EARTH RESISTANCE TESTER

Model : ET-3000

Your purchase of this EARTH RESISTANCE TESTER marks a step forward for you into the field of precision measurement.
Although this EARTH RESISTANCE TESTER is a complex and delicate instrument, its durable structure developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

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1. FEATURES

* Earth Resistance and Earth Voltage measurement.
* 3 ranges for earth resistance measurement, 19.99 ohm, 199.9 ohm, 1.999 K ohm.
* 0 to 199.9 V for earth voltage measurement.
* 18 mm, large size LCD display, easy to read–out.
* Data hold function to freeze the display reading value.
* LSI circuit provides high accuracy, reliability and durability.
* Manual power On/Off or auto power Off within two minutes after power On.
* Built–in over input indication.
* Durable & portable housing plastic case with the front protective cover.
* Complete testing accessories included.

2. SPECIFICATIONS

2–1 General Specifications

Display	18 mm (0.7") LCD (Liquid Crystal Display). Max. indication 1999.
Function	Earth Resistance & Earth Voltage measurement.
Response Time	4 seconds on earth resistance range approximately.
	1 seconds on earth voltage range approximately.
Input Terminals	3 terminal input (E/P/C Terminals).
Over input Indication	Indication of " 1 . ".

Data Hold	To freeze the display reading value.
Safety Standard	IEC1010.
Overload Protection	* 200V AC for 10 seconds across 2 of the 3 terminals for Earth Resistance measurement.
	* 300V AC for 1 minute on Earth Voltage range.
Insulation Resistance	More than 5 Meg ohm between the circuit and the housing case when measured with 500 DCV.
Power Management	Manual power On/Off or auto power Off within 2 minutes after power On.
Operating Temp.	0° to 50° C (32° to 122° F).
Operating Humidity	Less than 80 % R.H.
Power Supply	DC 9V, 1.5V AA (UM−3) batteries x 6 PCs. @ Alkaline or heavy duty battery.
Power Consumption	*Earth Resistance* * Approx. 74 mA for stand−by condition * Approx. 84 mA for ON condition @ at 1,900 ohm on 2,000 ohm range
	Earth Voltage Approx. 82 mA for stand−by condition.
Dimension	160 x 120 x 65 mm (6.3 x 4.7 x 3.3 inch)
Weight	Approx. 560 g (1.2 LB).

Standard Accessories	Instruction Manual..... 1 PC Plug with alligators clips (Red, Green, Black) * Red wire with red plug AL−3KR..... 1 PC * Green wire with Green plug AL−3KG..... 1 PC * Black wire with black plug AL−3KB..... 1 PC Auxiliary Earth Spikes SP−3K.....2 PCs Carrying case (CA−3K)..... 1 PC

2−2 Electrical Specifications (23 ± 5 °C)

Function	*Range*	*Resolution*
Earth Resistance	20 ohm	0.01 ohm
	200 ohm	0.1 ohm
	2 K ohm	1 ohm (0.001 K ohm)
Earth Voltage	200 ACV *(50, 60 Hz)*	0.1 V

Function	*Range*	*Accuracy*
Earth Resistance	20 ohm	± (2% rdg + 0.1 ohm) *@ 0 to 19.99 ohm*
	200 ohm	
	2 K ohm	± (2% rdg + 3 d) *@ above 20 ohm.*
Earth Voltage	200 ACV *(50, 60 Hz)*	± (1% rdg + 4 d)

Remark :

Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.

3. FRONT PANEL DESCRIPTION

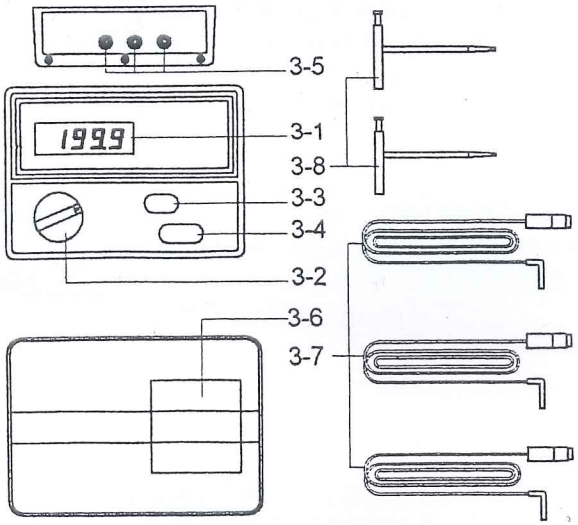
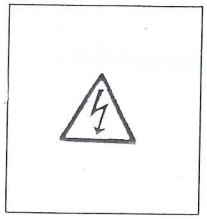


