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Model AX-594

INSTRUCTION MANUAL



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1. General

The instrument is a high performance, high accuracy, 3 ¾ digit multi-meter, it uses the LCD with 33 mm high figure to make the Reading clear, the display simple and the operation convenient. The instrument can measure DC and AC voltage, DC and AC current, Resistance, Capacitance, Frequency, Duty Circle, Diode and Continuity test; and it also has the features of Bar Graph, Unit Indication, Data Hold, Relative Value Measurement (REL), USB Interface, AUTO/MANUAL range selection, Auto Power Off and Alarm Buzzer. The instrument adopts the directly driven 4 digits microprocessor and dual-integral A/D converter, which provide the high solution and high accuracy digital displaying driver. Because of its outstanding features, it is an excellent tool and most suitable for lab. Factory, maintenance and repair users.

2. Open-package Inspection

Open the gift box and take out the instrument, carefully check the following accessories. If any accessory was lost or damaged, please contact the manufactory at once.

Digital Multimeter:	1pc
Operation Manual:	1pc
Test Lead:	1set
Temperature Cable:	1pc
USB Cable:	1pc
Software disc:	1pc

3. Safety Note

The instrument meets the standard of IEC1010 (safety standard promulgated by the International Electrician Committee). Design and manufacture complied with the standard of Pollution Degree 2.



WARNING:

To avoid endangering the safety of the users, should read the operation manual carefully before operation, and strictly aide by the safety warning information and operation description to use the instrument.

1. Caution to avoid the electric shock when measuring the voltage higher than 30V, the current higher than 10mA, AC Power Lines with Inductive Load and the AC Power Lines during the period of Electric Power Fluctuation.
2. Before measuring, should check if the function knob is set in the correct range, make sure the test lead connects reliably, links up correctly, and insulates properly to avoid the electric shock.
3. It means the requirements of the safety standard only to use the instrument with the equipped test lead. If the test lead is broken, should replace it by the same type and same electric specification test lead.
4. Do not replace the inside fuse by the unconfirmed one. Only replace it by the same type and specification fuse. Before replacement, should keep the test lead off the tested point to make sure there is no any signal at the input terminal.
5. Do not replace the inside battery by the unconfirmed one. Only replace it by the same type and electric specification battery. Before replacement, should keep the test lead off the tested point to make sure there is no any signal at the input terminal.
6. When measuring electricity, do not connect the body with the ground directly, and do not touch the possible exposed metal terminal, output socked or lead clamp with ground potential. Usually use the dry cloth, rubber overshoes, rubber cushion and other insulated materials to keep the body isolated with the ground
7. Do not store and use the instrument in high humidity, high temperature, combustible, explosive and strong magnetic places.




8. It is possible to damage the instrument and endanger the safety of the users when measuring the voltage over the range limit. The allowed maximum voltage is printed on the front panel of the instrument, do not input the range limit specified to avoid the electric shock and instrument damage.

9. Do not measure any voltage when connecting the test lead with the current terminal to avoid damaging the instrument and endangering the safety of the users.

10. Do not try to calibrate or repair the instrument, should operate it by the specially trained or qualified professional people.

11. The function range selection knob should be set in the correct range when measuring.











When switching the function/range selection knob, keep the test lead off the tested object to make sure there is no any signal at the input terminal. Do not switch the function/range selection knob when measuring.

12. When LCD display , please replace the battery In time to make sure the measuring accuracy.

13. Do not allow to measure the voltage when connecting the test lead with the current terminal?

14. Do not try to modify the inner circuit at will to avoid damaging the instrument and endangering the safety of the users.

