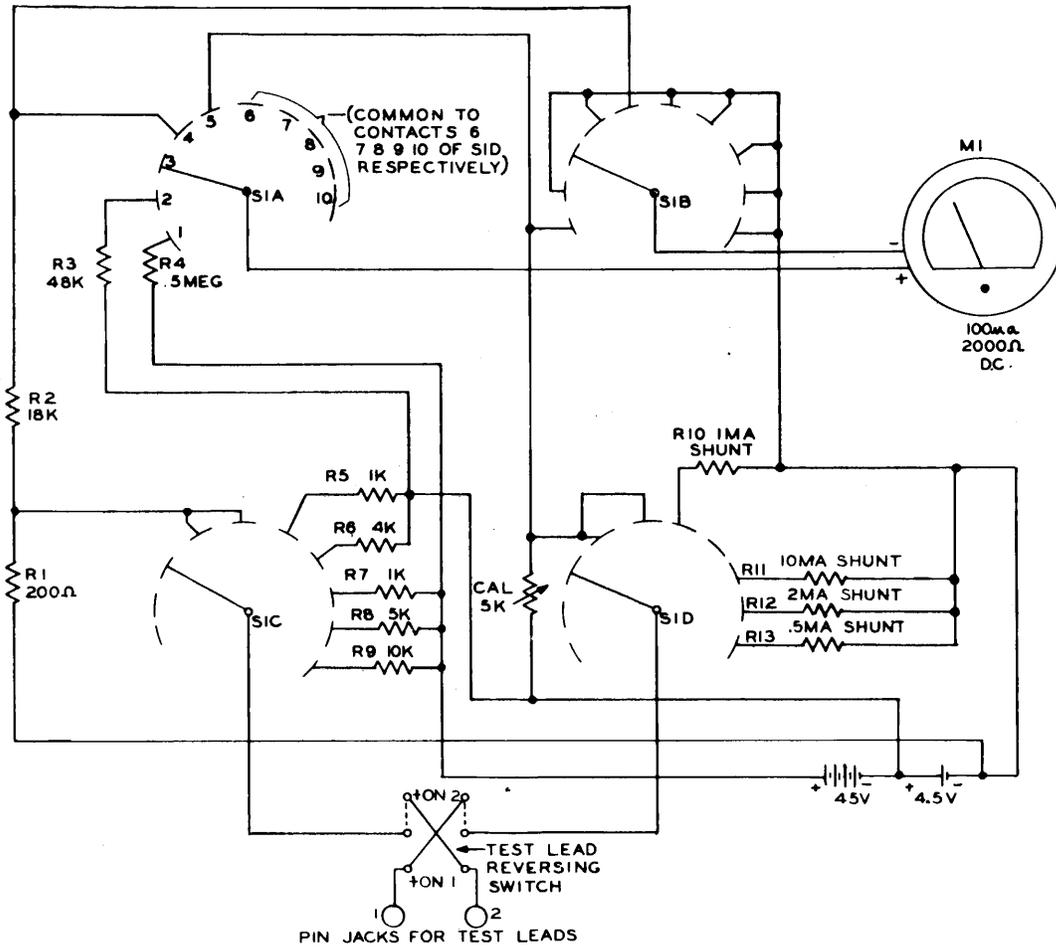


Fig. 3—Circuit Schematic KS-12054 Test Set

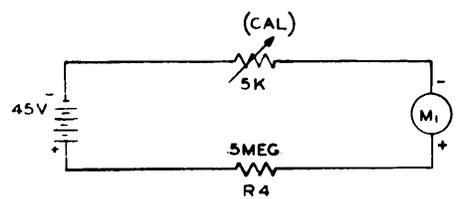


Fig. 4—Voltage Measurement of 45V Battery (Position 45V)

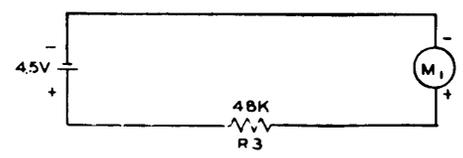


Fig. 5—Voltage Measurement of 4.5V Battery (Position 4.5V)

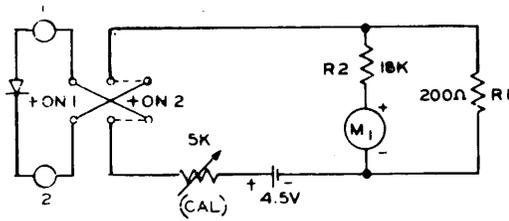


Fig. 6—Forward Current Measurement (Position CAL)

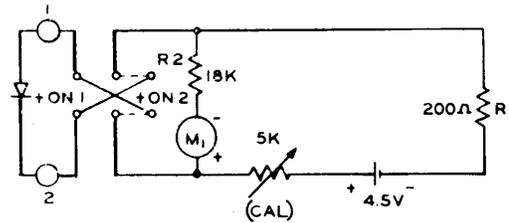


Fig. 7—Forward Voltage Measurement (Position F2V)

VOLTAGE TEST OF TEST SET INTERNAL BATTERIES

4.02 In order to assure that the test set batteries are of proper voltage before testing a varistor, turn the rotary switch to its 45V position. This will provide a measurement of the voltage of the two 22.5-volt internal batteries which are connected in series. The voltage is read on the 50-volt scale of the meter. If the batteries are normal and of suitable voltage for varistor testing, the meter pointer will be within the green area (41 to 48) of the meter scale.

