sanwa®

YX-361TR
MULTITESTER

INSTRUCTION MANUAL

Wide Ranging, Personal Type Multitester
Model YX-361TR
(With Automatic Polarity Function)

● Introduction

Thank you very much for purchasing the tester. It is a high class, wide ranging, personal type tester with the adoption of newly-designed, one control 24-channel rotary switch. It incorporates automatic polarity circuit and safety device. In addition, its functions can be increased with the use of a variety of optional accessories.
We hope you will master as many usages of the tester as possible after perusal of this operator manual and will make habitual use of it for a long time.

● Features

1. **Automatic polarity function (can be used as NULL meter)**
   0-centering meter (NULL meter) function required for the measurement of digital circuits, operational amplifier circuits, and TV-FM detecting circuits can be set automatically by operating the one control switch. With this function, it is easy to judge positive and negative polarities during measurement.

2. **Widened measuring ranges with the adoption of the 24-channel rotary switch**
   One control, 24-channel, rotary switch is newly adopted. In addition to general measurements, it provides 33 measuring ranges in all including extra functions.

3. **Performs continuity check with a light**
   Continuity can be judged visually in an instant because an LED is built-in in the meter.

4. **Provides BATT test range**
   To perform practical battery test, a load equal to that of battery being used is built-in in the tester. The quality of battery can be judged with an exclusive color-coded GOOD-?-BAD scale.

5. **Equipped with OUTPUT (series capacitor terminal)**
   The tester can be applied to the measurement of TV, audio, and other electronic circuits, for it detects AC signal element alone in AC/DC coupled circuit.

6. **Safety-emphasis measuring terminals and test leads are adopted**
   The measuring terminals and test leads are specially designed for operator safety. The test lead plugs are guarded with insulating material. So the metal part is not exposed to avoid a possible electric shock.

7. **Double protection device**
   Safety-emphasis circuitry design with the combined use of a high performance fuse and protection diode.

8. **Newly-designed, unique appearance**
   The housings are designed to be easier-to-carry and easier-to-use with the adoption of a wide, easy-to-see indicator and large, easy-to-operate knob in the front panel.

SAFETY INFORMATION

Following description is intended to protect operators from such injury as burn and electric shock. Be sure always to observe it at the time of using this instrument.

⚠ WARNING

Do not use the tester for the measurement of electric circuits of a large capacity. The fuse contained in the tester is rated as 250 V (breaking capacity 100 A). Avoid measuring such circuits as there may be some problem that jeopardizes safety measurement due to a possible error in setting range.

⚠ WARNING

Be sure to use a fuse of the specified rating and type (500 mA/250 V, ϕ5 mm, 20 mm long). Never use a substitute or short the circuit.

⚠ WARNING

Never operate the tester with wet hands, at places with high humidity or much moisture. You may get electric shock.

⚠ WARNING

Do not touch the test pins during measurement.

⚠ WARNING

There is a danger of electric shock. Exercise special care when measuring voltage above 60 VDC or 25 Vrms AC.

⚠ WARNING

The repair and redesign works call for our service man.

⚠ WARNING

Do not make a measurement with the rear case or the meter cover removed.

⚠ WARNING

Each time you make a measurement, be sure to check ranges. Measurement with erroneous range setting or beyond the measuring range is hazardous.

⚠ WARNING

Make sure that the coating of the cord of the test lead is not damaged or conductor is not exposed. If they are damaged or exposed, do not use the tester.

⚠ WARNING

Take care not to cause an overloaded state when measuring voltage or current containing pulsating currents of pulses.

