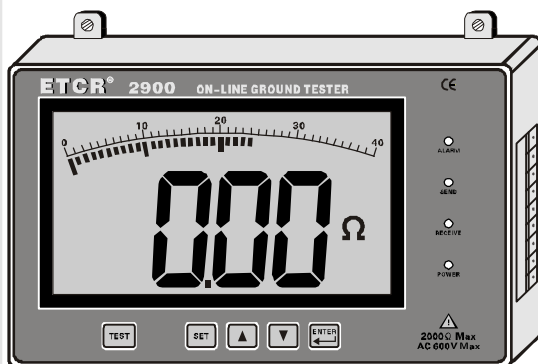


ETCR[®] ON-LINE GROUND TESTER

ETCR 2900



<http://www.etcrc.com>

MANUAL

ETCR Electronic Technology Co.,Ltd

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Attention

Thank you for purchasing **ETCR2900 Earth Resistance Online Tester** of our company. 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.**

- ⌚ Apply to ground resistance, ground wire voltage on-line monitoring.
- ⌚ Need to assist the auxiliary ground electrode, then install the detector.
- ⌚ Note that this detector specified measuring range and the using environment.
- ⌚ Protection against rain shower and water logging of installation.
- ⌚ Install protective device at outdoors.
- ⌚ The shell of the detector is non-metallic material, which has the potential danger of electrostatic charge. No friction in the dangerous situation, wipe clean with a damp cloth.
- ⌚ The dismantling, calibration and maintenance the detector shall be operated by the authorized staff.
- ⌚ If the continuing use of it would be dangerous, the Detector should be stopped using immediately, and immediately sealed for the treatment by the authorized agencies.

I. Brief introduction

ETCR2900 Earth Resistance Online Tester is our company devotes ourselves to Grounding resistance test technical research's another new high-tech product for more than ten years. Adopting precise 3-wire or simple 2-wire method for ground resistance measurement, average value rectification method for ground voltage measurement online testing and real-time monitoring. The user can select RS232 or RS485 communication, according to the protocol MODBUS, user also can proceed secondary development, build network, realization of remote multipoint online monitoring etc.

ETCR2900 Earth Resistance Online Tester composed of the detector and the monitoring software. The large LCD display of the detector is very intuitive. Setting the alarm thresholds and audible and visible alarm indicator are available. The material of the shell has the characteristic of resistance to high low temperature, corrosion prevention, inflaming retarding etc, ensure high-accuracy, high stability and high reliability of long time on-line monitoring outdoors, underground mine and indoors. The monitor software can real-time display the values of measured ground resistance and voltage. The user also can set the automatic monitoring interval time by the detector or the monitor software, the range of interval time is 1-999 hours. The automatic recording data can be generated reports, it is convenient to preservation, historical data query, print, analysis.

ETCR2900 Earth Resistance Online Tester apply to transmission line tower grounding, underground mine equipment grounding, meteorological lightning proof grounding, petrochemical grounding, communication grounding, distribution substation grounding, railway equipment grounding, building warehouse grounding, electrical equipment grounding etc.


II. Range and accuracy

Function	Range	Accuracy	Resolution
resistance	0.01Ω~20Ω	±1%rdg±3dgt (auxiliary ground resistance 100Ω±5%, voltage to ground<10V)	0.01Ω
	0.1Ω~200Ω		0.1Ω
	1Ω~2000Ω		1Ω
voltage	0~600V AC	±1%rdg±3dgt	1V

(Note: 23°C±5°C, below 75%rh)

