Dear Client

Thank you for Purchasing our **ETCR2000 Clamp Type Earth Resistance Tester**. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.

Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.

The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark. PLEASE CAUTION RISK OF ELECTRICAL SHOCK!

Company Address:

- T4，No. 41, High-tech 2 Road，East Lake High-tech Development Zone，Wuhan
- Sales Hotline: 86-27- 87457960
- After Service Hotline**:** 86-27- 87459656
- Fax: 86-27- 87803129
- E-mail: qiao@hvtest.cc
- Website: www.hvtest.cc

◆ SERIOUS COMMITMENT

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ SAFETY REQUIREMENTS

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the

ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

—Security Terms

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

Contents

I. Attention

Thank you for purchasing this pincer earth tester from ETCR Electronic. In order to make better use of the product, please be certain:

--To read this user manual carefully.

--To comply with the operating cautions presented in this manual.

◆ Under any circumstances, pay special attention to safety in the use of the Meter.

◆ Pay attention to the measurement range of the Meter and the using environment provided.

◆ Pay attention to the text labeled on the panel and back plane of the Meter.

◆ Before booting up, the trigger should be pressed for a couple of times to ensure the jaws are well closed.

◆ In the process of auto inspection in booting up, DO NOT press the trigger, nor clamp any wire.

◆ The process of auto inspection would display "CAL6, CAL5, CAL4…CAL0, OL Ω."

◆ Before the auto inspection is completed and the "OL Ω" symbols are showed, the measured objects cannot be clamped on.

◆ The jaw planes contact must be maintained clean, and should not be polished with corrosive and rough materials.

◆ Avoid any impact onto this Meter, especially the jaw contact planes.

◆ This Meter will have some buzzing sound in measurement process, and it is normal.

◆ The measurement current of the wire should not exceed the upper limit of the Meter.

◆ Please take out the batteries in the case of the Meter being idle for a long time.

◆ The dismantling, calibration and maintenance the Meter shall be

operated by the authorized staff.

◆ If the continuing use of it would be dangerous, the Meter should be stopped using immediately, and immediately sealed for the treatment by the authorized agencies.

◆ The contents in this user manual marked with **"*"** are limited to **ETCR2000C**.

II. Brief Introduction

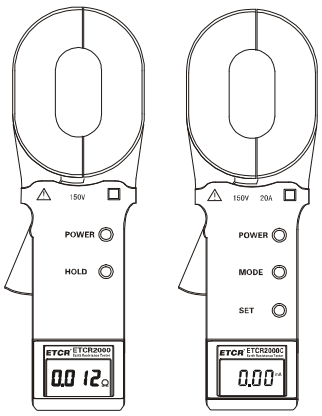
ETCR2000 series of Pincer Earth Tester is a major breakthrough in traditional grounding resistance measurement. It is widely used in the grounding resistance measurement of the power, telecommunications, meteorology, oilfield, construction and the industrial and electrical equipment.

ETCR2000 series of Pincer Earth Tester, in the measurement of a grounding system with loop current, does not require breaking down the grounding wire, and need no auxiliary electrode. It is safe, fast and simple in use.

ETCR2000 series of Pincer Earth Tester can measure out the faults beyond the reach of the traditional methods, and can be applied in the occasions not in the range of the traditional methods. **ETCR2000** series of Pincer Earth Tester can measure the integrated value of the grounding body resistance and the grounding lead resistance.

ETCR2000 series of Pincer Earth Tester is equipped with a long jaw, as indicated in the figure below. A long jaw is particularly suitable for the occasion of grounding with the flat steel.

In addition, **ETCR2000C** Pincer Earth Tester is also able to measure the leakage current and the neutral current in the grounding system.



III. Specification

1. Model of Series

Model	Jaw specification (mm)	Range of Measurement (Ω)		Range of Current (A)	Storage Function	Alarm Function	Remarks
	65x32	0.01-200	0.01-1000	0.00-20.00			
ETCR2000	√		√				Base Model
ETCR2000A	√	√					Practical Model
ETCR2000C	√		√	√	√	√	Multi-functional Model

Note: "√" means available.

