ＮＪＪ－１０５

Handy Search
Users Guide

Preface

Thank you very much for purchasing this JRC NJJ-105 Handy Search (hereafter called this product).

The NJJ-105 Handy Search nondestructively locates, detects, and displays the depths and positions of reinforcing steel bars in reinforced concrete structures.

- Before starting to use the NJJ-105 Handy Search, read through this instruction manual carefully to learn correct operations and ensure correct and trouble-free operations.

- Keep the instruction manual handy for reference. Refer to the manual when facing unknown things or when experiencing troubles during operation.

DC50-NJJ-105
First edition January 2011

Before Operation

Pictorial Indication

Various icons are indicated in this manual and are labeled on this product to ensure your safe and correct operations and to prevent any danger to you and/or other persons and any damage to your property during operation. Such indications and their meanings are as follows. Please understand them before reading this manual.

⚠**WARNING**	This indication is shown where any person is supposed to be in danger of being killed or seriously injured if this indication is neglected and this product is not operated correctly.
⚠**CAUTION**	This indication is shown where any person is supposed to be injured or any property is supposed to be damaged if this indication is neglected and this product is not operated correctly.

Examples of Pictorial Indication

Electric shock

A △ mark indicates CAUTION (including DANGER and WARNING). Detailed content of the specific CAUTION ("Electric Shock" in the example on the left.) is shown in the mark.

Disassembling Prohibited

Prohibition

A ⃠ mark indicates prohibition. Detailed content of the prohibited action ("Disassembling Prohibited" in the example on the left.) is shown in the mark.

Disconnect the power plug

Instruction

A ● mark indicates instruction. Detailed content of the instruction ("Disconnect the power plug" in the example on the left.) is shown in the mark.

●JRC assumes no liability for any damage (such as damage caused to reinforcing steel bars, electrical pipes, gas pipes, etc.) arising from scan results using this product.
●JRC assumes no liability for any damage arising from the disappearance of scan results stored in CF memory.

* Windows is a registered trademark or a trademark of Microsoft Corporation in United State and other countries.
*CompactFlash (CF) is a registered trademark or SanDisk Corporation.

Precautions for Use

⚠ WARNING

Do not use any battery pack other than the recommended battery packs. Doing so may cause fire, electric shock, or breakdown.

Do not short-circuit the terminals of the battery charger or battery pack. Doing so may cause fire, explosion, or breakdown.

Do not insert metallic or flammable objects into the CF memory slot. Doing so may cause injury, fire, electric shock, or breakdown.

Do not disassemble, modify, heat, or place battery pack in fire. Doing so may cause fire, explosion, or breakdown.

Do not use any charger other than the recommended battery charger to charge the battery pack. Doing so may cause fire, electric shock, or breakdown.

Do not disassemble, modify, or repair this product by yourself. Doing so may cause fire, electric shock, or breakdown.

If the power cord is damaged (exposure of the core wire, open circuit failure, or break in the sheath), contact our nearest branch office (See Section 9), sales outlet, or service station for a replacement power cord. Use of a damaged power cord may cause fire or electric shock.

Do not connect/disconnect the power plug by wet hands. Doing so could cause an electric shock.

Do not use (place) this product in a location where it is exposed to flammable or corrosive gas. Doing so could cause fire, personal injury, or breakdown.

This product has a waterproof construction but must not be dipped in water. Do not expose this product to water or moisture, and do not use it in rainy weather. Doing so could cause an electric shock or breakdown.

Stop using this product immediately when a sign of malfunctioning is detected, and follow only the detailed procedure in this instruction manual. If it cannot be restored to normal operation, contact our nearest branch office (See Section 9), sales outlet, or service station. Use of this product in an abnormal state could cause fire or breakdown.

Should this product emit an abnormal sound, odor, or smoke, immediately turn off the power switch, remove the battery pack, disconnect the power plug from the socket outlet, and contact our nearest branch office (See Section 9), sales outlet, or service station. Use of this product in an abnormal state could cause fire, electric shock, or breakdown.

Before disposing of the used lithium ion battery, insulate the charging terminals by taping or the like. Otherwise, the battery could cause fire or explosion if short-circuited.

⚠ CAUTION

Judge the scan result with considering the depth sensing capability of this product. Since the depth sensing capability of this product is subject to the conditions of the object of investigation, judging the scan result with no consideration of the depth sensing capability may cause the cutting of rebar.

Put your hand through the hand strap and hold this product. Dropping of this product may cause an accident such as a device breakdown or personal injury.

When disconnecting the power cord, hold the plug. Pulling the power cord by itself may cause cord damage, fire, or electric shock.

Do not place this product on an unstable place such as a wobbly table or sloping surface. Doing so may cause a personal injury or breakdown when it drops or falls.

Do not use (place) this product in a humid or dusty location, or a location where water, oil, or chemical may splash onto this product. Doing so may cause fire, electric shock, or breakdown.

Do not use (place) this product in a location where it is subject to vibration or shock. Doing so may cause a personal injury or breakdown.

When loading/unloading printing paper, be careful not to cut or jam your fingers in the printer.

Point the antenna surface in the direction of the object (concrete) while you are performing a probe. If it is pointed into the air or otherwise unsuitable direction, it can cause malfunction of other equipment or other such accidents.

Do not use this product in the vicinity of a radio or TV set. Doing so may cause noise or poor reception such as disturbance of television pictures. Doing so also adversely affects the depth sensing capability of this product, and may cause the cutting of reinforcing steel bars.

Do not use this product near a cell phone or transceiver that transmits electromagnetic waves. Electromagnetic waves from the cell phone or transceiver may adversely affect the depth sensing capability of this product, and may cause the cutting of reinforcing steel bars.

When this product is used for probing on a road, take safety precautions such as providing guard fences to prevent traffic accidents.

Appearance


START MARK
SET
ENTER
GAIN
PRF
CF
OUTPUT
JRC
NJJ-105
HANDY SEARCH

Table of Contents

Glossary of Terms

A-mode	Displays received waveform as it is. The conditions of concrete directly underneath this product are displayed as reflected waveform in real time.
B-mode	Displays the vertical cross section of a scan point by gradating the reflected waveform shown in A-mode according to reflection intensity and continuously displaying it.
BA-mode	Displays both B-mode and A-mode images at the same time.
Real time auto surface wave processing	Image processing to automatically remove the unwanted waves reflected from the concrete surface during scanning by using the internal fixed surface wave data and shows only the reflected wave from rebar etc.
Real time manual deduction processing	Image processing used in the case where the unwanted waves reflected from the concrete surface can not be fully removed by using the real time auto surface wave processing and the unwanted waves remain as the form of stripes in the scan result. In this Image processing, an arbitrary line is designated while scanning. The data of the designated line is subtracted from the scan result data, and the reflected wave from the concrete surface is automatically removed. Thus, only the reflected waves from rebar etc. are shown.
Real time auto user surface wave processing	Image processing to automatically remove the unwanted waves reflected from the concrete surface during scanning by using the surface wave data which are defined by the user and stored in the product and shows only the reflected wave from rebar etc.
Fixed surface wave processing	Image processing to remove the unwanted waves reflected from the concrete surface by using the internal fixed surface wave data and shows only the reflected wave from rebar etc.
User surface wave processing	Image processing to remove the unwanted waves reflected from the concrete surface by using the surface wave data which are defined by the used and stored in the product and shows only the reflected wave from rebar etc.
Deduction processing	Image processing to remove the stripe reflected waves throughout the entire depth, such as reflected waves from the concrete surface and from the rear surface etc. In this processing, an arbitrary line in the scan result is designated and the designated line is subtracted from the scan result data and only the reflected waves from rebar etc. are shown.
Manual surface wave processing	Image processing to remove the unwanted waves reflected from the concrete surface by using the surface wave data of the disignated position in the search results and shows only the reflected waves from rebar etc. In this processing, an arbitrary line is designated from scan results. The surface portion of the designated line is subtracted from the scan result data, and the reflected waves from the concrete surface is removed.
Average wave processing	Image processing to remove the stripe reflected waves throughout the entire depth, such as reflected waves from the concrete surface and from the rear surface etc. In this processing, the averaged waveform of the entire scan results data are calculated and is subtracted from the scan result data, and only the reflected waves from rebar etc. are shown.
Peak processing	Image processing that shows only the waveform of the first peak on the +side of the scan result. This enables removal of multiple reflected signals and only displays the upper rebar.

