

AU-32 MULTITESTER

取扱説明書 INSTRUCTION MANUAL

三和電気計器株式会社

本社 東京都千代田区外神田4-4-1 電話 03-3253-4871
総機部 03-3253-4871
大阪営業所 大阪府東淀川区東山町2-7-2 電話 06-6631-7361
福岡営業所 福岡県福岡市東区東区2-7-2 電話 092-6631-7361

SANWA ELECTRIC INSTRUMENT CO., LTD.
Densetsu Bldg., 4-4-1, Sotokanda, Chiyoda-Ku, Tokyo, Japan

植物油インキを使用しています。

09-1108 2040 2040

オートレンジ式マルチテスタ MODEL AU-32

1. はじめに

このたびは、オートレンジ式マルチテスタ AU-32 を、お買い上げいただきまして誠にありがとうございます。
ご使用にあたりましては、取扱説明書をよくお読みいただき正しく安全にご使用ください。
また、取扱説明書は製品と共に大切に保管してください。

2. 安全に関する項目 ～ご使用前に必ずお読みください～
本書および取扱説明書中に使用されており、マークは次のことを意味します。
● 高電圧が印加されるため注意してください。
▲ 人身事故あるいは機器の破損事故など起こる恐れがあるため注意してください。

警告

下記の項目は、やけどや感電などの人身事故を防止するためのものです。取扱説明書の記載内容とともに必ずお守りください。

- 6kVAを超える電力ラインでは使用しないこと。
- AC33Vrms(46.7Vpeak)またはDC70V以上の電圧は人体に危険ですから注意すること。
- 最大定格入力値を超える信号は入力しないこと。
- 最大過負荷入力値を超えるおそれがあるため、静電電圧、サージ電圧の発生する(モーターなど)ラインの測定はしないこと。
- 本体またはテストリードが濡れている場合は使用しないこと。
- ケースをはずした状態で使用しないこと。
- ヒューズは必ず指定定格および仕様のもので使用すること。
- ヒューズの代替品を用いたり短絡などは絶対にしないこと。
- 測定中はテストリードのつばより先のテストピン側を持たないこと。
- 電圧端子に電圧を入力しないこと。電圧を入力するとショート状態になります。特に大電流専用端子には測定時以外は必ずサーフェイキャップを差し込み、テストリードの挿入を防止すること。
- 測定中は他のファンクションに切り換えないこと。
- 測定ごとのレンジおよびファンクションの確認を確実にすること。
- 本書または手がなでた状態で使用はしないこと。
- テストリードは指定タイプのもので使用すること。
- 電池交換、ヒューズ交換を除く修理・改造は行わないこと。
- 始業点検および年1回以上の点検は必ず行うこと。
- 屋内で使用すること。

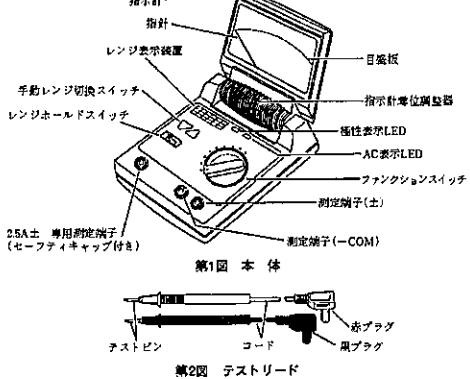
3. 製品の概要

3-1 用途と特長

(1)用途

- 小形の通信機器や家電製品、電灯線電圧や各種電池等の一般電気回路の測定に使用いただけます。
- (2)特長
 - ① 電圧・抵抗測定は、本格的フルオートレンジ式ですので、自動的に最適レンジに設定されます。
 - ② 電圧・電流測定は、自動的にDCかACかを判別しますので、ファンクション切り換えの必要性がありません。
 - ③ 直読電圧、電流は、同一極性の測定が、自動的にこなされます。
 - ④ 電圧測定時の入力抵抗は、直読、交流共に10MΩと高いため、測定ロスがありません。
 - ⑤ 抵抗測定時の0Ω調整は、必要ありません。

3-2 各部名称



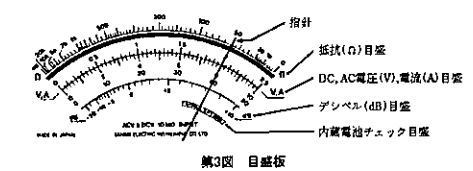
— 2 —

4. 測定方法

4-1 目盛板の読み取り方

本書は、オートレンジ式のため一般のテスタのようにスイッチツマミの位置によって、現在のレンジの値が表示されません。かわりにレンジ表示装置により表示されます。
読み取り方は、ファンクションスイッチで設定されているものと同じ行(V, Ω, OTHERS)で、上部にレンジ表示LEDが点灯している欄をみます。それにより次のように指示針の指針の指示値を読み取ります。

レンジ	LEDの点灯している所	読み取る目盛板の目盛	読取る倍率	読取る数値	
V	V	2.5	V目盛 0~2.5	×1	0~2.5V
		10	0~10	×1	0~10V
		50	0~50	×1	0~50V
		250	0~250	×100	0~250V
		500	0~500	×10	0~500V
Ω	Ω	×10k	Ω目盛 0~∞	×10k	中心 2MΩ
		×1k	0~∞	×1k	中心 200kΩ
		×0.1k	0~∞	×100	中心 20kΩ
		×10	0~∞	×10	中心 2kΩ
		×1	0~∞	×1	中心 200Ω
250mV	OTHERS	● V目盛 0~2.5	×100	0~250mV	
250μA	OTHERS	● A目盛 0~2.5	×100	0~250μA	
2.5mA	OTHERS	● A目盛 0~2.5	×1	0~2.5mA	
25mA	OTHERS	● A目盛 0~2.5	×10	0~25mA	
250mA	OTHERS	● A目盛 0~2.5	×100	0~250mA	
2.5A	OTHERS	● A目盛 0~2.5	×1	0~2.5A	



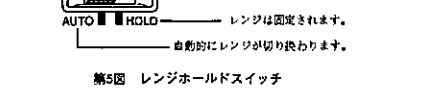
— 3 —

RANGE	レンジ表示装置	計測例
V	2.5	2.5V
V	10	10V
V	50	50V
V	250	250V
V	500	500V
Ω	×10k	10kΩ
Ω	×1k	1kΩ
Ω	×0.1k	100Ω
Ω	×10	10Ω
Ω	×1	1Ω

