



ADMT-2B
电阻率法仪
使用说明书
Operation Instructions



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Thank you for choosing the ADMT-2B Resistivity Meter. In order to ensure smooth operation, please read this user manual carefully before using the instrument.

1. Instrument Overview

The ADMT-2B Resistivity Meter is a new generation of DC electrical instrument carefully researched by our company based on advanced electrical instruments abroad, combined with China's national conditions and our company's years of experience in producing electrical instruments. It integrates advanced transmission and reception functions and can be directly used for measurement of induced polarization method.

This instrument is widely used for detailed and general exploration of mineral and energy resources (metal ores, non-metal ores, oil and gas, coal mines, etc.); Used for detailed investigation and survey exploration of underground natural energy sources such as groundwater and geothermal energy; Used for detailed investigation and general survey of hydrogeology such as coal mine goaf, groundwater disasters, dam hazards, fault zones and collapse columns, landslides, etc; Simultaneously used for engineering geological exploration such as railways and bridges, urban geophysical exploration, archaeological excavation, and detailed and general survey exploration of underground pipelines.

2. Main characteristics of the instrument

1. Lightweight and flexible - integrating advanced transmission and reception functions, with small size and light weight.

2. Ultra large power supply, ultra wide range, and ultra-high precision - with a power supply capacity of up to 2500W and extremely high small signal measurement accuracy, the instrument can be better applied to work in high resistance areas to obtain deeper and better measurement results.

3. Comprehensive anti-interference technology - using multi-stage filtering and signal enhancement technology, integrated electrical interference suppressor function, with super strong resistance to common mode interference and differential mode interference, and high measurement accuracy.

4. Automatic compensation for natural potential, drift, and electrode

polarization, with a compensation range of $\pm 3000\text{mV}$.

5. The imported fully sealed box has the advantages of moisture resistance, dust prevention, and long service life.

3. Main technical specifications of the instrument

1. Voltage resolution: $0.5\mu\text{V}$
2. Natural potential compensation range: $\pm 3000\text{mV}$
3. Voltage measurement range: 14000mV
4. Input impedance: $\geq 50\text{M}\Omega$
5. Visual resistivity measurement accuracy: $\pm 0.5\%$
6. Measurement accuracy of visual polarization rate: $\pm 1\%$
7. Suppression of 50Hz power frequency interference: $\geq 80\text{dB}$
8. Maximum emission voltage: $\text{DC}800\text{V}$
9. Maximum emission current: 5A
10. Power waveform: pulse width 0.5-60 seconds, duty cycle 1:1, bipolar
11. Current channel: $\pm 5000\text{mA} \pm 2\%$
12. Current resolution: $0.5\mu\text{A}$
13. Power supply: $12\text{V}/6800\text{mAH}$ lithium battery
14. Working environment: $-10\text{ }^\circ\text{C}\sim+50\text{ }^\circ\text{C}$, 95% Rh
15. Storage temperature: $-20\text{ }^\circ\text{C}\sim+60\text{ }^\circ\text{C}$

4. Instrument panel diagram



4.1 Panel Composition

(1) High voltage input cable terminal: used for connecting high voltage power supply;

(2) fuse tube;

(3) Voltage current display screen;

(4) WIFI antenna;

(5) Power supply terminals A and B;

(6) Infinite pole terminal;

(7) WIFI status indicator light;

(8) Function status indicator light;

(9) Measurement electrode terminal MN;

(10) Charging port;

(11) Instrument power switch;

5. Introduction to main concepts

5.1 Visual resistivity R0

Visual resistivity: When the ground is horizontal and the underground is a uniform, infinite, and isotropic medium, connecting electrodes A and B as power supply electrodes to a power source and supplying a current intensity of I_p to the underground, the potential difference V_p between the M and N electrodes can be obtained. At this time, the measured resistivity is the "uniform earth resistivity".

In fact, the earth conditions cannot meet the uniform earth resistivity conditions, so the measured resistivity is neither the rock resistivity nor the ore resistivity, which is called the apparent resistivity. The apparent resistivity is represented by R_0 , with the unit of $\Omega \cdot m$, and can be defined as:

$$R_0 = k \cdot \frac{V_p}{I_p}$$

Among them, K is the device constant, v_p is the primary field potential difference between M and N measurement electrodes, and I_p is the power supply through A and B

The current emitted by electrodes towards the earth.

5.2 Natural potential

Under natural conditions, there is no need to supply power underground. A certain potential difference can usually be observed between two points on the ground, indicating the existence of a natural electric current field, also known as a natural electric field. Practice has proven that this type of field is mainly formed by the natural electrochemical action of electron conducting ore bodies, the diffusion of electric ions in groundwater, as well as factors such as earth currents and thunderstorm discharges. The observed potential difference is called the natural potential, abbreviated as self potential SP, with the unit of mv.

5.3 Polarization rate

In the induced polarization method, in order to characterize the induced polarization effect of the polarizing medium, polarization rate is introduced, and

the functions of charging time (T) and discharge sampling time (t) are defined, expressed as:

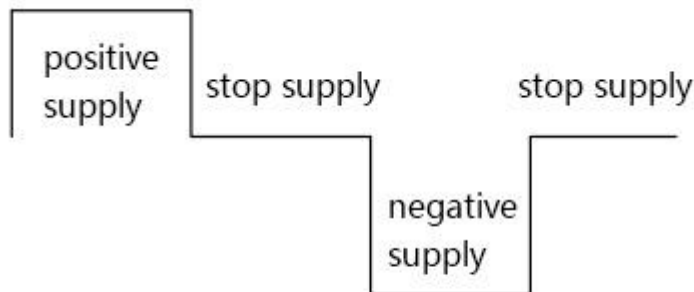
$$\eta(T, t) = \frac{\Delta V_2(t)}{\Delta V_1(t)} \times 100\%$$

Among them, $\Delta v_2(t)$ refers to the secondary field potential difference at time t after power failure, and $\Delta V(T)$ refers to the total field current during the power supply time (T)

Position difference.