Glossary of Terms (Continued)

Original image	Restores the image processed result to the original state and displays unprocessed raw data.
Distance feed scan	Scan method that performs scanning in accordance with Handy Search's traveling distance, using the distance detector mounted on the wheels of this product.
Time feed scan	Scan method that performs B-mode scanning at preset time intervals, regardless of movement of this product.
Relative dielectric constant	Object-specific coefficient. The radio wave propagation velocity changes with the relative permittivity (dielectric constant). Therefore, the wave propagation velocity and search depth change based on the relative permittivity of the concrete. Calculation error of search depth can be reduced by setting a depth calibration value.

1 Description of Equipment

This product is indispensable for repairing/rebuilding and maintaining reinforced concrete structures using its accurate and speedy diagnostic technology.

This product (concrete internal probe vehicle) radiates electromagnetic waves through the surface of concrete and receives reflected signals from objects found inside such as reinforcing steel bars, cavities, or other objects that have different electrical characteristics from concrete. Object position and depth are then displayed and recorded as image data.

CAUTION

Judge the scan result with considering the depth sensing capability of this product. Since the depth sensing capability of this product is subject to the conditions of the object of investigation, judging the scan result with no consideration of the depth sensing capability may cause the accidental cutting of rebar.

1.1 Function

Table 1-1 shows functions and performances of this product.

Table 1-1 Functions and Performances of this product

No.	item	Functions and Performances
1	Search method	Electromagnetic wave radar method
2	Search object	Rebar (reinforcing steel bar), Polyvinyl-chloride pipe, Cavity, etc.
3	Search depth	5 to 300mm for concrete having a relative dielectric constant ＝ 6.2 and the top rebar of diameter ≧ 6mm
4	Depth resolution	Approx. 1 mm at the display range setting of Shallow Approx. 2 mm at the display range setting of Deep
5	Horizontal discrimination resolution	≧ 75mm for the scanned object located at depth < 75mm ≧ Depth of the scanned object for the object located at depth ≧ 75mm ※Typical performance for the reference concrete: This product allows the user to discriminate between two rebars located respectively at depth 75mm and 175mm and at the interval of 40 mm.

Table 1-1 Functions and Performances of NJJ-105 (Continued)

No.	item	Functions and Performances
6	Maximum search depth	2.5mm
7	Maximum scan distance	15m
8	Display mode	B-mode (Vertical Cross Section) and BA-mode(Vertical Cross Section and Reflection Waveform Graph)
9	Image processing	During scanning: Real time auto surface wave processing, Real time manual deduction processing, and Real time user surface wave processing
		After scanning: Fixed surface wave processing, User surface wave processing, Deduction processing, Manual surface wave processing, Average wave processing, Peak processing, and Original image
10	Depth calibration	2.0 to 20.0, 0.1 step and time
11	Maximum scan speed	Approx. 40cm/s, Alarm capability furnished for the over speed scanning
12	Control functions	Display marker（Maximum 42 points), Battery capacity indicator, and Display inverse video
13	Data output functions	Dedicated printer (Option, Monochrome print) and CF Memory (Approx. 200 scan data of 15m distance and binary format can be stored in the 1GB CF memory)

1.2 Features

This product has the following features:

(1) The material of the object to be scanned can be either metallic or non-metallic

Reflected electromagnetic waves are generated at an interface when the electrical property of an object is different from that of concrete. Thus, this product can probe polyvinyl-chloride pipes and cavities (dependent on the position and size) as well as the reinforcing steel bars. Note that polyvinyl-chloride pipes and cavities echo weakly in compared with the reinforcing steel bars.

If a polyvinyl-chloride pipe or cavity is near or below the reinforcing steel bars, the reflected signals from the polyvinyl-chloride pipe or cavity may not be obtained due to the strong reflected signals from the reinforcing steel bars. Thus, care should be taken when you make a judgment on the scan result.

(2) Detects rebars that cross the scanning direction

Rebar that cross the scanning direction transmit a large magnetic wave reflection. On the other hand, rebar that is parallel to the scanning direction transmit a smaller magnetic wave reflection. Even if scanning is performed above rebar that is parallel to the scanning direction, this product can still detect any rebar that is crosswise to the scanning direction.

(3) Obtaining continuous scan results

The scan result are obtained as a representation of the vertical cross section of the inside of concrete. Thus, a comprehensive view of the internal concrete conditions can be obtained.

(4) Obtaining scan results at the site

This product does not need to be secured to the surface of concrete. Scanning is carried out while this product is moved, and scan results concerning the internal conditions of the concrete can be provided immediately.

(5) Saving and reading scan data

Using a CF memory, scan data can be saved and reopened (maximum of roughly 50 sets of data can be saved in text format for a depth of 15 m using a 512 MB CF). The data can also be loaded from the CF memory into a PC by using a memory reader or the like.

(6) Printing without cable connection

This product is equipped with IrDA, therefore, printing can be performed without using a cable using a DPU-3345 series printer.

However, the IrDA optical receptors for this product and the printer must be set facing each other at a distance of 50 ~ 500 mm (without any obstacles between them).

(7) Performing real time automatic surface wave processing

Internal fixed surface wave data is used to automatically remove the wave reflected from the concrete surface during scanning enabling the showing of the reflected wave from rebar.

Furthermore, surface wave processing can be switched to processing that uses scan data surface waves during scanning (real time manual deduction) enabling highly accurate surface processing.

(8) Displaying the data of an arbitrary point after scanning (scroll function)

This product can store 15m worth of data at a time and display the data of arbitrary points continuously.

(9) Changing sensitivity and performing image processing for scan data

This product can display scan results after changing sensitivity or performing image processing (manual surface wave processing, peak processing, original image, fixed surface wave processing, or deduction processing). Thus, performing a scanning again with a new sensitivity setting is not necessary.

(10) A marker can be displayed in the scan results using the cursor marker function.

A maximum of 42 cursor markers can be placed in the scan results to display the scan position and depth of the marker.

(11) Providing the screen inversion function

Screen inversion function is available. In case of scanning from right to left on a wall surface, the display on the screen is upright (normal). In the case of scanning left to right, the display will be inverted.

Therefore, the user can achieve the correct display by performing the scan either right to left or left to right.

(12) Recording of date and settings

The main unit records the date and settings (data number, sensitivity, etc.) using a backup function. When data is output, the date and settings are recorded.

