

OPERATION MANUAL

3 1/2 DIGITAL MULTIMETER

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1. INTRODUCTION

This instrument is a compact, battery operated, handheld 3 1/2 digital multimeter designed for use by technicians, servicemen, students, and hobbyists who required an instrument that is accurate, reliable, and always ready for use. The Dual-slope -A/D Converter uses C-MOS technology for auto-zeroing, polarity selection and over-range indication. Full overload protection is provided. It is powered by a standard 9V transistor radio type battery.

Please read this manual that describes various useful message before using the multimeter.

2. SPECIFICATION

2.1 GENERAL CHARACTERISTICS

- 2.1.1 3 1/2 digit big LCD max. indication 1999.
- 2.1.2 Auto-Zero & Auto-Polarity.
- 2.1.3 Overrange: indication of "OL" or "-OL".
- 2.1.4 Low battery indication: "BAT".
- 2.1.5 Power supply: 9V Zinc-carbon battery.
- 2.1.6 Auto power off:
Approx. 30 minutes after power on, the meter automatically enter to power off mode. Push the "POWER" then push down it, power on again.
- 2.1.7 Safety standards:
The meter is up to the standards of IEC1010 Double Insulation, Pollution Degree 2, Overvoltage Category II.
- 2.1.8 Temperature for guaranteed accuracy:
 $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
- 2.1.9 Temperature range:
Operating: 0°C to 40°C .
Storage: -20°C to 60°C .
- 2.1.10 Humidity range:
Operating: max. 75%RH.
Storage: max. 80%RH.
- 2.1.11 Size: 194mm × 91mm × 44mm.

2.1.12 Weight: Approx. 320g (including battery).

2.1.13 Accessories:

operation manual	1 piece
test leads	1 pair
battery (6F22)	1 piece
temperature test probe	1 pair
packing box	1 piece

2.2 MEASUREMENT SPECIFICATION

Environment:

temperature:	$23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
relative humidity:	max. 75%

2.2.1 DC voltage

Range	Accuracy	Resolution
200mV	$\pm (0.5\% \text{ of reading} + 2\text{digits})$	100uV
2V		1mV
20V		10mV
200V		100mV
1000V	$\pm (0.8\% \text{ of reading} + 2\text{digits})$	1V

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Overload Protection: 500V DC/350Vrms AC
for range 200mV;
1000V DC/750Vrms AC
on other ranges.

Input impedance: 10M Ω on all ranges.

2.2.2 AC voltage (Average sensing. calibrated to rms of sine wave)

Range	Accuracy	Resolution
2V	$\pm (1.0\% \text{ of reading} + 3\text{digits})$	1mV
20V		10mV
200V		100mV
700V	$\pm (1.5\% \text{ of reading} + 3\text{digits})$	1V

Frequency: 2V ~ 200V at 50Hz ~ 500Hz;
700V at 50Hz ~ 100Hz.

Overload Protection: 1000V DC/750Vrms AC
on all ranges.

Input impedance: 1M Ω on 2V range;
10M Ω on other ranges.

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2.2.3 DC Current

Range	Accuracy	Resolution
2mA	$\pm (1.0\% \text{ of reading} + 2\text{digit})$	1uA
20mA		10uA
200mA	$\pm (1.5\% \text{ of reading} + 2\text{digits})$	100uA
10A	$\pm (2.0\% \text{ of reading} + 3\text{digits})$	10mA

Overload Protection: 0.8A/250V fuse,
10A/250V fuse.
10A up to 15 seconds.

2.2.4 AC Current (Average sensing. calibrated to rms of sine wave)

Range	Accuracy	Resolution
20mA	$\pm (1.5\% \text{ of reading} + 3\text{digits})$	10uA
200mA	$\pm (2.0\% \text{ of reading} + 3\text{digits})$	100uA
10A	$\pm (2.5\% \text{ of reading} + 5\text{digits})$	10mA

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Frequency: 20mA~200mA at 50~500Hz;
10A at 50~100Hz.
Overload Protection: 0.8A/250V fuse,
10A/250V fuse.
10A up to 15 seconds.

2. 2. 5 Resistance

Range	Accuracy	Resolution
200 Ω	$\pm (1.0\% \text{ of reading} + 3\text{digits})$	100m Ω
2K Ω	$\pm (0.8\% \text{ of reading} + 2\text{digits})$	1 Ω
20K Ω		10 Ω
200K Ω		100 Ω
2M Ω		1K Ω
20M Ω	$\pm (2.0\% \text{ of reading} + 3\text{digit})$	10K Ω

Overload Protection: 250V DC/250Vrms AC
for all ranges.

