

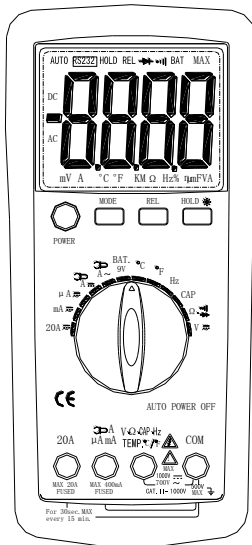
# OPERATING INSTRUCTION



## ZI-6940

www.zicotech.com

DMM with Mechanical Protection



- 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.
- Never apply voltage or current to the meter that exceeds the specified maximum:

Input Limits	
Function	Maximum Input
V DC or V AC	1000V DC, 700V AC
mA DC/AC	400mA DC/AC
A DC/AC	20A DC/AC (30 seconds max every 15 minutes)
Frequency, Resistance, Capacitance, Diode test, Continuity	250V DC/AC
Temperature	250V DC/AC

## 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.

## SAFETY SYMBOLS

This symbol adjacent to another symbol, terminal or operating device indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.

**WARNING**

This **WARNING** symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

**CAUTION**

This **CAUTION** symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.

**MAX**

This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth

ground exceeds (in this case) 500 VAC or VDC.

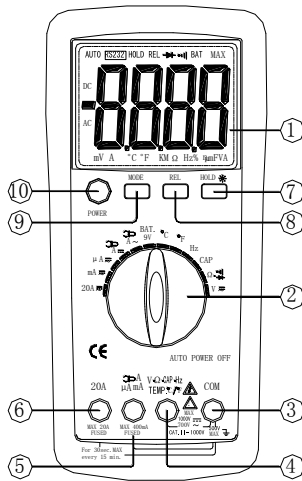


This symbol adjacent to one or more terminals identifies them as being associated with ranges that may, in normal use, be subjected to particularly hazardous voltages. For maximum safety, the meter and its test leads should not be handled when these terminals are energized.

## SYMBOLS AND ANNUNCIATORS

	Continuity
BAT	Low Battery
	Diode
DATA HOLD	Data Hold
AUTO	AutoRanging
AC	Alternating Current or Voltage
DC	Direct Current or Voltage

## CONTROLS AND JACKS



1. Large 4000 count Liquid Crystal Display with symbolic signs.
2. Function switch
3. COM (negative) input jack.
4. Positive input jack for DC/AC Voltage, Hz, Ohms, Diode, Continuity, Capacitance, Temperature ( $^{\circ}\text{C}$  or  $^{\circ}\text{F}$ ) measurements
5.  $\mu\text{A}$ ,  $\text{mA}$ , current (A) clamp positive input jack for DC or AC measurements.
6. 20A (positive) input jack for 20A DC or AC measurements.
7. Data Hold and Backlight pushbutton
8. Relative pushbutton Mode pushbutton.
9. Mode pushbutton
10. Power pushbutton.

## SPECIFICATIONS

**The instrument complies with:** EN61010-1.

**Insulation:** Class2, Double insulation.

**Overvoltage category:** CATII 1000V.

**Display:** 4000 counts LCD display with function indication.

**Polarity:** Automatic, (-) negative polarity indication.

**Overrange:** "OL" mark indication.

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

**Measurement rate:** 2 times per second, nominal.

**Auto power off:** Meter automatically shuts down after approx. 30 minutes of inactivity.

**Operating environment:**  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  ( $32^{\circ}\text{F}$  to  $122^{\circ}\text{F}$ ) at  $< 70\%$  relative humidity.

**Storage temperature:**  $-20^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$  to  $140^{\circ}\text{F}$ ) at  $< 80\%$  relative humidity.

**For inside use, max height:** 2000m

**Pollution degree:** 2

**Power:** One 9V battery, NEDA 1604, IEC 6F22.

**Dimensions:** 146 (H) x 66.2 (W) x 41.5 (D) mm

**Weight: Approx.:** 200g.

Accuracy is given at  $18^{\circ}\text{C}$  to  $28^{\circ}\text{C}$  ( $65^{\circ}\text{F}$  to  $83^{\circ}\text{F}$ ), less than 70 % RH

### DC Voltage (Auto-ranging)

Range	Resolution	Accuracy
400.0mV	0.1mV	$\pm 0.5\%$ of rdg $\pm 2$ dgts
4.000V	1mV	$\pm 1.2\%$ of rdg $\pm 2$ dgts
40.00V	10mV	
400.0V	100mV	
1000V	1V	$\pm 1.5\%$ of rdg $\pm 2$ dgts

Input Impedance: 10MΩ.

Maximum Input: 1000V dc or 700V ac rms.

