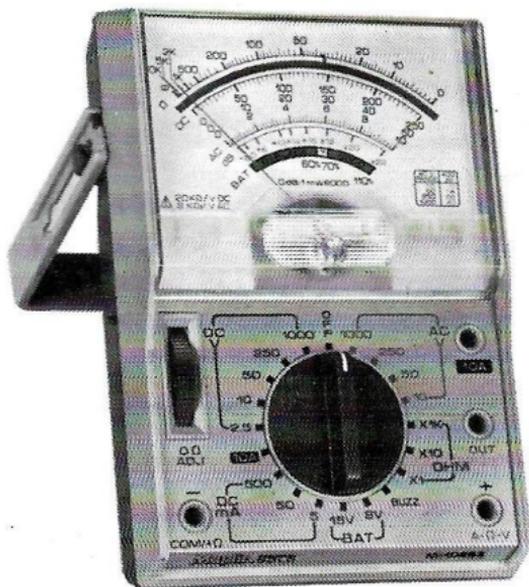


# INSTRUCTION MANUAL

## MULTIMETER

20,000 ohms per volt DC

### Model M-102BZ



## DESCRIPTION

The M-102BZ Multimeter is a compact and reliable bench type multimeter designed to service a wide variety of equipment.

This wide range multimeter features a mirror-back scale, double-jewelled precision moving-coil movement and overload protection system with dual silicon diode and 1 Amp fuse.

High 20,000 ohms/V DC and 8,000 ohms/V AC sensitivities minimize circuit loading.

Additional functions – battery test function and DC 10 Amp scale – extend the measurement capabilities of the meter.

Also the Buzzer function offers an audible signal for continuity tests.

If it is kept clean and is not subjected to extreme shock or continuous vibration the M-102BZ will give you many years of trouble-free service.

## SPECIFICATION

### ELECTRICAL

Range	: 23 measuring ranges
DC Volts	: 2.5–10–50–250–1000V
AC Volts	: 10–50–250–1000V
DC Current	: 5–50–500mA, 10A on separate jack.
Resistance	: Rx1, Rx10, Rx1K (Centre 50 $\Omega$ )
Decibels	: –8dB to +62dB on all AC V ranges.

BAT test : 1.5V size AA. Internal loading resistance and current 75 ohm / 20mA 9V PP3. Internal loading resistance and current 450 ohm / 20mA

Audio power level : -8dB to +22dB on a 600 ohm line, on separate jack.

Accuracies : DC V/A 4% FS, AC V 5% FS, Ohms 4° of scale length.

Sensitivity : 20,000 ohms/V DC, 8,000 ohms/V AC

## PHYSICAL

Front panel controls : Range-Function switch, Ohms Adjust

Movement : Moving Coil - 90° Arc, 40 $\mu$ A FS

Operating position : Horizontal or Vertical

Operating temperature : 18°-25°C for rated accuracy.

Batteries : 1.5V AA x 2

Protection : 2A/250V Fuse and Silicon double diode.

Construction : High impact plastic and phenolic PCB and rugged handle for carrying or for use as a bench-top stand.

Size : 133 x 89 x 38mm.

Weight : 544g (including battery)

## FRONT PANEL FEATURES

### Range-Function

- switch : Used to select range to be measured.
- 0 $\Omega$  ADJ : Used to set pointer to 0 at extreme right of meter scale on uppermost  $\Omega$  scale when test leads are shorted together on an ohms range.

### Mechanical

- adjust : Screw located on the meter movement to set pointer to zero mark on the scale.

- 10A Jack : Plug-in connection for Red, positive test lead when measuring DC current over 0.5A up to 10A. Range switch must be set to 10A position.

- OUT Jack : Plug-in connection for Red test lead when measuring audio output. Range switch must be set to AC V ranges.

- A- $\Omega$ -V Jack : Plug-in connection for red test lead when measuring current, resistance and AC or DC Voltages.

- COM/+ $\Omega$  Jack: Plug-in connection for Black, negative test lead for all measurements.

## **OPERATING PROCEDURES**

### **PRELIMINARY ADJUSTMENTS**

1. Carry out the 'mechanical adjust' screw setting as follows:
  - a. Place the M-102BZ tester flat on a bench.
  - b. Set the range switch to OFF.
  - c. Short the two test prods together.
  - d. Note if the meter pointer indicates exactly "0" at the extreme left end of the black scale.
  - e. If it does not read 0, turn the screw on the meter movement slowly clockwise or counter-clockwise until the "0" reading is obtained.
2. Check the internal batteries as follows:
  - a. Short the two test prods together.
  - b. Set the Range switch to Rx1.
  - c. Turn the  $0\Omega$  ADJ control until the pointer reads exactly 0 ohm at the right-hand end of the  $\Omega$  scale. If the pointer cannot be brought to the "0" mark, replace the 1.5V AA cells (see MAINTENANCE).

### **OPERATING SUGGESTIONS**

1. Set the range switch to the proper position before making any measurements.
2. Never apply more voltage or current than the amount shown at each position.

3. When the voltage or current to be measured is not known, always start with the highest range in each case.
4. For most accurate readings, look at the scale from the point where the pointer and its reflection on the mirror come together to avoid parallax error. Also use a range setting that results in a reading in the upper third of the meter scale.
5. Always observe correct test lead polarity when making DC voltage and current measurements.
6. Keep the Range selector switch in the OFF position when the tester is not in use or during transit.
7. Remove the batteries before storing the tester for a long period of time.

