

sanwa

AU-31

MULTITESTER

INSTRUCTION MANUAL 

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AUTO-RANGE TYPE MULTITESTER MODEL AU-31

This is a circuit tester developed for measurement of small capacity electric circuits based on our advanced design and engineering technology. Electric circuits that can be measured include small communication equipment, household appliances, lighting lines (voltage), various batteries and other general electric circuits. Before using your new tester, please read this instruction manual that describes various useful methods of application and safe operation.

[1] FEATURES

1. Auto range

A fully automatic range selector type eliminates a need for selection of ranges for voltage or resistance measurement. The suitable range is automatically set according to application.

2. Auto polarity

Both positive and negative polarities of DC voltage and current can be automatically measured.

3. High input resistance

An input resistance as high as $10\text{M}\Omega$ for measurement of both DC and AC voltage minimizes measurement loss.

4. Series capacitor input



When measuring AC voltage in a DC and AC superimposed circuit, the DC component can be cut and only AC voltage can be detected and measured.

5. No need for 0Ω adjustment

There is no need for 0Ω adjustment, that is required when other conventional testers are used.

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

This instruction manual explains how to use your multimeter AU-31, 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.

Warning Instruction for Safe Use

 **WARNING**

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

Please be careful that the protection circuit may be undermined by unjustifiable usage that does not follow the guidelines in the instruction manual.

1. Never use the meter on the electric circuits that exceed 6kVA.
2. Pay special attention when measuring the voltage of AC 33 Vrms (46.7V peak) or DC 70V or more to avoid injury.
3. Never apply an input signals exceeding the maximum rating input value.
4. Never use the 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 the 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. Before starting measurement, make sure that the function and range are properly set in accordance with the measurement.
11. Never use the meter with wet hands or in a damp environment.
12. Never open rear 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.

[3] MEASURING RANGE AND PERFORMANCE

Table 1

Type of Measurement	Max. Scale	Allowance	Remarks
DC voltage \pm DCV	300mV	\pm 3% of max. scale.	Input resistance approx.1M Ω
	3/12/60/300/1000V	\pm 3% of max. scale. \pm 4% for 1000V	Input resistance 10M Ω min.
	30kV (by use of optional probe)	\pm 10% of max. scale.	Probe resistance 1000M Ω
AC voltage ACV	300mV	\pm 3% of max. scale. Frequency characteristic 40Hz~10kHz \pm 5%.	Input resistance approx.1M Ω Full wave rectification
	3/12/60/300/1000V	\pm 3% of max. scale. \pm 4% for 1000V	Input resistance 10M Ω min. Full wave rectification
Low frequency output dB	-9/+11/+23/+37/ +51/+62 dB 0dB=0.775V (1mW) (600 Ω)	\pm 3% of max. scale length. \pm 4% for +62 dB	Input resistance 10M Ω min. Full wave rectification
DC current \pm DCA	300mA/3A	\pm 3% of max. scale.	Shunt voltage drop 220mV
AC current ACA	300mA/3A	\pm 3% of max. scale.	Shunt voltage drop 220mV
Resistance Ω	Range Center Max x1 200 Ω 20k Ω x10 2k Ω 200k Ω x0.1k 20k Ω 2M Ω x1k 200k Ω 20M Ω x10k 2M Ω 200M Ω	\pm 3% of scale length	Terminal open voltage 1.2V DC

- Standard working temperature : $23 \pm 2^{\circ}\text{C}$
- Standard working frequency : 50 Hz ~ 60 Hz
- Standard working humidity : 45 ~ 75% RH
- Working temperature range : 0 ~ 40°C
- Working humidity range : 80% RH max.
(No condensation)
- Dimensions and weight : 110(W) x 124(D) x 48(H)mm,
290g
- Accessories : Instruction manual,
A pair of test leads (TL-61G type),
Fuse (5 ϕ x 20mm, 250V/0.5A)
- Battery : R03(IEC)or UM-4
4 pieces
- Life of dry cell : Approx. 100 hours
when used 8 hours a day
- * Factory-preinstalled built-in battery
A battery for monitoring is preinstalled before shipping, therefore it may run down sooner than the battery life specified in the instruction manual. The "battery for monitoring" is a battery to inspect the functions and specifications of the product.
- Options : DC 30kV probe(HV-50 type),
Portable case(C-AU type)

