kaise

DIGITAL MULTIMETER

INSTRUCTION MANUAL

SK-6161/6163

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 instrument. **WARNING** with the symbol ⚠ on the instrument 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

Do not measure High Power Line (High Energy Circuits). High Power Line is very dangerous and sometimes includes High Surge Voltage that could cause explosive short in the instrument and could result in serious injury to the operator. This instrument is for Low Power Line measurement. Even in the Low Power Line, pay careful attention when measuring high voltage line.

INTRODUCTION

Thank you for purchasing KAISE **"SK-6161/6163 DIGITAL MULTIMETER"**. To obtain the maximum performance of this instrument, read this Instruction Manual carefully, and take safe measurement.

1. UNPACKING AND INSPECTIONS

Confirm if the following items are contained in the package in good condition. If there is any damage or missing items, ask your local dealer for replacement.

1. Digital Multimeter	1 pce.
2. Test Lead (100-57)	1 set
3. Carrying Case (1020)	1 pce.
4. Spare Batteries (1.5V R6P, AA)	2 pcs.
5. Spare Fuses (0.5A/250V, 15A/250V)	1 pce. each
6. Instruction Manual	1 pce.

2. SPECIFICATIONS

2-1. GENERAL SPECIFICATIONS

1. **DISPLAY (LCD)**
   a. **Numerical Display** : 4000 count, 20mm high
   b. **Units and Symbols** : AUTO, −, ⎓, ～, APO, DH, DIFF, Ω, kΩ, MΩ, Hz, %, nF, μF, mV, V, μA, mA, A, ⊟+, •))), ⊣◀ and decimal point
2. **OPERATING PRINCIPLE** : Σ Δ conversion
3. **RANGE SELECTION** : Auto/Manual
4. **POLARITY** : Auto polarity ("−" sign when minus)
5. **OVERLOAD INDICATION** : "OL" display when exceeding 4000 count (2V in diode test)
6. **BATTERY WARNING** : ⊟+ indication at approx. 2.4V or less
7. **OPERATING POWER SUPPLY VOLTAGE** : approx. 2.4V or more and 3.6V or less
8. **SAMPLING RATE** : 2.5 times/second (except for Frequency, Duty Cycle and Capacitance measurement)
9. **DISPLAY HOLD (SK-6163 only)** : Hold indicating values by DH Key
10. **DIFFERENCE MEASUREMENT (SK-6163 only)** : Measurable by pressing DIFF Key for 1 second or more
11. **DIELECTRIC STRENGTH** : AC 3kVrms for 1 minute between input terminals and cases
12. **OPERATING TEMPERATURE & HUMIDITY** : 0℃ to 40℃, less than 80%RH in non-condensing
13. **STORAGE TEMPERATURE & HUMIDITY** : -20℃ to 60℃, less than 70%RH in non-condensing
14. **TEMPERATURE COEFFICIENT** : Accuracy at 23℃±5℃×0.1/℃
15. **POWER SUPPLY** : 1.5V R6P (AA) batteries × 2
16. **POWER CONSUMPTION** : approx. 6mW typ (70mW max.), approx. 0.03mW in Auto Power Off
17. **CONTINUOUS OPERATING TIME** : 300 hours or more

18. **AUTO POWER OFF** : Power turns off automatically after approx. 12 minutes (cancelable)
19. **FUSE** : μA, mA function : 0.5A/250V, φ5×20mm
    20A function : 15A/250V, φ5×20mm
20. **DIMENSIONS & WEIGHT** : 160(H)×75(W)×34(D)mm, approx. 180g
21. **ACCESSORIES** : 100-57 Test Leads, 1020 Carrying Case, 1.5V R6P (AA) Batteries × 2, F14 Spare Fuse (0.5A/250V), F16 Spare Fuse (15A/250V), Instruction Manual
22. **OPTIONAL ACCESSORIES** : 660 AC/DC Clamp Adapter, 821 AC Clamp Adapter, 100-41 Test Lead Kit, 100-62 Test Lead Set, 940 Alligator Clip

