

sanwa

SP21

MULTITESTER

INSTRUCTION MANUAL 

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[1] SAFETY PRECAUTIONS: Before use, read the following safety precautions

This instruction manual explains how to use your multimeter SP21 safely. Before use, please read this manual thoroughly. After reading it, keep it together with the product for reference to it when necessary.

The instruction given under the heading “WARNING” “CAUTION” must be followed to prevent accidental burn or electrical shock.

1-1 Explanation of Warning Symbols

The meaning of the symbols used in this manual and attached to the product is as follows.

 : Very important instruction for safe use.

- The warning messages are intended to prevent accidents to operating personnel such as burn and electrical shock.
- The caution messages are intended to prevent damage to the instrument.

 : DC Voltage

 : Ground

 : AC Voltage

 : Plus input

 : Resistance

 : Minus input

 : Continuity

 : Fuse

 : Fuse & Diode protection

 : Double insulation

 : Drop proof

1-2 Warning Instruction for safe use



WARNING

To ensure that the meter is used safely, Be sure to observe the instruction when using the instrument.

1. Never use meter on the electric circuit that exceed 3k VA.
2. Pay special attention when measuring the voltage of AC 30Vrms (42.4 Vpeak) or DC 60V or more to avoid injury.
3. Never apply an input signals exceeding the maximum rating input value.
4. Never use meter for measuring the line connected with equipment (i.e. motors) that generates induced or surge voltage since it may exceed the maximum allowable voltage.

5. Never use meter if the meter or test leads are damaged or broken.
6. Never use uncased meter.
7. Be sure to use a fuse of the specified rating or type. Never use a substitute of the fuse or never make a short circuit of the fuse.
8. Always keep your fingers behind the finger guards on the probe when making measurements.
9. Be sure to disconnect the test pins from the circuit when changing the function or range.
10. Be sure to disconnect the test pins from the circuit when changing the function or range.
11. Never use meter with wet hands or in a damp environment.
12. Never open tester case except when replacing batteries or fuse. Do not attempt any alteration of original specifications.
13. To ensure safety and maintain accuracy, calibrate and check the tester at least once a year.
14. Indoor use.

1-3 Maximum Overload Protection Input

Function (Range)	Input	Maximum rating input value	Maximum overload protection input
DCV30~600	+, -	Full scale value at the ranges	DC1000V, AC750V or PEAK MAX 1100V
ACV30~600			* DC, AC200V or PEAK MAX 250V
DCV0.3~12			
ACV12			
DCA30m/0.3			* DC, AC0.5A
DCA60 μ			* DC, AC1mA
Ω		Voltage and current input prohibited	* DC, AC200V or PEAK MAX 250V
		DC2V	
			

Note : AC voltage is regulated by rms value of sinusoidal wave.

“*” is within 5 second.

[2] APPLICATION AND FEATURES

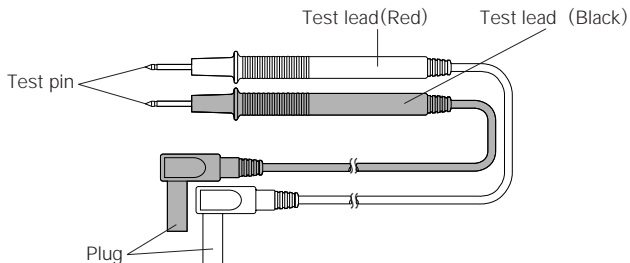
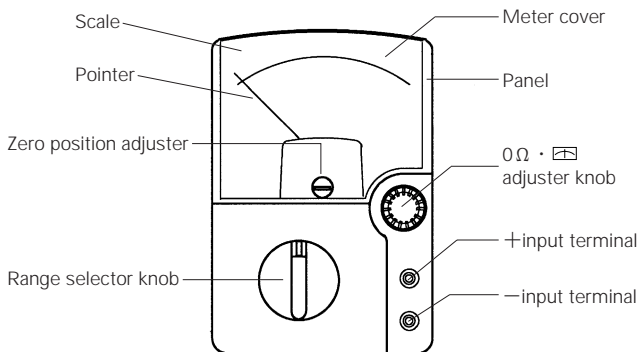
2-1 Application

This instrument is portable multimeter designated for measurement of weak current circuit.

