

kaise

AC/DC DIGITAL MINI-CLAMP METER

INSTRUCTION MANUAL

SK-7660/7661

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 Clamp Meter. WARNINGS with the symbol on the Clamp Meter 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

Measurement on High Power Line is very dangerous. It sometimes includes High Surge Voltage that could cause dangerous arcs of explosive short in the instrument and could result in serious injury to the operator. For dangerous voltage measurement on High Power Line or High Voltage Circuit, always keep the instrument away from your body without holding it in your hands. Do not touch the Clamp Meter, its Test Leads, and any part of the circuit.

INTRODUCTION

Thank you for purchasing KAISE "MODEL SK-7660/7661 AC/DC DIGITAL MINI-CLAMP METER". 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.

- 1. Digital Clamp Meter
- 2. 1 set of Test Lead (100-63)
- 3. Instruction Manual

2. SPECIFICATIONS

2-1. GENERAL SPECIFICATIONS

- 1. **DISPLAY (LCD)**
 - a. **Numerical Display** : 4000 count, Maximum reading 4050, 12mm high.
 - b. **Units and Symbols** : —, —, ~, A, mV, V, Ω, kΩ, MΩ, Hz, kHz, %, nF, μF, ⇄, ⎓, ⚡, DH, DIFF, PH(SK-7660), MAX/MIN(SK-7661), APO, BAT, AUTO and decimal point.
- 2. **OPERATING PRINCIPLE** : $\Sigma \Delta$ conversion
- 3. **AC MEASUREMENT** : SK-7660 : True RMS
SK-7661 : Average Rectification
- 4. **SAMPLING RATE** : 3 times / second
- 5. **RANGE SELECTION** : Auto-Ranging
- 6. **POLARITY** : Auto-Polarity ("—" symbol appears in minus)
- 7. **OVERLOAD INDICATION** : "OL" symbol appears.
- 8. **BATTERY WARNING** : "BAT" symbol appears when battery voltage goes down to approx. 2.4V or less.
- 9. **DISPLAY HOLD** : Enables to hold indicating values by DH Key
- 10. **PEAK HOLD (SK-7660 only)** : Peak value is measurable by pressing PH key for one second or more.
- 11. **MAX/MIN MEASUREMENT (SK-7661 only)** : MAX/MIN values are measurable by pressing MAX/MIN key for one second or more.

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- 12. **DIFFERENCE MEASUREMENT** : Difference value is measurable by pressing DIFF key for one second or more.
- 13. **CONTINUITY TEST** : Buzzer sounds and $\cdot \Omega \cdot$ symbol appears on LCD.
 - a. Buzzer Sounds : at approx. 50 Ω or less
 - b. Open Circuit Voltage : approx. 0.44V
- 14. **OVERLOAD PROTECTION** :
 - a. **Current** : 600A rms for 1 minute (600V line)
 - b. **Voltage** : 1000V rms for 1 minute.
 - c. **Resistance** : 300V rms for 1 minute
- 15. **DIELECTRIC STRENGTH** : 3.52kV AC (50Hz) for 1 minute (between input terminal and case)
- 16. **OPERATABLE TEMPERATURE & HUMIDITY** : 0°C to 40°C, 80%RH or lower in non-condensing.
- 17. **STORAGE TEMPERATURE & HUMIDITY** : -20°C to 60°C, 70%RH or lower in non-condensing.
- 18. **TEMPERATURE COEFFICIENT** : Accuracy in 23°C \pm 5°C \times 0.1 / °C
- 19. **SAFETY LEVEL** : CE Marking approved (IEC-61010-1, CAT III 300V, CAT II 600V and EMC Test passed.)
- 20. **POWER SUPPLY** : 1.5V R03 (AAA) batteries \times 2 (not attached)
- 21. **POWER CONSUMPTION** : SK-7660 : Approx. 15mA, SK-7661 : Approx. 13mA
- 22. **CONTINUOUS OPERATING TIME** : SK-7660 : Approx. 25 hours (Manganese cell), Approx. 50 hours (Alkaline cell) / SK-7661 : Approx. 30 hours (Manganese cell), Approx. 60 hours (Alkaline cell) (in DC Current range, 0A input)
- 23. **AUTO POWER OFF** : Power turns off automatically after 12 minutes of any switch operation. (releasable)
- 24. **CONDUCTOR DIAMETER** : 27mm ϕ
- 25. **DIMENSIONS & WEIGHT** : 170(H) \times 58(W) \times 27(D)mm, 160g (Battery Included)
- 26. **ACCESSORIES** : 100-63 Test Lead \times 1 set, Instruction Manual
- 27. **OPTIONAL ACCESSORIES** : 1015 Carrying Case, 880 Line Separator, 940 Alligator Clips

