

METEX[®]

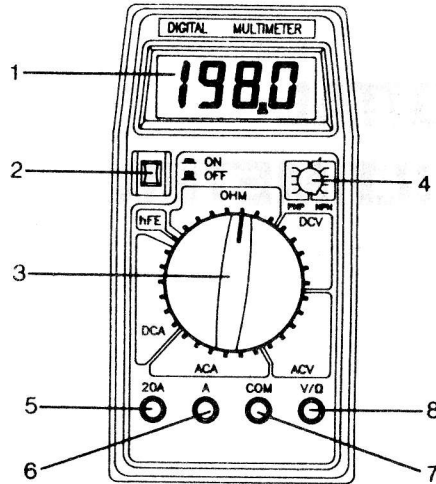
**DIGITAL
MULTIMETER**

**OPERATING MANUAL
M-3800**

M 3800 Familiarization

||||||| CONTENT |||||

1. LCD, (3 1/2 Digit; Max 1999)
2. Power on-off switch
3. Function/Range switch



4. TR socket (Transistor h_{FE} measurement only)
5. 20A terminal
6. A terminal
7. COM terminal
8. V/Ω terminal
9. Tilt stand (on the rear case); movable by squeezing to hanging or standing position

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1. Introduction

With this Digital Multimeter, you have acquired a high-quality, powerful performance, heavy-duty rugged and handheld multimeter that will give you confidence and peace of mind in your every measuring job. Please read these operating instructions very carefully, before commencing your measurement.

2. Safety Information

2-1. This meter has manufactured and tested in accordance with IEC 348 and DIN 57411/VDE 0411, Part 1: Safety Requirements for Electronic Measuring Apparatus, Safety Class II. This manual contains information and warnings which must be observed to assure safe operation and maintain the meter in safe condition.

2-2. Safety Symbols



on the front panel warns that the input voltage or current should not exceed the values indicated on the Terminal panel.




on the front panel indicates that dangerous voltages may exist at the terminals.



for Fuse replacement.



for Battery replacement.


 on the front panel indicates double insulation.

2-3. Safety Warnings

2-3-1. To prevent electrical shock hazard and/or damage to the meter, do not measure voltages exceeding 1000V DC or 750V AC.

2-3-2. To avoid damage to the meter and/or injury, observe the input limits as stated hereunder.

INPUT LIMITS

FUNCTION	TERMINALS	INPUT LIMITS
V DC	V/Ω + COM	1000V DC
V AC	V/Ω + COM	700V AC
Ω	V/Ω + COM	250V DC/AC
A DC/AC	A + COM	2A DC/AC
20A DC/AC	20A + COM	20A DC/AC
 ⌚	V/Ω + COM	250V DC/AC

2-3-3. The 20A range is not fuse-protected. To avoid damage or injury, use the meter only in circuits limited by fuse or circuit-breaker to 20A or 4000 VA.

Do not apply voltage to between the A or 20A terminal and COM terminal. This warning assures protection against injury and/or damage to the meter.

WHEN MAKING CURRENT MEASUREMENTS, MAKE SURE THAT THE MULTIMETER IS CONNECTED IN SERIES WITH THE LOAD IN WHICH THE CURRENT IS TO BE MEASURED. NEVER CONNECT THE METER ACROSS A VOLTAGE SOURCE. NEGLIGENCE TO DO SO, WILL RESULT IN EITHER BLOWING THE OVERLOAD PROTECTION FUSE OR DAMAGING THE DEVICE UNDER TEST.


- 2-3-4. To avoid damage to the meter, disconnect test leads from test points before changing function.
- 2-3-5. To avoid electrical shock, be careful when working above 60V DC or 25V AC. Such voltages pose a shock hazard.
- 2-3-6. To avoid electrical shock hazard, do not touch test leads, tips or the circuit under measurement while power is turned on.
- 2-3-7. Ensure the test leads are in good condition.
- 2-3-8. Do not get the meter and test leads wet.

3. Features

3-1. Overload Indication

" 1 " is displayed, when input is too excessive to display.

3-2. Low Battery Indicator

The "  " symbol appears when the battery voltage drops to certain limits. For proper operation, replace the battery as soon as possible. Continued use with a low battery will lead abnormal readings.

3-3. Other Features

- 3-3-1. 30-positions-rotary switch to select function and range.
- 3-3-2. 17mm high contrast LCD.
- 3-3-3. Ruggedized case protected against an external collision.
- 3-3-4. High surge voltage protection upto 3KV.

