

OWNER'S MANUAL
9908-TE
HIGH PRECISION
AUTO-RANGING
DC/True RMS AC
BENCH-TOP DIGITAL MULTIMETER



IMPORTANT!

Read and understand this manual before using the instrument.
Failure to understand and comply with safety rules and operating
Instructions can result in serious or fatal injuries and/or property damage.

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1. DESCRIPTION

The **9908-TE** bench-top auto-ranging digital multimeter is designed for measuring resistance, DC and True RMS AC voltage, DC and True RMS AC current, frequency, capacitance, testing diodes and checking continuity.

This meter is designed for indoor use at altitudes up to 2000m, temperatures between 5°C and 40°C, and a maximum humidity of 80% at temperatures up to 31°C with decreasing linearly to 50% relative humidity at 40°C and a pollution degree of 2.

The large backlit LCD display with bargraph is clear and easy to read.

The easy access push buttons, the auto-range, relative measurement, Maximum/Minimum measurement, data hold and data memory functions make this multimeter a versatile solution for your measurement needs now and in the future.


2. SAFETY INSTRUCTIONS


This meter has been designed for safe use in accordance with IEC61010.1 CAT II, but must be operated with caution.

The rules listed below must be carefully followed for safe operation.

- 2.1 NEVER** operate this instrument when the cover is open or not properly attached in its place.
- 2.2** Make sure that the insulation of the test leads is not damaged.
- 2.3** When **BAT** appears on the display, use the AC power supply for accurate measurements and to charge the built-in rechargeable batteries.
- 2.4** NEVER apply a voltage to the meter that exceeds the specified maximum: DC1000V or AC750V.
- 2.5** USE extreme caution when working with voltages over the 36V safe point.
- 2.6** NEVER change the measurement function while measuring. For example: don't push the current measurement button "A" while you are in the Voltage measurement process.
- 2.7** CHOOSE the right position of all function switches before testing.
- 2.8** NEVER change any connection on the circuit board of the meter.
- 2.9** USE only a damp cloth or mild detergent to clean the outside of the meter.
- 2.10** Safety Symbols:

 Hazardous voltage

 Read the manual first

 Connect to common ground

3. SPECIFICATIONS

3.1 GENERAL

- 3.1.1** Display: Large LCD with bargraph, annunciators and back light.
- 3.1.2** Maximum read: 39,999 with auto polarity display (no sign for positive polarity).
- 3.1.3** Measuring method: A/D converter.
- 3.1.4** Sampling speed: 3 times/sec.
- 3.1.5** Maximum common mode voltage: 500V AC/DC.
- 3.1.6** Over range indicator: "OL" displayed or audible signal sound.
- 3.1.7** Relative measurement indication: "~" displayed.
- 3.1.8** Power supply: switchable 115/220 V AC 50-60Hz with built-in rechargeable batteries.
- 3.1.9** Low battery indicator: "BATT" is displayed if battery voltage drops below operating voltage.
- 3.1.10** Operating environment: 5-35°C, Humidity <75%.
- 3.1.11** Storing environment: -10 to 50°C, Humidity <75%.
- 3.1.12** Fuse: two 500mA/250V Fast, one 10A/250V Fast.
- 3.1.13** Accessories included: Manual, one pair of test leads and one AC power cord.

