KS-20538 METER
(PORTABLE VOLT-OHM-MILLIAMMETER)
DESCRIPTION AND APPLICATION

CONTENTS PAGE

1. GENERAL

1.01 This section describes the KS-20538 meter (portable volt-ohm-milliammeter) and includes instructions for its use.

1.02 The KS-20538 meter is a solid state, portable, self-contained meter for general maintenance use for the measurement of ac and dc voltages, dc current, and resistance. A black leather carrying case, KS-20538 L3, and a pair of test leads, KS-20538 L2, are available as accessories.

2. DESCRIPTION

2.01 The meter illustrated in Fig. 1 is provided with the following ranges, available by means of a range switch:

DC VOLTS	AC VOLTS	DC CURRENT	RESISTANCE
	0.01	0.01 mA (10ua)	X1
	0.03	0.1 (100ua)	X10
0.01	0.1	1.0 mA	X100
0.3	0.3	10.0 mA	X1K
1.0	1.0		X10K
3.0	3.0		X100K
10.0	10.0		X1 MEG
30.0	30.0		
100.0	100.0		
300.0	300.0		
1000.0	1000.0		

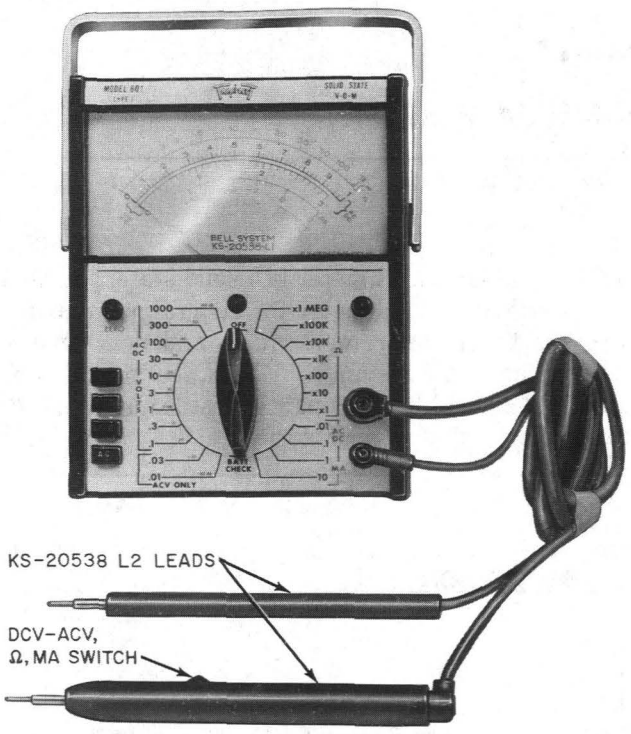

Fig. 1—KS-20538 L1 Volt-Ohm-Milliammeter with KS-20538 L2 Leads

2.02 The basic meter is of the permanent magnet moving coil type, having a sensitivity of 50 microamperes dc for full scale deflection.

2.03 The meter is equipped with four push buttons. They are marked DC+Ω, DC-Ω, LPΩ and AC. The DC+Ω and DC-Ω are for measuring positive and negative dc voltages and currents, and for conventional ohms measurements.

2.04 The conventional ohms test circuit is handy for checking forward and reverse resistance of semiconductors. Polarity reversing is accomplished by use of push buttons rather than the reversing of leads.

2.05 The LP is a low power ohms circuit which is most useful for checking resistances in circuit since it eliminates the errors caused by silicon diode and transistor loading. The circuit is also safe for checking resistance between terminals of integrated circuits.

2.06 The red probe lead is equipped with a slide switch. One position is for reading dc volts and the other position for use when reading ac volts, ohms, or milliamperes.

2.07 There are four scales on the meter as shown in Fig. 2. The top red scale is used when measuring resistance and is marked 0 to 1K. The two middle scales are used for all dc and ac voltage readings. The bottom red scale is used for reading decibels.

