

kaise



DIGITAL MULTIMETER INSTRUCTION MANUAL

KU-2600

KAISE CORPORATION

FOR SAFETY MEASUREMENTS!!

To prevent an electrical shock hazard to the operator and/or damage to the instruments, read this instruction manual carefully before using the Digital Multimeter. WARNINGS with the symbol ⚠ on the Digital Multimeter and this instruction manual are highly important.

Important Symbols

- ⚠ The symbol listed in IEC 61010-1 and ISO 3864 means "Caution (refer to instruction manual)".
- ⚠ **WARNING** : The symbol in this manual advises the user of an electrical shock hazard that could result in serious injury or even death.
- ⚠ **CAUTION** : The symbol in this manual advises the user of an electrical shock hazard that could cause injury or material damages.

WARNING

KU-2600 is designed to comply with CAT II 600V. But, do not measure High Power Line of more than 3kVA power. High Power Line sometimes includes High Surge Voltage that could possibly induce dangerous arcs of explosive short in the instrument and could result in serious injury to the operator. Even if it is Low Power Line, use extreme care when measuring high voltage.

INTRODUCTION

Thank you for purchasing KAISE "MODEL KU-2600 DIGITAL MULTIMETER". To obtain the maximum performance of this instrument, read this Instruction Manual carefully, and take safe measurement.

1. UNPACKING AND INSPECTIONS

Inspect the instrument and accessories for transport damage. If any damage or missing items are found, ask your local dealer for replacement.

Confirm that the following items are contained in the package.

- Digital Multimeter and Test Leads
- Two 1.5V R6P Batteries (Installed and spare)
- Two Spare Fuses (0.5A/250V, 10A/250V)
- Holster
- Instruction Manual

2. SPECIFICATIONS

2-1. GENERAL SPECIFICATIONS

- DISPLAY (LCD)**
 - Numerical Display** : 4000 count LCD, 12mm high
 - Units and Symbols** : mV, V, Hz, %, Ω, kΩ, MΩ, nF, μF, \rightarrow , mA, A, RELΔ, \square , OL, AUTO, AC, DC, - and decimal point.
- OPERATING PRINCIPLE** : Σ/Δ conversion
- RANGE SELECTION** : Auto-Ranging / Range Hold
- SAMPLING RATE** : 2 times per second
- POLARITY** : Auto-Polarity ("—"symbol appears in minus)
- OVERRRANGE INDICATION** : "OL" symbol appears. (excluding DC/AC 600V)
- DIFFERENCE MEASUREMENT (Zero Adjustment)** : Press RELΔ Key to make Difference Measurement and Zero Adjustment.
- DISPLAY HOLD** : Press HOLD Key.
- BATTERY WARNING** : \square symbol appears when battery voltage goes down below approx. 2.4V.
- OPERATING TEMPERATURE & HUMIDITY** : 0°C to 40°C, less than 75% RH in non-condensing.
- STORAGE TEMPERATURE & HUMIDITY** : -20°C to 60°C less than 80% RH in non-condensing.
- POWER SUPPLY** : Two 1.5V R6p Batteries.
- POWER CONSUMPTION** : 4.5mW typically.

①

- BATTERY LIFE** : 150 hours continuous operation.
- AUTO POWER OFF** : Power turns off automatically in 15 minutes after any switch operation.
- DIELECTRIC STRENGTH** : 3.7kV rms for one minute between input Terminal and Cases.
- FUSES** : mA Function : Fast Active 0.5A/250V, 5 × 20mm
10A Function : Fast Active 10A/250V, 6 × 30mm
- OVERLOAD PROTECTION** :
 - V : 1000V DC or 750V AC rms max. for 1 minute. (400mV Range is 500V rms)
 - Ω / \rightarrow / \rightarrow / \rightarrow : 250V rms max. for 1 minute.
- DIMENSIONS & WEIGHT** : 155 × 75 × 29 mm, 180g
- SAFETY LEVEL** : IEC-61010-1, Overvoltage CAT. II 600V, CAT III 300V.
- ACCESSORY** : One Pair of Test Leads, Batteries (Installed), Carrying Case, Instruction Manual
- OPTIONAL ACCESSORY** : 940 Alligator Clips.

