All-Channel Speedy Groundwater Detector operation instructions

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Contents

This operation manual is applicable to the following instruments:

Model \ Serial	Compatible with 1-60 channels (standard single channel MN, optional multi-channel MN/TT)
Speedy groundwater detector	ADMT-180ZN
	ADMT-300ZN
	ADMT-600ZN
	ADMT-900ZN
	ADMT-1200ZN

1 Instrument overview

The ADMT series fast version multi-channel water detector is an intelligent water detector that integrates 1-60 channels. It performs real-time data collection, automatic imaging, and data sharing with multiple terminals. It is equipped with a 7-inch high-definition touch screen (resolution 800* 1280), and the host is compatible with 1-60 channels. The number of channels is automatically increased and recognized according to the accessories. A special magnetic suction multifunctional interface and touch switch are designed, and data collection is completed to automatically map the instrument screen Both mobile and computer screens can view data and plot analysis.

Multi channel simultaneous input measurement solves the defect of MT method field source changing at any time, and can obtain a relatively stable field source. Repetitive measurement consistency is very good. Through multi channel simultaneous input measurement, big data of high-

density method measurement can be obtained, breaking through the depth limit of traditional high-density electrical instruments, and allowing exploration depth to reach a maximum of 1200 meters.

2 Main features

1. The host is compatible with multiple channels such as 1, 12, 24, 36, 48, and 60 in one;

2. Optional within the maximum depth range of the instrument;

3. Equipped with a 7-inch highlighted touch screen as standard, the horizontal and vertical screens can be freely switched for display;

4. The magnetic suction multifunctional interface integrates charging, data transmission, connection of sensors and MN cables;

5. High performance heat sink enhances instrument performance, weighing only 990g, waterproof, anti drop, waterproof and dustproof;

6. Support wireless screen projection and multi-screen interaction;

7. Equipped with a high-performance lithium battery, it can be connected to universal mobile phone chargers, power banks, and car mounted mobile phone chargers for charging and use;

3 Introduction of the working principle of the instrument

3.1 Electromagnetic wave propagation theory, Helmholtz equation

Ground electromagnetic waves are sent to the ground, and the propagation of electromagnetic waves in the earth and soil follows the

Maxwell equation. If it is assumed that most of the subterranean geotechnical soil is non-magnetic and is uniformly conductive macroscopically, there is no charge accumulation, then the Maxwell equation can be simplified to:

$$\left.\begin{aligned}\nabla^2 H + k^2 H = 0\\ \nabla^2 E + k^2 E = 0\end{aligned}\right\} \qquad (1)$$

where k is called the wave number (or propagation coefficient)

$$k = [\omega^2 \mu\varepsilon - i\omega\sigma\mu]^{\frac{1}{2}} \qquad (2)$$

Considering that the propagation coefficient k is a complex number, let k = b + ia, where: a is called the phase coefficient and b is called the absorption coefficient. In the electromagnetic frequency range measured by the ADMT series of natural electric field geophysical instruments (0.1 Hz to 5 kHz), the displacement current can usually be ignored, and K is further simplified as

$$k = -i\omega\mu\sigma \qquad (3)$$

3.2 Wave group resistance and resistivity

A magnetic field with a change in the Helmholtz equation induces a changing electric field, and we have a magnetoelectric relationship:

$$\frac{E}{H} = -\frac{i\omega\rho}{k} \qquad (4)$$

The surface impedance Z is defined as the ratio of the surface electric field and the horizontal component of the magnetic field. In the case of

uniform earth, this impedance is independent of the polarization of the

incident field and is related to the earth resistivity and the frequency of the electromagnetic field:

$$Z = \frac{E}{H} = \sqrt{\omega\mu\rho}e^{i\pi/4} \qquad (5)$$

(5) The formula can be used to determine the resistivity of the earth:

$$\rho = \frac{1}{5f}\left|\frac{E}{H}\right|^2 \qquad (6)$$

3.3 Skin depth

In non-magnetic media, the skin depth formula is:

$$\delta \approx 503\sqrt{\rho/f} \qquad (7)$$

It can be seen from the above equation that the penetration depth of electromagnetic waves is related to frequency and resistivity. The frequency is certain, the higher the resistivity, the greater the penetration depth, the higher the resistivity, and the lower the frequency, the greater the penetration depth.

4 Instrument Instruction and Main parameters

4.1 Instrument Instruction

Figure 1

Figure 2

New spring type cables and electrode connectors, more secure and stable: The cable nodes are equipped with low- power and high-performance control measurement circuits, making connection more convenient and measurement more accurate. Tensile and waterproof structural design, alloy rust resistant metal contacts are integrated with cable sealing through high-pressure injection molding.

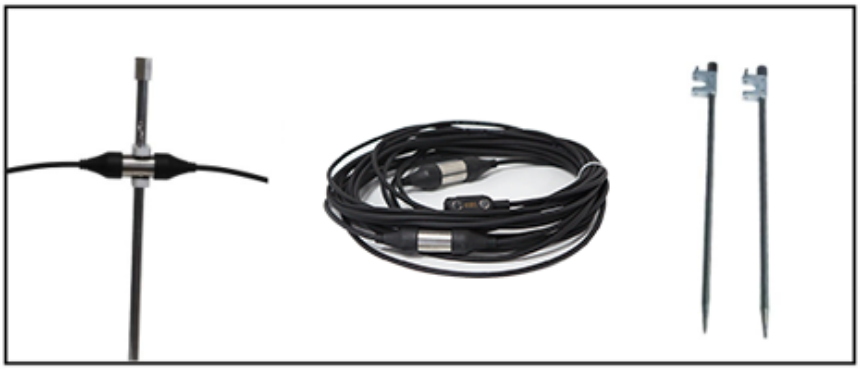
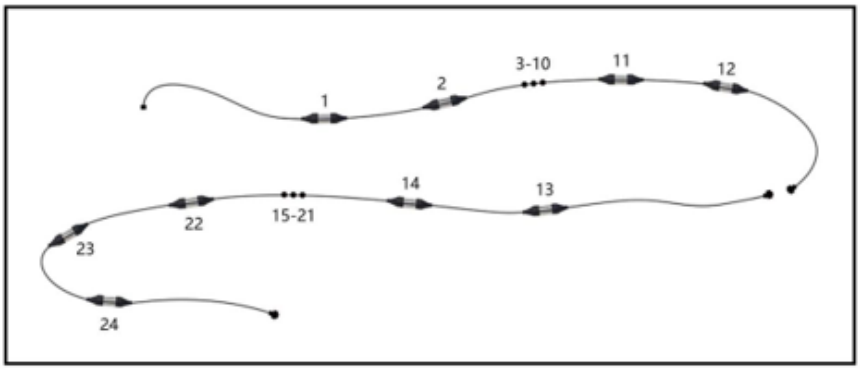
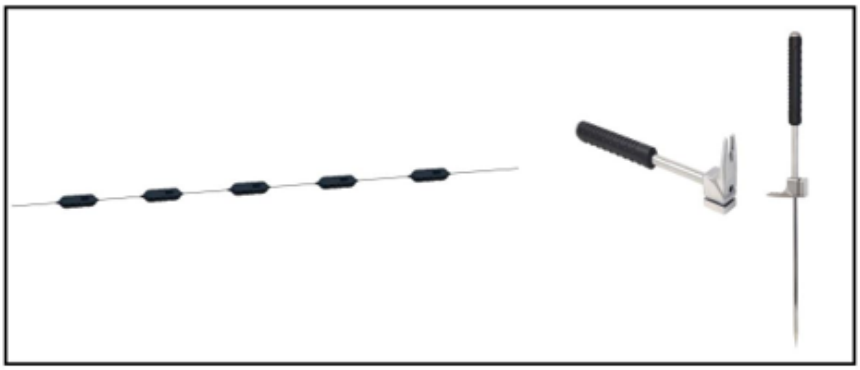


Figure 3



(Figure 4) High density cascade cable



(Figure 5) High density cascade sensor

(Figure 6) special multi-functional electrode rod

The electrode hammer can be hammered, pulled out, used as a handheld electrode handle, and can be stepped on; Specially made alloy electrodes that can be hammered, pulled out, and inserted.