Fig. 1

3–1 Display
3–2 Function Switch
3–3 Hold/Normal Switch
3–4 Power Button
3–5 Terminals (E/P/C)
3–6 Battery Cover/Compartment
3–7 Test leads (Black/Green/Red)
3–8 Earth Spikes

4. MEASURING PROCEDURES



The instrument will generate an approx. 40 AC voltage (max.) across E and C terminals, or E and P terminals for Earth Resistance function.
Do not touch the test leads during make the Earth Resistance measurement.

4–1 Normal earth resistance measurement

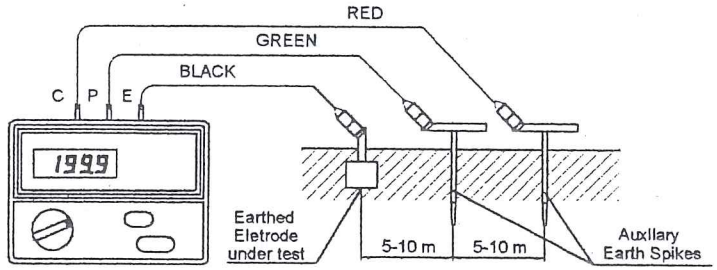


Fig. 2

1) **Test leads connection :**
Stick the Earth Spikes (3−8, Fig. 1), P and C, into the ground as shown below (Fig. 2). They should be aligned at an interval of 5 to 10 meters from the earthed equipment under test. Connect the Black lead wire to the terminal E of the instrument, the Green wire to terminal P and the Red wire to terminal C.

Note :
Make sure to stick the earth spikes in the most part of the earth. Give enough water where the earth spikes have to be stuck into the dry, stone or sandy part of the erath, so that it may become moist.

2) **Earth Voltage Measurement**
a. Set the " Hold/Normal Switch " (3−3, Fig. 1) to the " Normal " position.
b. Set the " Function Switch " (3−2, Fig. 1) to the " EARTH VOLT " position to check earth voltage.
c. Push the " Power Button " (3−4, Fig. 1) once a while then release the finger from the " Power Button " will power on the instrument. Earth voltage will be indicated on the display.
d. The instrument will be auto power off approx. two minutes after power on. During the power on, just push the " Power Button " will be manual power off.

Note :
When the display reads more than 10 V, it may result in excess errors in the earth resistance measurement.
To avoid this, off the power source of the equipment under test or take other measures to reduce the earth voltage.

3) **Earth Resistance Measurement**
a. Set the " Hold/Normal Switch " (3−3, Fig. 1) to the " Normal " position.
b. Set the " Function Switch " (3−2, Fig. 1) to the " 2 K ohm " position.
c. Push the " Power Button " (3−4, Fig. 1) once a while then release the finger from the " Power Button " will power on the instrument. The Earth Resistance value will be indicated on the display.
If necessary turn the " Function Switch " (3−2, Fig. 1) to the " 200 ohm " or " 20 ohm " and make another measurement.
The instrument will be auto power off approx. two minutes after power on. During the power on, just push the " Power Button " will be manual power off.

Note :
When measurement, start from " 2 K ohm " range, if the display reading show the over range " 1 . ", there are two major problems may be happened as :
a) The earth resistance of the spike C is too high to make the display. Reduce the erath resistance of the spike C, for example by adding moisture to the part of the earth where the spike is stuck, and check the test lead for loose connection.
b) According above a) procedures, if the earth resitance of the spike C and the test lead connection are OK, the dsipaly still show over range, then the meassured earth resistance (terminal E) will higher than 2 K ohm or existing the open circuit of the measured earth loop.

