



**LARGE GROUNDING NETWORK EARTH RESISTANCE TESTER**

KOBAN 



**KMPC-01-50A (0769711)**

**MANUAL**

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# CONTENT

1. Introduction .....	1
2. Performance Feature .....	1
2.1. Large touch LCD is clear and obvious, easy to operate. ....	1
3. Ttechnical breakthrough .....	2
4. Technology Specification .....	2
5. Operation Procedure & Function Description .....	3
5.1. Measurement principle & testing wiring diagram .....	3
5.2. Operation Steps .....	5
5.3. Internal Power Supply Instrument Operation Instructions .....	5
5.4. Test Menu Detail Description .....	8
5.5. Instrument Self-Inspection Description During Testing .....	8
6. Attentions .....	9
7. Internal Power Supply Testing wiring reference .....	9
7.1. Measurement Of Grounding Conduction(G.Cont) .....	9
7.2. Measurement Grounding Impedance Of The Grounding Grid	10
8. Attention .....	12
9. External Power Supply Instrument Operation Instruction .....	12
10. Wiring Connection Reference .....	13
11. Accessories .....	13

## 1. Introduction

**Large Grounding Grid Earth Resistance Tester** is a multi-purpose model to test the grounding impedance, grounding resistance and soil resistivity of substation ground network( $4\Omega$ ), water and fire power plant, microwave station( $10\Omega$ ), lightning arrester( $10\Omega$ ), communication base station and other large ground network, The instrument adopts the new frequency type conversion AC power supply, microcomputer processing control and signal processing measures, which solves the anti-interference problem in the test process, simplifies the test operation process, improves the accuracy of the test results, and greatly reduces the labor intensity and test cost of the test personnel.

**Large Grounding Grid Earth Resistance Tester** adopt super strong automatic frequency conversion anti-interference technology, can accurately measure the power frequency data of below 50Hz under strong interference environment. It is suitable for testing the power frequency grounding impedance, grounding resistance, auxiliary machine and other power frequency characteristic parameters of various grounding devices, measuring the on-off impedance or resistance between grounding devices, and measuring the soil resistivity.

The instrument is manufactured according to the Resistance Tester for JJG984-2004 Grounding Conduction Verification Regulation, DL/T475-2006 Grounding Device Characteristic Parameters Measurement Guidelines, DL/T845.2-2004 Resistance Measuring Device General Technical Conditions Part II: Power Frequency Grounding Resistance Tester.

Test current with two measuring model:

**Internal power supply mode:** Max. Current 5A, will not cause the potential of the grounding device to be too high during testing. At the same time, also has strong anti-interference ability, so can be measured without power off.

**External power supply mode:** Max. Current 30A, can accurately measure ground networks various current with different requirements.

## 2. Performance Feature

- 2.1. Large touch LCD is clear and obvious, easy to operate.
- 2.2. Touch colorful screen input, convenient to search.
- 2.3. The external power mode can be extended to large current measurements.
- 2.4. Adopt automatic double sided combination advanced frequency conversion technology, use 45Hz and 55Hz two frequency measurement, at the same time there are multiple frequency conversion for choice.
- 2.5. Strong anti-interference ability, adopts automatic frequency conversion method to measure, and matches with modern software and hardware filtering technology, so that the instrument has high anti-interference performance and the test data is stable and reliable.
- 2.6. High accuracy, baic error only  $0.005\Omega$ , can be used to measure the large grounding grid which the grounding impedance is very small.
- 2.7. Measure the impedance or resistance of the grounding device
- 2.8. Measure the continuity impedance or resistance of the grounding device

- 2.9.Measure earth voltage, step voltage, voltage gradient and others characteristic parameters.
- 2.10.Measure soil resistivity.
- 2.11.Pylon measurement function(
- 2.7. With RS232 and USB interface

**\*PS.: RS232 and USB interface only for secondary development or improvement, can supply the Serial Protocol, not provide the background software.**

### 3. Ttechnical breakthrough

- 3.1.Step voltage option can setting the current output time control, can set the constant current output time as request.
- 3.2.Storage uses keyboard input to convient query.
- 3.3.After step voltage testing, the voltage can input to print out.
- 3.4.Use external power supply mode can extend to the large current measurement