4.2 Main parameters

Parameter\Model	ADMT-180ZN	ADMT-300ZN	ADMT-600ZN	ADMT-900ZN	ADMT-1200ZN
Max Depth(m)	≤180	≤300	≤600	≤900	≤1200
Scan interval	10m				
Channel Options	Compatible with 1-60 channels(standard with single MN channel, multiple MN and TT accessories are optional)				
Operating Model	MN/TT				
Frequency Range	0.1-6500HZ				
Filtering	FFT				
Filter Resolution	0.01mV±2%				
Sampling time	10s				
Connection	All-in-one magnetic connection (charging, USB and single input)、Wifi5、Bluetooth4.2				
Display	7”IPS high brightness touch screen, Automatic screen rotation				
Screen Resolution	800*1280				
OS	Android 13				
CPU	RK 3568				
GPU	Mali G52				
RAM	LDDR4/4GB				
Storage	32GB				
Core Feature	All channels in one ,Real-time curve/contour mapping/All-device interconnection/Free software upgrade				
Other Feature	Water and dust proof/4G optional/GNSS				
Battery	6000mA/H				
Size	23.8*13.9*5.3cm				

Figure 7

5 Login and registration

5.1 System instruction and connection

After turning on the power of the instrument, on screen display, System settings, BLUETOOTH, Instrument setup, Files, New measurement (Figure 8).

Figure 8

The first use of this instrument is recommended to have a network environment to send verification using a cell phone number to log in and register an account.

After logging in to use, after logging in the cell phone number or registered account is the cloud data management account, you can log in to this account on your cell phone or computer to realize data

synchronization and analysis. The logged-in mobile phone number or registered account is the cloud data management account, which can be logged in the mobile phone or computer to realize data synchronization and analysis. Without network, the instrument can only use the basic measurement function and plotting function. The instrument has no network and can only use the basic measurement function and plotting function.

To connect to WiFi, click on the Setup menu and then click on “WiFi” to search and connect to a nearby WiFi network.

After the instrument is connected to the network, click the icon on the upper left or click “User Login” in the system settings to log in and register (Figure 9).

Login and register (Figure. 9), you can choose “cell phone number login”, “e-mail login” two kinds of login methods. We suggest you choose “Mobile Phone Quick Login” to input your cell phone number and send your password to login, and the password sent from your cell phone will be valid for a long time until the next time you send it. The password sent from your cell phone will be valid for a long time until the next time you send it, and you can use it next time you log in or log in on other devices, so it is recommended that you get the password once and keep it.

It is recommended to get the password once and save it.

Special Note: Be sure to connect the WiFi network or cell phone WiFi hotspot to keep the instrument network smooth to send the verification

code and login to be effective. If you do not connect to the network or the network is abnormal, you will be prompted to send the verification code failed.

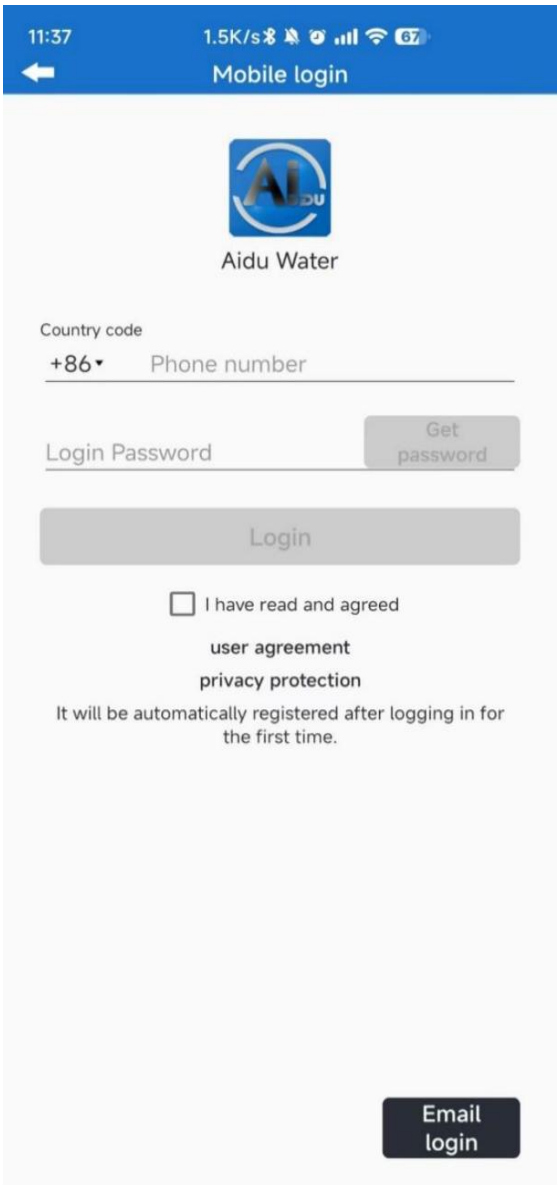


Figure 9

6 New Measurement

6.1 New Measurement

There are four types of instrument connections in the Aidu Water Finder APP, and the ZN series water finder uses a USB connection, so you need

to make sure that the connection is set to USB when you use it.

Figure 10

6.2 Parameter Setting Description

The Instrument Setup page displays the instrument model, ID number, data processing parameters, and measurement parameters.

There are two different setup forms for instrument setup based on networking and login status. Before setting up the instrument, you need to make sure that the connection method is USB and that the device is connected properly.

It is recommended to set up the instrument after the wiring is completed

and the instrument is connected.

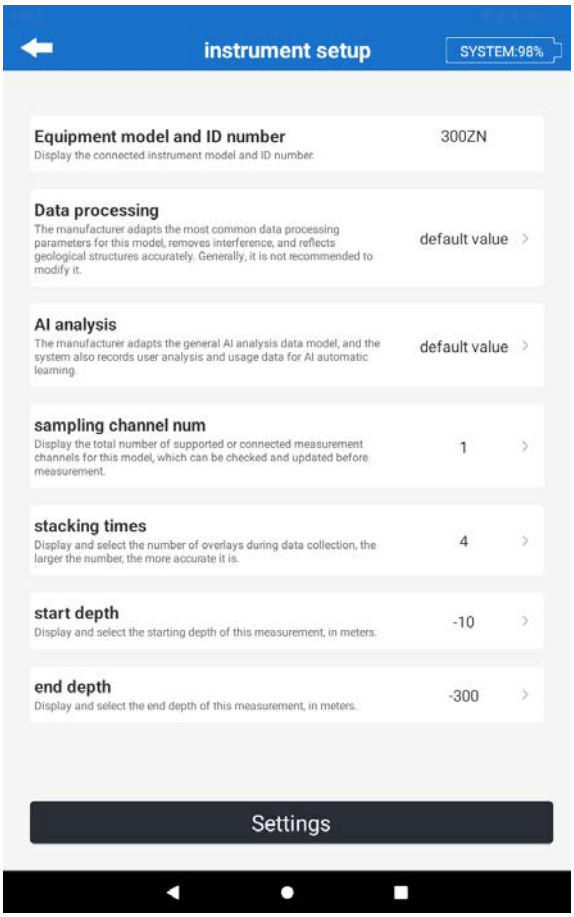


Figure 11

6.2.1 Unlogged Account

When the account is not logged in, the parameters of data processing and AI analysis will be set by default according to the model number of the instrument, and the parameters cannot be changed.

"Number of measurement channels": the instrument will automatically detect the number of channels of the connected line, and select the number of measurement channels according to your needs.

" Measurement mode": the instrument automatically selects the measurement mode according to the type of the connected line, and the default is 'MN'.

"Stacking times": click to set the number of stacking times when the

instrument is measuring.

“Measurement depth”: you can set the maximum depth of the current measurement, according to different models have different maximum depth can be set.

After setting the above four items, click Setup and it will automatically jump to the New Measurement page.

6.2.2 Logged in account

After logging in the account, users can set parameters for data processing and AI analysis, either using the default parameters set by Aidoo or adjusting the parameters for local conditions.

(1) Setting up data processing: Synchronize parameters → Select equipment model → Adjust parameters if necessary → Save settings.

