ZBL-R620/630

Rebar Locator

Operation Manual

Contents

ZBL-R620/R630 Rebar Locator is designed for the measurement of concrete cover, bar diameters, rebars distribution and trend.

1. General Introduction

1.1 Basic Working Principles

From its probe the apparatus emits an electromagnetic field into the interior of the test area, and then receives the induced magnetic field emitted from ferromagnetic media such as rebars, which is then converted into an electrical signal. The main instrument system allows real-time analysis and treatment of the electrical signal, displays the signal in several different forms such as image, data, and sound etc. enabling the correct determination of rebar location, thickness of concrete cover, and rebar diameter.

1.2 Components of ZBL-R620/R630

ZBL-R620/R630 Rebar Locator is composed of a main instrument body, a probe, a scan car (ZBL-R630 only) and signal transmission wire.

► The probe has direction sensitivity. The signal is strongest when the probe and the rebar directions are parallel, on the contrary the signal is weakest when the probe and rebar directions are perpendicular to each other.

► The scan car real-time correctly records the displacement of the probe.

Note: when measuring with the scan car, it is better to move the car in a smooth, uniform motion.

► ZBL-R620/R630 Rebar Locator standard accessories (Fig. 1.1)

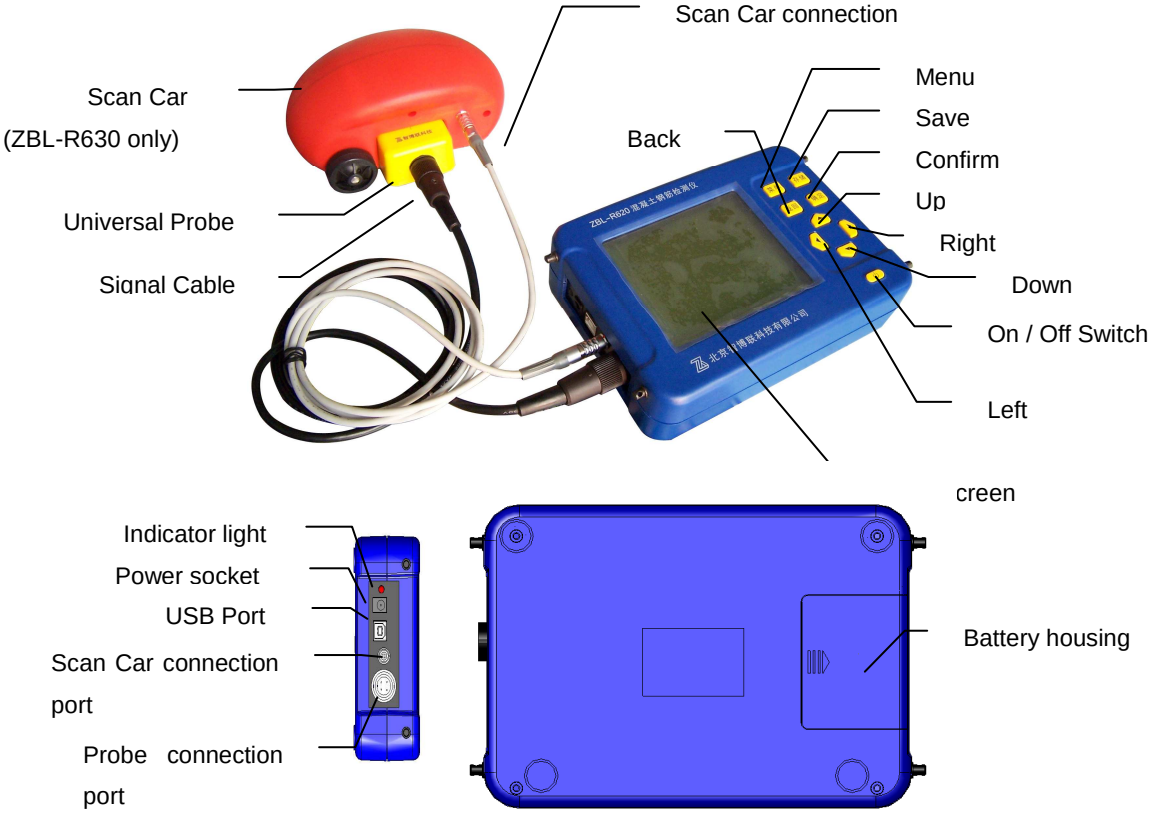


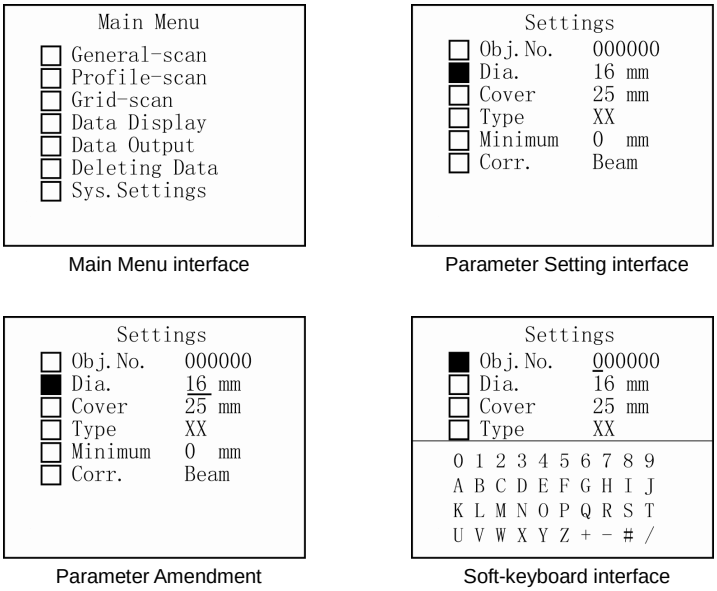
Fig. 1.1 Components of ZBL-R620/R630 Rebar Locator

1.3 System Interface

The ZBL-R620/R630 utilizes a multi-level menu management system.

The menu operation interface is used to choose functions and set parameters, including: (shown in Fig. 1.2)

- Main Menu interface
- Parameter Setting interface
- Parameter Amendment interface
- Soft-keyboard interface

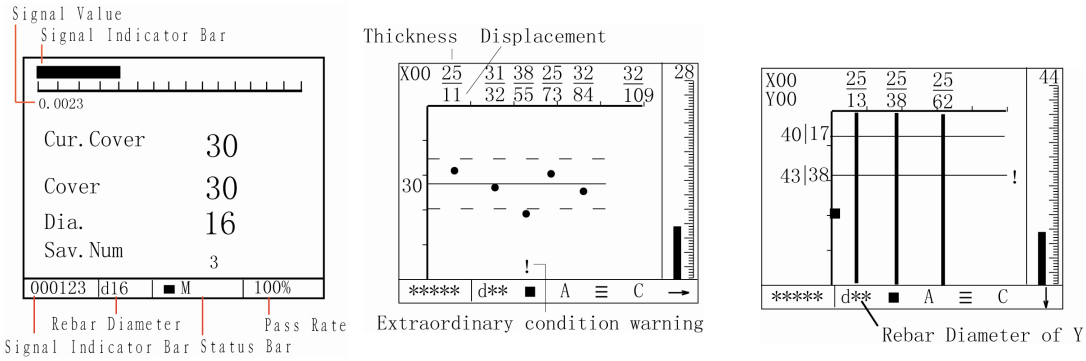


Main Menu interface | Parameter Setting interface | Parameter Amendment | Soft-keyboard interface

Fig. 1.2 Menu Operation Interface

The testing interface is used to scan data and display image, including: (shown in Fig. 1.3)

- General test (scan)
- Profile-scan (ZBL-R630 only)
- Grid-scan (ZBL-R630 only)



General-scan interface | Profile-scan interface | Grid-scan interface

Fig. 1.3 Testing Interface

2. Quick Access

Before using the apparatus outdoors it may be useful to first familiarize yourself with

the instrument by performing a number of tests in your home or office, prepare simple scenarios which mimic onsite working environments.