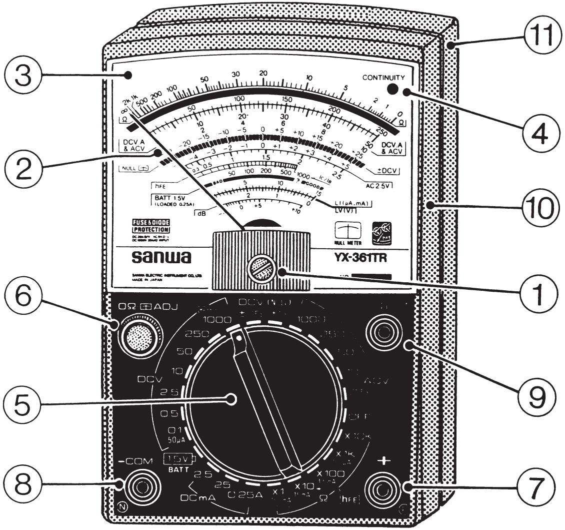
⚠ CAUTION

Make sure that the case is not damaged by dropping. If it is damaged or displaced, do not use the tester.

⚠ CAUTION

It is highly recommended that the tester be calibrated and inspected at least every 6 months or a year to maintain the accuracy and ensure safety.

● Frontal panel and the name of each part



① Indicator zero corrector
② Indicator pointer
③ Indicator scale
④ Continuity indicating LED (CONTINUITY)
⑤ Range selector switch knob
⑥ 0Ω adjusting knob/0-centering meter (NULL meter) adjusting knob
⑦ Measuring terminal +
⑧ Measuring terminal –COM
⑨ Series capacitor terminal (OUTPUT) 0.047 μF/400 V
⑩ Panel
⑪ Rear case

● General cautions prior to using the tester

1. **Check whether the indicator pointer points exactly to the zero line.**
   If the indicator pointer fails to point to the zero line, the leftmost scale line, turn the indicator zero corrector ① so that the indicator pointer may point right to the zero line.

2. **Check NULL meter range.**
   An automatic polarity system is adopted in ± DCV (±5 V, ±25 V) range. If the range selector switch knob is set to the range, the indicator pointer will automatically point to around the center of the scale. If measurement is not performed or the tester is put away, it is advisable to set the knob to other ranges.

3. **Confirm the measuring range well and select a most appropriate range.**
   Select the range selector switch position that is most suitable for measured object before measurement is performed. When measuring an unknown value, start with the highest range. After the first reading, reset the switch to lower ranges until an appropriate range nearest to measured object value is selected. Take enough care especially when measuring AC power voltage (AC 100 V or more).

4. **Plug the test lead pins into the terminal jacks fully and firmly.**
   Safety device is adopted in the attached test leads. Be sure to plug the test lead pins into the terminal jacks fully and firmly.

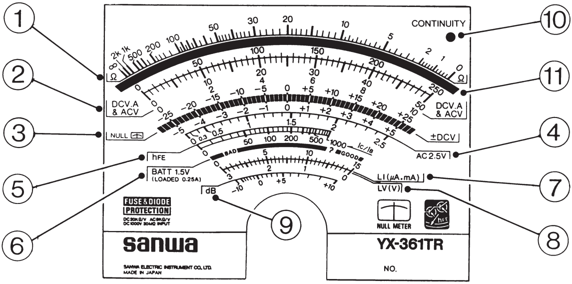
5. **Check the internal fuse.**
If the internal fuse has been blown due to misuse, the tester fails to function. Refer to page 23 for the ratings of fuse and fuse replacement.

6. **Exercise caution when the tester is put away.**
Avoid storing the tester for a long time in the place where much shock and vibration are given, in the direct rays of the sun, or in a high temperature and humidity.

7. **Avoid wiping the indicator cover surface with dry cloth.**
The cover surface is coated with anti-static solvent. If anti-static effect becomes weakened after a long use of the tester, wipe the cover surface with cloth moistened with soap water containing anti-static solvent as a stop-gap measure.