When setting parameters, you can synchronize the parameters to download the default parameters of all bound devices in the login account;

Click “Add Program” to save the current parameter program to the server after modifying the parameter value;

Click “Delete Scheme” to delete the currently selected customized scheme;

Click “Modify Scheme” to modify the parameter values of the currently configured scheme.

Parameter introduction:

[Data Correction] is to remove part of the abnormal measurement point data that is too high or too low caused by environmental interference or other interference in the measurement process; the larger the

magnitude of the correction amplitude, the larger the range of fluctuation of the corrected data. For example, if the correction amplitude is 0.2 or 0.3, the corrected data may fluctuate within 20% or 30% of the original data; the larger the correction threshold input value, the larger the deviation of the data after the bad point correction. If the correction threshold value is too large, the data is prone to significant offset; if the threshold value is too small, the corrected data may differ from the real data. And the data correction is divided into X, Y, Z three axes to correct, X is the horizontal direction, generally refers to the measurement points between, Y is the vertical direction, generally the depth or the direction of the measurement line, Z is the dimension of the overall data.

[Data Finishing]It is the overall filtering process according to the three dimensions of X, Y and Z. Set it to 0 for no finishing, and set it to 1 for finishing, X is the horizontal direction, which generally refers to between the measurement points, Y is the vertical direction, which generally refers to the direction of the depth or the measurement line, and Z is the dimension of the overall data.

[Data Smoothing] Data smoothing can reduce the peaks and valleys between neighboring data, smooth curves and reduce noise to make the image effect more smooth and silky, you can choose 3 points, 5 points, 7 points, 3 times 5 points, 3 times 7 points, and other smoothing methods, according to the need to choose.

[Likelihood resistivity inversion] Likelihood resistivity inversion of the original data for normalization, modeling, the original measurement of the electric field or electromagnetic values in accordance with a certain model algorithm inverse performance of the stratum resistivity, which is not the real resistivity, similar to the resistivity, so the name “likelihood resistivity”, can also be understood as the visual resistivity, inversion models Inversion model selection is generally 0.1-0.9 model data, the larger the model value, the faster the formation resistivity changes, the model coefficient is generally set to 1, set 0 does not perform this step.

Figure 12

(2) Setting up AI analysis: data download → select equipment model → adjust parameters if necessary → save settings.

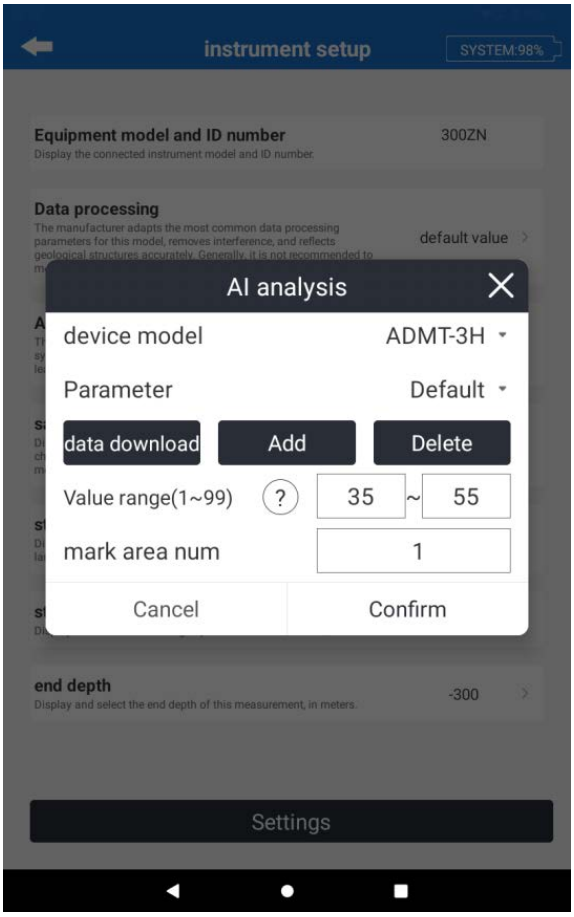


Figure 13

(3) Set the number of sampling channels: after clicking it, the channels will be detected automatically, and then you can select the desired number of channels.

(4) Set the number of stacking times: select the preset value in the pop-up window.

(5) Set the measurement depth: select the preset value in the pop-up window.

(6) Click “Set” after finishing the setting, and then click “Confirm” to enter the new measurement page.

7 New Measurment

(1) Set the name of the new project: Enter the name in the pop-up window or click “Select Project” to select the previously used project.

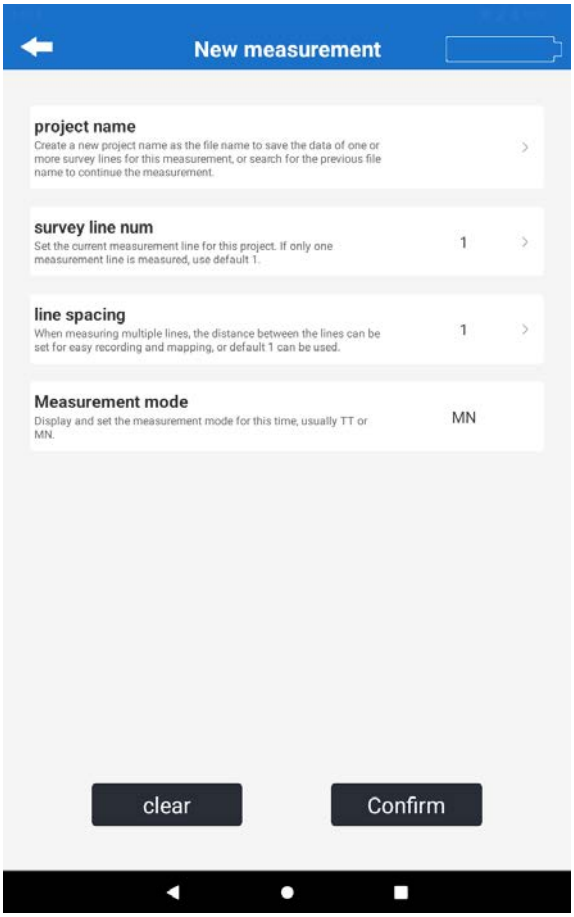


Figure 14

(2) Set the number of lines to be measured and the distance between the lines.

(3) Click “Confirm” to enter the measurement page.

(4) Click “Measurement” to start channel detection to check the channel connection. The channel detection pop-up window will show all the channel connections, red means the channel is disconnected and you need to check the channel connection, blue means the channel connection

is normal and you can measure normally.

(5) Click “Confirm” to carry out the measurement, the upper part displays the line graph of the current measurement results, the lower part displays the data, ABCDE stands for “Measurement Point Number”, “Measurement Depth ABCDE stands for “measurement point number”, “measurement depth”, “apparent resistivity”, “current channel number”, “total channel number”.

(6) After completing the measurement, you can click “Auto Plot” to enter the plotting page.

① “O2D” is the old version of contour plot, “N2D” is the new version of contour plot, both contour plots can be selected by clicking the button to draw vertical contour plot or plane contour plot;

