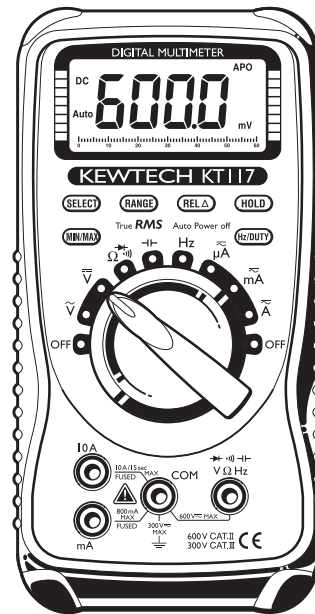


INSTRUCTION MANUAL

AUTO RANGE DIGITAL MULTIMETER

KEWTECH KT117



1. Safety Warnings

This instrument has been designed, manufactured and tested according to the following standards.

IEC 61010-1 Measurement CAT. III 300V Pollution degree 2



IEC 61010-031

IEC 61326


This instruction manual contains warnings and safety rules which must be observed by the user to ensure safe operation of the instrument and retain it in safe condition. Therefore, read through these operating instructions before using the instrument.

WARNING

- Read through and understand instructions contained in this manual before starting using the instrument.
- Save and keep the manual handy to enable quick reference whenever necessary.
- This instrument should only be used by suitably trained person and be sure to follow measurement procedures described in the manual. KEWTECH assumes no responsibility for damage and injury caused by misuse or not following instructions in the manual.
- Be sure to understand and follow all safety instructions contained in the manual.
Be sure to observe the above instructions.
Failure to follow the above instructions may cause injury, instrument damage and/or damage to equipment under test.

The symbol  indicated on the instrument means that the user must refer to related parts in the manual for safe operation of the instrument. Be sure to carefully read the instructions following each  symbol in the manual.

 **DANGER** is reserved for conditions and actions that are likely to cause serious or fatal injury.

 **WARNING** is reserved for conditions and actions that can cause serious or fatal injury.

 **CAUTION** is reserved for conditions and actions that can cause injury or instrument damage.

DANGER

- Never make measurement on the circuit in which electrical potential to ground over 300V AC/DC exists.
- Do not attempt to make measurement in the presence of flammable gasses. Otherwise, the use of the instrument may cause sparking, which can lead to an explosion.
- Be sure to keep your fingers behind the Finger barrier part of test lead.
- Never attempt to use the instrument if its surface or your hand is wet.
- Do not open the battery cover and the instrument case when making measurement.

WARNING

- Never attempt to make any measurement if any abnormal conditions are noted, such as broken case, cracked test leads and exposed metal parts.
- Do not turn the Function Selector Switch with test leads connected to the instrument.
- Do not install substitute parts or make any modification to the instrument.
- Do not try to replace the batteries if the surface of the instrument is wet.
- Make sure to disconnect test leads from the device under test when opening the Battery cover for battery replacement.

⚠ CAUTION

- Always make sure to check the Function Selector Switch is setting to the appropriate range before starting measurement.
- Do not expose the instrument to the direct sun, high temperature and humidity or dewfall.
- When the instrument will not be in use for a long period, place it in storage after removing the batteries.
- Use a cloth dipped in water or neutral detergent for cleaning the instrument. Do not use abrasives or solvents.
- Allowable measurement time at 10A range of current function is 15 seconds. If you carry on making measurement continuously over 15 seconds, it can cause instrument damage.

Please refer to following explanation of the symbols marked on the instrument or in the manual.

● Symbols

- ⏏ : Ground ~ : AC ≡ : DC
- ⎓ : AC and DC Ω : Resistance
- ⤴ : Diode ⦿ : Buzzer
- ⏏ : Capacitor Hz : Frequency
- ⏏ : Double or reinforced insulation

● Measurement category

- CAT. II : Primary electrical circuit of equipment with power cord for connection to outlet.
- CAT. III : Primary electrical circuit of the equipment, which is supplied power from a distribution board, and cable run from a distribution board to an outlet.