2-2 Features

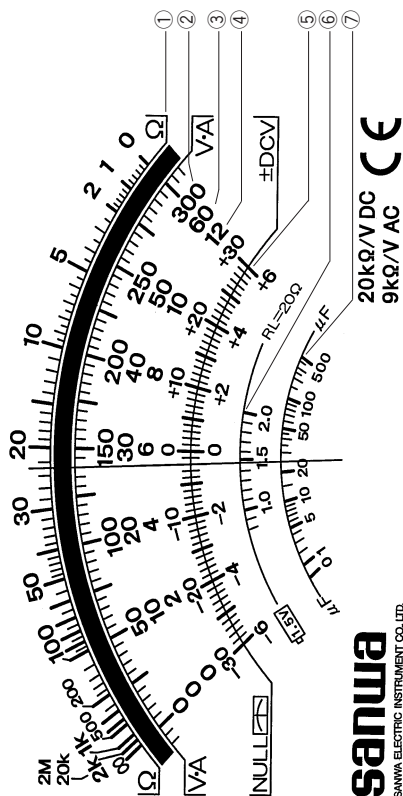
- The instrument has been designed in accordance with the safety standard IEC 1010-1 overvoltage category **III**.
- Band meter of drop shock type with high sensitivity has been employed.
- A stand has adhered.
- It can be measurement in a zero center meter.
- A continuity buzzer has adhered.
- The main unit case and the circuit board is made of fire retarding materials.
- Circuit protection is double protection according to fuse and diode.

[3] NAME OF COMPONENT UNITS



Test lead(TL-21)

[4] SCALE READING



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SANWA ELECTRIC INSTRUMENT CO., LTD.
SP21



	Range	Multiplier		Range	Multiplier
①	$\Omega \times 1k$	$\times 1k(1000)$	④	DCV120	$\times 10$
	$\Omega \times 10$	$\times 10$		DCV12	$\times 1$
	$\Omega \times 1$	$\times 1$		ACV120	$\times 10$
②	DCV30	$\times 0.1$	⑤	ACV12	$\times 1$
	DCV3	$\times 0.01$		\pm DCV30	$\times 1$
	DCV0.3	$\times 0.001$	\pm DCV6	$\times 1$	
	ACV300	$\times 1$	⑥	$\square 15V$	$\times 1$
	ACV30	$\times 0.1$	⑦	$\mu F \times 1$	$\times 1$
	DCA0.3	$\times 0.001$			
	DCA30m	$\times 0.1$			
③	DCV600	$\times 10$			
	ACV600	$\times 10$			
	DCA60 μ	$\times 0.1$			

* Please reading an indication right over pointer as possible.

● A reading example in a figure pointer place.

Function	Range	scale No.	How to reading	Reading
Ω	$\times 10$	①	23×10	230 Ω
DCV	120V	④	5.6×10	56V
ACV	300V	②	140×1	140V
DCA	60 μA	③	28×1	28 μA

[5] DESCRIPTION OF FUNCTIONS

5-1 Knob and Adjuster

○ Range selector knob

Turn this switch to turn on select the function and ranges.

○ Zero position adjuster

This adjuster knob is turn and meter pointer is adjusted to 0 point (scale left edge) .

○ 0Ω ·  Adjuster knob

It is used at the time of a resistance and \pm DCV measurement.

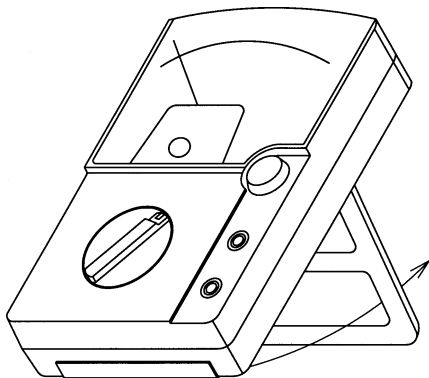
· They short test pin at the time of Ω and this knob is turn and pointer is adjusted to right edge (Ω scale of 0 place) of a scale.

Since pointer move automatically at the time of \pm DCV, this knob is turn and pointer is adjusted to center (\pm DCV scale of 0 place) of a scale.

