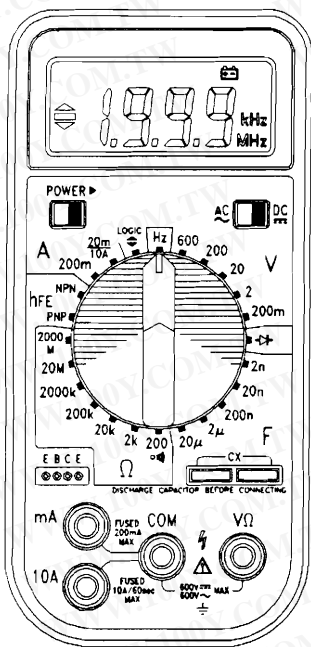


# OPERATING INSTRUCTIONS

## MODEL 122 DIGITAL MULTIMETER



# SAFETY INFORMATION

The following safety information must be observed to insure maximum personal safety during the operation at this meter:

Do not use the meter if the meter or test leads look damaged, or if you suspect that the meter is not operating properly.

Never ground yourself when taking electrical measurements. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.

Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.

Use caution when working above 60V dc or 30V ac rms. Such voltages pose a shock hazard.

When Using the probes, keep your fingers behind the finger guards on the probes.

Measuring voltage which exceeds the limits of the multimeter may damage the meter and expose the operator to a shock hazard. Always recognize the meter voltage limits as stated on the front of the meter.

# SPECIFICATIONS

**Display:** 3½ digit liquid crystal display (LCD) with a maximum reading of 1999.

**Polarity:** Automatic, positive implied, negative polarity indication.

**Overrange:** (OL) or (-OL) is displayed.

**Zero:** Automatic.

**Low battery indication:** The " " is displayed when the battery voltage drops below the operating level.

**Measurement rate:** 2.5 times per second, nominal.

**Operating environment:** 0°C to 50°C at < 70% relative humidity.

**Storage temperature:** -20°C to 60°C, 0 to 80% R.H. with battery removed from meter.

**Accuracy:** Stated accuracy at 23°C ± 5°C, < 75% relative humidity.

**Power:** Single standard 9-volt battery, NEDA 1604, JIS 006P, IEC 6F22.

**Battery life:** 200 hours typical with carbon-zinc.

**Dimensions:** 147mm (H) x 70mm (W) x 39mm (D).

**Weight:** Approx. 345g including holster.

**Accessories:** One pair test leads, One spare fuse, 9V battery (installed) and Operating Instructions.

### DC VOLTS

**Ranges:** 200mV, 2V, 20V, 200V, 600V

**Resolution:** 100μV

**Accuracy:** ±(0.8% rdg + 1dgt)

**Input impedance:** 10MΩ

**Overload protection:** 600VDC or AC rms

### AC VOLTS (50Hz - 500Hz)

**Ranges:** 200mV, 2V, 20V, 200V, 600V

**Resolution:** 100μV

**Accuracy:**

±(1.5% rdg + 3dpts) on 200mV to 20V ranges

±(2.0% rdg + 3dpts) on 200V to 600V ranges

**Input impedance:** 10MΩ

**Overload protection:** 600VDC or AC rms

### DC CURRENT

**Ranges:** 20mA, 200mA, 10A

**Accuracy:**

±(1.0% rdg + 1dgt) on 20mA to 200mA ranges

±(3.0% rdg + 3dpts) on 10A range

**Input protection:** 0.5A/400V fast blow fuse

10A/600V fast blow ceramic fuse

### AC CURRENT (50Hz - 500Hz)

**Ranges:** 20mA, 200mA, 10A

**Accuracy:**

±(2.0% rdg + 4dpts) on 20mA to 200mA ranges

±(3.5% rdg + 4dpts) on 10A range

**Input protection:** 0.5A/400V fast blow fuse

10A/600V fast blow ceramic fuse

### RESISTANCE

**Ranges:** 200Ω, 2KΩ, 20KΩ, 200KΩ, 2000KΩ, 20MΩ, 2000MΩ

**Accuracy:**

±(1.0% rdg + 4dpts) on 200Ω to 2000KΩ ranges

±(2.0% rdg + 4dpts) on 20MΩ range

±[(5.0% rdg - 10dpts) + 10dpts] on 2000MΩ range

**Open circuit volts:** 0.3Vdc

(3.0Vdc on 200Ω, 2000MΩ ranges)