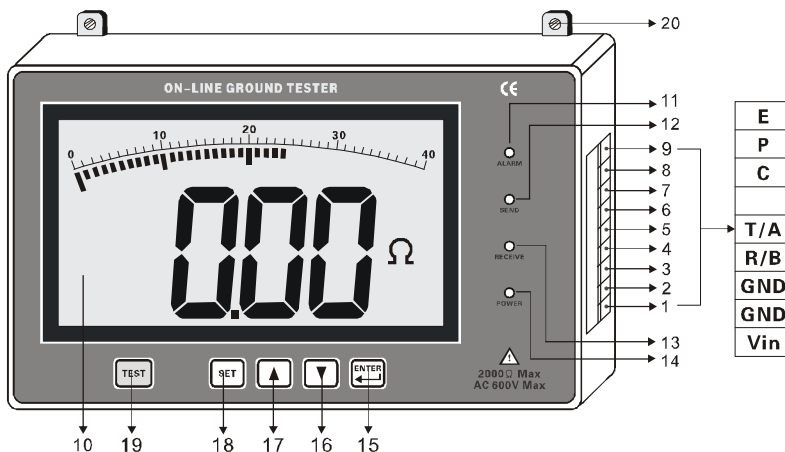
III. Technical specifications

Function	On-line monitoring ground resistance, ground voltage, equipotential connection resistance, low resistance.
Power Supply	Standard: 12V±1VDC, 150mA Max. Optional: 24V±1VDC.
Measure Mode	Precise 3-wire measurement, simple 2-wire measurement.
Measure Method	Ground resistance: rated current change-pole method, measured current 3mA Max, 820Hz; Voltage to ground: average value rectification method.
Data Mode	Mean.
Display Mode	4-digital super-large LCD.
Measuring Indicator	During measurement, LCD count down display.
LCD Size	128mm×75mm; Display field: 124mm×67mm.
Dimension	L×W×H: 190mm×117mm×54mm.
Measure Rate	Voltage to ground: about 2 times/second; ground resistance: about 30 seconds/time.
Measure Times	Over 5000 times(Measuring 10Ω for one time)

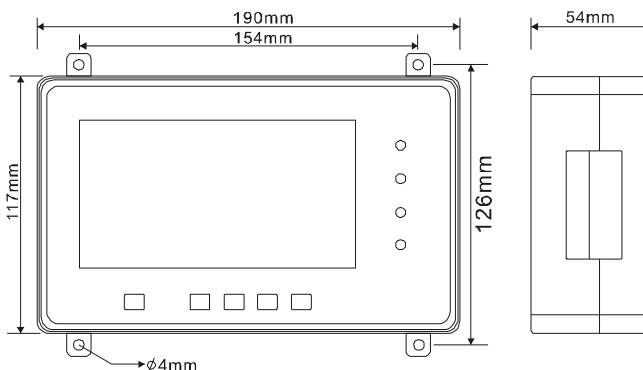
	and take a pause for 30s).
Line Voltage	Measuring voltage to ground: measuring below AC 600V.
Instrument Interface	Pluggable terminal blocks: 9 pin connector.
Communication Method	RS485 (or optional RS232).
Communication Line	USB to RS485 communication line(or optional USB to RS232 communication line).
Range Shift	Automatically.
Data Storage	400 sets, flash display FULL icon to indicate storage is full.
Interval Time	Range of automatic monitoring interval time: 1-999 h.
Data Access	Data read function: READ icon display.
Overflow Display	Exceeding measuring range overflow function: OL icon display.
Power Consumption	Backlit : 20mA Max.
	Standby: 25mA Max.
	Measurement: 70mA Max.
Alarm	Audible and visible alarm.
Power supply Voltage	When power supply voltage decreases to about 7.8V,  will display, reminding to replace the power.
Weight	Detector: 450g.
Working Humiture	-10°C~40°C; below 80%rh.
Storage Humiture	- -20°C~60°C; below 70%rh.
Overload Protection	Measurement ground resistance: E-P , E-C between each interfaces AC 280V/3 sec.
Insulation Value	Over 10MΩ(between circuit and enclosure 500V).
Withstand Voltage	AC 3700V/rms. (Between circuit and enclosure).
Electromagnetism	IEC61010-4-3, Radio frequency electromag-

	netic field $\leq 1\text{V/m}$.
Applicable Safety Rules	IEC61010-1, IEC1010-2-31, IEC61557-1,5, IEC60529(IP54), Pollution degree 2, CAT III 300V.

