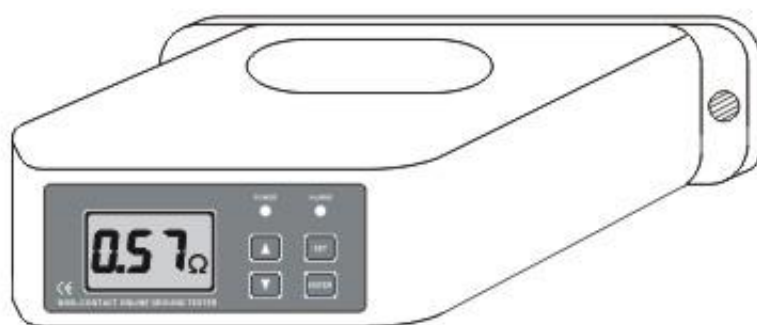


ETCR

Non-Contact Ground Resistance Online Detector

ETCR 2800B
ETCR 2800C

<http://www.etcrc.com>



MANUAL

ETCR Electronic Technology Company

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Attention Items:

Thank you for purchasing **ETCR2800 series products Non-Contact Ground Resistance Online Detector** of the 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.**

- I Apply to return circuit ground resistance, metallic return connection resistance, grounding conditions on-line monitoring.
- I Single point grounding system, needs to increase assistance after the ends of the earth form a loop, then install detector.
- I Note that this detector specified measuring range and using the environment.
- I Protection against rain shower and water logging of installation.
- I Install waterproof and rainproof of device at outdoors.
- I Detector signal line connected port towards the ground.
- I The dismantling, calibration and maintenance the Detector shall be operated by the authorized staff.
- I 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

Non-Contact Grounding Resistance Online Detector is our company devotes ourselves to Grounding resistance test technical research's another new high-tech product for more than ten years, built for online monitoring grounding down lead connection status, return circuit grounding resistance and metal return circuit connection resistance well-designed manufactured. on-line testing, non-contact measurement, grounding wire pass through the hole, definitely not influence grounding for lightening effect and facilities' normal operation, real time on-line testing. Detector provides power supply and **RS485** signal interface, provides standard **MODBUS-RTU** communication protocol, which is convenient for doing second development. Detector can install and use singly, and also set up a network, realize long-distance on-line monitoring. Detector internally installs sensor and circuit board, completely seals, possesses features of protection against rain, dust prevention, 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.

Non-Contact Grounding Resistance Online Detector applies to electric transmission line pole ground connection, underground mine device ground connection, Meteorological lightning protection ground connection, petrochemical engineering ground connection, communication ground connection, rail facility ground connection, building the warehouse ground connection, electrical equipment ground connection etc..

II. Model Difference

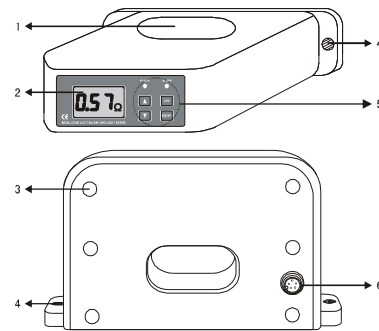
Model	Difference Explanation
ETCR2800B	Detector without display, user needs to do secondary development according to offered RS485 communication protocol, to monitor the detection data.
ETCR2800C	Detector owns LCD display, Alarm setting, audible and visual alarm instructions and can be independent installation and use, and also does secondary development according to offered RS485 communication protocol and organizes a network.

