



Model: AR4105A

Digital Earth Resistance Tester Instruction Manual



Introduction

- Thanks for your purchase of our product.
- This book provides the info about how to operate with this unit and notice about it. To operate this unit to the best, please read this book carefully before use, and keep it well for further reference.
- Please make some simple test before operation to ensure the unit is in good condition

Catalogue

1. before operation

- checkup -----(01)
- safety alert----- (02)
- features and functions----- (04)
- specifications ----- (05)
- appearance and components -----(07)

2. operation instruction

- before measurement----- (08)
- operation----- (09)

3. others

- upkeep and maintenance----- (13)
- declaration----- (15)



Declaration:

- a. The battery used must be dealt with according to the local laws, rules and regulations.
- b. Our company reserve the right to upgrade and amend the specifications and design of the instrument and instructions, they are subject to change without further notification if any.



1、 before operation

Checkup

Please check the package after purchase, if there is any thing missing of the following or incomplete manual pages that seriously affect reading of it, contact the local distributor.

➤ Groudmeter	1PCS
➤ 1.5V alkaline battery	6PCS
➤ chinese manual	1PCS
➤ guarantee card	1PCS
➤ green test wire	1PCS
➤ yellow test wire	1PCS
➤ red test wire	1PCS
➤ grounding pin	2PCS
➤ clipped wire	1PCS
➤ nylon backpack belt	1PCS

- do not store the unit under the following environment:
 - In risk of water splash or highly intense dust room
 - Air of highly content of salt or sulfurate
 - Air of other chemical gas or substance
 - High temperature and humidity (over 40°C , 90%RH) or exposed directly under sunlight
- Do not disassemble the unit or amend the inner structure

Guarrantee:

- contact our afterservice department or distributor, if there is any problem as below:
 - Component damage
 - Abnormal display of LCD
 - Too big error in operation
 - Malfunction of keys.
- This groundmeter is of hightech and precise professional product, all the authorized maintenance personnel have been specially trained, it cannot be maintained by users.
- Please refer to the Guarantee Card for guarantee terms.
- Any damage resulting from unauthorized dismantle of the unit, improper transport or storage in breach of the manual instruction as well as unauthorized amendment of Guarantee Card or lack of proof will lead to refusal of guarantee service.

3. Others

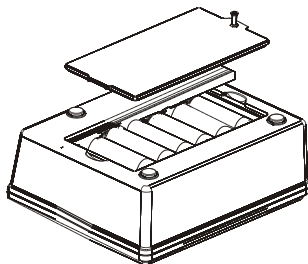
Upkeep and maintenance:

upkeep:

1. upkeep and maintenance of battery:

If there is low battery icon appearing, replace the battery immediately in following steps:

- a. Turn off the unit, and disconnect the wires
- b. unscrew the bottom door and open it;
- c. Replace the old ones with 6 fresh batteries with attention to the polarity.
- d. Close the door and screw it on firmly. Take out the battery if the unit is expected not to be used for a long time in future.



2. housing cleaning:

Use cloth with little water to clean the housing, alcohol and diluent is erosive to the housing especially to the LCD.

safety warning

This unit complies with the following standards in process of design, manufacture, test and transport

- ICE 61010-1 Overvoltage CAT III 300V Pollution
- Degree 2
- IEC 61010-2-31
- IEC 61557-1,5
- IEC 60529 (Ip54)

This book contains the warnings and safety rules that users must follow under safety environment, please read this book carefully before use.

⚠ Warning

- Read and understand the contents specified in this book before operation.
- Keep this book well and refer to it in case of need.
- Strictly follow the steps specified in the manual to operate.
- Understand all the details about safety contained in the manual.
- Strictly follow the below safety rules to operate, otherwise safety accident or damage of the unit may occur.
- Our company holds no responsibility to any loss resulting from that the unit is improperly operated or breach of safety rules.