3.2 SPECIFICATIONS:

Function	Range	Resolution	Accuracy
DC Voltage (V DC)	400mV	10uV	±(0.08% rdg + 5 dgts)
	4V	100uV	±(0.05% rdg + 5 dgts)
	40V	1 mV	±(0.08 % rdg + 5 dgts)
	400V	10mV	±(0.1 % rdg + 5 dgts)
	1000V	100mV	±(0.1 % rdg + 5 dgts)
	400mV	10uV	±(0.1 % rdg + 5 dgts)
AC Voltage (V AC)	4V	100uV	±(0.8 % rdg + 10 dgts)
	40V	1 mV	
	400V	10mV	
	750V	100mV	
DC Current (A DC)	40mA	1 ì A	±(0.8% rdg + 5 dgts)
	400mA	10ì A	±(1.5% rdg +5 dgts)
	10A	1 mA	
AC Current (A AC)	40mA	1 ì A	±(1.0% rdg +10dgts)
	400mA	10ì A	±(2.0% rdg + 10 dgts)
	10A	1 mA	
Resistance	400:	0.01 :	±(0.8% rdg +5 dgts)
	4k:	0.1 :	±(0.5% rdg +5 dgts)
	40k:	1:	±(3.0% rdg + 10 dgts)
	400k:	10:	
	4000k:	100:	
	40M:	1k:	
Frequency (Auto Range)	100Hz:	0.01 Hz	±(0.08 % rdg + 3 dgts)
	1000Hz:	0.1 Hz	
	10kHz:	10Hz	
	100kHz:	100Hz	
	1000kHz:	1000Hz	
Capacitance (Auto Range)	4nF	0.001nF	approximate ±(4% rdg + 20 dgts)
	40nF	0.01nF	±(2% rdg + 10 dgts)
	400nF	0.1 nF	
	4uF	1 nF	±(3% rdg +10 dgts)
	40uF	10nF	
	300uF	100nF	

The VAC and AAC range are specified from 5% to 100% of the range.

Input Impedance – 10M: (AC/DC measurement).

Diode Test – reads approximate forward voltage, test current of 1 mA maximum.

Continuity Check – Audible signal will sound if the resistance is less than 40 ohms.

Understand the AC zero input.

When measuring AC voltage and current, the meter is calculating the input and converting them to the data that the LCD can display. The converters need certain levels of the input voltage to make the measurement. This level is 5% of the ranges for this meter. So that, the non-zero digits that are displayed on the meter (especially the True RMS meter) when the test leads are open or are shorted, are normal. This will not affect the specified AC accuracy above 5% of the ranges.

4. OPERATION

4.1.0 Front Panel Diagram (Fig. 1)

1. LCD Display with bargraph & function icons.
2. POWER button Alternate action; Push this button for power On and again for power Off.
3. Frequency input jack Plug-in the red (positive) lead for frequency measurements only.
4. 10A Input Jack Plug-in the red (positive) lead for 10A measurements only.
5. mA Input Jack Plug-in the red (positive) lead for current measurements up to 400mA
6. COM Input Jack Plug-in the black (negative) lead for **All** measurements.
7. V / Ω / CAP Input Jack Plug-in the red (positive) lead for voltage, capacitance, resistor, continuity and diode check.

8. V button Push this button in for voltage measurements.
9. mA button Push this button in for mA range current measurements.
10. A button Push this button in for 10A range current measurements.
11. RANGE button Used to manually select the desired range. When first turned ON the meter goes into Auto Range. When this button is pressed again, a manual range is selected. It is indicated by turning off the "AUTO" icon on the display. Each additional push causes the range to go higher. When the highest range is reached, the next push returns the range to its lowest point. To cancel the manual range and return to Auto Ranging, press the button until "AUTO" appears on the display.

12. FREQ button Push this button in for frequency measurements.
13. DC/AC button Push this button to jump from DC mode to AC mode or AC to DC.
14. Continuity button Push in this button to set the meter to the continuity testing mode.
15. Diode button Push this button in for diode testing mode.
16. Resistance button Push this button in for resistance testing mode.
17. CAP button Push this button in for capacitance testing mode.
18. MIN/MAX button Push this button; The minimum or maximum value that is detected during a series of tests will be displayed on the LCD. "MIN" or "MAX" icon will appear on the LCD. To exit this mode push the button until the "MIN" or "MAX" icon disappears.

19. REL button This is a very convenient function button. It is used for measuring the different (relative) values between parts and the reference.
Ex.: During the measurement of a +5V standard DC voltage, press this button once, the value on the display will be changed from +5V to 0V and "REL" icon appears on the LCD. Disconnect the test lead from the source (-5V will be displayed on the LCD).
If you measure a +4.5VDC source, the LCD will display -0.5V. This is indicating that the value you measured is 0.5V lower than the standard value.
Display value = (reading – reference value)

20. RST button Push this button to bring the meter back to the DCV mode – power on mode.
21. MEM button Press this button to store the present displayed value in memory and "MEM" icon appears on the LCD.