III. Technical Specifications

Function	Return circuit grounding resistance on-line monitoring, metal return resistance connection online monitoring, grounding condition monitoring.
Power Supply	Detector: DC6V~DC9V,50ma Max.
Resistance Range	0.01Ω~200Ω
Resolution	0.001Ω
Indication Range	0.00Ω~500Ω
Accuracy	±2%rdg±3dgt(20℃±5℃, below 70%RH)
Grounding Wire Perforation Size	60mm×30mm, closed mode (60mm×4mm steel flat or external diameterΦ30mm electric cable)
Overflow Indication	When show value is beyond 500Ω, systems software and LCD show “OLΩ” sign.
Connecting Line	A one meter long wire(5cores shielded wire)
Connection Identifier	Red/brown---power supply input anode; Black--- power supply input cathode; Blue--- RS485 signal anode; Grey--- RS485 signal cathode; White--- analog grounding (power supply input cathode can connects with analog grounding by short circuit connection)
Protocol Standard	RS485 standard MODBUS-RTU communication protocol
Alarm Indication	ETCR2800C :Detector Audible and visual alarm instructions
Alarm Setting	ETCR2800C :Detector panel setting
Data Display	ETCR2800C :4digits LCD direct indication
LCD Dimensions	47mm×28.5mm
Detector Dimensions	175mm×170mm×130mm
Installing Screw Hole Size	Φ8mm
Quality	Detector: 960g
Working Temperature And Humidity	-20℃~55℃;20%RH~90%RH
Humiture Error	Within 5%
Shift	Automatic shift
GND Interference Current	Prohibited
External Magnetic Field	<40A/m
External Electric Field	<1V/m
Single Measurement Of Time	About 0.5 second
Power Consumption	Detector: 50ma Max.
Installation	Grounding wire through Detector centre bore
Level Of Protection	IP65
Installation Requirements	Avoid rain and water logging
Power Supply Mode	External power supply (Equipped by user)

IV. Detector Structure

1. Grounding wire perforation size: 60mm×30mm.
2. LCD displayer.
3. Up and down cover connecting screws (6 pieces).
4. Install screw holes.
5. Button and the indicator light.
6. Power supply, **RS485** communication interface.

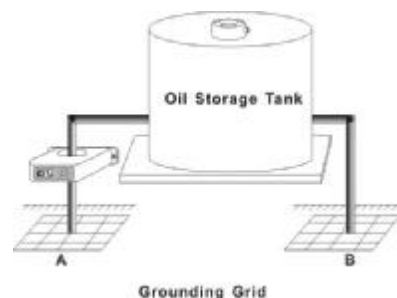
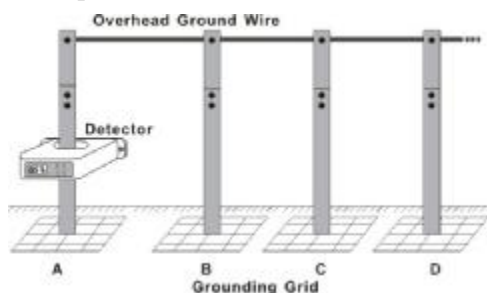


Power Supply Indicator Light	Working indication when power supply switches on.
Alarm Indicator Light	Alarm light switches on when measured value is beyond pre-set critical value.
SET Key	Enter setup
Up and Down Arrow Key	Press SET key to enter the alarm setting, press up and down arrow key to set value.
Enter Key	After setting up alarm critical value, press ENTER key to ensure saving.

Note: **ETCR2800B** mode without LCD display and press key function.

V. Network Structure

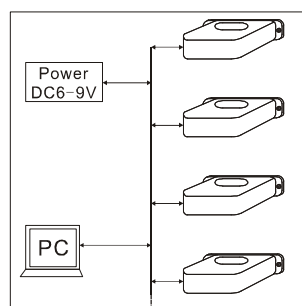
1. Independent Installation and Use.



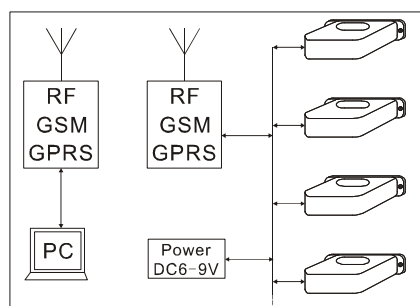
ETCR2800C can be installed and used independently, also can develop system software on their own according to offered RS485 communication protocol, organizes a network monitor. LCD shows measured value directly, also sets up Detector's alarm critical value, and possess audible and visual alarming function. When independent installation it can use 2 batteries instead of power supply, or use solar cell panel to charge batteries, batteries need placing in the protection box.