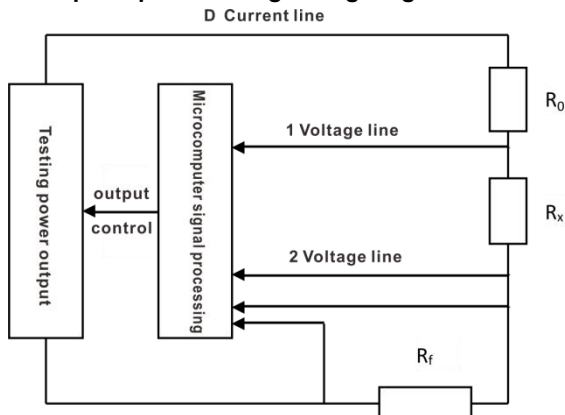
### 4. Technology Specification

<b>Function</b>	Measure the grounding impedance or resistance of the grounding device, measure the on-off impedance or resistance between the grounding devices, and measure the soil resistivity.
<b>Resistance Impedance measurement Range</b>	0Ω~200Ω
<b>Resolution</b>	0.001Ω
<b>Measurement Error</b>	± (Reading×2%+0.005Ω)
<b>Anti-Power Frequency 50HZ Voltage Interference Ability</b>	10V
<b>Test Current Wave</b>	Sine Wave
<b>Internal Power Test Current Frequency</b>	Auto 45Hz, 55Hz, double frequency, multiple frequency conversion groups are available for optional use
<b>Internal Power Maximum Current Output</b>	5A
<b>Internal Power Maximum Voltage Output</b>	400V
<b>Internal Power Test Wires Demand</b>	Current wires copper core cross-sectional area≥2.0mm <sup>2</sup> ; Voltage wires copper core cross-sectional area≥1.5mm <sup>2</sup>
<b>External Power Supply</b>	0~50A(variable frequency large current), external isolation transformer, constant current and constant voltage regulator
<b>Power Supply</b>	AC220V±10%, 50Hz
<b>Instrument Size</b>	440mm(L)×350mm(W)×210mm(H)
<b>Instrument Weight</b>	20KG

<b>Data Storage</b>	100 groups
<b>Computer Interface (Only For Secondard Development)</b>	RS232 and USB
<b>Printer</b>	Yes
<b>Working Temperature &amp; Humidity</b>	-10°C~40°C; 80%rh below
<b>Storage Temperature &amp; Humidity</b>	-20°C~60°C; 70%rh below
<b>Insulation Resistance</b>	Above 20MΩ (between the circuit and shell 500V)
<b>Withstand Voltage</b>	AC 3700V/rms(between the circuit and shell)

## 5. Operation Procedure & Function Description

### 5.1. Measurement principle & testing wiring diagram



$R_0$  circuit loop resistance about 5~200Ω

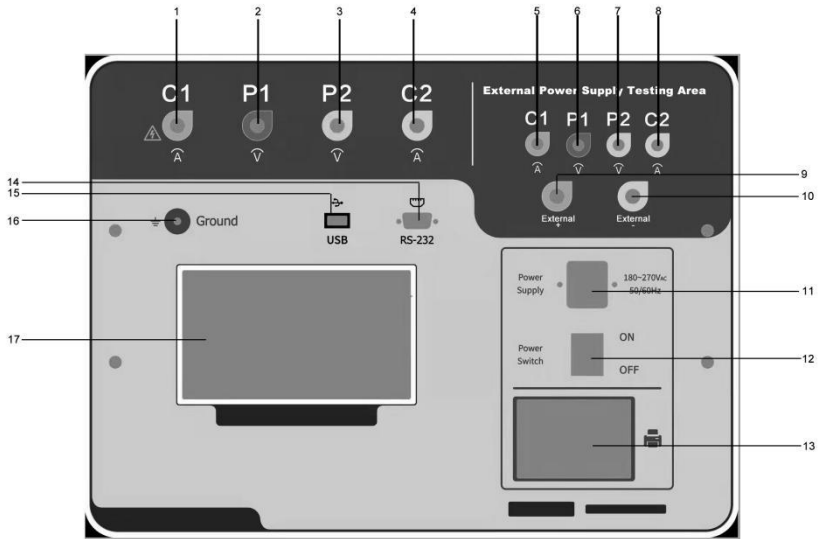
$R_x$  testing resistance about 0~200Ω

$R_f$  standard resistance

Measurement current line D: The length is 3 ~ 5 times of the diagonal length of the grounding grid.