2-2. MEASUREMENT SPECIFICATION

(23℃±5℃, <80%RH in non-condensing)

1. DC Voltage・Frequency・Duty Cycle (⎓V・Hz・%)

1-1. DC Voltage (⎓V)

Range	Accuracy	Resolution	Input Impedance	Maximum Input	Range Selection	Overload Protection
400.0mV	±0.5%rdg±2dgt	0.1mV	>100MΩ	1100V DC or AC peak	Auto/ Manual	1500V DC or AC peak
4.000V	±0.5%rdg±1dgt	1mV	≒11MΩ			
40.00V		10mV	≒10MΩ			
400.0V		100mV				
1000V		1V				

1-2. Frequency (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Maximum Input	Range Selection
5.00Hz to 49.99Hz	±0.2%rdg±2dgt	0.01Hz	5V rms	300V rms	Auto
50.0Hz to 499.9Hz		0.1Hz			
0.500kHz to 4.999kHz		1Hz			
5.00kHz to 20.00kHz		10Hz			

2-3. Duty Cycle (%)

Range	Accuracy (40Hz to 500Hz)	Resolution	Input Sensitivity	Maximum Input
10.0% to 90.0%	±2%rdg±2dgt	0.1%	5V square wave	300V rms

2. AC Voltage・Frequency・Duty Cycle (～V・Hz・%)

2-1. AC Voltage (～V)

Average Rectification

Range	Accuracy (40 to 500Hz)	Resolution	Input Impedance	Maximum Input	Range Selection	Overload Protection
4.000V	±1%rdg±5dgt	1mV	≒11MΩ	750V rms	Auto/ Manual	1500V DC or AC peak
40.00V		10mV				
400.0V		100mV	≒10MΩ			
750V		1V				

Accuracy at 300Hz to 500Hz in 4.000V range : ±1.5%rdg±5dgt

2-2. Frequency (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Maximum Input	Range Selection
5.00Hz to 49.99Hz	±0.2%rdg±2dgt	0.01Hz	5V rms	300V rms	Auto
50.0Hz to 499.9Hz		0.1Hz			
0.500kHz to 4.999kHz		1Hz			
5.00kHz to 20.00kHz		10Hz			

2-3. Duty Cycle (%)

Range	Accuracy (40Hz to 500Hz)	Resolution	Input Sensitivity	Maximum Input
10.0% to 90.0%	±2%rdg±2dgt	0.1%	5V square wave	300V rms

3. Resistance (Ω)

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage	Range Selection	Overload Protection
400.0Ω	±0.8%rdg±3dgt	0.1Ω	≦0.3mA	approx. 0.44V	Auto/ Manual	300V rms for 1 minute
4.000kΩ	±0.8%rdg±2dgt	1Ω	≦40μA			
40.00kΩ		10Ω	≦4μA			
400.0kΩ		100Ω	≦0.4μA			
4.000MΩ	±2%rdg±3dgt	1kΩ	≦40nA			
40.00MΩ	±3%rdg±3dgt	10kΩ				

4. Continuity Test (•))))

Range	Buzzer Sound	Response Time	Open Circuit Voltage	Overload Protection
400.0Ω	less than 60Ω	1ms	approx. 0.44V	300V rms for 1 minute

5. Diode Test (⊣◀)

Range	Accuracy	Test Current	Open Circuit Voltage	Overload Protection
1.000V	±5%rdg±3dgt	≦0.7mA	lower than 1.7V	300V rms for 1 minute

6. Capacitance (⊣⊢) ※SK-6163 only

Range	Accuracy	Resolution	Test Voltage	Range Selection	Overload Protection
50.00nF	±5.0%rdg±10dgt	10pF	≦1.7V	Auto	300V rms for 1 minute
500.0nF		0.1nF			
5.000μF		1nF			
50.00μF		10nF			
100.0μF		0.1μF			