(13) Compact and light weight

This product weighs only about 1.1 kg, so it is easy to operate.

(14) Operating with the battery pack and commercial power supply

This product can operate with the battery pack for about 1.5 hours (at normal temperature). It can also operate with the commercial power supply when an AC adapter (optional) is used.

1.3 Configuration

(1) Standard components

Table 1-2 shows the standard configuration of the Product NJJ-105.

Table 1-2 Standard Components

Name	Model Number	Quantity	Remarks
Handy Search	NJJ-105	1	
Battery pack	BP-3007 series	1	
Battery charger	BC-3008 series	1	
AC cable	CB-JP05 series	1	For the battery charger
Hand strap	H-7ZYMD0018	1	
CF memory	TS1GCF80	1	Memory size: 1GB
Storage box	H-7ZYMD0017 series	1	
Users Guide	DC50-NJJ-105	1	This manual
Quick instruction sheet	DC60-NJJ-105	1	
License agreement for software	DC20-NJJ-105	1	

(2) Options

Table 1-3 shows optional products that are provided in addition to the standard components.

Table 1-3 Options

Name	Model Number	Remarks
Battery charger set for the Handy Search (*1)	CBK-154	For the battery pack BP-3007 series: Set configuration: Adapter (PWC-L07 series) AC cable (CB-JP05 series)
Printer set	CMZ-303	Set configuration: Printer (DPU-S445 series) Battery pack (BP-L0720 series) Printing paper (TP-341series)
AC adapter set (*1)	CBD-2485	Set configuration: AC adapter (PW-0904 series) AC cable (CB-JP04) series
Battery charger set for the printer (*1)	CBK-254	For the battery pack BP-L0720 series Set configuration: Adapter (BC-3008 series) AC cable (CB-JP04 series)
Battery pack (*1)	BP-3007 series	For the Handy Search (NJJ-105)
Battery pack	BP-L0720 series	For the printer DPU-S445 series
Printing paper (*1)	TP451C	Set of 10 rolls

(*1): Are common for NJJ-95 series option printer DPU-3445.

1.4 Overall System Diagram

Figure 1-1 shows the overall system diagram of this product.

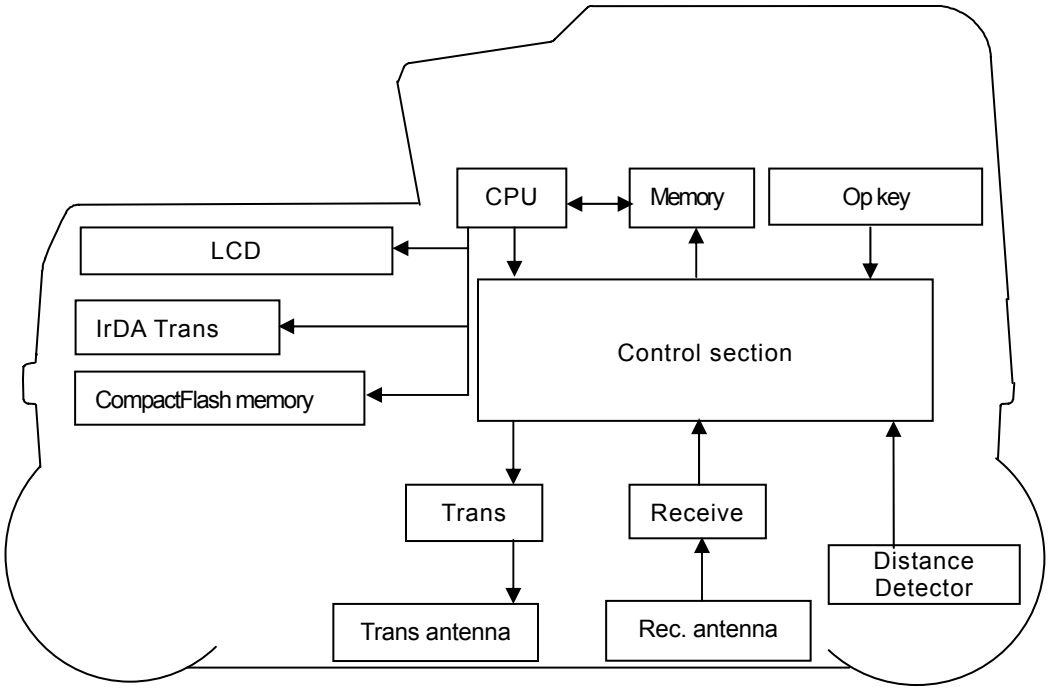
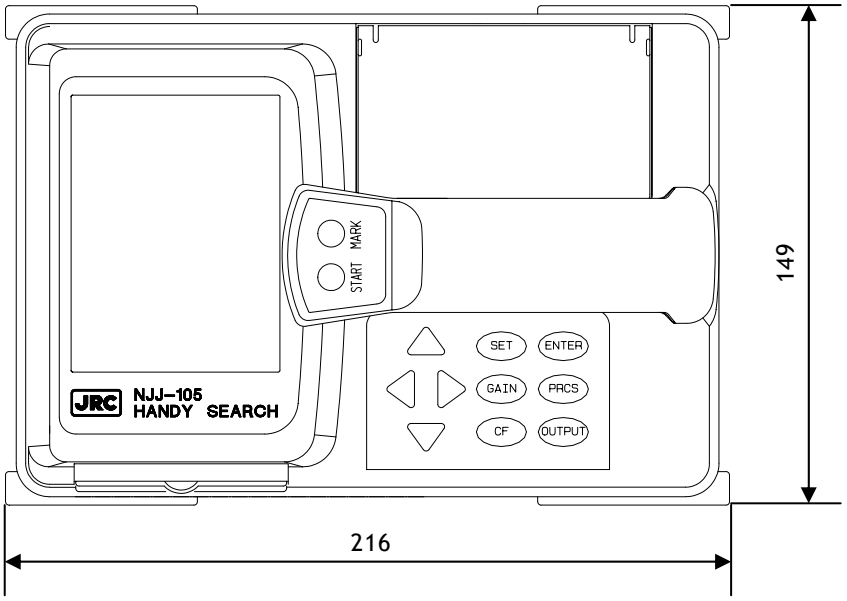


Figure 1-1 Overall System Diagram

1.5 Configuration

Figure 1-2 shows the external views of this product.

Top view drawing



Side view drawing

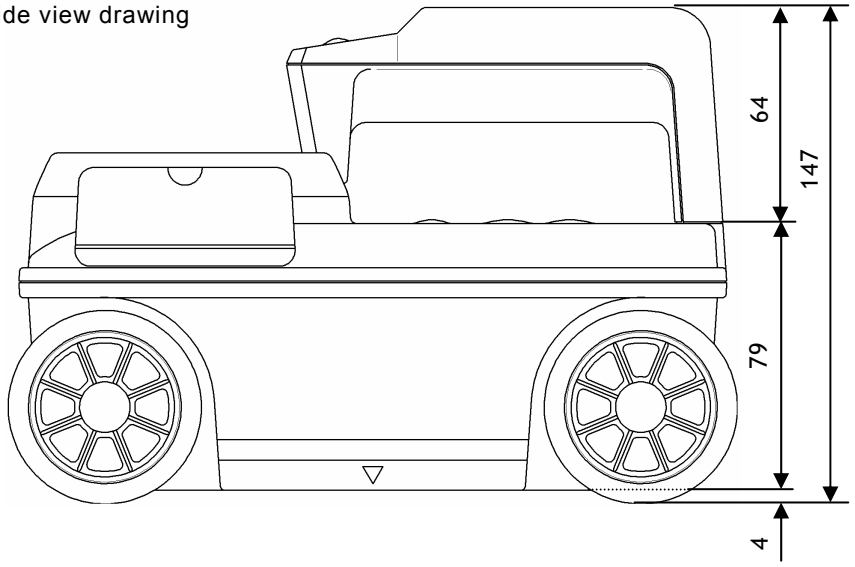


Figure 1-2. Handy Search NJJ-105 external dimensions diagram

2 Parts Names and Functions

2.1 Handy Search NJJ-105

This section shows the operation panel of this product and explains the functions for each part.