2. Ranges and Accuracy of Measurement

Mode	Range	Resolution	Accuracy
Resistance	0.010-0.099Ω	0.001Ω	±(1%+0.01Ω)
	0.10-0.99Ω	0.01Ω	±(1%+0.01Ω)
	1.0-49.9Ω	0.1Ω	±（1%+0.1Ω）
	50.0-99.5Ω	0.5Ω	±（1.5%+0.5Ω）
	100-199Ω	1Ω	±（2%+1Ω）
	200-395Ω	5Ω	±（5%+5Ω）
	400-590Ω	10Ω	±(10%+10Ω)
	600-1000Ω	20Ω	±(20%+20Ω)
*Current	0.00-99mA	1mA	±(5%+2mA)
	100-299mA	1mA	±(5%+5mA)
	0.30-2.99A	10mA	±（5%+0.03A）
	3.00-9.99A	10mA	±(5%+0.04A)
	10.00-20.00A	10mA	±（5%+0.05A）

Note: "*" is limited to ETCR2000C.

3. Technical Specifications

Power Source: 6VDC (4 ×5# alkaline battery)

Working Temperature: -10 ° -55 ° C

Relative Humidity: 10%-90%

LCD: 4-digital LCD, 47 × 28.5mm width

Net Weight (including batteries): 1130g

Demension: 275mm long, 85 mm wide, 56mm thick

Protection Level: Double insulation

Structural Feature: In the jaw way

Shift: Automatic

External Magnetic Field: ＜40A/m

External Electric Field: ＜1V/m

Measuring Time: 1 second

Resistance Measurement Frequency: ＞1KHz

Maximum Resistance Measurement Resolution: 0.001 Ω

Resistance Measurement Range: 0.01-1000 Ω

***Current Measuring Range**: 0.00-30.0A

*** Measured Current Frequency**: 50/60Hz

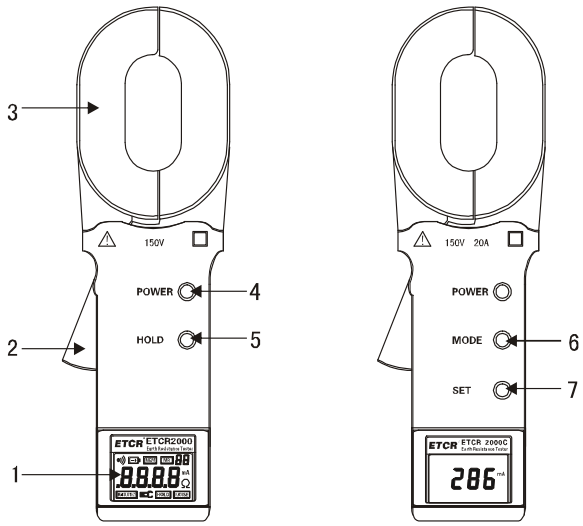
*** Storable Measurement Data**: 99 Units

***Setting Range of Resistance Alarm Critical Value**: 1-199 Ω

***Setting Range of Current Alarm Critical Value**：1-499mA

Note: "*" is limited to ETCR2000C.

IV. Structure of Meter



1. Liquid Crystal Display (LCD)

2. Trigger: to control opening and closing of jaw :

3. Pincer Jaw : 55 x 32mm

4. POWER Key: Boot Up / Shutdown /***Quit**

5. HOLD Key: lock / Release display

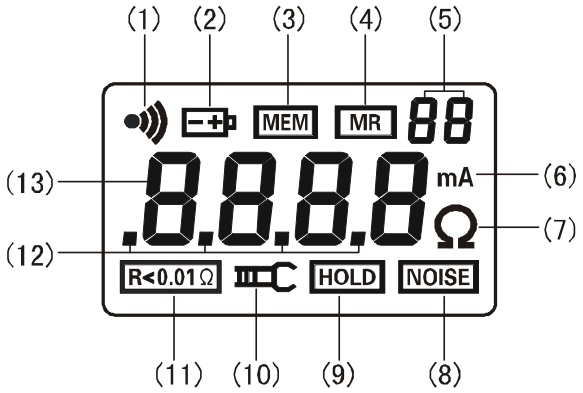
***6.MODE Key**: switch key of function mode (resistance measurement / current measurement /data access)

***7. SET Key**: function key combinations (Combination with MODE key to achieve: Lock / Release / Storage / Set / Check / Browse / Delete Data)

Note: "*" is limited to ETCR2000C.