► Prepare some non-tensile rebars (use the two thick rebars to imitate the main rebar, and use the thin rebars to imitate the top redar), plexiglass boards (or other non-ferromagnetic materials such as wooden board), the board thickness is about 25mm

► Put the rebars on a plane and keep them away from ferromagnetic materials. Put the plexiglass board over the rebars. (Fig. 1.4)

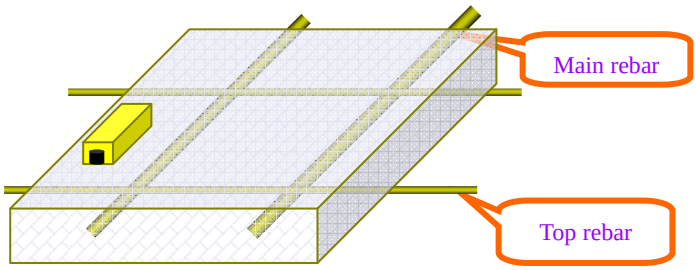


Fig. 1.4

2.1 System Connection

► Connecting the Probe (Fig. 2.1)

Insert the plug (black) of the signal line into the socket on the left of the rebar locator, **rotate clockwise and lock it tightly in place**. Insert the other end of the signal line into the socket on the probe and again lock it tightly.

Note：There is no directional difference in the signal line.

Fig. 2.1

► Connecting the Scan Car（Fig. 2.2）(ZBL-R630 only)

When inserting the scan car plug into its socket ensure to align the red dots, one on the apparatus with one on the signal line plug.

Caution: When inserting or removing the cable be sure to hold the grip at the plug end of the cable, otherwise the wiring my become loose.

Note：There is no directional difference in the signal line.

Correct

Incorrect

Fig. 2.2 connect with Scan Car

► Attach Scan Car (Fig. 2.3) (ZBL-R630 only)

Place the probe in the correct direction (with the ports of the probe and Scan Car in same direction, see fig 2.3), the central hole of the probe must be aligned with the raised point on the scan car. The probe should click firming and tightly into place.

Caution: When removing the probe from the scan car, open the two red clips and push the probe out.

Fig. 2.3 Attach and remove

2.2 Startup

Press the power On/Off key "⏻" and the rebar locator begins to operate.

The screen displays the startup interface (Fig. 2.4):

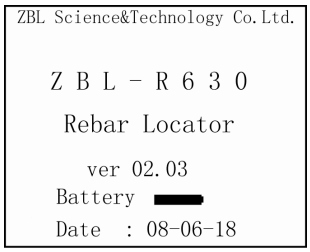


Fig. 2.4 Startup Display

The displayed information is as follows:

－Name of the Company

－Name and model number of the Rebar Locator

－Version Number of Rebar locator

－Remaining battery life

－Todays date

When the remaining power of the battery is low, the bar flashes three times, and there is a short beeping sound, indicating that the battery must be re-charged.

If the automatic self-test is OK, it automatically enters the menu display after about five seconds.

Shortcuts in Main Menu interface:

► 【→】key, background light on/off switch;

► 【↑, ↓】keys, move cursor up or down;

► 【**Enter**】key, access the highlighted option

2.3 System Reset

The reset operation is used to elimination instrument interference coming from environmental factors, and ensures that the test results are accurate and reliable. Before implementing a reset operation hold the transducer in the air, away from magnetic materials, and then begin the reset operation as detailed below. After 3 seconds, the current thickness value displays as "0" to indicate that the reset is complete, the display will then access "test waiting" status.

The system reset can be operated by the following two methods

1) Auto reset – when instrument accesses scan interface an automatic reset operation is implemented.

2) Manual reset – press 【**Enter**】key when in scan-test interface, to implement reset operation.

Caution:

- During detection process, it is advised to implement a reset operation about every ten minutes.
- If test data is unreliable, implement reset, then re-test.

2.4 Choosing Scan Mode

ZBL-R630 Rebar Locator provides several scan and work modes, the user can select the most suitable mode according to their requirements.

► Measuring modes: general test, profile-scan, and grid-scan.

Press 【**Enter**】key to access the highlight option

Caution: Each scan mode has corresponding parameter setting interface.

(Select the different mode to watch the corresponding video)

2.5 Parameter Settings (Fig. 2.5)

Set related parameters according to testing component situation, including object code, diameter forecast, design thickness, component type, etc.

► 【↑, ↓】keys, move cursor;

► 【**Enter**】key, access highlight option;

►【**Back**】key, save current parameter setting, return to previous menu, and reset the system;

► 【**Menu**】key, return to main menu interface.

