Contents

Chapter I Instrument Functions and Introduction

1.1 According to the standard

Technical Regulations for Ultrasonic Testing of Concrete Defects (CECS21-2000)

1.2 Working principle

Crack depth gauge sounder measures the crack depth of concrete according to the principle of sound wave diffraction. The test principle is shown in Figure 1-1.

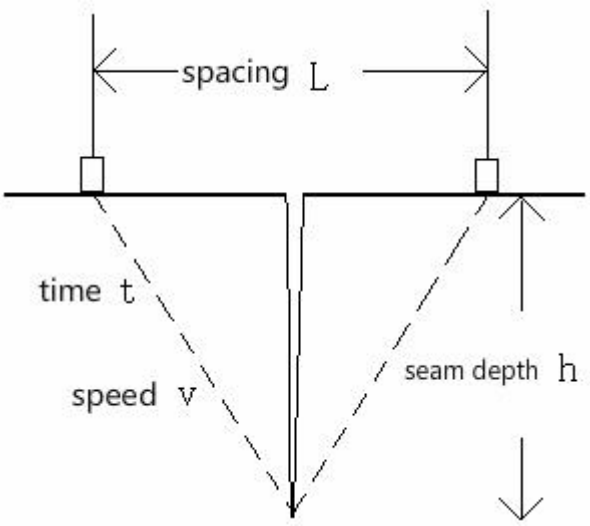

Figure 1-1 Principle of seam depth test

The transmitting and receiving transducers are equally spaced on either side of the crack. After the transmitting transducer transmits a signal, the receiving transducer receives the signal after the elapse of time t. The seam depth h is calculated from the known spacing L, the velocity v and the measured time t.

1.3 instrument composition

The instrument consists of a host, a transmitting and receiving transducer, a transducer holder, and a signal line.

Panel description:

Button	Function Description
Option	Test sound velocity value
Save	Save current test results
▲	The cursor moves up or the number increases, and later uses up instead.
◀	Move the cursor to the left and replace it with Left

▶	Move the cursor to the right and replace it with Right
▼	Move the cursor down or decrease the number, then use down instead
Back	Cancel the current operation, return to the previous interface, and use the back button instead
Enter	Confirm selection of project or confirmation of test results

1.4 Notes

1. Avoid water ingress.
2. Avoid high temperatures (>50 ° C).
3. Avoid getting close to strong magnetic fields, such as large electromagnets, large transformers, etc.
4. Avoid violent impact on the transducer.
5. Connect the signal cable and transducer in the off state.
4. Do not open the instrument case without permission.

1.5 problems to be noted when measuring

1. When using this instrument to detect the crack depth of structural concrete, it is required that there is no coupling medium (such as water, mud, etc.) in the crack to be tested, so as to avoid the ultrasonic signal being “short-circuited” through these coupling media.
2. The depth of the crack should be perpendicular to the concrete surface, otherwise it will affect the test results.
3. The concrete surface is clean and flat.
4. The transducer is coupled to the concrete surface by a coupling agent. The coupling agent can be selected from cheaper pastes such as petrolatum, butter, toothpaste, and the like.
5. In order to avoid the short-circuited sound waves inside the concrete being short-circuited by the steel bars across the cracks, the connection direction of the two transducers should not be parallel to the direction of the steel bars inside the concrete, but a certain angle should be formed.

1.6 Conventions

1. Text with gray shading indicates a button on the screen, such as fast sounding.
2. A text with a gray shading and a boxed text indicates a button such as Enter.
3. In addition to the contents described in this manual, the user will automatically display some prompt information during the process of using the user. Please follow the prompt information.

Chapter II Instrument Operation Instructions

2.1 Preparation before testing

1. Select the measurement part of the component.
2. Remove dust and debris from the surface of the test part of the component.
3. Remove debris and residual couplant from the bottom of the transducer.
4. Connect the transducer to the host.
5. Turn on the instrument and start measuring.

