

LANGRY™



PIT8300

OPERATING INSTRUCTIONS



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Chapter 1 Overview

1.1 Overview

PIT8300 Low Strain Pile Integrity Tester is a digital and portable instrument produced by Langry Technology Pte. Ltd., which uses low strain reflection wave method to test the integrity of concrete piles.

The low strain method is suitable for detecting the integrity of concrete piles and determining the degree and location of pile defects.

1.2 Features

1. High precision 24 bit A/D data acquisition, high-precision broadband response, and true and clear signal acquisition;

2. The host adopts anti drop design and dual material injection molding technology, which is more suitable for harsh on-site testing environments;

3. Real time smoothing, integration, filtering, exponential or linear amplification of the detected waveform on site;

4. The signal can be overlaid and averaged to remove "noise" signals, and the overlaid signal can be viewed at any time to eliminate signals with poor quality;

5. The data hierarchy is intuitive, making it easy to view, add, and delete testing data for projects or piles;

6. Built in rechargeable lithium battery for long power supply time;

7. Small size, light weight, easy to carry;

8. Multiple hammer waveforms are displayed in the same frame, automatically identifying invalid signals for more efficient detection;

9. Professional PC data processing and analysis software, supporting multiple signal processing and custom report template output modes.

1.3 Technical Parameters

LCD	8-inch color LCD screen, resolution 1280 × 800
Storage Method	16GB internal storage space
A/D Sampling Accuracy	24 digits
Sampling Interval	1-1000μs
Sampling Length	1024, 2048, 4096, 8192 are available in four gears
Transfer Method	USB flash drive transfer
Sensor Type	Accelerometer
Sensor Range	50g
Frequency Range	0.5-9000Hz
Impact-resistant	1500g
Trigger Method	signal triggering
Power Supply Method	Detachable lithium battery (6360mAh/10.8V)
Working Hours	> 8h
Working Environment	-10 ~ 50℃, ≤90%RH
Number of Channels	2-channel
Overall Dimensions	258×188×52mm
Weight	1.5kg

1.4 Standards

Standard Number	Standard Name
JJG 930	Pile dynamic measuring instrument
JGJ 106	Technical Specification for Testing of Building Foundation Piles
JTG/T 3512	Technical specification for foundation pile testing of highway engineering
JG/T 518	Pile dynamic testing instrument
JGJ/T 422	Technical standards for foundation testing of existing buildings
JGJ340	Technical Specification for Building Foundation Testing

1.5 Precautions

1. Please read this manual carefully before using the instrument.

2. Operating environment: $-10\sim 50\text{ }^{\circ}\text{C}$, $\leq 90\%$ RH

No strong alternating electromagnetic field and no prolonged exposure to sunlight;

Necessary protective measures should be taken when used in damp, dusty, and corrosive gas environments;

3. Storage environment: $-20\sim 50\text{ }^{\circ}\text{C}$, $\leq 90\%$ RH

4. If the instrument is not used for a long time, please check and charge it regularly. The instrument should be placed in a ventilated, cool, and dry place, and should not be exposed to direct sunlight for a long time. The instrument should not be exposed to direct sunlight during use.

5. Avoid water ingress; Avoid using in strong magnetic field environments, such as near large electromagnets, transformers, frequency converters, etc.

6. Shock resistance: During use and handling, severe vibrations and impacts should be prevented.

7. Maintenance: After each use of the instrument, it is necessary to clean it appropriately to prevent dust from entering the instrument or connectors, which may cause performance degradation or damage. Do not wipe this instrument with a damp cloth! Do not use organic solvents to clean instruments and accessories! Please wipe the instrument and accessories with a clean, soft, dust-free cloth.

8. Charging management:

The instrument is powered by rechargeable lithium batteries. When the battery is low, it should be charged in a timely manner to avoid damaging the battery. The red indicator light is always on during charging, and it will turn off when fully charged; Charging should be done using the dedicated charger provided with the instrument, and other types of adapters or chargers should not be used to charge the instrument, otherwise it may cause damage to the battery.

Note: Do not charge in high temperature environments. The recommended charging temperature range is $10\sim 35\text{ }^{\circ}\text{C}$; If the instrument is not used for a long time, the battery will experience slight power loss, resulting in a decrease in power. It is necessary to recharge it before use. It is normal for the charger to generate heat during the charging process, and the charging environment should be kept well ventilated for easy heat dissipation.

1.6 Responsibility

This instrument is a precision testing instrument, and our company does not assume any corresponding responsibility when the user engages in the following behaviors:

1. Violation of the above work environment requirements or storage environment requirements;
2. Abnormal operation;
3. Unauthorized opening of the casing and dismantling of any components;
4. Serious damage to the instrument caused by human or accidental accidents.

Chapter 2 Instrument Composition

2.1 Host Composition

The main components of the PIT8300 Low Strain Pile Integrity Tester instrument include the host and sensors, and accessories include a hammer, adapter, USB flash drive, etc.

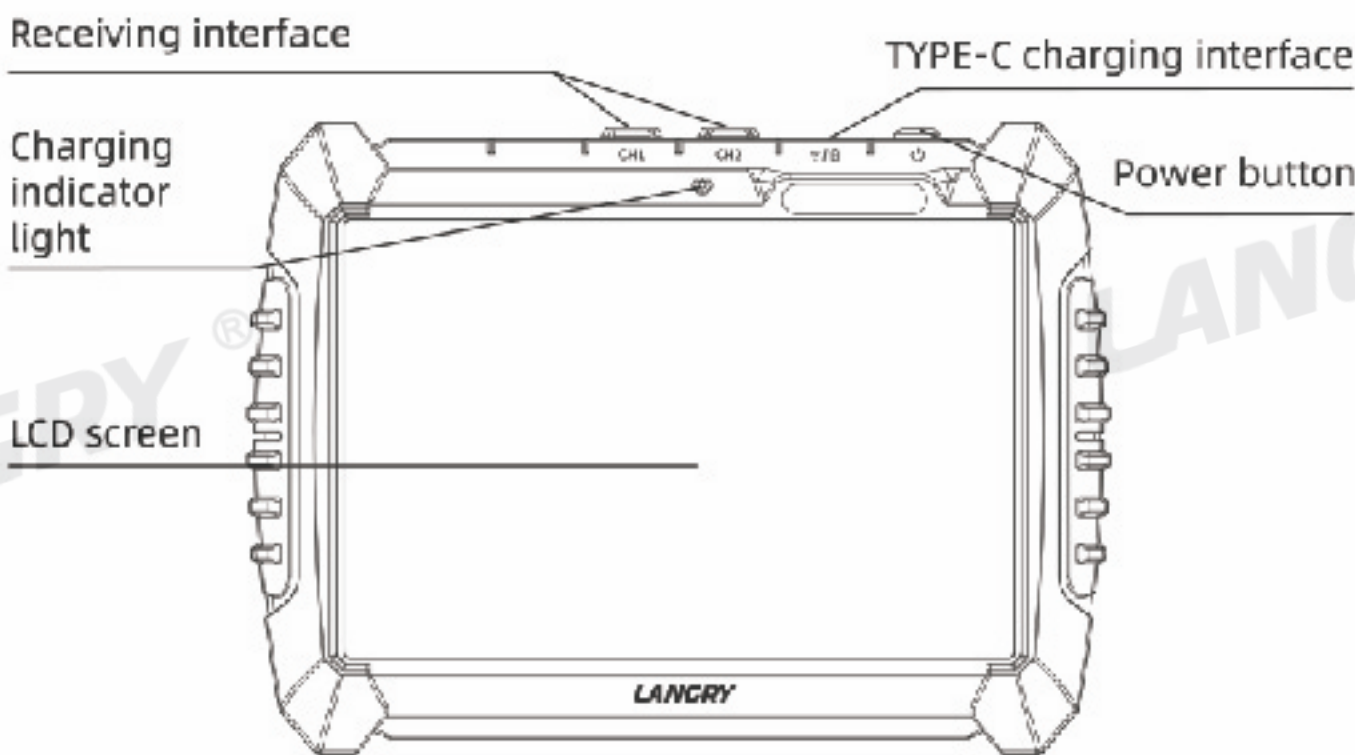


Figure 2-1 Instrument schematic diagram

Chapter 3 Working principle and testing preparation

3.1 Working Principle

The reflection wave method is a detection method that uses low-energy transient excitation to excite the pile top, measures the velocity time history curve of the pile top, and determines the integrity of the pile body through wave theory analysis or frequency domain analysis.

The reflection wave method can detect the integrity of pile concrete and determine the degree and location of pile defects.

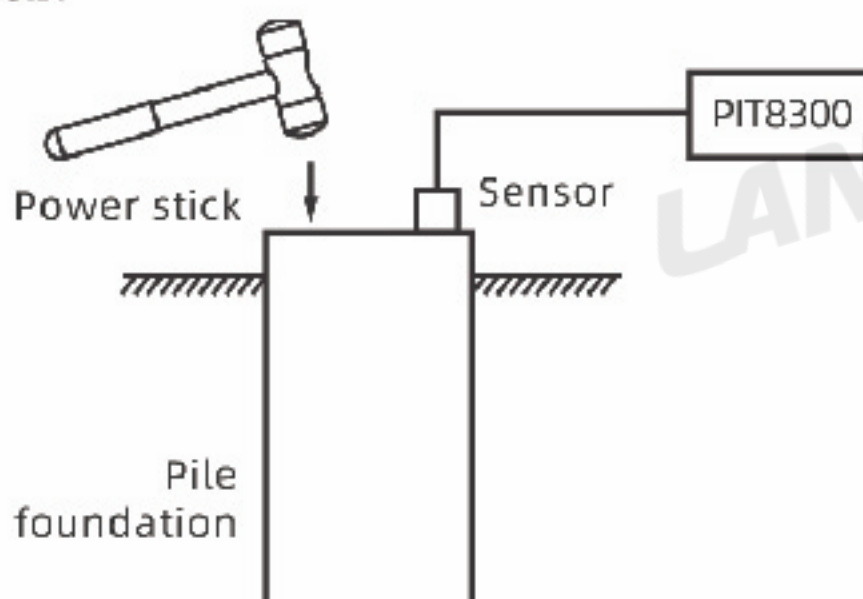


Figure 3-1 Schematic diagram of reflected wave detection

The schematic diagram of the reflection wave method for measuring piles is shown in Figure 3-1. Its basic principle is to excite the pile head with a hammer or force rod, and the stress wave generated will propagate downward along the pile body. During the propagation process, if it encounters a wave impedance interface, it will produce reflection and transmission of sound waves. The magnitude of stress wave reflection and transmission energy depends on the impedance of the two media waves. According to wave theory, when stress waves encounter fracture, segregation, diameter expansion and diameter reduction, due to the decrease in wave impedance, the reflected wave is in phase with the initial phase of the incident wave; When stress waves encounter diameter expansion and diameter reduction, the wave impedance increases, and the initial phase of the reflected wave is opposite to that of the incident wave. By combining the amplitude, wave velocity, and arrival time of reflected waves, a comprehensive judgment can be made on the integrity, defect degree, and location of the pile.

3.2 Test Preparation

3.2.1 The inspected pile shall comply with the following regulations

1. The strength of the pile body should not be less than 70% of the design strength and should not be less than 15MPa;

2. The material and strength of the pile head should be the same as that of the pile body, and the cross-sectional size of the pile head should not be significantly different from that of the pile body;

3. The top surface of the pile should be flat, dense, and perpendicular to the axis of the pile.

3.2.2 Test parameter settings should comply with the following regulations

1. The length of the time period for recording time-domain signals should last for no less than 5ms after $2L/c$ time; the upper limit of the frequency range for amplitude frequency signal analysis should not be less than 2000Hz;

2. The set pile length should be the construction pile length from the pile top measuring point to the pile bottom, and the set pile body cross-sectional area should be the construction cross-sectional area;

3. The wave velocity of the pile body can be preliminarily set based on the test values of similar piles in the local area;

4. The sampling time interval or sampling frequency should be reasonably selected based on the pile length, pile body wave velocity, and frequency domain resolution; The number of sampling points for time-domain signals should not be less than 1024;

5. The set value of the sensor should be set according to the results of metrological verification or calibration.

3.2.3 Installation and excitation operation of acceleration sensor

1. The coupling point of the sensor and the tapping point of the hammer must be clean, flat, and hard. Before testing, the floating slurry and other debris on the surface of the pile head should be cleaned up, and two or three flat surfaces should be polished on the pile head for placing the sensor and tapping;

2. When installing the accelerometer, connect it to CH1 or CH2 of the instrument and connect it according to the channel selected by the trigger channel settings in the instrument settings interface. Then install the sensor on the pile head, and the coupling position can use butter or other coupling agents to ensure tight bonding and ensure that the sensor is perpendicular to the top surface of the pile;

Note: Coupling agents such as butter and Vaseline with high viscosity can be used. The coupling agent should be as thin as possible, with high viscosity, and the adhesion should not be affected by water or other factors. The installed sensor must be kept perpendicular to the top surface of the pile and closely attached to it. During the signal acquisition process, it must not slip or loosen. The red dot mark on the accelerometer plug should be connected to the corresponding red dot mark on the instrument socket.