V. Crystal Display

1. LCD Screen



(1). Alarming sign

(2). Sign of low battery voltage

(3). Symbol of full data storage

(4). Symbol of data access

(5). 2-Digital No. Of Data Storage Unit

(6). Current unit

(7). Resistance unit

(8). Noise signal

(9). Data lock symbol

(10).Symbol of an open jaw

(11).Symbol of resistance of less than 0.01 Ω

(12). Metrication decimal point

(13). 4-digital LCD figures display

2. Description of Special Symbols

(1). Symbol of an open jaw: As a jaw is in the open state, the symbol shows. At this point, trigger may be artificially pressed, or the jaws have been seriously polluted, and can no longer continue to measure.

(2). Symbol of low battery voltage: when the battery voltage is lower than 5.3V, the symbol shows. At this time, it cannot guarantee accuracy of the measurements. Batteries should be replaced.

(3). "**OL Ω**" symbol indicates that the measured resistance has exceeded the upper limit of the Meter.

(4). "**L0.01Ω**" symbol indicates that the measured resistance has exceeded the lower limit of the Meter.

***(5).** "**OL A**" symbol indicates that the measured current has exceeded the upper limit of the Meter.

***(6).** Alarm symbol: when the measured value is greater than the critical value of alarm setting, the symbol flashes.

***(7).** MEM Symbol of full data storage: memory is full of data units of 50, and can no longer continue to store data.

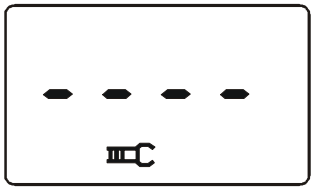
***(8).** MR Symbol of access to data: to display in an access to data, also including the number of data.

***(9).** NOISE Noise signal: the symbol shows in the measurement of grounding resistance at a greater interference current in the loop. At this time it cannot guarantee accuracy of the measurements.

Note: "*" is limited to ETCR2000C.

3. Examples Illustrated

(1) ---Jaw is in open state, and cannot measure



(2) ---Measured loop resistance is less than 0.01 Ω

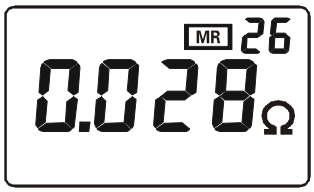
(3) ---Measured loop resistance is 5.1 Ω

(4) ---Measured loop resistance is 2.1 Ω

---Lock the current measurement value: 2.1 Ω

*(5) ---Access to the stored data of Unit No. 26

---Measured loop resistance is 0.028 Ω



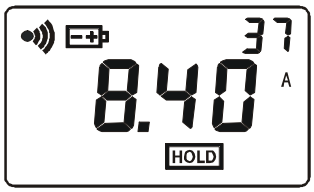
*(6)---Alarm function activated, the measured current exceeded the critical value of alarm setting

---Low battery voltage is displayed. At this time, it not guarantee the accuracy of the measurements

---Measured current is 8.40A

---Lock the current value displayed

---Store the current value as the data Unit No. 37

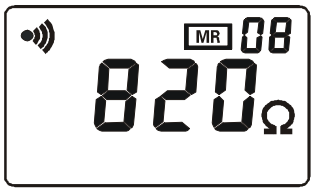


*(7) ---Alarm function activated, the measured resistance exceeded the

critical value of alarm setting.

--- Access to the stored data unit No. 8

---Measured resistance is 820 Ω



Note: "*" is limited to ETCR2000C.

VI. Quick Find Table

Function	**Key**
Boot Up / Shutdown / Shutdown Delay	**POWER**
Lock / Release Display	**HOLD**
* Quit	**POWER**
*Resistance measurement / current measurement / Data Access model	**MODE**
*Lock / Release Display / storage / Access To Alarm Critical Value	**SET**
* Alarm Critical Value Setting / Digital Option / Browse And Store Data	**MODE/SET**
* To clear all stored data	**SET+MODE**

Note: "*" is limited to ETCR2000C.