IV. Structure and size

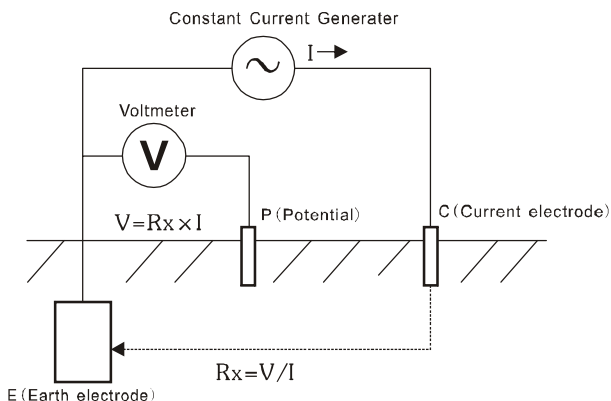


1. **(Vin)** The power supply positive interface.
2. **(GND)** Power GND.
3. **(GND)** Communication GND.
4. The R end of RS232/The B end of RS485(R/B).
5. The T end of RS232/The A end of RS485(T/A).
6. Reserve terminal(Do not use temporarily).
7. **C** (current electrode).
8. **P** (voltage electrode).
9. **E** (ground electrode).
11. **(ALARM)** alarm indicator.
12. **(SEND)** send indicator.
13. **(RECEIVE)** receive indicator.
14. **(POWER)** power indicator.
15. **[ENTER]** key.
16. Down key.
17. Up key.
18. **[SET]** key.
19. **[TEST]** key.
20. The mounting hole.



V. Measuring Principle

1. Voltage to ground measurement adopts average value rectification method.
2. Ground resistance measurement with rated current change-pole method. AC constant current I (3mA Max, 820Hz) is applied between the measurement object **E** (ground electrode) and **C** (current electrode), and finding out the potential difference V between **E** and **P** (voltage electrode), calculating the ground R_x .



3. Maximum Operating Error: Operating error(B) is an error obtained within the rated operating conditions, and calculated with the intrinsic error(A), which is an error of the instrument used, and the error(E) due to variations.

$$B = \pm (|A| + 1.15 \times \sqrt{E_1^2 + E_2^2 + E_3^2 + E_4^2 + E_5^2 + E_7^2 + E_8^2})$$

A: Intrinsic error

E1: Variation due to position change

E2: Variation due to power supply voltage

E3: Variation due to temperature change

E4: Variation due to interference voltage change


E5: Variation due to contact electrode resistance

E7: Variation due to system frequency change

E8: Variation due to system voltage change

VI. LCD display

1. Special symbol description

(1)  symbol of low power supply voltage: when the power supply voltage is lower than 7.8V, the symbol shows, please check the power supply.

(2) **OL** symbol indicates that the measured resistance has exceeded the upper limit of the detector.

(3) **MEM** storage mode, displayed in the data storage process

(4) **READ** symbol of access to data: to display in an access to data, also including the number of data.

2. An example of display

(1) Measured resistance is 0.02Ω



(2) Access to the stored data unit No.3
Measured resistance is 0.03Ω



- (3) Measured resistance is 571Ω
 Display the Symbol of low power supply voltage
 Please check the power supply.



VII. Operation Methods

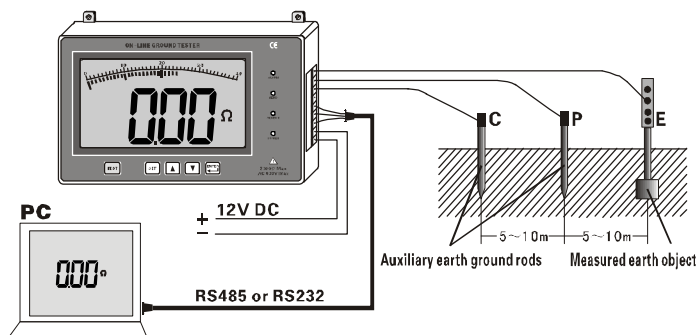
1. Installation and connection

note	The connection must be one to one correspondence, otherwise damage to the detector or other device.
	The power supply ground wire: first connection and finally removed;
	The power supply positive wire: finally connection and first removed.

