

KAISE

INSTRUCTION MANUAL

MODEL SK-6100

SK-6110

SK-6200

SK-6220

V- Ω -mA

DIGITAL MULTITESTER

KAISE ELECTRIC WORKS, LTD.

KAISE ELECTRIC WORKS, LTD.

422 Oaza Hayashinogo, Ueda City, Nagano Pref., 386-01 Japan

TELEPHONE: UEDA (0268) 35-1600 (REP.)

TELEX: 3327409 KAISE J.

CABLE ADDRESS: KAISE UEDA JAPAN

Printed in Japan

CONTENTS

	Page
1. INTRODUCTION	2
A. GENERAL	2
B. FEATURES	2
C. UNPACKING AND INSPECTION	2
2. SPECIFICATIONS	3
A. GENERAL	3
B. SPECIFICATIONS of Model SK-6100/6110	4
C. SPECIFICATIONS of Model SK-6200/6220	5
3. NAME ILLUSTRATION	6
4. SAFETY PRECAUTIONS	8
5. MEASUREMENT PROCEDURE	8
A. BATTERY	8
B. FUSE	9
C. POWER SWITCH	9
D. MODE SWITCH	10
E. FUNCTION KEYSWITCH	10
F. RANGE KEYSWITCH on Model SK-6100/6110	10
G. ZERO ADJ. KEYSWITCH	11
H. INPUT TERMINALS	12
I. TEST LEADS	12
J. OVERRANGE INDICATION	13
K. INITIAL CHECKOUT	13
6. DC VOLTAGE MEASUREMENTS	14
7. AC VOLTAGE MEASUREMENTS	16
8. DC CURRENT MEASUREMENTS	17
9. AC CURRENT MEASUREMENTS	18
10. RESISTANCE MEASUREMENTS	19
11. LOW POWER RESISTANCE MEASUREMENTS	21
12. MAINTENANCE	22
A. WARRANTY STATEMENT	22
B. BATTERY REPLACEMENT	22
C. FUSE REPLACEMENT	22
D. GENERAL MAINTENANCE	22
E. CALIBRATION	23
F. REPAIR	23
G. OPTIONAL ACCESSORIES	24

1. INTRODUCTION

A. GENERAL

The models of SK-6000 Series are the most reliable, precision Digital Multitesters, which have been designed in handy, compact size, and especially features the simplest, easiest operation by Autoranging System.

The lowest cost and the highest performances such as autoranging, automatic indication of units and signs, low battery consumption... etc. were achieved by employing a 3.5 digit LCD and a CMOS LSI in the circuit.

This is a very sensitive, general purpose instrument which provides the facilities and quality required by today's electric/electronic technicians and engineers.

B. FEATURES

- 1. EASIEST OPERATION:** AUTORANGING SYSTEM requires no range selections.
- 2. EASIEST READING:** Automatic Indications of units, signs, polarity, decimal point, overrange and battery warning.
- 3. LOW BATTERY CONSUMPTION of 5 mW:** 300 hour continuous use with two 1.5V batteries, type UM-3 or AA.
- 4. ULTIMATE PORTABILITY:** actualized light weight and compactness in excellently designed ABS cases.

C. UNPACKING AND INSPECTION

Before unpacking, examine the shipping carton for any sign of damage. Unpack and inspect the instrument and accessories for any damage from mechanical shock, water leakage, or other causes. If any damage or missing item is found, consult the local dealer for replacement.

Make certain that following items are included in the box.

1. Digital Multitester
2. One pair of Test Leads
3. Two 1.5V (UM-3) Batteries
4. One Spare Fuse, 0.3A 250V rating
5. Instruction Manual

2. SPECIFICATIONS

A. GENERAL

1. DISPLAY:

a. **Numerical Display:** 3.5 digit LCD, 10mm high, maximum reading 1999

b. **Unit and Sign:** mV, V, mA, A (Model SK-6110 & SK-6220), Ω , K Ω , AUTO, BATT, ADJ, LO, -, AC

2. OPERATING PRINCIPLE:

Dual slope integration

3. RANGE SELECTION:

Full Autoranging on VOLT and OHM

4. RANGE HOLD:

RANGE HOLD FUNCTION by RANGE Key on Model SK-6100 and SK-6110 only

5. POLARITY:

Autopolarity, (-) sign when minus, (+) sign is implied and is not shown.

6. OVERRANGE INDICATION:

MSD "1" blinks, and Buzzer Warning on Model SK-6100 and SK-6110 only

7. BATTERY WARNING:

BATT sign shows

8. SAMPLING RATE:

Two times per second

9. POWER CONSUMPTION:

5mW Typically

10. POWER SUPPLY:

Two 1.5V Batteries, type UM-3 or AA

11. BATTERY LIFE:

300 hour continuous operation

12. OPERATING TEMPERATURE

AND HUMIDITY: 0 to +40°C, less than 80%

13. STORAGE TEMPERATURE:

-20°C to +60°C

14. CONTINUITY TEST:

Continuity Test on OHM Range by Buzzer on Model SK-6100 and SK-6110

15. LOW POWER OHM RANGES:

for in-circuit resistance measurements at voltage levels below 0.3 volts.