2. Features

This instrument, KT117, is a Digital Multimeter which designed for making measurement of the low-voltage equipment.



- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| (1) Designed to international safety standards
IEC 61010-1 Measurement CAT. III 300V Pollution degree 2
IEC 61010-031 (Requirements for the hand-held probe) | (6) Diode and Continuity check function |
| (2) Accurate true RMS readings of AC current and voltage regardless of the waveform. | (7) Auto-ranging function |
| (3) REL function to check the difference of measured values | (8) Frequency measurement function |
| (4) Auto power off function to save battery consumption | (9) DUTY measurement function
(Express Pulse width / Pulse period as a percentage) |
| (5) Data hold function | (10) Current function is protected by fuse |
| | (11) Instrument is protected from mechanical shock by holster |

3. Specification

- Measuring ranges and accuracy (23±5°C, under the 45%~75%RH)

Function	Ranges	Measuring range	Accuracy	Note
DCV	600.0mV	0~600V (5 Auto ranging)	±0.5%rdg±2dgt	Overload protection: 600V DC or AC rms Impedance: 10MΩ (Only 600.0mV range is approx 100MΩ)
	6.000V			
	60.00V			
	600.0V			
	600V		±0.8%rdg±3dgt	

A C V	6.000V	0~600V (4 Auto ranging)	$\pm 1.5\%rdg \pm 5dgt$ (50 / 60Hz)	Overload protection: 600V DC or AC rms Impedance: 10M Ω 0.1V or less is outside the accuracy Crest factor(CF): 3.0 or less	
	60.00V		$\pm 1.8\%rdg \pm 5dgt$ (40~400Hz)		
	600.0V		$\pm 1.2\%rdg \pm 3dgt$ (50 / 60Hz)		
	600V		$\pm 1.5\%rdg \pm 3dgt$ (40~400Hz)		
D C A	600.0 μ A	0~6000 μ A (2 Auto ranging)	$\pm 1.2\%rdg \pm 3dgt$	Overload protection: 0.8A/600V	
	6000 μ A				
	60.00mA				
	600.0mA	0~600mA (2 Auto ranging)			
	6.000A				
	10.00A		0~10A (2 Auto ranging)		$\pm 2.0\%rdg \pm 5dgt$
A C A	600.0 μ A	0~6000 μ A (2 Auto ranging)	$\pm 1.5\%rdg \pm 4dgt$ (50/60Hz) $\pm 2.0\%rdg \pm 4dgt$ (40~1kHz)	Overload protection: 0.8A/600V Crest factor(CF): 3.0 or less	
	6000 μ A				
	60.00mA				
	600.0mA	0~600mA (2 Auto ranging)			
	6.000A				
	10.00A		0~10A (2 Auto ranging)	$\pm 2.2\%rdg \pm 5dgt$ (50/60Hz) $\pm 2.5\%rdg \pm 5dgt$ (40~1kHz)	Overload protection: 10A/600V Crest factor(CF): 3.0 or less
Ω	Resistance	0~60M Ω (6 Auto ranging)	$\pm 1.0\%rdg \pm 2dgt$	Overload protection: 600V DC or AC rms.	
					600.0 Ω
					6.000k Ω
					60.00k Ω
					600.0k Ω
					6.000M Ω
60.00M Ω	$\pm 2.0\%rdg \pm 3dgt$				

Ranges	Description	Test condition	Note
 	Display read approximately forward voltage of diode	Forward DC current approx.0.4mA Reversed DC voltage approx.2.8V	It can not display bar graph on diode range
	Build-in buzzer sounds if resistance is less then 100 Ω	Open circuit voltage approx.0.5V	Overload protection: 600V DC or AC rms.