First, the user need to make the auxiliary grounding electrode P and C every 5-10 meters near the grounding electrode E(which to be monitored) in a straight line. The auxiliary electrode should be used the grounding materials or stainless steel materials to prevent rust and rot. The smaller the better for the ground resistance of the auxiliary grounding electrode, In order to ensure the accuracy of online monitoring, the ground resistance of the auxiliary grounding electrode is not exceed 100Ω , voltage to ground is less than 10V.


Second, corresponding connect the detector, computer and power supply as the following table. The connection between the detector and the auxiliary electrode use the wire clip to fix (to facilitate the later maintenance and disassembly), it also can weld.

Terminal	Connection Explain
E	Measured ground electrode.
P	Voltage electrode.
C	Current electrode.
T/A	The T end of RS232 or the A end of RS485.
R/B	The R end of RS232 or the B end of RS485.
GND	Communication GND.
GND	Power GND.
Vin	Positive power supply input.




2. Connect the power supply to work

When the power supply connect to the detector, it will automatically startup and then into working state. The detector without the automatic shutdown function, it will shutdown when disconnect the power supply.

After startup, if the LCD display  icon, that means the power supply voltage is low, Please check the power supply in accordance with the instructions.

3. Monitor

	The detector cannot be used for commercial power supply voltage measurement. Otherwise, measuring voltage in the grounding circuit of cutout switch may cause cutout switch start.
	On measuring grounding voltage, please do not impose over 600V voltage on measurement connectors.
	When measuring, please do not touch measured bare conductors and the terminal exposed part ,in case of electric shock.
	On measuring grounding voltage, between E and C interface, it will occur the maximum voltage about 50V! Please do not impose voltage on measurement interface. Please pay attention to avoiding electric shock accident.
	Measurement of ground resistance need to confirm that voltage value to ground must be lower than 10V. If the voltage value is over 10V, the measurement value of ground resistance may cause error and at that time, it shall firstly cut off power on measured grounding equipment and make resistance measurement after the grounding voltage is decreased.

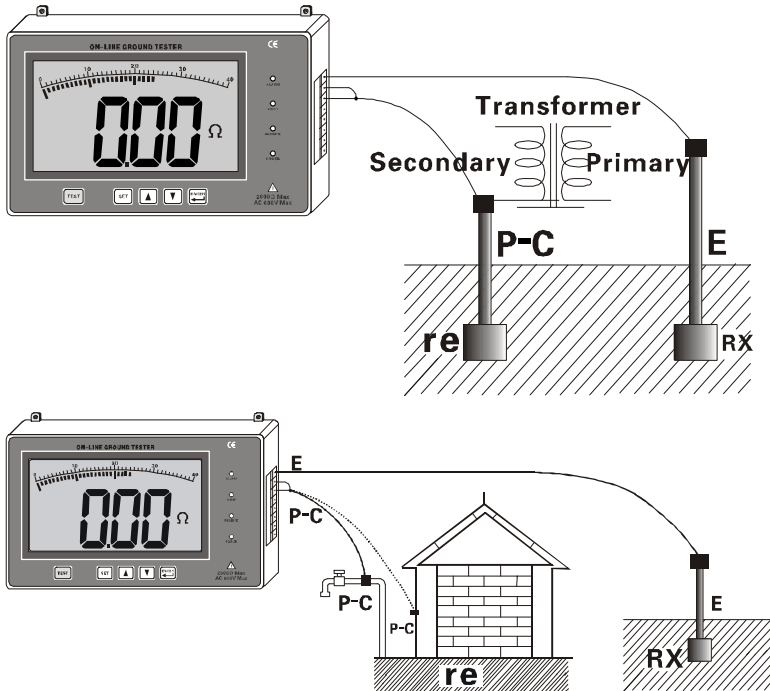
Short press **TEST** key to measure ground resistance, press **TEST** key for a longer time (over 3 seconds) to measure ground voltage, hand release return to the wait for ground resistance test, the LCD display the measured values. When on-line monitoring, upper-computer software can automatic sent the test commands and complete the ground resistance and ground voltage test, no need for manual operation.