4. Safety Symbol Description

	Warning		DCA
	High Voltage! Dangerous!		ACA
	GND		DCA & ACA
	Dual Insulation		Meets the direction of European IEC
	Low Battery		Fuse

5. Front Panel Description

1. Instrument Model Numb

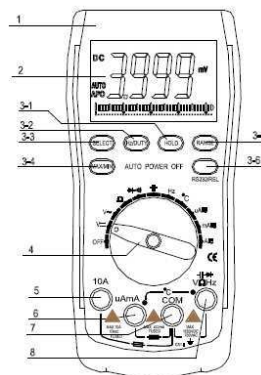
2. LCD Display

3. HOLD: Date Hold button, press the button, the value is held on LCD; Press the button again, exit the hold mode and get in the normal measuring status.

4. Hz/DUTY: Frequency/Duty Circle selection button, press the button to switch between the Frequency and Duty Circle mode at Frequency Range; Press the button to switch to Voltage or Current/Frequency/ Duty Circle mode at AC Voltage or AC Current Range.

5. SELECT: button switch, press the button to switch the measuring function.

6. MAX/MIN: Maximum, Minimum, press the button , the instrument gets into the MAX mode, the measuring maximum value will be held at this mode; Press the button again to get into the



MIM mode, the measuring minimum value will be held on LCD. Under this circumstance, there are no Bar Graph and Auto Power Off function, hold pressing MAX/MIN button for 2 seconds, exit the MAX/MIN mode.

7. RANGE: Auto Range/Manual Range switch, the default is set as Auto range mode when turning on, press the button and switch to Manual Range. At the Manual range mode, press the button once, the range is switched to the higher one, press the button again to switch the range to the lowest one when measuring the highest range, the cycle is in proper order from low to high. Keep pressing the button for 2 sec., return to Auto Range mode. There is no Auto Range mode at Frequency and Capacitance range.

8. REL: Relative Value Measurement, press the button to the mode of Relative Value Measurement, press again to cancel the Relative Value Measurement.

Keep pressing the button more than 2 seconds to switch to RS232, RS232 symbol appears on LCD, it indicates the instrument is getting into the status of data transmission. Keeping pressing the button more than 2 seconds, RS232 symbol disappears, the data transmission is stopped.

9. Function /range selection knob: select the measuring function and range.

10. 10A current input terminal: measuring AC/DC 10A positive input terminal, insert red test lead.


11. $\mu\text{A}/\text{mA}/^\circ\text{C}$ input terminal: measuring AC/DC $\mu\text{A}/\text{mA}$ and Temperature positive input terminal.

12. COM input terminal: negative input terminal, insert the black test lead.

13. $\text{V}\Omega\text{Hz}$ input terminal: measure Voltage, Frequency/Duty Circle, Resistance, Capacitance, Diode and Continuity positive input terminal, insert the red test lead.

6. Property

General Feature

Display:	LCD
Max Display:	3999 (3 $\frac{3}{4}$) counts automatic polarity display and unit display
Measuring method:	dual-integral A/D converter
Sampling range:	3 times/ second
Over range indication:	display "OL"
Low battery indication:	 appearance 1-7
Operation environment:	0-40 °C, relative humidity <80%
Storage environment:	-10-50 °C, relative humidity < 80 %
Power:	2 pcs 1.5V batteries (AAA 7# battery)
Dimension:	192mm x 95mm x 48mm
Weight:	Approx. 390g (including batteries)

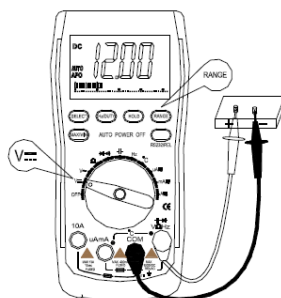
Technic Property

Accuracy: (a% x reading + digits) at $23 \pm 5^\circ\text{C}$, relative humidity < 75%

One year calibration guarantee since the time dispatched from the factory.