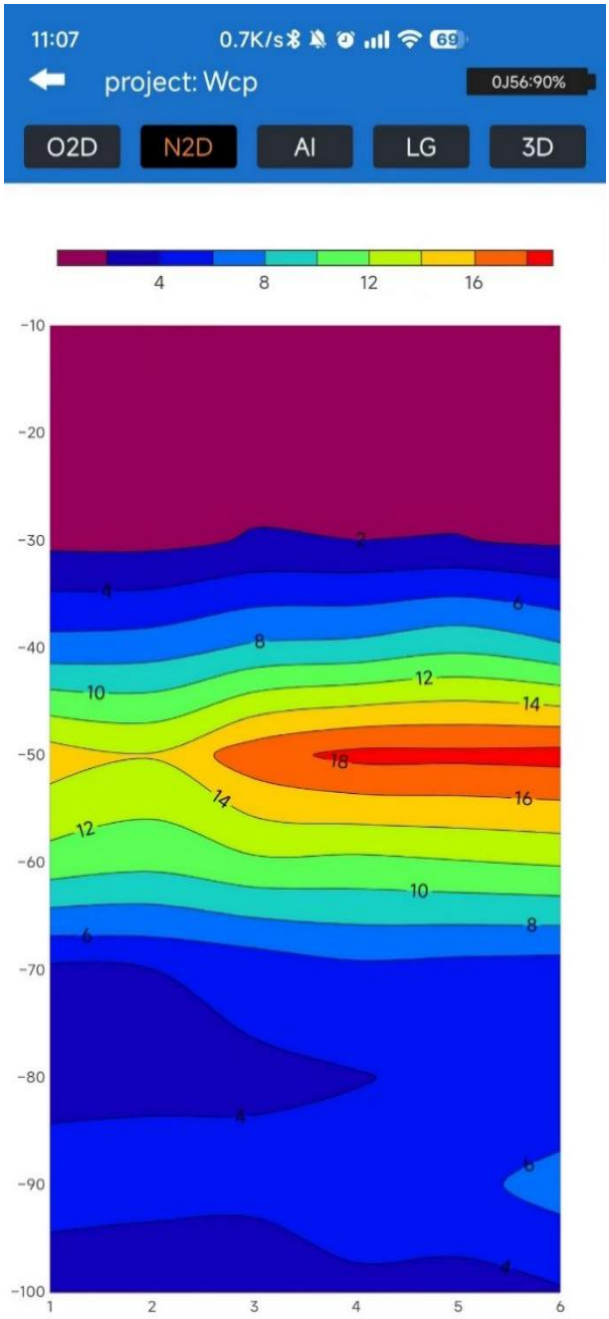


Figure 15

② “AI” for the AI analysis of mapping, you need to enter the first parameter analysis of the AI analysis, and select the measurement line, select the history can be loaded in the past to carry out the AI analysis of the data;

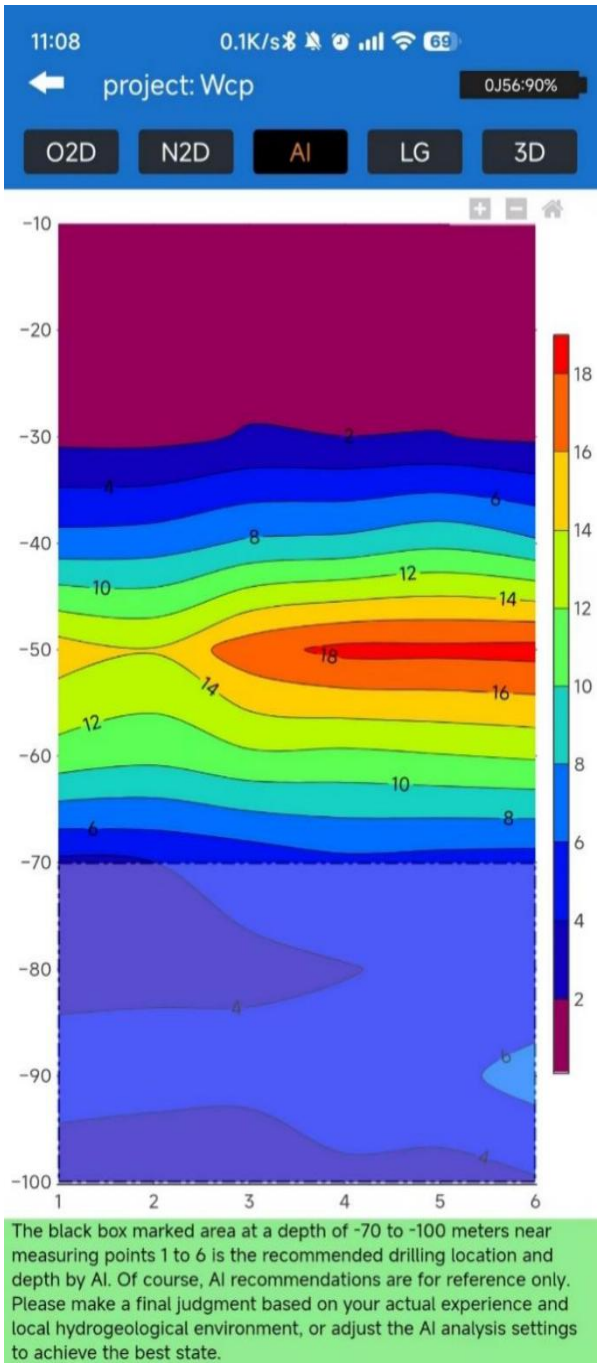


Figure 16

③ “LG” is a curve graph, you can choose plane curve graph or vertical curve graph;

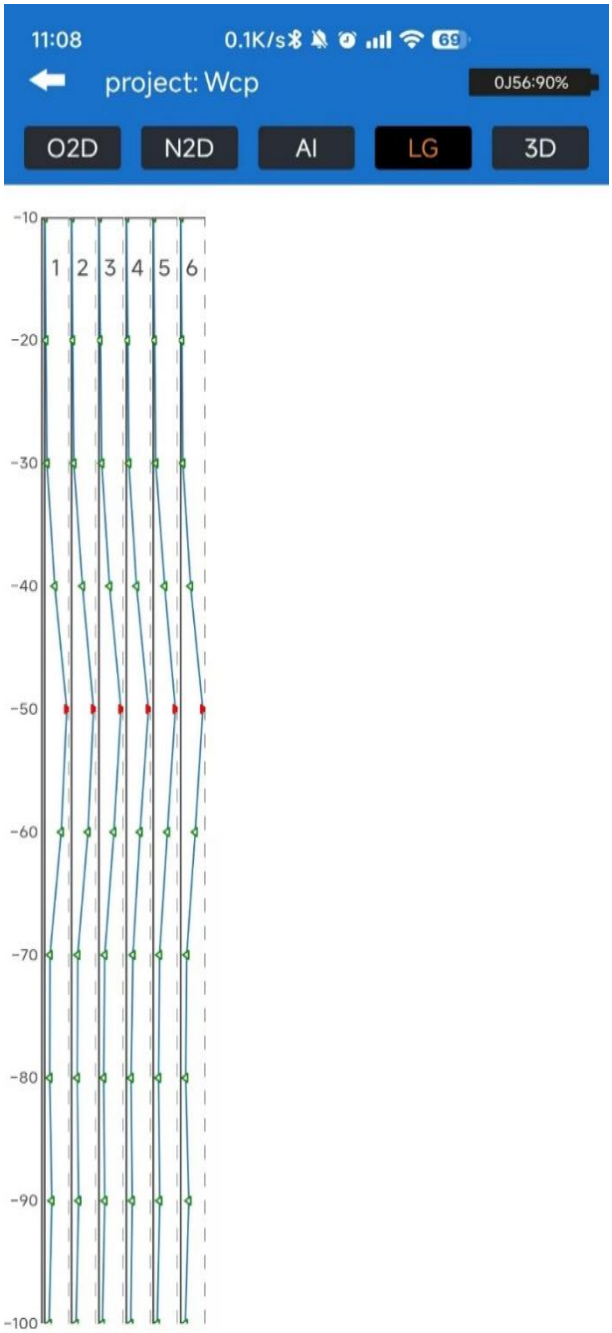


Figure 17

④ “3D” is 3D contour map, you can choose 3D map or 3D slice map, in 3D slice map you need to choose to slice according to bathymetry or survey line or survey point increment.

