# Contents

# 1  Overview

## 1.1 Introduction

LR-G150 Rebar Scanner is a portable intelligent NDT device, which is mainly used for structural testing of reinforced concrete, and able to carry out accurate testing on depth of rebar cover and diameter of rebar on the surface of reinforced concrete, and analyze distribution of rebar.

## 1.2 Functions and characteristics

1.The appearance of the main engine is fashionable, and the design conforms to ergonomics, which makes it easier to use for a long time;

2.One machine dual use, dual operation mode, the probe can be used alone, can also be used with the displacement car;

3.The host is equipped with touch-able full-color LCD screen (854*480), with clear UI interface design and easy interaction;

4.Equipped with large capacity rechargeable lithium battery (6400mAh), battery compartment pluggable design, battery life is carefree;

5.Adopt high-power solid transmitting coil, super anti-interference ability, higher detection accuracy;

6.Innovative use of high-precision linear Hall sensor, rebar spacing detection accuracy is higher;

7.Upgrade stirrup correction function, support stirrup spacing and diameter correction at the same time, improve the measurement accuracy of concrete cover depth;

8.Professional PC software, intelligent analysis and automatic generation of detection report.

9.LR-150 can store 5000 objects and 500,000 measuring point data.

## 1.3 Technical indicators

| Description | | Technical indicators |
|---|---|---|
| Applicable range of rebar diameter(mm) | | Φ6-Φ50 |
| Max. range (mm) | 1$^{st}$ range | 6~90 |
| | 2$^{nd}$range | 6~180 |
| Max. allowable deviation on concrete cover depth | $\pm 1$ (mm) | 6~80 |
| | $\pm 2$ (mm) | 81~120 |
| | $\pm 3$ (mm) | 121~140 |
| | $\pm 4$ (mm) | 141-180 |
| Applicable range on diameter estimate (mm) | | Φ6-Φ50 |
| Max. deviation on diameter estimate | | $\pm 1$ spec |
| Display accuracy on diameter estimate (mm) | | 0.1 |

## Detailed specification on testing of concrete cover depth

| Dia. \ Range | Small | Large |
|---|---|---|
| φ6-φ8 spirally deformed steel bar | 6~70 | 8~100 |
| Φ10-φ18 spirally deformed steel bar | 7~80 | 8~130 |
| Φ20-φ22 spirally deformed steel bar | 8~85 | 10~140 |
| Φ25-φ28 spirally deformed steel bar | 10~85 | 12~150 |
| Φ32-φ36 spirally deformed steel bar | 12~90 | 15~160 |
| Φ40 Round steel | 12~90 | 15~170 |
| Φ50 Round steel | 12~90 | 15~180 |

## 1.4 Performance Indicators

| Performance indicators on LR-G150 Rebar Scanner | | | | | | |
|---|---|---|---|---|---|---|
| Conventional Scanning | Profile scanning | Grid scanning | Data correction | Range of scanning | Mode of data transmission | Wireless connections |
| Yes | Yes | Yes | Yes | Unbounded | Yes | Bluetooth |
| Data storage | Way of power supply | Host weight | Screen size | Displacement sensor | Touch screen operation | Host size |
| Flash Memory | Lithium battery | 620g | 5.0" (854*480) | Yes | Yes | 200*125*50 mm |

## 1.5 Precaution

1. Please carefully read the instructions prior to use.
2. Expected operating environment:
   Ambient temp.: -10°C~40°C
   Relative humidity: <90%RH

Electromagnetic interference: no strong alternating electromagnetic field

Exposure to direct sunshine for an extended period prohibited

Corrosion control: take necessary measures to ensure proper operation at the humid, dust and corrosive gas environment.

3. Expected storage environment:

Ambient temp.: -20°C~50°C

Relative humidity: <90%RH

In case of out of use for an extended period, please regularly switch on the instrument and recharge it. The instrument shall be placed at a well ventilated, cool and dry location without repeated exposure to direct sunshine.

4. Prevent moisture impact, and operation at the intense magnetic fields, such as in the vicinity of large electrical magnet, transformer, VFD, etc.