7. 20A Range : DC/AC Current・Frequency (⎓A・～A・Hz)

7-1. DC/AC Current (⎓A / ～A)

AC : Average Rectification

Range	Accuracy (AC : 40 to 500Hz)	Resolution	Voltage Drop	Maximum Input	Range Selection	Overload Protection
4.000A	DC : ±1.5%rdg±2dgt AC : ±2%rdg±7dgt	1mA	30mV/A	4A	Auto/ Manual	15A/250V fuse
20.00A	0 to 10.00A DC : ±1.5%rdg±2dgt AC : ±2%rdg±7dgt	10mA		20A (30 seconds)		
	10.01 to 20.00A DC : ±2.5%rdg±4dgt AC : ±3%rdg±7dgt					

7-2. Frequency (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Maximum Input	Range Selection
5.00Hz to 49.99Hz	±0.2%rdg±2dgt	0.01Hz	0.5A or more	20A (30 seconds)	Auto
50.0Hz to 499.9Hz		0.1Hz			
0.500kHz to 1.000kHz		1Hz			

8. mA Range : DC/AC Current・Frequency (⎓mA・～mA・Hz)

8-1. DC/AC Current (⎓mA / ～mA)

AC : Average Rectification

Range	Accuracy (AC : 40 to 500Hz)	Resolution	Voltage Drop	Maximum Input	Range Selection	Overload Protection
40.00mA	DC : ±1%rdg±1dgt	0.01mA	2mV/mA	40mA	Auto/ Manual	0.5A/250V fuse
400.0mA	AC : ±1.5%rdg±5dgt	0.1mA		400mA		

8-2. Frequency (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Maximum Input	Range Selection
5.00Hz to 49.99Hz	±0.2%rdg±2dgt	0.01Hz	5mA or more	400mA	Auto
50.0Hz to 499.9Hz		0.1Hz			
0.500kHz to 1.000kHz		1Hz			

9. μA Range : DC/AC Current・Frequency (⎓μA・～μA・Hz)

※SK-6163 only

9-1. DC/AC Current (⎓μA / ～μA)

AC : Average Rectification

Range	Accuracy (AC : 40 to 500Hz)	Resolution	Voltage Drop	Maximum Input	Range Selection	Overload Protection
400.0μA	DC : ±1%rdg±1dgt	0.1μA	0.11mV/μA	400μA	Auto/ Manual	0.5A/250V fuse
4000μA	AC : ±1.5%rdg±5dgt	1μA		4000μA		

9-2. Frequency (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Maximum Input	Range Selection
5.00Hz to 49.99Hz	±0.2%rdg±2dgt	0.01Hz	50μA or more	4000μA	Auto
50.0Hz to 499.9Hz		0.1Hz			
0.500kHz to 1.000kHz		1Hz			

3. SAFETY PRECAUTIONS

3-1. WARNINGS

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.

⚠ WARNING 1. Checks of Body and Test Lead

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

⚠ WARNING 2. High Power Line Measurements is Prohibited

Do not measure High Power Line (High Energy Circuits) such as Distribution Transformers, Bus Bars and Large Motors. High Power Line sometimes includes High Surge Voltage that could cause explosive short in the instrument and could result in shock hazard. 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 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 any part of the circuit.

⚠ WARNING 4. Dangerous Voltage Measurement Procedure

For dangerous voltage measurement, strictly observe the warnings below. **See Fig-1**

- Do not hold the instrument in your hands.
- Keep safety distance from power source or circuit to be measured not to touch the dangerous voltage.
- Attach black and red alligator clips to test lead pins.
- Turn off the circuit to be measured when connecting the test leads.
- After finishing the measurement, turn off the circuit to be measured again and discharge the all capacitors. Then, detach alligator clips (test leads) from the circuit.

In case of live-line measurement, strictly observe the warnings below **See Fig-2**

- Do not hold the instrument in your hands.
- Keep safety distance from power source or circuit to be measured not to touch the dangerous voltage.
- Black test lead : Attach black alligator clip and connect to − (earth) side of the circuit.
- Red test lead : Connect to + (positive) side of the circuit.