5.4 Power Supply Mode

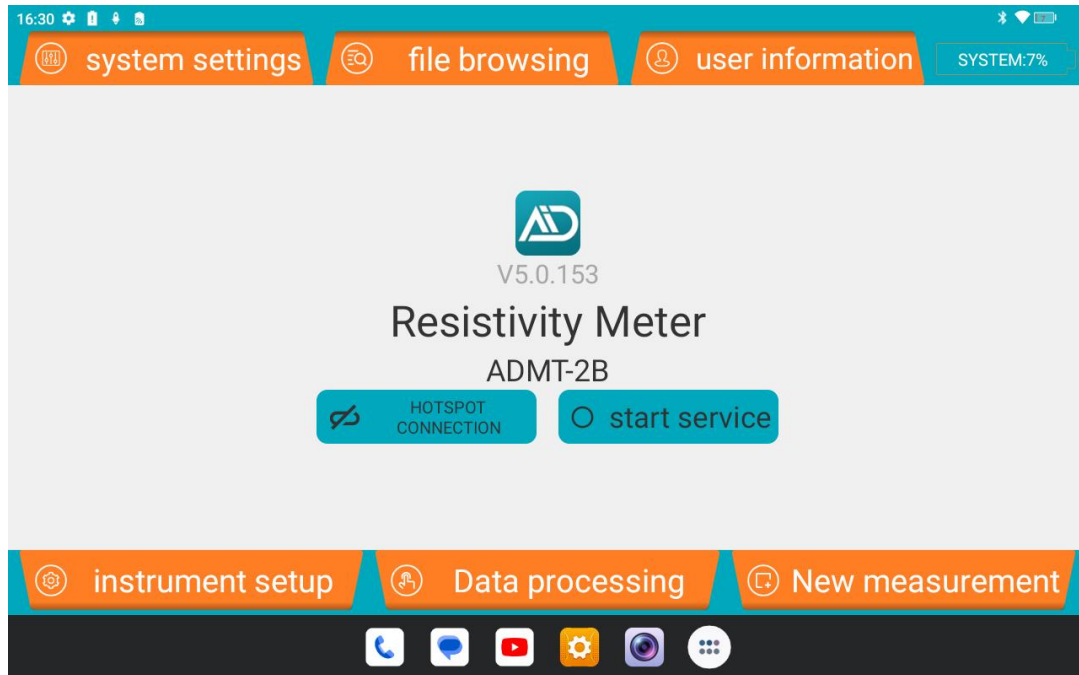
Bidirectional power supply mode: The bidirectional mode has two power supply cycles, namely "positive supply - stop supply - negative supply - stop supply" (as shown in the figure below).



The bidirectional mode

Figure power supply mode

6. Introduction to the main page of the operating software



6.1 System Settings

Mainly includes parameter download, Bluetooth WiFi、 Language, WiFi hotspot, mobile data, intelligent distribution network, screen brightness and other system functions can be used according to actual needs, and some functions may not be needed temporarily.

6.2 File browsing

You can see the files that have been measured or downloaded from this account, and you can perform operations such as deleting files, sharing, downloading, and deleting them in the cloud, backing up, viewing, and drawing.

6.3 User Information

It mainly includes functions such as registration and login, logout, personal information, QR code login, device binding, about us, system messages, and checking for updates.

6.4 Battery Level

Display the battery level of the control host and ADMT-2B,After connecting the ADMT-2B, it displays "ID number: percentage of battery".

6.5 Central Region

Display software APP version number, firmware version, product name, product model, connection status, TCP service enabled status, etc. of ADMT-2B. The product name and model will be displayed as empty when used for the first time, and the last connected product name and model will be displayed by default after the device is initialized and connected.

6.6 Instrument Settings

After the instrument is connected, it displays the device ID, the number of channels, and sets various parameters of the instrument, including channel mode, pole spacing mode, power supply time, sampling delay, sampling interval, pole arrangement method, sampling waveform, superposition times, current abnormal threshold, self check, K value management, and other operational functions.

6.7 Data Processing

It includes operational functions such as device model, configuration scheme, selection of data files, and execution of processing.

6.8 Drawing Analysis

It mainly includes vertical contour maps、Planar curve chart、survey line selection, etc.

6.9 New Measurement

Create a new project or select an existing project to continue measuring. K-value file selection, line selection, line spacing operation, etc

7.Offline software download and setup

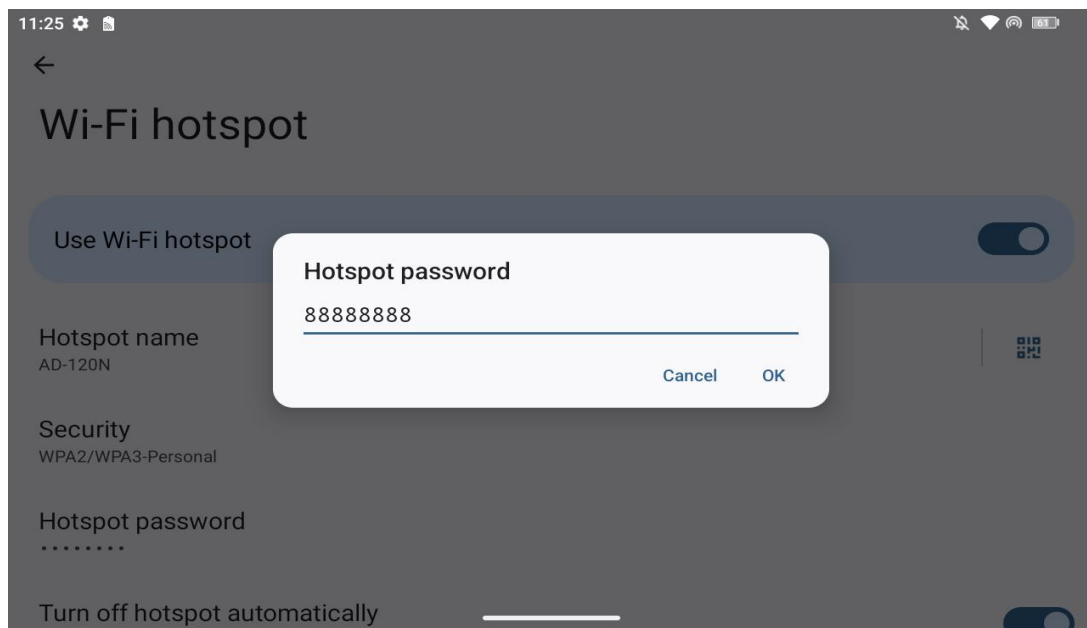
7.1 Selecting the operating host or software installation

Use the operating host to directly open the " Aidu Measure " APP software. If using a mobile phone or tablet (currently only supports Android and HarmonyOS systems) device terminal to connect to the ADMT-2B, you can scan the QR code (as shown below) or enter download connection in the browser (<https://admtdetector.com/download/>) Download the " Aidu Measure " app software.