### **CAUTION**

**Before using the tester read this manual carefully. Failure to use the tester in complete accordance with this manual could result in severe electrical shock and/or damage to the tester.**

### **DC VOLTAGE MEASUREMENT**

1. Select the required DC voltage range.
2. Plug the black test lead into the  $-COM/+Ω$  jack, and the red test lead into the  $+A-Ω-V$  jack.

3. If you know the polarity of the circuit to be tested, connect the black probe to the negative side and the red probe to the positive side of the circuit under test.
4. If you don't know the polarity, connect the probes to each side of the circuit and watch the pointer. If it deflects to the left, reverse the probes. The red probe will now be connected to the positive side.
5. Read the DC voltage on the appropriate scale.

## **DC CURRENT MEASUREMENT**

### **CAUTION**

**Never connect the test leads directly across any voltage when the tester is used as a current meter. This could damage the instrument. Always connect the meter in series with the load.**

1. Select the required DC current range.
2. Plug the black test lead into the  $-COM/+Ω$  jack and the red test lead into the  $+A-Ω-V$  jack.
3. Using the test leads, connect the meter in series with the circuit under test. If the pointer deflects to the left, reverse the test prods.
4. Read DC current on the appropriate DC mA scale.

## **DC 10A MEASUREMENT**

1. Set the selector switch to 10A position.
2. Insert the red test lead into the 10A jack, the black test lead into the  $-COM/+Ω$  jack.
3. Follow the procedures in DC current measurement steps 3 and 4 above.

## **AC VOLTAGE MEASUREMENT**

1. Set the selector switch to the appropriate AC V range. If the voltage is unknown use the highest range.
2. Plug the leads into the jacks and place test prods on each side of the AC voltage to be measured (polarity of test probes is unimportant on AC voltages).
3. Read AC voltage on the appropriate scale.

## **RESISTANCE MEASUREMENT**

1. Set the selector switch to the appropriate OHM range.
2. Short two test prods together, and check that the pointer reads zero at the right-hand end of the scale.
3. If pointer does not indicate zero, adjust  $0Ω$  ADJ control until pointer lines up with "0" on  $Ω$  scale.
4. If pointer cannot be brought to "0", replace the batteries. (See MAINTENANCE).
5. Separate the test leads and connect them across the resistor to be measured.

### **NOTE**

**Disconnect all power from resistor to be measured before applying the test prods.**

6. Take reading on  $\Omega$  scale and multiply the reading by the multiplication factor indicated by the selector switch.

### **NOTE**

**When switching ranges, readjust pointer to "0" ohm each time as outlined above.**

### **dB RATIO MEASUREMENT**

1. For some applications, output voltage and audio frequency voltage are frequently measured in terms of decibels. The decibel scale (dB) is numbered from  $-8$  to  $+22$ .
2. To measure decibels read the dB scale after carrying out the instructions for measuring AC voltages. The dB scale is calibrated for direct reading on the lowest AC volt range (10V AC).
3. Scale factors for other AC V ranges are given in the table on the scale plate. Add the appropriate number of dB as shown in the table on the scale plate.

## **BATTERY MEASUREMENT**

### **CAUTION**

**Do not keep the leads connected to the battery for a longer time than is necessary to determine its condition.**

1. Set the selector switch to the position for testing the battery in question.
2. Remove the battery from the unit in which it is used.
3. Connect the black probe to the negative side and red probe to the positive side of the battery.
4. Note the reading on the "BAT" meter scale. If the pointer stops in the green area or above, the battery is in good condition. If the pointer stops in the red area, the battery is too weak and should be replaced. When the pointer stops in the white area (marked "?") the battery condition is marginal. It is likely that the battery will not perform properly for a reasonable period of time in the equipment in which it is being used and probably should be replaced now.

## **BUZZER OPERATION**

### **CAUTION**

**Disconnect power from any resistor or circuit to be measured before measuring resistance and operating the buzzer.**

1. The meter is provided with a self-contained buzzer actuated by the internal battery. On this function the M-102BZ operates as a continuity open-short tester giving an audible signal.
2. When the test leads are connected across any conductor or circuit which has a resistance less than 100 ohms, the buzzer sounds, so you can make continuity checks very easily and quickly without observing the meter scale.

### **NOTE**

**Do not operate the buzzer continuously as this will wear out the battery.**

## **OUTPUT VOLTAGE MEASUREMENT**

1. A capacitor is connected in series with the OUTPUT and +A- $\Omega$ -V terminal to cut off any DC element present on the circuit so that an AC signal alone may be read on the meter.
2. Set the function switch to desired AC range position.
3. Plug the black test lead into the -COM/+ $\Omega$ , red test lead into the OUT jack.
4. Connect the black test lead to grounded side of the circuit to be measured and the red test lead to the live side.
5. Turn on the power in the circuit. Read the output voltage on the AC voltage scale.

## **MAINTENANCE**

### **GENERAL**

1. No periodic maintenance is required other than replacement of battery, fuse and visual inspection of the meter.
2. Keep the meter clean and dry. To clean, use a damp cloth. Never use solvents.
3. The only field replaceable parts are two 1.5V "AA" cells and a 2A/250V fuse.

## **BATTERY REPLACEMENT**

1. Remove the screw in the rear cover of the case and lift the back off the front section.
2. Note the orientation of the AA cells in their compartment. Replace battery, observing polarity marking on the bottom of the battery compartment.
3. Carefully replace the rear cover. Retighten the screw. Do not tighten excessively or you will strip the threads in the case.

## **FUSE REPLACEMENT**

To replace fuse, carry out the procedures described above. Replace blown fuse with a new 2A/250V fuse or equivalent only.





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