5-2 How to Use the Stand

Please use the stand that there is on the side of rear case like a figure.

● How to use the stand

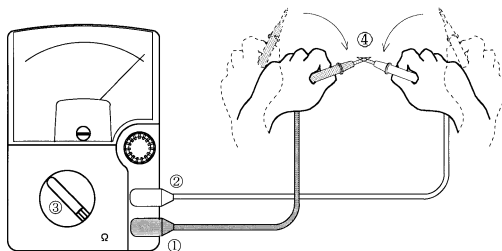
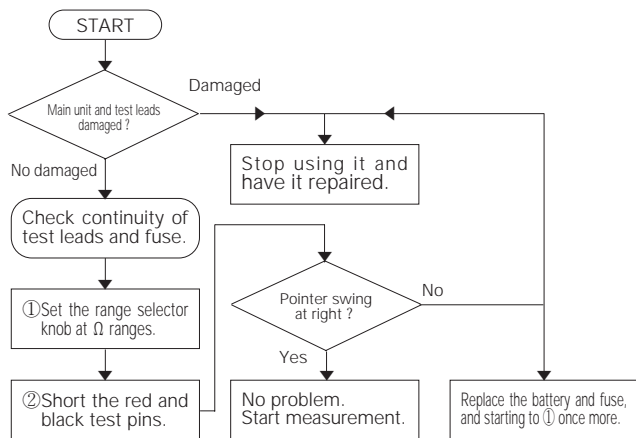


[6] MEASUREMENT PROCEDURE

6-1 Start-up Inspection

⚠ WARNING

1. Never use meter if the meter or test leads are damaged or broken.
2. Make sure that the test leads are not cut or otherwise damaged.

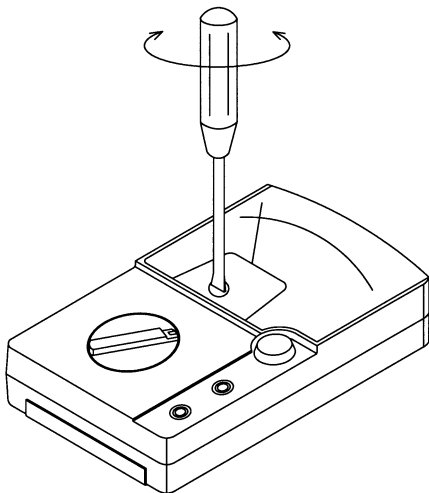


6-2 How to Setup Range (Selection of a appropriate range)

- ① At the time of a voltage, a current measurement appropriate range. When determining a measuring range, select such one for higher voltage than the value to be measured as well as where the pointer of a meter moves to a considerable extent. However, select the maximum range and measure in case the extent of value to be measured can not be predicted.
- ② At the time of resistance(Ω) measurement appropriate range. The range that pointer does an indication is chosen in the central vicinity.

6-3 Preparation for Measurement

- ① Turn the zero position adjuster so that the pointer may align left to zero position.
- ② Select a range proper for the item to be measured set the range selector knob accordingly.



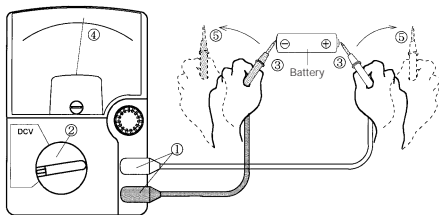
6-4 Voltage Measurement

⚠ WARNING

1. Never apply an input signals exceeding the maximum rating input value.
2. Be sure to disconnect the test pins from the circuit when changing the function.
3. Select the maximum range and measure in case the extent of value to be measured can not be predicted.
4. Always keep your fingers behind the finger guards on the probe when making measurements.

6-4-1 DCV Measurement (—) Maximum rating input value 600VDC

- 1) Applications
Measures batteries and d.c. circuits.
- 2) Measuring ranges
0.3/3/12/30/120/600(6ranges)



3) Measurement procedure

- ① Connect the testlead of the black plug to the – input terminal and the red plug to the + input terminal.
- ② Set the range selector knob to an appropriate DCV range.
- ③ Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
- ④ Read the move of the pointer by V.A scale.
- ⑤ After measurement, remove the red and black test pins from the circuit measured.

