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Chapter One Introduction

Concrete Crack Integrated Detector is mainly designed to accurately detect crack width and depth in bridges, tunnels, concrete pavements and so on.

It is a multi-purpose instrument which can both measure the crack width and depth. Operator can not only view and record the crack width by color amplification probe, but also can measure the crack depth by ultrasonic probe.

1.1 Main Parts

Figure 1-1 Main Parts

This instrument is composed of main unit, color amplification probe, ultrasonic probe etc.

1.2 Main Technical Specifications

Hardware Platform	Embedded ARM9 Hardware Platform ，WinCe5.0 Operating System，True Color TFT Touch Screen
Crack Width	Standard Probe: 0.01mm～6.5mm；

Test Range	High Grade Probe：0.005mm～3.5mm
Crack Width Test Accuracy	Standard Probe：≤±0.02mm； High Grade Probe: ≤±0.01mm
Crack Depth Test Range	10mm～500mm
Crack Depth Test Accuracy	≤±5%
Power Supply	Rechargeable Lithium Battery
Working Time	≥28 Hours
Working Temperature	-10℃～＋50℃
Working Humidity	≤90%RH

1.3 Main Features

Professional Design	● **Standard and high grade color** amplification probes are available, which can work with different width test. ● Standard and instant depth testing methods. Operator can test the depth by standard program and simplified program. It can greatly simplify the testing work on site. ● Adopt ultrasonic transducer holder. The distance between testing points is adjustable and precise. There is no need to lining on site, which greatly improves the testing efficiency. ● Automatically identify and modify crack image, as well as calculate crack

	width wisely. ● Automatically identify crack, calculate and real-time display the result.
Man-Machine Interaction	● Easy and quick touch-screen operation. ● User-friendly design: voice and words instructions during the whole testing process. ● Helpful documents and demonstration video available to allow new user to operate the instrument skillfully.
Mass Storage	● 4GB SD Card can storage more than 200,000 documents.
Energy Saving & Low-carbon	● High-efficiency and energy-saving rechargeable lithium battery. ● Low power dissipation

1.4 Notes

- Avoid Water
- Avoid high temperature(>50℃)
- Do not pull the connecting wire out by force. Hold the wire end when pulling it out.
- Keep away from strong magnetic field like large electromagnet, large transformer, etc.
- Do not open the shell without permission.

Chapter Two Operating Software

This instrument adopts WinCE5.0 operating system which is similar to Windows. Users can operate the instrument by touch screen and keyboard. The following table2-1 is the detailed information of keyboard.

Switch	Switch the button and function of the main unit；
Save	Save the data
Enter	Verify the operation
Back	Delete a character or back to the previous interface
▲ ▼ ◀ ▶	Direction keys are used respectively to move the cursor, select one operation in menu and other auxiliary function.

Table2-1 Key-press Description

2.1 Interface

It brings you to start interface by turning on the instrument.

Figure2-1 Start Interface

Press【Instrument】，it will brings you to the following interface to select width or depth testing program.

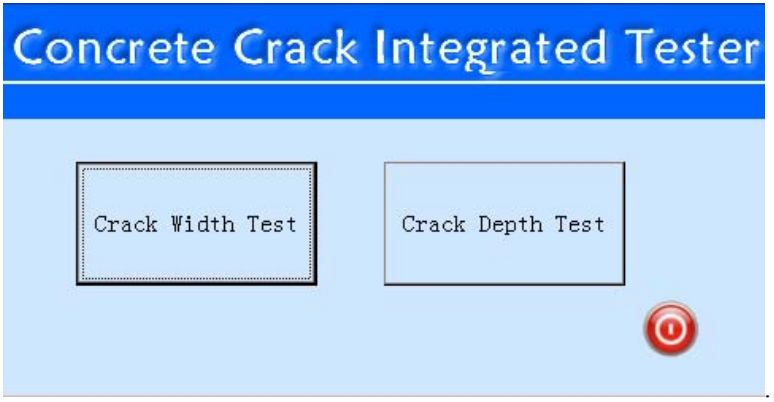


Figure2-2 Function Selection Interface

2.2Crack Width Test

2.2.1 Function

1）The following dialog will popup if the probe is not connecting with main machine. Plug in detector head and re-run the programs!

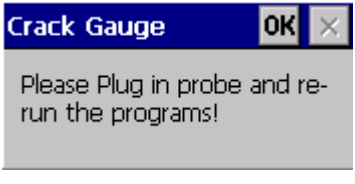


Figure 2-3 Failure Connection Dialog Box

2）The interface will be like the following image when the program start to run.