2.2 menu introduction and operation

2.2.1 Main menu

1. Press the switch key above the housing and the instrument will display the boot interface, as shown in Figure 2-1.

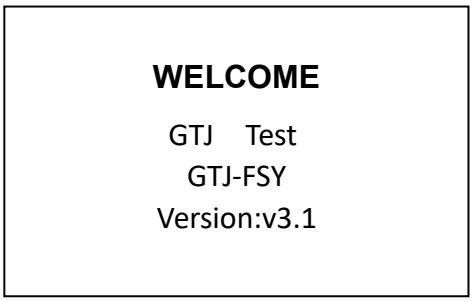

Figure 2-1 boot interface

2. Press Enter to enter the main menu interface, as shown in Figure 2-2.

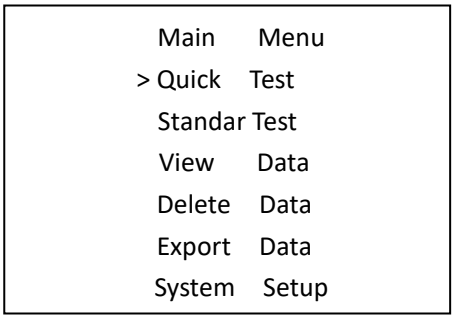

Figure 2-2 Main menu interface

In the main menu interface, press the back key to return to the boot interface.
Enter the main menu interface, the cursor selects the fast sounding by default. Press the up and down keys to move the cursor. After selecting the desired function, press the enter key to enter.

2.2.2 fast sounding

Select Fast Sounding in the main menu interface, and press Enter to enter the fast sounding interface, as

shown in Figure 2-3.

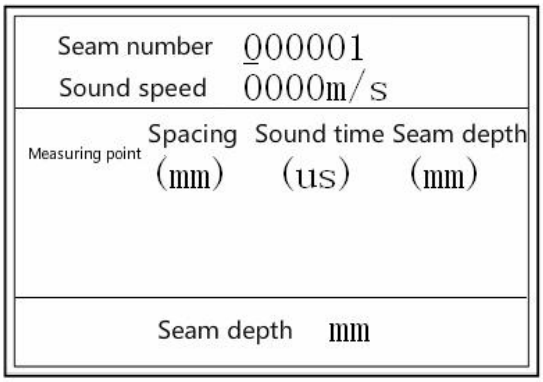

Figure 2-3 Fast sounding interface

Fast sounding consists of two parts: first, testing or picking up the speed of sound; second, testing and assessing the depth of the crack. Specific steps are as follows:

1. Test or retrieve the speed of sound:

There are three ways to get the speed of sound, depending on the situation:

(1) Method 1: Test the speed of sound

(a) Move a pair of transducers to the bracket and mark them as 200. The number of the brackets represents the internal spacing (mm) of the acoustic radiation surface of the transducer;

(b) Apply a small amount of couplant on the sound radiating surface of the transducer, hold the transducer bracket in the seamless area near the crack to be tested, apply pressure, and make the transducer close to the concrete surface. The void is filled with the paste of the coupling agent to remove air and achieve good acoustic coupling;

(c) Press the option button to obtain the sound velocity value of the cracked part to be tested;

(d) If the purpose of the test is simply to obtain the speed of sound of the member under test without testing the seam depth, press the save key to save the speed of sound;

(e) If the test purpose is to test the seam depth, press the enter key to save the speed of sound and enter the cross-slit measurement interface. ;

(2) Method 2: Manually inserting the sound velocity

Use the left and right keys to move the cursor to the sound speed digital position, use the up and down keys to increase or decrease the number, and manually set the known sound speed or the empirical sound speed.

(3) Method 3: Retrieving the speed of sound

After entering the crack test interface, the memory sound speed is automatically retrieved and displayed, that is, the most recent sound speed test value. If the test condition is judged to have no significant change, the sound speed value can be used. The memory sound velocity value is updated once a new sound velocity test is performed or the sound velocity is manually placed and the sound velocity is stored.

2. Crack depth test

Press the enter key to enter the crack depth test process:

(1) Determine the seam depth test point on the crack to be tested and mark it as a measuring point number.