6-4-2 \pm DCV Measurement ($\overline{\text{---}}$) Maximum rating input value $\pm 30\text{V}$, $\pm 6\text{VDC}$

1) Applications

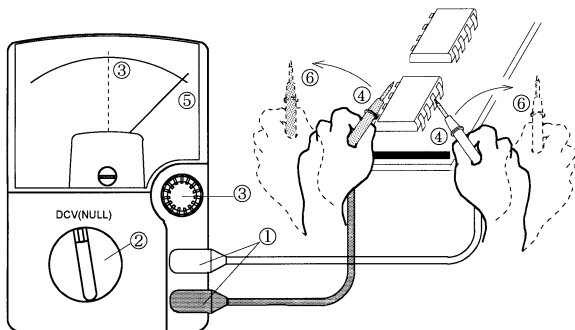
Direct current power supply circuit check of the equipment which uses IC.

2) Measuring ranges

$\pm 6/\pm 30$ (2 ranges)

3) Measurement procedure

- ① Connect the testlead of the black plug to the $-$ input terminal and the red plug to the $+$ input terminal.
- ② Set the range selector knob to an appropriate \pm DCV range.
- ③ Turn the $0\Omega \cdot \square$ adjuster so that the pointer may align exactly to 0 by \pm DCV scale.
- ④ Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
- ⑤ Read the move of the pointer by \pm DCV scale.
- ⑥ After measurement, remove the red and black test pins from the circuit measured.



6-4-3 ACV Measurement(～)Maximum rating input value 600VAC.

1) Applications

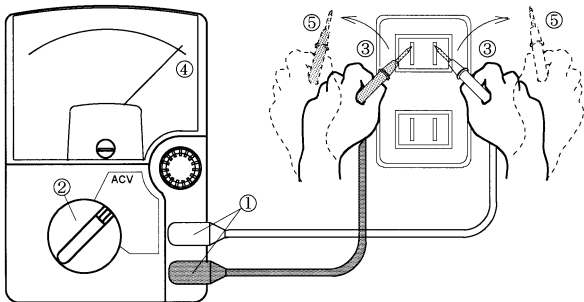
Measures sine-wave AC voltages such as lighting voltages.

2) Measuring ranges

12/30/120/300/600(5ranges)

3) Measurement procedure

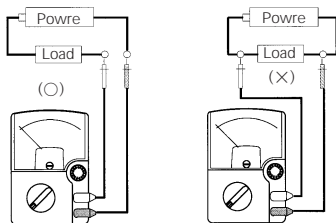
- ①Connect the testlead of the black plug to the –input terminal and the red plug to the +input terminal.
 - ②Set the range selector knob to an appropriate ACV range.
 - ③Apply the black red test pin to measured circuit.
 - ④Read the move of the pointer by V · A scale.
 - ⑤After measurement, remove the red and black test pins from the circuit measured.
- Since this instrument employs the means value system for its AC voltage measurement circuit, AC waveform other than sine wave may cause error.
 - There occurs error under such frequencies other than specified specification.



6-5 DCA Measurement (---)Maximum rating input value 0.3ADC

⚠ WARNING

1. Never apply voltage to the input terminals.
2. Be sure to make a series connection via load. (Please see to above drawing)
3. Do not apply an input exceeding the maximum rated current to the input terminals.



1) Applications

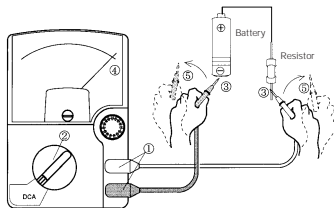
Current in batteries and DC circuit is measured.

2) Measuring ranges

$60\ \mu$ / 30m / 0.3A (3 ranges)

3) Measurement procedure

- ① Connect the testlead of the black plug to the $-$ input terminal and the red plug to the $+$ input terminal.
- ② Set the range selector knob to an appropriate DCA range.
- ③ Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
- ④ Read the move of the pointer by $V \cdot A$ scale.
- ⑤ After measurement, remove the red and black test pins from the circuit measured.



6-6 Resistance Measurement(Ω)

WARNING

Never apply voltage to the input terminals.