**AC Voltage (Auto-ranging)**

Range	Resolution	Accuracy
4.000V	1mV	+1.2% of rdg ± 3 dgts
40.00V	10mV	±1.5% of rdg ± 3 dgts
400.0V	100mV	
700V	1V	+2.0% of rdg ± 4 dgts

Input Impedance: 10MΩ.

Frequency Range: 50 to 400Hz

Maximum Input: 1000V dc or 700V ac rms.

**DC Current (Auto-ranging for uA, mA, A)**

Range	Resolution	Accuracy
400.0uA	0.1uA	±1.0% of rdg ± 3 dgts
4000uA	1uA	±1.5% of rdg ± 3 dgts
40.00mA	10uA	
400.0mA	100uA	
4A	1mA	±2.5% of rdg ± 5 dgts
20A	10mA	

Overload Protection: 0.5A / 250V and 20A / 250V Fuse.

Maximum Input: 400mA dc or 400mA ac rms on uA / mA ranges, 20A dc or ac rms on 4A, 20A range.

**AC Current (Auto-ranging for uA, mA, A)**

Range	Resolution	Accuracy
400.0uA	0.1uA	±1.5% of rdg ± 5 dgts
4000uA	1uA	±1.8% of rdg ± 5 dgts
40.00mA	10uA	
400.0mA	100uA	
4A	1mA	±3.0% of rdg ± 7 dgts
20A	10mA	

Overload Protection: 0.5A / 250V and 20A / 250V Fuse.

Frequency Range: 50 to 400 Hz

Maximum Input: 400mA dc or 400mA ac rms on uA / mA ranges, 20A dc or ac rms on 4A, 20A range.

**Resistance (Auto-ranging)**

Range	Resolution	Accuracy
400.0Ω	0.1Ω	±1.2% of rdg ± 4 dgts
4.000kΩ	1Ω	±1.0% of rdg ± 2 dgts
40.00kΩ	10Ω	±1.2% of rdg ± 2 dgts
400.0kΩ	100Ω	
4.000MΩ	1kΩ	
40.00MΩ	10kΩ	+2.0% of rdg ± 3 dgts

Input Protection: 250V dc or 250V ac rms.

**Capacitance (Auto-ranging)**

Range	Resolution	Accuracy
40.00nF	10pF	±5.0% of rdg ± 7 dgts
400.0nF	0.1nF	

4.000uF	1nF	±3.0% of rdg ± 5 dgts
40.00uF	10nF	±3.0% of rdg ± 5 dgts
100.0uF	0.1uF	±5.0% of rdg ± 5 dgts

Input Protection: 250V dc or 250V ac rms.

**Frequency (Auto-ranging)**

Range	Resolution	Accuracy
9.999Hz	0.001Hz	±1.5% of rdg ± 5 dgts
99.99Hz	0.01Hz	
999.9Hz	0.1Hz	
9.999kHz	1Hz	±1.2% of rdg ± 3 dgts
99.99kHz	10Hz	
999.9kHz	100Hz	
9.999MHz	1kHz	±1.5% of rdg ± 4 dgts

Sensitivity: 0.5V RMS min. while ≤ 1MHz ;

Sensitivity: >3V RMS while >1MHz ;

Overload protection: 250V dc or ac rms.

**Duty Cycle**

Range	Resolution	Accuracy
0.1%~99.9%	0.1%	±1.2% of rdg ± 2 dgts

Pulse width: >100us, <100ms;

Frequency width: 5Hz – 150kHz

Sensitivity: >0.5V RMS

Overload protection: 250V dc or ac rms.

**Clamp DC Current**

Range	Resolution	Accuracy
400A	0.1A	±1.0% of rdg ± 3dgts (meter only, Clamp-on Adaptor accuracy not included)

Sensor: Clamp-on Adaptor (Note: not provide)

Overload protection: 250V dc or ac rms..

**Clamp AC Current**

Range	Resolution	Accuracy
400A	0.1A	±1.5% of rdg ± 3dgts (meter only, Clamp-on Adaptor accuracy not included)

Sensor: Clamp-on Adaptor (Note: not provide)

Frequency Range: 50 to 400 Hz

Overload protection: 250V dc or ac rms..

**9V Battery test**

Range	Resolution	Accuracy
9V	10mV	±1.0% of rdg ± 3dgts

Test current : 6mA

Overload protection: 250V dc or ac rms..

### Temperature

Range	Resolution	Accuracy
-20 <sup>0</sup> C~+760 <sup>0</sup> C	1 <sup>0</sup> C	±3% of rdg ±3dgts
-4 <sup>0</sup> F~+1400 <sup>0</sup> F	1 <sup>0</sup> F	

Sensor: Type K Thermocouple

Overload protection: 250V dc or ac rms..