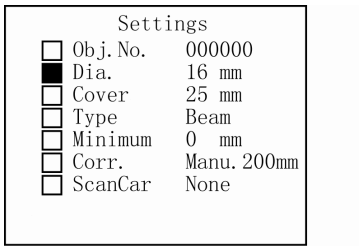


Fig. 2.5 General Test

Parameter amendment:

1) General situation

► 【↑, ↓】keys, select the parameter required;

► 【**Save**】key, save current setting, return to parameter setting interface.

2) Object code settings

Select the “object code” option, the soft-keyboard will display.

► Select the digit which requires modification

Press【← , →】keys, move the cursor to the digit which requires modification;

Press 【↓】key, a cursor displays in the top-left corner of soft-keyboard;

Press 【**Back**】key, return to parameter setting interface.

► Select character

【↑, ↓、←、→】keys, move cursor to select character;

【**Enter**】key, select the character at present cursor point, and return to previous menu.

E.g. (shown in video)

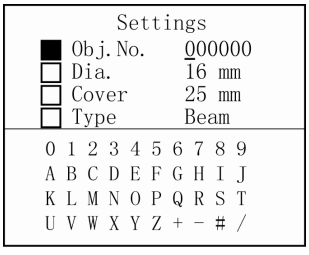


Fig. 2.6 object code setting interface

Move the cursor to “general test” option, press 【**Enter**】 key to access parameter setting interface. (Fig. 2.6)

1) **Object code** -- Object code is composed of six characters; numbers, letters or

symbols. The initial object code is 000000. When restarting, enter the parameter setting interface, the initial object code is the previously used code incremented by one character.

Move the cursor to “object code”, press 【**Enter**】key, the curser moves to below the first digit of the code.

▶ Press 【←、→】keys, move the cursor to the digit requiring modification;

▶ Press 【↓】key, a cursor displays in the top-left corner of soft-keyboard;

▶ Press 【↑, ↓、←、→】keys, select a character from the soft-keyboard;

▶ Press 【**Enter**】key, the selected character now appears in the new object code. The cursor of object code moves to the next digit and the cursor in soft keyboard will disappear.

If the next digit needs to be changed, repeat the operation above.

When the object code setting is complete, press the【**Save**】key to save this object code. The cursor will disappear, and the interface automatically returns to the parameter setting interface.

2）**Diameter setting** – Set the test rebar diameter. The initial value is automatically set to the previously used rebar diameter value.

When accessing the current setting, the cursor will be shown beneath the diameter value.

- Press 【↑, ↓】keys, to increase or decrease the rebar diameter value;
- Press 【**Save**】key, setting are saved, the cursor disappears and the interface automatically returns to the parameter setting interface.

3) **Thickness setting** – Set the concrete cover thickness of test rebar, the available range is 10 ~ 99mm, the initial value is automatically set to the previously used rebar thickness.

When setting thickness:

- Press 【↑, ↓】keys, increase or decrease the thickness value,
- Press 【**Save**】key, save setting, the cursor disappears, and the interface automatically returns to the parameter setting interface.

4) **Concrete component type** – type of concrete component, including “beam” and “board”.

- Press 【↑, ↓】keys, switch between beam and board. It can automatically judge if the value of thickness conforms to the international 50204 standard.

5) **Minimum thickness** – when fast general testing, set the allowed minimum concrete cover thickness of test rebar. The available range is 0 ~ 100 mm, the initial value is 0 mm.

- Press 【↑, ↓】keys, set the minimum concrete cover thickness;
- Press 【**Save**】key, save current setting, the cursor disappears, and the interface automatically returns to the parameter setting interface.

When the concrete cover thickness is found to be smaller than the minimum thickness, the apparatus will give a warning. In such an event the thickness value will not be displayed or saved.

Note: **When the minimum thickness is set as 0, the alarm function may be unavailable.**

6) **Data correcting** – There are two modes, “manual” and “none”, the initial mode is set to “none”, in which case the apparatus will not make any corrections to the data. To access this option,

- Press 【↑, ↓】keys, to switch the select between “manual” and “none”;

If the “manual” mode is selected, the apparatus corrects the test results by setting the distance from two neighboring parallel rebars to the test rebar. This function may improve the accuracy of the test results. The available range is 50 ~ 110 mm. To set the value of the distance to the neighboring rebars, first select the “manual” mode then;

- Press【→】key, move the cursor to the digit which need modified;
- Press 【↑, ↓】keys, to amend the data;
- Press【**Save**】key, save current setting, the cursor disappears, and the interface automatically returns to the parameter setting interface.