3. The installation position of the excitation point and measurement sensor should avoid the influence of the main reinforcement of the steel cage;

4. The excitation direction should be along the axis of the pile;

5. Excitation technology is one of the important links in detecting the integrity of foundation piles using the reflection wave method. Transient excitation should be tested through on-site tapping. For foundation piles of different lengths and strengths, appropriate materials and weights of excitation equipment should be selected. Generally, larger and longer piles use larger excitation equipment, shorter piles use smaller excitation equipment, deep defects use low-frequency excitation equipment with softer materials, and shallow defects use high-frequency excitation equipment with harder materials. Users can

choose equipment based on their experience. The angle of simultaneous tapping should be as perpendicular as possible to the contact surface and appropriate force should be used;

3.2.4 Signal acquisition and filtering shall comply with the following regulations

1. According to the size of the pile diameter, 2-4 monitoring points for installing sensors should be symmetrically arranged at the center of the pile: the excitation point for solid piles should be selected at the center of the pile, and the detection point should be located at a radius of $\frac{2}{3}$ from the center of the pile; The excitation and detection points of hollow piles should be at $\frac{1}{2}$ of the pile wall thickness, and the angle formed by the connection between the excitation and detection points and the pile center should be 90° , as shown in Figure 3-2;

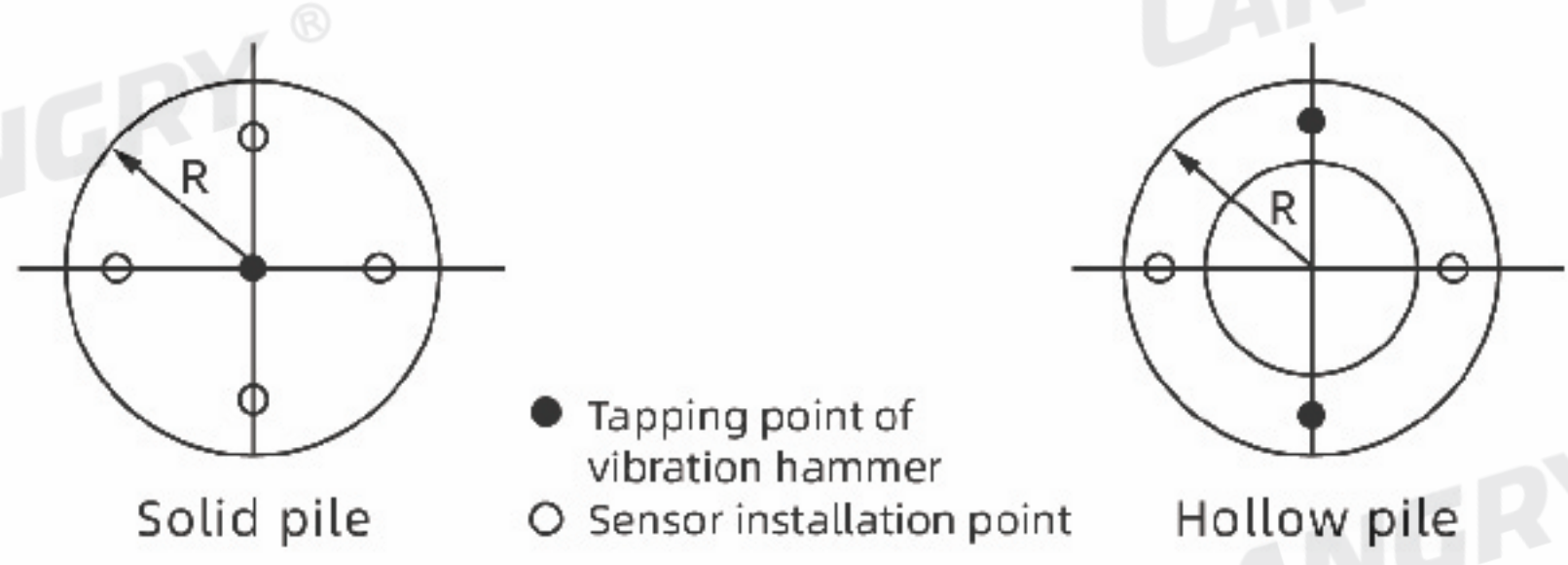


Figure 3-2 Schematic diagram of sensor installation points and excitation tapping points

2. When the pile diameter is large or the cross-sectional size of the upper part of the pile is irregular, in addition to collecting signals at the specified excitation and detection points according to the previous paragraph, the positions of the excitation and detection points should also be changed based on the characteristics of the measured signals to collect signals;

3. When the consistency of time-domain signals from different detection points and multiple measurements is poor, the reasons should be analyzed and the number of detection points should be increased;

4. The signal should not be distorted or produce zero drift, and the signal amplitude should not exceed the range of the measurement system;

5. The number of effective signals recorded at each detection point should not be less than 3;

6. Based on the integrity of the pile body reflected by the measured signals, it should be determined whether to retest or end the test by changing the excitation point position and increasing the number of detection points.

Chapter 4 Instrument Operation Instructions

4.1 Main Menu Interface

Long press the power button on the side of the instrument to turn it on. After turning it on, enter the main menu interface of the instrument, as shown in Figure 4-1. The upper menu bar of the main menu includes: date and time, USB connection symbol, WiFi symbol, and battery level. The main interface contains the product model name, start detection, data viewing, measurement calibration, system settings, and shutdown.



Figure 4-1 Main menu interface

Select different function options by clicking on the image in the main menu interface:

Start testing: Enter **【Detection】** to test the integrity of the pile body;

Data Viewing: Enter **【Data Viewing】** to view the detected data;

Metrological verification: enter into **【metrological verification】** ;

Settings: Set device information, network parameters, and other parameters, etc;

Shutdown: Perform a shutdown operation.

4.2 Pile Detection

4.2.1 Parameter setting interface

Click on "Start Image Detection" on the main menu interface to enter the parameter settings interface, as shown in Figure 4-2. The parameter settings interface includes: basic settings, advanced settings, and network settings.

The screenshot shows a mobile application interface for parameter settings. At the top, there is a status bar with the date and time '04/02/2023 06:46' and a battery level indicator at '100%'. Below the status bar is a navigation menu with three tabs: 'Basic' (highlighted in blue), 'Advanced', and 'Network'. The 'Basic' tab is active, displaying a form with the following fields:

Field	Value
Proj. Name	lty-111
Bldg. No.	
Pile ID	lty-11111
Samp. Int	1 μ s automatic
Wave Speed	1500 m/s
Est. Pile L.	1 m
Samp. Len.	2048
Pile type	Bored Cast-in-situ Pile
Conc. Grd.	C80
Pile shape	circular
Test Points	4
Samp. Ch.	Channel 1
TP Blows	4

At the bottom right of the form, there are two buttons: 'Confirm' and 'Back'.

Figure 4-2 Parameter Setting Interface

4.2.1.1 Basic Settings

Click the [Basic] button in the parameter settings interface to enter the basic settings interface. The basic settings interface includes: project name, building, pile ID, sampling interval, estimated wave velocity, estimated pile length, sampling length, pile type, concrete grade, pile shape, number of test points, sampling channel, and number of test point hammers. The [▼] button behind the option box is a dropdown menu.

1. Project name, building, pile ID, click the drop-down menu to select the saved name and other information;
2. Sampling interval: The sampling interval is the time difference between every two samplings of a signal, and the sampling interval and sampling frequency are reciprocal to each other. Click the [automatic] button at the back, which will be highlighted. The sampling interval will be automatically calculated based on the set pile length and wave velocity; If the [automatic] button is grayed out, you can manually input sampling detection by clicking the option box. The input range is 1-1000 μ s, with a default of 1 μ s;

3.Estimation of wave velocity: After clicking the option box, enter the input wave velocity interface, as shown in Figure 4-3. The input wave velocity interface includes: a table of corresponding relationships between different intensity levels and wave velocities, and a soft keyboard;

12/15/2025 11:17parameter76%

W. Speed2700m/s

Concrete Grade	Ref. Vel.	1	2	3	←
C5~C15	2700~3100m/s				
C20	3000~3400m/s				
C25	3300~3700m/s				
C30	3600~4000m/s	4	5	6	0
C35	3800~4200m/s				
C50~C80	3900~4500m/s				
Precast Pile:3600~4200m/s	Steel Pile:5100~5400m/s	7	8	9	Confirm
Cast-in-situ Pile:3400~4000m/s	Cem. Spray Pile:1400~2100m/s				

Figure 4-3 Input wave velocity interface

4. Estimated pile length: Click on the option box to manually enter the pile length, which can range from 1-200m and defaults to 1m;
5. Sampling length: The sampling length is the number of points sampled from the signal. Click on the dropdown menu to select the desired length. There are four options for sampling length: 1024, 2048, 4096, and 8192, with a default of 2048;
6. Pile type: Click on the drop-down menu to select the required pile type. There are eight options for pile types: drilled pile, manually excavated pile, precast concrete pile, prestressed pipe pile, immersed pile, compacted pile, CFG pile, and others. The default is drilled pile;
7. Concrete grade: Click the drop-down menu to select the required concrete grade. There are 20 options for concrete grades, including C5, C10... C100, with C30 as the default;
8. Pile shape: Click the drop-down menu to select the required pile shape, which has two options: circular and rectangular. The default is circular.
9. Number of test points: The number of test points. Click the drop-down menu to select the number of test points. There are twelve options for test points, including 1, 2... 12, with a default of 3;
10. Sampling channel: Click on the drop-down menu to select the required channel. There are two options for the sampling channel: Channel 1 and Channel 2. The default is Channel 1;
11. Number of hammers at test points: The number of times each measuring point needs to be sampled by tapping. There are six options for the number of hammers at measuring points: 1, 2, 3, 4, 5, and 6, with a default of 3;

4.2.1.2 Advanced Settings

Click the 【Advanced】 button on the parameter settings interface to enter the advanced settings interface, as shown in Figure 4-4. The advanced settings interface includes gain, delay point count, trigger level, horizontal axis, high pass filtering, and low-pass filtering. The 【▼】 button behind the option box is a dropdown menu.



Figure 4-4 Advanced Settings Interface

- 1. Gain: Gain is the amplification factor of the electrical signal received by the sensor by the instrument, that is, fixed-point amplification. Click on the dropdown menu to select the desired option. There are seven options for gain, including 1, 2, 5, 10, 20, 50, and 100, with a default of 10;The number of delay points is the reserved data length before receiving data.
- 2. Delay points: Delay points refer to the reserved data length before receiving data.
- 3. Trigger level: The trigger level is the signal level used to start the instrument for acquisition. Click on the dropdown menu to select the desired option. The trigger level has three options: low, medium, and high, with the default being medium;
- 4. Horizontal axis: Change the unit and scale value of the horizontal axis of each waveform. Click on the dropdown menu to select the desired option. The horizontal axis has two options: length and time, with the default length;
- 5. Filtering: Low pass filtering filters out signals above a certain cutoff frequency, while high pass filtering filters out signals below a certain cutoff frequency. Click the desired number button, and the number button will be highlighted.

4.2.1.3 Network Settings

Click the 'Network Settings' button on the parameter settings interface to enter the network settings interface, as shown in Figure 4-5. The network settings interface includes: Wifi function, Wifi name, Wifi password, data server, username, and data server password. The [▼] button behind the option box is a dropdown menu.

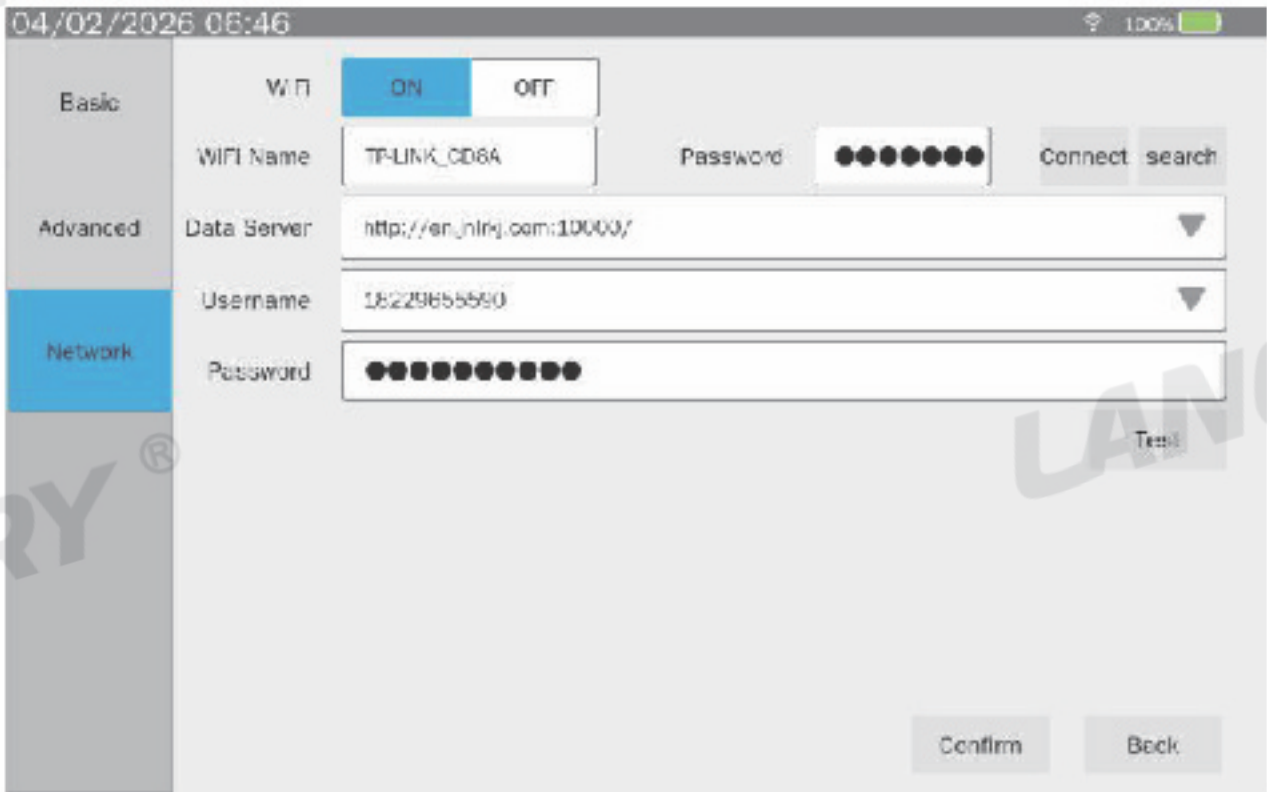


Figure 4-5 Network Settings Interface

- 1. Wifi function: To turn on and off Wifi, select which button to highlight, and the other will appear in a dark state;
- 2. Wifi name and Wifi password: Click on the option box to manually enter them. After entering, click on [Connect] to pop up a prompt box to connect to the Wifi. You can also click on [Search] to search for nearby available Wifis. Click on the connected Wifi to pop up a prompt box to enter the password. Enter it and connect;
- 3. Data Server: Click on the option box to manually enter the website address of the data server provided by the company;
- 4. Username: Click on the option box to manually enter the username;
- 5. Data server password: Click on the option box to manually enter the password and then click the [Test] button at the back. A prompt box will pop up to indicate the testing process.