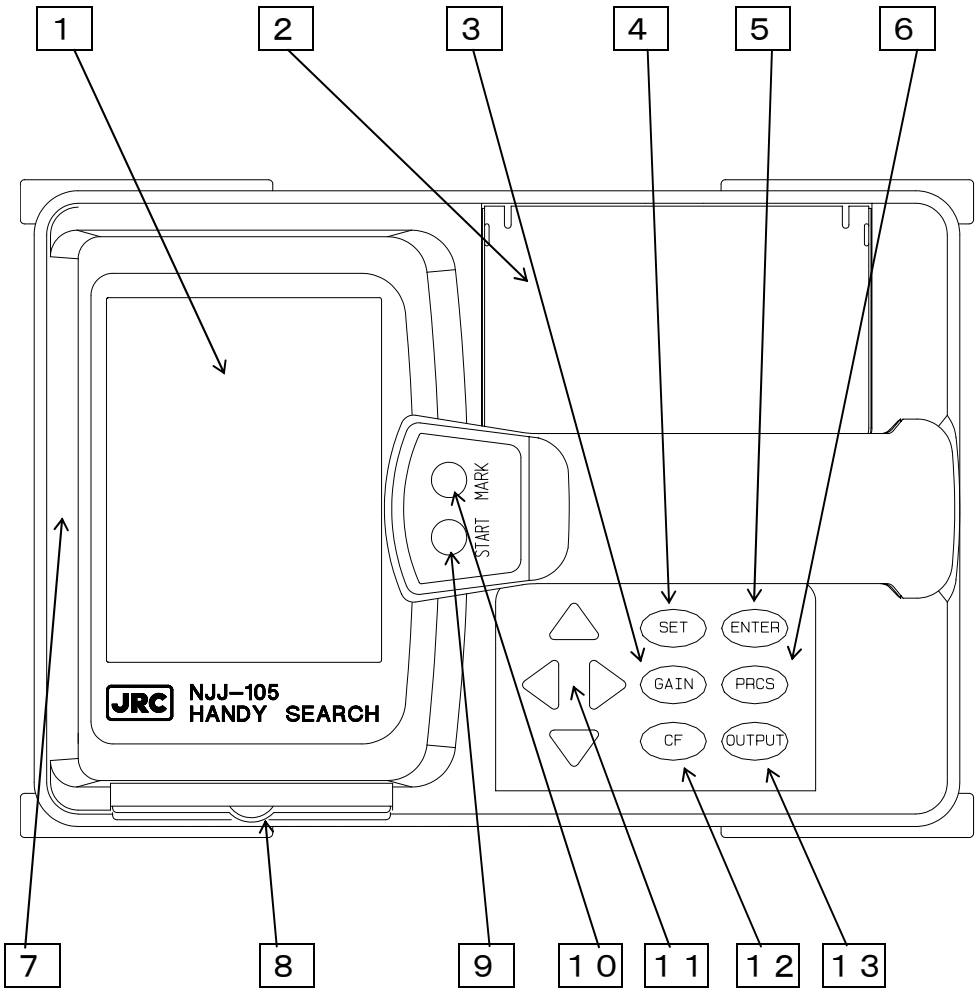


Figure 2-1 Top View

Table 2-1 Main Functions of Parts on this product

Number in Square	Label	Function
1	(None)	LCD (liguid crystal display) screen
2	(None)	Battery holder
3	GAIN	Sets the sensitivity
4	SET	Sets each of the parameters.
5	ENTER	Decision key for start of image processing and various types of selection.
6	PRCS	Switch to image processing mode.
7	(None)	IrDA optical receptor for communicating with the printer
8	(None)	CF memory slot
9	START	Starts/stops the scanning.
10	MARK	Displays a marker on the scan screen.
11	▲ ◀ ▶ ▼	Used for movement of cursor and screen and making changes to the various parameters.
12	CF	Switch to the CF control screen.
13	OUTPUT	Key for outputting data.

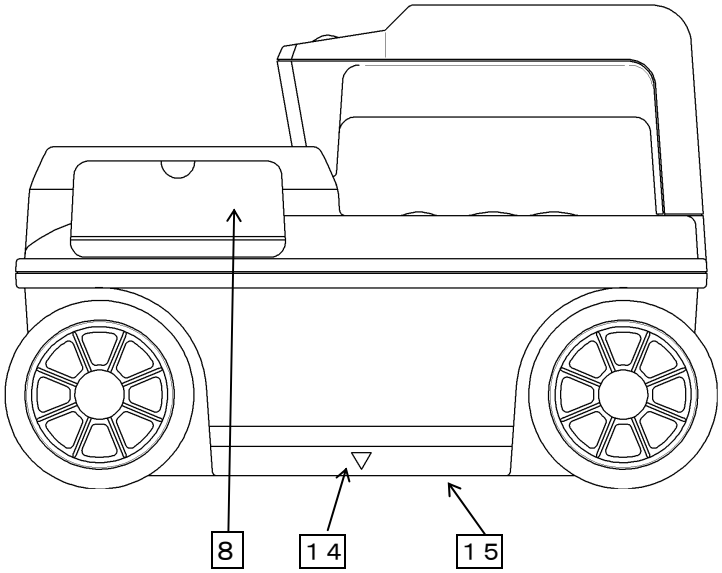


Figure 2-2 Side View

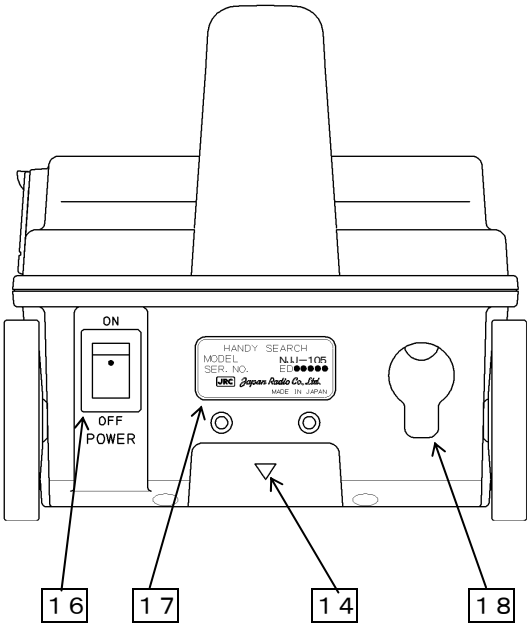


Figure 2-3 Rear View

Table 2-2 Functions of Parts on the Side and Rear Panel

Number in Square	Label	Function
14	▽	Mark indicating the scan position.
15	(None)	Antenna face to radiate and receive electromagnetic waves
16	POWER ON OFF	Turns power on and off.
17	(None)	Equipment nameplate
18	(None)	Connector for AC adapter

2.2 Example of the Scan Screen

Describes each display on the scan screen.