VII. Operating Method

1. Boot Up

Before booting up, the trigger should be pressed for a couple of times to ensure the jaws are well closed.

Press **POWER** key, and it is switched into the boot-up state. First to automatically test LCD display, all its symbols show up, see Figure 1. Then to start the auto inspection; in this process, it will be followed by showing **"CAL6,**

CAL5, CAL4:CAL0, OL Ω" , see Figure 2. When "OLΩ" appears, auto inspection is completed, and then automatically enter the resistance measurement model, see figure 3.

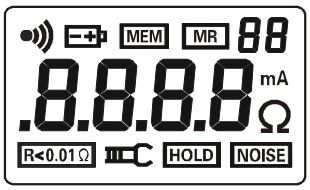


Figure 1

Figure 2

Figure 3

In the process of auto inspection, DO NOT press the trigger, nor open the jaw, nor clamp any wire.

In auto-inspection process, be sure to maintain the natural static state of the Meter; do not overturn the Meter, nor impose any external force on the jaw. Otherwise, the accuracy of measurement cannot be guaranteed.

In auto-inspection process, if the jaws clamped around a conductor loop, the measurement is not accurate. Please remove conductor loop and reboot it up.

If there was not an OL appearing after auto-inspection, but a greater resistance value displayed, as shown in figure 4; But the test loop detection can still give out the correct result. This shows that the Meter has a larger error only in measuring the major resistance (e.g. more than 100Ω), whereas in measuring the small resistance, it can still maintain the original accuracy, users can be rest assured in use.

Figure 4

*After auto-inspection is completed, **ETCR2000C** shows "OL Ω", and also

flashes the symbol , as shown in Figure 5. Due to that no-load resistance "OL" has exceeded the alarm critical value of resistance.

Figure 5

2. Shutdown

After the Meter is switched on, press **POWER** key to shut it down.

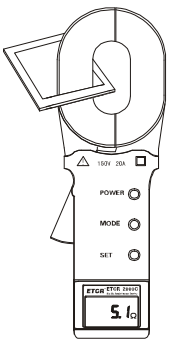
In five minutes after the Meter started up, the LCD screen entered flashing state, and would automatically shut down after the flashing state is sustained for 30 seconds to reduce battery consumption. Press **POWER** key in flashing state may delay the shutdown of the Meter, and keep it working.

In **HOLD** state, it is required to first press **HOLD** key to quit from the **HOLD** state, then press **POWER** key to shut it down.

***In** **HOLD** state, **ETCR2000C** is required to press **SET** key or **POWER** key to quit **HOLD** state; then press **POWER** key to shut down.

***In** a state of alarm setting value, **ETCR2000C** needs first to press **POWER** key or **SET** key for 3 sec to quit from the state, then press **POWER** key to shut down.

3. Resistance Measurement



After the booting auto-inspection is completed, it shows "OL Ω" and will be able to proceed with resistance measurement. At this point, press the trigger and open the jaws, clamp the target loop, reading to get the resistance value.

If the user thinks it necessary, the test can be done with the ring as shown in the following figure. Its show value should be

consistent with the normal value on the test ring (5.1 Ω).

The normal value on the test ringis the value at a temperature of 20 ° C.

It is normal to find the difference of numerical 1 word between the show value and the nominal value, For instance: If the nominal value of test ring is 5.1 Ω, it would be normal showing 5.0 Ω or 5.2 Ω.

It shows "OL Ω", indicating that the measured resistance value exceeded the upper limit of Meter, see Figure 3.

It shows "L0.01Ω", indicating that the measured resistance value exceeded the lower limit of Meter, see Figure 6.

Figure 6

In **HOLD** state, it is required to press **HOLD** key to quit the **HOLD** state before continuing measuring.

***** Flash symbol))) indicates that the measured resistance value has gone beyond the alarm critical value.

*****In other modes, **ETCR2000C** can be switched to the resistance measurement mode by pressing **MODE** key.

*****In **HOLD** state, **ETCR2000C** is required to press **SET** key or **POWER** key to quit **HOLD** state; then press **MODE** key to switch to the mode of resistance measurement.