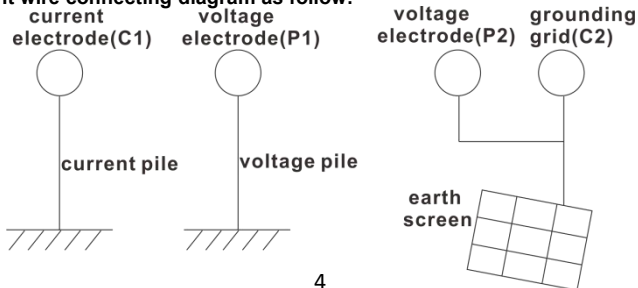
Measurement voltage line 1: the length is 0.618D; Wire dia.:≥1.0mm<sup>2</sup>

Measurement voltage line 2: the tested grounding grid



- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. Current electrode(C1)          | 2. Voltage electrode(P1)          |
| 3. Voltage electrode(P2)          | 4. Grounding grid(C2)             |
| 5. Current electrode(external C1) | 6. Voltage electrode(external P1) |
| 7. Voltage electrode(external P2) | 8. Grounding grid(external C2)    |
| 9. External +                     | 10. External -                    |
| 11. Power supply                  | 12. Power switch                  |
| 13. Printer                       | 14. RS-232 port                   |
| 15. USB port                      | 16. Ground port                   |
| 17. LCD                           |                                   |

Measurement wire connecting diagram as follow:



Note: voltage electrode2(P2), grounding grip(C2) two line must connect to the instrument, and then according the measurement operation steps to testing.

## 5.2. Operation Steps

5.2.1. First of all, check whether the current line, voltage line and grounding network line used for the test are open circuit situation or not (can be measured with multimeter), whether the rust on the grounding pile is cleared, and whether the buried depth is appropriate (>0.5 meters). At the same time, check whether the connection between the test line and grounding pile is conductive. If not, please handle and reconnect it.

5.2.2. The length ratio of the current test line to the voltage test line is 1:0.618, and the length of the current test line should be 3-5 times to the diagonal of the ground network.

5.2.3. The current test line and voltage test line shall be connected with the instrument at one end according to the specified length, the other end is connected to the two grounding piles respectively (as shown in Figure 2).

5.2.4. Check the test line that has been put in, connect one end of the multimeter to the current line or voltage line, if no resistance value is displayed on the other end of the grounding network line, that is open circuit, and the test should be carried out after confirmation.

5.2.5. After checking the wiring connection is correct, connect the instrument with AC220V/50HZ power supply and electrify.

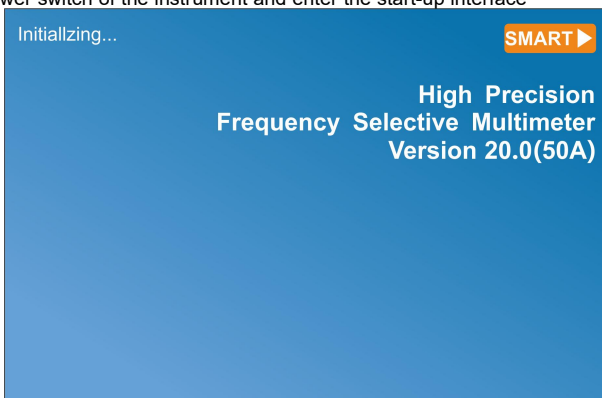
5.2.6. Press test button to start measurement.

5.2.7. After the instrument displays the testing is finish, record the test data.

5.2.8. After shutdown the instrument power, remove the wiring connection, and the test process is finish.

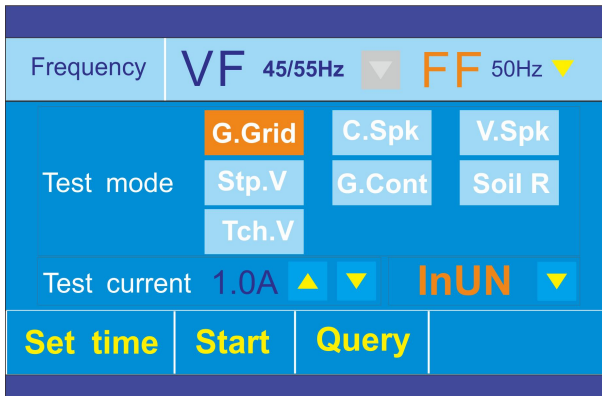
## 5.3. Internal Power Supply Instrument Operation Instructions