2-2. MEASUREMENT SPECIFICATIONS

(23°C \pm 5°C, <80%RH in non-condensing)

1. CURRENT MEASUREMENTS (— A / ~ A / Hz)

1-1. DC CURRENT (— A)

Range	Accuracy	Resolution	Max. Input Current	Overload Protection
40.00A	$\pm 1.5\%rdg \pm 3dgt$	10mA	400A DC	600A rms (for 1 minute)
400.0A	$\pm 1.5\%rdg \pm 5dgt$ (40~200A) $\pm 3.0\%rdg \pm 3dgt$ (201~300A) $\pm 4.0\%rdg \pm 3dgt$ (301~400A)	100mA		

1-2. AC CURRENT (~ A) SK-7660 : True RMS / SK-7661 : Average Rectification

Range	Accuracy ($>0.5A$)	Resolution	Max. Input Current
40.00A	$\pm 1.5\%rdg \pm 5dgt$ (50/60Hz)	10mA	400A rms
400.0A	$40 \sim 200A / \pm 2.0\%rdg \pm 3dgt$ (50/60Hz) $201 \sim 300A / \pm 4.0\%rdg \pm 5dgt$ (50/60Hz) $301 \sim 400A / \pm 5.0\%rdg \pm 5dgt$ (50/60Hz)	100mA	

Frequency Characteristic : 40A Range : (0.5~9A) add 1.5% / (10~40A) : add 0.5% (40~400Hz) 400A Range : add 1.0%

Overload Protection : 600A rms (for 1 minute)

Crest Factor : 0.5~200A : 3 or less / 300A : 2 or less / 400A : 1.5 or less
> 2 : add 2% to Accuracy (SK-7660 only)

1-3. FREQUENCY (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Max. Input Current
5.00Hz~49.99Hz	$\pm 0.2\%rdg \pm 2dgt$	0.01Hz	5A (sine wave)	400A rms
50.0Hz~499.9Hz		0.1Hz		
0.500kHz~1.000kHz		1Hz		

1-4. PEAK CURRENT (\approx 400A) *SK-7660 only

Range	Accuracy (Pulse Width : 10ms)	Resolution	Max. Input Current
400A	$\pm 5.0\%rdg \pm 5dgt$	100mA	400A peak

2. VOLTAGE MEASUREMENTS (— V / ~ V / Hz / %)

2-1. DC VOLTAGE (— V)

Range	Accuracy	Resolution	Input Resistance	Max. Input Voltage	Overload Protection
400.0mV	$\pm 1.0\%rdg \pm 3dgt$	0.1mV	$\geq 100M\Omega$	600V DC	1000V rms (for 1 minute)
4.000V		1mV			
40.00V	$\pm 1.0\%rdg \pm 2dgt$	10mV	$\approx 10M\Omega$	600V DC	
400.0V		100mV			
600V		1V			

2-2. AC VOLTAGE (~ V) SK-7660 : True RMS / SK-7661 : Average Rectification

Range	Accuracy	Resolution	Input Resistance	Max. Input Voltage	Overload Protection
4.000V	$\pm 1.5\%rdg \pm 5dgt$ (40Hz~400Hz)	1mV	$\approx 11M\Omega$	600V rms	1000V rms (for 1 minute)
40.00V		10mV			
400.0V		100mV	$\approx 10M\Omega$		
600V		1V			

Crest Factor : ~400V : 3 or less / 401~600V : 2 or less (SK-7660 only)

2-3. FREQUENCY (Hz)

Range	Accuracy	Resolution	Input Sensitivity	Max. Input Voltage
5.00Hz~49.99Hz	$\pm 0.2\%rdg \pm 2dgt$	0.01Hz	5V (sine wave)	600V rms
50.0Hz~499.9Hz		0.1Hz		
0.500kHz~4.999kHz		1Hz		
5.00kHz~49.99kHz		10Hz		