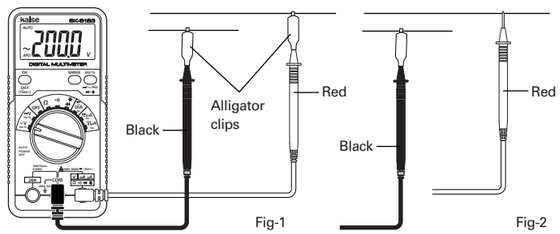

Fig-1

Fig-2

3-2. PREVENTION OF FAILURE

⚠ WARNING 1. Correct Selection of Function Switch

Always confirm that **FUNCTION** Switch is set to the correct position. Do not measure voltage except at Voltage measurement function.

⚠ WARNING 2. Maximum Input Observance

Do not measure anything that might exceed the specified maximum input values.

⚠ WARNING 3. Test Lead Detachment

Detach test leads from the measuring circuit when changing measurement functions or removing rear case for battery or fuse replacement.

3-3. GENERAL WARNINGS AND CAUTIONS

⚠ **WARNING 1.** Children and the persons who do not have enough knowledge about electric measurements must not use this instrument.
⚠ **WARNING 2.** Do not measure the electricity naked or barefooted to protect yourself from electrical shock hazard.
⚠ **WARNING 3.** Be careful not to get hurt with the sharp test lead pins.
⚠ **CAUTION 1.** Keep away the instrument from hot and humid conditions like in the car. Do not apply hard mechanical shock or vibration.
⚠ **CAUTION 2.** Do not polish the case or attempt to clean it with any cleaning fluid like gasoline or benzine. If necessary, use silicon oil or antistatic fluid.
⚠ **CAUTION 3.** Remove the batteries when the instrument is out of use for a long time. The exhausted battery might leak electrolyte and corrode the inside.

4. NAME ILLUSTRATION

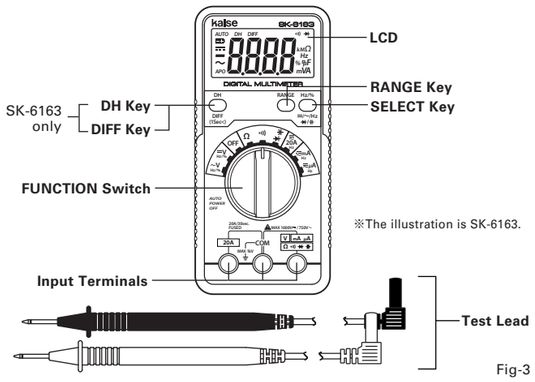

Fig-3

4-1. LCD

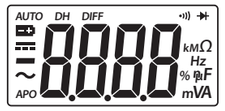

Fig-4

AUTO	: Auto-ranging	•)))	: Continuity test
⊟+	: Low battery warning	⊣◀	: Diode test
⎓	: Direct Current	**Ω, kΩ, MΩ**	: Resistance measurement
−	: Minus	**Hz**	: Frequency measurement
～	: Alternative Current	**%**	: Duty cycle measurement
APO	: Lights up in Auto Power Off mode	**nF, μF**	: Capacitance measurement (SK-6163 only)
DH	: Lights up in Display Hold function (SK-6163 only)	**mV, V**	: Voltage measurement
		μA, mA, A	: Current measurement (μA is SK-6163 only)
DIFF	: Lights up in Difference measurement (SK-6163 only)		

4-2. FUNCTION SWITCH

The switch to turn on the instrument and to select measurement functions. After finishing the measurement, turn it to **"OFF"**.

⚠ WARNING

- Always confirm that **FUNCTION Switch** is set to the correct position. Do not measure voltage except at Voltage measurement function.
- To prevent electric shock or damage of this unit, detach test leads from measuring circuit before changing measurement functions.