Safety signal “ ⚠ ” contains three meanings in this manual, the user shall pay special attention to the operation marked with the signal “ ⚠ ”

- ⚠ Dangerous- means that certain environment or operation may lead to fetal harm.
- ⚠ Warning- means that certain environment or operation may lead to severe harm or fetal damage of this instrument.
- ⚠ Note- means that certain environment or operation may lead to harm or damage of the instrument.

△ Dangerous

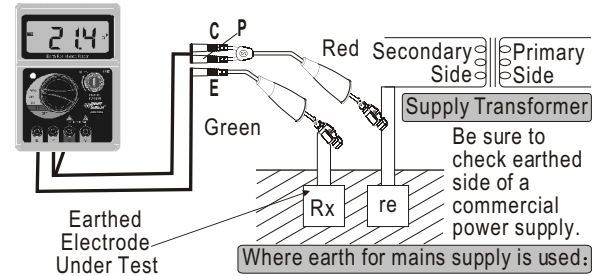
- Do not operate under environment of flammable gas, the unit may generate spark during operation which may lead to blast.
- Do not connect the test pin if the operator has a wet hand.
- Do not apply any power supply that is above the allowed limit or test range of the instrument.
- Do not open the battery door during operation.

△ Warning

- Do not use the instrument if there is any abnormal run of the instrument such as broken housing and test pin, or exposed metal parts.
- Do not shift the test range during operating after the test pin connected.
- Do not disassemble this instrument by the user, please contact our service department in case of need.
- Do not open the battery door or replace the battery when the instrument is wet and slippery, it must be dried with dry cloth.
- Turn off the instrument in case of opening the battery door or replacing the battery.

△ Note

- Make sure the test pin is connected with the device terminal safely
- Make sure the instrument is turned off after use.
- Take out the battery, if the instrument is expected not to be used for a long time in future.
- Do not put the instrument in the harsh environment of sunlight, extreme temperature and humidity.
- Use wet cloth of water or neutral cleanser to clean the unit, do not use any abrasive or solvent.
- When the instrument is wet, make sure store it after it is dried.



In this method, the terminal P and C has been short connected. This simple method can also be adopted to measure voltage with the green wire connected with V connector.

△ Warning

Use volt meter to measure voltage of the common terminal to the earth, this instrument cannot be used to measure that, it is very dangerous, because uncertain state of the terminal and connecting wire, the voltage may not be displayed, which leads to electric shock or damage of the unit. This unit cannot be used to measure the common power voltage, this unit is not designed for this operation, when using quick test head to measure (measure earth resistance only), the terminal P and C will be short connected which will lower the input resistance of the product.

4. In operation, press PRESS TO TEST key and turn it clockwise to LOCK position can perform measure without manual operation.

5. After measurement, turn the switch to OFF if the unit is expected not to be used for a while later.

△Special attention:

- (1). In process of measuring EV, do not press PRESS TO TEST key, otherwise the unit is in wrong operation state, and LCD displays ERR.
 - c. Switch the level switch to 200Ω and press TEST key, if the reading is too small, then switch in sequence of 20Ω/2Ω level, this time the reading is the EV value; in measuring resistance, pressing PRESS TO TEST will light on the state LED indicating the state of measuring.
(note: 1. if the resistance of the grounded pin is too big, "OL" or "----" will be displayed, check the test wires are properly connected or the pins are firmly inserted into the soil. 2. if the test wire has resistance, the value is difference between the readings and the resistance value of wire (0.04Ω) at level 2Ω, while the resistance value of wire can be neglected at the level 200Ω and level 20Ω.
Warning: the reading may be affected if the earth pin is distorted or smeared with other substance, so clean the pin before connecting the test wires; if the pin resistance is too big, error occurs.
 - d. The unit will turn off automatically if there is no further operation of the key after 8 minutes. Note: Turn the switch to Off position after auto turn off, then turn to other level for next turn on.
 - e. Backlight: it will be turned off automatically if there is no further operation after 30 seconds.
3. quick measure (with provided quick wire):
In case that it is not convenient to use the pin, set a subject that is lowly grounded as a polarity, for example metal gullet, water supply pipe, common ground terminal of power supply, ground terminal of buildings. Connection as shown in figure: $R_e = R_x + r_e$