Turn on the power switch of the instrument and enter the start-up interface



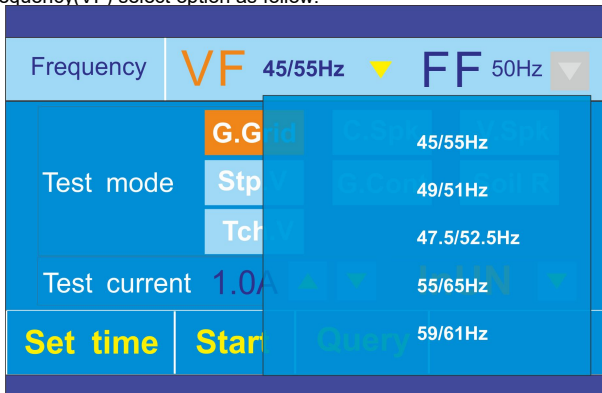
Enter the selection interface after the startup interface stops for 2 seconds, In this interface, touch and click the colorful screen to select various functional options.



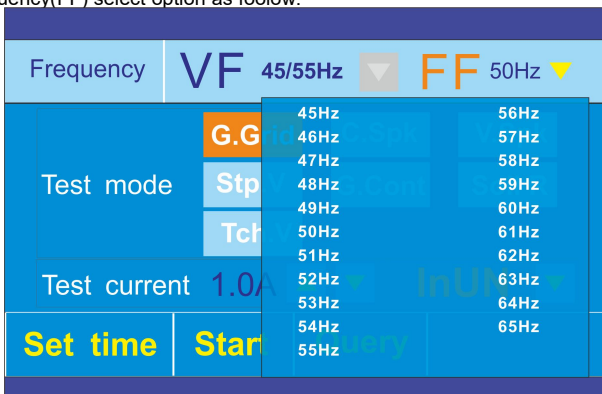


5.3.1. **Frequency** can select **Variable Frequency(VF)** and **Fixed Frequency(FF)**;

(a).Variable Frequency(VF) select option as follow:



(b).Fixed Frequency(FF) select option as foolow:

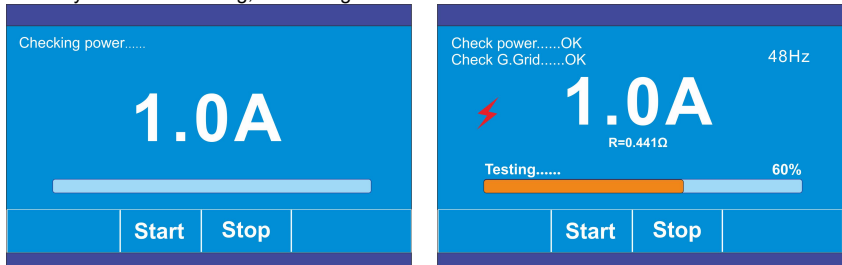


5.3.2. **Test mode** can select different mode as **G.Grid**(Grounding Grid), **C. Spk**(Current Spike), **V. Spk**(Voltage Spike), **Stp.V**(Step Voltage), **G. Cont**( Grounding Continuity), **Soil R**( Soil

Resistivity), **Tch. V** ( Touch Voltage).

5.3.4. **Test current** can select 1A-5A gears in input current, click the up and down allow to select different input current.

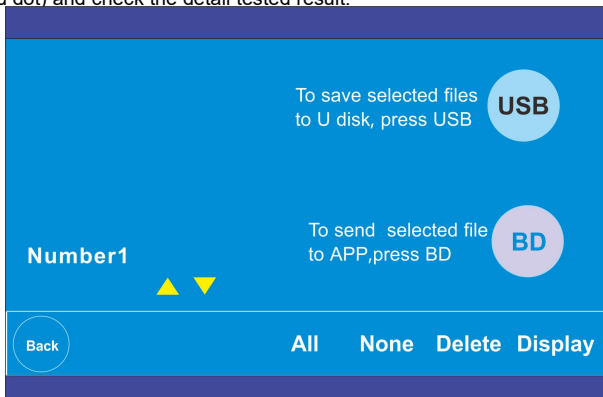
5.3.5. After finish the selection of frequency, test mode and the input current gear, can press the Start key to start the testing, the testing interface as follow:



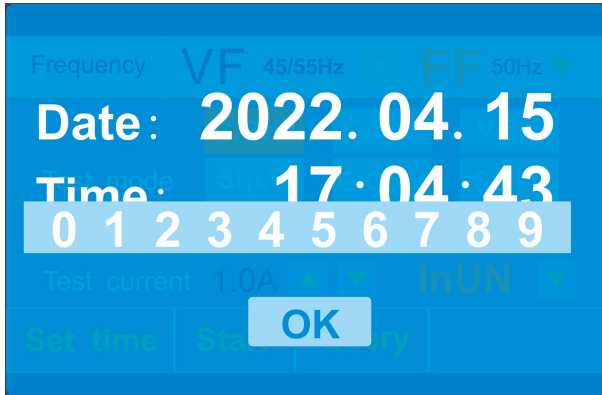
When finish the testing, will display the tester result, and can click **"SAVE"** key to save the testing result directly with default or click **"SAVEAS"** key to input the record file name, as well as can click **"PRINT"** key to print out the test result, the tester equip with the printer



5.3.6. After finish the testing, click **"BACK"** key return back the function selection interface, click **"Query"** key enter into access store test record interface, select the different test record (selected and display red dot) and check the detail tested result.



5.3.7. In the function selection interface, click "time set" key to set the time.



## 5.4. Test Menu Detail Description

**5.4.1. Test mode:** the instrument can select 7 test modes, which are "G.Grid", "C.SpK", "V.SpK", "Stp.V", "G.Cont", "Soil R", "Tch.V". The function of "G. Grid", "C.SpK", "V.SpK" modes are to measure the impedance of the grounding grid, the current spike and the voltage spike. In general experiments, "G.Grid" mode should be selected to measure the impedance of large grounding grid. However, the user requests to measure the impedance of current spike or voltage spike, can select the corresponding mode and measure directly. The mode of "G.Cont" is to measure the conducting between grounding devices. The mode of "Soil R" is to measure the ground resistance and soil resistivity (the default line length is 20 meters, but the line length can also be modified). The "Stp.V" "Tch. V" mode is to measure the step voltage, touch voltage and other parameters. (Note: the "Stp.V" "Tch.V" measurement mode required to matching with extra frequency selection voltmeter, or the "Stp.V", "Tch.V" mode will not workable.)

**5.4.2. Frequency selection:** The instrument can choose two measurement frequencies, that is "VF" and "FF". It must to select "VF" for the experiment on site, so that the measurement can eliminate electromagnetic interference in the field. "VF" adopts automatic double frequency combination, such as 45Hz/55Hz dual-frequency, etc., provide multiple groups of frequency conversion for optional use. While "FF" adopts single frequency measurement, such as 50Hz, etc., provide many single frequencies for selection.

**5.4.3. Current selection:** The instrument provides 5 gears of measuring current, that is 1/2/3/4/5A, one gear for each 1A, 5 grades in total. According to the magnitude of the measured impedance to select the test current. Generally, the smaller the impedance unit is, the larger the current will be used, in general, the "G.Gird" mode select 1A gear.

**5.4.4. Print:** click the "Print" button.

## 5.5. Instrument Self-Inspection Description During Testing

5.5.1. When the test current is 0.01A, there may be poor contact between the "current line" wiring

and the "current pole" ground spike or too few ground piles, the ground pile should be increased to reduce the loop resistance. The depth of the ground spike shall not be less than 0.5m. Current spike resistance should be less than 200  $\Omega$ .

5.5.2. If the measured value of the instrument display very low ( $< 0.01 \Omega$ ) could be the voltage line not connection well.

5.5.3. When instrument in testing, it is necessary to connect the resistance above 20 ohms at C1 output terminal to simulate the site current pile resistance, otherwise cause the measurement data with large error.

## 6. Attentions

6.1. In order to make the test run smoothly, please check whether the contact point of the test wire and the ground pile is well with the multimeter before the test, and measure whether the connection wiring is breaking phenomena or not.

6.2. The instrument will automatically eliminate the wiring error in 4-pole measurement.

6.3. In case of any other faults of the instrument, please contact the after-sales service department of our company directly. Please do not disassemble and repair the instrument without permission.