2. Reference of Network Organization.

Users can develop system software on their own according to offered communication protocol, organize wired network, as the picture below.



Cable Network System



Wireless Network System

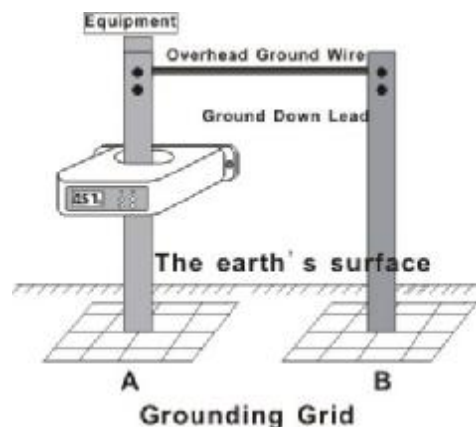
VI. The Principle and Application of Detection

1. Testing Principle.

Non-Contact Grounding Resistance Online Detector's fundamental is measuring return circuit resistance. firstly Sensor send out a drive pulse signal to be measured ground return circuit, then measured ground return circuit responses a pulse electromotive force E , under the influence of electromotive force E there will generate current I in the be measured ground return circuit. Sensor measures E and I , and immediately gets resistance of be measured ground return circuit through the formula: $R=E/I$.

2. Return Circuit Resistance Definition.

As picture: return circuit is a composite value includes A spot grounding resistance, grounding down lead metallic conductor's resistance, metal overhead line's resistance, connection resistance(contact resistance)between grounding down lead and metal overhead line, B spot grounding resistance. For the formative above-mentioned return circuit's grounding system, Detector can be installed directly for monitoring, if the grounding system not form a return circuit, it need adding auxiliary grounding electrode to form a return circuit, further install the Detector, see the after-mentioned single point grounding system. If the Detector measured out return circuit's composite value of grounding network A and grounding network B is $5.0\ \Omega$, that is: $R_A+R_B+R_C+R_D=5.0\ \Omega$ (R_C and R_D respectively represent resistance of metal overhead line and grounding down lead), actual grounding resistance value of grounding network A and grounding network B's in parallel resistances less than or equal to $2.5\ \Omega$, accordingly judge actual grounding resistance value of grounding network A and grounding network B parallel connection whether qualified. If grounding network A and grounding network B's in parallel resistances less than engineering standard required value, so grounding network A and grounding network B are all qualified.



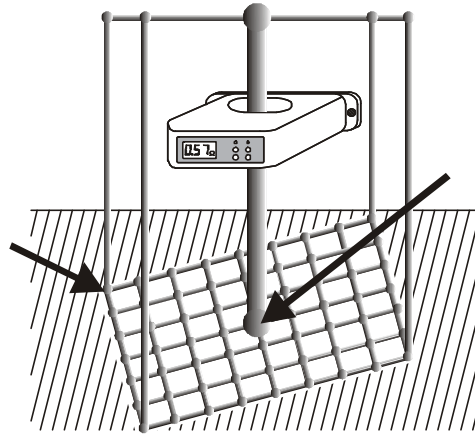
3. Metal Return Circuit Connection Resistance Testing.

If grounding network A and grounding network B up and down are connected together on the ground, then Detector measures out metal return circuit resistance's value is very small general speaking, only few of an Ohm, this is the connection resistance of metal return circuit, namely equipotential resistance, isn't grounding resistance. Therefore the Detector is also convenient to test metal return circuit's connection resistance.

