



AQUA
LEAK DETECTION



AQUA-T SERIES

UNDERGROUND WATER FINDER

Operation Manual





ACKNOWLEDGMENT:

Results are instantly shown on the screen when you need them most.

If you need additional training, a second opinion on the data, or wish to seek out our expert advice on a course of action?

Feel free to contact our team via -

Phone: (+61) 1300 343 464

Email: info@aquald.com





TABLE OF CONTENTS

Product Overview & What's Included	04
Technical Specifications	05
Introduction & Working Principle	06
Advantages	06
Handheld Host Device	08
Getting Started	09
Grid and Cross Method	18
Advised Measurement Approach	19
Operation Process	20
Measurement: Preparatory work	21
How To Analyze The Data	24
Safety Instructions	28
Maintenance	28



PRODUCT OVERVIEW & WHAT'S INCLUDED:

Handheld Host
Device



Electrode cable

M N Connector



Handles



Copper electrode





TECHNICAL SPECIFICATIONS:

Model No.	Depth	Accuracy	Channel	Frequency	LCD	PS	Other
AQUA-T1	150 meters	0.001mv	4	Single, triple and 33-frequency	Industrial 7-inch HD touchscreen	DC12V 4000mAh Built-in Battery	<ul style="list-style-type: none"> • Automatic noise reduction with strong anti-interference ability. • Interactive and user-friendly interface, featuring high-speed CPU control and menu prompting. • Data is automatically measured and stored. • The water detector automatically draws curve graphs and profile maps, eliminating the need to output data to a computer for map creation. • Data is saved automatically upon power-off. • Capable of storing data for 999 measuring lines and recording 999 measuring points for each line. • Data can be directly transformed into curve graphs or maps within the detector or can be output to a computer for map creation. • Utilises rechargeable batteries with a standby time of over 12 hours.
AQUA-T3	300 meters	0.001mv	6	Single, triple and 40-frequency	Industrial 7-inch HD touchscreen	DC12V 4000mAh Built-in Battery	
AQUA-T5	500 meters	0.001mv	8	Single, triple and 56-frequency	Industrial 7-inch HD touchscreen	DC12V 4000mAh Built-in Battery	



INTRODUCTION & WORKING PRINCIPLE:

The **AQUA-T Series** is a geophysical prospecting device powered by natural electric fields, designed to detect underground water. It measures changes in resistivity in rocks and minerals using the Earth's natural electric field, providing a simple and lightweight solution for water detection. The device automatically generates graphs and maps during data collection, aiding in the swift identification of underground water sources.

ADVANTAGES:

High Measurement Speed and Efficiency:

Capable of conducting over 8000 meters of profile measurement within a day, detecting geological abnormalities across various depths. This method improves prospecting speed and efficiency by approximately tenfold compared to traditional resistivity techniques.

Portability:

This system operates without relying on heavy power sources, utilizing low-frequency signals from the Earth's natural electric field. With a total weight of less than 2 kilograms, it's incredibly easy to carry around.

User-Friendly Operation:

Controlled by a micro-PC, the equipment's operation is straightforward. It only takes about 10 minutes to learn how to use it, and even individuals without prior prospecting experience can complete their training within the same timeframe.



High Performance and Accuracy:

Offers a measurement resolution of up to 0.001mV and a precision level of $\pm 2\%$. This system ensures high stability and matches abnormality curves observed with traditional geo-electrical equipment across various field surveys.

Strong Resistance to Interference:

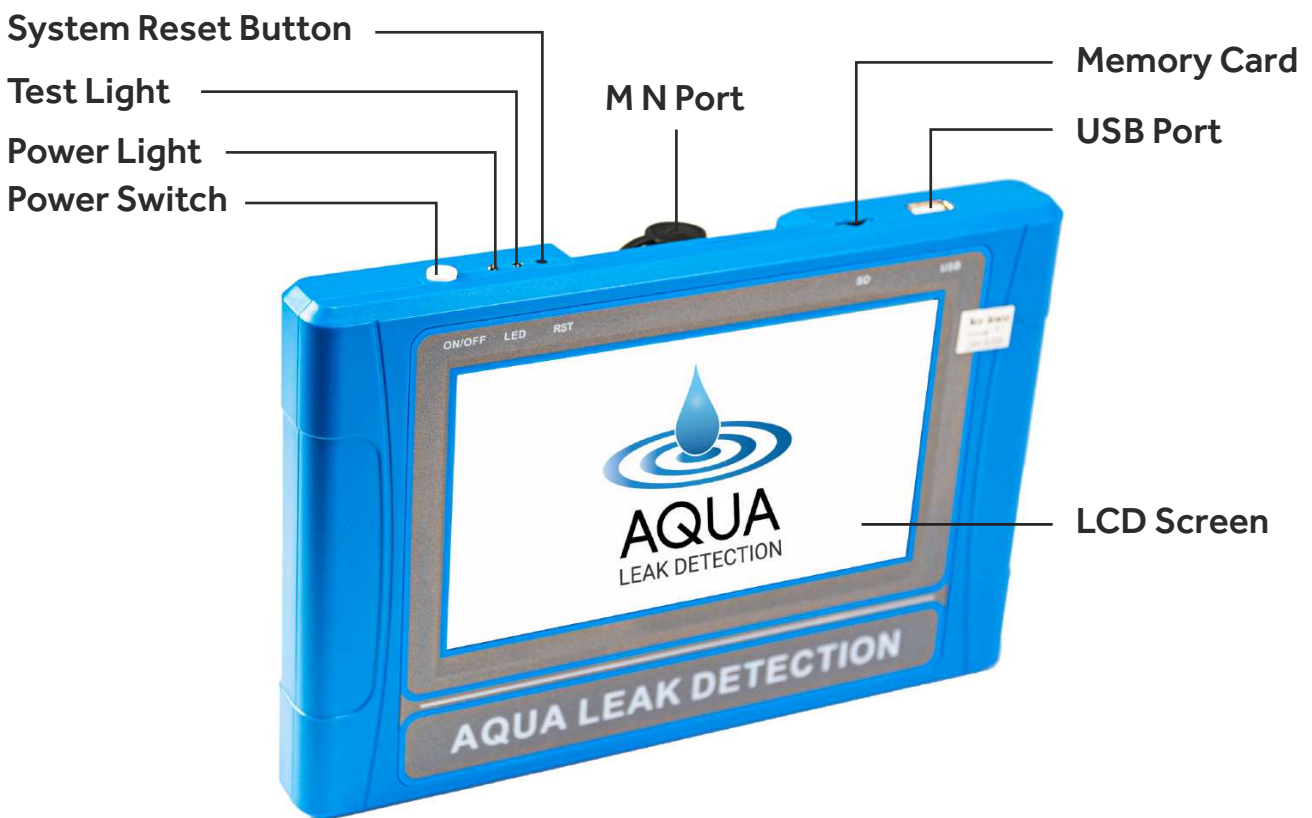
Equipped with advanced anti-jamming technology and multiple interference-resistant designs, this system maintains consistent and reliable abnormality curve results even in areas with weak signals, high electric interference (such as cities), or external interferences. Its frequency selector and digital processing capabilities contribute to this resilience.