4-3. SELECT Key

Use this Key to select sub-measurement functions in the following measurement. Functions are changed as follows each time when the **SELECT Key** is pressed.

- Voltage measurement : ⎓V or ～V → Hz → % → ⎓V or ～V
- Current measurement (A / mA / μA) : ⎓A → ～A → Hz → ⎓A
- Diode test / Capacitance measurement (SK-6163 only) : ⊣◀ → ⊣⊢

4-4. RANGE Key

Manual-range measurement is possible by pressing this key during the auto-range measurement ("AUTO" disappears from LCD). To change the measurement range in manual-range, press **RANGE Key**. Check decimal point and select the suitable ranges.
To return to Auto-range : Press **RANGE Key** for 1 second or more. ("AUTO" lights up).
NOTE : **RANGE Key** is available for DC/AC Voltage, resistance and DC/AC current measurements.

4-5. DH Key : Display Hold ※SK-6163 only

Press this key to hold displayed value on LCD. (" DH " lights up).
To release it : Press **DH Key** again.

4-6. DIFF Key：Difference measurement

※shares with DH Key, SK-6163 only

Press **DIFF Key** for 1 second or more to start difference measurement (" DIFF " lights up). Measurement value displayed on LCD is converted into 0±1 digit, and the relative value is displayed.

To release it： Press **DIFF Key** for 1 second or more again. Difference measurement is finished and returns to the normal measurement mode.

4-7. Input terminals • Test lead

Insert black test lead to COM terminal and red test read to the other terminals.

NOTE： Insert RED test lead to 20A terminal when measuring in DC/AC 20A ranges.

5. MEASUREMENT PROCEDURES

5-1. PREPARATION FOR USE

1. INSTRUCTION MANUAL ⚠

Read INSTRUCTION MANUAL carefully to understand the specification and functions correctly. "**3. SAFETY PRECAUTIONS**" is very important for safety measurement.

2. BATTERY

Two 1.5V R6P (AA) batteries are installed in this instrument. When " " lights up on LCD, replace them into the new ones in reference to "**6-1. BATTERY AND FUSE REPLACEMENT**".

3. FUSE

0.5A/250V and 15A/250V fuses are installed to protect current measurement function. Replace them in reference to "**6-1. BATTERY AND FUSE REPLACEMENT**" when blown out.

4. OVERLOAD INDICATION

LCD displays "**OL**" when measurement value exceeds 4000 count (2V in Diode Test).

5. AUTO POWER OFF

Power turns off automatically after approx. 12 minutes of last operation.

NOTE： Small power consumption (approx. 0.03mW) remains even in the auto power off condition. Be sure to set **FUNCTION Switch** to "**OFF**" after finishing the measurement.

To cancel it： Turn on the instrument holding down **SELECT Key**. ("APO" disappears)

5-2. DC VOLTAGE • FREQUENCY • DUTY CYCLE MEASUREMENT (⎓V • Hz • %)

⚠ WARNING

- Do not measure High Power Line or high power circuit.
- Do not measure any voltage that might exceed maximum input value.
- Confirm the **FUNCTION Switch** is set to the correct position before measurement.
- Read "**3. SAFETY PRECAUTIONS**" carefully to avoid electric shock hazard and serious damage to the instrument.

1. Insert black test lead to COM terminal, and insert red test lead to V terminal.
2. Set **FUNCTION Switch** to " ⎓V Hz/% ".
   NOTE： LCD display might be drifting at this time due to the high input impedance of this instrument, but does not affect the measurement.
3. Connect black test lead to − (earth) side of the circuit being measured and connect red test lead to + (positive) side.
   NOTE： Connect the instrument **IN PARALLEL** to the circuit.
   NOTE： Use alligator clips (option) for dangerous voltage measurement.
4. Read the measurement value on LCD.
5. After finishing the measurement, set **FUNCTION Switch** to "**OFF**".

FREQUENCY MEASUREMENT (Hz)：

Frequency (Hz) can be measured by pressing **SELECT Key** during DC voltage measurement.