(2) Move a pair of transducers to the bracket and mark them as 100. Perform the seam depth test according to the first spacing (100mm). The center of the bracket is aligned with the precise position of the measured crack point to ensure the transducer and The surface of the concrete is well coupled. After

pressing the enter key, the sound time and seam depth of the first spacing are displayed, and the measurement of the first spacing is completed.

(3) After the test of the first spacing is completed, the screen automatically prompts the indication of the second spacing (50 or 150), and according to the indicated spacing of the indications, the transducers are respectively moved to the corresponding positions on the bracket, and the second method is completed as described above. Spacing test.

(4) In a few cases, the screen prompts that a third pitch (150 or 200) test is required, in the same manner as above.

3. Crack depth determination and storage

(1) After completing the test of 2 times (three times in a few cases), the seam depth value is automatically displayed at the bottom of the screen.

(2) Press the enter key or the save key to store the sound velocity and seam depth value of the measuring point. Or press the back button to re-measure.

(3) After the storage, the number is automatically increased by 1, and the test of the next measurement point is performed.

2.2.3 Standard sounding

Select the standard sounding in the main menu interface, and then press enter to enter the standard sounding interface, as shown in Figure 2-4.

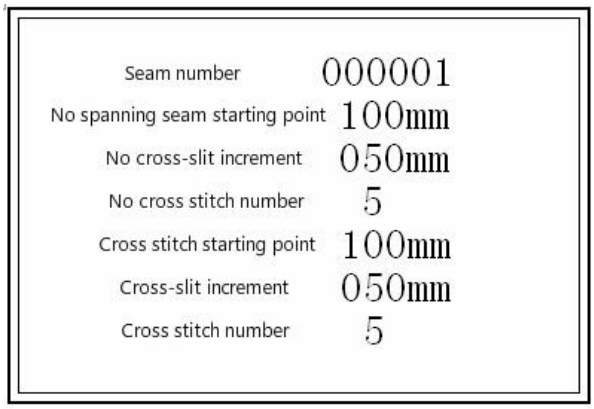

Figure 2-4 Standard sounding interface

The standard sounding consists of two parts: first, no cross-slit measurement; second, cross-slit measurement. The cross-slit measurement is to measure the speed of sound propagation of the member; the cross-slit measurement is to measure the depth of the crack by measuring the speed of sound measured without the cross-slit measurement.

First, set the parameters of the standard sounding. Press the left and right keys to select the parameter to be modified, and the up and down keys to modify the value.

After all the parameters are set, press the enter key, and the system will enter the interface to be tested without cross-slit. Press the back button to return to the main menu interface.

1. No cross-slit measurement

The interface to be tested without cross-sew is shown in Figure 2-5.

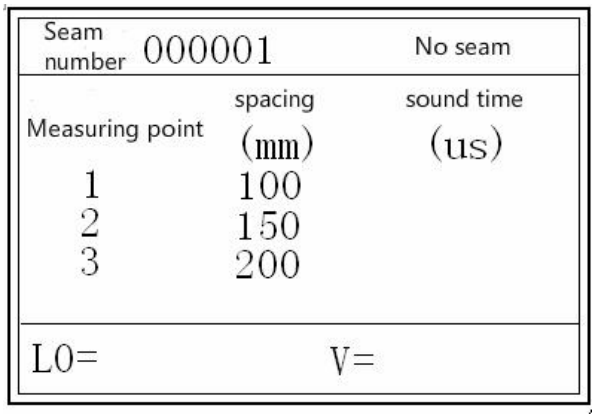

Figure 2-5 No cross-slit measurement

There are two ways to measure without cross-slit, depending on the situation:

(1) Method 1: Direct measurement

(a) Place the two transducers on the same side near the crack. Adjust the position of the transducer on the bracket so that the spacing of the transducers is the first spacing. Ensure that the transducer is well coupled to the concrete surface. When the sound of the first pitch is displayed after pressing the enter key, the measurement of the first pitch is completed.

(b) Measure sequentially as described above until all points have been measured.

(c) Press the ENTER button and the sound speed value appears at the bottom of the screen. Press enter or save to store the data, and the system will automatically jump to the measurement interface across the seam. Press the back key, the data is not stored, return to the main menu interface.