In the large-scale grounding grid, such as converting station ground connection, oil depot ground connection, building construction ground connection and so on, they are all an integral large-scale grounding grid under the ground, meanwhile there are many grounding down lead extends to the ground, and connects the other on the ground, as the following picture. To such large-scale grounding grid, its grounding grid's maximum diagonal distance is about a few hundred meters to thousands of meters, testing its grounding resistance is very difficult and troublesome. If it exist unqualified grounding resistance, that problem is appearing at the connection position of grounding down lead and grounding grid (direction of arrow of the welding position in the picture), engineering reform is to excavate grounding down lead's position, then again weld grounding down lead. Actually it's

impossible to reform the whole grounding grid, or the whole grounding grid and surface facilities need to pull down and rebuild, this is impossible.

Therefore, for the large-scale grounding grid, we can install Detector on the primary grounding down lead and secondary grounding down lead to monitor connection status between the grounding down lead and the grounding grid, judge the grounding down lead's grounding conditions by testing metal return circuit connection resistance.



4. Single Point Grounding System.

If grounding network A and grounding network B is without overhead line, and doesn't connect together on the ground, then grounding network A and grounding network B can regard as standalone single point grounding connection. Detector cannot test single point grounding system's grounding resistance directly. This moment it needs adding one or more auxiliary grounding electrode, to form multipoint return circuit, then to install Detector. In the small range, if there are two or more single point grounding system, it can use metallic conductor to connect all single point grounding system's grounding down lead together on the ground, to form a return circuit, then install the Detector to monitor.

5. Application.

(1). Power Transmission System Pole Ground Connection.

It forms multipoint grounding system through overhead ground wire connection; test conveniently, its equivalent circuit as the following picture on the right.

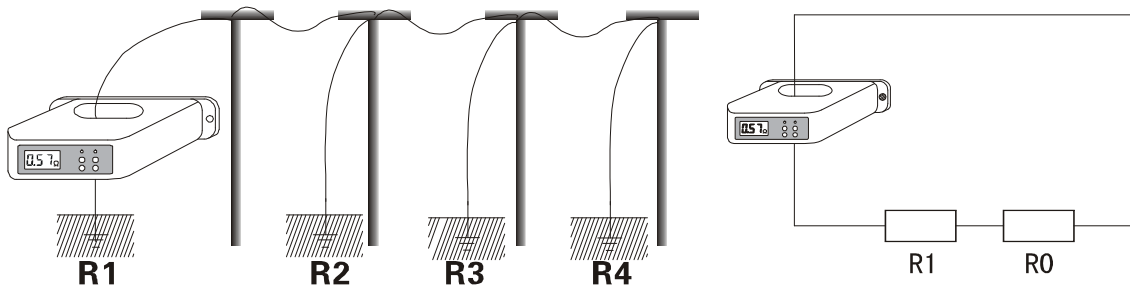
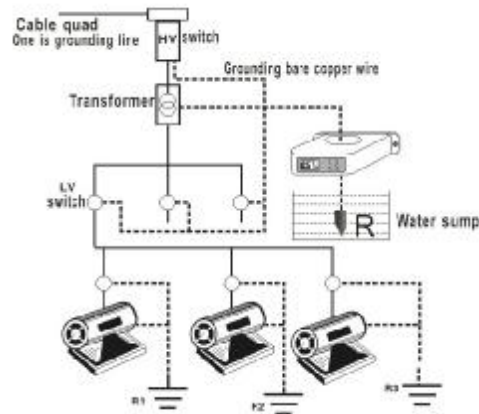


illustration: R_1 is predicted grounding resistance, R_0 is the equivalent resistance of all the other pole's grounding resistance parallel connection, that is $R_0 = R_2 // R_3 // R_4 // \dots // R_n$, if the greater n is (the more grounded junction), the closer R_0 gets to 0, far smaller than R_1 , from engineering point of view, $R_0 = 0$, so, the data Detector receives should be R_1 's value.