2-2. MEASUREMENT SPECIFICATIONS

(23°C±5°C, <80%RH in non-condensing)

1. DC Voltage (— V)

Range	Accuracy	Resolution	Input Impedance	Max Input Voltage
400.0mV	±0.5%rdg±4dgt	100 μV	≧100MΩ	600V DC
4.000 V		1mV		
40.00 V		10mV		
400.0 V	100mV			
600 V	±1.0%rdg±4dgt	1 V		

2. AC Voltage (~ V)

Range	Accuracy	Resolution	Input Impedance	Max Input Voltage
400.0 mV	±4.0%rdg±8dgt	0.1 mV	≧10MΩ	600V AC rms
4.000 V		1mV		
40.00 V		10mV		
400.0 V		100mV		
600 V	±1.5%rdg±5dgt	1 V		

Frequency Response : 50Hz~500Hz. 500Hz~1000Hz : ±3.5%rdg±5dgt.
*400.0mV Range : 5mV~400mV.

3. Frequency (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Max. Input Voltage
9.999Hz ~9.999MHz	±0.2%rdg ±1dgt	0.01Hz ~1.0kHz	1V RMS	250V AC rms

4. Duty Cycle (%)

Range	Accuracy	Resolution	Input Sensitivity	Max. Input Voltage
0.0% ~99.9%	±0.2%rdg±2dgt	0.1%	1V RMS	250V AC rms

Frequency Scope : 1Hz~1kHz

5. Resistance (Ω)

Range	Accuracy	Resolution	Open Circuit Voltage	Overload Protection
400.0 Ω	±1.0%rdg±3dgt	0.1 Ω	≧0.44V	250V DC/AC rms
4.000kΩ		1 Ω		
40.00kΩ		10 Ω		
400.0kΩ		100 Ω		
4.000MΩ		1 kΩ		
40.00MΩ	±1.8%rdg±3dgt	10 kΩ		

6. Diode Tests (\rightarrow)

Range	Accuracy	Test Current	Open Circuit Voltage	Overload Protection
4.000V	±5.0%rdg±3dgt	≦0.5mA	≦1.5V	250V DC/AC rms

7. Continuity Tests (•||)

Range	Buzzer Sound	Open Circuit Voltage	Response Time	Overload Protection
400.0Ω	less than 50Ω	≧0.44V	≧1m sec	250V DC/AC rms

8. Capacitance (\rightarrow)

Range	Accuracy	Resolution	Test Current
0.1nF~40nF	0.001nF~nF	±5.0%rdg±5dgt	≧1.2V
40nF~40 μF	nF~μF	±3.0%rdg±5dgt	
40 μF~200 μF	μF	±4.0%rdg±5dgt	

Overload Protection : 250V DC/AC rms

9. DC Current (— mA / — A)

Range	Accuracy	Resolution	Voltage Drop	Max. Input Voltage
40.00 mA	±2.0%rdg±4dgt	10 μA	200mV	400mA
400.0 mA		100 μA	max.2.0V	
10.00 A	±2.5%rdg±4dgt	10 mA	1.0V	

NOTE : 40.00mA, 400.0mA : 0.5A/250V Fuse Protected
10.00A : 10A/250V Fuse Protected

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10. AC Current (~ mA / ~ A)

Range	Accuracy	Resolution	Voltage Drop	Max. Input Voltage
40.00 mA	±2.5%rdg±5dgt	10 μA	200mV	400mA
400.0 mA		100 μA	max.2.0V	
10.00 A	±3.0%rdg±5dgt	10 mA	1.0V	

NOTE : 40.00mA, 400.0mA : 0.5A/250V Fuse Protected
10.00A : 10A/250V Fuse Protected