4.03 Turn the rotary switch to its 4.5V position in order to measure the voltage of the three 1.5-volt internal batteries which are connected in series. The voltage is read on a 5-volt scale of the meter. If the batteries are normal and of suitable voltage for varistor testing, the meter pointer will be within the green area (4.1 to 4.8) of the meter scale.

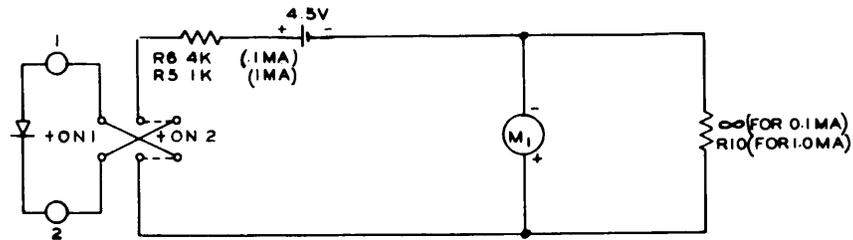


Fig. 8—Reverse Current Measurement at -4.5V (Positions 1 mA and .1 mA)

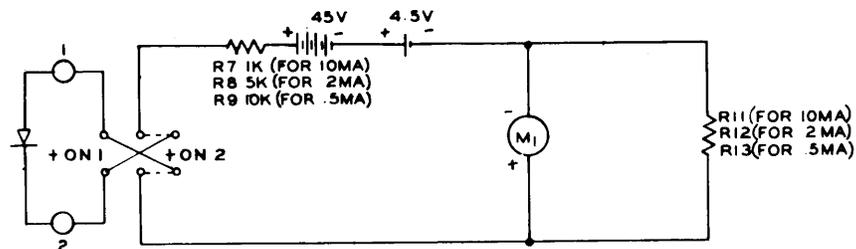


Fig. 9—Reverse Current Measurement at -49.5V (-50V)

CONNECTION OF TEST SET TO VARISTOR

4.04 After satisfactorily testing the internal batteries of this test set, turn the rotary switch to its OFF position. Connect either the \blacklozenge KS-12054 L3 \blacklozenge test clip leads or the \blacklozenge KS-12054 L2 \blacklozenge test pick leads, both of which are furnished with the set, to the two pin jacks which are designated by a (1) and (2). With the test lead in the (1) pin jack attached to the end of the varistor marked (1), the test lead in the (2) pin jack attached to the end of the varistor marked (2), and the toggle switch set on its +ON2 position, proper polarity will be established for testing the varistor by selecting the various switch positions.

MEASUREMENT OF VOLTAGE/CURRENT CHARACTERISTIC OF VARISTOR IN FORWARD DIRECTION

4.05 Before any measurements of the varistor are made, it is necessary to insure that proper polarity of connection is made to the varistor. This can be determined by turning the rotary switch to its CAL position. While in this position, if the meter does not show a deflection, the polarity of the varistor is reversed. In such an event, by operating the toggle switch to its other position, the polarity of the test leads can be reversed. To establish the current, the CAL rheostat should be adjusted. Unless otherwise specified on the

circuit drawing or other test data, this current value generally is set at 3 mAs as read on the 10-mA scale of the meter.

4.06 The forward voltage required to produce the forward current of the CAL position can be measured with the rotary switch on its F2V position. A reading of one volt or less on the 2.0-volt scale indicates a varistor within requirements.

MEASUREMENT OF CURRENT THROUGH VARISTOR IN REVERSE DIRECTION

4.07 With the rotary switch set on its 1-mA position, a reverse voltage of 4.5 volts is applied to the varistor. The three 1.5-volt internal batteries are connected in series with the varistor to provide this test voltage. The reading is made on the 1-mA scale. If the current is less than 0.1 mA, turn the rotary switch to its 0.1-mA position, which provides the same 4.5 test voltage, but with the meter at 0.1-mA full-scale sensitivity. A translation of meter current readings to resistance in ohms is shown in Fig. 10.

4.08 With all of the test set batteries (two 22.5 volts and three 1.5 volts) connected in series, a total voltage of 49.5 volts is obtained. On the next three switch positions of the test set, which