2.2.1 Scan screen example (during scanning)

An example of a scan screen (during scanning) is shown in Figure 2-4.

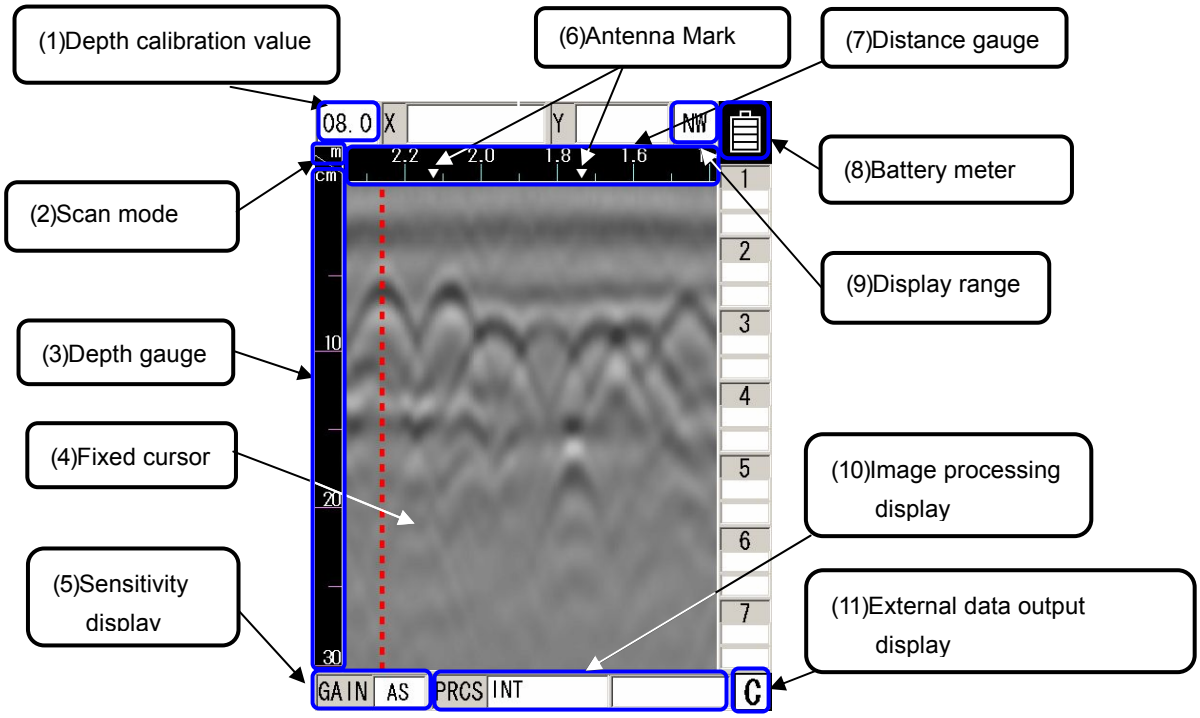


Figure 2-4 Scan screen example (during scanning)

(1) Depth calibration value

Displays the depth calibration value set at the parameter setting screen. See Section 2.3.6 depth to set the depth calibration value.

(2) Scan mode

Displays the scan mode set at the parameter setting screen. When selecting the distance feed scan, m , cm , or mm is displayed. When the time feed scan is selected, s is displayed. See Section 2.3.5 X-axis to set the scan mode.

(3) Depth gauge

Displays a depth gauge. The depth gauge changes based on the depth calibration value.

(4) Fixed cursor

Is a cursor fixed at the specified position that is used to designate surface waves used for real time manual deduction processing. See Section 3.2.5 Real time manual deduction processing for more details.

(5) Sensitivity display

Displays the scan sensitivity setting. See Section 3.2.3 Sensitivity for more details.

(6) Antenna mark

Displays the position of antenna marks. See Section 3.2.4 Antenna mark for how to use the antenna mark.

(7) Distance gauge

Displays the distance moved while performing a scan.

(8) Battery meter

Displays the remaining power in the battery pack.

(9) Display range

Displays the display range set at the parameter setting screen. See Section 2.3.11 Display range for mode details.

(10) Image processing display

Displays the selected image processing performed during scanning. See Section 3.4 Image processing for how to perform the image processing.

(11) External data output display

Displays the destination of the external data output set at the parameter setting screen. See Section 2.3.10 External data output for more details.

2.2.2 Scan screen example (during not scanning)

An example of a scan screen (not during scanning) is shown in Figure 2-5.

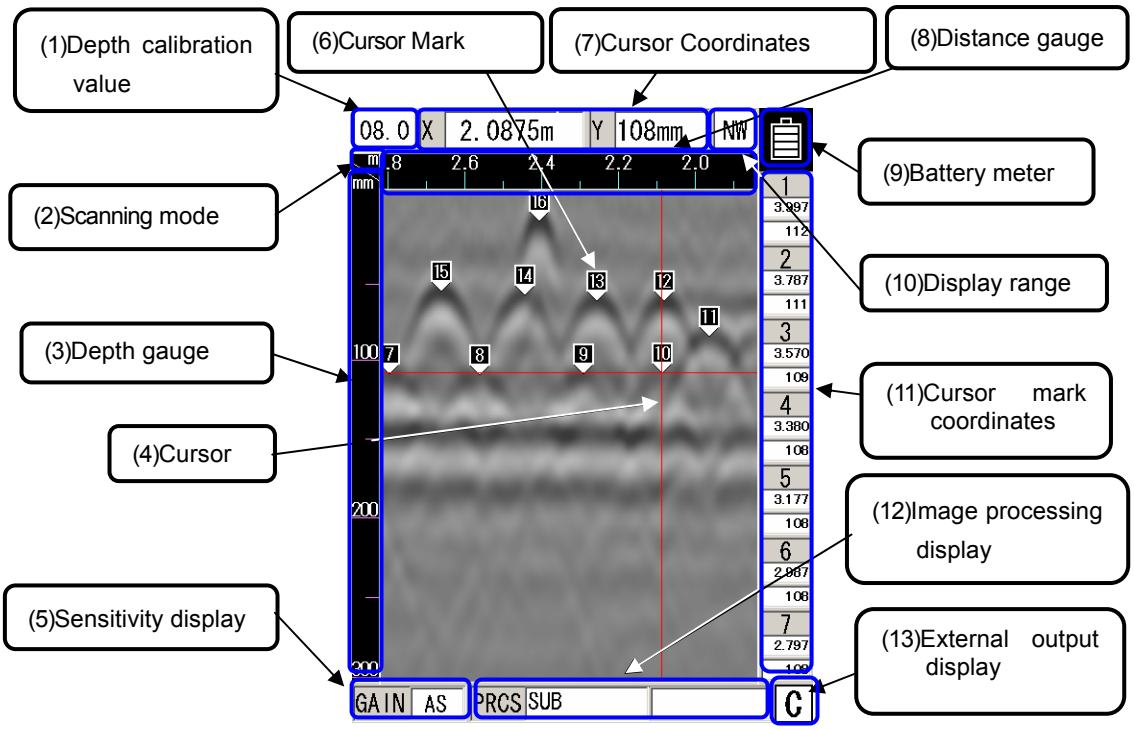


Figure 2-5 Sensing test screen example (not during sensing)

(1) Depth calibration value

Displays the depth calibration value set at the parameter setting screen. See Section 2.3.6 depth to set the depth calibration value.