How to Use the Tester

● Meter scale plate



Explanations about scales

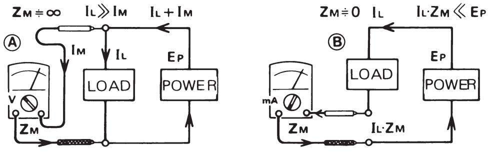
1. Resistance (Ω) scale .... Black color
2. DCV, A scale and ACV scale (10 V or more) .... Black color
3. 0-centering (NULL) ±DCV scale .... Blue color
4. ACV 2.5 V (AC 2.5 V) exclusive scale . Red color
5. Transistor DC amplification factor (h_{FE}) scale .... Blue color
6. 1.5 V battery test (BATT 1.5 V) exclusive scale .... Red/Blue color-coded
7. Ω range terminal to terminal current (LI) scale .... Blue color
8. Ω range terminal to terminal voltage (LV) scale .... Black color
9. Decibel (dB) scale .... Red color
10. Continuity indicating LED
11. Mirror: To obtain most accurate readings, the mirror is devised to make operator eyes, the indicator pointer, and the indicator pointer reflexed to the mirror put together in line.

• What should be understood before measurement

Difference between voltage and current measurements

Fig. 1 Ⓐ is a standard measuring way of voltage while Fig. 1 Ⓑ a standard measuring way of current. Voltage measurement is to detect the potential difference between two points, so the voltage range must be connected in parallel with measured circuit.

On the other hand, current measurement is to check current that is supplied by power and consumed by load, so the current range must be connected in series with measured circuit, in other words, between power source and load.



Ⓐ Measuring voltage

Ⓑ Measuring current

IM ...... Meter current
IL ...... Load current
EP ...... Power voltage
ZM ...... Input impedance of the tester

Fig. 1

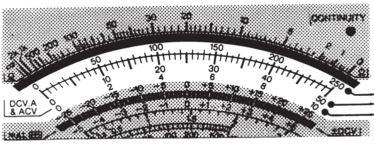
Generally speaking, the input impedance of the voltmeter is desired to be large, for only small current of the meter will do for measurement. On the contrary, the input impedance of the ammeter is desired to be small, for only small power loss by $I_L \times Z_M$ will do for measurement.

For this very reason, errors in Ⓐ and Ⓑ connections are very dangerous. Especially, if measurement is performed in current range with the connection of voltage measurement Ⓐ, excess current flows across the tester and damages internal parts and fuse by combustion.

The operator is, therefore, requested to fully understand the difference between voltage and current measurements and perform measurement with a correct connection.

● Measuring DCV

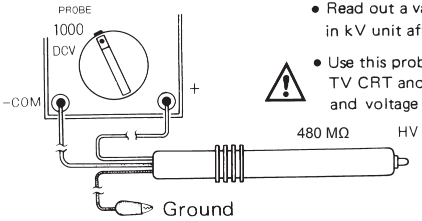
1. Used ranges:
   DCV 0.1 V~0.5 V~2.5 V~10 V~50 V~250 V~1000 V
2. Measuring terminals:
   + and −COM; as a rule, plug the red test lead into + terminal and the black test lead into −COM terminal.
3. Indicator scale: DCV, A scale is used.
   Refer to Fig. 2 for readings.



Range	Multiplying factor	Reading range
2.5 V	by 0.01	(0~2.5 V)
250 V	Direct reading	(0~250 V)
0.5 V	by 0.01	(0~0.5 V)
50 V	Direct reading	(0~50 V)
0.1 V	by 0.01	(0~0.1 V)
10 V	Direct reading	(0~10 V)
1000 V	by 100	(0~1000 V)

Fig. 2 How to read out DCV scale

4. Set the range selector switch knob to a necessary range in DCV ranges for measurement. Generally, fix the black negative test lead pin to the negative potential point (earth line), connect the red positive test lead pin to each test point, and perform measurement. Take note of the polarities well when measuring voltage drop in the both ends of resistor, minus voltage of oscillation circuit, and transistor circuit.
5. For measurement of high voltage of TV, connect optional HV probe to the tester as shown in Fig. 3.



- Read out a value on 0 ~ 250 of DCV·A scale in kV unit after multiplying it by 0.1.
- Use this probe only for the measurement of TV CRT anode voltage, high voltage for focus, and voltage of a high impedance circuit.