16. ZERO ADJUSTMENT:

Zero Adjustment by ZERO ADJ. Key on the lowest range

17. SIZE AND WEIGHT:

155 x 85 x 28mm, 250g

B. SPECIFICATIONS of Model SK-6100/6110

1. DC VOLTAGE

Range	Accuracy	Resolution	Input Impedance	Max. Input Voltage
200mV	±0.5% rdg ±0.2% f.s.	100 μ V	≥100M Ω	1000V
2V		1mV	≥10M Ω	1000V
20V		10mV	≥10M Ω	1000V
200V		100mV	≥10M Ω	1000V
1000V		1V	≥10M Ω	1000V

2. AC VOLTAGE

Range	Accuracy	Resolution	Input Impedance	Max. Input Voltage
2V	±1% rdg ±0.4% f.s.	1mV	≥10M Ω	750V RMS
20V		10mV	≥10M Ω	750V RMS
200V	±1% rdg ±0.25% f.s.	100mV	≥10M Ω	750V RMS
600V		1V	≥10M Ω	750V RMS

*Frequency response: 40Hz to 500Hz

3. DC CURRENT

Range	Accuracy	Resolution	Input Impedance	Max. Input Current
20mA	±1% rdg ±0.2% f.s.	10 μ A	10 Ω	200mA
200mA		100 μ A	1 Ω	200mA
10A (SK-6110 only)	±1% rdg ±0.2% f.s.	10mA	0.01 Ω	10A

4. AC CURRENT

Range	Accuracy	Resolution	Input Impedance	Max. Input Current
20mA	±1.3% rdg ±0.25% f.s.	10 μ A	10 Ω	200mA RMS
200mA		100 μ A	1 Ω	200mA RMS
10A (SK-6110 only)	±1.3% rdg ±0.25% f.s.	10mA	0.01 Ω	10A RMS

*Frequency response: 40Hz to 500Hz

5. RESISTANCE

Range	Accuracy	Resolution	Test Current	Max. Input Voltage
200 Ω	±0.5% rdg ±0.2% f.s.	0.1 Ω	1.5mA TYP	DC 250V AC 250V
2K Ω		1 Ω	≤300 μ A	DC 250V AC 250V
20K Ω		10 Ω	≤30 μ A	DC 250V AC 250V
200K Ω		100 Ω	≤3 μ A	DC 250V AC 250V
2000K Ω	±1.8% rdg ±0.25% f.s.	1000 Ω	≤0.3 μ A	DC 250V AC 250V

*Max. open circuit voltage: 200 Ω range 1.5V, 2K Ω ~2000K Ω range 0.65V

6. LOW POWER RESISTANCE

Range	Accuracy	Resolution	Test Current	Max. Input Voltage
2K Ω	±1% rdg ±0.5% f.s.	1 Ω	≤150 μ A	DC 250V AC 250V
20K Ω		10 Ω	≤15 μ A	DC 250V AC 250V
200K Ω		100 Ω	≤1.5 μ A	DC 250V AC 250V
2000K Ω	±2% rdg ±0.5% f.s.	1000 Ω	≤0.15 μ A	DC 250V AC 250V

*Max. open circuit voltage: 0.4V

C. SPECIFICATIONS of Model SK-6200/6220

1. DC VOLTAGE

Range	Accuracy	Resolution	Input Impedance	Max. Input Voltage
200mV	-0.8% rdg ±0.2% f.s.	100 μ V	≥100M Ω	1000V
2V		1mV	≥10M Ω	1000V
20V		10mV	≥10M Ω	1000V
200V		100mV	≥10M Ω	1000V
1000V		1V	≥10M Ω	1000V

2. AC VOLTAGE

Range	Accuracy	Resolution	Input Impedance	Max. Input Voltage
2V	±1% rdg ±0.4% f.s.	1mV	≥10M Ω	750V RMS
20V		10mV	≥10M Ω	750V RMS
200V		100mV	≥10M Ω	750V RMS
600V		1V	≥10M Ω	750V RMS

*Frequency response: 40Hz to 500Hz

3. DC CURRENT

Range	Accuracy	Resolution	Input Impedance	Max. Input Current
200mA	±1.2% rdg ±0.2% f.s.	100 μ A	1 Ω	200mA
10A (SK-6220 only)	±1.2% rdg ±0.2% f.s.	10mA	0.01 Ω	10A

4. AC CURRENT

Range	Accuracy	Resolution	Input Impedance	Max. Input Current
200mA	±1.4% rdg ±0.4% f.s.	100 μ A	1 Ω	200mA RMS
10A (SK-6220 only)	±1.4% rdg ±0.4% f.s.	10mA	0.01 Ω	10A RMS

*Frequency response: 40Hz to 500Hz

5. RESISTANCE

Range	Accuracy	Resolution	Test Current	Max. Input Voltage
200 Ω	±0.8% rdg ±0.25% f.s.	0.1 Ω	1.5mA TYP	DC 250V AC 250V
2K Ω		1 Ω	≤300 μ A	DC 250V AC 250V
20K Ω		10 Ω	≤30 μ A	DC 250V AC 250V
200K Ω		100 Ω	≤3 μ A	DC 250V AC 250V
2000K Ω	±2% rdg ±0.25% f.s.	1000 Ω	≤0.3 μ A	DC 250V AC 250V