(2) Method 2: Extract the last test result

After entering the interface that is not across the seam to be tested, press the option button to display the test result of the last time without the seam. If the test condition is judged to have no significant change, the test result can be used.

2. Cross seam measurement

The cross-sew test interface is shown in Figure 2-6.

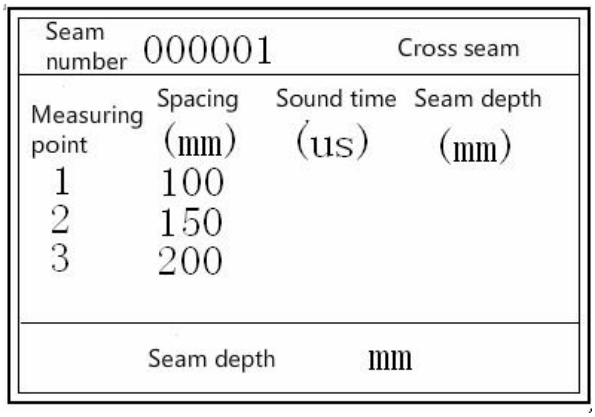

Figure 2-6 Cross-slit measurement

(1) Determine the seam depth test point on the crack to be tested and mark it as a measuring point number.

(2) Move a pair of transducers to the bracket at the first spacing, and the center of the bracket is aligned with the precise position of the measured crack point to ensure good coupling between the transducer and the concrete surface. Press the enter key to display The first interval is measured by the acoustic time and the depth of the first pitch.

(3) Measure sequentially according to the above method until all the measuring points are measured.
(4) Press the enter button and the seam depth value appears at the bottom of the screen. Press enter or save again to store, the system automatically jumps to the main menu interface. Press the back button, the data is not stored, return to the main menu interface.
In the standard sounding, in the case of no cross-slit measurement and cross-slit measurement interface, when the error of a certain measuring point is felt, you can press the up and down keys to select the measuring point and press the right button to mark the point (after the measuring point) Show an asterisk). At this time, the system considers that the measurement point is not within the calculation range, and the system recalculates the remaining measurement points, and the data displayed at the bottom of the screen changes.
When you want to cancel the mark of the point, after selecting the point, press the left button to cancel the selection, and the measurement point is again within the calculation range.

2.2.4 Data View

Select Data View under the main menu interface, and then press enter to enter the data viewing interface, as shown in Figure 2-7.
The instrument can store up to 13,000 slits for fast sounding and 8180 slits for standard sounding. It is recommended that the data be output after each engineering test is completed (see 2.2.6 Data Output for details), and then the data is deleted (see 2.2.5 Data Clearing for details).

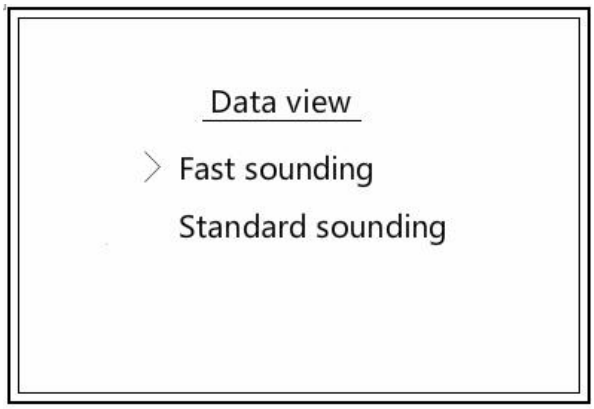

Figure 2-7 Data View

Data viewing is divided into fast sounding and standard sounding. Fast sounding stores data for fast sounding, and standard sounding stores data for standard sounding. Press the up and down keys to select it, press the enter key to enter the seam number selection interface, as shown in Figure 2-8. Press the back button to return to the main menu.