- (指示針の読み取り方およびレンジ表示装置の読み取り方)
 (1) ファンクションスイッチを「V」の位置に設定
 (2) レンジ表示装置の表示：250V以上に点灯(第4図)
 (3) 指示針の読み取り：第3図のように指示した。
 ● 読み取り方1 → 表1に示すように読み取る数値は0~250V目盛であるからDC200Vと読み取る。
 ● 読み取り方2(極性LEDが点灯した場合) → DC200Vと読み取る。
 ● 読み取り方3(AC表示LEDが点灯した場合) → AC200Vと読み取る。

4-2 レンジを固定するには

レンジホルドスイッチにより、レンジを固定することができます。V, Ω測定の際に使用します。



この値が求められる電圧値となります。
(AC表示LEDが点灯した場合には、交流電圧が、消灯している場合には、直流電圧が測定端子に、印加されていることを意味します。また、極性表示LEDが点灯した場合は、測定端子(-COM)側に+電位が、(±)側に-電位が印加されていることを意味します。)

- (4) レンジ表示装置にしたがって、指示値を読み取ります。
この値が求められる電圧値となります。
(AC表示LEDが点灯した場合には、交流電圧が、消灯している場合には、直流電圧が測定端子に、印加されていることを意味します。また、極性表示LEDが点灯した場合は、測定端子(-COM)側に+電位が、(±)側に-電位が印加されていることを意味します。)

▲セーフティ(安全)キャップについて
2.5A専用測定端子にはヒューズが入っておりますが、電圧測定の際のテストリード挿入時のために、セーフティキャップが装着されています。2.5Aレンジを使用するとき以外は外さないでください。

4-8 電流の測定(固定レンジ式)

● DC 0~±2.5AおよびAC 0~2.5Aの測定
最大2.5A以下の直流電流および正弦波交流電流の測定。

ファンクションスイッチの電流レンジ	測定範囲	DCA	ACA
250μA	0~±250μA	0~250μA	0~250μA
2.5mA	0~±2.5mA	0~2.5mA	0~2.5mA
25mA	0~±25mA	0~25mA	0~25mA
250mA/2.5A	0~±250mA	0~250mA	0~250mA
	0~±2.5A	0~2.5A	0~2.5A

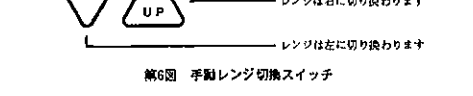
▲ 損傷や事故防止のため、250Vを超える電圧が印加されている回路の電流測定はおこなわないでください。
第4-4項の測定前の準備が済みましたら、
(1) 測定端子(-COM)にテストリードの黒プラグ、(±)に赤プラグ(DC 0~±2.5AおよびAC 0~2.5Aの測定の際には、2.5A専用測定端子に赤プラグをそれぞれ接続します。(交流電流の場合、赤黒の区別にはこだわらない。)

6. アフターサービスについて

- 保証期間について**
本製品の保証期間は、お買い上げの日より3年間です。ただし、日本国内で購入し日本国内でご利用いただく場合に限りです。また、製品本体の許容差は1年保証、製品付属の電池、ヒューズ、テストリード等は保証対象外とさせていただきます。
- 有償修理について**
1. 修理をご依頼の前には、ご連絡ください。
① 内蔵ヒューズの切れ ② テストリードの断線
③ 内蔵電池の消耗
2. 修理期間：本品の検修部品等の最低保証期間は、製造打切後6年間です。(修理期間も準じます)
3. 修理費用：修理や輸送費用が製品価格よりかさむ場合もありますので、事前にお見積りをご相談ください。
4. 輸送費用：輸送にかかる送料は、修理費用と併せてお見積りさせていただきます。
5. 送り先は：下記宛に「修理品在中」としてお送りください。
三和電気計器株式会社 研修工場サービス課
〒205-8604 東京都羽村市神明町4-7-15
TEL(042)551-0113
- 検修用ヒューズについて**
検修用ヒューズをお求めの場合は、上記サービス課にてヒューズの大きさと定格を明記し、ヒューズ代金と送料分の切手を同封してご注文ください。(大きさ) (定格) (しり断容量) (構造) (送料)
φ5×20 300mA/250V 300A ¥42 ¥110(10本まで)
- お問合せ先について**
東京本社 TEL(03)3253-4871 FAX(03)3251-7022
大阪営業所 TEL(06)6631-7361 FAX(06)6644-3249
お客様計測相談室 TEL 0120-51-3930
受付時間 09:00~12:00 13:00~17:00(土日祭日を除く)
ホームページ http://www.sanwa-meter.co.jp

4-3 手でレンジを切り換えるには

手動レンジ切換スイッチを押すことにより、レンジを切り換えることができます。V, Ω測定の際に使用します。



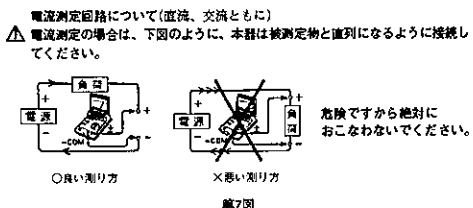
このスイッチは、レンジホルドスイッチの設定に関係なく動作しますので、違うレンジで読み取りたい場合にご利用ください。ただし、ファンクションスイッチの「V」および「Ω」以外では動作しません。

4-4 測定前の準備事項

▲ 安全にご使用いただくために、測定前には必ず、ファンクションスイッチの位置、使用端子、テストリードのテストタテの装着状態を確認してください。また、測定後は内蔵電池の消費を防ぐため必ず、ファンクションスイッチを「POWER OFF」に戻してください。
なお、本書は万一この操作を忘れたととの場合に、指示針をおり曲げて閉じた場合、自動的に電源スイッチが切れるようになっています。

- (1) 内蔵電池の確認
本書は第4(R03)乾電池4本で動作しておりますので、測定前に電池容量の確認をおこなってください。
ファンクションスイッチを内蔵電池確認レンジ(「INTERNAL BATT CHECK」)に合わせると、指示針が右方向へ移動しますので目盛板の最下部(INTERNAL BATT GOOD)の範囲内にあるかどうかを確認します。この位置より左にはずれている場合は、電池が消耗しているため、第52項の方法で新しい電池と交換してください。
- (2) 指示針のゼロ調整
指示針の指針が、目盛板の0Vラインよりはずれているときは、指示針ゼロ調整器をドライバーなどでまわして、0Vラインにあわせてください。