3. NAME ILLUSTRATION

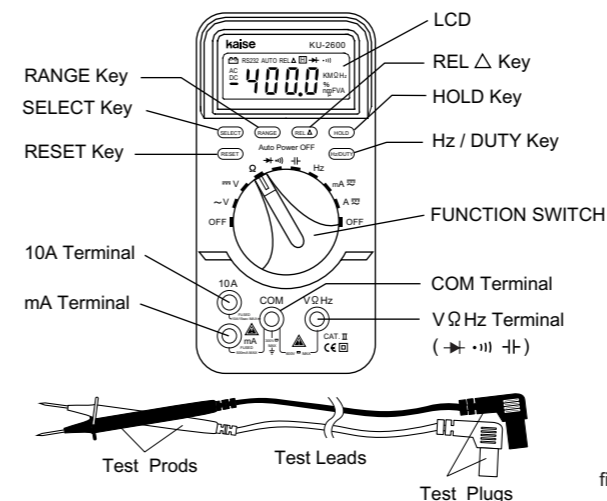
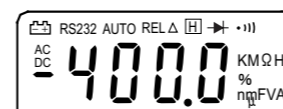


fig.1

1. LCD



- DC (—) : Direct Current
- AC (~) : Alternative Current (AC)
- : Minus Symbol when polarity is minus
- mV, V : Units of Voltage
- Hz : Unit of Frequency
- % : Unit of Duty Cycle
- Ω, kΩ, MΩ : Units of Resistance
- nF, μF : Units of Capacitance
- \rightarrow : Diode Tests
- || : Continuity Tests
- AUTO : Auto-ranging
- \square : Display Hold
- REL Δ : Difference Measurements
- \square : Battery Warning Symbol

2. FUNCTION Switch

Set FUNCTION Switch to desired position.

3. SELECT Key (\rightarrow / •||) or DC/AC selection)

Select \rightarrow or •||, and DC or AC.

4. RANGE Key

When making voltage, resistance or mA measurements, press RANGE Key to select Range Hold. AUTO symbol turns off from LCD. There are two ways in Range Hold.

- Just press RANGE Key several times to select a desired range watching the position of decimal point. The decimal point moves from the lowest range to the highest range and circulates with each press.
- When taking voltage, resistance or mA measurements, press RANGE Key. The range to which the input value belongs is held and AUTO symbol turns off. To cancel Range Hold, press RANGE Key for more than 1 second and AUTO symbol turns on.

To cancel Range Hold, press RANGE Key for more than 1 second and AUTO symbol turns on.

5. RELΔ Key

When measuring capacitance, press RELΔ Key to make zero adjustment. In the other functions, (~V, =V, Ω, mA, A) press this Key to make difference measurements.

To cancel this Key, press it again and RELΔ symbol disappears.

6. HOLD Key

Press HOLD Key while measuring, a measuring value is held on LCD with \square symbol shown.

To cancel this Key, press it again and \square symbol disappears on LCD.

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7. RESET Key

Press this Key to reset the operation of the function. This Key is used when operation is mistaken in the measurement.

8. Hz/Duty Key

Press this Key to select Hz or Duty on ~V, =V, Hz, mA and A positions.

4. SAFETY PRECAUTIONS

Correct knowledge of electric measurements is essential to avoid unexpected danger such as operator's injury or damage to the instrument. Read carefully and observe the following precautions for safety measurements.

4-1. WARNINGS

WARNING 1. Checks of Body and Test Lead

Before measurement, confirm the body of this instrument and handle insulators of the Test Leads have no cracks or any other damages. Dust, grease and moisture must be removed.

WARNING 2. Warning for High Power Line Measurements

High Power Line (High Energy Circuits) such as Distribution Transformers, Bus Bars and Large Motors are very dangerous. High Power Line sometimes includes High Surge Voltage that could cause explosive short in the instrument and could result in shock hazard. For voltage measurement of High Power Line, do not touch Clamp Meter, its Test Leads, and any part of the circuit.

WARNING 3. Warning for High Voltage Measurements

Even for Low Energy Circuits of electric/electronic appliances, such as heating elements, small motors, line cords and plugs, High Voltage Measurements are very dangerous. Do not touch Clamp Meter, Test Leads, and any part of the circuit. Generally, shock hazard could occur when the current between the circuit, that involves more than 33V rms or 46.7V DC or peak, and ground goes up to 0.5mA or more.