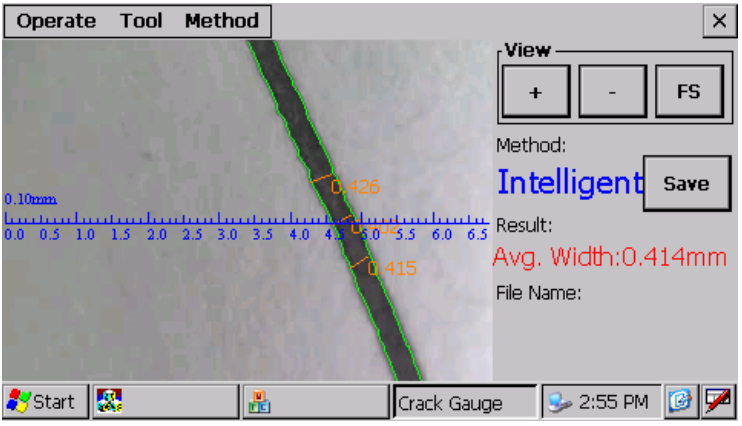


Figure 2-4 Measuring Software Interface

3）Operating Interface

【Restart】——It will auto collect and display the image of crack. Select this option to restart the collection of crack image when it says “Plug in detector head and re-run the programs!”

【Stop】——Stop collecting crack-image information.

Note: User must click【Stop】before pull out the probe.

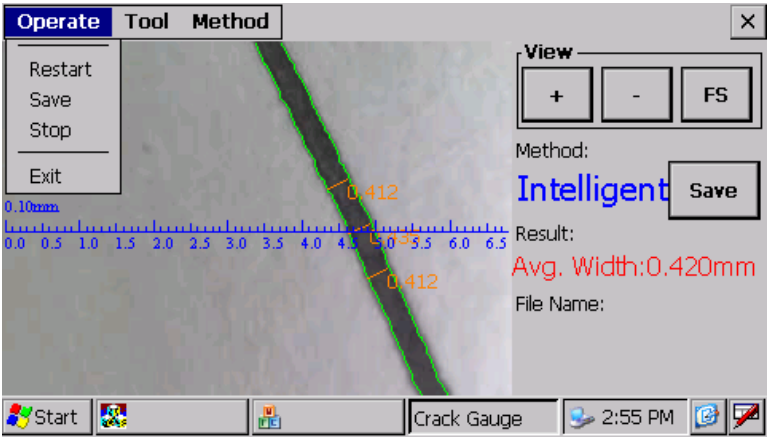


Figure 2-5 File Menu

4）Tools Menu

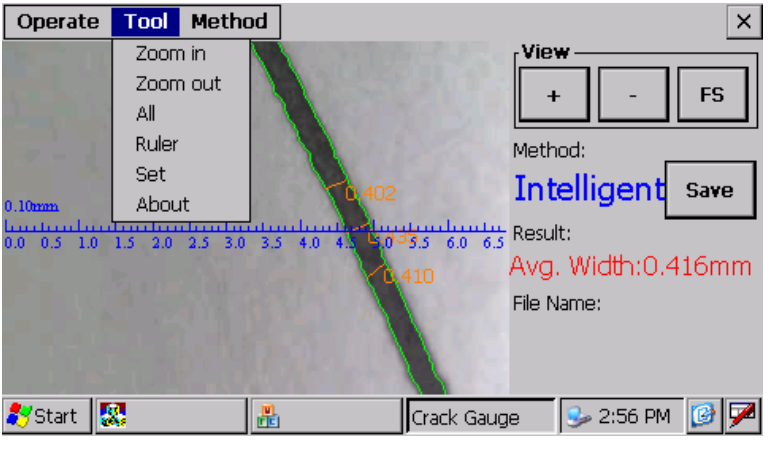


Figure 2-6 Tools Menu

It will display the following dialog by click【Set】.

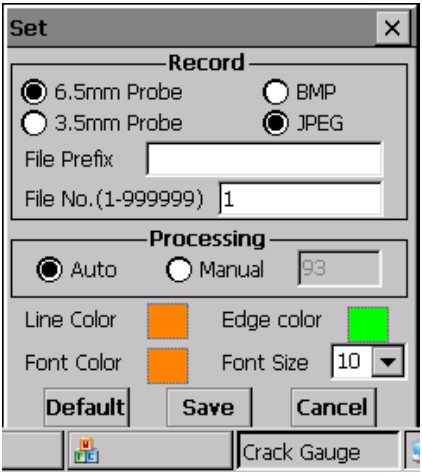


Figure 2-7 Settings Menu

"Type"——Probe type. The measuring range of standard lens is 6.5mm. User can optional choose the high grade lens with 3.5mm testing range.

Note: User must select the probe type when replace a new one or else the testing result will be wrong

"bmp" and "PEG"——Select the image storage format

"File Prefix"——User can name the prefixed name of files. The software will save your files by prefixed name plus file NO.

"File No."——User can set the start number of files. The

file number can realize automatic accumulation.

"Auto" and "Manual"——Setting method of the threshold. It will auto set the threshold if you select "Auto". User can select "Manual" and input a threshold.

"Line Color"、" Font Color" and "Font Size" can be edited according to user's requirements.

Please click 【Save】 when your finish the above setting.

2.2.2 Crack Test

There are 3 ways to measure cracks: manual testing, intelligent testing and scale testing. User can switch the method by click【Method】or press Switch.