(2) Scan mode

Displays the selected scan mode set at the parameter setting screen. When selecting Distance feed scan, m , cm , or mm is displayed. When selecting Time feed scan, s is displayed. See Section 2.3.5 X-axis to set the scan mode.

(3) Depth gauge

Displays a search depth gauge. The search depth gauge changes based on the depth calibration value.

(4) Cursor

Is a criss-cross cursor that is used to place a cursor marker on the scan screen, to scroll the scan screen, and to designate the position of the A-mode waveform displayed on the B-mode display.

(5) Sensitivity display

Displys the sensitivity setting. See Section 3.3.2 Sensitivity switching for the method to switch sensitivity.

(6) Cursor marker

Displays the position of cursor markers. See Section 3.3.3 Cursor operation for how to display and erase the cursor marker.

(7) Cursor coordinates

Displays the coordinates of the cross point of the cursor described in the item (4) above. The distance moved is shown in the X field and depth in the Y field.

(8) Distance gauge

Displays the distance gauge in the direction the scan is performed. This gauge displays the distance this product has moved.

(9) Battery meter

Displays the remaining power in the battery pack.

(10) Display range

Displays the display range set at the parameter setting screen. See Section 2.3.11 disp. range for the method to set the display range.

(11) Cursor marker coordinates

Displays the coordinates of the cursor marker described in the item (6) above. Below each of the marker numbers, the movement distance (X) is shown in the first row and the depth (Y) is shown in the second row.

The movement distance value is displayed with truncating 0.5mm order. Therefore when the least significant number is 2 or 7, treat it as 25 or 75, respectively.

Example: when the cursor marker coordinate X = 1.002, the actual marker coordinate is 1.0025.

(12) Image processing display

Displays the selected image processing which is performed to the scan results. See Section 3.4 Image processing for more details.

(13) External data output display

Displays the selected external data output (output destination) set at the parameter setting screen. See Section 2.3.10 External data output for how to use the external data output.

2.3 Parameter setting screen

The parameter setting screen Is used to see the current setting and to change the setting for each parameter. To access this screen, press the [4] **SET** key while the scan is stopped, then the parameter setting screen shown in Figure 2-6 appears. To change the setting of a parameter, move the cursor (inverse video line) on the parameter by pressing the ▲▼ cursor keys, press the ◀ ▶ cursor keys to enter into the setting field of the parameter. Select a desired setting by pressing the ▲▼ cursor keys, then press the ◀ ▶ cursor keys to exit from the setting field. To exit from the parameter setting screen, press the [4] **SET** key again.

Regarding the operation to read out the scan data in CF memory, see Section 3.7.2 Reading saved data.

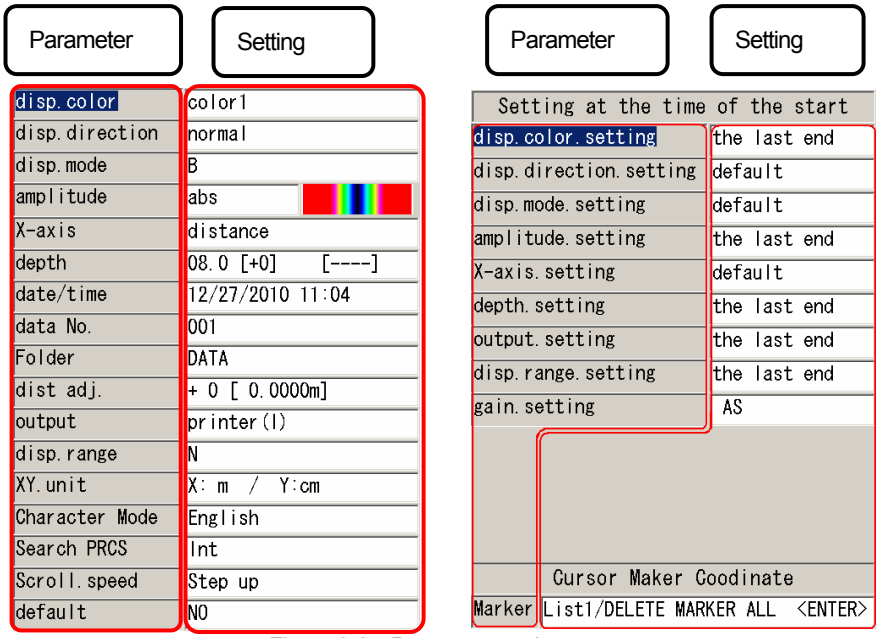


Figure 2-6 Parameter setting screen

2.3.1 disp. color

You can specify the display color used in the B-mode display by this parameter. The available settings are Color1, Color2, Color3, Monochrome1, or Monochrome2. Set a desired setting to this parameter in accordance with the method described in section 2.3. When changing the setting, the color bar displayed at the amplitude setting field automatically changes and shows visually the selected display color.

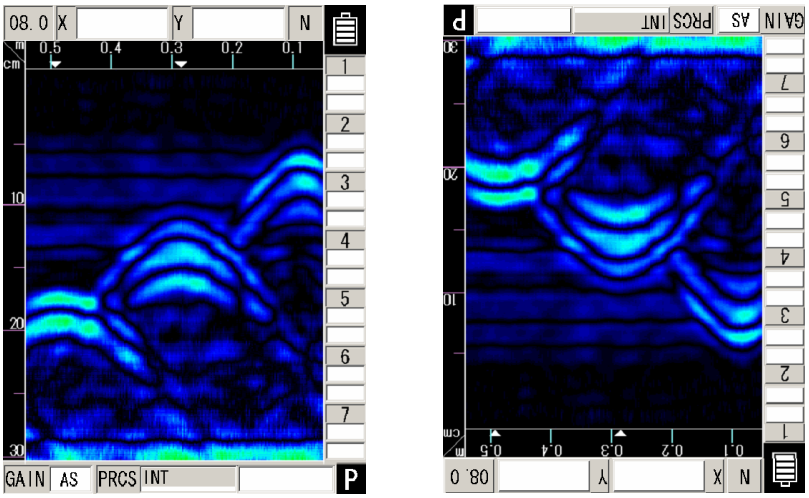
2.3.2 disp. direction

You can specify the display direction by this parameter. The available settings are normal and invert. When setting invert to this paramter, the screen display is inverted on the scan screen

while scanning to the right or to the left. The examples of the screen display for normal and invert settings are shown in Figure 2-7. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

Remarks

- The direction of the image data output to the printer (optional) follows the setting of the display directcion . To output image data to the printer always in the same direction, set the same setting to the display direction.
- While the screen display is inverted, the cursor keys ▲▼◀▶ work in the opposite direction. (They work in the same direction as when normal is selected for the display direction.)



Screen display direction [Normal] Screen display direction [invert]

Figure 2-7 Screen display inversion

2.3.3 disp. mode

You can specify the display mode by this parameter. The available settings are B and BA. This product supports two display modes of B-mode (vertical cross section) and BA-mode (vertical cross section and reflected waveform display). When setting B to this parameter, the scan result is displayed in the B-mode. When setting BA to this parameter, the scan result is displayed in the BA-mode. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

Remarks

- When the display mode is switched between B and BA after scanning, the data scanned in the B-mode is displayed in the BA-mode, and the data scanned in the BA-mode is displayed in the B-mode. See Section 3.3.1 Mode switching.