Automatic Mapping Feature:

Upon completing data recording, this instrument can automatically generate curve graphs and profile maps with a single button press. There's no need to transfer data to a computer for mapping purposes.

HANDHELD HOST DEVICE:

High Measurement Speed and Efficiency:



1. LCD Screen:

Shows different operational states and measurement outcomes, including measurement data, curve graphs, and profile maps pertinent to the instrument's functionality.

2. Main Switch:

Turns on the the device. A blue indicator light indicates normal system operation, with flashing indicating regular system activity. A continuous light suggests system busyness or a pause, while no light indicates either a power-off state or automatic shutdown due to low voltage. The cable test indicator light is green.

3. M N Port:

Input terminal for the M and N electrode connectors.

4. USB Port:

Establishes a connection between the host machine and a computer using a connection cable or links to an Android mobile phone with an OTG cable to transfer data files, curves, and profile maps. Note: OTG functionality is supported only by specific models of Android phones.

GETTING STARTED:



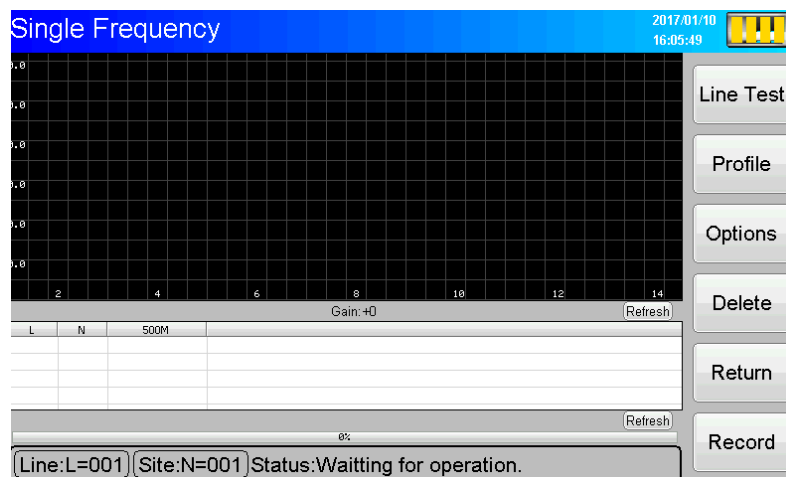
Frequency Measurement States:

There are three measurement states:

1. Single Frequency Measurement State
2. Three Frequency Measurement State
3. Profile Survey Measurement State

1. Single Frequency Measurement State:

Once you are on the main screen, double-tap on **"single-frequency"** to access single-frequency measurements. This action allows you to perform operations associated with single-frequency measurements, as illustrated in the figure below:

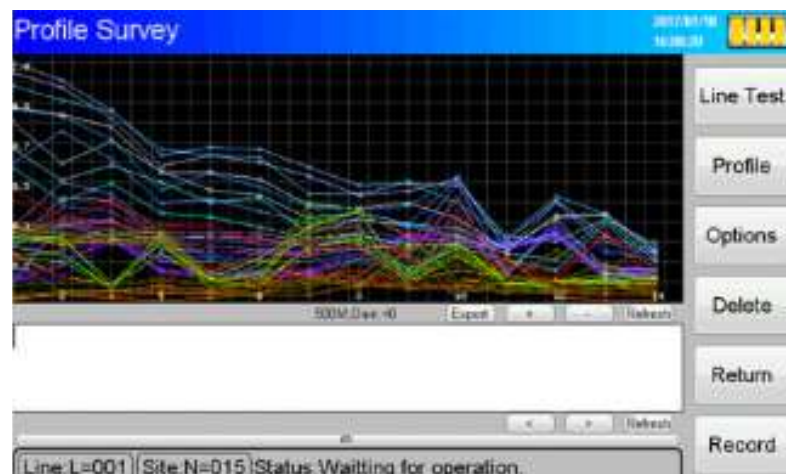


i. Line Test:

Before conducting measurements, verify the functionality of the prospecting instrument. Cross over the two connected copper electrodes whilst making them touch each other and tap and hold the **"Line Test"** option. If the detection indicator (green light) illuminates, the line is operating correctly. If there is no light, it indicates a cable fault, requiring cable repair or replacement.

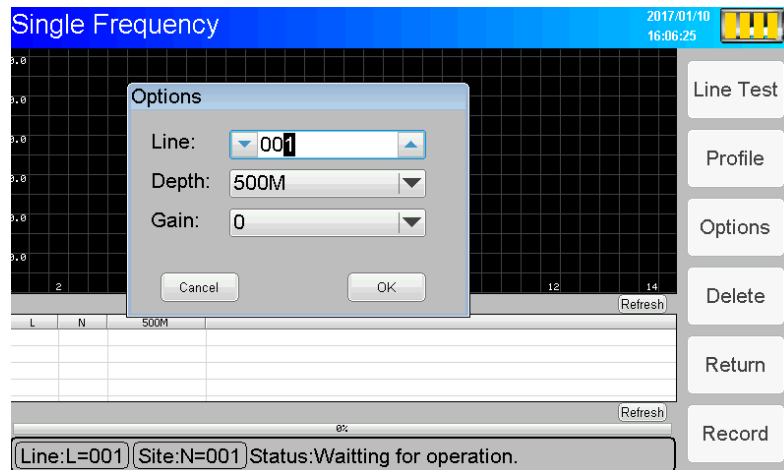
ii. Profile:

This function lets the user conduct a profile survey.



iii. Options:

"Select the 'Options' button, triggering the appearance of a dialogue box labelled 'Options,' as depicted in Figure below;



The device can save up to 999 measurement lines, with each line capable of storing 999 measurement sites. The display at the bottom left shows information about the current line and the stored measurement site. The number next to 'Line: L =' indicates the present line number, while the number next to 'Site: N =' indicates the stored measuring site on the current line. For instance, 'Line: L = 5; Site: N = 20' means that 20 sites have been measured on Line 5.

'Depth': The depth is set to 500 meters for the AQUA-T5 Model, while it should be adjusted to 300 meters for the AQUA-T3 Model.

