Digital-Multimeter

OPERATION MANUAL

1. INTRODUCTION

This instrument is compact, rugged, battery operated, handheld $3\frac{1}{2}$digit digital multimeter for measuring DC and AC voltage, DC and AC current, Resistance, Diode, Transistor and continuity Test.

The Dual-slope A-D Converter uses C-MOS technology for auto-zeroing, polarity selection and over-range indication. Full overload protection is provided. It is an ideal instrument for use in the field, laboratory, workshop, hobby and home applications.

2. FEATURES

★ Push-button ON-OFF power switch.
★ Single 30 position easy to use rotary switch for FUNCTION and RANGE selection.
★ High sensitivity of 100μV.
★ Automatic overrange indication with the "1" displayed.
★ Automatic polarity indication on DC range.
★ All ranges fully protected
★ Diode testing with 1mA fixed current.
★ Transistor hFE Test
★ Auto power off (Optional)

3. SPECIFICATIONS

Accuracies are ± (% reading +No. of digits)
Guaranteed for 1 year, 23℃ ± 5℃,less than 75%RH.

DC Voltage

RANGE	ACCURACY	RESOLUTION
200mV	± 0.5% of rdg ± 1 digit	100μV
2V		1mV
20V		10mV
200 V		100mV
1000V	± 0.8% of rdg ± 2 digit	1V

Input Impedance: 10M ohm on all ranges.
Overload Protection: 220Vrms on 200 mV range and 1000V dc or peak ac on all other ranges.

AC Voltage

RANGE	ACCURACY	RESOLUTION
200mV	± 1.2% of rdg ± 3 digits	100μV
2V	± 0.8% of rdg ± 3 digits	1mV
20V		10mV
200 V		100mV
700V	± 1.2% of rdg ± 3 digit	1V

Input Impedance: 10M ohm on all ranges.
Frequency Range: 40Hz to 400Hz
Overload Protection: 750V rms or 1000V peak continuous on ac ranges, except 200mV ac range (15 seconds maximum above 300V rms):
Indication: Average (rms of sine wave).

DC Current

RANGE	ACCURACY	RESOLUTION
200μA	± 0.8% of rdg ± 1 digit	0.1μA
2mA		1μA
20mA		10μA
200mA	± 1.2% of rdg ± 1 digits	100μA
2A		1mA
20A	± 2% of rdg ± 5 digits	10mA

Overload Proterction: 2A/250V fuse, (20A range not fused.)
Maximum input Current: 20A, 15 sec.
Maximum voltage Drop: 200mV

AC Current

RANGE	ACCURACY	RESOLUTION
200μA	± 1.8% of rdg ± 3 digits	0.1μA
2mA	± 1.2% of rdg ± 3 digits	1μA
20mA		10μA
200mA	± 2.0% of rdg ± 3 digits	100μA
2A		1mA
20A	± 3% of rdg ± 7 digits	10mA

Overload Protection: 2A/250V fuse. (20A range not fused)
Frequency Range: 40Hz to 400Hz.
Maximum Input Current: 20A, 15 sec.
Indication: Average (rms of sine wave)
Maximum voltage Drop: 200mV.

Resistance:

RANGE	ACCURACY	RESOLUTION
200ohm	± 0.8% of rdg ± 3 digits	0.1ohm
2K ohm	± 0.8% of rdg ± 1 digits	1ohm
20K ohm		10ohm
200K ohm		100ohm
2M ohm		1K ohm
20M ohm	± 1% of rdg ± 2 digits	10K ohm

Overload Protection: 220V DC/rms AC on all ranges.
open circuit volta[illegible] Lower than 700mV.

4. GENERAL CHARACTERISTICS

Maximum Display	:1999 counts ($3\frac{1}{2}$digits) with automatic polarity indication.
Indication Method	:LCD display.
Measuring Method	:Dual-Slope integration A-D converter system.
Overrange Indication	:"1" Figure only in the display.
Maximum common mode voltage	:500V dc/ac rms.
Reading rate	:2-3 reading per sec (approximate).
Temperature for guaranteed accuracy	:23℃ ± 5℃
Temperature Ranges	:Operating 0℃ to 40℃, 32° F to 104° F. Storage -10℃ to 50℃, 14° F to 122° F.
Power Supply	:One 9-volt battery (NEDA 1604, 6F22 TYPE or equivalent).
Low Battery Indication	: ⊏+ to left of display.
Size	:88W× 170D× 38Hmm
Weight	:340g (including 9 volt batteries).
Accessories	:Operating manual, Set of test leads.
Optional Accessories	:Spare fuse (2A/250V fast blow type). :9V Battery (Zinc Carbon type.) :Soft Carring case.