22. READ button Press this button once to read the stored value. Press it again to exit.
23. HOLD button Use to hold a reading. When this button is pressed, the data being displayed will be frozen in the display and "HOLD" icon will appear. Changes in the input signals will not change the display. It can be used in all measurement modes. Press the button again to release this function and "HOLD" icon will disappear.

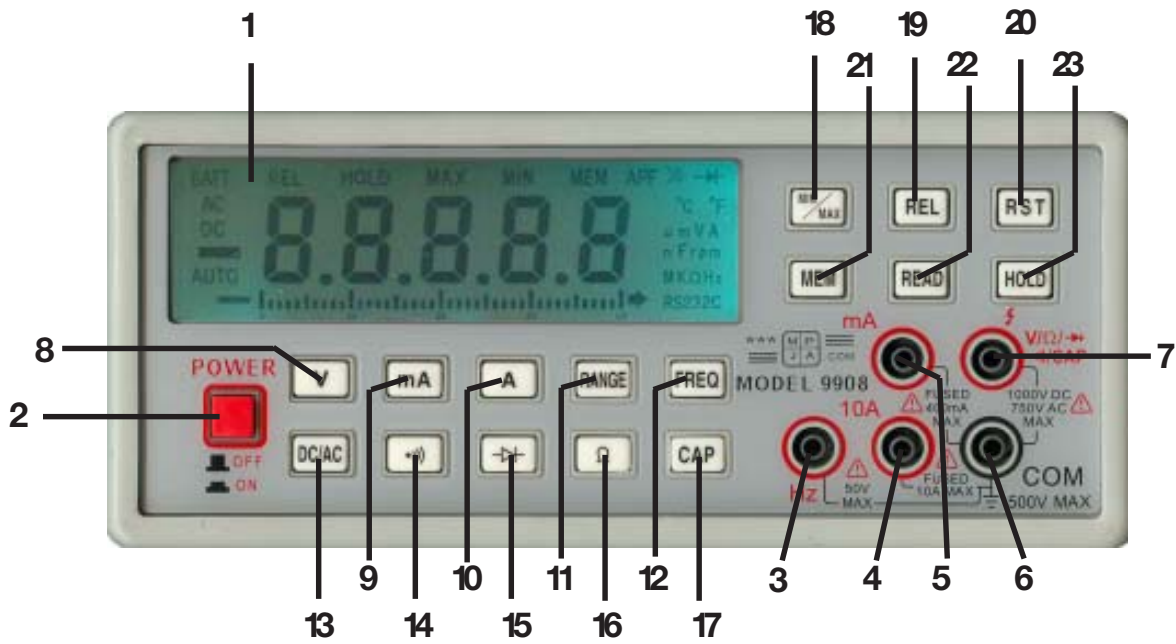


FIG. 1
METER FRONT



FIG. 1
METER REAR

4.1.2 Rear Panel Diagram (Fig.2)

1. 110V/220V AC power selector switch.
2. AC Power line socket.
3. AC Power Master switch.
4. 500mA/250V Fast fuse socket for AC.
5. 500mA/250V Fast fuse socket for DC.
6. 10A/250V Fast fuse socket.

4.2 OPERATING INSTRUCTIONS

4.2.1 DC Voltage Measurement

1. Press the **V** button; the "V" and "AUTO" icons will display on the LCD.
2. Push the **DC/AC** button till the "DC" icon displays on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **V/Ω/→+/-/)) /CAP** positive (+) jack.



NOTE: The meter will be in Auto-ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item 11) section of this manual. For manual ranging, start at the highest range and work down.

4. Touch the test lead tips to the circuit under test.
5. The value and polarity of the voltage will appear on the display.



CAUTION: During the manual ranging testing, if "OL" icon shows on the display and the buzzer sounds, disconnect the test lead from the circuit immediately to avoid damaging the meter.



Never apply a voltage over 1000 V.

Use **extreme** caution when working with high voltages.

Never connect test leads with a circuit when changing the position of functions.

4.2.2 AC Voltage Measurement

1. Press the **V** button; the "V" and "AUTO" icons will display on the LCD.
2. Push the **DC/AC** button till the "AC" icon displays on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **V/Ω/→+/-/)) /CAP** positive (+) jack.



NOTE: The meter will be in Auto-ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item 11) section of this manual. For manual ranging, start at the highest range and work down.