4.2.2 Pile testing interface

Click on the start detection image in the main menu interface to enter the foundation pile detection interface, as shown in Figure 4-6. The foundation pile detection interface includes four parts: menu bar, waveform area, cursor parameter area and analysis parameter area, pile information area, pile shape diagram, and function button area.



Figure 4-6 Pile Testing Interface

1. Function button area: displays various function buttons, located at the bottom of the interface

- ① **Next post:** Click to enter the detection of the next post. Before entering, the currently unsaved data will be saved;
- ② **Parameters:** Click to enter the detection parameter setting interface;
- ③ **Sampling:** Click to enter sampling mode;
- ④ **Analysis:** Click to enter the selected waveform analysis interface;
- ⑤ **Save:** Click to save the currently sampled signal;
- ⑥ **Exit:** Click to exit the pile foundation testing interface and return to the main menu interface.

2. Waveform area: Display the collected signal waveform

Used to display the collected signal waveform, located in the left half of the foundation pile detection interface. The thin black line in the middle of each waveform serves as the baseline, and a scale is marked below the waveform. The scale value can be time or length. Each waveform has two vertical green solid lines, representing the positions of the pile head and pile bottom respectively; The red vertical dashed line represents the defect location we have set, and the location of the defect is marked on the right side of the dashed line.

The waveform area can be interacted with as follows:

- (1) Clicking on a certain waveform in the waveform area will make it the current waveform, and a vertical cursor will be displayed at the clicked position. At the same time, the parameters of the cursor position will be displayed in the cursor parameter area;
- (2) Click the 【 ← 】 and 【 → 】 keys on the cursor parameters to move the cursor left or right. Short press once to move one point, long press to accelerate cursor movement;
- (3) When the waveform exceeds one screen, sliding up and down vertically can achieve waveform scrolling.

3. Cursor parameter area: displays information about the cursor position

Located in the upper right corner of the interface, click on a waveform in the waveform area to select it as the current waveform. The cursor parameter area will display the sound time difference T (relative to the pile top), depth L , and the parameters set for the waveform during analysis and processing. At the bottom of this area, there are two auxiliary buttons [$\leftarrow$] and [$\rightarrow$] used to move the cursor left or right.

4. Pile Information Area: Display the parameter information of the set pile

Located in the lower right corner of the interface, it is used to display the set project name, pile foundation number, pile length, and wave velocity.

5. Pile diagram area: displaying pile shapes

Located below the waveform area, it is used to display the schematic diagram of the current pile shape.

4.2.3 signal acquisition

Click the 'Sampling' button in the function button area of the foundation pile testing interface to enter the sampling interface, as shown in Figure 4-7. The cursor parameter area will display prompt messages such as "waiting for hammer drop", and the tracks waiting for hammer drop will be highlighted, while the rest of the tracks will be in a dark state; The average value of hammer sampling is displayed above the function button area.

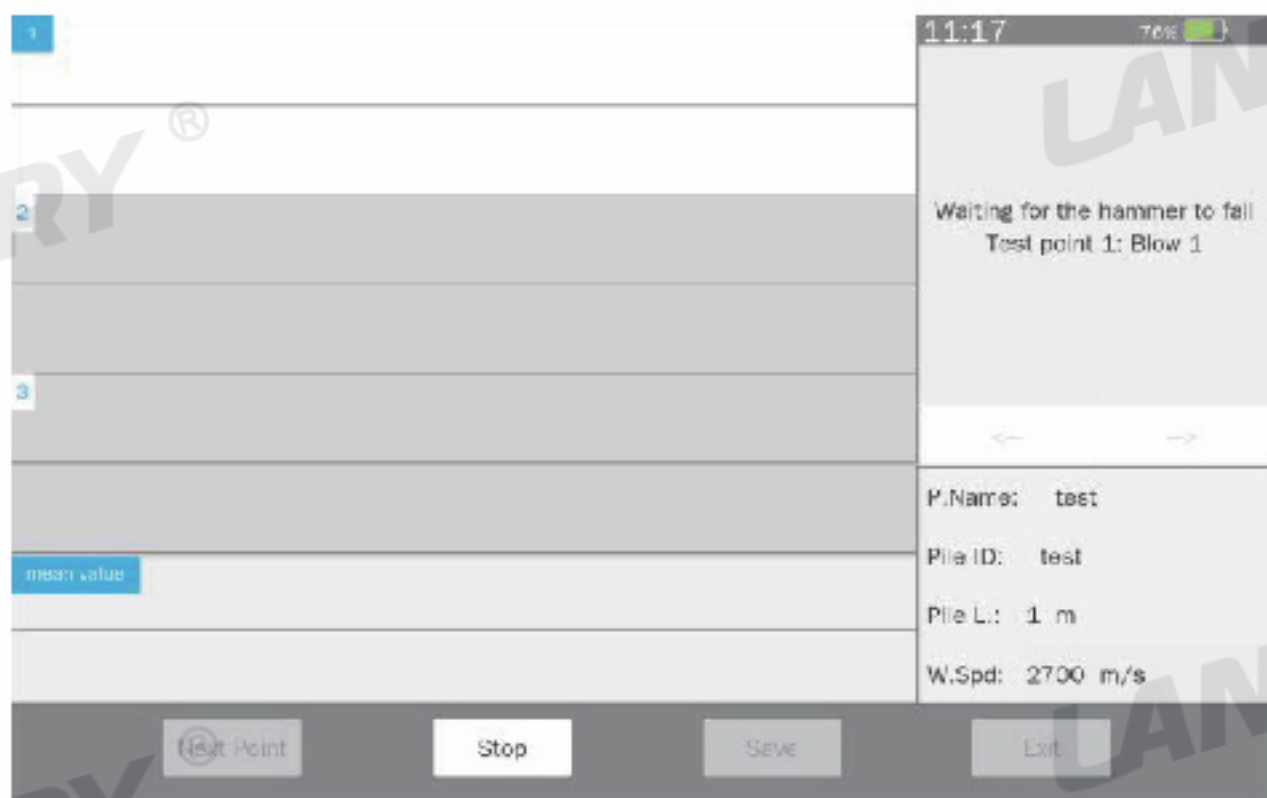


Figure 4-7 Sampling Interface

After each waveform is sampled by tapping, it is displayed in the waveform area and automatically jumps to the next one, waiting for the next sampling. When the last waveform is collected, the sampling will automatically stop. During the sampling process, you can click the 'Stop' button at any time to stop the sampling. After the sampling is completed, the sensor can be moved to the next measurement point and installed. Clicking on 'Next Point' will enter the sampling mode. Simply tap on the sampling button, and after the detection is complete, you can click the 'Save' button to save the data at any time.

4.2.3.1 Waveform Coverage

After collecting the signal and clicking the [Stop] button, if it is found that the quality of a waveform collected is poor and you want to re collect and overwrite it, you can click on the channel that needs to be covered and click the [Sample] button to re tap and sample. The collected signal will automatically overwrite that channel.

4.2.3.2 Detailed waveform investigation

After sampling, the 'Detailed View' button will appear in the upper right corner of each track. Clicking the 'Detailed View' button of a track will enter the waveform detailed view interface of that track, as shown in Figure 4-8.

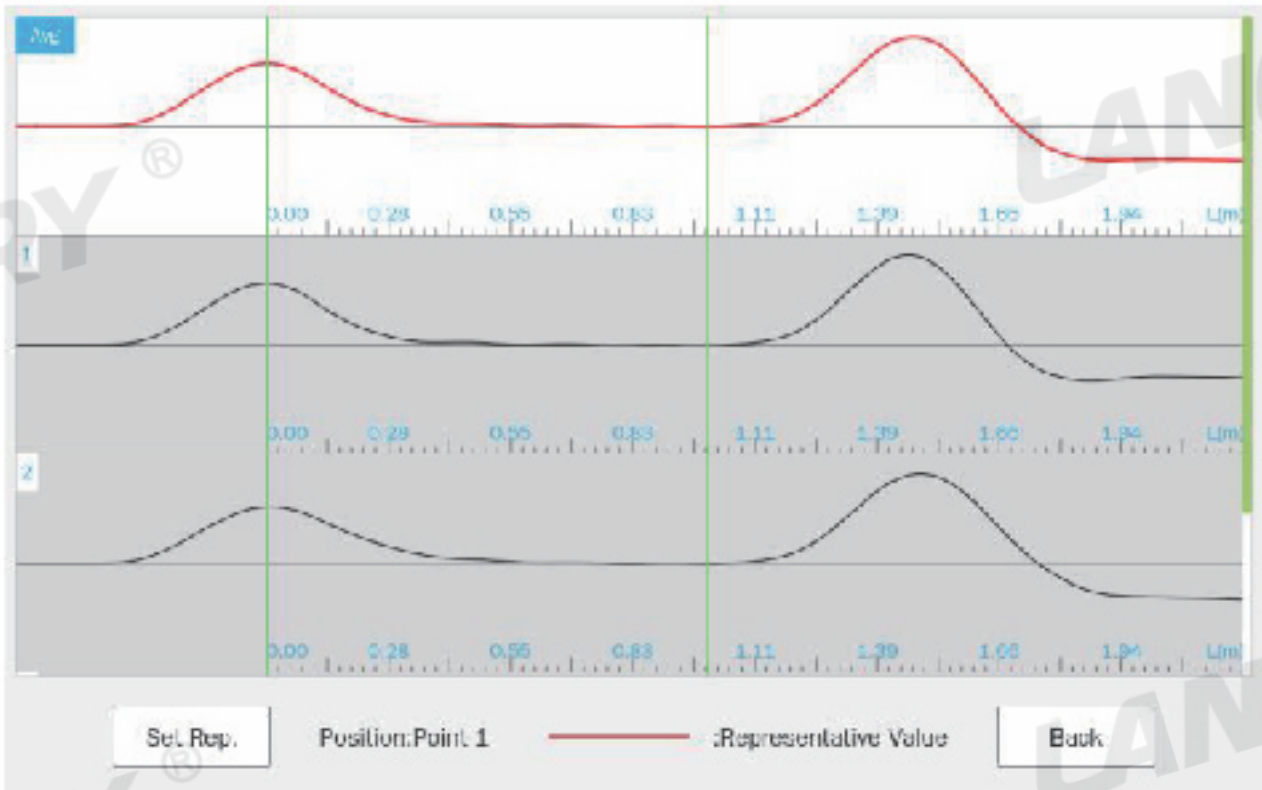


Figure 4-8 Waveform Detailed Investigation Interface

The waveform detailed inspection can perform operations such as deleting and setting the waveform as a representative value. The first waveform in the waveform area is the average value of the waveform, and the default average value is the representative value, which is the waveform style displayed in the foundation pile detection interface. If a waveform better than the average value is found during the detailed inspection, you can click on it and then click the [Set as Representative Value] button. The waveform set as the representative value will be displayed in red. After returning to the foundation pile detection interface, the waveform of the current detailed inspection channel will be replaced with the waveform set as the representative value.

After entering the waveform detailed inspection interface, if you find that a certain waveform in the waveform area has poor quality, you can click the [×] in the upper right corner of the waveform to delete it. The remaining waveforms will be re averaged and the averaged waveform will be displayed in the first channel. Click the 'Return' button in the bottom right corner of the interface to exit the waveform detailed investigation and return to the foundation pile testing interface.

4.2.3.3 Waveform Editing

When there is a waveform in the waveform area, it can be stretched, compressed, deleted, and other operations. Long press any position in the waveform area, and a menu will pop up in the cursor parameter area, as shown in Figure 4-9. If there is no waveform in the waveform area, the menu cannot pop up.