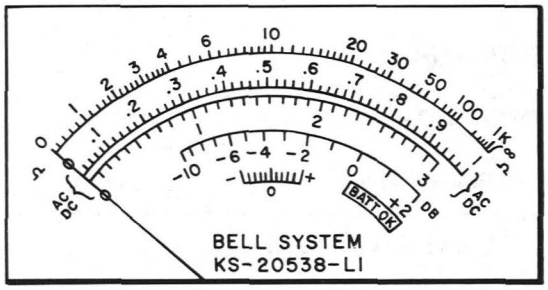

Fig. 2—Meter Scale

2.08 The KS-20538 L3 carrying case is constructed of black leather and is felt lined. It is equipped with a leather strap handle and a built-in stand on the back. The flaps open to permit use of the tester in the case.

2.09 When used as a dc voltmeter, the meter has an accuracy of ±2% on all ranges except 1000v which is ±3%.

2.10 When used as an ac voltmeter, the accuracy of the meter depends on the voltage being measured and the frequency as shown in the following table:

RANGE	FREQUENCY	ACCURACY
0.01 to 10v	50Hz to 20KHz	±3%
	20KHz to 50KHz	±5%
30v to 300v	50Hz to 10KHz	±3%
	10KHz to 20KHz	±5%
1000v	50Hz to 1KHz	±3%
	1KHz to 5KHz	±5%

2.11 When used as an ohmmeter, the accuracy is 3 degrees of arc.

2.12 When used as an ammeter, the meter has an accuracy of 3% on dc and an accuracy of 4% on ac.

2.13 The meter is 3-3/16 inches by 5-1/8 inches by 6-1/2 inches and weighs approximately 3 pounds with batteries.

3. OPERATION

Precautions

3.01 The KS-20538 L1 meter is a precision instrument and, although ruggedly constructed, may be seriously damaged or burned out if improperly used.

3.02 The meter should be placed in a horizontal position when in use. It should not rest on a magnetic surface or other location where it might be subject to magnetic influence.

3.03 When making resistance measurements, the operator should make sure that the unit or circuit being measured does not include a source of either ac or dc power which might damage the meter movement or meter resistance.

3.04 When making either current or voltage measurements the range switch should be placed in the proper position before making contact with the test probe or ground lead to the circuit to be measured. If there is any doubt as to the approximate value of the voltage or current to be measured, the range switch should be set to the highest value for the initial test and then decreased step-by-step until the proper scale range is reached.

3.05 Ordinary voltage-to-ground measurements should be made with the test probe connected to the "high" side of the test meter and the "low" side connected to ground or to the chassis or frame of the equipment under test by means of the test clip provided.

Preparation

3.06 Before making voltage or current measurements, check that the pointer of the meter lines up exactly with the zero marks on the ac and dc scales. The zero position of the pointer can be adjusted by turning slightly the adjustment screw which is located immediately below the meter scale and above the range switch. Use a small screwdriver.

3.07 The proper setting of the range switch should be made ***before*** making contact with the potential or current to be measured.

3.08 The meter scales are illustrated in Fig. 2. A familiarity with these scales and their relation to the ranges controlled by the range switch is desirable.

Voltage Measurements

General

3.10 Connect the test leads to the meter using the red lead or probe as the positive conductor. Whenever possible it is desirable to use the test leads equipped with alligator clips or with the test probe on the positive or nongrounded lead and a clip on the negative or grounded lead. Thus one, or both, test leads may be firmly attached to the unit to be measured.

3.11 Set selector switch to the position that gives a reading nearest full scale and read on the scale corresponding to the range setting.

Caution: If the approximate voltage is not known, start with the highest (1000-volt) range and if the reading is less than 300 volts, change the range switch to the 300-volt scale. If the reading on this scale is less than 100 volts, change the range switch to the 100-volt scale. The same method should be followed on the other voltage scales.

3.12 Where polarity is difficult to determine, the meter may attempt to read backwards. In this case simply reverse the leads at the unit being measured. The meter will not be damaged by such a reversal if the potential applied to the meter does not exceed the scale range in use.

DC Voltage Measurements

3.13 The probe switch should be in the DCV position for all dc voltage measurements. Values are read on the black scale. The probe is positive when the push button switch is in the +DC volts position and negative when in the −DC

volts position. Short the test leads together and adjust ZERO control for zero position indication.