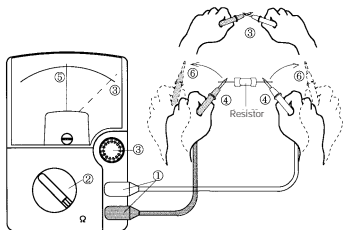
- 1) Application
Resistance of resistors and circuits are measured.
- 2) Measuring ranges
 $\times 1/\times 10/\times 1k$ (3ranges)
- 3) Measurement procedure
 - ①Connect the testlead of the black plug to the $-$ input terminal and the red plug to the $+$ input terminal.
 - ②Set the range selector knob to an appropriate Ω range.
 - ③Short the red and black test pins and turn the 0Ω adjuster so that the pointer may align exactly to 0Ω .
 - ④Apply the black and red test pin to the measured resistance.
 - ⑤Read the move of the pointer by Ω scale.
 - ⑥After measurement, remove the red and black test pins from the resistor measured.

Note : The polarity of $+$ and $-$ turns revers to that of the test leads when measurement is done in Ω range.

Note : Be sure to use the same rated fuse. In case a fuse other than the same rated one(see "SPECIFICATIONS") is used, error in indication occurs and/or circuit protection is made unble.

Note : Operating voltage of Ω range for this tester is 3V and, accordingly, operator can make lighting test of LED. $\times 10$ range is optimum for the test.

Caution : If the pointer fails to swing up to 0 Ω even when the 0Ω adjuster is turned clockwise fully, replace the internal battery with a fresh one.

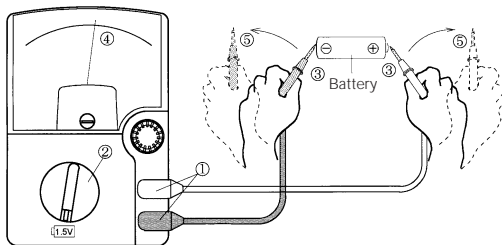


6-7 Battery check

⚠ WARNING

Never apply an input signals exceeding the battery voltage to the input terminals.

- 1) Application
Measured battery voltage.
- 2) Measuring ranges
□ 1.5V / ○ 15V
- 3) Measurement procedure
 - ① Connect the testlead of the black plug to the - input terminal and the red plug to the + input terminal.
 - ② Set the range selector knob to an appropriate □ 1.5V or ○ 15V range.



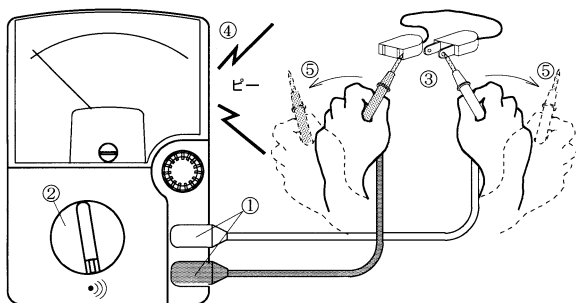
- ③ Apply the black test pin to the negative potential side of the circuit to measure and the red test pin to the positive potential side.
 - ④ Read the move of the pointer by □ 1.5V or V · A scale.
 - ⑤ After measurement, remove the red and black test pins from the battery measured.
- □ 1.5V range : 20Ω load
For measure the cylindrical type battery (R20, R14, R6, LR20, LR14, LR6 etc.)
 - ○ 15V range : 60kΩ load
For measure the button type battery (SR43, SR44 etc.)

6-8 Checking Continuity(•)))

⚠ WARNING

Never apply voltage to the input terminals.

- 1) Application
Checking the continuity of wiring and selecting wires.
- 2) How to use
 - ①Connect the testlead of the black plug to the –input terminal and the red plug to the +input terminal.
 - ②Set the range selector knob at •))) range.
 - ③Apply the red and black test pins to a circuit or conductor to measure.
 - ④The continuity can be judged by whether the buzzer sounds or not.
 - ⑤After measurement, release the red and black test pins from the object measured.



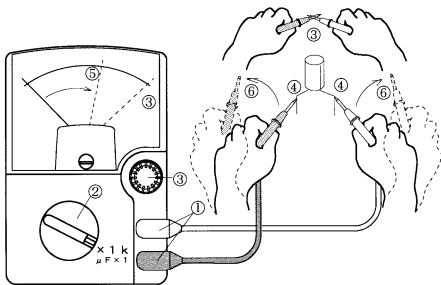
●Checking resistance range : Approx. 100Ω Max.