2-4. DUTY CYCLE (%)

Range	Accuracy	Resolution	Input Sensitivity	Max. Input Voltage
5.0%~95.0%	$\pm 1.0\%rdg \pm 3dgt$	0.1%	5V (square wave)	600V rms

Frequency Range : 40~400Hz

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3. RESISTANCE (Ω)

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage
400.0 Ω	$\pm 1.5\%rdg \pm 5dgt$	0.1 Ω	$\leq 0.4mA$	$\approx 0.44V$
4.000k Ω		1 Ω		
40.00k Ω		10 Ω		
400.0k Ω	100 Ω	$\leq 50 \mu A$		
4.000M Ω	$\pm 1.2\%rdg \pm 5dgt$	1k Ω	$\leq 5 \mu A$	
40.00M Ω	$\pm 3.0\%rdg \pm 5dgt$	10k Ω	$\leq 50nA$	

Overload Protection : 300V rms (for 1 minute)

4. CONTINUITY TEST ($\cdot \Omega \cdot$)

Range	Accuracy	Resolution	Test Current	Open Circuit Voltage
400.0 Ω	$\pm 1.5\%rdg \pm 5dgt$	0.1 Ω	$\leq 0.4mA$	$\approx 0.44V$

Overload Protection : 300V rms (for 1 minute)

Buzzer Sound : Approx. 50 Ω or less

5. DIODE TEST (\blacktriangleleft)

Range	Accuracy	Resolution	Open Circuit Voltage	Overload Protection
0~1.5V	$\pm 5.0\%rdg \pm 5dgt$	1mV	$\leq 1.7V$	300V rms (for 1 minute)

6. CAPACITANCE (— F)

Range	Accuracy	Resolution	Open Circuit Voltage	Overload Protection
50.00 nF	$\pm 5.0\%rdg \pm 10dgt$	10pF	$\approx 1.25V$	300V rms (for 1 minute)
500.0 nF		100pF		
5.000 μF		1nF	$\approx 0.44V$	
50.00 μF		10nF		
100.0 μF		100nF		

3. 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.

3-1. 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 test lead connector into input terminals matching "+" and "-".
- Attach Black and Red Alligator Clips (optional) to Test Lead pins.
- Set FUNCTION Switch to " $\approx V / Hz / \%$ ".
- Select "— (DC)" or "~ (AC)" by SHIFT key.
- 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.
- Place the Clamp Meter away from your body not holding it in your hands. Take safety distance from power source or circuit to measured not to touch the dangerous voltage.
- Turn on the power of the circuit to be measured. Read the measurement value on LCD.

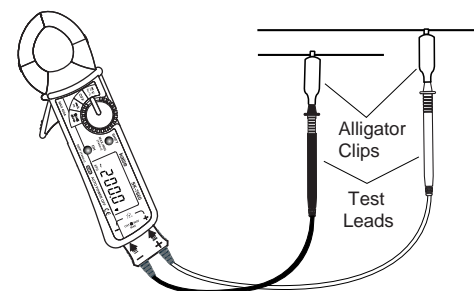


fig. 1

- After measurement, turn off the power of the measuring 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 Clamp Meter away from your body not holding it in your hands.
- Set FUNCTION Switch to " $\approx V / Hz / \%$ ".
- Select "— (DC)" or "~ (AC)" by SHIFT key.

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- 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 to be measured not to touch the dangerous voltage.
- Hold Red Test Lead with one hand and connect it to + (positive) side of the circuit to be measured.
- Read the measurement value on LCD.
- After measurement, disconnect Red Test Lead and Black Alligator Clip from the circuit.

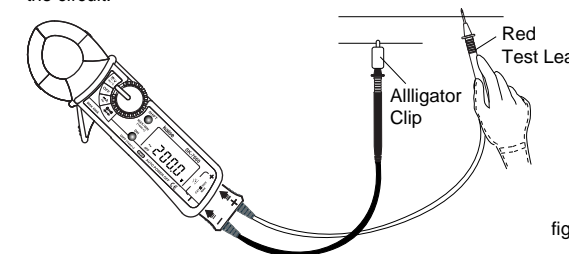


fig. 2

WARNING 5. Correct Selection of FUNCTION Switch

Always confirm that FUNCTION Switch is set to the correct position. Do not measure voltage at $\Omega / \cdot \Omega \cdot$ / \blacktriangleleft / + position.