*Max. open circuit voltage: 200 Ω range 1.5V, 2K Ω ~2000K Ω range 0.65V

6. LOW POWER RESISTANCE

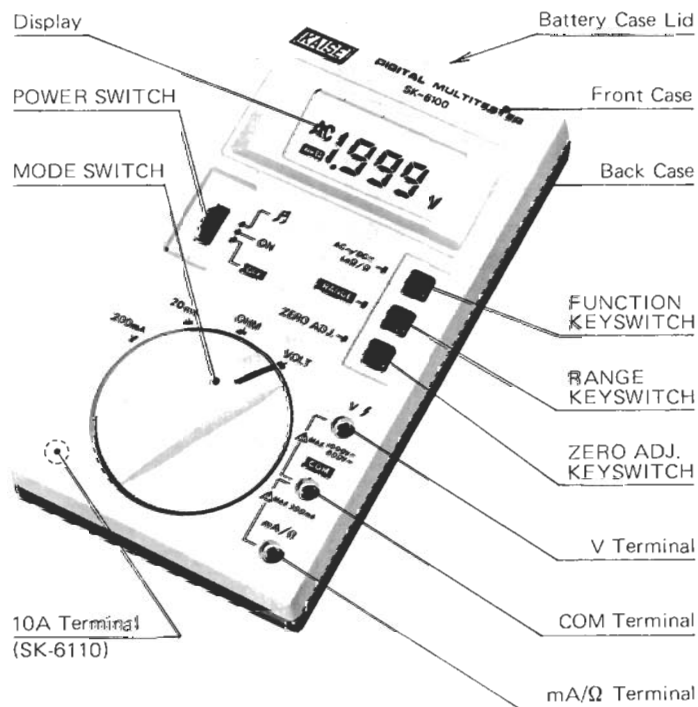
Range	Accuracy	Resolution	Test Current	Max. Input Voltage
2K Ω	±1.2% rdg ±0.5% f.s.	1 Ω	≤150 μ A	DC 250V AC 250V
20K Ω		10 Ω	≤15 μ A	DC 250V AC 250V
200K Ω		100 Ω	≤1.5 μ A	DC 250V AC 250V
2000K Ω	±2% rdg ±0.5% f.s.	1000 Ω	≤0.15 μ A	DC 250V AC 250V

*Max. open circuit voltage: 0.4V

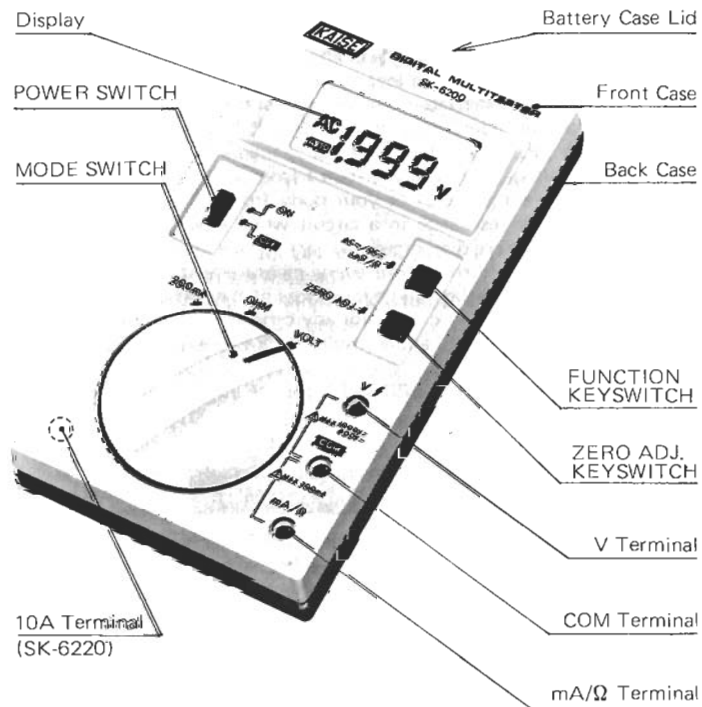
*Specifications are subject to change without notice.

3. NAME ILLUSTRATION

Model SK-6100/6110



Model SK-6200/6220



4. SAFETY PRECAUTIONS

Correct knowledge about electric measurements is necessary since electric measurement is sometimes a very dangerous work.

To eliminate possibility of injury to operator and damage to the instrument and equipment, the following precautions and measurement procedures are recommended. Mis-use, abuse and carelessness cannot be prevented by any written word and is fully the operator's responsibility. Observing the following precautions, take safe measurements.

1. Do NOT attempt to take any measurement of voltage or current higher than the maximum range of the function on this instrument.
2. Acquaint yourself with the location of high voltage in the equipment under test or in the circuit to be measured. If there is something wrong with the equipment or the circuit, high voltage leaks from unexpected locations, which may cause the electric shock accidents.
3. When measuring, take safety distance from the power supply or the circuit to prevent any part of your body from touching high voltage.
4. Do NOT check resistance in a circuit while power is on or before circuit capacitors are discharged.
5. Do not fail to confirm before every measurement that the body of this instrument and the handle insulators of the test leads attached to the instrument have no cracks nor any other damage on it. Make sure that the body and the handle insulators are free of dust, grease and moisture.
6. This instrument is NOT APPROVED for use in explosive atmosphere, vapor or dust.

5. MEASUREMENT PROCEDURE

A. BATTERY

1. Two 1.5V type UM-3 or AA batteries are furnished with this instrument. Remove Battery Case Lid and place the batteries in the battery case. Replace Battery Case Lid.


NOTE: If the batteries are installed in the wrong polarity and POWER SWITCH is turned on, the display is not shown.
Do not leave the instrument in this condition as it results in battery consumption.