Features

- This ground meter is designed for testing ground wire of electric power net, as well as earth voltage test in the fields of household electric power system and electric appliance application.
- Dustproof and waterproof structure of the product meets IEC 60529, i.e. the unit can be used under very bad weather.
 - Big sized LCD display and backlight
 - Simple and easy operation, wide application.
 - High precision and economical.
 - Auto turn-off.

Specification

- Measuring range and error (under the condition of $23 \pm 5^\circ\text{C}$ and $\leq 75\% \text{RH}$): earth voltage.

Range	Earth resistance	Accuracy	resolution	
Earth resistance	0~200V	$\pm 2\% \text{rdg} + 5 \text{dgt}$	0.1V	
Earth resistance	2Ω	0~1.999Ω	$\pm 2.0\% \text{rdg} + 0.02\Omega$	0.001Ω
	20Ω	2~19.99Ω	$\pm 2.0\% \text{rdg} + 0.1\Omega$	0.01Ω
	200Ω	20~199.9Ω	$\pm 2.0\% \text{rdg} + 3 \text{drg}$	0.1Ω

- Electromagnetic compatibility: (radiation protection RF and IEC 61000-4-3)
RF geomagnetism $\leq 1\text{V/m}$, overall error: in range of specification.
RF geomagnetism $\leq 3\text{V/m}$, overall error: $(1+5\%) \times$ (range of specification)

- standards in line with

- IEC 61010-1 Overvoltage CAT III 330V Pollution
- Degree 2
- IEC 61010-2-31
- IEC 61557-1, 5
- IEC 60529 (IP54)

- Measuring mode:

- 1). Earth voltage measuring: average value induction
- 2). Earth voltage measuring: tangent current converter.
Frequency: about 820Hz
measuring current: about 20Ω about 3mA (AC)

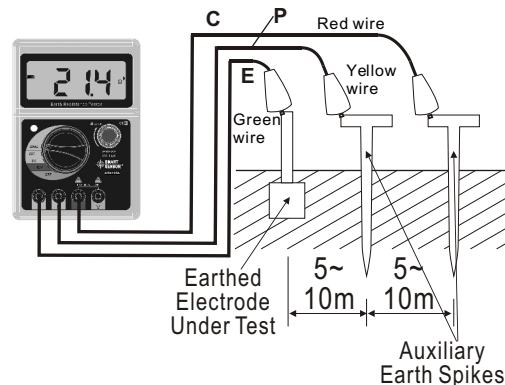
- Max operating error(B)

$$B = \pm (|A| + 1.15 \times \sqrt{E1^2 + E2^2 + E3^2 + E4^2 + E5^2 + E7^2 + E8^2})$$

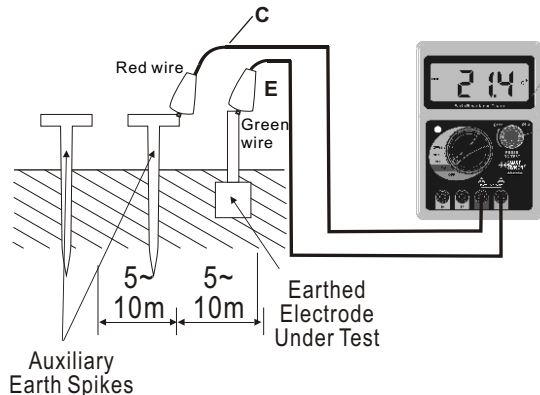
in which: A: inherent error

E1: error arising from location change

E2: error arising from volt supplied



- Earth voltage test: switch the level switch to the earth voltage (E.V) level, the EV displays automatically, make sure the EV is less than 10V, otherwise extra error may happen. So turn off the electric appliance, then measure the EV after the measuring voltage is lowered.