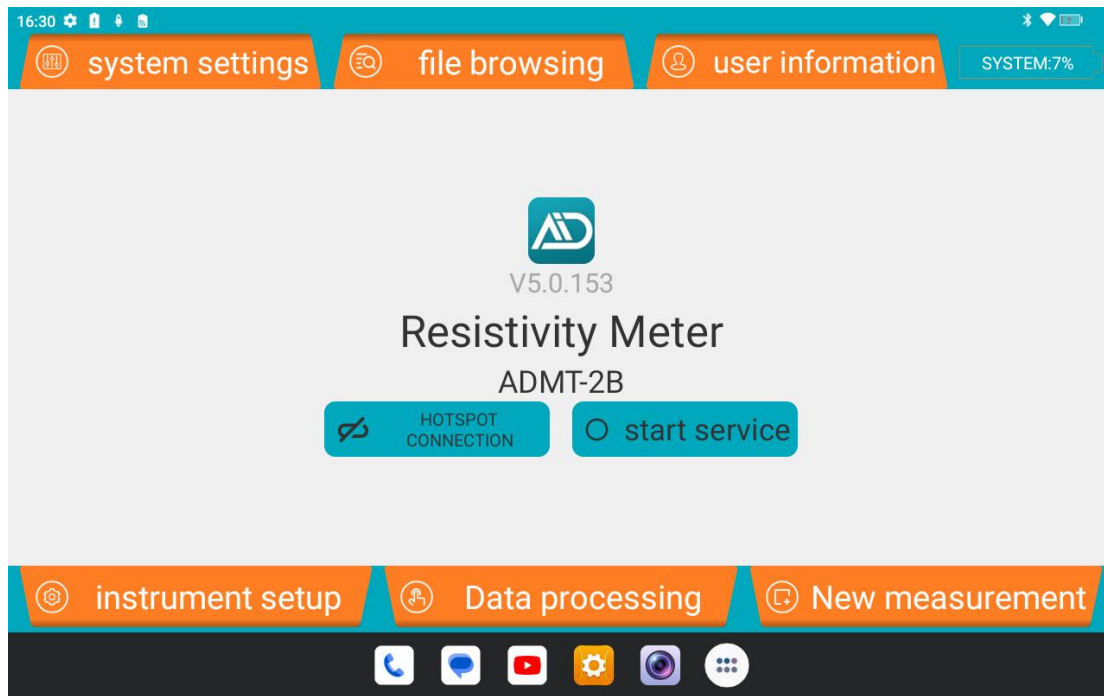
7.2 WiFi hotspot configuration

In the main interface of the software, select System Settings → WiFi Hotspot → Set Hotspot → Set WLAN Hotspot → Network Name: AD-2B → Security: WPA2 PSK → Password: 88888888 → Save → Enable WLAN Hotspot → Return to the previous interface → Enable Services → Complete.



7.3 Device Connection

After completing and opening the personal hotspot settings, open the "Aidu Measure" app, press the "Not turned on" button, wait for about 5-10 seconds, and "Connected" and "turned on" will be displayed. The WIFI blue light on the device panel will remain on, and the version number, device name, and specific model will be displayed in the central area of the software. Initialization is successful.



7.4 Measurement parameter configuration

7.4.1 Instrument Settings

After the device is successfully connected, it enters the "Instrument Settings" interface (as shown in the following figure). Configure the measurement parameters according to the measurement requirements, and click the "Confirm" button after configuration is complete.

Channel mode: Select the number of channels, which depends on the supported content of the device.

Electrode distance mode: Automatic or manual. In the automatic mode, the measurement sequence is generated by the system. In the manual mode, the settings need to be made for each measurement.

Infinite electrode: Set either electrode A or B as the infinite electrode to meet the requirements of some measurement algorithms.

Electrode arrangement: Select the K value calculation method.

Sampling waveform: The number of times of data sampling waveform, which can be selected from 1 to 2.

Power supply time: The design adopts a bidirectional power supply mode, that is, "positive supply - power off - negative supply - power off". In the figure below, each stage is powered for 4 seconds, so the complete measurement time is 16 seconds.

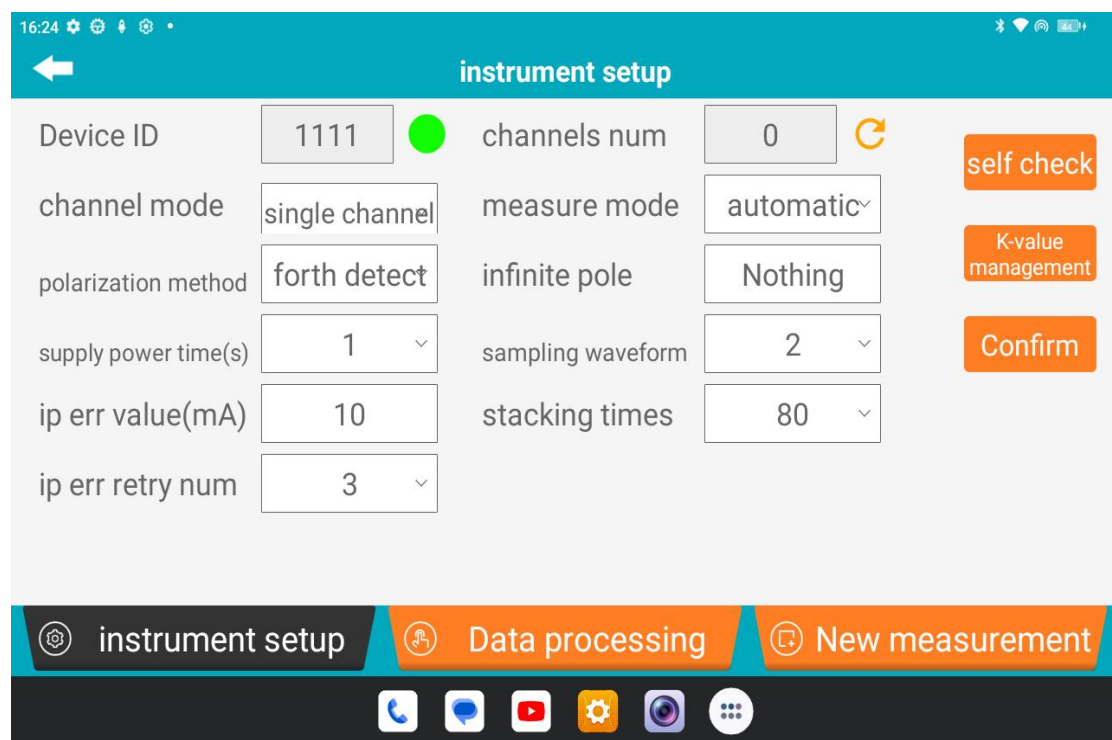
Superposition times: Selectable from 1 to 100 times, which is the number of superimposed data sampling samples.

Sampling interval: The time interval between each data sampling, in milliseconds.

Sampling delay: The delay time of the data sampling stage, in milliseconds.

Current anomaly threshold: The default is 10mA, used to determine whether the current in the measurement result data is normal. A value less than this is considered abnormal.

Retest times for small current: Set the number of retests for abnormal data during the measurement process.