'Gain': The default setting is '0', suitable for weak areas. Depending on the situation, adjust it to '1' or '2' to enhance the field source signal. Moving the electrode rods during an actively recording line measure isn't allowed as it may disrupt the data. Press 'OK' to save the options and return.



iv. Delete:

In cases of accidents or unresolved data anomalies during the measurement process, it may be necessary to remove data from the previous measuring site. To achieve this, click on the 'delete' button, which will remove the last column in the table. As a result, the number following 'Site: N =' will decrease by 1, indicating the deletion of data from that specific measuring site. A single click will eliminate the data set associated with that measuring point.

v. Return:

Click the **"Return"** button to return to the main screen.

vi. Record:

Click on the **"Record"** button to initiate the sampling process on the instrument. The screen below the status bar will indicate **"Waiting for operation"**, then change to **"Recording Freq1 Data"**. The DATA column will display frequency data. Once sampling is complete, the display will show **"Record completed"**.

To move to the next measurement point, click the **"Record"** button again. This action will increase the number after **"Site: N="** by 1, enabling data collection for the next point. Repeat this process until you've completed a measuring line (where $N \leq 999$).

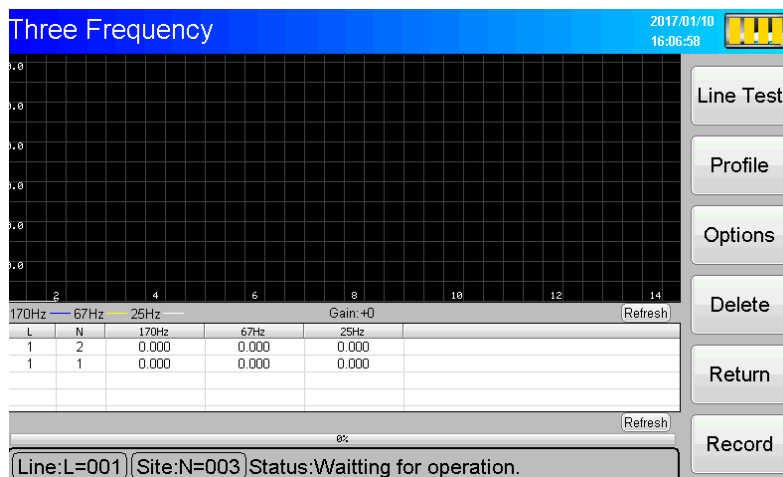
If the number of sites reaches 999 (**"N = 999"**), clicking the **"Record"** button will overwrite the data for the initial measurement site. To continue, press the **"Options"** button, select **"Line: 002,"** and proceed with the measuring operation.

During recording, if there are issues like poor electrode rod contact with the ground or loose plugs, press the **"Stop"** button to halt the process. Resume recording after addressing the issue.

Important: Avoid shutting down the instrument while it's measuring to prevent data loss or program errors. The shutdown is safe at any other time.

2. Three Frequency Measurement State:

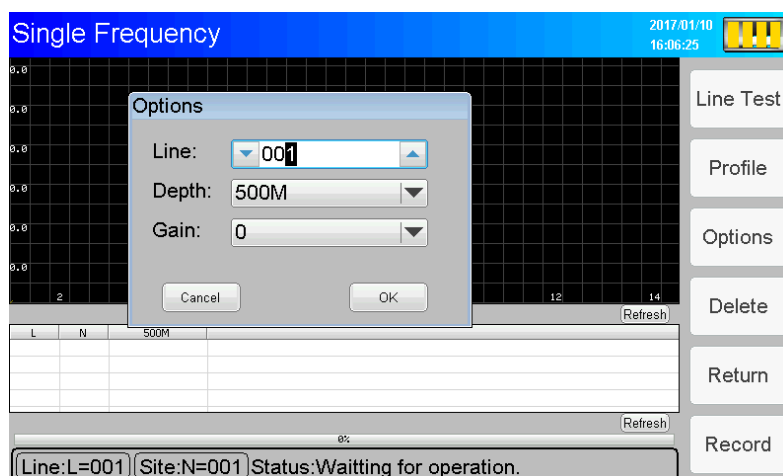
Enter the Three-frequency measurement state, LCD display is shown below;



Line Test, Delete, Return, Record, the function of recording introduced during the Single Frequency measurement state.

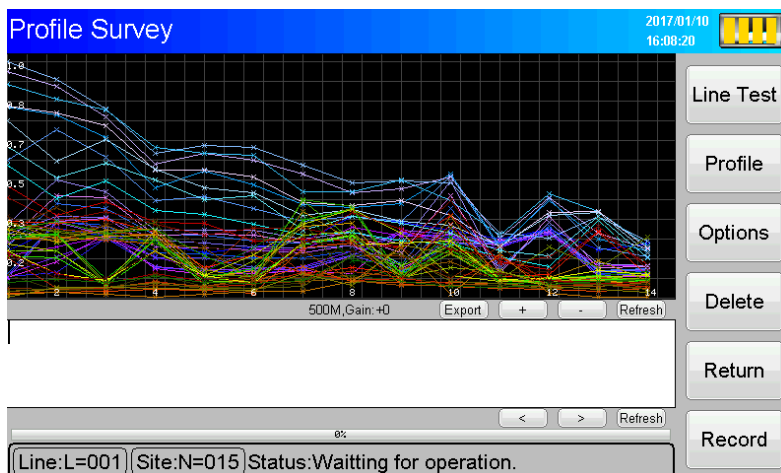
Choices:

Click the **"Options"** button to open the **"Options"** dialogue box (as seen in Figure). By choosing the measurement line below and press , you can proceed with the recording operation in the next step. Both the measurement line and site are introduced during the single-frequency measurement state.

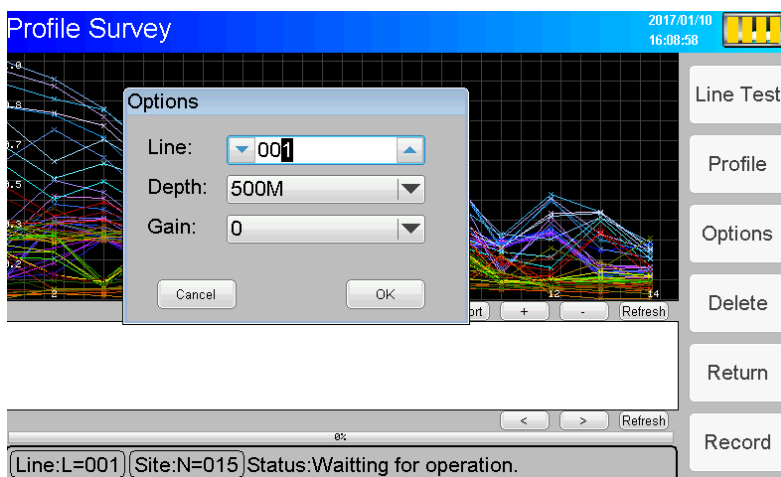


3. Profile Survey Measurement State:

Enter profile survey measurement state, LCD display is shown below;



To access the Single Frequency Measurements, begin by selecting 'Line Test' from the main screen. Then, click on the 'Options' button to open the 'Options' dialogue box. In this dialogue box, select the desired measuring line , followed by pressing 'Record' to proceed with the recording function. This action will introduce the measuring line and site for the single-frequency measurement state. Once completed, you can proceed with further operations.