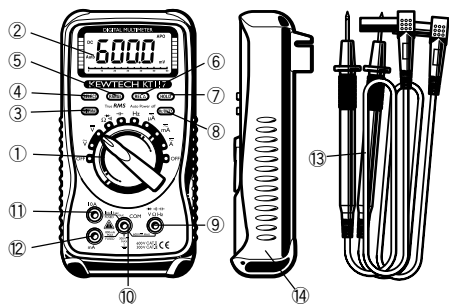
Function	Ranges	Measuring range	Accuracy	Note
Capacitance	40.00nF	0.01nF~4000 μ F (6 Auto ranging)	$\pm 3.0\%rdg \pm 10dgt$	It can not display bar graph on capacitance range
	400.0nF		$\pm 2.5\%rdg \pm 5dgt$	
	4.000 μ F			
	40.00 μ F		—	
	400.0 μ F			
	4000 μ F			
Frequency	10Hz	1Hz~10MHz (7 Auto ranging) Input which can be measured : Voltage : ~1MHz = more than 1.5V 1~10MHz = more than 2V	$\pm 0.1\%rdg \pm 5dgt$	It can not display bar graph on frequency range Overload protection: 600V DC or AC rms
	100Hz			
	1000Hz			
	10kHz			
	100kHz			
	1000kHz			
	10MHz			
	DUTY			

● Standards	IEC61010-1 Measurement CAT. III 300V, pollution degree 2 / Measurement CAT. II 600V, pollution degree 2 IEC61010-031 IEC61326
● Mode of operation	$\Delta \Sigma$ mode
● Indication	LCD maximum value 6000 (ACV/A, DCV/A, Ω) / maximum value 9999 (Hz) / maximum value 4000 (F), units, symbols
● Over range display	"OL" symbol is displayed on the LCD. "OL" displayed when exceeding the measuring ranges. (except for AC/DC 600V ranges and AC/DC 10A ranges.)
● Auto-ranging	Range shifts to upper range when indicated value is more than 6040. Range shifts to lower range when indicated value is less than 560.
● Sampling rate	approx. 400ms
● Operating Environmental conditions	— indoor use — altitude up to 2000m
● Temperature & Humidity range (guaranteed accuracy)	23°C \pm 5°C Relative humidity: less than 75%
● Operating Temperature & Humidity range	0°C \sim +40°C Relative humidity: less than 80%
● Storage Temperature & Humidity range	-20°C \sim +60°C Relative humidity: less than 90%
● Insulation Resistance	It should be more than 100M Ω /DC1000V between electrical circuit and enclosures.
● Withstand Voltage	It should be more than AC3700V/ for one minute between electrical circuit and enclosures.
● Overload Protection	Voltage function : 720V (RMS.) 10seconds Resistance function : 600V (RMS.) 10seconds Capacitance function : 600V (RMS.) 10seconds Frequency function : 600V (RMS.) 10seconds Current function : μ A, mA : Protected by 600V 0.8A fuse A : Protected by 600V 10A fuse
● Dimensions / Weight	approx. 161(L) x 82(W) x 50(D) mm / approx. 280g(including batteries, holster installation)
● Power source	Two R6P(AA)1.5V or equivalent
● Accessories	Test lead 1set / R6P (AA) 2p.c.s / Holster 1 / Instruction manual 1
● Fuse	F600V/800mA (fast acting type), ϕ 6.3 x 32mm / F600V/10A(fast acting type), ϕ 6.3 x 32mm

⚠ CAUTION

- The voltage shown above is the overload protection(overvoltage protection)for the instrument. Make sure not to exceed the value of voltage shown above.
- In locations subject to radio frequency interference, the product may malfunction and it will recover automatically after the test.