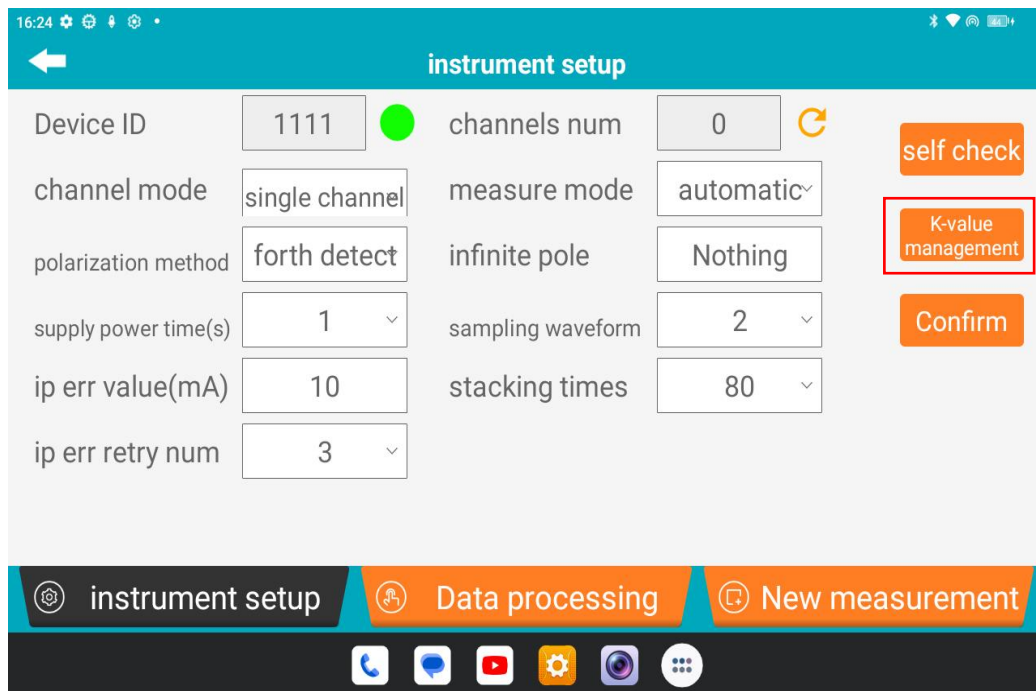
7.4.2 Equipment Self Inspection

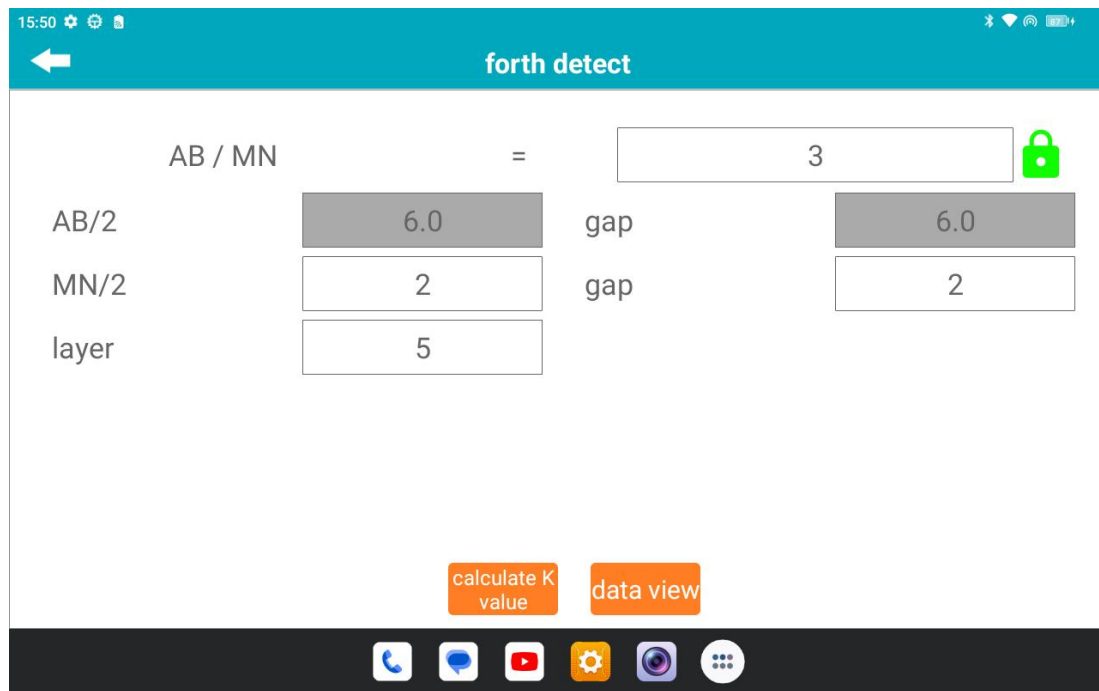
Click the "Self-check" button on the right side of the instrument settings interface. It is recommended to perform a device self-check before formal measurement to ensure that the measurement cables are in normal condition. "ABMN detection" can be used to verify whether the cable control is normal, Normal detection shows green, abnormal display shows yellow, and fault display shows red, and "self-electrical detection" can be used to detect the self-electrical condition of the channel.



7.4.3 Creating K-value files

Click the "K Value Management" button on the right side of the instrument settings interface. The algorithm calculation will be based on the electrode arrangement method selected in the instrument settings. Fill in the data according to the actual situation of the measurement site, click the "Calculate K Value to Generate Collection Sequence" button to produce the K value file, and click the "View" button to view the file content, including K value data and MN measurement sequence. To customize the K value file, click the "Customize" button to set it.





7.4.4 Measurement

Enter the "New Measurement" interface, fill in the project name, select the K value file to enter the measurement interface (as shown below).

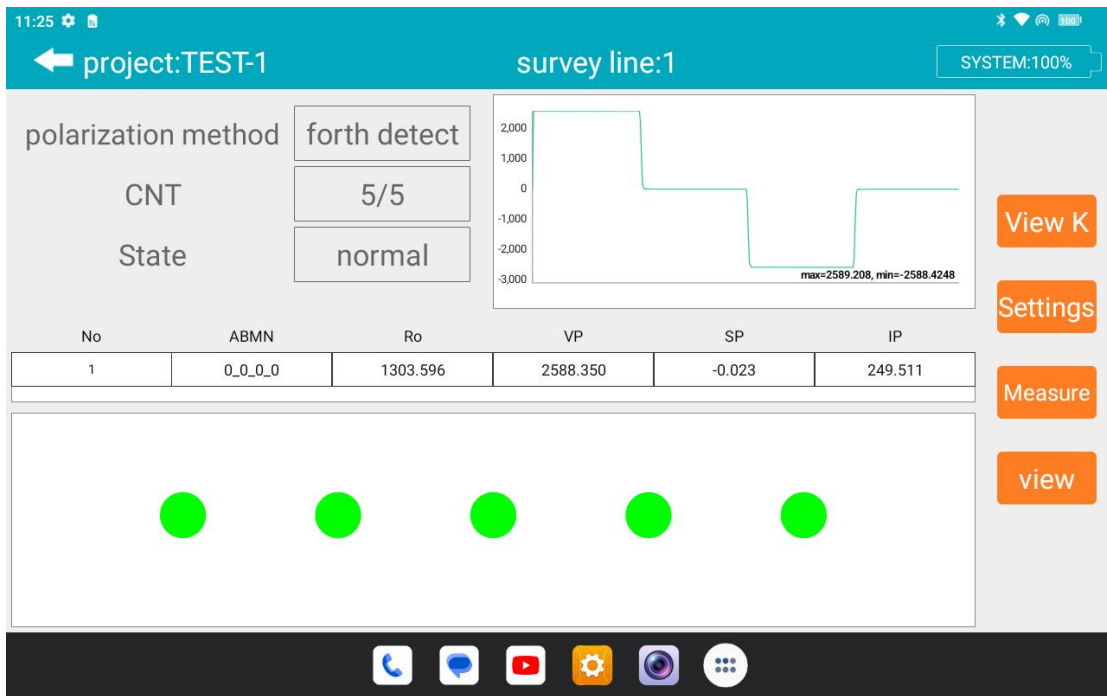
Click 'Settings' to set K-value algorithm parameters in manual mode.