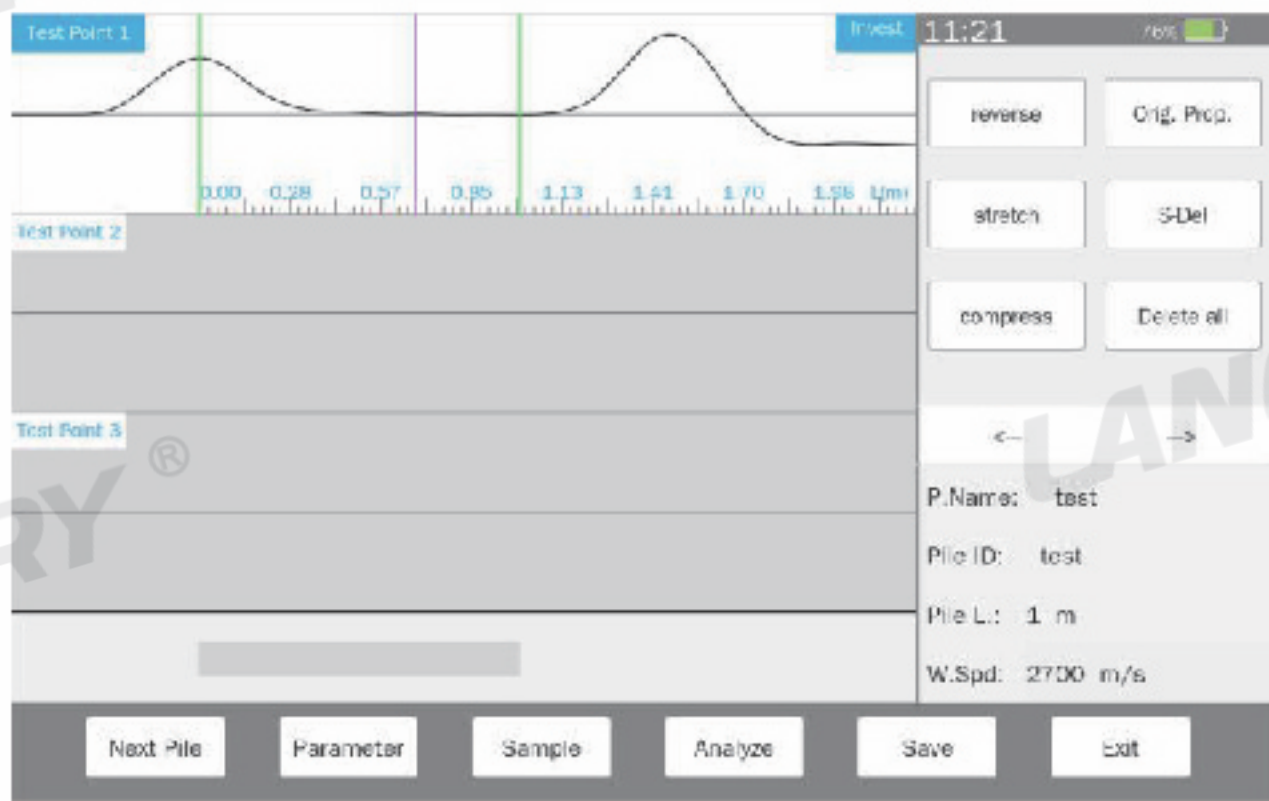


Figure 4-9 Waveform Editing

1. Reverse waveform: Click the [Reverse] button to display the waveform of the current track in reverse up and down;
2. Compression, stretching, and restoration of waveforms: Clicking the [Compression] or [Stretch] button can compress or stretch the waveform of the current track horizontally (time or length axis) for display. After compressing or stretching to a certain degree, clicking the [Compression] or [Stretch] button will not work. After compression or stretching, you can click the 'Original Scale' button to restore the original display scale;
3. Waveform deletion: After collecting the signal and stopping sampling, if a waveform in the waveform area is found to have poor quality, you can select the waveform and click the [Single Channel Delete] button to delete it; If you want to delete all waveforms in the waveform area, simply click the [Delete All] button, and the instrument will pop up a prompt box asking "Do you want to delete all channel waveforms?" Click the [Yes] button to delete all waveforms, click the [No] button to not delete and return to waveform editing mode.

4.2.3.4 Waveform Viewing

When there are a large number of waveforms in the waveform area, a scroll bar will appear on the right side of the waveform area. Clicking on the upper part of the scroll bar will flip the waveform up, and clicking on the lower part of the scroll bar will flip the waveform down; You can also slide up and down directly in the waveform area to scroll the waveform.

4.2.4 analyze

Click the 'Analysis' button in the function button area of the foundation pile testing interface to enter the analysis interface, as shown in Figure 4-10. The analysis interface includes four parts: waveform area, cursor parameter area, analysis parameter area, and function button area.

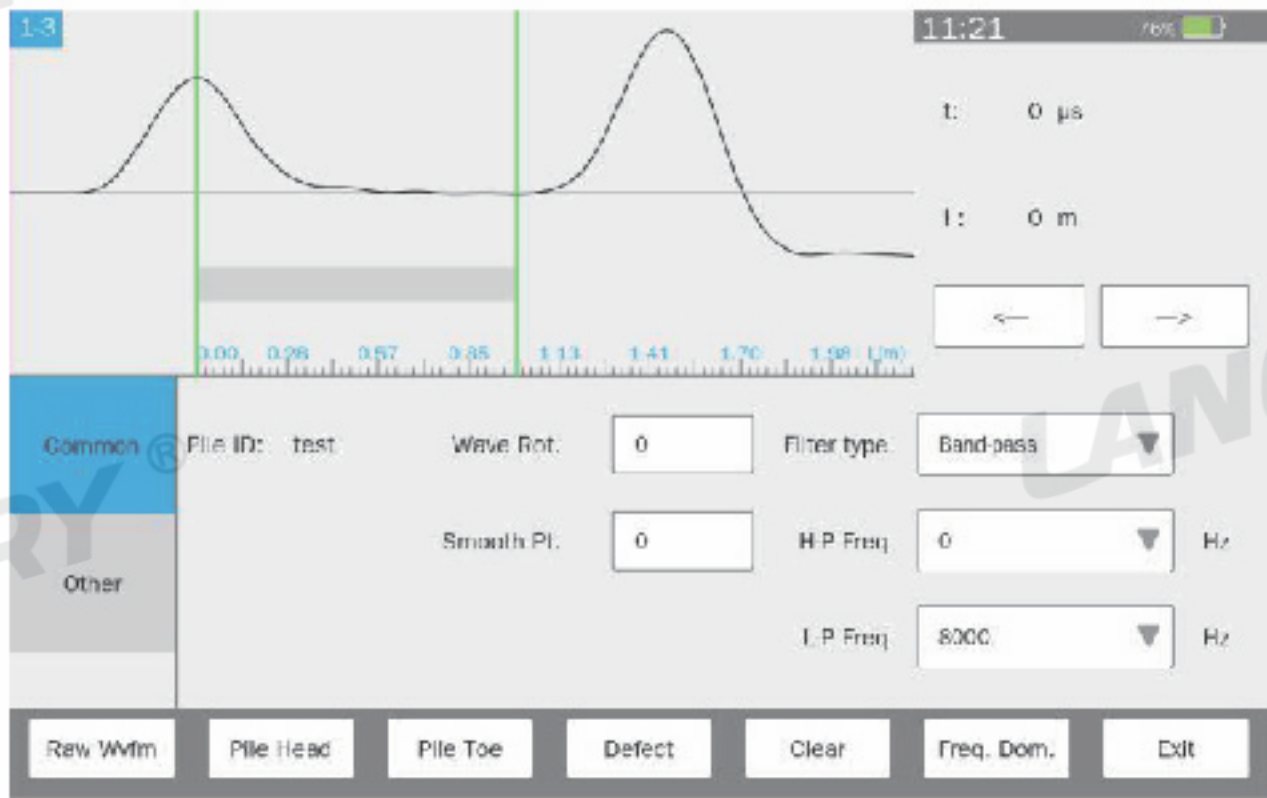


Figure 4-10 Analysis Interface

1. Function button area: displays various function buttons, located at the bottom of the interface

- ① Original waveform: Click to restore all analysis and processing parameters to zero (integration set to No, filtering set to None, wavelet, smoothing, and rotation set to zero, amplification set to 1x index)
- ② Pile head: After clicking, set the current cursor position as the pile head;
- ③ Pile base: After clicking, set the current cursor position to the pile base;
- ④ Defect: After clicking, set the confirmation at the current cursor position;
- ⑤ Clear: Click to clear the defect closest to the cursor;
- ⑥ Frequency domain: Click to enter amplitude spectrum analysis;
- ⑦ Exit: Click to exit the analysis interface and return to the pile testing interface. Analyze and process all waveforms in the current file according to the set parameters before displaying them.

2. Waveform area: Display the waveform that needs to be analyzed

Used to display waveforms, located in the upper left half of the analysis interface. The thin black line in the middle of the waveform serves as the baseline, and a scale is marked below the waveform. The scale value can be time or length. Each waveform has two vertical green solid lines, representing the positions of the pile head and pile bottom respectively; The red vertical dashed line represents the defect location we have set, and the location of the defect is marked on the right side of the dashed line.

3. Cursor parameter area: displays information about the cursor position

Located in the upper right half of the interface, it displays the sound time difference T

(relative to the pile top) and depth L of the cursor position. At the bottom of this area, there are two auxiliary buttons [←] and [→] used to move the cursor left and right.

4. Analysis parameter area: used to set various analysis parameters

Located in the middle and lower part of the interface, it is used to set various analysis parameters for waveforms.

4.2.4.1 Analysis Parameters - Common Parameters

Click the 'Common Parameters' button in the analysis parameter area to set common parameters, including amplification type, amplification factor, amplification starting point, integration, pile length, wave velocity, and complete pile classification.

1. Zoom in type: Click on the drop-down menu to select the desired type. There are two zoom in types: exponential and linear, with the default being linear;

2. Magnification factor: Click the option box to manually enter the magnification factor, which can be entered within the range of 1-100, with a default of 1; The exponential or linear amplification factor should not be too large, as long as the signal at the bottom of the pile can be clearly seen;

3. Amplification starting point: It is the starting position for exponential or linear amplification of the signal (relative to the pile head, unit: m). Click the option box to manually input, and the input range is 0-0.5m;

4. Integral: When using an accelerometer for detection, the collected signal is an acceleration signal, which may appear "complex" and generally requires integral processing to turn it into a fast signal, which will appear clearer. Click the checkbox in front to turn it on or off, which is enabled by default;

5. Pile length: Click on the option box to manually enter, the input range is 0.1-200m, and the default is the parameter set during signal acquisition;

6. Wave speed: Click on the option box to manually input, with a range of 100-10000m/s, default to the parameters set during signal acquisition;

7. Integrity classification: Based on the analysis of the waveform, determine which type of pile it belongs to. Click the drop-down menu to select, and there are four levels of integrity classification.

4.2.4.2 Analysis Parameters - Other Parameters

Click the 'Other Parameters' button in the analysis parameter area to set other parameters, as shown in Figure 4-11. Other parameters include waveform rotation, smoothing point count, filtering type, high pass frequency, and low-pass frequency.

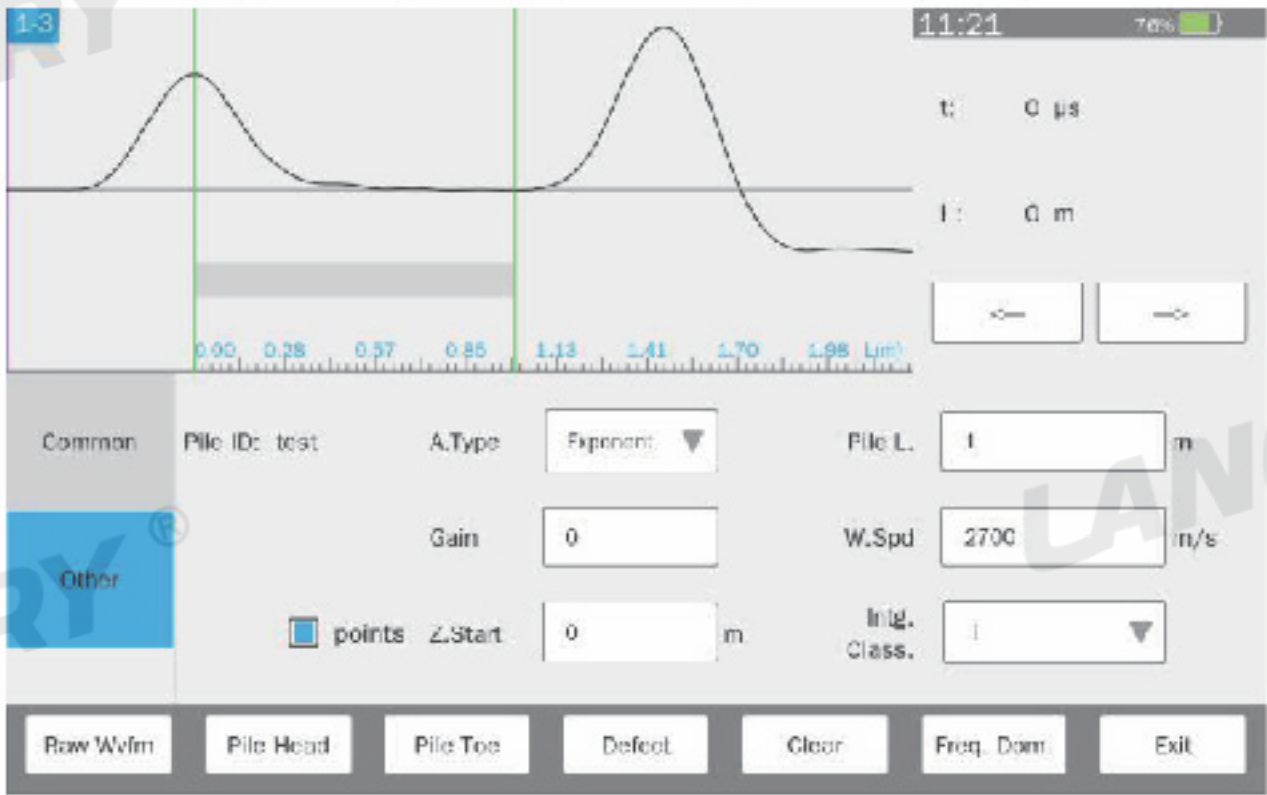


Figure 4-11 Other parameter setting interface

1. Waveform rotation: Sometimes, after signal integration and other processing, the tail of the waveform will tilt upwards. In this case, it is necessary to rotate the waveform to bring its tail back to the baseline position. The rotation percentage is relative to the direct wave amplitude. If the direct wave amplitude is A and the amplitude at the end of the signal is B, then the rotation percentage is $(100 \times B/A)$, which can be positive or negative (clockwise or counterclockwise rotation, the larger the value, the more rotation). Click the option box to manually enter the rotation parameter, which can be entered in the range of -90-90, default 0;
2. Smooth point count: When there is high-frequency "clutter" in the signal, smoothing can be used to filter it out. The larger the number of smooth points, the smoother the waveform will be. Click the option box to manually enter the number of smooth points, which can be in the range of 0-1000, default 0, and generally set to 10;
3. Filter type: Click the drop-down menu to select the filter type, which includes low-pass, high pass, and band-pass. The default is band-pass. Low pass filtering filters out signals above a certain cutoff frequency, high pass filtering filters out signals below a certain cutoff frequency, and band-pass filtering filters out signals above a high cutoff frequency but below a low cutoff frequency. The filtering schematic is shown in Figure 4-12.