5. Vibration control: take measures to prevent violent vibration and impact during operation and handling.

6. Charge management: the instrument is recharged with the rechargeable lithium battery. In case of low battery, recharge the instrument without delay to avoid battery damage. Perform recharge with the recharger specific to the instrument rather than other types of adapter or recharger, which may otherwise lead to battery damage.

7. Maintenance: conduct proper cleaning at the end of operation every time to prevent declined performance or property damage due to dust presence in the instrument or plug connector.

## 1.6 Responsibility

The instrument is a precision detector. We will bear no responsibility in case of the following user operations being identified.

1. Incompliance with the above working environment requirements or storage environment requirements.

2. Non-standard operation.

3. Unauthorized removal of the casing and parts.

4. Serious instrument damage by operator or accident.

# 2  Instrument Description

## 2.1 Instrument Composition

The instrument consists of main machine, specific charger and attachment.

### 2.1.1 Main Machine

LR-G150 Rebar Scanner is illustrated below.



### 2.1.2 External Interface

USB interface: data transmission interface is used for connection to the computer to upload the data saved in the instrument or charge the instrument.
Signal interface: connect the sensor probe through the signal line for detection.

## 2.1.3 Key Description

| Key | Function description |
|---|---|
| **OK** | Enter the currently selected menu or confirm the input data |
| ▲▼ | Move the cursor up and down; add and subtract the selected data |
| ◀ ▶ | Move the cursor left and right; page up and down |
| **C** | Exit the current interface and Back to the previous menu |
| **SAVE** | Save the measured point value in sampling state |
| ⏻ | press and hold to start the machine when it is off |

The machine can also achieve full touch operation, the user can choose the operation mode according to the need.

Note: Refer to the related chapters for details on function of each key.

## 2.2 Testing Principle

The instrument will generate the pulsed magnet field via high-current excitation transmitting coil. In case of rebar being detected underneath the magnetic field, the rebar will produce the turbulence at the excitation of pulsed magnet field, and then make an induced magnetic field. The receiving coil will convert the induced magnetic field to an electrical signal. The main machine performs real-time analysis of the electrical signal, and then identify the location of rebar, Depth of concrete cover and diameter. The receiving coil is configured in a multiple set of coil combination, thus yielding the higher testing accuracy against the traditional coil testing in a single way.

## 3 Operation Description

## 3.1 System Overview

LR-G150 Rebar Scanner system is designed to assure indication of each function menu, instrument status, measurement data and result. The man-machine interaction for the entire system is achieved through the key and touch units, which is easier to operate than the traditional simple key operation.

### 3.1.1 Interface Description

The system interface mainly contains the menu selection and data result display, in which there are title display zone and content display zone. In the title display

zone, the current interface title, Bluetooth device and USB interface readiness and instrument battery status appear. In the content display zone, the main content in the current interface appears.

3.1.2 Operation Method Description

The user can work via key or touch screen. Use of touch screen is more convenient so we recommend to run the instrument with touch screen.

Key operation: the user can select the desired menu via Direction key in each interface, and confirm with【OK】key. Exit or cancel with【C】key.

Touch screen operation: the user can work with the icon in the touch screen.

**3.2 Function description**

The instrument is designed for rebar detection, data view, data uploading, data deleting, system setting, instrument information, etc.



Fig.3.1 Main interface

### 3.2.1 Rebar Detection

The rebar detection function is designed for detection on depth of concrete cover, rebar location, rebar diameter and distribution. Moreover, the obtained testing data can be saved to facilitate data view or uploading after detection. The rebar detection interface is illustrated in Fig.3.2.
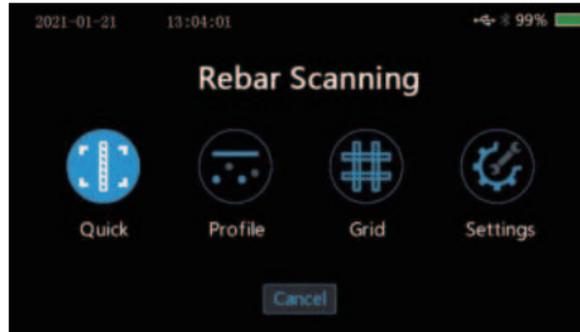


Fig.3.2 Main interface on rebar detection

The following operations are allowed in the rebar detection interface:

Key:
【◀▶】key: select the mode of rebar detection

【OK】key: go to the parameter setting interface under the appropriate mode of scanning

【C】key: return to the main menu

Touch: touch the appropriate icon to go to the appropriate mode of detection

### 3.2.1.1 Scanning parameter setting

The scanning parameter setting is mainly used to set the parameters which may be selected under the current mode of scanning. The parameter scanning interface is illustrated in Fig.3.3 (take the quick scanning parameter setting interface as an example).



| 2021-01-20 | 15:44:17 | | | +← 100% |
|---|---|---|---|---|
| ObjectNo. | | Type | Depth(mm) | Dia.(mm) |
| 0002 | | Girder | 25 | Φ16 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | DEL |
| Q | W | E | R | T | Y | U | I | O | P | |
| A | S | D | F | G | H | J | K | L | / | Scan |
| Z | X | C | V | B | N | M | + | - | # | |

Fig.3.3 Scanning parameter setting interface

The following operations are allowed in the parameter setting interface:

Key:

Direction key: select the option requiring adjustment

【OK】key: go to the status of change for the option

【C】key: exit the parameter change status or return to the rebar detection interface.

【SAVE】key: go to detection

Touch: touch the area requiring change to complete parameter change. Touch the appropriate icon button to function as expected.

**The parameters permitting change are as follows:**

Object No.

The object No. consists of digit, letter and symbol. The user can set a object No. in max. 16 digits and min. 1 digit. The user may carry out setting whenever required, as detailed below:

Move the cursor to the desired object No. Press【OK】key or directly touch the field to go to the object No. edit status. Now, a soft keyboard will appear in the bottom of screen. Select the character to be entered with use of direction key, and press【OK】key to confirm or directly touch Enter. Later, press【C】key return button to exit the edit status.

Type Of Object

It is used to set the type of rebar object being detected. You may select two types of object, i.e. "Beam" and "Slab".

**Design Depth**

It is used to set the design depth of concrete cover for the rebar being detected within a range of 6-180.

**Design Diameter**

It is used to set the diameter of rebar being detected. Total 15 types of rebar diameter can be selected, ie. 6, 8, 10, 12, 14, 16, 18, 20, 22, 25, 28, 32, 36, 40, 50.

**Notes:**

1) The object No. can be set in max. 16 digits without space. If you start detection without entering the object No., a prompt message will appear, reminding you of entering the object No.

2) For rebar depth of concrete cover measurement, it is required to set the rebar diameter beforehand. Only with correct setting of design diameter, can the correct depth of concrete cover being measured be assured. Otherwise, deviation to a varying extent may occur.

3) Setting of design depth and object type parameters is a basis of assessing if the depth of concrete cover at the measuring point during measurement is acceptable. All unacceptable measurements in the measurement interface are highlighted in red for quick identification.

**3.2.1.2 Quick scanning**

In the quick scanning interface, slowly move the trolley at constant speed to the right to start measurement. When the trolley approaches the rebar, The signal value starts to get bigger, At this time, the trolley needs to be moved slowly. When the signal value reaches the maximum value, it will be positioned to the middle

position of the rebar. This moment a beep sound being heard, The red indicator on the probe lights up,The depth value is displayed at the bottom of the screen. When the trolley is far away from the rebar, the signal value becomes smaller, and no signal value is displayed until it moves beyond the effective detection range.The cover depth and spacing is automatically calculated during the detection process. When the user removes the trolley and only uses the probe to detect, only the calculated value of cover depth is displayed.



Fig.3.4 Quick scanning interface

When the scanning distance is beyond the range of screen display, the screen will go to the next page. In case of unacceptable depth of concrete cover for the rebar being detected during detection, you may withdraw the trolley for measurement again. When the trolley moves back to the left side of measuring point,the system

will automatically remove the measured data. The retracement function only supports the detection mode with trolleys.The following key operations are allowed during depth detection:

【◀▶】key: Review the measurement data during detection

【SAVE】key: Instantaneously press for save the current depth of determination under the manual mode

【OK】key: Switch between the manual or automatic save mode

【C】key: Exit the scanning interface

【▲】key: Estimated diameter

【▼】key: Instrument self-calibration

Touch operation: complete appropriate operation in the field corresponding to the touch status bar.