4. Instrument Layout




- | | |
|-------------------------------|----------------------------|
| ① Function Selector Switch | ② Display |
| ③ MIN/MAX Key | ④ SELECT Key |
| ⑤ RANGE Key | ⑥ REL Key |
| ⑦ HOLD Key | ⑧ Hz/DUTY Key |
| ⑨ Measuring terminal (V/Ω/Hz) | ⑩ Measuring terminal (COM) |
| ⑪ Measuring terminal (10A) | ⑫ Measuring terminal (mA) |
| ⑬ Test Leads | ⑭ Holster |

5. Preparation

5-1 Checking Battery Voltage

Set the Function Selector Switch to other positions except the OFF position.

Battery Voltage is enough if indication is clear and  symbol is not indicated in this bout.

If  symbol is indicated or no indication on the display, follow to the Battery.

Replacement procedures shown in section 9 in this document and replace with new batteries.

6. Measurements

6-1 Voltage Measurement (DCV, ACV)

DANGER

- To avoid the danger of getting electrical shock, never make measurement on a circuit over 600V AC/DC. (electrical potential to ground 300V AC/DC)
- Do not operate the Function Selector Switch during measurement.
- Do not make measurement when opening the battery cover and the instrument case.

6-1-1 DC Voltage Measurement (DCV)

(1) Insert the black test lead plug into the COM terminal and the red test lead plug into the VΩHz terminal.

(2) Set the Function Selector Switch to " \bar{V} " position. (Then, "DC", "Auto", and "mV" symbols are indicated on the display.)

(3) Connect the black test lead to the negative side of the circuit under the test and the red test lead to the positive side of the circuit, then the measured value is indicated on the display. If you connect the test leads the other way, "—" symbol is indicated on the display.

6-1-2 AC Voltage Measurement (ACV)

(1) Insert the black test lead plug into the COM terminal and the red test lead plug into the VΩHz terminal.

(2) Set the Function Selector Switch to " \tilde{V} " position.(Then, "AC", "Auto", and "V" symbols are indicated on the display.)

(3) Connect the test leads to the circuit under test.

Measured value is indicated on the display.

Note) When you make measurement of the voltage less than 0.1V at the AC6V range, the measurement value cannot be indicated correctly.

Even if short-circuit the input line at the range of AC6V, 1~3dgt may remain indicated.

In that case, by pressing "REL" Key, "0" will be indicated.

6-2 Current Measurement (DCA/ACA)

DANGER

- Do not apply voltage to the current measuring terminals.
- To avoid the danger of getting electrical shock, never make measurement on a circuit over 600V AC/DC. (electrical potential to ground 300V AC/DC)
- Do not operate the Function Selector Switch during measurement.
- Do not make measurement when opening the battery cover and the instrument case.

6-2-1 DC Current Measurement (up to 600mA)

(1) Insert the black test lead plug into the COM terminal and the red test lead plug into the mA terminal.

(2) Set the Function Selector Switch to the appropriate "uA" or "mA" position.

In case that the measurement current is 6000uA or less, set the Function Selector Switch to "uA" position, and it is 600.0mA or less, set the Function Selector Switch to "mA" position.(Then, "DC" , "Auto", and "uA" or "mA" symbols are indicated on the display.)

(3) Power off the circuit under test.

(4) Connect the black test lead to the negative side of the circuit under the test and the red test lead to the positive side of the circuit so the instrument is in the series with the circuit.

(5) Power on the circuit under test.

(6) Measured value is indicated on the display.

If you connect the test leads the other polarity, "-" symbol is indicated on the display.

6-2-2 DC Current Measurement (up to 10A)

CAUTION

- For safety sake, the measuring time on 10A range should be 15 seconds or less. Interval time between 2 measurements should be greater than 15 minutes. If you carry on making measurement continuously over 15 seconds, or make measurement in short interval time, it may cause error of measurement and instrument damage.

(1) Insert the black test lead plug into COM terminal and the red test lead plug into the 10A terminal.

(2) Set the Function Selector Switch to the "A" position.(Then, "DC" , "Auto", and "A" symbols are indicated on the display.)