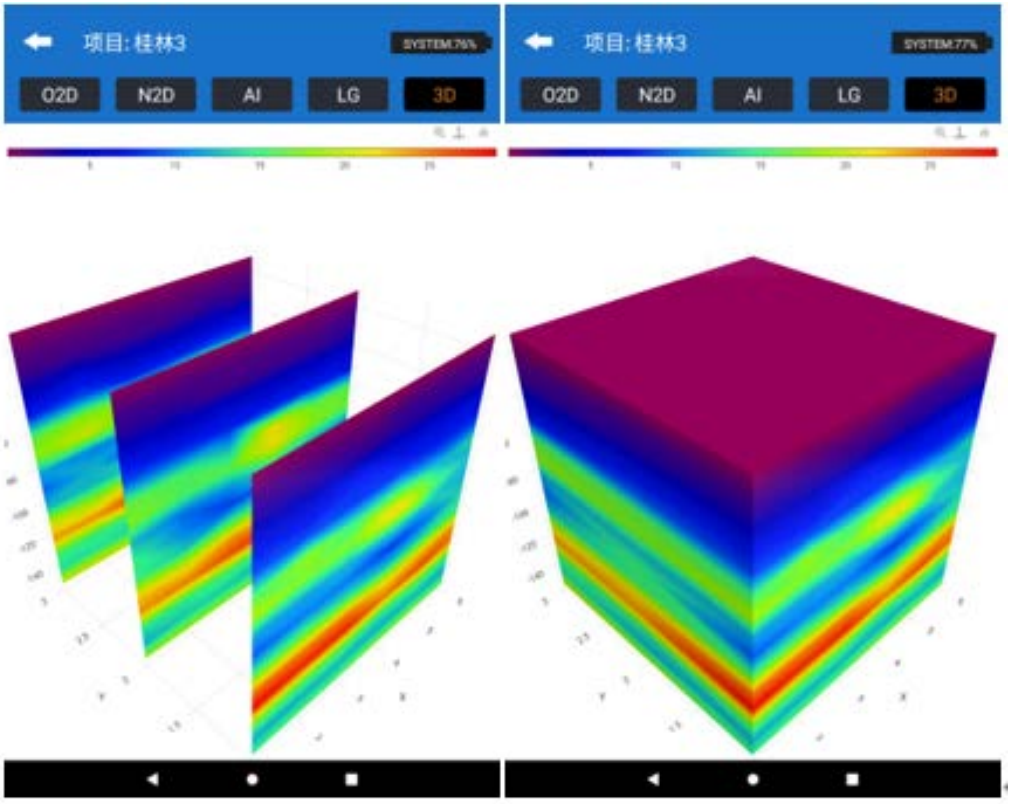


Figure 18

8 Folder Browsing

(1) You can select files for plotting, “Backup” - backup data to cloud and “View” - view data of selected files.

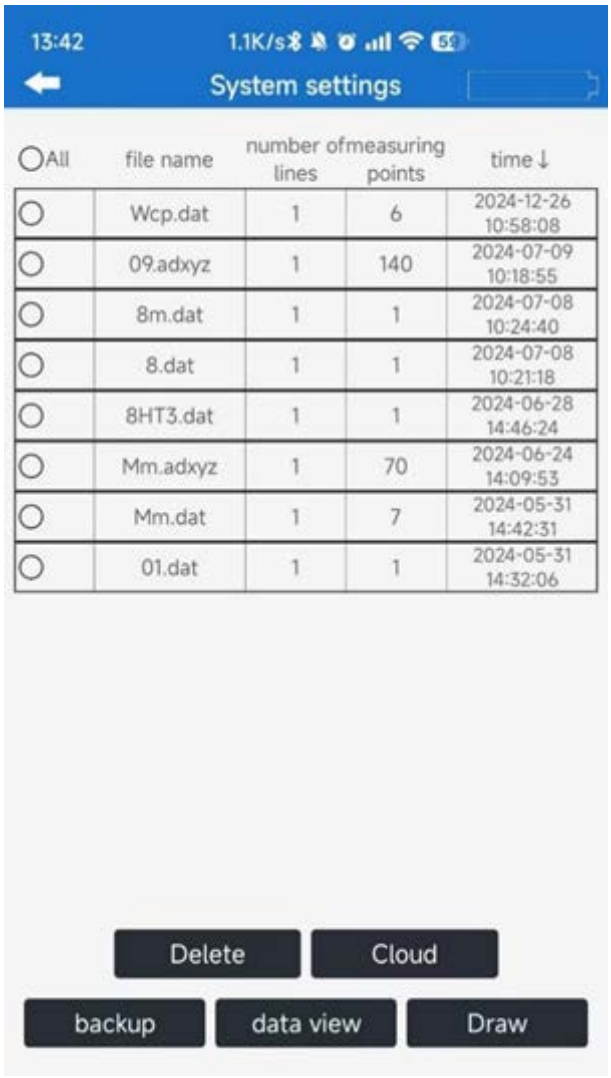


Figure 19

(2) In “Cloud”, you can view the files saved in the cloud, delete them or download them locally.

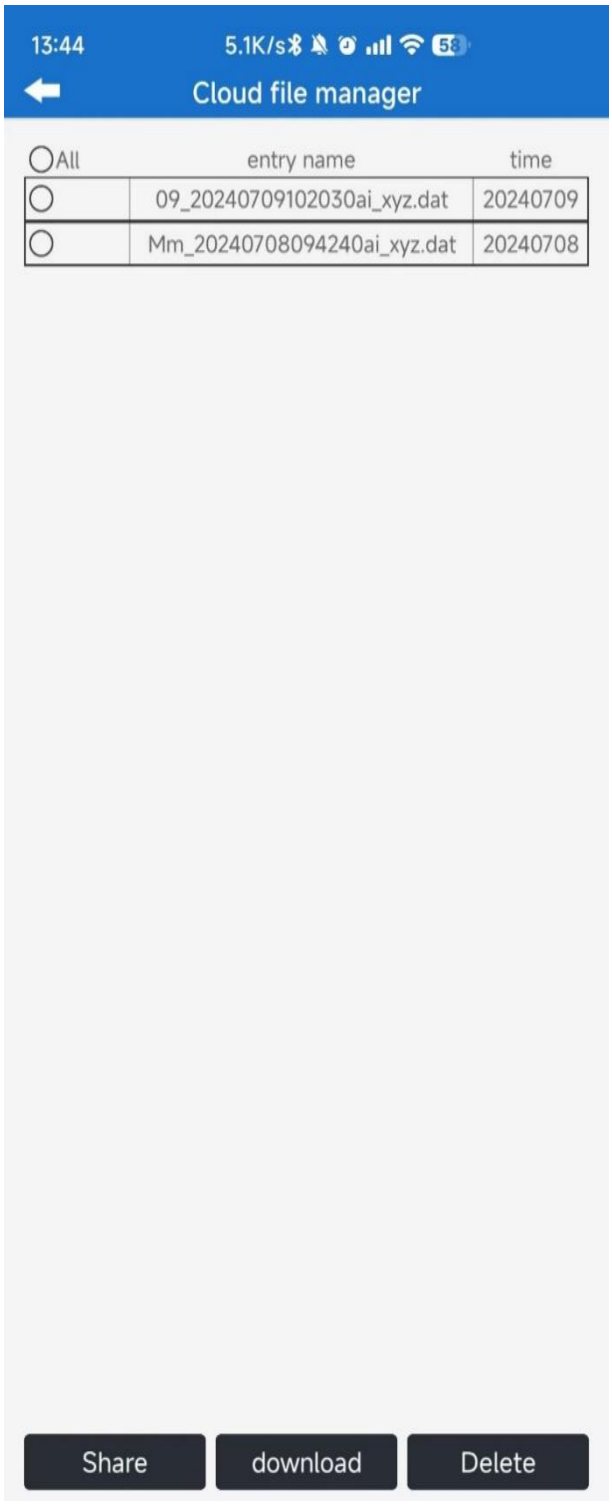

13:44
5.1K/s
Cloud file manager
All
entry name
time
09_20240709102030ai_xyz.dat
20240709
Mm_20240708094240ai_xyz.dat
20240708
Share
download
Delete