Note: **This function may not fully eliminate the influence coming from the neighboring rebars.**

7) **Scan car (ZBL-R630 only)** – It has two options, “on” and “off”. **If the scan car is to be used, select “on”, otherwise select “off”.**

- Press 【**Back**】key, save the setting and access the testing interface.

If it is in “parameter setting” interface

- Press 【**Menu**】key, return to main menu.

2.6 Scan Operation

ZBL-R620 provides three scan modes , ZBL-R630 provides three scan modes

1) **General Test:** It is the basic scan mode of R630. It accurately measures the thickness of concrete cover and the diameter of rebar, it may also judge if the component conforms to international standards.
2) **Profile Scan (ZBL-R630 only):** Displays rebar’s distribution in concrete’s profile style, suitable for situations when rebars have sparse distribution, we suggest to use this sort of scan in column and plate components’ detection.
3) **Grid Scanning (ZBL-R630 only):** Displays the rebar distribution over a single plane, suitable for situations when rebars have sparse distribution, we suggest to use this sort of scan in plate components’ detection.

Introduction of shortcuts:

- 【→】key, adjust measuring range(status bar indicate: ■ / □);
- 【←】key, switch save mode between “auto” and “manual” (In general test mode, it indicate A/M);
- 【↑】key, shortcut to diameter-test (suitable for general test mode);
- 【↓】key, switch work mode between “high-resolution rebar” and “general rebar” (status bar indicator: ☰);

When parameter setting is completed, press 【**Back**】key, the system accesses the “test waiting” status.

Note: The system will reset first. When the reset is completed, it is ready to begin testing. The scan starting point should be selected first, and then the system will save the scan results. This process is discussed in more detail below.

2.6.1 **Pre-scanning**

In order to know the rebar's general distribution a pre-scan may be performed on the concrete element. It is an important part when selecting scan starting point. A pre-scan allows real-time display of test information without saving data.

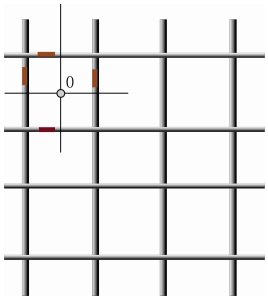


Fig. 2.7 Pre-Scanning

Generally, the rebars of the top layer are located first, and then a measurement of the central point between two top layer rebars is needed in order to locate lower layer rebars.

1) Rebar Location (Fig. 2.7, also see video)

Put the probe on the surface of the concrete element; ensuring that the probe is parallel to the rebar. Be sure to move the probe smoothly and evenly in a uniform motion. When the probe moves closer to the rebar, the signal strength bar rises, the signal value is larger, and the concrete cover thickness value becomes lower; once the peak value has been reached the instrument will produce a "beep" sound, and the screen displays related information. The display style differs according to the different scan mode.

T o accurately determine the peak of the signal move the probe in the opposite direction until the signal value is largest, and the thickness is the lowest. The central line of the probe is then the accurate location of the rebar. Select the central location of the two rebars which have largest distance between each other as the starting point of scanning. (Please mark this point with a pen)

2) Rebar Direction (Fig. 2.8, video)

The direction of rebars can be detected by the following two methods.

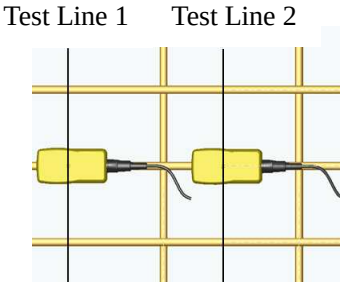


Fig. 2.8 Rebar Distribution

- When the rebar location is known, rotating the probe directly on the rebar. When **the signal value is the largest and the thickness value is the smallest**, the direction of the probe is the direction of the rebar.
- Detect two rebars location along two parallel measuring lines, the connected line between the two locations is then the direction of the rebar. (See fig. 2.8)

3) Estimate the rebar diameter

When the probe is located directly on the rebar, and is parallel to the rebar.

- Press 【↑】key, the screen displays the rebar diameter and the concrete cover thickness.