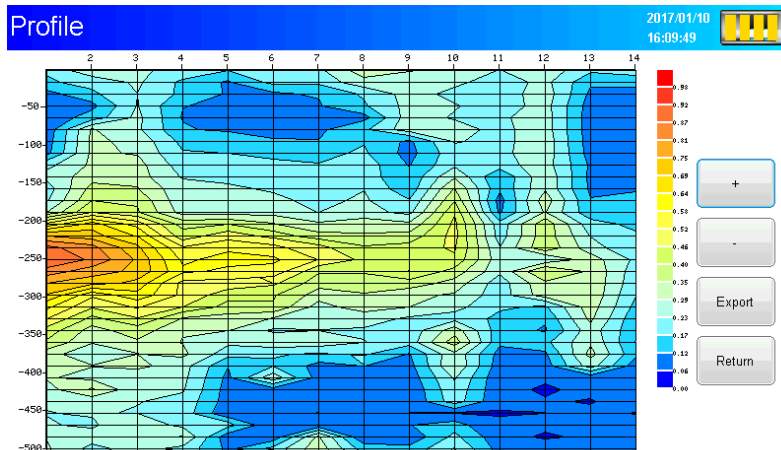


Profile Curve:

In the ongoing survey line, each measuring point automatically generates a curve by the system. After the measurement is complete, you can adjust the size by clicking on the "+" icon. To save the curve and its associated data, click the **"Export"** button. The system will automatically store the curve in the **"File Explorer"** dedicated to that survey line, ensuring the data is saved together.

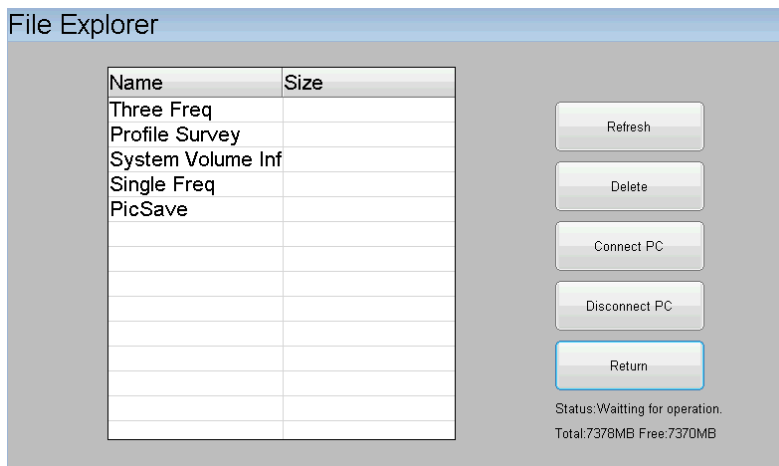
Profile:

Click on the **"Profile"** button to prompt the system to automatically generate a profile. Use the "+" icon to enlarge the picture and the "-" icon to narrow it down. Click on **"Export"** to instruct the system to save the drawn picture into the designated folder in File Explorer, alongside the saved data curve for the profile, as illustrated in the figure below:



File Explorer:

Start and enter the main screen, then click **"File Explorer"**, as figure below:

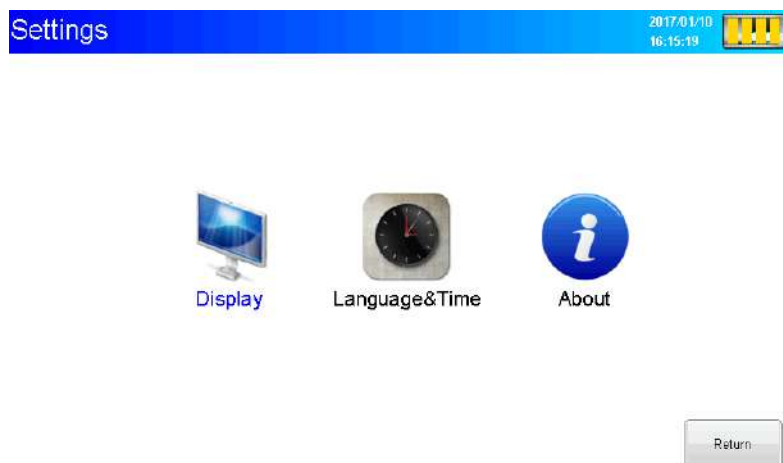


The folder within the profile survey is organized by line numbers, such as 'L1,' 'L2,' 'L3,' and so forth. Once the measurement is finished, easily access the 'File Export' and 'Profile' options for the curve. Inside each line folder, find three files: 'System volume inf,' 'Profile Survey,' and 'Three Freq.' Connect the device to your computer using a data cable, then copy these files to your computer for analysis.

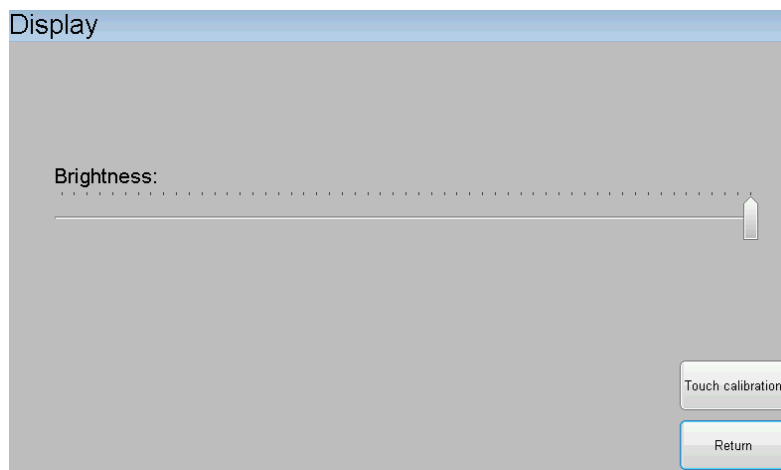
If you're using an Android phone supporting the 'OTG' function, use the provided 'OTG' cable along with the data cable to connect it to your mobile phone. This allows you to copy the data directly to your phone for access and analysis.