### Diode Test

Test current	Resolution	Accuracy
0.3mA typical	1 mV	±10% of rdg ± 5 dgts

Open circuit voltage: 1.5V dc typical

Overload protection: 250V dc or ac rms.

### Audible continuity

Audible threshold: Less than 50Ω; Test current: <0.3mA

Overload protection: 250V dc or ac rms.

### OPERATION

**WARNING:** Risk of electrocution. High-voltage circuits, both AC and DC, are very dangerous and should be measured with great care.

1. ALWAYS turn the function switch to the OFF position when the meter is not in use. This meter has Auto OFF that automatically shuts the meter OFF if 15 minutes elapse between uses.
2. If "OL" appears in the display during a measurement, the value exceeds the range you have selected. Change to a higher range.

**NOTE:** On some low AC and DC voltage ranges, with the test leads not connected to a device, the display may show a random, changing reading. This is normal and is caused by the high-input sensitivity. The reading will stabilize and give a proper measurement when connected to a circuit.

### MODE BUTTON

To select DC/AC Voltage, Resistance/ Diode/Continuity or DC/AC current

### DATA HOLD AND BACKLIGHT BUTTON

The Data Hold function allows the meter to "freeze" a measurement for later reference.

1. Press the DATA HOLD button to "freeze" the reading

on the indicator. The indicator "HOLD" will appear in the display.

2. Press the DATA HOLD button to return to normal operation.
3. Press the HOLD button for 2 seconds to BACKLIGHT button it will turn on or off)

### RELATIVE BUTTON

The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, etc. can be stored and measurements made in comparison to that value. The displayed value is the difference between the reference value and the measured value.

1. Perform any measurement as described in the operating instructions.
2. Press the RELATIVE button to store the reading in the display and the "REL" indicator will appear on the display.
3. The display will now indicate the difference between the stored value and the measured value.
4. Press the RELATIVE button to return to normal operation.

### DC VOLTAGE MEASUREMENTS

**CAUTION:** Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the V DC position ("mV" will appear in the display).
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V) jack.
3. Touch the test probe tips to the circuit under test. Be sure to observe the correct polarity (red lead to positive, black lead to negative).
4. Read the voltage in the display. The display will indicate the proper decimal point and value. If the polarity is reversed, the display will show (-) minus before the value.
5. Press the MODE button until "DC" appears in the display.

## AC VOLTAGE MEASUREMENTS

**WARNING:** Risk of Electrocution. The probe tips may not be long enough to contact the live parts inside some 240V outlets for appliances because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has voltage on it. Make sure the probe tips are touching the metal contacts inside the outlet before assuming that no voltage is present.

**CAUTION:** Do not measure AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur that can damage the meter.

1. Set the function switch to the V AC position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive (V) jack.
3. Touch the test probe tips to the circuit under test.
4. Read the voltage in the display. The display will indicate the proper decimal point, value and symbol (AC, V, etc.).
5. Press the MODE button until "AC" appears in the display.

## DC CURRENT MEASUREMENTS

**CAUTION:** Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative (COM) jack.
2. For current measurements up to 4000 $\mu$ A DC, set the function switch to the  $\mu$ A position and insert the red test lead banana plug into the ( $\mu$ A) jack.
3. For current measurements up to 400mA DC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 20A DC, set the function switch to the A position and insert the red test lead banana plug into the 10A jack.
5. Press the MODE button until "DC" appears in the display.

6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the black test probe tip to the negative side of the circuit. Touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display. The display will indicate the proper decimal point, value and symbol.

## AC CURRENT MEASUREMENTS

**WARNING:** To avoid electric shock, do not measure AC current on any circuit whose voltage exceeds 250V AC.

**CAUTION:** Do not make current measurements on the 10A scale for longer than 30 seconds. Exceeding 30 seconds may cause damage to the meter and/or the test leads.

1. Insert the black test lead banana plug into the negative (COM) jack.
2. For current measurements up to 4000 $\mu$ A AC, set the function switch to the  $\mu$ A position and insert the red test lead banana plug into the ( $\mu$ A) jack.
3. For current measurements up to 400mA AC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 20A AC, set the function switch to the A position and insert the red test lead banana plug into the 10A jack.
5. Press the MODE button until "AC" appears in the display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the black test probe tip to the negative side of the circuit. And touch the red test probe tip to the positive side of the circuit.
8. Apply power to the circuit.
9. Read the current in the display. The display will indicate the proper decimal point, value and symbol.




## RESISTANCE MEASUREMENTS

**WARNING:** To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the  $\Omega$  position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive  $\Omega$  jack.
3. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
4. Read the resistance in the display. The display will indicate the proper decimal point, value and symbol.