Note: There is a black triangle symbol before the thickness value; it means the thickness does not correspond to the pre-set diameter.

☞ In abnormal testing conditions, the rebar diameter may not be measured.

2.6.2 Start Scanning (Save Scanning)

Put the probe in the scan starting point as determined by the pre-scan, move the probe, the test result may vary with the probe location

1) General Test

When the rebar is detected by the probe, the system locks the thickness, in manual mode, press 【**Save**】key, save test result, and the save object code incremented by one.

In auto save mode, the save number automatically incremented by one.

When the probe is parallel to and directly above the rebar, and the probe and the rebar have the same direction:

- Press 【↑】key to estimate the rebar diameter.

The screen displays the practical test rebar diameter and thickness.

Note: There is a black triangle symbol before the thickness value; it means the thickness is not related with the pre-set diameter.

2) Profile Scan

- Press 【**Save**】key, access "waiting for save scan result" status. There is a black square on the top left of the screen, it indicates the location of the probe. Move the probe evenly and smoothly, when the probe is closer to the rebar, the signal strength bar is higher, the thickness is smaller; A "beep" sound means the probe have already crossed the centre of the rebar, and a black dot will appear to indicate the location of the rebar. The concrete cover thickness and the rebar coordinate (the distance between the rebar and the starting point, unit: cm) will be displayed above the black dot. The instrument automatically saves the test data and the image.
- Press 【**Back**】key, return to parameter setting interface.
- Press 【**Menu**】key, access the main menu interface.

Note: The maximum distance displayed on every page is 1.2m, if the test results exceed this length the screen will automatically turn to the next page, and the page number is increased by one.

3) Grid Scan

Select the direction to start the scan,

- Press 【**Save**】key, access "waiting for save scan result" status.
- Press 【**Back**】key, return to parameter setting interface.

When the scan of the first direction is completed, the user may scan another direction.

- Press 【**Save**】key, stop the current scan of the first direction.
- Press 【↑】key, change the scan direction.

Repeat the operation above, complete scan of another direction. A X, Y-2D scan is completed.

2.6.3 Second scan

A Second scan is scanning several test lines along X's direction (X2, X3, X4,…, Xn) or Y's direction (Y2, Y3, Y4,…., Yn) based on an initial first scan(Fig. 2.9). The second scan produces the real distribution of rebars, the test data is then transferred to computer where Windows analysis software will display rebar distribution image of rebar according to test data. (Fig. 2.10)

Principles of second scan operation:

- The beginning of the first and second scan should lie on the same line perpendicular to the scanning direction.

- Second scan updates scan data only, doesn't update the rebar's distribution image.

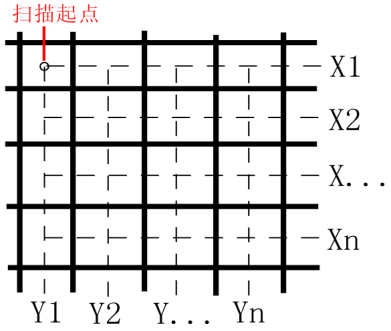


Fig. 2.9

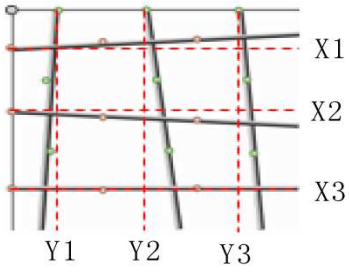


Fig. 2.10

The second scan operation introduced above is the normal operation, users don't need to scan every adjacent bar, instead a cross-bar scan is performed. For the Cross-bar scan a single bar in the x-direction and a single bar in the y-direction are selected for use during a second-scan operation. In order to use Windows software analysis the operator is required to record the separation between the parallel test lines of the first and second scans. For queries related to the use of the Windows software, the reader is directed to the R650 software operation manual.

2.7 Data Display

Display the saved component, data and image

1) In Menu interface, move the cursor to "data display" option.

- Press 【**Enter**】to access the "components list" interface

2) In data display interface

The left column shows the "components list", listed in descending order with the newest at the top. The right column shows the "data display" area, displaying the statistical information of saved data for the current concrete element.

- 【↑, ↓】keys, move cursor to the concrete element you want to select.
- 【← ,→】keys, allow movement to the next or previous pages of "concrete elements menu" shown in the left column of the screen;
- Press 【**Menu**】key, return to main menu.

