

2208146

UM-11 MULTIMETER

OPERATING INSTRUCTIONS

720



FEATURES

1. Full meter overload protection provided electronically with circuit fuse for other circuit element.
2. Friction free patented taut band suspension movement results in outstanding shock absorption characteristics together with absolute freedom from pointer "stickiness" over life of movement.
3. Very low rotary switch contact resistance due to special top quality component incorporated.
4. Frequency characteristics excellent due to use of matched "State of the Art" semiconductor components, not selenium rectifiers.
5. DC Input Polarity switch provided. Measurements possible with unknown input polarity.
6. Carry handle provided. Using this, meter can be inclined to any desired angle for best reading.
7. Meter mechanical "Zero Adjust" control of unique design. Allows finger adjustment of mechanical zero without tools of any description.
8. 100,1000 Ω/V ULTRASENSITIVITY for DC voltage measurements, 31,600 Ω/V for AC voltage measurement offers the highest sensitivity coupled with lowest circuit loading of any instrument available in the world market.
9. 39 measuring ranges
10. Single rotary switch for range selection
11. Legible easy to read scale with scale length of 100 mm.
12. Separate compartment for batteries. Overload protection fuse plus spare fuse extend optimum user versatility for quick fuse replacement without necessity of opening instrument.
13. Outstanding aesthetics. Instrument is ultramodern in two-tone case. This will harmonize with any technical decor.
14. Top accuracy. 2.0% for DC voltage and current, 3.0% for AC voltage and current and 2.0% for resistance.

15. Compact proportions plus optimum meter exposure for fast measurement, 190x133x62 mm (7.5" x 5.25" x 2.4").

16. Lightweight, 1 kg (2.2 lbs).

17. Easily carried, easily handled. Human engineered for maximum practicality in service. Housed in genuine bridle leather carry case. Instrument can be operated in situ.

18. Ultrastable shunt and multiplier resistors extending calibration accuracy, despite tough environmental conditions, for many years.

19. Meter scale is as depicted in Fig. 1.

20. Fig. 2 gives external appearance.

SPECIFICATION SUMMARY

DC Voltage Measuring Ranges:

150 mV/500 mV/1.5/5/15/50/150/500/1500 V.

AC Voltage Measuring Ranges:

1.5/5 15 50 150/250/500/1500 V.

DC Current Measuring Ranges:

10 μ A/15 μ A/500 μ A/15 mA/500 mA/1.5 A/15 A.

AC Current Measuring Ranges:

15 A.

Resistance Measuring Ranges:

See table below.

Resistance Measuring Ranges:

Table A

Resistance Range	Scale Centre Value	Battery Voltage
0-20 k Ω	70 Ω	1.5 V
0-200 k Ω	700 Ω	1.5 V
0-2 M Ω	7 k Ω	1.5 V
0-20 M Ω	70 k Ω	1.5 V
0-200 M Ω	700 k Ω	10.5 V

Ohmmeter Circuits Supply:

One battery Type R14

One battery Type 6F22

Decibel Measuring Ranges Correspond to AC Voltage Measuring Ranges as follows:

Table B

Decibel Measuring Ranges		Position of Switch
-20 dBm	+6 dBm	1.5 V
-10 dBm	+16 dBm	5 V
0 dBm	+26 dBm	15 V
+10 dBm	+36 dBm	50 V
+20 dBm	+46 dBm	150 V
+24 dBm	-50 dBm	250 V
+30 dBm	+56 dBm	500 V
+40 dBm	+66 dBm	1500 V

Accessories

Each instrument supplied with following items:

- Leather carry case with strap enabling operator to effect measurements with meter suspended from neck.
- Two test leads with terminals and peds.
- Two alligator clips to be attached to test terminals.
- Spare fuse.
- Instruction manual.

APPLICATION

The instrument is designed to measure the following electrical parameters:

- DC volts

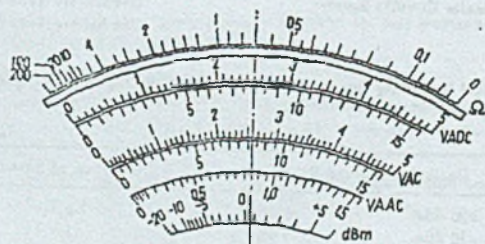


Fig. 1

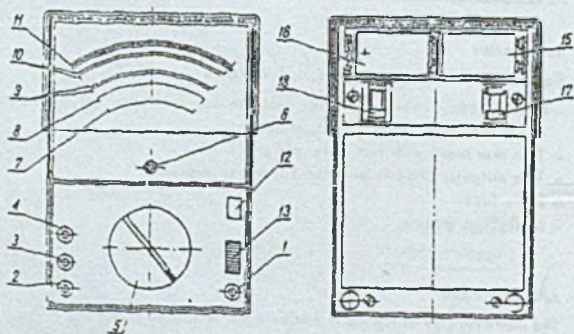


Fig. 2

- AC volts
- DC current
- AC current
- Resistance
- Decibels based upon $\text{OdB} = 1 \text{ mW into } 600 \Omega$ 0.775 Volt

