DIGITAL MULTIMETER

OPERATION MANUAL

1. Summary

This series product is a stable and battery-driven 3 1/2 digital multimeter with high reliability. It adopts LCD screen with character height of 28mm; with functions including unit sign/backlight and overload protection, it is easy to use.

This series of device can be used to measure DCV, ACV, DCA, ACA, resistance, capacitance, inductance, diode, triode, continuity, temperature and frequency, as well as hold peak value. As an instrument with excellent performance it adopts double integral A/D converter as its core.

2. For purchasers of this multimeter

1. Safety notice

This series of device is designed according to IEC1010 standard (safety standard issued by International Electrotechnical Committee). Please read these safety notices before using it.

1-1. Never input DC higher than 1000V or AC higher than 750V virtual voltage as measuring voltage；

1-2. The voltage lower than 36V is safe. Please confirm the earthing, connection and insulation of test leads to avoid electric shock when measuring the voltage of DC higher than 36V or AC higher than 25V；

1-3. Test lends should be away from test points when switching function or range；

1-4. Select correct function and range and beware of misoperation. You may still be careful to ensure the safety even the device has range protection functions.

1-5. Do not input current higher than 20A when measuring current；

1-6. Introduction for safety symbols：

"⚠" Dangerous voltage existing； "⏚" GND； "▣" Dual insulation； "⚠" Shall refer to the user's manual； "🔋" Low battery.

3. Unpacking inspection

Open the package to check if all parts and accessories are all right in the box

1. Multimeter   1
2. Battery (9V)   1
3. holster   1
4. Thermocouple(banana type) 1 pair
5. Testing accessory   1
6. Test leads (20A)   1 pair
7. User's manual   1

4. Features

1. General features

1-1. Displaying: LCD；

1-2. Max display: 1999 (3 1/2) digits automatic polarity display；

1-3. Measurement method: dual integral A/D conversion；

1-4. Sampling rate: approx 3 time per second；

1-5. Over-range display: the highest digit displays "OL" or "-OL"；

1-6. Low voltage display："🔋"；

1-7. Working environment: (0～40)℃, relative humidity: <80%；

1-8. Power supply: one 9V battery (6F22 or equivalent model)；

1-9. Dimension: 189mm×97mm×35mm (length×width×height)；

1-10. Weight: about 400g (including 9V battery)；

2. Technical features

2-1. Accuracy：±(a%×reading data + digit), ensuring the accuracy. Environment temperature：(23±5)℃, relative humidity <75%, and the calibration warranty period lasts for one year from the date of leaving the factory.

2-2. Performance (▲ indicates the function is available for this model)

Function	Model
DCV	▲
ACV	▲
DCA	▲
ACA	▲
Resistance Ω	▲
Diode/ Open circuit	▲
Triode hFE	▲
Capacitance C	▲
Temperature ℃	▲
Frequency f	▲
Inductance L	▲
Auto power off	▲
Backlight	▲
Peak value holding	▲

2-3. Technical index

2-3-1. DCV

Range	Accuracy	Resolution
200mV		100uV
2V	±(0.5%+3)	1mV
20V		10mV
200V		100mV
1000V	±(1.0%+5)	1V

Input impedance: All range is10MΩ;

Overload protection: 250V DC or AC peak value for range 200mV;
1000V DC or AC peak value for other range.

2-3-2. ACV

Range	Accuracy	Resolution
200mV	±(1.2%+3)	100uV
2V		1mV
20V	±(0.8%+5)	10mV
200V		100mV
750V	±(1.2%+5)	1V

Input impedance: All range is10MΩ;

Overload protection: 250V DC or AC peak value for range 200mV;
1000V DC or AC peak value for other range.

Frequency response:（40~400）Hz for range under 200V;
（40~100）Hz for range 750V;

Display: Sine wave rms (AVG value response).

2-3-3. DCA

Range	Accuracy	Resolution
2mA	±(0.8%+3)	1uA
20mA		10uA
200mA	±(1.2%+4)	100uA
20A	±(2.0%+5)	10mA

Max measurement voltage drop: 200mV;

Max input current: 20A (no more than 10 seconds);

Overload protection: 0.2A / 250V quick-action fuse for ranges under
20A, 12A / 250V quick-action fuse for range 20A

2-3-4. ACA.