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2. 2. 8 Frequency (Auto-range)

Range	Accuracy	Resolution
2kHz	$\pm (1.0\% \text{ of reading} + 4\text{digits})$	1Hz
20kHz		10Hz
200kHz		100Hz
2000kHz		1kHz
20MHz		10kHz

Calibrated to the signal of square wave.

Sensitivity: 1.5V.

Overload protection: 250V DC/250Vrms AC.

2. 2. 9 Temperature (NiCr-NiSi probe)

Scale	Accuracy	Resolution
-20 $^{\circ}\text{C}$ ~ +800 $^{\circ}\text{C}$	$<150^{\circ}\text{C} \pm (3^{\circ}\text{C} + 1\text{digit})$ $>150^{\circ}\text{C} \pm (3.0\% \text{ of reading} + 1\text{digit})$	1 $^{\circ}\text{C}$

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2. 2. 6 Capacitance

Range	Accuracy	Resolution
2nF	$\pm (2.5\% \text{ of reading} + 10\text{digits})$	1pF
20nF	$\pm (2.5\% \text{ of reading} + 3\text{digits})$	10pF
2uF		1nF
200uF	$\pm (5.0\% \text{ of reading} + 5\text{digits})$	100nF

2. 2. 7 Inductance



Range	Accuracy	Resolution
20mH	$\pm (2.5\% \text{ of reading} + 3\text{digits})$	10uH
200mH		100uH
2H		1mH
20H		10mH

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2. 2. 10 Transistor hFE Test

Range	Description	Test Condition
hFE	Display read approx. hFE value (0~1000) of transistor under test (NPN and PNP Type).	Base Current approx. 10uA. Vce approx. 3V.

2. 2. 11 Diode test and Audible Continuity Test

Range	Description	Test Condition
	Display read approximately forward voltage of diode.	Forward DC current approx. 1.5mA. Reversed DC voltage approximately 3V.
	Built-in buzzer sounds if resistance is less than 50 Ω .	Open Circuit Voltage approx. 3V.

Overload protection: 250V DC/250Vrms AC.

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3. HOW TO USE THE MULTIMETER

PRELIMINARY NOTE

1. If the battery is weak. a "BAT" sign will appear on display. the battery should be replaced.
2. The mark or sign Δ next to the test lead jacks is for warning that the input voltage or current should not exceed the indicated values. this is to prevent damage to internal circuitry.
3. The FUNCTION switch should be set to the range to be used before operation.

3. 1 DC Voltage Measurement

- (1) Connect the BLACK test lead to the "COM" jack and the RED test lead to the "V Ω " jack.
- (2) Set the FUNCTION switch to "DCV" range to be used.
- (3) Connect the test leads across the source or load under measurement.

Note:

1. If the voltage range is not known beforehand. set the FUNCTION switch to high range and work down.
2. When "OL" is display, overrange is being

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voltage.

3. 3 DC Current Measurement

- (1) Connect the BLACK test lead to the "COM" jack and the RED test lead to the "mA" jack for a maximum of 200mA. for a maximum of 10A, move the RED test lead to "10A" jack.
- (2) Set the FUNCTION switch to "DCA" range to be used.
- (3) Connect the test leads in series with the load under measurement.

Note:

1. If the current range is not known beforehand. set the FUNCTION switch to high range and work down.
2. When "OL" is display, overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. The maximum input current is 200mA, 10A depending upon the jack used. Excessive current will blow the fuse which must be replaced. The fuse rating should be 200mA or 10A and no more to prevent damage to the internal circuitry.

3. 4 AC Current Measurement

indicated and the FUNCTION switch must be set to a higher range.

3. Don't apply more than DC 1000V to the input, indication is possible at higher voltage but there is danger of damaging the internal circuitry.
4. Use extreme caution to avoid contact with high tension circuits when measuring high voltage.

3. 2 AC Voltage Measurement

- (1) Connect the BLACK test lead to the "COM" jack and the RED test lead to the "V Ω " jack.
- (2) Set the FUNCTION switch to "ACV" range to be used.
- (3) Connect the test leads across the source or load under measurement.