DETAILED SPECIFICATION

Voltmeter Input Resistance:

100,000 Ω/V for DC Voltage

31,600 Ω/V for AC Voltage

Measuring Ranges:

DC Voltage: 150/500 mV/1.5/5/15/50/150/500/1500 V

AC Voltage: 1.5/5/15/50/150/250/500/1500 V.

Decibels: From -20 dBm to +66 dBm
depending on range.

$\text{OdBm} = 1 \text{ mW into } 600 \Omega$

DC Current: 10/15/500 μA /15/500 mA/1.5/15 A.

AC Current: 15A.

Resistance: See Table 1.

Table 1

Position of Switch	Range of Indication	Scale Centre Value	Supply Voltage
$\Omega \times 100$	0-20 k Ω	70 Ω	1.5 V
$\Omega \times 1 \text{ k}$	0-200 k Ω	700 Ω	1.5 V
$\Omega \times 10 \text{ k}$	0-2 M Ω	7 k Ω	1.5 V
$\Omega \times 100 \text{ k}$	0-20 M Ω	70 k Ω	1.5 V
$\Omega \times 1 \text{ M}$	0-200 M Ω	700 k Ω	10.5 V

PREPARATION OF METER FOR MEASUREMENT

1. Adjust pointer to mechanical "zero", by means of zero adjuster knob Fig. 2 (6).

2. Press polarity switch (12) marked "+".
3. Select the required or the highest measuring range by means of switch knob (5).
4. Connect leads to jacks (2), (1), marked "+", "-", and for measurements of currents higher than 0.5 A, connect leads to jack (1) marked "-" and jacks (4) or (3) marked "1.5" or "15 A" respectively.

MEASUREMENTS

1. DC Voltage

Set central selector switch knob (5) to required range, (marked black). Connect input voltage or current via jacks (1), (2), marked "-", "+" respectively. The potential nearer to ground potential or the cold side of input must be connected to jack (1), "-".

Caution: Do not touch leads if voltage higher than 500 V

If pointer deflects to left it indicates input polarity of voltage is reverse to polarity of jacks.

Deflection to right is accomplished by pressing polarity switch (12) marked "+". This changes polarity of input to meter.

The parameter being measured is read on black scales (10) 0-5 or 0-15, according to range selected. Apply decimal multipliers accordingly as specified in Table 2.

Table 2

Measuring Range	Scale	Multiplier
0-150 mV	0-15	x 10 mV
0-500 mV	0-5	x 100 mV
0-1.5 V	0-15	x 0.1 V
0-5 V	0-5	x 1 V
0-15 V	0-15	x 1 V
0-50 V	0-5	x 10 V
0-150 V	0-15	x 10 V
0-500 V	0-5	x 100 V
0-1500 V	0-15	x 100 V

2. DC Current

Set selector knob (5) to required range. DC current measurements within the range of $10\ \mu\text{A}$ to $0.5\ \text{A}$.

Connect current circuit to jacks (1), (2), marked "-", "+".

For DC current measurements within the ranges $1.5\ \text{A}$ and $15\ \text{A}$ set selector switch knob (5) to the $0.5\ \text{A}$ range and connect current circuit to jacks (1), (4), or (3), marked "-", and "1.5A" or "15A".

If necessary reverse direction of pointer deflection by depression of polarity switch (12), (Marked "+"). This changes polarity of supply to meter movement.

The value measured is read on black scale (10) 0-5 or 0-15 according to range selected. Apply decimal multipliers accordingly as specified in Table 3.

Table 3

Measuring Range	Scale	Multplier
0-10 μA	0-5	x 2 μA
0-15 μA	0-15	x 1 μA
0-500 μA	0-5	x 100 μA
0-15 mA	0-15	x 1 mA
0-500 mA	0-5	x 100 mA
0-1.5 A	0-15	x 0.1 A
0-15 A	0-15	x 1 A

Measuring current greater than 6 A must not exceed 10 minutes

3. AC Voltage

Set selector switch (5) to the required range (marked red).