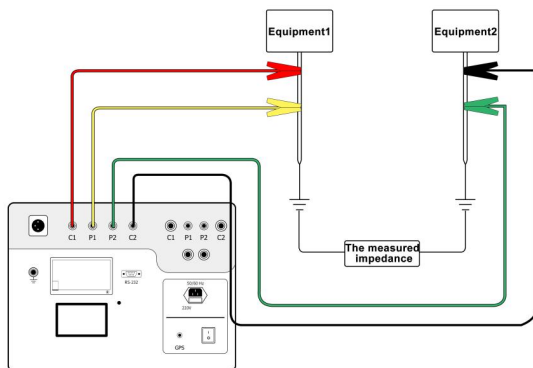
## 7. Internal Power Supply Testing wiring reference

### 7.1. Measurement Of Grounding Conduction(G.Cont)

C1/P1 connect with a grounding device, C2/P2(measurement grounding end) connect with another grounding device.

Note:

- (1) Don't entwine the leads.
- (2) Voltage lines should be kept as far away from current lines as possible
- (3) Both sides of the grounding clamp should be pressed against the geodesic to prevent paint rust from causing bad contact.
- (4) To prevent current protection, select the current 1A gear. Select the "G.Cont" "VF" mode 1A



## 7.2. Measurement Grounding Impedance Of The Grounding Grid

### 7.2.1. Inclined angle method

In general, the measurement of grounding impedance of large grounding devices adopts the mode of the included Angle arrangement of the current and voltage line. Generally, the distance between current pile C and the tested grounding device edge  $d_{CG}$  should be 4~5 times of the diagonal length of the grounding grid. The length of  $d_{PG}$  is similar to  $d_{CG}$ . The grounding impedance formula can be modified by the following formula:

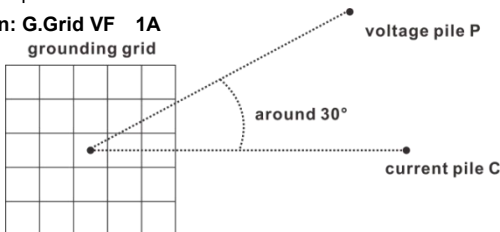
$$Z = \frac{Z'}{1 - \frac{D}{2} \left[ \frac{1}{d_{PG}} + \frac{1}{d_{CG}} - \frac{1}{\sqrt{d_{PG}^2 + d_{CG}^2 - 2d_{PG}d_{CG} \cos \theta}} \right]}$$

The formula:  $\theta$ -- the inclined angle of the current line and voltage line;

$Z'$ --the tested value of the grounding impedance.

If soil resistivity is uniform, can use the isosceles triangle wiring with  $d_{PG}$  and  $d_{CG}$  equal to each other. At this time, the inclined angle  $\theta$  is about  $30^\circ$ , and the modified calculation formula of  $d_{PG}=d_{CG}=2D$  ground impedance is still same as above formula

**Test mode selection: G.Grid VF 1A**



### 7.2.2. Straight-line method

The current pile and voltage pile are in straight line with the measured grounding device. Generally, the distance between current pile C and the tested grounding device edge  $d_{CG}$  should be 4~5 times of the diagonal length of the grounding grid. The distance  $d_{PG}$  between voltage pile P and the edge of the tested grounding device is usually (0.5~0.6)  $d_{CG}$ . When wiring, the distance between the current line and the voltage line should be kept as far as possible to reduce the influence of electromagnetic coupling on the test results.

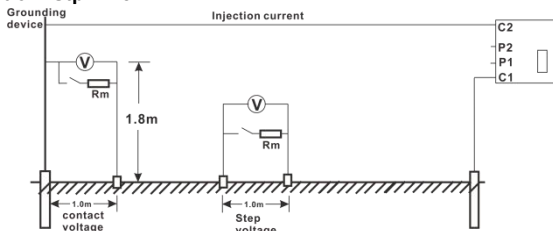
The resistance of the current pile should be reduced as much as possible, and water can be used to reduce the resistance if necessary. The instrument use the "CPILE" or "VPILE" mode to measuring, the current pile resistance should be less than  $80\Omega$ , voltage pile should be less than  $200\Omega$ .

**Test mode selection: G.Grid VF 1A**



It can put in a human body simulation resistance  $R_m$  inside the frequency selective voltmeter.  
 (Note: the frequency selective voltmeter need to purchase extra.)