7. DC Voltage (DCV)

1. Turn the function/range selection knob to DCV
2. Insert the red and black test lead separately to $\text{V}\Omega\text{Hz}$ and COM input terminal.
3. The instrument was preset as the Auto Range mode of DCV measurement, displays "AUTO" symbol on LCD, press ":RANGE" button to switch to the Manual range mode.
4. Connect the test lead to the tested circuit in parallel, the polarity of the red test lead and the tested voltage value will be displayed on LCD simultaneously.



**Note:**

1. Do not measure the voltage higher than DC 1000V or AC 750V.
2. When measuring the high voltage, caution to avoid electric shock. Cut the connection between the test lead and tested circuit at once after measurement.
3. At the Manual Range mode, if “OL” is displayed on LCD, it indicates the tested voltage value has exceeded the present range limit, please select the higher range to complete the measurement.

Range	Accuracy	Resolution
400mV	$\pm(0.5\% + 4)$	0.1mV
4V		1mV
40V		10mV
400V		100mV
1000V	$\pm(1.0\% + 6)$	1V

Input impedance : >40M Ω at Range 400mV, 10M Ω at other range.

Overload protection: 1000V DC or 750V AC peak value.

1. Turn the function/range selection knob to ACV.
2. Insert the red and black test lead separately to V Ω Hz and VCOM input terminal, displayed as the right picture.
3. The instrument was preset as the Auto Range mode, displays “AUTO” symbol on LCD, press “RANGE” button to switch to the Manual Range mode. ACVmV only can be operated under “RANGR”. Press “Hz/DUTY” button to measure Frequency/Duty Circle at the Auto Range or Manual ACA model, but the frequency response is very low, at this time, it suits to measure the circuit of high voltage and low frequency under the circumstance of magnetic disturbance , such as 220V/50Hz-400Hz, 38V/50Hz-400Hz.
4. Connect the test lead to the tested circuit in parallel, the polarity of the red test lead and the tested voltage value will be displayed on LCD simultaneously.

**Note:**

1. Do not measure the voltage higher then DC 1000V or AC 750V.
2. When measuring the high voltage, caution to avoid electric shock. Cut the connection between the test lead and tested circuit at once after measurement.

8. AC Voltage (ACV)

Range	Accuracy	Resolution
400mV	$\pm(1.6\% + 8)$	0.1mV
4V	$\pm(0.8\% + 10)$	1mV
40V		10mV
400V		100mV
750V	$\pm(1.0\% + 10)$	1V

Input impedance: >40M Ω at Range 400mV, 10M Ω at other range. Overload protection: 1000V DC or 750V AC peak value.



Frequency response: 40-400Hz. Indication: average value response (RMS of sine wave). Duty Circle indicaton (0.1%-99.9%)

1. Insert the black test lead to “COM” input terminal and the red test lead to “uA mA” or “10A”, the max input current value is respectively 400mA and 10A, display as the right picture.

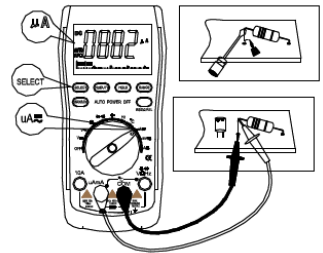
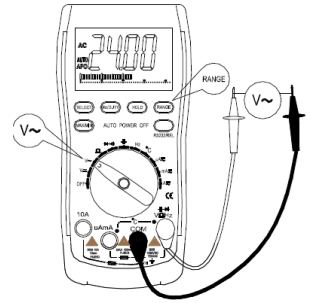
2. Turn the function/ range selection knob to current range, press “SELECT”, switch to DC measurement mode, then connect the test with the tested circuit in series, the polarity of the red test lead and the tested current value will be displayed on LCD simultaneously.

3. If “OL” is displayed on LCD, it indicates the tested current value has exceeded the present range limit, please select the higher range to complete the measurement.

a. Do not measure the current higher than 10A at Range 10A higher than 400uA at uA Range and higher than 400mA at mA Range, otherwise the fuse will be burnt out or the instrument will be damaged.

b. Do not connect the test lead to any circuit in parallel when the test lead is inserted in the current input terminal, otherwise it is possible to damage the instrument or endanger the safety of the users. Cut the connection between the test lead and tested circuit at once after measurement.