【Manual Testing】

Draw a line perpendicular to the crack with your handwriting pen. It will display the crack width automatically. The testing method and unit "mm" will be displayed too. User can move the probe to do continuous test.

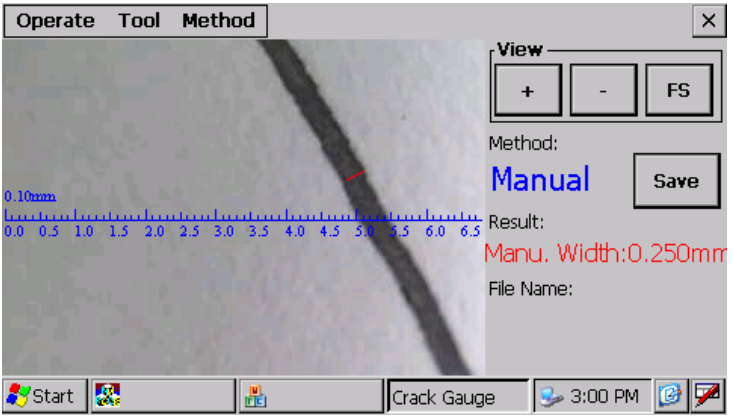


Figure 2-8 Manual Testing

【Intelligent Testing】

This is the default testing method. The software will analyze the width and display the result when there appears a crack. It will analyze the middle one when there appear various cracks, but the testing result is the average width of these cracks. User can move the probe to do continuous test. Click【Save】or press Save to save images.

Note: User does not need to move the probe and make the crack perpendicular to the scale. We suggest the crack be beveled at an angle of 30~70 with the scale. Please move the

probe up or down with manual and keep away from the big unevenness test points if the deviation of cracks is large.

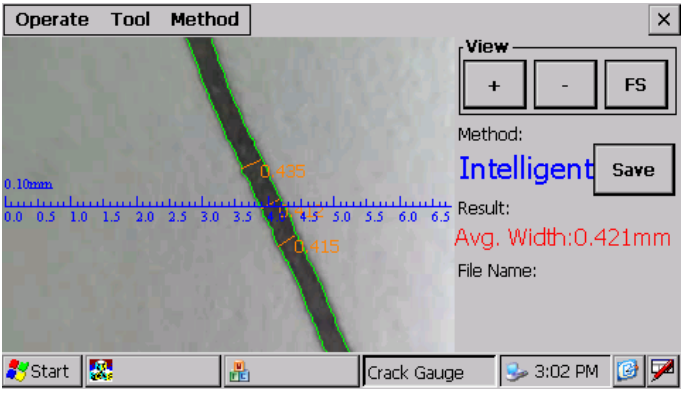


Figure 2-9 Intelligent Testing

【Scale Testing】

Turn the probe to make the measured crack perpendicular to the scale. Use the scale to measure the width of crack. It will display the result (unit mm) automatically. Click 【Save】 or press Save to save the image.

This test method is especially suitable to measure and compare the width of dynamic cracks.

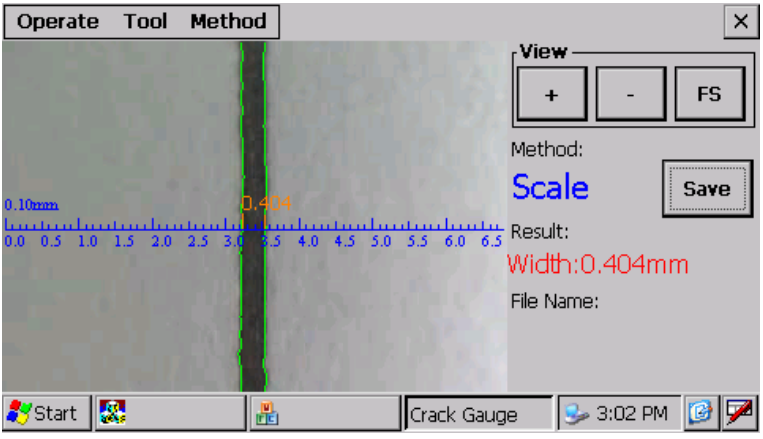


Figure 2-10 Scale Testing

User can use the zoom function if the crack is too large or too tiny. He can click the corresponding keys under View menu to enlarge, shrink or view original size of the image, and also can click Tools menu to use such function.