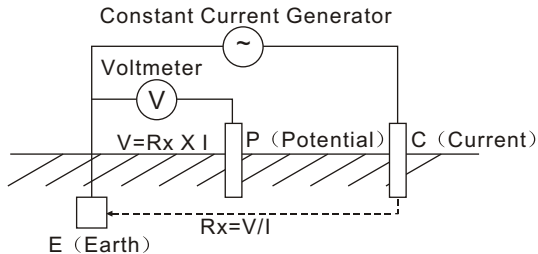
Operation

⚠ Warning

- When measuring the earth resistance with the unit, a voltage up to 50V is generated between terminal E and terminal C which may shock to human.
- For earth voltage measuring, do not apply voltage more than 220V to avoid damage of the unit.
- For earth resistance measuring, do not apply voltage to the wire terminal

1. Measuring principle(as shown in figure):

The earth resistance value comes from that by calculation of the alternative current between terminal C and terminal E and the potential difference between terminal E and terminal P in formula: $R_x = V/I$



2. Precise measurement(with provided test wire): $R_x = V/I$

- a. Pin the terminal P and C into earth and aligned with the ground device in spacing 5 to 10 meters between, and connect them as shown in the following:

(note: make sure the soil to be pinned is wet, water shall be injected if the soil is dry or sanded.)

- E3: Error arising from temperature difference
- E4: Error arising from different serial medium
- E5: Error arising from different resistance between pin and assistant connection
- E6: Error arising from fluctuation of system frequency
- E7: Error arising from fluctuation of system voltage.

6. Max operating error:

max operating error in measure range: ($\pm 30\%$):

Within 2Ω : 0.5~1.999 Ω

Within 20Ω : 2~19.99 Ω

Within 200Ω : 20~199.9 Ω

7. Measuring mode: .all levels are continuous measurement.

8. Operating environment: temperature: 0~40°C ;
relative humidity: $\leq 85\%RH$ (no fog)

9. Storage condition: temp: -20~60°C ; RH: $\leq 75\%rh$ (no fog)

10. Power supply: 9V DC R6P (SUM-3)x6

11. Overload protection:

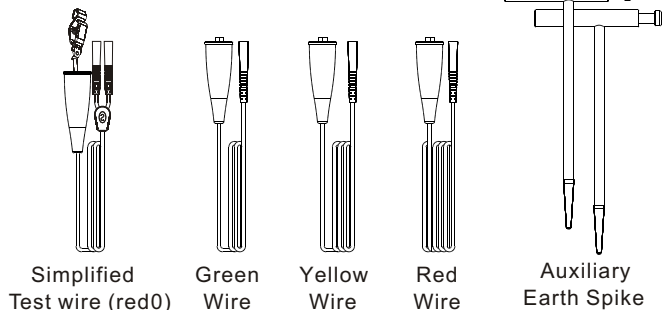
earth resistance range: 200V AC(10 seconds)

Earth voltage Range: 300V AC (30 seconds)

12. Insulation resistance: (500v wire to the housing) $\geq 5m\Omega$

13. Resistant voltage: (wire to the housing) 3700v ac 1 minute without jump spark

Appearance and components




Operation sketch

2、 Operation instruction

Before measurement

1. Battery voltage check :

Turn on the unit, the LCD displays all info for once, and backligh is on, then return to the selected level, if the battery icon on LCD is “”, that means low battery, it is necessary to replace the battery with fresh one, otherwise the unit cannot work properly.

2. Connecting test pin:

Insert the pin with clip into the corresponding connector in the unit, with terminal E to the green wire, P to yellow, and C to red; or connect terminal P and C with the quick test wire (for simple test); loose connection will affect the measure result