9. DC Current (DCA)



Range	Accuracy	Resolution
400μA	±(1.0% + 10)	0.1μA
4000μA		1μA
40mA		10μA
400mA		100μA
4A	±(1.2% + 10)	1mA
10A		10mA

Max input current: 10A (less than 15 seconds).

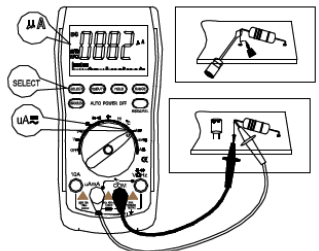
Overload protection: 0.5A/250V fuse,10A/250V fuse.

10. AC Current (ACA)

1. Insert the black test lead to “COM” input terminal and the red test lead to “uA mA” or “10A” input terminal, displayed as the right picture.

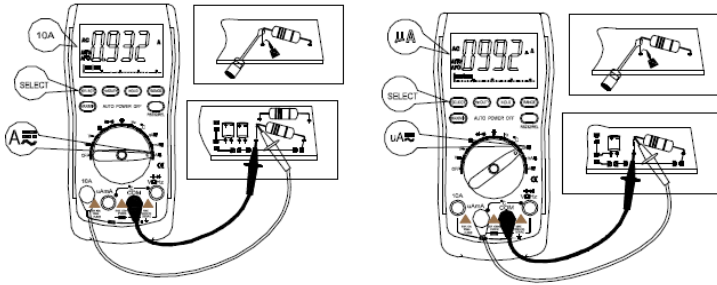
2. Turn the function/ range selection knob to current range, press “SELECT”, switch to AC measurement mode, than connect the test lead to the tested circuit in series, the polarity of the red test lead and the tested current value will be displayed on LCD simultaneously.

3. If “OL” is displayed on LCD, it indicates the tested current value has exceeded the present range limit, please select the higher range to complete the measurement.



⚠ Note:

- a. Do not measure the current higher than 10A At Range 10A and higher than 400mA At Ma Range.
- b. Do not connect the test lead to any circuit in parallel when the test lead is inserted in the current input terminal, otherwise it is possible to damage the instrument or endanger the safety of the users. Cut the connection between the test lead and tested circuit at once after measurement.



Range	Accuracy	Resolution
400μA	±(1.5% + 10)	0.1μA
4000μA		1μA
40mA		10μA
400mA		100μA
4A	±(2.0% + 15)	1mA
10A		10mA

Max input current: 10A (less than 15 seconds).
 Overload protection: 0.5A/250V fuse, 10A/250V fuse.
 Frequency response: 40-100Hz.
 Duty Circle Indication: (0.1%-99.9%)

11. Resistance (Ω)

1. Turn the function/range selection knob to Ω, insert the red and black test lead separately to V/Ω/Hz and COM input terminal.
2. Connect the test lead to the tested resistance in parallel, the tested resistance value will be displayed on LCD.
3. Auto Range mode is preset when turning on, press “RANGE” button to switch to Manual Range mode.
4. If “OL” is displayed on LCD, it indicates the tested resistance value has exceeded the present range limit, please select the higher range to complete the measurement.

⚠ Note:

- a. When measuring the In-circuit resistance, be sure all the Power of the tested circuit Has been turned off and all capacitors are fully discharged.
- b. It will cause the reading incorrect to input any voltage when measuring the resistance. If the voltage exceeds 250V, over-range protection voltage, it is possible to damage the instrument and endanger the safety of the users.




c. At Range 400Ω, short-circuit the test lead to measure the wire resistance, and then subtract it from the real measurement.