Probe【◀】key:Instantaneously press for estimated diameter

Probe【▶】key:Instantaneously press for save the current depth of determination under the manual mode;Long press the key to Instrument self-calibration.

### 3.2.1.3 Profile scanning

Profile scanning is a type of scanning designed to display the location of rebar being detected,depth of concrete cover, distance of neighboring rebars, measurement diameter, etc. in the longitudinal profile distribution diagram.This type of

scanning is similar to the quick scanning. Please refer to quick scanning Section for specific operation.

Profile scanning must be carried out with trolley scanning, single probe scanning is not supported.The profile scanning is illustrated in Fig.3.5.
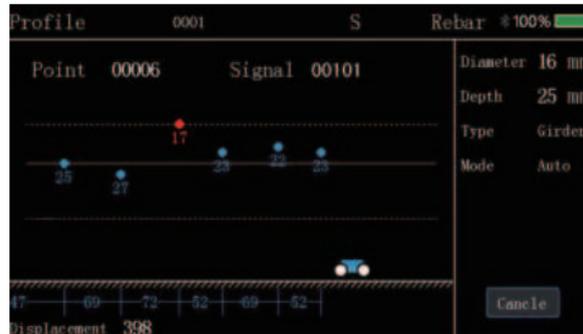


Fig.3.5 profile scanning interface

3.2.1.4 Grid scanning

Grid scanning is a type of measurement designed to display the location of rebar being measured , depth of concrete cover and rebar distance in the grid schematic. In the grid schematic obtained from grid scanning , the user can

clearly view the rebar distribution.Grid scanning must be carried out with trolley scanning, single probe scanning is not supported.

The grid scanning is illustrated in Fig.3.6.
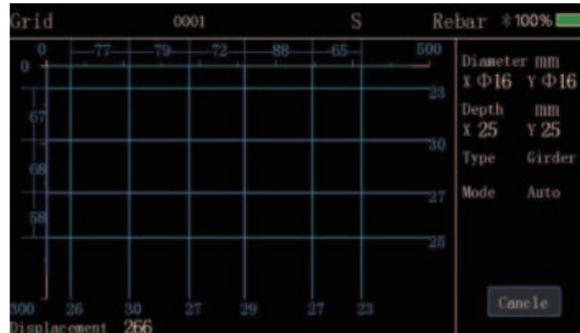


Fig.3.6 Grid scanning interface

For grid detection, firstly carry out "Grid horizontal" scanning, and slowly move the trolley to the bottom left of screen to start recording the displacement. When the rebar is detected, plot the rebar measuring point and depth of concrete cover with use of the grid line at the appropriate location, and calculate and display the

distance of neighboring rebars. At the end of scanning the rebar in the horizontal direction, press 【SAVE】 key to switch to the "Grid vertical" scanning to continue detection. At the end of entire detection, press 【C】key to save data and exit the grid detection.

The following key operations are allowed in the grid scanning:

【◄►】key: View the measurement data in the previous/next page during detection

【SAVE】key: Switch measurement direction

【C】key: exit the grid detection

【▲】key: Estimated diameter

【▼】key: Instrument self-calibration

Touch operation: complete appropriate operation in the field corresponding to the touch status bar.

Probe【◄】key:Instantaneously press for estimated diameter

Probe【►】key:Instantaneously press for switch measurement direction;Long press the key to Instrument self-calibration.

3.2.1.5 Detection setting

In the measurement interface, touch to select the detection setting, in which the stirrup diameter, stirrup distance, range selection, rebar type and other information can be set. select settings depending on the user's need.

### 3.2.1.6 Diameter estimation

It is able to display the estimated diameter under all scanning modes. In case of need to estimate the rebar diameter, move the probe to a point just above the rebar,and keep pressing 【▲】key to go to the diameter estimate function. Wait for 3sec. after measurement, and the instrument interface will display the estimated diameter and depth of concrete cover. Automatically exit 3 sec. later.

**Note:**

Keep the probe location constant during diameter measurement, which may otherwise lead to deviation of measurement result.

The diameter measurement results are displayed only, and not saved.

### 3.2.1.5 Signal resetting calibration

In case of change to the detection environment or considerable difference between the measured depth of concrete cover and the design, it is necessary to carry out signal resetting calibration for the instrument. Under any mode of measurement, press【▼】key to start the signal calibration function.