- (2) ファンクションスイッチを表3の測定範囲に適した電流レンジ位置に設定します。
(例) 25mAの測定をする場合には、ファンクションスイッチを「25mA」の位置に設定します。
(3) 被測定物にテストピンを接触し、測定します。
(4) レンジ表示にしたがって、指示値を読み取ります。
この値が求められる電流値となります。
(AC表示LEDが点灯した場合には、交流電流が、消灯している場合には、直流電流が、測定端子に印加されていることを意味します。また、極性表示LEDが点灯した場合には、測定端子(-COM)側に+電位が、(±)側に-電位が印加されていることを意味します。)



▲ 保護回路について
本書は、抵抗、電流測定の際、もしも誤操作された場合にそなえ、入力部にヒューズが入っており、過熱するようになっております。しかし、安全のため誤操作をしないよう、ご注意ください。
(注記) 2.5A専用測定端子には安全のため、ヒューズが入っていますが、万一過熱した場合は、修理品として弊社までお送りください。

7. 仕様

測定の種類	最大目盛値	許容差	備考
直流電圧 ±DCV	250mV	最大目盛値の±3%	入力抵抗 約1MΩ
	2.5/10/50/250/500V	最大目盛値の±3%	入力抵抗 10MΩ以上
交流電圧 ACV	25V	最大目盛値の±3%	プローブ抵抗 1000MΩ
	250mV	最大目盛値の±3%	入力抵抗 約1MΩ
低周波出力 dB	2.5/10/50/250/500V	最大目盛値の±3%	全波整流式
	10/10/10/22/4/35/50/7/56dB	目盛長の±3%	周波数特性 40Hz~10kHz±5%
直流電流 ±DCA	250μA/2.5mA/25mA/250mA	最大目盛値の±3%	分波器電圧 降下200mV
	250μA/2.5mA/25mA/250mA/2.5A	最大目盛値の±3%	分波器電圧 降下200mV
交流電流 ACA	250μA/2.5mA/25mA/250mA/2.5A	最大目盛値の±3%	分波器電圧 降下200mV
	250μA/2.5mA/25mA/250mA/2.5A	最大目盛値の±3%	周波数特性 40~600Hz±5%
抵抗 Ω	レンジ 中心値 最大値	目盛長の±3%	端子開放電圧 DC1.2V
	×1 200Ω 20kΩ		
	×10 2kΩ 200kΩ		
	×0.1k 200Ω 2MΩ		
	×1k 200kΩ 20MΩ		

- 標準使用温度：23±2℃
- 標準使用周波数：50Hz~60Hz(正弦波交流)
- 許容差保証温度範囲：23±2℃、75%RH以下 結露のないこと
- 使用湿度範囲：0~43℃、80%RH以下 結露のないこと
- 使用相対湿度範囲：80%以下(ただし結露のないこと)
- 保存湿度範囲：-10~50℃ 70%RH以下(結露のないこと)
- 寸法・重量：110(W)×124(D)×48(H)mm 290g
- 付属品：取扱説明書、テストリード1組(TL-61形) ヒューズ(5φ×20mm, 300mA/250V)
- 内蔵電池：R03(単4)1.5V×4
- 電池寿命：1日8時間使用にて 約100時間
- 出荷時の電池について
工場出荷時にモニター用電池が組み込まれておりますので、記載された電池寿命に満たないうちに切れることがあります。モニター用電池とは製品の機能や性能をチェックするための電池のことです。
- 別売付属品：直読25kV用プローブ(HV-50形) 携帯ケース(CAU形)

取扱説明書に載った仕様、外観など、改良その他やむを得ない理由により、予告なしに変更することがありますがご了承ください。

- 0Ω調整器について(第52項、第8項参照)
本書は抵抗測定に定電圧法をもちいてありますので、一般測定では0Ω調整の必要はありません。ただし、×10レンジでのテストリードなどの抵抗をキャンセルして測定される場合は、テストリードを短絡させた状態でバッテリーケース内の0Ω調整器を左右に回転し0Ω表示の0Ωラインにあわせてください。また、長年のご使用で0Ω点が変動した場合はこの方法で0Ωラインにあわせてください。
- 抵抗測定時の印加電圧と電流について
抵抗測定は、本書の内蔵電源よりおこないます。このとき極性は、(-COM)端子側に+が、(±)端子側に-が約1.2V出力されます。また、その時の電流は次の表の通りですのトランジスタやダイオードなど有極性抵抗の測定の際に、流れる電流によって抵抗値が変わる物を測定される場合にご利用ください。

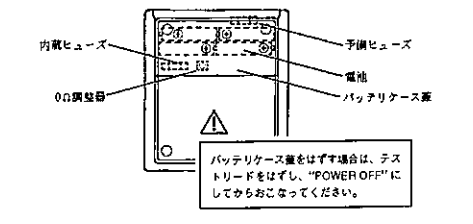
レンジ	×10k	×1k	×0.1k	×10	×1
電圧(端子開放時)			1.2V	一定	
電流(端子短絡時)	0.6μA	6μA	60μA	600μA	6mA

▲ 電圧測定上の注意
本書は高感度のアナログテスタであるために、外部からのノイズを拾いやすいという性質があります。高抵抗(100kΩ以上)を測定する際は…
● 金属部に指を絶対につれないこと。
● なるべく短い(10cm以下)リード線で接続すること。

4-7 250mVの測定(固定レンジ式)

- DC 0~±250mVおよびAC 0~250mVの測定
最大250mV以下の直流電圧および正弦波交流電圧の測定。
- ▲ 安全測定のため過大電圧(AC, DC 100V以上)は絶対に印加しないでください。
第4-4項の測定前の準備が済みましたら、
(1) 測定端子(-COM)にテストリードの黒プラグ、(±)に赤プラグをそれぞれ接続します。(交流電流の場合、赤黒の区別にはこだわらない。)

▲ 感電事故を防止するため、バッテリーケースをはずす場合はテストリードをすべての回路から切り離してください。
(1) 本書裏のバッテリーケース蓋をはずします。
(2) 第4項電池(R03)4本を交換します。(電池の極性に注意すること)
(3) バッテリーケース蓋を取り付けます。



5-3 一般的注意事項

- ▲ (1) 新築や修繕の多い所、および高温(60℃以上)、多湿(85%以上)、結露する場所に長時間放置しないでください。
- ▲ (2) 本品のお手入れは、雑や布で軽く程度にとどめ、シンナーやアルコールなどは使用しないでください。
- ▲ (3) メータカバーは乾いた布などで拭くことなすしないでください。等電防止効果があります。長年のご使用で等電がなくなつた場合は、応急処置として中性洗剤をメータカバー裏面に塗ってください。
本取扱説明書に記載している以外の保守修理および改造などをおこなった場合は、弊社では責任をおいせん。

保証書

ご氏名	様	製品名	AU-32
ご住所	□□□□□□	保証期間	3年間

この保証書は厳密な品質管理を経て製造された製品です。本保証書は所定項目をご記入の上保管してください。アフターサービスの際にご提示ください。本保証書は複製発行はいたしませんので大切に保管してください。

保証期間 三和電気計器株式会社
本社 東京都千代田区外神田4-4-1 電話 03-3253-4871
総機部 03-3253-4871

ご購入日 年 月 日 3年間
This warranty is valid only within Japan.