WARNING 4. Dangerous Voltage Measurement Procedure

For dangerous voltage measurement, strictly observe the following procedure.

- Before measurement, turn off the power of the circuit to be measured.
- Plug Black Test Lead into COM terminal and Red Test Lead into VΩHz terminal.
- Attach Black and Red Alligator clips (optional) to Test Lead pins.
- Set FUNCTION Switch to ~V or — V.
- Confirm the power of the circuit to be measured is turned off. Connect Black Alligator Clip to — (earth) side and Red Alligator Clip to + (positive) side. (Refer to fig.2)
- Place the Digital Multimeter away from your body not holding it in your hands. Take safety distance from power source or circuit not to touch the dangerous voltage.
- Turn on the power of the circuit. Read the measurement value on LCD.
- After measurement, turn off the power of the circuit and discharge the all capacitors.
- Disconnect Alligator Clips (with Test Leads) from the circuit.

In case of live-line measurement, observe the following procedure.

- Place the Digital Multimeter away from your body not holding it in your hands.
- Set FUNCTION Switch to ~V or — V.
- Attach Black Alligator Clip to Black Test Lead pin. Connect it to — (earth) side of the circuit to be measured.
- Take safety distance from power source or circuit not to touch the dangerous voltage.
- Hold Red Test Lead with one hand and connect it to + (positive) side. (Refer to fig. 3)
- Read the measurement value on LCD.
- After measurement, disconnect Red Test Lead and Black Alligator Clip from the circuit.

WARNING 5. Maximum Input Observance

Do not attempt to measure voltage that might exceed 600V AC or DC, the specified maximum input of this instrument.

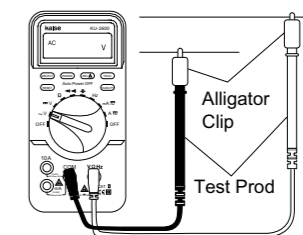


fig.2

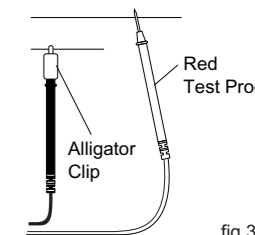


fig.3

WARNING 6. Correct Selection of FUNCTION Switch

When taking measurement, always confirm that FUNCTION Switch is set to correct position. Do not measure voltage on Ω, \rightarrow , •||, \rightarrow , mA and A positions.

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WARNING 7. Test Leads Disconnection

Prior to changing FUNCTION Switch to another position when measuring, or opening Rear Case for replacement of batteries or fuse, always disconnect Test Leads from the circuit being measured.

4-2. GENERAL WARNINGS AND CAUTIONS

WARNING 1. Do not let the children use the instrument or those people who are unable to recognize the dangers of electric measurements.

WARNING 2. Do not make electric measurements in a naked or barefooted state. This will give electric shock hazard to the operator.

WARNING 3. The points of Test Prods are sharp and dangerous. Do not get hurt with them.

CAUTION 1. Do not polish the meter case, or attempt to clean it with any cleaning fluid, gasoline, benzene, etc. If necessary, use silicon oil or antistatic fluid.

CAUTION 2. Avoid severe mechanical shock or vibration, extreme temperature or very strong magnetic field.

5. MEASUREMENT PROCEDURES

5-1. PREPARATION FOR USE

1. INSTRUCTION MANUAL

Prior to use, read INSTRUCTION MANUAL carefully and acquaint yourself with the specifications and functions of the instrument. Especially, read and observe strictly the 「4. SAFETY PRECAUTIONS」.

2. OVERLOAD INDICATION

If input value exceeds 4050 counts, the maximum value of the range being used, OL symbol appears on LCD. In case more than 600V AC or DC is measured in Auto-ranging or in Range Hold, OL symbol does not appear.

3. AUTO POWER OFF

After 15 minutes of last operation of FUNCTION Switch, or any other Keys, power turns off automatically (goes down in sleep condition with 0.01mW consumption) with LCD displayed off. This function prevents battery consumption when power off is forgotten.

4. SYMBOL MARK

The following symbols shown on instrument and in the instruction manual are listed in IEC 61010-1 and ISO 3864.