Fig. 3

- **Measuring DCV (NULL)**

As 0-centering meter (NULL meter)

1. Used ragnes: DCV ±5 V ~ ±25 V
2. Measuring terminals: + and –COM
   Same as in DCV measurement
3. Indicator scale: DCV (NULL) scale is used.
   Refer to Fig. 4 for readings.

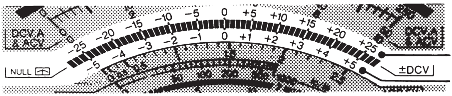


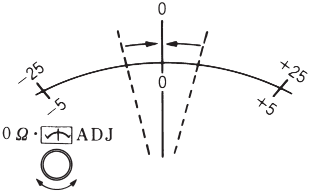
Fig. 4 DCV (NULL) scale and way of readings

4. Set the range selector switch knob to either ±5 V or ±25 V in DCV ranges. The two ranges are of automatic polarity circuit. So, if the knob is set to one of the ranges, the indicator pointer will automatically move to around the center and becomes a 0-centering meter (NULL meter).
5. When the indicator pointer moves to around the center 0 line, align the pointer exactly to the zero line with 0-centering meter (NULL meter) adjusting knob ⑥. (See Fig. 5)
6. The tester performs ± DCV measurement as 0-centering meter (NULL meter).
7. Set the range selector switch knob to other range positions after finishing measurement.

Caution

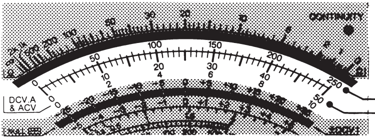
If the indicator pointer fails to reach the center 0 line even after 0Ω· [symbol] ADJ knob is turned, replace the internal 9 V battery with a new one.

Fig. 5



● Measuring DCmA

1. Used ranges:
   DCmA 50 μA～2.5 mA～25 mA～0.25 A
2. Measuring terminals:
   + and -COM; as a rule, plug the red test lead into + terminal and the black test lead into –COM terminal.
3. Indicator scale:
   DCV, A scale is used. Refer to Fig. 6 for readings.



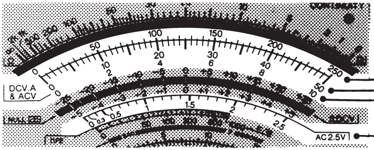
Range	Multiplying factor	Reading range
2.5 mA	by 0.01	(0～2.5 mA)
25 mA	by 0.1	(0～25 mA)
0.25 A	by 0.001	(0～0.25 A)
(250 mA	Direct reading	0～250 mA)
50 μA	Direct reading	(0～50 μA)

Fig.6 DCmA scale and way of readings

4. Set the range selector switch knob to DCV 0.1 range position, common to 50 μA range, for measuring 50 μA. Set the knob to a necessary position in DCmA ranges for measuring other amperes.
5. Connect the tester range in series with measured circuit through load as Fig. 1 Ⓑ. Be sure not to apply any voltage to DCmA ranges.

● Measuring ACV

1. Used ranges: ACV 2.5～10 V～50 V～250 V～1000 V
2. Measuring terminals:
   + and –COM; the operator may disregard color discrimination of the test leads.
3. Indicator scales:
   ACV and AC 2.5 V scales are used. Refer to Fig. 7 for readings.



Range	Multiplying factor	Reading range
250 V	Direct reading	(0～250 V)
50 V	Direct reading	(0～50 V)
10 V	Direct reading	(0～10 V)
1000 V	by 100	(0～1000 V)

This scale is exclusive only for 2.5 V, so read out indicated values directly.

Fig. 7 ACV scale and way of readings

4. Set the range selector switch knob to a necessary range position in ACV ranges and start measurement. Abide by "**General cautions prior to using the tester No. 3**" especially when measuring ACV.
5. Exert caution when measuring a high voltage of 200 V or more.
   a) Check if the range selector switch knob is set to AC 250 V or 1000 V range and the test leads are properly connected to + and –COM terminals.
   b) Connect the tester with measured power circuit after turning off POWER switch of the circuit.
   c) Do not touch wirings or the tester during measurement. When measurement is finished, turn off POWER switch and detach the tester from the circuit.

