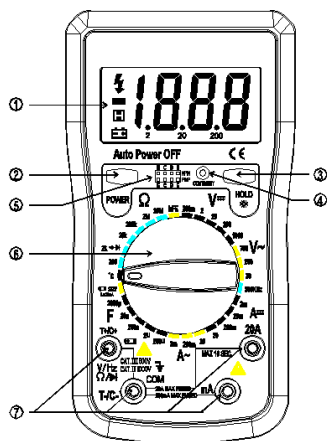


90D OPERATION MANUAL DIGITAL MULTIMETER

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. **Power supply current is zero when it auto power off.** please read this manual that describes various useful message before using the multimeter.

2. Panel Layout



- 1) LCD Display
- 2) POWER Key: Press the key to turn on, Press it button more than 2.5 seconds, the meter turn off.
- 3) HOLD/BACK LIGHT Key: Pressing this button, the meter enters the auto data hold mode and "H" is displayed on the LCD, at the same time BACK LIGHT is lighted up for Approx three minutes, push it again, cancel data hold mode
- 4) Continuity indicator lamp
- 5) hFE Input Jack
- 6) Rotary Switch: use this switch to select functions and ranges
- 7) V Ω Input Jack, 20A Input Jack, mA Input Jack, COM Input Jack

3. SPECIFICATION

3.1 GENERAL CHARACTERISTICS

- 3.1.1 3 1/2 digit big LCD max. Indication 1999;
- 3.1.2 Auto-Zero & Auto-Polarity;
- 3.1.3 Overrange: indication of "1" or "-1";
- 3.1.4 Low battery indication: "EOL";
- 3.1.5 Power supply: 9V Zinc-carbon battery.
- 3.1.6 Auto power-off: Aprox. 10 minites, Push POWER Key turn on;
- 3.1.7 Safety standards :The meter is up to the standards of IEC1010 Double Insulation, Pollution Degree 2, overvoltage Category III 600V;
- 3.1.8 Fuse :F-200mA/250V(Ø6x30mm), F-20A/250V (Ø6x30mm);
- 3.1.9 Temperature for guaranteed accuracy: 23°C ± 5°C;
- 3.1.10 Temperature range :
Operating :0°C to 40 °C Storage : -20°C to 60 °C;
- 3.1.11 Humidity range :
Operating : max 75%RH Storage: max 80%RH;
- 3.1.12 Size: 190mm × 88.5mm × 27.5mm;
- 3.1.13 Weight: Approx 320g (including battery).

3.2 MEASUREMENT SPECIFICATION

Environment :
Temperature : 23°C ± 5°C relative humidity : max .75%

3.2.1 DC voltage

Range	Accuracy	Resolution
200mV	±(0.5% of rdg + 8digits)	100 μ V
2V		1mV
20V		10mV
200V		100mV
1000V	±(1.5% of rdg + 8 digits)	1V

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

Input impedance : 10M Ω on all ranges

3.2.2 AC voltage (Average sensing, calibrated to rms) of sine wave)

Range	Accuracy	Resolution
20V	±(1.5% of rdg + 10 digits)	10mV
200V		100mV
750V	±(2.5% of rdg + 10 digits)	1V

Frequency: 40Hz~400Hz;

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

Input impedance : 10 M Ω

3.2.3 DC Current

Range	Accuracy	Resolution
2mA	±(0.8% of rdg + 8 digits)	1 μ A
20mA		10 μ A
200mA	±(1.2% of rdg + 8 digits)	100 μ A
20A	±(2.0% of rdg + 10 digits)	10mA

Overload Protection : 0.2A/250V fuse 20A/250V fuse 20A up to 10 seconds

3.2.4 AC current (Average sensing, Calibrated to rms of sine wave)

Range	Accuracy	Resolution
2mA	±(1.0% of rdg + 8 digits)	1 μ A
200mA	±(2.0% of rdg + 8 digits)	100 μ A
20A	±(3.0% of rdg + 15 digits)	10mA

Frequency : 40~400Hz

Overload protection : 0.2A /250V fuse ,20A/250V fuse 10A up to 10 seconds

3.2.5 Resistance

Range	Accuracy	Resolution
200 Ω	±(1.2% of rdg + 15 digits)	0.1 Ω
2k Ω		1 Ω
20k Ω	±(0.8% of rdg + 8 digits)	10 Ω
200k Ω		100 Ω
2M Ω	±(2.5% of rdg + 10 digits)	1k Ω
20M Ω	±(2.5% of rdg + 15 digits)	10k Ω

Overload protection :250V DC/250Vrms AC for all range.