The current crack image can be saved as a file for further management. For example, the following image is saved and named as 000002.jpg

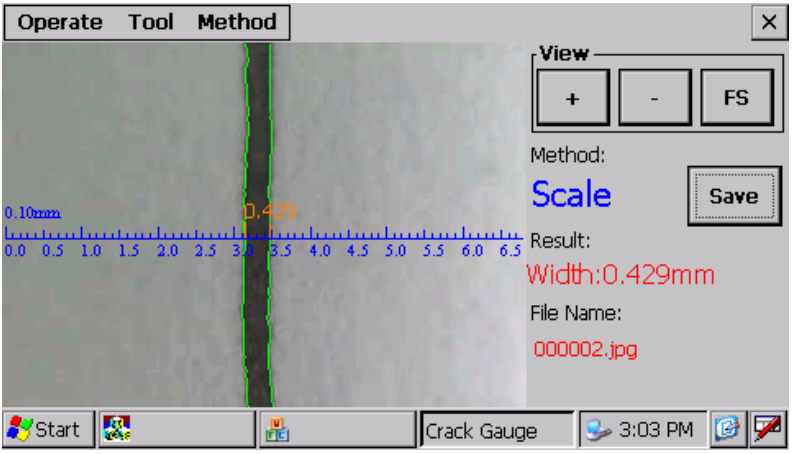


Figure 2-11 Saved Crack Image

Note: User should stick the probe closely to crack. We suggest use manual test method if the crack image is blur.

2.2.3 Notes

1）It will popup the following information if the probe is not well connect with main machine.

User should quit the testing program, plug in the probe again and rerun the program.

2）Please contact us if it prompt you to reinstall the software.

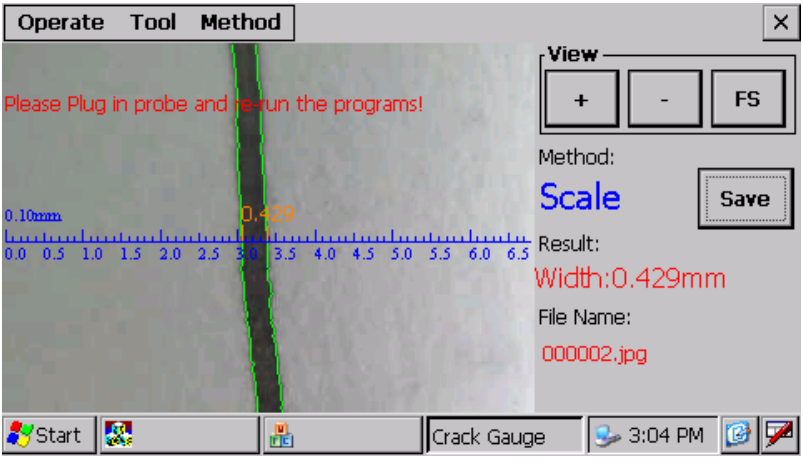


Figure 2-12 Error Message Display

2.3 Crack Depth Test

As shown in Fig. 2-13, it will display the following dialog by entering the crack-depth test module. There are four modules, including non cross-crack test, cross-crack test, data management and system settings. User can run the program by clicking on the menu with a touch pen or pressing the【Switch】key to select appropriate function. Please make sure the ultrasonic probe is well connected before measuring the crack depth.

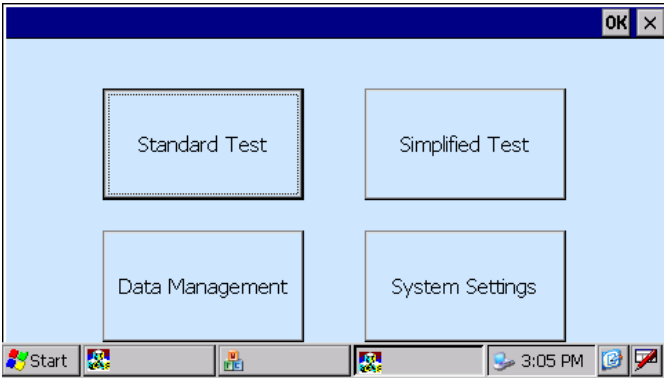


Figure 2-13 Crack Depth Test

2.3.1 Non Cross-crack Test

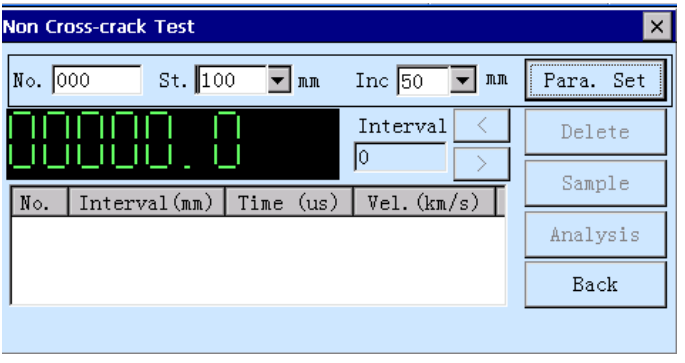


Figure 2-14 Interface of Non Cross-crack Test

1) Parameter Settings

As shown in figure 2-14, it will display the above dialog when you enter non cross-crack test. First, set parameters. The

component number realizes automatic accumulation by default. The starting interval is 100mm and increment is 50mm.

【Component Number】 Identify different testing points.

【Starting Interval】 Interval between the first two testing points. User can input relative data or select them from the drop-down list.

【Increment】Difference between the latter and former pair of testing points. User can input relative data or select them from the drop-down list.

2) Sampling

Place the ultrasonic probe on the same side of a crack. The space between probes should be 100mm, 150mm, 200mm or 250mm. Then, click the【Sample】key to read the results.