*****In a state of alarm setting value, **ETCR2000C** needs first to press **POWER** key or **SET** key for 3 sec to quit from the state, then press **MODE** key to switch to the mode of resistance measurement.

*4. Current Measurement

After the booting auto-inspection is completed, the Meter automatically enter the resistance measurement mode. Upon showing "OL Ω", press **MODE** key, and the Meter enter the current measurement mode, showing "0.00mA" ,

see Figure 7. At this point, press the trigger and open the jaws, clamp the target wire, reading to get the current value.

Figure 7

Figure 8

It shows "OL A", indicating that the measured current value exceeded the upper limit of Meter, see Figure 8.

Flash symbol))) indicates that the measured current value has gone beyond the alarm critical value.

In other models, it can switch to the resistance measurement by pressing **MODE** key mode.

In **HOLD** state, needs first to press **SET** key or **POWER** key to quit from **HOLD** state, then press **MODE** key to switch to the current measurement mode.

In a state of alarm setting value, needs first to press **POWER** key or **SET** key for 3 sec to quit from the state, then press **MODE** key to switch to the mode of current measurement.

5. Data Lock/Release/Storage

In the process of resistance measurement, press **HOLD** key to lock the current show value, displaying **HOLD** symbol. Then press **HOLD** key to release locking, **HOLD** symbol would disappear and can continue to measure.

***When** **ETCR2000C** is in the measurement of the resistance or current, press the **SET** key to lock the current show value, showing **HOLD** symbol, while take this locked value as a data unit and have it automatically numbered and stored. Then press **SET** key or **POWER** key to cancel locking, the **HOLD** symbol would disappear, returning to the measurement state. Repeat the above operations, a total of 50 units data can be stored. When memory is full,

MEM symbol would flashs display.

*As indicated in Figure 9, lock the measured resistance 0.016Ω, and save it as data unit No.1.

*As indicated in Figure 10, lock the measured current 278mA, and save it as data unit No.50.And the memory is full now.

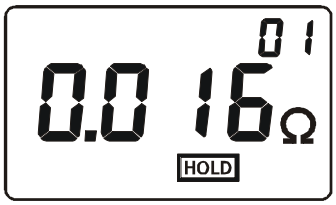


Figure 9

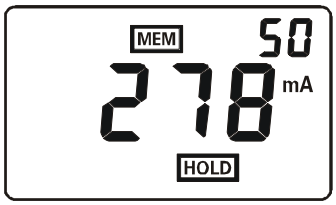


Figure 10

*In the access mode, press **MODE** key to switch to the measurement mode, then the operation can be done to lock and save data.

*In the setting state of alarm critical value, it is required to press down **POWER** key or **SET** key for 3 sec to quit from the setting state of alarm critical value before operating locking and saving function.

*Switching on after shutdown will not lose the saved data.

*6. Data Access

Press **MODE** key to enter the Access Mode of the stored data, and the default to display is the data unit No.01 stored, as shown Figure 11. Then press **SET** key to turn down to browse the saved data. On browsing the last data unit, it returns to the data unit No.01.If no stored data, as shown in Figure 12.

In the setting state of alarm critical value, it is required to press down **POWER** key or **SET** key for 3 sec to quit from the setting state of alarm critical value before pressing **MODE** key to switch to the access data mode.

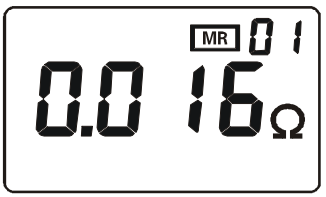


Figure 11

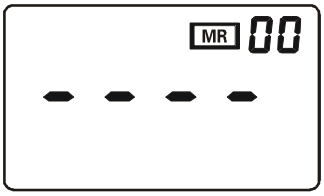


Figure 12

*7. Setting of Alarm Critical Value

Press **MODE** key enter the measurement mode of resistance or current. After pressing down **SET** key for 3 sec, you can enter the setting function of alarm critical value. At this point, the highest-digit begins to flash. First set the highest digit as indicated in Figure 13 and Figure 14. Press **MODE** key to switch from high to low digits. As the current figure flashes, press **SET** key to change the figures of "0, 1…9 "; After setting all the digits, press down **SET** key for 3 seconds to confirm the alarm critical value currently set. A successful setting would show the flashed alarm critical value, and then automatically return to the measurement mode.