Range	Accuracy	Resolution
400Ω	$\pm(0.8\% + 5)$	0.1Ω
4kΩ	$\pm(0.8\% + 4)$	1Ω
40kΩ		10Ω
400kΩ		100Ω
4MΩ		1kΩ
40MΩ	$\pm(1.2\% + 10)$	10kΩ

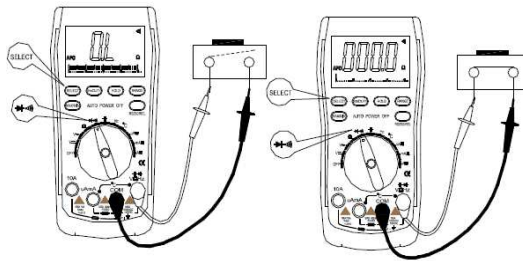
Open circuit voltage: 400mV.
Over range protection: 250V AC/DC peak value.


12. Diode and Continuity Test

1. Turn the function/ range selection knob to “” Range. Insert the red and black test lead separately to VΩHz and COM input terminal. Press “SELECT” button to choose the Buzzer and Diode measurement function, displayed as the right pictures.
2. Connect the RED test lead to the positive pole of the tested diode, BLACK test lead to the negative pole.
3. Read the present test result from LCD.

 **Note:**

- a. If the diode is open circuit or the polarity is connected counter, „OL” will be displayed on LCD.
- b. When measuring the in-circuit diode, make sure all the power of the tested circuit has been turned off and all capacitors are fully discharged.
- c. Cut the connection between the test lead and tested circuit at once after measurement.



Range	Display	Test Condition
	Diode Forward voltage drop	Forward AC Current: 1.0mA, Counter Voltage: 3.0V





Buzzer sound At less than 50Ω

Open Voltage: 0.5V

Overload protection: 250V DC/AC peak value.

Warning: Do not input the voltage at the range for safety.

13. Capacitance (C)

1. Turn the function/ range selection knob to Capacitance Range. Insert the red and black test lead separately to VΩHz and COM input terminal.
2. Connect the test lead to the tested capacitor in parallel, the tested capacitor value will be displayed on LCD.
3. If “OL” is displayed on LCD, it indicates the test capacitor value has exceeded the present range limit or the capacitor is short-circuit, please select the higher range to complete the measurement.
4. Read the present test result from LCD.



Note:

- a. When measuring the in-circuit capacitor, make sure all the power of the tested circuit has been turned off and all capacitors are fully discharged (Note: no Bar Graph display at this range)
- b. It requires longer testing time when measuring the large capacitor at once after measurement.

Range	Accuracy	Resoluton
40nF	$\pm(5.0\% + 30)$	10pF
400nF	$\pm(3.5\% + 8)$	100pF
4μF		1nF
40μF		10nF
200μF	$\pm(5.0\% + 10)$	100nF

Overload protection: 250V DC/AC peak value.

14. Frequency (Hz)

1. Turn the function/range selection knob to Hz Range. Insert the red and black test lead separately to VΩHz and COM input terminal.
2. Connect the test lead to the tested signal source in parallel. (Note: no Bar Graph display at this range)
3. When measuring Frequency, press “Hz/DUTY” button to get into the mode of Frequency measurement, and press “Hz/DUTY” button again to get into the mode of Duty Circlr measurement, and press the button third to return to the mode of AC current or voltage measurement.



Note:

- a. Do not input the signal more than 60V. Otherwise it is possible to damage the instrument and endanger the safety of the users
- b. Cut the connection between the test lead and tested circuit at once after measurement.

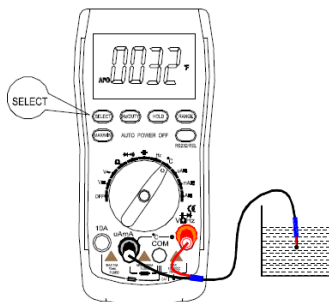
Range	Accuracy	Resolution
100Hz	$\pm(0.5\% + 4 \text{ cyfry})$	0.01Hz



1000Hz		0.1Hz
10kHz		1Hz
100kHz		10Hz
1MHz		100Hz
30MHz		1kHz

Input sensitivity: 1.0V

Overload protection: 250 V DC/AC peak value.