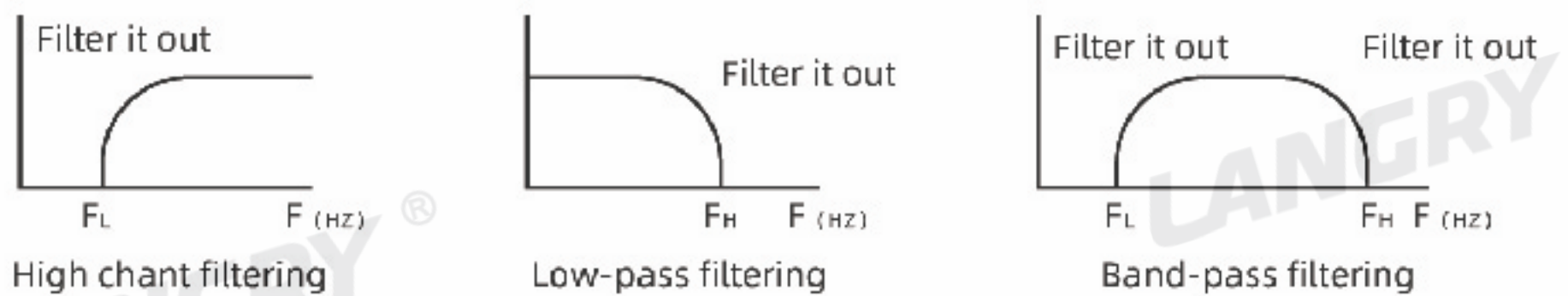


Figure 4-12 Schematic diagram of filtering

When analyzing, low-pass filtering is generally used more frequently, and the cut-off frequency value can be set based on experience. The longer the pile, the lower the low-pass cut-off frequency should be. Alternatively, spectral analysis of the signal can be performed first, and then the cut-off frequency value can be set;

4. High pass frequency: Click on the drop-down menu to select. There are four options for high pass frequency: 0, 10, 50, and 100, with a default of 100;When the filtering type is low-pass, this option cannot be set;

5. Low pass frequency: Click on the drop-down menu to select. There are eight options for high pass frequency, including 800, 1000, 2000, 4000, 8000, 12000, 20000, and 50000. The default is 4000;When the filtering type is high pass, this option cannot be set;

4.2.4.3 Defect Setting and Clearing

Click on the waveform area, select the position, and click the [Defect] button in the function button area. The instrument will pop up a prompt box, as shown in Figure 4-13. After selecting the defect type and severity, click the [OK] button to set the corresponding defect at the current cursor position. A red vertical marker line will appear at the cursor position in the waveform diagram, and the defect position will be displayed on the right side of the line. If multiple defects are set at the same location, the last setting shall prevail. After setting the defect, the schematic diagram in the pile shape area of the foundation pile detection interface will also change accordingly. After setting the defect, click the [Clear] button to clear the defect closest to the cursor.

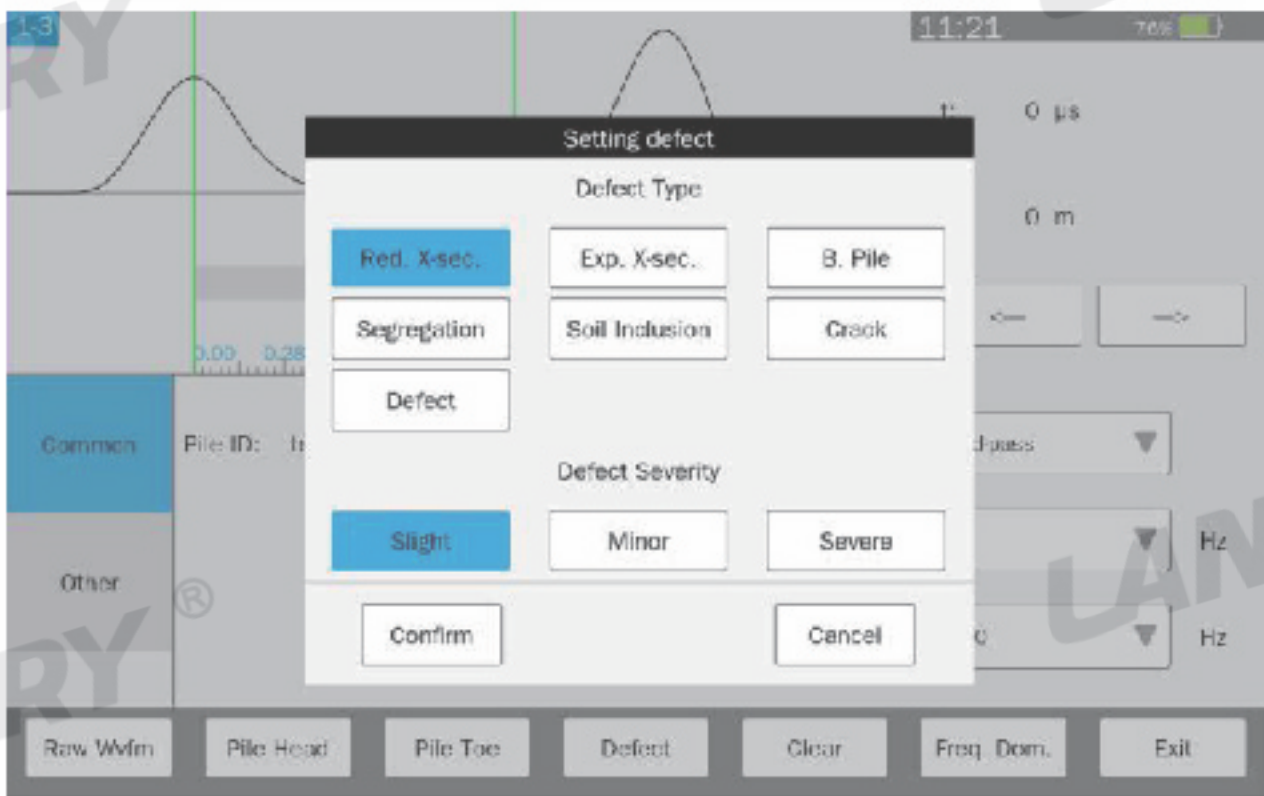


Figure 4-13 Set Defect Prompt Box

4.2.4.4 Waveform Editing

The waveform editing function is the same as that in the foundation pile testing interface, but the [Single Channel Delete] and [Delete All] buttons are hidden.

4.2.4.5 Spectrum analysis

Click the "Frequency Domain" button in the function button area of the analysis interface to enter the spectrum analysis interface, as shown in Figure 4-14. The spectrum analysis interface includes three parts: waveform area, cursor parameter area, and function button area.

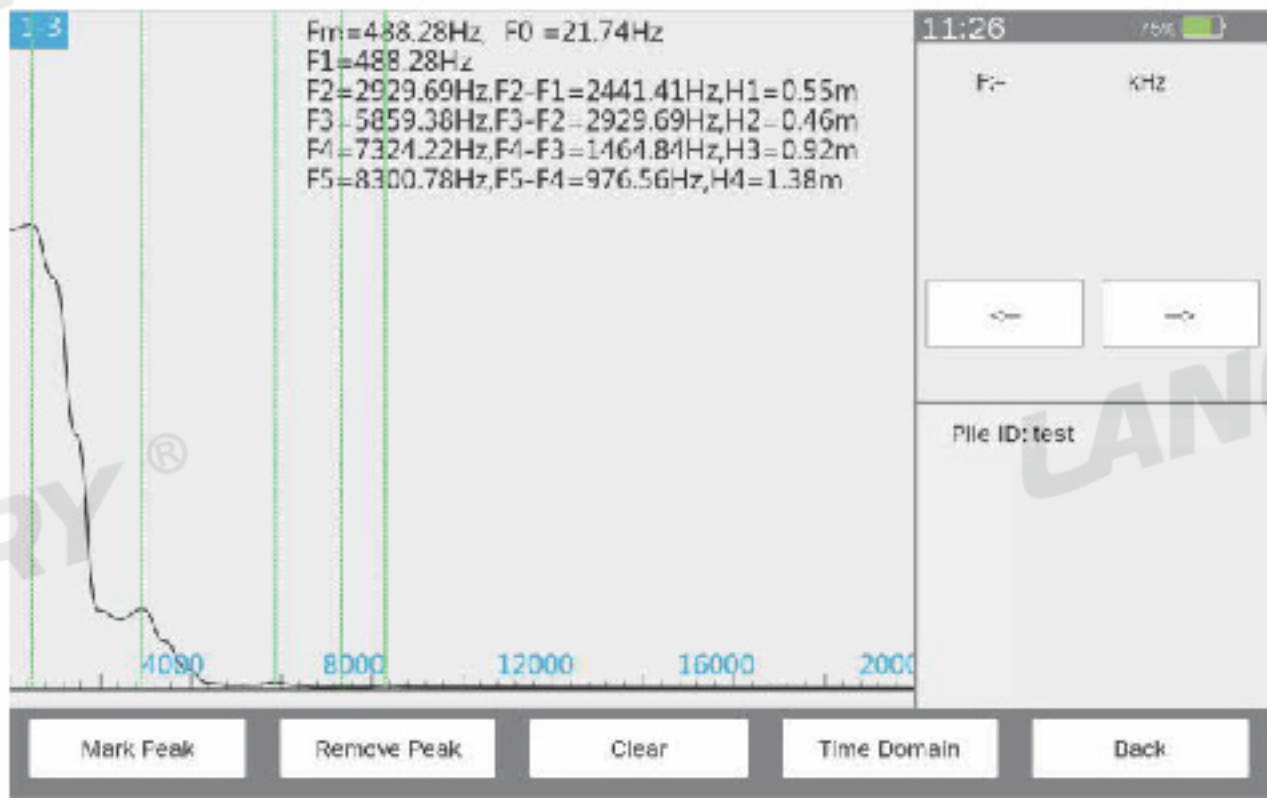


Figure 4-14 Spectrum Analysis Interface

1. Function button area: displays various function buttons, located at the bottom of the interface

- ① Set peak frequency: After clicking, use the frequency at the current cursor position as the peak frequency and calculate the difference between all peak frequencies. Up to 5 peak frequencies can be set;
- ② Remove frequency peak: After clicking, clear the frequency peak mark near the cursor position;
- ③ Clear: Click to clear all frequency peak markers set;
- ④ Time domain: Click to enter time domain analysis;
- ⑤ Save: Click to save the parameters of spectrum analysis;
- ⑥ Exit: Click to exit the spectrum analysis interface and return to the foundation pile testing interface.

2. Waveform area: Display waveforms that require spectral analysis

Used to display waveforms, located in the left half of the spectrum analysis interface. The F_0 displayed in the upper right corner of the waveform area is the frequency resolution, F_m is the main frequency, F_1 to F_5 are the peak frequencies, and $F_n - F_{n-1}$ is the difference between the peak frequencies;

3. Cursor parameter area: displays information about the cursor position

Located in the right half of the interface, it displays the frequency value F of the cursor position. At the bottom of this area, there are two auxiliary buttons $\leftarrow$ and $\rightarrow$ used to move the cursor left and right.

4.2.5 File saving

After the current pile signal collection is completed, the data needs to be saved. Click the [Save] button in the function button area to save the data.

4.2.6 Exit

Click the 'Exit' button in the function button area to exit the foundation pile testing interface. If the current data has not been saved or has been modified, a prompt box will pop up asking the user whether to save the current data. If the data has not been saved, click the 'Yes' button, and a save file dialog box will pop up, which has the same function as the 'Save' button.

4.3 Data View

4.3.1 Data viewing interface

Click on the data view image in the main menu interface to enter the data view interface, as shown in Figure 4-15. The data view interface includes: project list area, file list area, and function button area.