**Test mode selection: Stp.V/Tch.V VF 1A**

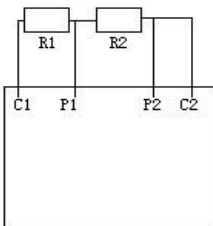


### 7.2.6. The instrument verification

During instrument verification, a resistance of more than 20 ohms must be connected at the output end of C1 to simulate the resistance of field current pile, otherwise may cause the measurement data error too large, or cause the instrument may be directly protected. Please refer to the following figure for wiring.

$R_1$  is load resistance, simulate the resistance of field current pile,  $R_2$  is standard resistance.

**Test mode selection: G.Grid VR 1-5 A**



If without high power resistance, please select 1A current gear when calibrating. Please refer to the wiring diagram below.

$R_1$  is the standard resistance.

**Test mode selection: G. Grid VF 1A**

## 8. Attention

8.1. In order to make the test proceed smoothly, please use multimeter to check whether the contact point between the test lead and the ground pile is intact before testing, and measure whether there is any open circuit situation for the wiring.

8.2. When measuring with 4-pole equidistant method, the instrument will automatically eliminate wiring errors.

8.3. If other malfunctions occur with this instrument, please contact the after-sales service department of our company directly. Please do not disassemble and inspect it without permission.

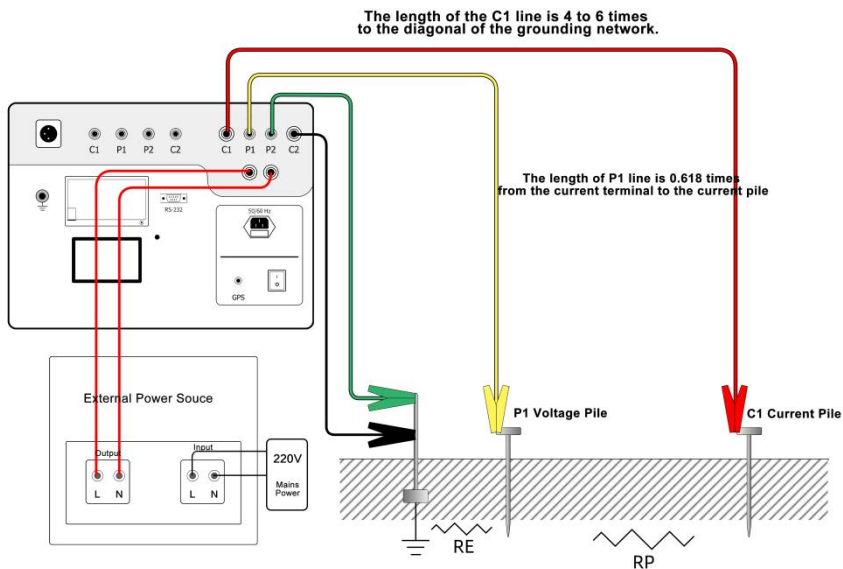
## 9. External Power Supply Instrument Operation Instruction

9.1. Wiring connection with the 50A specialized external power supply source

- 9.2.Starting the host power souce and enter the main interface, press “External Power” key to select external power mode
- 9.3.Starting the 50A external power souce instrument.
- 9.4.Enter into test current adjustment interface, at the same time, set the external power souce to request current, and then press “TEST” key of the earth tester, then the tester will measurement with external power.

## 10. Wiring Connection Reference

### Measurement grounding grid earth resistance



Host Instrument	1 PCS
External Power Souce	1 SET
Frequency Selection Voltage Meter	1 PCS
Current Sensor	1 PCS
Internal Power Supply Test Lines	1 PCS Each of Yellow/red/black
External Power Supply Test Line	2 PCS
Power Line	2 PCS
Ground Pile	4 PCS
12V Charger(for frequency selection vottage meter)	1 PCS
Big resistor(for self-checking)	1 PCS
Grounding Wire	1 PCS
Fuse(10A)	5 PCS
Print Paper	1 ROLL
Manual/Warranty Card/Qualification Certificate	1 Copy



**Note:**

The measurement line is equipped by the user according to the size of the grounding grid  
Please do not disassemble the instrument, including the panel. It may break the connection wire inside of the instrument and cause the instrument malfunction!

**The company is not responsible for other losses caused by use.**

**The contents of this user manual cannot be used as a reason to use the product for special purposes.**

**The company reserves the right to modify the contents of the user manual. If there are any changes, no further notice will be given.**