4. Touch the test lead tips to the circuit under test.
5. Apply power to the circuit.
6. The TrueRMS value of the voltage will appear on the display.



CAUTION: During the manual ranging testing, if "OL" icon shows on the display and the buzzer sounds, disconnect the test lead from the circuit immediately to avoid damaging the meter.



Never apply a voltage over 750 VAC

Use **extreme** caution when working with high voltages.

Never connect test leads with a circuit when changing the position of functions.

4.2.3 DC Current mA range Measurement

1. Press the **mA** button the "mA" and "AUTO" icons will display on the LCD.
2. Push the **DC/AC** button till the "DC" icon displays on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **mA** jack.



NOTE: The meter will be in Auto-ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item 11) section of this manual. For manual ranging, start at the highest range and work down.

4.2.3 DC Current mA range Measurement (Continued)

4. Remove power from the circuit under test. Then open up the circuit at the point where you wish to measure the current.
5. Touch the black test lead tip to the negative side of the circuit. Touch the red test lead tip to the positive side of the circuit.
6. Apply power to the circuit.
7. The value and polarity of the Current will appear on the display.



CAUTION: During the manual ranging testing, if "OL" icon shows on the display, disconnect the test leads from the circuit immediately to avoid damaging the meter.

Never connect test leads with a circuit when changing the position of functions.

Never apply any voltages to the test leads when the meter is set for current testing, otherwise this will cause damage to the meter and user.

4.2.4 DC Current 10A range Measurement

1. Press the **A** button; the "A" and "AUTO" icons will display on the LCD.
2. Push the **DC/AC** button till the "DC" icon displays on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **10A** jack.



NOTE: The meter will be in Auto ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item11) section of this manual. For manual ranging, start at the highest range and work down.

4. Remove power from the circuit under test. Then open up the circuit at the point where you wish to measure current.
5. Touch the black test lead tip to the negative side of the circuit. Touch the red test lead tip to the positive side of the circuit.
6. Apply power to the circuit.
7. The value and polarity of the Current will appear on the display.



CAUTION: During the manual ranging testing if "OL" icon shows on the display, disconnect the test leads from the circuit immediately to avoid damaging the meter.

Never connect test leads with a circuit when changing the position of functions.

Never apply any voltage to the test leads when the meter is set for current testing otherwise this will cause damage to the meter and user.

4.2.5 AC Current mA range Measurement

1. Press the **mA** button; the "mA" and "AUTO" icons will display on the LCD.
2. Push the **DC/AC** button till the "AC" icon displays on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **mA** jack.



NOTE: The meter will be in Auto ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item11) section of this manual. For manual ranging, start at the highest range and work down.

4. Remove power from the circuit under test. Then open up the circuit at the point where you wish to measure the current.
5. Touch the black test lead tip to the negative side of the circuit. Touch the red test lead tip to the positive side of the circuit.
6. Apply power to the circuit.
7. The value and polarity of the Current will appear on the display.



CAUTION: During the manual ranging testing if "OL" icon shows on the display, disconnect the test leads from circuit immediately to avoid damaging the meter.

Never connect test leads with a circuit when changing the position of functions.

Never apply any voltage to the test leads when the meter is set for current testing otherwise this will cause damage to the meter and user.

4.2.6 AC Current 10A range Measurement

1. Press the **A** button; the "A" and "AUTO" icons will display on the LCD.
2. Push the **DC/AC** button till the "AC" icon displays on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **10A** jack.



NOTE: The meter will be in Auto ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item11) section of this manual. For manual ranging, start at the highest range and work down.

4. Remove power from the circuit under test. Then open up the circuit at the point where you wish to measure current.
5. Touch the black test lead tip to the negative side of the circuit. Touch the red test lead tip to the positive side of the circuit.
6. Apply power to the circuit.
7. The value and polarity of the Current will appear on the display.



CAUTION: During the manual ranging testing if "OL" icon shows on the display, disconnect the test leads from the circuit immediately to avoid damaging the meter.

Never connect test leads with a circuit when changing the position of functions.

Never apply any voltage to the test leads when the meter is set for current testing. otherwise this will cause damage to the meter and user.