5. OPERATION

1. Check the 9-volt battery by setting the ON-OFF switch to ON, If the battery is weak, a ⊏+ sign will appear on the display.
If this does not appear on the display, proceed as below, See MAINTENANCE if the battery has to replaced
2. The mark, or sign, ⚠ next to the test lead jacks is for warning that the input voltage or current should not exceed the indicated values.
This is to prevent damage to the internal circuitry.
3. The function switch should be set to the range which you want to test before operation.

5.1) DC Voltage Measurement

1. Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack.
2. Set the FUNCTION switch to the V ⎓ range to be used and connect the test leads across the source or load under measurement.
The polarity of the RED lead connection will be indicated at the same time as the voltage.

Note:

1. If the voltage range is not known beforehand set the FUNCTION switch to a high range and work down.
2. When only the figure "1" is displayed, over range is being indicated and the FUNCTION switch must be set to a higher range.
3. ⚠ Do not apply more than 1000V to the input, Indication is possible at higher voltages but there is danger of damaging the internal circuitry.
4. Use extreme caution to avoid contact with high tension circuits when mesauring high voltage.

5.2) AC Voltage Measurement

1. Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack.
2. Set the FUNCTION switch to the V~ range to be used and connect the test leads across the source or load under measurement.

Note:

1. See DC Voltage measurement Note 1.2
2. ⚠ Do not apply more than 700V rms to the input. indication is possible at higher voltages but there is danger of damaging the internal circuitry.
3. Use extreme caution to avoid contact with high tension circuits when measuring high voltage.

5.3) DC Current Measurement

1. Connect the BLACK test lead to the COM jack and the RED test lead to the mA jack for a Maximum of 2 A. For a maximum of 20A move the red test lead to the 20A jack.
2. Set the FUNCTION switch to the A ⎓ range to be used and connect the test leads in series with the load under measurement, The polarity at the RED test lead connection will be indicated at the same time as the current.

Note:

1. If the current range is not known beforehand, set the FUNTION switch to a high range and work down.
2. When only the figure "1" is displayed overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. ⚠ :The Maximum input current is 2 A, or 20A depending on the jack used, Excessive current will blow the fuse which must be replaced. The 20A range is not protected by a fuse. The fuse rating should be 2A and no more to prevent damage to the internal circuitry, The Maximum terminal voltage drop is 200mV.

5.4) AC Current measurement

1. Connect the BLACK test lead to the COM jack and the RED test lead to the mA jack for a maximum of 2A For a maximum of 20A, move the RED test lead to the 20A jack.
2. Set the FUNCTION swich to the A~ range to be used and connect the test lead in series with the load under measurement.

Note:

1. If the current range is not known beforehand, set the FUNCTION switch to a high range and work down.
2. When only the figure "1" is displayed overrange is being indicated and the FUNCTION swich must be set to a higher range.
3. ⚠ The Maximum input current is 2A or 20A depending upon the jack used. Excessive current will blow the fuse which must be replaced. The 20A Range is not protected by a fuse. The fuse rating should be 2A and no more to prevent damage to the internal circuitry.
4. The Maximum terminal voltage drop is 200mV.

5.5) Resistance Measurement

1. Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack, (Note: The polarity of the RED test lead is "+").
2. Set the FUNCTION switch to the Ω range to be used and connect the test leads across the resistance under measurement.

Note:

1. If the resistance value being measured exceeds the maximum value of the range selected, an over-range indication will be displayed ("1"), Select a higher range, For resistance of approximately 1 Megohm and above, the Meter may take a few seconds to become stable, This is normal for high resistance readings.
2. When the input is not connected, i.e. at open circuit, the figure "1" will be displayed for the overrange condition.
3. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors are fully discharged.

5.6) Diode Measurement and Continuity Test.

1. Connect the BLACK test lead to the COM jack and the RED test lead to the V/Ωjack, (Note: The polarity of the RED test lead is "+")
2. Set the FUNCTION switch to the ⏚ ♫ range and connect the test leads across the diode under measurement, display shows the approx forward voltage of this diode.
3. Connect the test leads to two points of circuit, if the resistance is lower than approx 50Ω, Buzzer sounds.

5.7) Transistor hFF Test

1. Set the FUNCTION swich to the hFE range.
2. Determine whether the transistor is NPN or PNP and locate the Emitter. Base and collector leads. Insert the leads into the proper holes in the socket on the front panel.
3. The display will reads the approximate hFE vaue at the test condition of Base Current 10μA, VCE 2.8V.

5.8) Auto Power-off (Optional Function)

Automatic Power-off extends the life of the battery by turning the meter off if no rotary function switch is operated for about 30 min. The meter turns back on if either the rotary switch is turned or the Power switch is pressed again.

6. MAINTENANCE

Battery and/or fuse replacement should only be done after the test leads have been disconnected.

6.1) 9-Volt Battery Replacement

Note the condition of the 9-volt battery using the procedure described above. If the battery needs to be replaced, open the back cover remove the spent battery and replace it with a battery of the same type.

6.2) Fuse Replacement

Should the fuse need replacement use only 2A fuses identical in physical size to the original.