15. Temperature Test

1. Turn the function/range selection knob to Temperature range.
2. Insert the two ends of the temperature sensor into the “VΩHz” and “uA mA” input terminal, the positive end into the “VΩHz” input terminal.
3. Connect the sensor of the temperature cable to the surface or inside of the tested object, displayed as the right picture.
4. read the present test result from LCD
5. Press “SELECT” button to choose F temperature measurement mode, and press “SELECT” button again to choose C temperature measurement mode, circulated like this.



Note:

- a. Without the signal input, LCD automatically displays the normal temperature. Do not input any other signal, caution to avoid damaging the instrument or endangering the safety of the users.
- b. Do not replace the temperature sensor at will. Otherwise the accuracy can't be assured.
- c. Do not input the voltage at Temperature Range! Otherwise there is the danger to damage the instrument.

Zakres	Dokładność	Rozdzielczość
-20°C - 400°C	±(1.0% + 5)	1°C
400°C - 1000°C	±(1.5% + 15)	
0°F - 750°F	±(1.0% + 5)	1°F
750°F do 1832°F	±(1.5% + 5)	

Overload protection: 0.5A/250V



16. Other Functions and Instrument Maintenance

Other Function:

1. Data Hold

Press "HOLD" button, the present value is held on LCD; Press the button again exit the hold mode and get in the normal measuring status.


2. Auto Power Off.

Stop working for 15 seconds, the instrument will auto power off, and get into the sleeping mode. The buzzer inside will sound 5 times one minute before powering off, there is a long sound one minute later and the instrument gets into the sleeping mode. Press any key to restart the power.

3. Press "REL/RS232" button to get into the Relative Value Measurement mode, Keep holding "REL/RS232" button more than 2 seconds, RS232 symbol is displayed on LCD, it indicates it is the status of the instrument connecting with PC, then connect the instrument to PC by USB Cable, accessory of the instrument, and then, can transmit the measuring data to PC, it is convenient to record, analyze, process and print the measuring results, etc. Please refer the details to the description in the software.

Instrument maintenance:

This is a highly precise instrument, do not try to modify the inner circuit at will.

1. Keep the instrument dry, and keep it away from dust and shock.
2. Do not store and use the instrument in high humidity, high temperature, combustible, explosive and strong magnetic places.
3. Clean the surface of the instrument with the damp cloth and gentle detergent, do not use the strong solvent like the abrasive cleaner and alcohol, etc.
4. Take out the batteries if do not use the instrument for a long time to prevent the batteries from leaking the liquid to corrode the instrument.
5. When LCD displays "" symbol, should replace the batteries as the following steps:
 - a. Loose the screw that fixes the batteries and remove the battery case.
 - b. Remove the spent 1.5V batteries, and replace them by two same type new batteries. It is better to use alkaline batteries for lengthening the usage time.
 - c. Fit on the battery case and lock the screw tightly.
 - d. The steps of replacing the fuse are same as the above. When replacing the fuse, please use the same specification, same type of fuse.

Note:

1. Do not input the voltage more than 1000V DC/AC peak value.
2. Do not measure the voltage at the Current, Resistance, Diode and Buzzer range.
3. Do not use this battery before fixing the battery or tightening the bottom case.
4. Please remove the test lead from the tested point and turn the power off before replacing the battery or fuse.

The instruction manual is subject to change without notice.

The contents in the instruction manual are considered to be correct, if the users find any errors or premissions, etc., please contact the manufacturer.

The manufacturer hereby will not be responsible for any accident and damage caused by the improper operation.

The functions described in this instruction manual do not be the reason for special usage.