Settings:

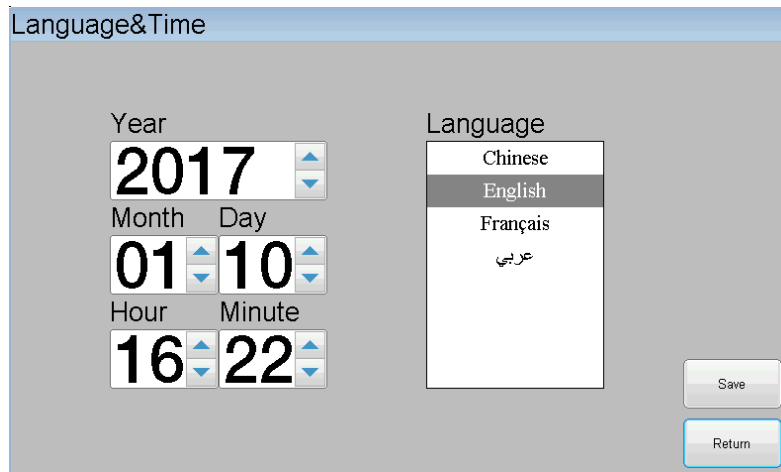
Start and enter the main screen, tap **“settings”** to show the page below:



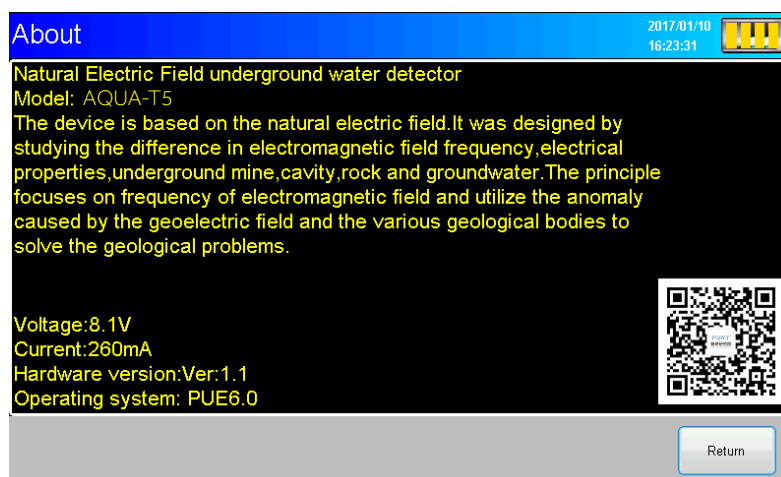
After clicking the **“Display” “Language & Time” “About”**, the screen as below:



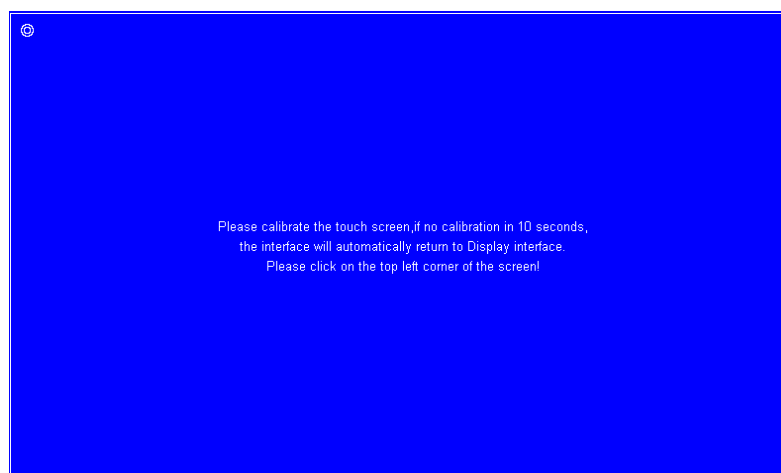
Display screen



Language & Time screen



About



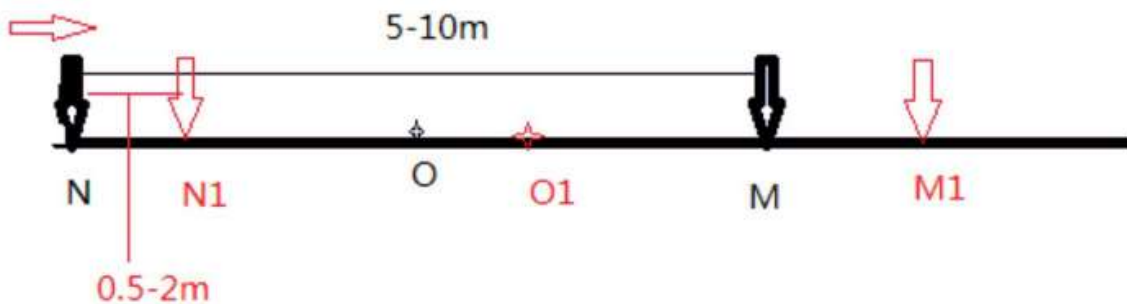
Touch Calibration screen

GRID AND CROSS METHOD:

Geophysical survey lines are usually positioned perpendicular to the area being examined, allowing for the identification of tectonic crushed zones and their distinct physical attributes on both sides of the boundary. These zones exhibit clear contrasts, highlighting differences in crushing width and unique extensions.

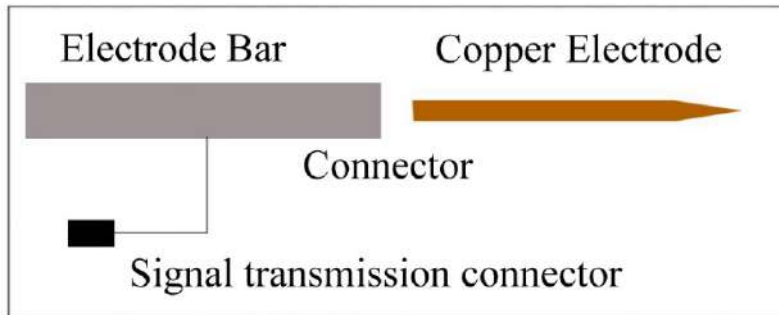
To precisely locate abnormal ground points, a measuring rope or tape is commonly used to draw a straight line. The initial measurement point is marked with paint, facilitating the identification and measurement of positions based on subsequent test drawings.

Data collection takes place at each midpoint between two electrode readings. In Figure 16, point O represents the initial data set. Electrode spacing typically ranges from 5 to 10 meters, selected based on specific field conditions (e.g., 6/8/10 meters). Dot spacing is generally maintained between 0.5 to 2 meters, emphasizing the importance of equal distances between electrode and dot spacings along a single measurement line.