[4] APPEARANCE AND NAMES OF COMPONENTS

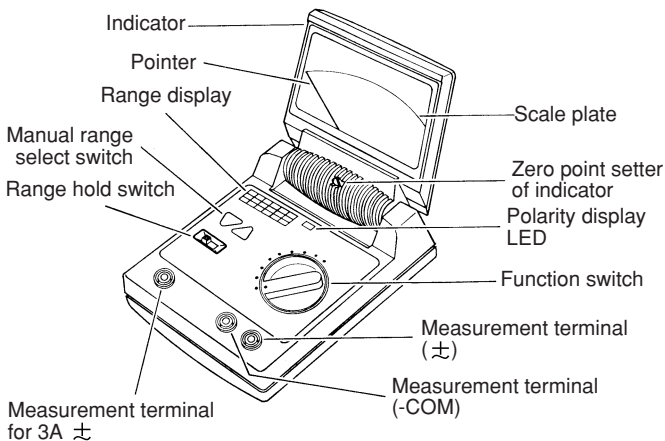


Fig. 1 Tester

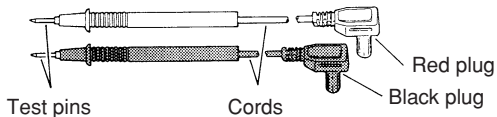


Fig. 2 Test Leads

[5] HOW TO READ SCALE PLATE

Unlike other conventional testers, this tester is of auto range type and does not show a value in the current range corresponding to the position of the switch, but instead shows it on the range display.

First look at the line indicated by the function switch (V, Ω , mV • mA) and go down the column on which the range display LED is lit. Then, read a value indicated by the pointer as follows.

Table 2

Column Indicated by LED	Scale of Scale Plate to Read	Magnification of Value Read	Value to Read
V	3 scale 0 ~ 3 12 scale 0 ~ 12 60 scale 0 ~ 60 300 scale 0 ~ 3 1000 scale 0 ~ 1000	x 1 x 1 x 1 x 100 x 1	0 ~ 3V 0 ~ 12V 0 ~ 60V 0 ~ 300V 0 ~ 1000V
Ω	Ω scale 0 ~ ∞ 0 ~ ∞ 0 ~ ∞ 0 ~ ∞ 0 ~ ∞	x 10k x 1k x 100 x 10 x 1	Center 2M Ω Center 200k Ω Center 20k Ω Center 2k Ω Center 200 Ω
mV • mA 300	A scale 0 ~ 3	x 100	0 ~ 300mV, mA

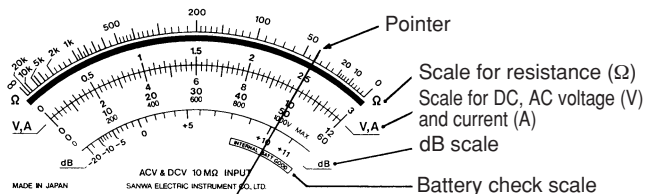


Fig. 3 Scale Plate

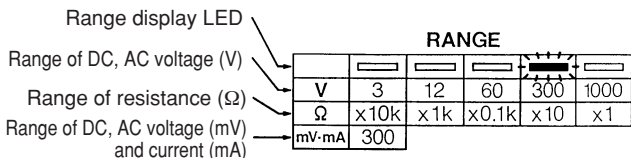


Fig. 4 Range Display and Example of Measurement

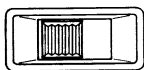
(Example of measurement)

1. Function switch: Set to “V $\overline{\text{---}}$ ” position
2. Range display: LED lit on 300 (Fig. 4)
3. Pointer of indicator: As in Fig. 3

How to read: A value to read is 0 ~ 300V scale as show in Table 2 and the voltage is 250 VDC.

[6] HOW TO FIX RANGE

A range can be fixed with the range hold switch. This function is used for measurement of DCV, ACV and Ω .



AUTO HOLD ——— Range is fixed.

————— Range is automatically selected.

[7] HOW TO SELECT RANGE MANUALLY

A range can be changed over by pressing the manual range select switch. This function is used for measurement of DCV, ACV and Ω .