When connecting the lead wires, make sure that they are separated. If measurement is made when the lead wires twisted or in touch with each other. The reading of the instrument may be affected by induction voltage. If earth resistance of earth spikes is too large, it may result in inaccurate measurement. Make sure to stick the earth spikes into moist parts to the earth. Also, ensure sufficient connections between the respective terminals and lead wires,

4–2 Simplified earth resistance measurement

Use this method when there is no space to stick earth spikes. In this method, an existing earth electrode with a low earth resistance, such as a metal water pipe, a common earth of a commercial power supply and an earth terminal of a building can be used in place of C and P earth spikes. Use the simplified measurement probes in stead of THE TEST LEADS.

1) **connection :**

Make connection as shown below.

Note:

When the simplified measured probes are not used, short P and C terminals with a shorting wire.

Take caution to avoid electric shock hazard when making connection to an earth of a commercial power supply. Never attempt to measure mains supply voltage with the instrument.

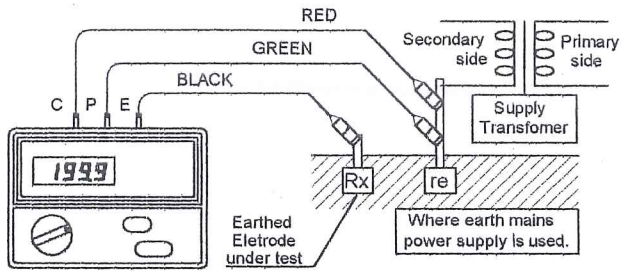


Fig. 3

2) **Earth Voltage Measurement**

a. Set the " Hold/Normal Switch " (3−3, Fig. 1) to the " Normal " position.

b. Set the " Function Switch " (3−2, Fig. 1) to the " EARTH VOLT " position to check earth voltage.

c. Push the " Power Button " (3−4, Fig. 1) once a while then release the finger from the " Power Button " will power on the instrument. Earth voltage will be indicated on the display.

d. The instrument will be auto power off approx. two minutes after power on. During the power on, just push the " Power Button " will be manual power off.

Note :

When the display reads more than 10 V, it may result in excess errors in the earth resistance measurement. To avoid this, off the power source of the equipment under test or take other measures to reduce the earth voltage.

3) **Earth Resistance Measurement**

a. Set the " Hold/Normal Switch " (3−3, Fig. 1) to the " Normal " position.

b. Set the " Function Switch " (3−2, Fig. 1) to the " 2 K ohm " position.

c. Push the " Power Button " (3−4, Fig. 1) once a while then release the finger from the " Power Button " will power on the instrument. The Earth Resistance value will be indicated on the display.
If necessary turn the " Function Switch " (3−2, Fig. 1) to the " 200 ohm " or " 20 ohm " and make another measurement.

The instrument will be auto power off approx. two minutes after power on. During the power on, just push the " Power Button " will be manual power off.

Note :

** The instrument does not trip any residual current circuit breaker in a power distribution circuit since its measuring current is less than 2 mA.*

** True earth resistance value RX is calculated as follow*

RX = RE − re

re : Earth resistance of a common earth of commercial power supply etc.

RE = Reading of the instrument.

4−3 Data Hold

a. During the measurement (under power on) if slide " Hold/Normal Switch " (3−3, Fig. 1) to the " Hold " position will freeze the display reading at the same time the upper left LCD will show the " ▲ " indicator.

b. Set " Hold/Normal Switch " (3−3, Fig. 1) to the " Normal " position will cancel the Data Hold function in the same time the " ▲ " indicator will be disappeared.

5. BATTERY REPLACEMENT

1) When the lower left corner of LCD display show " BAT ". It is necessary to replace the batteries.

2) Loose the screws that on the battery cover (3−6, Fig. 1). Slide the battery cover & remove the battery.

3) Replace with 6 x 1.5V batteries (Alkaline or heavy duty type) and reinstate the cover.