2. For replacement, use 1.5V type UM-3, AA, NEDA 15, R6 or any equal batteries.
3. If the instrument is taken out of service for an extended time, remove the batteries from the battery case and store separately.

B. FUSE

1. A removable fuse is furnished with this instrument, installed in its holder to protect the circuit against overloads. When checking the batteries, make certain that the fuse is properly installed, and the fuse clips are tight.
2. For replacement, use any fast acting glass tube fuse, 5 x 20mm, 0.3A (300mA), 250V rating.
3. **CAUTION:** Do NOT jump fuse or use fuse with rating other than 0.3 amperes.
4. **NOTE:** If the instrument is used with blown fuse or without fuse, resistance and current measurements become impossible.

C. POWER SWITCH

1. Set POWER SWITCH to ON position, and set it to OFF position when measurements are finished.
2. **BUZZER WARNING on Model SK-6100/6110:** If the instrument is used with POWER SWITCH set at  position, the buzzer sounds in the following cases.
 - a. **Continuity Test:** The buzzer sounds when continuity test less than 19Ω is performed, and/or resistance measurement less than 19 digits is performed on a fixed ohm range.

NOTE: When ZERO ADJ. is operative on a fixed ohm range, the buzzer does not sound.

NOTE: The buzzer responses faster if the range is fixed by RANGE KEYSWITCH.
 - b. **Overload Warning:** The buzzer sounds if the reading exceeds 1999 digits when measuring voltage or current.
 - c. **Switch Warning:** The buzzer sounds whenever MODE SWITCH is turned, and FUNCTION KEYSWITCH or RANGE KEYSWITCH is depressed.

NOTE: The buzzer does not sound when MODE SWITCH is turned between 20mA and 200mA positions.

D. MODE SWITCH

1. Set MODE SWITCH to desired position.

VOLT position: 0~1000V DC in 5 ranges or
0~600V AC in 4 ranges.

OHM position: 0~2000k Ω in 5 ranges or
0~2000k Ω Low OHM in 4 ranges.

20mA position: 0~20mA DC or AC in 1 range.
(SK-6100)

200mA position: 0~200mA DC or AC in 1 range.
(SK-6100/6200)

20mA/10A position: 0~20mA and 0~10A DC or AC in 1 range each
(SK-6110)

10A position: 0~10A DC or AC in 1 range.
(SK-6220)

E. FUNCTION KEYSWITCH

1. Depress FUNCTION KEYSWITCH to select DC or AC when measuring voltage or current.
2. Depress FUNCTION KEYSWITCH to select OHM (Ω) or Low OHM (Lo Ω) when measuring resistance.

F. RANGE KEYSWITCH on Model SK-6100/6110

RANGE KEYSWITCH enables this instrument to operate as a manual type one in voltage and resistance measurements. If a range is fixed with RANGE KEYSWITCH depressed, AUTO sign disappears.

To hold desired range, use following procedure.

1. Depress RANGE KEYSWITCH watching the movement of the decimal point until desired range is selected.
- The decimal point and the range move as shown in the following table.

	SW.ON	DEPRESSION OF RANGE KEYSWITCH							
		1st	2nd	3rd	4th	5th	6th	7th	8th
DC V RANGE	AUTO 00.0 200mV	00.0 200mV	00.0 200mV	.000 2V	0.00 20V	00.0 200V	000 1000V	00.0 200mV	.000 2V
AC V RANGE	AC AUTO .000 2V	000 2V	000 2V	0.00 20V	00.0 200V	000 200V	000 2V	0.00 20V	00.0 200V
Ω RANGE	AUTO 1*000 2000k Ω	1*000 2000k Ω	1*00.0 200k Ω	1*0.00 2k Ω	1*0.00 20k Ω	1*00.0 200k Ω	1*000 2000k Ω	1*00.0 200k Ω	1*000 2k Ω
Lo Ω RANGE	AUTO 1*000 Lo 2000k Ω	1*000 2000k Ω	1*0.00 2k Ω	1*0.00 20k Ω	1*00.0 200k Ω	1*000 2000k Ω	1*000 2k Ω	1*00.0 20k Ω	1*00.0 200k Ω
mA RANGE	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant	Constant

2. Depress RANGE KEYSWITCH when applying into the instrument an input value which belongs to desired range. For example, apply 1.5V DC or 18.5k Ω into the instrument and depress RANGE KEYSWITCH.

Range moves as follows.

Input Applied	SW.ON	DEPRESSION OF RANGE KEYSWITCH							
		1st	2nd	3rd	4th	5th	6th	7th	8th
1.5V DC	AUTO 1.500V	1.50V	1*00.0mV	1.500V	1.50V	01.5V	100V	1*00.0mV	1.500V
18.5k Ω	AUTO 18.5k Ω	18.5k Ω	1*00.0k Ω	1.500k Ω	18.5k Ω	18.5k Ω	020k Ω	1*00.0k Ω	1*000k Ω

3. To cancel RANGE HOLD, depress RANGE KEYSWITCH for several seconds, or change function by FUNCTION KEYSWITCH or MODE SWITCH.

G. ZERO ADJ. KEYSWITCH

ZERO ADJ. KEYSWITCH is a kind of memory keyswitch which is used to make ZERO ADJUSTMENT and also to make DIFFERENCE MEASUREMENTS like a galvanometer.