年 月 日	修理内容をご記入ください。

保証期間中に正常な使用状態のもとで、万一故障が発生した場合には無償で修理いたします。ただし下記事項に該当する場合は無償修理の対象から除外いたします。

- 1 取扱い説明書に準じた不適当な取扱いまたは使用による故障
- 2 第三者サービスによる不適当な修理や改造による故障
- 3 火災や水害などの災害による故障
- 4 電池の消耗による不動作
- 5 修理後の輸送、移動、落下などによる故障および損傷
- 6 本保証書は日本国内において有効です。
This warranty is valid only within Japan.

※ 保証書の認定は当社において行われます。

1. SAFETY PRECAUTIONS

(Before use, read the following safety precautions)
This instruction manual explains how to use your multimeter AU-32, 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.

- Never use the meter on the electric circuits that exceed 6kVA.
- Pay special attention when measuring the voltage of AC 33 Vrms (46.7V peak) or DC 70V or more to avoid injury.
- Never apply an input signals exceeding the maximum rating input value.
- 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.
- Never use the meter if the meter or test leads are damaged or broken.
- Never use unsealed meter.
- 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.
- Always keep your fingers behind the finger guards on the probe when making measurements.
- Be sure to disconnect the test pins from the circuit when changing the function or range.
- Before starting measurement, make sure that the function and range are properly set in accordance with the measurement.
- Never use the meter with wet hands or in a damp environment.
- Never open rear case except when replacing batteries or fuse. Do not attempt any alteration of original specifications.
- To ensure safety and maintain accuracy, calibrate and check the tester at least once a year.
- Indoor use.

- 1 -

Range display LED	RANGE					
	V	2.5	10	50	250	500
Volts (V) range indication	V	2.5	10	50	250	500
Ohms (Ω) range indication	Ω	x10k	x1k	x100k	x10	x1
Range indication other than V and Ω	OTHERS					

Fig. 4 Range Display and Measuring Example

(Example of measurement)

- Function switch: Set at "V".
- Indication of range display: Lamp lit above 250 (see Fig. 4).
- Pointer of indicator: Indicates as shown in Fig. 3.
 - Reading 1 ... Read as 200V DC since the value to be read is 0 to 250V as shown in Table 1.
 - Reading 2 (when the polarity LED lamp is lit) ... Read as -200V DC.
 - Reading 3 (when the AC indicator LED lamp is lit) ... Read as 200V AC.

3-2 Fixing the Range

You can fix the range using the range hold switch. It is used when measuring in volts and ohms.

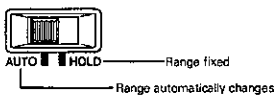


Fig. 5 Range Hold Switch

- 5 -

Use this table when measuring polarized resistance such as of transistors, diodes and a resistive value that changes depending on the flowing current.

Range	x10k	x1k	x100k	x10	x1
Voltage (terminals open)			12V constant		
Current (terminals shorted)	0.6μA	6μA	60μA	600μA	6mA

3-7 Measuring 250mV (Fixed Range)

- Measuring 0 to ±250mV DC and 0 to 250mV AC
 - Measure a DC voltage or sign wave AC voltage of less than 250mV.
 - To ensure safe measurement, never apply an excessive voltage (more than 100V AC, DC).
- After completing the preparations in para. 3-4, do the following:
- Connect the black test lead plug to the measurement terminal (-COM), and the red plug to the measurement terminal (±). (For AC voltage, the distinction between the red and black plugs does not matter.)
 - Set the function switch at "250mV".
 - Measure the voltage by touching the equipment to be tested with the test pins.
 - Read the indication by referring to the range display. This value will be the voltage value to be measured. (AC voltage is applied to the measurement terminals when the AC display LED lamp is on, and DC voltage when it is off. If the polarity display LED lamp is lit, it indicates that the positive voltage is applied to the measurement terminal (-COM), and negative voltage to the measurement terminal (±).)
 - After measurement, remove the test pins from the equipment under test.
 - Return the function switch to "POWER OFF".

- 9 -

4-2 Internal Battery Replacement (See Fig. 8)

If the pointer moves below the scale zone of "INTERNAL BATT GOOD" with the function switch at "INTERNAL BATT CHECK", replace the batteries.

- Before removing the battery case cover, disconnect the test leads from all the circuits to prevent accidents due to electric shocks.
- Remove the battery case cover on the reverse side of this unit.
- Replace the four R03 (UM-45G) batteries. (Note the polarities of the batteries.)
- Mount the battery case cover.

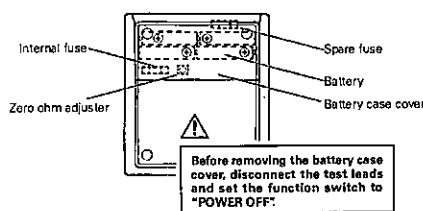


Fig. 8 Specified Locations of Batteries and Fuses

- 13 -

2. PRODUCT OUTLINE

2-1 Uses and Features

- Uses**
Used for testing general electric circuits such as small communication equipment, household electric appliances, lamp cord voltage, and various batteries.
- Features**
 - Auto range**
For measuring voltage and resistance, the real fully automatic range system makes range selection unnecessary and automatically sets the optimum range.
 - DC-AC auto switching**
For measuring voltage and current, it automatically discriminates between DC and AC and you do not have to select a range.
 - Auto polarity**
It permits measurement of DC voltage and current by automatically identifying the polarities of positive and negative.
 - High input resistance**
For measuring voltage, the high input resistance of as high as 10M ohms for both DC and AC eliminates measurement loss.
 - Free of zero ohm adjustment**
Unlike conventional multimeters, no zero ohm adjustment is necessary when measuring resistance.