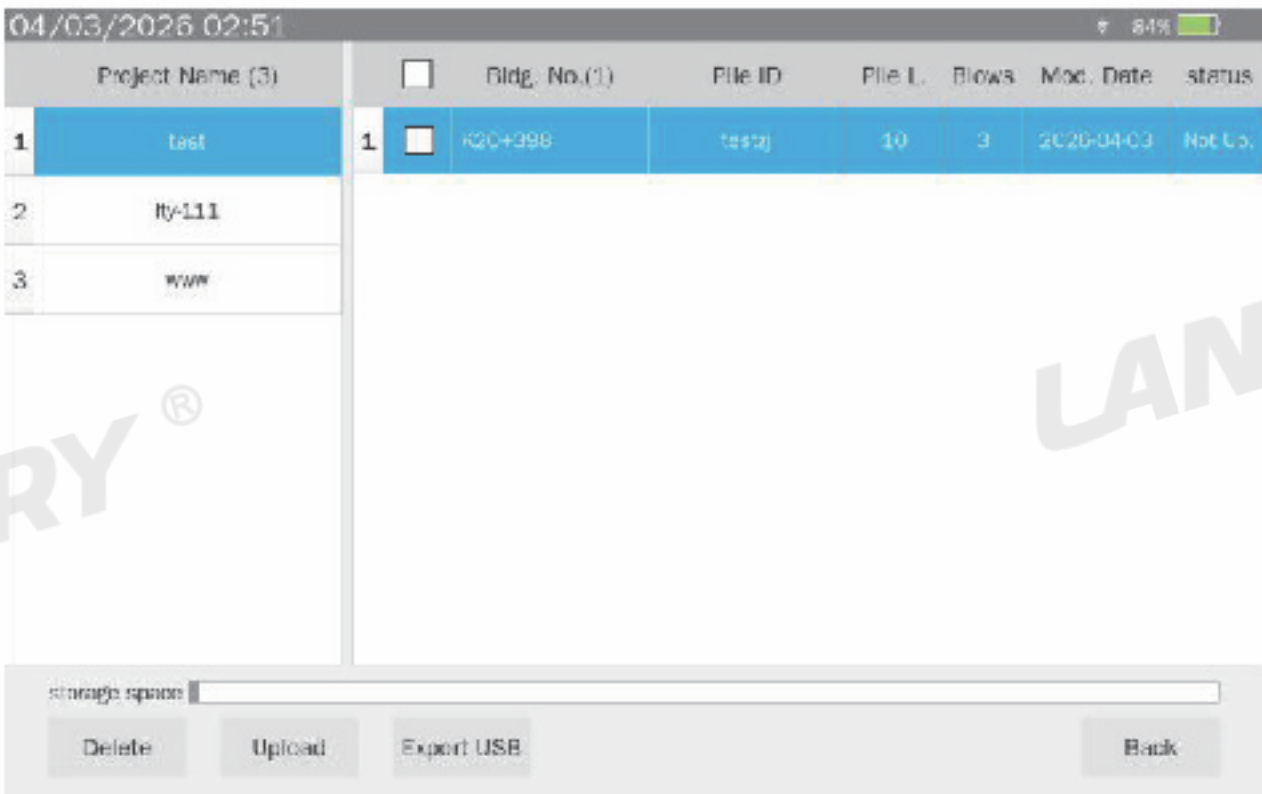


Figure 4-15 Data Viewing Interface

1. Function button area: displays various function buttons, located at the bottom of the interface

- ① Storage space: the number of files that can be stored;
- ② Delete: Click to delete the checked project or pile file;
- ③ Export USB drive: Click to export the checked project or pile files to the USB drive;
- ④ Upload: Click to upload the checked project or pile file to the data server;
- ⑤ Exit: Click to exit the data viewing interface and return to the foundation pile testing interface.

2. Project List Area: Display all created projects; File List Area: Display all saved pile files
Located in the upper part of the data viewing interface. There is a checkbox before the name of the pile file. Clicking the checkbox before the file list can select all pile files, and clicking the checkbox before the pile file you want to select can select multiple pile files. Clicking on one of the projects in the project list will display all the corresponding pile files

in the file list area on the right, and the current line of the clicked project will be highlighted. When the content in the project or pile file exceeds one screen, a scrollbar will appear on the right side of the list box. Clicking on the upper part of the scrollbar will flip up, and clicking on the lower part of the scrollbar will flip down. You can also swipe up or down directly to scroll through the pages.

4.3.1.1 Export USB flash drive

Check the checkbox in front of the pile file that needs to be exported, click the 'Export USB Drive' button to start exporting data. If no USB drive is inserted, a prompt box will pop up asking the user 'Please insert USB drive'. The USB flash drive needs to be configured or specified by the company. If it is not the above-mentioned USB flash drive, a prompt box will pop up when clicking the 'Export USB flash drive' button, prompting the user that 'This system only supports FAT32 formatted USB flash drives!' You can also swipe up or down directly to scroll through the pages.

4.3.1.2 Upload

Check the checkbox in front of the pile file that needs to be uploaded to the data server, click the [Upload] button to upload the data. If there is no network connection to the data server, a prompt box will pop up indicating that the user has "no network" and needs to go to System Settings - Network Settings to connect to the network.

4.3.2 Detailed Data Investigation

Click on a single pile file in the data viewing interface to enter the detailed investigation interface of the file, as shown in Figure 4-16. The data detailed investigation interface is basically the same as the foundation pile detection interface.

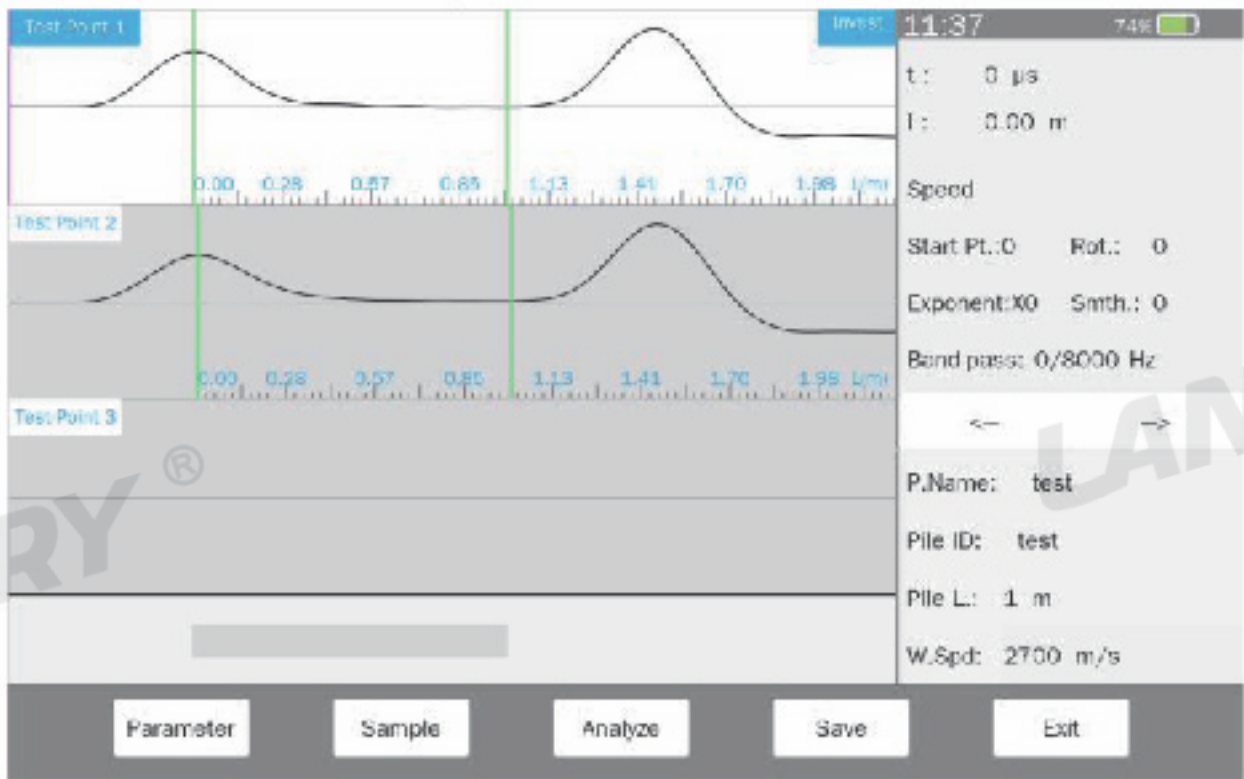


Figure 4-16 Data Inquiry Interface

In the data survey interface, it is also possible to sample and analyze the waveform in the current pile file. However, unlike normal testing, the parameters in the data survey can only be changed for pile shape, pile type, and concrete grade, and the rest cannot be changed. The analysis is consistent with that in pile foundation testing.

Click the [Return] button to return to the data viewing interface. If there are any changes, a prompt box will pop up asking the user whether to save the data.

4.4 metrological verification

4.4.1 Measurement interface for metrological verification

Click on the metrological calibration image in the main menu interface to enter the metrological calibration measurement interface, as shown in Figure 4-17. The metrological calibration measurement interface includes three parts: waveform area, cursor parameter area, and function button area.

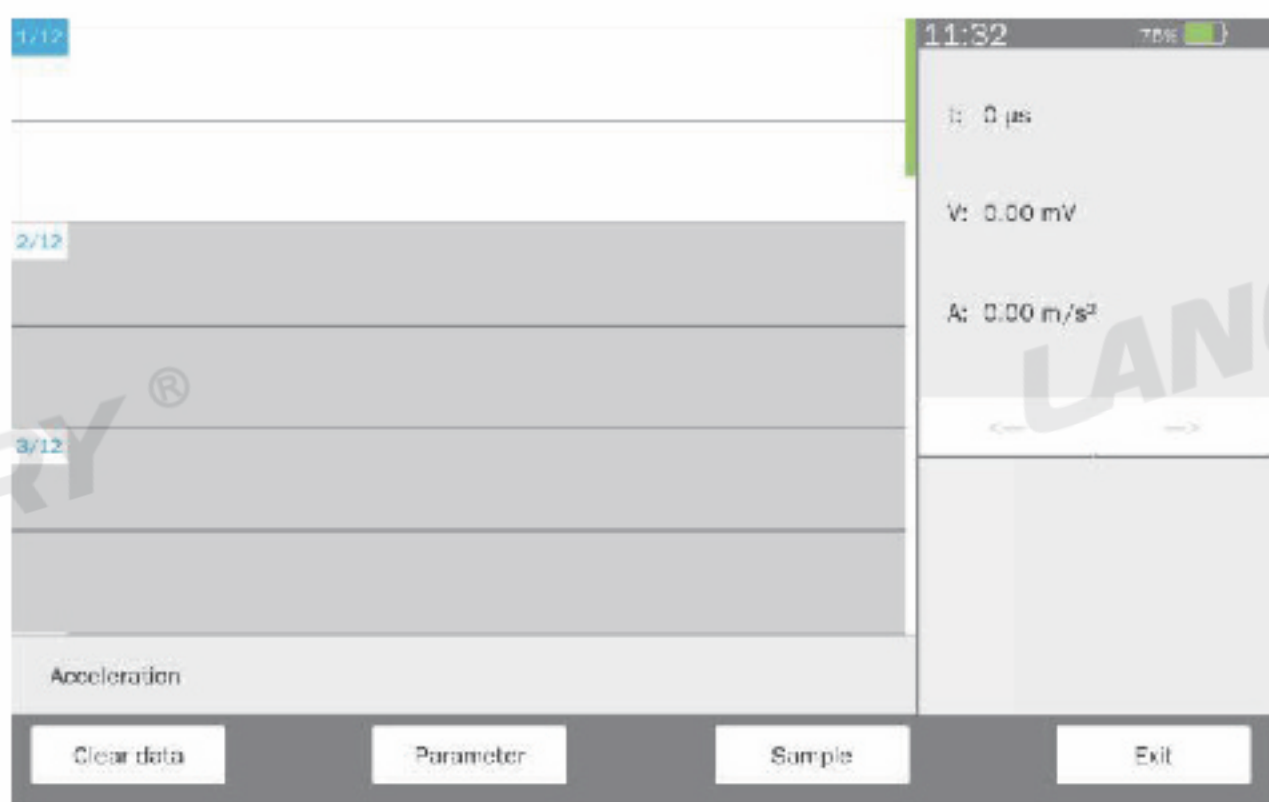


Figure 4-17 Measurement interface for metrological verification

1. Function button area: displays various function buttons, located at the bottom of the interface

- ① Clear data: Click to clear all waveforms collected by the channel;
- ② Parameters: Click to enter the detection parameter setting interface;
- ③ Sampling: Click to enter sampling mode;
- ④ Exit: Click to exit the metrological verification measurement interface and return to the main menu interface.

2. Waveform area: Display the collected signal waveform

Used to display the collected signal waveform, located in the left half of the metrological calibration measurement interface. The thin black line in the middle of each waveform serves as the baseline, and a scale is marked below the waveform. Each waveform has two vertical green solid lines, representing the positions of the pile head and pile bottom respectively. On the left side of each waveform, display the sequence number n and total number m of the current waveform (in n/m format).

When the waveform in the waveform area exceeds one screen, a scrollbar will automatically appear on the right side. Click the scrollbar to scroll up and down to flip pages.

The waveform area can be interacted with as follows:

- ① Clicking on a certain waveform in the waveform area will make it the current waveform, and a vertical cursor will be displayed at the clicked position. At the same time, the parameters of the cursor position will be displayed in the cursor parameter area;

- ② Click the [←] and [→] keys in the cursor parameter area to move the cursor left or right. Short press once to move one point, long press to accelerate cursor movement;
- ③ When the waveform exceeds one screen, sliding up and down vertically can achieve waveform scrolling.

3. Cursor parameter area: displays information about the cursor position

Located in the upper right corner of the interface, clicking on a waveform in the waveform area will take that waveform as the current one, and display the sound time difference T (compared to the pile top), voltage V, and acceleration A of the cursor position in the cursor parameter area. There are two auxiliary buttons at the bottom of this area, [←] [→], used to move the cursor left and right.

4.4.2 Interface for setting metrological calibration parameters

Click the [Parameters] button in the function button area of the metrological verification measurement interface to enter the metrological verification parameter setting interface. The metrological verification parameter setting interface includes sampling parameters and sensors.

Click the 'Sampling Parameters' button on the metrological calibration parameter setting interface to enter the sampling parameter interface, as shown in Figure 4-18. The sampling parameter interface includes: sampling channel, delay point count, sampling interval, trigger mode, trigger level, gain, sensitivity 1, and sensitivity 2. Sampling parameters can be set to parameters related to measurement, while other parameters are set to default values (sampling method is single, sampling length is 1024, sampling channels are 12, each screen channel is 3, each hammer is 1, all cursor parameters are displayed, integration is set to No. Filter type is none, smoothing point number is 10, waveform rotation is 0, amplification type is exponential, amplification factor is 1). The [▼] button behind the option box is a drop-down menu.