● Measuring low frequency output (dB)

A ratio of input to output in amplifier and transmission

circuits is shown in logarithm because the human ears are proportioned to logarithm sensorially. Decibel (dB) is used as a unit. When the load impedance of circuit is fixed, power can be compared by only expressing voltage (current) ratio in dB.
The dB scale of this tester is graduated in a way that the value is 0 dB when 1 mW is consumed in 600 Ω impedance circuit and when it is converted into voltage 0 dB is equal to 0.775 V. So, output in 600 Ω impedance circuit can be read directly in dB value. However, when the impedance of measured circuit varies, measured dB value is nothing but an AC voltage value measured in dB scale that corresponds with ACV scale.

1. Used ranges: −10 ~ +10 ~ +62 dB, 5 ranges
2. The method of measurement is quite same as that for ACV measurement.
3. The scale is graduated, corresponding to AC 2.5 V range, and only output in 600 Ω impedance circuit can be read directly in dB unit (0 dB = 1 mW = 0.775 V). For ranges over 10 V, calculate true values after adding ADD dB values to indicated values.

ACV range	2.5 V	10 V	50 V	250 V	1000 V
ADD dB value	0	12	26	40	52

(Example)

When +7 dB is obtained in 10 V range as an indicated value, add 12 (ADD dB value in 10 V range) to it, and the true value will be calculated as +7 + 12 = +19 dB.

● Measuring ACV with OUTPUT terminal (Measuring low frequency output)

A capacitor is connected in series with OUTPUT terminal with capacitor 0.047 μF/400 V. It is very convenient to use this terminal when the operator needs to measure AC signal element alone in TV or audio circuit where DC and AC elements are mixed. DC element is blocked by the capacitor.

For examples,

- Measuring output voltage of general, low frequency amplifiers
- Detecting horizontal signal in TV horizontal amplification circuit
- Checking whether or not input signal is present in TV synchronizing separation and synchronizing amplification circuits

The method of measurement is same as for ACV except connecting the positive test lead to OUTPUT terminal. Therefore, in this measurement, OUTPUT and –COM terminals are used.

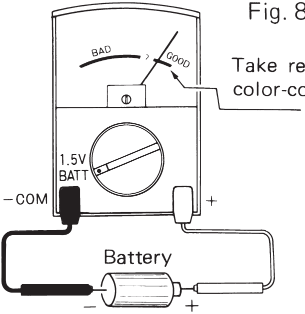
● Testing batteries (Practical test of 1.5 V dry battery)

The value measured in DC voltage range of a tester is a value of no-load voltage (open voltage) with a high impedance and small current. So, even an aged battery with increased internal resistance and no current capacity may indicate 1.5 V or the like. This means that the battery is considered to be good only by judging its voltage.

To test true voltage of dry battery, BATT. test range of this tester includes load resistance of about 0.25 A that corresponds with the current consumed by common appliance.

The tester is, therefore, considered to perform practical test of batteries and to judge their quality. Connection of leads and the method of measurement are as shown in Fig. 8. Judgements are made by the indication of the indicator pointer as follows:

Fig. 8



Take readings in red/blue color-coded scale.

BATT. test range should be used for batteries with a large capacity such as R20 (SUM-1), R14 (SUM-2), and R6P (SUM-3).

- Good battery . . .The pointer stays within the blue range.
  (GOOD)
- Good or bad?. . .The pointer stays within the ? range. The battery may be used for a small transistor radio, but not for equipment that needs power.
  (?)
- Bad . . . . .The pointer stays within the red range.
  (BAD)

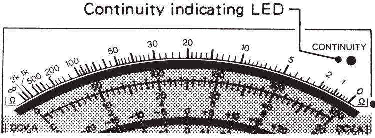
For accurate voltage value, take readings by regarding LI blue scale as a voltmeter of 0 ~ 1.5 V

Caution

For the measurement of small, thin-type batteries used for wrist watches and small computers, do not use BATT. test range. Instead, use DC 2.5 V range to measure such batteries with + and −COM terminals, and if measured voltage value is fairly lower than nominal voltage value, consider the batteries to be bad and useless.