6-9 Measuring Capacity (μF)

⚠ WARNING

1. Never apply voltage to the input terminals.
2. Do not measure as for a condenser of a charged condition.

- 1) Application
Measured large capacitor.
- 2) Measuring ranges
 $\mu F \times 1$ (same as $\Omega \times 1k$ range)
- 3) Measurement procedure
 - ① Connect the testlead of the black plug to the $-$ input terminal and the red plug to the $+$ input terminal.
 - ② Set the range selector knob to an appropriate $\mu F \times 1$ range.
 - ③ Short the red and black test pins and turn the 0Ω adjuster so that the pointer may align exactly to 0Ω .



- ④ Apply the black and red test pin to the measured capacitor.
- ⑤ The pointer moves full scale by the charge current to the capacitor. However, the pointer starts gradual returning from a certain point. Read the indicated maximum value on μF scale.
- ⑥ After measurement, remove the red and black test pins from the object measured.

6-10 DC High Voltage measurement (Optinal HV Probe)

⚠ WARNING

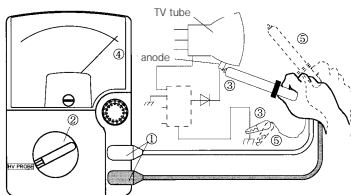
1. The probe is designed for the measurement of very small direct current circuit. Never use the probe to measure high voltage in power lines, such as transmission and distribution lines ; it is very dangerous.
2. Never apply an input signals exceeding the maximum measuring voltage (30kV) of HV prove.
3. Be sure to disconnect the test pins from the circuit when changing the function.
4. Always keep your fingers behind the finger guards on the probe when making measurements.

1) Applications

The probe is a suitable for measuring voltage of high impedance circuits, such as CRT anode voltage of TV sets and high voltage for focusing.

2) Measuring ranges

HV PROBE (DC0.3V)



3) Measurement procedure

- ① Connect the HV Probe of the black plug to the -input terminal and the red plug to the +input terminal.
- ② Set the range selector knob to **HV PROBE** range.
- ③ First, connect the clip (black) of the probe to the earth line (-) in the circuit to be measured, and then apply the measuring pin on the probe body to your measuring point.
- ④ Read the move of the pointer by V · A scale, measured value in terms of kV.
- ⑤ After measurement, remove the measuring pin from the measured circuit, and then remove the clip.

6-11 End of Measurement

Be a maximum range of DCV or ACV(600V) if measurement terminated it.

[7] MAINTENANCE

WARNING

1. This section is very important for safety. Read and understand the following instruction fully and maintain your instrument properly.
2. The instrument must be calibrated and inspected at least once a year to maintain the safety and accuracy.

7-1 Maintenance and inspection

1. Appearance

- Is the appearance not damaged by falling ?

2. Test leads and fuse

- Is the cord of the test leads not damaged ?
- Is the core wire not exposed at any place of the test leads ?

If your instrument falls in any of the above items, do not use it and have it repaired or replace it with a new one.

- Make sure that the test leads are not cut, referring to the section 6-1.

7-2 Calibration

The calibration and inspection may be conducted by the dealer. For more information, please contact the dealer.

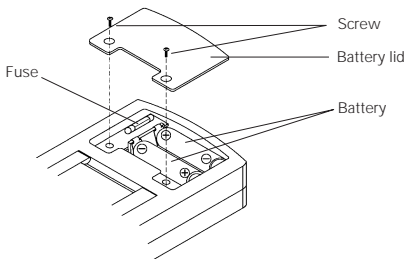
7-3 How to Replace Battery and Fuse

⚠ WARNING

1. If the rear case or the battery lid is removed with input applied to the input terminals, you may get electrical shock. Before starting the work, always make sure that no inputs is applied.
2. Be sure to use the fuse is same rating so as to ensure safety and performance of tester.
3. When operator remove the battery lid, do not touch the internal parts or wire with hand.

<How to replace the battery>

- ① Remove the battery lid screw with a screwdriver.
- ② Remove the battery lid.
- ③ Take out the battery and replace it with a new one.
- ④ Attach the battery lid and fix it with the screw.