3) Analysis

Click【Analysis】after sampling at least 3 times and it will display the following dialog.

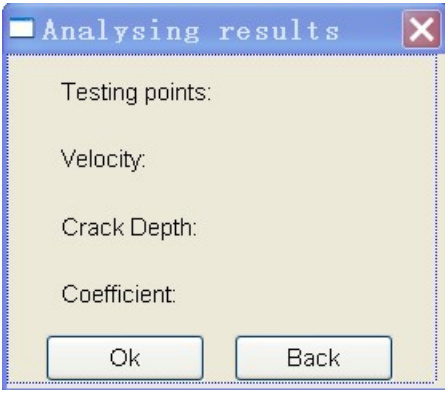


Figure 2-15 Analyzing Result

4) Adjustment

Press the direction keys【▲】【▼】 to adjust the interval between probes so that you can edit the tested data. For instance, if user wants to edit the data took under test interval as 150mm, he can reset the interval as 150mm and then press the【Sample】key to test. Meanwhile, user can delete the last data.

2.3.2 Cross-crack Test

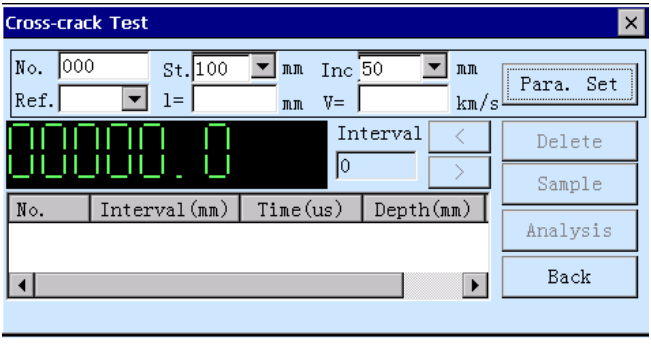


Figure 2-16 Interface of Cross-crack Test

1） Parameter Settings

As shown in figure 2-16, it will display the above dialog when you enter cross-crack test. First, set parameters. The component number realizes automatic accumulation by default. The starting interval is 100mm and increment is 50mm.

【Component Number】 Identify different testing points.

【Starting Interval】 Interval between the first two testing points. User can input relative data or select them from the drop-down list.

【Increment】 Difference between the latter and former pair

of testing points. User can input relative data or select them from the drop-down list.

【Reference】 Import tested data and analyzing results in non cross-crack test from the drop-down list.

【Adjust Testing Space L】Import appropriate data from the drop-down list of【Reference】item received by non cross-crack test. User can also input the data.

【Velocity】 Import appropriate data from the drop-down list of【Reference】received by non cross-crack test. User can also input the data.

2） Sampling

Ultrasonic probes are equally placed on both sides of a crack. The space between probes should be 100mm, 150mm, 200mm. Then, click the【Sample】key to read the results.

3） Analysis

Click【Analysis】after at least 3 times sampling, it will display the following dialog .

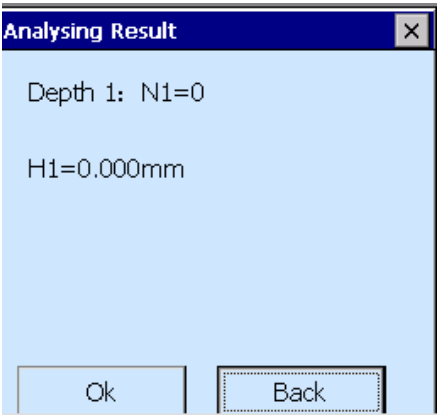


Figure 2-17 Analyzing Result

4) Adjustment

Press the direction keys【▲】【▼】 to adjust the interval between probes so that you can edit the tested data. For instance, if user wants to edit the data took under test interval as 150mm, he can reset the interval as 150mm and then press the【Sample】key to test. Meanwhile, user can delete the last data.

2.3.3 Simplified Test

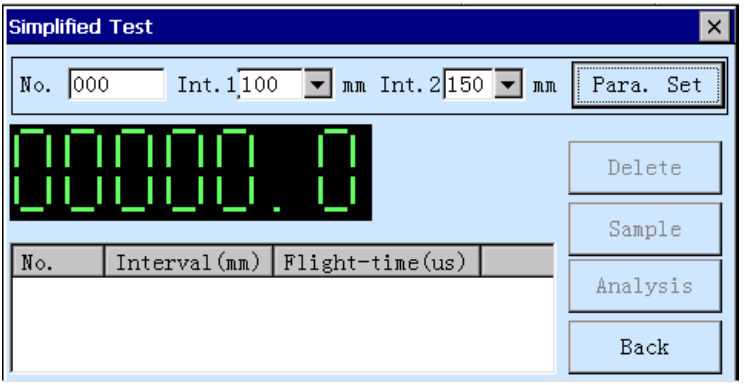


Figure 2-18 Interface of Simplified Test

1) Parameter Settings

As shown in figure 2-18, it will display the above dialog when you enter simplified test. First, set parameters.