Figure 20

9 System settings

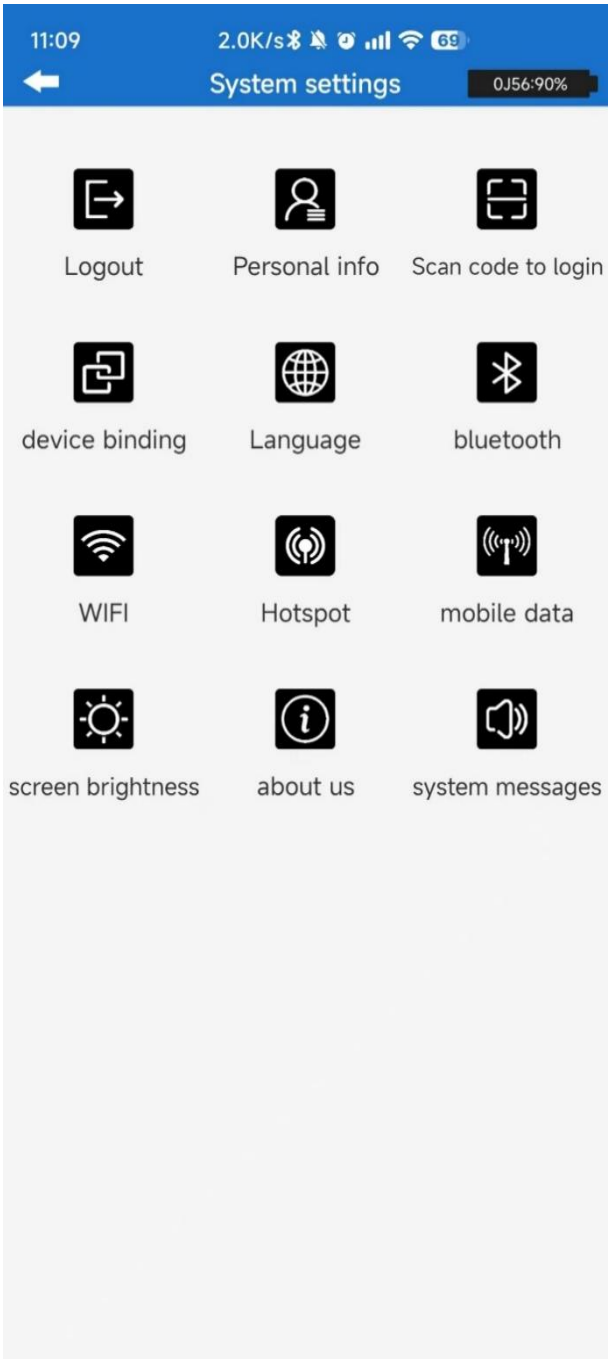


Figure 21

The system settings page allows you to set the user account, device information, language, and host functions.

The three function keys on the top row can be used to log in, log out, set personal information, and scan code to log in to the web side of

the user account.

“Bind Device”: manually bind the current device to the login account, or unbind all the bound devices in the account.

“Language”: Aidu Water APP provides ten languages for users to choose, and you can adjust the display language in the software.

“Bluetooth” ‘WiFi’ ‘WiFi Hotspot’ ”Mobile Data” “Screen Brightness”: set the corresponding function for the device, mobile data is only open for 4G version devices.

“About Us”: introduce Aidoo Water APP and update the software version.

“System News”: check the official notification of Aidoo system.

10 Instrument field connection method

10.1 Single Channel Connection

10.1.1 Wired Electrode Connection Mode

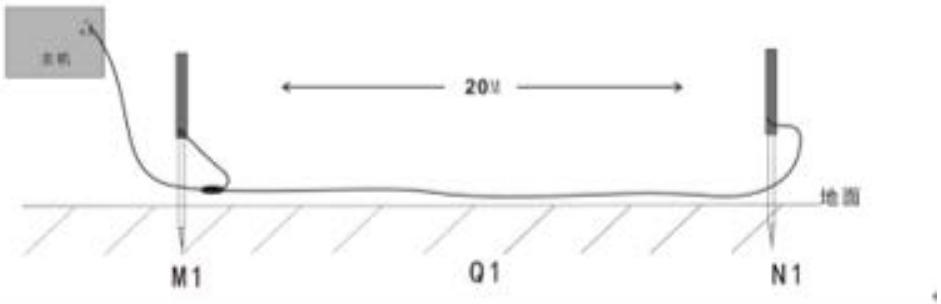


Figure 22

After the instrument is turned on, connect the instrument as shown in the above figure (Figure 22), insert the M and N measuring electrodes into the ground, and start sampling, and the measuring point position is the center of the two M and N electrode rods. After the end of the

point sampling to a certain point distance to the same direction to move the M, N electrodes, the second measurement point sampling measurement (Figure 23). And so on, until the completion of the entire profile measurement.

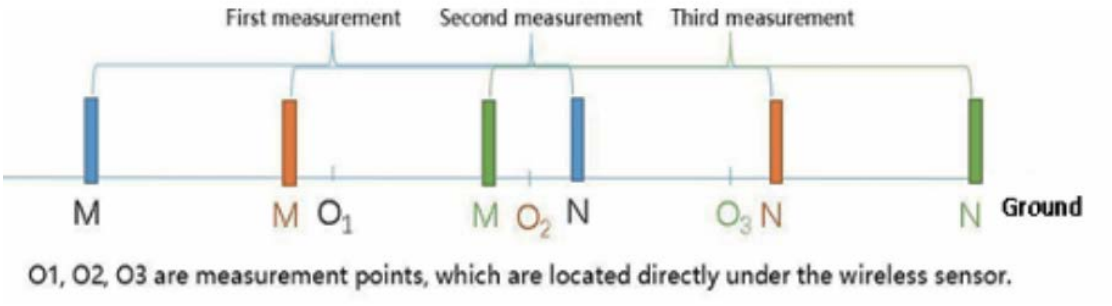


Figure 23

10.1.2 Wied Magnetic Sensor Connection Method (optional)

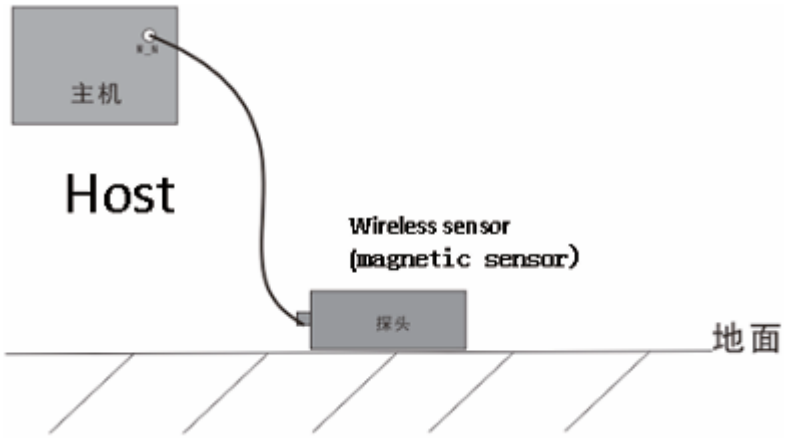


Figure 24

After the instrument is turned on, connect the instrument as shown in the figure above (Figure 24, place the sensor on the ground, and start sampling. The measurement point is directly below the sensor. The sensor placement direction is not required, but the placement direction

of each measuring point sensor on a survey line is required to be consistent. After sampling at this point, move the sensor in the same direction at ertain point distance to perform sampling measurement at the second measurement point. And so on, until the entire profile measurement is completed.

10.2 12 Channel Instrument Connection Mode

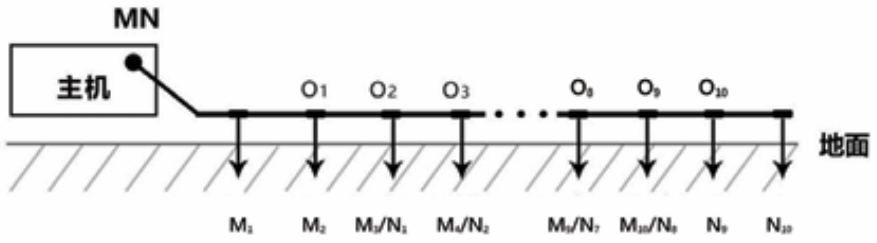


Figure 25

After the instrument is turned on, connect the instrument as shown in the figure above (Figure 25), spread the measuring cable along the measuring line, insert the electrode into the ground, and connect the electrode to the measuring cable by pulling out the card. Get ready to start sampling.

The 12-channel instrument can complete data acquisition of 10 measuring points at the same time in one measurement. The measuring point is the center point of the MN electrode, that is, the second electrode is the position of the first measuring point, and the third electrode is the position of the second measuring point. By analogy, the last measurement point is at the penultimate electrode. After the measurement is completed, the second profile can

be sampled and measured. And so on, until the entire profile measurement is completed.