————— Range is changed to right.

————— Range is changed to left.

This switch is valid regardless of setting of the range hold switch and is useful for reading in a different range. Note, however, that this switch will not operate with the function switch at positions other than “V~” , “V $\overline{\text{---}}$ ” and “ Ω ” .

[8] PREPARATION FOR MEASUREMENT

⚠ For safe operation, be sure to check the position of the function switch, terminals to use and condition of connection of the test leads to the tester before starting measurement.

When measurement has been completed, be sure to return the function switch to “POWER OFF” to prevent unnecessary consumption of the battery. As a countermeasure against a failure to do this operation, the tester is designed to turn off the power automatically when its indicator section is closed.

1. Check of the battery

The tester is driven by four dry cells R03. Before starting measurement, check the remaining capacity. Turn the function switch to “INTERNAL BATT CHECK” (a range to check the battery). Then, the pointer deflects toward the right. The capacity is sufficient when the pointer comes within the range of “INTERNAL BATT GOOD” at the lowest scale of the scale plate. If the pointer stops on the left of this range, the dry cells have been consumed and replace them in accordance with the procedure described in [15] MAINTENANCE.

2. Zero adjustment of the indicator

If the pointer stays off the 0V line at the left end of the scale plate, adjust it to the 0V line by turning the zero point setter of indicator with a screwdriver.

[9] MEASURING OF DC VOLTAGE

● Measurement of 0 ~ $\pm 1000\text{V}$ DC (auto range)

Measurement of DC voltage below $\pm 1000\text{V}$ max.

⚠ For safe measurement, never apply a voltage exceeding $\pm 1000\text{VDC}$.

⚠ Never apply an excessive voltage (more than 100 times the maximum value of the applicable range) with the range held.

After preparation described in [8] PREPARATION FOR MEASUREMENT has been completed, measure voltage as follows.

1. Connect the black plug of the test lead to the measurement terminal (-COM) and the red plug to (\pm).
2. Turn the function switch to “V $\overline{\text{---}}$ ” .
3. Set the range hold switch at “AUTO” .
4. Apply the test pins to an object.
5. Read the value as indicated on the range display. This is the voltage you have measured.
(If the polarity display LED lights, it indicates that the + potential is applied to the measurement terminal (-COM) and - potential to the(\pm .)
6. After measurement, release the test pins from the object.
7. Return the function switch to “POWER OFF” .

● Measurement of $\pm 300\text{mV}$ (fixed range)

Measurement of DC voltage below $\pm 300\text{mV}$ max.

⚠ Never apply an excessive voltage (over 100VAC or DC)

The measuring procedure is the same as for the above steps 1 to 7, except for the step 2 where the function switch should be turned to “mV $\overline{\text{---}}$ ” .

[NOTE] Influence of the electromagnetic field

ACV and DCV measurement functions may not work properly in the electromagnetic field over 10kHz.

[10] MEASURING OF AC VOLTAGE

● Measurement of 0 ~ 1000V AC (auto range)

Measurement of sine wave AC voltage below 1000V max.

⚠ For safe measurement, never apply a voltage above 1000V AC.

⚠ Never apply an excessive voltage (more than 100 times the maximum value of the applicable range) with the range held.

After preparation described in [8] PREPARATION FOR MEASUREMENT has been completed, measure voltage as follows.

1. Connect the plugs of the test leads to the measurement terminals (-COM) and (\pm).

(For AC voltage measurement, the red and black plugs need not be distinguished.)

2. Turn the function switch to “V~” .

3. Set the range hold switch at “AUTO” .

4. Apply the test pins to an object.

5. Read the value as indicated on the range display. This is the voltage you have measured.

6. After measurement, release the test pins from the object.

7. Return the function switch to “POWER OFF” .

● Measurement of 300mV (fixed range)

Measurement of sine wave AC voltage below 300mV max.

⚠ Never apply an excessive voltage (above 100VAC or DC)

The measuring procedure is the same as for the above steps 1 to 7, except for the step 2 where the function switch should be turned to “mV~” .