	Caution (refer to instruction manual.)		
	Direct Current (DC)		Alternating Current (AC)
	Earth (Ground)		Double Insulation

5-2. VOLTAGE, FREQUENCY, DUTY CYCLE (~V / ≐V / Hz / %) MEASUREMENTS

WARNING

Do not measure High Power Line of more than 3kVA power with this instrument. Maximum Input Voltage of Voltage Function is 600V. Do not measure voltages that might exceed 600V to avoid electrical shock hazard and/or damage to the instrument. Prior to use, read carefully 「4. SAFETY PRECAUTIONS」 of this instruction manual.

- Set FUNCTION Switch to ~V or ≐V position.

NOTE : Under this no input condition, random numerals may appear on LCD. This phenomena is caused by high internal resistance of the instrument and not the trouble.
- Connect Black Test Prod to - (earth) side and Red Test Prod of Probe Tester to + (High potential) side of the circuit to be measured.

NOTE : For safety measurements, connect Alligator Clips (optional) to Test Prods of Probe Tester.

NOTE : When taking voltage measurements, always connect the instrument **IN PARALLEL** with the circuit being measured.
- Reads the voltage on LCD.
- Hz and % :** When measuring ~V or ≐V, press Hz/DUTY Key once to measure Hz and press once again to measure % (Duty Cycle).
- RANGE Key, RELΔ Key, HOLD Key and RESET Key are available.
- After measurements, set FUNCTION Switch to OFF position.

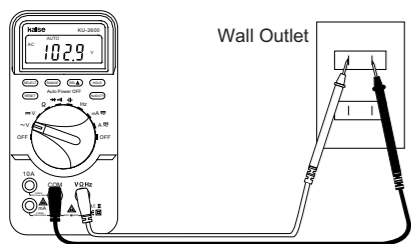


fig.4

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5-3. RESISTANCE (Ω) MEASUREMENTS

WARNING

Do not measure Voltage on Ω position. This will cause shock hazard to the operator and/or damage to the instrument. In case in-circuit resistance is measured, turn off power to the circuit being measured and discharge all capacitors in the circuit. Prior to measurements, read carefully 「4. SAFETY PRECAUTIONS」 of this instruction manual.

- Set FUNCTION Switch to Ω position.
- If the resistor to be measured is connected in a circuit, turn off power to the circuit and discharge all capacitors in the circuit.
- Open one side of the resistor to be measured and connect Test Prods to both sides of the resistor (or circuit).
- Read the resistance on LCD.
- RANGE Key, RELΔ Key, HOLD Key and RESET Key are available.
- When measurements are finished, remove Test Prods from the resistor (circuit) and set FUNCTION Switch to OFF position. Then restore the circuit as it was.

5-4. DIODE (→) TEST

WARNING

If the diode is connected in a circuit, turn off power to the circuit and discharge all capacitors in the circuit. Disconnect one side of the diode and test it. Do not measure Voltage on → position.

- Set FUNCTION Switch to → position. → symbol appears on LCD.
- If the diode is connected in a circuit, turn off power to the circuit and discharge all capacitors in the circuit and disconnect one side of diode from the circuit.
- Connect Black Test Prod to Anode and Red Test Prod to Cathode of the diode being measured. This is Reverse Connection. Confirm that the LCD displays OL symbol. Refer to the figure 5.
- Reverse Test Prod connection to the diode being tested. This is Forward Connection. Test results are good if the following voltage values are indicated on LCD.
 - Silicon diodes...0.4V to 0.7V
 - Germanium diodes...0.1V to 0.4V
- When measurements are finished, remove Test Prods from the diode and set FUNCTION Switch to OFF position.