**Note:**

Instrument calibration shall be carried out to atmosphere, far from the ferromagnetic substances. As instructed in the interface, press【OK】key to start calibration. Exit at the end of instruct self-calibration.

The unacceptable calibration signal indicates calibration failure. Now, carry out calibration again.

### 3.2.2 Data view

There are two ways of viewing the object data available in the instrument, i.e. in graphic and list. The user can select an appropriate way of view on a case-by-case basis.

In the data view interface, the object list appears, as illustrated in Fig.3.7, including: object list information and data statistics of designated object

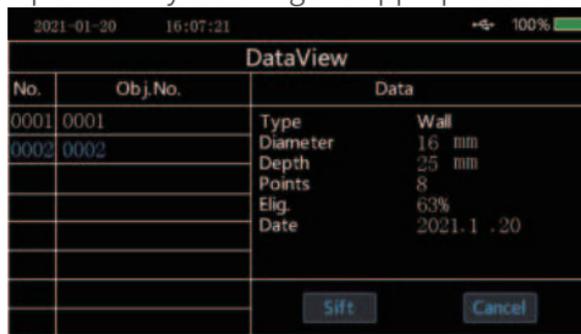The following operations are allowed in the object list display interface:

Key:

【◀▶】key: page turning

【▲▼】key: select a object

【OK】key: go to the graphic display interface containing the selected object data

【C】key: exit the data view interface

Touch: complete operation by touching the appropriate field or button.



Fig.3.7 Data view interface

### 3.2.3 Data deletion

The data deletion function is designed to allow data deletion manually. With access to the data deletion interface, the instrument will ask you if you want to delete data or not?. Now, press 【OK】key or the corresponding button in the touch screen to delete data. Press 【C】key or the corresponding button in the touch screen to cancel data deletion. The data deletion interface is illustrated in Fig.3.8.
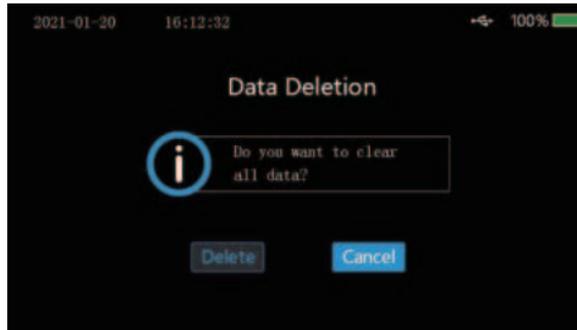


Fig.3.8 Data deletion interface

Notes:

1. Figure out if the data are uploaded to the computer prior to data deletion since the data are not retrieved after deletion.

2. The instrument is not configured to cancel with key or touch during data deletion.

3.2.4 Data uploading

It is advisable to upload the data to the computer on completion of data detection or with the memory nearly fully loaded. The user can upload the data via USB.

USB transmission is carried out in steps below:

1. Conduct wiring to the instrument and computer via specific USB data cable;

2. Switch on the instrument;

3. Activate the Langry rebar detector management software already in the computer;

4. Click the import object data menu in the menu bar;

5. Select the object data requiring uploading, and click the upload to start uploading the data;

6. Wait until data transmission ends.

### 3.2.5 System setting

The system setting menu interface is designed to provide the user with the system setting parameter information for his/her own adjustment, including the Key Tone, Backlight brightness, Power off time delay, scan setting and system management, as illustrated in Fig.3.9.



Fig.3.9 System setting interface

Key Tone:The user can choose whether to turn on the key tone according to the needs.

Backlight brightness:The system provides four levels of backlight brightness selection, which users can choose according to their needs. When the user does not operate the instrument for a long time, the backlight brightness will automatically drop to the minimum to save power.

Shutdown delay: when the user does not operate the instrument for a long time to reach the time set by the shutdown delay, the system will automatically shut down.

Initial value setting: when there is error in the test result, the test precision can be fine-tuned by adjusting the initial value.

Language setting: the default language of the system is english, which can be customized according to user needs.

### 3.2.6 About device

The About device menu provides the information on the device, as illustrated in F Fig.3.10, including the following:

Firware Ver.
BaudRate.
Device No.