3.14 ***Null*** measurement can be performed by setting the zero to the center scale null line with the ZERO adjust control. Only the 0.1, 1.0, 10, 100, and 1 KV ranges can be used for ***null*** measurement.

AC Voltage Measurements

3.14 The probe switch should be in the ACV, OHMS, MA position for all ac voltage measurements. Values are read on the black scale. Set the push button to AC. No zero adjustment is required in the ACV function.

Resistance Measurements

General

3.15 This meter contains two ohm test circuits, a conventional circuit using a 1-1/2 volt battery as a power source and a low power circuit with a power source of 75 millivolts.

3.16 The conventional ohms circuit is selected by depressing either the DC+Ω push button or the DC-Ω push button. With the DC+Ω button depressed, a positive voltage is presented to the red probe tip. The DC-Ω button depressed will present a negative voltage to the red probe tip.

3.17 The low power ohms circuit is selected by depressing the LPΩ button. No polarity reversing is provided in this position since the low potential used in this circuit is below the threshold of conduction of most semiconductors.

> ***Caution: Make sure there is no external power to resistor under test. False readings or a blown fuse may result.***

Measurements

3.18 The probe switch should be in the ACV, OHMS, MA position.

3.19 Turn the range switch to 1 KV range, depress the DC+Ω push button and check for meter zero.

3.20 Depress the push button to desired ohms function, either DC+Ω, DC-Ω, or LPΩ.

3.21 Turn the range switch to the range which will best cover the resistor to be measured. Check for Ω with leads open. To reset, adjust the adjust control.

> ***Note:*** With the test leads shorted on the Rx1 range, the test lead resistance is indicated on the meter. This resistance should be subtracted from the value measured.

DB Measurements

3.22 The decibel scale can be used to determine power level based on 0dB = 1 mW in 600 ohms. The operation of the meter is the same as for ac voltage measurements. The numerical value is indicated by meter scale and added to the dB value for the position of the range switch.

3.23 Refer to Fig. 3 for decibel correction for impedance other than 600 ohms.

3.24 Refer to Fig. 4 for converting the dB reading into watts.

Current Measurements

General

3.25 Four current ranges are available and these are 10 uA, 100 uA, 1 mA, and 10 mA. The circuit drop for a full scale reading on all ranges is 100 millivolts. DC or ac currents (50 Hz to 50 KHz) can be measured.

Measurement

3.26 The probe switch should be in the ACV, OHMS, MA position.

3.27 Rotate range selector to desired current range and if ac current is to be measured, depress the AC push button. If dc current is to measured, depress the DC+Ω button.

3.28 Check zero on the meter. If off, adjust ZERO adjust control as covered in DC voltage measurements. There is no adjustment for AC current measurements.

3.29 Current is read on the 0-1 scale using the appropriate scale multiplier. Reset selector for a reading nearest full scale if necessary.