10.3 24 Channel Instrument Connection Mode

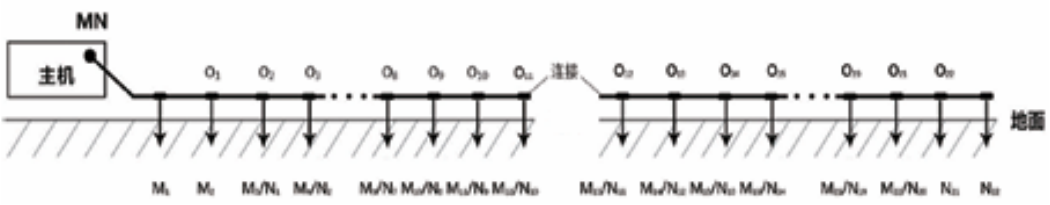


Figure 26

Connect two 12 measuring cables together, lay them along the direction of the measuring line, and place the instrument on magnetic tape A section of suction interface cable, with the electrode inserted into the ground, is connected to the

measuring cable through a metal spring (as shown in Figure 26 and Figure 27). Ready to start sampling. 24 channel instruments can complete 22 measurements simultaneously in one measurement data collection of points; Due to site restrictions, only one cable can be laid, and the cable interface needs to be

selected as (MN_1) number Interface connection. The starting electrode of the measuring line is the end of cable (MN_1), and the measuring point is the middle of the MN electrode The second electrode at the end of cable (MN_1) is the first

measurement point position, and the third electrode is the position of the second measurement point, and so on, with the last measurement point at the penultimate electrode. Measure Complete the sampling

measurement for the second profile, and so on, until the entire profile measurement is completed.

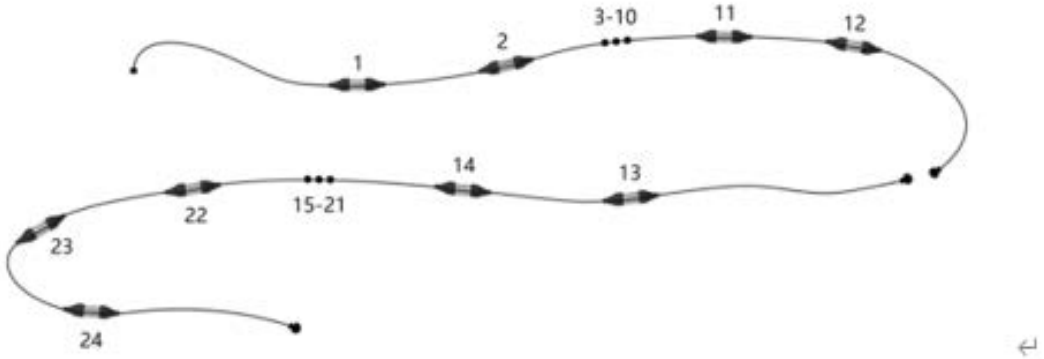


Figure 27

10.4 36 Channel Instrument Connection Mode

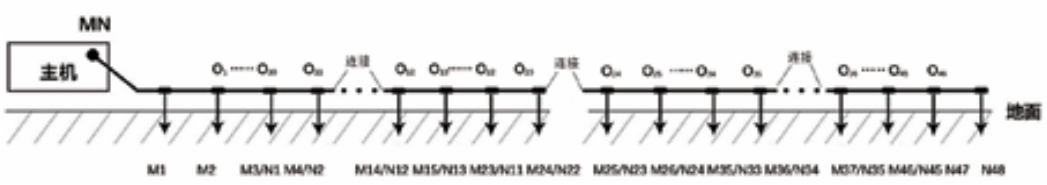


Figure 28

Connect three 12 measuring cables together, lay them along the direction of the measuring line, and place the instrument on magnetic tape A section of suction interface cable, with the electrode inserted into the ground, is connected to the

measuring cable through a metal spring (as shown in Figure 28). Ready to start sampling. 36 channel instruments can complete 34 measurements simultaneously in one measurement data collection of points; Due to site restrictions,

only one cable can be laid, and the cable interface needs to be selected as (MN_1) number Interface connection. The starting electrode of the

measuring line is the end of cable (MN_1), and the measuring point is the middle of the MN electrode The second electrode at the end of cable (MN_1) is the first measurement point position, and the third electrode is the position of the second measurement point, and so on, with the last measurement point at the penultimate electrode. Measure complete the sampling measurement for the second profile, and so on, until the entire profile measurement is completed.

10.5 48 Channel Instrument Connection Mode

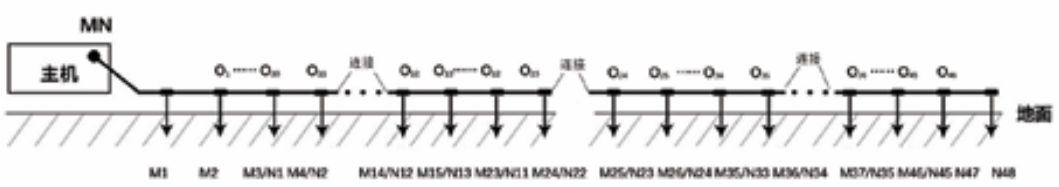


Figure 29

Connect four 12 measuring cables together, lay them along the direction of the measuring line, and place the instrument on magnetic tape A section of suction interface cable, with the electrode inserted into the ground, is connected to the measuring cable through a metal spring (as shown in Figure 29). Ready to start sampling. 48 channel instruments can complete 46 measurements simultaneously in one measurement data collection of points; Due to site restrictions, only one cable can be laid, and the cable interface needs to be selected as (MN_1) number Interface connection. The starting electrode of the measuring line is the end of cable (MN_1), and the measuring point is the middle of the MN electrode The

second electrode at the end of cable (MN_1) is the first measurement point position, and the third electrode is the position of the second measurement point, and so on, with the last measurement point at the penultimate electrode. Measure

complete the sampling measurement for the second profile, and so on, until the entire profile measurement is completed.

10.6 60 Channel Instrument Connection Mode

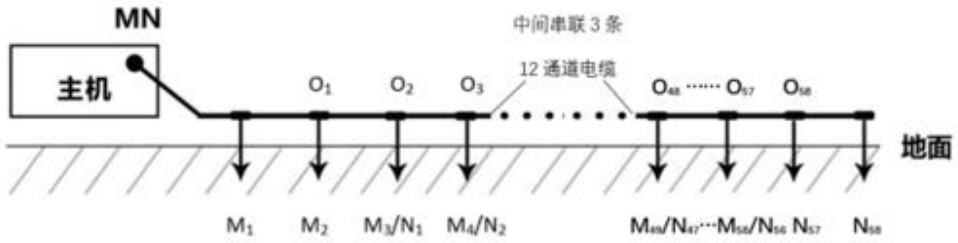


Figure 30

Connect four 12 measuring cables together, lay them along the direction of the measuring line, and place the instrument on magnetic tape A section of suction interface cable, with the electrode inserted into the ground, is connected to the

measuring cable through a metal spring (as shown in Figure 30). Ready to start sampling. 60 channel instruments can complete 58 measurements simultaneously in one measurement data collection of points; Due to site restrictions, only one cable can be laid, and the cable interface needs to be selected as (MN_1) number Interface connection. The starting electrode of the measuring line is the end of cable (MN_1), and the measuring point is the middle of the MN electrode The

second electrode at the end of cable (MN_1) is the first measurement

point position, and the third electrode is the position of the second measurement point, and so on, with the last measurement point at the penultimate electrode. Measure

complete the sampling measurement for the second profile, and so on, until the entire profile measurement is completed.

10.7 Instrument Wired Electromagnetic Probe Connection Method

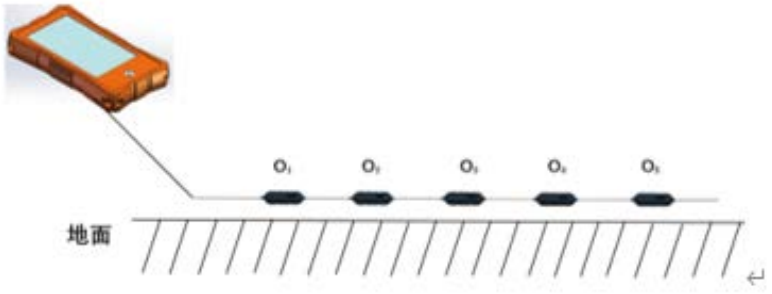


Figure 31

After the instrument is turned on, connect it as shown in the above figure (as shown in the figure for the multi-channel sensor) and follow the measuring line Spread it out, place the instrument on a section of the cable with a magnetic suction interface, and place the electromagnetic sensor at the corresponding point 0. Ready Sampling can begin immediately.