4. Measuring Instructions

4-1. Preliminary Notes

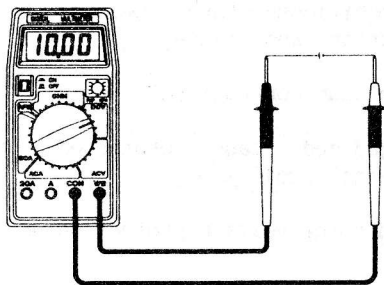
- 4-1-1. Sometimes the last digit will not register "0". This, however, will have no effect on the measured value.

4-1-2. The function switch must be set to the range before commencing measurement or test.

4-2. DC Voltage Measurement

4-2-1. Connect the Black test lead to the COM terminal and the Red test lead to the V/ Ω terminal.

4-2-2. Set the function switch to your desired DC V range and connect the test leads across the source or load under measurement. In case of negative voltage, " - " segment will appear on the left side of LCD. See Figure 4-2.



4-2 DC Voltage measurement

Note: 1. If the voltage is unknown before measurement, set the function switch to the highest range first and move down the ranges, step by step.

2. When the "1" is displayed, the range is overloaded. The function switch must be set to a higher range.

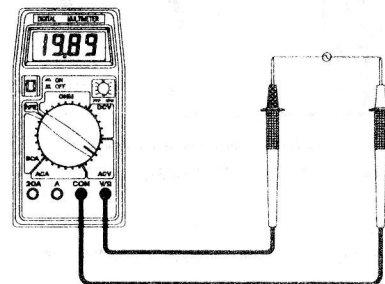
3. Take care to avoid contact with high tension circuits when measuring high voltage.

4. Do not apply over 1000V DC / 700V AC to the meter.

4-3. AC Voltage Measurement

4-3-1. Connect the Black test lead to the COM terminal and the Red test lead to the V/ Ω terminal.

4-3-2. Set the function switch to your desired AC V range and connect the test leads across the source or load under measurement. See Figure 4-3.

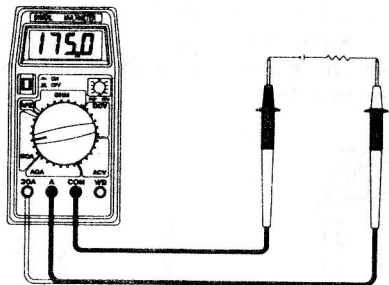


4-3 AC Voltage measurement

Note: 1. See DC voltage measurement Note 1,2,3,4.

4-4. DC Current Measurement

- 4-4-1. Connect the Black test lead to the COM terminal and the Red to the A terminal for a maximum of 2A. For a maximum of 20A, move the Red test lead to the 20A terminal.
- 4-4-2. Set the function switch to the DC A range to be used and open circuit in which current is to be measured. Connect the test leads in series with the load under measurement. See Figure 4-4.
- 4-4-3. " - " sign for a negative current will appear on the left side of the LCD.



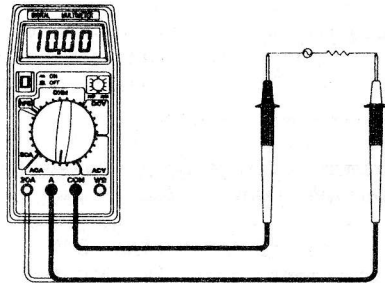
4-4 DC Current measurement

Note: 1. See DC voltage measurement Note 1, 2, 3.

2. The maximum input current is 2A or 20A depending on the terminal used. Excessive current will blow the fuse, which must be replaced. The 20A range is not protected by the fuse. The fuse rating should not be over 2A to prevent damage to the internal circuit.
3. Maximum Voltage Drop (under full scale)
200 μ A-2A:300mV, 20A: 900mV
4. In case of measuring 20A, continuous measurement over 15 minutes may cause damage to the meter.
5. WHEN MAKING CURRENT MEASUREMENTS, MAKE SURE THAT THE MULTIMETER IS CONNECTED IN SERIES WITH THE LOAD IN WHICH THE CURRENT IS TO BE MEASURED. NEVER CONNECT THE MULTIMETER ACROSS A VOLTAGE SOURCE. TO DO SO, CAN RESULT IN EITHER BLOWING THE OVERLOAD PROTECTION FUSE OR DAMAGING THE DEVICE BEING TESTED.

4-5. AC Current Measurement

- 4-5-1. Connect the Black test lead to the COM terminal and the Red test lead to the A terminal for a maximum of 2A. For a maximum of 20A, move the Red test lead to the 20A terminal.
- 4-5-2. Set the function switch to your desired AC A range and open circuit in which current is to be measured. Connect the test leads in series with the load under measurement. See Figure 4-5.