1. **ZERO ADJUSTMENT:** Short Test Leads from Input Terminals together for several seconds until digital display decrease below 4 digits, then depress ZERO ADJ. KEYSWITCH to read zero plus or minus one digit. Now ADJ. sign is shown on the display.

ZERO ADJUSTMENT is required when measuring DC voltage less than 200mV. When measuring any other ranges or functions, ZERO ADJUSTMENT is recommended, but can be neglected.

- NOTE:**
- a. When measuring resistance with MODE SWITCH set at OHM position on SK-6200 or SK-6220, ZERO ADJ. KEYSWITCH is useless and null.
 - b. When measuring resistance holding a range with RANGE KEYSWITCH on Model SK-6100/6110, ZERO ADJ. KEYSWITCH is available to cancel the resistance value of Test Leads and installed Fuse, and assures the easiest and correct measurements.

c. Cancellation of ADJ sign can be made by ZERO ADJ., RANGE or FUNCTION KEYSWITCH, or by MODE SWITCH.

2. **DIFFERENCE MEASUREMENTS:** Desired input value less than 99 digits of the range being used can be put into memory and converted into zero plus or minus one digit on the display.

REFERENCE: 015→000, 099→000, 100→100
199→100, 222→200, 990→900

a. Apply desired value of voltage or current into the instrument. The input value should be less than 99 digits of the range being used.

NOTE: Desired resistance value less than 99 digits can be put into memory, if the range is fixed by RANGE KEYSWITCH on Model SK-6100/6110.

b. Depress ZERO ADJ. KEYSWITCH.

c. Make difference measurements.

REFERENCE: On 200mA DC range, if 5.0mA DC is put into memory and ADJ is operative.

3.0mA DC input is measured as -2.0mA
15.0mA DC input is measured as 10.0mA
0.0mA DC input is measured as -5.0mA

NOTE: When ADJ is operative on Model SK-6100/6110, Continuity Buzzer becomes useless and null.

H. INPUT TERMINALS

1. COM Terminal is applied to the negative side of the circuit to be measured and V, mA/Ω or 10A Terminal to the positive side.

I. TEST LEADS

1. One pair of TEST LEADS which consists of a Red Test Lead and a Black Test Lead is furnished with each instrument.
2. Each TEST LEAD consists of one Banana Plug with a short insulator and one Test Prod with a long handle insulator.
3. The Banana Plugs fit in the Terminals on the Front Case and the Test Prods are used to make contact with the circuit being measured.

J. OVERRANGE INDICATION

1. If an input value greater than 1999 digits of the range being used is impressed on the instrument, MSD "1" blinks.

2. **CAUTION:** In voltage measurements, even if an overload greater than 1000V DC or 600V AC is impressed, MSD "1" cannot blink.

To avoid electrical shock hazard and/or damage to the instrument, do not measure voltages that might exceed the Maximum Input Voltage of the range being used.

3. **NOTE on Model SK-6100/6110:** If 200mV DC range is held and an overload greater than 199.9mV is impressed, MSD "1" continues blinking after removing the overload from the instrument.

This phenomenon is the normal one caused by the extremely high input impedance greater than 100MΩ on the 200mV DC range. To cancel the blinking of MSD "1", short test leads together.

K. INITIAL CHECKOUT

Before placing the multitester into use, a simple checkout procedure is recommended to ensure that the device is working properly.

1. Make certain that the batteries and fuse are installed tightly and properly.
2. Insert Banana Plugs of test leads into COM and V Terminals.
3. Set POWER SWITCH to ON position and MODE SWITCH to VOLT position. Depress FUNCTION KEYSWITCH to select DC.
4. Short Test Prods of test leads together until the Digital Display goes down below 4 digits, and depress ZERO ADJ. KEYSWITCH.
5. The Digital Display should read zero plus or minus one digit.

NOTE: If Test Prods are unshorted in this condition, the Digital Display reads random numerals one after another. But, this is normal phenomenon for this instrument due to high input impedance.


6. Depress FUNCTION KEYSWITCH and select AC with Test Prods shorted together. Make ZERO ADJUSTMENT to confirm that the Digital Display reads zero plus or minus one digit.
7. Insert Test Leads into COM and mA/Ω Terminals. Set MODE SWITCH to OHM position. The Digital Display reads 1000KΩ and the most significant 1 digit blinks. Then make ZERO ADJUSTMENT to confirm that the Digital Display reads zero plus or minus one digit.

8. Make ZERO ADJUSTMENT on each current range one after another to confirm that the Digital Display reads zero plus or minus one digit.

NOTE: To Check 10A DC and AC ranges on Model SK-6110/6220, use COM and 10A Terminals.

9. The Decimal Point should be positioned as follows on each function in autoranging


FUNCTION:	VOLT	DC	00.0
	VOLT	AC	.000
	OHM		000
	Lo OHM		000
	20mA	DC or AC	0.00
	200mA	DC or AC	00.0
	10A	DC or AC	0.00

10. **Model SK-6100/6110:** Set POWER SWITCH to  position, and perform Continuity Test, Overload Warning Test and Switch Warning Test if the buzzer sounds.
11. **Model SK-6100/6110:** Perform Range Hold Test by depressing RANGE KEYSWITCH if the Decimal Point shifts correctly. Refer to "5.F. RANGE KEYSWITCH."
12. If the instrument has performed properly during this checkout procedure, it is fully operational and ready to use.