- 2 -

2-2 Appearance and Names of Components

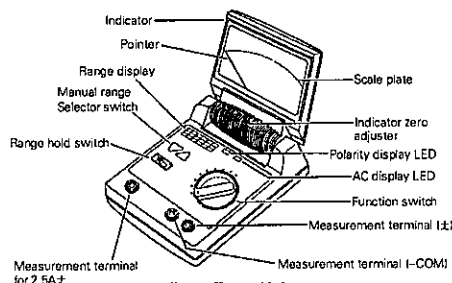


Fig. 1 Tester Unit

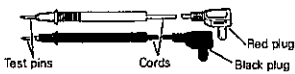


Fig. 2 Test Leads

3. MEASURING PROCEDURES

3-1 How to Read the Scale

Unlike most multimeters, this unit adopting the auto range system does not indicate the present range value by a function switch position. It indicates such a value on the range display instead. To read the range, see the column with the range display LED on at the top on the same row (V, Ω, OTHERS) as set by the function switch. Then read a value indicated by the pointer in the following manner.

Range	LED Indication	Scale to Be Read	Scale to Be Read	Multiplication Factor	Value to Be Read	
V	V	2.5	V scale	0-2.5	x 1	0-2.5V
		10		0-10	x 1	0-10V
		50		0-50	x 1	0-50V
		250		0-2.5	x 100	0-250V
Ω	Ω	x10k	Ω scale	0-∞	x 10k	Center 2MΩ
		x1k		0-∞	x 1k	Center 200kΩ
		x0.1k		0-∞	x 100	Center 20kΩ
		x1		0-∞	x 10	Center 200Ω
250mV	OTHERS	V scale	0-2.5	x 100	0-250mV	
250μA	OTHERS	A scale	0-2.5	x 100	0-250μA	
2.5mA	OTHERS	A scale	0-2.5	x 1	0-2.5mA	
25mA	OTHERS	A scale	0-2.5	x 10	0-25mA	
250mA/2.5A	OTHERS	A scale	0-2.5	x 100	0-250mA	
	OTHERS	A scale	0-2.5	x 1	0-2.5A	

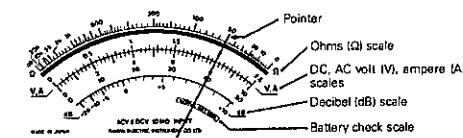


Fig. 3 Scale Plate

- 4 -

3-3 Manual Range Selection

You can change the range by pressing the manual range selector switches. It is used for measuring in volts and ohms.



Fig. 6 Manual Range Selector Switch

These switches operate regardless of the setting of the range hold switch and should be used for reading in a different range. However, they operate only when the function switch is set at "V" or "Ω".

3-4 Preparations Before Measuring

- Before measuring, be sure to check the position of the function switch, measurement terminals to be used, and test lead mounted condition to the tester, to ensure safe use.
- After measuring, be sure to return the function switch to "POWER OFF" to prevent the waste of the internal batteries. On this unit, the power switch is designed to be automatically turned off in case the indicator section is closed by folding without doing the above operation.

(1) Meter Zero Check

If the pointer is off the 0V line at the left end of the scale, turn the indicator zero adjuster with a screwdriver to align the pointer with the 0V line.

(2) Checking the Internal Batteries

This unit operates with four R03 batteries. Before measurement, check the battery capacity. When the function switch is turned to the internal battery check range ("INTERNAL BATT CHECK"), the pointer should move to the right. Check if it is in the bottom zone (INTERNAL BATT GOOD) on the scale. If the pointer is to the left of the zone, it means the battery is used up. Replace the batteries in the procedures described in para. 4-2.

- 6 -

3-8 Measuring the Current (Fixed Range)

- Measuring 0 to ±2.5A DC and 0 to 2.5A AC
- Measure a DC current or sign wave AC current of less than 2.5A.

Current Range of function switch	Measuring Range	
	DCA	ACA
250μA	0-±250μA	0-250μA
2.5mA	0-±2.5mA	0-2.5mA
25mA	0-±25mA	0-25mA
250mA / 2.5A	0-±250mA	0-250mA
	0-±2.5A	0-2.5A

- To prevent damage or accident, do not measure the current in a circuit to which a voltage of more than 450 volts is applied.
- After completing the preparations in para. 3-4, do the following:

- Connect the black test lead plug to the measurement terminal (-COM), and the red plug to the measurement terminal (±). (Connect the red plug to the measurement terminal for 2.5A since when measuring 0 to ±2.5A DC and 0 to 2.5A AC). (For AC current, the distinction between the red and black plugs does not matter.)
- Set the function switch at the current range suitable for the measuring range in Table 3. (Example: When measuring 0 to 25mA, set the function switch at "25mA".)
- Measure the current by touching the equipment to be tested with the test pins.
- Read the indication by referring to the range display. This value will be the current value to be measured. (AC current is applied to the measurement terminals when the AC display LED lamp is on, and DC current when it is off. If the polarity display LED lamp is lit, it indicates that the positive voltage is applied to the measurement terminal (-COM), and negative voltage to the measurement terminal (±).)

- 10 -

4-3 General Precautions

- Avoid leaving this unit in a place subject to excessive shock, vibration, high temperature (over 60°C), high humidity (over 85%) or dew condensation for a long period or time.
- To clean this unit, just lightly wipe with a brush or cloth. Do not use thinner or alcohol.
- Do not rub the meter cover hard with a dry cloth, etc., or the static charge prevention effect will be reduced. If the unit tends to be easily charged after many years of use, apply a neutral-detergent-and-water solution to the meter cover surface as an emergency measure. We are not responsible for any trouble due to maintenance service other than stated in this instruction manual or modification.

5. BEFORE CALLING FOR SERVICE

If the unit fails to operate normally despite operation conforming to the instructions, check the following three points.

- Check if the battery capacity is sufficient and if the mounted polarities are correct.
- Check if the internal fuse has blown.
- Check if the test leads are open.

- 14 -

3-5 Measuring the Voltage (Auto Range)

- Measuring 0 to ±500V DC and 0 to 500V AC
 - Measure a DC voltage or sign wave AC voltage of less than 500V.
 - To ensure safe measurement, never apply a voltage beyond ±500V DC and 500V AC.
 - Do not apply an excessive voltage with the range fixed (more than 100 times the maximum value for the range).
- After completing the preparations in para. 3-4, do the following:
- Connect the black test lead plug to the measurement terminal (-COM), and the red plug to the measurement terminals (±). (For AC voltage, the distinction between the red and black plugs does not matter.)
 - Set the function switch at "V".
 - Set the range hold switch to "AUTO".
 - Measure the voltage by touching the equipment to be tested with the test pins.
 - Read the indication by referring to the range display. This value will be the voltage value to be measured. (AC voltage is applied to the measurement terminals when the AC display LED lamp is on, and DC voltage when it is off. If the polarity display LED lamp is lit, it indicates that the positive voltage is applied to the measurement terminal (-COM), and negative voltage to the measurement terminal (±).)
 - After measurement, remove the test pins from the equipment under test.
 - Return the function switch to "POWER OFF".