Note:

1. See DC voltage measurement note 1~2.
2. Don't apply more than 700Vrms AC to the input, indication is possible at higher voltage but there is danger of damaging the internal circuitry.
3. Use extreme caution to avoid contact with high tension circuits when measuring high

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- (1) Connect the BLACK test lead to the "COM" jack and the RED test lead to the "mA" jack for a maximum of 200mA. for a maximum of 10A, move the RED test lead to "10A" jack.
- (2) Set the FUNCTION switch to "ACA" range to be used.
- (3) Connect the test leads in series with the load under measurement.

Note:

1. If the current range is not known beforehand. set the FUNCTION switch to high range and work down.
2. When "OL" is display, overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. The maximum input current is 200mA, 10A depending upon the jack used. Excessive current will blow the fuse which must be replaced. The fuse rating should be 200mA or 10A and no more to prevent damage to the internal circuitry.

3. 5 Resistance Measurement

- (1) Connect the BLACK test lead to the "COM" jack and the RED test lead to the "V Ω " jack.

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(2) Set the FUNCTION switch to "OHM" range to be used.

(3) Connect the test leads across the resistance under measurement.

Note:

1. If the resistance value being measured exceeds the maximum value of the range selected, an over-range indication will be displayed ("OL"). Select a higher range. For resistance of approximately 1 Megohm and above, the meter may take a few seconds to stabilize. This is normal for high resistance readings.

2. When the input is not connected, i. e. at open circuit, the sign "OL" will be displayed for the overrange condition.

3. When checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors are fully discharged.

3. 6 Capacitance Measurement

(1) Set the FUNCTION switch to "C" to be used and the "LC" to be pushed down.

(2) Insert the capacitor under measurement into

the two jacks "Cx" at the left on the front panel.

Note:

1. Capacitors should be discharged before being inserted into the test-jacks.

2. When testing large capacitance, note that there will be a certain time lag before the final indication.

3. Do not connect an external voltage or charged capacitor (especially larger capacitors) to measuring terminals.

3. 7 Inductance Measurement

(1) Set the FUNCTION switch to "L" to be used and the "LC" to be pushed down.

(2) Insert the inductor under measurement into the two jacks "Lx" at the left on the front panel.

3. 8 Frequency Measurement

(1) Connect the BLACK test lead to the "COM" jack and the RED test lead to the "VΩ" jack

(2) Set the FUNCTION switch to "Hz" range to be used.

(3) Connect the test leads to the point under measurement.

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3. 9 Temperature Measurement

(1) Connect the BLACK test lead of the sensor to "mA" jack, the RED test to "VΩ" jack.

(2) Set the FUNCTION switch to "TEMP".

(3) Put the sensor probe into the temperature field under measurement.

3. 10 Diode Measurement and audible continuity test

(1) Connect the BLACK test lead to "COM" jack and the RED test lead to the "VΩ" jack.

(2) Set the FUNCTION switch to the "▶-||)" range and connect the test leads across the diode under measurement, display shows the approx. forward voltage of this diode.

(3) Connect the test leads to two point of circuit, if the resistance is lower than approx. 50Ω, the buzzer sounds.

3. 11 Transistor hFE Test.

(1) Set the FUNCTION switch to the "hFE" range.

(2) Determine whether the transistor is NPN or PNP and locate the Emitter. Base and collector leads. Insert the leads into the proper holes in the socket on the front panel.

(3) The display will read the approximated hFE value at the test condition Base Current 10uA, Vce 3V.

4. MAINTENANCE

(1) The multimeter is a precision electronic device. Do not tamper with the circuitry. to avoid damage:

A: Never connect more than 1000V DC or 700Vrms AC.

B: Never connect a source of voltage under the condition of resistance measurement.

C: Never operate the meter unless the battery cover is in place and fully closed.

D: Battery and / or fuse replacement should be done after the test leads have been disconnected and POWER IS OFF.

(2) Turn off the power if the meter is not in use, removed the battery if the meter will be free for long period.

(3) If a sign of "BAT" appear on the display, open the battery compartment cover, remove the spent battery and replace it with a battery of the same type. fuse replacement follow the same steps.

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- (4) Contact with the maintenance service center of our company if you have trouble.

5. WARRANTY

Warranty this instrument to be free 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 charge 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 fuse. if the defect has been caused by a misuse or abnormal operating conditons the repair will be billed at a normal cost.