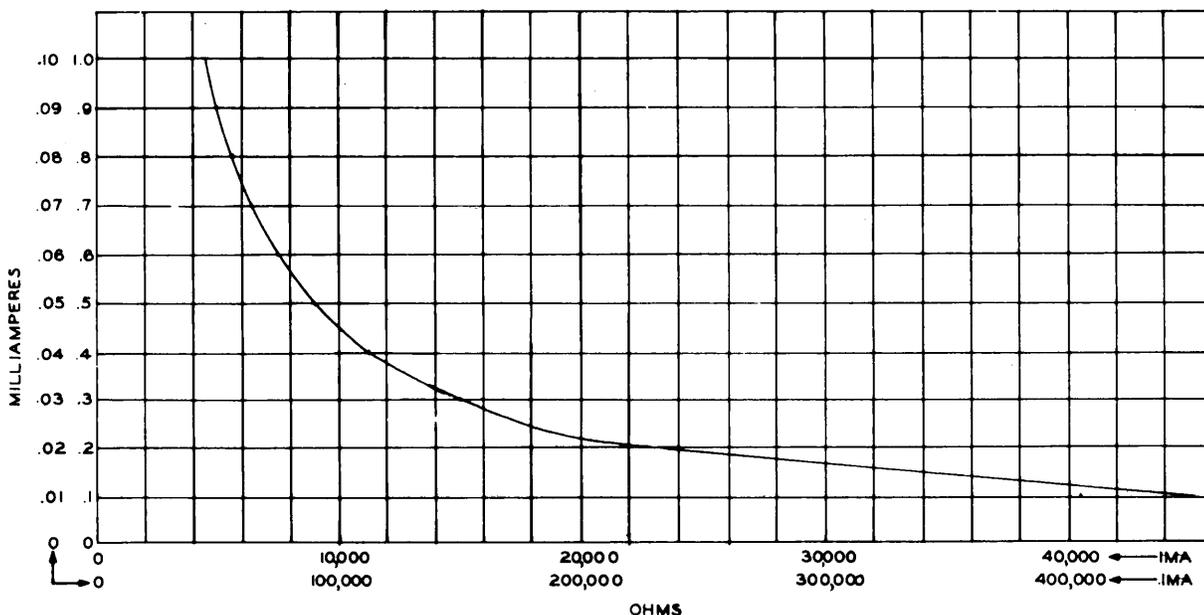


Fig. 10—Resistance vs Current KS-12054 \blacklozenge L1 \blacklozenge Varistor Test 4.5-Volt Test Condition

are designated 50V, this total of 49.5 volts is applied.

4.09 To measure the current through the varistor in the reverse direction with 49.5 volts applied, the rotary switch may be turned to either

the 10-mA position, the 2-mA position, or the 0.5-mA position. The reading is made either on the 10-mA scale, 2-mA scale, or 0.5-mA scale, respectively, according to the difficulty in reading the current. A translation of meter current readings to resistance in ohms is shown in Fig. 11.

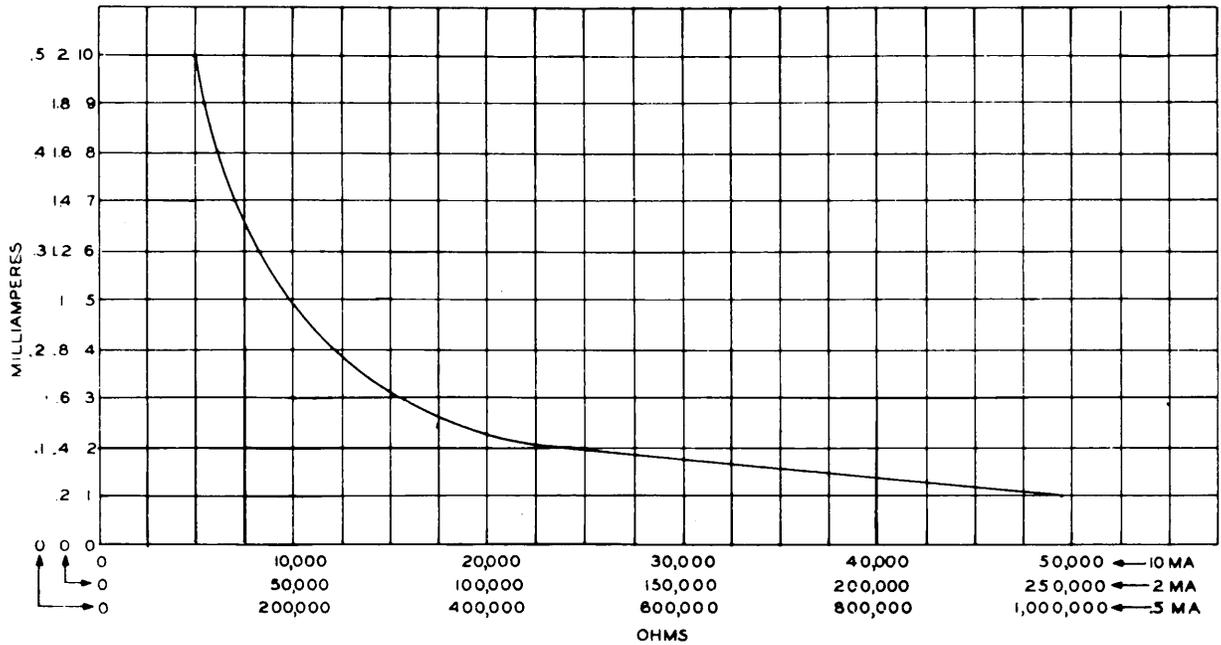


Fig. 11—Resistance vs Current KS-12054 Varistor Test Set 49.5-Volt Test Condition