To use the electrode, which consists of alloy rods and copper electrodes, please consult the figure for instructions on connecting the handheld alloy rod with the copper electrode inserted into the soil. It is recommended to insert them into compacted soil for each insertion. Before clicking on the **"Record"** button, begin by pressing **"Line Test"** to ensure proper grounding. The **"green light"** indicator will illuminate upon successful grounding (connection between the two rods), allowing the measurement process to proceed.

Note: It is advisable to insert the rods into dampened soil for each placement. Before tapping the **"Record"** button, tap the **"Line Test"** button to confirm proper grounding. The **"green light"** indicator will illuminate upon successful grounding (connection between the two rods), allowing the measurement process to proceed.



ADVISED MEASUREMENT APPROACH:

Cross Method:



Grid Method:

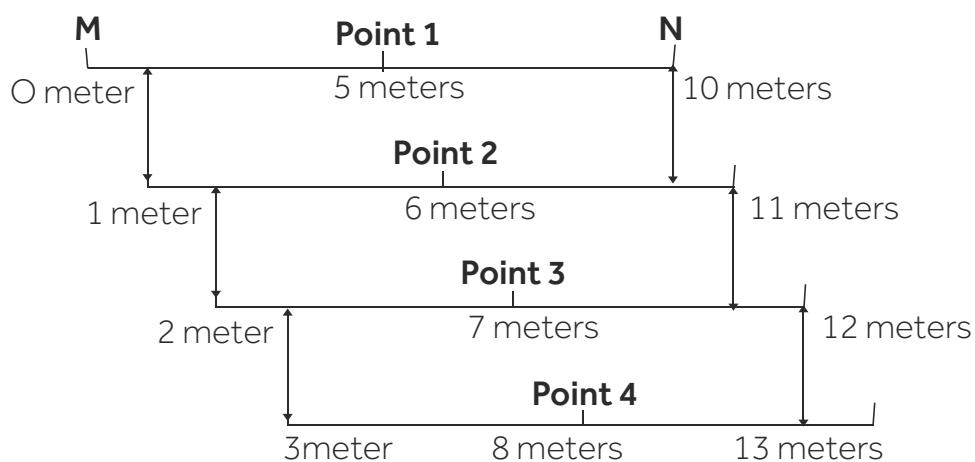


OPERATION PROCESS:

Wiring direction & Location:

Take a tape measure and measure 10 meters. Mark the starting point as 0 meters. The MN two-electrode rods should be distanced 10 meters apart, with both MN electrodes moving 1 meter after measuring each point. The wiring for the MN electrodes should be as follows:

Start at '0' and mark the centre points accordingly:



M N equidistance is 10 meters;
M N both move 1 meter



(**Note:** It is recommended to take measurements and scans at a 10 meter MN equidistance, with both MN electrodes moving 1 meter between each scan. This is because the water detector was designed for a 10 meter MN equidistance, and altering the MN equidistance affects the measurement depth.)

To calculate the distance on the ground corresponding to a point on the profile map, follow these examples:

Example 1: For M N equidistance of 10 meters, with both M N moving 1 meter, Point 4 is at 8 meters on the ground. (Point number + 4 meters)

Example 2: For M N equidistance of 10 meters, with both M N moving 2 meters, Point 4 is at 11 meters on the ground. (Point number * 2 + 3 meters)

MEASUREMENT: PREPARATORY WORK

Insert both MN into the soil (or cross the two connected copper electrodes and place them together). Click on the "**Line Test**" operation screen and hold for 2-3 seconds. If the detection indicator (green) lights up, the line is normal and connected. Without the green light, it indicates a cable fault, and the cable needs to be repaired or replaced.

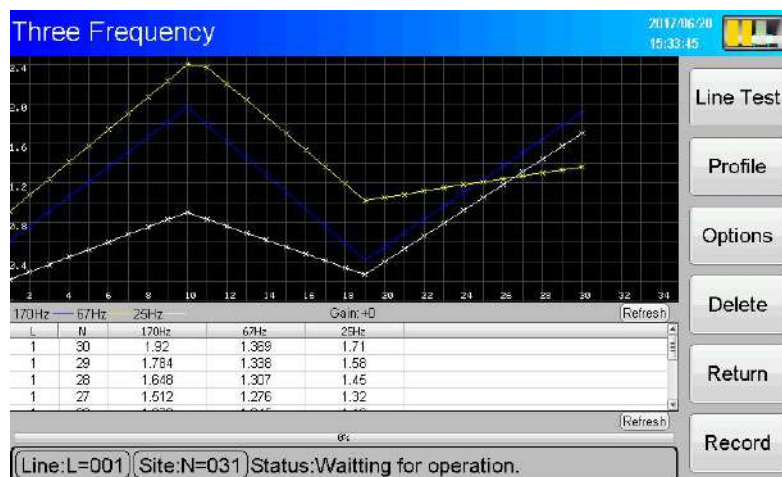
(For dry or stone surface land, we recommend clicking "**Line Test**" to check the machine's working line and connection before measuring each point.)

1. Single Frequency:

In the Single Frequency mode, each depth option corresponds to a specific frequency. You can choose the depth based on your geological survey requirements. For instance, selecting "**50m**" means the obtained curve reflects the conditions at a depth of 50 meters. This mode is ideal for a rapid and preliminary detection. Once low-value areas are identified, you can then utilise the profile survey mode for more detailed measurements.

2. Three Frequency: (General testing)

In the three-frequency mode, 170Hz is used for shallow levels, 67Hz for middle levels, and 25Hz for deep levels, but the depth in this mode cannot be directly determined. For measuring large areas, you can initially use the triple frequency to detect low-value areas, taking only 5 seconds for one point. After identifying potential areas, you can then use the profile survey mode for a more precise depth measurement.



Utilise the three-frequency mode to generate a curve as shown above. Identify abnormal points with either high or low values. Choose either the high value at point 10 or the low value at point 19 for the profile survey measurement.

3. Profile Survey: (Accuracy measurement, using profile survey for finding underground water)

Tips Before Measuring:

1. Avoid areas with high-voltage power lines or signal towers exceeding 1000V near the measurement site.
2. Ensure that the two-electrode rods do not come into contact with underground metal during measurements.
3. Maintain a safe distance from highways and trains during the measurement process.



Measurement Points:

It is advisable to measure at least 15 points for each line, but no more than 30 points for optimal completion of the geological scan (15 points provide a comprehensive view).

Gain+1/+2:

The Gain function is effective for weak electrical signals. For general measurements, maintaining the "**Gain: 0**" setting is sufficient. Increase the "**Gain: +1**" or "**Gain: +2**" only when data shows zero during measurement. Ensure consistent Gain settings for each line test.

Export:

The Export function saves the profile map and curve graph. Use "+" to enlarge and "-" to zoom down the profile map or curve.