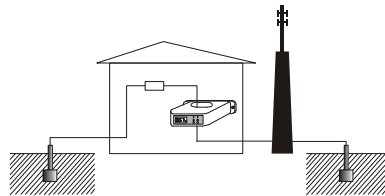
(2). Underground Mine Power Transformation Ground Connection.

respectively, primary grounding electrode $R, R_1 \sim R_3 \cdots R_n$ is a independent grounding body under the ground, don't connect together, are multipoint grounding system, convenient to test. Detector is installed on the primary grounding electrode, the Detector's indication is $R_f = R + R_1 // R_2 // R_3 // \dots // R_n$. If the more part grounded junctions are, so $R_1 // R_2 // R_3 // \dots // R_n \approx 0$, then $R_f = R$. It's the four-code cable in the picture, one code is ground lead among it, all the devices and part grounding connection are connected to be a network by cable grounding connection, dotted line is bare copper wire of grounding connection.



(3). Generator Room and Launch Tower Grounding Connection.

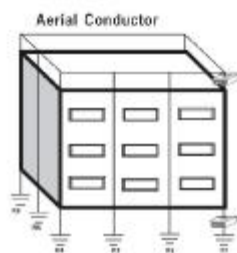
Generator Room and Launch Tower is independent outdoors generally, connect both together to form second return circuit, then install detector, as the picture below.



(4). Construction Grounding Connection.

If $R_1 \sim R_6 \cdots R_n$ is a independent grounding body under the ground, don't connect together, are multipoint grounding system, convenient to test grounding resistance. If $R_1 \sim R_6 \cdots R_n$ are connected together under the ground, for the single point grounding system, testing grounding resistance in accordance with single point grounding system, direct installation test return circuit resistance, can judge grounding connection condition.

For the large-scale construction grounding grid, it is to monitor its equipotential value of grounding condition between grounding down lead and grounding network. If problems occur, it would be located at the connection point between grounding down lead and grounding network, and judging that whether its equipotential value qualified or not.



VII. Wiring Instructions

Wire Color	Introductions
Red/Brown	Power Supply Anode
Black	Power Supply Cathode (GND)
Blue	RS485 Signal Positive Electrode
Grey	RS485 Signal Negative Electrode
White	Signal grounding electrode can short connect GND.

When organize a network, it needs connecting Detector in accordance with wire color.

VIII. Install Caution

Special Explanation: only if it forms a return circuit grounding connection system, it could directly install and use. Otherwise, firstly it needs to set up an auxiliary grounding connection nearby to form a return circuit, then to install the Detector.

1. Install the Detector to grounding down lead, and grounding down lead needs to unbuckle buckle, convenient for product maintenance latterly. Installation must be waterproof, rainproof, anti-theft and breakage-proof and so on in the open air.

2. Notice direction, try to be vertical and wire port downwards.

3. Notice height.

4. Deploy power supply and communication wire on the basis of field and distance.

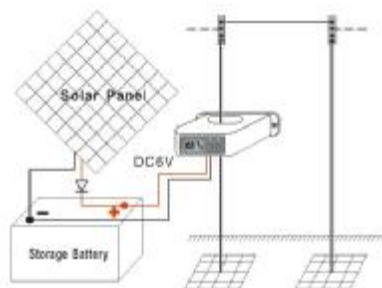
5. Power supply wire's polarities connect properly or Detector doesn't work.

IX. Power Supply Way Choice

1. AC adapter converts power supply's 220V AC into 6-9V DC, which can supply Detector.

2. 2 pieces standby batteries for alternate use.

3. As the picture below, solar cell panel supply is suitable for the places where can't get electricity. Solar cell panel's anode and batteries' anode needs a fast recovery rectifier forward connection in series (as IN5817), when using **ETCR2800C** is convenient.



X. Basic Equipment

Detector	1Set
Connector Wire	1PCS
Packing Box	1 Set
User's Manual, Warranty Manual, Certification	1 Set

 **Manufactured by**

ETCR Electronic Technology Company

Address: F-3F, No.4 Pengshang Zhifu Road, Jiahe, Baiyun District, Guangzhou, Guangdong, China

Post Code: 510440

Tel: (86-20)62199556 62199554

Fax: (86-20)62199550

E-mail: info@etcr.cc

Website: www.etcr.cc