Range	Accuracy	Resolution
2mA	±(1.0%+5)	1uA
20mA		10uA
200mA	±(2.0%+5)	100uA
20A	±(3.0%+10)	10mA

Max measurement voltage drop: 200mV;

Max input current: 20A (no more than 10 seconds);

Overload protection: 0.2A / 250V quick-action fuse for ranges under
20A, 12A / 250V quick-action fuse for range 20A.

Frequency response: 40~200Hz;

Display: Sine wave RMS (AVG value response).

2-3-5. Resistance (Ω)

Range	Accuracy	Resolution
200Ω	±(0.8%+5)	0.1Ω
2kΩ		1Ω
20kΩ		10Ω
200kΩ	±(0.8%+3)	100Ω
2MΩ		1kΩ
20MΩ	±(1.0%+15)	10kΩ
2000MΩ	±[5.0%(reading- 10)+ 20]	1MΩ

Open circuit voltage: lower than 3V;

Overload protection: 250V DC or AC peak value;

Note:

a) If in range 200Ω, please short the test leads and measure wine
resistance, And then subtract the resistance from the value measured.

b) It is normal to display 10MΩ when the test leads shorted in range
2000MΩ, it will not effect the accuracy and shall be subtracted
from the value measured. For example: The object resistance is
1000MΩ, the reading value is 1010MΩ, then the correct value
Shall be 1010-10＝1000MΩ.

c) Lagged display of value is normal when measuring resistance
higher than 1MΩ. Please wait until the display is stable.

2-3-6. Capacitance (C)

Range	Accuracy	Resolution
20nF		10pF
200nF		100pF
2uF	±(2.5%+20)	1nF
20uF		10nF
200uF	±(5.0%+5)	100nF

Testing frequency: 100Hz;

Overload protection: 36V DC or AC peak value;

2-3-7. Inductance (L)

Range	Accuracy	Resolution
2mH		1uH
20mH		10uH
200mH	±(2.5%+20)	100uH
2H		1mH
20H		10mH

Testing frequency: 100Hz;

Overload protection: 36V DC or AC peak value;

2-3-8. Temperature (T)

Range	Accuracy	Resolution
(-20 ~ 1000)℃	±(1.0%+4) ＜ 400℃ ±(1.5%+15) ≥ 400℃	1℃

Thermocouple (plug of banana type).

2-3-9. Frequency (f)

Range	Accuracy	Resolution
2kHz		1Hz
20kHz		10Hz
200kHz	±(1.0%+10)	100Hz
2000kHz		1kHz
10MHz		10kHz

Input sensitivity: higher than $3.5VV_{P-P}$;

Overload protection: 250V DC or AC peak value(less than 10 seconds);

2-3-10. Diode and continuity test

Range	Displaying	Test condition
▶︎⊢·ᵒ)))	Diode forward voltage drop (Unit: mV)	DC: approx 1mA, reverse voltage: about 3V.
	Buzzer sounds continuously, resistance between two test points is less than (70±20)Ω	open circuit voltage is approx. 3V

Overload protection: 250V DC or AC peak value;
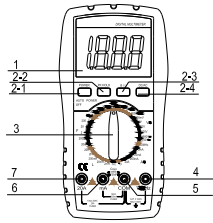
Warning: Do not input voltage in this range.