4.2.7 Resistance Measurement

1. Press the Ω button, the " Ω " and "AUTO" icons will display on the LCD.
2. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **V/ Ω →+/-) /CAP** positive (+) jack.
3. Check if the "AUTO", "OL" and "M Ω " appear in the display.
4. Touch the test probe tips across the resistor under test, read the value on the display. (If the resistor is part of the circuit, it is necessary to disconnect one end of the resistor to avoid the unwanted interference from the rest of the circuit).



NOTE: The meter will be in Auto ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item11) section of this manual. For manual ranging, start at the highest range and work down.



CAUTION: Never measure a resistor that has voltage on it otherwise this will cause damage to the meter and user.

4.2.8 Diode Check

1. Press the \rightarrow button, the " \rightarrow " icon will display on the LCD.
2. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **V/ Ω →+/-) /CAP** positive (+) jack.
3. Touch the test probe tips across the diode under test, read the value on the display.
4. Reverse the test probes' measuring positions across the diode and read the value.
5. The result may as follow:
 1. If one reading is around 0.5 and the other reading is "OL", the diode is good.
 2. If both readings are "OL", the diode is open.
 3. If both readings are "OL" or very small number, the diode is shorted.

(If the diode is part of the circuit, it is necessary to disconnect one end of the diode to avoid the unwanted interference from the rest of the circuit).



CAUTION: Never measure a device that has voltage on it, otherwise this will cause damage to the meter and user.

4.2.9 Continuity Check 1. 2.

1. Press the **continuity button** the " continuity icon" will display on the LCD.
2. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **V/Ω/→+/-) /CAP** positive (+) jack.
3. Touch the test probe tips across the device under test.
4. If the resistance is less than 40Ω, the audible signal will sound.
(If the device is part of the circuit, it is necessary to disconnect one end of the device to avoid the unwanted interference from the rest of the circuit).



CAUTION: Never measure a device that has voltage on it.

4.2.10 Capacitance Measurement

1. Discharge the capacitor being tested before starting the measurement.
2. Press the **CAP button**; the "nF" icon will display on the LCD.
3. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red **V/Ω/→+/-) /CAP** positive (+) jack.



NOTE: The meter will be in Auto ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item11) section of this manual. For manual ranging, start at the highest range and work down.

4. Touch the test probe tips across the device under test.
(The red probe to Positive and the black probe to Negative).
5. Read the value and units shown on the display.



CAUTION: Never measure a device that has voltage on it.

4.2.11 Frequency Measurement

1. Press the **FREQ button**; the "AUTO" and "Hz" icons will display on the LCD.
2. Insert the black test lead banana plug into the black **COM** negative (-) jack and the red test lead banana plug into the red jack **FREQ**.



NOTE: The meter will be in Auto ranging. If you wish to manually set the range, do so following instructions in the Description (4.1.1 Diagram item11) section of this manual. For manual ranging, start at the highest range and work down.

3. Touch the test probe tips across the device under test.
4. Read the value and units shown on the display.



CAUTION: Never input a voltage over 250V AC/DC!

5. Maintenance

1. **Read** and **understand** all Safety Instructions and Operating Instructions before use this meter. Always keep the meter dry.
2. Never use a meter that has been damaged.
3. Check the power cord and test leads carefully before every use.
4. Never use a power cord or test leads that are damaged.
5. Clean the meter with a damp cloth only

6. Charging batteries.

This instrument is equipped with built-in rechargeable batteries. The fully charged batteries can keep the meter on for hours when the AC power is off.

The batteries will be in charge mode during the use of normal AC power.

If the "BATT" icon appears on the display, the batteries should be charged by the use of AC power.

Back panel **Master Power** switch must be turned on for batteries to charge.

Batteries should not be left in a discharged state for long periods of time.

Replacement of batteries should be left to qualified Technicians.

7. Changing Fuses.



1. Turn both power switches off (one at the front panel and one on the back panel), unplug the AC power cord from the socket on the back panel and unplug the test leads from the front panel jacks.
2. Unscrew the cap of one the fuse holders (Check one at a time), then pull out the fuse.
3. Check and replace the fuse as required.
4. Screw on the cap to hand tight only.
5. Repeat the step 7.2 to 7.4 above for the other two fuses.



CAUTION: Never replace the fuse(s) with a different rated type, otherwise this will cause damage to the meter and user.