(3) Power off the circuit under test.

(4) Connect the black test lead to the negative side of the circuit under the test and the red test lead to the positive side of the circuit so the instrument is in the series with the circuit.

(5) Power on the circuit under test.

(6) Measured value is indicated on the display.

If you connect the test leads the other polarity, "-" symbol is indicated on the display.

6-2-3 AC Current Measurement (up to 600mA)

(1) Insert the black test lead plug into the COM terminal the red test lead plug into the mA terminal.

(2) Set the Function Selector Switch to the appropriate "uA" or "mA" position.

In the case of the measurement current is 6000uA or less, set the Function Selector Switch to "uA" position, and it is 600.0mA or less, set the Function Selector Switch to "mA" position.(Then, "DC" , "Auto", and "uA" (or "mA") symbols are indicated on the display.)

(3) Set the instrument to AC mode by pressing "SELECT" Key.(Then, "AC" symbol is indicated on the display.)

(4) Power off the circuit under test.

- (5) Connect the test leads to the circuit under test so the instrument is in the series.
- (6) Power on the circuit under test.
- (7) Measured value is indicated on the display.

6-2-4 AC Current Measurement (up to 10A)

⚠ CAUTION

- For safety sake, the measuring time on 10A range should be 15 seconds or less. Interval time between 2 measurements should be greater than 15 minutes. If you carry on making measurement continuously over 15 seconds, or make measurement in short interval time, it may cause error of measurement and instrument damage.

- (1) Insert the black test lead plug into the COM terminal and the red test lead plug into the 10A terminal.
- (2) Set the Function Selector Switch to "A" position.(Then, "DC", "Auto", and "A" symbols are indicated on the display.)
- (3) Set the instrument to AC mode by pressing "SELECT" Key.(Then, "AC" symbol is indicated on the display.)
- (4) Power off the circuit under test.
- (5) Connect the test leads to the circuit under test so the instrument is in the series.
- (6) Power on the circuit under test.
- (7) Measured value is indicated on the display.

6-3 Resistance Measurement (Ω / Diode check/ Continuity Check)

⚠ DANGER

- To avoid the danger of getting electrical shock, never make measurement of the circuit in which electric potential exists.
- Do not make measurement when opening the battery cover and the instrument case.

6-3-1 Resistance Measurement

- (1) Insert the black test lead plug into the COM terminal and the red test lead plug into the V Ω Hz terminal.
- (2) Set the Function Selector Switch to " Ω " position.(Then, "Auto" and "M Ω " symbols are indicated on the display.)
Make sure that the "O.L" symbol is indicated on the display at this point, then short the test lead tips and check "0" is indicated on the display.
- (3) Connect the test leads to both ends of the resistance under test.
Measured value is indicated on the display.

Note) Even if short the test lead tips, indicated value may not be "0". But this is because of the resistance of test leads and not a failure. In that case, by pressing "REL" key, "0" will be indicated.

6-3-2 Diode Check

- (1) Insert the black test lead plug into the COM terminal and the red test lead plug into the V Ω Hz terminal.
- (2) Set the Function Selector Switch to " Ω " position.(Then, "Auto" and "M Ω " symbols are indicated on the display.)
- (3) Press the "SELECT" Key twice and set the instrument to Diode Check mode.
(Then, "▶" and "V" symbols are indicated on the display.)
Make sure that the ".OL" symbol is indicated on the display at this point, then short the test lead tips and check "0" is indicated on the display.
- (4) Connect the black test lead to the cathode side of the Diode and the red test lead to the anode side of the Diode.
Forward voltage of Diode is indicated on the display.
- (5) Connect the black test lead to the anode side of the Diode and the red test lead to the cathode side of the Diode.
Normally, ".OL" symbol is indicated on the display.

Conclusion : Diode is OK if the instrument complies with above items(4) and (5).