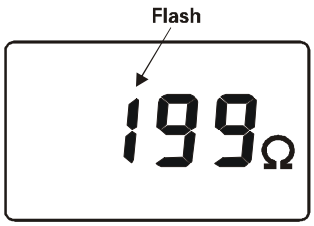


Figure 13

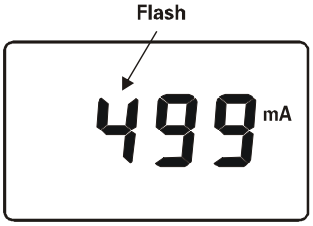


Figure 14

(Figure 13 Critical Value Setting of Resistance Alarm)

(Figure 14 Critical Value Setting of Current Alarm)

In the process of setting or After a successfully process, press **POWER** key can also quit from setting functions of alarm critical value, return to the measuring state.

In the data access mode, it is required to press **MODE** key to switch to the measurement mode, then the operation can be done to set the alarm critical value.

*8. Access to Alarm Critical Value

Press **MODE** key to enter the mode of resistance or current measurement. Press down **SET** key for 3 sec, you can access to check the alarm critical value, which would flashes in high-digit. The value accessed was set in the last time. And again press down **SET** key for 3 sec or **POWER** key to quit from the access state and return to the measuring state.

As indicated in Figure 15, the alarm critical value of resistance set in the

last time is 20Ω.

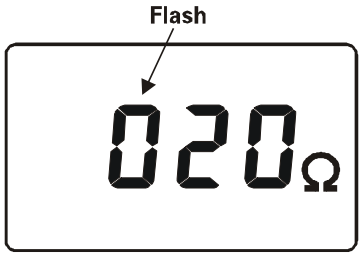


Figure 15

*9. Clear Data

Press **MODE** key to enter the access mode of the stored data. Pressing down **SET + MODE** combination key may automatically clear all the stored data. That is, press down **SET** key while pressing down **MODE** key.

The display after a clearing operation is shown Figure 12.

In **HOLD** state, it is required to press down **POWER** key or **SET** key to quit from **HOLD** state; then press **MODE** key to enter the access data mode, and followed by pressing down **SET + MODE** combination key to clear all the stored data.

In the setting state of alarm critical value, it is required to press down **POWER** key or **SET** key for 3 sec to quit from the setting state of alarm critical value before pressing **MODE** key to switch to the access data mode; then press down **SET + MODE** combination key to clear all the stored data

Note: "*" is limited to ETCR2000C.

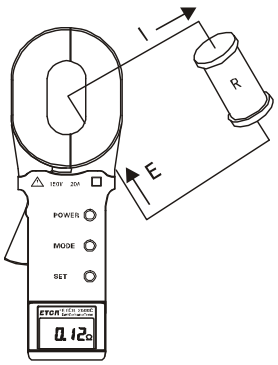
VIII. Measurement Principle

1. Principle of Resistance Measurement

The basic principle of **ETCR2000** in the measurement of resistance is to measure the loop resistance, as shown in the figure below. The jaw part of the Meter is comprised of voltage coil and current coil. The voltage coil provides excitation signal, and will induce a potential E on the measured loop. Under the effects of the potential E, the current I can

generate on the measured loop. The Meter will measure E & I, and the measured resistance R can be obtained by the following formula.

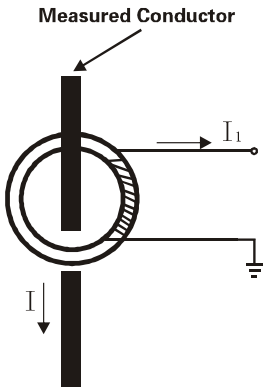
$$R = \frac{E}{I}$$



2. Principle of Current Measurement

The basic principle of **ETCR2000C** in the measurement of current is the same with that of the measurement of resistance, as shown in the figure below. The AC current on the measured wire, through the current magnetic loop and coil, can generate a induction current I_1; The Meter will measure I_1, and the measured current I can be obtained by the following formula.