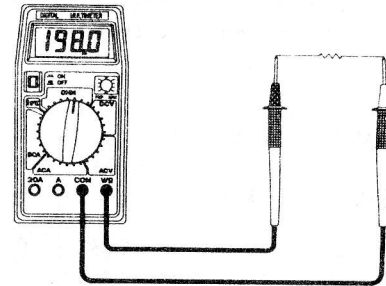


4-5 AC Current measurement

Note: 1. See DC Current measurement Note 1,2,3,4,5.

4-6. Resistance Measurement

- 4-6-1. Connect the Black test lead to the COM terminal and the Red test lead to the V/ Ω terminal.
- 4-6-2. Set the function switch to your desired ohm range and connect the test leads across the resistance to be measured. See Figure 4-6.



4-6 Resistance measurement

- Note: 1. If the resistance value being measured exceeds the maximum value of the range selected, "1" will be displayed for indicating overload. Select a higher range. For a resistance of approximately 1Mohm and above, the meter may take a few seconds to stabilize. This is normal for high resistance readings.
2. When the input is not loaded, i.e. at open circuit, the "1" will be displayed
 3. When checking in-circuit resistance, ensure that the circuit under test has all power off and all capacitors are fully discharged.
 4. The resistance ranges of this instrument are protected by a posistor above 500V and a resistor network below 500V, except 200ohm range which is protected up to 250V only.

5. Some devices may be damaged by the current applied during resistance measurements. The following table shows the voltage and current available on each range.

RANGE	A	B	C
200 Ω	1.2	0.8	0.44
2K Ω	1.2	0.3	0.27
20K Ω	1.2	0.42	0.06
200K Ω	1.2	0.43	0.07
2M Ω	1.2	0.43	0.001
20M Ω	1.2	0.43	0.0001

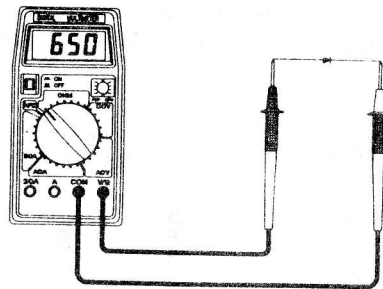
- A. is open circuit voltage at the terminals
 B. is voltage across a resistance equal to full scale value.
 C. is current in milliamperes through a shorted circuit at the input terminals.

* All values are typical.

4-7. Diode Measurement

- 4-7-1. Connect the Black test lead to the COM terminal and the Red test lead to the V/ Ω terminal.

- 4-7-2. Set the function switch to the " $\rightarrow \nabla \rightarrow$ " range and connect the test leads across the diode under measurement. See Figure 4-7.



4-7 Diode measurement

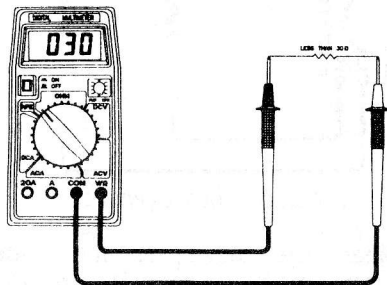
- Note: 1. When the input is not loaded, i.e. at open circuit, only "1" on the left side of the LCD is displayed, indicating overload.
 2. There is 1mA Current flow through the device under test.
 3. The meter displays the forward voltage drop in millivolts, and overload when the diode is reversed.
 4. The polarity of the RED test lead is "+".

4-8. Audible Continuity Test

- 4-8-1. Connect the Black test lead to the COM terminal and the Red test lead to the V/ Ω terminal.

4-8-2. Set the function switch to the $\rightarrow \text{N}$ range (the same range as diode) and connect test leads across the resistance under measurement. See Figure 4-8.

4-8-3. The buzzer sounds if the resistance between two leads is less than approximately 30ohms.



4-8 Audible continuity Test

Note: 1. See Diode measurement Note 1.

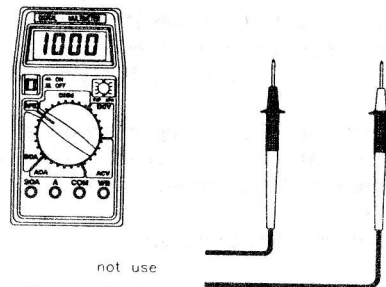
2. The circuit to be tested must be in power-off condition whilst performing the continuity test.