【Component Number】Identify different testing points. The component number realizes automatic accumulation by default.

【Interval No.1】,【Interval No.2】 The two ultrasonic probes are equally placed on both sides of a crack. The interval between probes should be same as interval No.1 and interval No.2. User can input the number or choose from the drop-down list. (Please

note the NO.1 and NO.2 should be different). The default interval No.1 is 100mm, interval No.2 is 150mm.

2) Sampling

First, click the【Parameter settings】key. Then, place the two probes according to interval No.1 and No.2. Last, click【Sample】key and read the testing results respectively

3) Analysis

Having the sampling completed, you can click the【Analysis】key and then it will display the following dialog as shown in Figure 2-19.

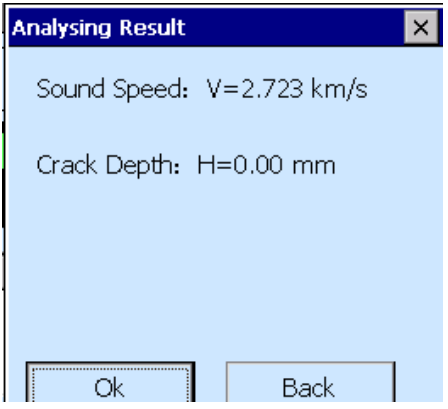


Figure 2-19 Analyzing Result

2.3.4 Notes

Please be sure that the ultrasonic probes and measured surface are close coupled. Meanwhile, make sure that the probe spacing errors are as small as possible. Applied with scale, one can effectively reduce such errors.

2.3.5 Data Management

As shown in Figure 2-20, user can check the tested crack depth by clicking on【Data Management】. Then, choose a record information and click【Modify】, user can edit the component No., crack No., testing point No, and crack depth. User can also delete relative crack record by clicking on【Delete】.

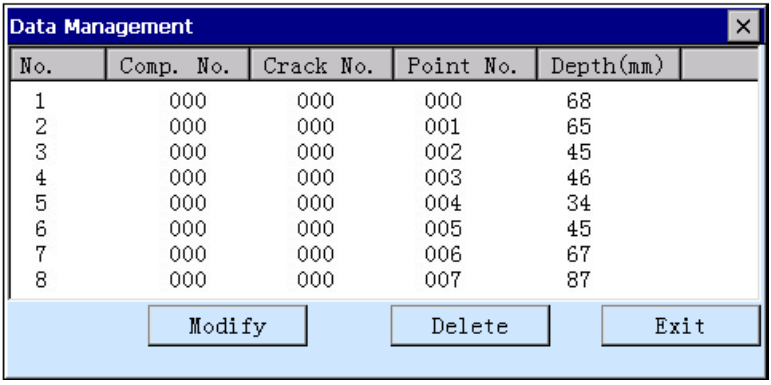


Figure 2-20 Interface of Data Management

2.3.6 System Settings

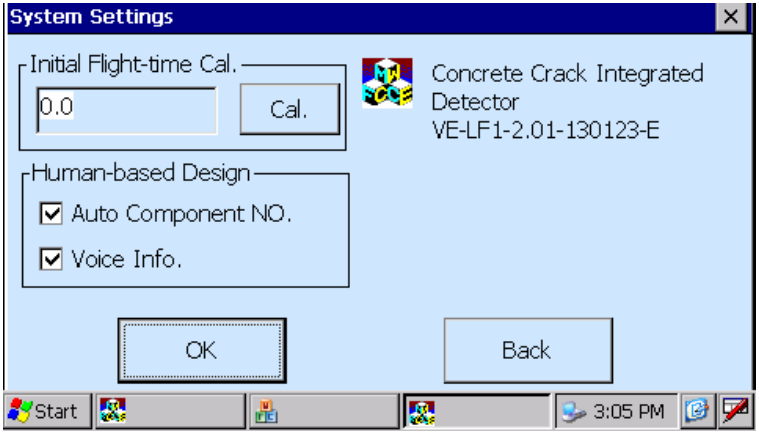


Figure 2-21 System Settings

As shown in Figure 2-21, it will display the above interface

when you enter【System Settings】. User can do the following operation.

(1) 【Initial Flight-time Calibration】

Couple the two ultrasonic probes and click【Initial Flight-time Calibration】, the instrument will record the initial flight-time automatically. Generally, please do not calibrate by yourself, as initial flight-time calibration for the instrument has been set in the factory.

(2) 【Auto Component NO.】

Check【Auto Component NO.】and system automatically generates the testing point number. Otherwise, user is responsible to input these points.

(3) It will display the register interface by click the icon five times. Please call us to get your serial No. Input your serial No. and click【Registered】. It will say your register is completed. If the register fails, please check whether serial number is right or not. Please do not close the dialog during the register process.

Chapter Three Post-processing Software

3.1 Crack Width Management Software

With this crack management software, user is able to view, manage and print the crack data obtained by the crack-width measurement. The software supports single image display and multi-image display, owns functions of sequencing and checking the items of crack information, deleting and combining crack files. In addition, user could modify information for each crack and finally get corresponding report form. Therefore, managing crack images becomes easy and trouble free.