$$I = n \cdot I_1$$



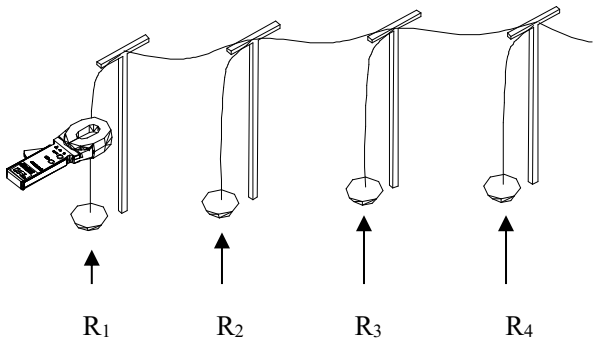
Where: n is the turn ratio of the secondary side vs. primary side.

IX. Measurement Method of Grounding Resistance

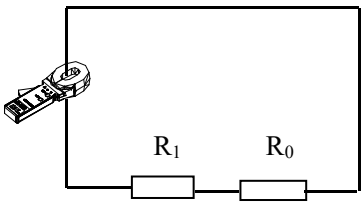
1. Multi-Point Grounding System

As for the multi-point grounding system (such as electricity transmission tower grounding system, grounding cable communications systems, certain

buildings, etc.), They usually pass the overhead ground wire (cable shielding layer) connected to form a grounding system.



As the Meter is in the above measurement, its equivalent electric circuit is shown in the figure below:



Where: R_1 is the target grounding resistance.

R_0 is the equivalent resistance of the other entire tower grounding resistances paralleled.

Although strictly on the theoretical grounding, because of the existence of so-called "mutual resistance", R_0 is not the usual parallel value in the sense of electrical engineering (slightly higher than its IEC parallel output value). But because a tower-grounding hemisphere was much smaller than the distance between the towers, and with a great number of locations after all, R_0 is much smaller than R_1. Therefore, it can be justified to assume R_0=0 from an engineering perspective. In this way, the resistance we measured should be R1.

Times of comparing tests in different environments and different occasions with the traditional method proved that the above assumption is entirely reasonable.

2. Limited Point Grounding System

This is also quite common. For example, in some towers, five towers are linked with each other through overhead ground wire; Besides, the grounding of some of the buildings is not an independent grounding grid, but several grounding bodies connected with each other through the wire.

Under such circumstances, the above R_0 regarded as 0, will yield more error on the results of the measurement.

Due to the same reasons mentioned above, we may ignore the impact of the mutual resistance; and the equivalent resistance of the grounding resistance paralleled is calculated by the usual sense. Thus, for the grounding system of N (N is smaller, but larger than 2) grounding bodies, it can offer N equations:

$$R_1 + \frac{1}{\frac{1}{R_2}+\frac{1}{R_3}+.....+\frac{1}{R_N}} = R_{1T}$$

$$R_2 + \frac{1}{\frac{1}{R_1}+\frac{1}{R_3}+.....+\frac{1}{R_N}} = R_{2T}$$

.

.

.

$$R_N + \frac{1}{\frac{1}{R_1}+\frac{1}{R_2}+.....+\frac{1}{R_{(N-1)}}} = R_{NT}$$

Where: R1, R2, ……R_N are grounding resistances of N grounding bodies.

R_{1T},R_{2T},……R_{NT} are the resistances measured with the Meter in the different grounding branches.

It is nonlinear equations with N unknown numbers and N equations. It indeed has a definite solution, but it is very difficult to solve the issue artificially, even impossible when N is larger.

Therefore, you’re expected to buy the Limited-Point Grounding System Solution software produced by this Company. Users can use the office computer or notebook computer to carry out solutions.

In principle, in addition to ignoring the mutual resistance, this method does not have the measurement error caused by neglecting R_0.

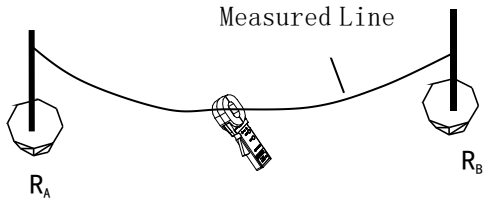
However, users need to pay attention to that: in response to the number of the grounding bodies mutually linked in your grounding system, it is necessary to measure the same number of the testing values for calculating of the program, not more or less. And the program would output the same number of grounding resistance values.