Press【**Enter**】key to access the data display interface, the screen displays data or image (profile, grid).

- 【↑, ↓】key, allow movement to previous or next page in up-down direction (profile or grid scan mode);
- 【← ,→】key, allow movement to previous or next image in left-right direction(profile or grid scan mode).

2.8 Data Transmission

Using data transmission any data saved within the appliance can be transferred to an

external storage device, personal computer or notebook computer. Make sure that the computer has already been installed with the “rebar detect data treatment software” before transmission. Use a USB cable to connect the USB port of the instrument and USB port of the computer; if this data transmission function is used for the first time, you need to install appropriate driver first, the reader is directed to the appendix of R630 software operation manual.

☞ ：Please strictly obey the operation order following strictly.

1) Connection between reinforced detector and computer

- Use a USB cable to connect the instrument and computer. If the device is not recognized and the computer indicates that it has “found new hardware device” the user is directed to the appendix of R650 software operation manual for further advice.

2) Computer operation

Launch “Rebar test data analysis software”, select Tools menu, then select Data transmission, the transmission window shall now appear (see fig. 2.11).

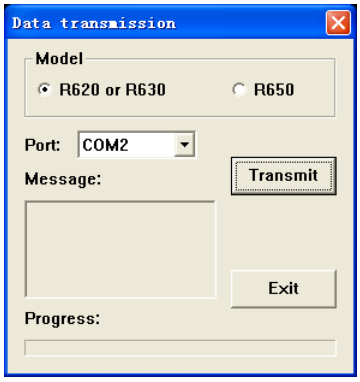


Fig. 2.11

- Select rebar test data (R630) from data type, then select USB port as data transmission port.
- press the Transmission key, pop-up window shown in fig. 2.12 appears.
- Input file name and press Save key. The computer is now ready to receive data transmitted from the instrument. The screen will displays “port initialization finished”.

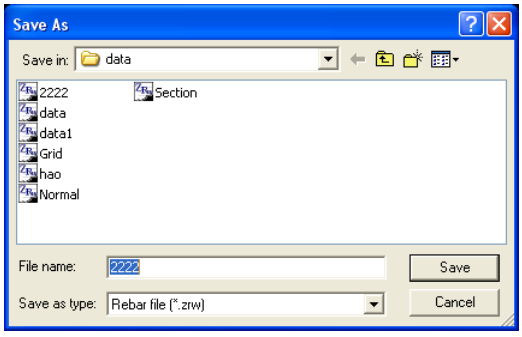


Fig. 2.12

3) Rebar locator operation

- Select “data transmission” option from ZBL-R620/R630 menu
- press【Enter】key to access data transmission interface (fig. 2.13);
- press 【Enter】key again to begin transmitting data (fig.

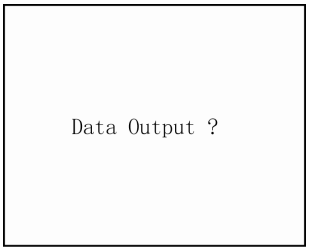


Fig. 2.13

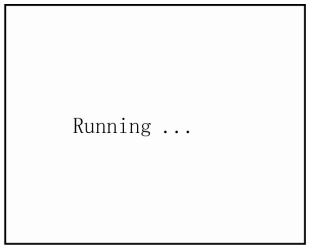


Fig. 2.14

2.14) . When the progress bar is full, transmission is complete and the display will automatically return to the menu interface.

4) When transmission is complete, the transmission dialogue exits automatically and the user can open the newly created document and begin analysis.

2.9 Deleting Data

Fig. 2.15 Deleting Data

This function will delete all data, if you want to keep the data, please transfer it to a computer or other external device.

The screen displays “Do you really want to delete the data?” (Fig. 2.15)

- Press 【**Back**】key, do not delete and return to main menu interface;
- Press 【**Enter**】key, begin deleting, the screen displays “deleting…”.

2.10 System Settings

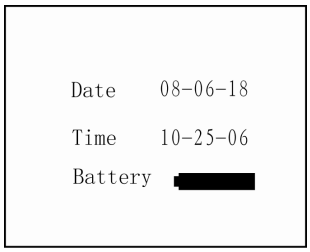


Fig. 2.16 System Settings Interface

When accessing the system setting function, the information below may be amended. (Fig. 2.16)

- Date: Year / Month / Day
- Time: Hour / Minute / Second (24hours mode)
- Power status may be checked in this interface.