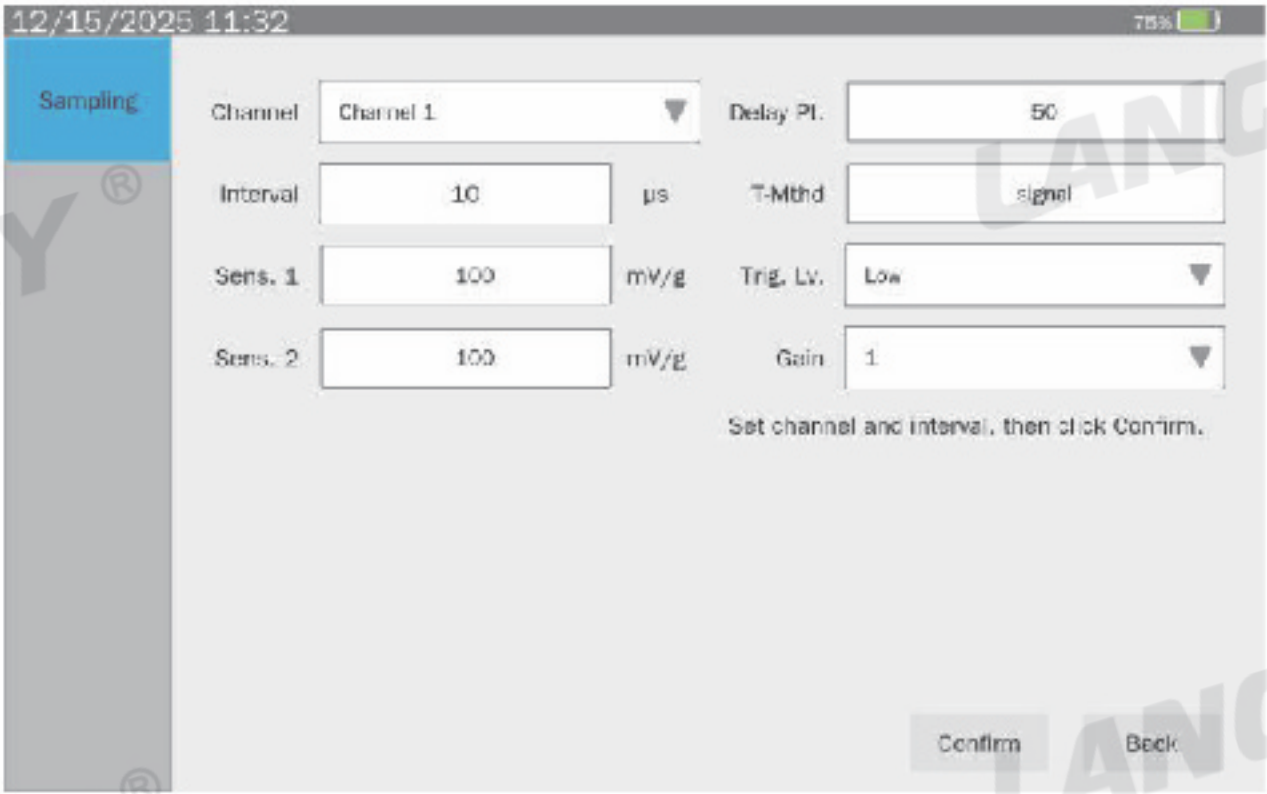


Figure 4-18 Sampling Parameter Interface

1. Sampling channel: The instrument has two receiving channels. During testing, you can choose channel 1 or channel 2 for sampling. If the sensor is connected to a channel, select the corresponding channel. Otherwise, no signal can be collected. Click the option box to select the desired sampling channel. Sampling channels include channel 1 and channel 2, with channel 1 being the default.
2. Delay point count: Delay point count is the reserved data length before receiving data. Click the option box to manually enter the delay point count, which can be entered in the range of 0-1000, with a default of 10; Generally, no modification is required, just use the default values.
3. Sampling interval: The sampling interval is the time difference between every two samplings of a signal. After clicking the option box, enter the input sampling interval interface, as shown in Figure 4-19. The input sampling interval interface includes a table of signal frequency and sampling interval correspondence (which can be set according to the frequency of the signal source), and a soft keyboard; The input range is 1-64000 μ s, with a default of 10 μ s;

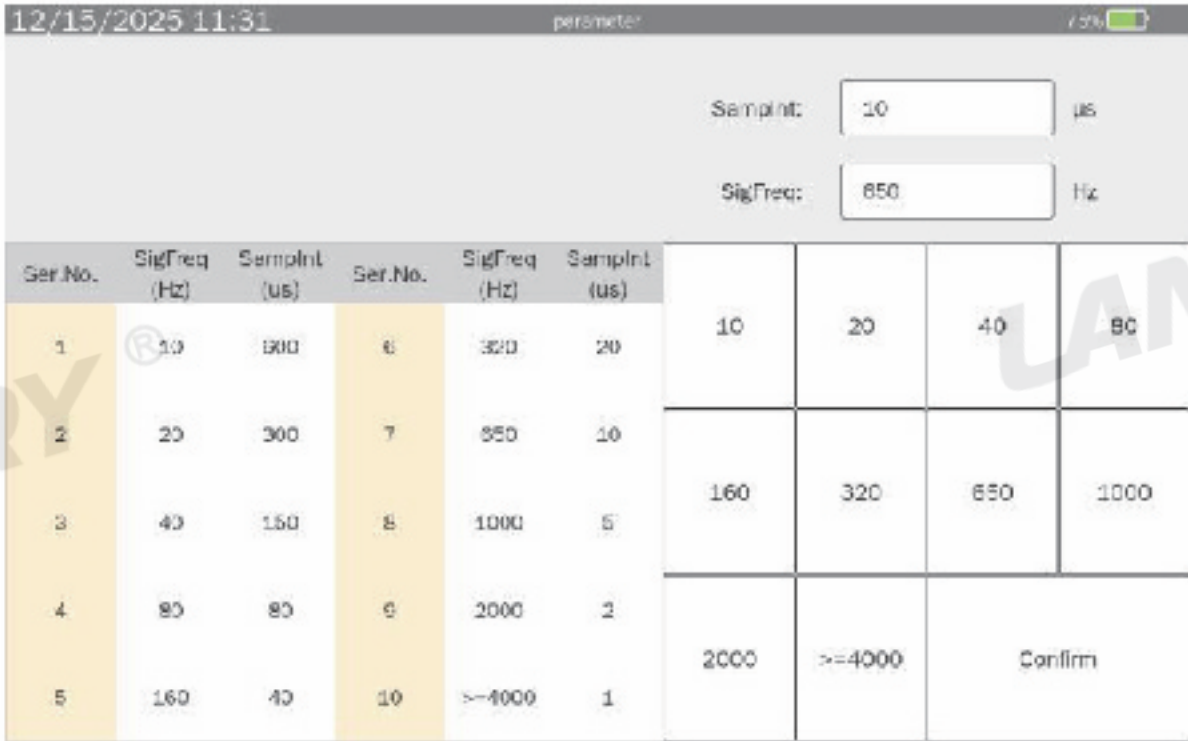


Figure 4-19 Input Sampling Interval Interface

4. Trigger method: default signal trigger, cannot be changed;
5. Trigger level: refers to the signal level at which the instrument is started for acquisition, with three options: low, medium, and high. The higher the gear setting, the stronger the received signal that needs to be started for acquisition. Generally, the "low" gear is used when the gain is not greater than 10, and the "medium" or "high" gear is used when the gain is greater than 10. If the on-site interference signal is strong and there is still a signal without knocking after installing the sensor, set the level to "medium" or "high";
6. Gain: Gain is the amplification factor of the electrical signal received by the sensor by the instrument, that is, fixed-point amplification. Click on the dropdown menu to select the desired option. There are seven options for gain, including 1, 2, 5, 10, 20, 50, and 100, with a default of 10;
7. Fill in the option box based on the sensitivity information provided by the sensor manufacturer or the calibrated information. Click on the option box and a soft keyboard will pop up for input. The sensitivity can be modified within the range of 0-10000 mV/g.

4.4.3 Verification steps

1. Click on the metrological calibration image in the main menu interface to enter the metrological calibration measurement interface;
2. Click on 'Parameters' in the metrological verification measurement interface to enter the metrological verification measurement parameter setting interface. Set the parameters of the sampling channel, sampling interval, trigger level, etc. to be verified, and click 'Confirm' to return to the measurement interface;
3. Click the 'Sampling' button on the measurement interface to collect signals. After sampling is completed, the collected signal waveform will be displayed in the waveform area;
4. If you want to collect the next waveform, click on the waveform area where the next waveform is located, and then click the [Sampling] button;
5. After sampling is completed, click on the peak (the position with the highest signal amplitude) or valley (the position with the lowest signal amplitude) of a certain waveform in the waveform area to display a vertical light mark line. You can make precise adjustments by clicking the [←] or [→] button, display time, amplitude and other information in the parameter area, find the position with the highest or lowest amplitude, and read the signal replication record;
6. Repeat steps 2-5 until the verification is completed.

4.5 System Settings

Click on the system settings image in the main menu interface to enter the system settings interface. The system settings interface includes: instrument information, personalization, network settings, update settings, and about us.

4.5.1 Instrument Information

Click the 'Instrument Information' button in the system settings interface to enter the instrument information interface, as shown in Figure 4-20. The instrument information interface includes: product model, product number, calibration certificate number, calibration date, calibration cycle, calibration reminder, commissioning unit, testing personnel 1, work permit number, and testing personnel 2. The [↓] button behind the option box is a dropdown menu.

The screenshot shows a mobile application interface titled 'Instrument Information'. At the top, there is a status bar with the date '04/03/2026 02:47' and a battery level of '85%'. On the left side, there is a vertical menu with five options: 'Instrument Info' (highlighted in blue), 'Customization', 'Network', 'Update', and 'About Us'. The main area contains several input fields: 'P/N' with the value 'U975180002', 'Model' with the value 'PIT6300', 'Client' with a dropdown menu showing '55555555555555555555555555555555', 'Inspector 1' with the value 'ff', 'Inspector 2' with the value '%/219;61%', 'Work Permit' with the value 'ilm', and another 'Work Permit' field with the value 'rsjhw/wqgdw'. A 'Confirm' button is located at the bottom right.

Figure 4-20 Instrument Information Interface

1. Product model and product number: Refers to the model and number of the product when it leaves the factory, in a dark state and cannot be changed;
The following options are all non mandatory:
2. Entrusting unit: Click the option box to manually enter the entrusting unit, or click the drop-down menu to select the entrusting unit that has been previously entered;
3. Testing personnel 1/2: Click on the option box to manually input;
4. Work permit number: Click on the option box to manually enter it;

4.5.2 Personalization

Click the 'Personalization' button in the system settings interface to enter the personalization interface, as shown in Figure 4-21. The commonly used settings interface includes: system time, sleep time, system language, button sound, and brightness display. The 【 ▼ 】 button behind the option box is a dropdown menu.

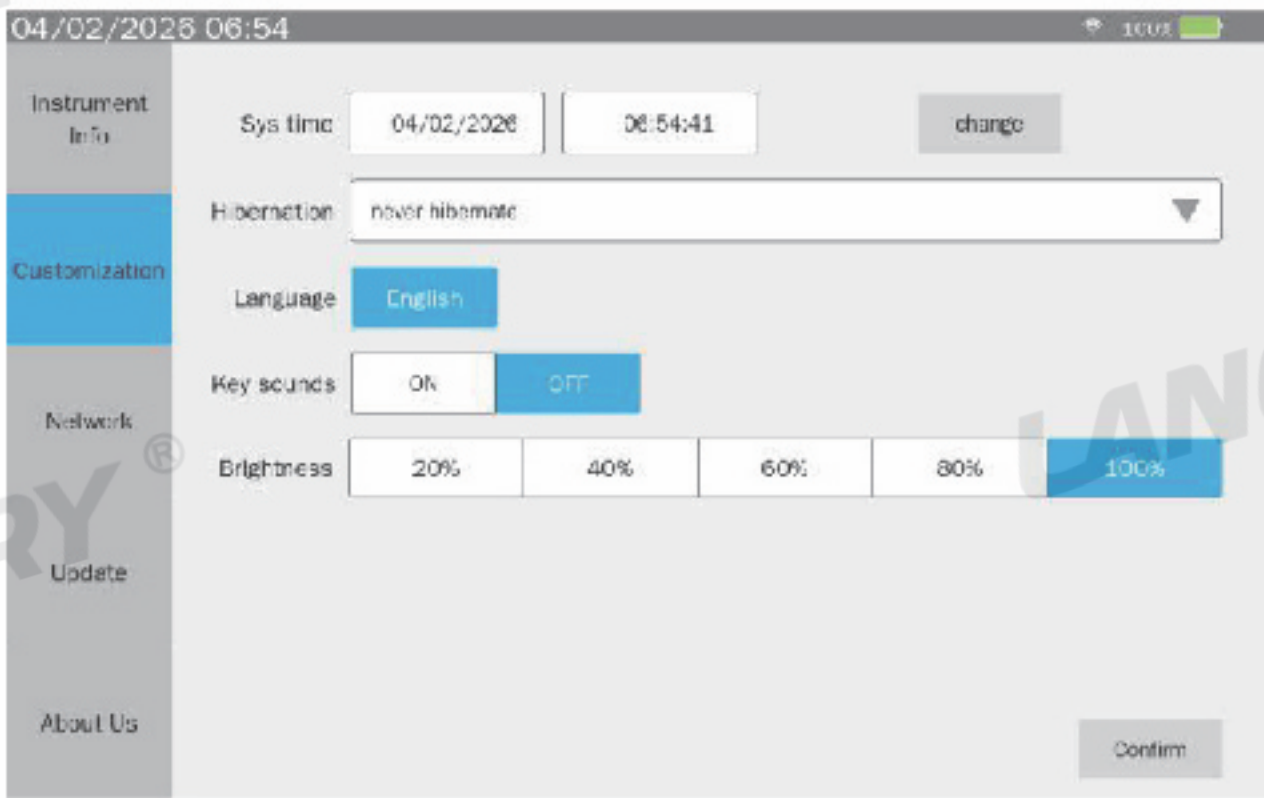


Figure 4-21 Personalized Interface

1. System time: Click the 'Change' button at the back to pop up a prompt box, where you can modify the date and time;
2. Sleep time: Click the drop-down menu to select the desired sleep time. There are six options for sleep time: 15 seconds, 5 minutes, 10 minutes, half an hour, 1 hour, and never sleep. The default is half an hour;
3. System language: Select which button to highlight;
4. Button sound: whichever button is selected will be highlighted, while the other will be in a dark state;
5. Screen brightness: Adjust by clicking the button, and highlight whichever button is selected.