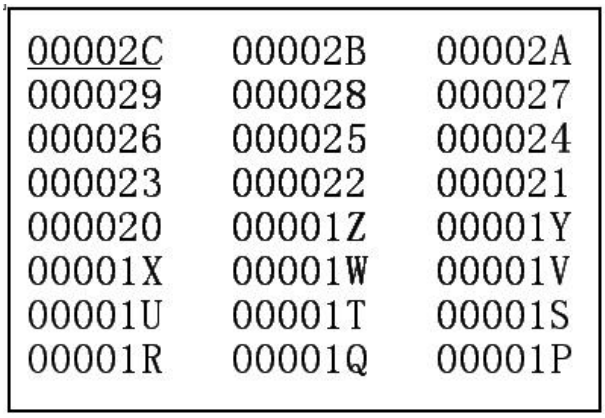

Figure 2-8 Sewing number selection interface

1. Quick sounding view

(1) When the data is viewed, the data of 8 rows and 3 columns is displayed on the screen, and a total of 24 seam numbers are displayed, and the seam numbers are sorted in the order of test time. Press the left, right, up, and down keys to select the seam number, press the save key to scroll to the next page, and press the option key to scroll to the previous page.

(2) When the cursor points to the seam number you want to view, press the enter key to view the measurement data under the seam number. After viewing the data, press the enter key or the back key to return to the seam number selection interface.

2. Standard sounding view

The standard sounding view is similar to the quick sounding view, but it is somewhat different.

In the standard sounding view, when you feel that the error of a certain measuring point is large, you can press the up and down keys to select the measuring point, and press the right button to mark the point (the asterisk is displayed after the measuring point). At this time, the system considers that the measurement point is not within the calculation range, and the system recalculates the remaining measurement points, and the data displayed at the bottom of the screen changes. Take the cross-seam viewing interface as an example, as shown in Figure 2-9. When the measuring point 1 is marked, the seam depth value changes.

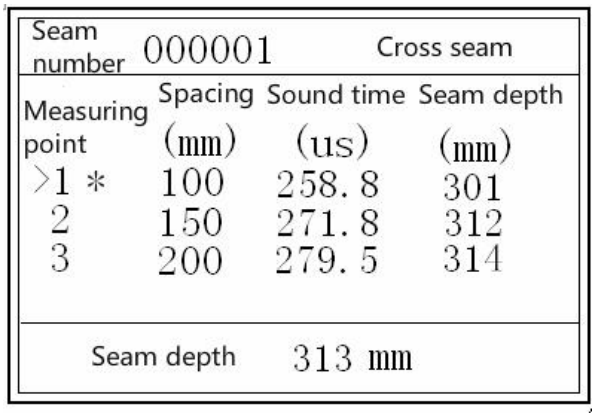

Figure 2-9 Cross-seam viewing interface

When you want to cancel the mark of the point, after selecting the point, press the left button to cancel the selection.

After viewing, press the enter key or the back key to save the view status. The marked points are still marked the next time you view the seam number.

2.2.5 Data Clearing

Before starting the test, transfer the data in the instrument to the computer (see 2.2.6 Data Output) and then clear the data in the instrument.

Select Data Clear under the main menu interface, and then press enter to enter the data clear interface, as shown in Figure 2-10.

Figure 2-10 Data Clearing

Press the enter key to clear the data directly. It will automatically return to the main menu interface after clearing. Press the back key, the data is not cleared, and return to the main menu interface.

2.2.6 Data output

It is recommended that data be transmitted to the computer in time after each test. The operation method is as follows:

(1) Connect the instrument to the computer with a USB cable.

(2) Turn on the power of the host.

(3) Enter the system main menu interface, select the data output submenu, enter the data transmission interface, as shown in Figure 2-11.

(4) Press enter to enter the transmission waiting state.

(5) Open the high-speed railway crack sounding data analysis software in the computer.

(6) Click on Tools in the menu bar to select Data Transfer. The Data Transfer dialog box is displayed, as shown in Figure 2-12.

(7) Click to select the address, select the address where the data is to be stored; enter the file name.

(8) Click enter, the crack depth gauge starts to transfer data, and the data can be transmitted successfully after a while.