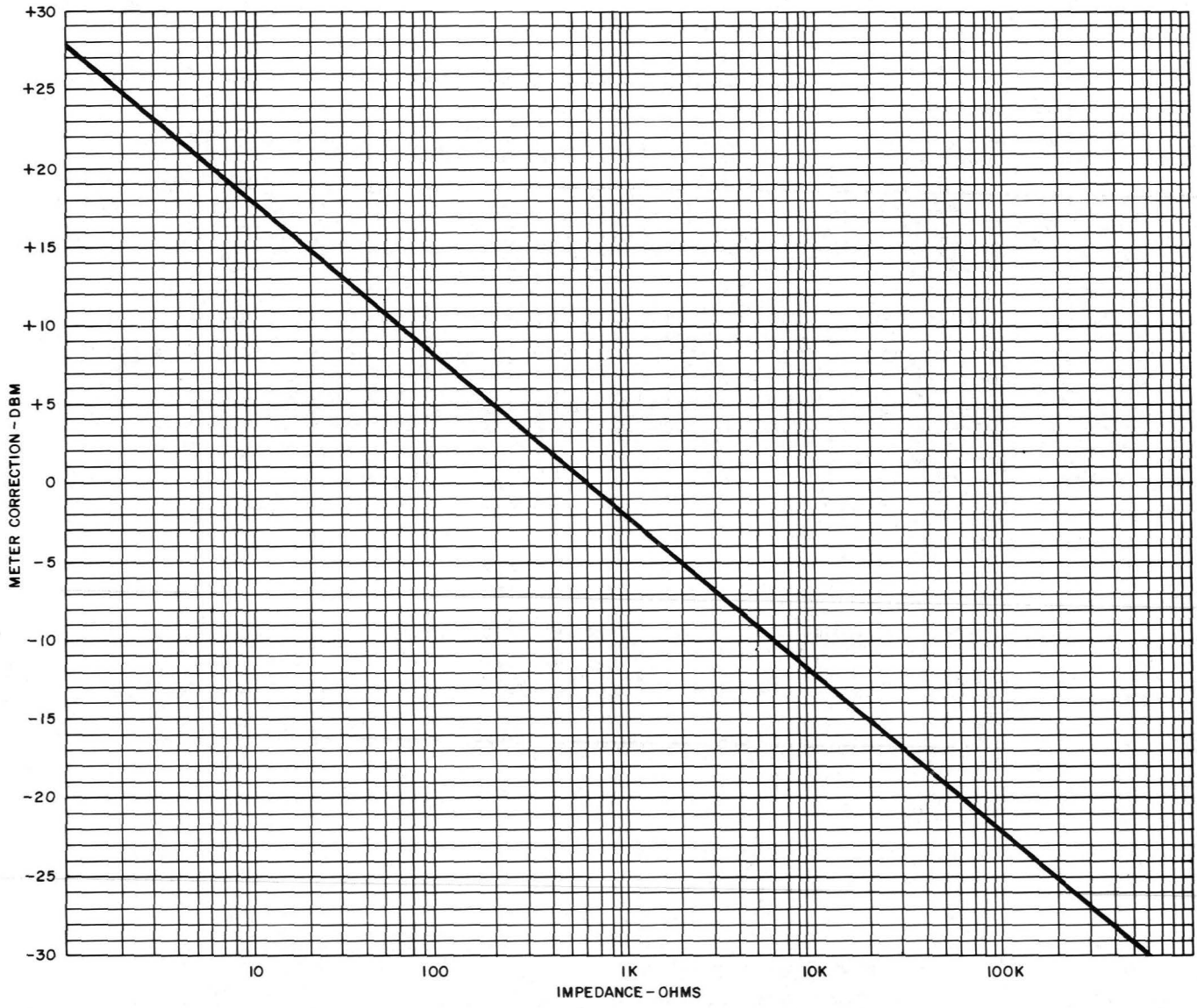

Fig. 3—DB Correction Chart

Caution: If current greatly in excess of 10 mA is applied, the fuse located on the printed circuit board will blow. Fuse should be immediately replaced since it affects other measurement circuits.

4. MAINTENANCE

Meter Accuracy

4.01 No regular routine accuracy tests are required but it is recommended that both DC and AC readings be occasionally checked against the readings of meters of known accuracy. The ohmmeter portion of the meter may be checked by measuring various resistors of known value.

Battery Replacement

4.02 Batteries are used in three different circuits. All batteries, of which there are 10, are 1-1/2 volt AA (KS-14368) penlight cell type.

4.03 The B1 circuit or ohms battery consists of one cell which discharges only when resistance measurements are made. This battery should be