**Overload protection:** 500VDC or AC rms

### CONTINUITY

**Audible indication:** Less than 100Ω

**Overload protection:** 500VDC or AC rms

### DIODE TEST

**Test current:** 0.8mA ± 0.3mA

**Accuracy:** ±(3.0% rdg + 1dgt)

**Open circuit volts:** 3.0Vdc typical

**Overload protection:** 500VDC or AC rms

### CAPACITANCE

**Ranges:** 2nF, 20nF, 200nF, 2μF, 20μF

**Accuracy:** ±(4.0% rdg + 10dpts) on all ranges

**Test frequency:** 400Hz

### TRANSISTOR hFE

**Ranges:** 0 - 1000

**Base current:** 10μAdc approx. (Vce=3.0Vdc)

### FREQUENCY (Autoranging)

**Ranges:** 2kHz, 20kHz, 200kHz, 2MHz, 15MHz

**Accuracy:** ±(0.5% rdg + 2dpts) on all ranges

**Sensitivity:** 1V RMS min.

**Duty:** >40% and >60%

**Overload protection:** 500VDC or AC rms

### LOGIC TEST

**Threshold:** Logic Hi (2.8 ± 0.8V)

Logic Lo (0.8 ± 0.5V)

**Indication:** 40 msec beep at logic low

**Overload protection:** 500VDC or AC rms

### Input Warning Beeper

Incorrect test lead placement will cause this meter to issue a warning beeper sound. The warning beeper indicates that a test lead is plugged into a current input jack and the Function/Range switch is not set to a current range. For instance, if the red test lead is plugged into the mA current jack and the meter switch is set to 200V, the warning beeper will sound. Another safety feature to protect the meter and you.

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## OPERATION

Before taking any measurements, read the Safety Information Section. Always examine the instrument for damage, contamination (excessive dirt, grease, etc.) and defects. Examine the test leads for cracked or frayed insulation. If any abnormal conditions exist do not attempt to make any measurements.

### Voltage Measurements

1. Connect the red test lead to the "V $\Omega$ " jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the desired voltage range and slide the "AC/DC" selector switch to the desired voltage type. If magnitude of voltage is not known, set switch to the highest range and reduce until a satisfactory reading is obtained.
3. Connect the test leads to the device or circuit being measured.
4. For dc, a (-) sign is displayed for negative polarity; positive polarity is implied.

### Current Measurements

1. Set the Function/Range switch to the desired current range and slide the "AC/DC" selector switch to the desired current type.
2. For current measurements less than 200mA, connect the red test lead to the mA jack and the black test lead to the COM jack.
3. For current measurements of 200mA or greater, connect the red test lead to the 10A jack and the black test lead to the COM jack.

### Logic Measurements

1. Set the Function/Range switch to the LOGIC position.
2. Connect the red test lead to the "V $\Omega$ " jack and the black test lead to the "COM" jack.
3. Connect the red test lead to the test point and the black lead to the common buss of the logic circuit.
4. A " $\blacktriangle$ " on the display indicates TTL logic high and a " $\blacktriangledown$ " indicates a TTL logic low. Both indicators are on when the point of measurement is toggling high and low.

### Frequency Measurements

1. Set the Function/Range switch to the kHz position.
2. Connect the red test lead to the "V $\Omega$ " jack and the black test lead to the "COM" jack.
3. Connect the test leads to the point of measurement and read the frequency from the display.

## MAINTENANCE

### WARNING

Remove test leads before changing battery or fuse or performing any servicing.