Note) Open-circuit voltage between measuring terminals is approx.2.8V.(measuring current approx. 0.4mA)

6-3-3 Continuity Check

- (1) Insert the red test lead plug into the V Ω Hz terminal and the black test lead plug into COM terminal.
- (2) Set the Function Selector Switch to " Ω " position.(Then, "Auto" and "M Ω " symbols are indicated on the display.)
- (3) Press the "SELECT" Key one time and set the instrument to Continuity Check mode.

(Then, "•) " and "Ω" symbols are indicated on the display.)

Make sure that the "OL." symbol is indicated on the display at this bout, then short the test lead tips and check "0" is indicated on the display and check if the buzzer beeps.

(4) Connect the test leads to both ends of the resistance under test.

Measured value is indicated on the display. The buzzer beeps below about 100Ω.

Note) Even if short the test lead tips, indicated value may not be "0". But this is because of the resistance of test leads and not a failure. In that case, by pressing "REL" key, "0" will be indicated.

6-4 Capacitance Measurement

DANGER

- To avoid the danger of getting electrical shock, never make measurement of the circuit in which electric potential exists.
- Do not make measurement when opening the battery cover and the instrument case.
- Make sure to discharge the capacitor before making measurement.

(1) Insert the black test lead plug into the COM terminal and the red test lead plug into the VΩHz terminal.

(2) Set the Function Selector Switch to "F" position.(Then, "Auto" and "nF" symbols are indicated on the display.)

(3) Press the "REL" key and "0" shall be indicated.(Then, "Δ" symbol is indicated on the display.)

(4) Connect the test leads to both ends of the Capacitance under test.

Measured value is indicated on the display.

Measuring unit "nF" / "uF" is automatically chosen and indicated due to the measured value.

Note) It may take some time according to the measuring capacitance.

Measuring capacitance < 4uF ----- Measuring time is about 2seconds

Measuring capacitance < 40uF ----- Measuring time is about 7seconds

Measuring capacitance < 100uF ----- Measuring time is about 15seconds

6-5 Frequency Measurement

DANGER

- To avoid the danger of getting electrical shocks, never make measurement on a circuit over 600V AC/DC. (electrical potential to ground 300V AC/DC)
- Do not operate the Function Selector Switch during measurement.
- Do not make measurement when opening the battery cover and the instrument case.

(1) Insert the black test lead plug into COM terminal and the red test lead plug into the VΩHz terminal.

(2) Set the Function Selector Switch to "Hz" position.(Then, "Auto" and "Hz" symbols are indicated on the display.)

(3) Connect the test leads to the circuit under test.

Measured value is indicated on the display.

Frequency can be measured at ACV and ACA functions by pressing "Hz/DUTY" key.

Concerning with the direction for use of "Hz/ DUTY" key, please reference to the section 7-6 Hz/DUTY in this document.

Note) The minimum input can be measured is approx. 1.5V.

To measure a frequency, measure the voltage on the electrical circuit in advance. Then press the "Hz/DUTY" key to enter into frequency measurement.

Readings of frequency may fluctuate or be influenced under noisy environment.

7. How to use Function Switches

7-1 SELECT Key

This key is to choose the measuring function at Ω / Diode Check/ Continuity/ function and Current function(μ A, mA, A). Actions at each function are as below.

- Ω / Diode Check/ Continuity function

When setting the instrument to " Ω / Diode Check/ Continuity" function, " Ω " measuring mode has been selected in the initial condition. By pressing "SELECT" Key, measuring mode changes.

" Ω " → "Continuity Check" → "Diode Check"

- Current function (μ A, mA, A)

When setting the instrument to any function of the " μ A", "mA", and "A", DC Current Measuring mode has been selected in the initial condition.

By pressing "SELECT" Key, measuring mode changes.

"DC" → "AC"

7-2 MIN/MAX Key

Press the "MIN/MAX" Key to lock MAX or MIN value, and the "MAX" or "MIN" sign will appear on the display, press it over 2 seconds to exit.