After the data transmission is successful, the number corresponding to the number in the crack sounding data analysis software, the fast sounding data at the beginning of f, and the standard sounding data at the beginning of s.

Note: When the user uses USB data cable for transmission, the driver should be installed first. (The installation program is included on the CD. The user only needs to install the driver when the first transmission is performed. In addition to reinstalling the system, the user transmits data. You do not need to install this driver again).

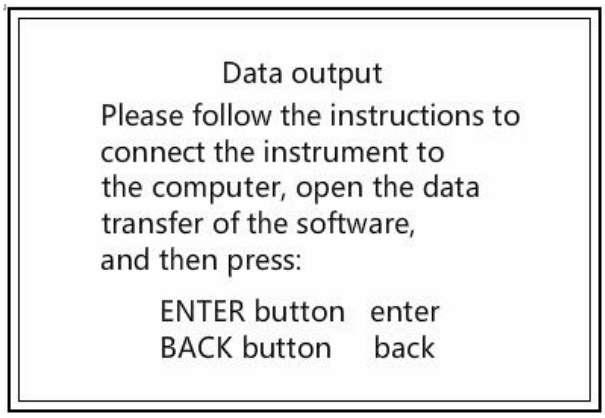

Figure 2-11 Data output

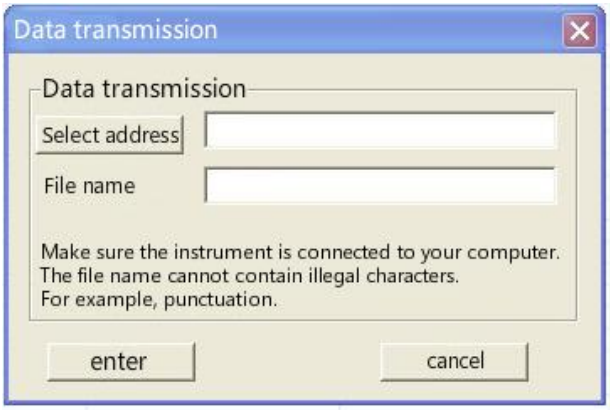

Figure 2-12 Data Transfer Dialog Box

2.2.7 System Settings

Select System Settings in the main menu interface, and then press the enter button to enter the system settings interface, as shown in Figure 2-13.

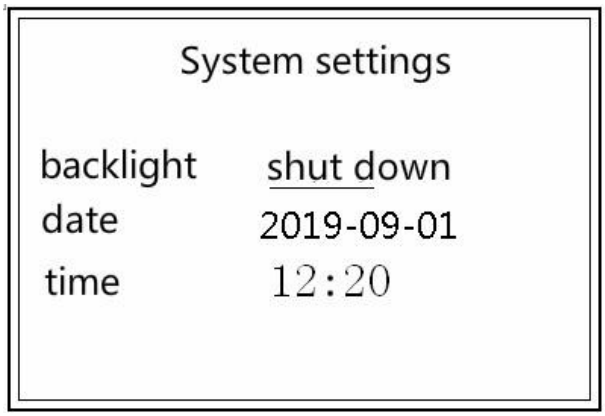

Figure 2-13 System Settings

In the system settings, you can set the backlight, date and time. Move the cursor with the left and right keys, the up and down keys to modify the value, the enter key to save the settings, and automatically return to the main menu interface. The back button cancels the setting and returns to the main menu.

Chapter III Maintenance and Maintenance

3.1 Check before use

Please check if the power is sufficient before use. The power should be above 5% when using. If the battery is low, please charge it before use.

3.2 cleaning

Do not put the instrument and accessories in water or scrub with a damp cloth.
Do not scrub the instrument and accessories with organic solvents.
Wipe the main unit with a clean, soft, dry cloth.
Please clean the socket with a clean, soft brush.

3.3 rechargeable battery

The instrument is powered by a built-in dedicated rechargeable lithium battery. When the power is turned on, “Please charge” flashes at the bottom of the boot interface, or “Please charge” flashes on the screen when using it, and the instrument should be charged in time.
If the instrument is not used for a long time, the rechargeable battery will naturally discharge, resulting in a decrease in power. Please recharge it before use. During the charging process, the instrument and the power adapter may have a certain amount of heat, which is a normal phenomenon. The instrument and the power adapter should be kept well ventilated for heat dissipation.
Do not short the battery or be near a high temperature heat source.