4.5.3 Network Settings

The network settings are consistent with those in section 4.2.1.3.

4.5.4 Update Settings

Click the 'Update Settings' button in the system settings interface to enter the update settings interface, as shown in Figure 4-22. The update settings interface includes firmware program updates and pile dynamic testing.

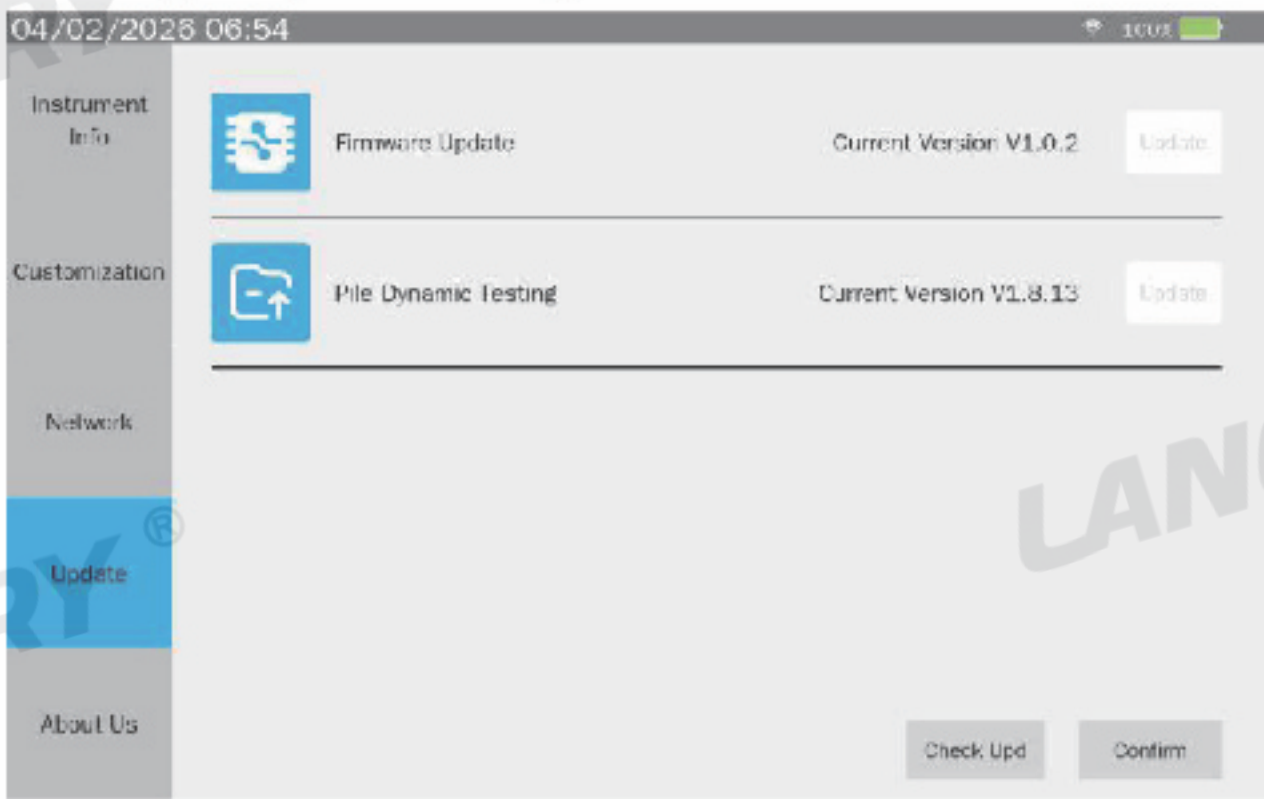


Figure 4-22 Update Settings Interface

When there is a new version update, you can download the new version from the official website to a USB drive, insert the USB drive into the instrument, and click the [Update] button to update.

4.5.5 About Us

Click the 'About Us' button in the system settings interface to enter the 'About Us' interface, as shown in Figure 4-23. The 'About Us' interface includes: company name, company website, and contact phone number. All cannot be changed and are in a dark state.



Figure 4-23 About our interface

Chapter 5 Precautions for On-site Inspection

The reflection wave method is suitable for detecting the integrity of concrete piles, determining the degree and location of pile defects. It is a semi direct method for quickly surveying the quality of pile bodies. Due to its advantages of fast detection speed, low cost, and wide detection coverage, it has become the most widely used method in pile integrity testing.

There are many issues that need to be noted and taken seriously in the practical application of the reflection wave method, otherwise it will have a significant impact on the effectiveness of pile integrity testing.

5.1 Key points of on-site inspection

1. Fully understand the characteristics of the instrument, site, and pile type, and make detailed preparations before measurement:

① Choose a suitable hammer. Generally, specialized hand hammers and small-sized force rods should be prepared for small and medium-sized piles, while sufficient weight of force rods should be carried for long and large piles;

② Select appropriate sensors based on the pile type and pile head condition.

2. Select appropriate coupling agents and installation methods based on weather conditions, pile head preparation, and selected sensors;

3. Carefully test the first few piles, paying attention to whether the waveform is reasonable and whether the reflection of bottom and shallow defects is normal;

4. After debugging the sensors, vibration sources, installation methods, parameter settings, etc. on the first few piles, they can be quickly deployed in the remaining piles. During the process, the difficult piles should be noted (or more time should be spent on detailed measurement on the difficult piles), and attention should be paid to the reflection at the bottom of each pile and shallow defects. At the same time, attention should be paid to the consistency of the signals, and three or more signals with good consistency should be ensured on each pile;

5. Thoroughly test the difficult pile, replace it with sensors, vibration hammers, and vibration points, and carefully consider the possible problems with the pile.

5.2 Precautions

5.2.1 The influence of soil around piles on waveform curves

When conducting low strain reflection wave testing on foundation piles, it is necessary to fully consider the influence of the soil around the pile on the collected waveform curve. Generally speaking, the better the mechanical properties of the soil on the pile side, the greater the loss of stress waves in the soil on the pile side. When the soft soil layer around the pile changes to a hard soil layer, the collected waveform curve will generate a reflection wave similar to an expanded diameter at the corresponding position, as shown in Figure 5-1; When the soil around the pile changes from a hard soil layer to a soft soil layer, the collected waveform curve will produce a necking like reflection wave at the corresponding position, as shown in Figure 5-2.



Figure 5-1 When transitioning from soft soil layer to hard soil layer



Figure 5-2: When transitioning from a hard soil layer to a soft soil layer

If the influence of soil around the pile on the collected waveform curve is not considered and the geological conditions of the foundation pile are not understood, it is easy to make misjudgments. Therefore, in order to better analyze and judge the quality of piles, it is necessary to comprehensively collect and understand the relevant information of the testing site, including collecting geological data of the site, consulting the physical and mechanical indicators of the rock, clarifying the distribution and direction of the soil layer, and especially understanding the recommended values of water content, porosity, compression modulus, bulk density, internal friction angle, foundation bearing capacity, lateral friction resistance and end resistance of each stratum within the length range of the foundation pile.

5.2.2 Regarding the 'blind spot'

From the perspective of stress wave propagation, the impact of the hammer on the pile top during actual testing can be regarded as a point vibration source. After the impact, a hemispherical wave is generated, which can only be approximated as a plane wave when it propagates to a certain depth, satisfying the assumption of a plane cross-section. Within this depth, stress wave propagation is complex and signal interference is severe. Theoretical and practical measurements show that the "blind zone" range is from 1 times the pile diameter to $1/2 \lambda$ below the measuring point. The low strain excitation frequency is approximately in the range of 1000-4000Hz, so the "blind zone" for reflection wave testing

is generally within 2 meters below the measuring point.

Due to the existence of "blind spots", the defects in the shallow part of the foundation pile itself are covered up. Therefore, the impact of "blind spots" on the test results should be minimized as much as possible. Therefore, in actual testing, the range of "blind spots" can be reduced by changing the quality of the hammer, the stiffness of the contact surface, using appropriate sensors and detection parameters. Generally, more serious defects about 1 meter below the measuring point can be detected. Even shallower defects can only be inferred based on experience, and since the defects are near the pile head, they can be verified by excavation.

5.2.3 Low strain accurate analysis method for pile body defects

In order to accurately analyze pile defects, it is necessary to:

1. Analyze the integrity of foundation piles based on geological data and construction records. The pile type and construction technology have a significant impact on the integrity and defect types of foundation piles. For example, prefabricated piles and manually excavated piles cannot reduce their diameter; Many defects or quality accidents occur at flowing water or geological changes; Stratigraphic changes can also have an impact on waveforms (producing reflected waves) and so on. Therefore, reviewing geological data and understanding construction records are very helpful in determining the location of defects;
2. Use quantitative analysis software to determine the degree of defects in foundation piles. Although quantitative analysis software itself has some shortcomings, it analyzes the detailed process of stress wave propagation in the pile body. As long as the parameters of the soil around the pile are selected reasonably, its role is far greater than our naked eye judgment of the degree of waveform defects;
3. Comprehensively analyze all the tested piles of the same project. The geological and construction conditions of the same project are roughly the same. By finding commonalities between the tested piles and analyzing the situation of each pile, the analysis effect can often be effectively improved. Sometimes analyzing only one pile without understanding the overall situation of the project can easily lead to judgment errors.

5.3 Common quality issues of main foundation piles

5.3.1 Possible problems with punching and drilling cast-in-place piles

1. The relative density of the prepared protective wall mud is not suitable - it may cause collapse of the hole, resulting in broken piles or mud inclusions;
2. Discontinuous pouring of concrete - broken piles, mud inclusions, or concrete segregation in the pile body;
3. Unclean hole cleaning or poor quality control of mud at the bottom of the hole - pile bottom sediment;
4. When pouring concrete underwater, the slump of the concrete is not suitable - segregation of the concrete in the pile body;
5. Leakage or rapid removal of the conduit - broken pile.

5.3.2 Possible problems with manually excavated piles

1. The concrete of the pile body segregates, and the concrete strength does not meet the design requirements;
2. The pile end bearing layer does not meet the design requirements;
3. Poor concrete bonding near the bottom of the pile;
4. Sediments at the bottom of the pile.

5.3.3 Possible Problems with Prefabricated Piles

1. Pile body fracture or pile top breakage;
2. Unsoldered or poorly welded;
3. Circular crack.

5.3.4 Possible issues with CFG piles

1. During the construction process, problems such as pipe blockage and perforation may occur, resulting in quality issues such as necking, pile breakage, segregation, and reduced pile strength;
2. When the pore water pressure is high, it will cause liquefaction of the soil and sand body in the formation, and the poured pile will not form properly;
3. Excessive force applied during the crushing and breaking of pile heads by large machinery can cause shallow fractures in the pile.

5.3.5 Possible Problems of Immersed Pipe Grouting Pile

1. The hammering or vibration sinking process can easily break adjacent piles that have just set, especially in the soil layer where the soft hard interface is most prone to pile breakage;
2. There is a sand layer with pressurized water in the formation, and due to the action of dynamic water pressure, water seepage occurs along the pile body to the pile top. Any water seepage pile generally forms a broken pile;
3. If the distance between piles is small, the sinking process will generate a certain vertical tension on the adjacent pile body, causing the newly set concrete to crack and form broken piles or cracks;
4. If the pulling speed is too fast, it is easy to cause shrinkage in the silt layer;
5. Due to the inflexible opening of the vibrating immersed tube flap, it is advisable to cause pile breakage or poor concrete compaction;
6. The quality of precast concrete is poor. During the sinking process, it is crushed and inserted into the pile tube. When the tube is pulled out to a certain height, the pile tip falls and gets stuck by the hole wall, causing the lower section of the pile body to have no concrete, commonly known as a suspended pile.

Chapter 6: Online System Software

6.1 Introduction

The online system management software is a multifunctional analysis software developed by Jinan Langrui Testing Technology Co., Ltd. for data processing. The software has a user-friendly interface and is easy to operate, designed specifically for engineering testing personnel.

6.2 Software Installation

For the first use, open the official website of www.langryndt.com, find the corresponding model in the product center and enter its product details page. Click on the relevant download button in the upper right corner to download and install the online system software, and then you can start using it.

6.3 Data Transmission

The data is transmitted through a USB flash drive, and the data that needs to be uploaded is saved to the USB flash drive. Open the online system software, click on the "Online" option in the title bar, select the "USB Import" option in the drop-down menu, and click to select the data that needs to be uploaded.

6.4 Data Processing

The online system can process all components and data.

6.4.1 Testing Component Data

Double click on any component in the selected component list area to view and edit its detailed information;

6.4.2 Testing Report

1. Used to generate a report document for the currently opened data file.
2. Right click on the "Detection Report" node in the tree diagram or select the data processing menu to create a new detection report.
3. After selecting one of the detection reports, right-click or choose the data processing menu to delete the selected detection report; The composition of the detection report can also be modified.

6.4.3 Component deletion

Select the component that needs to be deleted, right-click and select the Data Processing menu to delete the selected component. The deleted component data can be viewed and restored within the deleted component; The deleted detection report cannot be viewed and restored.

6.5 Printing and Preview

Select the report that needs to be previewed and printed, right-click, choose the data processing menu or select the file menu to preview the print; Printing operations can also be performed on the print preview interface.

6.6 Data Preservation

Select the file menu and click "Save" or "Save As" to save the current data file with a file extension of. xdyb.

6.7 Instrument version upgrade

After connecting the instrument, select the "Online" menu, click on "Firmware Upgrade", download and upgrade the instrument version.

6.7.1 Software version upgrade

Select the Help menu and click on 'Version Update' to check or upgrade the version of the online system software.

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