[11] MEASURING OF LOW FREQUENCY OUTPUT(dB)

The dB value is scaled in the 3V AC range and only when the impedance is 600Ω, 0dB is equal to 1mW and the output value can be read directly. (0dB = 1mW = 0.775V at 600Ω)

1. The measuring procedure is the same as for measurement of AC voltage.
2. Add the following dB values to dB values on the scale panel in the ACV range.

Table 31

AC voltage range	300mV	3V	12V	60V	300V	1000V
dB value to add	-20	0	+12	+26	+40	+52

[12] MEASURING OF RESISTANCE (auto range)

Measurement of DC resistance below 200MΩ max.

⚠ Never apply an external voltage. Otherwise, the tester may be damaged.

- Caution:
- Be sure to turn off the power source switch of measured circuit when the resistance in the circuit is measured.
 - Make sure that no voltage is applied to a resistor to measure.

After preparation described in [8] PREPARATION FOR MEASUREMENT has been completed, measure resistance as follows.

1. Connect the plugs of the test leads to the measurement terminals (-COM) and (±).
2. Turn the function switch to “Ω” .
3. Set the range hold switch at “AUTO” .
4. Apply the test pins to an object.
5. Read the value as indicated on the range display. This is the resistance you have measured.
6. After measurement, release the test pins from the object.
7. Return the function switch to “POWER OFF” .

- 0Ω setter(Refer to Fig. 6 in [16] MAINTENANCE) This tester employs the constant voltage method for measurement of resistance and there is no need of 0Ω adjustment for normal measurement.

To cancel resistance of the test leads in measurement in the x 1Ω range, turn the 0Ω setter in the battery case with the test pins shorted CW or CCW to the 0Ω line at the right end of the Ω scale. Also if the 0Ω point has moved over a long period of use, make 0Ω adjustment in the same manner.

- Applicable voltage and current in measurement of resistance
Measurement of resistance is conducted with the internal power source. About 1.2V is output as follows: + to the (-COM) terminal and - to the (±) terminal. When this voltage is applied, the following current flows. Refer to the following table when measuring polarized resistors such as transistors and diodes or resistors whose values change according to intensity of current to flow.

Table 4

Range	x10k	x1k	x0.1k	x10	x1
Voltage (terminals open)	1.2V constant				
Current (terminals shorted)	0.6 μA	6 μA	60 μA	600 μA	6mA

[13] MEASURING OF DC CURRENT (fixed range)

● Measurement of $0 \sim \pm 300\text{mA}$ ($0 \sim \pm 3\text{A}$)

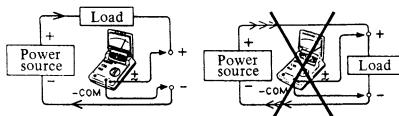
⚠ To prevent damage to the tester and personal injury, do not measure current when the voltage exceeds $\pm 600\text{V}$.

After preparation described in [8] PREPARATION FOR MEASUREMENT has been completed, measure current as follows.

1. Connect the black plug of the test lead to the measurement terminal(-COM) and the red plug to (\pm).
(For measurement of $0 \sim \pm 3\text{A}$, connect the red plug to the special measurement terminal for 3A \pm .)
2. Turn the function switch to “mA/3A --- ” .
3. Apply the test pins to an object.
4. Read the value as indicated on the range display. This is the current you have measured.
(If the polarity display LED lights, it indicates that the + potential is applied to the measurement terminal (-COM) and -potential to the (\pm).)
5. After measurement, release the test pins from the object.
6. Return the function switch to “POWER OFF” .

Current measuring circuit (for both AC and DC):

⚠ For measurement of current, connect the tester in series with an object to measure as shown below.



○ Correct circuit

× Dangerous circuit

Never make this dangerous circuit.

Fig. 5

[14] MEASURING OF AC CURRENT (fixed range)

● Measurement of 0 ~ 300mA(0 ~ 3A)

⚠ To prevent damage to the tester and personal injury, do not measure current when the voltage exceeds $\pm 600\text{V}$.

After preparation described in [8] PREPARATION FOR MEASUREMENT has been completed, measure current as follows.

1. Connect the plugs of the test leads to the measurement terminals (-COM) and (\pm).
(For AC current measurement, the red and black plugs need not be distinguished.)
2. Turn the function switch to “mA/3A~” .
3. Apply the test pins to an object.
4. Read the value as indicated on the range display. This is the current you have measured.
5. After measurement, release the test pins from the object.
6. Return the function switch to “POWER OFF” .