DUTY CYCLE MEASUREMENT (%)：

Duty cycle (%) can be measured by pressing **SELECT Key** during frequency measurement. Press **SELECT Key** again to return to DC voltage measurement.

AVAILABLE FUNCTIONS：

Range hold, Display hold (SK-6163 only), Difference measurement (SK-6163 only)

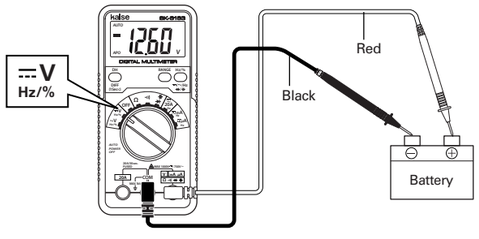

Fig-5

5-3. AC VOLTAGE • FREQUENCY • DUTY CYCLE MEASUREMENT (∼V • Hz • %)

⚠ WARNING

- Do not measure High Power Line or high power circuit.
- Do not measure any voltage that might exceed maximum input value.
- Confirm the **FUNCTION Switch** is set to the correct position before measurement.
- Read "**3. SAFETY PRECAUTIONS**" carefully to avoid electric shock hazard and serious damage to the instrument.

1. Insert black test lead to COM terminal, and insert red test lead to V terminal.
2. Set **FUNCTION Switch** to " ∼V Hz/% ".
   NOTE： LCD display might be drifting at this time due to the high input impedance of this instrument, but does not affect the measurement.
3. Connect black test lead to − (earth) side of the circuit being measured and connect red test lead to + (positive) side.
   NOTE： Connect the instrument **IN PARALLEL** to the circuit.
4. Read the measurement value on LCD.
5. After finishing the measurement, set **FUNCTION Switch** to "**OFF**".

FREQUENCY MEASUREMENT (Hz)：

Frequency (Hz) can be measured by pressing **SELECT Key** during AC voltage measurement.

DUTY CYCLE MEASUREMENT (%)：

Duty cycle (%) can be measured by pressing **SELECT Key** during frequency measurement. Press **SELECT Key** again to return to AC voltage measurement.

AVAILABLE FUNCTIONS：

Range hold, Display hold (SK-6163 only), Difference measurement (SK-6163 only)

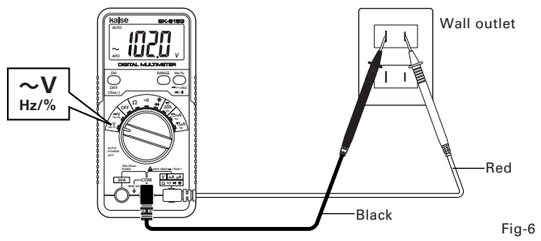

Fig-6

5-4. RESISTANCE MEASUREMENT (Ω)

⚠ WARNING

- Confirm the **FUNCTION Switch** is set to the correct position.
- Do not measure voltage in Ω position. This will cause electrical shock hazard to the operator and/or serious damage to the instrument.
- In case in-circuit resistance is measured, turn off the power to the circuit being measured and discharge the all capacitors.
- Read "**3. SAFETY PRECAUTIONS**" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to Ω terminal.
2. Set **FUNCTION Switch** to " Ω ".
3. If the resistor to be measured is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Then, disconnect one side of the resistor.
4. Connect test leads to the resistor (or circuit) to be measured.
5. Read the measurement value on LCD.
6. After finishing the measurement, set **FUNCTION Switch** to "**OFF**".