Connect voltage input to jacks (1), (2), marked "-", "+" respectively, the potential nearer to ground potential must be connected to jack (1) marked "-".

Caution: Do not touch leads particularly if voltage higher than 500 V

The value measured is read on red scales (9) 0-5 or 0-15. For 1.5 V range on scale (8) 0-1.5. Apply respective decimal multipliers as specified in Table 4.

Table 4

Measuring Range	Scale	Multiplier
0-1.5 V	0-1.5	x 1 V
0-5 V	0-5	x 1 V
0-15 V	0-15	x 1 V
0-50 V	0-5	x 10 V
0-150 V	0-15	x 10 V
0-250 V	0-5	x 50 V
0-500 V	0-5	x 100 V
0-1500 V	0-15	x 100 V

4. Resistance

Set selector switch (5) to required range (green colour).

Note: The highest accuracy in resistance measurement is to middle segment of scale.

Before measurement short circuit jacks (1), and (2) marked "—" and "—".

Adjust pointer to "0 Ω " by control (13) marked "0 Ω ADJ".

If such adjustment cannot be accomplished, Ohms battery is discharged and must be replaced. Move flap situated in the lower part of the case.

Connect resistance or element to be measured.

The measured value is read on green scale (11). Apply decimal multipliers as inscribed at range switch knob (5).

The ohmmeter is energized by the following batteries:

1.5 V Type R14 (16)

9 V Type 6F22 (15) depending on range as per Table 1.

5. Decibels

Decibels measurement is performed on AC voltage ranges distinguished by red scale.

Table 5

Voltage Measuring Range	Decibel Measuring Range	Add Value dBm
0-1.5 V	-20 +6 dBm	0
0-5 V	-10 +16 dBm	+10
0-15 V	0 +26 dBm	+20
0-50 V	+10 +36 dBm	+30
0-150 V	+20 +46 dBm	+40
0-250 V	+24 +50 dBm	+44
0-500 V	+30 +56 dBm	+50
0-1500 V	+40 +66 dBm	+60

Value dBm is read on red scale (7). Add respective value dBm specified in Table 5 according to range.

Table 6

Decibels dBm	-20	-15	-10	-9	-8	-7	-6	-5	-4	-3
Power mW	0.01	0.03	0.10	0.13	0.16	0.20	0.25	0.32	0.40	0.50

Decibels dBm	-2	-1	0	+1	+2	+3	+4	+5	+6
Power mW	0.63	0.80	1	1.26	1.58	2.00	2.50	3.16	4.00

0 dBm corresponds to power 1 mW dissipated in resistor of 600 Ω with a drop of 0.775 V.

Relation between power and decibels corresponding to dBm scale is shown in Table 6.

The value of power lost on the 600 Ω resistor (In case of decibel measurement on voltage range selected at will) is obtained by multiplying a power value from Table 6 by a multiplier from Table 7.

Table 7

Voltage Measuring Range	Decibel Measuring Range	Power Range	Multiplier
0-1.5 V	-20 +6 dBm	0.01 4 mW	$\times 1$
0-5 V	-10 +16 dBm	0.1 40 mW	$\times 10$
0-15 V	0 +26 dBm	1 400 mW	$\times 100$
0-50 V	+10 +36 dBm	0.01 4 mW	$\times 1000$
0-150 V	+20 +46 dBm	0.1 40 mW	$\times 10,000$
0-250 V	+24 +50 dBm	0.25 100 mW	$\times 100,000$
0-500 V	+30 +56 dBm	1 400 mW	$\times 100,000$
0-1500 V	+40 +66 dBm	10 4000 mW	$\times 1,000,000$

If the value of load resistance is different from 600 Ω the power should be multiplied by coefficient.

$$K = \frac{600}{\text{resistance of load}}$$

For example, for load resistance of 6 Ω the value calculated according to the table should be multiplied by 100.

6. AC Current

Set control knob (5) to position 15 A AC. Connect the current circuit to jacks (1) and (3) marked "-" and "15A".

Read the current value on red scale (8) 0-1.5, applying multiplier $\times 10A$.
Current measurement greater than 6A should not exceed 10 minutes.

REPLACEABLE ELEMENTS

Meter is equipped with fuse (17), (18), Type Wbo-0.5A-250 V.

Fuse (18) is spare fuse. Fuse (18) should be placed into holder in place of fuse (17) if fuse (17) is defective).