## CONTINUITY CHECK

**WARNING:** To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the function switch to the  position.
2. Insert the black lead banana plug into the negative (-) jack (COM) and the red test lead banana plug into the positive (+) jack ( $\Omega$ ).
3. Press the  button until the  symbol appears in the display.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than approximately  $30\Omega$ , the audible signal will sound. The display will also show the actual resistance.

## DIODE TEST

**WARNING:** To avoid electric shock, do not test any diode that has voltage on it.

1. Set the function switch to  position.
2. Press the  button until the  symbol appears in the display.
3. Insert the black test lead banana plug into the negative (-) jack (COM) and the red test lead banana plug into the positive (+) jack ( $\Omega$ ).
4. Touch the test probe tips to the diode or semiconductor junction you wish to test. Note the meter reading

5. Reverse the probe polarity by switching probe position. Note this reading.
6. The diode or junction can be evaluated as follows:
  - A. If one reading shows a value and the other reading shows OL, the diode is good.
  - B. If both readings show OL, the device is open.
  - C. If both readings are very small or 0, the device is shorted.

**NOTE:** The value indicated in the display during the diode check is the forward voltage.

## FREQUENCY MEASUREMENT

1. Set the function switch to the FREQ position.
2. Insert the black test lead banana plug into the negative (-) jack (COM) and the red test lead banana plug into the positive (+) jack (F).
3. Touch the test probe tips to the circuit under test.
4. Read the frequency in the display. The digital reading will indicate the proper decimal point, symbols (Hz, kHz) and value.

## CAPACITANCE MEASUREMENTS

**WARNING:** To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any capacitance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the CAP position. ("nF" and a small value will appear in the display).
2. Insert the black test lead banana plug into the negative (-) jack (COM) and the red test lead banana plug into the positive (+) jack (CAP).
3. Touch the test leads to the capacitor to be tested. The display will indicate the proper decimal point, value and symbol.

## TEMPERATURE MEASUREMENTS

**WARNING:** To avoid electric shock, disconnect both test probes from any source of voltage before making a temperature measurement.

1. If you wish to measure temperature in °F, set the function switch to the °F range. If you wish to measure temperature in °C, set the function switch to the °C range.
2. Insert the Temperature Probe into the negative (-) jack (COM) and the positive (+) jack (Temperature), making sure to observe the correct polarity.
3. Touch the Temperature Probe head to the part whose temperature you wish to measure. Keep the probe touching the part under test until the reading stabilizes (about 30 seconds).
4. Read the temperature in the display. The digital reading will indicate the proper decimal point and value.

**WARNING:** To avoid electric shock, be sure the thermocouple has been removed before changing to another measurement function.

## BATTERY TEST

1. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the positive **V** jack.
2. Select the **9V BAT** position using the function select switch.
3. Connect the red test lead to the positive side of the 9V battery and the black test lead to the negative side of the 9V battery.
4. Read the voltage in the display.

	Good	Weak	Bad
9V battery:	>8.2V	7.2 to 8.2V	<7.2V

## CLAMP CURRENT TEST

1. Insert the clamp –on adaptor black banana plug into the negative **COM** jack and the clamp –on adaptor red banana plug into the positive **uA, mA, A** jack.
2. Select the clamp current DC or AC position using the function select switch.
3. Press the trigger to open jaw. Fully enclose one conductor to be measured.

4. The meter LCD will display the reading.

## REPLACING THE BATTERY

**WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery door.

1. When the batteries become exhausted or drop below the operating voltage, “BAT” will appear in the right-hand side of the LCD display. The battery should be replaced.
2. Follow instructions for installing battery. See the Battery Installation section of this manual.
3. Dispose of the old battery properly.

**WARNING:** To avoid electric shock, do not operate your meter until the battery door is in place and fastened securely.

## BATTERY INSTALLATION

**WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery door.

1. Disconnect the test leads from the meter.
2. Open the battery door by loosening the screw using a Phillips head screwdriver.
3. Insert the battery into battery holder, observing the correct polarity.
4. Put the battery door back in place. Secure with the two screws.

**WARNING:** To avoid electric shock, do not operate the meter until the battery door is in place and fastened securely.

**NOTE:** If your meter does not work properly, check the fuses and battery to make sure that they are still good and that they are properly inserted.

## REPLACING THE FUSES

**WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the fuse door.

1. Disconnect the test leads from the meter and any item under test.
2. Open the meter cover by loosening the screw on the cover using a Phillips head screwdriver.

3. Remove the old fuse from its holder by gently pulling it out.
3. Install the new fuse into the holder.
4. Always use a fuse of the proper size and value (0.5A/250V fast blow for the 400mA range, 20A/250V fast blow for the 10A range).
5. Put the cover . Insert the screw and tighten it securely.

**WARNING:** To avoid electric shock, do not operate your meter until the meter cover is in place and fastened securely.