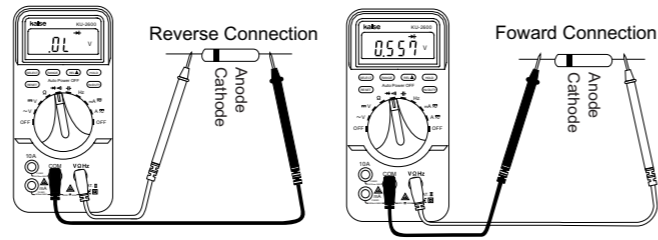


fig.5

5-5. CONTINUITY (•||) TEST

WARNING

Do not measure Voltage on •|| position. This will cause electrical shock hazard to the operator and/or damage to the instrument. In case continuity test is made, turn off power to the circuit being measured and discharge all capacitors in the circuit.

- Set FUNCTION Switch to •|| position.
- Press SELECT Key once to display •|| symbol on LCD.
- Turn off power to the circuit and discharge all capacitors in the circuit.
- Connect Test Prods of Probe Tester to the circuit to be tested. Buzzer sounds when the resistance value is less than approx. 50 Ω.
- When measurements are finished, remove Test Prods from the circuit and set FUNCTION Switch to OFF position.

5-6. CAPACITANCE (±) MEASUREMENTS

WARNING

Do not measure Voltage on ± position. That will cause electrical shock hazard to the operator and damage to the instrument. Before taking Capacitance measurements, remove power to the circuit being measured and discharge all capacitors.

- Set FUNCTION Switch to ± position.
- Auto -----nF symbol appears on LCD.
- Press RELΔ Key once to display 0±2digit on LCD in case it shows more digits.
- Remove power to the circuit being tested and discharge all capacitors in the circuit.
- Connect Test Prods to the capacitor being measured.
- Read capacitance on LCD.
- After measurements, set FUNCTION Switch to OFF position.

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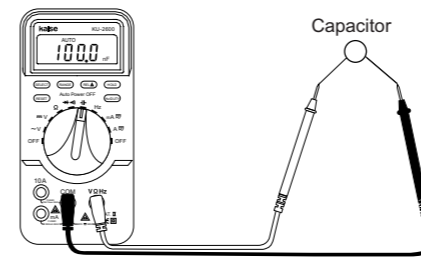


fig.6

NOTE : Measurement time takes longer to measure higher capacitance.

5-7. FREQUENCY (Hz) and DUTY CYCLE (%) MEASUREMENTS

WARNING

Do not measure voltage or current that might exceed the maximum allowable Voltage or Current of the function being used to avoid electrical shock hazard and/or damage to the instrument.

- Set FUNCTION Switch to Hz position.
 - Connect Test Prods to the circuit to be measured.
 - Read the measurement value on LCD.

NOTE : Connect the instrument **IN PARALLEL** with the measuring circuit.
 - Press Hz/DUTY Key for Duty Cycle measurement.
 - HOLD Key (Duty Cycle only) and RESET Key are available.
 - After measurement, set FUNCTION Switch to OFF.
- NOTE :** Frequency and Duty Cycle are also measurable by pressing Hz/DUTY Key during AC/DC Voltage.

5-8. CURRENT (mA ≐ / A ≐) MEASUREMENTS

WARNING

Maximum Input Current is 400mA ≐ on mA position and 10A within 15 seconds on A position. Do not measure the current that exceeds the maximum value of the function being used to avoid electrical shock hazard and/or damage to the instrument. Use extreme care to use appropriate Terminals.

- To measure 4000mA ≐ and less current, insert Black Test Plug into COM Terminal and Red Test Plug into mA Terminal. To measure 10A within 15 seconds and less current, insert Black Test Plug into COM Terminal and Red Test Plug into 10A Terminal.
- Set FUNCTION Switch to mA ≐ (max. 4000mA ≐) position or A ≐ (max. 10A position according to the current value to be measured).
- Press SELECT Key to select DC (≐) or AC (≐).
- Remove power to the circuit being measured and open the circuit in which current is to be measured.
- Connect Black Test Prod to the negative side of the circuit being measured and Red Test Prod to the positive side.

NOTE : When taking current measurements, always connect the instrument **IN SERIES** with the circuit being measured.

NOTE : Use Alligator Clips connected with Test Prods when desired.
- Turn on the power to the circuit being measured and read the current on LCD.
- Disconnect Test Prods of Test Leads from the circuit and reconnect the circuit that was being measured.
- SELECT Key, RANGE Key, RELΔ Key, HOLD Key, RESET Key and Hz/DUTY Key are available. RANGE Key does not work on A ≐ position as it consists of only one range.