Battery types:

1.5 V R14 (16)

9 V 6F22 (15) employed for ohmmeter energization.

Discharged batteries must be replaced for new ones generally available, of the same type. Batteries should be leakproof types.

Batteries and the fuses are accessible upon moving flap situated in the rear of lower part of meter case. Do not open instrument up to replace batteries. This is absolutely not necessary.

Parts - lists

Resistors

No	Value	Tolerance %	Power W
1	2	3	4
R1	10.24 mΩ	±0,5	2
R2	90 mΩ	±1	0.5
R3	212.5 mΩ	±1	0.25
R4	18 Ω	±0,5	0.25
R5	165 Ω	±1	0.25
R6	397 Ω	±0,5	0.25
R7	1.26 kΩ	±0,5	0.25
R8	8.56 kΩ	±0,5	0.25
R9	7.96 kΩ	±0,5	0.25
R10	10.2 kΩ	±1	0.25
R11	500 Ω	±20	0.1
R12	9.88 kΩ	±0,5	0.25
R13	1 kΩ	±20	0.1
R14	2.2 kΩ	±20	0.1
R15	1.1 kΩ	±2	0.25
R16	698 kΩ	±1	0.25
R17	61.9 kΩ	±1	0.25
R18	5.23 kΩ	±1	0.25
R19	511 Ω	±1	0.25
R20	51.1 Ω	±2	0.25
R21	2.61 kΩ	±2	0.25
R22	59 kΩ	±2	0.25
R23	22 kΩ	±20	0.25
R24	5.97 kΩ	±0,5	0.25
R25	34.2 kΩ	±0,5	0.25
R26	108 kΩ	±1	0.25
R27	340 kΩ	±0,5	0.25
R28	1 MΩ	±1	0.5
R29	80.6 kΩ	±1	0.25
R30	3.42 MΩ	±1	0.25
R31	2.9 MΩ	±1	0.25
R32	7.9 MΩ	±1	0.5
R33	34.2 MΩ	±1	2
R34	7.15 kΩ	±1	0.25
R35	500 Ω	±20	0.1
R36	12.1 kΩ	±1	0.25
R37	2.2 kΩ	±20	0.1
R38	1.62 kΩ	±1	0.25
R39	2.2 kΩ	±20	0.1
R40	34.2 kΩ	±1	0.25
R41	100 Ω	±5	0.25

Diodes

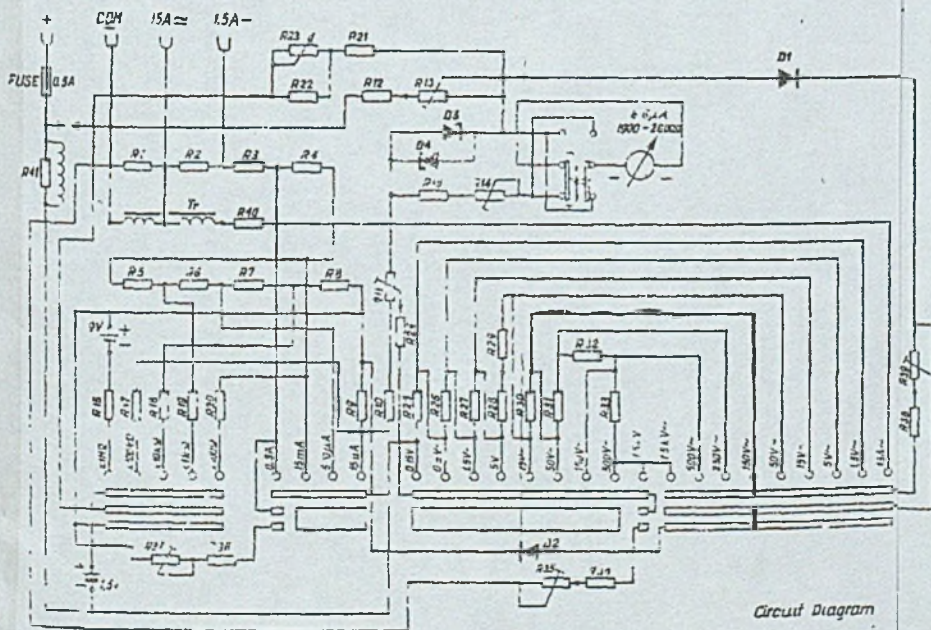
Designation	Type
D1, D2	DK-3
D3, D4	BZYP 11/D1

FUSES

Designation	Type
Fuse	500 mA/250 V

BATTERIES

Designation	Type	Voltage
B 1	R14	1.5 V
B 2	3F22	9 V



Circuit Diagram