Instruments using high-density cascaded electromagnetic sensors can simultaneously collect data from multiple measurement points. (1 channel, 1 measurement point)

Type of high-density cascaded electromagnetic sensor

AD-5D2.5H1-CX	5 channels, sensor 2.5 meter spacing H1 probe
AD-5D5H1-CX	5-channel, sensor 5-meter spacing H1 probe
AD-10D2.5H1-CX	10 channels, sensor 2.5 meter spacing H1 probe
AD-10D5H1-CX	10 channels, sensor 5 meter spacing H1 probe

The site limit allows for only one cable to be laid, and the cable interface needs to be connected using the (MN_1) interface. measure The starting measurement point number of the line is the end of the cable (MN_1), and the measurement point position is directly below the sensor. Measurement completed can quickly change the position for sampling measurement of the second profile. And so on, until the entire piece is completed Profile measurement.

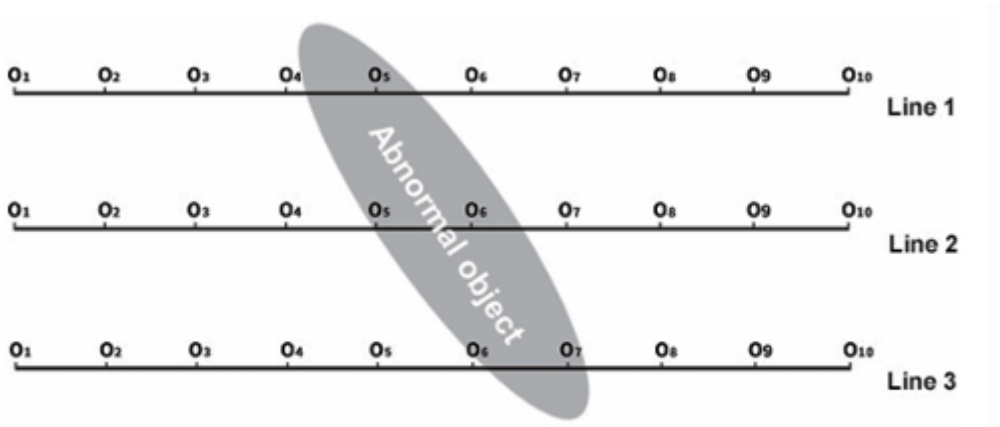
11 On -site survey Line Layout Method

The survey line layout is a very important part of the exploration. The quality of survey line layout will directly affect the measurement accuracy and improve the anti-interference ability. The basic principle is that the survey line direction

should be perpendicular to the direction of the exploration target, and the straight section should be straight and circular. Try to be as round as possible and the ground as flat as possible. Choose different survey line layout methods according to the actual topography.

11.1 Parallel Layout Method Straight Section

Straight-line profile is the most commonly used layout method, and multiple straight-line profiles are formed in parallel by multiple straight-line profiles. This method can quickly determine the direction of exploration targets. First, assume and judge the direction of the exploration target, and arrange the survey line perpendicular to the direction of the exploration target (Figure 32). One or more linear profiles can be laid out. Generally, 2-3 can be used to quickly the direction of anomalous objects, according to the exploration target. Multiple straight-line sections are laid out based on the length of the object. The direct distance of each straight-line section is called the line distance. The line distance is generally ≤the length of the exploration target, in meters.

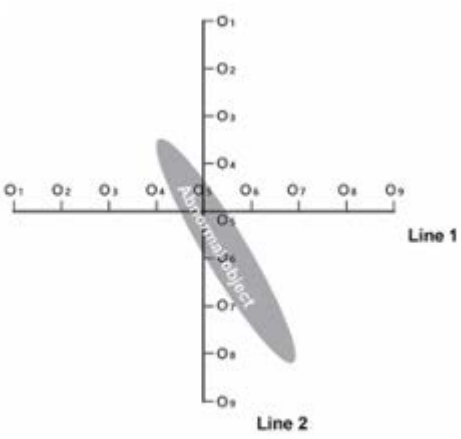


(Figure32)

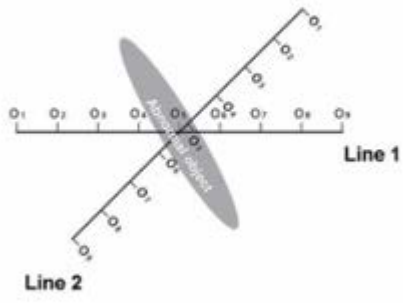
11.2 Layout Method Of Cross Or Diagonal Cross Of Straight Section

After measuring one straight line section, it is found that there is an abnormal body or the site is relatively limited. When it is difficult

to lay out multiple straight line sections, you can use cross (Figure 33) or diagonal crossing (Figure 34) to lay out the second line. The anomalous areas of the two straight line profiles can repeatedly confirm the existence of the exploration target, and can also assist in judging and confirming the approximate direction of the exploration target.



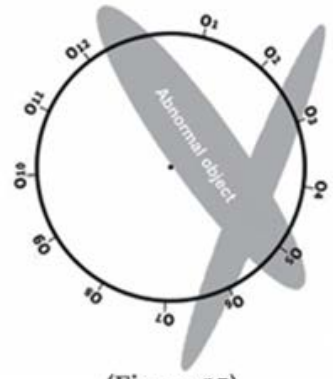
(Figure 33)



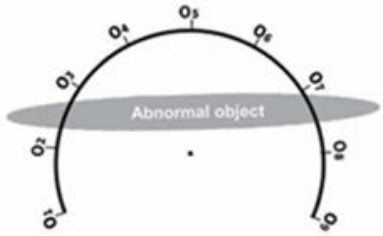
(Figure 34)

11.3 Layout Method Of Circular Section

When the survey site in some areas is really narrow or there are point interferences like transformers, signal transmission towers, etc. nearby, make a circle (Figure 35) or semicircle (Figure 36) with the site or interference as the center to measure. Can also quickly track the direction and location of exploration target objects (water veins, mineral veins, etc.).



(Figure 35)



(Figure 36)

11.4 Wiring Principle

1.The survey line layout should be as vertical as possible to the direction of the abnormal body, the linear section should be as straight as possible, the circular section as round as possible, and the ground as flat as possible. You can make sure that the survey line is as straight as possible by using a compass or a benchmark with three points and one line.

2.When measuring on a mountain slope, try to choose the same altitude layout. When the same height layout is not possible, try to choose the same slope or a gentle slope direction as possible. The height difference between adjacent points should preferably not exceed 2 meters.

3.The measuring line should be as far away as possible from high-voltage transmission lines and telephone lines. When not far away, the wiring direction should be as parallel as possible.

4.When measuring, make sure that the M and N electrodes are on the same plane as much as possible, and the recording point is the center point of the M and N electrodes or below the device sensor.

5. In the same measurement area, the point distance should be kept the same as far as possible, and the line distance should be kept the same to facilitate recording and analysis.

6. Try to keep the grounding consistency of M and N electrodes when measuring in MN electrode mode.

12 Precautions For Using The Instrument

1. Please check the battery level of the device regularly and charge it regularly. Maintain sufficient power during working hours and turn off the power promptly after work.

2. The equipment should be kept by a dedicated person during transportation or use to avoid severe vibration, impact, and moisture ingress.

3. After each work, keep the equipment and MN electrode clean and place them in a ventilated and dry place.

4. If the MN electrode or electromagnetic sensor is not connected or disconnected, it will prompt measurement failure. Please check whether the line is connected.

5. When the measurement data of each measuring point is too small and the value is basically the same in the equipment measurement, the instrument may be malfunctioning, please contact the after-sales confirmation.

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Aidu Exploration and Foundry Model

AIDU

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