- 7 -

- After measurement, remove the test pins from the equipment under test.
- Return the function switch to "POWER OFF".

- Current Measuring Circuit (Both DC and AC)
- When measuring current, connect this unit in series with the equipment under test as shown below.

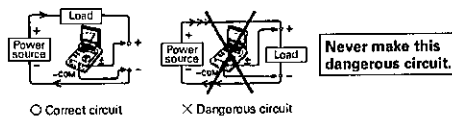


Fig. 7

Protection Circuit

- This unit has a fuse at the input to protect against misoperation when measuring resistance and current.
- However, be careful not to perform misoperation to ensure safety.

NOTE: A fuse is provided for the measurement terminal for 2.5A for safety purpose. Should the fuse blow, send it to us as a repair part.

- 11 -

6. SPECIFICATIONS

Type of Measurement	Max. Scale	Allowance	Remarks
DC voltage ±DCV	250mV	±3% of max. scale.	Input resistance approx. 1MΩ
	2.5/10/50/250/500V	±3% of max. scale.	Input resistance 10MΩ min.
AC voltage ACV	250mV	±20% of max. scale.	Probe resistance 1000MΩ
	2.5/10/50/250/500V	±3% of max. scale.	Input resistance approx. 1MΩ Full wave rectification
Low frequency output dB	-10/+10/-22/+36/+50/+56dB	±3% of max. scale length.	Input resistance 10MΩ min. Full wave rectification
	0dB=0.775V(1mW/600Ω)		
DC current ±DCA	250μ / 2.5m/25m/250m/2.5A	±3% of max. scale.	Shunt voltage drop 200mV
AC current ACA	250μ / 2.5m/25m/250m/2.5A	±3% of max. scale.	Shunt voltage drop 200mV
Resistance Ω	Range Center Max	±3% of max. scale length.	Terminal open voltage 1.2V DC
	x1 2000 20k x10 21k 200k x0.1k 20k 2k x1k 200k 20k x10k 2M 200k		

- 15 -

3-6 Measuring the Resistance (Auto Range)

- Measuring a DC resistance of less than 200M ohms.
- Never apply external voltage, or the unit may be damaged.

Example: If the circuitry is in operation, turn off the power and then measure.

- Check that no voltage is applied to the equipment under test.
- After completing the preparations in para. 3-4, do the following:
- Connect the test lead plugs to the measurement terminals (-COM) and (±).
 - Set the function switch at "Ω".
 - Set the range hold switch to "AUTO".
 - Measure the resistance by touching the equipment to be tested with the test pins.
 - Read the indication by referring to the range display. This value will be the resistive value to be measured.
 - After measurement, remove the test pins from the equipment under test.
 - Return the function switch to "POWER OFF".

• Zero Ohm Adjuster (See Fig. 8 in para. 4-1)

This unit requires no zero ohm adjustment in general measurement because the constant-voltage method is used for resistance measurement. However, for measurement by canceling the resistance of the test leads in the x1Ω range, turn clockwise or counterclockwise the zero ohm adjuster in the battery case with the test pins shorted, to align the pointer with the 0Ω line at the right end of the ohms scale. Also align the pointer with the 0Ω line in the same manner as above if the zero ohm point has fluctuated after many years of use.

- Applied Voltage and Current When Measuring Resistance
- Resistance is measured by using the internal power supply of this unit. For the polarities at this time, a positive output of about 1.2 volts appears at the measurement terminal (-COM), and a negative output of about 1.2 volts at the measurement terminal (±). The currents at this time are listed in the following table.

- 8 -

3-9 Measuring the Low Frequency Output (dB)

The dB scale of this unit is provided for the 2.5V AC range. Only when the impedance is 600 ohms, the output value can be directly read assuming 0dB = 1mW. (0dB = 1mW = 0.775V, 600 ohms)

- The measuring procedures are the same as for AC voltage.
- Read the indication by adding the dB value on the scale to the following dB value according to the ACV range.

AC voltage range	250mV	2.5V	10V	50V	250V	500V
dB value to add	-20	0	+12	+26	+40	+46

4. MAINTENANCE SERVICE

4-1 Internal Fuse Replacement (See Fig. 8)

- Before removing the battery case cover, disconnect the test leads from all the circuits to prevent accidents due to electric shocks.

- Remove the battery case cover.
- Replace the fuse (φ 5 x 20mm, 300mA / 250V).
- Mount the battery case cover.

• Standard operating temperature

: 23 ± 2°C

• Standard operating frequency

: 50 Hz to 60 Hz

• Standard operating humidity

: 45 to 75% RH (no-condensation)

• Operating temperature range

: 0 to 40°C

• Operating humidity range

: Less than 80% RH (no-condensation)

• Dimensions and weight

: 110(W) x 124(D) x 48(H) mm, 290g

• Accessories

: Instruction Manual, A pair of test leads (type TL-61), Fuse (φ 5 x 20mm, 300mA / 250V)

• Internal battery

: 1.5V x 4 (R03 or UM-45G)

• Battery life

: About 100 hours of operation based on 8 hours of use per day

• Optional accessories

: Probe for 25kVDC (type HV-50), Carrying case (type C-AU)

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

- 16 -

sanwa

AU-31
MULTITESTER

INSTRUCTION MANUAL



CONTENTS

AUTO-RANGE TYPE MULTITESTER MODEL AU-31	1
[1] FEATURES	1
[2] SAFETY PRECAUTIONS:Before use, read the following safety precautions	2
[3] MEASURING RANGE AND PERFORMANCE	3
[4] APPEARANCE AND NAMES OF COMPONENTS	5
[5] HOW TO READ SCALE PLATE	6
[6] HOW TO FIX RANGE	7
[7] HOW TO SELECT RANGE MANUALLY	7
[8] PREPARATION FOR MEASUREMENT	8
[9] MEASURING OF DC VOLTAGE	8
[10] MEASURING OF AC VOLTAGE	10
[11] MEASURING OF LOW FREQUENCY OUTPUT(dB)	11
[12] MEASURING OF RESISTANCE (auto range)	11
[13] MEASURING OF DC CURRENT (fixed range)	13
[14] MEASURING OF AC CURRENT (fixed range)	14
[15] MAINTENANCE	15
15-1 Replacement of dry cells (Refer to Fig. 6):	15
15-2 Replacement of fuses (Refer to Fig. 6):	15
15-3 Cleaning and Storage.....	16
[16] AFTER-SALES SERVICE	16
16-1 Warranty and Provision	16
16-2 Repair	17
16-3 SANWA web site.....	17