Protection circuit:

⚠ As a safety measure against misoperation in measurement of resistance and current, a fuse is set in the input section (but no fuse in the measurement terminal for 3A \pm). If the tester is operated erroneously, this fuse is blown. Although this fuse can protect the tester, the best practice is, of course, to operate the tester as instructed in this manual.

[15] MAINTENANCE

15-1 Replacement of dry cells (Refer to Fig. 6):

Replace dry cells if the pointer stays out of the range of "INTERNAL BATT GOOD" when the function switch is turned to "INTERNAL BATT CHECK" .

1. Remove the battery case lid.
2. Remove four old dry cells R03 and set new ones (UM-4SG).
(Pay attention to the polarity.)
3. Remount the battery case.

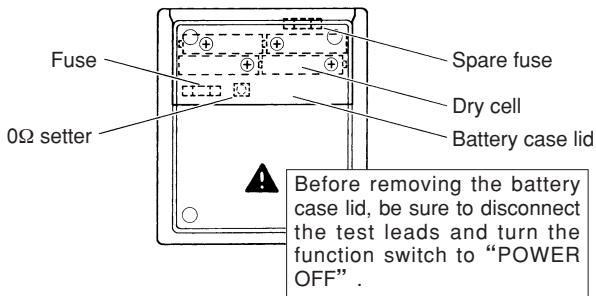


Fig. 6 Layout of Dry Cells and Fuses

15-2 Replacement of fuses (Refer to Fig. 6):

1. Remove the battery case lid and replace fuses.
2. Use a mini fuse of 5 ϕ x 20mm of rating of 250V AC/0.5A.

15-3 Cleaning and Storage

CAUTION

1. For cleaning, wipe lightly with a soft, and either dry or slightly water-dampened cloth. Do not use volatile solvent such as thinner or alcohol for panel, case, and meter cover.
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.

[16] AFTER-SALES SERVICE

16-1 Warranty and Provision

Sanwa offers comprehensive warranty services to its end-users and to its product resellers. Under Sanwa's general warranty policy, each instrument is warranted to be free from defects in workmanship or material under normal use for the period of one (1) year from the date of purchase.

This warranty policy is valid within the country of purchase only, and applied only to the product purchased from Sanwa authorized agent or distributor.

Sanwa reserves the right to inspect all warranty claims to determine the extent to which the warranty policy shall apply. This warranty shall not apply to fuses, test leads, disposables batteries, or any product or parts, which have been subject to one of the following causes:

1. A failure due to improper handling or use that deviates from the instruction manual.
2. A failure due to inadequate repair or modification by people other than Sanwa service personnel.
3. A failure due to causes not attributable to this product such as fire, flood and other natural disaster.

4. Non-operation due to a discharged battery.
5. A failure or damage due to transportation, relocation or dropping after the purchase.

16-2 Repair

Customers are asked to provide the following information when requesting services:

1. Customer name, address, and contact information
2. Description of problem
3. Description of product configuration
4. Model Number
5. Product Serial Number
6. Proof of Date-of-Purchase
7. Where you purchased the product
- 1) Prior to requesting repair, please check the following:
Capacity of the built-in battery, polarity of installation and discontinuity of the test leads.
- 2) Repair during the warranty period:
The failed meter will be repaired in accordance with the conditions stipulated in 16-1 Warranty and Provision.
- 3) Repair after the warranty period has expired:
In some cases, repair and transportation cost may become higher than the price of the product. Please contact Sanwa authorized agent / service provider in advance.
The minimum retention period of service functional parts is 6 years after the discontinuation of manufacture. This retention period is the repair warranty period. Please note, however, if such functional parts become unavailable for reasons of discontinuation of manufacture, etc., the retention period may become shorter accordingly.
- 4) Precautions when sending the product to be repaired
To ensure the safety of the product during transportation, place the product in a box that is larger than the product 5 times or more in volume and fill cushion materials fully and then clearly mark "Repair Product Enclosed" on the box surface. The cost of sending and returning the product shall be borne by the customer.

16-3 SANWA web site

<http://www.sanwa-meter.co.jp>

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sanwa

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