It cannot display bar graph on MAX/MIN HOLD mode.

7-3 RANGE Key

At each "ACV", "DCV", " Ω ", " μ A", "mA" and "A" function, setting for the measuring ranges can be done manually by pressing "RANGE" Key. ("Auto" symbol disappears from the display.)

Every time when pressing "RANGE" Key, range moves.

In order to change from manual mode to Auto-ranging, there are following 2ways.

- 1) Press "RANGE" Key for 2seconds
- 2) Change to the other functions.

7-4 REL Key

The difference between measured values can be indicated on the display at each "ACV", "DCV", " Ω ", "Capacitance", "ACA" and "DCA" function.

When pressing "REL" Key, " Δ " symbol lights up and the value under measuring is stored.

After that, the difference between stored value and measuring value is indicated on the display.

It can be released by pressing the "REL" Key again, changing to the other functions.

Note) Do not press "REL" Key over 2 seconds to cause the malfunction.

It can be released again by pressing "REL" Key over 2 seconds.

7-5 HOLD Key

The measured value can be hold at all functions.

By pressing "HOLD" Key, "DH" symbol indicated on the display and the indicated value can be held.

By pressing "HOLD" Key again, "DH" symbol disappears from the display and held data is released.

7-6 Hz/DUTY Key

Making measurement for frequency of input signal and DUTY(Pulse width / Pulse period).

(1) Change from normal measurement to "Frequency Measurement" and "DUTY Measurement".

Every time when pressing "Hz/DUTY" Key, it changes in the following sequence from normal measurement.

"Frequency" → "DUTY" → "Normal measurement"

(2) Change Frequency and DUTY at "Hz/DUTY" function.

By pressing "Hz/DUTY" Key, it changes in the sequence : "Frequency" → "DUTY".

8. Auto Power Off

Auto power off function operates when about 15minutes passed after power on this instrument.

When Auto power off function operates and the instrument powered off, the power-off statue returns to normal by pressing any key.

And it is possible to release the Auto power off function.

Turn the Function Selector Switch from OFF position to the function you want with pressing "SELECT" Key, and power on the instrument.

9. Battery & Fuse Replacement

DANGER

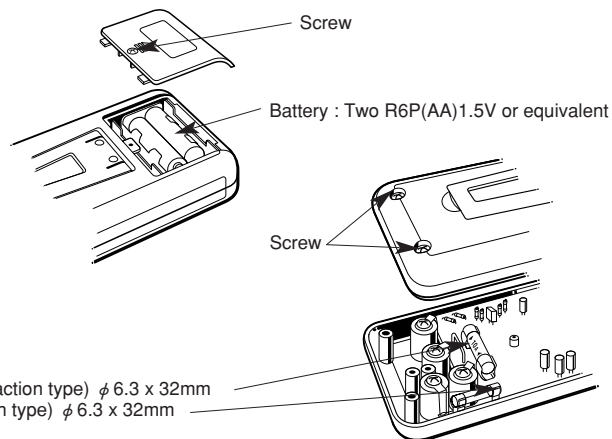
- Never open the battery cover and the instrument case when making measurement.
- To avoid getting electrical shock, be sure to remove test leads from the instrument when opening the battery cover in order to replace batteries and fuses.

9-1 Battery replacement

- (1) Remove test leads from the instrument.
- (2) Remove the holster from the instrument.
- (3) Loosen one screw on the bottom of the Instrument and open the battery cover then replace batteries.

9-2 Fuse replacement

- (1) Remove test leads from the instrument.
- (2) Remove the holster from the instrument.
- (3) Loosen two screws on the bottom of the instrument and open the battery cover, then replace fuses.



10. Maintenance

Use a cloth dipped in water or neutral detergent for cleaning the instrument. Do not use abrasives or solvents.

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