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

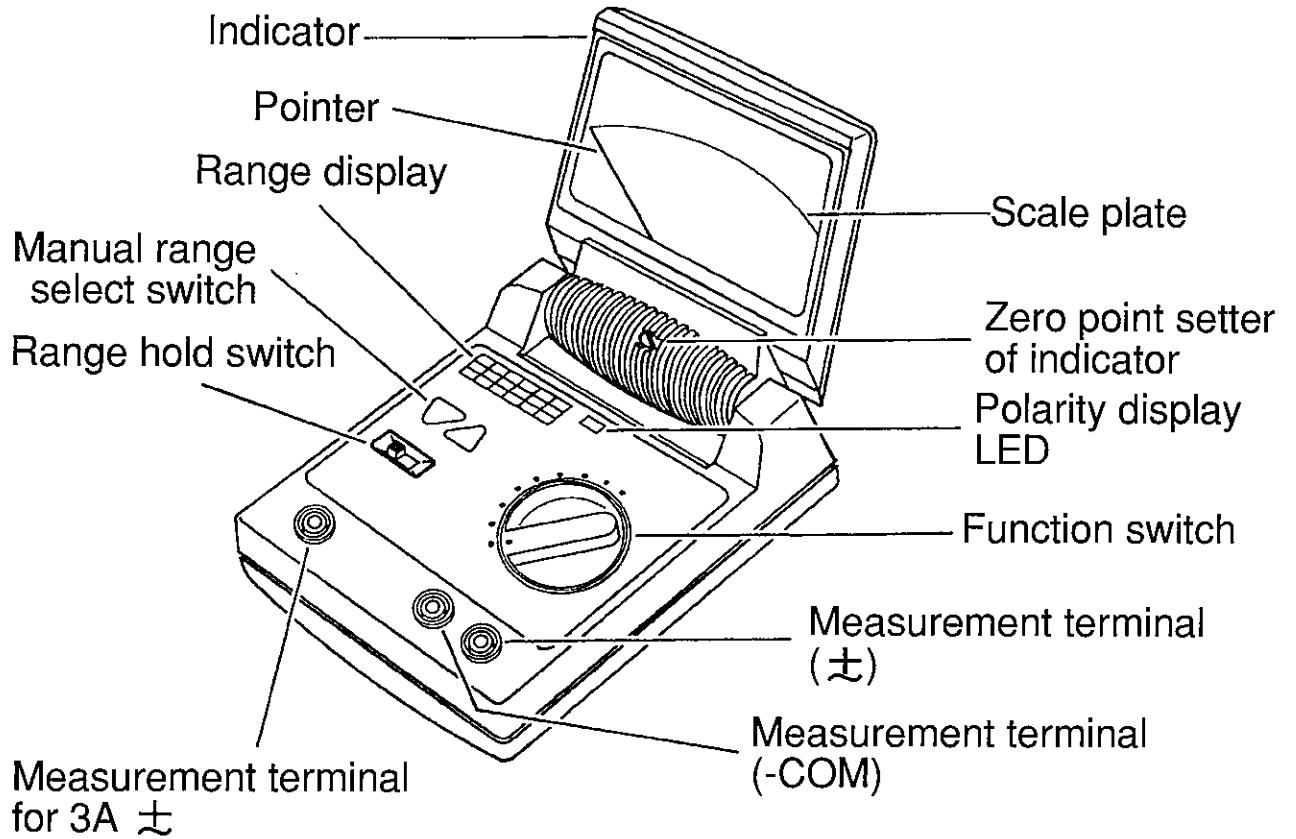


Fig. 1 Tester

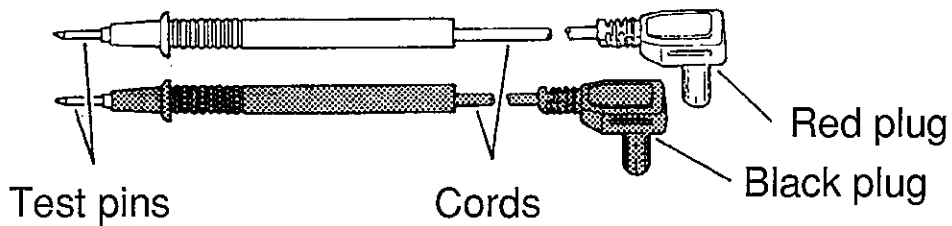


Fig. 2 Test Leads

[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 12 60 300 1000	V scale 0 ~ 3 0 ~ 12 0 ~ 60 0 ~ 3 0 ~ 1000	x 1 x 1 x 1 x 100 x 1	0 ~ 3V 0 ~ 12V 0 ~ 60V 0 ~ 300V 0 ~ 1000V
Ω	x 10k x 1k x 0.1k x 10 x 1	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