3.1.1 Software Installation

Click Setup.exe in installation package to complete the installation.

3.1.2 Data Transmission

Remove the SD card from the concrete crack integrated tester. Then, copy the folder [CrackManage] to your desktop.

3.1.3 Main interface

Click “Crack Management Software” on the desktop to enter the main interface; click **Start** button; select the file **Index** under folder [CrackManage] so as to import the crack information into the software. See Figure 3-1.

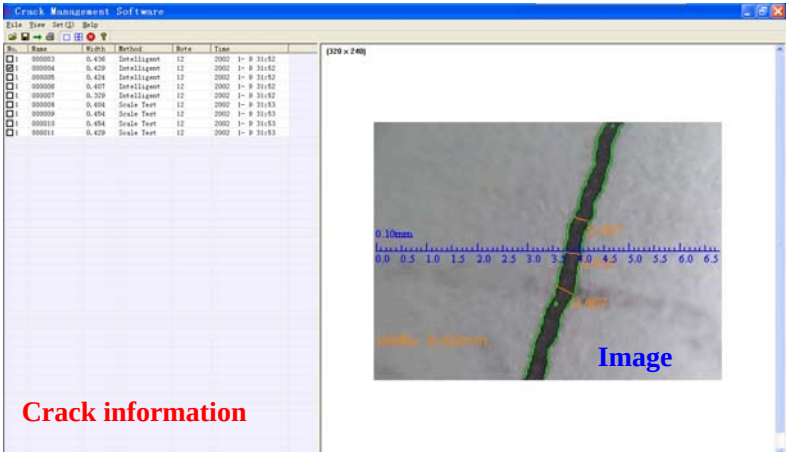


Figure 3-1 Main interface

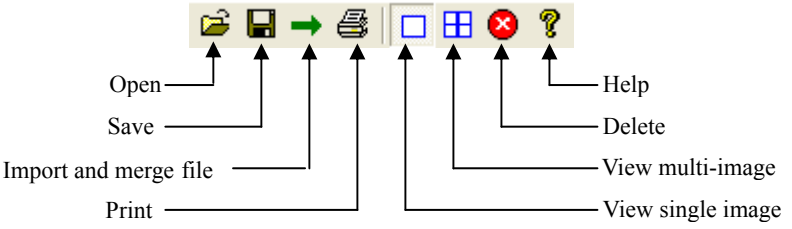


Figure 3-2 Toolbar

3.1.4 Sequencing

User could view the crack information according to certain sequence. He could view the information by ascending or descending order of the numbers, by names, or by crack width. This software provides contrast checking function for convenience. See Figure3-3.

No.	Name	Width	Method	Note	Time
☐ 1	000003	0.436	Intelligent	12	2002 1- 9 31:52
☑ 1	000004	0.429	Intelligent	12	2002 1- 9 31:52
☐ 1	000005	0.424	Intelligent	12	2002 1- 9 31:52
☐ 1	000006	0.407	Intelligent	12	2002 1- 9 31:52
☐ 1	000007	0.329	Intelligent	12	2002 1- 9 31:52
☐ 1	000008	0.404	Scale Test	12	2002 1- 9 31:53
☐ 1	000009	0.454	Scale Test	12	2002 1- 9 31:53
☐ 1	000010	0.454	Scale Test	12	2002 1- 9 31:53
☐ 1	000011	0.429	Scale Test	12	2002 1- 9 31:53

Image 3-3 Sequencing by Width

3.1.5 Single Image Display

Click **Single Image Viewing**; click the crack information to be viewed at the left side; it shall display the corresponding crack image at the right side. See Figure 3-4.

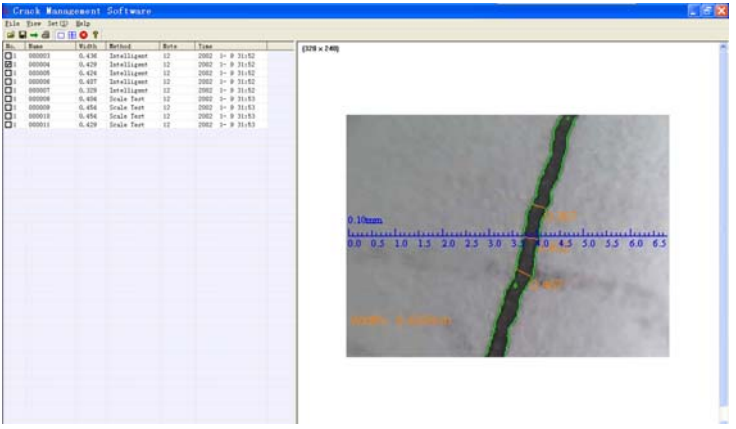


Figure 3-4 Single Image Checking Function

3.1.6 Multi-image Display

Click **Viewing Multi-image** button; click several items of crack information at the left side and corresponding crack images shall display at the right side. It supports At most 6

images on display simultaneously. See Figure 3-5.