Process Function:

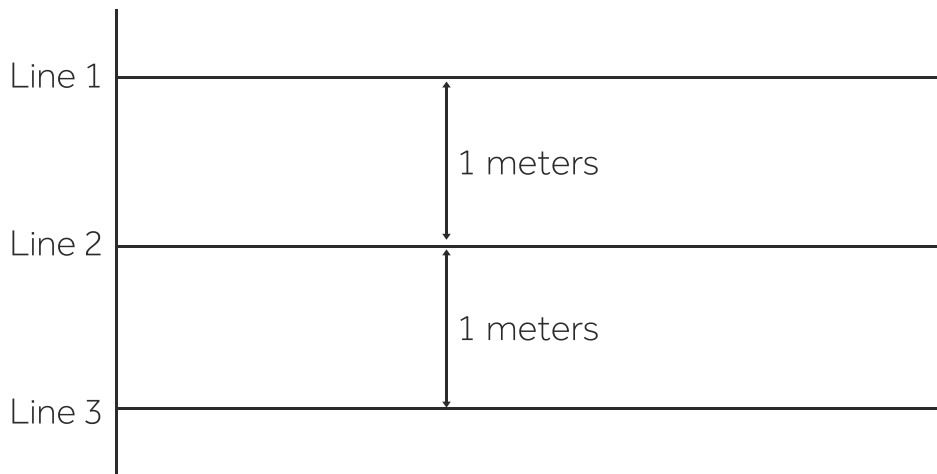
The "Process" function is necessary when automatically forming the profile map on the instrument, especially if the original profile map is predominantly blue.

Important Note:

For those new to operating the machine, please send us the profile map and curve graph after completing the measurement. You will need to provide information on the local rock name/soil type or share images of the area you are measuring. We will offer suggestions for selecting optimal drilling boreholes based on the data.

For measurements, we recommend the following approach:

Divide the measurement area into three parallel lines, all starting at the same point. Each line should be a distance of 1 meter apart.



The three parallel lines display similar profile maps of the underground geological structure. This method aids in selecting optimal borehole points.

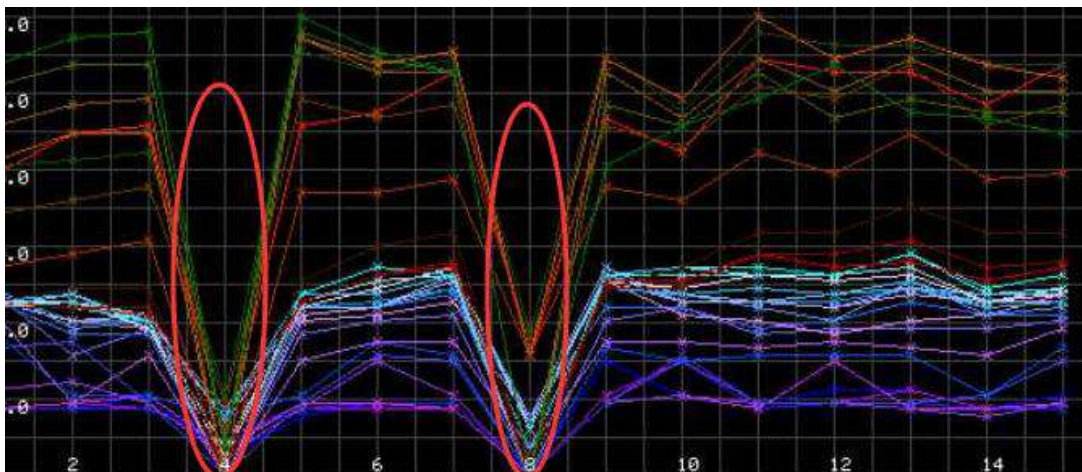
HOW TO ANALYZE THE DATA:

After completing the measurements, to analyze the curve graph and profile map to identify drilling locations:

Step1: Begin by observing the curve to identify patterns such as **"V," "L," "W,"** or **"A"** (measuring points displaying regular patterns of falling curves, lower potential difference data). Mark the position number corresponding to these patterns. (Note: The horizontal line of the curve represents the measurement point, while the vertical line represents the potential difference data, akin to resistivity values.)

Note: The specific patterns **"V," "L," "W,"** or **"A"** suggest distinct geological features, and recognising these patterns aids in pinpointing potential drilling locations.

From the curve below, identify the "V" pattern characterised by a significant number of falling curves. Low values indicate low potential difference data, suggesting a higher probability of water. In the example provided, observe the "V" pattern at both point 4 and point 8.



Step 2: Now, let's observe the profile map:

- 1. Blue and Light Blue:** These colours indicate low resistivity, typically associated with water, soft mud, or certain metal minerals. However, not every instance of these colours represents water.
- 2. Yellow:** Represents medium resistivity, often associated with rocks or similar materials.
- 3. Red:** Indicates high resistivity, potentially suggesting the presence of a cavity or hard rock.

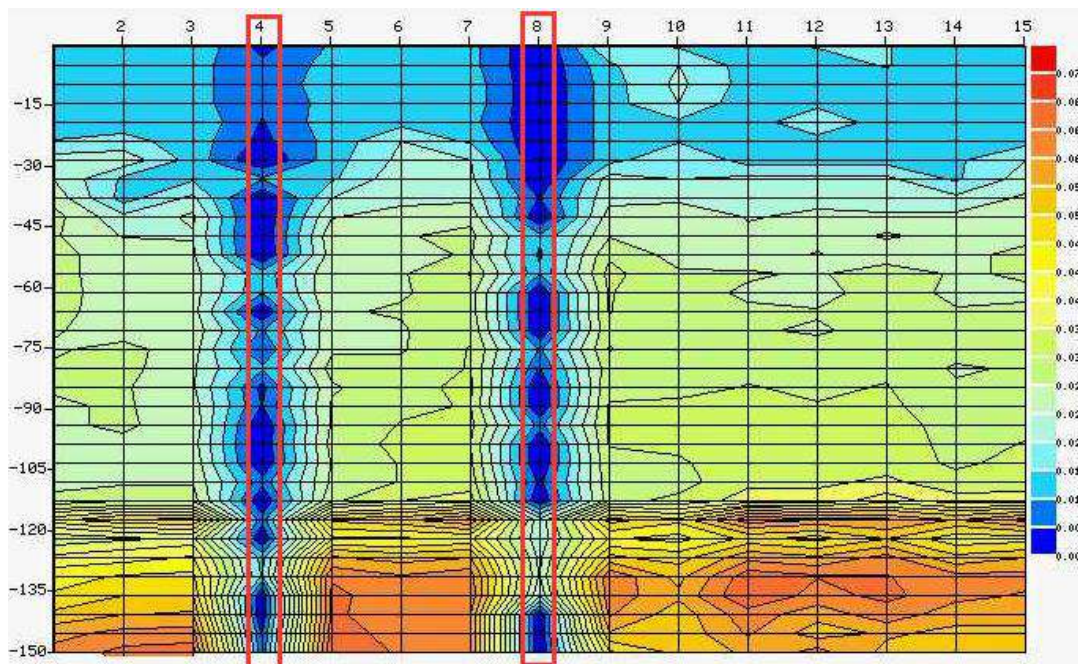
It's important to note that each color does not have a fixed meaning; the map helps in analyzing the geological structure. The interpretation should be combined with local geological knowledge for accuracy. We recommend measuring local drilled wells before using the machine and providing the data for reference to enhance accuracy.