Operating method:

- Press 【↑, ↓, ← , →】keys, move the cursor to the item which requires modification;
- Press 【**Enter**】key, access the highlight option;
- Press 【↑, ↓】keys, change the value;
- Press 【**Enter**】key, save settings and return to main menu;
- Press 【**Back**】key, return to main menu.

3. Troubleshooting

3.1 No display when booting

After booting, if there is nothing displayed (blank screen), please first check power status.

- Connect the instruments power supply using the charger provided, the green light in the upper-right corner of the screen will light up when connected properly; startup the instrument as usual, the screen will display as normal, the instrument

can work after being fully charged (or while connected to the charger).

- If there is still no display after connecting to the charger, please check charger or call our company hotline.

3.2 No signal

No signal display when scanning.

- Place the transducer away from any magnetic materials (in the air), and perform a system reset. Begin scan after the status bar indicates that reset is complete.
- Check if the connection of transducer's signal cable is correct.
- Check if the power is low, (battery power 0%).

3.3 No keypad tone

- Check system settings, turn keyboard tones on, then save settings.
- If settings are normal but there are still no keypad tones, call our company hotline.

4. Technical Indicators

Table 1.1: Ranges of Measuring Concrete Cover: Unit: mm

Bar Diameter	Concrete cover over small measuring range	Concrete cover over large measuring range
ϕ6 ~ ϕ8	6 ~ 70	10 ~ 100
ϕ10 ~ ϕ18	9 ~ 80	16 ~ 126
ϕ20 ~ ϕ28	10 ~ 86	20 ~ 160
ϕ32 ~ ϕ36	16 ~ 90	28 ~ 180
ϕ40 ~ ϕ50		

Table 1.2: Measurement Accuracy (covers) Unit: mm

Accuracy	Concrete cover over small measuring range	Concrete cover over large measuring range
±1	6 ~ 59	10 ~ 79
±2	60 ~ 69	80 ~ 119
±4	70 ~ 90	120 ~ 180

Table 1.3: Measuring Range of Rebar Diameter (Φ 6 mm ~ Φ 32 mm)

Rebar Diameter	Minimum Thickness of Concrete Cover	Maximum Thickness of Concrete Cover
6	8	60
8	12	62
10	12	66
12	14	68
14	14	68
16	16	72
18	16	72
20	18	74
22	18	74
25	20	76
28	22	76
32	22	80

Table 1.4: Measurement Accuracy (Bar Diameter) Unit: mm

Bar Diameter	6	8	10	12	14	16	18	20	22	25	28	32
Accuracy	+2	±2	±2	±2	±2	±2	±2	±2	+3 -2	±3	+4 -3	-4

Appendix A: General Principles of Rebar Testing

- Scan surface should be smooth and flat. If the surface is too rough to clean, put a thin board on the scan surface, after completing the scan the board's thickness must be subtracted from the scan results.
- Move the transducer in a unidirectional, uniform motion during the scan process.
- Direction of scan should be perpendicular to the direction of the rebar (fig. A.2), otherwise this may cause misjudge (Fig. A.1)
- For mesh rebar, locate the rebar of upper layer first then detect the central line of two upper layer rebars. This central line may then be used to locate the lower layer rebar.

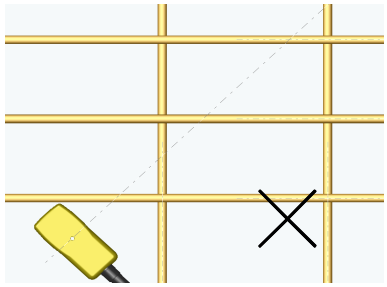


Fig. A.1

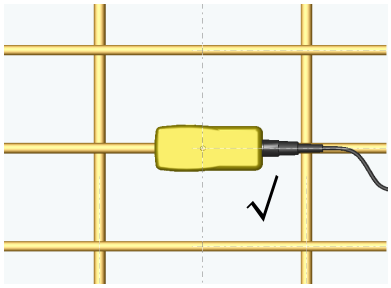


Fig. A.2