● Measuring resistance (Ω)

1. Used ranges:
   ×1∼×10∼×100∼×1 k∼×10 k (0.2 Ω∼20 MΩ)
2. Measuring terminals:
   + and −COM
3. Indicator scale:
   Ω scale is used. Refer to Fig. 9 for readings.



	Multiplying factor	Reading range
×1	Direct reading	(0∼2 kΩ)
×10	by 10	(0∼20 kΩ)
×100	by 100	(0∼200 kΩ)
×1 k	Direct reading in kΩ unit	(0∼2 MΩ)
×10 k	by 10 in kΩ unit	(0∼20 MΩ)

Fig. 9 Ω scale and way of readings

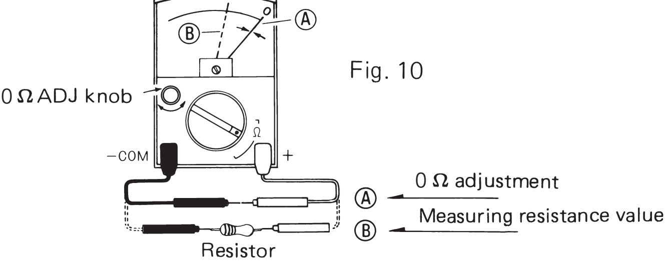


Fig. 10

4. 0Ω adjustment (0Ω ADJ)
   0Ω adjustment, in other words, fullscale adjustment must be done prior to using the tester. Short + and -COM terminals together as shown in Fig. 10 Ⓐ, turn the zero ohm adjuster (0Ω ADJ) knob, and align the indicator pointer to the rightmost 0Ω line of the Ω scale. After this adjustment is finished, proceed to measurement. If this adjustment is done whenever the range is switched, more accurate indicated value can be obtained.
5. Be sure to turn off POWER switch of measured object before measuring resistance in its circuit. Be careful not to apply any voltage to X1 or X10 range.
6. Checking continuity with an LED
   Continuity (CONTINUITY) indicating LED right above on the indicator lights when measured resistance value is about 10Ω or less in X1 range. (Brilliance of LED varies according to resistance value.) It is very convenient to use LED because the operator can judge continuity visually, faster than with the pointer, and more quiety than with buzzer.

⚠ Caution

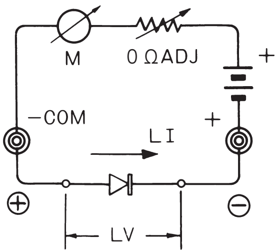
- The polarity of + and − turns revers to that of the test leads when measurement is done in Ω range.
- Be sure to use the same rated fuse. In case a fuse other than the same rated one (see "SPECIFICATIONS") is used, error in indication occurs and/or circuit protection is made unble.
- If the pointer fails to swing up to 0Ω even when the 0Ω adjuster is turned clokwise fully, replace the internal battery with a fresh one.

Reference

- **The polarities of the tester terminals during measurement of resistance.**

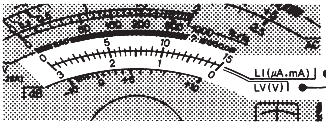
The resistance measuring circuit of the tester is composed as in Fig.11. The positive polarity of the internal battery is connected to + terminal of the tester, so when measurement is done in resistance ranges -COM terminal becomes positive and + terminal negative. Bear this relation in your mind, and it will be useful to measure such polarized resistors (semi-conductors) as transistors and diodes or to test the leakage of electrolytic capacitors.

Fig. 11



- **About current across the terminals (LI) and voltage across the terminals (LV)**

Current flowing across + and -COM terminals while an object is being measured in resistance (Ω) range is called LI. When LI flows across the measured object, voltage drop originates. This voltage is called LV, and LI and LV values are shown on the scale plate.