<How to replace the fuse>

Fuse of the specified rating and type
0.5A/250V ϕ 6.3×30mm Blowout capacity:500A

- ① Remove the battery lid screw with a screwdriver.
 - ② Pull out the fuse out of holder on the circuit board and replace it.
 - ③ Put back the battery lid where it was and tighten the screw.
 - ④ Check and see whether or not indications of respective ranges are normal.
- Please use spare fuse of a battery lid back side.

7-4 Storage

CAUTION

1. The panel and the case are not resistant to volatile solvent and must not be cleaned with thinner or alcohol.
For cleaning, use dry, soft cloth and wipe it lightly.
2. The panel and the case are not resistant to heat. Do not place the instrument near heat-generating devices (such as a soldering iron).
3. Do not store the instrument in a place where it may be subjected to vibration or from where it may fall.
4. For storing the instrument, avoid hot, cold or humid places or places under direct sunlight or where condensation is anticipated.

Following the above instructions, store the instrument in good environment. (See 9-1)

[8] AFTER-SALE SERVICE

8-1 Repair

If the multimeter fails during use, check the following items before sending it for repair.

- Is the battery not exhausted ?
- Are the test leads not disconnected ?
- Is the fuse not blown ?

We repair defective product at our cost. When mailing it to us for repair, do not use the same cardboard box in which it was delivered to you because it may receive damage in transit. Please send it in a box at least five times as large as the original box with enough cushioning material stuffed around it.

8-2 For Information or Enquiries

If you need information regarding purchase of repair parts or if you have any other sales related questions, please contact the dealer, selling agent, or maker.

[9] SPECIFICATIONS

9-1 General Specifications

AC Rectifier Form

: Half-wave rectifier form

Meter type : Internal magnet type, Taut band meter

Accuracy Assurance Temperature/Humidity Range

: 21~25°C 75%RH max. No condensation

Operating Temperature/Humidity Range

: 3~43°C 80%RH max. No condensation

Storage temperature/Humidity Range

: -10~50°C 70%RH max. No condensation

Internal Battery : R6 (IEC) or UM-3 1.5V×2

Internal fuse : ϕ 6.3×30mm 0.5A/250V Fast fuse
Blowout capacity 500A

Dimension and Weight

: 144(H)×99(W)×41(D)mm · approx.270 g

Accessories : Instruction manual 1 Spare fuse 1

Test leads(TL-21) 1

Safety : Designed to protection Class **II**

requirement of IEC 1010-1 overvoltage
category **III**. (EN61010-1)

Installation Category (Overvoltage Category) **III**

: Distribution Level Fixed Installation

9-2 Optimal Accessories

· Clip adapter CL-11 (Red, Black 1set)

· HV probe HV-20

· Carrying case C-SP

9-3 Measurement Range and Accuracy

Accuracy assurance range : 23°C ± 2°C 45 ~ 75% RH max.

No condensation

Attitude : Horizontal (± 5°)

ACV accuracy in the case of sine wave AC.

Function	full scale value	Accuracy	Remarks
DCV (≡)	0.3	± 3% against full scale	Input impedance 5kΩ
	3/12/30/120/600		Input impedance 20kΩ/V
±DCV (≡)	±6/±30	± 5% against full scale	Input impedance 20kΩ/V
ACV (~)	12/30/120/300/600	± 3% against full scale	Input impedance 9kΩ/V Frequency : 40Hz ~ 100kHz with in ± 3% f.s. (AC12V range)
DCA (≡)	60 μ / 30m / 0.3	± 3% against full scale	Voltage drop 0.3V Not including the resistance of the fuse
Ω	2k/20k/2M (×1) (×10) (×1k)	± 3% of arc	Center value 20Ω Max. Value 2kΩ Release voltage 3V
Battery Check	2.0V	————	Load resistance 20Ω
•))	————	————	Release voltage 3V
Capacity (μF)	500	————	Poiter indication of the maximum move by charged current in the capacitor.

Specifications and external appearance of the product described above may be revised for modification without prior notice.

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**SANWA ELECTRIC
INSTRUMENT CO.,LTD.**

Dempa Bldg, Sotokanda2-Chome
Chiyoda-Ku, Tokyo, Japan