3.4 transducer

At all times, try to avoid the violent impact of the transducer.
After the test is completed, disconnect the connecting cable. Clean the surface of the transducer with a dry cloth, dry it and put it back in the instrument box.

Chapter IV Data Processing Software

The crack sounding data analysis software can post-process the inspection data of the GTJ-FSY crack depth sounder.

4.1 Installation

This software can be used in the Windows operating system, and the installation process is basically similar to the installation of common Windows software.

4.2 software interface

The crack sounding data analysis software is shown in Figure 1-8:

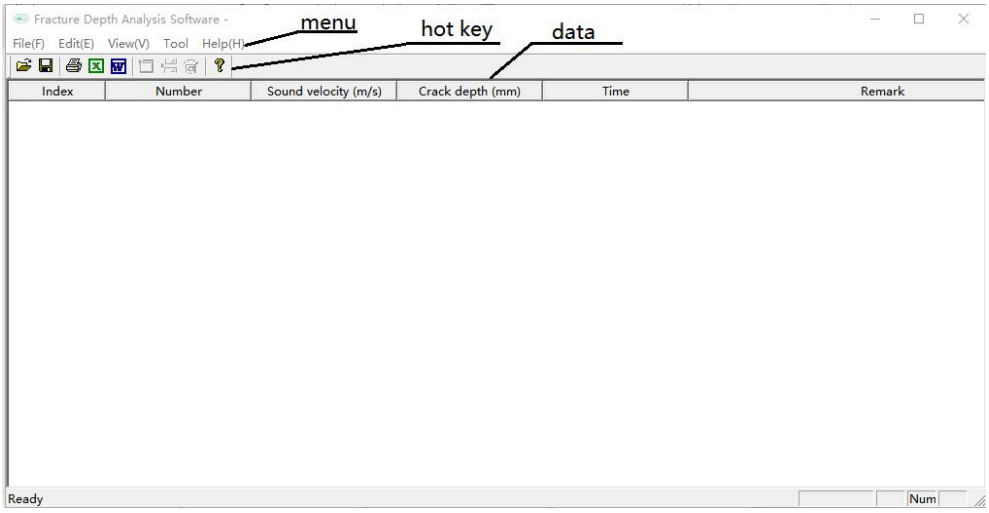

Figure 1-8 software interface

4.3 menu function description

Menu	Option	Description
File	Open	Select file to open in the dialog box
	Save	Save current data
	Save as	Save the current data file in a new file path
	Print	Print current data
	Printing preview	Analog display print effect
	Printing settings	Dialog settings print related parameters
	Back	Exit the software

Edit	Adding data	Add the same measuring point as the last measuring point at the end of the current measuring point
	Insert data	Insert the same measuring point as the current measuring point in front of the current measuring point
	Delete data	Delete current measurement point
View	Toolbar	Show or hide the toolbar
	Status bar	Show or hide the status bar
Tool	Data transmission	Transfer data from the crack depth sounder to the computer for processing
	Generate report	Start Microsoft Word automatically (this machine should be installed, otherwise it can't be done), and generate all the data currently open to generate data table in Word format.
	Generate reports	Automatically start Microsoft Excel (this machine should be installed, otherwise it can not be performed), and generate all the data currently open to generate data report in Excel format.

4.4 data table operation

After opening the software, click the menu bar file, then click Open to select the file you want to open. The data table can be operated after opening the file.
When adding, inserting, or deleting data, click the row you want to edit, and then click the right mouse button to pop up the edit menu for editing.
The number, speed of sound, seam depth, time, and notes in the data sheet area can be edited. Click the row you want to edit, then click the cell you want to edit so that you can edit the contents of the data table.

4.5 data transmission operation

The Data Transfer dialog is used to transfer data from the crack sounder to the computer for processing. The specific
transmission steps are detailed in Section 2.2.6.