AVAILABLE FUNCTIONS：

Range hold, Display hold (SK-6163 only), Difference measurement (SK-6163 only)

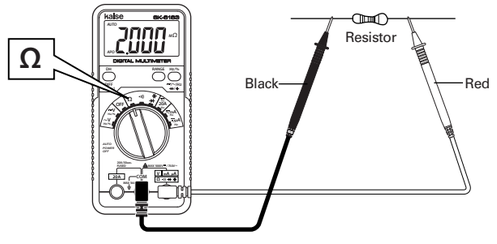

Fig-7

5-5. CONTINUITY TEST (•)))

⚠ WARNING

- Confirm the **FUNCTION Switch** is set to the correct position.
- Do not measure voltage in •)) position. This will cause electrical shock hazard to the operator and/or serious damage to the instrument.
- When measuring in-circuit continuity, turn off the power to the circuit to be measured and discharge the all capacitors.
- Read "**3. SAFETY PRECAUTIONS**" carefully before measurement.

1. Insert black test lead to COM Terminal and insert red test lead to •)) terminal.
2. Set **FUNCTION Switch** to " •)) ".
3. If testing continuity in a circuit, turn off the power to the circuit and discharge the all capacitors.
4. Connect test lead to both side of the circuit to be measured. Buzzer sounds when the circuit resistance is approx. 60Ω or lower.
5. After finishing the measurement, set **FUNCTION Switch** to "**OFF**".

5-6. DIODE TEST (⊣◀)

⚠ WARNING

- Confirm the **FUNCTION Switch** is set to the correct position.
- Do not measure voltage in ⊣◀ (SK-6161) / ⊣◀⊢ (SK-6163) position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- If the diode is connected in a circuit, turn off the power to the circuit and discharge the all capacitors.
- Read "**3. SAFETY PRECAUTIONS**" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to ⊣◀ terminal.
2. Set **FUNCTION Switch** to " ⊣◀ " (SK-6161) / " ⊣◀⊢ " (SK-6163).
3. If the diode is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Disconnect one side of the diode.
4. Connect black test lead to Anode side and red test lead to Cathode side of the diode (Reverse connection). Confirm "OL" is displayed on LCD.
5. Connect test leads to the opposite side of 4 (Forward Connection). Test results are good if the following voltage values are displayed on LCD.
   - Silicon diodes：0.4V to 0.7V
   - Germanium diodes：0.1V to 0.4V
6. After finishing the measurement, set **FUNCTION Switch** to "**OFF**".

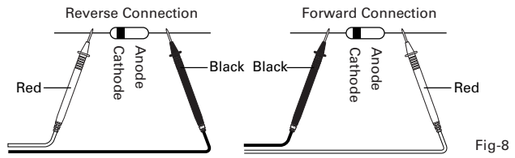

Fig-8

5-7. CAPACITANCE MEASUREMENT (⊣⊢) ※SK-6163 only

⚠ WARNING

- Confirm the **FUNCTION Switch** is set to the correct position.
- Do not measure voltage in ⊣◀⊢ position. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- If the capacitor is connected in a circuit, turn off the power to the circuit and discharge the all capacitors.
- Read "**3. SAFETY PRECAUTIONS**" carefully before measurement.

1. Insert black test lead to COM terminal and insert red test lead to ⊣⊢ terminal.
2. Set **FUNCTION Switch** to " ⊣◀⊢ ".
3. Press **SELECT Key** three times to display the unit of " nF " on LCD.
4. Press **DIFF Key** to reset the display into 0.000nF±3dgt.
5. If the capacitor is connected in a circuit, turn off the power to the circuit and discharge the all capacitors. Then, disconnect one side of the capacitor.
6. Connect test lead to both side of the capacitor to be measured. Read the measurement value on LCD.
   NOTE： High capacitance capacitor should be taken longer to get a measurement value.
7. After finishing the measurement, set **FUNCTION Switch** to "**OFF**".

AVAILABLE FUNCTIONS： Display hold (SK-6163 only)

5-8. CURRENT • FREQUENCY MEASUREMENT (≂A / ≂mA / ≂μA • Hz)

⚠ WARNING

- Do not measure High Power Line high power circuit.
- Do not measure the current that exceeds the maximum input value.
- Confirm the **FUNCTION Switch** is set to the correct position.
- Do not measure voltage in **≂20A Hz**/ **≂mA Hz**/ **≂μA Hz** positions. This will cause electrical shock hazard to the operator and/or damage to the instrument.
- Read "**3. SAFETY PRECAUTIONS**" carefully before measurement.
- Be sure to connect **RED** test read to **20A terminal** in ≂20A measurement.
- Continuous loading time of 20A (maximum input value) in ≂20A measurement is within 30 seconds.