The on-line monitoring of ground resistance usually adopts precise 3- wire measurement, also use the simple 2-wire measurement.

2-wires method: This method is a simple method for measurement that does not use auxiliary grounding rod, taking the ground elec-

trode with the minimal existing ground resistance value as auxiliary ground electrode, (P, C interfaces are in short-circuit). It can make use of metal pipes, fire hydrants and other metal buried objects, common grounding of commercial electric power system or lightning protection ground electrode and others to replace auxiliary grounding rods C(H),P(S), and pay attention to remove oxide layer on the connection point of the selected metal auxiliary grounding object when making measurement.

Wire connection is as following figure:



Simple method for measurement of ground resistance, its reading on detector is the total value of ground resistance value of measured grounding object and that of commercial grounding object, namely:

$$RE = RX + re$$

In which: **RE** is the Tester reading value;

RX is the ground resistance value of measured grounding object;

re is the ground resistance value of common grounding object like commercial use power system.

Then, the ground resistance value of measured grounding object is:

$$RX=RE-re$$

Adopting simple method for measurement of ground resistance shall try to select the grounding object with low value as the auxiliary ground electrode and thus the tester reading value can be more approaching to true value.

4. Alarm setting

After detector electricity work, in the test mode, press **SET** key to enter the setup mode, and then press **SET** to move the cursor until the LED display **SE1**. At this time is the alarm setting mode, press **←** or **→** to change current digital, press **SET** key to move the cursor and then press **ENTER** key to store and exit. When measurement value is larger than alarm critical settings value, the detector will flash and display LED alarm indicator and give out “toot-toot-toot--” alarming sound.

As shown in the figure below: the alarm threshold is 10Ω



5. Automatic monitoring interval time configuration

There are two automatic monitoring interval time configurations:

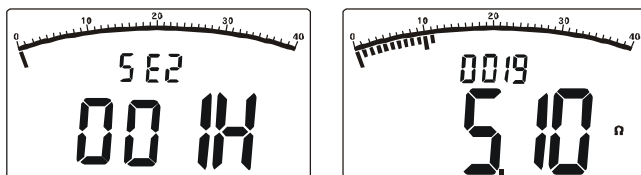
- ⌚ Configuration via the detector, the data is stored in the detector.
- ⌚ Configuration via the upper-computer software, the data is stored in the computer.

The automatic monitoring interval time of this 2 configuration is independent, and the storage locations are different.

After detector electricity work, in the test mode, press **SET** key to enter the setup mode, and then press **SET** to move the cursor until the LED display **SE2**, to set the automatic monitoring interval time, press **▲** or **▼** to change current digital, the range of interval time is 1-999 hours. Press **SET** key to move the cursor and then press **ENTER** key to store and exit.

The data which stored in the detector is automatically store with serial numbers. Store up to 400 sets of data .If storage is full, the detector will display "FULL" icon.

As the following, the interval time is 1 hour, No.19 of data storage is 5.1Ω.



6. Data Reading/Deletion

If the detector has stored data, press **ENTER** key for a longer time (over 3 seconds) to enter data reading, press **▲** or **▼** key to select reading data group number by step value 1, press **ENTER** again to exit the reading. In the data reading condition, press **SET** key for a longer time (over 3 seconds) to delete the data and then return to test mode.

VIII. Communication mode

The detector using RS232 or RS485 communication. RS232 communication apply to monitor single point ground resistance in short distance, RS485 communication is suitable for multi-point ground resistance monitoring within 1500 meters. In the secondary development, the user can choice RS232 or RS485 communication, and provide protocol MODBUS.

IX.Packing list

Detector	1pc
Packing box	1pc
software CD	1pc
USB to RS485 communication line (or optional USB to RS232 communication line)	1pc
User's Manual, Warranty Manual, Certification	1 Set



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