Click "Measure" to start the measurement, or stop the measurement halfway.

Click 'View' to browse the completed measurement data content.

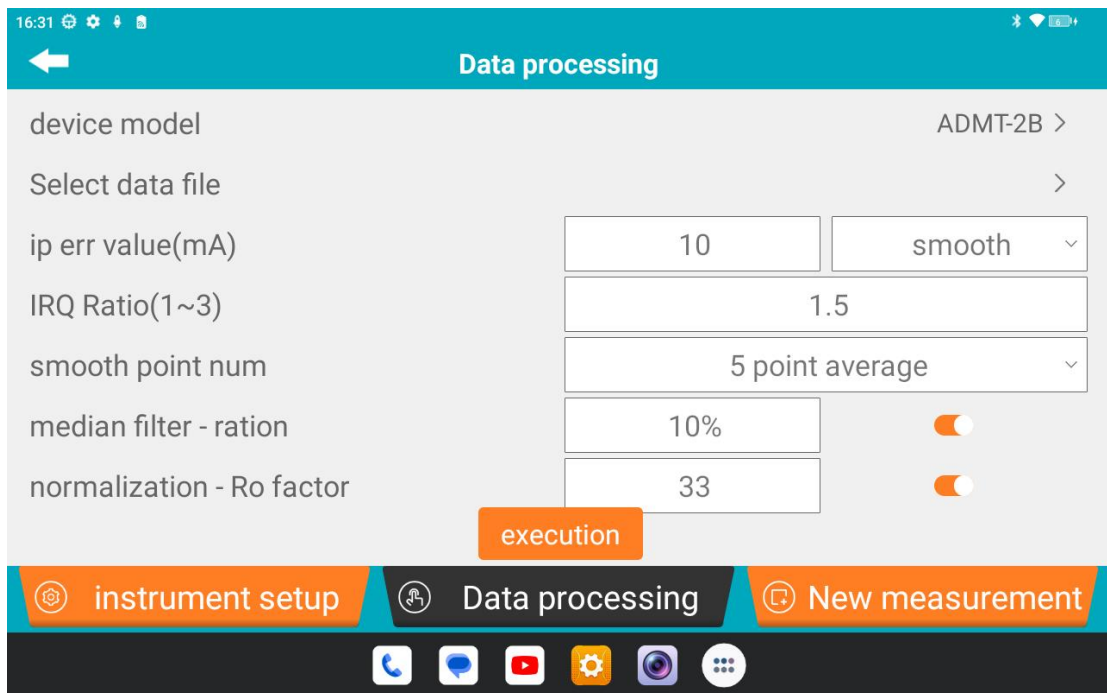
Interface display: basic information area, polarization rate attenuation graph, waveform line graph, data display area, and measurement point status graph.

Measuring point status diagram: Generate a sequence pattern diagram of K values according to the K value list file. Blue indicates measurement in progress, green indicates normal results, Yellow is to be measured, Purple represents measurement timeout, and red indicates abnormal results (current is less than the set value, and remains less than the set current value even after executing the set number of retests)



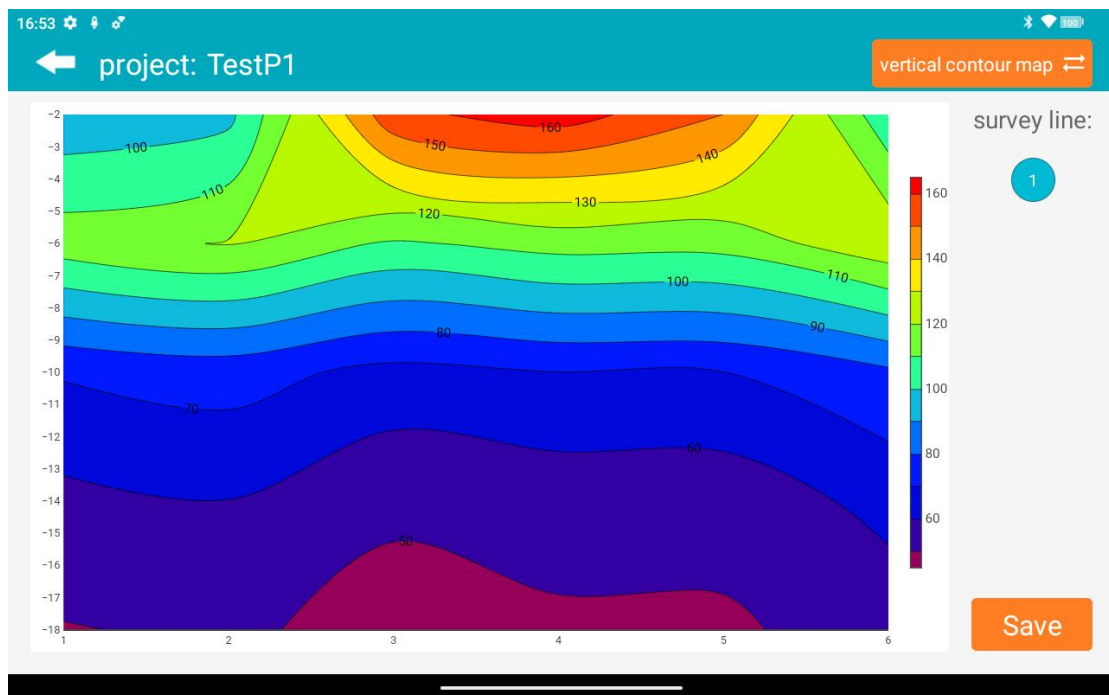
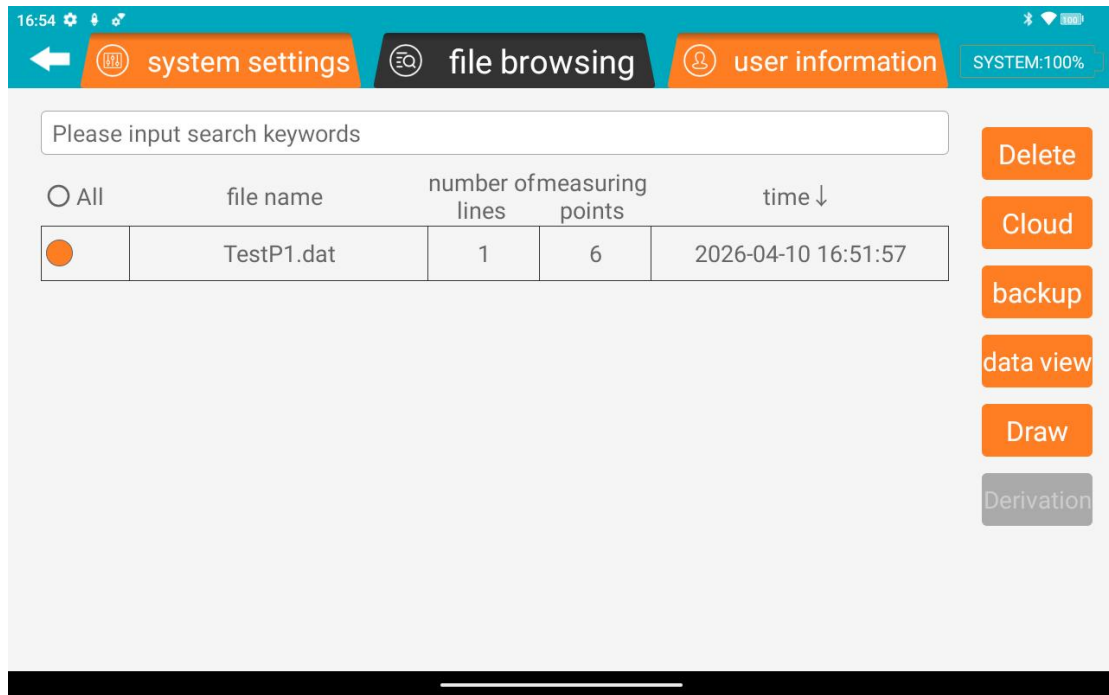
7.4.5 Data processing