Range	Multiplying factor	Reading range
×1	by 10	(0~150 mA)
×10	Direct reading	(0~15 mA)
×100	by 0.1	(0~1.5 mA)
×1k	by 10	(0~150 μA)

3 V~0 V common to each range

Fig. 12 LI and LV scale

The maximum LI values are shown in each Ω range. The impedance of measured object may vary according to flowing current or applied voltage, depending on measured object or something unusual may originate due to self-heating of measured object. The operator is, therefore, requested to perform measurement in each Ω range after fully understanding the relation.

- **Testing LED (Application of tester Ω range)**

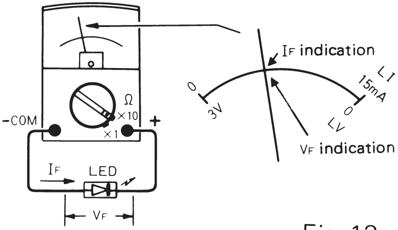
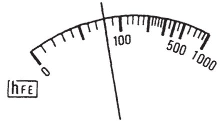


Fig. 13

Connect LED as shown in Fig. 13 and perform measurement in ×1 Ω or ×10 Ω range. LED lights if its continuity is normal and the current value then, namely I_F is indicated on LI scale and V_F on LV scale at the same time.

MEASUREMENT OF TRANSISTORS
(USE AS TRANSISTOR CHECKER)

With the attachment of the h_{FE} connector(HFE-6T),this unit can measure the DC current amplification factor h_{FE} (I_C/I_B) of transistors in the 0 to 1000 range.



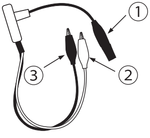


Fig. 14

① Probe jack
② Transistor collector terminal connecting clip
③ Transistor base terminal connecting clip

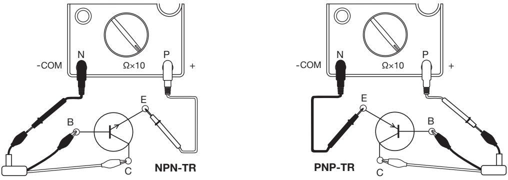
- **Preparations before Measurement**

  To measure transistors, this unit uses the resistance measuring range. Therefore, make full scale adjustment (O Ω adjustment) of the indicator needle before doing the measurement. Just as before measuring resistance, turn the range to x10 Ω, short-circuit the + and –COM terminals and align the needle to 0 Ω line with 0 Ω ADJ.

- **Measurement of h_{FE}**
  (DC Current Amplification Factor)

1. Connection Diagram

Fig. 15



2. Then depending on the polarity of the transistor to be tested, insert the probe jack into the black lead if it is NPN transistor and into the red lead if it is PNP transistor.
3. There are two lead lines each with an alligator clip at the end. Connect the black clip to the base terminal of the transistor and the red clip to the collector terminal.
4. Then connect the test lead (the red lead if the transistor is NPN and the black lead if PNP) to the emitter terminal of the transistor to be tested.
   With this connection, the tester needle responds, indicating the IC/IB (hFE) value on the blue hFE scale ⑥.

Battery replacement

1. If 0 Ω adjustment is impossible in ×1 Ω range, the two internal 1.5 V (R6P) batteries have worn out. Replace them with fresh ones.
2. If 0 Ω adjustment is impossible only in ×10 kΩ range, replace the internal 9 V (6F22) battery with a new one.
3. To replace the batteries, open the rear case after removal of the screw (4 mm dia x 12 mm) and insert them into the battery compartment correctly, taking note of their polarities.

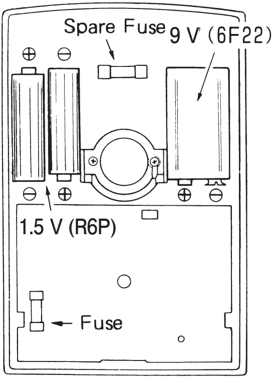


Fig. 16

Fuse replacement

1. The internal fuse is blown if power voltage is inadvertently applied to the tester with the range selector knob left set to current ranges, especially to 0.25 A range, or to ×1 Ω range.
2. When the fuse is blown, the tester fails to work. Replace it with the spare fuse (5 mm dia × 20 mm, 500 mA/250 V). Refer to Fig. 16 for its position.