Figure 3-5 Multi-image Checking Function

3.1.7 Combination Function

Click **Merge and Import file** button; the software shall automatically combine the crack information and import the combined information into the present document, and meanwhile automatically copy the corresponding images into the present document. In addition, the software provides duplication removal function; it shall remove the crack information that is the same.

3.1.8 Deletion Function

After selecting one or several items of the crack information, click **Delete** button; the software shall delete the corresponding crack information.

3.1.9 Modification Function

Right-click an item of the crack information so that you can modify the group number, name and note of the crack. See Figure 3-6.

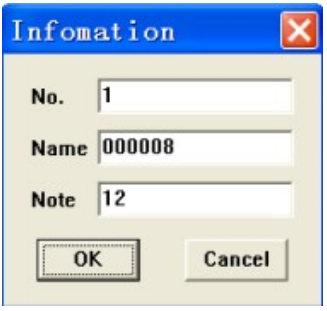


Figure 3-6 Modification

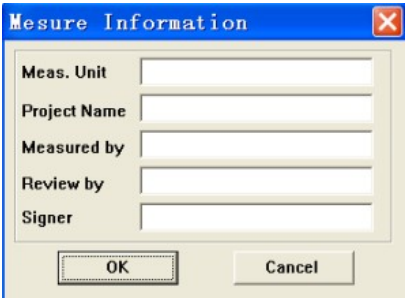


Figure 3-6 Information Settings

3.1.10 Information Settings

It will display the Figure 3-7 by click the button “Set”. User can edit relative information such as Measurement Unit, Project Name, Review by, Measured by, Signer and so on. Such information shall be viewed when report

3.1.11 Print Preview and Print Function

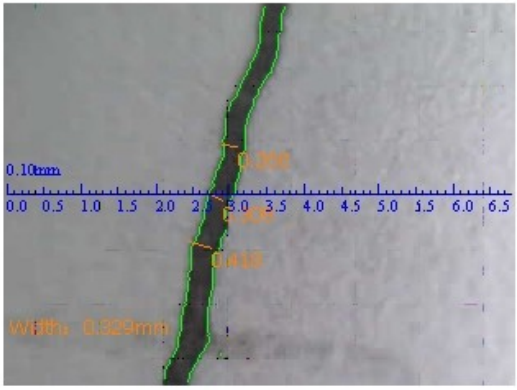
After selecting one or several items of crack information, click **Print Preview** button to see the crack information that will be printed; click **Print** button to print the crack information. See Figure 3-8.

Crack Detecting Report

Meas. Unit **Meas. Time** 2002 1- 9 31:52

Project Name

No.	1	**Name**	000007
Method	Intelligent	**Width**	0.329 mm



Note	12

Measurec **Review by** **Signer**

Figure 3-8 Print Preview

3.2 Crack Depth management software

3.2 .1 Software Installation

Click Setup.exe in installation package to complete the installation.

3.2.2 Data transmission

Remove the SD card from the crack depth gauge. Then, copy the file *CrackDepthData.DM* under the directory [DepthMesData] to your desktop.

3.2.3 Main Interface

Click the icon "crack depth gauge" and enter the main interface, as shown in Figure 3-9.

Figure 3-9 Main Interface

3.2.4 Opening

On the File menu, click Open button to open the stored crack data. User can open files with suffix **.DM*. Then, on the desktop, open the file *CrackDepthData.DM* to view measured data.

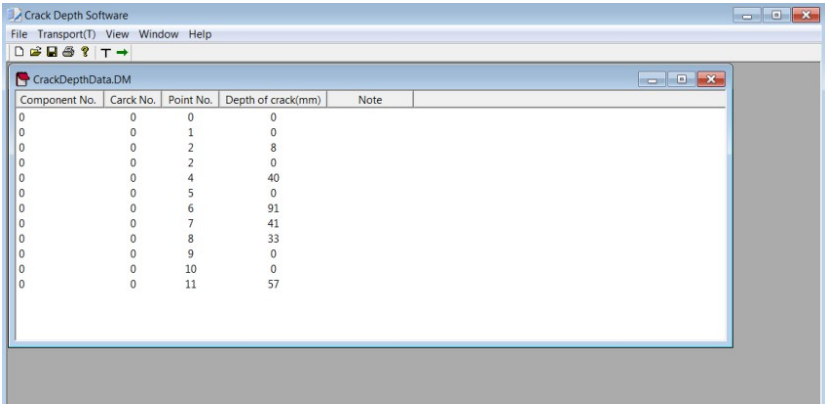


Figure 3-10 opening and uploading files

3.2.5 Print settings

Print settings means to invoke the corresponding functions of WINDOWS directly. Change the appropriate printer parameters and page setup parameters to complete the print settings.

3.2.6 Printing

Printing means to invoke the corresponding functions of WINDOWS. Choose the right printer to execute the printing.

Notes:

The contents of this operation manual are subject to change without prior notice.