### Battery Replacement

Power is supplied by a 9 volt "transistor" battery. (NEDA 1604, IEC 6F22). The " $\text{☒}$ " appears on the LCD display when replacement is needed. To replace

4. Remove power from the circuit under test and open the normal circuit path where the measurement is to be taken. Connect the meter in series with the circuit.

### Resistance and Continuity Measurements

1. Set the Function/Range switch to the desired resistance range or continuity position.
2. Remove power from the equipment under test.
3. Connect the red test lead to the "V $\Omega$ " jack and the black test lead to the "COM" jack.
4. Touch the probes to the test points. In ohms, the value indicated in the display is the measured value of resistance. In continuity test, the beeper sounds continuously, if the resistance is less than 100 $\Omega$ .

#### Note when using 2000M $\Omega$ Range

The 2000M $\Omega$  range has a fixed 10-count offset in the reading. When the test leads are shorted together in this range, the meter will display 010. This residual reading must be subtracted from the reading. For example, when measuring 1100M $\Omega$  on the 2000M $\Omega$  range, the display will read 1110, from which the 10 residual is subtracted to obtain the actual resistance of 1100M $\Omega$ .

### Diode Tests

1. Connect the red test lead to the "V $\Omega$ " jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the " $\rightarrow$ " position.
3. Turn off power to the circuit under test.
4. Touch probes to the diode. A forward-voltage drop is about 0.6V (typical for a silicon diode).

the battery, remove the three screws from the back of the meter and lift off the front case. Remove the battery from case bottom.

### Fuse Replacement

If no current measurements are possible, check for a blown overload protection fuse. There are two fuses; F1 for the mA jack and F2 for the 10A jack. For access to fuses, remove the three screws from the back of the meter and lift off the front case. Replace F1 only with the original type 0.5A/400V fast acting fuse. Replace F2 only with the original type 10A/600V, fast acting ceramic fuse.

5. Reverse probes. If the diode is good, "OL" is displayed. If the diode is shorted, ".000" or another number is displayed.
6. If the diode is open. "OL" is displayed in both directions.
7. If the junction is measured in a circuit and a low reading is obtained with both lead connections, the junction may be shunted by a resistance of less than 1k $\Omega$ . In this case the diode must be disconnected from the circuit for accurate testing.

### Transistor Gain Measurements

1. Set the Function/Range switch to the desired hFE range (PNP or NPN type transistor).
2. Never apply an external voltage to the hFE sockets. Damage to the meter may result.
3. Plug the transistor directly into the hFE sockets. The sockets are labeled E, B, and C for emitter, base, and collector.
4. Read the transistor hFE directly from the display.

### Capacitance Measurements

1. Set the Function/Range switch to the desired Cx (capacitance) range.
2. Never apply an external voltage to the Cx sockets. Damage to the meter may result.
3. Insert the capacitor leads directly into the Cx sockets.
4. Read the capacitance directly from the display.

### NOTE

The instrument complies with class II, overvoltage CAT.III of the IEC 1010-1 (EN61010-1) standard. If the equipment is used in a manner not specified, the protection provided by the equipment may be impaired.

$\triangle$   $\square$  When servicing, use only specified replacement parts or equivalent.

The symbols used on this instrument are:

- $\text{⚡}$  Caution, risk of electric shock
- $\triangle$  Caution, refer to accompanying documents
- $\square$  Equipment protected throughout by Double insulation (Class II)
- $\sim$  Alternating current
- $\text{---}$  Direct current
- $\text{⊥}$  Ground

# CE

This product complies with the requirements of the following European Community Directives: 89/336/EEC (Electromagnetic Compatibility) and 73/23/EEC (Low Voltage) as amended by 93/68/EEC (CE Marking).

However, electrical noise or intense electromagnetic fields in the vicinity of the equipment may disturb the measurement circuit. Measuring instruments will also respond to unwanted signals that may be present within the measurement circuit. Users should exercise care and take appropriate precautions to avoid misleading results when making measurements in the presence of electromagnetic interference.

P/N: 7000-1263A

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