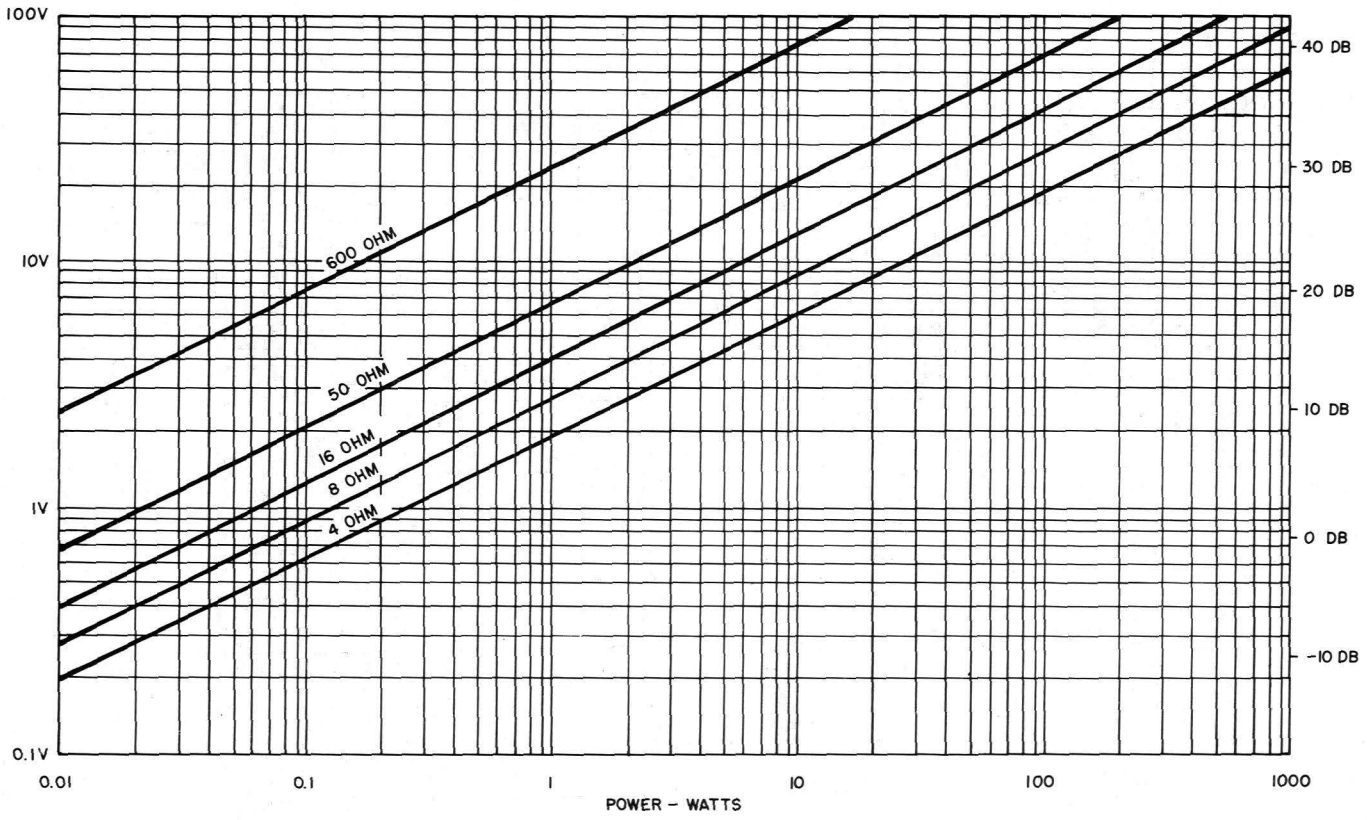

Fig. 4—Voltage vs Power

replaced when the ohms adjust control will no longer calibrate the ohm range to full scale.

4.04 The B2 circuit or zero reference battery consists of two cells which supply a bias potential required by the amplifier. They should be replaced every two years or when zero drift becomes excessive.

4.05 The B3 circuit or amplifier battery supply consists of seven cells. Battery life is approximately 1000 hours. Replacement is needed when battery test indicates less than BATT. OK section.

4.06 To replace batteries, unscrew the large nut in the rear of the case and pull the tester out of the case. Loosen two screws to free six unit battery rack from printed circuit board. When installing batteries be sure to observe polarity so that the battery + is on the same side as the + in each battery compartment.

5. REPAIR

5.01 The replacement of parts in the field, other than the replacement of batteries is not recommended since the calibration of the meter may be affected by variations in replacement parts. The instrument should be returned through the usual channels for repair and calibration.