6. MAINTENANCE

6-1. BATTERY REPLACEMENT

WARNING

To prevent electrical shock / hazard, turn the power off and disconnect Test Leads before removing Battery Case Cover.

- Unscrew Battery Case Cover.
- Remove the exhausted batteries and insert new 1.5V R6P (AA or any equivalent) batteries in correct polarity.
- Fix Battery Case Cover and tighten the screw.

* Installed battery is for inspection purpose and might be exhausted earlier than the new battery.

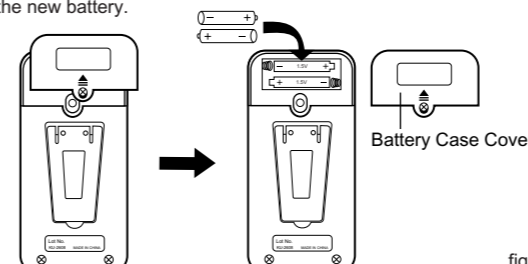


fig.7

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6-2. FUSE REPLACEMENT

- Two fuses are installed. 0.5A/250V fuse is for protecting mA function and 10A/250V fuse is for 10A function. If one of them is blown, the function concerned becomes null.
- Remove Rear Case unscrewing the 2 screws at the bottom.
- Take out the blown fuse from Fuse Holder and place a specified one in it.
 - Fuse for mA : Fast acting 0.5A/250V 5 × 20 mm
 - Fuse for 10A : Fast acting 10A/250V 6 × 30 mm

CAUTION : Always use fuses that have the same specifications as above.
- Replace Rear Case and screw the 2 screws.

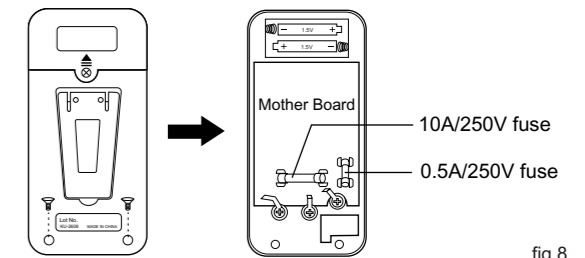


fig.8

6-3. PERIODICAL CHECK AND CALIBRATION

Periodical check and calibration is necessary to make safety measurements and to maintain the specified accuracy. The recommended check and calibration term is once a year and after the repair service. This service is available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer.

6-4. REPAIR

Repair service is available at KAISE AUTHORIZED SERVICE AGENCY through your local dealer. Pack the instrument securely with your name, address, telephone number and problem details, and ship prepaid to your local dealer.

Check the following items before asking repair service.

- Check the battery connection, polarity, and the rest capacity (exhausted or not).
- Confirm that FUNCTION Switch is set to the correct position.
- Confirm that the body of this instrument and handle insulators of the Test Leads have no cracks or any other damages.
- Check if any noise affects the instrument. This instrument is fully shielded against noise, but possibly to be affected by very strong noise.

WARRANTY

KU-2600 is warranted in its entirety against any defects of material or workmanship under normal use and service within a period of one year from the date of purchase of the original purchaser. Warranty service is available at **KAISE AUTHORIZED SERVICE AGENCY** through your local dealer. Their obligation under this warranty is limited to repairing or replacing KU-2600 returned intact or in warrantable defect with proof of purchase and transport charges prepaid. **KAISE AUTHORIZED DEALER** and the manufacturer, **KAISE CORPORATION**, shall not be liable for any consequential damages, loss or otherwise. The foregoing warranty is exclusive and in lieu of all other warranties including any warranty of merchantability, whether expressed or implied. This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside of **KAISE AUTHORIZED SERVICE AGENCY**, nor which have been subject to misuse, negligence, accident, incorrect repair by users, or any installation or use not in accordance with instructions provided by the manufacturer.

KAISE AUTHORIZED DEALER

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Product specifications and appearance are subject to change without notice due to continual improvements.

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