After the measurement is completed, the system enters the data processing module, where the measurement data is automatically processed using an algorithm based on the device model. The processing results will automatically generate a new file suitable for R2D, with the file name marked with the "_R2D" suffix. The file can be viewed in the file browsing module.



7.4.6 Draw

Enter the file browsing module, select the data file name processed in the previous step, and click the "Draw" button to complete the drawing.



Appendix 1: Operation Instructions for Electrode Arrangement

1. Four-pole Electrical Sounding (4P-WES)

In this array configuration, MN electrodes are symmetrically placed on both sides of AB's center. The origin O serves as their common center point. When maintaining fixed midpoint O, the investigation depth is achieved by increasing the AB power supply line length.

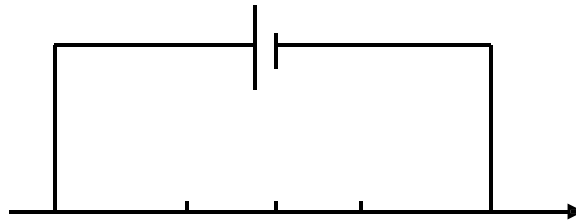


Fig.26: Four-pole Electrical Sounding (4P-WES)

$$K = \frac{2\pi}{\frac{1}{AM} - \frac{1}{AN} - \frac{1}{BM} + \frac{1}{BN}}$$

Simplified K formula (when $AB/2 > MN/2$)

Let $AB/2=a$ 和 $MN/2=b$

$$K = \pi (a^2 - b^2) / 2b$$

2. Three-pole Electrical Sounding (3P-VES)

Electrode B is fixed at a sufficiently remote location, enabling depth investigation by moving electrode A. Since $1/AM$ and $1/AN$ can be neglected, and the origin O always remains the midpoint of MN.

B as infinite remote pole $OB \geq 10AO$

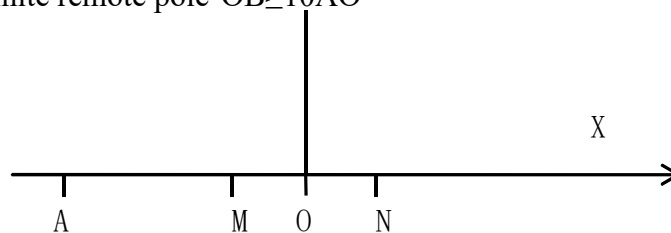


Fig.27: Three-pole Electrical Sounding (3P-VES)

Let $a=OB$ and $b=MN/2$.

$$K = 2 \pi \left(\frac{1}{BN} - \frac{1}{BM} \right) = \pi (a^2 - b^2)/b$$

3. Four-pole Electrical Profiling (4P-PRFL)

Dynamic source electrical profiling with four electrodes moving along the X-axis is used to study lateral resistivity variations while maintaining constant relative electrode positions. The K value for this profile remains constant. Origin O is a fixed point on the X-axis (typically the initial midpoint of MN).

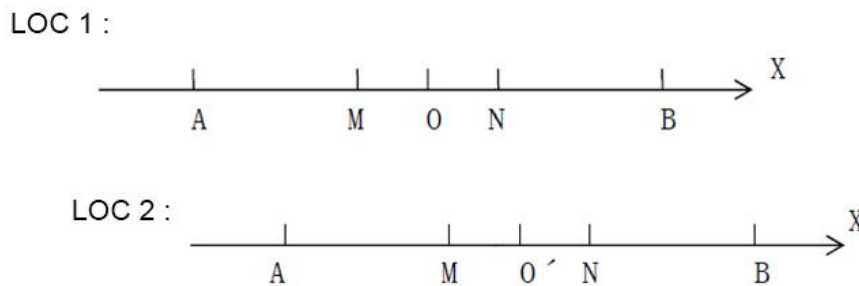


Fig.28: Four-pole Electrical Profiling (4P-PRFL)

K remains constant as: $K = \pi(a^2 - b^2)/2b$

4. Composite Profiling

Electrode B is placed at an infinite remote location while AMN electrodes move simultaneously along the survey line with constant relative spacing.

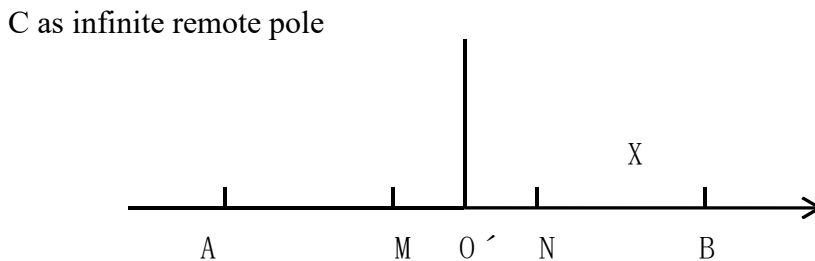


Fig.29: Composite Profiling

K remains constant as: $K = \pi(a^2 - b^2)/2b$

The composite profiling method typically uses five electrodes: A, B, M, N, and infinite remote pole C. C should be placed perpendicular to the survey line with $OC \geq 10AO$ distance.