6. DC VOLTAGE MEASUREMENTS

WARNING

Maximum Input Voltage of DC VOLT Range is 1000V DC.
Do NOT attempt to take any voltage measurement that might exceed 1000V DC to avoid electrical shock hazard and/or damage to the instrument.

1. Insert Black Banana Plug of test lead into COM Terminal and Red Banana Plug of test lead into V Terminal.
It is good practice to use Black Test Lead for (–) polarity and Red Test Lead for (+) polarity.
2. Set POWER SWITCH to ON position.
NOTE on Model SK-6100/6110: If Buzzer Sound is required, set POWER SWITCH to  position.

3. Set MODE SWITCH to VOLT position.

4. Depress FUNCTION KEYSWITCH to select DC.

NOTE: DC sign is implied and is not shown on the display.

5. Short Test Prods of test leads together and depress ZERO ADJ. KEYSWITCH to read zero plus or minus one digit. ADJ sign is shown on the display.

6. Connect Black Test Prod to the negative side of the circuit being measured and Red Test Prod to the positive side of the circuit.

NOTE: When taking voltage measurements, DC or AC, always connect the instrument **IN PARALLEL** with the circuit being measured.

7. Read the voltage on the digital display.

8. **RANGE HOLD on Model SK-6100/6110:** This is an autoranging multimeter, but is also used as a manual type one by using RANGE KEYSWITCH. There are two ways to select and hold desired range. If a range is fixed, AUTO sign disappears.

a. Depress RANGE KEYSWITCH to hold desired range watching the movement of the Decimal Point.

b. Apply a voltage which belongs to desired range into the instrument, then depress ZERO ADJ. KEYSWITCH.

NOTE: If a range is fixed by using RANGE KEYSWITCH, Display Response Time and Buzzer Response Time become shorter than in autoranging.

Range Hold Function operates in the same way on AC VOLT, OHM and Low OHM ranges. For details, refer to "5.F. RANGE KEYSWITCH on Model SK-6100/6110."

9. **DIFFERENCE MEASUREMENTS:** Use ZERO ADJ. KEYSWITCH to make DIFFERENCE MEASUREMENTS as performed by a galvanometer. Use following procedure.

a. Apply into the instrument desired input value less than 99 digits of the range being used.

b. Depress ZERO ADJ. KEYSWITCH. The input value is put into memory and ADJ sign is shown on the display.

c. Make measurement and read the difference value on the display.

NOTE: If the instrument is used in autoranging, the difference measurements can be made on the lowest voltage ranges (200mV DC and 2V AC) and current ranges.


If the range is fixed on Model SK-6100/6110, the difference measurements can be made on each fixed range including OHM ranges.

For details, refer to "5.G.2. DIFFERENCE MEASUREMENTS."

7. AC VOLTAGE MEASUREMENTS

WARNING

Maximum Input Voltage of AC VOLT Range is 600V AC.
Do NOT attempt to take any voltage measurement that might exceed 600V AC to avoid electrical shock hazard and/or damage to the instrument.

1. Insert Black Banana Plug of test lead into COM Terminal and Red Banana Plug of test lead into V Terminal.
2. Set POWER SWITCH to ON position.
NOTE on Model SK-6100/6110: If Buzzer Sound is required, set POWER SWITCH to  position.
3. Set MODE SWITCH to VOLT position.
4. Depress FUNCTION KEYSWITCH to select AC.
AC sign is shown on the display.
5. Make ZERO ADJUSTMENT to read zero plus or minus one digit.
ADJ sign is shown on the display.


ZERO ADJUSTMENT is recommended, but can be neglected in AC voltage measurements.

6. Connect Black Test Prod to the negative side of the circuit being measured and Red Test Prod to the positive side of the circuit. The connection should be **IN PARALLEL** with the circuit being measured.
7. Read the voltage on the digital display.
8. **RANGE HOLD on Model SK-6100/6110:** Use RANGE KEYSWITCH in the same way as in DC voltage measurements.
9. **DIFFERENCE MEASUREMENTS:** Perform in the same way as in DC voltage measurements.

8. DC CURRENT MEASUREMENTS

WARNING

Maximum Input Current of mA Range is 200 mA, and that is 10A on COM and 10A Terminals.
Do NOT attempt to take any current measurement that might exceed the maximum input current of the range or terminals to avoid damage to the instrument.
Use extreme care not to measure voltage on the current range.

1. Insert Black Banana Plug of test lead into COM Terminal and Red Banana Plug of test lead into mA/ Ω Terminal when measuring 0 to 200mA. To measure 200mA up to 10A on Model SK-6110/6220, use COM and 10A Terminals.
2. Set POWER SWITCH to ON position.
NOTE on Model SK-6100/6110: If Buzzer Sound is required, set POWER SWITCH to  position.
3. Set MODE SWITCH to desired position, 200mA or 20mA (SK-6100/6110).
To measure 10A on Model SK-6110, set MODE SWITCH to 20mA/10A position.
To Measure 10A on Model SK-6220, set MODE SWITCH to 10A position.
4. Depress FUNCTION KEYSWITCH to select DC.
DC sign is implied and is not shown.
5. Make ZERO ADJUSTMENT to read zero plus or minus one digit.
ADJ sign is shown on the display.

ZERO ADJUSTMENT is recommended, but can be neglected in DC current measurements.

6. Remove power to the circuit being measured and open the circuit in which current is to be measured.
7. Observing polarity, connect Black Test Prod to one side of the circuit and Red Test Prod to the other side.
NOTE: When taking current measurements, always connect the instrument **IN SERIES** with the circuit being measured.
8. Apply power to the circuit being measured and read the current on the digital display.