WARNING 6. Maximum Input Observance

Do not measure voltage or current that might exceed the specified maximum input values.

WARNING 7. Test Lead Disconnection

Disconnect Test Leads from the measuring circuit before changing the measurement functions or removing Battery Cover for battery replacement.

WARNING 8. Safety Line

Do not put your fingers over the Safety Line while current measurement.

3-2. 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.

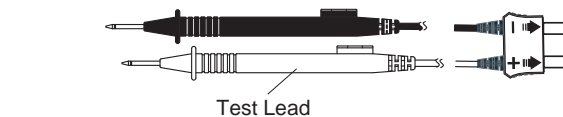
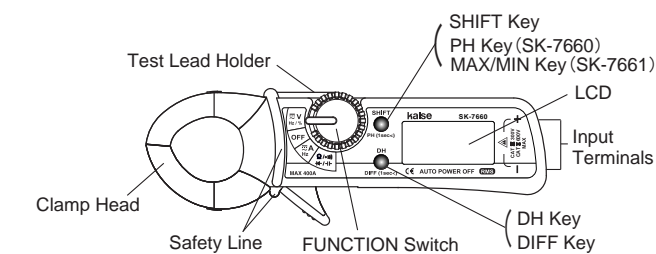
WARNING 3. Be careful not to get hurt with the sharp Test Lead pins.

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

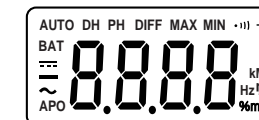
CAUTION 2. Avoid the clamp meter from hard mechanical shock or vibration, high temperature and strong magnetic field.

CAUTION 3. Remove the batteries when the clamp meter is out of use for a long time. The exhausted batteries might leak electrolyte and corrode the inside.

4. NAME ILLUSTRATION



4-1. LCD



AUTO	: Auto-Ranging	MAX	: Maximum Value (SK-7661)
BAT	: Battery Warning	MIN	: Minimum Value (SK-7661)
\approx	: Direct Current (DC)	$\cdot \Omega \cdot$: Continuity Test
—	: Minus Symbol	\blacktriangleleft	: Diode Test
\sim	: Alternating Current (AC)	mV, V	: Units of Voltage
APO	: Auto Power Off	MΩ, kΩ, Ω	: Units of Resistance
DH	: Display Hold	A	: Unit of Current
PH	: Peak Hold (SK-7660)	Hz, kHz	: Unit of Frequency
DIFF	: Difference Measurement	%	: Unit of Duty Cycle
MAX/MIN	: Max/Min Measurement	nF, μF	: Units of Capacitance

(SK-7661)

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4-2. Clamp Head

Clamp on a single conductor to measure AC/DC current.
NOTE : Measurement is unable if several conductors are clamped.

4-3. Safety Line

The line to protect yourself against electrical shock hazard. Do not put your fingers over this line while current measurement.

4-4. FUNCTION Switch

Enables to select main-measurement functions. After measurement, turn it to "OFF".

4-5. SHIFT Key : Enables to select sub-measurement functions.

Current Measurement : $\Rightarrow A \rightarrow \sim A \rightarrow Hz$
 Voltage Measurement : $\Rightarrow V \rightarrow \sim V \rightarrow Hz \rightarrow \%$
 Resistance Measurement : $\Omega \rightarrow \bullet \parallel \rightarrow \leftarrow \rightarrow \leftarrow$

4-6. PH Key : Peak Hold (SK-7660 only)

Press this key for one second or more without any input. "PH" symbol appears on LCD and starts Peak Measurement.

To release it : Press PH key again for one second or more.

NOTE : If display could not be "0" by effect of temperature, the displayed value should be added to the measurement.

NOTE : The maximum peak value is displayed on LCD.

4-7. MAX/MIN Key : MAX/MIN Measurement (SK-7661 only)

Press this key for one second or more while regular measurement. "MAX MIN" symbol appears on LCD and starts MAX/MIN Measurement.

Enables to confirm MAX (maximum) and MIN (minimum) values by pressing this key during MAX/MIN measurement.

To release it : Press MAX/MIN Key again for one second or more.

NOTE : If display could not be "0" by effect of temperature, the displayed value should be added to the measurement.