2-3-11 Transistor hFE data test

Range	Displaying	Test condition
hFE NPN or PNP	0 ~ 1000	base electrode current is approx 10uA, and Vce is approx 3V

5. Operation method
5-1. Operation panel introduction

1. LCD: display the measured value and the unit;
2. Function keys
2-1. Power switch: turn on off the power;
2-2. PK HOLD: Pressing this key is will hold the max value measured on LCD showing sign "PH"; press again, "PH" will disappear and exit the status of peak value holding.
2-3. B/L switch to enable backlight which will be turned off auto after about 5 seconds.
2-4. DC/AC: select DC/AC working mode.
3. Range knob: to select measurement function and range;
4. Jack for measurement of voltage, resistance and frequency;
5. GND ground: positive input for Capacitance (Cx), inductance (Lx), triode and temperature.
6. Positive jack for current lower th an 200mA; cathode input for capacitance (Cx), inductance (Lx), Transistor and temperature.
7. Jack for current 20A.
Please refer to the figure:

5-2. Voltage measurement
1. Insert the black test lead into the "COM" jack, and the red one into the "V/Ω/Hz" jack;
2. Turn the switch to position "V". If the level of voltage to be measured is unknown then select the highest range and then decrease the range step by step until getting the value with the highest resolution.
3. Make the key "DC/AC" pop up to enter into DC mode if measuring DCV; Press down the key "DC/AC" to set into ACV measuring.
4. The LCD will display the voltage measured if touch the testing point using the test leads; the point touched by the red test leads is in positive voltage if the value showed is positive.

Note:
   1. As showed, "OL" indicates the range is over and shall switch to a higher range.
   2. The voltage to be tested shall not over DC 1000V or AC 750V. the test leads shall be away from the testing point as switching functions or ranges.
   3. When measuring high voltage circuit, any parts of your body should not touch the high voltage circuit, otherwise it may hurt your body.

5-3. Current measurement
1. Insert the black test lead into the "COM" jack, and the red one into the "mA" or "20A" jack.
2. Turn the switch to position "A". If the level of current to be measured is unknown then select the highest range and then decrease the range step by step until getting the value with the highest resolution.
3. Popup the key "DC/AC" to enter into DC mode if measuring DC; press down the key "DC/AC" to set into AC mode.
4. The screen will show the value of current measured if connect in parallel the pencil to the circuit to be tested; the point touched by the red pencil is in positive voltage if the value showed is positive.

Note:
   1. As showed, "OL" indicates the range is over and shall switch to a higher range.
   2. The input in "mA" jack shall not over 200mA and "20A" not over 20A (less than 10 seconds of testing duration) as measuring current; the pencils shall be away from testing points as switching function or range.

5-4 Resistance measurement
1. Insert the black test leads into the "COM" jack, and the red one into the "V/Ω/Hz" jack;
2. Turn the range switch to resistance position, then connect the test leads at the two ends of the resistor.

Note:
   1. "OL" will be displayed on LCD if the resistance is over the range, then you shall increase the range by one step;
   2. When input is open circuit, it will display status of overload;
   3. When measuring resistance on line, ensure that all power of circuit tested are turn down and all capacitor are discharged completely;
   4. Never input voltage if in resistance measurement mode!
   5. It normal for resistance higher than 1MΩ that the reading data is not stable for the first several seconds;

5-5 Capacitance measurement
1. Switch to a proper range, and insert test leads into "mA" and "com" jack.
2. Connect the test leads in parallel to the two ends of the capacitor. Please pay attention to the polarity, as the "com" for positive and "mA" for negative.

Note:
   1. If capacitance exceeds the range selected, "OL" will be displayed on LCD, then you shall increase the range by one step.
   2. The LCD may show some remained digits upon the starting of capacitance measurement. It's normal and will not affect the testing result;
   3. If there is serious creepage or capacitor broken down in high capacitance range, the digits showed will be random and unstable.
   4. Please discharge capacitor completely to avoid device damage before measuring capacitance.

5-6. Inductance measurement
1. Switch to a proper range, and insert test leads into "mA" and "com" jack.
2. Connect the test lesds crossty to the two ends of inductor.

Note:
   1. If inductance exceeds the range selected, "OL" will be displayed on LCD, then you shall increase the range by one step.
   2. The inductance value measured for identical inductor may be different if there is different impendence;
   3. If in range 2mH, please short test leads and measure lead inductance, and then subtract the inductance from the value measured.
   4. Avoid measuring small inductor in high range, or the accuracy is not guaranteed.