5. Central Gradient Method (RECTGL)

In this configuration, power electrodes AB are fixed while measuring electrodes MN move within the central 1/3 section of AB. Additionally, MN can observe on parallel offset lines at $AB/6$ distance. This setup is suitable for detecting resistivity changes at specific depths.

The device uses O (MN midpoint) as measurement point and A as coordinate origin. For measurement coordinates (x,y), x is always positive, y represents distance from main survey line AB ($y=0$ for main line).

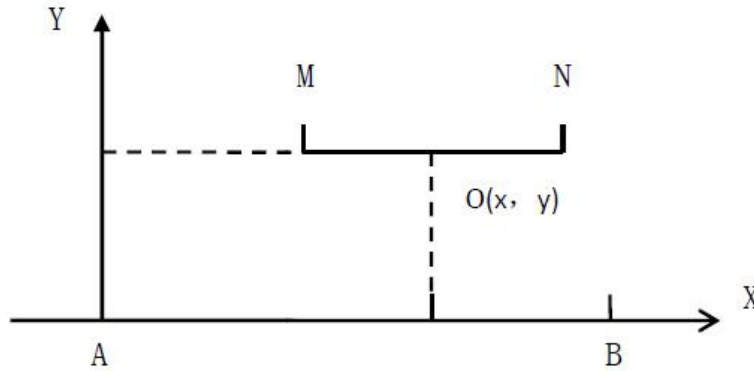


Fig.30: Central Gradient Method (RECTGL)

K expression:

$$K = \frac{2\pi}{\left| \frac{1}{AM} - \frac{1}{AN} - \frac{1}{BM} + \frac{1}{BN} \right|}$$

Let $AB = a$, $MN = b$, measurement coordinates (x,y)

$$AM = \sqrt{(x - b/2)^2 + y^2} \quad AN = \sqrt{(x + b/2)^2 + y^2}$$

$$BM = \sqrt{(a - x + b/2)^2 + y^2} \quad BN = \sqrt{(a - x - b/2)^2 + y^2}$$

6. Axial Dipole Method

As shown in Fig.26, this setup features both power (AB) and measuring (MN)

dipoles separated by a certain distance. All four electrodes are colinear, hence called axial dipole. Origin is the midpoint between AB and MN dipoles (O for AB midpoint, O' for MN midpoint). Suitable for studying resistivity variations at different depths. Profile extension achieved by simultaneous dipole movement (typically distance d).

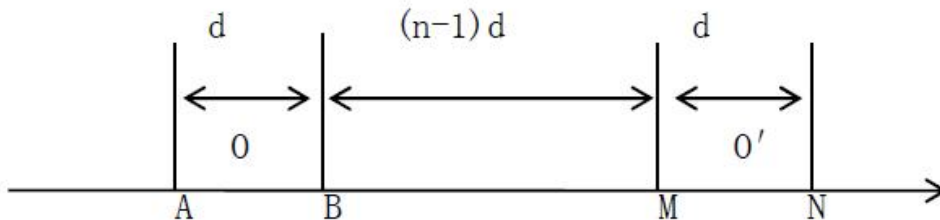


Fig. 31: Axial Dipole Method

Set $AB = MN = d$ ($d =$ dipole length), $OO' = nd$ ($n =$ positive integer spacing coefficient)

$$K = \pi \cdot AM \left[\left(\frac{AM}{MN} \right)^2 - 1 \right]$$

$$K = \pi \cdot d \cdot n(n+1)(n-1)$$

7. Borehole Electrical Method

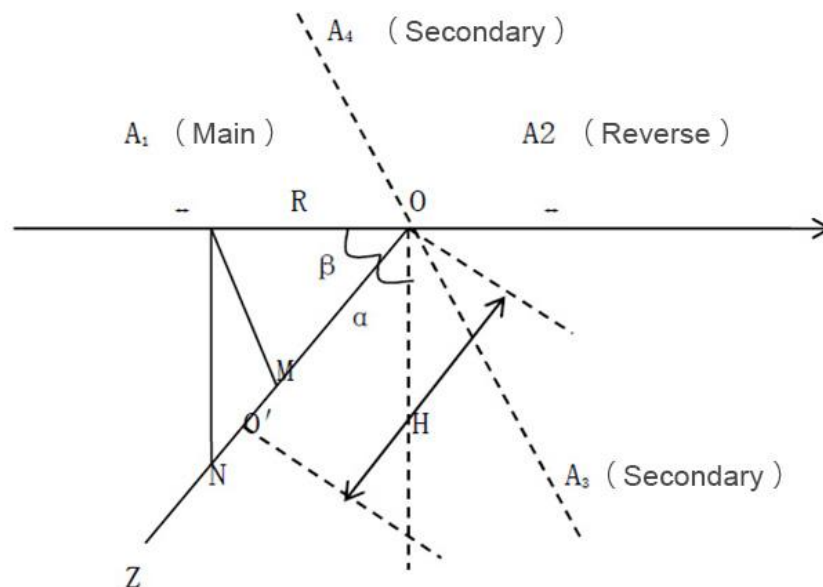


Fig.32 : Borehole Electrical Method (IP—BUR)

(1) Regulations:

a) Main orientation: Power electrode A located on exploration line, borehole

tilted toward A (A1 in Fig.27)

b) Reverse orientation: A located on exploration line but borehole not tilted toward A (A2 in Fig.27)

c) Secondary orientation: A not on exploration line but perpendicular to it (A3, A4 in Fig.27)

R : Distance from power electrode to borehole mouth O
(OA1=OA2=OA3=OA4=R)

α : Borehole angle with vertical

B: Borehole angle with horizontal

(2) Calculation

parameters:

Main orientation:

$$\beta = 90^\circ - \alpha$$

Reverse orientation: $\beta = 90^\circ + \alpha$

Secondary orientation: $\beta = 90^\circ$

(3) K formula:

THFTA = instrument displayed angle (β value)

$$K = 2\pi \frac{AM \cdot AN}{MN}$$

Where: $AM = \sqrt{(H - MN/2)^2 + R^2 - 2(H - MN/2)R \cos \beta}$

$$AN = \sqrt{(H + MN/2)^2 + R^2 - 2(H + MN/2)R \cos \beta}$$

8. Five-pole Longitudinal Axis Sounding

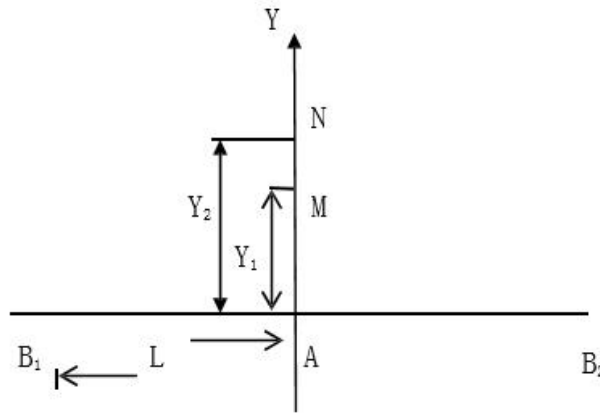


Fig.33: Five-pole Longitudinal Axis Sounding Electrode Layout

Five-pole sounding: $Y_1=AM$ (sounding point), distance from A to M; $Y_2=AN$ (distance from A to N). The midpoint of MN corresponds to investigation depth.