4-8. DH Key : Display Hold

Enables to hold indicating values on LCD. "DH" symbol appears on LCD.

To release it : Press DH Key again.

4-9. DIFF Key : Difference Measurement

Enables to start Difference Measurement. Press this key for one second or more while regular measurement. "DIFF" symbol appears on LCD, and reset indicating value into 0 ± 1 digit.

Difference Measurement : Convert a certain measurement value into zero and indicate the relative values. Also usable to make zero adjustment.

To release it : Press DIFF Key again for one second or more.

4-10. Input Terminals · Test Leads

Use for $V, \Omega, \bullet \parallel, \leftarrow \rightarrow \leftarrow$ measurements. Plug test lead connector into input terminals matching "+" and "-".

WARNING : Unplug the Test Leads from input terminals while current measurement.

4-11. Test Lead Holder

Fixable Test Lead on the side of Clamp Meter by inserting its hook into the holder socket.

WARNING : Remove the Test Lead from the holder while current measurement.

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 highly important for safety measurement.

2. BATTERY

No battery is attached to this Clamp Meter. Please purchase 2 of 1.5V R03 (AAA) separately. How to install the batteries, refer to 「6-1. BATTERY REPLACEMENT」.

3. OVERLOAD INDICATION

"OL" symbol appears on LCD if input value exceeds 4000 counts that should be the maximum input value of the measuring range. 600V AC/DC range is excepted.

4. AUTO POWER OFF

Power turns off automatically after 12 minutes of last operation of FUNCTION Switch to conserve battery life (10 μA consumption is remained).

To disable it : Turn the power on pressing SHIFT Key. "APO" symbol disappears from LCD.

5. POWER-ON INITIALIZE (effective for DC current measurement)

Initialize the internal circuit automatically and reset LCD indications into 0 ± 1 digit when turning on the power without any input. If it does not work correctly, turn the power on again or use DIFF Key.

To avoid incorrect measurement, do not press SHIFT key before finishing Power-on Initialize and LCD indicates 0 ± 1 digit.

NOTE : This function does not work correctly if some inputs are applied.

NOTE : This function sometimes does not work correctly due to unexpected CPU error. Use DIFF Key if 3 digits or more remain indicated.

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6. $\sim V / \sim A$ MEASUREMENT

Digits on LCD come down to 0 ± 1 digit gradually in $\sim V / \sim A$ measurements, but specified measurements are made if the measurement is started before it becomes into 0 ± 1 digit.

NOTE : For the measurement near the noisy environment or current conductor, LCD does not indicate 0 ± 1 digit.

7. Hz / Duty MEASUREMENT ON V/A FUNCTIONS (Duty measurement is effective in Voltage measurement only)

0-basis High or low level pulse wave measurement is unable in this measurement function.

8. SYMBOL MARK

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

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

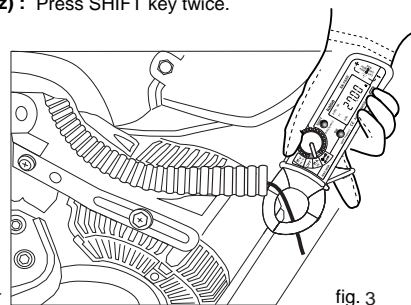
5-2. CURRENT MEASUREMENTS ($\Rightarrow A / \sim A / Hz$)

WARNINGS	
<ul style="list-style-type: none"> ● Maximum input current 400A AC/DC (600V line). Do not measure any current that might exceed 400A. ● Read 「3. SAFETY PRECAUTIONS」 carefully to avoid electric shock hazard to the operator or serious damage to the instrument. ● Unplug the Test Leads from input terminals while current measurement. ● Do not touch any part of the power line or the circuit to be measured. 	

- Set FUNCTION Switch to " $\Rightarrow A / Hz$ ".
NOTE : To avoid incorrect measurement, do not press SHIFT key before finishing Power-on Initialize and LCD indicates 0 ± 1 digit.
- Select " \Rightarrow (DC)" or " \sim (AC)" by SHIFT key.
- Open Clamp Head, and clamp-on a single conductor.
For $\Rightarrow A$ measurement and $\sim A$ Peak Hold measurement : Align the polarity with " \Rightarrow " mark on the Clamp Head (from + to -).
NOTE : Measurement is unable if several conductors are clamped.
- Read the measurement value on LCD.
- After measurement, unclamp from the conductor and set FUNCTION Switch to "OFF".