3. Single-Point Grounding System

From the measuring principle, **ETCR2000** series Meter can only measure the loop resistance, and the single-point grounding is not measured. However, users will be able to use a testing line very near to the earth electrode of the grounding system to artificially create a loop for testing. The following presented is two kinds of methods for the single-point grounding measurement by use of the Meter. These two methods can be applied to the occasions beyond the reach of the traditional voltage-current testing methods.

(1)Two-Point Method

As shown in the figure below, in the vicinity of the measured grounding body R_A, find an independent grounding body of better grounding state R_B (for example, near a water pipe or a building). R_A and R_B line will connect to each other using a single testing line.



As the resistance value measured by the Meter is the value of the series resistance from the testing line and two grounding resistances.

$R_T=R_A + R_B + R_L$

Where: R_T is the resistance value measured with the Meter.

R_L is the resistance value of the testing line. Meter can measure out the

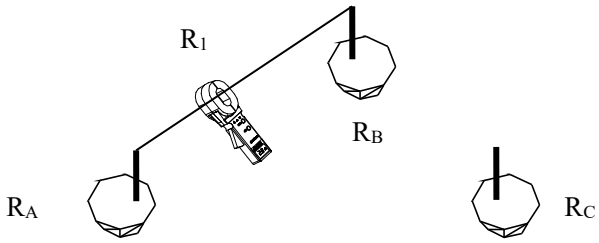
resistance value by connecting the test lines with both ends.

So, if the measurement value of the Meter is smaller than the allowable value of the grounding resistance, then the two grounding bodies are qualified for grounding resistance.

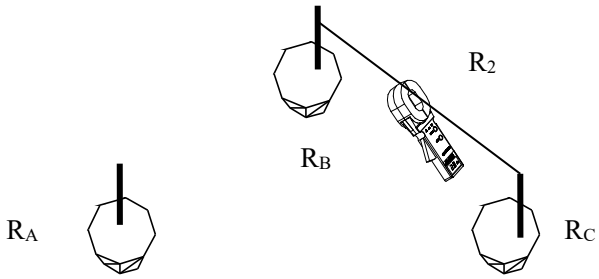
(2) Three-Point Method

As shown in the figure below, in the vicinity of the measured grounding body $R_{A,}$ find two independent grounding bodies of better grounding state R_B and $R_{C.}$

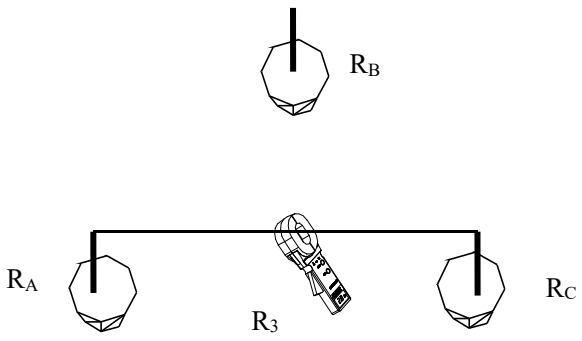
First, link R_A and R_B with a test line; use the Meter to get the first reading R_1.



Second, have RB and RC linked up, as shown in the following figure. Use the Meter to get the second reading R2.



Third, have RC and RA linked up, as shown in the following figure. Use the Meter to get the third reading R3.



In the above three steps, the reading measured in each step is the value of the two series grounding resistance. In this way, we can easily calculate the value of each grounding resistance:

From:

$$R_1 = R_A + R_B$$

$$R_2 = R_B + R_C$$

$$R_3 = R_C + R_A$$

We get:

$$R_A = \frac{R_1 + R_3 - R_2}{2}$$

This is the grounding resistance value of the grounding body RA.To facilitate the memory of the above formula, these three grounding bodies scan be viewed as a triangle; then the measured resistance is equivalent to the value of the resistance values of the adjacent edges plus or minus resistance value of the opposite sides, and divided by 2.

As the reference points, the grounding resistance values of the other two grounding bodies are:

$$R_B = R_1 - R_A$$

$$R_C = R_3 - R_A$$