9. Remove all power to the circuit being measured and discharge all capacitors.
10. Disconnect Test Leads from the circuit and reconnect the circuit that was being measured.
11. **NOTE:** RANGE KEYSWITCH on Model SK-6100/6110 does not operate on current ranges, because each current range consists of only one range.
12. **DIFFERENCE MEASUREMENTS:** Perform in the same way as in DC voltage measurements. But, the test leads connection should be **IN SERIES** with the circuit being measured.


9. AC CURRENT MEASUREMENTS

WARNING

Maximum Input Current of mA Range is 200mA, and that is 10A on COM and 10A Terminals.

Do NOT attempt to take any current measurement that might exceed the maximum input current of the range or terminals to avoid damage to the instrument.

Use extreme care not to measure voltage on the current range.

1. Insert Black Banana Plug of test lead into COM Terminal and Red Banana Plug of test lead into mA/ Ω Terminal when measuring 0 to 200mA.
To measure 200mA up to 10A on Model SK-6110/6220, use COM and 10A Terminals.
2. Set POWER SWITCH to ON position.
NOTE on Model SK-6100/6110: If Buzzer Sound is required, set POWER SWITCH to  position.
3. Set MODE SWITCH to desired position, 200mA or 20mA (SK-6100/6110).
To measure 10A on Model SK-6110, set MODE SWITCH to 20mA/10A position.
To measure 10A on Model SK-6220, set MODE SWITCH to 10A position.
4. Depress FUNCTION KEYSWITCH to select AC.
AC sign is shown on the display.

5. Make ZERO ADJUSTMENT to read zero plus or minus one digit. ADJ sign is shown on the display.


ZERO ADJUSTMENT is recommended, but can be neglected in AC current measurements.

6. Remove power to the circuit being measured and open the circuit in which current is to be measured.
7. Observing polarity, connect Black Test Prod to one side of the circuit and Red Test Prod to the other side.
NOTE: When taking current measurements, always connect the instrument **IN SERIES** with the circuit being measured.
8. Apply power to the circuit being measured and read the current on the digital display.
9. Remove all power to the circuit being measured and discharge all capacitors.
10. Disconnect Test Leads from the circuit and reconnect the circuit that was being measured.
11. **NOTE:** RANGE KEYSWITCH on Model SK-6100/6110 does not operate on current ranges, because each current range consists of only one range.
12. **DIFFERENCE MEASUREMENTS:** Perform in the same way as in DC voltage measurements. But, the test leads connection should be **IN SERIES** with the circuit being measured.

10. RESISTANCE MEASUREMENTS

WARNING

Maximum Input Voltage of OHM Range is 250V DC and AC.
Before taking any in-circuit resistance measurement, remove power to the circuit being tested and discharge all capacitors in the circuit.

1. Insert Black Banana Plug of test lead into COM Terminal and Red Banana Plug of test lead into mA/ Ω Terminal.
2. Set POWER SWITCH to ON position.
NOTE on Model SK-6100/6110: If Buzzer Sound is required in Continuity Test less than 19 Ω or measurements less than 19 digits on each fixed range, set POWER SWITCH to  position.

3. Set MODE SWITCH to OHM position. AUTO 1000k Ω appears on the display with the most significant "1" digit blinking.
4. Depress FUNCTION KEYSWITCH to select normal OHM. Normal OHM sign is implied and is not shown on the display.
5. Short Test Prods of test leads together and read the value shown on the display.

NOTE: The value of 1.2 Ω to 1.4 Ω is the resistance value of the test leads and the installed fuse. Remember this value and reduce it from the resistance value of the circuit being measured.

NOTE: ZERO ADJUSTMENT is useless and null when measuring in autoranging.

6. **NOTE on Model SK-6100/6110:** If measurements less than 200 Ω are to be made on the 200 Ω Range fixed by RANGE KEYSWITCH, ZERO ADJUSTMENT cancels the resistance value of Test Leads and Fuse and enables direct reading of the digital display. ZERO ADJUSTMENT is recommended, but can be neglected on the fixed range higher than 200 Ω range.

7. If the resistance being measured is connected to a circuit, remove power to the circuit being tested and discharge all capacitors.

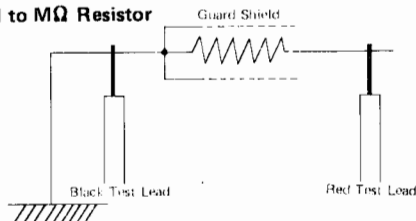
8. Connect Test prods of test leads to the circuit being measured and read the resistance on the digital display.

NOTE: When measuring resistance values less than 200 Ω , always remember to reduce 1.2 Ω ~ 1.4 Ω , the resistance value of the test leads and fuse, from the reading on the digital display.

NOTE: If ZERO ADJUSTMENT is made on Model SK-6100/6110, this reduction is not necessary.

NOTE: When measuring high resistance value more than one megohm, the reading is liable to receive influence of noise, or of some insulators that have a relatively low insulation resistance. Therefore, to make accurate measurements, guard-shield as shown below is recommended. Allow time for the display to stabilize.

Guard Shield to M Ω Resistor



9. **RANGE HOLD on Model SK-6100/6110:** This instrument is used as a manual type one in resistance measurements as well as voltage measurements. Use following procedure to hold desired range.