Frequency Measurement (Hz) : Press SHIFT key twice.

Supporting Functions :
 Peak Hold (SK-7660 only),
 MAX/MIN Measurement (SK-7661 only),
 Difference Measurement, Display Hold (Refer to 4-6 to 4-9).



Charging Current measurement of car alternator

fig. 3

5-3. VOLTAGE MEASUREMENTS ($\Rightarrow V / \sim V / Hz / \%$)

WARNINGS	
<ul style="list-style-type: none"> ● Maximum input voltage is 600V AC/DC. Do not measure any voltage that might exceed 600V. ● Read 「3. SAFETY PRECAUTIONS」 carefully to avoid electric shock hazard to the operator or serious damage to the instrument. ● For dangerous voltage measurement more than 220V AC/DC, turn off the power of the circuit to be measured and use Alligator Clips (optional). Refer to " WARNING 4. Dangerous Voltage Measurement Procedure" for details. ● Do not touch any part of the power line or the circuit to be measured. 	

- Plug test lead connector into input terminals matching "+" and "-".
 - Set FUNCTION Switch to " $\Rightarrow V / Hz / \%$ ".
 - Select " \Rightarrow (DC)" or " \sim (AC)" by SHIFT key.
NOTE : LCD indicates random digits, but does not affect the specified accuracy.
 - Connect Black Test Lead to -(earth) side and Red Test Lead to +(high potential) side of the circuit to be measured.
NOTE : For Voltage Measurements, connect Clamp Meter **IN PARALLEL** to the measuring circuit.
 - Read the measurement value on LCD.
 - After measurement, set FUNCTION Switch to "OFF".
Frequency Measurement (Hz) : Press SHIFT key twice.
Duty Cycle (%) : Press SHIFT key three times.
- Supporting Functions :**
 MAX/MIN Measurement (SK-7661 only), Difference Measurement, Display Hold (Refer to 4-6 to 4-9)

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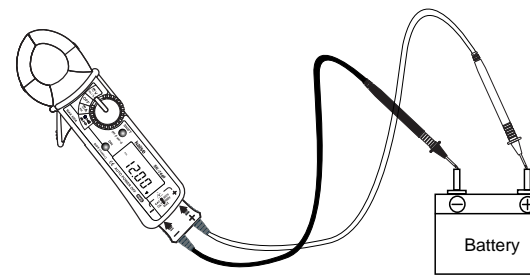


fig. 4

5-4. RESISTANCE MEASUREMENTS (Ω)

WARNINGS	
<ul style="list-style-type: none"> ● Do not measure Voltage at "$\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$" position to avoid electric shock hazard to the operator or serious damage to the instrument. ● When measuring in-circuit resistance, turn off the power of the circuit to be measured and discharge the all capacitors. ● Before measurements, read 「3. SAFETY PRECAUTIONS」 carefully. 	

- Plug test lead connector into input terminals matching "+" and "-".
- Set FUNCTION Switch to " $\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$ ".
- If the resistor to be measured is connected in a circuit, turn the circuit power off and discharge the all capacitors. Disconnect one side of the resistor.
- Connect Test Leads to the resistor (or circuit) to be measured.
- Read the measurement value on LCD.
- After measurement, set FUNCTION Switch to "OFF".

Supporting Functions :

Difference Measurement, Display Hold (Refer to 4-8 to 4-9)

5-5. CONTINUITY TESTS ($\bullet \parallel$)

WARNINGS	
<ul style="list-style-type: none"> ● Do not measure Voltage at "$\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$" position to avoid electric shock hazard to the operator or serious damage to the instrument. ● When testing in-circuit continuity, turn off the power of the circuit to be measured and discharge the all capacitors. ● Before measurements, read 「3. SAFETY PRECAUTIONS」 carefully. 	

- Plug test lead connector into input terminals matching "+" and "-".
- Set FUNCTION Switch to " $\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$ ".
- Press SHIFT Key once. " $\bullet \parallel$ " symbol appears on LCD.
- When testing in-circuit continuity, turn the circuit power off and discharge the all capacitors.
- Connect Test Leads to the circuit to be tested. Buzzer sounds when the resistance value that is displayed on LCD is approx.50 Ω or less.
- After measurements, set FUNCTION Switch to "OFF".