● AFTER-SALE SERVICE

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, 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.

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 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.

3 SANWA web site

http://www.sanwa-meter.co.jp
E-mail: exp_sales@sanwa-meter.co.jp

● Specifications

Accuracy assurance Temperature/Humidity range
: 23 ± 2 ˚C 75 %RH max. No condensation
Operating temperature and humidity
: 5~31 ˚C, 80 %RH max.
31<~40 ˚C, 80~50 %RH(decreasing linearly)
Storage temperature/Humidity range
: –10~50 ˚C 70 %RH max. No condensation
Size・mass : 150 x 100 x 37 mm About 290 g
Accessories : One pair of test leads (TL-61), one copy of instruction manual, and one spare fuse (5 mm dia x 20 mm, 500 mA/250 V) built-in.
Optional accessories : HV probe (HV-10), and carrying case (C-YS).
HFE-6T

Measurement	Measuring range	Accuracy	Remarks
DCV	0–0.1 V–0.5 V–2.5 V–10 V–50 V –250 V–1000 V– (25 kV) (25 kV with optional HV probe)	± 2.5 % fs (1000V or less)	Input impedance 20 kΩ/V
DCV NULL meter	0– ± 5 v 0– ± 25 v	± 5 % fs	0–centering meter type Input impedance 40 kΩ/V
DCmA	0–50 μA–2.5 mA–25 mA–0.25 mA (50 μA at the DC 0.1 V position)	± 2.5 % fs	Terminal voltage drop 250 mV
ACV	0–2.5 V–10 V–50 V–250 V–1000 V [2.5 V range : 40 Hz~100 kHz ±3 %] * 10 V range : 40 Hz~100 kHz ±3 % 50 V range : 40 Hz~20 kHz ±3 % 250 V range : 40 Hz~3 kHz ±3 % 1000 V range : 40 Hz~1 kHz ±3 %	± 3 % fs ± 4 % fs (10 V or less)	Input impedance 9 kΩ/V
AF output (dB)	–10 dB~+10 dB (AC 250 V) ~+62 dB 0 dB = 0.775 V (1mW through 600 Ω impedance circuit)	Same as in ACV	Same as in ACV
Ω (with continuity indicating LED)	X1 : 0 ~ 0.2 Ω ~ 2 kΩ Center 20 Ω X10 : 0 ~ 2 Ω ~ 20 kΩ Center 200 Ω X100 : 0 ~ 20 Ω ~ 200 kΩ Center 2 Ω X1 k : 0 ~ 200 Ω ~ 2 MΩ Center 20 kΩ X10 k : 0 ~ 2 kΩ ~ 20 MΩ Center 200 kΩ Continuity indicating LED: in X1 range (Light is emitted at 10 Ω or less)	± 3 % of arc	Internal batteries R6P (1.5 V) X2 6F22 (9 V) X1
Battery test (BATT)	0–1.5 V GOOD–?–BAD color-coded scale	± 5 % fs	Load current 0.25 A
Terminal-to-terminal current (LI)	0–150 μA . . . . . . X 1 k range 0–1.5 mA . . . . . . X100 range 0–15 mA . . . . . . X10 range 0–150 mA . . . . . . X1 range	± 5 % of arc	Current flowing across terminals while object is measured.
Terminal-to-terminal voltage (LV)	Common to each Ω range 3 V~0 V (Reverse of LI scale)	± 5 % of arc	Voltage applied across terminals while Ω is measured.
DC amplificationfactor hFE	Transistor hFE : 0~1000 (in X 10 Ω range)	± 3 % of arc	With the use of optional probe

* Frequency characteristics

sanwa®

三和電気計器株式会社
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大阪営業所=大阪市浪速区恵美須西2－7－2
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VEGETABLE OIL INK
植物油インキを使用しています。

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