- a. Depress RANGE KEYSWITCH watching the movement of the Decimal Point until desired range is selected.
- b. Depress RANGE KEYSWITCH when applying into the instrument a resistance value which belongs to desired range.

For details, refer to "5.F. RANGE KEYSWITCH on Model SK-6100/6110".

10. **DIFFERENCE MEASUREMENTS on Model SK-6100/6110:** Desired resistance value less than 99 digits on the fixed range can be put into memory and converted into zero by ZERO ADJ. KEYSWITCH.

Then, apply a resistance value less than 99 digits of the range being held and read the difference value on the digital display.

For details, refer to "5.G.2. DIFFERENCE MEASUREMENTS".

11. LOW POWER RESISTANCE MEASUREMENTS

The test voltages on Low OHM Ranges are typically held less than 0.33V. Therefore, Low OHM Range allow accurate measurements of in-circuit resistances directly shunted by typical silicon diodes and transistors.

WARNING

Maximum Input Voltage of OHM Range is 250V DC and AC.
Before taking any in-circuit resistance measurement, remove power to the circuit being tested and discharge all capacitors in the circuit.

Make in-circuit resistance measurements taking the same measurement procedures as in "10. RESISTANCE MEASUREMENTS". Remember to depress FUNCTION KEYSWITCH so that Low OHM Range may be selected. LO sign is shown on the display when Low OHM Range is selected.

NOTE: 200 Ω range is not included in Low OHM Ranges, since Low OHM Ranges consist of four ranges of 2k Ω , 20k Ω , 200k Ω and 2000k Ω .

12. MAINTENANCE

A. WARRANTY STATEMENT

The warranty statement for The Digital Multitester of Model SK-6000 Series is printed on the inside back cover of the manual. Read it carefully before requesting a warranty repair.

B. BATTERY REPLACEMENT

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

1. Push and slide off Battery Case Lid.
2. Take out the worn-out batteries from the battery case.
3. Place fresh 1.5V batteries in the battery case.
4. Replace Battery Case Lid.

C. FUSE REPLACEMENT

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

1. Remove Battery Case Lid.
 2. Replace with any fast acting glass tube fuse, 5x20mm, 0.3A (300mA), 250V rating.
 3. Replace Battery Case Lid.
- CAUTION:** Do NOT jump fuse or use fuse with rating other than 0.3 amperes.

D. GENERAL MAINTENANCE

For best and safest performance, the following maintenance and examination are required.

1. Always keep the instrument and test leads clean, dry and without damages.
2. Do NOT polish the tester case, or attempt to clean it with any cleaning fluid, gasolin, benzine, etc. If necessary, use silicon oil or anti-static fluid.
3. Avoid severe mechanical shock or vibration, extreme temperature or very strong magnetic fields.

4. Remove the batteries when not in use for an extended time since the exhausted batteries might leak electrolyte and corrode the internal components.
5. Do NOT touch any potentiometers or modify any existing circuits in the instrument.

E. CALIBRATION

In order to maintain the specifications described in page 3~5, it is recommended that the instrument may be calibrated once each year and/or after it is repaired.

Calibration service is available at **KAISE AUTHORIZED SERVICE AGENCY** through your local dealer at a cost basis charge.

Pack the instrument securely in its original carton together with descriptions of your name, address, telephone number and the service required, and ship prepaid to your local dealer.

F. REPAIR

Repair service, warranty or non-warranty, is available at **KAISE AUTHORIZED SERVICE AGENCY** through your local dealer. Warranty repair is executed free of charge, but, non-warranty repair is charged on the cost basis.

Pack the instrument securely in its original carton together with descriptions of your name, address, telephone number, problem encountered and the service required, and ship prepaid to your local dealer.

When the instrument does not operate properly, the following steps should be taken before returning the instrument for repair, warranty or non-warranty.

1. Check the battery and fuse connections.
2. Check the battery if they are alive and usable.
3. Check the fuse if it is not blown.
4. Make sure that FUNCTION SWITCH and RANGE SWITCH are set at correct positions for the measurement being taken.
5. Make sure that the body of this instrument and the handle insulators of the test leads have no cracks nor any other damage on them.
6. Be careful of noise from the equipment under test or the ambient environment in which the instrument is being used. The instrument is fully shielded against noise, but may read error due to very strong noise.

G. OPTIONAL ACCESSORIES

- Detachable Alligator Clips for Test Leads
- Vinyl Carrying Case

WARRANTY

The Digital Multitester of Model SK-6000 series is warranted in its entirety against any defects of material or workmanship under normal use and service within a period of six months after the date of purchase of the Multitester by the original purchaser. This warranty is extended by **KAISE AUTHORIZED DEALER** only to original purchaser or original user of the Multitester on condition that the Warranty Registration Card is completed and returned to the authorized dealer within two weeks after the purchase of the Multitester new from the dealer.

The obligation under this warranty to be executed by **KAISE AUTHORIZED DEALER** is limited to repairing or replacing the Digital Multitester SK-6000 series returned intact to it, with transportation charge prepaid, and which to its satisfaction is judged by it to have been thus defective. **KAISE AUTHORIZED DEALER** and **KAISE ELECTRIC WORKS, LTD.**, the manufacturer shall not otherwise be liable for any damages or loss, consequential 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 **KAISE AUTHORIZED SERVICE AGENCY**, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

KAISE AUTHORIZED DEALER

--