3.2.6 Capacitance

Range	Accuracy	Resolution	
2000pF	±(2.5% of rdg + 25 digits)	1pF	
20nF		10pF	
200nF		100pF	
2 μ F		1nF	
200 μ F	0~100 μ F	±(2.5% of rdg + 25 digits)	100nF
	100~200 μ F		

Overload Protection :36V DC/36Vrms AC for all range

3.2.7 Frequency

Range	Accuracy	Resolution
200kHz	±(3.0% of rdg + 15 digits)	100Hz

Calibrated to the signal of square wave Sensitivity: 1.0V

Overload protection : 250V DC/250Vrms AC (up to 15 seconds)

3.2.8 Temperature

Scale	Accuracy	Resolution
-20~150 °C	±(3% of rdg + 2 digits)	1°C
150~300 °C		
300~1000 °C	±(3.5% of rdg + 10 digits)	

K TYPE NiCr-NiSi probe

3.2.9 Transistor hFE test

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

3.2.10 Diode test and Audible Continuity Test

Range	Description	Test Condition
➔	Display read approximately forward Voltage of diode .	Open circuit voltage approx 3V Short circuit approx 1.5mA
🔊	Built-in buzzer sounds if resistance is less than 80 Ω .	

Overload protection: 250V DC/250Vrms AC.



3.2.11 Battery Power Test

Range	Accuracy	Test Condition
L+	±(1.5% of rdg + 5 digits)	Loading Current: Approx. 25mA



Overload protection: DC/AC PEAK 15V

4. HOW TO USE THE MULTIMETER

PRELIMINARY NOTE:

1. If the battery is weak, a  sign will appear on display. The battery should be replaced.
2. The mark or sign  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.



4.1 DC Voltage Measurement

- (1) set the FUNCTION switch to " " range to be used
- (2) Connect the BLACK test lead to the "COM" jack and the RED test lead to the " " jack
- (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 "1" is display, overrange is being 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


4.2 AC Voltage Measurement

- (1) Set the FUNCTION switch to " " range to be used.
- (2) Connect the BLACK test lead to the "COM" jack and the RED test lead to the " " jack.
- (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 750Vrms 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 voltage.


4.3 DC current Measurement

- (1) Set the FUNCTION switch to " " range to be used
- (2) 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 20A, move the RED test lead to "20A" jack.
- (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 "1" is display, overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. The maximum input current is 200mA, 20A depending upon the jack used. Excessive current will blow the fuse which must be replaced. The fuse rating should be 200mA or 20A and no more to prevent damage to the internal circuitry.



4.4 AC Current Measurement

- (1) Set the FUNCTION switch to " " range to be used.
- (2) 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 20A, move the RED test lead to "20A" jack.
- (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 "1" is display, overrange is being indicated and the FUNCTION switch must be set to a higher range.
3. The maximum input current is 200mA, 20A depending upon the jack used. Excessive current will blow the fuse which must be replaced. The fuse rating should be 200mA or 20A and no more to prevent damage to the internal circuitry.


4.5 Resistance Measurement

- (1) Set the FUNCTION switch to " " range to be used
- (2) Connect the BLACK test lead to the "COM" jack and the RED test lead to the " " jack.
- (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 ("1"). 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 "1" will be displayed for the overrange condition.
- when checking in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors are fully discharged.


4.6 Capacitance Measurement

- (1) Set the FUNCTION switch to " " to be used and the "LC" button to be pushed down.
- (2) Insert the capacitor under measurement into the two jacks "LCx-" and "LCx+" 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.

4.7 Frequency Measurement

- (1) Set the FUNCTION switch to "200KHz" range to be used.
- (2) Connect the BLACK test lead to the "COM" jack and the RED test lead to the " " jack.
- (3) Connect the test leads to the point under measurement.



4.8 Temperature Measurement

- (1) Set the FUNCTION switch to " " " range
- (2) Connect the BLACK test lead of the sensor to "T-" jack, the RED test to "T+" jack.



Put the sensor probe into the temperature field under measurement.

- A. The temperature function shows the random number at ordinary times, must insert the thermocouple in temperature test hole while examining temperature. In order to guarantee the accuracy of the measurement, need to close Light switch while measuring temperature.
- B. This meter enclosure WRNM-010 type contact thermocouple limit temperature is 250 °C (300 °C shortly);
- C. Please don't change the thermocouple at will, otherwise we can't guarantee to measure accuracy;
- D. Please don't importing the voltage in the temperature function.
- E. Please use special probe for test high temperature.


4.9 Diode Measurement and audible continuity test

- (1) Set the FUNCTION switch to the " " range.
- (2) Connect the BLACK test lead to "COM" jack and the RED test lead to the " " jack..
- (3) connect the test leads across the diode under measurement, display shows the approx. forward voltage of this diode. Connect the test leads to two point of circuit, if the resistance is lower than approx. 80 Ω, the buzzer sounds.

4.10 Battery Power Test

- (1) Set the FUNCTION switch to the " " range
- (2) Connect the BLACK test lead to "COM" jack and the RED test lead to the " " jack.
- (3) Connect the BLACK test lead to the cathode of battery by testing and the RED test lead to the anode of battery by testing.
- (4) The LCD display Voltage of battery by testing with load

5. 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 750Vrms 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  appear on the display, open the compartment cover, remove the spent battery and replace it with a battery of the same type. fuse replacement follow the same the same steps.
- (4) Contact with the maintenance service center of our company if you have trouble.
- (5) Please take out the battery when not using for a long time.

6. Accessories

- [1] Test Leads: electric rating 1000V 10A
- [2] 'K' type Thermocouple
- [3] Operator's Manual



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