5-7. Temperature measurement
Turn range switch to "℃", insert the cathode(black pin) of cold end (free end) of thermocouple into "mA" jack, anode (red pin) into "COM" jack, put the working end (temperature measuremen end) of thermocouple on the surface or inside the object to be tested. Then you can read temperature from the screen, and the data is in centigrade.

Note:
   1. As the input end is open, it will show environment temperature if the operation temperature is higher than 18℃, or normal temperature if lower than 18℃.
   2. Do not replace temperature sensor optionally, or the Accuracy is not guaranteed;
   3. Do not input voltage if in temperature mode.

5-8. Frequency measurement

1. Insert test leads or shield cable into "COM" and "V/Ω/Hz" jack;

2. Turn range switch to frequency position, and connect the test leads or shield cables crossly to the signal source or load tested.

Note:

　　1. It can be read work if the input is higher than 10V rms value, but the accuracy is not guaranteed;

　　2. In noise environment, you'd better use shield cable to measure small signal;

　　3. When measuring high voltage circuit, any parts of your body should not touch the high voltage circuit, otherwise it may hurt your body.

　　4. Never input voltage higher than 250V DC or AC peak value, otherwise it may damage your meter.

5-9. Transistor hFE

1. Turn the range switch to "hFE" position;

2. Insert test leads into "mA" and "com" jack. Please pay attention to the polarity, as the "com" for positive and "mA" for negative.

3. To determine the transistor`s type, NPN or PNP, insert the emitting, base and collector electrode into the corresponding jacks in testing accessory.

5-10. Diode and open circuit test

1. Insert the black test lead into "COM" jack, and the red one into the "V/Ω/Hz" jack (Notice: the red one is anode);

2. Turn the range switch to position "▸⊬•))" , connect test leads in parallel to the diode tested, with the red test lead to the anode and the black to cathode, then the reading value will be approximate forward voltage drop of the diode;

3. Connect pencils to two points of the circuit to be tested, if buzzer sounds, then the resistance between the two points is lower than (70±20)Ω.

5-11. Peak value holding

Press HOLD, the peak value of current data will be keep displaying on LCD; press itagain to cancel this function.

5-12. Auto power off

After about (20±10)minutes meter not being used, it will be powered off automatically and enter into dormant status, and press "POWER" again for two times to turn on power.

5-13. Backlight

Press "B/L" key to turn on backlight. After 5 seconds, the backlight will be turn down automatically.

Note:

　　When backlight is bright, working current becomes higher, and it will short the meter life of battery and the error for some other functions will increase.

6. Maintenance

This series of meter is a kind of precise instrument; please do not change the internal circuit by your self.

6-1. Pay attention to the waterproof, dustproof and breakproof of the meter;

6-2. Please do not store or use it in environment of hightemperature, high humidity, high flammability or strong magnetic.

6-3. Please wipe the meter with a damp cloth and soft detergent, and abrasive and drastic solvent such as alcohol are forbidden.

6-4. Please take out battery to prevent meter from being eroded by battery weeping if the meter will not be used for a long time;

6-4-1. Be care of the status of batteries. When "🔋" is displeayed on LCD , please replace batteries.

6-4-1-1. Remove the holster, screw out nut that fixing battery lid, and remove battery case;

6-4-1-2. Take off 9V batteries, replace with new one. It is recommended to use alkaline battery for a long-time operation; even any 9V battery is adoptable.

6-4-1-3. Close the battery case and tighten the screws.

6-4-1-4. Take on hotster.

6-4-2. Replacing fuse

　　Please replace fuse with another same one if necessary.

7. Trouble shooting

If your meter can not work normally, the methods bellow may help you to solve general problems. If these methods do not work, Please contact service center or dealer.

Conditions	Way to solve
No reading on LCD	■Turn on the power ■Set the HOLD key to a correct mode ■Replace battery
🔋 signal appears	■Replace battery
No current or temperature input	■Replace fuse
Big error Value	■Replace battery

● **The specifications are subject to change without notice.**

● **The content of this manual is regarded as correct, error or omits Pls. contact with factory.**

● **We hereby will not be responsible for the accident and damage caused by improper operation.**

● **The function stated for this User Manual cannot be the Reason of special usage.**

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