2.3.4 amplitude

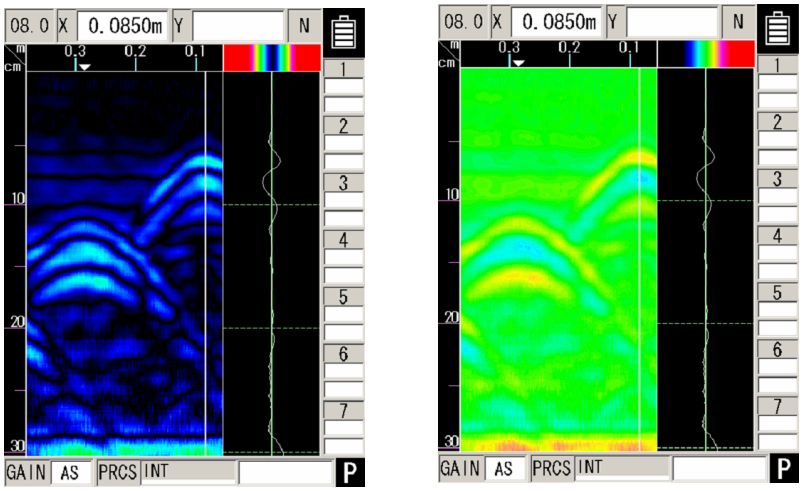
You can specify the zero axis of the A-mode waveform and the color gradation used in the B-mode display by this parameter. The available settings are abs and offset.

The abs sets the zero axis of the A-mode waveform (absolute amplitude) at the vertical center line in the A-mode diaply, and the offset sets the zero axis of the A-mode waveform (offset amplitude) at the left edge of the A-mode display.

When the display color is set to Color1, Color2, or Color3, the abs uses the color gradation in the B-mode display which changes the drawing color between Black → Indigo → Green → Yellow → Red as the absolute amplitude of the A-mode waveform increases as shown in Figure 2-8 Abosolute value. The offset uses the color gradation changing the drawing color between Black → Indigo → Green → Yellow → Red as the offset amplitude of the A-mode waveform increases as shown in Figure 2-8 Offset.

When the display color is set to Monochrome1 or Monochrome2, the abs uses the color gradation in the B-mode display which changes the drawing color between White → Gray → Black as the absolute amlitude of A-mode waveform increases. The offset uses the color gradation changing the drawing color between White → Gray → Black as the offset amlitude of the A-mode waveform increases.

Set a desired setting to this parameter in accordance with the procedure described in section 2.3.



Absolute value Offset

Figure 2-8 Gradation

2.3.5 X-axis

You can specify the scan mode by this parameter. The available settings are distance (distance feed) and time (time feed). When distance is selected, this product scans and displays the scan result in units of 2.5 mm in the B or BA-mode display with synchronizing the wheels' moving distance. When time is selected, this product scans and displays the scan result at 50 ms intervals in the B or BA-mode display, regardless of the wheels' moving distance. Set a desired scan mode to this parameter in accordance with the procedure described in section 2.3.

2.3.6 depth

You can specify the depth calibration value (correction constant used for the depth calibration) by this parameter. Enter the relative dielectric constant of the concrete being scanned to this parameter. For the relative dielectric constant, refer to Glossary of Terms.

This product corrects the depth guage by using the depth calibration value (relative dielectric constant of the concrete) entered in this parameter. The relative dielectric constant depends on the condition (such as moisture content) of the concrete being scanned. Therefore the more difference between the actual relative dielectric constant of the concrete and the entered value, the more the depth error. Set an appropriate value to this parameter in accordance with the procedure described in section 2.3.

In order to reduce the depth error, perform the depth calibration before the scanning by performing the following procedure. Scan the object whose actual depth is known (Ex. the rebar with a known depth) and detect the depth of the object. Then adjust the depth calibration value so as the depth value displayed in the scan result matches the known depth. If the object with the known depth is not avaialble and the relative dielectric constant of the concrete is unclear, it is recommended to set 08.0 (+0) to this parameter.

Remarks

- Each interval between neighboring two scales on the depth gauge is not same. Use the depth value (Y) displayed at the cursor coordinates or cursor marker coordinates.
- The right hand side of the display field for the depth calibration value displays the depth value (Y) at the cursor position.

2.3.7 date/time

You can set the date and time by this parameter. This product keeps and updates the date and time in an internal non-volatile memory powered by a built-in rechargeable button-type lithium battery. Set the correct time and date to this parameter in accordance with the procedure described in section 2.3.

2.3.8 data No.

You can specify the data number for the external output dat by this parameter. The scan result data is recorded and numbered when being externally output. This parameter displays the current data number of the output data, and the data number (Data No.) in this parameter is incremented each time when the data is recorded and output. Set a desired data number to this parameter in accordance with the procedure described in section 2.3.

Remarks

- When the data are recorded again, it can be easily managed by changing the value of the data No.

2.3.9 Folder

You can specify one folder among 10 predefined folders in the CF memory by this parameter. The file operation (saving, reading, and deleting the scan data file) is performed under the specified folder in the CF memory. The available settings are DATA, DATA02, ---, DATA10. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

Remarks

- When using a blank CF memory (which does not have any folders of DATA, DATA02, ---, DATA10), insert the CF memory into this product and cycle the power of the product. Then this product creates 10 folders automatically in the CF memory. When the CF memory has only DATA folder, cycling the power of this product creates 9 folders of DATA02, ---, DATA10 automatically.
- Regarding the data save/recall operation of the scan data in CF memory, see Section 3.6 External output methods and Section 3.7 CF Control Screen.

2.3.10 dist. adj.

You can specify the distance correction constant by this parameter. This product determines its scanning distance using the number of rotations of the wheel. Thus, wear of the wheels causes error in determining the scanning distance. To remove erro in the scanning distance, this product compensates the detected distance by using the distance correction constant set to this parameter. If the scanning distance has error, enter the correct distance correction constant to this parameter by performing the following procedure.

Example of the scanning distance compensation:

a) Perform a 1m (actual value) scan and stop the scan.
b) Press the 4 **SET** key to show the parameter setting screen
c) Select the dist.. adj by using the ▲▼ cursor keys and enter the setting field by using the ◀ ▶ cursor keys.
d) Adjust the distance correction constant by using the ▲▼ cursor keys so as the distance value displayed by [ ] to the right of the distance correction constant is as close as possible to 1 m.
e) Exit from the setting field by using the ◀ ▶ cursor keys and press the 4 **SET** key to return to the scan screen.

Remarks

- The scanning distance of the last scanning is displayed at the right of the distance correction constant. When the distance correction constant is changed, the scanning distance is also changed. Adjust the distance correction constant by refering this scanning distance value.
- The new distance correction constant becomes effective from the next scan. The new distance constant is not reflected to the existing test results.
- When setting a value ≧13 to the distance correction constant , scanning the distance longer than 10m, and printing the scan result at the wide display range setting (DW :Deep Wide, NW :Normal Wide, SW :Shallow Wide), the printed result may show a part which is difficult to read.