As a general principle, if the rock is solid, water is less likely to accumulate underground. Look for cracks or fractures between rocks, as these areas have a higher probability of containing water deep underground. Additionally, observe areas where the rock is broken, especially with blue between the broken sections, indicating the potential accumulation of water in rock fractures. Water well drilling positions are often favorable at the edges of massive rocks where cracks or perched rock formations are present.

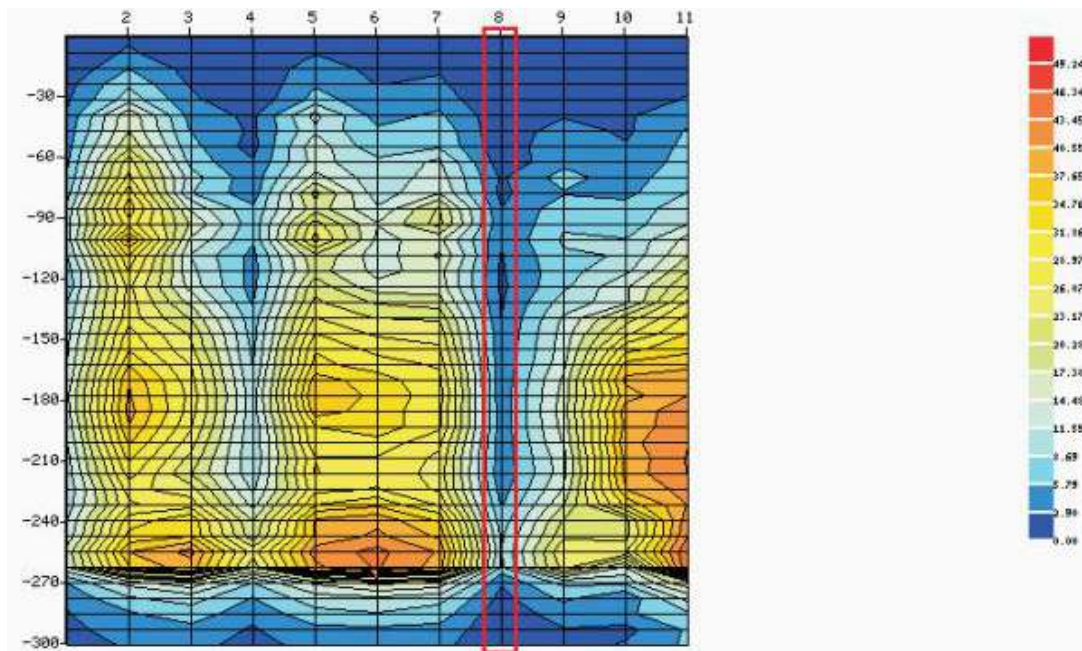
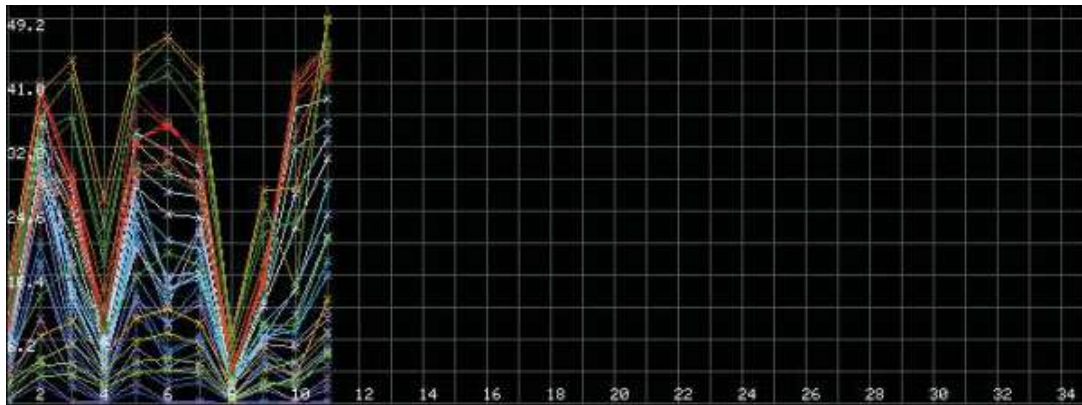
From the provided map:

- **Blue:** Represents low values, indicating a high probability of water presence.
- **Yellow:** Indicates medium values, suggesting a higher probability of encountering rock.
- **Red:** Signifies high values, implying the possibility of a cave or hard rock.

Observing Points 4 and 8, situated in the crack of the rock, it's crucial to note that the crack area is most conducive to water accumulation. Whole rocks are less likely to store water. Combining the information from the curve and the map, Points 4 and 8 emerge as the optimal choices for well drilling.



Analysis: The customer drilled a water well at Point 8, reaching water at a depth of 60 meters. The final well depth is 150 meters, and the well yields a water quantity of 24 cubic meters per hour. This successful outcome aligns with the earlier analysis, reinforcing the reliability of the chosen drilling location based on the curve and map observations.





SAFETY INSTRUCTIONS:

Read the operating instructions and act accordingly.

- Unpack the product carefully.
- Store the product in a dry place out of reach of children.
- If the cord becomes damaged, unplug it immediately and turn the device off.
- Make sure the charger is unplugged before use.
- Do not use the product in bad weather or when there is nearby lightning strikes.
- Keep this device away from flammable products to avoid fire.
- Do not use the product other than intended use.
- Do not use in wet weather and do not use on wet surfaces and environments.

MAINTENANCE:

- Do not throw or drop the device.
- To reduce the risk of damage to the electric plug and cord, pull by plug rather than by cord when disconnecting the unit.
- Keep all the components including the handheld host device and the rods clean and dry when not used.
- If the instrument is not used for a long time, please charge it before use.

Please visit our website: www.aquald.com to view our complete terms and conditions, including warranty and up-to-date information regarding shipping and returns address.

www.aquald.com
info@aquald.com
(+61) 1300 343 464



AQUA
LEAK DETECTION