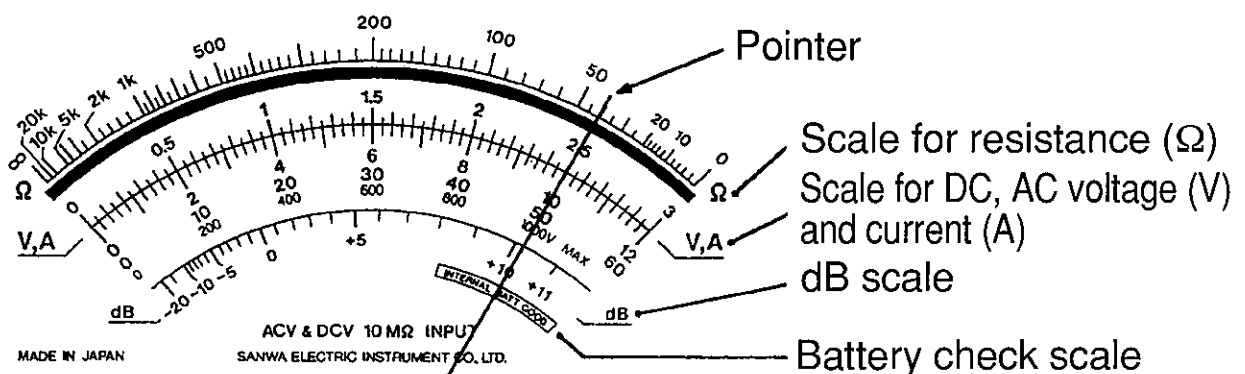


Fig. 3 Scale Plate

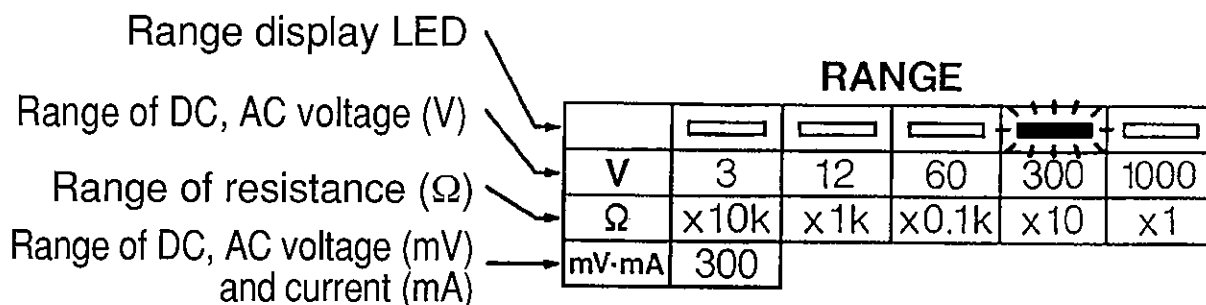


Fig. 4 Range Display and Example of Measurement

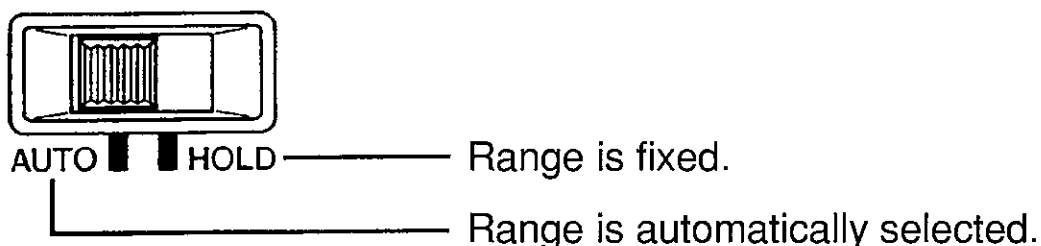
(Example of measurement)

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.

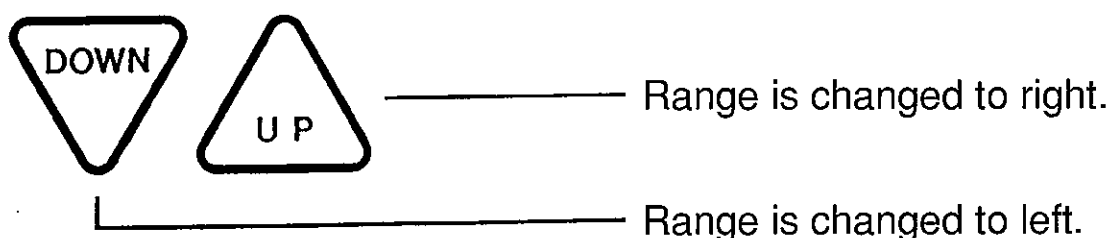
[6] HOW TO FIX RANGE

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



[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 .



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 \sim ”, “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 \sim ± 1000 V DC (auto range)

Measurement of DC voltage below ± 1000 V max.

⚠ For safe measurement, never apply a voltage exceeding ± 1000 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 (±).

(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.

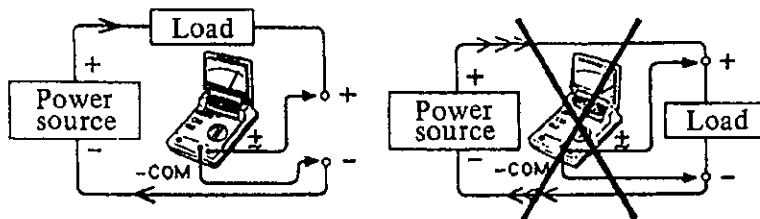
(If the polarity display LED lights, it indicates that the + potential is applied to the measurement terminal (-COM) and -potential to the (\pm).)

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.

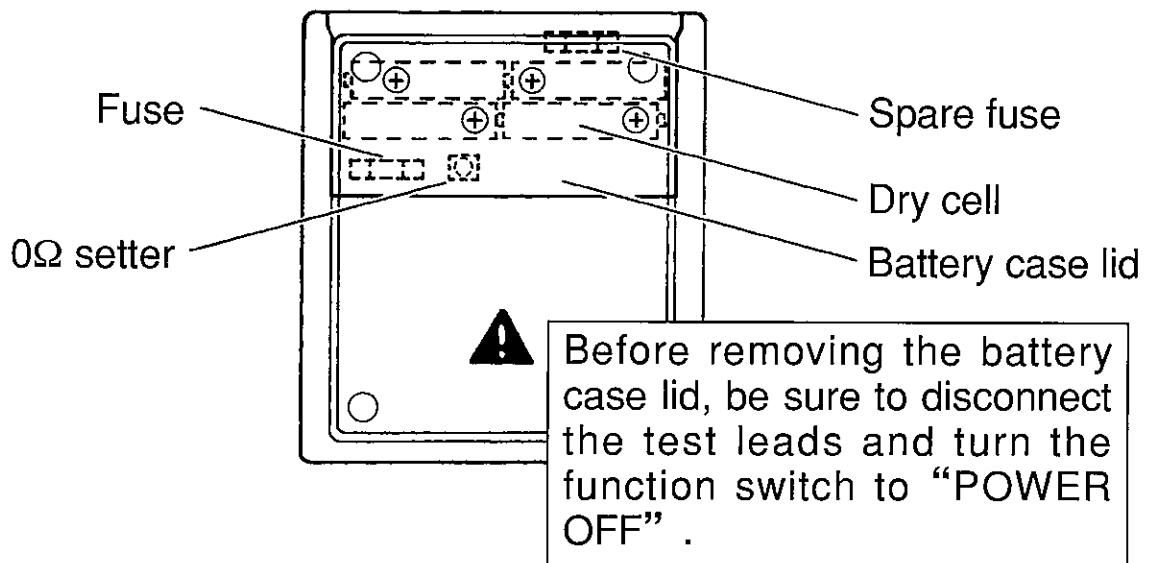


Fig. 6 Layout of Dry Cells and Fuses

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>

E-mail: exp_sales@sanwa-meter.co.jp



sanwa

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

Dempa Bldg, 4-4 Sotokanda2-Chome
Chiyoda-ku, Tokyo, Japan