5-6. DIODE TEST ($\leftarrow \rightarrow \leftarrow$)

WARNINGS	
<ul style="list-style-type: none"> ● Do not measure Voltage at "$\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$" position to avoid electric shock hazard to the operator or serious damage to the instrument. ● When testing in-circuit diode, turn off the power of the circuit to be measured and discharge the all capacitors. ● Before measurements, read 「3. SAFETY PRECAUTIONS」 carefully. 	

- Plug test lead connector into input terminals matching "+" and "-".
- Set FUNCTION Switch to " $\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$ ".
- Press SHIFT Key twice. " $\leftarrow \rightarrow \leftarrow$ " symbol appears on LCD.
- If the diode to be tested is connected in a circuit, turn the circuit power off and discharge the all capacitors. Disconnect one side of the diode.
- Connect Black Test Lead to Anode side and Red Test Lead to Cathode side (Reverse Connection). Confirm "OL" is indicated o LCD.
- Connect Test Leads to the opposite sides of 5.(Foward Connection). Test results are good if the following voltage values are indicated on LCD.
 Silicon diodes 0.4V \sim 0.7V
 Germanium diodes 0.1V \sim 0.4V
- After measurement, set FUNCTION Switch to "OFF".
NOTE : Light-emitting diode is not testable.

5-7. CAPACITANCE MEASUREMENTS ($\leftarrow \rightarrow \leftarrow$)

WARNINGS	
<ul style="list-style-type: none"> ● Do not measure Voltage at "$\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$" position to avoid electric shock hazard to the operator or serious damage to the instrument. ● When testing in-circuit capacitors, turn off the power of the circuit to be measured and discharge the all capacitors. ● Before measurements, read 「3. SAFETY PRECAUTIONS」 carefully. 	

- Plug test lead connector into input terminals matching "+" and "-".
- Set FUNCTION Switch to " $\Omega / \bullet \parallel / \leftarrow \rightarrow \leftarrow$ ".
- Press SHIFT Key three times. "nF" is indicated on LCD.
- Press DIFF key to reset LCD into 0 ± 3 digit or less.
- If the capacitor to be measured is connected in a circuit, turn the circuit power off and discharge the all capacitors. Disconnect one side of the capacitor.
- Connect Test Leads to the circuit to be tested.
- Read the measurement value on LCD.
- After measurement, set FUNCTION Switch to "OFF".

⑦

NOTE : Measurement time takes longer to measure higher capacitance.
 (Example : approx. 4 sec. at 10 μF , approx. 14 sec. at 90 μF .)

6. MAINTENANCE

6-1. BATTERY REPLACEMENT

WARNING	
To prevent electrical shock hazard, turn the power off and disconnect Test Leads from the circuit before opening Battery Cover.	

Replace the battery when "BAT" symbol appears on LCD.

- Turn the power off and disconnect Test Leads from the circuit.
- Unscrew the Battery Cover and remove the exhausted batteries.
- Insert 2 pcs of new 1.5V R03 (AAA) batteries in correct polarity.
- Fix the Battery Cover and tighten the screw.

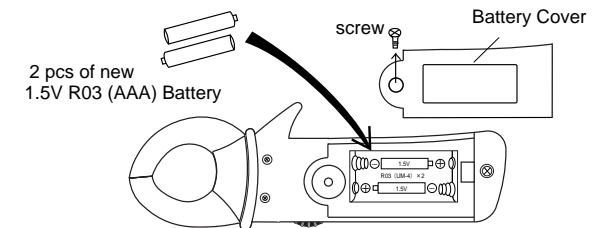


fig. 5

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.

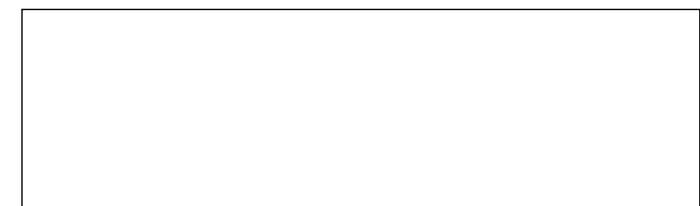
Check the following items before asking repair service.

- 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

SK-7660/7661 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-7660/7661 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.

⑧