OPERATING INSTRUCTIONS
ELENCO LCM-1950
DIGITAL MULTIMETER

SAFETY INFORMATION

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

1. Do not use the meter if the meter or test leads look damaged, or if you suspect that the meter is not operating properly.
2. This meter is not recommended for high voltage industrial use; for example, not for measurements of 440VAC or 600VAC industrial power mains. The unit is intended for use with low energy circuits to 1000VDC or 750VAC or high energy circuits to 250VAC or DC. Accidental misuse by connection across a high voltage, high energy power source when the meter is set up for mA measurement may be very hazardous.
3. Turn off power to the circuit under test before cutting, unsoldering, or breaking the circuit. Small amounts of current can be dangerous.
4. Use caution when working above 60VDC or 30VAC rms. Such voltages pose a shock hazard.
5. When using the probes, keep your fingers behind the finger guards on the probes.
6. 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: 3 3/4 digit liquid crystal display (LCD) with a maximum reading of 3999.

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: 150 hours typical with carbon-zinc.

Dimensions: 200mm (H) x 90mm (W) x 40mm (D).

Weight: Approx. 14 oz. (400g.) including battery.

Accessories: One pair test leads, one spare fuse (installed), 9V battery (installed) and operating instructions.

DC VOLTS

Ranges: 400mV, 4V, 40V, 400V, 1000V

Resolution: 100µV

Accuracy: ±(0.5% rdg + 1 dgt)

Input Impedance: 10MΩ

Overload Protection: 1000VDC or 750VAC rms

AC VOLTS (50Hz - 500Hz)

Ranges: 400mV, 4V, 40V, 400V, 750V

Resolution: 100µV

Accuracy: ±(1.5% rdg + 4 dgts) on 400mV to 400V ranges
±(2.0% rdg + 4 dgts) on 750V ranges

Input Impedance: 10MΩ

Overload Protection: 1000VDC or 750VAC rms

DC CURRENT

Ranges: 40mA, 400mA, 10A

Accuracy: ±(1.5% rdg + 1 dgt) on mA range
±(3.0% rdg + 1 dgt) on 10A range

Input Protection: 0.5A / 250V fast blow fuse
10A / 600V fast blow ceramic fuse

AC CURRENT (50Hz - 500Hz)

Ranges: 40mA, 400mA, 10A

Accuracy: ±(2.0% rdg + 4 dgts) on mA range
±(3.5% rdg + 4 dgts) on 10A range

Input Protection: 0.5A / 250V fast blow fuse
10A / 600V fast blow ceramic fuse

RESISTANCE

Ranges: 400Ω, 4kΩ, 40kΩ, 400kΩ, 4MΩ, 40MΩ, 4000MΩ

Accuracy: ±(1.0% rdg + 4 dgts) on 400Ω range
±(0.8% rdg + 2 dgts) on 4kΩ to 4MΩ ranges
±(3.0% rdg + 4 dgts) on 40MΩ range
±[(5.0% rdg + 10 dgts) + 10 dgts] on 4000MΩ range

Open Circuit Volts: 0.6VDC (3.0VDC on 400Ω and 4000MΩ ranges)

Overload Protection: 500VDC or AC rms

CONTINUITY

Audible Indication: Less than 40Ω ±20Ω

Overload Protection: 500VDC or AC rms

DIODE TEST

Test Current: 1.0mA ±0.6mA

Accuracy: ±(3.0% rdg + 3dgt)

Open Circuit Volts: 3.0VDC typical

Overload Protection: 500VDC or AC rms

CAPACITANCE

Ranges: 4nF, 40nF, 400nF, 4µF, 200µF

Accuracy: ±(5.0% rdg + 10dgts) on all ranges
±(8.0% rdg + 10dgts) above 100µF

Test Frequency: 200Hz

INDUCTANCE

Ranges: 4mH, 40mH, 400mH, 4H, 40H

Accuracy: ±(5.0% rdg + 20 dgts) on 4mH
±(5.0% rdg + 10 dgts) on other ranges

Test Frequency: 200Hz

FREQUENCY (Autoranging)

Ranges: 4kHz, 40kHz, 400kHz, 1000kHz

Accuracy: ±(0.5% rdg + 1 dgt) on all ranges

Sensitivity: 0.2V rms min.

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

Frequency Response: 20MHz

Detectable Pulse Width: 25nS.

Pulse Limits: >30% & <70% duty

Overload Protection: 500VDC or AC rms

TRANSISTOR h_{FE}

Ranges: 0 - 1000

Base Current: 10μADC approx. (Vce = 3.3VDC)

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.

Max. Hold Feature

Press "MAX" to toggle in and out of the Maximum Hold mode (holding the highest reading). In the MAX mode, the MAX annunciator is displayed and maximum reading is stored in display register. If the new reading is higher than the reading being displayed, the higher reading is transferred to the display register. A "higher" reading is defined as the reading with the higher absolute value.

The MAX hold function is also available in the frequency count mode. The counter autoranging feature is disabled when the MAX hold function is selected.

Voltage Measurements

1. Connect the red test lead to the "VΩ" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the desired range and press the "⎓/~" switch to toggle between the desired voltage type. If the magnitude of the voltage is not known, set the 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 press the "⎓/~" selector switch to the desired current type.
2. For current measurements less than 400mA, connect the red test lead to the "mA" jack and the black test lead to the "COM" jack.
3. For current measurements over 400mA or greater, connect the red test lead to the "10A" jack and the black test lead to the "COM" jack.
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 "VΩ" 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 100Ω.

Transistor Gain Measurements

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

Capacitance & Inductance Measurements

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

Frequency Measurements

1. Set the Function/Range switch to the KHz position.
2. Connect the red test lead to the "VΩ" 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.

Logic Measurements

1. Set the Function/Range switch to the LOGIC position.
2. Connect the red test lead to the "VΩ" 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 "▲" on the display indicates TTL logic high and a "▼" indicates a TTL logic low. Both indicators are on when the point of measurement is toggling high and low.

Diode Tests

1. Connect the red test lead to the "VΩ" jack and the black test lead to the "COM" jack.
2. Set the Function/Range switch to the "⏭" position.
3. Turn off the power to the circuit under test.
4. Touch the probes to the diode. A forward-voltage drop is about 0.6V (typical for a silicon diode).
5. Reverse the probes. If the diode is good, the display will be between 2.800V and 3.200V. If the diode is shorted, ".000" of another number is displayed.
6. If the diode is open, the display will be between 2.800V and 3.200V 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 1kΩ. In this case, the diode must be disconnected from the circuit for accurate testing.

MAINTENANCE

WARNING

Remove test leads before changing battery or performing any servicing.

Battery Replacement

Power is supplied by a 9 volt "transistor" battery (NEDA 1604, IEC 6F22). The "🔋" appears on the LCD display when replacement is needed. To replace the battery, remove the two screws from the back of the meter and lift off the battery cover. Remove the battery from the battery snap.

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 two screws from the back of the meter and lift off the battery cover. Replace F1 only with the original type 0.5A/250V, fast acting fuse. Replace F2 only with the original type 10A/600V, fast acting ceramic fuse.