4-9. Transistor hFE Test

4-9-1. Change the function switch to the hFE range

4-9-2. Determine whether the transistor is NPN or PNP and locate the Emitter, Base and Collector Leads. Insert the leads of the transistor into the correct holes in the socket on the front panel. See Figure 4-9.

4-9-3. The meter will read the approximate hFE value at the test condition of base current $10\mu\text{A}$ V_{CE} 2.8V.



4-9 Transistor hFE Test

5. Maintenance

Your Digital Multimeter is a precise electronic device. Do not tamper with circuit.


To prevent electrical shock hazard, turn off the meter and disconnect test leads before removing the back cover, for any adjustment, replacement or repair.

After completion of any adjustment, replacement, maintenance or repair, if applying a voltage is necessary, it must be carried out only by a skilled person who is aware of the potential hazard.

TO AVOID DAMAGE ; -

1. Never connect more than 1000 Volt DC or 700 Volt AC.
2. Never connect a source of voltage with function switch in OHM POSITION.
3. Never operate the DMM, unless the back case is in place and fully closed.
4. Battery or Fuse replacement should only be done, after the test leads have been disconnected and power is OFF.

5-1. 9 Volt Battery Replacement

When the "  " appears on the LCD, please replace the battery as soon as possible for maintaining normal readings. The battery type is NEDA 1604 or 6F22 for 9 voltage.

5-2. Fuse Replacement

If the fuse should be replaced, use only 2A/250V, fast blow type fuse which should be identical in physical size to the original or the spare fuse in the storage compartment inside of the meter.

6. Specifications

6-1. General Characteristics

- * Max Display : 1999 counts (3 1/2 Digit) with automatic polarity indication
- * Input Impedance : 10 Mohm
- * Max Input Current of AC & DC : 20A (Max 15 minutes)
- * Reading Time : 2-3 readings per second
- * Operating Temperature : 0°C to 40°C (32°F to 104°F)
- * Storage Temperature : -10°C to 50°C (14°F to 122°F)
- * Temperature for Guaranteed Accuracy: +23°C ± 5°C
- * Battery Type: NEDA 1604 9V or 6F22 9V
- * Size (H x W x L. Cm) : 3.6 x 8.8 x 17.2
- * Net Weight : 340g + 10g (Incl. 9V Battery)
- * Accessories supplied : Operating Manual, a pair of test leads, spare fuse, 9V battery, carrying case.

6-2 Special Characteristics

FUNCTION	RANGE	ACCURACY	RESOLUTION
DC VOLTAGE	200mV	$\pm 0.5\%$ of rdg + 1 dgt	100 μ V
	2V		1mV
	20V		10mV
	200V		100mV
	1000V		1V
AC VOLTAGE	200mV	$\pm 1.2\%$ of rdg + 3 dgt	100 μ V
	2V	$\pm 0.8\%$ of rdg + 3 dgt	1mV
	20V		10mV
	200V		100mV
700V	$\pm 1.2\%$ of rdg + 3 dgt	1V	
DC CURRENT	200 μ A	$\pm 0.5\%$ of rdg + 1 dgt	0.1 μ A
	2mA		1 μ A
	20mA		10 μ A
	200mA	$\pm 1.2\%$ of rdg + 1 dgt	100 μ A
	2A		1mA
	20A		10mA
	20 μ A	$\pm 2.0\%$ of rdg + 5 dgt	10nA
	20A		10mA
	20 μ A		10nA
AC CURRENT	200 μ A	$\pm 1.0\%$ of rdg + 3 dgt	0.1 μ A
	2mA		1 μ A
	20mA		10 μ A
	200mA	$\pm 1.8\%$ of rdg + 3 dgt	100 μ A
	2A		1mA
	20A		10mA
	20 μ A	$\pm 3.0\%$ of rdg + 7 dgt	10nA
	20A		10mA
	20 μ A		10nA
RE- SISTANCE	200 Ω	$\pm 0.5\%$ of rdg + 3 dgt	0.1 Ω
	2K Ω		1 Ω
	20K Ω		10 Ω
	200K Ω		100 Ω
	2M Ω	$\pm 1.0\%$ of rdg + 2 dgt	1K Ω
	20M Ω		10K Ω

WARRANTY

Warrants this instrument to be free from defects in material and workmanship for a period of one year. Any instrument found defective within one year from the delivery date and returned to the factory with transportation charges prepaid, will be repaired, adjusted, or replaced at no charge to the original purchaser. This warranty does not cover expendable items such as batteries or fuses. If the defect has been caused by a misuse or abnormal operating conditions, the repair will be billed at a nominal cost.