E-mail.
Website.



Fig.3.10 About device interface

### 3.3 Firmware upgrading

There is a built-in firmware online upgrading program so that the user can carry out firmware upgrading through connection to the computer via data cable. Through connection to the computer via data cable, the computer software can automatically detect the firmware version no. In case of latest version of firmware, the computer software may ask theuser if upgrading is required.Refer

to the software description profile for details.
Note:
You shall not shut down the instrument during firmware upgrading. If upgrading fails, shut down the instrument and manually go to the upgrading interface for upgrading again.

# 4  Data analysis software description
## 4.1 Introduction
The rebar detection data analysis software is a multi-function analysis software developed by Jinan Langrui Detection Technology Co., Ltd. for processing the rebar detection data. The software can run in XP/win7/win10 OS, presenting friendly interface and easy operation, which is specifically designed for project detection staff.

1)Conduct management on all component information as well as the detection data at each measuring point;

2)Conduct analysis and evaluation on detection data according to the construction quality acceptance criteria;

3)Display the component data in a graphic way;

4)Generate a detection data file through integration of several ones; it is easy to add or remove the detection data;

5)Print the preview and export treatment results;

6)It is easy to import the rebar scanner data into the computer with use of the software to facilitate further analysis and archive;

7)Automatically generate the detection report in word format.

The data files saved in the software has the file extension name in . xgjy format. The detection report automatically generated has the file extension name in .docx format.

## 4.2 Software installation

Open www.langry.cn, find the corresponding model of rebar detector in the products and go to its product detail page, click the download center, download Installation files, double click the installation program "setup-x.x" and open the installation wizard. Please complete the installation as instructed and operate it. Please tick the option to generate a desktop shortcut. You can run the software by double-clicking the desktop shortcut.
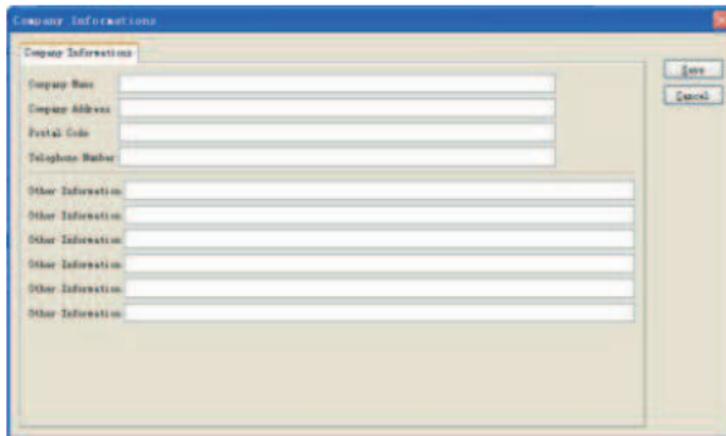
## 4.3 System setting

### 4.3.1 Enterprise information

Click "Tool (T) → Company information" menu item so that the enterprise, information option card may appear below. The enterprise information as shown below may appropriately appear at the corresponding page location in the testing report.

### **4.4 Receiving component data**

### 4.4.1 Connection to the rebar scanner host computer

1) Wiring of communication cable: confirm that the USB communication cable leading the computer to the rebar scanner host computer has been attached.

2) Instrument power-on: press the power-on key to switch on the rebar scanner host computer, and keep it online.

3) Click the title bar "Rebar Measurement" option. Select the "Import From Device" option in the pull-down menu, and click it. The rebar scanner data dialog box appears. The software provides the automatic port identification function. If the rebar scanner host computer is correctly attached to the computer, and maintained online, the software can automatically identify the communi

cation port and Baud rate, and display it. If the software fails to identify the communication port or the communication port is incorrect, please click the "Refresh" in the dialog box.
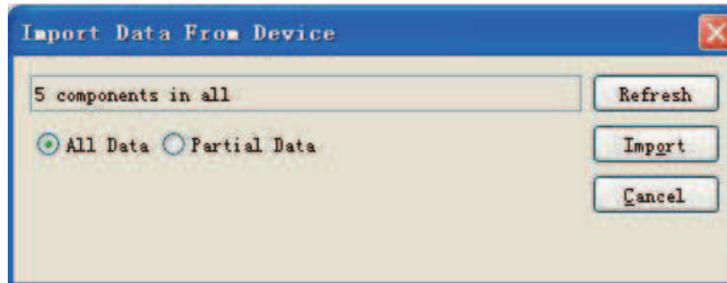