A as origin, central power electrode with +I current, lateral electrodes B1/B2 with -I/2 current. Measuring electrodes MN move along longitudinal axis Y. Current density mainly distributes within $h < 0.93L$ range, exceeding symmetric four-pole density. This enables larger potential distortion values compared to symmetric four-pole sounding, providing clearer geological information. Five-pole longitudinal sounding can effectively detect non-stratified bodies (e.g. karst caves) under certain geoelectric conditions. Compared to other resistivity methods, it offers advantages in resolution, curve interpretation, and operational efficiency.

Currently, symmetric four-pole electrical sounding is predominantly used to address geological issues related to horizontal layered structures. However, in hydrological and engineering investigations, non-stratified geological bodies such as karst caves are frequently encountered. The five-pole longitudinal axis sounding method demonstrates superior exploration effectiveness for non-stratified geological bodies under specific geoelectric conditions. Compared to other resistivity techniques, this method offers advantages including strong resolution capability, intuitive curve interpretation, and simplified data analysis procedures.

Notes:

1. Apparent resistivity values differ between four-pole and five-pole soundings at same point due to different K coefficients and medium conditions. For layered

structures, symmetric four-pole is preferred. Electrode spacing L should be ≥ 2 times the target depth ($L \geq 2h$).

$$L = AB_1 = AB_2 = AB$$

2. Five-pole longitudinal sounding curves should be plotted on arithmetic coordinates with vertical axis for resistivity (R) and horizontal axis for depth:

$$h = (Y_1 + Y_2) / 2$$

$$K = \frac{2\pi}{\frac{Y_2 - Y_1}{Y_1 \cdot Y_2} - \frac{1}{\sqrt{L^2 + Y_1^2}} + \frac{1}{\sqrt{L^2 + Y_2^2}}}$$

Where: $Y_1 = AM$, $Y_2 = AN$

9. Two-pole Method (Pole-Pole)

$$R_S = 2\pi a \frac{\Delta V_{MN}}{I_{AB}}$$

(ΔV_{MN} = potential difference, I_{AB} = current)

Where a = distance between moving electrodes

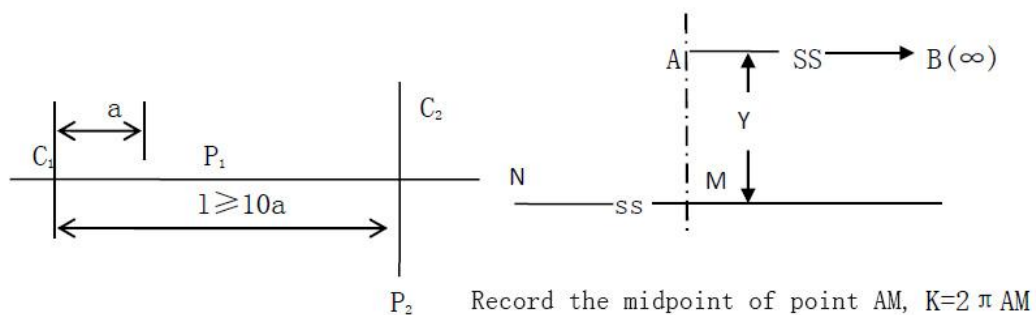


Fig.34: Two-pole Method

C_1 , C_2 is power electrodes;

P_1 , P_2 is receiving electrodes;

C_1 , P_1 is moving electrodes;

C_2 , P_2 is infinite remote electrodes;

Typically $l \geq 10a$

(1) The advantages of the two-pole array configuration are: Under the same electrode spacing conditions, it provides greater investigation depth and wider detection range compared to other array configurations. The potential difference measured using the two-pole method is generally larger than that obtained through other techniques.

(2) The advantages of the above-mentioned two-pole method are summarized as follows:

- a. Larger signal acquisition.
- b. Smaller electrode spacing for same investigation depth, enabling larger coverage with same survey line length.
- c. High operational efficiency after remote electrodes setup.
- d. Simple data interpretation due to pure underground influence, enabling automatic processing. Two-pole data can synthesize other electrode array data through combination.

(3) Electrode setup:

C_2 and P_2 placed at sufficiently remote locations from survey line. Distance between C_2 - P_2 (B-N) should also be infinite and roughly perpendicular to survey line.

(4) Resistivity profiling measurement sequence:

- a. First survey line electrode as power electrode (C_1), measure potentials at M electrodes from 2nd to $(M+1)$ th points.
- b. Second electrode as power electrode, measure potentials from 3rd to $(N+2)$ th points.

Repeat until final electrode. Record midpoint between C_1 - P_1 (AM) as measurement point.

- c. Measurement point is midpoint of C_1 - P_1 (AM)

d. $C_2(B)$ and $P_2(N)$ remain fixed at infinite remote locations. Only $C_1(A)$ and $P_1(M)$ move along or perpendicular to survey line.

Appendix 2: Maintenance and Repair of Instruments

- 1、 After the work is completed, remember to turn off the power to avoid wasting it.
- 2、 During transportation or use, the instrument should be kept by a dedicated person to prevent severe vibration, impact, and water ingress.
- 3、 After work every day, the instrument surface should be cleaned of dust and placed in a ventilated and dry place.
- 4、 After use, the measuring electrode should be kept clean by removing any dirt or debris from the surface.
- 5、 The instrument casing is affixed with a tamper proof seal, please do not tear it open as it cannot be restored. We will not provide warranty.

Appendix 3: Maintenance and Repair of Instruments

- 1、 Low voltage/current indication: Check HV input and connections, verify grounding resistance.
- 2、 Poor electrode grounding: Improve connection or deepen electrode with water.
- 3、 High voltage/current indication: Reduce input voltage and remeasure.
- 4、 Non-polarized electrodes: Ensure potential difference $<5\text{mV}$ before measurement. Soak in saline if needed.
- 5、 Instrument freeze: Power cycle and clear memory (regular maintenance recommended).



Resistivity Meter

ADMT-2B Operating Manual

Shanghai Weiqi Equipment Technology Co., Ltd.

Website: <https://admtdetector.com/>

Tel: +8613227326207