2.3.11 output

You can specify the destination and format of the external data output by this parameter. The available settings are printer(I) , CF[text] , and CF[binary] . Also a character showing the current setting is displayed at the lower right of the scan screen. The table below shows the relationship among the setting, destination and format, and character displayed at the lower right of the scan screen . See Section 3.6 External output methods for the operation method. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

Setting	External data output	Character displayed on the scan screen
Printer (I)	Print to the printer	P
CF [text]	Saved in text format in CF memory	C
CF [binary]	Saved in binary format in CF memory	C

2.3.12 disp. range

You can specify the display range of the search depth and distance range by this parameter. The available settings are D (Deep), N (Normal), S (Shallow), DW (Deep Wide), NW (Normal Wide), SW (Shallow Wide). Select a setting based on depth of the object to be scanned as follows.

Depth of the targeted object is 30 cm or less: D , DW

Depth of the targeted object is 20cm or less: N , NW

Depth of the targeted object is 10cm or less: S , SW

Set a correct setting to this parameter in accordance with the procedure described in section 2.3.

2.3.13 XY.unit

You can specify the unit of the displayed value in the scan screen and the cursor marker list by this parameter. The available settings are X: m , X:cm , and X:mm for the vertical direction (X), and Y:cm and Y:mm for the depth direction (Y). Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

Remarks

- The XY.unit setting is kept in the nonvolatile memory after turning off the product.

2.3.14 Character Mode

You can specify the language of the displayed characters by this parameter. The available settings are Japanese and English . Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.15 Search PRCS

You can specify the image processing which is executed in real time during scanning by this parameter. The available settings are Int and User. For the image processing of the Int setting, see Section 3.4.1 Fixed surface wave processing. For the image processing of the User setting, see Section 3.4.2 User surface wave processing. The graphical image displayed after completing the scan is also image-processed by the selected image processing in this parameter. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.16 Scroll.speed

You can specify a scrolling speed by this parameter. The available settings are Step up and Constant. Select Step up when the scrolling speed is getting faster gradually. Select Constant when the scrolling speed is constant. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

Remarks

- By using the setting of Constant, you can confirm the number of rebar and the reinforced condition in the concrete by scrolling the scan screen.

2.3.17 default

You can reset all the parameters other than the Data/time back to the standard settings (initial settings at the factory shipment) by this parameter. To revert to the standard settings, set YES to this parameter in accordance with the procedure described in Section 2.3. After resetting the parameters, the settting of this parameter changes automatically to NO .

2.3.18 disp.color. setting

You can specify the initial setting for disp. color (the display color) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous setting at the power off to the display color at the power on. The default sets the pre-defined setting (color1) to the display color at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.19 disp. direction. setting

You can specify the initial setting for disp. direction (the display direction) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous setting at the power off to the display direction at the power on. The default sets the pre-defined setting (normal) to the display direction at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.20 disp.mode. setting

You can specify the initial setting for disp. mode (the display mode) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous setting at the power off to the display mode at the power on. The default sets the pre-defined display mode (B) to the display mode at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.21 Amplitude. setting

You can specify the initial setting for amplitude (the amplitude specifying zero axis of the A-mode waveform and the color gradation of the B-mode display) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous setting at the power off to the amplitude at the power on. The default sets the pre-defined setting (abs) to the amplitude at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.22 X-axis. setting

You can specify the initial setting for X-axis (the X-axis specifying a scan mode) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous setting at the power off to the X-axis at the power on. The default sets the pre-defined setting (distance) to the X-axis at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.23 depth. setting

You can specify the initial value for depth (the depth specifying a depth calibration value) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous value at the power off to the depth at the power on. The default sets the pre-defined value (8) to the depth at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.24 output. setting

You can specify the initial setting for output (the external data output) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous value at the power off to the output at the power on. The default sets the pre-defined value (printer (I)) to the output at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.25 disp. range. setting

You can specify the initial setting for disp. range (the display range) at the power on by this parameter. The available settings are the last end and default. The the last end sets the previous value at the power off to the display range at the power on. The default sets the pre-defined value (N) to the display range at the power on. Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.26 gain. setting

You can specify the initial setting for GAIN (the sensitivity) at the power on by this parameter. The available settings are -2S (-2, shallow), -1S (-1, shallow), AS (A, shallow), +1S (+1, shallow), +2S (+2, shallow), -2D (-2, deep), -1D (-1, deep), AD (A, deep), +1D (+1, deep), +2D (+2, deep). Set a desired setting to this parameter in accordance with the procedure described in section 2.3.

2.3.27 Marker

You can display cursor marker coordinate lists (X, Y, and Pitch) and delete some or all cursor markers by using this field. This field has two subfields: List x / DELETE MARKER xxxxx. The available setting for List x are List1, List2, List3, and List4. The List1, List2, and List3 display the list of every 14 cursor marker coordinates (X, Y, and Pitch). The List4 displays the maximum, minimum, and average depth and pitch of all cursor markers. The available settings for DELETE MARKER xxxxx are DELETE MARKER ALL, DELETE MARKER 1– 7, DELETE MARKER 8–14, DELETE MARKER 15 – 21, DELETE MARKER 22 – 28, DELETE MARKER 29–35, DELETE MARKER 36–42. You can delete all or 7 cursor markers at one time by selecting one of these available settings. For more details about cursor marker coordinate list and cursor marker group delete, see Section 3.3.3 Cursor Operation.

2.4 CF Control screen

While scanning is in off status and the 12 **CF** key is pressed, the screen switches to the CF control screen and CF memory control can be performed. To return to the scan screen, press the 12 **CF** key once more. See Sections 3.6.2 to 3.7.4 for how to control the CF memory. The CF control screen is shown in Figure 2-9.

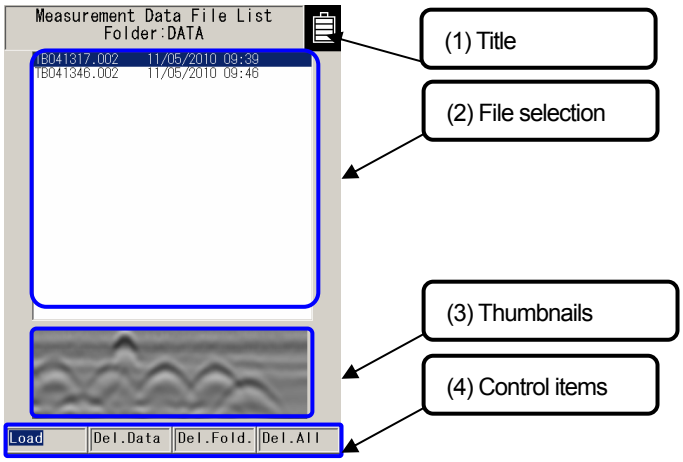


Figure 2-9 CF Control Screen

(1) Title

Displays the folder name accessed on the CF memory. To change the accessed folder, see Section 2.3.9 Folder.

(2) File selection

Displays the file names for data saved on the CF memory. To select a file, move the cursor (inverse video line) on the desired file by pressing the ▲▼ cursor keys.

(3) Thumbnail image display

Displays the scan result stored in the file selected in (1) as a thumbnail.

(4) Control functions

Displays control functions (Load , Del.Data , Del.Fold. , and Del.All) for the CF memory. To select and execute a function, move the cursor (inverse video line) on the desired function by pressing the ◀ ▶ cursor keys and press the 5 **ENTER** key.

Remarks

- The thumbnail displays a part of the selected file (Distance direction; around 0.5 m, depth direction: around half of the display range). The image processing selected at the image processing setting is applied to the thumbnail image.