## 4.4.2 Data uploading

Select to import all components or partial components as illustrated above. Then, click "Import" so that the instrument can automatically upload the selected component data. No operation is required during uploading.
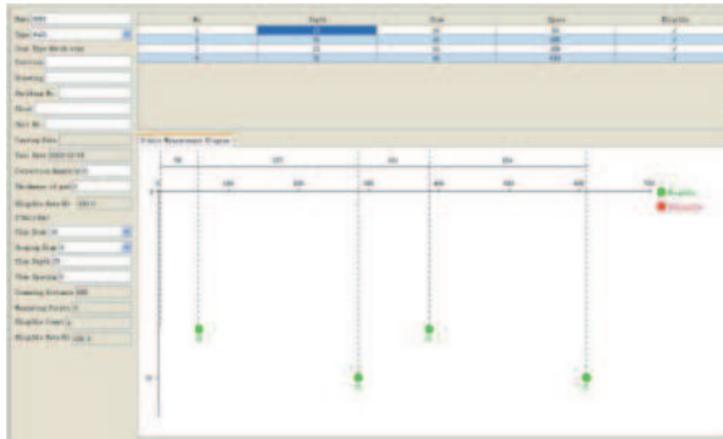
★When the data are transmitted the computer, the data saved in the instrument will not get lost.

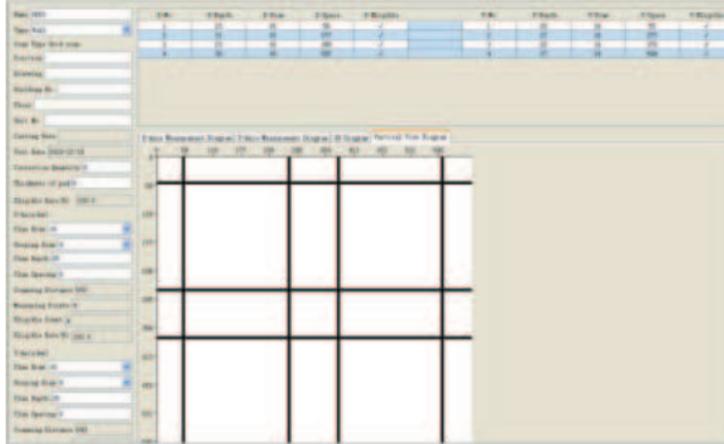★You may click Cancel to stop uploading at any time during uploading.

**4.5 Data processing**

4.5.1 Original data processing

In the software's home page, fill out the detection information and enterprise information, and "Original data record". In the "Detection data" master window, you can alter all the parameters which were not correctly entered, and make calculations again to meet the need of different clients.

When the data are uploaded, select the component no. in the left navigation bar, and fill out and set the component information in the right item box. Furthermore, you can view the detection results on the component.

Grid scanning and image scanning can display 3D stereogram and plan in the right graphic display box.

Display the waveform schematic via fine scanning

### 4.5.2 Data deletion

If you want to delete a component, click selection and press "Data processing (D)"→" Delete component" to delete the selected component.

★The deleted component goes to the list of deleted components, in which you may select the component deleted by mistake and retrieve it.

### 4.5.3 Data save

The original data or completed report can be saved in the computer. Click the title bar "File (F)" →" Save" to save the file in a format of .xgjy.

## 4.6 Upgrading

The user can manually carry out software upgrading and firmware upgrading. The computer shall be attached to the internet.

Software upgrading: click the title bar "Help" →" Check for updates" so that the software will automatically check for latest version of software. If so, the computer may ask the user if upgrading is required. Click "Upgrade" to start automatic upgrading.

Firmware upgrading: attach the rebar scanner to the computer's USB port via data cable. Switch on the rebar scanner, and click the software title bar " Rebar Measurement " →" updates firmware " so that the software may automatically check for latest version of firmware software. If so, the computer may ask the user if upgrading is required. Click "Upgrade" to start automatic upgrading