1. Insert black test lead to COM terminal and insert red test lead μA, mA or 20A terminal.
   NOTE：RED test lead must be connected to **20A terminal** in ≂20A measurement.
2. Set **FUNCTION Switch** to " **≂20A Hz** " , " **≂mA Hz** " or " **≂μA Hz** ". Select the suitable position depending on the amount of the measurement current.
3. Press **SELECT Key** once to measure AC current.
4. Turn off the power of the circuit to be measured. Open the circuit after discharging the capacitors.
5. Connect black test lead to − (earth) side and connect red test lead to + (positive) side of the circuit to measured.
   NOTE： Connect the instrument **IN SERIES** to the circuit.
   NOTE： Use alligator clips (option) for dangerous current measurement.
6. Turn on the power of the circuit to be measured. Read the measurement value on LCD.
7. Turn off the power of the circuit to be measured and discharge the all capacitors. Set **FUNCTION Switch** to "**OFF**".

FREQUENCY MEASUREMENT (Hz)：

Frequency (Hz) can be measured by pressing **SELECT Key** during **≂20A** / **≂mA** / **≂μA** measurement. Press twice in DC current measurement, press once in AC current measurement.

AVAILABLE FUNCTIONS：

Range hold, Display hold (SK-6163 only), Difference measurement (SK-6163 only)

6. MAINTENANCE

6-1. BATTERY AND FUSE REPLACEMENT

⚠ WARNING

- To avoid electrical shock, replace batteries and fuses after finishing measurement.
- Detach test leads from circuit and input terminals and set **FUNCTION Switch** to "**OFF**".
- Always use the specified fuse. Do not use this instrument shorting fuse holder or without using the fuse.

FUSE SPECIFICATION：0.5A/250V (φ5×20mm) and 15A/250V (φ5×20mm)

1. Detach test leads from input terminals and set **FUNCTION Switch** to "**OFF**".
2. Loosen a screw on the rear case and remove the rear case from the bottom side.
3. Remove the exhausted batteries and insert 2 pcs of new 1.5V R6P (AA) batteries in the correct polarity.
4. When replacing fuses, replace blown fuses into new ones.
   NOTE： The fuse rating is stamped on the metal part of the fuse edge. Install the suited fuse after confirming the fuse rating carefully because 0.5A fuse and 15A fuse are the same size.
5. Fix rear case onto the front case from upper side fitting their hooks and tighten a screw.

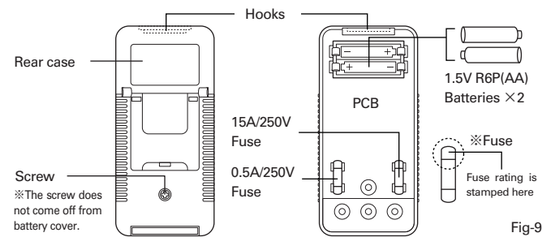

Fig-9

NOTE： Remove the batteries when the instrument is out of use for a long time. The exhausted battery might leak electrolyte and corrode the inside.

6-2. 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.

6-3. 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.

1. Check the battery connection, polarity, and capacity.
2. Check if the fuse does not blow out or not drop off from the fuse holder.
3. Confirm that the FUNCTION Switch is set correctly.
4. Confirm if the over input, exceeding the specified range value, is not applied.
5. Confirm that measured accuracy is adopted in the operating environment.
6. Confirm that the body of this instrument and test leads have no cracks or any other damages.
7. Check if the instrument is not affected by the strong noise generated from the equipment to be measured or measuring surroundings.

WARRANTY

SK-6161/6163 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 SK-6161/6163 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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